Rockwell International

overhaul manual

Collins Air Transport Division

Collins 618T-( )
Airborne SSB Transceivers

618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-4

Insert facing page 825/826, 23-10-0

Subject: Chassis A, Schematic Diagram

Reverse the polarity of the diode, CR11, which is connected between tie point E4 and terminal 5 of relay K6.

618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-4

Insert facing page 881/882, 23-10-0

Subject: 27.5-V dc High-Voltage Power Supply A8, Schematic Diagram

Reverse the polarity of the diode, CR33, which is connected between ground and terminal 2 of relay K2.

618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-5

This TEMPORARY REVISION replaces TEMPORARY REVISION NO 23-10-0-4

Insert facing page 825/826, 23-10-0

Subject: Chassis A, Schematic Diagram

Reverse the polarity of the diode, CR11, which is connected between tie point E42 and terminal 5 of relay K6.

618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-5

This TEMPORARY REVISION replaces TEMPORARY REVISION NO 23-10-0-4

Insert facing page 881/882, 23-10-0

Subject: 27.5-V dc High-Voltage Power Supply A8, Schematic Diagram

Reverse the polarity of the diode, CR33, which is connected between ground and terminal 2 of relay K2.

618T-( ) AIRBORNE SSB TRANSCEIVERS

OVERHAUL MANUAL (520-5970003)

TEMPORARY REVISION NO 23-10-0-6

Insert facing page 762, 23-10-0

Subject: Module checks and adjustments, IF Translator A3, Figure 712

Replace the portion of test step 6.0 that exists on pages 763 and 764 with the following sheets. Insert sheet 2 facing page 763 and sheet 3 facing page 764.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Remove short from A3C9.			
			Set 714E-( ) to AM.			
			Check voltage on Boonton 91-C RF VTVM.	0.24 to 0.38 V. NOTE: Result based on a 1.7 V rms carrier reading at A3J4. See test step 4.	Value of A3R42.	Select value of A3R42 that will provide required results from complement given in 618T-( ) illustrated parts catalog.
			Connect 678Z-1 and audio oscillator as shown in figure 702.			
			Key 618T-( ) and set audio oscillator output to 1.0 kHz, 0.25 v as measured with Ballantine 310A VTVM at 678Z-1 TEST POINT jack.			
			Determine the frequency which results in the lowest gain on USB or LSB in the range of 900 to 2800 Hz by keying the 618T-( ) and switching between USB and LSB sidebands. The sideband setting which gives the lowest voltage on the Boonton 91-C RT VTVM at the determined frequency, is the lower gain sideband.			
			Set 714E-( ) to lower gain sideband and set audio oscillator to the lowest gain frequency.			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Check voltage on the Boonton 91-C RF VTVM.	0.31 to 0.39 v. NOTE: Result based on a 1.7 V rms carrier reading at A3J4. See test step 4.	Value of A3R2.	Select value of A3R2 that will provide results from the values given in the 618T-( ) illustrated parts catalog.
			Set 714E-( ) to higher gain sideband.			
			While keying the 618T-( ), determine the frequency in the 900 to 2800 Hz range which results in the lowest gain.			
			Set audio oscillator to lowest gain frequency.			
			Check voltage on the Boonton 91-C RF VTVM.	Within 2 db of voltage noted in previous step.	Value of A3R45.	Select value of A3R45 that will provide results from the values given in the 618T-( ) illustrated parts catalog.
			Disconnect audio oscillator.			

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Apr 1/61
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International

overhaul manual

Collins 618T-( )
Airborne SSB Transceivers

This manual includes coverage of the following equipment:

Airborne SSB Transceivers

Model No	*Collins Part No*	*Model No*	*Collins Part No*
618T-1	*522-1230-000*	*618T-3B*	*522-4830-001*
	-021, -022		*-002*
	-023	*618T-4*	*622-2586-001*
618T-1B	*522-4828-001*		*-002*
	-002	*618T-4B*	*622-2587-001*
618T-2	*522-1501-000*	*618T-5*	*622-2588-001*
	-041, -043, -044		*-002*
618T-2B	*522-4829-001*	*618T-5B*	*622-2589-001*
	-002	*618T-6*	*622-2590-001*
618T-3	*522-1660-000*		*-002*
	-031, -033, -034	*618T-6B*	*622-2591-001*

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Rockwell International
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RECORD OF REVISIONS

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We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, the paragraph or figure number, and the page number.

Send your comments to: Publications Department
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The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have complete and up-to-date publications by referring to the applicable Publications and Service Bulletin Indexes.

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	*850B	Blank Added		883	Feb 15/68
				884	Blank
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	801/34	Blank		801/77	Feb 15/68
	*801/35	Oct 1/78		801/78	Blank
	801/36	Blank		801/79	Feb 15/68
	801/37	Feb 15/68		801/80	Blank
	801/38	Blank		801/81	Feb 15/68
	*801/39	Oct 1/78		801/82	Blank
	801/40	Blank		801/83	Feb 15/68
	801/41	Nov 1/75		801/84	Blank
	801/42	Blank		801/85	Dec 1/72
	801/43	Nov 1/75		801/86	Blank
	801/44	Blank		801/87	Dec 1/72
	801/45	Nov 1/75		801/88	Blank
	801/46	Blank		801/89	Nov 1/75
	801/47	Nov 1/75		801/90	Blank
	801/48	Blank		801/91	Nov 1/75
	801/49	Feb 15/68		801/92	Blank
	801/50	Blank		*801/93	Oct 1/78
	801/51	Feb 15/68		801/94	Blank
	801/52	Blank		*801/95	Oct 1/78
	801/53	Feb 15/68		801/96	Blank
	801/54	Blank		801/97	Feb 15/68
	801/55	Feb 15/68		801/98	Blank
	801/56	Blank		801/99	Feb 15/68

*The asterisk indicates pages changed, added, or deleted by the current change.

LIST OF EFFECTIVE PAGES

SUBJECT	PAGE	DATE	SUBJECT	PAGE	DATE
	801/100	Blank			
	801/101	Feb 15/68			
	801/102	Blank			
	801/103	Feb 15/68			
	801/104	Blank			
	801/105	Feb 15/68			
	801/106	Blank			
	801/107	Feb 15/68			
	801/108	Blank			
	801/109	Feb 15/68			
	801/110	Blank			
	801/111	Feb 15/68			
	801/112	Blank			
	801/113	Feb 15/68			
	801/114	Blank			
	801/115	Feb 15/68			
	801/116	Blank			
Storage	901	Feb 15/68			
Instructions	902	Blank			
Special Tools,	1001	Dec 1/72			
Fixtures, and	1002	Mar 1/74			
Test Equipment	1003	Feb 15/68			
	1004	Blank			
	1005	Feb 15/68			
	1006	Blank			
	1007	Feb 15/68			
	1008	Apr 15/70			
	1009	Apr 15/70			
	1010	Feb 15/68			
	1011	Apr 15/70			
	1012	Feb 15/68			

*The asterisk indicates pages changed, added, or deleted by the current change.

LIST OF EFFECTIVE TEMPORARY REVISION PAGES

NO	SUBJECT	PAGE	DATE	NO	SUBJECT	PAGE	DATE

This page replaces List of Effective Temporary Revision Pages dated Nov 1/75.

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1/4			
1	To improve APC suppression at relay K1 contacts to the Autopositioner® assembly		
2	To improve operation in CW function		
3	To improve discriminator output of power amplifier		
4	A: Installation of improved high-voltage connectors B: Installation of guide plate and indexing pin to ensure installation of unit to shockmount having correct power source.		
5	A: Prevention of sidetone output before operation of 30-second time delay relay K7 B: Improvement in dropout action of sidetone relay K6 C: Addition of 115-volt, 400-cycle safety interlock D: Improvement in microphone audio switching		
6	To minimize possibility of vfo locking on wrong frequency		
7	Substitution of variable frequency oscillator 70K-5 for variable frequency oscillator 70K-3		
8	Enable gain of AM/audio modules with MCN above 2649 and 3058 to be more easily adjusted		
9	Increase power dissipation rating of resistor R3 in power amplifier		
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1/4 (Cont)			
10	Increase SELCAL gain and improve isolation between SELCAL and audio input circuits		
11	Counteract effects of variations in semiconductor characteristic in keyer circuit operation	4	5-15-64
12	Provide transient protection for relays K2 and K6 and allow relays from different vendors to be used in K7 position	7	7-15-66
13	Add filter to 18-volt dc input line	4	5-15-64
14	Improve reliability and performance of pa module	4	5-15-64
15	Improved transmit gain control circuit	4	5-15-64
16	Substitution of 618T-1/2 chassis relays K2, K3, and K4	7	7-15-66
17	Replace 70K-5 variable frequency oscillator with 70K-9 variable frequency oscillator	8	2-15-68
18	Squelch capability	8	2-15-68
19	Transmit gain control circuit change, capacitor C20	8	2-15-68
20	Negative transient voltage protection on 27.5-Vdc input	9	8-15-68
21	Reduction of internal signals	10	4-15-70
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1/4 (Cont)			
22	Reduce possibility of transient voltages	11	3-15-71
23	Improved transceiver reliability	10	4-15-70
24	Short protection for 18-volt dc regulator	10	4-15-70
25	Suppression of 300-MHz parasitic oscillators	10	4-15-70
26	Conversion to hermetically sealed relays K2, K3, and K4	*	*
27	Replacement of filters FL1 and FL2	12	12-1-72
28	28-volt blanker transient protection	12	12-1-72
29	Parallel contact wiring of chassis relay K4	12	12-1-72
30	Modify filter circuit in 18-volt dc line	12	12-1-72
31	Replace ALC amplifier A3Q1	13	Mar 1/74
32	Elimination of spike when power is turned on	14	Nov 1/75
33	Replacement of diode quad packages (A3CR1)	13	Mar 1/74
34	Replacement of switch S7 on Auto-positioner	14	Nov 1/75
35	Elimination of spike when power is turned off	14	Nov 1/75
36	Narrow-band 618T-1 conversion to 618T-4	14	Nov 1/75
37	Wide-band 618T-1 conversion to 618T-4	14	Nov 1/75

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1B/4B			
1	Negative transient voltage protection	9	8-15-68
2	Addition of voltage-controlled oscillator filter	10	4-15-70
3	Reduce possibility of transient voltages	11	3-15-71
4	Improved reliability of the transceiver	10	4-15-70
5	Reduction of internal signals	10	4-15-70
6	Short protection for 18-volt dc regulator	10	4-15-70
7	Suppression of 300-MHz parasitic oscillations	10	4-15-70
8	Addition of divider-stabilizer filter	10	4-15-70
9	Conversion to hermetically sealed relays K2, K3, and K4	*	*
10	Replacement of filters FL1 and FL2	12	12-1-72
11	28-volt blanker transient protection	12	12-1-72
12	Parallel contact wiring of chassis relay K4	12	12-1-72
13	Reduction of internal signals	12	12-1-72
14	Replace ALC amplifier A3Q1	13	Mar 1/74
15	Elimination of spike when power is turned on	14	Nov 1/75
16	Replacement of diode quad packages (A3CR1)	14	Nov 1/75
(Cont)			

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1B/4B (Cont)			
17	Replacement of switch S7 on Auto-positioner	14	Nov 1/75
18	Eliminate spike when power is turned off.	14	Nov 1/75
19	Narrow-band 618T-1B conversion to 618T-4B	14	Nov 1/75
20	Wide-band 618T-1B conversion to 618T-4B	14	Nov 1/75
618T-2/5			
1	To improve ARC suppression of relay K1 contacts in the Autopositioner assembly		
2	To improve operation in CW function		
3	To improve discriminator output of power amplifier		
4	A: Installation of improved high-voltage connectors B: Installation of guide plate and indexing pin to ensure installation of unit to shockmount having correct power source		
5 (Cont)	A: Prevention of sidetone output before operation of 30-second time delay relay K7		

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2/5 (Cont)	B: Improvement in dropout action of sidetone relay K6 C: Addition of 115-volt, 400-cycle safety interlock D: Improvement in microphone audio switching		
6	To minimize possibility of vfo locking on wrong frequency		
7	Substitution of variable frequency oscillator 70K-5 for variable frequency oscillator 70K-3		
8	Enable gain of AM/audio modules with MCN above 2649 and 3058 to be more easily adjusted		
9	Increase power dissipation rating of resistor R3 in power amplifier		
10	Increase SELCAL gain and improve isolation between SELCAL and audio input circuits		
11	Counteract effects of variations in semiconductor characteristics on keyer circuit operation	4	5-15-64
12	Provide transient protection for relays K2 and K6 and allow relays from different vendors to be used in K7 position	7	7-15-66
13	Add filter to 18-volt dc input line	4	5-15-64
14	Improve reliability and performance at pa module	4	5-15-64
15	Improved transmit gain control circuit	4	5-15-64
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2/5 (Cont)			
16	Substitution of 618T-1/2 chassis relays K2, K3, and K4	7	7-15-66
17	Replace 70K-5 variable frequency oscillator with 70K-9 variable frequency oscillator	8	2-15-68
18	Step-start circuit modification	8	2-15-68
19	Squelch capability	8	2-15-68
20	Transmit gain control circuit change, capacitor C20	9	8-15-68
21	Negative transient voltage protection on 27.5-Vdc input	10	4-15-70
22	Reduce possibility of transient voltages	11	3-15-71
23	Reduction of internal signals	10	4-15-70
24	Improved transceiver reliability	10	4-15-70
25	Short protection for 18-volt dc regulator	10	4-15-70
26	Suppression of 300-MHz parasitic oscillations	11	3-15-71
27	Addition of improved relay	10	4-15-70
28	Conversion to hermetically sealed relays K2, K3, and K4	*	*
29	Replacement of filters FL1 and FL2	12	12-1-72
30	28-volt blanker transient protection	12	12-1-72
(Cont)			

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2/5 (Cont)			
31	Parallel contact wiring of chassis relay K4	12	12-1-72
32	Provide positive squelch override	12	12-1-72
33	Modify filter circuit in 18-volt dc line	12	12-1-72
34	Replace ALC amplifier A3Q1	13	Mar 1/74
35	Elimination of spike when power is turned on	14	Nov 1/75
36	Replacement of diode quad packages (A3CR1)	13	Mar 1/74
37	Replacement of switch S7 on Autopositioner	14	Nov 1/75
38	Elimination of spike when power is turned off	14	Nov 1/75
39	Narrow-band 618T-2 conversion to 618T-5	14	Nov 1/75
40	Wide-band 618T-2 conversion to 618T-5	14	Nov 1/75
618T-2B/5B			
1	Negative transient voltage protection on 27.5-Vdc input	9	8-15-68
2	Addition of voltage-controlled oscillator filter	10	4-15-70
3	Reduce possibility of transient voltages	11	3-15-71
4	Improved reliability of the transceiver	10	4-15-70
5	Reduction of internal signals	10	4-15-70
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2B/5B (Cont)			
6	Short protection for 18-volt dc regulator	10	4-15-70
7	Suppression of 300-MHz parasitic oscillations	10	4-15-70
8	Addition of divider-stabilizer filter	10	4-15-70
9	Addition of improved relay	10	4-15-70
10	Conversion to hermetically sealed relays K2, K3, and K4	*	*
11	Replacement of filters FL1 and FL2	12	12-1-72
12	28-volt blanker transient protection	12	12-1-72
13	Parallel contact wiring of chassis relay K4	12	12-1-72
14	Provide positive squelch override	12	12-1-72
15	Reduction of internal signals	12	12-1-72
16	Modify filter circuit in 18-volt dc line	12	12-1-72
18	Replace ALC amplifier A3Q1	13	Mar 1/74
19	Elimination of spike when power is turned on	14	Nov 1/75
20	Replacement of diode quad packages (A3CR1)	13	Mar 1/74
21	Replacement of switch S7 on Auto-positioner	14	Nov 1/75
22	Elimination of spike when power is turned off	14	Nov 1/75
(Cont)			

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2B/5B (Cont)			
23	Narrow-band 618T-2B conversion to 618T-5B	14	Nov 1/75
24	Wide-band 618T-2B conversion to 618T-5B	14	Nov 1/75
618T-3/6			
1	To improve ARC suppression at relay K1 contacts in the Autopositioner assembly		
2	To improve operation in CW function		
3	To improve discriminator output of power amplifier		
4	A: Installation of improved high-voltage connectors B: Installation of guide plate and indexing pin to ensure installation of unit to shockmount having correct power source		
5	A: Prevention of sidetone output before operation of 30-second time delay relay K7 B: Improvement in dropout action of sidetone relay K6 C: Addition of 115-volt, 400-cycle safety interlock D: Improvement in microphone audio switching		
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3/6 (Cont)			
6	To minimize possibility of vfo locking on wrong frequency		
7	Substitution of variable frequency oscillator 70K-5 for variable frequency oscillator 70K-3		
8	Enable gain of AM/audio modules with MCN above 2649 and 3508 to be more easily adjusted		
9	Increase power dissipation rating of resistor R3 in power amplifier		
10	Increase SELCAL gain and improve isolation between SELCAL and audio input circuits		
11	Counteract effects of variations in semiconductor characteristics on keyer circuit operation		
12	Provide transient protection for relays K2 and K6 and allow relays from different vendors to be used on K7 position		
13	Add filter to 18-volt dc input line		
14	Improve reliability and performance of pa module		
15	Improved transmit gain control circuit		
16	Replacement of 2N1100 transistor in the dc high-voltage power supply module A8		
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3/6 (Cont)			
17	Substitution of 618T-3 chassis relays K2, K3, and K4	8	2-15-68
18	Replace 70K-5 variable frequency oscillator with variable frequency oscillator 70K-9	8	2-15-68
19	Squelch capability	8	2-15-68
20	Transmit gain control circuit change, capacitor C20	9	8-15-68
21	Negative transient voltage protection on 27.5-Vdc input	10	4-15-70
22	Reduction of internal signals	11	3-15-71
23	Reduce possibility of transient voltages	10	4-15-70
24	Improved transceiver reliability	10	4-15-70
25	Short protection for 18-volt dc regulator	10	4-15-70
26	Suppression of 300-MHz parasitic oscillations	11	3-15-71
27	Conversion to hermetically sealed relays K2, K3, and K4	*	*
28	Replacement of filters FL1 and FL2	12	12-1-72
29	28-volt blanker transient protection	12	12-1-72
30	Dc high-voltage relay change	12	12-1-72
(Cont)			

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3/6 (Cont)			
31	Parallel contact wiring of chassis relay K4	12	12-1-72
32	Provide positive squelch override	12	12-1-72
33	Modify filter circuit in 18-volt dc line	12	12-1-72
34	Replace ALC amplifier A3Q1	13	Mar 1/74
35	Elimination of spike when power is turned on	14	Nov 1/75
36	Hv power supply transistors 1A8Q9, 1A8Q10, 1A8Q11, and 1A8Q12 replacement.	13	Mar 1/74
37	Replacement of diode quad packages (A3CR1)	14	Nov 1/75
38	Replacement of switch S7 on Auto-positioner	14	Nov 1/75
39	Elimination of spike when power is turned off	14	Nov 1/75
40	Narrow-band 618T-3 conversion to 618T-6	14	Nov 1/75
41	Wide-band 618T-3 conversion to 618T-6	14	Nov 1/75
618T-3B/6B			
1	Negative transient voltage protection on 27.5-Vdc input	9	8-15-68
2	Addition of voltage-controlled oscillator filter	10	4-15-70
(Cont)			

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3B/6B (Cont)			
3	Reduce possibility of transient voltages	11	3-15-71
4	Improved reliability of the transceiver	10	4-15-70
5	Reduction of internal signals	10	4-15-70
6	Short protection for 18-volt dc regulator	10	4-15-70
7	Suppression of 300-MHz parasitic oscillations	10	4-15-70
8	Addition of divider-stabilizer filter	10	4-15-70
9	Conversions to hermetically sealed relays K2, K3, and K4	*	*
10	Replacement of filters FL1 and FL2	12	12-1-72
11	28-volt blanker transient protection	12	12-1-72
12	Dc high-voltage relay change	12	12-1-72
13	Parallel contact wiring of chassis relay K4	12	12-1-72
14	Provide positive squelch override	12	12-1-72
15	Reduction of internal signals	12	12-1-72
16	Modify filter circuit in 18-volt dc line	12	12-1-72
18	Replace ALC amplifier A3Q1	13	Mar 1/74
19	Elimination of spike when power is turned on	14	Nov 1/75
(Cont)			

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3B/6B (Cont)			
20	Hv power supply transistors 1A8Q9, 1A8Q10, 1A8Q11, and 1A8Q12 replacement	13	Mar 1/74
21	Replacement of diode quad packages (A3CR1)	14	Nov 1/75
22	Replacement of switch S7 on Autopositioner	14	Nov 1/75
23	Elimination of spike when power is turned off	14	Nov 1/75
24	Narrow-band 618T-3B conversion to 618T-6B	14	Nov 1/75
25	Wide-band 618T-3B conversion to 618T-6B	14	Nov 1/75

TABLE OF CONTENTS

FOREWORD

This manual has been prepared in accordance with Air Transport Association Specification No. 100 for Manufacturer's Technical Data. If used as intended, this manual will facilitate the effective, continued operation of the 618T-1/1B/2/2B/3/3B/4/4B/5/5B/6/6B Airborne SSB Transceivers.

This manual contains all information required for shop testing, repair, and mechanical overhaul. It contains complete performance tests and functional (simple go/no-go) checks that may be used to determine whether the equipment needs repair.

To facilitate discussion, the term 618T-( ) will be understood to refer to all versions of the transceiver. The last digit or the last two digits will be used only when referring to a specific version; for example, 618T-3 or 618T-2B.

An alphanumerical prefix is assigned to components for ease of location. For example, A4A5R66 indicates that resistor R66 is located in module A4 on circuit board A5. Components without a prefix are located on the 618T-( ) chassis or front panel.

The following is a list of related publications.

PUBLICATION	COLLINS PART NUMBER
618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B Airborne SSB Transceivers Maintenance Manual (with installation data)	520-5970004
618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B Airborne SSB Transceivers Illustrated Parts Catalog	520-5970005
HF Interconnecting Wiring Diagrams Manual	523-0758695
714E-1/2( )/3( ) Radio Set Control Overhaul Manual	523-0759328
714E-6( ) Radio Set Control Overhaul Manual	523-0759269
678P-1/2 Radio Set Test Harness	523-0758156
678Y-1/3 Maintenance Kit	523-0757128
678Z-1 Function Test Set	523-0757125
390J-2 Shockmount, Unit Instructions	523-0756546

618T-1/2/3 Airborne SSB Transceivers

618T-1B/2B/3B Airborne SSB Transceivers

618T-( ) Airborne SSB Transceiver
Figure 1

618T-( ) Airborne SSB Transceiver - Description and Operation

1. GENERAL.

This manual contains information for disassembly, cleaning, inspection, repair, assembly, alignment, testing, adjustment, and troubleshooting of the 618T-( ) Airborne SSB Transceiver (refer to figure 1).

All procedures in this manual are to be performed in a maintenance shop with the proper test equipment.

Figure 2 is a list of equipment covered in this manual.

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
618T-1	Airborne SSB transceiver	522-1230-000
618T-1	Airborne SSB transceiver with squelch capability	522-1230-021
618T-1	Airborne SSB transceiver with narrow-band selectivity	522-1230-022 (See note 1.)
618T-1	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1230-023 (See note 1.)
618T-1B	Airborne SSB transceiver with squelch	522-4828-001
618T-1B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4828-002 (See note 1.)
618T-2	Airborne SSB transceiver	522-1501-000
618T-2	Airborne SSB transceiver with squelch capability	522-1501-041
618T-2	Airborne SSB transceiver with narrow-band selectivity	522-1501-043 (See note 1.)
618T-2	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1501-044 (See note 1.)
618T-2B	Airborne SSB transceiver with squelch	522-4829-001
618T-2B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4829-002 (See note 1.)
618T-3	Airborne SSB transceiver	522-1660-000
618T-3	Airborne SSB transceiver with squelch capability	522-1660-031
618T-3	Airborne SSB transceiver with narrow-band selectivity	522-1660-033 (See note 1.)
618T-3	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1660-034 (See note 1.)

Equipment Covered
Figure 2 (Sheet 1 of 3)

LIST OF EFFECTIVE TEMPORARY REVISION PAGES

NO	SUBJECT	PAGE	DATE	NO	SUBJECT	PAGE	DATE

This page replaces List of Effective Temporary Revision Pages dated Nov 1/75.

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
618T-3B	Airborne SSB transceiver with squelch	522-4830-001
618T-3B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4830-002 (See note 1.)
618T-4	Airborne SSB transceiver with narrow-band selectivity	622-2586-002
618T-4	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2586-001
618T-4B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2587-001
618T-5	Airborne SSB transceiver with narrow-band selectivity	622-2588-002
618T-5	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2588-001
618T-5B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2589-001
618T-6	Airborne SSB transceiver with narrow-band selectivity	622-2590-002
618T-6	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2590-001
618T-6B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2591-001
516H-1	Power supply	622-1204-000

NOTE 1: Narrow-band transceivers have been given different type and part numbers in order to more easily identify them from their wide-band equivalents. Consequently, the following nomenclature changes have been made.

NOMENCLATURE CHANGE			
OLD NOMENCLATURE		TO NEW NOMENCLATURE	
COLLINS TYPE	COLLINS PART NUMBER	COLLINS TYPE	COLLINS PART NUMBER
618T-1	522-1230-023	618T-4	622-2586-001
618T-1	522-1230-022	618T-4	622-2586-002
618T-1B	522-4828-002	618T-4B	622-2587-001
618T-2	522-1501-044	618T-5	622-2588-001
618T-2	522-1501-043	618T-5	622-2588-002
618T-2B	522-4829-002	618T-5B	622-2589-001
618T-3	522-1660-034	618T-6	622-2590-001
618T-3	522-1660-033	618T-6	622-2590-002
618T-3B	522-4830-002	618T-6B	622-2591-001

Equipment Covered
Figure 2 (Sheet 2)

NOTE 2: The following service bulletin changes have also been incorporated:

618T-1; service bulletins are now applicable to all 618T-1 and 618T-4 units.

618T-1B; service bulletins are now applicable to all 618T-1B and 618T-4B units.

618T-2; service bulletins are now applicable to all 618T-2 and 618T-5 units.

618T-2B; service bulletins are now applicable to all 618T-2B and 618T-5B units.

618T-3; service bulletins are now applicable to all 618T-3 and 618T-6 units.

618T-3B; service bulletins are now applicable to all 618T-3B and 618T-6B units.

NOTE 3: Since the information covering the new type numbers is already available in this manual under the old nomenclature, the new nomenclature will not be incorporated. Refer to this table for cross-reference between old and new nomenclature.

Equipment Covered
Figure 2 (Sheet 3)

2. PURPOSE OF EQUIPMENT.

The 618T-( ) Airborne SSB Transceiver is used for voice, CW, or data communications in the high-frequency band. The 618T-1/2/3 operates from 2.000 through 29.999 MHz in 1-kHz increments. The 618T-1B/2B/3B operates from 2.0000 through 29.9999 MHz in 0.1-kHz increments.

Figure 3 is a list of associated equipment. Refer to the applicable manual for detailed information about the equipment listed in figure 3.

MODEL NO	COLLINS PART NO.	DESCRIPTION	FUNCTION
714E-1 714E-2 714E-2A 714E-2B 714E-3 714E-3B 714E-3D 714E-3F 714E-3G	522-1261-000 522-2213-XXX 522-2892-XXX 787-6377-XXX 522-2457-XXX 522-3903-XXX 777-1029-XXX 787-6378-XXX 787-6557-001	Radio set control	Provides remote control of 618T-1, 618T-2, and 618T-3.
714E-6 714E-6 714E-6 714E-6A	522-4466-001 772-5271-001 772-5272-001 777-1225-001	Radio set control	Provides remote control of 618T-1B, 618T-2B, and 618T-3B.
390J-1 390J-2	522-1658-000 522-3353-005/015	Shockmount	Provides shock isolation mounting between 618T-( ) and aircraft.
516H-1	522-1204-00	Power supply (618T-1/1B only)	Provides dc and ac power for 618T-1/1B.
180L-2 180L-3 180L-3A AT-101 AT-101A AT-102 AT-102A AT-107 180R-6 180R-7 180R-8 180R-12 490S-1 490T-1	506-1199-004 522-0092-000 522-0293-004 522-1375-000 522-3323-000 522-1376-000 522-3324-000 787-6370-001 522-0998-005 522-1416-005 522-1422-004 522-3159-000 792-6140-001 522-3443-000	Antenna coupler system	Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.

Associated Equipment
Figure 3 (Sheet 1 of 2)

EQUIPMENT	COLLINS PART NO.	DESCRIPTION	FUNCTION
490T-1A 490T-2 490R-1 490R-2 490R-3 490R-4	522-3444-001 522-3445-000 522-3897-000 522-4096-001 522-3535-000 522-4787-001		
437R-1	522-3635-00	Helical monopole loading coil	Tunable loading coil used in long-wire antenna installations where length of antenna is restricted by vehicle size.

Associated Equipment (Sheet 2 of 2)
Figure 3

3. EQUIPMENT SPECIFICATIONS.

Figure 4 lists the equipment specifications for the 618T-( ) Airborne SSB Transceiver.

CHARACTERISTIC	SPECIFICATION
Design specifications	
ARINC characteristic	ARINC Document No. 533, Airborne HF SSB/AM System. ARINC Document No. 404, Air Transport Equipment Cases and Racking.
TSO	FAA TSO C-31b and C-32b.
Physical specifications	
Size	10-1/8 in. wide, 7-5/8 in. high, and 22-3/16 in. long.
Weight	50 lb (nominal).

Equipment Specifications (Sheet 1 of 4)
Figure 4

CHARACTERISTIC	SPECIFICATION
Environmental specifications	
Temperature	-40 to +55 °C (-40 to +131 °F) continuous. +55 to +70 °C (+131 to +158 °F) 30 minutes. -65 °C (-85 °F) storage.
Humidity	Up to 95% relative humidity at +50 °C (+122 °F) for 48 hours.
Altitude	Pressure equivalent of 30,000 ft with externally supplied cooling air.
Shock	With isolators 12 impact shocks, 15 g, 11 ms minimum. 4 impact shocks, 30 g, 11 ms minimum. Without isolators 18 impact shocks, 6 g, 10 ms minimum.
Electrical specifications	
Power requirements	618T-1/1B with 516H-1 Power Supply 22.5 to 30.25 vdc, approximately 1150 w. NOTE: Approximately 1030 w are consumed by the 516H-1 Power Supply. 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 165 w. 618T-2/2B 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 160 w. 103.5 to 126.5 vac (line to neutral), 380 to 420 Hz, 3-phase, approximately 1000 w. 22.5 to 30.25 vdc, approximately 120 w. 618T-3/3B 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 100 w. 22.5 to 30.25 vdc, approximately 1150 w.

Equipment Specifications (Sheet 2 of 4)
Figure 4

CHARACTERISTIC	SPECIFICATION
Frequency range	618T-1/2/3 2.000 to 29.999 MHz in 1.0-kHz increments. 618T-1B/2B/3B 2.0000 to 29.9999 MHz in 0.1-kHz increments.
Frequency channels	618T-1/2/3 28,000. 618T-1B/2B/3B 280,000.
Frequency stability	0.8 ppm.
Channel change time	8 s average (independent of external antenna tuner).
Warmup time	15 minutes
Types of emission	3A3H: compatible am (that is, usb with the carrier inserted). 3A3J: ssb (that is, am with the carrier suppressed (usb or lsb)). Cw: 1-kHz tone in usb.
Transmit characteristics	
Rf power output	Ssb: 400-W pep +2, -1 dB. Am: 125-W carrier ±1 dB. Cw: 125-W locked key ±1 dB.
Rf output impedance	51.5 ohms.
Audio input impedance	80 ohms unbalanced, 600 ohms balanced.
Audio-frequency response (618T-( ) without narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 3000 Hz.
Audio-frequency response (618T-( ) with narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 2500 Hz.
Distortion	SSB: third-order distortion products down at least 30 dB AM: less than 10% at 80% modulation with 1000 Hz and 1000 μV at the antenna.

Equipment Specifications
Figure 4 (Sheet 3)

CHARACTERISTIC	SPECIFICATION
Receive characteristics	
Sensitivity	SSB: 1 μV for 10-dB snr ratio. AM: 3 μV modulated 30% at 1000 Hz for a 6-dB snr ratio.
Selectivity (618T-( ) without narrow-band selectivity)	SSB: 300 to 3000 Hz, not more than 5-dB variation. 6.0 kHz, 60 dB down. AM: 6.0 kHz, not more than 5-dB variation. 14.0 kHz, not less than 60 dB down.
Selectivity (618T-( ) with narrow-band selectivity)	SSB: 2.2 kHz, 6 dB down. 4.0 kHz, 60 dB down. AM: 6.0 kHz, not more than 5-dB variation. 14.0 kHz, not less than 60 dB down.
Agc characteristics	Maximum variation of audio output is 6 dB for input signals from 10 to 100,000 μV. No overload below 1-V signal input.
If rejection	80 dB minimum.
Audio output power	300 mW into 300-ohm load with 1000-μV input modulated 30% at 1000 Hz.
Audio distortion	Less than 10% with 1000-μV input modulated 80% at 1000 Hz.
Audio-frequency response (618T-( ) without narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 3000 Hz.
Audio-frequency response (618T-( ) with narrow-band selectivity).	6-dB peak-to-valley ratio from 300 to 2500 Hz.
Selective calling (SELCAL) output level	Not less than 0.1 V into 500-kΩ resistive load with 5-μV input modulated 30% at 1000 Hz.
Image and spurious frequency response	60 dB minimum below desired frequency relative to 5-μV input.

Equipment Specifications (Sheet 4 of 4)
Figure 4

4. EQUIPMENT DESCRIPTION.

A. Mechanical Description.

The 618T-( ) Airborne SSB Transceiver, housed in a standard 1-ATR case, is 10-1/8 inches wide, 7-5/8 inches high, and 22-3/16 inches long and weighs 50 pounds (nominal). A PHONE jack, MIC jack, meter, meter selector switch, and SQUELCH IN-OUT switch are located on the front panel of the 618T-( ). Three meter selector switch positions check internal power supply voltages of the 618T-( ). The fourth switch position monitors the power amplifier plate current, and the fifth position, CAL TONE (618T-1/2/3 only), compares the operating frequency of the 618T-( ) with WWV. A 400-Hz blower provides forced air cooling, and all antenna connections are located on the front panel of the 618T-( ). The SQUELCH IN-OUT switch allows the selection of squelch or no squelch modes of reception. All electrical connections are made at a 60-pin connector located at the rear of the unit. A separate grounding pin is located beside the 60-pin connector.

The 618T-( ) features modular construction. Figure 5 lists the module complement for the specific versions of the 618T-( ). Each module is equipped with locating pins to prevent improper location of the module and permit proper alignment of the connectors before engagement. There are no mechanical linkages between any modules in the 618T-( ). Maintenance of the 618T-( ) is simplified by the modular construction, and color-coded test points on the modules permit troubleshooting without removing the modules from the chassis. Transistors, widely used in the 618T-( ), increase reliability and reduce weight and power consumption.

MODULE	FUNCTION	COLLINS PART NUMBER
A1	Frequency divider (618T-1/2/3 only)	546-2142-005
A2	Rf oscillator	544-9285-005 (early model) 528-0251-005 (late model)
	Rf oscillator including squelch circuits	528-0690-001 (early model) 528-0690-002 (late model)
A3	If translator (618T-( ) without narrow-band selectivity)	544-9286-000
	If translator (618T-( ) with narrow-band selectivity)	528-0720-001
A4	kHz-frequency stabilizer (618T-1/2/3 only)	544-9288-005 (early model) 528-0112-005 (late model)
A5	Low-voltage power supply	544-9292-00
A6	Electronic control amplifier	544-9290-005
A7	3-phase high-voltage power supply (618T-2/2B only)	544-9291-00 (early model, MCN 17,999 and below) (late model, MCN 18,000 and above)

618T-( ) Module Complement (Sheet 1 of 3)
Figure 5

MODULE	FUNCTION	COLLINS PART NUMBER
A8	27.5-Vdc high-voltage power supply (618T-3/3B only)	545-4971-000 (early model, MCN 4249 and below) (late model, MCN 4250 and above)
A9	AM/audio amplifier	544-9287-000 (early model) 546-6053-000 (late model)
A10	MHz-frequency stabilizer	544-9289-005 (early model) 528-0329-005 (late model)
A11	Power amplifier	544-9283-000
A12	Rf translator (618T-1/2/3 only) (618T-1/2/3 only) (618T-1B/2B/3B only)	544-9284-00 (early model) 528-0113-000 (late model) 528-0682-001
A12A1	Autopositioner-submodule (618T-1/2/3 only) (618T-1B/2B/3B only)	546-6873-017 528-0683-001
A12A2	Variable-frequency oscillator (vfo) submodule (618T-1/2/3 only)	522-1380-003 (70K-3) 522-2424-004 (70K-5) 522-3552-000 (70K-9)
A13	Single-phase high-voltage power supply (618T-1/1B only)	545-5858-000

618T-( ) Module Complement
Figure 5 (Sheet 2)

MODULE	FUNCTION	COLLINS PART NUMBER
A15	Frequency divider-stabilizer (618T-1B/2B/3B only)	528-0671-001
A16	Control data converter (618T-1B/2B/3B only)	528-0641-001
	Chassis (618T-1/2/3 only)	544-9293-000
	Chassis with squelch capability (618T-1/2/3 only)	544-9293-000 (MCN 2, 332 and above)
	Chassis (618T-1B/2B/3B only)	757-8930-001

618T-( ) Module Complement (Sheet 3 of 3)
Figure 5

B. Electrical Description.

The 618T-( ) Airborne SSB Transceiver is remotely controlled completely by the 714E-( ) Radio Set Control. For the 618T-1/2/3, any one of 28,000 communication channels, spaced 1 kHz apart in the 2.000- through 29.999-MHz range, can be directly selected at the 714E-1/2( )/3( ) Radio Set Control. For the 618T-1B/2B/3B, any one of 280,000 communication channels, spaced 0.1 kHz apart in the 2.0000- through 29.9999-MHz range, can be directly selected at the 714E-6( ) Radio Set Control. The function selector control on the 714E-( ) selects the desired mode of operation: usb, lsb, am, cw, or data.

NOTE: All of the previously mentioned operational modes are not available on some versions of the 714E-( ) Radio Set Control. Refer to the 714E-1/2( )/3( ) Radio Set Control Overhaul Manual, Collins part number 523-0759328 or to the 714E-6( ) Radio Set Control Overhaul Manual, Collins part number 523-0759269, for a listing of the functional modes of operation available on various versions of the 714E-( ).

An rf sensitivity control on the 714E-( ) controls the rf sensitivity of the 618T-( ) in all operational modes except data, in which case the rf sensitivity is set within the 618T-( ) for maximum receive sensitivity.

In 618T-( ) installations where the squelch function is used, the rf sensitivity control on the 714E-( ) is used as a squelch control that adjusts the squelch circuit within the 618T-( ) to the desired operating level.

The operating frequency of the 618T-( ) is crystal controlled and stabilized to within 0.8 part per million. The 618T-( ) is capable of 400 watts pep output in sideband operations and 125 watts carrier in am, cw, or data operations. Transmit output impedance is 52 ohms unbalanced.

The tuned circuits and output circuit of the 618T-( ) are tuned automatically by an Autopositioner and a servo motor. The receiver portion of the 618T-( ) is muted during tuning. The average tuning time of the 618T-( ), independent of an external antenna tuner, is 8 seconds.

C. Controls and Indicator.

The controls and indicator located on the 618T-( ) front panel are shown in figure 6. Figure 7 lists all controls and indicator and describes the functions of each.

D. Model Differences.

There are nine models of the 618T-( ). The following paragraphs describe differences between the nine models.

(1) 618T-1 Airborne SSB Transceiver, Collins part number 522-1230-00, 522-1230-021, 522-1230-022*, or 522-1230-023*.

The 618T-1 retrofits most 618S-( ) installations with no changes necessary in the aircraft wiring. The 516H-1 Power Supply required is mountable in the 416W-1 Power Supply shockmount. The primary power required for the 618T-1 is listed in figure 4. The 618T-1 (Collins part number 522-1230-00) does not have audio squelch capability. The 618T-1 (Collins part number 522-1230-021) has audio squelch capability. The 618T-1 (Collins part number 522-1230-022) has narrow-band selectivity. The 618T-1 (Collins part number 522-1230-023) has narrow-band selectivity and audio squelch capability.

(2) 618T-1B Airborne SSB Transceiver, Collins part number 522-4828-001 or 522-4828-002*.

The 618T-1B retrofits most 618S-( ) installations with the addition of four control wires from the 618T-1B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-1B are identical to those of the 618T-1. The 618T-1B (Collins part number 522-4828-001) has audio squelch capability. The 618T-1B (Collins part number 522-4828-002*) has audio squelch and narrow-band selectivity capability.

(3) 618T-2 Airborne SSB Transceiver, Collins part number 522-1501-00, 522-1501-041, 522-1501-043*, or 522-1501-044*.

Primary power requirements for the 618T-2 are listed in figure 4. The 618T-2 (Collins part number 522-1501-00) does not have audio squelch capability. The 618T-2 (Collins part number 522-1501-041) has audio squelch capability. The 618T-2 (Collins part number 522-1501-043*) has narrow-band selectivity. The 618T-2 (Collins part number 522-1501-044*) has audio squelch and narrow-band selectivity.

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*The above part numbers are obsolete and are replaced with type numbers 618T-4/4B/5/5B/6/6B. Refer to figure 2 for cross-reference of old part numbers to new part numbers.

(4) 618T-2B Airborne SSB Transceiver, Collins part number 522-4829-001 or 522-4829-002*.

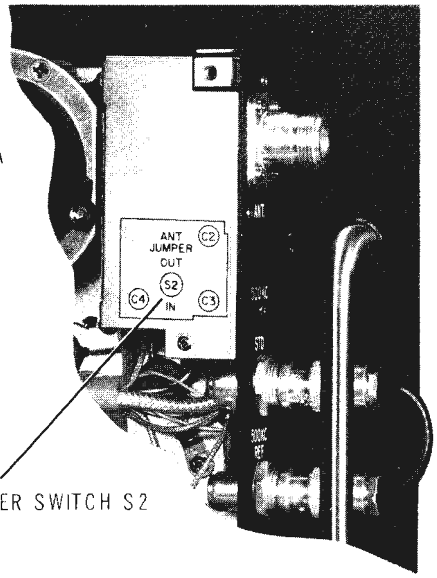
The 618T-2B retrofits 618T-2 installations with the addition of four control wires from the 618T-2B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-2B are identical to those of the 618T-2. The 618T-2B (Collins part number 522-4829-001) has audio squelch capability. The 618T-2B (Collins part number 522-4829-002*) has audio squelch and narrow-band selectivity.

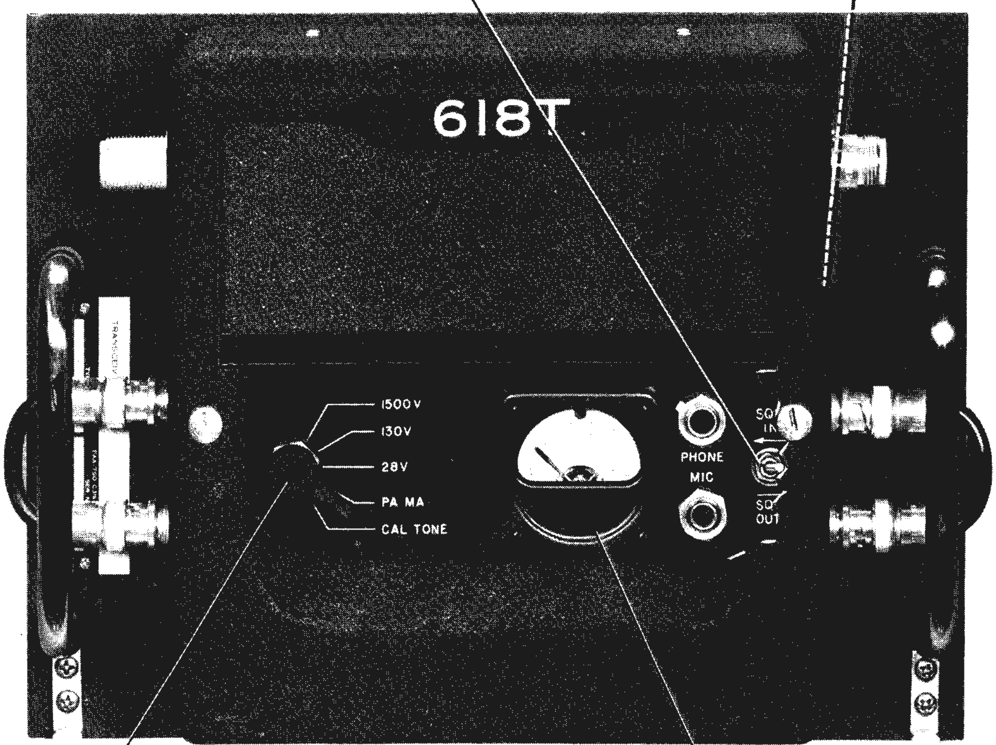
(5) 618T-3 Airborne SSB Transceiver, Collins part number 522-1660-00, 522-1660-031, 522-1660-033*, or 522-1660-034*.

Primary power requirements for the 618T-3 are listed in figure 4. The 618T-3 may also retrofit some 618S-( ) installations. Retrofit installation data is contained in the 618T-( ) Maintenance Manual, Collins part number 520-5970004. The 618T-3 (Collins part number 522-1660-00) does not have audio squelch capability. The 618T-3 (Collins part number 522-1660-031) has audio squelch capability. The 618T-3 (Collins part number 522-1660-033*) has narrow-band selectivity. The 618T-3 (Collins part number 522-1660-034*) has audio squelch and narrow-band selectivity.

(6) 618T-3B Airborne SSB Transceiver, Collins part number 522-4830-001 and 522-4830-002*.

The 618T-3B retrofits 618T-3 installations with the addition of four control wires from the 618T-3B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-3B are identical to those of the 618T-3. The 618T-3B (Collins part number 522-4830-001) has audio squelch capability. The 618T-3B (Collins part number 522-4830-002) has audio squelch and narrow-band selectivity.





Typical Control and Indicator Locations
Figure 6

CONTROL/INDICATOR	FUNCTION
Meter switch (S1)	Places meter M1 in correct circuit to indicate condition of internal power supplies (1500V, 130V, and 28V positions) or power amplifier plate current (PA MA position). CAL TONE position activates circuitry that is used to compare the operating frequency of the 618T-( ) to WWV (618T-1/2/3 only).
ANT JUMPER switch (S2) (chassis with MCN 3025 and above)	Places antenna transfer relay K5 in circuit (when set to IN) for 618T-( ) that uses common antenna for both transmit and receive modes. S2 is located in 618T-( ) relay compartment.
Squelch enable switch (S3)	Activates audio squelch circuitry within the 618T-( ).
Meter (M1)	Indicates the conditions of internal power supplies or power amplifier plate current.

Control and Indicator Functions
Figure 7

5. THEORY OF OPERATION.

A. General.

The 618T-( ) Airborne SSB Transceiver provides usb, lsb, am, cw, and data modes of operation. The 618T-1/2/3 provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 1-kHz increments. The 618T-1B/2B/3B provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 0.1-kHz increments. The following is the functional theory of operation of the 618T-( ). Refer to figures 17 and 18. Figure 17 is a functional block diagram of the 618T-1/2/3; figure 18 is a functional block diagram of the

618T-1B/2B/3B. Where specific differences between versions of the 618T-( ) exist, references to the applicable block diagram will be made. Transmit signal paths and functions common to both transmit and receive are shown in solid lines. Receive only functions are shown in dashed lines. Modules are defined by dashed lines. Begin with the transmit function at the left of the applicable illustration.

B. Functional Theory of Operation.

(1) Transmit Mode.

The AM/audio amplifier, A9, provides three stages of amplification in the transmit mode. For voice, the unbalanced input (80 ohms) is amplified by audio amplifiers A9Q1 and A9Q2. An additional audio amplifier, A9Q8, is provided for 600-ohm balanced inputs and for CW. The CW is produced by amplifying the 1-kHz tone from keyers A1Q12 and A1Q13 of frequency divider A1 in the 618T-1/2/3 (see figure 17). In the 618T-1B/2B/3B, the 1-kHz tone is generated by A16Q9 and A16Q10 of control data converter A16. Variable level adjustments are provided in amplifier stages A9Q8 and A9Q1 to equalize voice and CW at the output of amplifier A9Q2.

Amplifier A9Q2 provides an output to the headset for sidetone monitoring. This sidetone output is also variable at the 618T-( ) front panel so that receive and sidetone signals can be approximately equal. The transmit signal path continues from audio amplifier A9Q2 to a balanced modulator in if translator A3. There the audio is combined with a 500-kHz carrier from rf oscillator A2. Details of the balanced modulator are shown in figure 21.

The balanced modulator produces intelligence as sidebands of the 500-kHz carrier and then suppresses the carrier. The double sideband signal appears at the output of the balanced modulator and is amplified by ALC (automatic load control) amplifier A3Q1. The 1-kHz signal for CW is adjusted to a fixed value and does not vary in amplitude. The voice signal may overdrive power amplifier A11 if the operator speaks too loudly or during voice peaks. Feedback from the grid circuit of the power amplifier A11 is generated if the driving signal causes power amplifier grid current to flow. The feedback voltage, in turn, reduces the gain of alc amplifier A3Q1. In this manner, drive to power amplifier A11 is held at optimum value near grid current threshold. Details of the alc circuits are shown in figure 15.

The transmit signal continues from alc amplifier A3Q1 through if. amplifier A3Q2 and is then fed to one of two mechanical filters FL1 or FL2. Either FL1 or FL2 is selected by the mode selector switch (in USB or LSB position) on the radio set control. Only one sideband is needed since both contain identical intelligence. The bandpass of FL1 and FL2 is 3 kHz (nominal). Beyond the selected filter, the signal is a suppressed carrier containing one set of sidebands that represent the voice modulation.

Since the suppression of the carrier prevents a conventional AM receiver from detecting the SSB signal, the carrier must be reinserted for compatibility with conventional AM receivers. This happens when the function selector switch on the radio set control is switched to the AM position. In the AM mode of operation, the USB filter is also selected. Note that the transmit signal from the mechanical filter goes directly to if amplifier A3Q4, bypassing if amplifier A3Q3 (and A3Q7 for if translator module Collins part number 528-0720-001). If. amplifier A3Q4 is controlled by tgc/adc (transmit gain control/automatic drive control) amplifier A3Q6, a dc amplifier that operates to reduce the gain of if amplifier A3Q4.

In all modes except SSB, the tgc circuit maintains the rf carrier level constant within 1 db to compensate for varying rf gain over the operating range of the 618T-( ). The tgc does not function in the SSB mode since there is no carrier for tgc reference. The feedback voltage applied to tgc/adc amplifier A3Q6 is a rectified sample of the carrier obtained from a linear demodulator and is proportional to the average instantaneous peak carrier amplitude. Refer to figure 16 for additional circuit details.

The adc circuit provides override or additional control of if amplifier A3Q4 during the tuning cycle or if a 618T-( ) malfunction occurs resulting in excessive rf plate voltage or plate current swing. The feedback voltages applied to the adc and tgc circuits combine so that linear operation is maintained for power amplifier A11 during changes in rf gain and rf drive. The transmit signal, after amplification by if amplifier A3Q4, is applied to TX/RX switch CR6 and then to rf translator A12.

The transmit signal from the if translator is combined in lf mixer A12V1 with the output of vfo A12A2 in the 618T-1/2/3 and with the output of frequency divider-stabilizer A15 in the 618T-1B/2B/3B. For any of the operating frequencies, the output of lf mixer A12V1 will be 3.000 to 2.001 MHz in the 618T-1/2/3 and 3.0000 to 2.0001 MHz in the 618T-1B/2B/3B. This range is tuned by the variable if filter. The transmit signal goes from the variable if filter to one of two paths. If the operating frequency is below 7 MHz, the transmit signal is mixed in transmit 17.5-MHz mixer A12V2 and applied to the 14.5/15.5-MHz bandpass filter. If the operating frequency is above 7 MHz, the transmit signal goes from the variable if filter directly to hf transmit mixer A12V3, bypassing the 17.5-MHz mixer. The output of 17.5-MHz mixer A12V2 is the difference output between transmit signal and 17.5-MHz oscillator A12V10. The output of the 14.5/15.5-MHz bandpass filter is applied to the hf transmit mixer A12V3. The output of this mixer is the difference signal from 2 through 29 MHz. The hf oscillator, A12V11, operates below the transmit signal from 2 through 6 MHz and above the transmit signal from 7 through 29 MHz. The hf oscillator also doubles frequencies to provide heterodyning for operating frequencies 14 through 29 MHz. Figure 26 lists all hf oscillator A12V11 frequencies. The output of hf transmit mixer A12V3 is the transmit signal at the operating frequency. Transmit mixers A12V1, A12V2, and A12V3 provide linear amplification and are balanced mixers; that is, the oscillator signal for each mixer is simultaneously applied to one triode element for mixing and to the other element 180 degrees out of phase for cancellation (balancing out) of the oscillator output in the signal path. Extra circuits are provided in hf transmit mixer A12V3 to provide cancellation through a nulling adjustment. The balanced mixers help reduce spurious signals that can distort the signal within the 618T-( ) and/or radiate interference at unwanted frequencies. After the hf mixing, the transmit signal is amplified by linear voltage amplifiers in two stages; rf amplifier A12V4 and A12V5 and driver amplifier A12V6 and A12V7.

The driver stages provide sufficient rf voltage to drive power amplifier A11. Other than the alc, tgc, and adc circuits previously discussed, an additional feedback circuit for rf is also applied from power amplifier A11 plate circuit to drivers A12V6 and A12V7. This feedback provides power amplifier and driver neutralization.

The power amplifier develops approximately 125 watts carrier power in the AM mode and 400 watts pep. in SSB mode. The output of power amplifier A11 is coupled to an antenna coupler so that a variety of antennas may be driven with minimum vswr.

The power amplifier consists of two parallel connected tetrodes driving a pi network that combines the functions of tank circuit loading of the tubes and impedance matching to low-impedance unbalanced transmission lines.

Coarse tuning and antenna loading are performed by a motor that is actuated through band switching in rf translator A12. Fine tuning to resonance requires that the 618T-( ) be keyed after frequency selection. Since a carrier must be present, internal switching selects the AM mode for this operation. Resonance is achieved by discriminating between the rf input and output phase and applying the detected difference as an error voltage to a servo motor. The servo motor drives a roller coil to tune the tank circuit.

Electronic control amplifier A6 inverts the error signal (a dc voltage) to 400 Hz and amplifies it sufficiently to drive the servo motor.

Grid current flow is detected in this module and fed back as controlling bias voltage to the alc amplifier in the if. translator to control transmit if. gain. A sample of rf voltage is taken from the plate circuit, rectified, and applied as negative dc voltage to the tgc/adc amplifier in if. translator A3 for additional if. gain control.

(2) Receive Mode.

In the receive mode (the signal path traced from the top, right section of block diagrams, figures 17 and 18), the signal is coupled from the antenna directly to rf amplifiers A12V4 and A12V5. Conversion of the received signal in rf translator A12 in the receive mode is similar to that in the transmit mode except that separate unbalanced mixer circuit stages are used. The signal level is adjusted manually by varying the rf sensitivity control on the radio set control that controls the cathode bias of rf amplifiers A12V4 and A12V5 and thereby varies the signal-to-noise ratio. The rf sensitivity control is not an audio level control.

The received signal continues through rf translator A12 to receive lf mixer A12V8. The output of lf mixer A12V8 is applied directly to if. amplifier A3Q2 in if. translator A3 and to if. amplifier A9Q3 in AM/audio amplifier A9. This allows detection of receive signals in both SSB and AM modes regardless of the position of the function selector control on the radio set control.

Using the data or SELCAL (selective calling) output, AM reception is available with the function selector control in any position. Assume that the received signal is AM. The signal is amplified by if. amplifier A9Q3 and passed through 6-kHz mechanical filter A9FL1 whose selectivity allows both sidebands to pass. The signal from the mechanical filter is amplified by A9Q4, A9Q5, and A9Q6, detected by A9CR4, then provided with two alternate paths. For data and SELCAL, the detected signal passes through audio amplifier A9Q9. For other modes, the signal is applied to audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

Now assume that the received signal is ssb. The output of lf mixer A12V8 is amplified by if amplifier A3Q2 and then passed through mechanical filter A3FL1 or A3FL2, as selected at the radio set control. The signal from the mechanical filter is amplified by if amplifiers A3Q7 (for if translator module Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. Note that tgc/agc amplifier A3Q6 is used and biased for maximum gain operation of if amplifier A3Q4 in the receive mode. Also TX/RX switch CR6 is reverse biased to prevent entry of receive signals into rf translator A12. From if amplifier A3Q5, the signal goes to the product detector, where it is combined with a 500-kHz carrier from rf oscillator A2. The output of the product detector, the detected audio, is applied through audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

A number of agc feedback loops are used in the 618T-( ). The ssb agc is developed from the audio signal. Agc is first applied to rf amplifiers A12V4 and A12V5. Two sources, other than manual rf sensitivity, combine to control this stage. A very strong signal causes the agc circuit in the plate circuit of receive lf mixer A12V8 to reduce the gain of both the lf mixer and the rf amplifier. A normal signal level is controlled by agc from detector A9CR2 and A9CR7 in AM/audio amplifier A9. The agc voltage is proportional to the rms audio output voltage from A9Q2.

(3) Frequency Selection and Translation, 618T-1/2/3.

Refer to the 618T-1/2/3 block diagram, figure 17, and to figure 19, a block diagram of the 618T-1/2/3 frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1/2/3 to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits are formed by the four frequency selector controls on the radio set control.

The 100-, 10-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of translator A12. These motors, A12A1B1 controlled by the 1-kHz frequency select control and A12A1B2 controlled by the 10- and 100-kHz frequency selector controls, mechanically coarse tune variable-frequency oscillator (vfo) A12A2. Autopositioner A12A1 also tunes the 2- to 3-MHz variable if. stage and fine tunes rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and rf driver turret switches A12S2 and A12S3.

The 1-MHz frequency select on the radio set control operates band motor A12B1 that mechanically fine tunes hf oscillator A12V11, rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4, and rf driver turret switches A12S2 and A12S3. It operates PA BAND switch A12S12 and also controls switching of 17.5-MHz oscillator A12V10 on operating frequencies below 7 MHz.

As an example, an operating frequency of 2.520 MHz has been selected at the radio set control (figure 19). Operation for the receive mode is the same except for the deletion of fine tuning of roller coil servo motor A12B2 and the antenna coupler in the receive mode. Fine tuning of these two stages is obtained by keying the transceiver.

The 500-kHz if. is produced in AM/audio amplifier A9 and if. translator A3 upon application of an audio signal at the microphone. This 500-kHz if. is applied to lf mixer A12V1, where it is mixed with the vfo A12A2 output. The injection frequency from vfo A12A2 varies between 3.5 and 2.5 MHz in 1000 1-kHz steps as the operating frequency selected at the remote control unit varies from X.000 to X.999 MHz. The vfo frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from 3.500 MHz (upper vfo limit).

Example: 2.520-MHz operating frequency
3.500-MHz vfo upper limit
-0.520 MHz
2.980 MHz = vfo frequency

The lf mixer A12V1 output is tuned to the mixed difference frequency, which is a variable if. in the range of 3 to 2 MHz. The exact variable if. is found by subtracting the 500-kHz if. input from the vfo injection frequency. For this example, the resultant is 2.480 MHz.

From the variable if. circuits, the signal is fed to 17.5-MHz mixer A12V2. The 17.5-MHz mixer, A12V2, raises the 3- to 2-MHz if. to a 14.5- to 15.5-MHz signal due to the possibility of harmonic distortion entering the transmitter bandpass at operating frequencies between 2 and 7 MHz. The 17.5-MHz mixer, A12V2, is fed by 17.5-MHz oscillator A12V10. The resultant frequency, after mixing occurs, is 14.5 to 15.5 MHz, found by subtracting the variable if. from the 17.5-MHz injection frequency.

The 15.020-MHz signal, the 17.5-MHz mixer A12V2 output, is filtered by a 14.5- to 15.5-MHz bandpass filter and fed to hf mixer A12V3. The hf mixer combines the 14.5- to 15.5-MHz signal with an injection frequency from hf oscillator A12V11. Figure 26 lists the hf oscillator A12V11 frequencies mechanically set up by band motor A12B1 for all settings of the 1-MHz frequency selector control on the radio set control. The hf mixer A12V3 output, the difference between the hf oscillator A12V11 injection frequency and the variable if. or 17.5-MHz mixer A12V2 output, is now the desired operating frequency originally selected at the radio set control.

The hf mixer A12V3 output is fed to rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and to rf driver turret switches A12S2 and A12S3. Here the final output is fine tuned and mechanically controlled by band motor A12B1, dc motor A12A1B2, and dc motor A12A1B1. The signal is then fed to power amplifier A11 output tank switch A11S2.

The 8-position output tank switch, A11S2, is mechanically coarse tuned by the motor A11B1. From the output tank, the signal is fed to power amplifier roller coil A11L4 and then to the antenna coupler and antenna.

Power amplifier roller coil A11L4 and the antenna coupler must receive rf produced by keying the transceiver before fine tuning of these two elements is possible. The rf actuates roller coil servo motor A11B2 that mechanically tunes power amplifier roller coil A11L4.

(4) Frequency Selection and Translation, 618T-1B/2B/3B.

Refer to 618T-1B/2B/3B block diagram, figure 18, and to figure 20, a block diagram of 618T-1B/2B/3B frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1B/2B/3B to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits areformed by the five frequency selector controls on the radio set control.

The 100-, 10-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of rf translator A12. These motors, A12A1B1 controlled by the 1-kHz selector control and A12A1B2 controlled by the 100- and 10-kHz selector controls, operate inverted binary coded decimal (BCD) switches A12A1S2, A12A1S4, and A12A1S6 that transform the 100-, 10-, and 1-kHz reentry code frequency control information, from the radio set control, to inverted BCD frequency control information that is fed directly to frequency divider-stabilizer A15. The 0.1-kHz reentry code frequency control information from the radio set control is converted to inverted BCD frequency control information by control data converter A16 and fed directly to frequency divider-stabilizer A15. A 1-kHz oscillator, A16Q9 and A16Q10, in control data converter A16 provides a 1-kHz tone during transceiver tuning and CW transmission.

Frequency divider-stabilizer A15 contains the circuits necessary to supply variable injection frequency from 2.5001 to 3.5000 MHz in 100-Hz increments to lf mixer stage A12V1 in rf translator A12. Eight circuits comprise the basic portion of frequency divider-stabilizer A15 (see figure 42 or 838).

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's) A15A7Q2 and A15A7Q4. One oscillator has a frequency range from 2.5001 to 3.0000 MHz, and the other has a range from 3.0001 to 3.5000 MHz. Transistor switches, operated by 100-kHz frequency control information from Autopositioner A12A2, turn on the proper oscillator depending on the frequency selected. The output frequency of vco A15A7 is controlled by a dc output voltage from phase/frequency discriminator A15A5 applied across voltage variable capacitors in the vco circuitry. The output of vco A15A7 is fed to isolation amplifier A15A8 before being applied to lf mixer A12V1. Isolation amplifier A15A8 provides a constant output impedance for vco A15A7. An additional output from isolation amplifier A15A8 is applied directly to variable frequency divider circuitry A15A1, A15A2, A15A3, and A15A4. The variable frequency divider circuitry divides the output frequency of isolation amplifier A15A8 25,001 to 35,000 times depending upon the frequency control information from the radio set control. When vco A15A7 is operating on the proper frequency, the output of the variable frequency divider circuit will always be 100 Hz. The output of variable frequency divider A15A1, A15A2, A15A3, and A15A4 is applied directly to phase/frequency discriminator A15A5. A second input to phase/frequency discriminator A15A5 is from reference divider A15A6. The input to reference divider A15A6 is a 100-kHz reference signal from rf oscillator A2. Reference divider A15A6, a 1000-to-1 frequency divider, provides a continuous output of 100 Hz, a reference used for comparison with the output of the variable frequency circuitry, that is as accurate as the reference signal.

When vco A15A7 is operating on the proper frequency, the dc output voltage from phase/frequency discriminator A15A5 will remain constant because the outputs from the variable frequency divider circuits and the reference divider will both be 100 Hz. A change in frequency control information from the radio set control causes the output of the variable divider circuits to vary from 100 Hz. The output voltage from the phase/frequency discriminator will change, causing the effective capacitance of the voltage variable capacitors to change. This will cause the vco to sweep across its entire frequency range until a frequency is reached where the output of the variable frequency divider circuit is again 100 Hz. At this point, the phase/frequency discriminator is able to lock the output frequency of vco A15A7. When vco A15A7 is phase locked, its output frequency is as accurate as the 100-kHz reference signal from rf oscillator A2.

The output frequency is applied to lf mixer A12V1 in rf translator A12, where it is mixed with the 500-kHz if. from AM/audio amplifier A9 and if. translator A3. From this point on, the frequency translation process of the 618T-1B/2B/3B is identical to the 618T-1/2/3 explained previously. The vco operating frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from the upper output frequency limit of the vco, 3.5000 MHz.

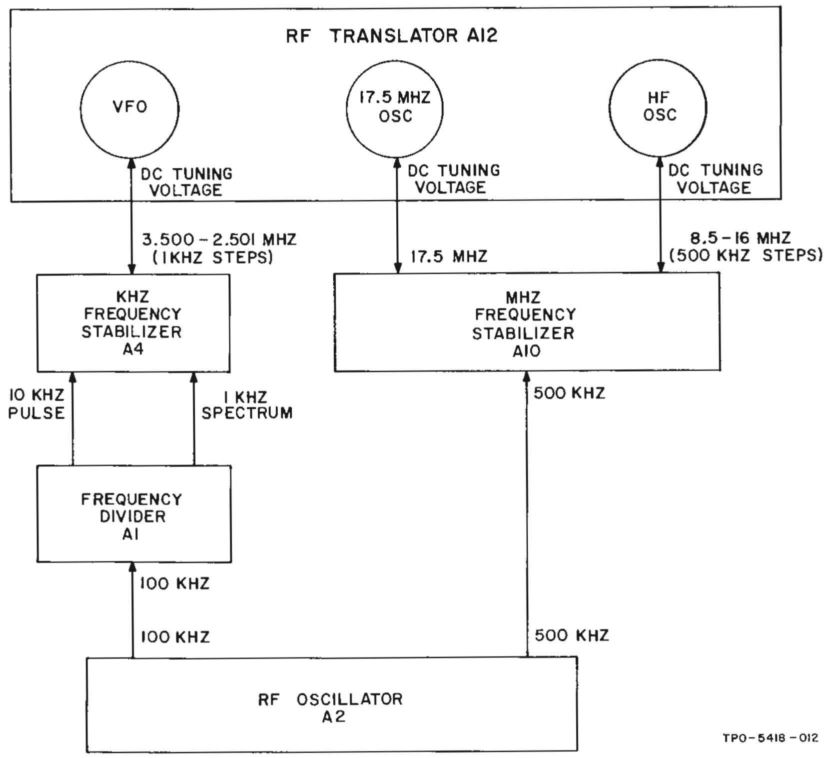
Example: 2.5200-MHz operating frequency

3.5000-MHz vco upper limit
-0.5200 MHz
―――――――
2.9800-MHz vco operating frequency

(5) Frequency Stabilizing Circuits, 618T-1/2/3.

Four 618T-1/2/3 Airborne SSB Transceiver modules stabilize the frequencies of the three injection oscillators in rf translator A12. These modules phase lock the frequencies of the oscillators with frequencies derived from a reference oscillator. The 500-kHz if. injection frequency is also derived from this reference oscillator. Therefore, each of the 28,000 possible 618T-1/2/3 rf operating frequencies is as stable as the crystal-controlled reference frequency in rf oscillator A2.

Refer to figure 8. The MHz-frequency stabilizer, A10, stabilizes the 17.5-MHz and hf injection oscillators in rf translator A12. The kHz-frequency stabilizer, A4, stabilizes variable frequency-oscillator A12A2 in rf translator A12.



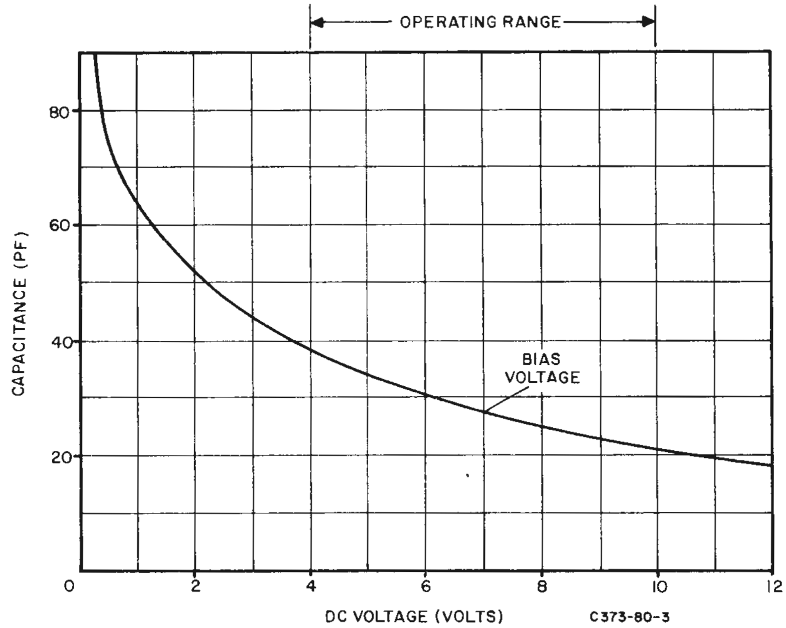
618T-1/2/3 Frequency Stabilizing Circuits, Block Diagram
Figure 8

Radio-frequency oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are references in the frequency stabilizing process. The 500-kHz output is also used in a separate output for if. injection.

Frequency divider A1 converts the 100-kHz output of rf oscillator A2 to two different outputs that are used as references in kHz-frequency stabilizer A4.

In general, the frequency stabilizing circuits operate as follows. Samples of the injection oscillator signals are fed to the frequency stabilizing modules. A reference frequency derived from the crystal reference oscillator is also fed to these modules. The signal and reference frequencies are compared by discriminators in the modules, and dc error voltages proportional to the phase difference between the signal and reference frequencies are fed back to the oscillators. These dc error voltages are applied to voltage-variable capacitors in the tuned circuits of the oscillators to tune them so that they will be phase locked to the reference frequencies.

The voltage-variable capacitors used in the oscillator tuned circuits are semiconductor devices with a capacitance that varies as the dc voltage across them varies. The relationship between capacitance and dc tuning voltage for a typical voltage-variable capacitor is shown in figure 9. To obtain a linear relationship between capacitance and voltage, a dc bias voltage is applied to the device, and the voltage across it is varied by only a small amount.



Voltage-Variable Capacitor, Typical Characteristics
Figure 9

(6) Frequency Stabilizing Circuits, 618T-1B/2B/3B.

Two 618T-1B/2B/3B Airborne SSB Transceiver modules stabilize the two injection oscillators in rf translator A12. MHz-frequency stabilizer A10 stabilizes the 17.5-MHz and hf oscillators in rf translator A12.

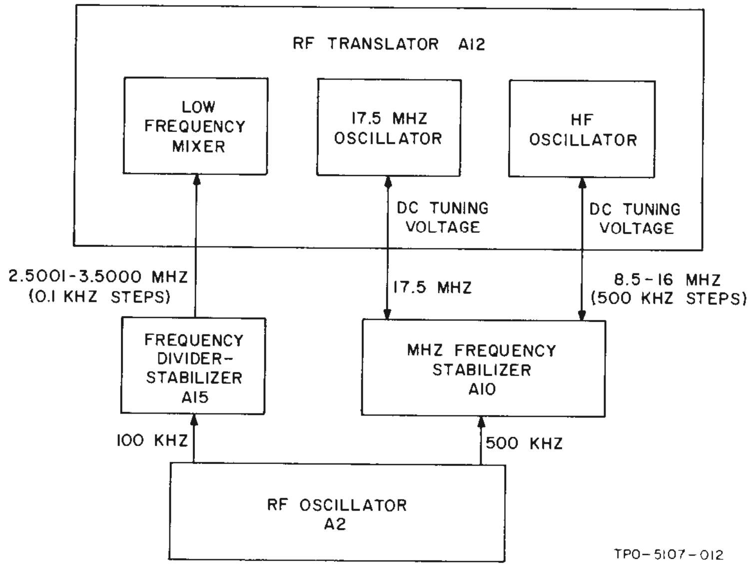
Refer to figure 10. Rf oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are used as references in the frequency stabilizing processes. The 500-kHz output is also used in a separate output for if injection.

Frequency divider-stabilizer module A15, as previously explained, is stabilized by the comparison of the operating frequency of vco A15A7 with the 100-kHz reference frequency from rf oscillator A2. The comparison and stabilizing functions are performed by phase/frequency discriminator A15A5.

The frequency stabilization process of the 17.5-MHz and hf oscillators is identical to that of the 618T-1/2/3.

(7) Squelch Circuits.

The audio squelch circuit is physically located in a new model rf oscillator module, Collins part number 528-0690-001/528-0690-002, that is directly interchangeable with existing rf oscillator modules. The audio squelch level is adjusted at the radio set control. New versions of the radio set control, the 714E-3D used



618T-1B/2B/3B Frequency Stabilizing Circuits,
Block Diagram
Figure 10

with the 618T-1/2/3, and the 714E-6A used with the 618T-1B/2B/3B contain a squelch level control (SQL) in place of the existing rf sensitivity control (RF SENS).

The squelch amplifier and control circuit is comprised of two frequency-sensitive active filters, two peak detector stages, a comparator, and a holding circuit. The holding circuit serves to drive the audio squelch relay. The squelch amplifier and control circuit receives audio input signals from AM/audio amplifier A9. The squelch circuit filters and converts the input signal to dc voltages. These voltages are compared by the comparator that has a bias determined by the squelch level control on the 714E-( ) Radio Set Control. After comparision, the squelch circuit energizes the holding circuit and the squelch relay. If sufficient and desirable audio is present, the squelch relay connects the audio signal to the balanced output line of AM/audio amplifier A9. If noise predominates, the squelch relay disconnects the balanced output line and inserts a 300-ohm load across the output of AM/audio amplifier A9. When the squelch level control is turned to the extreme clockwise position, the comparator is biased on and, in turn, energizes the holding circuit and squelch relay.

(8) Selective Calling (SECAL).

A selective calling system, used in conjunction with the 618T-( ) Airborne SSB Transceiver, allows the ground radio operator to call a single aircraft of a group of aircraft, thus relieving aircraft personnel in flight of having to constantly monitor the ground station radio frequency.

The Collins selective calling system consists of the 456C-1 Airborne Selective Calling Unit, the 288A-1 Tone Generator, the 614J-1 Remote Control Panel, the 614K-1 Remote Control Console, and the 278H-1 Preset Remote Control Panel.

The 456C-1 Airborne Selective Calling Unit is the airborne portion of the system. The 288A-1 and one or more of the control units make up the ground station system.

The ground operator selects a code of four audio frequency tones at one of the control units. The operator then presses an activate switch that causes the 288A-1 Tone Generator to produce the four selected tones to the transmitter in the proper time sequence and time duration. The 456C-1 Airborne Selective Calling Unit is connected to the audio output line of the 618T-( ) Airborne SSB Transceiver. When the proper tones are received in the proper sequence, the 456C-1 actuates a visual or aural signal, alerting flight personnel. Switches on the front panel of the 456C-1 allow flight personnel to change the calling codes without removing the unit from the aircraft.

(9) Power Distribution Circuits, 618T-( ).

Refer to figure 11. The power distribution circuits are activated when the function selector switch on the radio set control is moved from OFF. In the 618T-1/2/3, a 400-Hz interlock relay, K9, is energized only when both ac and dc input power to the 618T-( ) is present. A delay relay, K10, disables the frequency stabilizer circuits during operating frequency changes. Operating frequency changes appear as drift to the frequency stabilizer circuits, and therefore the stabilizer circuits must be disabled to prevent an attempted phase lock on an erroneous spectrum point. Resistor R22 and capacitor C13, in transistor stage Q1, delay the energizing of relay K10 for approximately 1/2 second after 130 volts dc has been applied to delay interlock relay K8. This time delay circuit prevents the frequency stabilizer circuits from phase locking on an erroneous spectrum point. In the 618T-1B/2B/3B, only the MHz-frequency stabilizing circuits are affected by the time delay circuits as explained above. The time delay is unnecessary for the phase-locking action of frequency divider-stabilizer A15.

(10) Keying Circuits.

Refer to figure 12, a simplified schematic diagram of the keying circuits. The major keying function is the transfer of circuits from receive mode to transmit mode. When the 618T-( ) is keyed, the following action occurs:

AM/audio amplifier A9 is switched to a speech amplifier function.
Two receive stages are bypassed in if. translator A3.
The receive mixers in rf translator A12 are switched out.
The transmit mixers in rf translator A12 are switched in.
The antenna transfer relay operates, and the rf driver is coupled to the rf amplifier.
Voltage is applied to the plates and screens of the power amplifier tubes.
The 500-kHz carrier is removed from the product detector and applied to the balanced modulator for sideband generation.

The first function when the 618T-( ) is keyed after a frequency change is fine tuning of the power amplifier output circuit and antenna coupler. Keying provides rf to the antenna coupler, and a 1-kHz tone in the headset indicates the tune power cycle. The antenna coupler locks the key line so that it remains closed until the power amplifier roller coil has tuned for 180 degrees difference between grid and plate circuit and the antenna coupler has tuned for minimum vswr (1.3:1). During tuning, the output circuit is in series with a resistor to help stabilize transmitter load. The position of the function selector switch on the radio set control is not important during this tuning function since the AM mode is selected internally to provide the necessary carrier for phase and vswr differentiation for tuning. After power amplifier A11 and the antenna coupler are tuned, the key line opens, and the mode of operation is again under the control of the function selector switch.

If the CW mode is used, a 1-kHz tone from frequency divider A1 in the 618T-1/2/3 and control data converter A16 in the 618T-1B/2B/3B is processed for the proper keying waveform by components on CW TR delay relay A9K2. Recycle relay K4 is a part of keying function so that a transmission cannot be made during a change of frequency. In voice modes, keying is accomplished by depressing the push-to-talk switch on the microphone. Protective circuits include overload relays A7K3 or A8K2, depending upon the power supply being used, and the step-start relay in the high-voltage power supply that switches current-limiting resistors in each leg of the incoming ac line to prevent surges before tube warmup. If a frequency change should be made while keying, the key line is interrupted, recycle takes place, and after the frequency change is completed, the key line closes again. Then, rf (tune power) is applied with the key locked while the power amplifier A11 roller coil and antenna coupler retune to the new frequency. The key then opens again, and a transmission may be made. Tune power function is automatic only when an antenna coupler is available to lock the keying circuits. When the receiver-transmitter is operated separately, the key must be held down manually until power amplifier A11 tunes.

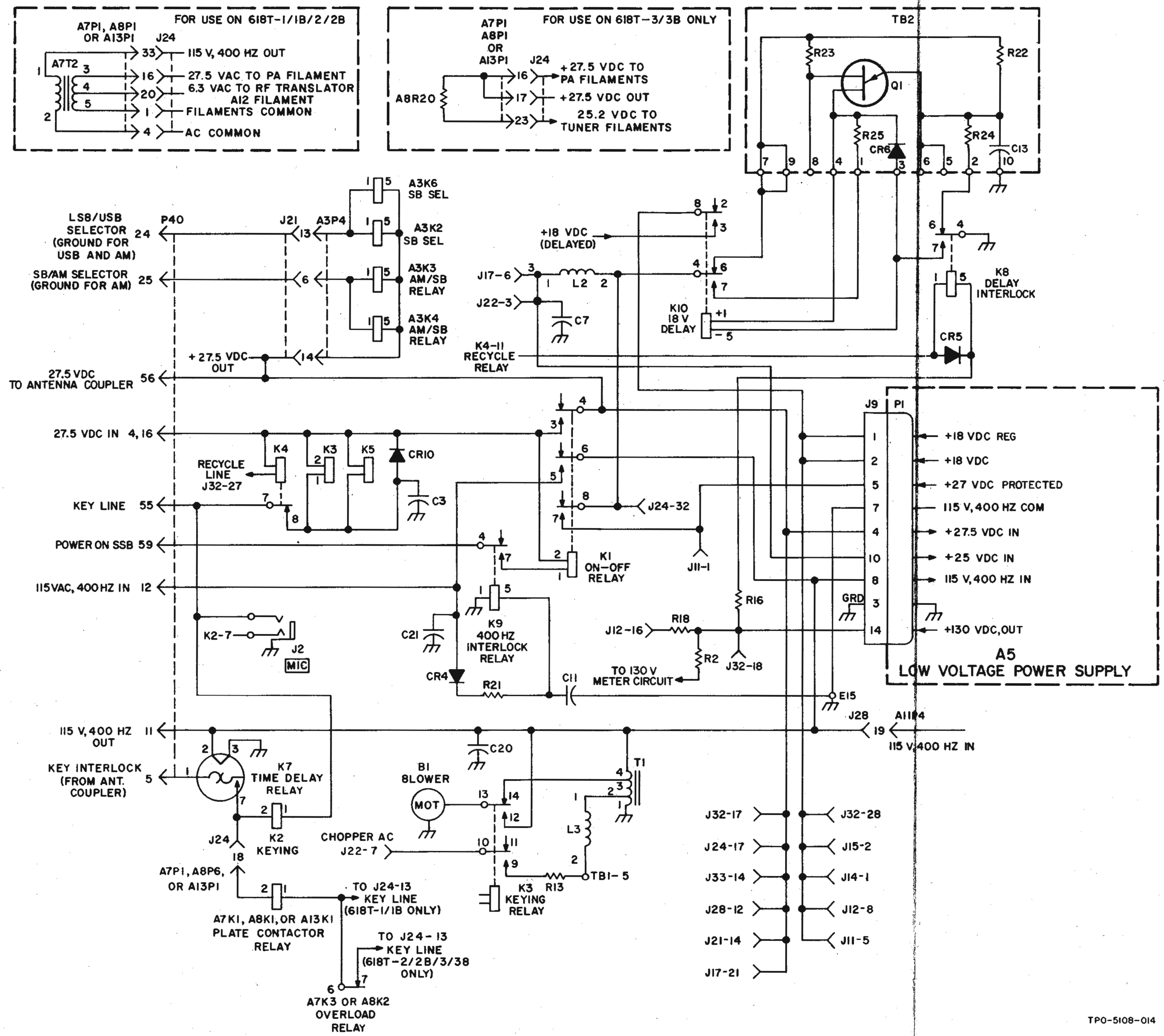
(11) Recycle Circuits.

(a) 618T-1/2/3.

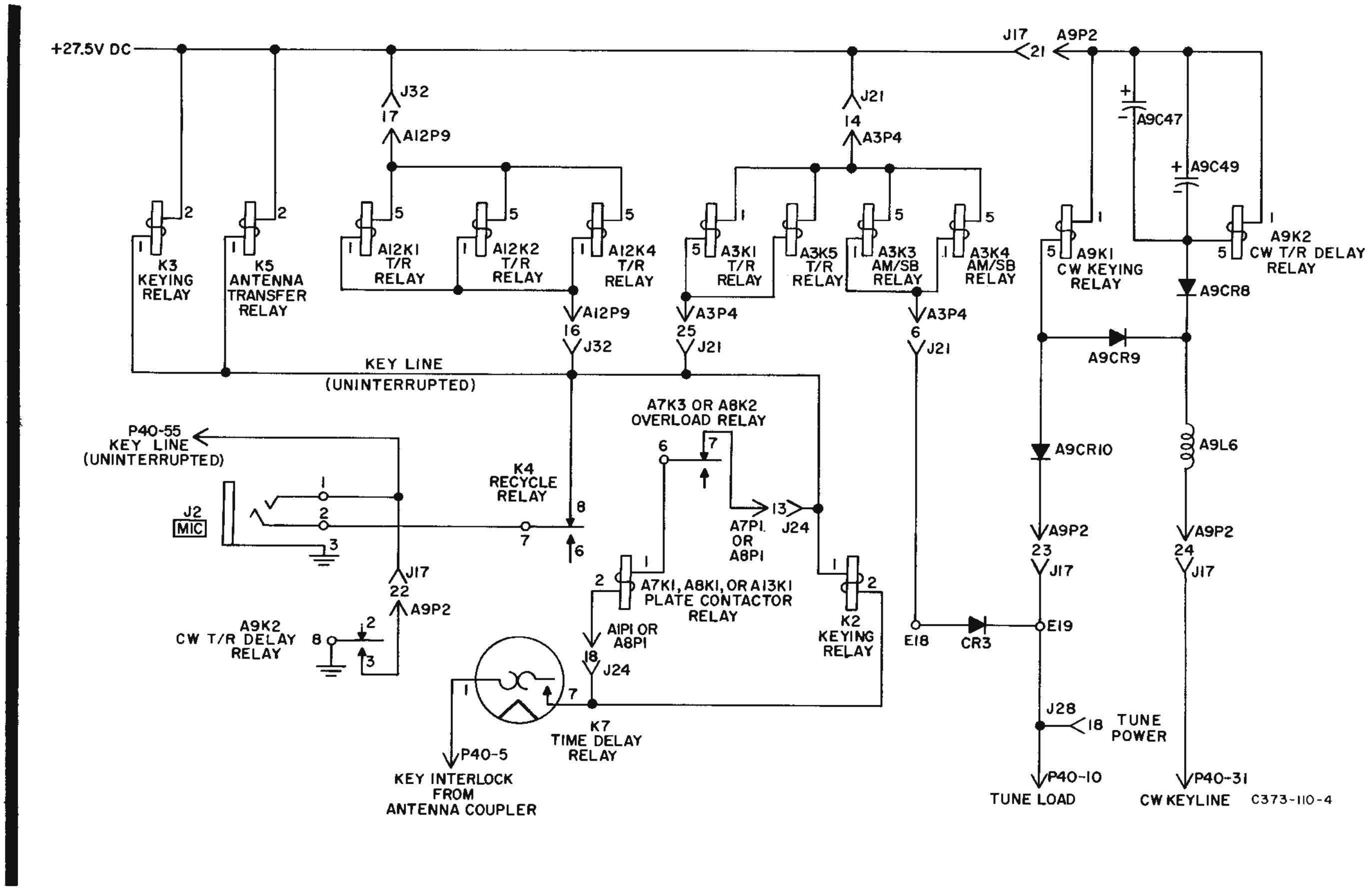
Refer to figure 13. A change of frequency is called recycle. When any of the frequency selector switches on the radio set control is moved, recycle relay K4 is energized. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna coupler, and disable the frequency stabilizing signals. Recycle relay K4 opens when the servo motors stop, but there is some residual motion in the mechanical linkage. The frequency stabilizing circuits are restored when recycle relay K4 opens. To prevent these circuits from attempting to phase lock vfo A12A2 during this interval, the +18 volts to kHz-frequency stabilizer A4 discriminator circuits is delayed for approximately 1/2 second. The delay circuit, contained on terminal board TB2, consists of transistor stage Q1.

(b) 618T-1B/2B/3B.

Refer to figure 13. When any of the frequency selector switches on the radio set control are moved, relay K4 is energized, and the 618T-1B/2B/3B is recycled. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna [illegible] the MHz-frequency



Power Distribution Circuits, Simplified Schematic Diagram
Figure 11

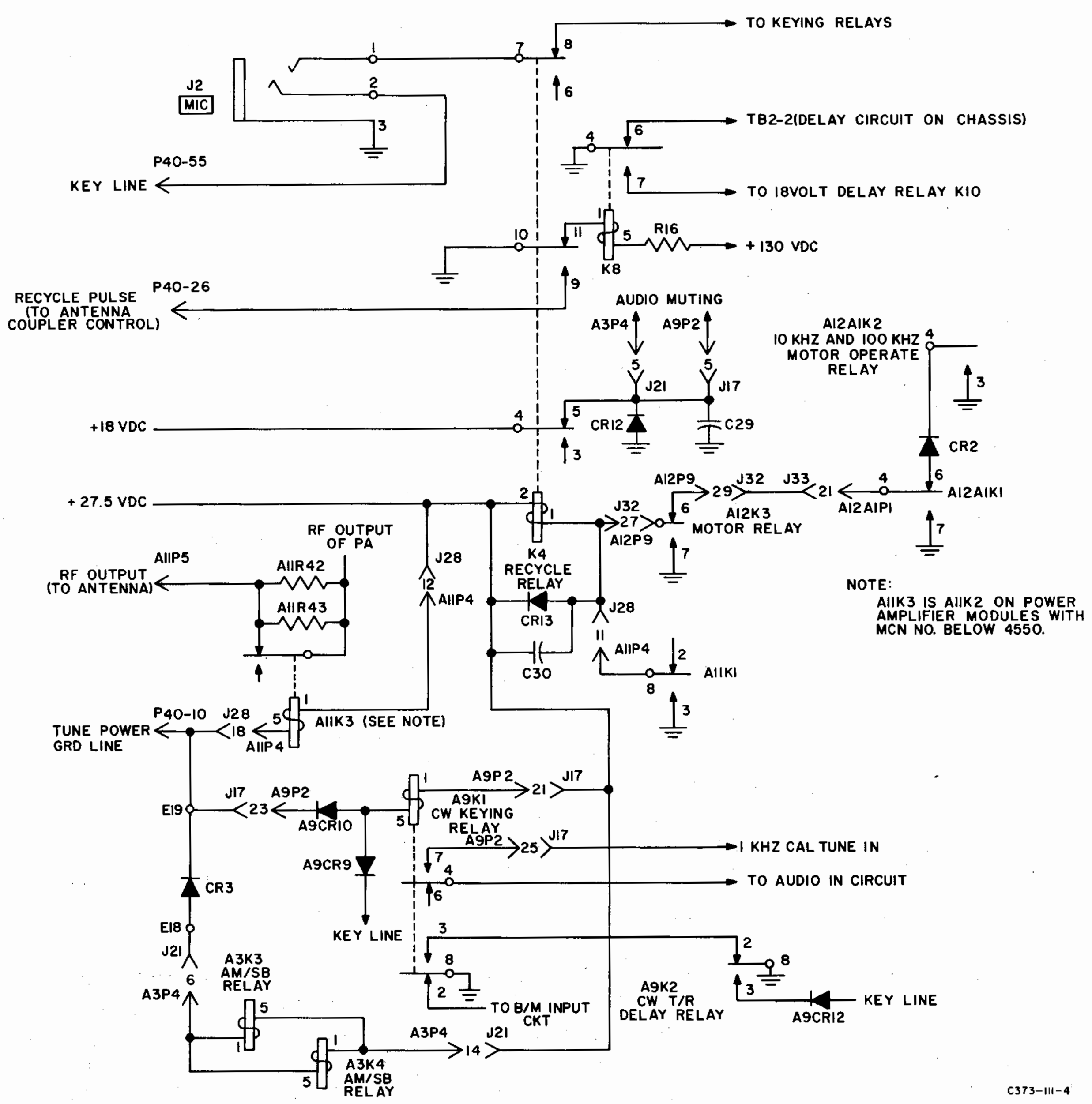


Keying Circuits, Simplified Schematic Diagram
Figure 12

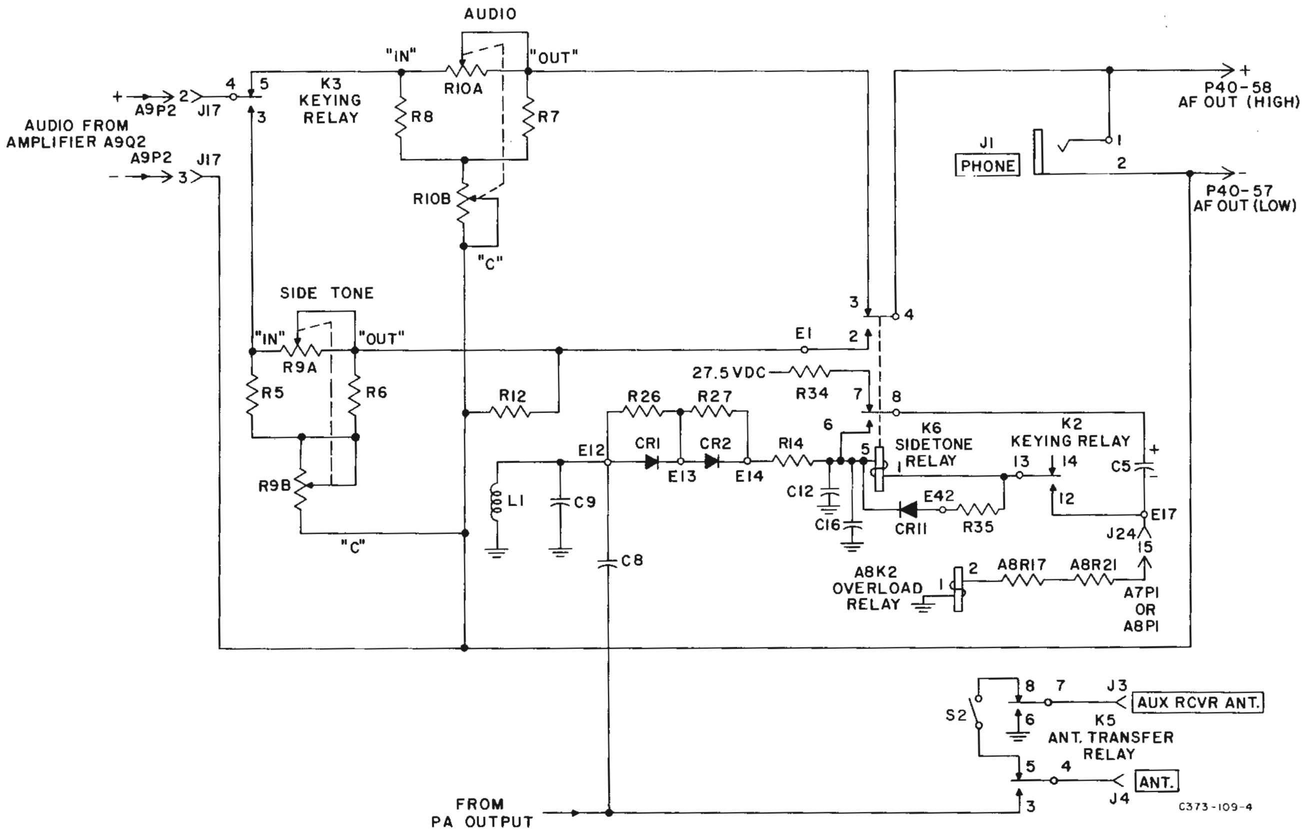
stabilizing circuits. When the servo motors stop, recycle relay K4 opens and restores the MHz-frequency stabilizing circuits. The kHz-frequency stabilizing circuits are unaffected by the actions of recycle relay K4. These circuits receive frequency control information directly from the radio set control and therefore begin to stabilize on the new frequency immediately.

(12) Audio and Sidetone Circuits.

Figure 14 is a simplified schematic diagram of the audio and sidetone circuits. The sidetone is taken from audio amplifier stage A9Q2 to provide monitoring of the transmission. The sidetone passes from A9Q2, through keying relay K3 in the sidetone level adjust network, and through sidetone relay K6 to the headset. A combination of two voltages is necessary to energize sidetone relay K6. One voltage, derived from the rf output of power amplifier A11, is rectified by CR1 and CR2, filtered by C12, and applied to sidetone relay K6. The second voltage, from the high-voltage power supply, is proportional to power amplifier plate current. For sidetone relay K6 to energize, both sufficient plate current and plate voltage swing must be present in power amplifier A11. Capacitor C5, across the coil of sidetone relay K6, keeps the coil energized in the sideband transmit mode when the output voltage varies with speech.



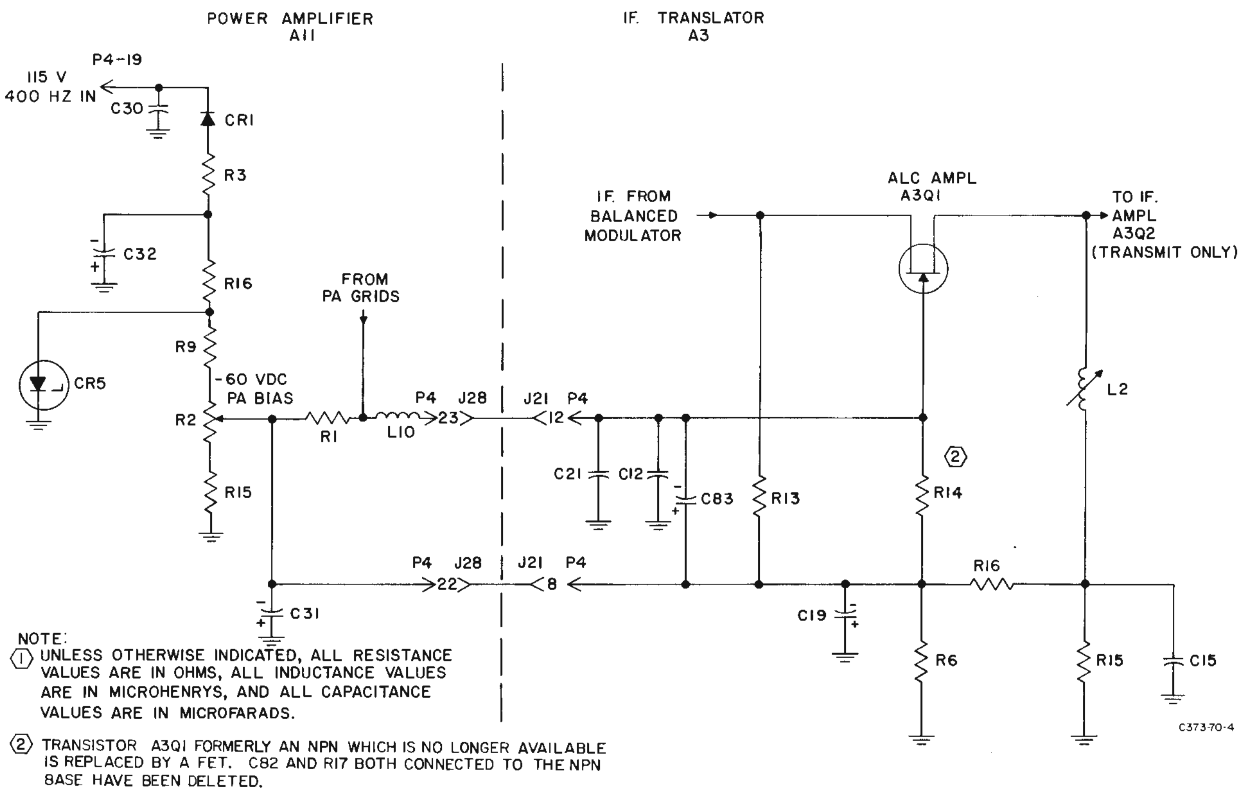
Recycle Circuits, Simplified Schematic Diagram
Figure 13



Audio and Sidetone Circuits, Simplified Schematic Diagram
Figure 14

(13) ALC Circuits.

Figure 15 is a simplified schematic diagram of the alc circuits. Automatic load control functions when the power amplifier is driven into grid current. The duration of voice peaks and their period of recurrence, as well as average voice volume, differs between operators. These differences affect the amount of drive to the power amplifier grids and must be compensated for since the grid circuit must be driven at the threshold of grid current to derive maximum linear output. The alc circuits control the drive to the power amplifier by monitoring power amplifier grid voltage. Voice peaks that drive the power amplifier grids into grid current (class AB2) increase the voltage drop across resistor A11R1 in the grid bias circuit. Resistor A11R1 is common to the grid circuit of the power amplifier and the source-gate circuit of ALC amplifier A3Q1 in the if translator. The voltage drop across A11R1 increases with grid current flow and reduces the current in A3Q1. With the gain of A3Q1 lowered, drive to the power amplifier is decreased. The time constant of the circuit permits a slow decay for the feedback voltage required because of the intervals between voice peaks. Audio gain adjustment is made in the speech amplifiers (AM/audio amplifier module).



ALC Circuits, Simplified Schematic Diagram
Figure 15

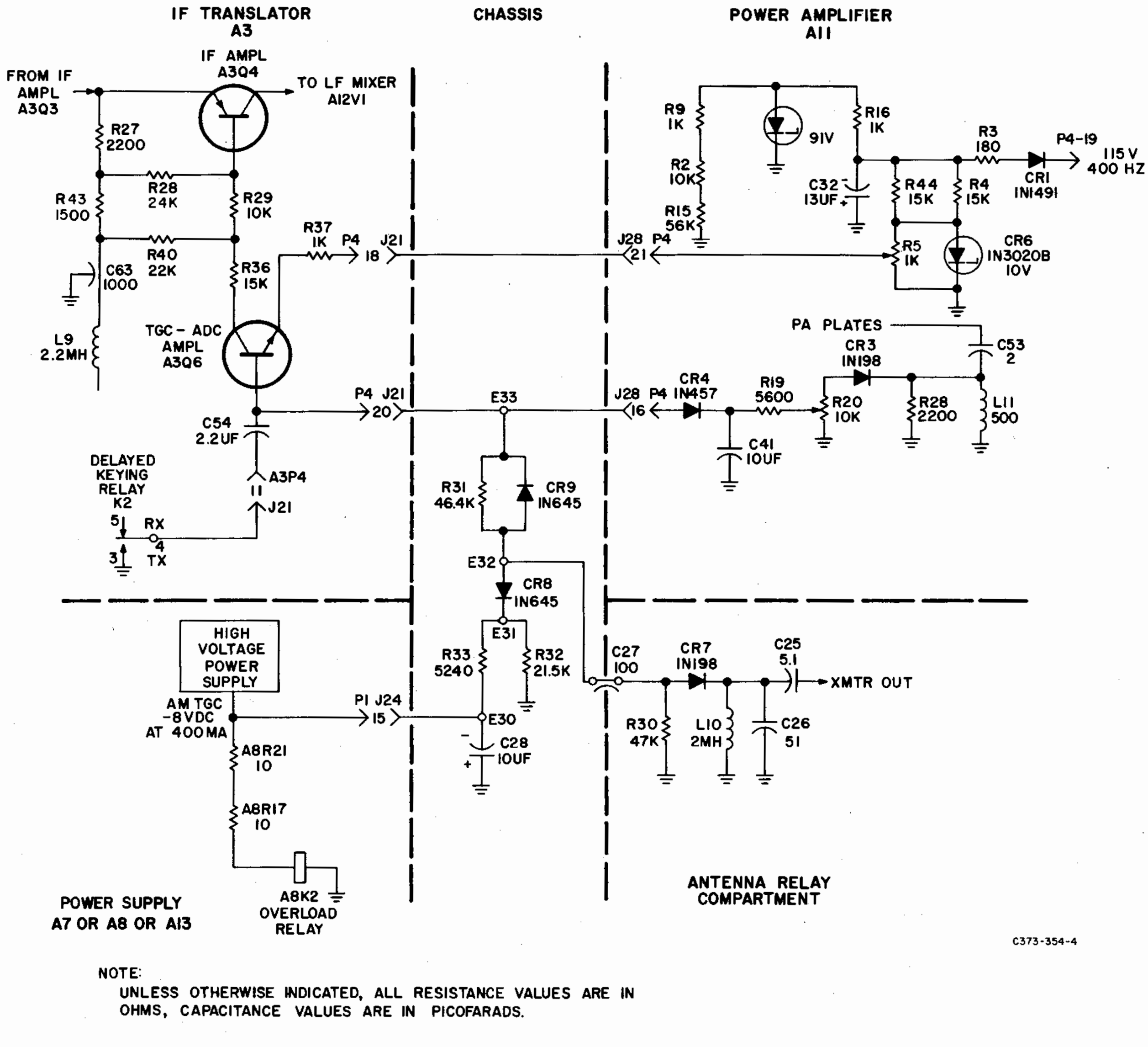
(14) TGC Circuits.

Transmitter gain control regulates carrier level in the AM mode to compensate for variations in gain throughout the 618T-( ) frequency range. (Refer to figure 16.) Transmitter gain control is a feedback voltage derived by sampling and rectifying the carrier voltage in a linear demodulator. This circuit is in the antenna relay compartment. A 10-to-1 voltage divider (C25 and C26) provides approximately 8 volts of rf to diode CR7 that rectifies and produces negative feedback voltage. Diode CR7, resistor R30, and capacitor C27 form the linear demodulator. The tgc feedback voltage obtained is proportional to average instantaneous peak carrier amplitude and is independent of frequency or modulation index. The tgc does not control the SSB level, but does maintain carrier level within the limits of 70 to 90 volts rms over the 618T-( ) frequency range.

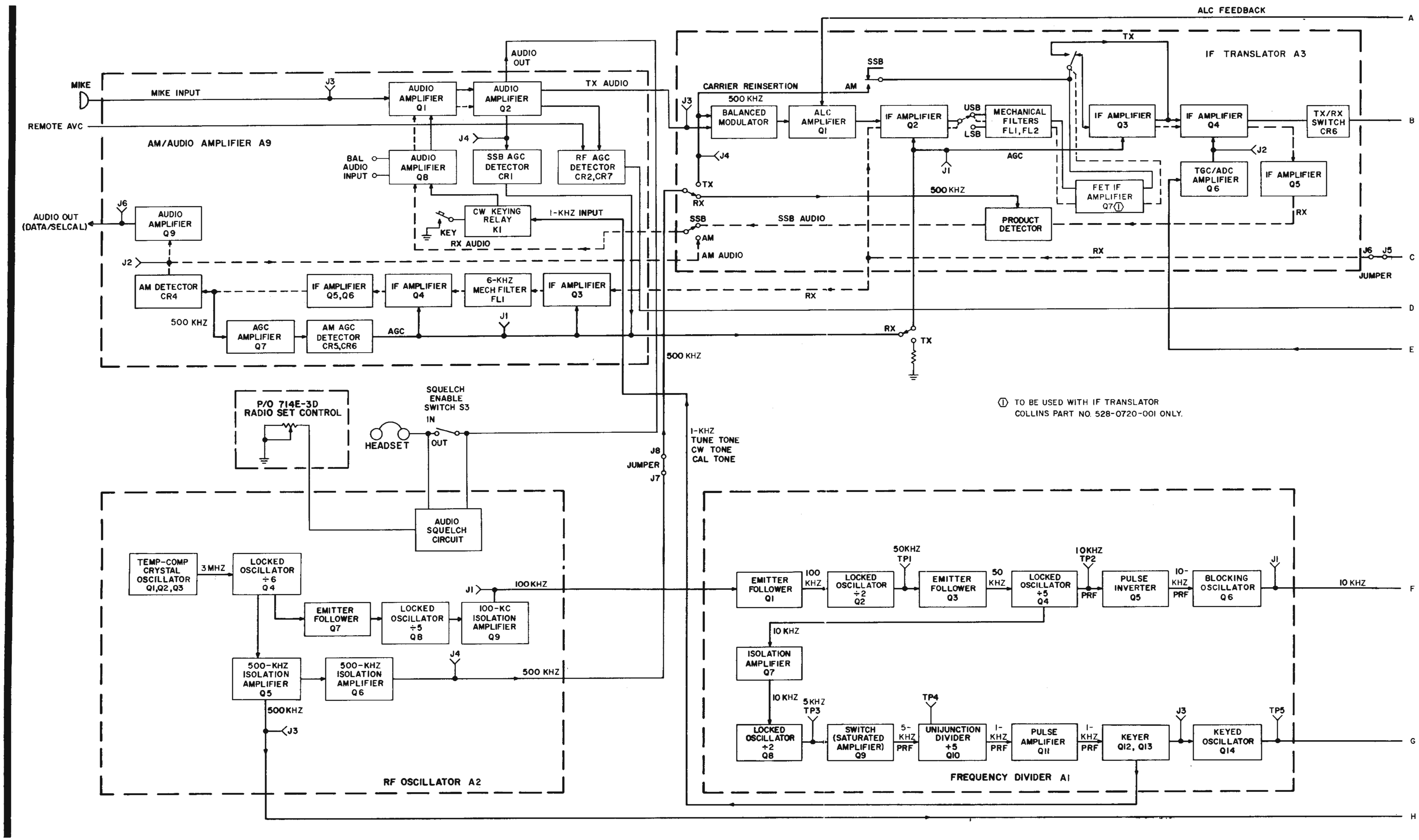
C. Detailed Theory of Operation.

(1) AM/Audio Amplifier A9. (Refer to figure 822.)

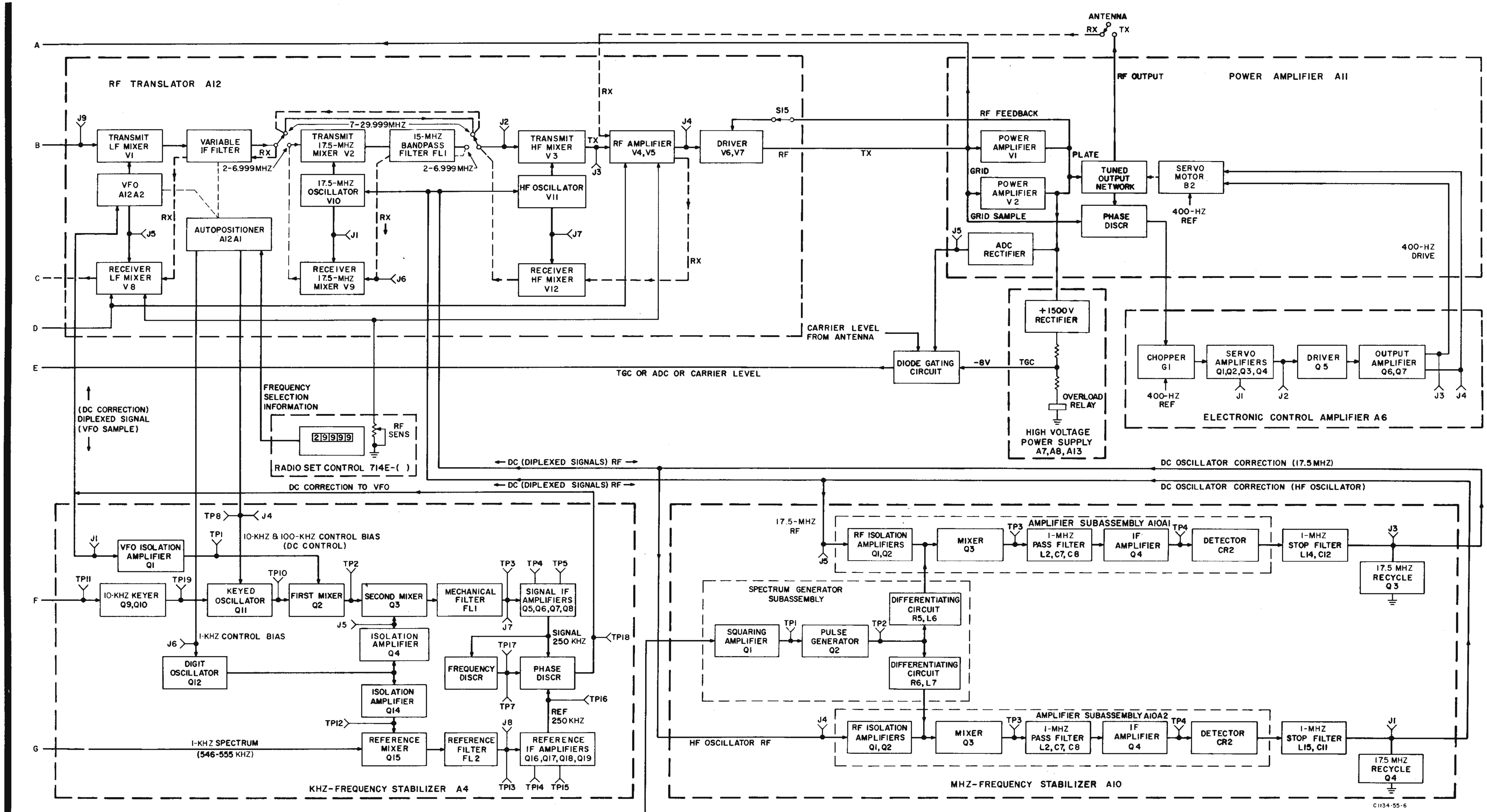
The AM/audio amplifier, A9, amplifies voice, CW, or DATA signals in the transmit mode. Inputs are provided for mike or key and for balanced interphone



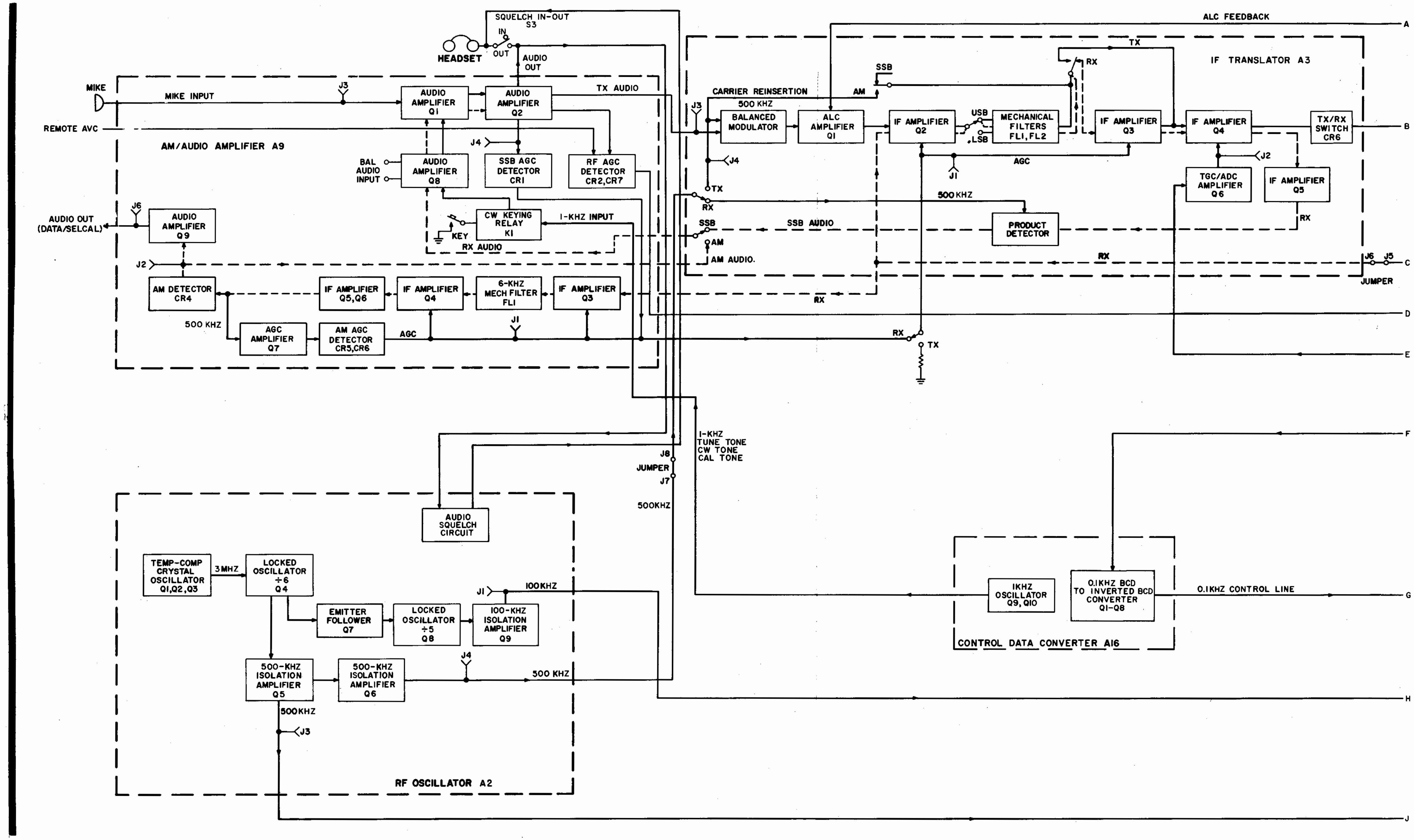
TGC and ADC Circuits, Simplified Schematic Diagram
Figure 16



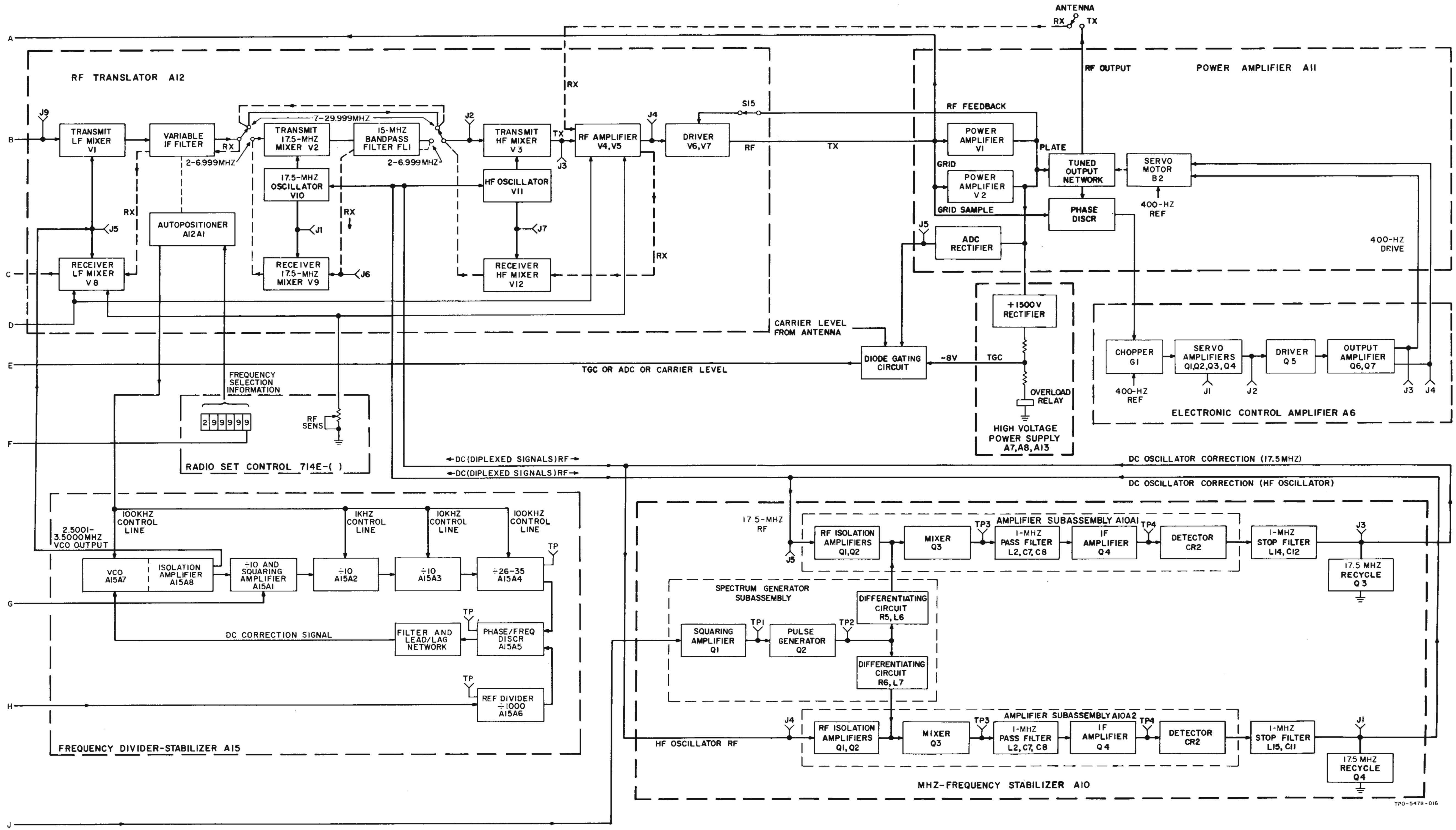
618T-1/2/3 Airborne SSB Transceivers, Block Diagram
Figure 17 (Sheet 1 of 2)



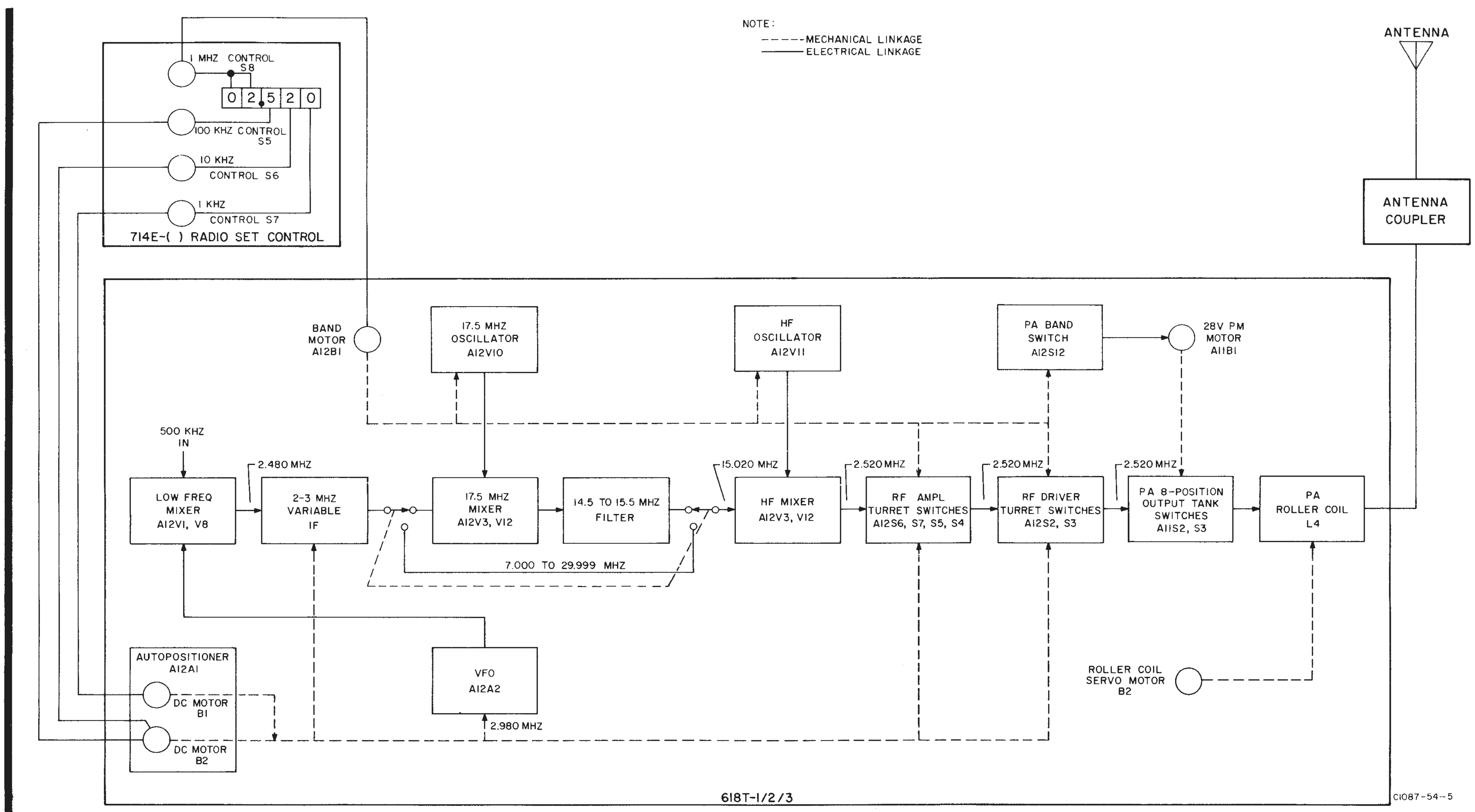
618T-1/2/3 Airborne SSB Transceivers, Block Diagram (Sheet 2 of 2)
Figure 17



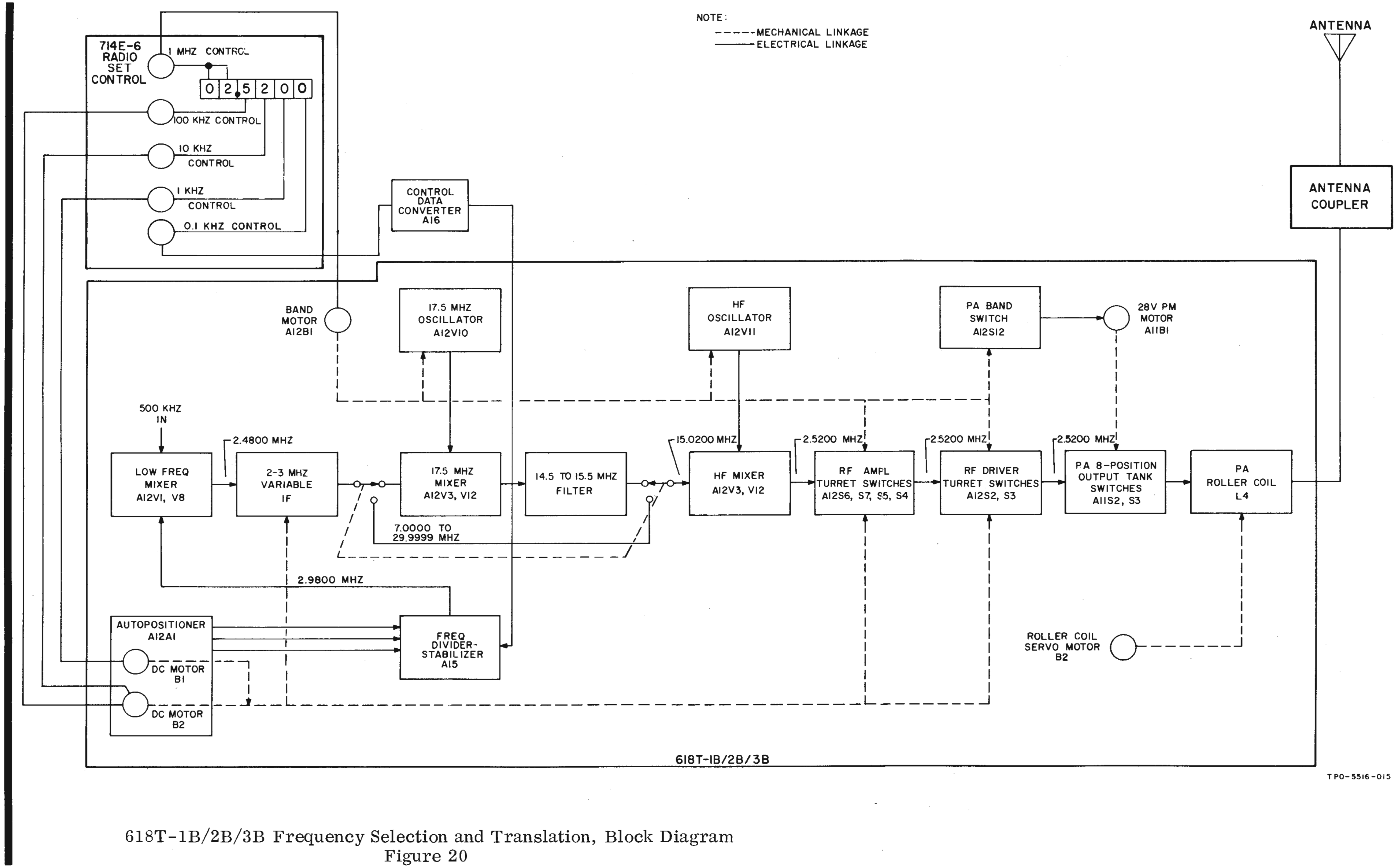
618T-1B/2B/3B Airborne SSB Transceivers, Block Diagram
Figure 18 (Sheet 1 of 2)



618T-1B/2B/3B Airborne SSB Transceivers, Block Diagram (Sheet 2 of 2)
Figure 18



618T-1/2/3 Frequency Selection and Translation, Block Diagram
Figure 19



618T-1B/2B/3B Frequency Selection and Translation, Block Diagram
Figure 20

lines. A 1-kHz tone is fed to this module for CW keying and as an antenna coupler tuning indicator. The 500-kHz if. signal from the rf translator module is also received by AM/audio amplifier A9 in the receive mode. DATA and SELCAL signals are amplified in three audio stages of amplification, while voice (microphone) signals are amplified in two audio stages. The amplified audio output is available for headphones, interphone lines, and for developing agc for SSB received signals.

(a) Transmit.

When the CW key is depressed, CW TR delay relay A9K2 switches the receiver-transmitter from receive to transmit.

When the CW key is depressed or during the tune cycle of an antenna tuner or antenna coupler, CW keying relay A9K1 connects the 1-kHz tone to the input of audio amplifier A9Q8. In AM/audio amplifier A9 modules MCN 40000 and above (CPN 546-7267-004), the 1-kHz tone is filtered by A9U1 before being applied to audio amplifier A9Q8. Capacitors A9C47 and A9C49 hold relay A9K2 closed for approximately 550 milliseconds after the key is released.

Besides the tone input, two af inputs are provided. One input is single ended and applied through A9R6 to the base circuit of audio amplifier A9Q1. The second af input is a 600-ohm balanced input for other modulating sources, such as interphone or data. This second input is applied through A9R5 to the base of audio amplifier A9Q8.

Audio amplifiers A9Q8, A9Q1, and A9Q2 form the speech amplifier for transmit. The output of A9Q2 in transmit is single ended and coupled from the collector of A9Q2, through resistor A9R49, to the balanced modulator in if. translator A3.

(b) Receive.

In the receive mode, the three stages used for speech amplification become the output audio amplifier. Detected AM audio from diode A9CR4 is applied to the base of transistor A9Q8 through resistor A9R2 and capacitor A9C1 after selection by AM/SSB relay A3K3 in if. translator A3. Detected SSB audio is routed in the same manner from the product detector in if. translator A3.

The 500-kHz if. signal from the lf mixer in rf translator A12 is amplified in stages A9Q3 through A9Q6. Bandwidth is restricted to 6 kHz by mechanical filter FL1 in the output circuit of if. amplifier A9Q3.

The AM if. signal, after amplification, is detected by diode A9CR4 and applied to the audio amplifier and a separate stage for SELCAL. This audio amplifier stage (A9Q9) permits interception of AM signals regardless of the position of the mode switch on the radio set control.

(2) IF. Translator A3. (Refer to figure 813.)

The if. translator, A3, functions both in transmit and receive modes. In the transmit mode, it produces a 500-kHz SSB or AM signal. In the receive SSB mode, it provides if. amplification and product detection.

(a) Transmit.

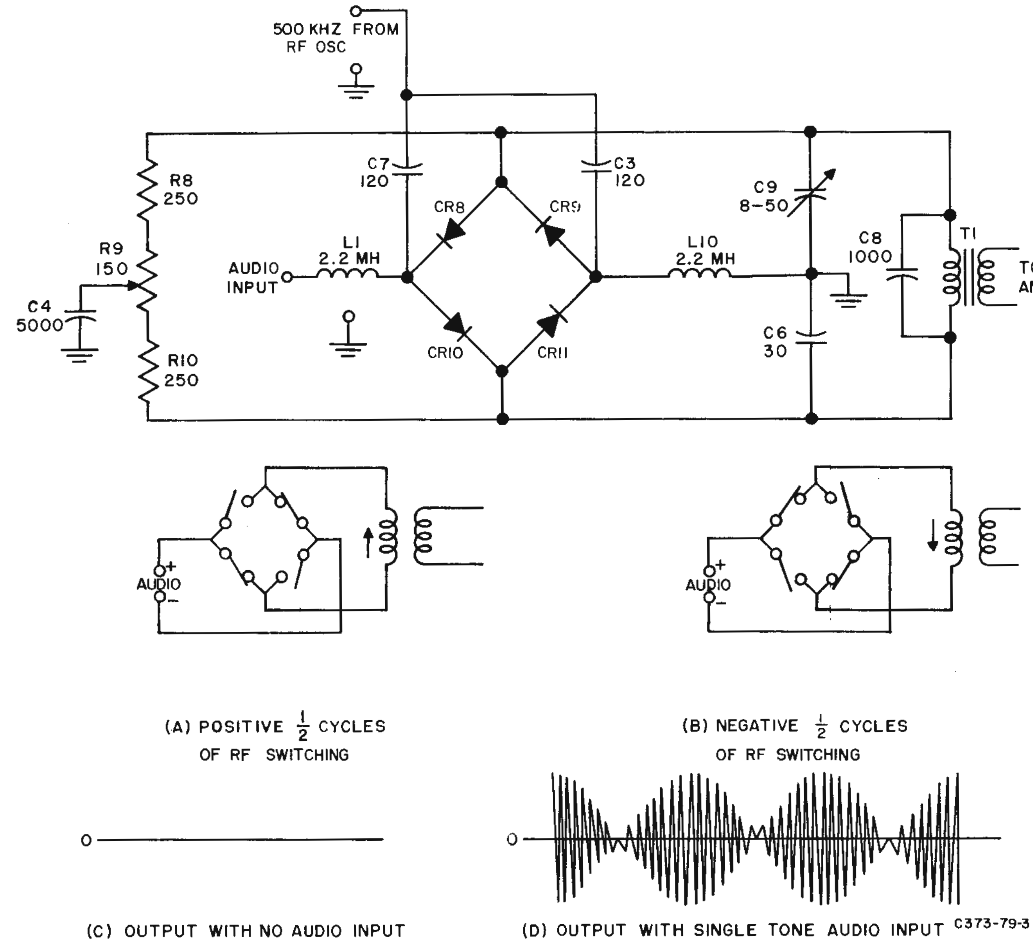
In the transmit mode, if translator A3 translates audio into an ssb or am signal at 500 kHz. The amplified audio from am/audio amplifier A9 is translated in the balanced modulator to the 500-kHz reference, producing a double sideband signal with a suppressed carrier. The signal is then amplified by alc amplifier A3Q1, whose output level varies according to its bias. Details of alc amplifier A3Q1 are contained in chassis circuit theory. After additional amplification by if amplifier A3Q2, sideband select relay A3K2 routes the signal through mechanical filter A3FL1 or A3FL2, depending upon the position of the function selector switch (usb or lsb) on the radio set control. When if translator (Collins part number 528-0720-001) is used, A3K6 switches the output of mechanical filter A3FL1 or A3FL2. If the function selector switch is in the am position, the usb mode is selected and the 500-kHz carrier is reinserted with the signal at the filter output. Amplifier A3Q7 is an FET transistor that provides a high impedance for the output of mechanical filters A3FL1 and A3FL2 (used on if translator, Collins part number 528-0720-001 only). Relay A3K5 routes the signal around if amplifier A3Q3 since this stage is used only in the receive mode. Additional amplification is provided by if amplifier A3Q4, and its output is the if translated signal to be converted to operating frequency in rf translator A12. Diode A3CR6 prevents the passage of unwanted spurious signals produced by receive and transmit mixers in rf translator A12.

The balanced modulator (A3CR8 through A3CR11) is a diode chopper that reverses polarity of the applied audio at a 500-kHz rate. Figure 21 is a simplified diagram of the balanced modulator. The 500-kHz carrier voltage is nearly 10 times larger than the audio voltage so the audio voltage peaks do not switch the diodes. The switching action of the diodes causes 500-kHz current in the primary windings of transformer A3T1 to reverse direction. By utilizing matched diodes and by adjustment of A3R9 and A3C9, the current flow during both positive and negative half-cycles is nearly equal. Therefore, the current flow in A3T1 is effectively canceled and the 500-kHz carrier is suppressed.

(b) Receive.

In the receive mode, if translator A3 converts the signal from lf mixer A12V8 of rf translator A12 to audio at the product detector in either lsb or usb mode. The signal is amplified by if amplifier A3Q2, the sideband selected as in the transmit mode, and further amplified by A3Q7 (used on if translator Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. The output is combined in the product detector with the 500-kHz carrier. The output of the product detector is proportional to the 500-kHz carrier and the ssb signal. The detected audio is routed to am/audio amplifier A9 by ssb/am relay A3K3 that is deenergized in usb to lsb mode.

Several selected components are used in if translator A3. At the output of the mechanical filters, resistor A3R5 is selected for the proper signal level, and resistor A3R45 is selected to equalize lsb and usb gain within ±2 dB. The input level to if amplifier A3Q2 is adjusted by selection of A3R2.



Balanced Modulator, Simplified Schematic Diagram
Figure 21

(3) RF Translator A12, 618T-1/2/3. (Refer to figure 830.)

The prime function of rf translator A12, Collins part number 528-0113-00, is to translate the 500-kHz input to the 28,000 operating frequencies of the 618T-1/2/3 in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2.000 to 6.999 MHz. (Refer to figure 22.)

Although conversion methods differ in the two tuning ranges, the first conversion, from transmit lf mixer A12V1 to the variable if. output, is identical throughout the 2.000- to 29.999-MHz range. For convenience, the range from 2.000 to 6.999 MHz will be called the low band, and the range from 7.000 to 29.999 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set control shown in figure 22 is 3.451 MHz. To calculate the variable frequency oscillator (vfo) A12A2 operating frequency, subtract the last three digits of the operating frequency of the radio set control from 3.500 MHz, the upper frequency limit of the vfo.

Example: 3.451-MHz operating frequency

3.500-MHz vfo upper limit
-0.451 MHz

3.049-MHz vfo operating frequency (injection frequency)

In the transmit mode, the injection frequency, 3.049 MHz, is combined in transmit lf mixer A12V1 with the 500-kHz input from if. translator A3. The difference frequency, 2.549 MHz, is tuned by the variable if. that is mechanically connected to the Autopositioner linkage. The MHz digit enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.549-MHz variable if. signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 14.951 MHz, is passed through the 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VFO Frequency.

   3.500 MHz minus last three digits of operating frequency.

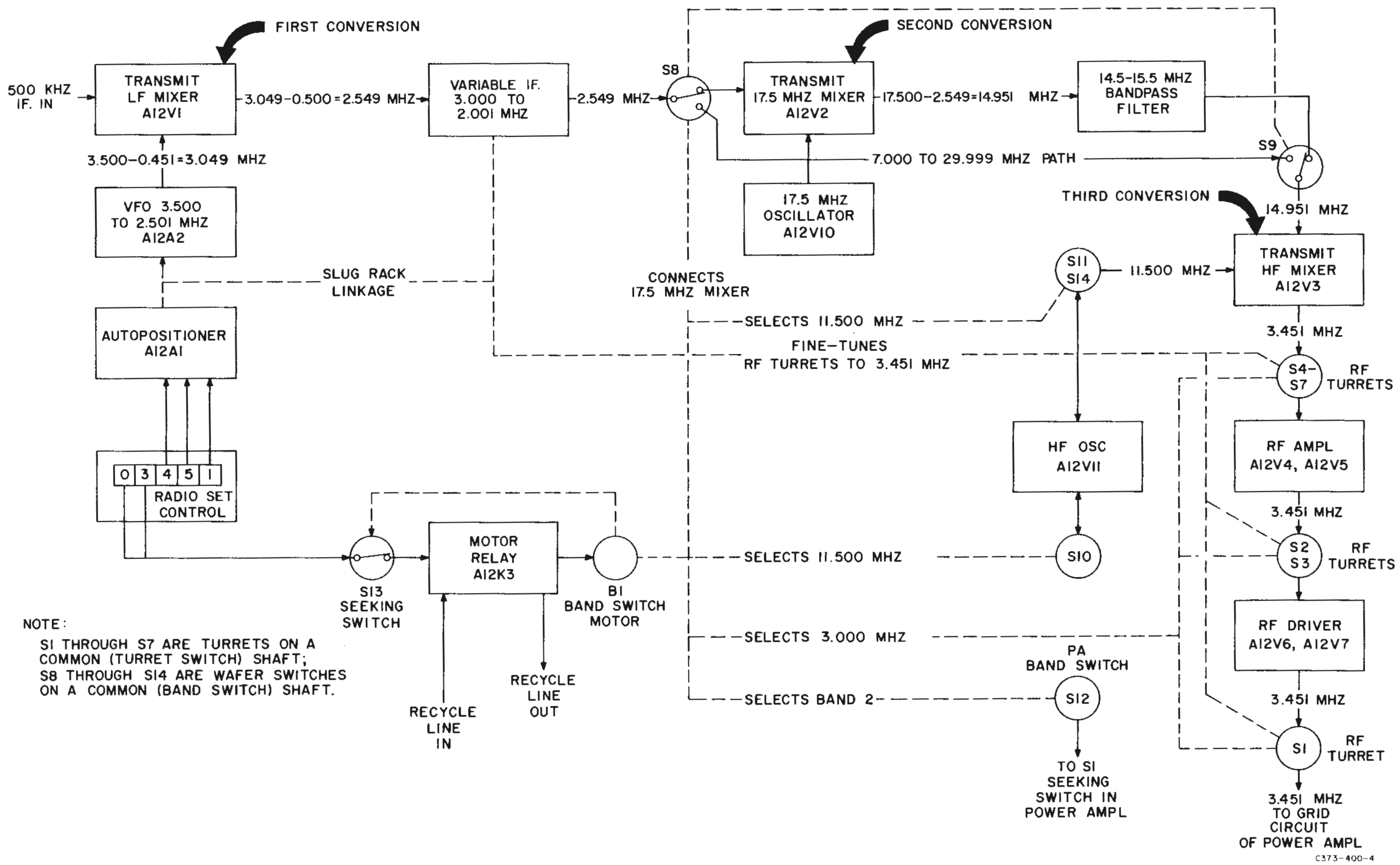
2. Variable IF.

   3.000 MHz minus last three digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.

   14.500 MHz plus last three digits of operating frequency.

A third conversion stage converts the 14.951-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 14.951-MHz signal with the output of hf oscillator A12V11 to obtain the operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the output frequency of hf oscillator A12V11 is between 12.5 and 8.5 MHz, while the operating frequency is between 2 through 6.999 MHz. The example, 3 MHz, requires an hf oscillator output of 11.500 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and the rf driver stages, while the Autopositioner uses a mechanical gear train to fine tune the rf amplifier and rf driver stages.



618T-1/2/3 Frequency Translation 2 to 6.999 MHz, Block Diagram
Figure 22

(b) Frequency Translation, 6.999 to 29.999 MHz. (Refer to figure 23.)

The operating frequency of the radio set control, shown in figure 23, is 9.451 MHz. The last three digits of the operating frequency, .451 MHz, are the same as those used in the 2- through 6.999-MHz explanation, since, for all operating frequencies from 2 through 29.999 MHz, the vfo and variable if. frequencies are determined by the last three digits of the operating frequency only.

Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.549-MHz signal from lf mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this mixer is not used for operating frequencies above 6.999 MHz.

The variable if. signal, 2.549 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.451 MHz (12.000 MHz minus 2.549 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

Rf translation in the receive mode is substantially the reverse of that of the transmit mode. The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit lf mixer A12V1 is replaced by receive lf mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of if. translator A3 and AM/audio amplifier A9.

(c) Autopositioner A12A1 Mechanism, 618T-1/2/3 Only (Collins Part Number 546-6873-005).

The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation. For kHz increments of tuning, the Autopositioner contains two motors that drive a single shaft coupled to the vfo shaft. Another mechanical output from the Autopositioner tunes the variable if. and fine tunes the rf amplifier and rf driver through a train of gears as explained in the preceding sections covering frequency translation. The basic elements of the Autopositioner system are shown in figure 24. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

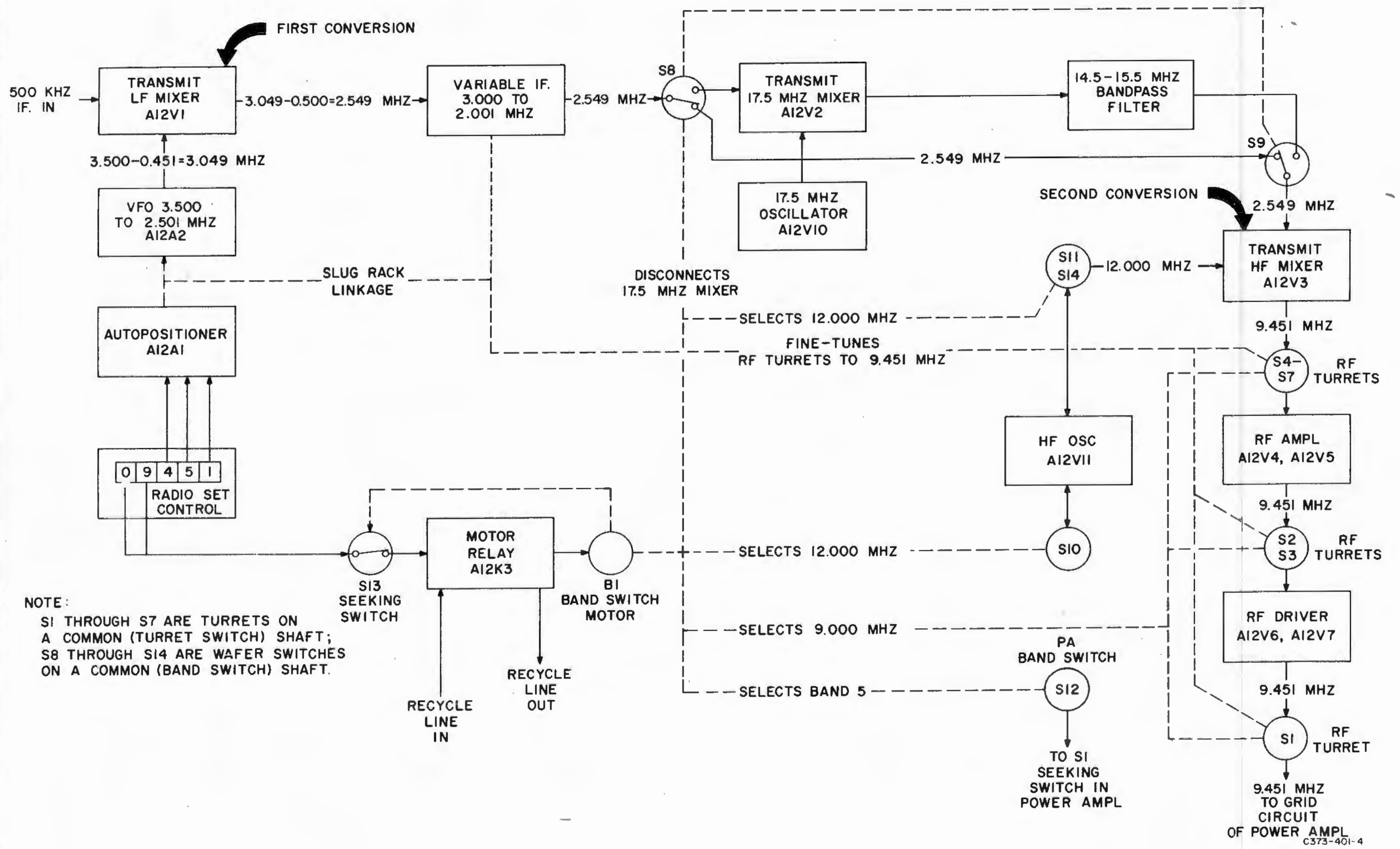
A typical cycle of operation of the Autopositioner is as follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the Autopositioner shaft, the rotor of the seeking switches, and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened, and the pawl is dropped into a stop-wheel notch to halt shaft rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop-wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of the radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. When the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its shaft (and connected tuning elements) to the proper position to restore the symmetry of the control system. It is a reentrant control system providing a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

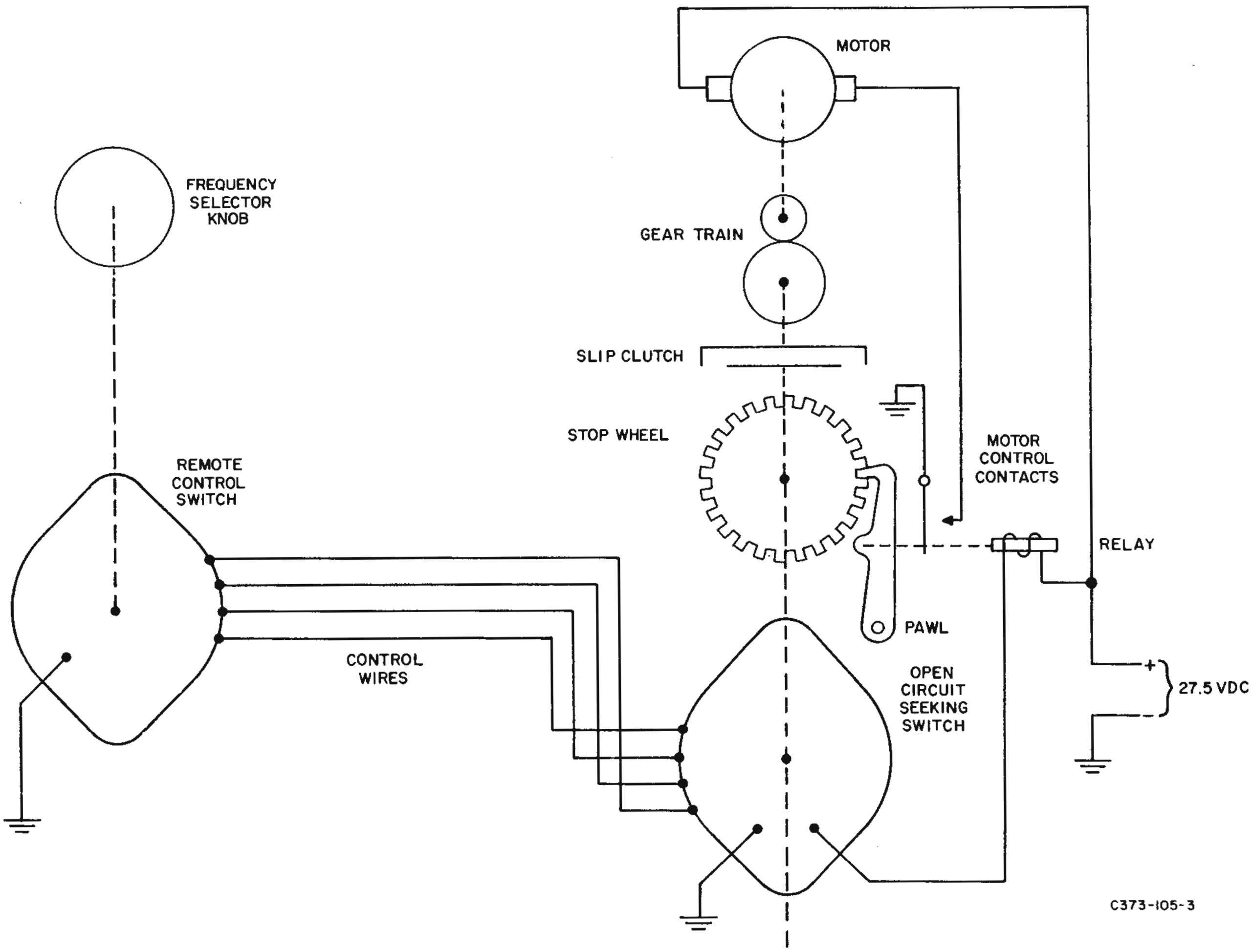
The reentrant system is comparable to a single-pole, double-throw switch scheme shown in figure 25. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens, and the motor stops. The total number of combinations of switch positions in such a system is $2^{n}-1$, where n is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 832 is a schematic diagram of the Autopositioner submodule. There are three seeking switches in the Autopositioner: the 100-, 10-, and 1-kHz seeking switches corresponding to the last three digits of operating frequency selected on the radio set control. For the selected vfo frequency to be set up, all three seeking switches must be satisfied. Since each of the three switches has 10 positions, there are 10^3 or 1000 possible switch combinations or shaft positions. Since the 1000 possible combinations occur within a 1-MHz range, the 618T-1/2/3 tunes in 1-kHz increments.

The 100-kHz seeking switch is geared to the output shaft by an intermittent movement so that it is advanced one position for each revolution (100 kHz) of the Autopositioner output shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the output shaft. The stop wheel has 10 notches,



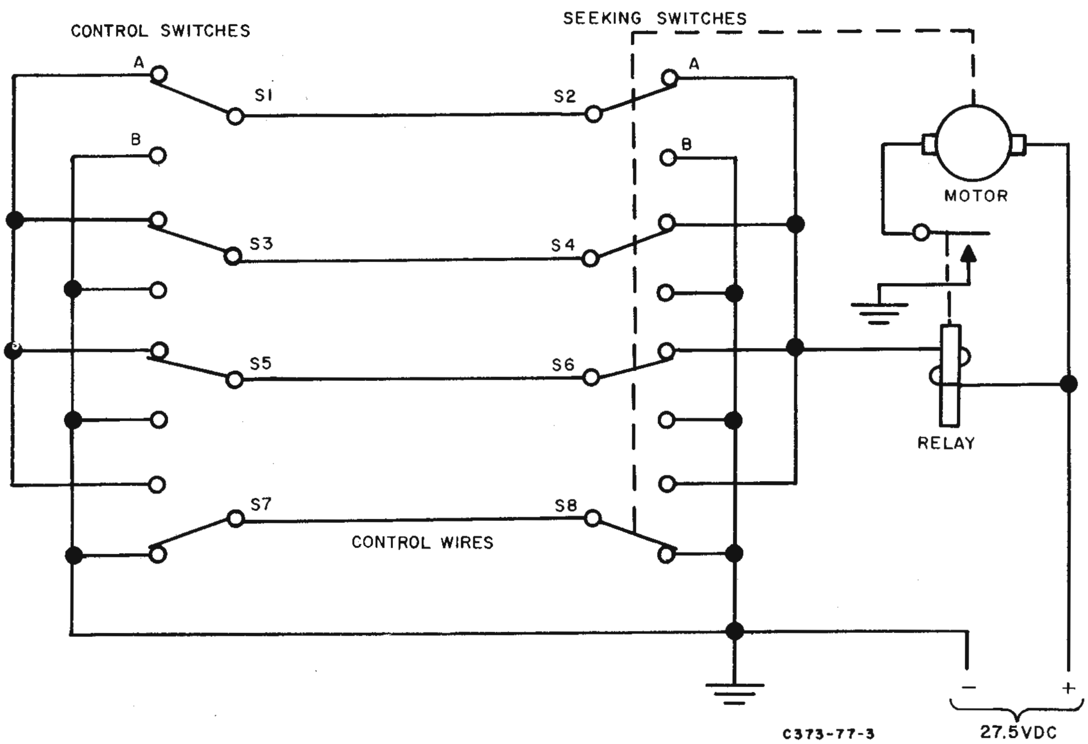
618T-1/2/3 Frequency Translation 7 to 29.999 MHz, Block Diagram
Figure 23



618T-1/2/3 Autopositioner System, Basic Elements
Figure 24

making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire output shaft assembly through the action of a cam. The cam turns the output shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.



618T-1/2/3 Remote Frequency Control, Simplified Schematic Diagram
Figure 25

(d) Balanced Mixer Theory.

Refer to figure 830. The rejection of unwanted mixer products produced by frequency translation in rf translator A12 includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.

(e) Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C128 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

(f) Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In transmit, a key-line ground is applied through A12P9-16 to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit lf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +27.5-volt dc line at A12P9-17 and thus biased off).

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the agc voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +27.5-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier grid tank. Components of the 2- to 29.999-MHz tuned circuit are selected by 28-position band switches A12S4, A12S4, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contracts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver lf mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

(g) Variable Frequency Oscillator A12A2.

Variable frequency oscillator A12A2 is a submodule of rf translator A12. Refer to the schematic diagram in figure 833. The vfo is variable-reactance tuned by inductor A12A2L2. The inductor is mechanically driven by Autopositioner A12A1 and changes the vfo 100 kHz for every revolution of the Autopositioner shaft. Ten turns of the Autopositioner shaft cover the 1-MHz range of the vfo minus 1 kHz (3.500 to 2.501 MHz). Variable inductor A12A2L1 is manually tuned to set the upper frequency limit when making tracking adjustments. Mechanical tracking adjustments are performed by adjustment of the shaft coupling between the vfo and the Autopositioner. Capacitors A12A2C12, A12A2C9, and voltage variable capacitor A12A2VC1 are in parallel with inductor A12A2L1 and A12A2L2 to form the major portion of the tuned circuit. A12A2VC1 is back biased by a +10.000-volt calibrated reference, and the application of dc voltage to its anode terminal varies its capacity and thus, the vfo A12A2 output frequency.

The voltage applied to A12A2VC1 anode is the error voltage produced by kHz-frequency stabilizer A4 to provide phase locking of vfo A12A2 to the 3-MHz reference crystal oscillator. If the vfo output frequency is too high, a positive error voltage is applied that decreases the back bias and causes A12A2VC1 capacitance to increase, in turn lowering vfo A12A2 output frequency.

Negative error voltage is applied when vfo A12A2 output frequency is too low. Refer to kHz-frequency stabilizer A4 detailed theory for the detailed theory of this process.

The output of transistor A12A2Q1 is coupled through capacitor A12A2C8 to the base of buffer amplifier A12A2Q2. The output of buffer amplifier A12A2Q2 is coupled through capacitor A12A2C10 to the base of buffer amplifier A12A2Q3. The output of buffer amplifier A12A2Q3 drives isolation amplifier A12A2Q4 and is also coupled to transformer A12A2T1. The output of transformer A12A2T1 provides the rf sample voltage for kHz-frequency stabilizer A4. The output of amplifier A12A2Q4 is the oscillator injection output coupled to the lf mixer through transformer A12A2T2. Inductor A12A2Z1 is a 500-kHz trap that isolates the 500-kHz carrier from the oscillator.

To prevent signals from rf translator A12 from entering vfo A12A2 and providing false error signals to kHz-frequency stabilizer A4, vfo A12A2 contains an isolation bridge adjusted by A12A2R15. When the bridge is balanced, signals from rf translator A12 develop opposite and equal voltages across A12A2R14 and A12A2R15 and no output is produced. The unilateral network of capacitor A12A2C18 and resistor A12A2R19 provide isolation as well as positive feedback to increase the gain of the isolation output stage. The 70K3, 70K5, and 70K9 vfo's are basically similar. The 70K9 differs principally in the use of oven temperature control for crystal stability.

(h) 17.5-MHz Oscillator A12V10.

Refer to figure 830. The 17.5-MHz oscillator, A12V10, is also fine tuned by a voltage-variable capacitor. Capacitor A12C276 responds in the same manner as the one used in vfo A12A2. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to the MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(i) HF Oscillator A12V11.

Refer to figure 830. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator remains in operation for all 28 frequencies that are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

(4) RF Translator A12, 618T-1B/2B/3B. (Refer to figure 828.)

The prime function of rf translator A12 (Collins part number 528-0682-001) is translation of the 500-kHz input to the 280,000 operating frequencies of the 618T-1B/2B/3B Airborne SSB Transceiver in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2.0000 to 6.9999 MHz. (Refer to figure 27.)

Although conversion methods differ in the two tuning ranges, the first conversion from transmit lf mixer A12V1 to the variable if. output is identical throughout the 2.0000- to 29.9999-MHz range. For convenience, the range from 2.0000 to 6.9999 MHz will be called the low band, and the range from 7.0000 to 29.9999 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set control shown in figure 27 is 3.7434 MHz. To calculate the voltage-controlled oscillator (vco) A15A7 operating frequency, subtract the last four digits of the operating frequency (from the radio set control) from 3.5000 MHz, the upper frequency limit of the vco.

Example: 3.7434-MHz operating frequency

 3.5000-MHz vfo upper limit
-0.7434 MHz
 2.7566-MHz vco operating frequency (injection frequency)

In the transmit mode, the injection frequency, 2.7566 MHz, is combined with the 500-kHz input from if. translator A3 in transmit lf mixer A12V1. The difference frequency, 2.2566 MHz, is tuned by the variable if. that is mechanically connected to the Autopositioner mechanical linkage. The MHz digit 2 enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.2566-MHz variable if. signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 15.2434 MHz, is passed through 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VCO Frequency.

3.5000 MHz minus last four digits of operating frequency.

OPERATING FREQUENCY (MHz)	HF OSCILLATOR FREQUENCY (MHz)
2-3	*12.500
3-4	*11.500
4-5	*10.500
5-6	* 9.500
6-7	* 8.500
7-8	10.000
8-9	11.000
9-10	12.000
10-11	13.000
11-12	14.000
12-13	15.000
13-14	16.000
14-15	** 8.500
15-16	** 9.000
16-17	** 9.500
17-18	**10.000
18-19	**10.500
19-20	**11.000
20-21	**11.500
21-22	**12.000
22-23	**12.500
23-24	**13.000
24-25	**13.500
25-26	**14.000
26-27	**14.500
27-28	**15.000
28-29	**15.500
29-30	**16.000

*Hf oscillator frequencies that are mixed with the 14.5- to 15.5-MHz output from the 17.5-MHz mixer.
**Hf oscillator frequencies that are doubled before injection into the hf mixer.

HF Oscillator Frequency for Each Operating Frequency Range
Figure 26

2. Variable IF.

3.0000 MHz minus last four digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.

14.5000 MHz plus last four digits of operating frequency.

A third stage converts the 15.2434-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 15.2434-MHz signal with the output of hf oscillator A12V11 to attain the desired operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the frequency of the hf oscillator is from 12.5000 to 8.5000 MHz, while the operating frequency is from 2.0000 to 6.9999 MHz. The example MHz digit 3 requires an hf oscillator output of 11.5000 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and rf driver stages, while the Autopositioner fine tunes the rf amplifier and rf driver stages through a mechanical gear train.

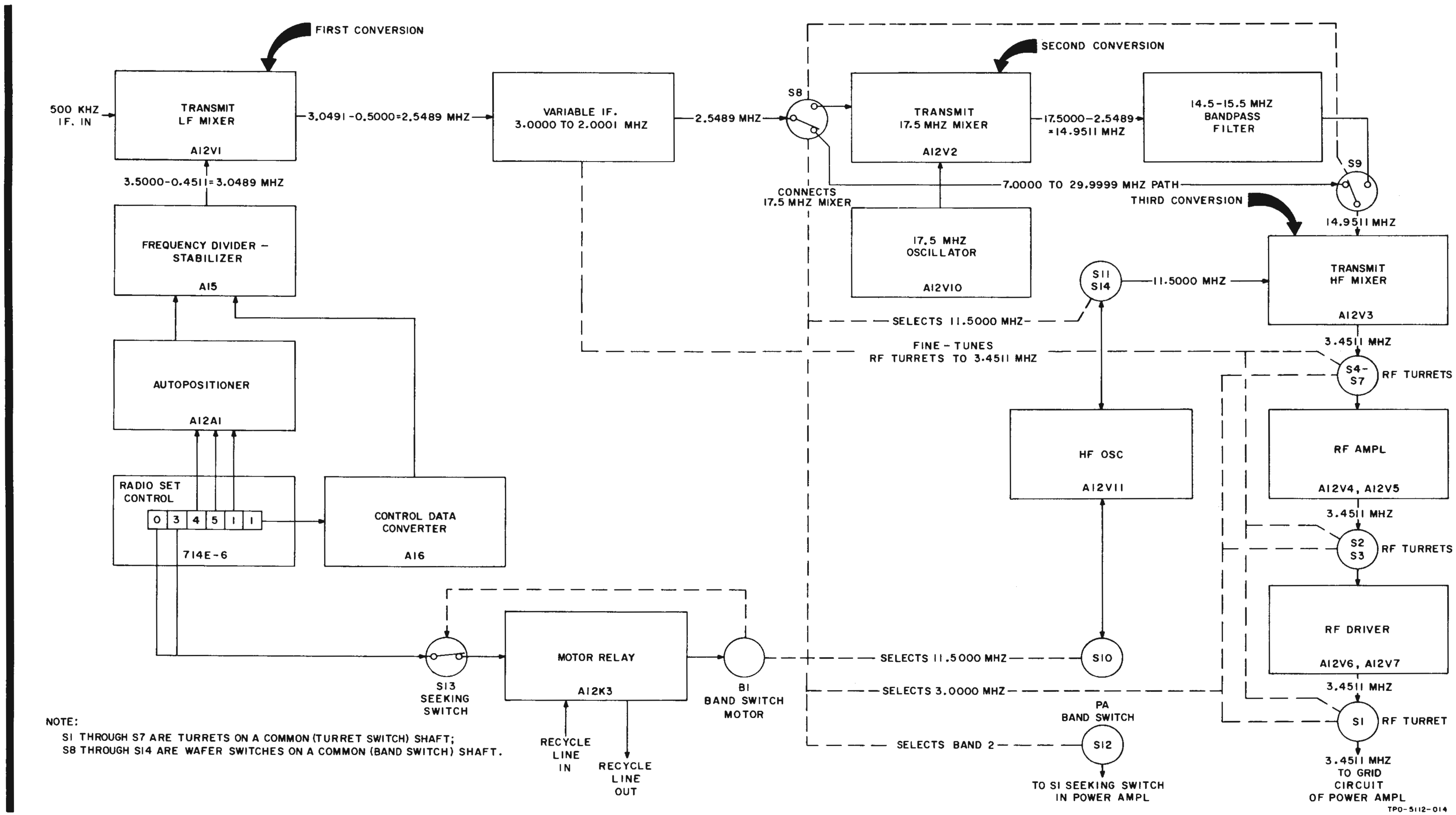
(b) Frequency Translation, 7.0000 to 29.9999 MHz. (Refer to figure 28.)

The operating frequency of the radio set control, shown in figure 28, is 9.7434 MHz. The last four digits of the operating frequency, .7434 MHz, are the same as those used in the 2- through 6.9999-MHz explanation, since, for all operating frequencies from 2 through 29.9999 MHz, the vco and variable if. frequencies are determined by the last four digits of the operating frequency only.

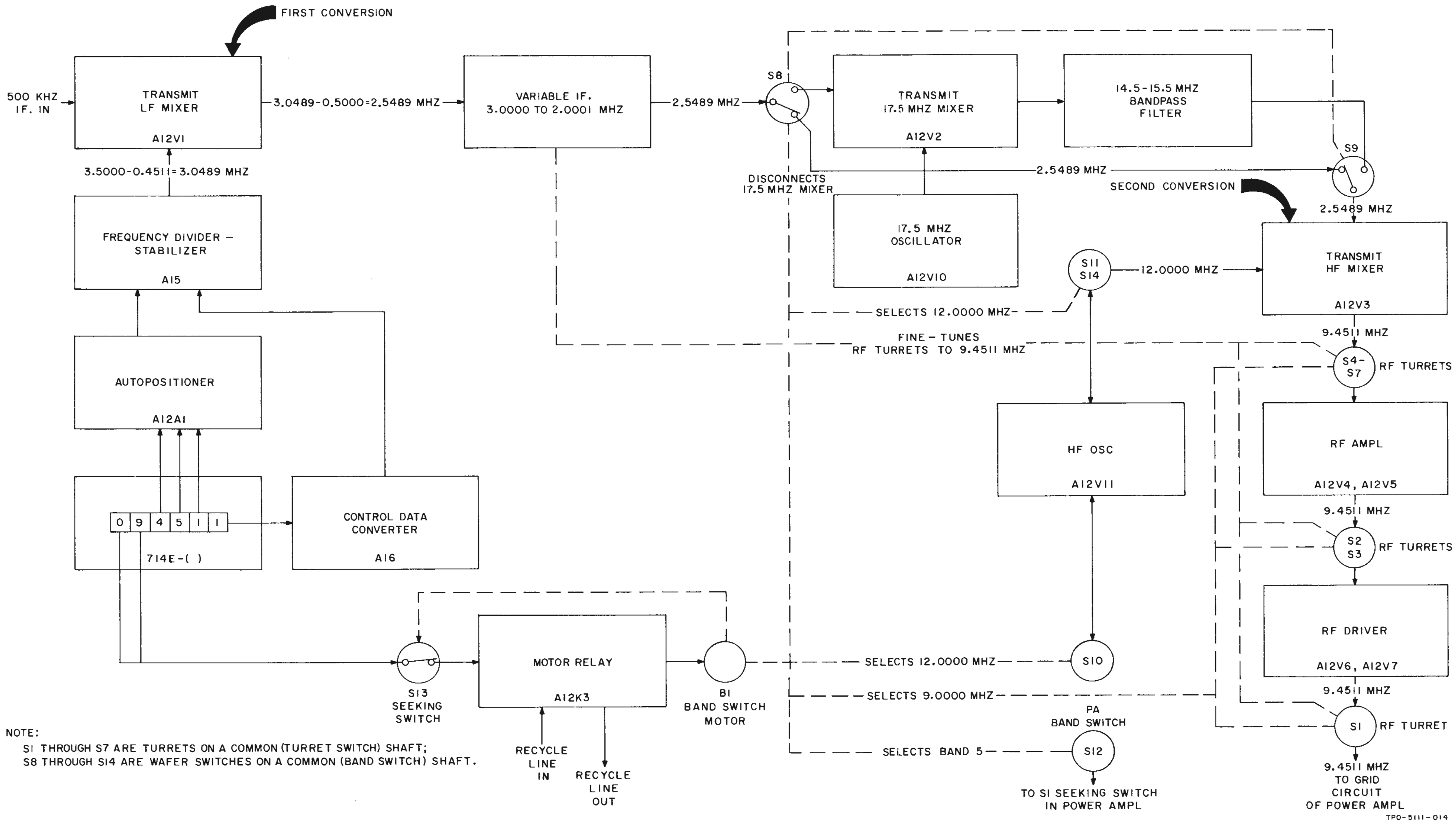
Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.2566-MHz signal from lf mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this stage is not used for operating frequencies above 6.9999 MHz. The variable if. signal, 2.2566 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.7434 MHz (12.0000 to 2.2566 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

Radio-frequency translation in the receive mode is substantially the reverse of that of the transmit mode. The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit lf mixer A12V1 is replaced by receive lf mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of if. translator A3 and AM/audio amplifier A9.



618T-1B/2B/3B Frequency Translation 2 to 6.9999 MHz, Block Diagram
Figure 27



618T-1B/2B/3B Frequency Translation 7 to 29.9999 MHz, Block Diagram
Figure 28

(c) Autopositioner A12A1 Mechanism (Collins Part Number 528-0683-001).

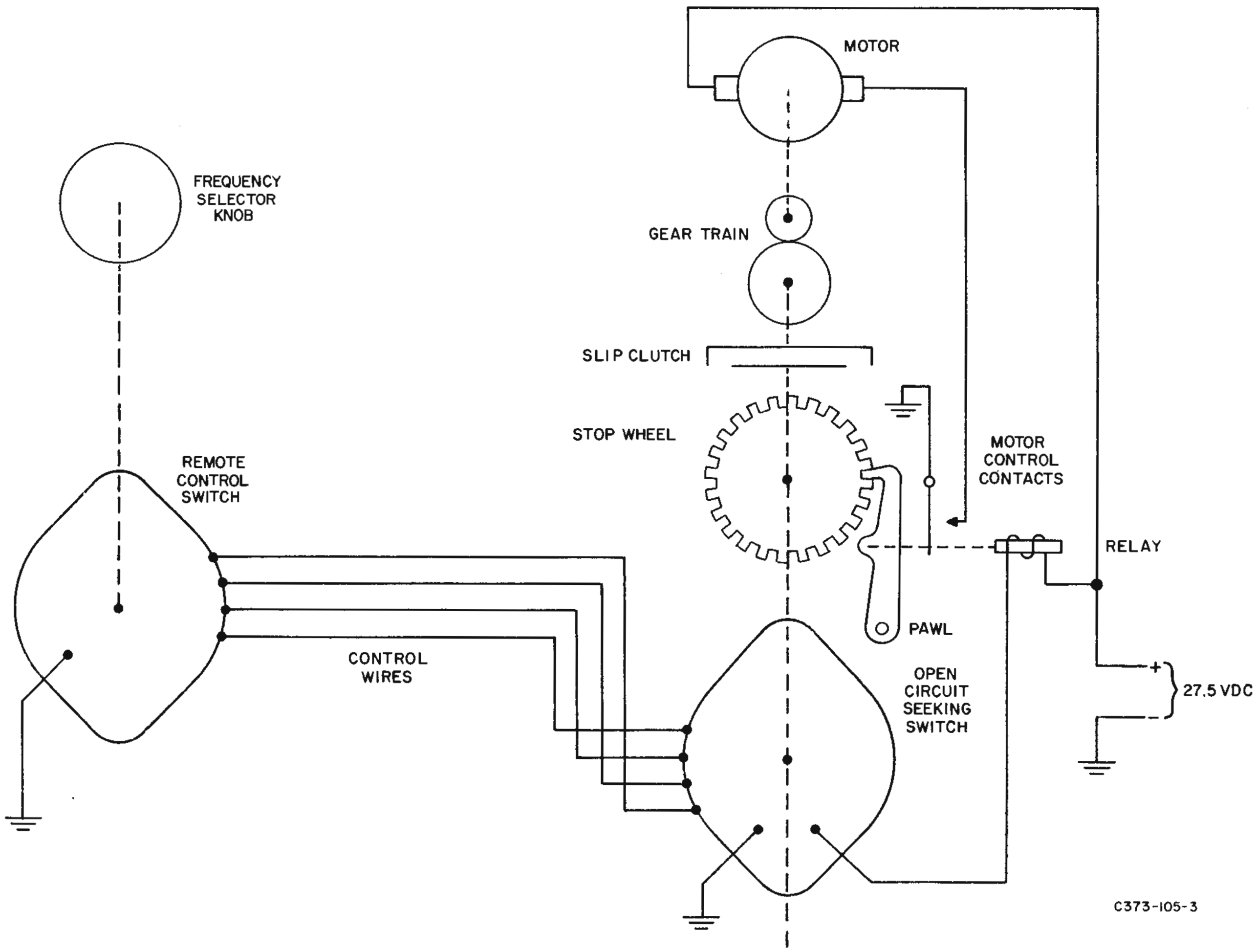
Refer to figure 829. The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation.

For kHz increments of tuning, the Autopositioner contains two motors that mechanically position switches for converting binary coded decimal (BCD) frequency control information from the radio set control to inverted BCD frequency control information used in frequency divider-stabilizer A15 for vco output frequency control. Another mechanical output from the Autopositioner, a gear train, tunes the variable if. and fine tunes the rf amplifier and rf driver stages (explained in the sections covering frequency translation). The basic elements of the Autopositioner system are shown in figure 29. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

A typical operational cycle of the Autopositioner follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the rotors of the seeking switches and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened and the pawl is dropped into a stop-wheel notch to halt rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. Whenever the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its elements to the proper position to restore the symmetry of the control system. It provides a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

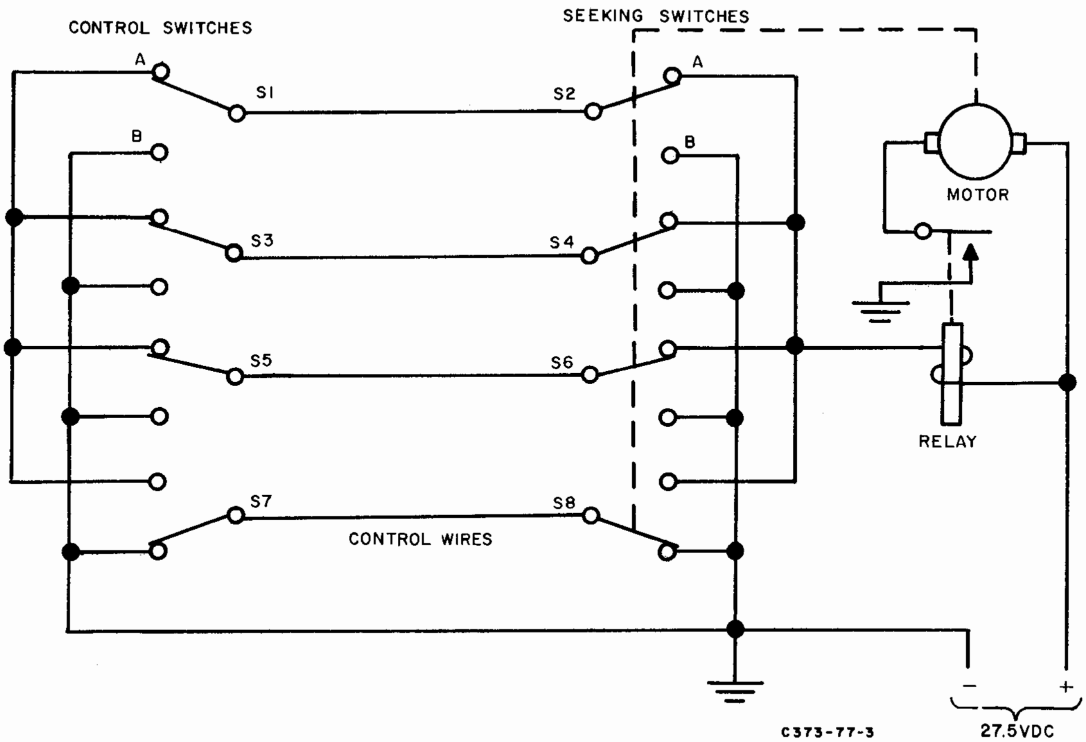
The system is comparable to a single-pole, double-throw switch scheme shown in figure 30. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the



618T-1B/2B/3B Autopositioner System, Basic Elements
Figure 29

relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens and the motor stops. The total number of combinations of switch positions in such a system is 2^{n-1}, where n is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 829 is a schematic diagram of Autopositioner A12A1. There are three seeking switches and associated inverted BCD switches in Autopositioner A12A1: 100-, 10-, and 1-kHz switches. The 0.1-kHz inverted BCD frequency control information is not a function of Autopositioner A12A1. For the selected vco frequency to be set up, all 3 switches must be satisfied. Since all 3 switches have 10 positions each, there are 10^3 or 1000 possible combinations. Since the 1000 possible combinations occur within a 1-MHz



618T-1B/2B/3B Remote Frequency Control, Simplified Schematic Diagram
Figure 30

range, the Autopositioner tunes the 618T-1B/2B/3B in 1-kHz increments. The 0.1-kHz tuning process theory will be explained in the control data converter A16 and frequency divider-stabilizer A16 sections.

The 100-kHz seeking switch is geared so that it is advanced one position for each revolution (100 kHz) of the Autopositioner shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the shaft. The stop wheel has 10 notches, making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor A12B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire shaft assembly through the action of a cam. The cam turns the shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.

(d) Balanced Mixer Theory.

Refer to figure 828. The rejection of unwanted mixer products, produced by frequency translation in rf translator A12, includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.

(e) Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C128 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

(f) Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In transmit, a key-line ground is applied through of A12P9-16, to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit lf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +28-volt dc line at A12P9-17 and thus biased off.)

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the agc voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +28-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier grid tank. Components of the 20- to 29.9999-MHz tuned circuit are selected by the 28-position band switches A12S4, A12S5, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contacts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver lf mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and the turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

(g) 17.5-MHz Oscillator A12V10.

Refer to figure 828. The 17.5-MHz oscillator, A12V10, is fine tuned by voltage variable capacitor A12C276. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(h) HF Oscillator A12V11.

Refer to figure 828. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator remains in operation for all 28 frequencies which are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

(5) Power Amplifier A11, 618T-( ). (Refer to figure 826.)

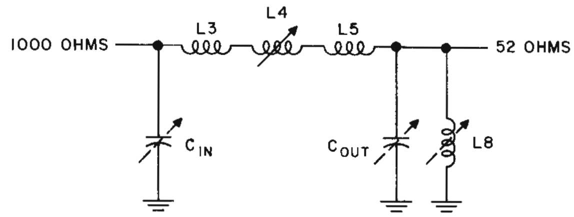
(a) General.

Power amplifier A11 amplifies the low-level rf output of rf translator A12. The power output is 400 watts pep. nominal in the SSB mode and 125 watts with carrier reinserted (amplitude-modulated equivalent). In the voice mode, voice peaks that cause grid current flow develop a control voltage for an automatic load control circuit that reduces drive. The plate circuit is under the control of transmit gain control (tgc) circuits and automatic drive control (adc) circuits.

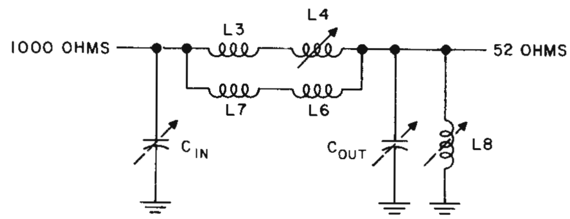
(b) Power Amplifier Supply Voltages.

Static plate current has a marked effect on the linearity of power amplifier A11. Provision is made to monitor the static plate current balance of the individual power amplifier tubes with switches A11S4 and A11S5. Depressing these switches, with no drive applied to the grid circuit, permits separate checking of plate current for each tube. Drive to the power amplifier may be disconnected by removing the 500-kHz jumper cable between J5 and J6 on the right-hand side of the front cover.

The filaments operate on ac or dc voltage depending upon the high-voltage power supply used. Grid bias (which is not metered) is obtained by rectifying and filtering 115 volts, 400 Hz. Adjustment of bias is made by varying A11R2 for a setting of 300 ma on the front panel meter (100-ma static plate current for each power amplifier tube and 100-ma plate current for driver tubes and bleeder resistor totaling 300 ma). Adjustment is made of transmit gain control (tgc) to provide the rated rf voltage output. Filter A11FL1 is a low-pass LC circuit required to prevent the passage of rf energy into the power supply. Capacitor A11C1 couples rf energy back to rf translator A12 for feedback neutralization.



(A) BANDS 1 THROUGH 3.



(B) BANDS 4 THROUGH 8.

BAND	RANGE (MHZ)	FREQUENCY RATIO
1	2-3	1.5 : 1
2	3-4	1.3 : 1
3	4-6	1.3 : 1
4	6-8	1.5 : 1
5	8-11	1.4 : 1
6	11-16	1.5 : 1
7	16-22	1.4 : 1
8	22-30	1.4 : 1

NOTE:
BROKEN ARROW INDICATES THAT VALUE IS VARIED IN 8 STEPS.
C373-112-3

Power Amplifier Output Network,
Simplified Schematic Diagram
Figure 31

(c) Band Switching and Loading.

The rf voltage at operating frequency is applied to power amplifier A11 from rf translator A12. Power amplifier tubes A11V1 and A11V2 are connected in parallel. The plate load is a pi network that steps up the 50-ohm antenna impedance to match the 1000-ohm plate circuit of A11V1 and A11V2 (refer to the simplified schematic diagram of the output network in figure 31 and to the schematic diagram in figure 826 for power amplifier A11). The pi network for the plate load consists of variable inductor (or roller coil) A11L4 and various shunt capacitors. The shunt capacitors are selected by servo motor A11B1 driving wafer switches A11S1, A11S2, and A11S3. Wafer switch A11S1 is a seeking switch that derives the band information from wafer switch A12S12 in rf translator A12. The band information divides the twenty-eight 1-MHz increments into eight ranges of coarse tuning for power amplifier A11. Figure 31, a simplified schematic diagram of the pi network, lists the tuning range for each of the eight bands.

The coarse tuning for the eight bands occurs during recycle. Band-switch motor A12B1 in rf translator A12 positions band switch A12S12 according to the operating frequency selected. Band switch A12S12, in turn, provides band information to seeking switch A11S1 in power amplifier A11 and activates motor A11B1.

(d) Servo Tuning.

After changing frequency, variable inductor A11L4 requires retuning. On some of the eight bands, the variable inductor is combined in series with other inductors as shown in figure 31. On the other bands the variable inductor is connected in series parallel.

Inductor A11L8 (see figure 826) is a compensating inductor that is tapped so that the parallel combination of A11L8 and C (out) approaches resonance at the high end of the band being used. The high impedance of this parallel resonant circuit holds the output impedance, and therefore, the amplifier plate load nearly constant over the entire tuning range of the band in use. The 52-ohm output of power amplifier A11 is generally coupled to an antenna tuner or antenna coupler. A signal from the antenna coupler during the tuning cycle energizes relay A11K3 and connects 25 ohms of resistance in series with the 52-ohm output to prevent the antenna coupler from attempting to tune prematurely.

(e) Phase Discriminator.

A servo loop tunes the power amplifier plate circuit to resonance. The phase discriminator that provides the error signal is shown in the power amplifier A11 schematic diagram. The signal at the power amplifier grids is coupled to the phase discriminator through parasitic suppressor A11E3. This is the reference signal. The error signal is picked off the pi network circuit by transformer A11T1 and applied to diodes A11CR2A and A11CR2B with equal potential but opposite polarity. Rectification of the error signal by these diodes causes unilateral current flow in resistors A11R12 and A11R13, and the resultant voltage drops across these resistors are opposite in polarity, causing cancellation and zero output voltage. If the rf voltage in the power amplifier plate circuit is not 180 degrees out of phase with grid voltage, the grid voltage reference will reinforce the current flow in either diode circuit A11CR2A or A11CR2B, depending upon the direction of phase error. The net difference in voltage drops between A11R12 and A11R13 is the error voltage. The polarity of the error voltage is determined by the direction of the phase error.

Refer to figure 817, a schematic diagram of electronic control amplifier A6. The 400-Hz chopper (A6G1) receives the error voltage from the power amplifier module and inverts it into a 400-Hz error signal. The error signal is then amplified in A6Q1 through A6Q4, phase inverted by A6Q5, and applied to push-pull amplifier A6Q6 and A6Q7. The push-pull amplifier output provides sufficient 400-Hz power to drive servo motor A11B2 in the power amplifier module. The solenoid of chopper A6G1 is supplied by the same 115-volt, 400-Hz phase leg as the reference winding of servo motor A11B2. This establishes phase relationship with the polarity of the signal voltage from the electronic control amplifier module. Therefore, servo motor A11B2 will run in the direction determined by the polarity of the error voltage and tune roller coil A11L4. Continuous sampling of the phase angle tuning of the roller coil provides feedback to reduce the error voltage to zero when the plate circuit is tuned to resonance.

(6) RF Oscillator A2, 618T-( ) (Collins Part Number 528-0251-005).

Refer to figure 811. A 3-MHz signal is generated by temperature-compensated crystal oscillator subassembly A2A1. The 3-MHz signal is applied to locked oscillator divider A2Q4. This locked oscillator divides the 3-MHz frequency by 6 to produce a 500-kHz output. This 500-kHz output is applied to amplifier A2Q5 and emitter-follower amplifier A2Q7. The output of amplifier A2Q5 is fed to the MHz-frequency stabilizer module and to amplifier A2Q6. The output of A2Q6 is fed to the if. translator module. Emitter-follower A2Q7 isolates locked oscillator A2Q8 from preceding circuit stages. The 500-kHz signal from A2Q7 is applied to locked oscillator divider A2Q8. This locked oscillator divides the 500-kHz signal by 5 to produce a 100-kHz output. This output is amplified by 100-kHz amplifier stage A2Q9 and fed to the frequency divider module.

The 3-MHz crystal oscillator in this module is the basis of the entire 618T-( ) frequency scheme. Therefore, it is very important that the oscillator frequency be kept as constant as possible. In the earlier version of rf oscillator module A2 (figure 812), the crystal is enclosed in a temperature-regulating oven that maintains the crystal temperature at 80 ±0.2 °C. The oven control circuit consists of a temperature-sensitive bridge and an audio amplifier composed of Q12 through Q15.

The bridge is composed of four resistance windings. The resistance values of two of the windings, made of a copper-nickel alloy, do not vary with temperature. These windings are on opposite legs of the bridge. The resistance values of the other two windings, which are made of pure copper, vary with temperature, the resistances being greater at a higher temperature. The resistances of the two temperature-variable windings are chosen so that, when the temperature of the oven is at the preset value, the values of all four winding resistances are equal and the bridge output is zero.

A new version of rf oscillator A2, Collins part number 528-0690-001 (figure 810), includes a squelch amplifier and control circuit. The oscillator portion of the module functions identically to rf oscillator A2, Collins part number 528-0251-005, explained above. The theory of operation of the squelch amplifier and control circuit is explained in paragraph 5.C.(16) of this manual.

(7) Frequency Divider A1, 618T-1/2/3. (Refer to figure 809.)

(a) General.

The spectrums used in the frequency stabilization circuits in the 618T-1/2/3 are a series of discrete frequencies, or spectrum points, spaced at equal intervals over a frequency range. These spectrums are produced by creating pulses of a certain frequency. A pulse with a repetition rate of exactly 1 kHz, for example, is composed of a series of sine waves of various frequencies. A 1-kHz pulse contains many sine-wave frequencies spaced exactly 1 kHz from the other at 2 kHz, 3 kHz, 4 kHz, etc. The amplitude of these 1-kHz spectrum points decreases as the frequencies get further from the fundamental 1 kHz.

Each spectrum point frequency has precisely the same frequency stability and phase relations as the fundamental 1-kHz frequency. Therefore, spectrum points may be used as injection frequencies or reference frequencies in stabilization circuits if they are generated by pulses that are derived from the crystal oscillator in rf oscillator module A2.

As stated previously, the amplitude of the 1-kHz spectrum point frequencies decreases as the frequencies progress away from the fundamental 1 kHz. In some instances, it is desirable to use spectrum points so far from the fundamental frequency that their amplitude is too small to be useful. If, for example, the 1-kHz spectrum points around 550 kHz are needed, it is possible to increase their amplitude in the following manner.

The fundamental 1-kHz pulse is used to synchronize a monostable multivibrator at 1 kHz. The multivibrator output is a 1-kHz rectangular pulse. This pulse keys a free-running oscillator on and off at a 1-kHz rate. The keyed oscillator is tuned to the frequency about which the spectrum points are to be used, in this case 550 kHz.

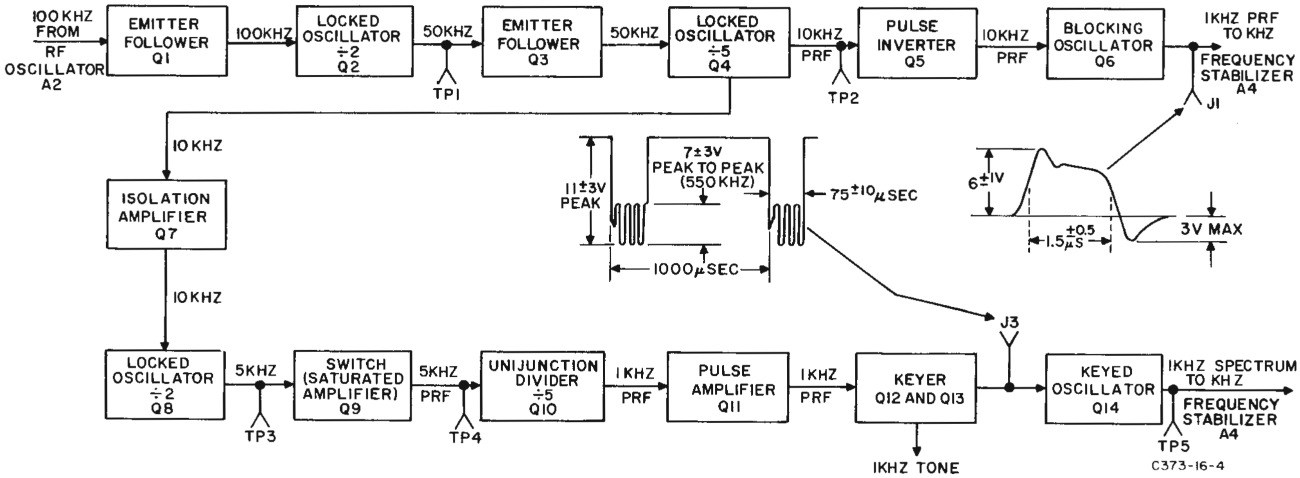
It is not necessary for the free-running frequency of the keyed oscillator to be exactly 550 kHz for a spectrum point to be at 550 kHz. The free-running oscillator frequency does not appear in the spectrum. It merely determines the frequency about which the amplitude of the spectrum frequencies will be greatest. In the example, if the keyed oscillator were tuned to 550.2 kHz and keyed by an exact 1-kHz pulse, the spectrum output would be a series of frequencies, one at exactly 550 kHz and others extending on each side of 550 kHz at exact 1-kHz intervals. The amplitudes of the spectrum points decrease as they progress further from 550 kHz.

It is important to remember that each spectrum point frequency is as stable and exact as the original 1-kHz keying frequency and that the free-running frequency of the keyed oscillator only determines the frequency around which the amplitude of the spectrum point is greatest, so it does not have to be exact.

(b) Details.

The frequency divider module transforms a 100-kHz sine-wave input from rf oscillator module A2 to a 10-kHz pulse and a 1-kHz spectrum, centered at 550 kHz, that are used for frequency stabilization in kHz-frequency stabilizer module A4.

Refer to figures 32 and 33. The 100-kHz input from the rf oscillator module is fed through emitter-follower amplifier A1Q1 to locked oscillator A1Q2. This locked oscillator divides the 100-kHz signal by 2 to produce a 50-kHz output. The 50-kHz output is fed through emitter-follower amplifier A1Q3 to locked oscillator A1Q4. Locked oscillator A1Q4 divides the 50-kHz output



618T-1/2/3 Frequency Divider A1, Block Diagram
Figure 32

by 5 to produce a 10-kHz output. The 10-kHz signal is differentiated by A1C10 and A1R14 to produce a 10-kHz pulse. This pulse is inverted by A1Q5 and triggers blocking oscillator A1Q6. The 10-kHz pulse output of blocking oscillator A1Q6 is coupled through transformer A1T1 to connector A1P1.

The 1-kHz spectrum is produced as follows. Part of the 10-kHz output of locked oscillator A1Q4 is fed through isolation amplifier A1Q7 to locked oscillator A1Q8. Locked oscillator A1Q8 divides the 10-kHz output by 2 to produce a 5-kHz output. The 5-kHz signal switches transistor A1Q9 to produce a positive square wave at the output of A1Q9. Refer to figure 809. When A1Q9 is switched on, A1C22, A1C45, and A1C23 are charged through A1R28. When A1Q9 is switched off, A1C22 and A1C45 discharge through diodes A1CR3 and A1R27. The charge on A1C23 is trapped by diode A1CR4. Thus, each square-wave pulse charges A1C23 to a higher voltage. The value of the A1C22 and A1C45 parallel combination determines the amount of voltage added to A1C23 during each cycle. A1C23 is connected to the input of unijunction transistor A1Q10.

A unijunction transistor is a single-junction semiconductor device whose input is shorted to ground when it exceeds a certain value. When the transistor input voltage across A1C23 becomes high enough, A1C23 is discharged through A1Q10, causing a positive pulse to appear at the output of A1Q10. The value of A1C45 is selected so that every fifth cycle the voltage across C23 is sufficient to cause A1Q10 to conduct. Therefore, the 5-kHz square-wave input to A1Q10 produces a 1-kHz pulse output that is amplified by A1Q11 and used to trigger a monostable multivibrator composed of A1Q12 and A1Q13. The multivibrator output triggers keyed oscillator A1Q14 on and off at a 1-kHz rate. The free-running frequency of keyed oscillator A1Q14 is 550 kHz. Therefore, the output of A1Q14 is a 1-kHz spectrum centered around 550 kHz. A series tuned circuit, A1L8 and C33, produces the spectrum pulse. The 10-kHz pulse and 1-kHz spectrum outputs of the frequency divider module are fed to kHz-frequency stabilizer A4.

(8) kHz-Frequency Stabilizer A4, 618T-1/2/3. (Refer to figure 814.)

(a) General.

The kHz-frequency stabilizer, A4, stabilizes the frequency of the vfo submodule in rf translator A12. Figure 814 is a schematic diagram of kHz-frequency stabilizer A4.

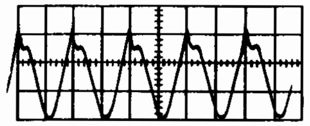
Refer to figures 34 and 37. The vfo frequency is phase locked in 1-kHz steps with the crystal-generated reference frequency from oscillator module A2 by the action of the kHz stabilizer. A voltage-variable capacitor in the tuned circuit of the vfo tunes the vfo according to a dc tuning voltage from the kHz-frequency stabilizer. The tuning voltage for the voltage-variable capacitor is a combination of an adjustable bias voltage from a bias supply and frequency/phase-sensitive control voltages from frequency and phase discriminators. The frequency discriminator initially tunes the vfo within capture range of the phase discriminator.

The inputs to the phase discriminator are two 250-kHz signals. One is the vfo frequency that has been heterodyned to 250 kHz. The other is the rf oscillator crystal frequency that has been heterodyned to 250 kHz. The phase discriminator output is a dc error signal proportional to the phase difference between the 250-kHz signals. This error signal shifts the vfo frequency, by tuning the voltage-variable capacitors in the vfo, until the two signals are phase locked. By phase locking the vfo to the rf oscillator, the vfo frequency is as accurate as that of the rf oscillator reference frequency.

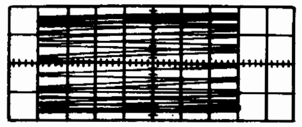
(b) Frequency Discriminator.

The vfo output, which varies from 3500 to 2501 kHz in 1000 1-kHz steps, is amplified by A4Q1 and mixed in A4Q2 with a spectrum of frequencies, spaced 10 kHz apart, which are centered 550 kHz higher in frequency than the vfo. As the vfo is tuned from 3500 to 2501 kHz, the center of the 10-kHz spectrum moves from 4050 to 3050 kHz. This 10-kHz spectrum is derived from the 10-kHz pulse from frequency divider module. The 10-kHz pulse synchronizes a monostable multivibrator, A4Q9 and A4Q10, which in turn triggers keyed oscillator A4Q11 to produce the spectrum. The free-running frequency of this keyed oscillator determines the frequency about which the 10-kHz spectrum points are located and is tuned to stay 550 kHz higher than the vfo. The keyed oscillator is tuned by a dc voltage applied to a voltage-variable capacitor, A4C52. The tuning voltage comes from a precision resistive divider located in Autopositioner A12A1.

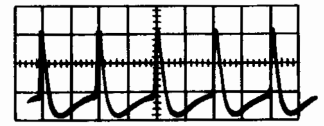
The output of mixer A4Q2, the difference between the vfo frequency and the 10-kHz spectrum frequencies, contains frequencies spaced 10 kHz apart and centered at 550 kHz. The exact frequencies present depend on the vfo frequency being fed to mixer A4Q2. This series of frequencies is fed to a second mixer, A4Q3, where it is mixed with a signal from a free-running digit oscillator, A4Q12. The digit oscillator output is a single frequency that



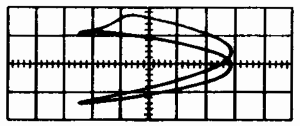
50-kHz locked oscillator, TP1,
10 us/cm,
1.5 v peak to peak



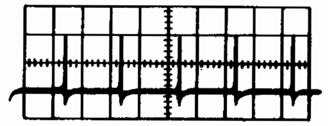
20:1 Lissajous figure, TP3



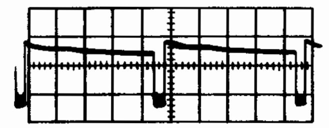
CAL TONE output, TP6
(module extender) 500 us/cm,
1.25 v peak to peak across
5.6K (Remove AM/audio
amplifier module for this
check.)



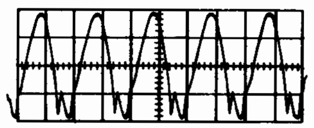
2:1 Lissajous figure, TP1



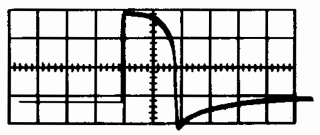
10-kHz pulse output, J1,
50 us/cm,
6 v peak into 50-ohm
load



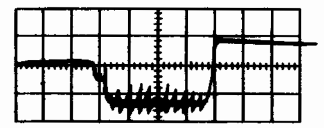
1-kHz keyer, J3,
200 us/cm,
-11 v peak



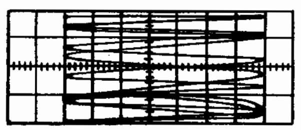
10-kHz locked oscillator, TP2,
50 us/cm,
2.3 v peak to peak



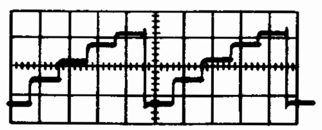
10-kHz pulse output, J1,
1 us/cm



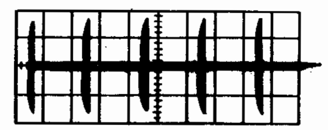
1-kHz keyer, J3,
expanded



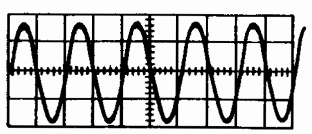
10:1 Lissajous figure, TP2



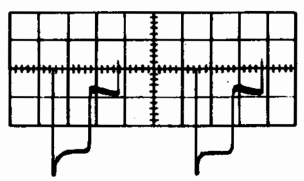
Unijunction divider, TP4,
200 us/cm



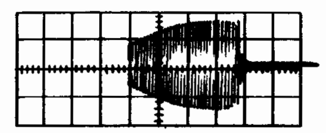
1-kHz spectrum, TP5,
500 us/cm,
7 v peak to peak



5-kHz locked oscillator, TP3,
100 us/cm,
4.5 v peak to peak

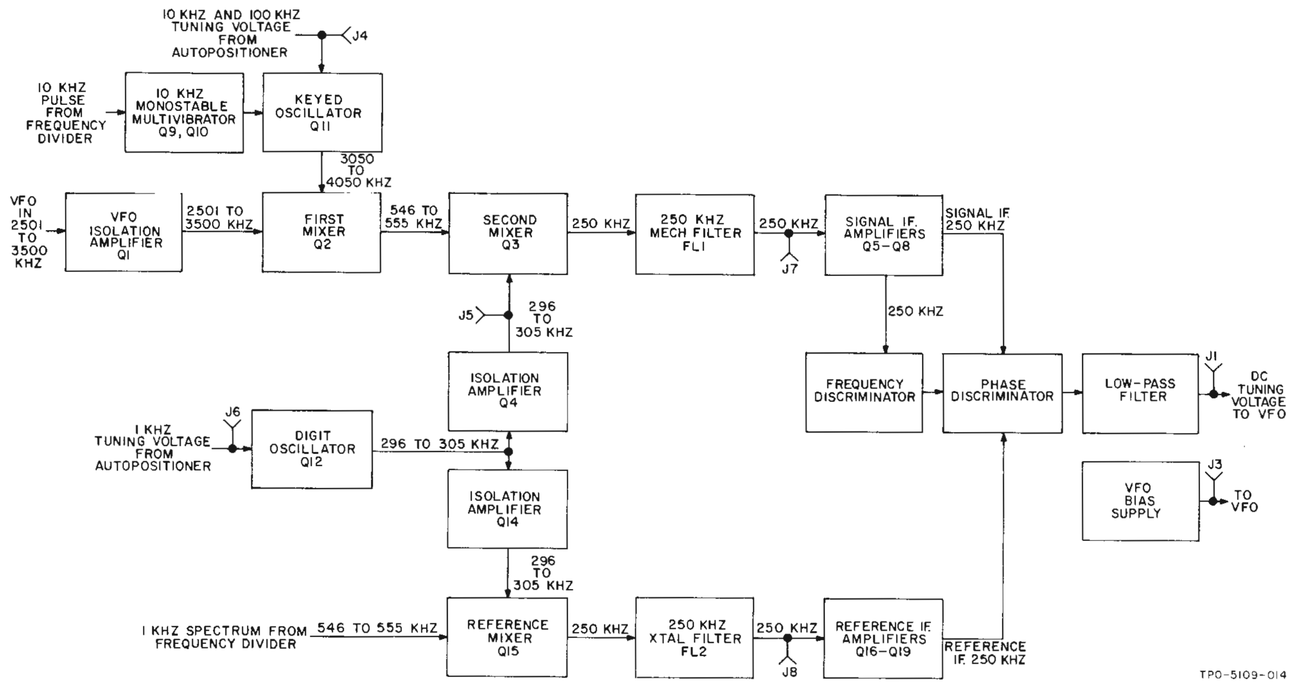


Unijunction divider, TP4,
5th step and firing point,
firing point voltage 0.65 v



1-kHz spectrum, TP5,
expanded

618T-1/2/3 Frequency Divider A1, Waveforms
Figure 33



618T-1/2/3 kHz-Frequency Stabilizer A4, Block Diagram
Figure 34

is varied by the 1-kHz frequency selector switch on the radio set control. The digit oscillator is tuned by a voltage-variable capacitor, A4C66, to ten 1-kHz frequencies from 296 to 305 kHz. The tuning voltage for the digit oscillator is derived from another precision resistive divider in Autopositioner A12A1. The free-running digit oscillator frequency is mixed in A4Q3 with the series of frequencies spaced 10 kHz apart and centered around 550 kHz. The output of A4Q3 is a series of frequencies spaced 10 kHz apart, centered around 250 kHz. One of these frequencies is 250 kHz plus or minus the vfo frequency error and the digit oscillator frequency error. The output of mixer A4Q3 is passed through mechanical filter FL1, which has a bandwidth of 10 kHz centered at 250 kHz. The mixer output frequency near 250 kHz is passed, but all the other frequencies are filtered out, for the nearest frequencies are 10 kHz away and will not pass through the filter whose bandwidth extends 5 kHz on either side of 250 kHz. The signal if. frequency (250 kHz plus or minus the vfo and digit oscillator errors) is then amplified by if. amplifiers A4Q5 through A4Q8 and fed to the frequency discriminator.

kHz-frequency stabilizer A4 is part of a feedback loop between the vfo output and a tuning-voltage input to a voltage variable capacitor in the vfo tune circuit. The module continually compares the vfo output frequency with a reference frequency and sends a dc tuning voltage to the vfo until it is phase locked with the reference. If the vfo drifts out of phase lock with the reference, kHz-frequency stabilizer A4 senses this change and provides a dc error voltage to keep the vfo phase locked with the reference at all times.

The free-running frequency of vfo A12A2, after tracking adjustments, will vary approximately ±2 kHz. Phase lock of the vfo reduces this error considerably. For example, at a vfo frequency of 3.500 MHz, the allowable error is only 2.8 Hz, the same 0.8-part-per-million accuracy of the 3-MHz crystal oscillator. This difference is too great to be controlled by one discriminator. The frequency discriminator can capture the vfo with a 2-kHz error but it becomes insensitive to frequency error at a fraction of 1 kHz, usually ±200 Hz. The phase discriminator retains its sensitivity down to the region of ±3 Hz, but its capture range is too narrow to initially change the vfo error. Therefore both discriminators are needed. The output circuits of the frequency and phase discriminators work simultaneously and are series connected to provide the dc error voltage.

Initially, assume that the vfo is to be captured by the frequency discriminator because the vfo frequency error is too great to be captured by the phase discriminator. Capture of vfo frequency by the frequency discriminator is accomplished by mixing the vfo frequency with a 10-kHz reference spectrum to obtain an if. signal that is amplified and applied to the frequency discriminator. It produces a dc error voltage that is applied to a voltage-variable capacitor in the vfo and the frequency is corrected within the capability of the frequency discriminator. Final vfo frequency correction is made by mixing the partially corrected vfo frequency with a 1-kHz reference spectrum. This yields a reference if. The reference if. is amplified and compared with the signal if. in the phase discriminator. The phase discriminator produces a dc error voltage that overrides the output of the frequency discriminator, applies it to the same voltage-variable capacitor, and phase locks the vfo. Note that the phase discriminator does not compare the reference if. with the frequency discriminator dc output voltage but with the same signal if. applied to the frequency discriminator. Note also that both the frequency and phase discriminators correct the vfo frequency once the vfo is within the capture range of the discriminators.

During normal 618T-1/2/3 operation, the phase discriminator usually retains control of the vfo, and the frequency discriminator does not sense an error. The frequency discriminator can be expected to function when the 618T-1/2/3 is first turned on and when a frequency change is made.

(c) Frequency Translation, 618T-1/2/3.

The frequency translation processes that convert the vfo and reference frequencies to 250 kHz will now be explained in detail for a typical 618T-1/2/3 operating frequency. The principles of operation are exactly the same for each of the other 999 possible vfo frequencies.

Refer to figure 36. Assume that the 618T-1/2/3 operating frequency is X.243 MHz on any of the 28 bands. The vfo frequency will then be 3.500 MHz -0.244 MHz or 3.257 MHz (3257 kHz). Also assume, in this example, that the vfo is phase locked with the reference. The vfo frequency, therefore, will be exactly 3257 kHz.

The vfo output is fed to the first signal mixer in the kHz-frequency stabilizer. The injection to this mixer is a series of 10-kHz harmonics around a frequency that is approximately 550 kHz higher than the vfo frequency. In the example, these 10-kHz harmonics have the greatest amplitude around the 3810-kHz harmonic. This 10-kHz spectrum is produced by a keyed oscillator in the kHz-frequency stabilizer module that operates in the same manner as the keyed oscillator in the frequency divider module. The reference pulse for this 10-kHz keyed oscillator is the 10-kHz pulse output of the frequency divider module. Thus, each frequency in this 10-kHz spectrum is as stable as the 10-kHz reference pulse. The oscillator free-running frequency is tuned by a tuning voltage tapped from a precision resistive voltage divider in the Autopositioner to keep the harmonic of greatest amplitude approximately 550 kHz higher than the vfo frequency.

The first signal mixer output is another 10-kHz spectrum that is the difference between injection spectrum and the vfo input. This spectrum will be centered at approximately 550 kHz. The exact spectrum frequencies depend on the vfo frequency. In the example, this spectrum is centered around 553 kHz. This first signal mixer output is fed to the input of a second signal mixer. The injection frequency for this mixer is the output of a digit oscillator.

The digit oscillator is a free-running oscillator in the kHz-frequency stabilizer module. It is tuned by a voltage-variable capacitor whose tuning voltage is tapped from a precision resistive voltage divider in the Autopositioner. The digit oscillator output frequency depends on the 1-kHz digit in the 618T-1/2/3 operating frequency and varies in 1-kHz steps from 296 kHz when the operating frequency is X.XX6 MHz to 305 kHz when the operating frequency is X.XX5 MHz. Figure 35 lists the digit oscillator frequency for each operating frequency digit. Figure 36 contains an example operating frequency.

In the example, the operating frequency is X.243 MHz, and the digit oscillator frequency will correspond to the X.XX3-MHz setting or 303 kHz. Because the digit oscillator is a completely free-running oscillator, its output frequency will depart somewhat from exactly 303 kHz. This error has been designated in the example as e.

The second signal mixer output is tuned to the mixer difference frequency output. When the digit oscillator is mixed with the 10-kHz spectrum, the output will be another 10-kHz spectrum centered at approximately 250 kHz. One of the mixer products will vary from 250 kHz only by the digit oscillator frequency error introduced in the mixing process. This mixer product is filtered from the spectrum by a mechanical filter whose bandpass is 4 kHz on either side of 250 kHz. This 250-kHz frequency is the input signal to the frequency and phase discriminators. The 250-kHz reference frequency is derived in a manner similar to the 250-kHz signal previously described.

The 1-kHz reference spectrum from 546 to 555 kHz, and output of the frequency divider module, is mixed with the digit oscillator output in the reference mixer. The mixer difference frequency output will contain (in addition to the other mixer products) a product that is the difference between

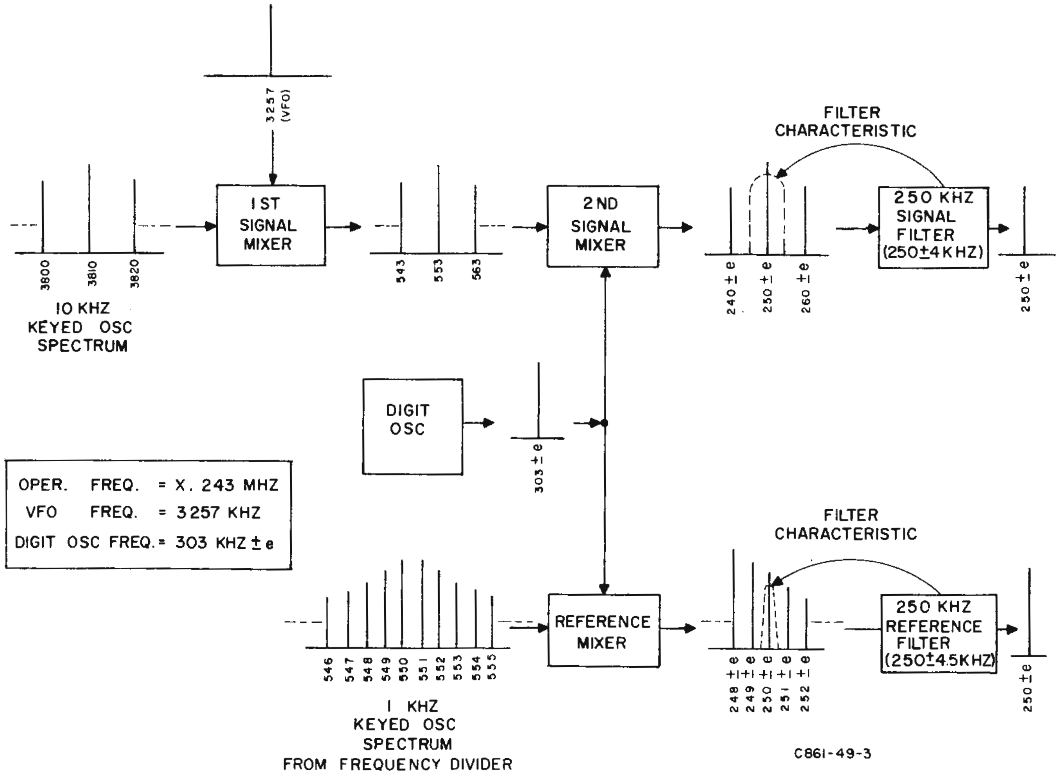
618T-1/2/3 OPERATING FREQUENCY (MHz)	DIGIT OSCILLATOR FREQUENCY (kHz)
X.XX6	296
X.XX7	297
X.XX8	298
X.XX9	299
X.XX0	300
X.XX1	301
X.XX2	302
X.XX3	303
X.XX4	304
X.XX5	305

618T-1/2/3 Digit Oscillator Frequency for Each Operating Frequency Digit
Figure 35

the 553-kHz reference spectrum component and the 303-kHz digit oscillator output. This 250-kHz reference mixer output will, like the 250-kHz signal from the second signal mixer, vary from exactly 250 kHz by the frequency error of the digit oscillator introduced in the reference mixer. The mixer products in the output of the reference mixer will be spaced 1 kHz apart. The 250-kHz spectrum component is filtered out by a crystal filter whose bandpass extends 5 kHz on either side of 250 kHz. This 250-kHz frequency is the reference input to the phase discriminator.

For the reference if. to function properly, digit oscillator frequency error e is held within ±150 Hz. If the error exceeds ±200 Hz, the 1-kHz reference spectrum component near 250 kHz (at the output of the reference mixer) will not fall within the bandpass of the crystal filter in the reference channel. If this happens, the 250-kHz reference if. will not be applied to the reference if. amplifiers and therefore not to the phase discriminator.

The digit oscillator frequency must be accurate. Therefore, the voltage that tunes the voltage-variable capacitor in the oscillator tuned circuit must be stable. This dc tuning voltage comes from a bridge circuit shown in figure 38. Part of this circuit is in the kHz-frequency stabilizer module, part in the chassis, and part in the Autopositioner submodule located in the rf



618T-1/2/3 kHz-Frequency Stabilizer A4, Frequency Translation Process
Figure 36

translator module. The bridge output is kept constant by the action of three series breakdown diodes CR6, CR7, and CR8. A 40-ohm resistor, R58, in the bridge arm opposite the diodes, nearly equals the resistance of the diodes in the breakdown condition. Because of the ratio of resistances between the upper and lower arms of the bridge, voltage changes at the bridge input are nearly eliminated at the bridge output.

The precision resistive voltage divider in the Autopositioner that provides the tuning voltage for the digit oscillator is connected across the bridge output. The digit oscillator frequency may be adjusted by varying R59, which is in series with the divider.

The vfo bias voltage and 10-kHz keyed oscillator tuning voltage are also taken from precision voltage dividers that are connected across the breakdown diode circuit of the bridge. Currents in both of these dividers may be varied to produce the proper tuning voltage for the voltage-variable capacitors.

The 250-kHz signal is applied to a frequency discriminator that is tuned to 250 kHz. The frequency discriminator dc output voltage is applied in series with the phase discriminator dc output to the voltage-variable capacitor in the vfo tuned circuit. The frequency discriminator output shifts the vfo frequency to within the phase discriminator capture range.

The phase discriminator compares the two 250-kHz if. signals and produces a dc output voltage proportional to the phase difference between the two. The effect of digit oscillator frequency error e is canceled in the phase discriminator, for the error appears in both discriminator inputs.

The phase discriminator dc output is not necessarily zero, for the two inputs may not be exactly in phase even though they are phase locked. The discriminator output, however, will remain constant as long as there is no relative phase drift between the 250-kHz signal and reference frequencies.

If the vfo frequency tends to drift with respect to the reference, the phase discriminator dc output voltage will change. This in turn will retune the vfo to decrease the phase drift to zero.

The vfo input to the kHz-frequency stabilizer module and the vfo dc tuning voltage from the stabilizer are carried on the same line. The vfo rf voltage is added to the dc tuning voltage so that there are both useful ac and dc components in the line. The two components are separated at the end of the line.

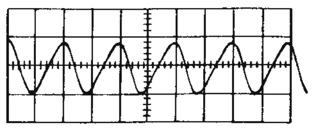
(9) MHz-Frequency Stabilizer A10, 618T-( ). (Refer to figure 824.)

The MHz-frequency stabilizer, A10, phase locks 17.5-MHz oscillator A12V10 and hf oscillator A12V11 with a 500-kHz spectrum. Both oscillators are contained in rf translator A12. The 17.5-MHz oscillator, A12V10, has one operating frequency, and hf oscillator A12V11 operates on 16 frequencies. Both 17.5-MHz oscillator A12V10 and hf oscillator A12V11 operate on frequencies that are harmonics of 500 kHz. A 500-kHz reference from rf oscillator A2 is used by MHz-frequency stabilizer A10 to generate 500-kHz harmonics comprising a spectrum. The spectrum is combined in separate mixer/amplifiers for each oscillator, and the output is rectified and provides an error signal for oscillator control through the use of a voltage-variable capacitor.

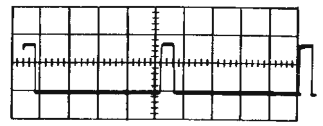
Refer to the block diagram, figure 39, and to the schematic diagram, figure 824. The MHz-frequency stabilizer is part of a feedback loop between the oscillator output and the dc tuning voltage input to a voltage-variable capacitor in the oscillator. The mixer/amplifier subassembly is identical for each oscillator. Subassembly A10A1 controls 17.5-MHz oscillator A12V10, and subassembly A10A2 controls hf oscillator A12V11. The 16 frequencies of hf oscillator A12V11 are fundamental frequencies. There are 28 output frequencies in hf oscillator A12V11 plate circuit, but 12 of these are obtained by doubling the fundamental frequency.

The following discussion describes the phase lock of 17.5-MHz oscillator A12V10. The theory applies as well to each of the 16 fundamental frequencies of hf oscillator A12V11.

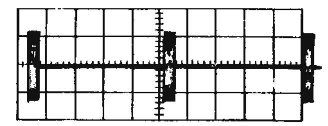
The oscillator control voltages appear at connectors A10P1A1 and A10P1A2. The sample rf frequency and the dc error voltage to correct it are diplexed and



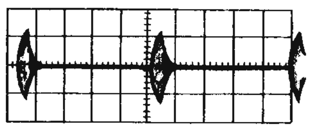
Vfo input, J1,
5 v/cm, 2 us/cm
(70K-5 vfo) 1 v/cm,
2 us/cm (70K-3 vfo)



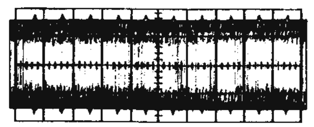
10-kHz keyer output,
TP19,
5 v/cm, 20 us/cm



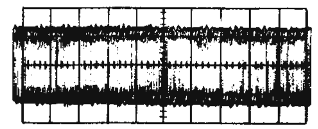
10-kHz keyed oscillator
output, TP10,
2 v/cm, 20 us/cm



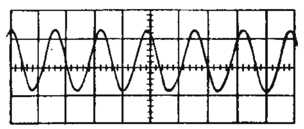
10-kHz spectrum generator
output, TP8,
50 mv/cm, 20 us/cm



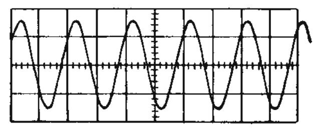
Vfo and 10-kHz spectrum
input to first mixer, TP1,
50 mv/cm, 100 us/cm
(70K-5 vfo) 100 mv/cm,
100 us/cm (70K-3 vfo)



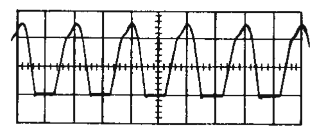
Digit oscillator and
10-kHz spectrum input
to second mixer, TP2,
100 mv/cm, 100
us/cm



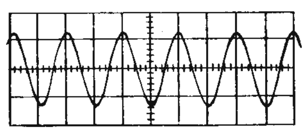
Digit oscillator isolation-
amplifier output, J5,
2 v/cm, 2 us/cm



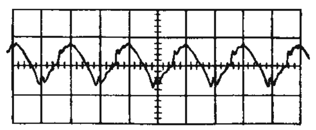
Mechanical filter
output-signal if. input,
J7, 50 mv/cm, 2 us/cm



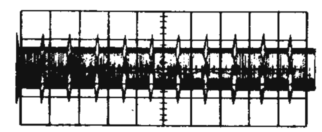
Signal if. amplifier
interstage test point,
TP4,
1 v/cm, 2 us/cm



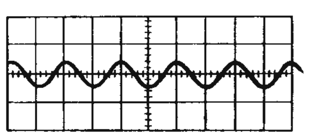
Signal if. amplifier
output, TP5,
5 v/cm, 2 us/cm



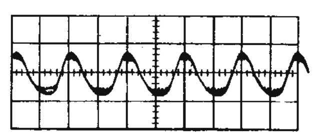
Signal if. input to phase
discriminator, TP16,
5 v/cm, 2 us/cm



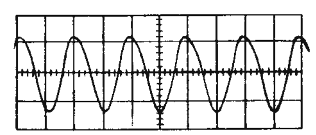
Digit oscillator and
1-kHz spectrum input to
reference mixer, TP12,
100 mv/cm, 1 ms/cm



Crystal filter output-
reference if. input, J8,
50 mv/cm, 2 us/cm

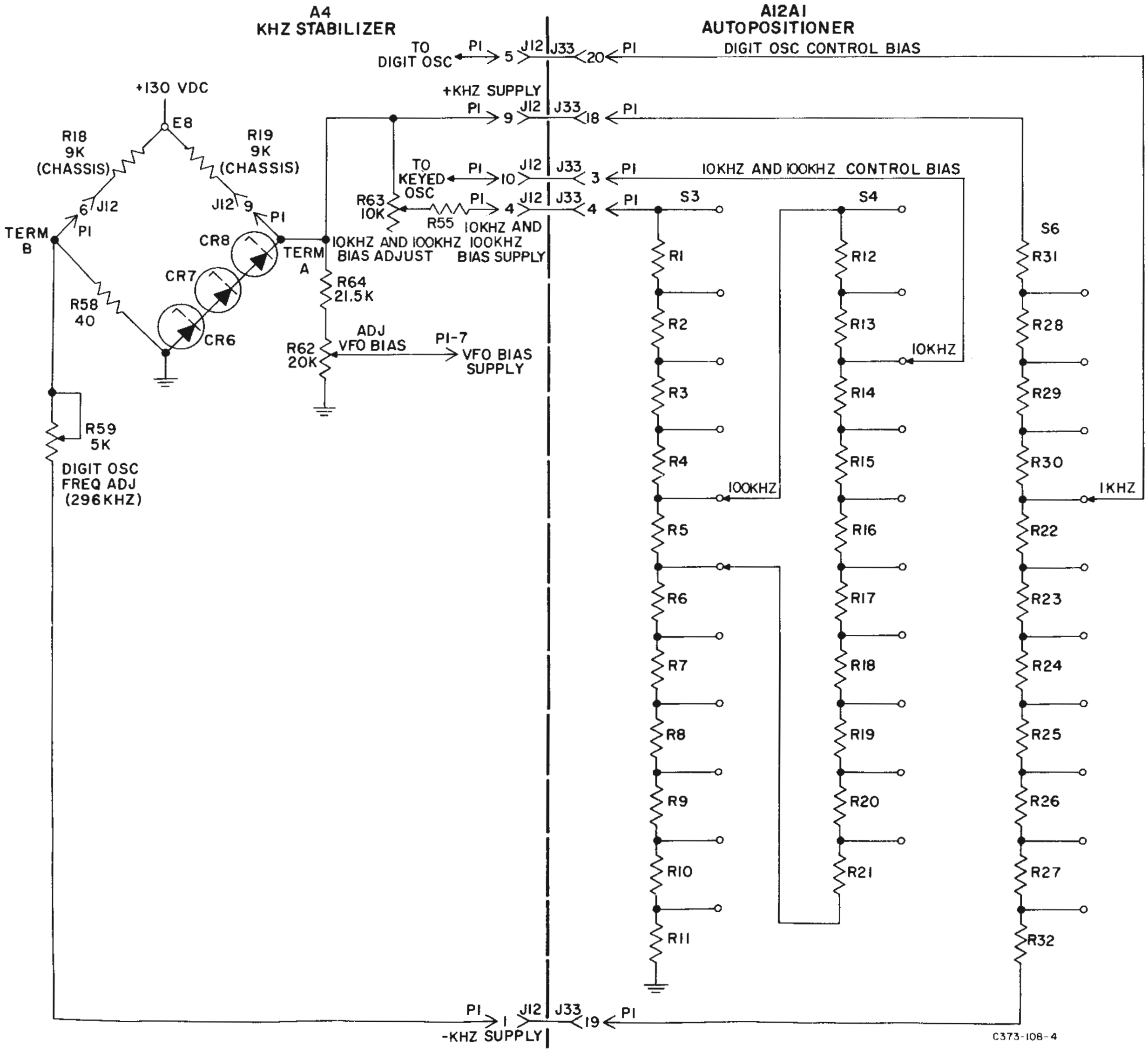


Reference if. amplifier
interstage test point,
TP14,
50 mv/cm, 2 us/cm



Reference if. amplifier
output, TP15,
1 v/cm, 2 us/cm

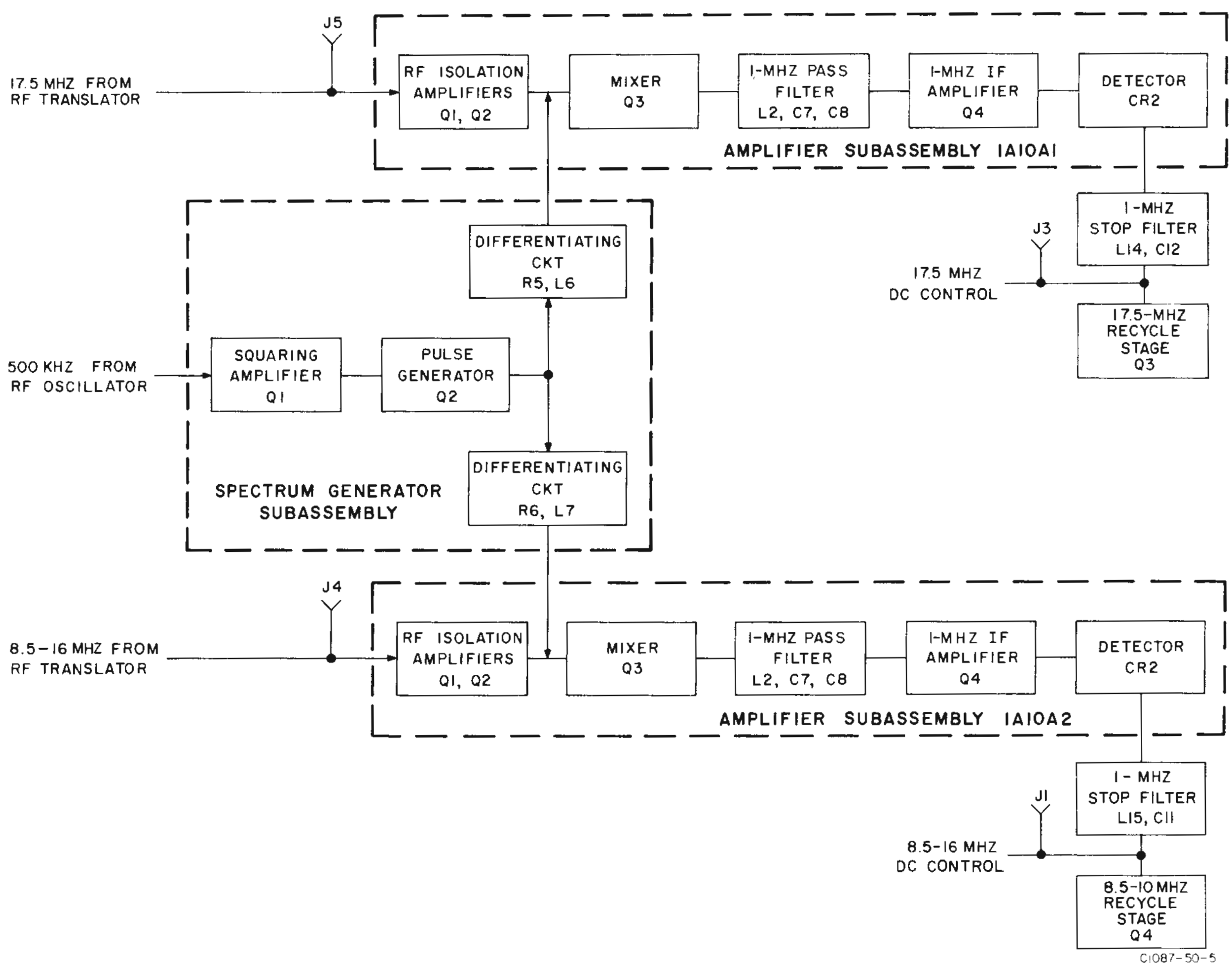
618T-1/2/3 kHz-Frequency Stabilizer A4, Waveforms
Figure 37



618T-1/2/3 Voltage Stabilizing Bridge Circuit,
Simplified Schematic Diagram
Figure 38

crosscoupled. That is, the rf sample from 17.5-MHz oscillator A12V10 and the dc error voltage used to correct hf oscillator A12V11 both appear at A10P1A1. Similarly, the rf sample from hf oscillator A12V11 and the dc error voltage to correct 17.5-MHz oscillator A12V11 both appear at A10P1A2.

From connector A10P1A1, the rf sample from 17.5-MHz oscillator A12V11 is amplified by rf amplifiers A10A1Q1 and A10A1Q2 and mixed with the 500-kHz spectrum in mixer A10A1Q3. The spectrum is a series of differentiated pulses containing reference frequencies equally spaced at 500-kHz intervals from 500 kHz to approximately 25 MHz. Each 500-kHz spectrum point is a harmonic of the reference pulse from rf oscillator A2 and therefore is as stable as the crystal fundamental.



MHz-Frequency Stabilizer A10, Block Diagram
Figure 39

If the connection to connector A10P1A1 is interrupted, the sample rf signal from 17.5-MHz oscillator A12V10 is interrupted, and the remaining input to A10A1 amplifier/mixer is the differentiated 500-kHz reference pulse from the spectrum generator. The reference pulse injection to mixer A10A1Q3 is adjusted with A10R5 on the spectrum generator. Resistors A10A1R10 and A10A1R11, together with thermistor A10A1RT1, form a voltage divider that also influences the amplitude of the injection voltage. Thermistor A10A1RT1 holds amplitude variations relatively constant over a wide temperature range.

The spectrum is applied to the base of mixer A10A13 and, due to the nonlinear characteristics of the mixer, the spectrum points mix. Since each spectrum point is separated by 500 kHz, a 1-MHz component is obtained by the mixing of every other spectrum point. In the range of the 17.5-MHz amplifier, these components appear at 16.5 MHz, 17.5 MHz, 16 MHz, 17 MHz, etc.

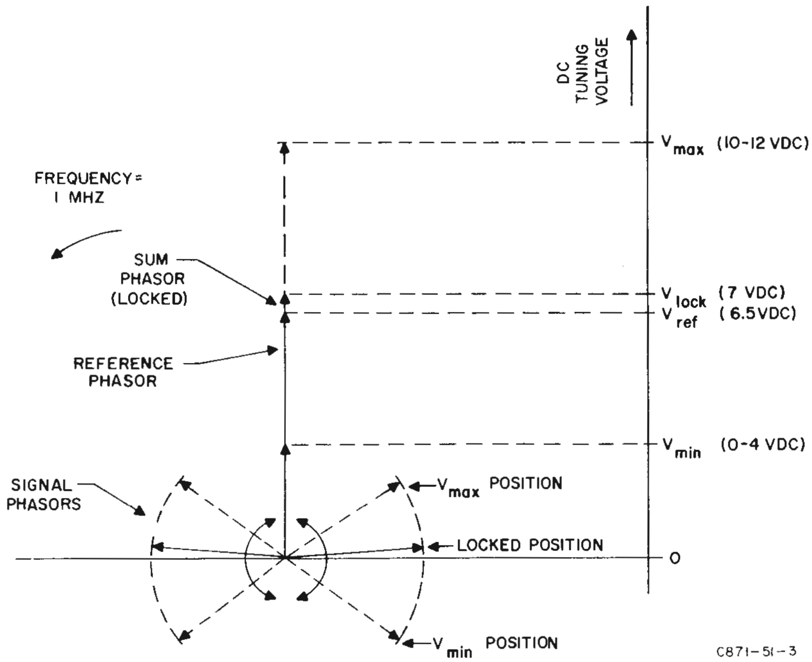
This 1-MHz component is applied to if. amplifier A10A1Q4, which is tuned to 1 MHz; it filters out the undesired spectrum products. The desired 1-MHz component is detected by A10A1CR2 and filtered by the 1-MHz stop filter made up of A10L15 and A10C11. Spectrum amplitude adjustment A10R5 is set so that the detected voltage from the spectrum alone is +6.5 volts. This dc voltage is the bias voltage for the 17.5-MHz oscillator A12V10 voltage-variable capacitor.

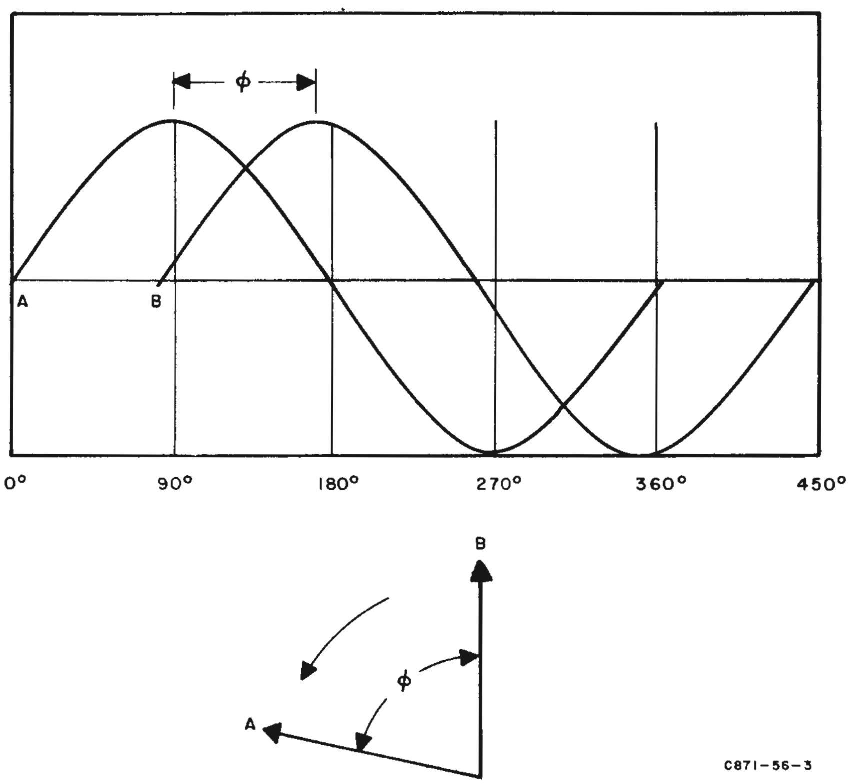
With the connection completed to connector A10P1A1, the sample rf signal from 17.5-MHz oscillator A12V10 is amplified in rf isolation amplifiers A10A1Q1 and A10A1Q2 and then mixed in A10A1Q3 with the spectrum reference.

Two frequencies that are not identical differ in phase relationship. This difference may be used to produce an error voltage. Presume that only a 1-Hz error exists in 17.5-MHz oscillator A12V10 frequency. If this error is in the direction of the upper spectrum point (18.5 MHz), the difference frequency is 999,999 Hz. The difference frequency between the oscillator and the lower spectrum point at 16.5 MHz is 1,000,001 Hz.

Both of the previously mentioned mixer products represent oscillator frequency error, and they drift, phase relative, to the third mixer output, of which the 1-MHz component is the reference. Refer to the diagram of mixer output phasors in figure 40. This figure is a phasor representation of the three 1-MHz mixer output products. The 1-MHz reference is represented by a vertical phasor that is rotating counterclockwise at a 1-MHz rate. The two signal phasors that represent the sum and the difference between the reference and the 1-Hz errors are shown approximately 90 degrees out of phase with the reference. This is an instantaneous phase relationship to the reference and varies constantly since there is no phase lock. Because the two signal phasors are the sum and difference of one reference, they always lead and lag the reference by equal angles.

If the 17.5-MHz oscillator is phase locked with reference, the three phasors are all rotating at exactly the same rate. The sum of the three 1-MHz components will be a single 1-MHz frequency represented by a vertical phasor. (The three phasors rotate at a 1-MHz rate but are stationary relative to one another.)





Phasor Diagrams
Figure 40

The vertical plot of tuning voltage in the figure represents the magnitude of the output voltage from A10A1CR2. Only under the condition that all three 1-MHz signals are at the same phase will the maximum voltage be developed. However, the condition of phase lock does not represent zero phase difference between phasors. Phase lock will occur at some angle less than 90 degrees, at which time the signal phasors will not change phase relationship with the reference. Exact in-phase relationship will periodically occur when there is no phase lock, however. Since both signal phasors are drifting relative to reference, the voltage they develop will drift accordingly. This varying voltage alternately adds to and subtracts from the reference that is represented by the +6.5-volt bias. The result is that the detector output at A10A1CR2 will change from near-0 volt when the signal phasors are in opposite phase with the reference to approximately +13 volts when the signal phasors swing in phase with the reference. The time required for this voltage change to occur depends upon the frequency error. With the 1-Hz error, the time for 1/2 cycle (0 volt to peak) will be 500 milliseconds.

Because this 0- to 13-volt output is applied to the voltage sensitive capacitor in the 17.5-MHz oscillator, the frequency of the oscillator will swing through its entire correction range in 500 milliseconds. With only a 1-Hz error to correct, the first slight change in voltage will correct it. When the error is reduced to 0.1 Hz, the rate of output voltage change slows to 5 seconds for 0 volt to peak. When the error is reduced to 0.01 Hz, the rate of change is 50 seconds. Ultimately, the exact frequency is reached and the drift rate is zero. At this point there is phase lock and the output voltage is zero.

When the 618T-( ) is turned on, it is possible that the signal phasors will be at the wrong point in the drift cycle. Assume that +7.5 volts is the correct locking voltage, but the oscillator begins operating and produces phasors that are rotating in the direction of in-phase condition with the reference and already producing an 8-volt dc output. The voltage is on the increase and tunes the oscillator even higher in frequency. In turn, a larger error is created. Since the larger the error the more rapid the drift rate, the increasing output voltage accelerates to maximum almost instantly.

When an approximate 12-volt dc output is reached, the oscillator is at the high end of its correction range. At this point, 17.5-MHz recycle stage A10A3 operates, and unijunction transistor A10Q3 fires. This occurs due to discharge of capacitor A10C5, which was initially charged by the rising output voltage. When the unijunction transistor fires, A10C5 discharges to ground, and the output voltage is reduced to zero. The oscillator is then tuned to the opposite (low) end of the correction range. Capacitor A10C5 begins to charge again as the oscillator is tuned toward phase lock by the output voltage. As previously explained, the rate of change slows until it becomes zero at the correct frequency and the oscillator is phase locked to the reference.

(10) Control Data Converter A16, 618T-1B/2B/3B. (Refer to figure 848.)

Control data converter A16 converts 0.1-kHz reentry code frequency control data from the radio set control to inverted binary coded decimal (BCD) frequency control data. The inverted BCD data controls the 0.1-kHz frequency circuitry in divider-stabilizer A15 in both transmit and receive modes of operation. A 1-kHz oscillator in control data converter A16 provides a 1-kHz tone for transceiver tuning and CW transmission.

Figure 848 is a schematic diagram of control data converter A16. Refer to figure 41, a functional logic diagram of control data converter A16. The use of the reentry code frequency control system provides a selection of any one of ten 0.1-kHz frequency selections (0 through 9) on four control wire inputs to control data converter A16 from the radio set control. The frequency control information presented to control data converter A16 is a combination of grounded and open-to-ground circuits. The output of control data converter A16, fed directly to frequency divider-stabilizer A15, is a combination of 0 volt dc (logic 0) and positive voltage to ground (logic 1).

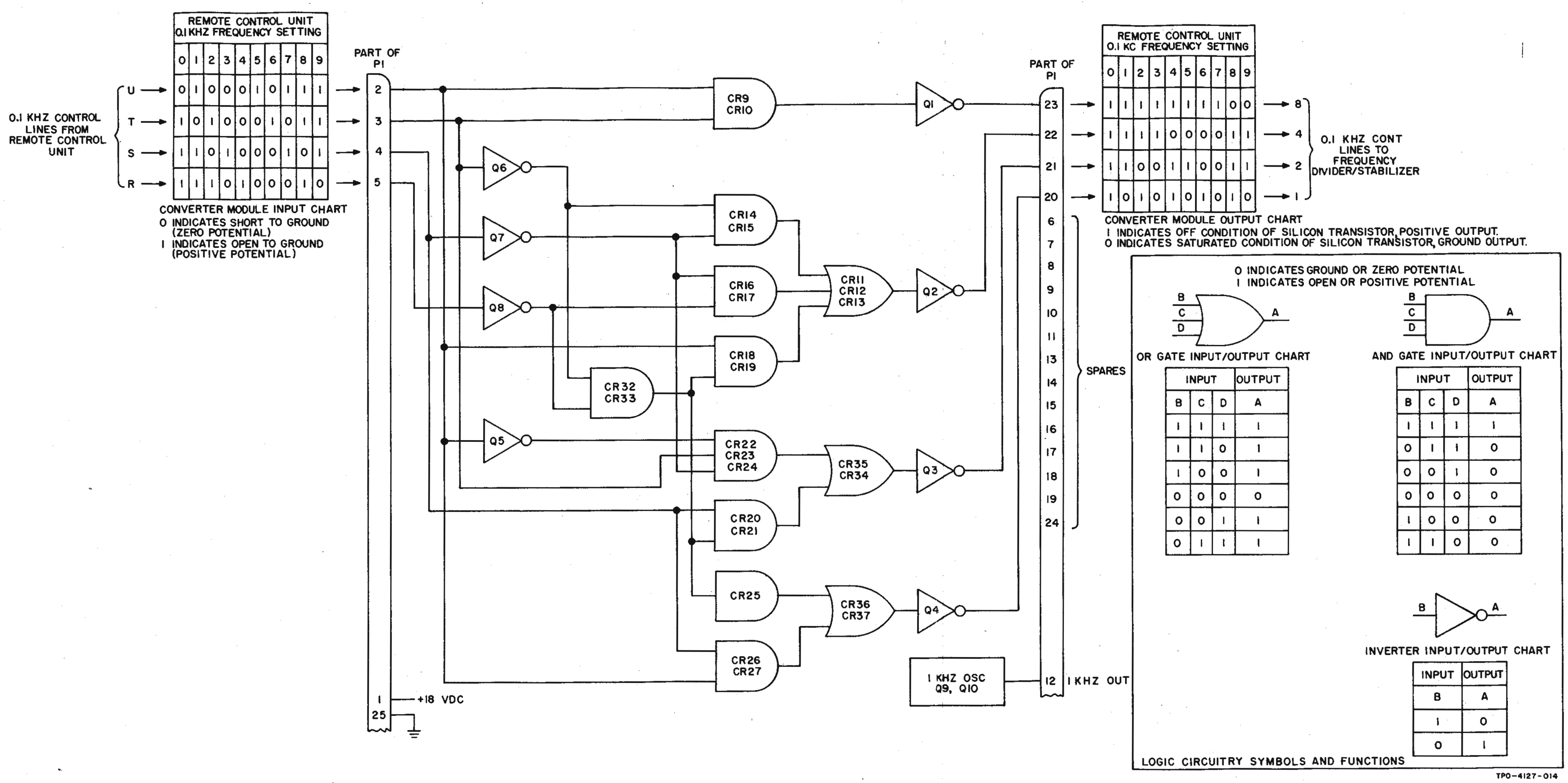
The following discussion describes the actions of control data converter A16 for one frequency setting on the radio set control. The principles apply, however, to the other nine settings.

When the 0.1-kHz frequency selector switch on the radio set control is set to 2, control data converter connector A16P1-2 and A16P1-4 are grounded while A16P1-3 and A16P1-5 are open to ground. The ground at A16P1-2 applies logic 0 to the input of inverter A16Q5 and to one input of AND gates A16CR9 and A16CR10, A16CR18 and A16CR19, and A16CR26 and A16CR27. The open at A16P1-3 applies logic 1 to the input of inverter A16Q6 and to one input of AND gates A16CR9 and A16CR10 and A16CR22, A16CR23, and A16CR24. AND gate A16CR9 and A16CR10 with inputs of logic 0 and logic 1 has an output of logic 0 that is applied directly to the input of inverter A16Q1. Inverter A16Q1 inverts the logic 0 input to a logic 1 output and applies it directly to output A16P1-23.

The ground at A16P1-4 applies logic 0 to the input of inverter A16Q7 and to one input of AND gates A16CR20 and A16CR21 and A16CR26 and A16CR27. The open circuit at A16P1-5 applies logic 1 to the input of inverter A16Q8.

Inverter A16Q5, with a logic 0 input, applies a logic 1 output to one input of AND gate A16CR22, A16CR23, and A16CR24. Inverter A16Q6, with a logic 1 input, applies a logic 0 output to one input of AND gates A16CR14 and A16CR15 and A16CR32 and A16CR33. Inverter A16Q7, with a logic 0 input, applies a logic 1 output to one input of AND gates A16CR14 and A16CR15, A16CR16 and A16CR17, and A16CR22, A16CR23, and A16CR24. Inverter A16Q8, with a logic 1 input, applies a logic 0 output to AND gates A16CR16 and A16CR17 and A16CR32 and A16CR33. AND gate A16CR32 and A16CR33, with logic 0 inputs, applies a logic 0 output to one input of AND gates A16CR18 and A16CR19 and A16CR20 and A16CR21 and to the input of AND gate A16CR25.

AND gate A16CR14 and A16CR15, with a logic 0 and a logic 1 input, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR16 and A16CR17, with logic 1 and logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR18 and A16CR19, with logic 0 inputs, applies a logic 0 output to one input of AND gate A16CR11, A16CR12, and A16CR13. AND gate A16CR22, A16CR23, and A16CR24, with logic 1 inputs, applies a logic 1 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR20 and A16CR21, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR25, with a logic 0 input, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37. AND gate A16CR26 and A16CR27, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37.



618T-1B/2B/3B Control Data Converter A16, Functional Logic Diagram
Figure 41

OR gate A16CR11, A16CR12, and A16CR13, with three logic 0 inputs, applies a logic 0 output to inverter A16Q2 that inverts it to produce a logic 1 output at A16P1-22. OR gate A16CR34 and A16CR35, with a logic 1 and a logic 0 input, applies a logic 1 output to inverter A16Q3 that inverts it to produce a logic 0 output at A16P1-21. OR gate A16CR36 and A16CR37, with logic 0 at both inputs, applies a logic 0 output to inverter A16Q4 that inverts it to produce a logic 1 output at A16P1-20.

(11) Frequency Divider-Stabilizer A15.

Frequency divider-stabilizer A15 supplies and stabilizes a variable frequency from 2.5001 MHz to 3.5000 MHz in 100-Hz steps to the lf mixer in rf translator A12.

Figures 838 through 847 are schematic diagrams of the individual circuit boards in frequency divider-stabilizer A15. Refer to figure 42, a block diagram of frequency divider-stabilizer A15.

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's). One oscillator has a frequency range from 2.5001 to 3.0000 MHz. The other oscillator has a frequency range from 3.000 to 3.5000 MHz. Transistor switches are operated by information supplied through the 100-kHz radio set control lines that turn on the proper oscillator, depending upon the frequency selected. The oscillator output frequency is controlled by a dc voltage input from phase/frequency discriminator circuit board A15A5 that is applied across voltage-variable capacitors in the oscillator circuit. As the voltage applied across the voltage-variable capacitors increases, the capacitance decreases, thus increasing the oscillator frequency. Also, as the voltage applied across the voltage-variable capacitors decreases, the oscillator frequency decreases.

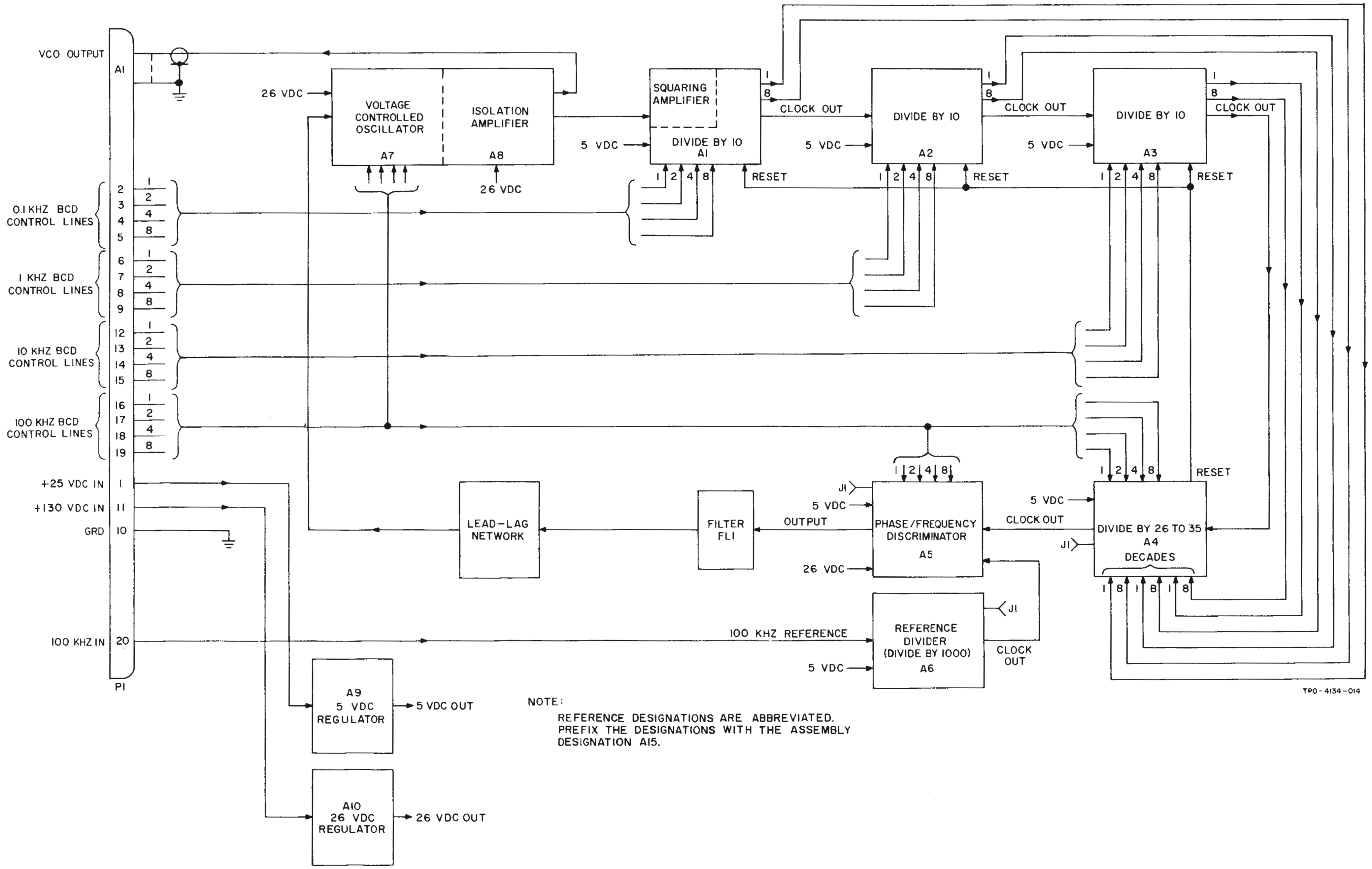
The output of the oscillator is fed into an isolation amplifier before being applied to the lf frequency mixer. The output of the vco must work into a constant impedance source supplied by the isolation amplifier. The output impedance of the isolation amplifier may vary a considerable amount, but the input impedance will remain constant. Two outputs are obtained from the isolation amplifier: one output is connected to the lf mixer stage of rf translator A2, while the other output is connected directly to the variable frequency divider circuit.

The variable frequency divider circuit is capable of dividing the output frequency of the vco 25,001 to 35,000 times, depending upon the frequency control information supplied by the radio set control. The variable frequency divider circuit, consisting of three divide-by-10 circuit boards (A15A1, A15A2, and A15A3) and one divide-by-26-to-35 circuit board (A15A4), is actually a counting circuit. With no frequency control information applied to the frequency control lines, each of the divide-by-10 circuit boards counts 10 input pulses prior to producing 1 output pulse. The three divide-by-10 circuits are connected in series and, therefore, 1000 input pulses are required at the input to divide-by-10 circuit board A15A1 to produce 1 output pulse from divide-by-10 circuit board A15A3. Divide-by-26-to-35 circuit board A15A4 requires 35 input pulses to produce 1 output pulse. Divide-by-26-to-35 circuit board A15A4 is connected in series with the output of the three divide-by-10 circuit boards and, therefore, 35,000 input pulses are required at the input of divide-by-10 circuit board A15A1 for 1 pulse output from divide-by-26-to-35 circuit board A15A4. The output of the divide-by-26-to-35 circuit board, when the vco is locked on frequency, is 100 pulses per second. Therefore, an input of 3,500,000 pulses per second is required at the input of divide-by-10 circuit board A15A1 for an output of 100 pulses per second from divide-by-26-to-35 circuit board A15A4.

The frequency control information supplied to the variable frequency divider circuit boards control lines by the radio set control tells each divider circuit board how many pulses not to count. Since the variable divider circuitry normally counts 35,000 pulses with no frequency information on the control lines, it will count 35,000 pulses minus the number of pulses defined by the information appearing on the control lines.

An example of the frequency division process follows. Assume that the radio set control is set to a frequency of XX.7434 MHz (743,400 Hz), that the vco output frequency is 3.5000 MHz (3,500,000 Hz), and that the variable divider circuit is dividing the vco output by 35,000 to attain the required output of 100 pulses per second (pps). The frequency control information will appear on the variable divider circuit control lines as a 7 on divide-by-26-to-35 circuit board A15A4, a 4 on divide-by-10 circuit board A15A3, a 3 on divide-by-10 circuit board A15A2, and a 4 on divide-by-10 circuit board A15A1. The action of telling a divider circuit how many pulses not to count is accomplished by an addition process. The vco output frequency is now 2.7566 MHz (3.5000 MHz minus the radio set control setting of XX.7434 MHz). Divide-by-10 circuit board A15A1 is told not to count 4 pulses and is told so at a repetition rate of 100 times per second or, in effect, 400 pulses have been added to the input frequency, 2,756,600 pulses per second (pps), from the isolation amplifier. The combined frequency is now 2,757,000 pps, and after being divided by 10 by circuit board A15A1, becomes 275,700 pps that is fed directly to divide-by-10 circuit board A15A2. Divide-by-10 circuit board A15A2 is told not to count 300 pps. When 300 pps is added to the input frequency to circuit board A15A2 (275,700 pps), the result is 276,000 pps and after division by 10 becomes 27,600 pps and is fed directly to divide-by-10 circuit board A15A3. Divide-by-10 circuit board A15A3 is told not to count 400 pps. When 400 pps is added to the input frequency of circuit board A15A3 (27,600 pps), the result is 28,000 pps and after division by 10 becomes 2,800 pps and is fed directly to divide-by-26-to-35 circuit board A15A4. Divide-by-26-to-35 circuit board A15A4 is told not to count 700 pps. When 700 pps is added to the input frequency of circuit board A15A4 (2,800 pps), the result is 3,500 pps and after division by 35 becomes 100 pps and is fed directly to the phase/frequency discriminator circuit board A15A5. When the vco is locked on the proper frequency, the output of the variable frequency divider circuitry is 100 pps.

The reference frequency divider, divide-by-1000 circuit board A15A6, produces a 1 output pulse from 1000 input pulses. The input signal to circuit board A15A6 is a 100-kHz signal obtained from rf oscillator A2. The output of reference frequency divider circuit board A15A6 is 100 pps with an accuracy equal to the frequency standard. The 100-pps output is compared with the output of the variable frequency divider circuit. When the vco is locked on frequency, the outputs of both the reference frequency divider and the variable frequency divider circuits



618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram
Figure 42

are 100 pps and, therefore, the output frequency of the vco is as accurate as the frequency standard. The output of reference frequency divider circuit board A15A6 is fed directly to phase/frequency discriminator circuit board A15A5.

Phase/frequency discriminator circuit board A15A5 constantly compares the two input signals from the variable frequency divider circuit and the reference divider circuit. If the two input signals differ only slightly in frequency, the phase discriminator sends a dc voltage to the voltage-variable capacitors in the vco that changes the output frequency of the vco until the output frequency of the variable frequency divider circuit is 100 pps and is frequency locked to the 100-pps reference signal.

If the difference in frequency between the reference signal and the variable frequency divider output signal becomes so great that the phase discriminator cannot bring them to a frequency lock, the discriminator sends a narrow pulse to the voltage-variable capacitors in the vco. The narrow pulse drives the frequency of the vco to either limit of its frequency range with the polarity of the pulse determining to which limit of the frequency range the vco is driven. After the vco reaches one limit of its frequency range, it sweeps across its entire frequency range until the phase discriminator is able to bring the output of the variable frequency divider circuit into frequency lock with the reference signal. For example, assume that the vco output frequency is 3.5000 MHz and that the variable frequency divider circuit is dividing by 35,000. The output of the variable divider circuit is 100 pps and is phased locked with the 100-pps output of the reference divider circuit. Now assume that the frequency control information changes and tells the variable divider circuitry to divide by 25,001. Momentarily, the output frequency of the vco will remain at 3.500 MHz, but the output of the variable divider circuitry will be 140 pps (3,5000 MHz divided by 25,001). The frequency discriminator circuit sends a narrow negative pulse to the voltage-variable capacitors in the vco, causing the vco to sweep toward the lower limit of its frequency range (2.5001 MHz). As the vco output frequency reaches 2.5001 MHz, the output of the variable frequency divider circuitry will be 100 pps and will allow the phase discriminator to lock the output frequency of the vco at 2.5001 MHz. The output of phase/frequency discriminator circuit board is fed directly to low-pass filter A15FL1.

Low-pass filter A15FL1 extracts the average dc voltage from the input voltage supplied by phase/frequency discriminator circuit board A15A5. This dc voltage is fed through the lead-lag (compensation) network to the voltage-variable capacitors in the vco.

The lead-lag (compensation) network performs two functions. It compensates for any phase shift at lower frequencies caused by filter A15FL1 and acts as an attenuator at lower frequencies to prevent undesired oscillations. The output of lead-lag network is fed directly to the voltage-variable capacitors in the vco.

(12) Low-Voltage Power Supply A5.

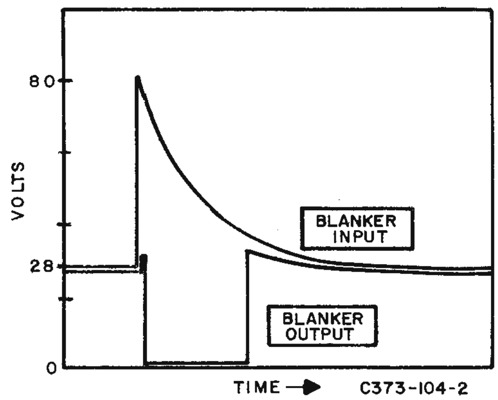
(a) General.

Low-voltage power supply A5 includes a rectifier-filter power supply circuit that produces +130 volts dc from the 115-volt, 400-Hz line input and an

+18-volt dc divider power supply that provides the highly regulated voltage required for stable transistor operation in the 618T-( ). Low-voltage power supply A5 also contains a transient blanker circuit that protects transistors in the 618T-( ) from transient line voltage surges. A schematic diagram of low-voltage power supply A5 is shown in figure 816.

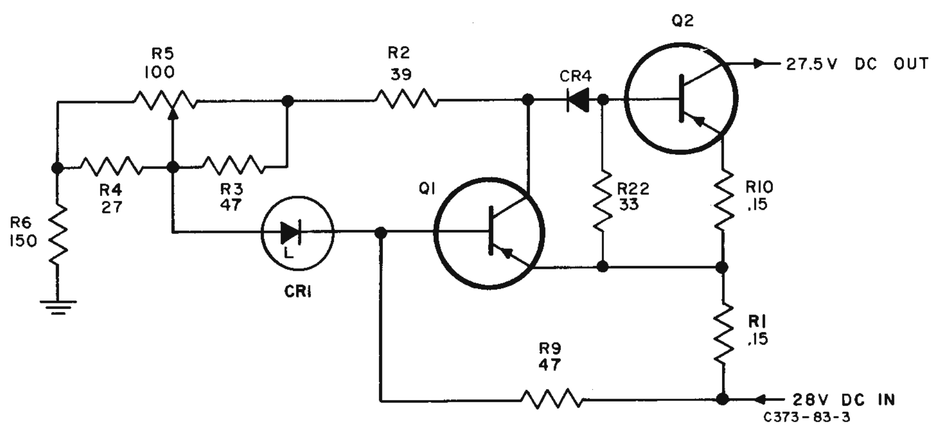
(b) Transient Blanker Circuit.

Refer to figure 43. Sudden changes in load on the primary power circuits often cause large transient peaks on the 27.5-volt dc line feeding the 618T-( ). Low-voltage power supply A5 contains a transient blanker circuit that protects transistors during transients by dropping the 27.5 volts dc to zero for the duration of the transient. A threshold of 32 volts dc is chosen as the maximum. If this voltage is exceeded, the transient blanker circuit operates.



Transient Blanker Waveforms
Figure 43

Refer to figure 44. When the voltage is below 32 volts, A5Q2 is forward biased and current flows through A5R1, A5R10, emitter to base of A5Q2, A5CR4, and resistors A5R2 through A5R6. Transistor A5Q2 becomes saturated, thereby making the collector voltage nearly equal to emitter voltage. The resistors form a voltage-dividing network, and there is a 1-volt drop across A5R1, A5R10, and emitter to collector of A5Q2. The output



Transient Blanker Circuit, Schematic Diagram
Figure 44

voltage is then 26.5 volts dc. If the input voltage exceeds 32 volts dc, diode A5CR1 breaks down and A5Q1 becomes forward biased. Current flow from emitter to base of A5Q1 is shunted to ground through A5CR1 and A5Q1, saturates A5Q1, and cuts off A5Q2 by removing its forward bias. At this point there is no output from A5Q2 collector. Cutoff remains until the voltage again drops below 32 volts dc. Then, A5CR1 ceases conduction, and normal bias is restored at A5Q2.

(c) Voltage Regulator Circuit

Refer to the +18-volt dc regulator in the center portion of the schematic diagram (figure 816). The +18-volt dc voltage regulator consists of two dc amplifiers A5Q3 and A5Q4 and a series regulator A5Q5. The dc amplifiers regulate the control voltage to the series regulator. Amplifier A5Q4 is controlled by a sensing voltage developed by a voltage-divider circuit and a zener diode controlled circuit both of which are connected to the output. The zener diode A5CR2 provides a reference voltage 9.3 volts below the output voltage that is applied to the emitter of A5Q4. A variation in the output is sensed directly at the emitter of A5Q4. The voltage divider consists of A5R14, A5R15, A5R16, A5RT1, and A5R17. A5R15 is set to develop +18 volts at the output. Approximately one-half of the variation in the output will be sensed by the base of A5Q4. Because of the difference of the variation of the output sensed by the emitter and base of A5Q4, an increase in the output decreases the current through A5Q4 and a decrease in the output increases the current through A5Q4. When A5Q4 decreases conduction, it decreases the current through A5Q3 and, in turn, decreases the current through A5Q5, reducing the output voltage. A decrease in the output voltage will have the opposite reaction. If the output is shorted, the base-emitter junction of A5Q4 will not be supplied enough voltage to provide base current and A5Q4 will turn off. This shuts off A5Q3 and A5Q5 and prevents A5Q5 from burning out if the 18-Vdc output is shorted to ground. Thermistor A5RT1 compensates for the change in amplification due to temperature variation.

(d) +130-Volt DC Supply.

Refer to figure 816. The third portion of low-voltage power supply A5 contains the +130-volt dc supply. The circuit is a conventional half-wave rectifier followed by a pi network filter and A5R11 bleeder resistor. A5R8 is a protective (fusible) resistor for diode A4CR3.

(13) 516H-1 Power Supply and Single-Phase High-Voltage Power Supply A13.

(a) 516H-1 Power Supply.

The 516H-1 Power Supply is an external power supply that is used, in conjunction with a single-phase high-voltage power supply module, to provide operating voltages for the 618T-1/1B Airborne SSB Transceiver. The 516H-1 mounts directly in the shockmount tray used by the power supply for the 618S and is used primarily in 618S retrofit installations. Figure 849 is a schematic diagram of the 516H-1 Power Supply.

The 516H-1 is completely transistorized and uses a saturable-core oscillator to convert 27.5 volts dc to 1500 Hz ac. The saturable-core oscillators, Q1 and Q2, used in the inverter circuit, are fast-acting switches whose switching action depends on the saturation of the core of transformer T1 in the oscillator circuit. When the oscillator is first energized, unbalance in the two halves of the oscillator circuit causes saturation current to flow in one transistor and the other transistor to be cut off. This current increases until the core of transformer T1 becomes saturated. When this occurs, voltage is no longer induced in the windings of T1 and the saturation current is cut off. When the magnetic field in the transformer windings starts to collapse, voltages are induced in the windings that cause the transistor that was previously cut off to be saturated and vice versa. This action produces a square-wave output at the transformer output. This square wave switches transistors Q3 through Q8, in a push-pull power circuit, to provide a 400-volt, 1500-Hz square-wave output from the power supply. The output of the 516H-1 Power Supply is fed to the single-phase high-voltage power supply module.

(b) Single-Phase High-Voltage Power Supply A13.

Refer to figure 837. The single-phase high-voltage power supply module contained in the 618T-( ) case steps up the 400-volt, 1500-Hz input to 1500 volts and rectifies it to provide the 1500-volt dc plate voltage for the power amplifier. This module also supplies tgc control voltage, vacuum-tube filament voltage, and a 260-volt dc plate voltage for tubes in the rf translator module. Early models also provide 400 volts for power amplifier screen voltage. In later models of the 618T-( ), however, this screen voltage is derived from the 1500-volt plate voltage input to the power amplifier module. The single-phase high-voltage power supply module also contains an overload relay that is automatically reset when the key-line ground is removed.

(14) 3-Phase High-Voltage Power Supply A7 (618T-2/2B).

Refer to figures 818 and 819. The 3-phase high-voltage power supply, A7, is a single unit that plugs into the 618T-2 chassis and derives its operating voltage from a 115-volt (line-to- neutral), 400-Hz, 3-phase primary power source. This module is used only in 618T-2/2B Airborne SSB Transceiver.

The time delay plate contactor relay, K1, is energized 30 seconds after the 618T-2/2B is turned on at the radio set control. When time delay relay K7 in the chassis circuit (see figure 807) is energized, A7R1, A7R2, and A7R3 are in series with the primary winding of A7T1, limiting the initial current transient. After the transient, step-start relay A7K2 is energized by the closing of relay contacts A7K1-3 and A7K1-4, and relay A7K2 bypasses resistors A7R1, A7R2, and A7R3, permitting full input voltage to be applied to A7T1 (MCN 17,999 and below). For modules with MCN 18,000 and above (figure 818), step-start relay A7K1 has been eliminated and capacitors A7C27, A7C28, and A7C29, in parallel with the primary winding of A7T1, provide initial current transient protection.

The two A7T1 secondaries supply diode rectifier banks connected in series to provide 1500- and 400-volt dc input to the power amplifier module. Bleeder resistors A7R11, A7R14, and A7R15 provide a 260-volt dc output for the rf translator module.

Transformer A7T2 supplies filament voltage for vacuum tubes in the 618T-2/2B. Overload relay A7K3 contains one winding (1 and 2) in series with the ground return of the rectifier to monitor total current. Approximately 750 to 800 ma will energize A7K3, opening contacts 6 and 7 and disrupting operation. Contacts 5 and 7 close and latch the relay with 27.5 volts dc through winding 3 and 4.

A7R5 through A7R8 form a bleeder that is tapped at A7R7 and A7R8 to provide the 618T-2/2B front panel meter with a voltage sample of monitoring +1500 volts dc. The AM tgc terminal (A7P1-15) is the current control voltage for the tgc/adc amplifier in the if. translator module. The control voltage that is dropped across A7R13, A7R4, and the overload coil of A7K3 by the flow of current is negative and, therefore, varies proportionately with current consumption. If plate current in the power amplifier module is excessive, the negative voltage reduces the gain of the if. amplifier that results in reduced drive to the power amplifier module. Refer to figure 16 for further study of this circuit. The AM tgc voltage is also the source for plate current metering (PA MA) at the 618T-2/2B front panel meter.

Filter A7FL1 is a low-pass filter used to prevent rf from entering the module on the high-voltage load. Diodes across relays suppress transients during switching.

(15) 27.5-Volt DC High-Voltage Power Supply A8 (618T-3/3B).

27.5-volt dc high-voltage power supply A8 is a single unit that plugs into the 618T-3/3B. It performs the same operations as the 516H-1 Power Supply and single-phase high-voltage power supply module in combination. The schematic diagram is shown in figure 820. The 27.5-volt input power is applied to switching transistors for transformation to high voltage. The module also supplies 27.5-volt dc power for application to the low-voltage power supply module and to the vacuum tubes for heater voltage.

When the radio set control function selector switch is moved from the OFF position, a ground is completed at A8P1-13. This supplies a ground for relay A8K1 through contacts 6 and 7 of overload relay A8K2 and diode A8CR26. Chassis relay K7 delays relay A8K1 for 30 seconds. When relay A8K7 contacts close, 27.5 volts dc is applied to relay A8K1 through A8P1-18. Diode A8CR32 across relay A8K1 solenoid suppresses rf transients.

With relay A8K1 energized, delay relay A8K3 is energized by 27.5 volts dc through contacts 3 and 4 of A8K1. Relay A8K3 has the same ground return as A8K1. Relay A8K3 contacts 3 and 8 and latch relay A8K1 contacts 4 and 7 provide continuity for 27.5 volts dc at A8P1-32 to energize the saturable core oscillator A8Q1 and A8Q2. Transistors A8Q1 and A8Q2 are fast-acting switches. The switch action depends upon the saturation of transformer A8T2. When the oscillator is first energized, unbalance causes one transistor to conduct to saturation and the other to cut off. After the first half-cycle, when the magnetic field surrounding A8T2 windings begins to collapse, the saturated transistor is cut off and the other transistor becomes saturated. This action produces a square-wave output at the A8T2 secondary.

The rectifier consists of the push-pull power circuit A8Q9-Q11 and A8Q12-Q14, transformer A8T1, and bridge rectifiers A8CR18 and A8CR21 for low voltage and A8CR6 and A8CR17 for high voltage. The output of A8Q9 and A8Q12 is 400 volts ac at approximately 1500 Hz that is stepped up to 1500 volts across A8T1 secondary taps 4 and 5. The 400- and 1500-volt bridge rectifiers are series connected, and ground is returned through the series combination of A8R21 and A8R17 and the relay A8K2 overload winding. A current of 750 to 800 ma will energize the winding and break contacts 7 and 6 of relay A8K2, thus disrupting input to the rectifier.

Terminal A8P1-15 returns a small negative voltage for metering of plate current at the front panel. Voltage drop is read across A8K2 coil and A8R17 and A8R21 in series. This same negative voltage overrides carrier tgc and reduces drive to the power amplifier module if plate current swing is excessive. Refer to figure 16 for further study of the tgc circuit.

Terminal A8P1-35 returns one-fourth of the voltage (bled by resistors A8R13 through A8R16) to the 618T-3/3B for metering of high voltage (+1500 volts) at the front panel.

Resistors A8R18, A8R22, and A8R23 are the low-voltage bleeders with a tap at the junction of A8R18 and A8R22 to supply +260 volts to the rf translator module.

Filter A8FL1 is in series with the high-voltage output to prevent rf energy from entering the power supply. Coil A8L1 at terminal A8P1-32 serves the same purpose.

Diodes are used for dc voltage blocking transient suppression, rf interference suppression, and, in the oscillator circuit, zener diode A8CR24 is used for stabilization of transistors A8Q1 and A8Q2.

(16) Squelch Amplifier and Control Circuit (618T-( )).

The squelch amplifier and control circuit, physically located in rf oscillator module A2, Collins part number 528-0690-001 (figure 810), and Collins part number 528-0690-002 (figure 810A) receives input audio signals from AM/audio amplifier module A9. The squelch circuit converts the input signal to a dc voltage and compares it with a threshold level provided by a squelch level control on the radio set control. After comparison, the squelch circuitry commands the squelch relay to connect the audio signal to the balanced output line, if sufficient and desirable audio is present, or to disconnect the balanced output line and insert a 330-ohm load across the AM/audio amplifier module output if noise predominates.

(a) Squelch Amplifier and Control Circuits in RF Oscillator; Collins Part Number 528-0690-001. (Refer to figure 810.)

The squelch amplifier circuit consists of amplifier, summation, and comparison stages. The comparison stage also drives the squelch relay.

The amplifier stages are in two parallel frequency-sensitive channels. The high frequency includes a resonant circuit peaked at approximately 2.5 kHz while the low-frequency channel includes a resonant circuit peaked at approximately 600 Hz. The output from each channel is fed through a buffer stage, diode detectors, and into a summation circuit.

The summation circuit provides the algebraic sum of the outputs of the two frequency-sensitive channels to a dc amplifier that provides the input to the comparison circuit.

The comparison circuit determines whether the desired audio level exceeds the threshold level set by the squelch level control on the radio set control. If the level is exceeded, a signal is capacitor coupled to the gate of an scr. The scr is triggered and energizes the squelch relay that connects the audio output signal from AM/audio amplifier A9 directly to the balanced audio output lines. If the audio level does not exceed the threshold level, the squelch relay is deenergized and connects a 300-ohm load directly across the audio lines of AM/audio amplifier A9. During transmit operation, the squelch circuit is disabled to permit passage of the sidetone for monitoring.

The capacitor coupling to the scr gate provides a form of syllabic detector. If the signal from the summing amplifier to the doupling capacitor does not switch at a rate slow enough for the coupling capacitor to discharge between pulses, the scr will not be triggered on, and the squelch relay will be deenergized. When the scr is turned off, C18 charges and holds Q9 on for 1 to 5 seconds. This prevents relay chatter that could be caused by the syllabic rate signals supplied to the coupling capacitor.

When the squelch level on the radio set control is turned to the extreme clockwise position, the squelch override dc amplifiers override the squelch amplifier and control circuit and connects the audio signal directly to the headset.

(b) Squelch Amplifier and Control Circuits in RF Oscillator, Collins Part Number 528-0690-002. (Refer to figure 810A.)

The amplifier consists of a low-pass filter, high-pass filter, isolation amplifiers, comparator, override switch, and a relay driver with holding capability.

The high-pass filter (audio above approximately 1.2 kHz) and the low-pass filter (audio below approximately 1.2 kHz) convert the input signal to a dc voltage. The dc output of the filters is coupled through isolation stages (Q4 and Q7) to a comparator. When the frequency of the input signal to the filters is below approximately 1.2 kHz (audio), the input to the positive terminal (noninverting input) will be larger than the input to the negative terminal (inverting input) of the comparator and its output will go positive. The positive voltage turns on Q8 which turns on Q9 and energizes relay K1. With K1 energized, the audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the audio signal is lost momentarily, the 10-μF capacitor on the base of Q8 holds

Q8 on for a period of 1 to 5 seconds. When the input signal to the filters is above approximately 1.2 kHz (noise), the comparator output is zero. Switch Q8 and Q9 are turned off and relay K1 is deenergized. The input from AM/audio amplifier A9 is dropped across the 330-ohm resistor.

The override switch has a preset dc level on the noninverting input. The dc level on the inverting input is determined by the setting of the RF SENS/SQL control on the 714E-( ) Radio Set Control. When the squelch override condition is desired, the 714E-( ) RF SENS/SQL control is adjusted so the inverting input to the override switch is at a lower dc level than at the noninverting input. The output of the override switch goes positive, turns on Q8 which turns on Q9 and energizes K1. The audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the RF SENS/SOL control is left in the override position, K1 remains energized regardless of the frequency input to the squelch circuits.

618T-( ) Airborne SSB Transceiver - Disassembly

1. GENERAL.

The disassembly procedures for the 618T-( ) Airborne SSB Transceiver contained in this section should be followed when it is necessary to remove a part in order to repair or replace it. The 618T-( ) should not be disassembled completely as a routine part of the overhaul procedure.

2. GENERAL TECHNIQUES AND PRECAUTIONS IN DISASSEMBLY OF THE 618T-( ) AIRBORNE SSB TRANSCEIVER.

Standard electrical disassembly techniques apply to the 618T-( ) Airborne SSB Transceiver. However, special attention should be given to the following techniques:

A. Removal of Electrical Wiring.

Tag or otherwise identify all disconnected electrical wiring. Note color coding, placement of wires, and method of insulation (if any) before unsoldering or removing.

B. Removal of Transistors and Diodes.

When removing transistors or diodes, use long-nosed pliers to grasp the lead to which heat is applied between the solder joint and the component. This will bleed off some of the heat that conducts into the component from the soldering iron.

C. Removal of Printed Circuit Boards.

Printed circuit boards may be removed from the module chassis by removing the screws which fasten the boards to the spacers on the module chassis. Be careful, when removing circuit boards, not to damage any connecting wiring or components that are mounted on the board. Refer to the repair section for information regarding removal of components from printed circuit boards.

3. SPECIFIC DISASSEMBLY TECHNIQUES.

A. Removal of Side Covers, Front Panel Cover, and Front Panel.

(1) Modules may be exposed by removing the two side covers on the 618T-( ). To do this, loosen four screws, two on each side, at rear of transceiver. Side covers then may be lifted off.

(2) The front panel cover may be removed by turning the two Dzus fasteners on the cover and pulling cover forward. This will expose the blower filter, sidetone level adjusting screw, audio level adjusting screw, and S3 (on units with squelch capability).

(3) To expose the components on the rear of the front panel and in the relay compartment on the front of the chassis, remove four screws at the four corners

of the front panel. The front panel may then be moved to expose the components, but will remain attached to the main chassis by a wiring cable.

B. Removal of Module Covers and Modules.

(1) Most module covers may be removed by pulling the attached handles. Module covers equipped with handles are not equipped with screws. The rf translator A12 cover is a press fit and may be removed by pulling upward with fingers inserted in the cover holes. The power amplifier module cover is attached with screws, but the cover screw holes are slotted so that the screws need only be loosened. High-voltage rectifier module covers are also attached with screws.

(2) Remove modules from the chassis by loosening the redheaded captive holddown screws at the corners of the module and pulling straight out.

CAUTION: DO NOT TWIST OR PRY ON MODULE TO DISENGAGE MATING CONNECTORS OR CONNECTORS MAY BE DAMAGED.

C. Removal of VFO and Autopositioner from RF Translator A12.

(1) With rf translator A12 in the chassis and power applied to the 618T-( ), position the vfo and Autopositioner to 500 kHz by setting the frequency indicator on the 714E-( ) to X.500 MHz. Turn power off.

(2) Remove rf translator A12 from the 618T-( ) chassis.

(3) Remove the top and bottom covers from rf translator A12.

(4) Refer to figure 101. Remove four screws (1) fastening the vfo to the Autopositioner.

(5) Remove four screws (2) fastening the vfo brackets to the rf translator chassis and backplate.

(6) Loosen two screws (3) holding the back brackets on the vfo. Rotate the brackets approximately 90 degrees in order to get room to move the vfo.

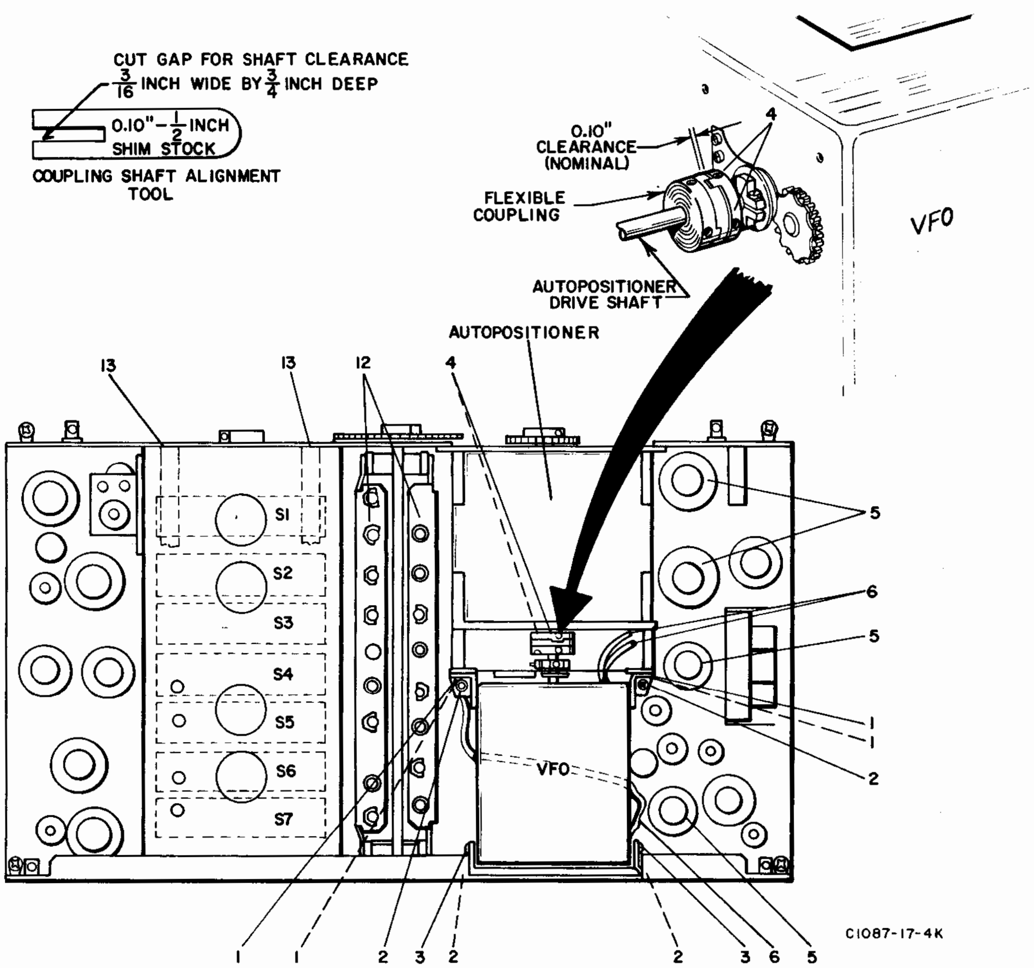
(7) Loosen two setscrews (4) retaining the coupler to the vfo shaft.

(8) Refer to figure 104. Loosen two screws (14) holding the cable guide plate (15). Remove the cable guide plate. Note placement of cables.

(9) Refer to figure 101. Remove four tubes (5) adjacent to the vfo and Autopositioner.

(10) To remove the vfo, tag and unsolder the vfo leads (6) from connectors P6 and P9-31 and the other internal connections in the module. Note placement of these leads on the rf translator chassis. The vfo may then be lifted from rf translator A12.

NOTE: Variable frequency oscillator 70K-9 has four leads; vfo 70K-5, three leads; and vfo 70K-3, two leads. Consult the appropriate schematic.



RF Translator A12, Top View
Figure 101

On rf translator A12 (Collins part number 528-0113-013), a filter circuit for the vfo was incorporated at approximately MCN 1100. The filter circuit consists of A12L41, A12L122, A12L131, and A12L261. In rf translator modules containing this circuit, the white sleeved vfo coaxial lead is connected to terminal E85 instead of J5. See figure 105.

(11) Refer to figure 102. Remove 3/8-inch flatted shaft (7), directly above 25-pin connector (8), by loosening clamp (9) on the gear that drives the shaft. Pull the shaft out through the gear.

(12) Remove 2 screws (10) holding the 25-pin connector to the bottom of the rf translator chassis.

(13) Refer to figure 103. Using a sharp pencil, make a mark on a tooth of gear G8. Make a corresponding mark on the rf translator chassis.

(14) Remove idler gear G9.

(15) Remove four screws (11) holding the Autopositioner to the gearplate.

(16) Carefully maneuver the Autopositioner to free it from the mounting plate. Remove the Autopositioner by slowly lifting it from the rf translator chassis. Be careful not to damage the 28-position switch wafers when pulling 25-pin connector (8) up through the chassis (figure 102).

D. Disassembly of VFO A12A2 (618T-1/2/3 Only).

The vfo is a potted assembly and cannot be disassembled in the field. Attempting to disassemble or adjust the vfo will result in misalignment and loss of accuracy. If the source of trouble is the vfo, it should be returned to the factory and replaced with a new unit.

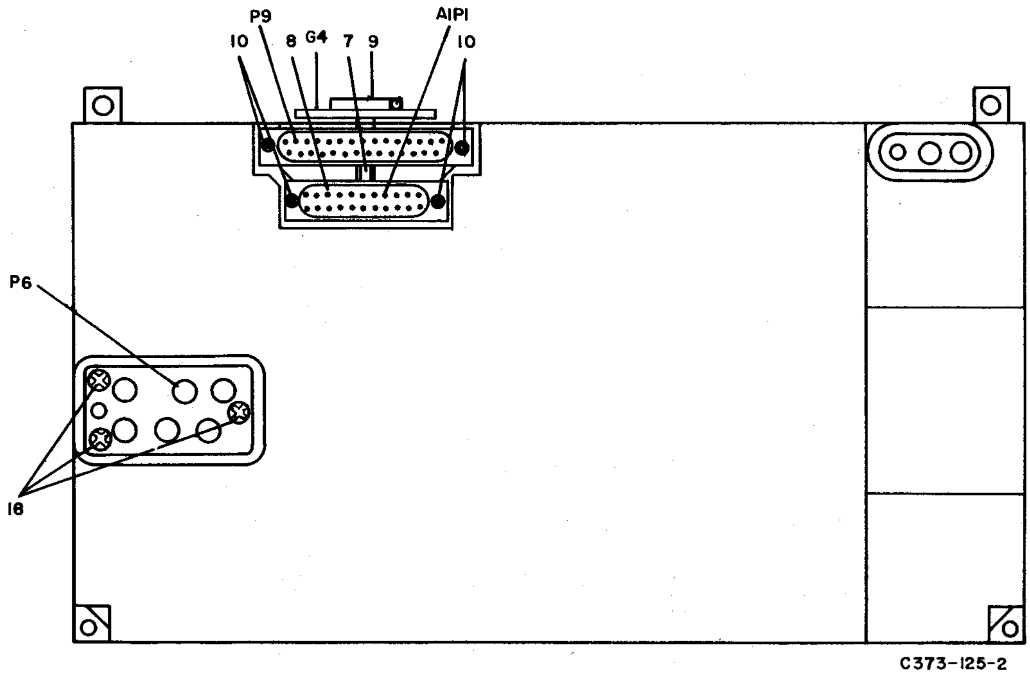
E. Replacement of 70K-5 VFO With 70K-9 VFO (618T-1/2/3 Only).

70K-9 vfo, Collins part number 522-3552-019, contains all parts required to perform this procedure. Holders of 70K-9 vfo need order replacement kit, Collins part number 757-1376-001, only. Replacing the 70K-5 vfo with the 70K-9 vfo requires removing the 70K-5 vfo and Autopositioner, changing the flexible coupling on the Autopositioner shaft, installing a new 70K-9 vfo,and reinstalling the Autopositioner. The vfo, rf translator slug rack, and 28-position switches must then be aligned. Installation of the 70K-9 vfo will not significantly change the weight of the 618T-( ).

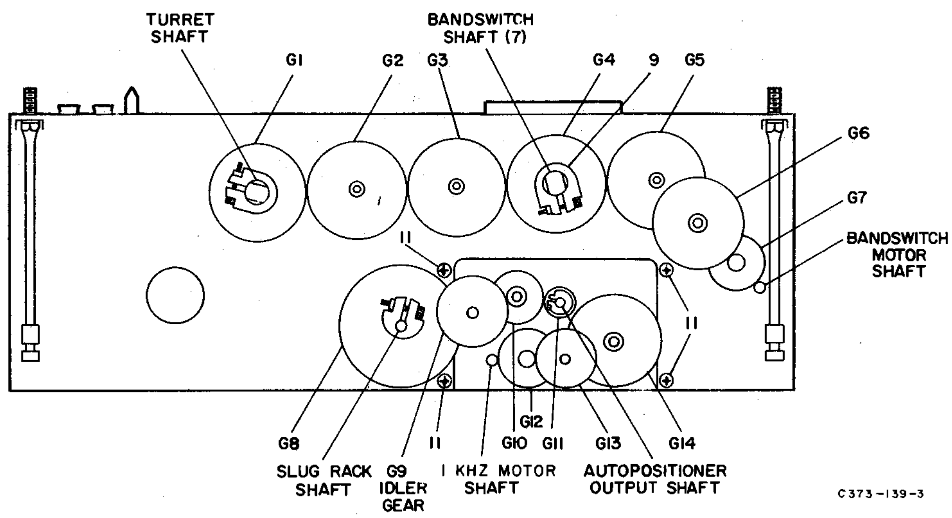
(1) Perform step 3.C (removal of vfo and Autopositioner from rf translator A12).

(2) Refer to figure 106. Position shaft midway between end stops on the 70K-9 vfo to be installed.

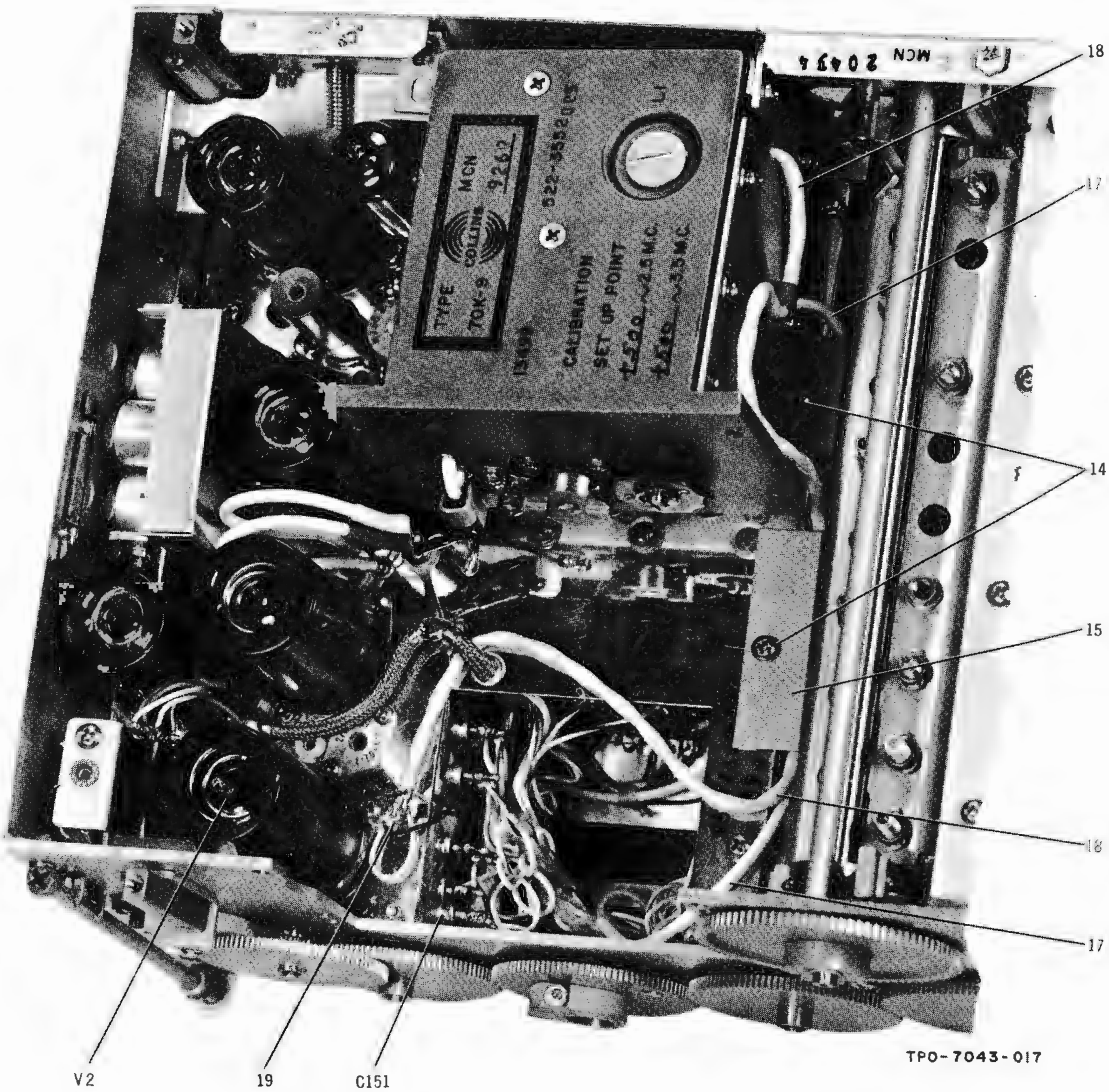
CAUTION: DO NOT LOOSEN SETSCREW SECURING THE COUPLING DEVICE ON THE 70K-9 VFO SHAFT. THIS COUPLING IS PART OF THE 70K-9 VFO MECHANICAL END STOP MECHANISM AND HAS BEEN PRESET AT THE FACTORY.



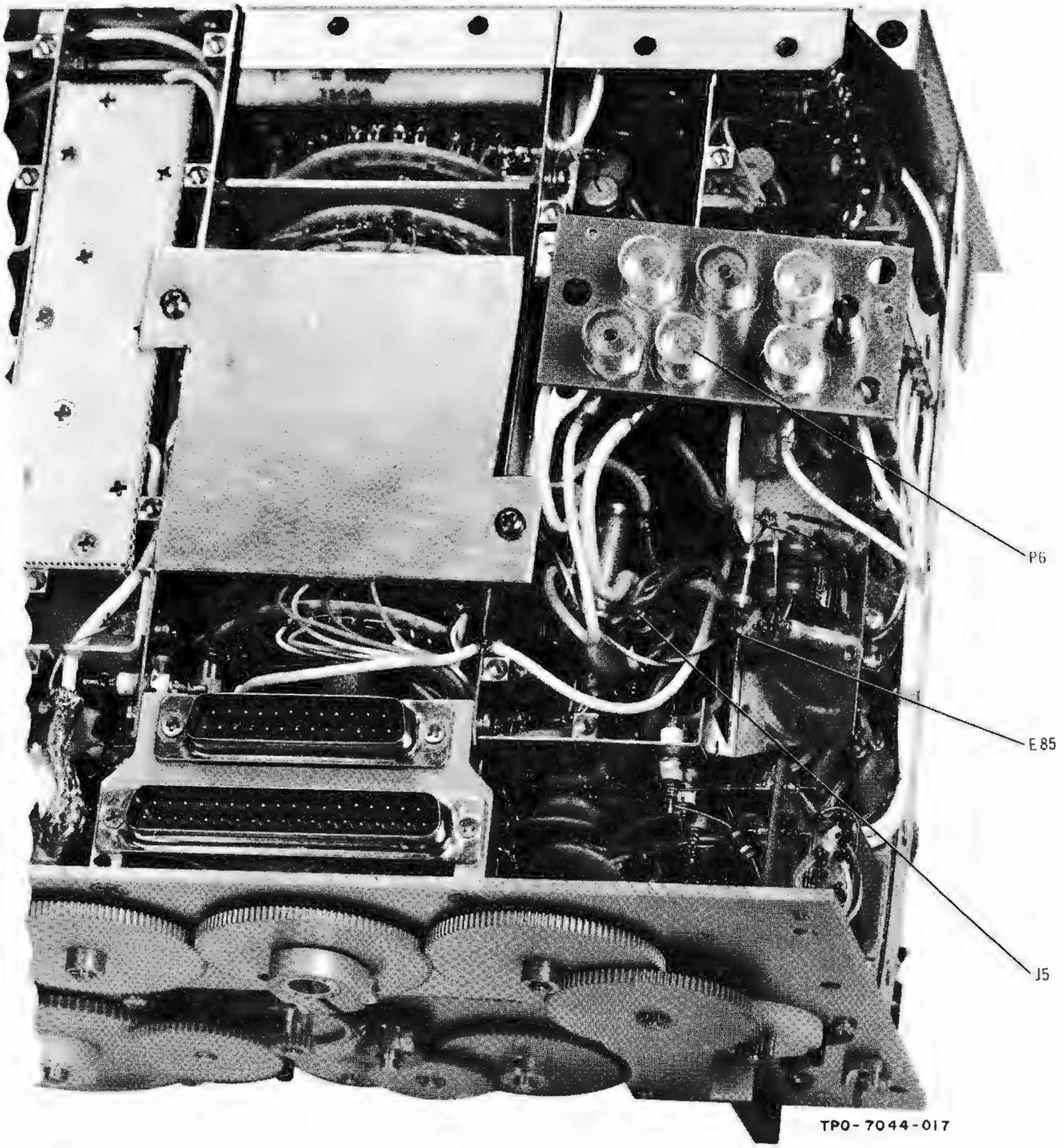
RF Translator A12, Bottom View
Figure 102



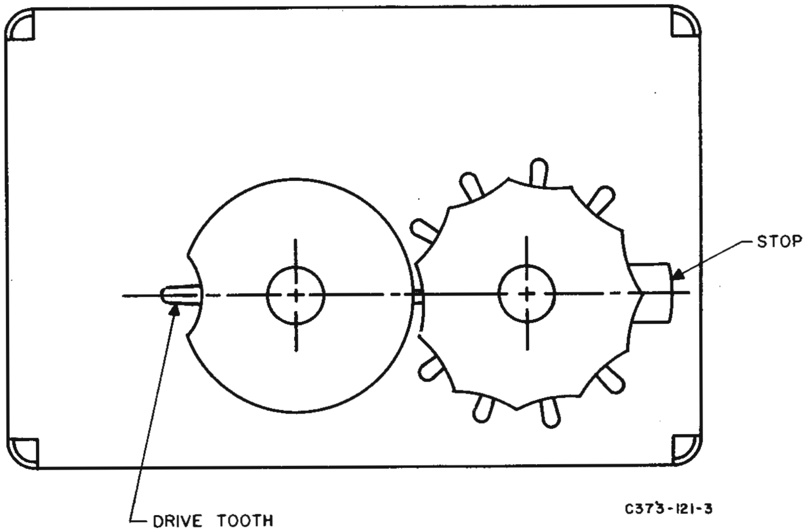
RF Translator A12, Gearplate
Figure 103



RF Translator With Autopositioner Removed, Top View
Figure 104



RF Translator, Low-Frequency Mixer Compartment, Bottom View
Figure 105



VFO in 500-kHz Position
Figure 106

(3) Place the 70K-9 vfo in position in rf translator A12, taking care to position the coaxial cable under the vfo as noted in step 3.C.(10). Secure the vfo temporarily in place by fastening one of the rear brackets to the rear plate.

(4) Refer to figure 104. The coaxial cable (17) and shielded-twisted-pair cable (18) from the vfo should be routed adjacent to the slug rack. The cable guide plate (15) removed in step 3.C.(8) should be mounted in place, as shown, using two screws (14).

(5) Refer to figure 102. Remove two screws (10) holding P9 to chassis.

(6) Refer to figure 104. Solder coaxial cable (17) to connector P9-31 using lead placement noted in step 3.C.(10). Secure P9 using two screws removed in step 3.E.(5).

(7) Route shielded-twisted-pair cable (18) from the vfo as shown in figure 104. Install grounding lug (Collins part number 304-0898-000) under mounting screw securing tube socket XV2. Solder cable shield and white wire to the grounding lug. Solder red wire to the terminal of feedthrough capacitor C151 as shown.

NOTE: Keep the cable routed close to the rf translator chassis so that the cable does not interfere with the Autopositioner, which will be installed above part of this cable.

(8) Route the green and white sleeved vfo coaxial leads through the holes in the rf translator chassis, using the same lead placement noted when removing the vfo

leads in step 3.C.(10). Remove the outer insulation from these coaxial leads at the point where the leads pass through the chassis. Solder the grounded bus wires to the shields in the same manner in which the vfo leads were grounded. Solder the green sleeved coded coaxial to P6 and the white sleeved coded coaxial to J5. (Refer to step 3.C.(10).)

(9) Replace the coaxial connector mounting plate assembly and secure it with three screws (16, figure 102).

(10) Remove the screw installed in step 3.E.(3) to temporarily hold the vfo in place. Loosen the vfo rear bracket screw and rotate the bracket approximately 180 degrees from the normal position to provide more room for installing the Autopositioner.

(11) Refer to figure 101. Slip the front vfo mounting bracket into position. Do not install any mounting screws.

(12) Remove the flexible coupling from the Autopositioner shaft. Replace it with the new flexible coupling (Collins part number 549-7715-002) that mates with the 70K-9 vfo coupling. Insert, but do not tighten the setscrews (Collins part number 328-0048-000) on the Autopositioner coupling.

NOTE: The new Autopositioner flexible coupling (Collins part number 549-7715-002) is considerably thicker than the Autopositioner flexible coupling (Collins part number 546-6825-002) that was used with the 70K-5 vfo.

(13) Perform step 4.E of the Assembly section (replacement of Autopositioner and vfo in rf translator A12).

F. Disassembly of Autopositioner A12A1.

(1) Removal of the Reversing Switch.

(a) Refer to figure 107. Rotate gear (9) or (5) by hand to position control cam (34) for minimum tension on spring (139).

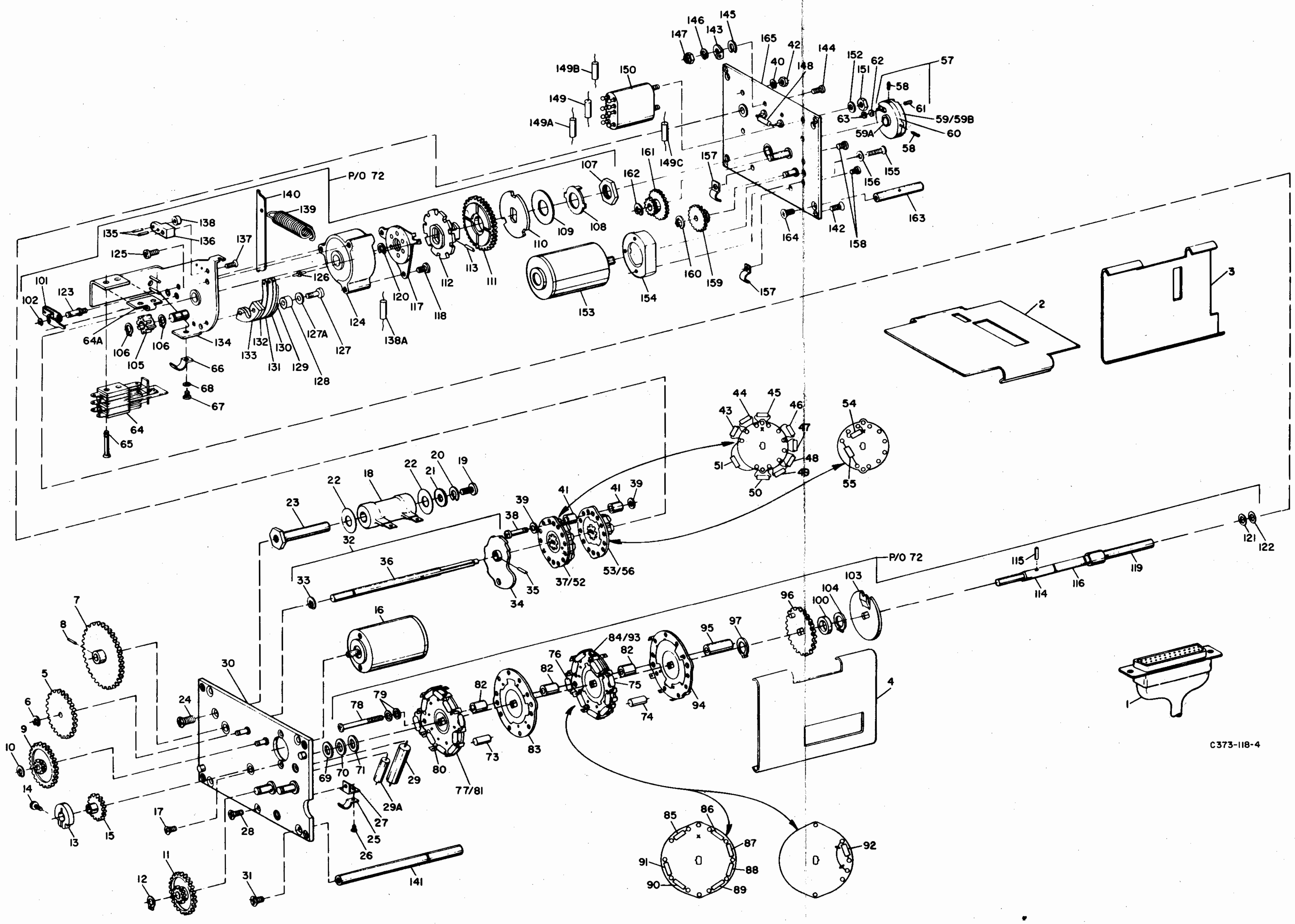
CAUTION: ALWAYS TURN THE GEARS SO THAT THE CAM ROTATES IN COUNTERCLOCKWISE DIRECTION AS VIEWED FROM THE GEARPLATE SIDE.

(b) Remove spring (139) by unhooking bar (140). Do not stretch the spring excessively while removing it.

(c) Remove cable clamp bracket (27) by removing screw (28).

(d) Remove cable clamp (66) by removing screw (67) and lockwasher (68). Lay the cable back so that reversing switch (64) is accessible.

(e) Remove two screws (65) holding the switch to mounting plate (134). Remove the reversing switch from the bracket.



Autopositioner A12A1, Exploded View
Figure 107

(f) Tag and unsolder the six wires connected to the switch. Reversing switch terminal identification is given in figure 108(A). The switch may now be removed.

(2) Removal of 1-kHz Switches. (Refer to figure 107.)

(a) Rotate gear (9) or (5) by hand to position control cam (34) for minimum tension on spring (139).

(b) Remove spring (139) by unhooking from bar (140). Loosen screw (14) of gear clamp (13), and remove spur gear (15).

(c) Disengage vfo shaft coupling (60) from shaft (119) by loosening two setscrews (58).

(d) Remove two cable clamps (157) by removing two screws (158).

(e) Remove relay (150) from bearing plate (165) by removing two nuts (151) and two lockwashers (152).

(f) Remove dc motor (153) and motor mount (154) from the bearing plate by removing two screws (155) and two lockwashers (156).

(g) Loosen bearing plate (165) by removing four screws (142). Lift the plate straight up to clear shaft (119) and camshaft (36).

(h) Remove 1-kHz rotary switch sections (37/52, 53/56) from bearing plate by removing two screws (38). Be careful not to lose any of the small ceramic spacers (41) and fiber washers (39).

(i) Tag any leads before unsoldering from switch terminals. Refer to figure 109(B).

(3) Removal of 10-kHz and 100-kHz Switches. (Refer to figure 107.)

(a) Perform steps (a) through (g) of paragraph 3.F.(2).

(b) Rotate gear (9) or (5) by hand to position control cam (34) so that screw (19) holding resistor (18) to front plate (30) is accessible.

(c) Remove screw (19) holding resistor (18) to front plate. Note placement of the resistor leads. Do not lose the washers at the ends of this resistor.

(d) Remove cable clamp (25) by removing screw (26).

(e) Remove spur gear (15) by loosening setscrew (14) in gear clamp (13) and pulling straight off.

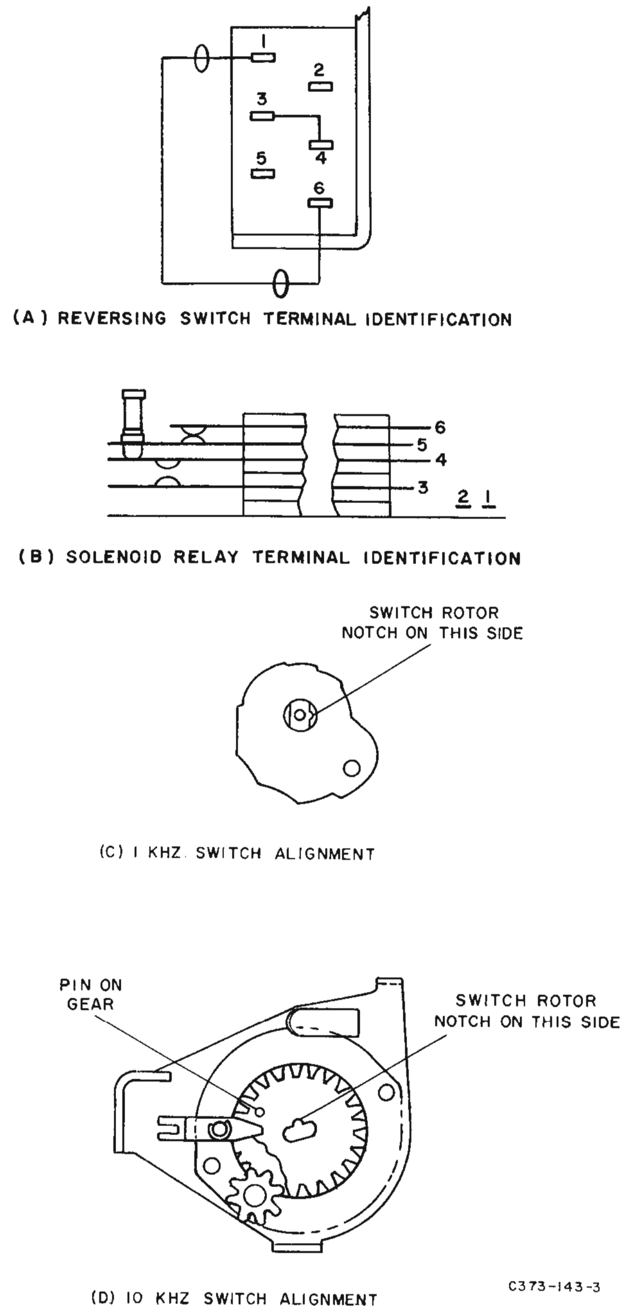
(f) Pull output shaft (114) out of the hole in the front plate. Be careful not to lose the shim washers (if any) between the output shaft and the front plate. The switch assembly is now free of the Autopositioner chassis.

(g) Remove cable clamp (66) by removing screw (67) and lockwasher (68).

(h) Remove reversing switch (64) by removing two screws (65).

(i) Tag and unsolder the six wires connected to solenoid (124) and relay (150). Solenoid relay terminal identification is given in figure 108(B).

(j) Remove two screws (78) and four washers (79) holding switch wafers (77/81, 83, 84/93, 94) to bracket (134). Switch wafers may now be removed. Tag any leads before unsoldering from switch terminals. Refer to figure 109(A).



Autopositioner A12A1, Alignment
Figure 108

(4) Solenoid Clutch Disassembly. (Refer to figure 107.)

(a) Perform steps (a) through (f) of paragraph 3.F.(3).

(b) Bend down tabs on washer (108) under nut (107). Remove nut (107), washer (108), and spring washer (109).

(c) Remove clutch disc (110) and clutch gear (111).

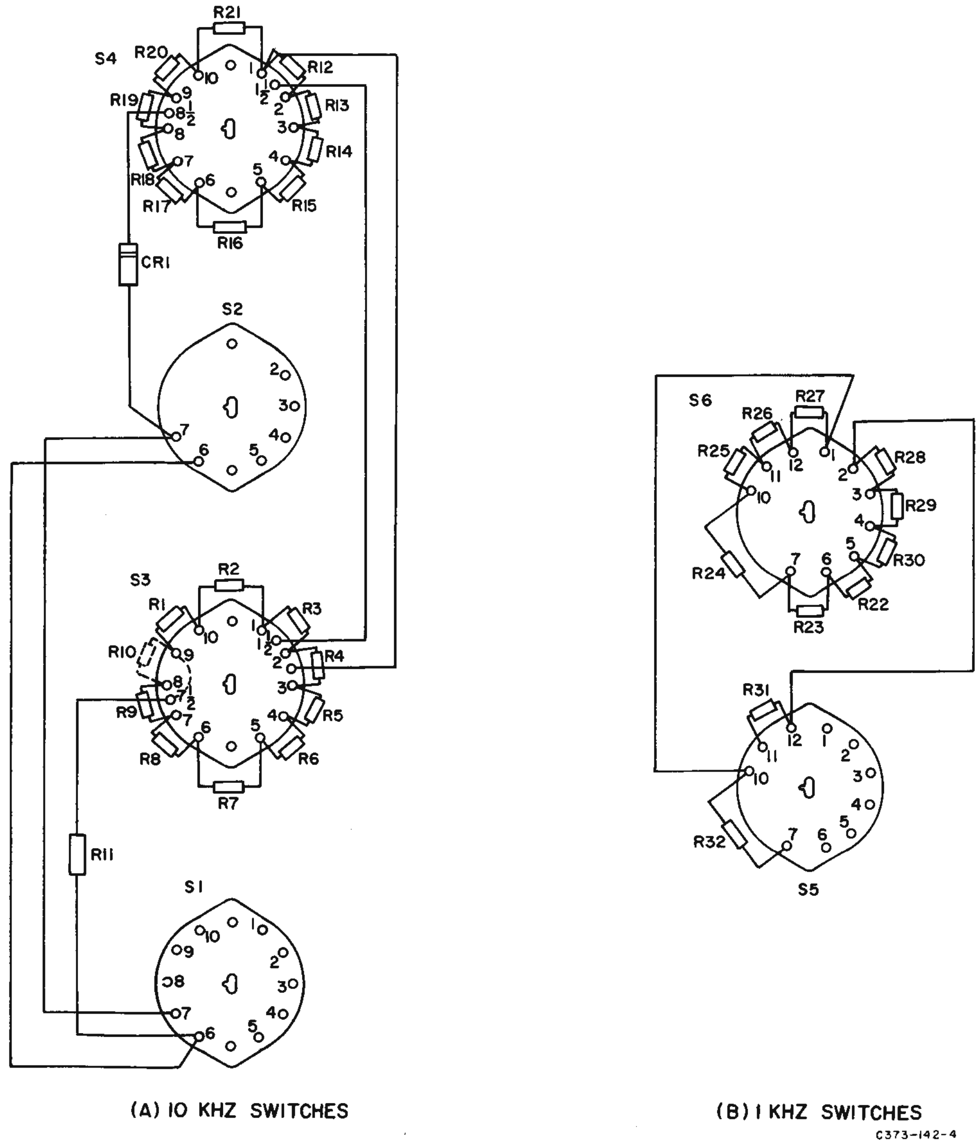
CAUTION: DO NOT TOUCH THE CLUTCH SURFACES WITH FINGERS. KEEP SURFACES FREE OF DUST, DIRT, AND LUBRICANTS OF ANY KIND.

(5) Removal of Solenoid. (Refer to figure 107.)

(a) Perform steps (a) through (j) of paragraph 3.F.(3) and steps (b) and (c) of paragraph 3.F.(4).

NOTE: Disassembly of the following spring pin connection is not recommended. Assembly of wheel (112) and shaft (119) cannot be accomplished without alignment fixture since each wheel (112) is unique. The notched wheel (112) is first aligned, then shaft (119) is drilled for spring pin (113). Replacement must be made at subassembly level (CPN 546-6849-004).

(b) Remove spring pin (113) through hub of wheel (112) and shaft (119) with a punch. Slide hub and attached notched wheel (112) off shaft.



Autopositioner A12A1, Switch Identification
Figure 109

(c) Remove armature (117) from solenoid (124) by removing two screws (118). Be careful not to lose small fiber actuator (126) that separates armature (117) from the solenoid relay contacts. Screws (118) are color coded for mounting the armature only.

(d) Remove retaining ring (120) from shaft (119).

(1) Insert the turrets from the bottom of the module so that all color-coded dots on the turrets are in a line at the top of the module.

NOTE: Each turret is marked with two color-code dots: one white and one a standard color-code color. The white dot is always nearest the gear-plate. Turrets are color coded so that turret S1 is nearest the gear-plate. Therefore, color-code dots should be (from the gearplate): white, brown, white, red, white, orange, etc. When inserting the turret, orient it so that the spring contacts which project from the faces of the turret will not fall into the shaft holes when the turret is being positioned.

(2) When all seven turrets are in place, replace the turret shaft through the gear that turns the shaft. Before tightening the shaft clamp, refer to paragraph 6.B in this section for the turret alignment procedure.

(3) Replace two aligning rods (13) by inserting through the gearplate. Secure the rods with two screws through the rear plate. Refer to note in paragraph 3.G.(5) of disassembly section concerning rf translator modules with turret setscrews.

D. Assembly of Autopositioner A12A1. (Refer to figure 107.)

(1) Replacement of Solenoid.

(a) Replace solenoid (124) on mounting plate (134) using two screws (125) and post (123). Be sure that the post holding the reversing switch level is in the correct hole. Align solenoid (124) so that its shaft hole is lined up with shaft hole in mounting plate (134) before tightening screws.

(b) Solder the insulated jumper from solenoid relay terminal 6 to solenoid terminal 2. See figure 108(B).

(c) Replace retaining ring (120) on shaft (119).

(d) Replace armature (117) in solenoid (124) using two screws (118).

NOTE: Be sure these two screws (118) are the same as those removed during disassembly. If screws are lost, they must be replaced with screws having the same color code.

(e) Replace notched wheel (112) on shaft (119). Replace spring pin (113) through the hole in the notched wheel and shaft.

NOTE: Assembly of wheel (112) and shaft (119) cannot be accomplished without alignment fixture since each wheel (112) is unique. The notched wheel (112) is first aligned, then shaft (119) is drilled for spring pin (113). Replacement must be made at subassembly level (CPN 546-6849-004).

(f) Replace small fiber actuator (126) between armature (117) and the solenoid relay contacts. See figure 108(B) for proper placement of the actuator.

(g) Perform steps (a) through (c) of paragraph 4.D.(2).

(2) Solenoid Clutch Assembly. (Refer to figure 107.)

(a) Replace spur gear (111) and clutch disc (110).

CAUTION: DO NOT LUBRICATE OR CLEAN CLUTCH SURFACES ON 110, 111, OR 112. WIPE WITH DRY, CLEAN, LINTLESS CLOTH. DO NOT TOUCH CLUTCH SURFACES WITH FINGERS.

(e) Unsolder the insulated jumper wire from terminal 2 of the solenoid. See figure 108(B).

(f) Remove solenoid (124) from mounting plate (134) by removing two screws (125) and mounting post (123).

G. Removal of Turrets from RF Translator A12. (Refer to figure 101.)

(1) With rf translator A12 in the chassis and power applied to the 618T-( ), position turrets to the 2-MHz position by setting frequency indicator on the 714E-( ) to 2.000 MHz. Allow to tune and turn off power to 618T-( ).

(2) Remove rf translator A12 from 618T-( ) chassis.

(3) Remove the top and bottom covers from rf translator A12.

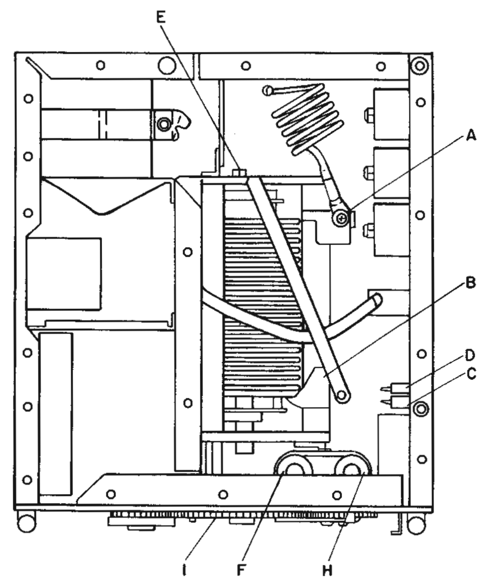
(4) Remove the turret cover by removing 14 screws on cover.

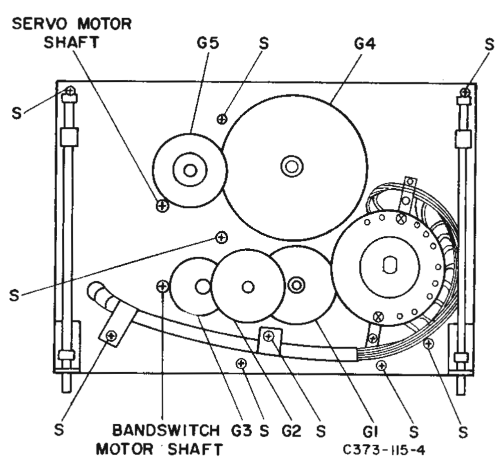
(5) Remove two phenolic aligning posts (13) by removing the two screws on rear of module. Slide the rods out through the gearplate.

NOTE: Late versions of rf translator A12 contain a notation on the gearplate concerning turret setscrews. The setscrews must be loosened before performing step 6. If this notation is found, use a no. 2 Bristol wrench and loosen the setscrews that hold turrets A12S1, A12S3, A12S4, and A12S7. The module bottom cover illustrates the location of these turrets. Access to the setscrews is through the hole adjacent to the color-coded dot on each turret.

(6) Remove the turret shaft by loosening the clamp on the gear that drives the shaft. Pull the shaft out through the gear.

(7) Remove the turrets at the bottom of rf translator A12 by pushing them from the top of the module.





Power Amplifier A11, Gearplate
Figure 110

Use care to avoid catching spring contacts, extending from the turret faces, in the shaft holes.

H. Disassembly of Power Amplifier Module A11. (Refer to figure 110.)

(1) Remove nine screws (S) from gearplate.

(2) Remove the top cover plate from the module by loosening 17 screws, sliding it toward the gearplate, and lifting it off.

(3) Remove the square plate on the end of the module opposite the gearplate by removing the eight screws.

(4) Remove the two nylon screws and washers holding the roller coil assembly to bracket at end of roller coil nearest tubes. Push the screen bypass capacitor out of the way to get at these screws.

(5) Remove the one screw and washer holding the end of the large silver-plated coil to the bracket on the roller coil assembly.

(6) Loosen the one screw holding the lower strap on the roller coil assembly.

(7) Disconnect resistors A11R42 and A11R43.

(8) Pull the gearplate out from the chassis. Be careful to pull straight out because the band-switch shaft comes out with the gearplate. The gearplate will remain connected to the module chassis by the wiring cable.

CAUTION: SHORT PLATE STRAPS TO CHASSIS WITH A SCREWDRIVER WITH AN INSULATED HANDLE BEFORE REMOVING TUBES.

(9) To remove the power amplifier tubes, remove the tube cover plate from the end of the module opposite the gearplate by removing six screws. Loosen the straps around the tube. Remove the tubes with the tube pullers supplied in the 678Y-1 Maintenance Kit chimneys.

I. Removal of Crystal from RF Oscillator A2 (Early Model). (Refer to figure 111.)

(1) Remove rf oscillator A2 from the 618T-( ) chassis.

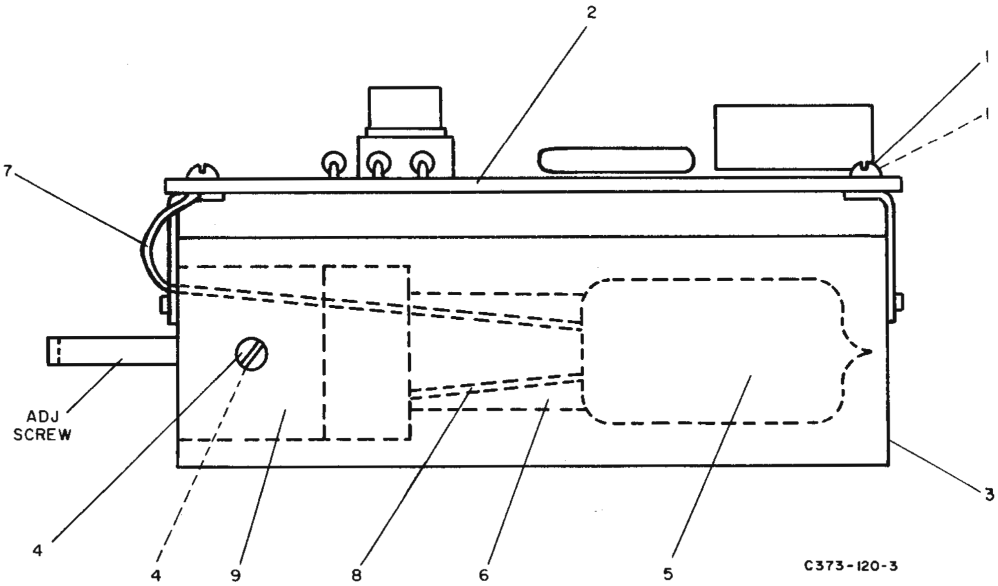
(2) Remove the dust cover from the module.

(3) Remove the triangular-shaped cover plate from the top of the module by removing four screws.

(4) Remove the two holddown screws on the foam-insulated end of the module.

(5) Remove the foam plug from the top of the module. Pull the wire cable so that it is outside the insulation.

(6) Tilt the insulating foam so that the bottom of the foam is exposed.



Oven and Crystal Oscillator Assembly, RF Oscillator A2 (Early Model)
Figure 111

(7) Remove the foam plug from the bottom of the module. Pull the wire cable so that it is outside the foam.

(8) With a finger, push the oven and crystal oscillator assembly up through the foam. Do not use a tool to push the oven out of the foam or the oven may be damaged.

(9) Remove two screws (1) from circuit board (2) to loosen oven assembly (3).

(10) Remove two screws (4) from opposite sides of the oven.

(11) Hold the circuit board in one hand, and remove the oven to expose crystal (5).

(12) Remove all grease (6) from around the crystal. Wipe all grease from the crystal Do not get grease on the circuit board.

(13) Unsolder green crystal lead (7) from the circuit board.

(14) Unsolder blue crystal lead (8) from C1 (9). The crystal may now be removed.

J. Removal of Crystal from RF Oscillator A2 (Late Model).

(1) Remove rf oscillator A2 from the 618T-( ) chassis.

(2) Remove the dust cover from the module.

(3) Remove the large foam protective plug from the module.

(4) Tag and unsolder the three leads at the reference oscillator board.

(5) Remove the reference oscillator board from the foam protection plug. The reference oscillator board contains the crystal.

618T-( ) Airborne SSB Transceiver - Cleaning

1. GENERAL.

This section presents instructions for cleaning parts and disassembled subassemblies of the 618T-( ) Airborne SSB Transceiver.

Instructions are arranged to facilitate reference by paragraph to the procedure for cleaning. All parts requiring particular methods of cleaning are considered separately, and parts similar enough to permit identical cleaning procedures are grouped.

2. CLEANING MATERIALS.

The use of the word "solvent" in the following procedures means Turcosol or Stoddard solvent. The cleaning materials referred to are listed in figure 201.

In this section, "air jet" refers to a hand-operated air nozzle supplied with clean, dry, compressed air at a maximum of 28 psig.

WARNING: USE CLEANING SOLVENT UNDER A VENTILATED HOOD. AVOID BREATHING SOLVENT VAPOR AND FUMES. WEAR A SUITABLE MASK WHEN NECESSARY. AVOID CONTINUOUS CONTACT WITH SOLVENT. USE GOGGLES, GLOVES, AND APRON TO PREVENT IRRITATION FROM PROLONGED CONTACT. CHANGE CLOTHING UPON WHICH SOLVENTS HAVE BEEN SPILLED. OBSERVE ALL FIRE PRECAUTIONS FOR FLAMMABLE MATERIALS. USE THESE MATERIALS IN A HOOD PROVIDED WITH EXPLOSION-PROOF ELECTRICAL EQUIPMENT AND AN EXHAUST FAN WITH SPARKPROOF BLADES. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORKING ENCLOSURE.

WARNING: WEAR GOGGLES WHEN USING AN AIR JET TO BLOW DUST AND DIRT FROM EQUIPMENT. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.

MATERIAL	RECOMMENDED TYPE
Solvent	Turcosol or Stoddard solvent
Isopropyl alcohol	
Chamois skin	
Cloth, lintless cotton	
Detergent, powder	
Paper, lens tissue	
Paper, fine grade tissue	
Cleaning agent	Miller-Stephenson #MS-230 Contact RE-NU

Cleaning Materials
Figure 201

3. PROCEDURES.

A. Bearings, Sealed and Porous Bronze.

NOTE: Refer to figures 23, 24, 34, and 43 of the 618T-( ) illustrated parts catalog (Collins part number 520-5970005).

Normally, sealed bearings require no cleaning or lubrication, since they are lubricated by the manufacturer for lifetime operation. It is recommended that these bearings be replaced if faulty; however, under certain circumstances, lubrication may be necessary. If lubrication is necessary, bearings must be thoroughly cleaned as follows:

(1) Sealed Ball Bearings.

(a) Sealed ball bearings must be cleaned in a suitable bearing-cleaning machine, such as a spray cleaner or an ultrasonic installation. Follow the manufacturer's instructions for proper use of these machines.

(b) If bearings are not to be lubricated, protect bearings from dust and moisture before inspection.

CAUTION: PERMANENT DAMAGE MAY RESULT FROM FORCIBLY SPINNING A BEARING BEFORE IT IS THOROUGHLY CLEAN. BEARINGS MUST NOT BE HANDLED WITH BARE HANDS DURING AND AFTER CLEANING AND PRESERVATION. OPERATORS MUST WEAR RUBBER GLOVES OR FINGER-STALLS TO AVOID CONTAMINATING BEARINGS WITH FINGERPRINTS. KEEP HANDLING TO A MINIMUM.

(2) Porous Bronze Bearings.

Lubrication of porous bronze bearings is not recommended. Wipe dust from items that contain porous bronze bearings with a clean, dry, lintless cloth. Protect the bearings from dust and moisture pending inspection.

B. Blower Filter.

The blower filter should be cleaned regularly. Always clean the filter before the air outlet side becomes dirty.

(1) Slowly immerse the filter, dirty side up, in cool water that contains a mild detergent. This will float out dirt and lint. A slight up-and-down motion will remove any remaining particles. If it is impossible to immerse filter, pass a fine spray of water through it in the direction opposite that of the air flow.

(2) Shake the filter to remove excess water. Allow the filter to dry.

(3) Before replacing the filter, lightly coat all filter surfaces with Air-Maze Filterkote "M" Water Soluble Oil, Collins part number 005-0609-00.

C. Cables, Covered.

(1) Clean outer surfaces of flexible Vinylite conduit by wiping dirt from surfaces with a lintless cloth moistened with solvent.

(2) Wipe dry with a clean, dry, lintless cloth.

(3) Treat all connector terminals as directed in paragraph F. Wipe lug terminals clean with a lintless cloth moistened with solvent, and dry with a clean, dry, lintless cloth.

D. Castings.

Castings should be cleaned as follows:

(1) Remove most of the surface grease with rags.

(2) Blow dust from surfaces, holes, and recesses using an air jet.

(3) Immerse casting in bath of solvent, and scrub until clean, working over all surfaces and into all holes and recesses with a suitable nonmetallic brush. Flat, woodbacked brushes with soft fiber bristles are recommended for surfaces; round brushes, like those used for washing bottles and test tubes, are recommended for holes and recesses.

(4) Raise casting from bath, and permit solvent to drain into bath.

(5) Immerse in rinsing bath of cleaning solvent, rinse, and raise from bath. Position casting to drain dry so solvent is not trapped in holes or recesses. When practical positioning will not permit complete draining, use air jet to blow out any trapped solvent.

(6) When thoroughly dry, touch up any minor damage to finish. Extensive damage to finish may require complete refinishing.

(7) Protect the casting from dust and moisture pending inspection.

E. Chassis, Wired.

The following cleaning procedures should be used for chassis containing terminal boards, resistor and capacitor assemblies, rf coils, switches, tube sockets, inductors, transformers, and other wired parts.

(1) Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with an air jet.

CAUTION: AVOID AIR-BLASTING SMALL COILS, LEADS, AND OTHER DELICATE PARTS BY HOLDING THE AIR JET NOZZLE TOO CLOSE. USE CAUTION IN USE OF BRUSHES ON DELICATE PARTS.

NOTE: When necessary to disturb the dress of wiring and cables, dressing should be noted and wiring and cables restored to dress after cleaning is completed.

(2) Clean jacks as instructed in paragraph J.

(3) Clean sockets as instructed in paragraph O.

(4) With minimum disturbance of wiring, clean connectors as prescribed in paragraph F.

(5) Clean wafer switches as directed in paragraph P.

(6) Clean ceramic or plastic insulators by method given in paragraph I.

(7) Finish cleaning chassis by wiping down all finished surfaces with a lintless cloth moistened with solvent.

(8) Dry and polish these surfaces, using a clean, dry, lintless cloth.

(9) Protect chassis from dust, moisture, and damage before inspection.

F. Connectors.

(1) Wipe dust and dirt from bodies, shells, and cable clamps using a lintless cloth moistened with solvent. Wipe dry with a clean, dry, lintless cloth.

(2) Remove dust from inserts using a small soft-bristled brush and an air jet.

(3) Wash dirt and any traces of lubricant from inserts, insulation, and contacts using a solvent applied sparingly with a small camel-hair brush.

CAUTION: DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT COVERING ANY WIRES OR CABLES CONNECTED TO CONTACT TERMINALS OF THE INSERT.

(4) Dry insert with the air jet.

G. Covers and Shields.

Clean all unfinished, finished, and partly finished sheet metal covers, such as dust covers, inspection covers, chassis covers, and housings, according to applicable steps of procedures used for cleaning castings. Refer to paragraph D.

H. Gears, Metal and Fiber.

If gear trains are disassembled for replacement of defective gears, the gears should be cleaned according to the following procedures:

(1) Metal gears should be cleaned according to applicable steps of paragraph K.

(2) Composition or plasticized gears and nylon friction clutches should be cleaned according to procedures given in steps (3) and (4).

(3) Remove all surface dust and dirt by using a soft-bristled brush in conjunction with an air jet.

(4) Using a clean, lintless cloth lightly moistened with solvent, clean composition gears by wiping them clean.

CAUTION: SOLVENT SHOULD NOT BE USED TO CLEAN GEARS COMPOSED OF OR CONTAINING NYLON. CLEAN THESE GEARS USING A WASHING BATH OF 2 OUNCES OF DETERGENT POWDER TO A GALLON OF WATER AND USING SUITABLE BRUSHES TO REMOVE SURFACE DIRT OR FOREIGN MATTER. GEARS COMPOSED OF EPOXY AND SUPPORTING BASE MATERIAL ARE SUSCEPTIBLE TO SOFTENING IF SOLVENT IS APPLIED FOR TOO LONG OR IF TOO MUCH SOLVENT IS USED. USE CARE IN CLEANING THESE GEARS WITH SOLVENT, AND DRY WITH A CLEAN, LINTLESS CLOTH.

I. Insulators, Ceramic or Plastic.

Clean all ceramic insulators and plastic standoff insulators as follows:

(1) Wipe clean with a clean, lintless cloth lightly moistened with solvent.

(2) Wipe dry, and polish using a dry, clean, lintless cloth.

J. Jacks.

(1) Remove dust from exteriors with a camel-hair brush and an air jet.

(2) Blow dust from interior of female contact with the air jet.

K. Machined Metal Parts.

Detached shafts, keys, pins, collars, worms, springs, and similar machined parts should be cleaned in a suitable cleaning machine, if available; otherwise, proceed as follows:

(1) Use procedures listed in steps (1) through (5) of paragraph D and steps (2) and (3) of this paragraph.

CAUTION: TO PREVENT CORROSION, AVOID TOUCHING ANY MACHINED OR FINISHED SURFACES WITH BARE HANDS AFTER CLEANING.

(2) Dry in a dust-free, dry area or suitable enclosure. Radiant heat used in a ventilated enclosure is recommended for drying, particularly if humidity is high.

(3) When dry, immediately apply a light coat of MIL-L-7870 lubricating oil to any bare steel surfaces.

L. Mechanical Metal Parts.

The detached miscellaneous mechanical metal parts include ventilating grilles, mounting plates, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware. These should be cleaned in a suitable cleaning machine or according to applicable steps of procedures for castings. Refer to paragraph D.

M. Molded Plastic Parts.

Plastic parts include insulating members, terminal boards, mounting blocks, etc. These should be cleaned in the following manner:

(1) Using an air jet, blow loose dust and dirt from surfaces, holes, and crevices.

(2) Wipe clean using a lintless cloth moistened with solvent.

(3) Dry and polish with a clean, dry, lintless cloth.

N. Relay Contacts.

CAUTION: DO NOT USE BURNISHING TOOL ON RELAY CONTACTS EXCEPT AS DETAILED IN THE REPAIR SECTION. BURNISHING OF GOLD-FLASHED RELAY CONTACTS IS NOT RECOMMENDED BECAUSE REMOVAL OF SURFACE FINISH MAY DEGRADE PERFORMANCE WITH LOW-LEVEL SIGNALS.

(1) Remove loose foreign materials from relay contacts with an air jet. If possible, operate relay armature manually while using air jet.

(2) Spray contacts with Miller-Stephenson #MS-230 Contact RE-NU or equivalent cleaning agent. Use force of spray to loosen heavy buildup on contacts.

(3) If necessary to remove any remaining residue, hold the contacts closed by manually operating relay armature and pass small strips of clean white paper back and forth between each pair of contacts.

O. Sockets.

Bakelite sockets are cleaned as follows:

(1) Remove any resin adhering to silver-plated contacts using a hardwood stick with a wedge point.

CAUTION: DO NOT USE METAL TOOLS TO REMOVE FOREIGN MATTER FROM THESE CONTACTS, AS DAMAGE TO THE CONTACT PLATING INVITES CORROSION, WHICH MAY END ULTIMATELY IN FAILURE OF THE EQUIPMENT. EXISTING CORROSION CONTACTS SHOULD NOT BE DISTURBED. CORROSION INDICATES DAMAGE TO PLATING AND NECESSITY FOR REPLACEMENT OF SOCKET.

(2) Wash contacts with solvent applied lightly with a small, soft-bristled brush.

(3) Using a lintless cloth moistened with solvent, remove any foreign matter adhering to body of socket or wafer.

(4) Repeat alcohol wash and dry with an air jet.

P. Switches, Wafer.

Clean switches of the phenolic wafer type as follows:

(1) Remove all dust with an air jet, turning switch rotor back and forth several times while blowing.

(2) Wash all contacts and insulation with solvent lightly applied with a small, camel-hair brush.

(3) Dry with air jet; then repeat wash using clean solvent while turning switch rotor.

Q. Turret Assembly Contacts.

Clean turret assembly contacts as follows:

CAUTION: TO PREVENT CORROSION, AVOID TOUCHING CONTACTS WITH BARE HANDS AFTER CLEANING.

(1) Remove all dust with an air jet.

(2) Wash all contacts with alcohol, lightly applied with a small camel-hair brush.

(3) Dry with an air jet.

(4) Repeat alcohol wash and dry with an air jet.

618T-( ) Airborne SSB Transceiver - Inspection/Check

1. GENERAL.

This section presents instructions necessary to verify by inspection, the condition of disassembled and cleaned assemblies of the 618T-( ). Inspection will reveal defects that result from wear, damage, deterioration, or other causes. Detailed inspection procedures are arranged alphabetically. Wear tolerances are listed in the fits and clearances section of this manual where applicable. Refer to the repair section of this manual for replacement of defective parts.

2. PROCEDURES.

A. Bearings.

(1) Bearings, Porous Bronze.

Inspect bearings for pitted, scarred, or scuffed load-bearing surfaces. Inspect for burns, corrosion, and any abnormal conditions occurring on load-bearing surfaces.

(2) Bearings, Ball.

The following inspection procedure applies to ball bearings of the shielded type. After the bearing has been cleaned, it is inspected to determine whether it is serviceable, and the bearing is cleaned again. After final cleaning, lubricate for installation. Inspect bearings as outlined below:

CAUTION: ALL INSPECTION REQUIRES THE UTMOST CLEANLINESS. OPERATORS HANDLING BEARINGS MUST WEAR RUBBER GLOVES OR FINGERSTALLS TO PREVENT CORROSION FROM FINGERPRINTS.

(a) Check for blue or purple discoloration (from overheating) of any part of bearing.

(b) Check for tarnished outer surfaces (indicated by a light discoloration of highly finished surfaces).

(c) Check for rust.

(d) Check for pitted, scarred, scuffed, or balled surfaces of bearings, balls, and races.

(e) Check for flat bearing balls, broken ball separators, flaking or spalling of load-carrying surfaces, and all other abnormal conditions.

In addition to the above inspection, check for undersized od (outside diameter) caused by creepage of outer race in its housing. This applies to all ball bearings with races that do not separate when the bearing is removed from companion parts. Also, check with a plug gauge for oversize or defective bore caused by the inner race having turned on its shaft and for excessive radial play. Use a suitable radial gauge equipped with a dial indicator calibrated in ten-thousandths of an inch when checking radial play of each bearing. A noise inspection of this type of bear-can be made by mechanical rotation. If motor driven, the bearing should be lubricated lightly with recommended lubricant (see lubricant chart, figure 501), and rotated at 500 to 1000 r/min. A dental lathe can be used to drive the inner race while the outer race is held in gloved fingers. A used but serviceable bearing will develop a certain amount of noise. A light, uniform noise is to be expected, but loud noise, nonuniform noises such as clicks or buzzes, and vibration originating in the bearing indicate that it is unfit for service. If manually rotated, the bearing must be clean and dry (unlubricated), and the outer race should be spun with the gloved finger while the bearing is held by a bearing holder inserted in its bore. Hold the bearing in several positions while making the check, and listen for any vibration or intermittent resistance.

B. Capacitors.

Inspect capacitors for defects listed in figure 301.

DEFECT	METAL TYPE	MOLDED TYPE	CERAMIC TYPE
Leakage of electrolyte (at case seams or around terminal insulation)	X		
Cracked, broken, or charred terminal insulation	X		
Case damage (dents or holes)	X		
Case damage (cracks or breakage)		X	
Loose, broken, or corroded terminal studs, lugs, or leads	X	X	X
Loose, broken, or poorly soldered connections	X	X	X

Fixed-Capacitor Inspection
Figure 301

C. Chassis.

Inspect chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, or damaged handles. Inspect for corrosion and damage to finish that requires work in finishing department.

D. Connectors.

Inspect connector bodies for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, broken, or corroded terminal connections.

E. Covers and Shields.

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Inspect for damaged fastener devices, corrosion, and damage to finish that requires work in finishing department.

F. Gaskets and Seals.

Inspect gaskets and seals for deformation and for damage such as tears, creases, rough surfaces, and imbedded foreign matter.

G. Gears, Metal and Fiber.

Inspect gears for broken, chipped, or badly worn teeth. Inspect gear bodies for cracks and deformation. Inspect surfaces for corrosion or other abnormal conditions.

H. Insulators, Ceramic or Plastic.

Inspect ceramic or plastic insulators for evidence of damage, such as broken or chipped edges, burned areas, or foreign material.

I. Jacks.

Inspect jacks for corrosion, rust, loose or broken parts, cracked insulation, bad contacts, and other irregularities.

J. Machined Metal Parts.

Inspect for physical damage to surfaces, corners, and edges. Inspect closely all machined surfaces, holes, bores, counterbores, slots, grooves, shoulder, flanges, teeth, tapped holes, and all threaded members, both male and female, for damage of any sort, including roughness of surface, corrosion, or foreign matter. Inspect plated or finished areas for damage requiring replating or refinishing beyond touch-up repair.

K. Mechanical Metal Parts.

Inspect unmachined mechanical metal parts, including mounting plates, chassis, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware, for damage or deformation. Inspect for corrosion and any damage that would require replating or refinishing beyond practical touchup.

L. Molded Plastic Parts.

Inspect plastic parts, such as terminal boards, mounting blocks, and insulating members, for signs of corrosion, cracked or charred insulation, and loose or missing mounting hardware. Inspect for other abnormal indications that might be a source of later breakdown.

M. Laminated Circuit Boards.

Inspect laminated circuit boards for loose, broken, corroded, or poorly soldered terminal connections. Inspect laminated circuits for any evidence of damage, such as burned, broken, cracked, or corroded plating. Inspect for loose mounting of laminated circuit boards.

N. RF Coils.

Inspect rf coils for broken leads and loose, poorly soldered, or broken terminal connections. Inspect for crushed, scratched, cut, bruised or charred windings; corrosion on windings, leads, terminals, and connections; and for damage to forms.

O. Receptacles.

Inspect receptacles for cracked, broken, or charred insulation. Inspect for damage to all other parts, loose or bent contacts, damage to contact plating, corrosion, and other abnormal conditions.

P. Relays.

Inspect relay contacts for burned or pitted areas, welds, misalignment, and improper separation. Check contact support members for deformation causing contact misalignment or improper contact operation. With the finger, test movable contacts for sluggish action or sticking at any point of travel in either direction. Check for damage to armature. Inspect for foreign matter between end of pole piece and armature. Inspect for loose coil, corrosion, loose leads or terminals, and for cuts and damage to coil. Inspect for loose, broken, brittle, or charred insulation on coil or leads between contact support members and between terminals on relay. Inspect for bent, loose, or broken terminals. Inspect relay mounting and mechanical parts for looseness and physical damage or corrosion.

Q. Resistors.

Inspect fixed composition resistors for cracked, broken, blistered, or charred bodies and loose, broken, poorly soldered, or corroded terminal connections.

Inspect fixed wire-wound resistors for signs of heating; cracked, broken, or charred insulation; loose, poorly soldered, broken, or corroded terminal connections; and loose mounting.

R. Semiconductors.

Inspect diodes, silicon-controlled rectifiers, and transistors for cracked, broken blistered, or charred bodies. Inspect for loose, broken, poorly soldered, or corroded terminal connections.

S. Sockets.

Inspect sockets for loose, broken, or missing socket-mounting rings. Inspect for cracked, broken, or charred insulation. Inspect for broken, corroded, or deformed contacts and loose, poorly soldered, broken, or corroded connections.

T. Switch Wafers, Rotary.

Inspect switch wafers for bent, weak, broken, or deformed contacts. Inspect for corrosion, damage to contact plating, and cracked or broken contact insulation. Check to see that movable contacts are free to turn properly, without binding, throughout entire travel. Inspect parts mounted on switch wafers for damage.

U. Soldered Terminal Connections.

Inspect soldered terminal connections for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond, using the point of a tool. Examine for excess of solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductor, or other parts. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also, look for insulation that is stripped back too far from joint or badly frayed at joint. Inspect for corrosion (verdigris) on copper conductor at the joint.

V. Transformers and Reactors.

Inspect transformers and reactors for signs of excessive heating, damage to case, cracked or broken ceramic insulators, and other irregularities. Inspect for corroded, poorly soldered, or loose terminals and loose, broken, or missing mounting hardware.

W. Wiring.

Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for damage and charring. Inspect wires for breakage and for improper dress in relation to adjacent wiring and chassis.

618T-( ) Airborne SSB Transceiver - Repair

1. GENERAL.

This section presents instructions for the replacement or repair of damaged or defective components of the 618T-( ). Faulty parts usually are detected through procedures in the inspection/check or testing section of this manual. If a new part is to be installed, it should first be inspected and tested.

Most of the repair or replacement instructions apply to disassembled equipment. Refer to the disassembly section for proper instructions.

2. PROCEDURES.

A. Bearings.

Shielded bearings will rarely need lubrication. If defective, replace with another bearing, new or known to be good.

Porous bearings never need lubrication. If defective or dry, replace with a new bearing.

B. Capacitors.

If defective or suspected of causing difficulties, capacitors should be replaced. Clean all connections thoroughly, and apply new solder.

C. Connectors.

Straighten bent pins and damaged shell areas. Replace bad connections, broken wires, or wires with split insulation. If connector insert is broken, replace connector.

D. Covers and Shields.

Replace damaged screws, straighten any dents or warped sections, and retouch scratched or worn painted surfaces.

E. Frame.

Straighten misshapen areas. Remove all corrosion with a suitable cleaner. Retouch silk screening and refinish where needed.

F. Gears, Metal and Fiber.

Metal or fiber gears should be replaced if found defective in inspection or testing. Instructions are given in the assembly and disassembly sections of this manual.

G. Integrated Circuits (Flatpacks). (Refer to figure 401.)

(1) Remove defective flatpack.

(a) Before removing the flatpack, note the position of the printed dot in the corner of the flatpack relative to positioning of the flatpack on the circuit board.

(b) If the flatpack and board have been coated with epoxy, perform the following procedure; if not, proceed to step (c).

CAUTION: APPLY ONLY AS MUCH HEAT AS NECESSARY TO LOOSEN THE EPOXY. ALSO, SCRAPE FROM CIRCUITRY TO THE BOARD: CIRCUITRY CAN BE ACCIDENTALLY LIFTED FROM THE BOARD IF TOO MUCH HEAT IS APPLIED OR IF THE SCRAPER CATCHES ITS EDGE. DON'T RUSH. THIS IS A VERY DELICATE OPERATION.

1. Touch the tip of a small soldering iron between each lead of the flatpack.

NOTE: This step is sometimes necessary before the individual leads can be grasped with a tweezers.

2. Soak a piece of shielding braid in 1544 rosin. Lay the braid over the leads on one side of the flatpack, and apply heat with the soldering iron.

NOTE: This step both loosens the epoxy coating and removes some of the solder from the connections.

3. Use tweezers to grasp each lead, one at a time, adjacent to the planar board. Heat each lead and lift it just far enough to break the connection to its pad. Repeat until all of the leads are unsoldered. Clean the tweezers periodically by dipping in cleaning solvent.

4. If the flatpack is still attached, carefully lift it, and sever the attaching epoxy coating with a hot soldering iron.

5. Carefully remove the remaining epoxy from the connection pads. Remove the larger pieces by first heating them slightly with the iron, and then, while they are still hot, scraping them away using a bakelite probe or a knife with a curved blade.

(e) If the flatpack is not coated with epoxy, either perform steps (b)2 and (b)3 above, or proceed as follows:

1. Mount the flatpack removal tool in an arbor press so that the two prongs of the spring are facing you. .

2. Thread the defective flatpack onto the spring so that the prongs pass under all the leads of the flatpack.

3. Apply just enough pressure so that all the connections make contact with the heating unit. As soon as the solder melts, remove the flatpack by gently releasing pressure and pulling away.

CAUTION: APPLY ONLY NECESSARY PRESSURE TO MAKE GOOD THERMAL CONTACT. TOO MUCH PRESSURE MAY DAMAGE THE BOARD.

(d) Soak a piece of shielding braid in 1544 rosin (figure 401). Lay the braid over the connecting pads, and heat with a soldering iron until the excess solder is drawn into the braid.

CAUTION: DO NOT APPLY MORE HEAT THAN NECESSARY.

(e) Clean the connecting pads with a small brush dipped in cleaning solvent (figure 401).

(f) Retin the connecting pads lightly. Use enough solder to form a crescent-shaped bulge but not enough to form a U-shaped bulge (about 1/32 inch of 0.020-inch diameter solder).

(2) Prepare the new flatpack as follows:

(a) The bottom of the flatpack should be spaced away from the circuit board slightly. The manufacturer cements a small plastic pedestal to the side of the flatpack that faces the circuit board, using Armstrong A12 adhesive. If replacement pedestals are not available, insert a toothpick under the flatpack while soldering the leads of the flatpack, and then remove the toothpick.

(b) Provide strain relief in the leads by bending them downward and outward as follows:

1. Use long-nosed pliers to grasp all leads on one side of the flatpack about 1/16 inch away from the body of the flatpack. Simultaneously bend all leads down at about a 65-degree angle.

2. Grasp the bent leads with the long nose at a point about 1/16 inch from the first bend (step 1), and simultaneously bend all leads on this side back 65 degrees so that the end portions of the leads are slightly below and parallel to the bottom of the flatpack.

3. Repeat steps 1 and 2 on the leads extending from the other side of the flatpack.

(c) Temporarily lay the flatpack in position on the circuit board. Mark and cut the flatpack leads so that they extend to the ends of, but not beyond, their circuit pads.

(d) If necessary, use tweezers to bend leads so they lay directly over their circuit pads.

(e) Pre-tin the flatpack leads.

1. Dip the leads into 1544 rosin (figure 401) to a depth up to the first (lower) bend in the leads.

2. Either dip the leads of the flatpack into a solder pot to a depth up to the lower bend, or tin the leads with a soldering iron (figure 401).

   NOTE: Solder is permitted on the ascending portion of the lead, but not on the portion of the lead that extends straight out from the flatpack.

   CAUTION: DO NOT ALLOW SOLDER NEARER THAN 1/16 INCH TO THE FLATPACK. THIS MIGHT CAUSE HEAT DAMAGE TO THE FLATPACK AND ALSO SERIOUSLY DEGRADE THE STRAIN RELIEF FEATURE OF THE DOUBLE BEND.

(3) Replace flatpack.

(a) Use a pipe cleaner to apply 1544 rosin to the connection pads on the circuit board.

(b) Refer to step (1)(a); position the dot near one corner of the replacement flatpack in the same position relative to the circuit board as the original flatpack.

NOTE: If original positioning of the flatpack was not recorded, observe whether one of the corner circuit pads on the board is longer than the other pads. If so, use tweezers to position the flatpack to the circuit board so that the lead nearest the dot on the flatpack lays over the longer circuit pad.

A photo or figure in the illustrated parts list section of this manual may show proper positioning of the replacement flatpack.

If an identical unit is available, the proper position can be ascertained by noting the positioning in the identical unit.

(c) While holding the flatpack in position, tack-solder the two corner leads on one side of the flatpack.

(d) Rotate the board 180 degrees, and tack-solder the other two corner leads.

(e) Use a tweezers to grasp each lead near the board. Apply just enough pressure so that the lead lays directly over its connecting pad and so that the entire lower part of the lead contacts the pad. Heat lead with iron until solder from the pad flows up around the edges of the lead, and remove the soldering iron. Continue to hold the lead until the solder solidifies. Repeat until all the leads are soldered. Periodically clean tweezers by dipping in a cleaning solvent.

CAUTION: DO NOT APPLY MORE HEAT THAN NECESSARY.

NOTE: The surface of the special soldering tip listed in figure 401 is small enough (0.015-inch maximum width) to touch only one lead at a time. If two adjacent pads are accidentally bridged with solder, the solder can be removed by quickly stroking it with the iron in a direction parallel to the pads.

If not enough pressure is applied, usually only the tip of the lead will contact the circuit pad, and if too much pressure is applied, usually only the first bend of the lead will contact the pad.

(f) Use a small brush and cleaning solvent to remove any remaining 1544 rosin from connecting pads.

CAUTION: CLEANING SOLVENT WILL REMOVE PRINTED IDENTIFICATION FROM COMPONENTS. ALSO, CLEANING SOLVENT WILL DISSOLVE THE SMALL PEDESTAL OF THE FLATPACK. AFTER CLEANING IMMEDIATELY BLOW AREA DRY.

(g) If the flatpack had been coated with epoxy, replace the coating as follows:

1. Obtain a 1-ounce bottle of Dennis 1169A liquid and a 2-ounce bottle of Dennis 1169B liquid (Collins part number 821-0166-00). Mix these two liquids together by pouring the contents of the small bottle into the larger bottle. Replace the lid and mix by shaking. Small amounts of coating material may be used by measuring equal portions of 1169A and 1169B into a paper cup. Use a separate measuring spoon for each item. Mix thoroughly with a stirring stick.

2. Use an expendable brush to coat the replaced flatpack and surrounding area from which the original coating was removed.

3. Allow to dry overnight, or place assembly in an oven and bake 1 hour at 60 °C.

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Illuminated magnifying glass	Various, 3-10X magnification.	Magnify working area to make repair.
20-watt soldering iron	Hexacon Model 25S or equivalent.	Remove/replace flatpacks.
Special soldering iron tip	Fabricate per figure 1004.	Remove/replace flatpacks.
Flatpack removal tool	Fabricate per figure 1005.	Remove flatpacks.

Repair Tools and Supplies (Sheet 1 of 3)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Tweezers, metal	Clauss No. 231, Fremont, Ohio, or equivalent. Maximum jaw width is 0.030 inch.	Maneuver flatpack leads and provide heat sink.
Solder, 0.020-inch diameter, 60/40 energized rosin core	Cen-Tri-Core energized rosin core per QQ-S-51d.	Bond components to circuit board.
or	or	
Solder, 0.015-inch diameter, 63137 energized rosin core	Kester 44 Sn 63 0.015 solder or equivalent.	
1544 rosin	Kester 1544. CAUTION: REPLACE WITH FRESH ROSIN IF PARTIALLY CRYSTALLIZED.	Facilitate soldering to circuit boards.
Pipe cleaners	Various.	Apply and remove rosin flux.
Cleaning solvent	Trichloroethylene or equivalent.	Remove excess rosin flux.
Lintless tissue	Kimberly-Clark Corporation, Kimwipes or equivalent.	Remove excess rosin flux.
Shielding braid	Various; fine mesh of silver-plated braid works best.	Remove old solder from connecting pads on circuit board.
#26 stranded wire	Various; silver-plated wire works best.	Remove old solder from holes in circuit board.
Small brush	Various, but should have fairly stiff bristles.	Remove excess rosin flux and general cleaning.
Post coating	Dennis 1169, Collins part number 821-0166-00.	Replacement of epoxy coating on coated boards after repair.

Repair Tools and Supplies (Sheet 2 of 3)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Small expendable brushes	Various.	Same as above.
60 ±5 °C oven	Various.	Heat-cure of epoxy coating on coated boards after repair (optional).
Bakelite probe	6-inch length of bakelite rod with 1/8-inch diameter. Sharpen to point on one end, and grind to screwdriver shape on the other end.	Aid for removing epoxy coating from circuit board.
Knife with curved blade	Various, such as X-acto handle with #22 curved blade of X-acto Company, 48-41 Van Dam Street, Long Island, New York 11101, or a small pen knife.	Aid for removing epoxy coating from circuit board.
Toenail cutters or side cutters	Various. The toenail cutters is preferred because there is less danger of forming a burr on the lead with it. (Refer to caution following step G.(1)(b).)	Remove defective components from circuit board.

Repair Tools and Supplies (Sheet 3 of 3)
Figure 401

H. Relays.

CAUTION: DO NOT BURNISH RELAY CONTACTS EXCEPT THOSE THAT ARE LISTED BELOW. RELAY CONTACT PERFORMANCE IN LOW SIGNAL LEVEL CIRCUITS MAY BE DEGRADED IF CONTACTS ARE BURNISHED.

If inspection reveals extensive pitting or burning of relay contacts and relay appears to be defective or is in danger of becoming defective, replace relay. Make sketch of wire connections to simplify rewiring. Burnishing of relay contacts with a burnishing tool is recommended only for the following relays:

Main chassis: Relay K1 (Collins part number 972-1544-000)
618T-1 high-voltage power supply module: all relays
618T-2 high-voltage power supply module: all relays
618T-3 high-voltage power supply module: all open frame relays

I. Resistors.

Replace defective resistors with components known to be good, and carefully resolder bad connections.

J. Semiconductors.

Use long-nosed pliers as a heat sink while applying heat to a lead of a semiconductor.

K. Soldered Terminal Connections.

Resolder cold-soldered or resin joints. Remove all traces of corrosion.

L. Switches.

Switches are usually replaced and seldom repaired. Wafers in wafer-type switches may be replaced separately and so may defective pins in the crimped-pin type of connector. Leads should be properly identified to simplify rewiring.

M. Transformers and Reactors.

Replace or resolder as required.

N. Variable Resistors.

Add a drop or two of contact cleaner (carbon tetrachloride) to windings of a resistor with rough operation. Clean corroded terminals. Replace resistor if shaft is loose in case.

O. Wiring.

Replace damaged wiring with wire of the same size and color code. Ensure that no bare wires are touching chassis, other bare wires, or metal cases of other parts.

If a wire is to be removed from a terminal or component, it should be marked with an indication tag to prevent incorrect connections.

NOTE: When necessary to disturb the dress of the wires, carefully ensure that the original wire dress is maintained when replacing wires.

618T-( ) Airborne SSB Transceiver - Assembly

1. GENERAL.

This section presents assembly instructions and mechanical alignment procedures for the 618T-( ) Airborne SSB Transceiver. The order of assembly starts with the individual components and proceeds to the completed equipment. Fits, clearances, tolerances, and torques are contained in this section. The required lubrication and sealing procedures are also listed in this section.

2. PRECAUTIONS AND GENERAL TECHNIQUES.

Before soldering any part, refer to the notes of color coding, placement of leads, and wire insulation made during disassembly.

CAUTION: WHEN REPLACING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEADS TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

3. LUBRICATION DATA.

Figure 501 lists all items that can be lubricated and specifies the type of lubricant to be used. The lubricants listed for each item in figure 501 must be used; substitutions are not recommended.

A. Contamination and Compatibility.

The following is an example of problems that may be encountered when using lubricants that are not compatible.

Major contamination problems that arise between Versilube and conventional lubricants or hydraulic fluids are a result of some additives used in these fluids (oxidation inhibitors, corrosion inhibitors, etc.). Many of these additives are not soluble in Versilube and will precipitate as gummy or crystalline sludges when the fluids are mixed. When inadequate cleaning procedures lead to this type of contamination, high torques, sticking mechanisms, lubrication failure, and ultimate failure of the equipment can result.

CAUTION: THE IMPORTANCE OF MAINTAINING THE CORRECT LUBRICANT CANNOT BE OVEREMPHASIZED. SINCE FAILURE CAN RESULT FROM IMPROPER USE OF LUBRICANTS, IT IS IMPERATIVE THAT THE CORRECT LUBRICANTS BE USED IN THE RIGHT PLACE AND IN THE RIGHT AMOUNT.

B. Bearings.

It is recommended that porous bronze bearings be replaced if faulty or dry.

CAUTION: DO NOT LUBRICATE ANY BEARING. IF A PRESS-FIT BRONZE BEARING IS REMOVED, IT MUST BE REPLACED WITH A NEW BEARING.

NAME	SUPPLIER	COLLINS PART NUMBER	USE
MIL-G-3278 Beacon 325	Standard Oil Company of New Jersey	005-0423-00	Protective coating and lubricant for gear teeth and switch detents.
MIL-L-7870	Panef Manufacturing Company, Milwaukee, Wisconsin	005-0116-00	Protective coating and lubricant for gear teeth and switch detents.
Filterkote "M"	Air-Maze Corporation Cleveland, Ohio	005-0609-00	Water soluble oil for use on air filters that must be cleaned in water.
MIL-I-8660	Dow Corning Corporation, Midland, Michigan	005-0201-00	Insulating and sealing.
Blue Glyptal	General Electric Company, Waterbury, New York	005-0133-00	Secure hardware where other locking means are not provided.
Lubricant	The lubricant is composed of 37-1/2 parts butyl alcohol (by weight); 37-1/2 parts xylene (by weight); 25 parts grease per Mil-G-23827, Aeroshell 7, Collins part number 005-0810-00, (by weight).	005-1796-010	Lubrication of printed circuit contact ring surface on sides of turret switch compartments.

Lubricants and Sealants
Figure 501

4. DETAILED ASSEMBLY PROCEDURES.

A. Replacement of Crystal in RF Oscillator A2 (Early Model). (Refer to figure 111.)

(1) Position crystal (5) as shown.

(2) Solder blue crystal lead (8) to A2C1 (9). Make connection quickly to avoid overheating the crystal.

(3) Solder green crystal lead (7) to circuit board (2). Make connection quickly to avoid overheating the crystal.

(4) Repack grease (6), Collins part number 005-0201-00, around the base of the crystal.

(5) Place oven (3) over the crystal and A2C1.

(6) Replace two screws (4) on opposite sides of the oven.

(7) Replace two screws (1) that fasten the oven to the circuit board.

(8) Replace the oven and the crystal oscillator assembly in foam.

(9) Replace the wires extending from bottom of foam, and replace the foam plug at bottom.

(10) Replace the wires extending from the top of the foam, and replace foam plug at top.

(11) Replace the foam in the module chassis.

(12) Replace the two holddown screws.

(13) Replace the cover plate.

(14) Replace the dust cover.

(15) Replace the module in the 618T-( ) chassis.

B. Assembly of Power Amplifier A11. (Refer to figure 110.)

(1) Replace the gearplate by sliding the band-switch shaft through the switch. Be sure that the lower strap is inserted under the securing screw washers when the gearplate is pushed into place. Resolder resistors A11R42 and A11R43 before the gearplate is completely seated.

NOTE: If the shaft is not chamfered on end, chamfer slightly before replacing.

(2) Replace nine screws (S) on the gearplate.

(3) Tighten the screw securing the lower strap to the roller coil assembly.

(4) Replace the screw and washer holding the large silver-plated coil to the roller coil assembly. Use the hole nearest the gearplate.

(5) Replace the two nylon screws and washers holding the roller coil assembly to the bracket near the tubes. Damage will result if the screws are secured too tightly.

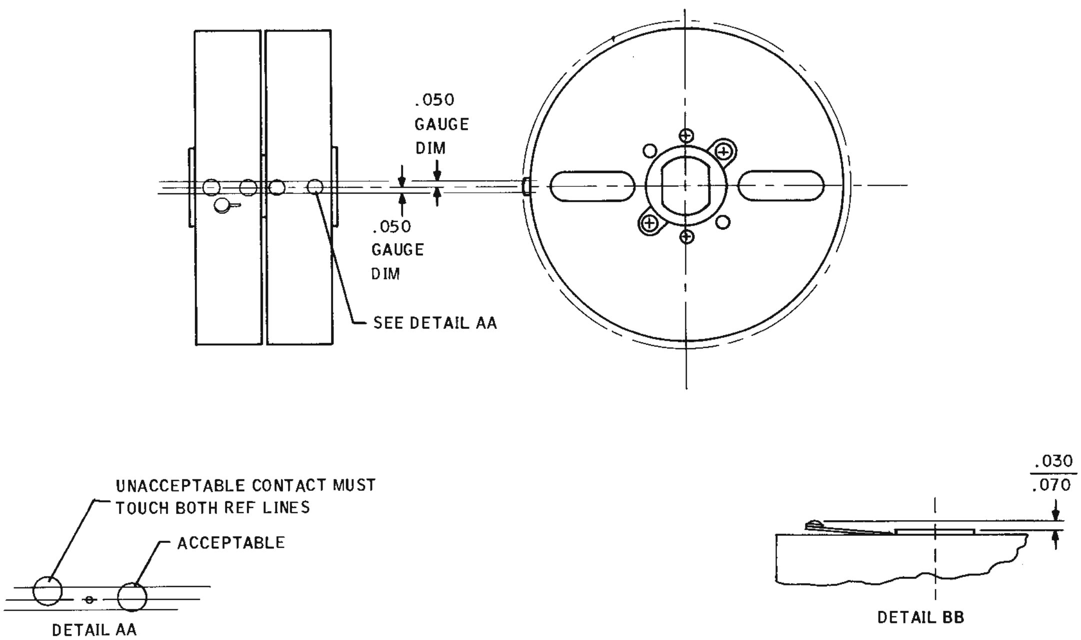
CAUTION: BEND THE SCREEN BYPASS CAPACITOR DOWN TO COVER THE SCREWS JUST REPLACED. IF THE CAPACITOR IS NOT POSITIONED CORRECTLY, THE PLATE STRAP WILL ARC TO THE CAPACITOR.

(6) Replace the square plate on the rear of the module using eight screws.

(7) Replace the top cover plate by laying it in position, pushing it toward the rear of the module, and tightening 17 screws.

C. Replacement of Turrets in RF Translator A12. (Refer to figure 101.)

NOTE: Apply a thin film of lubricant (figure 501) to the contact ring surface of printed circuit on sides of turret switch compartments. Refer to figure 501A for contact positioning dimensions.



INTERCHANGABILITY CHECK:
WITH TURRET LOCATED ON SIMULATED SHAFT AND WITH TURRET SETSCREW TIGHTENED, CONTACTS NEXT TO REFERENCE HOLE (& COLOR CODING) MUST ALIGN WITH CENTERLINE WITHIN LIMITS.

TYP 4 PLACES POSITIONING OF CONTACT SPRING IN RELATION TO HUB.

NOTE:
DIMENSIONS ARE FOR REFERENCE ONLY.

TP2-8894-014

Contact Positioning Diagram
Figure 501A

(1) Insert the turrets from the bottom of the module so that all color-coded dots on the turrets are in a line at the top of the module.

NOTE: Each turret is marked with two color-code dots: one white and one a standard color-code color. The white dot is always nearest the gearplate. Turrets are color coded so that turret S1 is nearest the gearplate. Therefore, color-code dots should be (from the gearplate): white, brown, white, red, white, orange, etc. When inserting the turret, orient it so that the spring contacts which project from the faces of the turret will not fall into the shaft holes when the turret is being positioned.

(2) When all seven turrets are in place, replace the turret shaft through the gear that turns the shaft. Before tightening the shaft clamp, refer to paragraph 6.B in this section for the turret alignment procedure.

(3) Replace two aligning rods (13) by inserting through the gearplate. Secure the rods with two screws through the rear plate. Refer to note in paragraph 3.G.(5) of disassembly section concerning rf translator modules with turret setscrews.

D. Assembly of Autopositioner A12A1. (Refer to figure 107.)

(1) Replacement of Solenoid.

(a) Replace solenoid (124) on mounting plate (134) using two screws (125) and post (123). Be sure that the post holding the reversing switch lever is in the correct hole. Align solenoid (124) so that its shaft hole is lined up with shaft hole in mounting plate (134) before tightening screws.

(b) Solder the insulated jumper from solenoid relay terminal 6 to solenoid terminal 2. See figure 108(B).

(c) Replace retaining ring (120) on shaft (119).

(d) Replace armature (117) in solenoid (124) using two screws (118).

NOTE: Be sure these two screws (118) are the same as those removed during disassembly. If screws are lost, they must be replaced with screws having the same color code.

(e) Replace notched wheel (112) on shaft (119). Replace spring pin (113) through the hole in the notched wheel and shaft.

(f) Replace small fiber actuator (126) between armature (117) and the solenoid relay contacts. See figure 108(B) for proper placement of the actuator.

(g) Perform steps (a) through (c) of paragraph 4.D.(2).

(2) Solenoid Clutch Assembly. (Refer to figure 107.)

(a) Replace spur gear (111) and clutch disc (110).

CAUTION: DO NOT LUBRICATE OR CLEAN CLUTCH SURFACES ON 110, 111, OR 112. WIPE WITH DRY, CLEAN, LINTLESS CLOTH. DO NOT TOUCH CLUTCH SURFACES WITH FINGERS.

(b) Replace spring washer (109) with concave side against disc (110). Replace washer (108) and nut (107).

(c) Tighten nut (107) until 30 or 40 in-oz of torque is needed to slip spur gear (111). This torque can be measured with a Waters Torque Watch, Model 651C3, or equivalent. Attach the torque watch to the end of shaft (119). Hold gear (111) stationary and rotate the watch. Adjust nut (107) until the proper torque is indicated on the watch. Bend two tabs on washer (108) against flats on nut (107) when the clutch is torqued properly.

(d) Perform steps (a) through (j) of paragraph 4.D.(4).

(3) Replacement of Switch Wafers.

Because of problems encountered in replacing individual resistors on the switch wafers, the entire switch wafer assembly, which includes resistors on the wafer, should be replaced if one or more of the resistors is defective. Collins part numbers for all switch wafer assemblies are given in figure 502. Refer to figure 109 for identification of these wafers and connecting wiring between wafers.

SWITCH WAFER	COLLINS PART NUMBER
S1	269-2190-00
S2	269-2190-00
S3	546-6865-003
S4	546-6862-002
S5	546-6861-002
S6	546-6860-002

Autopositioner Switch Assemblies
Figure 502

(4) Replacement of 10- and 100-kHz Switches. (Refer to figure 107.)

(a) Position the switch wafers on shaft (116) so that they are oriented as shown in figure 108(D).

(b) Resolder any cable leads that were unsoldered during disassembly. Use figure 109(A) as a guide when replacing wires that connect the switch wafers.

(c) Replace all metal spacers (82, 95) between the switch wafers. Fasten the wafers together and to mounting plate (134) with two screws (78) and washers (79).

(d) Place the six solenoid leads that were unsoldered earlier through the hole in the mounting plate (134). Resolder these six wires to solenoid (124) and solenoid switch block (133). See figure 108(B). Retie these wires.

(e) Replace reversing switch (64) using two screws (65). Be sure the switch leaf is in the slot in reversing switch panel (101).

(f) Replace cable clamp (66) using screw (67) and washer (68).

(g) Place the switch assembly in Autopositioner chassis. Be sure to place all the shim washers (if any) that were removed earlier over the shaft before inserting the shaft through the gearplate. Be sure spur gear (111) meshes with gear (159).

(h) Replace cable clamp (25) using screw (26).

(i) Replace resistor (18) on front plate (30) using screw (19) and washers (20, 21, 22). Position the resistor terminals so that they are parallel to the long sides of the front plate.

(j) Perform steps (a) through (j) of paragraph 4.D.(5).

(5) Replacement of 1-kHz Switches. (Refer to figure 107.)

(a) Resolder any cable wires or wires connecting wafers (37/52, 53/56) that were removed during disassembly. Use figure 109(B) as a guide.

(b) Replace all ceramic spacers (41) and fiber washers (39) between the switch wafers. Fasten the wafers together and fasten them to the bearing plate (165) with two screws (38).

(c) Rotate gear (9 or 5) by hand to position control cam (34) for minimum tension on spring (139).

(d) Place bearing plate (165) in position at the ends of the mounting posts (141). When sliding camshaft (36) through 1-kHz switch sections, be sure both sections are aligned as shown in figure 108(C). Tighten the bearing plate using four screws (142).

(e) Replace dc motor (153) and motor mount (154) on the bearing plate using two screws (155) and two washers (156).

(f) Replace relay (150) on the bearing plate using two nuts (151) and two lock-washers (152).

(g) Replace two cable clamps (157) using two screws (158).

(h) Replace vfo shaft coupling (59) on shaft (119) by tightening two setscrews (58).

(i) Replace output shaft spur gear (15) using setscrew (14) in gear clamp (13). Be sure this gear has maximum face width engagement with gear (11).

(j) Replace spring (139) by hooking onto bar (140).

(k) Refer to paragraph 6.A. for Autopositioner testing procedure before replacing A12A1 in the rf translator A12 chassis.

(6) Replacement of Reversing Switch. (Refer to figure 107.)

(a) Resolder the six wires connected to switch (64). Refer to figure 108(A).

NOTE: Be sure switch leads are positioned so that there is clearance for the switch assembly to rotate.

(b) Replace the switch in bracket (134). The brass-plate side should be against the bracket. Be sure the switch leaf is in the slot in reversing switch lever (101).

NOTE: On some units, a spring clip is mounted with a finger between the reversing switch and the bracket.

(c) Replace two screws (65) through the switch. When the spring clip is used, Tighten clamp (9) so that the switch leaf is the same distance from the center of the hole in the bracket in both positions.

(d) Replace cable clamp (66) using screw (67) and washer (68).

(e) Replace cable clamp bracket (27) using screw (28).

(f) Replace spring (138) by hooking bar (139) in slots on mounting posts (140). Hook the free end of the spring in place first.

NOTE: Check again to see that the switch leads are positioned so that there is clearance for the switch assembly to rotate.

E. Replacement of Autopositioner and VFO in RF Translator A12. (Refer to figures 101, 102, and 103.)

NOTE: Be sure that the Autopositioner is positioned to 500 kHz before installing it in the rf translator module.

(1) Carefully maneuver the Autopositioner into place under the gearplate. Place 25-pin connector (8) through the 28-position switch to its position at the bottom of the module. Be careful not to damage the switch wafers when placing the connector through the switch.

(2) Replace four screws (11) holding the Autopositioner to the gearplate. Leave the screws one-half of a turn loose.

(3) Position the two slug racks (12) at equal height above the chassis.

CAUTION: MAKE CERTAIN THAT THE TWO SLUG RACKS ARE EQUAL IN HEIGHT ABOVE THE CHASSIS. THE SLUG RACK HAS NO STOPS. THEREFORE, IF THE RACKS ARE NOT POSITIONED CORRECTLY AT 500 kHz, THE AUTOPOSITIONER COULD RUN BACK BEYOND ITS DESIGN RANGE, STRETCHING AND RUINING THE TAPES.

With the slug racks in this position, position the clamp on the slug rack so that it is facing the top of the module.

(4) Align the mark on gear G8 (made in step 3.C.(13) of the Disassembly section) with the mark on the rf translator chassis. Replace idler gear (G9).

(5) Position the Autopositioner in the oversize mounting holes to remove as much backlash as possible in the idler gear drive. Tighten four Autopositioner mounting screws (11).

(6) Fasten 25-pin connector (8) to the bottom of the rf translator chassis with two screws (10).

(7) Replace 3/8-inch flatted shaft (7) above the 25-pin connector by placing it through the gear that turns the shaft.

(8) Tighten clamp (9) that holds the shaft.

(9) Position the vfo shaft midway between the end stops by positioning the stop mechanism as shown in figure 106.

(10) Place the vfo in position under the Autopositioner. Run the vfo leads (6) through the holes in the rf translator chassis, and solder the leads to connectors P6 and P9-31 and internal connections in the module.

(11) Replace four screws (1) fastening the vfo to the Autopositioner.

(12) Replace four tubes (5) adjacent to the vfo and the Autopositioner.

(13) Rotate rear brackets (3) on the vfo so that they can be fastened to the rear plate.

(14) Replace four screws (2) fastening the vfo brackets to the rear plate and the rf translator chassis.

(15) Tighten the setscrews in the coupler on the Autopositioner output shaft. Refer to figure 730 for slug rack alignment and for vfo alignment. Refer to figure 101 for coupler adjustment.

F. Replacement of Modules and Module Covers. (Refer to figure 504.)

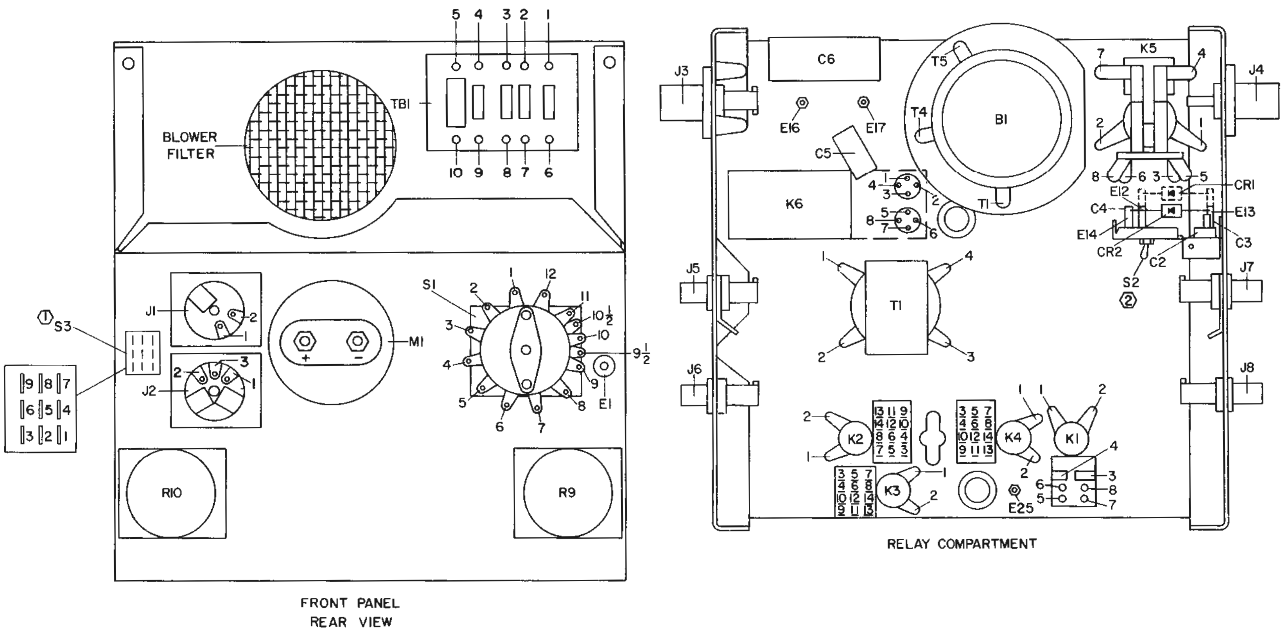
(1) Replace the modules on the chassis by carefully engaging the aligning pins and connectors on the bottom of the module and tightening the redheaded captive holddown screws.

CAUTION: BE CERTAIN THAT ALL CONNECTORS ARE SEATED PROPERLY BEFORE TIGHTENING THE HOLDDOWN SCREWS. CONNECTORS MAY BE DAMAGED IF CONNECTORS ARE NOT MATED PROPERLY. BE CERTAIN THAT GASKETS ON J25, J26, AND J29 ARE IN PLACE BEFORE THE MODULES ARE FASTENED ON THE CHASSIS.

(2) Replace the module covers by placing them over the modules and pushing them toward the chassis. The covers are held in place without screws.

G. Replacement of Front Panel, Front Panel Cover, and Side Covers of 618T-( ).

NOTE: Be sure that ANT JUMPER switch S2 is in the proper position before replacing the 618T-( ) front panel. Refer to the silk screening on the antenna transfer relay compartment cover for positions of S2 (figure 503). If the



NOTES:
① S3 IS LOCATED UNDER FRONT PANEL ON ALL 618T-1B/2B/3B UNITS AND ON 618T-1/2/3 CHASSIS WITH MCN 21332 AND ABOVE.
② ANT. JUMPER SWITCH S2 IS INCORPORATED ON ALL 618T-( ) CHASSIS WITH MCN 3025 AND ABOVE.

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618T-( ) Airborne SSB Transceiver, Front Panel (Rear View) and Relay Compartment
Figure 503

same antenna is used for both transmit and receive, set S2 to IN (chassis with MCN 3025 and above). For chassis with MCN 3024 and below, connect a jumper wire between K5-5 and K5-8. If separate antennas are used for transmit and receive, set S2 to OUT (chassis with MCN 3025 and above) or omit jumper wire between K5-5 and K5-8 on units with MCN 3024 or below.

(1) Replace the front panel by tightening the four screws located at each corner of the panel.

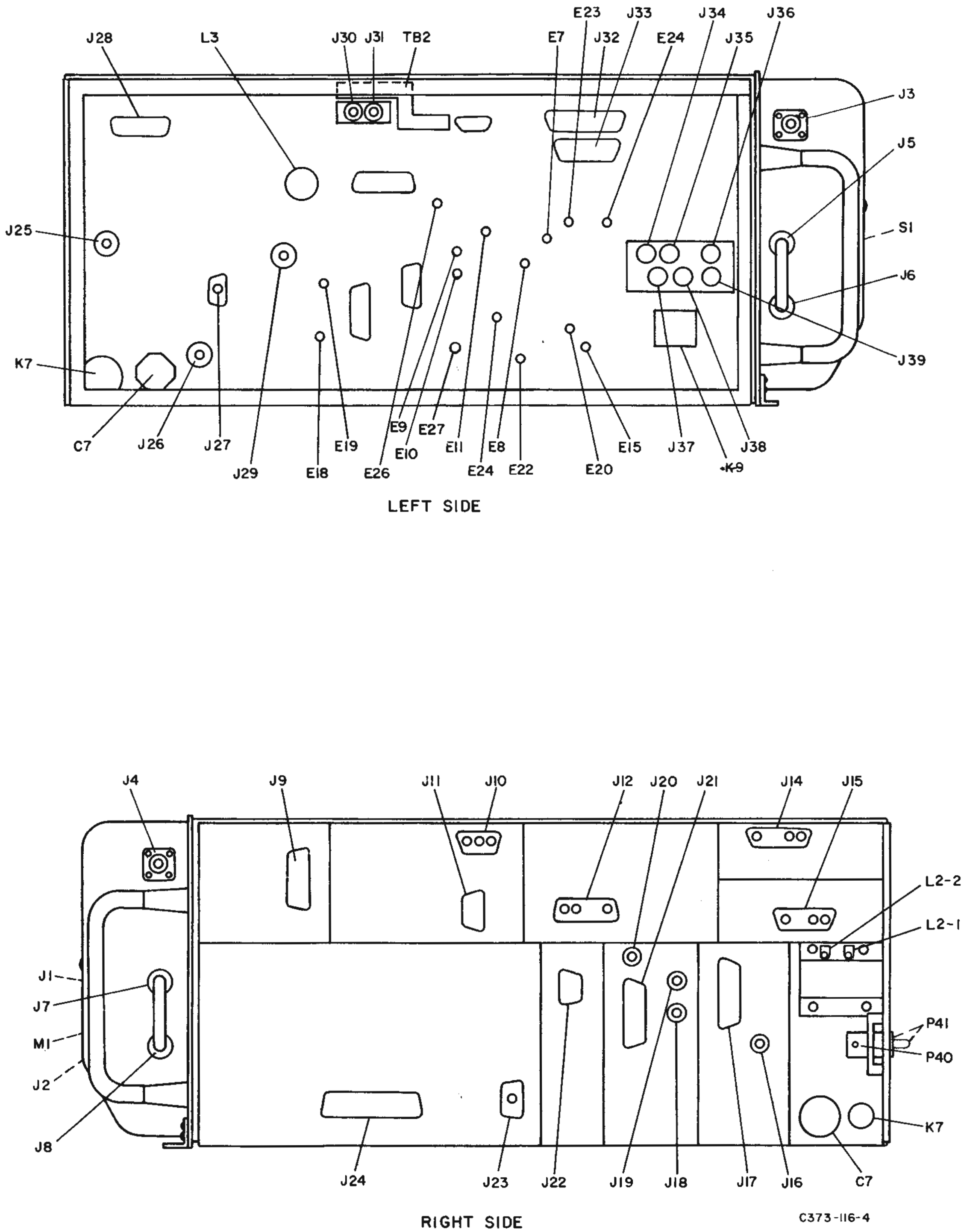
(2) Replace the front panel cover by placing the cover over the front panel and turning two Dzus fasteners on the cover.

(3) Replace the side covers by placing the covers in the slots at the front of the chassis and tightening the four screws at the rear of the chassis.

5. VISUAL CHECKS.

After replacing all the modules in the chassis, check that each module is secure and seated properly. Inspect each module for loose parts, broken wires and hardware, and loose plugs and connectors.

NOTE: Check cable wires from A12P9 and A12A1P1 for contact with moving parts of band-switch shaft. If contact is made, use sufficient lacing cord to locate wires so they do not touch band-switch shaft.



618T-( ) Airborne SSB Transceiver, Left and Right Side Views (Modules Removed)
Figure 504

6. ALIGNMENT AND ADJUSTMENT PROCEDURES.

A. Autopositioner A12A1 Alignment and Check.

The following procedure is to be performed with Autopositioner A12A1 fastened to the rf translator module extender that is supplied with the 678Y-( ) Maintenance Kit. Use the special attachment in this kit to fasten the Autopositioner to the extender. Set the 714E-( ) mode selector switch to OFF.

(1) Check to see that the actuating leaf of the reversing switch is visible in both operating positions through the hole in the switch mounting bracket.

(2) Refer to figure 108(b). Check that the gap between contacts 3 and 4 on solenoid relay (with pawl in notch) is at least 0.015 inch.

(3) Check that contacts 3 and 4 on the solenoid relay are closed when the pawl engages the notched wheel by at least 0.005 inch.

(4) Check that the gap between contacts 5 and 6 on the solenoid relay (with back of pawl against solenoid housing) is at least 0.015 inch.

(5) Rotate the 1-kHz cam by hand until the hole in the cam is adjacent to the cam follower. Set frequency to XX.000 MHz, any megahertz band. Momentarily switch the mode selector on the 714E-( ) to USB, then back to OFF. While doing this, observe the direction of rotation of the camshaft from the gearplate side. When viewed from this side, the shaft must rotate counterclockwise.

CAUTION: CAM WILL BE DAMAGED IF IT ROTATES CLOCKWISE.

(6) Push the actuating leaf of the reversing switch toward the cam. Momentarily switch the 714E-( ) mode selector to USB, then back to OFF. Clutch gear should rotate clockwise as viewed from the gearplate side. With the leaf in the opposite position, the clutch gear rotation should be in the opposite direction. If directions of rotation are improper, rewire the reversing switch as shown in figure 108(A).

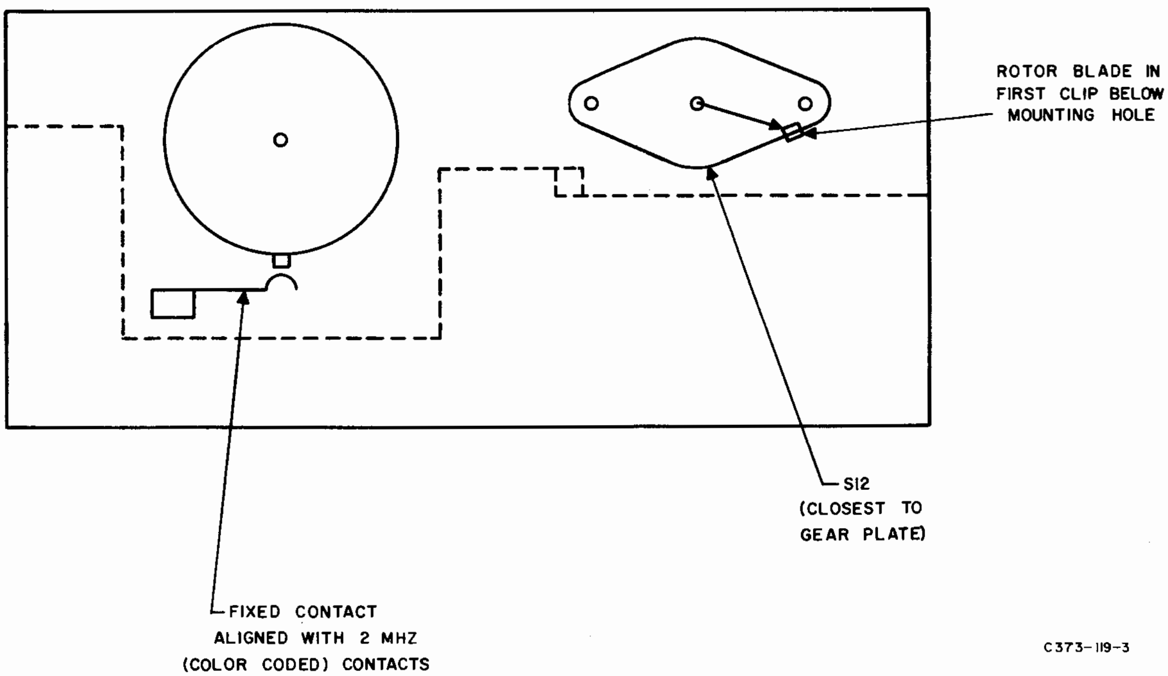
(7) Attach the calibrated disc and pointer supplied in the 678Y-( ) Maintenance Kit to the Autopositioner output shaft. Check that the disc rotates one position for each 1-kHz change in frequency, 10 positions for each 10-kHz change, and one revolution for each 100-kHz change.

B. RF Translator A12 Turret and Switch Alignment. (Refer to figure 505.)

(1) With the 714E-( ) positioned to 2.000 MHz, adjust the turret drive shaft so that the 2-MHz turret contacts (identified by color coding) are centered on the fixed contacts. Tighten the clamp screw.

NOTE: Refer to the note following paragraph 3.G.(5) of the disassembly procedures concerning the turret setscrews.

(2) Adjust the band-switch shaft until the clip is positioned as shown in figure 505. Tighten the clamp screw.



Turret and Switch Alignment, RF Translator A12
Figure 505

(3) Recycle the Autopositioner to 2.000 MHz, and recheck the turret contacts and band-switch clip positions. Readjust them if necessary.

(4) Early models of rf translator A12 have a 28-position switch in place of the turrets. To align this switch, remove the module covers, place the rf translator module on the module extender supplied with the 678Y-( ) Maintenance Kit, and apply power to the 618T-( ). Set the 714E-( ) to 22.000 MHz. View the band switch from the bottom of the module. (The switch will be on the right side when viewed from the bottom of the module.) Inspect the 5th switch wafer from the gearplate. The tooth on the rotor should be in the center of the 22-MHz clip, which is the 8th clip clockwise from the left-hand mounting hole on the switch wafer. This clip can be identified by the fact that the wiring to the first seven clips goes to the left, and the wiring to the 8th to 14th clip goes to the right side as viewed from the bottom of the module. If the tooth on the rotor is not centered in the clip, loosen the clamp on the gear mounted on the switch shaft, and rotate the shaft until the rotor tooth is centered in the switch clip. Reposition rf translator to 22.000 MHz, and again check to see that the rotor tooth is centered in the 22-MHz clip position. Repeat this procedure if necessary.

618T-( ) Airborne SSB Transceiver - Fits and Clearances

The fits and clearances for the 618T-( ) Airborne SSB Transceiver can be found in the assembly section of this manual.

618T-( ) Airborne SSB Transceiver - Testing

1. GENERAL.

This testing section is divided into three main divisions. These divisions, and a brief description of what each division contains, are listed below.

A. Operational Check.

The operational check is a functional, go/no-go check to be performed under normal operating conditions. Test equipment required to perform this test is listed in paragraph 3. If this check shows that the 618T-( ) is not operating properly, perform the unit performance checks and adjustments.

B. Unit Performance Checks and Adjustments.

The unit performance checks are detailed black-box checks performed at a test bench equipped with regular and special test equipment for the 618T-( ). These checks indicate whether or not the 618T-( ) meets the performance standards of the equipment specifications. If this check indicates that the 618T-( ) is not operating properly, refer to the module checks and adjustments to isolate trouble within the unit to a particular module or group of modules.

C. Module Checks and Adjustments.

The module checks and adjustments are detailed procedures for checking and adjusting each of the individual 618T-( ) modules. The adjustments in these procedures are not affected by module replacement. These checks will isolate the trouble within a module to a particular stage or group of stages.

2. TEST EQUIPMENT AND POWER REQUIREMENTS.

A. Test Equipment Required.

The test equipment required to perform the checks and adjustments in this section is listed in figure 1001.

B. Transistor Test Equipment.

Transistor damage from test equipment usually results when an incorrect value of voltage is applied to the transistor elements. Observe the following precautions regarding test equipment when testing transistor circuits.

(1) Observe polarity when using external power supplies. A diode, connected in series with the supply, will prevent reverse current flow.

(2) Do not cause transients by rapid power switching of external supply. Do not use external supply not equipped with transient protection.

(3) Make the ground connection first.

(4) Do not troubleshoot transistor circuits by bridging capacitors and resistors while power is applied. Do not use capacitor testers for capacitors in circuit unless the capacitor tester applied voltage is known to be safely below rated component voltages.

(5) Be certain external power supply has adequate regulation at the current values drawn by the transistor circuits.

(6) Use at least 20,000-ohm-per-volt meters or vacuum-tube voltmeters for making all measurements.

(7) Use test prods that are clean and sharp. It is good practice to cover all of the exposed prod, except about 1/8 inch on the end, with plastic tape or some other insulating material.

(8) Before using an ohmmeter to make transistor resistance measurements, check the ohmmeter on all scales by placing an external, low-resistance milliammeter in series with the ohmmeter leads. If the ohmmeter draws more than one milliampere on any range, do not use this range on circuits containing small transistors.

(9) When using an ohmmeter to make transistor resistance measurements, remember that these components are polarity conscious; therefore, be sure that the correct polarity is applied to the circuit by the ohmmeter.

C. Power Requirements.

Power requirements for the 618T-( ) are as follows:

(1) 618T-1/1B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 165 watts.

23.5 to 30.25 volts dc at 1150 watts.

(2) 618T-2/2B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 160 watts.

103.5 to 126.5 volts ac, 3-phase, 380 to 420 Hz (with Y-connected, line-to-grounded neutral) at 1000 watts.

23.5 to 30.25 volts dc at 120 watts.

(3) 618T-3/3B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 100 watts.

23.5 to 30.25 volts dc at 1150 watts.

3. OPERATIONAL CHECK.

NOTE: If any of the following checks indicate that the 618T-( ) is not operating properly, perform the 618T-( ) unit performance check and adjustments.

A. Test Procedures.

The test procedures are presented in tabular form. Figure 701 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

CAUTION: DO NOT OPERATE THE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.

B. Test Equipment.

A 714E-( ) Radio Set Control, an Electro-Voice 250 Carbon Microphone, and high-impedance headphones are required to perform the operational check.

C. Equipment Setup.

Connect the 618T-( ) in its normal operating installation to perform the operational check procedure. Ensure that the 618T-( ) is grounded properly.

TEST/STEP	PROCEDURE	RESULTS	NOTES
1. RECEIVER CHECKS			
A. Power Supply Checks	Set 714E-( ) mode selector switch to AM. With 618T-( ) unkeyed, set front panel meter switch to 28V, then to 130V.	618T-( ) blower should operate. CAUTION: IF BLOWER DOES NOT OPERATE, IMMEDIATELY SET 714E-( ) MODE SELECTOR SWITCH TO OFF. 618T-( ) front panel meter should indicate in red area at both settings.	
B. Frequency Check Using WWV Voice Transmission	Set 618T-( ) operating frequency to an operating frequency of WWV. Adjust 714E-( ) RF SENS/SQL control to a comfortable listening level. At a time when WWV is making a voice transmission, switch the 714E-( ) between USB and LSB.	Voice quality should be equally good in both USB and LSB.	WWV transmits on 2.500, 5.000, 10.000, 15.000, 20.000, and 25.000 MHz.
C. (Deleted)			
D. Squelch Check (If applicable)			
(1) Squelch Adjustment	Set 714E-( ) to AM, USB, or LSB and to a frequency that is clear of transmission. Set squelch (SQL) control on 714E-( ) fully clockwise. Using either speaker or headphones, adjust (SQL) control on 714E-( ) counterclockwise until carrier noise ceases.	Squelch should be overridden, and background noise should be heard. Background noise should not be heard.	Do not turn the SQL control further counterclockwise than necessary to block the carrier noise, or blocking of low-level audio signals may result.

TEST/STEP	PROCEDURE	RESULTS	NOTES
(2) Listening Check	Set 714E-( ) to am, usb, or lsb to a frequency on which various transmissions can be received.		Audio output should be obtained in speaker or headphones during voice transmissions. One to five seconds after voice transmissions cease, squelch should operate and remove audio output and background noise.
2. <u>TRANSMITTER CHECKS</u>			
A. <u>Power Supply Checks</u>	Set 618T-( ) operating frequency to one on which transmissions may be made. <u>NOTE:</u> 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Set front panel meter switch, in turn, to 1500V, 130V, and 28V. Unkey 618T-( ).	<u>CAUTION:</u> 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY IMMEDIATELY. Front panel meter should indicate in red area in each position.	
B. <u>Power Amplifier Plate Current Check</u>	Set 618T-( ) front panel meter switch to PA MA. Disconnect coaxial jumper from 500KC STD connector on right front of 618T-( ). Key 618T-( ). Unkey 618T-( ). Reconnect coaxial jumper to 500KC STD connector.	618T-( ) front panel meter should indicate 280 to 300 ma.	Panel meter scale is read X100 with meter switch to PA MA position.

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. Transmission Checks	Make test transmissions in USB, LSB, and AM modes.	Sidetone should be present in all modes and be of good quality. Front panel meter should indicate approximately 500 ma on voice peaks.	
	If possible, establish 2-way communications with another station.	Obtain signal quality reports from other station, and note quality of received signal.	
3. DISCONNECT	Unkey 618T-( ), and set 714E-( ) to OFF.		

Operational Check (Sheet 3 of 3)
Figure 701

4. UNIT PERFORMANCE CHECKS AND ADJUSTMENTS.

A. Use of Test Procedures.

The test procedures are presented in tabular form. Figure 704 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

B. Test Equipment Required.

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

C. Power Requirements.

Power requirements for the 618T-( ) are listed in paragraphs 2.C.(1), 2.C.(2), and 2.C.(3) in this section.

D. Unit Performance Test.

(1) Test Setup.

(a) Remove side dust covers from the 618T-( ), and ensure that all modules and holddown screws are secure.

(b) Place the 618T-( ) on mounting tray supplied in the 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set the 678P-( ) Test Harness controls as follows:

CONTROL	SETTING
KEY INTLK	BY PASS
AC	OFF
DC POWER	OFF
300 Ω AUDIO LOAD	IN
CW KEY	Center (off) position
KEY	Center (off) position
WATTS	FORWARD, 200

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding unit under test (618-1/1B, -2/2B, or -3/3B. Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).

CAUTION: THE 618T-2/2B, OFF, 618T-3/3B SELECTOR SWITCH ON THE 678P-( ) MUST BE PLACED PROPERLY. FAILURE TO DO SO MAY RESULT IN HIGH-VOLTAGE POWER SUPPLY DAMAGE AND/OR FAILURE OF THE 678P-( ) LINE FUSES. THE 618T-1/1B USES THE SINGLE-PHASE, HIGH-VOLTAGE POWER SUPPLY AND THE 516H-1 EXTERNAL POWER SUPPLY. THE 618T-2/2B USES THE 3-PHASE HIGH-VOLTAGE POWER SUPPLY ONLY. THE 618T-3/3B USES THE 27.5-VOLT DC HIGH-VOLTAGE POWER SUPPLY ONLY.

(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 678P-( ), 714E-1, 714E-2/3, 714E-6 selector switch to the applicable position.

NOTE: If testing a 618T-1B/2B/3B, set the 0.1 kHz digit on the 714E-( ) to 0.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

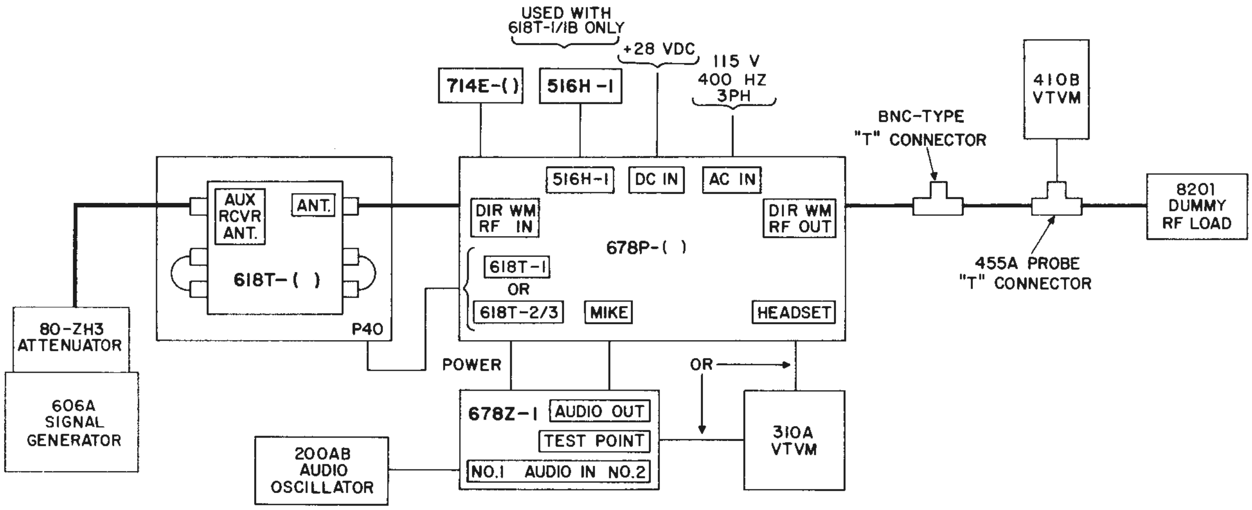
(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

(k) Perform test procedures as outlined in figure 704. Tests must be performed in the order given.

CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.



NOTES:

(1) SET 678P-( ) CONTROLS AS FOLLOWS:
KEY INTLK —————— BY PASS
618T-2/2B,OFF,618T-3/3B —— AS REQUIRED (SET TO OFF FOR 618T-1/1B)
WATTS —————— FORWARD, 200
300Ω AUDIO LOAD ——— IN
714E-1/714E-2/3/714E-6 —— AS REQUIRED

(2) SET "ANT JUMPER" TOGGLE SWITCH IN 618T-( ) RELAY COMPARTMENT TO "OUT".

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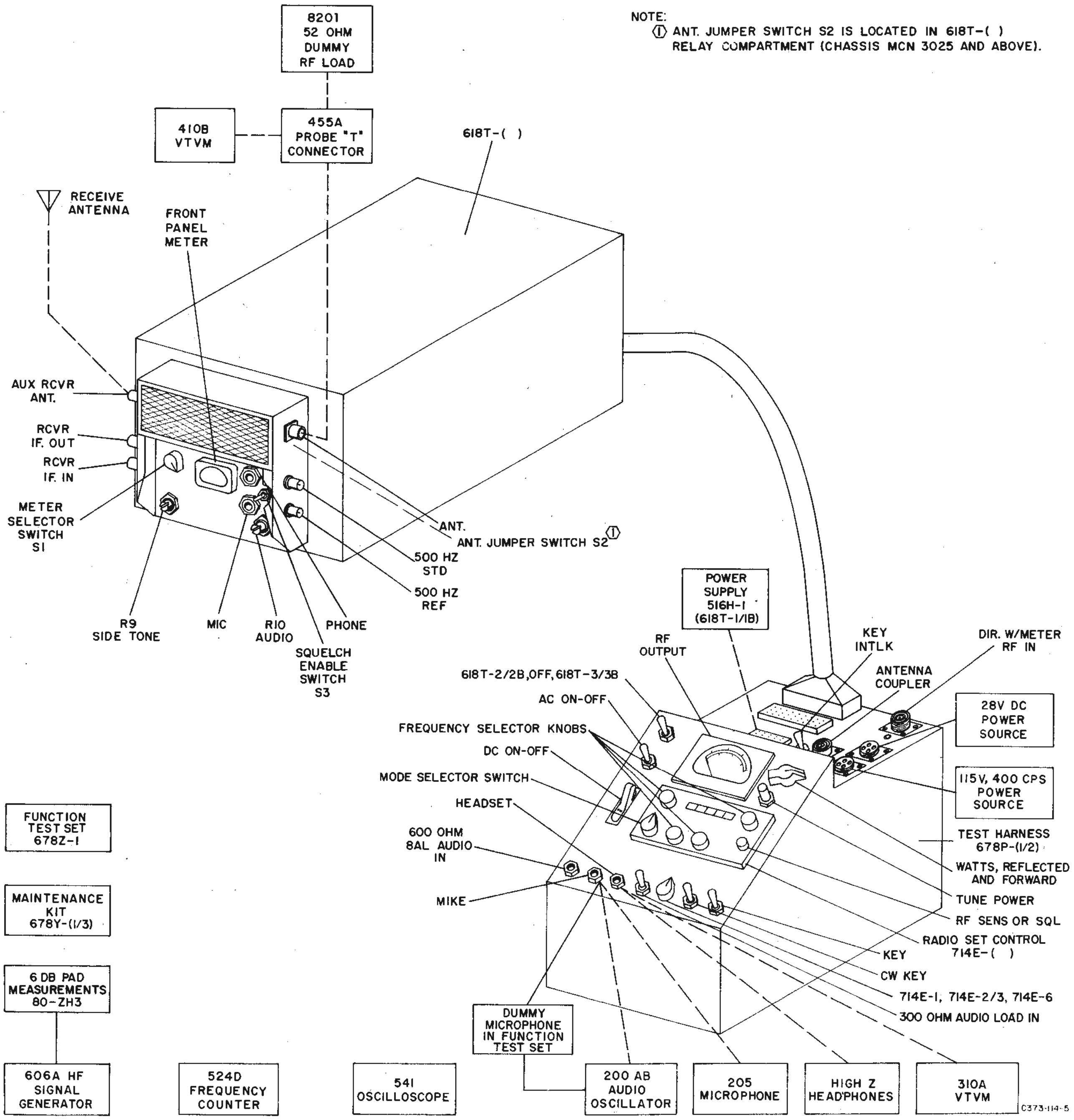
618T-( ) Test Setup Diagram Using a 678P-( ) Test Harness
Figure 702



Bench Test Setup
Figure 703

TEST/STEP	PROCEDURE	RESULTS	NOTES
1. PRELIMINARY CHECKS			
A. Power Supply and Power Amplifier Plate Current Check	Set 714E-( ) mode selector switch to AM.	618T-( ) blower should operate. CAUTION: IF BLOWER DOES NOT OPERATE IMMEDIATELY, SET 714E-( ) TO OFF.	
	With 618T-( ) unkeyed, set front panel meter switch to 28V and 130V.	618T-( ) front panel meter should indicate in red area of scale for both settings.	
	Set 618T-( ) front panel meter switch to PA MA, and disconnect coaxial jumper from 500KC STD connector on front panel of 618T-( ). NOTE: 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).	618T-( ) front panel meter should indicate 280 to 300 ma. CAUTION: 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY 618T-( ) IMMEDIATELY.	
	Use a nonmetallic tool, and depress switch A11S4 in power amplifier A11. Key 618T-( ). Note meter reading, and unkey 618T-( ) before releasing A11S4.	618T-( ) front panel meter should indicate 80 to 120 ma less than previous step.	
	Repeat for A11S5 instead of A11S4.	Same as for A11S4.	If indication is abnormal, replace tubes with matched pair, and recheck.
	Reconnect 500KC STD jumper. Set 618T-( ) front panel meter switch to 1500V, and key 618T-( ). Unkey 618T-( ).	618T-( ) panel meter should indicate in red area of scale.	
B. +18-Volt Check (1) Preferred Method (Cont)	Connect Fluke 801 VTVM across A5J3 and ground in low-voltage power supply A5.	Vtvm should indicate +17.82 to +18.18 volts dc.	Adjust A5R15 to provide required results.

Unit Performance Test Procedures
Figure 704 (Sheet 1 of 17)

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. MHz Frequency Stabilizer Check	Connect HP 410B VTVM and oscilloscope between A10J1 and ground in MHz-frequency stabilizer A10.		
	Set 714E-( ) to each MHz band from 2.000 to 29.000 MHz.	Vtvm should indicate +6.0 to +7.6 Vdc at each band. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	Oscillator may need adjustment.
	Connect vtvm and oscilloscope from A10J3 to ground in MHz-frequency stabilizer A10.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	Oscillator may need adjustment.
	Note vtvm indication at 2, 3, 4, 5, and 6 MHz.		
D. VFO Tracking Check (618T-1/2/3 only.)	Connect frequency counter to the vfo output (A12J5 in rf translator A12).		Test probe no. 1 from the 678Y-( ) should be used.
	Connect A12J8 in rf translator A12 to ground.		This unlocks the vfo.
	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	If unit fails this test, perform the vfo check and alignment test step 9 of figure 730. If unit passes either of these tests, it is ok.
	(1) 2.999 MHz	(1) 2.499 to 2.503 MHz	
	(2) 2.888 MHz	(2) 2.610 to 2.614 MHz	
	(3) 2.777 MHz	(3) 2.721 to 2.725 MHz	
	(4) 2.666 MHz	(4) 2.832 to 2.836 MHz	
	(5) 2.555 MHz	(5) 2.943 to 2.947 MHz	
	(6) 2.444 MHz	(6) 3.054 to 3.058 MHz	
	(7) 2.333 MHz	(7) 3.165 to 3.169 MHz	
	(8) 2.222 MHz	(8) 3.276 to 3.280 MHz	
	(9) 2.111 MHz	(9) 3.387 to 3.391 MHz	
	(10) 2.000 MHz	(10) 3.498 to 3.502 MHz	
(Cont)	Remove the ground from A12J8 in rf translator A12.		

Unit Performance Test Procedures (Sheet 2 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	
	(1) 2.999 MHz	(1) 2.500998 to 2.501002 MHz	
	(2) 2.888 MHz	(2) 2.6119979 to 2.6120021 MHz	
	(3) 2.777 MHz	(3) 2.7229979 to 2.7230021 MHz	
	(4) 2.666 MHz	(4) 2.8339978 to 2.8340022 MHz	
	(5) 2.555 MHz	(5) 2.9449977 to 2.9450023 MHz	
	(6) 2.444 MHz	(6) 3.0559976 to 3.0560024 MHz	
	(7) 2.333 MHz	(7) 3.1669975 to 3.1670025 MHz	
	(8) 2.222 MHz	(8) 3.2779974 to 3.2780026 MHz	
	(9) 2.111 MHz	(9) 3.3889973 to 3.3890027 MHz	
	(10) 2.000 MHz	(10) 3.4999972 to 3.5000028 MHz	
E. VFO Capture Range Check (618T-1/2/3 only)	Connect frequency counter, through 678Y-( ) probe no. 1, to A12J5.		
	Set 714E-( ) to 2.999 MHz.	Frequency counter indication should be 2.501 MHz ±0.8 ppm. Record this reading for reference.	
	Connect 678Z-1 J2-FREQ DIV jack to A1J2.		
	Connect 678Z-1 GRND jack to 618T-( ) chassis.		
(Cont)	NOTE: If kHz-frequency stabilizer A4 is Collins part number 528-0112-005, connect 678Z-1 J3-KC STAB jack to A4J3, and place 678Z-1 FUNCTION SELECTOR switch in 70K-5 CAPTURE RANGE position. That position is also correct for vfo 70K-9. If kHz-frequency		

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (Cont)	stabilizer A4 is Collins part number 544-9288-005, connect 678Z-1 J1-KC STAB jack to A4J1, and place 678Z-1 FUNCTION SELECTOR switch in 70K-3 CAPTURE RANGE position.		
	Ground A12J8 to 618T-( ) chassis.		
	Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz higher than reference.		
	Without changing setting of 678Z-1 R3, unground A12J8.	Frequency indication should return to that of reference within 1 second.	
	Ground A12J8.		
	Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz lower than reference.		
	Without changing setting of 678Z-1 R3, unground A12J8.	Same as above.	
	Repeat above procedure with 714E-( ) set to 2.000 MHz. Reference indication should be 3.500 MHz ±0.8 ppm (all other steps and indications should be identical).		
	If test indication is incorrrect, temporarily remove connections to 678Z-1 and repeat step.		
	Disconnect 678Z-1.		
F. <u>Digit Oscillator Check</u> (618T-1/2/3 only)	Connect frequency counter to the digit oscillator output (A4J5 in kHz-frequency stabilizer A4) through probe no. 1 of the 678Y-( ) Maintenance Kit.		
	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	
(Cont)	(1) 2.006 MHz	(1) 295.850 to 296.150 kHz	

Unit Performance Test Procedures (Sheet 4 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	(2) 2.000 MHz (3) 2.005 MHz	(2) 299.850 to 300.150 kHz (3) 304.850 to 305.150 kHz	
2. RECEIVER TESTS	During all receiver tests, the HP 606A Signal Generator is connected through a 6-dB attenuator (Measurements Corp. 80-ZH3) to 618T-( ) connector J3 (AUX RCVR ANT.). Remove 618T-( ) front dust cover. Set SIDETONE control R9 and AUDIO control R10 fully clockwise. Set 618T-( ) squelch enable switch S3 to SQL OUT.		
A. AM Gain and Sensitivity	Set the 714E-( ) frequency selector to 2.100 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise.		
	Connect Ballantine 310A VTVM to the 678P-( ) HEADSET jack.		
	Set the signal generator for 3-uv output at 2.100 MHz, modulated 30% at 1000 Hz.	Note the vtvm indication in db (reference).	
	Remove the modulation.	Vtvm indication should drop NLT 6 db from reference.	
	Repeat for each MHz band from 2.100 through 28.100 and 29.900 MHz. At each setting, remove modulation, and observe change in vtvm indication.	Same as above for each band.	Record results of this test for future use.
	Change signal generator output level from 3 uv to 5 uv with 714E-( ) and signal generator at 2.100 MHz.	Vtvm should indicate not less than 3.9 v (50 mw into 300-ohm load).	
	Repeat for all frequencies listed above.	Same as above for each band.	
	Change signal generator output level from 5 uv to 50 uv with the 714E-( ) and the signal generator set to 29.900 MHz.	Vtvm should indicate not less than 7.75 v (200 mw into 300-ohm load).	
	Change signal generator output from 50 to 1000 uv.	Vtvm indicates not less than 9.5 v (300 mw into 300-ohm load).	

Unit Performance Test Procedures (Sheet 4A of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. <u>SSB Gain and Sensitivity</u>	Set 714E-( ) to 2.100 MHz, USB.		
	Set the signal generator to 2.100 MHz with no modulation. Set output level for 1 uv.		
	Adjust signal generator frequency slightly for maximum reading on ac vtvm.		
	Remove input signal by tuning signal generator 10 kHz off frequency.	Vtvm should indicate not less than a 10-db drop in signal.	
(Cont)	Readjust signal generator to frequency which produces maximum vtvm indication.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. (Cont)	Adjust signal generator output level for 3 uv with no modulation.	Vtvm indicates not less than 3.9 v (50 mw into a 300-ohm load).	
	Set 714E-( ) mode selector switch to LSB.		
	Adjust signal generator output level for 1 uv with no modulation.		
	Adjust signal generator frequency for maximum reading on the ac vtvm.		
	Remove input signal by tuning signal generator 10 kHz off frequency.	Vtvm should indicate not less than 10-db drop in signal.	
	Readjust signal generator to frequency which produces maximum vtvm indication.		
	Adjust signal generator output level for 3 uv with no modulation.	Vtvm indicates not less than 3.9 v (50 mw into 300-ohm load).	
	Repeat step B at 8.400 and 29.900 MHz.	Same as above.	
C. <u>AGC Characteristics</u>	Set 714E-( ) to 7.300 MHz, AM.		
	Set signal generator to 7.300 MHz modulated 30% at 1000 Hz at an output level of 10 uv.	Record vtvm indication for reference.	
	Increase signal generator output to 100,000 uv.	Vtvm should indicate not more than a 6-db increase over reference.	
	Set 714E-( ) to 7.300 MHz, USB.		
	Set signal generator to 7.300 MHz unmodulated at a level of 10 uv.		
	Adjust frequency of signal generator for maximum indication on vtvm.	Record vtvm indication for reference.	
	Increase signal generator output level to 100,000 uv.	Vtvm should indicate not more than 6-db increase over reference.	

Unit Performance Test Procedures (Sheet 5 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. Selectivity	Set 714E-( ) to 2.100, AM.		
	Connect the frequency counter to the signal generator output through a T-connector.		
	Adjust signal generator for 2.100 MHz modulated 30% at 1000 Hz and output level for an ac vtvm indication of 6.0 v.		
	Increase signal generator output 60 db, then tune signal generator above 2.100 MHz until the ac vtvm indication drops back to 6.0 v.	Note and record the frequency.	
	Lower the signal generator frequency below 2.100 MHz until the vtvm again indicates 6.0 v.	Note and record the frequency.	
	Compute the difference between the two frequencies recorded.	Difference should be not more than 14 kHz for equipment with and without narrow-band selectivity.	
	Set 714E-( ) mode selector switch to USB.		
	Set signal generator to 2.100 MHz unmodulated with an output level of 1 uv.		
	Adjust signal generator frequency for maximum ac vtvm indication.		
	Adjust signal generator output level for an ac vtvm indication of 6.0 v.		
	Increase signal generator output 60 db, and tune signal generator on each side of bandpass until the 6-v reference audio output is repeated on each side.	At each 60-db point, note and record frequency of signal generator.	
	Compute difference between measured frequencies.	Difference should be no more than 6.3 kHz for equipment without narrow-band selectivity, and no more than 4.8 kHz for equipment with narrow-band selectivity.	
	Repeat with 714E-( ) mode selector switch set to LSB.	Same as USB results.	
E. Audio Distortion	Set 714E-( ) to 7.300 MHz, AM.		
	Set signal generator to 7.300 MHz 80% modulated at 1000 Hz and output level to 1000 uv.		
	Connect distortion analyzer to HEADSET jack on the 678P-( ), and measure the distortion.	Not more than 10%.	

Unit Performance Test Procedures
Figure 704 (Sheet 6)

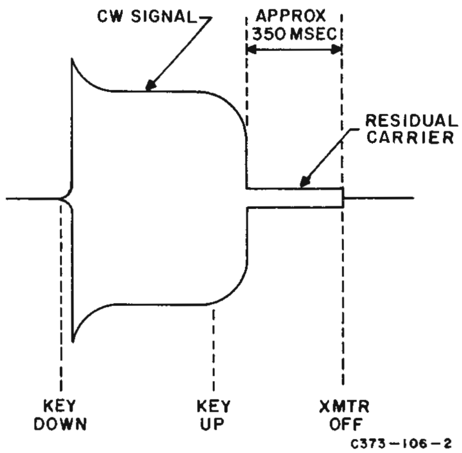
TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)			following procedures of step D.
	Connect HP 410B VTVM ohms probe to P40-9 and common probe to 618T-( ) chassis.		
	Key 618T-( ).	Vtvm should indicate 5 ohms or less.	
	Unkey 618T-( ).	Vtvm should indicate 1 megohm or greater.	
E. <u>Recycle Line Output</u>	<u>CAUTION:</u> DO NOT CONNECT AN ANTENNA COUPLER TO THE SYSTEM WHILE PERFORMING THIS CHECK. THE ANTENNA COUPLER INTRODUCES VOLTAGES WHICH MAY DAMAGE THE TEST EQUIPMENT USED FOR OHMMETER MEASUREMENTS.		
	Set 714E-( ) to AM, any frequency.		
	After transceiver tuneup, select another frequency with 714E-( ) and observe coupler retune light.	Coupler retune lamp lights during tune cycle.	If 678P-1 is not equipped with chopper ground and coupler retune lamps, do the following procedures of step E.
	Connect HP 410B VTVM ohms probe to P40-26 of 618T-( ).	Vtvm should indicate 1 megohm or greater.	
	Set frequency selector switches on 714E-( ) to a different frequency, and observe vtvm while Autopositioner is operating.	Vtvm should indicate 5 ohms or less.	
F. <u>Tune Power Check</u>	Set 714E-( ) to USB, any frequency.		
	Connect high-impedance headphones to 618T-( ) PHONE jack on 618T-( ) front panel.		
	Connect HP 410B VTVM ac probe to HP 455A Probe T-Connector.		
	Key 618T-( ).	Vtvm should indicate 25 V or less.	
(Cont)	Unkey 618T-( ).		

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	Press the TUNE POWER switch on the 678P-( ) test harness, and key 618T-( ). CAUTION: DO NOT HOLD THE TUNE POWER SWITCH DOWN OVER 15 S WHILE 618T-( ) IS KEYED.	Vtvm should indicate 55 v or greater, and an audible tune tone is heard on the headphones.	
G. Receive Audio Output Adjustment	Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Set 714E-( ) to 7.300 MHz, AM. Set RF SENS/SQL control fully clockwise. Set signal generator output to 7.300 MHz, 1000 uv, 30% modulated with 1 kHz. Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack. Adjust AUDIO control R10 on 618T-( ) front panel for 5.5 v on Ballantine 310A. Set 714E-( ) RF SENS/SQL control fully counterclockwise.	Vtvm indicates 0.05 v or less.	
H. Sidetone Output Level Adjustment	Connect 678Z-1 and audio oscillator as shown in figure 702. Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack. Key 618T-( ). Set audio oscillator to 2 kHz, and set output level for 0.25 vrms as measured at 678Z-1 TEST POINT jack. Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Adjust SIDETONE level control R9, on 618T-( ) front panel, for 5.5 vrms at 678P-( ) HEADSET jack. Unkey 618T-( ).		

Unit Performance Test Procedures (Sheet 12 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
I. SELCAL Output Voltage Check	Connect signal generator thru 6-dB attenuator to auxiliary receiver antenna.		
	Connect a 2200-ohm resistor load across pin 60 (SELCAL out) and pin 18 (chassis ground) of 618T-1 or 618T-2/3 connector located on horizontal top deck of 678P-( ).		
	NOTE: The 618T-1 and 618T-2/3 connectors are in parallel. When testing the 618T-1, connect load to unused 618T-2/3 connector; when testing 618T-2/3, connect load to unused 618T-1 connector.		
	Connect Ballantine 310A vtvm across 2200-ohm load.		
	Set signal generator to 7.3000 MHz, 50 μV, modulated 30% at 1000 Hz.		
	Check voltage at pin 60 of power connector.	Not less than 0.1 volt	
5. DISCONNECT	Turn power off.		
	Disconnect all test equipment from 618T-( ).		
	Reset ANT JUMPER switch S2 to original position: IN, if 618T-( ) is being used with same antenna for transmit and receive; OUT, if separate antennas are being used for transmit and receive.		
	Reinstall covers on 618T-( ).		

Unit Performance Test Procedures
Figure 704 (Sheet 13)



Envelope of CW Keying Output
From 618T-( )
Figure 705

5. MODULE CHECKS AND ADJUSTMENTS.

A. Use of Test Procedures.

The test procedures are presented in a 7-column, tabular form. Column 1 (STEP) indicates the step number. Column 2 (DESCRIPTION) describes the test to be performed. Column 3 (TEST EQUIPMENT) lists the test equipment needed to perform the test. Test equipment needed to perform entire module test is listed in step 1 initial test requirements, of each module test. Column 4 (TEST PROCEDURE) outlines test procedures to be performed. Column 5 (REQUIRED TEST RESULT) presents the desired results of the test procedure including tolerances required. Column 6 (PROBABLE CAUSE OF ABNORMAL RESULT) lists components and/or circuits that may be causing abnormal results in that particular test. Column 7 (REMEDY) indicates action necessary to correct abnormal results.

When any block under TEST PROCEDURE is blank, the control has been properly set in a previous step and should not be changed.

B. Test Equipment Required.

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

C. Power Requirements.

Power requirements for the 618T- ( ) are listed in paragraph 2.C.(1), 2.C.(2), and 2.C.(3).

D. Module Checks and Adjustments.

(1) Test Setup.

(a) Remove side dust covers from the 618T-( ), and check all modules and holddown screws for secureness.

(b) Place the 618T-( ) on mounting tray supplied in 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set 678P-( ) Test Harness controls as follows:

CONTROL	SETTING
KEY INTLK	BY PASS
AC	OFF
DC POWER	OFF
300 Ω AUDIO LOAD	IN
CW KEY	Center (off) position
KEY	Center (off) position
WATTS	FORWARD, 200

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding to unit under test (618T-1/1B,-2/2B, or -3/3B). Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).

CAUTION: THE 618T-2/2B, OFF, 618T-3/3B SELECTOR SWITCH ON ON THE 678P-( ) MUST BE PLACED PROPERLY. FAILURE TO DO SO MAY RESULT IN HIGH-VOLTAGE POWER SUPPLY DAMAGE AND/OR FAILURE OF THE 678P-( ) LINE FUSES. THE 618T-1/1B USES THE SINGLE-PHASE, HIGH-VOLTAGE POWER SUPPLY AND THE 516H-1 EXTERNAL POWER SUPPY. THE 618T-2/2B USES THE 3-PHASE HIGH-VOLTAGE POWER SUPPLY ONLY. THE 618-T-3/3B USES THE 27.5-VOLT DC HIGH-VOLTAGE POWER SUPPLY ONLY.

(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 714E-1, 714E-2/3, 714E-6 mode selector switch to the applicable position.

NOTE: If testing a 618T-1B/2B/3B, set the 0.1-kHz digit on the 714E-( ) to zero.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

(2) Module Checks and Adjustments.

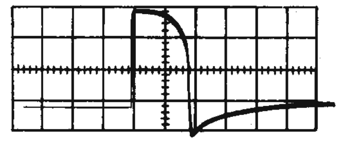
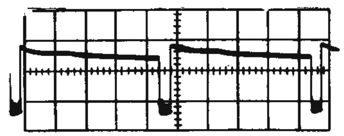
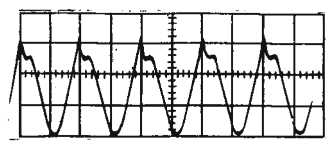
Perform test procedures as outlined in figures 706 through 742. When troubleshooting a module, be certain that all other modules and the chassis of the 618T-( ) are normal.

WARNING: 1500 VDC AND 115 VAC 400 Hz ARE PRESENT IN THE 618T-( ). DO NOT REMOVE OR INSERT MODULES WITH POWER APPLIED TO THE 618T-( ).

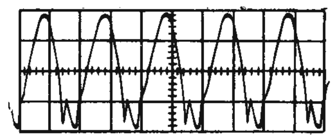
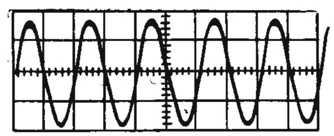
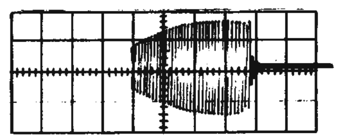
CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED. FILAMENT VOLTAGE DIVIDER NETWORK WILL BE UNBALANCED AND DAMAGE TO OTHER TUBES MAY RESULT.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Signal generator Oscilloscope HP-410B VTVM 6-db attenuator Rf dummy load	NOTE: This test procedure applies to the 618T-1/2/3 Airborne SSB Transceiver only. Refer to figures 707 and 715 for location of all test points on A1, A4, and module extender. Remove frequency divider A1 and kHz-frequency stabilizer A4 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust covers from A1 and A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect A1 and A4 through module extenders to 618T-( ) chassis. Be sure that coaxial jumpers are connected on A1 module extender. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A1A1J2. Check voltage at A1A1J2.	+15 to +18 Vdc.	Low-voltage power supply A5. A1L11 open.	Check low-voltage power supply A5. Check A1L11 and check for shorted components.

Courtesy AC5XP

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	10-kHz pulse output check		Set oscilloscope for 2 v/cm, dc, 1.0 us/cm. Connect oscilloscope vertical input to A1A1J1. Check waveform at A1A1J1.	 5 to 7 v peak to peak.	100-kHz output at A2J1. A1A1Q1 through A1A1Q6 and associated circuits.	Check 100-kHz output at A2J1. A1A1Q1 through A1A1Q6 and associated circuits.
4	Keyer output check		Set oscilloscope for 5 v/cm, dc, 200 us/cm. Connect oscilloscope vertical input to A1A3J3. Check waveform at A1A3J3.	 9 to 15 v peak to peak.	A1A2Q11, A1A3Q12, A1A3Q13, and associated circuits.	Check A1A2Q11, A1A3Q12, A1A3A13, and associated circuits.
5	50-kHz locked oscillator output		Set oscilloscope for 0.5 v/cm, 10 us/cm. Connect oscilloscope vertical input to A1A1TP1. Check waveform at A1A1TP1.	 1.4 to 2.0 v peak to peak.	A1A1Q1, A1A1Q2, and associated circuits.	Check A1A1Q1, A1A1Q2, and associated circuits.

Module Checks and Adjustments, Frequency Divider A1 (Sheet 2 of 7)
Figure 706

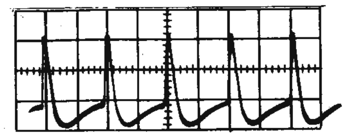
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	10-kHz locked oscillator output check		Set oscilloscope for 0.5 v/cm, 50 us/cm. Connect oscilloscope vertical input to A1A1TP2. Check waveform at A1A1TP2.	 1.5 to 2.5 v peak to peak.	A1A1Q3, A1A1Q4, and associated circuits.	Check A1A1Q3, A1A1Q4, and associated circuits.
7	5-kHz locked oscillator output check		Set oscilloscope for 1.0 v/cm, 100 us/cm. Connect oscilloscope vertical input to A1A1TP3. Check waveform at A1A1TP3.	 2.5 to 4.5 v peak to peak.	A1A1Q7, A1A1Q8, and associated circuits.	Check A1A1Q7, A1A1Q8, and associated circuits.
8	Keyed oscillator output check		Set oscilloscope for 2 v/cm, 25 us/cm. Connect oscilloscope vertical input to A1A3TP5. Check waveform at A1A3TP5.	 9 to 12 v peak to peak.	A1A3Q14 and associated circuits.	Check A1A3Q14 and associated circuits.
9 (Cont)	Divider bandwidth check		Disconnect coaxial jumper at A2 on A1 module extender (figure 707). Connect signal generator through 6-db attenuator and BNC T-connector to A2 (upper connector) on A1 module extender.			

Module Checks and Adjustments, Frequency Divider A1 (Sheet 3 of 7)
Figure 706

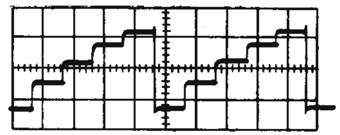
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)			Connect oscilloscope horizontal input to BNC T-connector.			
			Set signal generator for 100-kHz 0.5-v output.			
			Connect oscilloscope vertical input to A1A1TP1.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	2-to-1 Lissajous pattern. NOTE: Pattern must be centered at 99 to 101 kHz and remain stable (not fuzzy) at least 4 kHz on either side of the center. Point at which pattern becomes fuzzy is edge of band.	A1A1L1 incorrectly adjusted.	Adjust A1A1L1 to provide required results. NOTE: Adjustment of A1A1L1 will center bandwidth.
					A1A1Q1, A1A1Q2, and associated circuits.	Check A1A1Q1, A1A1Q2, and associated circuits.
			Connect oscilloscope vertical input to A1A1TP2.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	10-to-1 Lissajous pattern. See note above.	A1A1L2 incorrectly adjusted.	Adjust A1A1L2 to provide required results. NOTE: Adjustments of A1A1L2 will center bandwidth.
(Cont)						

Module Checks and Adjustments, Frequency Divider A1 (Sheet 4 of 7)
Figure 706

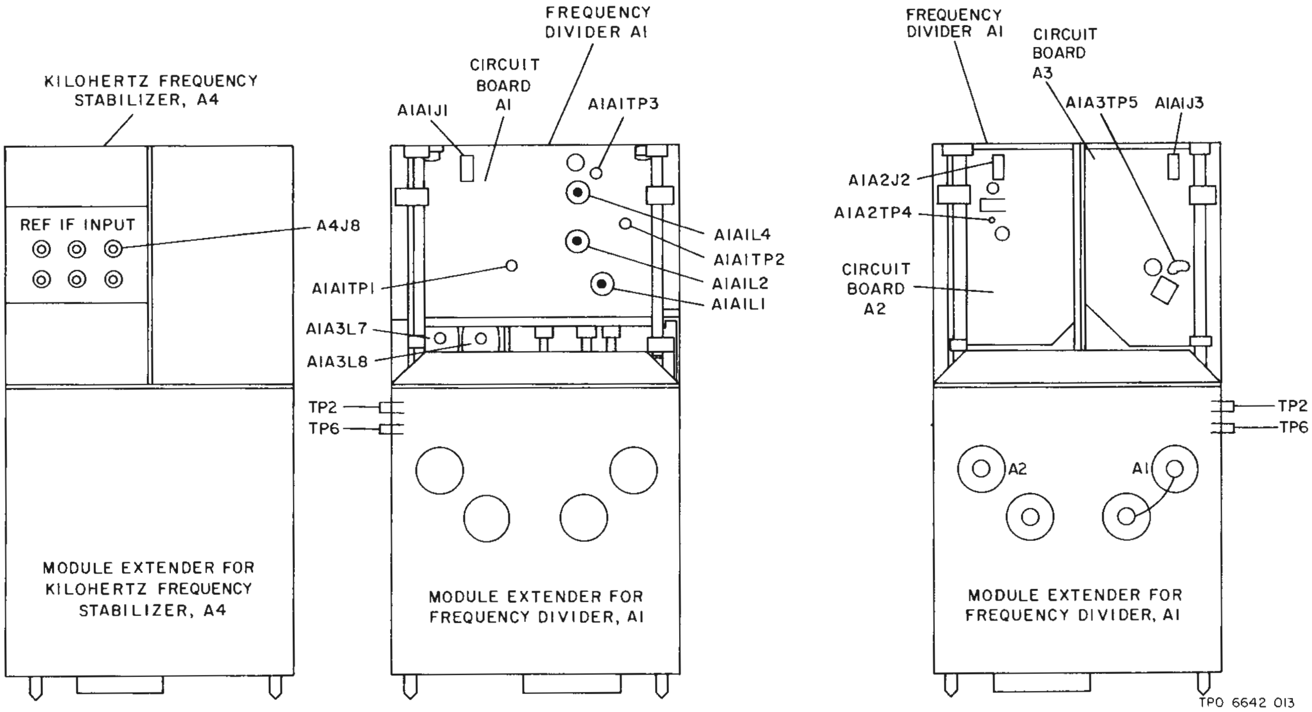
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)					A1A1Q3, A1A1Q4, and associated circuits.	Check A1A1Q3, A1A1Q4, and associated circuits.
			Connect oscilloscope vertical input to A1A1TP3.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	20-to-1 Lissajous pattern. See note above.	A1A1L4 incorrectly adjusted.	Adjust A1A1L4 to provide required results. NOTE: Adjustment of A1A1L4 will center bandwidth.
					A1A1Q5 through A1A1Q8 and associated circuits.	Check A1A1Q5 through A1A1Q8 and associated circuits.
			Disconnect oscilloscope, signal generator, and 6-db attenuator.			
			Replace coaxial jumper to A2 on module extender.			
10	Keyed oscillator output adjustment		Connect oscilloscope vertical input to A4J8.			
			Adjust A1A3L7 and A1A3L8 to peak signal amplitude at A4J8. Adjust for largest of several peaks.			
(Cont)			Disconnect oscilloscope.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10 (Cont)			Turn power off. Remove kHz-frequency stabilizer A4 from module extender. Remove A4 module extender from 618T-( ) chassis. Replace dust cover on A4. Replace A4 in 618T-( ) chassis.			
11	CAL TONE output level check		Turn power on. Set oscilloscope for 0.5 v/cm, 500 us/cm. Connect oscilloscope vertical input to TP6 on A1 module extender. Check waveform at TP6 on module extender.	 1.0 to 1.5 v peak to peak.	A1A2Q11 and associated circuit. A1A3R48 NOTE: A1A3R48 is a selected value of resistance.	Check A1A2Q11 and associated circuit. Replace A1A3R48 with a resistor selected from complement listed in the 618T-( ) illustrated parts catalog.

Module Checks and Adjustments, Frequency Divider A1 (Sheet 6 of 7)
Figure 706

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12	Unijunction divider input check		Set oscilloscope for 5 v/cm, 200 us/cm. Connect oscilloscope vertical input to A1A2TP4. Check waveform at A1A2TP4.	 Firing voltage must be 0.6 to 0.7 v above fifth step of pattern.	A1A2Q9 and associated circuit. A1A2C22 and/or A1A2C45. NOTE: A1A2C22 and A1A2C45 are selected values of capacitance.	Check A1A2Q9 and associated circuit. Replace A1A2C22 and/ or A1A2C45 with a capacitor selected from complement listed in the 618T-( ) illustrated parts catalog.
13	Disconnect		Turn power off. Disconnect all test equipment. Remove A1 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A1. Replace A1 in 618T-( ) chassis.			

Module Checks and Adjustments, Frequency Divider A1 (Sheet 7 of 7)
Figure 706



Frequency Divider A1, Checks and Adjustments
Figure 707

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Boonton 91-C RF VTVM HP 410B VTVM Oscilloscope Audio oscillator Frequency counter Vom Signal generator 6-dB attenuator Ballantine 310A VTVM Rf dummy load Headphones	NOTE: This test procedure applies to rf oscillator A2, Collins part numbers 528-0251-005, 528-0690-001, and 528-0690-002. Steps 1 through 7 apply to all Collins part numbers of rf oscillator modules. Steps 8, 9, and 10 include individual squelch checks for rf oscillators 528-0690-001 and 528-0690-002. Refer to figure 709 for location of all test points on A2 and module extender. The rf oscillator module ambient temperature must be between +20 °C (68 °F) and +30 °C (+86 °F) while performing this test. Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A2 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect rf oscillator A2 through the module extender to 618T-( ) chassis. Rf oscillator A2, Collins part numbers 528-0690-001 and 528-0690-002, must be tested on 618T-( ) chassis with MCN 21332 or above. NOTE: Unless otherwise specified, steps performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 1 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A2J2. Check voltage at A2J2.	+15 to +17 vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	100-kHz reference output check		Connect Boonton 91-C RF VTVM to A2J1. Check voltage at A2J1.	Not less than 0.4 vrms.	Mixer A2Q9 and associated circuit.	Check mixer A2Q9 and associated circuit.
			Connect frequency counter to A2J1. Check frequency at A2J1.	100 kHz ±0.1 Hz.		
4	500-kHz reference output to MHz-frequency stabilizer A10 check		Connect Boonton 91-C RF VTVM to A2J3. Check voltage at A2J3.	0.9 to 1.3 vrms.	A2Q4, A2Q5, and associated circuits.	Check A2Q4, A2Q5, and associated circuits.
			Connect frequency counter to A2J3. Check frequency at A2J3.	500 kHz ±0.4 Hz.		
5	500-kHz carrier output to balanced modulator check		Connect Boonton 91-C RF VTVM to A2J4. Check voltage at A2J4.	1.5 to 1.9 vrms.	A2Q4, A2Q5, A2Q6, and associated circuits.	Check A2Q4, A2Q5, A2Q6, and associated circuits.
			Connect frequency counter to A2J4. Check frequency at A2J4.	500 kHz ±0.4 Hz.		

Module Checks and Adjustments, RF Oscillator A2,
Late Models (Sheet 2 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	3-MHz oscillator board test		Connect HP 410B VTVM dc probe to +17 VOLT TEST POINT.			
			NOTE: Refer to figure 709 for location of +17 VOLT TEST POINT.			
			Check voltage at +17 VOLT TEST POINT.	Approximately 17 Vdc.	A2FL1, A2L10, or A2C40.	Replace faulty components.
					+18-vdc output of low-voltage power supply A5.	Check module.
			Connect frequency counter to 3 MHZ TEST POINT.			
			Refer to figure 709 for location of 3 MHZ TEST POINT.			
			Check frequency at 3 MHZ TEST POINT.	3.0 MHz ±2 Hz.	3-MHz oscillator board circuitry.	See NOTE in TEST PROCEDURE column.
			Connect Boonton 91-C RF VTVM to 3 MHZ TEST POINT.			
			Check voltage at 3 MHZ TEST POINT.	0.4 to 0.6 v.	3-MHz oscillator board circuitry.	See NOTE in TEST PROCEDURE column.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 3 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			NOTE: If +17 V is present, but 3-MHz frequency or signal amplitude is improper, return oscillator board to Collins Radio Company for repair. Board may be removed by unsoldering one coaxial cable and two wires from bottom of board.			
7	Divider bandwidth adjustment		Unsolder coaxial cable at junction of A2R24 and A2Q4. NOTE: Oscillator board must be disconnected. Connect signal generator through 6-db attenuator and a 1000-pf capacitor to junction of A2R24 and A2Q4. Connect oscilloscope vertical input to junction of A2R24 and A2Q4. Connect oscilloscope horizontal input to A2J3. Connect frequency counter to oscilloscope vertical output. Set signal generator output to 0.5 Vrms. Vary signal generator frequency from 2.9 to 3.1 MHz as indicated on frequency counter.			
			Check pattern on oscilloscope.	6-to-1 Lissajous pattern. NOTE: Pattern must remain stable; no phase changes or fuzziness.	A2Q4, A2Q5, and associated circuits.	Check A2Q4, A2Q5, and associated circuits.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 4 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)					Incorrect value of A2C14.	Select value of A2C14 that will provide required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect Boonton 91-C RF VTVM to A2J3. Check voltage at A2J3.	0.9 to 1.3 Vrms.	Incorrect value of A2C20 and/or A2R44.	Select value of A2C20 that peaks the voltage at A2J3, then select value of A2R44 that provides required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect Boonton 91-C RF VTVM to A2J4. Check voltage at A2J4.	1.5 to 1.9 vrms.	A2Q6 and associated circuit.	Check A2Q6 and associated circuit.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2,
Late Models (Sheet 5 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)					Incorrect value of A2C25 and/ or A2R30.	Select value of A2C25 that peaks the voltage at A2J4, then select value of A2R30 that provides required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect oscilloscope vertical input to A2J1.			
(Cont)						

Module Checks and Adjustments, RF Oscillator A2,
Late Models (Sheet 6 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Set signal generator output to 0.5 Vrms. Vary signal generator frequency from 2.9 to 3.1 MHz as indicated on frequency counter.			
			Check pattern on oscilloscope.	5-to-1 Lissajous pattern. NOTE: Pattern must remain stable; no phase changes or fuzziness.	A2Q7, A2Q8, A2Q9, and associated circuits. Incorrect value of A2C29.	Check A2Q7, A2Q8, A2Q9, and associated circuits. Select value of A2C29 that will provide required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
8	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-001 only)					
A	Comparator circuit static bias check		Connect the HP-410B VTVM dc probe to A2A3J8 and note the indication.	+1.9 to +2.1 vdc.	A2A3R33 out of adjustment.	Continue test.
B	20-volt regulated power supply check		Connect the Fluke 801B VTVM to A2A2J9 and note the indication.	+19.8 to +20.2 vdc.	A2R9 out of adjustment.	Continue test.

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 7 of 13)
Figure 708

COLLINS OVERHAUL MANUAL

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8C (Cont)	20-volt regulated power supply adjustment		Turn power off. Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender. Turn power on. Set 714E-( ) RF SENS/SQL control fully clockwise. Set SQUELCH ENABLE switch S3 on 618T-( ) front panel to IN. Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J4-KC STAB jack to A2A2J9. <u>NOTE:</u> Ensure 678Z-1 has been calibrated in past 6 months. Set 678Z-1 FUNCTION SELECTOR to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10. <u>CAUTION:</u> DO NOT OPERATE X10 METER SENSITIVITY SWITCH AT THIS TIME. Set 678Z-1 FUNCTION SELECTOR to 10KC CONTROL BIAS (+20V).			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 8 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8C (Cont)			Depress 678Z-1 X10 METER SENSITIVITY switch and note FUNCTION METER indication.	Meter should indicate 0.		
			Repeat last step several times.	Same indication.	A2R9 incorrectly adjusted.	Adjust A2R9 to provide required results.
D	Comparator circuit static bias and squelch threshold adjustment		Connect HP-410B VTVM dc probe to A2A3J8 and adjust A2A3R33.	1.9 to 2.1 vdc.		
			Set vom to RX10 scale and connect it to TP2 and TP3 on A9 module extender.			
			Set AUDIO control R10 on 618T-( ) front panel fully clockwise.			
			Set 678P-( ) AUDIO LOAD switch to OUT.			
			Set 714E-( ) RF SENS/SQL control fully counterclockwise.			
			Connect a 330-ohm, 10% resistor from pin 30 of the unused 618T-( ) connector on the 678P-( ) to ground.			
(Cont)			Set A2A3R51 fully clockwise and note that the vom indicates approximately 300 ohms.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 9 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8D (Cont)			Rotate A2A3R51 slowly counterclockwise until vom indication suddenly increases (indicates that A2A3K1 has operated).			
			Disconnect 330-ohm resistor.			
			Rotate 714E-( ) RF SENS/SQL control slowly clockwise, and note that shortly before the clockwise stop is reached, the vom indication suddenly increases from approximately 300 ohms (indicates that A2A3K1 has operated).			
			Rotate 714E-( ) RF SENS/SQL control slowly counter-clockwise, and note that the vom indication drops suddenly to approximately 300 ohms (indicates that A2A3K1 has deenergized).			
E	Squelch circuit gain adjustment		Set 714E-( ) RF SENS/SQL control fully counterclock-wise.			
			Connect audio oscillator to TP2 and TP3 of A9 module extender (TP3 is common).			
			Connect HP-410B VTVM ac probe to audio oscillator output.			
			Set audio oscillator for 7.0 ±0.5-v output at 1 kHz.			
(Cont)			Record exact output for reference.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 10 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8E (Cont)			Connect HP 410B VTVM ac probe to A2A4J5 and adjust A2A4R55 for voltage indication within 1.0 V of audio voltage level fed into module.			
			Disconnect audio oscillator from TP2 and TP3 of A9 module extender.			
			Remove any antennas connected to the radio.			
			Set the 714E-( ) mode control to USB.			
			Remove A9 module extender from 618T-( ) chassis and install AM/audio amplifier A9.			
			Connect the 410B to 1A2J6 and measure the audio noise level.			
			Connect the 410B to 1A2J7 and adjust 1A2A4R23 for an audio noise level at 1A2J7 of 2 dB greater than that at 1A2J6.			
			Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender.			
			Reconnect audio oscillator to TP2 and TP3 of A9 module extender.			
F	Squelch circuit operation check (low channel)		Connect the HP 410B VTVM ac probe to audio oscillator output.			
			Set the audio oscillator for 7.0 ±0.5-V output at approximately 600 Hz.			
(Cont)			Momentarily disconnect the audio oscillator from TP2 of the A9 module extender.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 11 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8F (Cont)			Reconnect the audio oscillator and listen.	Audio should be present in the headphones for about 1 to 5 seconds (indicates relay A2A3K1 is energized), then drop out. No audio should be present (indicates relay A2A3K1 is not energized).		
G	Squelch circuit operation check (high channel)		Repeat step 8F except set the audio oscillator to 2500 Hz. Perform step 4.G of figure 704 to return AUDIO control R10 to proper setting.	No audio should be present.		
H	Go to step 11.					
9	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-002) below MCN 1284 and without 618T-2/3 Service Bulletin 32 or 618T-2B/3B Service Bulletin No 14		Turn power off. Set 618T-( ) squelch enable switch S3 under front panel to SQL IN. Disconnect all antenna inputs to 618T-( ). Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender. Apply power.			
A	Squelch delay check		Rotate 714E-( ) RF SENS/SQL control to the clockwise stop. Then rotate it quickly to the ccw stop and note the time lapse until the voltage at A2J8 drops to less than 2 Vdc.	1 to 5 seconds.	Failure of delay or relay driver.	

TEST	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9B (Cont)	Squelch balance check		Plug A9 module into module extender. Check the noise level at A2J6 and then at A2J7 with 714E-( ) RF SENS/ SQL control at cw stop.	Noise level at A2J7, 1.5 to 2.5 dB higher than at A2J6.	A2R1 improperly adjusted.	Adjust A2R1 and repeat step 9B.
C	High channel check		Rotate the 714E-( ) RF SENS/ SQL control to the clockwise stop.			
			Remove A9 from A9 module extender.			
			Connect HP 410B VTVM dc probe to A2J8. Connect an audio oscillator to TP2 and TP3 of A9 module extender. Connect HP 410B VTVM ac probe to A2J5. Adjust the audio oscillator for 2.2 kHz with an output of 3 volts measured at A2J5. Note the voltage at A2J8.	NMT 2.5 volts dc.		
			Remove input signal and note the voltage at A2J8.	NLT 14 volts dc.	Failure of high channel.	
D	Low channel check		Rotate the 714E-( ) RF SENS/ SQL control to the counterclockwise stop. Note the voltage at A2J8. Reconnect the audio oscillator to TP2 and TP3 of A9 module extender. Set the audio oscillator frequency to 600 Hz and adjust the output for 3 volts at A2J5.			
			Note the voltage at A2J8.	NLT 14 volts dc.	Failure of low channel.	
E	Go to step 11.					

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12A of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-002) above MCN 1284 or below MCN 1284 but including modification per 618T-2/3 Service Bulletin No 32 or 618T-2B/3B Service Bulletin No 14		Turn power off. Set 618T-( ) squelch enable switch S3 under 618T front panel to SQL IN. Disconnect all antenna inputs to the 618T-( ). NOTE: If necessary, position 618T-( ) on its side to gain access to squelch circuits in rf oscillator module.			
A	Squelch balance check		Turn power on. Rotate 714E-( ) RF SENS/SQL control to clockwise stop.			
			Check the noise level at A2J6 and then A2J7 using Ballantine 310A.	Noise level at A2J7 should be 1.5 to 2.5 dB higher than at A2J6.	A2R1 improperly adjusted.	Adjust A2R1 and repeat step 10A.
B	Positive over-ride trip point check		Turn power off. Rotate 714E-( ) RF SENS/SQL control to counterclockwise stop.			
			Remove AM/audio amplifier module A9 and install module extender. Do not plug AM/audio amplifier module into extender. Apply power and set 714E-( ) mode switch to USB. Use HP 410B VTVM dc probe and measure dc voltage from A2A3U1-6 to ground on modules with service bulletin modification or from A2A2U1A-1 to ground on modules with MCN 1284 and above.	NMT 2.5 volts dc.	A2A3R8 on modules with service bulletin modification or A2A2R41 on modules with MCN 1284 and above misadjusted.	Plug A9 module into module extender. Set 714E-( ) to 7.300 MHz in USB mode. Set RF SENS/SQL control to the counterclockwise stop position.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12B of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10B (Cont)						Clip 410-ohm ±10% resistor from TP2 on rf oscillator module extender to ground. Connect a vtvm between A2A3U1-6 or A2A2U1A-1 and ground. Adjust R8 in a counterclockwise direction (R41 in a clockwise direction) until vtvm indicates less than +2.5 Vdc. Adjust R8 in a clockwise direction (R41 in a counterclockwise direction) until vtvm indication increases to a level of between +14 and +18 Vdc. Remove 410-ohm resistor. Remove A9 module from module extender and repeat step 10B.
(Cont)						

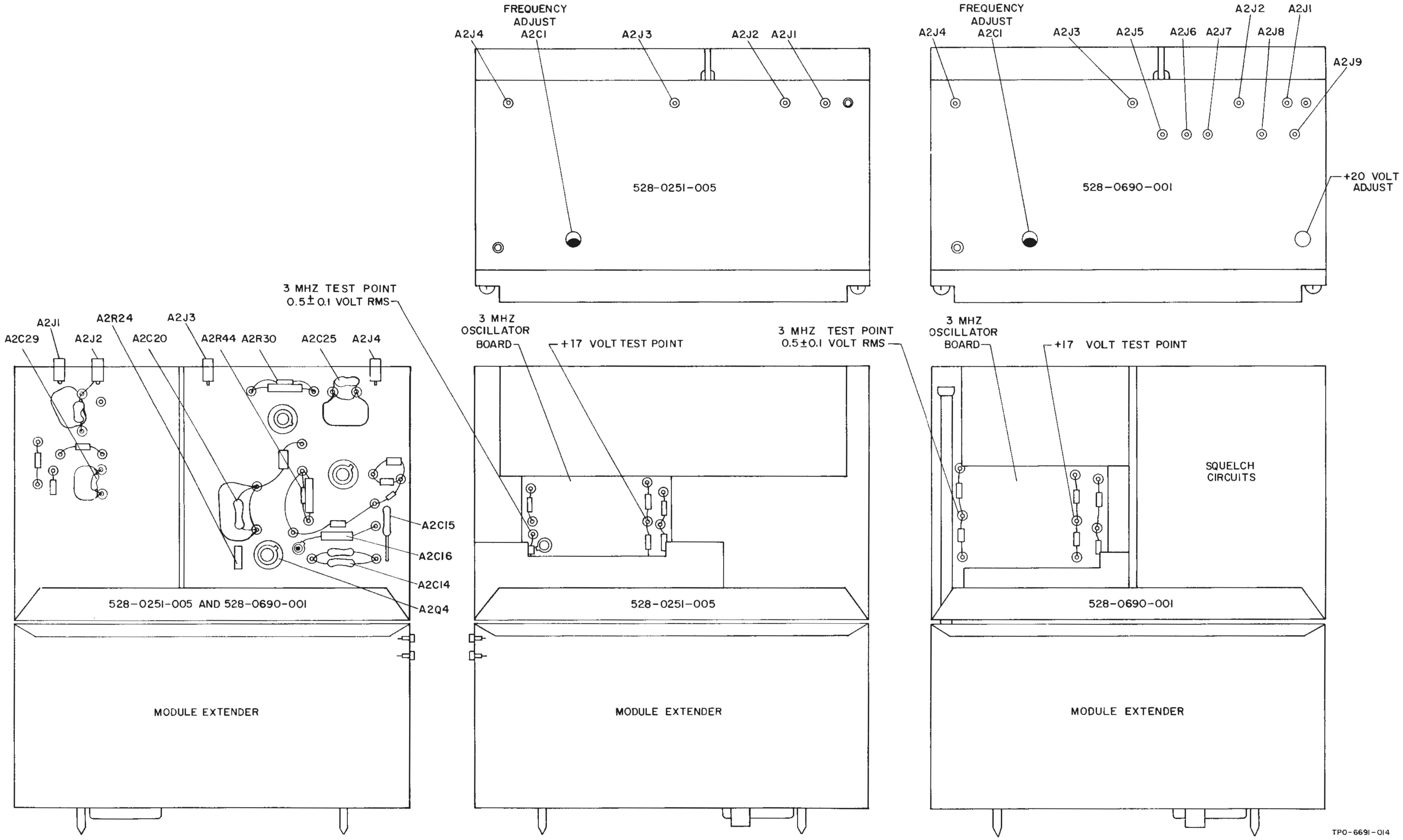
Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12C of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10B (Cont)			Connect an 820-ohm ±10% resistor from TP2 on the rf oscillator module extender to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.	NMT 2.5 volts dc.	A2A3R8 or A2A2R41 misadjusted.	Refer to previous remedy for adjustment for A2A3R8 or A2A2R41.
			Replace the 820-ohm resistor with a 330-ohm ±10% resistor from TP2 to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.	NLT 14 volts dc.	A2A3R8 or A2A2R41 misadjusted.	Refer to previous remedy for adjustment of A2A3R8 or A2A2R41.
C	Positive override operation and high channel check		Connect an audio oscillator to TP2 and TP3 on AM/audio module extender. Connect Ballantine 310A to A2J5. Adjust audio oscillator to approximately 2.2 kHz at a level providing 5 vrms at A2J5.	Audio should be present in headphones at 618T-( ) audio output.		
			With vtvm measure dc voltage at A2J8.	NMT 2.5 volts dc.		
D	Squelch delay check		Remove 330-ohm resistor, and note time lapse for audio to be removed from headphones.	1 to 5 seconds.		
			With vtvm, measure dc voltage at A2J8.	NMT 2.5 volts dc.		
E	Low channel check		Change audio oscillator to approximately 600 Hz at a level providing 5 Vrms at A2J5.	Audio should be present in headphones.		
			With vtvm, measure dc voltage at A2J8.	NLT 14 volts dc.		

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12D of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11	Disconnect		Turn power off. Disconnect all test equipment. Remove A2 from module extender. Remove module extenders from 618T( ) chassis. Replace dust cover on A2. Replace A2 and A9 in 618T( ) chassis.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 13 of 13)
Figure 708



RF Oscillator A2, Late Model, Checks and Adjustments
Figure 709

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Boonton 91-C RF VTVM HP-410B VTVM Rf dummy load Oscilloscope Frequency counter Signal generator 6-db attenuator Ballantine 310A VTVM	NOTE: This test procedure applies to the early model rf oscillator A2, Collins part number 544-9285-005 only. Refer to figure 711 for location of all test points on A2 and module extender. Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section. Remove dust cover from A2 to perform this step. The rf oscillator module ambient temperature should be between +20 °C (+68 °F) and +30 °C (+86 °F) while performing this test. Connect 618T-( ), 678P-( ), and dummy load as shown in figure 702. Connect rf oscillator A2 through module extender to 618T-( ) chassis. NOTE: Unless otherwise specified, the steps are performed with power on, 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 1 of 6)
Figure 710

Module Checks and Adjustments, RF Oscillator A2,
Early Model (Sheet 2 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A2J2. Check voltage at A2J2. Connect HP-410B VTVM dc probe to A2J5. Check voltage at A2J5.	+15 to +16 vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	3-MHz reference oscillator check		Connect frequency counter to A2J6. Check frequency at A2J6. Connect Boonton 91-C RF VTVM to A2J6. Check voltage at A2J6.	3 MHz ±2 Hz. Not less than 40.0 mv.	3-MHz oscillator frequency incorrectly adjusted.	Adjust A2C1.
4	500-kHz reference output to MHz-frequency stabilizer A10 check		Connect Boonton 91-C RF VTVM to A2J3. Check voltage at A2J3. Connect frequency counter to A2J3. Check frequency at A2J3.	From 1.0 to 1.2 vrms. 500 kHz ±0.4 Hz.	A2Q2 through A2Q5 and associated circuits.	Check A2Q2 through A2Q5 and associated circuits.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5	500-kHz carrier output to balanced modulator check		Connect Boonton 91-C RF VTVM to A2J4.			
			Check voltage at A2J4.	1.5 to 1.9 vrms.	A2Q6 and associated circuit.	Check A2Q6 and associated circuit.
			Connect frequency counter to A2J4.			
			Check frequency at A2J4.	500 kHz ±0.4 Hz.		
6	100-kHz reference output check		Connect Boonton 91-C RF VTVM to A2J1.			
			Check voltage at A2J1.	Not less than 0.4 vrms.	A2Q8 through A2Q11 and associated circuits.	Check A2Q8 through A2Q11 and associated circuits.
			Connect frequency counter to A2J1.			
			Check frequency at A2J1.	100 kHz ±0.1 Hz.		
7	Divider bandwidth adjustment		Unsolder coaxial cable at junction of A2C4 and A2C5.			
			Connect signal generator through 6-db attenuator to A2J6 and oscilloscope vertical input. Connect frequency counter to oscilloscope vertical output.			
			Connect oscilloscope horizontal input to A2J4.			
(Cont)			Set signal generator output to 3 MHz, 50 mv (as indicated by frequency counter).			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 3 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Check waveform at A2J4.	6-to-1 Lissajous pattern. NOTE: Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.92 to 3.08 MHz.	A2C10 and/or A2C14 incorrectly adjusted.	Adjust A2C10 and/or A2C14. NOTE: A2C10 adjusts bandwidth above 3 MHz. A2C14 adjusts bandwidth below 3 MHz.
			Increase signal generator output level to 150 mv.			
			Check waveform at A2J4.	6-to-1 Lissajous pattern. See note above.	A2C10 and/or A2C14 incorrectly adjusted.	Adjust A2C10 and/or A2C14. See note above.
			Connect oscilloscope horizontal input to A2J4, vertical input to A2J1.			
			Set signal generator to 3 MHz with 50 mv output.			
			Check waveform at A2J1.	5-to-1 Lissajous pattern. NOTE: Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.92 to 3.08 MHz.	A2C29 and/or A2C34 incorrectly adjusted.	Adjust A2C29 and/or A2C34. NOTE: A2C29 adjusts the bandwidth above 3 MHz. A2C34 adjusts the bandwidth below 3 MHz.
(Cont)						

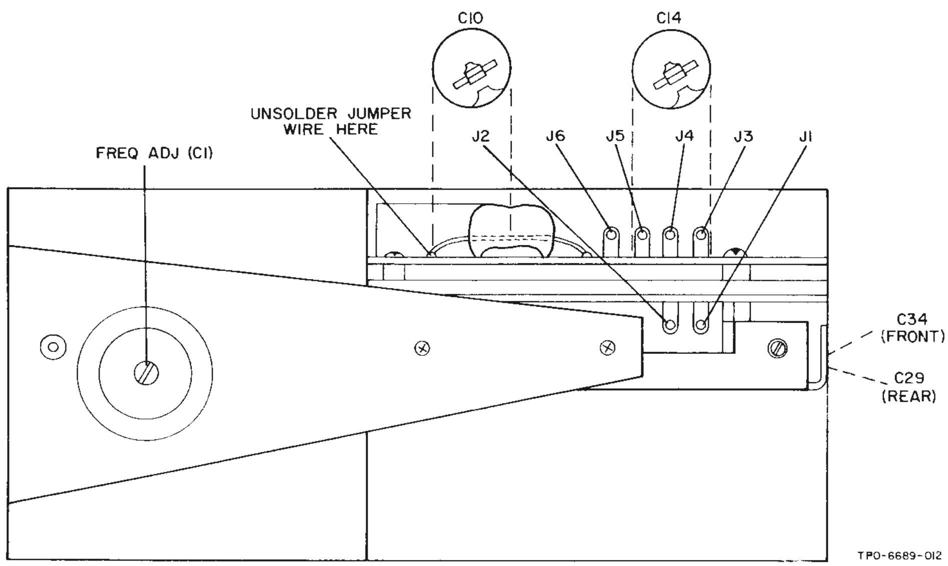
Module Checks and Adjustments, RF Oscillator A2,
Early Model (Sheet 4 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Increase signal generator output level to 150 mv.			
			Check waveform at A2J1.	5-to-1 Lissajous pattern. See note above.	A2C29 and/or A2C34 incorrectly adjusted.	Adjust A2C29 and/or A2C34. See note above.
			Resolder coaxial cable to junction of A2C4 and A2C5.			
8	Crystal oven check		CAUTION: BALLANTINE 310A MUST BE UNGROUNDED FOR THIS STEP.			
			Connect Ballantine 310A VTVM across terminals of A2T3.			
			Check voltage between A2T3 terminal 1 and terminal 3 (this is the output voltage).	Several volts (record this voltage).		
			Connect Ballantine 310A VTVM across A2CR1.			
			Check voltage across A2CR1 (this is the input voltage).	Several hundred microvolts (record this voltage).		
			Divide output voltage by input voltage.	Quotient should be approximately 6000.	A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.	Check A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.
9	Disconnect		Turn power off.			
			Disconnect all test equipment.			
			Remove A2 from module extender.			
(Cont)			Remove module extender from 618T-( ) chassis.			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 5 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)			Replace dust cover on A2. Replace A2 in 618T-( ) chassis.			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 6 of 6)
Figure 710



RF Oscillator A2, Early Model, Checks and Adjustments
Figure 711

[redacted]

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Boonton 91-C RF VTVM Triplett 630-NA VOM Signal generator 6-db attenuator Frequency counter Rf dummy load HP-711A Power Supply Audio oscillators (two) Spectrum analyzer	<u>NOTE:</u> AM/audio amplifier A9 checks and adjustments must be performed before testing this module. Refer to figure 713 for location of all test points on A3 and module extender. Remove if. translator A3 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A3 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect if. translator A3 through module extender to 618T-( ) chassis. <u>NOTE:</u> Unless otherwise specified, all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, IF. Translator A3 (Sheet 1 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to TP5 on module extender.			
			Check voltage at TP5 on module extender.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	Tgc voltage check		Connect HP-410B VTVM dc probe to A3J2, using a coaxial jumper. Set 714E-( ) to 7.300 MHz. The 618T-( ) requires a minimum warmup period of 15 minutes. Key 618T-( ).			
			Check voltage at A3J2.	+10 to +14 vdc.	A3Q6 and associated circuit.	Check A3Q6 and associated circuit.
			Unkey 618T-( ).			
4	500-kHz carrier input to balanced modulator check		Connect HP-410B VTVM ac probe to A3J4. Key 618T-( ).			
			Check voltage at A3J4.	1.5 to 1.9 vrms.	A2Q4, A2Q5, A2Q6, and associated circuits.	Check A2Q4, A2Q5, A2Q6, and associated circuits.
			Unkey 618T-( ).			
5	SSB receive if. alignment		Connect coaxial jumper between IF. OUTPUT jack and unmarked coaxial connector on A3 module extender (figure 713).			
(Cont)			Set 714E-( ) to USB.			

Module Checks and Adjustments,
IF Translator A3
Figure 712 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Set 618T-( ) front panel AUDIO control fully clockwise. Disconnect jumper from RCVR IF. IN connector at left front of 618T-( ). Connect HP-410B VTVM ac probe to 678P-( ) HEADSET jack. Connect signal generator through 6-db attenuator to a BNC T-connector. Connect frequency counter to T-connector. Connect remaining portion of T-connector to RCVR IF. IN jack at front of 618T-( ). Set signal generator for 500.3-kHz, CW output. Adjust signal generator output level for 2 to 3 volts at 678P-( ) HEADSET jack. <u>NOTE:</u> To prevent overloading, maintain voltage at HEADSET jack below 3.5 v. Do this by reducing signal generator output level as circuit gain is increased. Adjust A3L4, A3L5, and A3T2 to peak voltage at HEADSET jack.			
(Cont)						

Module Checks and Adjustments, IF. Translator A3 (Sheet 3 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Tune signal generator to 501.0 kHz.			
			Adjust A3C25 and A3C29 to peak voltage at HEADSET jack.			
			Set 714E-( ) to LSB.			
			Tune signal generator to 499.0 kHz.			
			Adjust A3C27 and A3C32 to peak voltage at HEADSET jack.			
			Determine which sideband has lower gain by keeping signal generator output level constant while switching between LSB (with signal generator tuned to 499.0 kHz) and USB (with signal generator tuned to 501.0 kHz). Lower gain sideband has lowest voltage at HEADSET jack.			
			Set 714E-( ) to the lower gain sideband. Adjust signal generator output level for 5 V at HEADSET jack.			
			Note signal generator output level.	Between 40.0 and 100.0 uv.	Value of A3R5.	Select value of A3R5 that provides required results from complement given in the 618T-( ) illustrated parts catalog.
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Disconnect signal generator from RCVR IF. IN connector. Reconnect coaxial jumper to RCVR IF. IN connector. Reset 618T-( ) front panel AUDIO control for 5.5 v at the HEADSET jack by performing step 4.G of figure 704.			
6 (Cont)	SSB/AM transmit if. alignment		NOTE: Perform the SSB receive if. alignment procedure, step 5, before performing this procedure. Connect coaxial jumper between RF LOAD and IF OUTPUT coaxial connectors on A3 module extender. Connect Boonton 91-C RF VTVM to RF test point on A3 module extender. Set 714E-( ) to USB. Place short across A3C9 to utilize carrier for alignment. Key 618T-( ). Adjust trimmer on RF LOAD block on A3 module extender for peak indication on Boonton 91-C RF VTVM. Adjust A3T1 and A3L2 for a peak on the Boonton 91-C RF VTVM.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Remove short from A3C9.			
			Set 714E-( ) to AM.			
			Check voltage on Boonton 91-C RF VTVM.	0.24 to 0.38 v.	Value of A3R42.	Select value of A3R42 that will provide required results from complement given in 618T-( ) illustrated parts catalog.
			Connect 678Z-1 and audio oscillator as shown in figure 702.			
			Key 618T-( ) and set audio oscillator output to 1.0 kHz, 0.25 v as measured with Ballantine 310A VTVM at 678Z-1 TEST POINT jack.			
			Determine lower gain sideband by keying 618T-( ) and switching between USB and LSB. The setting that gives the lower voltage on the Boonton 91-C RF VTVM is the lower gain sideband.			
(Cont)			Set 714E-( ) to lower gain sideband.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Check voltage on the Boonton 91-C RF VTVM.	0.31 to 0.39 v.	Value of A3R2.	Select value of A3R2 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.
			Set 714E-( ) to higher gain sideband.	Within 2 db of voltage noted in previous step.	Value of A3R45.	Select value of A3R45 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.
			Disconnect audio oscillator.			
7	Carrier balance adjustment		<u>NOTE:</u> Step 7A of this procedure does not produce ideal carrier balance. For best results, proceed to step 7B. Step 7B requires the use of a spectrum analyzer.			
A	Carrier balance adjustment		Connect coaxial jumper between RF LOAD and IF. OUTPUT coaxial connectors of A3 module extender.			
			Connect Boonton 91-C RF VTVM to RF test point on A3 module extender.			
			Set 714E-( ) to USB, 2.100 MHz.			
(Cont)			Key 618T-( ).			

Module Checks and Adjustments, IF. Translator A3 (Sheet 7 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7A (Cont)			Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Set 714E-( ) to LSB. Key 618T-( ). Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Repeat above procedure until null voltages are approximately equal.			
B	Carrier balance adjustment using spectrum analyzer		Override tgc using 678Z-1 Function Test Set as follows: Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J2-IF. TRANS jack to A3J2. Connect 678Z-1 J2-FREQ DIV jack to A1A2J2. <u>NOTE:</u> B versions of the 618T-( ) have no module A1 for TGC override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Set 678Z-1 TGC and CAPTURE RANGE control counterclockwise and FUNCTION SELECTOR to TGC OVERRIDE.			
(Cont)						

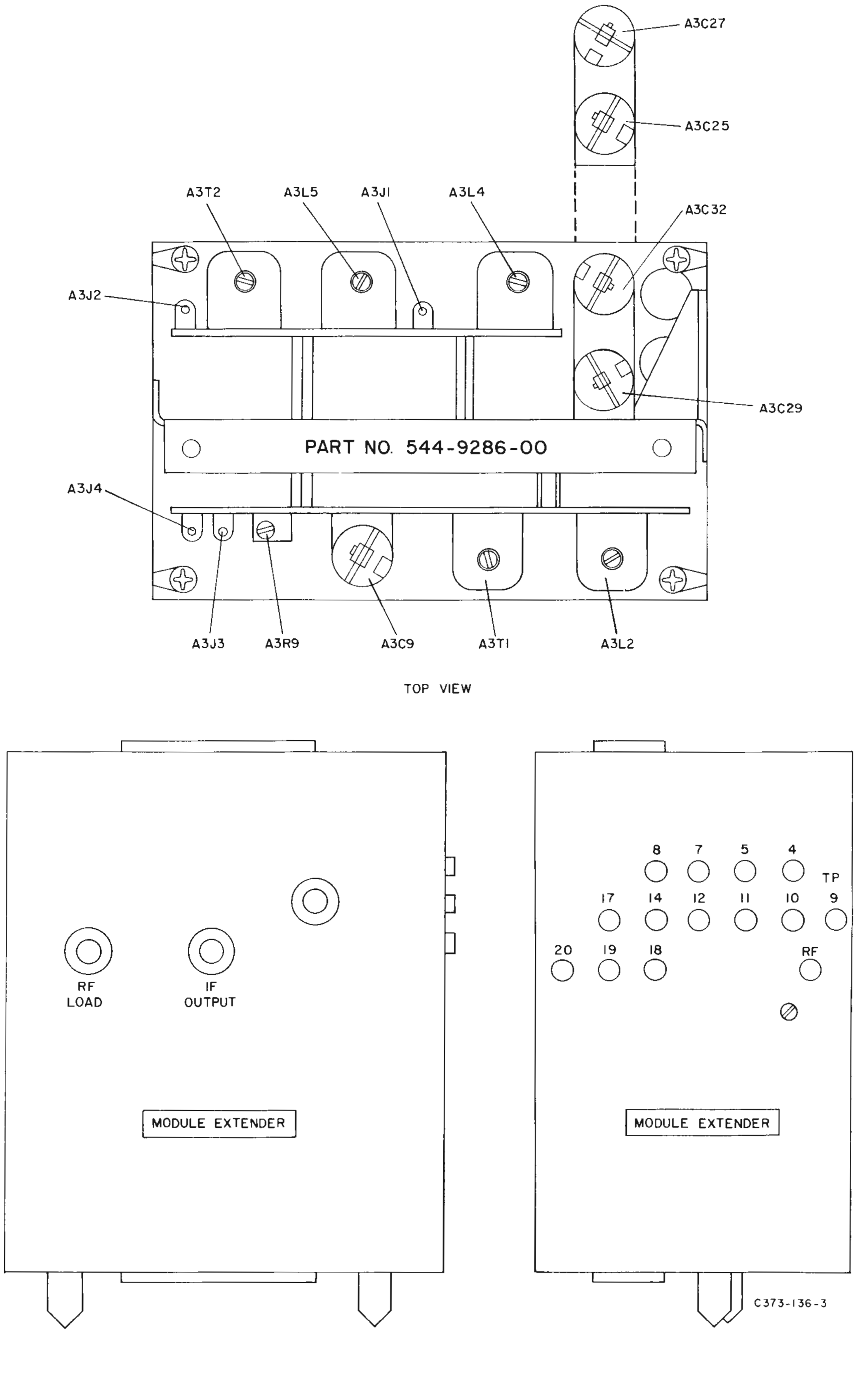
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7B (Cont)			Connect output of audio oscillator to 678Z-1 NO. 1 AUDIO IN. Set output of audio oscillator to 900 Hz. Connect output of second audio oscillator to 678Z-1 NO. 2 AUDIO IN. Set output of second audio oscillator at 2800 Hz for 618T-1/1B/2/2B/3/3B or 2300 Hz for 618T-4/4B/5/5B/6/6B. Set 714E-( ) to USB, 2.100 MHz. Adjust output level of each audio oscillator, while keying 618T-( ), to provide 0.1 volt by alternately monitoring each output with the HP-410B. Connect vom positive probe to A11J1 and common probe to A11J4. Refer to figure 729 for location of these jacks. Monitor vom while keying 618T-( ). Slowly adjust 678Z-1 TGC and CAPTURE RANGE control, while keying 618T-( ), to increase drive to power amplifier module. Stop at point that voltage indicated on vom begins to change. This point is grid current threshold.			
(Cont)						

Module Checks and Adjustments, IF Translator A3
Figure 712 (Sheet 9)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7B (Cont)			Unkey 618T-( ). Connect spectrum analyzer, through 2- to 8-MHz capacitive divider, to 618T-( ) rf output. Key 618T-( ). Monitor rf output voltage with spectrum analyzer, and alternately adjust A3C9 and A3R9 for minimum carrier level. Set 714E-( ) to LSB. Monitor rf output voltage with spectrum analyzer, and alternately adjust A3C9 and A3R9 for minimum carrier level. Alternately adjust A3C9 and A3R9 in USB and LSB until best compromise is reached. Adjust tgc for correct voltage level according to unit performance test procedures, paragraph 3.H, figure 704. Unkey 618T-( ).			
8 (Cont)	Disconnect		Turn power off. Disconnect all test equipment. Remove A3 from module extender.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8 (Cont)			Remove module extender from 618T-( ) chassis. Replace dust cover on A3. Replace A3 in 618T-( ) chassis.			

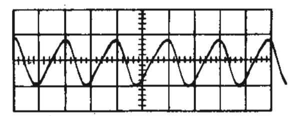
Module Checks and Adjustments, IF. Translator A3 (Sheet 11 of 11)
Figure 712



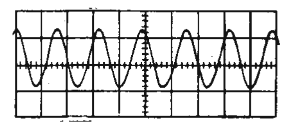
IF. Translator A3, Checks and Adjustments
Figure 713

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Signal generator 6-db attenuator Oscilloscope Frequency counter Fluke 801B VTVM Temperature box (range from -50 °C to +80 °C). Rf dummy load	This test procedure applies to both early and late models of kHz-frequency stabilizer A4. Refer to figure 715 for location of all test points on A4. Remove kHz-frequency stabilizer A4 from 618T-( ) and perform visual inspection as described in the inspection/check section of this manual. Remove dust cover from A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect kHz-frequency stabilizer A4 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.			

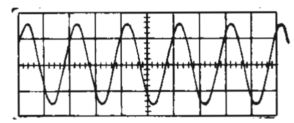
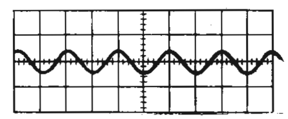
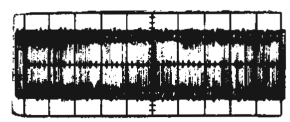
Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 1 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A4A1J2. Check voltage at A4A1J2.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check supply voltage at A5J3.
3	Vfo rf input check		Set oscilloscope for 0.5 v/cm 0.2 us/cm for units with 70K-5 and 70K-9 vfo's or 1.0 v/cm, 2.0 us/cm for units with 70K-3 vfo's. Connect oscilloscope vertical input to A4A1J1. Check waveform at A4A1J1.		Vfo output.	Check vfo output at A12J5.
4	Perform step 26 of this test procedure.					
5	Perform step 27 of this test procedure.					

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 2 of 20)
Figure 714

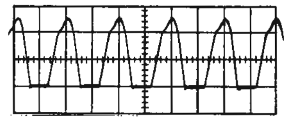
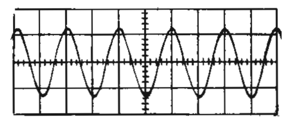
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	Digit oscillator/ isolation amplifier (Q4) output check		Set oscilloscope for 2.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A1J5. Check waveform at A4A1J5.		A4A1Q4, A4A4Q12, and associated circuits.	Check A4A1Q4, A4A4Q12, and associated circuits.
7	Digit oscillator dc tuning voltage check		Set 714E-( ) to X.XX5 MHz. Connect HP-410B VTVM dc probe to A4A4J6. Check voltage at A4A4J6.	Approximately +23.0 v.	A12A1R22 through A12A1R32 and A12A1S6.	Check A12A1R22 through A12A1R32 and A12A1S6.
			Set 714E-( ) to X.XX6 MHz. Check voltage at A4A4J6.	Approximately +7 v.		

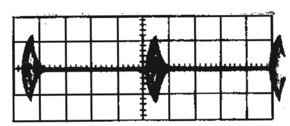
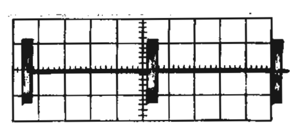
Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 3 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Signal channel if. input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4J7. Check waveform at A4J7.	Approximately 50 mV p-p minimum. 	A4A1Q3, A4FL1, and associated circuits.	Check A4A1Q3, A4FL1, and associated circuits.
9	Reference channel if. input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4J8. Check waveform at A4J8.		A4A5Q15, A4FL2, and associated circuits.	Check A4A5Q15, A4FL2, and associated circuits.
10	First signal mixer input check		Set oscilloscope for 50.0 mv/cm, 100.0 us/cm. Connect oscilloscope vertical input to A4A1TP1. Check waveform at A4A1TP1.		A4A1Q1 and associated circuit.	Check A4A1Q1 and associated circuit.
11	Second signal mixer input check		Set oscilloscope for 100.0 mv/cm, 100.0 us/cm. Connect oscilloscope vertical input to A4A1TP2. Check waveform at A4A1TP2.		A4A1Q2 and associated circuit.	Check A4A1Q2 and associated circuit.
12	FL1 output/ Q5 input check		Used for adjustment only.			

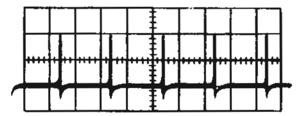
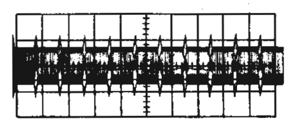
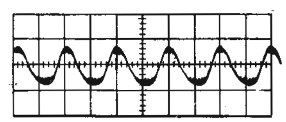
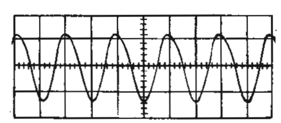
Module Checks and Adjustments, kHz-Frequency Stabilizer A4
Figure 714 (Sheet 4)

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 5 of 20)
Figure 714

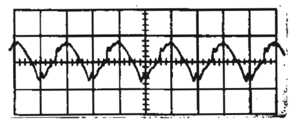
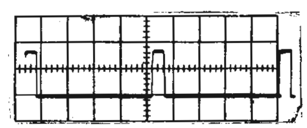
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13	Q6 output/ Q7 input check		Set oscilloscope for 1.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A2TP4. Check waveform at A4A2TP4.		A4A2Q5, A4A2Q6, and associated circuits.	Check A4A2Q5, A4A2Q6, and associated circuits.
14	Q8 output/ signal input to phase discriminator check		Set oscilloscope for 5.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A2TP5. Check waveform at A4A2TP5.		A4A2Q7, A4A2Q8, and associated circuits.	Check A4A2Q7, A4A2Q8, and associated circuits.
15	Frequency discriminator dc output check					
A	kHz-frequency stabilizer A4, Collins part number 544-9288-005 only		Ground A4A6TP15. Connect signal generator output through 6-db attenuator to frequency counter and A4J7. Set signal generator for output of 40 mv at 250,000 ±5 Hz. Connect Fluke 801B VTVM between A4A2TP6 and A4A2TP7.	-5 to +5 mvdc.	Frequency discriminator output.	Check frequency discriminator circuit.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15B	kHz-frequency stabilizer A4, Collins part number 528-0112-005 only		Ground A4A6TP15. Connect signal generator output through 6-db attenuator to frequency counter and A4J7. Set signal generator for 40-mv output at 250,000 ±5 Hz. Connect Fluke 801B VTVM between A4A2TP7 and ground. Disconnect signal generator and unground A4A6TP15.	-5 to +5 mvdc.	Frequency discriminator output.	Check frequency discriminator circuit.
16	Spectrum generator output check		Set oscilloscope for 50.0 mv/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP8. Check waveform at A4A3TP8.		A4A3T2.	Check A4A3T2.
17	Keyer/keyed oscillator supply voltage check		Connect HP-410B VTVM dc probe to A4A3TP9. Check voltage at A4A3TP9.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
18	Keyed oscillator output check		Set oscilloscope for 2.0 v/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP10. Check waveform at A4A3TP10.		A4A3Q11 and associated circuit.	Check A4A3Q11 and associated circuit.

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 6 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
19	10-kHz pulse input from frequency divider A1 check		Set oscilloscope for 2.0 v/cm, 50.0 us/cm. Connect oscilloscope vertical input to A4A3TP11. Check waveform at A4A3TP11.		A1A1Q1 through A1A1Q6 and associated circuits.	Check A1A1Q1 through A1A1Q6 and associated circuits.
20	Reference mixer input check		Set oscilloscope to 100.0 mv/cm, 1.0 ms/cm. Connect oscilloscope vertical input to A4A5TP12. Check waveform at A4A5TP12.		A1A3Q14 and associated circuit.	Check A1A3Q14 and associated circuit.
21	Q17 output/ Q18 input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP14. Check waveform at A4A6TP14.		A4A6Q16, A4A6Q17, and associated circuits.	Check A4A6Q16, A4A6Q17, and associated circuits.
22	Q19 output/ reference input to phase discriminator check		Set oscilloscope for 10.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP15. Check waveform at A4A6TP15.		A4A6Q18, A4A6Q19, and associated circuits.	Check A4A6Q18, A4A6Q19, and associated circuits.

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 7 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
23	Signal input to phase discriminator check		Set oscilloscope for 5.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP16. Check waveform at A4A6TP16.		A4A2T1.	Check A4A2T1.
24	Phase discriminator dc output check		Ground A4A2TP5 and A4A6TP15. Using Fluke 801B, check voltage at A4A6TP17. Check voltage at A4A6TP18. Unground A4A2TP5 and A4A6TP15.	-5 to +5 mvdc. -5 to +5 mvdc.	Phase discriminator circuit. Phase discriminator circuit.	Check phase discriminator circuit. Check phase discriminator circuit.
25	Keyer output check		Set oscilloscope for 5.0 v/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP19. Check waveform at A4A3TP19.		A4A3Q9, A4A3Q10, and associated circuits.	Check A4A3Q9, A4A3Q10, and associated circuits.
26	Vfo bias adjustment		NOTE: Do not perform this step unless it is known that 678Z-1 is in accurate calibration.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 8 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
26A	Late model, Collins part number 528-0112-005 only		Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10. CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME. Ground A4A2TP5. Connect 678Z-1 J1-KC STAB jack to A4A1J1. Set 678Z-1 FUNCTION SELECTOR switch to OFF-SET ADJUST. Adjust 678Z-1 OFF-SET ADJUST control until the FUNCTION METER indicates 0 when the X10 METER SENSITIVITY switch is operated several times. Connect 678Z-1 J3-KC STAB jack to A4A4J3. Set 678Z-1 FUNCTION SELECTOR switch to 70K-5 VFO BIAS. Operate X10 METER SENSITIVITY switch several times. Unground A4A2TP5. Disconnect test leads from A4A1J1, A4A4J3, and chassis.	FUNCTION METER must indicate 0.	A4A4R62 incorrectly adjusted.	Adjust A4A4R62.

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 9 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
26B	Early model, Collins part number 544-2988-005		Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J1-KC STAB jack to A4A1J1. Connect 678Z-1 J3-KC STAB jack to A4A4J3. Ground A4A2TP5. Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10. <u>CAUTION:</u> DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME. Set 678Z-1 FUNCTION SELECTOR switch to 70K-3 VFO BIAS.			
			Operate X10 METER SENSITIVITY switch several times.	FUNCTION METER must indicate 0.	A4A4R62 incorrectly adjusted.	Adjust A4A4R62.
			Unground A4A2TP5. Disconnect test leads from A4A1J1, A4A4J3, and chassis.			
27 (Cont)	Keyed oscillator adjustment		Connect 678Z-1 J4-KC STAB jack to A4A3J4. Connect 678Z-1 GRND jack to 618T-( ) chassis.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 10 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
27 (Cont)			Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL.			
			Set 678Z-1 LEVEL SET control for FUNCTION METER indication of +10.			
			CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.			
			Set 714E-( ) to X.000 MHz.			
			Set 678Z-1 FUNCTION SELECTOR switch to 10KC CONTROL BIAS (+20 V).			
			Operate X10 METER SENSITIVITY switch several times.	FUNCTION METER should indicate 0.	A4A4R63 incorrectly adjusted.	Adjust A4A4R63.
			Disconnect test leads from A4A3J4 and chassis.			
			Connect HP-410B VTVM dc probe to A4A4J4 and check level.	Approx +20 vdc.	Autopositioner submodule A12A1.	Perform A12 checks and adjustments.
			Check voltage with 714E-( ) set at each frequency listed.	X.111 - approx +17 vdc. X.222 - approx +14 vdc. X.333 - approx +12 vdc. X.444 - approx +10 vdc. X.555 - approx +8 vdc. X.666 - approx +7 vdc. X.777 - approx +6 vdc. X.888 - approx +5 vdc. X.999 - approx +4 vdc.		
(Cont)						

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 11 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
27 (Cont)			Connect oscilloscope vertical input to A4J7 (output of A4FL1).			
			Set 714E-( ) to X.000 MHz.			
			Adjust A4A3C54 and A4A3C55 to provide peak waveform at A4J7.			
			Set 714E-( ) to X.999 MHz.			
			Adjust A4A3T2-P and A4A3T2-S to provide peak waveform at A4J7.			
			Disconnect oscilloscope from A4J7.			
28	Digit oscillator input check		Connect HP-410B VTVM dc probe to A4A4J6.			
			Set 714E-( ) to X.XX0 MHz and check voltage with HP-410B.	Approx +11 vdc.	Autopositioner submodule A12A1.	Perform A12 checks and adjustments.
			Check voltage with 714E-( ) set at each frequency listed (voltages approximate).	X.XX1 - +12.5 vdc. X.XX2 - +14 vdc. X.XX3 - +16.5 vdc. X.XX4 - +19 vdc. X.XX5 - +23 vdc. X.XX6 - +7 vdc. X.XX7 - +8 vdc. X.XX8 - +9 vdc. X.XX9 - +10 vdc.		
(Cont)			Connect frequency counter to vertical output of oscilloscope.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 12 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
28 (Cont)			Connect vertical input of oscilloscope to A4A1J5 through 678Y-( ) test probe no. 1.			
			Set 714E-( ) to 2.006 MHz.	Counter should indicate between 295.850 to 296.150 kHz.	A4A4R59 incorrectly adjusted.	Adjust A4A4R59 to provide required results.
			Set 714E-( ) to 2.005 MHz.	Counter should indicate 304.850 to 305.150 kHz.	A4A4L14 incorrectly adjusted.	Adjust A4A4L14 to provide required results.
			Reset 714E-( ) to 2.006 MHz.	Counter should indicate 295.850 to 296.150 kHz.		
			NOTE: If necessary, readjust A4A4R59 and A4A4L14 until proper frequency indications are obtained at both 2.006 and 2.005 MHz frequency settings.			
			Set 714E-( ) to each of the frequencies listed and note the frequency counter indication.	2.007 MHz = 297,000 ±150 Hz. 2.008 MHz = 298,000 ±150 Hz. 2.009 MHz = 299,000 ±150 Hz. 2.000 MHz = 300,000 ±150 Hz. 2.001 MHz = 301,000 ±150 Hz. 2.002 MHz = 302,000 ±150 Hz. 2.003 MHz = 303,000 ±150 Hz. 2.004 MHz = 304,000 ±150 Hz.		
(Cont)			NOTE: If frequency at each digit setting is not within specified limits, replace A4A4C64 and A4A4C125 with values of capacitance that will give the required indication. A change of +5 pf will raise the frequency at the 2.001-MHz setting about 10 Hz. Leave a minimum capacitance of			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 13 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
28 (Cont)			20 pf in the circuit. These capacitors are selected from the complement listed in the 618T-( ) illustrated parts catalog. Connect kHz-frequency stabilizer A4 to 618T-( ) chassis with an 18-inch pendant cable. NOTE: The remainder of step 28 is optional. Place A4 in temperature box.			
			Check all frequencies listed in previous steps at temperatures of -55, -5, +5, +50, and +80 °C.	Frequency at each digit setting must be within ±200 Hz of frequencies listed in previous step.	A4A4C64 and A4A4C125.	Replace A4A4C64 and A4A4C125 with capacitors having the same capacitance but with different temperature coefficients.
			Remove A4 from temperature box and replace on A4 module extender.			
29 (Cont)	Signal channel input adjustment		Connect vertical input of oscilloscope to A4J7. Set 714E-( ) to X.XX0 MHz. Adjust A4A1L2, A4A1L3, A4C18, and A4C19 to peak waveform at A4J7.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 14 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
29 (Cont)			<u>NOTE:</u> Check for two tuning points on each capacitor to be sure they are at resonance. Pick the highest point.			
30 (Cont)	Signal channel if./frequency discriminator adjustment		Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender. Connect a #22 wire from pin 2 of chassis connector A4J12 to TP2 on module extender. Connect a #22 wire from 618T-( ) chassis to A4 chassis. <u>NOTE:</u> Make no other connections between 618T-( ) chassis and module A4 or module extender. Connect oscilloscope vertical input to A4A6TP16. Connect signal generator output through 6-db attenuator to A4J7 and the frequency counter. Set signal generator output between 249,970 and 250,030 Hz with an output level below that required to saturate if. amplifiers (indicated by output at A4A6TP16 dropping sharply or clipping).			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 15 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			NOTE: Some of the following test points and adjustments are located on circuit board A4A2. This board is located behind circuit board A4A6. Refer to figure 715 for location of circuit boards. To make test points and adjustments on A4A2 accessible, remove A4A6 and the metal divider between A4A6 and A4A2 by removing five screws from A4A6.			
			Adjust A4A2L7 and A4A2T1 to provide peak waveform at A4A6TP16. If necessary, reduce signal generator output level to prevent amplifier saturation.			
			Connect differential vtvm between A4A2TP7 and ground on late model modules (between A4A2TP6 and A4A2TP7 on early model modules).			
			Check voltage at A4A2TP7.	0 ±5.0 mv.	A4A2L8 (MCN through 7236).	
					A4A2C128 incorrectly adjusted (MCN 7237 and above).	Adjust A4A2L8 or A4A2C128.
(Cont)			NOTE: The following portion of step 30 need be performed only if a component on board A4A2 was replaced and if a temperature box is available. If no temperature box is available, return the module to Collins Radio Company for repair.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 16 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			Leave signal generator, frequency counter, oscillo-scope, and differential vtvm connected as in the previous steps. Maintain signal generator output level as it was in the last step.			
			Connect A4 to chassis through 18-inch pendant cable and place A4 in the temperature box. Connect HP-410B VTVM ac probe to A4A6TP16.			
			Lower temperature box temperature to -55 °C.			
			Adjust signal generator fre-quency to produce null on differential vtvm (approxi-mately 250 kHz).			
			Record output frequency of signal generator and HP-410B indication.	See next step.		
			Raise temperature box temperature to +80 °C.			
			Adjust signal generator frequency to produce null on differential voltmeter.			
			Record signal generator output frequency and HP-410B indication.	Signal generator output frequency must be between 249.930 and 250.070 kHz at both temperatures.	A4A2C37 and/ or A4A2C124.	Replace with capacitors having same capacitance but different temp-erature coefficient.
(Cont)						

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 17 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			Remove A4 from temperature box and replace in 618T-( ) with A4 module extender. Remove test equipment from A4.	HP-410B indications should be within 3 db of each other.	A4A2C33 and/ or A4A2C123.	Same as above.
31	Reference channel input adjustment		Connect oscilloscope vertical input to A4J8. Set 714E-( ) to X.XX0 MHz. Adjust A4A5L17, A4C85, and A4C86 to peak waveform at A4J8. NOTE: Check for two tuning points on each capacitor to be sure they are at resonance. Pick highest point. Set 714E-( ) to X.XX6 MHz. Adjust A1A3L8 in frequency divider A1 to peak waveform at A4J8. Set 714E-( ) to X.XX1 MHz. Adjust A1A3L7 in frequency divider A1 to peak waveform at A4J8.			

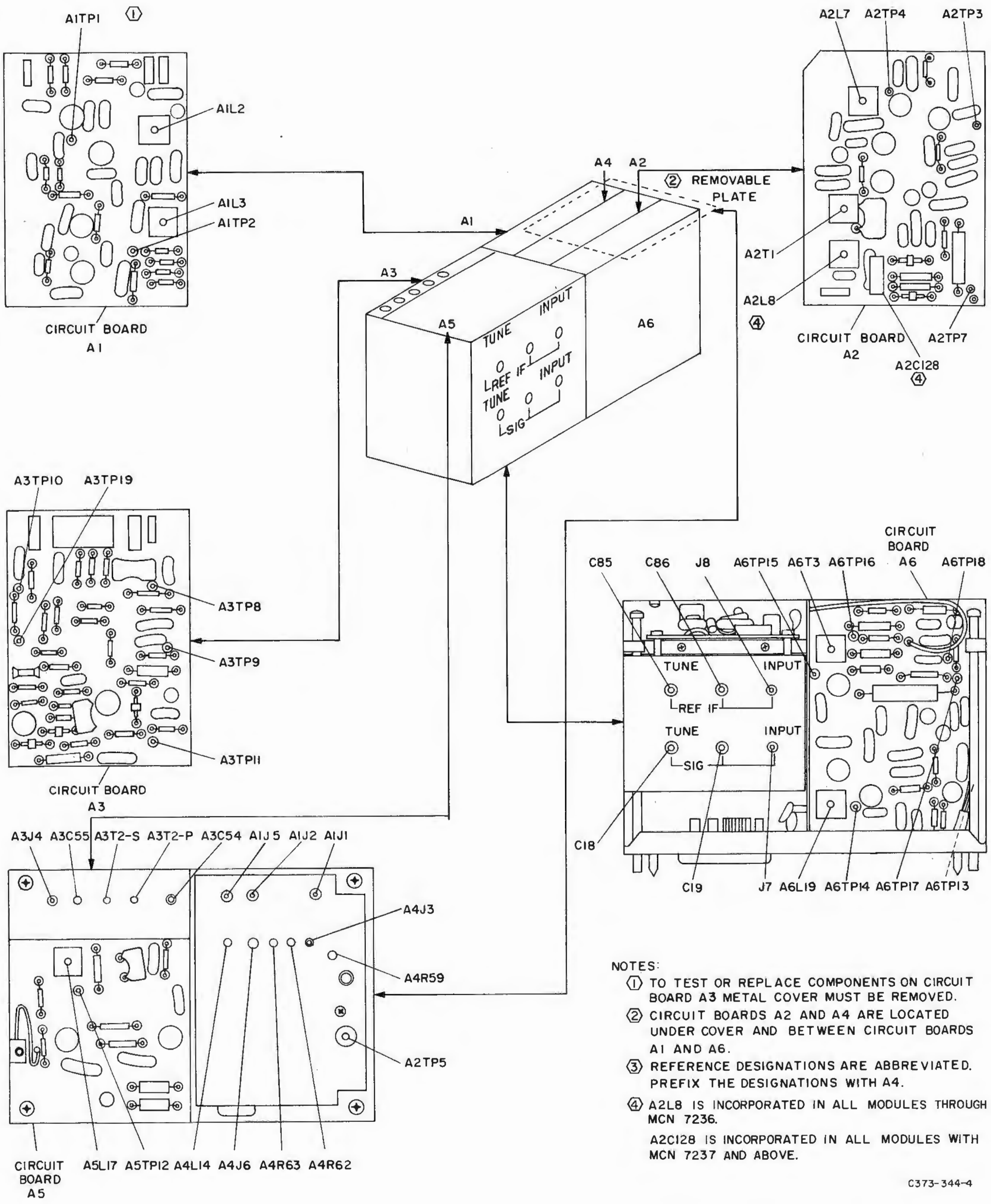
Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 18 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
32	Reference channel if. adjustment		Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender. Connect a #22 wire from pin 8 of A4J12 to TP8 on module extender. Connect a #22 wire from 618T-( ) chassis to chassis of A4. NOTE: Make no other connections between 618T-( ) chassis and A4 or A4 module extender. Connect oscilloscope vertical input to A4A6TP15. Connect signal generator output through 6-db attenuator to A4J8 and frequency counter. Set signal generator output between 249,970 and 250,030 Hz. Set signal generator output level just below that required to saturate if. amplifiers (indicated by clipping at A4A6TP15). Adjust A4A6L19 and A4A6T3 to provide peak waveform at A4A6TP15. If necessary, reduce signal generator output during peaking procedure to prevent amplifier saturation.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 19 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
33	Disconnect		Turn power off. Disconnect all test equipment. Remove A4 from module extender. Replace dust cover on A4. Replace A4 in 618T-( ) chassis.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 20 of 20)
Figure 714



NOTES:
① TO TEST OR REPLACE COMPONENTS ON CIRCUIT BOARD A3 METAL COVER MUST BE REMOVED.
② CIRCUIT BOARDS A2 AND A4 ARE LOCATED UNDER COVER AND BETWEEN CIRCUIT BOARDS A1 AND A6.
③ REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A4.
④ A2L8 IS INCORPORATED IN ALL MODULES THROUGH MCN 7236.
A2C128 IS INCORPORATED IN ALL MODULES WITH MCN 7237 AND ABOVE.

kHz-Frequency Stabilizer A4, Checks and Adjustments
Figure 715

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM HP-711A Power Supply Variable dc voltage source (+25 to +35 V, 0.40 A) Rf dummy load	Refer to figure 717 for location of all test points on A5 and module extender. Remove low-voltage power supply A5 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A5 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect low-voltage power supply A5 through module extender to 618T-( ) chassis. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transient blanker trigger check		Connect Fluke 801B VTVM to A5J3.			
			Check voltage at A5J3.	+17.82 to +18.18 v.	Refer to step 4 of this test procedure.	Refer to step 4 of this test procedure.
			Ground A5J1 to 618T-( ) chassis.			
			Check voltage at A5J3.	0 v.		
			Unground A5J1.			

Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 1 of 4)
Figure 716

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Transient blanker input voltage check		Connect HP 410B VTVM dc probe to A5J2. Check voltage at A5J2.	+27 to +28 Vdc.	Relay K1.	
4	Transient blanker adjustment		Set 714E-( ) to OFF. Connect A5 to module extender. Connect variable dc voltage source to 618T-( ) (positive lead to either P40-4 or P40-16 and negative lead to chassis). Set variable dc voltage source to provide +27.5 V. Connect HP 410B VTVM dc probe to TP5 on module extender. NOTE: In the following procedure, the dc voltage must be increased fast enough to prevent Q2 from burning out. Increase dc voltage until voltage at TP5 on module extender drops to not more than 0.1 Vdc. The drop should occur when dc voltage reaches +31.5 to +32.5 V. If it does not, set variable dc voltage to +32 V and adjust A5R5 until voltage at TP5 on module extender drops to not more than 0.1 Vdc.			

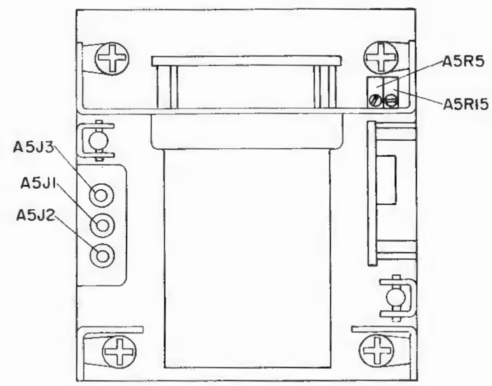
Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 2 of 4)
Figure 716

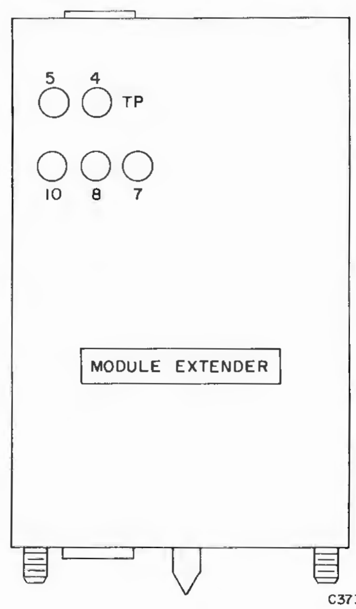
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4 (Cont)			Repeat this entire test procedure. Disconnect variable dc voltage source and HP-410B VTVM.			
5 (Cont)	+18-v regulator adjustment		Connect 678Z-1 J2-FREQ DIV jack to J2 in frequency divider A1. NOTE: B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of performing the above step. +20 Vdc can be used from 1A2J9 or ±16 Vdc from 1A2J2. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 714E-( ) to AM, any frequency. Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust LEVEL SET control until 678Z-1 FUNCTION METER indicates +10. CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME. Set 678Z-1 FUNCTION SELECTOR switch to +18V.			

Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 3 of 4)
Figure 716

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Operate X10 METER SENSITIVITY switch several times. Disconnect 678Z-1 Function Test Set.	678Z-1 FUNCTION METER must indicate 0 ±1 scale division.	A5R15 incorrectly adjusted.	Adjust A5R15 to provide required indication.
6	+130-v supply check		Set 618T-( ) front panel meter selector switch to 130V.	Front panel meter must indicate in red area.	Components in +130-V supply circuit in A5.	Check components in +130-V supply circuit in A5.
7	Disconnect		Turn power off. Remove A5 from module extender. Remove module extender from 618T-( ) chassis. Replace A5 in 618T-( ) chassis.			

Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 4 of 4)
Figure 716





Low-Voltage Power Supply A5,
Checks and Adjustments
Figure 717

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Rf dummy load	Refer to figure 719 for location of all test points on A6 and module extender. Remove A6 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A6 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect electronic control amplifier A6, through A6 module extender, to 618T-( ) chassis. Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	A6Q1 output/ A6Q2 input voltage check		Connect HP-410B VTVM dc probe to A6J1. Check voltage at A6J1.	+5.8 to +7 vdc.	A6G1, A6Q1, and associated circuits.	Check A6G1, A6Q1, and associated circuits.
3	A6Q4 output voltage check		Connect HP-410B VTVM dc probe to A6J2. Check voltage at A6J2.	+5.1 to +6.1 vdc.	A6Q2, A6Q3, A6Q4, and associated circuits.	Check A6Q2, A6Q3, A6Q4, and associated circuits.

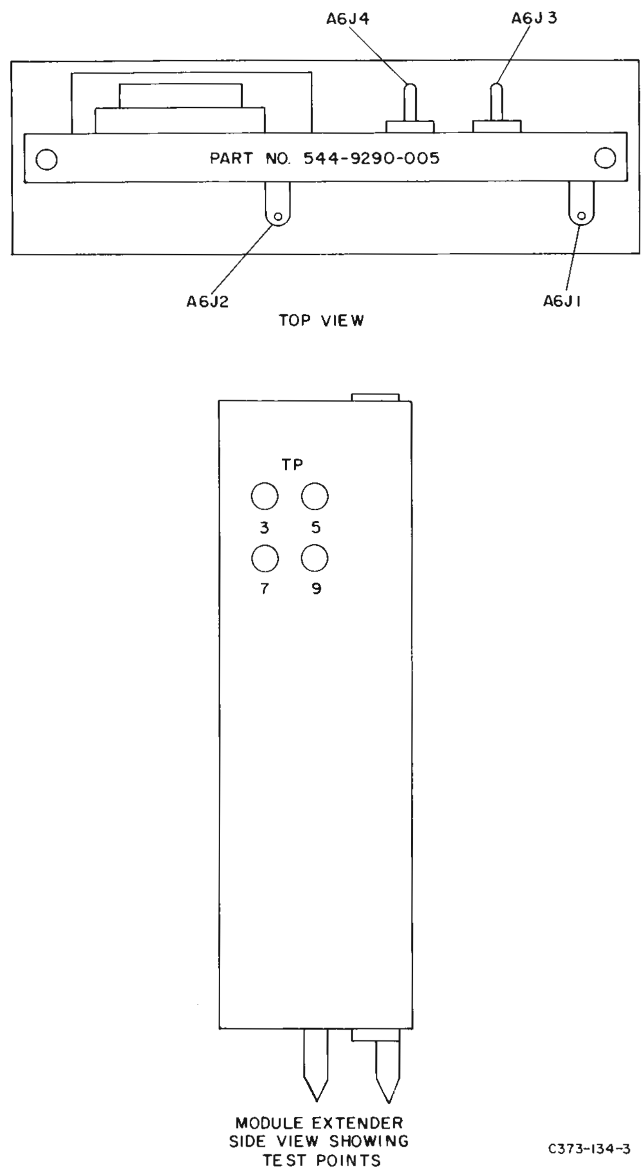
Module Checks and Adjustments, Electronic Control Amplifier A6 (Sheet 1 of 3)
Figure 718

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4	Push-pull amplifier output voltage check		Connect HP-410B VTVM dc probe to A6J3. Connect HP-410B VTVM common probe to A6J4. Check voltage between A6J3 and A6J4. Disconnect HP-410B VTVM.	+0.13 to +0.17 vdc.	A6Q5, A6Q6, A6Q7, and associated circuits.	Check A6Q5, A6Q6, A6Q7, and associated circuits.
5 (Cont)	Amplifier gain check		Set 714E-( ) to AM, X.500 MHz. Connect HP-410B VTVM dc probe to TP9 on module extender. Connect Ballantine 310A VTVM between A6J3 and A6J4. <u>NOTE:</u> Isolate vtvm primary power third wire ground when making balanced output readings. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Rotate large roller coil gear on top of power amplifier A11 in either direction until amplifier input voltage at TP9 on module extender is 0 ±0.2 V.			

Module Checks and Adjustments, Electronic Control Amplifier A6
Figure 718 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Check voltage between A6J3 and A6J4.	Between +18 and +30 v.	A6Q5, A6Q6, A6Q7, and associated circuits.	Check A6Q5, A6Q6, A6Q7, and associated circuits.
				If voltage is normal, roller coil gear should return to tuned position when released.	Insufficient torque or mechanical binding of roller coil mechanism.	Check for sufficient torque and mechanical binding of roller coil mechanism.
6	Disconnect		Turn power off. Disconnect all test equipment. Remove A6 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A6. Replace A6 in 618T-( ) chassis.			

Module Checks and Adjustments, Electronic Control Amplifier A6 (Sheet 3 of 3)
Figure 718



Electronic Control Amplifier A6,
Checks and Adjustments
Figure 719

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Vom HP-410B VTVM Rf dummy load	WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 3-PHASE HIGH-VOLTAGE POWER SUPPLY A7. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A7 REMOVED. Remove A7 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A7 to perform this step. Replace dust cover on A7 and replace A7 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12 from 618T-( ) chassis. Connect A12 through module extender to 618T-( ) chassis. Remove dust cover from A12. Unless otherwise specified, the steps are performed with the 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.			
2	1500-v check		Set 618T-( ) front panel meter selector switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).	Front panel meter should indicate in red area.		

Module Checks and Adjustments, 3-Phase High-Voltage Power Supply A7
Figure 720 (Sheet 1 of 2)

618T-1/2/3 Airborne SSB Transceivers

618T-1B/2B/3B Airborne SSB Transceivers

618T-( ) Airborne SSB Transceiver
Figure 1

618T-( ) Airborne SSB Transceiver - Description and Operation

1. GENERAL.

This manual contains information for disassembly, cleaning, inspection, repair, assembly, alignment, testing, adjustment, and troubleshooting of the 618T-( ) Airborne SSB Transceiver (refer to figure 1).

All procedures in this manual are to be performed in a maintenance shop with the proper test equipment.

Figure 2 is a list of equipment covered in this manual.

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
618T-1	Airborne SSB transceiver	522-1230-000
618T-1	Airborne SSB transceiver with squelch capability	522-1230-021
618T-1	Airborne SSB transceiver with narrow-band selectivity	522-1230-022 (See note 1.)
618T-1	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1230-023 (See note 1.)
618T-1B	Airborne SSB transceiver with squelch	522-4828-001
618T-1B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4828-002 (See note 1.)
618T-2	Airborne SSB transceiver	522-1501-000
618T-2	Airborne SSB transceiver with squelch capability	522-1501-041
618T-2	Airborne SSB transceiver with narrow-band selectivity	522-1501-043 (See note 1.)
618T-2	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1501-044 (See note 1.)
618T-2B	Airborne SSB transceiver with squelch	522-4829-001
618T-2B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4829-002 (See note 1.)
618T-3	Airborne SSB transceiver	522-1660-000
618T-3	Airborne SSB transceiver with squelch capability	522-1660-031
618T-3	Airborne SSB transceiver with narrow-band selectivity	522-1660-033 (See note 1.)
618T-3	Airborne SSB transceiver with narrow-band selectivity and squelch	522-1660-034 (See note 1.)

Equipment Covered
Figure 2 (Sheet 1 of 3)

LIST OF EFFECTIVE TEMPORARY REVISION PAGES

NO	SUBJECT	PAGE	DATE	NO	SUBJECT	PAGE	DATE

This page replaces List of Effective Temporary Revision Pages dated Nov 1/75.

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
618T-3B	Airborne SSB transceiver with squelch	522-4830-001
618T-3B	Airborne SSB transceiver with narrow-band selectivity and squelch	522-4830-002 (See note 1.)
618T-4	Airborne SSB transceiver with narrow-band selectivity	622-2586-002
618T-4	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2586-001
618T-4B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2587-001
618T-5	Airborne SSB transceiver with narrow-band selectivity	622-2588-002
618T-5	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2588-001
618T-5B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2589-001
618T-6	Airborne SSB transceiver with narrow-band selectivity	622-2590-002
618T-6	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2590-001
618T-6B	Airborne SSB transceiver with narrow-band selectivity and squelch	622-2591-001
516H-1	Power supply	622-1204-000

NOTE 1: Narrow-band transceivers have been given different type and part numbers in order to more easily identify them from their wide-band equivalents. Consequently, the following nomenclature changes have been made.

NOMENCLATURE CHANGE			
OLD NOMENCLATURE		TO NEW NOMENCLATURE	
COLLINS TYPE	COLLINS PART NUMBER	COLLINS TYPE	COLLINS PART NUMBER
618T-1	522-1230-023	618T-4	622-2586-001
618T-1	522-1230-022	618T-4	622-2586-002
618T-1B	522-4828-002	618T-4B	622-2587-001
618T-2	522-1501-044	618T-5	622-2588-001
618T-2	522-1501-043	618T-5	622-2588-002
618T-2B	522-4829-002	618T-5B	622-2589-001
618T-3	522-1660-034	618T-6	622-2590-001
618T-3	522-1660-033	618T-6	622-2590-002
618T-3B	522-4830-002	618T-6B	622-2591-001

Equipment Covered
Figure 2 (Sheet 2)

NOTE 2: The following service bulletin changes have also been incorporated:

618T-1; service bulletins are now applicable to all 618T-1 and 618T-4 units.

618T-1B; service bulletins are now applicable to all 618T-1B and 618T-4B units.

618T-2; service bulletins are now applicable to all 618T-2 and 618T-5 units.

618T-2B; service bulletins are now applicable to all 618T-2B and 618T-5B units.

618T-3; service bulletins are now applicable to all 618T-3 and 618T-6 units.

618T-3B; service bulletins are now applicable to all 618T-3B and 618T-6B units.

NOTE 3: Since the information covering the new type numbers is already available in this manual under the old nomenclature, the new nomenclature will not be incorporated. Refer to this table for cross-reference between old and new nomenclature.

Equipment Covered
Figure 2 (Sheet 3)

2. PURPOSE OF EQUIPMENT.

The 618T-( ) Airborne SSB Transceiver is used for voice, CW, or data communications in the high-frequency band. The 618T-1/2/3 operates from 2.000 through 29.999 MHz in 1-kHz increments. The 618T-1B/2B/3B operates from 2.0000 through 29.9999 MHz in 0.1-kHz increments.

Figure 3 is a list of associated equipment. Refer to the applicable manual for detailed information about the equipment listed in figure 3.

MODEL NO	COLLINS PART NO.	DESCRIPTION	FUNCTION
714E-1 714E-2 714E-2A 714E-2B 714E-3 714E-3B 714E-3D 714E-3F 714E-3G	522-1261-000 522-2213-XXX 522-2892-XXX 787-6377-XXX 522-2457-XXX 522-3903-XXX 777-1029-XXX 787-6378-XXX 787-6557-001	Radio set control	Provides remote control of 618T-1, 618T-2, and 618T-3.
714E-6 714E-6 714E-6 714E-6A	522-4466-001 772-5271-001 772-5272-001 777-1225-001	Radio set control	Provides remote control of 618T-1B, 618T-2B, and 618T-3B.
390J-1 390J-2	522-1658-000 522-3353-005/015	Shockmount	Provides shock isolation mounting between 618T-( ) and aircraft.
516H-1	522-1204-00	Power supply (618T-1/1B only)	Provides dc and ac power for 618T-1/1B.
180L-2 180L-3 180L-3A AT-101 AT-101A AT-102 AT-102A AT-107 180R-6 180R-7 180R-8 180R-12 490S-1 490T-1	506-1199-004 522-0092-000 522-0293-004 522-1375-000 522-3323-000 522-1376-000 522-3324-000 787-6370-001 522-0998-005 522-1416-005 522-1422-004 522-3159-000 792-6140-001 522-3443-000	Antenna coupler system	Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.

Associated Equipment
Figure 3 (Sheet 1 of 2)

EQUIPMENT	COLLINS PART NO.	DESCRIPTION	FUNCTION
490T-1A 490T-2 490R-1 490R-2 490R-3 490R-4	522-3444-001 522-3445-000 522-3897-000 522-4096-001 522-3535-000 522-4787-001		
437R-1	522-3635-00	Helical monopole loading coil	Tunable loading coil used in long-wire antenna installations where length of antenna is restricted by vehicle size.

Associated Equipment (Sheet 2 of 2)
Figure 3

3. EQUIPMENT SPECIFICATIONS.

Figure 4 lists the equipment specifications for the 618T-( ) Airborne SSB Transceiver.

CHARACTERISTIC	SPECIFICATION
Design specifications	
ARINC characteristic	ARINC Document No. 533, Airborne HF SSB/AM System. ARINC Document No. 404, Air Transport Equipment Cases and Racking.
TSO	FAA TSO C-31b and C-32b.
Physical specifications	
Size	10-1/8 in. wide, 7-5/8 in. high, and 22-3/16 in. long.
Weight	50 lb (nominal).

Equipment Specifications (Sheet 1 of 4)
Figure 4

CHARACTERISTIC	SPECIFICATION
Environmental specifications	
Temperature	-40 to +55 °C (-40 to +131 °F) continuous. +55 to +70 °C (+131 to +158 °F) 30 minutes. -65 °C (-85 °F) storage.
Humidity	Up to 95% relative humidity at +50 °C (+122 °F) for 48 hours.
Altitude	Pressure equivalent of 30,000 ft with externally supplied cooling air.
Shock	With isolators 12 impact shocks, 15 g, 11 ms minimum. 4 impact shocks, 30 g, 11 ms minimum. Without isolators 18 impact shocks, 6 g, 10 ms minimum.
Electrical specifications	
Power requirements	618T-1/1B with 516H-1 Power Supply 22.5 to 30.25 vdc, approximately 1150 w. NOTE: Approximately 1030 w are consumed by the 516H-1 Power Supply. 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 165 w. 618T-2/2B 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 160 w. 103.5 to 126.5 vac (line to neutral), 380 to 420 Hz, 3-phase, approximately 1000 w. 22.5 to 30.25 vdc, approximately 120 w. 618T-3/3B 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately 100 w. 22.5 to 30.25 vdc, approximately 1150 w.

Equipment Specifications (Sheet 2 of 4)
Figure 4

CHARACTERISTIC	SPECIFICATION
Frequency range	618T-1/2/3 2.000 to 29.999 MHz in 1.0-kHz increments. 618T-1B/2B/3B 2.0000 to 29.9999 MHz in 0.1-kHz increments.
Frequency channels	618T-1/2/3 28,000. 618T-1B/2B/3B 280,000.
Frequency stability	0.8 ppm.
Channel change time	8 s average (independent of external antenna tuner).
Warmup time	15 minutes
Types of emission	3A3H: compatible am (that is, usb with the carrier inserted). 3A3J: ssb (that is, am with the carrier suppressed (usb or lsb)). Cw: 1-kHz tone in usb.
Transmit characteristics	
Rf power output	Ssb: 400-W pep +2, -1 dB. Am: 125-W carrier ±1 dB. Cw: 125-W locked key ±1 dB.
Rf output impedance	51.5 ohms.
Audio input impedance	80 ohms unbalanced, 600 ohms balanced.
Audio-frequency response (618T-( ) without narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 3000 Hz.
Audio-frequency response (618T-( ) with narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 2500 Hz.
Distortion	SSB: third-order distortion products down at least 30 dB AM: less than 10% at 80% modulation with 1000 Hz and 1000 μV at the antenna.

Equipment Specifications
Figure 4 (Sheet 3)

CHARACTERISTIC	SPECIFICATION
Receive characteristics	
Sensitivity	SSB: 1 μV for 10-dB snr ratio. AM: 3 μV modulated 30% at 1000 Hz for a 6-dB snr ratio.
Selectivity (618T-( ) without narrow-band selectivity)	SSB: 300 to 3000 Hz, not more than 5-dB variation. 6.0 kHz, 60 dB down. AM: 6.0 kHz, not more than 5-dB variation. 14.0 kHz, not less than 60 dB down.
Selectivity (618T-( ) with narrow-band selectivity)	SSB: 2.2 kHz, 6 dB down. 4.0 kHz, 60 dB down. AM: 6.0 kHz, not more than 5-dB variation. 14.0 kHz, not less than 60 dB down.
Agc characteristics	Maximum variation of audio output is 6 dB for input signals from 10 to 100,000 μV. No overload below 1-V signal input.
If rejection	80 dB minimum.
Audio output power	300 mW into 300-ohm load with 1000-μV input modulated 30% at 1000 Hz.
Audio distortion	Less than 10% with 1000-μV input modulated 80% at 1000 Hz.
Audio-frequency response (618T-( ) without narrow-band selectivity)	5-dB peak-to-valley ratio from 300 to 3000 Hz.
Audio-frequency response (618T-( ) with narrow-band selectivity).	6-dB peak-to-valley ratio from 300 to 2500 Hz.
Selective calling (SELCAL) output level	Not less than 0.1 V into 500-kΩ resistive load with 5-μV input modulated 30% at 1000 Hz.
Image and spurious frequency response	60 dB minimum below desired frequency relative to 5-μV input.

Equipment Specifications (Sheet 4 of 4)
Figure 4

4. EQUIPMENT DESCRIPTION.

A. Mechanical Description.

The 618T-( ) Airborne SSB Transceiver, housed in a standard 1-ATR case, is 10-1/8 inches wide, 7-5/8 inches high, and 22-3/16 inches long and weighs 50 pounds (nominal). A PHONE jack, MIC jack, meter, meter selector switch, and SQUELCH IN-OUT switch are located on the front panel of the 618T-( ). Three meter selector switch positions check internal power supply voltages of the 618T-( ). The fourth switch position monitors the power amplifier plate current, and the fifth position, CAL TONE (618T-1/2/3 only), compares the operating frequency of the 618T-( ) with WWV. A 400-Hz blower provides forced air cooling, and all antenna connections are located on the front panel of the 618T-( ). The SQUELCH IN-OUT switch allows the selection of squelch or no squelch modes of reception. All electrical connections are made at a 60-pin connector located at the rear of the unit. A separate grounding pin is located beside the 60-pin connector.

The 618T-( ) features modular construction. Figure 5 lists the module complement for the specific versions of the 618T-( ). Each module is equipped with locating pins to prevent improper location of the module and permit proper alignment of the connectors before engagement. There are no mechanical linkages between any modules in the 618T-( ). Maintenance of the 618T-( ) is simplified by the modular construction, and color-coded test points on the modules permit troubleshooting without removing the modules from the chassis. Transistors, widely used in the 618T-( ), increase reliability and reduce weight and power consumption.

MODULE	FUNCTION	COLLINS PART NUMBER
A1	Frequency divider (618T-1/2/3 only)	546-2142-005
A2	Rf oscillator	544-9285-005 (early model) 528-0251-005 (late model)
	Rf oscillator including squelch circuits	528-0690-001 (early model) 528-0690-002 (late model)
A3	If translator (618T-( ) without narrow-band selectivity)	544-9286-000
	If translator (618T-( ) with narrow-band selectivity)	528-0720-001
A4	kHz-frequency stabilizer (618T-1/2/3 only)	544-9288-005 (early model) 528-0112-005 (late model)
A5	Low-voltage power supply	544-9292-00
A6	Electronic control amplifier	544-9290-005
A7	3-phase high-voltage power supply (618T-2/2B only)	544-9291-00 (early model, MCN 17,999 and below) (late model, MCN 18,000 and above)

618T-( ) Module Complement (Sheet 1 of 3)
Figure 5

MODULE	FUNCTION	COLLINS PART NUMBER
A8	27.5-Vdc high-voltage power supply (618T-3/3B only)	545-4971-000 (early model, MCN 4249 and below) (late model, MCN 4250 and above)
A9	AM/audio amplifier	544-9287-000 (early model) 546-6053-000 (late model)
A10	MHz-frequency stabilizer	544-9289-005 (early model) 528-0329-005 (late model)
A11	Power amplifier	544-9283-000
A12	Rf translator (618T-1/2/3 only) (618T-1/2/3 only) (618T-1B/2B/3B only)	544-9284-00 (early model) 528-0113-000 (late model) 528-0682-001
A12A1	Autopositioner-submodule (618T-1/2/3 only) (618T-1B/2B/3B only)	546-6873-017 528-0683-001
A12A2	Variable-frequency oscillator (vfo) submodule (618T-1/2/3 only)	522-1380-003 (70K-3) 522-2424-004 (70K-5) 522-3552-000 (70K-9)
A13	Single-phase high-voltage power supply (618T-1/1B only)	545-5858-000

618T-( ) Module Complement
Figure 5 (Sheet 2)

MODULE	FUNCTION	COLLINS PART NUMBER
A15	Frequency divider-stabilizer (618T-1B/2B/3B only)	528-0671-001
A16	Control data converter (618T-1B/2B/3B only)	528-0641-001
	Chassis (618T-1/2/3 only)	544-9293-000
	Chassis with squelch capability (618T-1/2/3 only)	544-9293-000 (MCN 2, 332 and above)
	Chassis (618T-1B/2B/3B only)	757-8930-001

618T-( ) Module Complement (Sheet 3 of 3)
Figure 5

B. Electrical Description.

The 618T-( ) Airborne SSB Transceiver is remotely controlled completely by the 714E-( ) Radio Set Control. For the 618T-1/2/3, any one of 28,000 communication channels, spaced 1 kHz apart in the 2.000- through 29.999-MHz range, can be directly selected at the 714E-1/2( )/3( ) Radio Set Control. For the 618T-1B/2B/3B, any one of 280,000 communication channels, spaced 0.1 kHz apart in the 2.0000- through 29.9999-MHz range, can be directly selected at the 714E-6( ) Radio Set Control. The function selector control on the 714E-( ) selects the desired mode of operation: usb, lsb, am, cw, or data.

NOTE: All of the previously mentioned operational modes are not available on some versions of the 714E-( ) Radio Set Control. Refer to the 714E-1/2( )/3( ) Radio Set Control Overhaul Manual, Collins part number 523-0759328 or to the 714E-6( ) Radio Set Control Overhaul Manual, Collins part number 523-0759269, for a listing of the functional modes of operation available on various versions of the 714E-( ).

An rf sensitivity control on the 714E-( ) controls the rf sensitivity of the 618T-( ) in all operational modes except data, in which case the rf sensitivity is set within the 618T-( ) for maximum receive sensitivity.

In 618T-( ) installations where the squelch function is used, the rf sensitivity control on the 714E-( ) is used as a squelch control that adjusts the squelch circuit within the 618T-( ) to the desired operating level.

The operating frequency of the 618T-( ) is crystal controlled and stabilized to within 0.8 part per million. The 618T-( ) is capable of 400 watts pep output in sideband operations and 125 watts carrier in am, cw, or data operations. Transmit output impedance is 52 ohms unbalanced.

The tuned circuits and output circuit of the 618T-( ) are tuned automatically by an Autopositioner and a servo motor. The receiver portion of the 618T-( ) is muted during tuning. The average tuning time of the 618T-( ), independent of an external antenna tuner, is 8 seconds.

C. Controls and Indicator.

The controls and indicator located on the 618T-( ) front panel are shown in figure 6. Figure 7 lists all controls and indicator and describes the functions of each.

D. Model Differences.

There are nine models of the 618T-( ). The following paragraphs describe differences between the nine models.

(1) 618T-1 Airborne SSB Transceiver, Collins part number 522-1230-00, 522-1230-021, 522-1230-022*, or 522-1230-023*.

The 618T-1 retrofits most 618S-( ) installations with no changes necessary in the aircraft wiring. The 516H-1 Power Supply required is mountable in the 416W-1 Power Supply shockmount. The primary power required for the 618T-1 is listed in figure 4. The 618T-1 (Collins part number 522-1230-00) does not have audio squelch capability. The 618T-1 (Collins part number 522-1230-021) has audio squelch capability. The 618T-1 (Collins part number 522-1230-022) has narrow-band selectivity. The 618T-1 (Collins part number 522-1230-023) has narrow-band selectivity and audio squelch capability.

(2) 618T-1B Airborne SSB Transceiver, Collins part number 522-4828-001 or 522-4828-002*.

The 618T-1B retrofits most 618S-( ) installations with the addition of four control wires from the 618T-1B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-1B are identical to those of the 618T-1. The 618T-1B (Collins part number 522-4828-001) has audio squelch capability. The 618T-1B (Collins part number 522-4828-002*) has audio squelch and narrow-band selectivity capability.

(3) 618T-2 Airborne SSB Transceiver, Collins part number 522-1501-00, 522-1501-041, 522-1501-043*, or 522-1501-044*.

Primary power requirements for the 618T-2 are listed in figure 4. The 618T-2 (Collins part number 522-1501-00) does not have audio squelch capability. The 618T-2 (Collins part number 522-1501-041) has audio squelch capability. The 618T-2 (Collins part number 522-1501-043*) has narrow-band selectivity. The 618T-2 (Collins part number 522-1501-044*) has audio squelch and narrow-band selectivity.

*The above part numbers are obsolete and are replaced with type numbers 618T-4/4B/5/5B/6/6B. Refer to figure 2 for cross-reference of old part numbers to new part numbers.

(4) 618T-2B Airborne SSB Transceiver, Collins part number 522-4829-001 or 522-4829-002*.

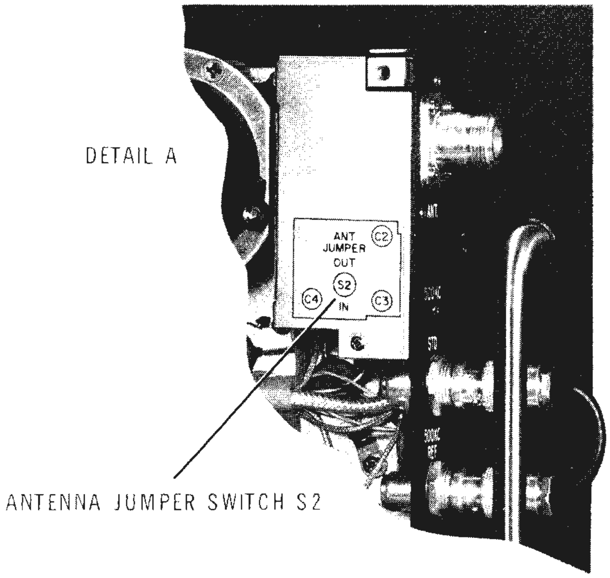
The 618T-2B retrofits 618T-2 installations with the addition of four control wires from the 618T-2B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-2B are identical to those of the 618T-2. The 618T-2B (Collins part number 522-4829-001) has audio squelch capability. The 618T-2B (Collins part number 522-4829-002*) has audio squelch and narrow-band selectivity.

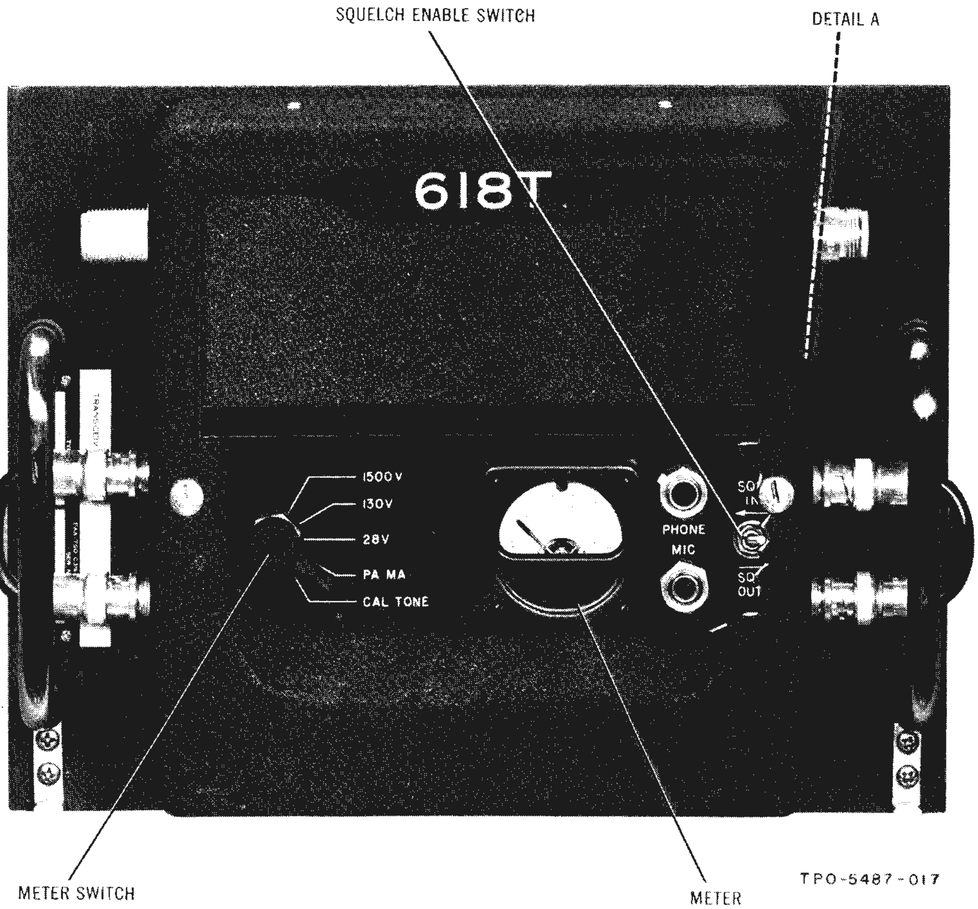
(5) 618T-3 Airborne SSB Transceiver, Collins part number 522-1660-00, 522-1660-031, 522-1660-033*, or 522-1660-034*.

Primary power requirements for the 618T-3 are listed in figure 4. The 618T-3 may also retrofit some 618S-( ) installations. Retrofit installation data is contained in the 618T-( ) Maintenance Manual, Collins part number 520-5970004. The 618T-3 (Collins part number 522-1660-00) does not have audio squelch capability. The 618T-3 (Collins part number 522-1660-031) has audio squelch capability. The 618T-3 (Collins part number 522-1660-033*) has narrow-band selectivity. The 618T-3 (Collins part number 522-1660-034*) has audio squelch and narrow-band selectivity.

(6) 618T-3B Airborne SSB Transceiver, Collins part number 522-4830-001 and 522-4830-002*.

The 618T-3B retrofits 618T-3 installations with the addition of four control wires from the 618T-3B main connector to the 714E-6( ) Radio Set Control to provide 0.1-kHz frequency control. Primary power requirements for the 618T-3B are identical to those of the 618T-3. The 618T-3B (Collins part number 522-4830-001) has audio squelch capability. The 618T-3B (Collins part number 522-4830-002) has audio squelch and narrow-band selectivity.





Typical Control and Indicator Locations
Figure 6

CONTROL/INDICATOR	FUNCTION
Meter switch (S1)	Places meter M1 in correct circuit to indicate condition of internal power supplies (1500V, 130V, and 28V positions) or power amplifier plate current (PA MA position). CAL TONE position activates circuitry that is used to compare the operating frequency of the 618T-( ) to WWV (618T-1/2/3 only).
ANT JUMPER switch (S2) (chassis with MCN 3025 and above)	Places antenna transfer relay K5 in circuit (when set to IN) for 618T-( ) that uses common antenna for both transmit and receive modes. S2 is located in 618T-( ) relay compartment.
Squelch enable switch (S3)	Activates audio squelch circuitry within the 618T-( ).
Meter (M1)	Indicates the conditions of internal power supplies or power amplifier plate current.

Control and Indicator Functions
Figure 7

5. THEORY OF OPERATION.

A. General.

The 618T-( ) Airborne SSB Transceiver provides usb, lsb, am, cw, and data modes of operation. The 618T-1/2/3 provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 1-kHz increments. The 618T-1B/2B/3B provides crystal-controlled operation in the frequency range from 2.000 through 29.999 MHz in 0.1-kHz increments. The following is the functional theory of operation of the 618T-( ). Refer to figures 17 and 18. Figure 17 is a functional block diagram of the 618T-1/2/3; figure 18 is a functional block diagram of the

618T-1B/2B/3B. Where specific differences between versions of the 618T-( ) exist, references to the applicable block diagram will be made. Transmit signal paths and functions common to both transmit and receive are shown in solid lines. Receive only functions are shown in dashed lines. Modules are defined by dashed lines. Begin with the transmit function at the left of the applicable illustration.

B. Functional Theory of Operation.

(1) Transmit Mode.

The AM/audio amplifier, A9, provides three stages of amplification in the transmit mode. For voice, the unbalanced input (80 ohms) is amplified by audio amplifiers A9Q1 and A9Q2. An additional audio amplifier, A9Q8, is provided for 600-ohm balanced inputs and for CW. The CW is produced by amplifying the 1-kHz tone from keyers A1Q12 and A1Q13 of frequency divider A1 in the 618T-1/2/3 (see figure 17). In the 618T-1B/2B/3B, the 1-kHz tone is generated by A16Q9 and A16Q10 of control data converter A16. Variable level adjustments are provided in amplifier stages A9Q8 and A9Q1 to equalize voice and CW at the output of amplifier A9Q2.

Amplifier A9Q2 provides an output to the headset for sidetone monitoring. This sidetone output is also variable at the 618T-( ) front panel so that receive and sidetone signals can be approximately equal. The transmit signal path continues from audio amplifier A9Q2 to a balanced modulator in if translator A3. There the audio is combined with a 500-kHz carrier from rf oscillator A2. Details of the balanced modulator are shown in figure 21.

The balanced modulator produces intelligence as sidebands of the 500-kHz carrier and then suppresses the carrier. The double sideband signal appears at the output of the balanced modulator and is amplified by ALC (automatic load control) amplifier A3Q1. The 1-kHz signal for CW is adjusted to a fixed value and does not vary in amplitude. The voice signal may overdrive power amplifier A11 if the operator speaks too loudly or during voice peaks. Feedback from the grid circuit of the power amplifier A11 is generated if the driving signal causes power amplifier grid current to flow. The feedback voltage, in turn, reduces the gain of alc amplifier A3Q1. In this manner, drive to power amplifier A11 is held at optimum value near grid current threshold. Details of the alc circuits are shown in figure 15.

The transmit signal continues from alc amplifier A3Q1 through if. amplifier A3Q2 and is then fed to one of two mechanical filters FL1 or FL2. Either FL1 or FL2 is selected by the mode selector switch (in USB or LSB position) on the radio set control. Only one sideband is needed since both contain identical intelligence. The bandpass of FL1 and FL2 is 3 kHz (nominal). Beyond the selected filter, the signal is a suppressed carrier containing one set of sidebands that represent the voice modulation.

Since the suppression of the carrier prevents a conventional AM receiver from detecting the SSB signal, the carrier must be reinserted for compatibility with conventional AM receivers. This happens when the function selector switch on the radio set control is switched to the AM position. In the AM mode of operation, the USB filter is also selected. Note that the transmit signal from the mechanical filter goes directly to if amplifier A3Q4, bypassing if amplifier A3Q3 (and A3Q7 for if translator module Collins part number 528-0720-001). If. amplifier A3Q4 is controlled by tgc/adc (transmit gain control/automatic drive control) amplifier A3Q6, a dc amplifier that operates to reduce the gain of if amplifier A3Q4.

In all modes except SSB, the tgc circuit maintains the rf carrier level constant within 1 db to compensate for varying rf gain over the operating range of the 618T-( ). The tgc does not function in the SSB mode since there is no carrier for tgc reference. The feedback voltage applied to tgc/adc amplifier A3Q6 is a rectified sample of the carrier obtained from a linear demodulator and is proportional to the average instantaneous peak carrier amplitude. Refer to figure 16 for additional circuit details.

The adc circuit provides override or additional control of if amplifier A3Q4 during the tuning cycle or if a 618T-( ) malfunction occurs resulting in excessive rf plate voltage or plate current swing. The feedback voltages applied to the adc and tgc circuits combine so that linear operation is maintained for power amplifier A11 during changes in rf gain and rf drive. The transmit signal, after amplification by if amplifier A3Q4, is applied to TX/RX switch CR6 and then to rf translator A12.

The transmit signal from the if translator is combined in lf mixer A12V1 with the output of vfo A12A2 in the 618T-1/2/3 and with the output of frequency divider-stabilizer A15 in the 618T-1B/2B/3B. For any of the operating frequencies, the output of lf mixer A12V1 will be 3.000 to 2.001 MHz in the 618T-1/2/3 and 3.0000 to 2.0001 MHz in the 618T-1B/2B/3B. This range is tuned by the variable if filter. The transmit signal goes from the variable if filter to one of two paths. If the operating frequency is below 7 MHz, the transmit signal is mixed in transmit 17.5-MHz mixer A12V2 and applied to the 14.5/15.5-MHz bandpass filter. If the operating frequency is above 7 MHz, the transmit signal goes from the variable if filter directly to hf transmit mixer A12V3, bypassing the 17.5-MHz mixer. The output of 17.5-MHz mixer A12V2 is the difference output between transmit signal and 17.5-MHz oscillator A12V10. The output of the 14.5/15.5-MHz bandpass filter is applied to the hf transmit mixer A12V3. The output of this mixer is the difference signal from 2 through 29 MHz. The hf oscillator, A12V11, operates below the transmit signal from 2 through 6 MHz and above the transmit signal from 7 through 29 MHz. The hf oscillator also doubles frequencies to provide heterodyning for operating frequencies 14 through 29 MHz. Figure 26 lists all hf oscillator A12V11 frequencies. The output of hf transmit mixer A12V3 is the transmit signal at the operating frequency. Transmit mixers A12V1, A12V2, and A12V3 provide linear amplification and are balanced mixers; that is, the oscillator signal for each mixer is simultaneously applied to one triode element for mixing and to the other element 180 degrees out of phase for cancellation (balancing out) of the oscillator output in the signal path. Extra circuits are provided in hf transmit mixer A12V3 to provide cancellation through a nulling adjustment. The balanced mixers help reduce spurious signals that can distort the signal within the 618T-( ) and/or radiate interference at unwanted frequencies. After the hf mixing, the transmit signal is amplified by linear voltage amplifiers in two stages; rf amplifier A12V4 and A12V5 and driver amplifier A12V6 and A12V7.

The driver stages provide sufficient rf voltage to drive power amplifier A11. Other than the alc, tgc, and adc circuits previously discussed, an additional feedback circuit for rf is also applied from power amplifier A11 plate circuit to drivers A12V6 and A12V7. This feedback provides power amplifier and driver neutralization.

The power amplifier develops approximately 125 watts carrier power in the AM mode and 400 watts pep. in SSB mode. The output of power amplifier A11 is coupled to an antenna coupler so that a variety of antennas may be driven with minimum vswr.

The power amplifier consists of two parallel connected tetrodes driving a pi network that combines the functions of tank circuit loading of the tubes and impedance matching to low-impedance unbalanced transmission lines.

Coarse tuning and antenna loading are performed by a motor that is actuated through band switching in rf translator A12. Fine tuning to resonance requires that the 618T-( ) be keyed after frequency selection. Since a carrier must be present, internal switching selects the AM mode for this operation. Resonance is achieved by discriminating between the rf input and output phase and applying the detected difference as an error voltage to a servo motor. The servo motor drives a roller coil to tune the tank circuit.

Electronic control amplifier A6 inverts the error signal (a dc voltage) to 400 Hz and amplifies it sufficiently to drive the servo motor.

Grid current flow is detected in this module and fed back as controlling bias voltage to the alc amplifier in the if. translator to control transmit if. gain. A sample of rf voltage is taken from the plate circuit, rectified, and applied as negative dc voltage to the tgc/adc amplifier in if. translator A3 for additional if. gain control.

(2) Receive Mode.

In the receive mode (the signal path traced from the top, right section of block diagrams, figures 17 and 18), the signal is coupled from the antenna directly to rf amplifiers A12V4 and A12V5. Conversion of the received signal in rf translator A12 in the receive mode is similar to that in the transmit mode except that separate unbalanced mixer circuit stages are used. The signal level is adjusted manually by varying the rf sensitivity control on the radio set control that controls the cathode bias of rf amplifiers A12V4 and A12V5 and thereby varies the signal-to-noise ratio. The rf sensitivity control is not an audio level control.

The received signal continues through rf translator A12 to receive lf mixer A12V8. The output of lf mixer A12V8 is applied directly to if. amplifier A3Q2 in if. translator A3 and to if. amplifier A9Q3 in AM/audio amplifier A9. This allows detection of receive signals in both SSB and AM modes regardless of the position of the function selector control on the radio set control.

Using the data or SELCAL (selective calling) output, AM reception is available with the function selector control in any position. Assume that the received signal is AM. The signal is amplified by if. amplifier A9Q3 and passed through 6-kHz mechanical filter A9FL1 whose selectivity allows both sidebands to pass. The signal from the mechanical filter is amplified by A9Q4, A9Q5, and A9Q6, detected by A9CR4, then provided with two alternate paths. For data and SELCAL, the detected signal passes through audio amplifier A9Q9. For other modes, the signal is applied to audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

Now assume that the received signal is ssb. The output of lf mixer A12V8 is amplified by if amplifier A3Q2 and then passed through mechanical filter A3FL1 or A3FL2, as selected at the radio set control. The signal from the mechanical filter is amplified by if amplifiers A3Q7 (for if translator module Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. Note that tgc/agc amplifier A3Q6 is used and biased for maximum gain operation of if amplifier A3Q4 in the receive mode. Also TX/RX switch CR6 is reverse biased to prevent entry of receive signals into rf translator A12. From if amplifier A3Q5, the signal goes to the product detector, where it is combined with a 500-kHz carrier from rf oscillator A2. The output of the product detector, the detected audio, is applied through audio amplifiers A9Q8, A9Q1, and A9Q2 and then to the headset.

A number of agc feedback loops are used in the 618T-( ). The ssb agc is developed from the audio signal. Agc is first applied to rf amplifiers A12V4 and A12V5. Two sources, other than manual rf sensitivity, combine to control this stage. A very strong signal causes the agc circuit in the plate circuit of receive lf mixer A12V8 to reduce the gain of both the lf mixer and the rf amplifier. A normal signal level is controlled by agc from detector A9CR2 and A9CR7 in AM/audio amplifier A9. The agc voltage is proportional to the rms audio output voltage from A9Q2.

(3) Frequency Selection and Translation, 618T-1/2/3.

Refer to the 618T-1/2/3 block diagram, figure 17, and to figure 19, a block diagram of the 618T-1/2/3 frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1/2/3 to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits are formed by the four frequency selector controls on the radio set control.

The 100-, 10-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of translator A12. These motors, A12A1B1 controlled by the 1-kHz frequency select control and A12A1B2 controlled by the 10- and 100-kHz frequency selector controls, mechanically coarse tune variable-frequency oscillator (vfo) A12A2. Autopositioner A12A1 also tunes the 2- to 3-MHz variable if. stage and fine tunes rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and rf driver turret switches A12S2 and A12S3.

The 1-MHz frequency select on the radio set control operates band motor A12B1 that mechanically fine tunes hf oscillator A12V11, rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4, and rf driver turret switches A12S2 and A12S3. It operates PA BAND switch A12S12 and also controls switching of 17.5-MHz oscillator A12V10 on operating frequencies below 7 MHz.

As an example, an operating frequency of 2.520 MHz has been selected at the radio set control (figure 19). Operation for the receive mode is the same except for the deletion of fine tuning of roller coil servo motor A12B2 and the antenna coupler in the receive mode. Fine tuning of these two stages is obtained by keying the transceiver.

The 500-kHz if. is produced in AM/audio amplifier A9 and if. translator A3 upon application of an audio signal at the microphone. This 500-kHz if. is applied to lf mixer A12V1, where it is mixed with the vfo A12A2 output. The injection frequency from vfo A12A2 varies between 3.5 and 2.5 MHz in 1000 1-kHz steps as the operating frequency selected at the remote control unit varies from X.000 to X.999 MHz. The vfo frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from 3.500 MHz (upper vfo limit).

Example: 2.520-MHz operating frequency
3.500-MHz vfo upper limit
-0.520 MHz
2.980 MHz = vfo frequency

The lf mixer A12V1 output is tuned to the mixed difference frequency, which is a variable if. in the range of 3 to 2 MHz. The exact variable if. is found by subtracting the 500-kHz if. input from the vfo injection frequency. For this example, the resultant is 2.480 MHz.

From the variable if. circuits, the signal is fed to 17.5-MHz mixer A12V2. The 17.5-MHz mixer, A12V2, raises the 3- to 2-MHz if. to a 14.5- to 15.5-MHz signal due to the possibility of harmonic distortion entering the transmitter bandpass at operating frequencies between 2 and 7 MHz. The 17.5-MHz mixer, A12V2, is fed by 17.5-MHz oscillator A12V10. The resultant frequency, after mixing occurs, is 14.5 to 15.5 MHz, found by subtracting the variable if. from the 17.5-MHz injection frequency.

The 15.020-MHz signal, the 17.5-MHz mixer A12V2 output, is filtered by a 14.5- to 15.5-MHz bandpass filter and fed to hf mixer A12V3. The hf mixer combines the 14.5- to 15.5-MHz signal with an injection frequency from hf oscillator A12V11. Figure 26 lists the hf oscillator A12V11 frequencies mechanically set up by band motor A12B1 for all settings of the 1-MHz frequency selector control on the radio set control. The hf mixer A12V3 output, the difference between the hf oscillator A12V11 injection frequency and the variable if. or 17.5-MHz mixer A12V2 output, is now the desired operating frequency originally selected at the radio set control.

The hf mixer A12V3 output is fed to rf amplifier turret switches A12S6, A12S7, A12S5, and A12S4 and to rf driver turret switches A12S2 and A12S3. Here the final output is fine tuned and mechanically controlled by band motor A12B1, dc motor A12A1B2, and dc motor A12A1B1. The signal is then fed to power amplifier A11 output tank switch A11S2.

The 8-position output tank switch, A11S2, is mechanically coarse tuned by the motor A11B1. From the output tank, the signal is fed to power amplifier roller coil A11L4 and then to the antenna coupler and antenna.

Power amplifier roller coil A11L4 and the antenna coupler must receive rf produced by keying the transceiver before fine tuning of these two elements is possible. The rf actuates roller coil servo motor A11B2 that mechanically tunes power amplifier roller coil A11L4.

(4) Frequency Selection and Translation, 618T-1B/2B/3B.

Refer to 618T-1B/2B/3B block diagram, figure 18, and to figure 20, a block diagram of 618T-1B/2B/3B frequency selection and translation circuits. The frequency selection loop enables automatic tuning of the 618T-1B/2B/3B to the desired operating frequency. The automatic tuning is the open circuit seeking type. Open circuits are formed by the five frequency selector controls on the radio set control.

The 100-, 10-, and 1-kHz frequency selector controls on the radio set control operate dc motors A12A1B1 and A12A1B2 in Autopositioner A12A1 of rf translator A12. These motors, A12A1B1 controlled by the 1-kHz selector control and A12A1B2 controlled by the 100- and 10-kHz selector controls, operate inverted binary coded decimal (BCD) switches A12A1S2, A12A1S4, and A12A1S6 that transform the 100-, 10-, and 1-kHz reentry code frequency control information, from the radio set control, to inverted BCD frequency control information that is fed directly to frequency divider-stabilizer A15. The 0.1-kHz reentry code frequency control information from the radio set control is converted to inverted BCD frequency control information by control data converter A16 and fed directly to frequency divider-stabilizer A15. A 1-kHz oscillator, A16Q9 and A16Q10, in control data converter A16 provides a 1-kHz tone during transceiver tuning and CW transmission.

Frequency divider-stabilizer A15 contains the circuits necessary to supply variable injection frequency from 2.5001 to 3.5000 MHz in 100-Hz increments to lf mixer stage A12V1 in rf translator A12. Eight circuits comprise the basic portion of frequency divider-stabilizer A15 (see figure 42 or 838).

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's) A15A7Q2 and A15A7Q4. One oscillator has a frequency range from 2.5001 to 3.0000 MHz, and the other has a range from 3.0001 to 3.5000 MHz. Transistor switches, operated by 100-kHz frequency control information from Autopositioner A12A2, turn on the proper oscillator depending on the frequency selected. The output frequency of vco A15A7 is controlled by a dc output voltage from phase/frequency discriminator A15A5 applied across voltage variable capacitors in the vco circuitry. The output of vco A15A7 is fed to isolation amplifier A15A8 before being applied to lf mixer A12V1. Isolation amplifier A15A8 provides a constant output impedance for vco A15A7. An additional output from isolation amplifier A15A8 is applied directly to variable frequency divider circuitry A15A1, A15A2, A15A3, and A15A4. The variable frequency divider circuitry divides the output frequency of isolation amplifier A15A8 25,001 to 35,000 times depending upon the frequency control information from the radio set control. When vco A15A7 is operating on the proper frequency, the output of the variable frequency divider circuit will always be 100 Hz. The output of variable frequency divider A15A1, A15A2, A15A3, and A15A4 is applied directly to phase/frequency discriminator A15A5. A second input to phase/frequency discriminator A15A5 is from reference divider A15A6. The input to reference divider A15A6 is a 100-kHz reference signal from rf oscillator A2. Reference divider A15A6, a 1000-to-1 frequency divider, provides a continuous output of 100 Hz, a reference used for comparison with the output of the variable frequency circuitry, that is as accurate as the reference signal.

When vco A15A7 is operating on the proper frequency, the dc output voltage from phase/frequency discriminator A15A5 will remain constant because the outputs from the variable frequency divider circuits and the reference divider will both be 100 Hz. A change in frequency control information from the radio set control causes the output of the variable divider circuits to vary from 100 Hz. The output voltage from the phase/frequency discriminator will change, causing the effective capacitance of the voltage variable capacitors to change. This will cause the vco to sweep across its entire frequency range until a frequency is reached where the output of the variable frequency divider circuit is again 100 Hz. At this point, the phase/frequency discriminator is able to lock the output frequency of vco A15A7. When vco A15A7 is phase locked, its output frequency is as accurate as the 100-kHz reference signal from rf oscillator A2.

The output frequency is applied to lf mixer A12V1 in rf translator A12, where it is mixed with the 500-kHz if. from AM/audio amplifier A9 and if. translator A3. From this point on, the frequency translation process of the 618T-1B/2B/3B is identical to the 618T-1/2/3 explained previously. The vco operating frequency may be found by subtracting the portion of the operating frequency to the right of the decimal point from the upper output frequency limit of the vco, 3.5000 MHz.

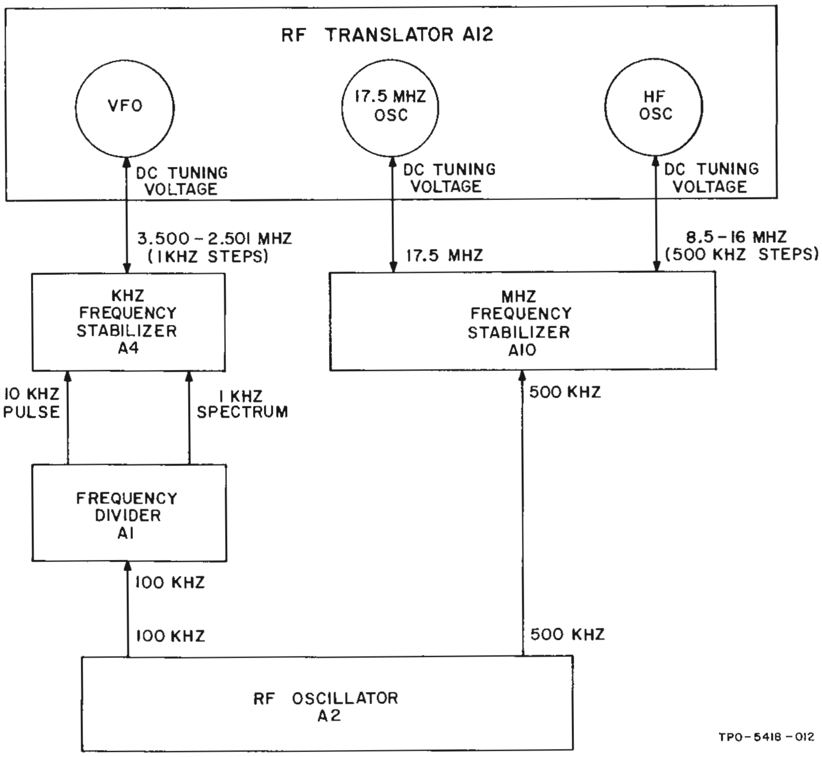
Example: 2.5200-MHz operating frequency

3.5000-MHz vco upper limit
-0.5200 MHz
———————
2.9800-MHz vco operating frequency

(5) Frequency Stabilizing Circuits, 618T-1/2/3.

Four 618T-1/2/3 Airborne SSB Transceiver modules stabilize the frequencies of the three injection oscillators in rf translator A12. These modules phase lock the frequencies of the oscillators with frequencies derived from a reference oscillator. The 500-kHz if. injection frequency is also derived from this reference oscillator. Therefore, each of the 28,000 possible 618T-1/2/3 rf operating frequencies is as stable as the crystal-controlled reference frequency in rf oscillator A2.

Refer to figure 8. The MHz-frequency stabilizer, A10, stabilizes the 17.5-MHz and hf injection oscillators in rf translator A12. The kHz-frequency stabilizer, A4, stabilizes variable frequency-oscillator A12A2 in rf translator A12.



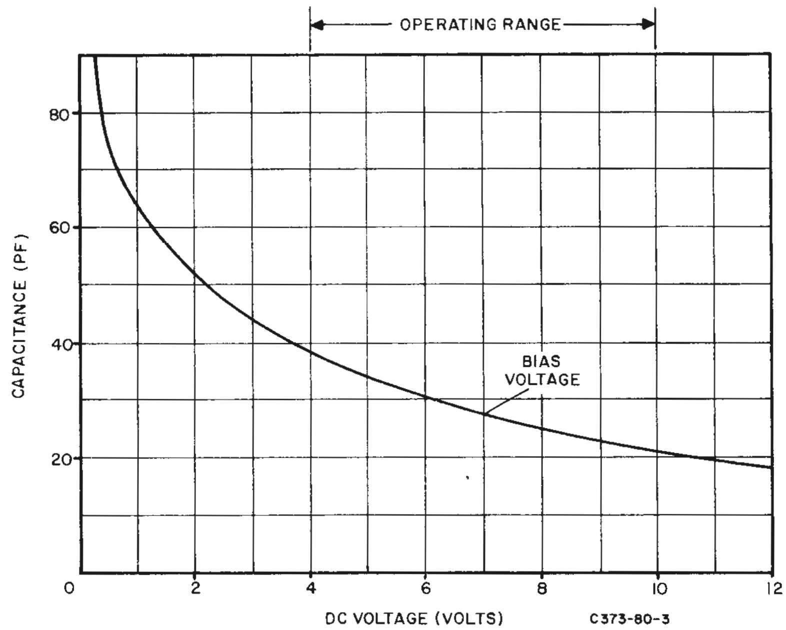
618T-1/2/3 Frequency Stabilizing Circuits, Block Diagram
Figure 8

Radio-frequency oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are references in the frequency stabilizing process. The 500-kHz output is also used in a separate output for if. injection.

Frequency divider A1 converts the 100-kHz output of rf oscillator A2 to two different outputs that are used as references in kHz-frequency stabilizer A4.

In general, the frequency stabilizing circuits operate as follows. Samples of the injection oscillator signals are fed to the frequency stabilizing modules. A reference frequency derived from the crystal reference oscillator is also fed to these modules. The signal and reference frequencies are compared by discriminators in the modules, and dc error voltages proportional to the phase difference between the signal and reference frequencies are fed back to the oscillators. These dc error voltages are applied to voltage-variable capacitors in the tuned circuits of the oscillators to tune them so that they will be phase locked to the reference frequencies.

The voltage-variable capacitors used in the oscillator tuned circuits are semiconductor devices with a capacitance that varies as the dc voltage across them varies. The relationship between capacitance and dc tuning voltage for a typical voltage-variable capacitor is shown in figure 9. To obtain a linear relationship between capacitance and voltage, a dc bias voltage is applied to the device, and the voltage across it is varied by only a small amount.



Voltage-Variable Capacitor, Typical Characteristics
Figure 9

(6) Frequency Stabilizing Circuits, 618T-1B/2B/3B.

Two 618T-1B/2B/3B Airborne SSB Transceiver modules stabilize the two injection oscillators in rf translator A12. MHz-frequency stabilizer A10 stabilizes the 17.5-MHz and hf oscillators in rf translator A12.

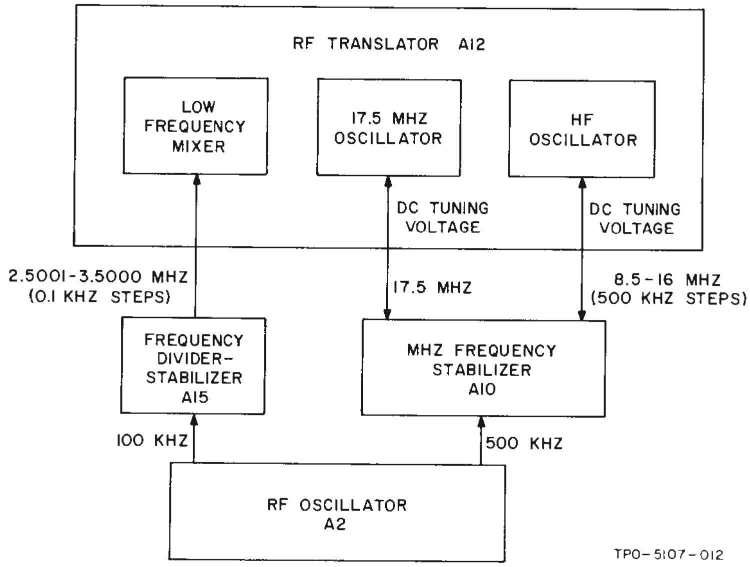
Refer to figure 10. Rf oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are used as references in the frequency stabilizing processes. The 500-kHz output is also used in a separate output for if injection.

Frequency divider-stabilizer module A15, as previously explained, is stabilized by the comparison of the operating frequency of vco A15A7 with the 100-kHz reference frequency from rf oscillator A2. The comparison and stabilizing functions are performed by phase/frequency discriminator A15A5.

The frequency stabilization process of the 17.5-MHz and hf oscillators is identical to that of the 618T-1/2/3.

(7) Squelch Circuits.

The audio squelch circuit is physically located in a new model rf oscillator module, Collins part number 528-0690-001/528-0690-002, that is directly interchangeable with existing rf oscillator modules. The audio squelch level is adjusted at the radio set control. New versions of the radio set control, the 714E-3D used



618T-1B/2B/3B Frequency Stabilizing Circuits,
Block Diagram
Figure 10

with the 618T-1/2/3, and the 714E-6A used with the 618T-1B/2B/3B contain a squelch level control (SQL) in place of the existing rf sensitivity control (RF SENS).

The squelch amplifier and control circuit is comprised of two frequency-sensitive active filters, two peak detector stages, a comparator, and a holding circuit. The holding circuit serves to drive the audio squelch relay. The squelch amplifier and control circuit receives audio input signals from AM/audio amplifier A9. The squelch circuit filters and converts the input signal to dc voltages. These voltages are compared by the comparator that has a bias determined by the squelch level control on the 714E-( ) Radio Set Control. After comparision, the squelch circuit energizes the holding circuit and the squelch relay. If sufficient and desirable audio is present, the squelch relay connects the audio signal to the balanced output line of AM/audio amplifier A9. If noise predominates, the squelch relay disconnects the balanced output line and inserts a 300-ohm load across the output of AM/audio amplifier A9. When the squelch level control is turned to the extreme clockwise position, the comparator is biased on and, in turn, energizes the holding circuit and squelch relay.

(8) Selective Calling (SECAL).

A selective calling system, used in conjunction with the 618T-( ) Airborne SSB Transceiver, allows the ground radio operator to call a single aircraft of a group of aircraft, thus relieving aircraft personnel in flight of having to constantly monitor the ground station radio frequency.

The Collins selective calling system consists of the 456C-1 Airborne Selective Calling Unit, the 288A-1 Tone Generator, the 614J-1 Remote Control Panel, the 614K-1 Remote Control Console, and the 278H-1 Preset Remote Control Panel.

The 456C-1 Airborne Selective Calling Unit is the airborne portion of the system. The 288A-1 and one or more of the control units make up the ground station system.

The ground operator selects a code of four audio frequency tones at one of the control units. The operator then presses an activate switch that causes the 288A-1 Tone Generator to produce the four selected tones to the transmitter in the proper time sequence and time duration. The 456C-1 Airborne Selective Calling Unit is connected to the audio output line of the 618T-( ) Airborne SSB Transceiver. When the proper tones are received in the proper sequence, the 456C-1 actuates a visual or aural signal, alerting flight personnel. Switches on the front panel of the 456C-1 allow flight personnel to change the calling codes without removing the unit from the aircraft.

(9) Power Distribution Circuits, 618T-( ).

Refer to figure 11. The power distribution circuits are activated when the function selector switch on the radio set control is moved from OFF. In the 618T-1/2/3, a 400-Hz interlock relay, K9, is energized only when both ac and dc input power to the 618T-( ) is present. A delay relay, K10, disables the frequency stabilizer circuits during operating frequency changes. Operating frequency changes appear as drift to the frequency stabilizer circuits, and therefore the stabilizer circuits must be disabled to prevent an attempted phase lock on an erroneous spectrum point. Resistor R22 and capacitor C13, in transistor stage Q1, delay the energizing of relay K10 for approximately 1/2 second after 130 volts dc has been applied to delay interlock relay K8. This time delay circuit prevents the frequency stabilizer circuits from phase locking on an erroneous spectrum point. In the 618T-1B/2B/3B, only the MHz-frequency stabilizing circuits are affected by the time delay circuits as explained above. The time delay is unnecessary for the phase-locking action of frequency divider-stabilizer A15.

(10) Keying Circuits.

Refer to figure 12, a simplified schematic diagram of the keying circuits. The major keying function is the transfer of circuits from receive mode to transmit mode. When the 618T-( ) is keyed, the following action occurs:

AM/audio amplifier A9 is switched to a speech amplifier function.
Two receive stages are bypassed in if. translator A3.
The receive mixers in rf translator A12 are switched out.
The transmit mixers in rf translator A12 are switched in.
The antenna transfer relay operates, and the rf driver is coupled to the rf amplifier.
Voltage is applied to the plates and screens of the power amplifier tubes.
The 500-kHz carrier is removed from the product detector and applied to the balanced modulator for sideband generation.

The first function when the 618T-( ) is keyed after a frequency change is fine tuning of the power amplifier output circuit and antenna coupler. Keying provides rf to the antenna coupler, and a 1-kHz tone in the headset indicates the tune power cycle. The antenna coupler locks the key line so that it remains closed until the power amplifier roller coil has tuned for 180 degrees difference between grid and plate circuit and the antenna coupler has tuned for minimum vswr (1.3:1). During tuning, the output circuit is in series with a resistor to help stabilize transmitter load. The position of the function selector switch on the radio set control is not important during this tuning function since the AM mode is selected internally to provide the necessary carrier for phase and vswr differentiation for tuning. After power amplifier A11 and the antenna coupler are tuned, the key line opens, and the mode of operation is again under the control of the function selector switch.

If the CW mode is used, a 1-kHz tone from frequency divider A1 in the 618T-1/2/3 and control data converter A16 in the 618T-1B/2B/3B is processed for the proper keying waveform by components on CW TR delay relay A9K2. Recycle relay K4 is a part of keying function so that a transmission cannot be made during a change of frequency. In voice modes, keying is accomplished by depressing the push-to-talk switch on the microphone. Protective circuits include overload relays A7K3 or A8K2, depending upon the power supply being used, and the step-start relay in the high-voltage power supply that switches current-limiting resistors in each leg of the incoming ac line to prevent surges before tube warmup. If a frequency change should be made while keying, the key line is interrupted, recycle takes place, and after the frequency change is completed, the key line closes again. Then, rf (tune power) is applied with the key locked while the power amplifier A11 roller coil and antenna coupler retune to the new frequency. The key then opens again, and a transmission may be made. Tune power function is automatic only when an antenna coupler is available to lock the keying circuits. When the receiver-transmitter is operated separately, the key must be held down manually until power amplifier A11 tunes.

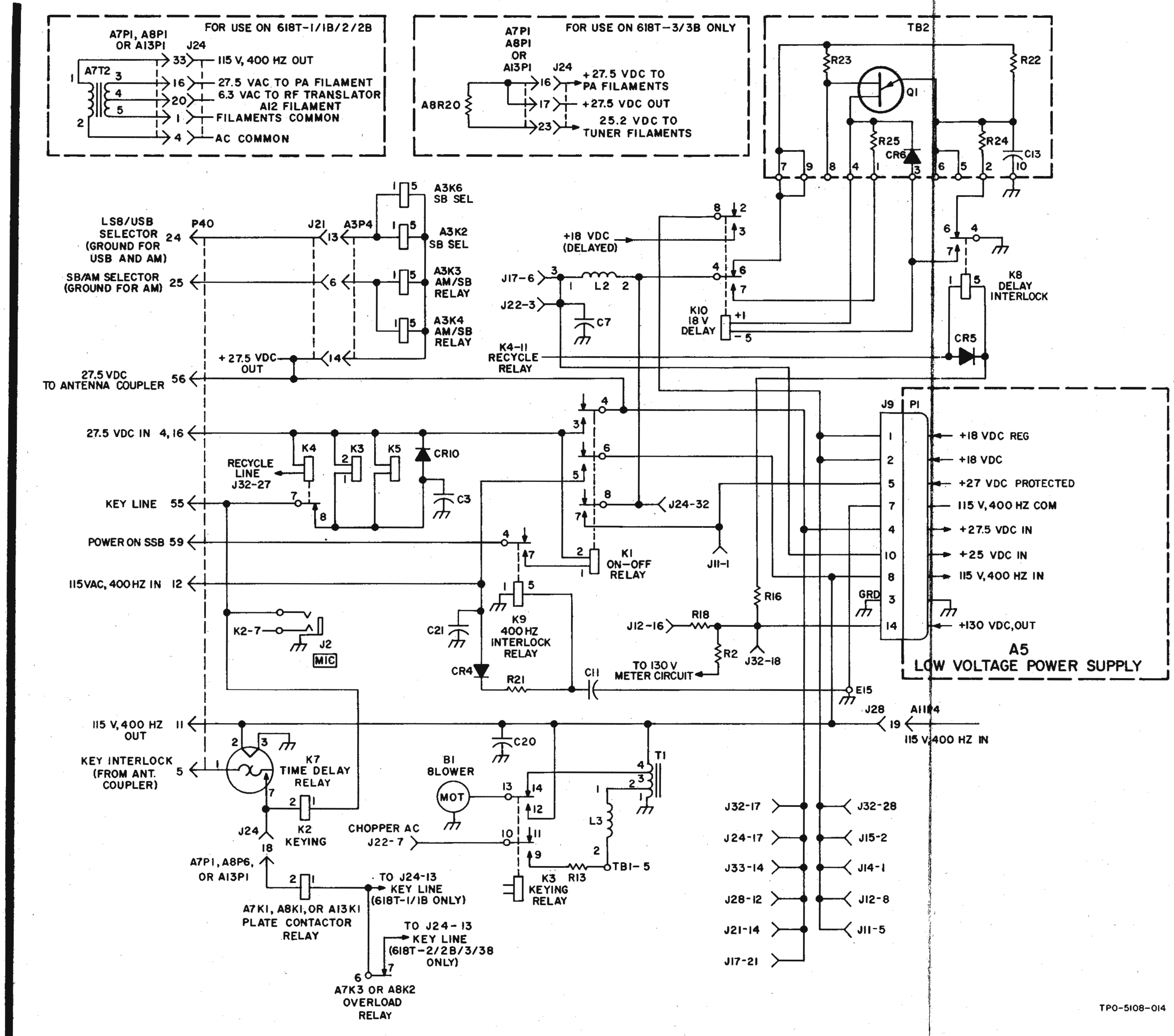
(11) Recycle Circuits.

(a) 618T-1/2/3.

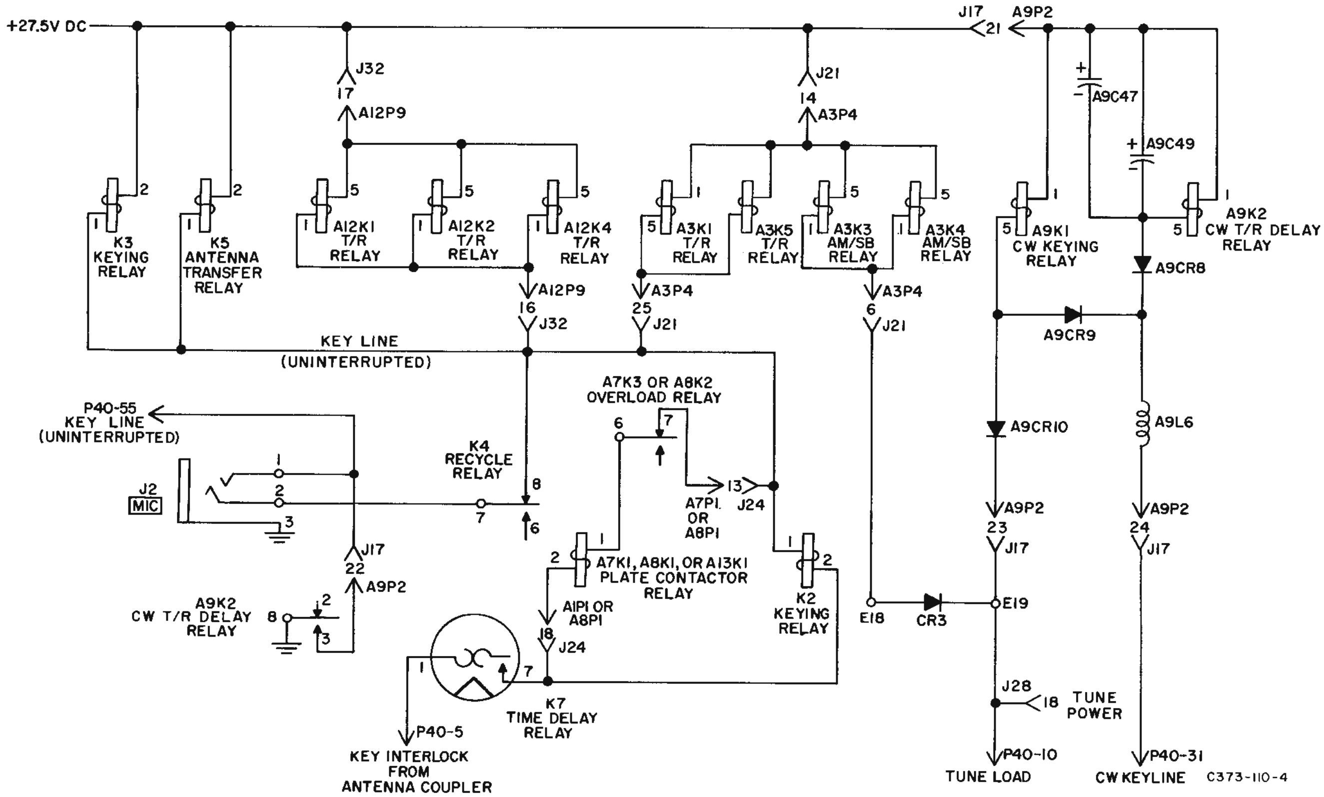
Refer to figure 13. A change of frequency is called recycle. When any of the frequency selector switches on the radio set control is moved, recycle relay K4 is energized. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna coupler, and disable the frequency stabilizing signals. Recycle relay K4 opens when the servo motors stop, but there is some residual motion in the mechanical linkage. The frequency stabilizing circuits are restored when recycle relay K4 opens. To prevent these circuits from attempting to phase lock vfo A12A2 during this interval, the +18 volts to kHz-frequency stabilizer A4 discriminator circuits is delayed for approximately 1/2 second. The delay circuit, contained on terminal board TB2, consists of transistor stage Q1.

(b) 618T-1B/2B/3B.

Refer to figure 13. When any of the frequency selector switches on the radio set control are moved, relay K4 is energized, and the 618T-1B/2B/3B is recycled. While the servo motors adjust the tuned circuits to the new frequency, the recycle circuits mute the audio, disconnect the key line, connect a ground line to the antenna [illegible] the MHz-frequency



Power Distribution Circuits, Simplified Schematic Diagram
Figure 11

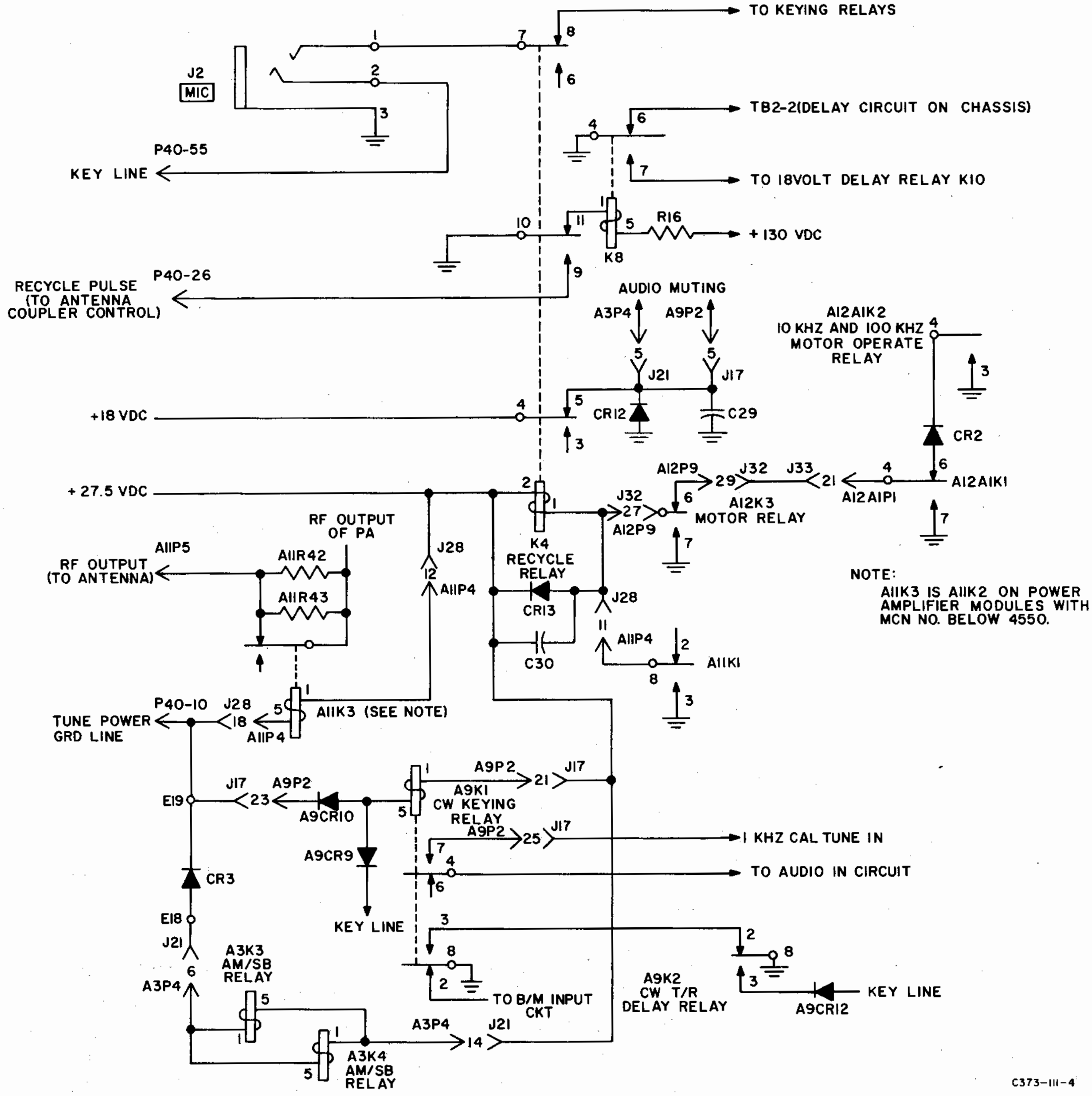


Keying Circuits, Simplified Schematic Diagram
Figure 12

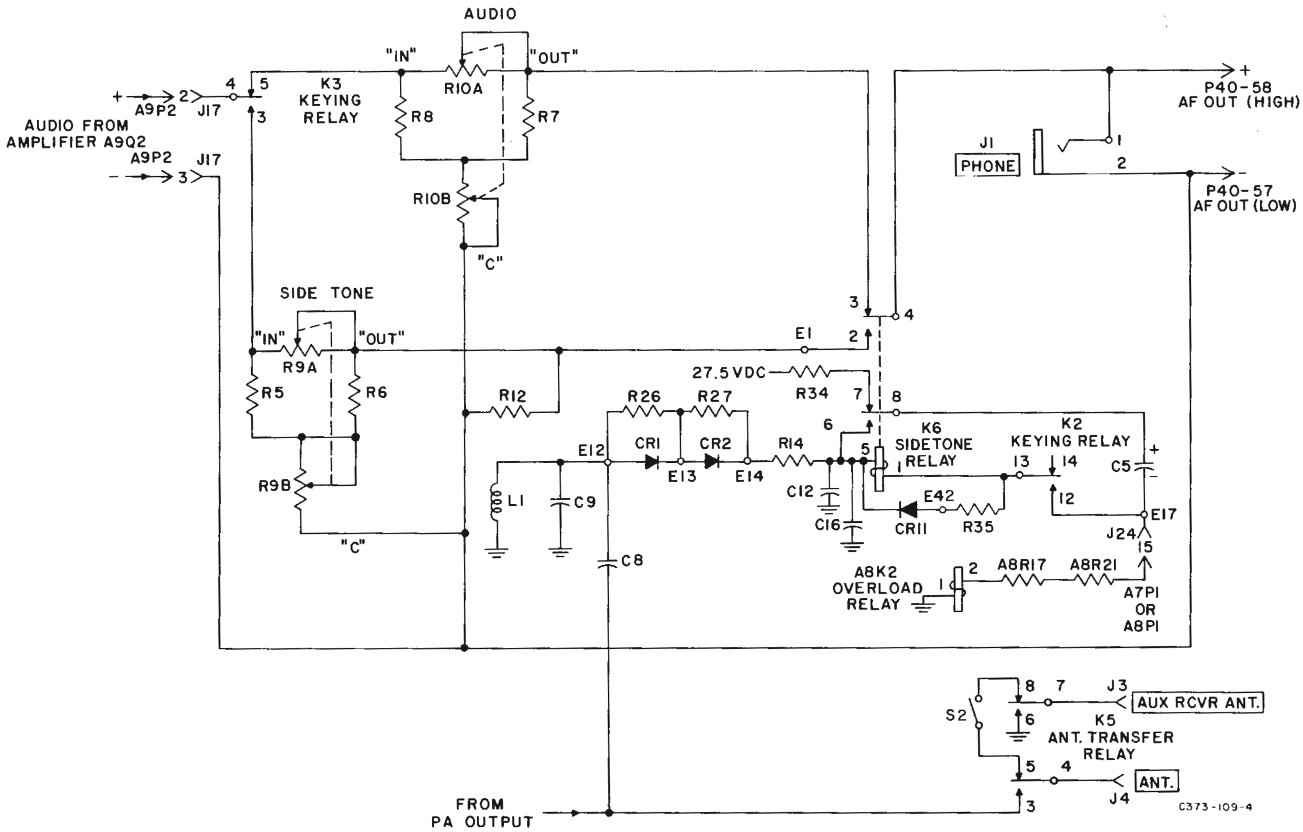
stabilizing circuits. When the servo motors stop, recycle relay K4 opens and restores the MHz-frequency stabilizing circuits. The kHz-frequency stabilizing circuits are unaffected by the actions of recycle relay K4. These circuits receive frequency control information directly from the radio set control and therefore begin to stabilize on the new frequency immediately.

(12) Audio and Sidetone Circuits.

Figure 14 is a simplified schematic diagram of the audio and sidetone circuits. The sidetone is taken from audio amplifier stage A9Q2 to provide monitoring of the transmission. The sidetone passes from A9Q2, through keying relay K3 in the sidetone level adjust network, and through sidetone relay K6 to the headset. A combination of two voltages is necessary to energize sidetone relay K6. One voltage, derived from the rf output of power amplifier A11, is rectified by CR1 and CR2, filtered by C12, and applied to sidetone relay K6. The second voltage, from the high-voltage power supply, is proportional to power amplifier plate current. For sidetone relay K6 to energize, both sufficient plate current and plate voltage swing must be present in power amplifier A11. Capacitor C5, across the coil of sidetone relay K6, keeps the coil energized in the sideband transmit mode when the output voltage varies with speech.



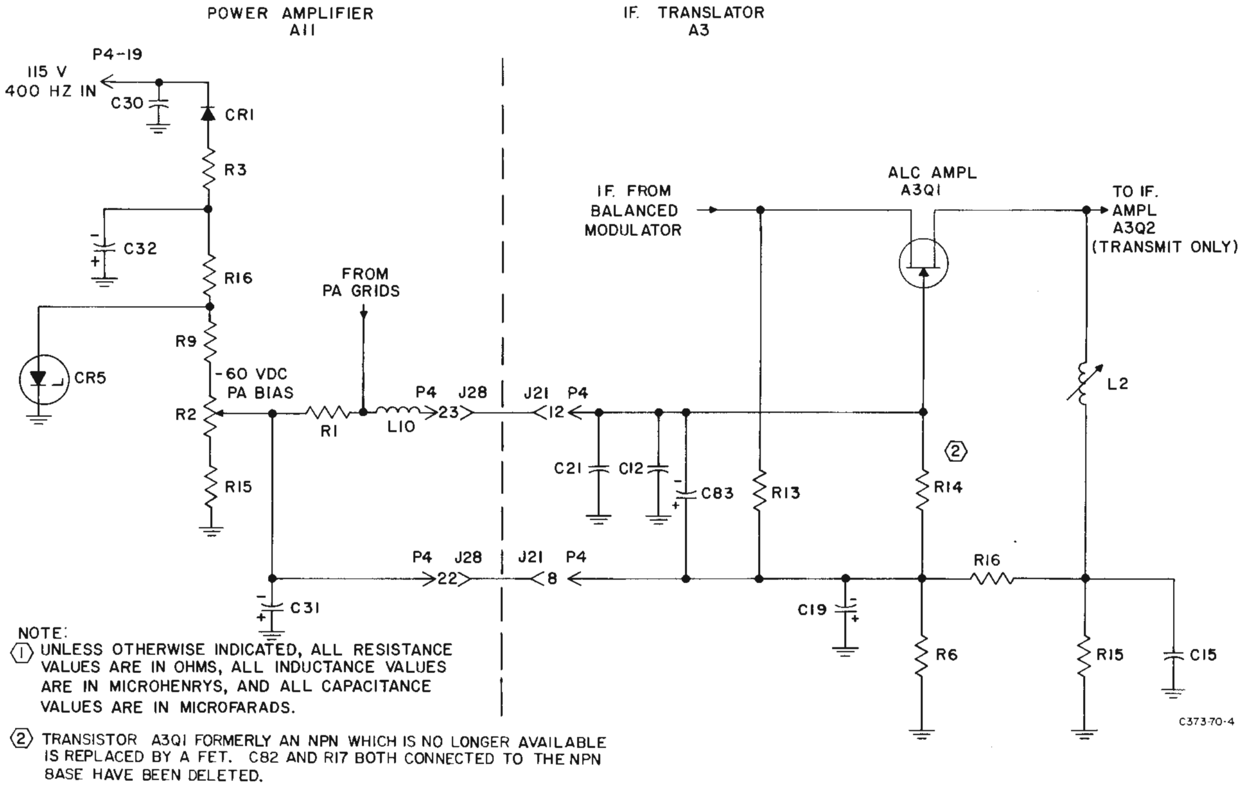
Recycle Circuits, Simplified Schematic Diagram
Figure 13



Audio and Sidetone Circuits, Simplified Schematic Diagram
Figure 14

(13) ALC Circuits.

Figure 15 is a simplified schematic diagram of the alc circuits. Automatic load control functions when the power amplifier is driven into grid current. The duration of voice peaks and their period of recurrence, as well as average voice volume, differs between operators. These differences affect the amount of drive to the power amplifier grids and must be compensated for since the grid circuit must be driven at the threshold of grid current to derive maximum linear output. The alc circuits control the drive to the power amplifier by monitoring power amplifier grid voltage. Voice peaks that drive the power amplifier grids into grid current (class AB2) increase the voltage drop across resistor A11R1 in the grid bias circuit. Resistor A11R1 is common to the grid circuit of the power amplifier and the source-gate circuit of ALC amplifier A3Q1 in the if translator. The voltage drop across A11R1 increases with grid current flow and reduces the current in A3Q1. With the gain of A3Q1 lowered, drive to the power amplifier is decreased. The time constant of the circuit permits a slow decay for the feedback voltage required because of the intervals between voice peaks. Audio gain adjustment is made in the speech amplifiers (AM/audio amplifier module).



ALC Circuits, Simplified Schematic Diagram
Figure 15

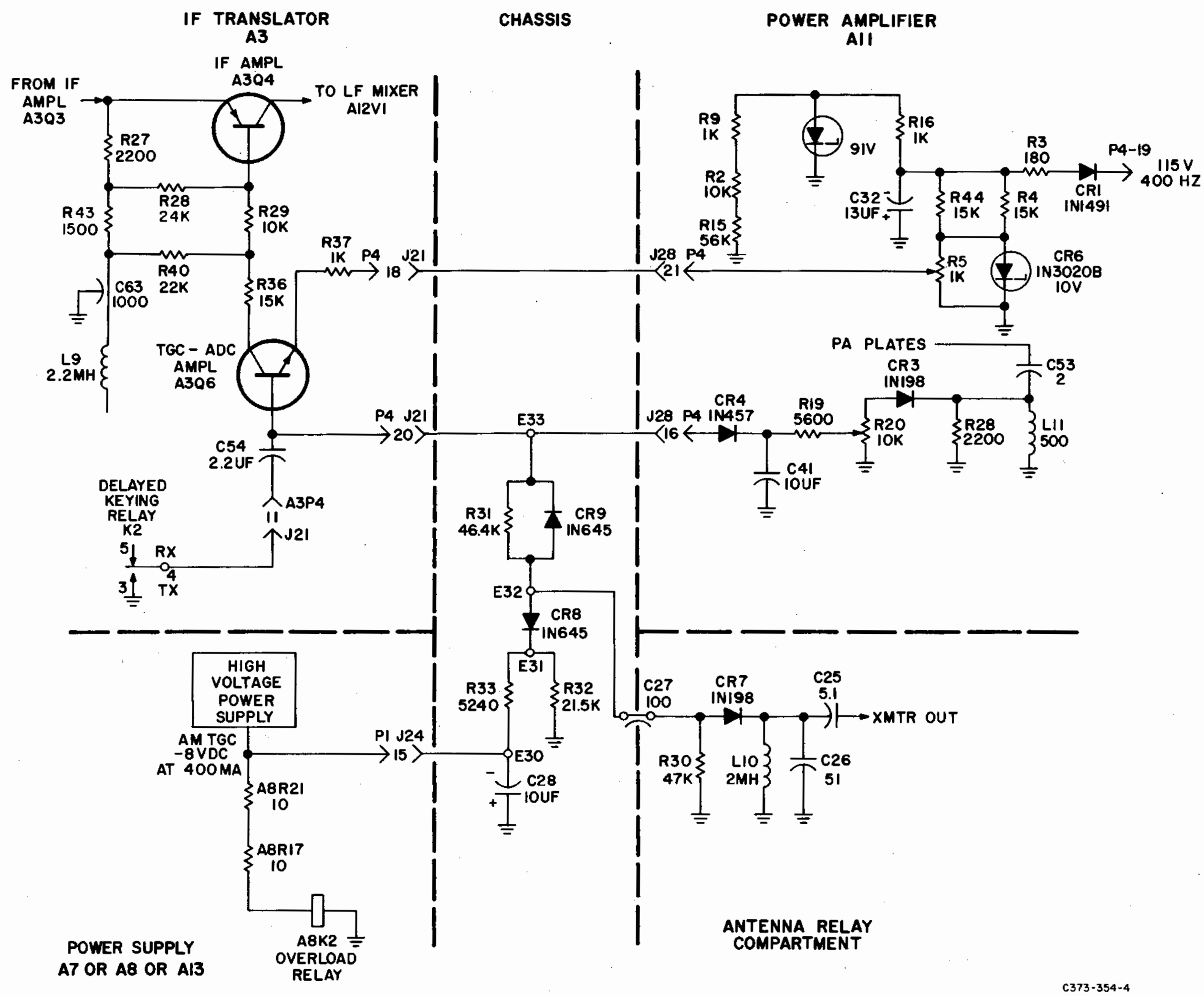
(14) TGC Circuits.

Transmitter gain control regulates carrier level in the AM mode to compensate for variations in gain throughout the 618T-( ) frequency range. (Refer to figure 16.) Transmitter gain control is a feedback voltage derived by sampling and rectifying the carrier voltage in a linear demodulator. This circuit is in the antenna relay compartment. A 10-to-1 voltage divider (C25 and C26) provides approximately 8 volts of rf to diode CR7 that rectifies and produces negative feedback voltage. Diode CR7, resistor R30, and capacitor C27 form the linear demodulator. The tgc feedback voltage obtained is proportional to average instantaneous peak carrier amplitude and is independent of frequency or modulation index. The tgc does not control the SSB level, but does maintain carrier level within the limits of 70 to 90 volts rms over the 618T-( ) frequency range.

C. Detailed Theory of Operation.

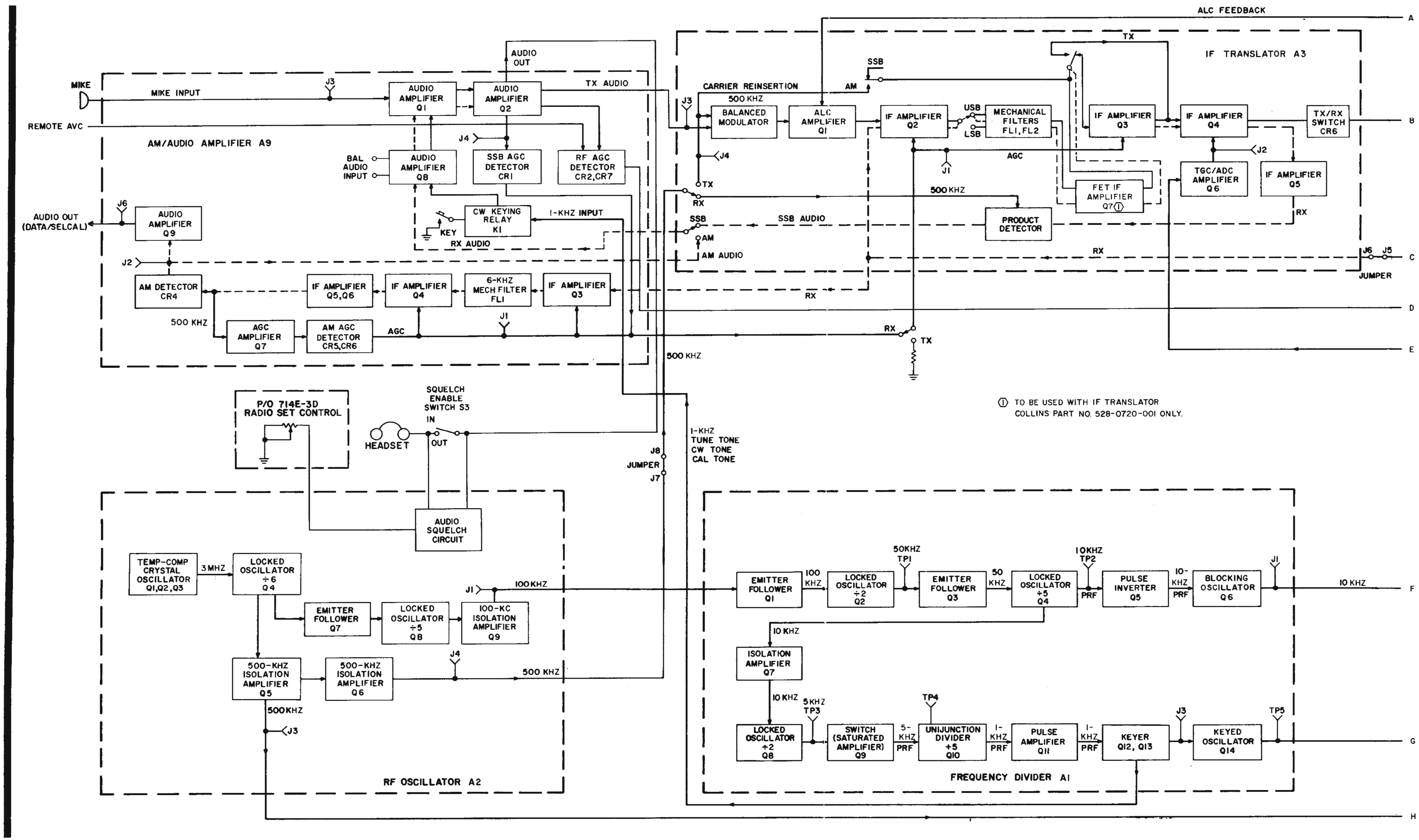
(1) AM/Audio Amplifier A9. (Refer to figure 822.)

The AM/audio amplifier, A9, amplifies voice, CW, or DATA signals in the transmit mode. Inputs are provided for mike or key and for balanced interphone

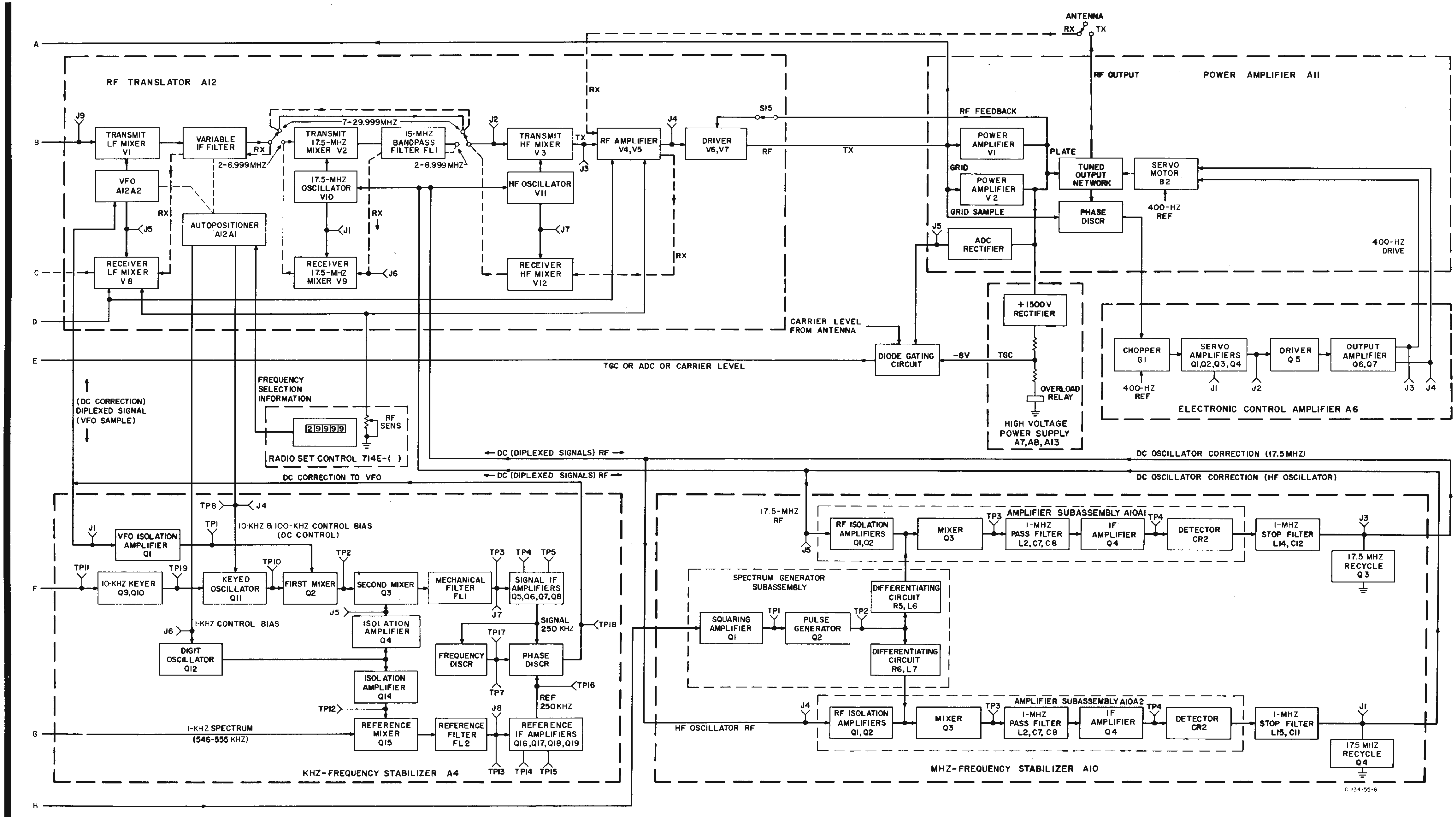


NOTE:
UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS.

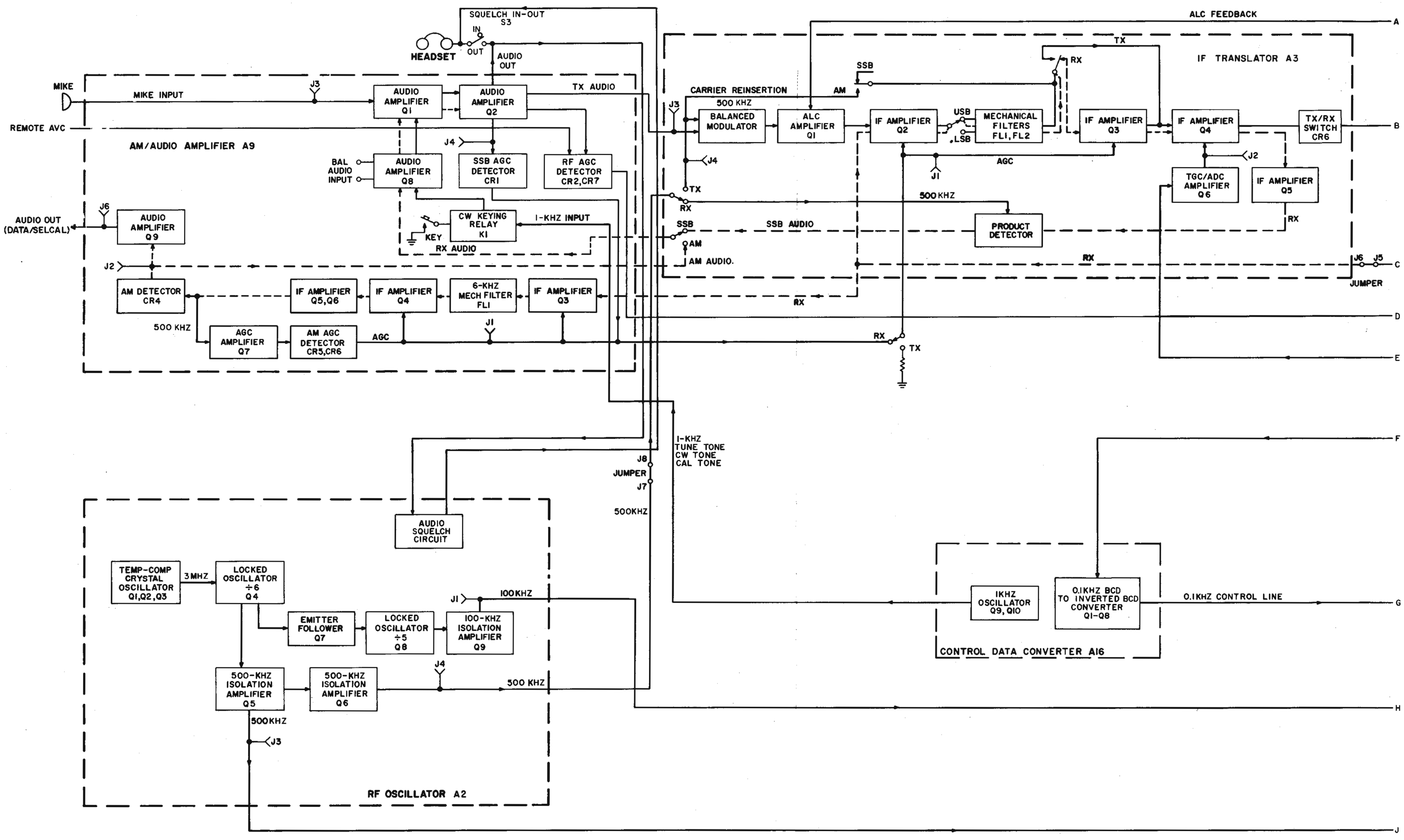
TGC and ADC Circuits, Simplified Schematic Diagram
Figure 16



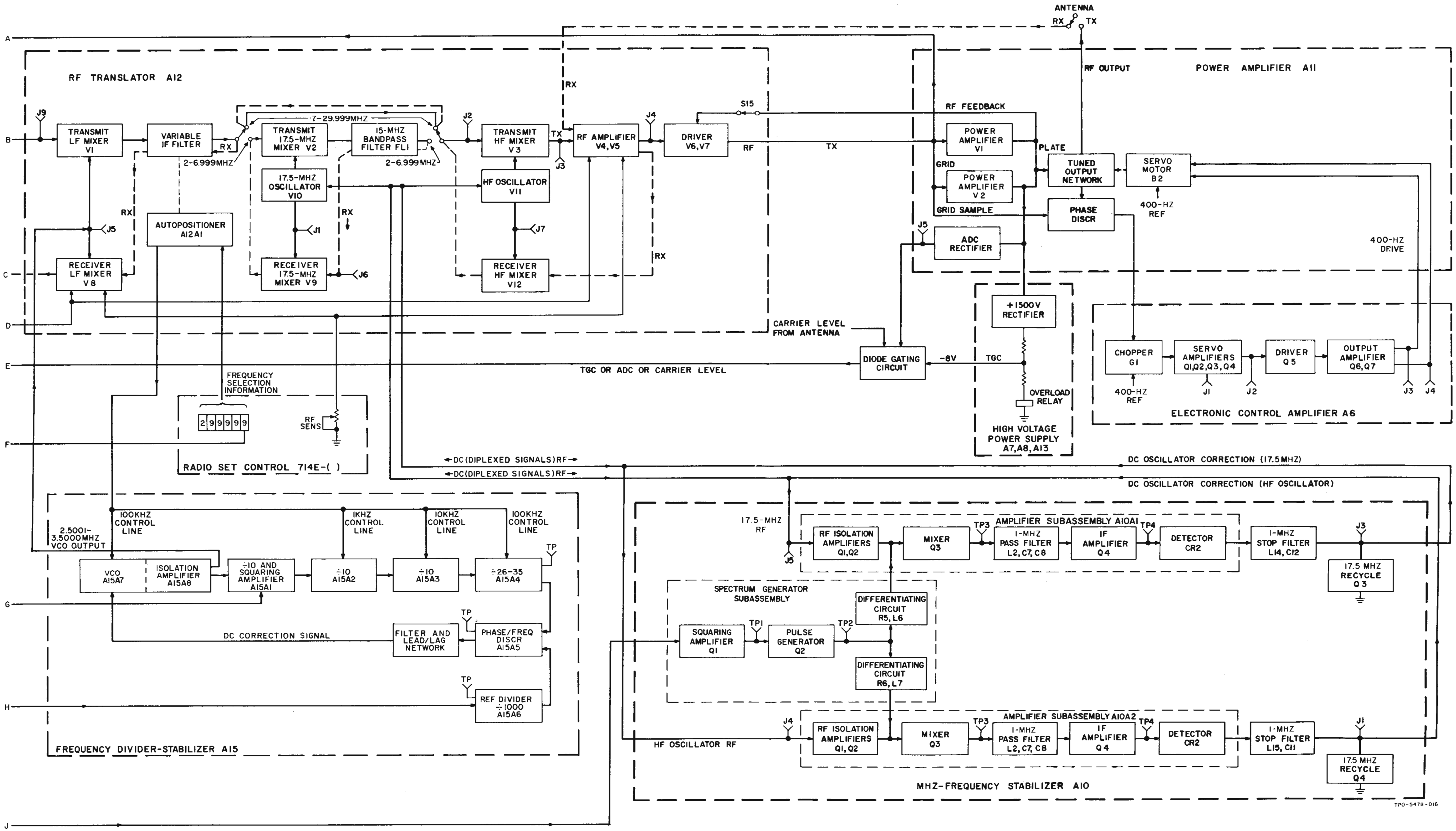
618T-1/2/3 Airborne SSB Transceivers, Block Diagram
Figure 17 (Sheet 1 of 2)



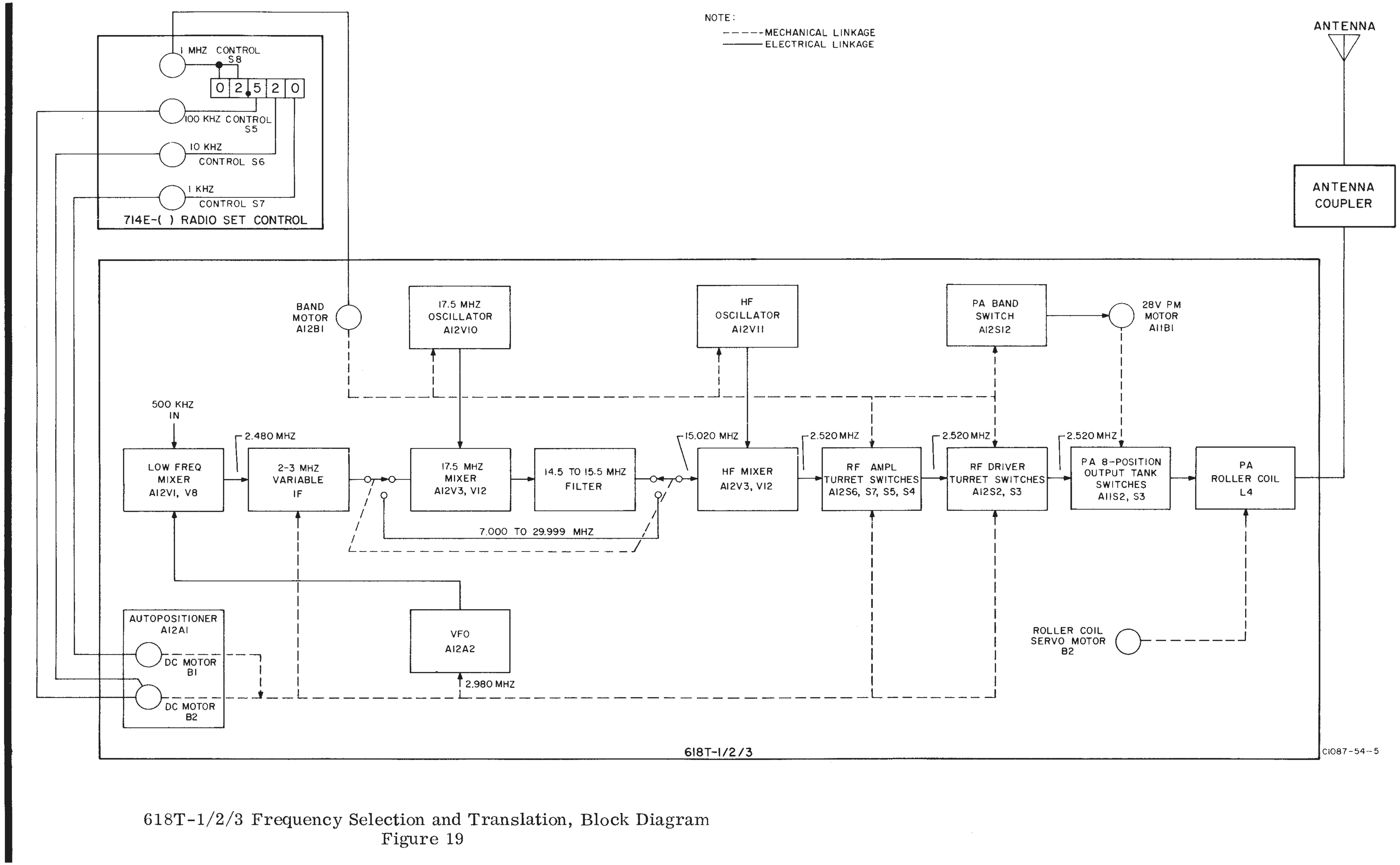
618T-1/2/3 Airborne SSB Transceivers, Block Diagram (Sheet 2 of 2)
Figure 17



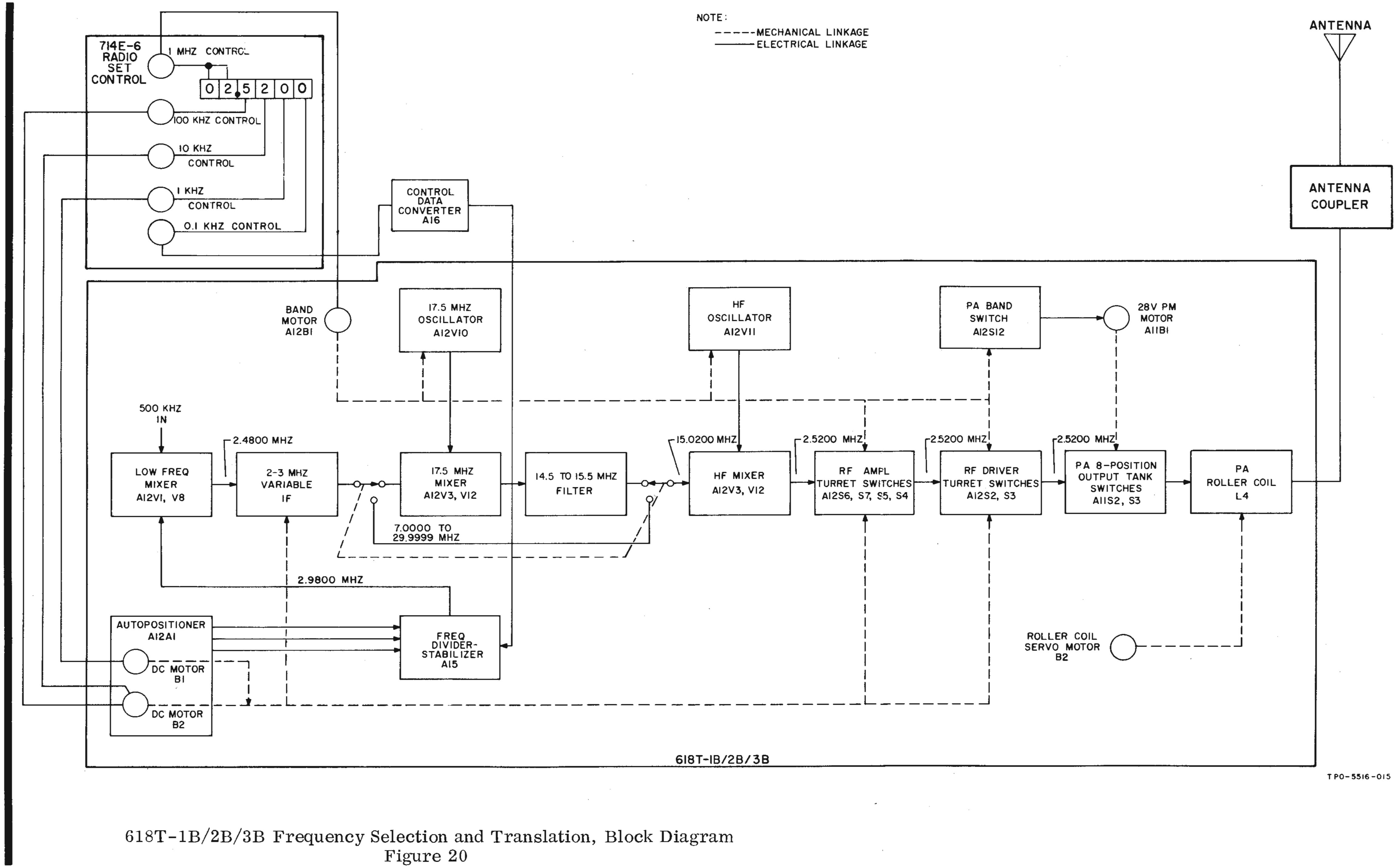
618T-1B/2B/3B Airborne SSB Transceivers, Block Diagram
Figure 18 (Sheet 1 of 2)



618T-1B/2B/3B Airborne SSB Transceivers, Block Diagram (Sheet 2 of 2)
Figure 18



618T-1/2/3 Frequency Selection and Translation, Block Diagram
Figure 19



618T-1B/2B/3B Frequency Selection and Translation, Block Diagram
Figure 20

lines. A 1-kHz tone is fed to this module for CW keying and as an antenna coupler tuning indicator. The 500-kHz if. signal from the rf translator module is also received by AM/audio amplifier A9 in the receive mode. DATA and SELCAL signals are amplified in three audio stages of amplification, while voice (microphone) signals are amplified in two audio stages. The amplified audio output is available for headphones, interphone lines, and for developing agc for SSB received signals.

(a) Transmit.

When the CW key is depressed, CW TR delay relay A9K2 switches the receiver-transmitter from receive to transmit.

When the CW key is depressed or during the tune cycle of an antenna tuner or antenna coupler, CW keying relay A9K1 connects the 1-kHz tone to the input of audio amplifier A9Q8. In AM/audio amplifier A9 modules MCN 40000 and above (CPN 546-7267-004), the 1-kHz tone is filtered by A9U1 before being applied to audio amplifier A9Q8. Capacitors A9C47 and A9C49 hold relay A9K2 closed for approximately 550 milliseconds after the key is released.

Besides the tone input, two af inputs are provided. One input is single ended and applied through A9R6 to the base circuit of audio amplifier A9Q1. The second af input is a 600-ohm balanced input for other modulating sources, such as interphone or data. This second input is applied through A9R5 to the base of audio amplifier A9Q8.

Audio amplifiers A9Q8, A9Q1, and A9Q2 form the speech amplifier for transmit. The output of A9Q2 in transmit is single ended and coupled from the collector of A9Q2, through resistor A9R49, to the balanced modulator in if. translator A3.

(b) Receive.

In the receive mode, the three stages used for speech amplification become the output audio amplifier. Detected AM audio from diode A9CR4 is applied to the base of transistor A9Q8 through resistor A9R2 and capacitor A9C1 after selection by AM/SSB relay A3K3 in if. translator A3. Detected SSB audio is routed in the same manner from the product detector in if. translator A3.

The 500-kHz if. signal from the lf mixer in rf translator A12 is amplified in stages A9Q3 through A9Q6. Bandwidth is restricted to 6 kHz by mechanical filter FL1 in the output circuit of if. amplifier A9Q3.

The AM if. signal, after amplification, is detected by diode A9CR4 and applied to the audio amplifier and a separate stage for SELCAL. This audio amplifier stage (A9Q9) permits interception of AM signals regardless of the position of the mode switch on the radio set control.

(2) IF. Translator A3. (Refer to figure 813.)

The if. translator, A3, functions both in transmit and receive modes. In the transmit mode, it produces a 500-kHz SSB or AM signal. In the receive SSB mode, it provides if. amplification and product detection.

(a) Transmit.

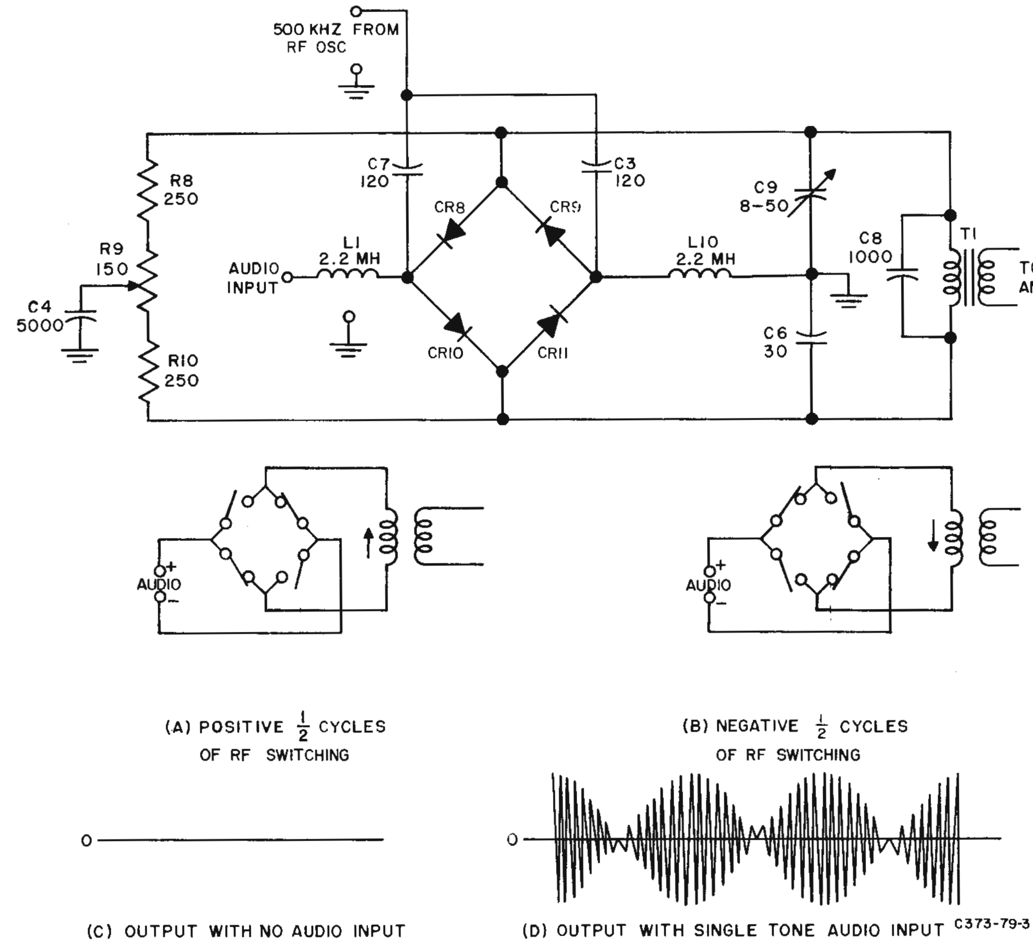
In the transmit mode, if translator A3 translates audio into an ssb or am signal at 500 kHz. The amplified audio from am/audio amplifier A9 is translated in the balanced modulator to the 500-kHz reference, producing a double sideband signal with a suppressed carrier. The signal is then amplified by alc amplifier A3Q1, whose output level varies according to its bias. Details of alc amplifier A3Q1 are contained in chassis circuit theory. After additional amplification by if amplifier A3Q2, sideband select relay A3K2 routes the signal through mechanical filter A3FL1 or A3FL2, depending upon the position of the function selector switch (usb or lsb) on the radio set control. When if translator (Collins part number 528-0720-001) is used, A3K6 switches the output of mechanical filter A3FL1 or A3FL2. If the function selector switch is in the am position, the usb mode is selected and the 500-kHz carrier is reinserted with the signal at the filter output. Amplifier A3Q7 is an FET transistor that provides a high impedance for the output of mechanical filters A3FL1 and A3FL2 (used on if translator, Collins part number 528-0720-001 only). Relay A3K5 routes the signal around if amplifier A3Q3 since this stage is used only in the receive mode. Additional amplification is provided by if amplifier A3Q4, and its output is the if translated signal to be converted to operating frequency in rf translator A12. Diode A3CR6 prevents the passage of unwanted spurious signals produced by receive and transmit mixers in rf translator A12.

The balanced modulator (A3CR8 through A3CR11) is a diode chopper that reverses polarity of the applied audio at a 500-kHz rate. Figure 21 is a simplified diagram of the balanced modulator. The 500-kHz carrier voltage is nearly 10 times larger than the audio voltage so the audio voltage peaks do not switch the diodes. The switching action of the diodes causes 500-kHz current in the primary windings of transformer A3T1 to reverse direction. By utilizing matched diodes and by adjustment of A3R9 and A3C9, the current flow during both positive and negative half-cycles is nearly equal. Therefore, the current flow in A3T1 is effectively canceled and the 500-kHz carrier is suppressed.

(b) Receive.

In the receive mode, if translator A3 converts the signal from lf mixer A12V8 of rf translator A12 to audio at the product detector in either lsb or usb mode. The signal is amplified by if amplifier A3Q2, the sideband selected as in the transmit mode, and further amplified by A3Q7 (used on if translator Collins part number 528-0720-001 only), A3Q3, A3Q4, and A3Q5. The output is combined in the product detector with the 500-kHz carrier. The output of the product detector is proportional to the 500-kHz carrier and the ssb signal. The detected audio is routed to am/audio amplifier A9 by ssb/am relay A3K3 that is deenergized in usb to lsb mode.

Several selected components are used in if translator A3. At the output of the mechanical filters, resistor A3R5 is selected for the proper signal level, and resistor A3R45 is selected to equalize lsb and usb gain within ±2 dB. The input level to if amplifier A3Q2 is adjusted by selection of A3R2.



Balanced Modulator, Simplified Schematic Diagram
Figure 21

(3) RF Translator A12, 618T-1/2/3. (Refer to figure 830.)

The prime function of rf translator A12, Collins part number 528-0113-00, is to translate the 500-kHz input to the 28,000 operating frequencies of the 618T-1/2/3 in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2.000 to 6.999 MHz. (Refer to figure 22.)

Although conversion methods differ in the two tuning ranges, the first conversion, from transmit lf mixer A12V1 to the variable if. output, is identical throughout the 2.000- to 29.999-MHz range. For convenience, the range from 2.000 to 6.999 MHz will be called the low band, and the range from 7.000 to 29.999 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set control shown in figure 22 is 3.451 MHz. To calculate the variable frequency oscillator (vfo) A12A2 operating frequency, subtract the last three digits of the operating frequency of the radio set control from 3.500 MHz, the upper frequency limit of the vfo.

Example: 3.451-MHz operating frequency

3.500-MHz vfo upper limit
-0.451 MHz

3.049-MHz vfo operating frequency (injection frequency)

In the transmit mode, the injection frequency, 3.049 MHz, is combined in transmit lf mixer A12V1 with the 500-kHz input from if. translator A3. The difference frequency, 2.549 MHz, is tuned by the variable if. that is mechanically connected to the Autopositioner linkage. The MHz digit enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.549-MHz variable if. signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 14.951 MHz, is passed through the 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VFO Frequency.

   3.500 MHz minus last three digits of operating frequency.

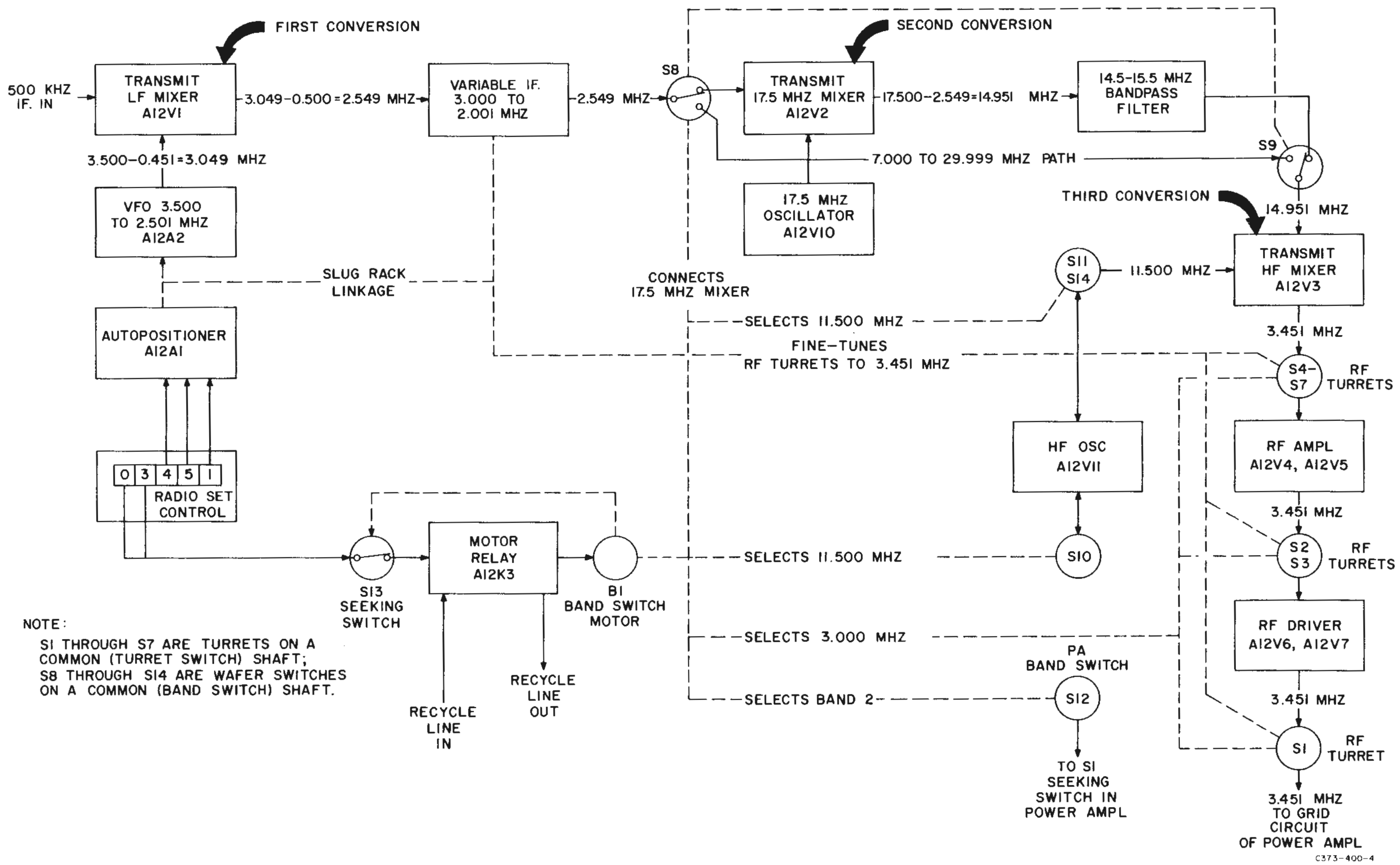
2. Variable IF.

   3.000 MHz minus last three digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.

   14.500 MHz plus last three digits of operating frequency.

A third conversion stage converts the 14.951-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 14.951-MHz signal with the output of hf oscillator A12V11 to obtain the operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the output frequency of hf oscillator A12V11 is between 12.5 and 8.5 MHz, while the operating frequency is between 2 through 6.999 MHz. The example, 3 MHz, requires an hf oscillator output of 11.500 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and the rf driver stages, while the Autopositioner uses a mechanical gear train to fine tune the rf amplifier and rf driver stages.



618T-1/2/3 Frequency Translation 2 to 6.999 MHz, Block Diagram
Figure 22

(b) Frequency Translation, 6.999 to 29.999 MHz. (Refer to figure 23.)

The operating frequency of the radio set control, shown in figure 23, is 9.451 MHz. The last three digits of the operating frequency, .451 MHz, are the same as those used in the 2- through 6.999-MHz explanation, since, for all operating frequencies from 2 through 29.999 MHz, the vfo and variable if. frequencies are determined by the last three digits of the operating frequency only.

Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.549-MHz signal from lf mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this mixer is not used for operating frequencies above 6.999 MHz.

The variable if. signal, 2.549 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.451 MHz (12.000 MHz minus 2.549 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

Rf translation in the receive mode is substantially the reverse of that of the transmit mode. The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit lf mixer A12V1 is replaced by receive lf mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of if. translator A3 and AM/audio amplifier A9.

(c) Autopositioner A12A1 Mechanism, 618T-1/2/3 Only (Collins Part Number 546-6873-005).

The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation. For kHz increments of tuning, the Autopositioner contains two motors that drive a single shaft coupled to the vfo shaft. Another mechanical output from the Autopositioner tunes the variable if. and fine tunes the rf amplifier and rf driver through a train of gears as explained in the preceding sections covering frequency translation. The basic elements of the Autopositioner system are shown in figure 24. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

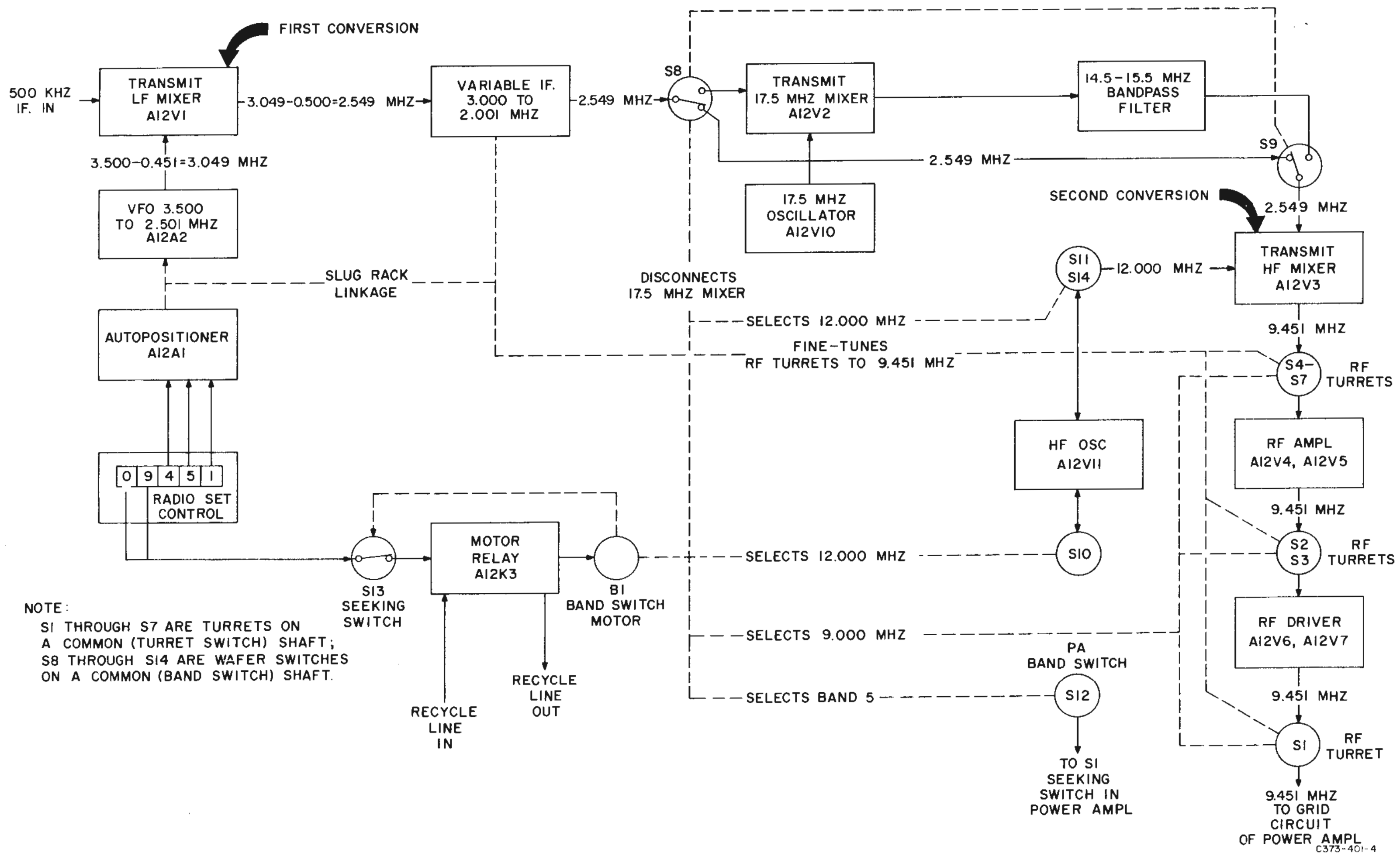
A typical cycle of operation of the Autopositioner is as follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the Autopositioner shaft, the rotor of the seeking switches, and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened, and the pawl is dropped into a stop-wheel notch to halt shaft rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop-wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of the radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. When the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its shaft (and connected tuning elements) to the proper position to restore the symmetry of the control system. It is a reentrant control system providing a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

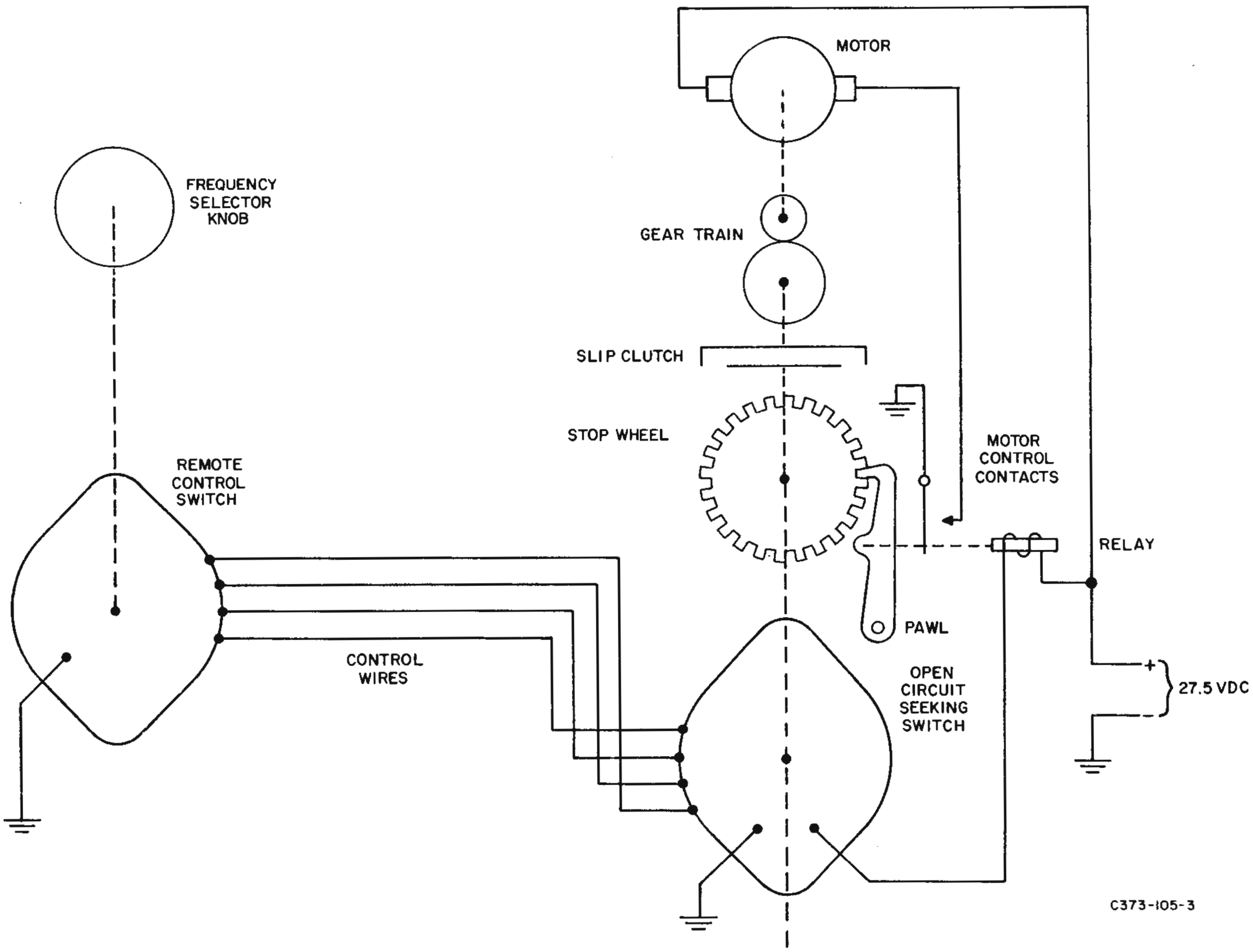
The reentrant system is comparable to a single-pole, double-throw switch scheme shown in figure 25. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens, and the motor stops. The total number of combinations of switch positions in such a system is 2^{n-1}, where n is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 832 is a schematic diagram of the Autopositioner submodule. There are three seeking switches in the Autopositioner: the 100-, 10-, and 1-kHz seeking switches corresponding to the last three digits of operating frequency selected on the radio set control. For the selected vfo frequency to be set up, all three seeking switches must be satisfied. Since each of the three switches has 10 positions, there are 10^3 or 1000 possible switch combinations or shaft positions. Since the 1000 possible combinations occur within a 1-MHz range, the 618T-1/2/3 tunes in 1-kHz increments.

The 100-kHz seeking switch is geared to the output shaft by an intermittent movement so that it is advanced one position for each revolution (100 kHz) of the Autopositioner output shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the output shaft. The stop wheel has 10 notches,



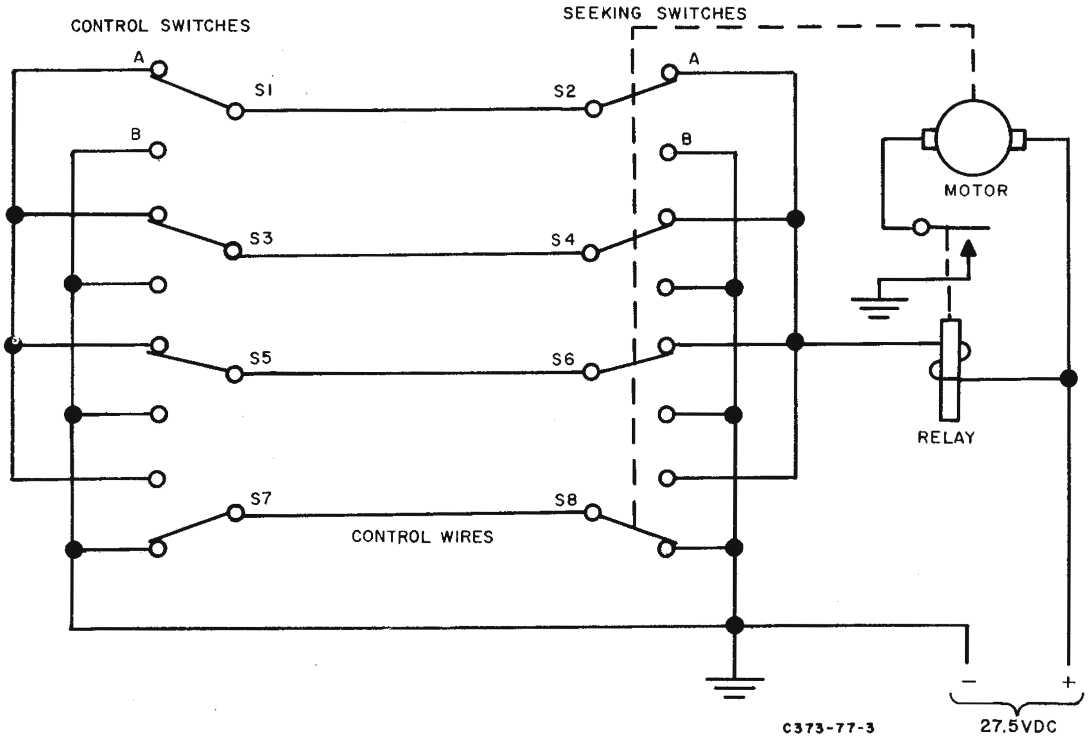
618T-1/2/3 Frequency Translation 7 to 29.999 MHz, Block Diagram
Figure 23



618T-1/2/3 Autopositioner System, Basic Elements
Figure 24

making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire output shaft assembly through the action of a cam. The cam turns the output shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.



618T-1/2/3 Remote Frequency Control, Simplified Schematic Diagram
Figure 25

(d) Balanced Mixer Theory.

Refer to figure 830. The rejection of unwanted mixer products produced by frequency translation in rf translator A12 includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.

(e) Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C128 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

(f) Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In transmit, a key-line ground is applied through A12P9-16 to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit lf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +27.5-volt dc line at A12P9-17 and thus biased off).

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the agc voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +27.5-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier grid tank. Components of the 2- to 29.999-MHz tuned circuit are selected by 28-position band switches A12S4, A12S4, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contracts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver lf mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

(g) Variable Frequency Oscillator A12A2.

Variable frequency oscillator A12A2 is a submodule of rf translator A12. Refer to the schematic diagram in figure 833. The vfo is variable-reactance tuned by inductor A12A2L2. The inductor is mechanically driven by Autopositioner A12A1 and changes the vfo 100 kHz for every revolution of the Autopositioner shaft. Ten turns of the Autopositioner shaft cover the 1-MHz range of the vfo minus 1 kHz (3.500 to 2.501 MHz). Variable inductor A12A2L1 is manually tuned to set the upper frequency limit when making tracking adjustments. Mechanical tracking adjustments are performed by adjustment of the shaft coupling between the vfo and the Autopositioner. Capacitors A12A2C12, A12A2C9, and voltage variable capacitor A12A2VC1 are in parallel with inductor A12A2L1 and A12A2L2 to form the major portion of the tuned circuit. A12A2VC1 is back biased by a +10.000-volt calibrated reference, and the application of dc voltage to its anode terminal varies its capacity and thus, the vfo A12A2 output frequency.

The voltage applied to A12A2VC1 anode is the error voltage produced by kHz-frequency stabilizer A4 to provide phase locking of vfo A12A2 to the 3-MHz reference crystal oscillator. If the vfo output frequency is too high, a positive error voltage is applied that decreases the back bias and causes A12A2VC1 capacitance to increase, in turn lowering vfo A12A2 output frequency.

Negative error voltage is applied when vfo A12A2 output frequency is too low. Refer to kHz-frequency stabilizer A4 detailed theory for the detailed theory of this process.

The output of transistor A12A2Q1 is coupled through capacitor A12A2C8 to the base of buffer amplifier A12A2Q2. The output of buffer amplifier A12A2Q2 is coupled through capacitor A12A2C10 to the base of buffer amplifier A12A2Q3. The output of buffer amplifier A12A2Q3 drives isolation amplifier A12A2Q4 and is also coupled to transformer A12A2T1. The output of transformer A12A2T1 provides the rf sample voltage for kHz-frequency stabilizer A4. The output of amplifier A12A2Q4 is the oscillator injection output coupled to the lf mixer through transformer A12A2T2. Inductor A12A2Z1 is a 500-kHz trap that isolates the 500-kHz carrier from the oscillator.

To prevent signals from rf translator A12 from entering vfo A12A2 and providing false error signals to kHz-frequency stabilizer A4, vfo A12A2 contains an isolation bridge adjusted by A12A2R15. When the bridge is balanced, signals from rf translator A12 develop opposite and equal voltages across A12A2R14 and A12A2R15 and no output is produced. The unilateral network of capacitor A12A2C18 and resistor A12A2R19 provide isolation as well as positive feedback to increase the gain of the isolation output stage. The 70K3, 70K5, and 70K9 vfo's are basically similar. The 70K9 differs principally in the use of oven temperature control for crystal stability.

(h) 17.5-MHz Oscillator A12V10.

Refer to figure 830. The 17.5-MHz oscillator, A12V10, is also fine tuned by a voltage-variable capacitor. Capacitor A12C276 responds in the same manner as the one used in vfo A12A2. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to the MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(i) HF Oscillator A12V11.

Refer to figure 830. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator remains in operation for all 28 frequencies that are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

(4) RF Translator A12, 618T-1B/2B/3B. (Refer to figure 828.)

The prime function of rf translator A12 (Collins part number 528-0682-001) is translation of the 500-kHz input to the 280,000 operating frequencies of the 618T-1B/2B/3B Airborne SSB Transceiver in the transmit mode and to reverse the process in the receive mode.

(a) Frequency Translation, 2.0000 to 6.9999 MHz. (Refer to figure 27.)

Although conversion methods differ in the two tuning ranges, the first conversion from transmit lf mixer A12V1 to the variable if. output is identical throughout the 2.0000- to 29.9999-MHz range. For convenience, the range from 2.0000 to 6.9999 MHz will be called the low band, and the range from 7.0000 to 29.9999 MHz the high band. Selection of the operating frequency is made at the radio set control. The example low-band frequency for the radio set control shown in figure 27 is 3.7434 MHz. To calculate the voltage-controlled oscillator (vco) A15A7 operating frequency, subtract the last four digits of the operating frequency (from the radio set control) from 3.5000 MHz, the upper frequency limit of the vco.

Example: 3.7434-MHz operating frequency

 3.5000-MHz vfo upper limit
-0.7434 MHz
____
 2.7566-MHz vco operating frequency (injection frequency)

In the transmit mode, the injection frequency, 2.7566 MHz, is combined with the 500-kHz input from if. translator A3 in transmit lf mixer A12V1. The difference frequency, 2.2566 MHz, is tuned by the variable if. that is mechanically connected to the Autopositioner mechanical linkage. The MHz digit 2 enters the translation process in the second conversion stage. When the selected MHz digit is from 2 through 6, two band switches, A12S8 and A12S9, are positioned by band-switch motor A12B1 to include transmit 17.5-MHz mixer A12V2 and the 14.5- to 15.5-MHz bandpass filter. The 2.2566-MHz variable if. signal is combined with the injection frequency from 17.5-MHz oscillator A12V10 by transmit 17.5-MHz mixer A12V2, and the difference frequency, 15.2434 MHz, is passed through 14.5- to 15.5-MHz bandpass filter and band switch A12S9 to the grid of hf mixer A12V3. Calculations to determine the frequencies at various points in the translation process are as follows:

1. VCO Frequency.

3.5000 MHz minus last four digits of operating frequency.

OPERATING FREQUENCY (MHz)	HF OSCILLATOR FREQUENCY (MHz)
2-3	*12.500
3-4	*11.500
4-5	*10.500
5-6	* 9.500
6-7	* 8.500
7-8	10.000
8-9	11.000
9-10	12.000
10-11	13.000
11-12	14.000
12-13	15.000
13-14	16.000
14-15	** 8.500
15-16	** 9.000
16-17	** 9.500
17-18	**10.000
18-19	**10.500
19-20	**11.000
20-21	**11.500
21-22	**12.000
22-23	**12.500
23-24	**13.000
24-25	**13.500
25-26	**14.000
26-27	**14.500
27-28	**15.000
28-29	**15.500
29-30	**16.000

*Hf oscillator frequencies that are mixed with the 14.5- to 15.5-MHz output from the 17.5-MHz mixer.
**Hf oscillator frequencies that are doubled before injection into the hf mixer.

HF Oscillator Frequency for Each Operating Frequency Range
Figure 26

2. Variable IF.

3.0000 MHz minus last four digits of operating frequency.

3. 17.5-MHz Mixer Output Frequency.

14.5000 MHz plus last four digits of operating frequency.

A third stage converts the 15.2434-MHz signal to the proper operating frequency. Transmit hf mixer A12V3 mixes the 15.2434-MHz signal with the output of hf oscillator A12V11 to attain the desired operating frequency. Figure 26 provides the hf oscillator output frequencies for the MHz-digit operating frequencies. For the low band, the frequency of the hf oscillator is from 12.5000 to 8.5000 MHz, while the operating frequency is from 2.0000 to 6.9999 MHz. The example MHz digit 3 requires an hf oscillator output of 11.5000 MHz. Band-switch motor A12B1 performs this function by positioning band switches A12S10, A12S11, and A12S14 and rf turret switches A12S1 through A12S7 for the 3-MHz band. Turret switching coarse tunes the rf amplifier and rf driver stages, while the Autopositioner fine tunes the rf amplifier and rf driver stages through a mechanical gear train.

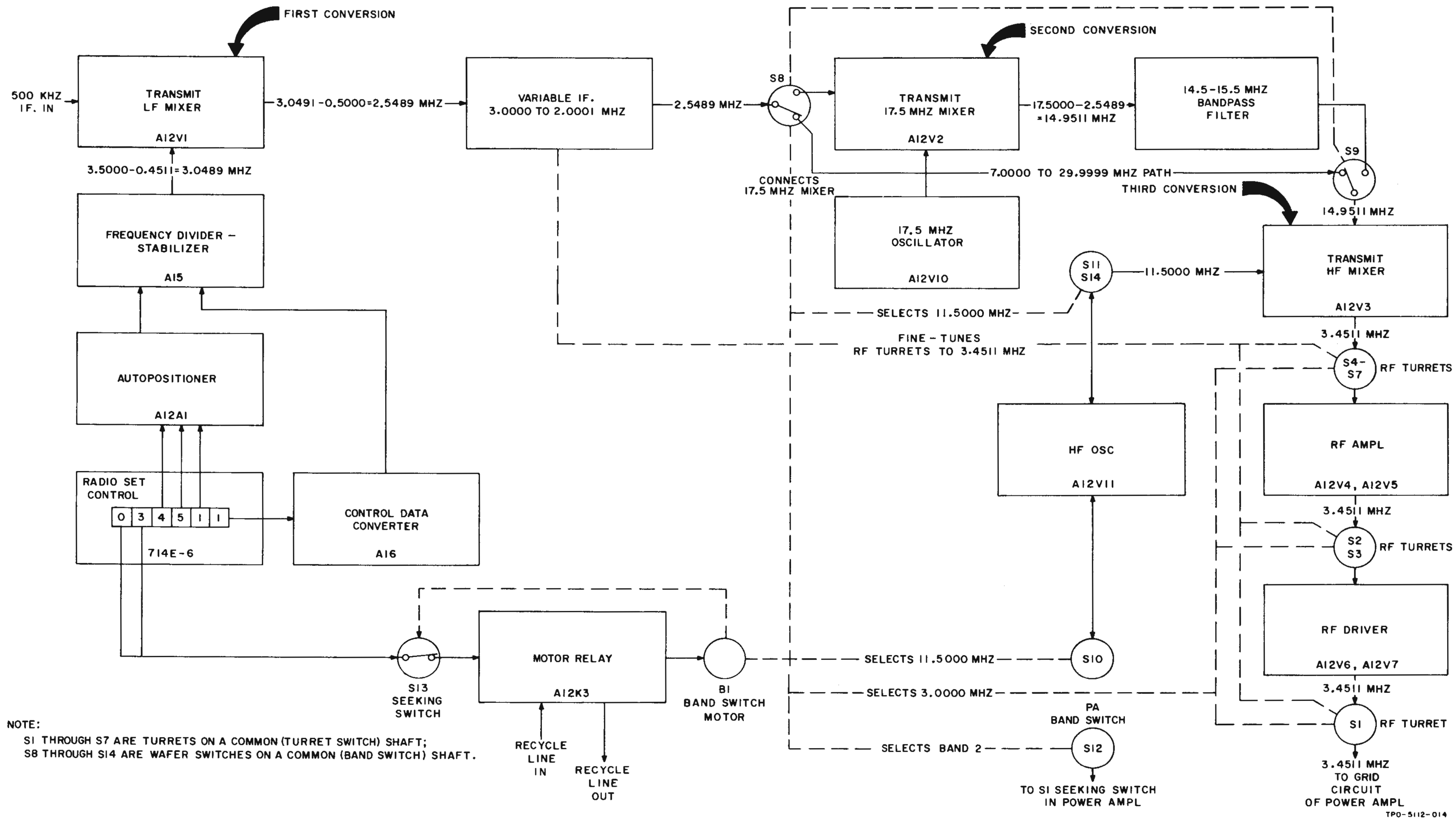
(b) Frequency Translation, 7.0000 to 29.9999 MHz. (Refer to figure 28.)

The operating frequency of the radio set control, shown in figure 28, is 9.7434 MHz. The last four digits of the operating frequency, .7434 MHz, are the same as those used in the 2- through 6.9999-MHz explanation, since, for all operating frequencies from 2 through 29.9999 MHz, the vco and variable if. frequencies are determined by the last four digits of the operating frequency only.

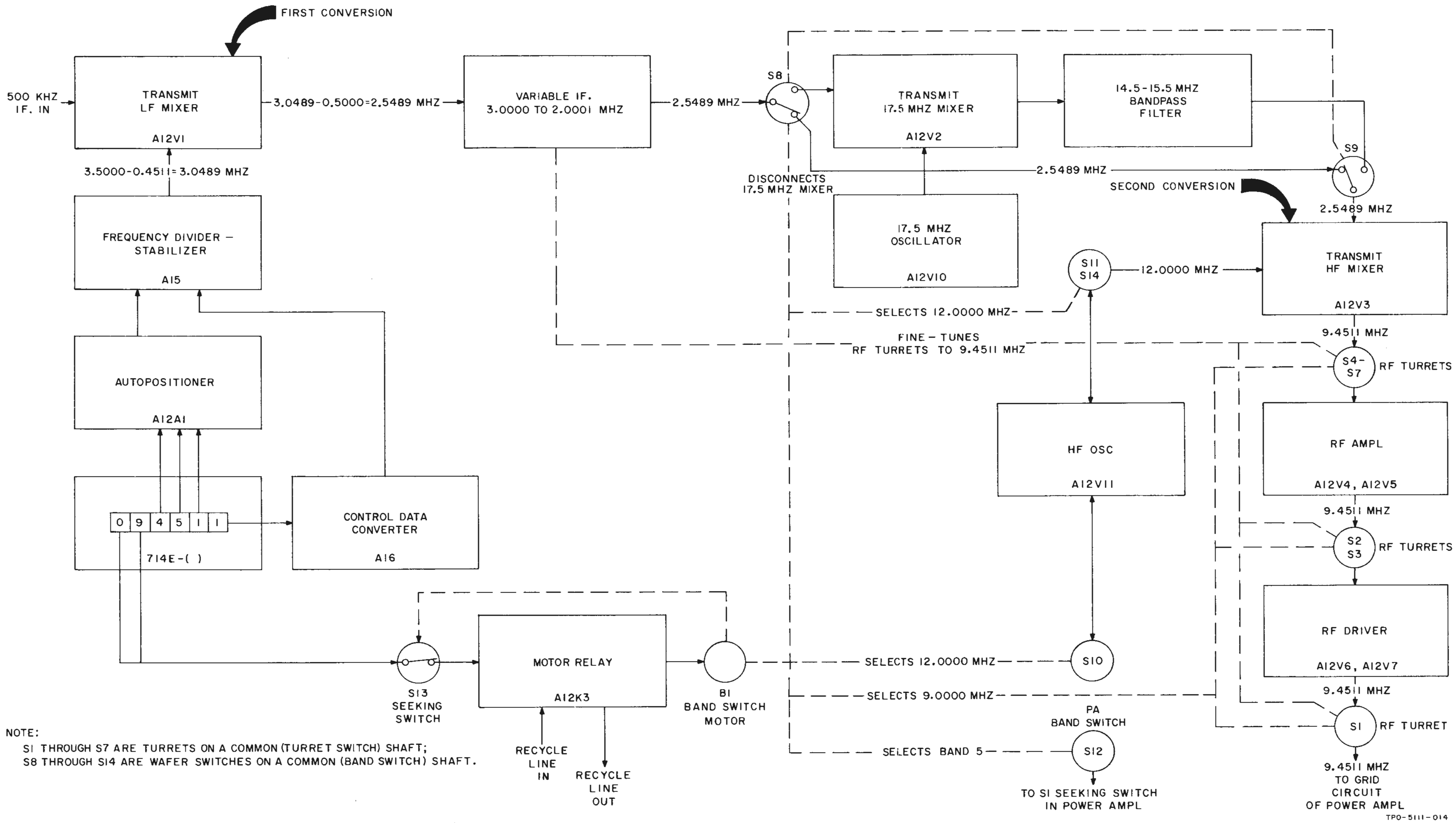
Changing the MHz digit to 9 on the radio set control causes band-switch motor A12B1 to reset band switches A12S8 and A12S9 so that the 2.2566-MHz signal from lf mixer A12V1 bypasses transmit 17.5-MHz mixer stage A12V2; this stage is not used for operating frequencies above 6.9999 MHz. The variable if. signal, 2.2566 MHz, is mixed with the output of hf oscillator A12V10 by hf mixer A12V3. Band-switch motor A12B1 positions band switches A12S10, A12S11, and A12S14 for the 12-MHz injection frequency from hf oscillator A12V10 required for the 9-MHz digit (refer to figure 26). The difference frequency, 9.7434 MHz (12.0000 to 2.2566 MHz), from hf mixer A12V3, is the desired operating frequency and is fed to rf amplifier stage A12V4 and A12V5 and then to rf driver stage A12V6 and A12V7.

Radio-frequency translation in the receive mode is substantially the reverse of that of the transmit mode. The receive signal from the antenna is fed directly to rf amplifier stage A12V4 and A12V5, bypassing rf driver stage A12V6 and A12V7. Transmit hf mixer A12V3 is replaced by receive hf mixer A12V12, transmit 17.5-MHz mixer A12V2 is replaced by receive 17.5-MHz mixer A12V9, and transmit lf mixer A12V1 is replaced by receive lf mixer A12V8.

In the receive mode, the output of rf translator A12 is applied directly, without switching, to the inputs of if. translator A3 and AM/audio amplifier A9.



618T-1B/2B/3B Frequency Translation 2 to 6.9999 MHz, Block Diagram
Figure 27



618T-1B/2B/3B Frequency Translation 7 to 29.9999 MHz, Block Diagram
Figure 28

(c) Autopositioner A12A1 Mechanism (Collins Part Number 528-0683-001).

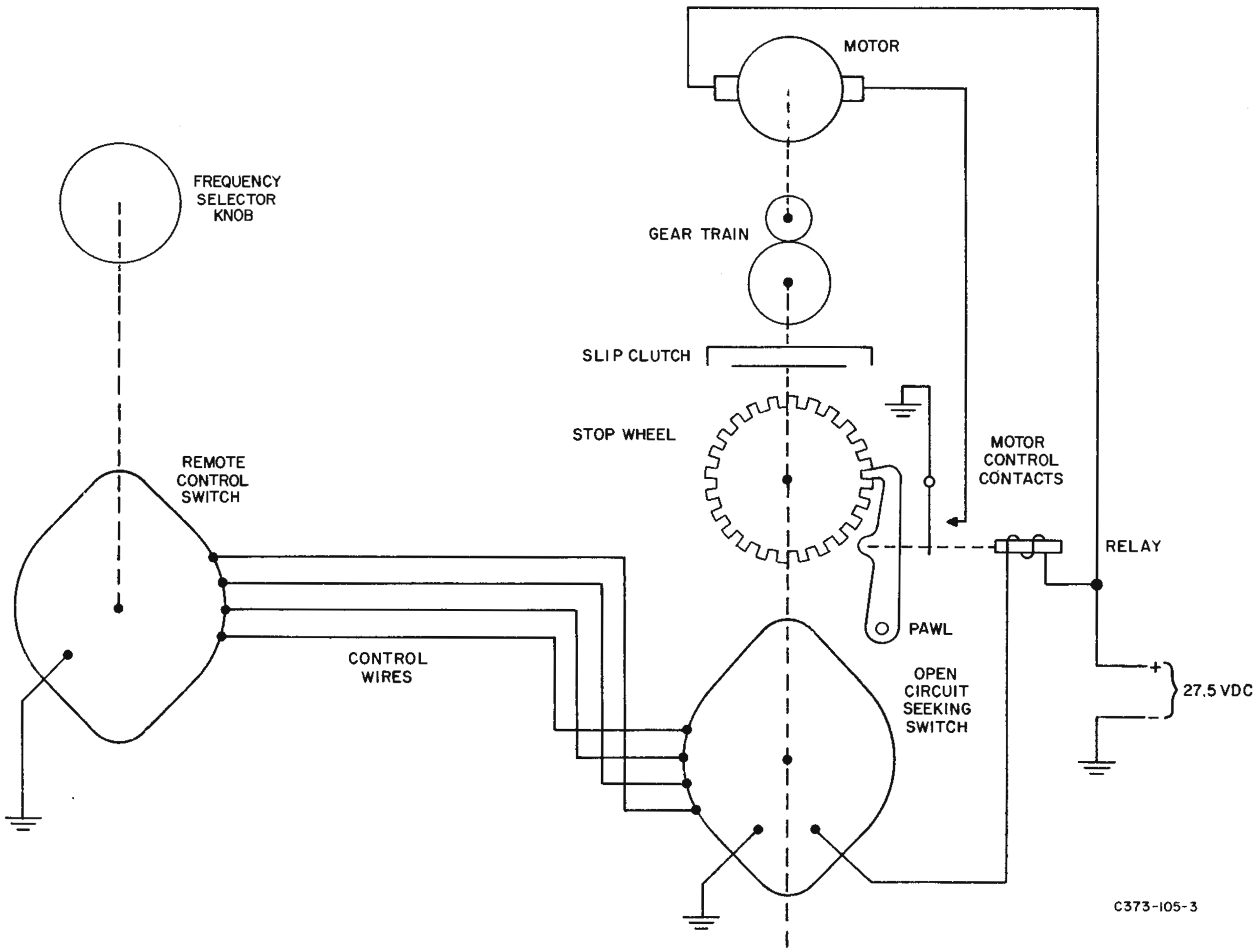
Refer to figure 829. The following explanation provides the detailed description of the mechanical linkages and circuit switching elements used in rf translation.

For kHz increments of tuning, the Autopositioner contains two motors that mechanically position switches for converting binary coded decimal (BCD) frequency control information from the radio set control to inverted BCD frequency control information used in frequency divider-stabilizer A15 for vco output frequency control. Another mechanical output from the Autopositioner, a gear train, tunes the variable if. and fine tunes the rf amplifier and rf driver stages (explained in the sections covering frequency translation). The basic elements of the Autopositioner system are shown in figure 29. These elements are a motor and its gear reduction train, a slip clutch driving a rotary shaft that is fastened to a notched stop wheel, a pawl that engages the notches in the stop wheel, and a relay that controls the pawl and operates a set of electrical contacts to start and stop the motor.

A typical operational cycle of the Autopositioner follows: The system is originally at rest with the control and seeking switches in corresponding positions to form open circuits; the relay is in the deenergized position; the pawl is engaging a stop-wheel notch; and the motor is not energized. When the operator changes the setting of the radio set control frequency selector switches, the control system energizes the relay, lifting the pawl out of the stop-wheel notch and closing the motor control contacts. The motor starts, driving the rotors of the seeking switches and the elements in the tuned circuits. When the seeking switch reaches the point corresponding to the new position of the control switch, the relay circuit is opened and the pawl is dropped into a stop-wheel notch to halt rotation. The motor control contacts open, and the motor coasts to a stop, dissipating kinetic energy in the slip clutch. The seeking switch of the control circuit is adjusted to open the relay circuit before the stop wheel reaches the point where the pawl engages the proper notch. The relay contacts controlling the motor are adjusted so that they do not open until the pawl drops into the notch.

An electrical control system is part of each Autopositioner system. The control system consists of radio set control frequency selector switches and electrically similar open circuit seeking switches in the Autopositioner. The control system is the open circuit seeking type. Whenever the control switches and open circuit seeking switches are not set to the same electrical position, the Autopositioner is energized and rotates its elements to the proper position to restore the symmetry of the control system. It provides a maximum number of tuning positions with a minimum number of control wires by using the control wires in various combinations.

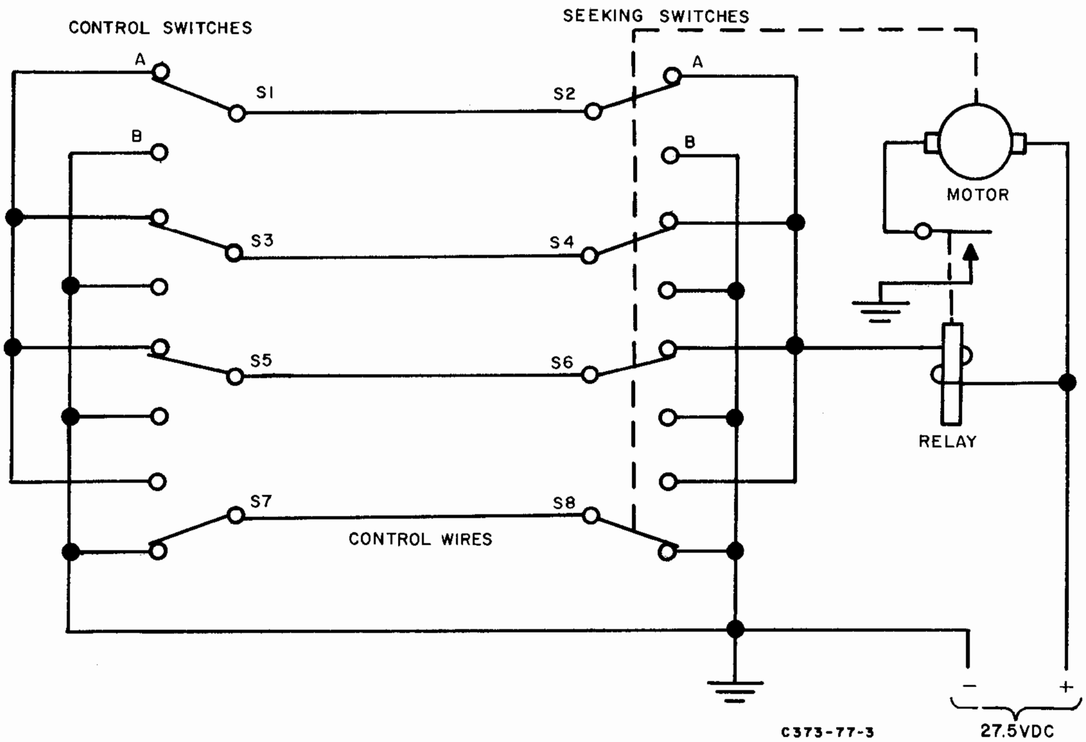
The system is comparable to a single-pole, double-throw switch scheme shown in figure 30. When the control and seeking switches are set symmetrically (S1 in the same position as S2, etc., as shown), there is no current path from the relay coil to ground, and the relay and motor are not energized. If any control switch is set to a position opposite that of a corresponding seeking switch, a path to ground is closed, energizing the



618T-1B/2B/3B Autopositioner System, Basic Elements
Figure 29

relay and motor that turns the rotary open circuit seeking switches until they are again positioned in a symmetrical arrangement with the control switches. When this happens, the relay circuit opens and the motor stops. The total number of combinations of switch positions in such a system is 2^{n-1}, where n is the number of control wires used. In the 4-wire system shown, 16-1 or 15 combinations exist.

Figure 829 is a schematic diagram of Autopositioner A12A1. There are three seeking switches and associated inverted BCD switches in Autopositioner A12A1: 100-, 10-, and 1-kHz switches. The 0.1-kHz inverted BCD frequency control information is not a function of Autopositioner A12A1. For the selected vco frequency to be set up, all 3 switches must be satisfied. Since all 3 switches have 10 positions each, there are 10^3 or 1000 possible combinations. Since the 1000 possible combinations occur within a 1-MHz



618T-1B/2B/3B Remote Frequency Control, Simplified Schematic Diagram
Figure 30

range, the Autopositioner tunes the 618T-1B/2B/3B in 1-kHz increments. The 0.1-kHz tuning process theory will be explained in the control data converter A16 and frequency divider-stabilizer A16 sections.

The 100-kHz seeking switch is geared so that it is advanced one position for each revolution (100 kHz) of the Autopositioner shaft. The 10-kHz seeking switch and stop wheel are coupled directly to the shaft. The stop wheel has 10 notches, making each notch position 10 kHz apart in frequency. The 100- and 10-kHz seeking switches are both driven by motor A12B2 in the Autopositioner.

The 1-kHz seeking switch is driven by a separate motor, A12B1, in the Autopositioner. This motor also drives a gear that turns the entire shaft assembly through the action of a cam. The cam turns the shaft to 10 intermediate positions between each notch on the stop wheel, the total deflection of the shaft corresponding to one-tenth of a revolution of the shaft. Each of the 10 positions is a 1-kHz step. These 10 positions, together with the 100 notch positions furnished by the 10 revolutions of the stop wheel, give the required 1000 positions.

(d) Balanced Mixer Theory.

Refer to figure 828. The rejection of unwanted mixer products, produced by frequency translation in rf translator A12, includes mixer balancing, the 14.5- to 15.5-MHz bandpass filtering, disabling of unused mixers, and linear operating of all mixers. More linear operation is also assured by neutralization of rf drivers A12V6 and A12V7. Balanced mixers are used in the transmit mode. Mixers A12V1, A12V2, and A12V3 each operate in the same manner to attenuate the injection oscillator in the mixer output circuit. In each mixer, the oscillator signal is applied to the cathode circuit of the mixer (pin 3) and also to the grid of the second triode element (pin 7). Cancellation of the oscillator signal takes place since the signal causes grid current to flow in the second triode 180 degrees out of phase with oscillator signal current injected into the mixer cathode. Attenuation of the oscillator signal is approximately 20 db. Better attenuation is obtained by tuning of the grid circuits of the second triode. High-frequency mixer A12V3 is critically adjusted for mixer balance by tuning oscillator balance capacitor A12C256 for null at the operating frequency where the interference is most pronounced.

(e) Neutralization.

Radio-frequency driver stages A12V6 and A12V7 receive negative feedback from power amplifier A11 through connector A12P3 and capacitors A12C142 and A12C143. The feedback is applied to the cathodes and improves driver amplifier linearity.

Radio-frequency driver stages A12V6 and A12V7 are neutralized by a bridge circuit consisting of capacitors A12C125, tuning capacitors, series equivalent of A12C128 and A12C129, and the grid to plate capacitances of the driver tubes. Driver neutralization capacitor A12C128 is adjusted to balance grid to plate coupling. This condition is met when the signal appearing at the grids as a result of the feedback voltage is equal in amplitude but 180 degrees out of phase with the signal appearing at the grid as a result of the grid to plate capacitance.

To ensure that the negative feedback from power amplifier A11 to the rf driver cathodes does not appear in the rf driver grid circuit, the feedback is also neutralized. This is done in a bridge circuit formed by A12C125, tuning capacitance, parallel combination of A12C126 and A12C127, and the cathode to grid capacitance of the driver tubes. By adjusting A12C127, the voltage appearing at the grid as a result of coupling through the grid to cathode capacity is canceled out by an equal but 180-degree out-of-phase voltage coupled to the other end of the grid tuning network. The series combination of A11C1 and neutralizing capacitor A12C141, capacitor A12C140, the driver plate tank circuit capacitance, and the grid to plate capacitance of the power amplifier tubes forms the neutralizing bridge for power amplifier A11.

(f) Switching Circuits.

Relay functions of rf translator A12 in the transmit mode are explained together with functions particularly associated with receive mode. In transmit, a key-line ground is applied through of A12P9-16, to TR relays A12K1, A12K2, and A12K4, causing them to energize. Contacts 3 and 8 of relay A12K1 close and supply a ground return for the cathodes of rf amplifiers A12V4 and A12V5. Contacts 4 and 7 close, providing a ground return for the cathode of transmit lf mixer A12V1 and transmit 17.5-MHz mixer A12V2. (In receive, when relay A12K1 is deenergized, the cathodes of the rf amplifiers and of the mixers are returned to the +28-volt dc line at A12P9-17 and thus biased off.)

When relay A12K4 energizes, contacts 3 and 8 close, grounding the receive antenna path. Contacts 4 and 7 close, supplying a ground return for the control grids of rf amplifiers A12V4 and A12V5. This ground removes the agc voltage present in the receive mode.

When A12K2 energizes, contacts 3 and 8 close and furnish a ground return for the cathodes of transmit hf mixer A12V3 and rf driver amplifiers A12V6 and A12V7. (In receive, these cathodes are returned to the +28-volt dc source at A12P9-17.) This biases off the mixers and drivers. When relay A12K2 energizes, contacts 4 and 7 also close. This applies the output of transmit hf mixer A12V3 to a tuned circuit serving as mixer plate tank and rf amplifier grid tank. Components of the 20- to 29.9999-MHz tuned circuit are selected by the 28-position band switches A12S4, A12S5, A12S6, and A12S7.

In the receive mode, the key-line ground is removed from A12P9-16, and TR relays A12K1, A12K2, and A12K4 deenergize. Contacts 4 and 6 of relay A12K1 provide a ground return for receiver 17.5-MHz mixer A12V9. Contacts 2 and 8 close, removing the ground from A12P9-14. The rf sensitivity control is therefore a common cathode variable resistor for rf amplifiers A12V4 and A12V5 and receiver lf mixer A12V8.

Contacts 2 and 8 of relay A12K2 provide a ground return for receiver hf mixer A12V12 and diode A12CR1 in the control grid circuit of the rf driver amplifiers. Contacts 4 and 6 ground one side of capacitor A12C135, placing it in parallel with transformer A12T7 and thereby compensating for the impedance difference between antenna input and transmit hf mixer A12V3 output.

During recycle of motor relay A12K3, contacts 4, 6, and 7 control the recycle pulse that actuates chassis-mounted recycle relay K4. Within rf translator A12, the recycle function deenergizes the TR relays and provides muting for the receiver.

Band switching in rf translator A12 is provided by band-switch motor A12B1. Operation of the motor is controlled by band switch A12S13 and motor relay A12K3. When the MHz digit of operating frequency is changed, a ground is applied to pin 26 of band switch A12S13. The ground causes relay A12K3 to energize and apply +28 volts through contacts 3 and 8 to the band-switch motor. Contacts 4 and 7 ground the recycle line to mute the receiver. Band-switch motor A12B1 drives the band switches and the turrets that tune the rf amplifier and rf driver; A12B1 stops when seeking switch A12S13 reaches the desired point and opens the circuit. The ground path through relay A12K3 is opened to stop the band-switch motor. Power amplifier band switch A12S12 sends positioning information to power amplifier A11 to tune the power amplifier output circuit. Refer to power amplifier A11 detailed theory for description of amplifier tuning.

(g) 17.5-MHz Oscillator A12V10.

Refer to figure 828. The 17.5-MHz oscillator, A12V10, is fine tuned by voltage variable capacitor A12C276. The error voltage is applied from the output of MHz-frequency stabilizer A10 to phase lock the oscillator (refer to MHz-frequency stabilizer A10 detailed theory). The 17.5-MHz oscillator receives plate voltage from pin 16 of band switch A12S8 if the operating frequency is below 7 MHz. If the operating frequency is above 7 MHz, the oscillator is turned off, and the rf sample to MHz-frequency stabilizer A10 is no longer applied. To prevent MHz-frequency stabilizer A10 from sweeping and generating noise, the bias at the cathode of A12CR9 is removed when the oscillator is turned off. Diode A12CR9 then conducts and swamps MHz-frequency stabilizer A10 with resistors A12R88 and A12R89 to prevent sweeping.

(h) HF Oscillator A12V11.

Refer to figure 828. The operating and phase locking of hf oscillator A12V11 is similar to that of 17.5-MHz oscillator A12V10. However, the hf oscillator remains in operation for all 28 frequencies which are selected by band switches A12S10, A12S11, and A12S14. Refer to figure 26. Voltage variable capacitor A12C277 fine tunes oscillator A12V11 in response to error voltages from MHz-frequency stabilizer A10.

(5) Power Amplifier A11, 618T-( ). (Refer to figure 826.)

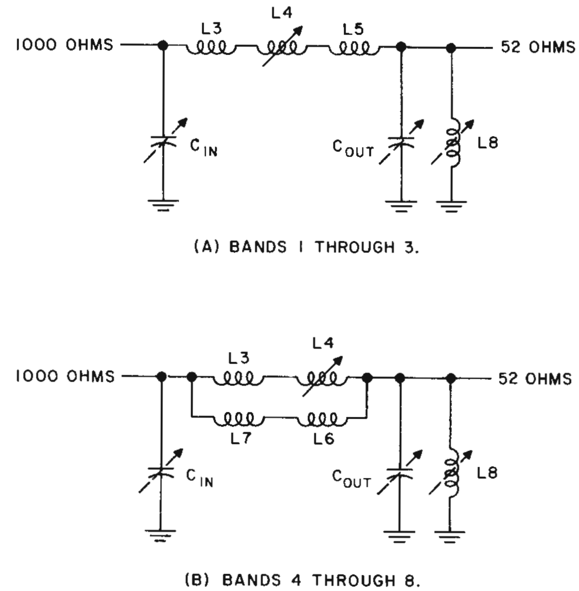
(a) General.

Power amplifier A11 amplifies the low-level rf output of rf translator A12. The power output is 400 watts pep. nominal in the SSB mode and 125 watts with carrier reinserted (amplitude-modulated equivalent). In the voice mode, voice peaks that cause grid current flow develop a control voltage for an automatic load control circuit that reduces drive. The plate circuit is under the control of transmit gain control (tgc) circuits and automatic drive control (adc) circuits.

(b) Power Amplifier Supply Voltages.

Static plate current has a marked effect on the linearity of power amplifier A11. Provision is made to monitor the static plate current balance of the individual power amplifier tubes with switches A11S4 and A11S5. Depressing these switches, with no drive applied to the grid circuit, permits separate checking of plate current for each tube. Drive to the power amplifier may be disconnected by removing the 500-kHz jumper cable between J5 and J6 on the right-hand side of the front cover.

The filaments operate on ac or dc voltage depending upon the high-voltage power supply used. Grid bias (which is not metered) is obtained by rectifying and filtering 115 volts, 400 Hz. Adjustment of bias is made by varying A11R2 for a setting of 300 ma on the front panel meter (100-ma static plate current for each power amplifier tube and 100-ma plate current for driver tubes and bleeder resistor totaling 300 ma). Adjustment is made of transmit gain control (tgc) to provide the rated rf voltage output. Filter A11FL1 is a low-pass LC circuit required to prevent the passage of rf energy into the power supply. Capacitor A11C1 couples rf energy back to rf translator A12 for feedback neutralization.



BAND	RANGE (MHZ)	FREQUENCY RATIO
1	2-3	1.5 : 1
2	3-4	1.3 : 1
3	4-6	1.3 : 1
4	6-8	1.5 : 1
5	8-11	1.4 : 1
6	11-16	1.5 : 1
7	16-22	1.4 : 1
8	22-30	1.4 : 1

NOTE:
BROKEN ARROW INDICATES THAT VALUE IS VARIED IN 8 STEPS.
C373-112-3

Power Amplifier Output Network,
Simplified Schematic Diagram
Figure 31

(c) Band Switching and Loading.

The rf voltage at operating frequency is applied to power amplifier A11 from rf translator A12. Power amplifier tubes A11V1 and A11V2 are connected in parallel. The plate load is a pi network that steps up the 50-ohm antenna impedance to match the 1000-ohm plate circuit of A11V1 and A11V2 (refer to the simplified schematic diagram of the output network in figure 31 and to the schematic diagram in figure 826 for power amplifier A11). The pi network for the plate load consists of variable inductor (or roller coil) A11L4 and various shunt capacitors. The shunt capacitors are selected by servo motor A11B1 driving wafer switches A11S1, A11S2, and A11S3. Wafer switch A11S1 is a seeking switch that derives the band information from wafer switch A12S12 in rf translator A12. The band information divides the twenty-eight 1-MHz increments into eight ranges of coarse tuning for power amplifier A11. Figure 31, a simplified schematic diagram of the pi network, lists the tuning range for each of the eight bands.

The coarse tuning for the eight bands occurs during recycle. Band-switch motor A12B1 in rf translator A12 positions band switch A12S12 according to the operating frequency selected. Band switch A12S12, in turn, provides band information to seeking switch A11S1 in power amplifier A11 and activates motor A11B1.

(d) Servo Tuning.

After changing frequency, variable inductor A11L4 requires retuning. On some of the eight bands, the variable inductor is combined in series with other inductors as shown in figure 31. On the other bands the variable inductor is connected in series parallel.

Inductor A11L8 (see figure 826) is a compensating inductor that is tapped so that the parallel combination of A11L8 and C (out) approaches resonance at the high end of the band being used. The high impedance of this parallel resonant circuit holds the output impedance, and therefore, the amplifier plate load nearly constant over the entire tuning range of the band in use. The 52-ohm output of power amplifier A11 is generally coupled to an antenna tuner or antenna coupler. A signal from the antenna coupler during the tuning cycle energizes relay A11K3 and connects 25 ohms of resistance in series with the 52-ohm output to prevent the antenna coupler from attempting to tune prematurely.

(e) Phase Discriminator.

A servo loop tunes the power amplifier plate circuit to resonance. The phase discriminator that provides the error signal is shown in the power amplifier A11 schematic diagram. The signal at the power amplifier grids is coupled to the phase discriminator through parasitic suppressor A11E3. This is the reference signal. The error signal is picked off the pi network circuit by transformer A11T1 and applied to diodes A11CR2A and A11CR2B with equal potential but opposite polarity. Rectification of the error signal by these diodes causes unilateral current flow in resistors A11R12 and A11R13, and the resultant voltage drops across these resistors are opposite in polarity, causing cancellation and zero output voltage. If the rf voltage in the power amplifier plate circuit is not 180 degrees out of phase with grid voltage, the grid voltage reference will reinforce the current flow in either diode circuit A11CR2A or A11CR2B, depending upon the direction of phase error. The net difference in voltage drops between A11R12 and A11R13 is the error voltage. The polarity of the error voltage is determined by the direction of the phase error.

Refer to figure 817, a schematic diagram of electronic control amplifier A6. The 400-Hz chopper (A6G1) receives the error voltage from the power amplifier module and inverts it into a 400-Hz error signal. The error signal is then amplified in A6Q1 through A6Q4, phase inverted by A6Q5, and applied to push-pull amplifier A6Q6 and A6Q7. The push-pull amplifier output provides sufficient 400-Hz power to drive servo motor A11B2 in the power amplifier module. The solenoid of chopper A6G1 is supplied by the same 115-volt, 400-Hz phase leg as the reference winding of servo motor A11B2. This establishes phase relationship with the polarity of the signal voltage from the electronic control amplifier module. Therefore, servo motor A11B2 will run in the direction determined by the polarity of the error voltage and tune roller coil A11L4. Continuous sampling of the phase angle tuning of the roller coil provides feedback to reduce the error voltage to zero when the plate circuit is tuned to resonance.

(6) RF Oscillator A2, 618T-( ) (Collins Part Number 528-0251-005).

Refer to figure 811. A 3-MHz signal is generated by temperature-compensated crystal oscillator subassembly A2A1. The 3-MHz signal is applied to locked oscillator divider A2Q4. This locked oscillator divides the 3-MHz frequency by 6 to produce a 500-kHz output. This 500-kHz output is applied to amplifier A2Q5 and emitter-follower amplifier A2Q7. The output of amplifier A2Q5 is fed to the MHz-frequency stabilizer module and to amplifier A2Q6. The output of A2Q6 is fed to the if. translator module. Emitter-follower A2Q7 isolates locked oscillator A2Q8 from preceding circuit stages. The 500-kHz signal from A2Q7 is applied to locked oscillator divider A2Q8. This locked oscillator divides the 500-kHz signal by 5 to produce a 100-kHz output. This output is amplified by 100-kHz amplifier stage A2Q9 and fed to the frequency divider module.

The 3-MHz crystal oscillator in this module is the basis of the entire 618T-( ) frequency scheme. Therefore, it is very important that the oscillator frequency be kept as constant as possible. In the earlier version of rf oscillator module A2 (figure 812), the crystal is enclosed in a temperature-regulating oven that maintains the crystal temperature at 80 ±0.2 °C. The oven control circuit consists of a temperature-sensitive bridge and an audio amplifier composed of Q12 through Q15.

The bridge is composed of four resistance windings. The resistance values of two of the windings, made of a copper-nickel alloy, do not vary with temperature. These windings are on opposite legs of the bridge. The resistance values of the other two windings, which are made of pure copper, vary with temperature, the resistances being greater at a higher temperature. The resistances of the two temperature-variable windings are chosen so that, when the temperature of the oven is at the preset value, the values of all four winding resistances are equal and the bridge output is zero.

A new version of rf oscillator A2, Collins part number 528-0690-001 (figure 810), includes a squelch amplifier and control circuit. The oscillator portion of the module functions identically to rf oscillator A2, Collins part number 528-0251-005, explained above. The theory of operation of the squelch amplifier and control circuit is explained in paragraph 5.C.(16) of this manual.

(7) Frequency Divider A1, 618T-1/2/3. (Refer to figure 809.)

(a) General.

The spectrums used in the frequency stabilization circuits in the 618T-1/2/3 are a series of discrete frequencies, or spectrum points, spaced at equal intervals over a frequency range. These spectrums are produced by creating pulses of a certain frequency. A pulse with a repetition rate of exactly 1 kHz, for example, is composed of a series of sine waves of various frequencies. A 1-kHz pulse contains many sine-wave frequencies spaced exactly 1 kHz from the other at 2 kHz, 3 kHz, 4 kHz, etc. The amplitude of these 1-kHz spectrum points decreases as the frequencies get further from the fundamental 1 kHz.

Each spectrum point frequency has precisely the same frequency stability and phase relations as the fundamental 1-kHz frequency. Therefore, spectrum points may be used as injection frequencies or reference frequencies in stabilization circuits if they are generated by pulses that are derived from the crystal oscillator in rf oscillator module A2.

As stated previously, the amplitude of the 1-kHz spectrum point frequencies decreases as the frequencies progress away from the fundamental 1 kHz. In some instances, it is desirable to use spectrum points so far from the fundamental frequency that their amplitude is too small to be useful. If, for example, the 1-kHz spectrum points around 550 kHz are needed, it is possible to increase their amplitude in the following manner.

The fundamental 1-kHz pulse is used to synchronize a monostable multivibrator at 1 kHz. The multivibrator output is a 1-kHz rectangular pulse. This pulse keys a free-running oscillator on and off at a 1-kHz rate. The keyed oscillator is tuned to the frequency about which the spectrum points are to be used, in this case 550 kHz.

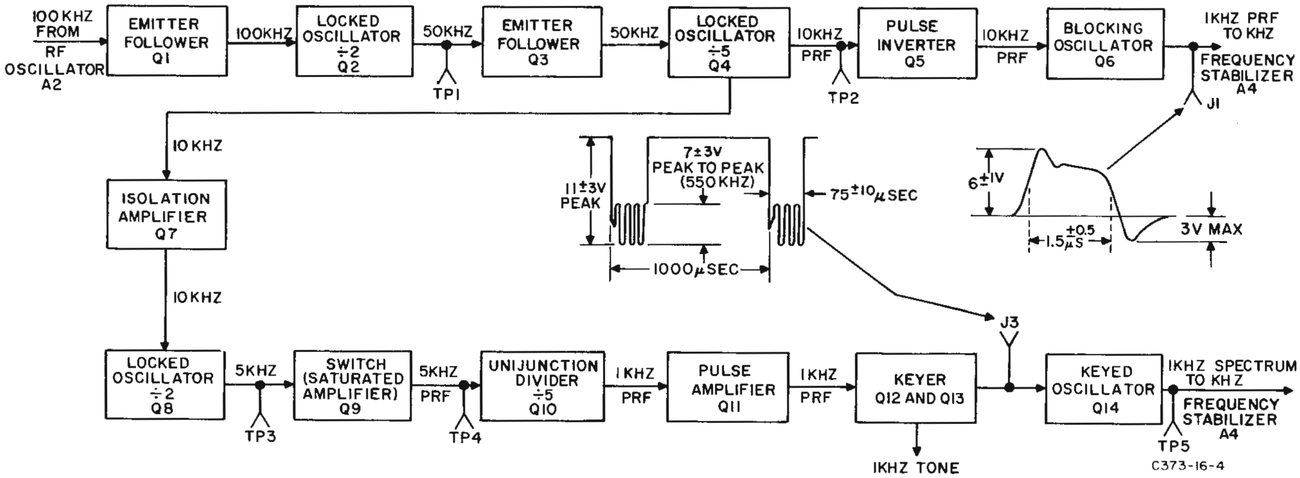
It is not necessary for the free-running frequency of the keyed oscillator to be exactly 550 kHz for a spectrum point to be at 550 kHz. The free-running oscillator frequency does not appear in the spectrum. It merely determines the frequency about which the amplitude of the spectrum frequencies will be greatest. In the example, if the keyed oscillator were tuned to 550.2 kHz and keyed by an exact 1-kHz pulse, the spectrum output would be a series of frequencies, one at exactly 550 kHz and others extending on each side of 550 kHz at exact 1-kHz intervals. The amplitudes of the spectrum points decrease as they progress further from 550 kHz.

It is important to remember that each spectrum point frequency is as stable and exact as the original 1-kHz keying frequency and that the free-running frequency of the keyed oscillator only determines the frequency around which the amplitude of the spectrum point is greatest, so it does not have to be exact.

(b) Details.

The frequency divider module transforms a 100-kHz sine-wave input from rf oscillator module A2 to a 10-kHz pulse and a 1-kHz spectrum, centered at 550 kHz, that are used for frequency stabilization in kHz-frequency stabilizer module A4.

Refer to figures 32 and 33. The 100-kHz input from the rf oscillator module is fed through emitter-follower amplifier A1Q1 to locked oscillator A1Q2. This locked oscillator divides the 100-kHz signal by 2 to produce a 50-kHz output. The 50-kHz output is fed through emitter-follower amplifier A1Q3 to locked oscillator A1Q4. Locked oscillator A1Q4 divides the 50-kHz output



618T-1/2/3 Frequency Divider A1, Block Diagram
Figure 32

by 5 to produce a 10-kHz output. The 10-kHz signal is differentiated by A1C10 and A1R14 to produce a 10-kHz pulse. This pulse is inverted by A1Q5 and triggers blocking oscillator A1Q6. The 10-kHz pulse output of blocking oscillator A1Q6 is coupled through transformer A1T1 to connector A1P1.

The 1-kHz spectrum is produced as follows. Part of the 10-kHz output of locked oscillator A1Q4 is fed through isolation amplifier A1Q7 to locked oscillator A1Q8. Locked oscillator A1Q8 divides the 10-kHz output by 2 to produce a 5-kHz output. The 5-kHz signal switches transistor A1Q9 to produce a positive square wave at the output of A1Q9. Refer to figure 809. When A1Q9 is switched on, A1C22, A1C45, and A1C23 are charged through A1R28. When A1Q9 is switched off, A1C22 and A1C45 discharge through diodes A1CR3 and A1R27. The charge on A1C23 is trapped by diode A1CR4. Thus, each square-wave pulse charges A1C23 to a higher voltage. The value of the A1C22 and A1C45 parallel combination determines the amount of voltage added to A1C23 during each cycle. A1C23 is connected to the input of unijunction transistor A1Q10.

A unijunction transistor is a single-junction semiconductor device whose input is shorted to ground when it exceeds a certain value. When the transistor input voltage across A1C23 becomes high enough, A1C23 is discharged through A1Q10, causing a positive pulse to appear at the output of A1Q10. The value of A1C45 is selected so that every fifth cycle the voltage across C23 is sufficient to cause A1Q10 to conduct. Therefore, the 5-kHz square-wave input to A1Q10 produces a 1-kHz pulse output that is amplified by A1Q11 and used to trigger a monostable multivibrator composed of A1Q12 and A1Q13. The multivibrator output triggers keyed oscillator A1Q14 on and off at a 1-kHz rate. The free-running frequency of keyed oscillator A1Q14 is 550 kHz. Therefore, the output of A1Q14 is a 1-kHz spectrum centered around 550 kHz. A series tuned circuit, A1L8 and C33, produces the spectrum pulse. The 10-kHz pulse and 1-kHz spectrum outputs of the frequency divider module are fed to kHz-frequency stabilizer A4.

(8) kHz-Frequency Stabilizer A4, 618T-1/2/3. (Refer to figure 814.)

(a) General.

The kHz-frequency stabilizer, A4, stabilizes the frequency of the vfo submodule in rf translator A12. Figure 814 is a schematic diagram of kHz-frequency stabilizer A4.

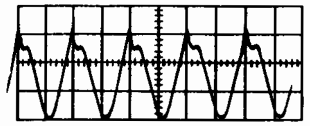
Refer to figures 34 and 37. The vfo frequency is phase locked in 1-kHz steps with the crystal-generated reference frequency from oscillator module A2 by the action of the kHz stabilizer. A voltage-variable capacitor in the tuned circuit of the vfo tunes the vfo according to a dc tuning voltage from the kHz-frequency stabilizer. The tuning voltage for the voltage-variable capacitor is a combination of an adjustable bias voltage from a bias supply and frequency/phase-sensitive control voltages from frequency and phase discriminators. The frequency discriminator initially tunes the vfo within capture range of the phase discriminator.

The inputs to the phase discriminator are two 250-kHz signals. One is the vfo frequency that has been heterodyned to 250 kHz. The other is the rf oscillator crystal frequency that has been heterodyned to 250 kHz. The phase discriminator output is a dc error signal proportional to the phase difference between the 250-kHz signals. This error signal shifts the vfo frequency, by tuning the voltage-variable capacitors in the vfo, until the two signals are phase locked. By phase locking the vfo to the rf oscillator, the vfo frequency is as accurate as that of the rf oscillator reference frequency.

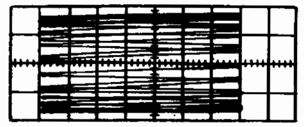
(b) Frequency Discriminator.

The vfo output, which varies from 3500 to 2501 kHz in 1000 1-kHz steps, is amplified by A4Q1 and mixed in A4Q2 with a spectrum of frequencies, spaced 10 kHz apart, which are centered 550 kHz higher in frequency than the vfo. As the vfo is tuned from 3500 to 2501 kHz, the center of the 10-kHz spectrum moves from 4050 to 3050 kHz. This 10-kHz spectrum is derived from the 10-kHz pulse from frequency divider module. The 10-kHz pulse synchronizes a monostable multivibrator, A4Q9 and A4Q10, which in turn triggers keyed oscillator A4Q11 to produce the spectrum. The free-running frequency of this keyed oscillator determines the frequency about which the 10-kHz spectrum points are located and is tuned to stay 550 kHz higher than the vfo. The keyed oscillator is tuned by a dc voltage applied to a voltage-variable capacitor, A4C52. The tuning voltage comes from a precision resistive divider located in Autopositioner A12A1.

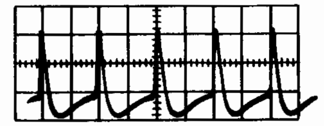
The output of mixer A4Q2, the difference between the vfo frequency and the 10-kHz spectrum frequencies, contains frequencies spaced 10 kHz apart and centered at 550 kHz. The exact frequencies present depend on the vfo frequency being fed to mixer A4Q2. This series of frequencies is fed to a second mixer, A4Q3, where it is mixed with a signal from a free-running digit oscillator, A4Q12. The digit oscillator output is a single frequency that



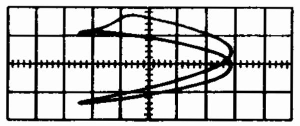
50-kHz locked oscillator, TP1,
10 us/cm,
1.5 v peak to peak



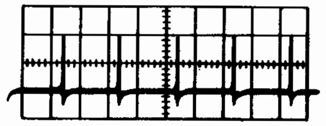
20:1 Lissajous figure, TP3



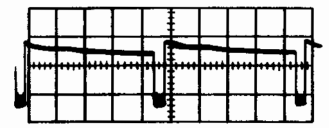
CAL TONE output, TP6 (module extender) 500 us/cm, 1.25 v peak to peak across 5.6K (Remove AM/audio amplifier module for this check.)



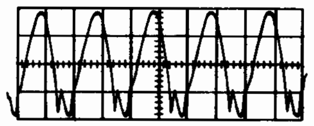
2:1 Lissajous figure, TP1



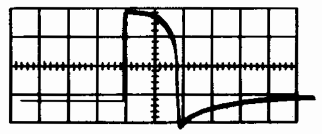
10-kHz pulse output, J1,
50 us/cm,
6 v peak into 50-ohm load



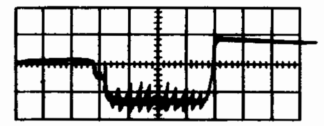
1-kHz keyer, J3,
200 us/cm,
-11 v peak



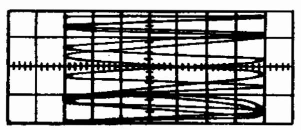
10-kHz locked oscillator, TP2,
50 us/cm,
2.3 v peak to peak



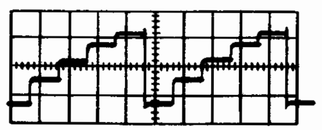
10-kHz pulse output, J1,
1 us/cm



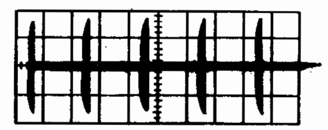
1-kHz keyer, J3,
expanded



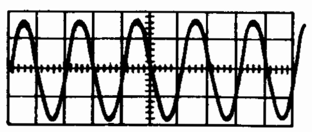
10:1 Lissajous figure, TP2



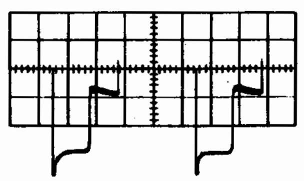
Unijunction divider, TP4,
200 us/cm



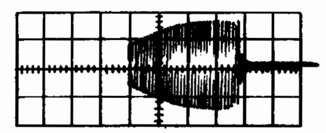
1-kHz spectrum, TP5,
500 us/cm,
7 v peak to peak



5-kHz locked oscillator, TP3,
100 us/cm,
4.5 v peak to peak

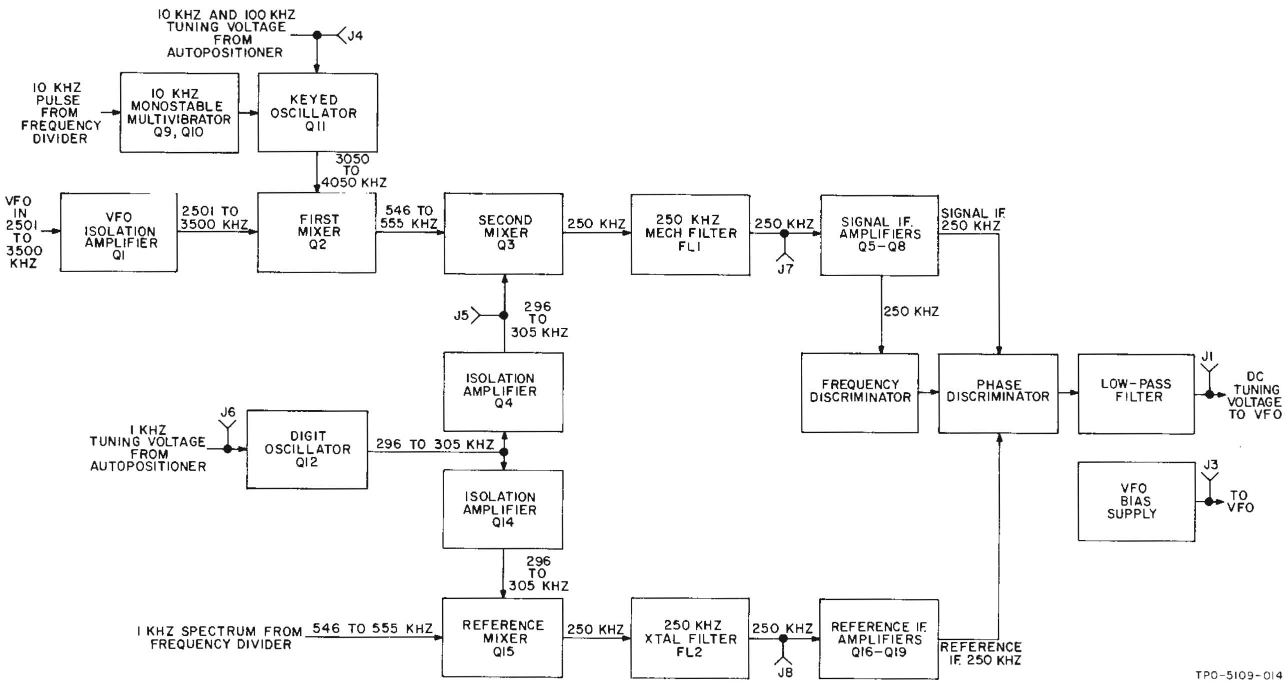


Unijunction divider, TP4,
5th step and firing point,
firing point voltage 0.65 v



1-kHz spectrum, TP5,
expanded

618T-1/2/3 Frequency Divider A1, Waveforms
Figure 33



618T-1/2/3 kHz-Frequency Stabilizer A4, Block Diagram
Figure 34

is varied by the 1-kHz frequency selector switch on the radio set control. The digit oscillator is tuned by a voltage-variable capacitor, A4C66, to ten 1-kHz frequencies from 296 to 305 kHz. The tuning voltage for the digit oscillator is derived from another precision resistive divider in Autopositioner A12A1. The free-running digit oscillator frequency is mixed in A4Q3 with the series of frequencies spaced 10 kHz apart and centered around 550 kHz. The output of A4Q3 is a series of frequencies spaced 10 kHz apart, centered around 250 kHz. One of these frequencies is 250 kHz plus or minus the vfo frequency error and the digit oscillator frequency error. The output of mixer A4Q3 is passed through mechanical filter FL1, which has a bandwidth of 10 kHz centered at 250 kHz. The mixer output frequency near 250 kHz is passed, but all the other frequencies are filtered out, for the nearest frequencies are 10 kHz away and will not pass through the filter whose bandwidth extends 5 kHz on either side of 250 kHz. The signal if. frequency (250 kHz plus or minus the vfo and digit oscillator errors) is then amplified by if. amplifiers A4Q5 through A4Q8 and fed to the frequency discriminator.

kHz-frequency stabilizer A4 is part of a feedback loop between the vfo output and a tuning-voltage input to a voltage variable capacitor in the vfo tune circuit. The module continually compares the vfo output frequency with a reference frequency and sends a dc tuning voltage to the vfo until it is phase locked with the reference. If the vfo drifts out of phase lock with the reference, kHz-frequency stabilizer A4 senses this change and provides a dc error voltage to keep the vfo phase locked with the reference at all times.

The free-running frequency of vfo A12A2, after tracking adjustments, will vary approximately ±2 kHz. Phase lock of the vfo reduces this error considerably. For example, at a vfo frequency of 3.500 MHz, the allowable error is only 2.8 Hz, the same 0.8-part-per-million accuracy of the 3-MHz crystal oscillator. This difference is too great to be controlled by one discriminator. The frequency discriminator can capture the vfo with a 2-kHz error but it becomes insensitive to frequency error at a fraction of 1 kHz, usually ±200 Hz. The phase discriminator retains its sensitivity down to the region of ±3 Hz, but its capture range is too narrow to initially change the vfo error. Therefore both discriminators are needed. The output circuits of the frequency and phase discriminators work simultaneously and are series connected to provide the dc error voltage.

Initially, assume that the vfo is to be captured by the frequency discriminator because the vfo frequency error is too great to be captured by the phase discriminator. Capture of vfo frequency by the frequency discriminator is accomplished by mixing the vfo frequency with a 10-kHz reference spectrum to obtain an if. signal that is amplified and applied to the frequency discriminator. It produces a dc error voltage that is applied to a voltage-variable capacitor in the vfo and the frequency is corrected within the capability of the frequency discriminator. Final vfo frequency correction is made by mixing the partially corrected vfo frequency with a 1-kHz reference spectrum. This yields a reference if. The reference if. is amplified and compared with the signal if. in the phase discriminator. The phase discriminator produces a dc error voltage that overrides the output of the frequency discriminator, applies it to the same voltage-variable capacitor, and phase locks the vfo. Note that the phase discriminator does not compare the reference if. with the frequency discriminator dc output voltage but with the same signal if. applied to the frequency discriminator. Note also that both the frequency and phase discriminators correct the vfo frequency once the vfo is within the capture range of the discriminators.

During normal 618T-1/2/3 operation, the phase discriminator usually retains control of the vfo, and the frequency discriminator does not sense an error. The frequency discriminator can be expected to function when the 618T-1/2/3 is first turned on and when a frequency change is made.

(c) Frequency Translation, 618T-1/2/3.

The frequency translation processes that convert the vfo and reference frequencies to 250 kHz will now be explained in detail for a typical 618T-1/2/3 operating frequency. The principles of operation are exactly the same for each of the other 999 possible vfo frequencies.

Refer to figure 36. Assume that the 618T-1/2/3 operating frequency is X.243 MHz on any of the 28 bands. The vfo frequency will then be 3.500 MHz -0.244 MHz or 3.257 MHz (3257 kHz). Also assume, in this example, that the vfo is phase locked with the reference. The vfo frequency, therefore, will be exactly 3257 kHz.

The vfo output is fed to the first signal mixer in the kHz-frequency stabilizer. The injection to this mixer is a series of 10-kHz harmonics around a frequency that is approximately 550 kHz higher than the vfo frequency. In the example, these 10-kHz harmonics have the greatest amplitude around the 3810-kHz harmonic. This 10-kHz spectrum is produced by a keyed oscillator in the kHz-frequency stabilizer module that operates in the same manner as the keyed oscillator in the frequency divider module. The reference pulse for this 10-kHz keyed oscillator is the 10-kHz pulse output of the frequency divider module. Thus, each frequency in this 10-kHz spectrum is as stable as the 10-kHz reference pulse. The oscillator free-running frequency is tuned by a tuning voltage tapped from a precision resistive voltage divider in the Autopositioner to keep the harmonic of greatest amplitude approximately 550 kHz higher than the vfo frequency.

The first signal mixer output is another 10-kHz spectrum that is the difference between injection spectrum and the vfo input. This spectrum will be centered at approximately 550 kHz. The exact spectrum frequencies depend on the vfo frequency. In the example, this spectrum is centered around 553 kHz. This first signal mixer output is fed to the input of a second signal mixer. The injection frequency for this mixer is the output of a digit oscillator.

The digit oscillator is a free-running oscillator in the kHz-frequency stabilizer module. It is tuned by a voltage-variable capacitor whose tuning voltage is tapped from a precision resistive voltage divider in the Autopositioner. The digit oscillator output frequency depends on the 1-kHz digit in the 618T-1/2/3 operating frequency and varies in 1-kHz steps from 296 kHz when the operating frequency is X.XX6 MHz to 305 kHz when the operating frequency is X.XX5 MHz. Figure 35 lists the digit oscillator frequency for each operating frequency digit. Figure 36 contains an example operating frequency.

In the example, the operating frequency is X.243 MHz, and the digit oscillator frequency will correspond to the X.XX3-MHz setting or 303 kHz. Because the digit oscillator is a completely free-running oscillator, its output frequency will depart somewhat from exactly 303 kHz. This error has been designated in the example as e.

The second signal mixer output is tuned to the mixer difference frequency output. When the digit oscillator is mixed with the 10-kHz spectrum, the output will be another 10-kHz spectrum centered at approximately 250 kHz. One of the mixer products will vary from 250 kHz only by the digit oscillator frequency error introduced in the mixing process. This mixer product is filtered from the spectrum by a mechanical filter whose bandpass is 4 kHz on either side of 250 kHz. This 250-kHz frequency is the input signal to the frequency and phase discriminators. The 250-kHz reference frequency is derived in a manner similar to the 250-kHz signal previously described.

The 1-kHz reference spectrum from 546 to 555 kHz, and output of the frequency divider module, is mixed with the digit oscillator output in the reference mixer. The mixer difference frequency output will contain (in addition to the other mixer products) a product that is the difference between

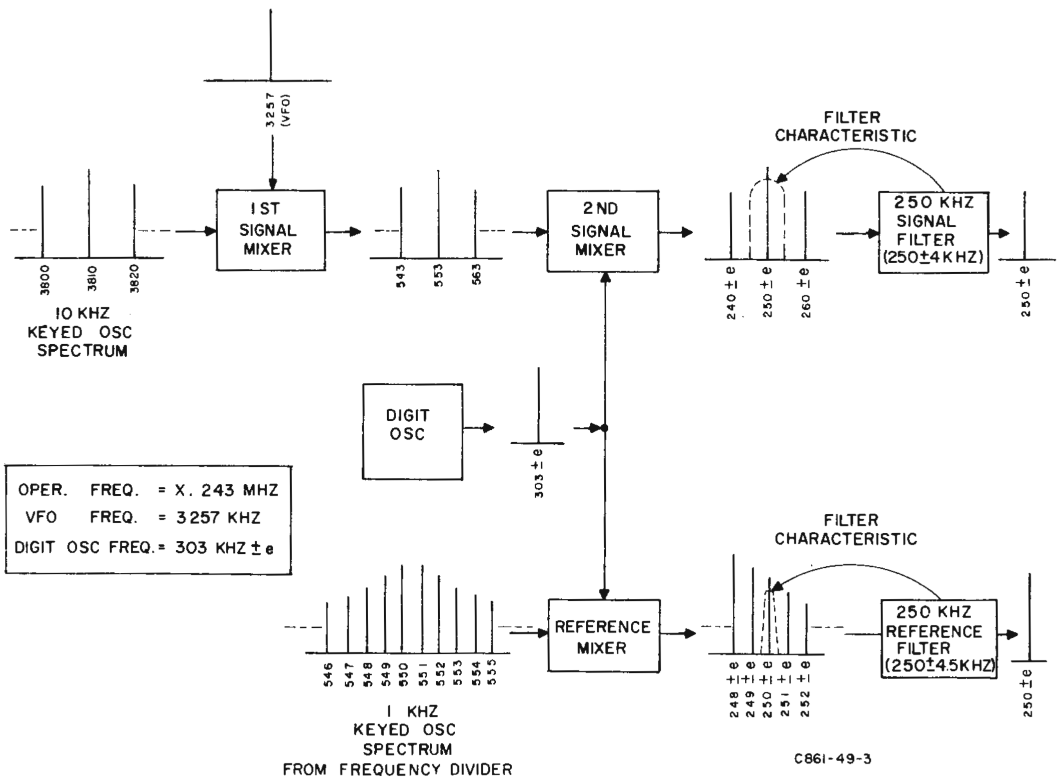
618T-1/2/3 OPERATING FREQUENCY (MHz)	DIGIT OSCILLATOR FREQUENCY (kHz)
X.XX6	296
X.XX7	297
X.XX8	298
X.XX9	299
X.XX0	300
X.XX1	301
X.XX2	302
X.XX3	303
X.XX4	304
X.XX5	305

618T-1/2/3 Digit Oscillator Frequency for Each Operating Frequency Digit
Figure 35

the 553-kHz reference spectrum component and the 303-kHz digit oscillator output. This 250-kHz reference mixer output will, like the 250-kHz signal from the second signal mixer, vary from exactly 250 kHz by the frequency error of the digit oscillator introduced in the reference mixer. The mixer products in the output of the reference mixer will be spaced 1 kHz apart. The 250-kHz spectrum component is filtered out by a crystal filter whose bandpass extends 5 kHz on either side of 250 kHz. This 250-kHz frequency is the reference input to the phase discriminator.

For the reference if. to function properly, digit oscillator frequency error e is held within ±150 Hz. If the error exceeds ±200 Hz, the 1-kHz reference spectrum component near 250 kHz (at the output of the reference mixer) will not fall within the bandpass of the crystal filter in the reference channel. If this happens, the 250-kHz reference if. will not be applied to the reference if. amplifiers and therefore not to the phase discriminator.

The digit oscillator frequency must be accurate. Therefore, the voltage that tunes the voltage-variable capacitor in the oscillator tuned circuit must be stable. This dc tuning voltage comes from a bridge circuit shown in figure 38. Part of this circuit is in the kHz-frequency stabilizer module, part in the chassis, and part in the Autopositioner submodule located in the rf



618T-1/2/3 kHz-Frequency Stabilizer A4, Frequency Translation Process
Figure 36

translator module. The bridge output is kept constant by the action of three series breakdown diodes CR6, CR7, and CR8. A 40-ohm resistor, R58, in the bridge arm opposite the diodes, nearly equals the resistance of the diodes in the breakdown condition. Because of the ratio of resistances between the upper and lower arms of the bridge, voltage changes at the bridge input are nearly eliminated at the bridge output.

The precision resistive voltage divider in the Autopositioner that provides the tuning voltage for the digit oscillator is connected across the bridge output. The digit oscillator frequency may be adjusted by varying R59, which is in series with the divider.

The vfo bias voltage and 10-kHz keyed oscillator tuning voltage are also taken from precision voltage dividers that are connected across the breakdown diode circuit of the bridge. Currents in both of these dividers may be varied to produce the proper tuning voltage for the voltage-variable capacitors.

The 250-kHz signal is applied to a frequency discriminator that is tuned to 250 kHz. The frequency discriminator dc output voltage is applied in series with the phase discriminator dc output to the voltage-variable capacitor in the vfo tuned circuit. The frequency discriminator output shifts the vfo frequency to within the phase discriminator capture range.

The phase discriminator compares the two 250-kHz if. signals and produces a dc output voltage proportional to the phase difference between the two. The effect of digit oscillator frequency error e is canceled in the phase discriminator, for the error appears in both discriminator inputs.

The phase discriminator dc output is not necessarily zero, for the two inputs may not be exactly in phase even though they are phase locked. The discriminator output, however, will remain constant as long as there is no relative phase drift between the 250-kHz signal and reference frequencies.

If the vfo frequency tends to drift with respect to the reference, the phase discriminator dc output voltage will change. This in turn will retune the vfo to decrease the phase drift to zero.

The vfo input to the kHz-frequency stabilizer module and the vfo dc tuning voltage from the stabilizer are carried on the same line. The vfo rf voltage is added to the dc tuning voltage so that there are both useful ac and dc components in the line. The two components are separated at the end of the line.

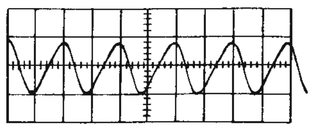
(9) MHz-Frequency Stabilizer A10, 618T-( ). (Refer to figure 824.)

The MHz-frequency stabilizer, A10, phase locks 17.5-MHz oscillator A12V10 and hf oscillator A12V11 with a 500-kHz spectrum. Both oscillators are contained in rf translator A12. The 17.5-MHz oscillator, A12V10, has one operating frequency, and hf oscillator A12V11 operates on 16 frequencies. Both 17.5-MHz oscillator A12V10 and hf oscillator A12V11 operate on frequencies that are harmonics of 500 kHz. A 500-kHz reference from rf oscillator A2 is used by MHz-frequency stabilizer A10 to generate 500-kHz harmonics comprising a spectrum. The spectrum is combined in separate mixer/amplifiers for each oscillator, and the output is rectified and provides an error signal for oscillator control through the use of a voltage-variable capacitor.

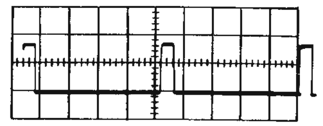
Refer to the block diagram, figure 39, and to the schematic diagram, figure 824. The MHz-frequency stabilizer is part of a feedback loop between the oscillator output and the dc tuning voltage input to a voltage-variable capacitor in the oscillator. The mixer/amplifier subassembly is identical for each oscillator. Subassembly A10A1 controls 17.5-MHz oscillator A12V10, and subassembly A10A2 controls hf oscillator A12V11. The 16 frequencies of hf oscillator A12V11 are fundamental frequencies. There are 28 output frequencies in hf oscillator A12V11 plate circuit, but 12 of these are obtained by doubling the fundamental frequency.

The following discussion describes the phase lock of 17.5-MHz oscillator A12V10. The theory applies as well to each of the 16 fundamental frequencies of hf oscillator A12V11.

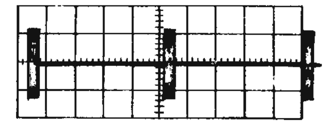
The oscillator control voltages appear at connectors A10P1A1 and A10P1A2. The sample rf frequency and the dc error voltage to correct it are diplexed and



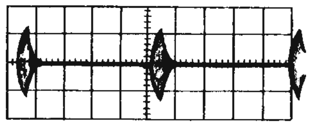
Vfo input, J1,
5 v/cm, 2 us/cm
(70K-5 vfo) 1 v/cm,
2 us/cm (70K-3 vfo)



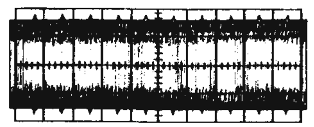
10-kHz keyer output,
TP19,
5 v/cm, 20 us/cm



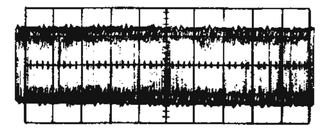
10-kHz keyed oscillator
output, TP10,
2 v/cm, 20 us/cm



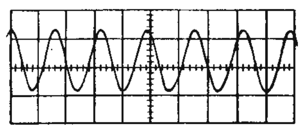
10-kHz spectrum generator
output, TP8,
50 mv/cm, 20 us/cm



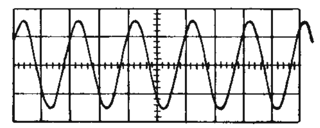
Vfo and 10-kHz spectrum
input to first mixer, TP1,
50 mv/cm, 100 us/cm
(70K-5 vfo) 100 mv/cm,
100 us/cm (70K-3 vfo)



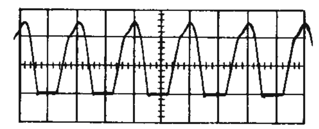
Digit oscillator and
10-kHz spectrum input
to second mixer, TP2,
100 mv/cm, 100
us/cm



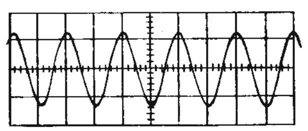
Digit oscillator isolation-
amplifier output, J5,
2 v/cm, 2 us/cm



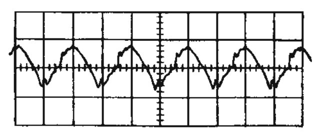
Mechanical filter
output-signal if. input,
J7, 50 mv/cm, 2 us/cm



Signal if. amplifier
interstage test point,
TP4,
1 v/cm, 2 us/cm

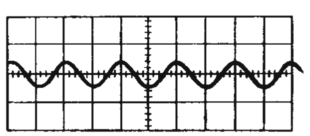


Signal if. amplifier
output, TP5,
5 v/cm, 2 us/cm

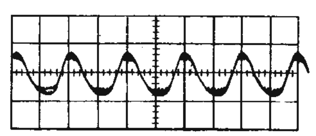


Signal if. input to phase
discriminator, TP16,
5 v/cm, 2 us/cm

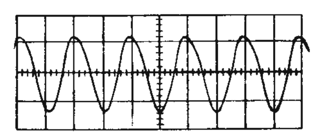
Digit oscillator and
1-kHz spectrum input to
reference mixer, TP12,
100 mv/cm, 1 ms/cm



Crystal filter output-
reference if. input, J8,
50 mv/cm, 2 us/cm

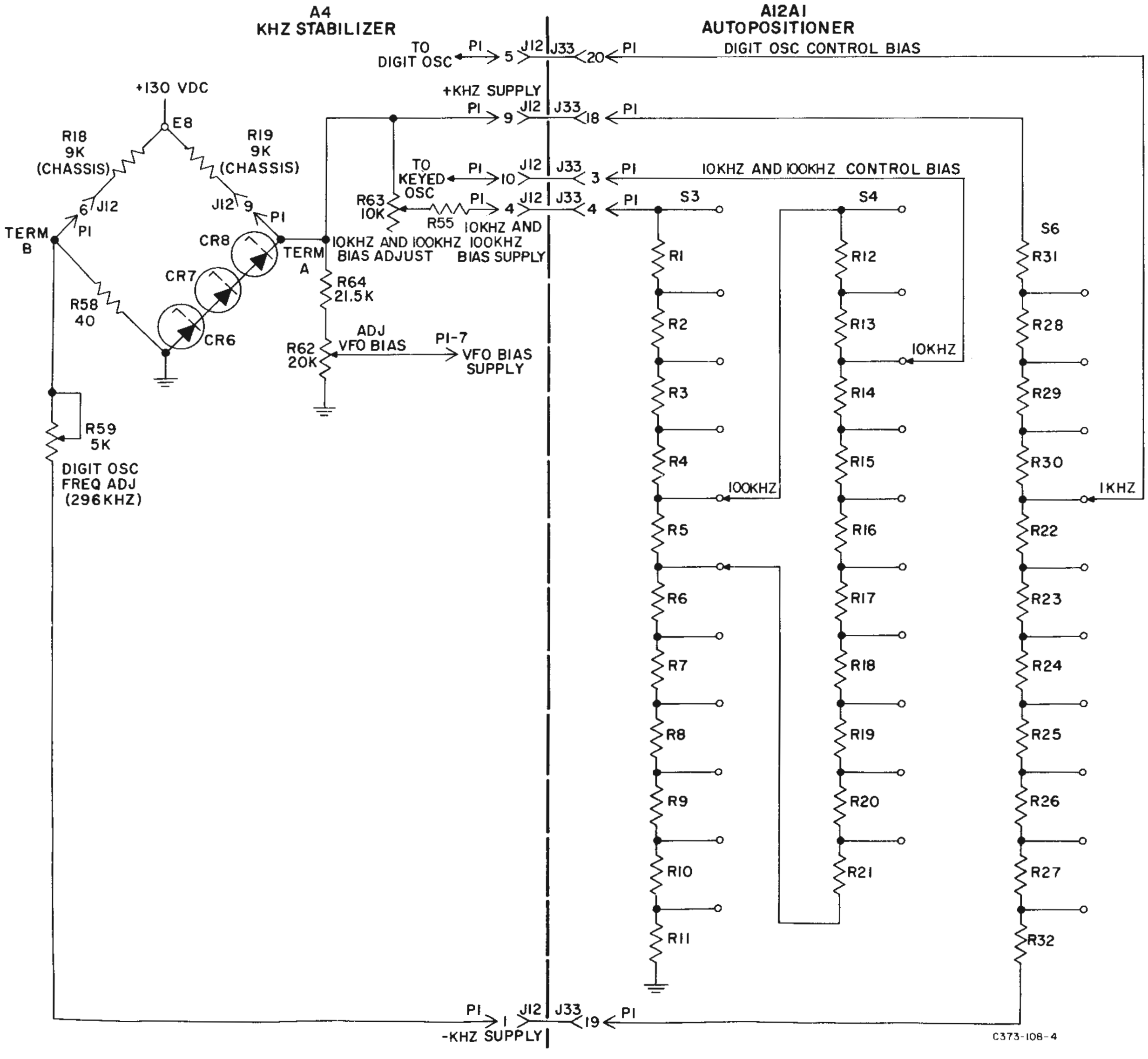


Reference if. amplifier
interstage test point,
TP14,
50 mv/cm, 2 us/cm



Reference if. amplifier
output, TP15,
1 v/cm, 2 us/cm

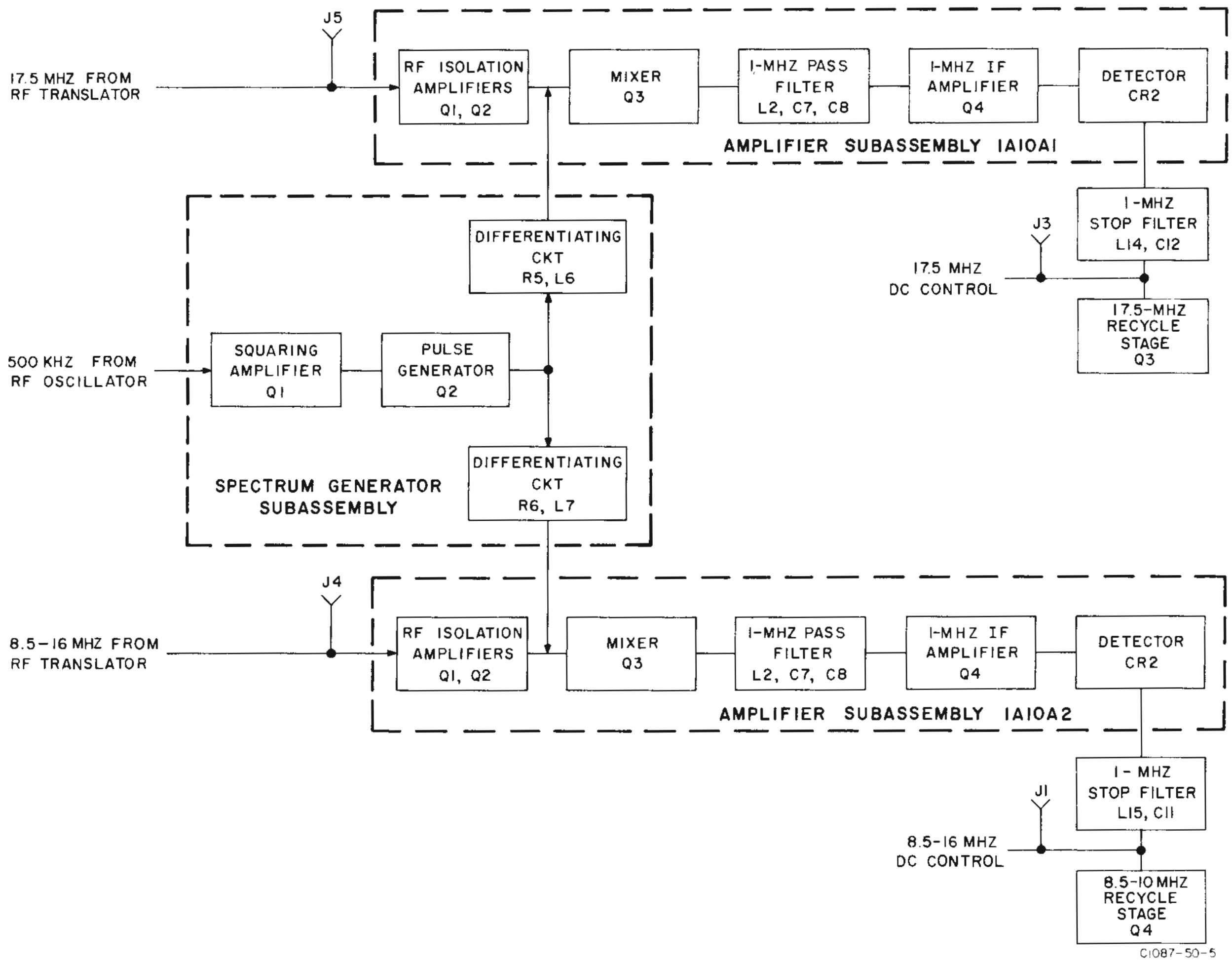
618T-1/2/3 kHz-Frequency Stabilizer A4, Waveforms
Figure 37



618T-1/2/3 Voltage Stabilizing Bridge Circuit,
Simplified Schematic Diagram
Figure 38

crosscoupled. That is, the rf sample from 17.5-MHz oscillator A12V10 and the dc error voltage used to correct hf oscillator A12V11 both appear at A10P1A1. Similarly, the rf sample from hf oscillator A12V11 and the dc error voltage to correct 17.5-MHz oscillator A12V11 both appear at A10P1A2.

From connector A10P1A1, the rf sample from 17.5-MHz oscillator A12V11 is amplified by rf amplifiers A10A1Q1 and A10A1Q2 and mixed with the 500-kHz spectrum in mixer A10A1Q3. The spectrum is a series of differentiated pulses containing reference frequencies equally spaced at 500-kHz intervals from 500 kHz to approximately 25 MHz. Each 500-kHz spectrum point is a harmonic of the reference pulse from rf oscillator A2 and therefore is as stable as the crystal fundamental.



MHz-Frequency Stabilizer A10, Block Diagram
Figure 39

If the connection to connector A10P1A1 is interrupted, the sample rf signal from 17.5-MHz oscillator A12V10 is interrupted, and the remaining input to A10A1 amplifier/mixer is the differentiated 500-kHz reference pulse from the spectrum generator. The reference pulse injection to mixer A10A1Q3 is adjusted with A10R5 on the spectrum generator. Resistors A10A1R10 and A10A1R11, together with thermistor A10A1RT1, form a voltage divider that also influences the amplitude of the injection voltage. Thermistor A10A1RT1 holds amplitude variations relatively constant over a wide temperature range.

The spectrum is applied to the base of mixer A10A13 and, due to the nonlinear characteristics of the mixer, the spectrum points mix. Since each spectrum point is separated by 500 kHz, a 1-MHz component is obtained by the mixing of every other spectrum point. In the range of the 17.5-MHz amplifier, these components appear at 16.5 MHz, 17.5 MHz, 16 MHz, 17 MHz, etc.

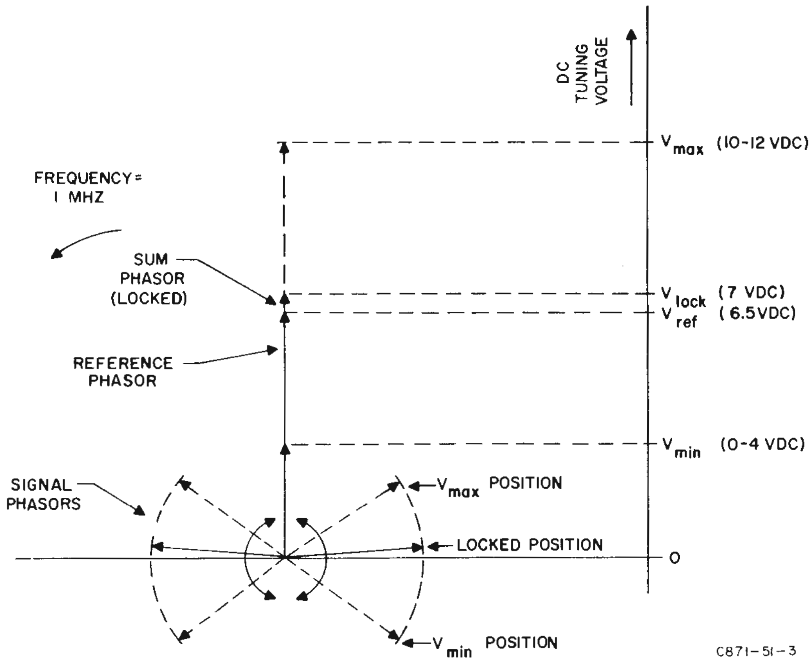
This 1-MHz component is applied to if. amplifier A10A1Q4, which is tuned to 1 MHz; it filters out the undesired spectrum products. The desired 1-MHz component is detected by A10A1CR2 and filtered by the 1-MHz stop filter made up of A10L15 and A10C11. Spectrum amplitude adjustment A10R5 is set so that the detected voltage from the spectrum alone is +6.5 volts. This dc voltage is the bias voltage for the 17.5-MHz oscillator A12V10 voltage-variable capacitor.

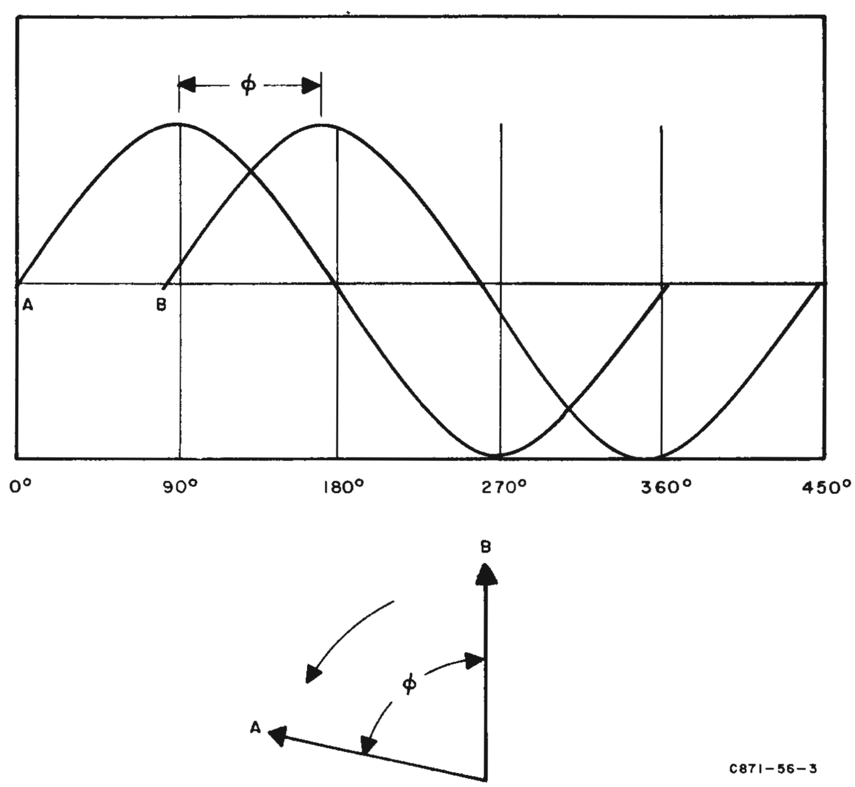
With the connection completed to connector A10P1A1, the sample rf signal from 17.5-MHz oscillator A12V10 is amplified in rf isolation amplifiers A10A1Q1 and A10A1Q2 and then mixed in A10A1Q3 with the spectrum reference.

Two frequencies that are not identical differ in phase relationship. This difference may be used to produce an error voltage. Presume that only a 1-Hz error exists in 17.5-MHz oscillator A12V10 frequency. If this error is in the direction of the upper spectrum point (18.5 MHz), the difference frequency is 999,999 Hz. The difference frequency between the oscillator and the lower spectrum point at 16.5 MHz is 1,000,001 Hz.

Both of the previously mentioned mixer products represent oscillator frequency error, and they drift, phase relative, to the third mixer output, of which the 1-MHz component is the reference. Refer to the diagram of mixer output phasors in figure 40. This figure is a phasor representation of the three 1-MHz mixer output products. The 1-MHz reference is represented by a vertical phasor that is rotating counterclockwise at a 1-MHz rate. The two signal phasors that represent the sum and the difference between the reference and the 1-Hz errors are shown approximately 90 degrees out of phase with the reference. This is an instantaneous phase relationship to the reference and varies constantly since there is no phase lock. Because the two signal phasors are the sum and difference of one reference, they always lead and lag the reference by equal angles.

If the 17.5-MHz oscillator is phase locked with reference, the three phasors are all rotating at exactly the same rate. The sum of the three 1-MHz components will be a single 1-MHz frequency represented by a vertical phasor. (The three phasors rotate at a 1-MHz rate but are stationary relative to one another.)





Phasor Diagrams
Figure 40

The vertical plot of tuning voltage in the figure represents the magnitude of the output voltage from A10A1CR2. Only under the condition that all three 1-MHz signals are at the same phase will the maximum voltage be developed. However, the condition of phase lock does not represent zero phase difference between phasors. Phase lock will occur at some angle less than 90 degrees, at which time the signal phasors will not change phase relationship with the reference. Exact in-phase relationship will periodically occur when there is no phase lock, however. Since both signal phasors are drifting relative to reference, the voltage they develop will drift accordingly. This varying voltage alternately adds to and subtracts from the reference that is represented by the +6.5-volt bias. The result is that the detector output at A10A1CR2 will change from near-0 volt when the signal phasors are in opposite phase with the reference to approximately +13 volts when the signal phasors swing in phase with the reference. The time required for this voltage change to occur depends upon the frequency error. With the 1-Hz error, the time for 1/2 cycle (0 volt to peak) will be 500 milliseconds.

Because this 0- to 13-volt output is applied to the voltage sensitive capacitor in the 17.5-MHz oscillator, the frequency of the oscillator will swing through its entire correction range in 500 milliseconds. With only a 1-Hz error to correct, the first slight change in voltage will correct it. When the error is reduced to 0.1 Hz, the rate of output voltage change slows to 5 seconds for 0 volt to peak. When the error is reduced to 0.01 Hz, the rate of change is 50 seconds. Ultimately, the exact frequency is reached and the drift rate is zero. At this point there is phase lock and the output voltage is zero.

When the 618T-( ) is turned on, it is possible that the signal phasors will be at the wrong point in the drift cycle. Assume that +7.5 volts is the correct locking voltage, but the oscillator begins operating and produces phasors that are rotating in the direction of in-phase condition with the reference and already producing an 8-volt dc output. The voltage is on the increase and tunes the oscillator even higher in frequency. In turn, a larger error is created. Since the larger the error the more rapid the drift rate, the increasing output voltage accelerates to maximum almost instantly.

When an approximate 12-volt dc output is reached, the oscillator is at the high end of its correction range. At this point, 17.5-MHz recycle stage A10A3 operates, and unijunction transistor A10Q3 fires. This occurs due to discharge of capacitor A10C5, which was initially charged by the rising output voltage. When the unijunction transistor fires, A10C5 discharges to ground, and the output voltage is reduced to zero. The oscillator is then tuned to the opposite (low) end of the correction range. Capacitor A10C5 begins to charge again as the oscillator is tuned toward phase lock by the output voltage. As previously explained, the rate of change slows until it becomes zero at the correct frequency and the oscillator is phase locked to the reference.

(10) Control Data Converter A16, 618T-1B/2B/3B. (Refer to figure 848.)

Control data converter A16 converts 0.1-kHz reentry code frequency control data from the radio set control to inverted binary coded decimal (BCD) frequency control data. The inverted BCD data controls the 0.1-kHz frequency circuitry in divider-stabilizer A15 in both transmit and receive modes of operation. A 1-kHz oscillator in control data converter A16 provides a 1-kHz tone for transceiver tuning and CW transmission.

Figure 848 is a schematic diagram of control data converter A16. Refer to figure 41, a functional logic diagram of control data converter A16. The use of the reentry code frequency control system provides a selection of any one of ten 0.1-kHz frequency selections (0 through 9) on four control wire inputs to control data converter A16 from the radio set control. The frequency control information presented to control data converter A16 is a combination of grounded and open-to-ground circuits. The output of control data converter A16, fed directly to frequency divider-stabilizer A15, is a combination of 0 volt dc (logic 0) and positive voltage to ground (logic 1).

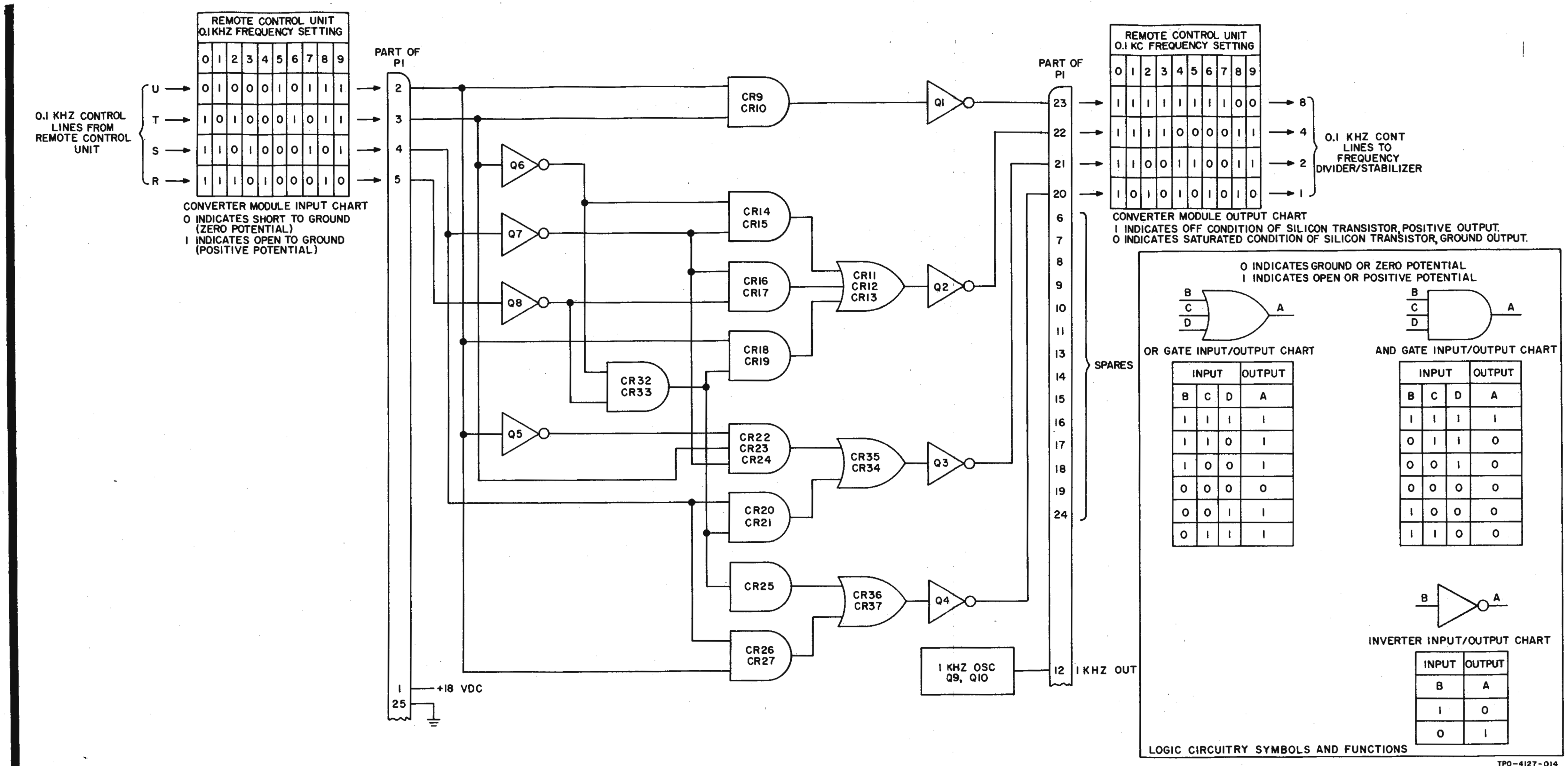
The following discussion describes the actions of control data converter A16 for one frequency setting on the radio set control. The principles apply, however, to the other nine settings.

When the 0.1-kHz frequency selector switch on the radio set control is set to 2, control data converter connector A16P1-2 and A16P1-4 are grounded while A16P1-3 and A16P1-5 are open to ground. The ground at A16P1-2 applies logic 0 to the input of inverter A16Q5 and to one input of AND gates A16CR9 and A16CR10, A16CR18 and A16CR19, and A16CR26 and A16CR27. The open at A16P1-3 applies logic 1 to the input of inverter A16Q6 and to one input of AND gates A16CR9 and A16CR10 and A16CR22, A16CR23, and A16CR24. AND gate A16CR9 and A16CR10 with inputs of logic 0 and logic 1 has an output of logic 0 that is applied directly to the input of inverter A16Q1. Inverter A16Q1 inverts the logic 0 input to a logic 1 output and applies it directly to output A16P1-23.

The ground at A16P1-4 applies logic 0 to the input of inverter A16Q7 and to one input of AND gates A16CR20 and A16CR21 and A16CR26 and A16CR27. The open circuit at A16P1-5 applies logic 1 to the input of inverter A16Q8.

Inverter A16Q5, with a logic 0 input, applies a logic 1 output to one input of AND gate A16CR22, A16CR23, and A16CR24. Inverter A16Q6, with a logic 1 input, applies a logic 0 output to one input of AND gates A16CR14 and A16CR15 and A16CR32 and A16CR33. Inverter A16Q7, with a logic 0 input, applies a logic 1 output to one input of AND gates A16CR14 and A16CR15, A16CR16 and A16CR17, and A16CR22, A16CR23, and A16CR24. Inverter A16Q8, with a logic 1 input, applies a logic 0 output to AND gates A16CR16 and A16CR17 and A16CR32 and A16CR33. AND gate A16CR32 and A16CR33, with logic 0 inputs, applies a logic 0 output to one input of AND gates A16CR18 and A16CR19 and A16CR20 and A16CR21 and to the input of AND gate A16CR25.

AND gate A16CR14 and A16CR15, with a logic 0 and a logic 1 input, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR16 and A16CR17, with logic 1 and logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR11, A16CR12, and A16CR13. AND gate A16CR18 and A16CR19, with logic 0 inputs, applies a logic 0 output to one input of AND gate A16CR11, A16CR12, and A16CR13. AND gate A16CR22, A16CR23, and A16CR24, with logic 1 inputs, applies a logic 1 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR20 and A16CR21, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR34 and A16CR35. AND gate A16CR25, with a logic 0 input, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37. AND gate A16CR26 and A16CR27, with logic 0 inputs, applies a logic 0 output to one input of OR gate A16CR36 and A16CR37.



618T-1B/2B/3B Control Data Converter A16, Functional Logic Diagram
Figure 41

OR gate A16CR11, A16CR12, and A16CR13, with three logic 0 inputs, applies a logic 0 output to inverter A16Q2 that inverts it to produce a logic 1 output at A16P1-22. OR gate A16CR34 and A16CR35, with a logic 1 and a logic 0 input, applies a logic 1 output to inverter A16Q3 that inverts it to produce a logic 0 output at A16P1-21. OR gate A16CR36 and A16CR37, with logic 0 at both inputs, applies a logic 0 output to inverter A16Q4 that inverts it to produce a logic 1 output at A16P1-20.

(11) Frequency Divider-Stabilizer A15.

Frequency divider-stabilizer A15 supplies and stabilizes a variable frequency from 2.5001 MHz to 3.5000 MHz in 100-Hz steps to the lf mixer in rf translator A12.

Figures 838 through 847 are schematic diagrams of the individual circuit boards in frequency divider-stabilizer A15. Refer to figure 42, a block diagram of frequency divider-stabilizer A15.

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco's). One oscillator has a frequency range from 2.5001 to 3.0000 MHz. The other oscillator has a frequency range from 3.000 to 3.5000 MHz. Transistor switches are operated by information supplied through the 100-kHz radio set control lines that turn on the proper oscillator, depending upon the frequency selected. The oscillator output frequency is controlled by a dc voltage input from phase/frequency discriminator circuit board A15A5 that is applied across voltage-variable capacitors in the oscillator circuit. As the voltage applied across the voltage-variable capacitors increases, the capacitance decreases, thus increasing the oscillator frequency. Also, as the voltage applied across the voltage-variable capacitors decreases, the oscillator frequency decreases.

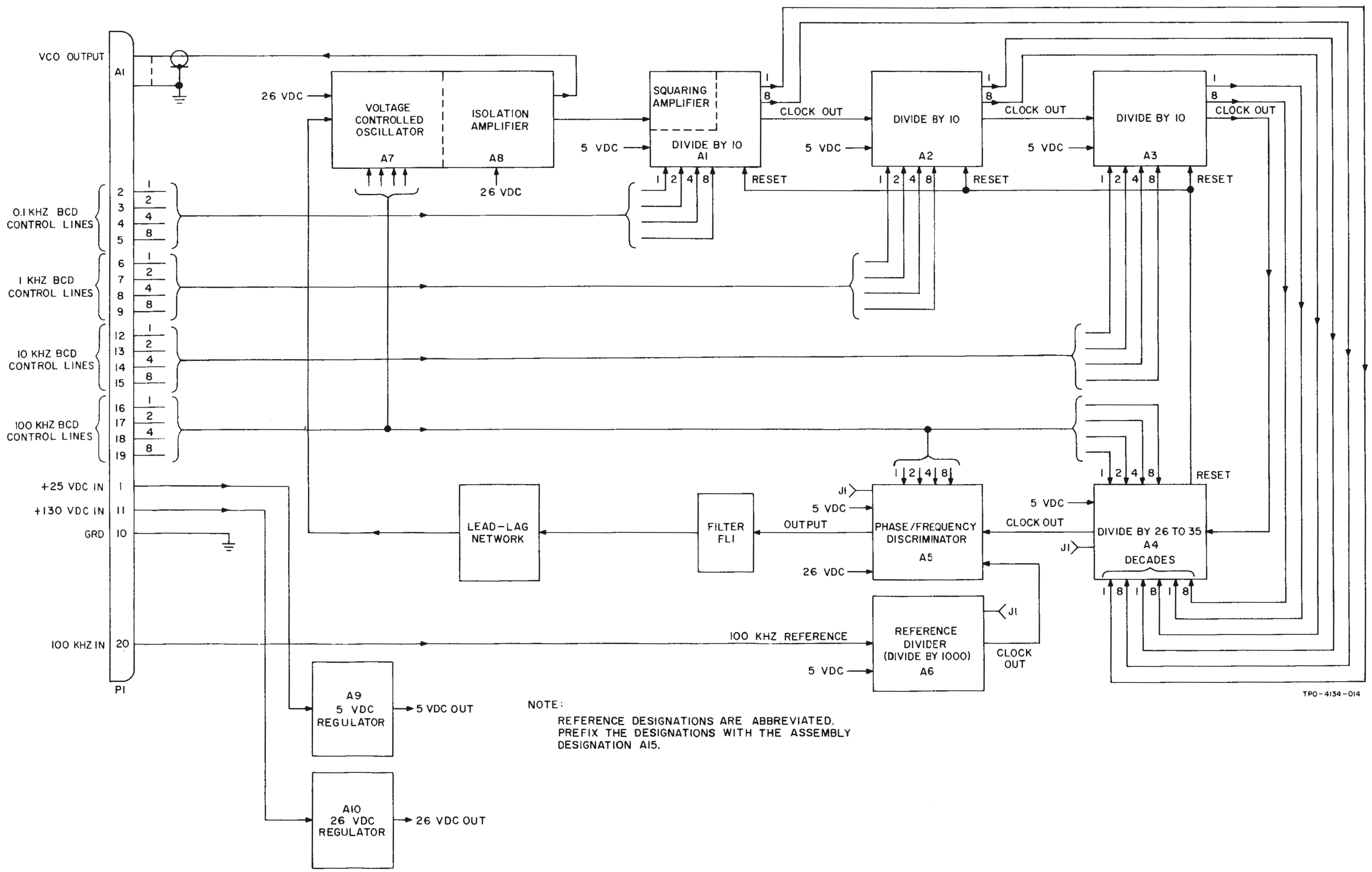
The output of the oscillator is fed into an isolation amplifier before being applied to the lf frequency mixer. The output of the vco must work into a constant impedance source supplied by the isolation amplifier. The output impedance of the isolation amplifier may vary a considerable amount, but the input impedance will remain constant. Two outputs are obtained from the isolation amplifier: one output is connected to the lf mixer stage of rf translator A2, while the other output is connected directly to the variable frequency divider circuit.

The variable frequency divider circuit is capable of dividing the output frequency of the vco 25,001 to 35,000 times, depending upon the frequency control information supplied by the radio set control. The variable frequency divider circuit, consisting of three divide-by-10 circuit boards (A15A1, A15A2, and A15A3) and one divide-by-26-to-35 circuit board (A15A4), is actually a counting circuit. With no frequency control information applied to the frequency control lines, each of the divide-by-10 circuit boards counts 10 input pulses prior to producing 1 output pulse. The three divide-by-10 circuits are connected in series and, therefore, 1000 input pulses are required at the input to divide-by-10 circuit board A15A1 to produce 1 output pulse from divide-by-10 circuit board A15A3. Divide-by-26-to-35 circuit board A15A4 requires 35 input pulses to produce 1 output pulse. Divide-by-26-to-35 circuit board A15A4 is connected in series with the output of the three divide-by-10 circuit boards and, therefore, 35,000 input pulses are required at the input of divide-by-10 circuit board A15A1 for 1 pulse output from divide-by-26-to-35 circuit board A15A4. The output of the divide-by-26-to-35 circuit board, when the vco is locked on frequency, is 100 pulses per second. Therefore, an input of 3,500,000 pulses per second is required at the input of divide-by-10 circuit board A15A1 for an output of 100 pulses per second from divide-by-26-to-35 circuit board A15A4.

The frequency control information supplied to the variable frequency divider circuit boards control lines by the radio set control tells each divider circuit board how many pulses not to count. Since the variable divider circuitry normally counts 35,000 pulses with no frequency information on the control lines, it will count 35,000 pulses minus the number of pulses defined by the information appearing on the control lines.

An example of the frequency division process follows. Assume that the radio set control is set to a frequency of XX.7434 MHz (743,400 Hz), that the vco output frequency is 3.5000 MHz (3,500,000 Hz), and that the variable divider circuit is dividing the vco output by 35,000 to attain the required output of 100 pulses per second (pps). The frequency control information will appear on the variable divider circuit control lines as a 7 on divide-by-26-to-35 circuit board A15A4, a 4 on divide-by-10 circuit board A15A3, a 3 on divide-by-10 circuit board A15A2, and a 4 on divide-by-10 circuit board A15A1. The action of telling a divider circuit how many pulses not to count is accomplished by an addition process. The vco output frequency is now 2.7566 MHz (3.5000 MHz minus the radio set control setting of XX.7434 MHz). Divide-by-10 circuit board A15A1 is told not to count 4 pulses and is told so at a repetition rate of 100 times per second or, in effect, 400 pulses have been added to the input frequency, 2,756,600 pulses per second (pps), from the isolation amplifier. The combined frequency is now 2,757,000 pps, and after being divided by 10 by circuit board A15A1, becomes 275,700 pps that is fed directly to divide-by-10 circuit board A15A2. Divide-by-10 circuit board A15A2 is told not to count 300 pps. When 300 pps is added to the input frequency to circuit board A15A2 (275,700 pps), the result is 276,000 pps and after division by 10 becomes 27,600 pps and is fed directly to divide-by-10 circuit board A15A3. Divide-by-10 circuit board A15A3 is told not to count 400 pps. When 400 pps is added to the input frequency of circuit board A15A3 (27,600 pps), the result is 28,000 pps and after division by 10 becomes 2,800 pps and is fed directly to divide-by-26-to-35 circuit board A15A4. Divide-by-26-to-35 circuit board A15A4 is told not to count 700 pps. When 700 pps is added to the input frequency of circuit board A15A4 (2,800 pps), the result is 3,500 pps and after division by 35 becomes 100 pps and is fed directly to the phase/frequency discriminator circuit board A15A5. When the vco is locked on the proper frequency, the output of the variable frequency divider circuitry is 100 pps.

The reference frequency divider, divide-by-1000 circuit board A15A6, produces a 1 output pulse from 1000 input pulses. The input signal to circuit board A15A6 is a 100-kHz signal obtained from rf oscillator A2. The output of reference frequency divider circuit board A15A6 is 100 pps with an accuracy equal to the frequency standard. The 100-pps output is compared with the output of the variable frequency divider circuit. When the vco is locked on frequency, the outputs of both the reference frequency divider and the variable frequency divider circuits



618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram
Figure 42

are 100 pps and, therefore, the output frequency of the vco is as accurate as the frequency standard. The output of reference frequency divider circuit board A15A6 is fed directly to phase/frequency discriminator circuit board A15A5.

Phase/frequency discriminator circuit board A15A5 constantly compares the two input signals from the variable frequency divider circuit and the reference divider circuit. If the two input signals differ only slightly in frequency, the phase discriminator sends a dc voltage to the voltage-variable capacitors in the vco that changes the output frequency of the vco until the output frequency of the variable frequency divider circuit is 100 pps and is frequency locked to the 100-pps reference signal.

If the difference in frequency between the reference signal and the variable frequency divider output signal becomes so great that the phase discriminator cannot bring them to a frequency lock, the discriminator sends a narrow pulse to the voltage-variable capacitors in the vco. The narrow pulse drives the frequency of the vco to either limit of its frequency range with the polarity of the pulse determining to which limit of the frequency range the vco is driven. After the vco reaches one limit of its frequency range, it sweeps across its entire frequency range until the phase discriminator is able to bring the output of the variable frequency divider circuit into frequency lock with the reference signal. For example, assume that the vco output frequency is 3.5000 MHz and that the variable frequency divider circuit is dividing by 35,000. The output of the variable divider circuit is 100 pps and is phased locked with the 100-pps output of the reference divider circuit. Now assume that the frequency control information changes and tells the variable divider circuitry to divide by 25,001. Momentarily, the output frequency of the vco will remain at 3.500 MHz, but the output of the variable divider circuitry will be 140 pps (3,5000 MHz divided by 25,001). The frequency discriminator circuit sends a narrow negative pulse to the voltage-variable capacitors in the vco, causing the vco to sweep toward the lower limit of its frequency range (2.5001 MHz). As the vco output frequency reaches 2.5001 MHz, the output of the variable frequency divider circuitry will be 100 pps and will allow the phase discriminator to lock the output frequency of the vco at 2.5001 MHz. The output of phase/frequency discriminator circuit board is fed directly to low-pass filter A15FL1.

Low-pass filter A15FL1 extracts the average dc voltage from the input voltage supplied by phase/frequency discriminator circuit board A15A5. This dc voltage is fed through the lead-lag (compensation) network to the voltage-variable capacitors in the vco.

The lead-lag (compensation) network performs two functions. It compensates for any phase shift at lower frequencies caused by filter A15FL1 and acts as an attenuator at lower frequencies to prevent undesired oscillations. The output of lead-lag network is fed directly to the voltage-variable capacitors in the vco.

(12) Low-Voltage Power Supply A5.

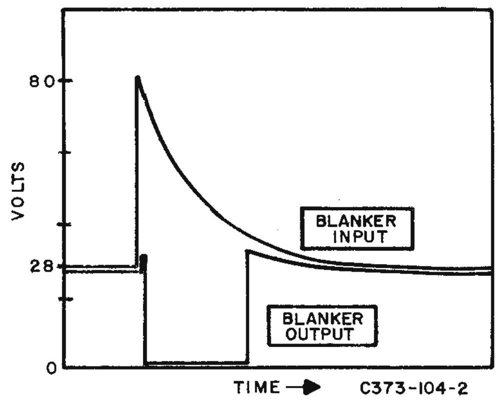
(a) General.

Low-voltage power supply A5 includes a rectifier-filter power supply circuit that produces +130 volts dc from the 115-volt, 400-Hz line input and an

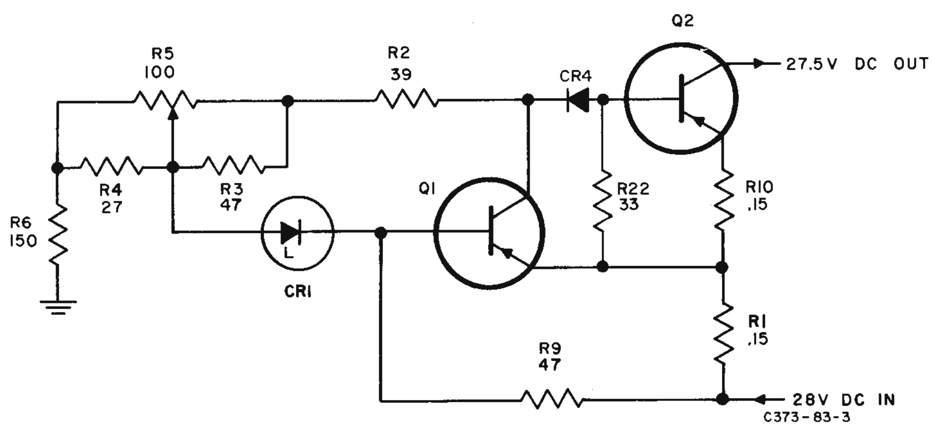
+18-volt dc divider power supply that provides the highly regulated voltage required for stable transistor operation in the 618T-( ). Low-voltage power supply A5 also contains a transient blanker circuit that protects transistors in the 618T-( ) from transient line voltage surges. A schematic diagram of low-voltage power supply A5 is shown in figure 816.

(b) Transient Blanker Circuit.

Refer to figure 43. Sudden changes in load on the primary power circuits often cause large transient peaks on the 27.5-volt dc line feeding the 618T-( ). Low-voltage power supply A5 contains a transient blanker circuit that protects transistors during transients by dropping the 27.5 volts dc to zero for the duration of the transient. A threshold of 32 volts dc is chosen as the maximum. If this voltage is exceeded, the transient blanker circuit operates. Refer to figure 44. When the voltage is below 32 volts, A5Q2 is forward biased and current flows through A5R1, A5R10, emitter to base of A5Q2, A5CR4, and resistors A5R2 through A5R6. Transistor A5Q2 becomes saturated, thereby making the collector voltage nearly equal to emitter voltage. The resistors form a voltage-dividing network, and there is a 1-volt drop across A5R1, A5R10, and emitter to collector of A5Q2. The output



Transient Blanker Waveforms
Figure 43



Transient Blanker Circuit, Schematic Diagram
Figure 44

voltage is then 26.5 volts dc. If the input voltage exceeds 32 volts dc, diode A5CR1 breaks down and A5Q1 becomes forward biased. Current flow from emitter to base of A5Q1 is shunted to ground through A5CR1 and A5Q1, saturates A5Q1, and cuts off A5Q2 by removing its forward bias. At this point there is no output from A5Q2 collector. Cutoff remains until the voltage again drops below 32 volts dc. Then, A5CR1 ceases conduction, and normal bias is restored at A5Q2.

(c) Voltage Regulator Circuit

Refer to the +18-volt dc regulator in the center portion of the schematic diagram (figure 816). The +18-volt dc voltage regulator consists of two dc amplifiers A5Q3 and A5Q4 and a series regulator A5Q5. The dc amplifiers regulate the control voltage to the series regulator. Amplifier A5Q4 is controlled by a sensing voltage developed by a voltage-divider circuit and a zener diode controlled circuit both of which are connected to the output. The zener diode A5CR2 provides a reference voltage 9.3 volts below the output voltage that is applied to the emitter of A5Q4. A variation in the output is sensed directly at the emitter of A5Q4. The voltage divider consists of A5R14, A5R15, A5R16, A5RT1, and A5R17. A5R15 is set to develop +18 volts at the output. Approximately one-half of the variation in the output will be sensed by the base of A5Q4. Because of the difference of the variation of the output sensed by the emitter and base of A5Q4, an increase in the output decreases the current through A5Q4 and a decrease in the output increases the current through A5Q4. When A5Q4 decreases conduction, it decreases the current through A5Q3 and, in turn, decreases the current through A5Q5, reducing the output voltage. A decrease in the output voltage will have the opposite reaction. If the output is shorted, the base-emitter junction of A5Q4 will not be supplied enough voltage to provide base current and A5Q4 will turn off. This shuts off A5Q3 and A5Q5 and prevents A5Q5 from burning out if the 18-Vdc output is shorted to ground. Thermistor A5RT1 compensates for the change in amplification due to temperature variation.

(d) +130-Volt DC Supply.

Refer to figure 816. The third portion of low-voltage power supply A5 contains the +130-volt dc supply. The circuit is a conventional half-wave rectifier followed by a pi network filter and A5R11 bleeder resistor. A5R8 is a protective (fusible) resistor for diode A4CR3.

(13) 516H-1 Power Supply and Single-Phase High-Voltage Power Supply A13.

(a) 516H-1 Power Supply.

The 516H-1 Power Supply is an external power supply that is used, in conjunction with a single-phase high-voltage power supply module, to provide operating voltages for the 618T-1/1B Airborne SSB Transceiver. The 516H-1 mounts directly in the shockmount tray used by the power supply for the 618S and is used primarily in 618S retrofit installations. Figure 849 is a schematic diagram of the 516H-1 Power Supply.

The 516H-1 is completely transistorized and uses a saturable-core oscillator to convert 27.5 volts dc to 1500 Hz ac. The saturable-core oscillators, Q1 and Q2, used in the inverter circuit, are fast-acting switches whose switching action depends on the saturation of the core of transformer T1 in the oscillator circuit. When the oscillator is first energized, unbalance in the two halves of the oscillator circuit causes saturation current to flow in one transistor and the other transistor to be cut off. This current increases until the core of transformer T1 becomes saturated. When this occurs, voltage is no longer induced in the windings of T1 and the saturation current is cut off. When the magnetic field in the transformer windings starts to collapse, voltages are induced in the windings that cause the transistor that was previously cut off to be saturated and vice versa. This action produces a square-wave output at the transformer output. This square wave switches transistors Q3 through Q8, in a push-pull power circuit, to provide a 400-volt, 1500-Hz square-wave output from the power supply. The output of the 516H-1 Power Supply is fed to the single-phase high-voltage power supply module.

(b) Single-Phase High-Voltage Power Supply A13.

Refer to figure 837. The single-phase high-voltage power supply module contained in the 618T-( ) case steps up the 400-volt, 1500-Hz input to 1500 volts and rectifies it to provide the 1500-volt dc plate voltage for the power amplifier. This module also supplies tgc control voltage, vacuum-tube filament voltage, and a 260-volt dc plate voltage for tubes in the rf translator module. Early models also provide 400 volts for power amplifier screen voltage. In later models of the 618T-( ), however, this screen voltage is derived from the 1500-volt plate voltage input to the power amplifier module. The single-phase high-voltage power supply module also contains an overload relay that is automatically reset when the key-line ground is removed.

(14) 3-Phase High-Voltage Power Supply A7 (618T-2/2B).

Refer to figures 818 and 819. The 3-phase high-voltage power supply, A7, is a single unit that plugs into the 618T-2 chassis and derives its operating voltage from a 115-volt (line-to- neutral), 400-Hz, 3-phase primary power source. This module is used only in 618T-2/2B Airborne SSB Transceiver.

The time delay plate contactor relay, K1, is energized 30 seconds after the 618T-2/2B is turned on at the radio set control. When time delay relay K7 in the chassis circuit (see figure 807) is energized, A7R1, A7R2, and A7R3 are in series with the primary winding of A7T1, limiting the initial current transient. After the transient, step-start relay A7K2 is energized by the closing of relay contacts A7K1-3 and A7K1-4, and relay A7K2 bypasses resistors A7R1, A7R2, and A7R3, permitting full input voltage to be applied to A7T1 (MCN 17,999 and below). For modules with MCN 18,000 and above (figure 818), step-start relay A7K1 has been eliminated and capacitors A7C27, A7C28, and A7C29, in parallel with the primary winding of A7T1, provide initial current transient protection.

The two A7T1 secondaries supply diode rectifier banks connected in series to provide 1500- and 400-volt dc input to the power amplifier module. Bleeder resistors A7R11, A7R14, and A7R15 provide a 260-volt dc output for the rf translator module.

Transformer A7T2 supplies filament voltage for vacuum tubes in the 618T-2/2B. Overload relay A7K3 contains one winding (1 and 2) in series with the ground return of the rectifier to monitor total current. Approximately 750 to 800 ma will energize A7K3, opening contacts 6 and 7 and disrupting operation. Contacts 5 and 7 close and latch the relay with 27.5 volts dc through winding 3 and 4.

A7R5 through A7R8 form a bleeder that is tapped at A7R7 and A7R8 to provide the 618T-2/2B front panel meter with a voltage sample of monitoring +1500 volts dc. The AM tgc terminal (A7P1-15) is the current control voltage for the tgc/adc amplifier in the if. translator module. The control voltage that is dropped across A7R13, A7R4, and the overload coil of A7K3 by the flow of current is negative and, therefore, varies proportionately with current consumption. If plate current in the power amplifier module is excessive, the negative voltage reduces the gain of the if. amplifier that results in reduced drive to the power amplifier module. Refer to figure 16 for further study of this circuit. The AM tgc voltage is also the source for plate current metering (PA MA) at the 618T-2/2B front panel meter.

Filter A7FL1 is a low-pass filter used to prevent rf from entering the module on the high-voltage load. Diodes across relays suppress transients during switching.

(15) 27.5-Volt DC High-Voltage Power Supply A8 (618T-3/3B).

27.5-volt dc high-voltage power supply A8 is a single unit that plugs into the 618T-3/3B. It performs the same operations as the 516H-1 Power Supply and single-phase high-voltage power supply module in combination. The schematic diagram is shown in figure 820. The 27.5-volt input power is applied to switching transistors for transformation to high voltage. The module also supplies 27.5-volt dc power for application to the low-voltage power supply module and to the vacuum tubes for heater voltage.

When the radio set control function selector switch is moved from the OFF position, a ground is completed at A8P1-13. This supplies a ground for relay A8K1 through contacts 6 and 7 of overload relay A8K2 and diode A8CR26. Chassis relay K7 delays relay A8K1 for 30 seconds. When relay A8K7 contacts close, 27.5 volts dc is applied to relay A8K1 through A8P1-18. Diode A8CR32 across relay A8K1 solenoid suppresses rf transients.

With relay A8K1 energized, delay relay A8K3 is energized by 27.5 volts dc through contacts 3 and 4 of A8K1. Relay A8K3 has the same ground return as A8K1. Relay A8K3 contacts 3 and 8 and latch relay A8K1 contacts 4 and 7 provide continuity for 27.5 volts dc at A8P1-32 to energize the saturable core oscillator A8Q1 and A8Q2. Transistors A8Q1 and A8Q2 are fast-acting switches. The switch action depends upon the saturation of transformer A8T2. When the oscillator is first energized, unbalance causes one transistor to conduct to saturation and the other to cut off. After the first half-cycle, when the magnetic field surrounding A8T2 windings begins to collapse, the saturated transistor is cut off and the other transistor becomes saturated. This action produces a square-wave output at the A8T2 secondary.

The rectifier consists of the push-pull power circuit A8Q9-Q11 and A8Q12-Q14, transformer A8T1, and bridge rectifiers A8CR18 and A8CR21 for low voltage and A8CR6 and A8CR17 for high voltage. The output of A8Q9 and A8Q12 is 400 volts ac at approximately 1500 Hz that is stepped up to 1500 volts across A8T1 secondary taps 4 and 5. The 400- and 1500-volt bridge rectifiers are series connected, and ground is returned through the series combination of A8R21 and A8R17 and the relay A8K2 overload winding. A current of 750 to 800 ma will energize the winding and break contacts 7 and 6 of relay A8K2, thus disrupting input to the rectifier.

Terminal A8P1-15 returns a small negative voltage for metering of plate current at the front panel. Voltage drop is read across A8K2 coil and A8R17 and A8R21 in series. This same negative voltage overrides carrier tgc and reduces drive to the power amplifier module if plate current swing is excessive. Refer to figure 16 for further study of the tgc circuit.

Terminal A8P1-35 returns one-fourth of the voltage (bled by resistors A8R13 through A8R16) to the 618T-3/3B for metering of high voltage (+1500 volts) at the front panel.

Resistors A8R18, A8R22, and A8R23 are the low-voltage bleeders with a tap at the junction of A8R18 and A8R22 to supply +260 volts to the rf translator module.

Filter A8FL1 is in series with the high-voltage output to prevent rf energy from entering the power supply. Coil A8L1 at terminal A8P1-32 serves the same purpose.

Diodes are used for dc voltage blocking transient suppression, rf interference suppression, and, in the oscillator circuit, zener diode A8CR24 is used for stabilization of transistors A8Q1 and A8Q2.

(16) Squelch Amplifier and Control Circuit (618T-( )).

The squelch amplifier and control circuit, physically located in rf oscillator module A2, Collins part number 528-0690-001 (figure 810), and Collins part number 528-0690-002 (figure 810A) receives input audio signals from AM/audio amplifier module A9. The squelch circuit converts the input signal to a dc voltage and compares it with a threshold level provided by a squelch level control on the radio set control. After comparison, the squelch circuitry commands the squelch relay to connect the audio signal to the balanced output line, if sufficient and desirable audio is present, or to disconnect the balanced output line and insert a 330-ohm load across the AM/audio amplifier module output if noise predominates.

(a) Squelch Amplifier and Control Circuits in RF Oscillator; Collins Part Number 528-0690-001. (Refer to figure 810.)

The squelch amplifier circuit consists of amplifier, summation, and comparison stages. The comparison stage also drives the squelch relay.

The amplifier stages are in two parallel frequency-sensitive channels. The high frequency includes a resonant circuit peaked at approximately 2.5 kHz while the low-frequency channel includes a resonant circuit peaked at approximately 600 Hz. The output from each channel is fed through a buffer stage, diode detectors, and into a summation circuit.

The summation circuit provides the algebraic sum of the outputs of the two frequency-sensitive channels to a dc amplifier that provides the input to the comparison circuit.

The comparison circuit determines whether the desired audio level exceeds the threshold level set by the squelch level control on the radio set control. If the level is exceeded, a signal is capacitor coupled to the gate of an scr. The scr is triggered and energizes the squelch relay that connects the audio output signal from AM/audio amplifier A9 directly to the balanced audio output lines. If the audio level does not exceed the threshold level, the squelch relay is deenergized and connects a 300-ohm load directly across the audio lines of AM/audio amplifier A9. During transmit operation, the squelch circuit is disabled to permit passage of the sidetone for monitoring.

The capacitor coupling to the scr gate provides a form of syllabic detector. If the signal from the summing amplifier to the doupling capacitor does not switch at a rate slow enough for the coupling capacitor to discharge between pulses, the scr will not be triggered on, and the squelch relay will be deenergized. When the scr is turned off, C18 charges and holds Q9 on for 1 to 5 seconds. This prevents relay chatter that could be caused by the syllabic rate signals supplied to the coupling capacitor.

When the squelch level on the radio set control is turned to the extreme clockwise position, the squelch override dc amplifiers override the squelch amplifier and control circuit and connects the audio signal directly to the headset.

(b) Squelch Amplifier and Control Circuits in RF Oscillator, Collins Part Number 528-0690-002. (Refer to figure 810A.)

The amplifier consists of a low-pass filter, high-pass filter, isolation amplifiers, comparator, override switch, and a relay driver with holding capability.

The high-pass filter (audio above approximately 1.2 kHz) and the low-pass filter (audio below approximately 1.2 kHz) convert the input signal to a dc voltage. The dc output of the filters is coupled through isolation stages (Q4 and Q7) to a comparator. When the frequency of the input signal to the filters is below approximately 1.2 kHz (audio), the input to the positive terminal (noninverting input) will be larger than the input to the negative terminal (inverting input) of the comparator and its output will go positive. The positive voltage turns on Q8 which turns on Q9 and energizes relay K1. With K1 energized, the audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the audio signal is lost momentarily, the 10-μF capacitor on the base of Q8 holds

Q8 on for a period of 1 to 5 seconds. When the input signal to the filters is above approximately 1.2 kHz (noise), the comparator output is zero. Switch Q8 and Q9 are turned off and relay K1 is deenergized. The input from AM/audio amplifier A9 is dropped across the 330-ohm resistor.

The override switch has a preset dc level on the noninverting input. The dc level on the inverting input is determined by the setting of the RF SENS/SQL control on the 714E-( ) Radio Set Control. When the squelch override condition is desired, the 714E-( ) RF SENS/SQL control is adjusted so the inverting input to the override switch is at a lower dc level than at the noninverting input. The output of the override switch goes positive, turns on Q8 which turns on Q9 and energizes K1. The audio output signal from AM/audio amplifier A9 is directly coupled to the balanced audio output lines. If the RF SENS/SOL control is left in the override position, K1 remains energized regardless of the frequency input to the squelch circuits.

618T-( ) Airborne SSB Transceiver - Disassembly

1. GENERAL.

The disassembly procedures for the 618T-( ) Airborne SSB Transceiver contained in this section should be followed when it is necessary to remove a part in order to repair or replace it. The 618T-( ) should not be disassembled completely as a routine part of the overhaul procedure.

2. GENERAL TECHNIQUES AND PRECAUTIONS IN DISASSEMBLY OF THE 618T-( ) AIRBORNE SSB TRANSCEIVER.

Standard electrical disassembly techniques apply to the 618T-( ) Airborne SSB Transceiver. However, special attention should be given to the following techniques:

A. Removal of Electrical Wiring.

Tag or otherwise identify all disconnected electrical wiring. Note color coding, placement of wires, and method of insulation (if any) before unsoldering or removing.

B. Removal of Transistors and Diodes.

When removing transistors or diodes, use long-nosed pliers to grasp the lead to which heat is applied between the solder joint and the component. This will bleed off some of the heat that conducts into the component from the soldering iron.

C. Removal of Printed Circuit Boards.

Printed circuit boards may be removed from the module chassis by removing the screws which fasten the boards to the spacers on the module chassis. Be careful, when removing circuit boards, not to damage any connecting wiring or components that are mounted on the board. Refer to the repair section for information regarding removal of components from printed circuit boards.

3. SPECIFIC DISASSEMBLY TECHNIQUES.

A. Removal of Side Covers, Front Panel Cover, and Front Panel.

(1) Modules may be exposed by removing the two side covers on the 618T-( ). To do this, loosen four screws, two on each side, at rear of transceiver. Side covers then may be lifted off.

(2) The front panel cover may be removed by turning the two Dzus fasteners on the cover and pulling cover forward. This will expose the blower filter, sidetone level adjusting screw, audio level adjusting screw, and S3 (on units with squelch capability).

(3) To expose the components on the rear of the front panel and in the relay compartment on the front of the chassis, remove four screws at the four corners

of the front panel. The front panel may then be moved to expose the components, but will remain attached to the main chassis by a wiring cable.

B. Removal of Module Covers and Modules.

(1) Most module covers may be removed by pulling the attached handles. Module covers equipped with handles are not equipped with screws. The rf translator A12 cover is a press fit and may be removed by pulling upward with fingers inserted in the cover holes. The power amplifier module cover is attached with screws, but the cover screw holes are slotted so that the screws need only be loosened. High-voltage rectifier module covers are also attached with screws.

(2) Remove modules from the chassis by loosening the redheaded captive holddown screws at the corners of the module and pulling straight out.

CAUTION: DO NOT TWIST OR PRY ON MODULE TO DISENGAGE MATING CONNECTORS OR CONNECTORS MAY BE DAMAGED.

C. Removal of VFO and Autopositioner from RF Translator A12.

(1) With rf translator A12 in the chassis and power applied to the 618T-( ), position the vfo and Autopositioner to 500 kHz by setting the frequency indicator on the 714E-( ) to X.500 MHz. Turn power off.

(2) Remove rf translator A12 from the 618T-( ) chassis.

(3) Remove the top and bottom covers from rf translator A12.

(4) Refer to figure 101. Remove four screws (1) fastening the vfo to the Autopositioner.

(5) Remove four screws (2) fastening the vfo brackets to the rf translator chassis and backplate.

(6) Loosen two screws (3) holding the back brackets on the vfo. Rotate the brackets approximately 90 degrees in order to get room to move the vfo.

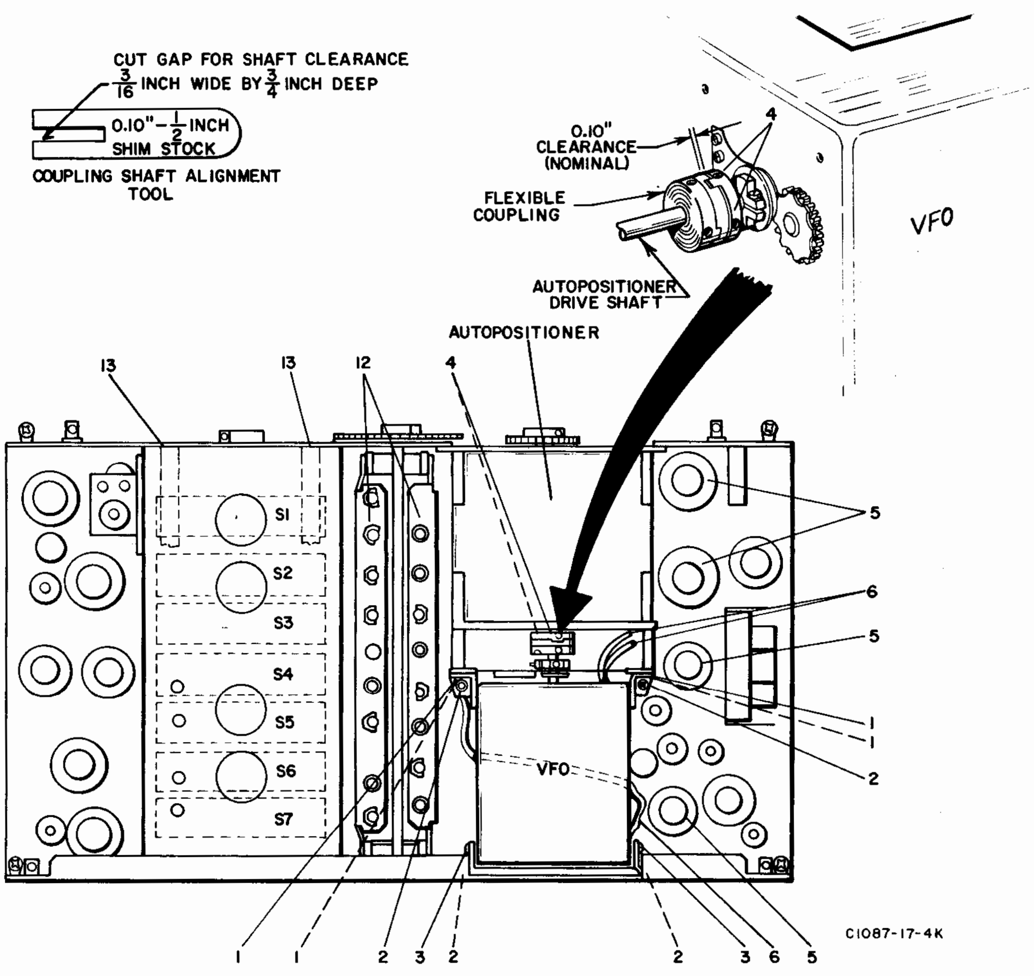
(7) Loosen two setscrews (4) retaining the coupler to the vfo shaft.

(8) Refer to figure 104. Loosen two screws (14) holding the cable guide plate (15). Remove the cable guide plate. Note placement of cables.

(9) Refer to figure 101. Remove four tubes (5) adjacent to the vfo and Autopositioner.

(10) To remove the vfo, tag and unsolder the vfo leads (6) from connectors P6 and P9-31 and the other internal connections in the module. Note placement of these leads on the rf translator chassis. The vfo may then be lifted from rf translator A12.

NOTE: Variable frequency oscillator 70K-9 has four leads; vfo 70K-5, three leads; and vfo 70K-3, two leads. Consult the appropriate schematic.



RF Translator A12, Top View
Figure 101

On rf translator A12 (Collins part number 528-0113-013), a filter circuit for the vfo was incorporated at approximately MCN 1100. The filter circuit consists of A12L41, A12L122, A12L131, and A12L261. In rf translator modules containing this circuit, the white sleeved vfo coaxial lead is connected to terminal E85 instead of J5. See figure 105.

(11) Refer to figure 102. Remove 3/8-inch flatted shaft (7), directly above 25-pin connector (8), by loosening clamp (9) on the gear that drives the shaft. Pull the shaft out through the gear.

(12) Remove 2 screws (10) holding the 25-pin connector to the bottom of the rf translator chassis.

(13) Refer to figure 103. Using a sharp pencil, make a mark on a tooth of gear G8. Make a corresponding mark on the rf translator chassis.

(14) Remove idler gear G9.

(15) Remove four screws (11) holding the Autopositioner to the gearplate.

(16) Carefully maneuver the Autopositioner to free it from the mounting plate. Remove the Autopositioner by slowly lifting it from the rf translator chassis. Be careful not to damage the 28-position switch wafers when pulling 25-pin connector (8) up through the chassis (figure 102).

D. Disassembly of VFO A12A2 (618T-1/2/3 Only).

The vfo is a potted assembly and cannot be disassembled in the field. Attempting to disassemble or adjust the vfo will result in misalignment and loss of accuracy. If the source of trouble is the vfo, it should be returned to the factory and replaced with a new unit.

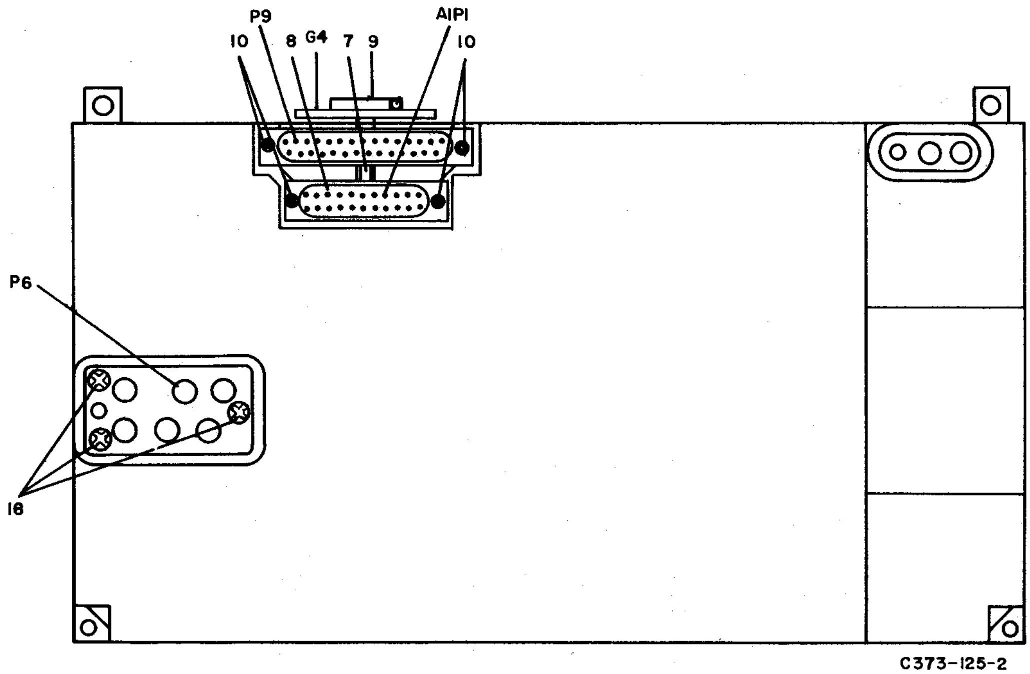
E. Replacement of 70K-5 VFO With 70K-9 VFO (618T-1/2/3 Only).

70K-9 vfo, Collins part number 522-3552-019, contains all parts required to perform this procedure. Holders of 70K-9 vfo need order replacement kit, Collins part number 757-1376-001, only. Replacing the 70K-5 vfo with the 70K-9 vfo requires removing the 70K-5 vfo and Autopositioner, changing the flexible coupling on the Autopositioner shaft, installing a new 70K-9 vfo,and reinstalling the Autopositioner. The vfo, rf translator slug rack, and 28-position switches must then be aligned. Installation of the 70K-9 vfo will not significantly change the weight of the 618T-( ).

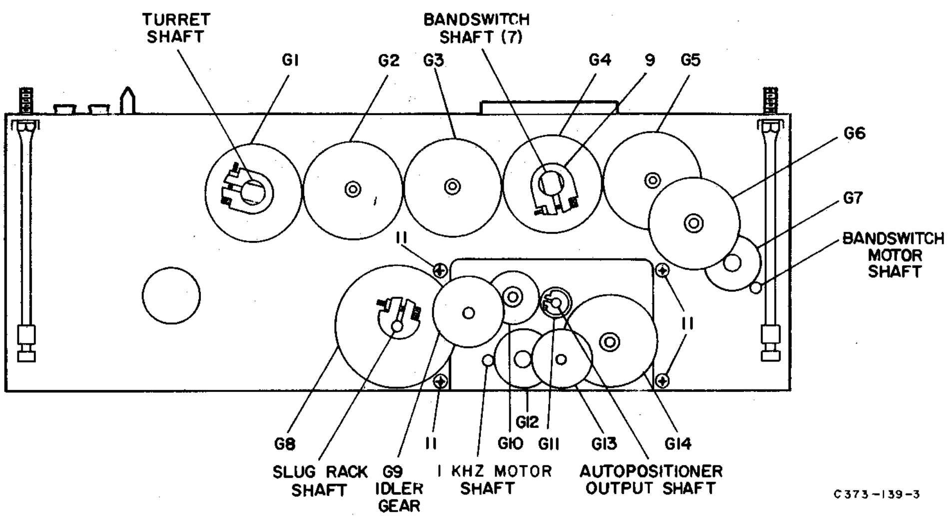
(1) Perform step 3.C (removal of vfo and Autopositioner from rf translator A12).

(2) Refer to figure 106. Position shaft midway between end stops on the 70K-9 vfo to be installed.

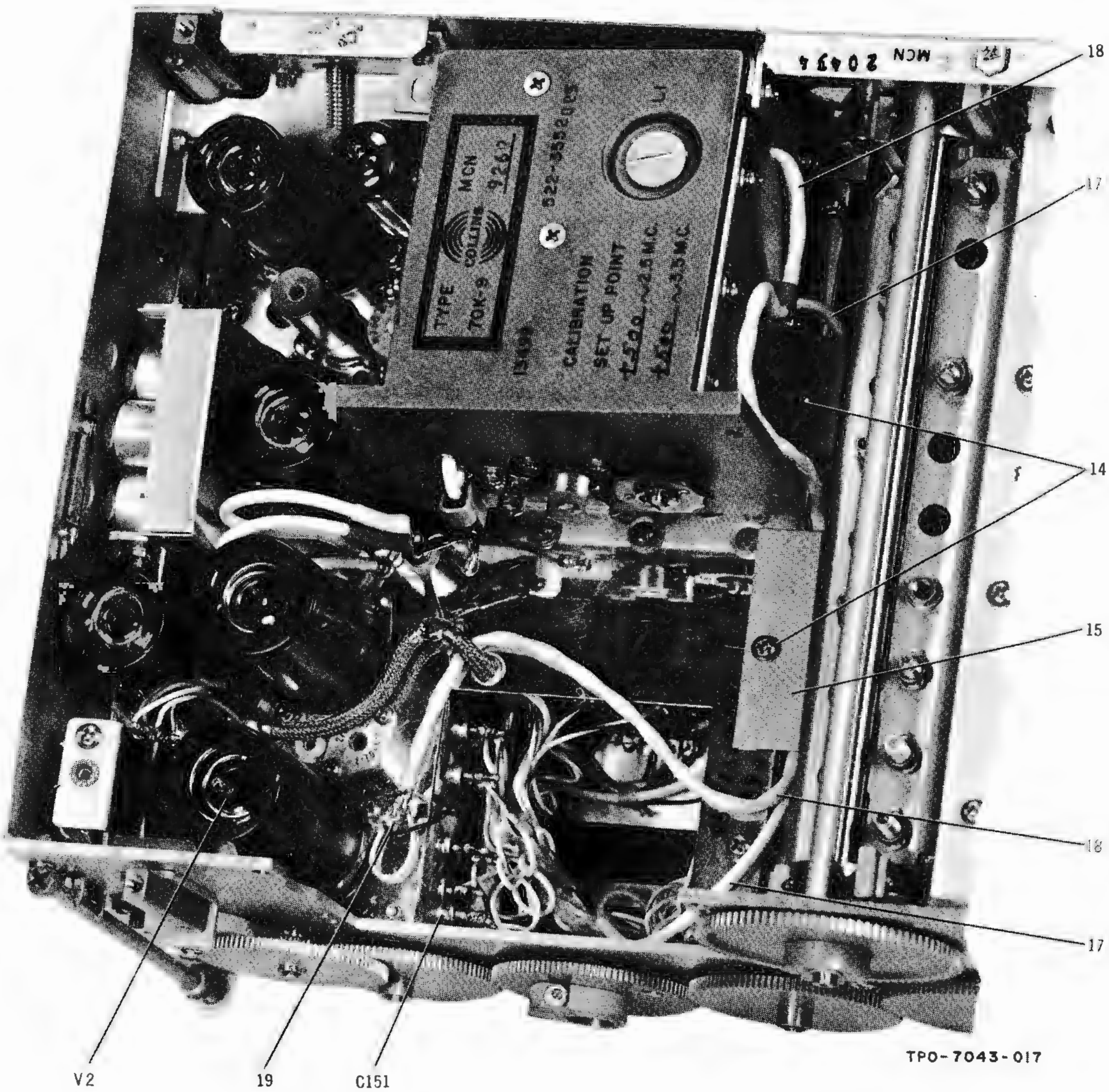
CAUTION: DO NOT LOOSEN SETSCREW SECURING THE COUPLING DEVICE ON THE 70K-9 VFO SHAFT. THIS COUPLING IS PART OF THE 70K-9 VFO MECHANICAL END STOP MECHANISM AND HAS BEEN PRESET AT THE FACTORY.



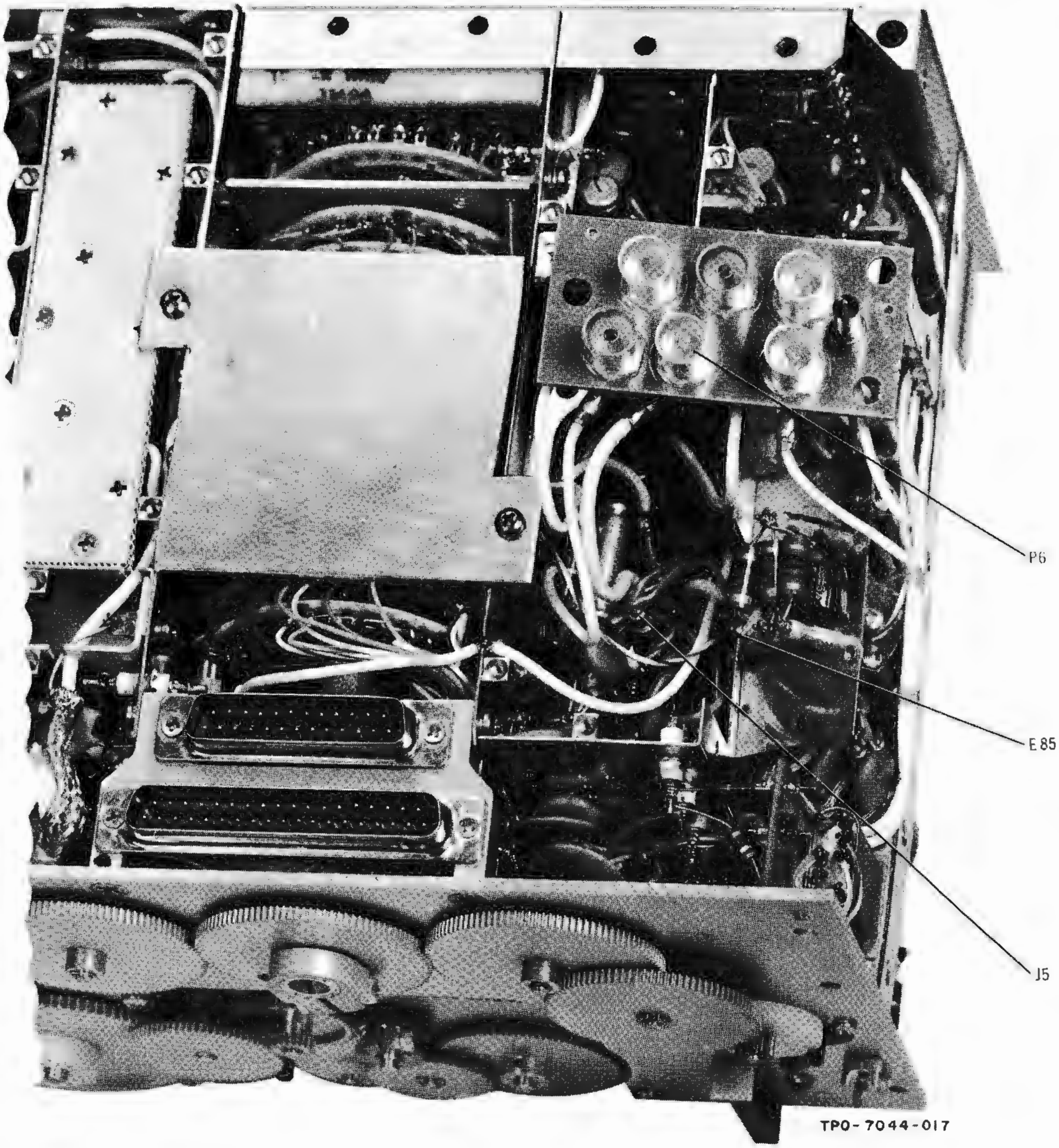
RF Translator A12, Bottom View
Figure 102



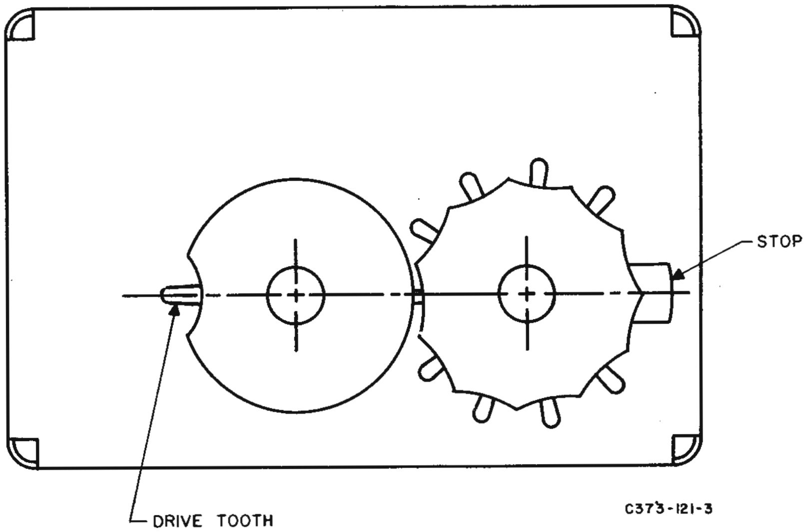
RF Translator A12, Gearplate
Figure 103



RF Translator With Autopositioner Removed, Top View
Figure 104



RF Translator, Low-Frequency Mixer Compartment, Bottom View
Figure 105



VFO in 500-kHz Position
Figure 106

(3) Place the 70K-9 vfo in position in rf translator A12, taking care to position the coaxial cable under the vfo as noted in step 3.C.(10). Secure the vfo temporarily in place by fastening one of the rear brackets to the rear plate.

(4) Refer to figure 104. The coaxial cable (17) and shielded-twisted-pair cable (18) from the vfo should be routed adjacent to the slug rack. The cable guide plate (15) removed in step 3.C.(8) should be mounted in place, as shown, using two screws (14).

(5) Refer to figure 102. Remove two screws (10) holding P9 to chassis.

(6) Refer to figure 104. Solder coaxial cable (17) to connector P9-31 using lead placement noted in step 3.C.(10). Secure P9 using two screws removed in step 3.E.(5).

(7) Route shielded-twisted-pair cable (18) from the vfo as shown in figure 104. Install grounding lug (Collins part number 304-0898-000) under mounting screw securing tube socket XV2. Solder cable shield and white wire to the grounding lug. Solder red wire to the terminal of feedthrough capacitor C151 as shown.

<u>NOTE:</u> Keep the cable routed close to the rf translator chassis so that the cable does not interfere with the Autopositioner, which will be installed above part of this cable.

(8) Route the green and white sleeved vfo coaxial leads through the holes in the rf translator chassis, using the same lead placement noted when removing the vfo

leads in step 3.C.(10). Remove the outer insulation from these coaxial leads at the point where the leads pass through the chassis. Solder the grounded bus wires to the shields in the same manner in which the vfo leads were grounded. Solder the green sleeved coded coaxial to P6 and the white sleeved coded coaxial to J5. (Refer to step 3.C.(10).)

(9) Replace the coaxial connector mounting plate assembly and secure it with three screws (16, figure 102).

(10) Remove the screw installed in step 3.E.(3) to temporarily hold the vfo in place. Loosen the vfo rear bracket screw and rotate the bracket approximately 180 degrees from the normal position to provide more room for installing the Autopositioner.

(11) Refer to figure 101. Slip the front vfo mounting bracket into position. Do not install any mounting screws.

(12) Remove the flexible coupling from the Autopositioner shaft. Replace it with the new flexible coupling (Collins part number 549-7715-002) that mates with the 70K-9 vfo coupling. Insert, but do not tighten the setscrews (Collins part number 328-0048-000) on the Autopositioner coupling.

<u>NOTE:</u> The new Autopositioner flexible coupling (Collins part number 549-7715-002) is considerably thicker than the Autopositioner flexible coupling (Collins part number 546-6825-002) that was used with the 70K-5 vfo.

(13) Perform step 4.E of the Assembly section (replacement of Autopositioner and vfo in rf translator A12).

F. <u>Disassembly of Autopositioner A12A1.</u>

(1) Removal of the Reversing Switch.

(a) Refer to figure 107. Rotate gear (9) or (5) by hand to position control cam (34) for minimum tension on spring (139).

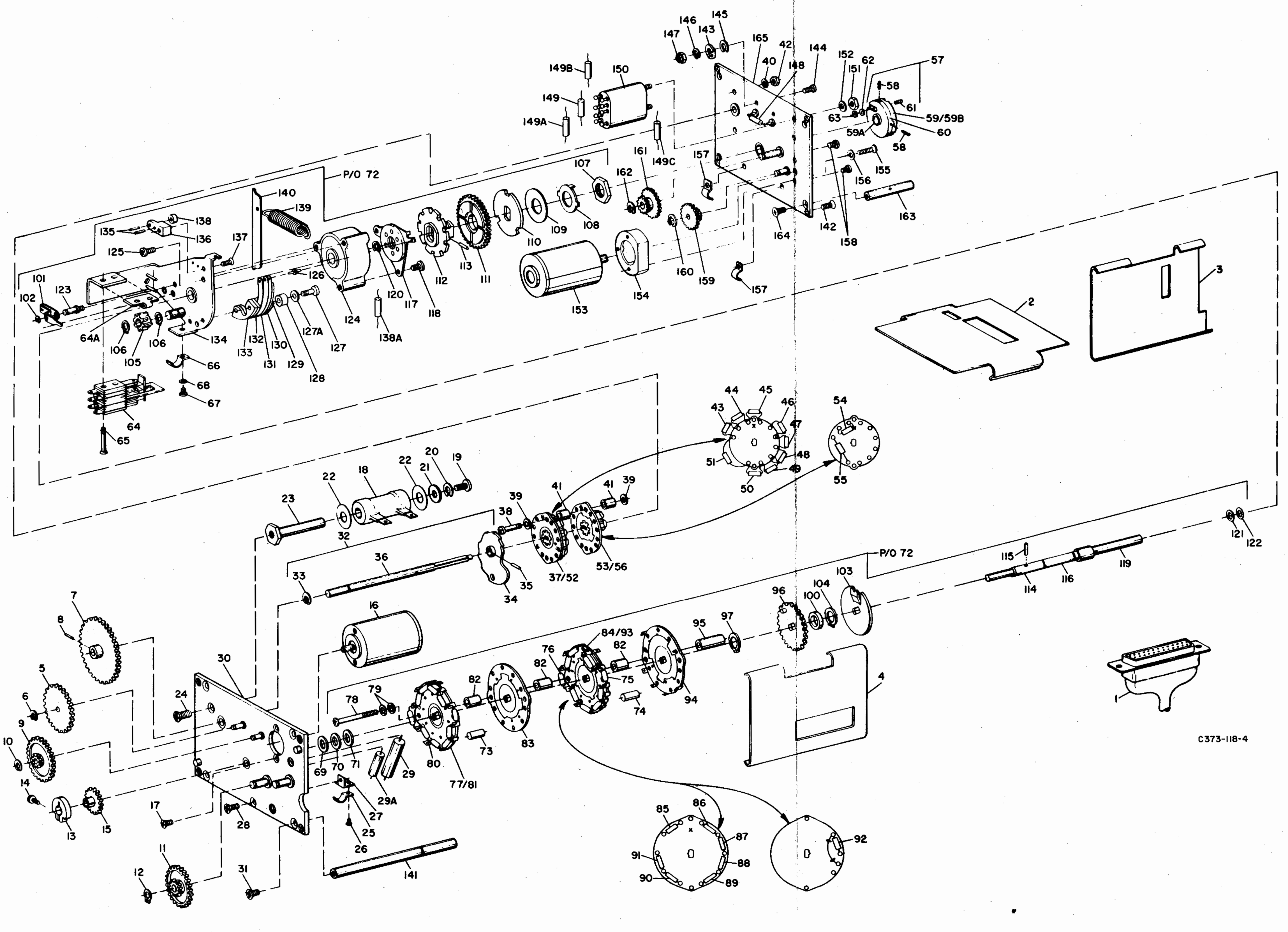
<u>CAUTION:</u> ALWAYS TURN THE GEARS SO THAT THE CAM ROTATES IN COUNTERCLOCKWISE DIRECTION AS VIEWED FROM THE GEARPLATE SIDE.

(b) Remove spring (139) by unhooking bar (140). Do not stretch the spring excessively while removing it.

(c) Remove cable clamp bracket (27) by removing screw (28).

(d) Remove cable clamp (66) by removing screw (67) and lockwasher (68). Lay the cable back so that reversing switch (64) is accessible.

(e) Remove two screws (65) holding the switch to mounting plate (134). Remove the reversing switch from the bracket.



Autopositioner A12A1, Exploded View
Figure 107

(f) Tag and unsolder the six wires connected to the switch. Reversing switch terminal identification is given in figure 108(A). The switch may now be removed.

(2) Removal of 1-kHz Switches. (Refer to figure 107.)

(a) Rotate gear (9) or (5) by hand to position control cam (34) for minimum tension on spring (139).

(b) Remove spring (139) by unhooking from bar (140). Loosen screw (14) of gear clamp (13), and remove spur gear (15).

(c) Disengage vfo shaft coupling (60) from shaft (119) by loosening two setscrews (58).

(d) Remove two cable clamps (157) by removing two screws (158).

(e) Remove relay (150) from bearing plate (165) by removing two nuts (151) and two lockwashers (152).

(f) Remove dc motor (153) and motor mount (154) from the bearing plate by removing two screws (155) and two lockwashers (156).

(g) Loosen bearing plate (165) by removing four screws (142). Lift the plate straight up to clear shaft (119) and camshaft (36).

(h) Remove 1-kHz rotary switch sections (37/52, 53/56) from bearing plate by removing two screws (38). Be careful not to lose any of the small ceramic spacers (41) and fiber washers (39).

(i) Tag any leads before unsoldering from switch terminals. Refer to figure 109(B).

(3) Removal of 10-kHz and 100-kHz Switches. (Refer to figure 107.)

(a) Perform steps (a) through (g) of paragraph 3.F.(2).

(b) Rotate gear (9) or (5) by hand to position control cam (34) so that screw (19) holding resistor (18) to front plate (30) is accessible.

(c) Remove screw (19) holding resistor (18) to front plate. Note placement of the resistor leads. Do not lose the washers at the ends of this resistor.

(d) Remove cable clamp (25) by removing screw (26).

(e) Remove spur gear (15) by loosening setscrew (14) in gear clamp (13) and pulling straight off.

(f) Pull output shaft (114) out of the hole in the front plate. Be careful not to lose the shim washers (if any) between the output shaft and the front plate. The switch assembly is now free of the Autopositioner chassis.

(g) Remove cable clamp (66) by removing screw (67) and lockwasher (68).

(h) Remove reversing switch (64) by removing two screws (65).

(i) Tag and unsolder the six wires connected to solenoid (124) and relay (150). Solenoid relay terminal identification is given in figure 108(B).

(j) Remove two screws (78) and four washers (79) holding switch wafers (77/81, 83, 84/93, 94) to bracket (134). Switch wafers may now be removed. Tag any leads before unsoldering from switch terminals. Refer to figure 109(A).

(4) Solenoid Clutch Disassembly. (Refer to figure 107.)

(a) Perform steps (a) through (f) of paragraph 3.F.(3).

(b) Bend down tabs on washer (108) under nut (107). Remove nut (107), washer (108), and spring washer (109).

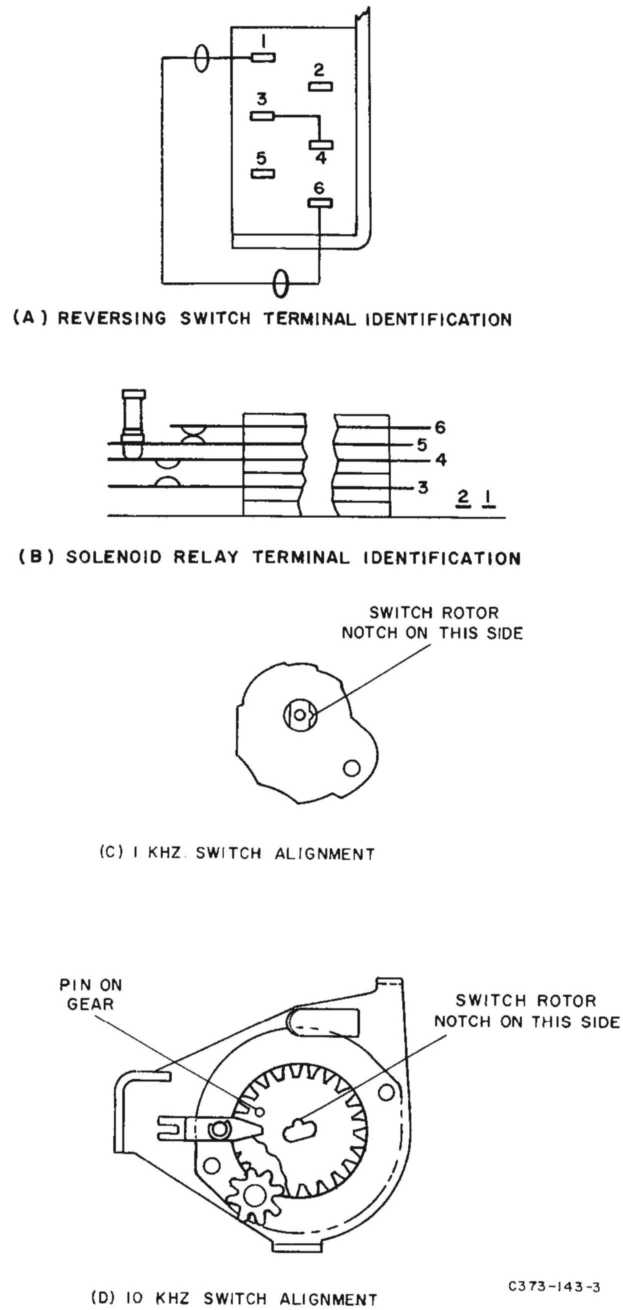
(c) Remove clutch disc (110) and clutch gear (111).

CAUTION: DO NOT TOUCH THE CLUTCH SURFACES WITH FINGERS. KEEP SURFACES FREE OF DUST, DIRT, AND LUBRICANTS OF ANY KIND.

(5) Removal of Solenoid. (Refer to figure 107.)

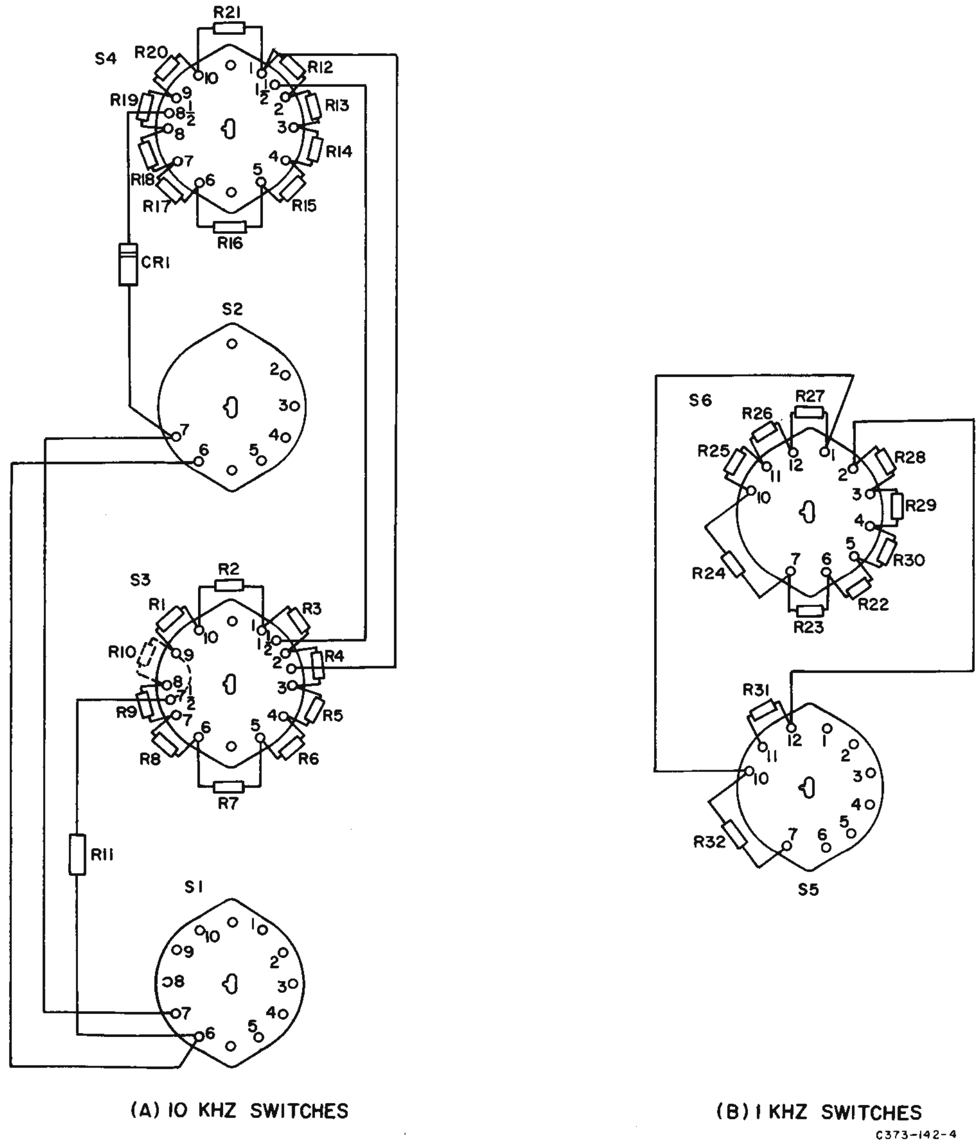
(a) Perform steps (a) through (j) of paragraph 3.F.(3) and steps (b) and (c) of paragraph 3.F.(4).

NOTE: Disassembly of the following spring pin connection is not recommended. Assembly of wheel (112) and shaft (119) cannot be accomplished without alignment fixture since each wheel (112) is unique. The notched wheel (112) is first aligned, then shaft (119) is drilled for spring pin (113). Replacement must be made at subassembly level (CPN 546-6849-004).



Autopositioner A12A1, Alignment
Figure 108

(b) Remove spring pin (113) through hub of wheel (112) and shaft (119) with a punch. Slide hub and attached notched wheel (112) off shaft.



Autopositioner A12A1, Switch Identification
Figure 109

(c) Remove armature (117) from solenoid (124) by removing two screws (118). Be careful not to lose small fiber actuator (126) that separates armature (117) from the solenoid relay contacts. Screws (118) are color coded for mounting the armature only.

(d) Remove retaining ring (120) from shaft (119).

(1) Insert the turrets from the bottom of the module so that all color-coded dots on the turrets are in a line at the top of the module.

NOTE: Each turret is marked with two color-code dots: one white and one a standard color-code color. The white dot is always nearest the gear-plate. Turrets are color coded so that turret S1 is nearest the gear-plate. Therefore, color-code dots should be (from the gearplate): white, brown, white, red, white, orange, etc. When inserting the turret, orient it so that the spring contacts which project from the faces of the turret will not fall into the shaft holes when the turret is being positioned.

(2) When all seven turrets are in place, replace the turret shaft through the gear that turns the shaft. Before tightening the shaft clamp, refer to paragraph 6.B in this section for the turret alignment procedure.

(3) Replace two aligning rods (13) by inserting through the gearplate. Secure the rods with two screws through the rear plate. Refer to note in paragraph 3.G.(5) of disassembly section concerning rf translator modules with turret setscrews.

D. Assembly of Autopositioner A12A1. (Refer to figure 107.)

(1) Replacement of Solenoid.

(a) Replace solenoid (124) on mounting plate (134) using two screws (125) and post (123). Be sure that the post holding the reversing switch level is in the correct hole. Align solenoid (124) so that its shaft hole is lined up with shaft hole in mounting plate (134) before tightening screws.

(b) Solder the insulated jumper from solenoid relay terminal 6 to solenoid terminal 2. See figure 108(B).

(c) Replace retaining ring (120) on shaft (119).

(d) Replace armature (117) in solenoid (124) using two screws (118).

NOTE: Be sure these two screws (118) are the same as those removed during disassembly. If screws are lost, they must be replaced with screws having the same color code.

(e) Replace notched wheel (112) on shaft (119). Replace spring pin (113) through the hole in the notched wheel and shaft.

NOTE: Assembly of wheel (112) and shaft (119) cannot be accomplished without alignment fixture since each wheel (112) is unique. The notched wheel (112) is first aligned, then shaft (119) is drilled for spring pin (113). Replacement must be made at subassembly level (CPN 546-6849-004).

(f) Replace small fiber actuator (126) between armature (117) and the solenoid relay contacts. See figure 108(B) for proper placement of the actuator.

(g) Perform steps (a) through (c) of paragraph 4.D.(2).

(2) Solenoid Clutch Assembly. (Refer to figure 107.)

(a) Replace spur gear (111) and clutch disc (110).

CAUTION: DO NOT LUBRICATE OR CLEAN CLUTCH SURFACES ON 110, 111, OR 112. WIPE WITH DRY, CLEAN, LINTLESS CLOTH. DO NOT TOUCH CLUTCH SURFACES WITH FINGERS.

(e) Unsolder the insulated jumper wire from terminal 2 of the solenoid. See figure 108(B).

(f) Remove solenoid (124) from mounting plate (134) by removing two screws (125) and mounting post (123).

G. Removal of Turrets from RF Translator A12. (Refer to figure 101.)

(1) With rf translator A12 in the chassis and power applied to the 618T-( ), position turrets to the 2-MHz position by setting frequency indicator on the 714E-( ) to 2.000 MHz. Allow to tune and turn off power to 618T-( ).

(2) Remove rf translator A12 from 618T-( ) chassis.

(3) Remove the top and bottom covers from rf translator A12.

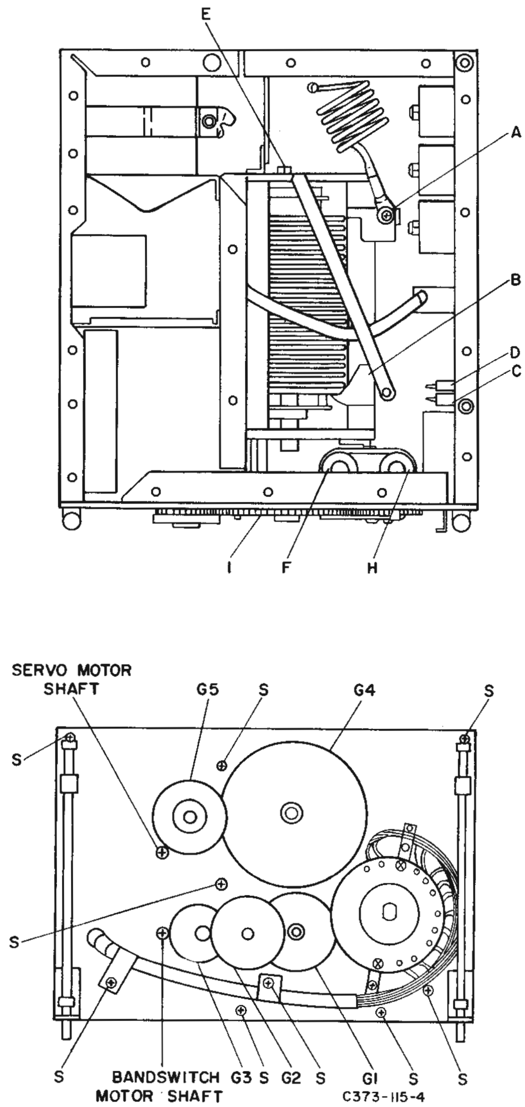
(4) Remove the turret cover by removing 14 screws on cover.

(5) Remove two phenolic aligning posts (13) by removing the two screws on rear of module. Slide the rods out through the gearplate.

NOTE: Late versions of rf translator A12 contain a notation on the gearplate concerning turret setscrews. The setscrews must be loosened before performing step 6. If this notation is found, use a no. 2 Bristol wrench and loosen the setscrews that hold turrets A12S1, A12S3, A12S4, and A12S7. The module bottom cover illustrates the location of these turrets. Access to the setscrews is through the hole adjacent to the color-coded dot on each turret.

(6) Remove the turret shaft by loosening the clamp on the gear that drives the shaft. Pull the shaft out through the gear.

(7) Remove the turrets at the bottom of rf translator A12 by pushing them from the top of the module.



Power Amplifier A11, Gearplate
Figure 110

Use care to avoid catching spring contacts, extending from the turret faces, in the shaft holes.

H. Disassembly of Power Amplifier Module A11. (Refer to figure 110.)

(1) Remove nine screws (S) from gearplate.

(2) Remove the top cover plate from the module by loosening 17 screws, sliding it toward the gearplate, and lifting it off.

(3) Remove the square plate on the end of the module opposite the gearplate by removing the eight screws.

(4) Remove the two nylon screws and washers holding the roller coil assembly to bracket at end of roller coil nearest tubes. Push the screen bypass capacitor out of the way to get at these screws.

(5) Remove the one screw and washer holding the end of the large silver-plated coil to the bracket on the roller coil assembly.

(6) Loosen the one screw holding the lower strap on the roller coil assembly.

(7) Disconnect resistors A11R42 and A11R43.

(8) Pull the gearplate out from the chassis. Be careful to pull straight out because the band-switch shaft comes out with the gearplate. The gearplate will remain connected to the module chassis by the wiring cable.

CAUTION: SHORT PLATE STRAPS TO CHASSIS WITH A SCREWDRIVER WITH AN INSULATED HANDLE BEFORE REMOVING TUBES.

(9) To remove the power amplifier tubes, remove the tube cover plate from the end of the module opposite the gearplate by removing six screws. Loosen the straps around the tube. Remove the tubes with the tube pullers supplied in the 678Y-1 Maintenance Kit chimneys.

I. Removal of Crystal from RF Oscillator A2 (Early Model). (Refer to figure 111.)

(1) Remove rf oscillator A2 from the 618T-( ) chassis.

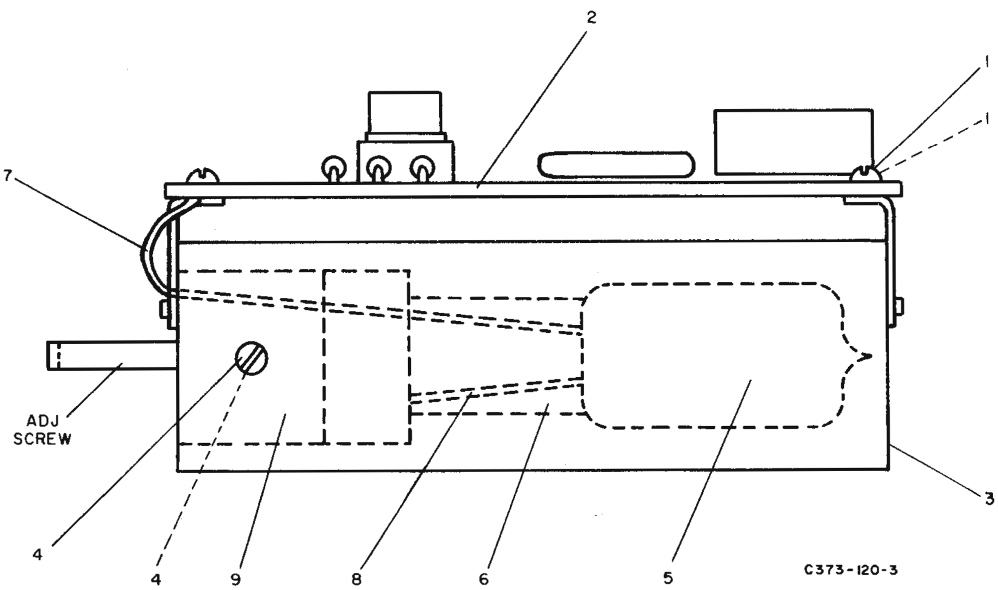
(2) Remove the dust cover from the module.

(3) Remove the triangular-shaped cover plate from the top of the module by removing four screws.

(4) Remove the two holddown screws on the foam-insulated end of the module.

(5) Remove the foam plug from the top of the module. Pull the wire cable so that it is outside the insulation.

(6) Tilt the insulating foam so that the bottom of the foam is exposed.



Oven and Crystal Oscillator Assembly, RF Oscillator A2 (Early Model)
Figure 111

(7) Remove the foam plug from the bottom of the module. Pull the wire cable so that it is outside the foam.

(8) With a finger, push the oven and crystal oscillator assembly up through the foam. Do not use a tool to push the oven out of the foam or the oven may be damaged.

(9) Remove two screws (1) from circuit board (2) to loosen oven assembly (3).

(10) Remove two screws (4) from opposite sides of the oven.

(11) Hold the circuit board in one hand, and remove the oven to expose crystal (5).

(12) Remove all grease (6) from around the crystal. Wipe all grease from the crystal Do not get grease on the circuit board.

(13) Unsolder green crystal lead (7) from the circuit board.

(14) Unsolder blue crystal lead (8) from C1 (9). The crystal may now be removed.

J. Removal of Crystal from RF Oscillator A2 (Late Model).

(1) Remove rf oscillator A2 from the 618T-( ) chassis.

(2) Remove the dust cover from the module.

(3) Remove the large foam protective plug from the module.

(4) Tag and unsolder the three leads at the reference oscillator board.

(5) Remove the reference oscillator board from the foam protection plug. The reference oscillator board contains the crystal.

618T-( ) Airborne SSB Transceiver - Cleaning

1. GENERAL.

This section presents instructions for cleaning parts and disassembled subassemblies of the 618T-( ) Airborne SSB Transceiver.

Instructions are arranged to facilitate reference by paragraph to the procedure for cleaning. All parts requiring particular methods of cleaning are considered separately, and parts similar enough to permit identical cleaning procedures are grouped.

2. CLEANING MATERIALS.

The use of the word "solvent" in the following procedures means Turcosol or Stoddard solvent. The cleaning materials referred to are listed in figure 201.

In this section, "air jet" refers to a hand-operated air nozzle supplied with clean, dry, compressed air at a maximum of 28 psig.

WARNING: USE CLEANING SOLVENT UNDER A VENTILATED HOOD. AVOID BREATHING SOLVENT VAPOR AND FUMES. WEAR A SUITABLE MASK WHEN NECESSARY. AVOID CONTINUOUS CONTACT WITH SOLVENT. USE GOGGLES, GLOVES, AND APRON TO PREVENT IRRITATION FROM PROLONGED CONTACT. CHANGE CLOTHING UPON WHICH SOLVENTS HAVE BEEN SPILLED. OBSERVE ALL FIRE PRECAUTIONS FOR FLAMMABLE MATERIALS. USE THESE MATERIALS IN A HOOD PROVIDED WITH EXPLOSION-PROOF ELECTRICAL EQUIPMENT AND AN EXHAUST FAN WITH SPARKPROOF BLADES. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORKING ENCLOSURE.

WARNING: WEAR GOGGLES WHEN USING AN AIR JET TO BLOW DUST AND DIRT FROM EQUIPMENT. WARN OTHER PERSONS TO KEEP AWAY FROM HAZARDOUS AREA OR WORK ENCLOSURE.

MATERIAL	RECOMMENDED TYPE
Solvent	Turcosol or Stoddard solvent
Isopropyl alcohol	
Chamois skin	
Cloth, lintless cotton	
Detergent, powder	
Paper, lens tissue	
Paper, fine grade tissue	
Cleaning agent	Miller-Stephenson #MS-230 Contact RE-NU

Cleaning Materials
Figure 201

3. PROCEDURES.

A. Bearings, Sealed and Porous Bronze.

NOTE: Refer to figures 23, 24, 34, and 43 of the 618T-( ) illustrated parts catalog (Collins part number 520-5970005).

Normally, sealed bearings require no cleaning or lubrication, since they are lubricated by the manufacturer for lifetime operation. It is recommended that these bearings be replaced if faulty; however, under certain circumstances, lubrication may be necessary. If lubrication is necessary, bearings must be thoroughly cleaned as follows:

(1) Sealed Ball Bearings.

(a) Sealed ball bearings must be cleaned in a suitable bearing-cleaning machine, such as a spray cleaner or an ultrasonic installation. Follow the manufacturer's instructions for proper use of these machines.

(b) If bearings are not to be lubricated, protect bearings from dust and moisture before inspection.

CAUTION: PERMANENT DAMAGE MAY RESULT FROM FORCIBLY SPINNING A BEARING BEFORE IT IS THOROUGHLY CLEAN. BEARINGS MUST NOT BE HANDLED WITH BARE HANDS DURING AND AFTER CLEANING AND PRESERVATION. OPERATORS MUST WEAR RUBBER GLOVES OR FINGER-STALLS TO AVOID CONTAMINATING BEARINGS WITH FINGERPRINTS. KEEP HANDLING TO A MINIMUM.

(2) Porous Bronze Bearings.

Lubrication of porous bronze bearings is not recommended. Wipe dust from items that contain porous bronze bearings with a clean, dry, lintless cloth. Protect the bearings from dust and moisture pending inspection.

B. Blower Filter.

The blower filter should be cleaned regularly. Always clean the filter before the air outlet side becomes dirty.

(1) Slowly immerse the filter, dirty side up, in cool water that contains a mild detergent. This will float out dirt and lint. A slight up-and-down motion will remove any remaining particles. If it is impossible to immerse filter, pass a fine spray of water through it in the direction opposite that of the air flow.

(2) Shake the filter to remove excess water. Allow the filter to dry.

(3) Before replacing the filter, lightly coat all filter surfaces with Air-Maze Filterkote "M" Water Soluble Oil, Collins part number 005-0609-00.

C. Cables, Covered.

(1) Clean outer surfaces of flexible Vinylite conduit by wiping dirt from surfaces with a lintless cloth moistened with solvent.

(2) Wipe dry with a clean, dry, lintless cloth.

(3) Treat all connector terminals as directed in paragraph F. Wipe lug terminals clean with a lintless cloth moistened with solvent, and dry with a clean, dry, lintless cloth.

D. Castings.

Castings should be cleaned as follows:

(1) Remove most of the surface grease with rags.

(2) Blow dust from surfaces, holes, and recesses using an air jet.

(3) Immerse casting in bath of solvent, and scrub until clean, working over all surfaces and into all holes and recesses with a suitable nonmetallic brush. Flat, woodbacked brushes with soft fiber bristles are recommended for surfaces; round brushes, like those used for washing bottles and test tubes, are recommended for holes and recesses.

(4) Raise casting from bath, and permit solvent to drain into bath.

(5) Immerse in rinsing bath of cleaning solvent, rinse, and raise from bath. Position casting to drain dry so solvent is not trapped in holes or recesses. When practical positioning will not permit complete draining, use air jet to blow out any trapped solvent.

(6) When thoroughly dry, touch up any minor damage to finish. Extensive damage to finish may require complete refinishing.

(7) Protect the casting from dust and moisture pending inspection.

E. Chassis, Wired.

The following cleaning procedures should be used for chassis containing terminal boards, resistor and capacitor assemblies, rf coils, switches, tube sockets, inductors, transformers, and other wired parts.

(1) Remove dust and dirt from all surfaces, including parts and wiring, using soft-bristled brushes in conjunction with an air jet.

CAUTION: AVOID AIR-BLASTING SMALL COILS, LEADS, AND OTHER DELICATE PARTS BY HOLDING THE AIR JET NOZZLE TOO CLOSE. USE CAUTION IN USE OF BRUSHES ON DELICATE PARTS.

NOTE: When necessary to disturb the dress of wiring and cables, dressing should be noted and wiring and cables restored to dress after cleaning is completed.

(2) Clean jacks as instructed in paragraph J.

(3) Clean sockets as instructed in paragraph O.

(4) With minimum disturbance of wiring, clean connectors as prescribed in paragraph F.

(5) Clean wafer switches as directed in paragraph P.

(6) Clean ceramic or plastic insulators by method given in paragraph I.

(7) Finish cleaning chassis by wiping down all finished surfaces with a lintless cloth moistened with solvent.

(8) Dry and polish these surfaces, using a clean, dry, lintless cloth.

(9) Protect chassis from dust, moisture, and damage before inspection.

F. Connectors.

(1) Wipe dust and dirt from bodies, shells, and cable clamps using a lintless cloth moistened with solvent. Wipe dry with a clean, dry, lintless cloth.

(2) Remove dust from inserts using a small soft-bristled brush and an air jet.

(3) Wash dirt and any traces of lubricant from inserts, insulation, and contacts using a solvent applied sparingly with a small camel-hair brush.

CAUTION: DO NOT ALLOW SOLVENT TO RUN INTO SLEEVES OR CONDUIT COVERING ANY WIRES OR CABLES CONNECTED TO CONTACT TERMINALS OF THE INSERT.

(4) Dry insert with the air jet.

G. Covers and Shields.

Clean all unfinished, finished, and partly finished sheet metal covers, such as dust covers, inspection covers, chassis covers, and housings, according to applicable steps of procedures used for cleaning castings. Refer to paragraph D.

H. Gears, Metal and Fiber.

If gear trains are disassembled for replacement of defective gears, the gears should be cleaned according to the following procedures:

(1) Metal gears should be cleaned according to applicable steps of paragraph K.

(2) Composition or plasticized gears and nylon friction clutches should be cleaned according to procedures given in steps (3) and (4).

(3) Remove all surface dust and dirt by using a soft-bristled brush in conjunction with an air jet.

(4) Using a clean, lintless cloth lightly moistened with solvent, clean composition gears by wiping them clean.

CAUTION: SOLVENT SHOULD NOT BE USED TO CLEAN GEARS COMPOSED OF OR CONTAINING NYLON. CLEAN THESE GEARS USING A WASHING BATH OF 2 OUNCES OF DETERGENT POWDER TO A GALLON OF WATER AND USING SUITABLE BRUSHES TO REMOVE SURFACE DIRT OR FOREIGN MATTER. GEARS COMPOSED OF EPOXY AND SUPPORTING BASE MATERIAL ARE SUSCEPTIBLE TO SOFTENING IF SOLVENT IS APPLIED FOR TOO LONG OR IF TOO MUCH SOLVENT IS USED. USE CARE IN CLEANING THESE GEARS WITH SOLVENT, AND DRY WITH A CLEAN, LINTLESS CLOTH.

I. Insulators, Ceramic or Plastic.

Clean all ceramic insulators and plastic standoff insulators as follows:

(1) Wipe clean with a clean, lintless cloth lightly moistened with solvent.

(2) Wipe dry, and polish using a dry, clean, lintless cloth.

J. Jacks.

(1) Remove dust from exteriors with a camel-hair brush and an air jet.

(2) Blow dust from interior of female contact with the air jet.

K. Machined Metal Parts.

Detached shafts, keys, pins, collars, worms, springs, and similar machined parts should be cleaned in a suitable cleaning machine, if available; otherwise, proceed as follows:

(1) Use procedures listed in steps (1) through (5) of paragraph D and steps (2) and (3) of this paragraph.

CAUTION: TO PREVENT CORROSION, AVOID TOUCHING ANY MACHINED OR FINISHED SURFACES WITH BARE HANDS AFTER CLEANING.

(2) Dry in a dust-free, dry area or suitable enclosure. Radiant heat used in a ventilated enclosure is recommended for drying, particularly if humidity is high.

(3) When dry, immediately apply a light coat of MIL-L-7870 lubricating oil to any bare steel surfaces.

L. Mechanical Metal Parts.

The detached miscellaneous mechanical metal parts include ventilating grilles, mounting plates, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware. These should be cleaned in a suitable cleaning machine or according to applicable steps of procedures for castings. Refer to paragraph D.

M. Molded Plastic Parts.

Plastic parts include insulating members, terminal boards, mounting blocks, etc. These should be cleaned in the following manner:

(1) Using an air jet, blow loose dust and dirt from surfaces, holes, and crevices.

(2) Wipe clean using a lintless cloth moistened with solvent.

(3) Dry and polish with a clean, dry, lintless cloth.

N. Relay Contacts.

CAUTION: DO NOT USE BURNISHING TOOL ON RELAY CONTACTS EXCEPT AS DETAILED IN THE REPAIR SECTION. BURNISHING OF GOLD-FLASHED RELAY CONTACTS IS NOT RECOMMENDED BECAUSE REMOVAL OF SURFACE FINISH MAY DEGRADE PERFORMANCE WITH LOW-LEVEL SIGNALS.

(1) Remove loose foreign materials from relay contacts with an air jet. If possible, operate relay armature manually while using air jet.

(2) Spray contacts with Miller-Stephenson #MS-230 Contact RE-NU or equivalent cleaning agent. Use force of spray to loosen heavy buildup on contacts.

(3) If necessary to remove any remaining residue, hold the contacts closed by manually operating relay armature and pass small strips of clean white paper back and forth between each pair of contacts.

O. Sockets.

Bakelite sockets are cleaned as follows:

(1) Remove any resin adhering to silver-plated contacts using a hardwood stick with a wedge point.

CAUTION: DO NOT USE METAL TOOLS TO REMOVE FOREIGN MATTER FROM THESE CONTACTS, AS DAMAGE TO THE CONTACT PLATING INVITES CORROSION, WHICH MAY END ULTIMATELY IN FAILURE OF THE EQUIPMENT. EXISTING CORROSION CONTACTS SHOULD NOT BE DISTURBED. CORROSION INDICATES DAMAGE TO PLATING AND NECESSITY FOR REPLACEMENT OF SOCKET.

(2) Wash contacts with solvent applied lightly with a small, soft-bristled brush.

(3) Using a lintless cloth moistened with solvent, remove any foreign matter adhering to body of socket or wafer.

(4) Repeat alcohol wash and dry with an air jet.

P. Switches, Wafer.

Clean switches of the phenolic wafer type as follows:

(1) Remove all dust with an air jet, turning switch rotor back and forth several times while blowing.

(2) Wash all contacts and insulation with solvent lightly applied with a small, camel-hair brush.

(3) Dry with air jet; then repeat wash using clean solvent while turning switch rotor.

Q. Turret Assembly Contacts.

Clean turret assembly contacts as follows:

CAUTION: TO PREVENT CORROSION, AVOID TOUCHING CONTACTS WITH BARE HANDS AFTER CLEANING.

(1) Remove all dust with an air jet.

(2) Wash all contacts with alcohol, lightly applied with a small camel-hair brush.

(3) Dry with an air jet.

(4) Repeat alcohol wash and dry with an air jet.

618T-( ) Airborne SSB Transceiver - Inspection/Check

1. GENERAL.

This section presents instructions necessary to verify by inspection, the condition of disassembled and cleaned assemblies of the 618T-( ). Inspection will reveal defects that result from wear, damage, deterioration, or other causes. Detailed inspection procedures are arranged alphabetically. Wear tolerances are listed in the fits and clearances section of this manual where applicable. Refer to the repair section of this manual for replacement of defective parts.

2. PROCEDURES.

A. Bearings.

(1) Bearings, Porous Bronze.

Inspect bearings for pitted, scarred, or scuffed load-bearing surfaces. Inspect for burns, corrosion, and any abnormal conditions occurring on load-bearing surfaces.

(2) Bearings, Ball.

The following inspection procedure applies to ball bearings of the shielded type. After the bearing has been cleaned, it is inspected to determine whether it is serviceable, and the bearing is cleaned again. After final cleaning, lubricate for installation. Inspect bearings as outlined below:

CAUTION: ALL INSPECTION REQUIRES THE UTMOST CLEANLINESS. OPERATORS HANDLING BEARINGS MUST WEAR RUBBER GLOVES OR FINGERSTALLS TO PREVENT CORROSION FROM FINGERPRINTS.

(a) Check for blue or purple discoloration (from overheating) of any part of bearing.

(b) Check for tarnished outer surfaces (indicated by a light discoloration of highly finished surfaces).

(c) Check for rust.

(d) Check for pitted, scarred, scuffed, or balled surfaces of bearings, balls, and races.

(e) Check for flat bearing balls, broken ball separators, flaking or spalling of load-carrying surfaces, and all other abnormal conditions.

In addition to the above inspection, check for undersized od (outside diameter) caused by creepage of outer race in its housing. This applies to all ball bearings with races that do not separate when the bearing is removed from companion parts. Also, check with a plug gauge for oversize or defective bore caused by the inner race having turned on its shaft and for excessive radial play. Use a suitable radial gauge equipped with a dial indicator calibrated in ten-thousandths of an inch when checking radial play of each bearing. A noise inspection of this type of bear-can be made by mechanical rotation. If motor driven, the bearing should be lubricated lightly with recommended lubricant (see lubricant chart, figure 501), and rotated at 500 to 1000 r/min. A dental lathe can be used to drive the inner race while the outer race is held in gloved fingers. A used but serviceable bearing will develop a certain amount of noise. A light, uniform noise is to be expected, but loud noise, nonuniform noises such as clicks or buzzes, and vibration originating in the bearing indicate that it is unfit for service. If manually rotated, the bearing must be clean and dry (unlubricated), and the outer race should be spun with the gloved finger while the bearing is held by a bearing holder inserted in its bore. Hold the bearing in several positions while making the check, and listen for any vibration or intermittent resistance.

B. Capacitors.

Inspect capacitors for defects listed in figure 301.

DEFECT	METAL TYPE	MOLDED TYPE	CERAMIC TYPE
Leakage of electrolyte (at case seams or around terminal insulation)	X		
Cracked, broken, or charred terminal insulation	X		
Case damage (dents or holes)	X		
Case damage (cracks or breakage)		X	
Loose, broken, or corroded terminal studs, lugs, or leads	X	X	X
Loose, broken, or poorly soldered connections	X	X	X

Fixed-Capacitor Inspection
Figure 301

C. Chassis.

Inspect chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, or damaged handles. Inspect for corrosion and damage to finish that requires work in finishing department.

D. Connectors.

Inspect connector bodies for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Inspect for corroded or damaged plating on contacts and for loose, poorly soldered, broken, or corroded terminal connections.

E. Covers and Shields.

Inspect covers and shields for punctures, deep dents, and badly worn surfaces. Inspect for damaged fastener devices, corrosion, and damage to finish that requires work in finishing department.

F. Gaskets and Seals.

Inspect gaskets and seals for deformation and for damage such as tears, creases, rough surfaces, and imbedded foreign matter.

G. Gears, Metal and Fiber.

Inspect gears for broken, chipped, or badly worn teeth. Inspect gear bodies for cracks and deformation. Inspect surfaces for corrosion or other abnormal conditions.

H. Insulators, Ceramic or Plastic.

Inspect ceramic or plastic insulators for evidence of damage, such as broken or chipped edges, burned areas, or foreign material.

I. Jacks.

Inspect jacks for corrosion, rust, loose or broken parts, cracked insulation, bad contacts, and other irregularities.

J. Machined Metal Parts.

Inspect for physical damage to surfaces, corners, and edges. Inspect closely all machined surfaces, holes, bores, counterbores, slots, grooves, shoulder, flanges, teeth, tapped holes, and all threaded members, both male and female, for damage of any sort, including roughness of surface, corrosion, or foreign matter. Inspect plated or finished areas for damage requiring replating or refinishing beyond touch-up repair.

K. Mechanical Metal Parts.

Inspect unmachined mechanical metal parts, including mounting plates, chassis, mounting clamps and brackets, nuts, bolts, screws, washers, handles, fasteners, and hardware, for damage or deformation. Inspect for corrosion and any damage that would require replating or refinishing beyond practical touchup.

L. Molded Plastic Parts.

Inspect plastic parts, such as terminal boards, mounting blocks, and insulating members, for signs of corrosion, cracked or charred insulation, and loose or missing mounting hardware. Inspect for other abnormal indications that might be a source of later breakdown.

M. Laminated Circuit Boards.

Inspect laminated circuit boards for loose, broken, corroded, or poorly soldered terminal connections. Inspect laminated circuits for any evidence of damage, such as burned, broken, cracked, or corroded plating. Inspect for loose mounting of laminated circuit boards.

N. RF Coils.

Inspect rf coils for broken leads and loose, poorly soldered, or broken terminal connections. Inspect for crushed, scratched, cut, bruised or charred windings; corrosion on windings, leads, terminals, and connections; and for damage to forms.

O. Receptacles.

Inspect receptacles for cracked, broken, or charred insulation. Inspect for damage to all other parts, loose or bent contacts, damage to contact plating, corrosion, and other abnormal conditions.

P. Relays.

Inspect relay contacts for burned or pitted areas, welds, misalignment, and improper separation. Check contact support members for deformation causing contact misalignment or improper contact operation. With the finger, test movable contacts for sluggish action or sticking at any point of travel in either direction. Check for damage to armature. Inspect for foreign matter between end of pole piece and armature. Inspect for loose coil, corrosion, loose leads or terminals, and for cuts and damage to coil. Inspect for loose, broken, brittle, or charred insulation on coil or leads between contact support members and between terminals on relay. Inspect for bent, loose, or broken terminals. Inspect relay mounting and mechanical parts for looseness and physical damage or corrosion.

Q. Resistors.

Inspect fixed composition resistors for cracked, broken, blistered, or charred bodies and loose, broken, poorly soldered, or corroded terminal connections.

Inspect fixed wire-wound resistors for signs of heating; cracked, broken, or charred insulation; loose, poorly soldered, broken, or corroded terminal connections; and loose mounting.

R. Semiconductors.

Inspect diodes, silicon-controlled rectifiers, and transistors for cracked, broken blistered, or charred bodies. Inspect for loose, broken, poorly soldered, or corroded terminal connections.

S. Sockets.

Inspect sockets for loose, broken, or missing socket-mounting rings. Inspect for cracked, broken, or charred insulation. Inspect for broken, corroded, or deformed contacts and loose, poorly soldered, broken, or corroded connections.

T. Switch Wafers, Rotary.

Inspect switch wafers for bent, weak, broken, or deformed contacts. Inspect for corrosion, damage to contact plating, and cracked or broken contact insulation. Check to see that movable contacts are free to turn properly, without binding, throughout entire travel. Inspect parts mounted on switch wafers for damage.

U. Soldered Terminal Connections.

Inspect soldered terminal connections for cold-soldered or resin joints. These joints present a porous or dull, rough appearance. Check for strength of bond, using the point of a tool. Examine for excess of solder, protrusions from the joint, pieces adhering to adjacent insulation, and particles lodged between joints, conductor, or other parts. Inspect for insufficient solder and unsoldered strands of wire protruding from conductor at joint. Also, look for insulation that is stripped back too far from joint or badly frayed at joint. Inspect for corrosion (verdigris) on copper conductor at the joint.

V. Transformers and Reactors.

Inspect transformers and reactors for signs of excessive heating, damage to case, cracked or broken ceramic insulators, and other irregularities. Inspect for corroded, poorly soldered, or loose terminals and loose, broken, or missing mounting hardware.

W. Wiring.

Inspect open and laced wiring of chassis, terminal boards, and parts of equipment by checking insulation for damage and charring. Inspect wires for breakage and for improper dress in relation to adjacent wiring and chassis.

618T-( ) Airborne SSB Transceiver - Repair

1. GENERAL.

This section presents instructions for the replacement or repair of damaged or defective components of the 618T-( ). Faulty parts usually are detected through procedures in the inspection/check or testing section of this manual. If a new part is to be installed, it should first be inspected and tested.

Most of the repair or replacement instructions apply to disassembled equipment. Refer to the disassembly section for proper instructions.

2. PROCEDURES.

A. Bearings.

Shielded bearings will rarely need lubrication. If defective, replace with another bearing, new or known to be good.

Porous bearings never need lubrication. If defective or dry, replace with a new bearing.

B. Capacitors.

If defective or suspected of causing difficulties, capacitors should be replaced. Clean all connections thoroughly, and apply new solder.

C. Connectors.

Straighten bent pins and damaged shell areas. Replace bad connections, broken wires, or wires with split insulation. If connector insert is broken, replace connector.

D. Covers and Shields.

Replace damaged screws, straighten any dents or warped sections, and retouch scratched or worn painted surfaces.

E. Frame.

Straighten misshapen areas. Remove all corrosion with a suitable cleaner. Retouch silk screening and refinish where needed.

F. Gears, Metal and Fiber.

Metal or fiber gears should be replaced if found defective in inspection or testing. Instructions are given in the assembly and disassembly sections of this manual.

G. Integrated Circuits (Flatpacks). (Refer to figure 401.)

(1) Remove defective flatpack.

(a) Before removing the flatpack, note the position of the printed dot in the corner of the flatpack relative to positioning of the flatpack on the circuit board.

(b) If the flatpack and board have been coated with epoxy, perform the following procedure; if not, proceed to step (c).

CAUTION: APPLY ONLY AS MUCH HEAT AS NECESSARY TO LOOSEN THE EPOXY. ALSO, SCRAPE FROM CIRCUITRY TO THE BOARD: CIRCUITRY CAN BE ACCIDENTALLY LIFTED FROM THE BOARD IF TOO MUCH HEAT IS APPLIED OR IF THE SCRAPER CATCHES ITS EDGE. DON'T RUSH. THIS IS A VERY DELICATE OPERATION.

1. Touch the tip of a small soldering iron between each lead of the flatpack.

NOTE: This step is sometimes necessary before the individual leads can be grasped with a tweezers.

2. Soak a piece of shielding braid in 1544 rosin. Lay the braid over the leads on one side of the flatpack, and apply heat with the soldering iron.

NOTE: This step both loosens the epoxy coating and removes some of the solder from the connections.

3. Use tweezers to grasp each lead, one at a time, adjacent to the planar board. Heat each lead and lift it just far enough to break the connection to its pad. Repeat until all of the leads are unsoldered. Clean the tweezers periodically by dipping in cleaning solvent.

4. If the flatpack is still attached, carefully lift it, and sever the attaching epoxy coating with a hot soldering iron.

5. Carefully remove the remaining epoxy from the connection pads. Remove the larger pieces by first heating them slightly with the iron, and then, while they are still hot, scraping them away using a bakelite probe or a knife with a curved blade.

(e) If the flatpack is not coated with epoxy, either perform steps (b)2 and (b)3 above, or proceed as follows:

1. Mount the flatpack removal tool in an arbor press so that the two prongs of the spring are facing you. .

2. Thread the defective flatpack onto the spring so that the prongs pass under all the leads of the flatpack.

3. Apply just enough pressure so that all the connections make contact with the heating unit. As soon as the solder melts, remove the flatpack by gently releasing pressure and pulling away.

CAUTION: APPLY ONLY NECESSARY PRESSURE TO MAKE GOOD THERMAL CONTACT. TOO MUCH PRESSURE MAY DAMAGE THE BOARD.

(d) Soak a piece of shielding braid in 1544 rosin (figure 401). Lay the braid over the connecting pads, and heat with a soldering iron until the excess solder is drawn into the braid.

CAUTION: DO NOT APPLY MORE HEAT THAN NECESSARY.

(e) Clean the connecting pads with a small brush dipped in cleaning solvent (figure 401).

(f) Retin the connecting pads lightly. Use enough solder to form a crescent-shaped bulge but not enough to form a U-shaped bulge (about 1/32 inch of 0.020-inch diameter solder).

(2) Prepare the new flatpack as follows:

(a) The bottom of the flatpack should be spaced away from the circuit board slightly. The manufacturer cements a small plastic pedestal to the side of the flatpack that faces the circuit board, using Armstrong A12 adhesive. If replacement pedestals are not available, insert a toothpick under the flatpack while soldering the leads of the flatpack, and then remove the toothpick.

(b) Provide strain relief in the leads by bending them downward and outward as follows:

1. Use long-nosed pliers to grasp all leads on one side of the flatpack about 1/16 inch away from the body of the flatpack. Simultaneously bend all leads down at about a 65-degree angle.

2. Grasp the bent leads with the long nose at a point about 1/16 inch from the first bend (step 1), and simultaneously bend all leads on this side back 65 degrees so that the end portions of the leads are slightly below and parallel to the bottom of the flatpack.

3. Repeat steps 1 and 2 on the leads extending from the other side of the flatpack.

(c) Temporarily lay the flatpack in position on the circuit board. Mark and cut the flatpack leads so that they extend to the ends of, but not beyond, their circuit pads.

(d) If necessary, use tweezers to bend leads so they lay directly over their circuit pads.

(e) Pre-tin the flatpack leads.

1. Dip the leads into 1544 rosin (figure 401) to a depth up to the first (lower) bend in the leads.

2. Either dip the leads of the flatpack into a solder pot to a depth up to the lower bend, or tin the leads with a soldering iron (figure 401).

NOTE: Solder is permitted on the ascending portion of the lead, but not on the portion of the lead that extends straight out from the flatpack.

CAUTION: DO NOT ALLOW SOLDER NEARER THAN 1/16 INCH TO THE FLATPACK. THIS MIGHT CAUSE HEAT DAMAGE TO THE FLATPACK AND ALSO SERIOUSLY DEGRADE THE STRAIN RELIEF FEATURE OF THE DOUBLE BEND.

(3) Replace flatpack.

(a) Use a pipe cleaner to apply 1544 rosin to the connection pads on the circuit board.

(b) Refer to step (1)(a); position the dot near one corner of the replacement flatpack in the same position relative to the circuit board as the original flatpack.

NOTE: If original positioning of the flatpack was not recorded, observe whether one of the corner circuit pads on the board is longer than the other pads. If so, use tweezers to position the flatpack to the circuit board so that the lead nearest the dot on the flatpack lays over the longer circuit pad.

A photo or figure in the illustrated parts list section of this manual may show proper positioning of the replacement flatpack.

If an identical unit is available, the proper position can be ascertained by noting the positioning in the identical unit.

(c) While holding the flatpack in position, tack-solder the two corner leads on one side of the flatpack.

(d) Rotate the board 180 degrees, and tack-solder the other two corner leads.

(e) Use a tweezers to grasp each lead near the board. Apply just enough pressure so that the lead lays directly over its connecting pad and so that the entire lower part of the lead contacts the pad. Heat lead with iron until solder from the pad flows up around the edges of the lead, and remove the soldering iron. Continue to hold the lead until the solder solidifies. Repeat until all the leads are soldered. Periodically clean tweezers by dipping in a cleaning solvent.

CAUTION: DO NOT APPLY MORE HEAT THAN NECESSARY.

NOTE: The surface of the special soldering tip listed in figure 401 is small enough (0.015-inch maximum width) to touch only one lead at a time. If two adjacent pads are accidentally bridged with solder, the solder can be removed by quickly stroking it with the iron in a direction parallel to the pads.

If not enough pressure is applied, usually only the tip of the lead will contact the circuit pad, and if too much pressure is applied, usually only the first bend of the lead will contact the pad.

(f) Use a small brush and cleaning solvent to remove any remaining 1544 rosin from connecting pads.

CAUTION: CLEANING SOLVENT WILL REMOVE PRINTED IDENTIFICATION FROM COMPONENTS. ALSO, CLEANING SOLVENT WILL DISSOLVE THE SMALL PEDESTAL OF THE FLATPACK. AFTER CLEANING IMMEDIATELY BLOW AREA DRY.

(g) If the flatpack had been coated with epoxy, replace the coating as follows:

1. Obtain a 1-ounce bottle of Dennis 1169A liquid and a 2-ounce bottle of Dennis 1169B liquid (Collins part number 821-0166-00). Mix these two liquids together by pouring the contents of the small bottle into the larger bottle. Replace the lid and mix by shaking. Small amounts of coating material may be used by measuring equal portions of 1169A and 1169B into a paper cup. Use a separate measuring spoon for each item. Mix thoroughly with a stirring stick.

2. Use an expendable brush to coat the replaced flatpack and surrounding area from which the original coating was removed.

3. Allow to dry overnight, or place assembly in an oven and bake 1 hour at 60 °C.

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Illuminated magnifying glass	Various, 3-10X magnification.	Magnify working area to make repair.
20-watt soldering iron	Hexacon Model 25S or equivalent.	Remove/replace flatpacks.
Special soldering iron tip	Fabricate per figure 1004.	Remove/replace flatpacks.
Flatpack removal tool	Fabricate per figure 1005.	Remove flatpacks.

Repair Tools and Supplies (Sheet 1 of 3)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Tweezers, metal	Clauss No. 231, Fremont, Ohio, or equivalent. Maximum jaw width is 0.030 inch.	Maneuver flatpack leads and provide heat sink.
Solder, 0.020-inch diameter, 60/40 energized rosin core	Cen-Tri-Core energized rosin core per QQ-S-51d.	Bond components to circuit board.
or	or	
Solder, 0.015-inch diameter, 63137 energized rosin core	Kester 44 Sn 63 0.015 solder or equivalent.	
1544 rosin	Kester 1544. CAUTION: REPLACE WITH FRESH ROSIN IF PARTIALLY CRYSTALLIZED.	Facilitate soldering to circuit boards.
Pipe cleaners	Various.	Apply and remove rosin flux.
Cleaning solvent	Trichloroethylene or equivalent.	Remove excess rosin flux.
Lintless tissue	Kimberly-Clark Corporation, Kimwipes or equivalent.	Remove excess rosin flux.
Shielding braid	Various; fine mesh of silver-plated braid works best.	Remove old solder from connecting pads on circuit board.
#26 stranded wire	Various; silver-plated wire works best.	Remove old solder from holes in circuit board.
Small brush	Various, but should have fairly stiff bristles.	Remove excess rosin flux and general cleaning.
Post coating	Dennis 1169, Collins part number 821-0166-00.	Replacement of epoxy coating on coated boards after repair.

Repair Tools and Supplies (Sheet 2 of 3)
Figure 401

DESCRIPTION	MANUFACTURER AND TYPE	FUNCTION
Small expendable brushes	Various.	Same as above.
60 ±5 °C oven	Various.	Heat-cure of epoxy coating on coated boards after repair (optional).
Bakelite probe	6-inch length of bakelite rod with 1/8-inch diameter. Sharpen to point on one end, and grind to screwdriver shape on the other end.	Aid for removing epoxy coating from circuit board.
Knife with curved blade	Various, such as X-acto handle with #22 curved blade of X-acto Company, 48-41 Van Dam Street, Long Island, New York 11101, or a small pen knife.	Aid for removing epoxy coating from circuit board.
Toenail cutters or side cutters	Various. The toenail cutters is preferred because there is less danger of forming a burr on the lead with it. (Refer to caution following step G.(1)(b).)	Remove defective components from circuit board.

Repair Tools and Supplies (Sheet 3 of 3)
Figure 401

H. Relays.

CAUTION: DO NOT BURNISH RELAY CONTACTS EXCEPT THOSE THAT ARE LISTED BELOW. RELAY CONTACT PERFORMANCE IN LOW SIGNAL LEVEL CIRCUITS MAY BE DEGRADED IF CONTACTS ARE BURNISHED.

If inspection reveals extensive pitting or burning of relay contacts and relay appears to be defective or is in danger of becoming defective, replace relay. Make sketch of wire connections to simplify rewiring. Burnishing of relay contacts with a burnishing tool is recommended only for the following relays:

Main chassis: Relay K1 (Collins part number 972-1544-000)
618T-1 high-voltage power supply module: all relays
618T-2 high-voltage power supply module: all relays
618T-3 high-voltage power supply module: all open frame relays

I. Resistors.

Replace defective resistors with components known to be good, and carefully resolder bad connections.

J. Semiconductors.

Use long-nosed pliers as a heat sink while applying heat to a lead of a semiconductor.

K. Soldered Terminal Connections.

Resolder cold-soldered or resin joints. Remove all traces of corrosion.

L. Switches.

Switches are usually replaced and seldom repaired. Wafers in wafer-type switches may be replaced separately and so may defective pins in the crimped-pin type of connector. Leads should be properly identified to simplify rewiring.

M. Transformers and Reactors.

Replace or resolder as required.

N. Variable Resistors.

Add a drop or two of contact cleaner (carbon tetrachloride) to windings of a resistor with rough operation. Clean corroded terminals. Replace resistor if shaft is loose in case.

O. Wiring.

Replace damaged wiring with wire of the same size and color code. Ensure that no bare wires are touching chassis, other bare wires, or metal cases of other parts.

If a wire is to be removed from a terminal or component, it should be marked with an indication tag to prevent incorrect connections.

NOTE: When necessary to disturb the dress of the wires, carefully ensure that the original wire dress is maintained when replacing wires.

618T-( ) Airborne SSB Transceiver - Assembly

1. GENERAL.

This section presents assembly instructions and mechanical alignment procedures for the 618T-( ) Airborne SSB Transceiver. The order of assembly starts with the individual components and proceeds to the completed equipment. Fits, clearances, tolerances, and torques are contained in this section. The required lubrication and sealing procedures are also listed in this section.

2. PRECAUTIONS AND GENERAL TECHNIQUES.

Before soldering any part, refer to the notes of color coding, placement of leads, and wire insulation made during disassembly.

CAUTION: WHEN REPLACING A SOLID-STATE DEVICE, USE A HEAT SINK ON THE LEADS TO PREVENT DAMAGE TO THE SEMICONDUCTOR.

3. LUBRICATION DATA.

Figure 501 lists all items that can be lubricated and specifies the type of lubricant to be used. The lubricants listed for each item in figure 501 must be used; substitutions are not recommended.

A. Contamination and Compatibility.

The following is an example of problems that may be encountered when using lubricants that are not compatible.

Major contamination problems that arise between Versilube and conventional lubricants or hydraulic fluids are a result of some additives used in these fluids (oxidation inhibitors, corrosion inhibitors, etc.). Many of these additives are not soluble in Versilube and will precipitate as gummy or crystalline sludges when the fluids are mixed. When inadequate cleaning procedures lead to this type of contamination, high torques, sticking mechanisms, lubrication failure, and ultimate failure of the equipment can result.

CAUTION: THE IMPORTANCE OF MAINTAINING THE CORRECT LUBRICANT CANNOT BE OVEREMPHASIZED. SINCE FAILURE CAN RESULT FROM IMPROPER USE OF LUBRICANTS, IT IS IMPERATIVE THAT THE CORRECT LUBRICANTS BE USED IN THE RIGHT PLACE AND IN THE RIGHT AMOUNT.

B. Bearings.

It is recommended that porous bronze bearings be replaced if faulty or dry.

CAUTION: DO NOT LUBRICATE ANY BEARING. IF A PRESS-FIT BRONZE BEARING IS REMOVED, IT MUST BE REPLACED WITH A NEW BEARING.

NAME	SUPPLIER	COLLINS PART NUMBER	USE
MIL-G-3278 Beacon 325	Standard Oil Company of New Jersey	005-0423-00	Protective coating and lubricant for gear teeth and switch detents.
MIL-L-7870	Panef Manufacturing Company, Milwaukee, Wisconsin	005-0116-00	Protective coating and lubricant for gear teeth and switch detents.
Filterkote "M"	Air-Maze Corporation Cleveland, Ohio	005-0609-00	Water soluble oil for use on air filters that must be cleaned in water.
MIL-I-8660	Dow Corning Corporation, Midland, Michigan	005-0201-00	Insulating and sealing.
Blue Glyptal	General Electric Company, Waterbury, New York	005-0133-00	Secure hardware where other locking means are not provided.
Lubricant	The lubricant is composed of 37-1/2 parts butyl alcohol (by weight); 37-1/2 parts xylene (by weight); 25 parts grease per Mil-G-23827, Aeroshell 7, Collins part number 005-0810-00, (by weight).	005-1796-010	Lubrication of printed circuit contact ring surface on sides of turret switch compartments.

Lubricants and Sealants
Figure 501

4. DETAILED ASSEMBLY PROCEDURES.

A. Replacement of Crystal in RF Oscillator A2 (Early Model). (Refer to figure 111.)

(1) Position crystal (5) as shown.

(2) Solder blue crystal lead (8) to A2C1 (9). Make connection quickly to avoid overheating the crystal.

(3) Solder green crystal lead (7) to circuit board (2). Make connection quickly to avoid overheating the crystal.

(4) Repack grease (6), Collins part number 005-0201-00, around the base of the crystal.

(5) Place oven (3) over the crystal and A2C1.

(6) Replace two screws (4) on opposite sides of the oven.

(7) Replace two screws (1) that fasten the oven to the circuit board.

(8) Replace the oven and the crystal oscillator assembly in foam.

(9) Replace the wires extending from bottom of foam, and replace the foam plug at bottom.

(10) Replace the wires extending from the top of the foam, and replace foam plug at top.

(11) Replace the foam in the module chassis.

(12) Replace the two holddown screws.

(13) Replace the cover plate.

(14) Replace the dust cover.

(15) Replace the module in the 618T-( ) chassis.

B. Assembly of Power Amplifier A11. (Refer to figure 110.)

(1) Replace the gearplate by sliding the band-switch shaft through the switch. Be sure that the lower strap is inserted under the securing screw washers when the gearplate is pushed into place. Resolder resistors A11R42 and A11R43 before the gearplate is completely seated.

NOTE: If the shaft is not chamfered on end, chamfer slightly before replacing.

(2) Replace nine screws (S) on the gearplate.

(3) Tighten the screw securing the lower strap to the roller coil assembly.

(4) Replace the screw and washer holding the large silver-plated coil to the roller coil assembly. Use the hole nearest the gearplate.

(5) Replace the two nylon screws and washers holding the roller coil assembly to the bracket near the tubes. Damage will result if the screws are secured too tightly.

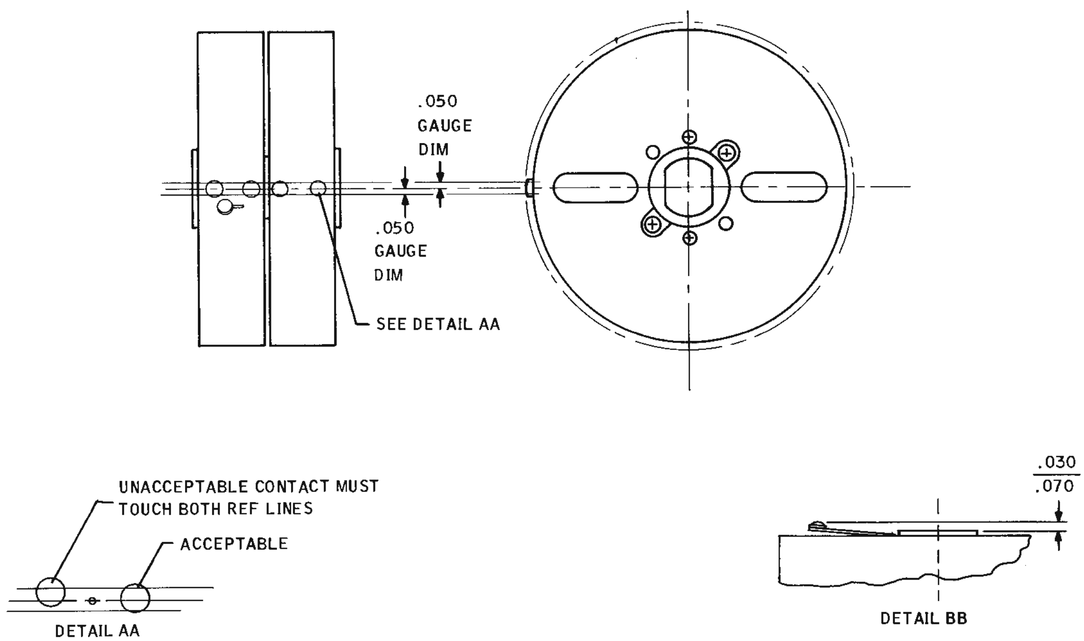
CAUTION: BEND THE SCREEN BYPASS CAPACITOR DOWN TO COVER THE SCREWS JUST REPLACED. IF THE CAPACITOR IS NOT POSITIONED CORRECTLY, THE PLATE STRAP WILL ARC TO THE CAPACITOR.

(6) Replace the square plate on the rear of the module using eight screws.

(7) Replace the top cover plate by laying it in position, pushing it toward the rear of the module, and tightening 17 screws.

C. Replacement of Turrets in RF Translator A12. (Refer to figure 101.)

NOTE: Apply a thin film of lubricant (figure 501) to the contact ring surface of printed circuit on sides of turret switch compartments. Refer to figure 501A for contact positioning dimensions.



INTERCHANGABILITY CHECK:
WITH TURRET LOCATED ON SIMULATED SHAFT AND WITH TURRET SETSCREW TIGHTENED, CONTACTS NEXT TO REFERENCE HOLE (& COLOR CODING) MUST ALIGN WITH CENTERLINE WITHIN LIMITS.

TYP 4 PLACES POSITIONING OF CONTACT SPRING IN RELATION TO HUB.

NOTE:
DIMENSIONS ARE FOR REFERENCE ONLY.

TP2-8894-014

Contact Positioning Diagram
Figure 501A

(1) Insert the turrets from the bottom of the module so that all color-coded dots on the turrets are in a line at the top of the module.

NOTE: Each turret is marked with two color-code dots: one white and one a standard color-code color. The white dot is always nearest the gearplate. Turrets are color coded so that turret S1 is nearest the gearplate. Therefore, color-code dots should be (from the gearplate): white, brown, white, red, white, orange, etc. When inserting the turret, orient it so that the spring contacts which project from the faces of the turret will not fall into the shaft holes when the turret is being positioned.

(2) When all seven turrets are in place, replace the turret shaft through the gear that turns the shaft. Before tightening the shaft clamp, refer to paragraph 6.B in this section for the turret alignment procedure.

(3) Replace two aligning rods (13) by inserting through the gearplate. Secure the rods with two screws through the rear plate. Refer to note in paragraph 3.G.(5) of disassembly section concerning rf translator modules with turret setscrews.

D. Assembly of Autopositioner A12A1. (Refer to figure 107.)

(1) Replacement of Solenoid.

(a) Replace solenoid (124) on mounting plate (134) using two screws (125) and post (123). Be sure that the post holding the reversing switch lever is in the correct hole. Align solenoid (124) so that its shaft hole is lined up with shaft hole in mounting plate (134) before tightening screws.

(b) Solder the insulated jumper from solenoid relay terminal 6 to solenoid terminal 2. See figure 108(B).

(c) Replace retaining ring (120) on shaft (119).

(d) Replace armature (117) in solenoid (124) using two screws (118).

NOTE: Be sure these two screws (118) are the same as those removed during disassembly. If screws are lost, they must be replaced with screws having the same color code.

(e) Replace notched wheel (112) on shaft (119). Replace spring pin (113) through the hole in the notched wheel and shaft.

(f) Replace small fiber actuator (126) between armature (117) and the solenoid relay contacts. See figure 108(B) for proper placement of the actuator.

(g) Perform steps (a) through (c) of paragraph 4.D.(2).

(2) Solenoid Clutch Assembly. (Refer to figure 107.)

(a) Replace spur gear (111) and clutch disc (110).

CAUTION: DO NOT LUBRICATE OR CLEAN CLUTCH SURFACES ON 110, 111, OR 112. WIPE WITH DRY, CLEAN, LINTLESS CLOTH. DO NOT TOUCH CLUTCH SURFACES WITH FINGERS.

(b) Replace spring washer (109) with concave side against disc (110). Replace washer (108) and nut (107).

(c) Tighten nut (107) until 30 or 40 in-oz of torque is needed to slip spur gear (111). This torque can be measured with a Waters Torque Watch, Model 651C3, or equivalent. Attach the torque watch to the end of shaft (119). Hold gear (111) stationary and rotate the watch. Adjust nut (107) until the proper torque is indicated on the watch. Bend two tabs on washer (108) against flats on nut (107) when the clutch is torqued properly.

(d) Perform steps (a) through (j) of paragraph 4.D.(4).

(3) Replacement of Switch Wafers.

Because of problems encountered in replacing individual resistors on the switch wafers, the entire switch wafer assembly, which includes resistors on the wafer, should be replaced if one or more of the resistors is defective. Collins part numbers for all switch wafer assemblies are given in figure 502. Refer to figure 109 for identification of these wafers and connecting wiring between wafers.

SWITCH WAFER	COLLINS PART NUMBER
S1	269-2190-00
S2	269-2190-00
S3	546-6865-003
S4	546-6862-002
S5	546-6861-002
S6	546-6860-002

Autopositioner Switch Assemblies
Figure 502

(4) Replacement of 10- and 100-kHz Switches. (Refer to figure 107.)

(a) Position the switch wafers on shaft (116) so that they are oriented as shown in figure 108(D).

(b) Resolder any cable leads that were unsoldered during disassembly. Use figure 109(A) as a guide when replacing wires that connect the switch wafers.

(c) Replace all metal spacers (82, 95) between the switch wafers. Fasten the wafers together and to mounting plate (134) with two screws (78) and washers (79).

(d) Place the six solenoid leads that were unsoldered earlier through the hole in the mounting plate (134). Resolder these six wires to solenoid (124) and solenoid switch block (133). See figure 108(B). Retie these wires.

(e) Replace reversing switch (64) using two screws (65). Be sure the switch leaf is in the slot in reversing switch panel (101).

(f) Replace cable clamp (66) using screw (67) and washer (68).

(g) Place the switch assembly in Autopositioner chassis. Be sure to place all the shim washers (if any) that were removed earlier over the shaft before inserting the shaft through the gearplate. Be sure spur gear (111) meshes with gear (159).

(h) Replace cable clamp (25) using screw (26).

(i) Replace resistor (18) on front plate (30) using screw (19) and washers (20, 21, 22). Position the resistor terminals so that they are parallel to the long sides of the front plate.

(j) Perform steps (a) through (j) of paragraph 4.D.(5).

(5) Replacement of 1-kHz Switches. (Refer to figure 107.)

(a) Resolder any cable wires or wires connecting wafers (37/52, 53/56) that were removed during disassembly. Use figure 109(B) as a guide.

(b) Replace all ceramic spacers (41) and fiber washers (39) between the switch wafers. Fasten the wafers together and fasten them to the bearing plate (165) with two screws (38).

(c) Rotate gear (9 or 5) by hand to position control cam (34) for minimum tension on spring (139).

(d) Place bearing plate (165) in position at the ends of the mounting posts (141). When sliding camshaft (36) through 1-kHz switch sections, be sure both sections are aligned as shown in figure 108(C). Tighten the bearing plate using four screws (142).

(e) Replace dc motor (153) and motor mount (154) on the bearing plate using two screws (155) and two washers (156).

(f) Replace relay (150) on the bearing plate using two nuts (151) and two lock-washers (152).

(g) Replace two cable clamps (157) using two screws (158).

(h) Replace vfo shaft coupling (59) on shaft (119) by tightening two setscrews (58).

(i) Replace output shaft spur gear (15) using setscrew (14) in gear clamp (13). Be sure this gear has maximum face width engagement with gear (11).

(j) Replace spring (139) by hooking onto bar (140).

(k) Refer to paragraph 6.A. for Autopositioner testing procedure before replacing A12A1 in the rf translator A12 chassis.

(6) Replacement of Reversing Switch. (Refer to figure 107.)

(a) Resolder the six wires connected to switch (64). Refer to figure 108(A).

NOTE: Be sure switch leads are positioned so that there is clearance for the switch assembly to rotate.

(b) Replace the switch in bracket (134). The brass-plate side should be against the bracket. Be sure the switch leaf is in the slot in reversing switch lever (101).

NOTE: On some units, a spring clip is mounted with a finger between the reversing switch and the bracket.

(c) Replace two screws (65) through the switch. When the spring clip is used, Tighten clamp (9) so that the switch leaf is the same distance from the center of the hole in the bracket in both positions.

(d) Replace cable clamp (66) using screw (67) and washer (68).

(e) Replace cable clamp bracket (27) using screw (28).

(f) Replace spring (138) by hooking bar (139) in slots on mounting posts (140). Hook the free end of the spring in place first.

NOTE: Check again to see that the switch leads are positioned so that there is clearance for the switch assembly to rotate.

E. Replacement of Autopositioner and VFO in RF Translator A12. (Refer to figures 101, 102, and 103.)

NOTE: Be sure that the Autopositioner is positioned to 500 kHz before installing it in the rf translator module.

(1) Carefully maneuver the Autopositioner into place under the gearplate. Place 25-pin connector (8) through the 28-position switch to its position at the bottom of the module. Be careful not to damage the switch wafers when placing the connector through the switch.

(2) Replace four screws (11) holding the Autopositioner to the gearplate. Leave the screws one-half of a turn loose.

(3) Position the two slug racks (12) at equal height above the chassis.

CAUTION: MAKE CERTAIN THAT THE TWO SLUG RACKS ARE EQUAL IN HEIGHT ABOVE THE CHASSIS. THE SLUG RACK HAS NO STOPS. THEREFORE, IF THE RACKS ARE NOT POSITIONED CORRECTLY AT 500 kHz, THE AUTOPOSITIONER COULD RUN BACK BEYOND ITS DESIGN RANGE, STRETCHING AND RUINING THE TAPES.

With the slug racks in this position, position the clamp on the slug rack so that it is facing the top of the module.

(4) Align the mark on gear G8 (made in step 3.C.(13) of the Disassembly section) with the mark on the rf translator chassis. Replace idler gear (G9).

(5) Position the Autopositioner in the oversize mounting holes to remove as much backlash as possible in the idler gear drive. Tighten four Autopositioner mounting screws (11).

(6) Fasten 25-pin connector (8) to the bottom of the rf translator chassis with two screws (10).

(7) Replace 3/8-inch flatted shaft (7) above the 25-pin connector by placing it through the gear that turns the shaft.

(8) Tighten clamp (9) that holds the shaft.

(9) Position the vfo shaft midway between the end stops by positioning the stop mechanism as shown in figure 106.

(10) Place the vfo in position under the Autopositioner. Run the vfo leads (6) through the holes in the rf translator chassis, and solder the leads to connectors P6 and P9-31 and internal connections in the module.

(11) Replace four screws (1) fastening the vfo to the Autopositioner.

(12) Replace four tubes (5) adjacent to the vfo and the Autopositioner.

(13) Rotate rear brackets (3) on the vfo so that they can be fastened to the rear plate.

(14) Replace four screws (2) fastening the vfo brackets to the rear plate and the rf translator chassis.

(15) Tighten the setscrews in the coupler on the Autopositioner output shaft. Refer to figure 730 for slug rack alignment and for vfo alignment. Refer to figure 101 for coupler adjustment.

F. Replacement of Modules and Module Covers. (Refer to figure 504.)

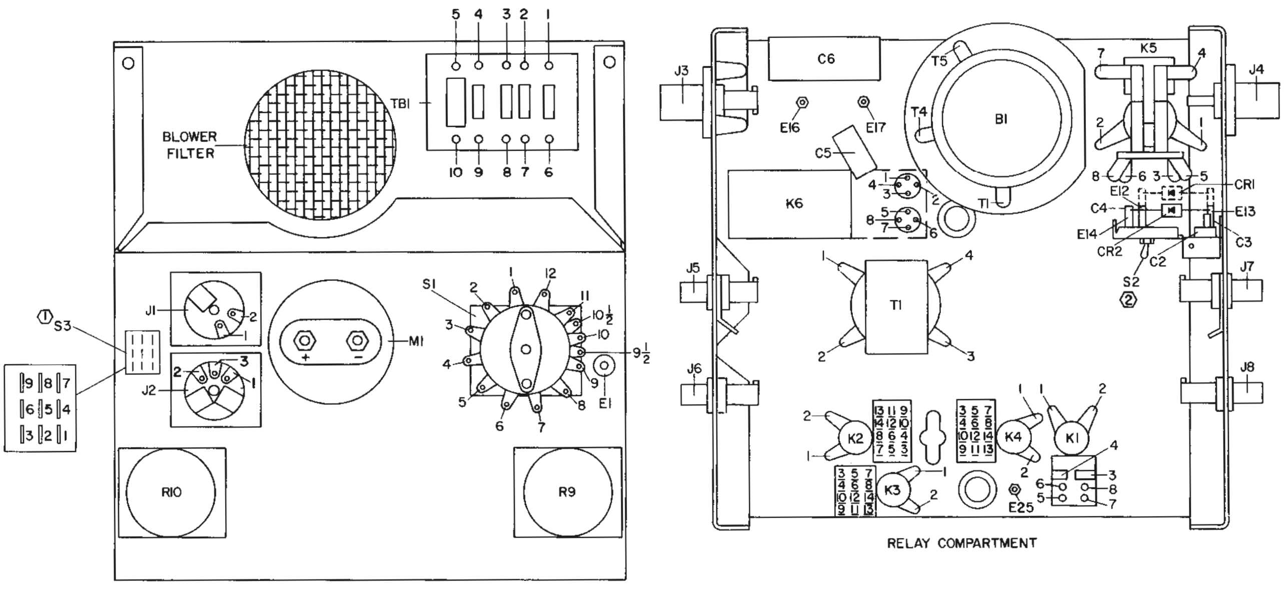
(1) Replace the modules on the chassis by carefully engaging the aligning pins and connectors on the bottom of the module and tightening the redheaded captive holddown screws.

CAUTION: BE CERTAIN THAT ALL CONNECTORS ARE SEATED PROPERLY BEFORE TIGHTENING THE HOLDDOWN SCREWS. CONNECTORS MAY BE DAMAGED IF CONNECTORS ARE NOT MATED PROPERLY. BE CERTAIN THAT GASKETS ON J25, J26, AND J29 ARE IN PLACE BEFORE THE MODULES ARE FASTENED ON THE CHASSIS.

(2) Replace the module covers by placing them over the modules and pushing them toward the chassis. The covers are held in place without screws.

G. Replacement of Front Panel, Front Panel Cover, and Side Covers of 618T-( ).

NOTE: Be sure that ANT JUMPER switch S2 is in the proper position before replacing the 618T-( ) front panel. Refer to the silk screening on the antenna transfer relay compartment cover for positions of S2 (figure 503). If the



NOTES:
① S3 IS LOCATED UNDER FRONT PANEL ON ALL 618T-1B/2B/3B UNITS AND ON 618T-1/2/3 CHASSIS WITH MCN 21332 AND ABOVE.
② ANT. JUMPER SWITCH S2 IS INCORPORATED ON ALL 618T-( ) CHASSIS WITH MCN 3025 AND ABOVE.

618T-( ) Airborne SSB Transceiver, Front Panel (Rear View) and Relay Compartment
Figure 503

same antenna is used for both transmit and receive, set S2 to IN (chassis with MCN 3025 and above). For chassis with MCN 3024 and below, connect a jumper wire between K5-5 and K5-8. If separate antennas are used for transmit and receive, set S2 to OUT (chassis with MCN 3025 and above) or omit jumper wire between K5-5 and K5-8 on units with MCN 3024 or below.

(1) Replace the front panel by tightening the four screws located at each corner of the panel.

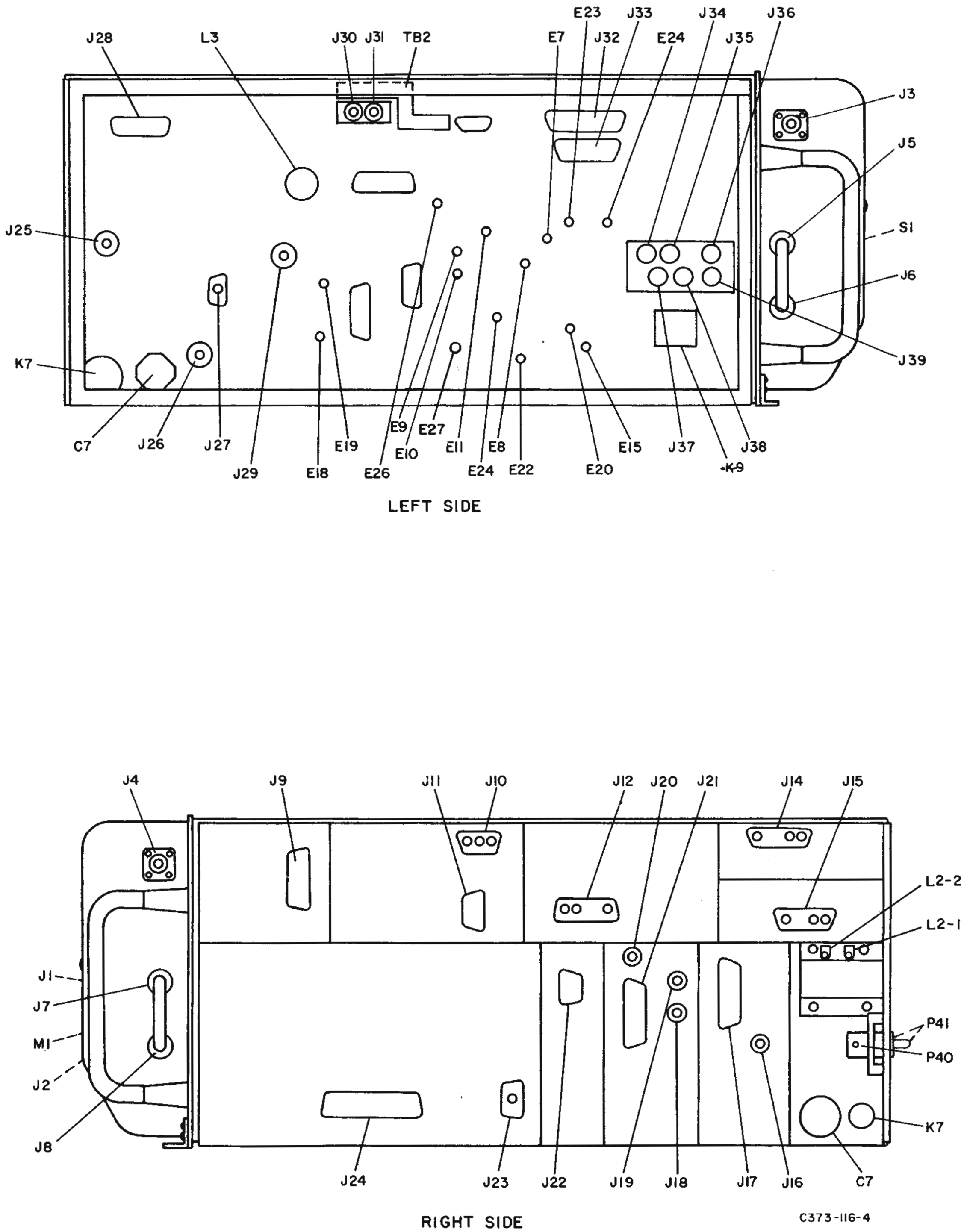
(2) Replace the front panel cover by placing the cover over the front panel and turning two Dzus fasteners on the cover.

(3) Replace the side covers by placing the covers in the slots at the front of the chassis and tightening the four screws at the rear of the chassis.

5. VISUAL CHECKS.

After replacing all the modules in the chassis, check that each module is secure and seated properly. Inspect each module for loose parts, broken wires and hardware, and loose plugs and connectors.

NOTE: Check cable wires from A12P9 and A12A1P1 for contact with moving parts of band-switch shaft. If contact is made, use sufficient lacing cord to locate wires so they do not touch band-switch shaft.



618T-( ) Airborne SSB Transceiver, Left and Right Side Views (Modules Removed)
Figure 504

6. ALIGNMENT AND ADJUSTMENT PROCEDURES.

A. Autopositioner A12A1 Alignment and Check.

The following procedure is to be performed with Autopositioner A12A1 fastened to the rf translator module extender that is supplied with the 678Y-( ) Maintenance Kit. Use the special attachment in this kit to fasten the Autopositioner to the extender. Set the 714E-( ) mode selector switch to OFF.

(1) Check to see that the actuating leaf of the reversing switch is visible in both operating positions through the hole in the switch mounting bracket.

(2) Refer to figure 108(b). Check that the gap between contacts 3 and 4 on solenoid relay (with pawl in notch) is at least 0.015 inch.

(3) Check that contacts 3 and 4 on the solenoid relay are closed when the pawl engages the notched wheel by at least 0.005 inch.

(4) Check that the gap between contacts 5 and 6 on the solenoid relay (with back of pawl against solenoid housing) is at least 0.015 inch.

(5) Rotate the 1-kHz cam by hand until the hole in the cam is adjacent to the cam follower. Set frequency to XX.000 MHz, any megahertz band. Momentarily switch the mode selector on the 714E-( ) to USB, then back to OFF. While doing this, observe the direction of rotation of the camshaft from the gearplate side. When viewed from this side, the shaft must rotate counterclockwise.

CAUTION: CAM WILL BE DAMAGED IF IT ROTATES CLOCKWISE.

(6) Push the actuating leaf of the reversing switch toward the cam. Momentarily switch the 714E-( ) mode selector to USB, then back to OFF. Clutch gear should rotate clockwise as viewed from the gearplate side. With the leaf in the opposite position, the clutch gear rotation should be in the opposite direction. If directions of rotation are improper, rewire the reversing switch as shown in figure 108(A).

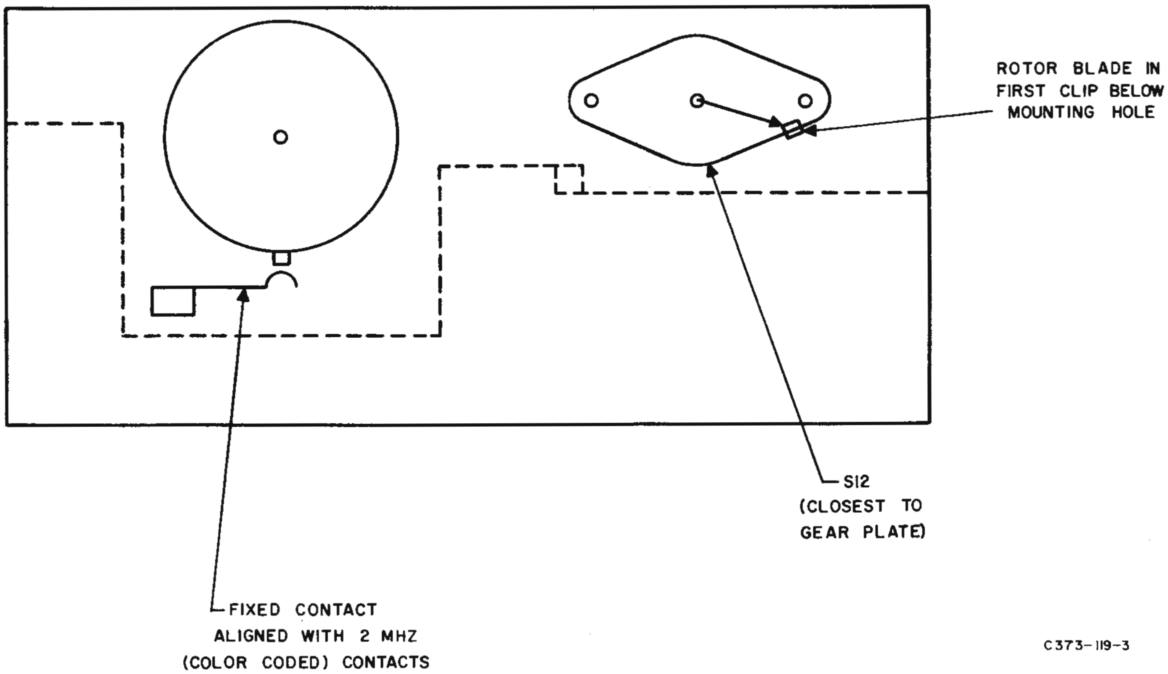
(7) Attach the calibrated disc and pointer supplied in the 678Y-( ) Maintenance Kit to the Autopositioner output shaft. Check that the disc rotates one position for each 1-kHz change in frequency, 10 positions for each 10-kHz change, and one revolution for each 100-kHz change.

B. RF Translator A12 Turret and Switch Alignment. (Refer to figure 505.)

(1) With the 714E-( ) positioned to 2.000 MHz, adjust the turret drive shaft so that the 2-MHz turret contacts (identified by color coding) are centered on the fixed contacts. Tighten the clamp screw.

NOTE: Refer to the note following paragraph 3.G.(5) of the disassembly procedures concerning the turret setscrews.

(2) Adjust the band-switch shaft until the clip is positioned as shown in figure 505. Tighten the clamp screw.



Turret and Switch Alignment, RF Translator A12
Figure 505

(3) Recycle the Autopositioner to 2.000 MHz, and recheck the turret contacts and band-switch clip positions. Readjust them if necessary.

(4) Early models of rf translator A12 have a 28-position switch in place of the turrets. To align this switch, remove the module covers, place the rf translator module on the module extender supplied with the 678Y-( ) Maintenance Kit, and apply power to the 618T-( ). Set the 714E-( ) to 22.000 MHz. View the band switch from the bottom of the module. (The switch will be on the right side when viewed from the bottom of the module.) Inspect the 5th switch wafer from the gearplate. The tooth on the rotor should be in the center of the 22-MHz clip, which is the 8th clip clockwise from the left-hand mounting hole on the switch wafer. This clip can be identified by the fact that the wiring to the first seven clips goes to the left, and the wiring to the 8th to 14th clip goes to the right side as viewed from the bottom of the module. If the tooth on the rotor is not centered in the clip, loosen the clamp on the gear mounted on the switch shaft, and rotate the shaft until the rotor tooth is centered in the switch clip. Reposition rf translator to 22.000 MHz, and again check to see that the rotor tooth is centered in the 22-MHz clip position. Repeat this procedure if necessary.

618T-( ) Airborne SSB Transceiver - Fits and Clearances

The fits and clearances for the 618T-( ) Airborne SSB Transceiver can be found in the assembly section of this manual.

618T-( ) Airborne SSB Transceiver - Testing

1. GENERAL.

This testing section is divided into three main divisions. These divisions, and a brief description of what each division contains, are listed below.

A. Operational Check.

The operational check is a functional, go/no-go check to be performed under normal operating conditions. Test equipment required to perform this test is listed in paragraph 3. If this check shows that the 618T-( ) is not operating properly, perform the unit performance checks and adjustments.

B. Unit Performance Checks and Adjustments.

The unit performance checks are detailed black-box checks performed at a test bench equipped with regular and special test equipment for the 618T-( ). These checks indicate whether or not the 618T-( ) meets the performance standards of the equipment specifications. If this check indicates that the 618T-( ) is not operating properly, refer to the module checks and adjustments to isolate trouble within the unit to a particular module or group of modules.

C. Module Checks and Adjustments.

The module checks and adjustments are detailed procedures for checking and adjusting each of the individual 618T-( ) modules. The adjustments in these procedures are not affected by module replacement. These checks will isolate the trouble within a module to a particular stage or group of stages.

2. TEST EQUIPMENT AND POWER REQUIREMENTS.

A. Test Equipment Required.

The test equipment required to perform the checks and adjustments in this section is listed in figure 1001.

B. Transistor Test Equipment.

Transistor damage from test equipment usually results when an incorrect value of voltage is applied to the transistor elements. Observe the following precautions regarding test equipment when testing transistor circuits.

(1) Observe polarity when using external power supplies. A diode, connected in series with the supply, will prevent reverse current flow.

(2) Do not cause transients by rapid power switching of external supply. Do not use external supply not equipped with transient protection.

(3) Make the ground connection first.

(4) Do not troubleshoot transistor circuits by bridging capacitors and resistors while power is applied. Do not use capacitor testers for capacitors in circuit unless the capacitor tester applied voltage is known to be safely below rated component voltages.

(5) Be certain external power supply has adequate regulation at the current values drawn by the transistor circuits.

(6) Use at least 20,000-ohm-per-volt meters or vacuum-tube voltmeters for making all measurements.

(7) Use test prods that are clean and sharp. It is good practice to cover all of the exposed prod, except about 1/8 inch on the end, with plastic tape or some other insulating material.

(8) Before using an ohmmeter to make transistor resistance measurements, check the ohmmeter on all scales by placing an external, low-resistance milliammeter in series with the ohmmeter leads. If the ohmmeter draws more than one milliampere on any range, do not use this range on circuits containing small transistors.

(9) When using an ohmmeter to make transistor resistance measurements, remember that these components are polarity conscious; therefore, be sure that the correct polarity is applied to the circuit by the ohmmeter.

C. Power Requirements.

Power requirements for the 618T-( ) are as follows:

(1) 618T-1/1B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 165 watts.

23.5 to 30.25 volts dc at 1150 watts.

(2) 618T-2/2B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 160 watts.

103.5 to 126.5 volts ac, 3-phase, 380 to 420 Hz (with Y-connected, line-to-grounded neutral) at 1000 watts.

23.5 to 30.25 volts dc at 120 watts.

(3) 618T-3/3B:

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz at 100 watts.

23.5 to 30.25 volts dc at 1150 watts.

3. OPERATIONAL CHECK.

NOTE: If any of the following checks indicate that the 618T-( ) is not operating properly, perform the 618T-( ) unit performance check and adjustments.

A. Test Procedures.

The test procedures are presented in tabular form. Figure 701 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

CAUTION: DO NOT OPERATE THE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.

B. Test Equipment.

A 714E-( ) Radio Set Control, an Electro-Voice 250 Carbon Microphone, and high-impedance headphones are required to perform the operational check.

C. Equipment Setup.

Connect the 618T-( ) in its normal operating installation to perform the operational check procedure. Ensure that the 618T-( ) is grounded properly.

TEST/STEP	PROCEDURE	RESULTS	NOTES
1. RECEIVER CHECKS			
A. Power Supply Checks	Set 714E-( ) mode selector switch to AM.	618T-( ) blower should operate. CAUTION: IF BLOWER DOES NOT OPERATE, IMMEDIATELY SET 714E-( ) MODE SELECTOR SWITCH TO OFF.	
	With 618T-( ) unkeyed, set front panel meter switch to 28V, then to 130V.	618T-( ) front panel meter should indicate in red area at both settings.	
B. Frequency Check Using WWV Voice Transmission	Set 618T-( ) operating frequency to an operating frequency of WWV. Adjust 714E-( ) RF SENS/SQL control to a comfortable listening level.		WWV transmits on 2.500, 5.000, 10.000, 15.000, 20.000, and 25.000 MHz.
	At a time when WWV is making a voice transmission, switch the 714E-( ) between USB and LSB.	Voice quality should be equally good in both USB and LSB.	
C. (Deleted)			
D. Squelch Check (If applicable)			
(1) Squelch Adjustment	Set 714E-( ) to AM, USB, or LSB and to a frequency that is clear of transmission.		
	Set squelch (SQL) control on 714E-( ) fully clockwise.	Squelch should be overridden, and background noise should be heard.	
	Using either speaker or headphones, adjust (SQL) control on 714E-( ) counterclockwise until carrier noise ceases.	Background noise should not be heard.	Do not turn the SQL control further counterclockwise than necessary to block the carrier noise, or blocking of low-level audio signals may result.

Operational Check (Sheet 1 of 3)
Figure 701

TEST/STEP	PROCEDURE	RESULTS	NOTES
(2) Listening Check	Set 714E-( ) to am, usb, or lsb to a frequency on which various transmissions can be received.		Audio output should be obtained in speaker or headphones during voice transmissions. One to five seconds after voice transmissions cease, squelch should operate and remove audio output and background noise.
2. <u>TRANSMITTER CHECKS</u>			
A. <u>Power Supply Checks</u>	Set 618T-( ) operating frequency to one on which transmissions may be made. <u>NOTE:</u> 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Set front panel meter switch, in turn, to 1500V, 130V, and 28V. Unkey 618T-( ).	<u>CAUTION:</u> 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY IMMEDIATELY. Front panel meter should indicate in red area in each position.	
B. <u>Power Amplifier Plate Current Check</u>	Set 618T-( ) front panel meter switch to PA MA. Disconnect coaxial jumper from 500KC STD connector on right front of 618T-( ). Key 618T-( ). Unkey 618T-( ). Reconnect coaxial jumper to 500KC STD connector.	618T-( ) front panel meter should indicate 280 to 300 ma.	Panel meter scale is read X100 with meter switch to PA MA position.

Operational Check
Figure 701 (Sheet 2)

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. Transmission Checks	Make test transmissions in USB, LSB, and AM modes.	Sidetone should be present in all modes and be of good quality. Front panel meter should indicate approximately 500 ma on voice peaks.	
	If possible, establish 2-way communications with another station.	Obtain signal quality reports from other station, and note quality of received signal.	
3. DISCONNECT	Unkey 618T-( ), and set 714E-( ) to OFF.		

Operational Check (Sheet 3 of 3)
Figure 701

4. UNIT PERFORMANCE CHECKS AND ADJUSTMENTS.

A. Use of Test Procedures.

The test procedures are presented in tabular form. Figure 704 presents the test procedures in a 4-column format. Column 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULT) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any additional information that is needed for each individual test procedure.

B. Test Equipment Required.

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

C. Power Requirements.

Power requirements for the 618T-( ) are listed in paragraphs 2.C.(1), 2.C.(2), and 2.C.(3) in this section.

D. Unit Performance Test.

(1) Test Setup.

(a) Remove side dust covers from the 618T-( ), and ensure that all modules and holddown screws are secure.

(b) Place the 618T-( ) on mounting tray supplied in the 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set the 678P-( ) Test Harness controls as follows:

CONTROL	SETTING
KEY INTLK	BY PASS
AC	OFF
DC POWER	OFF
300 Ω AUDIO LOAD	IN
CW KEY	Center (off) position
KEY	Center (off) position
WATTS	FORWARD, 200

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding unit under test (618-1/1B, -2/2B, or -3/3B. Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).

CAUTION: THE 618T-2/2B, OFF, 618T-3/3B SELECTOR SWITCH ON THE 678P-( ) MUST BE PLACED PROPERLY. FAILURE TO DO SO MAY RESULT IN HIGH-VOLTAGE POWER SUPPLY DAMAGE AND/OR FAILURE OF THE 678P-( ) LINE FUSES. THE 618T-1/1B USES THE SINGLE-PHASE, HIGH-VOLTAGE POWER SUPPLY AND THE 516H-1 EXTERNAL POWER SUPPLY. THE 618T-2/2B USES THE 3-PHASE HIGH-VOLTAGE POWER SUPPLY ONLY. THE 618T-3/3B USES THE 27.5-VOLT DC HIGH-VOLTAGE POWER SUPPLY ONLY.

(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 678P-( ), 714E-1, 714E-2/3, 714E-6 selector switch to the applicable position.

NOTE: If testing a 618T-1B/2B/3B, set the 0.1 kHz digit on the 714E-( ) to 0.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

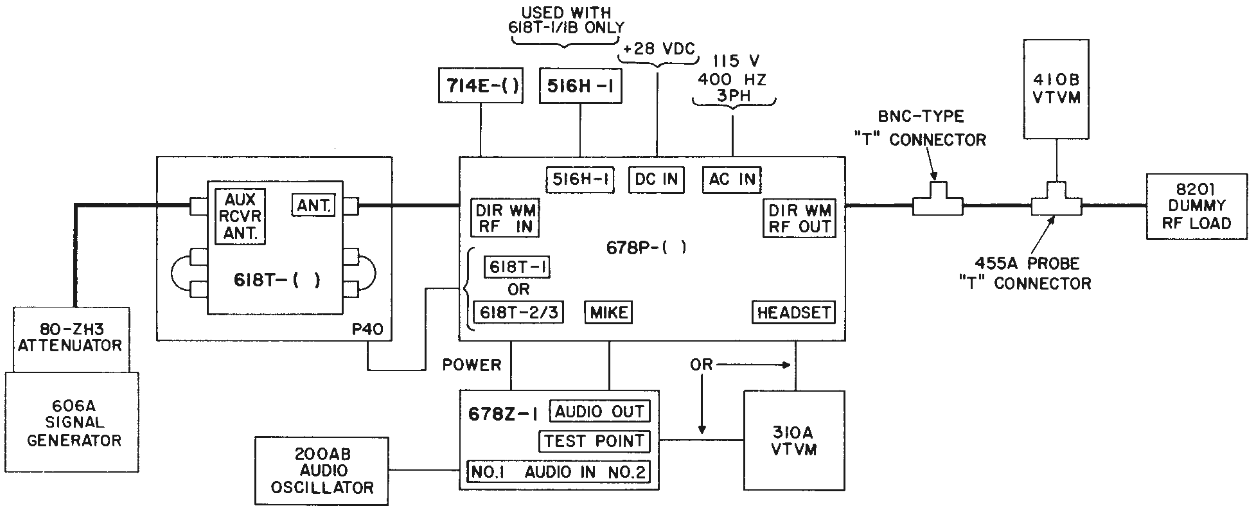
(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

(k) Perform test procedures as outlined in figure 704. Tests must be performed in the order given.

CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED; FILAMENT VOLTAGE-DIVIDER NETWORK WILL BE UNBALANCED, AND DAMAGE TO OTHER TUBES MAY RESULT.



NOTES:

(1) SET 678P-( ) CONTROLS AS FOLLOWS:
KEY INTLK ——— BY PASS
618T-2/2B,OFF,618T-3/3B ——— AS REQUIRED (SET TO OFF FOR 618T-1/1B)
WATTS ——— FORWARD, 200
300Ω AUDIO LOAD ——— IN
714E-1/714E-2/3/714E-6 ——— AS REQUIRED

(2) SET "ANT JUMPER" TOGGLE SWITCH IN 618T-( ) RELAY COMPARTMENT TO "OUT".

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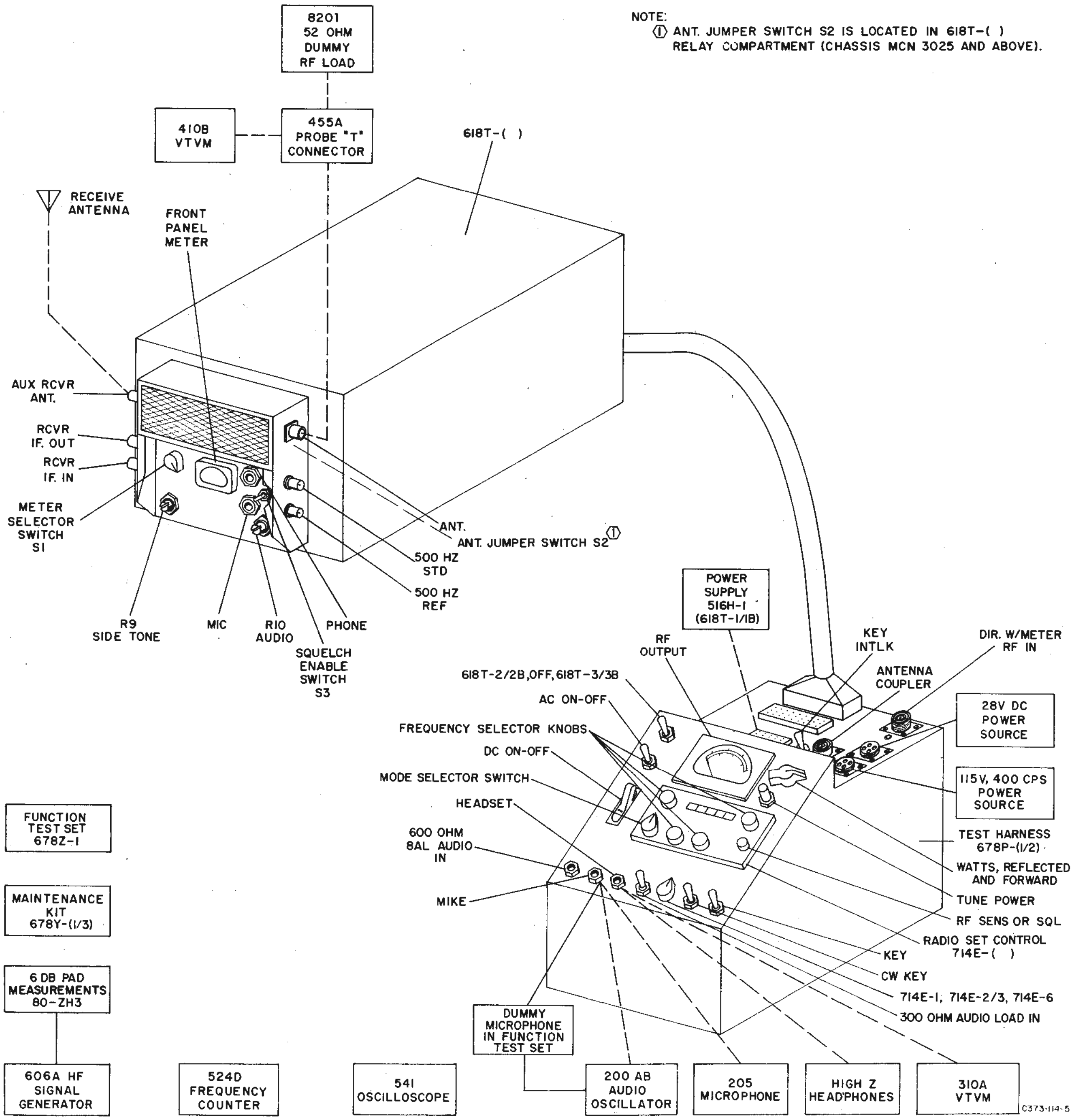
618T-( ) Test Setup Diagram Using a 678P-( ) Test Harness
Figure 702



Bench Test Setup
Figure 703

TEST/STEP	PROCEDURE	RESULTS	NOTES
1. PRELIMINARY CHECKS			
A. Power Supply and Power Amplifier Plate Current Check	Set 714E-( ) mode selector switch to AM.	618T-( ) blower should operate. CAUTION: IF BLOWER DOES NOT OPERATE IMMEDIATELY, SET 714E-( ) TO OFF.	
	With 618T-( ) unkeyed, set front panel meter switch to 28V and 130V.	618T-( ) front panel meter should indicate in red area of scale for both settings.	
	Set 618T-( ) front panel meter switch to PA MA, and disconnect coaxial jumper from 500KC STD connector on front panel of 618T-( ).	618T-( ) front panel meter should indicate 280 to 300 ma.	
	NOTE: 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).	CAUTION: 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY 618T-( ) IMMEDIATELY.	
	Use a nonmetallic tool, and depress switch A11S4 in power amplifier A11. Key 618T-( ). Note meter reading, and unkey 618T-( ) before releasing A11S4.	618T-( ) front panel meter should indicate 80 to 120 ma less than previous step.	
	Repeat for A11S5 instead of A11S4.	Same as for A11S4.	If indication is abnormal, replace tubes with matched pair, and recheck.
	Reconnect 500KC STD jumper. Set 618T-( ) front panel meter switch to 1500V, and key 618T-( ).	618T-( ) panel meter should indicate in red area of scale.	
	Unkey 618T-( ).		
B. +18-Volt Check			
(1) Preferred Method (Cont)	Connect Fluke 801 VTVM across A5J3 and ground in low-voltage power supply A5.	Vtvm should indicate +17.82 to +18.18 volts dc.	Adjust A5R15 to provide required results.

Unit Performance Test Procedures
Figure 704 (Sheet 1 of 17)

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. MHz Frequency Stabilizer Check	Connect HP 410B VTVM and oscilloscope between A10J1 and ground in MHz-frequency stabilizer A10.		
	Set 714E-( ) to each MHz band from 2.000 to 29.000 MHz.	Vtvm should indicate +6.0 to +7.6 Vdc at each band. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	Oscillator may need adjustment.
	Connect vtvm and oscilloscope from A10J3 to ground in MHz-frequency stabilizer A10.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	Oscillator may need adjustment.
	Note vtvm indication at 2, 3, 4, 5, and 6 MHz.		
D. VFO Tracking Check (618T-1/2/3 only.)	Connect frequency counter to the vfo output (A12J5 in rf translator A12).		Test probe no. 1 from the 678Y-( ) should be used.
	Connect A12J8 in rf translator A12 to ground.		This unlocks the vfo.
	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	If unit fails this test, perform the vfo check and alignment test step 9 of figure 730. If unit passes either of these tests, it is ok.
	(1) 2.999 MHz	(1) 2.499 to 2.503 MHz	
	(2) 2.888 MHz	(2) 2.610 to 2.614 MHz	
	(3) 2.777 MHz	(3) 2.721 to 2.725 MHz	
	(4) 2.666 MHz	(4) 2.832 to 2.836 MHz	
	(5) 2.555 MHz	(5) 2.943 to 2.947 MHz	
	(6) 2.444 MHz	(6) 3.054 to 3.058 MHz	
	(7) 2.333 MHz	(7) 3.165 to 3.169 MHz	
	(8) 2.222 MHz	(8) 3.276 to 3.280 MHz	
	(9) 2.111 MHz	(9) 3.387 to 3.391 MHz	
	(10) 2.000 MHz	(10) 3.498 to 3.502 MHz	
(Cont)	Remove the ground from A12J8 in rf translator A12.		

Unit Performance Test Procedures (Sheet 2 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	
	(1) 2.999 MHz	(1) 2.500998 to 2.501002 MHz	
	(2) 2.888 MHz	(2) 2.6119979 to 2.6120021 MHz	
	(3) 2.777 MHz	(3) 2.7229979 to 2.7230021 MHz	
	(4) 2.666 MHz	(4) 2.8339978 to 2.8340022 MHz	
	(5) 2.555 MHz	(5) 2.9449977 to 2.9450023 MHz	
	(6) 2.444 MHz	(6) 3.0559976 to 3.0560024 MHz	
	(7) 2.333 MHz	(7) 3.1669975 to 3.1670025 MHz	
	(8) 2.222 MHz	(8) 3.2779974 to 3.2780026 MHz	
	(9) 2.111 MHz	(9) 3.3889973 to 3.3890027 MHz	
	(10) 2.000 MHz	(10) 3.4999972 to 3.5000028 MHz	
E. VFO Capture Range Check (618T-1/2/3 only)	Connect frequency counter, through 678Y-( ) probe no. 1, to A12J5.		
	Set 714E-( ) to 2.999 MHz.	Frequency counter indication should be 2.501 MHz ±0.8 ppm. Record this reading for reference.	
	Connect 678Z-1 J2-FREQ DIV jack to A1J2.		
	Connect 678Z-1 GRND jack to 618T-( ) chassis.		
(Cont)	NOTE: If kHz-frequency stabilizer A4 is Collins part number 528-0112-005, connect 678Z-1 J3-KC STAB jack to A4J3, and place 678Z-1 FUNCTION SELECTOR switch in 70K-5 CAPTURE RANGE position. That position is also correct for vfo 70K-9. If kHz-frequency		

Unit Performance Test Procedures
Figure 704 (Sheet 3)

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (Cont)	stabilizer A4 is Collins part number 544-9288-005, connect 678Z-1 J1-KC STAB jack to A4J1, and place 678Z-1 FUNCTION SELECTOR switch in 70K-3 CAPTURE RANGE position.		
	Ground A12J8 to 618T-( ) chassis.		
	Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz higher than reference.		
	Without changing setting of 678Z-1 R3, unground A12J8.	Frequency indication should return to that of reference within 1 second.	
	Ground A12J8.		
	Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz lower than reference.		
	Without changing setting of 678Z-1 R3, unground A12J8.	Same as above.	
	Repeat above procedure with 714E-( ) set to 2.000 MHz. Reference indication should be 3.500 MHz ±0.8 ppm (all other steps and indications should be identical).		
	If test indication is incorrrect, temporarily remove connections to 678Z-1 and repeat step.		
	Disconnect 678Z-1.		
F. Digit Oscillator Check (618T-1/2/3 only)	Connect frequency counter to the digit oscillator output (A4J5 in kHz-frequency stabilizer A4) through probe no. 1 of the 678Y-( ) Maintenance Kit.		
	Set 714E-( ) to each of the following frequencies, and observe the counter:	Counter should indicate as follows for each setting:	
(Cont)	(1) 2.006 MHz	(1) 295.850 to 296.150 kHz	

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	(2) 2.000 MHz (3) 2.005 MHz	(2) 299.850 to 300.150 kHz (3) 304.850 to 305.150 kHz	
2. RECEIVER TESTS	During all receiver tests, the HP 606A Signal Generator is connected through a 6-dB attenuator (Measurements Corp. 80-ZH3) to 618T-( ) connector J3 (AUX RCVR ANT.). Remove 618T-( ) front dust cover. Set SIDETONE control R9 and AUDIO control R10 fully clockwise. Set 618T-( ) squelch enable switch S3 to SQL OUT.		
A. AM Gain and Sensitivity	Set the 714E-( ) frequency selector to 2.100 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise.		
	Connect Ballantine 310A VTVM to the 678P-( ) HEADSET jack.		
	Set the signal generator for 3-uv output at 2.100 MHz, modulated 30% at 1000 Hz.	Note the vtvm indication in db (reference).	
	Remove the modulation.	Vtvm indication should drop NLT 6 db from reference.	
	Repeat for each MHz band from 2.100 through 28.100 and 29.900 MHz. At each setting, remove modulation, and observe change in vtvm indication.	Same as above for each band.	Record results of this test for future use.
	Change signal generator output level from 3 uv to 5 uv with 714E-( ) and signal generator at 2.100 MHz.	Vtvm should indicate not less than 3.9 v (50 mw into 300-ohm load).	
	Repeat for all frequencies listed above.	Same as above for each band.	
	Change signal generator output level from 5 uv to 50 uv with the 714E-( ) and the signal generator set to 29.900 MHz.	Vtvm should indicate not less than 7.75 v (200 mw into 300-ohm load).	
	Change signal generator output from 50 to 1000 uv.	Vtvm indicates not less than 9.5 v (300 mw into 300-ohm load).	

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. SSB Gain and Sensitivity	Set 714E-( ) to 2.100 MHz, USB.		
	Set the signal generator to 2.100 MHz with no modulation. Set output level for 1 uv.		
	Adjust signal generator frequency slightly for maximum reading on ac vtvm.		
	Remove input signal by tuning signal generator 10 kHz off frequency.	Vtvm should indicate not less than a 10-db drop in signal.	
(Cont)	Readjust signal generator to frequency which produces maximum vtvm indication.		

Unit Performance Test Procedures (Sheet 4B of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. (Cont)	Adjust signal generator output level for 3 uv with no modulation.	Vtvm indicates not less than 3.9 v (50 mw into a 300-ohm load).	
	Set 714E-( ) mode selector switch to LSB.		
	Adjust signal generator output level for 1 uv with no modulation.		
	Adjust signal generator frequency for maximum reading on the ac vtvm.		
	Remove input signal by tuning signal generator 10 kHz off frequency.	Vtvm should indicate not less than 10-db drop in signal.	
	Readjust signal generator to frequency which produces maximum vtvm indication.		
	Adjust signal generator output level for 3 uv with no modulation.	Vtvm indicates not less than 3.9 v (50 mw into 300-ohm load).	
	Repeat step B at 8.400 and 29.900 MHz.	Same as above.	
C. AGC Characteristics	Set 714E-( ) to 7.300 MHz, AM.		
	Set signal generator to 7.300 MHz modulated 30% at 1000 Hz at an output level of 10 uv.	Record vtvm indication for reference.	
	Increase signal generator output to 100,000 uv.	Vtvm should indicate not more than a 6-db increase over reference.	
	Set 714E-( ) to 7.300 MHz, USB.		
	Set signal generator to 7.300 MHz unmodulated at a level of 10 uv.		
	Adjust frequency of signal generator for maximum indication on vtvm.	Record vtvm indication for reference.	
	Increase signal generator output level to 100,000 uv.	Vtvm should indicate not more than 6-db increase over reference.	

Unit Performance Test Procedures (Sheet 5 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. Selectivity	Set 714E-( ) to 2.100. AM.		
	Connect the frequency counter to the signal generator output through a T-connector.		
	Adjust signal generator for 2.100 MHz modulated 30% at 1000 Hz and output level for an ac vtvm indication of 6.0 v.		
	Increase signal generator output 60 db, then tune signal generator above 2.100 MHz until the ac vtvm indication drops back to 6.0 v.	Note and record the frequency.	
	Lower the signal generator frequency below 2.100 MHz until the vtvm again indicates 6.0 v.	Note and record the frequency.	
	Compute the difference between the two frequencies recorded.	Difference should be not more than 14 kHz for equipment with and without narrow-band selectivity.	
	Set 714E-( ) mode selector switch to USB.		
	Set signal generator to 2.100 MHz unmodulated with an output level of 1 uv.		
	Adjust signal generator frequency for maximum ac vtvm indication.		
	Adjust signal generator output level for an ac vtvm indication of 6.0 v.		
	Increase signal generator output 60 db, and tune signal generator on each side of bandpass until the 6-v reference audio output is repeated on each side.	At each 60-db point, note and record frequency of signal generator.	
	Compute difference between measured frequencies.	Difference should be no more than 6.3 kHz for equipment without narrow-band selectivity, and no more than 4.8 kHz for equipment with narrow-band selectivity.	
	Repeat with 714E-( ) mode selector switch set to LSB.	Same as USB results.	
E. Audio Distortion	Set 714E-( ) to 7.300 MHz, AM.		
	Set signal generator to 7.300 MHz 80% modulated at 1000 Hz and output level to 1000 uv.		
	Connect distortion analyzer to HEADSET jack on the 678P-( ), and measure the distortion.	Not more than 10%.	

Unit Performance Test Procedures
Figure 704 (Sheet 6)

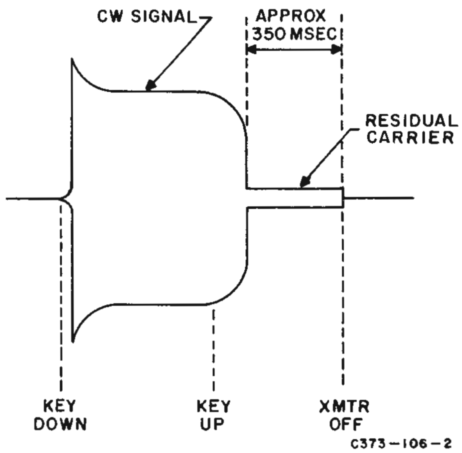
TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)			following procedures of step D.
	Connect HP 410B VTVM ohms probe to P40-9 and common probe to 618T-( ) chassis.		
	Key 618T-( ).	Vtvm should indicate 5 ohms or less.	
	Unkey 618T-( ).	Vtvm should indicate 1 megohm or greater.	
E. Recycle Line Output	CAUTION: DO NOT CONNECT AN ANTENNA COUPLER TO THE SYSTEM WHILE PERFORMING THIS CHECK. THE ANTENNA COUPLER INTRODUCES VOLTAGES WHICH MAY DAMAGE THE TEST EQUIPMENT USED FOR OHMMETER MEASUREMENTS.		
	Set 714E-( ) to AM, any frequency.		
	After transceiver tuneup, select another frequency with 714E-( ) and observe coupler retune light.	Coupler retune lamp lights during tune cycle.	If 678P-1 is not equipped with chopper ground and coupler retune lamps, do the following procedures of step E.
	Connect HP 410B VTVM ohms probe to P40-26 of 618T-( ).	Vtvm should indicate 1 megohm or greater.	
	Set frequency selector switches on 714E-( ) to a different frequency, and observe vtvm while Autopositioner is operating.	Vtvm should indicate 5 ohms or less.	
F. Tune Power Check	Set 714E-( ) to USB, any frequency.		
	Connect high-impedance headphones to 618T-( ) PHONE jack on 618T-( ) front panel.		
	Connect HP 410B VTVM ac probe to HP 455A Probe T-Connector.		
	Key 618T-( ).	Vtvm should indicate 25 V or less.	
(Cont)	Unkey 618T-( ).		

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	Press the TUNE POWER switch on the 678P-( ) test harness, and key 618T-( ). CAUTION: DO NOT HOLD THE TUNE POWER SWITCH DOWN OVER 15 S WHILE 618T-( ) IS KEYED.	Vtvm should indicate 55 v or greater, and an audible tune tone is heard on the headphones.	
G. Receive Audio Output Adjustment	Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Set 714E-( ) to 7.300 MHz, AM. Set RF SENS/SQL control fully clockwise. Set signal generator output to 7.300 MHz, 1000 uv, 30% modulated with 1 kHz. Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack. Adjust AUDIO control R10 on 618T-( ) front panel for 5.5 v on Ballantine 310A. Set 714E-( ) RF SENS/SQL control fully counterclockwise.	Vtvm indicates 0.05 v or less.	
H. Sidetone Output Level Adjustment	Connect 678Z-1 and audio oscillator as shown in figure 702. Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack. Key 618T-( ). Set audio oscillator to 2 kHz, and set output level for 0.25 vrms as measured at 678Z-1 TEST POINT jack. Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Adjust SIDETONE level control R9, on 618T-( ) front panel, for 5.5 vrms at 678P-( ) HEADSET jack. Unkey 618T-( ).		

Unit Performance Test Procedures (Sheet 12 of 13)
Figure 704

TEST/STEP	PROCEDURE	RESULTS	NOTES
I. SELCAL Output Voltage Check	Connect signal generator thru 6-dB attenuator to auxiliary receiver antenna.		
	Connect a 2200-ohm resistor load across pin 60 (SELCAL out) and pin 18 (chassis ground) of 618T-1 or 618T-2/3 connector located on horizontal top deck of 678P-( ).		
	NOTE: The 618T-1 and 618T-2/3 connectors are in parallel. When testing the 618T-1, connect load to unused 618T-2/3 connector; when testing 618T-2/3, connect load to unused 618T-1 connector.		
	Connect Ballantine 310A vtvm across 2200-ohm load.		
	Set signal generator to 7.3000 MHz, 50 μV, modulated 30% at 1000 Hz.		
	Check voltage at pin 60 of power connector.	Not less than 0.1 volt	
5. DISCONNECT	Turn power off.		
	Disconnect all test equipment from 618T-( ).		
	Reset ANT JUMPER switch S2 to original position: IN, if 618T-( ) is being used with same antenna for transmit and receive; OUT, if separate antennas are being used for transmit and receive.		
	Reinstall covers on 618T-( ).		

Unit Performance Test Procedures
Figure 704 (Sheet 13)



Envelope of CW Keying Output
From 618T-( )
Figure 705

5. MODULE CHECKS AND ADJUSTMENTS.

A. Use of Test Procedures.

The test procedures are presented in a 7-column, tabular form. Column 1 (STEP) indicates the step number. Column 2 (DESCRIPTION) describes the test to be performed. Column 3 (TEST EQUIPMENT) lists the test equipment needed to perform the test. Test equipment needed to perform entire module test is listed in step 1 initial test requirements, of each module test. Column 4 (TEST PROCEDURE) outlines test procedures to be performed. Column 5 (REQUIRED TEST RESULT) presents the desired results of the test procedure including tolerances required. Column 6 (PROBABLE CAUSE OF ABNORMAL RESULT) lists components and/or circuits that may be causing abnormal results in that particular test. Column 7 (REMEDY) indicates action necessary to correct abnormal results.

When any block under TEST PROCEDURE is blank, the control has been properly set in a previous step and should not be changed.

B. Test Equipment Required.

See figure 1001 for the list of test equipment required to perform the checks and adjustments in this section.

C. Power Requirements.

Power requirements for the 618T- ( ) are listed in paragraph 2.C.(1), 2.C.(2), and 2.C.(3).

D. Module Checks and Adjustments.

(1) Test Setup.

(a) Remove side dust covers from the 618T-( ), and check all modules and holddown screws for secureness.

(b) Place the 618T-( ) on mounting tray supplied in 678Y-( ) Maintenance Kit. This will allow exhaust air to flow freely under the unit during testing.

(c) Set 678P-( ) Test Harness controls as follows:

CONTROL	SETTING
KEY INTLK	BY PASS
AC	OFF
DC POWER	OFF
300 Ω AUDIO LOAD	IN
CW KEY	Center (off) position
KEY	Center (off) position
WATTS	FORWARD, 200

(d) Connect P40 (60-pin connector) at rear of 618T-( ) to 678P-( ) corresponding to unit under test (618T-1/1B,-2/2B, or -3/3B). Use pendant cable supplied with the 678P-( ). Set the 618T-2/2B, OFF, 618T-3/3B selector switch on the 678P-( ) to applicable position (OFF for 618T-1/1B).

CAUTION: THE 618T-2/2B, OFF, 618T-3/3B SELECTOR SWITCH ON ON THE 678P-( ) MUST BE PLACED PROPERLY. FAILURE TO DO SO MAY RESULT IN HIGH-VOLTAGE POWER SUPPLY DAMAGE AND/OR FAILURE OF THE 678P-( ) LINE FUSES. THE 618T-1/1B USES THE SINGLE-PHASE, HIGH-VOLTAGE POWER SUPPLY AND THE 516H-1 EXTERNAL POWER SUPPY. THE 618T-2/2B USES THE 3-PHASE HIGH-VOLTAGE POWER SUPPLY ONLY. THE 618-T-3/3B USES THE 27.5-VOLT DC HIGH-VOLTAGE POWER SUPPLY ONLY.

(e) When a 618T-1/1B is being checked, connect the 516H-1 Power Supply to the 516H-1 connector on the top of the 678P-( ) using the 516H-1 pendant cable supplied with the 678P-( ).

(f) Connect the 714E-( ) Radio Set Control to the 678P-( ). Set the 714E-1, 714E-2/3, 714E-6 mode selector switch to the applicable position.

NOTE: If testing a 618T-1B/2B/3B, set the 0.1-kHz digit on the 714E-( ) to zero.

(g) Connect the 115-volt, 400-Hz and the +27.5-volt dc power sources to the 678P-( ) AC IN and DC IN connectors respectively.

(h) Connect test equipment to 618T-( ) as shown in figure 702. (Use figure 703 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

(j) Set 678P-( ) AC and DC power switches to ON.

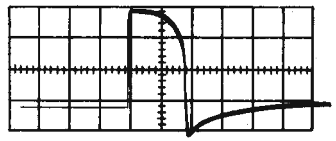
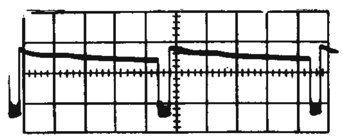
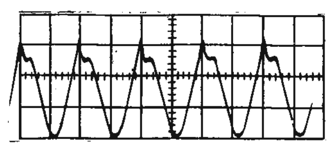
(2) Module Checks and Adjustments.

Perform test procedures as outlined in figures 706 through 742. When troubleshooting a module, be certain that all other modules and the chassis of the 618T-( ) are normal.

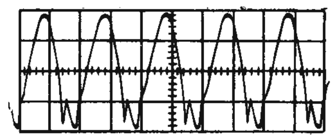
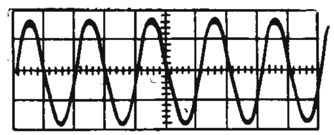
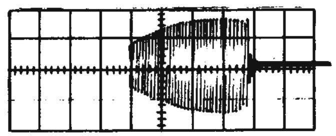
WARNING: 1500 VDC AND 115 VAC 400 Hz ARE PRESENT IN THE 618T-( ). DO NOT REMOVE OR INSERT MODULES WITH POWER APPLIED TO THE 618T-( ).

CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED. FILAMENT VOLTAGE DIVIDER NETWORK WILL BE UNBALANCED AND DAMAGE TO OTHER TUBES MAY RESULT.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Signal generator Oscilloscope HP-410B VTVM 6-db attenuator Rf dummy load	NOTE: This test procedure applies to the 618T-1/2/3 Airborne SSB Transceiver only. Refer to figures 707 and 715 for location of all test points on A1, A4, and module extender. Remove frequency divider A1 and kHz-frequency stabilizer A4 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust covers from A1 and A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect A1 and A4 through module extenders to 618T-( ) chassis. Be sure that coaxial jumpers are connected on A1 module extender. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A1A1J2. Check voltage at A1A1J2.	+15 to +18 Vdc.	Low-voltage power supply A5. A1L11 open.	Check low-voltage power supply A5. Check A1L11 and check for shorted components.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	10-kHz pulse output check		Set oscilloscope for 2 v/cm, dc, 1.0 us/cm. Connect oscilloscope vertical input to A1A1J1. Check waveform at A1A1J1.	 5 to 7 v peak to peak.	100-kHz output at A2J1. A1A1Q1 through A1A1Q6 and associated circuits.	Check 100-kHz output at A2J1. A1A1Q1 through A1A1Q6 and associated circuits.
4	Keyer output check		Set oscilloscope for 5 v/cm, dc, 200 us/cm. Connect oscilloscope vertical input to A1A3J3. Check waveform at A1A3J3.	 9 to 15 v peak to peak.	A1A2Q11, A1A3Q12, A1A3Q13, and associated circuits.	Check A1A2Q11, A1A3Q12, A1A3A13, and associated circuits.
5	50-kHz locked oscillator output		Set oscilloscope for 0.5 v/cm, 10 us/cm. Connect oscilloscope vertical input to A1A1TP1. Check waveform at A1A1TP1.	 1.4 to 2.0 v peak to peak.	A1A1Q1, A1A1Q2, and associated circuits.	Check A1A1Q1, A1A1Q2, and associated circuits.

Module Checks and Adjustments, Frequency Divider A1 (Sheet 2 of 7)
Figure 706

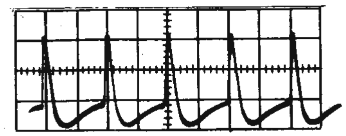
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	10-kHz locked oscillator output check		Set oscilloscope for 0.5 v/cm, 50 us/cm. Connect oscilloscope vertical input to A1A1TP2. Check waveform at A1A1TP2.	 1.5 to 2.5 v peak to peak.	A1A1Q3, A1A1Q4, and associated circuits.	Check A1A1Q3, A1A1Q4, and associated circuits.
7	5-kHz locked oscillator output check		Set oscilloscope for 1.0 v/cm, 100 us/cm. Connect oscilloscope vertical input to A1A1TP3. Check waveform at A1A1TP3.	 2.5 to 4.5 v peak to peak.	A1A1Q7, A1A1Q8, and associated circuits.	Check A1A1Q7, A1A1Q8, and associated circuits.
8	Keyed oscillator output check		Set oscilloscope for 2 v/cm, 25 us/cm. Connect oscilloscope vertical input to A1A3TP5. Check waveform at A1A3TP5.	 9 to 12 v peak to peak.	A1A3Q14 and associated circuits.	Check A1A3Q14 and associated circuits.
9 (Cont)	Divider bandwidth check		Disconnect coaxial jumper at A2 on A1 module extender (figure 707). Connect signal generator through 6-db attenuator and BNC T-connector to A2 (upper connector) on A1 module extender.			

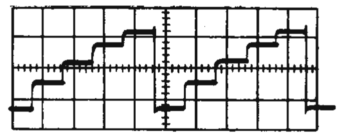
Module Checks and Adjustments, Frequency Divider A1 (Sheet 3 of 7)
Figure 706

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)			Connect oscilloscope horizontal input to BNC T-connector.			
			Set signal generator for 100-kHz 0.5-v output.			
			Connect oscilloscope vertical input to A1A1TP1.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	2-to-1 Lissajous pattern. NOTE: Pattern must be centered at 99 to 101 kHz and remain stable (not fuzzy) at least 4 kHz on either side of the center. Point at which pattern becomes fuzzy is edge of band.	A1A1L1 incorrectly adjusted.	Adjust A1A1L1 to provide required results. NOTE: Adjustment of A1A1L1 will center bandwidth.
					A1A1Q1, A1A1Q2, and associated circuits.	Check A1A1Q1, A1A1Q2, and associated circuits.
			Connect oscilloscope vertical input to A1A1TP2.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	10-to-1 Lissajous pattern. See note above.	A1A1L2 incorrectly adjusted.	Adjust A1A1L2 to provide required results. NOTE: Adjustments of A1A1L2 will center bandwidth.
(Cont)						

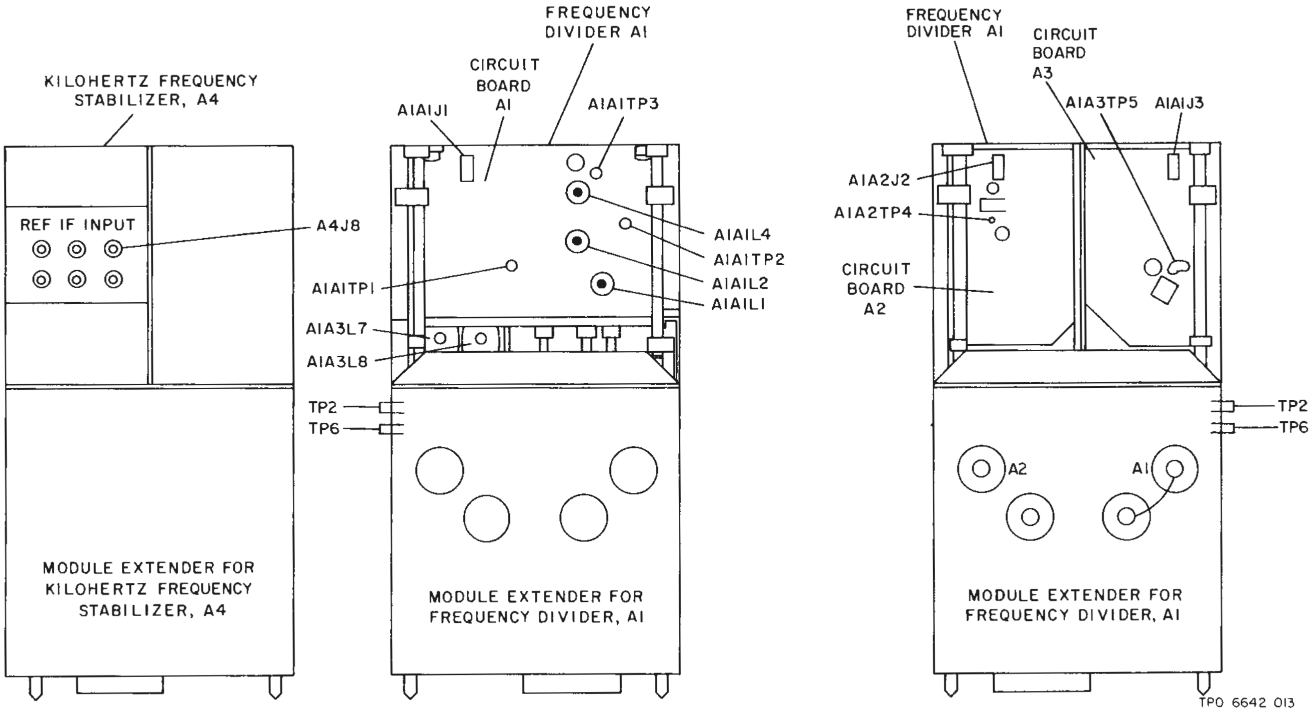
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)					A1A1Q3, A1A1Q4, and associated circuits.	Check A1A1Q3, A1A1Q4, and associated circuits.
			Connect oscilloscope vertical input to A1A1TP3.			
			While varying signal generator above and below 100 kHz, check waveform on oscilloscope.	20-to-1 Lissajous pattern. See note above.	A1A1L4 incorrectly adjusted.	Adjust A1A1L4 to provide required results. NOTE: Adjustment of A1A1L4 will center bandwidth.
					A1A1Q5 through A1A1Q8 and associated circuits.	Check A1A1Q5 through A1A1Q8 and associated circuits.
			Disconnect oscilloscope, signal generator, and 6-db attenuator. Replace coaxial jumper to A2 on module extender.			
10	Keyed oscillator output adjustment		Connect oscilloscope vertical input to A4J8. Adjust A1A3L7 and A1A3L8 to peak signal amplitude at A4J8. Adjust for largest of several peaks. Disconnect oscilloscope.			
(Cont)						

Module Checks and Adjustments, Frequency Divider A1 (Sheet 5 of 7)
Figure 706

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10 (Cont)			Turn power off. Remove kHz-frequency stabilizer A4 from module extender. Remove A4 module extender from 618T-( ) chassis. Replace dust cover on A4. Replace A4 in 618T-( ) chassis.			
11	CAL TONE output level check		Turn power on. Set oscilloscope for 0.5 v/cm, 500 us/cm. Connect oscilloscope vertical input to TP6 on A1 module extender. Check waveform at TP6 on module extender.	 1.0 to 1.5 v peak to peak.	A1A2Q11 and associated circuit. A1A3R48 NOTE: A1A3R48 is a selected value of resistance.	Check A1A2Q11 and associated circuit. Replace A1A3R48 with a resistor selected from complement listed in the 618T-( ) illustrated parts catalog.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12	Unijunction divider input check		Set oscilloscope for 5 v/cm, 200 us/cm. Connect oscilloscope vertical input to A1A2TP4. Check waveform at A1A2TP4.	 Firing voltage must be 0.6 to 0.7 v above fifth step of pattern.	A1A2Q9 and associated circuit. A1A2C22 and/or A1A2C45. NOTE: A1A2C22 and A1A2C45 are selected values of capacitance.	Check A1A2Q9 and associated circuit. Replace A1A2C22 and/or A1A2C45 with a capacitor selected from complement listed in the 618T-( ) illustrated parts catalog.
13	Disconnect		Turn power off. Disconnect all test equipment. Remove A1 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A1. Replace A1 in 618T-( ) chassis.			

Module Checks and Adjustments, Frequency Divider A1 (Sheet 7 of 7)
Figure 706



Frequency Divider A1, Checks and Adjustments
Figure 707

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Boonton 91-C RF VTVM HP 410B VTVM Oscilloscope Audio oscillator Frequency counter Vom Signal generator 6-dB attenuator Ballantine 310A VTVM Rf dummy load Headphones	NOTE: This test procedure applies to rf oscillator A2, Collins part numbers 528-0251-005, 528-0690-001, and 528-0690-002. Steps 1 through 7 apply to all Collins part numbers of rf oscillator modules. Steps 8, 9, and 10 include individual squelch checks for rf oscillators 528-0690-001 and 528-0690-002. Refer to figure 709 for location of all test points on A2 and module extender. The rf oscillator module ambient temperature must be between +20 °C (68 °F) and +30 °C (+86 °F) while performing this test. Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A2 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect rf oscillator A2 through the module extender to 618T-( ) chassis. Rf oscillator A2, Collins part numbers 528-0690-001 and 528-0690-002, must be tested on 618T-( ) chassis with MCN 21332 or above. NOTE: Unless otherwise specified, steps performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 1 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A2J2. Check voltage at A2J2.	+15 to +17 vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	100-kHz reference output check		Connect Boonton 91-C RF VTVM to A2J1. Check voltage at A2J1. Connect frequency counter to A2J1. Check frequency at A2J1.	Not less than 0.4 vrms. 100 kHz ±0.1 Hz.	Mixer A2Q9 and associated circuit.	Check mixer A2Q9 and associated circuit.
4	500-kHz reference output to MHz-frequency stabilizer A10 check		Connect Boonton 91-C RF VTVM to A2J3. Check voltage at A2J3. Connect frequency counter to A2J3. Check frequency at A2J3.	0.9 to 1.3 vrms. 500 kHz ±0.4 Hz.	A2Q4, A2Q5, and associated circuits.	Check A2Q4, A2Q5, and associated circuits.
5	500-kHz carrier output to balanced modulator check		Connect Boonton 91-C RF VTVM to A2J4. Check voltage at A2J4. Connect frequency counter to A2J4. Check frequency at A2J4.	1.5 to 1.9 vrms. 500 kHz ±0.4 Hz.	A2Q4, A2Q5, A2Q6, and associated circuits.	Check A2Q4, A2Q5, A2Q6, and associated circuits.

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 2 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	3-MHz oscillator board test		Connect HP 410B VTVM dc probe to +17 VOLT TEST POINT. NOTE: Refer to figure 709 for location of +17 VOLT TEST POINT.			
			Check voltage at +17 VOLT TEST POINT.	Approximately 17 Vdc.	A2FL1, A2L10, or A2C40. +18-vdc output of low-voltage power supply A5.	Replace faulty components. Check module.
			Connect frequency counter to 3 MHZ TEST POINT. Refer to figure 709 for location of 3 MHZ TEST POINT.			
			Check frequency at 3 MHZ TEST POINT.	3.0 MHz ±2 Hz.	3-MHz oscillator board circuitry.	See NOTE in TEST PROCEDURE column.
			Connect Boonton 91-C RF VTVM to 3 MHZ TEST POINT.			
			Check voltage at 3 MHZ TEST POINT.	0.4 to 0.6 v.	3-MHz oscillator board circuitry.	See NOTE in TEST PROCEDURE column.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 3 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			NOTE: If +17 V is present, but 3-MHz frequency or signal amplitude is improper, return oscillator board to Collins Radio Company for repair. Board may be removed by unsoldering one coaxial cable and two wires from bottom of board.			
7	Divider bandwidth adjustment		Unsolder coaxial cable at junction of A2R24 and A2Q4. NOTE: Oscillator board must be disconnected. Connect signal generator through 6-db attenuator and a 1000-pf capacitor to junction of A2R24 and A2Q4. Connect oscilloscope vertical input to junction of A2R24 and A2Q4. Connect oscilloscope horizontal input to A2J3. Connect frequency counter to oscilloscope vertical output. Set signal generator output to 0.5 Vrms. Vary signal generator frequency from 2.9 to 3.1 MHz as indicated on frequency counter.			
(Cont)			Check pattern on oscilloscope.	6-to-1 Lissajous pattern. NOTE: Pattern must remain stable; no phase changes or fuzziness.	A2Q4, A2Q5, and associated circuits.	Check A2Q4, A2Q5, and associated circuits.

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 4 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)					Incorrect value of A2C14.	Select value of A2C14 that will provide required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect Boonton 91-C RF VTVM to A2J3.			
			Check voltage at A2J3.	0.9 to 1.3 Vrms.	Incorrect value of A2C20 and/ or A2R44.	Select value of A2C20 that peaks the volt- age at A2J3, then select value of A2R44 that provides required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect Boonton 91-C RF VTVM to A2J4.			
			Check voltage at A2J4.	1.5 to 1.9 vrms.	A2Q6 and associated circuit.	Check A2Q6 and associated circuit.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 5 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)					Incorrect value of A2C25 and/or A2R30.	Select value of A2C25 that peaks the voltage at A2J4, then select value of A2R30 that provides required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
			Connect oscilloscope vertical input to A2J1.			
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 6 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Set signal generator output to 0.5 Vrms. Vary signal generator frequency from 2.9 to 3.1 MHz as indicated on frequency counter.			
			Check pattern on oscilloscope.	5-to-1 Lissajous pattern. NOTE: Pattern must remain stable; no phase changes or fuzziness.	A2Q7, A2Q8, A2Q9, and associated circuits. Incorrect value of A2C29.	Check A2Q7, A2Q8, A2Q9, and associated circuits. Select value of A2C29 that will provide required results. NOTE: Select values are listed in the 618T-( ) illustrated parts catalog.
8	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-001 only)					
A	Comparator circuit static bias check		Connect the HP-410B VTVM dc probe to A2A3J8 and note the indication.	+1.9 to +2.1 vdc.	A2A3R33 out of adjustment.	Continue test.
B	20-volt regulated power supply check		Connect the Fluke 801B VTVM to A2A2J9 and note the indication.	+19.8 to +20.2 vdc.	A2R9 out of adjustment.	Continue test.

Module Checks and Adjustments, RF Oscillator A2,
Late Models (Sheet 7 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8C (Cont)	20-volt regulated power supply adjustment		Turn power off. Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender. Turn power on. Set 714E-( ) RF SENS/SQL control fully clockwise. Set SQUELCH ENABLE switch S3 on 618T-( ) front panel to IN. Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J4-KC STAB jack to A2A2J9. <u>NOTE:</u> Ensure 678Z-1 has been calibrated in past 6 months. Set 678Z-1 FUNCTION SELECTOR to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10. <u>CAUTION:</u> DO NOT OPERATE X10 METER SENSITIVITY SWITCH AT THIS TIME. Set 678Z-1 FUNCTION SELECTOR to 10KC CONTROL BIAS (+20V).			

Module Checks and Adjustments, RF Oscillator A2,
Late Models (Sheet 8 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8C (Cont)			Depress 678Z-1 X10 METER SENSITIVITY switch and note FUNCTION METER indication.	Meter should indicate 0.		
			Repeat last step several times.	Same indication.	A2R9 incorrectly adjusted.	Adjust A2R9 to provide required results.
D	Comparator circuit static bias and squelch threshold adjustment		Connect HP-410B VTVM dc probe to A2A3J8 and adjust A2A3R33.	1.9 to 2.1 vdc.		
			Set vom to RX10 scale and connect it to TP2 and TP3 on A9 module extender.			
			Set AUDIO control R10 on 618T-( ) front panel fully clockwise.			
			Set 678P-( ) AUDIO LOAD switch to OUT.			
			Set 714E-( ) RF SENS/SQL control fully counterclockwise.			
			Connect a 330-ohm, 10% resistor from pin 30 of the unused 618T-( ) connector on the 678P-( ) to ground.			
(Cont)			Set A2A3R51 fully clockwise and note that the vom indicates approximately 300 ohms.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 9 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8D (Cont)			Rotate A2A3R51 slowly counterclockwise until vom indication suddenly increases (indicates that A2A3K1 has operated).			
			Disconnect 330-ohm resistor.			
			Rotate 714E-( ) RF SENS/SQL control slowly clockwise, and note that shortly before the clockwise stop is reached, the vom indication suddenly increases from approximately 300 ohms (indicates that A2A3K1 has operated).			
			Rotate 714E-( ) RF SENS/SQL control slowly counter-clockwise, and note that the vom indication drops suddenly to approximately 300 ohms (indicates that A2A3K1 has deenergized).			
E	Squelch circuit gain adjustment		Set 714E-( ) RF SENS/SQL control fully counterclock-wise.			
			Connect audio oscillator to TP2 and TP3 of A9 module extender (TP3 is common).			
			Connect HP-410B VTVM ac probe to audio oscillator output.			
			Set audio oscillator for 7.0 ±0.5-v output at 1 kHz.			
(Cont)			Record exact output for reference.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 10 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8E (Cont)			Connect HP 410B VTVM ac probe to A2A4J5 and adjust A2A4R55 for voltage indication within 1.0 V of audio voltage level fed into module.			
			Disconnect audio oscillator from TP2 and TP3 of A9 module extender.			
			Remove any antennas connected to the radio.			
			Set the 714E-( ) mode control to USB.			
			Remove A9 module extender from 618T-( ) chassis and install AM/audio amplifier A9.			
			Connect the 410B to 1A2J6 and measure the audio noise level.			
			Connect the 410B to 1A2J7 and adjust 1A2A4R23 for an audio noise level at 1A2J7 of 2 dB greater than that at 1A2J6.			
			Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender.			
			Reconnect audio oscillator to TP2 and TP3 of A9 module extender.			
F	Squelch circuit operation check (low channel)		Connect the HP 410B VTVM ac probe to audio oscillator output.			
			Set the audio oscillator for 7.0 ±0.5-V output at approximately 600 Hz.			
(Cont)			Momentarily disconnect the audio oscillator from TP2 of the A9 module extender.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 11 of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8F (Cont)			Reconnect the audio oscillator and listen.	Audio should be present in the headphones for about 1 to 5 seconds (indicates relay A2A3K1 is energized), then drop out. No audio should be present (indicates relay A2A3K1 is not energized).		
G	Squelch circuit operation check (high channel)		Repeat step 8F except set the audio oscillator to 2500 Hz. Perform step 4.G of figure 704 to return AUDIO control R10 to proper setting.	No audio should be present.		
H	Go to step 11.					
9	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-002) below MCN 1284 and without 618T-2/3 Service Bulletin 32 or 618T-2B/3B Service Bulletin No 14		Turn power off. Set 618T-( ) squelch enable switch S3 under front panel to SQL IN. Disconnect all antenna inputs to 618T-( ). Remove AM/audio amplifier A9 from 618T-( ) chassis and install A9 module extender. Apply power.			
A	Squelch delay check		Rotate 714E-( ) RF SENS/SQL control to the clockwise stop. Then rotate it quickly to the ccw stop and note the time lapse until the voltage at A2J8 drops to less than 2 Vdc.	1 to 5 seconds.	Failure of delay or relay driver.	

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12 of 13)
Figure 708

TEST	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9B (Cont)	Squelch balance check		Plug A9 module into module extender. Check the noise level at A2J6 and then at A2J7 with 714E-( ) RF SENS/ SQL control at cw stop.	Noise level at A2J7, 1.5 to 2.5 dB higher than at A2J6.	A2R1 improp-erly adjusted.	Adjust A2R1 and repeat step 9B.
C	High channel check		Rotate the 714E-( ) RF SENS/ SQL control to the clockwise stop.			
			Remove A9 from A9 module extender.			
			Connect HP 410B VTVM dc probe to A2J8. Connect an audio oscillator to TP2 and TP3 of A9 module extender. Connect HP 410B VTVM ac probe to A2J5. Adjust the audio oscillator for 2.2 kHz with an output of 3 volts measured at A2J5. Note the voltage at A2J8.	NMT 2.5 volts dc.		
			Remove input signal and note the voltage at A2J8.	NLT 14 volts dc.	Failure of high channel.	
D	Low channel check		Rotate the 714E-( ) RF SENS/ SQL control to the counter-clockwise stop. Note the volt-age at A2J8. Reconnect the audio oscillator to TP2 and TP3 of A9 module extender. Set the audio oscillator fre-quency to 600 Hz and adjust the output for 3 volts at A2J5.			
			Note the voltage at A2J8.	NLT 14 volts dc.	Failure of low channel.	
E	Go to step 11.					

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12A of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10	Squelch circuit checks and adjustments for rf oscillator A2 (Collins part number 528-0690-002) above MCN 1284 or below MCN 1284 but including modification per 618T-2/3 Service Bulletin No 32 or 618T-2B/3B Service Bulletin No 14		Turn power off. Set 618T-( ) squelch enable switch S3 under 618T front panel to SQL IN. Disconnect all antenna inputs to the 618T-( ). NOTE: If necessary, position 618T-( ) on its side to gain access to squelch circuits in rf oscillator module.			
A	Squelch balance check		Turn power on. Rotate 714E-( ) RF SENS/SQL control to clockwise stop.			
			Check the noise level at A2J6 and then A2J7 using Ballantine 310A.	Noise level at A2J7 should be 1.5 to 2.5 dB higher than at A2J6.	A2R1 improperly adjusted.	Adjust A2R1 and repeat step 10A.
B	Positive override trip point check		Turn power off. Rotate 714E-( ) RF SENS/SQL control to counterclockwise stop.			
			Remove AM/audio amplifier module A9 and install module extender. Do not plug AM/audio amplifier module into extender. Apply power and set 714E-( ) mode switch to USB. Use HP 410B VTVM dc probe and measure dc voltage from A2A3U1-6 to ground on modules with service bulletin modification or from A2A2U1A-1 to ground on modules with MCN 1284 and above.	NMT 2.5 volts dc.	A2A3R8 on modules with service bulletin modification or A2A2R41 on modules with MCN 1284 and above misadjusted.	Plug A9 module into module extender. Set 714E-( ) to 7.300 MHz in USB mode. Set RF SENS/SQL control to the counterclockwise stop position.
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12B of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10B (Cont)						Clip 410-ohm ±10% resistor from TP2 on rf oscillator module extender to ground. Connect a vtvm between A2A3U1-6 or A2A2U1A-1 and ground. Adjust R8 in a counterclockwise direction (R41 in a clockwise direction) until vtvm indicates less than +2.5 Vdc. Adjust R8 in a clockwise direction (R41 in a counter-clockwise direction) until vtvm indication increases to a level of between +14 and +18 Vdc. Remove 410-ohm resistor. Remove A9 module from module extender and repeat step 10B.
(Cont)						

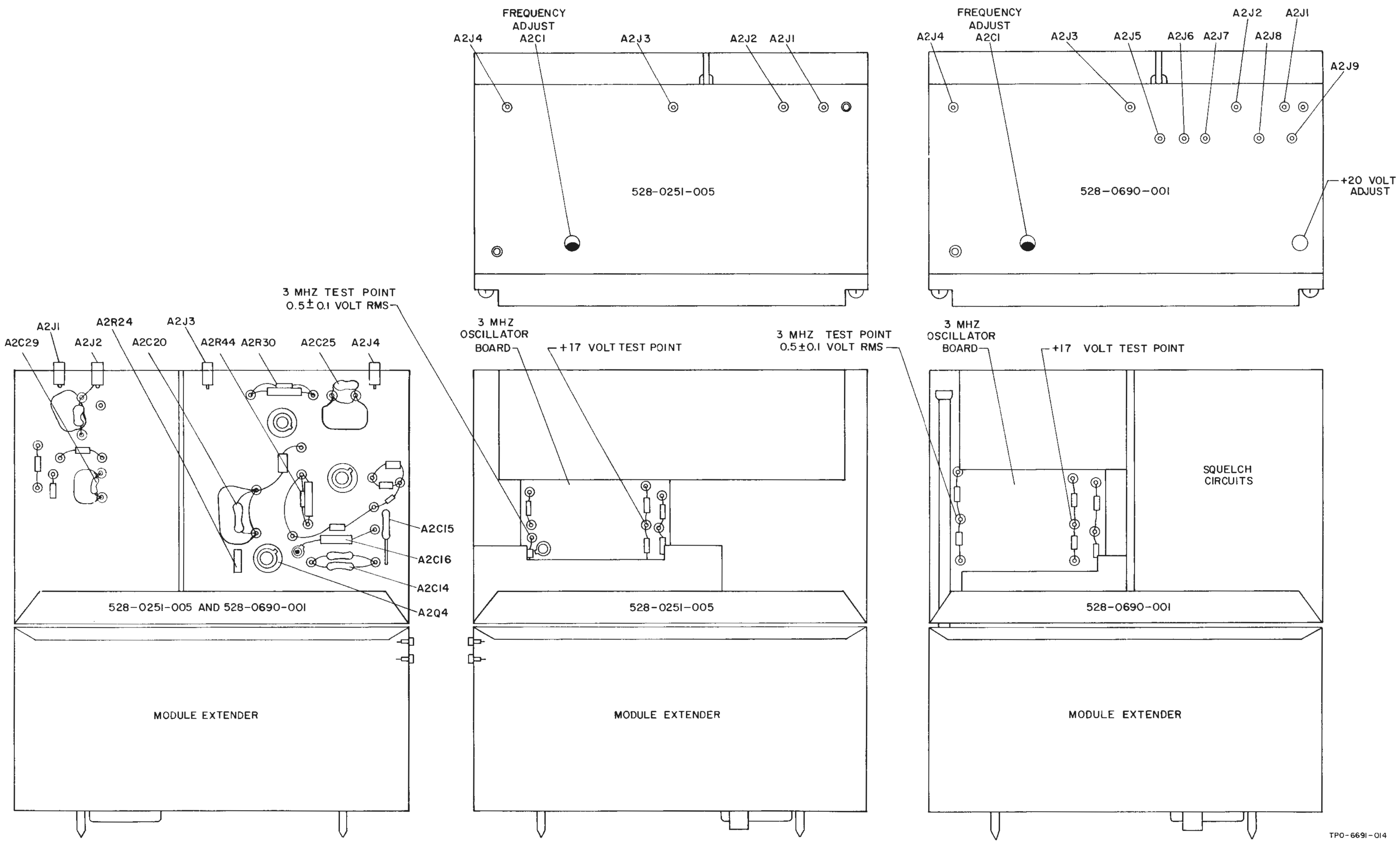
Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12C of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10B (Cont)			Connect an 820-ohm ±10% resistor from TP2 on the rf oscillator module extender to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.	NMT 2.5 volts dc.	A2A3R8 or A2A2R41 mis-adjusted.	Refer to previous remedy for adjustment for A2A3R8 or A2A2R41.
			Replace the 820-ohm resistor with a 330-ohm ±10% resistor from TP2 to ground, and measure dc voltage from A2A3U1-6 or A2A2U1A-1 to ground.	NLT 14 volts dc.	A2A3R8 or A2A2R41 mis-adjusted.	Refer to previous remedy for adjustment of A2A3R8 or A2A2R41.
C	Positive override operation and high channel check		Connect an audio oscillator to TP2 and TP3 on AM/audio module extender. Connect Ballantine 310A to A2J5. Adjust audio oscillator to approximately 2.2 kHz at a level providing 5 vrms at A2J5.	Audio should be present in headphones at 618T-( ) audio output.		
			With vtvm measure dc voltage at A2J8.	NMT 2.5 volts dc.		
D	Squelch delay check		Remove 330-ohm resistor, and note time lapse for audio to be removed from headphones.	1 to 5 seconds.		
			With vtvm, measure dc voltage at A2J8.	NMT 2.5 volts dc.		
E	Low channel check		Change audio oscillator to approximately 600 Hz at a level providing 5 Vrms at A2J5.	Audio should be present in headphones.		
			With vtvm, measure dc voltage at A2J8.	NLT 14 volts dc.		

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 12D of 13)
Figure 708

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11	Disconnect		Turn power off. Disconnect all test equipment. Remove A2 from module extender. Remove module extenders from 618T( ) chassis. Replace dust cover on A2. Replace A2 and A9 in 618T( ) chassis.			

Module Checks and Adjustments, RF Oscillator A2, Late Models (Sheet 13 of 13)
Figure 708



RF Oscillator A2, Late Model, Checks and Adjustments
Figure 709

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Boonton 91-C RF VTVM HP-410B VTVM Rf dummy load Oscilloscope Frequency counter Signal generator 6-db attenuator Ballantine 310A VTVM	NOTE: This test procedure applies to the early model rf oscillator A2, Collins part number 544-9285-005 only. Refer to figure 711 for location of all test points on A2 and module extender. Remove rf oscillator A2 from 618T-( ) and perform visual inspection as described in inspection/check section. Remove dust cover from A2 to perform this step. The rf oscillator module ambient temperature should be between +20 °C (+68 °F) and +30 °C (+86 °F) while performing this test. Connect 618T-( ), 678P-( ), and dummy load as shown in figure 702. Connect rf oscillator A2 through module extender to 618T-( ) chassis. NOTE: Unless otherwise specified, the steps are performed with power on, 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 1 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A2J2. Check voltage at A2J2. Connect HP-410B VTVM dc probe to A2J5. Check voltage at A2J5.	+15 to +16 vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	3-MHz reference oscillator check		Connect frequency counter to A2J6. Check frequency at A2J6. Connect Boonton 91-C RF VTVM to A2J6. Check voltage at A2J6.	3 MHz ±2 Hz. Not less than 40.0 mv.	3-MHz oscillator frequency incorrectly adjusted.	Adjust A2C1.
4	500-kHz reference output to MHz-frequency stabilizer A10 check		Connect Boonton 91-C RF VTVM to A2J3. Check voltage at A2J3. Connect frequency counter to A2J3. Check frequency at A2J3.	From 1.0 to 1.2 vrms. 500 kHz ±0.4 Hz.	A2Q2 through A2Q5 and associated circuits.	Check A2Q2 through A2Q5 and associated circuits.

Module Checks and Adjustments, RF Oscillator A2,
Early Model (Sheet 2 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5	500-kHz carrier output to balanced modulator check		Connect Boonton 91-C RF VTVM to A2J4.			
			Check voltage at A2J4.	1.5 to 1.9 vrms.	A2Q6 and associated circuit.	Check A2Q6 and associated circuit.
			Connect frequency counter to A2J4.			
			Check frequency at A2J4.	500 kHz ±0.4 Hz.		
6	100-kHz reference output check		Connect Boonton 91-C RF VTVM to A2J1.			
			Check voltage at A2J1.	Not less than 0.4 vrms.	A2Q8 through A2Q11 and associated circuits.	Check A2Q8 through A2Q11 and associated circuits.
			Connect frequency counter to A2J1.			
			Check frequency at A2J1.	100 kHz ±0.1 Hz.		
7	Divider bandwidth adjustment		Unsolder coaxial cable at junction of A2C4 and A2C5.			
			Connect signal generator through 6-db attenuator to A2J6 and oscilloscope vertical input. Connect frequency counter to oscilloscope vertical output.			
			Connect oscilloscope horizontal input to A2J4.			
(Cont)			Set signal generator output to 3 MHz, 50 mv (as indicated by frequency counter).			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 3 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Check waveform at A2J4.	6-to-1 Lissajous pattern. NOTE: Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.92 to 3.08 MHz.	A2C10 and/or A2C14 incorrectly adjusted.	Adjust A2C10 and/or A2C14. NOTE: A2C10 adjusts bandwidth above 3 MHz. A2C14 adjusts bandwidth below 3 MHz.
			Increase signal generator output level to 150 mv.			
			Check waveform at A2J4.	6-to-1 Lissajous pattern. See note above.	A2C10 and/or A2C14 incorrectly adjusted.	Adjust A2C10 and/or A2C14. See note above.
			Connect oscilloscope horizontal input to A2J4, vertical input to A2J1.			
			Set signal generator to 3 MHz with 50 mv output.			
			Check waveform at A2J1.	5-to-1 Lissajous pattern. NOTE: Pattern must be stable; no phase changes or fuzziness as signal generator is tuned from 2.92 to 3.08 MHz.	A2C29 and/or A2C34 incorrectly adjusted.	Adjust A2C29 and/or A2C34. NOTE: A2C29 adjusts the bandwidth above 3 MHz. A2C34 adjusts the bandwidth below 3 MHz.
(Cont)						

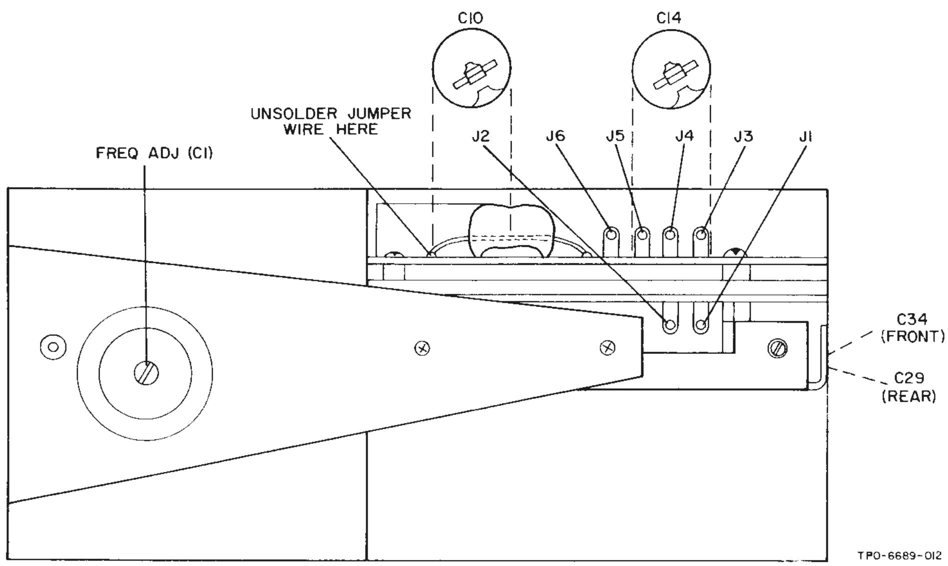
Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 4 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7 (Cont)			Increase signal generator output level to 150 mv.			
			Check waveform at A2J1.	5-to-1 Lissajous pattern. See note above.	A2C29 and/or A2C34 incorrectly adjusted.	Adjust A2C29 and/or A2C34. See note above.
			Resolder coaxial cable to junction of A2C4 and A2C5.			
8	Crystal oven check		CAUTION: BALLANTINE 310A MUST BE UNGROUNDED FOR THIS STEP.			
			Connect Ballantine 310A VTVM across terminals of A2T3.			
			Check voltage between A2T3 terminal 1 and terminal 3 (this is the output voltage).	Several volts (record this voltage).		
			Connect Ballantine 310A VTVM across A2CR1.			
			Check voltage across A2CR1 (this is the input voltage).	Several hundred microvolts (record this voltage).		
			Divide output voltage by input voltage.	Quotient should be approximately 6000.	A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.	Check A2Q12, A2Q13, A2Q14, A2Q15, and associated circuits.
9	Disconnect		Turn power off.			
			Disconnect all test equipment.			
			Remove A2 from module extender.			
			Remove module extender from 618T-( ) chassis.			
(Cont)						

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 5 of 6)
Figure 710

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)			Replace dust cover on A2. Replace A2 in 618T-( ) chassis.			

Module Checks and Adjustments, RF Oscillator A2, Early Model (Sheet 6 of 6)
Figure 710



RF Oscillator A2, Early Model, Checks and Adjustments
Figure 711

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Boonton 91-C RF VTVM Triplett 630-NA VOM Signal generator 6-db attenuator Frequency counter Rf dummy load HP-711A Power Supply Audio oscil-lators (two) Spectrum analyzer	<u>NOTE:</u> AM/audio amplifier A9 checks and adjustments must be performed before testing this module. Refer to figure 713 for location of all test points on A3 and module extender. Remove if. translator A3 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A3 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect if. translator A3 through module extender to 618T-( ) chassis. <u>NOTE:</u> Unless otherwise specified, all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, IF. Translator A3 (Sheet 1 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to TP5 on module extender.			
			Check voltage at TP5 on module extender.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
3	Tgc voltage check		Connect HP-410B VTVM dc probe to A3J2, using a coaxial jumper. Set 714E-( ) to 7.300 MHz. The 618T-( ) requires a minimum warmup period of 15 minutes. Key 618T-( ).			
			Check voltage at A3J2.	+10 to +14 vdc.	A3Q6 and associated circuit.	Check A3Q6 and associated circuit.
			Unkey 618T-( ).			
4	500-kHz carrier input to balanced modulator check		Connect HP-410B VTVM ac probe to A3J4. Key 618T-( ).			
			Check voltage at A3J4.	1.5 to 1.9 vrms.	A2Q4, A2Q5, A2Q6, and associated circuits.	Check A2Q4, A2Q5, A2Q6, and associated circuits.
			Unkey 618T-( ).			
5	SSB receive if. alignment		Connect coaxial jumper between IF. OUTPUT jack and unmarked coaxial connector on A3 module extender (figure 713).			
(Cont)			Set 714E-( ) to USB.			

Module Checks and Adjustments,
IF Translator A3
Figure 712 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Set 618T-( ) front panel AUDIO control fully clockwise. Disconnect jumper from RCVR IF. IN connector at left front of 618T-( ). Connect HP-410B VTVM ac probe to 678P-( ) HEADSET jack. Connect signal generator through 6-db attenuator to a BNC T-connector. Connect frequency counter to T-connector. Connect remaining portion of T-connector to RCVR IF. IN jack at front of 618T-( ). Set signal generator for 500.3-kHz, CW output. Adjust signal generator output level for 2 to 3 volts at 678P-( ) HEADSET jack. <u>NOTE:</u> To prevent overloading, maintain voltage at HEADSET jack below 3.5 v. Do this by reducing signal generator output level as circuit gain is increased. Adjust A3L4, A3L5, and A3T2 to peak voltage at HEADSET jack.			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Tune signal generator to 501.0 kHz.			
			Adjust A3C25 and A3C29 to peak voltage at HEADSET jack.			
			Set 714E-( ) to LSB.			
			Tune signal generator to 499.0 kHz.			
			Adjust A3C27 and A3C32 to peak voltage at HEADSET jack.			
			Determine which sideband has lower gain by keeping signal generator output level constant while switching between LSB (with signal generator tuned to 499.0 kHz) and USB (with signal generator tuned to 501.0 kHz). Lower gain sideband has lowest voltage at HEADSET jack.			
			Set 714E-( ) to the lower gain sideband. Adjust signal generator output level for 5 V at HEADSET jack.			
			Note signal generator output level.	Between 40.0 and 100.0 uv.	Value of A3R5.	Select value of A3R5 that provides required results from complement given in the 618T-( ) illustrated parts catalog.
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Disconnect signal generator from RCVR IF. IN connector. Reconnect coaxial jumper to RCVR IF. IN connector. Reset 618T-( ) front panel AUDIO control for 5.5 v at the HEADSET jack by performing step 4.G of figure 704.			
6 (Cont)	SSB/AM transmit if. alignment		<u>NOTE:</u> Perform the SSB receive if. alignment procedure, step 5, before performing this procedure. Connect coaxial jumper between RF LOAD and IF OUTPUT coaxial connectors on A3 module extender. Connect Boonton 91-C RF VTVM to RF test point on A3 module extender. Set 714E-( ) to USB. Place short across A3C9 to utilize carrier for alignment. Key 618T-( ). Adjust trimmer on RF LOAD block on A3 module extender for peak indication on Boonton 91-C RF VTVM. Adjust A3T1 and A3L2 for a peak on the Boonton 91-C RF VTVM.			

Module Checks and Adjustments, IF. Translator A3 (Sheet 5 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Remove short from A3C9.			
			Set 714E-( ) to AM.			
			Check voltage on Boonton 91-C RF VTVM.	0.24 to 0.38 v.	Value of A3R42.	Select value of A3R42 that will provide required results from complement given in 618T-( ) illustrated parts catalog.
			Connect 678Z-1 and audio oscillator as shown in figure 702.			
			Key 618T-( ) and set audio oscillator output to 1.0 kHz, 0.25 v as measured with Ballantine 310A VTVM at 678Z-1 TEST POINT jack.			
			Determine lower gain sideband by keying 618T-( ) and switching between USB and LSB. The setting that gives the lower voltage on the Boonton 91-C RF VTVM is the lower gain sideband.			
(Cont)			Set 714E-( ) to lower gain sideband.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Check voltage on the Boonton 91-C RF VTVM.	0.31 to 0.39 v.	Value of A3R2.	Select value of A3R2 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.
			Set 714E-( ) to higher gain sideband.	Within 2 db of voltage noted in previous step.	Value of A3R45.	Select value of A3R45 that will provide required results from complement given in the 618T-( ) illustrated parts catalog.
			Disconnect audio oscillator.			
7	Carrier balance adjustment		NOTE: Step 7A of this procedure does not produce ideal carrier balance. For best results, proceed to step 7B. Step 7B requires the use of a spectrum analyzer.			
A	Carrier balance adjustment		Connect coaxial jumper between RF LOAD and IF. OUTPUT coaxial connectors of A3 module extender.			
			Connect Boonton 91-C RF VTVM to RF test point on A3 module extender.			
			Set 714E-( ) to USB, 2.100 MHz.			
(Cont)			Key 618T-( ).			

Module Checks and Adjustments, IF. Translator A3 (Sheet 7 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7A (Cont)			Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Set 714E-( ) to LSB. Key 618T-( ). Adjust A3R9, then A3C9, to null voltage on Boonton 91-C RF VTVM. Repeat above procedure until null voltages are approximately equal.			
B	Carrier balance adjustment using spectrum analyzer		Override tgc using 678Z-1 Function Test Set as follows: Connect 678Z-1 GRND jack to 618T-( ) chassis. Connect 678Z-1 J2-IF. TRANS jack to A3J2. Connect 678Z-1 J2-FREQ DIV jack to A1A2J2. NOTE: B versions of the 618T-( ) have no module A1 for TGC override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Set 678Z-1 TGC and CAPTURE RANGE control counterclockwise and FUNCTION SELECTOR to TGC OVERRIDE.			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7B (Cont)			Connect output of audio oscillator to 678Z-1 NO. 1 AUDIO IN. Set output of audio oscillator to 900 Hz. Connect output of second audio oscillator to 678Z-1 NO. 2 AUDIO IN. Set output of second audio oscillator at 2800 Hz for 618T-1/1B/2/2B/3/3B or 2300 Hz for 618T-4/4B/5/5B/6/6B. Set 714E-( ) to USB, 2.100 MHz. Adjust output level of each audio oscillator, while keying 618T-( ), to provide 0.1 volt by alternately monitoring each output with the HP-410B. Connect vom positive probe to A11J1 and common probe to A11J4. Refer to figure 729 for location of these jacks. Monitor vom while keying 618T-( ). Slowly adjust 678Z-1 TGC and CAPTURE RANGE control, while keying 618T-( ), to increase drive to power amplifier module. Stop at point that voltage indicated on vom begins to change. This point is grid current threshold.			
(Cont)						

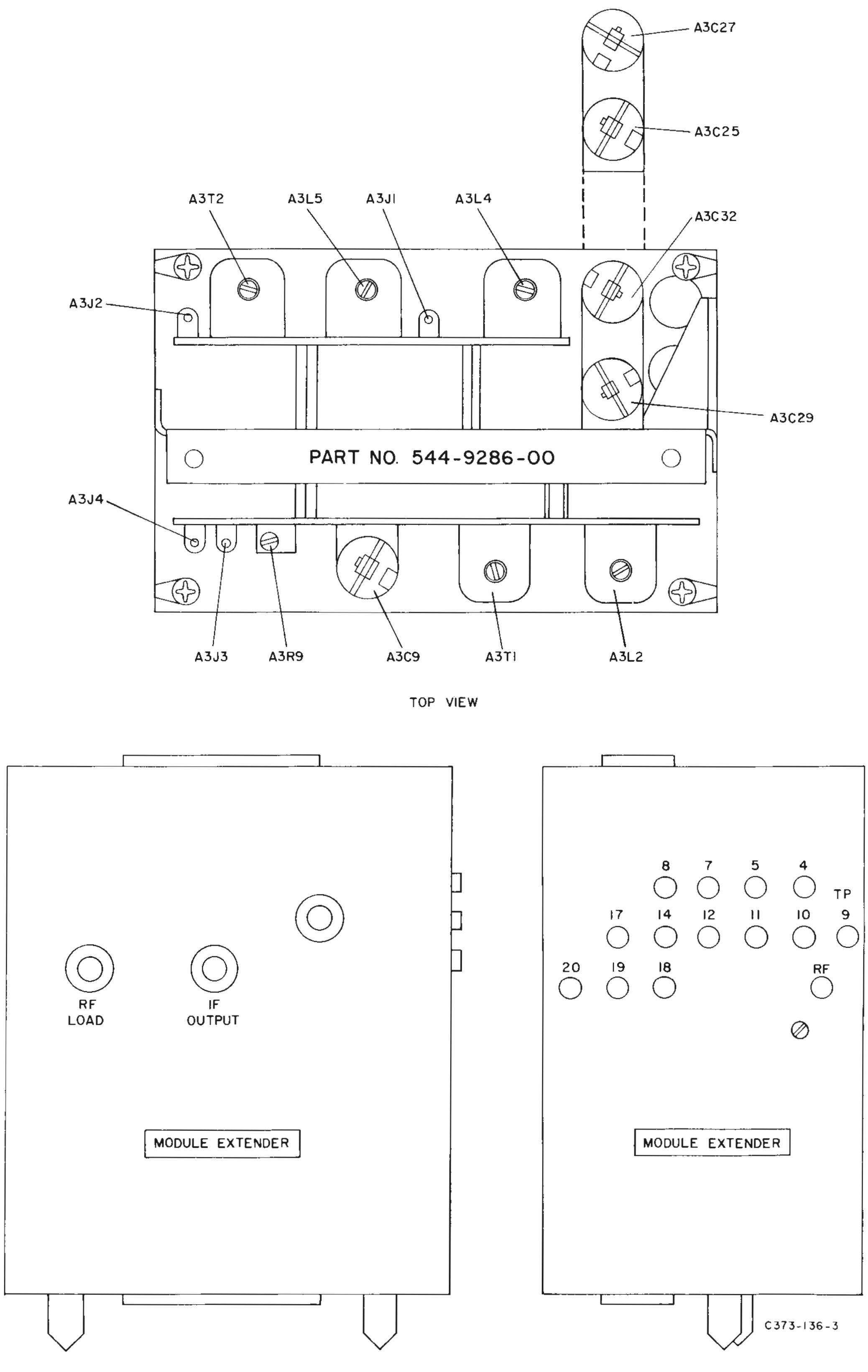
Module Checks and Adjustments, IF Translator A3
Figure 712 (Sheet 9)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7B (Cont)			Unkey 618T-( ). Connect spectrum analyzer, through 2- to 8-MHz capacitive divider, to 618T-( ) rf output. Key 618T-( ). Monitor rf output voltage with spectrum analyzer, and alternately adjust A3C9 and A3R9 for minimum carrier level. Set 714E-( ) to LSB. Monitor rf output voltage with spectrum analyzer, and alternately adjust A3C9 and A3R9 for minimum carrier level. Alternately adjust A3C9 and A3R9 in USB and LSB until best compromise is reached. Adjust tgc for correct voltage level according to unit performance test procedures, paragraph 3.H, figure 704. Unkey 618T-( ).			
8 (Cont)	Disconnect		Turn power off. Disconnect all test equipment. Remove A3 from module extender.			

Module Checks and Adjustments, IF. Translator A3 (Sheet 10 of 11)
Figure 712

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8 (Cont)			Remove module extender from 618T-( ) chassis. Replace dust cover on A3. Replace A3 in 618T-( ) chassis.			

Module Checks and Adjustments, IF. Translator A3 (Sheet 11 of 11)
Figure 712

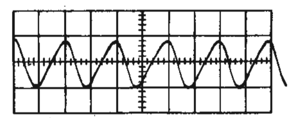


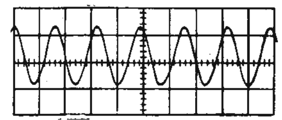
IF. Translator A3, Checks and Adjustments
Figure 713

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Signal generator 6-db attenuator Oscilloscope Frequency counter Fluke 801B VTVM Temperature box (range from -50 °C to +80 °C). Rf dummy load	This test procedure applies to both early and late models of kHz-frequency stabilizer A4. Refer to figure 715 for location of all test points on A4. Remove kHz-frequency stabilizer A4 from 618T-( ) and perform visual inspection as described in the inspection/check section of this manual. Remove dust cover from A4 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect kHz-frequency stabilizer A4 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.			

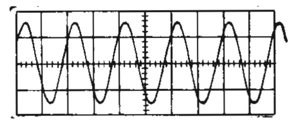
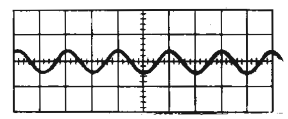
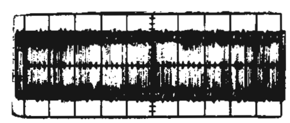
Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 1 of 20)
Figure 714

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 2 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A4A1J2. Check voltage at A4A1J2.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check supply voltage at A5J3.
3	Vfo rf input check		Set oscilloscope for 0.5 v/cm 0.2 us/cm for units with 70K-5 and 70K-9 vfo's or 1.0 v/cm, 2.0 us/cm for units with 70K-3 vfo's. Connect oscilloscope vertical input to A4A1J1. Check waveform at A4A1J1.		Vfo output.	Check vfo output at A12J5.
4	Perform step 26 of this test procedure.					
5	Perform step 27 of this test procedure.					

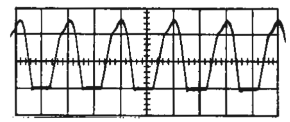
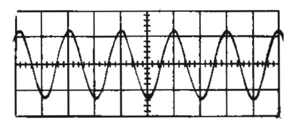
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6	Digit oscillator/ isolation amplifier (Q4) output check		Set oscilloscope for 2.0 v/cm, 2.0 us/cm.		A4A1Q4, A4A4Q12, and associated circuits.	Check A4A1Q4, A4A4Q12, and associated circuits.
			Connect oscilloscope vertical input to A4A1J5. Check waveform at A4A1J5.			
7	Digit oscillator dc tuning voltage check		Set 714E-( ) to X.XX5 MHz. Connect HP-410B VTVM dc probe to A4A4J6. Check voltage at A4A4J6.			
			Set 714E-( ) to X.XX6 MHz.	Approximately +23.0 v.	A12A1R22 through A12A1R32 and A12A1S6.	Check A12A1R22 through A12A1R32 and A12A1S6.
			Check voltage at A4A4J6.	Approximately +7 v.		

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 3 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Signal channel if. input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4J7. Check waveform at A4J7.	Approximately 50 mV p-p minimum. 	A4A1Q3, A4FL1, and associated circuits.	Check A4A1Q3, A4FL1, and associated circuits.
9	Reference channel if. input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4J8. Check waveform at A4J8.		A4A5Q15, A4FL2, and associated circuits.	Check A4A5Q15, A4FL2, and associated circuits.
10	First signal mixer input check		Set oscilloscope for 50.0 mv/cm, 100.0 us/cm. Connect oscilloscope vertical input to A4A1TP1. Check waveform at A4A1TP1.		A4A1Q1 and associated circuit.	Check A4A1Q1 and associated circuit.
11	Second signal mixer input check		Set oscilloscope for 100.0 mv/cm, 100.0 us/cm. Connect oscilloscope vertical input to A4A1TP2. Check waveform at A4A1TP2.		A4A1Q2 and associated circuit.	Check A4A1Q2 and associated circuit.
12	FL1 output/ Q5 input check		Used for adjustment only.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4
Figure 714 (Sheet 4)

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 5 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13	Q6 output/ Q7 input check		Set oscilloscope for 1.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A2TP4. Check waveform at A4A2TP4.		A4A2Q5, A4A2Q6, and associated circuits.	Check A4A2Q5, A4A2Q6, and associated circuits.
14	Q8 output/ signal input to phase discriminator check		Set oscilloscope for 5.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A2TP5. Check waveform at A4A2TP5.		A4A2Q7, A4A2Q8, and associated circuits.	Check A4A2Q7, A4A2Q8, and associated circuits.
15	Frequency discriminator dc output check					
A	kHz-frequency stabilizer A4, Collins part number 544-9288-005 only		Ground A4A6TP15. Connect signal generator output through 6-db attenuator to frequency counter and A4J7. Set signal generator for output of 40 mv at 250,000 ±5 Hz. Connect Fluke 801B VTVM between A4A2TP6 and A4A2TP7.	-5 to +5 mvdc.	Frequency discriminator output.	Check frequency discriminator circuit.

COLLINS
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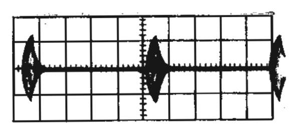
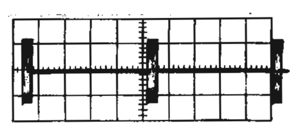
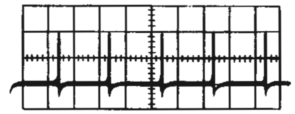
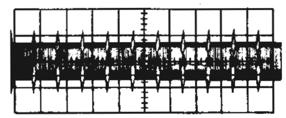
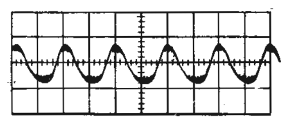
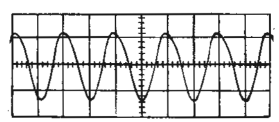
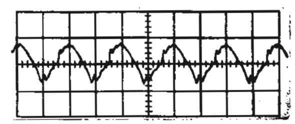
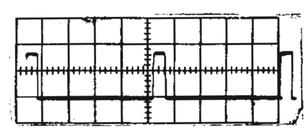
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15B	kHz-frequency stabilizer A4, Collins part number 528-0112-005 only		Ground A4A6TP15. Connect signal generator output through 6-db attenuator to frequency counter and A4J7. Set signal generator for 40-mv output at 250,000 ±5 Hz. Connect Fluke 801B VTVM between A4A2TP7 and ground. Disconnect signal generator and unground A4A6TP15.	-5 to +5 mvdc.	Frequency discriminator output.	Check frequency discriminator circuit.
16	Spectrum generator output check		Set oscilloscope for 50.0 mv/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP8. Check waveform at A4A3TP8.		A4A3T2.	Check A4A3T2.
17	Keyer/keyed oscillator supply voltage check		Connect HP-410B VTVM dc probe to A4A3TP9. Check voltage at A4A3TP9.	+17.0 to +19.0 Vdc.	Low-voltage power supply A5.	Check low-voltage power supply A5.
18	Keyed oscillator output check		Set oscilloscope for 2.0 v/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP10. Check waveform at A4A3TP10.		A4A3Q11 and associated circuit.	Check A4A3Q11 and associated circuit.

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 6 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
19	10-kHz pulse input from frequency divider A1 check		Set oscilloscope for 2.0 v/cm, 50.0 us/cm. Connect oscilloscope vertical input to A4A3TP11. Check waveform at A4A3TP11.		A1A1Q1 through A1A1Q6 and associated circuits.	Check A1A1Q1 through A1A1Q6 and associated circuits.
20	Reference mixer input check		Set oscilloscope to 100.0 mv/cm, 1.0 ms/cm. Connect oscilloscope vertical input to A4A5TP12. Check waveform at A4A5TP12.		A1A3Q14 and associated circuit.	Check A1A3Q14 and associated circuit.
21	Q17 output/ Q18 input check		Set oscilloscope for 50.0 mv/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP14. Check waveform at A4A6TP14.		A4A6Q16, A4A6Q17, and associated circuits.	Check A4A6Q16, A4A6Q17, and associated circuits.
22	Q19 output/ reference input to phase discriminator check		Set oscilloscope for 10.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP15. Check waveform at A4A6TP15.		A4A6Q18, A4A6Q19, and associated circuits.	Check A4A6Q18, A4A6Q19, and associated circuits.

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 7 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
23	Signal input to phase discriminator check		Set oscilloscope for 5.0 v/cm, 2.0 us/cm. Connect oscilloscope vertical input to A4A6TP16. Check waveform at A4A6TP16.		A4A2T1.	Check A4A2T1.
24	Phase discriminator dc output check		Ground A4A2TP5 and A4A6TP15.			
			Using Fluke 801B, check voltage at A4A6TP17.	-5 to +5 mvdc.	Phase discriminator circuit.	Check phase discriminator circuit.
			Check voltage at A4A6TP18.	-5 to +5 mvdc.	Phase discriminator circuit.	Check phase discriminator circuit.
			Unground A4A2TP5 and A4A6TP15.			
25	Keyer output check		Set oscilloscope for 5.0 v/cm, 20.0 us/cm. Connect oscilloscope vertical input to A4A3TP19. Check waveform at A4A3TP19.		A4A3Q9, A4A3Q10, and associated circuits.	Check A4A3Q9, A4A3Q10, and associated circuits.
26	Vfo bias adjustment		NOTE: Do not perform this step unless it is known that 678Z-1 is in accurate calibration.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 8 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
26A	Late model, Collins part number 528-0112-005 only		Connect 678Z-1 GRND jack to 618T-( ) chassis.			
			Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10.			
			CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.			
			Ground A4A2TP5.			
			Connect 678Z-1 J1-KC STAB jack to A4A1J1.			
			Set 678Z-1 FUNCTION SELECTOR switch to OFF-SET ADJUST. Adjust 678Z-1 OFF-SET ADJUST control until the FUNCTION METER indicates 0 when the X10 METER SENSITIVITY switch is operated several times.			
			Connect 678Z-1 J3-KC STAB jack to A4A4J3.			
			Set 678Z-1 FUNCTION SELECTOR switch to 70K-5 VFO BIAS.			
			Operate X10 METER SENSITIVITY switch several times.	FUNCTION METER must indicate 0.	A4A4R62 incorrectly adjusted.	Adjust A4A4R62.
			Unground A4A2TP5.			
			Disconnect test leads from A4A1J1, A4A4J3, and chassis.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 9 of 20)
Figure 714

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 10 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
26B	Early model, Collins part number 544-2988-005		Connect 678Z-1 GRND jack to 618T-( ) chassis.			
			Connect 678Z-1 J1-KC STAB jack to A4A1J1.			
			Connect 678Z-1 J3-KC STAB jack to A4A4J3.			
			Ground A4A2TP5.			
			Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust 678Z-1 LEVEL SET control until FUNCTION METER indicates +10.			
			<u>CAUTION:</u> DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.			
			Set 678Z-1 FUNCTION SELECTOR switch to 70K-3 VFO BIAS.			
			Operate X10 METER SENSITIVITY switch several times.	FUNCTION METER must indicate 0.	A4A4R62 incorrectly adjusted.	Adjust A4A4R62.
			Unground A4A2TP5.			
			Disconnect test leads from A4A1J1, A4A4J3, and chassis.			
27 (Cont)	Keyed oscillator adjustment		Connect 678Z-1 J4-KC STAB jack to A4A3J4.			
			Connect 678Z-1 GRND jack to 618T-( ) chassis.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
27 (Cont)			Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL.			
			Set 678Z-1 LEVEL SET control for FUNCTION METER indication of +10.			
			<u>CAUTION:</u> DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME.			
			Set 714E-( ) to X.000 MHz.			
			Set 678Z-1 FUNCTION SELECTOR switch to 10KC CONTROL BIAS (+20 V).			
			Operate X10 METER SENSITIVITY switch several times.	FUNCTION METER should indicate 0.	A4A4R63 incorrectly adjusted.	Adjust A4A4R63.
			Disconnect test leads from A4A3J4 and chassis.			
			Connect HP-410B VTVM dc probe to A4A4J4 and check level.	Approx +20 vdc.	Autopositioner submodule A12A1.	Perform A12 checks and adjustments.
			Check voltage with 714E-( ) set at each frequency listed.	X.111 - approx +17 vdc. X.222 - approx +14 vdc. X.333 - approx +12 vdc. X.444 - approx +10 vdc. X.555 - approx +8 vdc. X.666 - approx +7 vdc. X.777 - approx +6 vdc. X.888 - approx +5 vdc. X.999 - approx +4 vdc.		
(Cont)						

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 11 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
27 (Cont)			Connect oscilloscope vertical input to A4J7 (output of A4FL1). Set 714E-( ) to X.000 MHz. Adjust A4A3C54 and A4A3C55 to provide peak waveform at A4J7. Set 714E-( ) to X.999 MHz. Adjust A4A3T2-P and A4A3T2-S to provide peak waveform at A4J7. Disconnect oscilloscope from A4J7.			
28	Digit oscillator input check		Connect HP-410B VTVM dc probe to A4A4J6.			
			Set 714E-( ) to X.XX0 MHz and check voltage with HP-410B.	Approx +11 vdc.	Autopositioner submodule A12A1.	Perform A12 checks and adjustments.
			Check voltage with 714E-( ) set at each frequency listed (voltages approximate).	X.XX1 - +12.5 vdc. X.XX2 - +14 vdc. X.XX3 - +16.5 vdc. X.XX4 - +19 vdc. X.XX5 - +23 vdc. X.XX6 - +7 vdc. X.XX7 - +8 vdc. X.XX8 - +9 vdc. X.XX9 - +10 vdc.		
(Cont)			Connect frequency counter to vertical output of oscilloscope.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
28 (Cont)			Connect vertical input of oscilloscope to A4A1J5 through 678Y-( ) test probe no. 1.			
			Set 714E-( ) to 2.006 MHz.	Counter should indicate between 295.850 to 296.150 kHz.	A4A4R59 incorrectly adjusted.	Adjust A4A4R59 to provide required results.
			Set 714E-( ) to 2.005 MHz.	Counter should indicate 304.850 to 305.150 kHz.	A4A4L14 incorrectly adjusted.	Adjust A4A4L14 to provide required results.
			Reset 714E-( ) to 2.006 MHz.	Counter should indicate 295.850 to 296.150 kHz.		
			NOTE: If necessary, readjust A4A4R59 and A4A4L14 until proper frequency indications are obtained at both 2.006 and 2.005 MHz frequency settings.			
			Set 714E-( ) to each of the frequencies listed and note the frequency counter indication.	2.007 MHz = 297,000 ±150 Hz. 2.008 MHz = 298,000 ±150 Hz. 2.009 MHz = 299,000 ±150 Hz. 2.000 MHz = 300,000 ±150 Hz. 2.001 MHz = 301,000 ±150 Hz. 2.002 MHz = 302,000 ±150 Hz. 2.003 MHz = 303,000 ±150 Hz. 2.004 MHz = 304,000 ±150 Hz.		
(Cont)			NOTE: If frequency at each digit setting is not within specified limits, replace A4A4C64 and A4A4C125 with values of capacitance that will give the required indication. A change of +5 pf will raise the frequency at the 2.001-MHz setting about 10 Hz. Leave a minimum capacitance of			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
28 (Cont)			20 pf in the circuit. These capacitors are selected from the complement listed in the 618T-( ) illustrated parts catalog. Connect kHz-frequency stabilizer A4 to 618T-( ) chassis with an 18-inch pendant cable. NOTE: The remainder of step 28 is optional. Place A4 in temperature box. Check all frequencies listed in previous steps at temperatures of -55, -5, +5, +50, and +80 °C. Remove A4 from temperature box and replace on A4 module extender.	Frequency at each digit setting must be within ±200 Hz of frequencies listed in previous step.	A4A4C64 and A4A4C125.	Replace A4A4C64 and A4A4C125 with capacitors having the same capacitance but with different temperature coefficients.
29 (Cont)	Signal channel input adjustment		Connect vertical input of oscilloscope to A4J7. Set 714E-( ) to X.XX0 MHz. Adjust A4A1L2, A4A1L3, A4C18, and A4C19 to peak waveform at A4J7.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
29 (Cont)			NOTE: Check for two tuning points on each capacitor to be sure they are at resonance. Pick the highest point.			
30	Signal channel if./frequency discriminator adjustment		Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender. Connect a #22 wire from pin 2 of chassis connector A4J12 to TP2 on module extender. Connect a #22 wire from 618T-( ) chassis to A4 chassis. NOTE: Make no other connections between 618T-( ) chassis and module A4 or module extender. Connect oscilloscope vertical input to A4A6TP16. Connect signal generator output through 6-db attenuator to A4J7 and the frequency counter. Set signal generator output between 249,970 and 250,030 Hz with an output level below that required to saturate if. amplifiers (indicated by output at A4A6TP16 dropping sharply or clipping).			
(Cont)						

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 15 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			NOTE: Some of the following test points and adjustments are located on circuit board A4A2. This board is located behind circuit board A4A6. Refer to figure 715 for location of circuit boards. To make test points and adjustments on A4A2 accessible, remove A4A6 and the metal divider between A4A6 and A4A2 by removing five screws from A4A6.			
			Adjust A4A2L7 and A4A2T1 to provide peak waveform at A4A6TP16. If necessary, reduce signal generator output level to prevent amplifier saturation.			
			Connect differential vtvm between A4A2TP7 and ground on late model modules (between A4A2TP6 and A4A2TP7 on early model modules).			
			Check voltage at A4A2TP7.	0 ±5.0 mv.	A4A2L8 (MCN through 7236).	
					A4A2C128 incorrectly adjusted (MCN 7237 and above).	Adjust A4A2L8 or A4A2C128.
(Cont)			NOTE: The following portion of step 30 need be performed only if a component on board A4A2 was replaced and if a temperature box is available. If no temperature box is available, return the module to Collins Radio Company for repair.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 16 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			Leave signal generator, frequency counter, oscilloscope, and differential vtvm connected as in the previous steps. Maintain signal generator output level as it was in the last step.			
			Connect A4 to chassis through 18-inch pendant cable and place A4 in the temperature box. Connect HP-410B VTVM ac probe to A4A6TP16.			
			Lower temperature box temperature to -55 °C.			
			Adjust signal generator frequency to produce null on differential vtvm (approximately 250 kHz).			
			Record output frequency of signal generator and HP-410B indication.	See next step.		
			Raise temperature box temperature to +80 °C.			
			Adjust signal generator frequency to produce null on differential voltmeter.			
			Record signal generator output frequency and HP-410B indication.	Signal generator output frequency must be between 249.930 and 250.070 kHz at both temperatures.	A4A2C37 and/ or A4A2C124.	Replace with capacitors having same capacitance but different temperature coefficient.
(Cont)						

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 17 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
30 (Cont)			Remove A4 from temperature box and replace in 618T-( ) with A4 module extender. Remove test equipment from A4.	HP-410B indications should be within 3 db of each other.	A4A2C33 and/ or A4A2C123.	Same as above.
31	Reference channel input adjustment		Connect oscilloscope vertical input to A4J8. Set 714E-( ) to X.XX0 MHz. Adjust A4A5L17, A4C85, and A4C86 to peak waveform at A4J8. <u>NOTE:</u> Check for two tuning points on each capacitor to be sure they are at resonance. Pick highest point. Set 714E-( ) to X.XX6 MHz. Adjust A1A3L8 in frequency divider A1 to peak waveform at A4J8. Set 714E-( ) to X.XX1 MHz. Adjust A1A3L7 in frequency divider A1 to peak waveform at A4J8.			

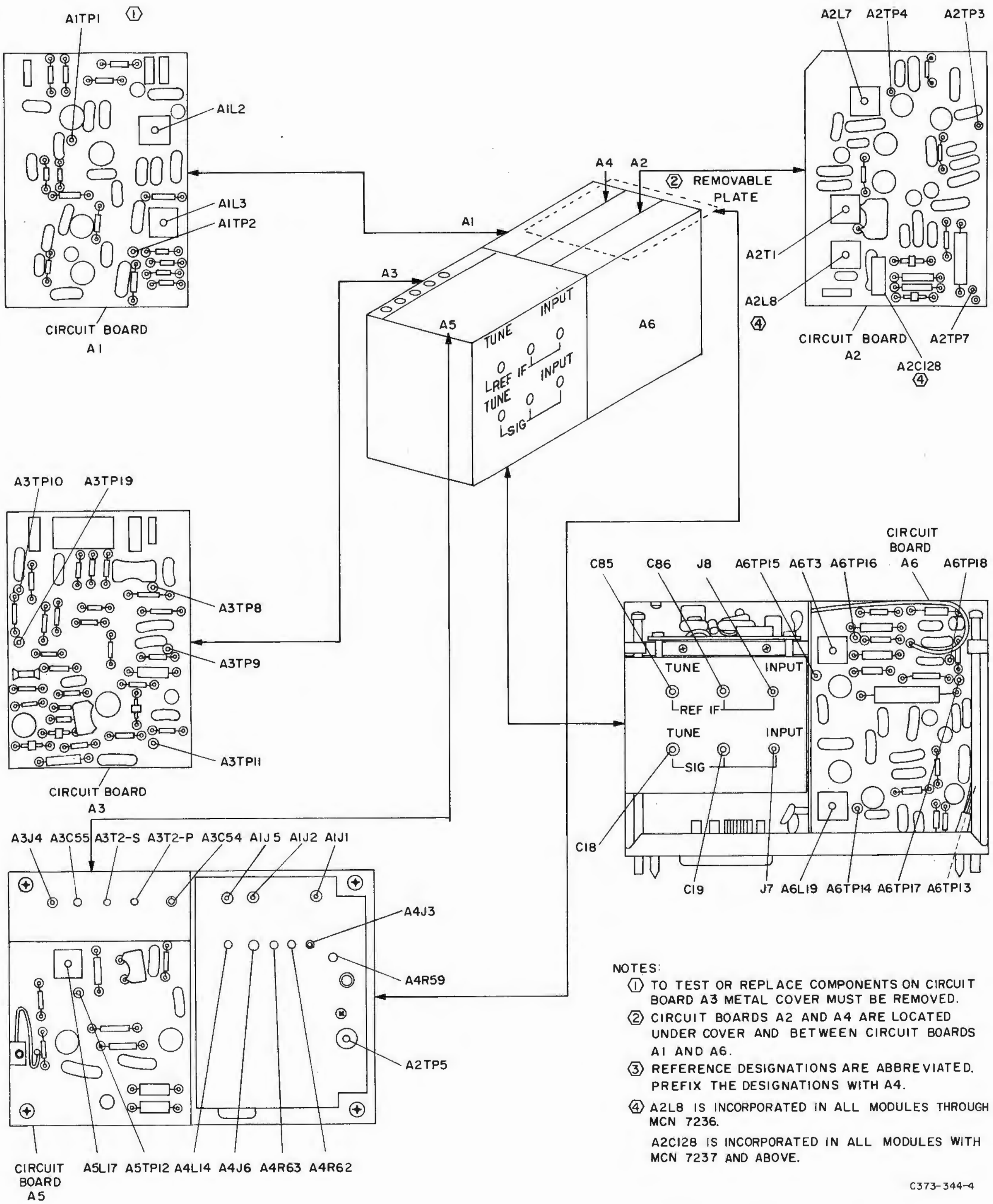
Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 18 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
32	Reference channel if. adjustment		Disconnect module extender from 618T-( ) chassis leaving A4 connected to module extender. Connect a #22 wire from pin 8 of A4J12 to TP8 on module extender. Connect a #22 wire from 618T-( ) chassis to chassis of A4. NOTE: Make no other connections between 618T-( ) chassis and A4 or A4 module extender. Connect oscilloscope vertical input to A4A6TP15. Connect signal generator output through 6-db attenuator to A4J8 and frequency counter. Set signal generator output between 249,970 and 250,030 Hz. Set signal generator output level just below that required to saturate if. amplifiers (indicated by clipping at A4A6TP15). Adjust A4A6L19 and A4A6T3 to provide peak waveform at A4A6TP15. If necessary, reduce signal generator output during peaking procedure to prevent amplifier saturation.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 19 of 20)
Figure 714

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
33	Disconnect		Turn power off. Disconnect all test equipment. Remove A4 from module extender. Replace dust cover on A4. Replace A4 in 618T-( ) chassis.			

Module Checks and Adjustments, kHz-Frequency Stabilizer A4 (Sheet 20 of 20)
Figure 714



kHz-Frequency Stabilizer A4, Checks and Adjustments
Figure 715

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM HP-711A Power Supply Variable dc voltage source (+25 to +35 V, 0.40 A) Rf dummy load	Refer to figure 717 for location of all test points on A5 and module extender. Remove low-voltage power supply A5 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A5 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect low-voltage power supply A5 through module extender to 618T-( ) chassis. NOTE: Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transient blanker trigger check		Connect Fluke 801B VTVM to A5J3. Check voltage at A5J3.	+17.82 to +18.18 v.	Refer to step 4 of this test procedure.	Refer to step 4 of this test procedure.
			Ground A5J1 to 618T-( ) chassis. Check voltage at A5J3. Unground A5J1.	0 v.		

Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 1 of 4)
Figure 716

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Transient blanker input voltage check		Connect HP 410B VTVM dc probe to A5J2. Check voltage at A5J2.	+27 to +28 Vdc.	Relay K1.	
4	Transient blanker adjustment		Set 714E-( ) to OFF. Connect A5 to module extender. Connect variable dc voltage source to 618T-( ) (positive lead to either P40-4 or P40-16 and negative lead to chassis). Set variable dc voltage source to provide +27.5 V. Connect HP 410B VTVM dc probe to TP5 on module extender. NOTE: In the following procedure, the dc voltage must be increased fast enough to prevent Q2 from burning out. Increase dc voltage until voltage at TP5 on module extender drops to not more than 0.1 Vdc. The drop should occur when dc voltage reaches +31.5 to +32.5 V. If it does not, set variable dc voltage to +32 V and adjust A5R5 until voltage at TP5 on module extender drops to not more than 0.1 Vdc.			

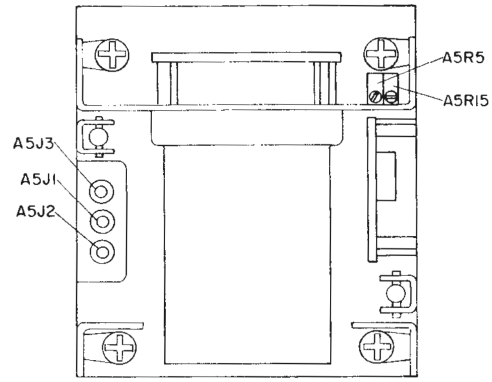
Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 2 of 4)
Figure 716

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4 (Cont)			Repeat this entire test procedure. Disconnect variable dc voltage source and HP-410B VTVM.			
5 (Cont)	+18-v regulator adjustment		Connect 678Z-1 J2-FREQ DIV jack to J2 in frequency divider A1. NOTE: B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of performing the above step. +20 Vdc can be used from 1A2J9 or ±16 Vdc from 1A2J2. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 714E-( ) to AM, any frequency. Set 678Z-1 FUNCTION SELECTOR switch to SET LEVEL. Adjust LEVEL SET control until 678Z-1 FUNCTION METER indicates +10. CAUTION: DO NOT USE X10 METER SENSITIVITY SWITCH AT THIS TIME. Set 678Z-1 FUNCTION SELECTOR switch to +18V.			

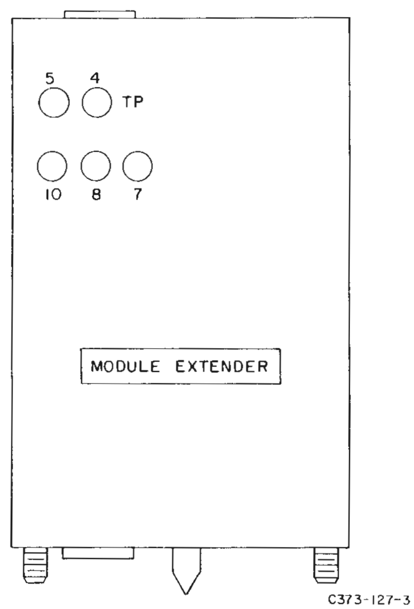
Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 3 of 4)
Figure 716

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Operate X10 METER SENSITIVITY switch several times. Disconnect 678Z-1 Function Test Set.	678Z-1 FUNCTION METER must indicate 0 ±1 scale division.	A5R15 incorrectly adjusted.	Adjust A5R15 to provide required indication.
6	+130-v supply check		Set 618T-( ) front panel meter selector switch to 130V.	Front panel meter must indicate in red area.	Components in +130-V supply circuit in A5.	Check components in +130-V supply circuit in A5.
7	Disconnect		Turn power off. Remove A5 from module extender. Remove module extender from 618T-( ) chassis. Replace A5 in 618T-( ) chassis.			

Module Checks and Adjustments, Low-Voltage Power Supply A5 (Sheet 4 of 4)
Figure 716



TOP VIEW



Low-Voltage Power Supply A5,
Checks and Adjustments
Figure 717

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Rf dummy load	Refer to figure 719 for location of all test points on A6 and module extender. Remove A6 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A6 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect electronic control amplifier A6, through A6 module extender, to 618T-( ) chassis. Unless otherwise specified, steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	A6Q1 output/ A6Q2 input voltage check		Connect HP-410B VTVM dc probe to A6J1. Check voltage at A6J1.	+5.8 to +7 vdc.	A6G1, A6Q1, and associated circuits.	Check A6G1, A6Q1, and associated circuits.
3	A6Q4 output voltage check		Connect HP-410B VTVM dc probe to A6J2. Check voltage at A6J2.	+5.1 to +6.1 vdc.	A6Q2, A6Q3, A6Q4, and associated circuits.	Check A6Q2, A6Q3, A6Q4, and associated circuits.

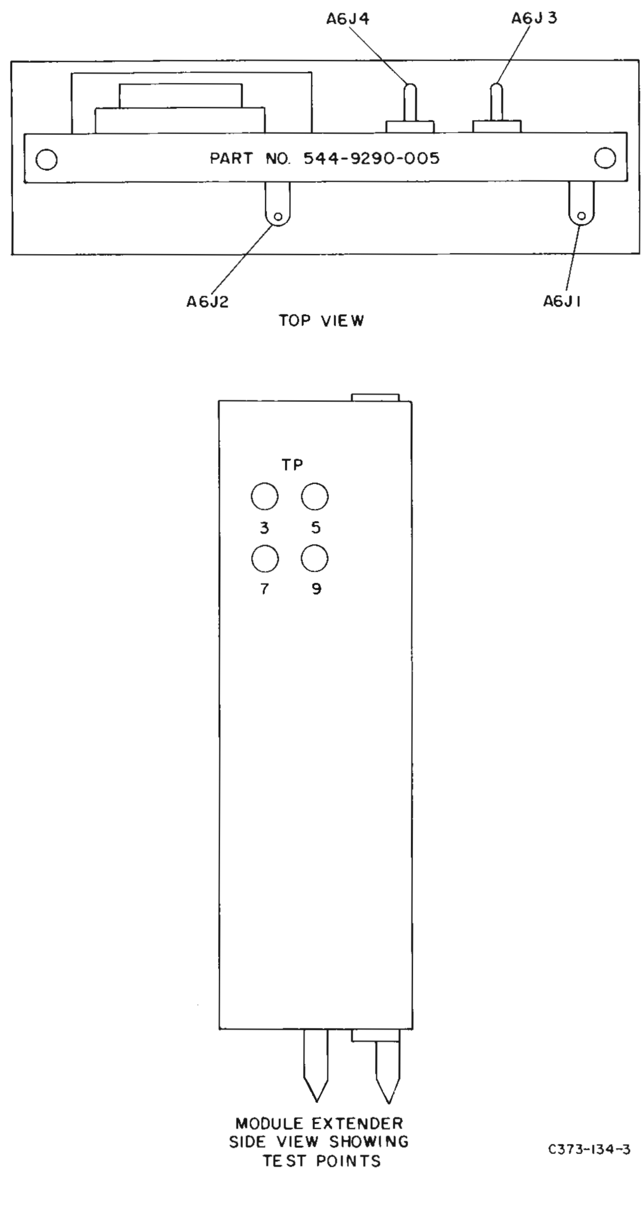
Module Checks and Adjustments, Electronic Control Amplifier A6 (Sheet 1 of 3)
Figure 718

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4	Push-pull amplifier output voltage check		Connect HP-410B VTVM dc probe to A6J3.			
			Connect HP-410B VTVM common probe to A6J4.			
			Check voltage between A6J3 and A6J4.	+0.13 to +0.17 vdc.	A6Q5, A6Q6, A6Q7, and associated circuits.	Check A6Q5, A6Q6, A6Q7, and associated circuits.
			Disconnect HP-410B VTVM.			
5	Amplifier gain check		Set 714E-( ) to AM, X.500 MHz.			
			Connect HP-410B VTVM dc probe to TP9 on module extender.			
			Connect Ballantine 310A VTVM between A6J3 and A6J4.			
			<u>NOTE:</u> Isolate vtvm primary power third wire ground when making balanced output readings.			
			618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed.			
			Key 618T-( ).			
(Cont)			Rotate large roller coil gear on top of power amplifier A11 in either direction until amplifier input voltage at TP9 on module extender is 0 ±0.2 V.			

Module Checks and Adjustments, Electronic Control Amplifier A6
Figure 718 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Check voltage between A6J3 and A6J4.	Between +18 and +30 v.	A6Q5, A6Q6, A6Q7, and associated circuits.	Check A6Q5, A6Q6, A6Q7, and associated circuits.
				If voltage is normal, roller coil gear should return to tuned position when released.	Insufficient torque or mechanical binding of roller coil mechanism.	Check for sufficient torque and mechanical binding of roller coil mechanism.
6	Disconnect		Turn power off. Disconnect all test equipment. Remove A6 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A6. Replace A6 in 618T-( ) chassis.			

Module Checks and Adjustments, Electronic Control Amplifier A6 (Sheet 3 of 3)
Figure 718



Electronic Control Amplifier A6,
Checks and Adjustments
Figure 719

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Vom HP-410B VTVM Rf dummy load	WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 3-PHASE HIGH-VOLTAGE POWER SUPPLY A7. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A7 REMOVED. Remove A7 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A7 to perform this step. Replace dust cover on A7 and replace A7 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12 from 618T-( ) chassis. Connect A12 through module extender to 618T-( ) chassis. Remove dust cover from A12. Unless otherwise specified, the steps are performed with the 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.			
2	1500-v check		Set 618T-( ) front panel meter selector switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).	Front panel meter should indicate in red area.		

Module Checks and Adjustments, 3-Phase High-Voltage Power Supply A7
Figure 720 (Sheet 1 of 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	260-v check		Connect HP-410B VTVM dc probe to TP19 on A12 module extender.			
			Key 618T-( ).			
			Note HP-410B VTVM indication.	+234 to +286 v.		
			NOTE: There are no adjustments in A7. If preceding checks indicate module output is abnormal, turn power off, remove A7 from 618T-( ) chassis, and use a vom to check for faulty diodes, transformer winding continuity, and proper relay operation. If +1500-v output is normal, but +260-v output is abnormal, check bleeder resistors A7R14 and A7R15. Refer to applicable module schematic diagram. Figure 818 applies to modules with MCN 18,000 or above. Figure 819 applies to modules with MCN 17,999 or below.			
4	Disconnect		Turn power off.			
			Disconnect all test equipment.			
			Remove A12 from module extender.			
			Remove module extender from 618T-( ) chassis.			
			Replace dust cover on A12.			
			Replace A12 in 618T-( ) chassis.			

Module Checks and Adjustments, 3-Phase High-Voltage Power Supply A7
Figure 720 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Vom Rf dummy load	WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 27.5-VDC HIGH-VOLTAGE POWER SUPPLY A8. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A8 REMOVED. Remove 27.5-vdc high-voltage power supply A8 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A8 to perform this step. Replace dust cover on A8 and replace A8 in 618T-( ) chassis. Remove rf translator A12 from 618T-( ) chassis. Connect rf translator A12 through module extender to 618T-( ) chassis. Remove dust cover from A12. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Unless otherwise specified all steps are performed with 714E-( ) in AM, no signal in, and 618T-( ) unkeyed.			
2	1500-v check		Set 618T-( ) front panel meter selector switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). Unkey 618T-( ).	Front panel meter should indicate in red area.		

Module Checks and Adjustments, 27.5-V DC High-Voltage Power Supply A8
Figure 721 (Sheet 1 of 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	260-v check		Connect HP-410B VTVM dc probe to TP19 on A12 module extender. Key 618T-( ). Note HP-410B indication. NOTE: There are no adjustments in A8. If preceding checks indicate module output is abnormal, turn power off, remove A8 from 618T-( ) chassis, and use a vom to check for faulty diodes, transformer winding continuity, and proper relay operation. If +1500-v output is normal but +260-v output is abnormal, check bleeder resistors A8R22 and A8R23. Refer to applicable module schematic diagram. Figure 820 applies to modules with MCN 4250 or above. Figure 821 applies to modules with MCN 4249 or below.	 +234 to +286 v.		
4	Disconnect		Turn power off. Disconnect all test equipment. Remove A12 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A12. Replace A12 in 618T-( ) chassis.			

Module Checks and Adjustments, 27.5-VDC High-Voltage Power Supply A8 (Sheet 2 of 2)
Figure 721

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Ballantine 310A VTVM Signal generator 6-dB attenuator Audio oscillator Rf dummy load Distortion analyzer	This test procedure applies to both early and late models of AM/audio amplifier A9. Refer to figure 723 for location of all test points on A9. Remove AM/audio amplifier A9 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A9 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect AM/audio amplifier A9 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM, no signal in, and 618T-( ) unkeyed.			
2	If. agc voltage check		Connect HP-410B VTVM dc probe to A9J1. Check voltage at A9J1. Disconnect HP-410B.	Not more than +5 Vdc.	A9Q7 and associated circuit.	Check A9Q7 and associated circuit.
3 (Cont)	Audio amplifier gain adjustment		Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack. Connect audio oscillator to 678Z-1 NO. 1 AUDIO IN. Connect 678Z-1 AUDIO OUT to 678P-( ) MIKE input.			

Module Checks and Adjustments, AM/Audio Amplifier A9
Figure 722 (Sheet 1 of 6)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3 (Cont)			618T-( ) requires a minimum warmup period of 15 minutes before unit is keyed. Key 618T-( ).			
			Set audio oscillator output level to 0.25 v at 1 kHz as measured at 678Z-1 TEST POINT jack.			
			Connect Ballantine 310A VTVM to A9J4.			
			Check voltage at A9J4.	5.7 v for units with MCN 3508 or above.	A9R6 incorrectly adjusted.	Adjust A9R6.
				8.7 v for units with MCN between 2650 and 3508.	A9R6 incorrectly adjusted.	Adjust A9R6.
				12.0 v for units with MCN below 2650.	A9R5 incorrectly adjusted.	Adjust A9R5.
					A9Q1, A9Q2, and associated circuits.	Check A9Q1, A9Q2, and associated circuits.
			Recheck voltage at 678Z-1 TEST POINT jack with Ballantine 310A.	0.25 v with correct voltage at A9J4.	Incorrect adjustment.	Repeat entire step.
			Disconnect vtvm and audio oscillator.			
			Connect audio oscillator 600-ohm balanced output to 678P-( ) 600Ω BAL AUDIO IN jack.			
			Connect HP-410B VTVM across audio oscillator output.			
(Cont)			Key 618T-( ).			

Module Checks and Adjustments, AM/Audio Amplifier A9
Figure 722 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3 (Cont)			Set audio oscillator output to 1 kHz, 0.78 vrms (as indicated on vtvm).			
			Connect Ballantine 310A VTVM to A9J4.			
			Check voltage at A9J4.	5.7 vrms for units with MCN 3508 or above.	A9R5 incorrectly adjusted.	Adjust A9R5.
				8.7 vrms for units with MCN between 2650 and 3508.	A9R5 incorrectly adjusted.	Adjust A9R5.
				12.0 vrms for units with MCN below 2650.	A9R5 incorrectly adjusted.	Adjust A9R5.
			Check audio oscillator output voltage (as indicated on HP-410B VTVM).	0.78 vrms with correct voltage at A9J4.		
			Disconnect HP-410B VTVM and audio oscillator.			
4	AM receive if. alignment		Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack.			
			Set 714E-( ) to AM.			
			Set 618T-( ) front panel AUDIO control fully clockwise.			
			Disconnect coaxial jumper from RCVR IF. IN connector at left front of 618T-( ).			
			Connect signal generator, through 6-db attenuator, to RCVR IF. IN jack.			
			Set signal generator output to 500 kHz, 30% modulated with 1 kHz.			
(Cont)						

Module Checks and Adjustments, AM/Audio Amplifier A9 (Sheet 3 of 5)
Figure 722

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4 (Cont)			Adjust signal generator output level for 2 to 3 vrms at 678P-( ) HEADSET jack. Adjust A9C18, A9C19, A9L2, A9L3, A9T2 to peak voltage at 678P-( ) HEADSET jack.			
			Increase signal generator output level to 300 uv.			
			Adjust A9T3 to null voltage at 678P-( ) HEADSET jack.			
			Adjust signal generator output level for 5.0 vrms at 678P-( ) HEADSET jack.			
			Note signal generator output level.	Between 100 and 200 uv.	A9R56. NOTE: A9R56 is a selected value of resistance in this circuit.	Replace A9R56 with a resistor selected from complement listed in the 618T-( ) illustrated parts catalog.
			Disconnect vtvm and signal generator.			
5	SELCAL output voltage check		Connect signal generator through 6-db attenuator to RCVR IF. IN jack.			
			Connect Ballantine 310A VTVM to TP12 on module extender.			
(Cont)			Set signal generator to 500 kHz, 500 uv, 30% modulated with 1 kHz.			

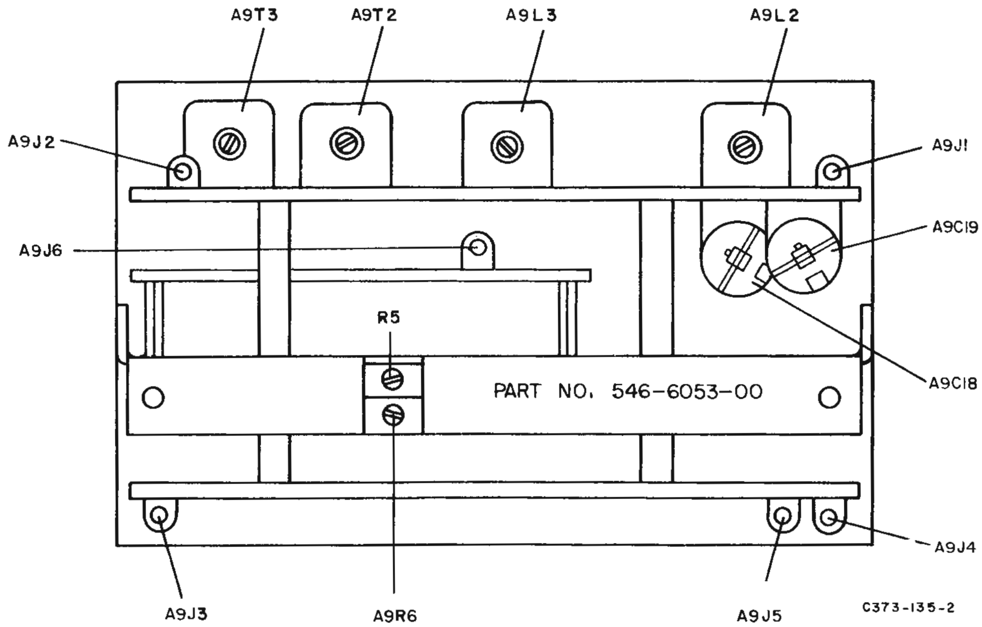
Module Checks and Adjustments, AM/Audio Amplifier A9 (Sheet 4 of 5)
Figure 722

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5 (Cont)			Check voltage at TP12 on module extender.	Not less than 0.1 v.	A9Q9 and associated circuit (late model). A9T4 (early model).	Check A9Q9 and associated circuit (late model). Check A9T4 (early model).
6	1-kHz active filter adjustment (Applicable to AM/audio amplifier A9 MCN 40000 and above.) 618T-( ) with service bulletins as follows: 618T-1/4: 36, 37 618T-1B/4B: 19, 20 618T-2/5: 39, 40 618T-2B/5B: 23, 24 618T-3/6: 40, 41 618T-3B/6B: 24, 25		Connect distortion analyzer to jack J4 on module A9. Key 618T-( ) in CW mode. Adjust A9R62 for minimum distortion at 1 kHz.			

Module Checks and Adjustments, AM/Audio Amplifier A9
Figure 722 (Sheet 5)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7	Disconnect		Reset 618T-( ) front panel AUDIO control according to unit performance test procedures, step 4.G, figure 704. Turn power off. Disconnect all test equipment. Remove A9 from module extender. Remove module extender from 618T-( ) chassis. Replace dust cover on A9. Replace A9 in 618T-( ) chassis. Reconnect coaxial jumper to RCVR IF. IN jack.			

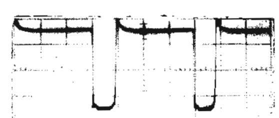
Module Checks and Adjustments, AM/Audio Amplifier A9
Figure 722 (Sheet 6)

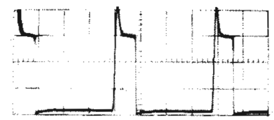
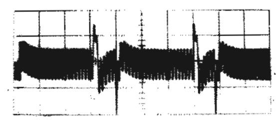
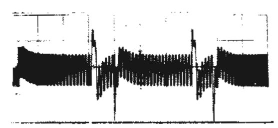
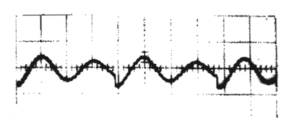


AM/Audio Amplifier A9, Checks and Adjustments
Figure 723

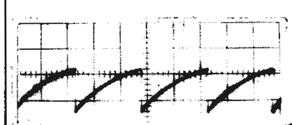
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Boonton 91-C RF VTVM Signal generator 6-db attenuator Oscilloscope	The following test procedure applies to MHz-frequency stabilizer A10, Collins part number 528-0329-005 only. Refer to figure 725 for location of all test points on A10 and module extender. Remove MHz-frequency stabilizer A10 from 618T-( ) chassis and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A10 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect MHz-frequency stabilizer A10 through module extender to 618T-( ) chassis. Unless otherwise specified all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A10J2. Check voltage at A10J2.	+15 to +18 V.	Low-voltage power supply A5.	Check low-voltage power supply A5.

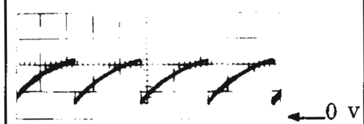
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Late Model (Sheet 1 of 5)
Figure 724

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Hf oscillator dc tuning voltage output check		Connect oscilloscope and HP 410B VTVM dc probe to A10J1.			
			Check voltage at A10J1.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	A1A2Q1 through A1A2Q4 and associated circuits or hf oscillator may need retuning.	Check A1A2Q1 through A1A2Q4 and associated circuits.
4	17.5-MHz oscillator dc tuning voltage output check.		Connect oscilloscope and HP 410B VTVM dc probe to A10J3.			
			Set 714E-( ) operating frequency to any frequency from 2.000 to 6.999 MHz.			
			Check voltage at A10J3.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	A1A1Q1 through A1A1Q4 and associated circuits or 17.5-MHz oscillator may need retuning.	Check A1A1Q1 through A1A1Q4 and associated circuits.
5	Hf oscillator rf rf input check		Connect Boonton 91-C RF VTVM to A10J4.			
			Check voltage at A10J4.	100 mv rms minimum.	A12V11 and associated circuit.	Check A12V11 and associated circuit.
6	17.5-MHz oscillator rf input check		Connect Boonton 91-C RF VTVM to A10J5.			
			Check voltage at A10J5.	100 mv rms minimum.	A12V10 and associated circuit.	Check A12V10 and associated circuit.
7	Squaring amplifier output check		Set oscilloscope for 0.5 V/cm, 0.5 μs/cm.			
			Connect oscilloscope vertical input to A10A3TP1.			
			Check waveform at A10A3TP1.	1.8 v peak to peak.	A10A3Q1 and associated circuit.	Check A10A3Q1 and associated circuit.

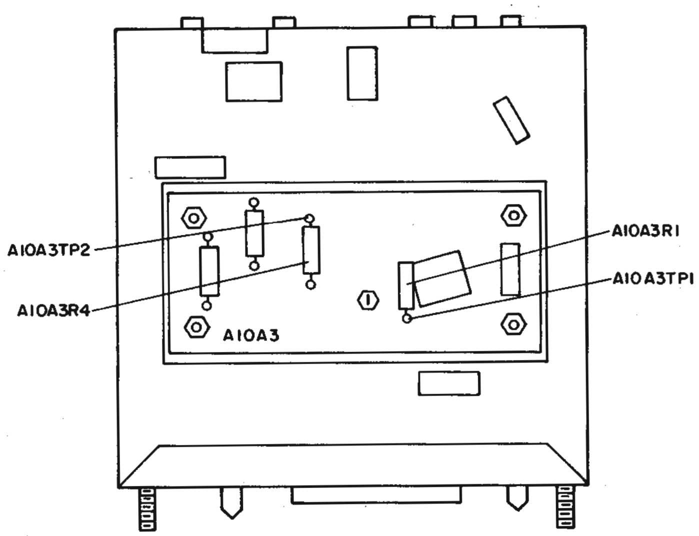
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Pulse generator output check		Set oscilloscope for 5 v/cm, 0.5 μs/cm. Connect oscilloscope vertical input to A10A3TP2. Check waveform at A10A3TP2.	 20 to 28 v peak to peak.	A10A3Q2 and associated circuit.	Check A10A3Q2 and associated circuit.
9	Mixer input check (A10A1Q3)		Set oscilloscope for 0.5 v/cm, 0.5 μs/cm. Connect oscilloscope vertical input to A10A3TP3. Check waveform at A10A3TP3.	 1.2 to 2.0 v peak to peak.	A10A3Q2 and associated circuit.	Check A10A3Q2 and associated circuit.
10	Mixer input check (A10A2Q3)		Set oscilloscope for 0.5 V/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10A2R9 and A10A2R10. Check waveform at junction of A10A2R9 and A10A2R10.	 1.2 to 2.0 v peak to peak.	A10A2Q3 and associated circuit.	Check A10A2Q3 and associated circuit.
11	Mixer output/ if. amplifier input check		Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to A10A1TP4. Check waveform at A10A1TP4.	 0.5 to 0.9 v peak to peak.	A10A1Q3 and associated circuit.	Check A10A1Q3 and associated circuit.
12 (Cont)	Reference spectrum level adjustment		Disconnect coaxial jumpers at A1 and A2 on module extender. Connect HP-410B VTVM dc probe to A10J1.			

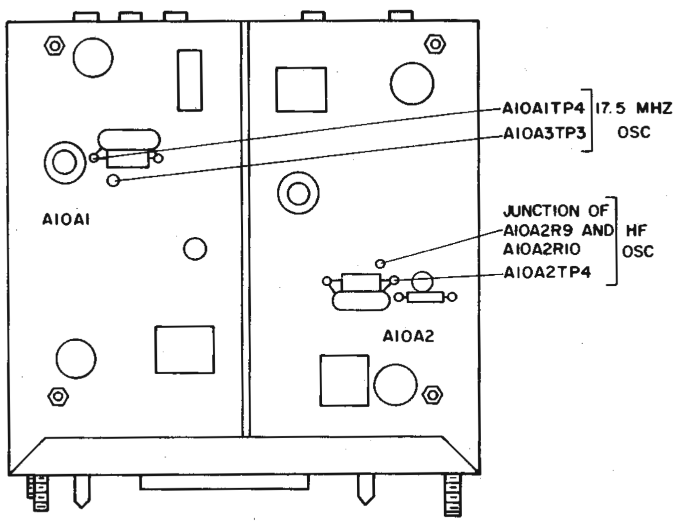
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Late Model (Sheet 3 of 5)
Figure 724

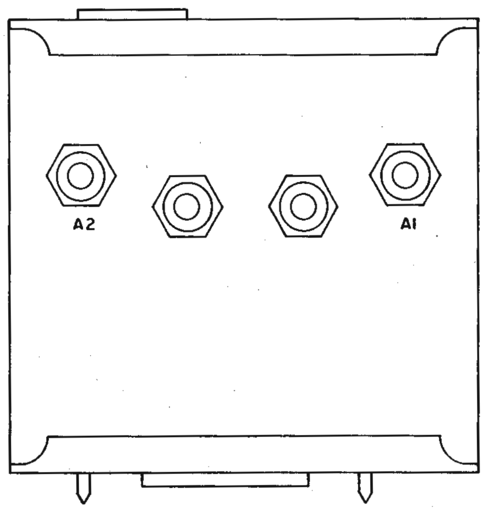
STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12 (Cont)			Check voltage at A10J1.	+6 to +7 v.	A10A3R6 incorrectly adjusted.	Adjust A10A3R6.
			Connect HP-410B VTVM dc probe to A10J3.			
			Check voltage at A10J3. NOTE: If necessary, readjust A10A3R5 and A10A3R6 until the voltage at A10J1 and A10J3 is +6 to +7 v.	+6 to +7 v.	A10A3R5 incorrectly adjusted.	Adjust A10A3R5. NOTE: Do not remove cover from circuit board A3 when performing these adjustments.
13	Recycle check		The two coaxial jumpers remain disconnected. Connect signal generator through 6-db attenuator to module input at A1 on module extender. Connect Boonton 91-C RF VTVM to A10J5. Set signal generator output level for 80 mv at 17.503 MHz (as indicated on Boonton 91-C). Connect oscilloscope vertical input to A10J3. Set oscilloscope for 5 v/cm, dc, 5 ms/cm.			
			Check waveform at A10J3.	 0 v Peak value must be +9 to +12 v. Minimum value must be 0 to +4 v. Period must be 5 to 15 ms.	A10A3Q3 and associated circuit.	Check A10A3Q3 and associated circuit.
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13 (Cont)			Connect signal generator through 6-db attenuator to module input at A2 on module extender. Connect Boonton 91-C RF VTVM to A10J4. Tune signal generator output level for 80 mv at 8.003 MHz (as indicated on Boonton 91-C). Connect oscilloscope vertical input to A10J1. Set oscilloscope for 5 v/cm, dc, 5 ms/cm. Check waveform at A10J1.	 Peak value must be +9 to +12 v. Minimum value must be 0 to +4 v. Period must be 5 to 15 ms.	A10A3Q4 and associated circuit.	Check A10A3Q4 and associated circuit.
14	Disconnect		Turn power off. Disconnect all test equipment. Remove A10 from module extender. Remove module extender from 618T-( ) chassis. Reconnect coaxial jumpers to module extender. Replace dust cover on A10. Replace A10 in 618T-( ) chassis.			

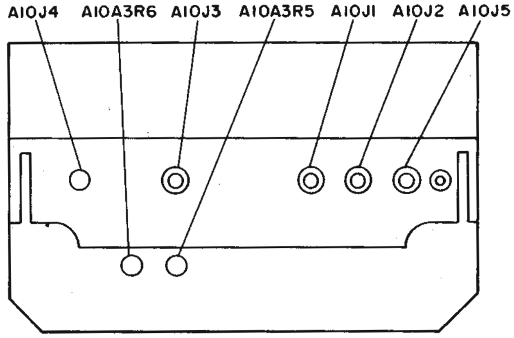
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Late Model (Sheet 5 of 5)
Figure 724







MODULE EXTENDER, REAR VIEW SHOWING TEST POINTS



TOP VIEW OF A10

NOTE:
(1) METAL COVER MUST BE REMOVED FROM A10A3 TO PERFORM TESTS ON CIRCUIT BOARD.

TPO-7120-014

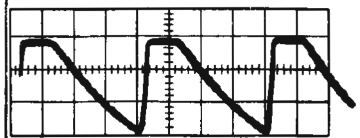
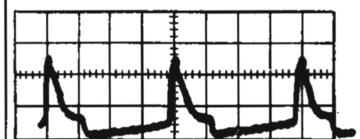
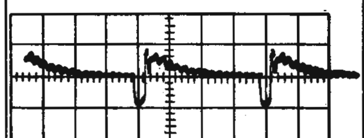
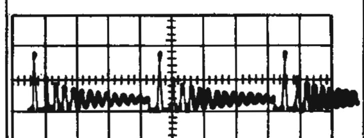
Figure 725

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Boonton 91-C RF VTVM Signal generator 6-db attenuator Oscilloscope	The following test procedure applies to MHz-frequency stabilizer A10, Collins part number 544-9289-005 only. Refer to figure 727 for location of all test points on A10 and module extender. Remove MHz-frequency stabilizer A10 from 618T-( ) and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A10 to perform this step. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Connect MHz-frequency stabilizer A10 through module extender to 618T-( ) chassis. Unless otherwise specified, all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			
2	Transistor supply voltage check		Connect HP-410B VTVM dc probe to A10J2. Check voltage at A10J2.	+15 to +18 Vdc.	Low-voltage power supply A5. L7 open or components shorted on +18-Vdc line.	Check low-voltage power supply A5.

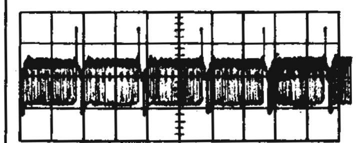
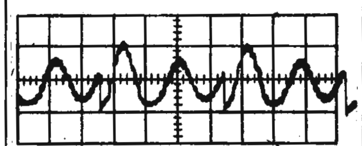
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 1 of 6)
Figure 726

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Hf oscillator dc tuning voltage output check		Connect oscilloscope and HP 410B VTVM dc probe to A10J1.			
			Check voltage at A10J1.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	A10A1Q1 through A10A1Q4 and associated circuits or hf oscillator may need retuning.	Check A10A1Q1 through A10A1Q4 and associated circuits.
4	17.5-MHz oscillator dc tuning voltage output check		Connect oscilloscope and HP 410B VTVM dc probe to A10J3.			
			Set 714E-( ) operating frequency to any frequency from 2.000 to 6.999 MHz.			
			Check voltage at A10J3.	Vtvm should indicate +6.0 to +7.6 Vdc. Oscilloscope trace should show steady dc voltage with no sawtooth effect.	A10A2Q1 through A10A2Q4 and associated circuits or 17.5-MHz oscillator may need retuning.	Check A10A2Q1 through A10A2Q4 and associated circuits.
5	Hf oscillator rf input check		Connect Boonton 91-C RF VTVM to A10J4.			
			Check voltage at A10J4.	100 mv minimum.	A12V11 and associated circuit.	Check A12V11 and associated circuit.
6	17.5-MHz oscillator rf input check		Connect Boonton 91-C RF VTVM to A10J5.			
			Check voltage at A10J5.	100 mv minimum.	A12V12 and associated circuit.	Check A12V12 and associated circuit.
7	500-kHz reference input check		Connect Boonton 91-C RF VTVM to A10J6.			
			Check voltage at A10J6.	Approximately 1.0 v.		

Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 2 of 6)
Figure 726

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Squaring amplifier output check		Set oscilloscope for 3.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10R4 and A10C7. Check waveform at junction of A10R4 and A10C7.		A10Q1 and associated circuit.	Check A10Q1 and associated circuit.
9	Pulse amplifier input check		Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10C7 and A10R5. Check waveform at junction of A10C7 and A10R5.		A10Q1 and associated circuit.	Check A10Q1 and associated circuit.
10	Spectrum generator input check		Set oscilloscope for 5.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10R6 and A10R7. Check waveform at junction of A10R6 and A10R7.		A10Q2 and associated circuit.	Check A10Q2 and associated circuit.
11	Spectrum generator output check		Set oscilloscope for 5.0 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10L4 and A10CR1. Check waveform at junction of A10L4 and A10CR1.		A10Q3 and associated circuit.	Check A10Q3 and associated circuit.
12 (Cont)	Mixer input check (A10A1Q3)		Set oscilloscope for 0.5 v/cm, 1.0 us/cm. Connect oscilloscope vertical input to junction of A10A1C5 and A10A1R7.			

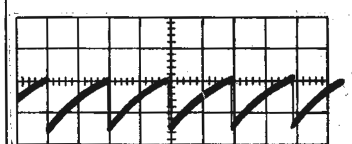
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 3 of 6)
Figure 726

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12 (Cont)			Check waveform at junction of A10A1C5 and A10A1R7.	See waveform in step 13.	Spectrum pulse generator circuit.	Check spectrum pulse generator circuit.
13	Mixer input check (A10A2Q3)		Set oscilloscope for 0.5 v/cm, 1.0 us/cm. Connect oscilloscope vertical input to junction of A10A2C5 and A10A2C7. Check waveform at junction of A10A2C5 and A10A2C7.		Spectrum pulse generator circuit.	Check spectrum pulse generator circuit.
14	Mixer output/ if. amplifier input check (A10A1Q4)		Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10A1C7 and A10A1L2. Check waveform at junction of A10A1C7 and A10A1L2.		A10A1Q3 and associated circuit.	A10A1Q3 and associated circuit.
15	Mixer output/ if. amplifier input check (A10A2Q4)		Set oscilloscope for 0.5 v/cm, 0.5 us/cm. Connect oscilloscope vertical input to junction of A10A2C7 and A10A2L2. Check waveform at junction of A10A2C7 and A10A2L2.	See waveform in step 14.	A10A2Q3 and associated circuit.	A10A2Q3 and associated circuit.

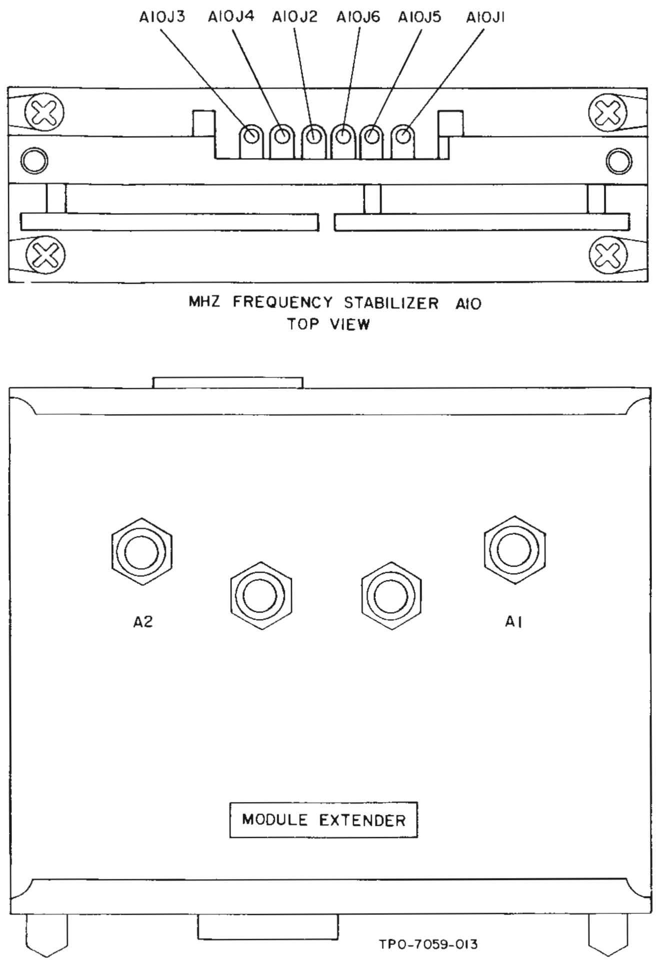
Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 4 of 6)
Figure 726

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
16	Reference spectrum level adjustment		Disconnect coaxial jumpers at A1 and A2 on module extender.			
			Connect HP-410B VTVM dc probe at A10J1.			
			Check voltage at A10J1.	+6.0 to +7.0 v.	A10R7 incorrectly adjusted.	Adjust A10R7.
			NOTE: Adjust A10R7 through hole in spectrum generator board cover.			
			Connect HP-410B VTVM dc probe to A10J3.			
			Check voltage at A10J3.	+6.0 to +7.0 v.	A10R7 incorrectly adjusted.	Adjust A10R7.
			NOTE: If necessary, readjust A10R7 until the voltage at A10J1 and A10J3 is +6.0 to +7.0 v.			
17	Recycle check		Coaxial jumpers on module extender remain disconnected.			
			Connect signal generator through 6-db attenuator to module input at A1 on module extender.			
			Connect Boonton 91-C RF VTVM to A10J5.			
			Set signal generator output level for 80 mv at 17.503 MHz as indicated on Boonton 91-C.			
			Connect oscilloscope to A10J3.			
			Set oscilloscope for 5.0 v/cm, dc, 2 ms/cm.			
(Cont)						

Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 5 of 6)
Figure 726

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont)			Check waveform at A10J3.	See waveform below. Peak value must be +9.0 to +12.0 v. Minimum value must be 0 to +4.0 v. Period must be 2 to 8 ms.	A10Q4 and associated circuit.	Check A10Q4 and associated circuit.
			Connect signal generator output, through 6-db attenuator, to module input at A2 on module extender. Connect Boonton 91-C RF VTVM to A10J4. Set signal generator output level for 80 mv at 8.003 MHz as indicated on Boonton 91-C. Connect oscilloscope vertical input to A10J1. Set oscilloscope for 5.0 v/cm, dc, 2.0 ms/cm. Check waveform at A10J1.	 Peak value must be +9.0 to +12.0 v. Minimum value must be 0 to +4.0 v. Period must be 2 to 8 ms.	A10Q5 and associated circuit.	Check A10Q5 and associated circuit.
18	Disconnect		Turn power off. Disconnect all test equipment. Remove A10 from module extender. Remove module extender from 618T-( ) chassis. Reconnect coaxial jumpers on module extender. Replace dust cover on A10. Replace A10 in 618T-( ) chassis.			

Module Checks and Adjustments, MHz-Frequency Stabilizer A10, Early Model (Sheet 6 of 6)
Figure 726



MHz-Frequency Stabilizer A10, Early Model,
Checks and Adjustments
Figure 727

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control HP-410B VTVM Rf dummy load Audio oscillators (two) Ballantine 310A VTVM HP-711A Power Supply Vom	Refer to figure 729 for location of all test points on A11. WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN POWER AMPLIFIER A11. TURN POWER OFF AND SHORT PLATES OF TUBES TO GROUND BEFORE GAINING ACCESS. CAUTION: DO NOT OPERATE POWER AMPLIFIER A11 MORE THAN 1 SECOND WITH MODULE COVER REMOVED. DAMAGE TO TUBES WILL RESULT. Remove power amplifier A11 from 618T-( ) and perform visual inspection as described in inspection/check section. Remove dust cover from A11 to perform this step. Replace A11 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), HP-410B VTVM, and rf dummy load as shown in figure 702. Unless otherwise specified, all steps are performed with 714E-( ) in AM mode, no signal in, and 618T-( ) unkeyed.			

Module Checks and Adjustments, Power Amplifier A11 (Sheet 1 of 7)
Figure 728

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	Static plate current adjustment		Disconnect coaxial jumper between 500 KC STD and 500 KC REF connectors at right front of 618T-( ). Set front panel meter switch to PA MA. 618T-( ) requires a minimum warmup period of 15 minutes before the unit is keyed. Key 618T-( ). CAUTION: UNKEY IMMEDIATELY IF BLOWER DOES NOT SPEED UP.			
			Read front panel meter on 618T-( ).	280 to 300 MA (meter is read X100).	A11R2 incorrectly adjusted.	Adjust A11R2 to provide required results.
			Unkey 618T-( ) and reconnect coaxial jumper.			
3	Tgc adjustment		CAUTION: DO NOT KEY 618T-( ) WITH POWER AMPLIFIER COVER OFF OR WITH LOOSE COVER SCREWS. Connect HP-410B as in figure 702. Set 714E-( ) to AM, 29.900 MHz for 618T-( ) with MCN below 6500, 2.100 MHz for 618T-( ) with MCN 6500 or above. Key 618T-( ).			
			Check voltage on HP-410B VTVM.	72 v for 618T-( ) with MCN below 6500. 78 v for 618T-( ) with MCN 6500 or above.	TGC ADJ control A11R5 incorrectly adjusted.	Adjust TGC ADJ control A11R5 to provide required results.
			Unkey 618T-( ). Disconnect HP-410B VTVM.			

Module Checks and Adjustments,
Power Amplifier A11
Figure 728 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4	Recycle line check		Change frequency so that band-switch motor will run; reset to original frequency.	When band-switch motor is running, 678P-( ) COUPLER RETUNE lamp is on; when band-switch motor is not running, 678P-( ) COUPLER RETUNE lamp is off.	Relay A11K1.	Check relay A11K1.
5	Adc adjustment		Set 714E-( ) to AM, 2.900 MHz. Remove plug at upper left of power amplifier module cover. Connect HP-410B VTVM dc probe to A11J5. <u>CAUTION:</u> MAKE ADJUSTMENT QUICKLY TO AVOID DAMAGE TO MODULE DUE TO LACK OF COOLING AIR. REPLACE PLUG AS SOON AS ADJUSTMENT IS MADE. Key 618T-( ).			
			Check voltage at A11J5.	-4.75 vdc.	A11R20 incorrectly adjusted.	Adjust A11R20 to provide required results.
			Unkey 618T-( ). Disconnect HP-410B VTVM.			
6 (Cont)	Pep. limiter adjustment (618T-( ), MCN 7389 or below, only)		Connect 678Z-1 J2-IF. TRANS jack to A3J2. Connect 678Z-1 J2-FREQ DIV jack to A1J2.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			<u>NOTE:</u> B versions of the 618T-( ) have no frequency divider module A1 for TGC override, so apply +18 Vdc (using the HP 711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step.			
			Connect 678Z-1 GRND jack to 618T-( ) chassis.			
			Set 678Z-1 TGC & CAPTURE RANGE control fully counterclockwise.			
			Set 678Z-1 FUNCTION SELECTOR switch to TGC OVERRIDE.			
			Set 714E-( ) to USB, 7.300 MHz.			
			Connect vom between A11J1 (+) and A11J4 (-).			
			Key 618T-( ).	Less than 1.0 Vdc.	Bias input not at proper level.	Check alc and bias circuits.
			Unkey 618T-( ).			
			Connect Ballantine 310A VTVM to 678Z-1 TEST POINT jack.			
			Connect an audio oscillator to AUDIO NO. 1 and AUDIO NO. 2 on the 678Z-1.			
(Cont)			Set one audio oscillator to 900 Hz, 0.1 V as indicated by the Ballantine 310A and the other audio oscillator to 2800 Hz, 0.1 V for 618T-1/1B/2/2B/3/3B or 2300 Hz, 0.1 V for 618T-4/4B/5/5B/6/6B as indicated by the Ballantine 310A.			

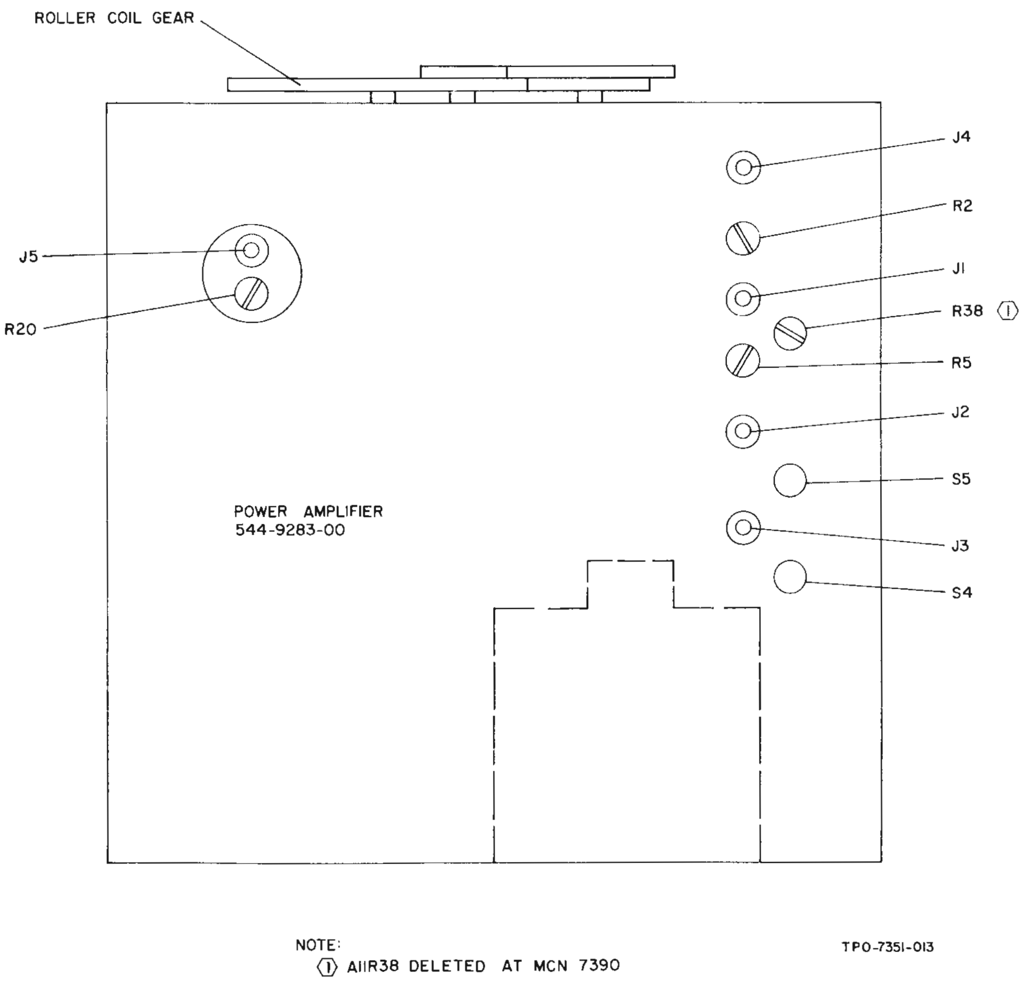
Module Checks and Adjustments, Power Amplifier A11
Figure 728 (Sheet 4)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Connect HP-410B VTVM as shown in figure 702. CAUTION: DO NOT KEEP THE 618T-( ) RF OUTPUT VOLTAGE AT ITS MAXIMUM VALUE ANY LONGER THAN NECESSARY TO NOTE THE MAXIMUM INDICATION. SET THE 678Z-1 TGC & CAPTURE RANGE CONTROL FULLY COUNTERCLOCKWISE AFTER NOTING THIS VOLTAGE. Key 618T-( ). Turn 678Z-1 TGC & CAPTURE RANGE control clockwise until the dc voltage between A11J1 and A11J4 begins to change. This is grid current threshold.			
			Check rf output voltage on HP-410B VTVM.	161 v maximum.	A11R38 incorrectly adjusted.	Adjust A11R38 to provide required results.
			Disconnect audio oscillators and vom.			
7	Power amplifier grid voltage check		Connect HP-410B VTVM dc probe A11J1. Set 714E-( ) to AM. Key 618T-( ).			
			Check voltage at A11J1.	-55 to -85 vdc. (Record this reading for reference.)	Bias circuit.	Check bias circuit.
			Unkey 618T-( ).			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Tgc reference voltage check		Connect HP-410B VTVM to A11J2.			
			Set 714E-( ) to AM.			
			Key 618T-( ).			
			Check voltage at A11J2.	-5 to -7 v.	A11R4, A11R5, and/or A11CR6 (late model only).	Check A11R4, A11R5, and/or A11CR6 (late model only).
					A11R4, A11R5, and/or A11R25 (early model only).	Check A11R4, A11R5, and/or A11R25 (early model only).
			Unkey 618T-( ).			
9	Power amplifier screen voltage check		Connect HP-410B VTVM dc probe to A11J3.			
			Set 714E-( ) to AM.			
			Key 618T-( ).			
			Check voltage at A11J3.	370 to 430 Vdc.	PA B+ abnormal; A11R29 through A11R34, A11C38, A11C45, A11C51, and A11C52.	Check PA B+ A11R29 through A11R34, A11C38, A11C45, A11C51, and A11C52.
			Unkey 618T-( ).			
10	Bias supply voltage check		Connect vom between A11J1 (+) and A11J4 (-).			
			Set 714E-( ) to AM.			
			Key 618T-( ).			
			Check voltage between A11J1 and A11J4.	Approximately 1.5 vdc less than voltage at A11J1 (see reference in step 7).	Bias circuit.	Check bias circuit.
			Unkey 618T-( ).			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11	(Deleted)					
12	Disconnect		Turn power off. Disconnect all test equipment.			

Module Checks and Adjustments, Power Amplifier A11 (Sheet 7 of 7)
Figure 728



Power Amplifier A11, Checks and Adjustments
Figure 729

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1 (Cont)	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 678Z-1 Function Test Set 714E-( ) Radio Set Control Signal generator Boonton 91-C RF VTVM Frequency counter 6-db attenuator 51S-1 Receiver Ballantine 310A VTVM Vom HP-711A Power Supply Rf dummy load	Refer to figure 731 for location of all test points on A12. Remove rf translator A12 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A12 to perform this step. Replace A12 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12 top cover plate by pulling cover off with fingers inserted in cover holes. <u>NOTE:</u> When necessary to use module extender, test setup is as follows: Connect rf translator A12, through module extender, to 618T-( ) chassis. Disconnect coaxial jumper at J34 on module extender. Connect signal generator, through 6-db attenuator, to module input at J34 on module extender. Set signal generator to 500 kHz, unmodulated. Remove block holding J30 and J31 on module extender. J30 and J31 mate with plugs P2 and P3 on rf translator A12.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1 (Cont)			Connect RF TRANSLATOR LOAD, supplied in 678Y-( ) Maintenance Kit, to P2 and P3. Make this connection so that blue test point on RF TRANSLATOR LOAD is on the same side as P2. Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Certain low-voltage signals may require a Boonton 91-C RF VTVM. Unless otherwise specified, perform all steps with 714E-( ) in AM mode at 2.XXX MHz, no signal in, and 618T-( ) unkeyed.			
2	17.5-MHz oscillator output check		Connect Boonton 91-C RF VTVM to A12J1.			
			Check voltage at A12J1.	0.9 v (min).	17.5-MHz oscillator and associated circuit.	Check 17.5-MHz oscillator and associated circuit.
			Connect frequency counter to A12J1.			
			Check frequency at A12J1.	17.5 MHz ±14 Hz.		
3	Hf oscillator output check		Connect Boonton 91-C RF VTVM to A12J7.			
			Check voltage at A12J7.	0.6 v (min).	Hf oscillator and associated circuit.	Check hf oscillator and associated circuit.
			Connect frequency counter to A12J7.			
			Check frequency at A12J7.	12.5 MHz ±10 Hz.		

Module Checks and Adjustments, RF Translator A12 (Sheet 2 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4	Vfo/vco output voltage check		Connect Boonton 91-C RF VTVM to A12J5. Check voltage at A12J5.	0.6 v (min).	Insufficient input level to vfo/vco.	Check vfo/vco input level.
5	Bandpass filter (low-frequency end) check		Connect Boonton 91-C RF VTVM to A12J2. 618T-( ) requires a minimum warm-up period of 15 minutes before unit is keyed. Key 618T-( ). Check voltage at A12J2. Unkey 618T-( ).	50 to 350 mv.	Tubes, supply voltages.	Check tubes and supply voltages.
6	Rf amplifier grid voltage check		Connect Boonton 91-C RF VTVM to A12J3. Key 618T-( ). Check voltage at A12J3. Unkey 618T-( ).	From 50 to 200 mv.	High-frequency mixer or coil assembly defective or misaligned.	Check A12S4 through A12S7. Align rf circuits (step 15).
7	Driver grid voltage check		Connect Boonton 91-C RF VTVM to A12J4. Key 618T-( ). Check voltage at A12J4. Unkey 618T-( ).	From 2.0 to 4.5 v.	Rf amplifier or coil assembly defective or misaligned.	Check and align rf circuits (step 15).
8 (Cont)	Recycle line check		Set 714E-( ) to 2.100 MHz, AM. Reset 714E-( ) to 3.100 MHz.			

Module Checks and Adjustments, RF Translator A12
Figure 730 (Sheet 3)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8 (Cont)			Check 678P-( ) COUPLER RETUNE lamp as 618T-( ) is recycling.	678P-( ) COUPLER RETUNE lamp should light as 618T-( ) is recycling.	A12K3, chassis relay K4.	Check A12K3 and chassis relay K4.
			Set 714E-( ), in turn, to 2.200, 2.110, and 2.101 MHz checking 678P-( ) COUPLER RETUNE lamp each time 618T-( ) recycles.	Same as above.		
9	Vfo check and alignment (618T-1/2/3)					
A	Tracking check		Connect frequency counter, through 678Y-( ) probe no. 1, to A12J5.			
			Ground A12J8 to 618T-( ) chassis.			
			NOTE: There are two CALIBRATION SET UP POINTS (frequency offset) stamped on the vfo case. Enter these points on the graph of figure 732. Connect the two points with a straight line drawn across the graph.			
			Set 714E-( ) to 2.999 MHz and record frequency counter indication on graph.	2.501 MHz, + frequency offset, ±600 Hz from line on graph.		
(Cont)			Set 714E-( ) to 2.000 MHz and record frequency counter indication on graph.	3.500 MHz, + frequency offset, ±600 Hz from line on graph.		

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9A (Cont)			Plot the midpoint frequencies of the vfo by setting the 714E-( ) to 2.111, 2.222, 2.333, 2.444, 2.555, 2.666, 2.7777, and 2.888 MHz; record the frequency counter indication at each point.	±1 kHz from line on graph.	Vfo out of alignment	Perform vfo alignment (step 9.C).
			Unground A12J8.			
B	Capture range check		Frequency counter remains connected to A12J5.			
			Set 714E-( ) to 2.999 MHz.	Frequency counter indication should be 2.501 MHz ±0.8 ppm. Record this reading for reference.		
			Connect 678Z-1 J2-FREQ DIV jack to A1J2.			
			Connect 678Z-1 GRND jack to 618T-( ) chassis.			
(Cont)			NOTE: If kHz-frequency stabilizer A4 is Collins part number 528-0112-005, connect 678Z-1 J3-KC STAB jack to A4J3, and place 678Z-1 FUNCTION SELECTOR switch in 70K-5 CAPTURE RANGE position. That position is also correct for vfo 70K-9. If kHz-frequency stabilizer A4 is Collins part number 544-9288-005, connect			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9B (Cont)			678Z-1 J1-KC STAB jack to A4J1, and place 678Z-1 FUNCTION SELECTOR switch in 70K-3 CAPTURE RANGE position.			
			Ground A12J8 to 618T-( ) chassis.			
			Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz higher than reference.			
			Without changing setting of 678Z-1 R3, unground A12J8.	Frequency indication should return to that of reference within 1 second.	Locking circuits in kHz frequency stabilizer A4.	Perform applicable step in kHz-frequency stabilizer A4 test procedures (figure 714).
			Ground A12J8.			
			Adjust R3 on 678Z-1 for a frequency indication between 3.5 and 4.0 kHz lower than reference.			
			Without changing setting of 678Z-1 R3, unground A12J8.	Same as above.	Same as above.	Same as above.
			Repeat above procedure with 714E-( ) set to 2.000 MHz. Reference indication should be 3.500 MHz ±0.8 ppm per month (all other steps and indications should be identical).			
(Cont)			Disconnect 678Z-1.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)						
C	Alignment		If the vfo did not check out as in steps 9.A and 9.B, perform the following steps: Leave frequency counter connected and ground A12J8.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9C (Cont)			CAUTION: ON 70K-9 VFO, DO NOT LOOSEN SET-SCREWS ON OLDHAM COUPLER SECURED TO VFO SHAFT. DAMAGE TO VFO MAY RESULT DUE TO LOSS OF END STOP CALIBRATION Set 714E-( ) to 2.999 MHz and loosen the screws securing the Oldham coupler to the Auto-positioner shaft. Manually twist the vfo drive shaft to obtain 2.501 MHz + frequency offset, ±200 Hz. Tighten Oldham coupler. Set 714E-( ) to 2.000 MHz, and remove cap on vfo to expose A12A2L1. Adjust A12A2L1 for 3.500 MHz, +frequency offset, ±200 Hz. NOTE: L1 cap may affect frequency. Replace cap after adjustment and reread frequency. Repeat the above steps until the proper indication is obtained. If unable to obtain proper results, after several tries, send vfo to Collins Radio Co. for repair. Unground A12J8 and disconnect frequency counter.			
10 (Cont)	17.5-MHz oscillator phase-locking check and alignment					

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10A (Cont)	17.5-MHz oscillator phase-locking check using 51S-1 Receiver		Couple 51S-1 Receiver to the 17.5-MHz oscillator by placing the receiver antenna wire near oscillator tube A12V10.			
			Set 714E-( ) to any frequency between 2.000 and 6.999 MHz.			
			Tune 51S-1 Receiver to 17.5 MHz.			
			Ground A10J3.	Oscillator will unlock and vary slightly from 17.5 MHz.		
			Unground A10J3.	Oscillator should lock to 17.5 MHz.	17.5-MHz oscillator circuit aligned improperly.	Proceed to step 10B.
			If indication is normal, proceed to step 11.			
10A (Alternate)	17.5-MHz oscillator phase locking check (alternate) using frequency counter		Connect frequency counter (use no 1 probe) to A12J1.			
			Set 714E-( ) to any frequency between 2.000 and 6.999 MHz.			
			Note frequency counter indication.			
			Ground A10J3.	Oscillator will unlock and vary slightly from 17.5 MHz.		
			Unground A10J3.	Oscillator should lock to 17.5 MHz.	17.5-MHz oscillator circuit aligned improperly.	Proceed to step 10B.
			If indication is normal, proceed to step 11A (alternate).			
B	17.5-MHz oscillator phase-locking alignment		Connect HP 410B VTVM dc probe to A10J3.			
(Cont)			Adjust A12L90 until the 17.5-MHz oscillator locks at 17.5 MHz and the voltage at A10J3 is +6.3 to +7.3 V.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
10B (Cont)			Connect Boonton 91-C RF VTVM to A12J1.			
			Adjust A12T4 to peak voltage at A12J1.			
			Repeat step 10A.	Phase-locking restored.	17.5-MHz oscillator circuit, MHz-frequency stabilizer A10.	Check 17.5-MHz oscillator and MHz-frequency stabilizer A10.
11	Hf oscillator phasing-locking check and alignment					
A	Hf oscillator phase-locking check using 515-1 Receiver		Couple 51S-1 Receiver to hf oscillator by placing receiver antenna wire near oscillator tube A12V11.			
			Set 714E-( ), in turn, to each frequency listed in figure 733.			
			Tune 51S-1 Receiver, in turn, to each of the hf oscillator frequencies corresponding to the 714E-( ) frequency.			
			Ground A10J1 momentarily at each frequency.	Hf oscillator must unlock when A10J1 is grounded; relock to original frequency when A10J1 is ungrounded.	Coils in coil block A12Z5 incorrectly Adjusted.	Continue test.
			If the indications are normal, proceed to step 12.			
(Cont)			NOTE: If the preceding checks indicate that the hf oscillator is unlocked on some of the bands, perform the following adjustment. If the hf oscillator is unlocked on all bands, refer to the MHz-frequency stabilizer A10 checks and adjustments.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11A (Alternate)	Hf oscillator phase-locking check using frequency counter		Connect frequency counter (use no 1 probe) to A12J7.			
			Set 714E-( ), in turn, to each frequency listed in figure 733.			
			Ground A10J1 momentarily at each frequency.	Hf oscillator must unlock when A10J1 is grounded; relock to original frequency when A10J1 is ungrounded.	Coils in coil block A12Z5 incorrectly adjusted.	Continue test.
			If indications are normal, proceed to step 12.			
			NOTE: If the preceding checks indicated that the hf oscillator is unlocked on same of the bands, perform the following adjustment. If the hf oscillator is unlocked on all bands, refer to the MHz-frequency stabilizer checks and adjustments.			
B	Hf oscillator phase-locking alignment (perform this only if results of step 11A were abnormal)		Place rf translator A12 on module extender supplied in 678Y-( ) Maintenance Kit. This procedure can be accomplished with the module mounted in the chassis if the chassis is a late version.			

Module Checks and Adjustments, RF Translator A12 (Sheet 9 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11B (Cont)			(MCN 21332 and above). Holes have been provided for this purpose. Perform setup procedure detailed, in note, in step 1 of this test procedure. <u>NOTE:</u> The following adjustments are made at coil block A12Z5. Coils in this block may be adjusted through holes in rf translator A12 sideplate opposite gearplate. Refer to silk screening above adjustment holes for number and location of each coil in coil block. Connect HP-410B VTVM dc probe to A10J1. Set 714E-( ) to frequency at which the oscillator is unlocked. Refer to figure 733. Adjust the proper coil in A12Z5 until the hf oscillator locks at the correct frequency. Continue to adjust the coil until the voltage at A10J1 is +6.3 to +7.3 v. <u>NOTE:</u> If on any band, the coil core adjustment range is insufficient to lock the oscillator, set that core flush with the block surface. Adjust the common (C) coil for proper lock. Whenever the core in the common (C) coil is			
(Cont)						

Module Checks and Adjustments, RF Translator A12 (Sheet 10 of 34) Feb 15/68
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11B (Cont)			repositioned, all individual band coils must be repositioned. When test is completed, remove rf translator A12 from module extender, and install A12 in 618T-( ) chassis. Connect Boonton 91-C RF VTVM to A12J7. Set 714E-( ) to 6.XXX MHz. Adjust bottom core in A12T5 to peak voltage at A12J7. Set 714E-( ) to 14.XXX MHz. Adjust top core in A12T5 to peak voltage at A12J7. Set 714E-( ) to 29.XXX MHz. Adjust A12C187 to peak voltage at A12J7. Repeat above three steps. Repeat step 11A. <u>NOTE:</u> If the preceding adjustments fail to restore hf oscillator phase-locking, refer to MHz-frequency stabilizer A10 checks and adjustments.			
12 (Cont)	Receive if. output adjustment		Set 714E-( ) frequency selector to 9.990 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise. Set AUDIO control on 618T-( ) front panel fully clockwise.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12 (Cont)			Connect HP-410B VTVM ac probe to 678P-( ) HEADSET jack. Connect signal generator, through 6-db attenuator, to AUX RCVR ANT jack at left front of 618T-( ). Set signal generator to 9.990 MHz, 30% modulated with 1 kHz. Adjust signal generator to provide 3 v at 678P-( ) HEADSET jack. Tune signal generator around 9.990 MHz to peak the voltage at 678P-( ) HEADSET jack. Adjust A12T3 to peak voltage at 678P-( ) HEADSET jack. Keep voltage at HEADSET jack below 3.5 vrms while making this adjustment by reducing signal generator output level. NOTE: For rf translator A12 MCN 6392 and above, the following adjustment must be performed. Set 714E-( ) to lowest gain band as determined in step 2A of unit performance test procedures, figure 704. Set signal generator to frequency corresponding to that set on 714E-( ) with 3.0-uv output modulated 30% with 1.0 kHz.			
(Cont)						

Module Checks and Adjustments, RF Translator A12 (Sheet 12 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12 (Cont)			Adjust A12R78 to provide approximately 3.7 vrms at 678P-( ) HEADSET jack.			
13 (Cont)	Variable/ bandpass if alignment check		Place rf translator A12 on module extender supplied in 678Y-( ) Maintenance Kit. Perform setup procedure detailed in note in step 1 of this test procedure. Connect HP-410B VTVM ac probe, through test probe no. 2 (supplied in 678Y-( ) Maintenance Kit), to A12J2. Ground A12J3 to 618T-( ) chassis. CAUTION: DAMAGE TO THE RF PLATE COILS MAY RESULT FROM FAILURE TO GROUND A12J3. Set 714E-( ) to 6.000 MHz. Key 618T-( ). Adjust signal generator to provide 0.5 V at A12J2. Vary 714E-( ) frequency from 6.000 MHz in 100-kHz steps. NOTE: If the maximum-to-minimum voltage at A12J2 is more than 2:1 across the frequency range, complete this test procedure. If the variation is less than 2:1, both the variable and bandpass if. circuits are aligned properly.			

Module Checks and Adjustments, RF Translator A12 (Sheet 13 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13 (Cont)			Set 714E-( ) to 8.000 MHz. Adjust signal generator to provide 0.5 V at A12J2. Vary 714E-( ) from 8.000 to 8.999 MHz in 100-kHz steps. If the maximum-to-minimum voltage at A12J2 is more than 2:1 across the frequency range, perform the variable if. alignment procedure. If the variation is within the specified limits, perform the bandpass if. alignment procedure.			
A	Variable if. alignment		Ground A12J3 to 618T-( ) chassis. Connect HP-410B VTVM ac probe to A12J2. Replace hf oscillator tube A12V11 with a 6AH6WA tube with pin 1 cut off. Set 714E-( ) to 8.999 MHz, AM. Key 618T-( ). Adjust signal generator to provide approximately 0.5 v at A12J2. Keep voltage at A12J2 constant by varying signal generator output level during the following procedure.			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13A (Cont)			Adjust A12L2, A12L3, A12L4, and A12L130 to peak voltage at A12J2. A12L130 may be adjusted to give two peaks. Adjust for the peak that provides the highest voltage at A12J2. NOTE: If rf translator A12 MCN is below 1508, A12C273 replaces A12L130. The adjustment procedure is the same. Set 714E-( ) to 8.000 MHz. Key 618T-( ). Adjust A12C7, A12C10, and A12C13 to peak voltage at A12J2. Repeat peaking procedure until no further improvement can be made. Set 714E-( ) to OFF. Remove 6AH6WA tube, and replace it with the original tube.			
			NOTE: At this point repeat step 13, variable/bandpass if. alignment check.	Variable if. circuits aligned properly.	Variable if. circuits aligned incorrectly.	Continue test procedure.
(Cont)			Set 714E-( ) to X.500 MHz. Check that both slug racks are equal in height above the chassis (within 1/32 inch). If they are not, loosen setscrews in slug rack gear, and position racks properly. Tighten setscrews.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13A (Cont)			Set 714E-( ) to X.600 MHz; reset to X.500 MHz. Again check to see that slug racks are positioned at the same height. If they are not, reposition them.			
			Set 714E-( ) to X.000 MHz.			
			Turn power off.			
			Remove rf translator A12 from module extender.			
			Remove bottom cover plate from A12.			
			Inspect, from bottom of module, slugs and capacitor driven by slug rack.			
			Measure distance from capacitor bottom to capacitor form bottom.	A12C139-1/8 in.		
			Measure distance from slug bottoms to coil bottoms.	A12L6-1/4 in. A12L37-1/4 in. A12L40-1/4 in. A12L59-11/32 in.	Slugs and/or capacitor adjusted incorrectly.	Adjust slugs and/or capacitor from top of module. Use no. 8 Bristol wrench supplied in 678Y-( ) Maintenance Kit.
(Cont)			NOTE: If any of the preceding mechanical adjustments are made, repeat peaking procedures performed earlier in this step.	NOTE: In rf translator A12, Collins part number 528-0113-00 (early model), A12L6, A12L37, A12L40, and A12C139 are adjusted as above. Coils A12L59 and A12L41 are adjusted as follows: A12L59-15/32 in. A12L41-1/4 in.		

Module Checks and Adjustments, RF Translator A12 (Sheet 16 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13A (Cont)			Replace bottom cover plate on A12. Unground A12J3. Replace rf translator A12 on module extender.			
B	Bandpass if. alignment		NOTE: Before performing this step, perform step 13, variable/bandpass if. alignment check, to determine if the following alignment procedure is required. Ground A12J3 to 618T-( ) chassis. Connect HP-410B VTVM ac probe to A12J2. Set 714E-( ) to 6.500 MHz, AM. Key 618T-( ). Adjust signal generator to provide approximately 0.5 vrms at A12J2. Keep voltage at A12J2 constant, by varying signal generator output level, during the following peaking procedure. CAUTION: IN THE FOLLOWING STEP, ADJUST THE TWO COILS ONLY. DO NOT ADJUST ANY OTHER COIL IN A12FL1 AT THIS TIME.			
(Cont)						

Module Checks and Adjustments, RF Translator A12 (Sheet 17 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13B (Cont)			Adjust A12L123 then A12L128 to peak voltage at A12J2. These adjustments are made through holes in module end plate nearest filter A12FL1.			
			NOTE: At this point repeat step 13, variable/bandpass if. alignment check.	Bandpass if. circuits aligned properly.	Bandpass if. circuits aligned incorrectly.	Continue test procedure.
13C	Internal adjustment of A12FL1		CAUTION: THE FOLLOWING STEPS ARE NOT A PART OF THE NORMAL ALIGNMENT PROCEDURE. THE COILS IN A12FL1 ARE PREADJUSTED AT THE FACTORY.			
			NOTE: The coils in A12FL1 should be adjusted only if it is known that they are out of alignment. For instance, it is possible that one of the coils could be inadvertently adjusted. All coils in A12FL1 would then have to be realigned.			
			Replace 17.5-MHz oscillator tube A12V10 with a 6AH6WA tube with pin 1 cut off.			
			Remove A12V2.			
			Connect A12V2, through 9-pin tube extender supplied in 678Y-( ) Maintenance Kit, to rf translator A12 chassis.			
			Connect signal generator, through 6-db attenuator, to pin 2 of A12V2.			
(Cont)			Set signal generator to 15.000 MHz.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13C (Cont) (Cont)			Connect Boonton 91-C RF VTVM, through tube extender, to pin 1 or 6 of A12V2. Set 714E-( ) to 6.500 MHz, AM. Key 618T-( ). Adjust signal generator output level to provide approximately 0.5 vrms as read on Boonton 91-C RF VTVM. <u>NOTE:</u> The following adjustments are made through holes in module end plate nearest A12FL1. Refer to silk screening near adjustment holes for location of specific test and adjustment points. Ground test point 1. Adjust A12L123 for a peak indication on Boonton 91-C RF VTVM. Unground test point 1. Ground test point 2. Adjust A12L125 for a null indication on Boonton 91-C RF VTVM. Unground test point 2. Ground test point 3. Adjust A12L126 for a peak indication on Boonton 91-C RF VTVM. Unground test point 3. Ground test point 4.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13C (Cont)			Adjust A12L127 for a null indication on Boonton 91-C RF VTVM. Unground test point 4. Adjust A12L128 for a peak indication on Boonton 91-C RF VTVM. Disconnect signal generator from A12V2. Remove tube extender from A12V2 and replace A12V2 in rf translator A12 chassis. Replace original A12V10 in rf translator A12 chassis. NOTE: At this point repeat step 13, variable/bandpass if alignment check.	Bandpass if. circuits aligned properly.	Bandpass if. circuits aligned incorrectly. A12FL1 defective.	Repeat steps 13B and 13C of this test procedure. Replace A12FL1.
14 (Cont)	Transmit gain check		Connect signal generator, through GENERATOR LOAD (supplied in 678Y-( ) Maintenance Kit), to J34 on module extender. Connect RF TRANSLATOR LOAD, supplied in 678Y-( ) Maintenance Kit, to A12P2 and A12P3 so that the blue test point is connected to A12P2. Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Set signal generator to 500 kHz unmodulated. Set 714E-( ) to AM, 2 MHz. Key 618T-( ).			

Module Checks and Adjustments, RF Translator A12 (Sheet 20 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
14 (Cont)			Adjust signal generator output level for 40 vrms on HP-410B VTVM.	Not more than 4000-uv signal generator output.		
			CAUTION: DO NOT EXCEED 40 VRMS AT RF TRANSLATOR LOAD BLUE TEST POINT OR DAMAGE TO DRIVER PLATE LOAD MAY RESULT.			
			Set signal generator to provide 20 v on HP-410B VTVM.			
			Set 714E-( ) to AM, 2.999 MHz.			
			Key 618T-( ).			
			Adjust signal generator output level for 40 v on HP-410B VTVM.	Signal generator output level should be within 12 db of output required for 40 v at 2 MHz.		
			Repeat above procedure at 1-MHz increments for entire frequency range (2 to 2.999 MHz through 29 to 29.999 MHz).	Signal generator output level required to produce 40 vrms on the HP-410B VTVM should not vary more than 12 db across any one band.	RF circuits not aligned properly.	Perform step 15 of this test procedure.
			Set 714E-( ) to OFF.			
			Disconnect signal generator, HP-410B VTVM, GENERATOR LOAD, and RF TRANSLATOR LOAD.			
			Reconnect jumper to J34 on module extender.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15 (Cont)	Rf circuit alignment using 51S-1 Receiver (refer to step 15A for alternate)		Remove turret cover plate. Set 714E-( ) to 2.XXX MHz, AM. Check turrets (A12S1 through A12S7) from top of module to see that turret contacts in line with color-code dots on turrets are making contact with fixed contacts on module chassis. If they are not, loosen clamp on turret shaft gear, insert screwdriver into slot in end of turret shaft, and rotate turrets counter-clockwise until they are aligned properly. Tighten clamp on turret shaft gear. Set 714E-( ) to 3.XXX MHz; reset 714E-( ) to 2.XXX MHz. If turret contacts do not return to proper alignment position, repeat above step. Couple 51S-1 Receiver to rf translator A12 rf output by placing receiver antenna lead wire near driver tubes A12V6 and A12V7. Observe receiver S-meter peaking indication to determine that rf adjustments in the following steps are being made at proper frequency. Set 714E-( ) to 2.000 MHz, AM. Connect 678Z-1 J2 IF. TRANS jack to test point J2 in if. translator A3.			

Module Checks and Adjustments, RF Translator A12 (Sheet 22 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15 (Cont)			Connect 678Z-1 J2-FREQ DIV jack to test point J2 in frequency divider A1. <u>NOTE:</u> B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 678Z-1 FUNCTION SWITCH to TGC OVERRIDE. Set 678Z-1 TGC & CAPTURE RANGE control R3 fully counterclockwise. Connect RF TRANSLATOR LOAD as in step 14 of this test procedure. Key 618T-( ). Connect HP-410B VTVM ac probe to blue test point on RF TRANSLATOR LOAD. Slowly adjust TGC & CAPTURE RANGE control to provide approximately 30 v at RF TRANSLATOR LOAD blue test point. <u>CAUTION:</u> KEEP VOLTAGE AT RF TRANSLATOR LOAD BLUE TEST POINT BELOW 40 VRMS WHILE MAKING THE FOLLOWING ADJUSTMENTS. Adjust A12L9A, A12L23A, and A12L43A to peak voltage			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15 (Cont)			at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 2.999 MHz, AM. Adjust A12L7, A12L38, and A12L42 to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 2.000 MHz, AM. Adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils in turrets to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 29.999 MHz, AM. Adjust A12C27, A12C103 and A12C65 to peak voltage at RF TRANSLATOR LOAD blue test point. Set 714E-( ) to 29.000 MHz, AM. Adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils in turrets to peak voltage at RF TRANSLATOR LOAD blue test point. Repeat above steps on 2- and 29-MHz bands, until no further improvement is noted. Replace turret cover plate. Set 714E-( ), in turn, to 3.000 MHz, 4.000 MHz, through 29.000 MHz. At each			
(Cont)						

Module Checks and Adjustments, RF Translator A12 (Sheet 24 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15 (Cont)			frequency, adjust the MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils, through holes in turret cover plate, to peak voltage at RF TRANSLATOR LOAD test point. Place A12 in 618T-( ) chassis. Set A12S15 to off (fully counterclockwise). CAUTION: NEVER OPERATE A12S15 WHILE KEYING 618T-( ). Set 714E-( ), in turn, to 3.500 MHz, 4.500 MHz, through 29.500 MHz, and adjust the DRIVER PLATE coil to peak voltage at 618T-( ) rf output. Set A12S15 to on (fully clockwise).			
15A	Rf circuit alignment (alternate) using signal generator		Remove turret cover plate. Set 714E-( ) to 2.XXX MHz, mode selector to AM. Check turrets (A12S1 through A12S7) from top of module to see that turret contacts in line with color-coded dots on turrets are making contact with fixed contacts on module chassis. If they are not, loosen clamp on turret shaft gear, insert screwdriver into slot in end of turret shaft, and rotate turrets counterclockwise until they are aligned properly. Tighten clamp on turret shaft gear.			

Module Checks and Adjustments, RF Translator A12
(Sheet 24A of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15A (Cont)			Set 714E-( ) to 3.XXX MHz; reset to 2.XXX MHz. If turret contacts do not return to proper alignment position, repeat above step.			
			Set 714E-( ) to 2.000 MHz.			
			Remove tubes A12V10 and A12V11.			
			Set signal generator to 2.000 MHz, output level to minimum.			
			Using no 2 probe, connect signal generator through 6-dB attenuator to J2.			
			Connect HP 410B vtvm to probe T-connector in rf output line.			
			CAUTION: DO NOT EXCEED 70 VOLTS ON HP 410B VTVM DURING FOLLOWING TESTS.			
			Set switch A12S15 (FEEDBACK) to maximum ccw position.			
			CAUTION: NEVER OPERATE SWITCH A12S15 WHILE 618T-( ) IS KEYED.			
			Key 618T-( ) and adjust signal generator to provide approximately 30 volts as measured on HP 410B VTVM.			
			Adjust A12L9A, A12L23A, and A12L43A to peak voltage on HP 410B. Readjust signal generator to maintain approximately 30 volts on HP 410B.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15A (Cont)			NOTE: Adjust signal generator to keep output voltage on HP 410B at approximately 30 volts during remainder of this test. With 618T-( ) keyed, adjust MIXER PLATE, RF AMP GRID, and RF AMP PLATE coils to peak voltage on HP 410B. Unkey 618T-( ). Set signal generator and 714E-( ) to 2.999 MHz. Key 618T-( ) and adjust A12L7, A12L38, and A12L42 to peak voltage on HP 410B. Unkey 618T-( ). Repeat tuning at 2.000 and 2.999 MHz until tracked. Set signal generator and 714E-( ) to 29.000 MHz. Key 618T-( ) and adjust MIXER PLATE, RF AMP GRID, RF AMP PLATE, and DRIVER PLATE coils to peak voltage on HP-410B. Unkey 618T-( ). Set signal generator and 714E-( ) to 29.999 MHz. Key 618T-( ) and adjust A12C27, A12C103, and A12C65 to peak voltage on HP 410B. Unkey 618T-( ).			

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(Sheet 24C of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
15A (Cont)			Repeat tuning at 29.000 and 29.999 MHz until tracked. Remove A12 from chassis, replace turret cover, and reinstall A12 in chassis. Set signal generator and 714E-( ), in turn, to 3.000, 4.000, through 29.000 MHz. At each frequency, key and adjust MIXER PLATE, RF AMP PLATE coils to peak voltage on HP 410B. Unkey 618T-( ). Set signal generator and 714E-( ), in turn, to 3.500, 4.500, through 29.500 MHz. At each frequency, key and adjust DRIVER PLATE coil to peak voltage on HP 410B. Unkey 618T-( ). Replace tubes A12V10 and A12V11 in A12 chassis. Set FEEDBACK switch A12S15 to ON position (maximum clockwise stop). Remove signal generator, 6-dB attenuator, and HP 410B VTVM.			

Module Checks and Adjustments, RF Translator A12
(Sheet 24D of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
16	Hf mixer balance adjustment		Connect oscilloscope to T-connector in rf output line through the 678Y-( ) 8- to 30-MHz divider. Set 714E-( ) to 29.999 MHz, AM. Key 618T-( ). Adjust A12C256 for minimum observable ripple on the rf envelope displayed on the oscilloscope. Unkey 618T-( ). Replace A12 on the module extender, and reconnect all the equipment as instructed in note in step 1.			

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Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont)	Neutralization adjustments		<u>NOTE:</u> Neutralization must be performed if either of the rf translator driver tubes, A12V6 and A12V7, have been replaced. Rf circuits must be aligned (see step 15) before making neutralization adjustments. Set 714E-( ) to 29.000 MHz, USB. Remove power. Ground A12J3. Remove small block that holds J30 and J31 on module extender. Connect RF TRANSLATOR LOAD, supplied in 678Y-( ) Maintenance Kit, to A12P2 and A12P3 so that blue test point on load block is on same side as connector A12P3. Connect signal generator, through GENERATOR LOAD (supplied in 678Y-( ) Maintenance Kit), to the coax connector on the RF TRANSLATOR LOAD. Remove turret cover plate. Attach neutralizing detector (supplied in 678Y-( ) Maintenance Kit) across A12L56B in rf amplifier plate compartment by connecting one lead of neutralizing detector to wire loop adjacent to trimmer capacitor A12C103. Connect second lead to bus wire connected to lug mounted on A12C103. Do not connect between grid and ground.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont)			Connect vom to neutralizing detector output jacks, and set vom to most sensitive current scale. Reverse vom leads if meter does not read upscale. Set feedback switch A12S15 to off by rotating switch fully counterclockwise. CAUTION: NEVER OPERATE A12S15 WHILE KEYING 618T-( ). Set 714E-( ) to USB, and do not key 618T-( ). Adjust signal generator for 2.0- to 3.0-v output at 29.000 MHz unmodulated. Adjust driver grid coil A12L56B for maximum indication on vom. Adjust driver plate neutralization capacitor A12C128, located below A12C141, for null indication on vom. This completes driver neutralization. Set 714E-( ) to OFF. Disconnect all test equipment. Replace turret cover plate. Unground A12J3. Remove A12 from module extender. Remove module extender from 618T-( ) chassis.			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont) (Cont)			Replace A12 in 618T-( ) chassis. Set 714E-( ) to 29.000 MHz, AM. Override 618T-( ) tgc as follows: Connect 678Z-1 J2-FREQ DIV jack to J2 on frequency divider A1. NOTE: B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Connect 678Z-1 J2-IF. TRANS jack to J2 on if. translator A3. Connect 678Z-1 GRND jack to 618T-( ) chassis. Set 678Z-1 Function Test Set TGC & CAPTURE RANGE control R3 fully counterclockwise. CAUTION: ALL AUDIO INPUTS MUST BE REMOVED. DO NOT MODULATE. DO NOT EXCEED 125 W AM RF OUTPUT WITH TGC OVERRIDDEN.			

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Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont) (Cont)			Connect HP-410B VTVM ac probe to rf output line. NOTE: S15 must be in counterclockwise position. Key 618T-( ). Slowly advance 678Z-1 TGC & CAPTURE RANGE control to obtain approximately 50 v rf output. NOTE: Do not exceed 50 v rf output during this procedure by adjusting 678Z-1 TGC & CAPTURE RANGE control. Adjust driver grid coil A12L56B for maximum rf output as indicated on HP-410B VTVM. Adjust A12L74B in driver plate circuit to peak rf output. While keying, alternately adjust A12C141, and rotate large roller coil gear A11G4. Roller coil gear A11G4, accessible between power amplifier A11 gear-plate and 618T-( ) chassis, may be rotated by hand. A12C141 is adjusted properly when the drop in rf output voltage is approximately symmetrical as the roller coil gear is rotated either side of the tuned position. Unkey 618T-( ).			

Courtesy AC5XP

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont)			This completes power amplifier neutralization. Set feedback switch A12S15 to on by rotating switch fully clockwise. With tgc overridden, provide approximately 50 v rf output as in preceding step. Key 618T-( ). Adjust feedback neutralization capacitor A12C127. To do this, alternately adjust A12C127 and large roller coil gear on power amplifier A11. Roller coil gear is accessible between power amplifier module gearplate and 618T-( ) chassis and can be operated with one finger. When A12C127 is adjusted properly, a symmetrical rf output voltage will be obtained as roller coil gear is moved either side of tuned position. NOTE: Because electronic control amplifier A6 supplies an error signal to power amplifier A11 for tuning the roller coil, it will return the roller coil to the tuned position when the roller coil is released. It is not necessary to displace the position of the roller coil gear a large amount. Unkey 618T-( ).			
(Cont)						

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
17 (Cont)			Reset tgc as follows: Key 618T-(·) at 2.000 MHz. Note rf output. Repeat in 1-MHz increments for the entire hf band. Disconnect 678Z-1 connections from 618T-( ). Set 714E-( ) to frequency that gave lowest rf output. Key 618T-( ). Set A11R5 for 75 v rf output. This completes neutralization procedures.	Determine which frequency has lowest rf output.		
18 (Cont)	Receive/ transmit gain balance check		Leave rf translator A12 connected to 618T-( ) chassis while performing this procedure. Remove rf translator A12 top cover plate. Connect 678Z-1 J2-IF. TRANS jack to J2 in if. translator A3. Connect 678Z-1 J2-FREQ DIV jack to J2 in frequency divider A1. NOTE: B versions of the 618T-( ) have no module A1 for tgc override, so apply +18 vdc (using the HP-711A Power Supply) to 678Z-1 J2-FREQ DIV jack instead of the above step. Connect 678Z-1 GRND jack to 618T-( ) chassis.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
18 (Cont)			Set 678Z-1 FUNCTION SELECTOR control to TGC OVERRIDE. Set 678Z-1 TGC & CAPTURE RANGE control R3 fully counterclockwise. Set 714E-( ) to 29.000 MHz, AM. Key 618T-( ). Adjust 678Z-1 TGC & CAPTURE RANGE control clockwise until rf output is approximately 30 vrms. Adjust RF AMP PLATE coil to peak rf output voltage as read on HP-410B VTVM. Unkey 618T-( ). Set 714E-( ) RF SENS/SQL control fully clockwise. Set AUDIO control R10 fully clockwise. Connect signal generator, through 6-db attenuator, to AUX RCVR ANT connector at left front of 618T-( ). Set signal generator output to 29.000 MHz, 30% modulated with 1.0 kHz. Connect Ballantine 310A VTVM to 678P-( ) HEADSET jack. Adjust signal generator output level to provide 3.0 vrms at 678P-( ) HEADSET jack.			
(Cont)						

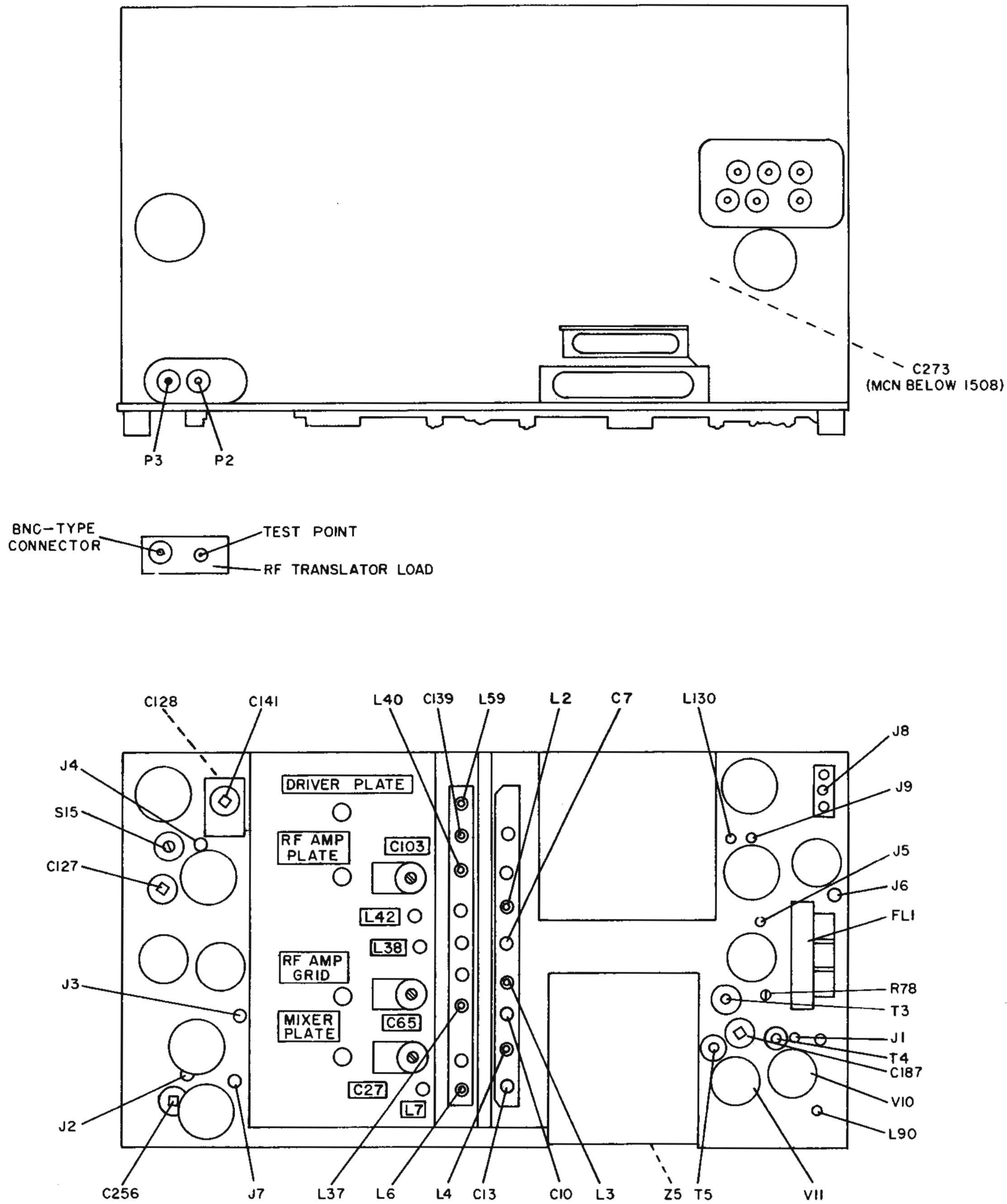
Module Checks and Adjustments, RF Translator A12 (Sheet 32 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
18 (Cont)			Readjust RF AMP PLATE coil to peak voltage at 678P-( ) HEADSET jack. If this adjustment causes the voltage at the 678P-( ) HEADSET jack to exceed 3.8 vrms, replace A12C61 with a value of capacitance that will provide the required results. NOTE: A12C61, located in driver compartment, is accessible from bottom of module. A12C61 is a selected value of capacitance. Select value of A12C61 from complement given in 618T-( ) illustrated parts catalog. If A12C61 is replaced, repeat step 17.			
			Set 714E-( ) to 7.300 MHz, AM.			
			Set signal generator output to 7.300 MHz, 1000 uv, 30% modulated with 1 kHz.			
			Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack.			
			Adjust AUDIO level control R10, on 618T-( ) front panel, for 5.5 vrms at 678P-( ) HEADSET jack.			
			Set 714E-( ) RF SENS/SQL control fully counterclockwise.	0.05 vrms at 678P-( ) HEADSET jack.		

Module Checks and Adjustments, RF Translator A12 (Sheet 33 of 34)
Figure 730

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
19	Disconnect		Turn power off. Disconnect all test equipment. Connect coaxial jumper to AUX RCVR ANT. connector at left front of 618T-( ).			

Module Checks and Adjustments, RF Translator A12 (Sheet 34 of 34)
Figure 730



NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A12.

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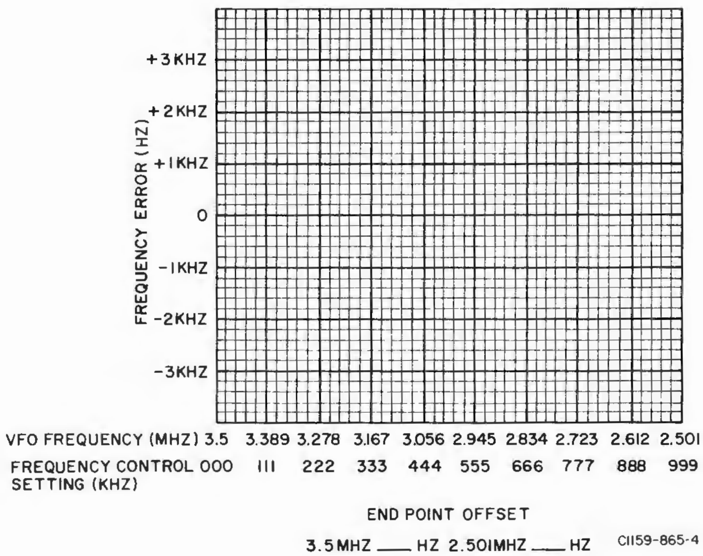
RF Translator A12, Checks and Adjustments
Figure 731



VFO Tracking Chart
Figure 732

714E-( ) FREQUENCY (MHz)	HF OSCILLATOR FREQUENCY (MHz)	ADJUST
2.XXX	12.500	Z5-2
3.XXX	11.500	Z5-3
4.XXX	10.500	Z5-4
5.XXX	9.500	Z5-5
6.XXX	8.500	Z5-6
7.XXX	10.000	Z5-7
8.XXX	11.000	Z5-8
9.XXX	12.000	Z5-9
10.XXX	13.000	Z5-10
11.XXX	14.000	Z5-11
12.XXX	15.000	Z5-12
13.XXX	16.000	Z5-13
14.XXX	17.000	Z5-14
15.XXX	18.000	Z5-15
16.XXX	19.000	Z5-16
17.XXX	20.000	Z5-17
18.XXX	21.000	Z5-18
19.XXX	22.000	Z5-19
20.XXX	23.000	Z5-20
21.XXX	24.000	Z5-21
22.XXX	25.000	Z5-22
23.XXX	26.000	Z5-23
24.XXX	27.000	Z5-24
25.XXX	28.000	Z5-25
26.XXX	29.000	Z5-26
27.XXX	30.000	Z5-27
28.XXX	31.000	Z5-28
29.XXX	32.000	Z5-29

Coil Block Z5, Adjustments
Figure 733

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control HP-410B VTVM Vom Rf dummy load	WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN SINGLE-PHASE HIGH-VOLTAGE POWER SUPPLY A13. DO NOT APPLY POWER TO 618T-( ) WITH DUST COVER OF A13 REMOVED. Remove A13 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A13 to perform this step. Replace dust cover on A13, and replace A13 in 618T-( ) chassis. Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Remove rf translator A12, from 618T-( ) chassis. Connect rf translator A12, through module extender, to 618T-( ) chassis. Remove dust cover from A12. Unless otherwise specified, the steps are performed with the 714E-( ) in AM, no signal input, and 618T-( ) unkeyed.			

Module Checks and Adjustments, Single-Phase High-Voltage Power Supply A13 (Sheet 1 of 3)
Figure 734

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
2	1500-v check		Set 618T-( ) front panel meter switch to 1500V. 618T-( ) requires a minimum warmup period of 15 minutes before unit is keyed. Key 618T-( ). Unkey 618T-( ).	Front panel meter should indicate in red area.		
3	260-v check		Connect HP-410B VTVM dc probe to TP19 on A12 module extender. Key 618T-( ). Note HP-410B indication. NOTE: There are no adjustments in A13. If preceding checks indicate module output is abnormal, turn power off, remove A13 from 618T-( ) chassis, and use a vom to check for faulty diodes, transformer winding continuity, and proper relay operation. If +1500-v output is normal but +260-v output is abnormal, check bleeder resistors A13R11 and A13R12. Refer to schematic diagram.	+234 to +286 v.		
4 (Cont)	Disconnect		Turn power off. Disconnect all test equipment. Remove A12 from module extender.			

Module Checks and Adjustments, Single-Phase High-Voltage Power Supply A13
Figure 734 (Sheet 2)

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4 (Cont)			Remove module extender from 618T-( ) chassis. Replace dust cover on A12. Replace A12 in 618T-( ) chassis.			

Module Checks and Adjustments, Single-Phase High-Voltage
Power Supply A13 (Sheet 3 of 3)
Figure 734

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	A15 module test fixture (fabricate as in figure 1002) HP 410B VTVM Oscilloscope Frequency counter Spectrum analyzer HP 711A Power Supply HP 723A Power Supply	NOTE: Figure 737A contains module checks and adjustments for frequency divider-stabilizer A15 using a module extender. This test procedure applies only to the 618T-1B/2B/3B Airborne SSB Transceivers. Refer to figure 737 for location of test points on A15. Remove frequency divider-stabilizer A15 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A15 to perform this step. Connect HP 711A Power Supply to 130 VDC IN connectors on rear of test fixture. Connect HP 723A Power Supply to 26 VDC IN connectors on rear of test fixture. Connect W2P2 of test fixture to J3 of test fixture. NOTE: The 100-kHz reference must be extremely stable. The amplitude must be 0.4 to 1.0 Vrms into 50 ohms; stability must be 0.8 ppm. It is recommended that the 100-kHz output of rf oscillator A2, A2P2A1, be used as the 100-kHz reference.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 1 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1 (Cont)			Connect frequency counter to J2 of test fixture. Connect W2P1 of test fixture to J12 of 618T-( ). Connect W1J1 of test fixture to A15P1. Connect W1P1 of test fixture to J1 of test fixture.			
2	Reference divider board A15A6 check		Set frequency selector switches on test fixture to 0000. Connect oscilloscope vertical input to A15A6J1. Check frequency and voltage at A15A6J1.	100 pps; 3.2 v peak-to-peak minimum.	A15A6.	A15A6.
3 (Cont)	Vco frequency check		Set frequency selector switches on test fixture to 5555. Connect frequency counter to VCO OUT jack on front panel of test fixture. Check frequency at VCO OUT jack. <u>NOTE:</u> Vco A15A7 and isolation amplifier A15A8 are sealed assemblies and cannot be disassembled in the field. If the source of trouble is the vco or isolation amplifier, the faulty unit should be	2.9445 MHz ±2.4 Hz.	Divider circuits.	Check divider circuits.

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 2 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3 (Cont)			returned to the factory and replaced with a new unit.			
4	5-vdc regulator check		CAUTION: CARE MUST BE EXERCISED WHEN CONNECTING A TEST PROBE TO AN INTEGRATED CIRCUIT (FLATPACK). IF AT ALL POSSIBLE, CONNECT TEST PROBE TO CIRCUIT BOARD ADJACENT TO FLATPACK. USE A SHARP PROBE. FLATPACK MAY BE DAMAGED IF TOO MUCH PRESSURE IS APPLIED OR IF FLATPACK LEADS ARE SHORTED TOGETHER. EPOXY (POSTCOATING) REMOVED DURING TESTING MUST BE REPLACED UPON COMPLETION OF TEST. REFER TO REPAIR SECTION OF THIS MANUAL FOR DETAILED INSTRUCTIONS PERTAINING TO REPLACEMENT OF EPOXY. Connect HP-410B VTVM dc probe to output of A15A9 (5 VDC OUT). (Cathode of A15A9CR6 may be used.)			
			Check voltage at 5 VDC OUT test point.	From 4.9 to 5.1 Vdc.	A15A9, zener diode A15A9CR6.	Check A15A9, voltage at zener diode A15A9CR6.

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
5	26-Vdc regulator check		Connect HP-410 VTVM dc probe to output of A15A10 (26 VDC OUT). (Emitter of A15A10Q2 located below A15A2 may be used.)			
			Check voltage at 26 VDC OUT test point.	From 23 to 28 Vdc.	A15A10.	Check A15A10.
6	Divide-by-10 board A15A1		Set frequency selector switches on test fixture to 0000.			
			Set oscilloscope vertical amplifier to 2 V/cm.			
			Place oscilloscope vertical input on A15A1A1-1.			
			Set time base so that 10 pulses are displayed on oscilloscope.			
			Remove oscilloscope vertical input from A15A1A1-1.			
			Do not change oscilloscope setting.			
			Place oscilloscope vertical input on A15A1 CLOCK OUT test point at A15A1A4-14.			
			Check waveform.	One pulse, 3.2-V peak-to-peak minimum.	A15A1.	Check A15A1.

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 4 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
7	Divide-by-10 board A15A2 check		See caution in step 4 of this test procedure. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place vertical input on CLOCK OUT point at A15A2A1-6. Set time base so that 10 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from CLOCK OUT point. Do not change oscilloscope setting. Place oscilloscope vertical input on A15A2 CLOCK OUT point at A15A2A4-14.	One pulse; 3.2 v peak-to-peak minimum.	A15A2.	Check A15A2.
8 (Cont)	Divide-by-10 board A15A3 check		See caution in step 4 of this test procedure. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place vertical input on A15A2 CLOCK OUT point at A15A3A1-6. Set time base so that 10 pulses are displayed on oscilloscope.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 5 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8 (Cont)			Remove oscilloscope vertical input from A15A3A1-6.			
			Do not change setting on oscilloscope.			
			Place oscilloscope vertical input on A15A3 CLOCK OUT point at A15A3A4-14.	One pulse; 3.2 v peak-to-peak minimum.	A15A3.	Check A15A3.
9	Divide-by-26-to-35 board A15A4 check		Set 100-kHz digit control on test fixture to 0.			
			Oscilloscope vertical amplifier control remains set at 2 V/cm.			
			Place oscilloscope vertical input on A15A3 CLOCK OUT at A15A4A5-5.			
			Set time base so that 35 pulses are displayed on oscilloscope.			
			Remove oscilloscope vertical input from A15A3 CLOCK OUT at A15A4A5-5.			
			Do not change setting of oscilloscope.			
			Connect oscilloscope vertical input to A15A4TP1.	One pulse; 3.2 v peak-to-peak minimum.	A15A4.	Check A15A4.
10	Phase/frequency discriminator A15A5 board check		Connect vertical input of oscilloscope to A15A5TP1.			
			Check frequency and voltage at A15A5TP1.	100 pps; 22 v peak-to-peak minimum.	A15A5.	Check A15A5.

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 6 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11	Phase/ frequency discriminator A15A5 duty cycle check		The term "duty cycle" as used in this test procedure refers to the ratio of pulse width to total length of the time period. This ratio is multiplied by 100 to express the duty cycle as a percentage. Refer to figure 736 for examples of duty cycle. Figure 736 shows three periods of time, 0.01 second each. The first pulse has a duty cycle of 60%. The period is 0.01 second; pulse width is 0.006 second. Therefore duty cycle = $\frac{0.006}{0.01}$ X 100 = 60%.			
			The second and third pulses show the minimum (20%) and maximum (80%) duty cycles.			
			Set frequency selector switches on the test fixture, in turn, to 0000, 3000, 5000, and 7000.			
			Oscilloscope vertical input remains connected to A15A5TP1.			
			Check duty cycle at each test fixture frequency setting listed above at A15A5TP1.	Duty cycle must not exceed 80%.		Continue test.
(Cont)			Set frequency selector switches on test fixture, in turn, to 2999, 4999, 7999, and 9999.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 7 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11 (Cont)			Oscilloscope vertical input remains connected to A15A5TP1.			
			Check duty cycle at each tester setting listed above at A15A5TP1.	Duty cycle must be 20% or greater.		Continue test.
12	Phase/frequency discriminator phase-locking time check		Oscilloscope vertical input remains connected to A15A5TP1.			
			Set oscilloscope to 10 V/cm, 1 ms/cm.			
			Set frequency selector switches on test fixture to 9000.			
			When signal becomes stable, reset 100-kHz switch on test fixture to 0.			
			When signal becomes stable, reset 100-kHz switch on test fixture to 9.			
			Measure the time it takes for the signal to stabilize from the time the 100-kHz switch is moved to 9.	Not more than 3.0 s.		
			Perform the above test procedure for the following test fixture 100-kHz switch positions:			
			From position 9 to position 0.			
			From position 4 to position 5.			
			From position 5 to position 4.			

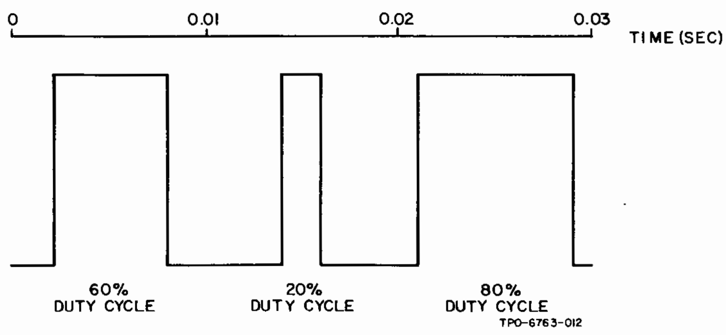
Module Checks and Adjustments, Frequency Divider-Stabilizer A15
(Using Test Fixture) (Sheet 8 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13	Vco sideband attenuation check		Connect spectrum analyzer to J2-VCO OUT jack on test fixture front panel.			
			Set frequency selector switches on test fixture to 7500.			
			Tune spectrum analyzer to 2.7500 MHz and establish a 0-db reference.			
			Set frequency selector switches on test fixture to 7501.			
			Check signal level on spectrum analyzer.	Not less than 55 db down.	A15FL1.	Check A15FL1.
			Set frequency selector switches on test fixture to 7499.			
			Check signal level on spectrum analyzer.	Not less than 55 db down.	A15FL1.	Check A15FL1.
			Set frequency selector switches on test fixture to 2500.			
			Tune spectrum analyzer to 3.2500 MHz and establish a 0-db reference.			
			Set frequency selector switches on test fixture to 2501.			
(Cont)			Check signal level on spectrum analyzer.	Not less than 55 db down.	A15FL1.	Check A15FL1.

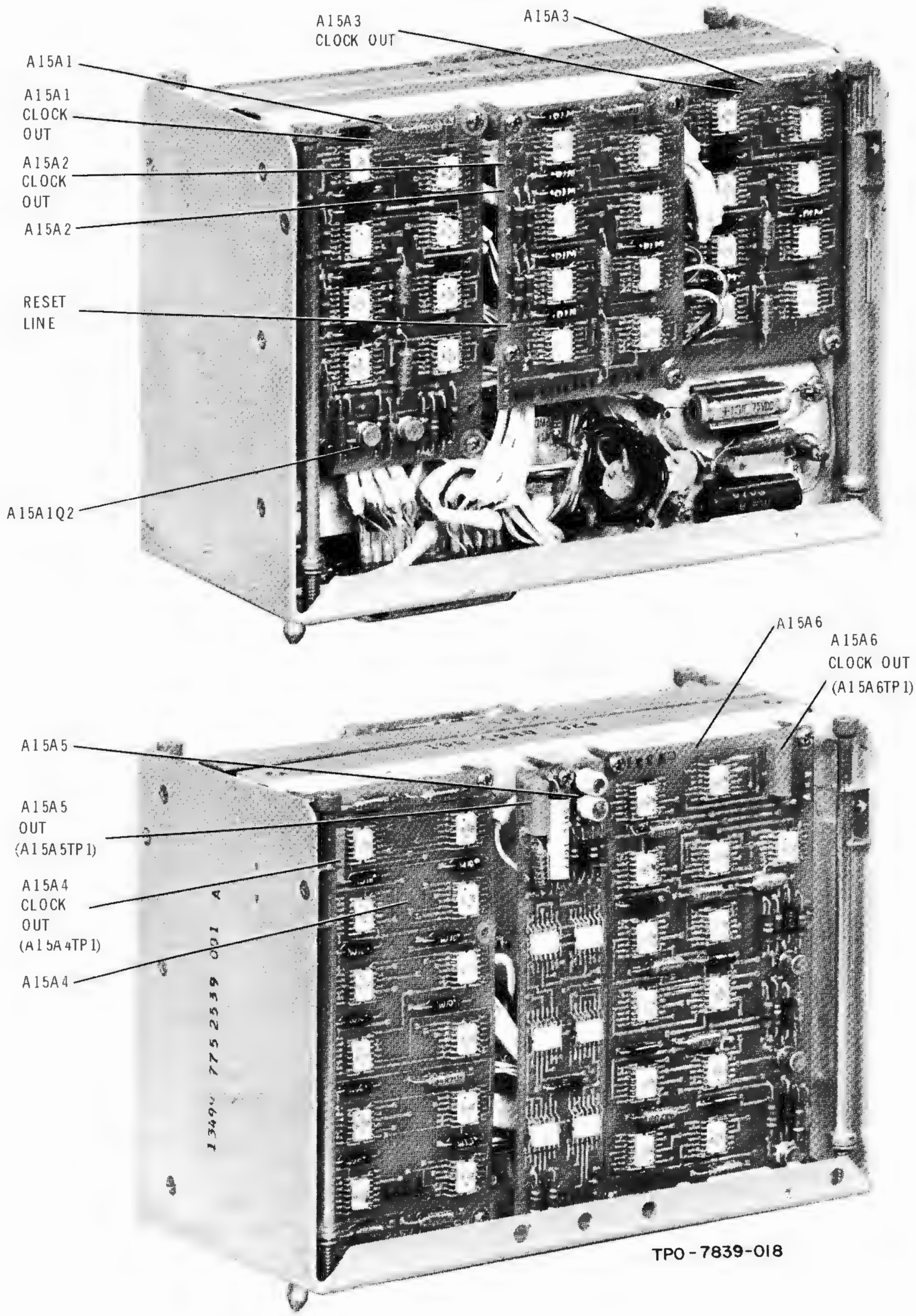
Module Checks and Adjustments, Frequency Divider-Stabilizer A15
(Using Test Fixture) (Sheet 9 of 10)
Figure 735

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13 (Cont)			Set frequency selector switches on test fixture to 2499.			
			Check signal level on spectrum analyzer.	Not less than 55 db down.	A15FL1.	Check A15FL1.
			Disconnect spectrum analyzer.			
14	Reset line check		Set frequency selector switches on test fixture to 0000.			
			Connect frequency counter to RESET LINE test point.			
			Check frequency at RESET LINE test point.	100 pps.	A15A4.	Check A15A4.
15	Disconnect		Turn power off.			
			Disconnect all test equipment from A15.			
			Replace dust cover on A15.			
			Replace A15 in 618T-( ) chassis.			

Module Check and Adjustments, Frequency Divider-Stabilizer A15 (Using Test Fixture) (Sheet 10 of 10)
Figure 735



Frequency Divider-Stabilizer A15,
Duty Cycle Examples
Figure 736



Frequency Divider-Stabilizer A15, Checks and Adjustments
Figure 737

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	HP 410B VTVM Oscilloscope Frequency counter Spectrum analyzer 678Y-1B 678P-1B 714E-6	NOTE: Figure 735 contains module checks and adjustments for frequency divider stabilizer A15 using a test fixture. This test procedure applies only to the 618T-1B/2B/3B Airborne SSB Transceivers. Refer to figure 737 for location of test points on A15. Remove frequency divider-stabilizer A15 from 618T-( ) and perform visual inspection as described in Inspection/Check section of this manual. Remove dust cover from A15 to perform this step. Connect frequency-divider-stabilizer A15 through module extender to 618T-( )B chassis. Connect VCO IN and OUT jacks on module extender with short length of 50-ohm coax jumper cable. Connect 100 KHZ REF IN and OUT jacks on module extender with short length of 50-ohm coax jumper cable.			
2	Reference divider board A15A6 check		Set 714E-6 to 7.0000 MHz, AM mode. Connect oscilloscope vertical input to A15A6J1. Check frequency and voltage at A15A6J1.	100 pp/s; 3.2-V peak-to-peak minimum.	A15A6.	A15A6.

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 1 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Vco frequency check		Set 714E-6 to 7.5555 MHz. Connect frequency counter to VCO OUT jack on front panel of test fixture. Check frequency at VCO OUT jack.	2.9445 MHz ±2.4 Hz.	Divider circuits.	Check divider circuits.
			NOTE: Vco A15A7 and isolation amplifier A15A8 are sealed assemblies and cannot be disassembled in the field. If the source of trouble is the vco or isolation amplifier, the faulty unit should be returned to the factory and replaced with a new unit.			
4 (Cont)	5-Vdc regulator check		CAUTION: CARE MUST BE EXERCISED WHEN CONNECTING A TEST PROBE TO AN INTEGRATED CIRCUIT (FLATPACK). IF AT ALL POSSIBLE, CONNECT TEST PROBE TO CIRCUIT BOARD ADJACENT TO FLATPACK. USE A SHARP PROBE. FLATPACK MAY BE DAMAGED IF TOO MUCH PRESSURE IS APPLIED OR IF FLATPACK LEADS ARE SHORTED TOGETHER. EPOXY (POSTCOATING) REMOVED DURING TESTING MUST BE REPLACED UPON COMPLETION OF TEST. REFER TO			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15
(Using Module Extender) (Sheet 2 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
4 (Cont)			REPAIR SECTION OF THIS MANUAL FOR DETAILED INSTRUCTIONS PERTAINING TO REPLACEMENT OF EPOXY.			
			Connect HP 410B VTVM dc probe to output of A15A9 (5 VDC OUT). (Cathode of A15A9CR6 may be used.)			
			Check voltage at 5 VDC OUT test point.	From 4.9 to 5.1 Vdc.	A15A9, zener diode A15A9CR6.	Check A15A9, voltage at zener diode A15A9CR6.
5	26-Vdc regulator check		Connect HP 410 VTVM dc probe to output of A15A10 26 VDC OUT). (Emitter of A15A10Q2 located below A15A2 may be used.)			
			Check voltage at 26 VDC OUT point.	From 23 to 28 Vdc.	A15A10.	Check A15A10.
6	Divide-by-10 board A15A1 check		Set 714E-6 to 7.0000 MHz.			
			Set oscilloscope vertical amplifier to 2 V/cm.			
			Place oscilloscope vertical input on A15A1A1-1.			
			Set time base so that 10 pulses are displayed on oscilloscope.			
(Cont)			Remove oscilloscope vertical input from A15A1A1-1.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 3 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
6 (Cont)			Do not change oscilloscope setting. Place oscilloscope vertical input on A15A1 CLOCK OUT at A15A1A4-14 Check waveform.	One pulse, 3.2-V peak-to peak minimum.	A15A1.	Check A15A1.
7	Divide-by-10 board A15A2 check		See caution in step 4 of this test procedure. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place oscilloscope vertical input on CLOCK OUT point at A15A2A1-6. Set time base so that 10 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from CLOCK OUT point. Do not change oscilloscope setting. Place oscilloscope vertical input on A15A2 CLOCK OUT point at A15A2A4-14.	One pulse; 3.2-V peak-to peak minimum.	A15A2.	Check A15A2.

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 4 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
8	Divide-by-10 board A15A3 check		See caution in step 4 of this test procedure. Oscilloscope vertical amplifier control remains set at 2 V/cm. Place oscilloscope vertical input on A15A2 CLOCK OUT point at A15A3A1-6. Set time base so that 10 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from A15A3A1-6. Do not change setting on oscilloscope. Place oscilloscope vertical input on A15A3 CLOCK OUT point at A15A3A4-14.	One pulse; 3.2-V peak-to-peak minimum.	A15A3.	Check A15A3.
9 (Cont)	Divide-by-26-to-35 board A15A4 check		Oscilloscope vertical amplifier control remains set at 2 V/cm. Place oscilloscope vertical input on A15A3 CLOCK OUT at A15A4A5-5 Set time base so that 35 pulses are displayed on oscilloscope. Remove oscilloscope vertical input from A15A3 CLOCK OUT at A15A4A5-5.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 5 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
9 (Cont)			Do not change setting of oscilloscope. Connect oscilloscope vertical input to A15A4TP1.	One pulse; 3.2-V peak-to peak minimum.	A15A4.	Check A15A4.
10	Phase/frequency discriminator A15A5 board check		Connect vertical input of oscilloscope to A15A5TP1. Check frequency and voltage at A15A5TP1.	100 pp/s; 22-V peak-to-peak minimum.	A15A5.	Check A15A5.
11 (Cont)	Phase/ frequency discriminator A15A5 duty cycle check		The term "duty cycle" as used in this test procedure refers to the ratio of pulse width to total length of the time period. This ratio is multiplied by 100 to express the duty cycle as a percentage. Refer to figure 736 for examples of duty cycle. Figure 736 shows three periods of time, 0.01 second each. The first pulse has a duty cycle of 60%. The period is 0.01 second; pulse width is 0.006 second. Therefore duty cycle = $\frac{0.006}{0.01} \times 100 = 60\%$ The second and third pulses show the minimum (20%) and maximum (80%) duty cycles. Set frequency selector switches on the test fixture, in turn, to 7.0000, 7.3000, 7.5000, and 7.7000 MHz.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 6 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
11 (Cont)			Oscilloscope vertical input remains connected to A15A5TP1.			
			Check duty cycle at each test fixture frequency setting listed above at A15A5TP1.	Duty cycle must not exceed 80%.		Continue test.
			Set frequency selector switches on test fixture, in turn, to 7.2999, 7.4999, 7.7999, and 7.9999 MHz.			
			Oscilloscope vertical input remains connected to A15A5TP1.			
			Check duty cycle at each tester setting listed above at A15A5TP1.	Duty cycle must be 20% or greater.		Continue test.
12	Phase/frequency discriminator phase-locking time check.		Oscilloscope vertical input remains connected to A15A5TP1.			
			Set oscilloscope to 10 V/cm, 1 ms/cm.			
			Set frequency selector switches on test fixture to 7.9000 MHz.			
			When signal becomes stable, reset 100-kHz switch on control unit to 0.			
(Cont)			When signal becomes stable, reset 100-kHz switch on control unit to 9.			

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
12 (Cont)			Measure the time it takes for the signal to stabilize from the time the 100-kHz switch is moved to 9.	NMT 6 seconds.		
			Perform the above test procedure for the following 714E-6 100-kHz switch positions:			
			From position 9 to position 0.	NMT 6 seconds.		
			Set 100-kHz switch to position 4. From position 4 to position 5.	NMT 3 seconds.		
			Set 100-kHz switch to position 6 and then to position 5. From position 5 to position 4.	NMT 3 seconds.		
			NOTE: Setup time of Autopositioner will affect results. Perform switch changes in order as specified in step 12.			
13	Vco sideband attenuation check		Connect spectrum analyzer to VCO OUT jack on module extender.			
			Set frequency selector switches on 714E-6 to 7.7500 MHz.			
			Tune spectrum analyzer to 2.7500 MHz and establish a 0-dB reference.			
(Cont)			Set frequency selector switches on 714E-6 to 7.7501 MHz.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 8 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
13 (Cont)			Check signal level on spectrum analyzer.	NLT 55 dB down.	A15FL1.	Check A15FL1.
			Set frequency selector switches on 714E-6 to 7.7499 MHz.			
			Check signal level on spectrum analyzer.	NLT 55 dB down.	A15FL1.	Check A15FL1.
			Set frequency selector switches on 714E-6 to 7.2500 MHz.			
			Tune spectrum analyzer to 3.2500 MHz and establish a 0-dB reference.			
			Set frequency selector switches on 714E-6 to 7.2501 MHz.			
			Check signal level on spectrum analyzer.	NLT 55 dB down.	A15FL1.	Check A15FL1.
			Set frequency selector switches on 714E-6 to 7.2499 MHz.			
			Check signal level on spectrum analyzer.	NLT 55 dB down.	A15FL1.	Check A15FL1.
			Disconnect spectrum analyzer.			
14	Reset line check		Set frequency selector switches on 714E-6 to 7.0000 MHz.			
(Cont)			Connect frequency counter or oscilloscope vertical input to RESET LINE point.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 9 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
14 (Cont)			Check frequency at RESET LINE test point. NOTE: Each pulse has less than 1-μs duration.	100 pp/s.	A15A4.	Check A15A4.
15	Disconnect		Turn power off. Disconnect all test equipment from A15. Replace dust cover on A15. Remove module extender and replace A15 in 618T-( ) chassis.			

Module Checks and Adjustments, Frequency Divider-Stabilizer A15 (Using Module Extender) (Sheet 10 of 10)
Figure 737A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	Suggested module tester (fabricate as in figure 1103) Frequency counter HP-711A Power Supply Oscilloscope	This test applies only to the 618T-1B/2B/3B Airborne SSB Transceivers. Remove control data converter A16 from 618T-( ), and perform visual inspection as described in inspection/check section of this manual. Remove dust cover from A16 to perform this step. Connect control data converter A16 and test equipment as shown in figure 741.			
2	1-kHz oscillator check		Set tester PWR switch to ON.			
			Check frequency on frequency counter connected to J2 on test fixture.	950 to 1050 Hz.	A16R21 and/or A16R22 adjusted incorrectly.	First adjust A16R22 until frequency is approximately 1000 Hz; then adjust A16R21 until frequency is 950 to 1050 Hz.
			Connect oscilloscope vertical input to J2 on test fixture.			
			Check peak-to-peak voltage at J2 on test fixture.	+0.5 to +0.9 v peak to peak.	A16Q9, A16Q10, and associated circuits.	Check A16Q9, A16Q10, and associated circuits.
			Reconnect frequency counter to J2 on test fixture.			

Module Checks and Adjustments, Control Data Converter A16 (Using Test Fixture) (Sheet 1 of 2)
Figure 738

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Converter check		Set FREQUENCY switch on test fixture, in turn, to each frequency listed in figure 739.	Indicator lights on tester must be on or remain off as shown in figure 739.	Refer to REMEDY column.	See figure 740. Set FRE-QUENCY switch on tester to 0. DS1 through DS4 should remain off. If any light or combination of lights is on, check compo-nents listed in ACTION column corresponding to light or lights that are on.
4	Disconnect		Turn power off. Disconnect all test equipment from A16. Replace dust cover on A16. Replace A16 in 618T-( ) chassis.			

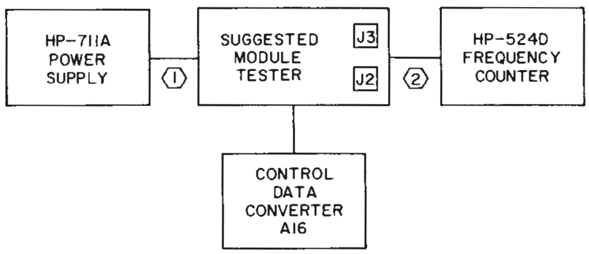
Module Checks and Adjustments, Control Data Converter A16 (Using Test Fixture) (Sheet 2 of 2)
Figure 738

TESTER FREQUENCY SWITCH POSITION	TESTER LIGHTS ON FOR EACH FREQUENCY			
	DS1	DS2	DS3	DS4
0				
1	X			
2		X		
3	X	X		
4			X	
5	X		X	
6		X	X	
7	X	X	X	
8				X
9	X			X
X Denotes indicators are lit.				

Control Data Converter A16, Test Fixture Indicator Status Chart
Figure 739

FREQUENCY SWITCH ON TESTER IN 0 POSITION	ACTION
DS1 ON	Check A16Q4, A16CR25 through A16CR27, A16CR36, and A16CR37.
DS2 ON	Check A16Q3, A16CR20 through A16CR24, A16CR34, and A16CR35.
DS3 ON	Check A16Q2 and A16CR11 through A16CR19.
DS4 ON	Check A16Q1 and A16CR9 through A16CR10.
DS1 through DS4 ON	Check switches on tester. Check A16P1 and 618T-( ) chassis jack J15.

Control Data Converter A16, Troubleshooting Chart
Figure 740



NOTES:

1. CONNECT HP-711A POWER SUPPLY TO J4 (+) AND J5 (GRND) ON TESTER FRONT PANEL.
2. CONNECT HP-524D FREQUENCY COUNTER TO J2 (1 KHZ OUT) ON TESTER FRONT PANEL. TPO-7728-012

Control Data Converter A16,
Test Equipment Setup
Figure 741

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-1B 678Y-1B 714E-6 HP 410B VTVM Frequency counter Oscilloscope	This test applies only to the 618T-1B/2B/3B Airborne SSB Transceivers. Remove control data converter A16 from 618T-( ), and perform visual inspection as described in Inspection/Check section of this manual. Remove dust cover from A16 to perform this step. Connect control data converter A16 and frequency divider-stabilizer A15 through module extenders to 618T-1B/2B/3B chassis.			
2	1-kHz oscillator check		Set 714E-6 to 7.0000 MHz, AM mode.			
			Check frequency on frequency counter connected to TP12 on module extender.	950 to 1050 Hz.	A16R21 and/or A16R22 adjusted incorrectly.	First adjust A16R22 until frequency is approximately 1000 Hz; then adjust A16R21 until frequency is 950 to 1050 Hz.
			Connect oscilloscope vertical input to J3 TP12 on module extender and check peak-to-peak voltage.	+0.5 to +1.0 V peak to peak.	A16Q9, A16Q10, and associated circuits.	Check A16Q9, A16Q10, and associated circuits.

Module Checks and Adjustments, Control Data Converter A16 (Using Module Extender) (Sheet 1 of 2)
Figure 741A

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	Converter check		Set the 100-Hz frequency switch on the 714E-6, in turn, to each frequency listed in figure 741B. For each setting, measure the dc voltage at the module extender test points listed in figure 741B.	Test point voltages must be as listed in figure 741B.	Refer to REMEDY column.	See figure 741C. Set 100-Hz frequency switch on 714E-6 to 0. +5 volts should be pre-set on each test point measured per figure 741B. If not, check components listed in ACTION column column, figure 741C, corresponding to voltage or voltages that are wrong.
4	Disconnect		Turn power off. Disconnect all test equipment from A16. Replace dust cover on A16. Replace A16 in 618T-( ) chassis.			

Module Checks and Adjustments, Control Data Converter A16 (Using Module Extender) (Sheet 2 of 2)
Figure 741A

714E-6 100-Hz FREQUENCY SWITCH POSITION	VOLTAGES FOR EACH FREQUENCY AT TEST POINTS ON DIVIDER-STABILIZER MODULE EXTENDER			
	TP2 (volts)	TP3 (volts)	TP4 (volts)	TP5 (volts)
0	+5	+5	+5	+5
1	NMT 0.4	+5	+5	+5
2	+5	NMT 0.4	+5	+5
3	NMT 0.4	NMT 0.4	+5	+5
4	+5	+5	NMT 0.4	+5
5	NMT 0.4	+5		+5
6	+5	NMT 0.4	NMT 0.4	+5
7	NMT 0.4	NMT 0.4	NMT 0.4	+5
8	+5	+5	+5	NMT 0.4
9	NMT 0.4	+5	+5	NMT 0.4
NMT means not more than. Tolerance on +5 volts is ±0.5 volt.				

Control Data Converter A16, Test-Point Voltage Chart
Figure 741B

714E-6 100-Hz FREQUENCY SWITCH IN 0 POSITION	ACTION
TP2 is not +5 volts.	Check A16Q4, A16CR25 through A16CR27, A16CR36, and A16CR37.
TP3 is not +5 volts.	Check A16Q3, A16CR20 through A16CR24, A16CR34, and A16CR35.
TP4 is not +5 volts.	Check A16Q2 and A16CR11 through A16CR19.
TP5 is not +5 volts.	Check A16Q1 and A16CR9 through A16CR10.
TP2 through TP5 are not +5 volts.	Check switches on 714E-6. Check A16P1 and 618T-( ) chassis jack J15.

Control Data Converter A16, Troubleshooting Chart
Figure 741C

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
1	Initial test requirements	678P-( ) Test Harness 678Y-( ) Maintenance Kit 714E-( ) Radio Set Control Vom Rf dummy load	WARNING: VOLTAGES DANGEROUS TO LIFE EXIST IN 516H-1 POWER SUPPLY. DO NOT APPLY POWER TO 516H-1 POWER SUPPLY WITH DUST COVER REMOVED. Perform visual inspection as described in inspection/check section of this manual. Remove 516H-1 Power Supply dust cover to perform this step. Dust cover may be removed by loosening one Dzus fastener at rear of unit.			
2	Continuity check		NOTE: All continuity checks are performed on P1 of 516H-1 Power Supply.			
			Check continuity from P1-2 to ground.	Continuity.	Connector P1.	Repair or replace P1.
			Check continuity from P1-21 to ground.	Continuity.	Defective terminal connection.	Repair terminal connection.
			Check continuity from P1-6 to P1-8.	Continuity.		
			Check continuity from P1-10 to P1-11.	Continuity.		
			Check continuity from P1-11 to P1-13.	Continuity.		

Module Checks and Adjustments, 516H-1 Power Supply (Sheet 1 of 2)
Figure 742

STEP	DESCRIPTION	TEST EQUIPMENT	TEST PROCEDURE	REQUIRED TEST RESULT	PROBABLE CAUSE OF ABNORMAL RESULT	REMEDY
3	1500-v output of single-phase high-voltage power supply A13 check		Connect 618T-( ), 678P-( ), and rf dummy load as shown in figure 702. Set 618T-( ) front panel meter switch to 1500V.			
			Set 714E-( ) to AM, any frequency. 618T-( ) requires a minimum warmup period of 15 minutes before unit is keyed. Key 618T-( ).	618T-( ) front panel meter indicates in red area.	Single-phase high-voltage power supply A13.	Perform module checks and adjustments for single-phase high-voltage power supply A13 as given in figure 734.
					516H-1 Power Supply.	Check 516H-1 Power Supply. See note in TEST PROCEDURE column of this step.
			CAUTION: IF 516H-1 BLOWER DOES NOT OPERATE, UNKEY IMMEDIATELY. NOTE: There are no adjustments in 516H-1 Power Supply. If preceding checks indicate module output is abnormal, turn power off, use an ohmmeter to check for faulty transistors and diodes, transformer winding continuity, and proper relay operation in 516H-1 Power Supply.			
4	Disconnect		Disconnect all test equipment.			

Module Checks and Adjustments,
516H-1 Power Supply
Figure 742 (Sheet 2)

618T-( ) Airborne SSB Transceiver - Troubleshooting

1. GENERAL.

Unit troubleshooting data is contained in figures 801 through 805 of this section. Information contained in these figures is to be used, after performing the unit performance test procedures in the testing section of this manual, to isolate the trouble to a particular module or group of modules.

NOTE: Module troubleshooting data is incorporated in the module checks and adjustments section in the testing section of this manual.

After the trouble is located and repaired, the equipment should be completely tested to verify that the repairs have not affected other portions of the circuit.

SYMPTOM	ACTION
618T-( ) dead.	Check primary power sources (both ac and dc). Check circuit breaker and fuses in the 678P-( ) Test Harness. Check control unit mode selector switch to see that power-enabling ground is being supplied to pin 59 of 618T-( ) connector P40. If all of above checks are positive, check 618T-( ) chassis relays K1 and K9.

General Troubleshooting Data
Figure 801

SYMPTOM	ACTION
618T-( ) rf output frequency abnormal below 7.000 MHz, but normal above 7.000 MHz.	Perform 17.5-MHz oscillator phase-locking check, figure 730.
618T-( ) rf output frequency abnormal both above and below 7.000 MHz.	For 618T-1/2/3, perform vfo and hf oscillator phase-locking checks, figure 730. For 618T-1B/2B/3B, perform vco frequency check, figure 734.
618T-( ) rf output frequency varies from the desired frequency by an integral number of kilohertz.	Remove kHz-frequency stabilizer A4 from 618T-( ) chassis. Connect HP-410B VTVM dc probe to pin 2 of chassis connector J12. Voltage at this point should be +18 volts. Rechannel 618T-( ). Voltage at J12-2 should drop to 0 during the time that the 618T-( ) is mechanically tuning. There should be a discernible delay (1/2 to 1 second) between the time that mechanical tuning is complete and +18 volts returns to J12-2. If there is not, check chassis relays K8 and K10 and components on chassis terminal board TB2.

Frequency Troubleshooting Chart
Figure 802

SYMPTOM	ACTION
Gain abnormal, but sensitivity normal.	Perform audio amplifier gain adjustment, figure 722.
Sensitivity abnormal, but gain normal.	Perform receive if. output adjustment, variable/bandpass if. alignment check, and rf circuits alignment, figure 730.
Gain abnormal in USB and LSB, but normal in AM.	Perform SSB receive if. alignment, figure 712.
Gain abnormal in AM, but normal in USB and LSB.	Perform AM receive if. alignment, figure 722.

Receive Troubleshooting Chart
Figure 803

SYMPTOM	ACTION
Transmit output power abnormal.	Perform tgc adjustment and rf circuits alignment, figures 704 and 730.
	Perform SSB/AM transmit if. alignment, figure 712.
	Perform rf circuits alignment and variable/ bandpass if. alignment check, figure 730.
	Perform neutralization adjustments, figure 730.
Transmit residual noise abnormal.	Perform carrier balance adjustment, figure 712.
	Perform transmit hf mixer balance adjustment, figure 730. Power source may be noisy.
Power amplifier static plate current abnormal.	Perform static plate adjustment, figure 730.
Power amplifier tube balance abnormal .	Perform power amplifier tubes balance check, figure 704.
CW output abnormal.	Check CW keying circuits in AM/audio amplifier A9.
AM modulation abnormal.	Perform audio amplifier gain adjustment, figure 722.
No sidetone.	Check chassis relay K6.

Transmit Troubleshooting Chart
Figure 804

SYMPTOM	ACTION
+260-volt output abnormal.	Check high-voltage power supply module.
115-volt ac output abnormal.	Check chassis relays K1 and K9.
+28-volt output abnormal.	Check chassis relays K1 and K9.
Transmitter key interlock abnormal.	Check chassis relay K7.
Chopper enable abnormal.	Check chassis relay K3.
Tune power enable.	Check keying and SSB/AM transfer relays.
Recycle line abnormal.	Check chassis relay K4.
Key line abnormal.	Check chassis relays K2, K3, and K5.

Antenna Coupler Power/Control Troubleshooting Chart
Figure 805

SCHEMATIC CHANGES

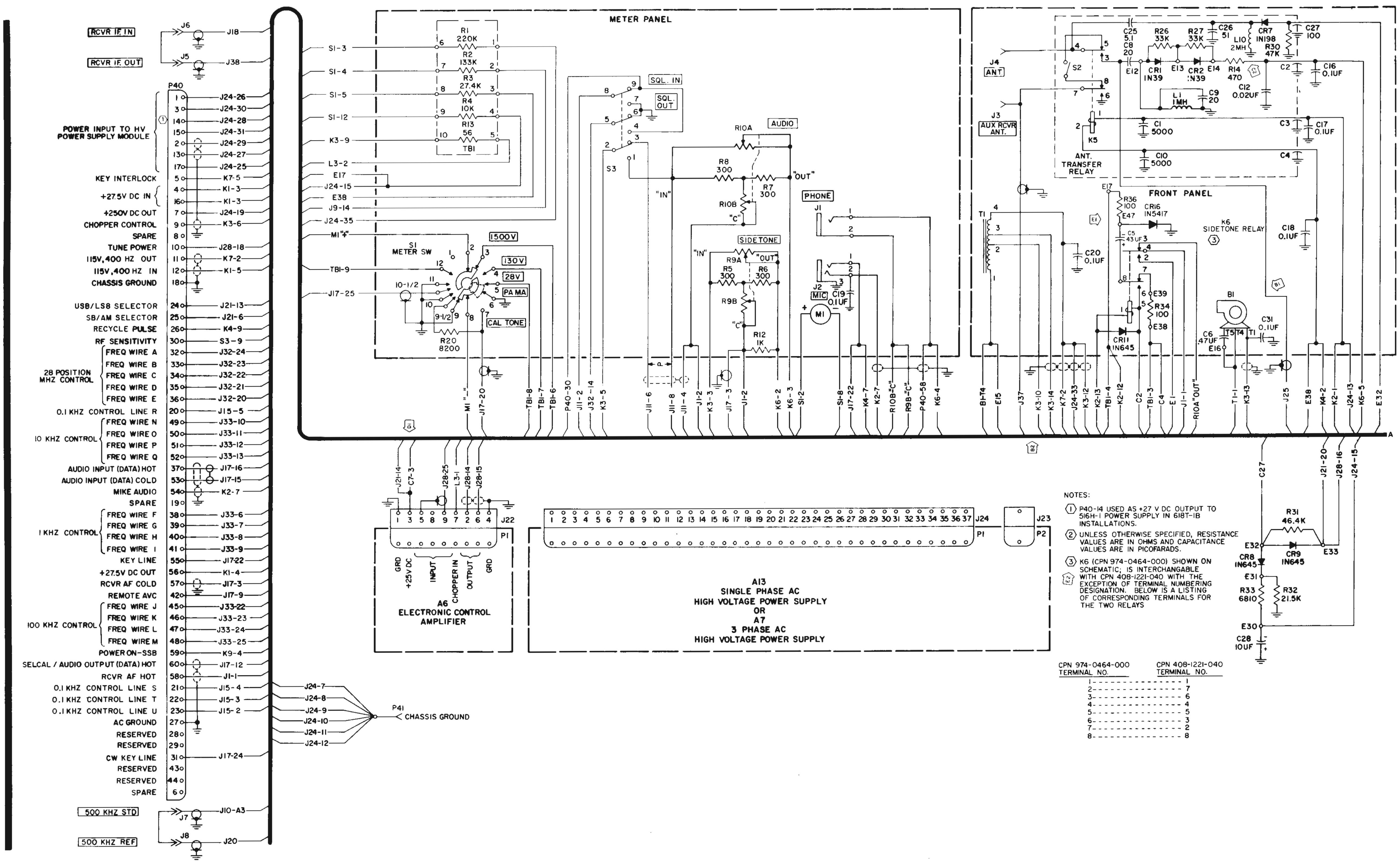
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
1, 2	B1	Added C31 and C32.		
1, 2	B2	Changed circuit from T1-2 to K3-10 (was to L3-1) and changed circuit from L3-1 to J22-7 (was to T1-2).		
2, 3	B3	Added CR14 between E25 and J9-4.		
3	B4	Added FL1 through FL19.	8	27430
2	B5	Added wire from K9-3 to K9-4 and from K9-8 to K9-7.		
2	B6	Renumbered relay contacts for relays K2, K3, and K4, to correct schematic.		
2	C1	Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.	618T-1B: 12 618T-2B/3B: 13	618T-1B, all units; 618T-2B, serno 336 and above; 618T-3B, serno 245 and above.
1, 2, 3	C2	Changed L10 from 2 μH to 2 mH, corrected destination at J17-2 to K3-4, and eliminated connection from J24-15 to J21-19 to correct schematic.		

618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet A)

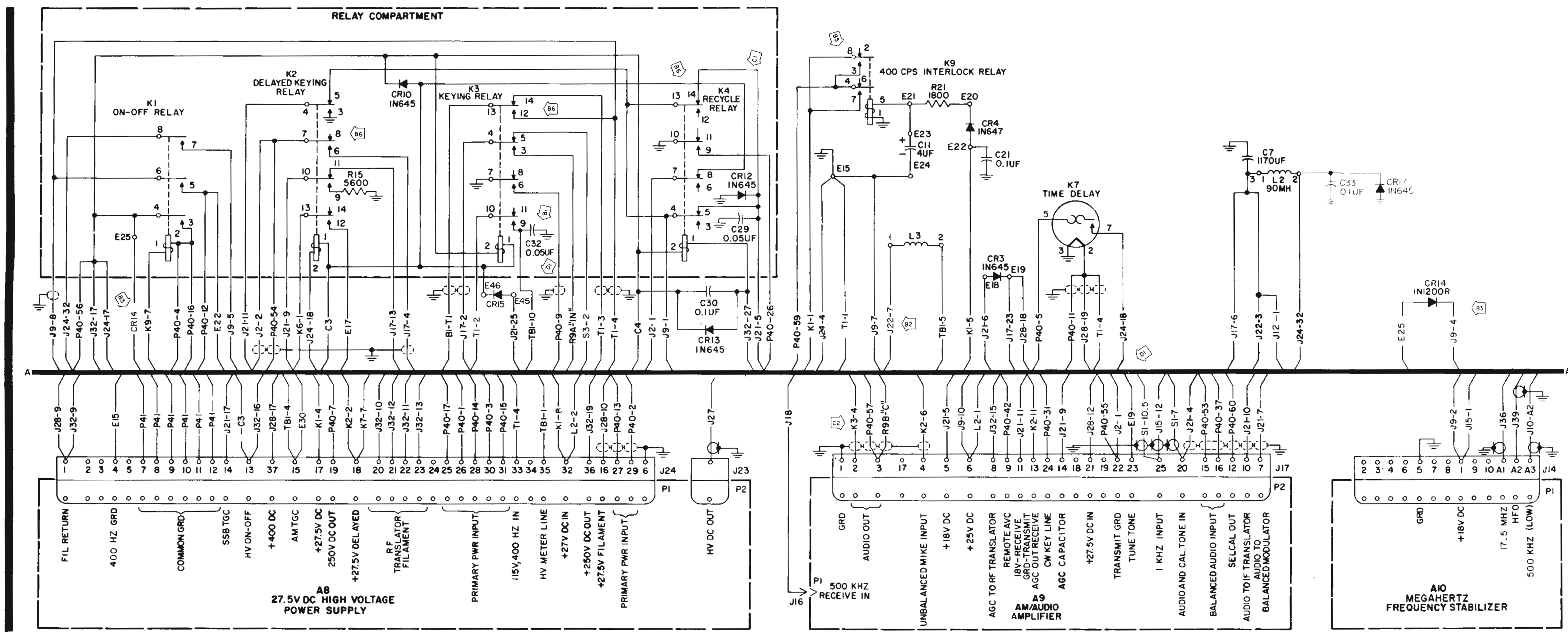
SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
1, 2, 3	D1	Added wiring: J22-3 to J21-14.		31045
		K3-1 to J21-25 changed to K3-1 to E46.		31045
		J17-21 to J21-14 deleted.		31045
		J28-12 to J21-14 changed to J28-12 to J17-21.		31045
		J21-25 to K3-1 changed to J21-25 to E45.		31045
		These changes reduce the noise introduced by the 28-volt power circuit into modules A3 and A9 during transmit.		
1	E1	Added E47, R36 (100 Ω), and CR16 (1N5417) between C5 and E17, relocating one end of C5 from E17 to E47; replaced capacitor C28 with higher voltage rated 10 μf. These changes made to eliminate spike when power is turned on.	618T-1B: 15 618T-2B/3B: 19	MCN 942
1	E2	Added note 3.		

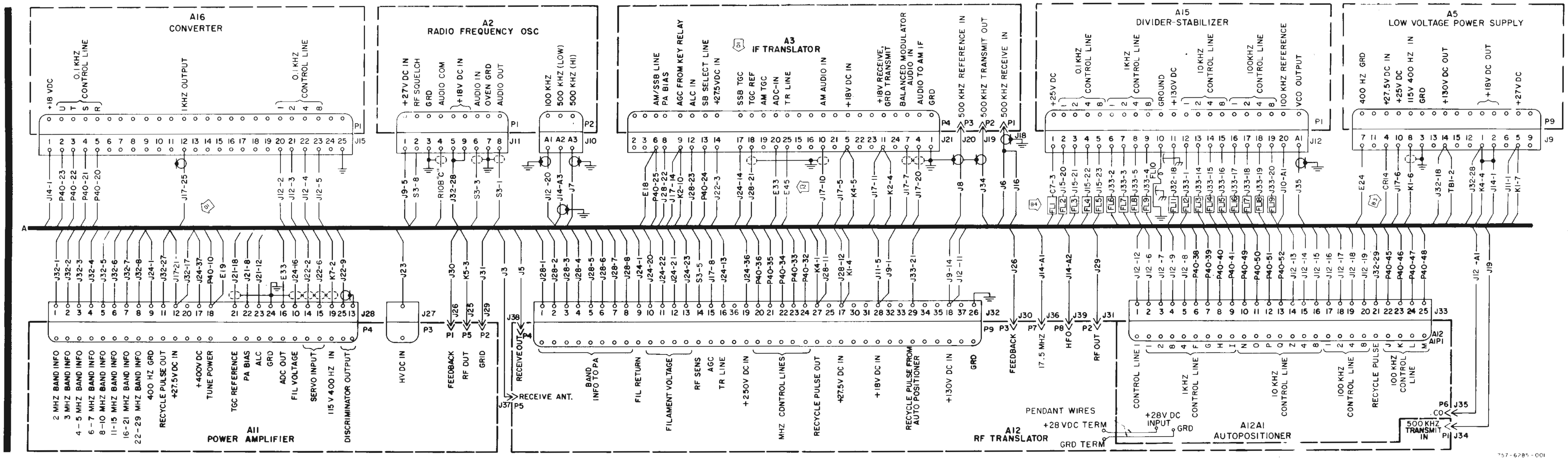
618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet B)



618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet 1 of 3)



618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet 2)



618T-1B/2B/3B Chassis A, Schematic Diagram
Figure 806 (Sheet 3)

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
815/816 817/818 819/820	A1	Added switch S3 (SQUELCH IN-OUT).	618T-1 - 18	21332
		Changed circuit from K3-5 to R10A-IN to K3-5 to S3-2.	618T-2/3 - 19	21332
		Added circuits from:		
		J11-2(B9) to B1.		
		J11-4(B9) to B29.		
		B9 to B29.		
		J11-6(B9) to B29.		
		J11-8(B9) to B29.		
		B9A to B29.		
		P40-19 to J11-2.		
		R10B-C to J11-4.		
		S3-2 to J11-6.		
		S3-1 to J11-8.		21332
815/816 817/818 819/820	A2	Deleted circuit from P40-19(B1) to J11-2(B9).		21332
		Changed S3 from toggle- to rotary-type switch.		21332
		Added circuit from J11-2(B9) to B29.		21332
	(Cont)	Added circuit from J32-14(B10) to B29.		21332

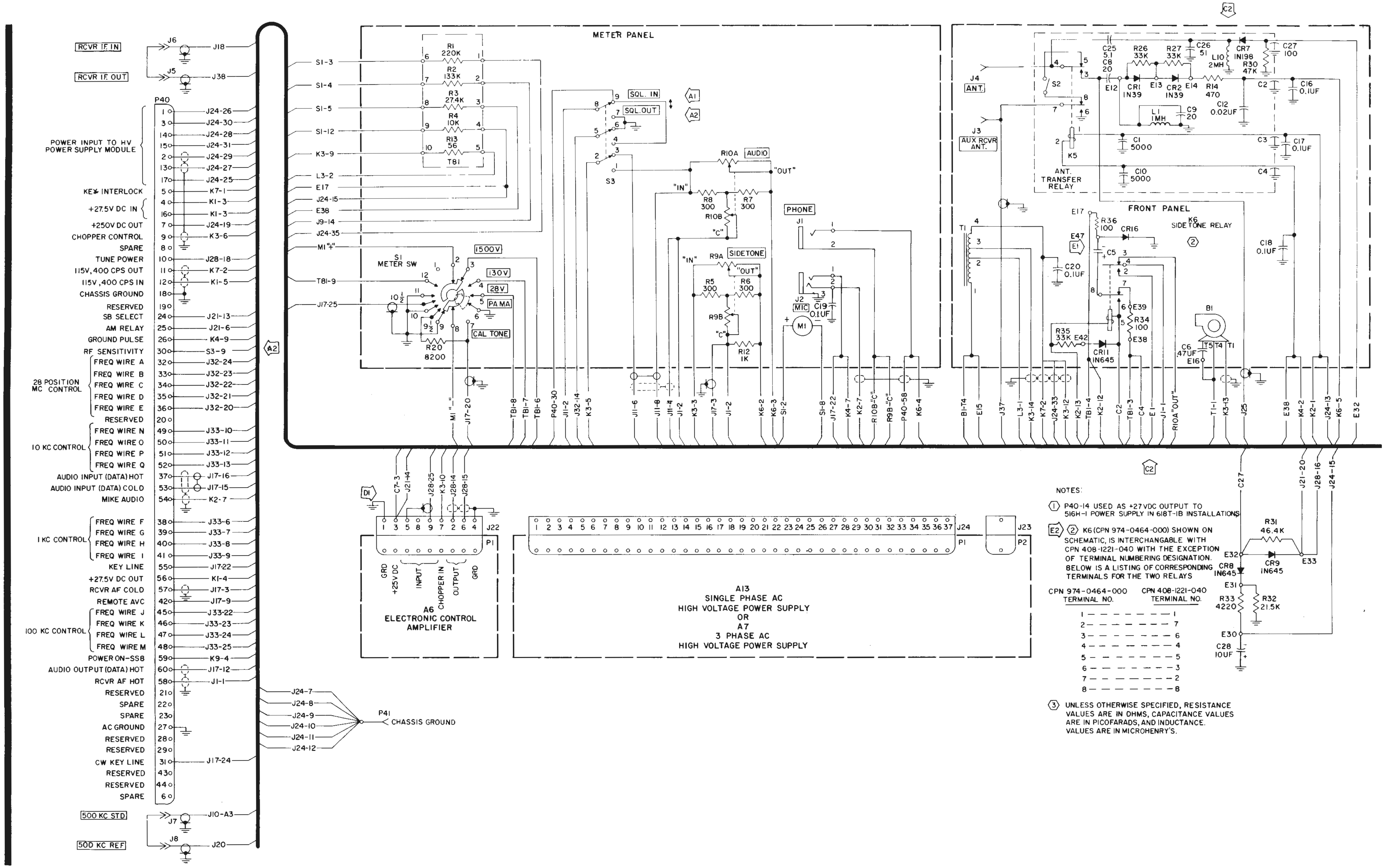
618T-1/2/3 Chassis A, Schematic Diagram (Late Model) (Sheet A)
Figure 807

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
	A2 (Cont)	Deleted circuit from P40-19 to J11-2.		21332
		Changed circuit from P40-30 to J32-14 to P40-30 to S3-9.		21332
		Changed circuit from J11 (end-nc) to ground-16 to J11 (end-nc) to ground-17.		21332
		Changed circuit from J11-6 to S3-2 to J11-6 to S3-3.		21332
		Changed circuit from J32-14 to P40-30 to J32-14 to S3-5.		21332
		Changed circuit from J11-6 to S3-2 to J11-6 to S3-3.		21332
		Changed circuit from J11-2 to P40-19 to J11-2 to S3-8.		21332
		Changed circuit from K3-5 to R10A-IN to K3-5 to S3-2.		21332
		Changed circuit from P40-30 to J32-14 to P40-30 to S3-9.		21332
		Changed K7-1 to K7-5.		21332
		These changes, A1 and A2, provide audio squelch capability for the 618T-1/2/3 Airborne SSB Transceiver.		
2, 3	B1	Added CR14 between E25 and J9-4.		
2	B2	Added wire from K9-3 to K9-4 and K9-8 to K9-7.		
2	B3	Renumbered relay contacts for relays K2, K3, and K4, to correct schematic.		

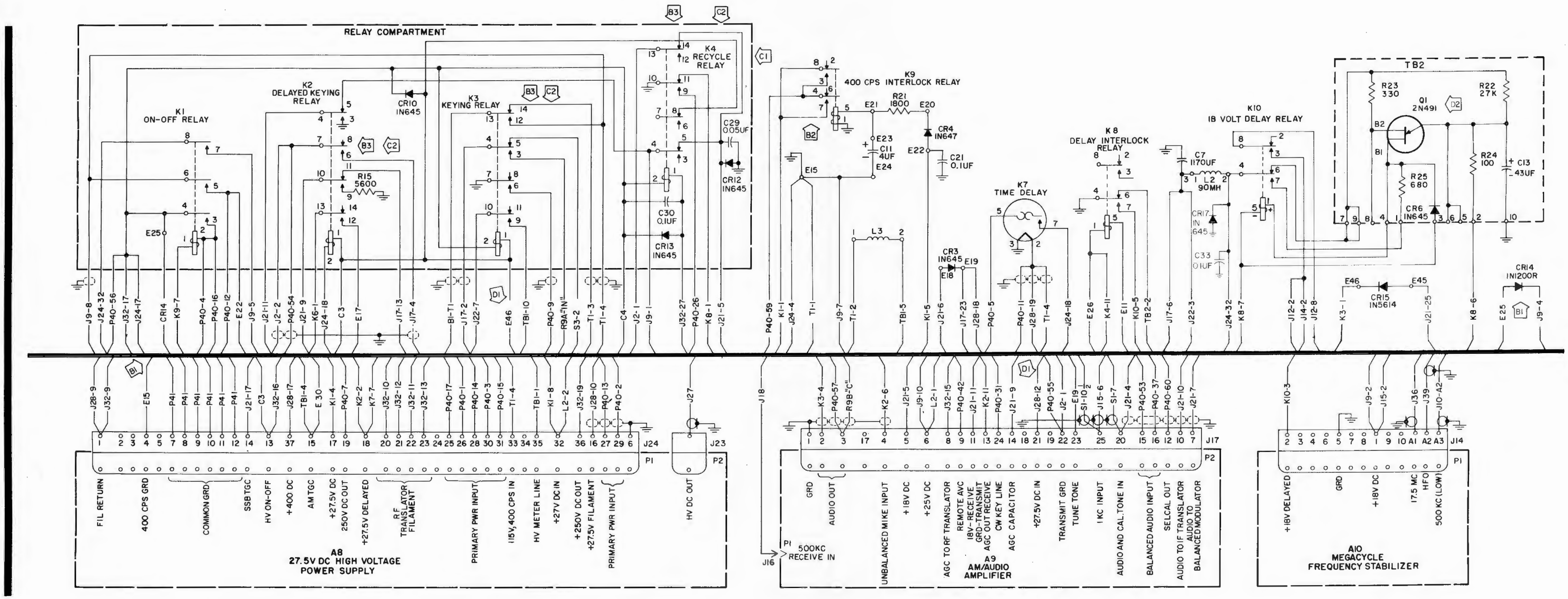
618T-1/2/3 Chassis A, Schematic Diagram (Late Model) (Sheet B)
Figure 807

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
2	C1	Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.	618T-1: 29 618T-2/3: 31	30074
1, 2, 3	C2	Changed value of L10 from 2 μh to 2 mH, corrected destinations at K6-2 and E38; renumbered relay contacts for K2, K3, and K4; and eliminated connection from J24-15 to J21-19 to correct schematic.		
1,2,3,	D1	Added wiring: J22-3 to J21-14.		31045
		K3-1 to J21-25 changed to K3-1 to E46.		31045
		J17-21 to J21-14 deleted.		31045
		J28-12 to J21-14 changed to J28-12 to J17-21.		31045
		J21-25 to K3-1 changed to J21-25 to E45.		31045
		Added E45, E46, and CR15 (1N5614).		31045
		These changes reduce the noise introduced by the 28-volt power circuit into modules A3 and A9 during transmit.		
2	D2	Q1 changed from 2N491 to 2N2647.		31820
1	E1	Added E47, R36 (100 Ω), and CR16 (1N5417) between C5 and E17, relocating one end of C5 from E17 to E47; replaced capacitor C28 with higher voltage rated 10 μf. These changes made to eliminate spike when power is turned on.	618T-1: 32 618T-2/3: 35	31972
1	E2	Added note 2.		

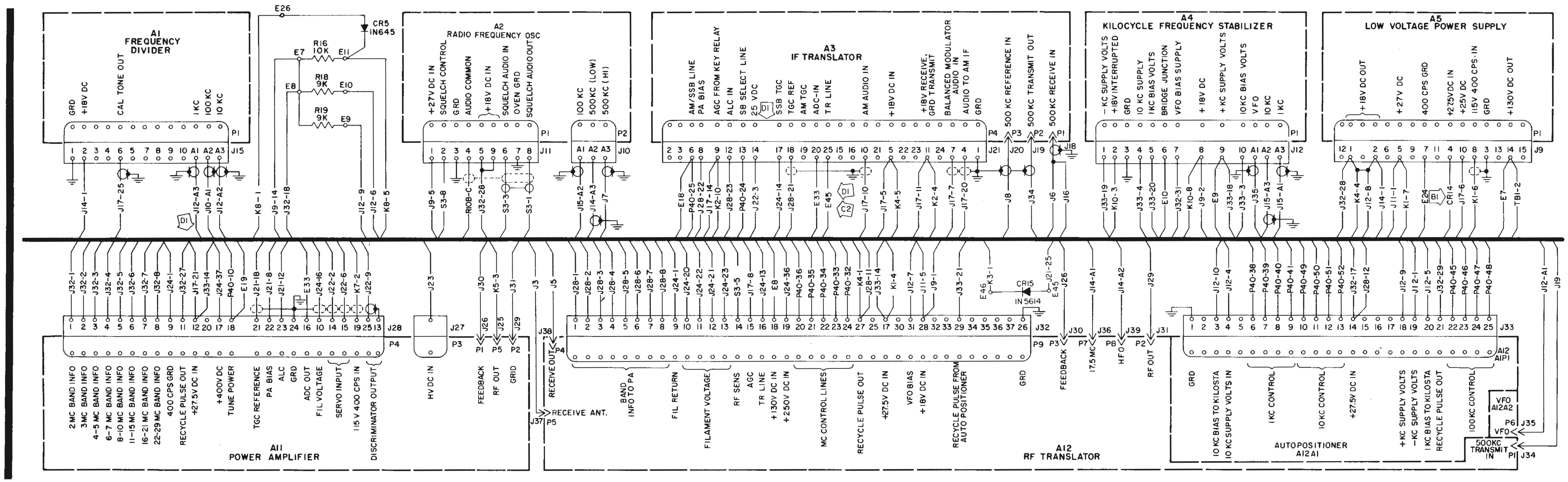
618T-1/2/3 Chassis A, Schematic Diagram
(Late Model)
Figure 807 (Sheet C)



618T-1/2/3 Chassis A, Schematic Diagram
(Late Model)
Figure 807 (Sheet 1 of 3)



618T-1/2/3 Chassis A, Schematic Diagram (Late Model)
Figure 807 (Sheet 2)



618T-1/2/3 Chassis A, Schematic Diagram (Late Model)
Figure 807 (Sheet 3)

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
825/826 827/828	A1	Changed circuit from C4 to K4-2.	5	34
		Changed circuit from J24-18 to K3-2 to J24-18 to K2-2.	5	34
		These changes improve the dropout action of sidetone relay K6.		
827/828	A2	Added relay K9, CR4 (1N647), R21 (1800 ohms), and C11 (4 uf).	5	1090
		These changes add a 115-volt, 400-Hz safety interlock circuit.		
825/826 827/828 829/830	A3	Deleted circuit from K6-1 to terminal E17.	5	34
		Deleted circuit from TB1-2 to K2-13.	5	34
		Changed circuit from K2-12 to J21-3 to K2-12 to terminal E17.	5	34
		Added circuit from K2-13 to K6-1.	5	34
		These changes prevent sidetone output prior to operation of 30-second time-delay relay K7.		
825/826 827/828	A4	Deleted circuit from P40-54 to J17-4.	5	1500
		Changed circuit from J17-4 to J2-1 to J17-4 to K2-6.	5	1500
	(Cont)	Added circuit from P40-54 to K2-7.	5	1500

618T-1/2/3 Chassis A, Schematic Diagram (Early Model) (Sheet A)
Figure 808

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
	A4 (Cont)	Added circuit from K2-7 to J2-1.	5	1500
		These changes improve microphone audio switching.		
		Changed L4 and L5 from 220 uh to 1500 uh.		2475
		Deleted L4 and L5.		3499
825/826	A5	Changed CR1 and CR2 from 1N39 to FD1009.		4613
825/826	A6	Added R26 and R27 in parallel with CR1 and CR2.		5030
825/826	A7	Added C25, C26, C27, and C28.	15	6500
		Added R30, R31, R32, and R33.	15	6500
		These changes improve the transmit gain control circuit.		
825/826	A8	Added CR7, CR8, and CR9.		6500
825/826	A9	Added L10.		6500
825/826 827/828	A10	Added CR10 and R34.	12	6500
		Added CR11.	12	6967
		These changes provide transient protection for relays K2 and K6.		
827/828	A11	Added C29, C30, CR12, and CR13.		8750
825/826	A12	Changed R33 from 5620 ohms to 3160 ohms.		11766

618T-1/2/3 Chassis A, Schematic Diagram (Early Model) (Sheet B)
Figure 808

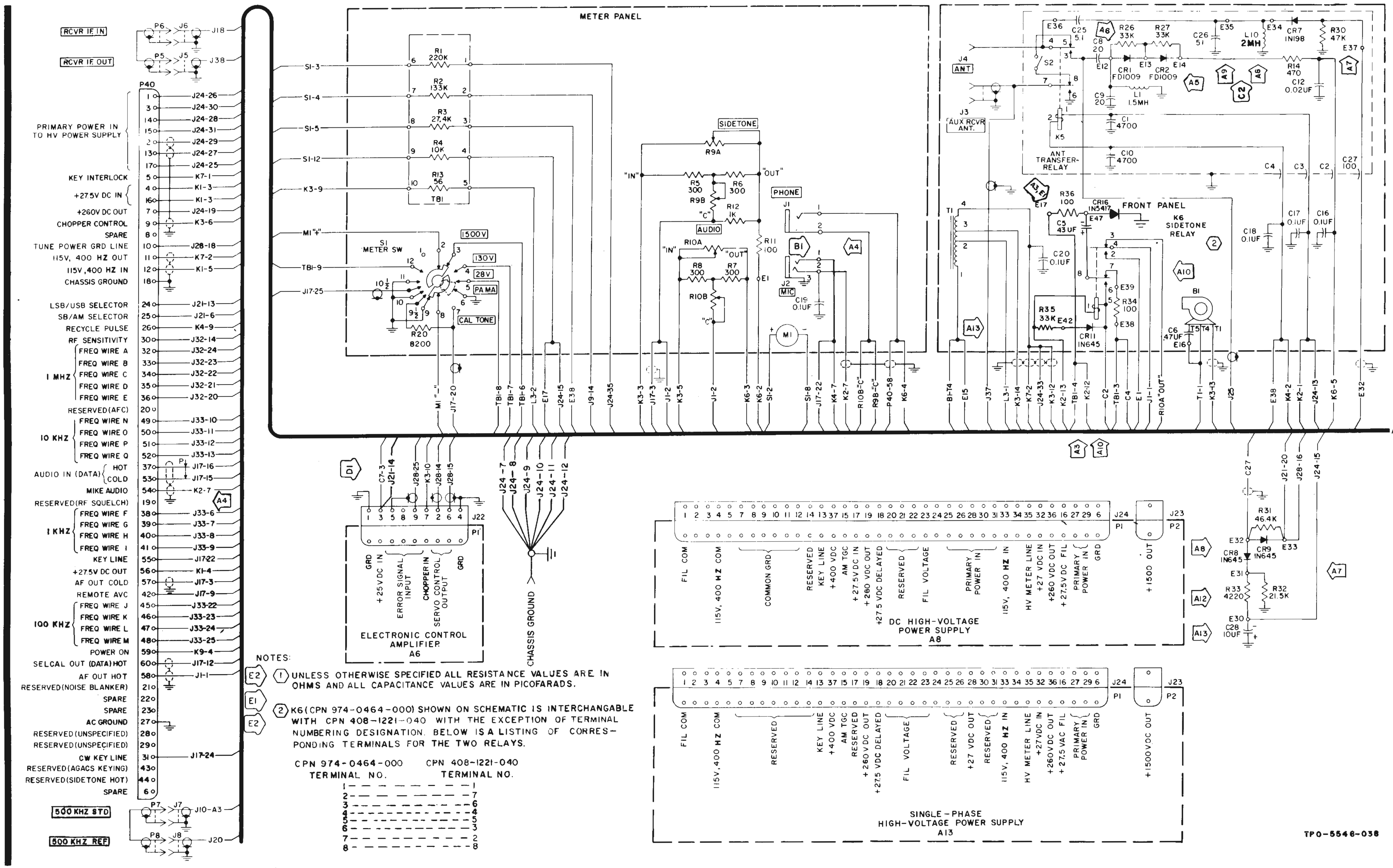
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
825/826	A13	Changed R33 from 3160 ohms to 4220 ohms.		13700
		Added R35.		13700
827/828	A14	Changed K2, K3, and K4 from open contact-type relay to dust-covered, contact-type relay.	618T-1/2 - 16	18032
		This change is for improved reliability.	618T-3 - 17	
825/826	B1	Reversed pins 1 and 2 at J2 on meter panel.		
827/828	B2	Schematic correction. Changed wire from K2-7 to J2-2 (was to J2-1). Changed wire from K4-7 to J2-1 (was to J2-2). Changed wire from J17-22 to J2-1 (was to J2-2).		
827/828	C1	Parallel-wired contacts K4-4 to K4-13 and K4-5 to K4-14.	618T-1: 29 618T-2/3: 31	30074
825/826, 827/828, 829/830	C2	Changed value of L10 from 2 μH to 2 mH and eliminated connection from J24-15 to J21-19 to correct schematic.		

618T-1/2/3 Chassis A, Schematic Diagram (Early Model)
Figure 808 (Sheet C)

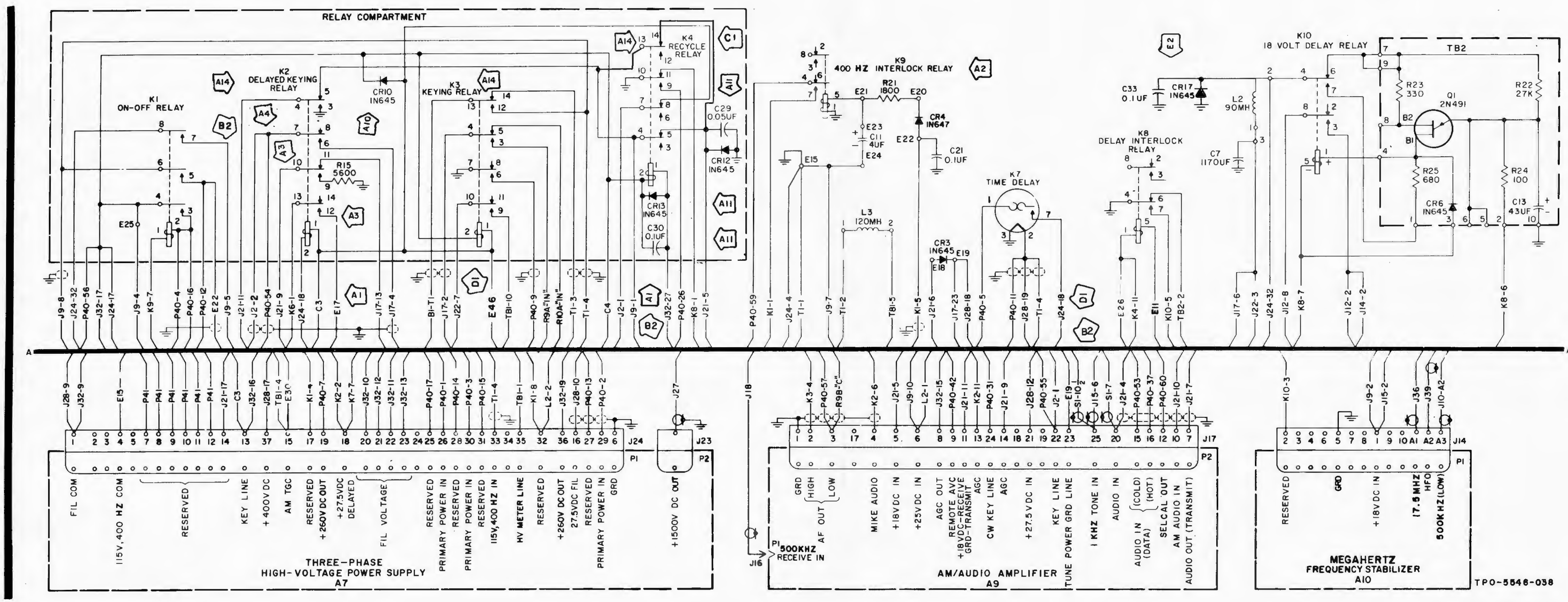
SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
1,2,3	D1	Added wiring: J22-3 to J21-14.		31045
		K3-1 to J21-25 changed to K3-1 to E46.		31045
		J17-21 to J21-14 deleted.		31045
		J28-12 to J21-14 changed to J28-12 to J17-21.		31045
		J21-25 to K3-1 changed to J21-25 to E45.		31045
		Added E45, E46, and CR15 (1N5614).		31045
		These changes reduce the noise introduced by the 28-volt power circuit into modules A3 and A9 during transmit.		
1	E1	Added E47, R36 (100 Ω), and CR16 (1N5417) between C5 and E17, relocating one end of C5 from E17 to E47; replaced capacitor C28 with higher voltage rated 10 μf. These changes made to eliminate spike when power is turned on.	618T-1: 32 618T-2, 3: 35	All models
1	E2	Added notes 1 and 2.		

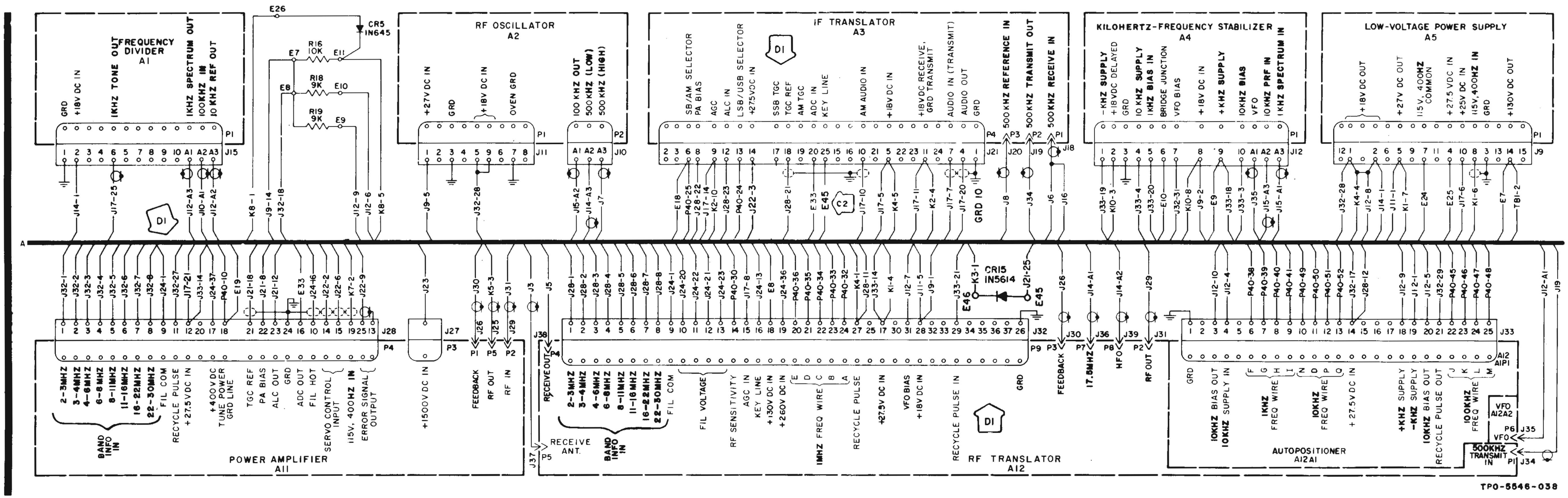
618T-1/2/3 Chassis A, Schematic Diagram
(Early Model)
Figure 808 (Sheet D)



618T-1/2/3 Chassis A, Schematic Diagram
(Early Model)
Figure 808 (Sheet 1 of 3)



618T-1/2/3 Chassis A, Schematic Diagram (Early Model)
Figure 808 (Sheet 2)



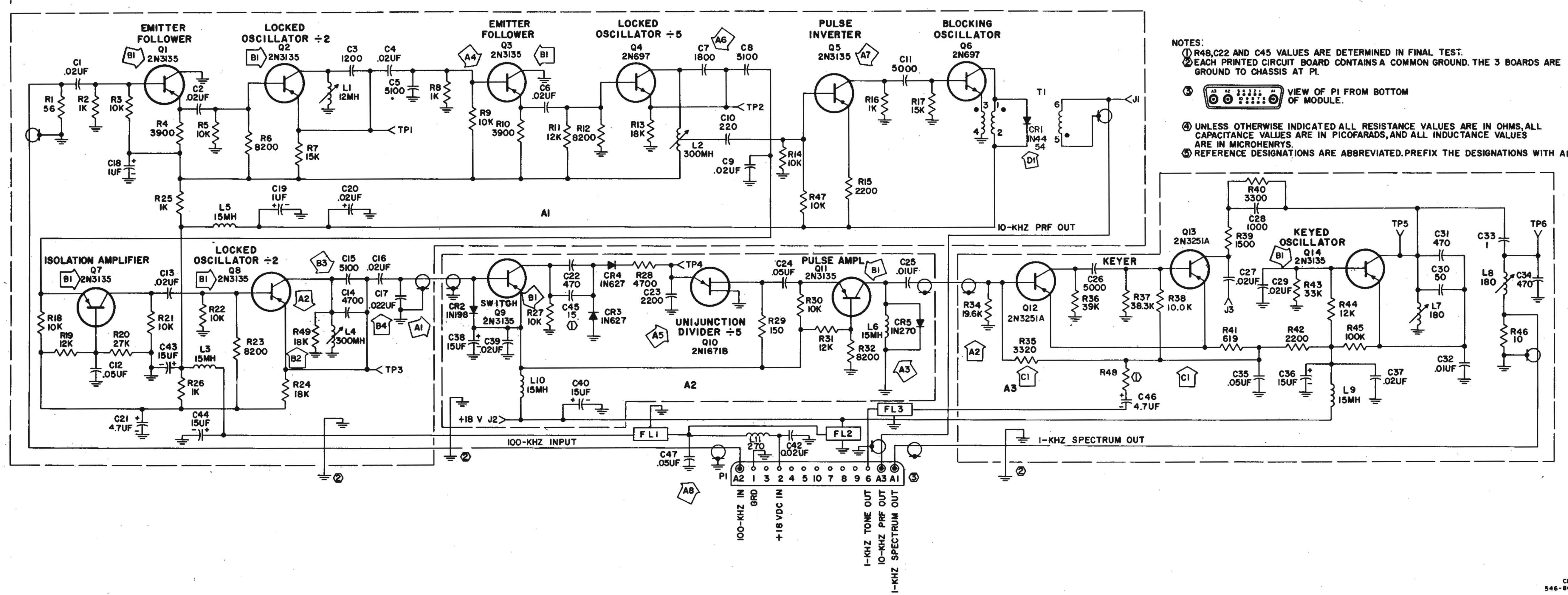
618T-1/2/3 Chassis A, Schematic Diagram (Early Model)
Figure 808 (Sheet 3)

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
833/834	A1	Changed CR2 from JAN 1N933M to 1N198.		
833/834	A2	Added R49, and changed R34 from 17,600 ohms to 19,600 ohms.		5000
833/834	A3	Removed R33 (2200 ohms), and grounded CR5 and L6. Changed CR5 from 1N627 to 1N270. Change made to counteract effects that variations in semi-conductor characteristics have upon the operation of the keyer circuit (Q12 and Q13).	11	5775
833/834	A4	Changed Q1, Q2, Q3, Q5, Q7, Q8, Q9, Q11, and Q14 from 2N1285 to 2N2188 for increased transistor reliability.		5775
833/834	A5	Changed Q10 from 2N491 to 2N1671B for increased transistor reliability.		9000
833/834	A6	Changed C7 from 2200 pf to 1800 pf.		
833/834	A7	Changed Q5 from 2N2188 to 2N3135.		16750
833/834	A8	Added C47 and L11, and grounded the shield of P1-A2 and P1-A3.		17900
833/834	B1	Changed Q1, Q2, Q3, Q7, Q8, Q9, Q11, and Q14 from 2N2188 to 2N3135.	618T-1: 23 618T-2, 3: 24	30640

618T-1/2/3 Frequency Divider A1,
Schematic Diagram
Figure 809 (Sheet A)

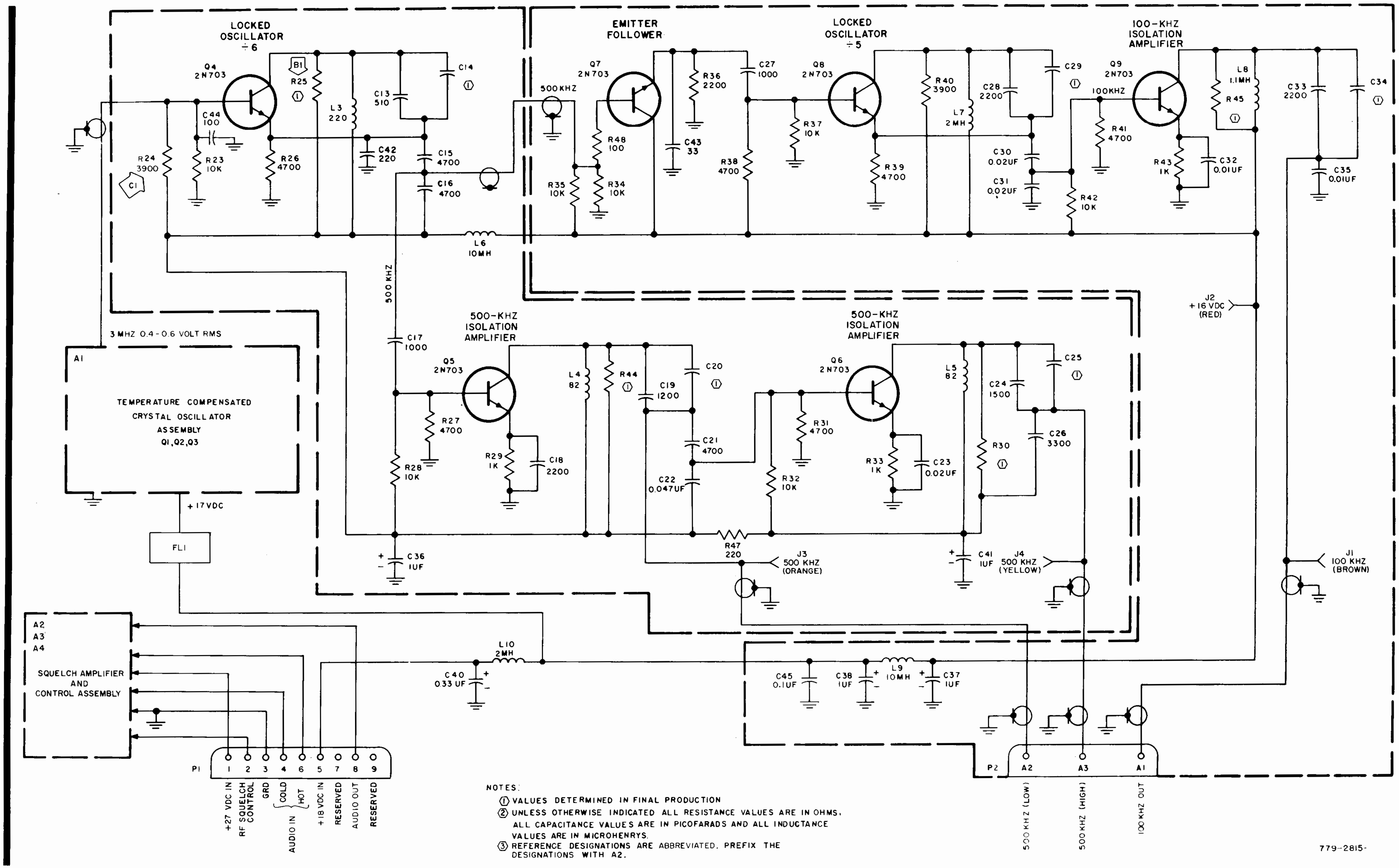
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	B2	Changed R49 from 12 kΩ to 18 kΩ.		31075
Na	B3	Changed C14 from 5100 pF to 4700 pF.		29366
	B4	Changed C17 from 0.05 μF to 0.022 μF.		31075
Na	C1	Changed Q12 and Q13 from 2N404 to 2N3251A. Changed R35 from 1960 to 3320 ohms. Changed R38 from 6.19 to 10 kilohms.		36256
NA	D1	Changed CR1 from 1N270 to 1N4454 to tighten parameter tolerance.		36684



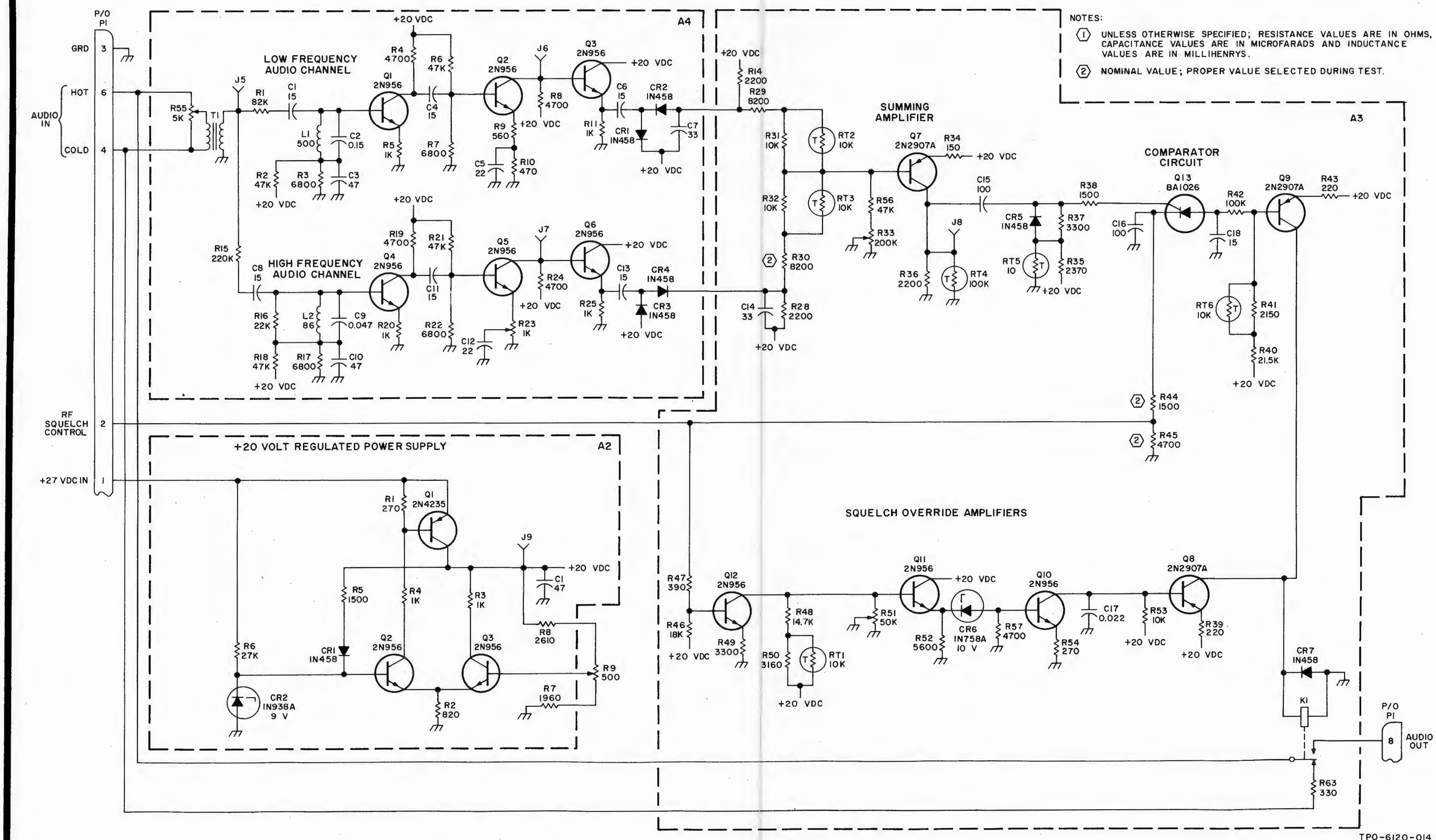
618T-1/2/3 Frequency Divider A1, Schematic Diagram
Figure 809

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
837/838	B1	Changed R25 from 4700 ohms to ⟨1⟩ test select.		460
837/838	C1	Changed resistor R24 from 4700 to 3900 Ω.		REV R



RF Oscillator A2 (528-0690-001),
Schematic Diagram
Figure 810 (Sheet 1 of 2)



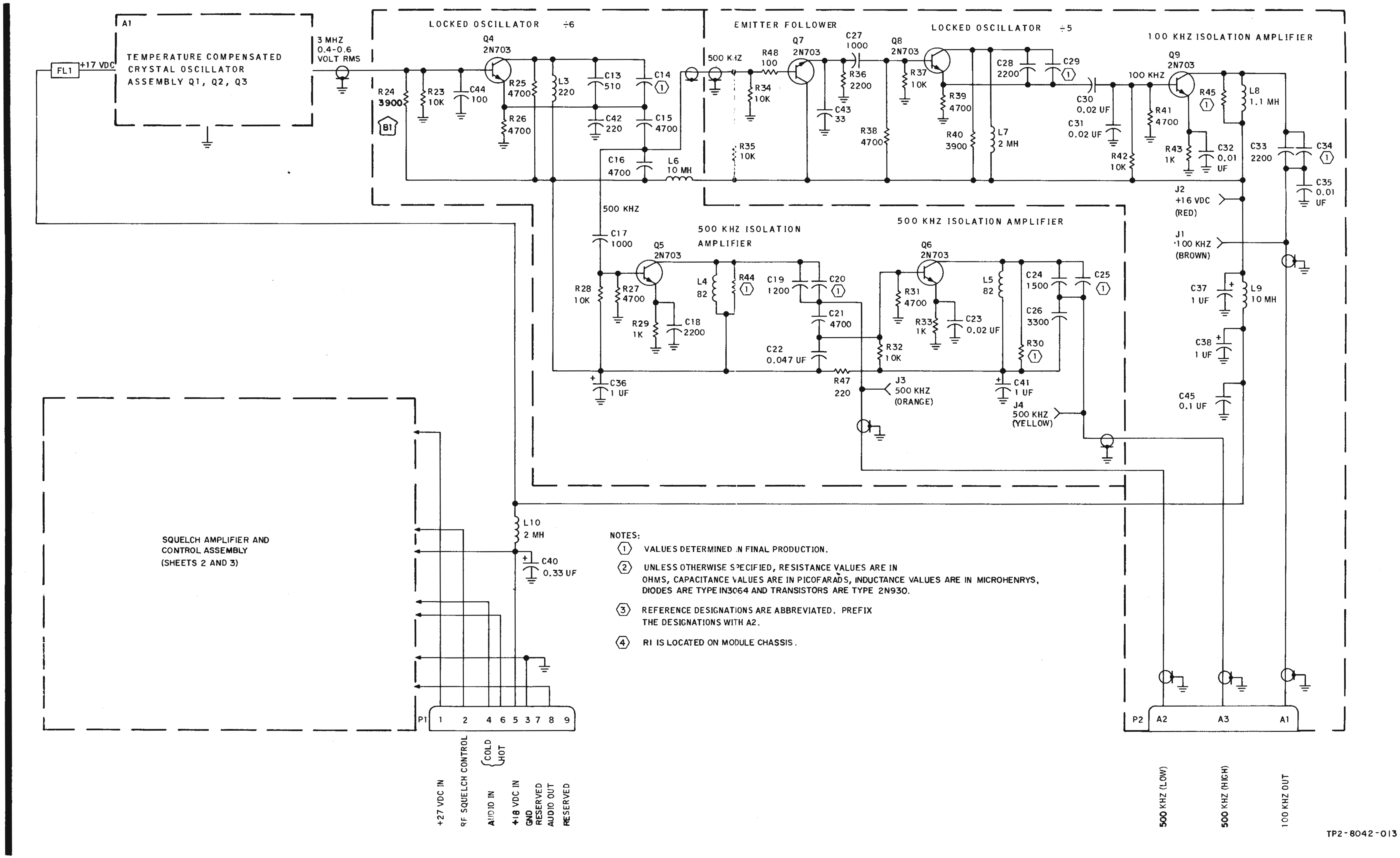
Feb 15/68

RF Oscillator A2 (528-0690-001), Schematic Diagram (Sheet 2 of 2)
Figure 810

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
840E/ 840F	A1	Added positive override squelch board A3.	618T-2/3: 32 618T-2B/3B: 14	1284
840C/ 840D	B1	Changed R24 from 4700 to 3900 ohms.		1784

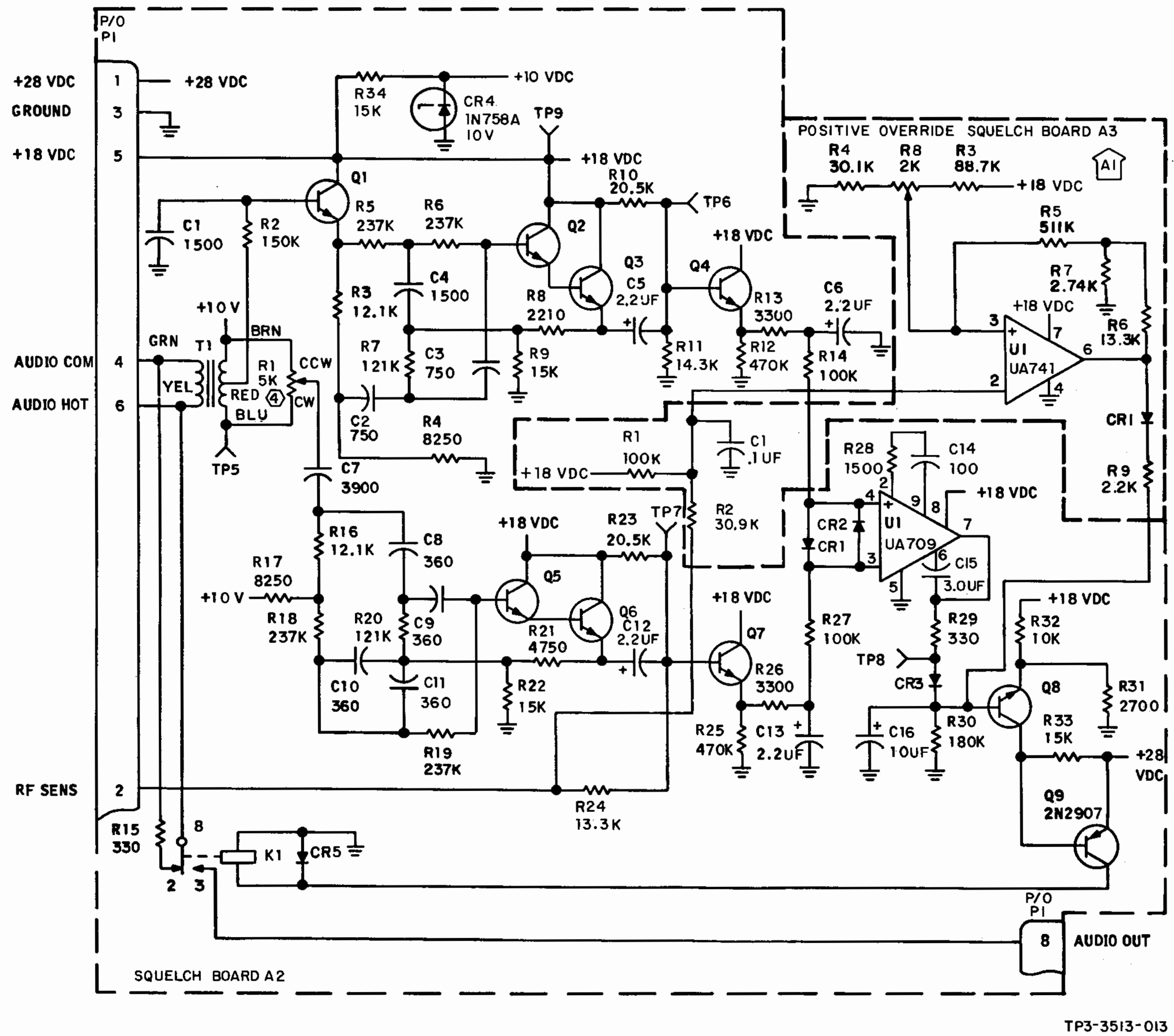
COLLINS
OVERHAUL MANUAL



NOTES:

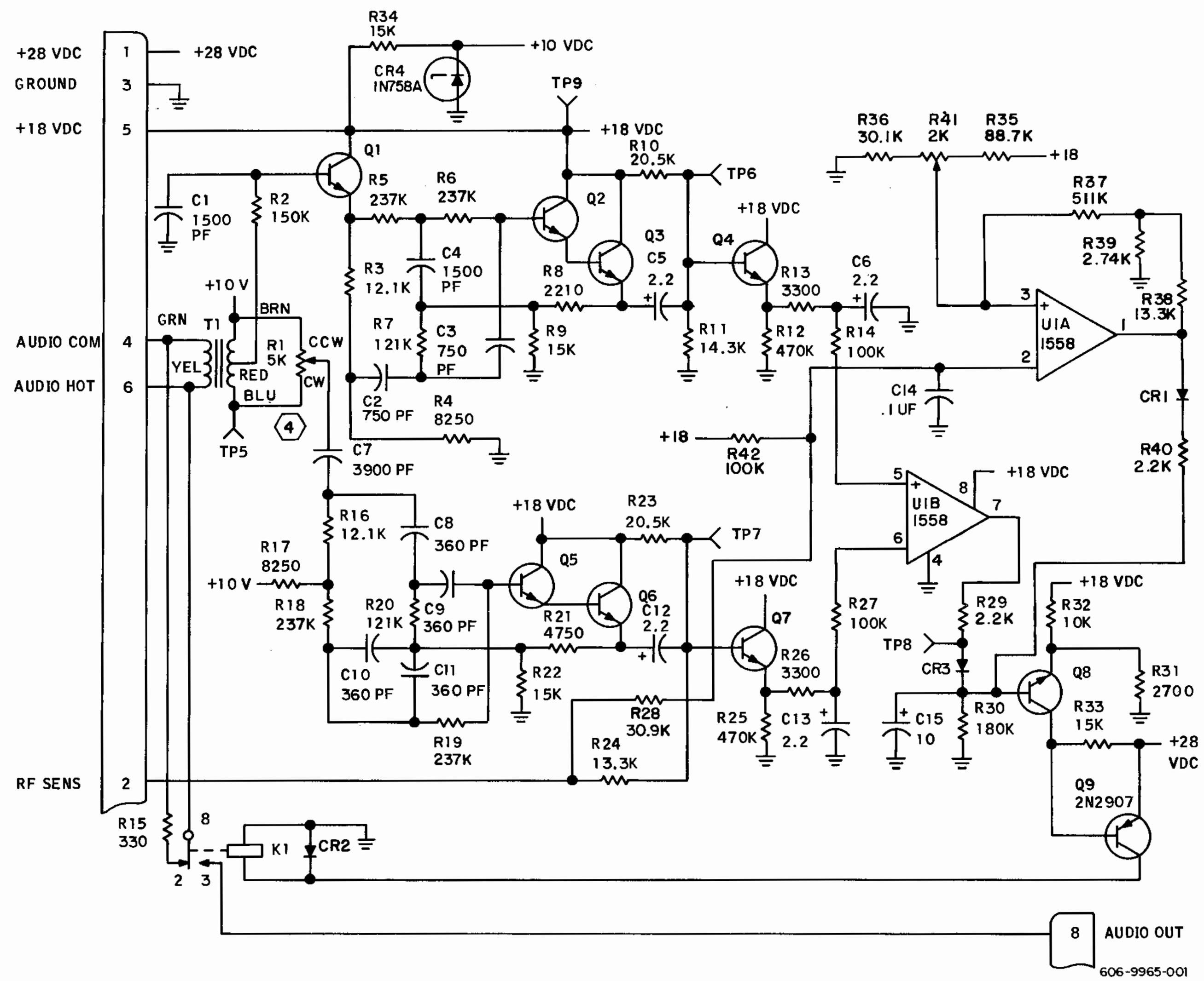
1. VALUES DETERMINED IN FINAL PRODUCTION.
2. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS, INDUCTANCE VALUES ARE IN MICROHENRYS, DIODES ARE TYPE IN3064 AND TRANSISTORS ARE TYPE 2N930.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A2.
4. RI IS LOCATED ON MODULE CHASSIS.

RF Oscillator (528-0690-002), Schematic Diagram
Figure 810A (Sheet 1 of 3)



RF Oscillator (528-0690-002) Squelch Board (797-3684-001)
With Service Bulletin Incorporation of Positive Override
Squelch, Schematic Diagram (Sheet 2 of 3)
Figure 810A

NOTE:
UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS
DIODES ARE TYPE 1N3064 AND TRANSISTORS ARE TYPE 2N930.



RF Oscillator (528-0690-002) Squelch Board (797-3684-002)
With Production Incorporation of Positive Override
Squelch, Schematic Diagram (Sheet 3 of 3)
Figure 810A

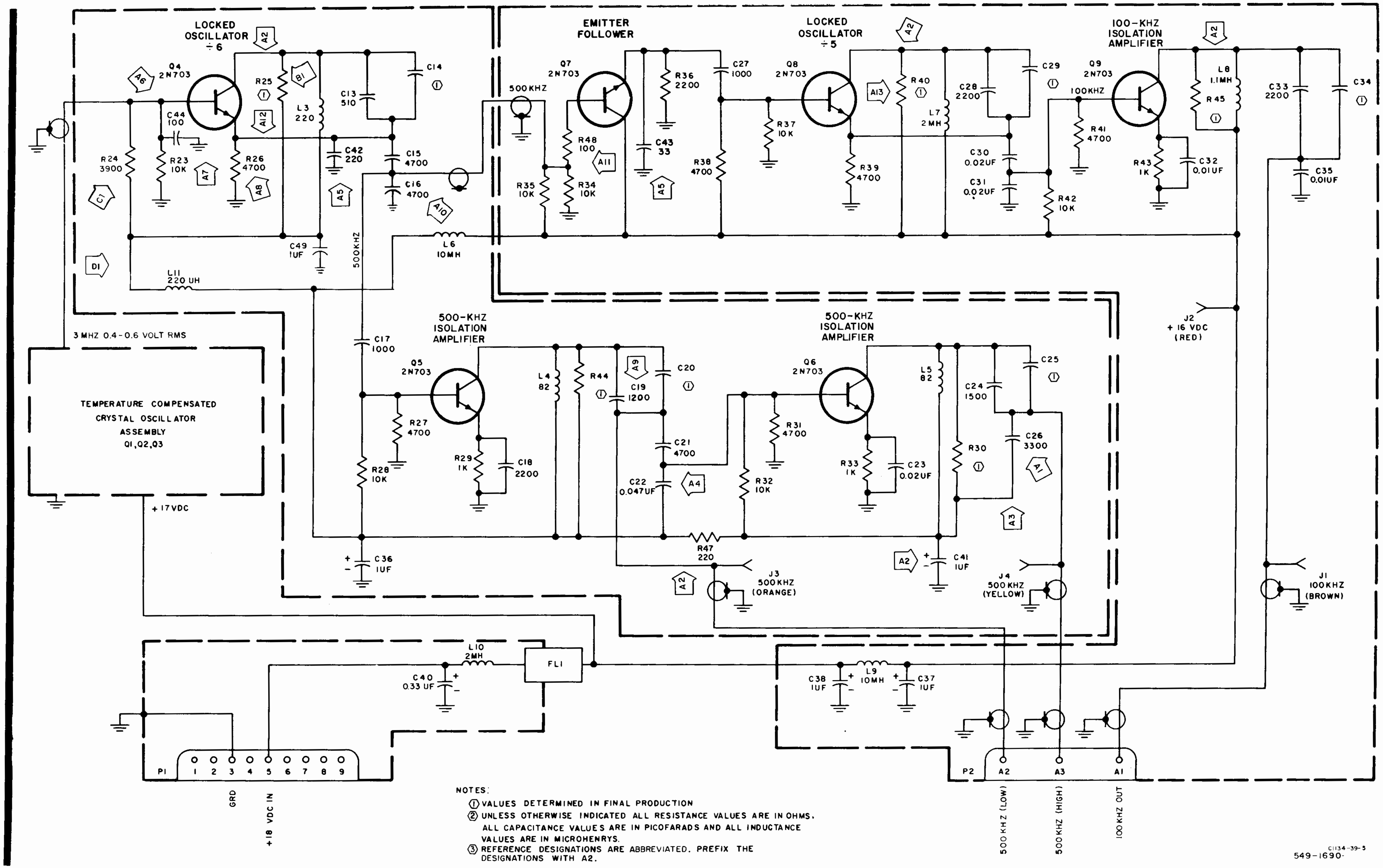
SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1	Changed C26 from 4700 to 3300 pf.		2775
Na	A2	Added C34, C41, and R47. Changed C32 from 0.02 uf to 0.01 uf, C21 from 0.01 uf to 4700 pf, C22 from 0.1 uf to 4700 pf, C18 from 1000 pf to 2200 pf, R25 from 2700 ohms to 4700 ohms, and R40 and R45 to selected values.		3050
Na	A3	Changed C26 connection from ground to junction of C41-R30.		
Na	A4	Changed C22 connection from ground to junction of R44-R47.		
Na	A5	Added C42 and C43.		6000
Na	A6	Added C44 between R23 and R26.		6475
Na	A7	Changed C44 connection from R26 to ground.		
Na	A8	Changed R26 from 4700 ohms to 3300 ohms.		16950
Na	A9	Changed C19 from 1500 pf to 1200 pf.		19250
Na	A10	Changed C16 connection from ground to L6-L3 junction.		19338
Na	A11	Added R48.		
Na	A12	Changed R26 from 3300 ohms to 4700 ohms.		22985

RF Oscillator A2 (528-0251-005), Schematic Diagram
Figure 811 (Sheet A)

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A13	Changed R40 from selected values to 3900 ohms.		
Na	B1	Changed R25 from 4700 ohms to ⟨1⟩ test select.		27381
Na	C1	Changed R24 from 4700 to 3900 ohms.		32023
Na	D1	Added capacitor C49 (1 μf) and coil L11 (220 μH); grounded C16 to improve circuit noise level.		REV BK

RF Oscillator A2 (528-0251-005), Schematic Diagram
Figure 811 (Sheet B)



RF Oscillator A2 (528-0251-005),
Schematic Diagram
Figure 811

SCHEMATIC CHANGES

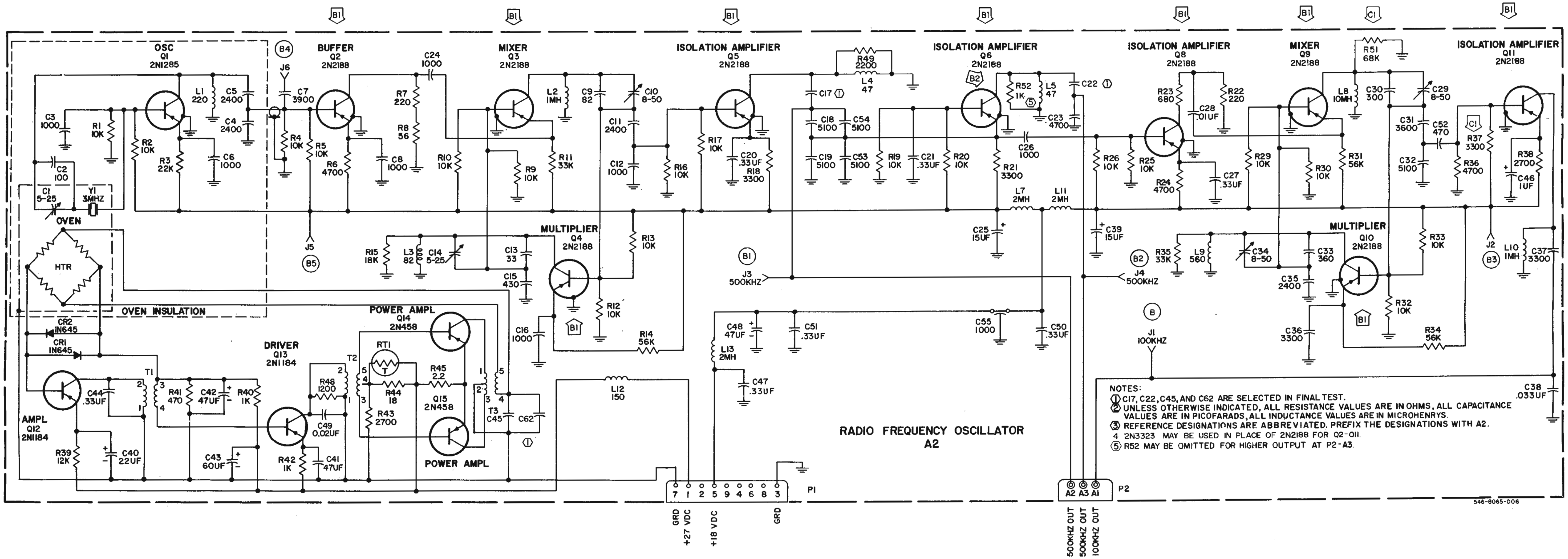
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na		Added C28.		
		Changed C2 from 82 pf to 91 pf.		
		Changed Q1 through Q11 from 2N1224 to 2N458.		
		Changed C4 from 47 uf to 22 uf.		
		Changed C22 from 3900 pf to selected value.		
		Changed C37 from 3000 pf to 3300 pf.		
		Changed C39 and C25 from 0.3 uf to 15 uf.		
		Changed C10 from 5-25 pf to 8-50 pf.		
		Changed L2 from 2 mh to 1 mh.		
		Changed R11 from 56K to 33K.		
		Changed C2 from 91 pf to 100 pf.		
		Added R48, C49, C62, and R49.		
		Changed R41 from 1K to 470 ohms.		
		Changed R39 from 10 kΩ to 12 kΩ.		
		Changed R15 from 33 kΩ to 18 kΩ.		
Na	B1	Q2 thru Q6 and Q8 thru Q11 changed from 2N1285 to 2N2188.		2684
Na	B2	Added R52 (1000 ohms).		2685

RF Oscillator A2 (544-9285-005), Schematic Diagram
Figure 812 (Sheet A)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	C1	Added R51, 68 kΩ, and changed R37 from 4700 to 3300 Ω. Added notes 4 and 5.		Alt ltr AP

RF Oscillator A2 (544-9285-005), Schematic Diagram
Figure 812 (Sheet B)



RF Oscillator A2 (544-9285-005), Schematic Diagram
Figure 812

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
851/852	A1	Deleted C28.		1560
851/852	A2	Changed value of L6 from 2 mh to 2.2 mh.		5766
851/852	A3	Changed transistors Q2, Q3, Q4, and Q5 from 2N274 to 2N2188.		6250
851/852	A4	Changed C10, C11, C12, and C15 from 0.05 uf to 0.02 uf.		6499
851/852	A5	Changed R22 from 5600 ohms to 12,000 ohms.		7050
851/852	A6	Changed C20 from 15 uf to 27 uf. Capacitor C83 (220 uf) was C13 (220 uf). Resistor R3 from J3 to C6, was from C6 to C1. Diode CR4 (1N34AS) was (HD2120). Diode CR3 (1N34AS) was (HD2120). Capacitors C42 and C43 reversed. Resistors R33 and R34 reversed. Relay K5-1 to K2-5; was to P4-14.		8835
851/852	A7	Changed R1 from 1000 ohms to 560 ohms.		23501

IF Translator A3 (544-9286-001), Schematic Diagram (Sheet A)
Figure 813

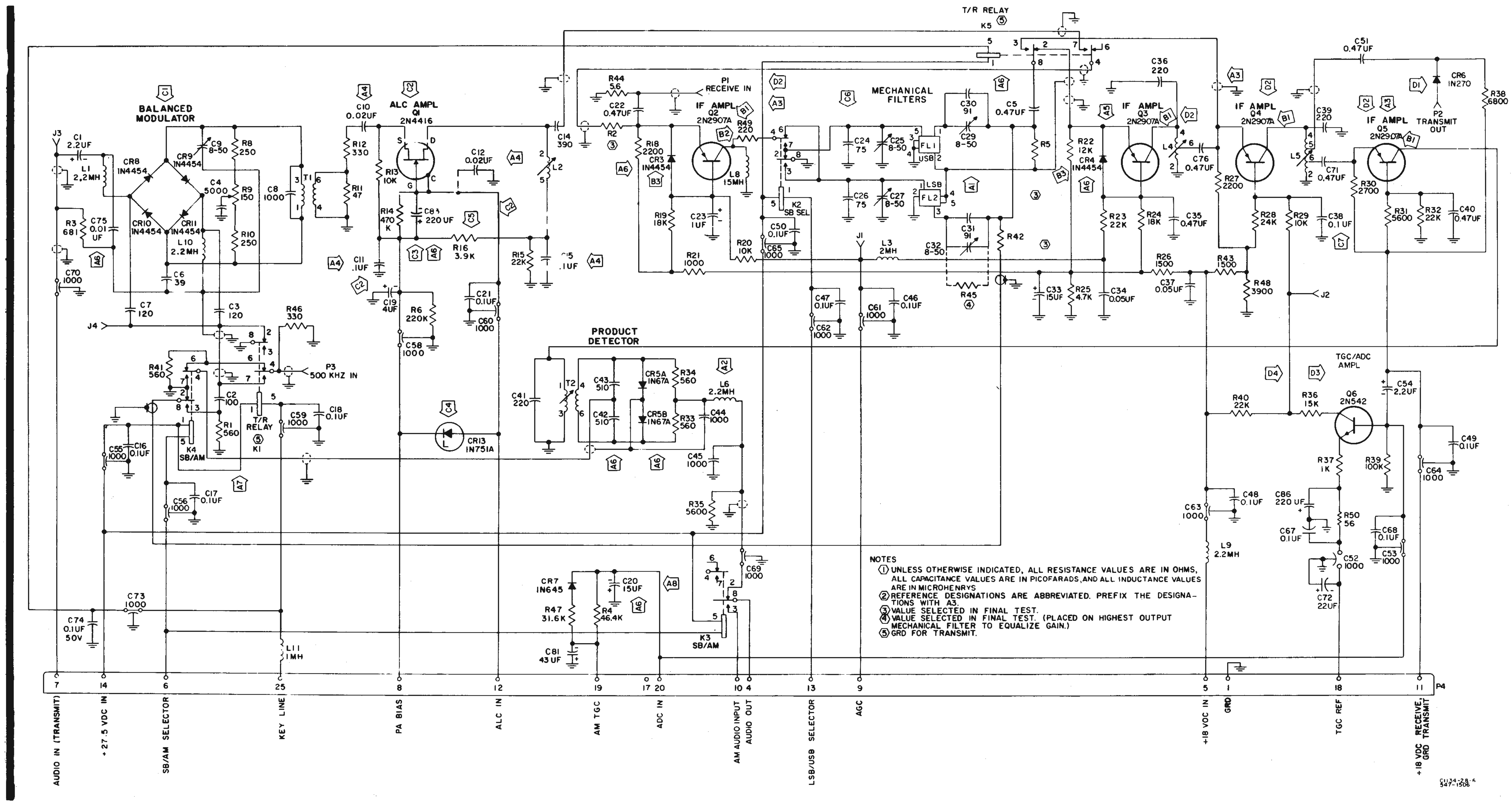
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A8	Changed C20 from 27 uf to 15 uf for improved tgc reponse.	618T-1-19 618T-2/3-20	23501
Na	B1	Changed Q2, Q3, Q4, and Q5 from 2N2188 to 2N3135.	618T-1: 23 618T-2,3: 24 618T-1B,2B 3B: 4	28732
Na	B2	Added R49 (220 ohms).		28240
Na	B3	Changed CR3 and CR4 from 1N34AS to 1N4454.		28732
Na	C1	Diode quad CR1 replaced by CR8 thru CR11 (1N4454's).		28732
Na	C2	Changed transistor Q1 from 2N78 to 2N4416. Deleted R17 and C82. Changed R13 from 6.8 to 10 kΩ. Changed R14 from 15 to 470 kΩ. Changed C83 from 220 to 100 μF. Changed C11 and C15 from 0.02 to 0.1 μF. Added CR12 (1N758A).	618T-1:31 618T-1B: 14 618T-2/3: 34 618T-2B/38 18	33800
Na	C3	Polarity of C83 reversed.		33800
Na	C4	Added CR13 to prevent transient overcharge of C83 when mode is switched from sideband to AM.		33163
Na	C5	Deleted CR12. Added R16, 3.9 kΩ (diode caused excessive carrier leakage).		33894
Na	C6	Changed C24 and C26 from 91 to 75 pF to center adjustment of C25 and C27.		33977
Na	C7	Changed C38 from 0.05 to 0.1 μF (reduces transmit noise level).		34081

IF Translator A3 (544-9286-001), Schematic Diagram
Figure 813 (Sheet B)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	D1	Replaced CR6 diode (HD2160) with new diode (1N270) due to availability.		REV BY
NA	D2	Changed transistors Q2, Q3, Q4, and Q5 from 2N3135 to 2N2907A.		CPN 549-0279-005, REV AJ
NA	D3	Added C85 (0.1 μF) to reduce residual noise in AM XMT mode.		CPN 549-0279-005, REV AK
NA	D4	Deleted C85 to improve attack time of AGC.		CPN 549-0279-005, REV AL

IF Translator A3 (544-9286-001), Schematic Diagram
Figure 813 (Sheet C)



IF Translator A3 (544-9286-001), Schematic Diagram
Figure 813

SCHEMATIC CHANGES

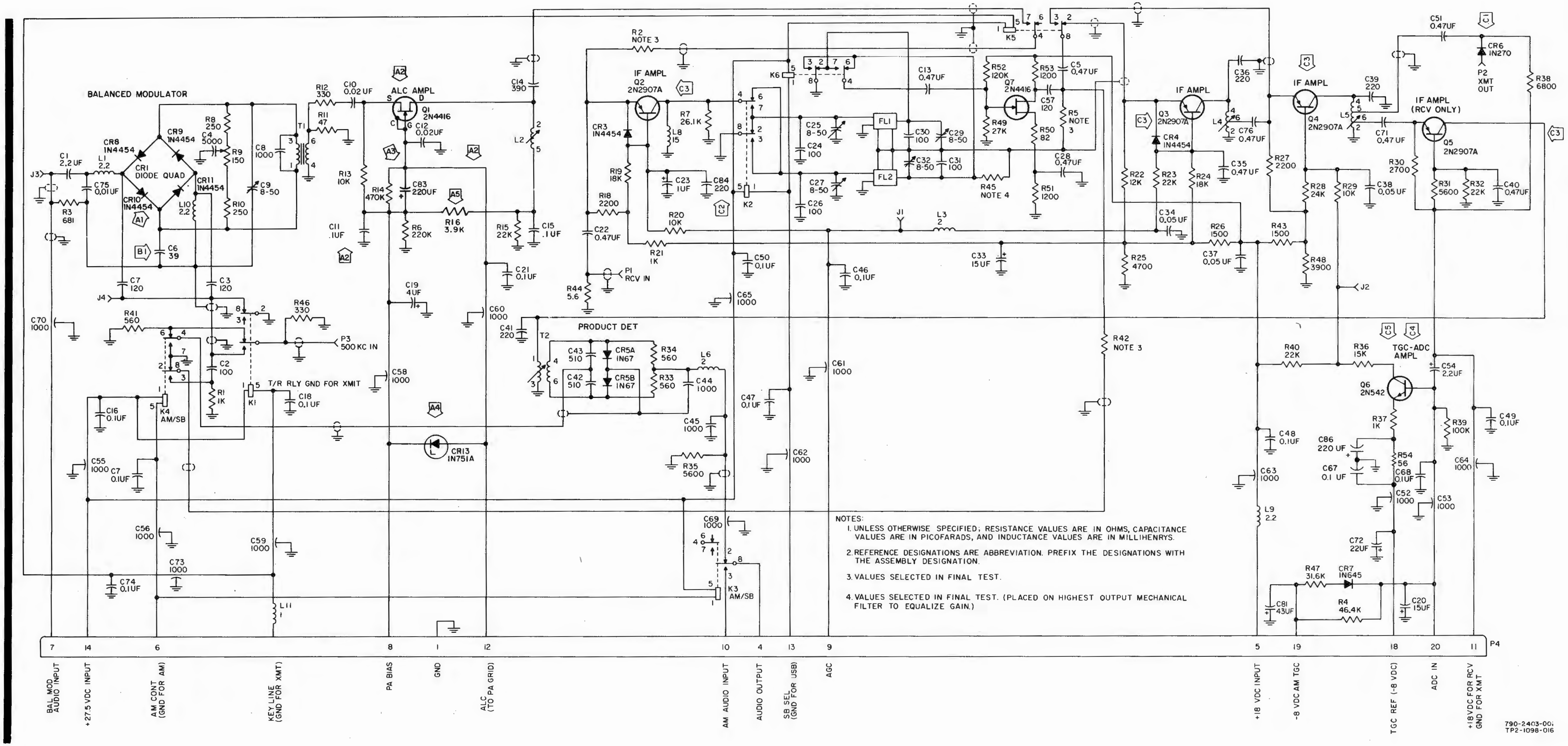
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1	Diode quad CR1 replaced by CR8 thru CR11 (1N4454's).		174
Na	A2	Changed transistor Q1 from 2N78 to 2N4416. Deleted C82 and R17. Changed R13 from 6800 to 10,000 ohms. Changed R14 from 15 to 470 ohms. Changed C11 and C15 from 0.02 to 0.1 μF. Changed C83 from 220 to 100 μF. Added CR12 (1N758).	618T-1: 31 618T-1B: 14 618T-2/3: 34 618T-2B/3B: 18	290
Na	A3	Polarity of C83 reversed.		277
Na	A4	Added CR13 to prevent transient overcharge of C83 when mode is switched from sideband to AM.		282
Na	A5	Deleted CR12. Added R16, 3.9 kilohms (diode caused excessive carrier leakage).		302
NA	B1	Change value of C6 from 24 to 39 pF to permit better balance of the modulator.		34982
NA	C1	Replaced CR6 diode (HD2160) with new diode (1N270) due to availability.		REV L
NA	C2	Added C84 (220 pF) to improve circuit stability.		CPN 790-1916-001, REV F
NA	C3	Changed transistors Q2, Q3, Q4, and Q5 from 2N3135 to 2N2907A.		CPN 790-1916-001, REV H

IF Translator A3 (528-0720-001), Schematic Diagram
Figure 813A (Sheet A)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	C4	Added C85 (0.1 μF) to reduce residual noise in AM XMT mode.		CPN 790-1916-001, REV J
NA	C5	Deleted C85 to improve attack time of AGC.		CPN 790-1916-001, REV K

IF Translator A3 (5238-0720-001), Schematic Diagram
Figure 813A (Sheet B)



NOTES:
1. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS, AND INDUCTANCE VALUES ARE IN MILLIHENRYS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATION. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION.
3. VALUES SELECTED IN FINAL TEST.
4. VALUES SELECTED IN FINAL TEST. (PLACED ON HIGHEST OUTPUT MECHANICAL FILTER TO EQUALIZE GAIN.)

IF Translator A3 (528-0720-001), Schematic Diagram
Figure 813A

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
857/858	A1	Changed Q12 from 2N1285 to 2N1132.		3650
857/858	A2	Changed Q9 from 2N332 to 2N706.		4000
		Changed Q11 from 2N128 to 2N706.		4000
		Changed R44 from 1500 ohms to 2700 ohms.		4000
		Added C124 (5N1800) and C125 (10 pf).		4000
		Changed C43 from 270 pf to 56 pf.		4000
		Deleted CR16, RT1, and R60.		4000
		Changed R45 from 3900 ohms to 2700 ohms.		4000
		Changed R42 from 2700 ohms to 10,000 ohms.		4000
		Changed R41 from 47,000 to 56,000 ohms.		4000
		Changed C45 from selected value to 5N1800.		4000
		Changed C53 from 1200 pf to 470 pf.		4000
857/858	A3	Changed C36 from 680 pf to 220 pf.		5349
		Included value for factory selected C37.		5349

618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model) (Sheet A)
Figure 814

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
857/858	A4	Changed Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q14, Q15, Q16, Q17, Q18, and Q19 from 2N1285 to 2N2188.		6000
		Changed C17 from 270 pf to 150 pf.		6000
		Changed R7 from 150,000 ohms to 180,000 ohms.		6000
		Changed R10 from 150,000 ohms to 180,000 ohms.		6000
		Changed R21 from 240 ohms to 2200 ohms.		6000
		Changed R22 from 4700 ohms to 2700 ohms		6000
		Changed R72 from 150,000 ohms to 120,000 ohms.		6000
		Added CR17 (1N645).		6000
		Changed C43 from 56 pf to 82 pf.		6000
		Changed R44 from 390 ohms to 560 ohms.		6000
		Changed C124 to C126 and C125 to C127.		6000
857/858	A5	Added C128.		7237
857/858	A6	Changed Q12 from 2N2188 to 2N1132.		8000
857/858	A7 (Cont)	Changed C27 from 510 pf to 1000 pf.		9800

618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model) (Sheet B)
Figure 814

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
857/858	A7 (Cont)	Changed C29 from 0.05 μF to 0.47 μF.		9800
857/858	A8	Changed C27 from 1000 pF to 510 pF.		
857/858	A9	Changed R61 from 12,000 ohms to 3900 ohms.		
857/858	A10	Changed Q7 from 2N2188 to 2N3135.		
857/858	A11	Changed R45 from 2700 ohms to 3300 ohms.		16815
857/858	A12	Changed C20 from 56 pF to 75 pF.		
857/858	A13	Changed R13 from 39 kΩ to 27 kΩ.		26599
		Changed C15 from 200 pF to 180 pF.		26599
		Changed R7 from 180 kΩ to 150 kΩ.		26599
857/858	B1	Changed Q1 thru Q6, Q8, Q12; Q14 thru Q19 from 2N2188 to 2N3135.	618T-1: SB 23 618T-2, 3: SB 24	32200
857/858	B2	Changed R7 from 150 kΩ to 82 kΩ.		32200
857/858	B3	Changed R10 from 180 kΩ to 82 kΩ.		32200
857/858	B4	Changed R21 from 2200 ohms to 1200 ohms.		32200
857/858	B5	Changed R23 from 4700 ohms to 1 kΩ.		32200
857/858	B6	Changed R72 from 120 kΩ to 82 kΩ.		32200
857/858	B7	Changed R84 from 1800 ohms to 1 kΩ and R82 from 4700 ohms to 1 kΩ.		32200

618T-1/2/3 kHz-Frequency Stabilizer A4,
Schematic Diagram (Late Model)
Figure 814 (Sheet C)

SCHEMATIC CHANGES

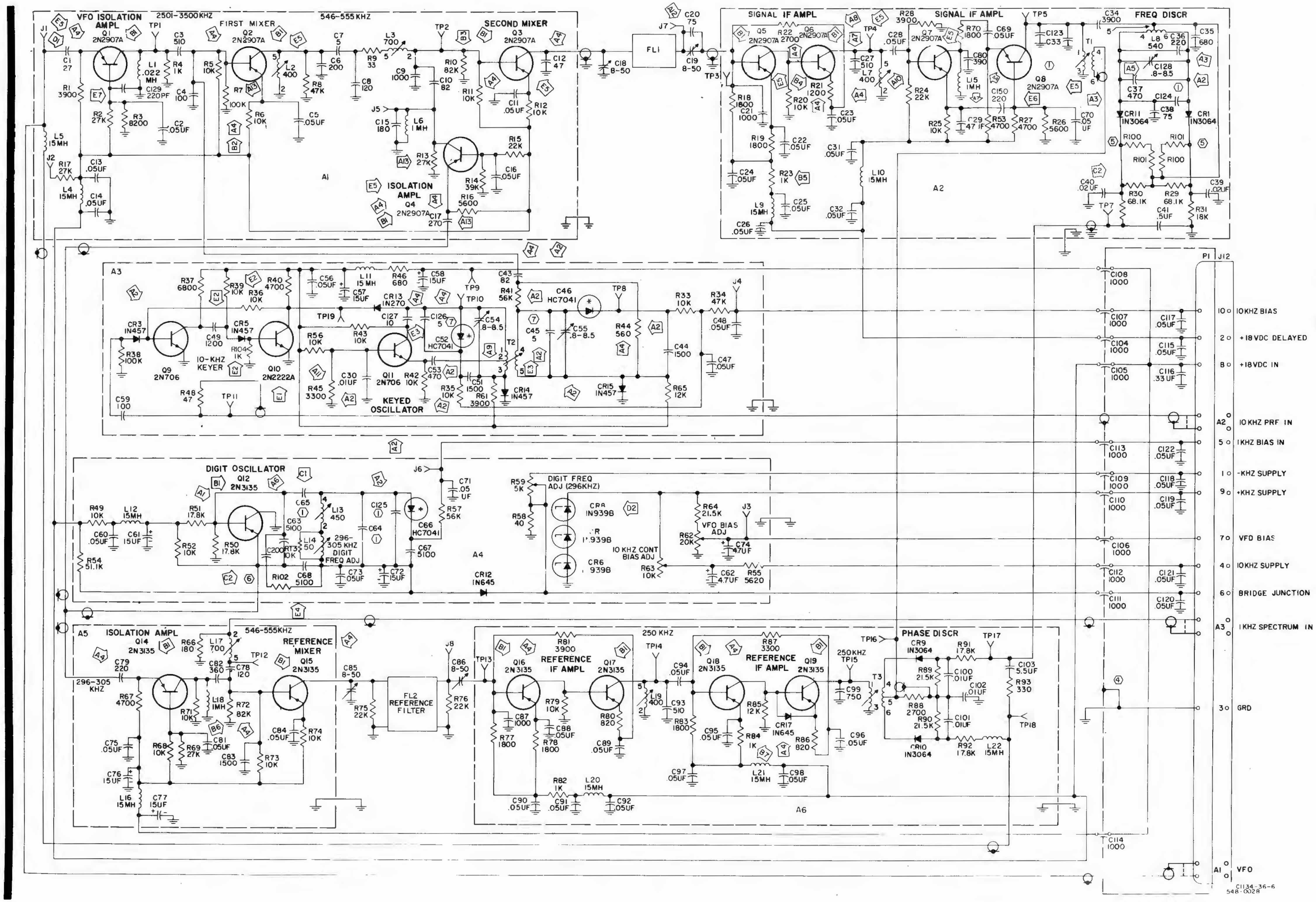
SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	C1	Note added to C65 to indicate test select value.		16650
NA	C2	Added R100 (5-megohm thermistor) and R101 (220 kΩ). Added note 5.		37925
		Added R102 (100-kΩ thermistor) and C200 (39 pF). Added note 6.		37925
NA	D1	Changed value of C1 from 18 to 27 pF to improve 1 kHz spurious.		Alt ltr AC and above
NA	D2	Changed zener diodes CR6, CR7, and CR8 from type 1N2167A to 1N939B. Interchangeable parts if 1N2167A zener diodes are not available.		Alt ltr AT and above
NA	E1	Changed transistor Q10 from 2N706 to 2N2222A, to improve pulse output of Q10.		CPN 546-6748-004, REV AK
NA	E2	Changed C49 (1000 pF) to 1200 pF; Changed R39 (15 kΩ) to 10 kΩ. Deleted diode CR4. Added resistor R104 (1 kΩ). These changes were made to improve 10 kHz keyer operation.		CPN 546-6748-004, REV AL
NA	E3	Added note 7.		CPN 546-6748-004, REV AM
NA	E4	Added RT3 (10 kΩ) as determined by temperature tests.		CPN 548-4138-004, REV AW
NA	E5	Changed transistors Q1 thru Q8 from type 2N3135 to 2N2907A.		CPN 546-6754-004 REV AD CPN 548-4135-004, REV BB

618T-1/2/3 kHz-Frequency Stabilizer A4,
Schematic Diagram (Late Model)
Figure 814 (Sheet D)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	E6	Added capacitor C150 (220 pF) in Q7 and Q8 stages to improve circuit stability.		CPN 548-4135-004, REV BC
NA	E7	Added C129 (220 pF) to improve circuit stability.		CPN 546-6754-004, REV AE

618T-1/2/3 kHz-Frequency Stabilizer A4,
Schematic Diagram (Late Model)
Figure 814 (Sheet E)



NOTE:

1. VALUE DETERMINED BY FINAL TEST.
2. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A4.
4. GROUND FEEDTHRU CAPACITORS TO P1-3.
5. (C2) USE OF R100 AND R101 DETERMINED BY FINAL TEST. R100 AND R101 SHOULD BE CONNECTED IN SERIES ACROSS R29 TO COMPENSATE FOR MINUS-MINUS BOW CAUSED BY L8. CONNECT R100 AND R101 IN SERIES ACROSS R30 TO COMPENSATE FOR POSITIVE-POSITIVE BOW. R100 IS A 5 MEG OHM THERMISTOR AND R101 IS A 220K OHM RESISTOR.
6. (C2) USE OF R102 AND C200 DETERMINED BY FINAL TEST. R102 AND C200 SHOULD BE CONNECTED IN SERIES FROM Q12 BASE TO THE ANODE END OF CR12 TO COMPENSATE FOR POSITIVE-POSITIVE BOW CAUSED BY L13. R102 IS A 100K OHM THERMISTOR AND C200 IS A 39PF CAPACITOR.
7. (E3) C45 AND/OR C126 MAY BE DELETED IN TEST.

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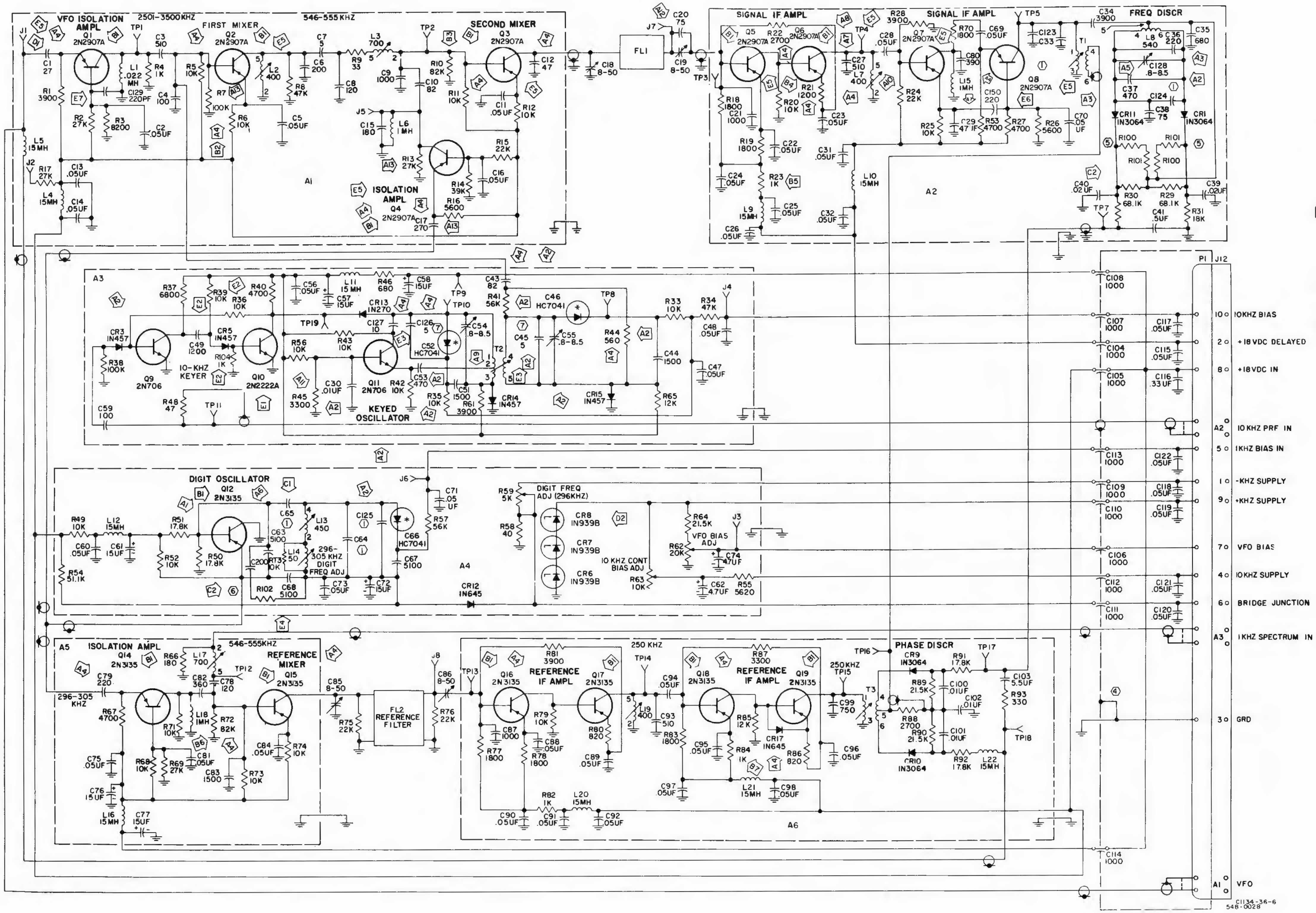
548-0028

618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model)
Figure 814



NOTE:

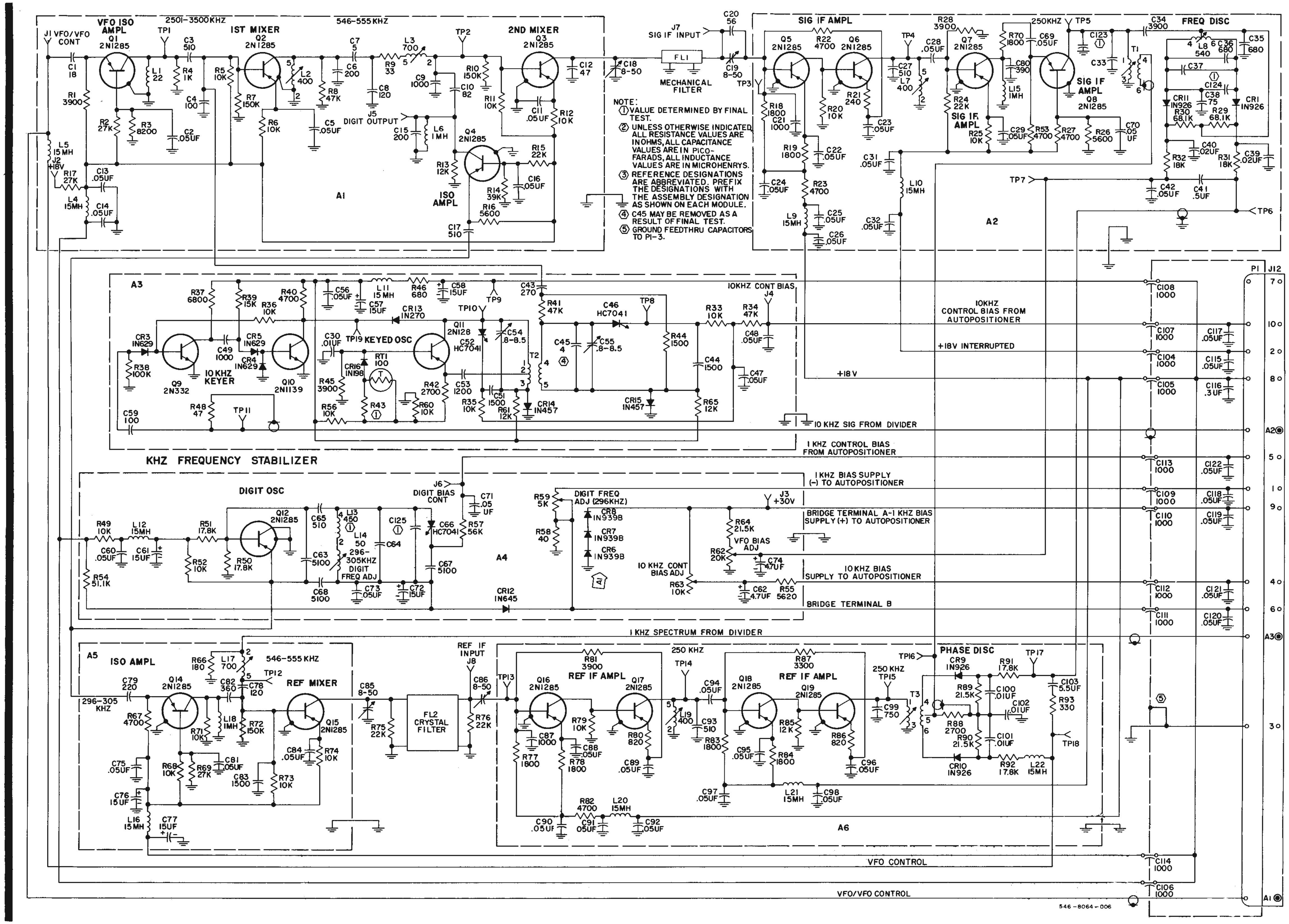
1. VALUE DETERMINED BY FINAL TEST.
2. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A4.
4. GROUND FEEDTHRU CAPACITORS TO P1-3.
5. C2 USE OF R100 AND R101 DETERMINED BY FINAL TEST. R100 AND R101 SHOULD BE CONNECTED IN SERIES ACROSS R29 TO COMPENSATE FOR MINUS-MINUS BOW CAUSED BY L8. CONNECT R100 AND R101 IN SERIES ACROSS R30 TO COMPENSATE FOR POSITIVE-POSITIVE BOW. R100 IS A 5 MEG OHM THERMISTOR AND R101 IS A 220K OHM RESISTOR.
6. C2 USE OF R102 AND C200 DETERMINED BY FINAL TEST. R102 AND C200 SHOULD BE CONNECTED IN SERIES FROM Q12 BASE TO THE ANODE END OF CR12 TO COMPENSATE FOR POSITIVE-POSITIVE BOW CAUSED BY L13. R102 IS A 100K OHM THERMISTOR AND C200 IS A 39PF CAPACITOR.
7. E3 C45 AND/OR C126 MAY BE DELETED IN TEST.

618T-1/2/3 kHz-Frequency Stabilizer A4, Schematic Diagram (Late Model)
Figure 814

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	A1	Diodes CR6, C R7, and CR8 changed from 1N2167A to 1N939B. Interchangeable parts if 1N2167A zener diodes are not available.		All models

618T-1/2/3 kHz-Frequency Stabilizer A4,
Schematic Diagram (Early Model)
Figure 815 (Sheet A)



618T-1/2/3 kHz-Frequency Stabilizer A4,
Schematic Diagram (Early Model)
Figure 815

SCHEMATIC CHANGES

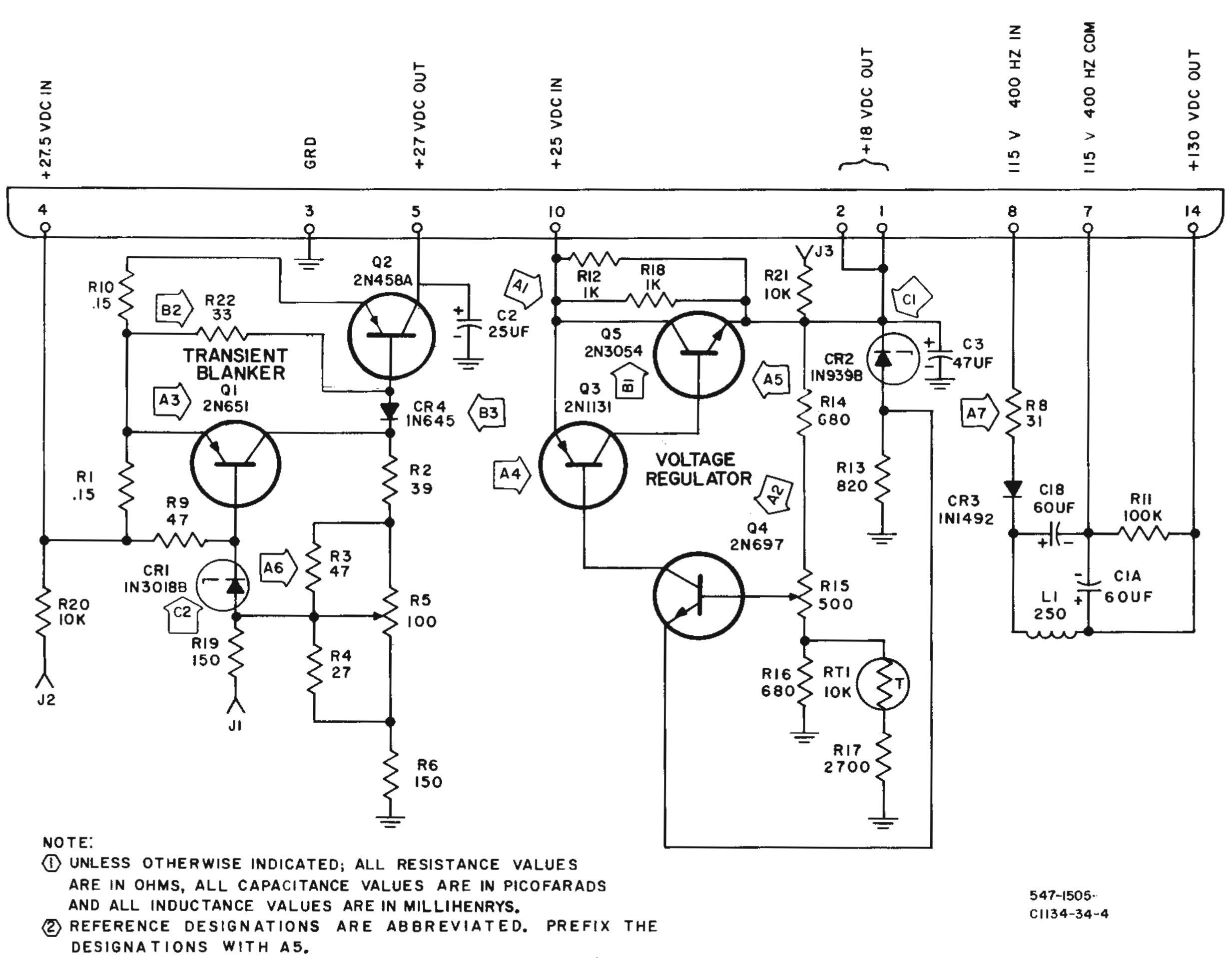
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
865/866	A1	Changed Q5 from 2N550 to ST4265.		
865/866	A2	Changed Q4 from 2N332 to 2N697.		
865/866	A3	Changed Q1 from 2N670 to 2N651.		
865/866	A4	Changed Q3 from 2N3053 to 2N1131.		
865/866	A5	Changed Q5 from ST4265 to 2N3053.		
865/866	A6	Changed R3 from 27 ohms to 47 ohms.		23750
865/866	A7	Changed R8 from 40 ohms to 31 ohms.		23750
865/866	B1	Changed Q5 from 2N3053 to 2N3054.		
865/866	B2	Added R22, 33 ohms.	618T-1: 28 618T-1B/ 3B: 11 618T-2: 30 618T-2B: 12 618T-3: 29	29325
865/866	B3	Added CR4, 1N645.	618T-1: 28 618T-1B/ 3B: 11 618T-2: 30 618T-2B: 12 618T-3: 29	29325

Low-Voltage Power Supply A5, Schematic Diagram
Figure 816 (Sheet A)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	C1	CR2 changed from 1N2621A to 1N939B due to part availability.		35562
NA	C2	CR1 changed from 1N3018A to 1N3018B due to part availability.		38810

Low-Voltage Power Supply A5, Schematic Diagram
Figure 816 (Sheet B)

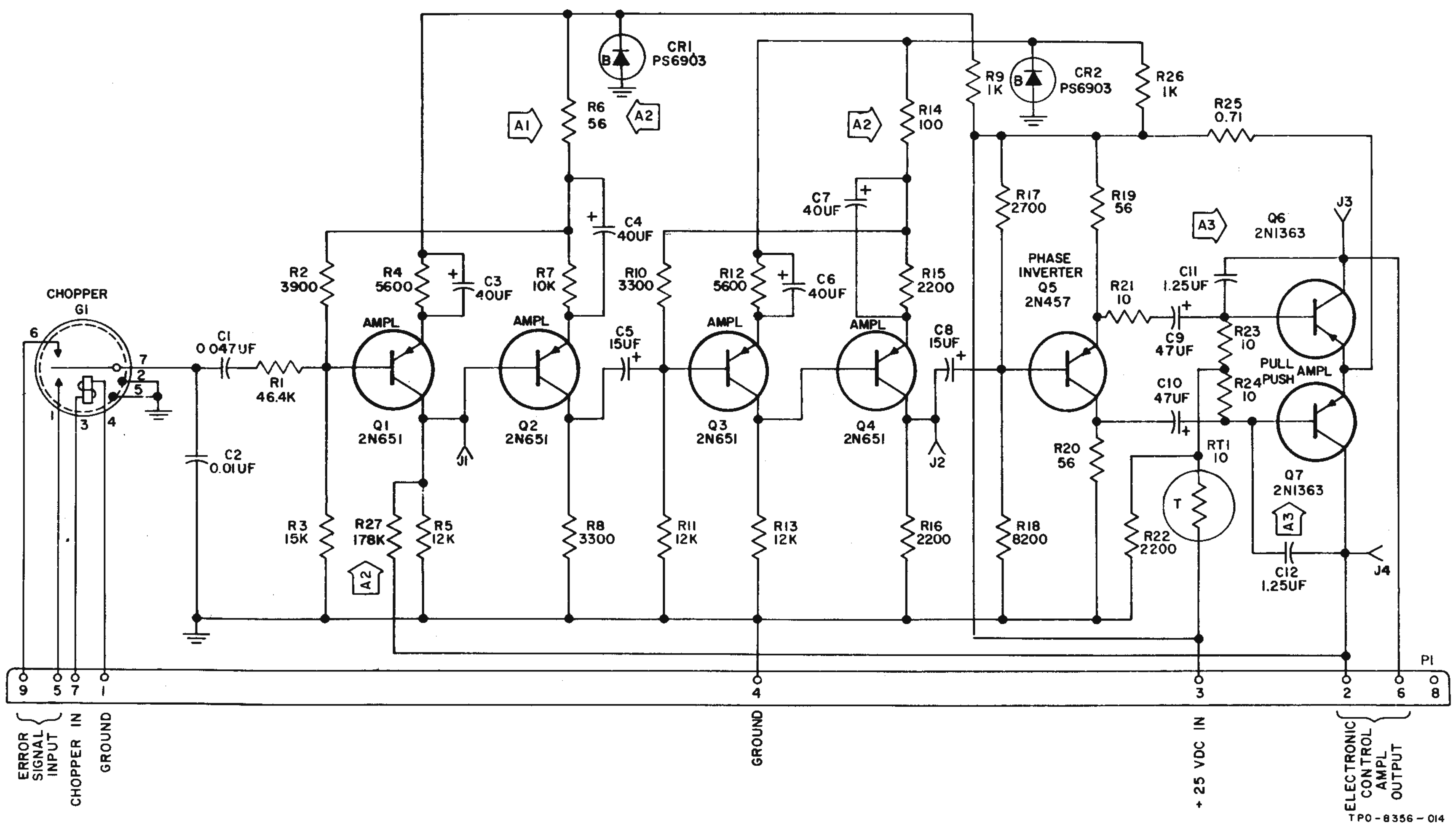


Low-Voltage Power Supply A5, Schematic Diagram
Figure 816

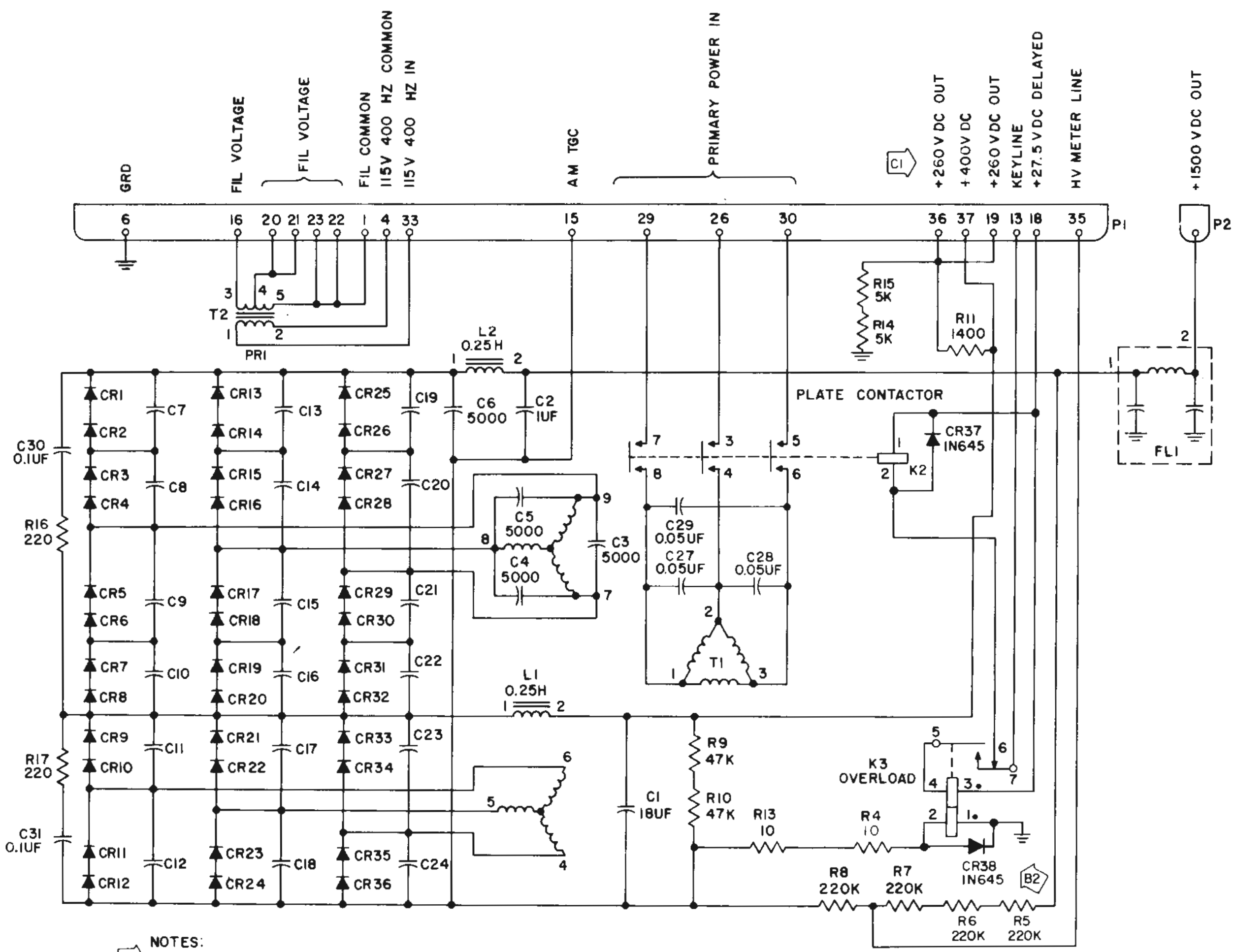
SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
869/870	A1	Changed R6 from 100 ohms to 120 ohms.		4000
869/870	A2	Added R27.		7000
		Changed R6 from 120 ohms to 56 ohms.		7000
		Changed R14 from 220 ohms to 100 ohms.		7000
869/870	A3	Changed Q6 and Q7 from 2N457A to 2N1363 for improved reliability during extreme high-temperature operations.		24,000

Electronic Control Amplifier A6, Schematic Diagram (Sheet A)
Figure 817



Electronic Control Amplifier A6, Schematic Diagram
Figure 817



NOTES:

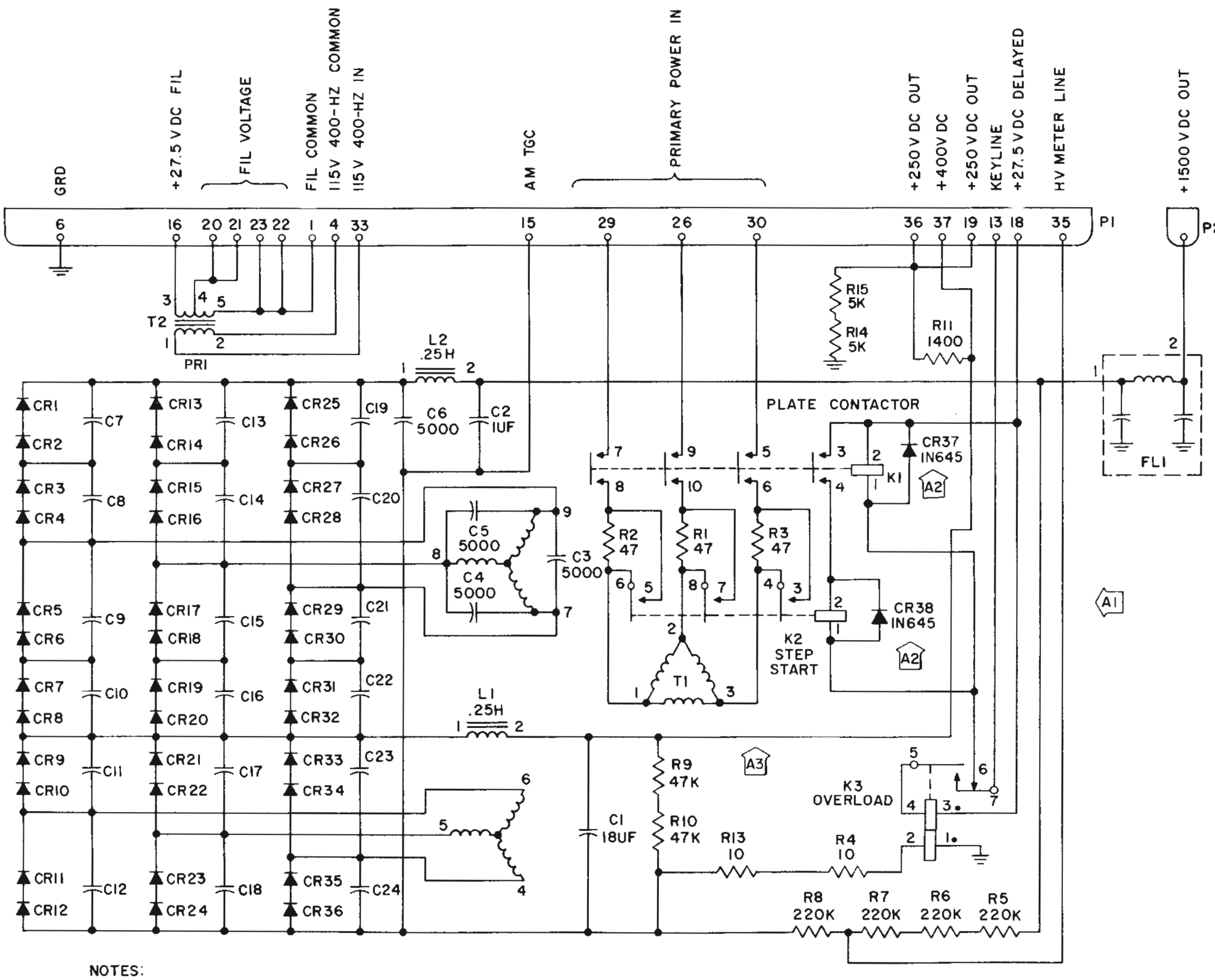
1. CR1 THRU CR36 ARE TYPE 1N1492 OR 1N4005
2. C7 THRU C24 ARE 1000 UUF.
3. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN PICOFARADS.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A7.

3-Phase High-Voltage Power Supply A7, Schematic Diagram (Late Model)
Figure 818

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
877/878	A1	Deleted CR37, CR38, R12, C25, and C26.		1880
877/878	A2	Added CR37 and CR38.		3788
877/878	A3	Deleted K1, R1, R2, R3, and CR38. Added C27, C28, C29, C30, C31, R16, and R17. See schematic diagram of late model 3-phase high-voltage power supply (MCN 18000 and up).	618T-2 18	18000

3-Phase High-Voltage Power Supply A7, Schematic Diagram (Early Model) (Sheet A)
Figure 819



NOTES:

1. CR1 THRU CR36 ARE IN1492 TYPE.
2. C7 THRU C24 ARE 1000 UUF.
3. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN PICOFARADS.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A7.

C1134-43-5

3-Phase High-Voltage Power Supply A7, Schematic Diagram (Early Model)
Figure 819

SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
881/882	A1	Added CR27, CR30, CR31, and CR32 (1N645).	16	4250
		Added CR28 and CR29.	16	4250
		Circuit from T2-9 to T2-8 was to Q6.	16	4250
		Circuit from T2-8 to ground was to Q5.	16	4250
		CR4 from CR5 to CR29 was to T2-8.	16	4250
		CR3 from CR26 to C1 was to T2-9.	16	4250
		Circuit from K1-3 to P1-26 was to P1-27.	16	4250
		Added circuit from P1-26 to P1-27.	16	4250
		Deleted R10 from Q8 to Q9.	16	4250
		Deleted R5 from R6 to Q3.	16	4250
		Deleted Q3 from R5 to Q4.	16	4250
		R25 (0.56) from Q9 to R26; was R9 (1) from Q7 to R8.	16	4250
		R26 (0.56 from Q10 to T2-10; was R8 (1) from Q6.	16	4250
		R27 (0.56) from Q11 to T2-7; was R7 (1) from Q5.	16	4250
	(Cont)	R28 (0.56 from Q12 to R27; was R6 (1) from Q4 to R7.	16	4250

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Late Model) (Sheet A)
Figure 820

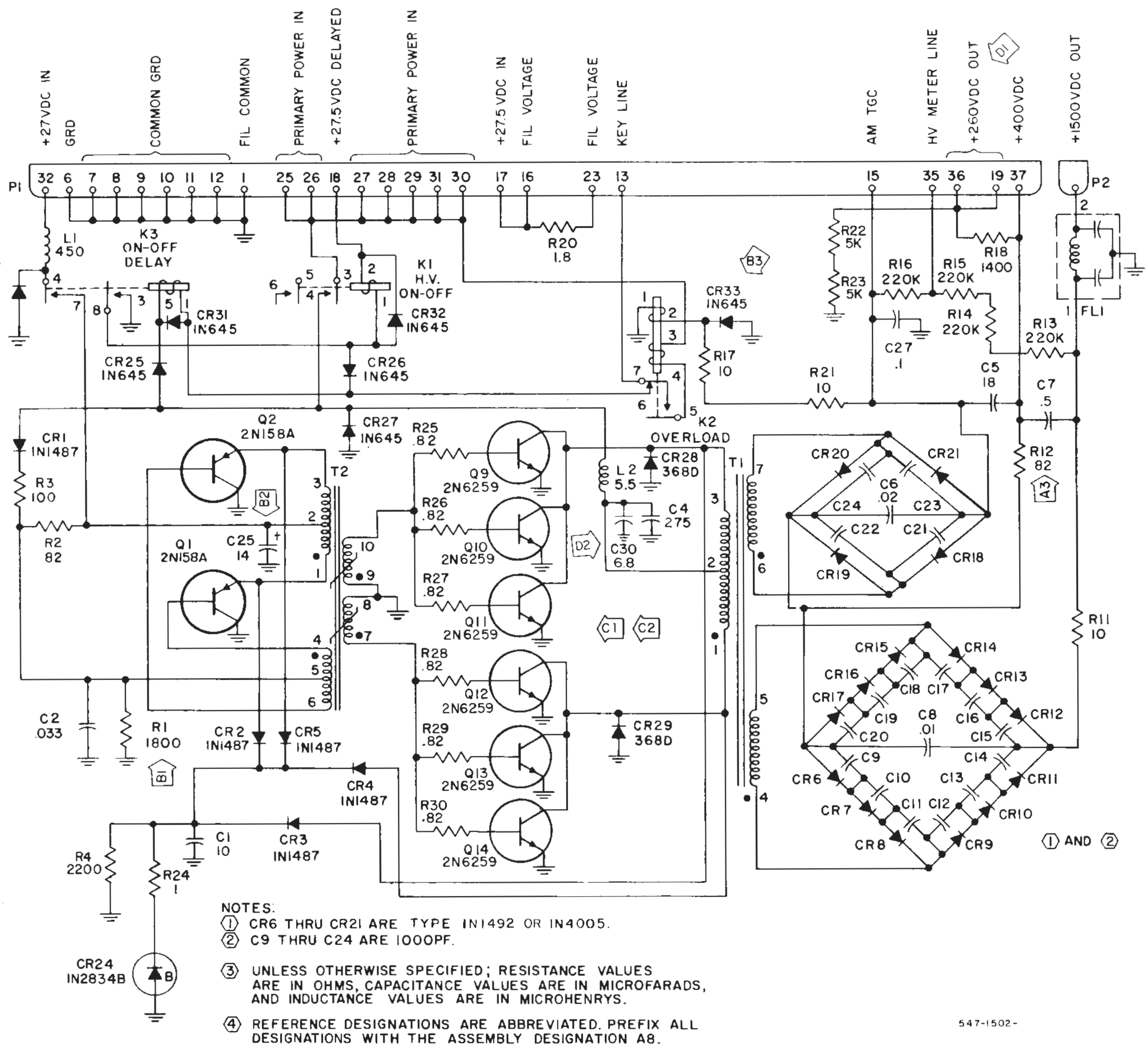
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1 (Cont)	Deleted circuit from Q8 to ground.	16	4250
		Deleted circuit from Q3 to ground.	16	4250
		Q9 (164-16) was Q7 (2N1100).	16	4250
		Q10 (164-16) was Q6 (2N1100).	16	4250
		Q11 (164-16) was Q5 (2N1100).	16	4250
		Q12 (164-16) was Q4 (2N1100).	16	4250
		These changes converted the early model A8 to the late model A8. These changes are not indicated on either schematic diagram.		
Na	A2	Deleted circuit from CR30 (1N645) K3-7.		
Na	A3	Changed R12 from 160 ohms to 82 ohms.		7300
Na	B1	Changed R1 from 2200 ohms to 1800 ohms.		11198
Na	B2	Added (+) positive polarity symbol to C25 (schematic error).		
Na	B3	Added CR33 for transient suppression.	23 for the 618T-3; 3 for 618T-3B	12095

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Late Model) (Sheet B)
Figure 820

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	C1	Added Q13 and Q14 (2N3773). Added R29, R30 (0.82 ohm). Changed Q9 thru Q12 from 2N1100 to 2N3773. Changed R25 thru R28 from 0.56 to 0.82 ohm.		13970
Na	C2	Changed Q9 thru Q14 from 2N3773 to 2N6259.		13975
	D1	Changed voltage between P1-19 and P1-36 from 250 to 260 V dc to correct schematic error.		
	D2	Added capacitor C30 (6.8 μF) parallel to C4 to improve circuit stability.		CPN 545-4971-000, REV U

27.5-V DC High-Voltage Power Supply A8,
Schematic Diagram (Late Model)
Figure 820 (Sheet C)



NOTES:
(1) CR6 THRU CR21 ARE TYPE IN1492 OR IN4005.
(2) C9 THRU C24 ARE 1000PF.
(3) UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
(4) REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX ALL DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A8.

547-1502-

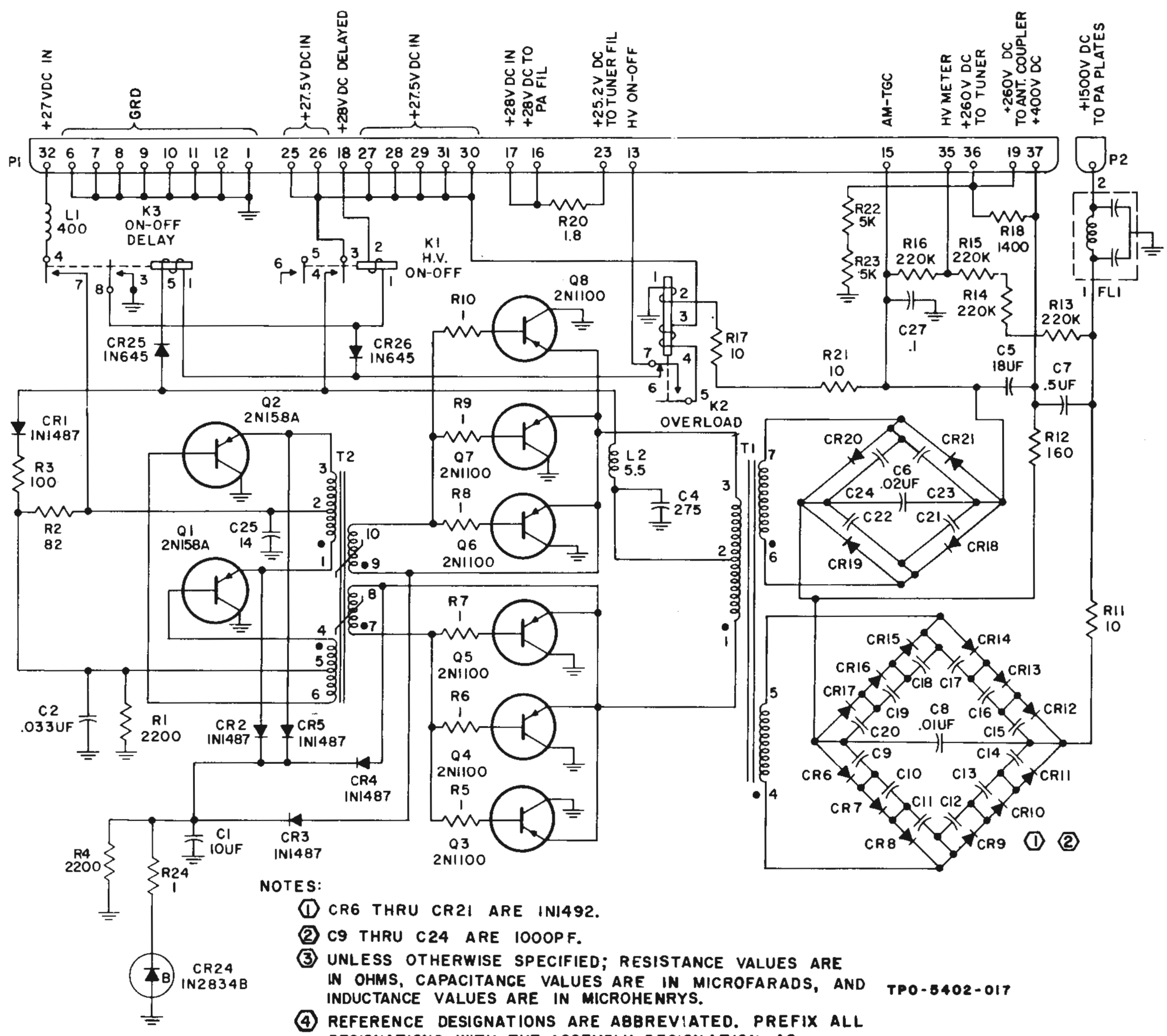
27.5-V DC High-Voltage Power Supply A8, Schematic Diagram (Late Model)
Figure 820

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Early Model) (Sheet A)
Figure 821



NOTES:

1. CR6 THRU CR21 ARE 1N1492.
2. C9 THRU C24 ARE 1000PF.
3. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX ALL DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A8.

27.5-VDC High-Voltage Power Supply A8, Schematic Diagram (Early Model)
Figure 821

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
889/890	A1	Changed C47 and C49 from 15 uf to 47 uf to improve operation in CW function.	2	1500
889/890	A2	Changed R49 from 47,000 ohms to 33,000 ohms to simplify audio gain adjustment	8	3508
889/890	A3	Changed Q3, Q4, Q5, Q6, and Q7 from 27274 to 2N2188 for increased transistor reliability.		6486
889/890	A4	Changed R26 from 2200 ohms to 3900 ohms and C6 from 0.68 uf to 0.33 uf.		7400
889/890	A5	Added L9 and C53 to reduce transmit noise on the 18-vdc line.	13	7600
889/890	A6	Changed CR13 from SZ885 to 1N4122.		9255
889/890	A7	Changed CR2, CR4, CR7, and CR11 from HD2120 to 1N34AS and R12 from 1500 ohms to 1000 ohms.		
889/890	A8	Changed C22 from 15 uf to 45 uf to improve TR transfer characteristics.		17300
889/890	A9	Changed CR5 and CR6 from HD2120 to 1N34AS and R41 from 22,000 ohms to 33,000 ohms.		20000
889/890	A10	Changed R26 from 3900 ohms to 2200 ohms to increase if. amplifier gain.		21500

AM/Audio Amplifier A9, Schematic Diagram (Late Model) (Sheet A)
Figure 822

SCHEMATIC CHANGES

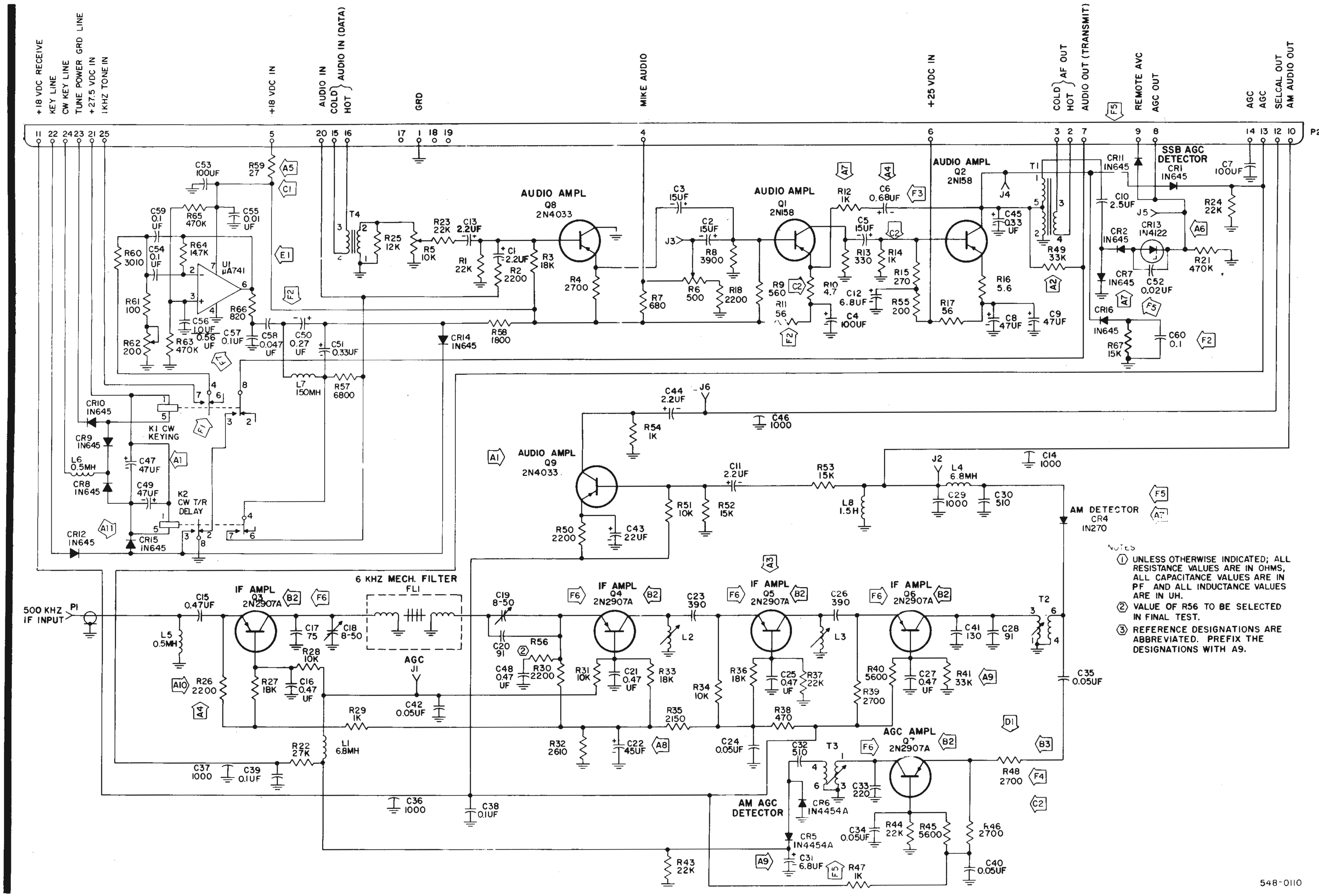
SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	A11	Added CR15 to improve relay arc suppression.		
NA	B1	Reversed polarity of CR15 (schematic error).		29427
NA	B2	Changed Q3, Q4, Q5, Q6 and Q7 from 2N2188 to 2N3135.	618T-1: SB 23 618T-2, 3: SB 24 618T-1B, 2B, 3B: SB 4	29427
NA	B3	Replaced RT1 with CR16.		29427
NA	C1	Replaced L9 (1 mH) with R59 to reduce surge current through chassis relay K4.	618T-1: 30 618T-2/3: 33 618T-2B/ 3B: 16	32814
NA	C2	Changed R10 from 5.6 ohms to 4.7 ohms, R14 from 1200 ohms to 1000 and R48 from 2200 ohms to 1800 ohms. Changes to decrease distortion and improve AGC characteristics.		30360
NA	D1	CR16 removed.		33567
NA	E1	Active filter consisting of U1, R60, R61, R62, R63, R64, R65, R66, C54, C55, C56, C57, C58, and C59 added between P2-25 and K1-7 to decrease CW emission bandwidth.	618T-1/4: 36, 37 618T-1B/ 4B: 19, 20 618T-2/5: 39, 40 618T-2B/ 5B: 23, 24 618T-3/6: 40, 41 618T-3B/ 6B: 24, 25	A9 MCN 40000 and above

AM/Audio Amplifier A9, Schematic Diagram
(Late Model)
Figure 822 (Sheet B)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	F1	Changed relay K1 contacts 7 and 4 from previous connection between C57 and C58 to reduce sideband residual output at cold temperature.		CPN 601-3997-001, REV C
NA	F2	Changed R11 from 82 to 56 Ω, C58 from 0.022 to 0.047 pF, and C50 from 0.33 to 0.27 pF. Added resistor R67 (15 kΩ) and capacitor C60 (0.1 pF). Added CR16 (1N645).		CPN 546-6053-000, REV BD
NA	F3	Changed C6 from 0.33 to 0.68 μF to improve audio frequency response.		CPN 601-3997-001, REV E
NA	F4	Changed resistor R48 from 1800 to 2700 to improve AM mode RCR AGC characteristics.		CPN 546-7273-004, REV AW
NA	F5	Changed CR2, CR7, and CR11 from 1N34AS to 1N645. Changed CR4 from 1N34AS to 1N270. Changed CR5 and CR6 from 1N34AS to 1N4454A.		CPN 546-7273-004, REV AY
NA	F6	Changed transistors Q3, Q4, Q5, Q6, and Q7 from 2N2135 to 2N2907A.		CPN 546-7273-004, REV BA
NA	F7	Changed capacitor C56 from 1.0 to 0.56 μF.		CPN 601-3997-001, REV G

AM/Audio Amplifier A9, Schematic Diagram
(Late Model)
Figure 822 (Sheet C)



NOTES
1. UNLESS OTHERWISE INDICATED; ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PF AND ALL INDUCTANCE VALUES ARE IN UH.
2. VALUE OF R56 TO BE SELECTED IN FINAL TEST.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A9.

548-0110

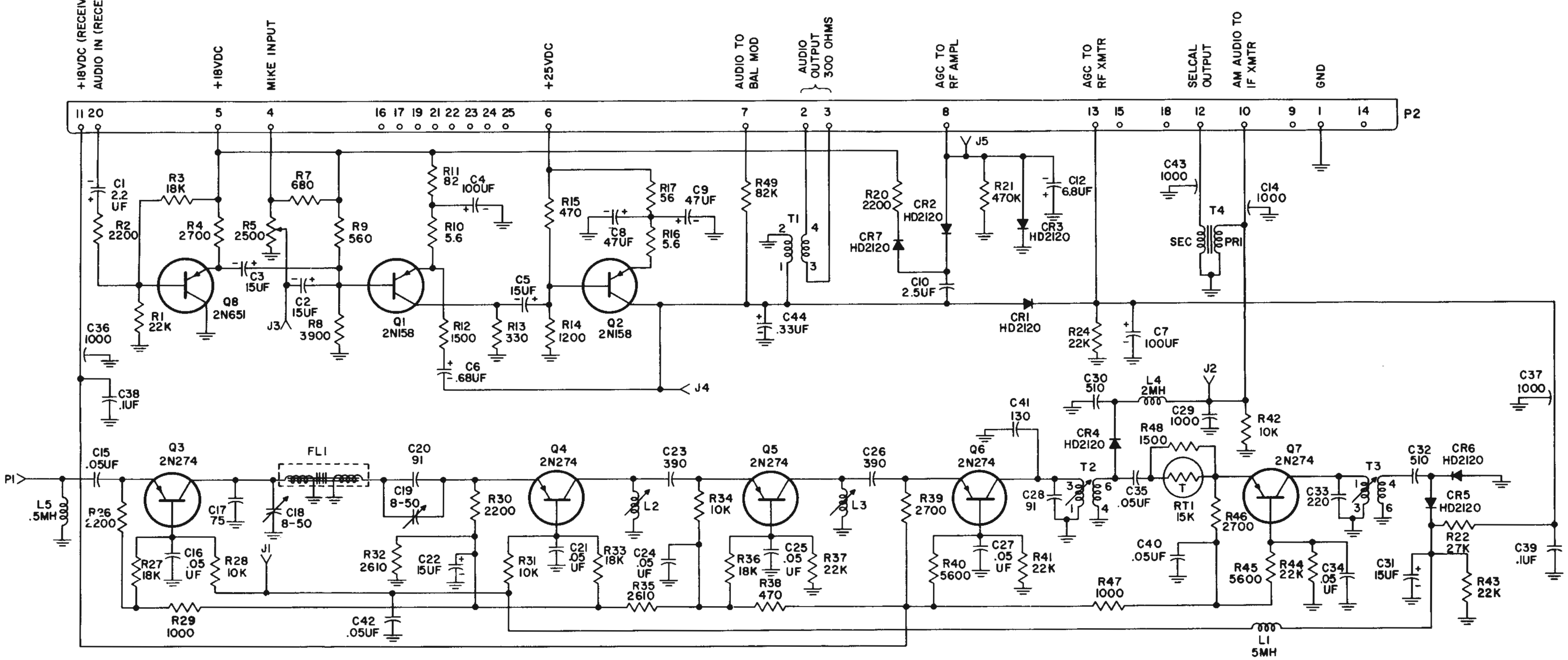
AM/Audio Amplifier A9, Schematic Diagram
(Late Model)
Figure 822

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

AM/Audio Amplifier A9, Schematic Diagram (Early Model) (Sheet A)
Figure 823



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A9.

TPO-5468-017

AM/Audio Amplifier A9, Schematic Diagram (Early Model)
Figure 823

SCHEMATIC CHANGES

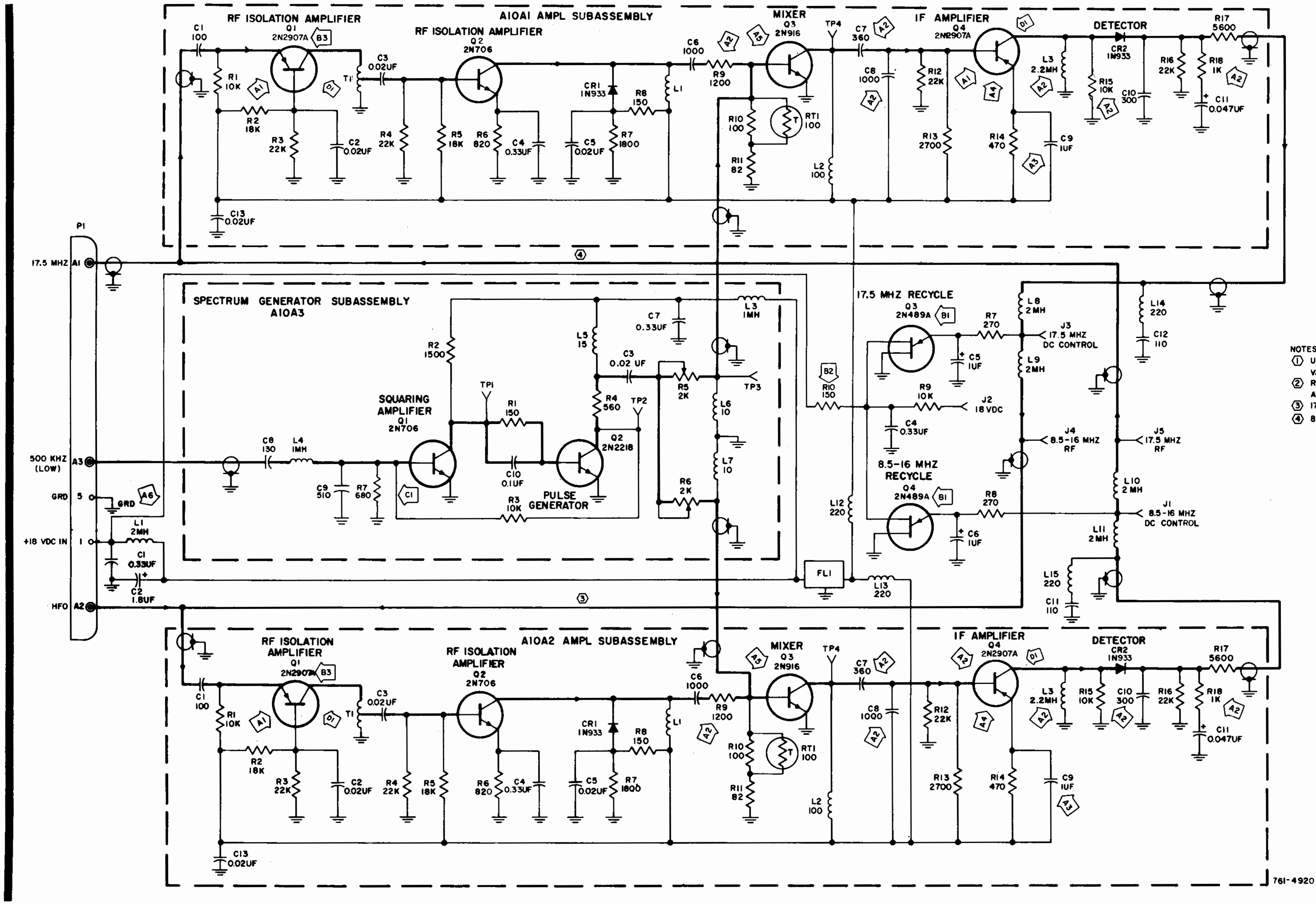
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
897/898	A1	Changed A1Q1, A1Q4, A2Q1, and A2Q4 from 2N1285 to 2N2188.		2835
897/898	A2	Deleted C12.		4200
		Interchanged C6 and C9.		4200
		Changed R18 to 1000 ohms.		4200
		Changed C8 to 1000 pf.		4200
		Changed L3 to 2.2 mh.		4200
		Changed C7 to 360 pf.		4200
897/898	A3	Changed A1C9 and A2C9 to 1 uf.		6350
897/898	A4	Changed A1Q4 and A2Q4 from 2N2188 to 2N3135.		6580
897/898	A5	Changed A1Q3 and A2Q3 from 2N706 to 2N916.		17000
897/898	A6	L2 connected to P1-1 was to junction of L1 and C2. Wiring change to increase voltage on unijunctions Q3 and Q4.		21500
897/898	B1	Changed A10Q3 and A10Q4 from 2N489 to 2N489A. Change to reduce minimum voltage below 4 V.		
897/898	B2	Replaced L2 with R10 (150 ohms).		30300

MHz-Frequency Stabilizer A10,
Schematic Diagram (Late Model)
Figure 824 (Sheet A)

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	B3	Changed A10A1Q1 and A10A2Q1 from 2N2188 to 2N3135.	618T-1: SB 23 618T-2, 3: SB 24 618T-1B, 2B, 3B: SB 4	29500
NA	C1	Added R7 from base of A10A3Q1 to ground.		36938
NA	D1	Changed transistors A1Q1, A1Q4, A2Q1, and A2Q4 from 2N2188 to 2N2907A.		CPN 548-5989-005, REV AE

MHz-Frequency Stabilizer A10,
Schematic Diagram (Late Model)
Figure 824 (Sheet B)



NOTES:

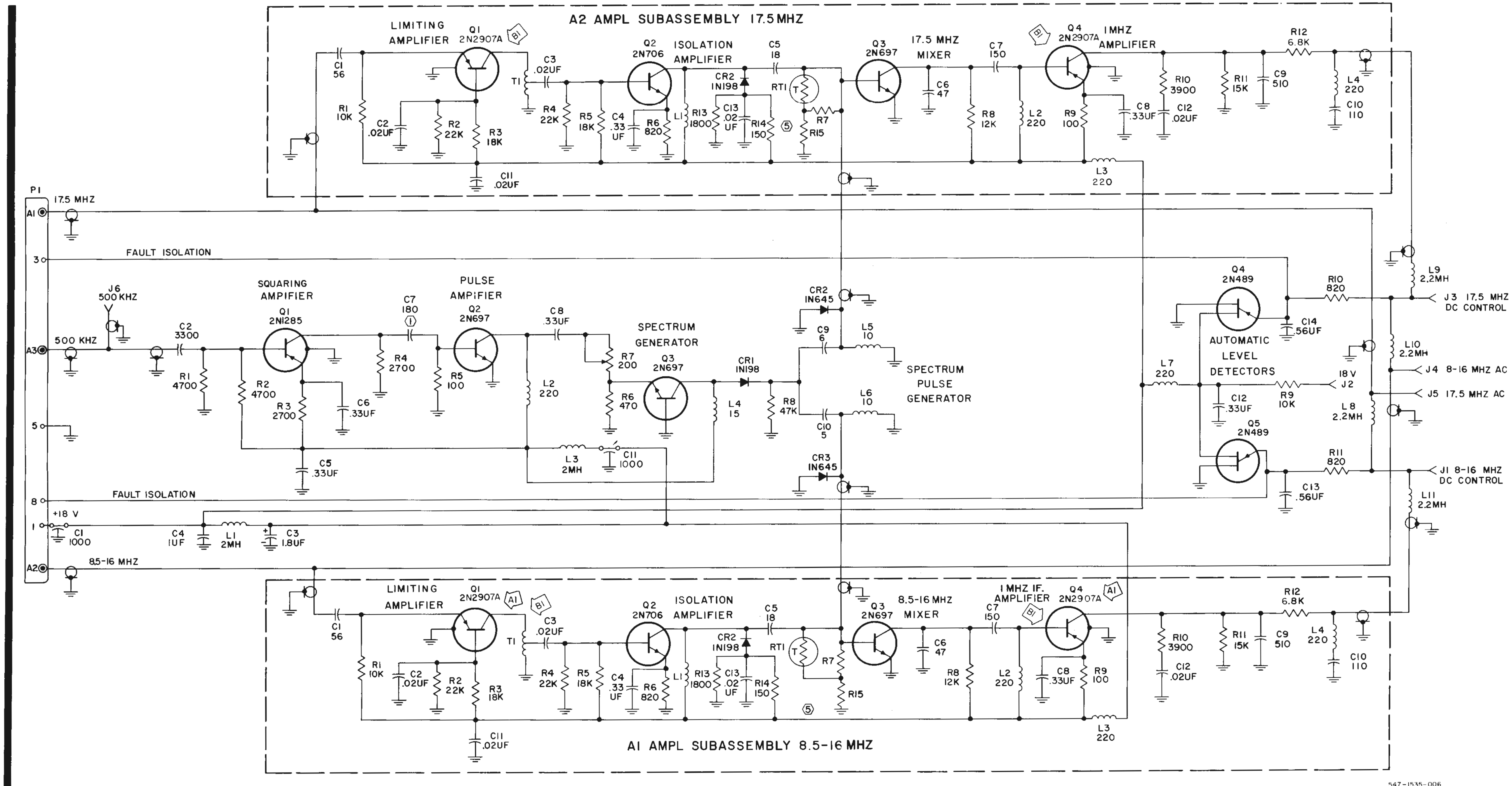
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY/SUBASSEMBLY DESIGNATION A10, A10A1, OR A10A2.
3. 17.5 MHZ DC CONTROL IS RETURNED TO RF TRANSLATOR BY 8.5-16 MHZ RF LINE.
4. 8.5-16 MHZ DC CONTROL IS RETURNED TO RF TRANSLATOR BY 17.5 MHZ RF LINE.

MHz-Frequency Stabilizer A10, Schematic Diagram (Late Model)
Figure 824

SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1	A1Q1, A1Q4 changed from 2N1285 to 2N2188.		2684
NA	B1	Changed transistors A1Q1, A1Q4, A2Q1, and A2Q4 from 2N1285 to 2N2907A.		CPN 546-7222-003, REV N

MHz-Frequency Stabilizer A10, Schematic
Diagram (Early Model)
Figure 825 (Sheet A)



NOTES:

1. NOMINAL VALUE; PROPER VALUE SELECTED DURING TEST.
2. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
3. PREFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A10.
4. EARLIER SERIAL NUMBERED MODULES USE 2N1224 TRANSISTORS IN PLACE OF 2N1285.
5. THE NOMINAL VALUE OF THE SERIES PARALLEL COMBINATION OF RT1, R7 AND R15 AT ROOM TEMPERATURE IS 250 OHMS. PROPER VALUES SELECTED AT FACTORY.

MHz-Frequency Stabilizer A10, Schematic Diagram (Early Model)
Figure 825

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/7, 801/8	A1	Replaced plain wire from C40 to junction of C35 and R14 with RG-196J coaxial cable to eliminate jitter from discriminator output.	3	1501
801/7, 801/8	A2	Changed V1 and V2 from 7204 to 7204G.		2250
801/7, 801/8	A3	Changed R3 from 680 ohms, 0.5 watt to 180 ohms, 3 watts for improved reliability.	9	5000
801/7, 801/8	A4	Placed R23 and R22 in parallel and removed from ground.		6261
		Added L12 in series from R22 and R23 to ground.		6261
801/7, 801/8	A5	Changed C20 and C58 from 1700 pf to 1800 pf.		6414
		Changed C38 and C52 from 0.02 uf to 0.022 uf.		6414
801/7, 801/8	A6	Added R44.		
		Changed R4 from 8200 ohms to 7500 ohms.		
801/7, 801/8	A7	Changed R16 from 1000 ohms to 1800 ohms.		
801/7, 801/8	A8	Added R43.		
801/7, 801/8	A9	Changed CR2A and CR2B from 1N198 to MP3040.		
801/7, 801/8	A10	Added rf ground to discriminator subassembly.	14	6833

Power Amplifier A11, Schematic Diagram (Late Model) (Sheet A)
Figure 826

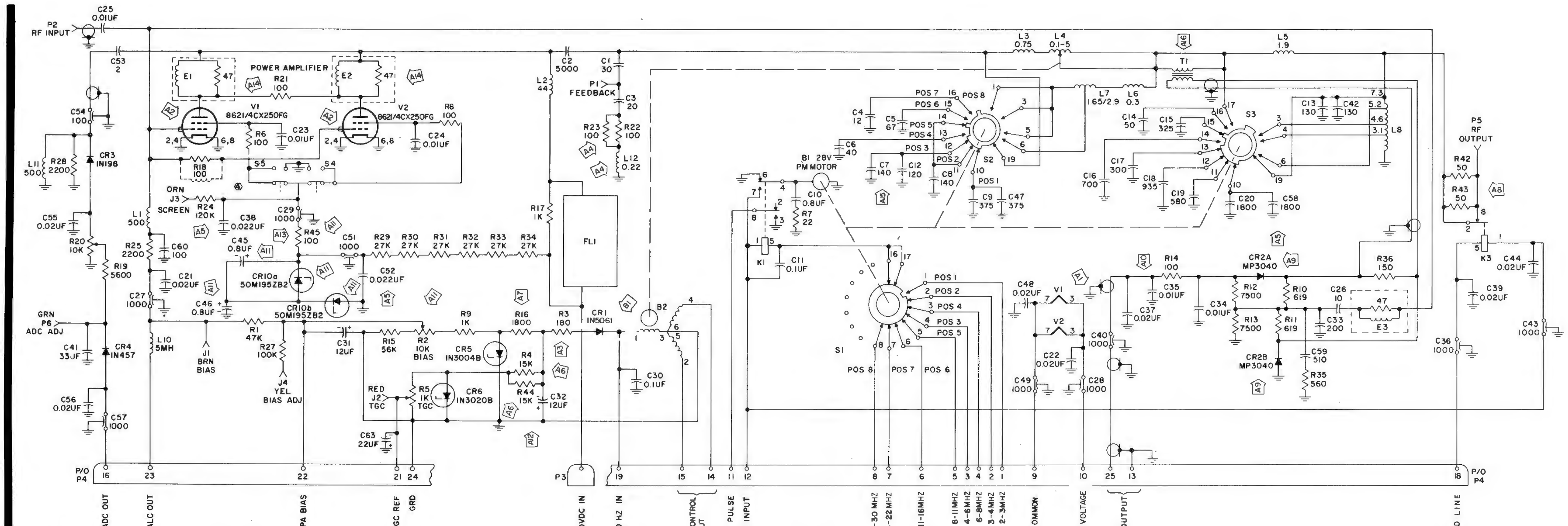
PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/7, 801/8	A11	Changed C45 and C46 from 1.2 uf to 0.8 uf.	14	7390
		Deleted R41.	14	7390
		Deleted R39.	14	7390
		Deleted R40.	14	7390
		Deleted CR8A.	14	7390
		Deleted CR8B.	14	7390
		Deleted C62.	14	7390
		Deleted C61.	14	7390
		Deleted R38.	14	7390
		Added R45.	14	7390
		Changed CR7A and CR7B (10M200Z2) to CR10A and CR10B (50M195ZB2).	14	7390
		The above changes (A11) were incorporated to improve the reliability and performance of the power amplifier module.		
801/7, 801/8	A12	Changed R4 and R44 from 7500 ohms to 15,000 ohms.		
801/7, 801/8	A13	Changed R45 from 470 ohms to 100 ohms.		
801/7, 801/8	A14	Changed V1 and V2 from 7204G to 8621.		
801/7, 801/8	A15	Changed C7 from 120 pf to 140 pf.		17875

Power Amplifier A11, Schematic Diagram (Late Model) (Sheet B)
Figure 826

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	A16	Changed shunt strap on transformer T1.		22400
801/7, 801/8	B1	Changed CR1 from 1N1491 to 1N5061.		CPN 549-4304-004, REV G

Power Amplifier A11, Schematic Diagram
(Late Model)
Figure 826 (Sheet C)



NOTES:

1. UNLESS OTHERWISE INDICATED; ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH A11
3. ALL SWITCHES VIEWED FROM KNOB OR DRIVEN END.
4. INDUCTANCE IS A STRAP TIED ACROSS R18.

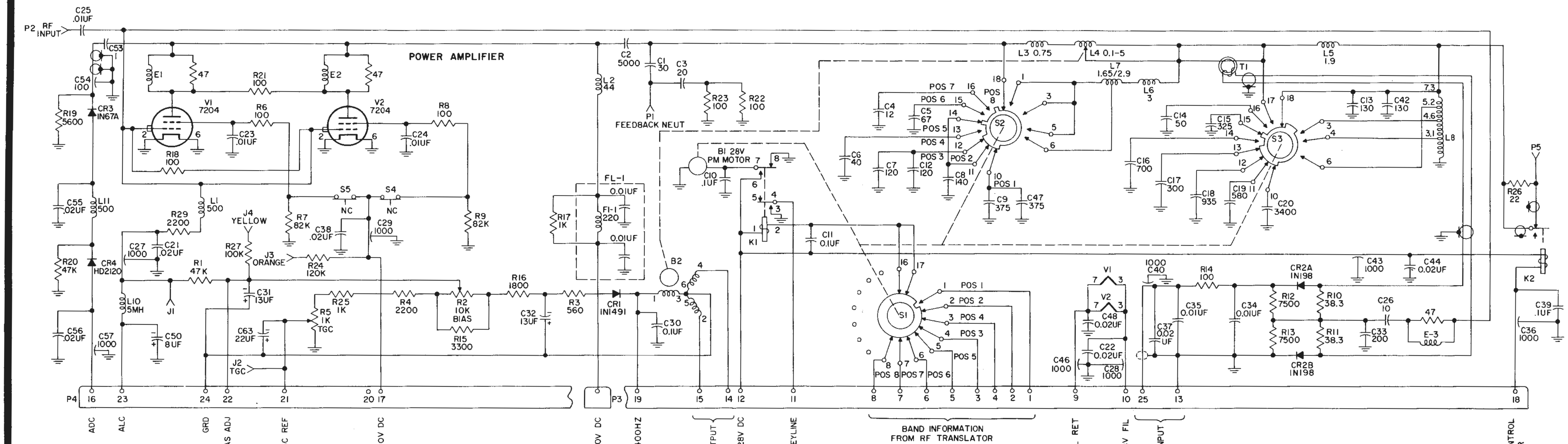
Power Amplifier A11, Schematic
Diagram (Late Model)
Figure 826

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

Power Amplifier A11, Schematic Diagram (Early Model) (Sheet A)
Figure 827



BAND INFORMATION FROM RF TRANSLATOR

BAND COVERAGE

PIN	POS.	
1	1	2MHZ – 3MHZ
2	2	3MHZ – 4MHZ
4	3	6MHZ – 8MHZ
3	4	4MHZ – 6MHZ
5	5	8MHZ – 11MHZ
6	6	11MHZ – 16MHZ
7	7	16MHZ – 22MHZ
8	8	22MHZ – 30MHZ

NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACTANCE VALUES ARE IN MICROMICROFAHRADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
2. PREFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION.

Power Amplifier A11, Schematic Diagram (Early Model)
Figure 827

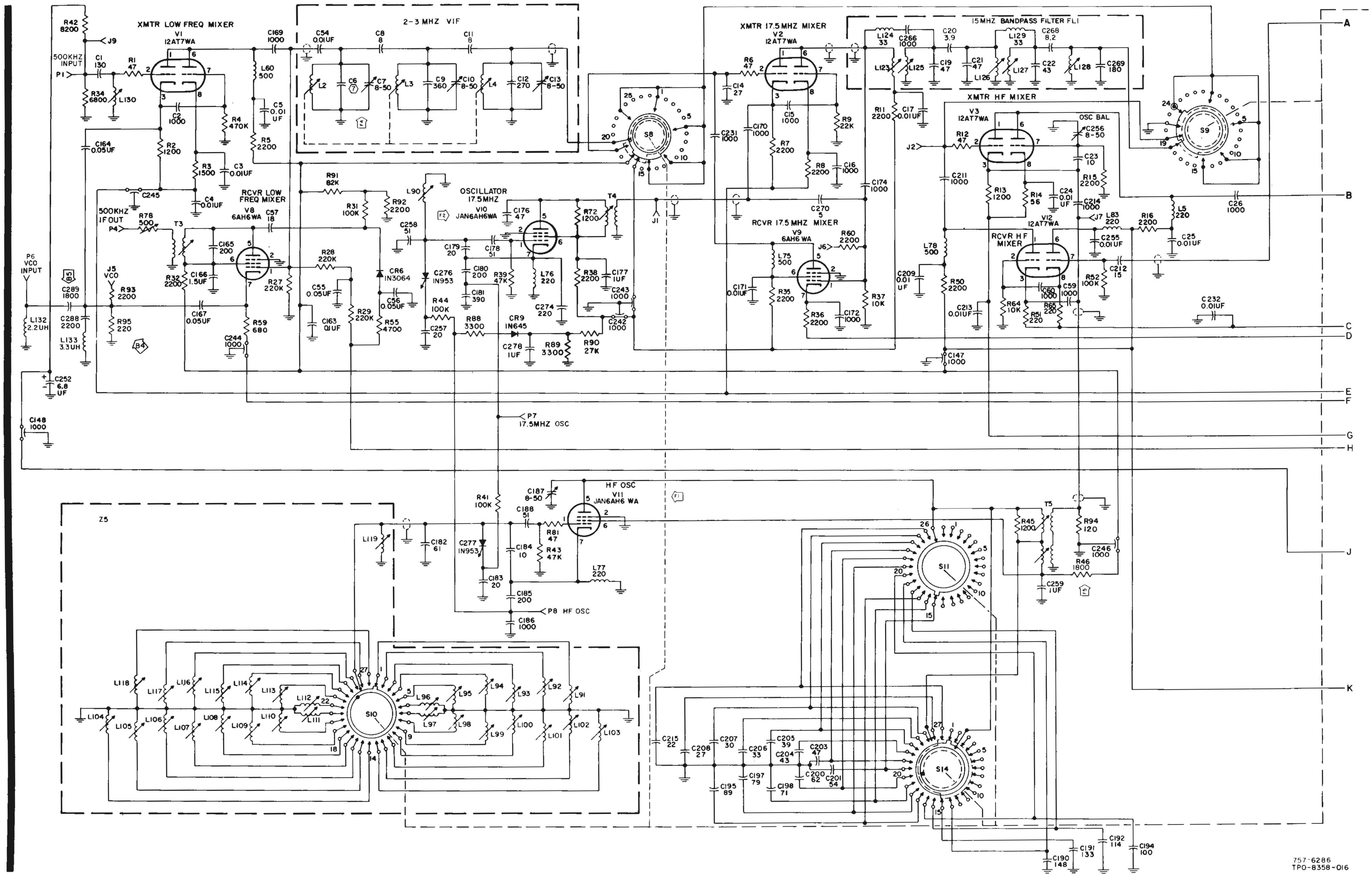
SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
3	B1	Added R97.		
3	B2	Added R96.		
2	B3	Replaced C234 with circuit from P9-15 to R55 and relocated C234.		
1	B4	Changed value of R95 from 50 ohms to 220 ohms.		
1	B5	Changed circuit from R93 to P6, and added C288, C289, L132, and L133.		157
3	B6	Added L134 from C144 to V8-3 and L135 from C145 to V2-4.	5	MCN 620
3	C1	Added L136 from C237 to V12-5, L137 from C155 to V5-4, L138 from C287 to C240, and L139 from R71 to C238 to reduce internal signals that are coupled through filament circuits.	618T-1B: 13 618T-2B/3B: 15	MCN 731
2	C2	Changed value of R30 from 5600 ohms to 8200 ohms to compensate for tube variations and improve rf gain control with high-level rf input signals in receive mode.		MCN 741
3	D1	Added C301 to XV8 to eliminate AM heterodyne at 2.1 MHz. Repositioned L139.		842

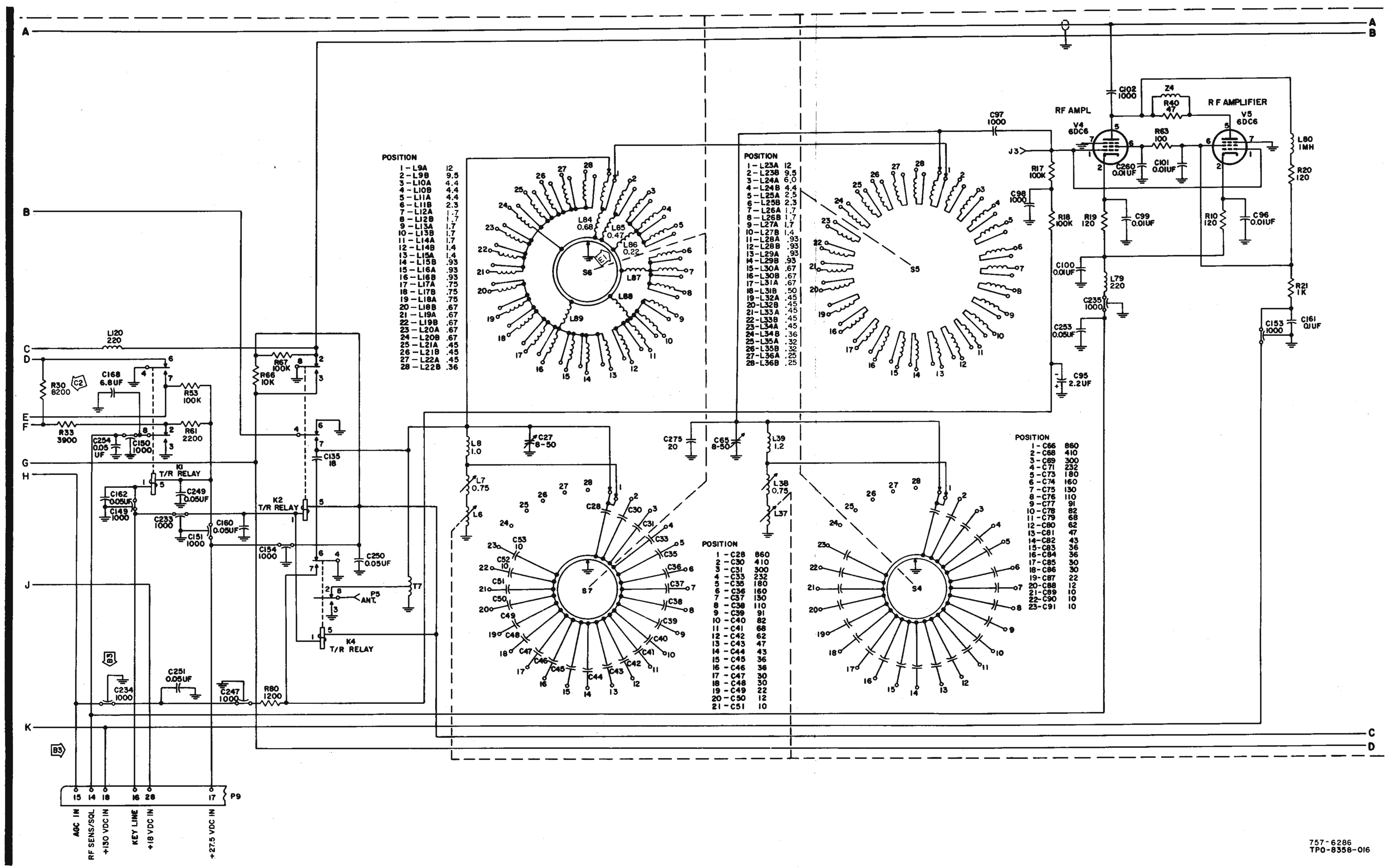
618T-1B/2B/3B RF Translator A12, Schematic Diagram
Figure 828 (Sheet A)

SCHEMATIC CHANGES

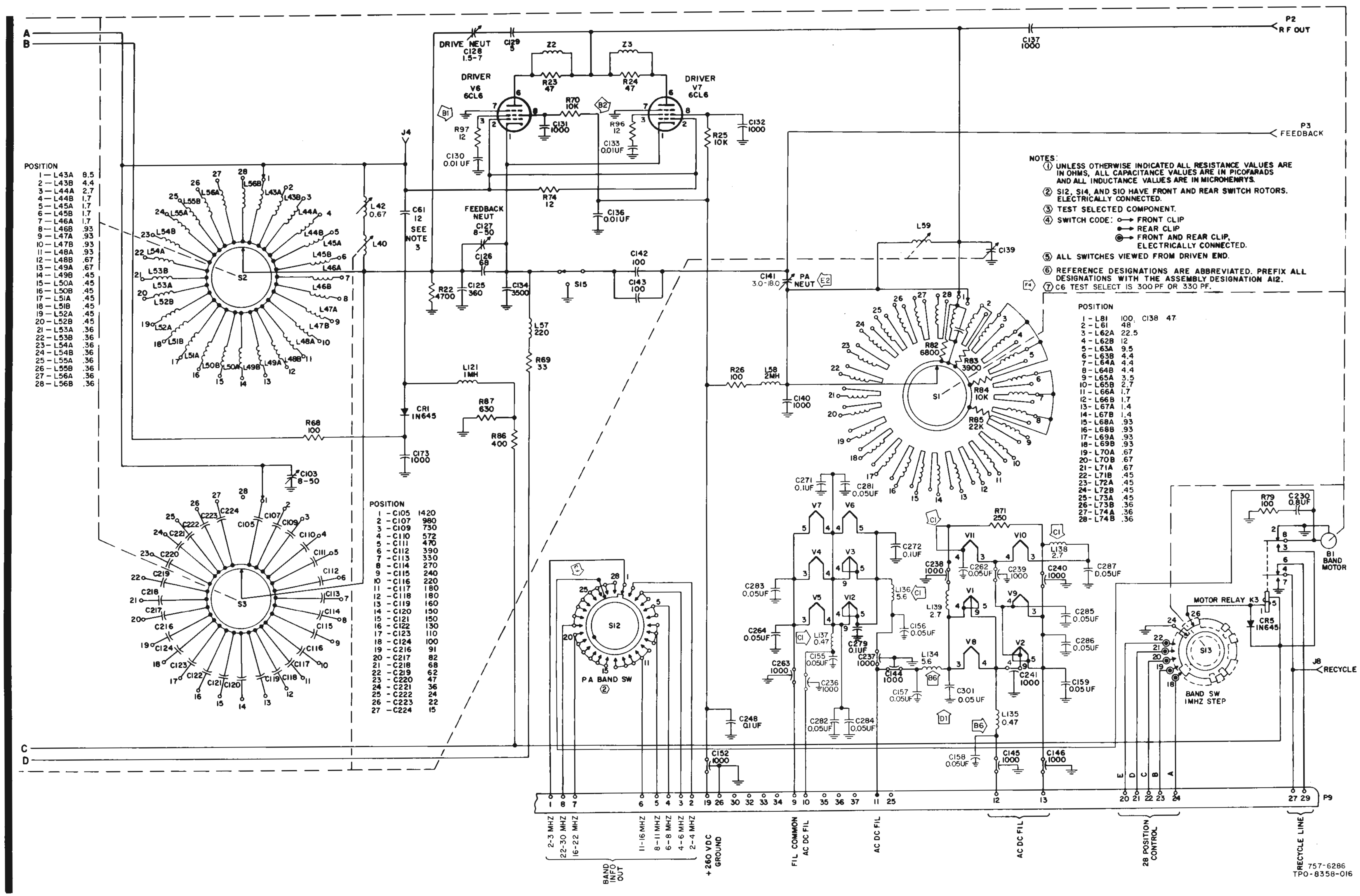
SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
2	E1	Changed L85 from 0.33 to 0.47 μH and L86 from 0.15 to 0.22 μH to improve gain on 3- to 7-MHz bands.		34007
3	E2	Changed C141 from 1.5 - 10.5 pF to 3.0 - 18.0 pF to extend adjustment for pa neutralization.		34106
1	F1	Changed V11 from 6AH6WA to JAN6AH6WA.		REV AG
1	F2	Changed V10 from 6AH6WA to JAN6AH6WA.		REV AH
3	F3	Changed direct ground connections of S12 wiper arm to relay connection of K3 motor relay pin 8 to cause rf translation to complete band switching before PA band switches.		
1, 3	F4	Added note 7.		
1	F5	Changed R46 from 2200 to 1800 Ω.		REV AP



618T-1B/2B/3B RF Translator
A12, Schematic Diagram
Figure 828 (Sheet 1 of 3)



618T-1B/2B/3B RF Translator A12, Schematic Diagram
Figure 828 (Sheet 2)



618T-1B/2B/3B RF Translator
A12, Schematic Diagram
Figure 828 (Sheet 3)

SCHEMATIC CHANGES

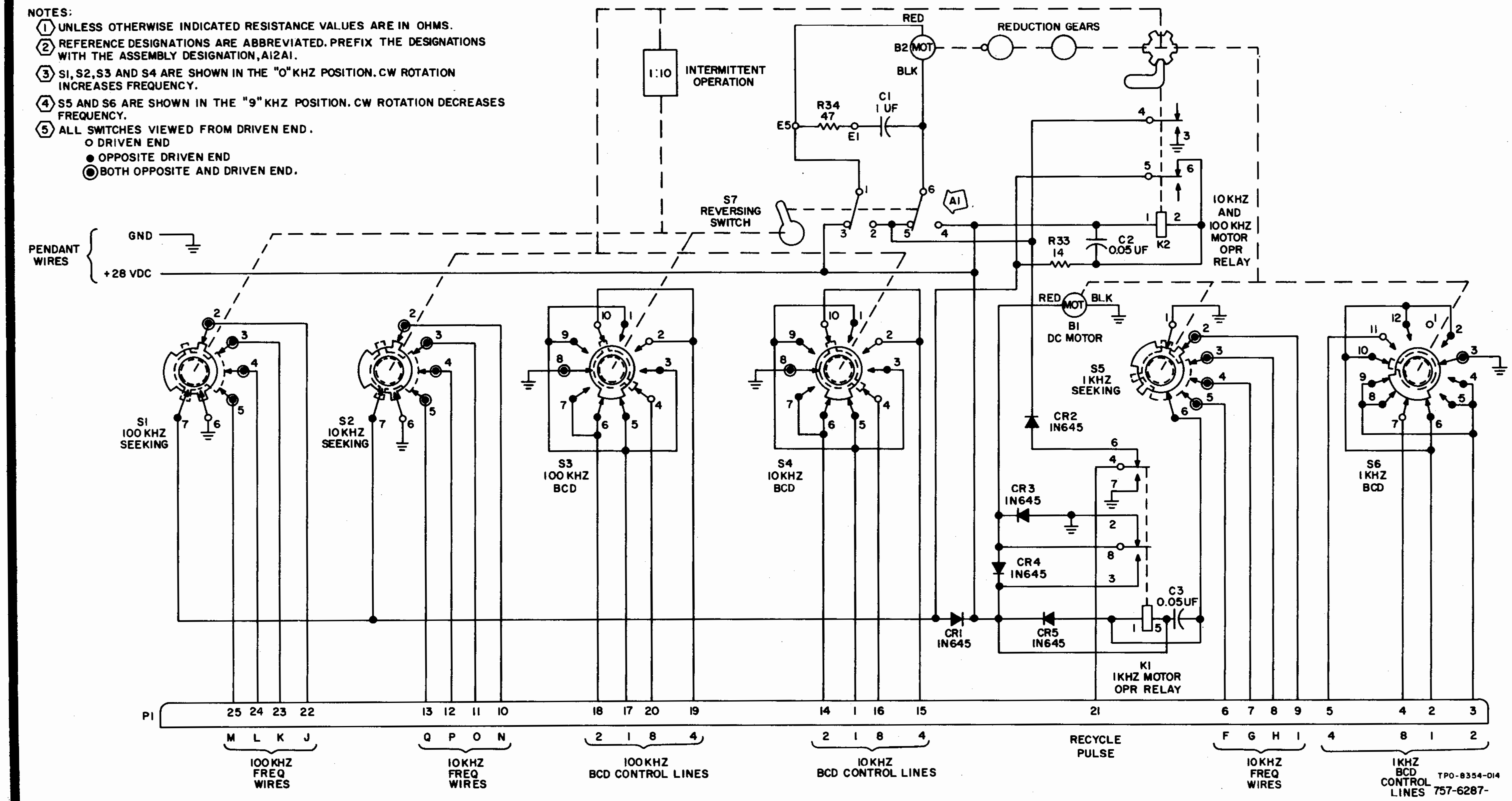
SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	A1	Renumbered switch S7 contacts per the replaced switch.	618T-1/4: 34 618T-1B/4B: 17 618T-2/5: 37 618T-2B/5B: 21 618T-3/6: 38 618T-3B/6B: 22	All models

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/37, 801/38	A1	Changed L10A from 8.5 uh to 4.4 uh.		224
801/37, 801/38	A2	Changed L12A and L12B from 2.3 uh to 1.7 uh.		224
801/35, 801/36; 801/39, 801/40	B1	Added note 3, making C6 a test select value.		

618T-1/2/3 RF Translator A12, Schematic Diagram (Early Model)
Figure 831 (Sheet A)

NOTES:
1. UNLESS OTHERWISE INDICATED RESISTANCE VALUES ARE IN OHMS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION, A12A1.
3. S1, S2, S3 AND S4 ARE SHOWN IN THE "0" KHZ POSITION. CW ROTATION INCREASES FREQUENCY.
4. S5 AND S6 ARE SHOWN IN THE "9" KHZ POSITION. CW ROTATION DECREASES FREQUENCY.
5. ALL SWITCHES VIEWED FROM DRIVEN END.
   O DRIVEN END
   ● OPPOSITE DRIVEN END
   ◉ BOTH OPPOSITE AND DRIVEN END.



618T-1B/2B/3B Autopositioner A12A1, Schematic Diagram
Figure 829

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/27, 801/28	A1	Changed C166 from 4 uf to 1.5 uf.		4098
801/27, 801/28	A2	Changed R92 from 10,000 ohms to 2200 ohms.		5100
		Changed CR6 from 1N67A to 1N645.		5588
		Changed CR6 from 1N645 to 1N3064.		19350
801/31, 801/32	A3	Changed C141 from 5-25 pf to 1.5-7.0 pf.		6342
		Changed C126 from 91 pf to 68 pf.		6342
801/27, 801/28	A4	Changed R78 from 47 ohms to 500 ohms.		6292
801/27, 801/28	A5	Added R94 (68) from T1 to ground.		6853
801/27, 801/28	A6	Changed C276 and C277 from HC7005 to 1N953.		
801/29, 801/30	A7	Changed R61 from 3300 ohms to 2200 ohms.		20373
801/27, 801/28	A8	Changed R94 from 68 ohms to 120 ohms.		20373
801/29, 801/30 801/31, 801/32	A9	Deleted C45, C47, C51, C53, C83, C85, C89, C91, C117, and C120.		
	(Cont)	Added circuits S3-11 to S3-12, S3-14 to S3-15, S4-15 to S4-16, S4-17 to S4-18, S4-21 to S4-22, S4-22 to S4-23, S7-15 to S7-16, S7-17 to S7-18, S7-21 to S7-22, and S7-22 to S7-23.		

618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model) (Sheet A)
Figure 830

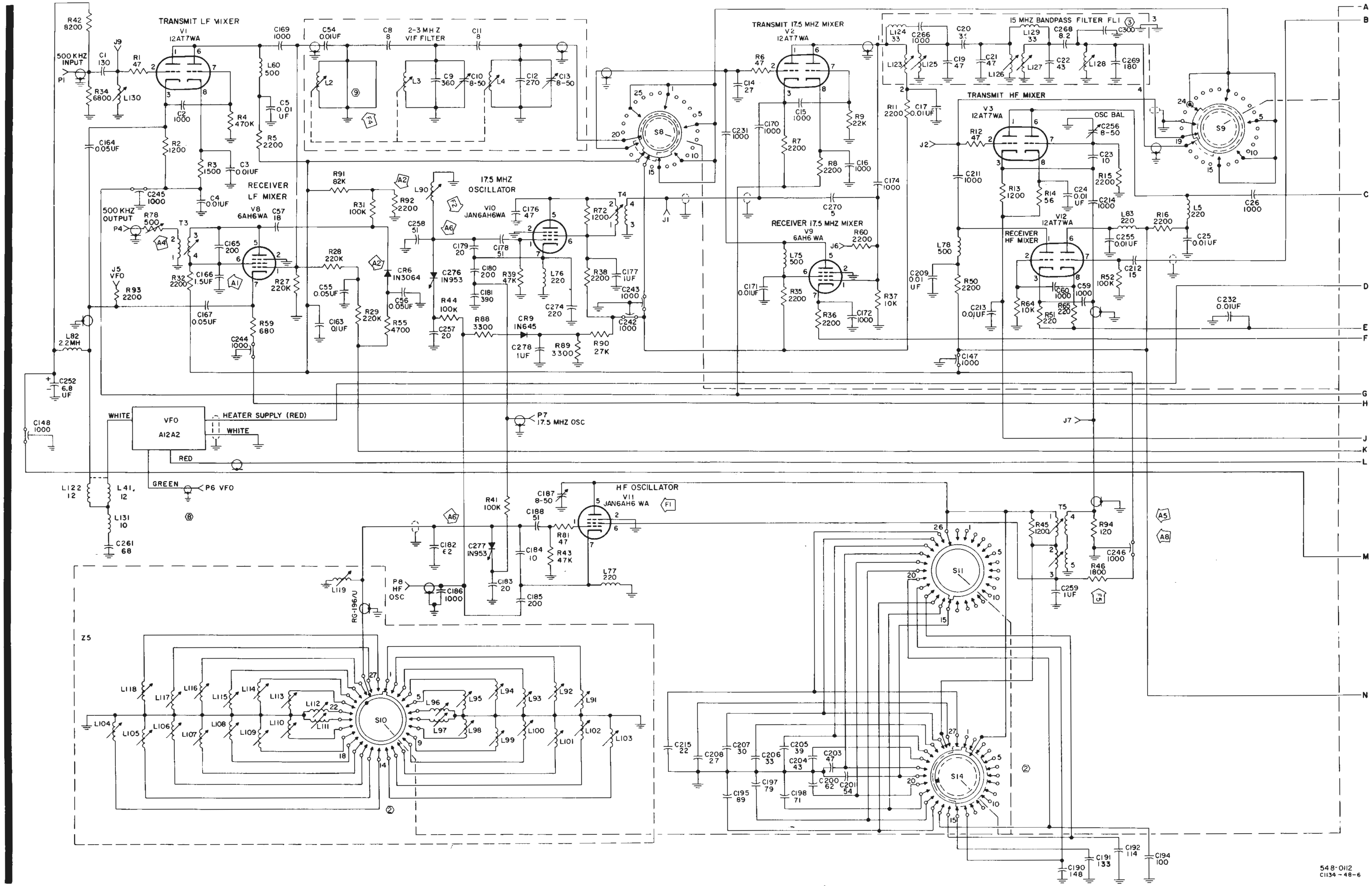
SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
2, 3	A9 (Cont)	These changes (A9) improve reliability by removing redundant components.		20193
3	A10	Changed R82 from 6800 ohms to 5600 ohms.		23750
2	A11	Changed vfo from 70K-5 to 70K-9 (618T-1/2 only). This change improves transceiver operation under extreme environmental conditions.	17	
2	A12	Changed vfo from 70K-5 to 70K-9 (618T-3 only). This change improves transceiver operation under extreme environmental conditions.	18	
3	B1	Added R96.		25850
3	B2	Added R95.		25850
2	B3	Replaced C234, C247, C251, and R80 with circuit from P9-15 to R55.		
2	B4	Replaced circuit from P9-15 to K4-7 with C234, C247, C251, and R80.		
3	B5	Added L132 and L133.	618T-1: 21 618T-2: 23 618T-3: 22 (B5, B6, B7)	27944
3	B6	Added L134 from C144 to V8-3, and L135 from C145 to V2-4.		28922
3	B7	Added L136 and L137.		28922

618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model)
Figure 830 (Sheet B)

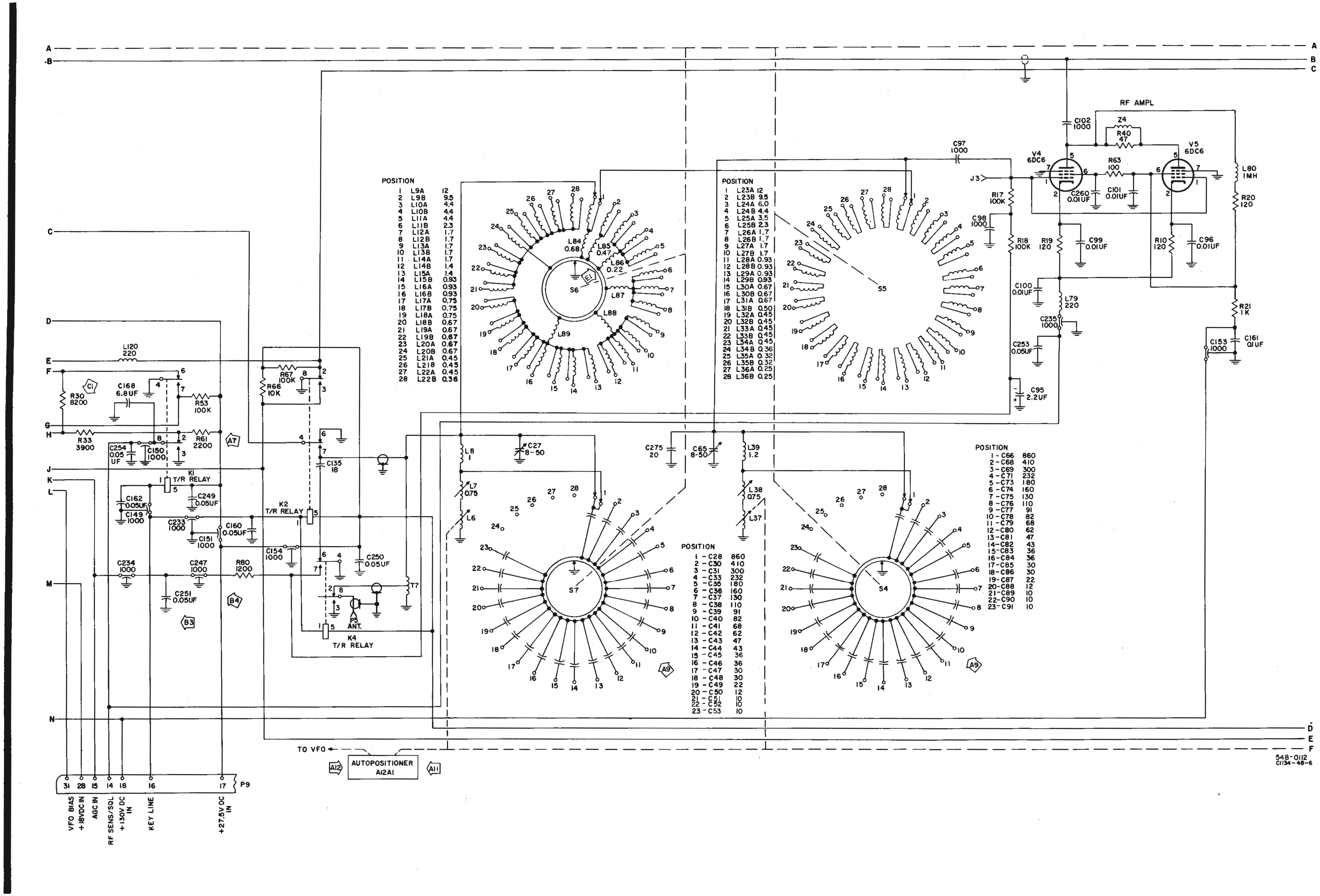
SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
2	C1	Changed value of R30 from 5600 ohms to 8200 ohms to compensate for tube variations and improve rf gain control with high-level rf input signals in receive mode.		31700
3	D1	C301, 0.05 μF, added to bypass XV8. Eliminates AM heterodyne at 2.1 MHz.		32547
2	E1	Changed L85 from 0.33 to 0.47 and L86 from 0.15 to 0.22 to improve gain on 3- to 7-MHz bands.		34007
3	E2	Changed C41 from 1.5 - 7 pF to 3 - 18 pF to extend adjustment for pa neutralization.		34106
1	F1	Changed V11 from 6AH6WA to JAN6AH6WA.		REV DG
1	F2	Changed V10 from 6AH6WA to JAN6AH6WA.		REV DJ
3	F3	Changed direct ground connection of S12 wiper arm to relay connection of K3 motor relay pin 8 to cause rf translator to complete band switching before PA band switches.		REV DP
1, 3	F4	Added note 9.		
1	F5	Changed resistor R46 from 2200 to 1800 Ω.		REV DV

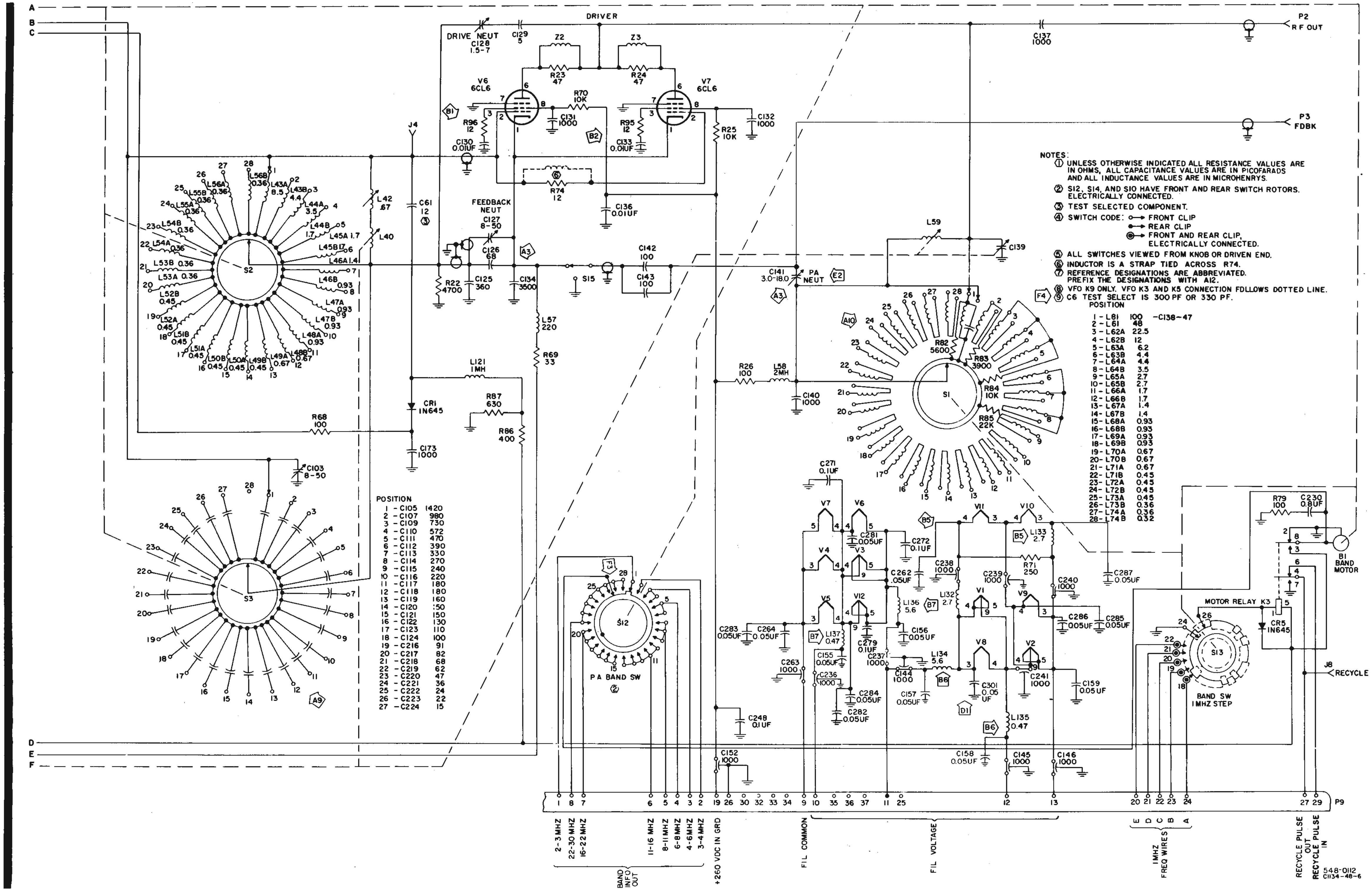
618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model)
Figure 830 (Sheet C)



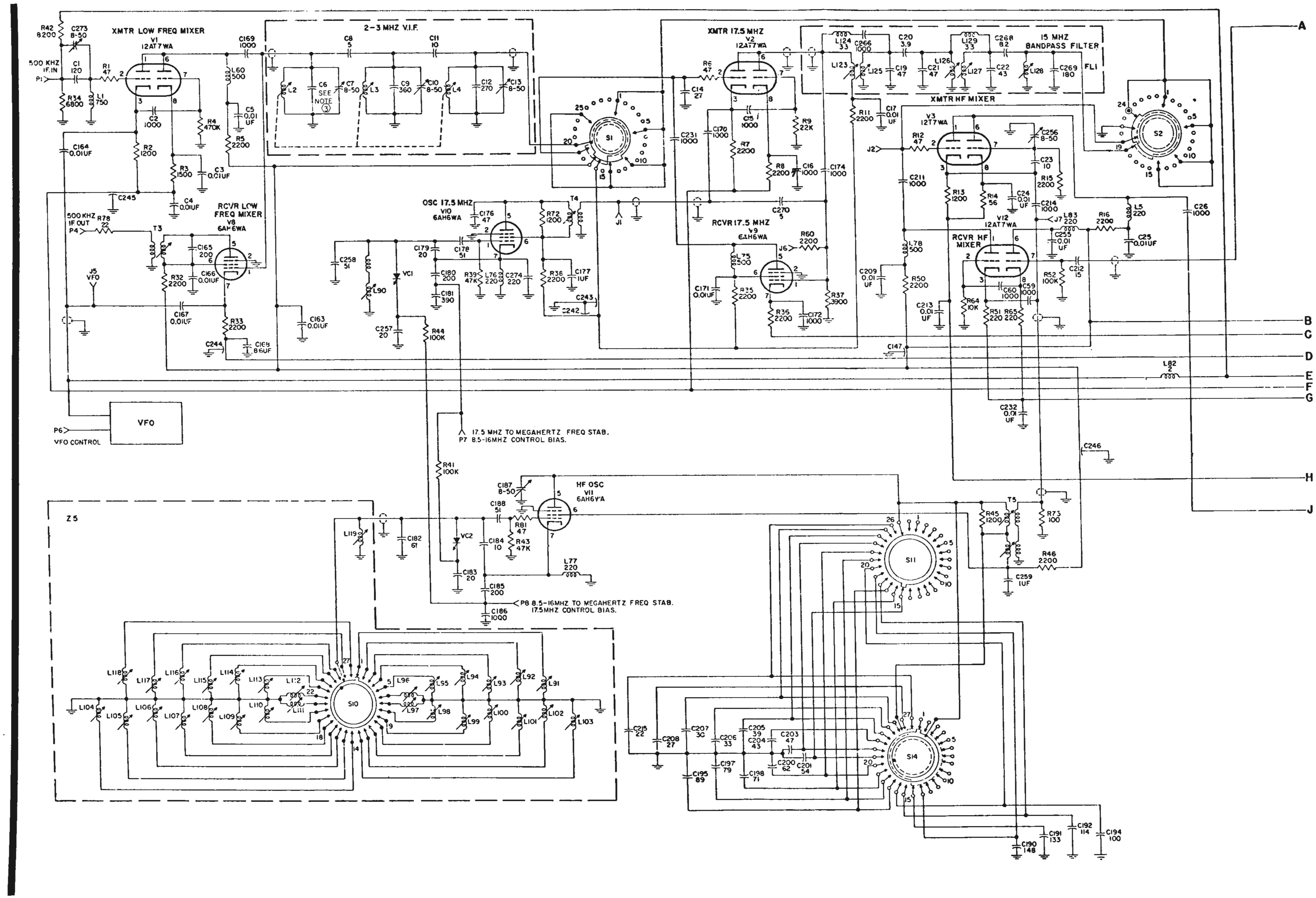
618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model)
Figure 830 (Sheet 1 of 3)



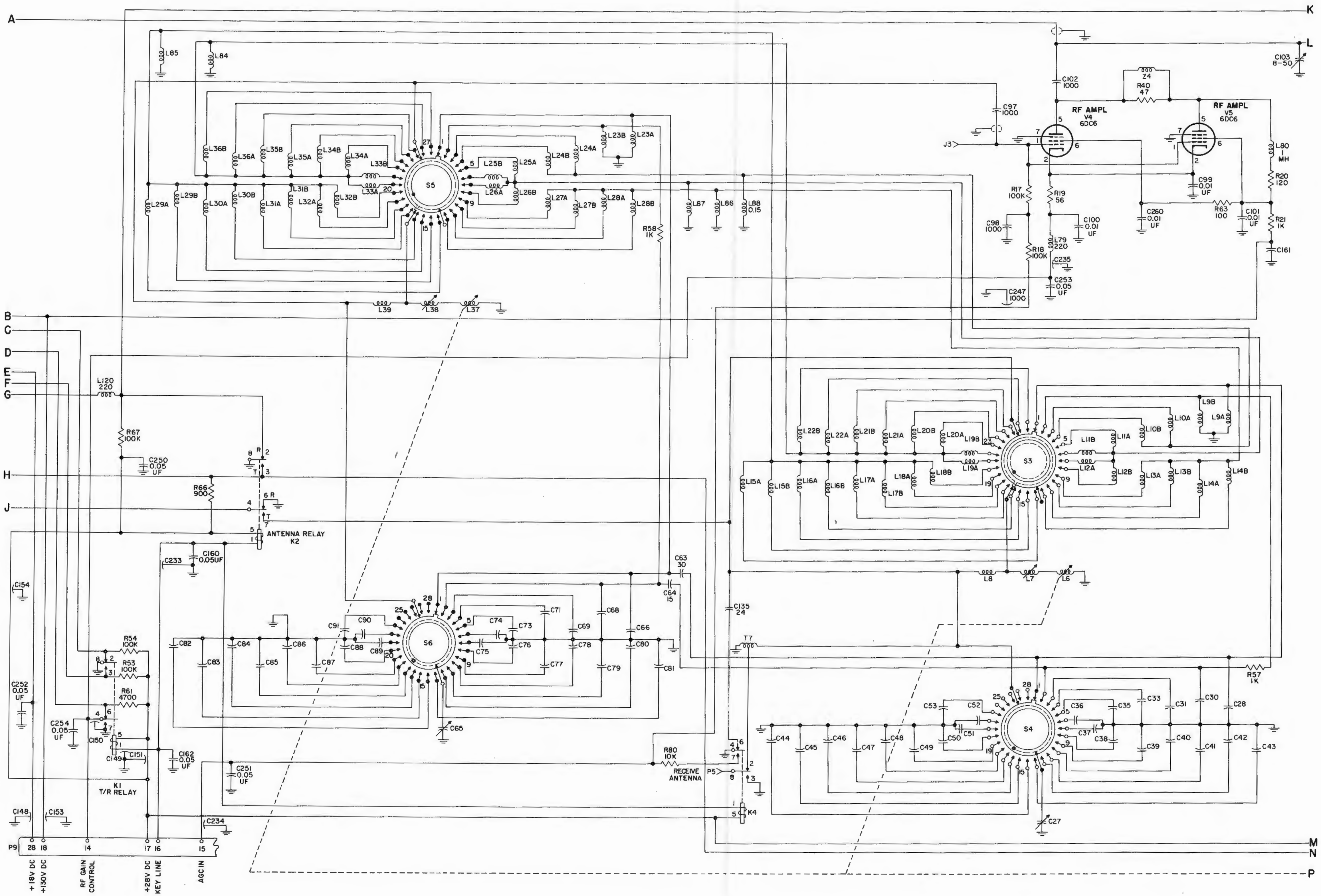
618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model) Figure 830 (Sheet 2)



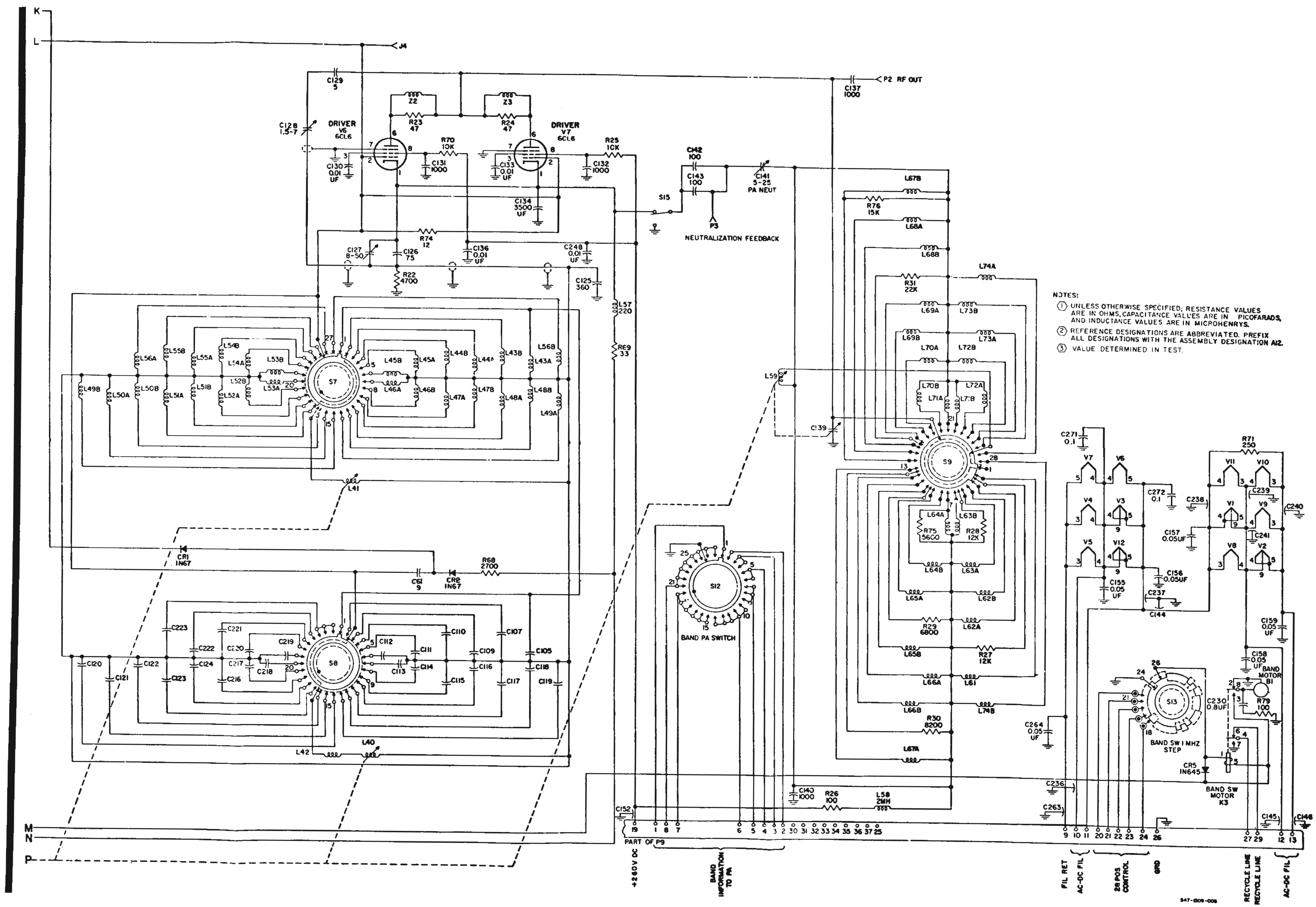
618T-1/2/3 RF Translator A12, Schematic Diagram (Late Model)
Figure 830 (Sheet 3)



618T-1/2/3 RF Translator A12, Schematic
Diagram (Early Model)
Figure 831 (Sheet 1 of 3)



618T-1/2/3 RF Translator A12, Schematic Diagram
(Early Model) (Sheet 2 of 3)
Figure 831

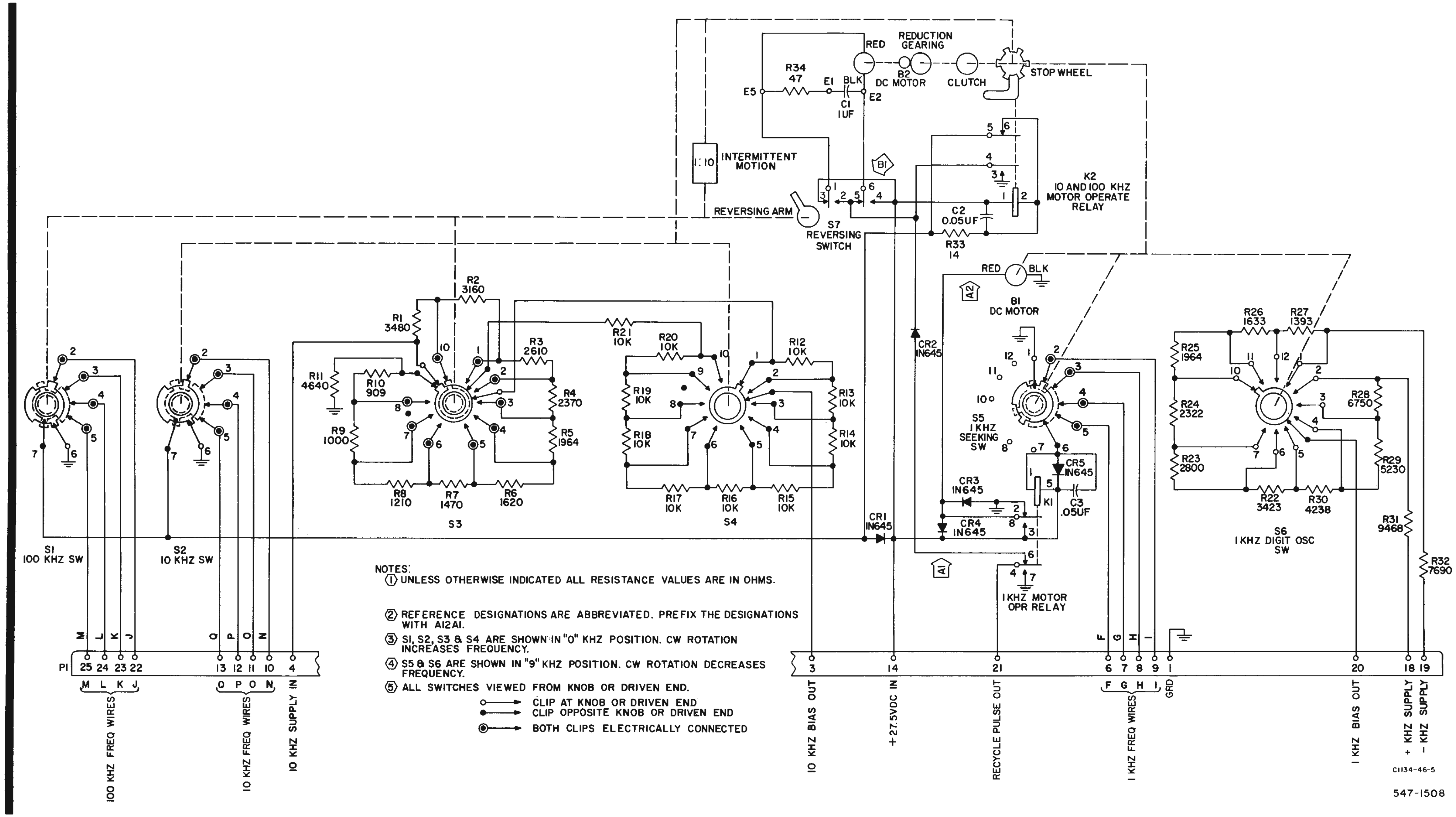


618T-1/2/3 RF Translator A12, Schematic Diagram (Early Model)
Figure 831 (Sheet 3)

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/43, 801/44	A1	Added CR3 and CR4 to improve relay arc suppression.	1	100
801/43, 801/44	A2	Changed R33 from 16 ohms to 14 ohms.		21152
NA	B1	Renumbered switch S7 contacts for switch replacement.	618T-1/4: 34 618T-1B/4B: 17 618T-2/5: 37 618T-2B/5B: 21 618T-3/6: 38 618T-3B/6B: 22	All models

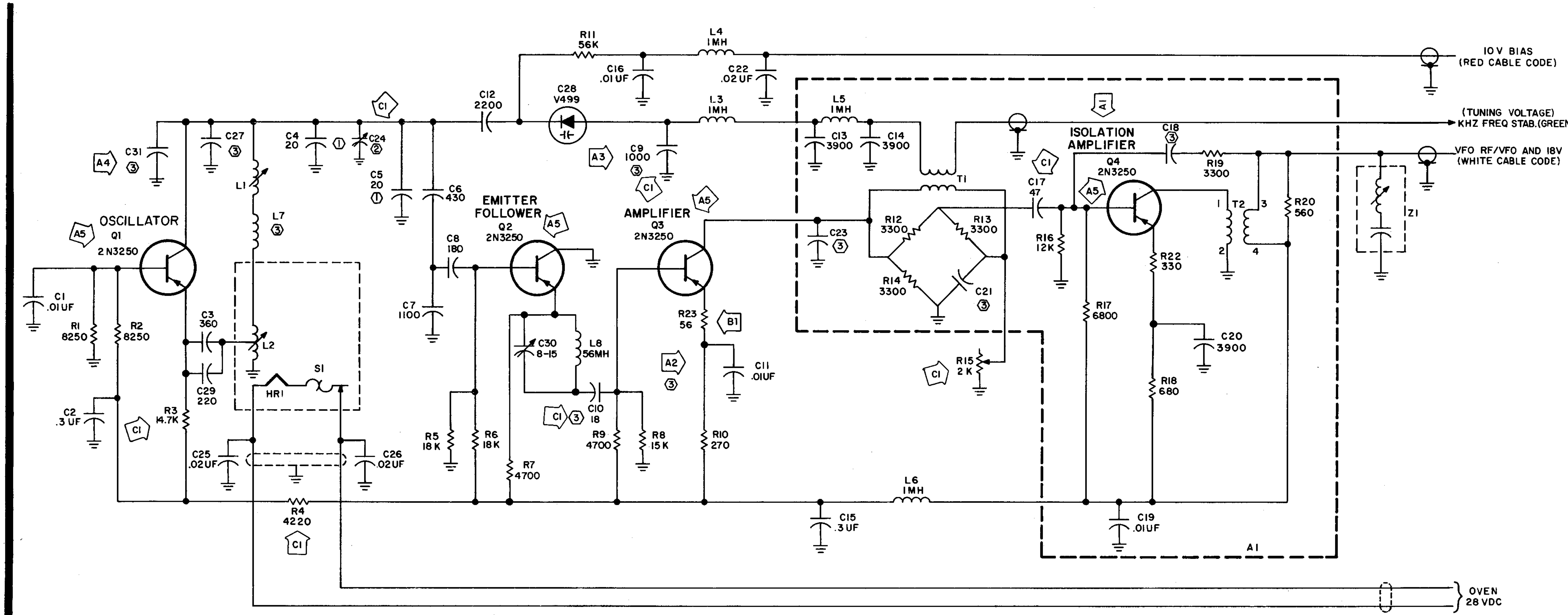
618T-1/2/3 Autopositioner A12A1,
Schematic Diagram
Figure 832 (Sheet A)



618T-1/2/3 Autopositioner A12A1, Schematic Diagram
Figure 832

SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1	Change Q4 from 2N2189 to 2N2861.		
Na	A2	Changed R23 from 1000 ohms (variable) to factory-selected value.		
Na	A3	Changed C9 from 620 pf to 1000 pF.		
Na	A4	Added C31.		
Na	A5	Changed Q1 through Q4 from 2N2861 to 2N3250.		
Na	B1	Changed R23 from 1000 to 56 ohms.		33225
NA	C1	Changed R3 from 15 to 14.7 kΩ. Changed C9 from 1000 to test select. Changed C17 from 22 to 47 pF. Changed R15 from 5 to 2 kΩ. Changed R4 from 4020 to 4220. Moved variable capacitor C24 from junction of L7 and L2 to ground to junction of C4 and C5 to ground. Changed C10 from 15 to 18 pF.		Alt ltr BJ



NOTES:
1. TEMPERATURE COMPENSATION SELECTED IN FINAL TEST.
2. VIBRATING COMPENSATING CAPACITOR.
3. TEST SELECT.
4. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN PICOFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE REFERENCE DESIGNATION A12A2.

554-4243-005
C1134-61-4

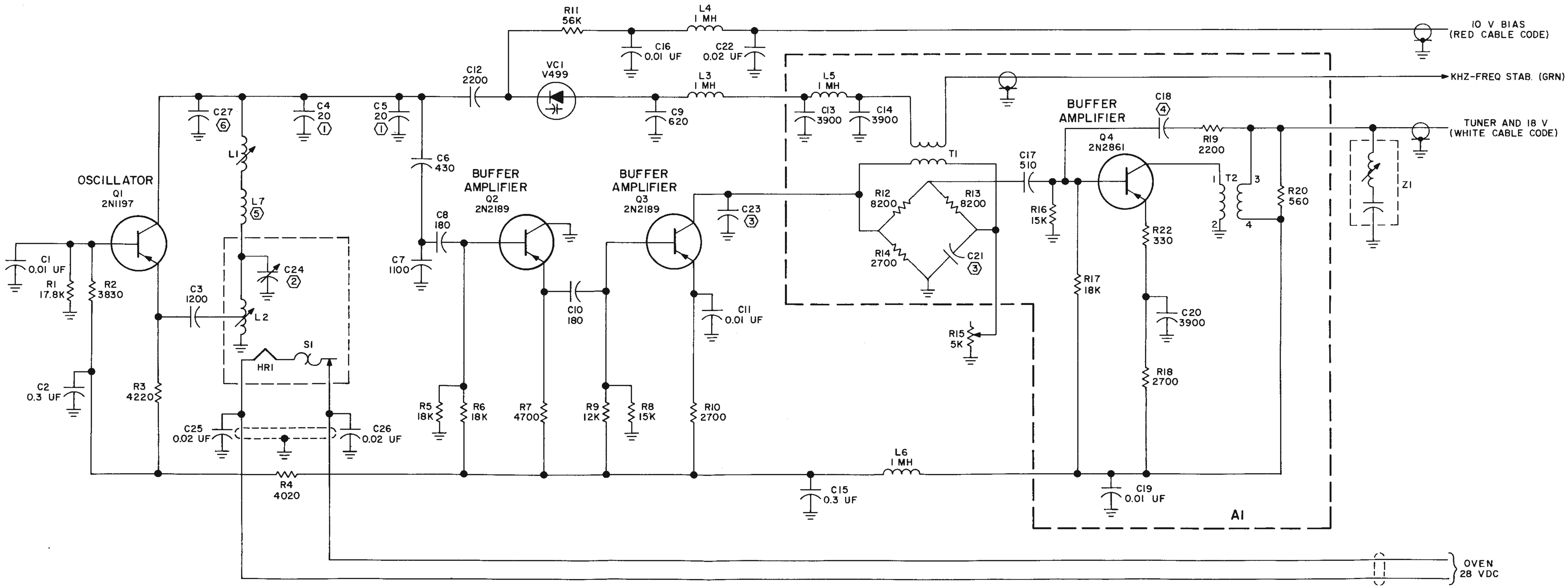
618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Late Model)
Figure 833

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Early Model) (Sheet A)
Figure 834



NOTES:

1. TEMPERATURE COMPENSATION SELECTED IN FINAL TEST.
2. VIBRATING COMPENSATING CAPACITOR.
3. SELECTED IN FINAL TEST FROM FOLLOWING VALUES:

0.51	3.0	6.2	10.0
1.0	3.6	6.8	15.0
1.5	4.3	7.5	20.0
2.0	4.7	8.2	24.0
2.4	5.1	9.1	30.0

4. SELECTED IN FINAL TEST FROM FOLLOWING VALUES:
   8.2 10 15
5. SELECTED IN FINAL TEST FROM FOLLOWING VALUES:
   0.1 UH 0.22 UH NONE
6. TEST SELECT.
7. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.

TPO-5496-014

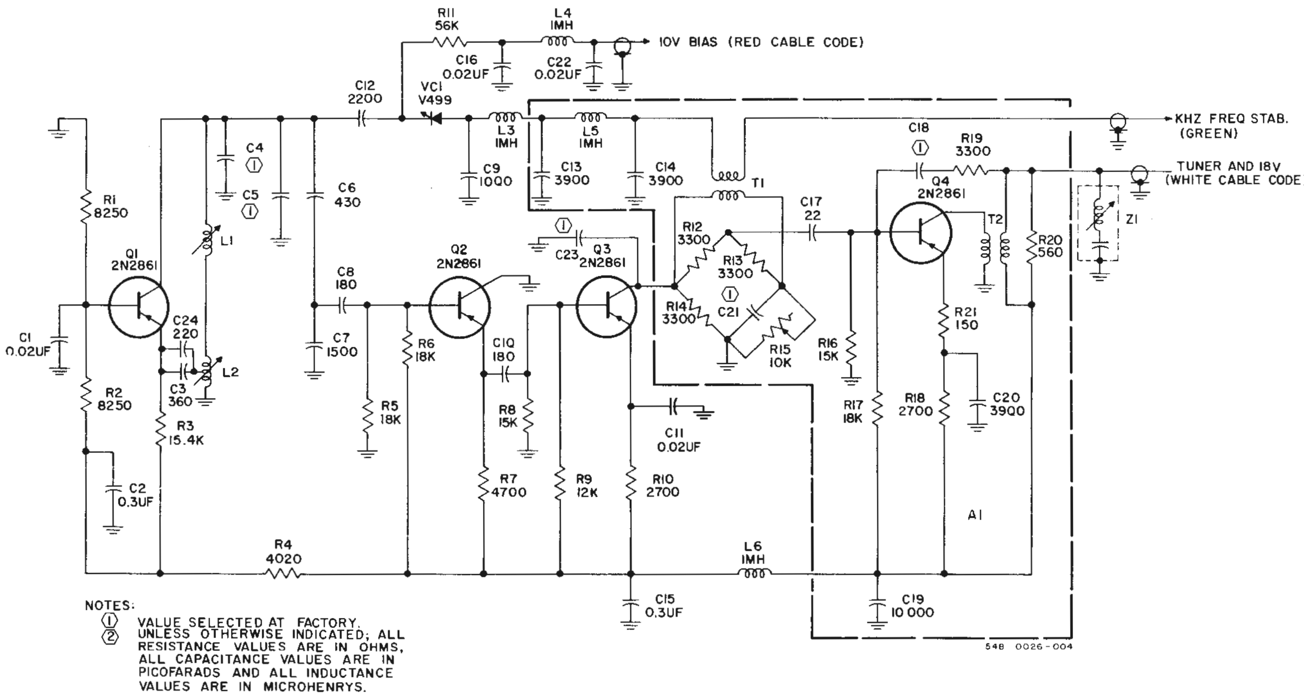
618T-1/2/3 VFO A12A2 (Model 70K-9), Schematic Diagram (Early Model)
Figure 834

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

618T-1/2/3 VFO A12A2 (Model 70K-5), Schematic Diagram (Sheet A)
Figure 835

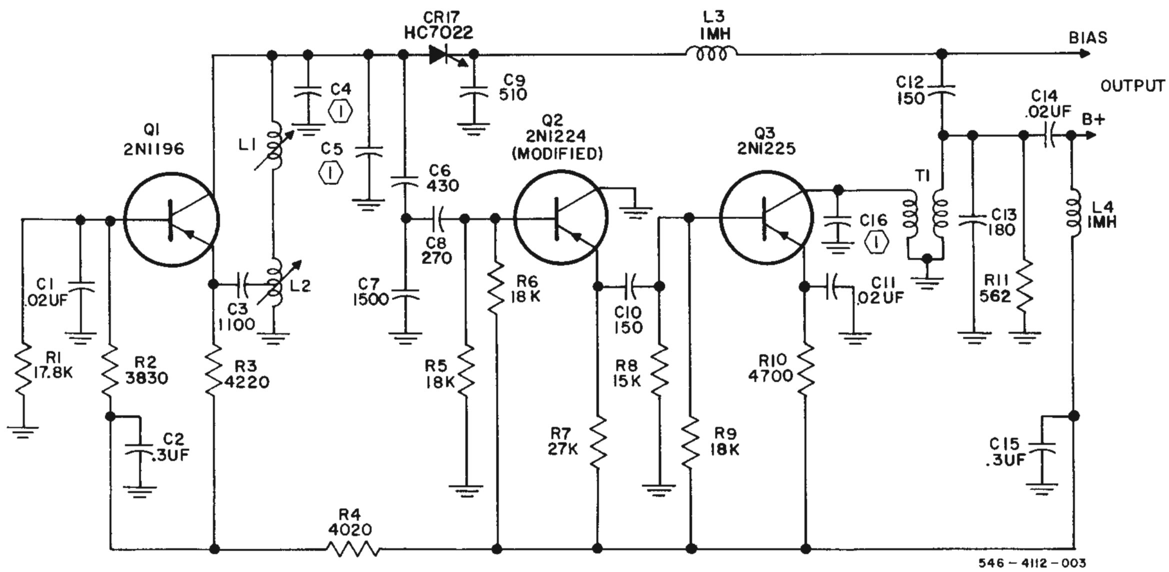


618T-1/2/3 VFO A12A2 (Model 70K-5), Schematic Diagram
Figure 835

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
		This page will contain schematic revision information.		

618T-1/2/3 VFO A12A2 (Model 70K-3), Schematic Diagram (Sheet A)
Figure 836



NOTES:

(1) SELECTED AT FACTORY.

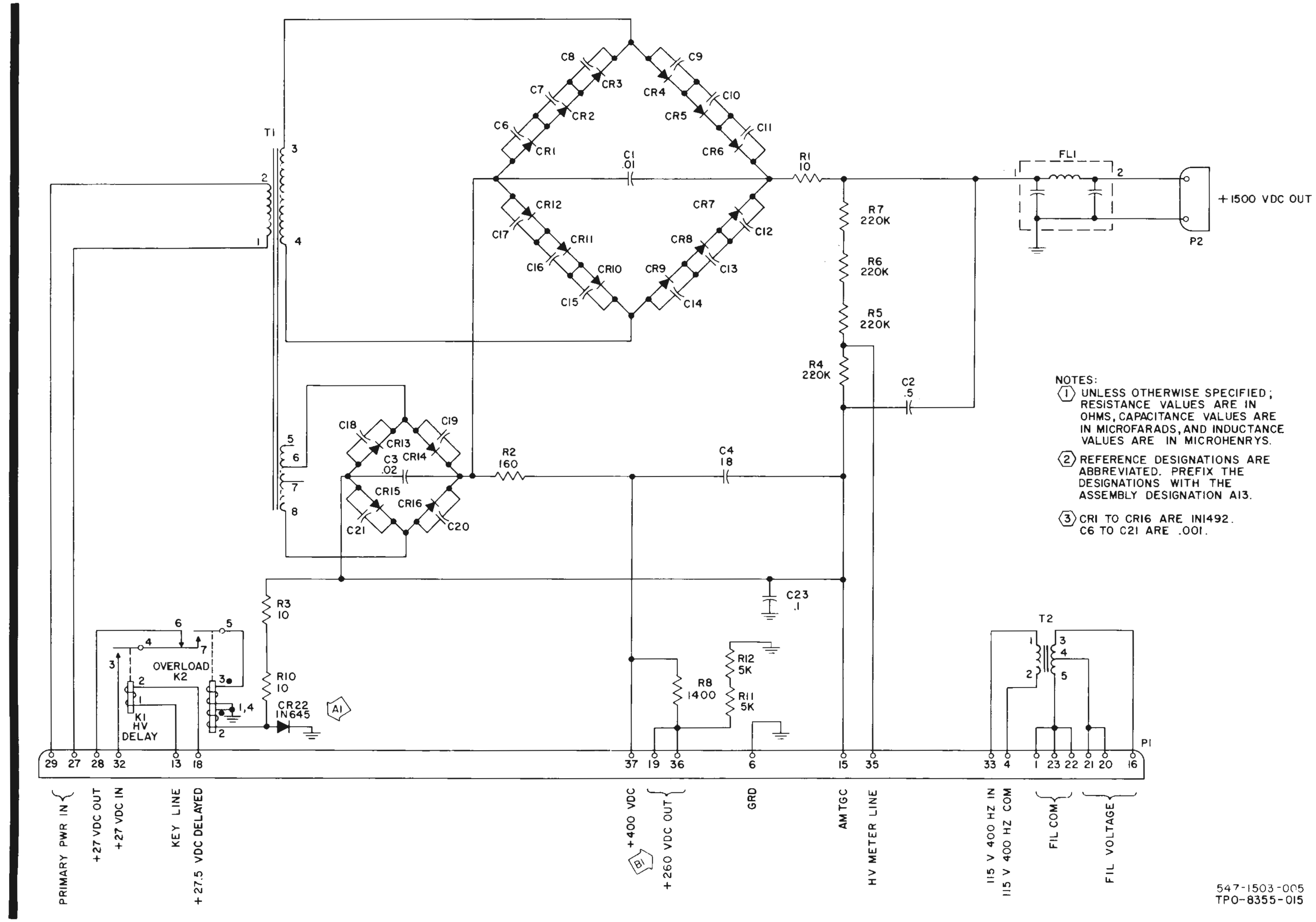
(2) UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRYS.

618T-1/2/3 VFO A12A2 (Model 70K-3), Schematic Diagram
Figure 836

SCHEMATIC CHANGES

SHEET	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
Na	A1	Added CR22 for transient suppression.	22 for the 618T-1; 2 for the 618T-1B	2266
Na	B1	Changed voltage at P1-19 and P1-36 from +250 to +260 V dc to correct schematic error.		

Single-Phase High-Voltage Power Supply
A13, Schematic Diagram
Figure 837 (Sheet A)

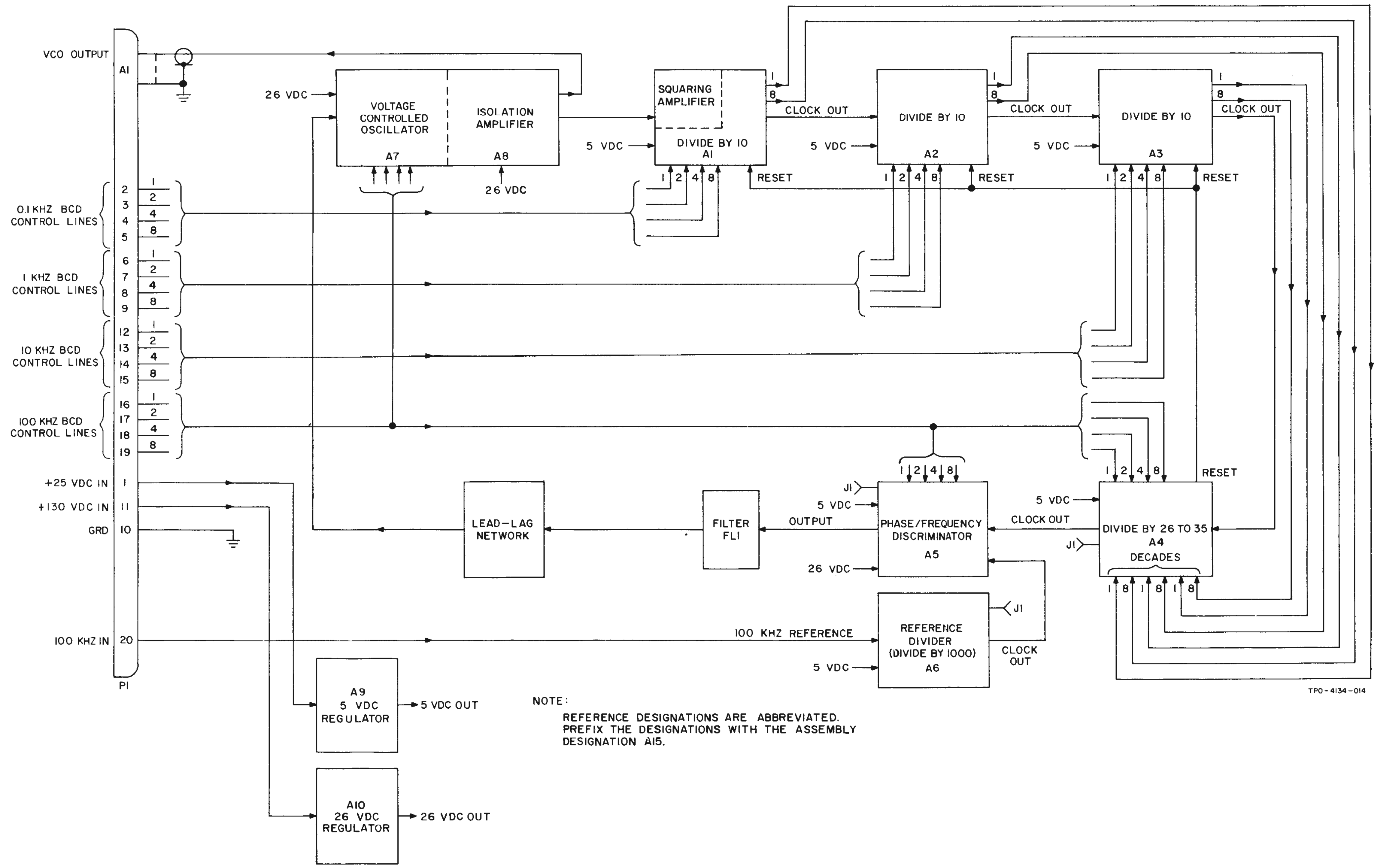


Single-Phase High-Voltage Power Supply A13, Schematic Diagram
Figure 837

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
		This page will contain schematic revision information.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram (Sheet A)
Figure 838

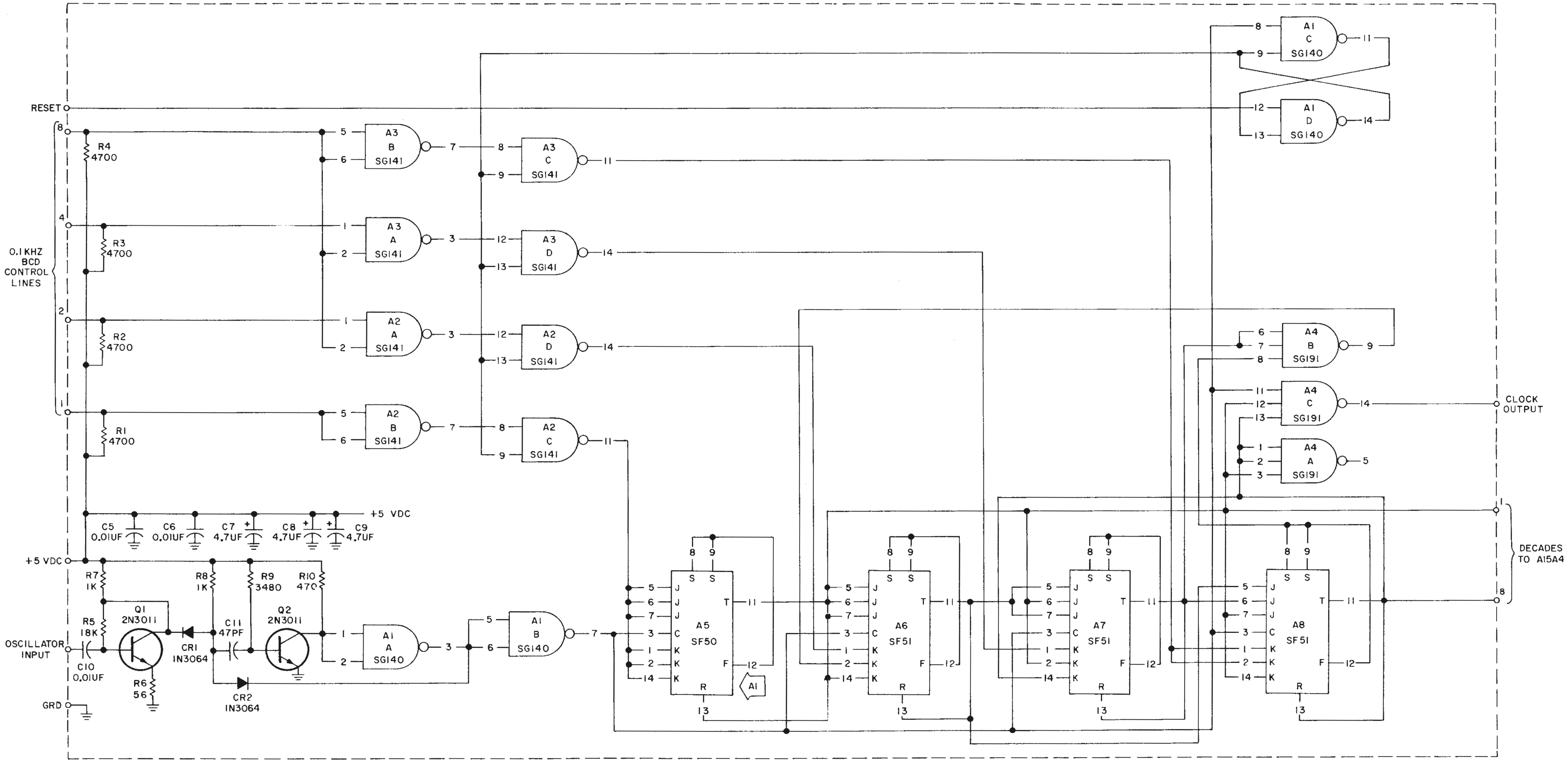


618T-1B/2B/3B Frequency Divider-Stabilizer A15, Block Diagram
Figure 838

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/71, 801/72	A1	Changed A5 from SF51 to SF50 for greater fanout capability.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 and Squaring Amplifier Assembly A15A1, Schematic Diagram (Sheet A)
Figure 839



NOTES:
(1) UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS.
(2) FLIP FLOPS A5-A8 PIN 4 IS CONNECTED TO +5 VDC AND PIN 10 IS CONNECTED TO GROUND.
(3) REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE ASSEMBLY DESIGNATION A15A1.

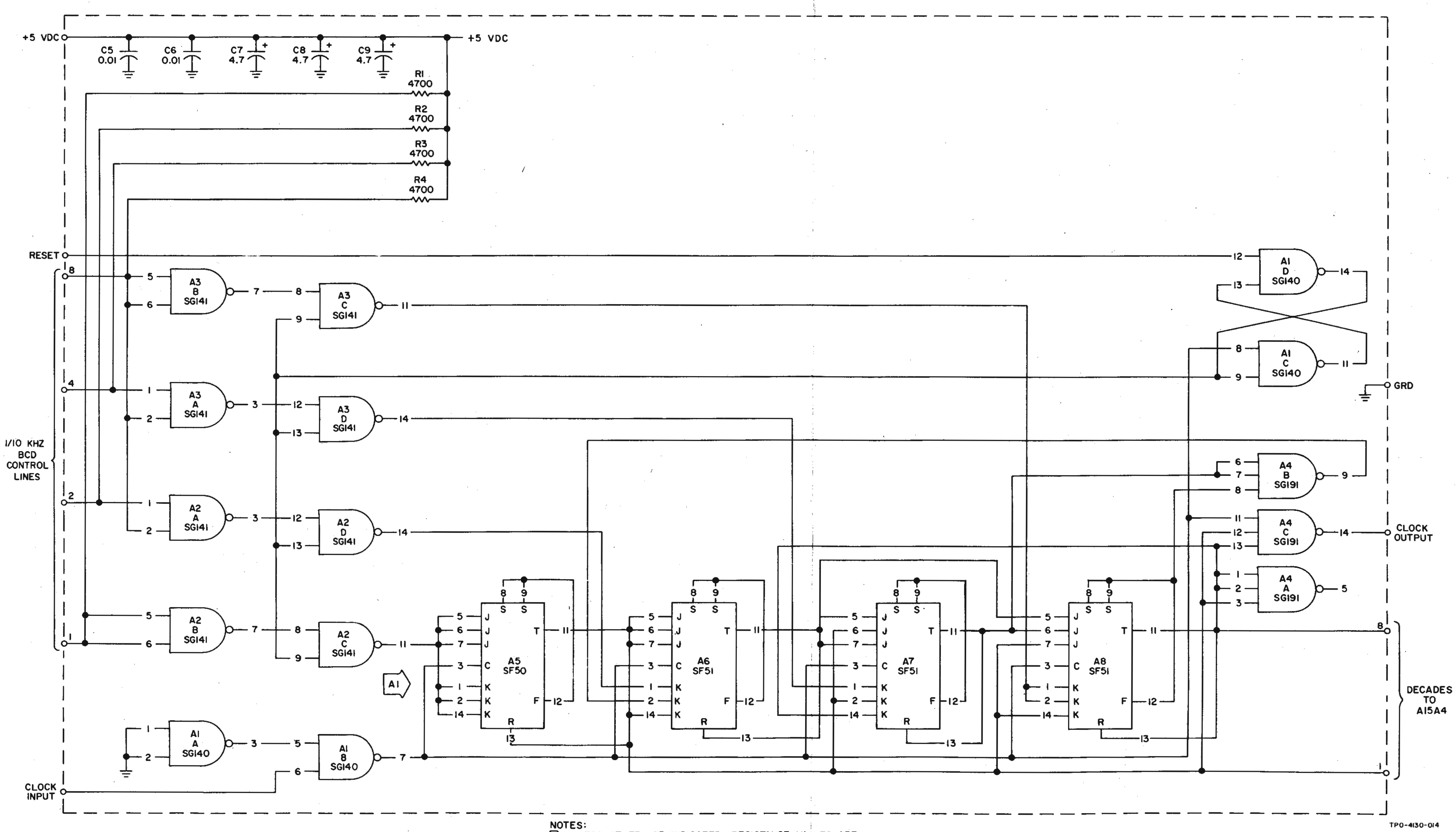
TPO 4133-015

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 and Squaring Amplifier Assembly A15A1, Schematic Diagram
Figure 839

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/75, 801/76	A1	Changed A5 from SF51 to SF50 for greater fanout capability.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 Assemblies A15A2 and A15A3, Schematic Diagram (Sheet A)
Figure 840



NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. FLIP FLOPS A5-A8 PIN 4 IS CONNECTED TO +5 VDC AND PIN 10 IS CONNECTED TO GRD.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A15A3.

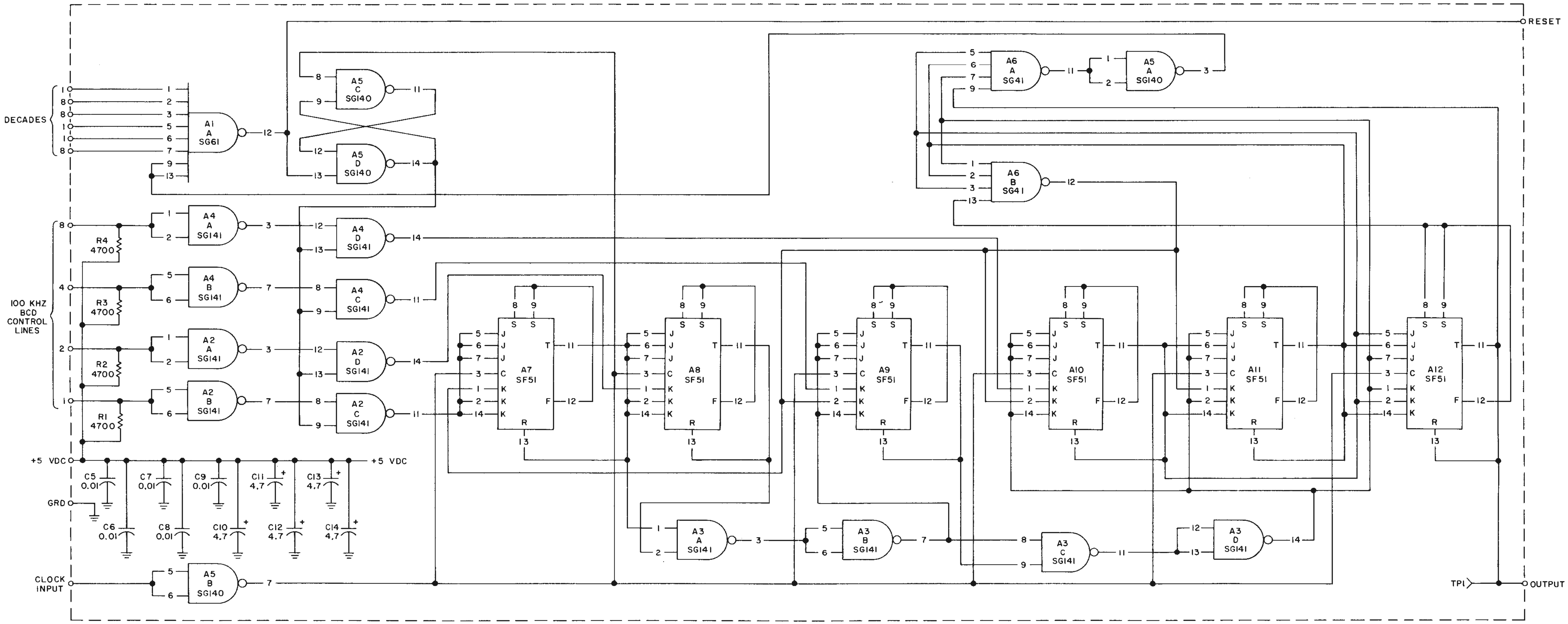
618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 10 Assemblies
A15A2 and A15A3, Schematic Diagram
Figure 840

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 26-35 Assembly A15A4, Schematic Diagram (Sheet A)
Figure 841



NOTES:
1. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. ON FLIP FLOPS A7-A12 PIN 4 IS CONNECTED TO +5 VDC AND PIN 10 IS CONNECTED TO GROUND.
3. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX THE DESIGNATION WITH THE ASSEMBLY DESIGNATION A15A4.

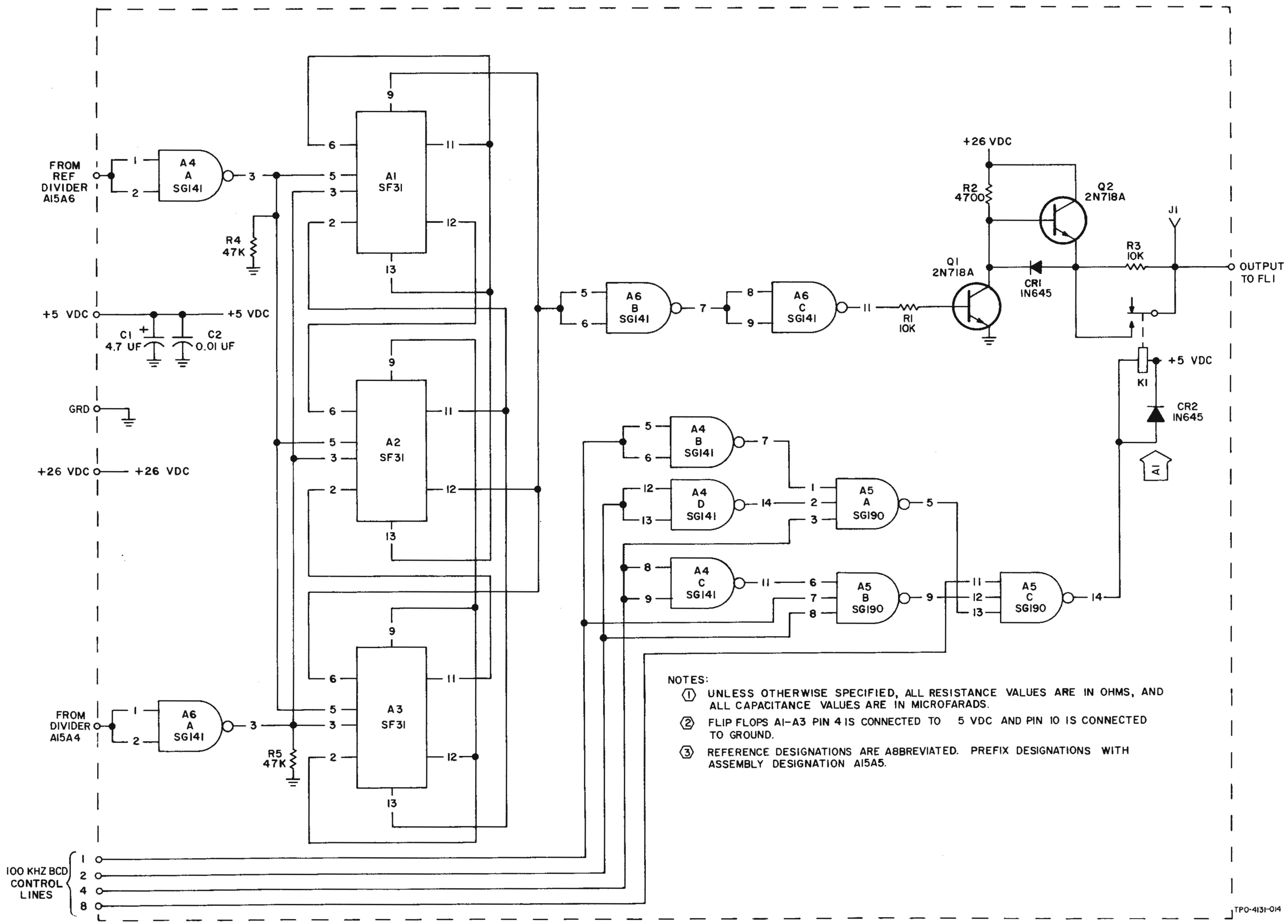
TPO-4135-015

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Divide by 26-35 Assembly A15A4,
Schematic Diagram
Figure 841

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/83, 801/84	A1	Added CR2 (1N645). Changed A5 from SG191 to SG190.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Phase/Frequency Discriminator A15A5, Schematic Diagram (Sheet A)
Figure 842

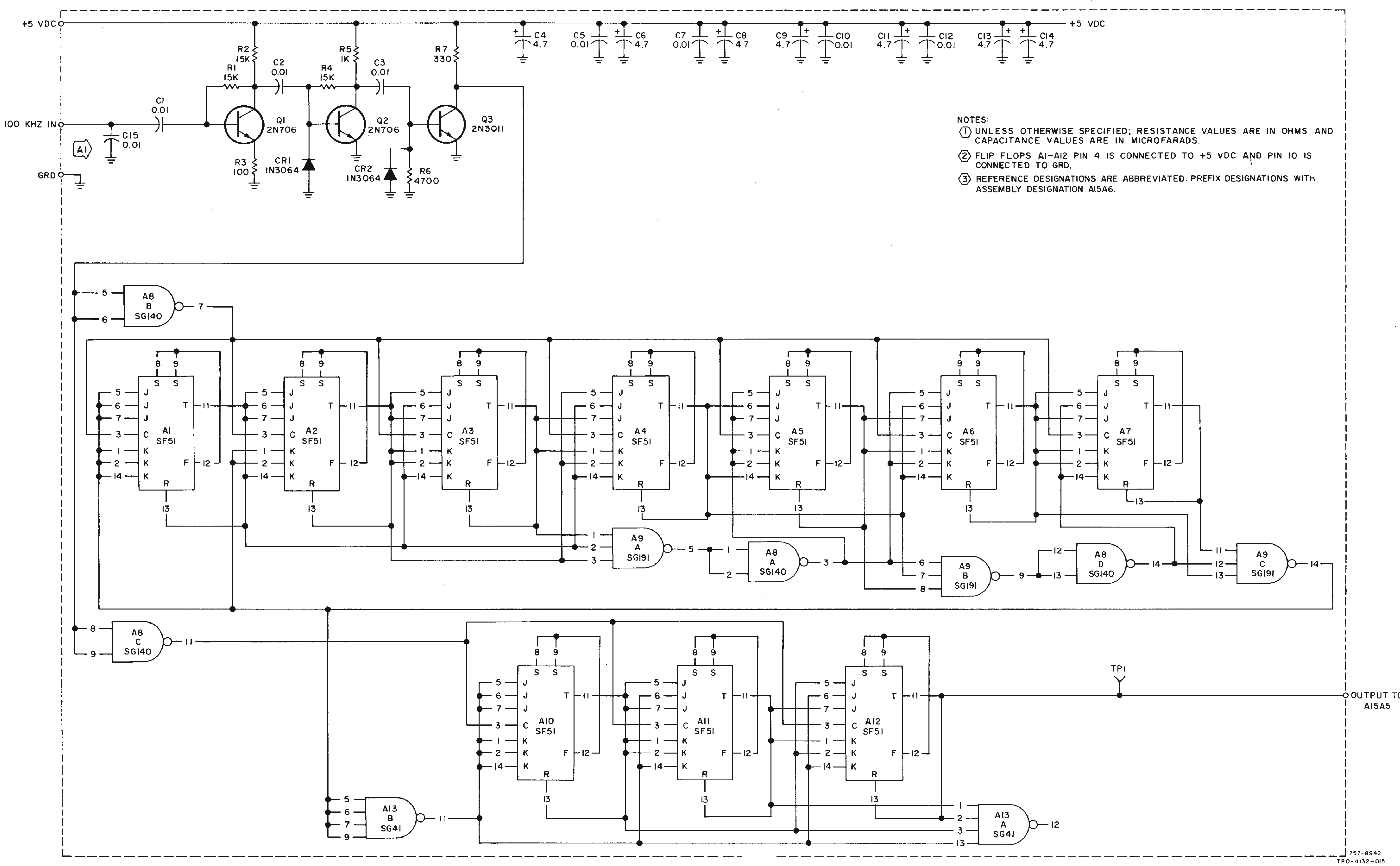


618T-1B/2B/3B Frequency Divider-Stabilizer A15, Phase/Frequency Discriminator A15A5, Schematic Diagram
Figure 842

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/87, 801/88	A1	Added C15 (0.0 μF) from C1 to ground.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Reference Frequency Divider Assembly A15A6, Schematic Diagram (Sheet A)
Figure 843

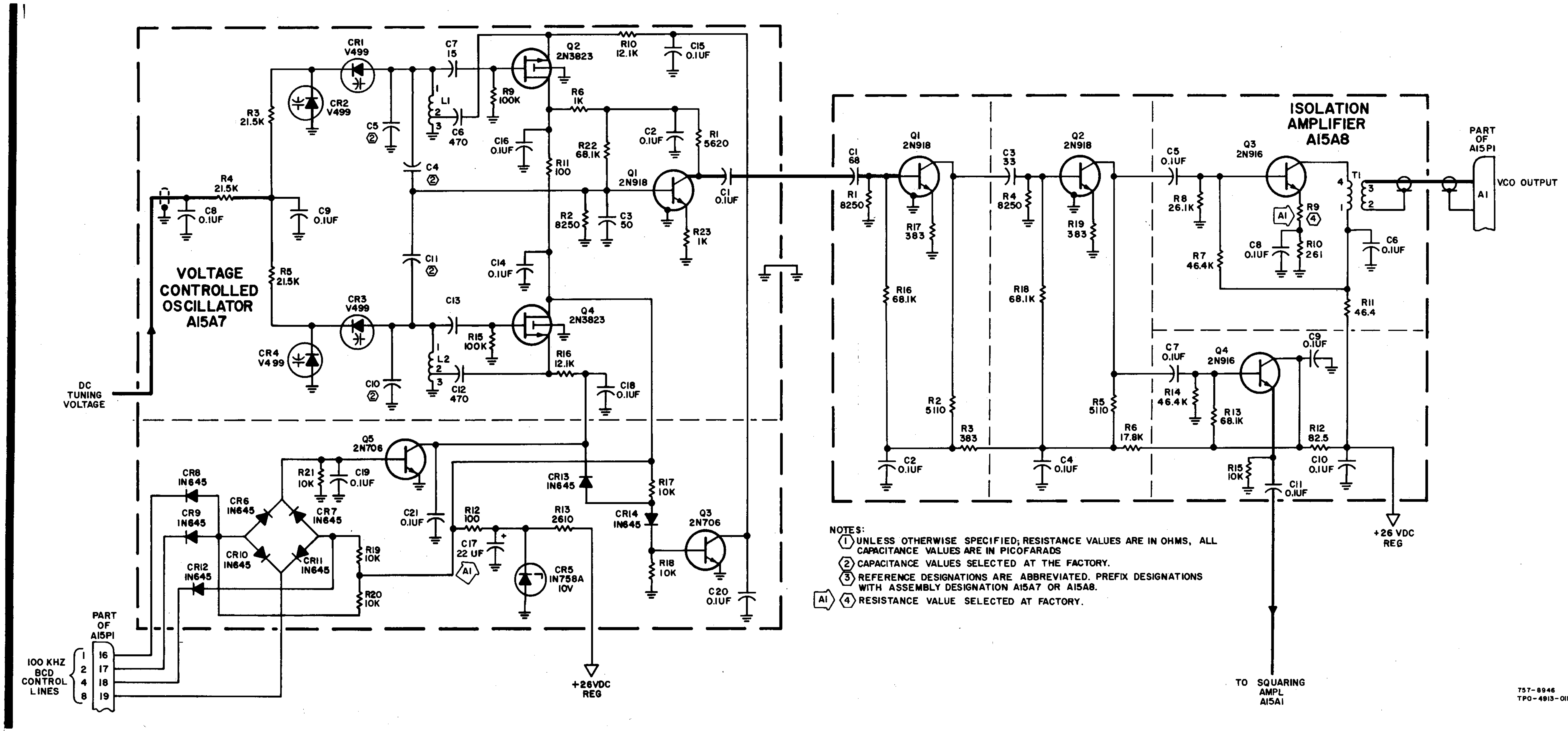


618T-1B/2B/3B Frequency Divider-Stabilizer A15, Reference Frequency Divider Assembly A15A6, Schematic Diagram
Figure 843

SCHEMATIC CHANGES

SHEET	REV IDENT	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
NA	A1	Corrected C17 from 22 MF to 22 μF. Changed R9 from 215 ohms to test select. Added note 4.		All models

618T-1B/2B/3B Frequency Divider-Stabilizer A15,
Voltage Controlled Oscillator and Isolation
Amplifier A15A7/A15A8, Schematic Diagram
Figure 844 (Sheet A)

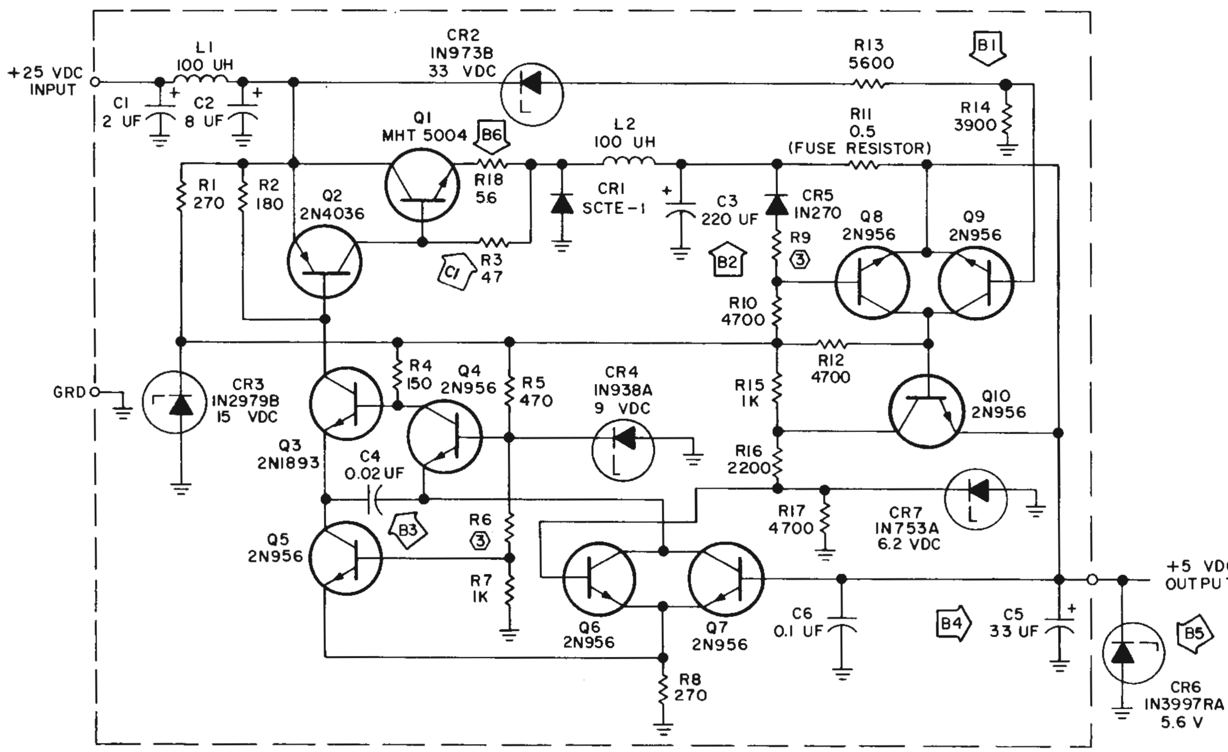


618T-1B/2B/3B Frequency Divider-Stabilizer A15,
Voltage Controlled Oscillator and Isolation
Amplifier A15A7/A15A8, Schematic Diagram
Figure 844

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
801/95, 801/96	B1	Changed R14 from 2700 ohms to 3900 ohms.		325
	B2	Changed C3 from 8μF to 220 μF.		101
	B3	Changed C4 from 0.01 μF to 0.02 μF.		378
	B4	Changed C5 from 220 μF to 33 μF.		265
	B5	Deleted CR6.		
	B6	Added R18, 5600 ohms.		378
801/95, 801/96	C1	Changed resistor R18 from 5600 to 5.6 Ω to correct schematic error.		

618T-1B/2B/3B Frequency Divider-Stabilizer
A15, 5-Volt DC Regulator Assembly
A15A9, Schematic Diagram
Figure 845 (Sheet A)



NOTES:

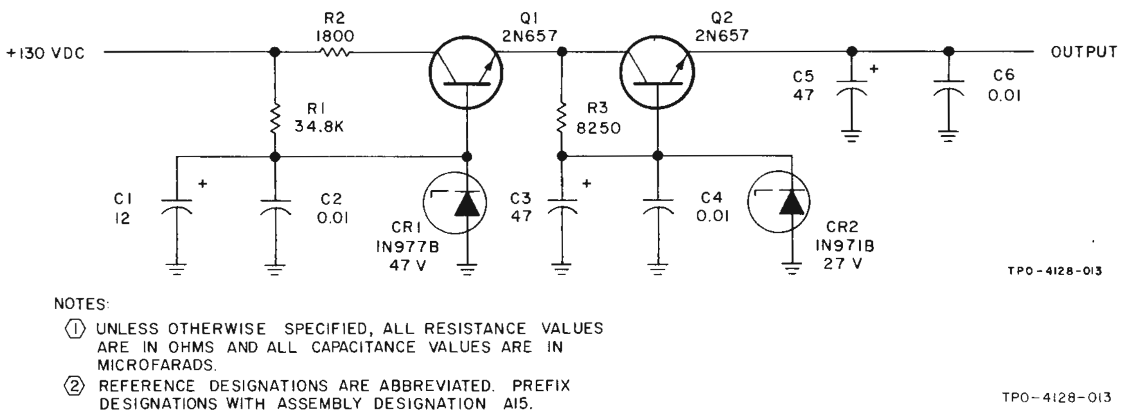
1. UNLESS OTHERWISE SPECIFIED; RESISTANCE VALUES ARE IN OHMS.
2. REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX DESIGNATIONS WITH ASSEMBLY DESIGNATION A15A9.
3. RESISTANCE VALUES SELECTED AT FACTORY.

618T-1B/2B/3B Frequency Divider-Stabilizer A15, 5-Volt DC Regulator Assembly A15A9, Schematic Diagram
Figure 845

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
		This page will contain schematic revision information.		

618T-1B/2B/3B Frequency Divider-Stabilizer A15, 26-Volt DC Regulator Assembly A15A10, Schematic Diagram (Sheet A)
Figure 846



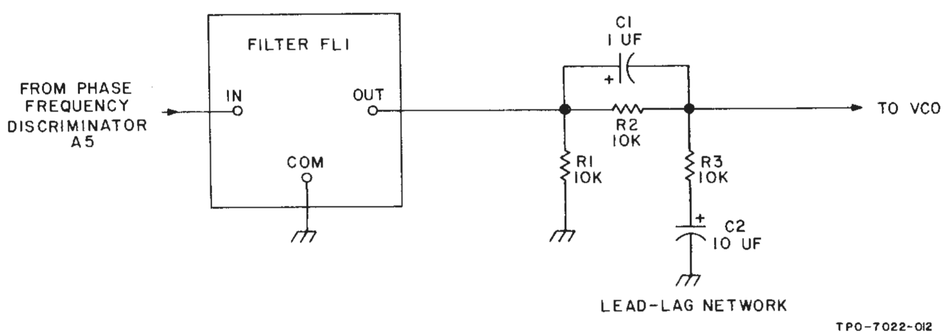
618T-1B/2B/3B Frequency Divider-Stabilizer A15, 26-Volt DC Regulator Assembly A15A10, Schematic Diagram
Figure 846

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

618T-1B/2B/3B Frequency Divider-Stabilizer A15, Filter FL1 and Lead-Lag Network, Simplified Schematic Diagram (Sheet A)
Figure 847

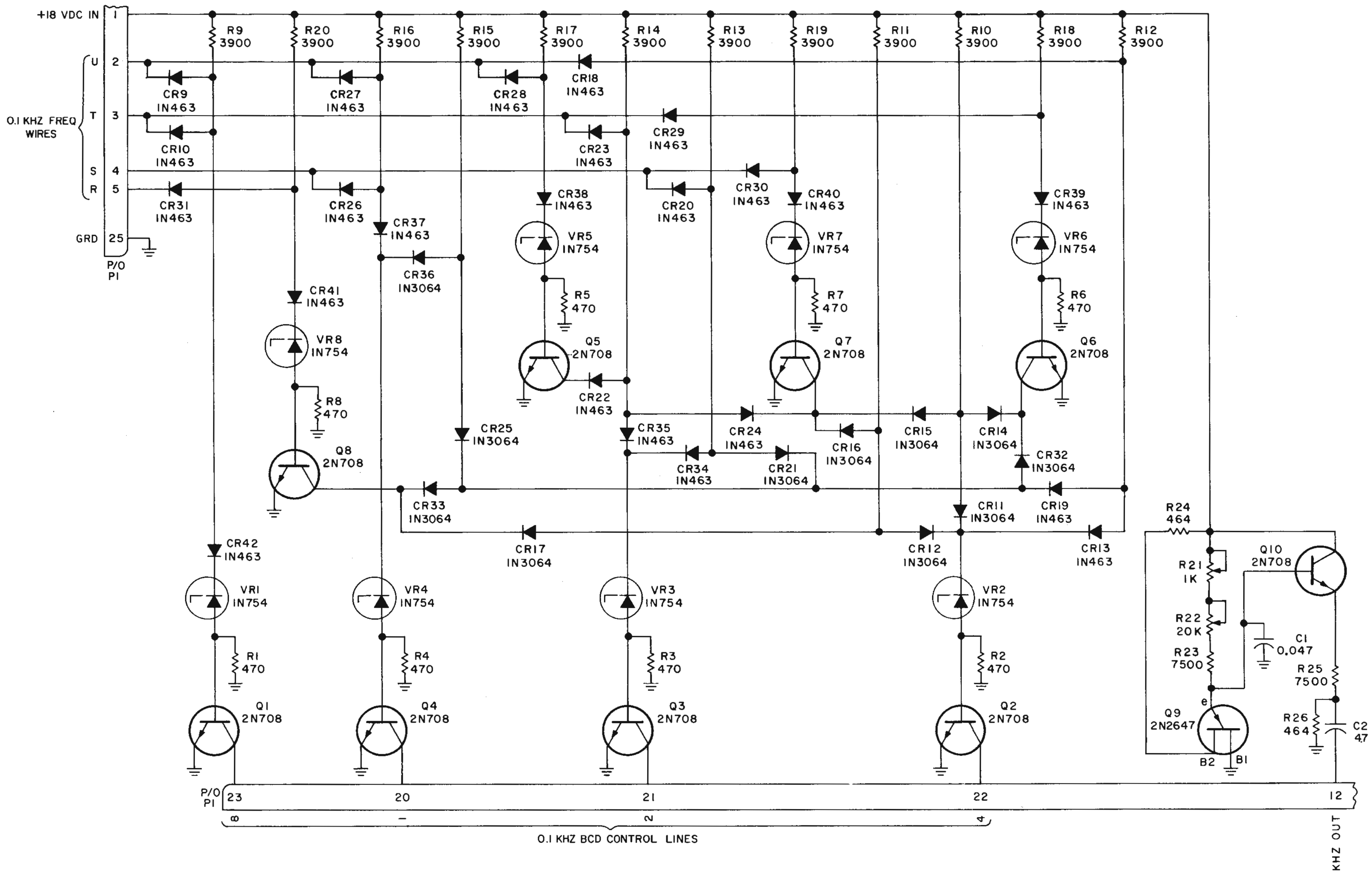


618T-1B/2B/3B Frequency Divider-Stabilizer A15, Filter FL1 and Lead-Lag Network, Simplified Schematic Diagram
Figure 847

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
		This page will contain schematic revision information.		

618T-1B/2B/3B Control Data Converter A16, Schematic Diagram (Sheet A)
Figure 848



NOTES:

(1) UNLESS OTHERWISE SPECIFIED; ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS.

(2) REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX DESIGNATIONS WITH THE ASSEMBLY DESIGNATION A16.

TPO-4617-014

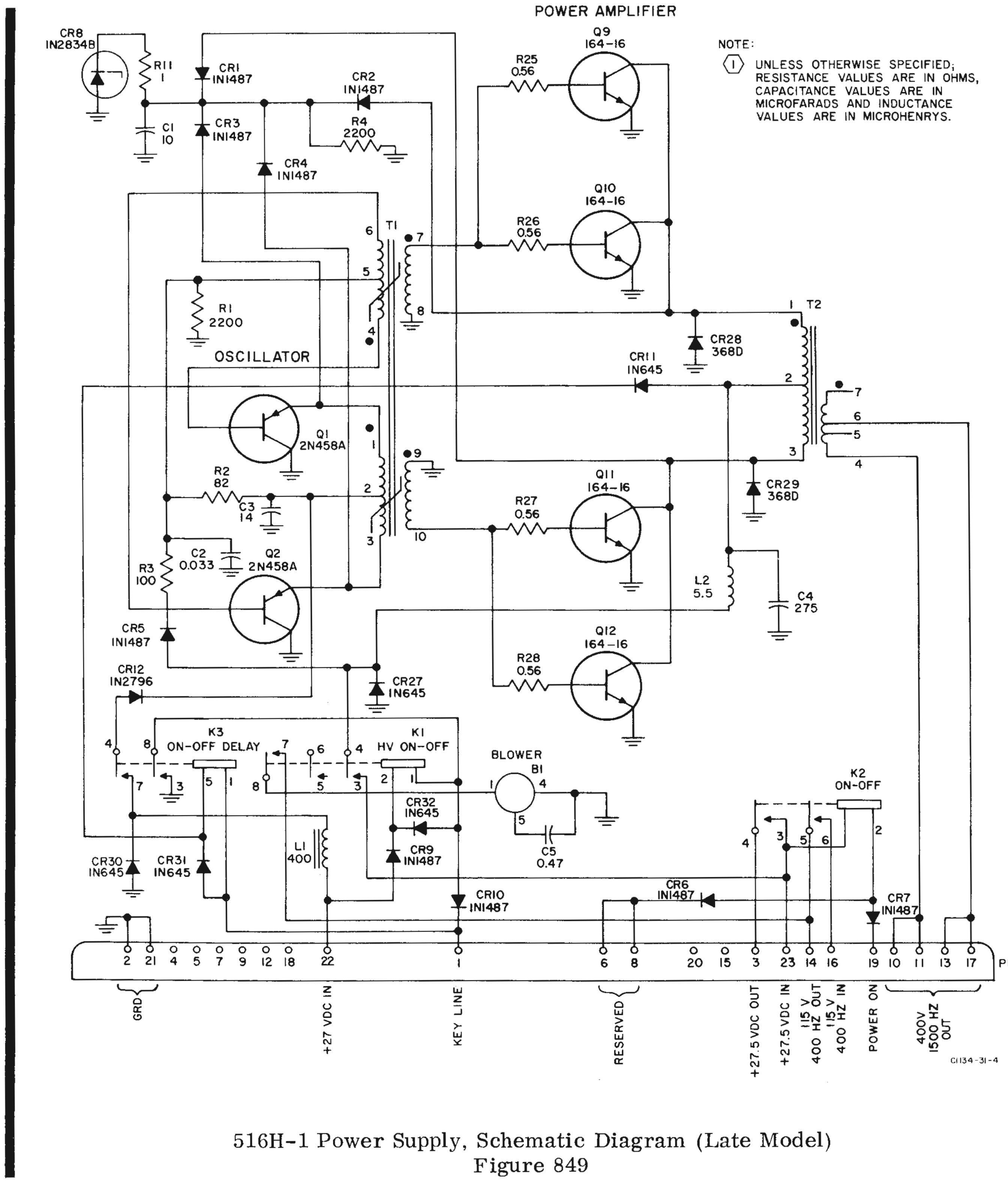
618T-1B/2B/3B Control Data Converter A16, Schematic Diagram
Figure 848

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

516H-1 Power Supply, Schematic Diagram (Late Model) (Sheet A)
Figure 849



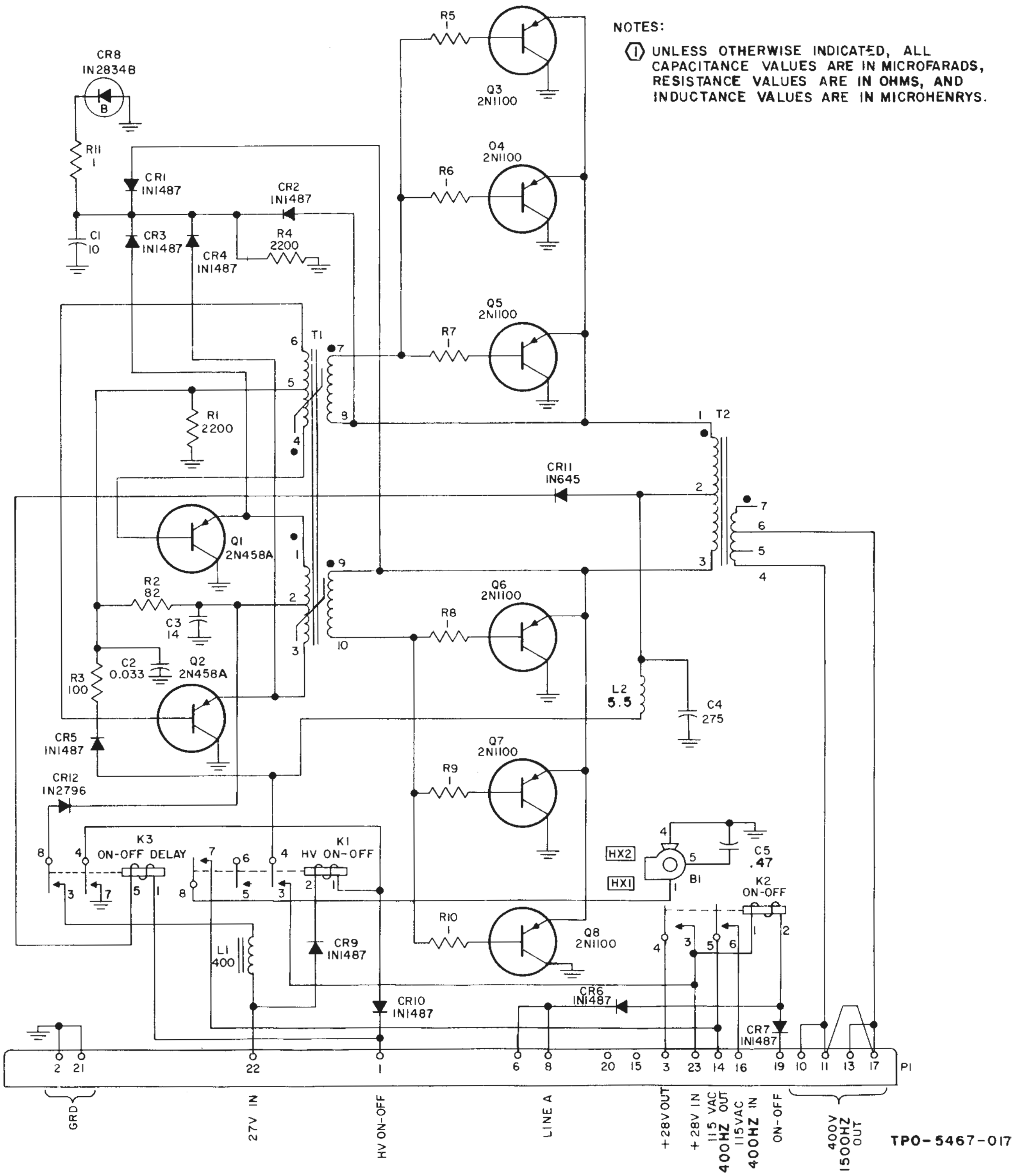
516H-1 Power Supply, Schematic Diagram (Late Model)
Figure 849

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY

This page will contain schematic revision information.

516H-1 Power Supply, Schematic Diagram (Early Model) (Sheet A)
Figure 850



516H-1 Power Supply, Schematic Diagram (Early Model)
Figure 850

618T-( ) Airborne SSB Transceiver - Storage Instructions

1. GENERAL.

This section presents storage instructions for the 618T-( ). Make certain that all modules are secured to the chassis and that the unit is installed in the dust cover. If the 618T-( ) must be stored in a hot, humid environment, perform the procedures in the inspection/check section before returning the unit to service. This inspection must be performed before returning the unit to service if the storage period is three months or longer in any environment.

618T-( ) Airborne SSB Transceiver - Special Tools, Fixtures, and Test Equipment

1. GENERAL.

This section presents a list of special tools, fixtures, and test equipment required for the test or overhaul of the 618T-( ) Airborne SSB Transceiver.

2. TEST EQUIPMENT REQUIRED.

Figure 1001 lists all the equipment required to test, troubleshoot, and overhaul the unit. Any substituted test equipment must be equivalent to that listed.

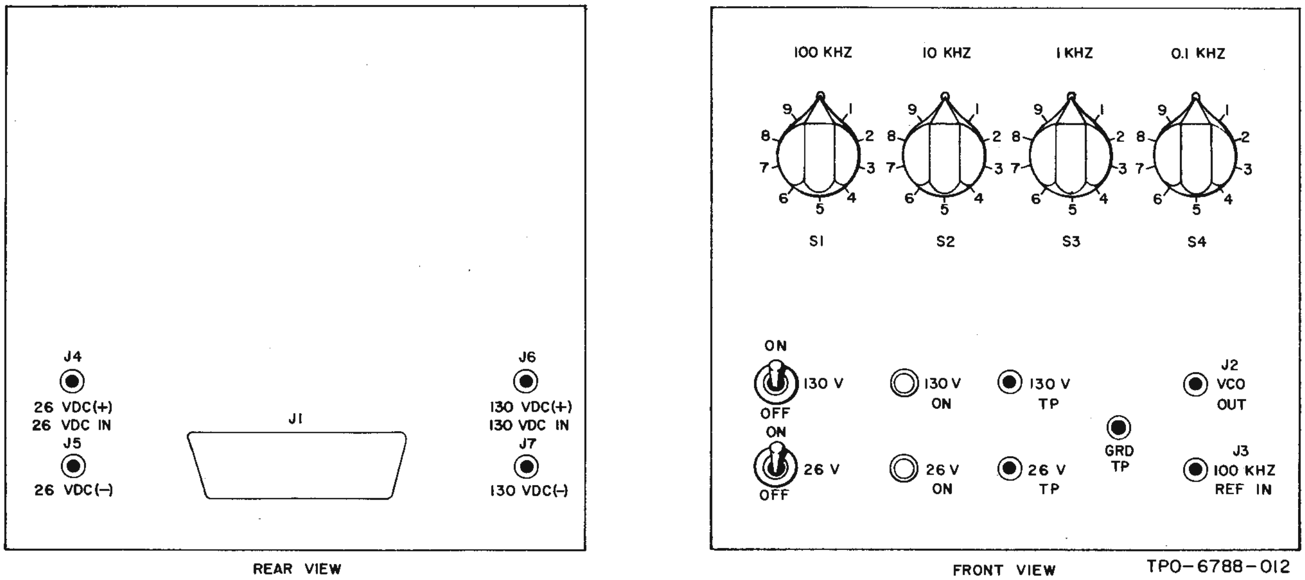
A test fixture for frequency divider-stabilizer A15 is shown in figure 1002 and a test fixture for control data converter A16 is shown in figure 1003. 678Y-1B includes module extenders for data converter and divider stabilizer modules.

EQUIPMENT	TYPE OR MODEL NO.	COLLINS PART NUMBER	MANUFACTURER
Rf dummy load	8201		Bird
Signal generator	606A		Hewlett-Packard
*Power supply	711A		Hewlett-Packard
*Power supply	723A		Hewlett-Packard
6-db attenuator	80-ZH3		Measurements Corp.
Vtvm	410B		Hewlett-Packard
Rf vtvm	91-C		Boonton
Probe T-connector	455A or 11042A		Hewlett-Packard
Harmonic distortion analyzer	330D		Hewlett-Packard
Spectrum analyzer	2836		Polarad
Oscilloscope	545B		Tektronix
Oscilloscope calibrated amplifier	1A2		Tektronix
Hf receiver	51S-1	522-2245-000	Collins Radio Co.
Frequency counter	524D		Hewlett-Packard

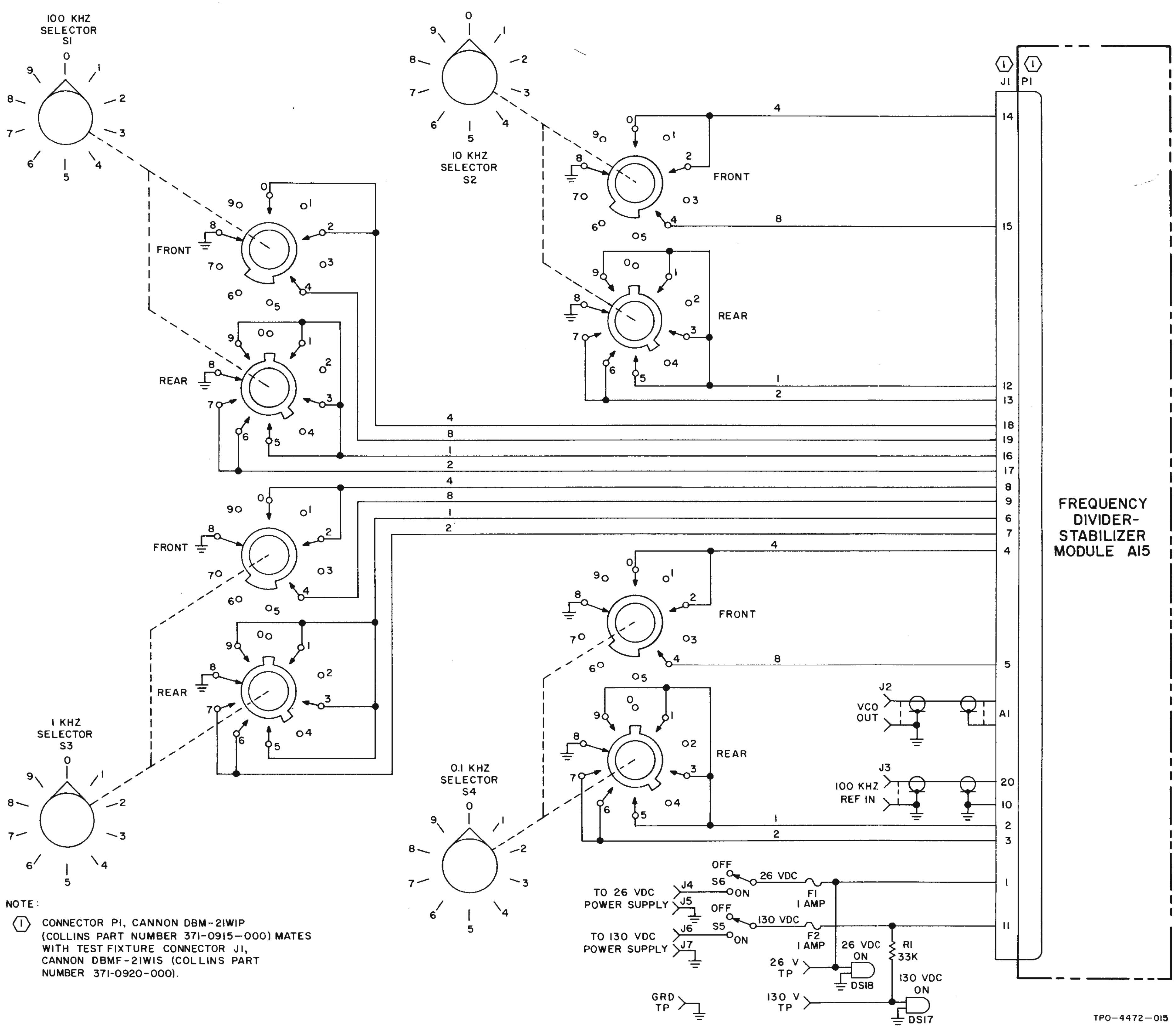
Test Equipment Required (Sheet 1 of 2)
Figure 1001

EQUIPMENT	TYPE OR MODEL NO.	COLLINS PART NUMBER	MANUFACTURER
Frequency converter	525A		Hewlett-Packard
Audio oscillators (2)	200AB		Hewlett-Packard
Test harness	678P-1 or 678P-1B 678P-2 or 678P-2A	547-3914-00 777-1861-001 522-3400-00 522-3400-006	Collins Radio Co.
Maintenance kit	678Y-1, 678Y-1B or 678Y-3	547-3915-000 777-1862-001 522-3401-006	Collins Radio Co.
Function test set	678Z-1 (part of 678Y-3)	548-8001-005	Collins Radio Co.
Differential vtvm	801B		Fluke
Radio set control	714E-2( ) or 714E-3( ) or 714E-6( )	522-2213-00 522-2457-00 522-4466-00	Collins Radio Co.
Ac vtvm	310A		Ballantine
Vom	630-NA		Tripplett
High-impedance headphones			Commercial
Carbon microphone	205		Electro-Voice
Temperature box, range from -50 to +80 °C			Commercial
Water's torque watch	651C3		Water Mfg. Inc. Wayland, Mass.
* Required if special testers are used.			

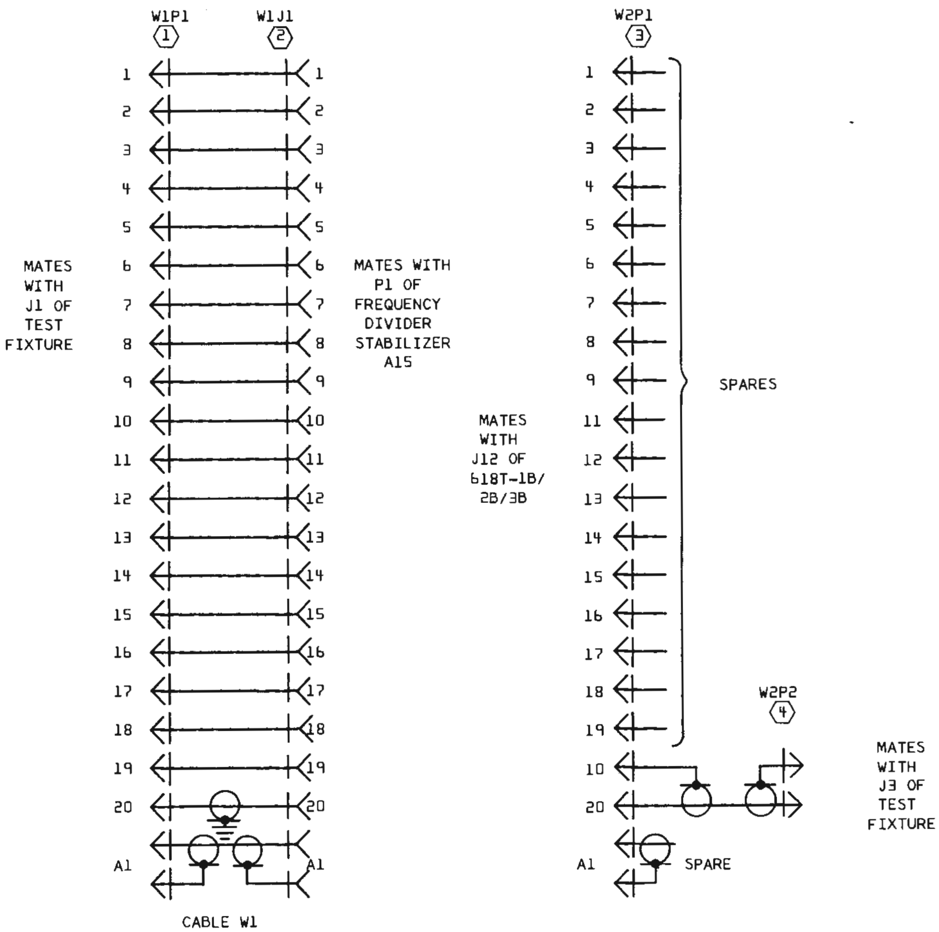
Test Equipment Required
Figure 1001 (Sheet 2)



Frequency Divider-Stabilizer A15, Test Fixture (Sheet 1 of 4)
Figure 1002



Frequency Divider-Stabilizer A15, Test Fixture (Sheet 2 of 4)
Figure 1002



NOTES:

1. CONNECTOR W1P1 CANNON DBM-21W1P (COLLINS PART NUMBER 371-0915-000) MATES WITH TEST FIXTURE CONNECTOR J1, CANNON DBMF-21W1S (COLLINS PART NUMBER 371-0920-000).

2. CONNECTOR W1J1, CANNON DBMF-21W1S (COLLINS PART NUMBER 371-0920-000) MATES WITH FREQUENCY DIVIDER STABILIZER A15 CONNECTOR P1, CANNON DBM-21W1P (COLLINS PART NUMBER 371-0915-000).

3. CONNECTOR W2P1, CANNON DBM-21W1P (COLLINS PART NUMBER 371-0915-000) MATES WITH 618T-1B/2B/3B CONNECTOR J12, CANNON DBMF-21W1S (COLLINS PART NUMBER 371-0920-000).

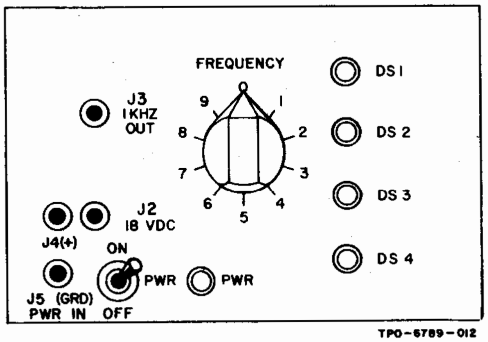
4. CONNECTOR W2P2, CANNON DIC-723 (COLLINS PART NUMBER 357-9018-000) MATES WITH TEST FIXTURE CONNECTOR J3, CANNON DIC-875 (COLLINS PART NUMBER 357-9047-000).

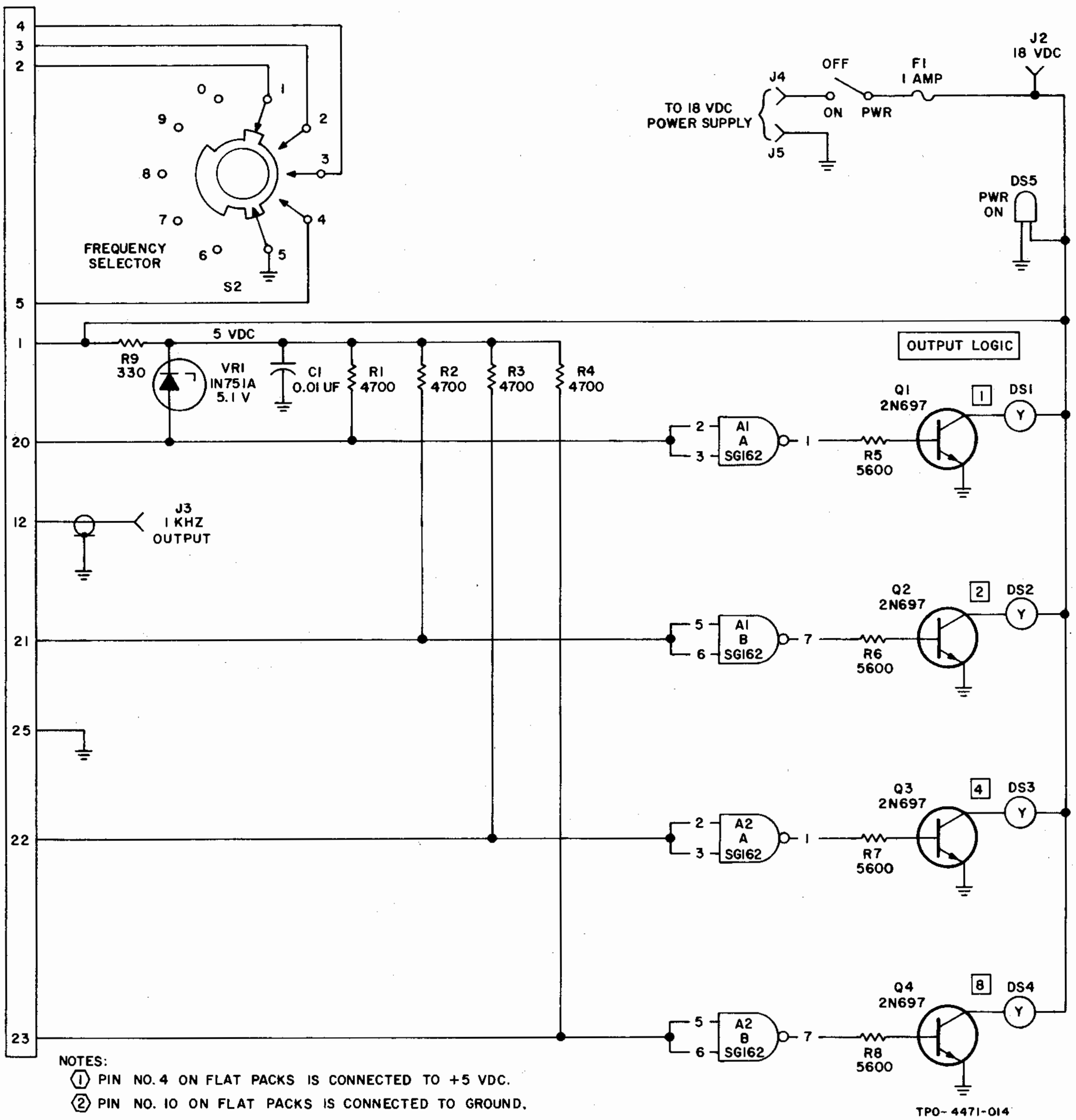
TPO-7717-012

Frequency Divider-Stabilizer A15, Test Fixture (Sheet 3 of 4)
Figure 1002

QTY	ITEM	COLLINS PART NO.	MANUFACTURER AND PART NO.	DESCRIPTION
4	S1 through S4	259-2843-010	Oak Mfg, 255921-BK	Wafer switch, rotary
4	Knobs	757-0228-001	None required for commercial switch	Knob for rotary wafer switch
2	S5, S6		Cutler-Hammer 8381K21D	Switch, power on-off
2	F1, F2	264-4050-000	Buss, 57D3426	Fuse, 1 A
2	XF1, XF2	265-1248-000	Buss, HKP	Fuseholder
1	DS17	262-0692-000		130 vdc lamp, power indicator
1	Mounting bracket and lens	262-1944-000		Mounting bracket and lens for DS17
1	DS18	262-2828-030	Dialco, 81-0410-011-201	Lamp/socket assembly, red, power indicator
1	J2	357-9047-000	Cannon, DIC-875	Coaxial connector, test fixture VCO OUT
1	J3	357-9047-000	Cannon, DIC-875	Mating connector for W2P2
2	J4, J6	372-1062-000	H. H. Smith, DF30RC	Connector, power in, red
2	J5, J7	372-1061-000	H. H. Smith, DF30BC	Connector, power in, black
2	130 V. TP, 26 V. TP	360-0062-00	E. F. Johnson, 105-602	Test jack, red
1	GRND TP	360-0063-00	E. F. Johnson, 105-603	Test jack, black
2	W1P1, W2P1	371-0915-000	Cannon, DBM-21W1P	Mating connector for test fixture connector J1 and 618T-1B/2B/3B connector J12
2	Test fixture J1, W1J1	371-0920-000	Cannon, DBMF-21W1S	Mating connector for W1P1 and W2P1
1	R1		RC07GF333K	Resistor, 33K, 1/4 w

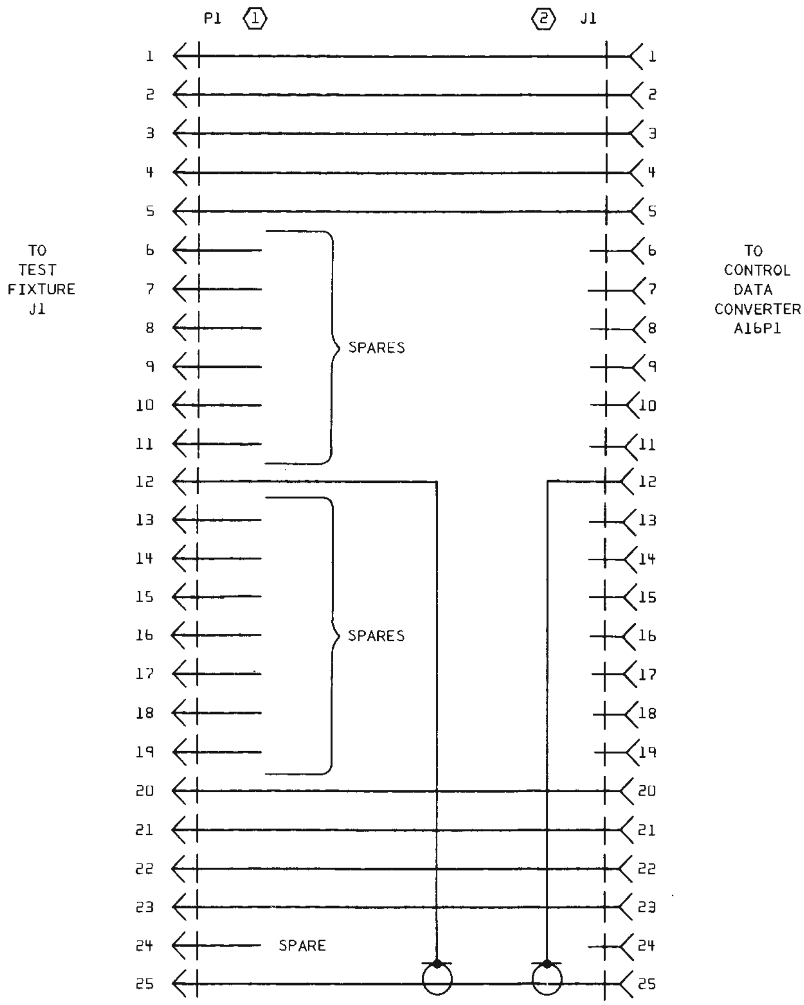
Frequency Divider-Stabilizer A15, Test Fixture (Sheet 4 of 4)
Figure 1002





NOTES:
1. PIN NO. 4 ON FLAT PACKS IS CONNECTED TO +5 VDC.
2. PIN NO. 10 ON FLAT PACKS IS CONNECTED TO GROUND.

Control Data Converter A16, Test Fixture (Sheet 1 of 3)
Figure 1003



NOTES:

1. CONNECTOR P1, CANNON DBM-25P (COLLINS PART NUMBER 371-0969-00) MATES WITH CANNON DBMF-25S (COLLINS PART NUMBER 371-0959-00).

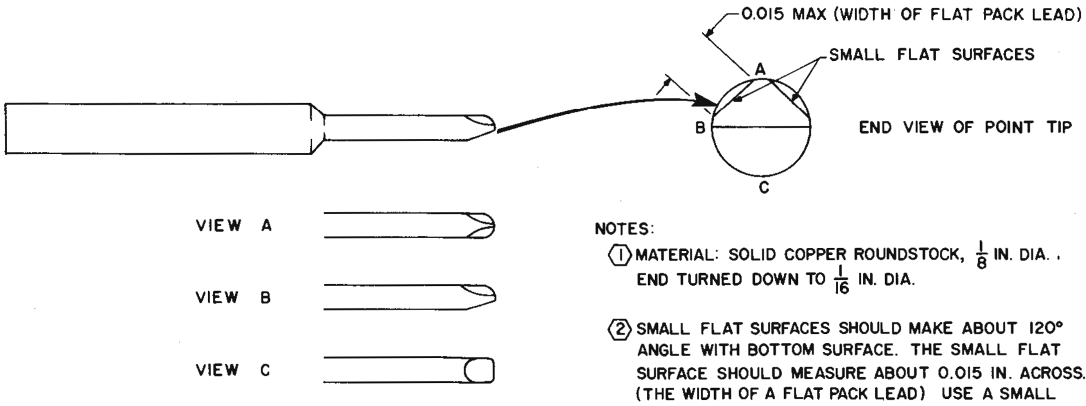
2. CONNECTOR J1, CANNON DBMF-25S (COLLINS PART NUMBER 371-0959-00) MATES WITH CANNON DBM-25P (COLLINS PART NUMBER 371-0969-00).

TPO-7716-012

Control Data Converter A16, Test Fixture (Sheet 2 of 3)
Figure 1003

QTY	ITEM	COLLINS PART NO.	MANUFACTURER AND PART NO.	DESCRIPTION
4	R1 through R4	745-0773-000	RC07GF472K	Resistor, 4700 ohms 1/4 w
4	R5 through R8	745-2368-000	RC05GF562K	Resistor, 5600 ohms, 1/8 w
1	R9	745-3331-000	RC32GF331K	Resistor, 330 ohms, 1 w
1	C1	913-3680-000	Erie Tech. Prod., 80-5014 X5V0 1037	Capacitor, 0.01 uf
2	A1	351-7134-010	Sylvania, SF162-02	Flatpack, SG 162
2	A2	351-7134-010	Sylvania, SF162-02	Flatpack, SG 162
4	Q1 through Q4	357-0197-000	2N697	Transistor, 2N697
1	VR1	353-2710-000	1N751A	Zener diode, 1N751A
2	J1	371-0959-000	Cannon, DBMF-25S	Connector, receptacle
1	P1	371-0969-000	Cannon, DBM-25P	Connector, plug
1	J2	357-9047-000	Cannon, DIC-785	Coaxial connector, 1 KHZ OUT
1	J3	360-0062-00	E. F. Johnson, 105-602	Test jack, red
1	J4	372-1062-000	H. H. Smith, DF30RC	Connector, power in, red
1	J5	372-1061-000	H. H. Smith, DF30BC	Connector, power in, black
1	F1	264-4050-000	Buss, 57D3426	Fuse, 1 A
1	XF1	265-1248-000	Buss, HKP	Fuseholder
1	S2	259-1272-010	Oak, 255987-RK3E	Rotary wafer switch, FREQUENCY SELECTOR
1	XS2	757-0288-001	None required for commercial switch	Knob for rotary wafer switch S2
1	S1	266-3072-000	Cutler-Hammer, 8381K21D	Toggle switch, power on-off
4	DS1 through DS4	262-0179-000	MS25237-327	Indicator lamp
4	XDS1 through XDS4	252-2828-010	MS255256	Lampholder
1	DS5	262-0179-000	MS25237-327	Power on-off indicator
1	XDS5	262-2828-030	MS25256-6	Lampholder

Control Data Converter A16, Test Fixture (Sheet 3 of 3)
Figure 1003

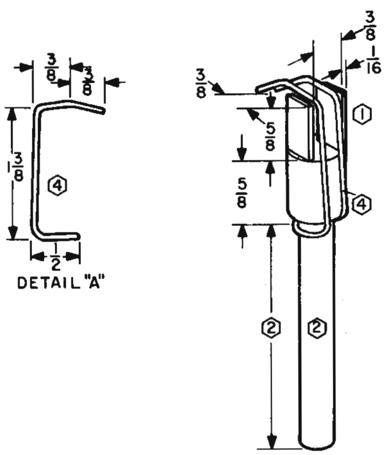


NOTES:

1. MATERIAL: SOLID COPPER ROUNDSTOCK, $\frac{1}{8}$ IN. DIA., END TURNED DOWN TO $\frac{1}{16}$ IN. DIA.
2. SMALL FLAT SURFACES SHOULD MAKE ABOUT 120° ANGLE WITH BOTTOM SURFACE. THE SMALL FLAT SURFACE SHOULD MEASURE ABOUT 0.015 IN. ACROSS. (THE WIDTH OF A FLAT PACK LEAD) USE A SMALL FLAT FILE TO SHAPE SURFACES.
3. ANY TIP WITH A SURFACE WORKING WIDTH OF ABOUT 0.015 WOULD BE SATISFACTORY. THE DESIGN ABOVE FEATURES MECHANICAL STRENGTH AND CAN BE RENEWED MANY TIMES.

TPO-5103-012

Special Soldering Iron Tip
Figure 1004



NOTES:

1. HEATING UNIT OF TOOL IS MADE FROM 5/8 INCH COPPER ROUNDSTOCK, 3 3/4 INCHES LONG
2. TURN DOWN ABOUT 2 1/2 INCHES OF SHAFT TO FIT 150-200 WATT SOLDERING IRON
3. MODIFY HANDLE OF SOLDERING IRON AS NECESSARY TO PERMIT MOUNTING IRON ON ARBOR PRESS
4. SPRING PART OF TOOL IS MADE FROM NO. 18 (0.04 INCH DIAMETER) STEEL WIRE, ABOUT 5 INCHES LONG
   - (A) BEND WIRE AROUND NARROW PART OF HEATING UNIT INTO U-SHAPE
   - (B) BEND BOTH SIDES OF WIRE AS SHOWN IN DETAIL A
   - (C) SLIP SPRING AROUND SHANK OF HEATING ELEMENT AND POSITON AS SHOWN
   - (D) TO SECURE SPRING IN POSITION MOUNT HEATING UNIT IN 150-200 WATT SOLDERING IRON AND PINCH SPRING BETWEEN HEATING UNIT AND BODY OF IRON

TPO-5877-012

Flatpack Removal Tool
Figure 1005

Rockwell
International