520-5970004-E11114
Jan 15/61
14th Revision, Jun 1/77

COLLINS AVIONICS

maintenance manual
(with installation data)

Collins 618T-( ) Airborne SSB Transceiver

Rockwell International
Collins Avionics Group
Cedar Rapids, Iowa 52406

Printed in the United States of America

23-10-0

RECORD OF REVISIONS

REV NO	ISSUE DATE	DATE INSERTED	BY	REV NO	ISSUE DATE	DATE INSERTED	BY	REV NO	ISSUE DATE	DATE INSERTED	BY
1	Jan 15/62										
2	Aug 1/63										
3	Jan 1/64										
4	May 15/64										
5	Aug 1/64										
6	Aug 1/65										
7	Jul 15/66										
8	Jun 1/67										
9	Mar 1/68										
10	Oct 15/68										
11	Apr 15/70										
12	Nov 30/70										
13	Aug 15/73										
14	Jun 1/77	20/9/77	JP								

RECORD OF TEMPORARY REVISIONS

TEMPORARY REV NO	PAGE NUMBER	ISSUE DATE	BY	DATE REMOVED	BY
1	520	Oct 1/74	Collins Air Transport	Jun 1/77	Collins Air Transport
1	521	Oct 1/74	Collins Air Transport	Jun 1/77	Collins Air Transport
1	522	Oct 1/74	Collins Air Transport	Jun 1/77	Collins Air Transport
2	7	Aug 1/78	Collins Air Transport		
3	LEP–1	Jun 15/95	Collins Air Transport		

Collins Divisions
Cedar Rapids, Iowa 52406
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Rockwell International

July 1, 1977

TO: HOLDERS OF 618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, AND 618T-3B AIRBORNE SSB TRANSCEIVER COMPONENT MAINTENANCE MANUAL (520-5970004)

REVISION NO 14 DATED JUN 1/77

HIGHLIGHTS

Pages that have been added, revised, or deleted are indicated below together with the highlights of the change. Remove and insert the affected pages and enter this revision number and date to the Record of Revisions sheet. Retain any superseded pages desired to maintain peculiar unit identity or history.

PAGE NUMBER	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
List of Effective Pages, pages 1, 2, 3/4	Revised to indicate added, deleted, and/or revised pages.		
List of Effective Temporary Revision Pages, pages 1/2	Revised to indicate Temporary Revision No 1 is incorporated.		
Service Bulletin List, pages 1 thru 10	Deleted all information, as it is unnecessary. Refer to the overhaul manual.		
Table of Contents, pages 1, 2	Revised to include latest revisions.		
Foreword	Revised to update format.		
1, 2, 2A, 2B, added 2C/2D	Revised to include latest status.		All models
520, 521, 522	Revised to incorporate Temporary Revision No 1.		All models

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August 15/1973

TO: HOLDERS OF 618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B AIRBORNE SSB TRANSCEIVERS MAINTENANCE MANUAL (520-5970004)

REVISION NO 13 HIGHLIGHTS

Pages that have been revised are listed below with descriptions and reasons for the changes. Determine the revised pages that are applicable to your equipment. Replace the corresponding pages of your manual. Retain this letter of transmittal for future reference.

PAGE NUMBER	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
List of Effective Pages, pages 1 thru 3/4	Revised to indicate added, revised, and/or deleted pages.		
List of Effective Temporary Revisions, pages 1/2	Added to conform to specification.		
Service Bulletin List, pages 3 thru 10	Incorporated latest service bulletins.		
Foreword, page 1	Added 390J-2A/2B Shockmounts and 488A-2A Static Inverter		
1, 2	Added squelch to various 618T-( )'s.		All
2A/2B	Included 390J-2A/2B shockmounts as associated equipment.		All
3	Added new types of radio set controls and shockmounts.		All
8, 8A/8B, 9	Revised equipment specifications.		All

PAGE NUMBER	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
10, 11	Indicated which 618T-( )'s that power supplies are used in.		All
12, 14, 34	Corrected part numbers and revised schematic.		All
102, 104, 105/ 106	Revised test equipment paragraph and operational check.		All
402A/402B, 415 431, 432, 433, 444	Corrected errors and added installation information for 390J-2/2A/2B.		All
501, 502	Revised list of test equipment.		All
502, 503	Revised power requirements.		All
504	Revised figure 502.		All
505	Revised bench test setup to include 8201 dummy rf load.		All
506 thru 535	Updated test procedures.		All
536	Figure 505 is on new page due to added pages in test procedure.		All

PUBLICATIONS ENGINEERING DEPARTMENT

618T–( ) AIRBORNE SSB TRANSCEIVER

MAINTENANCE MANUAL (520–5970004)

TEMPORARY REVISION NO 23-10-00-03

Insert facing page LEP–1, 23-10-00

Subject: List of Effective Pages

For the Description and Operation date listing, change page 5 from Apr 15/70 to Oct 15/68; change page 6 from Apr 15/70 to Mar 1/68.

LIST OF EFFECTIVE PAGES

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Record of Temporary Revisions	*1	Jun 1/77
	2	Blank
List of Effective Pages	*1	Jun 1/77
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	4	Blank
List of Effective Temporary Revision Pages	*1	Jun 1/77
	2	Blank
Service Bulletin List	*1	Jun 1/77
	*2	Blank
	*3 thru 10	Deleted
Table of Contents	*1	Jun 1/77
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Figure 1	*0	Jun 1/77
Description and Operation	*1	Jun 1/77
	*2	Jun 1/77
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	*2B	Jun 1/77
	*2C Added	Jun 1/77
	*2D	Blank Added
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*The asterisk indicates pages changed, added, or deleted by the current change.

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21	Reduction of spurious oscillations	10	10-15-68
22	Reduce possibility of transient voltages	11	4-15-70
23	Improved transceiver reliability	10	10-15-68
24	Improved transceiver reliability	10	10-15-68
25	Suppression of 300-MHz parasitic oscillations	10	10-15-68
26	Conversion to hermetically sealed relays K2, K3, and K4	*	*
27	Replacement of filters FL1 and FL2	13	8-15-73
28	28-volt blanker transient protection	13	8-15-73
29	Parallel contact wiring of chassis relay K4	13	8-15-73
30	Modify filter circuit in 18-volt dc line	13	8-15-73
618T-1B			
1	Negative transient voltage protection	9	3-1-68
2	Addition of voltage-controlled oscillator filter	10	10-15-68
3	Reduce possibility of transient voltages	11	4-15-70
4	Improved reliability of the transceiver	10	10-15-68
5	Reduction of spurious oscillations	10	10-15-68
6	Short protection for 18-volt dc regulator	10	10-15-68
7	Suppression of 300-MHz parasitic oscillations	10	10-15-68

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-1B (Cont)			
8	Addition of divider-stabilizer filter	10	10-15-68
9	Conversion to hermetically sealed relays K2, K3, and K4	*	*
10	Replacement of filters FL1 and FL2	13	8-15-73
11	28-volt blanker transient protection	13	8-15-73
12	Parallel contact wiring	13	8-15-73
13	Reduction of internal signals	13	8-15-73
618T-2			
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	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		

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2 (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 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
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	6-1-67
18	Step-start circuit modification	8	6-1-67
19	Squelch capability	8	6-1-67

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SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2 (Cont)			
20	Transmit gain control circuit change, capacitor C20	9	3-1-68
21	Negative transient voltage protection on 27.5-Vdc input	10	10-15-68
22	Reduce possibility of transient voltages	11	4-15-70
23	Reduction of spurious oscillations	10	10-15-68
24	Improved transceiver reliability	10	10-15-68
25	Short protection for 18-volt dc regulator	10	10-15-68
26	Suppression of 300-MHz parasitic oscillations	11	4-15-70
27	Addition of improved relay	13	8-15-73
28	Conversion to hermetically sealed relays K2, K3, and K4	*	*
29	Replacement of filters FL1 and FL2	13	8-15-73
30	28-volt blanker transient protection	13	8-15-73
31	Parallel contact wiring of chassis relay K4	13	8-15-73
32	Provide positive squelch override	13	8-15-73
33	Modify filter circuit in 18-volt dc line	13	8-15-73
618T-2B			
1	Negative transient voltage protection on 27.5-Vdc input	9	3-1-68
2	Addition of voltage-controlled oscillator filter	10	10-15-68
3	Reduce possibility of transient voltages	11	4-15-70

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-2B (Cont)			
4	Improved reliability of the transceiver	10	10-15-68
5	Reduction of spurious oscillations	10	10-15-68
6	Short protection for 18-volt dc regulator	10	10-15-68
7	Suppression of 300-MHz parasitic oscillations	10	10-15-68
8	Addition of divider-stabilizer filter	10	10-15-68
9	Addition of improved relay	13	8-15-73
10	Conversion to hermetically sealed relays K2, K3, and K4	*	*
11	Replacement of filters FL1 and FL2	13	8-15-73
12	28-volt blanker transient protection	13	8-15-73
13	Parallel contact wiring of chassis relay K4	13	8-15-73
14	Provide positive squelch override	13	8-15-73
15	Reduction of internal signals	13	8-15-73
16	Modify filter circuit in 18-volt dc line	13	8-15-73
618T-3			
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		

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3 (Cont)			
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 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 in 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		

SERVICE BULLETIN LIST

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618T-3(Cont)			
16	Replacement of 2N1100 transistor in the dc high-voltage power supply module A8		
17	Substitution of 618T-3 chassis relays K2, K3, and K4	8	6-1-67
18	Replace 70K-5 variable frequency oscillator with variable frequency oscillator 70K-9	8	6-1-67
19	Squelch Capability	8	6-1-67
20	Transmit gain control circuit change, capacitor C20	9	3-1-68
21	Negative transient voltage protection on 27.5-Vdc input	10	10-15-68
22	Reduction of spurious oscillations	11	4-15-70
23	Reduce possibility of transient voltages	10	10-15-68
24	Improved transceiver reliability	10	10-15-68
25	Short protection for 18-volt dc regulator	10	10-15-68
26	Suppression of 300-MHz parasitic oscillations	11	4-15-70
27	Conversion to hermetically sealed relays K2, K3, and K4	*	*
28	Replacement of filters FL1 and FL2	13	8-15-73
29	28-volt blanker transient protection	13	8-15-73
30	Dc high-voltage relay change	13	8-15-73
31	Parallel contact wiring of chassis relay K4	13	8-15-73
32	Provide positive squelch override	13	8-15-73
33	Modify filter circuit in 18-volt dc line	13	8-15-73

*Not incorporated in production models

SERVICE BULLETIN LIST

SERVICE BULLETIN NO	SUBJECT	MANUAL REVISION NUMBER	MANUAL REVISION DATE
618T-3B			
1	Negative transient voltage protection on 27.5-Vdc input	9	3-1-68
2	Addition of voltage-controlled oscillator filter	10	10-15-68
3	Reduce possibility of transient voltages	11	4-15-70
4	Improved reliability of the transceiver	10	10-15-68
5	Reduction of spurious oscillation	10	10-15-68
6	Short protection for 18-volt dc regulator	10	10-15-68
7	Suppression of 300-MHz parasitic oscillations	10	10-15-68
8	Addition of divider-stabilizer filter	10	10-15-68
9	Conversion to hermetically sealed relays K2, K3, and K4	13	8-15-73
10	Replacement of filters FL1 and FL2	13	8-15-73
11	28-volt blanker transient protection	13	8-15-73
12	Dc high-voltage relay change	13	8-15-73
13	Parallel contact wiring of chassis relay K4	13	8-15-73
14	Provide positive squelch override	13	8-15-73
15	Reduction of internal signals	13	8-15-73
16	Modify filter circuit in 18-volt dc line	13	8-15-73

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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 is intended for use by flight line and hangar maintenance personnel. A detailed description, including complete specifications, is given for the 618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, and 618T-3B Airborne SSB Transceivers. Operation of the equipments is described. Preinstallation and postinstallation test procedures, mounting, and cabling information are presented as an aid to both initial installation and to periodic maintenance. Troubleshooting information is limited to procedures required to trace a trouble to an easily replaceable unit.

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.

The following is a list of related publications.

PUBLICATION	COLLINS PART NUMBER
618T-1, 618T-1B, 618T-2, 618T-2B, 618T-3, 618T-3B Airborne SSB Transceivers, Overhaul Manual	520-5970003
618T-1/1B/2/2B/3/3B Airborne SSB Transceiver, 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
390J-2 Shockmount, Unit Instructions	523-0756546
390J-2B Shockmount with 488A-2A Static Inverter Instruction Book	523-0764697
678P-1/2 Radio Set Test Harness	523-0758156
678Y-1/3 Maintenance Kit	523-0757128
678Z-1 Function Test Set	523-0757125

618T-1/2/3 Airborne SSB Transceiver

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

618T-( ) Airborne SSB Transceiver
Figure 1

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

1. GENERAL.

This section presents the purpose, specifications, general description, and general theory of operation of the 618T-( ) Airborne SSB Transceiver. Refer to figure 1 for an overall view of the 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

Equipment Covered
Figure 2 (Sheet 1 of 4)

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
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.)
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

Equipment Covered
Figure 2 (Sheet 2)

EQUIPMENT	DESCRIPTION	COLLINS PART NUMBER
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
49T-3	Retrofit adapter	522-1645-000
49T-3A	Retrofit adapter	522-3032-000
49T-4	Retrofit adapter	522-1697-000
49T-4A	Retrofit adapter	522-2906-000
49T-6	Retrofit adapter	522-4469-000
49T-6A	Retrofit adapter	777-1847-001
440Q-1	Adapter cable	522-2964-000
440Q-2	Adapter cable	522-2968-000
440Q-3	Adapter cable	522-3471-000
440Q-4	Adapter cable	522-4699-001

Equipment Covered
Figure 2 (Sheet 3)

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

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 4)

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 1.0-kHz increments. The 618T-1B/2B/3B operates from 2.000 to 29.9999 MHz in 0.1-kHz increments.

A. Associated Equipment.

Figure 3 is a list of associated equipment. The 714E-1/2( )/3( ) Radio Set Controls are used in 618T-1/2/3 installations. The 714E-6/6( ) Radio Set Controls are used in 618T-1B/2B/3B installations. Refer to the applicable 714E-( ) overhaul manual for detailed information.

The 390J-2/2A Shockmounts (except statuses -055 and -057) listed in figure 3 contain the 488A-2 Static Inverter (the 488A-4 Power Inverter, interchangeable with the 488A-2 Static Inverter, should be used in extreme environmental conditions).

The 390J-2B is the same as the 390J-2, except it uses the 488A-2A Static Inverter. The 390J-2B Shockmount containing the 488A-2A inverter is listed in figure 3.

The 390J-1 contains all necessary connectors and terminal strips, but must be wired in the aircraft. The 390J-2, Collins part number 522-3353-005, -045, -055, and -056, is completely wired and ready for installation in the aircraft. The 390J-2, Collins part number 522-3353-015, -025, -035, -057, -058, and -059, is delivered minus the main connector and terminal boards for installations where it is more advantageous to complete the wiring in the aircraft. The 390J-2B, Collins part number 622-1253-001 and -003, is completely wired and ready for installation in the aircraft. The 390J-2B, Collins part number 622-1253-002 and -004, is delivered minus the main connector and terminal boards. Refer to the 390J-2 unit instructions for detailed information on the 390J-2 differences and to figure 419 for recommended primary power wiring for the 390J-1/2/2A/2B.

The antenna coupler systems listed in figure 3 are the more common systems in use. All the systems are applicable to 618T-( ) installations. Refer to the applicable antenna coupler instruction manual for detailed information.

The 437R-1 Helical Monopole Loading Coil is used to supplement the antenna system in low-speed aircraft 618T-( ) installations where the physical dimensions of the aircraft make the use of full long-wire antennas undesirable. Refer to the 437R-1 instruction manual (Collins part number 523-0757826) for detailed information.

EQUIPMENT	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 390J-2A 390J-2B	522-1658-000 522-3353-005/015 792-6315-002 622-1253-001/002	Shockmount	Provides shock isolation mounting between 618T-( ) and aircraft.
516H-1	522-1204-000	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 490T-1A 490T-2 490R-1 490R-2 490R-3 490R-4	506-1199-004 522-0092-000 522-0293-004 522-1375-000 522-3323-000 522-1376-000 522-3324-000 787-6370-001 522-0998-005 522-1416-005 522-1422-004 522-3159-000 792-6140-001 522-3443-000 522-3444-001 522-3445-000 522-3897-000 522-4096-001 522-3535-000 522-4787-001	Antenna coupler system	Transforms antenna impedance to provide 50-ohm resistive load for 618T-( ) transceiver.
437R-1	522-3635-000	Helical monopole loading coil	Tunable loading coil used on long-wire antenna installations where length of antenna is restricted by vehicle size.

B. System Designations.

Various combinations of 618T-( ) transceivers and associated equipments have been designated as high-frequency communications systems. Figure 4 lists the type 618T-( ) Airborne SSB Transceiver used in each of these systems. The removal/installation section of this manual provides the installation and interconnection data for the more common systems.

SYSTEM	618T-1	618T-2	618T-3
HF-101	X		
HF-102		X	
HF-103			X
HF-104			X
HF-105/5A			X
HF-106/6A		X	
HF-107/7A		X	
HF-108/8A		X	
HF-109/9A		X	
HF-111/11A		X	
VC-102			X
VC-104			X
VC-104A			X
VC-106			X
VC-110			X
HF-113		X	
HF-113A			X
AN/ARC-94		X	
AN/ARC-102			X
AN/ARC-119			X
AN/ARC-120			X
AN/GRC-158			X
AN/MRC-95			X
AN/MRC-108			X
AN/TRC-146			X

C. 618T-( ) Retrofit Requirements.

The following equipment is used for retrofitting the 618T-( ) to existing 618S-( ) and AN/ARC-38(A) installations.

(1) The 49T-3 Retrofit Adapter, Collins part number 522-1645-00, adapts the 618T-3 for a direct interchange with 618S-( ) or AN/ARC-38(A) installations which use either 614C-2 or C-1398/ARC-38 Radio Set Control and have the 416W-1 Power Supply mounted near the transceiver.

(2) The 49T-3A Retrofit Adapter, Collins part number 522-3032-00, is used only in installations where CW is desired. It cannot be used in 618S-( ) or AN/ARC-38(A) retrofit installations unless aircraft wiring changes are made.

(3) The 49T-4 Retrofit Adapter, Collins part number 522-1697-00, adapts the 618T-1 for direct interchange with 618S-( ) or AN/ARC-38(A) installations which use the 614C-2 or C-1398/ARC-38(A) Radio Set Control and have the 416W-1 Power Supply remotely located from the transceiver.

(4) The 49T-4A Retrofit Adapter, Collins part number 522-2906-00, is used only in installations where CW is desired. It cannot be used in 618S-( ) or AN/ARC-38(A) retrofit installations unless aircraft wiring changes are made.

(5) The 49T-6 Retrofit Adapter, Collins part number 522-4469-00, adapts the 618T-2 for direct interchange with 618S-( ) installations that use the 614C-2 Radio Set Control and have the 416W-3 Power Supply remotely located from the transceiver. The 28 vdc must be supplied to pin 23 of the 416W-3 Shockmount from the aircraft electrical system.

NOTE: The 49T-6 Retrofit Adapter, Collins part number 522-4469-001, has a pendant cable that is 74 to 76 inches long.

The 49T-6 Retrofit Adapter, Collins part number 522-4469-002, has a pendant cable that is 199 to 201 inches long.

(6) The 49T-6A Retrofit Adapter, Collins part number 777-1847-001, is used only in installations where CW is desired. It cannot be used in 618S-( ) or AN/ARC-38(A) retrofit installations unless aircraft wiring changes are made.

(7) The 440Q-1 Adapter Cable, Collins part number 522-2964-00, adapts the 714E-3 Radio Set Control to existing aircraft wiring in AN/ARC-38(A) to 618T-( ) retrofit installations.

(8) The 440Q-2 Adapter Cable, Collins part number 522-2968-00, adapts the 714E-2 Radio Set Control to existing aircraft wiring in AN/ARC-38(A) to 618T-( ) retrofit installations.

(9) The 440Q-3 Adapter Cable, Collins part number 522-3471-00, adapts the 714E-3 Radio Set Control to existing 614C-2 Radio Set Control wiring for CW operation in 618S-( ) to 618T-( ) retrofit installations.

(10) The 440Q-4 Adapter Cable, Collins part number 522-4699-001, adapts the 714E-2 Radio Set Control to existing G690V-1 Radio Set Control wiring in 618S-( ) to 618T-( ) retrofit installations.

3. EQUIPMENT SPECIFICATIONS.

Figure 5 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).
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 shock, 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.

Equipment Specifications (Sheet 1 of 4)
Figure 5

618T-( ) AIRBORNE SSB TRANSCEIVER

MAINTENANCE MANUAL (520-5970004)

TEMPORARY REVISION NO 23-10-0-2

Insert facing page 7, 23-10-0

Subject: Equipment Specifications, figure 5

Change warmup time from 2 minutes to 15 minutes.

CHARACTERISTIC	SPECIFICATION
Power requirements (Cont)	NOTE: Approximately 1030 w are consumed by the 516H-1 Power Supply. 103.5 to 126.5 vac, 380 to 420 Hz, single-phase, approximately165 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.
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	2 minutes.
Types of emission	3A3H: Compatible AM, i.e., USB with the carrier inserted.

Equipment Specifications (Sheet 2 of 4)
Figure 5

CHARACTERISTIC	SPECIFICATION
Types of emission (Cont)	3A3J: SSB, i.e., am with carrier suppressed (usb or lsb).
	Cw: 1-kHz tone in usb.
Transmit characteristics	
Rf power output	Ssb: 400 W pep $\frac{+2}{-1}$ 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)	6-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.
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.

CHARACTERISTIC	SPECIFICATION
Agc characteristic	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 and image 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.

Equipment Specifications
Figure 5 (Sheet 3A)

CHARACTERISTIC	SPECIFICATION
Selective calling (SELCAL) output level	Not less than 0.1 volt 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-uv input.

Equipment Specifications
Figure 5 (Sheet 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, 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, while the fifth position, CAL TONE (618T-1/2/3 only), compares the operating frequency of the 618T-( ) with WWV. A 400-Hz blower providing 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 6 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.

B. Electrical Description.

The 618T-( ) Airborne SSB Transceiver is remotely controlled 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.

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

618T-( ) Module Complement
Figure 6 (Sheet 1 of 2)

MODULE	FUNCTION	COLLINS PART NUMBER
A11	Power amplifier	544-9283-000
A12	Rf translator (618T-1/2/3 only)	544-9284-000 (early model)
	(618T-1/2/3 only)	528-0113-000 (late model)
	(618T-1B/2B/3B only)	528-0682-001
A12A1	*Autopositioner-submodule (618T-1/2/3 only)	546-6873-005
	(618T-1B/2B/3B only)	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
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 21,332 and above)
	Chassis (618T-1B/2B/3B only)	757-8930-001

618T-( ) Module Complement
Figure 6 (Sheet 2)

*Registered in U.S. Patent Office.

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 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 per month. 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 51.5 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 tuner, is 8 seconds.

C. Controls and Indicator.

Controls and indicator located on the 618T-( ) front panel are shown in figure 7. Figure 8 lists the indicator and all controls and describes the function of each.

D. Model Differences.

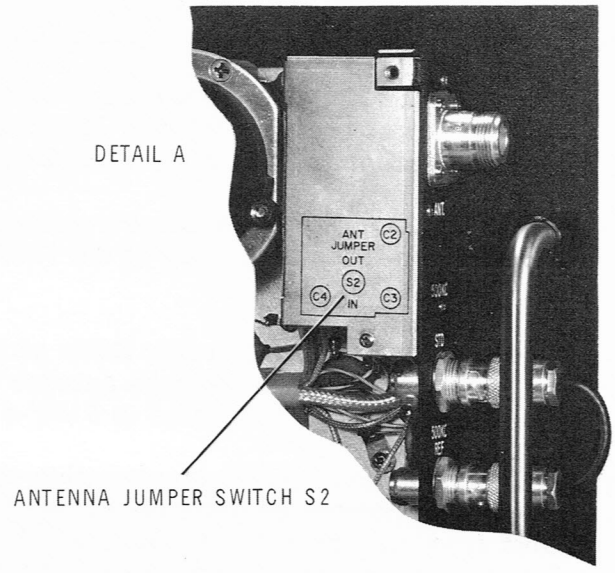
There are nine models of the 618T-( ). The following paragraphs describe differences between the nine models:

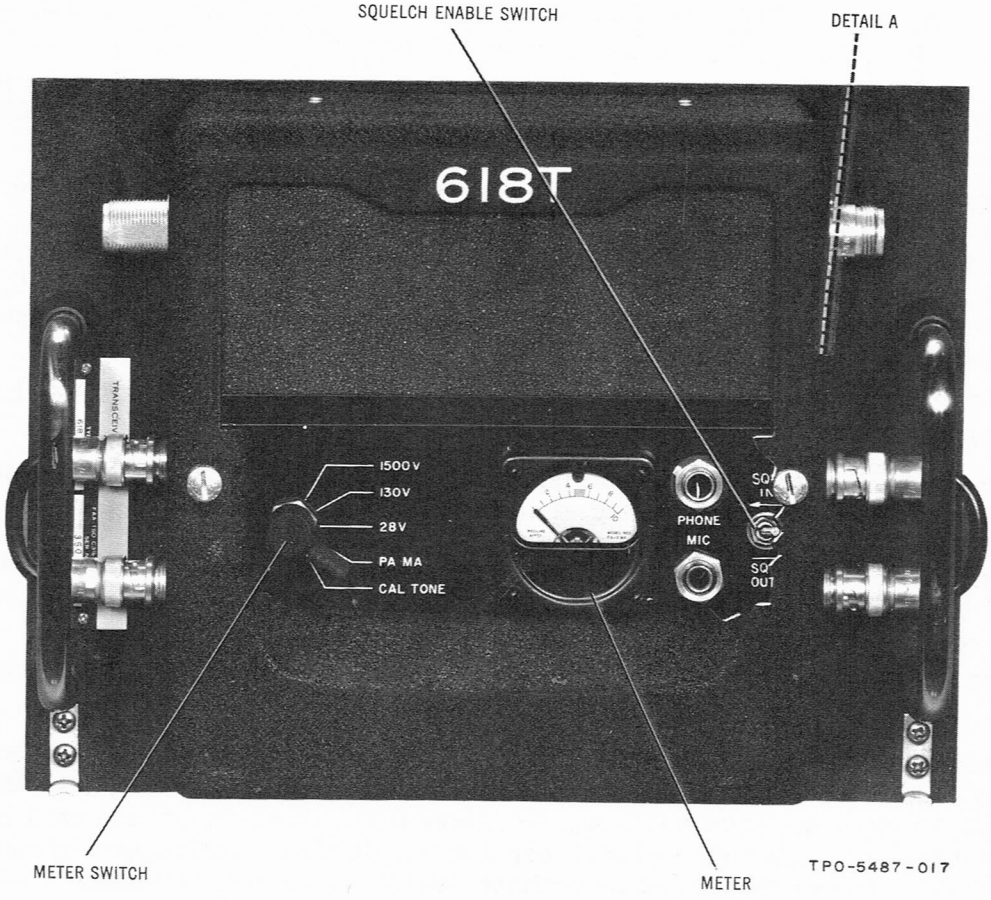
(1) 618T-1 Airborne SSB Transceiver, Collins part number 522-1230-000, 522-1230-021, 522-1230-022, or 522-1230-023.

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 5. 618T-1, Collins part number 522-1230-000, does not have audio squelch capability. 618T-1, Collins part number 522-1230-021, has audio squelch capability. 618T-1, Collins part number 522-1230-022, has narrow-band selectivity. 618T-1, Collins part number 522-1230-023, has narrow-band selectivity and 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 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 narrow-band selectivity and squelch capability.





Typical Control and Indicator Locations
Figure 7

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 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 circuit within the 618T-( ). Switch S3 must be positioned properly (IN if rf oscillator A2 contains squelch circuits, OUT if it does not). Figure 6 lists Collins part numbers for rf oscillator modules with and without squelch circuits.
Meter (M1)	Indicates the conditions of internal power supplies or power amplifier plate current.

Control and Indicator Functions
Figure 8

(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 5. The 618T-2, Collins part number 522-1501-00, does not have audio squelch capability; 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 narrow-band selectivity and squelch capability.

(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 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 narrow-band selectivity and squelch capability.

(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 5. The 618T-3 may also retrofit some 618S-( ) installations. 618T-3, Collins part number 522-1660-00, does not have audio squelch capability. 618T-3, Collins part number 522-1660-031, has audio squelch capability. 618T-3, Collins part number 522-1660-033, has narrow-band selectivity. 618T-3, Collins part number 522-1660-034, has narrow-band selectivity and squelch capability.

(6) 618T-3B Airborne SSB Transceiver, Collins part number 522-4830-001 or 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 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 narrow-band selectivity and squelch capability.

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 2.0000 through 29.9999 MHz in 0.1-kHz increments. The following is the functional theory of operation of the 618T-( ). Refer to figures 18 and 19. Figure 18 is a functional block diagram of the 618T-1/2/3; figure 19 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.

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. 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 10). 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 the balanced modulator A3CR1 in if. translator A3. There the audio is combined with a 500-kHz carrier from rf oscillator A2.

Balanced modulator A3CR1 produces intelligence as sidebands of the 500-kHz carrier and then suppresses the carrier. The double sideband signal appears at the output of balanced modulator A3CR1 and is amplified by the 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 17.

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 represents 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 A2Q4, bypassing if amplifier A3Q3 (and A3Q7 for if translator module, CPN 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 18 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 module 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 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 9 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, A12V5 and driver amplifier A12V6, 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 pa 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 module 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.

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 9

(2) Receive Mode.

In the receive mode (the signal path traced from the top right section of block diagrams, figures 19 and 20), 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 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 is 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, CPN-528-0720-001), A3Q3, A3Q4, and A3Q5. Note that tgc/agc amplifier A3Q6 is used and is biased for maximum gain operation of if amplifier A3Q4 in the receive mode. Also TX/RX switch CR6 is reversed 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 19, and to figure 21, 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 translator A12 Autopositioner A12A1. 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, S7, S5, and S4 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, S7, S5, and S4; 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 20).

Operation for the receive mode is the same except for the deletion of fine tuning of roller coil servo motor A12B2 and 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 low-frequency mixer A12V1 where it is mixed with the vfo A12A2 output. The injection frequency from the 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

$$\begin{array}{r} 3.500\text{-MHz vfo upper limit} \\ -0.520\ \text{MHz} \\ \hline 2.980\ \text{MHz} = \text{vfo frequency} \end{array}$$

The low-frequency 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 then fed to hf mixer A12V3. Hf mixer A12V3 combines the 14.5- to 15.5-MHz signal with an injection frequency from hf oscillator A12V11. Figure 9 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, S7, S5, and S4, and to rf driver turret switches A12S2 and S3. Here the final output is fine tuned, 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 motor A11B1. From the output tank, the signal is fed to pa roller coil A11L4 and then to the antenna coupler and antenna.

The pa 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 pa roller coil A11L4.

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

Refer to 618T-1B/2B/3B block diagram (figure 20) and to a block diagram of 618T-1B/2B/3B frequency selection and translation circuits (figure 22). 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 in 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 code 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 is 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 (figure 23).

The 2.5001- to 3.5000-MHz frequency range is covered by two voltage-controlled oscillators (vco) A15A7Q2 and A15A7Q4. One oscillator has a frequency range from 2.5001 to 3.0000 MHz, the other 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 is a 1000-to-1 frequency divider that provides a continuous output of 100 Hz, a reference used for comparison with the output of the variable frequency circuits.

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 outputs 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 10. MHz-frequency stabilizer A10 stabilizes the 17.5-MHz and hf injection oscillators in rf translator A12. KHz-frequency stabilizer A4 stabilizes variable-frequency oscillator A12A2 in rf translator A12.

Rf 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.

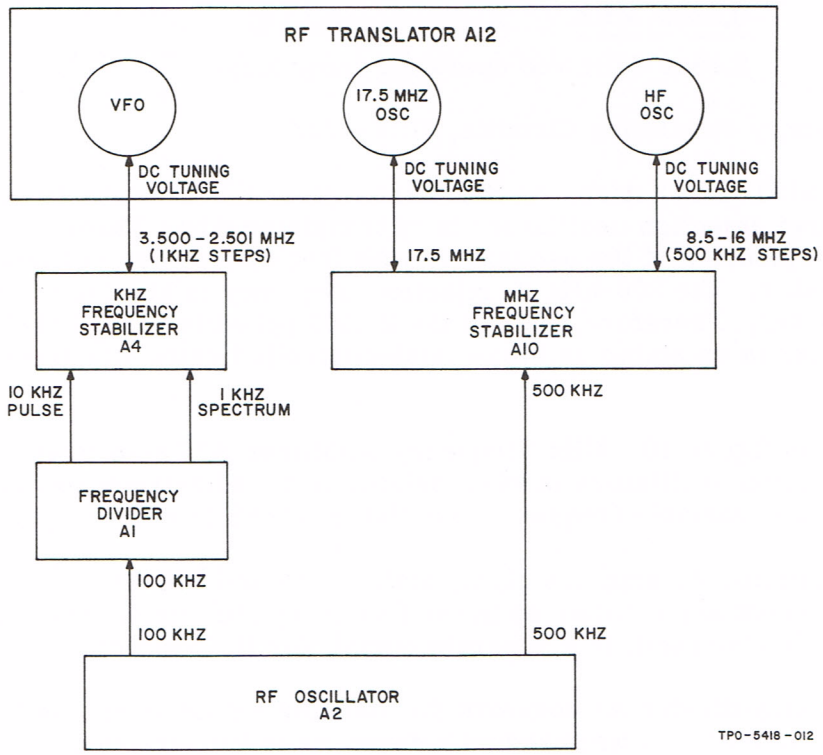
Frequency divider A1 converts the 100-kHz output of rf oscillator A2 to two different outputs that are used as references in kHz-frequency stabilizer A4.

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 11. 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.

(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.



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

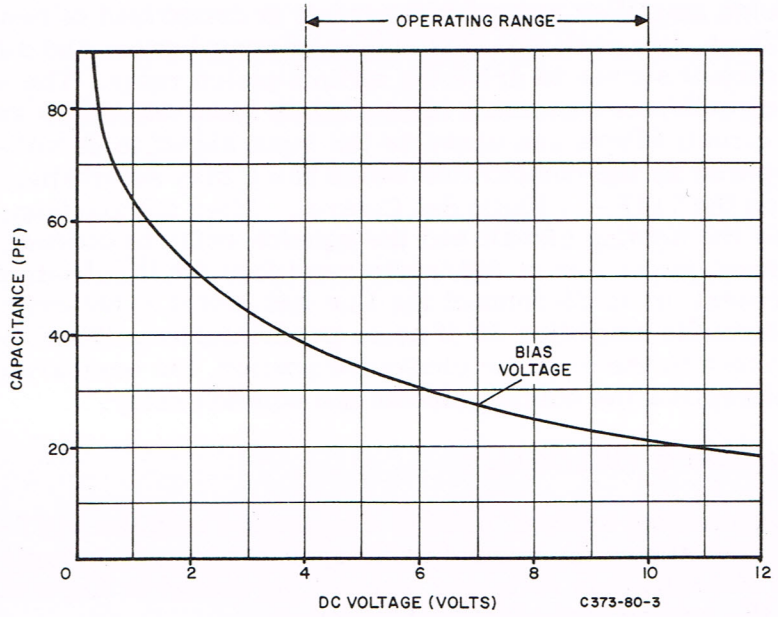
Refer to figure 12. Rf oscillator A2 supplies highly stable 100- and 500-kHz outputs. Both of these frequencies are used as references in the frequency stabilizing processes. The 500-kHz output is also used in a separate output for if. injection.

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.

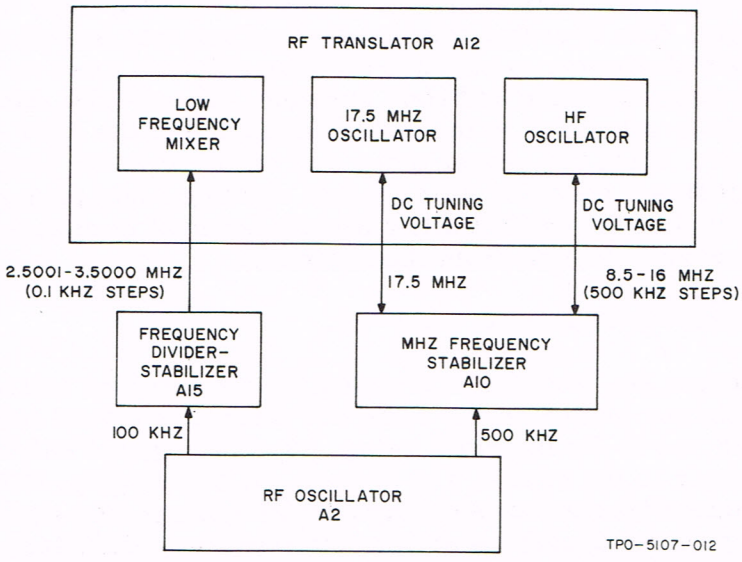
The frequency stabilization process of the 17.5-MHz and hf oscillators is identical to that of the 618T-1/2/3.

(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 with the



Voltage-Variable Capacitor, Typical Characteristics
Figure 11



618T-1B/2B/3B Frequency Stabilizing Circuits, Block Diagram
Figure 12

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 which has a bias determined by the squelch level control on the 714E-( ) Radio Set Control. After comparison, the squelch circuit energizes the holding circuit and the squelch relay to connect the audio signal to the balanced output line of AM/audio amplifier A9 if sufficient and desirable audio is present, or to disconnect the line and insert a 300-ohm load across the output of AM/audio amplifier A9 if noise predominates. When the squelch level control is turned to the extreme clockwise postion, the comparator is biased on and, in turn energizes the holding circuit and squelch relay.

(8) Selective Calling (SELCAL).

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 13. 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

one-half 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.

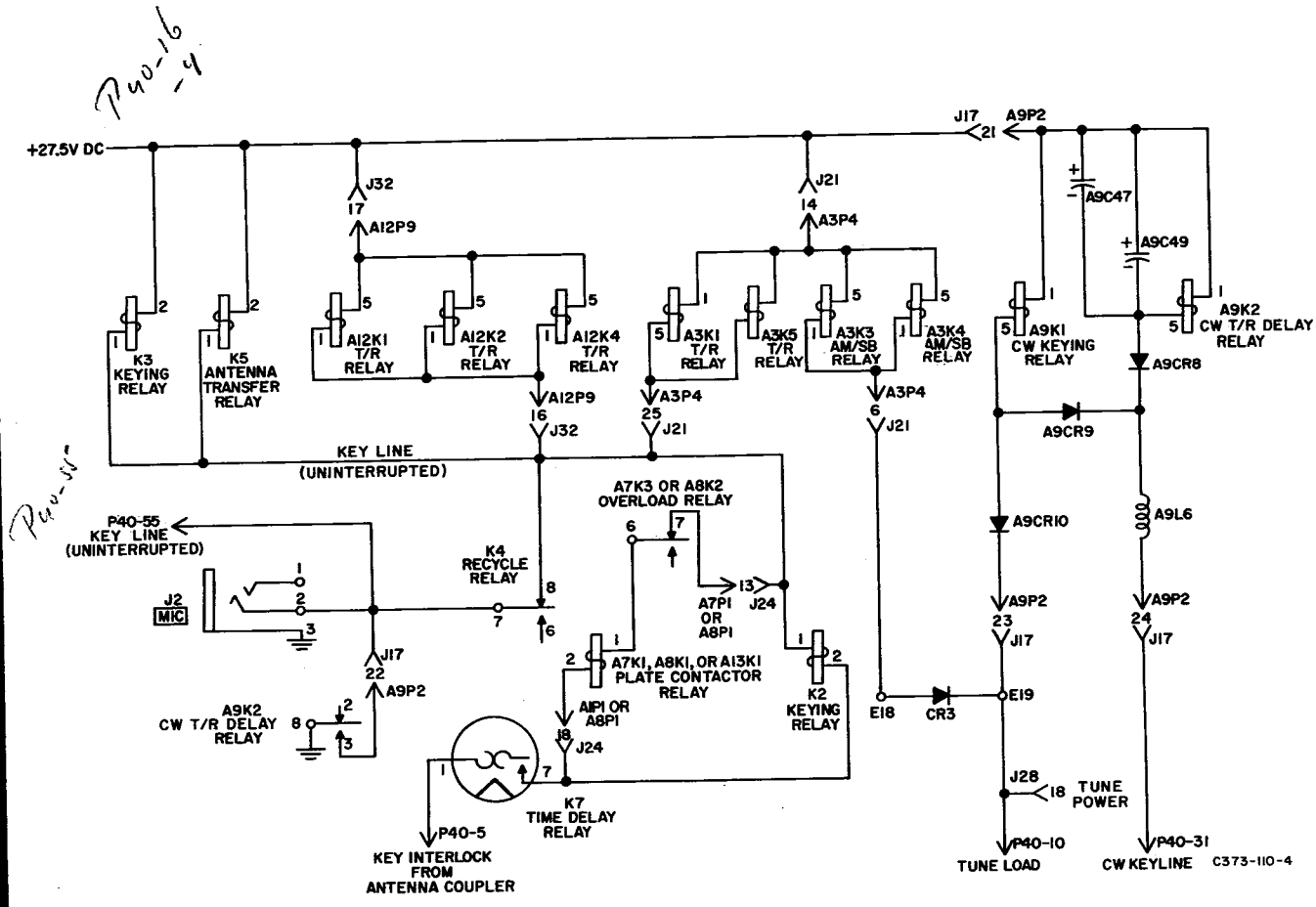
(10) Keying Circuits.

Refer to figure 14, 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 or control data converter A16 in the 618T-1B/2B/3B is processed for the proper keying waveform by components on CW T/R delay relay A9K2. The 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



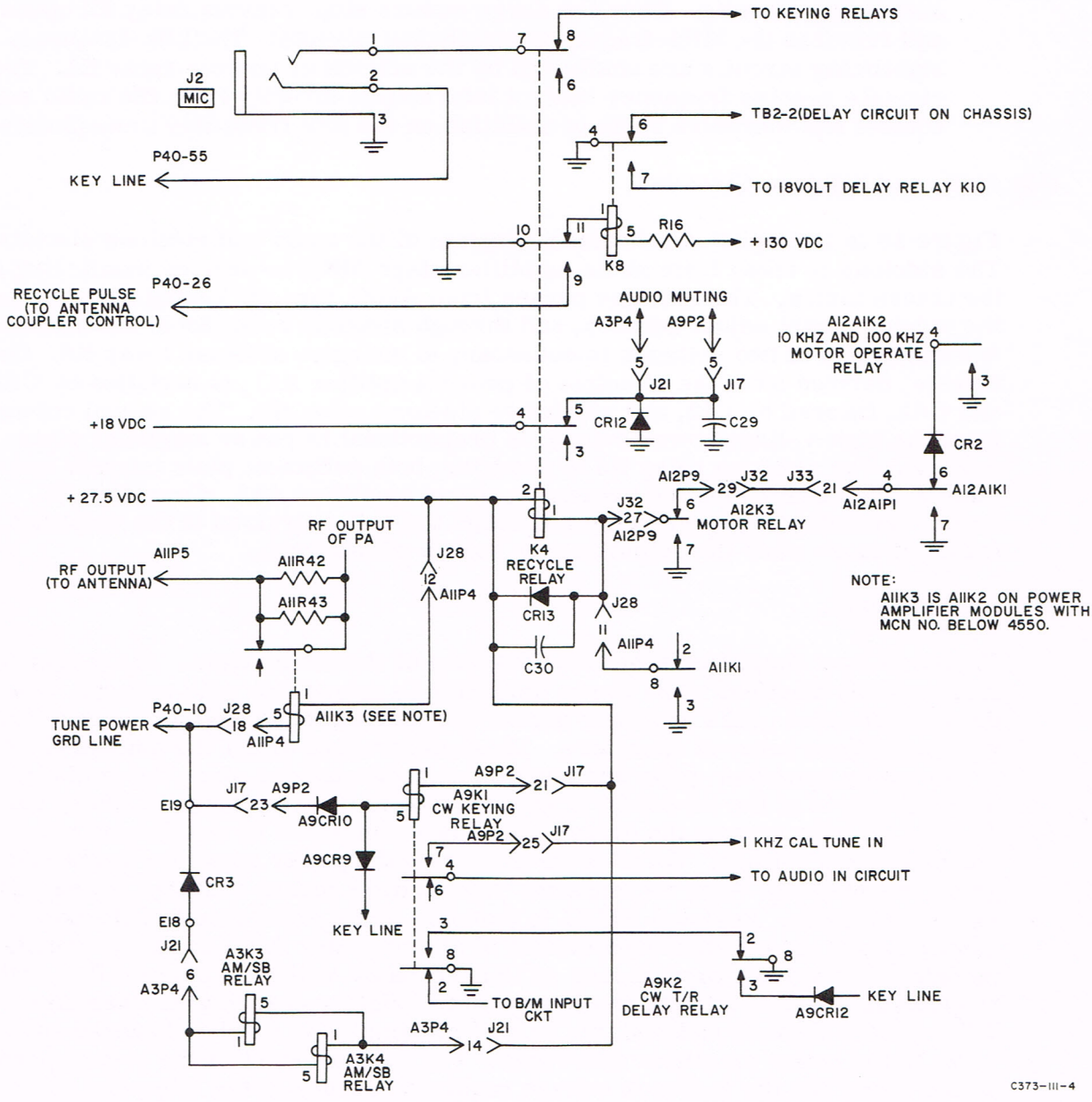
Keying Circuits, Simplified Schematic Diagram
Figure 14

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 15. A change of frequency is called recycle. When any of the frequency selector switches on the radio set control are 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 one-half second. The delay circuit contained on terminal board TB2 consists of transistor stage Q1.



Recycle Circuits, Simplified Schematic Diagram
Figure 15

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

Refer to figure 15. 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 coupler, and disable the MHz-frequency 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.

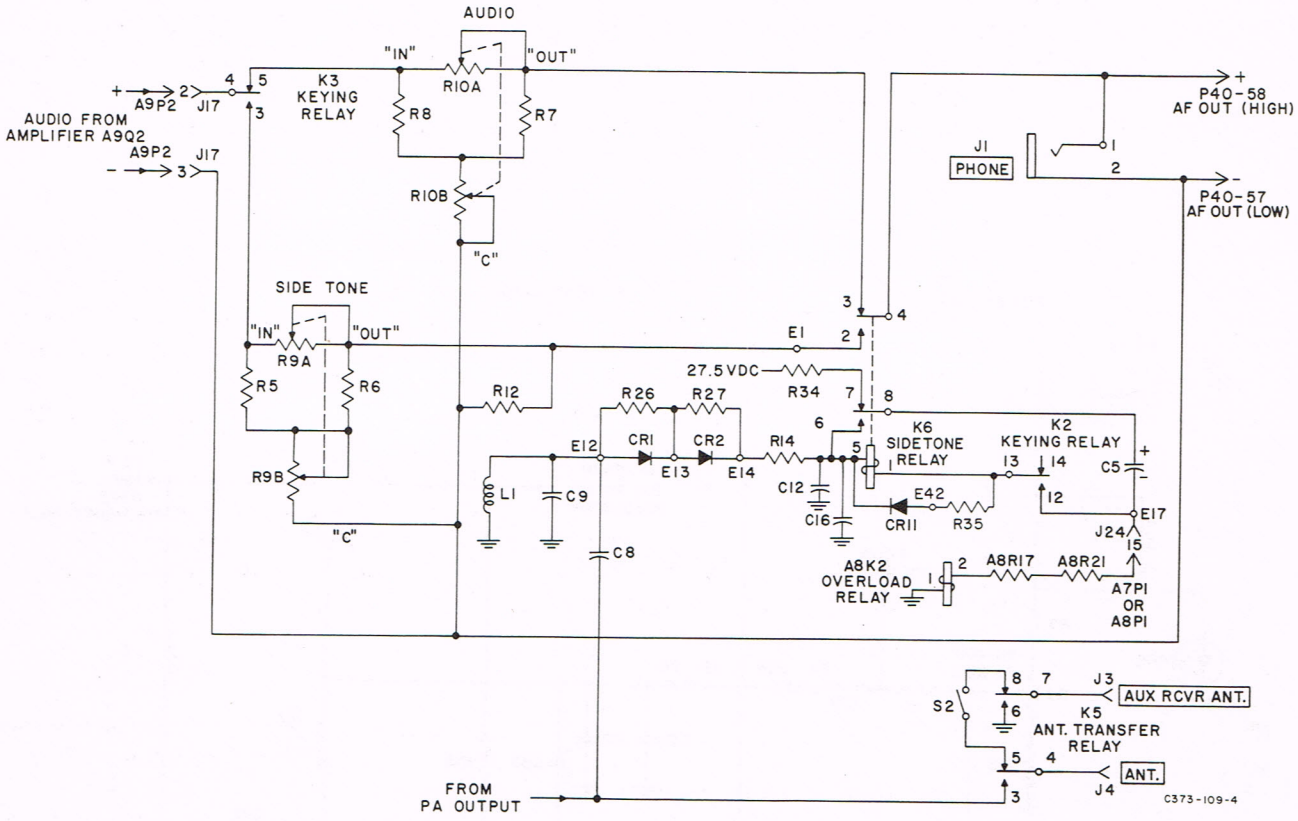
Figure 16 is a simplified schematic diagram of the audio and sidetone circuits. The sidetone is taken from audio amplifier stage A9Q2 to provide monitoring of the transmission. The sidetone passes from A9Q2, through keying relay K3 in the sidetone level adjust network, and through sidetone relay K6 to 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.

(13) ALC Circuits.

Figure 17 is a simplified schematic diagram of the alc circuits. Alc (automatic load control) functions when 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 emitter-base circuit of alc amplifier A3Q1 in the if. translator module. The voltage drop across A11R1 increases with grid current flow and reduces the emitter current in alc amplifier A3Q1 by changing its base bias. With emitter current reduced, the gain of alc amplifier A3Q1 is lowered and drive to the power amplifier 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).

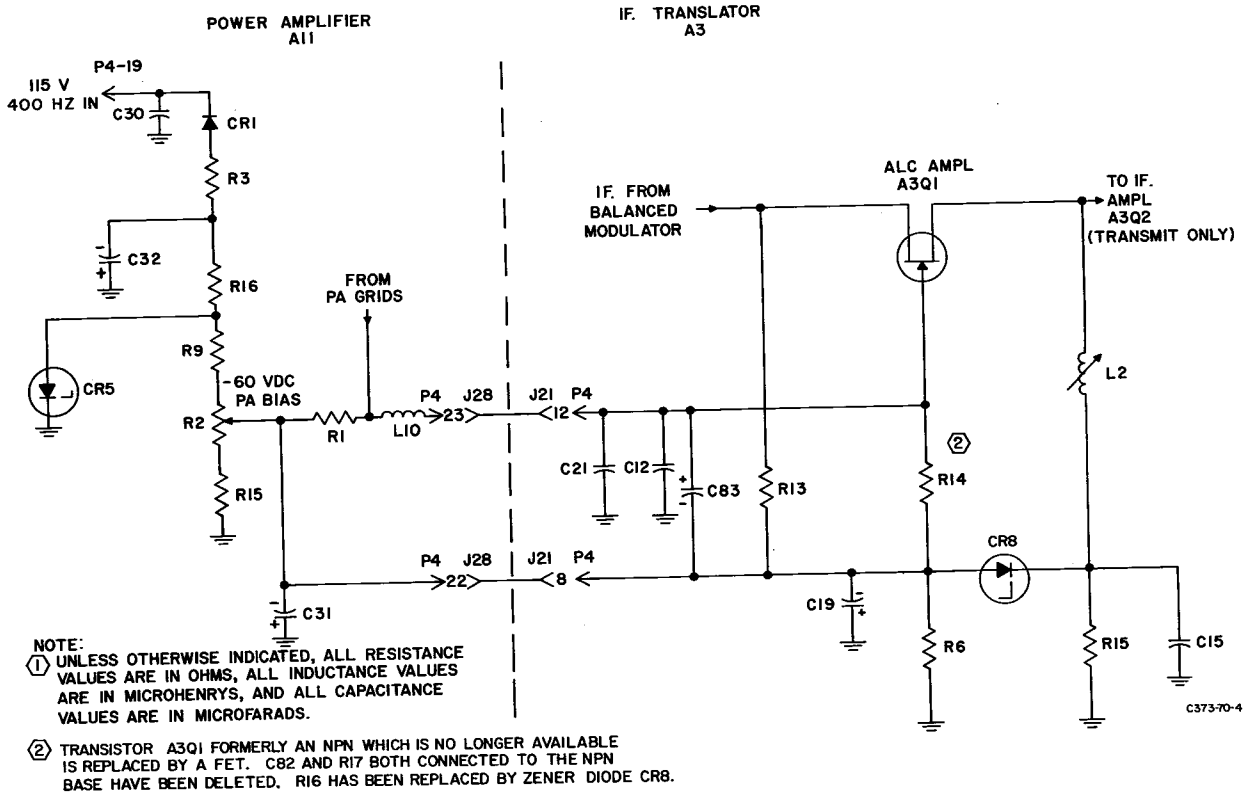
(14) TGC Circuits.

Tgc (transmitter gain control) regulates carrier level in the AM mode to compensate for variations in gain throughout the 618T-( ) frequency range (figure 18). Tgc 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 10:1 voltage divider (C25 and C26) provides approximately 8 volts of rf to diode

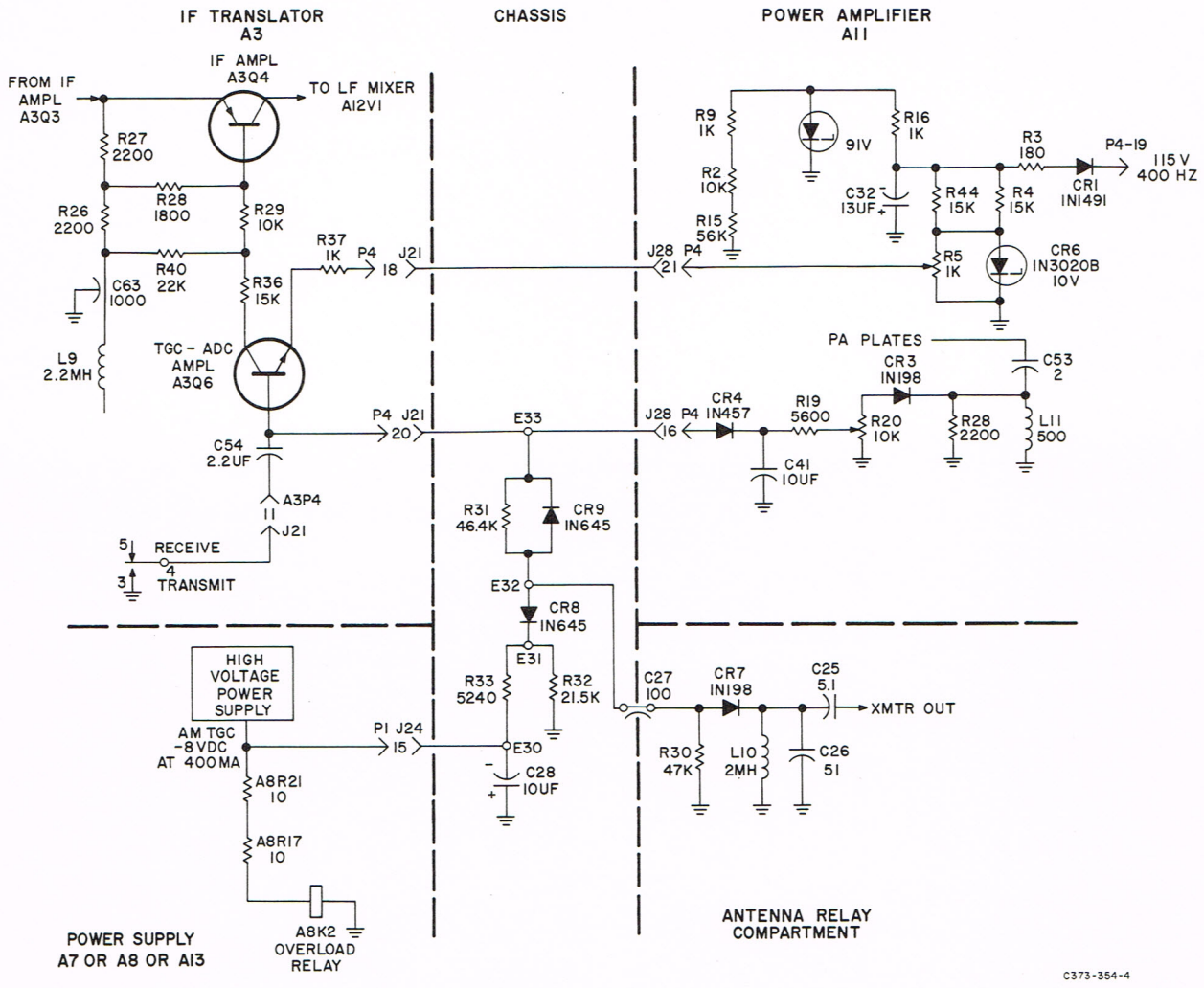


Audio and Sidetone Circuits, Simplified Schematic Diagram
Figure 16

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. Tgc does not control SSB level but does maintain carrier level within the limits of 70 to 90 volts rms over the 618T-( ) frequency range.



ALC Circuits, Simplified Schematic Diagram
Figure 17



NOTE:
UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS.

TGC and ADC Circuits, Simplified Schematic Diagram
Figure 18

618T-( ) Airborne SSB Transceiver - Troubleshooting

1. GENERAL.

This section presents information for isolating trouble to a specific equipment while it is installed in the aircraft.

2. TROUBLESHOOTING PHILOSOPHY.

The complete 618T-( ) system includes the 618T-( ) Airborne SSB Transceiver, its shockmount, control units, antennas, antenna tuner, power supplies, and interconnecting cables. Identify the defective unit, by substitution, and replace it with one known to be in good operating condition.

3. TROUBLESHOOTING PROCEDURES.

A. Shockmount Check.

(1) Visually check the shockmount in a normal, loaded position. Check for noticeable sagging in any of the resilient mounts.

(2) Depress one end of the shockmount from a normally loaded position until the resilient mounts are at a bottom position. The resilient mounts should permit a minimum travel of one-sixteenth of an inch. Check the other end of the shockmount in the same manner.

(3) Lift one end of the shockmount until the resilient mounts are in an extended position. The resilient mounts should permit a minimum travel of one-sixteenth of an inch. Check the other end of the shockmount in the same manner.

(4) If the shockmount fails any of these tests, replace it with one known to be in good condition.

B. Interconnecting Wiring.

The removal/installation section of this manual contains diagrams of installations possible with the 618T-( ) and its associated equipments. Make interconnecting wiring tests with reference to the installation diagram applicable to the specific installation.

C. Troubleshooting Procedures.

(1) Check all electrical connectors. Make sure that all locking rings are tight.

(2) Check each system component to make sure that it is seated properly and securely in its shockmount.

(3) Check the cabling for proper mounting. Make sure that it is clamped securely to prevent damage from vibration.

(4) Check the primary power source connections to make sure that no short circuits exist in the power input lines.

D. Operational Check.

NOTE: If any of the following checks indicate that the 618T-( ) is not operating properly, remove the 618T-( ) to a test bench and perform the 618T-( ) unit performance checks and adjustments in the 618T-( ) overhaul manual.

(1) Test Equipment.

A 714E-( ) Radio Set Control, an Electro-Voice 250 Carbon Microphone, and high-impedance headphones are required to perform the operational check.

(2) Equipment Setup.

The 618T-( ) should be in its normal operating installation while performing this test.

(3) Use of Test Procedure.

The test procedures are presented in tabular form. Figure 101 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 (RESULTS) presents the desired result of the test procedure including tolerances required, and column 4 (NOTES) presents any extra information that is needed for each individual test procedure.

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 selector 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. 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)			

TEST/STEP	PROCEDURE	RESULTS	NOTES
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.
(2) Listening Check	Set 714E-( ) to AM, USB, or LSB at a frequency that receives various transmissions.		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. TRANSMITTER CHECKS			
A. Power Supply Checks	Set 618T-( ) operating frequency to one on which transmissions may be made.		
	618T-( ) requires a minimum warmup period of 2 minutes before the unit is keyed.	CAUTION: 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY IMMEDIATELY.	
	Key 618T-( ).		
	Set front panel meter selector switch, in turn, to 1500V, 130V, and 28V.	Front panel meter should indicate in red area in each position.	
	Unkey 618T-( ).		

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. Power Amplifier Plate Current Check	Set 618T-( ) front panel meter selector 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 is read with scale X100 with meter switch in PA MA position.
C. Transmission Checks	Make test transmissions in USB, LSB, and AM modes. If possible, establish 2-way communications with another station.	Sidetone should be present in all modes and be of good quality. Front panel meter should indicate approximately 500 ma on voice peaks. Obtain signal quality reports from other station, and note quality of received signal.	
3. DISCONNECT	Unkey 618T-( ) and set 714E-( ) to OFF.		

618T-( ) Airborne SSB Transceiver - Servicing

(Not Applicable)

618T-( ) Airborne SSB Transceiver - Removal/Installation

1. GENERAL.

This section presents information for installation of the 618T-( ) and for subsequent removal and replacement. This information includes installation drawings and wiring and interconnect diagrams.

2. INSTALLATION.

A. Unpacking.

Unpack and carefully remove all units from shipping containers. Inspect all units for physical damage. All damage claims must be filed promptly with the responsible transportation company. If claims for damage are filed, retain the original packing materials and containers.

B. Location.

The 618T-( ) may be located in any reasonably accessible location. Adequate sway clearance must be provided for the unit in its associated shockmount. Refer to outline and mounting dimensions given in figures 402 through 408.

C. Preinstallation and Postinstallation Test.

The preinstallation test procedure is presented in the adjustment/test section of this manual.

The postinstallation test procedure (operational check) is presented in the troubleshooting section of this manual.

3. RETROFIT INSTALLATIONS.

A. 618S-( ) to 618T-1.

(1) Remove 618S-( ) and 416W-1 from their shockmounts.

(2) Install 49T-4 Retrofit Adapter in 350S-( ) shockmount. Refer to cooling note in figure 409.

(3) Install 618T-1 in 49T-4.

(4) Install 516H-1 Power Supply in 350T-1 shockmount.

(5) Replace 614C-2 Radio Set Control with 714E-2 Radio Set Control.

NOTE: If CW operation is desired, a 714E-3 Radio Set Control, 49T-4A Retrofit Adapter, and a 440Q-3 Adapter Cable must be used. Refer to figure 413.

B. AN/ARC-38(A) to 618T-1.

(1) Remove AN/ARC-38(A) from its shockmount.

(2) Remove C-1398/ARC-38(A) Radio Set Control.

(3) Install 49T-4 Retrofit Adapter in MT-1415/ARC-38(A) shockmount. Refer to cooling note in figure 409.

(4) Install 618T-1 in 49T-4.

(5) Install 516H-1 Power Supply in MT-1414/ARC-38(A) shockmount.

(6) Replace C-1398/ARC-38(A) Radio Set Control with 714E-2 Radio Set Control. Use 440Q-2 Adapter Cable to connect 714E-2 to existing aircraft wiring.

NOTE: If CW operation is desired, a 714E-3 Radio Set Control, 49T-4A Retrofit Adapter, and 440Q-1 Adapter Cable must be used. Two wires must be added; one from TB1801-5 on the receiver-transmitter shockmount to pin k on the connector which formerly mated with C-1398/ARC-38(A), and another from TB1801-20 to pin 1.

C. 618S-( ) to 618T-2.

(1) Remove 618S-( ) and 416W-3 from their shockmounts.

(2) Install 49T-6 Retrofit Adapter in 350S-( ) Shockmount. Refer to cooling note in figure 409.

(3) Install 618T-2 on 49T-6.

(4) Attach connector on pendant cable to connector on shockmount for 416W-3.

(5) Replace 614C-2 Radio Set Control with 714E-2 Radio Set Control.

NOTE: If CW operation is desired, a 714E-3 Radio Set Control, a 49T-6A Retrofit Adapter, and a 440Q-3 Adapter Cable must be used. Refer to figure 416.

D. 618S-( ) to 618T-3.

(1) Remove the 618S-( ) and 416W-1 from their shockmounts.

(2) Install 49T-3 Retrofit Adapter in 350S-( ) Shockmount. Refer to cooling note in figure 409.

(3) Install 618T-3 on 49T-3.

(4) Attach connector on pendant cable to connector on shockmount for 416W-1.

(5) Replace 614C-2 Radio Set Control with 714E-2 Radio Set Control.

NOTE: If CW operation is desired, a 714E-3 Radio Set Control, 49T-3A Retrofit Adapter, and 440Q-3 Adapter Cable must be used. Refer to figure 415.

E. AN/ARC-38(A) to 618T-3.

(1) Remove AN/ARC-38(A) from its shockmount.

(2) Remove C-1398/ARC-38(A) Radio Set Control.

(3) Install 49T-3 Retrofit Adapter in MT-1415/ARC-38(A) Shockmount. Refer to to cooling note in figure 409.

(4) Attach connector on pendant cable to connector on MT-1414/ARC-38(A) Shockmount.

(5) Replace C-1398/ARC-38(A) Radio Set Control with 714E-2 Radio Set Control. Use 440Q-2 Adapter Cable to connect 714E-2 to existing aircraft wiring.

NOTE: If CW operation is desired, a 714E-3 Radio Set Control, 49T-3A Retrofit Adapter, and a 440Q-1 Adapter Cable must be used. Two wires must be added; one from TB1801-5 on the receiver-transmitter shockmount to pin k on the connector which formerly mated with C-1398/ARC-38(A), and another from TB1801-20 to pin 1.

4. COOLING REQUIREMENTS.

A. General.

The reliability of electronic equipment is determined to a great extent by the operating temperatures of components. Proper cooling will ensure maximum reliability of electronic equipment. The 618T-( ) has been thermally balanced to ensure effective cooling of all components. This paragraph describes the cooling requirements for the 618T-( ).

B. Mounting.

The 618T-( ) may be mounted on the 390J-1/2/2A/2B Shockmount or on an ARINC 404 exhaust plenum. The 618T-( ) meets the cooling requirements specified in ARINC 404.

C. Temperature-Altitude Limits of the 618T-( ) With No Auxiliary Cooling.

The maximum transmit duty cycle at which the 618T-( ) will operate continuously within the temperature-altitude limits shown in figure 409 is 50 percent with a maximum of 5 minutes in transmit followed by a minimum of 5 minutes in receive. This

duty cycle applies when the 618T-( ) is operating on 10 percent high-line voltage with rated output of 400 watts pep. in SSB or 125 watts carrier in AM or CW. The 618T-( ) may be operated continuously in the receive mode.

CAUTION: THE GASKETS AND SEALS MUST BE IN PLACE AND IN GOOD CONDITION TO PRESERVE THE INTERNAL AIRLOW BALANCE. THE AIR FILTER AT THE INPUT OF THE 618T-( ) MUST BE CLEAN WHEN MAKING AIR-PRESSURE MEASUREMENTS.

D. Airflow Measurements.

Figure 401 describes and illustrates three procedures that may be used to check the 618T-( ) installation for proper airflow. These procedures apply only when auxiliary cooling is not used.

E. Airflow and Exhaust Characteristics.

Cooling air for the 618T-( ) enters through an air filter that removes dust and dirt particles. The air then is propelled through a transition into the chassis where it is metered through the modules and then exhausted through openings in the bottom of the case. These exhaust holes must not be obstructed when the equipment is operating. Metering orifices, which are part of an external exhaust system, must be placed at a sufficient distance from the bottom of the 618T-( ) so as not to disturb the internal air balance.

The exhaust air temperature is determined by the total power dissipation of the 618T-( ) and the temperature and flow rate of the cooling air. At 25 °C and sea level altitude with the maximum duty cycle, the air discharge temperature may be locally as high as 80 °C above the inlet temperature, although the average temperature of the discharge air is approximately 35 °C above the inlet air temperature.

F. ARINC Type Auxiliary Cooling.

(1) General.

(a) The 618T-( ) may be cooled by withdrawing air through the ARINC 404 exhaust air opening on the bottom of the equipment using auxiliary cooling equipment. The air is withdrawn by applying a negative pressure to the exhaust opening. The exhaust air thus obtained will be referred to as W_{out}.

(b) Tests and measurements performed on the 618T-( ) have determined the amount of cooling air necessary for various inlet cooling air temperature. Only that air which enters the blower opening in the front of the 618T-( ) can be used to cool the 618T-( ) efficiently. This air will be referred to as W_{in}.

(c) Δ P designates the minimum negative pressure in inches of water that must be applied to the exhaust plenum to cool the 618T-( ) properly under ambient air density conditions.

(d) $\sigma\Delta$ P designates the minimum negative pressure in inches of water that must be applied to the exhaust plenum to cool the 618T-( ) properly under standard air density conditions.

(e) Sigma (σ) is defined as the ratio of air density at the altitude of operation to air density at sea level.

(f) Figures 410, 411, and 412 are provided to enable Δ P to be determined when the ambient air temperature and air density are known. Proceed to paragraph (2) below for instructions in using the graphs pictured in figures 410 through 412.

(2) Procedure.

To determine the amount of negative pressure necessary in the exhaust plenum to cool the transceiver adequately, perform the following steps:

(a) Refer to figure 410. This figure illustrates the relationship between the amount of cooling air (W_{in}) that must enter the blower opening at the front of the 618T-( ) and the cooling air temperature. Determine the ambient temperature of the inlet air in degrees centigrade. Enter the graph along the vertical axis representing this temperature, and intersect the cooling curve. Read the required inlet airflow (W_{in}) in pounds per hour along the horizontal axis. The value obtained is the mass airflow input (W_{in}) required to cool the transceiver properly when it is operating under maximum duty cycle conditions for the determined ambient temperature.

(b) Refer to figure 411. This graph illustrates the relationship between the exhaust airflow (W_{out}) and the inlet cooling air (W_{in}). Enter the graph at the mass airflow input (W_{in}) found in step (a) above. Intersect the desired mode flow line.

CAUTION: IF THE INTERSECTION FALLS WITHIN THE SHADED AREA, FOLLOW THE DESIRED MODE FLOW LINE UP TO A POINT APPROXIMATELY 20 PERCENT BEYOND THE TOP OF THE SHADED AREA. CONSIDER THIS THE POINT OF INTERSECTION.

(c) From the intersection in (b) above, follow a vertical line down, and read the value of air exhaust flow (W_{out}). This is the air exhaust flow needed to maintain the required value of W_{in}.

(d) Refer to figure 412. This graph illustrates the relationship between the exhaust airflow (W_{out}) and the negative pressure in the exhaust plenum required to maintain W_{out} at sea level. Enter the graph along the horizontal axis at the value of (W_{out}) obtained in step (c) above. Follow a vertical line to the intersection of the desired mode flow line (transmit, receive, or blower off but freewheeling).

CAUTION: IF THE INTERSECTION FALLS WITHIN THE SHADED AREA, FOLLOW THE DESIRED MODE FLOW LINE UP TO A POINT APPROXIMATELY 20 PERCENT BEYOND THE TOP OF THE SHADED AREA. CONSIDER THIS THE POINT OF INTERSECTION.

(e) From the point of intersection, read the value of $\sigma\Delta\rho$ on the vertical scale. This is the negative pressure ($\sigma\Delta\rho$) required in the exhaust plenum to supply sufficient cooling air W_{in} to the transceiver at sea level. Obtain $\Delta\rho$ by

dividing $\sigma \Delta \rho$ by the value of σ for the desired altitude of operation. See the following equation.

$$\Delta \rho = \frac{\text{(value determined in step (e))}}{\sigma}$$

where

$$\sigma = \frac{\text{air density at altitude of operation}}{\text{air density at sea level}}$$

air density at sea level = 0.0765 lb/ft^3

This is the minimum value of negative pressure that is required to maintain the minimum amount of cooling inlet air (W_{in}) to cool the transceiver adequately at the desired altitude of operation. See figure 401, method 3.

(3) Example Solution.

The steps below present a sample solution using the procedures presented in paragraph 4.F.(2). The graphs of figures 410, 411, and 412 are marked with dashed lines to indicate the path of the solution as work progresses.

(a) Refer to figure 410. Assume cooling air temperature of 36 °C. Enter the graph from the left at 36 degrees. Follow a horizontal line to the intersection of the recommended cooling curve. Follow a vertical line down and read a value of 170 pounds per hour for W_{in}.

(b) Refer to figure 411. Enter the graph at the left at a W_{in} value of 170 pounds per hour. Follow a horizontal line to the intersection of the transmit mode curve. Since the example intersection falls within the shaded area, proceed along the transmit mode curve to a point about 20 percent beyond the right-hand edge of the shaded area. Assume this to be the intersection, and follow a vertical line down to 250 pounds per hour for required W_{out}. Note that W_{out} is always greater than W_{in}.

(c) Refer to figure 412. Enter the graph at the bottom at a W_{out} value of 250 pounds per hour. Follow a vertical line up to the intersection of the transmit mode curve. From this intersection follow a horizontal line left and read a required value of $\sigma \Delta \rho$ of 0.41 inch of water.

(d) Assume the air density at altitude of operation to be 0.521 pound per cubic foot. Solve the equation in paragraph 4.F.(2)(e):

$$\Delta \rho = \frac{\sigma \Delta \rho \text{(from figure 412)}}{\sigma}$$

$$\Delta \rho = \frac{0.41}{\frac{0.0521}{0.0765}} = 0.602 \text{ inch of water vacuum.}$$

5. AIRCRAFT PREPARATION.

A. Interconnecting Wiring Information.

The interconnecting wiring information required for various 618T-( ) installations is illustrated in figures 413 through 430. The interconnecting wiring between the 618T-( ) and the retrofit adapters is shown in figures 413, 414, 415, and 416.

NOTE: The more common interconnecting wiring diagrams are contained in this manual. For an interconnecting wiring diagram of a system not contained in this manual, refer to HF Interconnecting Wiring Diagrams Manual, Collins part number 523-0758695.

(1) The primary power connections to a particular type of 618T-( ) are not affected by other system components. Figure 419 shows all the primary power wiring using 390J-( ) terminal strips for tie points.

(2) The interconnections between the 714E-1 and any 618T-( ), or the 714E-2 and any 618T-( ), and the 714E-3 and any 618T-( ) are identical for all new installations. Figure 418 shows these universal connections.

NOTE: In retrofit installations, the 714E-2 or 714E-3 must be used. The interconnections between the 714E-2 or 714E-3 and the 618T-( ) are different in a retrofit installation from those in a new installation. (See paragraph 2.C in the description and operation section to determine which 714E-( ) to use for a particular retrofit installation.)

(3) The interconnections between a particular coupler and a 618T-( ) will be identical for all 618T-( ) transceivers, i.e., a 180R-6 connects to a 618T-2 in the same way as a 180R-6 connects to a 618T-3.

(4) To obtain a complete hf system interconnect, using figures 418 thru 429, make the control to transceiver connections shown in figure 418, add the applicable shockmount/aircraft connections shown in figure 419, and add the applicable antenna coupler connections from one of figures 420 through 429.

CAUTION: THE CIRCUIT BREAKERS MUST BE INSERTED IN THE PRIMARY POWER LINES AS NOTED IN THE INTERCONNECTING WIRING DIAGRAMS.

NOTE: If separate antennas are used for transmit and receive, connect the transmit antenna to the ANT. connector at the right front of the 618T-( ), and connect the receive antenna to the AUX RCVR ANT. jack at the left front of the 618T-( ). Set the ANT JUMPER switch in the antenna transfer relay compartment under the 618T-( ) front cover to OUT. If the same antenna is used for both transmit and receive, set the ANT JUMPER switch to IN.

618T-( ) chassis with MCN 3024 and below do not contain ANT JUMPER switch S2. If the same antenna is used for both transmit and receive, a jumper wire must be soldered between pins 5 and 8 of chassis relay K5. If separate antennas are used, the jumper wire should be omitted.

Squelch enable switch S3 should be checked to be sure that it is positioned correctly (IN if rf oscillator A2 contains squelch circuits, OUT if it does not). Figure 6 lists Collins part numbers for rf oscillator modules with and without squelch circuits.

B. Removal and Replacement.

This section describes procedures to be used in removing and reinstalling the 618T-( ) Airborne SSB Transceiver and its associated equipment.

(1) Removal of 618T-( ) Airborne SSB Transceiver.

(a) Disconnect the cables from the front of the 618T-( ). Identify and tag the disconnected cables.

(b) Loosen and disengage the holddown clamps on the shockmount.

(c) Carefully disengage the rear connector from the shockmount plug by pulling the two handles on the front of the 618T-( ).

(2) Installation of 618T-( ) Airborne SSB Transceiver.

(a) Place the 618T-( ) on the shockmount, and push toward the rear. Make sure that the plug on the 618T-( ) is properly inserted in the shockmount receptacle.

(b) Engage and tighten the holddown clamps on the shockmount.

(c) Safety-wire the shockmount clamps.

(3) Removal of Shockmount.

(a) Disconnect the groundstraps.

(b) Remove the 16 #10-32 screws, lockwashers, and nuts that fasten the shockmount to the radio shelf.

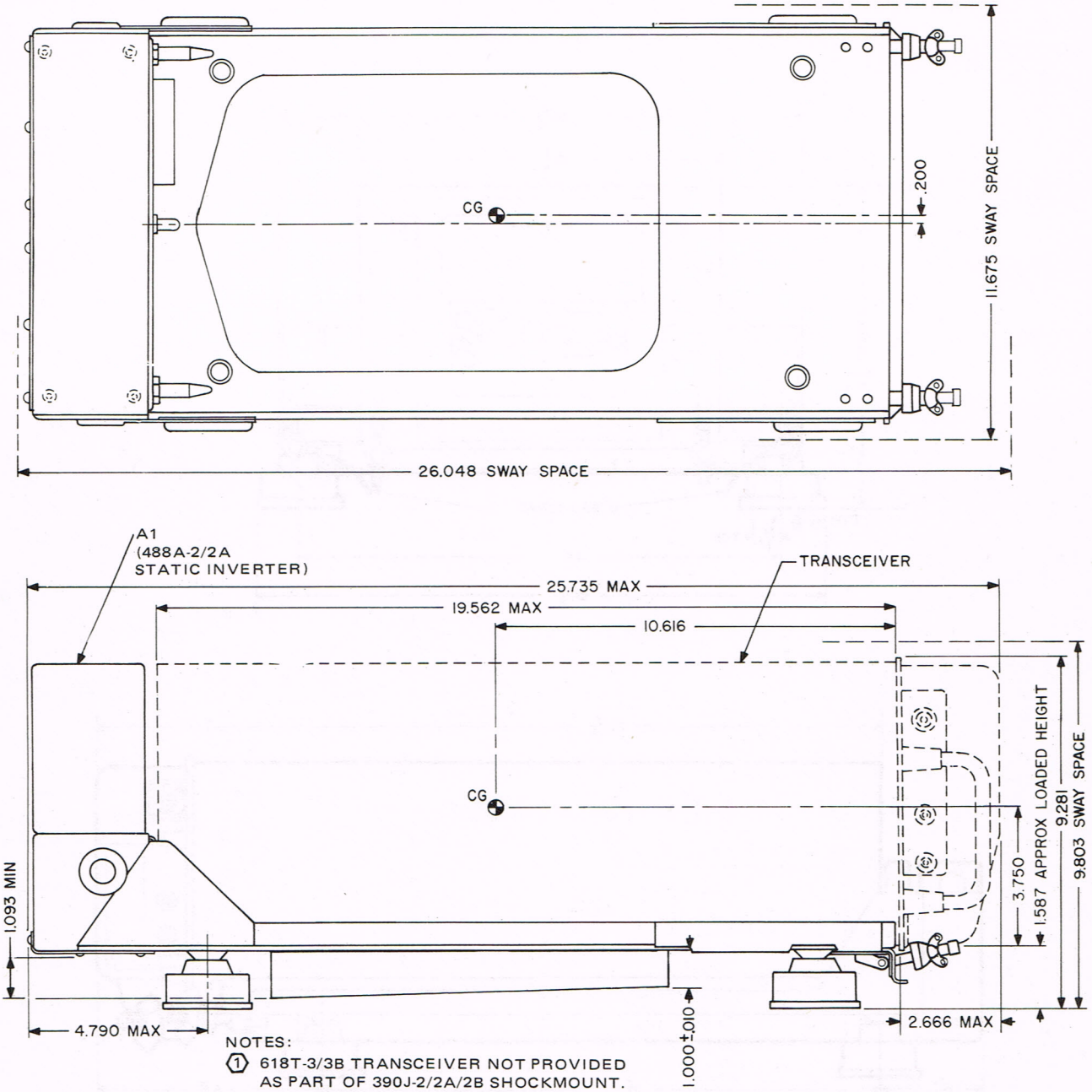
(c) Remove the electrical connector from the rear of the shockmount.

(4) Installation of Shockmount.

(a) Reconnect the electrical connector to the rear of the shockmount.

(b) Fasten the shockmount to the radio shelf with 16 #10-32 screws, lockwashers, and nuts.

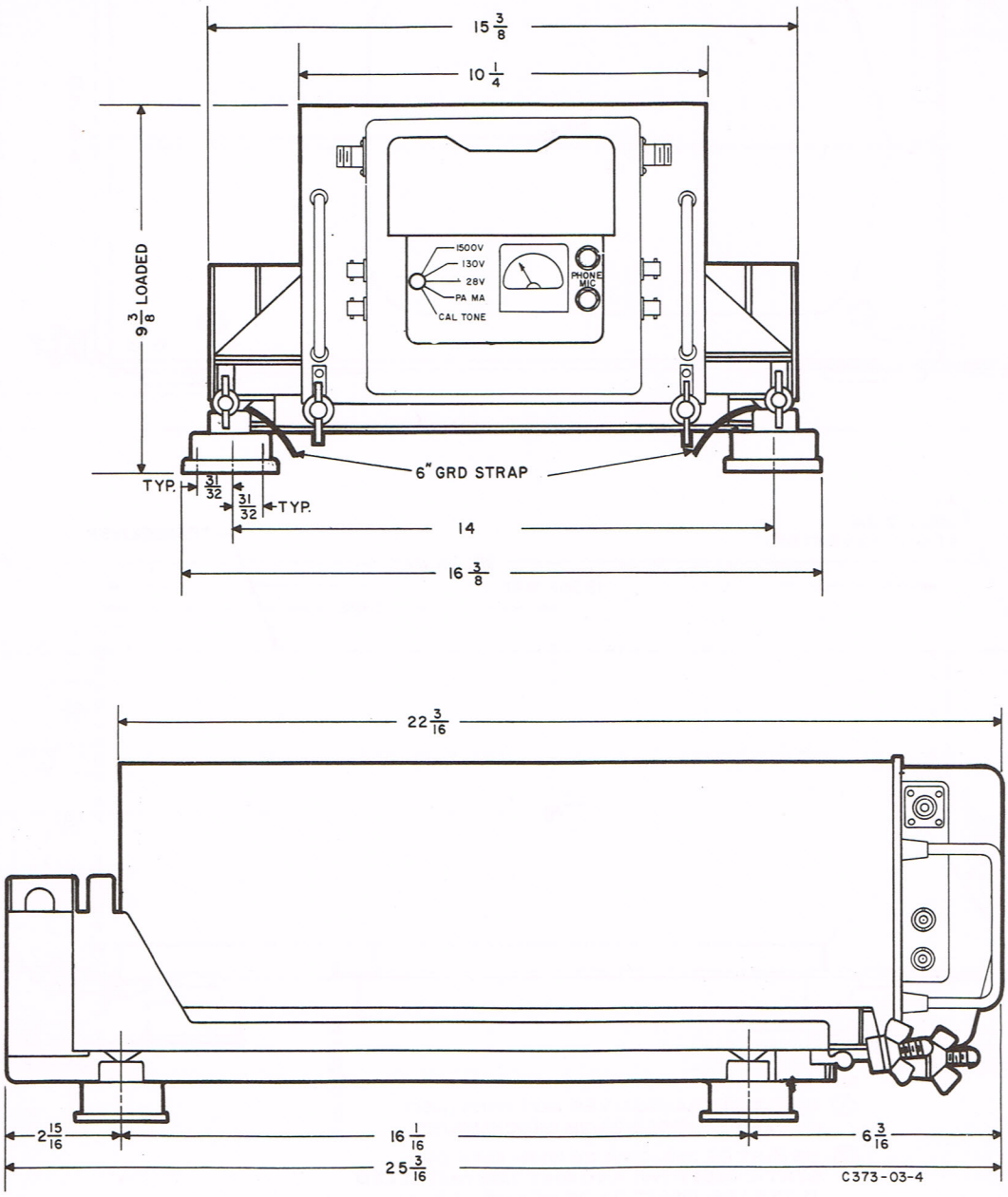
(c) Connect the groundstraps under each shockmount foot. Make sure that a good ground contact is made.



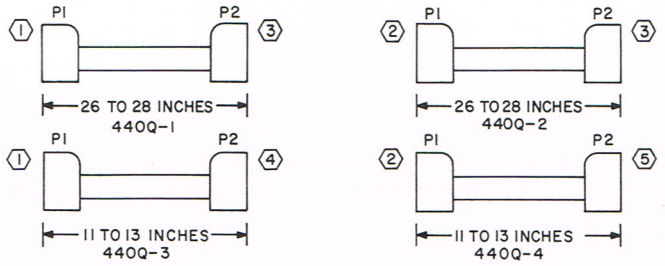
NOTES:

1. 618T-3/3B TRANSCEIVER NOT PROVIDED AS PART OF 390J-2/2A/2B SHOCKMOUNT.
2. WEIGHT OF 390J-2/2A/2B WITH 488A-2/2A STATIC INVERTER AND 618T-3/3B INSTALLED IS 73.8 LBS. (390J-2/2A/2B WEIGHS 13.8 LBS, 488A-2/2A WEIGHS 10 LBS, AND 618T-3/3B WEIGHS 50 LBS.)
3. SWAY SPACE REQUIREMENTS ARE WITH 618T-3/3B TRANSCEIVER MOUNTED IN PLACE.
4. THIS DRAWING APPLICABLE TO: 390J-2 (CPN 522-3353-XXX), 390J-2A(CPN 792-6315-XXX), AND 390J-2B (CPN 622-1253-XXX).

618T-3/3B Airborne SSB Transceiver on 390J-2/2A/2B Shockmount,
Outline and Mounting Dimensions
Figure 404



618T-( ) Airborne SSB Transceiver With 49T-3/3A Retrofit Adapter on 350S Shockmount, Outline and Mounting Dimensions
Figure 405

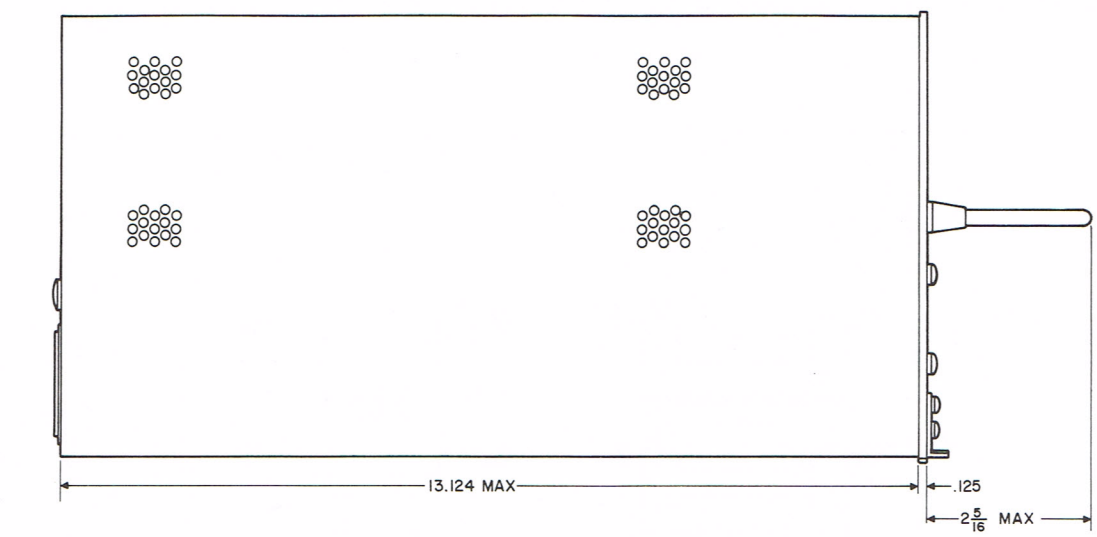


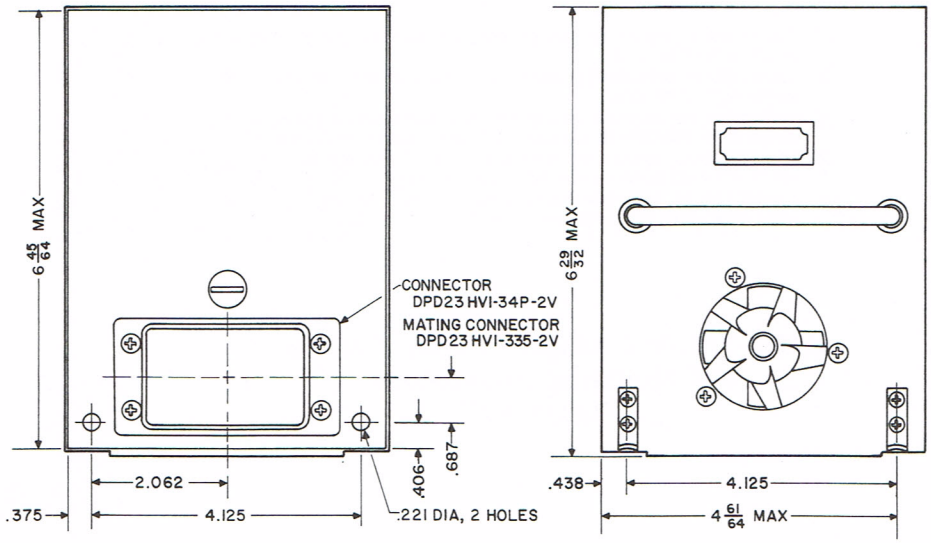
NOTES:

1. CONNECTOR P1, PT06A-20-39S SR (COLLINS PART NUMBER 371-6204-00), MATES WITH 714E-3, J1.
2. CONNECTOR P1, MS3106A-28-15S (COLLINS PART NUMBER 357-4065-00), MATES WITH 714E-2, J1.
3. CONNECTOR P2, MS3106A-28-21P (COLLINS PART NUMBER 357-5056-00), MATES WITH MS3102R-28-21S (COLLINS PART NUMBER 357-2305-00).
4. CONNECTOR P2, MS3101A-28-15P (COLLINS PART NUMBER 357-1572-00), MATES WITH MS3106A-28-15P (COLLINS PART NUMBER 357-4065-00).
5. CONNECTOR P2, DDM-50P (COLLINS PART NUMBER 371-0971-00), MATES WITH DDMF-50S (COLLINS PART NUMBER 371-0961-00).

TPO-8511-012

440Q-1/2/3/4 Adapter Cable, Outline and Mounting Dimensions
Figure 407





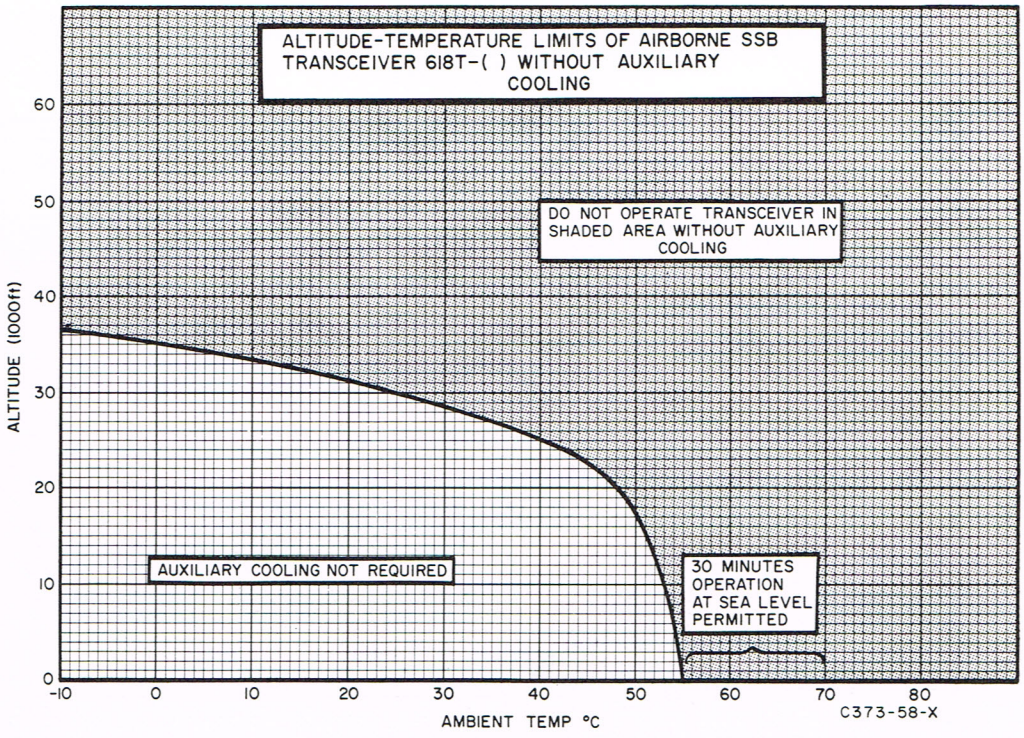
REAR VIEW

FRONT VIEW

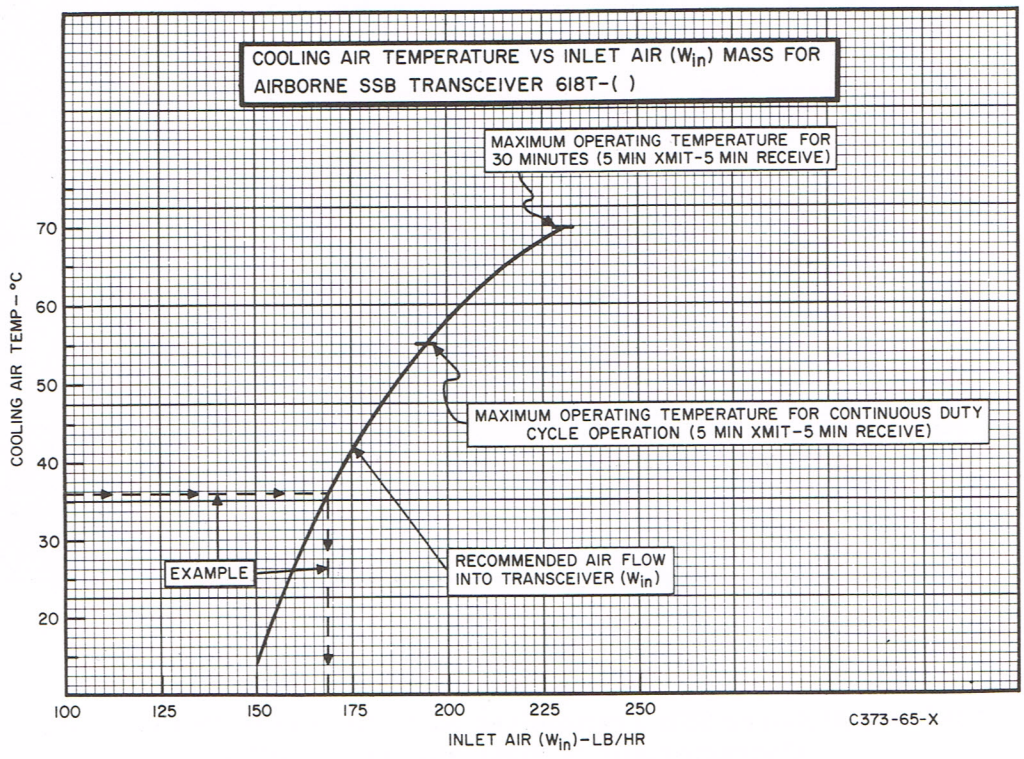
NOTE:
THIS DRAWING IS APPLICABLE TO ALL 516H-1 TYPE EQUIPMENT BEARING COLLINS PART NUMBER 522-1204-XXX.

C373-64-4

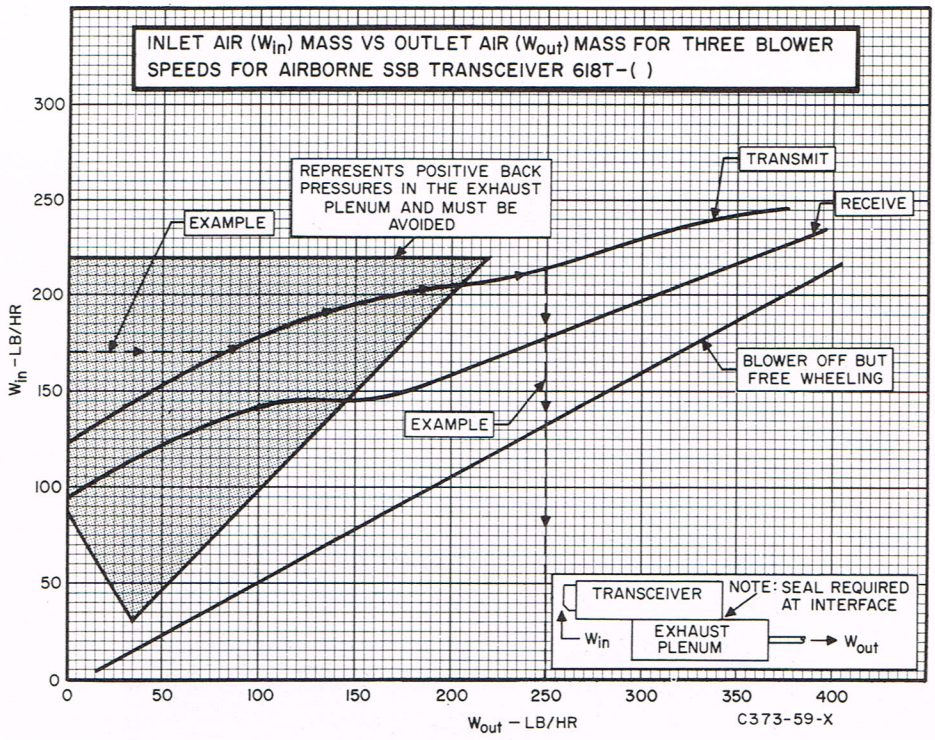
516H-1 Power Supply, Outline and Mounting Dimensions
Figure 408



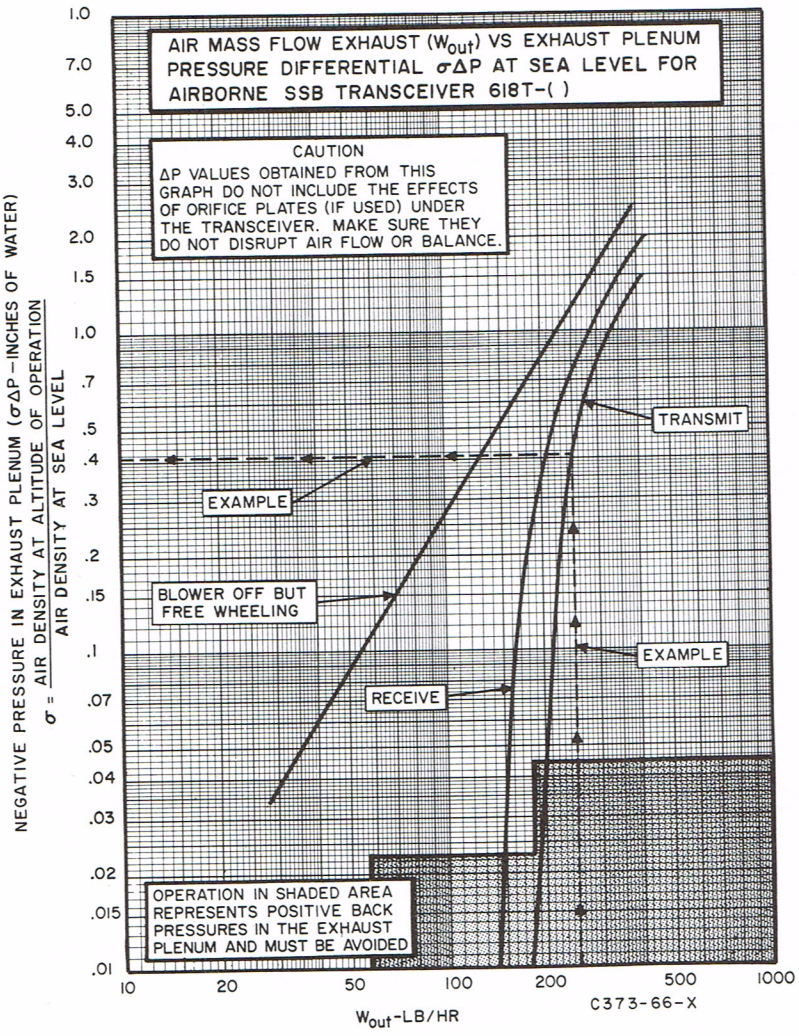
618T-( ) Airborne SSB Transceiver Altitude Versus Temperature Characteristic Without Auxiliary Cooling
Figure 409



Minimum Required Airflow
Figure 410



Inlet Air Versus Exhaust Air With 618T-( ) Mounting on ARINC 404 Plenum
Figure 411



Negative Pressure Required in ARINC 404 Plenum
Versus Mass Airflow Through ARINC 404 Plenum
Figure 412

(Figures 431 thru 436 deleted)

618T-( ) Airborne SSB Transceiver - Adjustment/Test

1. GENERAL.

This section contains the information required to perform the 618T-( ) Airborne SSB Transceiver preinstallation test procedure. The preinstallation test procedure is a detailed black-box check performed at a test bench equipped with special and regular 618T-( ) test equipment. If this test procedure indicates that the 618T-( ) is not operating properly, refer to the module checks and adjustments, in the 618T-( ) overhaul manual, to isolate the trouble within the unit to a particular module or group of modules.

2. PREINSTALLATION TEST.

The test procedures are presented in tabular form. Figure 504 presents the test procedures in a 4-column format. Columns 1 (STEP/TEST) indicates the step number and applicability, column 2 (PROCEDURE) outlines test procedures to be performed, column 3 (RESULTS) presents the desired result of the test procedures including tolerances required, and column 4 (NOTES) presents any extra information that is needed for each individual test procedure.

A. Test Equipment Required.

See figure 501 for the list of test equipment required to perform the preinstallation test procedures.

EQUIPMENT	TYPE OR MODEL NO.	COLLINS PART NUMBER	MANUFACTURER
Dummy rf load	8201		Bird
Signal generator	606A		Hewlett-Packard
6-db attenuator	80-ZH3		Measurements Corp.
Vtvm	410B		Hewlett-Packard
Probe T-connector	455A or 11042A		Hewlett-Packard
Harmonic distortion analyzer	330D		Hewlett-Packard
Oscilloscope	545B		Tektronix

List of Test Equipment
Figure 501 (Sheet 1 of 2)

EQUIPMENT	TYPE OR MODEL NO.	COLLINS PART NUMBER	MANUFACTURER
Oscilloscope calibrated preamplifier	1A2		Tektronix
Frequency counter	524D		Hewlett-Packard
Frequency converter	525A		Hewlett-Packard
Test harness	678P-1 or 678P-1B 678P-2 or 678P-2A	547-3914-000 777-1861-001 522-3400-000 522-3400-006	Collins Radio Company
Maintenance kit	678Y-1 or 678Y-1B 678Y-3	547-3915-000 777-1862-001 522-3401-006	Collins Radio Company
Function test set or Differential vtvm	678Z-1 (part of 678Y-3) or 801-B	548-8001-005	Collins Radio Company or Fluke
Radio set control	714E-2( ) or 714E-3( ) or 714E-6( )	522-2213-000 522-2457-000 522-4466-000	Collins Radio Company
Ac vtvm	310A		Ballantine
High-impedance headphones			Commercial
Carbon microphone	205		Electro-Voice
Audio oscillator	200AB		Hewlett-Packard

List of Test Equipment
Figure 501 (Sheet 2)

B. 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, 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, 160 watts.

103.5 to 126.5 volts ac, 3-phase, 380 to 420 Hz (with Y-connected, line-to-grounded neutral), 1000 watts.

23.5 to 30.25 volts dc, 120 watts.

(3) 618T-3/3B.

103.5 to 126.5 volts ac, single-phase, 380 to 420 Hz, 100 watts.

23.5 to 30.25 volts dc, 1150 watts.

C. Preinstallation Test Procedure.

(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	BYPASS
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-( ) connector corresponding to unit under test (618T-1/1B, 2/2B, 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 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 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 502. (Use figure 503 as reference for controls and indicators.)

(i) Visually check top fuses (4) of the 678P-( ).

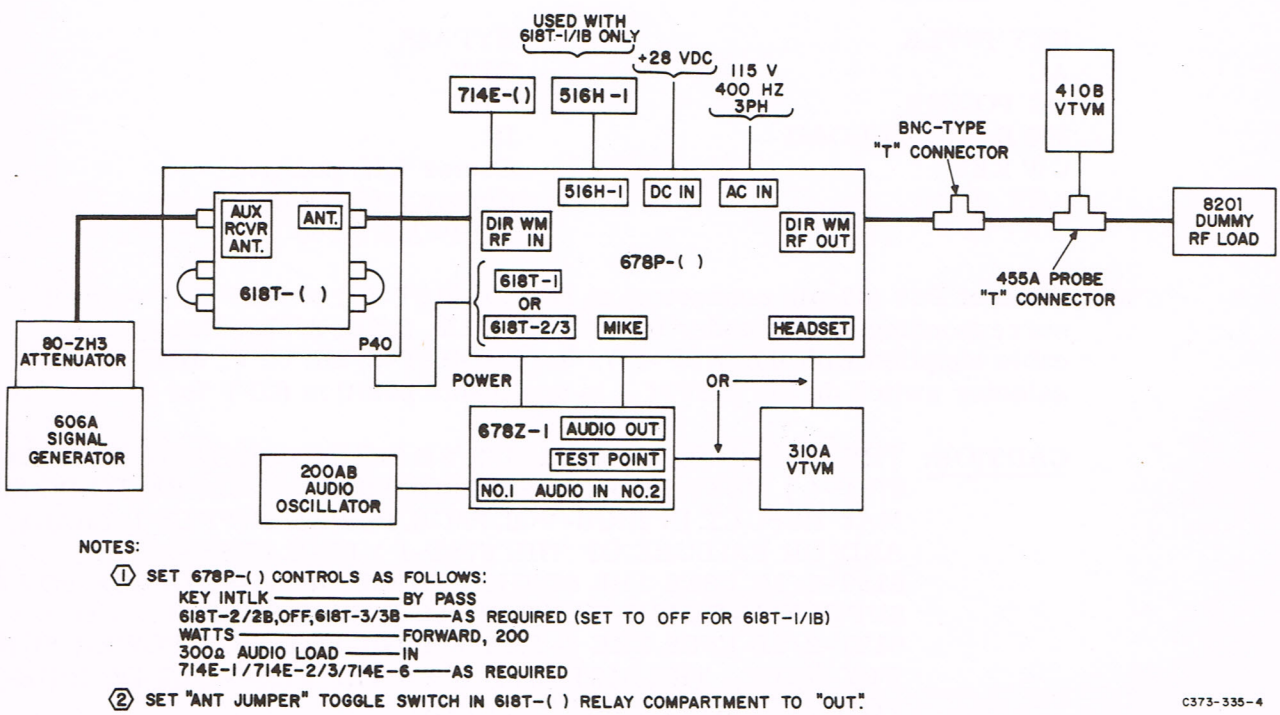
(j) Set 678P-( ) AC and DC power switches to ON.

(k) Perform test procedures as outlined in figure 504. Tests must be performed in the order given.

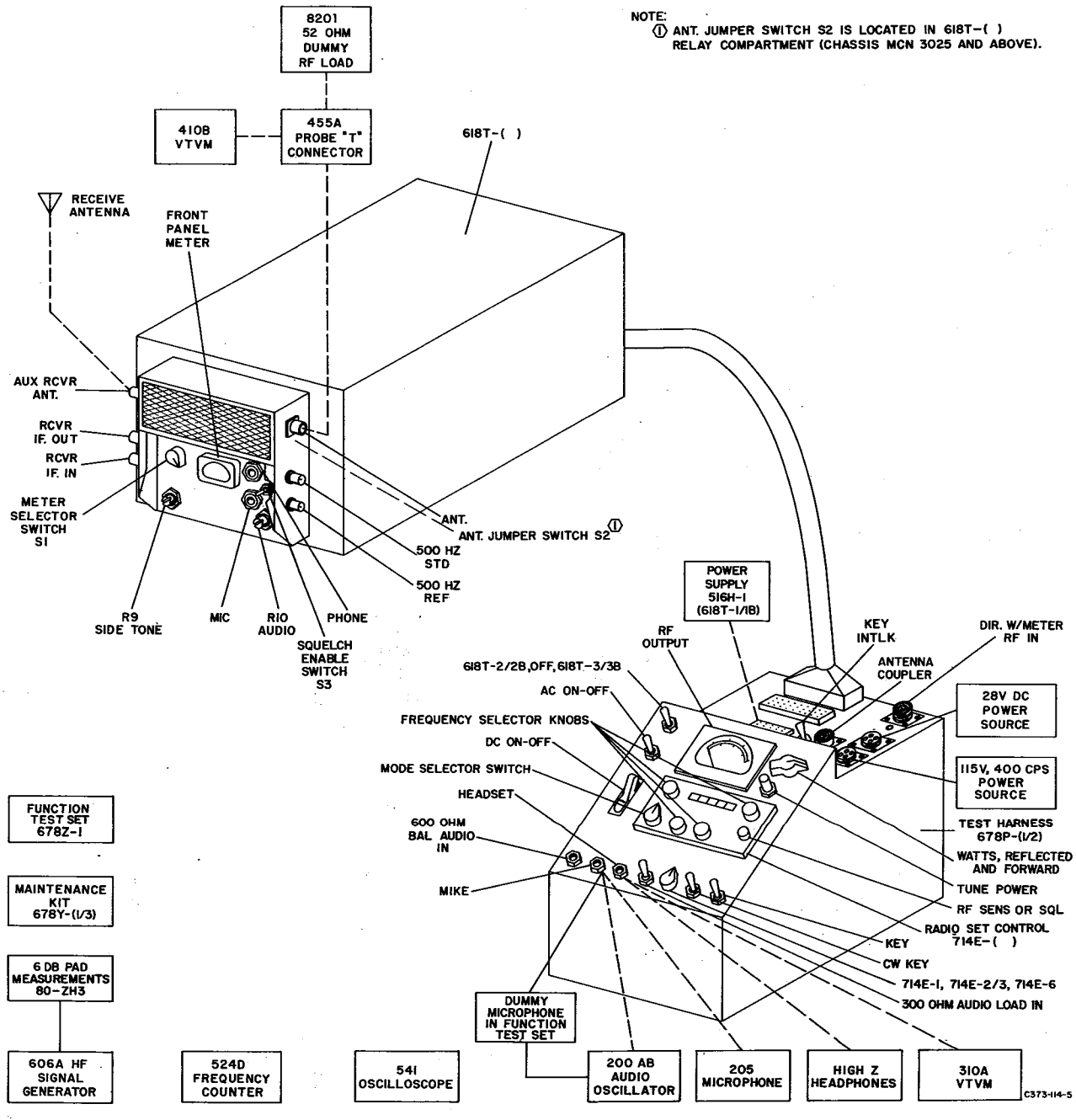
CAUTION: DO NOT OPERATE 618T-3/3B WITH ANY TUBE REMOVED. FILAMENT VOLTAGE DIVIDER NETWORK WILL BE UNBALANCED AND DAMAGE TO OTHER TUBES MAY RESULT.

3. POSTINSTALLATION TEST.

The postinstallation test procedure (operational check) for the 618T-( ) is contained in the troubleshooting section of this manual.



618T-( ) Test Setup Diagram Using a 678P-( ) Test Harness
Figure 502


NOTE:
① ANT. JUMPER SWITCH S2 IS LOCATED IN 618T-( ) RELAY COMPARTMENT (CHASSIS MCN 3025 AND ABOVE).
8201 52 OHM DUMMY RF LOAD
410B VTVM
455A PROBE "T" CONNECTOR
618T-( )
RECEIVE ANTENNA
FRONT PANEL METER
AUX RCVR ANT.
RCVR IF. OUT
RCVR IF. IN
METER SELECTOR SWITCH S1
ANT.
ANT. JUMPER SWITCH S2①
500 HZ STD
500 HZ REF
R9 SIDE TONE
MIC
RIO AUDIO
PHONE
SQUELCH ENABLE SWITCH S3
POWER SUPPLY 516H-1 (618T-1/18)
RF OUTPUT
KEY INTLK
DIR. W/METER RF IN
ANTENNA COUPLER
618T-2/28,OFF,618T-3/38
AC ON-OFF
FREQUENCY SELECTOR KNOBS
DC ON-OFF
MODE SELECTOR SWITCH
HEADSET
600 OHM BAL AUDIO IN
MIKE
28V DC POWER SOURCE
115V, 400 CPS POWER SOURCE
TEST HARNESS 678P-(1/2)
WATTS, REFLECTED AND FORWARD
TUNE POWER
RF SENS OR SQL
RADIO SET CONTROL 714E-( )
KEY
CW KEY
714E-1, 714E-2/3, 714E-6
300 OHM AUDIO LOAD IN
FUNCTION TEST SET 678Z-1
MAINTENANCE KIT 678Y-(1/3)
6 DB PAD MEASUREMENTS 80-ZH3
606A HF SIGNAL GENERATOR
524D FREQUENCY COUNTER
541 OSCILLOSCOPE
DUMMY MICROPHONE IN FUNCTION TEST SET
200 AB AUDIO OSCILLATOR
205 MICROPHONE
HIGH Z HEADPHONES
310A VTVM
C373-1114-5

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 2 minutes before the unit is keyed.	CAUTION: 618T-( ) BLOWER MOTOR SHOULD INCREASE IN SPEED. IF IT DOES NOT, UNKEY 618T-( ) IMMEDIATELY.	
	Key 618T-( ).		
(Cont)	Unkey 618T-( ).		

TEST/STEP	PROCEDURE	RESULTS	NOTES
A. (Cont)	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 1500 V, and key 618T-( ).	618T-( ) panel meter should indicate in red area of scale.	
	Unkey 618T-( ).		
B. +18-Volt Check			
(1) Preferred Method	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.
C. MHz Frequency Stabilizer Check	Connect HP 410B VTVM and oscilloscope between A10J1 and ground in MHz-frequency stabilizer A10.		
(Cont)			

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. (Cont)	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 saw-tooth 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, in the overhaul manual. 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	
(Cont)	(3) 2.777 MHz	(3) 2.721 to 2.725 MHz	

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	(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	
	Remove the ground from A12J8 in rf translator A12.		
	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	
(Cont)	(4) 2.666 MHz	(4) 2.8339978 to 2.8340022 MHz	

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	(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.		
(Cont)	Connect 678Z-1 GRND jack to 618T-( ) chassis		

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (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 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.	
(Cont)	Ground A12J8.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (Cont)	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. 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 incorrect, temporarily remove connections to 678Z-1 and repeat step. Disconnect 678Z-1.	Same as above.	
F. Digit Oscillator Check (618T-1/2/3 only) (Cont)	Connect frequency counter to the digit oscillator output (A4J5 in kHz-frequency stabilizer A4) through probe no 1 of the 678Y-( ) Maintenance Kit.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	Set 714E-( ) to each of the following frequencies, and observe the counter: (1) 2.006 MHz (2) 2.000 MHz (3) 2.005 MHz	Counter should indicate as follows for each setting: (1) 295.850 to 296.150 kHz (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 (Cont)	Set the 714E-( ) frequency selector to 2.100 MHz, mode selector to AM, and the RF SENS/SQL control fully clockwise.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
A. (Cont)	Connect Ballantine 310A VTVM to the 678P-( ) HEADSET jack.		
	Set the signal generator for 3-μV 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 to 5 μV 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.	
(Cont)	Change signal generator output level from 5 to 50 μV 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).	

TEST/STEP	PROCEDURE	RESULTS	NOTES
A. (Cont)	Change signal generator output from 50 to 1000 μV.	Vtvm indicates not less than 9.5 V (300 mW into 300-ohm load).	
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 μV.		
	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.	
	Readjust signal generator to frequency which produces maximum vtvm indication.		
	Adjust signal generator output level for 3 μV with no modulation.	Vtvm indicates not less than 3.9 V (50 mW into a 300-ohm load).	
(Cont)	Set 714E-( ) mode selector switch to LSB.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. (Cont)	Adjust signal generator output level for 1 μV 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. Readjust signal generator to frequency which produces maximum vtvm indication. Adjust signal generator output level for 3 μV with no modulation. Repeat step B at 8.400 and 29.900 MHz.	 Vtvm should indicate not less than 10-dB drop in signal. Vtvm indicates not less than 3.9 V (50 mW into 300-ohm load). Same as above.	
C. <u>AGC Characteristics</u> (Cont)	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 μV. Increase signal generator output to 100,000 μV.	 Record vtvm indication for reference. Vtvm should indicate not more than a 6-dB increase over reference.	

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. (Cont)	Set 714E-( ) to 7.300 MHz, USB. Set signal generator to 7.300 MHz unmodulated at a level of 10 μV. Adjust frequency of signal generator for maximum indication on vtvm. Increase signal generator output level to 100,000 μV.	 Record vtvm indication for reference. Vtvm should indicate not more than 6-dB increase over reference.	
D. Selectivity (Cont)	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.		

Preinstallation Test Procedure
Figure 504 (Sheet 12)

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	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.	
	Set 714E-( ) mode selector switch to USB.		
	Set signal generator to 2.100 MHz unmodulated with an output level of 1 μV.		
	Adjust signal generator frequency for maximum ac vtvm indication.		
(Cont)	Adjust signal generator output level for an ac vtvm indication of 6.0 V.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	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.	
	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 μV.		
(Cont)	Connect distortion analyzer to HEADSET jack on the 678P-( ), and measure the distortion.	Not more than 10%.	

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. Low Channel Operation and Squelch Delay Check for 618T-( ) With RF Oscillator Module 528-0690-001	Set 618T-( ) squelch enable switch S3 to SQL IN. Turn RF SENS/SQL control on the 714E-( ) control head fully clockwise. Set signal generator to 7.300 MHz externally modulated 30% at 600 Hz and an output level of 5 μV. Turn 600-Hz external modulation off for 10 seconds; then turn it back on. Squelch relay is energized for 1 to 5 seconds when modulation is reapplied, then deenergizes.	 An energized squelch relay is indicated by an audio voltage output at 618T-( ) receive output. There is no audio output when squelch relay is deenergized. Therefore, audio is present only for 1 to 5 seconds when the modulation is reapplied.	
G. Low Channel Operation and Squelch Delay Check for 618T-( ) With RF Oscillator Module 528-0690-002 (Cont)	Set 618T-( ) squelch enable switch S3 to SQL IN. Turn RF SENS/SQL control on the 714E-( ) control head fully clockwise.		

Preinstallation Test Procedure
Figure 504 (Sheet 15)

TEST/STEP	PROCEDURE	RESULTS	NOTES
G. (Cont)	Set signal generator to 7.300 MHz externally modulated 30% at 600 Hz and an output level of 5 μV. Turn external modulation off.	Uninterrupted audio output is present. Squelch relay drops out within 1 to 5 seconds. This is indicated by loss of audio output.	
H. High Channel Squelch Check for all 618T-( ) With Squelch Capability (Cont)	Set 618T-( ) squelch enable switch S3 to SQL IN. Turn RF SENS/SQL control on the 714E-( ) control head fully clockwise. Set signal generator to 7.300 MHz externally modulated 30% at 2500 Hz and an output level of 50 μV. Turn modulation off and on and note operation of squelch relay.	Squelch relay does not energize as indicated by no loss of audio output from 618T-( ).	

TEST/STEP	PROCEDURE	RESULTS	NOTES
I. Squelch Override Check (Applicable only to 618T-( ) with rf oscillator module 528-0690-001 or rf oscillator module 528-0690-002 with MCN 1284 and above or rf oscillator module 528-0690-002 MCN 1283 and below that include the positive override modification per 618T-2/3 Service Bulletin No 32 or 618T-2B/3B Service Bulletin No 14)	Set 618T-( ) squelch enable switch S3 to SQL IN. Turn RF SENS/SQL control on the 714E-( ) control head fully clockwise. Set signal generator to 7.300 MHz externally modulated 30% at 2500 Hz and an output level of 5 μV. Set 618T-( ) squelch enable switch S3 to SQL OUT.	Uninterrupted audio is present at output of 618T-( ).	
3. TRANSMITTER TESTS	CAUTION: FOR ALL TRANSMITTER TESTS, ENSURE THAT BIRD 8201 RF DUMMY LOAD IS CONNECTED TO 618T-( ) ANT. JACK J4.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
A. AM Power Output and TGC Adjustment	CAUTION: DO NOT KEY 618T-( ) WITH POWER AMPLIFIER COVER OFF OR WITH LOOSE COVER SCREWS. DO NOT OPERATE POWER AMPLIFIER MORE THAN 1 SECOND. DAMAGE TO TUBES WILL RESULT.		
	Set 714E-( ) to 2.100 MHz, AM.		
	Connect HP 455A Probe T-Connector between Bird 8201 Dummy Load and 618T-( ) ANT. jack. Connect HP 410B VTVM to the probe T-connector.		
	Key 618T-( ), and allow time for it to tune.	Vtvm should indicate 70 to 90 V.	No audio input.
	Repeat with the 714E-( ) frequency selector switches set to each MHz band from 3.100 to 28.1 MHz and at 29.900 MHz.	Same as above.	
(Cont)	Key 618T-( ) with 714E-( ) at 2.000 MHz, AM mode.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
A. (Cont)	Check voltage on HP 410B VTVM. Set 714E-( ), in turn, to 3.000, 4.000 through 29.000 MHz, AM mode. Check voltage on HP 410B VTVM and determine lowest gain MHz band. Set 714E-( ) to lowest gain MHz band as determined above, AM mode, and key 618T-( ). Set A11R5 for 75 V as indicated on HP 410B VTVM. Unkey 618T-( ).		
B. Residual Output Voltage	Set 714E-( ) to 2.100 MHz, USB. Key 618T-( ). Record HP-410B indication. Repeat with 714E-( ) mode selector switch set to LSB. Unkey 618T-( ).	Not more than 25 V at T-1 and T-2. 30 V at T-3. Same as above.	No audio input.

TEST/STEP	PROCEDURE	RESULTS	NOTES
C. Single Sideband Power Output	Set 714E-( ) to 2.100 MHz, USB. Connect microphone into MIC jack J2 on 618T-( ) front panel. Key 618T-( ), and talk into the microphone. Set 714E-( ) frequency selector switches to 29.900 MHz, and repeat.	 Vtvm should indicate 126 to 175 V. Same as above.	
D. Frequency Accuracy	Connect frequency counter through the proper voltage divider to the BNC T-connector in the rf output line. Set 714E-( ) to 2.100 MHz, AM. (Use 2- to 8-MHz capacitive divider.) Key 618T-( ), and observe counter. Repeat for each MHz band from 3.100 to 28.000 MHz and 29.900 MHz. (Use 2- to 8- MHz capacitive divider to 8 MHz. Use 8- to 30-MHz capacitive divider from 8 through 29.9 MHz.)	 Counter should indicate 2.100 MHz. Counter indication should be the same as frequency setting on 714E-( ).	Voltage dividers are supplied in the 678Y-( ). Tolerance is ±0.8 part per million. Tolerance is ±0.8 part per million.

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. Modulation Capability	Connect oscilloscope vertical input to probe T-connector using 11- to 14-pF oscilloscope probe. (If oscilloscope probe is not available, use 8- to 30-MHz capacitive divider from the 678Y-( ) Maintenance Kit.) Set 714E-( ) to 7.300 MHz, AM. Connect audio oscillator to NO. 1 AUDIO IN jack on 678Z-1 Function Test Set. Connect AUDIO OUT jack on 678Z-1 to MIKE jack on 678P-( ) Test Harness using mike cable from 678Y-( ) Maintenance Kit. Connect Ballantine 310A VTVM to TEST POINT jack on 678Z-1. Key 618T-( ).		
(Cont)			

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (Cont)	Set audio oscillator frequency to 2000 Hz, and adjust output level to minimum.		
	Slowly increase output level of audio oscillator until 85% modulation is noted on oscilloscope.	Vtvm should indicate 0.25 V or less.	An oscilloscope indication of a ratio of maximum peak-to-peak envelope height to minimum peak-to-peak envelope height is 12:1 at 85% modulation.
	Unkey 618T-( ).		
	Disconnect 678Z-1 from 678P-( ).		
F. CW Output	See note. Set 714E-( ) to 2.100 MHz, CW.		If 714E-( ) does not have CW switch position, set mode selector switch to USB.
	Operate CW key on 678P-( ) Test Harness.	HP 410B VTVM should indicate 70 to 90 V.	No audio input.
(Cont)	Repeat with 714E-( ) frequency selector switches set to 8.100 and 29.900 MHz.	Same as above.	

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	Rapidly key and unkey 618T-( ).	Waveform on oscilloscope should be as shown in figure 505.	
G. Sidetone Operation	Set the 714E-( ) to 7.300 MHz, USB. Connect high-impedance headphones into PHONE jack on 618T-( ) front panel and microphone to MIC jack on 618T-( ) front panel. Key 618T-( ) and speak into microphone. Unkey 618T-( ).	Sidetone should be audible in headphones.	
4. SYSTEM INTERFACE CHECKS (Cont)	The following checks are made from ground to the indicated pin on the 618T-( ) rear connector, P40. If 678P-( ) Test Harness is used, measurements can be made to pins on the unused 618T-( ) connected on the 678P-( ). If the 678P-( ) Test Harness is not used, provision should be made in the bench interconnect system for		

TEST/STEP	PROCEDURE	RESULTS	NOTES
4. (Cont)	test points in the wiring to the 618T-( ) rear connector pins listed in the following checks.		
A. +260-Volt DC Output	Disconnect vtvm, oscilloscope, and counter from 618T-1( ). Set 714E-( ) to AM, any frequency. Connect HP 410B VTVM dc probe to P40-7 of 618T-( ). Key 618T-( ). Unkey 618T-( ).	Vtvm should indicate +234 to +286 Vdc.	
B. 115-Volt 400-Hz Output (Cont)	Set 714E-( ) to AM, any frequency. Connect HP 410B VTVM ac probe to P40-11 of 618T-( ).	Vtvm should indicate 103 to 128 Vac.	Some 678P-1 equipment have pilot lamps to indicate presence of chopper power and recycle signal. Where present, simply key transmitter on any AM frequency (with no coupler in mockup and observe lamps. Lighted lamps signify flow

TEST/STEP	PROCEDURE	RESULTS	NOTES
B. (Cont)			of recycle signal and chopper power. Where these pilot lamps are not installed, follow procedures in steps B, C, D, and E.
C. +27.5-Volt DC Output	Set 714E-( ) to AM, any frequency. Connect HP-410B VTVM dc probe to P40-56 of 618T-( ).	Vtvm should indicate +24.5 to +30.5 Vdc.	
D. Chopper Enable Output (Cont)	CAUTION: DO NOT CONNECT AN ANTENNA COUPLER TO THE SYSTEM WHILE PERFORMING THIS CHECK. THE ANTENNA COUPLER MAY INTRODUCE VOLTAGES WHICH WILL DAMAGE THE TEST EQUIPMENT USED FOR OHMMETER MEASUREMENTS. Set 714E-( ) to AM, any frequency.		

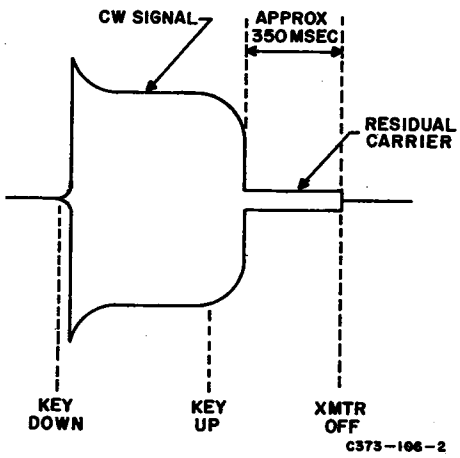
TEST/STEP	PROCEDURE	RESULTS	NOTES
D. (Cont)	Key 618T-( ).	Chopper ground lamp on 678P-1 lights.	If 678P-1 is not equipped with chopper ground and coupler retune lamps, do the following procedures of step D.
	Release 618T-( ) key.	Chopper lamp goes out.	
	Connect HP 410B VTVM ohms probe to P40-9 and common 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 (Cont)	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.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
E. (Cont)	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 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.		
(Cont)	Key 618T-( ).	Vtvm should indicate 25 V or less.	

TEST/STEP	PROCEDURE	RESULTS	NOTES
F. (Cont)	Unkey 618T-( ). Press the TUNE POWER switch on the 678P-( ) Test Harness, and key 618T-( ). CAUTION: DO NOT HOLD 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 (Cont)	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 μV, 30% modulated with 1 kHz. Tune signal generator around 7.300 MHz to peak voltage at 678P-( ) HEADSET jack.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
G. (Cont)	Adjust AUDIO control R10 on 618T-( ) front 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 (Cont)	Connect 678Z-1 and audio oscillator as shown in figure 502. 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.		

TEST/STEP	PROCEDURE	RESULTS	NOTES
H. (Cont)	Adjust SIDETONE level control R9, on 618T-( ) front panel, for 5.5 Vrms at 678P-( ) HEADSET jack. Unkey 618T-( ).		
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-( ).		



Envelope of CW Keying
Output From 618T-( )
Figure 505

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

1. GENERAL.

This section describes inspections and checks to be performed upon the 618T-( ) and its associated equipment while it is installed in the aircraft.

2. PROCEDURE.

A. Check the shockmount in a normal loaded position. Check for noticeable sagging in any of the resilient mounts.

B. Check the equipment for damage to the finish.

C. Check all cabling to the equipment for signs of wear, broken wires, or bad connections. Check that all cable connectors are secure. Check that all ground straps are secure.

D. Check that the equipment is securely fastened to the shockmount and that the tightening nuts on the shockmount are safety wired.

E. Check the blower air filter. The filter may be removed by removing the two Dzus fasteners holding the front panel cover to the chassis. Pull the filter straight up to remove it from its holder. If the filter needs cleaning, refer to the 618T-( ) overhaul manual, Collins part number 520-5970003.

618T-( ) Airborne SSB Transceiver - Cleaning/Painting

1. GENERAL.

No cleaning or painting is required or recommended while the equipment is installed in the aircraft. Approved cleaning and painting procedures should be performed when the equipment is removed from the aircraft as described in the 618T-( ) overhaul manual, Collins part number 520-5970003.

618T-( ) Airborne SSB Transceiver - Approved Repairs

1. GENERAL.

Do not attempt repairs which require the removal of the dust cover of the 618T-( ) while the equipment is installed in the aircraft. Complete overhaul instructions are furnished in the 618T-( ) overhaul manual, Collins part number 520-5970003.

CAUTION: ANY ATTEMPTED REPAIRS OF THE 618T-( ) WITHOUT THE REQUIRED TEST FACILITIES SPECIFIED IN THE OVERHAUL MANUAL MAY RESULT IN MISALIGNMENT OF THE EQUIPMENT AND CAUSE LOSS OF ACCURACY AND REDUCED RELIABILITY.

618T-( ) Airborne SSB Transceiver - Illustrations

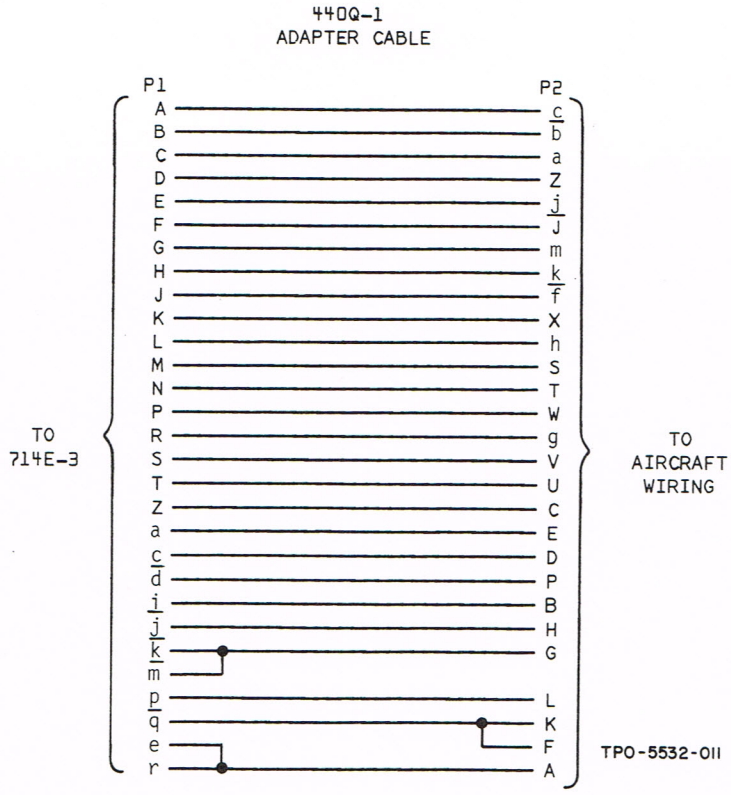
1. GENERAL.

618T-( ) chassis and module schematics are contained in the 618T-( ) Overhaul Manual.

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
		This page will contain schematic revision information.		

440Q-1 Adapter Cable, Schematic Diagram (Sheet A)
Figure 901

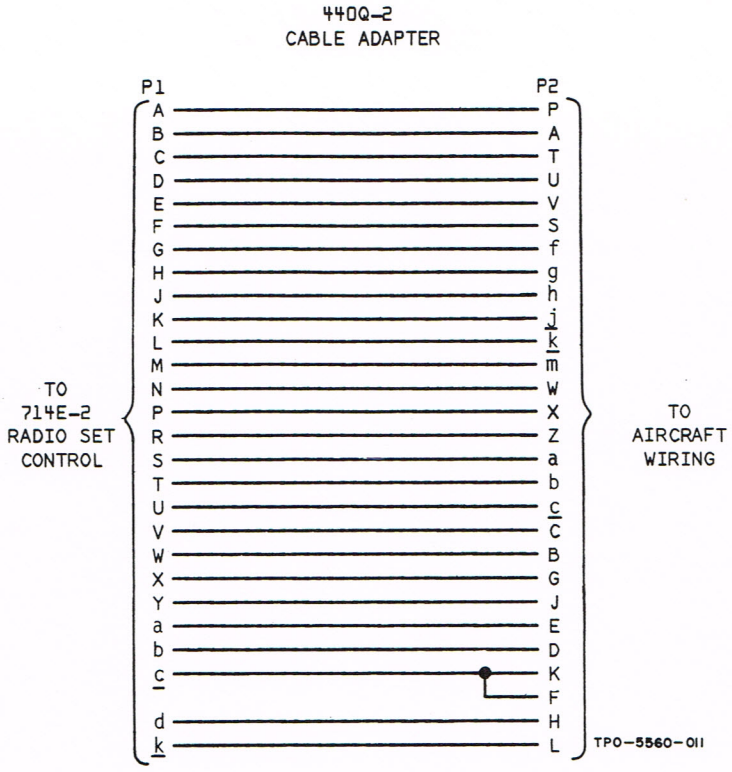


440Q-1 Adapter Cable, Schematic Diagram
Figure 901

SCHEMATIC CHANGES

PAGE	REVISION IDENTIFICATION	DESCRIPTION OF REVISION AND REASON FOR CHANGE	SERVICE BULLETIN	EFFECTIVITY
	This page will contain schematic revision information.			

440Q-2 Adapter Cable, Schematic Diagram (Sheet A)
Figure 902



440Q-2 Adapter Cable, Schematic Diagram
Figure 902

SCHEMATIC CHANGES

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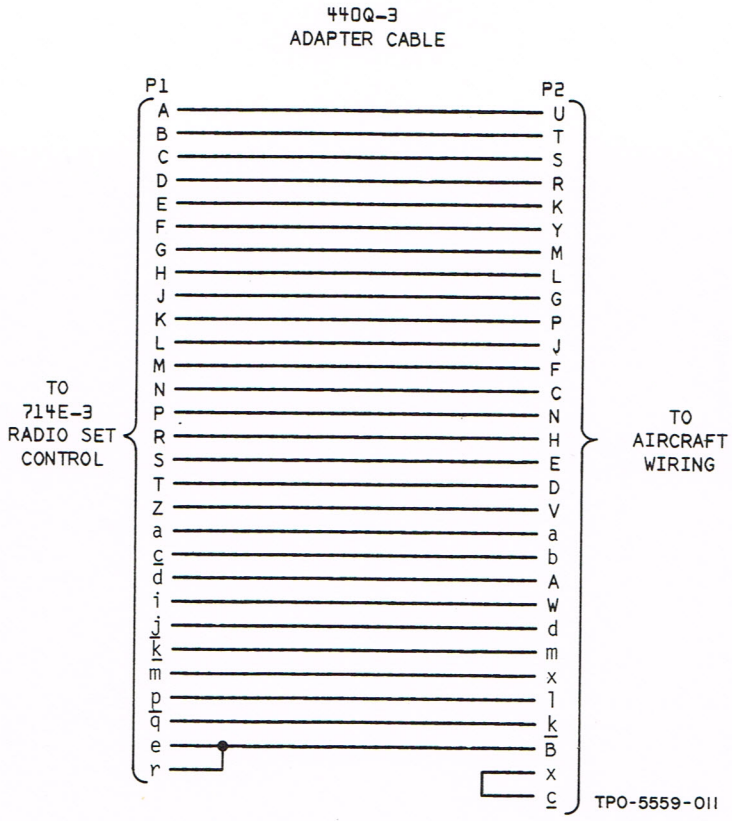
440Q-3 Adapter Cable, Schematic Diagram (Sheet A)
Figure 903



440Q-3 Adapter Cable, Schematic Diagram
Figure 903

SCHEMATIC CHANGES

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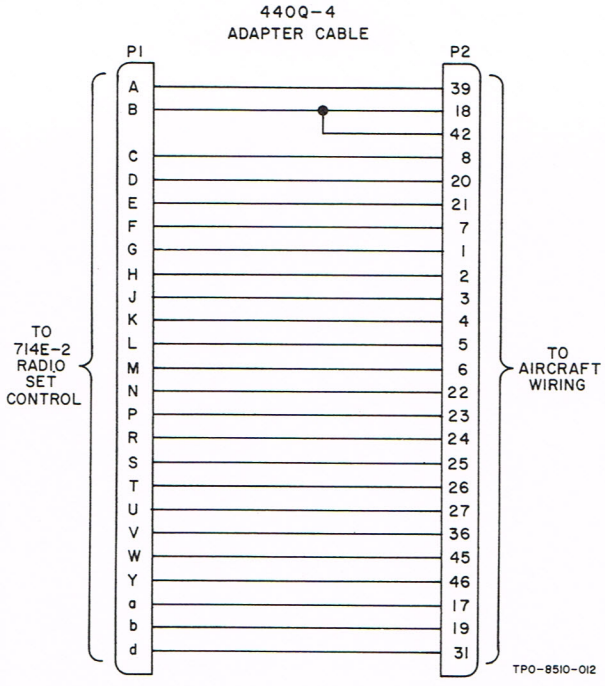
440Q-4 Adapter Cable, Schematic Diagram (Sheet A)
Figure 904



440Q-4 Adapter Cable, Schematic Diagram
Figure 904