TECHNICAL MANUAL

COMBINED OPERATION AND MAINTENANCE INSTRUCTIONS WITH CIRCUIT DIAGRAMS AND ILLUSTRATED PARTS BREAKDOWN

700VA POWER INVERTER

P/N 200810

C.F. ELECTRONICS, INC.

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USAF

SAFETY SUMMARY

WARNING

1,1,1 Trichloroethane (O-T-620, Type 1) is moderately toxic to skin, eyes, and respiratory tract. Avoid exposure or contact. Gloves and goggles are required. Good general ventilation is normally adequate.

WARNING

Dangerous voltages are present within this unit. Use extreme care when working on the equipment with power on, and when measuring supply and output voltages at equipment test points and connector. Always disconnect the equipment from the dc source when checking external wiring for continuity.

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INTRODUCTION

This publication provides instructions for operation and maintenance of the 700VA Power Inverter, Part Number 200810, manufactured by C.F. Electronics, Inc., Commack, New York. Eight chapters are provided herein, arranged as follows:

Chapter 1 - GENERAL INFORMATION - This chapter includes general information about the power inverter and its support requirements.

Chapter 2 - INSTALLATION - This chapter contains information required for installation of the power inverter.

Chapter 3 - PREPARATION FOR USE AND RESHIPMENT - This chapter describes procedures necessary to prepare the equipment for operator usage. In addition, procedures for reshipment of the power inverter are also included.

Chapter 4 - OPERATION INSTRUCTIONS - This chapter contains information required for operation of the equipment.

Chapter 5 - THEORY OF OPERATION - This chapter describes the theory of operation of the equipment from a functional standpoint.

Chapter 6 - MAINTENANCE - This chapter provides information required for proper maintenance and repair of the equipment.

Chapter 7 - ILLUSTRATED PARTS BREAKDOWN - This chapter contains information necessary for identification and ordering of replacement parts used in the equipment.

Chapter 8 - CIRCUIT DIAGRAMS - This chapter includes schematic and wiring data for the power inverter.

CHAPTER 1

GENERAL INFORMATION

1-1. DESCRIPTION OF EQUIPMENT. The 700VA Power Inverter (hereafter referred to as power inverter), figure 1-1, is contained in a single equipment case. There are no external operable controls and all electrical interconnections with the unit are made at the rear of the chassis. Two rear guide pins and two equipment hold-down clamps, at the front of the unit, provide chassis mounting. All chassis components are accessible for servicing once the side panel is removed from the case.

1-2. PURPOSE OF EQUIPMENT. The power inverter converts a 28-volt do input power source to 120 volts ac output at 400 Hz.

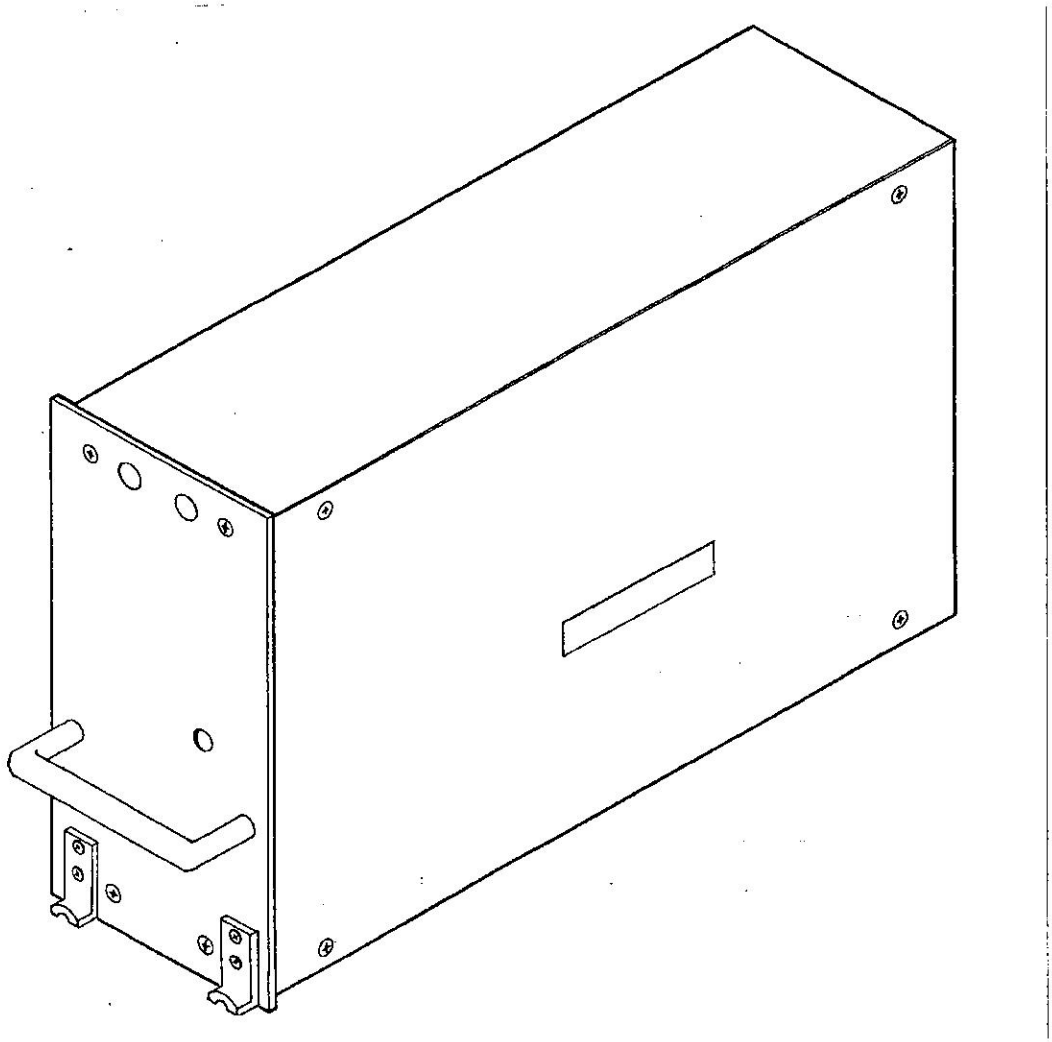


Figure 1-1. 700VA Power Inverter

1-3. LEADING PARTICULARS. Physical and electrical specifications for the power inverter are listed in table 1-1.

Table 1-1. Leading Particulars

Characteristic	Specification
Dimensions	3.68 in. W (9.34 cm) x 13.64 in. D (34.64 cm) x 7.8 in. H (19.8 cm)
Weight	16 lbs. (7.2 Kg)
Input Voltage	22 to 32 volts dc
Input Current	35A max. at 27.5 volts dc

1-4. CAPABILITIES AND LIMITATIONS. Capabilities and limitations of the power inverter are listed in table 1-2.

Table 1-2. Capabilities and Limitations

Characteristic	Specification
Output Voltage	120 ±6 volts ac single-phase, 400 Hz
Output Current	700VA continuous; 800VA intermittent
Duty Cycle	Continuous
Protective Features	Short-circuit protection (output); reverse polarity protection (input)
Temperature Range	Operating: -40 deg. F. (-40 deg. C.) to +122 deg. F. (+50 deg. C)
	Non-Operating: -65 deg. F (-54 deg. C.) to +150 deg. F. (+68 deg. C.)

1-5. EQUIPMENT SUPPLIED. The power inverter is a self-contained unit which is supplied ready for operation. Other than input and output power interconnections, no additional equipment is required to ensure that the unit performs its intended function.

1-6. EQUIPMENT REQUIRED BUT NOT SUPPLIED. Refer to table 1-3 for a listing of tools and test equipment required to perform checkout and maintenance procedures on the power inverter. Other than the items listed in table 1-3, only standard hand tools are required for maintenance on the equipment. Equivalent test equipment may be substituted if recommended test equipment is unavailable.

Table 1-3. Tools and Test Equipment List

Type Designation	Nomenclature	Quantity	Use and Application
Empro HA10-100	Meter Shunt	1	Measurement of supply current
Weston 7135	True RMS DMM	2	Measurement of ac output voltage, dc supply and resistance
Tektronix 2213	Oscilloscope	1	Measurement of waveforms
Hewlett-Packard HP6269B	Dc Power Supply	1	Supplies 20 to 35 volts dc for test
Hewlett-Packard HP5314A	Frequency Counter	1	Measurement of output frequency

Table 1-3. Tools and Test Equipment List - Continued

Type Designation	Nomenclature	Quantity	Use and Application
Parts Needed for Test Fixture:			
	Connector, Cannon P/N DPXB-8-335-0201	1	Access input and output voltage test points
	Switch, SPST, 40A	1	Input power control
	Load Resistance, 20.6 ohms, 800W, c/o:		Output load testing
	5 ohm, 210W resistor, P/N RW47V050	4	Connect in series to assemble
	2 ohm, 100W variable resistor	1	20 to 22 ohm variable load
	Load Resistance, 18 ohms, 1000W, c/o:		Output load testing
	90 ohm, 210W resistor, P/N RW47V90	5	Connect in parallel to assemble 18 ohm fixed load

CHAPTER 2 INSTALLATION

2-1. INTRODUCTION. This chapter provides instructions for installation of the power inverter. Section I contains information relative to unpacking and storage of the equipment prior to and during installation. Section II contains instructions for equipment interconnections and installation.

Section I

INSTALLATION LOGISTICS

2-2. UNPACKING. To unpack the power inverter, proceed as follows:

a. Cut the tape sealing the top of the box, fold back flaps and place box on side.
b. Remove bagged unit and set upright on work surface. Discard carton.
c. Slit open bag and peel away from box, slit open inner box and remove unit.
d. Lift power inverter out of box, place unit on work surface for inspection.
e. Check that unit is intact and shows no signs of external damage due to shipment and handling.

2-3. STORAGE. No special procedures are required for storage of the equipment. However, it is advisable to leave the equipment in the polyethylene shipping bag until it is installed.

Section II

INSTALLATION PROCEDURES

2-4. INSTALLATION. The power inverter is self-contained and requires no preliminary installation procedures. The unit is intended for use with specified types of equipment and its installation and interconnection with this equipment is described in the respective Technical Orders. Generally, installation of the power inverter consists of inserting the unit into the equipment rack, seating it fully so that the rear connector mates properly with the rack connector, and locking the unit into place with the two front hold-down clamps. On-off operation of the unit is controlled by the associated equipment/power source controls.

2-5. POWER REQUIREMENTS. All power required for operation of the power inverter is furnished and switched by the associated equipment. Input voltages will vary from 22 to 32 volts dc; output voltage is regulated to 120 ±6 volts ac, 400 Hz, and supplied to the powered equipment via the inverter rear-panel connector.

CHAPTER 3

PREPARATION FOR USE AND RESHIPMENT

3-1. INTRODUCTION. This chapter provides instructions necessary to prepare the power inverter for use and reshipment.

Section I

PREPARATION FOR USE

3-2. PREPARATION FOR USE. The power inverter is shipped factory-calibrated and ready for operation. No special procedures are required to prepare the equipment for use.

Section II

PREPARATION FOR RESHIPMENT

3-3. PREPARATION FOR RESHIPMENT. If the power inverter cannot be packed for shipment in the original packing materials, pack the unit carefully, using a vapor barrier and corrugated materials for protection. Use a desiccant whenever the power inverter is packaged for reshipment. or storage.....

CHAPTER 4 OPERATION INSTRUCTIONS

4-1. GENERAL. The unit is designed for unattended operation; control over equipment operation is exercised by the associated equipment.

CHAPTER 5

THEORY OF OPERATION

5-1. INTRODUCTION. This chapter describes the theory of operation of the power inverter with reference to a detailed functional block diagram. Refer to T.O. 31-1-141 for information concerning operation and functioning of basic circuits.

5-2. FUNCTIONAL DESCRIPTION. Figure 5-1 is a functional block diagram of the power inverter, showing how the dc input is converted to a 120-volt ac, 400 Hz, single-phase output. Power interconnections and external switching are accomplished via connector J1. Refer to figure 8-1 for a detailed schematic diagram of the unit.

a. Input Circuits. The 28 volt dc supply is connected to the power inverter between J1-1/2(+) and J1-5/6(-). EMI filtering is provided by a bypass filter consisting of capacitors A2C1 through A2C8, contained on the EMI circuit board assembly, A2. The filtered do supply is split into two lines: one line supplies the +15 volt dc regulator, A1U1, via forward-biased diode CR1; the second line is connected directly to the power switching stage, Q1, Q2.

b. +15V Regulator Circuit. Diode CR1 is part of the input voltage polarity protection circuit which inhibits power inverter operation if the supply voltage is not connected in the proper polarity. Note that CR1 and power transistors Q1 and Q2 are part of the chassis assembly. The +15 volt regulator, A1U1, supplies the regulated operating voltages for the 400Hz square-wave generator, switching regulator, and rms-to-dc converter stages. These components are part of the driver circuit board assembly, A1.

c. Square Wave Generator and Switching Regulator Circuits. The square wave generator, consisting of crystal-controlled oscillator/divider A1Y1/A1U5 and amplifier A1Q3, provides an 800 Hz pulse output to the switching regulator, A1U2. The switching regulator switches the push-pull power switcher transistors, Q1 and Q2, on and off at a 400 Hz rate to generate a 400 Hz chopped dc voltage in the primary of output transformer T1. The secondary output of T1 is applied to the load through a 400 HZ EMI filter, A2L1, A2C13, and A2C14.

d. Rms-to-Dc Converter and Power Switcher Circuits. Amplitude regulation for the power switcher stage, and, therefore, output voltage regulation, is provided by to-dc converter stage, A1U3. A small, proportional ac signal is fed back to A1U3 via a secondary tap on T1. The ac signal is converted to a proportional dc level and supplied as a switching regulator control voltage. Variations in ac output voltage then appear as corresponding positive- or negative-going do levels which tend to adjust the switching regulator output to vary the duty cycle of the power switching transistors to maintain constant output voltage. Potentiometer A1R10 is a screwdriver adjustment which is recessed behind an access hole in the case front panel and may be used to vary the output voltage within limits to maintain nominal value.

e. Circuit Protection. Circuit protection against excessive load currents or external shorts is provided by a do load current sense output from the power switcher stage. This do signal, proportional to the current drawn through Q1 and Q2, can be set, via A1R23, to inhibit operation of the switching stage, via the switching regulator, if the output current exceeds a desired threshold value. Note that A1Q1 and A1Q2 are part of the "soft start" power-up signal.

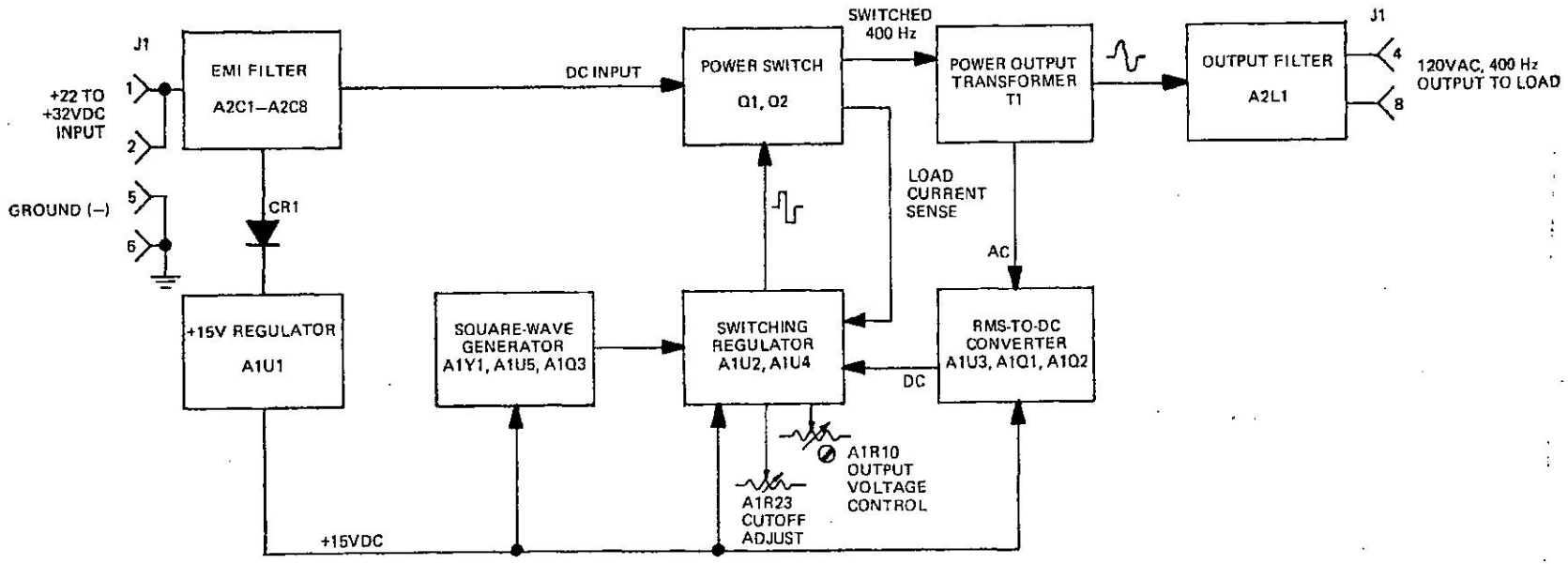


Figure 5-1. Functional Block Diagram

CHAPTER 6 MAINTENANCE

6-1. INTRODUCTION. This chapter provides instructions for maintenance of the power inverter and includes information on inspection and preventive maintenance procedures, troubleshooting, repair and checkout.

6-2. SCOPE OF MAINTENANCE PROCEDURES. The power inverter is designed to be maintained by the generally acknowledged maintenance organization organic to the U. S. Air Force. Three levels of maintenance organization will be employed in maintaining the power inverter, as follows: Section I provides organizational and intermediate maintenance; Section II provides special (depot level) maintenance; and. Section III provides instructions for performance testing.

Section I

ORGANIZATIONAL AND INTERMEDIATE MAINTENANCE

6-3. GENERAL. Organizational maintenance of the power inverter is restricted to visual external inspection, external cleaning, functional checking and the return of unserviceable power inverters to an intermediate maintenance repair facility. Failure of the power inverter to meet functional checkout requirements is indicated by malfunctioning of the unit during dynamic operation. Intermediate maintenance of the power inverter consists of repairing equipment failures by replacement of circuit board subassemblies and using general-purpose test equipment. Use of-test . equipment is limited to performing measurements at external inverter test points and at designated available test points accessible within the unit.

6-4. INSPECTION AND PREVENTIVE MAINTENANCE. Equipment inspections and preventive maintenance checks should be performed on a regularly-scheduled basis to be most effective. Tables 6-1 and 6-2 provide these procedures on a before-use basis and a 180-day basis.

Table 6-1. Before-Use Inspections and Preventive Maintenance Checks

Sequence No.	Item to be Inspected	Procedure
1	Connector	Check connector for damage, corrosion, dirt.

Table 6-2. 180-Day Inspections and Preventive Maintenance Checks.

Sequence No.	Item to be Inspected	Procedure
1	Connector	Check connector for damage, corrosion, dirt.
2	Interior	Clean interior of chassis and cabinet.
3	Metal surfaces	Inspect for scratches or gouges.

6-5. CLEANING. Inspect the exterior of the equipment. Exterior surfaces should be free of dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

WARNING

1,1,1 Trichloroethane (O-T-620, Type 1) is moderately toxic to skin, eyes, and respiratory tract. Avoid exposure or contact. Gloves and goggles are required. Good general ventilation is normally adequate.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with tricholoroethane O-T-620, Type 1.

c. Remove dirt from connector with a brush.

6-6. TOUCHUP PAINTING INSTRUCTIONS. The equipment housing and panels are fabricated from .125-inch thick aluminum alloy, Type 5052 per Specification QQ-A-250/8. Equipment finish is anodized, dull black, Type II per Specification MIL-A-8625. Refer to the applicable cleaning and refinishing practices.

6-7. LUBRICATION. No lubrication is required.

6-8. TEST EQUIPMENT REQUIRED. Refer to table 6-3 for a list of test equipment required for performance of intermediate maintenance procedures.

Table 6-3. Test Equipment Required for Intermediate Maintenance

Type Designation	Nomenclature	Application
Weston 7135	True RMS DMM	Measurement of ac output voltage, dc input voltage and resistance
Hewlett-Packard HP6269B	Dc Power Supply	Provide dc input supply voltage

6-9. INTERMEDIATE TROUBLESHOOTING AND REPAIR PROCEDURES. Before removing the power inverter from the installation, check first to be sure that the failure is in the unit, not the interconnecting cabling from the dc source or to the ac load.

WARNING

Dangerous voltages are present within this unit. Use extreme care when working on the equipment with power on, and when measuring supply and output voltages at equipment test points and connector. Always disconnect the equipment from the dc source when checking external wiring for continuity.

a. Using a true RMS ac voltmeter, check that 120 volts ac is present between test points, TP1 and TP2, located on the power inverter front panel. If this voltage appears at these points, but is not being supplied to the external load, check interconnecting wiring between J1-14 and J1-8 and the load.

b. If the required ac output is not present at TP1 and TP2, check that the dc source is connected to the power inverter. Disconnect plug P1 from the rear of the unit and, using the dc voltmeter, check between terminals 1 or 2 (+) and terminals 5 or 6 (-) for 22 to 32 volts dc. If this voltage is not present, check interconnecting wiring to the dc supply. If this voltage is present, and no ac output is supplied from the inverter, the unit itself is malfunctioning and repairs are required. Refer to paragraph 6-10 for appropriate troubleshooting procedures.

6-10. TROUBLESHOOTING PROCEDURES. Repairs made to the power inverter at the intermediate level of maintenance are limited to troubleshooting by substitution, which includes removal and replacement of circuit boards A1 or A2. If circuit board substitution fails to correct the problem, further repairs must be accomplished at a higher level of maintenance. Refer to figure 7-1 for disassembly of the equipment case and location of power inverter unit subassemblies.

a. Loosen the four captive screws which secure the cover to the case and remove the cover.

b. Examine the interior components of the unit, wiring, terminal connections, etc. for obvious signs of failure (charred resistors, pitted terminals, loose terminals, etc.). If the failure is apparent and can be corrected by the repairman by circuit board replacement, or tightening or cleaning-terminated leads, do so. If not, refer the power inverter to the next higher maintenance level for repair. After the corrective action has been accomplished, before returning the unit to service, connect a source of 28 volts dc between J1-1 (+) and J1-5(-) and check that approximately 120 volts ac appears between test points TP1 and TP2. If the output voltage is present, perform the checkout and calibration procedures given in paragraph 6-15 before the unit is returned to service.

Section II SPECIAL MAINTENANCE

6-11. GENERAL. Repairs accomplished at this level of maintenance include complete diagnosis, repair and alignment of all components of the inverter which are beyond the capability of the organizational and intermediate maintenance facilities. Fault isolation and repair procedures will aid the repairman to locate and repair piece-part failures through the use of available test equipment and standard troubleshooting methods.

6-12. TEST EQUIPMENT REQUIRED. Refer to table 6-4 for a list of test equipment required for performance of depot maintenance procedures.

Table 6-4. Test Equipment Required for Depot Maintenance

Type Designation	Nomenclature	Quantity	Use and Application
Empro HA10-100	Meter Shunt	1	Measurement of supply current
Weston 7135	True RMS DMM	2	Measurement of ac output voltage, do supply and resistance
Tektronix 2213	Oscilloscope	1	Measurement of waveforms
Hewlett-Packard HP6269B	Dc Power Supply	1	Supplies 20 to 35 volts do for test
Hewlett-Packard HP5314A	Frequency Counter	1	Measurement of output frequency
Parts Needed for Test Fixture:			
Connector, Cannon P/N DPXB-8-335-0201		1	Access input and output voltage test points
Switch, SPST, 40A		1	Input power control
Load Resistance, 20.6 ohms, 800W, c/o:			Output load testing
5 ohm, 210W resistor, P/N RW47V050		4	Connect in series to assemble
2 ohm, 100W variable resistor		1	20 to 22 ohm variable load
Load Resistance, 18 ohms, 1000W, a/o:			Output load testing
90 ohm, 210W resistor, P/N RW47V90		5	Connect in parallel to assemble 18 ohm fixed load

6-13. TROUBLESHOOTING AND REPAIR PROCEDURES.

a. Place the power inverter on the work surface and loosen the captive screws which hold the side cover in place. Remove the cover and set aside.

b. Connect the power inverter to the power supply, test equipment, external loads and associated equipment as shown in figure 6-1, and described below. Do not apply power to the unit under test at this time.

(1) Connect the output of the variable voltage power supply to pins 1(+) and 5 (-) of test connector P1.

(2) Connect the external resistor loads in series with the ammeter and SPST switch between pins 4 and 8 of test connector P1.

(3) Connect the ac voltmeter and the frequency counter between test points TP1 and TP2.

c. Troubleshoot the power inverter in accordance with the in-circuit voltage measurements and test waveforms annotated on the overall schematic diagram, figure 8-1. The location of all chassis-mounted and circuit board components is shown in the parts location diagrams given in the Parts List, Chapter 7.

Section III

PERFORMANCE TEST CHECKS

6-14. GENERAL. After the power inverter has been repaired, it is necessary to check that the unit meets the minimum performance standards. The performance checks provided in paragraph 6-19 describe a functional checkout of the power inverter under varying output loads, as well as varying do input supply voltages. Paragraphs 6-20 and 6-21 describe checkout of the automatic shutoff feature, which disables the power inverter in the event of external overloads or short-circuits.

6-15. CALIBRATION PROCEDURES. The need for calibration may become apparent during normal equipment operation. Generally, small variations from performance requirements can be corrected by equipment adjustments; large variations from nominal are usually an indication of equipment component failure. In this instance, or if calibration fails to bring circuit performance in-line, repairs must be accomplished on the equipment.

6-16. Three adjustments are included in the power inverter, located on circuit board assembly A1 (figure 7-2):

a. A1R10, voltage adjust, accessible through the front panel
b. A1R27, voltage adjust range
c. A1R23, overload adjustment

6-17. OUTPUT VOLTAGE ADJUSTMENT. Connect power inverter to test setup, figure 6-1.

a. Apply 27.5 volts and switch S1 (20.6 ohms) to on position. If the ac output cannot be varied approximately ±6 volts about the nominal 120 volts ac by A1R10, proceed to step_b; if the adjustment appears correct, proceed to step c.

b. Set A1R10 to mid-position and adjust A1R27 for 120 volts ac inverter output. Check that A1R10 can now be adjusted to approximately the ±6 volt output voltage variation then reset A1R10 to provide 120 volts ac output.

c. De-energize dc power supply, set S1 to off position and remove the power inverter from the test setup.

6-18. SHORT CIRCUIT ADJUSTMENT.

a. Apply 27.5 volts do under a 20.6 ohm load (S1 in on position) and observe that the output voltage is 120 volts ac.
b. Increase input voltage to 30 volts do.
c. Adjust A1R23 clockwise until unit goes into current limiting. (Input voltage will increase to approximately 35 volts do.)
d. Reduce input voltage to $_{33.5}$ volts dc.
e. Adjust A1R23 counterclockwise until voltage returns to normal.
f. Adjust input voltage to 32 volts do and observe that the output voltage is 120 ±6 volts ac.
g. De-energize do power supply, set S1 to off position and remove the power inverter from the test setup.

6-19. PERFORMANCE CHECKS.

CAUTION

Do not operate the power inverter for more than 15 minutes without a cooling air flow of 15 cfm.

a. Connect the power inverter (unit under test) into the test setup shown in figure 6-1.
b. Adjust load resistance RL for 20.6 ohms and set S1 to off (open) position.
c. Energize do power supply (PS1) and adjust output for 27.5 volts dc, as shown on voltmeter M2.
d.---Observe that do current across MS1 (calaulate) reads _less. than 35A_(static_dc input current); ac voltmeter M3 reads 120 volts ±6 volts; and the frequency counter displays 400 ±4 Hz.
e. Set test setup switch S1 to on (closed) position to connect the 20.6 ohms load across the power inverter output.
f. Adjust voltage adjust potentiometer A1R10 between extremes and observe that the ac output voltage, on M3, varies within approximately ±6 volts ac of the nominal 120 volts ac. Reset A1R10 so that M3 reads 120 volts ac.

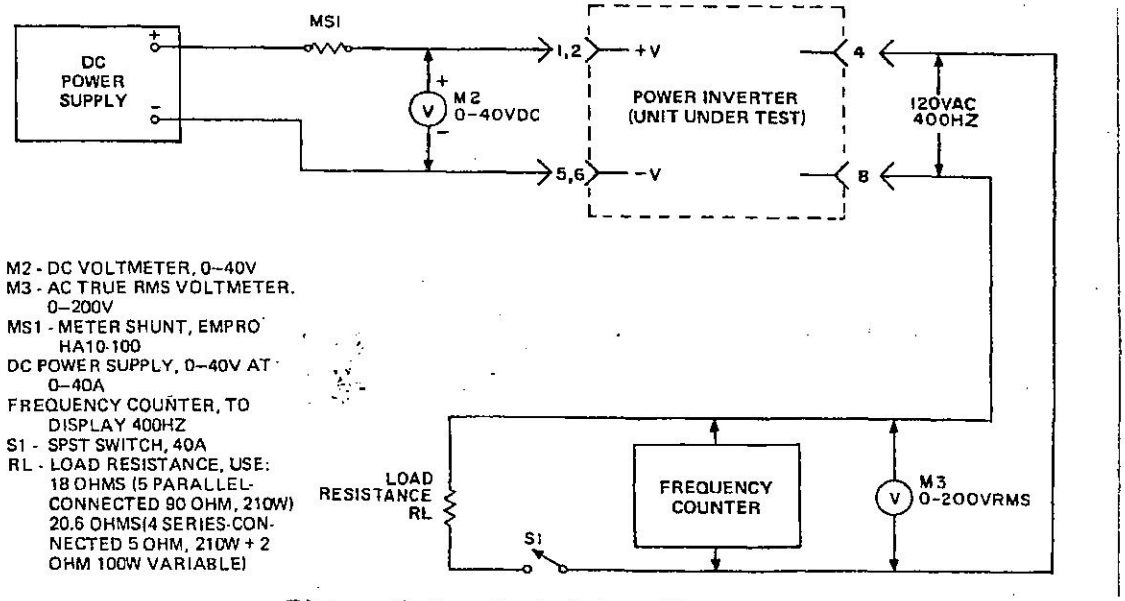


Figure 6-1. Test Setup Diagram

g. Observe that ac output voltage (M3) is 120 ±6 volts ac; calculate ac output current is 6A ±.3A; and that the power inverter dc input current (calculated across MS1) is less than 35A.

h. Adjust dc power supply output to 22 volts dc and see that output voltage (M3) is 120 ±6 volts ac.

i. Adjust dc power supply output to 32 volts dc and see that output voltage (M3) is 120 ±6 volts ac.

j. De-energize dc power supply, set S1 to off position and remove power inverter from test setup.

6-20. OVERLOAD TEST.

a. Adjust load resistance RL for 18 ohms.

b. Energize dc power supply and adjust dc output to 27.5 volts dc.

c. Set test setup switch S1 to on (closed) position to connect the 18 ohm load across the power inverter output and observe that ac output voltage meter (M3) reads 120 ±6 volts ac. Note that the power inverter supplies the correct output voltage for a maximum of one minute under these load conditions.

d. De-energize dc power supply, set S1 to off position and remove power inverter from test setup.

6-21. SHORT CIRCUIT TEST

WARNING

Use care to avoid bodily contact with ac output terminals during shorting step.

a. Connect power inverter into the test setup shown in figure 6-1, with load resistor RL set for 20.6 ohms.

b. Set S1 to off (open) position.

c. Energize dc power supply (PS1) and adjust output for 27.5 volts dc, as shown on M2. Set S1 to on position.

d. Observe that ac voltmeter (M3) reads 120 ±6 volts ac; calculate ac output current (6A ±.3A); and observe that frequency counter reads 400 Hz.

e. CAREFULLY connect a shorting lead or shorting bar across the load circuit (power inverter ac output) and observe that M3 reads 0, MS1 reads 0.9 ±0.2A, and the frequency counter indicates 0. (External short or overload causes a shutdown of the power inverter output circuits.)

f. Remove short from inverter output and observe readings as given in step d.

g. De-energize dc power supply and set S1 to off position. h. Remove power inverter from test setup.

CHAPTER 7

ILLUSTRATED PARTS BREAKDOWN

7-1. GENERAL. This section contains listings and illustrations of replaceable assemblies and components of the 700VA Power Inverter, CFE Part Number 200810. This information is to be used as an aid in maintenance and repair, procurement, requisitioning, storing, issuing and identification of new or reclaimed parts.

7-2. MAINTENANCE PARTS LIST. The maintenance parts list contains information such as part number, name, order of assembly, number of parts-required per assembly, those articles on which a part can be used, etc. The parts information for the major installation and assemblies of the article is presented in the form of a list of parts, or "breakdown" and an accompanying illustration indexed to the breakdown. Each breakdown in arranged with the complete installation or assembly at the head of the list, and with the remaining parts which comprise the breakdown following in number-indent order.

7-3. In general, the assemblies and parts installed at the time the end item(s) was manufactured are listed and identified in the manual. When an assembly or part (including vendor items), which is different from the original, was installed during the manufacture of later items, series or blocks, all assemblies and parts are listed (and "Usable On" coded). However, when the original assembly or part does not have continued application (no spares of the original were procured or such spares are no longer authorized for replacement), only-the-preferred item is listed. Interchangeable and substitute assemblies and parts, subsequently authorized by the Government, are not listed in this manual; such items are identified by information available through the Interchangeable and Substitute (I and S) Data Systems. Refer to T.O. 00-25-184. When a standard size part can be replaced with an oversize or undersized part, the latter parts, showing sizes, are also listed. Repair Parts Kits and Quick Change Units are listed when they are available for replacement.

7-4. The breakdown or parts list for each component, installation or assembly is arranged in column form to give the following information:

Figure and Index Number
Part Number
FSCM
Description and Indent Code
Units Per Assembly
Usable On Code
SMR Code

a. Figure and Index Number Column. This column identifies the figure number of the illustration on which the location and appearance of the parts indexed may be determined.

b. Part Number Column. This column contains the part number assigned to each part by the design activity or manufacturer. Commercial hardware procurable from normal commercial sources that are not identified as government standards, and does not have a manufacturer's part number assigned, are identified as commercial by the symbol "COM'L" in the Part Number column; identifying information such as dimensions, size, material, type and special features are entered in the Description column following the nomenclature.

NOTE

When a part is used in matched pairs, is affected by equipment modifications, is interchangeable only under certain conditions, or is affected by some other condition relating to usability, a symbol will be placed following the part number. This symbol relates to a footnote which describes the special condition.

c. FSCM Column. The respective FSCM (Federal Supply Code for Manufacturers) appears in this column opposite the listed part; manufacturer's codes and names appear in Cataloging Handbook H4-1, H4-2 and H4-3. See paragraph 7-5 for a complete list of FSCM's used in this section. Absence of an FSCM indicates that the item is a part manufactured by CF Electronics (FSCM 55364); or a military standard item.

d. Description and Indent Code Column. The Description column gives the name of the part, shows by a numbered indent system the assembly relationship of each part to other parts in the breakdown and gives pertinent information for vendor's items, description, abbreviations, reference phrases, and Manufacturer's Federal Supply Codes (where applicable).

(1) Nomenclature. The description for each part consists of the nomenclature` placed in the drawing title block of the contractor's or the design manufacturer's drawing. Modifiers separated by commas are added as necessary to further aid in the identification and use or location of the particular item.

(2) Indent of Nomenclature. Numbered columns on the left side of the Description column show, by indent of -the part name, how the various parts build up into subassemblies, etc., to make the complete assembly listed in the first column at the head of the breakdown. Since all detail parts, subassemblies, etc., may not be stocked as spares, such a part may have to be replaced by replacing the next higher assembly. In this case, the next higher assembly of a known part may be determined by noting the first item appearing one column to the left and above the known part. When an assembly is not stocked and must be made up from its component parts, these parts are one column to the right and directly below the known assembly. Any assembly made up of component parts has these component parts listed below and once column to the right. Any parts or assemblies appearing in the same indent must be used together to make up the next higher assembly appearing above and one column to the left and can never be used as components of each other. The only exception to this breakdown is in the case of attaching parts, which are listed immediately following and in the same column as the part which they attach. They are identified by the designation (AP). To determine the next higher assembly for any item appearing in column one of the breakdown, refer to the figure in parenthesis after the item nomenclature. Referenced figure number following assemblies or subassemblies in the breakdown indicate that it has been impracticable to illustrate the complete subassembly on the illustration for the breakdown, and that a separate illustration and parts listing is provided by the referenced figure.

(3) Special Descriptive Information. Following the nomenclature of each part in the parts description, additional information which is applicable may be given for superseding parts, altered parts, applicable government publications and manufacturer's code symbols as described in paragraph (4), which follows:

(4) Alternate Parts. When two parts may be used as an alternate for a particular purpose and location, the improved, or preferred, part number is listed

in the Part Number column, and the alternate part will be included in the Description column immediately following the nomenclature of the preferred part. The "Usable On" code will be the same for both items. In order to conserve space when three or more parts may be used as alternates, the preferred part is listed first-and all alternate parts are identified by a symbol in the Part Number column, keyed to a footnote. The "Usable On" code will be the same for each item.

e. Units Per Assembly Column. This column lists the quantity of units required per next assembly. "Ref" denotes that the assembly being broken down is referenced from another figure.

f. Usable On Code Column. This column indicates by code all articles, as covered by this publication, on which a part is usable.

NOTE

Absence of coding indicates that the part is usable, in relation to a particular assembly or installation, on all articles covered by this publication.

g. SMR Code Column. Refer to T.O. 00-25-195 for an explanation of SMR codes appearing in this column.

7-5. MANUFACTURER'S CODES. The following Federal Supply Codes for Manufacturers are used throughout this section.

04729
UNICORP
ORANGE, NEW JERSEY 07050

06540
AMATOM DIV. OF MITE CORP.
NEW HAVEN, CONNECTICUT 06515

12969
UNITRODE CORPORATION
WATERTOWN, MASSACHUSSETS 02172

13103
THERMALLOY, INC.
DALLAS, TEXAS 75234

24355
ANALOG DEVICES, INC.
NORWOOD, MASSACHUSSETS 02062

26132
HOLLINGSWORTH SOLDERLESS TERMINALS
FORT LAUDERDALE, FLORIDA 33309

27014
NATIONAL SEMICONDUCTOR CORP.
SANTA CLARA, CALIFORNIA 95051

30161
AAVID CORPORATION
LACONIA, NEW HAMPSHIRE 03246

46384
PENN ENGINEERING AND MFG. CO.
DOYLESTOWN, PENNSYLVANIA

54355
ACCESSORIES FOR ELECTRONICS,
INC. BALDWIN, NEW YORK 11510

55364
CF ELECTRONICS, INC.
COMMACK, NEW YORK 11725

57209
LAMBDA SEMICONDUCTOR CORP.
CORPUS CHRISTI, TEXAS 78410

71468
ITT CANNON, INC.
FOUNTAIN VALLEY, CALIFORNIA 92708

81349
MILITARY SPECIFICATIONS

91506
AUGAT INTERCONNECTION PRODUCTS,
INC. ATTLEBORO, MASSACHUSSETS 02073

91637
DALE ELECTRONICS, INC.
COLUMBUS, NEBRASKA 68601

96906 MILITARY STANDARDS

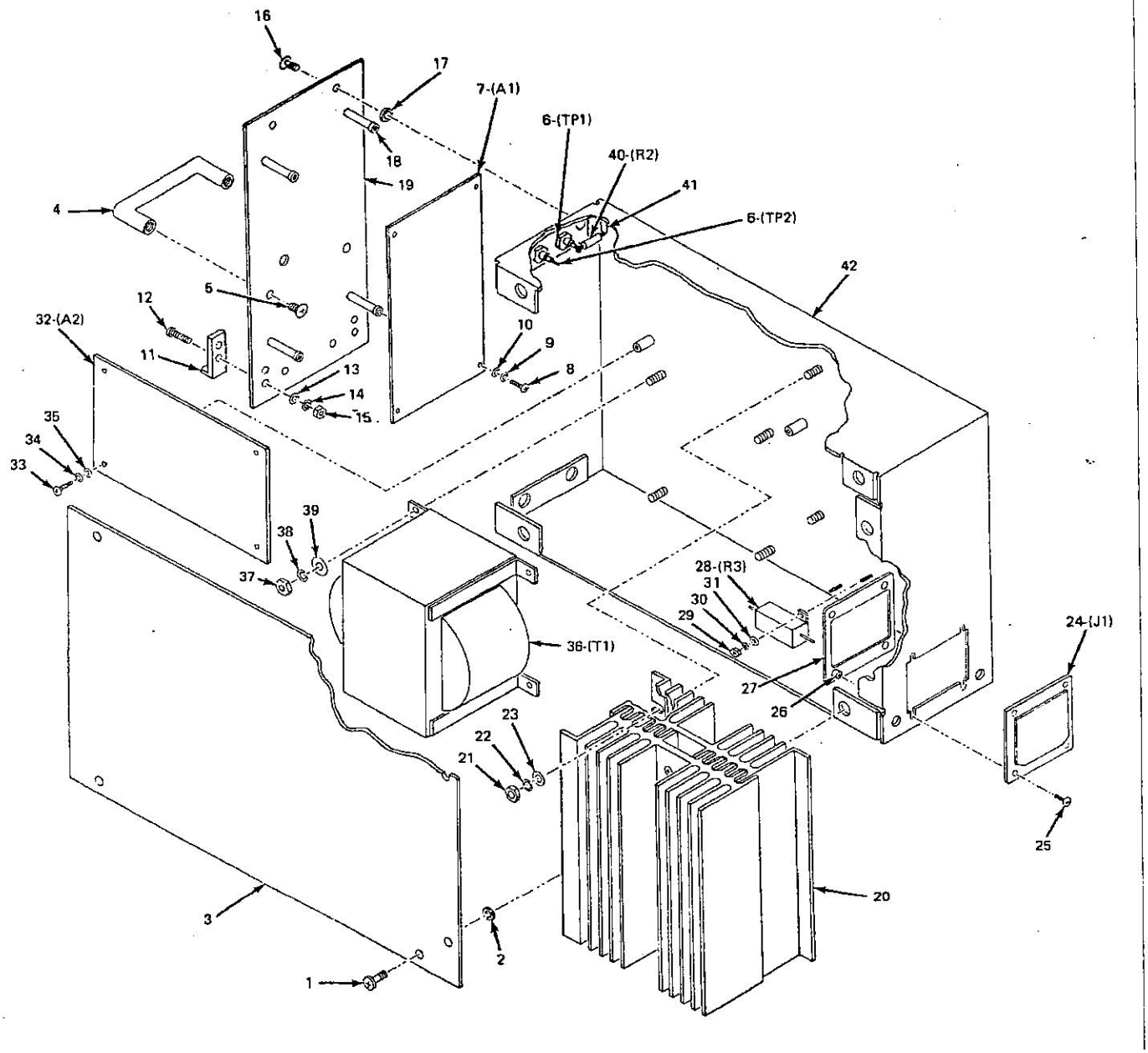


Figure 7-1. 700VA Power Inverter, CFE Part Number 200810

FIGURE AND INDEX NO.	PART NUMBER	FSCM	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASS'Y	USABLE ON CODE	SMR CODE
7-1-	200810		700VA POWER INVERTER			PAODDT
7-1-	201164		. COVER ASSY, ELEC EQPT	1		
7-1-1	PS10-632-40	46384	. . SCREW, CAPTIVE	4		PAFZZN
7-1-2	PR10-632	46384	. . RETAINER, SCREW	4		PAFZZN
7-1-3	201164-1		. . COVER	1		
7-1-4	A4364-16	04729	. HANDLE, BOW	1		PAFZZN
7-1-5	MS24693C270	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-1-6	M39024-10-01	81349	. CONNECTOR, TEST JACK	2		PAFZZN
7-1-7	201138		. CIRCUIT BD ASSY, DRIVER (See fig 7-2 for detail breakdown) .	1		PAFDDT
7-1-8	MS51957-15	96906	. SCREW, MACHINE (AP)	4		PAFZZN
7-1-9	MS35338-135	96906	. WASHER, LOCK (AP)	4		PAFZZN
7-1-10	MS15795-803	96906	. WASHER, FLAT (AP)	4		PAFZZN
7-1-11	NAS622CT2	81349	. CLAMP, LKG	2		PAFZZN
7-1-12	MS24693C28	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-1-13	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-1-14	MS35338-136	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-1-15	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	2		PAFZZN
7-1-	201167		. PANEL ASSY, FRONT	1		
7-1-16	PS10-632-40	46384	. . SCREW, CAPTIVE	4		PAFZZN
7-1-17	PR10-632	46384	. . RETAINER, SCREW	4		PAFZZN
7-1-18	BSOS440-32	46384	. . POST, ELEC-MECH EQPT	4		PAFZZN
7-1-19	201167-1		. . PANEL	1		
7-1-20	201171		. HEAT SINK ASSEMBLY (See fig 7-3 for detail breakdown) .	1		PAFZZN
7-1-21	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	4		PAFZZN
7-1-22	MS35338-139	96906	. WASHER, LOCK (AP)	4		PAFZZN
7-1-23	MS15795-808	96906	. WASHER, FLAT (AP)	4		PAFZZN
7-1-24	DPXB8-34P0001	71468	. CONNECTOR, REC, ELEC	1		PAFZZN
7-1-25	MS51957-5	96906	. SCREW, MACHINE (AP)	4		PAFZZN
7-1-	201351		. PLATE, MTG	1		
7-1-26	9505BSS0256	06540	. . POST, ELEC-MECH EQPT	4		PAFZZN
7-1-27	201351-1		. . PLATE	1		
7-1-28	RH25-.01-1%	91637	. RESISTOR, FXD, WW	1		PAFZZN
7-1-29	MS35649-224	96906	. NUT, PLAIN, HEX (AP)	2		PAFZZN
7-1-30	MS35338-134	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-1-31	MS15795-802	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-1-32	201142		. CIRCUIT BD ASSY, EMI (See fig 7-4 for detail breakdown)	1		PAFDDT
7-1-33	MS51957-29	96906	. SCREW, MACHINE (AP)	4		PAFZZN
7-1-34	MS35338-136	96906	. WASHER, LOCK (AP)	4		PAFZZN
7-1-35	MS15795-805	96906	. WASHER, FLAT (AP)	4		PAFZZN
7-1-36	201141		. TRANSFORMER, POWER	1		PAFZZN
7-1-37	NAS671C10	96906	. NUT, PLAIN, HEX (AP)	4		PAFZZN
7-1-38	MS35338-138	96906	. WASHER, LOCK (AP)	4		PAFZZN
7-1-39	MS15795-808	96906	. WASHER, FLAT (AP)	4		PAFZZN
7-1-40	RCR07G333KM	81349	. RESISTOR	1		PAFZZN
7-1-41	SE199D015	81349	. POST, ELEC-MECH EQPT	1		PAFZZN
7-1-42	201143		. CHASSIS ASSEMBLY (see fig 7-5 for detail breakdown) . . .	1		

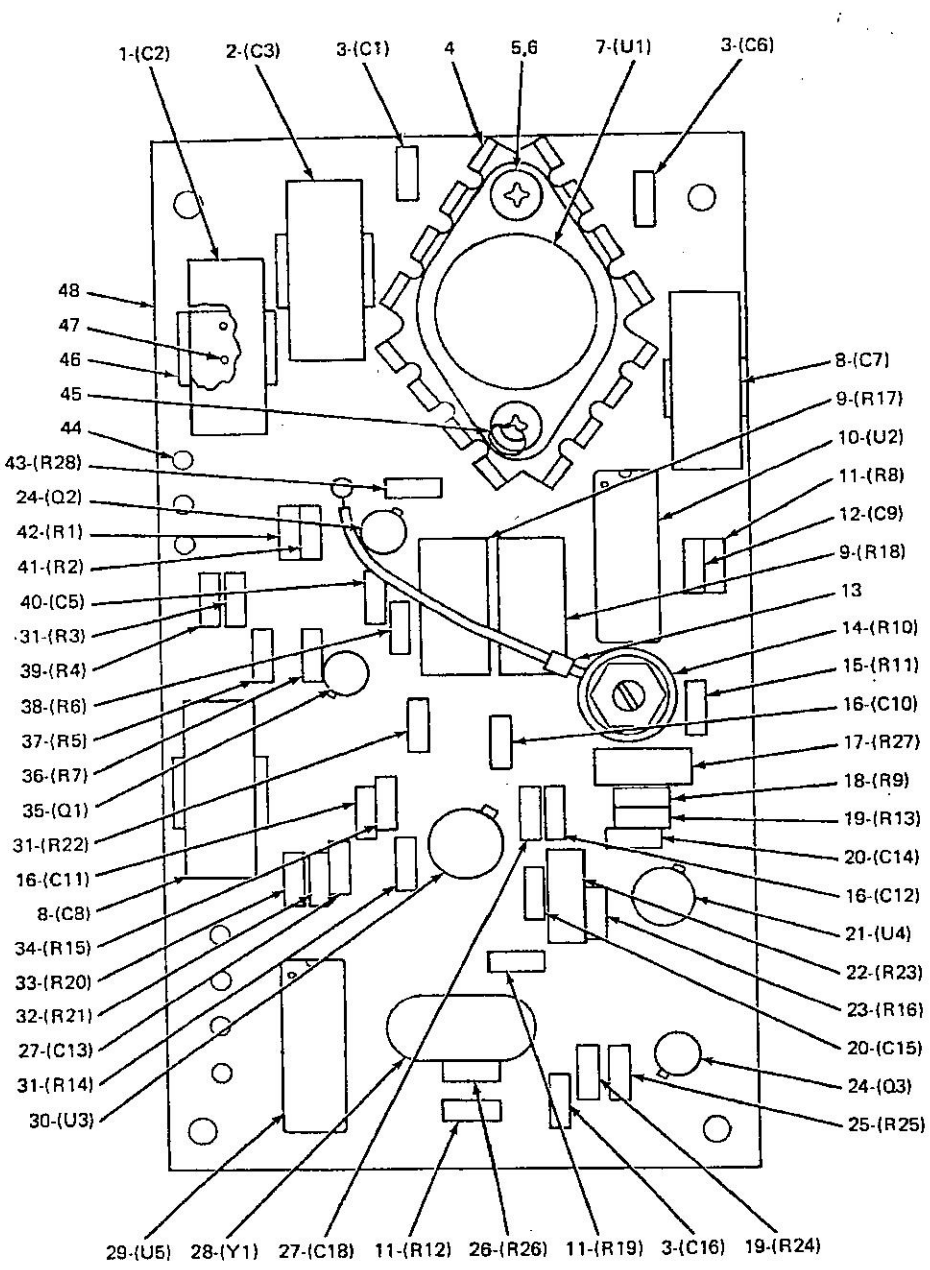


Figure 7-2. Driver Circuit Board Assembly

FIGURE AND INDEX NO.	PART NUMBER	FSCM	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASS'Y	USABLE ON CODE	SMR CODE
7-2-	201138		CIRCUIT BOARD ASSY, DRIVER . . . (See figure 7-1 for NHA)	REF		PAFDDT
7-2-1	M39018-01-0640	81349	. CAPACITOR	1		PAFZZN
7-2-2	M39018-01-0732	81349	. CAPACITOR	1		PAFZZN
7-2-3	M39014-01-1456	81349	. CAPACITOR	3		PAFZZN
7-2-4	5014B	30161	. HEAT SINK	1		PAFZZN
7-2-5	MS51957-28	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-2-6	MS35338-138	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-2-7	LM140AK15-883C	27014	. INTEGRATED CIRCUIT	1		PAFZZN
7-2-8	M39003-01-2313	81349	. CAPACITOR	2		PAFZZN
7-2-9	RCR42G101KM	81349	. RESISTOR	2		PAFZZN
7-2-10	LAS3800	57209	. INTEGRATED CIRCUIT	1		PAFZZN
7-2-11	RCR07G224KM	81349	. RESISTOR	3		PAFZZN
7-2-12	M39014-01-1465	81349	. CAPACITOR	1		PAFZZN
7-2-13	MS25036-150	96906	. TERMINAL, RING	1		PAFZZN
7-2-14	RV6SAYL102A	81349	. RESISTOR, VARIABLE.	1		PAFZZN
7-2-15	RCR07G113KM	81349	. RESISTOR	1		PAFZZN
7-2-16	M39014-01-1474	81349	. CAPACITOR	3		PAFZZN
7-2-17	RJR24CW253M	81349	. RESISTOR	1		PAFZZN
7-2-18	RCR07G623KM	81349	. RESISTOR	1		PAFZZN
7-2-19	RCR07G152KM	81349	. RESISTOR	2		PAFZZN
7-2-20	M39014-02-1238	81349	. CAPACITOR	2		PAFZZN
7-2-21	LM158H883C	27014	. INTEGRATED CIRCUIT	1		PAFZZN
7-2-22	RJR24CW503M	81349	. RESISTOR, VARIABLE	1		PAFZZN
7-2-23	RCR07G474KM	81349	. RESISTOR	1		PAFZZN
7-2-24	JANTX2N2222A	81349	. TRANSISTOR	2		PAFZZN
7-2-25	RCR07G222KM	81349	. RESISTOR	1		PAFZZN
7-2-26	RCR07G562KM	81349	. RESISTOR	1		PAFZZN
7-2-27	M39014-01-1407	81349	. CAPACITOR	2		PAFZZN
7-2-28	CR19U	18853	. CRYSTAL UNIT, QUARTZ	1		PAFZZN
7-2-29	CD4060BMJ883C	27014	. INTEGRATED CIRCUIT	1		PAFZZN
7-2-30	AD536ASH883C	24355	. INTEGRATED CIRCUIT	1		PAFZZN
7-2-31	RCR07G103KM	81349	. RESISTOR	3		PAFZZN
7-2-32	RCR07G151KM	81349	. RESISTOR	1		PAFZZN
7-2-33	RCR07G681KM	81349	. RESISTOR	1		PAFZZN
7-2-34	RCR07G203KM	81349	. RESISTOR	1		PAFZZN
7-2-35	JANTX2N2907A	81349	. TRANSISTOR	1		PAFZZN
7-2-36	RCR07G753KM	81349	. RESISTOR	1		PAFZZN
7-2-37	RCR07G104KM	81349	. RESISTOR	1		PAFZZN
7-2-38	RCR07G114KM	81349	. RESISTOR	1		PAFZZN
7-2-39	RCR07G332KM	81349	. RESISTOR	1		PAFZZN
7-2-40	M39014-01-1233	81349	. CAPACITOR	1		PAFZZN
7-2-41	RCR07G102KM	81349	. RESISTOR	1		PAFZZN
7-2-42	RCR07G910KM	81349	. RESISTOR	1		PAFZZN
7-2-43	RCR07G333KM	81349	. RESISTOR	1		PAFZZN
7-2-	201241		. CIRCUIT BOARD	1		
7-2-44	SE12XC01	96906	. TERMINAL, STUD	8		PAFZZN
7-2-45	KF2-632	46384	. INSERT, THD	2		PAFZZN
7-2-46	6005-23A	91506	. BRACKET, COMPONENT MTG	4		PAFZZN
7-2-47	MS16535A23	96906	. RIVET (AP)	2		PAFZZN
7-2-48	201241-1		. CIRCUIT BOARD, BLANK	1		

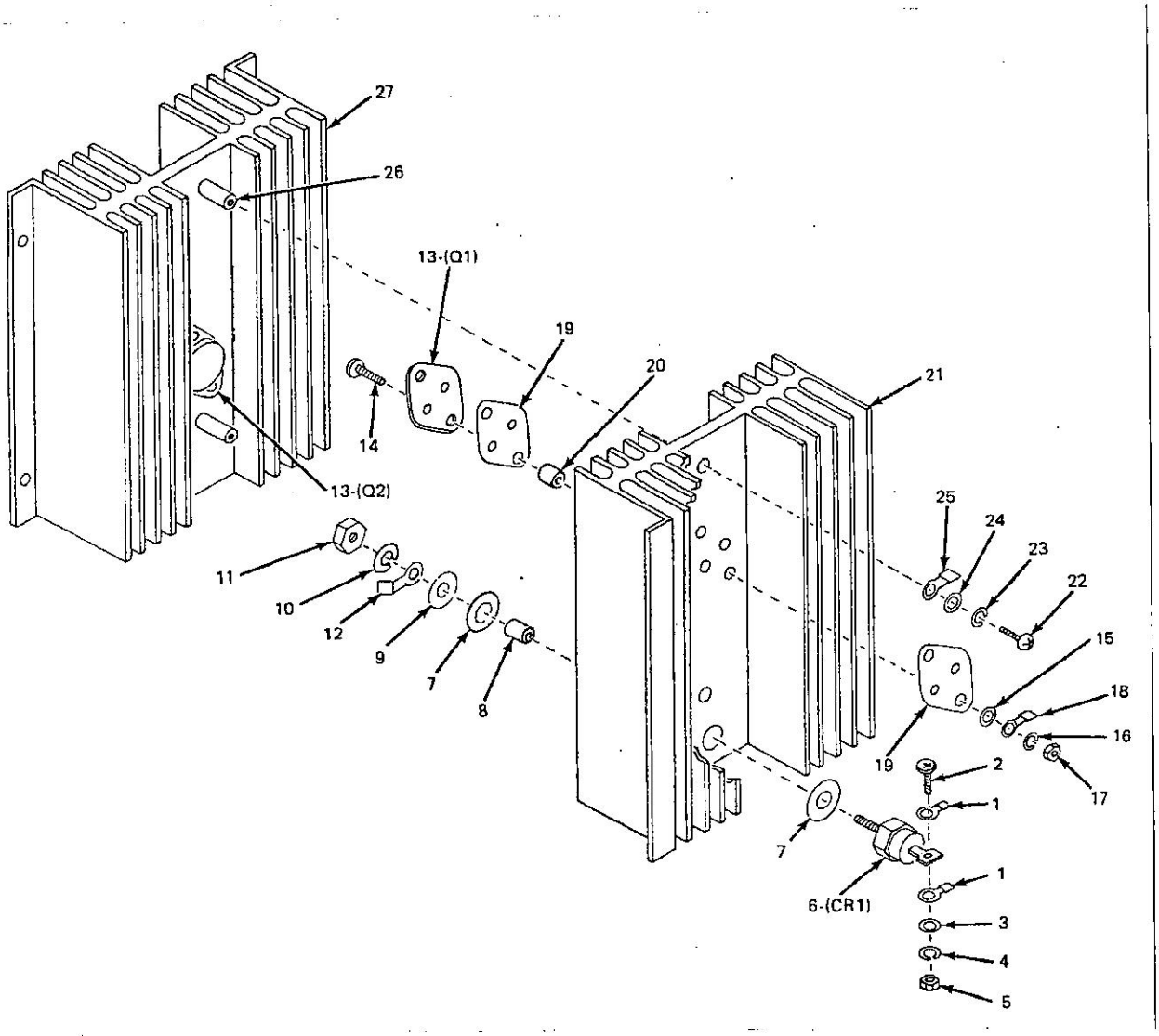


Figure 7-3. Heat Sink Assembly

FIGURE AND INDEX NO.	PART NUMBER	FSCM	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASS'Y	USABLE ON CODE	SMR CODE
7-3-	201171		HEAT SINK ASSEMBLY . . . . . (See figure 7-1 for NHA)	REF		PAFZZN
7-3-1	MS20659-165	96906	. LUG, TERMINAL	4		PAFZZN
7-3-2	MS51957-28	96906	. SCREW, MACHINE (AP)	1		PAFZZN
7-3-3	MS15795-805	96906	. WASHER, FLAT (AP)	1		PAFZZN
7-3-4	MS35338-136	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-3-5	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	1		PAFZZN
7-3-6	USD545	12969	. SEMICONDUCTOR DEVICE, DIODE . .	1		PAFZZN
7-3-7	43-02-25	54355	. WASHER, INSULATED (AP)	1		PAFZZN
7-3-8	113	13103	. BUSHING, TEFLON (AP)	1		PAFZZN
7-3-9	MS15795-810	96906	. WASHER, FLAT (AP)	1		PAFZZN
7-3-10	MS35333-74	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-3-11	MS25082C4	96906	. NUT, PLAIN, HEX (AP)	1		PAFZZN
7-3-12	R3458B	26132	. LUG, TERMINAL	1		PAFZZN
7-3-13	MJ11032	81349	. TRANSISTOR	2		PAFZZN
7-3-14	MS51957-31	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-3-15	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-3-16	MS35338-136	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-3-17	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	2		PAFZZN
7-3-18	MS25036-102	96906	. LUG, TERMINAL	2		PAFZZN
7-3-19	43-03-06	54355	. INSULATOR, MICA	2		PAFZZN
7-3-20	AEM3HD	54355	. INSULATOR	1		PAFZZN
7-3-21	201171-2		. HEAT SINK, UPPER	1		
7-3-22	MS51957-32	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-3-23	MS35338-136	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-3-24	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-3-25	MS25036-107	96906	. LUG, TERMINAL	4		PAFZZN
7-3-26	BS0S632-22	46384	. . POST, ELEC-MECH EQPT	2		PAFZZN
7-3-27	201171-1		. HEAT SINK, LOWER	1		

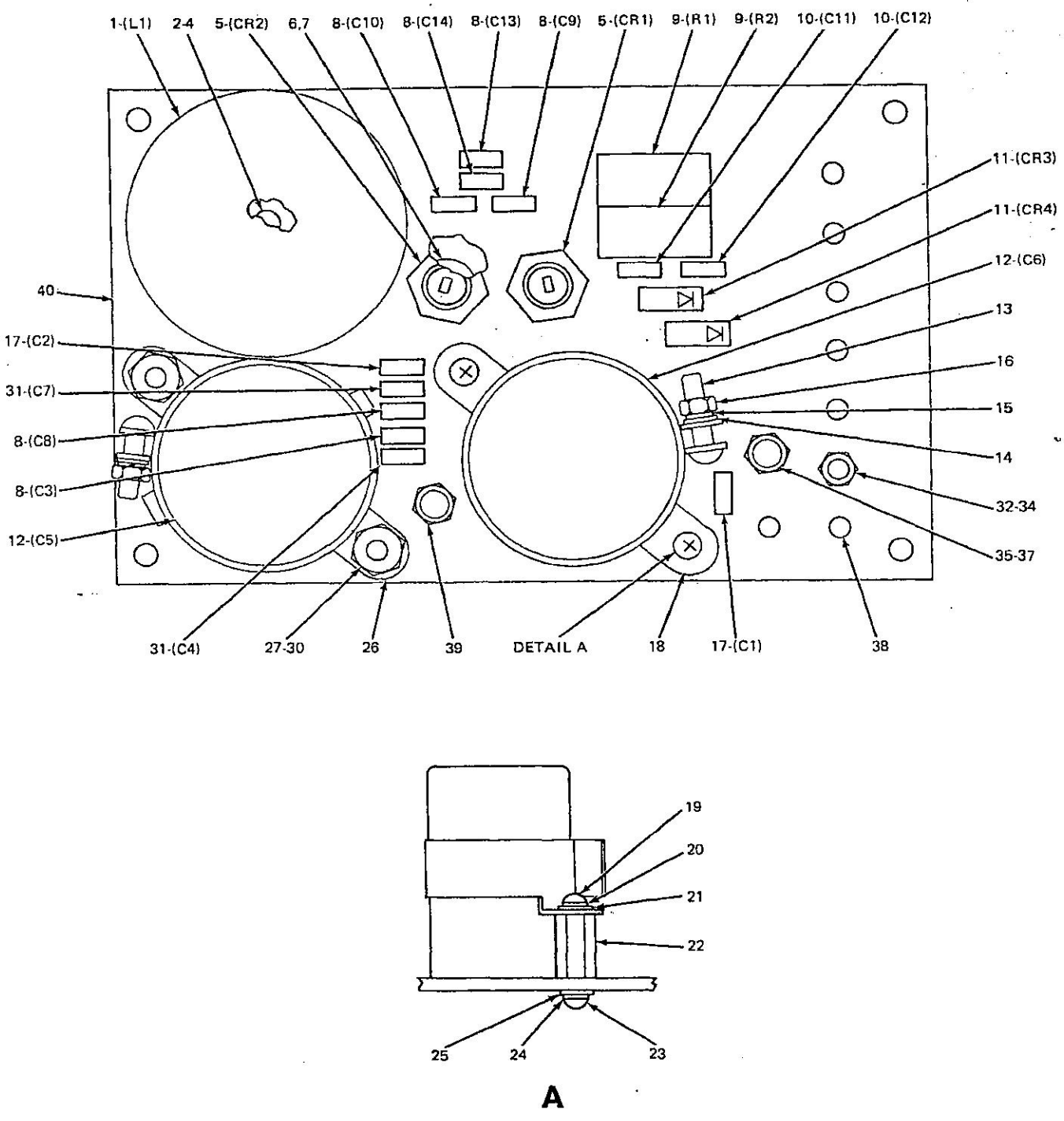


Figure 7-4. EMI Circuit Board Assembly

FIGURE AND INDEX NO.	PART NUMBER	FSCM	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASS'Y	USABLE ON CODE	SMR CODE
7-4-	201142		CIRCUIT BOARD ASSEMBLY, EMI . . . (See figure 7-1 for NHA)	REF		PAFDDT
7-4-1	201242		. INDUCTOR	1		PAFZZN
7-4-2	MS51957-27	96906	. SCREW, MACHINE (AP)	1		PAFZZN
7-4-3	MS35338-136	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-4-4	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-4-5	JANTX1N3001B	81349	. SEMICONDUCTOR DEVICE, DIODE . .	2		PAFZZN
7-4-6	MS35650-304	96906	. NUT, PLAIN, HEX (AP)	1		PAFZZN
7-4-7	MS35338-138	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-4-8	M39014-01-1456	81349	. CAPACITOR	6		PAFZZN
7-4-9	RCR42G621KM	81349	. RESISTOR	2		PAFZZN
7-4-10	M39014-02-1236	81349	. CAPACITOR	2		PAFZZN
7-4-11	JAN1N5551	81349	. SEMICONDUCTOR DEVICE, DIODE . .	2		PAFZZN
7-4-12	139R282M055AA2A	00853	. CAPACITOR	2		PAFZZN
7-4-13	MS51957-31	96906	. SCREW, MACHINE (AP)	1		PAFZZN
7-4-14	MS15795-805	96906	. WASHER, FLAT (AP)	1		PAFZZN
7-4-15	MS35338-136	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-4-16	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	1		PAFZZN
7-4-17	M39014-02-1240	81349	. CAPACITOR	2		PAFZZN
7-4-18	C21375	54355	. BRACKET, CAPACITOR MTG	1		PAFZZN
7-4-19	MS51957-27	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-4-20	MS35338-136	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-4-21	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-4-22	8396A0632-16	06540	. POST, ELEC-MECH EQPT	2		PAFZZN
7-4-23	MS51957-29	96906	. SCREW, MACHINE (AP)	1		PAFZZN
7-4-24	MS35338-136	96906	. WASHER, LOCK (AP)	1		PAFZZN
7-4-25	MS15795-805	96906	. WASHER, FLAT (AP)	1		PAFZZN
7-4-26	C21375	54355	. BRACKET, CAPACITOR MTG	1		PAFZZN
7-4-27	MS51957-29	96906	. SCREW, MACHINE (AP)	2		PAFZZN
7-4-28	MS15795-805	96906	. WASHER, FLAT (AP)	2		PAFZZN
7-4-29	MS35338-136	96906	. WASHER, LOCK (AP)	2		PAFZZN
7-4-30	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	2		PAFZZN
7-4-31	M39014-02-1230	81349	. CAPACITOR	2		PAFZZN
7-4-32	MS35649-264	96906	. NUT, PLAIN, HEX (AP)	16		PAFZZN
7-4-33	MS35338-136	96906	. WASHER, LOCK	8		PAFZZN
7-4-34	MS15795-805	96906	. WASHER, FLAT	16		PAFZZN
7-4-35	MS35650-304	96906	. NUT, PLAIN, HEX	4		PAFZZN
7-4-36	MS35338-138	96906	. WASHER, LOCK	2		PAFZZN
7-4-37	MS15795-808	96906	. WASHER, FLAT	4		PAFZZN
7-4-	201251		. CIRCUIT BOARD	1		
7-4-38	KFH632-10	46384	. . STUD, CLINCH	8		PAFZZN
7-4-39	KFH632-12	46384	. . STUD, CLINCH	2		PAFZZN
7-4-40	201251-1		. . CIRCUIT BOARD, BLANK	1		

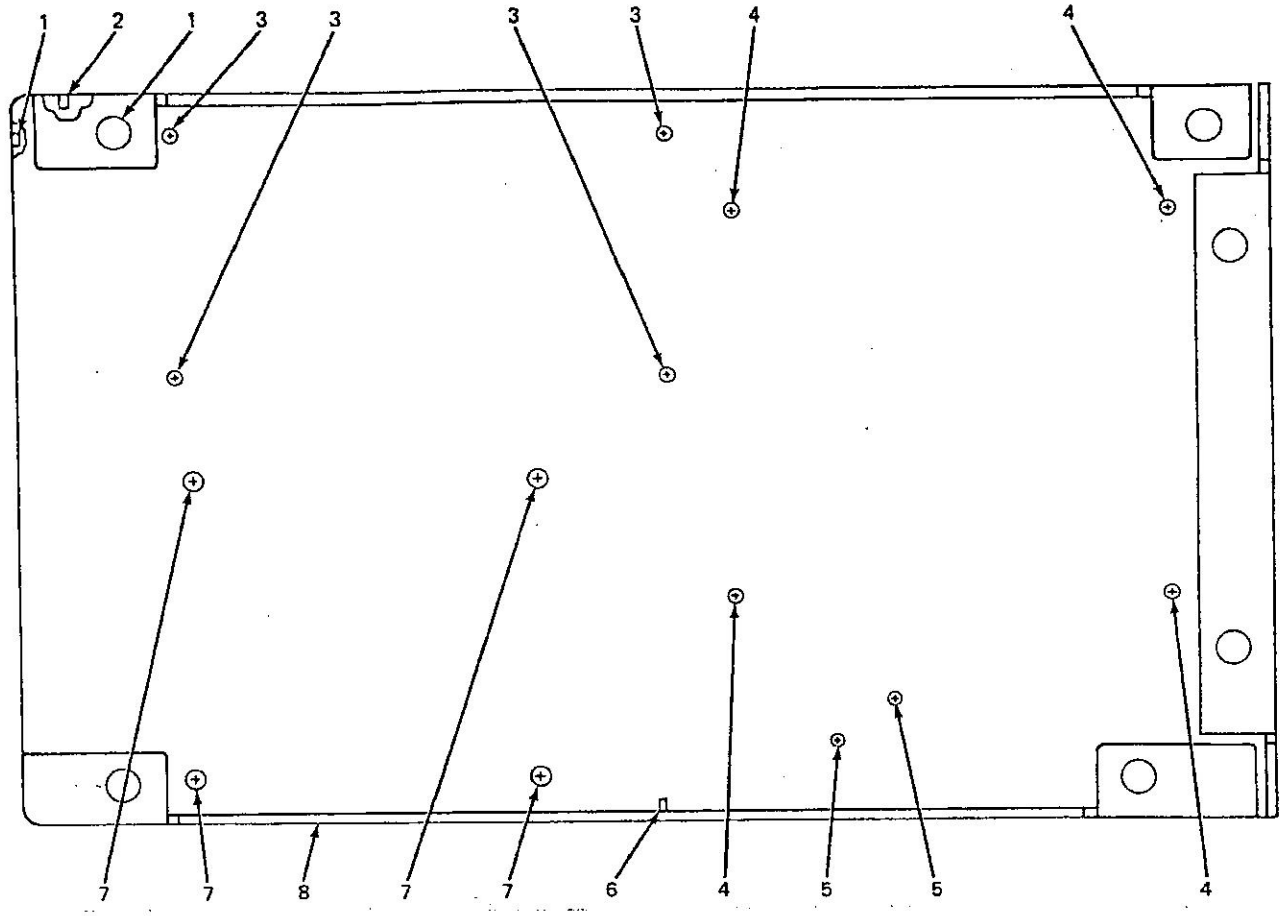


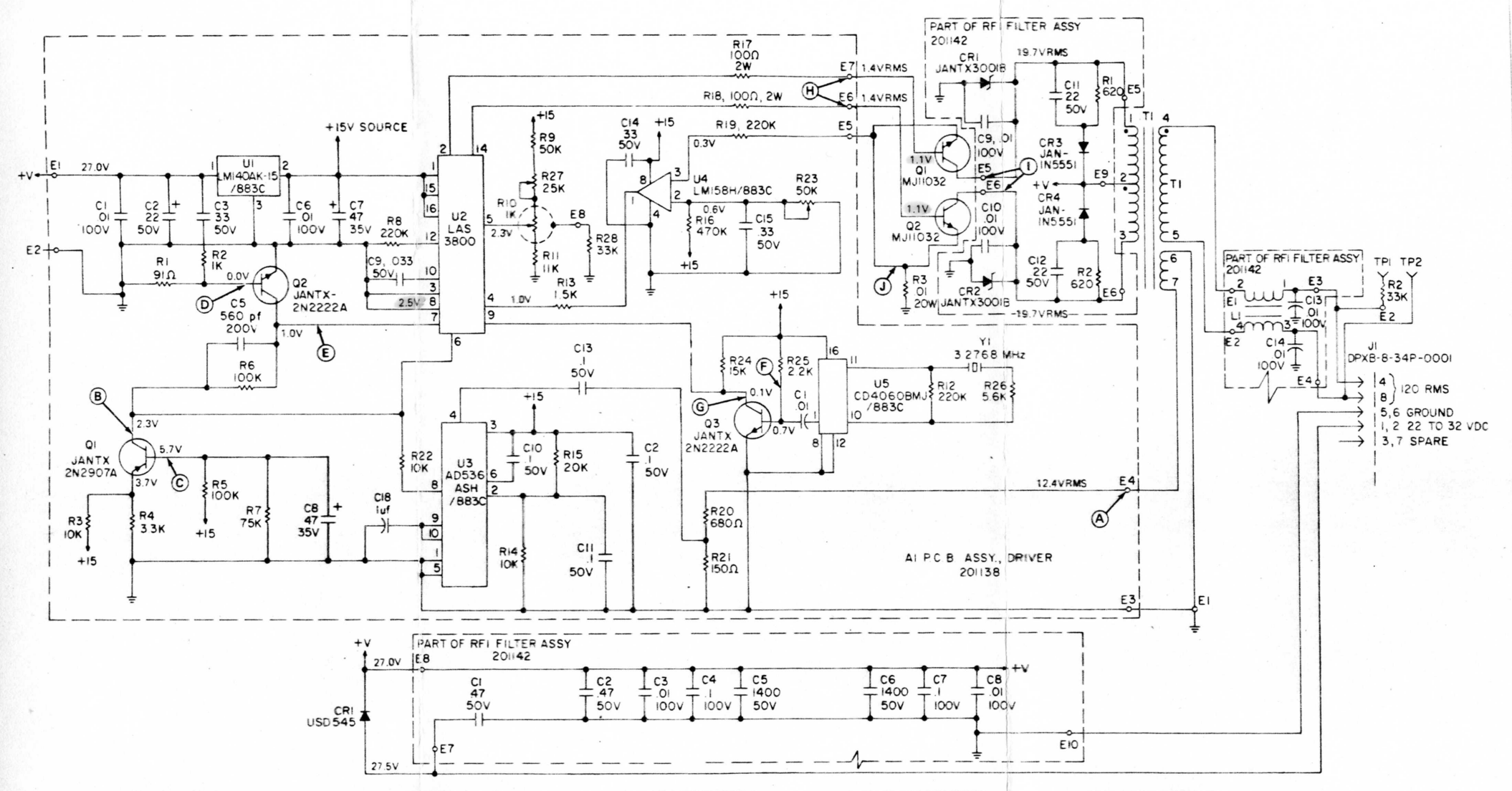
Figure 7-5. Chassis Assembly

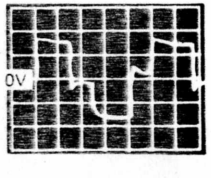
FIGURE AND INDEX NO.	PART NUMBER	FSCM	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASS'Y	USABLE ON CODE	SMR CODE
7-5-	201143		CHASSIS ASSEMBLY	REF		
			(See figure 7-1 for NHA)			
7-5-1	F10632-1C1	46384	. NUT, CLINCH	10		PAFZZN
7-5-2	FHS440-4	46384	. STUD, CLINCH	1		PAFZZN
7-5-3	BSOS632-20	46384	. STUD, CLINCH	4		PAFZZN
7-5-4	FHS632-8	46384	. STUD, CLINCH	4		PAFZZN
7-5-5	FHS440-8	46384	. STUD, CLINCH	2		PAFZZN
7-5-6	FHS632-14	46384	. STUD, CLINCH	1		PAFZZN
7-5-7	FHS032-8	46384	. STUD, CLINCH	4		PAFZZN
7-5-8	201143-1		. . CHASSIS	1		

CHAPTER 8

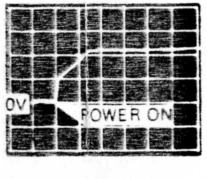
DIAGRAMS

8-1. INTRODUCTION. This section contains the overall schematic diagram of the power inverter, shown in figure 8-1.

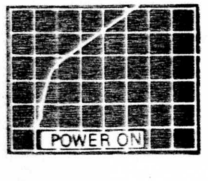




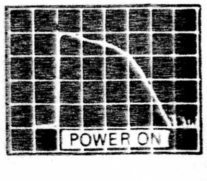
A
A1E4
V=1V/DIV
H=20mS/DIV



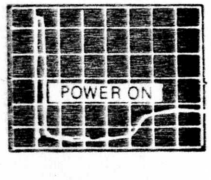
B
A1Q1-C
V=1V/DIV
H=20mS/DIV



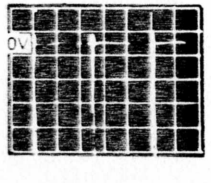
C
A1Q1-B
V=1V/DIV
H=.5S/DIV



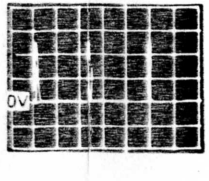
D
A1Q2-B
V=.2V/DIV
H=20mS/DIV



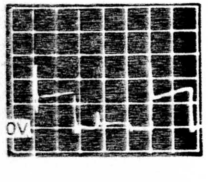
E
A1Q2-C
V=2V/DIV
H=.1S/DIV



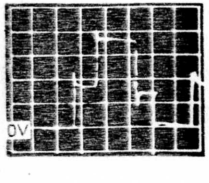
F
A1Q3-B
V=2V/DIV
H=.5S/DIV
.5MS



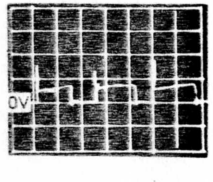
G
A1Q3-C
V=2V/DIV
H=.5S/DIV
.5MS



H
Q1/Q2-B
V=2V/DIV
H=.5mS/DIV



I
Q1/Q2-C
V=1V/DIV
H=.5mS/DIV



J
Q1/Q2-E
V=1V/DIV
H=.5mS/DIV

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTORS ARE ¼W, RESISTOR VALUES ARE IN OHMS
2. CAPACITOR VALUES ARE IN UF
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATIONS.

High-Current Complementary Silicon Transistors

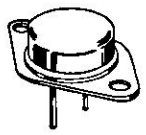
. . . for use as output devices in complementary general purpose amplifier applications.

- High DC Current Gain —
  h_{FE} = 1000 (Min) @ I_C = 25 Adc
  h_{FE} = 400 (Min) @ I_C = 50 Adc
- Curves to 100 A (Pulsed)
- Diode Protection to Rated I_C
- Monolithic Construction with Built–In Base–Emitter Shunt Resistor
- Junction Temperature to +200°C

NPN
MJ11028
MJ11032*
PNP
MJ11029
MJ11033*

*ON Semiconductor Preferred Device

50 AMPERE COMPLEMENTARY SILICON DARLINGTON POWER TRANSISTORS 60–120 VOLTS 300 WATTS



CASE 197A–05
TO–204AE (TO–3)

MAXIMUM RATINGS

Rating	Symbol	MJ11028 MJ11029	MJ11032 MJ11033	Unit
Collector–Emitter Voltage	V_{CEO}	60	120	Vdc
Collector–Base Voltage	V_{CB}	60	120	Vdc
Emitter–Base Voltage	V_{EB}	5		Vdc
Collector Current — Continuous Peak	I_C I_{CM}	50 100		Adc
Base Current — Continuous	I_B	2		Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C @ T_C = 100°C	P_D	300 1.71		Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Maximum Lead Temperature for Soldering Purposes for ≤ 10 seconds	T_L	275	°C
Thermal Resistance Junction to Case	$R_{\theta JC}$	0.584	°C

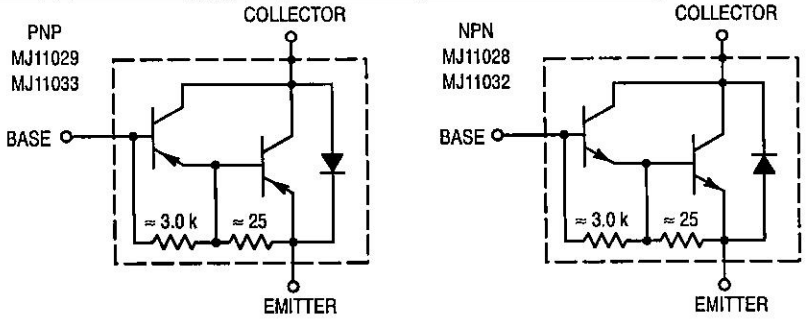


Figure 1. Darlington Circuit Schematic

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (1) (I_C = 1 00 mAdc, I_B = 0)	MJ11028, MJ11029 MJ11032, MJ11033	$V_{(BR)CEO}$	60 120	— —	Vdc
Collector–Emitter Leakage Current		I_{CER}			mAdc
(V_{CE} = 60 Vdc, R_{BE} = 1 k ohm)	MJ11028, MJ11029		—	2	
(V_{CE} = 120 Vdc, R_{BE} = 1 k ohm)	MJ11032, MJ11033		—	2	
(V_{CE} = 60 Vdc, R_{BE} = 1 k ohm, T_C = 150°C)	MJ11028, MJ11029		—	10	
(V_{CE} = 120 Vdc, R_{BE} = 1 k ohm, T_C = 150°C)	MJ11032, MJ11033		—	10	
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)		I_{EBO}	—	5	mAdc
Collector–Emitter Leakage Current (V_{CE} = 50 Vdc, I_B = 0)		I_{CEO}	—	2	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			—
(I_C = 25 Adc, V_{CE} = 5 Vdc)			1 k	18 k	
(I_C = 50 Adc, V_{CE} = 5 Vdc)			400	—	
Collector–Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 25 Adc, I_B = 250 mAdc)			—	2.5	
(I_C = 50 Adc, I_B = 500 mAdc)			—	3.5	
Base–Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 25 Adc, I_B = 200 mAdc)			—	3.0	
(I_C = 50 Adc, I_B = 300 mAdc)			—	4.5	

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

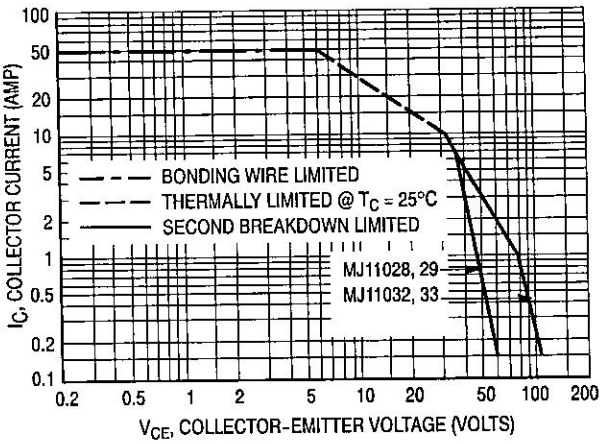


Figure 2. DC Safe Operating Area

There are two limitations on the power–handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 2 is based on $T_{J(pk)} = 200°C$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

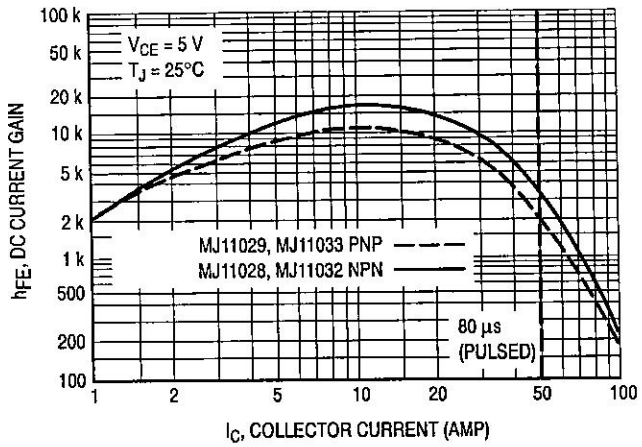


Figure 3. DC Current Gain

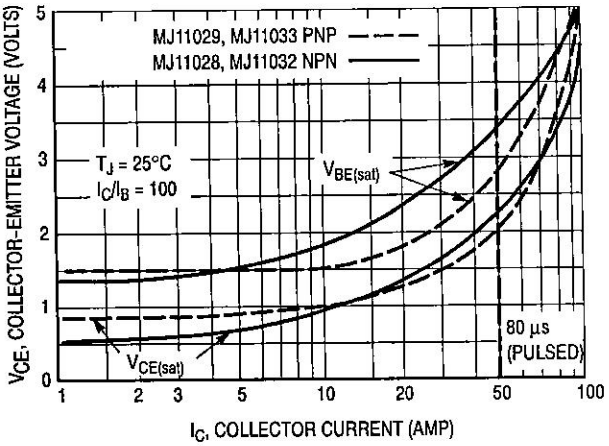
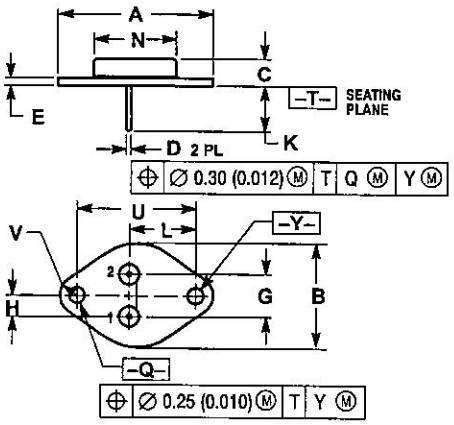


Figure 4. "On" Voltage

PACKAGE DIMENSIONS

CASE 197A–05
TO–204AE (TO–3)
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.530 REF		38.86 REF	
B	0.990	1.050	25.15	26.67
C	0.250	0.335	6.35	8.51
D	0.057	0.063	1.45	1.60
E	0.060	0.070	1.53	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	0.760	0.830	19.31	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

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