TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL,

DIRECT SUPPORT, AND GENERAL SUPPORT

MAINTENANCE MANUAL

FOR

INVERTER, POWER,

STATIC PP-7078/U

NSN 6130-00-148-5763

(DELTEC MODEL

DI-5003-259)

This copy is a reprint which includes current pages from Changes 1.

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Operator, Organizational, Direct Support, and General Support Maintenance Manual

For

INVERTER, POWER, STATIC PP-7078/U

(NSN 6130-00-148-5763)

(DELTEC MODEL DI-5003-259)

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual describes Inverter, Power, Static PP-7078/U (Deltec Model DI-5003-259) (fig. 1-1), hereafter referred to by the common name inverter, and contains its installation, operation, and instructions covering operator/organizational (chap. 4) and general support maintenance (chap. 6). It includes operation under normal and abnormal conditions, cleaning, performance verification and adjustment of the equipment, and replacement of parts available to operator and maintenance personnel. It also lists tools, materials, and test equipment required to perform the maintenance of the equipment. Repair parts and special tools lists (RPSTL) are provided in TM 11-6130-377-24P.

*b. T*his manual also contains instruction for performing preventive and periodic maintenance, troubleshooting and repair functions to be accomplished by operator, organizational, and general support maintenance personnel.

1-2. Indexes of Publications

a. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. Refer to DA PAM 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those described by TM 38-750, The Army Maintenance Management System.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DLAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-4. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. In either case, a reply will be furnished direct to you.

1-5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

1-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-6.1. Reporting Equipment Improvement Recommendations (EIR)

If your Inverter, Power, Static PP-7078/U needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to

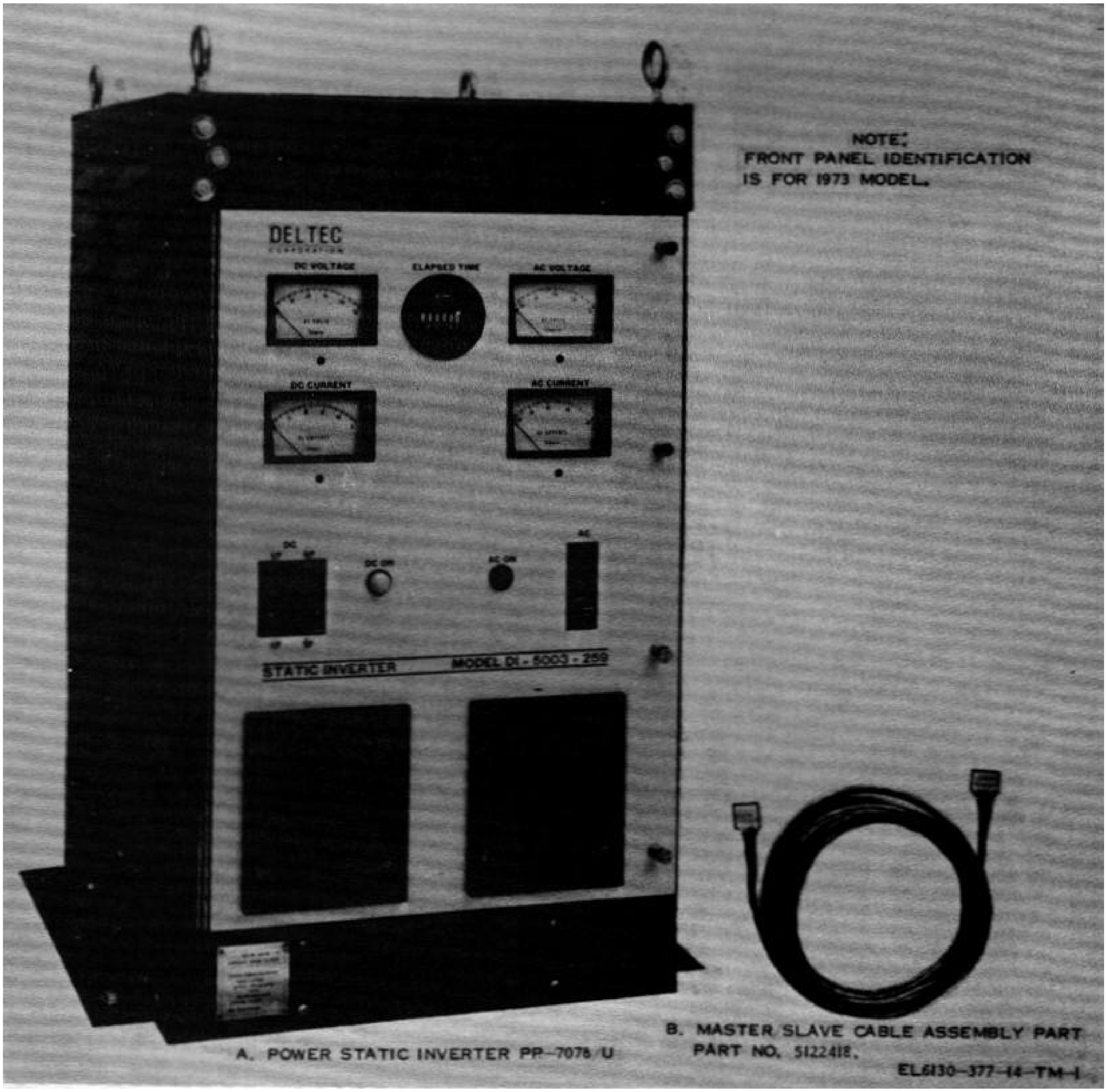


Figure 1-1. Inverter, Power, Static PP-7078/U and master/slave cable assembly.

Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

NOTE

Inverters covered in this manual were procured under Contract Numbers DAAB07-73-C-0233, DAAB07-C0327, and DAAB07-74-C0465. Inverters procured under the 1973 contracts differ from those procured under the 1974 contract. These differences are internal and do not affect overall equipment interchange-ability. Refer to paragraph 1-8.1 for specific differences.

Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

The inverter (fig. 1-1) is a general purpose, direct current (dc) to alternating current (ac), static inverter which provides a 120-volt alternating current, 60 Hz, 50 amperes (5 kW) power source for use in those locations where the primary power source is 110 volts direct current. Two inverters can be connected in parallel to provide twice the power output, 100 amperes (10kW), if required.

1-8. Description

a. The basic functional entities of the inverter (fig. 1-2) are the input filter, inverter drive, silicone controlled rectifier (SCR) inverter, and the ferroresonant transformer and filter. The input filter attenuates noise such that the inverter does not introduce noise back onto the input dc line. The inverter driver operates the SCR inverter at a frequency of 60 Hz which in turn, operates in a square wave mode to drive the ferroresonant output transformer. The ferroresonant transformer and filter provide a 120-volt, 60-Hz sine wave output, with voltage regulation, current limiting, and harmonic suppression.

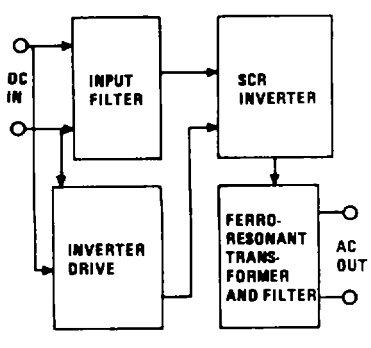


Figure 1-2. Simplified block diagram.

b. The front indicator panel of the inverter is hinged on the left side and can be opened to gain access to the various internal components and the terminal boards. Mounted on the panel are the operators' controls and instruments. The input/output terminals (fig. 2-1) are located inside the inverter and the cables from external equipment must be routed to their respective terminal boards through openings in the rear panel of the inverter. Fan openings (figs. 2-1 and 3-1) are provided in the front indicator panel and the right side panel to enable cooling air to be drawn in and exhausted to maintain operating temperatures within the inverter.

c. The Master/Slave cable assembly (Deltec Part No. 5122418) is used between two inverters when they are operated in parallel (para. 2-4).

1-8.1. Differences in Models

Front panel markings of the inverters differ only in item identification on the nomenclature plate (lower left corner) and across the front panel. The 1973 model front panel marking is: STATIC INVERTER MODEL DI-5003-259; the 1974 model marking is: INVERTER, POWER, STATIC PP-7078/U. Wiring differences between models are indicated in figures FO-1 and FO-1.1. Inverter drive circuit board A1A1A2, Part Number 5122348, is contained in the 1973 model; Part Number 5123023 is contained in the 1974 model. Differences in reference designations of identical components (electrical) are indicated in a below. Other differences are indicated in b below.

a. Reference Designation Differences.

1973 model	*1974 model*
A1C2	A1C1
A1C3	A1C2
A1C4	A1C3
A1CR5	A1CR3
A1CR6	A1CR4
A1CR7	A1CR5
A1K4	A1K1
A1L3	A1L4
A1L4	A1L5
A1L5	A1L3
A1Q3	A1Q1
A1Q4	A1Q2
A1R6	None
A1R9	A1R2 and A1R3
A1A2C2	A1A2C26

1973 model	*1974 model*
A1A2C3	A1A2C18
A1A2C6	A1A2C20
A1A2C14	A1A2C17
A1A2C15	A1A2C16
A1A2C18	A1A2C27
A1A2CR2	A1A2CR3
A1A2CR8	A1A2CR4
A1A2CR12	A1A2CR5
A1A2CR14	A1A2CR1
A1A2CR15	A1A2CR2
A1A2Q12	A1A2Q9
A1A2Q17	A1A2Q10
A1A2Q20	A1A2Q4
A1A2Q21	A1A2Q5
A1A2Q22	A1A2Q11
A1A2R8	A1A2R29
A1A2R11	A1A2R30
A1A2R14	A1A2R31
A1A2R15	A1A2R32
A1A2R29	A1A2R36
A1A2R30	A1A2R37
A1A2R31	A1A2R38
A1A2R51	A1A2R11
A1A2R52	A1A2R10
A1A2R54	A1A2R46
A1A2R55	A1A2R12
A1A2R57	A1A2R14
A1A2R58	A1A2R13
A1A2R59	A1A2R18
A1A2R60	A1A2R17
A1A2R61	A1A2R47
A1A2R62	A1A2R48
A1A2U2	A1A2U8
A1A2U7	A1A2U9
A1A2U9	A1A2U4

NOTE

Many components used in the 1974 models are also used in the 1973 models. These components may be identical in function and reference designation (that is T1, J1, DS1, etc) or may be identical only in characteristics (that is 0.1 uf, 12 vdc capacitors are used in many locations in both models). Fuse A1F1 is in the 1973 model only.

b. Circuit Differences.

(1) The input shunt circuit differs between models. Relay A1K1 and associated circuitry is included only in the 1973 model inverter. In the 1974 model, sensor circuits on inverter drive board A1A1A2 control and shunt trip coil activation and A1CB1.

(2) The soft start circuit consisting of A1Q2 and associated circuitry, including relay A1K3, is included only in the 1973 model inverter.

(3) The 12-volt shunt regulator consisting of transistor A1Q1 and resistor A1R2 and associated circuitry is included only in the 1973 model inverter.

(4) The 1974 model inverter is protected against normal overload, input overvoltage and input undervoltage by circuit breaker A1CB1 ((1) above). When circuit breaker A1CB1 is initially closed (inverter turn-on), capacitor C25 and resistor R28 prevent arcing across open contacts 1 and 2 of A1CB1. When A1CB1 is opened, to turn off the inverter, contacts 1 and 2 of A1CB1 close and allow capacitors A1C1 and A1A1A2C25 to discharge in less than 5 seconds.

1-9. System Application

The inverter can be utilized in two functional configurations: when the inverter is operated as a single unit (non-parallel) or when the inverter is connected for parallel operation of two units. These functional configurations are described fully in Functioning of Equipment contained-in chapter 5.

1-10. Technical Characteristics

Input:

Voltage	104 to 141 vdc (110 vdc nominal)
Circuit Breaker	70 Amperes
Protection	Reverse polarity Low voltage sensor opens input circuit breaker at 95 ± 0.5 vdc High voltage sensor opens input circuit breaker at 142 ± 0.5 vdc Isolation: 500 vac RMS, input to output, input to chassis, output to chassis

Output:

Voltage	120 vac RMS ± 5%, no load to full load, available within 5 seconds after turn-on
Circuit Breaker	60 Amperes
Protection	Output is current limited at 44 amperes into short circuit
Frequency	60 Hz ± 0.25%, single phase, sinusoidal
Power	Single inverter, 5000 VA (overload up to 6250 VA) Two parallel inverters, 10,000 VA (overload up to 12,500 VA)
Harmonic Distortion	Less than 5% at full load, nominal input
Power Factor	0.8 lagging to 0.8 leading
Efficiency	75% at full load, nominal input

Environment:

Temperature	0°C (32°F) to 55°C (131°F) operating, -40°C (-40°F) to 85°C (185°F) nonoperating
Humidity	95%, non-condensing

Dimensions:
- Height............................30 inches
- Width..............................17 inches
- Depth..............................21 inches
- Weight............................500 pounds

1-11. Items Comprising an Operable Equipment

The items in the chart make up an operable Inverter, Power, Static PP-7078/U.

NSN	Item	(Dimensions (in.)) Quan-tity	Height	Depth	Width	Weight (lb.)
6130-00-148-5763	Inverter, Power, Static PP-7078/U-------------------------------	1	30	21	17	500
	Cable assembly, master/slave (Deltec Corporation Part No. 5122418) --	1		8 ft. long		N/A
	Plug, non-parallel code (Deltec Corporation Part No. 5122460)--	1	0.75	1.00	0.75	N/A

CHAPTER 2

INSTALLATION

NOTE

Unless otherwise indicated, the information in this chapter applies to both models of inverters. Differences in reference designations are indicated in paragraph 1-8.1a. When text applies to both models and differences in reference designations exist, the 1973 model reference designation is indicated in parentheses.

Section 0. SYSTEMS PLANNING

2-0.1. Systems Planning

The inverter is a general purpose, direct current (DC) to alternating current (AC), static inverter which provides a 120-volt AC, 60-Hz, 50-ampere (5 kW) power source for use in those locations where the primary power source is 110 volts DC (nonparallel installation). If additional power is required, two inverters can be connected in parallel to provide twice the output, 100 amperes (10 kW) (parallel installation), if required.

2-0.2. Nonparallel Operation-(5 kW)

The following items are required for nonparallel operation:

a. 1 each Inverter, Power, Static PP-7078/U.

b. 1 each nonparallel code plug P2, PN 5122460.

c. 1 each DC lead-in cable capable of 10,000 va.

d. 1 each AC output cable capable of 7,500 va.

e. 1 each bonding strap capable of grounding 10,000 va.

2-0.3. Parallel Operation-(1 0 kW)

The following items are required for parallel operation:

a. 2 each Inverters, Power, Static PP-7078/U.

b. 1 each master-slave cable (P2 to P2) PN 5122418.

c. 1 each DC lead-in cable capable of 20,000 va.

d. 1 each DC unit-to-unit cable capable of 20,000 va.

e. 1 each AC unit-to-unit cable capable of 15,000 va.

f. 1 each AC output cable capable of 15,000 va.

g. 2 each bond straps capable of grounding 20,000 va.

h. 1 each 100-ampere, 120V, single-pole circuit breaker.

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Unpacking

When packed for shipment, the inverter is bolted to a pallet and covered with a corrugated shipping box. Unpack the equipment as follows:

a. Remove the shipping box.

b. Unbolt the pallet.

c. Lift the inverter off the pallet (as described in the equipment placement instructions, paragraph 2-3).

d. If possible, save the packing materials.

2-2. Checking Unpacked Equipment

Make the following checks to ensure that the equipment has suffered no damage in shipment:

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3*b*).

b. Check the equipment against the component listing (para 1-11) and the packing slip to see if the shipment is complete. Report all discrepancies on SF 361 (para 1-3*c*). The equipment should be placed in service even though a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. Equipment which has been modified will have the MWO number on the front panel, near the nomenclature plate. Check also to see whether all currently applicable MWO's have been applied. Current MWO's applicable to the equipment are listed in DA PAM 310-7.

Section II. INSTALLATION INSTRUCTIONS

2-3. Placement of Equipment

Adjacent equipment must allow clearance of at least four inches on all sides for adequate movement of cooling air. The equipment is mounted on any horizontal surface as follows. (Be aware that the inverter weighs 500 pounds.)

a. Using a ½ ton hoist, lift the inverter from the pallet by the four lifting eyes and place into position.

b. Bolt the inverter to its mounting surface in a manner similar to the way it was bolted to the pallet.

c. For optional bulkhead bracing from the top of the unit, remove the two rear lifting eyes and bolt the top of the inverter to the vertical bulkhead with angle brackets attached where the lifting eyes were. The angle brackets are not provided.

2-4. Electrical Interconnections

a. The bond strap (grounding) and the input and output cables are user-supplied and must be capable of handling the maximum current (wattage) to and from the inverter.

b. The input and output cables to the inverter shall be connected in the following manner:

(1) Non-parallel connections (fig. 2-1 and A, fig. 2-2). Use AWG #3 wire for the dc input and AWG #6 for the output.

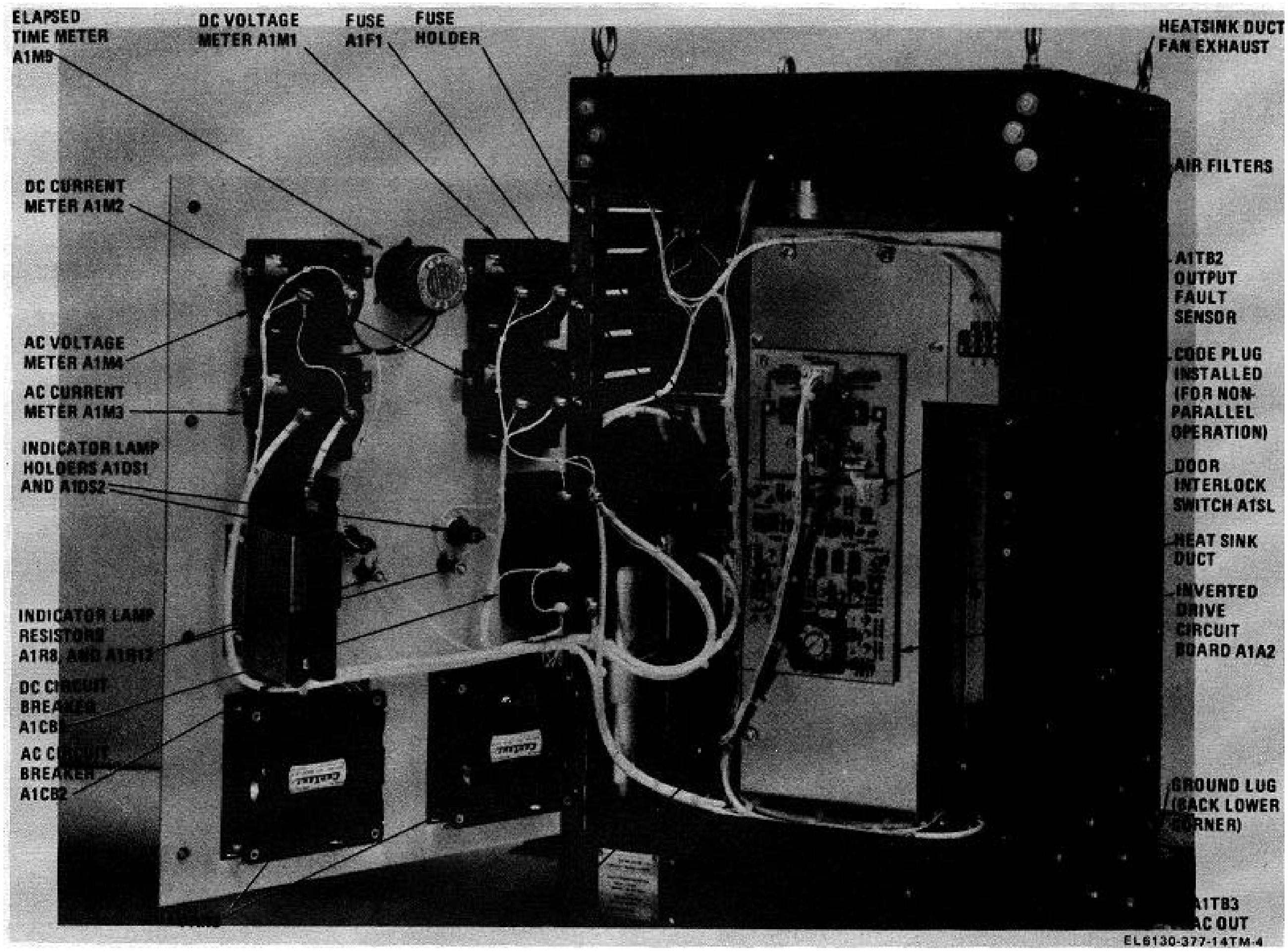


Figure 2-1. Front panel open, parts location, 1973 model.

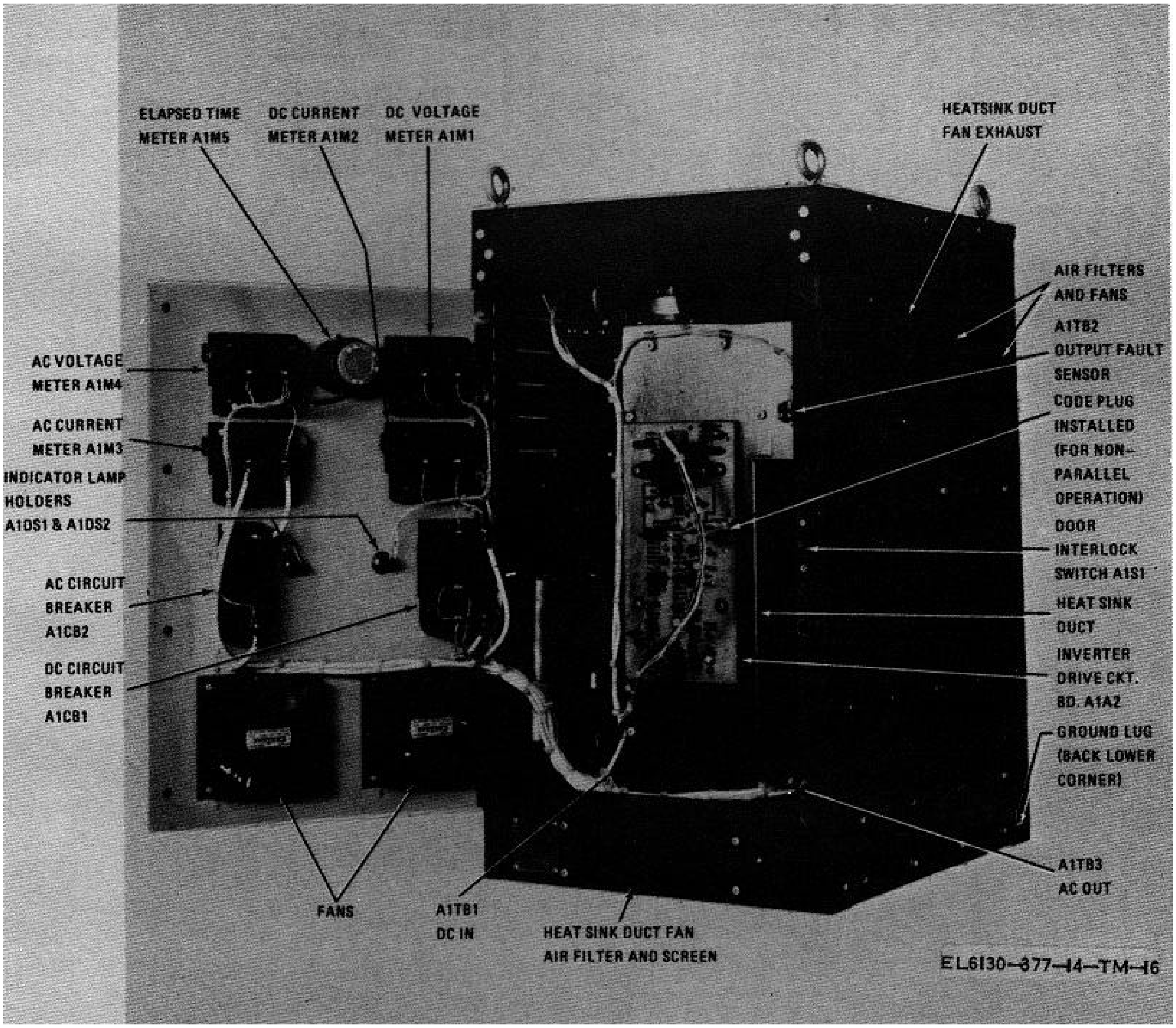


Figure 2-1.1. Front panel open, parts location, 1974 model.

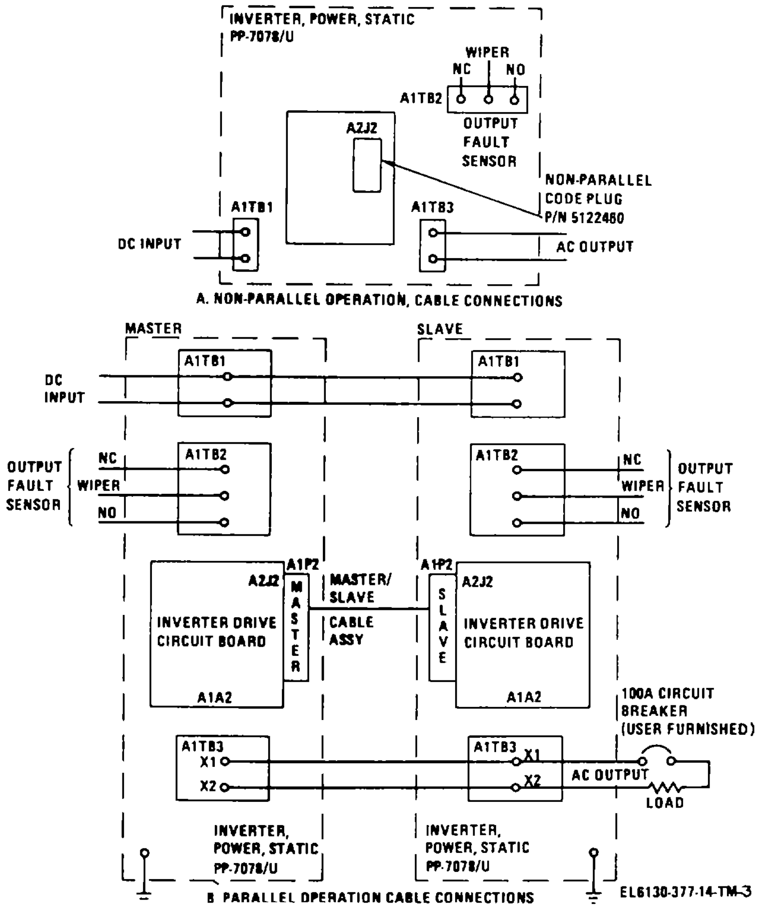


Figure 2-2. Installation wiring diagram for single and dual operation.

(a) Connect the bond (ground) strap from the GROUND terminal, located on the lower edge at the rear of the inverter, to a suitable earth or ship's-hull ground.

(b) Pass the input and output cables through the packing glands located in the rear panel of the inverter and route them to their respective terminal boards.

(c) Connect the dc input cables to A1TB1 and the ac output cables to A1TB3 (fig. 2-1).

(2) Parallel connections (fig. 2-1, and B, fig. 2-2). In this arrangement the user must provide the input and output cables, the inter-unit cables, and a 120 volt, 100 ampere single pole circuit breaker. The circuit breaker is placed between the ac output terminals of the slave inverter and the load. The wire size for the dc cables is AWG#3/0 and for the ac cables is AWG#1.

(a) Open the front panel of each inverter to gain access to the inverter drive circuit board.

(b) Remove the Code Plug (P-2) from the inverter drive circuit board of the two inverters being used in parallel.

NOTE

The inverter which receives the Master/Slave Cable plug placarded MASTER will control the inverter to which the SLAVE plug of the cable is installed.

(c) Install the master/slave cable assembly (fig. 1-1) between the inverters and connect the MASTER plug into receptacle A1A2J2 of one inverter drive board and the SLAVE plug into the other inverter drive board receptacle A1A2J2 (B, fig. 2-2).

(d) Complete the remaining cabling for DC IN and AC OUT as shown in B, figure 2-2.

(e) Clost front panels of both inverters and secure the captive screws.

c. A remotely located indicator device can be connected to A1TB2 (fig. 2-1 and fig. 2-2). Terminal board A1TB2 is connected to relay A1K4 (fig. 5-2) whose contacts are capable of operating at 2 amperes maximum (ac or dc). A user-furnished remote indicator tamp, bell, or buzzer, with its own power supply can be attached to the terminals of A1TB2 to signal a failure of the inverter.

2-5. Preparation for Reshipment

The Inverter shall be prepared for reshipment as follows:

a. Using a 1/2-ton hoist, lift the inverter (500 pounds) onto the pallet utilizing the four lifting eyes.

b. Bolt the power static inverter onto the pallet.

c. Cover the equipment with a suitable shipping box.

CHAPTER 3

OPERATING INSTRUCTIONS

3-1 Controls and Indicators

a. Operator's control panel (fig. 3-1).

Control or Indicator	*Function*
DC VOLTAGE indicator	Meter indicates input power voltage whether the DC circuit breaker is switched on or off.
DC CURRENT indicator	Meter indicates input power current during system operation.
DC circuit breaker	Connects DC input power to the inverter as indicated by the DC ON indicator (amber). The circuit breaker also provides overvoltage and undervoltage protection for the input.
DC ON indicator	Light (amber) indicates that DC input power is applied and the DC circuit breaker is positioned to ON.
AC VOLTAGE indicator	Meter indicates the output voltage whether the AC circuit breaker is switched on or off.
AC CURRENT indicator	Meter indicates the output current.
AC circuit breaker	Connects AC output power of the inverter to the load as indicated by the AC ON indicator (green). The circuit breaker also provides overload protection for the output.
AC ON indicator	Light (green) indicates that the inverter is operating and the AC circuit breaker is positioned to on.
ELAPSED TIME indicator	Accumulates running hours regardless of whether the AC output is switched on or off.

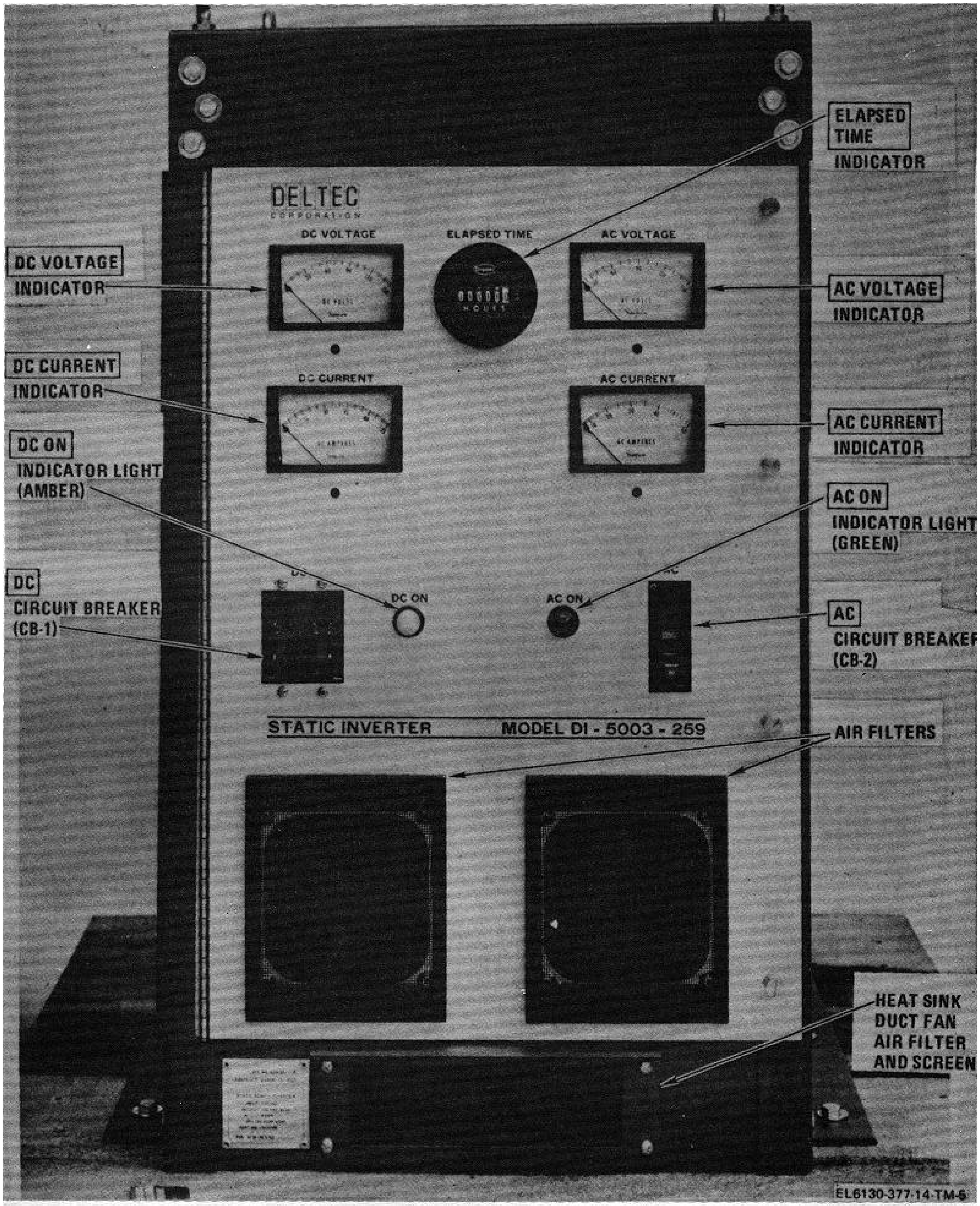


Figure 3-1. Controls and indicators.

3-2. Operating Procedures

This section contains the procedures required for starting and stopping the inverter in its various modes of operation (paga 1-9).

3-3. Equipment Starting Procedures

Prior to performing the following turn-on procedure, ensure that both DC and AC circuit breakers are set to OFF. Refer to paragraph 3-6 for the sequence of operation to be followed in the event a circuit breaker trips at turn-on.

a. Single Inverter Starting Procedure. Refer to paragraph 2-4 for electrical installation of a single inverter in the system, and figure 3-1 for location of controls and indicators.

NOTE

Perform the Following in sequence given.

(1) Position DC circuit breaker to ON. Amber DC ON indicator lamp lights. Within 5 seconds the cooling fans should be operating.

(2) Position AC circuit breaker to ON. Green AC ON indicator lamp lights.

b. Parallel Inverter Starting Procedure. Refer to paragraph 2-4 for electrical installation of two inverters in parallel in a system, and figure 3-1 for location of controls and indicators.

NOTE

Perform the following in sequence given.

(1) Position the DC circuit breaker of the master inverter to ON. Amber DC ON indicator lamp lights. Within 5 seconds the cooling fans should be operating.

(2) Position the DC circuit breaker of the slave inverter to ON. Amber DC ON indicator lamp lights. Within 5 seconds the cooling fans should be operating.

(3) Position the AC circuit breaker of the master inverter to ON. Green AC ON indicator lamp lights.

(4) Position the AC circuit breaker of the slave inverter to ON. Green AC ON indicator lamp lights.

(5) Position the user-furnished external 100 ampere circuit breaker to ON.

3-4. Equipment Operating Conditions

a. Non-parallel Operation. During normal operation, the DC VOLTAGE meter should indicate 104 to 141 vdc and the DC CURRENT meter should indicate up to 60 amp maximum. The AC VOLTAGE meter should indicate 120 vac and the AC CURRENT meter should indicate 42 amp maximum (5000 VA). Because of the current-limiting feature, a temporary short-circuit across the output only causes the voltage to collapse until the short-circuit is removed, at which time operation returns to normal.

b. Parallel Operation. If a load greater than 50 amperes (5 KVA) is anticipated, two inverters are to be connected in parallel to provide the necessary power. A Master/Slave cable assembly is provided to connect the two units in parallel as shown in detail "B" of figure 2-2. In this mode of operation the inverter to which the MASTER plug of the cable assembly is connected becomes the controlling or master inverter and the unit which receives the SLAVE plug becomes the slave inverter. The 100 amp circuit breaker (user furnished) should be placed in the AC OUT lead as shown in B, figure 2-2, for best operation.

c. Operating Time. When there are two inverters, it is recommended that they be used alternately to accumulate equal operating times (as counted on the ELAPSED TIME meter); e.g., operate each inverter on alternate days.

3-5. Stopping Procedure

Perform the following stopping procedures in the sequence given.

a. Non-Parallel Operation

(1) Position AC circuit breaker to OFF

(2) Position DC circuit breaker to OFF; the cooling fans stop operating.

b. Parallel Operation

(1) Position the external 100 amp circuit breaker to OFF.

(2) Position both AC circuit breakers to OFF.

NOTE

When the DC circuit breaker on the master inverter is placed in the OFF position, the DC circuit breaker of the slave inverter automatically trips off.

(3) Position the DC circuit breaker on the master inverter to OFF and observe that the DC circuit breaker on the slave inverter trips off automatically and the cooling fans stop operating.

3-6. Operation Under Abnormal Conditions

Abnormal conditions which could affect the system include progressive and prolonged output overload, overvoltage of the input voltage source above the maximum specified, and undervoltage of the input voltage source below the minimum specified.

a. Progressive and prolonged output overloads cause the AC circuit breaker to trip. After the overload is removed and the AC circuit breaker is reset by positioning to OFF and then to ON, normal operation can continue.

b. Overvoltage or undervoltage at the input causes the DC circuit breaker to trip. After the input voltage condition is corrected, the inverter is reactivated by following the turn-on sequence given in paragraph 3-3.

CHAPTER 4

OPERATOR AND ORGANIZATIONAL MAINTENANCE

Section I. GENERAL REQUIREMENTS

4-1. Scope of Operator's Maintenance

The Maintenance duties assigned to the operator of the inverter are listed below with a reference to the paragraphs covering the specific maintenance function.

a. Daily preventive maintenance checks and services (para. 4-5).

b. Weekly preventive maintenance checks and services (para. 4-6).

c. Cleaning (para. 4-7).

d. Operational checks (para. 4-9).

e. Operation of fans (para. 4-8).

4-2. Equipment and Materials Required for Maintenance

The equipment and materials required for operator maintenance are listed below.

a. Cleaning compound (Trichlorethane).

b. Cleaning cloth.

c. Detergent

d. Fine bristle brush.

4-3. Preventive Maintenance, General

Preventive Maintenance is the systematic care, servicing and inspection of equipment at stated intervals to prevent the occurrence of trouble to reduce downtime, and to insure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 4-4 through 4-9, and 4-11 cover routine systematic care essential to proper upkeep and operation of the equipment. The cleaning operation (para. 4-7) should be performed as necessary. If the equipment is not use daily, cleaning must be performed before operation or after any extended shutdown. The other items should be checked daily if the equipment is in continuous operation, or whenever the equipment is placed in operation after a shutdown.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 4-5, 4-6 and 4-12) outline functions to be performed at specific intervals. These checks and services are made to maintain Army electronic equipment in a serviceable condition; that is, in good general (physical) condition. To assist the operator in maintaining equipment serviceability, the charts indicate what to check, how to check, and the normal conditions. The References column in the charts provides a source of supplementary information or corrective measures. If any defect cannot be remedied by the operator, using the instructions contained in this chapter, higher category maintenance is required.

Section II. OPERATOR MAINTENANCE

4-4. Operator's Preventive Maintenance Checks and Service Periods.

Operator preventive maintenance checks and services of the inverter are required daily (para 4-5) and weekly (para 4-6). The daily and weekly preventive maintenance checks and services are performed while the inverter is operating.

a. Paragraph 4-5 specifies the checks and services that must be performed daily by the operator of the inverter as a routine part of his regular duties, and the least once each week if the equipment is maintained in a standby condition.

b. Paragraph 4-6 specifies additional checks and services that must be performed once each week by the operator.

4-5. Daily Preventive Maintenance Checks and Service Chart

Sequence No.	*Item*	*Procedure*	*References*
1	Cleanliness	Check that the exterior surfaces of the inverter are clean. Clean exterior surfaces as required.	Para 4.7
2	Fans	Check the operation of all fans.	Para 4-8
3	Operational checks	Check the operation of inverter.	Para 4-9

4-6. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	*Item*	*Procedure*	*References*
1	Meters	Check that the glass on all meters is clean. Clean the glass on all meters as required.	Para 4-7
2	Corrosion....................................	Check that exterior surfaces of the inverter are free of rust and corrosion.	

4-7. Cleaning

a. Exterior Surfaces. Inspect the exterior of inverter. The exterior surfaces should be clean, and free of dirt, dust, grease, and fungus.

(1) Remove the dust and loose dirt with a clean, soft cloth.

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near open flame. Trichloroethane is not flammable, but exposure to open flames converts the fumes to highly toxic dangerous gases.

(2) Remove grease, fungus, and ground-in dirt using a cloth dampened (not wet) with trichloroethane.

(3) Remove dust or dirt from terminals with brush.

CAUTION

Do not press on the meter faces (glass) when cleaning; the meter may be damaged.

(4) Clean the front panel, meters, and control knobs; use a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning.

4-8. Operation of Fans

The operator must check the operation of fans in the inverter on a daily basis. If any fan is not operating, is noisy, or seems to be scraping, notify higher echelon maintenance without delay. Use the procedures given in the following steps to check operation of fans.

a. Place hand over the three air filter screens (fig. 3-1) on the front panel and check that air is being sucked in through the filter.

b. Place hand over the rear two air filter screens (fig. 2-1) on the right hand side panel and check that air is being sucked in through the filter.

c. Place hand over the heat sink fan exhaust opening located on the right side panel (fig. 2-1) and check that air is being blown out of the screen.

4-9. Operational Checks

Operational checks consist of a cursory observation of the inverter performance during normal operation (para 3-3 and 3-4). If an abnormal indication is obtained during operation of the equipment, refer to higher echelon maintenance.

4-10. Operator Troubleshooting

a. General. Operator troubleshooting is based on a cursory observation of the inverter performance by the operator. When trouble is encountered during this observation of equipment performance note the abnormal indications and read down the Trouble symptoms column of the following troubleshooting chart, beginning with item No. 1, until the trouble symptom appears. Comply with the indicated disposition in taking corrective measures for the trouble symptom. Any trouble that is beyond the scope of the operator shall be referred to a higher echelon.

b. Operator Troubleshooting Chart

Item No.	*Trouble symptom*	*Corrective measures*
1	AC VOLTAGE meter indicates below 114 vac or above 121 vac.	Defective inverter; higher maintenance repair required.
2	AC circuit breaker is ON but AC VOLTAGE meter indicates 0 volt internal current-limiting circuit may be activated).	*a.* Defective inverter. Turn off ac power switch connected between inverter and ac equipment. (1) If AC VOLTAGE meter still indicates 0 volt, inverter is defective. (2) If normal AC VOLTAGE indication is obtained, reset ac power switch to off and proceed to b below. *b.* Defective ac equipment or wiring. Among equipment being fed by inverter, start turning off one unit after the other while observing AC VOLTAGE meter for return of normal indication (120 vac) which should occur when shorted equipment is turned off. If normal AC!' VOLTAGE meter indication is not obtained after all ac equipment is turned off, wiring between inverter and ac equipment is defective.

Item No.	Trouble symptom	Corrective measures
3	DC VOLTAGE meter indicates 0 volt.	*a.* Turn on dc power source. *b.* Set switch connected between the inverter and the dc source to ON. *c.* Replace fuses, if provided, between dc power source inverter.
4	DC VOLTAGE meter indicates below or above 143 vdc, and when DC circuit breaker is operated, it springs to OFF.	Adjust the dc-power source to nominal 110 vdc (or at least above and below 143 vcd).

Section III. ORGANIZATIONAL MAINTENANCE

4-11. Scope of Organizational Maintenance

The maintenance duties assigned to organizational maintenance of the inverter are listed below with a reference to the paragraphs covering specific maintenance functions.

a. Quarterly preventive maintenance checks and services (para. 4-12).

b. Fuse replacement (para. 4-16).

c. Clean and/or replace air filter element (para. 4-14, and 4-15).

d. Indicator lamp replacement (para. 4-17).

e. Troubleshooting (para 4-18). The required tools and test equipment are specified in table B-1, appendix B (MAC).

4-12. Organizational Preventive Maintenance Checks and Services

Organizational preventive maintenance checks and services of the inverter are required quarterly (para. 4-13). The quarterly preventive maintenance checks and services are performed while the inverter is operating and under the conditions listed below.

a. When the equipment is initially installed.

b. When the equipment is reinstalled after removal for any reason.

4-13. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Cleanliness	Check that the air filter elements are clean.	Para 4-14
2	Cables	Visually inspect all exterior cables for kinks, strain, cut, frayed or otherwise damaged insulation	
3	Indicator Lamps	Check that indicator lamps are in serviceable condition.	Para 4-17

4-14. Cleaning Air Filters

To clean air filters proceed as follows:

a. Remove air filter as described in paragraph 4-15.

b. Clean the air filter in a solution of water and detergent.

c. Air dry the filter or, if compressed air is available, dry the filter by blowing air (not to exceed 30 psi) through it.

d. Replace the air filter as described in paragraph 4-15.

4-15. Air Filter Removal and Replacement

The inverter is equipped with five air filters. Two air filters are located on the front panel assembly, lower edge, and two are located on the right hand side panel near the top edge. The fifth air filter is located in the base subassembly. Use the appropriate procedure given in a or b below to remove or replace the air filters.

a. Front and Side Panel Mounted Air Filters. To remove or replace a front or side panel mounted air filter (fig. 2-1 and 3-1) proceed as follows:

(1) Locate the pry-slot in the screen assembly of the air filter.

(2) Insert the blade of a flat tip screwdriver in the pry-slot of the screen assembly and gently apply pressure to remove the screen.

(3) Lift out the filter assembly from its retaining frame.

(4) Insert cleaned (para 4-14) or replacement air filter into its retaining frame.

(5) Install the screen assembly over the retaining frame and gently push it in place.

(6) Ensure the fan blades are clear of the filter.

b. Base Subassembly Mounted Air Filter. To remove or replace the air filter mounted in the base subassembly (fig. 2-1), proceed as follows:

(1) Remove four screws and lockwashers securing the heat sink inlet panel to the base subassembly and remove the inlet panel.

(2) Reach through the opening and pull the air filter out of its retaining frame.

(3) Guide cleaned (para 4-14) or replacement air filter into the retaining frame and push the filter in until it bottoms on the frame.

(4) Install the heat sink inlet panel in position on the base subassembly and secure with four lockwashers and screws.

4-16. Fuse Replacement (1973 Model Only)

CAUTION

If replacement fuse burns out, do not insert another fuse, notify higher echelon maintenance. Never use a fuse with an amperage rate higher than the equipment calls for.

a. Fuses. Fuses shall be Bussman (LKN-60, 250V) Fuse Renewal Links or an equivalent (Bussman NON-60 Fuse). Use the appropriate procedure given in *b* or *c* below to remove or replace a fuse.

b. Renewal Link Fuses. To remove or replace the fuse link proceed as follows:

(1) Position DC circuit breaker to OFF.

(2) Open the front indicator panel to gain access to fuse A1F1, located in the fuse holder mounted on the underside of the shelf to the left of the heat sink duct (fig. 2-1).

(3) Using a fuse puller or suitable tool remove the fuse from the fuse holder.

(4) Remove both end caps from the fuse body and discard the burned out link.

(5) Install a replacement link into the fuse body and through the slot in the fixed end. Bend the end of the fuse link over and replace the end cap. Install the slotted washer over the other end of the fuse link and bend link down over washer, replace end cap.

(6) Install the fuse into the holder using the fuse puller or a suitable tool.

(7) Close the front indicator panel and secure the four turn fasteners.

c. Standard One-Time Fuses. To remove or replace fuse A1F1 proceed as follows:

(1) Position DC circuit breaker to OFF.

(2) Open front indicator panel to gain access to fuse A1F1, located in the fuse holder mounted on the underside of the shelf to the left of the heat sink duct (fig. 2-1).

(3) Using a fuse puller or suitable tool remove the burned out fuse from the fuse holder.

(4) Install a new fuse into the fuse holder using a fuse puller or suitable tool.

(5) Close the front indicator panel and secure the four turn fasteners.

4-17. Indicator Lamp Replacement

To remove and replace a burned out DC or AC ON indicator lamp proceed as follows:

a. Position the DC circuit breaker A1CB1 to OFF.

b. Unscrew the lens cap of the indicator light to gain access to the burned out lamp.

c. Remove the faulty lamp by pressing in on bulb and turning to release bayonet base.

d. Install a replacement lamp into the light assembly by pressing in on bulb and turning to engage bayonet base.

e. Screw the lens cap on the light assembly finger tight.

f. Check lamp operation by performing equipment starting procedure (para. 3-3).

4-18. Organizational Troubleshooting Chart

The troubleshooting chart below is provided to aid the organizational repairmen to localize troubles in the inverter at organizational levels. To use the chart read down the trouble symptom column to locate the abnormal indication and then perform the corrective measures.

Item No.	*Trouble symptom*	*Corrective measures*
1	A blown input fuse A1F1 (1973 model only)	Replace blown fuse (para 4-16). Notify general support maintenance if replacement fuse blows.
2	DC ON indicator light does not illuminate	Replace burned out lamp (para 4-17).
3	AC ON indicator light does not illuminate	Replace burned out lamp (para 4-17).

CHAPTER 5

FUNCTIONING OF EQUIPMENT

NOTE

Items in parentheses refer to 1973 model only.

5-1. General

This section describes the major functions of the inverter at detailed schematic and block diagram levels. In addition, the functional circuits of inverter drive circuit board A1A2 are covered to explain the operating relationships between functional elements.

5-2. System Description of Inverter

a. The major functions of the various circuits of the inverter are described in the following subparagraphs and are to be used in conjunction with figures 5-1 and FO-1.

(1) *Input Shunt Trip Circuit Breaker* (fig. 5-1A and FO-1). The input shunt trip circuit breaker provides automatic turn off for high or low input voltages and manual turn off for the normal operation of the inverter. The circuit consists of DC circuit breaker A1CB1 (relay A1K1) and associated circuitry.

(2) *Input Filter and Soft Start* (fig. 5-1B and FO-1). The input filter attenuates noise so that the inverter does not induce noise back into the DC input line. The input filter consists of choke A1L1 capacitors A1C1 and A1C2, and associated circuitry. (The soft start circuit consists of SCR A1Q2, resistor A1R6, and associated drive circuitry resistors A1R4, A1R5 and capacitors A1C5 and A1C6.)

(3) *SCR Inverter* (fig. 5-1C and FO-1). The silicone controlled rectifier (SCR) inverter drives the ferroresonant transformer and filter system. The SCR inverter consists of SCR A1Q1 (A1Q3), A1Q2 (A1Q4), diodes A1CR4 (A1CR6), A1CR5 (A1CR7), capacitor A1C2 (A1C3), and inductors A1L2 and A1L3 (A1L5).

(4) *Ferroresonant Transformer and Filter* (fig. 5-1D and FO-1). The ferroresonant transformer and filter provide a 120-volt, 60-Hz sine wave output. This circuitry consists of transformer A1T1, chokes A1L4 (A1L3), A1L5 and (A1L4) and capacitor A1C3 (A1C4).

(5) *Output Circuit Breaker and Relay* (fig. 5-1E and FO-1). The output of the ferroresonant filter system drives through the output circuit breaker A1CB2. The circuit breaker is used as an ON/OFF feature. (In the 1973 model, relay A1K3 operates during the soft start feature that holds back ac output at terminals X1 and X2 of A1TB2. The relay will be deenergized at start.)

(6) *12 Volt Shunt Regulator, 1978 model only* (fig. 5-1F and FO-1). The shunt regulator provides a regulated 12 volts dc to the inverter drive circuit board from the 110-volt dc input. This circuit consists of transistor (A1Q1), resistor (A1R2) and associated circuitry.

(7) *Inverter Drive Circuit Board* (fig. 5-1G and FO-1). The inverter drive and its control circuitry is located in inverter drive circuit board A1A2 (para 5-3). The circuit board has the oscillator, the drive for the SCR's, the control signals for soft start, and the sensor circuits which drive the input circuit breaker.

(8) *Metering* (fig. 51H and FO-1). The metering which is throughout the system consists of the input DC voltmeter A1M1, the input DC ammeter A1M2, the output AC current meter A1M3, the output AC voltmeter A1M4 and the elapsed time indicator A1M5.

NOTE

Reference designation prefix A1 is deleted in the following discussion:

b. A detailed functional description of the operation, circuits and components of the inverter are described in the following paragraphs (fig. FO-1).

(1) When DC input power is connected to the system, DC VOLTAGE meter M1 indicates that input voltage and power are being applied to

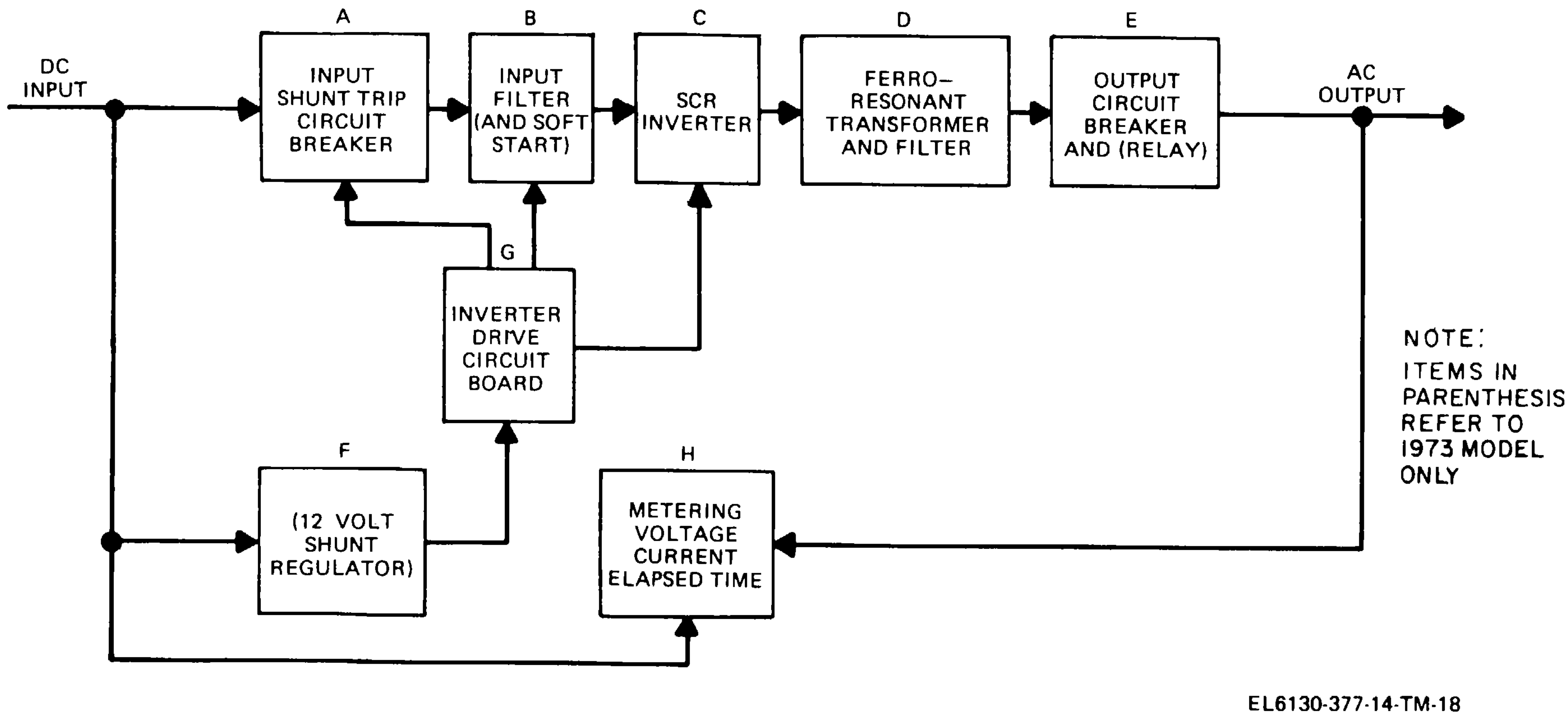


Figure 5-1. System block diagram.

TB1 (+) and (-). In the 1973 model, power is also applied to shunt regulator (Q1) through door interlock switch (S1) contacts 1 and 2, providing +10 to +12 vdc to inverter drive board A1A2.

(2) When DC circuit breaker CB1 is first positioned to ON, capacitor C1 (C2) charges through circuit breaker CB1, DC CURRENT meter M2, and inductor L1 (also F1 and R6 providing a soft start for the system) After a power on delay, the inverter drive circuit board energizes SCR Q1 and Q2 (In the 1973 model, the inverter drive circuit board energizes SCR Q2 and relay K3; SCR Q2 is turned on by passing R6 and closing the contacts of relay K3; closing the system output circuit breaker connects output terminals X1 and X2 (TB3).) The system is energized as indicated by dc ON indicator DS1. Input filter L1 and C1 (C2) prevents the inverter from introducing noise back onto the input DC line.

(3) In the 1974 model, contacts 1 and 2 of A1CB1 are held open while the inverter is operating. Capacitor A1A2C25 and resistor A1A2R28 (on the inverter circuit board) prevent arcing across the contacts when circuit breaker ALCB1 is first turned on. When the inverter is turned off, the contacts relax and discharge capacitor A1C1. The capacitors are discharged through resistor A1A2R28 and circuit breaker A1CB1, contacts 1 and 2, in less than 5 seconds. Circuit breaker A1CB1 provides normal overload protection as well as input overvoltage and undervoltage protection for the system. In the 1973 model, relay (A1K2) is energized by circuit breaker (A1CB1) and is held open while the inverter is operating. Capacitor (A1C1) and resistor (A1R3) prevent arcing across the contacts of relay (A1K2) when circuit breaker (A1CB1) is first turned on. When the inverter is turned off (either by positioning circuit breaker (A1CB1) to OFF or by removing input power), the contacts of relay (A1K2) relax and discharge capacitors (A1C1) and (A1C2) and all the capacitors connected to connector J1, pin 2 on the inverter drive circuit board. The capacitors are discharged through resistor (A1R3) and relay (A1K2), contacts 2 and 9, in less than 5 seconds.

(4) In the 1973 model, circuit breaker (A1CB1) provides normal overload protection as well as input overvoltage and undervoltage protection for the system. A small input overload (400 to 800 amperes) may take more time to trip the circuit breaker than a large overload. An input overload that takes more than 15 milliseconds to trip circuit breaker (CB1) causes fuse (F1) to blow, protecting the system from prolonged overloads on the input. Fuse (Fl) is also blown by diode (CR5) if the DC input voltage leads are reversed.

(5) If the door of the cabinet is opened, contacts 4 and 6 of switch S1 (door interlock) close, turning off the system by energizing the shunt trip coil of circuit breaker CB1. Switch S1 is positioned to enable the system either by closing the door or by pulling out the switch plunger. The shunt trip coil of circuit breaker CB1 is also energized by the sensors on inverter drive circuit board A1A2 upon detection of a voltage fault (dc input voltage outside its upper or lower limits). In the 1973 model, this is accomplished through relay (K1) which is closed by the inverter drive circuit board upon detection of a voltage fault.

(6) Thyristors (SCR's) Q1 (Q3) and Q2 (Q4) are connected to output transformer T1. These SCR's are alternately triggered into conduction by the inverter drive circuit board to produce an alternating current in the primary winding of the output transformer.

(7) The SCR's are commutated by capacitor C2 (C3), which is connected between the anodes of Q1 (Q3) and Q2 (Q4) through L3 (L5). The flow of current through the circuit can be traced by assuming that initially SCR Q2 (Q4) is conducting and Q1 (Q3) is non-conducting, and that the common cathode connection of the SCR's is the reference point. For this condition, the voltage at the anode (220 volts) of SCR Q1 (Q3) is twice the voltage of the DC input voltage. The load current flows from the positive terminal of the DC input through circuit breaker CB1, DC CURRENT meter M2, inductor L1, one half of the primary winding of transformer T1, SCR Q2 (Q4), and inductor L2 to the negative terminal of the DC input. When the firing current is applied to the gate of Q1 (Q3), this SCR turns ON and conducts.

(8) While SCR Q2 (Q4) is still on, capacitor C2 (C3) begins to discharge through SCR's Q1 (Q3) and Q2 (Q4). The discharge current through SCR Q2 (Q4) flows in a reverse direction, and after the carriers of Q2 (Q4) are swept out (recombined), Q2 (Q4) is switched to the off state. At this time, the voltage across capacitor C2 (C3), which is approximately 220 volts, appears across SCR Q2 (Q4) as reverse voltage. This voltage remains long enough to allow Q2 to recover for forward blocking. Simultaneously during this interval, the conducting SCR Q1 (Q3) establishes another discharge path for capacitor C2 (C3)

through inductor L2. Inductor L2 controls the rate of discharge of the capacitor to allow sufficient time for turn-off of SCR Q2 (Q4). Inductor L3 (L5) limits the discharge rate of C2 (C3).

(9) After capacitor C2 (C3) is discharged from 220 volts to 0 volt at the anode of Q1 (Q3), it starts to charge the anode of Q2 (Q4) to 220 volts. When C2 (C3) is charged to 220 volts because of the phase shift between voltage and current, the flux at that time in inductor L2 is at a maximum. The reactive energy stored in the inductor is transferred to the capacitor and tends to cause the capacitor to continue charging past 220 volts. A voltage on the capacitor higher than 220 volts at the anode of Q2 (Q4), however, would produce a negative voltage at the anode of SCR Q1 (Q3) with respect to the negative terminal of the input power. This condition is prevented by clamping diode CR4 (CR6) connected to tap number 2 on the transformer (oriented close to the anode of SCR Q1 (Q3)). As a result, the amount of overcharge of the capacitor is insignificant. The energy stored in inductor L2 causes current to flow through diode CR4 (CR6), transformer winding 2-to-1, and SCR Q1 (Q3). Transformer windings 2-to-1 and 3-to-2 act as auto-transformers through which the energy in the inductor is returned to the power input. When the firing current is applied to the gate of SCR Q2 (Q4), this device conducts and the process described above for Q1 (Q3) is repeated.

(10) Output transformer T1, capacitor C3 (C4), and inductors L4 (L3) and L5 (L4) form a ferroresonant transformer and filter. Capacitor C3 (C4) is the ferroresonant capacitor and inductors L4 (L3) and L5 (L4) suppress harmonics. The low-distortion, sine-wave output is taken from across the secondary winding 7-to-8 of transformer T1.

(11) The photocoupler of the master inverter is connected to operate the slave inverter's shunt trip relay driver and the photocoupler of the slave inverter is connected to operate the master inverter's shunt trip relay driver. This is accomplished by use of the cable between connector P2 of each inverter drive circuit board (refer to FO-1 for electrical interconnection configuration). The collector of the photocoupler transistor of the master inverter is connected through connector P2 pin 1 to +5 vdc of the slave inverter to connector P2 pin 3. The emitter of the photocoupler transistor in the master inverter is connected through connector P2 pin 4 to shunt trip relay driver transistor Q11 (Q22) of the slave inverter at connector P2 pin 9. Thus, when the photocoupler transistor in the master inverter turns on (because the shunt trip relay driver operated), the slave inverter +5 vdc is conducted to the base of transistor Q11 (Q22) in the slave inverter, causing the shunt trip relay drivers to operate simultaneously. The photocoupler of the slave inverter operates the shunt trips relay driver of the master inverter in a similar manner, except that master inverter +5 vdc is obtained at slave inverter connector P2 pin 10.

(a) Parallel SCR Driver Input. In this configuration, connector P2 on the master inverter contains the same jumpers as used for nonparallel operation, so that the SCR driver is operated from its own oscillator and frequency divider, in addition to interconnecting wires to the slave inverter. Connector P2 on the slave inverter, however, does not contain jumpers on its connector P2 pins 7 to 8, 3 to 10, 2 to 11, and 6 to 12. Instead, the SCR driver of the slave inverter is operated from the oscillator and frequency divider of the master inverter through the cable so that both inverters are operated in phase with each other. Master inverter connector P2 pins 8, 10, 11, and 12 are connected through the cable to slave inverter connector P2 pins 8, 10, 11, and 12, respectively.

(b) Non-Parallel SCR Driver Input. When the inverter is operated as a single unit (nonparallel), jumpers are connected across connector P2 which plugs into connector J2 (refer to figure FO-1 for electrical interconnection configuration). The jumpers in connector P2 are from pins 7 to 8, 3 to 10, 2 to 11, and 6 to 12. No other connections are made to connector P2 in the non-parallel mode of operation. Thus, the SCR driver circuit is operated from its own oscillator and frequency divider.

5-3. Functional Description of Inverter Drive Circuit Board A1A2 (1973 Model Only)

(fig. 5-2 and FO-2)

a. DC Power Supply Circuit (fig. 5-2 and FO-2). The unit power supply circuit consists of U1 and filter capacitors C3, C5, C6 and C7 (included in the inverter drive description are basic reference designators which in turn apply to inverter drive A1A2). The regulator, which starts operating when DC input power is first applied to the system, reduces the +10 to +12 volt input at connector J1 pin 10 to a regulated +5 vdc level that is filtered for use by the low-level circuitry of the inverter drive circuit board.

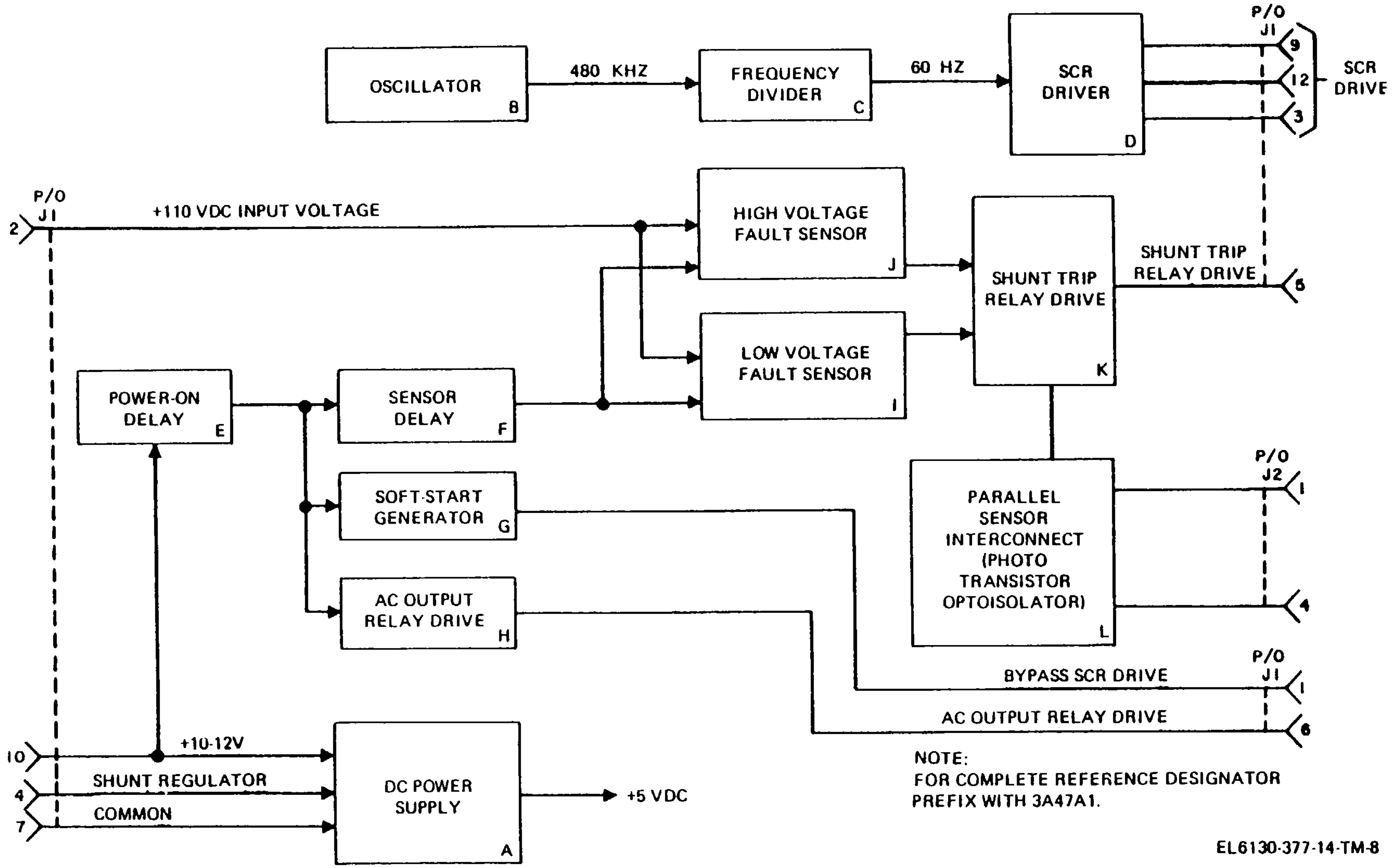


Figure 5-2. Inverter drive A1A2 overall block diagram, 1973 model.

5-4. Functional Description of Inverter Drive Circuit Board A1A2 (1974 Model Only)

(fig. 5-2.1 and FO-2.1)

a. General. The inverter drive circuit board contains 11 functional circuits (*b* through *l* below).

(1) When DC input power is connected to the system, the resulting +10- to +12-volt input is reduced by the dc power supply to a regulated +5 vdc. The oscillator provides a 15.36 kHz signal that is divided down to 60 Hz by the frequency divider. This 60-Hz signal operates the SCR driver circuit which provides gate drive to the power SCR's (not on the circuit board).

b. Oscillator Circuit (fig. 5-2 and FO-2). The crystal oscillator consists of transistors Q1 through Q5 and crystal Y1 (transistors Q1 and Q3 operate as a relaxation oscillator). The 480 KHz output to the frequency divider is buffered by transistor Q5.

c. Frequency Divider Circuit (fig. 5-2 and FO-2). The frequency divider consists of divide-by-ten counters U3, U4 and U5; divide-by-four counter U6; and divide-by-two counter U8. The output to the SCR driver is a 60-Hz squarewave through connector J2 pin 2.

d. SCR Driver Circuit (fig. 5-2D and FO-2). The SCR driver consists of phase-splitter U9 and transistors Q20 and Q21. The 60 Hz input to transistor Q21 is inverted by one gate and the input to transistor Q20 is double-inverted by two gates of integrated circuit U9 which is connected as a phase-splitter. The complementary 60 Hz signals cause transistors Q20 and Q21 to drive output transformer T1. Transformer T1 provides gate drive for the inverter power SCRs through connector J1 pins 3, 9 and 12.

e. Power-on Delay (fig. 5-2E and FO-2). When the system input circuit breaker CB1 is closed, + 110 vdc INPUT VOLTAGE is applied to connector J1 pin 2 and thus to the power-on delay circuit which consists of transistors Q7, Q9 and Q10. When +110 vdc is first applied, transistors Q7, Q9 and Q10 are off until capacitor C9 charges through resistor R23. When the charge on capacitor C9 exceeds approximately 7.4 volts (the voltage of Zener diode CR3 plus the base-emitter drop of transistor Q7), transistor Q7 turns on. This delay is approximately 350 milliseconds after turn-on of the inverter input circuit breaker. When transistor Q7 turns on, transistors Q9 and Q10 turn on. Transistor Q9, in turn, pulls up a line that is connected to the sensor delay, soft-start generator, and AC output relay driver circuits, which are subsequently described below.

f. Sensor Delay (fig. 5-2F and FO-2). The sensor delay consists of transistors Q11 and Q13. During the 350-millisecond power-on delay, transistor Q1 is off and capacitor C12 charges through resistors R34 and R35. The charge on capacitor C12 holds transistor C13 on, which inhibits the voltage fault sensor circuits. Transistor Q9 turning on causes transistor Q11 to turn on and provide a discharge path for capacitor C12 through resistor R35 and transistor Q11 to common. When capacitor C12 discharges to a voltage below the cut-off point of transistor Q13 (approximately 50 milliseconds), the transistor turns off and removes the inhibit command from the voltage fault sensors. The total delay of approximately 400 milliseconds (power-on delay plus sensor delay) prevents the fault sensors from reacting to transients that may be present at the turn-on of the inverter.

g. Soft-Start Generator. (fig. 5-2G and FO-2). The soft-start generator (bypass SCR driver) consists of transistor Q15 and Q16. During the 350 millisecond power-on delay, transistor Q15 is off and transistor Q16 is on, grounding the gate of the bypass SCR through connector J1 pin 1. The bypass SCR is off, causing the inverter input circuitry to come up to full power at a gradual rate. When transistor Q9 turns on, transistor Q15 turns on, transistor Q16 turns off, and the bypass SCR turns on for normal operation.

h. AC Output Relay Driver (fig. 5-2H and FO-2). The AC output relay driver consists of transistor Q18. During the 350-millisecond power-on delay, transistor Q18 is turned off. This caused the AC output relay (through connector P1 pin 6) to be deenergized, disconnecting the inverter AC output circuit breaker from the output terminals. When transistor Q9 turns on, transistor Q18 turns on and energizes the AC output relay. This connects the AC output circuit breaker of the inverter to the output terminal for normal operation.

i. Low Voltage Fault Sensor (fig. 5-21 and FO-2). The voltage fault sensors monitor the +110 vdc INPUT VOLTAGE at connector J1 pin 2 through a voltage divider consisting of resistors R8 and R11. The low voltage fault sensor consists of operational amplifies U2 and transistor Q6 and Q8. A reference voltage is setup at the + input of the operational amplifier by potentiometer R15 and resistors R14 and R16. Potentiometer R15 is set so that the voltage of the + input is below the-input as long as the +110 vdc INPUT VOLTAGE remains above approximately 95 vdc. If the + 110 vdc INPUT VOLTAGE drops to approximately 95 vdc, a voltage potential is created across the + and -inputs of the amplifier. This causes the amplifier output to rise which turns off transistors Q6 and Q8. When transistor Q8 turns off, the line through diode CR7 rises and causes the shunt trip relay driver to operate as described below.

j. High Voltage Fault Sensor (fig. 5-2J and FO-2). The high voltage fault sensor consists of operational amplifier U7 and transistors Q12 and Q14. The high voltage fault sensor operates in a manner similar to the low voltage fault sensor except that the amplifier inputs are reversed. Potentiometer R30 is set so that the voltage of the minus (-) input of the amplifier is above the voltage of the positive (+) input as long as the +110 VDC INPUT VOLTAGE remains below approximately 142 VDC. If the +110 VDC INPUT VOLTAGE rises to approximately 142 VDC, transistor Q14 turns off and causes the line through diode CR9 to rise and operate the shunt trip relay driver.

k. Shunt Trip Relay Driver. (Fig. 5-2K and FO 2). The shunt trip relay driver consists of transistors Q17, Q19 and Q22 and photocoupler U10. When transistor Q13 in the sensor delay circuit, transistor Q8 in the low voltage fault sensor, or transistor Q14 in the high voltage fault sensor is turned on, transistor Q17 is held off and the shunt trip relay driver is inhibited. After the sensor delay has timed out, turning off transistor Q13, either transistor Q8 or transistor Q14 turning off allows the base of transistor Q17 to rise. This turns on transistor Q17, turns on transistor Q19, turns on transistor Q22, and energizes the shunt trip relay K1 through connector J1 pin 5.

l. Parallel Sensor Interconnect. (fig. 5-2L and FO-2). During parallel operation (described in paragraph 3-4*b*), transistor Q19 turning on also forward-biases the light-emitting diode in the photocoupler. Light from the light-emitting diode turns on the light-sensitive transistor. (The photocoupler is not used during non-parallel operation). When the transistor of U10 turns on, it provides base drive to Q22 of the other parallel unit and trips the shunt trip, i.e., is parallel operation, the sensors in one unit trips both shunt trip breakers through the photo-diodes.

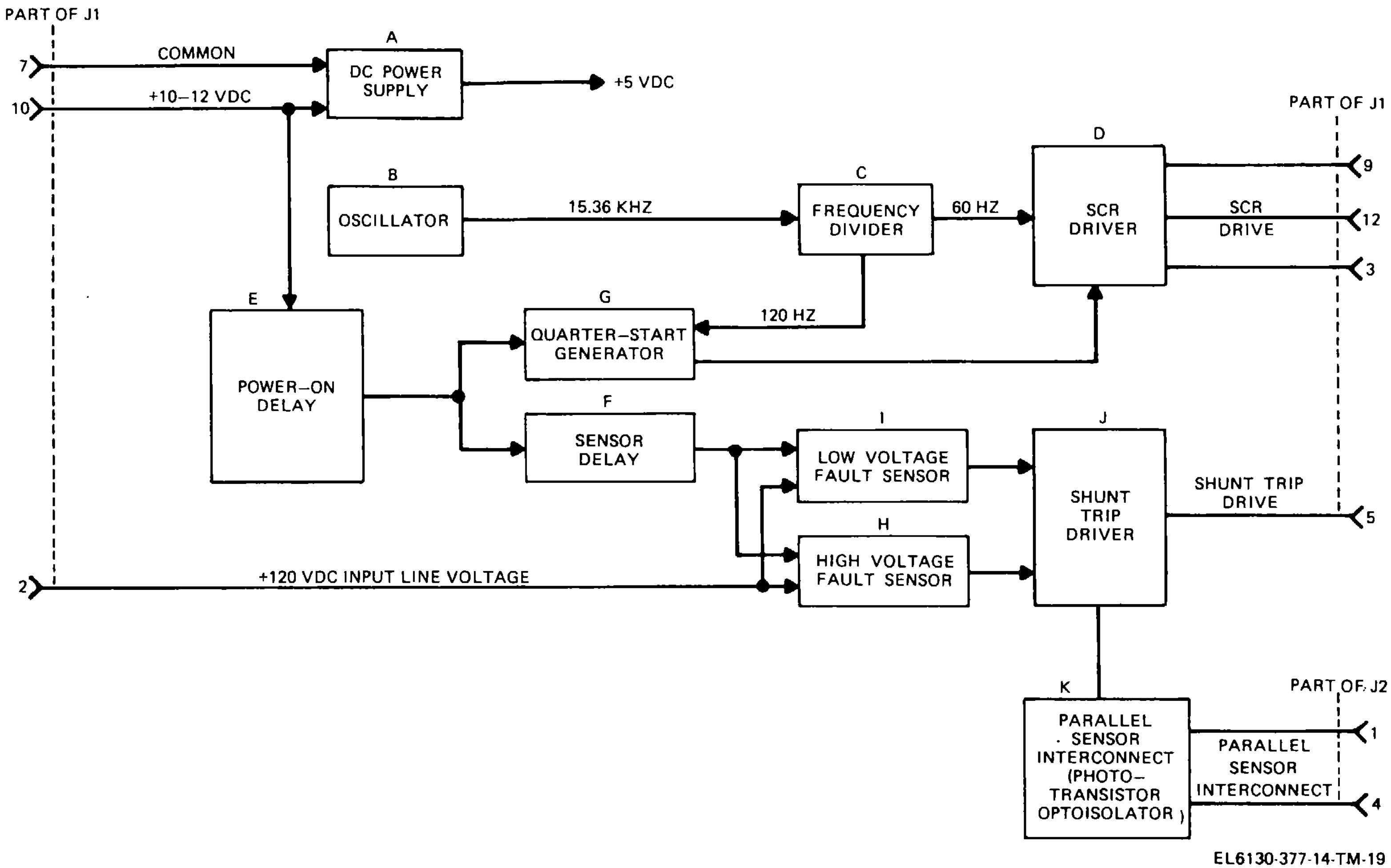


Figure 5-2.1. Inverter drive A1A2 overall block figure diagram, 1974 model.

(2) When the system input circuit breaker is turned on, +120 vdc input voltage is applied to the inverter drive circuit board. Upon receipt of the +120 vdc input voltage, the power-on delay circuit inhibits the voltage fault sensors through the sensor delay, and inhibits the SCR drive. After 2 to 5 seconds, the power-on delay circuit times out and initiates the sensor delay (which continues to inhibit the voltage fault sensors), and initiates the quarter-start generator. After a further delay of approximately 50 milli-seconds, the sensor delay removes the inhibit command from the voltage fault sensors.

(3) The +120 vdc input voltage is monitored by the voltage fault sensors. If the voltage of the input drops to approximately 95 vdc or rises to approximately 142 vdc, the appropriate voltage fault sensor causes the shunt trip driver to energize the shunt trip coil of the inverter input circuit breaker (not on the circuit board) and disconnects the inverter from the +120 vdc input voltage. Normal operation is restored by correcting the voltage fault and resetting the input circuit breaker.

b. Power Supply Circuit. Referring to the detailed schematic diagram of the inverter drive circuit board (fig. FO-2), the power supply consists of regulator U5 and filter capacitors C12, C18, C19, and C20. The regulator starts operating when dc input power is first applied to the system. Shunt regulator Q6 and CR3 reduces the input voltage to +10 to +12 volts at connector J1 pin 10 to a regulated +5 vdc level that is filtered for use by the low-level circuitry of the inverter drive circuit board.

c. Oscillator Circuit. The crystal oscillator consists of transistors Q1 and Q2 and crystal X1. Transistors Q1 and Q2 operate as a relaxation oscillator. The 15.36-kHz output to the frequency divider is buffered by U1.

d. Frequency Divider Circuit. The frequency divider consists of divide-by-16 counters U2 and U3. The output to the SCR driver is a 60-Hz square wave through connector J2, pin 2.

e. SCR Driver.

(1) *Nonparallel SCR driver input.* When the inverter is operated as a single unit (nonparallel), jumpers are connected across connector P2 which plugs into connector J2. The jumpers in connector P2 are from pin 7 to 8, 3 to 10, 2 to 11, and 6 to 12. No other connections are made to connector P2 in the nonparallel mode. Thus, the SCR driver circuit is operated from its own oscillator and frequency divider.

(2) *Parallel SCR driver input.* When the inverter is connected for parallel operation of two units, a cable is connected between connector P2 of the master inverter drive circuit board and connector P2 of the slave inverter drive circuit board. Connector P2 on the master inverted contains the same jumpers as used for non-parallel operation, so that the SCR driver is operated from its own oscillator and frequency divider, in addition to interconnecting wires to the slave inverter. Connector P2 on the slave inverter, however, does not contain jumpers on its connector P2 pins 7 to 8, 3 to 10, 2 to 11, and 6 to 12. Instead, the SCR driver of the slave inverter is operated from the oscillator and frequency divider of the master inverter through the cable so that both inverters are operated in phase with each other. Master inverter connector P2 pins 7, 10, 11, and 12 are connected through the cable to slave inverter connector P2 pins 7, 10, 11, and 12, respectively. Other connections to connector P2 during parallel operation are described in the parallel sensor interconnection description (para 5-41).

(3) *SCR driver circuit.* The SCR driver consists of phase-splitter U4 and transistors Q4 and Q5. The 60-Hz input to transistor Q5 is inverted by one gate and the input to transistor Q4 is double-inverted by two gates of integrate circuit U4, which is connected as a phase splitter. The complementary 60-Hz signals cause transistors Q4 and Q5 to drive output transformer T1. Transformer T1 provides gate drive for the inverter power SCR's through resistor diode network R13, R14, R15 and CR1 to connector J1 pins 3, 9, 12.

f. Power-On Delay. When the system input circuit breaker is closed, +120 vdc input voltage is applied to connector J1 pin 2 and thus to power-on delay circuit U6, R22 and C23. When +120 vdc is first applied, U6-3 is held at 5 vdc and Q7 is off until capacitor C23 charges through resistor R22. When the charge on capacitor C22 exceeds approximately 3.5 volts, U6-3 goes to zero, which turns Q7 off. This delay is approximately 2 seconds after turn-on of the inverter input circuit breaker. When transistor Q7 turns off, U7-5 goes high and on the next 120-Hz clock from Q8 U3-8, U7-6 goes high. When U7-6 goes high, U44 and -9 go high and the inverter drive from U3-11 is applied to Q4 and Q5.

g. Sensor Delay. The sensor delay consists of transistor Q10. During the 2-second power-on delay, transistor Q10 is held on by U6-3 and capacitor C28 charges through resistor R42. The charge on capacitor C28 holds transistor Q10 on, which inhibits the voltage fault sensor circuits. U6-3 goes low and provides a discharge path for capacitor C28 through resistor R42 and U6-3 to common. When capacitor C28 discharges to a voltage below the cutoff point of transistor Q10 (approximately 50 milliseconds), the transistor turns off and removes the inhibit command from the voltage fault sensors; that is, it allows the faults sensors to turn on Q11 through Q9. The total delay prevents the faults sensors from reacting to transients that may be present at the turn-on of the inverter.

h. Quarter-Start Generator. The quarter-start generator consists of U6 and U7. During the 2 second power-on delay, U6-3 is off and transistor Q7 is on, grounding U7-5 and holding U7-6 low. With U7-6 low, U4-4 and -10 are low and the 60-Hz on U4-5 is inhibited. When U6-3 goes low, transistor Q7 turns off and U7-5 goes high. The next 120 Hz-clock from U3-8 through Q8 to U7-2 causes U7-6 to go high and stay high. When U7-6 goes high, U4-4 and -10 go high and the 60-Hz signal is applied to Q4 and Q5.

i. Low Voltage Fault Sensor. The voltage fault sensors monitor the +120 vdc input voltage at connector J1 pin 2 through voltage divider R29 and R30. The low voltage fault sensor consists of operational amplifier U8 and transistors Q9 and Q11. A reference voltage is set up at the + input of the operational amplifier by potentiometer R32 and resistors R31 and R33. Potentiometer R32 is set so that the voltage of the + input is above the voltage of the - input as long as the +120 vdc input voltage remains above approximately 95 vdc. If the +120 vdc input voltage drops to approximately 95 vdc, the + input drops below the - input. This action causes the output to go low which turns on transistor Q9. When transistor Q9 turns on, Q21 is turned on through R45 and causes the shunt trip of CB1 to operate.

j. High Voltage Fault Sensor. The high voltage fault sensor consists of operational amplifier U9 and transistors Q9 and Q11. The high voltage fault sensor operates similar to the low voltage fault sensor, except that the amplified inputs are reversed. Potentiometer R37 is set so that the voltage of the - input of the amplifier is below the voltage of the + input as long as the +120 vdc input voltage remains below approximately 142 vdc. If the +120 vdc input voltage rises to approximately 142 vdc, U9-6 goes low and Q9 turns on Q11 through R45. Transistor Q11 operates the shunt trip of CB1.

k. Shunt Trip Relay Driver. The shunt trip relay driver consists of transistor Q11 and photocoupler U10. When transistor Q10 in the sensor delay circuit and transistor Q9 in the high and low voltage fault sensor are held off, the shunt trip driver is off. After the sensor delay has timed out, turning off transistor Q10, either sensor U8 or U9 turning on allows the base of transistor Q9 to go low. This action turns on transistor Q11 and energizes the shunt trip through connector J1 pin 5. During parallel operation, transistor Q9 turning on also forward-biases the photodiode in the photocoupler (U10) and light from the photodiode turns on the light-sensitive transistor. The photocoupler is not used during nonparallel operation.

l. Parallel Sensor Interconnection. When the inverter is connected for parallel operation of two units, the photocoupler (U10) of the master inverter is connected to operate the slave inverter's shunt trip driver and the photocoupler of the slave inverter is connected to operate the master inverter's shunt trip driver. This is accomplished by use of the cable between connector P2 of each inverter drive circuit board. The collector of the photocoupler transistor of the master inverter is connected through P2 pin 1 to +5 vdc of the slave inverter at connector P2 pin 3. The emitter of the master inverter photocoupler transistor is connected through connector P2 pin 4 to the base of shunt trip driver transistor Q11 of the slave inverter at connector P2 pin 9. When the master inverter photocoupler transistor turns on, the slave inverter +5 vdc is conducted to the .base of transistor Q11 in the slave inverter, causing the shunt trip drivers to operate simultaneously. The photocoupler of the slave inverter operates the shunt trip driver of the master inverter similarly, except that master inverter +5 vdc is obtained at slave inverter connector P2 pin 10. Other connections to connector P2 during parallel operation are described in the parallel SCR driver input description.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE

Section I. GENERAL REQUIREMENTS

6-1. Scope of General Support Maintenance

a. This chapter contains instructions covering general support maintenance of the inverter. It includes component location diagrams of the inverter and of the inverter drive subassembly A1A2. Section I of this chapter identifies the test equipment and tools required to perform general support maintenance.

b. Section II contains general support troubleshooting procedures. The procedures are a continuation of those covered at operator level to a higher maintenance level.

c. Section III contains repair procedures for replacing defective component parts.

d. Section IV contains the calibration and adjustment procedures required to maintain the inverter at the general support maintenance level and to determine that the repaired equipment is performing satisfactorily for return to users.

6-2. Tools and Test Equipment Required for Maintenance

The following chart lists the test equipment and tools required to troubleshoot, test, repair, and adjust the inverter at the general support maintenance level.

Item	*National Stock No.*
Voltmeter, Digital AN/GSM-64	6625-00-870-2264
Multimeter TS-352B/U	6625-00-242-5023
Oscilloscope AN/USM-281A	6625-00-053-3112
Counter, Electronic AN/USM-207	6625-00-911-6368
Distortion Analyzer TS-723/U	6625-00-668-9418
Variable DC Power Source, Deltec Part No. 2592, or equal (dc power source 115 volts, 70 amperes, plus a variable control, 100 to 150 volts dc) Load Bank. Deltec Part No. 2591 or equal, (dummy load resistors 5000 watts)	
Tool Kit, Electronic Repairman TK-100/U	5180-00-605-0079
Tool Kit, Electronic Repairman TK-105/U	5180-00-610-8177
Torque Wrench, range 200 to 400 inches pounds	
Silicone dielectric compound (GE 641 or equal)	
500 volt ac RMS high-pot generator	

Section II. TROUBLESHOOTING

WARNING

To avoid injury and possible death of personnel, use extreme caution with all components marked "HIGH VOLTAGE." Ensure that all capacitors are discharged after power is removed and do NOT attach test equipment with the inverter operating.

6-3. General

Troubleshooting procedures described in this section provide maintenance personnel with a systematic method of isolating troubles within the inverter. The troubleshooting procedures for the inverter are contained in troubleshooting chart (para. 6-5*b*).

6-4. Organization of Troubleshooting Procedures

a. General. The first step is servicing a defective inverter is to sectionalize the fault to the major unit responsible for abnormal operation. The second step is to localize the fault to a group of components or circuits within the faulty unit. After the fault has been localized, it must be isolated to a single component, wire, or piece part that is defective.

b. Sectionalization. Use the checks listed in (1) through (3) below to sectionalize the fault in the inverter to a definite location. The checks are arranged to reduce unnecessary work and aid in tracing the fault to the basic unit responsible for abnormal operation.

(1) Visual inspection. Some faults in the inverter can be sectionalized to a specific area by merely observing the operating and nonoperating status of the unit e.g., malfunctioning circuit breakers, damaged wires or cables, etc.

(2) Operational checks. When visual inspection fails to sectionalize a fault in the inverter to a major item, utilize the troubleshooting results contained in paragraph 4-10 of this manual.

(3) Localization. After the fault has been sectionalized to a major item, it is necessary to localize the fault to a group of components or circuits within the faulty unit. The localization procedures found in troubleshooting chart (para 6-5*b*), will aid the repairman in localizing faults in the inverter. In some cases the localization procedures will isolate the fault to a replaceable component, wire, or piece part. If not, the localization procedure will reference the isolation procedure to be used.

6-5. Operating Inverter with Front Panel Open

If the front panel is opened, the door interlock switch will cause the inverter to shut down, refer to paragraph 5-2*b*(5) for detailed explanation of switch in circuit.

a. Use the following procedure to override the door interlock switch when it is necessary to test or troubleshoot the inverter which the front panel is open.

(1) Position the DC circuit breaker to OFF.

(2) Open front panel to gain access to the door interlock switch plunger located on the right side of the door frame (fig. 2-1).

(3) Grasp the plunger and pull it out until it clicks into the extended detent. The system is now ready for power to be applied and tests can be made.

b. To apply DC power to the inverter from the Deltec 2592 Variable DC Power Source or equivalent (para. 6-2) make the connections to the input terminals A1TB1 of the inverter as shown in figure 6-2.

c. To connect the Deltec 2951 Load Bank or equivalent (para 6-2) to the inverter make the connections to the output terminals A1TB3 (fig. 6-2).

6-6. Inverter Troubleshooting Chart

WARNING

110 vdc is present in the inverter. Do not remove or replace parts, nor perform continuity or resistance checks while primary power is applied to the unit.

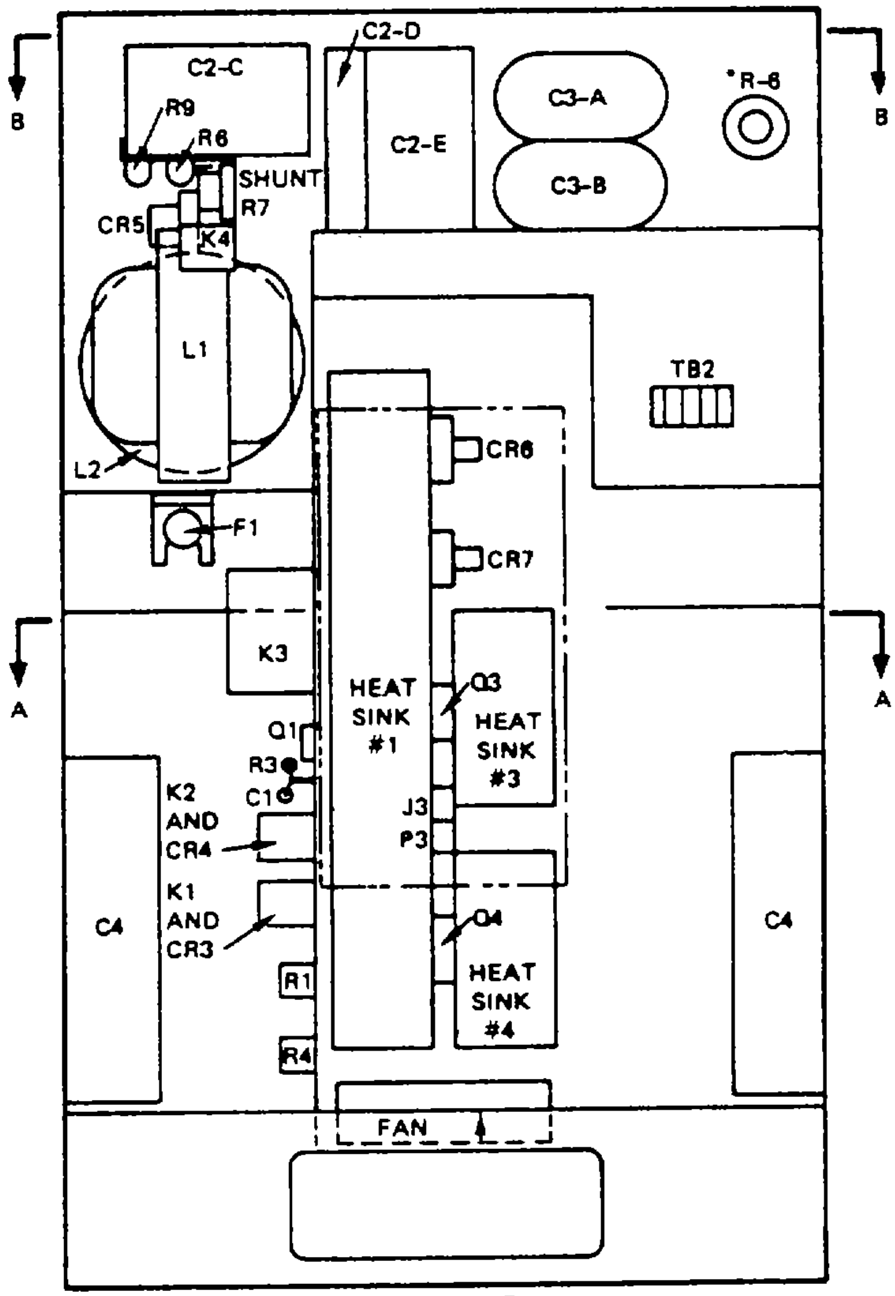
a. Use of the Chart. To use the chart, read down the Symptom column of the troubleshooting chart until the abnormal symptom or condition is found. Perform the corrective actions indicated in the chart until the abnormal symptom or condition is corrected. Figures 6-1 and FO-3 are parts location diagrams which will aid the maintenance man in locating designated parts.

b. Inverter Troubleshooting Chart.

Item No.	*Symptoms*	*Probable trouble*	*Corrective Action*
1	Input fuse A1F1 blows when replaced or circuit breaker A1CB1 trips when reset (1973 model	*a.* Defective inverter drive A1A2.	a Turn circuit breaker A1CB1(FO-1) off and replace input fuse A1F1 (FO-1) if necessary. Remove connector A1A2J1 (FO-3) from the inverter drive printed circuit (PC) board and observe the contacts of relay A1K2 (fig. 6-1) as circuit breaker A1CB1 (fig. 6-1) is turned on the second time. A1K2 is the top relay mounted on the left side of the heat sink tunnel). If the contacts of relay A1K1(fig. 6-1) close at turn on, the problem is probably a defective inverter drive. Replace inverter drive A1A2 (FO-3) in its entirety. Refer to paragraphs 6-8 and 6-9 for repair.

Item No.	Symptoms	Probable trouble	Correction Action
		b. Defective (shorted) diodes A1 CR5 thru A1CR7 and SCRs A1Q3 and A1Q4.	*b.* Perform the corrective action given for item *a* above. If relay A1K2 (fig. 6-1) contacts do not close at turn on, refer to paragraph 6-7*a* through 6-7*c* for repair/replacement procedure.
2	With the inverter operating there is no output ac voltage emanating from the unit. In addition, the input current is higher than 15 amps, which is the normal no-load current.	*a.* Defective (shorted) capacitor A1C4.	*a.* Perform a continuity check between meter A1M3-1 (fig. 6-1) to output terminals X2 and X1 (fig. 6-1) and inverter turned off. There should be a short to both X1 and X2 terminals with circuit breaker A1CB2 (fig. 6-1) turned on and the contacts of relay (A1K3) (fig. 6-1) held closed by hand. This check is to assure there is continuity to the output of the unit. Subsequently attach an ac voltmeter across capacitor A1C4 (fig. 6-1) and set the instrument to read 660 vac. Turn on the inverter. If the voltage reading approaches zero, this indicates a shorted capacitor. Replace the defective part.
		b. Open condition in AC CURRENT meter A1M3 or possibly a broken wire or wires between output transformer A1T1 and the ac output terminals.	*b.* Perform the corrective action given for item 2*a* above. If a shorted condition is not evident, check for an open condition in meter A1M3 (fig. 6-1) or defective wires between transformer A1T1 (fig. 6-1) and ac output terminals. Repair/replace defective items.
		c. Defective choke (A1L3) A1L4.	*c.* Measure continuity between A1 C4 (fig. 6-1) pin 1 and A1TB3-X2 (fig. 6-1). If not obtained, replace (A1L3) A1L4.
		d. Defective inverter drive circuit board A1A2 (1973 model).	*d.* Use a multimeter to determine if there is an A1K3 (fig. 6-1) relay drive (common) at connector A1A2J1, pins 5 and 6 (FO-2) (inverter drive circuit). If this drive is not evident, replace the defective circuit board. Refer to paragraphs 6-8 and 6-9 for repair.
3	Non-regulated output ac voltage emanating from the unit with the inverter operating at full load, whereas at light and no load conditions, the inverter runs and functions satisfactorily.	Defective (open) capacitor (A1C4) A1C3.	Disconnect one wire from each capacitor and check its resistance with an ohmmeter. The resistance reading of a normal operating capacitor should start at a short and then build up to an acceptable value. If the reading does not initially show a shorted condition, this is an indication that capacitor A1C3 (A1C4) (fig. 6-1) is defective and should be replaced. Upon completion of troubleshooting and subsequent repair, perform a functional verification of inverter operation per paragraph 6-9 to recheck the

Item No.	Symptoms	Probable trouble	Correction Action
			inverter regulation at low-line full load conditions.
4	Inverter randomly blows input fuse (A1F1) or trips circuit breaker A1CB1 upon unit start-up. Once the inverter is operating, unit operation appears normal.	Defective (shorted) SCR A1Q2 or improper drive to SCR A1Q2 gate (1973 model).	Measure the resistance across resistor (A1R6) (fig. 6-1). If it is less than one ohm, SCR (A1Q2) (fig. 6-1) is probably shorted and should be replaced. If the resistance is one ohm, problem is probably the drive to SCR (A1Q2) (fig. 6-1). Refer to paragraph 6-8*d* for troubleshooting procedure.
5	Inverter will not operate and input fuse (A1F1) is not blown and circuit breaker A1CB1 does not trip.	Defective inverted circuit drive A1A2.	Replace inverter drive circuit A1A2 (FO-3). Refer to paragraphs 6-8 and 6-9 for repair.
6	No output voltage from inverter drive circuit board at connector A1A2J1 (pin 1), coupled with a burned out resistor (A1A6).	Defective inverter circuit drive.	Use a multimeter to determine if a bypass thyristor drive greater than +1 vdc is evident at connector A1A2J1 (FO-3), pin 1 (inverter drive circuit). If a bypass SCR drive is not present, replace the inverter circuit drive A1A2 (FO-3) in its entirety. Refer to paragraphs 6-9 and 6-10 to troubleshoot and repair.
7	DC circuit breaker A1CB1 trips for no apparent reason.	Adjustment of upper or lower limit of DC circuit breaker A1CB1 trip points is required to achieve proper unit operation.	Perform a high or low voltage fault adjustment per paragraph 6-23 or 6-24, respectively.
8	The inverter drops out of regulation at light loads. Upon subsequent loading the units starts to smoke and becomes very hot (1973 model).	Defective SCR drive A1A2Q16.	Determine the voltage drop across resistor (A1R6) (fig. 6-1) on the inverter. This value should be less than -1vdc. Measure the voltage collector to emitter of transistor (A1A2Q16) (FO-3) on the p.c. Board. This reading should be +9 to +10 vdc. If it is zero, check the voltage from base to emitter. This reading should be less than 0.7 VDC. If it is at 0.7 VDC, replace defective transistor (A1A2Q16) (FO-3).
9	Circuit breaker A1CB1 trips on initial turn on (1973 model).	Blown input fuse A1F1.	Replace input fuse (A1F1) (fig. 6-1). Opening cabinet door with unit operating may cause A1F1 to blow.
10	No output but inverter is running (1974 model only).	*a.* Open A1CB2.	*a.* If AC VOLTAGE meter A1M4 indicates 120 VAC and there is no output, check/reset A1CB2. Replace faulty components.
		b. Shorted A1C3 or broken wire between A1T1 and system output.	*b.* If no voltage is indicated on AC VOLTAGE meter A1M4, disconnect one side of A1C3 and check for a short with a multimeter. If there is no short, check for an open in meter A1M4 or broken wires. A1C3 should be at 660 vac during normal operation. Replace faulty components.



A. FRONT VIEW.
(FRONT PANEL AND DUCT COVER REMOVED)

RESISTOR R6 ON RIGHT
PROVIDED IN SERIAL NO.
11 AND SUBSEQUENT
RESISTOR R6 ON LEFT
PROVIDED IN SERIAL
NOS. 1 THRU 10.

EL6130-377-14-TM-10

Figure 6-1(1). Component locations, 1973 model (sheet 1 of 3).

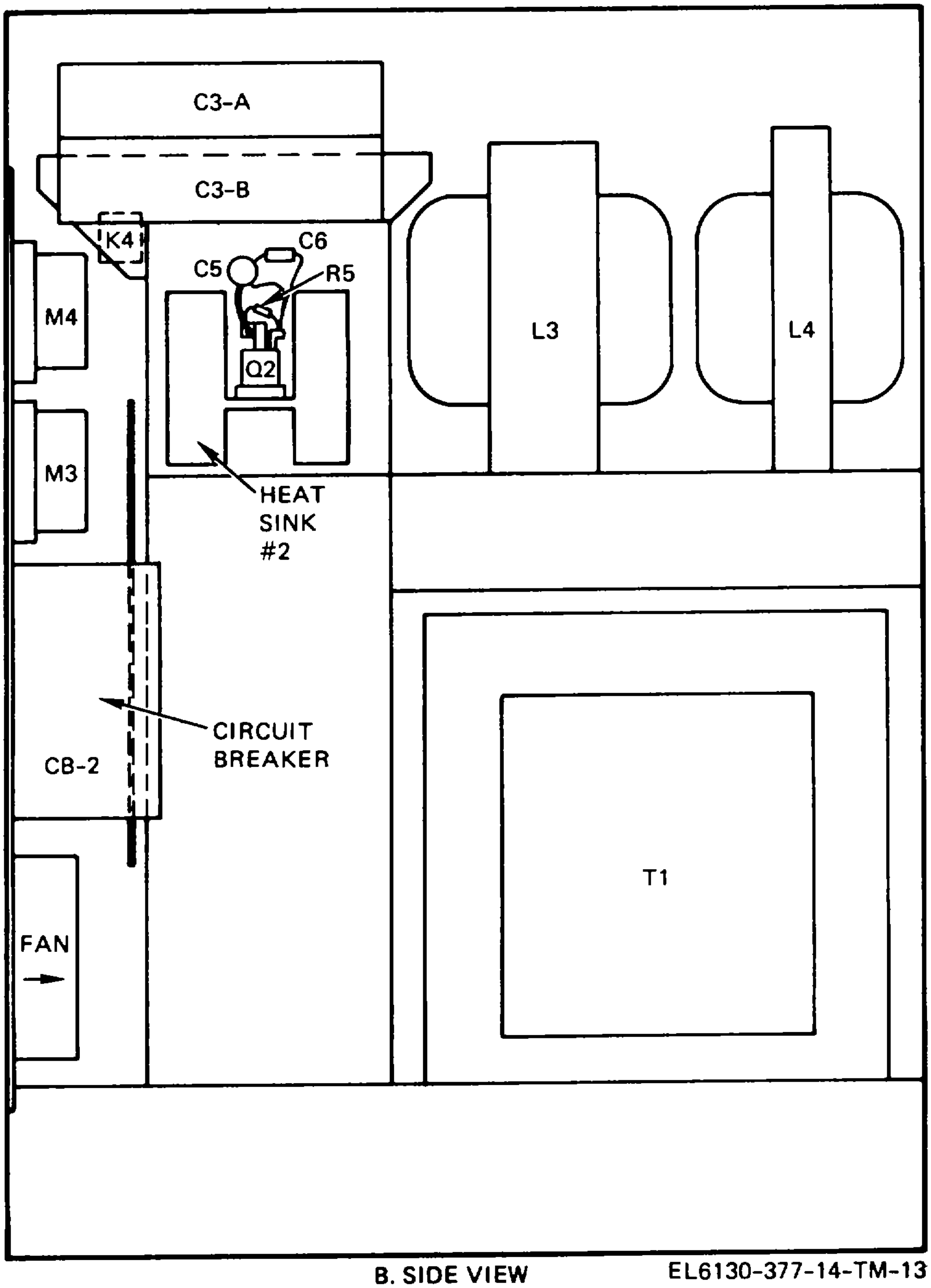
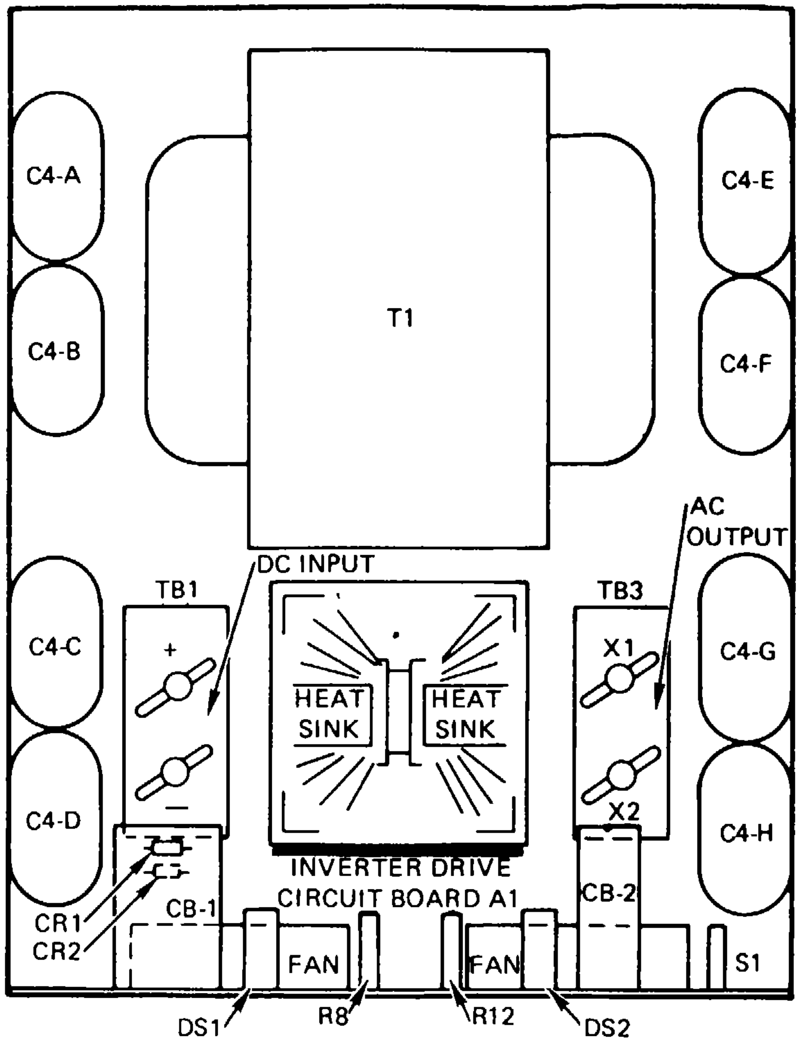
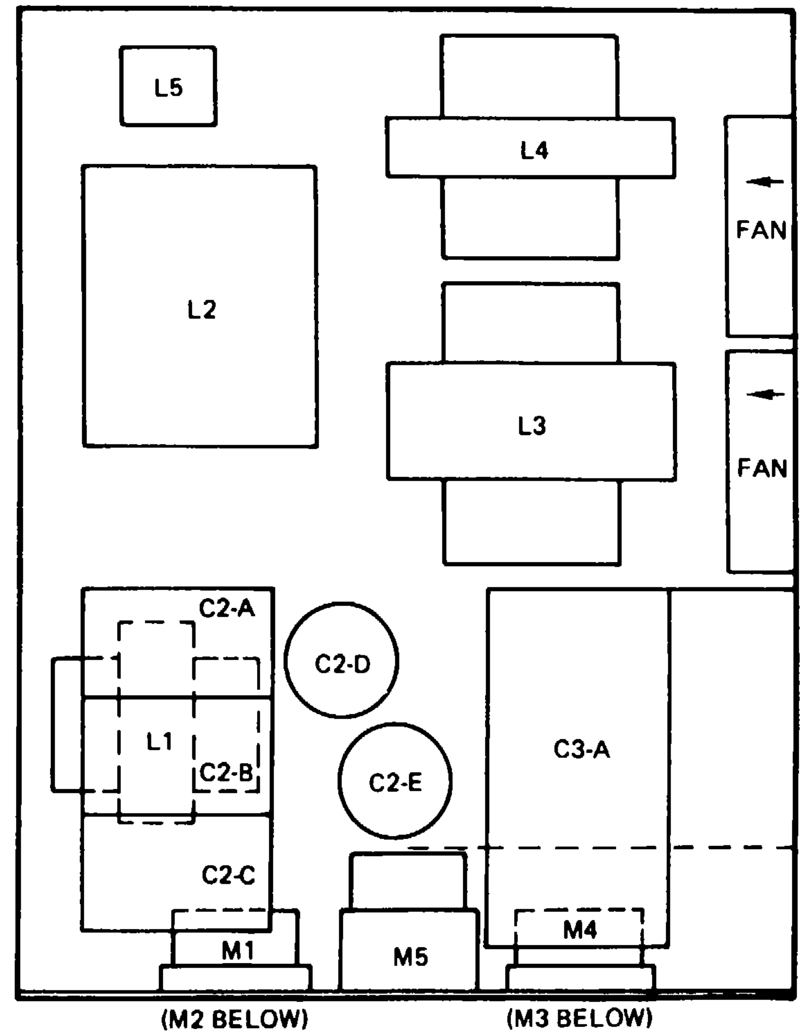


Figure 6-1(2). Component locations (sheet 2 of 3).



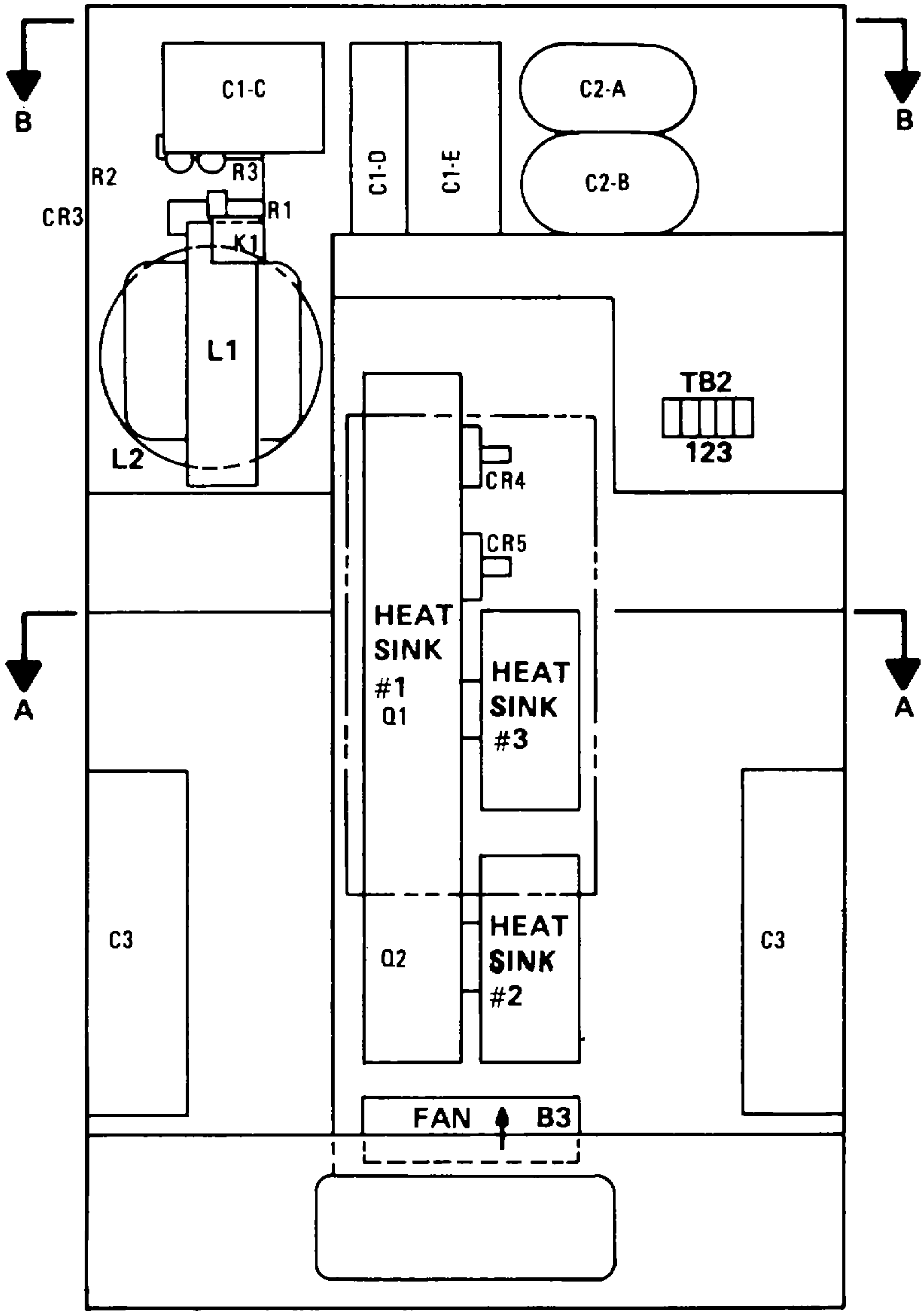
C. SECTION A-A OF
FRONT VIEW
(A SHEET 1 OF 3)



D. SECTION B-B OF
FRONT VIEW
(A SHEET 1 OF 3)

EL6130-377-14-TM-14

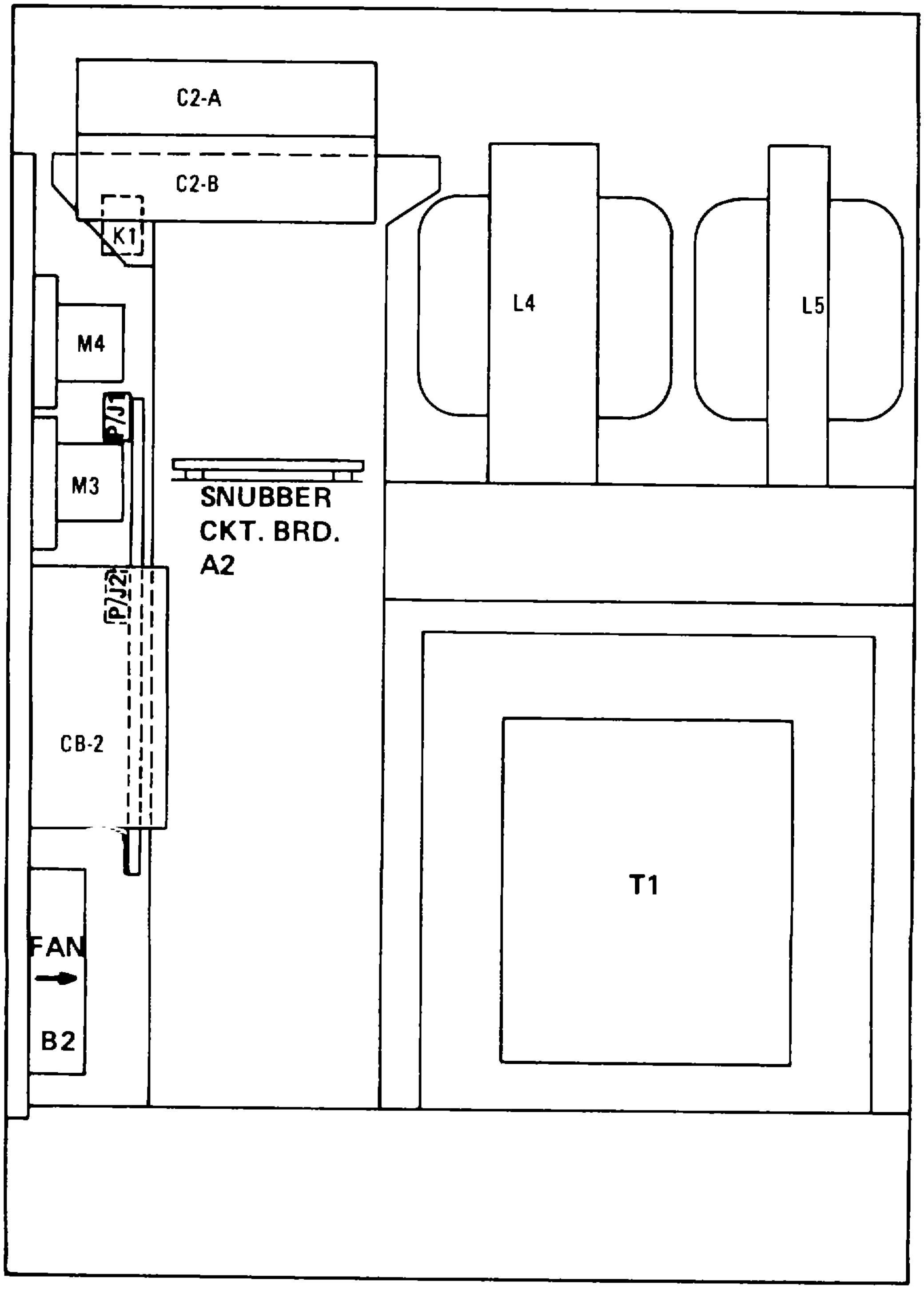
Figure 6-1(3). Component locations (sheet 3 of 3).



FRONT VIEW
FRONT PANEL & DUCT COVER REMOVED

EL6130–377–14–TM–20

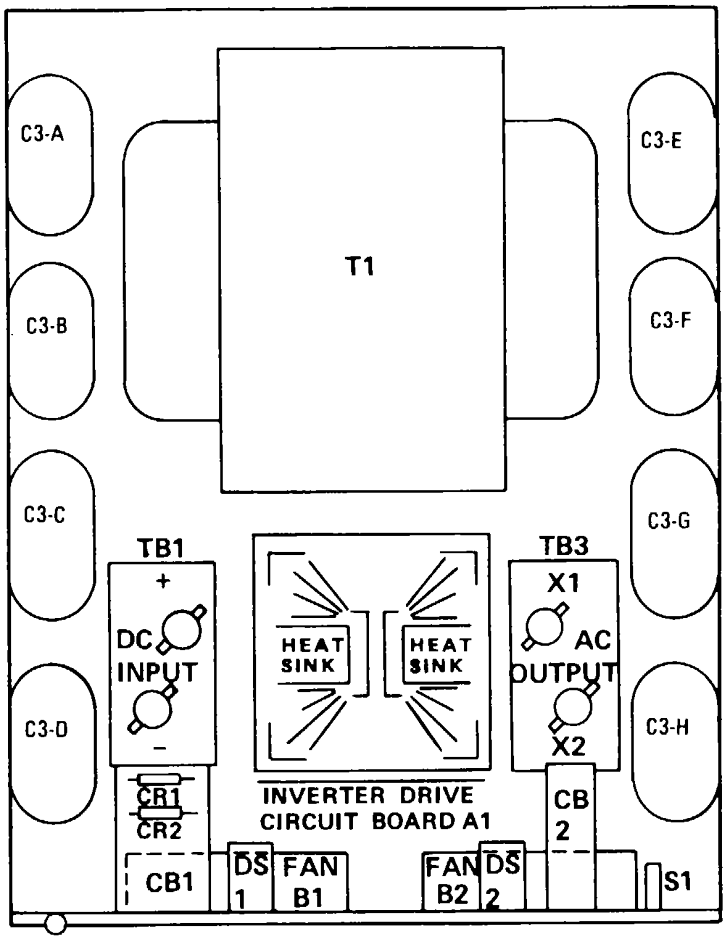
Figure 6-1.1(1). Component locations, 1974 model (sheet 1 of 3).



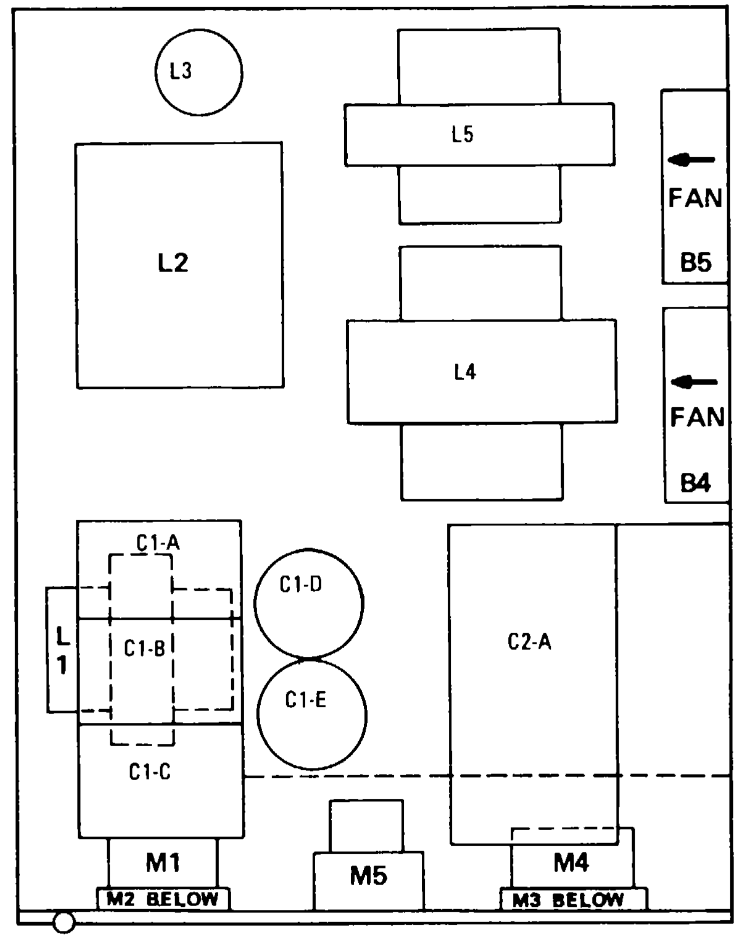
SIDE VIEW
ASSEMBLY DIAGRAM PP-7078/U

EL6130-377-14-TM-21

Figure 6-1.1(2). Component locations, 1974 model (sheet 2 of 5).



SECTION A – A OF FRONT VIEW



SECTION B–B OF FRONT VIEW

EL6130–377–14–TM–22

Figure 6-1.1(3). Component locations, 1974 model (sheet 3 of 3).

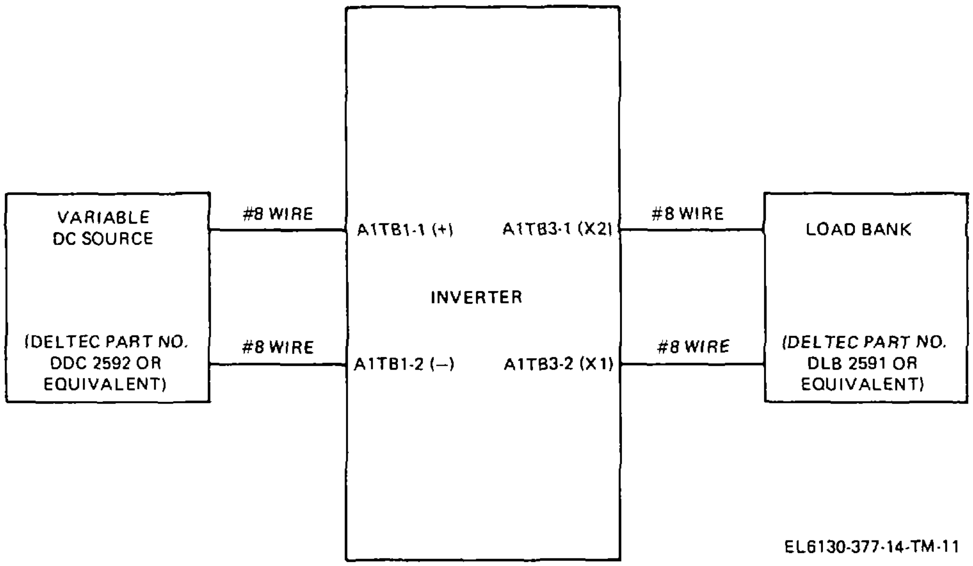


Figure 6-2. Performance verification and adjustment test setup.

Section III. REPAIRS

6-7. General Parts Replacement Techniques

The procedures required to remove or replace piece parts and nonrepairable assemblies which are not obvious or require the removal of one or more parts are given in paragraph 6-7. The following precautions apply when removing, replacing, or repairing parts in the inverter.

a. Before removal or replacement of any part unless otherwise stated, remove power from the unit. Restore power to the unit after the part has been replaced.

b. Tag all hardware and components during removal procedures for correct identification during replacement procedures. Before a part is unsoldered, note the position of the leads. If the part has several leads, tag each of the leads before unsoldering any of them.

c. When removing a defective part, be careful not to damage leads or other parts by pulling or pushing them out the way.

d. When replacing a part, install the new part in the same position as the original. Use an exact duplicate whenever possible.

e. Use a pencil-type soldering iron with a 25-watt maximum heating capacity. If the iron must be used with ac, use an isolating transformer between the iron and the ac line. Do not use a soldering gun; damaging voltages can be induced in the equipment parts.

f. If wiring must be replaced, use leads of the same length and gauge if possible. With the exception of harness cabling, run the leads in the same manner as the original wiring. For harness cabling, cut the old conductor as short as possible without removing it from the harness. Dress the new conductor along the harness and spot tie it to the outside of the harness. Make connections to same terminals used in the original wiring, even where there are alternatives which appear electrically equivalent.

g. Make well-soldered connections, using no more solder than is necessary. A carelessly soldered connection may create a new fault and is one of the most difficult faults to find.

h. Do not allow drops of solder to fall into the unit. Do not allow a soldering iron to come into contact with insulation or parts that might be injured by excessive heat.

i. Do not disturb the setting of any uncalibrated control without redetermining its proper setting before returning the equipment to service. If any switches are operated, return them to their original positions.

6-8. Inverter Repairs

(fig. 6-1)

a. SCR Thyristor A1Q1 (A1Q3) or A1Q2 (A1Q4).

(1) Position DC circuit breaker to OFF.

(2) Open front indicator panel.

(3) Remove twelve screws and lockwashers securing the top cover and remove the cover.

(4) Disconnect the electrical connector A1P1 from its receptacle A1A2J1 on the inverted drive circuit board A1A2.

(5) Remove the four screws securing the inverter drive circuit board A1A2 and remove the board.

(6) Remove ten screws, lockwashers, and flat washers securing the heat sink duct cover to the head duct and remove the cover.

(7) To check A1Q2 (A1Q4), disconnect wire 40 and the large heat sink, the A1Q2 (A1Q4) cathode.

(8) To check A1Q3, disconnect wire 113 from A1L5-2, measure the resistance between wire 113 and the large heat sink (cathode A1Q1 (A1Q3)).

(9) If short is indicated while performing step (7) or (8), complete steps (10) through (22) to replace defective thyristor. If no short is indicated reconnect the wires to their respective components.

(10) Loosen the nuts securing the SCR clamps using a ratchet handle and 1/2 inch deep socket. The clamps go through both halves of the heat sink.

NOTE

The SCR may be held on the small heat sink by a centering pin and must be pulled off the heat sink.

(11) Loosen the clamps just enough to slide the SCR from between the heat sinks. Do not completely remove nuts from stud.

(12) Cut the gate (white) lead, and pull out the catholode (red) lead, from the SCR. Connect the new SCR to the leads going to P3, red connector.

(13) Redistribute the silicone dielectric compounds on the heat sink surfaces and apply a small amount of compound to both side of the SCR.

(14) Replace the SCR on the small heat sink by snapping it onto the centering pin. The SCR surface with the red lead attached must be next to the large heat sink.

NOTE

The two heat sinks must remain parallel during the tightening operation.

(15) Run the clamp nuts down evenly and tighten finger tight.

CAUTION

In (16) below, do not apply excessive pressure to the heat sinks when final tightening the clamp nuts or this will damage the SCR's.

(16) Using a ratchet handle and ½ inch deep socket, alternately tighten each nut one-quarter turn at a time until both nuts have been rotated no more than one and one-quarter turns. (The clamp nuts will not be snugged up any tighter, but the proper pressure will have been applied to the SCR's.)

(17) Install the heat sink duct cover on the heat sink duct and install the ten screws, lockwashers and flat washers. Tighten screws to secure cover.

(18) Install the inverter drive circuit board A1A2 on the four standoffs and secure with four screws and lockwashers.

(19) Install the electrical plug A1P1 into the receptacle A1A2J1 on the inverter drive circuit board A1A2.

(20) Position top cover in place and align screw holes. Install 12 screws and lockwashers and tighten screws.

(21) Close front indicator panel and secure with four captive screws.

(22) Perform a functional verification (para 6-22) of inverter to check for proper operation.

b. Diodes A1CR4 (A1CR6) and A1CR5 (A1CR7).

(1) Position the DC circuit breaker A1CB1 to OFF.

(2) Open front indicator panel.

(3) Disconnect the electrical connector A1P1 from its receptacle A1A2J1 on the inverter drive circuit board A1A2.

(4) Remove four screws securing the inverter drive board A1A2 and remove board.

(5) Remove ten screws, lockwashers and flat washers securing heat sink duct cover to heat sink duct and remove the cover.

(6) Disconnect the anodes (diode flex leads bolted together) and wires No. 49, 42, and 43 attached to diodes A1CR4 (A1CR6) and A1CR5 (A1CR7). On A1CR4 (A1CR6), disconnect wire 32; on A1CR5 (A1CR7), disconnect wire 34.

(7) Measure the forward and reverse resistance of each diode. Replace the diode which is shorted. To replace a shorted diode proceed with the following steps.

(8) Remove the eight screws and lockwashers securing the heat sink assembly to the left side of the heat sink duct.

CAUTION

Use care not to damage or loosen leads connected to the heat sink assembly.

(9) Carefully move the heat sink assembly to the right and lift it forward to gain access to the mounting.

(10) Tag all electrical leads attached to the diodes to ensure proper reassembly.

(11) Disconnect the electrical leads going to the diode to be removed.

(12) Remove the diode using a one and one quarter inch open end wrench and a one and one eighth inch socket mount on a torque handle.

(13) Redistribute the silicone dielectric compound on the heat sink and apply a small amount of the compound on the new diode.

(14) Wrap the diode stud threads with two to three turns of Permacel 2 mil Kapton E 6761 1/2 inch wide tape.

(15) Replace cracked or broken mica insulating washers with Delbert-Blenn MW 1.625-.75.006 mica washers.

(16) Position new diode on the heat sink and torque the retaining nut 250 to 325 inch pounds.

(17) Test diode prior to installation of leads, high pot the diode to heat sink at 500 vac RMS. There should be no breakdown or leakage current.

(18) Reconnect the electrical leads to the diode.

(19) Position heat sink assembly in heat sink duct and secure with eight screws, lockwashers and flat washers.

(20) Position heat sink cover on heat sink duct and align screw holes.

(21) Install ten screws, lockwashers, and flat washers in their respective holes and tighten screws.

(22) Position the inverter drive circuit board A1A2 on the stand-offs of the heat sink cover and align the mounting holes.

(23) Install four screws and lockwashers and tighten screws.

(24) Connect plug A1P1 to its receptacle A1A2J1 on the inverter drive circuit board A1A2.

(25) Close front indicator panel and secure the four captive screws.

(26) Perform a function verification (para 6-22) to check for proper performance.

c. Diode A1CR3 (A1CR5).

(1) Position DC circuit breaker A1CB1 to OFF.

(2) Open front indicator panel.

(3) Remove seven screws and lockwashers securing the vent panel to the left side panel. Remove the vent panel.

(4) Unsolder wire No. 52 and 53 from A1CR3 (A1CR5).

(5) Measure the forward and reverse resistance of A1CR3 (A1CR5). If shorted, replace the defective diode as follows:

(6) Remove the nut and lockwasher securing the diode to the bracket and remove the diode.

(7) Install the replacement diode in the bracket and secure with the lockwasher and nut.

(8) Solder the electric wires nos. 52 and 53 to their respective terminals.

(9) Position the vent panel on the left side panel and align the screw holes. Install the seven lockwashers and screws and tighten screws.

(10) Close the front indicator panel and secure with four captive screws.

(11) Perform a functional verification (para 6-22) to check for proper operation.

d. Thyristor (SCR) (A1Q2) (1973 Model Only).

(1) Position DC circuit breaker A1CB1 to OFF.

(2) Open front indicator panel.

(3) Disconnect the electrical connector A1P1 from its receptacle A1A2J1 on the inverter drive circuit board A1A2.

(4) Remove four screws securing the inverter drive circuit board A1A2 and remove the board.

(5) Remove ten screws, lockwashers and flat washers securing heat sink duct cover to heat sink duct and remove cover.

(6) Disconnect electric lead (wire No. 49) from anodes of diodes A1CR6 and A1CR7.

(7) Remove screen from heat sink exhaust (front opening on right side panel).

(8) Measure the resistance between wire no. 49 and the flag terminal (cathode) of SCR A1Q2. If a short is evident replace A1Q2 as follows.

(9) Working from the front panel opening remove the two bolts and washers located on the underside of the heat sink tunnel, securing the No. 2 heat sink assembly.

(10) Reach in through the forward opening in the left side panel and carefully lift the heat sink assembly and bring it out of the tunnel.

(11) Tag the electrical leads and components attached to the terminals of SCR A1Q2 for proper reassembly. Remove the electrical leads from the SCR A1Q2.

(12) Remove the nut and lockwasher securing the SCR to heat sink No. 2 and remove SCR A1Q2.

(13) Install replacement SCR into mounting hole of heat sink No. 2 and secure using lockwasher and nut.

(14) Install the electrical leads and components on the terminals of the SCR A1Q2.

(15) Slide heat sink No. 2 into the heat sink duct tunnel and align the mounting holes of the tunnel and the stand-offs. Secure with lockwasher and bolts.

(16) Install the screen on the mounting brackets of the heat sink exhaust.

(17) Connect electric lead (wire No. 49) to the anodes of diodes A1CR6 and A1CR7.

(18) Position the heat sink duct cover on the heat sink duct and align the mounting holes.

(19) Install the ten screws, lockwashers, and flat washers in their respective holes and tighten screws.

(20) Position inverter drive circuit board A1A2 on the standoffs of the heat sink duct cover and align the mounting holes.

(21) Install four screws and lockwashers and tighten screws.

(22) Connect plug A1P1 to its receptacle A1A2J1 on the inverter drive circuit board A1A2.

(23) Close front indicator panel and secure the four captive screws.

(24) Perform equipment verification (para 6-22) to check for proper performance.

6-9. Inverter Drive Circuit Board A1A2, Preliminary Procedure for Testing and Repair

The inverter drive circuit board A1A2 can be tested and repaired by electrically attaching it to an inverter in a known operable condition. In this setup the power static inverter acts as a test fixture when used in conjunction with the variable DC source DDC 2595 (or equivalent).

a. To install the inverter drive circuit board into the inverter and prepare for checkout, proceed as follows:

(1) Open the front indicator panel to gain access to the inverter drive circuit board (fig. 2-1 and 2-2).

(2) Remove connector A1P1 and code plug A1P2 from the serviceable inverter drive circuit board.

(3) Remove four screws securing the inverter drive circuit board to the heat sink cover and remove inverter drive board.

(4) Remove ten screws securing the heat sink cover to the heat sink and remove cover to gain access to connector A1P3. Disconnect A1P3 (para 6-8).

(5) Cover the lower front chassis area of the inverter with a rubber mat or suitable insulating material.

(6) Install connector A1P1 and code plug A1P2 to the inverter drive circuit that is to be tested and place the board on the insulating material.

(7) Connect the variable DC source DDC 2592, or equivalent, to the input terminals of A1TB1 (fig. 6-2).

(8) Pull out the plunger of the door interlock switch A1S1 to enable the inverter to operate with the indicator panel open.

NOTES

1. The inverter drive circuit board is coated with acrylic lacquer; therefore, it may be necessary to scratch the various components or leads to make a good electrical contact before attaching test equipment.

2. When touching transistor leads, make certain no other surface is touched.

3. Turn off the dc input source BEFORE making test equipment connections.

6-10. Inverter Drive Circuit Board A1A2 Testing and Repair

Upon completion of each fault isolation and repair, reinstall the inverter drive circuit board into the inverter and perform a functional verification of the unit operation per paragraph 6-22. Connect the equipment as described in paragraph 6-8 to perform the following tests.

Symptom	Failure Isolation and Repair
a. A1CB1 trips at turn on.	a. Place an oscilloscope on the collector (case of A2Q11 (A2Q22)). Ground the oscilloscope to C2 negative. Set the sweep to 50 ms/cm and the sensitivity to 20v/cm. (Use an X10 probe if necessary.) (1) With the variable dc source set at 110 vdc, turn on A1CB1 and check oscilloscope trace. Trace should start at zero and go to 110 vdc. If oscilloscope trace does not move upward, A2Q11 (A2Q22) or A2CR5 (A2CR13) is shorted, or the drive to A2Q11 (A2Q22) is faulty. Turn OFF A1CB1. (2) To check drive circuitry to (A2Q22), disconnect lead to A1CB1-C and separate red connector A1P3 from A1J3. Turn on A1CB1 and measure voltage at the following points (1973 model only): (A2Q19) Collector 0 (A2Q17) Collector +5 vdc (A1Q14) Collector 0 (A2Q12) Collector +4 vdc (A2Q8) Collector 0 (A2Q6) Collector +4 vdc (3) If the voltages in (2) above are not as indicated, replace the faulty component.
b. Trip sensor circuits do not operate at the proper voltage (refer to para 6-23 and 6-24) (1973 model only).	*b.* Disconnect A1P3 from A1J3. If the low or high voltage sensor does not operate at the proper voltage, check the board voltage on A2CR2 cathode (should be 10 to 12 vdc) and the voltage on A2U1-2 which should be 4.5 to 5.5 vdc. Check the voltage on A2U1-2 and varying the 100 vdc input from 104 to 141 vdc. The voltage on A2U1-2 should stay within 4.5 to 5.5 vdc. If the voltage varies with the changing input, replace A2U1 and recheck for proper operation. If the voltage on A2U1-2 stays within 4.5 to 5.5 vdc limits, replace A2U2 if the low sensor is faulty and A2U7 if the sensor is faulty.
c. The inverter fails to start (operate) after 5 seconds, there is no drive to the SCR Gates.	*c.* Disconnect A1P3 from A1J3. Place an oscilloscope on A1P3-1 and -3 (in turn) with common on A1P3-2. With A1P3 disconnected from the SCR's, the voltage on A1P3-1 and -3 should be a 60-Hz square wave at 5 volts (peak to peak). (1) If this voltage is not present, connect the oscilloscope reference to A2C17 (A2C14) negative and measure the voltage on the collector of A2Q4 and A2Q5 (A2Q21). This voltage should be a 20v p-p square wave operating at 60 Hz. If this voltage is present but there is no voltage on A1P3-1 and -3 check the voltage on A2J1-9 and -3 with reference to A2J1-12. This voltage should be 5v p-p, 60 Hz. If this voltage is present, check the cabling and connectors between A2J1 and A1P3 and replace the faulty connector or cable as necessary. (2) If there is no voltage on A2Q4 (A2Q20) and A2Q5 (A2Q21) collector, measure the voltage on the base of A2Q4 (A2Q20) and A2Q5 (A2Q21). The base voltage should be 0.6v p-p at 60 Hz. If this is present, replace A2Q4 (A2Q20) and A2Q5 (A2Q21). (3) If this voltage is not present, check the voltage on A2U4-4 (A2U9-1 and -2) or A2J2-2 and -11. This waveshape should be 5v p-p at 60 Hz, square wave. If the voltage is present, replace A2U4 (A2U9). If it is not present, check the voltages at the following points: A2U2 960 Hz + 5v p-p A2U1 15.36 KHz + 5v p-p A2U3-11 60 Hz + 5v p-p (A2U6-8) 120 Hz + 5v p-p

Symptom	Failure Isolation and Repair
	(A2U5-12) 480 Hz + 5v p-p (A2U4-12) 4.8 KHz + 5v p-p (A2U3-12) 48 KHz + 5v p-p (A2Q5-Collector) 480 KHz + 5v p-p (4) Replace the component that has an input but no output. (5) If there is no waveshape on (A2Q5) collector, replace (A2Q1), (A2Q2), (A2Q3), (A2Q4), (A2Q5) and (A2CR1).
d. In parallel operation, both inverter DC circuit breaker fail to operate when sensors are tripped.	*d.* Replace A2UlO on both the A1A2 in the master inverter and A1A2 in the slave inverter.
e. Inverter turns on intermittently and then runs properly after starting. It can be seen that relay A1K3 does not close (1973 model only).	e. Check the voltage on A2Q18 collector. At turn on this voltage should stay at 110 vdc for 300 to 400 milliseconds (ms) and then go to 1 volt maximum. (1) If the collector of A2Q18 does not drop to 1 volt, check the following voltages: A2Q9 collector-at turn on of A1B1, stays at zero for 300 to 400 milliseconds (ms) and then goes to +5 vdc. A2Q10 collector-at turn on of A1CB1, stays at +5 vdc and then goes to zero after 300 to 400 milliseconds. A2Q7 collector-at turn on of A1CB1 stays at zero and then goes to +0.6 vdc after 300 to 400 milliseconds. A1A2C9(+)-at turn on of A1CB1 rises from zero to about +7.5 vdc and then stays at the final voltage. (2) Replace the component or components that do not exhibit the proper waveshape at turn on of A1CB1.
f. Inverter starts but will not drive a load (resistor A1R6 gets very hot) (1973 model only).	*f.* Turn off inverter and disconnect A2P1. (1) Check the resistance between A2Q16-C and -E. If this resistance is less than 100 ohms, replace A2Q16. (2) If A2Q16 is not shorted collector to emitter, disconnect A1J3 from A1P3 and reconnect A2P1. (3) Turn on A1CB1 and make the following checks: A2Q15-C +0.2 to 0.3 vdc A2Q9-C +5 vdc A2Q10-C +0.2 to 0.3 vdc A2Q15-B +0.6 to 0.7 vdc (4) Replace faulty components.
g. The inverter will not run but A1CB1 does not trip.	*g.* Check A1A2 inverter drive board. Replace board, determine that trouble is corrected.
h. Low output but inverter operates.	*h.* Possible overload condition on the output. (1) Possibly A1A3 is open. Remove one lead of A1C3 and remove the jumper from inside. Check each capacitor (8) with a multimeter to make sure it is not open. Replace faulty capacitor(s). (2) Check output load for shorts.

6 11. DC Circuit Breaker A1CB1

(fig. 2-1 and 3-1)

To remove and replace the DC circuit breaker A1CB1 proceed as follows:

a. Shut down the DC source from the generator.

b. Open the front indicator panel to gain access to DC INPUT terminal board A1TB1.

c. Disconnect DC input electrical cables from terminal board A1TB1.

d. Tag all electrical leads to ensure proper reassembly.

e. Remove the electrical leads and diodes A1CRI and A1CR2 from the DC circuit breaker A1CB1.

f. Remove four screws and washers securing the DC circuit breaker A1CB1 to the front indicator panel and remove the circuit breaker.

g. Install the replacement circuit breaker in the cutout of the front indicator panel and align the screw holes.

h. Insert the four screws and washers through the front indicator panel and into the circuit breaker. Tighten the screws to secure the circuit breaker to the front panel.

i. Install the electrical leads and diodes A1CR1 and A1CR2 on the circuit breaker terminals and secure with washers and nuts.

j. Connect the DC input cables to the terminals of A1TB1.

k. Close the front indicator panel and secure with four captive screws.

l. Turn on the DC source at the generator.

m. Perform a functional verification (para 6-22) of the inverter to check for proper operation of the circuit breaker A1CB1.

6-12. AC Circuit Breaker A1CB2
(fig. 2-1 and 3-1)

To remove or replace the AC circuit breaker A1CB2 proceed as follows:

a. Shut down the DC source from the generator.

b. Open the front indicator panel to gain access to DC INPUT terminal board A1TB1.

c. Disconnect DC input electrical cables from terminal board A1TB1.

d. Tag all electrical leads going to the terminals of AC circuit breaker A1CB2 to ensure proper reassembly.

e. Remove the screws and washers securing the electrical leads to the terminals of the circuit breaker A1CB2 and remove the leads.

f. Back off the four nuts securing the circuit breaker brackets to the front panel unit the circuit breaker can be lifted from the brackets. Remove the circuit breaker.

g. Position replacement circuit breaker in brackets and align with cutout in front panel.

h. Tighten the four nuts to pull the circuit breaker bracket tight against the front panel and circuit breaker.

i. Install the electrical leads on the circuit break terminals using the screws and washers. Tighten screws.

j. Reconnect the DC input electrical cables to the DC INPUT terminal board A1TB1.

k. Close the front indicator panel and secure with four captive screws.

l. Turn on the DC source from the generator.

m. Perform a functional verification (para 6-22) of the inverter to check for proper operation of circuit breaker A1CB2.

6-13. Meter, Indicators A1M1, A1M2, A1M3 and A1M4
(fig. 2-1 and 3-1)

All four meters of the inverter are mounted in the same manner. The electrical leads to the meter terminals are different. The same method of removal or replacement shall be used for all four. To remove or replace a meter proceed as follows:

a. Position DC circuit breaker A1CB1 to OFF.

b. Open front indicator panel to gain access to meter terminals and hold down clamp.

c. Tag the electrical leads going to the terminals of the meter that requires removing to ensure proper reassembly.

d. Remove the electrical leads from the meter terminals and replace the nuts and washers on the terminal lugs.

CAUTION

The meter and the bezel must be supported during the following step to prevent damage.

e. Loosen the screws of the two meter clamps and remove the clamps.

f. Remove the bezel from the forward side of the indicator panel and the meter from the rear side of the indicator panel.

g. Install bezel from the front, in cutout of front indicator panel.

h. Position meter between the slotted sides of the bezel so that the meter face aligns with the panel cutout and the bezel opening.

i. Insert the securing brackets with screws installed through the slots in the side of the bezel and rest them on the frame of the meter.

j. Tighten the screws evenly against the front panel assembly. This will pull the bezel and meter tight against the panel and secure them.

k. Install the electrical leads to their respective terminals and secure with nuts and washers.

l. Close front indicator panel and secure with captive screws.

m. Perform a functional verification (para 6-22) of the inverter to check for proper operation of the meters.

6-14. ELAPSED TIME Meter A1M5
(fig. 2-1 and 3-1)

To remove or replace ELAPSED TIME Meter A1M5, proceed as follows:

a. Position the DC circuit breaker A1CB1 to OFF.

b. Open front indicator panel to gain access to elapsed timer attaching hardware and electrical leads.

c. Tag all electrical leads to ensure proper reassembly.

d. Remove the elapsed timer electrical leads attached to the terminals of the AC VOLTAGE meter.

e. Remove the three screws, lockwashers and nuts securing the elapsed timer to the front indicator panel. Remove the meter.

f. Install replacement meter from the front, through the cutout in the front indicator panel and align the screw holes.

g. Insert screws, from the front and install the lockwashers and nuts from the rear. Tighten the nuts to secure the meter to panel.

NOTE

If electrical leads do not have terminal lugs attached, install them at this time.

h. Connect the electrical leads of the meter to the AC voltage meter terminals.

i. Close the front indicator panel and secure with four captive screws.

j. Perform equipment starting procedures (para 3-3) to check operation of ELAPSED TIME meter.

6-15. Indicator Lamp Resistors A1R8 and A1R12 (1973 Model Only)
(fig. 2-1)

To remove and replace indicator lamp resistors proceed as follows:

a. Position the DC circuit breaker A1CB1 to OFF.

b. Open the front indicator panel to gain access to the resistors A1R8 and A1R12.

c. Tag the electrical lead going to the resistor terminals to ensure proper reassembly.

d. Using a 25 watt soldering iron, unsolder the electrical leads from the resistor terminals.

e. Remove the nut, lockwasher and flat washer from the threaded stud and remove the resistor.

f. Install replacement resistor on threaded stud and secure using a flat washer, lockwasher and nut.

g. Attach the electrical leads to the resistor terminals making a good mechanical connection then solder the electrical leads to their respective terminals.

h. Close front indicator panel and secure with the four captive screws.

i. Perform equipment starting procedures (para 3-3) to check proper performance of lamps.

6-16. Indicator Lamp Holders A1DS1 and A1DS2
(fig. 2-1 and 3-1)

To remove or replace a defective indicator lamp holder proceed as follows:

a. Position the DC circuit breaker A1CB1 to OFF.

b. Open front indicator panel to gain access to the defective indicator lamp holder.

c. Tag the electrical leads going to the lamp holder terminals to ensure proper reassembly.

d. Using a 25 watt soldering iron, unsolder the electrical leads from the lamp holder terminals.

e. Unscrew the jam nut from the indicator lamp holder and remove the lockwasher. Push the lamp holder through the panel to remove.

f. Install the replacement indicator lamp holder through the front indicator panel.

g. Slip the lockwasher over the indicator lamp holder and then screw down on the jam nut to secure the holder to the front panel.

h. Attach the electrical leads to the lamp holder terminals making a good mechanical connection. Solder the electrical leads to the terminals.

i. Close the front indicator panel and secure the four captive screws.

j. Perform equipment starting procedures (para 3-3) to check proper performance of lamps.

6-17. Door Interlock Switch
(fig. 2-1)

To remove or replace a defective door interlock switch A1S1 proceed as follows:

a. Position DC circuit breaker A1CB1 to OFF.

b. Open front indicator panel to gain access to interlock switch.

c. Remove two screws securing the door interlock switch to the right side panel angle.

d. Lift and support the door interlock switch and tag all electrical leads to ensure proper reassembly.

e. Remove the switch terminal screws and remove the electrical leads.

f. Install the electrical leads on their proper switch terminals and secure with screws and washers.

g. Position door interlock switch on right side panel and angle and align mounting holes.

h. Install two screws through angle and into switch. Tighten screws.

i. Close front indicator panel and secure four captive screws.

I. Perform equipment starting procedure (para 3-3).

6-18. Cooling Fan Removal and Replacement (fig. 2-1, 3-1, and 6-1)

The inverter is equipped with five cooling fans. Two cooling fans are located on the front panel assembly near the lower edge (fig. 2-1), and two are located on the right hand side panel near the top edge (fig. 2-1). The fifth cooling fan is located in the heat sink duct assembly (fig. 6-1). Use the appropriate procedure given in *a, b* or *c* below to remove or replace the cooling fans.

a. Front Panel Mounted Fans (fig. 2-1 and 3-1).

(1) Position DC circuit breaker A1CB1 to OFF.

(2) Remove the screen assembly and air filter from the fan to be changed, to gain access to fan mounting screws (para 4-11*a*).

(3) Open front indicator panel to gain access to the cooling fan.

NOTE

Support the fan assembly to take the strain from the electrical leads when performing the following substeps (4), (5), and (6).

(4) Remove four screws, lockwashers and nuts securing the fan assembly to the fan mounting brackets.

(5) Tag all electrical leads to ensure proper reassembly.

(6) Using a 25 watt soldering iron, unsolder the leads from the fan terminals and remove the fan.

(7) Support the replacement fan assembly and attach the electrical leads to the fan terminals making a good mechanical joint then solder the electrical leads to terminals.

(8) Position the fan on the mounting brackets and align the screw holes.

(9) Install the four screws through the mounting bracket and fan housing and install the lockwashers and nuts. Tighten nuts.

(10) Install the air filter and filter screen assembly as described in paragraph 4-11.

(11) Perform equipment starting procedures (para 3-3) and operation of fans (para 4-8) to check for proper performance.

b. Right Side Panel Mounted Fans (fig. 2-1 and 6-1).

(1) Position DC circuit breaker A1CB1 to OFF.

(2) Remove the screen assembly and air filter from the fan to be changed, to gain access to the fan mounting screws (para 4-11*a*).

(3) Remove twelve screws and lockwashers securing the top cover of the inverter and remove the cover.

(4) Loosen the jam nuts of the lifting eyes on the right side of the inverter and unscrew the lifting eyes.

(5) Remove the cap screws securing the right side panel to the upper front and rear brace angle.

CAUTION

When moving the side panel care should be used to prevent damage to electrical leads still attached to components.

(6) Remove the cap screws securing the right side panel to the base subassembly and platform. Right side panel is free to be moved.

(7) Tilt the right side panel outboard from the top to gain access to the fan mounting hardware.

NOTE

Support the fan assembly to take the strain from the electrical leads when performing the following substeps (8), (9) and (10).

(8) Remove four screws, lockwashers and nuts securing the fan assembly to the fan mounting brackets.

(9) Tag all electrical leads to ensure proper reassembly.

(10) Using a 25 watt soldering iron unsolder the leads from the fan terminals and remove the fan.

(11) Support the replacement fan assembly and attach the electrical leads to the fan terminals making a good mechanical joint, then solder the electrical leads to the terminals.

(12) Position the fan assembly on the mounting brackets and align the screw holes.

(13) Install the four screws through the mounting brackets and fan housing, install the lockwashers and nuts. Tighten nuts.

(14) Position the right side panel against the upper brace angles and platform and align the bolt holes.

(15) Install the cap screws and tighten to secure side panel.

(16) Install the two lifting eyes and tighten the jam nuts.

(17) Position the top cover and place and align screw holes. Install twelve screws and lockwashers and tighten screws.

(18) Install the air filter and filter screen assembly as described in paragraph 4-11.

(19) Perform equipment starting procedure (para 3-3) and operation of fans (para 4-8) to check for proper performance.

c. Heat Sink Duct Mounted Fan (Fig. 6-1).

(1) Position DC circuit breaker A1CB1 to OFF.

(2) Open front indicator panel.

(3) Remove connector A1P1 from its receptacle A1A2J1 on the inverter drive board A1A2.

(4) Remove four screws securing the inverter drive board to the heat sink and remove the inverter drive board.

NOTE

Make a note as to where the three harness clamps are positioned so that they can be installed in same place during installation.

(5) Remove ten screws, lockwashers and flat washers securing the heat sink duct cover to the heat sink duct and remove the cover.

(6) Using an offset crosspoint screwdriver loosen the four screws and lockwashers securing the fan assembly to the fan plate.

NOTE

Turn the mounting screws so that they clear the captive nuts in the fan plate. The screws and lockwashers must remain in the fan housing during removal.

(7) Carefully lift and swing the fan assembly out of the heat sink duct and support it to relieve the strain on electrical leads.

(8) Remove the four screws and lockwashers from the fan housing and tag for reuse.

(9) Tag all electrical leads to ensure proper reassembly.

(10) Using a 25 watt soldering iron unsolder the electrical leads from the fan terminals and remove the fan.

(11) Support the replacement fan assembly and attach the electrical leads to the fan terminals making a good mechanical joint, then solder the electrical leads to the terminals.

(12) Install the four screws and lockwashers in the holes of the fan housing.

(13) Position the fan assembly in the heat sink duct and on the fan plate, and align the mounting holes.

(14) Using an offset crosspoint screwdriver turn the four screws down until tight.

(15) Position the heat sink duct cover on the heat sink duct and align the mounting holes.

(16) Install the ten screws, lockwashers and three harness clamps in their respective holes and tighten screws.

(17) Position the inverter drive board A1A2 on the standoffs of the heat sink duct cover and align the mounting holes.

(18) Install the four screws and lockwashers and tighten screws.

(19) Connect plug A1P1 to its receptacle A1A2J1 on the inverter drive board A1A2.

(20) Close the front indicator panel and secure the four captive screws.

(21) Perform equipment starting procedures (para 3-3) and operation of fans (para 4-8) to check for proper performance.

6-19. Capacitors A1C3-A (A1C4-A) Through A1C3-H (A1C4-H)

(fig. 6-1)

The eight capacitors are mounted in pairs on the left and right side panels. Right side panel holds A through D and left side panel holds E through H. To remove and replace any pair of the capacitors proceed as follows:

WARNING

To avoid injury and possible death of personnel, use extreme caution with all components marked "HIGH VOLTAGE." Ensure that all capacitors are discharged after power has been removed.

a. Position the DC circuit breaker A1CB1 to OFF.

b. Open front indicator panel to give access to interior of unit.

NOTE

Step *c* is to be accomplished only if a rear pair of capacitors, either right or left side, must be removed.

c. Remove 13 screws and washers securing the rear panel and remove the rear panel.

d. Disconnect and tag the electrical leads to the capacitors to be removed.

e. Working from the outside of the unit, remove the two screws and lockwashers securing the capacitor clamp for the pair which is to be removed.

f. Lift up and remove the capacitor(s).

g. Position a new capacitor in place of the one or more removed in step *f.*

h. Install the capacitor clamp around the capacitors and align the screw holes in the clamp and side panel.

i. Install the two screws and lockwashers and tighten screws.

j. Reconnect the electrical leads to their proper terminals.

k. Close front indicator panel and secure the four turn fasteners.

l. Position back panel in place and align screw holes. Install ten long screws and lockwashers in the outboard screw holes and three short screws and lockwashers in the center three holes. Tighten screws.

m. Perform functional verification of the inverter (para 6-22).

6-20. Resistor A1R6 Replacement (1973 Model Only)

(fig. 6-1)

To remove and replace a defective A1R6 resistor proceed as follows:

a. Position the DC circuit breaker A1CB1 to OFF.

b. Remove twelve screws and washers securing the top cover of the inverter and remove cover.

c. Remove the electrical leads from the resistor terminals. Tag the leads to ensure proper replacement.

d. Remove two screws, washers and nuts securing resistor to side panel and remove resistor.

e. Position new resistor on side panel and install two screws from side panel through mounting lugs of resistor. Install washers and nuts, tighten nuts to secure resistor.

f. Install electrical leads to their respective terminals of the resistor.

g. Position the top cover in place and align the screw holes. Install twelve screws and lockwashers and tighten screws.

h. Perform a functional verification of the inverter (para 6-22).

Section IV. VERIFICATION AND ADJUSTMENT

6-21. General

This section contains procedures for performing a low and high voltage fault adjustment and a functional verification of the inverter operation. The following procedures are performed when troubleshooting indicates that an adjustment of functional verification is required.

6-22. Functional Verification of the Inverter

WARNING

To avoid injury and possible death of personnel, use extreme caution with all components marked "HIGH VOLTAGE." Be sure that all capacitors are discharged after power is removed and do not attach test equipment with the Inverter operating.

a. Open front panel to gain access to the DC INPUT terminals and the AC OUTPUT terminals.

b. Pull out the plunger of the door interlock switch A1S1 to enable the inverter to function with the front panel open (para. 6-5).

c. Install the test equipment and connect it to the inverter as shown in figure 6-2.

d. Set the DC variable power source to 115 vdc.

Position the DC circuit breaker A1CB1 to ON, and readjust the DC variable power source to 120 vdc. The cooling fans should be operating and the DC indicator lamp should light.

e. Set the Load Bank to place a 5000 watt load on the inverter. Position the AC circuit breaker A1CB2 to ON. The AC indicator lamp should light.

f. Readjust the DC variable power source to 115 vdc.

g. Gradually decrease the input voltage to 94 vdc. Verify that the DC circuit breaker trips at 95 ± 0.5 vdc. (If this condition is not evident, perform the low voltage fault adjustment procedure described in paragraph 6-23). After adjustment, set the AC and DC circuit breakers to OFF and repeat steps *d, e,* and *f* above.

h. Gradually increase the input voltage to 143 vdc. Verify that the DC circuit breaker A1CB1 trips at 142 ± 0.5 vdc. (If this condition is not evident, perform the high voltage fault adjustment procedure described in paragraph 6-24).

i. Set the AC and DC circuit breakers OFF. Connect Distortion Analyzer TS-723/U across terminals X1 and X2 of terminal board A1TB3 (fig. 2-1). Repeat procedures in steps *d, e* and *f* above.

j. Repeat the procedures in step *d, e,* and *f* above. Verify that the output is a single-phase, 60-Hz sine wave with less than 5 percent distortion.

k. Position the DC circuit breaker A1CB1 to OFF, disconnect the load bank and Distortion Analyzer TS-723/U from the inverter.

l. Connect Digital Voltmeter AN/GSM-64 across terminals X1 and X2 of terminal board A1TB1.

m. Position the DC circuit breaker A1CB1 to ON and the AC circuit breaker to ON. Vary the input voltage from the DC power source between 104 vdc and 141 vdc. Verify that the output voltage is 120 vac ± 5 percent.

n. Position the DC circuit breaker A1CB1 to OFF and the AC circuit breaker A1CB2 to OFF. Leaving the digital voltmeter connected, reconnect the load bank to terminals X1 and X2 of terminal board A1TB3.

o. Position the DC and AC circuit breakers to ON, set the load bank to 1/2 load and repeat step *m.* Set the load bank to full load (5000 watts) and repeat step *m.* Verify that the output voltage holds at 120 vac ± percent at all loads.

p. Position the AC and DC circuit breakers to OFF, remove the digital voltmeter from the inverter.

q. Install Electronic Counter AN/USM-207 to terminals X1 and X2 of terminal board A1TB3.

r. Position the DC and AC circuit breakers to ON and repeat the input voltage and output load variations described in steps *m* and *o*. Observe that the output frequency is 60 Hz ± 0.25 percent.

s. Position the DC and AC circuit breakers to OFF, and remove all the test equipment from the inverter except the variable DC power source.

t. Install jumper wire between the input terminal A1TB1-2 and the output terminal A1TB3X1.

u. Connect the dual trace oscilloscope with reference on A1A2C10 (A1A2C7) and one X10 probe on A1A2Q5 (A1A2Q21) collector and the second probe X10 on A1TB2-2. Set both inputs to 10 V/cm and horizontal sweep to 5 MS/cm.

v. Set the variable DC power source to 110 vdc and position both the DC and AC circuit breakers to ON.

w. Verify that both the waveshapes shown on the oscilloscope are in phase. When A1A2Q5 (A1AQ21) collector is high, X2 terminal of A1TB2 is also high.

x. Upon completion of the functional verification test, position the DC circuit breaker A1CB1 to OFF and the AC circuit breaker A1CB2 to OFF, ensure that all input power is removed prior to removing the test equipment from the unit.

6-23. Low Voltage Fault Adjustment

Adjust the low voltage trip point of the DC circuit breaker A1CB1 as follows:

a. Position the DC circuit breaker A1CB1 to OFF, open front indicator panel to gain access to the inverter drive circuit board A1A2 and the DC input terminal board A1TB1.

b. Pull out the plunger of the door interlock switch A1S1 to enable the inverter to function with the front panel open (para. 6-5).

c. Install the variable DC power source to the DC input terminal board as shown in figure 6-2.

d. Locate potentiometer A1A2R32 (A1A2R15) on the inverter drive circuit board (fig. FO-3). Rotate the adjustment tab of the potentiometer so that it is pointing toward the transformer.

e. Set the variable DC power source to 110 vdc and position the DC circuit breaker A1CB1 to ON.

f. Lower the input voltage to 94 vdc.

g. Turn the adjustment tab of potentiometer

A1A2R34 (A1A2R15) until DC circuit breaker A1CB1 trips.

h. Raise the input voltage to 110 vdc and reset the DC circuit breaker A1CB1.

i. Repeat procedure given in *g* above to verify the low voltage trip setting has been obtained.

j. Repeat performance verification procedure (para. 6-22) and readjust as necessary until performance is verified.

6-24. High Voltage Fault Adjustment

Adjust the high voltage trip point of the DC circuit breaker A1CB1 as follows:

a. Position the DC circuit breaker A1CB1 to OFF, open front indicator panel to gain access to the inverter drive circuit board A1A2 and the DC input terminal board A1TB1.

b. Pull out the plunger of the door interlock switch A1Sl to enable the inverter to function with the front panel open (para. 6-5).

c. Install the variable DC power source at the DC input terminal board as shown in figure 6-2.

d. Locate potentiometer A1A2R37 (A1A2R30) on the inverter drive circuit board (fig. FO-3).

Rotate the adjustment tab of the potentiometer so that it is pointing toward the transformer.

e. Set the variable DC power source to 110 vdc and position the DC circuit breaker A1CB1 to ON.

f. Raise the input voltage to 142 vdc.

g. Turn the adjustment tab of potentiometer A1A2R37 (A1A2R30) until DC circuit breaker A1CB1 trips.

h. Lower the input voltage to 110 vdc and reset the DC circuit breaker A1CB1.

i. Repeat procedure given in *e* and *f* above to verify the high voltage trip setting has been obtained.

j. Repeat performance verification procedure (para 6-22) and readjust as many times as necessary until performance is verified.

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Publications: Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
TM 11-6625-203-12	Operator and Organizational Maintenance: Multimeter AN/URM-105 and AN/URM-105C Including Multimeter ME-77/U and ME-77C/U.
TM 11-6625-255-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual: Spectrum Analyzer TS-723A/U, TS-723B/U, TS723C/U and TS-723D/U (NSN 6625-00-668-7418) (TO 33A1-13170-1).
TM 11-6625-366-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U.
TM 11-6625-444-15	Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual: Digital Voltmeter AN/GSM-64.
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207 (NSN 6625-00-911-6368).
TM 11-6625-1703-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Oscilloscope AN/USM-281A (NSN 6625-00-228-2201).
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations for PP-7078/U. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, decontaminate), to preserve, to drain, to paint, or to replenish fuel lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/ action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

C-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column X, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C-Operator/Crew
O-Organizational
F-Direct Support
H-General Support
D-Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

C-4. Tool and Test Equipment Requirements (Sect. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

C-5. Remarks (Sect. IV)

a. Reference Code. Not applicable.

b. Remarks. Not applicable.

(Next printed page is C-3)

SECTION II MAINTENANCE ALLOCATION CHART FOR

POWER STATIC INVERTER PP-7078/U

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
01	POWER STATIC INVERTER PP-7078/U (A1)	Inspect	0.3						
		Service	0.3						
		Install				8.0		10,11	
		Adjust				1.0		1,2,4,5, 10,11	
		Replace				2.9		1 thru 7, 10,11	
		Test				10.0		1 thru 7, 10,11	
		Repair				20.0		1 thru 7, 10,11	
		Overhaul				8.0		1 thru 7, 10,11	
		Rebuild					16.0	1 thru 7, 10,11,12	
0101	BASE ASSEMBLY (A1A1)	Test				1.0		2,10,11	
		Replace		0.1				8,9	
		Adjust				1.0		1,2,4,5, 8 thru 11	
		Repair				2.0		2,4,5,10, 11	
0102	FRONT PANEL ASSEMBLY (A1A2)	Test				1.0		2,10,11	
		Service		0.3				8,9	
		Repair		0.1				8,9	
		Replace				0.5		10,11	
		Repair				4.0		1 thru 7, 10,11	
		Align					1.0	1 thru 7, 10,11,12	
0103	HEAT SINK SUBASSEMBLY (A1A1A2) INCLUDING DUCT HEAT SUBASSEMBLY (A1A1A1)	Test				2.0		2,4,5,10, 11	
		Repair				4.0		2,4,5,10, 11	
0104	SUPPORT BRACKET SUBASSEMBLY (A1A1A1A1)	Test				2.0		2,4,5,10, 11	
		Repair				2.0		2,4,5,10, 11	
0105	INVERTER DRIVE SUBASSEMBLY (A1A1A1A2)	Test				2.0		1 thru 7, 10,11	
		Replace				0.2		10,11	
		Repair				4.0		1 thru 7, 10,11	
0106	SNUBBER SUBASSEMBLY (A2)	Test				1.0		1 thru 7, 10,11	
		Replace				0.2		10,11	
		Repair				1.0		1 thru 7, 10,11	

SECTION II MAINTENANCE ALLOCATION CHART FOR

POWER STATIC INVERTER PP-7078/U

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	H,D	VOLTMETER, DIGITAL AN/GSM-64	6625-00-870-2264	
2	H,D	KULTIMETER TS-352B/U	6625-00-242-5023	
3	H,D	OSCILLOSCOPE AN/USM-281A	6625-00-053-3112	
4	H,D	VARIABLE DC POWER SOURCE, DELTEC 2592 (or equivalent)	*	
5	H,D	LOAD BANK, DELTEC DLB 2591 (or equivalent)	*	
6	H,D	COUNTER, ELECTRONIC AN/USM-207	6625-00-911-6368	
7	H,D	DISTORTION ANALYZER TS-723/U	6625-00-668-9418	
8	O	MULTIMETER AN/URM-105	6625-00-581-2036	
9	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
10	H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/C	5180-00-605-0079	
11	H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
12	D	DEPOT SUPPORT SHOP FACILITIES		
		***NOTE** **NSN'S THAT ARE MISSING FROM THIS TM 11-6130-377-14 HAVE BEEN APPLIED FOR AND WILL BE ADDED BY FUTURE CHANGE WHEN THEY ARE ENTERED IN THE ARMY MASTER DATA FILE (AMDF).**		

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USAES (2)
ATS (1)
MAAG (1)
WRAMC (1)
USAERDAA (1)
USAERDAW (1)
Sig FLDMS (1)
Units org under fol TOE:
11-500 (AA-AC) (1)

ARNG & USAR: None.

For explanation of abbreviations used, see Ar 310-50.

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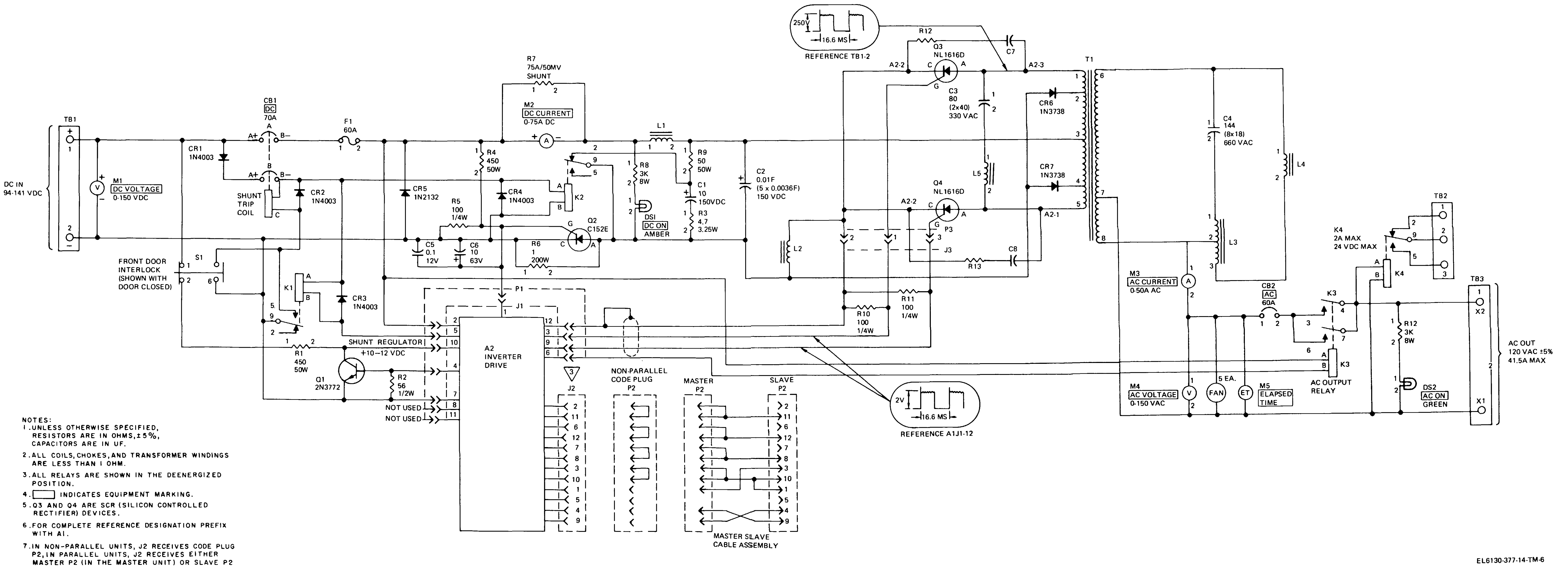


NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE IN OHMS, ±5%, CAPACITORS ARE IN UF.
2. ALL COILS, CHOKES, AND TRANSFORMER WINDINGS ARE LESS THAN 1 OHM.
3. ALL RELAYS ARE SHOWN IN THE DEENERGIZED POSITION.
4. [box] INDICATES EQUIPMENT MARKING.
5. Q3 AND Q4 ARE SCR (SILICON CONTROLLED RECTIFIER) DEVICES.
6. FOR COMPLETE REFERENCE DESIGNATION PREFIX WITH A1.
7. IN NON-PARALLEL UNITS, J2 RECEIVES CODE PLUG P2, IN PARALLEL UNITS, J2 RECEIVES EITHER MASTER P2 (IN THE MASTER UNIT) OR SLAVE P2 (IN THE SLAVE UNIT).

Figure FO-1. Inverter, Power, Static PP-7078/U (Deltec Model DI-5003-259), schematic diagram.

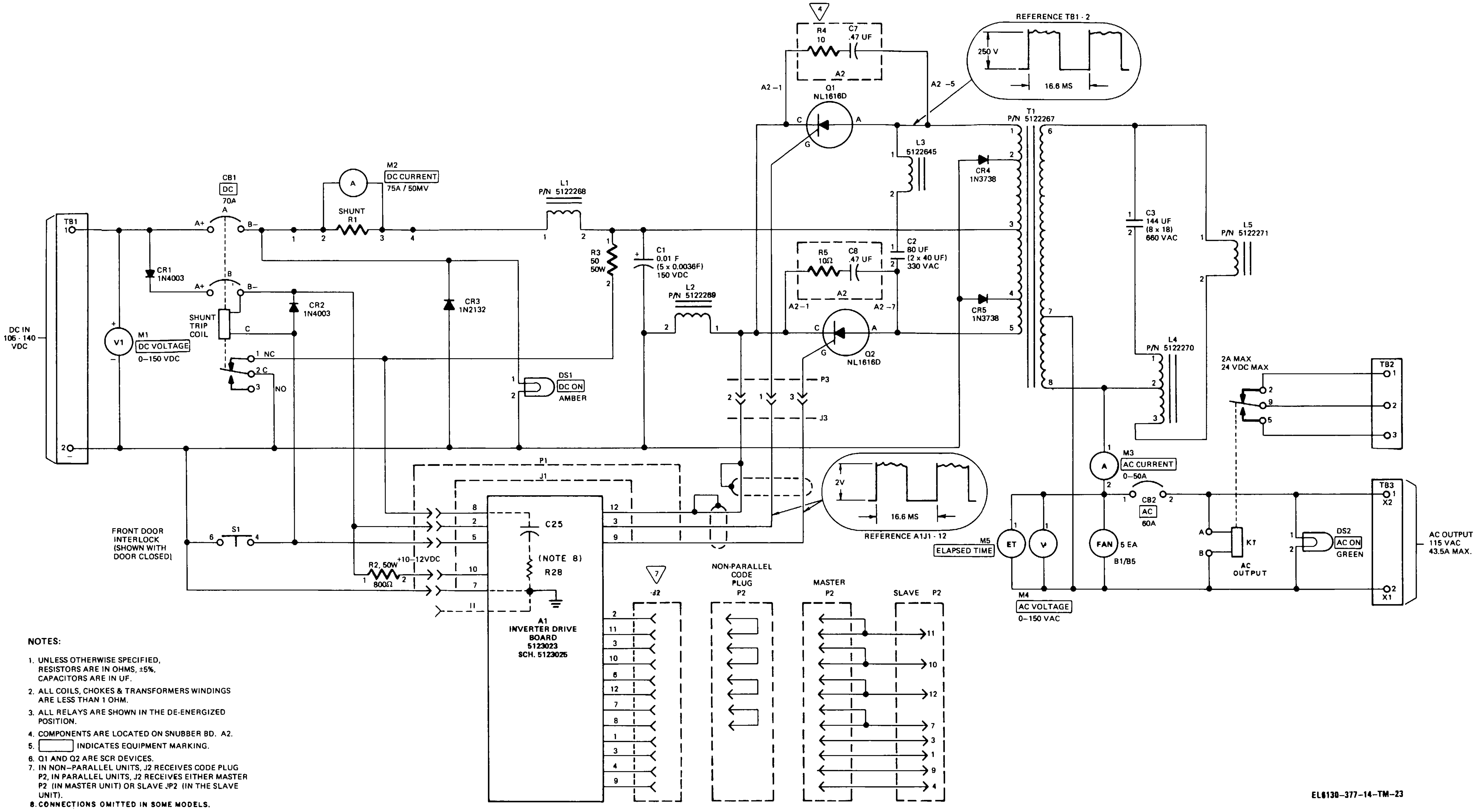


Figure FO-1.1. Inverter, Power, Static PP-7078/U schematic diagram, 1974 model.

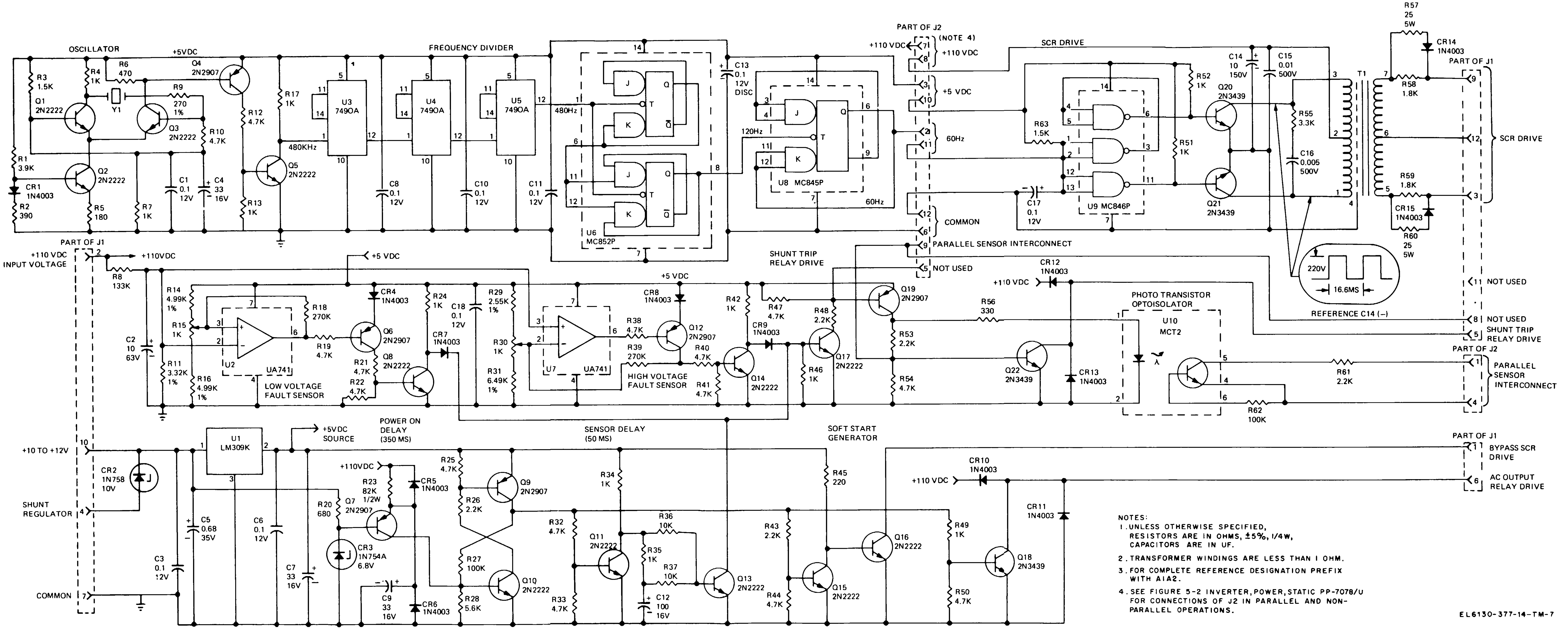
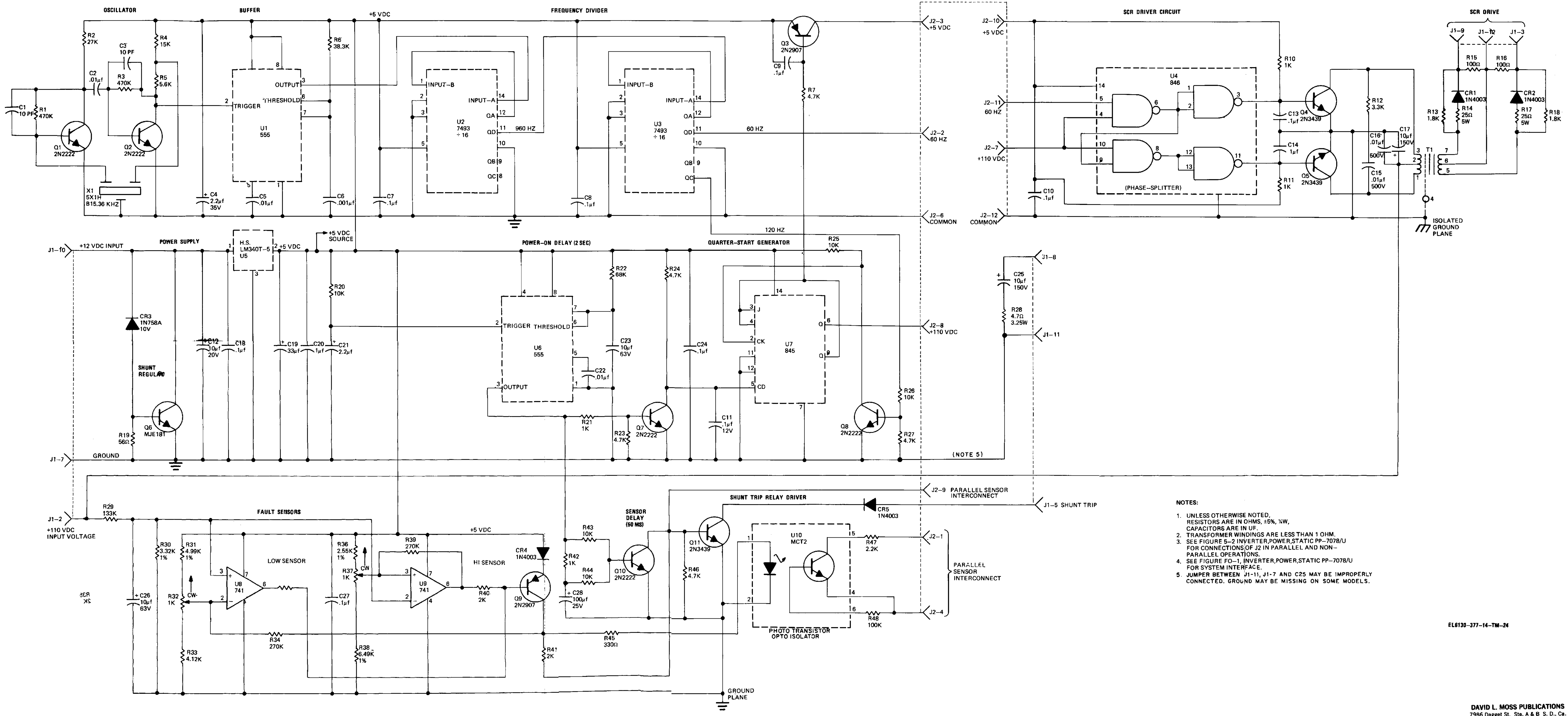


Figure FO-2. Inverter Drive A12, schematic diagram.



NOTES:

1. UNLESS OTHERWISE NOTED, RESISTORS ARE IN OHMS, ±5%, ¼W, CAPACITORS ARE IN UF.
2. TRANSFORMER WINDINGS ARE LESS THAN 1 OHM.
3. SEE FIGURE 5-2 INVERTER,POWER,STATIC PP-7078/U FOR CONNECTIONS OF J2 IN PARALLEL AND NON-PARALLEL OPERATIONS.
4. SEE FIGURE FO-1, INVERTER,POWER,STATIC PP-7078/U FOR SYSTEM INTERFACE.
5. JUMPER BETWEEN J1-11, J1-7 AND C25 MAY BE IMPROPERLY CONNECTED. GROUND MAY BE MISSING ON SOME MODELS.

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Figure FO 2-1. Inverter drive A1A2, schematic diagram, 1974 model.

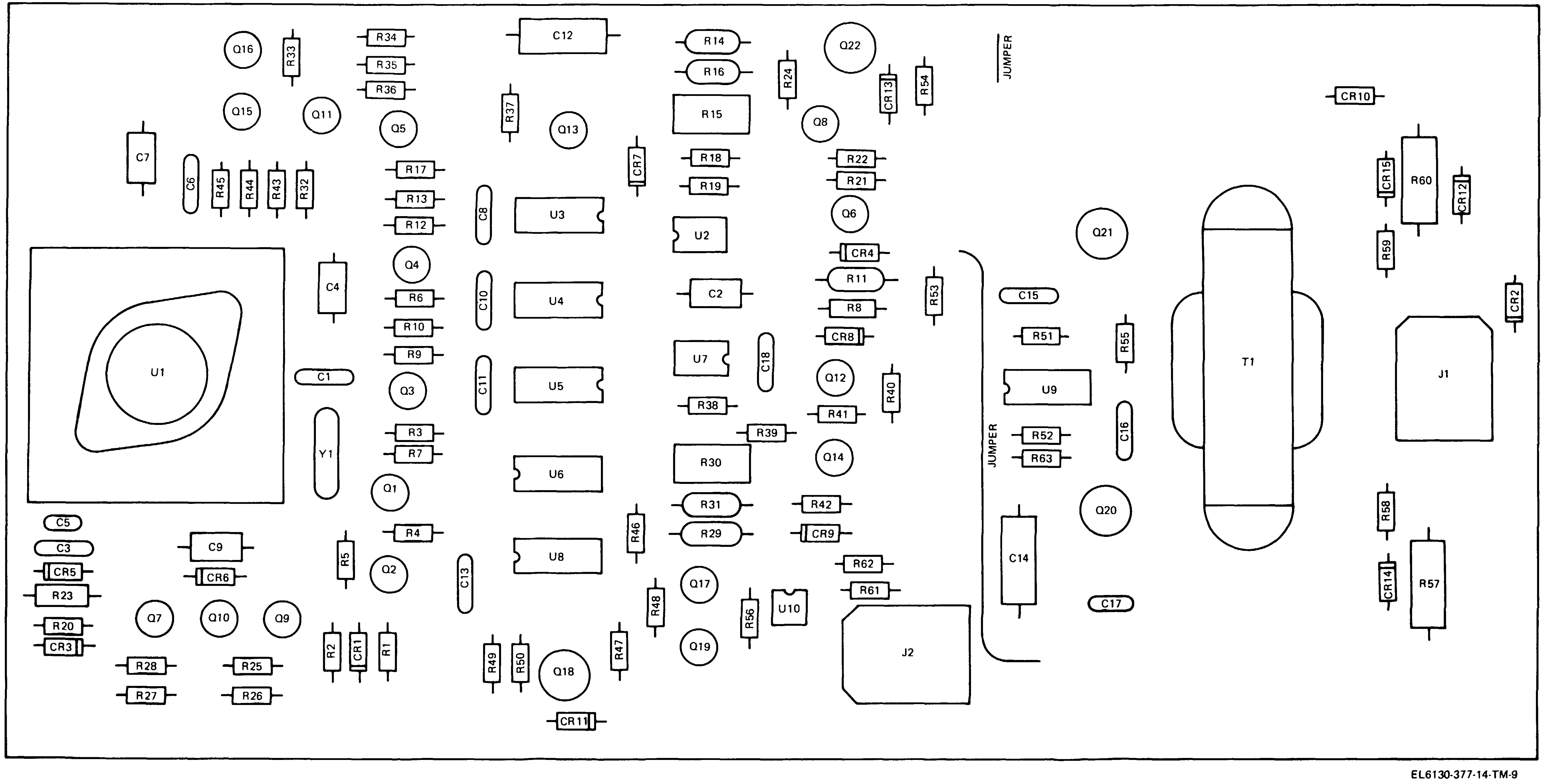
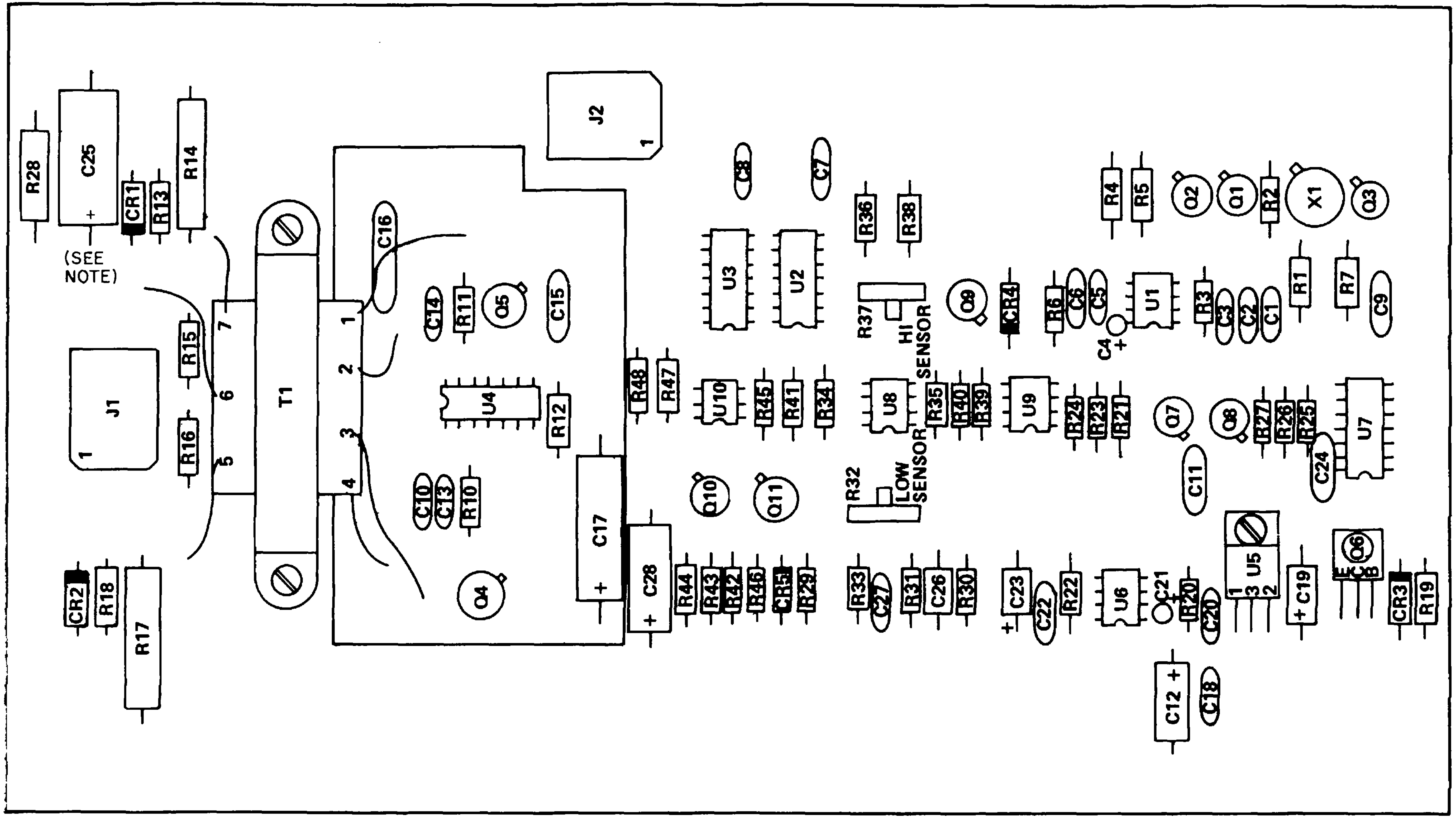


Figure FO-3. Inverter drive circuit board A1A2, component locations.



NOTE:
C25 POLARITY SHOULD BE AS SHOWN. SOME CIRCUIT BOARDS ARE IMPROPERLY WIRED AND MUST BE CHANGED.

EL6130-377-14-TM-25

Figure FO-3.1. Inverter drive circuit board A1A2, component locations 1974 model.

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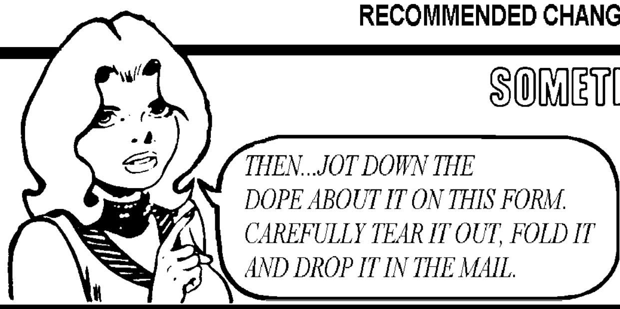

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	***To***	***Multiply by***	***To change***	***To***	***Multiply by***
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 009543-000