

DIGITAL AUTOMATIC  
ANTENNA COUPLER



CU-9125

OPERATION AND MAINTENANCE  
MANUAL REV. 5



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**SUNAIR ELECTRONICS, INC**

# CU-9125

## DIGITAL AUTOMATIC ANTENNA COUPLER



# OPERATION AND MAINTENANCE MANUAL REV. 5

## Revision History:

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Rev. 5	October 30, 2013	Changed CPU P/N in Parts List

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Sunair Electronics, Inc.  
3131 SW 42<sup>nd</sup> Street  
Ft. Lauderdale, FL 33312 U.S.A.

Telephone: (954) 400-5100

Fax: (954) 583-7337

Email: [techsupport@sunairelectronics.com](mailto:techsupport@sunairelectronics.com)

## Training:

Sunair offers training programs of varying lengths covering operation, service, and maintenance of all Sunair manufactured equipment. For details please contact the Product Service Department.

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## TABLE of ABBREVIATIONS

ADDR	Address	LVL	Level
AGC	Automatic Gain Control	MAN	Manual
ALC	Automatic Level Control	M CH	Manual Channel
AM	Amplitude Modulation	MED	Medium
AME	Amplitude Modulation Equivalent	MHz	Megahertz
AMP/AMPL	Amplifier	MIC	Microphone
ARQ	Automatic Request	MIL-STD	Military Standard
AUD	Audio	MNL	Manual
AUTO	Automatic	ms	Millisecond
AUX	Auxiliary	MTTR	Mean Time To Repair
BAUD	A variable unit of data transmission speed (bits per second)	MTR	Meter
BELL U.S.	Telephone standards	NAR	Narrow
BFO	Beat Frequency Oscillator	O.D.	Olive Drab
BITE	Built In Test Equipment	PA	Power Amplifier
BRD	Board	PC	Printed Circuit
CH /CHAN /CHL/CHN	Channel	PEP	Peak Envelope Power
CLR	Clear	PLL	Phase-Locked Loop
CMOS	Complementary Metal Oxide Semiconductor	P/N	Part Number
CPLR	Coupler	PNL	Panel
CPU	Computer	POSTSL	Post-Selector
CW	Carrier Wave	PRESEL	Pre-Selector
dB	Decibel	PTT	Push-To-Talk
dBm	Decibels referred to 1 milliwatt across 600 ohms	PWR	Power
DSBSC	Double Sideband Suppressed Carrier	RCV/RX	Receive
DSP	Display	REFL	Reflected
DUART	Dual Asynchronous Receive/Transmit	REV	Revision
EEPROM	Electrically Erasable and Programmable Read Only Memory	RF	Radio Frequency
EPROM	Electrically Programmable Read Only Memory	RFI	Radio Frequency Interference
EMI	Electromagnetic Radiation Interference	RFL	Reflected
ENTR	Enter	RMT	Remote
FAX	Facsimile	RS232	Computer control, hardwired up to 50 feet maximum
FEC	Forward Error Correction	RS422	Computer control, hardwired up to 4000 feet maximum
FREQ	Frequency	RS485	Computer control, hardwired for multiple users
FSK	Frequency Shift Keying	RTTY	Radio Teletype
FWD	Forward	SEL	Select
GRP	Group	SLO	Slow
HF	High Frequency	S MTR	Signal Strength Meter
Hz	Hertz	SPKR	Speaker
IC	Integrated Circuit	SPLX	Simplex
IF	Intermediate Frequency	SRAM	Static Random Access Memory
I/O	Input/Output	SSB	Single Sideband
IONCAP	Ionospheric Communications Analysis and Prediction	TCXO	Temperature Controlled Crystal Oscillator
kHz	Kilohertz	TGC	Transmit Gain Control
kW	Kilowatt	THD	Total Harmonic Distortion
ISB	Independent Sideband	TTL	Transistor-Transistor Logic
LCD	Liquid Crystal Display	TX/XMT	Transmit
LCL	Local	USB	Upper Sideband
LED	Light Emitting Diode	UTC	Universal Time
LK	Link	VCO	Voltage Controlled Oscillator
LO	Local Oscillator	VHF	Very High Frequency
LP/LPX	Lincompex	VRMS	Volts Root Mean Square
LRU	Lowest Repairable Unit	VSWR	Voltage Standing Wave Ratio
LSB	Lower Sideband	W	Watt
LT	Light	WPM	Words Per Minute

\* Asterisk indicates function selected

SECTION I  
GENERAL INFORMATION

**1.1 SCOPE**

This manual contains information necessary to install, operate, maintain and repair the CU-9125 Automatic Digital Antenna Coupler.

**1.2 DESCRIPTION**

See Figure 1.1

**1.2.1 GENERAL**

The CU-9125 is a high quality remotely controlled antenna coupler capable of matching a wide variety of antennas ranging from 9 ft. whips to 150 ft. longwires over the frequency range of 1.6000 to 29.9999 MHz. In addition, the coupler may be used as a 'line flattener' to correct the VSWR of resonant antennas.

The CU-9125 is designed to operate in conjunction with the Sunair 9000 Series Equipment utilizing Cable Assembly p/n 8076004098 at separations of up to 250 feet. Manual tuning cycles are initiated by depressing the 'CPLR TUNE' pushbutton on the 9000 Series Transceiver or Exciter. Tuning status metering for indicating forward and reflected power are located on the radio equipment. The coupler is mounted in a sturdy, fully gasketed case designed for outside mounting near the antenna.

**1.2.2 ASSEMBLIES**

**1.2.2.1 Chassis Assembly 2A1**

The Chassis Assembly provides the required mounting surfaces for the various electrical and mechanical components. The Motherboard 2A1A1 serves as the interconnect for all assemblies.

**1.2.2.2 RF ASSEMBLY 2A2**

The four (4) boards comprising the RF Assembly are the Input Board 2A2A1, the Intermediate Board 2A2A2, the Inductor Board 2A2A3 and the Output Board 2A2A4. The boards contain all of the variable binary elements in the antenna matching network.

**1.2.2.3 COMPUTER BOARD 2A3**

This assembly contains the microprocessor responsible for the operation and functions of the CU-9125.

**1.2.2.4 DETECTOR/PAD ASSEMBLY 2A4**

The Detector Assembly 2A4A1 contains the magnitude, phase and VSWR detectors. The Pad Assembly 2A4A2 plugs into the Detector Assembly and protects the Transceiver/Exciter from impedance variations during the tuning cycle.

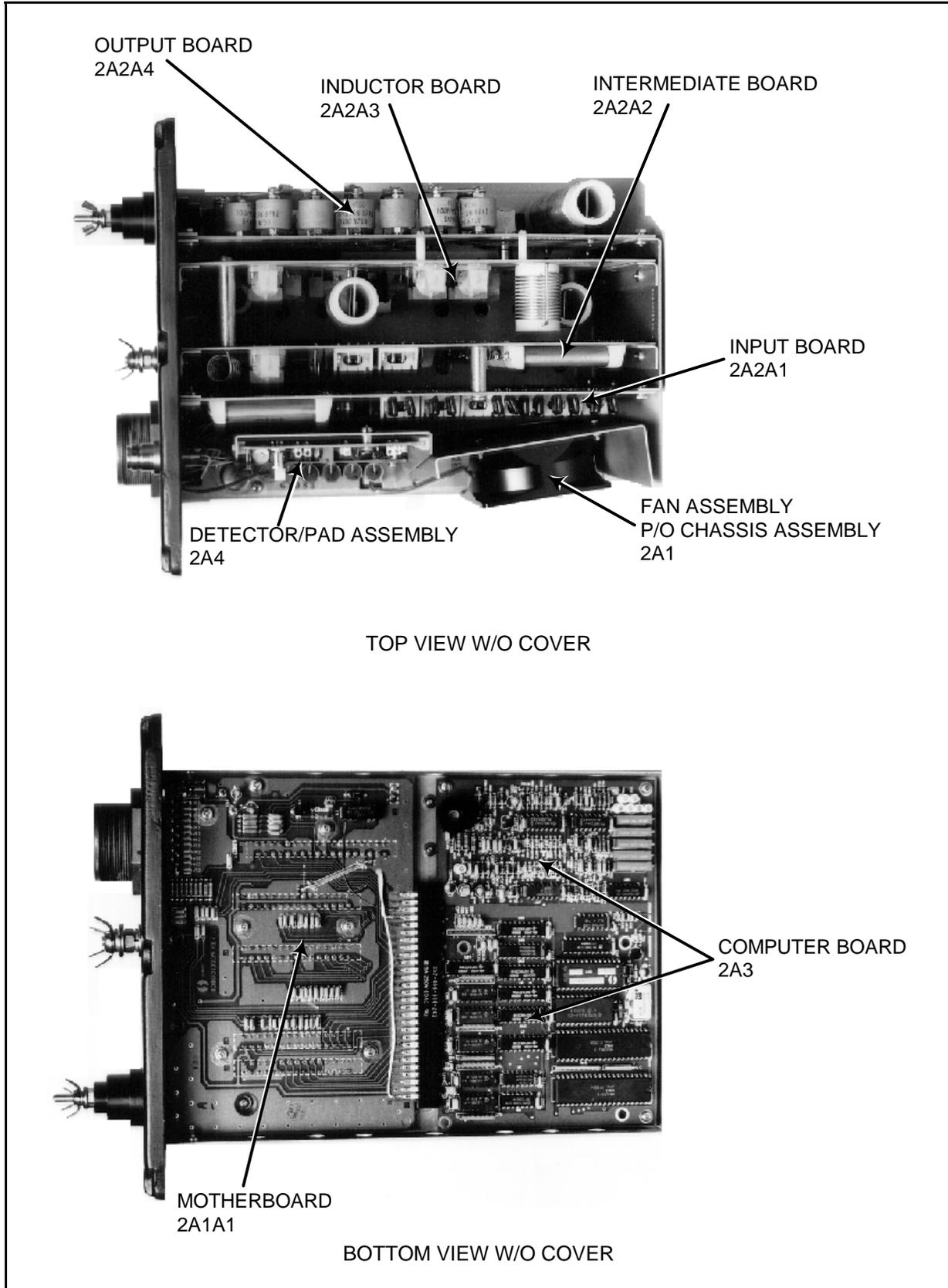


Figure 1.1 CU-9125 Major Assembly Locations.

**1.3 SPECIFICATIONS**

**1.3.1 GENERAL**

**FREQUENCY RANGE:** 1.6 to 30 MHz.

**TUNING CAPABILITIES:** 9 ft. whips  
16 ft. whips  
23 ft. whips  
35 ft. whips  
50 ft. to 150 ft. longwires  
suitable as a line flattener for broadband antennas

**RF INPUT POWER:** 150 Watts PEP and AVERAGE.

**INPUT IMPEDANCE:** 50 Ohms, non-reactive.

**DUTY CYCLE:** Continuous for antennas 23 feet and longer. Fifty percent (maximum 5 minutes continuous key down time) for 9 and 16 ft. antennas.

**TUNING TIME:** Memory Tuning - 10 milliseconds or less.  
Non-Memory Tuning: - Typical: 1 second.  
Maximum: 10 seconds.  
Memory: Non volatile, 128 channels (00 - 127).

**TUNE POWER REQUIRED:** 25 Watts RF delivered.

**TUNE ACCURACY:** 1.5:1 VSWR maximum.

**REMOTE CAPABILITY:** Up to 250 ft. from Transceiver/Exciter.

**POWER INPUT:** +28 VDC from Transceiver/Exciter, 1 Amp maximum.

**WEIGHT:** 23 lbs (10.35 kgs).

**DIMENSIONS:** (Inches) 9.1H X 9.6W X 11.4D.  
(CM) 23.1H X 24.4W X 28.96D.

1.3.2 ENVIRONMENTAL

**TEMPERATURE:** Operating: -30°C to +65°C.  
Storage: -50°C to +85°C.

**HUMIDITY:** MIL-STD 810C, Method 507.1, Procedure II.

**SHOCK:** MIL-STD-810C, Method 516.2, Proc I, Figure 516.2-2, Ampl. b (20 g.), Dur.d.

**VIBRATION:** MIL-STD-810C, Method 514.2 equipment category f, Table 514.2-VI for wheeled vehicles, Figure 514.2-6, curve V.

**DUST:** MIL-STD-810C, Method 510.1, Procedure I.

**RAIN:** MIL-STD-810C, Method 506.1, Procedure I.

**PACKAGING:** Rain tight, for exposed installations.

1.4 **EQUIPMENT SUPPLIED**

**SUNAIR PART NUMBER**

Automatic Digital Antenna Coupler, CU-9125 (Cast Case)	8085000253 Grey 8085000296 Olive Drab
or	
Automatic Digital Antenna Coupler, CU-9125 (Aluminum Welded)	8085000351
Connector Kit	6035002099
Operation and Maintenance Manual	8085000709

1.5 **EQUIPMENT REQUIRED BUT NOT SUPPLIED**

Control Cable Assembly: Order by length desired. The Coupler will operate with up to 250 ft. of remote control cable.	8076004195
Cable, Control. Specify length.	0588680001
Cable, Coaxial, RG-58A/U: Recommended where separation between Transceiver/Exciter and Coupler is less than 100 ft. Specify length.	0588130001
Cable, Coaxial, RG-8/U: Recommended where separation between Transceiver/Exciter and Coupler exceeds 100 ft. Specify length.	0588640000
Cable, Coaxial, RG-213: Same as RG-8/U.	1010770021
Connector, RF, PL-259: Mates with antenna connector J4 on 9000 Series.	0742190005

**1.6 OPTIONAL EQUIPMENT NOT SUPPLIED**

Transceiver/Exciter	Consult Sunair Marketing Dept.
Shockmount Kit - CU-9125	8080000492
PC Assy, Extender CU-9125	8080002096
Depot Spare Parts Kit	8085900092
Field Module Kit	8085902095
PC Assy, Detector Extender Board	8085165091
Antenna Simulator Model TS-100	8084001094

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## SECTION II INSTALLATION

### 2.1 GENERAL

Section II contains all necessary instructions for the unpacking, inspection, and if necessary, reshipping of damaged equipment or parts. In addition, further information regarding location and mounting considerations, power requirements, antenna and ground system hook-ups and final checkouts after installation is also provided.

### 2.2 UNPACKING AND INSPECTION

As soon as you have received your unit(s), unpack and inspect all components and accessories. Check the packing list to be sure you have received all items ordered and that all items necessary for operation have been ordered.

**NOTE:** Be sure to retain the carton and its associated packing materials should it be necessary to reship damaged equipment.

Do not accept a shipment when there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage of items or any evidence of damage, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier. If concealed damage is discovered after the shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to Sunair's Product Services Department. Include the following:

- Order Number
- Model and Serial Number
- Name of Transportation Agency
- Applicable dates.

When Sunair receives this information, arrangements will be made for repair or replacement.

### 2.3 RETURN OF EQUIPMENT TO FACTORY

The shipping container for the CU-9125 has been carefully designed to protect the equipment during shipment. The container and its associated packing materials should be used to reship the unit. When necessary to return equipment to Sunair for warranty or non-warranty repair, an authorization number is required. This number can be obtained from our Product Services Department, Telephone: (954)-525-1505, FAX: (954)-765-1322.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around connectors and other protrusions from the coupler. Rigid cardboard should be placed at the corners of the equipment to protect against denting.

When returning subassemblies or components for repair or replacement, be sure to pack each item separately, using suitable cushioning material.

Shipment to be made prepaid consigned to:

Sunair Electronics, Inc.  
Product Services Department  
3131 SW 42<sup>nd</sup> Street  
Ft. Lauderdale, Florida 33312  
U.S.A.

Plainly mark with indelible ink all mailing documents as follows:

U.S. Goods Returned For Repair  
Value For Customs - \$100.00

Mark ALL SIDES of the package:

FRAGILE - ELECTRONIC EQUIPMENT!

**NOTE:** Before shipping, carefully inspect the package to be sure it is marked properly and is securely wrapped.

## **2.4 POWER REQUIREMENTS**

All power necessary to operate the CU-9125 Automatic Digital Antenna Coupler is supplied from a companion Exciter/Transceiver via the Control Cable Assembly. See Figure 2.8 for control cable connections. If an Exciter/Transceiver other than a Sunair model is used, an external power source of +28VDC at 1.0 amp is required to power the CU-9125.

## **2.5 INSTALLATION CONSIDERATIONS AND MOUNTING INFORMATION**

The satisfactory operation of the equipment will depend upon the care and thoroughness taken during the installation.

### **IMPORTANT INSTRUCTIONS**

#### **2.5.1 GENERAL INSTALLATION PROCEDURES AND REQUIREMENTS**

1. Carefully plan radio/coupler/antenna locations, observing the following requirements before starting installation.
2. Provide best possible RF ground for radio and coupler. Use flat copper strap 1" wide or #6 (or larger) wire and connect to the ground terminal at rear of radio. Leads to ground system should be as short as possible.
3. Provide the maximum separation between coupler output and the radio with its associated wiring. Coupler may be mounted up to 100 feet from radio when RG-58 is used, and up to 250 feet from radio when RG-8 or RG-213 is used.
4. The antenna lead from the coupler to antenna must be insulated for at least 10 kv potential. The lead should not run parallel to metal objects that are bonded to the system ground. The coupler should be as close to the antenna as possible, and never more than three (3) feet away as this will decrease antenna efficiency.
5. If the coupler is installed on a wood or fiberglass boat, a 12 square foot minimum area of metal surface area in contact with the water should be provided for use as an RF ground.
6. If operating the coupler on external DC power, check for correct polarity before applying power.
7. The installation should be carefully planned beforehand in accordance with drawings on the following pages.
8. Linear amplifiers with low level modulation such as used in Sunair Exciters/Transceivers will oscillate if the RF power output is radiated or conducted into the low level stages. Evidence of this situation is erratic or excessive power output. This is caused by too close proximity of the coupler output and antenna to the

Transceiver/Exciter and/or inadequate RF grounds. Carefully following the above procedures will prevent this from occurring.

## 2.5.2 MOUNTING CONSIDERATIONS

See Figure 2.1 for Coupler dimensions.

### 2.5.2.1 Base Station Installation

A typical base installation consisting of an RT-9000 and a CU-9125 is shown in Figure 2.3. (Consult the RT-9000 Operation and Maintenance Manual, p/n 8076000505, for installation details for the Transceiver.) The CU-9125 can also be used with the T-9400 HF/ISB Exciter. (Consult the T-9400 HF/ISB Exciter Operation and Maintenance Manual, p/n 8103000507, for installation details.) Refer to Section 2.6 for recommendations for suitable antennas.

### 2.5.2.2 Vehicular Installation

Figure 2.4 shows a typical vehicular installation with an RT-9000 Transceiver and shockmount assembly.

**NOTE:** Shockmounting is required only in severe shock or vibration environments exceeding those noted in Section 1.3.2. See Figure 2.2 for installation.

See Section 2.6 for specific antenna recommendations. In order to minimize RF pickup, it is important that the ground straps supplied with the shockmount, if used, be securely fastened between the ground post on the radio and the bottom of the right rear shock isolator. (Consult the RT-9000 manual for further details.)

### 2.5.2.3 Marine Installation

In marine installations, follow the same recommendations as outlined in paragraph 2.5.2.2 above. If the radio is installed in a wood or fiberglass boat, a ground plate of 12 square foot minimum area in contact with the water should be installed. A heavy ground lead such as 1 inch wide strap or braid should be connected between the ground post on the radio and the ground plate. The length of this ground lead should be held to an absolute minimum commensurate with a neat installation.

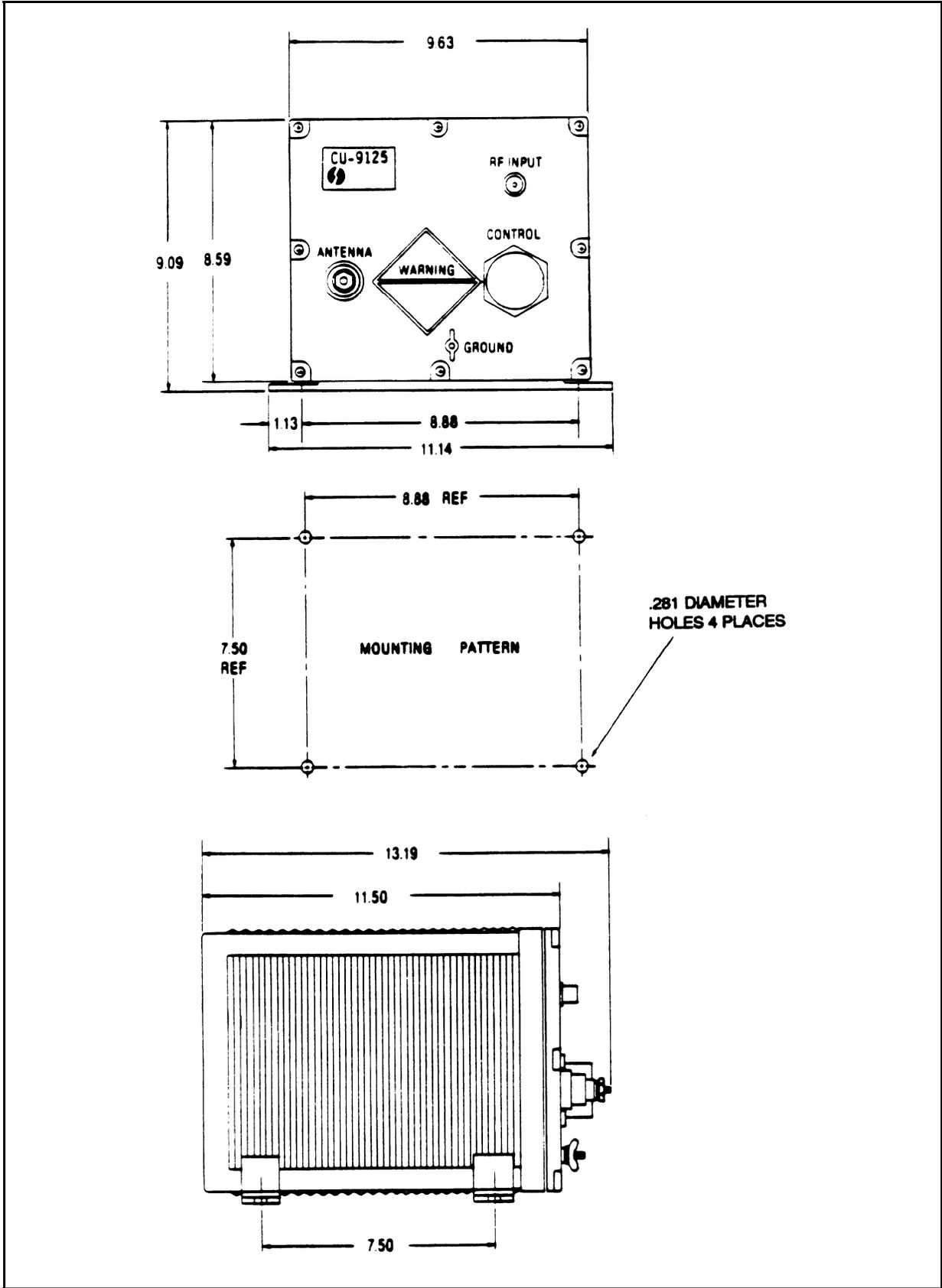


Figure 2.1 Outline Mounting Details CU-9125.

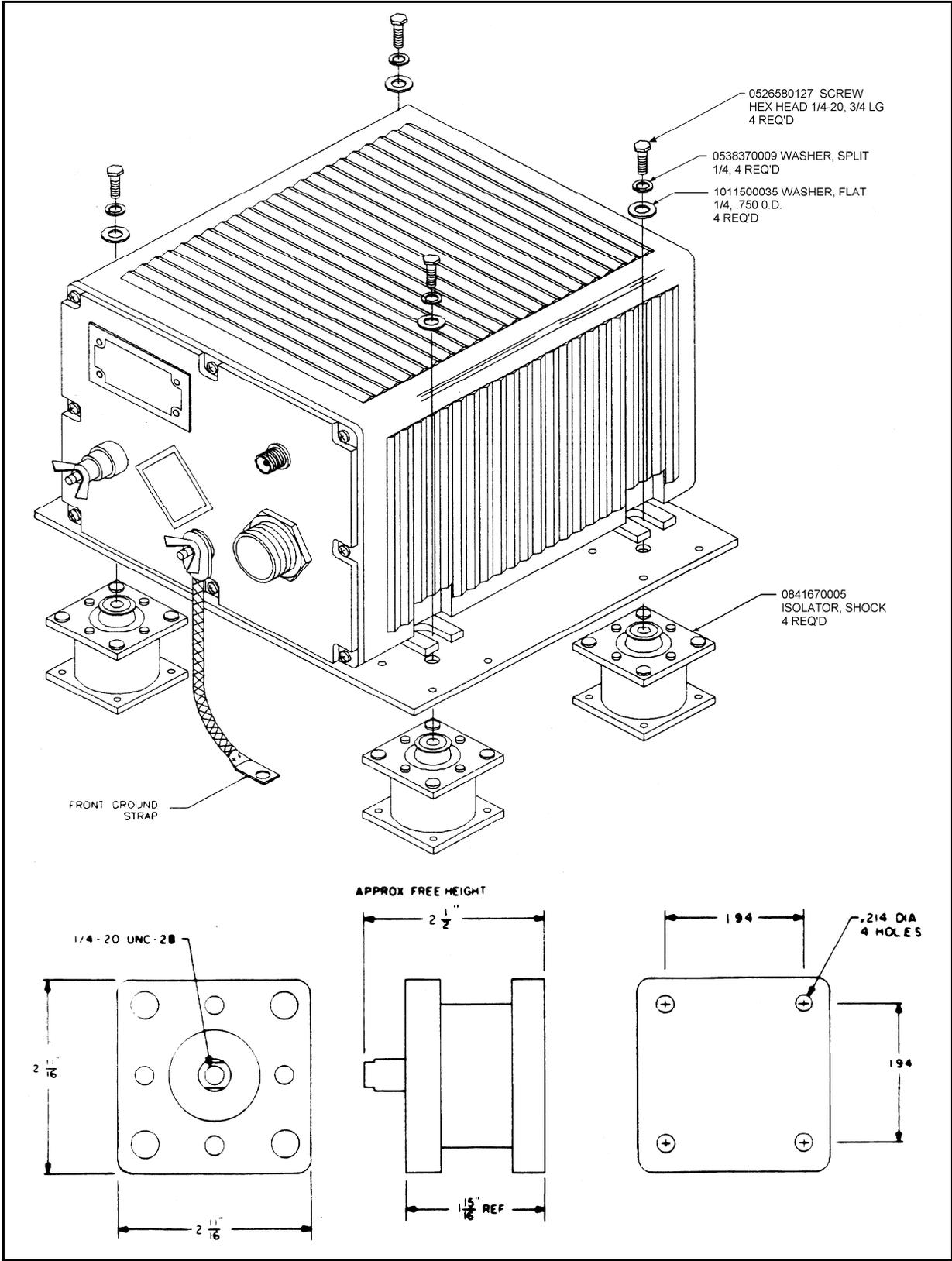


Figure 2.2 Shockmount Installation.

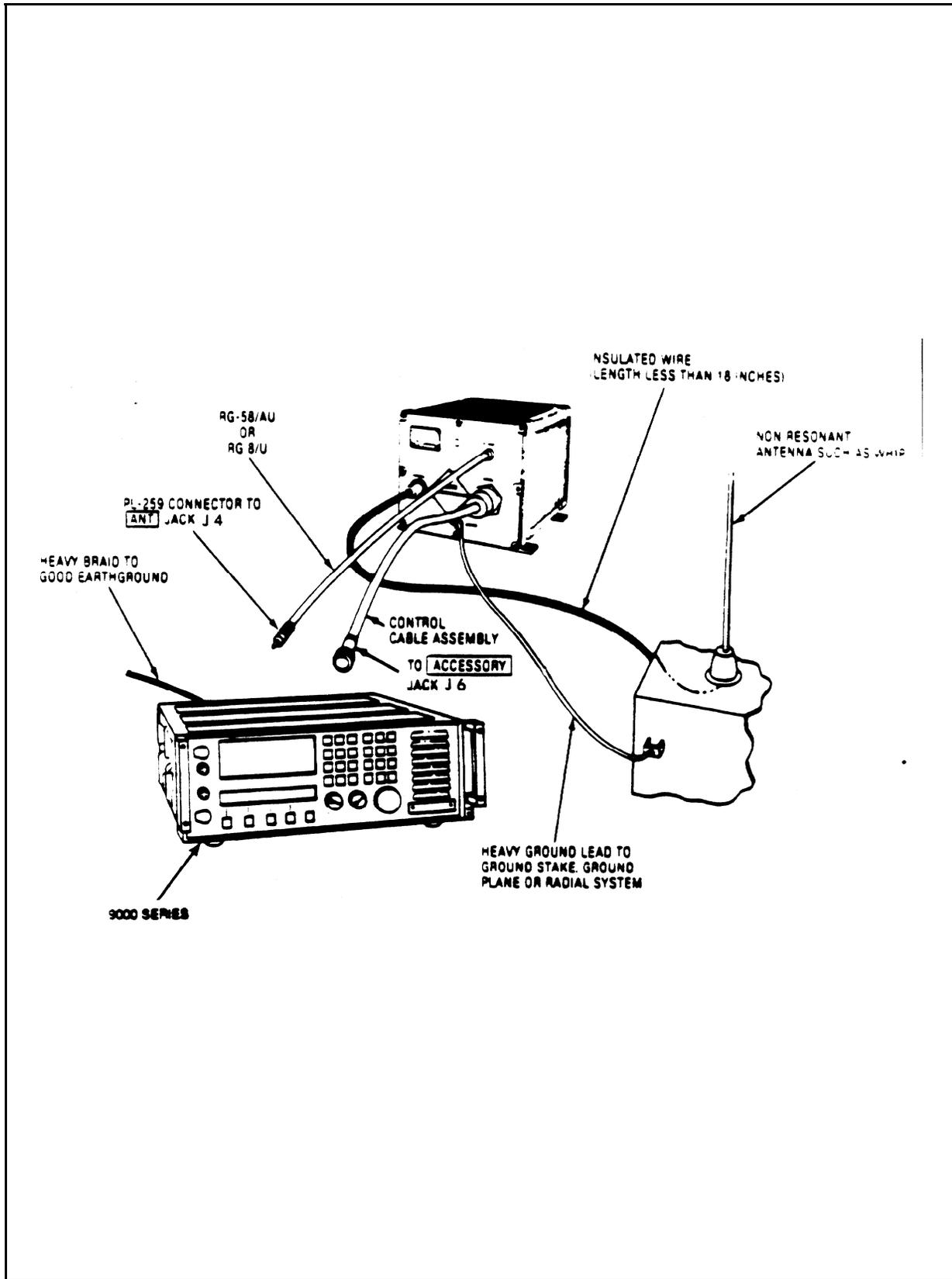


Figure 2.3 Typical Base Station Installation Using Non-Resonant Antennas.

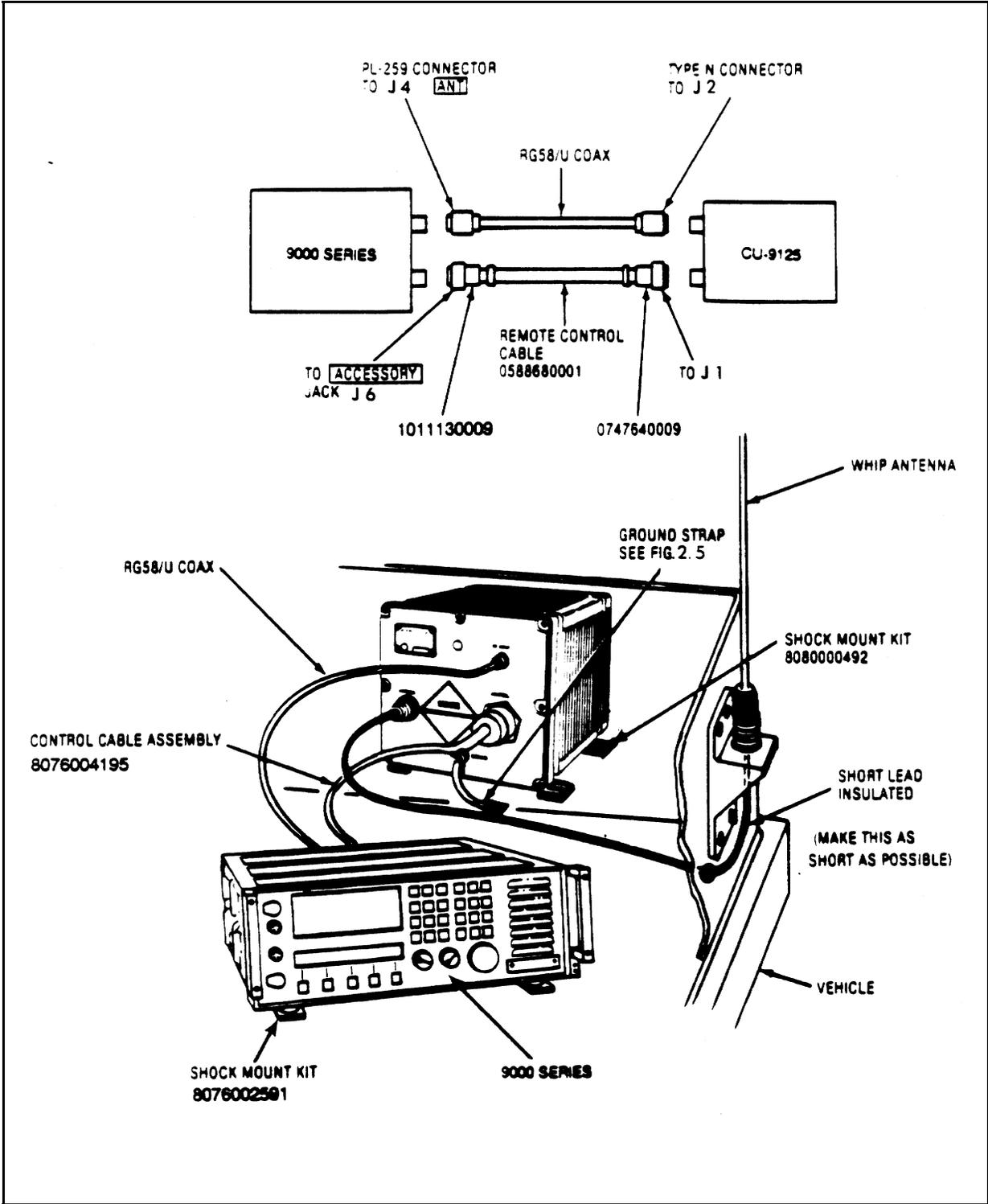


Figure 2.4 Typical Vehicular Installation.

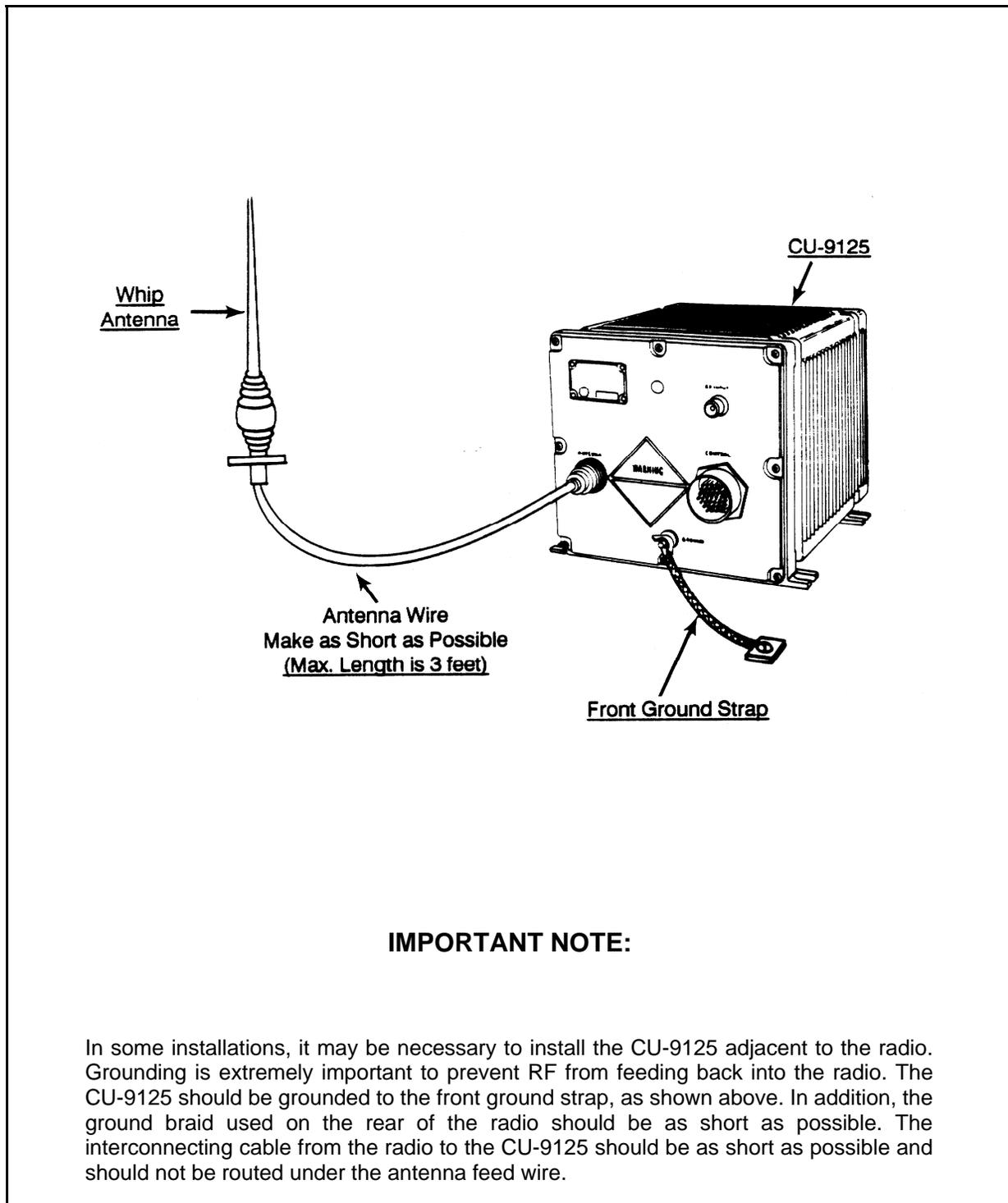


Figure 2.5 Coupler Grounding.

## 2.6 ANTENNAS AND GROUND SYSTEMS

### 2.6.1 GENERAL

Sunair Exciters/Transceivers are designed to operate into a 50 Ohm resistive antenna system with a maximum voltage standing wave ratio (VSWR) of 2:1. When used with the CU-9125 Automatic Digital Antenna Coupler the system will match antennas ranging from 9 foot whips to 150 foot longwires. Although the CU-9125 will match 9 foot whips down to 1.6 MHz, use of a 9 foot whip is not recommended for low frequency use due to poor radiation efficiency. The CU-9125 is unique in that it can be placed close to the antenna and controlled from the front panel of the Exciter/Transceiver. This optimizes both operator convenience and electrical performance. As there are numerous types of antennas, a complete discussion is beyond the scope of this manual. Antennas requiring an antenna coupler for use in the 1.6 to 30 MHz spectrum generally fall into two categories:

- a) Narrow Band 50 Ohm Antennas
- b) Random length non-resonant Antennas.

Antennas falling into each of the above mentioned categories are discussed in this section. For specific recommendations, consult our Marketing and Product Support Departments.

Some general **DOs** and **DON'Ts** of antenna installation are listed below:

- a) The antenna should be clear of all large objects such as trees and buildings.
- b) Although the coupler will match electrically short antennas (i.e. those under 1/8 wavelength), such antennas are not efficient radiators. If the installation permits, antennas over 1/8 wavelength long at the lowest operating frequency should be used. Antenna length generally limits system performance in vehicular applications at frequencies below 10 MHz as the size would be prohibitive.
- c) When using whip antennas, the ground system actually forms part of the radiating system. Where space permits (such as in a base station installation) a good ground plane or radial system should be installed at the base of the antenna. (See Figure 2.6)

**NOTE:** An inadequate ground system is most often responsible for disappointing performance when using a whip antenna.

### 2.6.2 NARROW BAND 50 OHM ANTENNAS

Typical of this type of antenna is the Inverted V illustrated in Figure 2.7. This type of antenna may be assembled from the Sunair Doublet Antenna Kit (p/n 0996240004). Its operation is efficient for only a narrow band of frequencies within approximately 2½% of their center frequency. The antenna coupler is **NOT** generally required if the above frequency span is not exceeded. Separate antennas must be erected for each small band of frequencies to be used. The antenna exhibits somewhat directional characteristics. The direction of maximum radiation is perpendicular to the antenna wire. This antenna is particularly suitable for communication with nearby mobile stations (with vertical antennas) since a portion of the radiation is in a vertical direction.

## 2.6.3 RANDOM LENGTH NON-RESONANT ANTENNAS

Whips and longwires are popular non-resonant antennas. The whip antenna (illustrated in Figure 2.6), is often used in mobile, marine, portable or semi-portable installations because it is rugged and self-supporting. The antenna impedance is strongly dependent on the operating frequency, and an antenna coupler, therefore, must be used to match the antenna to the Transceiver/Exciter. Best radiation efficiency will be obtained if the antenna is at least  $1/8$  wavelength long at the lowest operating frequency; however, this requirement does not result in a practical size antenna for low frequency operation. Thirty-five foot whip antennas offer a good compromise between practical height and good electrical performance at low frequencies. The antenna coupler is designed to efficiently match whip antennas of 15 foot length or greater. An efficient match may also be obtained for a 9 foot whip above 4 MHz. The whip's performance is greatly influenced by its ground system. For temporary base station installations, a minimum of four six-foot long ground rods should be driven into the ground symmetrically placed around the antenna base. The rods should be bonded together with heavy strap and then connected to the antenna coupler ground by another short heavy strap. If the antenna is mounted on the roof of a building where a short ground lead to coupler cannot be obtained, a minimum of four symmetrically placed ground radials should be installed at the base of the antenna, bonded together, and connected to the antenna coupler ground post. The radials should be made of number 12 gauge wire or larger and should be at least  $1/4$  wave long at the lowest operating frequency. (Radial length in feet =  $246/\text{frequency in MHz.}$ ) The whip's radiation pattern is omni-directional in the azimuthal plane.

The longwire antenna, illustrated in Figure 2.8, is a popular base station antenna where a wide range of operating frequencies are used. The antenna impedance varies greatly with frequency and, therefore, must be matched to the transmitter with the antenna coupler. The CU-9125 Antenna Coupler will efficiently match longwire antennas up to 150 foot in length. The radiation pattern of the longwire antenna is also a strong function of operating frequency. The two most popular longwire antennas, (75 and 150 foot) available from Sunair, exhibit excellent low frequency radiation efficiency.

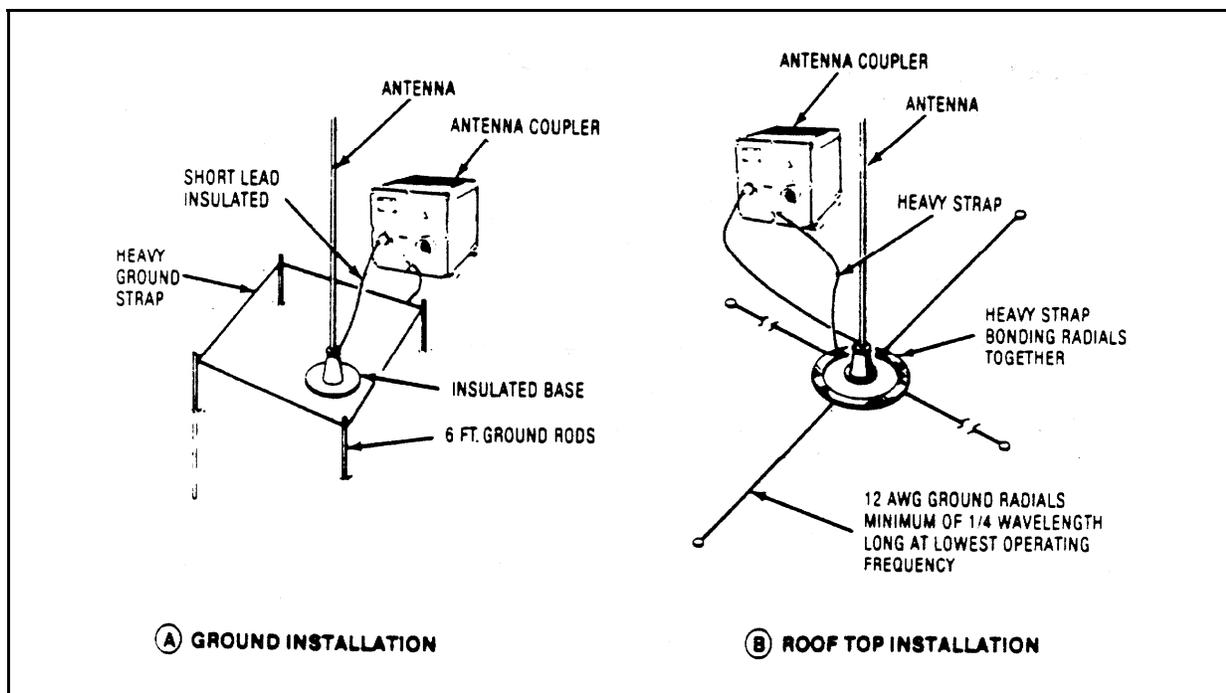


Figure 2.6 Whip Antenna.

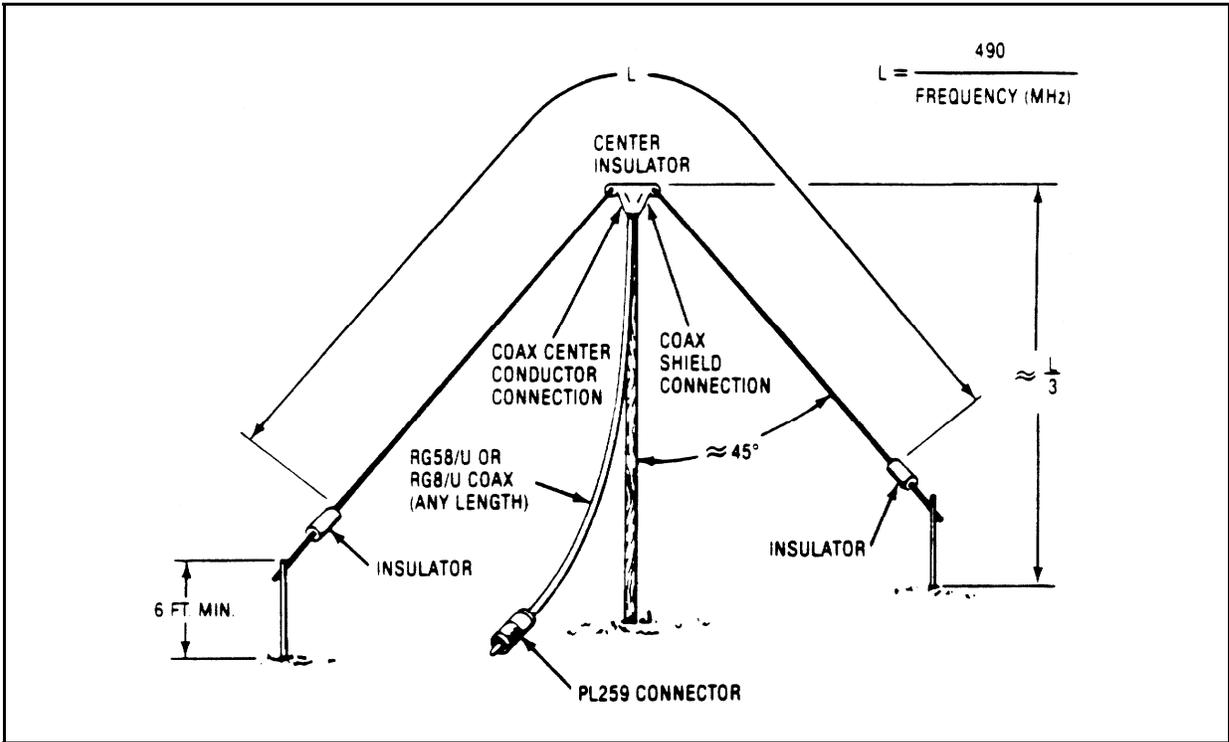


Figure 2.7 Inverted 'V' Antenna.

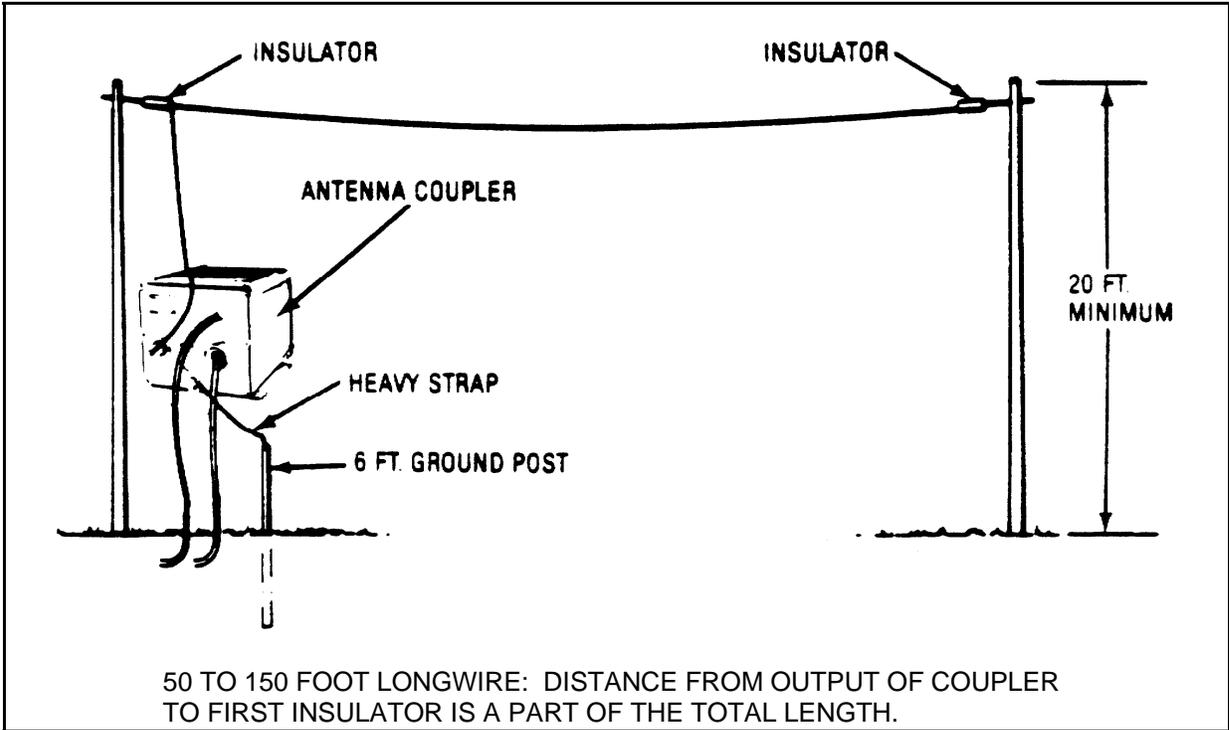


Figure 2.8 Long Wire Antenna.

## 2.7 CONSTRUCTION OF CONTROL CABLE ASSEMBLY 8076004195

It is recommended that the control cable assembly be procured from Sunair. However, if necessary, the cable may be made from individual wires of #20 AWG with an overall braided shield and PVC jacket.

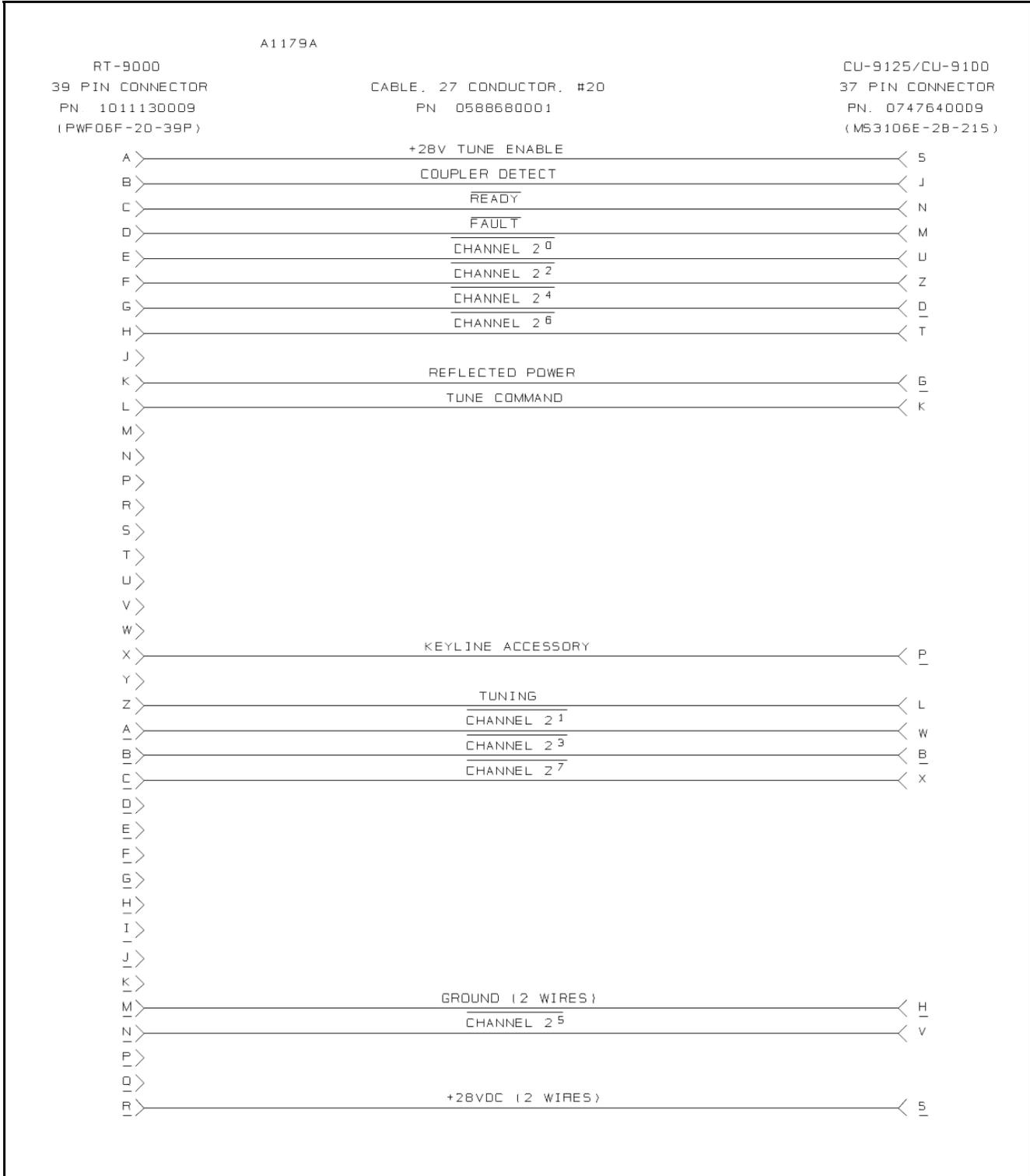
The control cable assembly may be shipped from the factory without connectors attached to facilitate the routing of this cable through walls, bulkheads, conduit, etc. After installing the cable, follow the procedure outlined below.

**NOTE:** The connector with the male pins (1011130009) should be wired at the transceiver end of the cable.

The connector with female pins (0747640009) should be wired at the coupler end of the cable. Refer to Figure 2.8.

1. Loosen both screws on one of the cable clamps.
2. Insert the rubber telescoping bushing (boot) through the rubber grommet on the inside of the cable clamp and push through until the lip on the boot bottoms on the rubber grommet. The boot should extend beyond the cable clamp.
3. Insert the cable (0588680001) into the open end of the boot and cable clamp and pull through until approximately six inches of cable extends from the inside of the cable clamp.
4. Carefully remove approximately 1½ inches of the plastic outer jacket of the remote control cable using a knife or razor blade. Use care so as not to damage the shield or inner conductors.
5. Carefully unbraid the cable shield to within approximately ¼ inch of the outer jacket. Carefully cut the unbraided shield wires at this point using a pair of small wire cutters.
6. Remove approximately one inch of insulation from the end of a three-inch piece of #22 gauge hook-up wire. Wrap the wire around the outer jacket and solder the connection using a medium-size soldering iron. Attach a #8 solder lug to the other end of the wire, after pulling the wire back through the telescoping bushing.
7. Note the mylar sleeve over the wire bundle. Carefully cut this sleeve, being careful not to nick the wires in the bundle, until the wire bundle is exposed back to the end of the shield.
8. Flare out the bundle of wires and separate the individual wires. Strip approximately 1/8 inch of insulation from each wire.
9. Choose one of the wires and carefully tin it. Solder the wire to one of the cups of the connector. Make a chart showing the wire color code and pin connection.
10. Proceed in a similar manner until all required wires are installed.
11. When all connections are completed, screw the rear shell and cable clamp assembly on the connector and tighten. Push a small additional amount of cable into the connector to ensure some slack. Remove one cable clamp screw and insert the lug on the #22 shield wire. Reinsert screw into cable clamp. Tighten the two screws on the cable clamp.
12. Follow an identical procedure to connect the other end of the cable to the proper pin as shown in Figure 2.9.

**WARNING:** Connectors installed by the customer must be wired in accordance with the instructions provided in this section. The cable **MUST BE** continuity checked after connector installation and prior to system power up.



**Figure 2.9** Wiring Diagram, Control Cable Assembly (8076004195)

## **2.8 CHECKS AFTER INSTALLATION**

9000 Series Exciters/Transceivers

1. Select a frequency in the 2 to 3 MHz range (or a frequency you are allowed to use).
2. Upon initial power on, the LCD will display function and status of the radio. An alternating 'Coupler Untuned' message will appear on the screen.
3. Depress the 'CPLR TUNE' pushbutton.
4. While coupler is tuning, screen will display 'Coupler Tuning'.
5. When a successful tune has been completed (1-2 seconds), screen will display 'System Ready' and then return to normal display status. If a 'System Fault' or 'Coupler Fault' message is displayed see section 3.1.

SECTION III  
OPERATION

3.1 ANTENNA COUPLER TUNING

Once an operating frequency has been selected, the exciter or transmitter section of the Transceiver is automatically tuned to the same frequency (Simplex Operation). If the Transceiver/Exciter output is fed to an Antenna Coupler (CU-9125), depression of the 'CPLR TUNE' key, will initiate the tune cycle. During this time (a few seconds or less), the message

'COUPLER TUNING'  
will appear on the Status Display Screen. When coupler tuning has been completed, the message  
'SYSTEM READY'  
will appear on the Status Display Screen.

THE TRANSCEIVER IS NOW FULLY OPERATIONAL

**NOTE:** If there is no antenna coupler in the system, depression of the 'CPLR TUNE' key will produce the message  
'NO ANTENNA COUPLER'  
on the Operational Display Screen.

**NOTE:** If the coupler is unable to tune the antenna within 10 seconds, the message  
'SYSTEM FAULT'  
will appear on the Status Display Screen. If this occurs, check the installation and the antenna. If all appears in order, proceed to the troubleshooting section of the coupler manual.

**NOTE:** If the coupler remains in the tune mode for longer than 10 seconds the message  
'COUPLER FAULT'  
will appear on the Status Display Screen. If this occurs, proceed to the troubleshooting section of the coupler manual.

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SECTION IV  
THEORY OF OPERATION

**4.1 GENERAL**

The CU-9125 is a fully automatic digital antenna coupler designed for use with Sunair 9000 series equipment or their equivalent. The coupler is rated for 125 watts PEP or average power, and will tune all common vehicular and ground based antenna systems 9 feet and longer. (For antennas shorter than 23 feet, duty cycle is limited to 5 minutes transmit, 5 minutes receive.) The tune command is generated by the Sunair 9000 series equipment by depression of the 'CPLR TUNE' pushbutton. Completion of a successful tune is indicated by an LCD message on the front panel of the Sunair 9000 series equipment.

Memory is provided within the coupler for 128 channels for use with Transceivers/Exciters such as the RT-9000 Transceiver or the T-9400 Exciter that provide channel information to the coupler. This memory will be retained in the coupler for a minimum power off period of ten years.

**4.2 ANTENNA TUNING NETWORK**

The antenna tuning network is basically an 'L' low pass circuit with additional shunt output capacitance, where required, to transform the network into a 'PI'. An additional capacitor is provided at the output of the network to allow tuning of inductive antennas. A block diagram of the CU-9125 is shown in Figure 4.1.

The input capacitor bank, located on the Input Board 2A2A1, Figure 5.12, and the Intermediate Board 2A2A2, Figure 5.13, consists of C1 through C11, and provides binary stepped values from 0 to 10293 picofarad (pF) steps. The series inductor bank, located on the Intermediate Board, Inductor Board 2A2A3, Figure 5.14, and the Output Board 2A2A4, Figure 5.15, and consisting of L1 through L11 and C12, provides binary stepped values from 0 to 21.8 microhenry ( $\mu\text{H}$ ) steps. C12 is used at the higher frequencies to cancel out the coupler stray inductance. The output capacitor bank, located on the Output Board 2A2A4, consisting of C13 through C16, provides binary stepped values from 0 through 750 pF. The series phase correcting capacitor C17, is located on the Output Board.

Refer to page 4-2 for Figure 4.1; CU-9125, Antenna Coupler, Block Diagram.

**4.3 DETECTOR/PAD ASSEMBLY (2A4)**

Refer to Figure 5.17 Detector/Relay Pad Assembly (2A4) Schematic.

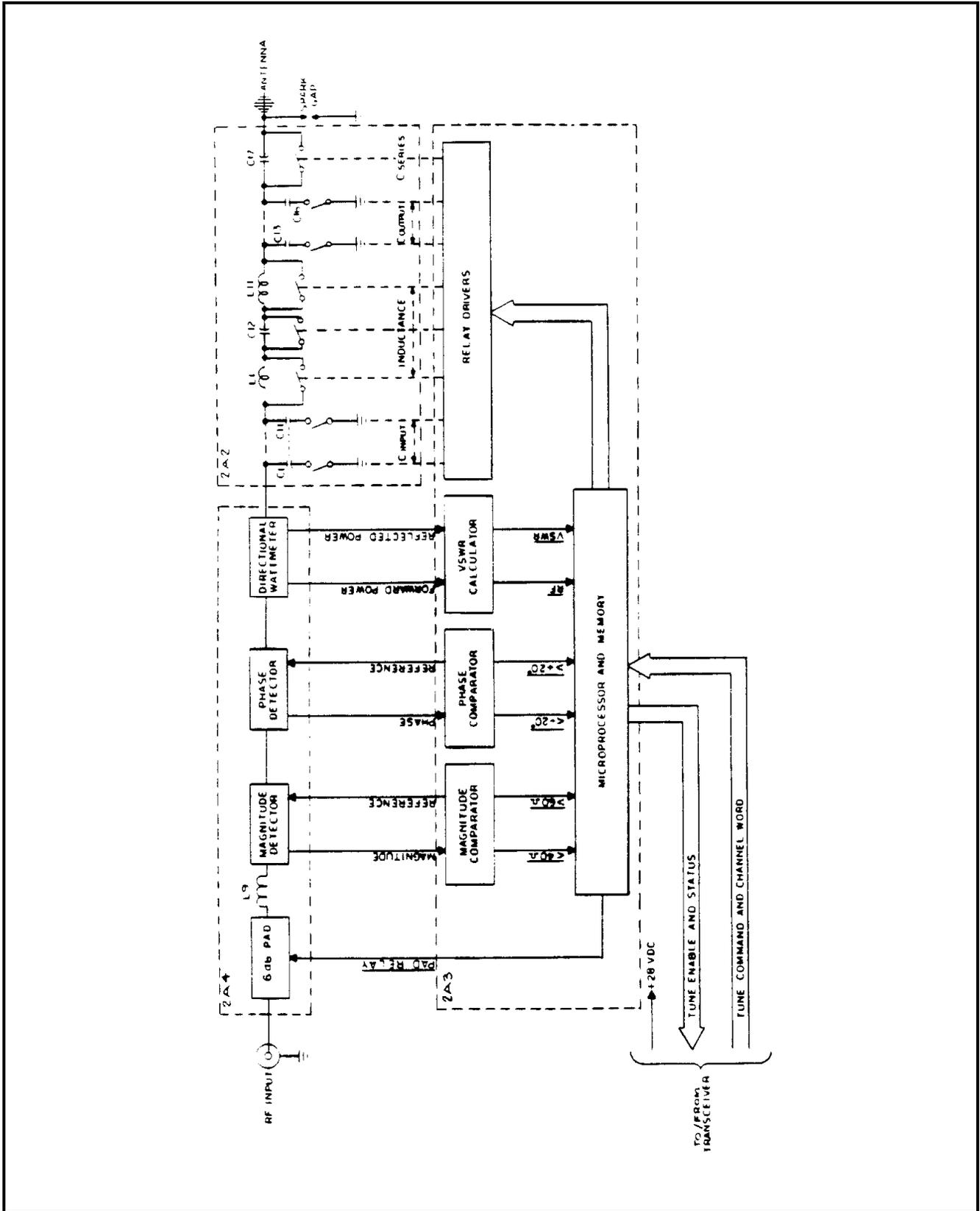


Figure 4.1 CU-9125, Antenna Coupler, Block Diagram.

### 4.3.1 GENERAL

The Detector/Pad Assembly contains the magnitude discriminator, the phase discriminator, the forward and reflected power detectors, the resistive pad network, the pad relay, and the tune relay.

### 4.3.2 MAGNITUDE DISCRIMINATOR

The magnitude discriminator consists of T1 and its associated components. It provides a means of measuring the relative magnitude of the transformed antenna impedance relative to 50 Ohms. For a magnitude greater than 50 Ohms, the magnitude discriminator produces an output voltage less than the +5 VDC reference voltage. For a magnitude less than 50 Ohms, an output greater than +5 VDC reference is produced. A voltage sample is provided from the transmission line by L1, C2, C3 and is rectified by CR2 to give a DC voltage proportional to the RF voltage on the line. A voltage proportional to the current in the transmission line is generated by transformer T1 and is rectified by CR3. Capacitor C2 is adjusted so that the voltage sample is exactly equal to the current sample when the transmission line is terminated with 50 Ohms resistance. The output of this discriminator is fed to differential amplifier U17B on the Computer Board Assembly 2A3, Figure 5.16. Note that the output of the magnitude discriminator is floating and is referenced to +5 VDC, not ground. So all measurements of the magnitude detector must be referenced to +5 VDC.

### 4.3.3 PHASE DISCRIMINATOR

The phase discriminator consists of transformer T2 and its associated components. It provides a means of measuring the relative phase angle at the input to the tuning network by comparing the phase of the line voltage with that of the line current. The discriminator output is zero when the transmission line voltage and current samples are in phase (pure resistance terminating the transmission line). The voltage sample is derived by C13, R10, C7, which shifts it in phase by  $90^{\circ}$ . The current sample is generated by transformer T2 and is in phase with the line current. The voltage sample is fed to T2 center tap, and the resulting output is detected by CR4, CR5 to produce a DC voltage proportional to the phase difference between the voltage on the transmission line and the current in the line. R12 is the phase discriminator balance control and is adjusted so the phase output is nulled (relative to +5 VDC) when the transmission line is terminated with a 50 Ohm non-inductive load.

The sensing of the phase discriminator is established to provide a positive output for inductive loads (positive phase angle) and a negative output for capacitive loads (negative phase angle). The output of this discriminator is fed to differential amplifier U17A on the Computer Board Assembly 2A3.

### 4.3.4 FORWARD AND REFLECTED POWER DETECTOR

The forward and reflected power detector consists of T3 and its associated components. The reflected power voltage sample obtained from C14, C15 is combined with the current sample obtained from T3, at CR6 to provide a DC voltage proportional to reflected RF power on the transmission line. This detector compares both phase and magnitude of the voltage and current samples. Its output is always one polarity, i.e., positive with respect to ground, and is a minimum when the coupler network has tuned the antenna to provide a 50 Ohm resistive load to the Transceiver/Exciter. C14 provides an adjustment to null the output when the transmission line is terminated with a 50 Ohm, non-reactive load.

The forward power voltage sample from C19, C17 is combined with the current sample from T3 at CR7 to provide a DC voltage proportional to forward power on the transmission line. It operates in much the same way as the reflected power detector, and its output is also positive with respect to ground, but maximum when the transmission line is terminated with a 50 Ohm, non-reactive load.

This output is used for (2) functions:

1 - to tell the microprocessor when RF energy is present, and

2 - to provide a reference against which the reflected power is compared for the calculation of VSWR.

The VSWR is used as an indication of the quality of the tune, and is acceptable for values of 2:1 or better.

#### 4.3.5 6dB ATTENUATOR PAD ASSEMBLY

The 6db attenuator consists of R1 through R6 and relay K1 and associated circuitry. It is switched between the coupler tuning network and the Transceiver/Exciter whenever the VSWR is greater than 2:1, and the Transceiver/Exciter is keyed. The pad provides protection for the Transceiver/Exciter by limiting the impedance variations placed on the Transceiver/Exciter during the tuning cycle. When a satisfactory tune has been accomplished, the pad is switched out of the circuit, allowing full transmit power to reach the antenna.

The Resistive Pad Subassembly 2A4A2, resistors R1 through R6, plugs into the Detector Board 2A4A1 to make up the Detector/Pad Assembly 2A4.

#### 4.3.6 TUNE RELAY

The tune relay K2, is energized by the microprocessor following receipt of a tune command from the Transceiver/Exciter, and supplies a +28 VDC signal to the Transceiver/Exciter. This 'Tune Enable' signal is used in the Transceiver/Exciter to supply AM carrier for coupler tuning. When the tune cycle has been terminated, the tune relay is deenergized allowing normal keyline operation.

### 4.4 COMPUTER BOARD ASSEMBLY WITH SLEEP CIRCUIT

Refer to Figure 5.16.

#### 4.4.1 GENERAL

The Computer Board 2A3 combines the analog interface circuitry used to process the detector outputs for use by the microprocessor U1, with the microprocessor computer circuitry. The analog circuits are located on the left side of the board and consist of integrated circuits U17 through U22, Q1, Q2, and their associated circuitry.

#### 4.4.2 PHASE DISCRIMINATOR INTERFACE

The phase discriminator interface consists of U17A, U18A, U18B, U20A and U20B. The phase discriminator output is compared with the +5 VDC reference voltage for magnitude and polarity in U17A. Potentiometer R6 and R66 determine the width of the output threshold 'window'. This window is adjusted to provide an output whenever the phase exceeds plus or minus 20 degrees. If the phase is positive and greater than 20 degrees, the discriminator output is positive, U17A output is positive, U18A output is positive, and U20A output is negative (ground), so a Low signal is sent to U5, RAM/IO/TIMER, on the  $\overline{\text{PHASE}} > +20^\circ$  line. Similarly, if the phase is negative and less than 20 degrees, an output from U17A, U18B, and U20B sends a Low signal to U5 on the  $\overline{\text{PHASE}} < -20^\circ$  line. Comparators U18A and U18B are used in conjunction with Schmitt triggers U20A and U20B to provide a toggle action to the phase commands, stabilizing the threshold limits. When the detected phase angle is within  $\pm 20^\circ$  of  $0^\circ$ , both the  $\overline{\text{PHASE}} > +20^\circ$  and  $\overline{\text{PHASE}} < -20^\circ$  lines are High, indicating to the microprocessor that the phase angle is within an acceptable 'window'.

#### 4.4.3 MAGNITUDE DISCRIMINATOR INTERFACE

The magnitude discriminator interface consists of U17B, U18C, U18D, U20C and U20D. The discriminator output is compared with the +5 VDC reference for magnitude and polarity, in U17B. Potentiometer R19 and R66 set the width of the magnitude window relative to 50 Ohms. The window is set to provide an output whenever the magnitude is greater than 60 Ohms or less than 40 Ohms. If the magnitude is greater than 60 Ohms, the discriminator output is negative, U17B output is negative, U18D output is positive and U20D output is negative, giving a Low on the  $\overline{\text{MAG}} > 60$  Ohm line to U5. The unaffected comparator, U18C in this case, provides a Low output to U20C, which in turn supplies a High to the  $\overline{\text{MAG}} < 40$  Ohm line. This way, only one output at a time may be Low, but both may be High, indicating to U5 that the magnitude is within an acceptable 'window'.

For magnitudes less than 40 Ohms, operation is similar to that described above, supplying a Low from U20C to the  $\overline{\text{MAG}} < 40$  Ohm line to U5.

#### 4.4.4 'RF PRESENT' DETECTOR

Transistor Q2 acts as a switch to provide a Low to microprocessor U1 on pin 5, whenever RF power is present at the coupler input. The transistor is turned on by a DC voltage from the forward RF power detector on the Detector/Pad Assembly 2A4. In order for U1 to continue its tuning program, the RF line must be held at a Low.

#### 4.4.5 VSWR COMPARATOR

Comparator U19A compares the relative magnitude of the forward and reflected power detectors to compute the VSWR. Potentiometer R43 will make this occur whenever the VSWR exceeds 2:1. Diode CR7 provides a reference to keep the VSWR line High between transmit speech pauses. Diode CR8 isolates the base circuit of Q2 from the voltage supplied by CR7. Diode CR16 isolates the reflected power detector on the Detector/Pad Assembly 2A4 from voltages generated by U19A circuitry.

U19C, U24F, U27C and U27D provide a High to microprocessor U1 on pin 9 when VSWR exceeds 2:1, U1 pin 9 is an interrupt input. This High awakens U1, permitting it to initiate a tune cycle to reduce the VSWR to an acceptable level. Normally U1 sleeps, keeping its DATA BUS and ADDRESS BUS quiet to eliminate any possible radiated BUS noise.

#### 4.4.6 REFLECTED POWER METER DRIVER

U19B is used as a current source with a voltage gain of one to drive the transceiver meter proportionally to reflected power level.

#### 4.4.7 REFERENCE VOLTAGE SOURCES

Voltage regulator U22 provides +10 VDC at TP1. Voltage divider R28 & R29 provides +5 VDC at TP2. These two voltages are used by the operational amplifiers and voltage comparators. Since plus and minus sensing is required, the reference 'ground' for U17A and U17B is established at +5 VDC. U18A, U18B, U18C, and U18D can compare the outputs of U17A and U17B to voltage thresholds set just above and below +5 VDC.

Zener Diode CR10 drops the voltage to the regulator from the supplied +28 VDC, to minimize power dissipation in the regulator.

#### 4.4.8 TUNE RELAY LATCH

Transistor Q1 is used to provide a ground to the tune relay K2 on the Detector/Pad Assembly 2A4, energizing the relay and starting the tune cycle. A positive pulse turns Q1 on, pulling in the tune relay, and awakening microprocessor U1 to begin a tuning cycle. The microprocessor then sends a positive voltage back called TUNE LATCH to the base of Q1, keeping it on and the tune relay latched during the tune cycle. When the tune cycle is terminated, the voltage from the base is removed, Q1 no longer conducts, and the tune relay is de-energized.

#### 4.4.9 MICROPROCESSOR CIRCUITS

##### 4.4.9.1 GENERAL

The microprocessor circuit portion of the Computer Board is the 'brain' of the CU-9125. Here, all appropriate signals are monitored, decisions are made, and control commands are generated for controlling the capacitor and inductor steps. An algorithm, which determines the process by which the coupler elements are manipulated, to achieve the proper transformation of the antenna impedance to 50 Ohms resistive, is resident in the EPROM memory. Included in this section are the microprocessor U1, the address decoder U2 and U8, the address latch U3, the EPROM U4, the RAM/IO/TIMER U5, the output ports U6, U7, and U15, element drivers U9, U10, U11, U12, U13, and storage memory EPROM U14 and input port U16.

##### 4.4.9.2 MICROPROCESSOR U1

The microprocessor U1 performs all of the required calculations from the information it receives from the discriminator and detectors, interrogates the program memory to determine the next logical step to take, and tells the element drivers which elements to connect in the RF circuit. When an acceptable tune condition has been found, i.e., both phase and magnitude signals are in their respective 'windows', U1 tells the pad and tune relays to drop out. U1 then stops all BUS activity and goes to sleep to eliminate any possible radiated BUS noise. U1, while sleeping, continuously monitors the 'CPLR TUNE' pushbutton, a channel change, and a VSWR fault condition. Any one of these conditions awakens U1 to take the proper action before going back to sleep. If a load cannot be tuned or a coupler failure occurs, a 'CPLR FAULT' indication will be displayed on the front panel of the Transceiver/Exciter. The coupler is also placed in a bypass mode (straight connection between input and the antenna), thus preventing loss of the receive path.

U23 establishes the clock frequency for U1 through a built-in oscillator circuit. Q5, R65, CR9, R63 and R64 form a power-on reset network to assure correct initialization of U1 upon application of power.

#### 4.4.9.3 ADDRESS DECODER U2

The address decoder consists of U2 and OR gates U8A, U8B, U8C, and U8D. These circuits take address codes supplied by U1 on A8-A15 and use them to enable the EPROM U4, the RAM/IO/TIMER U5, the storage memory unit U14, the output latches U6, U7 and U15, the channel update latch U25 and the input buffer U16. U1 uses the address decoder circuit to enable the proper device when it needs to transfer information.

EXAMPLE: The software in U4 requires the channel information to be sampled periodically. In order to do this U16, U25 and OR gate U8C must be addressed. U1 places an address on A8-A15 which causes Y5 pin 10 of U2 to go Low. With Y5 Low, U1 issues a Low read pulse on the  $\overline{RD}$  line. At this time OR gate U8C has two Lows at its inputs, causing its output pin 8 to be a Low. This Low enables the transfer to channel information from the inputs of U16 to the DATA BUS. Once on the bus, U1 will proceed to process the information.

#### 4.4.9.4 ADDRESS LATCH U3

The address latch U3, separates the address information from the data on bus lines AD0 through AD7 from microprocessor U1. U3 is employed to produce continuous address information to U4 and U14. Each time U1 produces address information to the inputs of U3 via DATA BUS, U1 also produces a positive going pulse called ALE (Address Latch Enable). The ALE pulse latches the address information on the DATA BUS inputs to U3 through to U3's outputs. The address information is then latched on the output lines (ADDRESS BUS) and sent to the EPROM U4 to call up a specific memory location where the data requested by U1 is stored. This latching/information gathering sequence is repeated every time U1 needs to know the next step in the algorithm.

#### 4.4.9.5 ERASABLE PROGRAMMABLE READ ONLY MEMORY (EPROM) U4

The EPROM U4, contains the data bits which make up the program algorithm used by the microprocessor U1 to adjust the network elements which tune the antenna. Address information from AD0, AD7, and A8-A11 is sent to the EPROM U4, when U1 requires information for the execution of the next algorithm instruction stored in U4. U4 responds by placing the instruction from its internal memory onto the DATA BUS when U1 issues a brief LOW going read pulse on the RD line pin 32. U1 collects the instruction from the DATA BUS, analyzes it, then acts on the directions provided.

#### 4.4.9.6 INPUT PORT

Integrated circuit U5 contains input ports to the microprocessor system. Through these ports, the microprocessor U1 can call up information, giving it the status of the phase and magnitude discriminators and the VSWR detector.

U5, Magnitude and Phase Inputs:

There are six signals coming into integrated circuit U5,  $\overline{\text{PHASE}} > +20^\circ$ ,  $\overline{\text{PHASE}} < -20^\circ$ ,  $\overline{\text{MAG}} > 60 \text{ Ohm}$ ,  $\overline{\text{MAG}} < 40 \text{ Ohm}$ , VSWR and TUNE command. Signals  $\overline{\text{PHASE}} > +20^\circ$ ,  $\overline{\text{PHASE}} < -20^\circ$  are the phase discriminator interface outputs, and  $\overline{\text{MAG}} > 60 \text{ Ohm}$ ,  $\overline{\text{MAG}} < 40 \text{ Ohm}$ , are the magnitude discriminator interface outputs (refer to sections 4.3.2 and 4.3.3). See Truth Tables below. These four signals direct U1 through the tuning algorithm program stored in the EPROM, U4. Truth tables for these signals follow:

	U5 Pin 1	U5 Pin 39
	MAG > 60 OHM	MAG < 40 OHM
* Illegal	0	0
>60	0	1
<40	1	0
In the window	1	1

**Table 4.1** Magnitude Discriminator Truth Table.

\* Note that a Low indication in both signals is not possible as the magnitude cannot be both greater than 60 Ohms and less than 40 Ohms simultaneously.

	U5 Pin 38	U5 Pin 37
	PHASE > +20°	PHASE < -20°
** Illegal	0	0
>+20°	0	1
<-20°	1	0
In the window	1	1

**Table 4.2** Phase Discriminator Truth Table.

\*\* Note that a Low indication in both signals is not possible as the phase cannot be both positive and negative simultaneously. A Low on any of these signals indicates the true state.

The VSWR signal coming into U5 pin 2 is a product of the VSWR comparator (refer to section 4.4.5) and is used by U1 to determine a tune ready condition (High on VSWR line), once the magnitude and phase discriminators fall in the window during a tune cycle.

Channel Lines: Input Port U16:

There are eight channel lines coming into the CU-9125 in the form of inverted binary coded decimal (BCD) numbers representing channels 00 thru 127. Table 4.3 shows the Truth Table for channels 00-09.

Channel Number	$\overline{CH}$ 2 <sup>7</sup>	$\overline{CH}$ 2 <sup>6</sup>	$\overline{CH}$ 2 <sup>5</sup>	$\overline{CH}$ 2 <sup>4</sup>	$\overline{CH}$ 2 <sup>3</sup>	$\overline{CH}$ 2 <sup>2</sup>	$\overline{CH}$ 2 <sup>1</sup>	$\overline{CH}$ 2 <sup>0</sup>
00	1	1	1	1	1	1	1	1
01	1	1	1	1	1	1	1	0
02	1	1	1	1	1	1	0	1
03	1	1	1	1	1	1	0	0
04	1	1	1	1	1	0	1	1
05	1	1	1	1	1	0	1	0
06	1	1	1	1	1	0	0	1
07	1	1	1	1	1	0	0	0
08	1	1	1	1	0	1	1	1
09	1	1	1	1	0	1	1	0

**Table 4.3** Truth Table BCD Channels.

The Truth Tables are utilized by the Coupler when the Transceiver/Exciter supplying channel information. Each one of the channels is then assigned a memory location. These memory locations will contain the tune settings (i.e. the relay settings in the coupler network) for the channels and a code indicating that particular channel has valid settings. If a channel change occurs, U26 detects this function and awakens U1. U1 then fetches the new tune combination from its channel memory location and configures the coupler network accordingly before returning to sleep.

**4.4.9.7 OUTPUT PORTS**

The Output Ports U5 (Port A and B), U6, U7, and U15, are used in conjunction with element drivers U9, U10, U11, U12, and U13 to energize the appropriate relays or generate command signals.

To understand how U1 performs an output operation, consider what is involved in enabling the 'READY' line. U1 issues an address on lines A8-A15, causing U2 output Y2 pin 13 to go Low. With Y2 Low, U1 issues a code onto the DATA BUS, placing a High on line AD5 pin 17. U1 also issues a short duration Low going write pulse on the WR line pin 31. OR gate U8A's Low inputs cause it to have a Low out on pin 3 to pin 11 of U6. The Low on U6 pin 11 clocks the information from the DATA BUS through U6 into Relay Driver U11, thus initiating the 'READY' line out of CU-9125.

#### 4.4.9.8 TIMER

The timer resides within U5 and, in conjunction with U1, acts as a stop watch beginning at the initiation of the TUNE command. It is programmed to stop the microprocessor program and turn on the 'FAULT' line if a satisfactory tune is not accomplished within ten seconds. The timer is reset whenever a new tune command is received. If a proper tune is achieved, the timer is disabled, and the 'READY' line is enabled.

The timer is programmed at power up and receives its basic timing information from microprocessor U1. U1 continuously issues a signal called CLK OUT on pin 37. The timer in turn issues a brief Low going pulse on  $\overline{\text{TIMER OUT}}$  pin 6 of U5, which clocks U1. As a tune cycle is initiated, U1 keeps sampling this line and uses it to stop the tune cycle if a satisfactory tune is not achieved within 10 seconds, then activates the 'FAULT' line. If a proper tune is achieved, U1 stops sampling the  $\overline{\text{TIMER OUT}}$  signal which is continuously issued by U5, and sends the READY line enable.

#### 4.4.9.9 RANDOM ACCESS MEMORY (RAM)

The RAM, also a part of U5, provides an area of temporary storage which U1 uses as a 'scratch pad' when making its calculations. When the microprocessor needs to store information in RAM, U1 issues a code on lines A8-A15. This code makes output Y1 pin 14 of U2 go Low. While Y1 is Low, U1 will issue a Low on the  $\overline{\text{IO/M}}$  line, the code it wants stored in RAM on the AD0-AD7 lines and a Low going write pulse on the  $\overline{\text{WR}}$  line.

#### 4.4.9.10 ELECTRICALLY ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM) U14

Long term storage of coupler element settings by channel is handled by the non-volatile memory in U14. If the Transmitter/Exciter has the capability of supplying channel number (in BCD format) to the coupler, the coupler element settings, when tuned, will be stored in this memory in a location corresponding to the selected channel. Memory capacity is 128 channels. This provides extremely fast tuning, on the order of 10 ms, or less.

### 4.5 CHASSIS ASSEMBLY (2A1)

#### 4.5.1 GENERAL

The Chassis Assembly contains the RF Assembly 2A2 and the Motherboard 2A1A1.

#### 4.5.2 RF ASSEMBLY (2A2)

##### 4.5.2.1 GENERAL (Refer to figures 5.12, 5.13, 5.14, and 5.15)

- a). Input Board 2A2A1 (Figure 5.12).  
The Input Board contains input capacitors C2, C3, C5, C8, C9, C10, C11 and their respective switching relays.
- b). Intermediate Board 2A2A2 (Figure 5.13).  
The Intermediate Board contains input capacitors C1, C4, C6, and C7, inductors L1, L2, L3, L4, L5 and their respective switching relays.

- c). Inductor Board 2A2A3 (Figure 5.14).  
The Inductor Board contains inductors L6, L7, L8, L9, L10, stray inductance cancelling capacitor C12, and their respective switching relays.
- d). Output Board 2A2A4 (Figure 5.15).  
The Output Board contains inductor L11, output capacitors C13, C14, C15, and C16, series phase-cancelling capacitor C17, and their respective switching relays.

#### 4.5.2.2 THEORY OF OPERATION

The four boards comprising the RF assembly contain all of the variable elements in the antenna matching network. The basic network is a low pass 'L' with the capability of adding shunt output capacitance, transforming the network to a low pass 'P'. In addition, a series capacitor is available at the output of the network to aid in tuning inductive antennas. Input capacitance is available in approximately 10 pF steps from 0 to 10293 pF (C1 through C11), selected in a binary progression. The series inductance, L1 through L11, is also binary progression, and is available in .01  $\mu$ H steps from 0 to 21.8  $\mu$ H. The output capacitance, C13 through C16, is also a binary progression and furnishes values from 0 to 750 pF in 50 pF steps. The output series capacitor, C17, is selected whenever the initial load phase angle is positive. Capacitor C12 is used at the higher frequencies to cancel out the stray coupler inductance, allowing full use of the small inductance steps available. The switching relays are high speed, where on or off transitions are made in approximately one millisecond. This allows the microprocessor 2A3U1 to make decisions very rapidly, providing extremely fast tuning time, typically less than one second.

#### 4.5.3 MOTHERBOARD (2A1A1)

Refer to Figure 5.11.

The Motherboard serves as an interconnection plane between the RF Assembly 2A2, the Computer Board 2A3, the Detector/Pad Assembly 2A4 and the coupler front panel. Transistor Q1 grounds the TUNING line during a coupler tune sequence. U1 is the primary +5 VDC regulator supplying power to the Computer Board 2A3. It is mounted on the coupler sheet metal chassis for heat sinking, and plugs into the motherboard. Figure 5.10 shows the Front Panel wiring diagram.

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## SECTION V ALIGNMENT

### 5.1 GENERAL

This section provides test procedures and evaluation of overall performance for the CU-9125 Automatic Digital Antenna Coupler. A Fault Analysis Table is included to aid the repairman in isolating a fault to the defective module or subassembly.

### 5.2 PREVENTIVE MAINTENANCE

Reduce the effects of salt air and salt water to the front panel and case of the CU-9125.

When CU-9125 Coupler is installed in a harsh environment (i.e. salt air/salt water), the following preventive maintenance procedures should be accomplished:

1. The complete outside of the coupler unit should be washed with fresh water every two (2) weeks.
2. Once a year open the coupler unit and remove the old gasket. Clean the metal surface and groove in the front panel. Clean the metal surface on the case. Install a new "O" Ring Gasket P/N 1006320032 into the front panel groove and reassemble coupler unit. See Figure 5.1.
3. Anytime the coupler unit is opened a new "O" Ring Gasket should be installed prior to reassembling the coupler unit.

### 5.3 INSPECTION

If the CU-9125 has the case removed for maintenance, a visual inspection should be performed and the resultant corrective action should be taken as follows:

1. Inspect chassis for loose or missing mounting hardware, deformation, damaged fasteners, or damaged connectors. Replace all damaged parts.
2. Inspect connectors for broken parts; check insulation for cracks; and check the pins for damage, misalignment, or bad plating. Carefully realign pins when possible; or, if connectors are otherwise severely damaged, replace connector. Check for loose, or poorly soldered connections to terminals or connectors. Tighten or solder as required.
3. Inspect wiring of chassis and subassemblies for any signs of physical damage or charring. Any damaged wires must be replaced.
4. Inspect for leaky, blistered, charred, or cracked capacitors, resistors, or diodes. Check for loose or corroded terminal connections. Obviously damaged components should be replaced.

5. Inspect for cold soldered or resin joints. Bad joints can be recognized by a dull, porous appearance. Resolder.
6. Antenna coupler cover removal:
  - a. Remove the 8 Phillips' head screws.
  - b. Slide the unit out of the case.

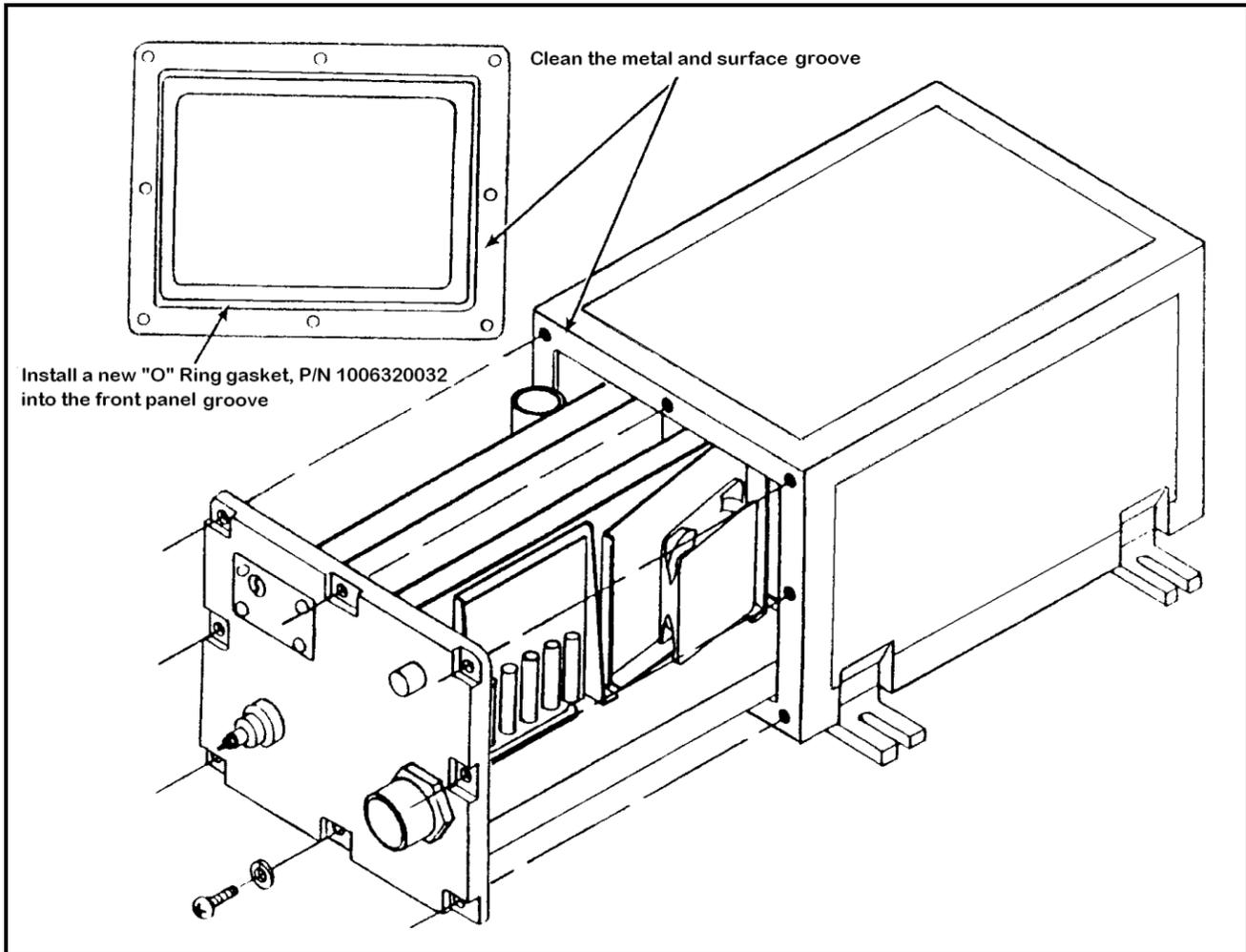


Figure 5.1 CU-9125 Antenna Coupler Cover Removal.

## 5.4 REPAIR OR REPLACEMENT

The repair or replacement of damaged and defective parts usually involves standard service techniques. Carefully examine the equipment to determine the correct technique required to effect the repair.

### 5.4.1 GENERAL PRECAUTIONS

- a) Perform repairs and replace components with power disconnected from unit.
- b) Replace connectors, shielded conductors, and twisted pairs only with identical items.
- c) Reference to component side of a printed circuit board means the side on which the majority of components are located; solder or circuit side refers to the other side.
- d) When repairing circuits, carefully observe lead dress and component orientation. Keep leads as short as possible and observe correct repair techniques.
- e) Observe cable routing prior to disassembly to enable the proper reinstallation of cabling during reassembly procedures.
- f) If component is defective beyond any reasonable doubt, remove and replace according to the procedures given in paragraph 5.4.4. If there is some doubt about the condition of a component, or if it is being removed for troubleshooting, remove it according to the procedures in paragraph 5.4.4.

### 5.4.2 CIRCUIT CARD ASSEMBLY, TWO-LEAD COMPONENT REMOVAL

(RESISTORS, CAPACITORS, DIODES, ETC.)

- a) Inspect solder side of component to determine if the leads were bent over prior to soldering. If they weren't, proceed to Step b. If they were, melt the solder and remove it with a desoldering tool, then straighten the leads and remove the component.
- b) Heat one lead from component side of board until solder flows and lift one lead from board; repeat for other lead and remove component (note orientation).
- c) Melt solder in each hole and using desoldering tool, remove solder from each hole.
- d) Dress and form leads of replacement component; insert leads into correct holes.
- e) Solder in place and clip leads on solder side of board.

### 5.4.3 CIRCUIT CARD ASSEMBLY, MULTI-LEAD COMPONENT REMOVAL

(IC's, etc.)

- a) Remove component by clipping each lead along both sides. Clip off leads as close to component as possible. Discard component.
- b) Heat hole from solder side and remove clipped lead from each hole.
- c) Melt solder in each hole and using a desoldering suction tool, remove solder from each hole.

- d) Insert replacement component, observing correct orientation.
- e) Solder component in place from solder side of board. Avoid solder runs. No solder is required on contacts where no track exists.

#### **5.4.4 REMOVAL OF COMPONENTS OF DOUBTFUL CONDITION**

- a) To remove components that are not heat sensitive melt the solder and remove it with a desoldering tool, then remove the component.
- b) To remove components that are heat sensitive, such as diodes, transistors, and IC's, connect a heat sink to the lead between the body of the component and the solder joint, melt and remove the solder. Repeat for all leads of the component, then remove the component. Apply heat to the lead for the minimum amount of time necessary to remove the solder. When working with IC's, start at one corner, then go to the lead farthest away, then back to where you started, etc....(Example: pins 1, 8, 14, 7,...) This is to keep heat buildup to a minimum. Remember that some solid state devices are extremely heat sensitive; and even though maximum care is exercised during their removal, they may still be destroyed by the removal procedure.
- c) To install a heat sensitive component, use a heat sink and the sequence outlined above to prevent heat from destroying the component.

### **5.5 PERFORMANCE TEST**

The following tests will aid in determining specific problems.

#### **5.5.1 TEST EQUIPMENT**

The following test equipment or equivalent is required to perform the test procedures outlined in this section.

1. Exciter/Transceiver
2. 35 ft. whip antenna simulator Sunair P/N 8084001094
3. "THRULINE" Wattmeter: Bird Model 43 with 100 Watt 2-30 MHz element
4. VOM: Simpson 260 (20k Ohm/Volts)
5. Digital Multimeter: H.P. Model 3476A
6. Oscilloscope: Tektronix 2445
7. Frequency Counter: Systron Donner Model 6242A
8. PC Assy, Detector Extender Board Sunair P/N 8085165091
9. Coaxial Resistor: Bird Model 8135, 50 ohm, 150 Watt

**5.5.2 PRELIMINARY**

Connect Transceiver/Exciter, Antenna Coupler, and Test Equipment as shown in Figure 5.4, Antenna Coupler Test Set Up.

- a) Set the Transceiver’s switches and controls to the positions shown below.

SWITCH OR CONTROL	POSITION
‘FREQUENCY’ ‘VOLUME’ Control/On/Off ‘SQUELCH’ Control	1.60000 MHz On Off

- b) The Transceiver display will alternately display ‘COUPLER UNTUNED’. Depress the ‘CPLR TUNE’ pushbutton. The thru-line wattmeter should indicate 30 to 35 watts of forward RF power while the coupler is tuning. The Transceiver will display ‘COUPLER TUNING’ and then ‘SYSTEM READY’ and the coupler should be tuned. The thru-line wattmeter should show no forward RF power after the tune cycle is completed.

- c) Set mode to CW and key the transceiver with CW key switch. Check the forward and reflected power on the thru-line wattmeter. An acceptable tune should show 70 to 125 forward watts and 2.8 to 5.1 reflected watts maximum. See chart below:

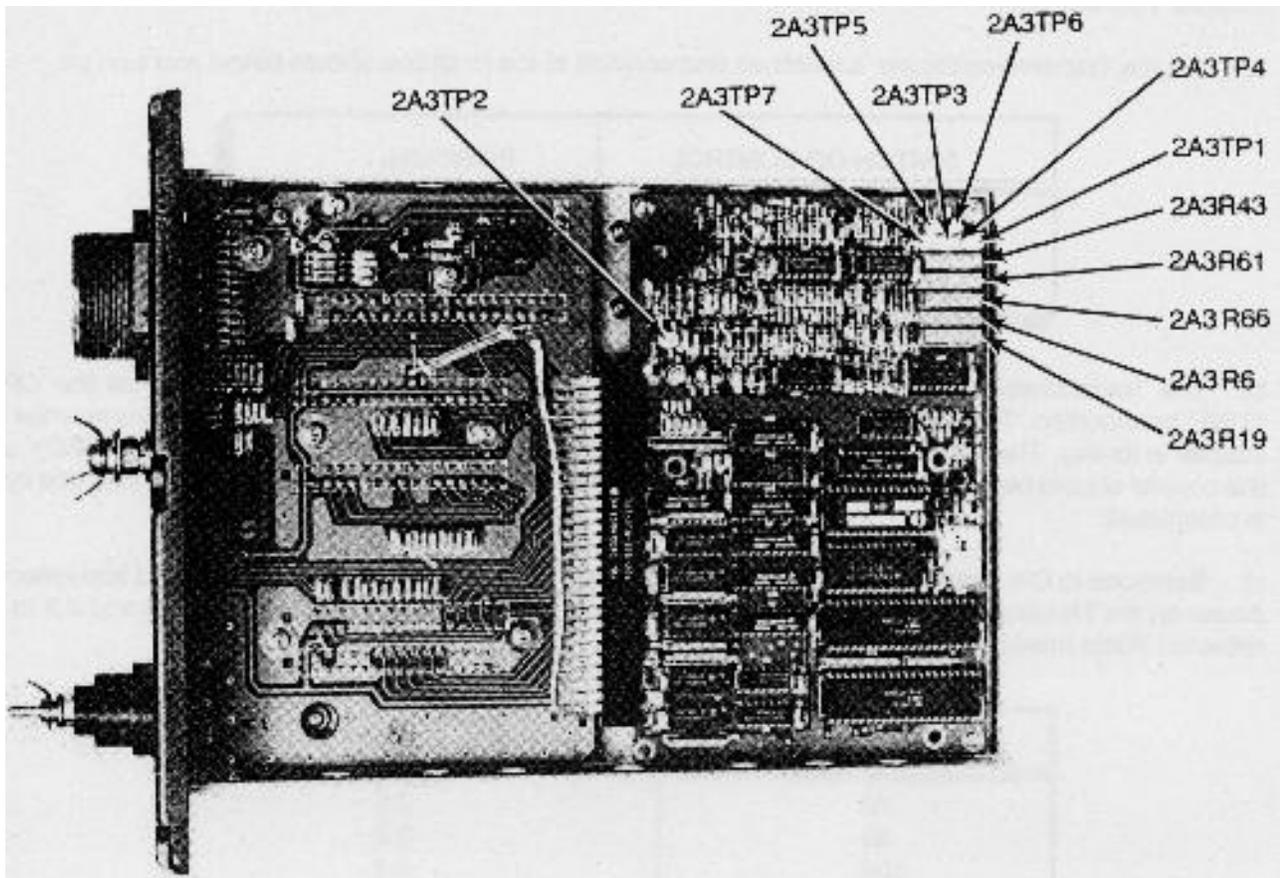
FORWARD WATTS	REFLECTED WATTS MAXIMUM
70	2.8
80	3.2
100	4.0
110	4.4
125	5.1

Acceptable Reflected Power Chart for VSWR 1.5:1.

- d) Set the Transceiver to the following frequencies and tune the coupler. Using the CW key switch check the forward and reflected power of each frequency to see if they fall within the parameters given in the preceding paragraph.

1.9900 MHz	4.6000 MHz	12.6000 MHz
2.6000 MHz	6.6000 MHz	25.6000 MHz
3.6000 MHz	9.6000 MHz	29.9900 MHz

**NOTE:** If upon completion of the Performance Test Procedures, the CU-9125 is not operating properly, accomplish the following alignment procedures. Remove Antenna Coupler from case, see Figure 5.1.



**Figure 5.2** CU-9125, Computer Board Test Points and Adjustment Locations.

### 5.5.3 CU-9125, ALIGNMENT PROCEDURE for COMPUTER BOARD ASSEMBLY (2A3)

**NOTE:** All measurements and adjustments are accomplished on the Computer Board (2A3). (See Figure 5.2).

- a) Turn on the Exciter/Transceiver. (It is necessary to supply power to the coupler).
- b) Connect negative lead of DVM to ground. Set meter scale to read +10 VDC.
- c) Measure voltage at TP1 (U22 pin 3+10VDC regulator); should read +10.5, +.5 VDC.
- d) Connect negative lead of DVM to ground. Set meter scale to read +5 VDC.
- e) Measure voltage at TP2 (junction of voltage divider R28 and R29) should read +5.25, +.5 VDC.
- f) Measure voltage at TP3 (U19 pin 4, VSWR OP amp). Adjust R43 until voltage is +1.75, +.05 VDC.

- g) Connect negative lead of DVM to TP7 (U18 pin 11 magnitude OP amp). Set meter scale to read 200 mv. Connect positive lead to TP6 (U18 pin 8 magnitude OP amp). Adjust R19 until voltage is +224, +5 mv.
- h) Connect negative lead of DVM to TP2. Measure voltage at TP6 and TP7. Adjust R66 until voltage at TP6 is +112, +5 mv, and voltage at TP7 is -112, +5 mv. Repeat steps g) and h) as required to obtain correct reading.
- i) Connect negative lead of DVM to TP5 (U18 pin 7, phase OP amp) and positive lead to TP4 (U18 pin 4, phase OP amp). Adjust R6 until voltage is +224, +5 mv.
- j) Connect negative lead of DVM to TP2. Measure voltage at TP5 and TP4. Adjust R61 until voltage at TP5 is -112, +5 mv, and voltage at TP4 is +112, +5 mv. Repeat steps i) and j) as required to obtain correct readings.

**NOTE:** This completes the alignment of the Computer Board Assembly.

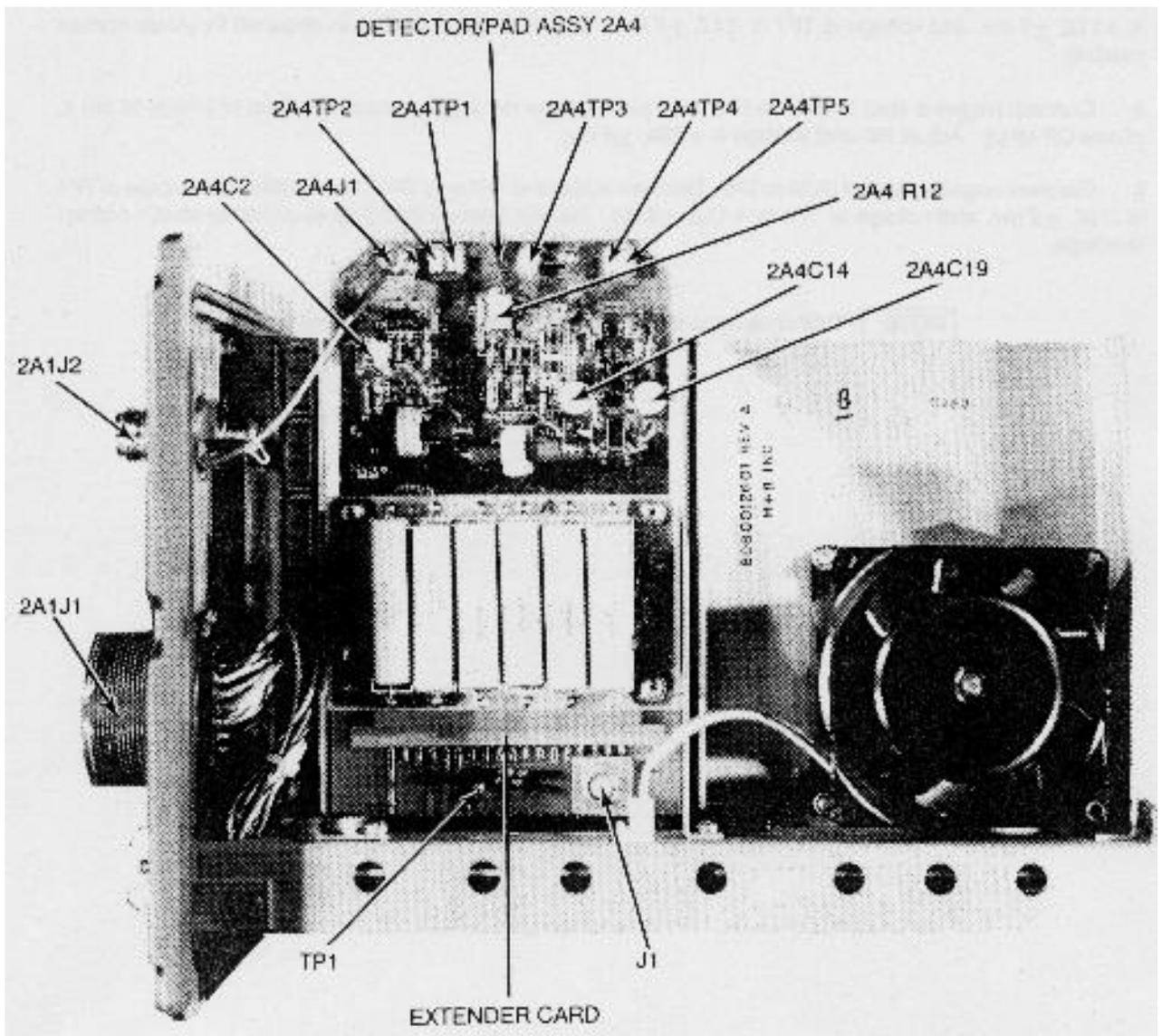


Figure 5.3 CU-9125 Detector/Pad (2A4) and Extender Card Test Points and Adjustment Locations.

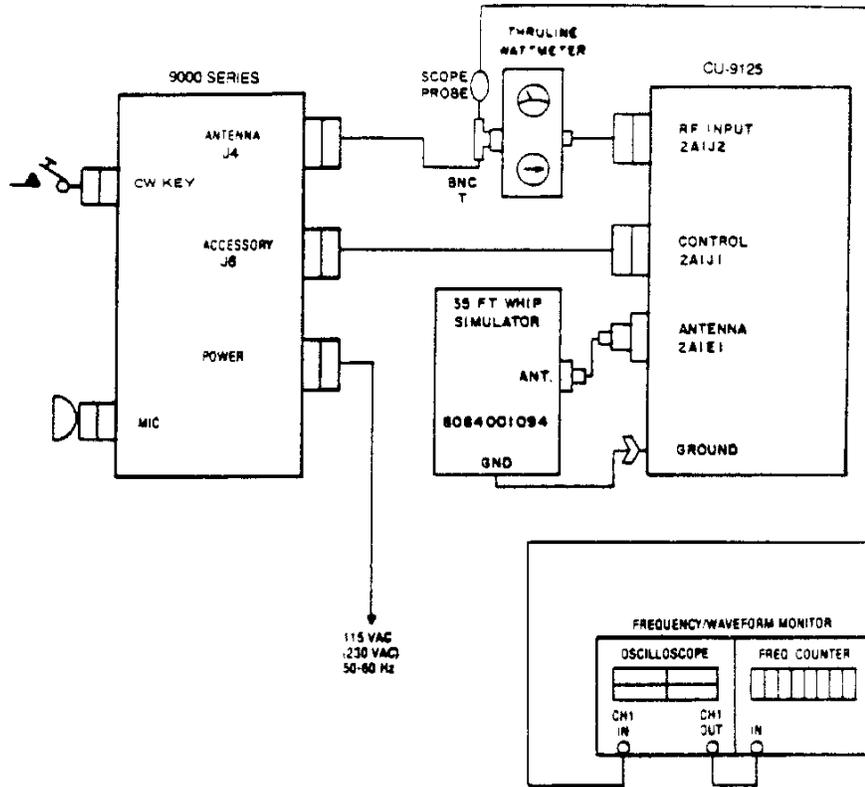
**5.5.4 ALIGNMENT PROCEDURE for DETECTOR/RELAY PAD ASSEMBLY (2A4)**

Connect Transceiver, Antenna Coupler and Test Equipment as shown in Figure 5.4 Detector/Relay Pad Alignment Setup. Install Detector/Relay Pad Assembly (2A4) on card extender (Sunair P/N 8085165091). (See Figure 5.3).

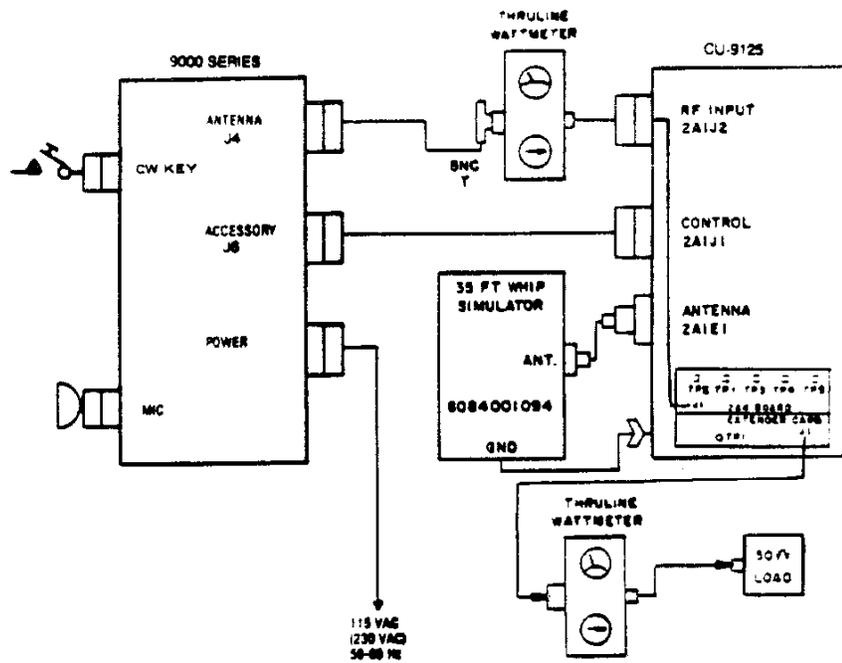
**NOTE:** All measurements and adjustments are accomplished on the 2A4 board. See Figure 5.3 for Test Point and Adjustment Locations.

- a) Turn on Transceiver (necessary to supply power to the coupler). Set Transceiver frequency to 29.6050 MHz and select 'AM' mode.
- b) Key the Transceiver with the microphone PTT key switch. Power shown on Thruline Wattmeter connected to Transceiver output will display 40 to 50 Watts. Thruline Wattmeter connected to J1 on Detector/Relay Pad extender card output will display 40 to 50 Watts. Ground TP1 on extender card, Transceiver output should still display 40 to 50 Watts, but extender card output should drop to 10 to 12 Watts. This verifies that the 6 dB pad is operating. Example: 40 Watts without the pad divided by 4 equals 10 Watts with the pad energized. Unkey the Transceiver and remove the ground from TP1.
- c) Connect common lead of DVM to ground. Connect positive lead of DVM to TP4 (Reflected Power). Key the Transceiver with the microphone PTT key switch. AM power of 40 to 50 Watts will now be displayed on the two (2) Wattmeters. The DVM will display a positive voltage. Adjust C14 for .000 to +.050 VDC reading on DVM. Momentarily disconnect coax cable to the 50 ohm load. Observe on DVM a positive change to 3.0 VDC or higher. If not, detector is not working and needs troubleshooting and repair. Reconnect cable to load. DVM should return to adjusted reading, unkey Transceiver.
- d) Connect common lead of DVM to TP2 (+5 VDC Reference) and connect positive lead to TP1 (Magnitude Detector). Key Transceiver with microphone PTT key switch. AM power of 40 to 50 Watts will be displayed on the two (2) Wattmeters. Adjust C2 for .000 to .050 VDC reading on DVM. Momentarily disconnect coax cable to the 50 ohm load. Observe DVM, a change should be seen. If not, the detector is not working and should be troubleshot and repaired. Reconnect cable to load. DVM will return to adjusted reading, unkey Transceiver.
- e) Leave common lead of DVM connected to TP2 (+5 VDC Reference) and move positive lead to TP3 (Phase Detector). Key Transceiver with microphone PTT key switch. AM power of 40 to 50 Watts will be displayed on the two (2) Wattmeters. Note the DVM reading at 29.90000 MHz. Step in MHz increments to 1.60500 MHz, noting the DVM reading at each step, to get the maximum positive and negative voltage reading. Adjust R12 as needed until maximum positive and negative voltage at TP3 are equal and the magnitude of the voltage does not exceed .050 VDC. Momentarily disconnect coax cable to 50 ohm load. A change in the DVM reading should be seen. If not, detector is not working and needs troubleshooting and repair. Reconnect cable to load. DVM should return to adjusted reading, unkey Transceiver.
- f) Reverse coax cable connections at 2A1J2 and J1 on extender card; this will send the RF in reverse through 2A4 circuitry. Connect common lead of DVM to ground and connect positive lead to TP5 (RF Detector FWD). Key the Transceiver with microphone PTT key switch. AM power of 40 to 50 Watts will be shown on the two (2) Thruline Wattmeters. The DVM will display a positive voltage. Adjust C19 for .000 to +.050 VDC. Momentarily disconnect coax cable to 50 ohm load. Observe on DVM a positive change to 2.0 VDC or higher. If not, detector is not working and needs troubleshooting and repair. Reconnect cable to load. DVM will return to adjusted reading, unkey Transceiver and turn off. Remove card extender and reinstall 2A4.

**NOTE:** This completes the alignments for the Computer Board (2A3) and the Detector/Relay Pad (2A4). Re-perform the Tests outlined in Section 5.5.2, Antenna Coupler Performance Test. If Antenna Coupler still fails the tests in Section 5.5.2, go to Tables 5.1 and 5.2, isolate and repair the problem.



ANTENNA COUPLER TEST SET UP



DETECTOR/RELAY PAD ALIGNMENT SET UP

Figure 5.4 Coupler Test

**Table 5.1** Fault Analysis.

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
<p>No meter readings in FWD or REF position, coupler faults 10 seconds after CPLR TUNE command.</p>	<p>a. No RF output from 9000 Series Exciter/Transceiver.</p>	<p>a. Defective Exciter/Transceiver.</p> <p>b. Defective Detector Assy, 2A4. Align, repair or replace.</p>
<p>Meter reads normally in FWD position. No reading in REF position. Coupler faults 10 seconds after CPLR TUNE command.</p>	<p>a. No RF to coupler.</p> <p>b. Coupler Detector Board 2A4, defective.</p>	<p>a. Check coax cable and connectors between exciter/transceiver and coupler. Meter in REF position should read greater than zero during TUNE, dipping to a low value when coupler TUNE is achieved.</p> <p>b. Align, repair or replace.</p>
<p>Meter reads normally in both FWD and REF positions. Coupler faults 10 seconds after CPLR TUNE command.</p>	<p>a. Computer Board 2A3, defective.</p> <p>b. Defective component on RF Assembly 2A2.</p>	<p>a. Align, repair or replace Computer Board 2A3.</p> <p>b. Check components for damage and/or severe discoloration. Replace as required.</p>
<p>Coupler tunes normally, but faults when 125 W is applied.</p>	<p>a. VSWR trip point set too low.</p> <p>b. Internal high voltage breakdown.</p> <p>c. Loose antenna or ground connection, or corrosion.</p> <p>d. Defective internal ground connection.</p>	<p>a. If fault condition is noted on more than just a very few frequencies, check voltage on Computer Board 2A3 test point TP3 to ground. Voltage should be 1.7 VDC minimum. Adjust VSWR control 2A3R43 to increase voltage reading to 1.72 VDC or to a value approximately 0.1 VDC higher than measured.</p> <p>b. Observe coupler tune in darkened area and look for breakdown on Output Board 2A2A4 or Inductor Board 2A2A3. Repair or replace defective component.</p> <p>c. Check antenna and ground connections for tightness and freedom from corrosion.</p> <p>d. (1) Check all Motherboard 2A1A1 and RF Assembly 2A2 ground screws for tightness.                  (2) Check Computer Board 2A3 connectors for clean connector contacts. Clean or replace.</p>

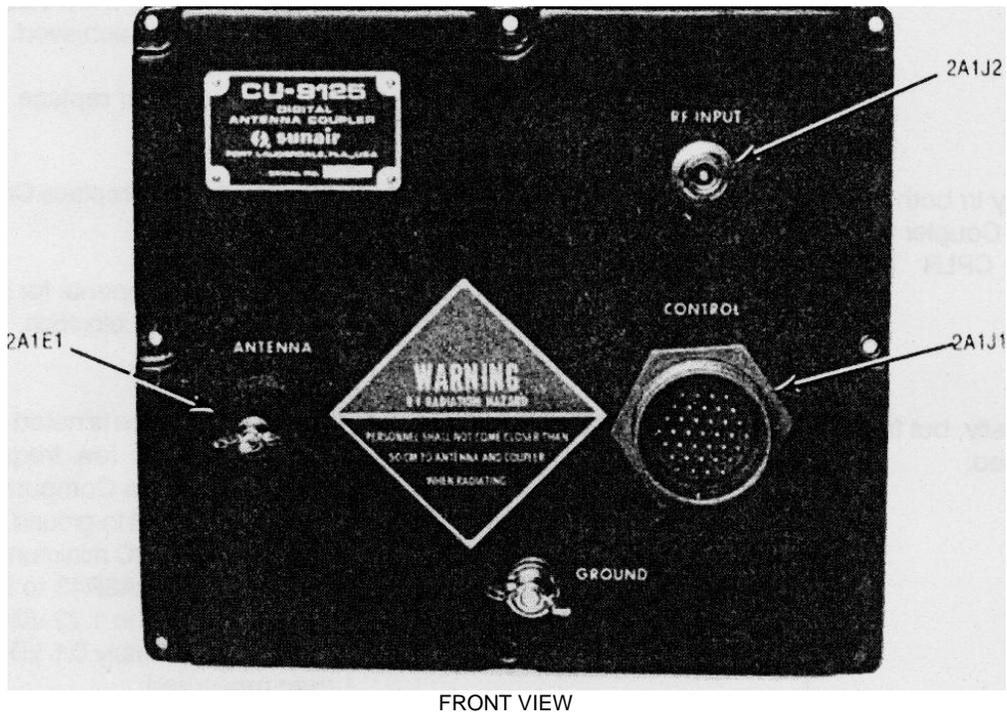


Figure 5.5 Major Assembly and Component Locations (Front View).

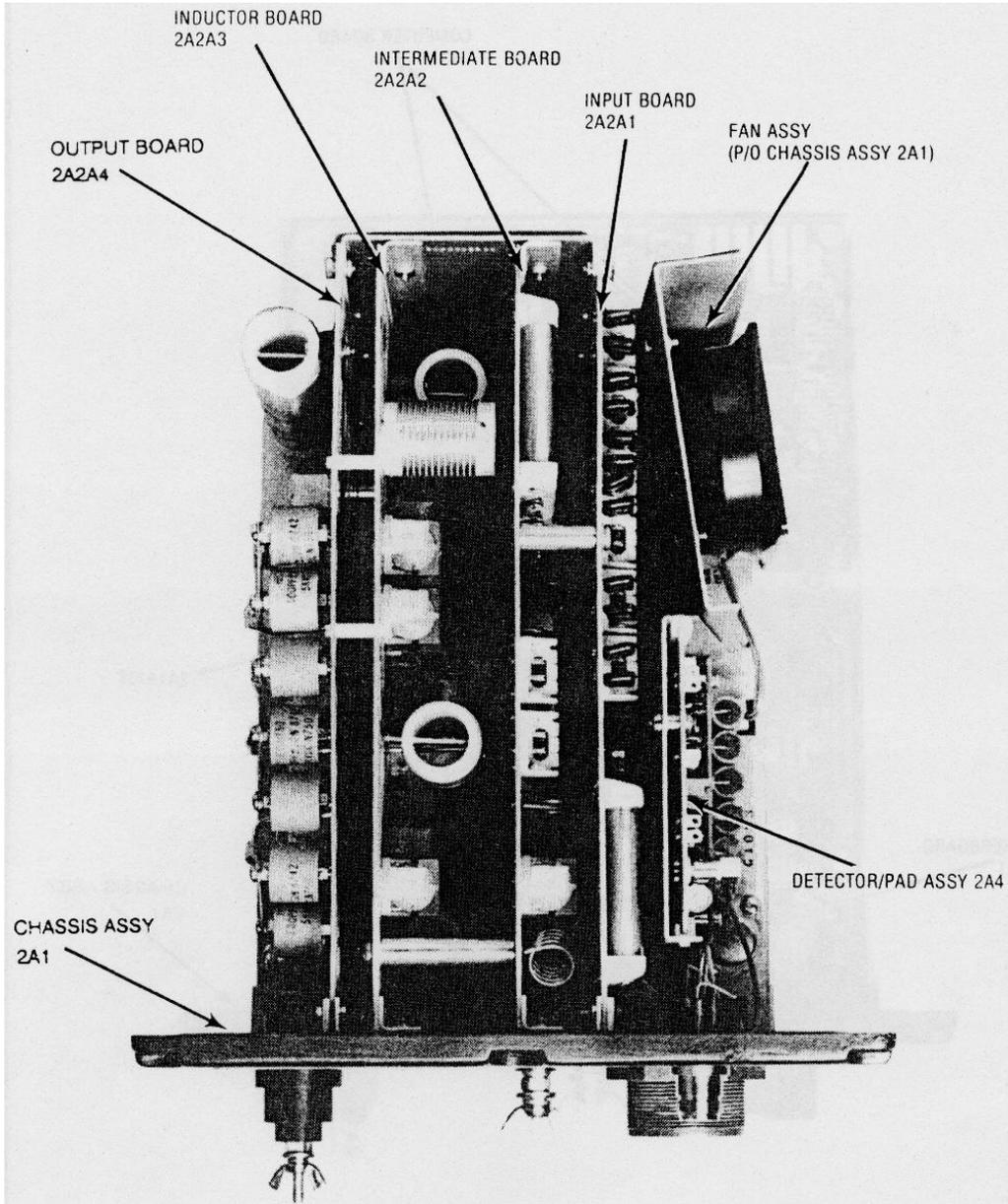


Figure 5.6 Major Assembly and Component Locations (Top View).

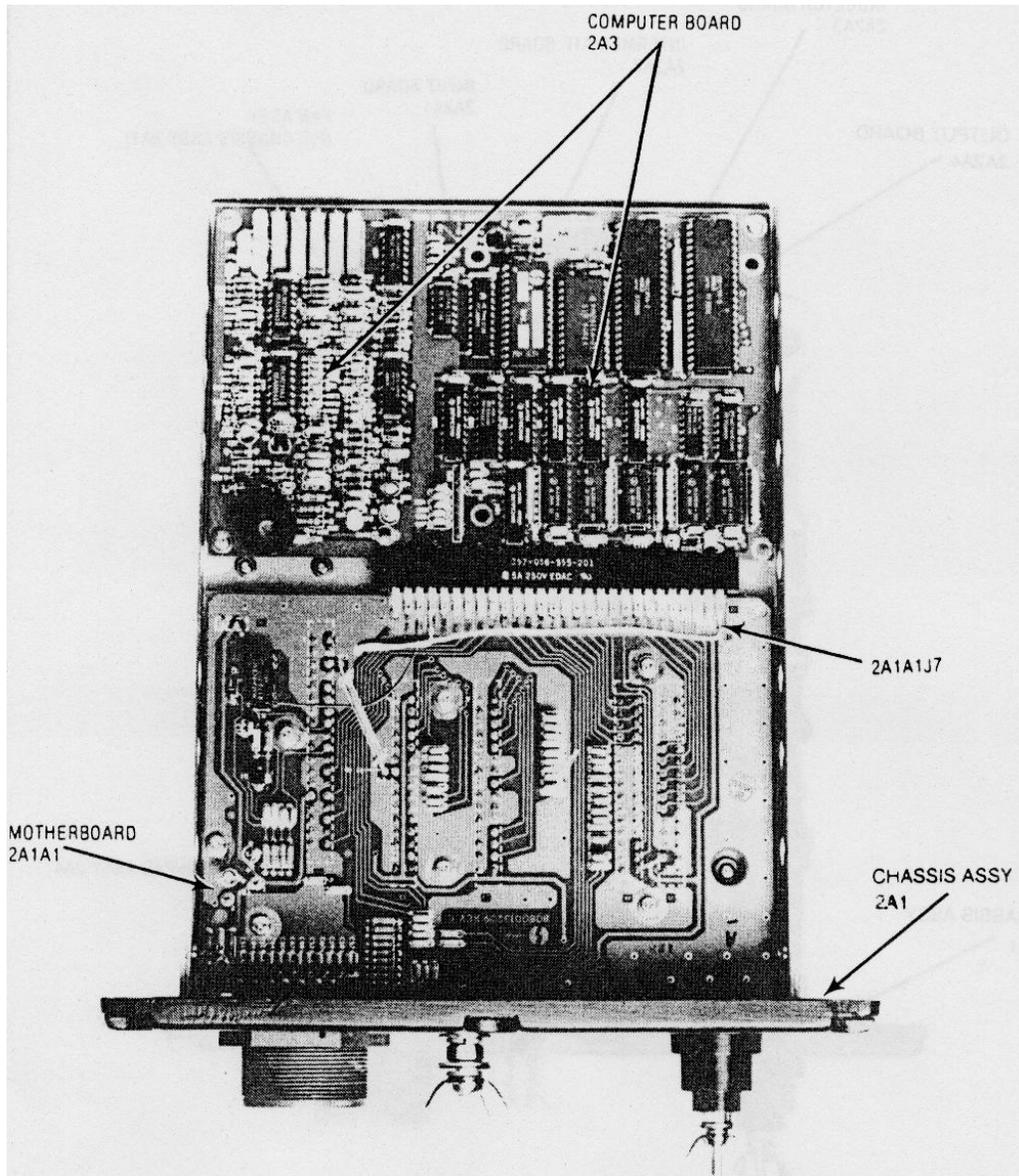


Figure 5.7 Major Assembly and Component Locations (Bottom View).

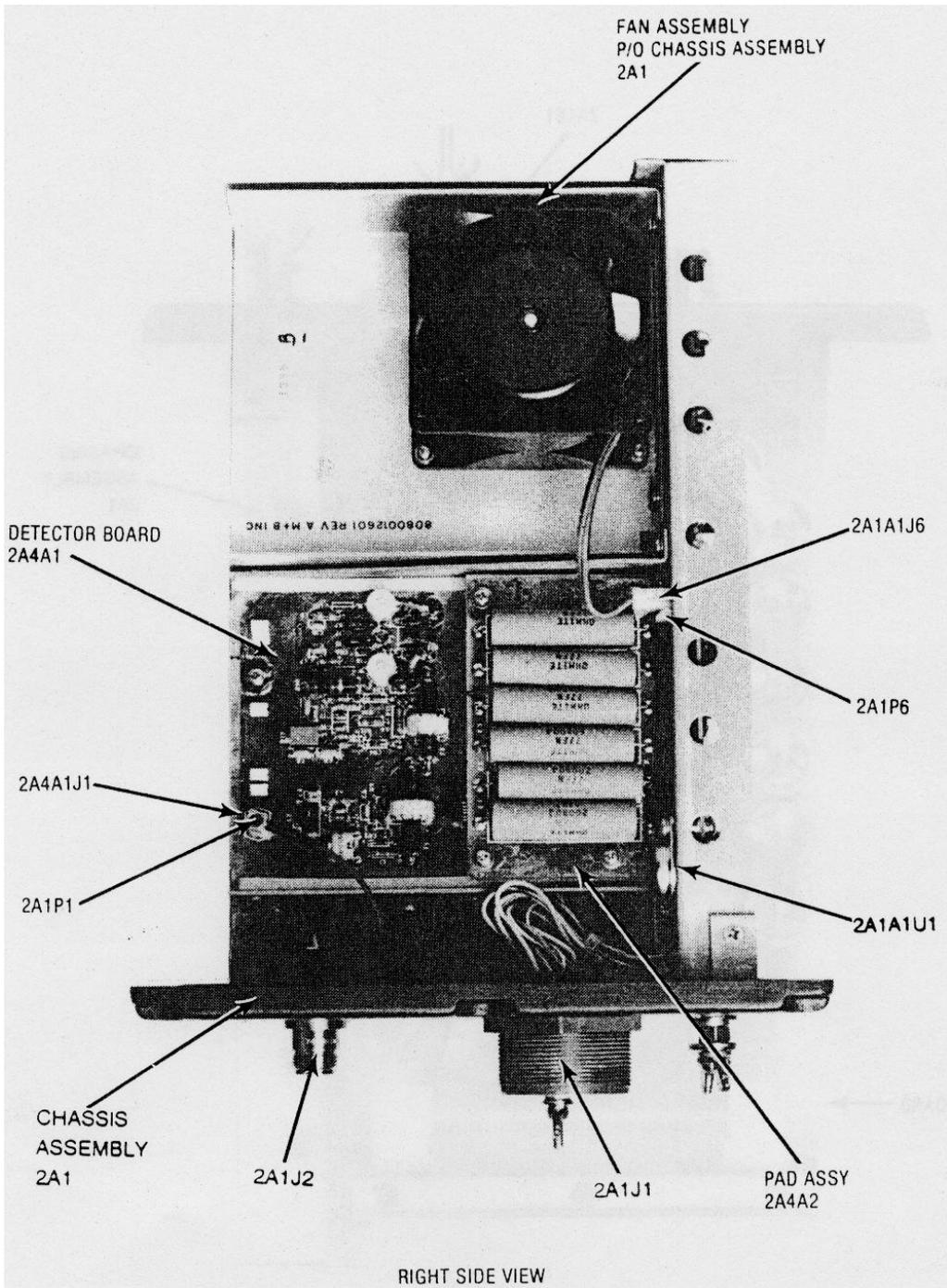


Figure 5.8 Major Assembly and Component Locations (Right Side View).

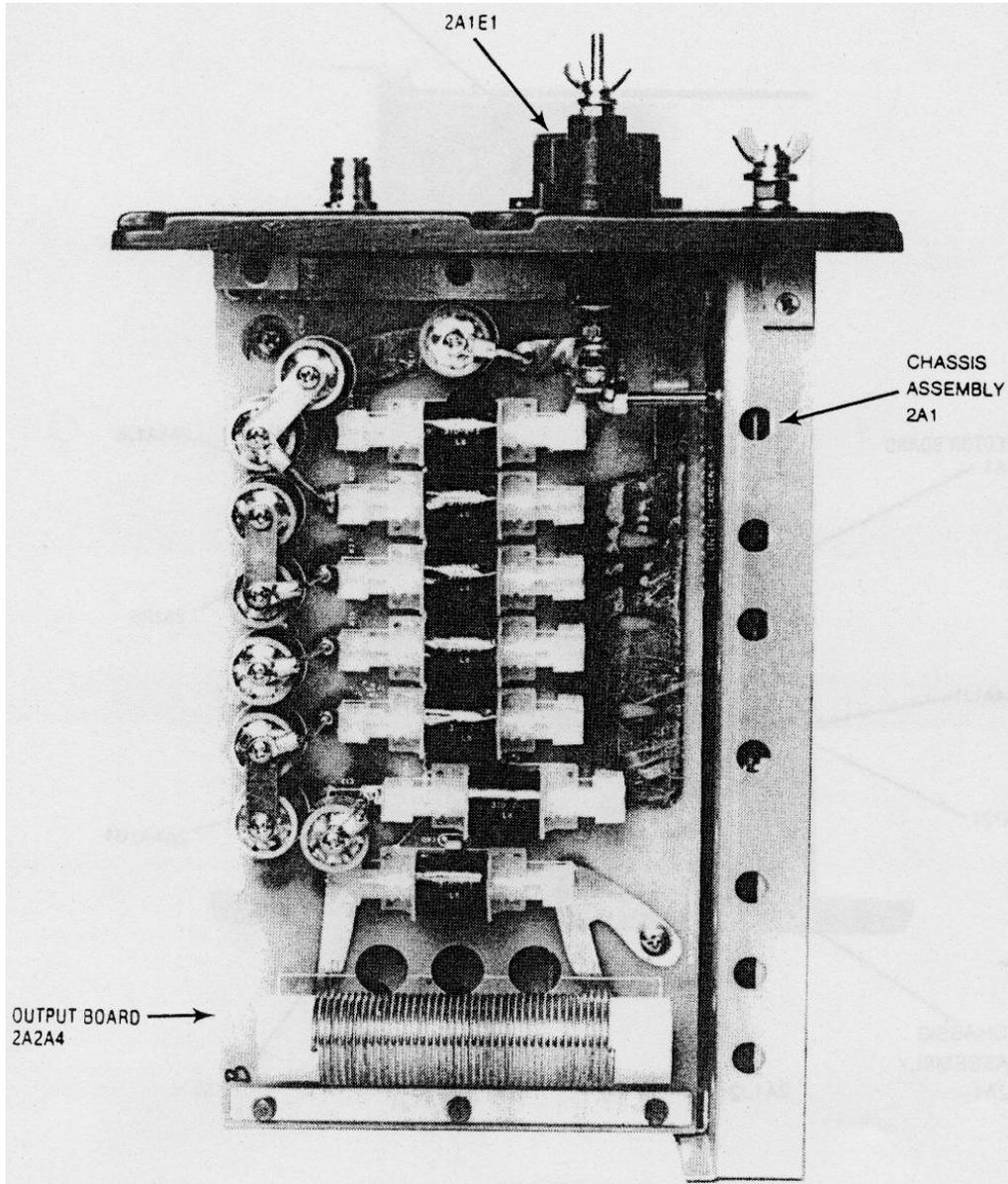


Figure 5.9 Major Assembly and Component Locations (Left Side View).

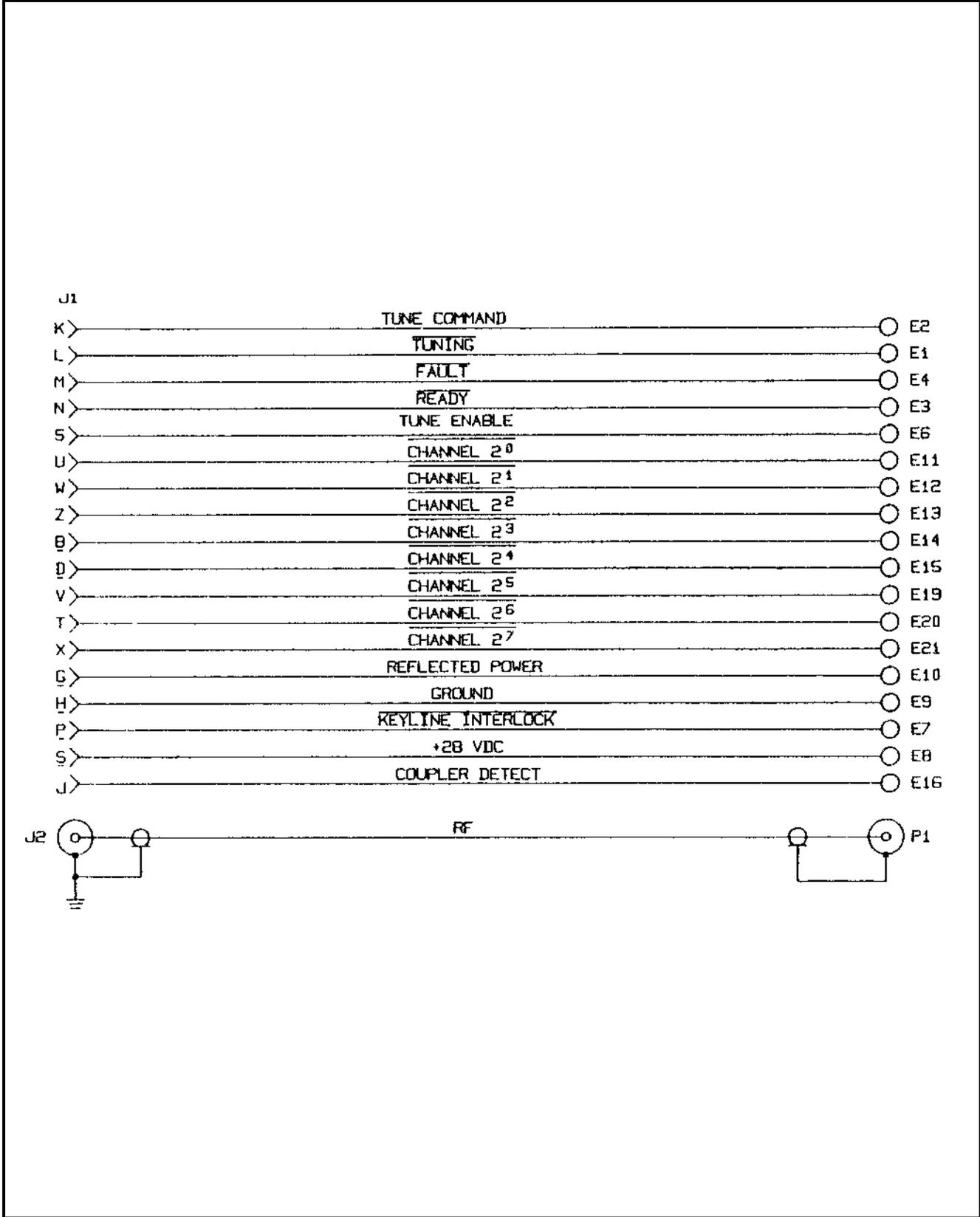


Figure 5.10 Front Panel Wiring Diagram.

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## Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD (2A3)

(Refer to Figure 5.16)

**NOTE:** For this test procedure, a 35 ft. whip antenna simulator is required. An equivalent type of simulator may be used or one may be purchased from Sunair (P/N 8084001094) or built from the schematic diagram in Figure 5.18.

Equipment necessary for preliminary setup will include the following:

- a) Test equipment: Frequency/waveform monitor, Figure 5.4 and a Digital Voltmeter (DVM).
- b) Exciter/Transceiver: AM mode of operation.
- c) Connect 35 ft. whip antenna simulator to antenna terminal on the coupler unit.

When instructed to change Exciter/Transceiver frequency, change frequency by no less than 2 MHz.

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1) +28 VDC supply.	a) Connect negative lead of DVM to chassis and positive lead to Mother board connector 2A1A1 J7, pin 27. (See Figure 5.11)	<u>NORMAL</u> : DVM indicates +28 V ±4 VDC. <u>ABNORMAL</u> : Unplug Computer board. If DVM reads the specified voltage, check for shorts on the board. If still reading wrong voltage, check control cable. Check for shorts on the RF Assembly, 2A2.
2) +5 VDC supply.	a) Connect positive lead of DVM to Mother board connector 2A1A1 VR1 pin 2. (See Figure 5.11)	<u>NORMAL</u> : DVM indicates ±5 V +.5 VDC. <u>ABNORMAL</u> : Unplug Computer board. If DVM reads the specified voltage, check for shorts on the board. If it still reads the wrong voltage, replace the 5 V regulator (U1), mounted on the chassis assembly 2A1.
3) 1 MHz clock oscillator.	a) Connect oscilloscope probe to U1, pin 1.	<u>NORMAL</u> : Frequency = 1 MHz square wave, 4 V p-p minimum. <u>ABNORMAL</u> : Replace U23.
4) TUNE command circuit.	a) Connect scope probe to CR2 anode. Depress 'CPLR TUNE' pushbutton on the Exciter/Transceiver.	<u>NORMAL</u> : Scope indicates a momentary 0 VDC to +10 VDC low to high change. Coupler tunes. <u>ABNORMAL</u> : Check Mother board. Check control cable between radio and coupler. Check Exciter/Transceiver for proper inputs to coupler.

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b) Connect scope probe to Q1 base. Depress 'CPLR TUNE' pushbutton on Exciter/Transceiver.	<p><u>NORMAL</u>: Scope indicates a +1 VDC level at Q1 base. This level remains until coupler has tuned, then indicates 0.5 V.</p> <p><u>ABNORMAL</u>: Check Q1 and associated circuitry.</p>
	c) Connect scope probe to Q1 collector. Depress 'CPLR TUNE' pushbutton on Exciter/Transceiver.	<p><u>NORMAL</u>: Scope indicates a voltage level of 0 VDC at Q1 collector while tuning. Level should remain low until coupler has completed the tune cycle. Scope now indicates a +24 VDC level.</p> <p><u>ABNORMAL</u>: Repair or replace Q1 or associated circuitry. Check Mother board 2A1A1. Check Tune Relay on Detector board, assembly 2A4. Refer to Section 4.3.6.</p>
	d) Connect scope probe to U5, pin 5. Depress 'CPLR TUNE' pushbutton on Exciter/Transceiver.	<p><u>NORMAL</u>: Scope indicates momentary 0 V to +5 VDC pulse. Coupler tunes.</p> <p><u>ABNORMAL</u>: Check C16, C17, C23, L4, R34, CR17, R35 and U5. Repair or replace.</p>
	e) Connect scope probe to U1, pin 8. Depress 'CPLR TUNE' pushbutton on Exciter/Transceiver.	<p><u>NORMAL</u>: Scope indicates momentary 0 V to +5 VDC pulse. Coupler tunes.</p> <p><u>ABNORMAL</u>: Check U27A, U27B and repair or replace.</p>
5) +10 VDC supply.	a) Connect DVM negative lead to ground (chassis) and connect positive lead to TP1.	<p><u>NORMAL</u>: DVM indicates a reading of approximately 10.5 V, <math>\pm 0.5</math> VDC.</p> <p><u>ABNORMAL</u>: If voltage is off by more than .5 VDC, check U22 circuitry for defective component.</p>
6) Detector reference.	a) Connect DVM negative lead to ground (chassis) and connect positive lead to TP2.	<p><u>NORMAL</u>: DVM indicates a reading of 5 V, <math>\pm 0.05</math> VDC.</p> <p><u>ABNORMAL</u>: If proper voltage is not present, check divider resistors R28 and R29.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
7) Phase and magnitude comparators.	a) Connect scope probe to U17, pin 12. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates a varying voltage of 3 to 5 V of approximately 2 V p-p. This continues until the tune cycle is complete.</p> <p><u>ABNORMAL</u>: Check circuitry related to U17 and check Detector/Pad Assembly 2A4. Refer to Sections 4.3 and 5.5.4.</p>
	b) Connect scope probe to U17, pin 10. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates a varying voltage of 3 to 5 V of approximately 2 V p-p. This continues until the tune cycle is complete.</p> <p><u>ABNORMAL</u>: Check circuitry related to U17 and check Detector/Pad Assembly 2A4. Refer to Sections 4.3 and 5.5.4.</p>
	c) Connect scope probe to U18, pin 2. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses between 0 V and +10 V during the tune cycle.</p> <p><u>ABNORMAL</u>: Check U18 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4. Check setup of phase and magnitude windows according to Section 5.5.3.</p>
	d) Connect scope probe to U18, pin 1. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses between 0 V and +10 V during the tune cycle.</p> <p><u>ABNORMAL</u>: Check U18 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4. Check setup of phase and magnitude windows according to Section 5.5.3.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	e) Connect scope probe to U18, pin 14. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses between 0 V and +10 V during the tune cycle.</p> <p><u>ABNORMAL</u>: Check U18 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4. Check setup of phase and magnitude windows according to Section 5.5.3.</p>
	f) Connect scope probe to U18, pin 13. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses between 0 V and +10 V during the tune cycle.</p> <p><u>ABNORMAL</u>: Check U18 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4. Check setup of phase and magnitude windows according to Section 5.5.3.</p>
	g) Connect scope probe to U20, pin 2. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses of 0 V to +5 V p-p.</p> <p><u>ABNORMAL</u>: Check related circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
	h) Repeat checks on U20, pins 4, 6, and 8. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates pulses of 0 V to +5 V p-p.</p> <p><u>ABNORMAL</u>: Check related circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
8) Reflected power.	a) Connect scope probe to U19, pin 1. Change frequency of Exciter/Transceiver and depress the 'CPLR TUNE' pushbutton on RT-9000 Transceiver.	<p><u>NORMAL</u>: Scope indicates a varying 2 V p-p voltage. Nulling occurs when tune is complete.</p> <p><u>ABNORMAL</u>: Check U19 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b) Connect scope probe to U19, pin 2. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates a high during the tune cycle, and a low at the completion of the tune.</p> <p><u>ABNORMAL</u>: Check U19 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
	c) Connect scope probe to U20, pin 10. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates a low during the tune cycle, and a high at the completion of the tune.</p> <p><u>ABNORMAL</u>: Check U20 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
	d) Connect scope probe to U1, pin 9. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates a high during the tune cycle and a low at the completion of the tune.</p> <p><u>ABNORMAL</u>: Check U19C, U24F, U27C, U27D, U1, and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
9) RF detector (forward power detector).	a) Connect scope probe to TP3. Change frequency of Exciter/Transceiver and depress microphone key.	<p><u>NORMAL</u>: Scope indicates varying voltage until end of tune cycle. Then indicates approximately +1.75 VDC.</p> <p><u>ABNORMAL</u>: Check U19 and associated circuitry. Check Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>
10) $\overline{RF}$	a) Connect scope probe to collector of Q2. Depress the 'CPLR TUNE' pushbutton on the Exciter/Transceiver.	<p><u>NORMAL</u>: The scope indicates a low during the tune cycle, and a high at the completion of the tune.</p> <p><u>ABNORMAL</u>: Check Q2 and associated circuitry. Check Forward Power Detector on Detector/Pad Assembly 2A4. See Sections 4.3 and 5.5.4.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
11) $\overline{\text{FAULT}}$ circuit.	<p>a) Connect scope probe to U6, pin 16. Turn the Exciter/Transceiver's power off. Wait approximately 4 seconds and turn power back on.</p> <p>b) Connect scope probe to U11, pin 12. Turn the Exciter/Transceiver's power off. Wait approximately 4 seconds and turn power back on.</p>	<p><u>NORMAL</u>: Scope will show a +5 VDC level indication when Exciter/Transceiver is turned back on. For further information on the function of the output ports, see Section 4.4.9.7.</p> <p><u>ABNORMAL</u>: Check U6 and associated circuitry. Check control cable between coupler and Exciter/Transceiver.</p> <p><u>NORMAL</u>: Scope will indicate a low voltage when the radio is turned back on.</p> <p><u>ABNORMAL</u>: Check U11 and associated circuitry. Check control cable between coupler and Exciter/Transceiver.</p>
12) $\overline{\text{READY}}$ circuit.	<p>a) Connect scope probe to U6, pin 15. Depress the 'CPLR TUNE' pushbutton on the Exciter/Transceiver.</p> <p>b) Connect scope probe to U11, pin 13.</p>	<p><u>NORMAL</u>: Scope indicates a high when tune cycle is complete. For further information on the function of the output ports, see Section 4.4.9.7.</p> <p><u>ABNORMAL</u>: Check U6 and associated circuitry. Check control cable between coupler and Exciter/Transceiver.</p> <p><u>NORMAL</u>: Scope indicates a low.</p> <p><u>ABNORMAL</u>: Check related circuitry of U11. Check control cable between coupler and Exciter/Transceiver.</p>
13) $\overline{\text{Pad}}$ relay.	<p>a) Connect scope probe to U6, pin 19. Depress the 'CPLR TUNE' pushbutton on the Exciter/Transceiver.</p>	<p><u>NORMAL</u>: Scope indicates a high during the tune cycle, and a low at the completion of the tune cycle.</p> <p><u>ABNORMAL</u>: Check U6 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
<p>b) Connect scope probe to U11, pin 11. Depress the 'CPLR TUNE' pushbutton on the Exciter/Transceiver.</p>		<p><u>NORMAL</u>: Scope indicates a low during the tune cycle, and approximately +28 V level at the completion of tune.</p> <p><u>ABNORMAL</u>: Check U11 and related circuitry. For further information on the function of the output ports see Section 4.4.9.7. Also check K1 and related circuitry on Detector board (2A4A1).</p>
<p>14) NETWORK RELAY DRIVERS: 14a) C17.</p>	<p>a) Connect scope probe to U5, pin 21. Remove 35 ft. whip antenna simulator. Short antenna terminal to ground terminal with a 3 ft. clip lead. (Short antenna terminal ONLY for the testing of 14a.a. NOT for any of the following like tests). Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p, ± change. If the tune cycle ends and the pulse did not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Reconnect Antenna simulator and connect scope probe to U9, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K28 and related circuitry on Output board (2A2A4).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14b) $\overline{C13}$ .	<p>a) Connect scope probe to U5, pin 25. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U9, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K24 and related circuitry on Output board (2A2A4).</p>
14c) $\overline{C14}$ .	<p>a) Connect scope probe to U5, pin 26. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U9, pin 14. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K25 and related circuitry on Output board (2A2A4).</p>
<p>14d) <math>\overline{C15}</math>.</p>	<p>a) Connect scope probe to U5, pin 27. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U9, pin 13. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K26 and related circuitry on Output board (2A2A4).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14e) $\overline{C16}$ .	<p>a) Connect scope probe to U5, pin 28. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U9, pin 12. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K27, K29 and related circuitry on Output board (2A2A4).</p>
14f) $\overline{C1}$ .	<p>a) Connect scope probe to U5, pin 29. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U9, pin 11. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K11 and related circuitry on Intermediate board (2A2A2).</p>
14g) $\overline{C2}$ .	<p>a) Connect scope probe to U5, pin 30. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U9, pin 10. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U9 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K10 and related circuitry on Input board (2A2A1).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14h) $\overline{C3}$ .	<p>a) Connect scope probe to U5, pin 31. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U10, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K9 and related circuitry on Input board (2A2A1).</p>
14i) $\overline{C4}$ .	<p>a) Connect scope probe to U5, pin 32. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U10, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K8 and related circuitry on Intermediate board (2A2A2).</p>
<p>14j) <math>\overline{C5}</math>.</p>	<p>a) Connect scope probe to U5, pin 33. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U10, pin 14. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K7 and related circuitry on Input board (2A2A1).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14k) $\overline{C6}$ .	<p>a) Connect scope probe to U5, pin 34. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U10, pin 13. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K6 and related circuitry on Intermediate board (2A2A2).</p>
14l) $\overline{C7}$ .	<p>a) Connect scope probe to U5, pin 35. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U10, pin 12. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K5 and related circuitry on Intermediate board (2A2A2).</p>
<p>14m) <math>\overline{C8}</math>.</p>	<p>a) Connect scope probe to U5, pin 36. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U10, pin 11. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K4 and related circuitry on Input board (2A2A1).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14n) $\overline{C9}$ .	a) Connect scope probe to U6, pin 2. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U6 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	b) Connect scope probe to U10, pin 10. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U10 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K3 and related circuitry on Input board (2A2A1).</p>
14o) $\overline{C10}$ .	a) Connect scope probe to U6, pin 5. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U6 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U11, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U11 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K2 and related circuitry on Input board (2A2A1).</p>
<p>14p) <u>C11</u>.</p>	<p>a) Connect scope probe to U6, pin 6. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U6 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U11, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U11 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K1 and related circuitry on Input board (2A2A1).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14q) $\overline{C12}$ .	<p>a) Connect scope probe to U5, pin 22. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U5 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U11, pin 10. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U11 and related circuitry. For further information on the function of the output ports, see 4.4.9.7. Also check relay K17 and related circuitry on Inductor board (2A2A3).</p>
14r) $\overline{L1}$ .	<p>a) Connect scope probe to U7, pin 2. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14s) $\overline{L2}$ .	<p>b) Connect scope probe to U12, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K12 and related circuitry on Intermediate board (2A2A2).</p>
	<p>a) Connect scope probe to U7, pin 5. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U12, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K13 and related circuitry on Intermediate board (2A2A2).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14t) $\overline{L3}$ .	<p>a) Connect scope probe to U7, pin 6. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U12, pin 14. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.17.8.7. Also check relay K14 and related circuitry on Intermediate board (2A2A2).</p>
14u) $\overline{L4}$ .	<p>a) Connect scope probe to U7, pin 9. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U12, pin 13. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K15 and related circuitry on Intermediate board (2A2A2).</p>
<p>14v) <math>\overline{L5}</math>.</p>	<p>a) Connect scope probe to U7, pin 12. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U12, pin 12. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K16 and related circuitry on Intermediate board (2A2A2).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14w) $\overline{L6}$ .	a) Connect scope probe to U7, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	b) Connect scope probe to U12, pin 11. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K18 and related circuitry on Inductor board (2A2A3).</p>
14x) $\overline{L7}$ .	a) Connect scope probe to U7, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U12, pin 10. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U12 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K19 and related circuitry on Inductor board (2A2A3).</p>
<p>14y) <math>\overline{L8}</math>.</p>	<p>a) Connect scope probe to U7, pin 19. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U7 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U13, pin 16. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times.</p> <p><u>ABNORMAL</u>: If after 6 times the scope does not change, check U13 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K20 and related circuitry on Inductor board (2A2A3).</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
14z) $\overline{L9}$ .	<p>a) Connect scope probe to U15, pin 2. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U15 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U13, pin 15. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, <math>\pm</math> change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U13 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K21 and related circuitry on Inductor board (2A2A3).</p>
14aa) $\overline{L10}$ .	<p>a) Connect scope probe to U15, pin 5. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U15 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>

**Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING,  
COMPUTER BOARD (2A3) CONTINUED...**

(Refer to Figure 5.16)

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	<p>b) Connect scope probe to U13, pin 14. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U13 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K22 and related circuitry on Inductor board (2A2A3).</p>
<p>14bb) <math>\overline{L11}</math>.</p>	<p>a) Connect scope probe to U15, pin 6. Place Exciter/Transceiver in the 'AM' mode, at 1.6000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +3 V p-p change. If tune cycle ends and the pulse did not occur change frequency on the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U15 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7.</p>
	<p>b) Connect scope probe to U13, pin 13. Place Exciter/Transceiver in the 'AM' mode, at 1.7000 MHz. Depress the microphone key.</p>	<p><u>NORMAL</u>: Scope indicates a +28 V p-p, ± change. If the +28 V change does not occur, change the frequency of the Exciter/Transceiver by 100 kHz and repeat. Perform this procedure 6 times. <u>ABNORMAL</u>: If after 6 times the scope does not change, check U13 and related circuitry. For further information on the function of the output ports, see Section 4.4.9.7. Also check relay K23 and related circuitry on Output board (2A2A4).</p>

## 5.6 SCHEMATICS AND PARTS LISTS

The following are schematics and parts lists for the CU-9125, see Table 5.3.

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER
ASSEMBLY	SUBASSEMBLY		
2A1	2A1A1	CHASSIS ASSEMBLY MOTHER BOARD	8085010097 8085013096
2A2	2A2A1 2A2A2 2A2A3 2A2A4	<u>RF ASSEMBLY</u> INPUT BOARD INTERMEDIATEBOARD INDUCTOR BOARD OUTPUT BOARD	8080003092 8080030090 8080040095 8080050091 8080060096
2A3		<u>COMPUTER MODULE</u>	8085025094
2A4	2A4A2	<u>DETECTOR/PAD ASSEMBLY</u> DETECTOR BOARD	8056160094
	2A4A2	PAD BOARD	8056161091

**Table 5.3** CU-9125 Table of Assemblies.

**CHASSIS ASSEMBLY CU-9125 (2A1)**

2A1	CHASSIS ASSEMBLY CU-9125	8085010097
E1	INSULATOR, ANTENNA	8056111808
A1U1	IC. LINEAR, VOL.REG. MC7805CK	0447190008
	CABLE ASSY, RF	8080015091
P1	CONNECTOR, RF, SUBMINIATURE	0753700000
J2	CONNECTOR, RF, N FEMALE	0756030005
	CARD GUIDE, PLASTIC	1005870039
J1	CONNECTOR, POWER, 37 PIN ENV.	1006330003
	GASKET, O RING, .926ID X .07THK	1006400028
	BRACKET, CARD GUIDE	8080012202
	BRACKET, BOTTOM, FRONT PANEL	8080100306
	BRACKET, TOP, FRONT PANEL	8080100209

**FAN ASSEMBLY**

2A1	FAN ASSEMBLY	8080012598
A1J6	HOUSING, CONNECTOR, 2 PIN	1006360000
A1J6	PIN, CONNECTOR, CRIMP, MALE	0754180000
	FAN, 24VDC	1006400036
	BRACKET, BLOWER	8080012601

**RF ASSEMBLY (2A2)**

2A2A1	RF ASSEMBLY	8080003092
2A2A2	PC ASSY, INPUT BOARD	8080030090
2A2A3	PC ASSY, INTERMEDIATE	8080040095
2A2A4	PC ASSY, INDUCTOR BD	8080050091
	PC ASSY, OUTPUT BOARD	8080060096
	BRACKET, RF ASSY, FRONT	8080003203
	BRACKET, RF ASSY, REAR	8080003301
	SPACER, INSULATOR, SNAP-IN	1006300023

**Table 5.4** Parts List of CU-9125 Major Assemblies.

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PC ASSEMBLY, MOTHER BOARD CU-9125 (2A1A1)

2A1A1	PC ASSEMBLY, MOTHER BOARD CU-9125	8085013096
C1	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C2	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C3	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C4	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C5	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C6	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C7	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C8	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C9	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C10	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C11	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C12	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C13	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C14	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C15	CAP. 1µF, 50V, 198D	0280910002
C16	CAP. 1µF, 50V, 198D	0280910002
C17	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C18	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C19	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C20	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C21	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C22	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C23	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C24	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C25	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C26	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C27	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C28	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C29	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C30	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C31	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C32	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C33	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C34	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C35	CAP. 0.47µF, 50V, X7R, 20%	0283377771
C36	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C37	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C38	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C39	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C40	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C41	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C42	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C43	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C44	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C45	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C46	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C47	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C48	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C49	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C50	CAP. 0.001µF, 100V, X7R, 20%	0281630003

C51	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C52	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C53	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C54	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C55	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C56	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C57	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C58	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C59	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C60	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C61	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C62	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C63	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C64	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C65	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C66	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C67	CAP. 0.47µF, 50V, X7R, 20%	0283377771
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, ZENER 1N5245B	0405210001
J1	CONNECTOR, PC, 18 PIN DUAL	1006470000
J2	CONNECTOR, PC, 15 PIN DUAL	1006450009
J3	CONNECTOR, PC, 15 PIN DUAL	1006450009
J4	CONNECTOR, PC, 15 PIN DUAL	1006450009
J5	CONNECTOR, PC, 15 PIN DUAL	1006450009
J6	CONNECTOR, 2 PIN MALE, HEADER	1006480005
J7	CONNECTOR, PC, 28 PIN DUAL	1006460004
K1	RELAY, SPDT, 24V, REED	1003400001
L1	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L2	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L3	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L4	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L5	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L6	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L7	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L8	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L9	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L10	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L11	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L12	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L13	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L14	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L15	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L16	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L17	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
L18	INDUCTOR, MOLDED, 6.8µH 245MA	0664180001
Q1	TRANSISTOR, NPN, SI. 2N4124	0448010003
R1	RESISTOR 47K, 10%, 1/4W	0171060008
R2	RESISTOR 4.7K, 5%, 1/4W	0170770001
	JACK, PCB, PRESS-IN	0754100006

Figure 5.11 Motherboard Assembly 2A1A1, page 1 of 3.



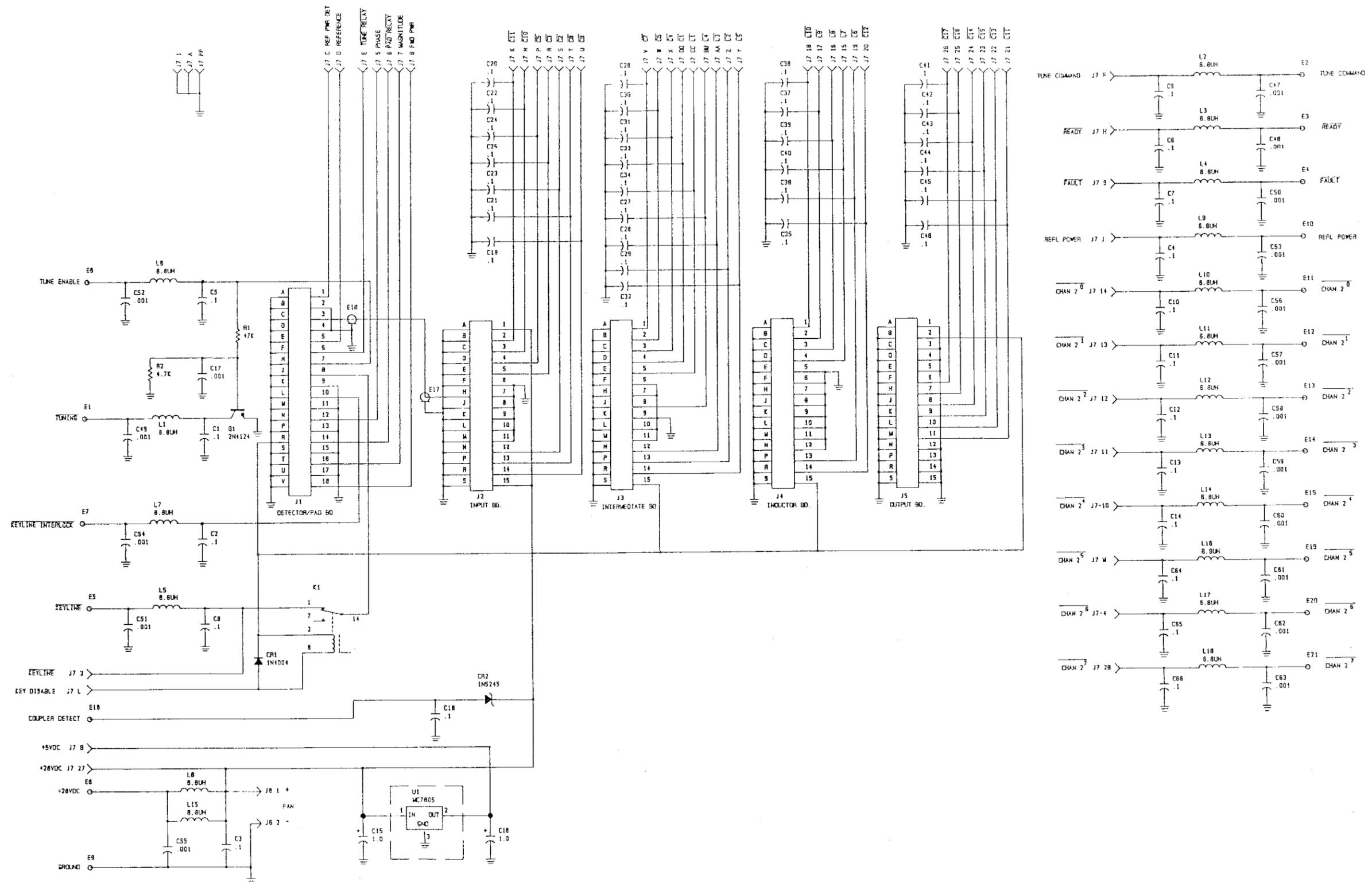


Figure 5.11 Mother Board Assembly 2A1A1, page 3 of 3.

PC ASSY, INPUT BOARD CU-9125 (2A2A1)

Part No.	Description	Quantity	Part No.
	PC ASSY, INPUT BOARD		8080030090
C2	CAP. 22PF, 500V, CD15, 2%		1000050025
C3A	CAP. 18PF, 500V, DM15		0281330000
C3B	CAP. 22PF, 500V, CD15, 2%		1000050025
C5A	CAP. 51PF, 500V, DM15, 2%		0281350001
C5B	CAP. 51PF, 500V, DM15, 2%		0281350001
C8A	CAP. 160PF, 500V, DM15, 2%		0281340005
C8B	CAP. 160PF, 500V, DM15, 2%		0281340005
C8C	CAP. 160PF, 500V, DM15, 2%		0281340005
C8D	CAP. 160PF, 500V, DM15, 2%		0281340005
C9A	CAP. 220PF, 500V, DM15, 2%		0281420009
C9B	CAP. 220PF, 500V, DM15, 2%		0281420009
C9C	CAP. 220PF, 500V, DM15, 2%		0281420009
C9D	CAP. 220PF, 500V, DM15, 2%		0281420009
C9E	CAP. 200PF, 500V, DM15, 5%		0258040009
C9F	CAP. 200PF, 500V, DM15, 5%		0258040009
C10A	CAP. 430PF, 500V, DM19, 5%		0254900003
C10B	CAP. 430PF, 500V, DM19, 5%		0254900003
C10C	CAP. 430PF, 500V, DM19, 5%		0254900003
C10D	CAP. 430PF, 500V, DM19, 5%		0254900003
C10E	CAP. 430PF, 500V, DM19, 5%		0254900003
C10F	CAP. 390PF, 500V, DM19, 2%		0282640002
C11A	CAP. 910PF, 500V, DM19, 5%		0297570005
C11B	CAP. 910PF, 500V, DM19, 5%		0297570005
C11C	CAP. 820PF, 500V, DM19, 2%		0281280002
C11D	CAP. 820PF, 500V, DM19, 2%		0281280002
C11E	CAP. 820PF, 500V, DM19, 2%		0281280002
C11F	CAP. 820PF, 500V, DM19, 2%		0281280002
C18	CAP. .01µF, 100V, 25V/Y5P		0273217771
C19	CAP. .01µF, 100V, 25V/Y5P		0273217771
C20	CAP. .01µF, 100V, 25V/Y5P		0273217771
C21	CAP. .01µF, 100V, 25V/Y5P		0273217771
C22	CAP. .01µF, 100V, 25V/Y5P		0273217771
C23	CAP. .01µF, 100V, 25V/Y5P		0273217771
C24	CAP. .01µF, 100V, 25V/Y5P		0273217771
K1A	RELAY, REED, 24VDC, 2 FORM A		1006070036
K1B	RELAY, REED, 24VDC, 2 FORM A		1006070036
K1C	RELAY, REED, 24VDC, 2 FORM A		1006070036
K2A	RELAY, REED, 24VDC, 2 FORM A		1006070036
K2B	RELAY, REED, 24VDC, 2 FORM A		1006070036
K2C	RELAY, REED, 24VDC, 2 FORM A		1006070036
K3A	RELAY, REED, 24VDC, 2 FORM A		1006070036
K3B	RELAY, REED, 24VDC, 2 FORM A		1006070036
K3C	RELAY, REED, 24VDC, 2 FORM A		1006070036
K4A	RELAY, REED, 24VDC, 2 FORM A		1006070036
K4B	RELAY, REED, 24VDC, 2 FORM A		1006070036
K7	RELAY, REED, 24VDC, 2 FORM A		1006070036
K9	RELAY, REED, 24VDC, FORM A		1006060031
K10	RELAY, REED, 24VDC, FORM A		1006060031

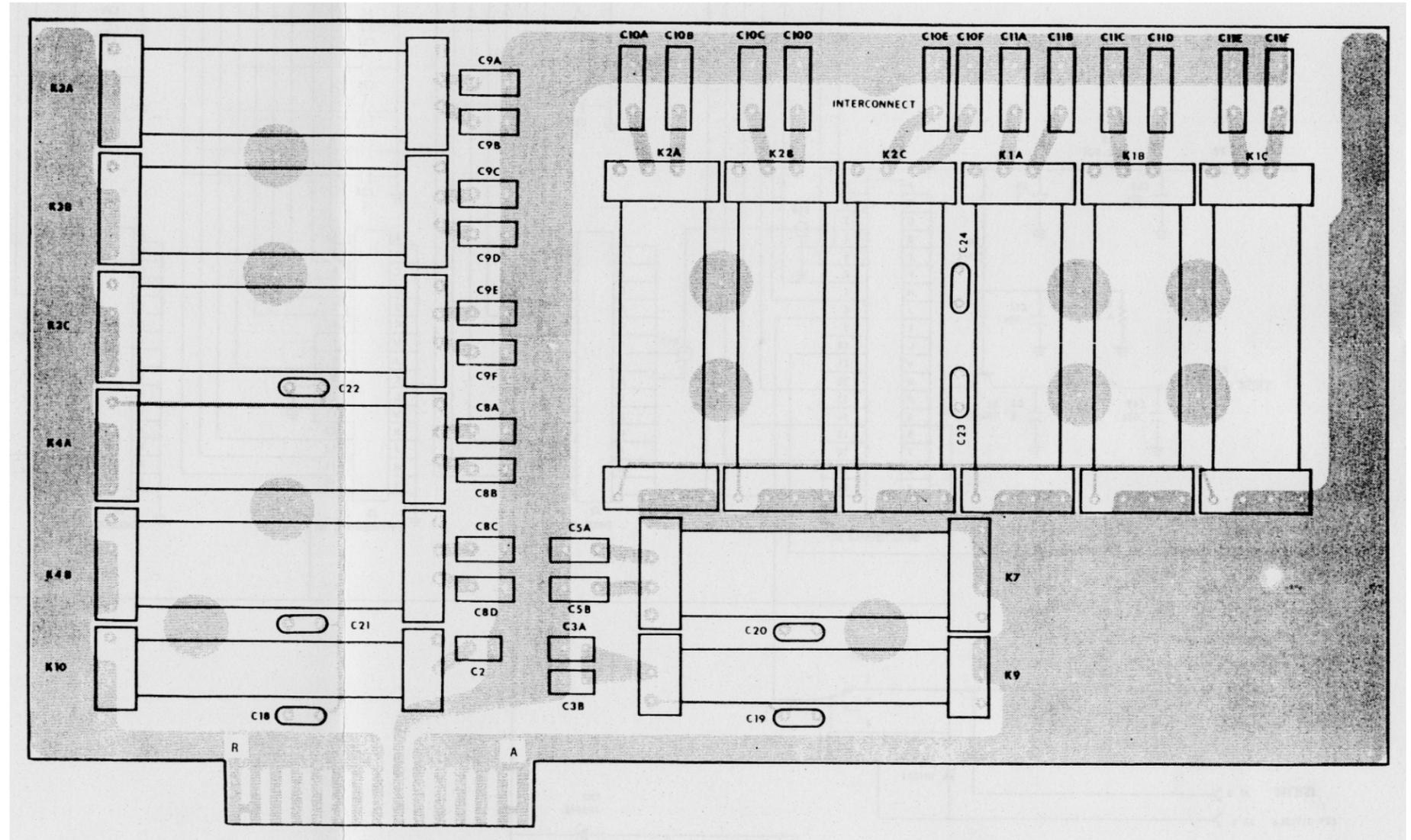
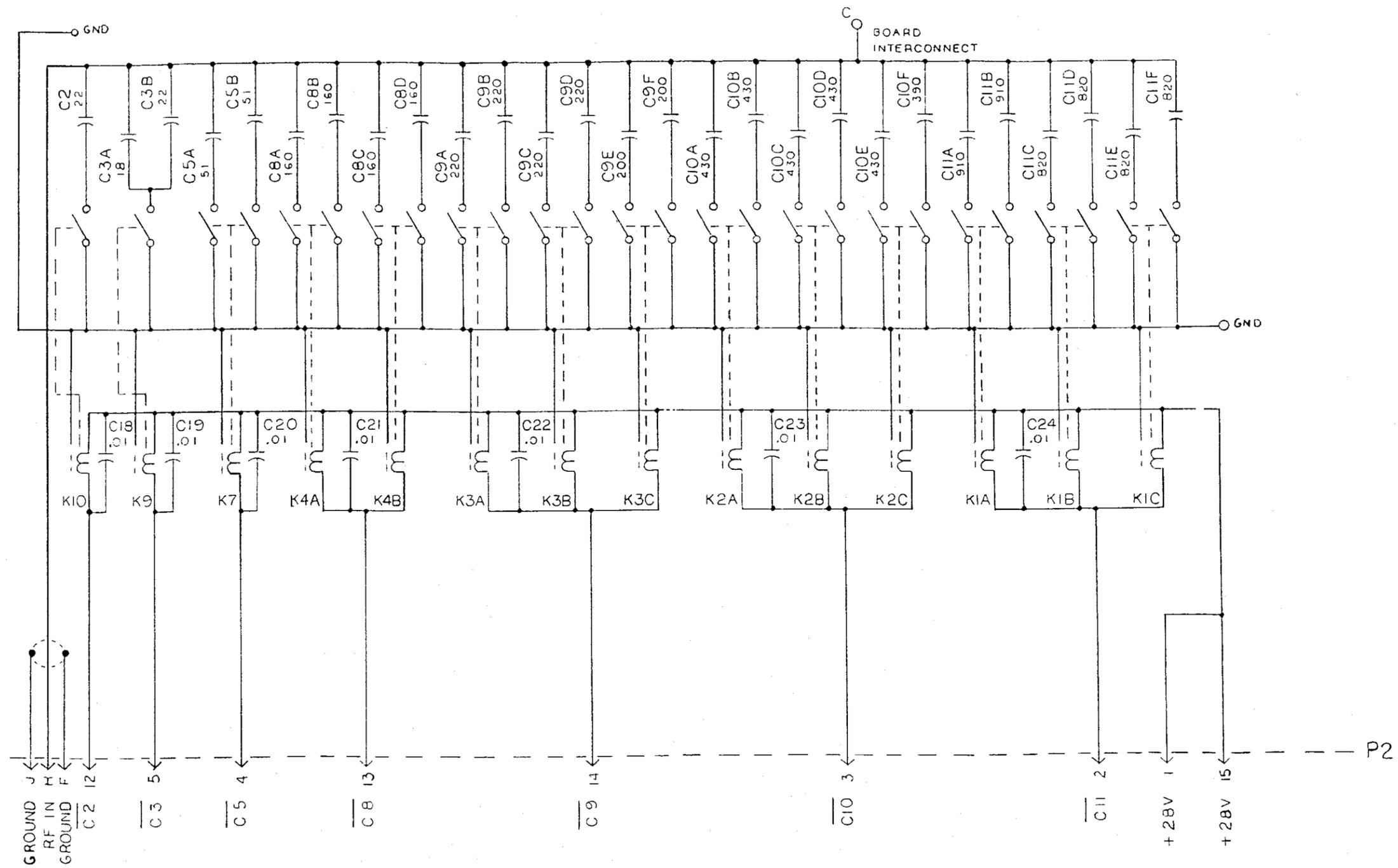


Figure 5.12 Input Board Assembly 2A2A1, page 1 of 2.



**NOTES** UNLESS OTHERWISE SPECIFIED:  
 1. DECIMAL CAPACITORS ARE IN MICROFARADS,  
 ALL OTHERS ARE IN PICO FARADS.  
 2. INDUCTORS ARE IN MICROHENRIES.

Figure 5.12 Input Board Assembly 2A2A1, page 2 of 2.

PC ASSY, INTERMEDIATE BOARD CU-9125 (2A2A2)

	PC ASSY, INTERMEDIATE BOARD	8080040095
C1	CAP. 10PF, 500V, DM10	0259830003
C4A	CAP. 33PF, 500V, DM15, 2%	0281020001
C4B	CAP. 33PF, 500V, DM15, 2%	0281020001
C6A	CAP. 43PF, 500V, DM15, 2%	1001240031
C6B	CAP. 43PF, 500V, DM15, 2%	1001240031
C6C	CAP. 43PF, 500V, DM15, 2%	1001240031
C6D	CAP. 43PF, 500V, DM15, 2%	1001240031
C7A	CAP. 82PF, 500V, DM15, 2%	0281120005
C7B	CAP. 82PF, 500V, DM15, 2%	0281120005
C7C	CAP. 82PF, 500V, DM15, 2%	0281120005
C7D	CAP. 75PF, 500V, DM15, 2%	0281110000
C25	CAP. .01μF, 100V, 25V/Y5P	0273217771
C26	CAP. .01μF, 100V, 25V/Y5P	0273217771
C27	CAP. .01μF, 100V, 25V/Y5P	0273217771
C28	CAP. .01μF, 100V, 25V/Y5P	0273217771
C29	CAP. .01μF, 100V, 25V/Y5P	0273217771
C30	CAP. .01μF, 100V, 25V/Y5P	0273217771
C31	CAP. .01μF, 100V, 25V/Y5P	0273217771
C32	CAP. .01μF, 100V, 25V/Y5P	0273217771
C33	CAP. .01μF, 100V, 25V/Y5P	0273217771
K5A	RELAY, REED, 24VDC, 2 FORM A	1006070036
K5B	RELAY, REED, 24VDC, 2 FORM A	1006070036
K6A	RELAY, REED, 24VDC, 2 FORM A	1006070036
K6B	RELAY, REED, 24VDC, 2 FORM A	1006070036
K8	RELAY, REED, 24VDC, 2 FORM A	1006070036
K11	RELAY, REED, 24VDC, FORM A	1006060031
K12	RELAY, REED, 24VDC, 2 FORM A	1006070036
K13	RELAY, REED, 24VDC, 2 FORM A	1006070036
K14	RELAY, REED, 24VDC, 2 FORM A	1006070036
K15	RELAY, REED, 24VDC, 2 FORM A	1006070036
K16	RELAY, REED, HV, 24V, 1 FORM A	1005920001
L2	INDUCTOR, 0.02μH	8080041202
L3	INDUCTOR, 0.04μH	8080041300
L4	INDUCTOR, 0.08μH	8080041407
L5	INDUCTOR, 0.16μH	8080041504

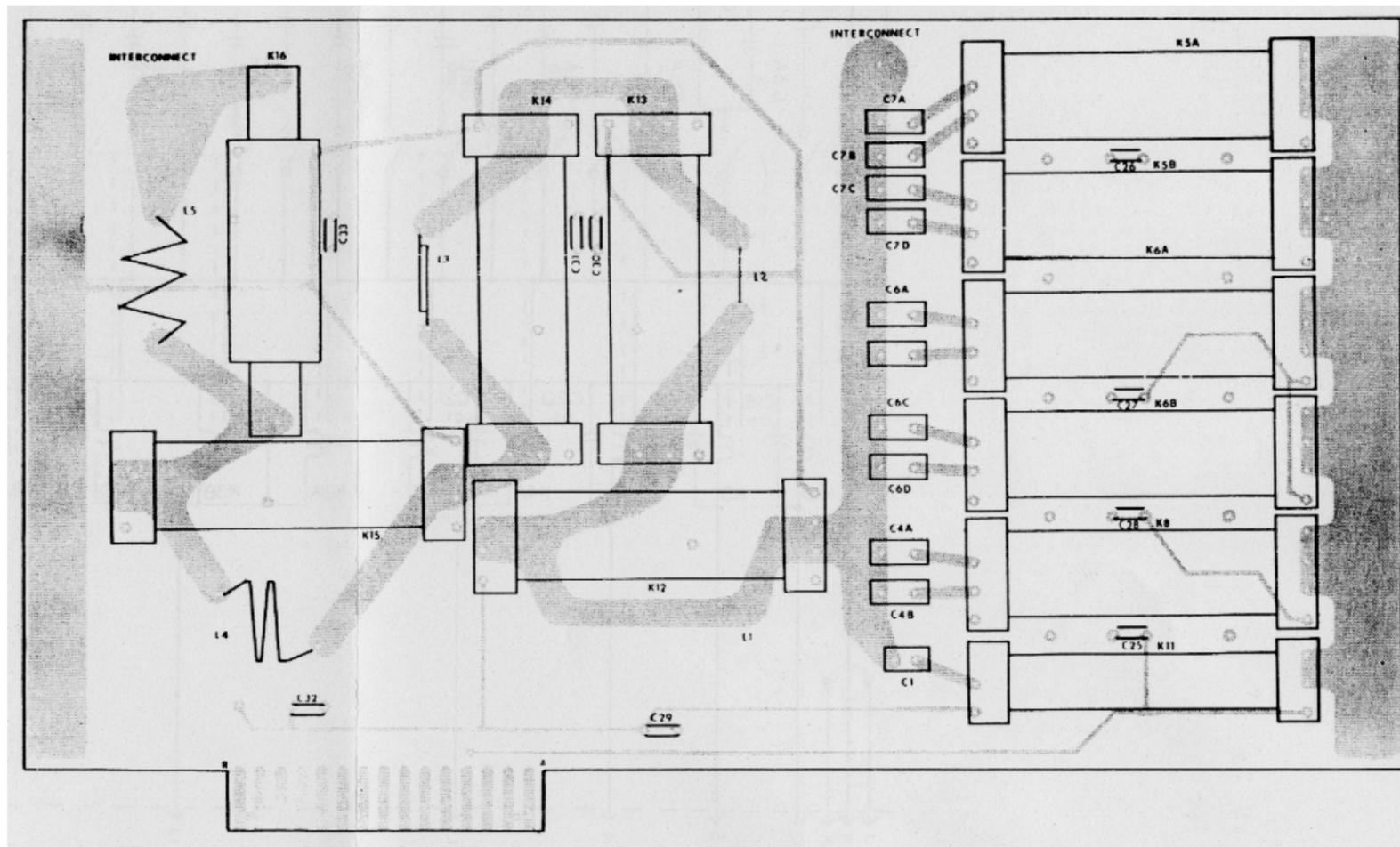
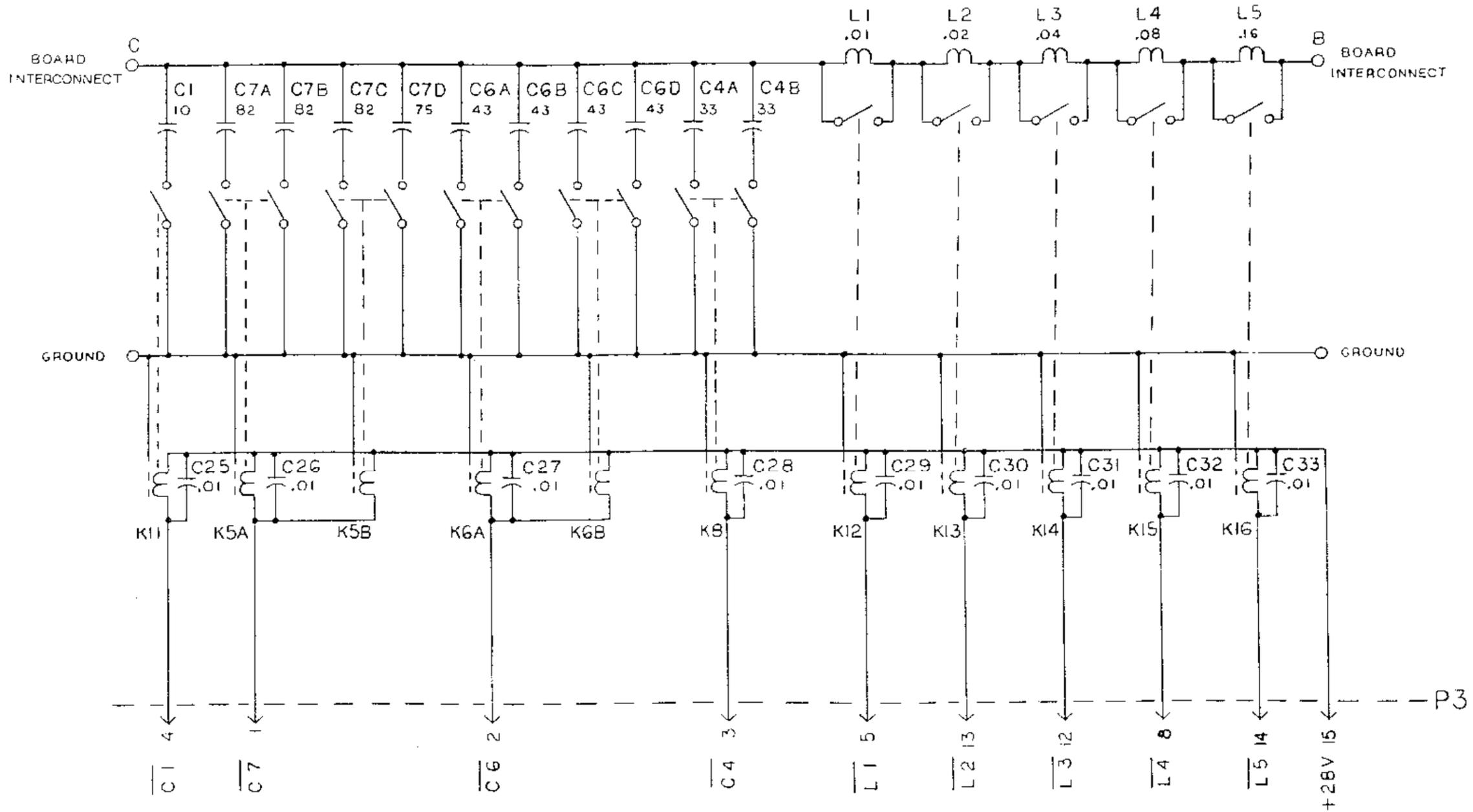


Figure 5.13 Intermediate Board Assembly 2A2A2, page 1 of 2.



NOTES, UNLESS OTHERWISE SPECIFIED:  
 1. DECIMAL CAPACITORS ARE IN MICROFARADS  
 ALL OTHERS ARE IN PICO FARADS.  
 2. INDUCTORS ARE IN MICROHENRIES.

Figure 5.13 Intermediate Board Assembly 2A2A2, page 2 of 2.

PC ASSY, INDUCTOR BOARD CU-9125 (2A2A3)

	PC ASSY, INDUCTOR BOARD	8080050091
C12A	CAP. 10PF, 3K0V NPO	0259690007
C12B	CAP. 10PF, 3K0V NPO	0259690007
C12C	CAP. 10PF, 3K0V NPO	0259690007
C34	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C35	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C36	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C37	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C38	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C39	CAP. 0.1μF, 50V, X7R, 20%	0281610002
K17	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K18	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K19	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K20	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K21	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K22	RELAY, REED, HV, 24V, 1 FORM A	1005920001
L6	INDUCTOR, 0.35μH	8080050601
L7	INDUCTOR, 0.70μH	8080050708
L8	INDUCTOR, 1.33μH	8080050805
L9	INDUCTOR, 2.62μH	8080050902
L10	INDUCTOR, 5.64μH	8080051003

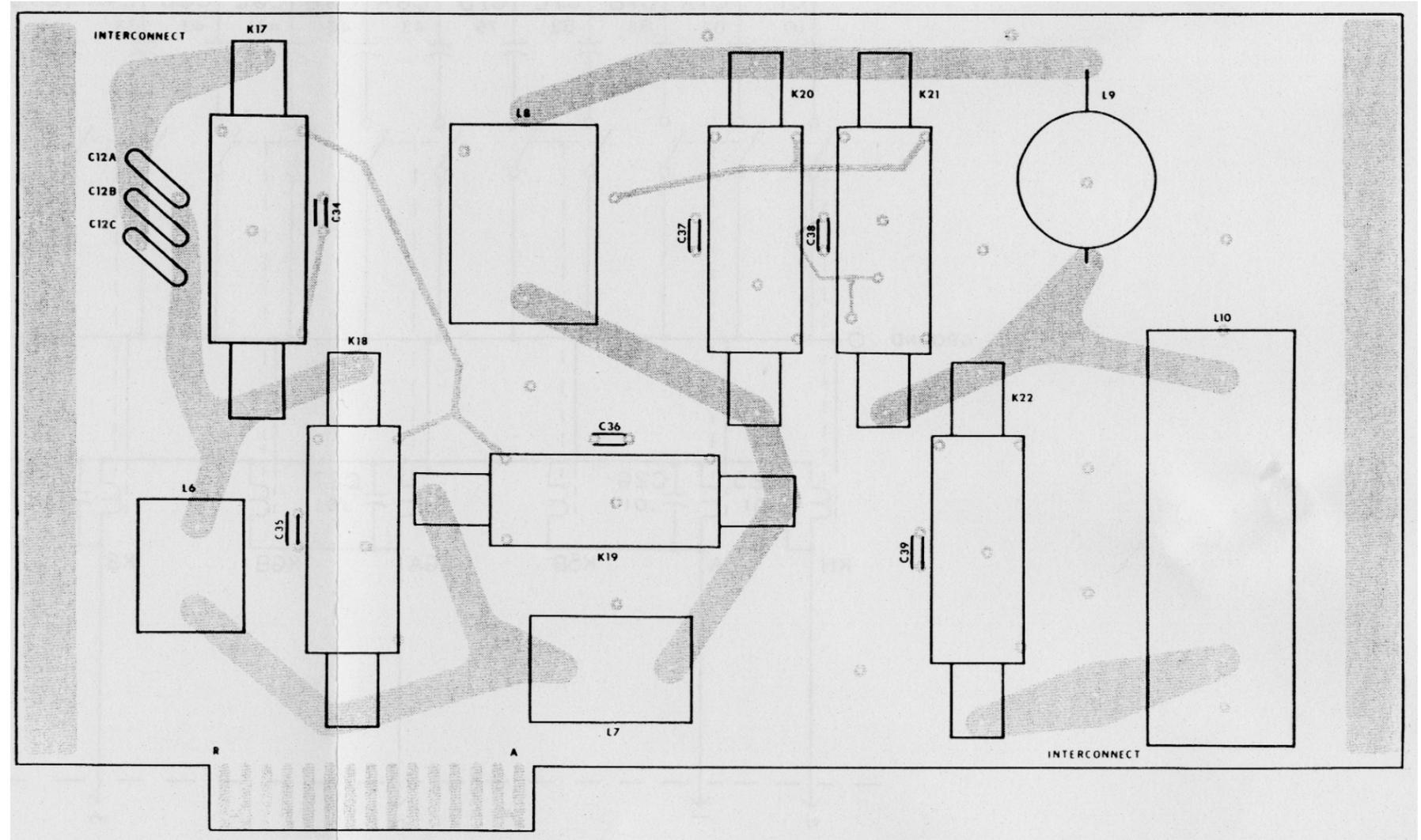
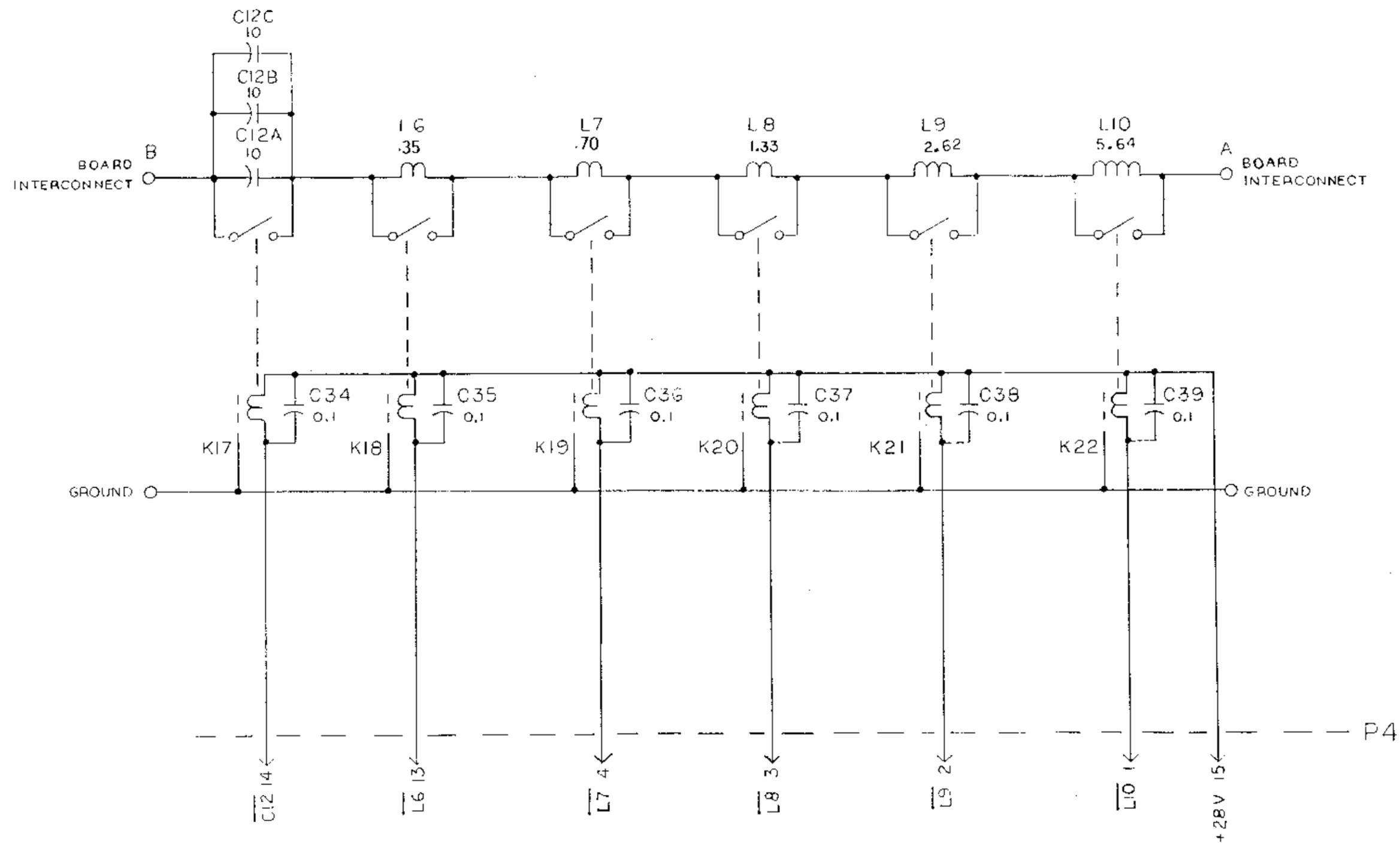


Figure 5.14 Inductor Board Assembly 2A2A3, page 1 of 2.



NOTES, UNLESS OTHERWISE SPECIFIED:  
 1. DECIMAL CAPACITORS ARE IN MICROFARADS,  
 ALL OTHERS ARE IN PICOFARADS.  
 2. ALL INDUCTORS ARE IN MICROHENRIES.

Figure 5.14 Inductor Board Assembly 2A2A3, page 2 of 2.

PC ASSY, OUTPUT BOARD CU-9125 (2A2A4)

	PC ASSY, OUTPUT BOARD	8080060096
C13	CAP. 50PF, 7.5KV, NPO	0290200008
C14	CAP. 100PF, 5KV, N750	0290440009
C15A	CAP. 100PF, 5KV, N750	0290440009
C15B	CAP. 100PF, 5KV, N750	0290440009
C16A	CAP. 100PF, 5KV, N750	0290440009
C16B	CAP. 100PF, 5KV, N750	0290440009
C16C	CAP. 100PF, 5KV, N750	0290440009
C16D	CAP. 100PF, 5KV, N750	0290440009
C17	CAP. 75PF, 7.5KV, N750	0290560004
C40	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C41	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C42	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C43	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C44	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C45	CAP. 0.1μF, 50V, X7R, 20%	0281610002
K23	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K24	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K25	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K26	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K27	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K28	RELAY, REED, HV, 24V, 1 FORM A	1005920001
K29	RELAY, REED, HV, 24V, 1 FORM A	1005920001
L11	INDUCTOR, 10.85μH	8080061106
	CLIP, ANTENNA	8080060606

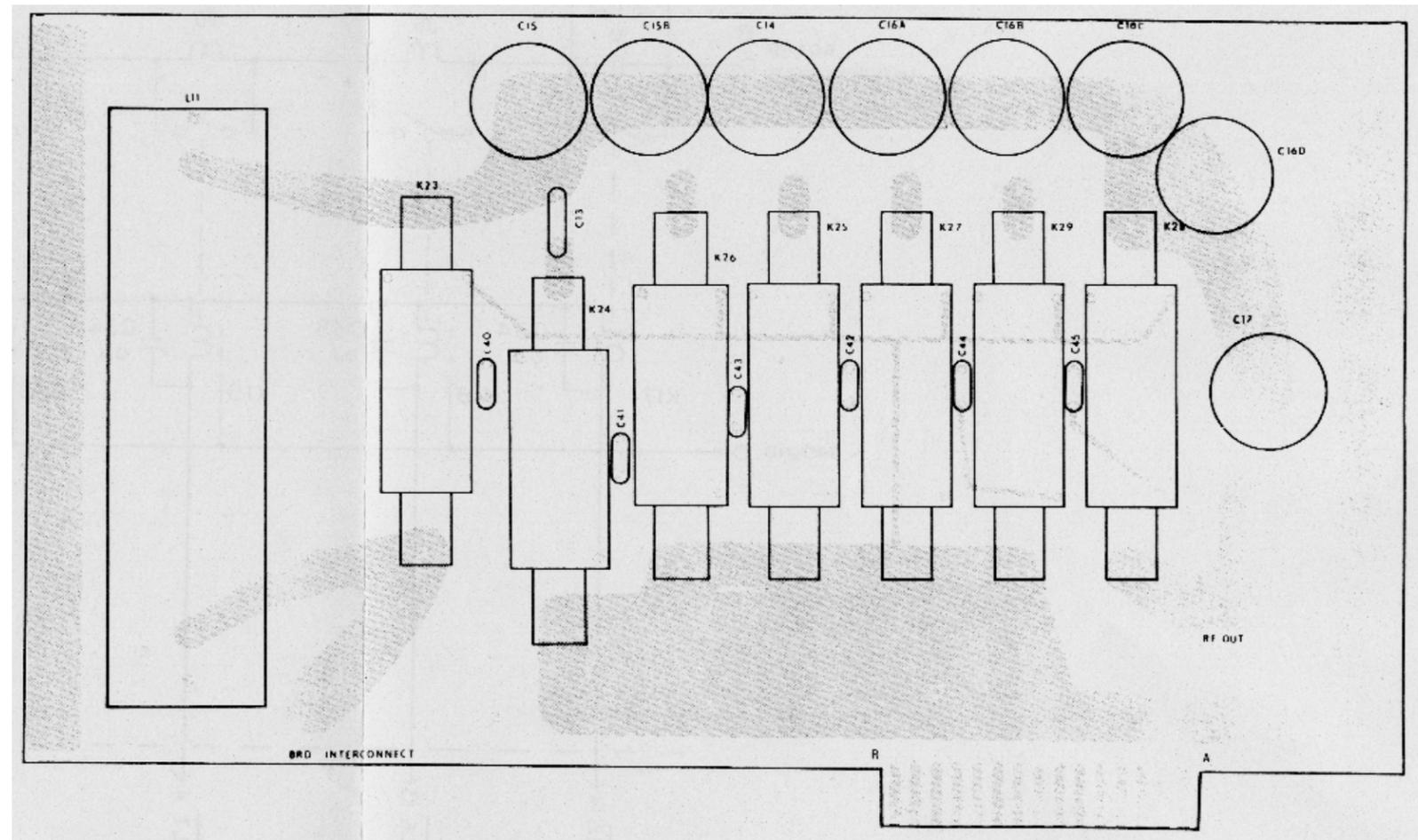
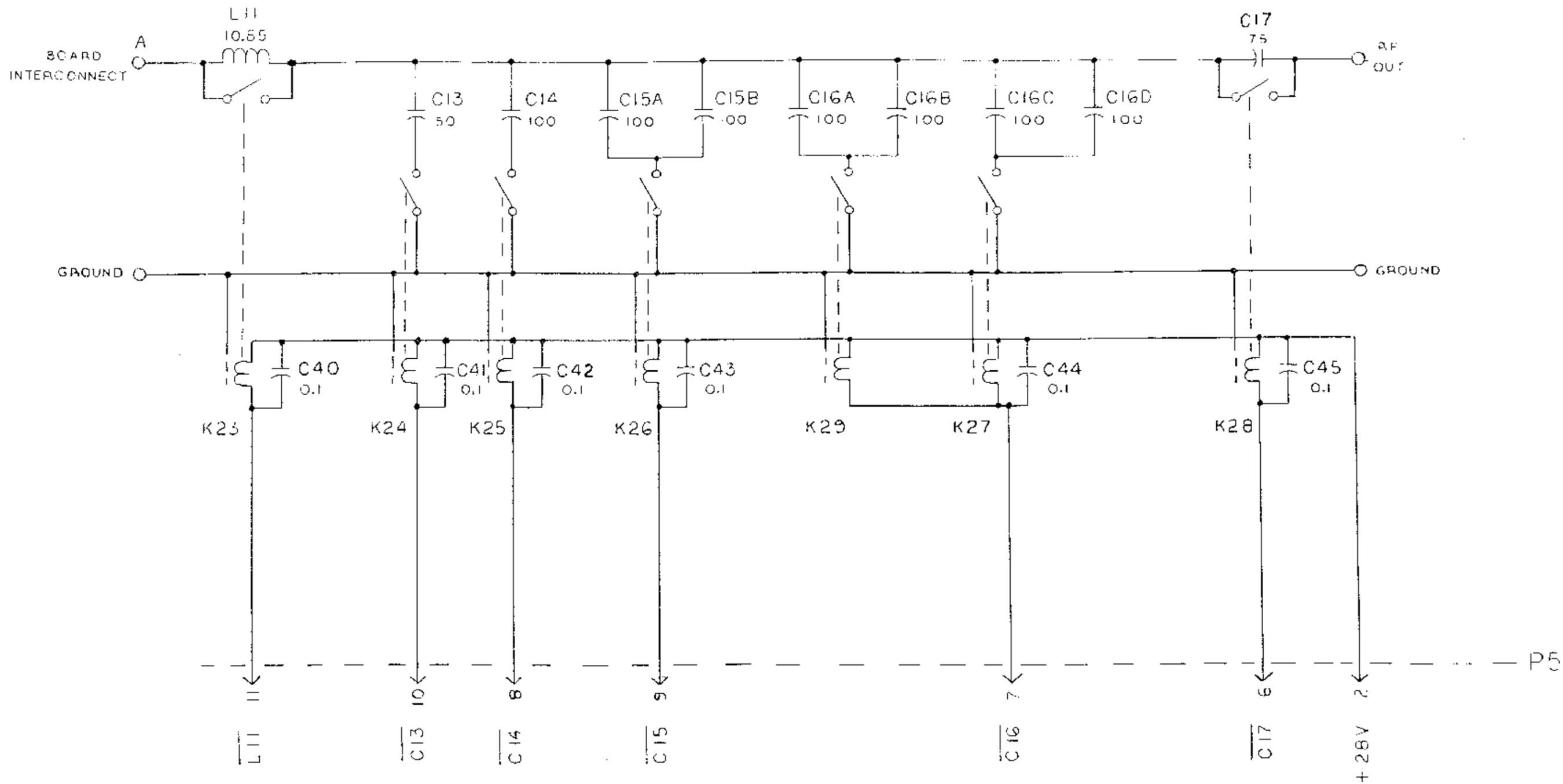


Figure 5.15 Output Board Assembly 2A2A4, page 1 of 2.



NOTES: UNLESS OTHERWISE SPECIFIED:  
 1. DECIMAL CAPACITORS ARE IN MICROFARADS,  
 ALL OTHERS ARE IN PICO FARADS,  
 2. ALL INDUCTORS ARE IN MICROHENRIES.

Figure 5.15 Output Board Assembly 2A2A4, page 2 of 2.

## COMPUTER MODULE CU-9125 (2A3)

2A3	PC ASSY, COMPUTER BOARD	8085025094
C1	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C2	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C3	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C4	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C5	NOT USED	-
C6	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C7	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C8	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C9	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C10	NOT USED	-
C11	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C12	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C13	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C14	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C15	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C16	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C17	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C18	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C19	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C20	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C21	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C22	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C23	CAP. .47 $\mu$ F, 50V, X7R 20%	0283377771
C24	CAP. 6.8 $\mu$ F, 25V 20%	1005050031
C25	CAP. .47 $\mu$ F, 50V, X7R 20%	0283377771
C26	CAP. .47 $\mu$ F, 50V, X7R 20%	0283377771
C27	CAP. .47 $\mu$ F, 50V, X7R 20%	0283377771
C28	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C29	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C30	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C31	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C32	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C33	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C34	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C35	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C36	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C37	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C38	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C39	NOT USED	-
C40	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C41	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C42	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C43	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C44	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C45	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C46	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C47	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C48	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C49	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C50	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002

C51	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C52	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C53	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C54	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C55	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C56-88	NOT USED	-
C89	CAP. 1 $\mu$ F, 50V, 198D	0280910002
C90	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C91	CAP. 0.001 $\mu$ F, 100V, X7R, 20%	0281630003
C92	NOT USED	-
C93	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C94	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C95	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C96	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C97	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C98	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C99	NOT USED	-
C100	NOT USED	-
C101	CAP. 6.8 $\mu$ F, 25V 20%	1005050031
C102	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C103	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C104	CAP. 1 $\mu$ F, 50V, 198D	0280910002
C105	CAP. 1 $\mu$ F, 50V, 198D	0280910002
C106	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C107	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C108	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C109	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C110	CAP. 0.1 $\mu$ F, 50V, X7R, 20%	0281610002
C111	CAP. .01 $\mu$ F, 50V, X7R 20%	0281730008
C112	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C113	CAP. .47 $\mu$ F, 50V Z5U	1006680039
C114	CAP. .47 $\mu$ F, 50V Z5U	1006680039
CP1	CAP. NTWK, 8 PIN, .1 $\mu$ F	1007360003
CP2	CAP. NTWK, 8 PIN, .1 $\mu$ F	1007360003
CP3	CAP. NTWK, 8 PIN, .1 $\mu$ F	1007360003
CP4	CAP. NTWK, 8 PIN, .1 $\mu$ F	1007360003
CP5	CAP. NTWK, 8 PIN, .1 $\mu$ F	1007360003
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, RECTIFIER 1N4004	0405180004
CR3	DIODE, RECTIFIER 1N4004	0405180004
CR4	DIODE, RECTIFIER 1N4004	0405180004
CR5	DIODE, RECTIFIER 1N4004	0405180004
CR6	DIODE, RECTIFIER 1N4004	0405180004
CR7	DIODE, RECTIFIER 1N4004	0405180004
CR8	DIODE, HCT CARRIER 5082-2835	0405280009
CR9	DIODE, RECTIFIER 1N4004	0405180004
CR10	DIODE, ZENER 1N5349A	0405380003
CR11	NOT USED	-
CR12	NOT USED	-
CR13	NOT USED	-
CR14	NOT USED	-

Figure 5.16 Computer Board Assembly 2A3, page 1 of 6.

CR15	DIODE, RECTIFIER 1N4004	0405180004
CR16	DIODE, HOT CARRIER 1N6263	0405610009
CR17	DIODE, HOT CARRIER 1N6263	0405610009
CR18	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR19	DIODE, SIGNAL, SIL. 1N4454	0405270003
L1	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L2	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L3	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L4	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L5	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L6	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L7	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
L8	INDUCTOR, MOLDED, 22 $\mu$ H, 10%	0664060005
Q1	TRANSISTOR, NPN, SI. 2N2222A	0448580004
Q2	TRANSISTOR, NPN, SI. 2N4124	0448010003
Q3	NOT USED	-
Q4	NOT USED	-
Q5	TRANSISTOR, P-CH, FET 2N5461	0446160008
R1	RESISTOR 6.8K, 5%, 1/8W	1010806823
R2	RESISTOR 6.8K, 5%, 1/8W	1010806823
R3	RESISTOR 100, 5%, 1/8W	1010801015
R4	RESISTOR 2.2K, 5%, 1/8W	1010802224
R5	RESISTOR 10K, 1%, 1/8W	1003050026
R6	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R7	RESISTOR 12K, 10%, 1/4W	0183180003
R8	RESISTOR 4.7K, 5%, 1/8W	1010804723
R9	RESISTOR 100K, 5%, 1/8W	1010801040
R10	RESISTOR 4.7K, 5%, 1/8W	1010804723
R11	RESISTOR 100K, 5%, 1/8W	1010801040
R12	RESISTOR 22M, 10%, 1/4W	0180950002
R13	RESISTOR 22M, 10%, 1/4W	0180950002
R14	RESISTOR 6.8K, 5%, 1/8W	1010806823
R15	RESISTOR 6.8K, 5%, 1/8W	1010806823
R16	RESISTOR 100, 5%, 1/8W	1010801015
R17	RESISTOR 2.2K, 5%, 1/8W	1010802224
R18	RESISTOR 10K, 1%, 1/8W	1003050026
R19	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R20	RESISTOR 12K, 10%, 1/4W	0183180003
R21	RESISTOR 4.7K, 5%, 1/8W	1010804723
R22	RESISTOR 100K, 5%, 1/8W	1010801040
R23	RESISTOR 4.7K, 5%, 1/8W	1010804723
R24	RESISTOR 100K, 5%, 1/8W	1010801040
R25	RESISTOR 22M, 10%, 1/4W	0180950002
R26	RESISTOR 22M, 10%, 1/4W	0180950002
R27	NOT USED	-
R28	RESISTOR 220, 10%, 1/2W	0172850002
R29	RESISTOR 220, 10%, 1/2W	0172850002
R30	NOT USED	-
R31	RESISTOR 80.6, 1%, 1/8W	0195200004
R32	RESISTOR, 8.45K 1%, 1/8W	1005900001
R33	RESISTOR 604, 1%, 1/8W	0193980002

R34	RESISTOR 6.8K, 5%, 1/8W	1010806823
R35	RESISTOR 22K, 5%, 1/8W	1010802232
R36	RESISTOR 10, 5%, 1/4W	0177160004
R37	RESISTOR 1K, 5%, 1/8W	1010801023
R38	RESISTOR 1K, 5%, 1/8W	1010801023
R39	NOT USED	-
R40	RESISTOR 1K, 5%, 1/8W	1010801023
R41	RESISTOR 47K, 5%, 1/8W	1010804731
R42	RESISTOR 22K, 5%, 1/8W	1010802232
R43	POT. 100K, 10% 3/4W, 15 TURNS	0338490051
R44	RESISTOR 15K, 5%, 1/8W	1010801538
R45	RESISTOR 15K, 5%, 1/8W	1010801538
R46	RESISTOR 2.2M, 10%, 1/4W	0176870008
R47	RESISTOR 4.7K, 5%, 1/8W	1010804723
R48	NOT USED	-
R49	RESISTOR, 8.45K 1%, 1/8W	1005900001
R50	NOT USED	-
R51	NOT USED	-
R52	NOT USED	-
R53	NOT USED	-
R54	RESISTOR 1K, 5%, 1/8W	1010801023
R55	RESISTOR, 3.9K, 5%, 1/8W	1010803921
R56	NOT USED	-
R57	RESISTOR 8.2K, 5%, 1/4W	0181620006
R58	RESISTOR 15K, 5%, 1/8W	1010801538
R59	NOT USED	-
R60	RESISTOR 39K, 5%, 1/8W	1010803930
R61	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R62	RESISTOR 100K, 5%, 1/8W	1010801040
R63	RESISTOR 100K, 5%, 1/8W	1010801040
R64	RESISTOR 39K, 5%, 1/8W	1010803930
R65	RESISTOR 100K, 5%, 1/8W	1010801040
R66	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R67	RESISTOR 10K, 5%, 1/8W	1010801031
R68	RESISTOR 100K, 5%, 1/8W	1010801040
R69	RESISTOR 39K, 5%, 1/8W	1010803930
R70	RESISTOR 470, 5%, 1/8W	1010804715
R71	RESISTOR 15K, 5%, 1/8W	1010801538
R72	RESISTOR 15K, 5%, 1/8W	1010801538
R73	RESISTOR 4.7K, 5%, 1/8W	1010804723
R74	RESISTOR 15K, 5%, 1/8W	1010801538
RP1	RES NTWK 6 PIN SIP 10K COM	1006130004
RP2	RES NTWK 10 PIN SIP 10K COM	1006130021
RP3	RES NTWK 10 PIN SIP 10K COM	1006130021
TP1	VERTICAL JACK, WHITE	1006200029
TP2	VERTICAL JACK, WHITE	1006200029
TP3	VERTICAL JACK, WHITE	1006200029
TP4	VERTICAL JACK, WHITE	1006200029
TP5	VERTICAL JACK, WHITE	1006200029
TP6	VERTICAL JACK, WHITE	1006200029
TP7	VERTICAL JACK, WHITE	1006200029

Figure 5.16 Computer Board Assembly 2A3, page 2 of 6.

U1	IC. DIGITAL 80C85A	1007400013
U2	IC. DIGITAL 74HC138	1006480013
U3	IC. DIGITAL 74HC373	1006480030
U4	EPROM, W/CU-9125 SOFTWARE	8085026899
U5	IC. DIGITAL 81C55	1007390026
U6	IC. DIGITAL 74HC374	1006450033
U7	IC. DIGITAL 74HC374	1006450033
U8	IC. DIGITAL 74HC32	1006470026
U9	IC. LINEAR ULS2003R	1007410019
U10	IC. LINEAR ULS2003R	1007410019
U11	IC. LINEAR ULS2003R	1007410019
U12	IC. LINEAR ULS2003R	1007410019
U13	IC. LINEAR ULS2003R	1007410019
U14	IC. DIGITAL X2816A	1009020005
U15	IC. DIGITAL 74HC374	1006450033
U16	IC. DIGITAL 74HC244	1006460039
U17	IC. LINEAR UA747ADMQB	1006430024
U18	IC. LINEAR LM239AJ	1006430032
U19	IC. LINEAR LM239AJ	1006430032
U20	IC. DIGITAL 4584B	1005190011
U21	NOT USED	-
U22	IC. LINEAR LM117	1006440011
U23	CRYSTAL, OSCILLATOR, 1.00 MHZ	1006670025
U24	IC. DIGITAL 74HC244	1006460039
U25	IC. DIGITAL 74HC374	1006450033
U26	IC. DIGITAL 74HC688	1009050001
U27	IC. DIGITAL 74HC132	1007360020
XU1	SOCKET, IC, 40 PIN TAILLESS	1006620010
XU2	NOT USED	-
XU3	NOT USED	-
XU4	SOCKET, IC, 28 PIN TAILLESS	1006620001
XU5	SOCKET, IC, 40 PIN TAILLESS	1006620010
XU6-13	NOT USED	-
XU14	SOCKET, IC, 24 PIN MOUNTING PAD, TRANSISTOR HEAT SINK	1006240021 0502710004 0840730004

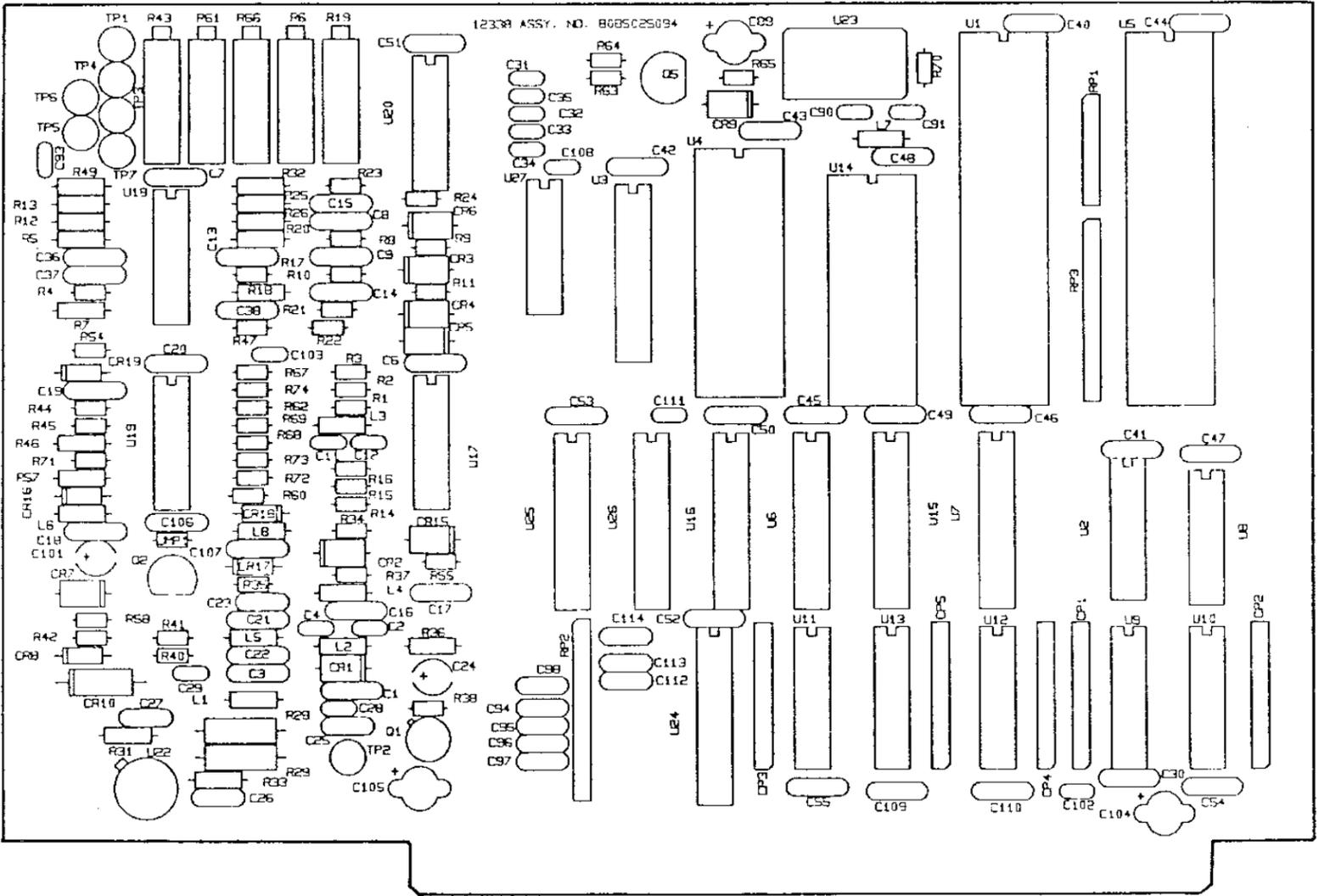


Figure 5.16 Computer Board Assembly 2A3, page 3 of 6.

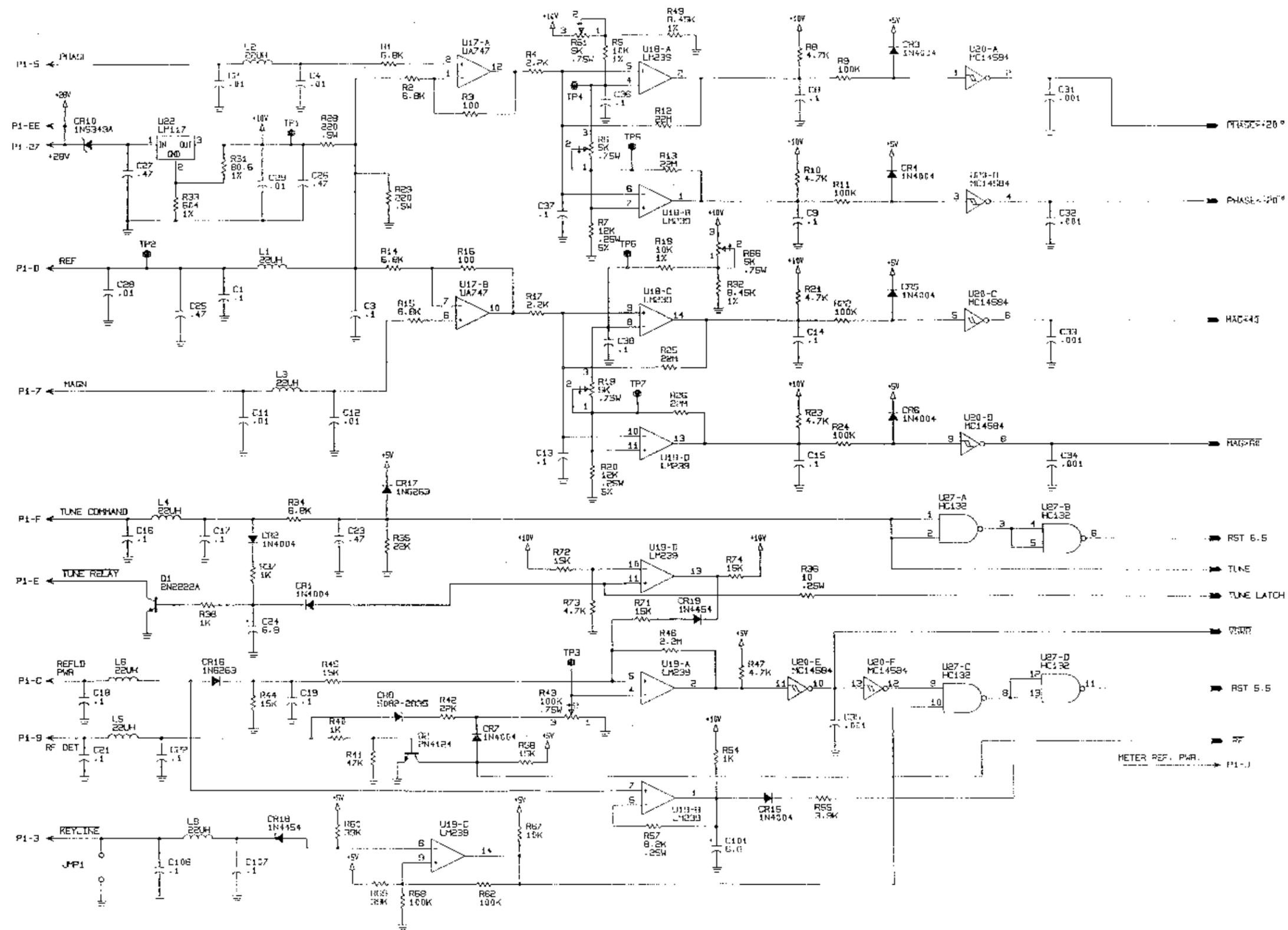


Figure 5.16 Computer Board Assembly 2A3, page 4 of 6.



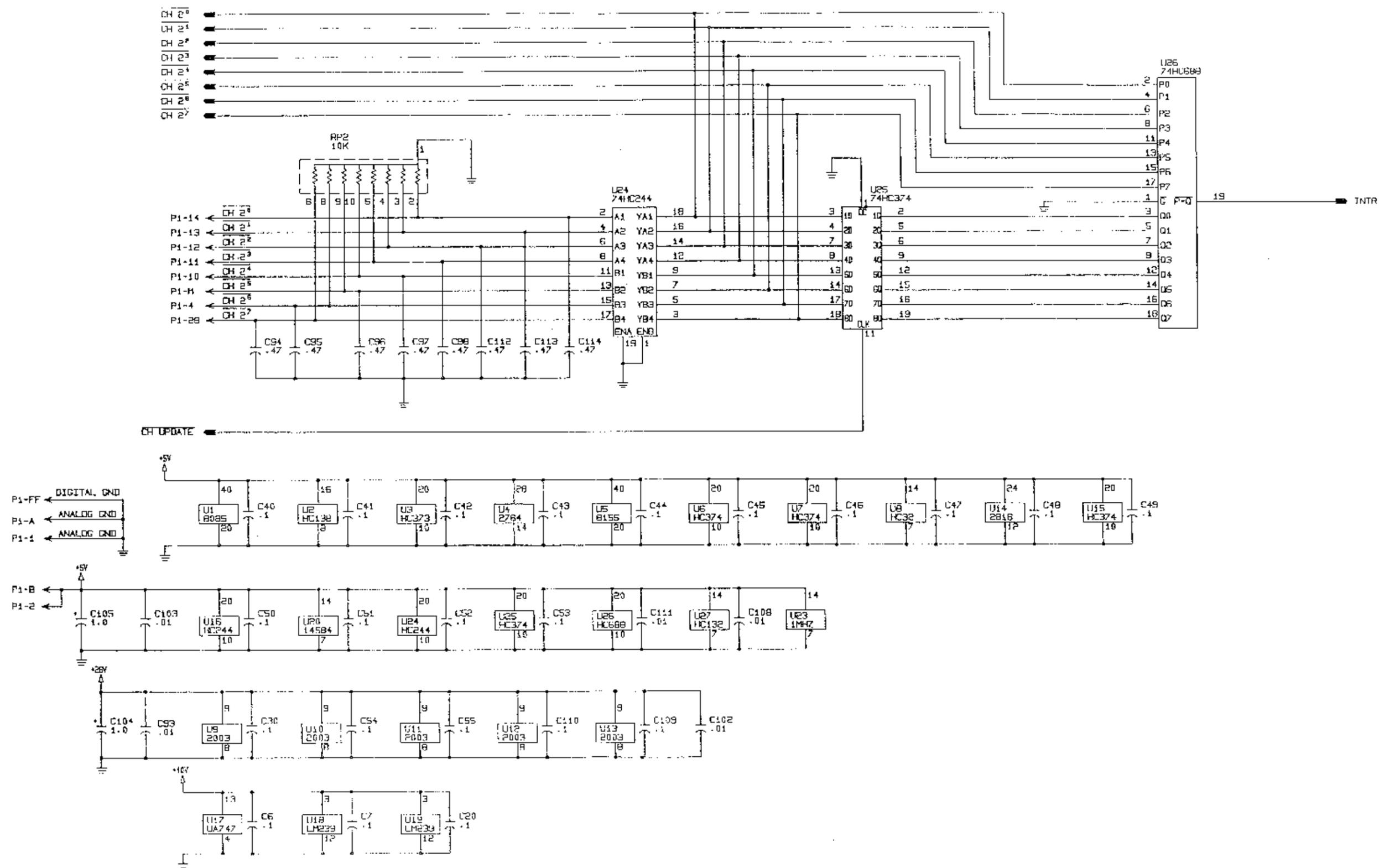


Figure 5.16 Computer Board Assembly 2A3, page 6 of 6.

PC ASSEMBLY, DETECTOR CU-9125 (2A4A1)

	PC ASSY, DETECTOR/PAD	8056160094
C2	CAP. 5.5-18PF, 350V, NPO	1007160021
C3	CAP. 390PF, 500V, DM15, 5%	0286000008
C4	CAP. .01μF, 50V, X7R 20%	0281730008
C5	CAP. .01μF, 50V, X7R 20%	0281730008
C6	CAP. .01μF, 50V, X7R 20%	0281730008
C7	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C8	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C9	CAP. .47μF, 50V, X7R 20%	0283377771
C10	CAP. .01μF, 50V, X7R 20%	0281730008
C11	CAP. .01μF, 50V, X7R 20%	0281730008
C12	CAP. .01μF, 50V, X7R 20%	0281730008
C13	CAP. 12PF, 500V, DM15	1005320039
C14	CAP. 2-8PF, 350V, NPO	0268220000
C15	CAP. 91PF, 500V, DM15, 5%	0298740001
C16	CAP. .01UF, 50V, X7R 20%	0281730008
C17	CAP. 91PF, 500V, DM15, 5%	0298740001
C18	CAP. .01UF, 50V, X7R 20%	0281730008
C19	CAP. 2-8PF, 350V, NPO	0268220000
C20	CAP. 33PF, 500V, DM15, 2%	0281020001
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, HOT CARRIER 1N6263	0405610009
CR3	DIODE, HOT CARRIER 1N6263	0405610009
CR4	DIODE, HOT CARRIER 1N6263	0405610009
CR5	DIODE, HOT CARRIER 1N6263	0405610009
CR6	DIODE, HOT CARRIER 1N6263	0405610009
CR7	DIODE, HOT CARRIER 1N6263	0405610009
CR8	DIODE, RECTIFIER 1N4004	0405180004
J1	CONNECTOR, RF, SNAP-ON	1000170012
K1	RELAY, 4PDT, 24V, PC MT 7.5A	0661600009
K2	RELAY, 4PDT, 24V, PC MT 7.5A	0661600009
L1	INDUCTOR, MOLDED, 0.47μH, 5%	0649410009
L2	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L3	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L4	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L5	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L6	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L7	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
L8	INDUCTOR, MOLDED, 1000μH, 10%	0664940005
R7	RESISTOR 12K, 10%, 1/4W	0183180003
R8	RESISTOR 18, 5%, 1/2W	0184730007
R9	RESISTOR 12K, 10%, 1/4W	0183180003
R10	RESISTOR 100, 10%, 1W	0165540001
R11	RESISTOR 56, 10%, 1/2W	0168890003
R12	POT., 10K, 5%, 0.6W, 15 TURNS	0344410005
R13	RESISTOR 22, 10%, 1/4W	0192690001
R14	RESISTOR 22, 10%, 1/4W	0192690001
R15	RESISTOR 220, 10%, 1/4W	0171320000
R16	RESISTOR 220, 10%, 1/4W	0171320000
T1	TRANSFORMER, AMPL. DETECTOR	6035040802
T2	TRANSFORMER, PHASE DETECTOR	6035040900
T3	TRANSFORMER, CURRENT	8080003602

TP1	TEST POINT, WHITE	0753640007
TP2	TEST POINT, WHITE	0753640007
TP3	TEST POINT, WHITE	0753640007
TP4	TEST POINT, WHITE	0753640007
TP5	TEST POINT, WHITE	0753640007
	SOCKET, RELAY, 4PDT CONTACTS	0754700003
	SOCKET PIN	1005990034
	SPRING, RELAY HOLD-DOWN	0881930008

PC ASSEMBLY, PAD CU-9125 (2A4A2)

	PC ASSY, PAD	8056161091
E1	PIN, SWAGED	1005980039
E2	PIN, SWAGED	1005980039
E3	PIN, SWAGED	1005980039
E4	PIN, SWAGED	1005980039
R1	RESISTOR 50, 5%, 14W	0191160008
R2	RESISTOR 50, 5%, 14W	0191160008
R3	RESISTOR 50, 5%, 14W	0191160008
R4	RESISTOR 50, 5%, 14W	0191160008
R5	RESISTOR 200, 5%, 14W	0197410006
R6	RESISTOR 200, 5%, 14W	0197410006

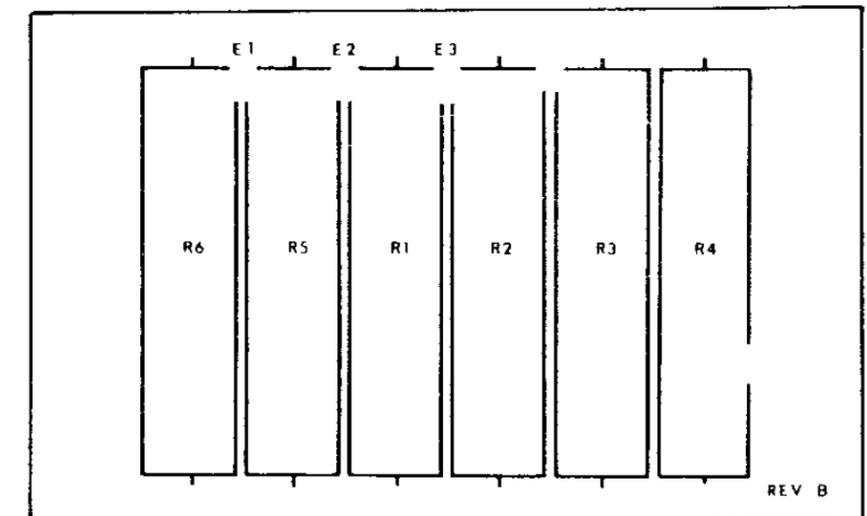
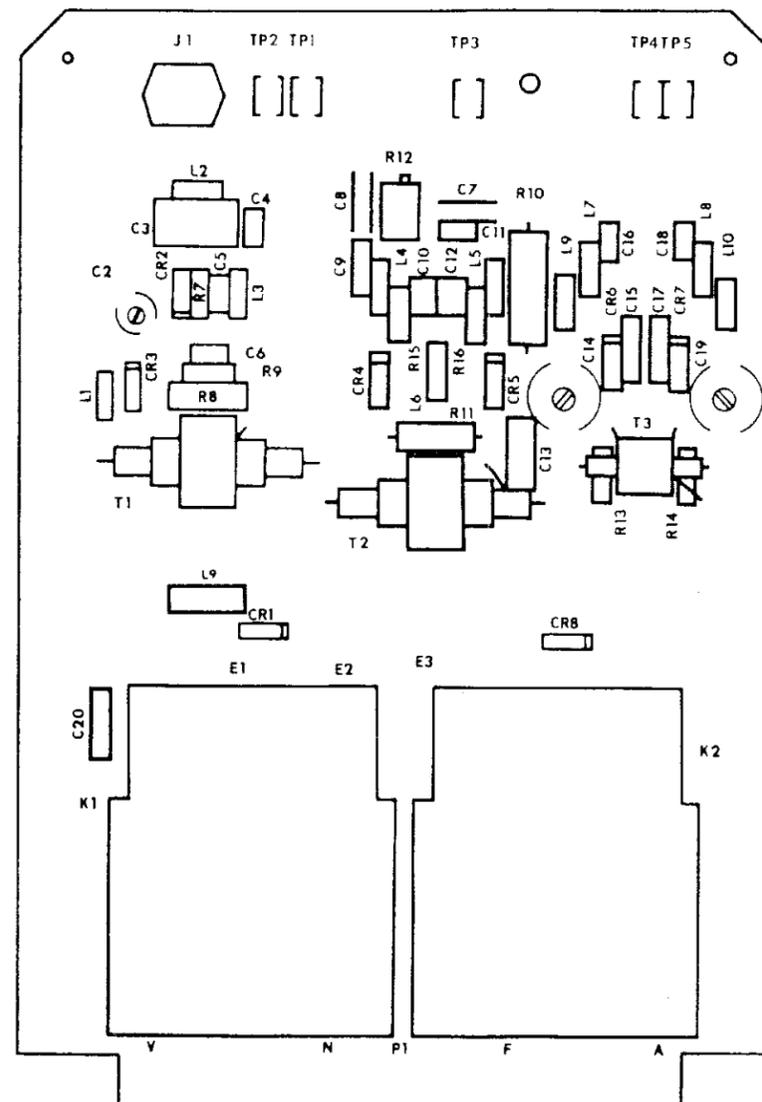
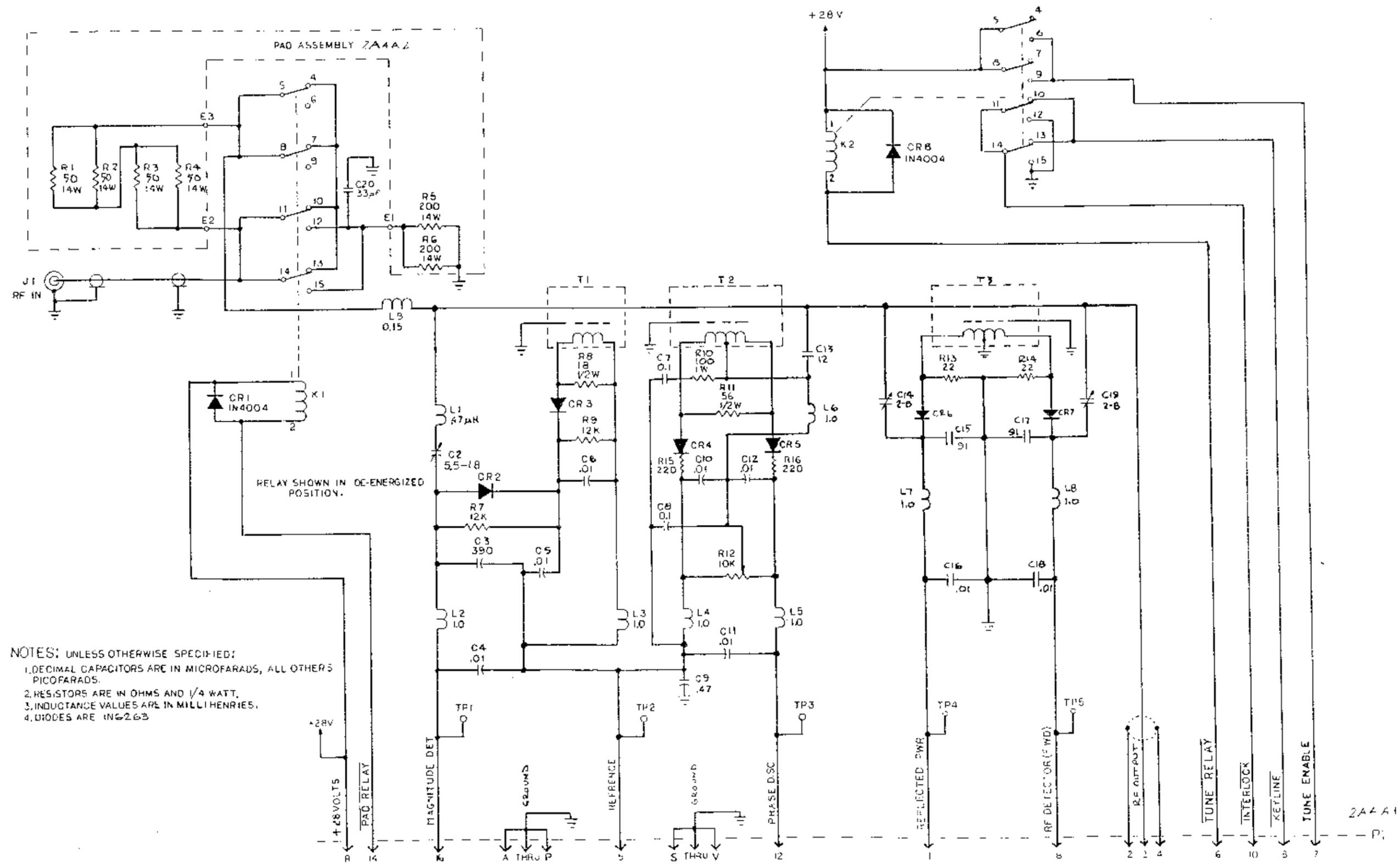
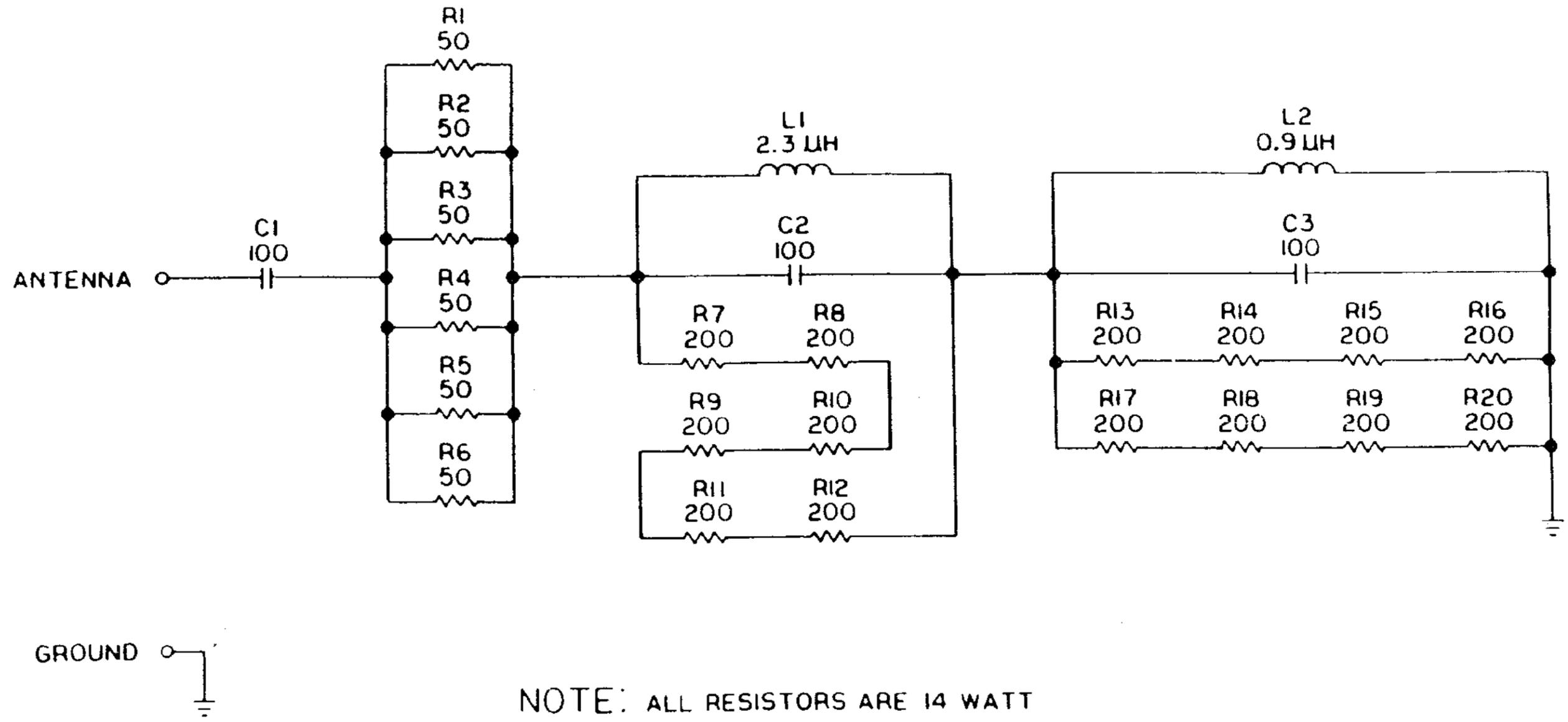


Figure 5.17 Detector Board Assembly 2A4A1, page 1 of 2.



NOTES: UNLESS OTHERWISE SPECIFIED:  
 1. DECIMAL CAPACITORS ARE IN MICROFARADS, ALL OTHERS PICOFARADS.  
 2. RESISTORS ARE IN OHMS AND 1/4 WATT.  
 3. INDUCTANCE VALUES ARE IN MILLIHENRIES.  
 4. DIODES ARE 1N4004

Figure 5.17 Detector Board Assembly 2A4A1, page 2 of 2.



NOTE: ALL RESISTORS ARE 14 WATT  
ALL CAPACITORS ARE IN PICO FARADS

Figure 5.18 TS-100 Antenna Simulator Schematic.

Appendix A  
Alternate Enclosure

A.1 GENERAL

There are two enclosures available for the CU-9125: The Cast Case shown in Section II and the Aluminum Welded version described here.

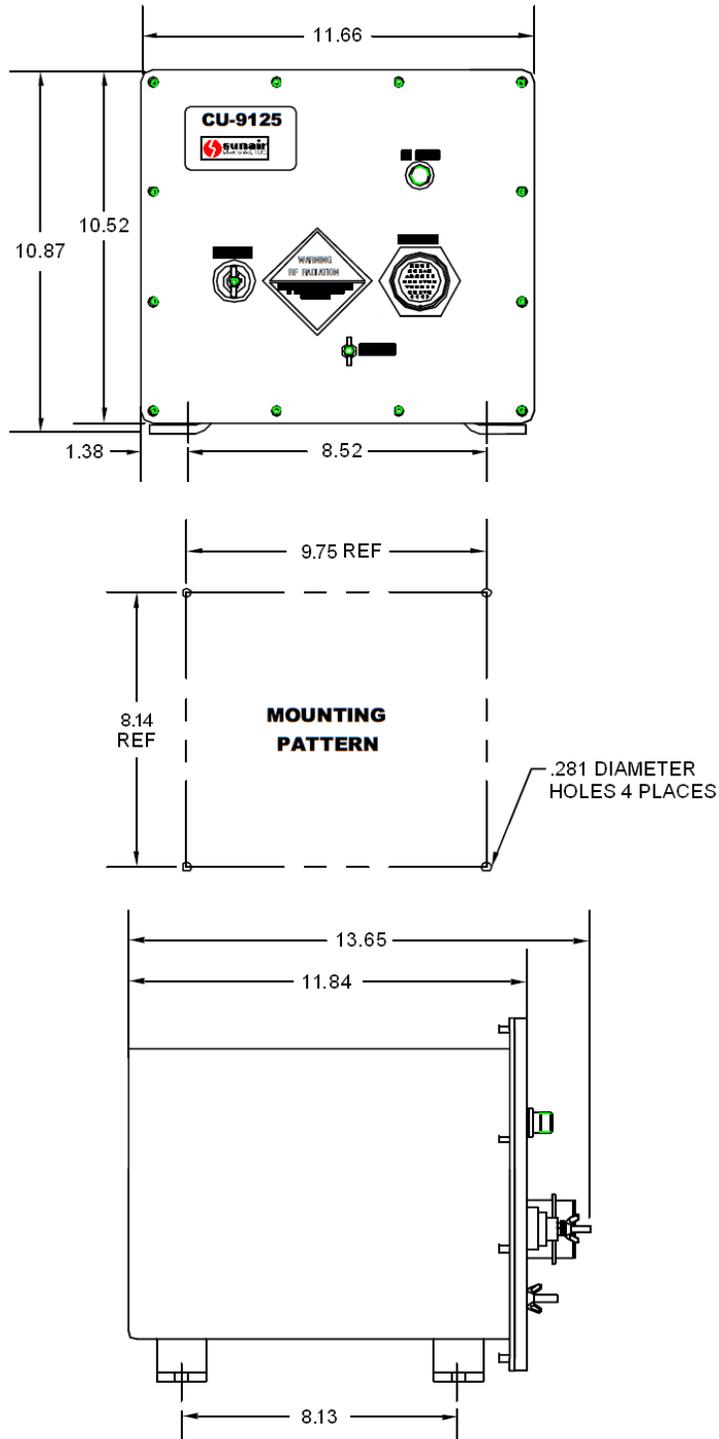


Figure A.1 Alternate Enclosure (Figure 1 of 2)

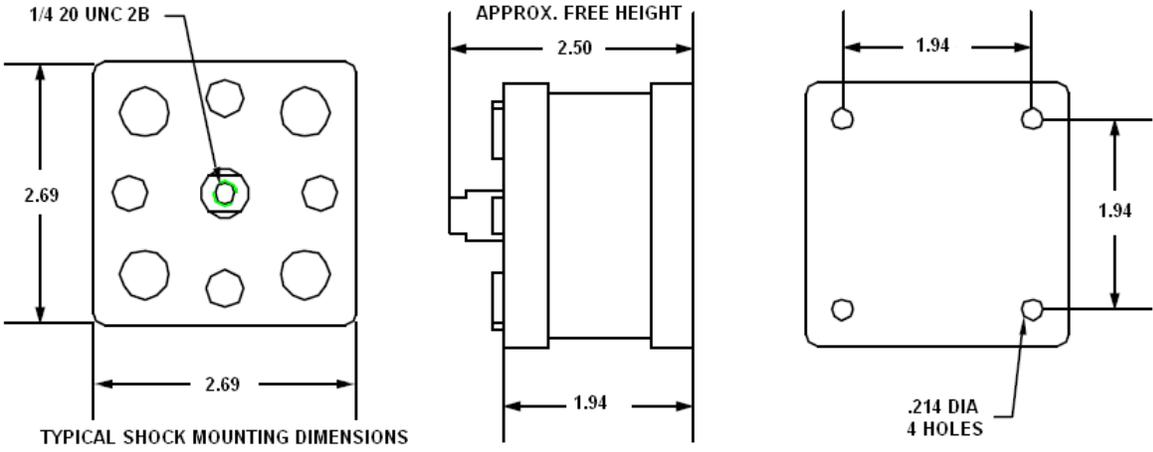
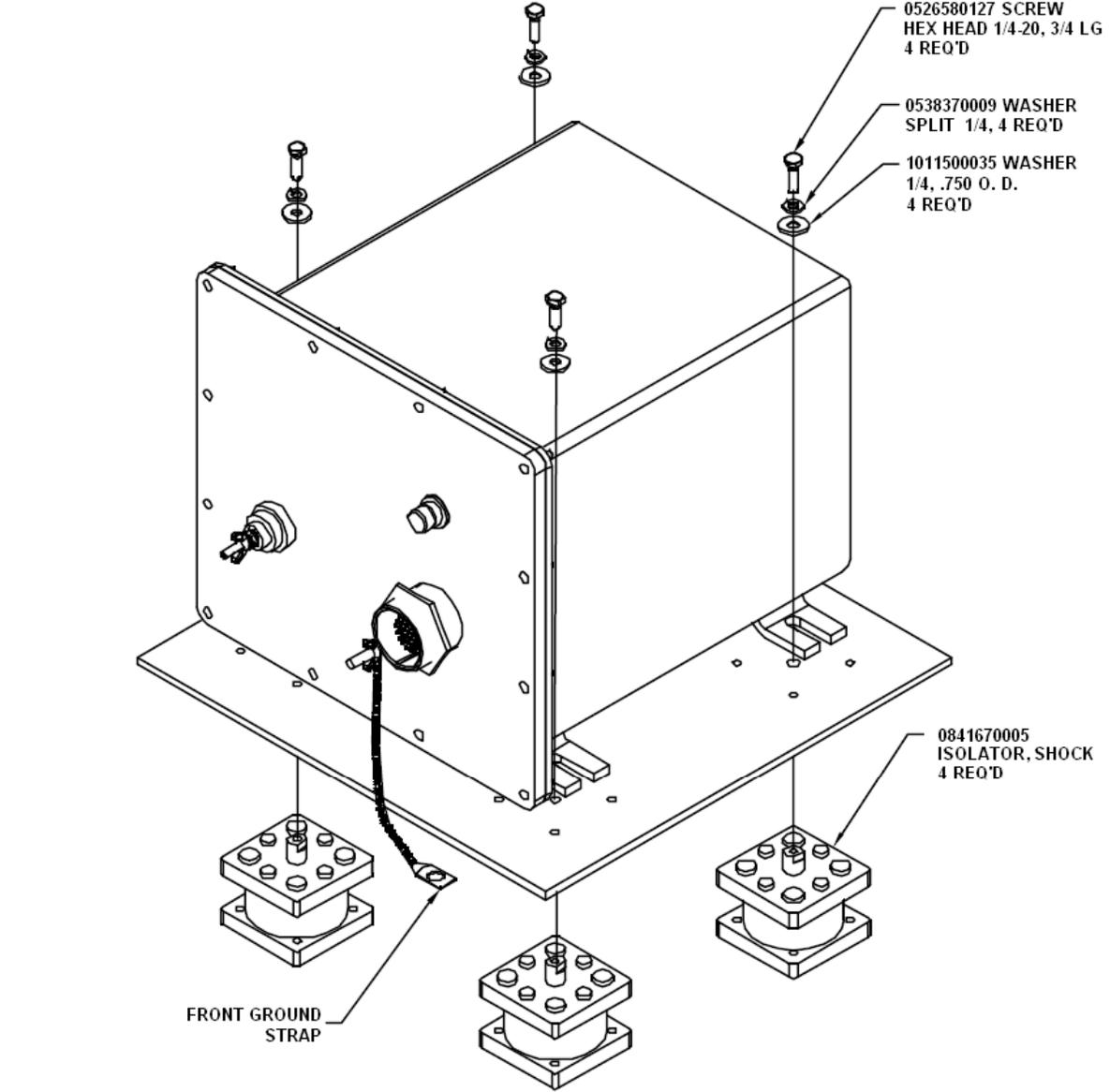


Figure A.1 Alternate Enclosure (Figure 2 of 2)