TM-8104000501

DIGITAL AUTOMATIC
1 KW
ANTENNA COUPLER

CU-9100

OPERATION and MAINTENANCE MANUAL

SUNAIR 3101 SW Third Avenue, Ft. Lauderdale, FL 33315-3389

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GROUND AND MARINE PRODUCTS

Sunair Electronics warrants equipment manufactured by it to be free from defects in material or workmanship, under normal use for the lesser of one (1) year from the date of installation or 15 months from date of shipment by Sunair.

Sunair will repair or replace, at its option, any defective equipment or component of the equipment returned to it at its factory, transportation prepaid, within such warranty period. No reimbursement will be made for non-factory repair charges.

This warranty is void if equipment is modified or repaired without authorization, subjected to misuse, abuse, accident, water damage or other neglect, or has its serial number defaced or removed.

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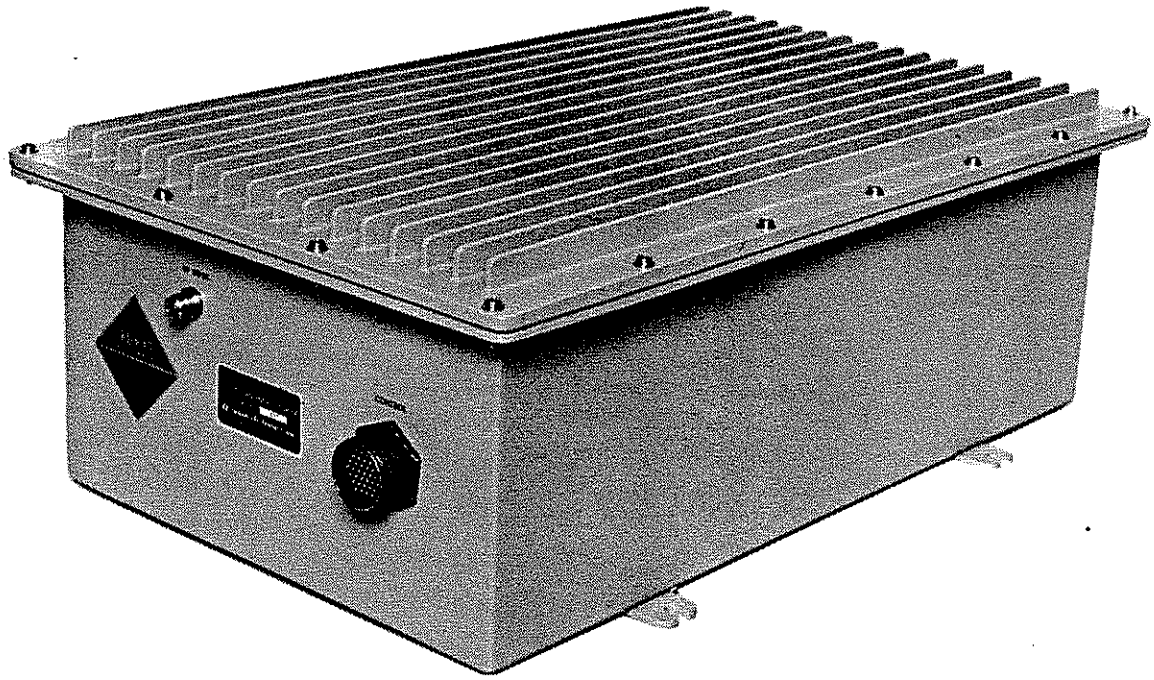
Sunair reserves the right to make changes in design or additions to or improvements in its equipment without obligation to install such additions or improvements in equipment theretofore manufactured.

sunair electronics, inc.

SUNAIR

CU-9100

DIGITAL AUTOMATIC 1 KW ANTENNA COUPLER



OPERATION AND MAINTENANCE MANUAL

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PRODUCT SERVICE:

In case of difficulty please contact the Sunair Product Service Department, between the hours of 8:00 AM and 5:00 PM or write to:

Product Service Dept.
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3101 SW Third Avenue
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Telephone: (305) 525-1505

Fax: (305) 765-1322

TRAINING:

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

TABLE of CONTENTS

LISTING of TABLES

SECTION I

GENERAL INFORMATION

1.1 SCOPE

This manual contains information necessary to install, operate, maintain and repair the CU-9100 1 KW Automatic Digital Antenna Coupler.

1.2 DESCRIPTION

The CU-9100 is a 1000 watt high quality remotely controlled antenna coupler, capable of providing efficient matching of antennas 35 feet and longer to a 50 ohm transmission line, 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 unit is designed as a companion to the Sunair LPA-9600 1 KW Solid State Linear Amplifier.

The CU-9100 is designed to operate at separations of up to 250 feet from the transceiver. The coupler control is located on the front panels of Sunair 9000 Series Exciters/Transceivers. Manual tuning cycles are initiated by depressing the 'CPLR TUNE' pushbutton on 9000 Series front panel. Tuning status 'CPLR TUNE' pushbutton and a meter for indicating forward and reflected power are located on the 9000 Series front panel. During a tuning cycle, the linear power amplifier is disabled and tune power (25 watts) is supplied by the exciter/transceiver. The operating power and commands to the coupler are also supplied by the exciter/transceiver alone. The coupler may be used directly with a 125 watt exciter/transceiver if low power operation is desired or the linear amplifier is off-line.

The CU-9100 case is sturdy, fully gasketed and meets all environmental requirements for exposed locations.

1.2.1 ASSEMBLIES

1.2.1.1 INPUT CONNECTOR ASSEMBLY A1

The Input Connector Assembly A1 provides the required mounting surface for the various electrical and mechanical components. It serves as interconnect for signals to and from the CU-9100, the exciter/ transceiver and the LPA-9600 kilowatt linear power amplifier.

1.2.1.2 COMPUTER BOARD A2

The Computer Board A2 contains the microprocessor responsible for the operations and functions of the CU-9100.

1.2.1.3 DETECTOR/RELAY PAD ASSEMBLY A3

The Detector Board A3A1 contains the magnitude, phase and VSWR detectors. The Pad Board A3A2, is mounted onto the Detector Board and protects the transmitter from impedance variations during the tuning cycle.

1.2.1.4 CAPACITOR BOARD A4

The Capacitor Board A4 contains the 11 binary variable capacitor elements of the antenna matching network.

1.2.1.5 RELAY BOARD A5

The Relay Board A5 is the interconnect board between the Computer Board A2 and the 28 latching relays, that place in or out of the antenna matching network, the binary variable inductor and capacitor elements.

1.2.1.6 COIL AND CAPACITOR ASSEMBLY A6

The Coil and Capacitor Assembly contains the binary variable 14 inductor and 4 capacitor elements of the antenna matching network.

1.3 SPECIFICATIONS

1.3.1 GENERAL

FREQUENCY RANGE: 1.6000 to 29.9999 MHz

TUNING CAPABILITIES: Antennas 35 feet and longer, suitable as a line flattener

RF INPUT POWER: Up to 1200 Watts PEP and Average

INPUT IMPEDANCE: 50 ohms, non-reactive

DUTY CYCLE: Continuous (above 2 MHz)

TUNING TIME: 1 second typical; 10 ms from memory. Channel Memory, 128 channels

TUNE POWER REQUIRED: 25 W RF delivered

TUNE ACCURACY: 1.5:1 VSWR or better

REMOTE CAPABILITY: Up to 250 ft. from exciter/transceiver

POWER INPUT: 28 VDC supplied from exciter/transceiver

WEIGHT: 45 lbs (20.4 kgs)

SIZE: (CM) 73.15L X 45.47W X 24.38H
(Inches) 28.8L X 17.9W X 9.6H = 4948.99 a^{11}

MTTR: 15 minutes

MTBF: 12,000 hours

1.3.2 ENVIRONMENTAL

TEMPERATURE: Operating: -50°C to +65°C
Storage: -55°C to +85°C

HUMIDITY: MIL-STD-810C, Method 507.1 Proc II

SHOCK AND VIBRATION: MIL-STD-810C, Method 516.2 and 514.2

ENCLOSURE: MIL-STD-810C, Method 510.1, waterproof

1.4 EQUIPMENT SUPPLIED

	SUNAIR PART NUMBER
CU-9100 Automatic Digital Antenna Coupler	8104000055 Gray 8104000098 Green
Connector Kit	8092000298
Consisting of:	
Bushing, Telescoping, .561D	0700550054
Bushing, Telescoping, .621D	0700550062
Bushing, Telescoping, .751D	0700550071
Connector, Power, 37 Pin Round	0747640009
Connector, RF, N Ug-21B/U	0754140008
Operation and Maintenance Manual	8104000501

1.5 EQUIPMENT REQUIRED - NOT SUPPLIED

	SUNAIR PART NUMBER
Control Cable Assembly	8092500096
Order by length desired. Contains:	
Connector Kit,	8092000298
cable,	0588680001
LPA-9600 mating connector and hardware.	

1.6 OPTIONAL EQUIPMENT - NOT SUPPLIED

	SUNAIR PART NUMBER
Linear Amplifier/Exciter/Transceiver	Consult Sunair Marketing Department.
Service Kit, contains PC Assy Card Extenders and test EPROM	8092907595
Depot Spares Kit	8092900094
Field Module Kit	8092905797
35 Foot Fiberglass Antenna	0715850008
Feed-Thru, Antenna Mount, 1 kW	1004890001

	SUNAIR PART NUMBER
KW Longwire Antenna Kit	1003090010
Control Cable Assembly Used to connect coupler directly to exciter/transceiver *	8076004195

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:

a) Order Number
b) Model and Serial Number
c) Name of Transportation Agency
d) 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-9100 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: 305-525-1505, TELEX: 51-4443, CABLE: SUNAIR, FAX: 305-765-1322.

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 separately, using suitable cushioning material. Shipment to be made prepaid consigned to:

Sunair Electronics, Inc.
Product Services Department
3101 SW Third Avenue
Ft. Lauderdale, Florida 33315-3389
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-9100 1 KW Automatic Digital Coupler is supplied from a companion exciter/transceiver via the control cable. See Figure 2.1 for control cable connections.

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/amplifier/coupler/antenna locations, observing the following requirements before starting installation.

2. Provide best possible RF ground for all equipment. Use flat copper strap 1" wide or #6 (or larger) wire and make connections to the ground terminal of all system components. Leads to ground system should be as short as possible.

After the system grounds have been installed, connect the station ground system to the antenna coupler ground terminal. Bear in mind that the antenna ground lead is actually part of the antenna itself, and therefore will have a marked effect on the antenna input impedance. If a 35 foot vertical antenna is to be used, at least 12 separate 35 foot radials connected to a common ground stake, are recommended.

3. Provide the maximum separation between coupler/antenna and the radio with its associated wiring. 100 feet is the recommended minimum distance and up to 250 feet separation may be used.

4. The antenna lead from the antenna coupler RF output insulator must be insulated for at least 15 kV potential. As an alternative, copper tubing with an outside diameter of at least 1/4" may be used, provided that it is routed to the antenna terminal so that it is spaced at least six inches from any metal objects in its vicinity. It is important to keep the length of this lead to an absolute minimum since it forms a part of the radiating portion of the antenna. Three (3) feet would be the maximum distance if antenna efficiency is not to be compromised.

5. Linear amplifiers with low level modulation such as used in Sunair exciters/transceivers will sometimes oscillate if the high RF power level 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 transmitter and/or inadequate RF grounds. Carefully following the above procedures will prevent this from occurring.

2.5.2 MOUNTING CONSIDERATIONS

See Figure 2.2 for coupler outline dimensions.

The mounting position for the CU-9100 is dependent on the available space for mounting. Four mounting feet with 3/8" wide slots are provided on the coupler. If it is necessary to mount the coupler on a wooden pole, simple angle-iron adapter brackets may easily be fabricated. Since the total weight of the unit is only 45 pounds, two wooden 4 x 4's set in cement would provide dependable support.

2.5.3 INSTALLATION OF REMOTE CONTROL AND RF CABLES

It is recommended that the remote control cable be procured from Sunair. However, if necessary, the cable may be made from individual No. 20 AWG stranded wire with an overall braided shield and PVC jacket. Interconnection cable details are given in Figure 2.1.

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-9100 1 KW Automatic Digital Antenna Coupler alone or with the LPA-9600 Linear Amplifier, the system will match antennas 35 feet and longer. The CU-9100 is placed close to the antenna (within 3 feet or less) 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; however, some general DO's 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) 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 2.3)

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

2.6.2 RANDOM LENGTH NON-RESONANT ANTENNAS

Refer to Figures 2.3, 2.4, and/or 2.5 as needed.

Whips and longwires are popular non-resonant antennas. The whip antenna 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. Thirty-five foot whip antennas offer a good compromise between practical height and good electrical performance at low frequencies. 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 ¼ wave long at the lowest operating frequency. (Radial length in feet = 246/frequency in MHz). The whip's radiation pattern is omni-directional in the azimuthal plane.

The longwire antenna, illustrated in Figure 2.5, 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-9100 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.

2.7 CHECKS AFTER INSTALLATION

Follow steps outlined in Section 3.2 for your particular system configuration.

WARNING HIGH VOLTAGE

The radio operator and service technician should exercise caution not to contact the output of insulator E2 while transmitting.

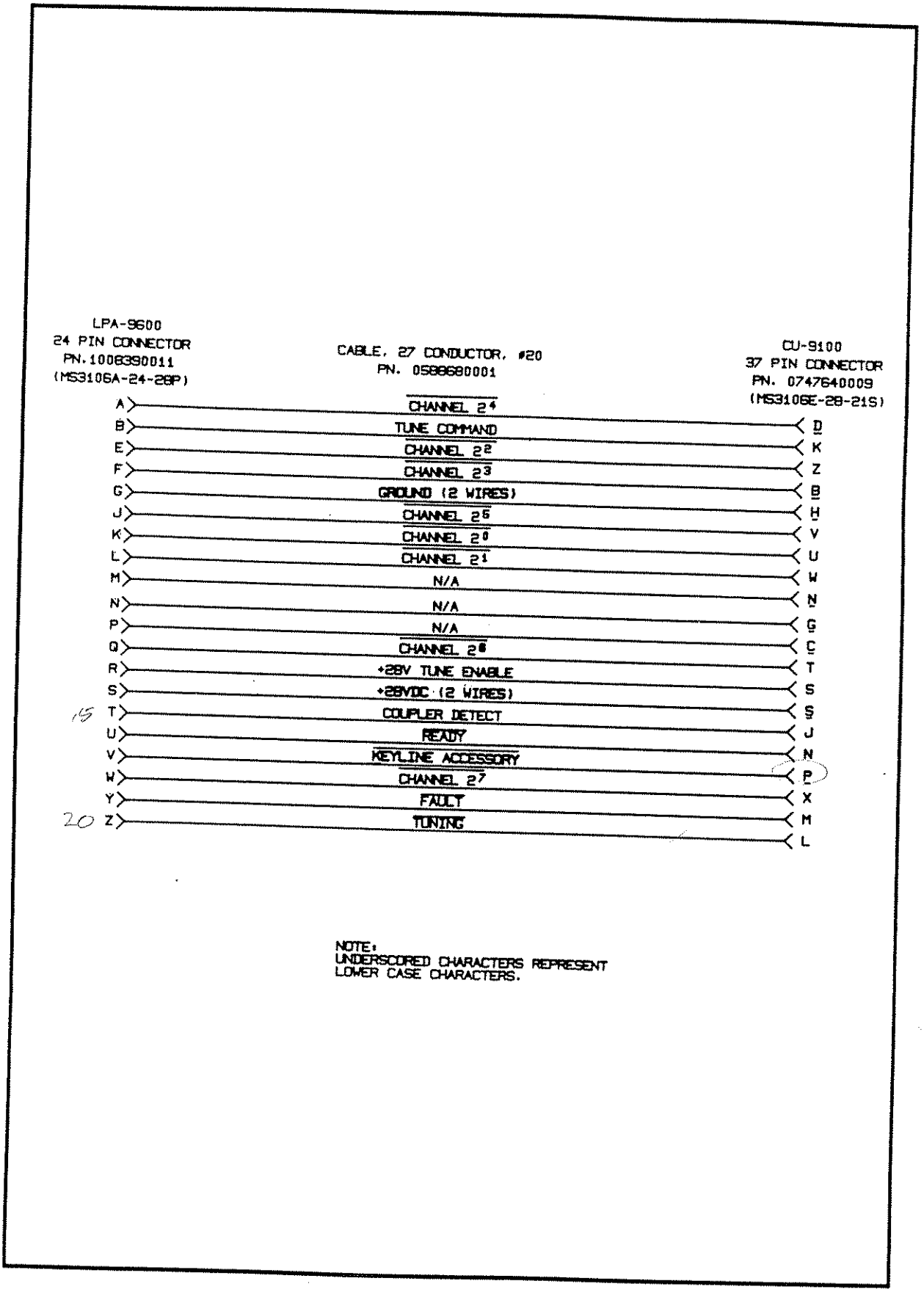

Figure 2.1 CU-9100 Control Cable P/N 8092500096.

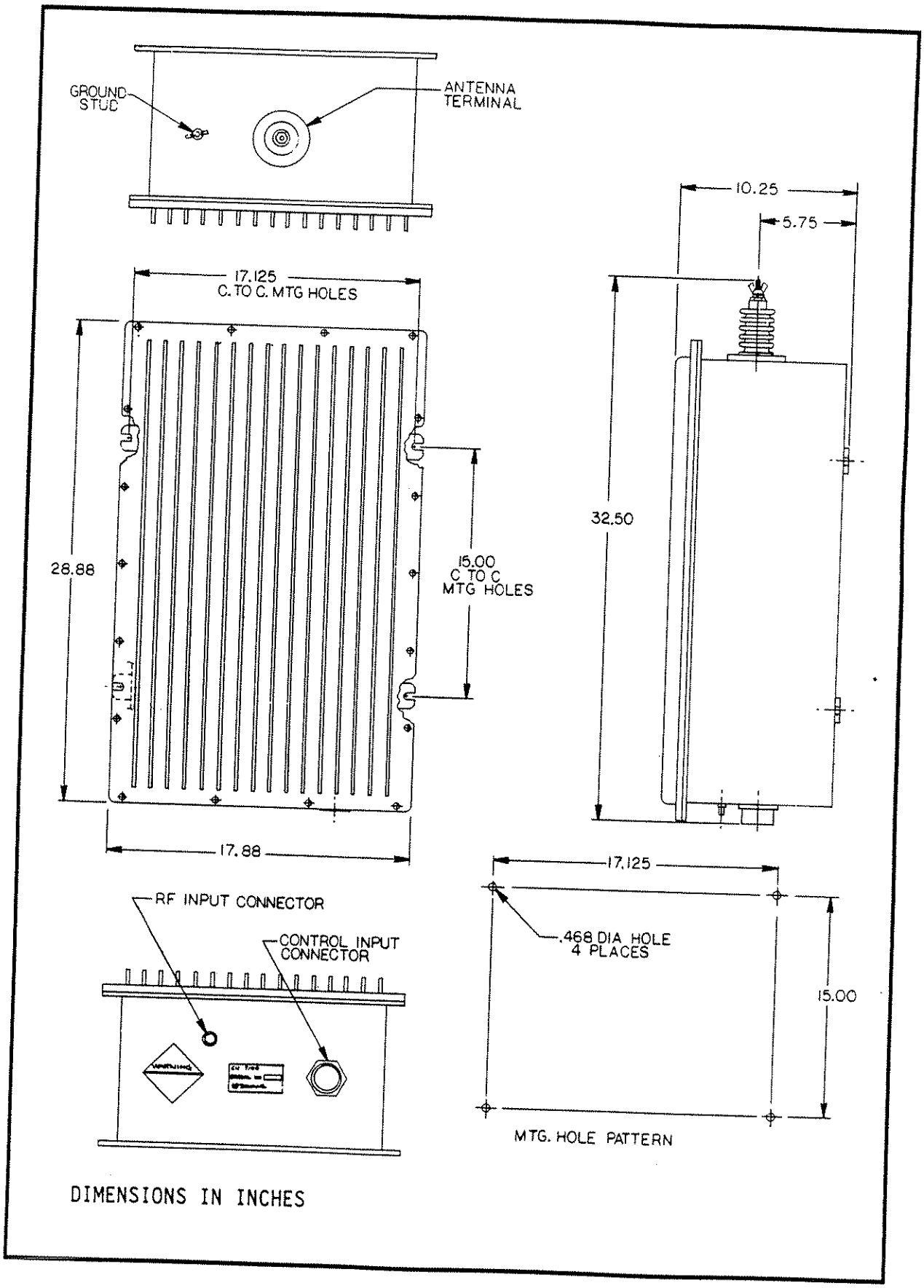

Figure 2.2 Coupler Outline Dimensions.

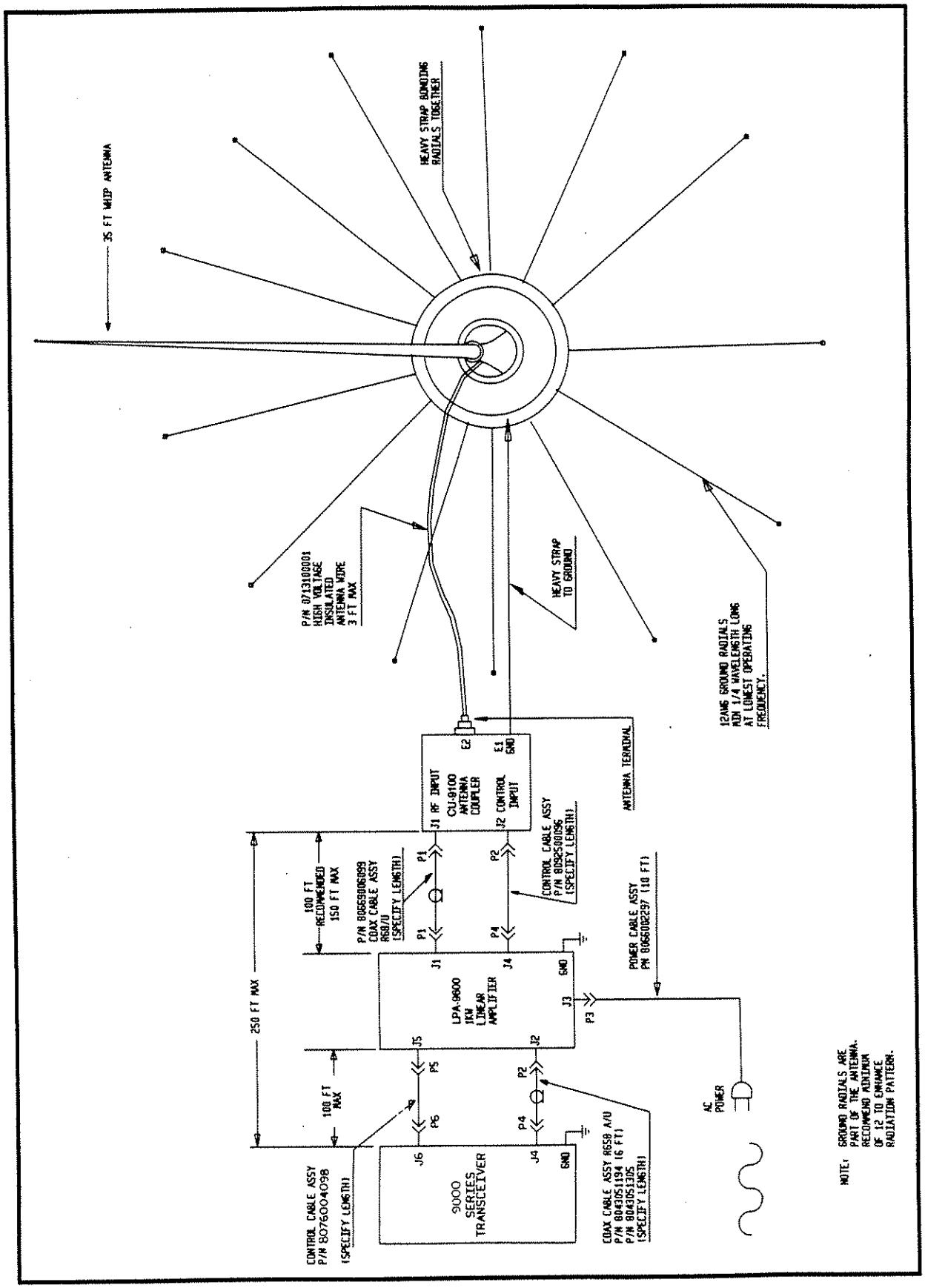

Figure 2.3 LPA-9600 W/CU-9100, 35 Ft Antenna.

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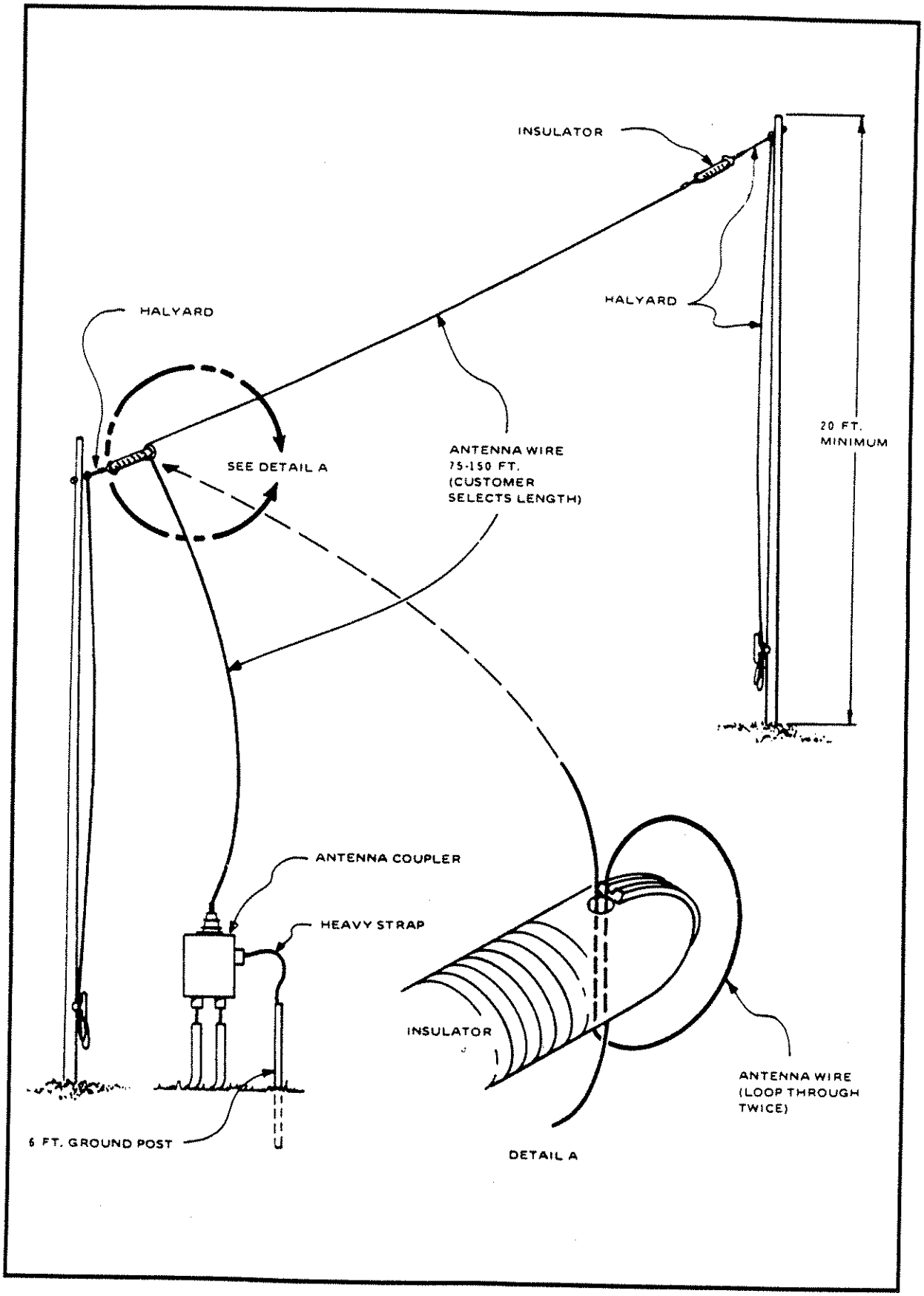

Figure 2.5 KW Longwire Antenna Kit.

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SECTION III

OPERATION

3.1 GENERAL

The CU-9100 Automatic Digital Antenna Coupler operates as a 'slave' unit to the LPA-9600 1 KW Solid State Linear Power Amplifier or to 9000 Series Exciters/Transceivers. Refer to the LPA-9600 manual and/or the applicable exciter/transceiver manual for operational considerations peculiar to the individual unit.

3.2 OPERATING THE CU-9100

3.2.1 OPERATION WITH 9000 SERIES EXCITERS/TRANSCEIVERS

Insure that the exciter/transceiver, LPA-9600 and CU-9100 are installed properly. Refer to Section II of the applicable manuals.

a) Apply power to the exciter/transceiver and LPA-9600.

b) On the LPA-9600, the green POWER lamp will light and the LCD will display system message:

	FAULT:	COUPLER UNTUNED,
	METER:	FWD,
and	PWR LVL:	1 KW.

c) Select desired operating frequency on exciter/transceiver.

d) Depress the 'CPLR TUNE' pushbutton on the Transceiver Front panel.

e) On the LPA-9600, the following system messages will be displayed: 'COUPLER TUNING', 'COUPLER TUNED', 'KW SYSTEM OPERATIONAL'.

f) Tuning will be accomplished in typically 1 to 2 seconds.

g) If during a tune attempt, the red FAULT lamp of the LPA-9600 lights, the CU-9100 has not tuned. Depress the 'CPLR TUNE' pushbutton again and allow the system to retune. If FAULT does not clear, see Section V of this manual and the exciter/transceiver manual.

3.2.2 1000 WATT OPERATIONAL CHECK OUT

a) Select CW 'MODE' and frequency 29.9900 MHz. Depress 'CPLR TUNE' pushbutton and observe a "SYSTEM READY" condition.

b) Key RT-9000 with CW key switch and check forward and reflected power on LPA-9600 front panel meter. An acceptable tune should show 700 to 1000 watts and 28 to 40 reflected maximum. See Chart below:

FORWARD WATTS	REFLECTED WATTS MAXIMUM
700	28
800	32
900	36
1000	40

Acceptable Reflected Power Chart for VSWR 1.5:1.

c) Continue tuning through the HF Spectrum from 29.99 to 1.6 MHz in 1 MHz steps and check for an acceptable tune at each frequency. If problems occur, go to Section V Table 5.1 Fault Analysis to determine correction of problem.

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

The CU-9100 is a fully automatic digital antenna coupler designed for use with the LPA-9600 1 KW Solid State Linear Power Amplifier, Sunair 9000 Series Exciters/Transceivers. The coupler is rated for 1200 W PEP or average power, and will 'tune' all common vehicular and ground based antenna systems from 35´ vertical to 50´ to 150´ longwires. The command to tune is generated by the exciter/transceiver. (See Section III for Operation details.)

A 128 channel non-volatile memory is provided within the coupler for use with transceivers providing channel information to the coupler.

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'. Additional capacitance is provided at the output of the network to allow tuning of inductive antennas. A block diagram of the CU-9100 is shown in Figure 4.1.

The input capacitor bank, located on the Capacitor Board A4 (Figure 5.16) consists of C1 through C11, and provides binary stepped values from 0 to 10571 pf. The series inductor bank, located on the Coil and Capacitor Assembly A6 (Figure 5.18) consisting of L1 through L14 and C12, provides binary stepped values from 0 to 51.196 μh. C12 is used at the higher frequencies to cancel out the coupler stray inductance. The output capacitor bank, consisting of C13, C14 and C15, provides binary stepped values from 75 through 575 pf.

4.3 DETECTOR/RELAY PAD ASSEMBLY A3

Refer to Figures 4.1 and 5.15 as needed.

4.3.1 GENERAL

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

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 the +5 VDC reference is produced. A voltage sample is provided from the transmission line by C1, C2 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 U41B on the Computer Board

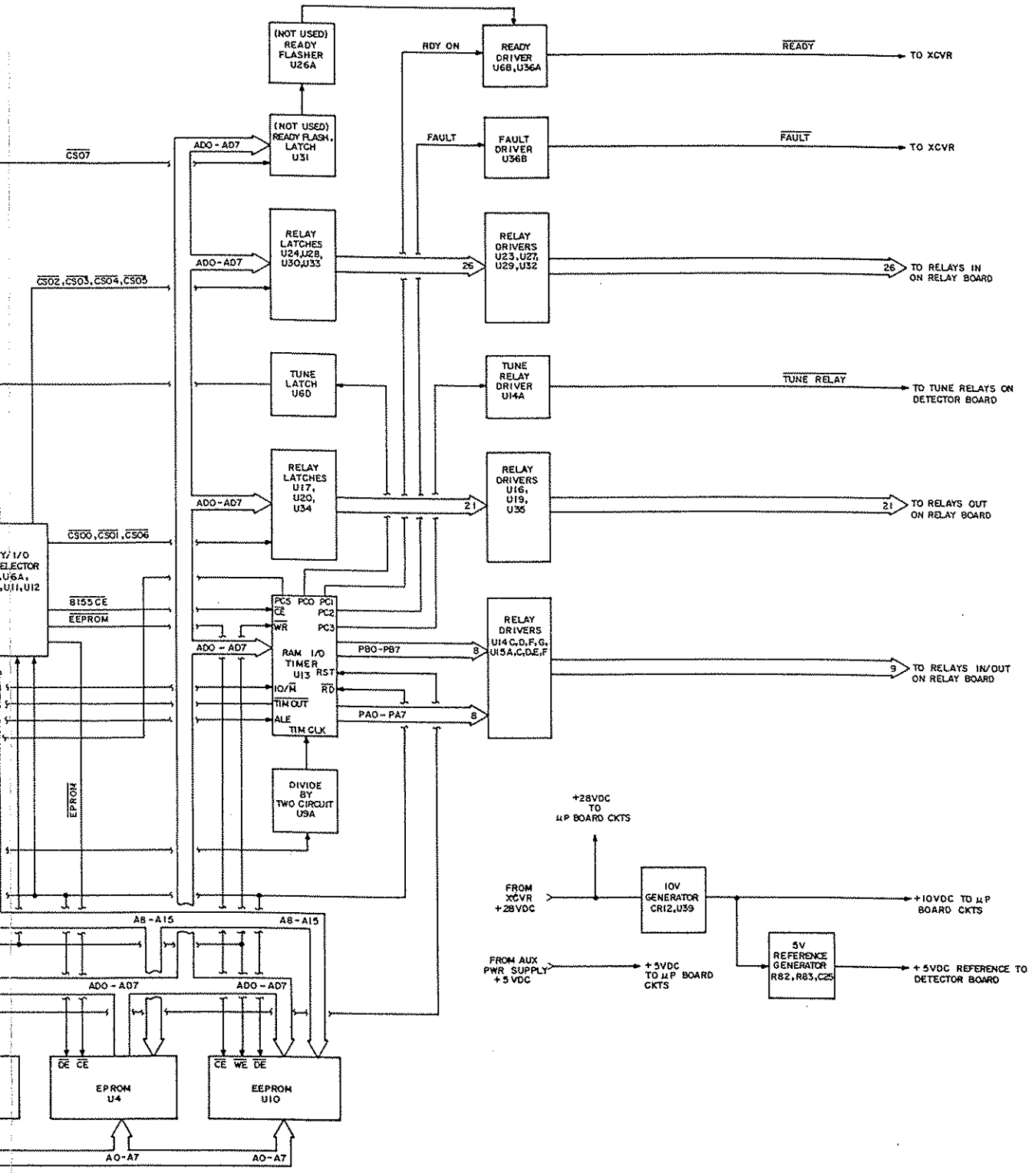

Figure 4.2 Computer Board A2 Block Diagram.

The forward power voltage sample from C25, C26 is combined with the current sample from T4 at CR9 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 two functions: (1) to tell the microprocessor when High power RF energy is present, and (2) to provide a reference against which the reflected power is compared for the detection of Operating Voltage Standing Wave Ratio (VSWR). The Operating VSWR is used as an indication of the quality of the operating Forward Power and is acceptable for values 1.5:1, or better. If the Operating VSWR exceeds 1.5:1 and the transmitter is keyed, the VSWR Fault Interrupt Generator circuit on Computer Board A2 will output a High. This High awakens U1, permitting it to initiate "COUPLER FAULT" to be displayed on 9000 and LPA-9600 front panels.

4.3.6 3 DB ATTENUATOR PAD ASSEMBLY

The 3 db attenuator consists of R1 through R6. It is switched between the coupler tuning network and the transmitter whenever the tune relays K1 and K2 are energized, and the transmitter is keyed. The pad provides protection for the transmitter by limiting the impedance variations placed on the transmitter 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 A3A2, resistors R1 through R6, plugs into the Detector Board A3A1 to make up the Detector/Pad Assembly A3.

4.3.7 TUNE RELAYS

The tune relays K1, K2 and K3, are energized and CR13 (Green LED) is lit by the microprocessor following receipt of a tune command from the transceiver. Keyline relay K4 is energized and CR14 (Green LED) is lit by the microprocessor. K3 supplies a +28 V TUNE ENABLE signal to the transceiver. This TUNE ENABLE signal is used in the RT-9000 Transceiver to supply AM carrier for coupler tuning. When the tune cycle has been terminated, the tune and keyline relays are deenergized, allowing normal operation through the deenergized contacts of K4.

4.3.8 FAN RELAY

The Fan Relay K5 is energized by $\overline{\text{FAN CONT}}$ from Computer Board Fan Control and Fan Relay Driver Circuits. This Low will be sent to the A3 Assembly after the transmitter has been keyed for approximately 3 seconds in OPERATE MODE. K5 is energized by this Low, sending +28 VDC to Fan 1 and 2 to force air through the inductors on Assembly A6 to dissipate the heat generated in the inductors.

4.4 CHASSIS ASSEMBLY

The Chassis Assembly contains the Input Connector Assembly A1, Detector/Relay Pad Assembly A3, Computer Board A2, Capacitor Board A4, Relay Board A5 and Coil and Capacitor Assembly A6.

4.4.1 INPUT CONNECTOR ASSEMBLY A1

Refer to Figure 5.13.

In Input Connector Assembly serves as the interconnection between the LPA-9600/9000 Series Radios, the Detector/Relay Pad Assembly A3, and the Computer Board A2. The +28 VDC used throughout the CU-9100 comes from the 9000 Series Radios through the interconnecting control cable to the A1 Assembly. It routes the +28 VDC to the Detector/Relay Pad Assembly A3 for relays K1 through K5 and DC Fans 1 and 2. It also sends the +28 VDC through a 'SOFT START' circuit composed of Q2, K1 and associated circuitry to Computer Board A2. On the A1 Assembly, +28 VDC is applied to U2, the primary +5 VDC regulator supplying power to the Computer Board A2. U2 is mounted on the sheet metal chassis of the A1 assembly for heatsinking. A +28 VDC TUNE voltage is switched ON and OFF by U1, Q3, Q4 and associated circuitry and sent through Computer Board A2 to Relay Board A5 latching relays K1 thru K28, allowing the capacitors and inductors to be latched IN or OUT to match the antenna.

Example of +28 VDC TUNE ON: During TUNE operation the $\overline{\text{READY}}$ and $\overline{\text{FAULT}}$ lines on the A1 Assembly are High causing a High to be placed on AND gate U1A pins 1 and 2. U1A outputs a High on pin 3 causing transistor Q3 to conduct, in turn causing Q4 to conduct. Q4 is also mounted on the sheet metal chassis for heatsinking. Q4's conduction switches on the +28 VDC TUNE and sends it to relays K1 thru K28 on Relay Board A5, allowing Computer Board A2 to latch IN or OUT the capacitor and inductor elements on Capacitor Board A4 and Coil and Capacitor Assembly A6.

Transistor Q1 and associated circuitry are used to ground the $\overline{\text{TUNE}}$ line during a coupler tune sequence.

4.4.2 RELAY ASSEMBLY A5

Refer to Figure 5.17.

The Relay Assembly consists of printed circuit board A5 and chassis sheet metal. The A5 Board is an interface between the Computer Board A2 and the latching relays K1 thru K28 that place into operation the variable elements in the antenna matching network. The latching relays are high speed, where IN or OUT transitions are made in approximately six (6) milliseconds. These relays are High Voltage, SPST, Latching Contact, that plug into the A5 Board.

4.5 COMPUTER BOARD ASSEMBLY A2

Refer to Figures 4.2 and 5.14.

4.5.1 GENERAL

The Computer Board A2 combines the analog interface circuitry used to process the Detector/Relay Pad Assembly A3 outputs for use by microprocessor U1, and within the microprocessor board circuitry. The analog circuits consist of integrated circuits U8, U37, U39, U41, U42, U45, Q3, Q4, Q5 and their associated circuitry.

4.5.2 PHASE COMPARATOR INTERFACE

The phase comparator interface consists of U41A, U42A, U42B, U45C and U45D. The phase discriminator output from the A3 Assembly is compared with the +5 VDC reference voltage for magnitude and polarity in U41A. Potentiometers R44 and R65 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 comparator output is positive, U41A output is positive, U42B output is positive, and U45C output is negative (ground), so a Low signal is sent to U44, INPUT BUFFER, on the $\overline{\text{PHASE}}$ $> +20°$ line. Similarly, if the phase is negative and less than 20 degrees, an output from U41A, U42A, and

U45D sends a Low signal to U44 on the $\overline{\text{PHASE} < -20^\circ}$ line. Comparators U42A and U42B are used in conjunction with Schmitt triggers U45C and U45D 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°, 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".

4.5.3 MAGNITUDE COMPARATOR INTERFACE

The magnitude comparator interface consists of U41B, U42C, U42D, U45E and U45F. The discriminator output from the A3 Assembly is compared with the +5 VDC reference for magnitude and polarity, in U41B. Potentiometers R54 and R68 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 comparator output is negative, U41B output is negative, U42D output is positive and U45F output is negative, giving a Low on the $\overline{\text{MAG} > 60 \text{ ohm}}$ line to U44. The unaffected comparator, U42C in this case, provides a Low output to U45E which in turn supplies a High to the $\overline{\text{MAG} < 40 \text{ ohm}}$ line. This way, only one output at a time may be Low, but both may be High, indicating to U44 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 U45E to the $\overline{\text{MAG} < 40 \text{ ohm}}$ line to U44.

4.5.4 RF PRESENT DETECTOR

AND gate U8C provides a Low $\overline{\text{RF PRESENT}}$ to U44 which places the information on the BUSS to be used by microprocessor U1, whenever RF power (FWD HI or FWD TUNE) is present at the input to the coupler. Q4 is turned on by a DC voltage from HI Power Forward RF Power Detector on the Detector/Pad Assembly A3, placing a Low on pin 9 of U8C making its output, pin 8, go Low ($\overline{\text{RF PRESENT}}$). Q5 is turned on by a DC voltage from TUNE Power Forward RF Power Detector on the A3 assembly, placing a low on pin 10 of U8C making its output pin 8 go Low ($\overline{\text{RF PRESENT}}$).

4.5.5 OPERATING VSWR FAULT DETECTOR

Comparator U37C compares the relative magnitude of the Forward and Reflected HI power detectors to detect excessive VSWR. Potentiometer R31 is adjusted to make this occur whenever the VSWR exceeds 1.5:1. Diode CR8 provides a reference to keep the $\overline{\text{OPERATING VSWR FAULT}}$ line High between transmit speech pauses, to prevent VSWR faults during voice modulation. Hot carrier diodes CR6 and CR7 isolate the forward and reflected HI power detector on the Detector/Relay Pad Assembly A3 from voltages generated by U37C circuitry.

4.5.6 TUNING VSWR FAULT DETECTOR

Comparator U37D compares the relative magnitude of the Forward and Reflected TUNE power detectors to detect excessive VSWR. Potentiometer R40 is adjusted to make this occur whenever the VSWR exceeds 1.5:1. Diode CR11 provides a reference to keep the $\overline{\text{TUNING VSWR FAULT}}$ line High during HI power operation. Hot carrier diodes CR9 and CR10 isolate the forward and reflected TUNE power detectors on the Detector/Relay Pad Assembly A3 from voltages generated by U37D circuitry.

U37D, U45B provides a Low to U44 when VSWR exceeds 1.5:1. U13 will see this on the DATA BUSS from U44 and will output a High on pin 39 (FAULT). This output goes to NAND gate U36B pin 7 which outputs a Low to the $\overline{\text{FAULT}}$ line.

4.5.7 REFLECTED POWER SWITCHING CIRCUITRY

U37A and U37B are used as a current source with a voltage gain of 1 (one) to drive control panel meter proportionally to reflected power level. CR4 and CR5 are used to correct the DC offset voltage, allowing the meter to properly zero. U37A and U37B inputs are from Detector/Relay Pad Assembly A3 REFLECTED HI and REFLECTED TUNE detectors. U38 is a two channel multiplexer/demultiplexer. U38's inputs are pin 12 (AX) OPERATING REFLECTED POWER from U37A and pin 13 (AY) TUNING REFLECTED POWER from U37B. Q3 is a switch that selects U38's output. During OPERATE, U13 sends a High to the base of Q3 causing it to conduct, sending a Low to pin 11 (A) of U38. This Low causes U38 to output on pin 14 (AX) the input on pin 12 OPERATING REFLECTED POWER. In turn this is sent back to the meter on the control panel. During TUNE, U13 sends a Low to the base of Q3 causing it to cut off sending a High to A of U38. This input causes U38 to output AY input information on COUPLER REFLECTED POWER line sent back to the meter display on the front panel of the 9000 Series equipment.

4.5.8 VOLTAGE SOURCES

The +28VDC used throughout the coupler comes from the 9000 series radios through the interconnecting control cable to the INPUT CONNECTOR Assembly A1. This +28VDC is applied to CR12 a zener diode which drops the voltage to regulator U39, to minimize power dissipation in U39. U39 supplies the +10 VDC needed for the operational amplifiers and voltage comparators (U37, U38, U41, U42, U43) on the A2 board. The +28 VDC is also used on the A2 board for relay drivers U14, U15, U16, U19, U23, U27, U29, U32 and U35. On the Computer Board A2, U41A and B require plus and minus sensing. The reference "ground" is established at +5VDC through voltage divider R82 and R83 from U39's +10VDC output. This reference is also sent to the MAGNITUDE and PHASE Detectors on the A3 Assembly.

On the Input Connector Assembly A1 the +28VDC is applied to +5 volt regulator U2. This +5 VDC regulated voltage is sent to Computer Board A2 to supply +5VDC to the following IC's: U1-U13, U17, U18, U20-U22, U24-U26, U28, U30, U31, U33, U34, U36 and U44-U46.

The A1 Assembly also supplies a switched +28VDC TUNE needed for relays K1 thru K28 on Relay Board A5 allowing the capacitors and inductors to be switched IN or OUT to match the antenna.

4.5.9 TUNE COMMAND INTERRUPT GENERATOR AND KEYLINE RELAY DRIVER

Transistor Q2 is used to provide a ground to relay K4 on Detector/Relay Pad Assembly A3, energizing K4 and starting the tune cycle. A positive pulse from the transceiver called TUNE COMMAND comes into the A2 board through CR2 and turns on Q2, pulling in K4 and at the same time goes through the Tune Command Interrupt Generator U7E and F becoming TUNE START which awakens microprocessor U1. U1 then sends a positive voltage back called TUNE LATCH to the base of Q2, keeping it on and the keyline relay latched during the tune cycle. When the tune cycle is terminated, the voltage from the base is removed by U1 and Q2 no longer conducts, causing the keyline relay to deenergize. U1 goes back to sleep.

4.5.10 MICROPROCESSOR CIRCUITS

4.5.10.1 GENERAL

The microprocessor circuit portion of the Computer Board A2 is the 'brain' of the CU-9100. 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 memory. Included in this section are the microprocessor U1, the MEMORY/IO Device Selector

U5A and B, U6A, U7A, U8A, U11 and U12, the address latch U3, the EPROM U4, the RAM/IO/TIMER U13, the RELAY LATCHES U17, U20, U24, U28, U30, U33 and U34, Relay Drivers U14, U16, U19, U23, U27, U29, U35, and U36, Channel input buffer U18, U21 and U46, Input port buffer U44 and EEPROM U10.

4.5.10.2 MICROPROCESSOR U1

Microprocessor U1 controls the functions of the Computer Board A2. U1 contains three major busses. The first bus is AD0 thru AD7, a multiplexed address/data bus containing either data or address information. The second bus is A8 through A15 and always contains address information. The third bus is the control/status bus which contains signals $\overline{RD}$, $\overline{WR}$, IO/$\overline{M}$, and ALE.

When U1 wishes to obtain an instruction from EPROM U4, it produces an address on AD0 thru AD7. U1 then produces an ALE signal which latches that address into Address Latch U3 which forwards it to U4. Once the address is directed to U4, U1 then produces $\overline{RD}$ to U4 and U4 responds by giving the instruction stored at that address onto the AD0 thru AD7 line. U1 reads the instruction, then acts upon it.

When U1 requires a Device Selection mechanism to communicate with its input or output ports, it produces the address on the A8 thru A15 address lines causing that port device to become enabled. When the device is enabled, it can either read information from or write information to U1 on the AD0 thru AD7 lines.

The signals present on the control/status bus are used by U1 to transfer information. $\overline{RD}$ is used by U1 when it wishes to obtain (read) information from a device on the AD0 thru AD7 lines. $\overline{WR}$ is used by U1 when it wishes to give (write) information to a device on the AD0 thru AD7 lines. IO/$\overline{M}$ line is used by U1 to discriminate between IO and Memory operations. If U1 is reading from or writing to memory, the IO/$\overline{M}$ line is low. If U1 is reading from or writing to IO the IO/$\overline{M}$ line is high. ALE (Address Latch Enable) is pulsed high when U1 wishes to write an address from AD0 thru AD7 lines into the Address Latch U3 to select an instruction from EPROM U4. When data is present on the AD0 thru AD7 lines, ALE is low.

Microprocessor U1 performs all of the required calculations from the information it receives from the comparators and detectors, interrogates the program memory to determine the next logical step to take, and tells the relay 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 tune relays to drop out, and displays 'SYSTEM READY' on the 9000 Front Panel. 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 and 'CHANNEL CHANGE'. Any one of these conditions awakens U1 causing it to take the proper action before going back to sleep. If a load cannot be tuned or a coupler failure occurs, a 'COUPLER FAULT' message will appear on the front panel of the 9000 equipment. If the fault condition is only temporary, it may be cleared by depressing the 'CPLR TUNE' pushbutton. Very short duration faults caused by OPERATING VSWR FAULTS during voice modulation are ignored by U1.

When power is initially applied, the 'COUPLER UNTUNED' message is automatically displayed, indicating that the status of the coupler to the selected frequency is unknown. A 'CPLR TUNE' command from the 9000 is required to clear the initial 'FAULT' indication.

4.5.10.3 CRYSTAL OSCILLATOR U2

U2 establishes the clock frequency of 6.144 MHz for U1 through a built-in oscillator circuit.

4.5.10.4 POWER CLEAR CIRCUIT R2 AND C1

The Power Clear Circuit is necessary to initialize microprocessor U1 when power is first applied to the CU-9100. The circuit provides a Low on pin 36 of U1 for a time after the power is applied to the CU-9100. This

holds U1 reset until transient conditions have passed. At that point, U1 is permitted to run because the Power Clear Circuit transfers U1 pin 36 to a High.

4.5.10.5 DIVIDE BY TWO CIRCUIT U9A

U9A is a flip-flop which receives the clock 3.072 MHz output of microprocessor U1 on pin 3. U9A divides its input by 2 and outputs 1.536 MHz on pin 5 which is the TIM CLK input pin 3 of RAM-IO-TIMER U13.

4.5.10.6 MEMORY/IO DEVICE SELECTOR CIRCUITRY

The Memory/IO Device Selector Circuitry consists of U5A and B, U6A, U7A, U8A, U11 and U12. These circuits take address codes supplied by U1 on A8-A15 and use them to enable the EPROM U4, the RAM/IO/TIMER U13, the EEPROM U10, Relay Latches U17, U20 and U24, U28, U30, U33 and U34, the channel change interrupt generator U22, U25 and the channel input buffer U21A and B and U22. U1 uses the Memory/IO Device Selector Circuitry to enable the proper device when it needs to transfer information.

EXAMPLE: The channel information is latched into the B side of comparator U25. Whenever a channel change occurs, A side will not equal B side and U25 will send a High on the CHANNEL CHANGE line to U1. This awakens U1 and causes an internal RESTART to be inserted causing U1 to output Data on Address BUS A8-A15. U1 also places a High on IO/$\overline{M}$ line and a Low on $\overline{RD}$ line. This causes U11 (Input/Output Device Selector) to output a Low on Y1, the $\overline{CSI1}$ line. This $\overline{CSI1}$ line enables U21A and B and U22 (Channel Input Buffer and Channel Change Latch) allowing the transfer of channel information from the inputs of U21A and B to the Data Bus AD0-AD7.

Once this information is on the Data Bus, U1 will proceed to process the new information (i.e. tune the coupler and place the new channel information in U10's memory) before going back to sleep.

4.5.10.7 ADDRESS LATCH U3

The address Latch U3, separates the address information from the data on bus lines AD0-AD7 from microprocessor U1. U3 is employed to produce continuous address information to U4 and U10. 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.

4.5.10.8 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 A0-A13 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 $\overline{RD}$ line pin 32, and has selected EPROM. U1 collects the instruction from the DATA BUS, analyzes it, then acts on the directions provided.

4.5.10.9 PHASE, MAGNITUDE, RF PRESENT, VSWR AND KEYLINE BUFFER

Integrated circuit U44 contains input ports to the Microprocessor Data Bus system. Through this buffer, the microprocessor U1 can call up information, giving it the status of the phase and magnitude discriminators, RF Present, Keyed, and the VSWR detectors. There are eight signals coming into integrated circuit U44, $\overline{\text{PHASE} > +20°}$, $\overline{\text{PHASE} < -20°}$, $\overline{\text{MAG} > 60\ \text{ohm}}$, $\overline{\text{MAG} < 40\ \text{ohm}}$, $\overline{\text{RF PRESENT}}$, $\overline{\text{TUNING VSWR FAULT}}$, $\overline{\text{OPERATING VSWR FAULT}}$, and $\overline{\text{KEYED}}$. Signals $\overline{\text{PHASE} > +20°}$, $\overline{\text{PHASE} < -20°}$ are the phase comparator interface outputs, and $\overline{\text{MAG} > 60\ \text{ohm}}$, $\overline{\text{MAG} < 40\ \text{ohm}}$, are the magnitude comparator interface outputs (refer to sections 4.5.2 and 4.5.3). These four signals direct U1 through the tuning algorithm program stored in the EPROM U4. A Truth Table for these signals follows.

	U44 Pin 5 MAG > 60 OHM	U44 Pin 4 MAG < 40 OHM
* Illegal	0	0
>60	0	1
<40	1	0
In the window	1	1

Table 4.1 Magnitude Discriminator Truth Table.

	U44 Pin 3 PHASE > +20°	U44 Pin 3 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 magnitude cannot be both greater than 60 ohms and less than 40 ohms simultaneously.

** 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.

EXAMPLE: The $\overline{\text{TUNING VSWR FAULT}}$ signal coming into U44 pin 7 is a product of the Tuning VSWR Fault Detector (refer to Section 4.5.6) and is used by U1 to determine a tune ready condition (High on VSWR line), once the magnitude and phase discriminators fall into the window during a tune cycle.

4.5.10.10 CHANNEL INPUT BUFFERS U18, U21, U46A AND B

There are eight channel lines coming into the CU-9100 in the form of inverted binary coded decimal (BCD) numbers representing channels 00 thru 127. Table 4.3 shows the Truth Table for channels 00-9. The truth table is utilized by the coupler when the transceiver is a channelized radio. Each one of the channels is then assigned a memory location in U10. 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, U25 detects this function and awakens U1. U1 then fetches the new tune combination from its channel memory location in U10 and configures the coupler network accordingly before returning to sleep. (See example in section 4.5.10.6 Memory/IO Device Selector Circuitry.

Channel Number	CH 2^7	CH 2^6	CH 2^5	CH 2^4	CH 2^3	CH 2^2	CH 2^1	CH 2^0
00	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	0
2	1	1	1	1	1	1	0	1
3	1	1	1	1	1	1	0	0
4	1	1	1	1	1	0	1	1
5	1	1	1	1	1	0	1	0
6	1	1	1	1	1	0	0	1
7	1	1	1	1	1	0	0	0
8	1	1	1	1	0	1	1	1
9	1	1	1	1	0	1	1	0

Table 4.3 Truth Table BCD Channels 00-9.

4.5.10.11 RELAY LATCHES AND DRIVERS

The Relay Latches U17, U20, U24, U28, U30, U33, and U34 are used to latch data from Address/Data Bus AD0-AD7 to relay drivers U14, U15, U16, U19, U23, U27, U29, U32, U35, to energize the appropriate relays. The purpose of the relay drivers is to accept a High from the latch and convert that signal to a low with sufficient current carrying capability to energize a relay.

To understand how U1 performs an output operation, consider what is involved in turning on 'SYSTEM READY' on 9000 Front Panel. U1 issues an address on lines A8-A15, causing U5B output $\overline{Y0}$ pin 12 to go Low. With $\overline{Y0}$ 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 $\overline{WR}$ line pin 31. Low inputs on U13 RAM/IO/TIMER cause it to clock the information from the Data Bus through U13 out to pin 38 to Lamp Driver U6B and U36A, causing a low on $\overline{READY}$ line to 9000 Equipment.

4.5.11 RAM/IO/TIMER U13

U13 contains a RAM (Random Access Memory), three IO ports, Address/Data Bus, and a Timer which is driven by U9A.

The IO Ports (Input/Output Ports A, B, and C) are all selected by U1 for output operation. Port A (PA0-PA7) provides C8-C11 out and CSL/C12 in information for driving the proper relays on Relay Board A5. Port B (PB0-PB7) provides C13 and 14 in and C13 and C14 out to Relay Board A5. Port C (PC0-PC5) provides TUNE LATCH, READY ON, FAULT, TUNE RELAY and OPERATE, and $\overline{TUNING}$ outputs to other circuits on the computer board.

4.5.11.1 TIMER

The timer resides within U13 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 $\overline{FAULT}$ 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 'SYSTEM READY' message is displayed.

The timer is programmed at power up and receives its basic timing information from microprocessor U1 and U9A. U1 continuously issues a signal called CLK OUT (3.072 MHz) on pin 37 which is divided by two in flip-flop U9A (1.536 MHz). The timer during tuning issues a brief Low going pulse on $\overline{\text{TIMER OUT}}$ pin 6 of U13, 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 a 'COUPLER FAULT' message is displayed. If a proper tune is achieved, U1 turns off the $\overline{\text{TIMER OUT}}$ signal issued by U13, 'SYSTEM READY' message is displayed and U1 goes to sleep.

4.5.11.2 RANDOM ACCESS MEMORY (RAM)

The RAM, also a part of U13, 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 the RAM, U1 issues a code on lines A8-A15. This code makes output $\overline{\text{Y0}}$ pin 12 of U5B go Low. While $\overline{\text{Y0}}$ is Low, U1 will issue a Low on the IO/$\overline{\text{M}}$ 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.

4.5.11.3 ELECTRICALLY ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM) U10

Long term storage of coupler element settings by channel is handled by the non-volatile memory in U10. If the transceiver 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.

4.5.11.4 KEYLINE COMPARATOR

U43A and associated circuitry make up the keyline comparator. It is used to make sure the coupler sees a $\overline{\text{KEYED}}$ condition for a low input on the radio equipment $\overline{\text{KEYLINE}}$. The output is sent to Schmitt trigger U7C and pin 9 of Input Buffer U44 to be placed on the DATA BUS to be used by microprocessor U1. U7C will output a High that enables AND gates U8B and D for $\overline{\text{FAN ON}}$.

4.5.11.5 FAN CONTROL

U26B, U6C, U7B, U8B and U32G and associated circuitry are used to turn ON and OFF the two +28 VDC fans used to circulate air through the inductor elements during long transmissions. U26B a delay timer is triggered by $\overline{\text{KEYED}}$ from U43A and approximately three seconds later it outputs a Low on pin 9 to OR gate U6C. If the coupler is in the operate mode, U13 RAM IO TIMER will output a High on pin 5, in turn sent to base of transistor switch Q3 causing it to conduct, sending a Low on $\overline{\text{OPER}}$/TUNING line to pin 10 of OR gate U6C. With two Low's on U6C it will output a Low to Schmitt trigger U7B which will output a High to AND gate U8B. With U8B enabled with the High from U7C (KEYED) it will output a High on pin 6 to Fan Relay Driver U32G. U32G will invert and send a Low out to relay K5 on Detector/Relay Pad Assembly A3, causing K5 to energize sending +28 VDC to FAN 1 and 2 until radio is unkeyed.

4.5.11.6 CIRCUITS NOT USED

Ready Flash Latch U31 and Ready Flasher U26A are unused circuits.

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SECTION V

MAINTENANCE AND REPAIR

5.1 GENERAL

This section provides test procedures and evaluation of overall performance for the CU-9100 1 KW 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

No preventive or periodic maintenance is required in the CU-9100.

5.3 INSPECTION

The CU-9100 has the cover 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 connectors. 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.

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 paragraphs 5.4.2 and 5.4.3. 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 DISASSEMBLY INSTRUCTIONS

Refer to Figures 5.1, 5.2, 5.3, and 5.4 as needed.

a) TOP COVER: Remove 18 Phillips head screws.

b) COMPUTER BOARD A2: Grasp assembly with thumb and forefinger and pull straight up, out of card cage. Disconnect the 20 pin ribbon cable from A2P3.

c) DETECTOR/RELAY PAD ASSEMBLY A3: Disconnect ground connections from A3P1 and P2 and FAN plugs A3P3/P4. Disconnect BNC UG-88D/U connector with RF cable RG-58A/U from A4J1 of Capacitor Board A4. Grasp A3 assembly with thumb and forefinger and pull straight up out of card cage. Disconnect BNC UG-88D/U with RG-1428/U RF cable from A3J1.

d) INPUT CONNECTOR ASSEMBLY A1: (Note: A3 Assembly must be removed first.) Remove retaining nut from J2, the 37 pin connector on the front of the CU-9100. Disconnect from A1J1 the 20 pin ribbon cable connector and from A1J2 the 10 pin ribbon cable connector. Slide A1 Assembly toward the A3 card cage and lift assembly straight up as soon as J2 clears the coupler case.

e) CLEAR PLASTIC SAFETY SHIELD: Remove 8 Phillips head screws and lift out.

f) CAPACITOR BOARD A4: Remove 13 Phillips head screws at E1 through E13. (Disconnect BNC UG-88D/U connector with RF cable RG-58A/U from A4J1, if not previously removed in step c.)

g) COIL AND CAPACITOR ASSEMBLY A6: Remove the ½ inch acorn nut and 7/16 inch nut and washer from antenna Rf insulator E2. Remove the 7 each, 7/16 inch nuts and washers attaching the A6 assembly to the coupler case bottom. Lift the front end of the A6 assembly (end with Computer Board and Detector Board card cages) and remove from the coupler case.

h) RELAY BOARD A5: Turn Coil and Capacitor Assembly A6 upside down after removal from coupler case. Remove 8 Phillips head screws and lift the A5 Board straight up off the 28 relays.

i) REMOVAL OF RELAYS K1 THRU K11:

NOTE: Assembly A6 does not have to be removed to accomplish repair to relays.

1. Remove Capacitor Board A4, see step f.
2. Remove the 3 Phillips head screws holding the particular relay to the A6 assembly.
3. Lift the particular relay being removed straight up to unplug the 4 contact wires that plug into the Relay Board A5.

NOTE: Do not twist the relay as it could bend or deform the contact wires.

j) REMOVAL OF RELAYS K12 THROUGH K28:

1. Using a 100 watt soldering iron, desolder the connecting link on the top of the particular relay being removed.
2. Desolder the particular element soldered across relay contacts A and C.
3. Remove the 2 Phillips head screws holding the particular relay to the A6 Assembly.
4. Lift the particular relay straight up to unplug the 4 contact wires that plug into the Relay Board A5.

NOTE: Do not twist the relay as it could bend or deform the contact wires.

5.6 PERFORMANCE TEST

125 watt operational check out is in Table 5.1.2 item G. 1000 watt operational check out is in Section III, paragraph 3.2.

NOTE: Various types of digital and linear logic devices are used in the CU-9100. When troubleshooting these devices, please keep the following in mind. HIGH, also known as a logic high or logic one, is a signal in two state 5 volt logic that generally measures between 2.5 volts and 5.0 volts. LOW, also known as a logic low or a logic zero, is a signal in two state 5 volt logic that generally measures between 0 and 0.5 volts.

5.6.1 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. Dummy load, 50 ohms @ 150 W, Bird Model 8135
5. VOM: Simpson 260 (20K Ohm/Volts)
6. Digital Multimeter: H.P. Model 3476A
7. Oscilloscope: Tektronix 465B
8. Frequency Counter: Fluke Model 1911A
9. DC VTVM: H.P. Model 412A
10. RF Signal Generator: WaveTek Model 3001, 1-520 MHz
11. Extender Cards and Test EPROM: Sunair Service Kit, Sunair P/N 8092907595
12. Transceiver to Coupler Test Cable: Sunair Cable Assembly, Sunair P/N 8076004195

5.6.2 EQUIPMENT CHECK OUT

Connect coupler and test equipment as shown in Figure 5.5. Perform Fault Analysis as outlined in Table 5.1.

WARNING HIGH VOLTAGE

The radio operator and service technician should exercise caution not to contact the output of insulator E2 while transmitting.

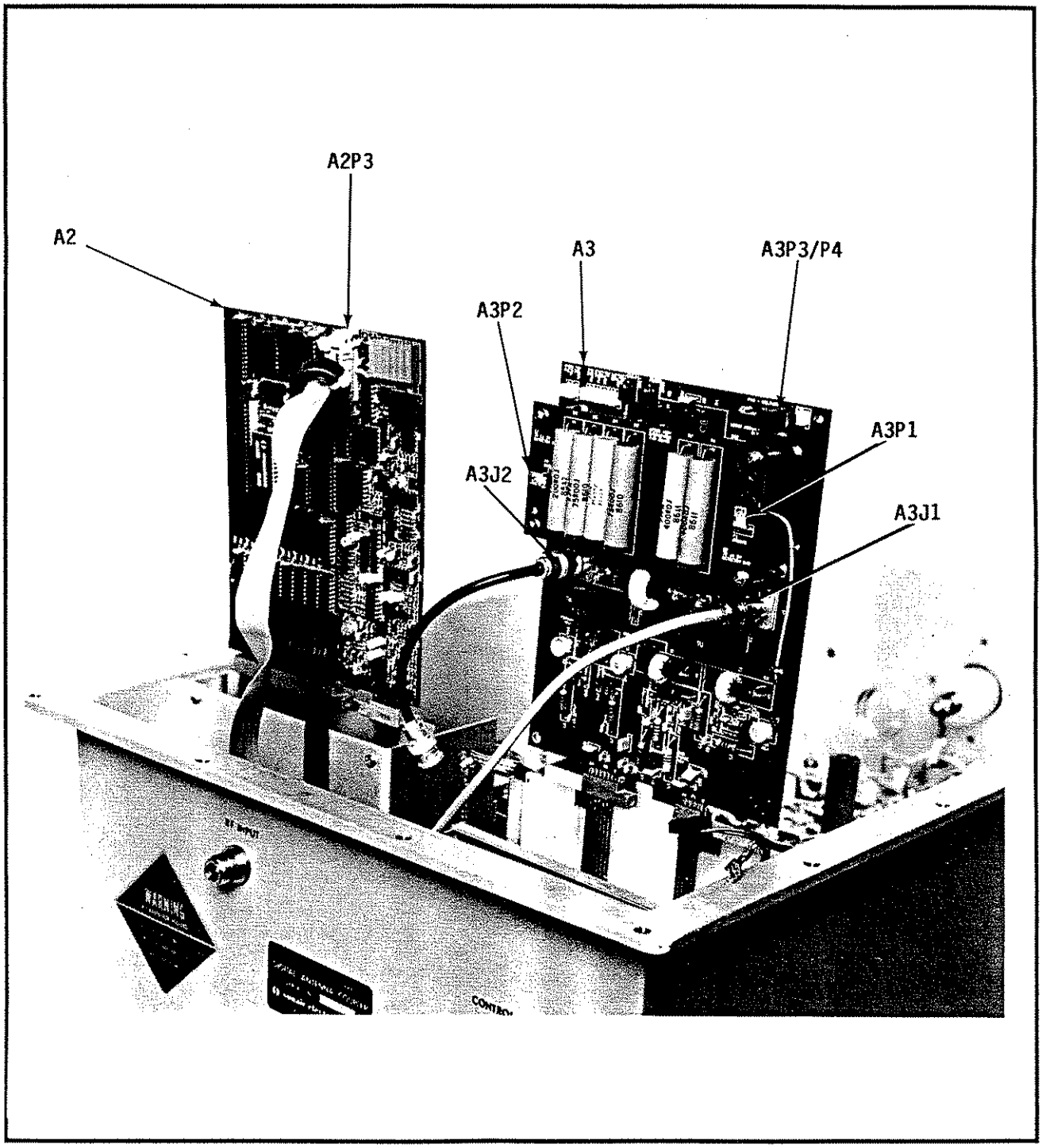


Figure 5.1 Computer A2 and Detector/Relay Pad A3 Boards Extended.

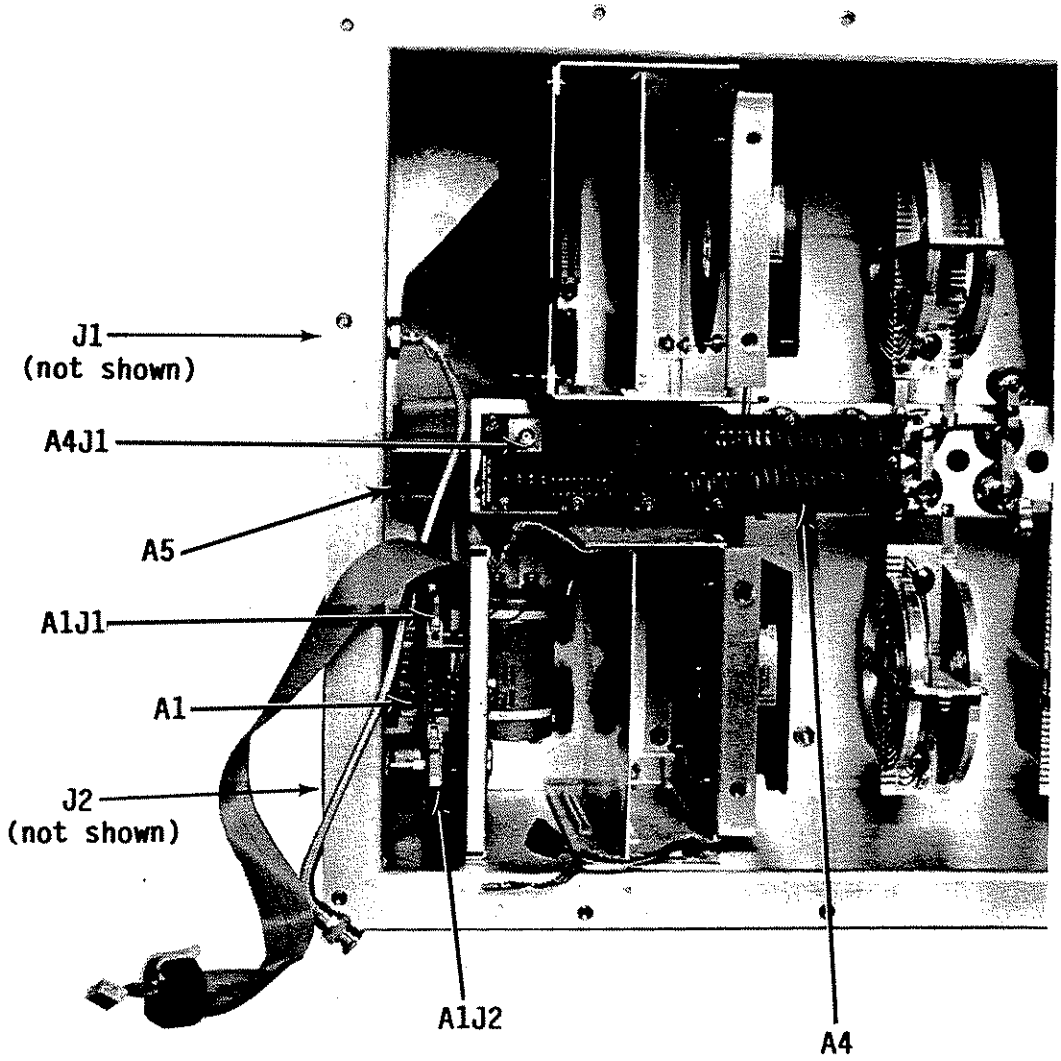


Figure 5.2 Computer A2 and Detector/Relay Pad A3 Boards Removed.

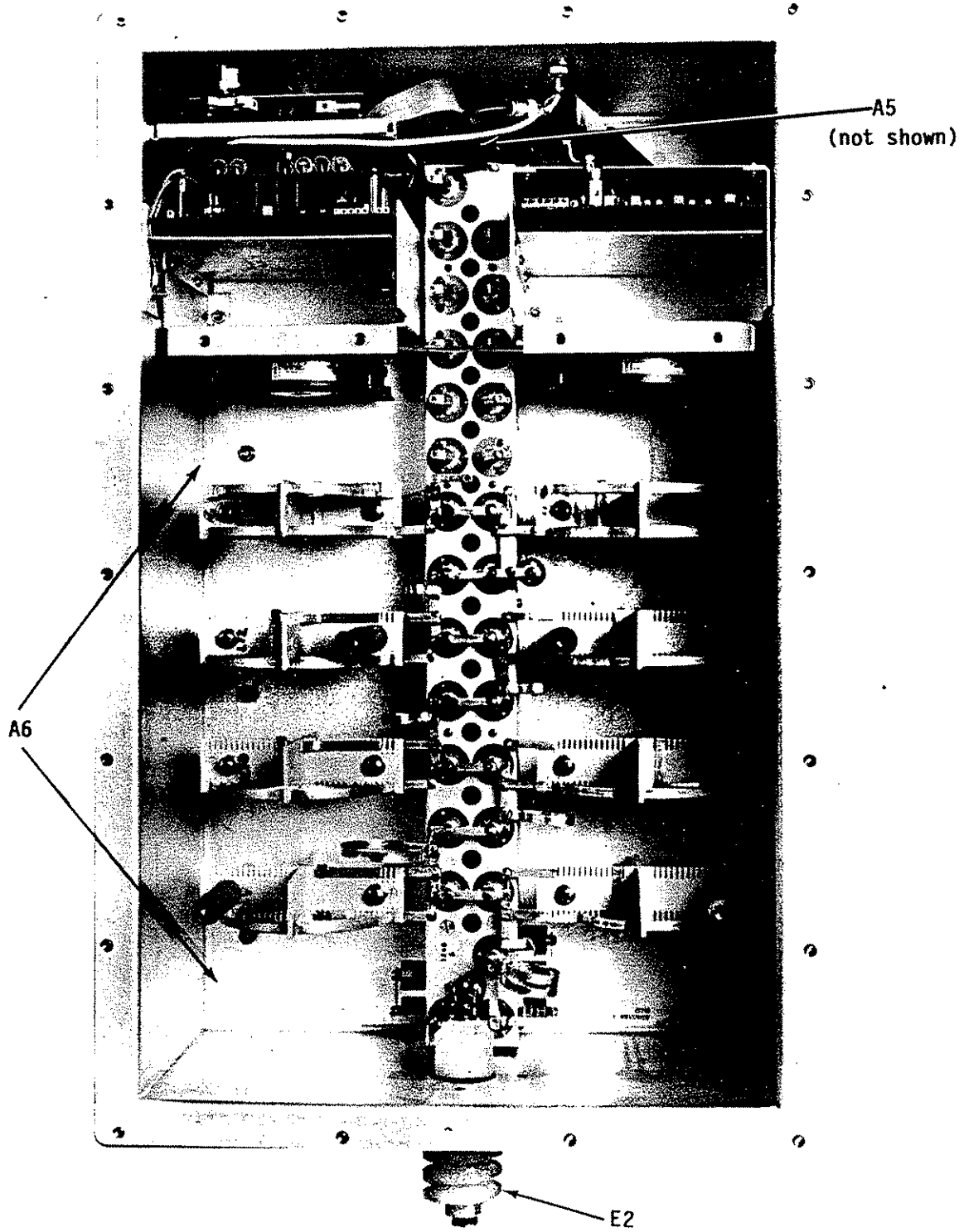


Figure 5.3 CU-9100 with Capacitor Board A4 Removed (View 1).

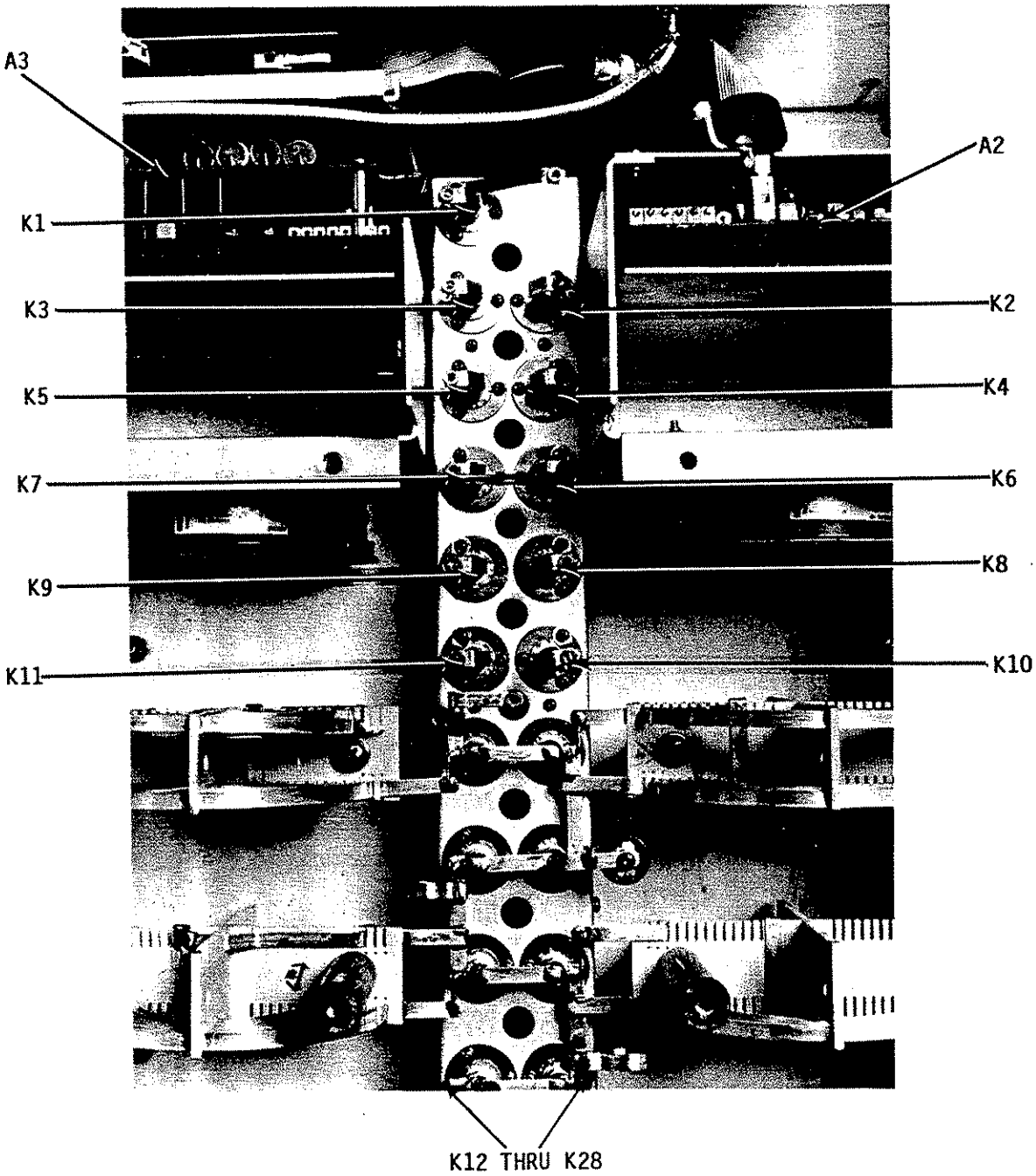


Figure 5.4 CU-9100 with Capacitor Board A4 Removed (View 2).

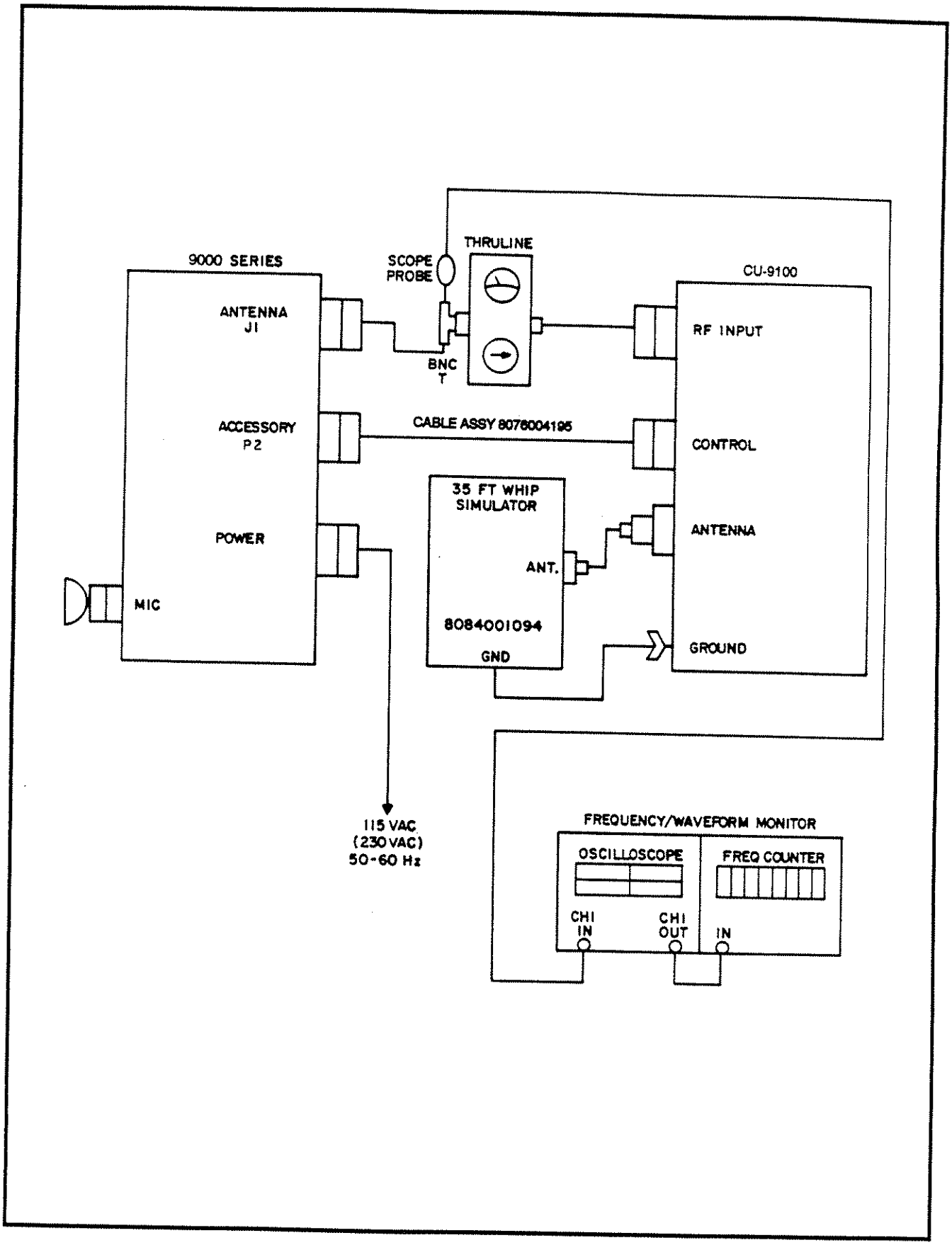


Figure 5.5 Coupler Test Setup.

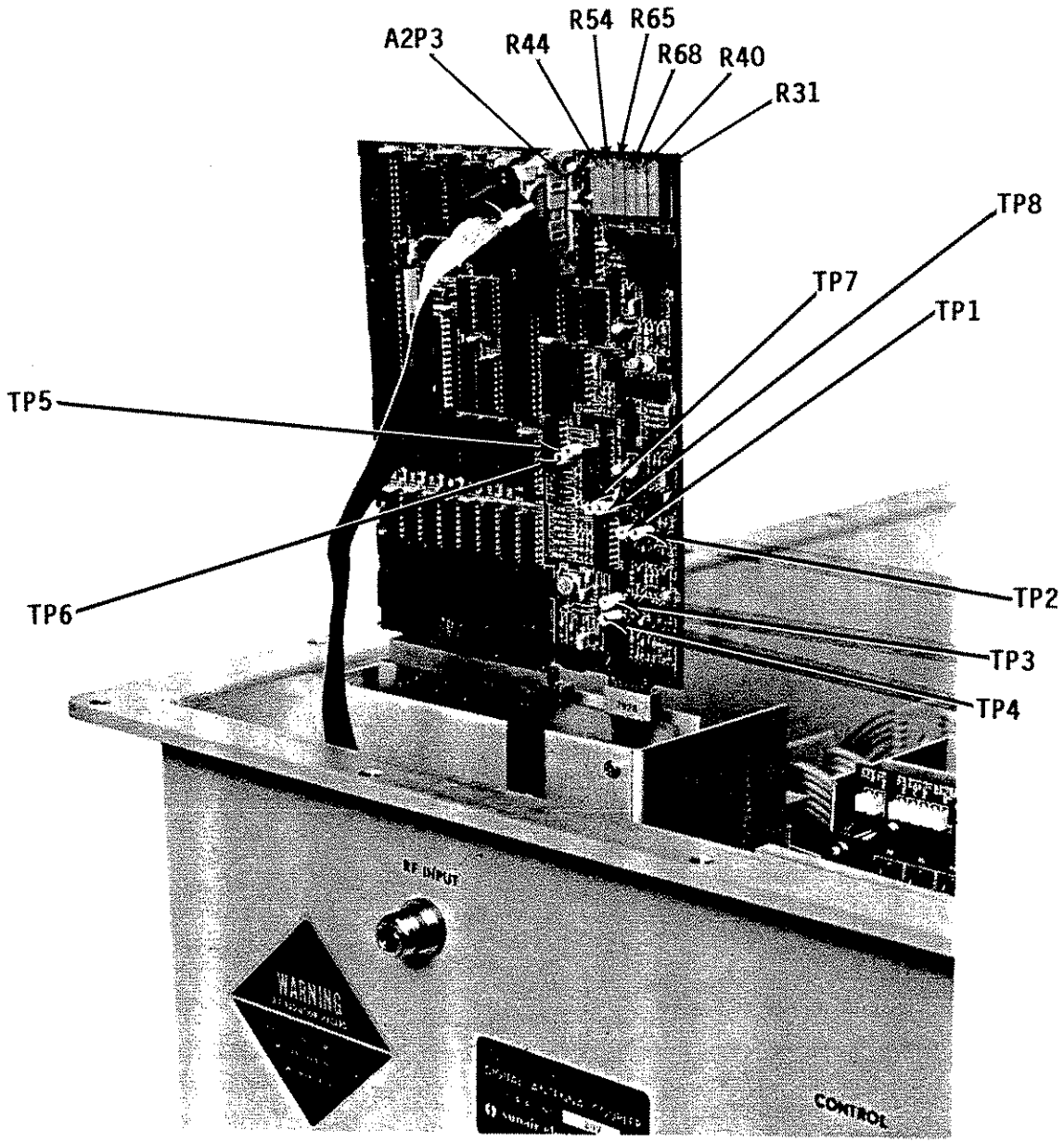


Figure 5.6 Computer Board A2 Extended.

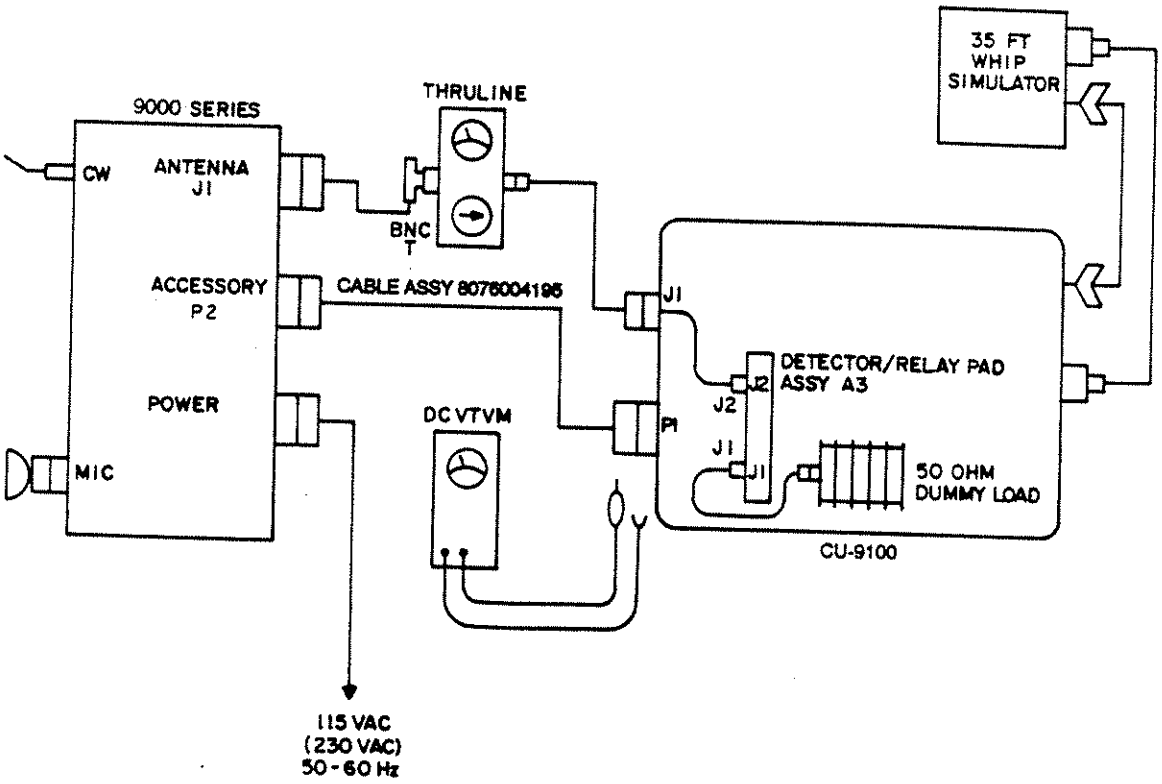


Figure 5.7 Detector/Relay Pad Alignment Setup (Forward Power Detectors).

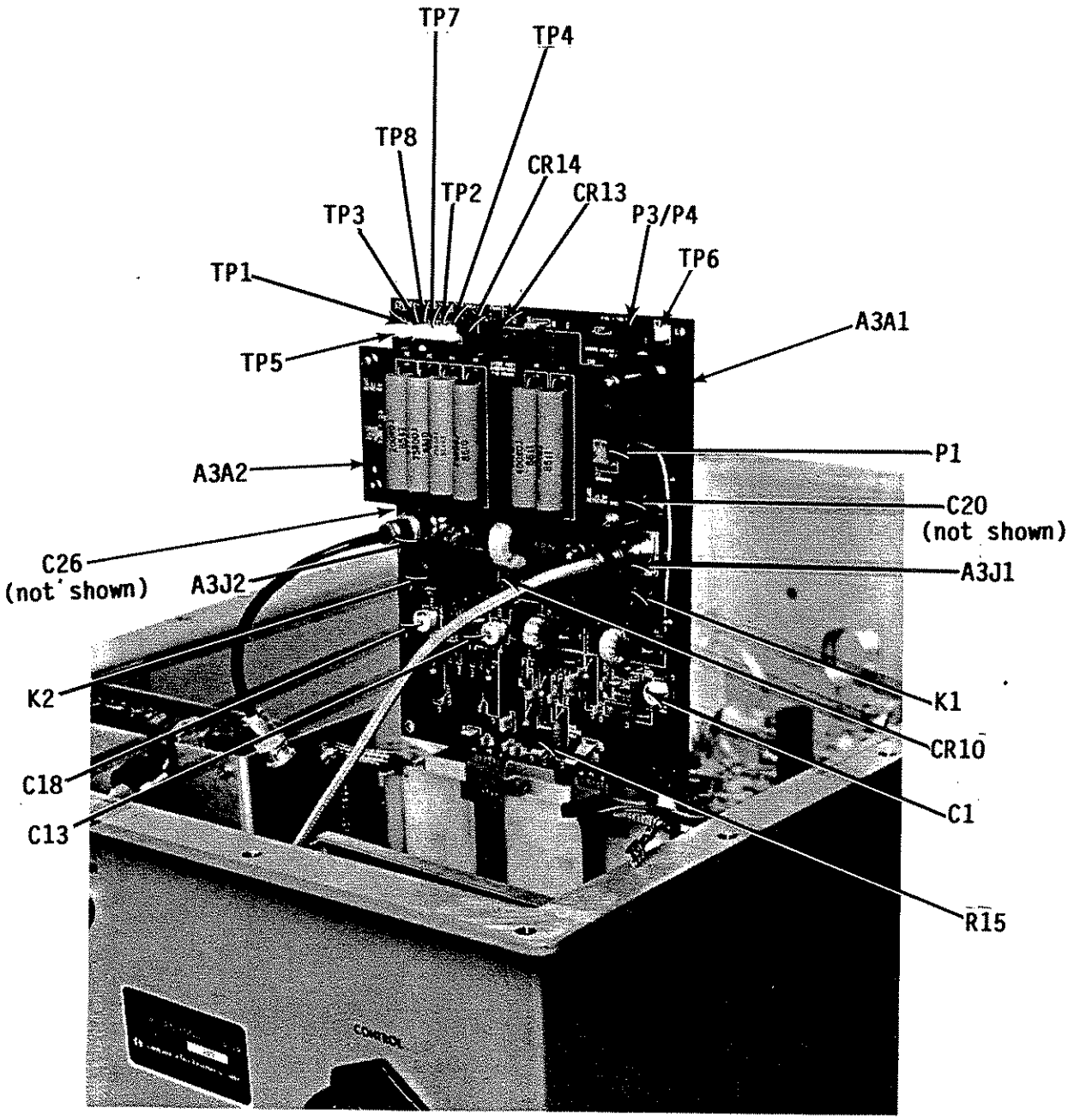


Figure 5.8 Detector/Relay Pad Assembly A3 Extended.

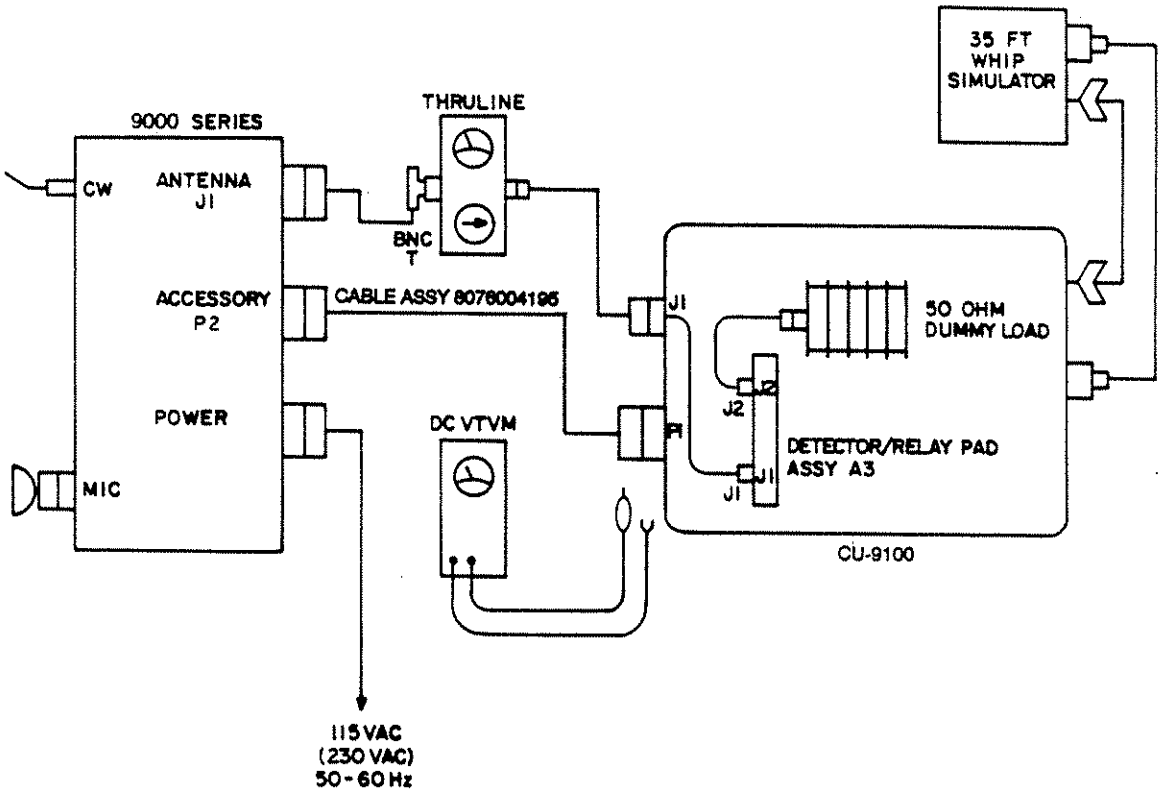


Figure 5.9 Detector/Relay Pad Alignment Setup
(Reflected Power Detector, Mag & Phase Detectors).

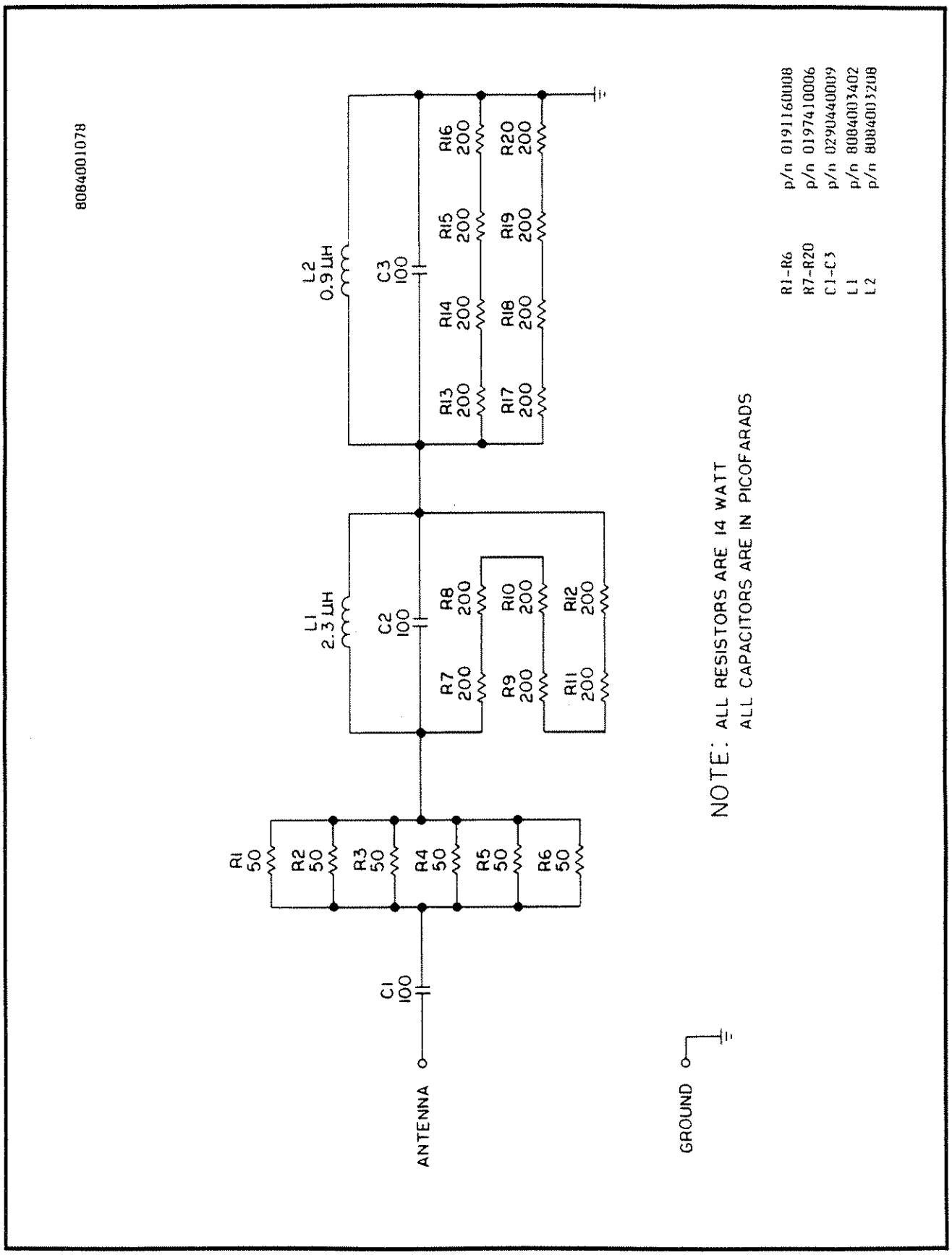


Figure 5.10 35 ft. Whip Antenna Simulator.

Table 5.1 FAULT ANALYSIS

TEST	POSSIBLE TROUBLE	CHECKS/CORRECTIVE ACTION
LPA-9600 Fault lamp on at initial power turn on.	a. Operation is normal and indicates status of coupler is unknown.	a. Depress 'CPLR TUNE' pushbutton. In 10 seconds or less, 9000 will display 'SYSTEM READY', indicating coupler is tuned and ready for operation. If the LPA-9600 red FAULT lamp lights, and 9000 displays 'COUPLER FAULT', follow through fault analysis procedures to determine fault.
No 9000 front panel display meter readings in FWD or REF position, coupler faults 10 seconds after 'CPLR TUNE' command.	a. No RF output from 9000 Series Exciter/Transceiver.	a. Defective Exciter/Transceiver. Refer to Operation and Maintenance Manual for defective unit.
	b. No TUNE ENABLE to RT-9000 Transceiver.	b. Defective Detector/Relay Pad Assembly A3. Repair or replace.
9000 front panel display meter reads normally in FWD position. No reading in REF position. Coupler faults 10 seconds after 'CPLR TUNE' command.	a. No RF to coupler.	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.
	b. Coupler Detector/Relay Pad Assembly A3 defective.	b. Repair or replace.
	c. Coupler reflected power circuitry on Computer Board A2 defective.	c. Repair or replace.
9000 front panel display meter reads normally in both FWD and REF positions. Coupler faults 10 seconds after 'CPLR TUNE' command.	a. Computer Board A2 out of alignment or defective.	a. Align A2 Board according to Table 5.1.1. If unable to align, repair or replace Computer Board A2.
	b. Detector/Relay Pad Assembly A3, out of alignment or defective.	b. Align A3 Board according to Table 5.1.2. If unable to align, repair or replace Computer Board A3.
	c. Defective component on Capacitor Assembly A4 or Coil and Capacitor Assembly A6.	c. Check components for damage and/or severe discoloration. Replace as required.
	d. Defective relays K1-K28.	d. Check out relay operation in Table 5.2.2.

Table 5.1 FAULT ANALYSIS (Cont...).

SYMPTOM	POSSIBLE TROUBLE	CHECKS/CORRECTIVE ACTION
LPA-9600 Fault lamp on at initial power turn on.	a. Operation is normal and indicates status of coupler is unknown.	a. Depress 'CPLR TUNE' pushbutton. In 10 seconds or less, 9000 will display 'SYSTEM READY', indicating coupler is tuned and ready for operation. If the LPA-9600 red FAULT lamp lights, and 9000 displays 'COUPLER FAULT', follow through fault analysis procedures to determine fault.
No 9000 front panel display meter readings in FWD or REF position, coupler faults 10 seconds after 'CPLR TUNE' command.	a. No RF output from 9000 Series Exciter/Transceiver.	a. Defective Exciter/Transceiver. Refer to Operation and Maintenance Manual for defective unit.
	b. No TUNE ENABLE to RT-9000 Transceiver.	b. Defective Detector/Relay Pad Assembly A3. Repair or replace.
9000 front panel display meter reads normally in FWD position. No reading in REF position. Coupler faults 10 seconds after 'CPLR TUNE' command.	a. No RF to coupler.	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.
	b. Coupler Detector/Relay Pad Assembly A3 defective.	b. Repair or replace.
	c. Coupler reflected power circuitry on Computer Board A2 defective.	c. Repair or replace.
9000 front panel display meter reads normally in both FWD and REF positions. Coupler faults 10 seconds after 'CPLR TUNE' command.	a. Computer Board A2 out of alignment or defective.	a. Align A2 Board according to Table 5.1.1. If unable to align, repair or replace Computer Board A2.
	b. Detector/Relay Pad Assembly A3, out of alignment or defective.	b. Align A3 Board according to Table 5.1.2. If unable to align, repair or replace Computer Board A3.
	c. Defective component on Capacitor Assembly A4 or Coil and Capacitor Assembly A6.	c. Check components for damage and/or severe discoloration. Replace as required.
	d. Defective relays K1-K28.	d. Check out relay operation in Table 5.2.2.

Table 5.1 FAULT ANALYSIS (Cont...).

TEST	POSSIBLE TROUBLE	CHECKS/CORRECTIVE ACTION
No indications on front panel of 9000 Series equipment.	a. +28 VDC in exciter/transceiver is shut off.	a. Check control cable for short from pin S to ground. Check +28 VDC line in coupler for short to ground. Repair as necessary.
	b. Defective Computer Board A2.	b. Repair or replace Computer Board A2.
Coupler tunes normally, but faults when 1000 watts is applied.	a. VSWR trip point set too low.	a. If fault condition is noted on more than just a very few frequencies, check voltage on Computer Board A2 test point TP1 to ground. Voltage should be 2.60 VDC or to a value approximately 0.1 VDC higher than measured.
	b. Internal high voltage breakdown.	b. Observe coupler tune in darkened area and look for breakdown on Capacitor Board A4 or Coil and Capacitor Assembly A6. Repair or replace defective component.
	c. Loose Antenna or ground connection, or corrosion.	c. Check antenna and ground connections for tightness and freedom from corrosion.
	d. Defective internal ground connection.	d. (1) Check all Chassis Assembly grounds for tightness. (2) Check Computer Board A2 and Detector/ Relay Pad Assembly A3 connectors for clean connector contacts. Clean or replace.

Table 5.1.1 CU-9100 ALIGNMENT PROCEDURE FOR COMPUTER BOARD A2

NOTE: If upon completion of the Fault Analysis Table 5.1, the CU-9100 is still not operating properly, accomplish the following alignment procedures. All measurements and adjustments in this procedure are accomplished on the Computer Board A2. Refer to Figure 5.6. If during any step, the A2 Board does not align properly, refer to Table 5.2.

1. Insure that the 9000 Series Exciter/Transceiver is OFF. Remove Computer Board A2 and reinstall, in coupler, on extender board P/N 8092039097.

2. Turn exciter/transceiver ON. (This is necessary to supply power to the coupler.)

3. Connect negative lead of DVM to ground. Select scale appropriate to measure +12 VDC.

4. Measure voltage at TP3. Voltage should be between +10.2 and +11.0 VDC.

5. Measure voltage at TP4. Voltage should be ½ of measured voltage in Step 4 above.

6. Measure voltage at TP1. Adjust R31 until voltage is +2.60 VDC ± .01 VDC.

7. Measure voltage at TP2. Adjust R40 until voltage is +250 mv ± 5 mv.

8. Connect negative lead to TP8 and positive lead to TP7. Adjust R68 until a reading of +300 mv ± 5 mv is obtained.

9. Connect negative lead to TP4 and positive lead to TP7. Adjust R54 until a reading of +150 mv ± 5 mv is obtained. Move positive lead to TP8, voltage should read -150 mv ± 5 mv. Repeat steps 8 and 9 as required to obtain readings.

10. Connect negative lead to TP6 and positive lead to TP5. Adjust R65 until a reading of +300 mv ± 5 mv is obtained.

11. Connect negative lead to TP4 and positive lead to TP5. Adjust R44 until a reading of +150 mv ± 5 mv is obtained. Move positive lead to TP6, voltage should read -150 mv ± 5 mv. Repeat steps 10 and 11 as required to obtain readings.

12. Turn OFF the exciter/transceiver. Remove Computer Board A2 and extender board. Reinstall Computer Board in coupler and turn exciter/transceiver ON.

NOTE: If upon completion of the above procedures, the coupler still fails to operate properly, continue on to Table 5.1.2 alignment procedure for Detector/Relay Pad Assembly A3.

TABLE 5.1.2 CU-9100 ALIGNMENT PROCEDURE FOR DETECTOR/RELAY PAD ASSEMBLY A3.

NOTE: If upon completion of the Fault Analysis procedures of Table 5.1, the CU-9100 is still not operating properly, accomplish the following alignment procedures. All measurements and adjustments in this procedure are accomplished on Detector/Relay Pad Assembly A3. If during any step, the A3 Assembly does not align properly, refer to Section 4.3. Using the Theory of Operation, check related circuitry using standard component troubleshooting procedures.

PRELIMINARY SETUP FIGURE 5.5

A. Turn POWER switch on 9000 Series Exciter/Transceiver to OFF. Remove A3 board and reinstall in coupler on extender board P/N 8092029091.

NOTE: In order to remove A3 board the following connections have to be disconnected:

1. RF coax cable connection on A4J1
2. The two (2) ground strap connections and FAN plug P3/P4 to the A3A2 Pad Board (these will be left disconnected during the alignment procedure).

B. Once the A3 board is reinstalled on its extender board, make the following connections for ALIGNMENTS A and B. See Figure 5.7.

1. Disconnect RF coax cables at A3J1 and J2.
2. Connect RF coax cable removed from A3J1 to A3J2 (RF input to coupler).
3. Connect an RF test coax cable with BNC connectors on each end to A3J1 and to the 50 ohm Dummy Load.
4. Connect an 8 inch clip lead between A3A2P1 and its ground strap.

C. Turn POWER switch on (necessary to supply power to coupler). Set frequency to 29.9000 MHz in AM mode.

ALIGNMENTS A AND B

NOTE: To insure proper alignment, do not deviate from sequence of steps. Refer to Figure 5.8.

A. Forward RF Power Detector (TUNE)

1. Set DC VTVM to +1.0 volt range. Connect negative lead to TP6 and positive lead to TP5. Connect a clip lead between chassis ground and anode of CR10. This will cause the green LED CR13 to light, and TUNE RELAYS K1 and K2 to energize.

2. Key the radio by holding the microphone PTT depressed.

3. Adjust C18 for a dip (minimum voltage reading) on the VTVM.

4. Unkey radio, disconnect positive lead from TP5 and clip lead ground from CR10. Green LED will go out and TUNE RELAYS will deenergize.

B. Forward RF Power Detector (HI)

1. Connect VTVM positive lead to TP8, set meter to 0.1 V range.
2. Place radio in CW MODE and key from CW key jack.
3. Adjust C26 for a dip on the VTVM.
4. Unkey radio and place in AM mode.
5. Disconnect meter lead from TP8.

C. Reflected RF Power Detector (TUNE)

1. Disconnect RF cables from A3J1 and A3J2 and reverse them so that the 50 ohm dummy load is now connected to A3J2 and RF input to the coupler is connected to A3J1. (See Figure 5.9.)
2. Connect VTVM positive lead to TP4, set meter to 0.1 range.
3. Connect clip lead to anode of CR10. This will cause green LED CR13 to light, and TUNE RELAYS K1 and K2 to energize.
4. Key radio with microphone PTT.
5. Adjust C13 for a dip on the VTVM.
6. Unkey radio and disconnect meter leads.

D. Phase Discriminator

1. Connect VTVM negative lead to TP2 and positive lead to TP3. Set meter to 0.1V range.
2. Key radio with microphone PTT.
3. Adjust R15 for a NULL on the VTVM (as close to 0 volts as possible, voltage will swing positive and negative).
4. Unkey radio and remove positive lead from TP3 and connect TP1.

E. Magnitude Discriminator

1. Key radio with microphone PTT.
2. Adjust C1 for a NULL on the VTVM.
3. Unkey radio and remove meter leads from TP1 and TP2. Remove clip lead from positive side of CR10 and from chassis ground. Green LED will go out and TUNE RELAYS will deenergize.

F. Reflected RF Power Detector (HI)

1. Connect VTVM negative lead to TP6 and positive lead to TP7. Set meter to 0.3V range.
2. Place in CW MODE and key radio from CW key jack.
3. Adjust C20 for a dip on the VTVM.

4. Unkey radio and turn POWER switch to OFF. Disconnect meter leads and disconnect 50 ohm dummy load. Remove A3 from extender and remove extender board. Reinstall A3 board in coupler and reconnect RF coax cables, fan plug, and ground straps for normal operation of coupler. Connect test equipment as in Figure 5.5.

G. 125 Watt Operational Checkout

1) With equipment connected as shown in Figure 5.5, place radio in CW 'MODE' and frequency set to 29.9900 MHz. Depress 'CPLR TUNE' pushbutton and observe a tuned condition.

2) Key radio with CW key switch. Check forward and reflected power on the thruline wattmeter. An acceptable tune should show 70 to 125 watts and 2.8 to 5.0 watts reflected maximum. See Chart below:

FORWARD WATTS	REFLECTED WATTS MAXIMUM
70	2.8
80	3.2
100	4.0
110	4.4
125	5.0

Acceptable Reflected Power Chart for VSWR 1.5:1.

3) Continue tuning through the HF Spectrum from 29.99 to 1.6 MHz in 1 MHz steps and check for an acceptable tune at each frequency.

NOTE: If upon completion of alignments in Tables 5.1.1 and 5.1.2, the coupler still fails to operate properly, continue on to Tables 5.2 and 5.2.1

H. 1000 Watt Operational Checkout

1. Use Section III, paragraph 3.2, to check out system at 1000 watts.

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2.

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 5.10. Also required is PC Assy Extender P/N 8092039097.

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
Preliminary Setup	a. Test equipment: Freq/waveform monitor, Figure 5.5 and a digital voltmeter (DVM). b. Exciter/Transceiver: AM Mode of operation. c. Connect 35 ft. whip antenna simulator to coupler's antenna terminal. d. Place Computer Board A2 on extender board P/N 8092039097.	

NOTE: When instructed to change exciter/transceiver frequency, be sure to change frequency by no less than 2 MHz.

1. 28 V Supply	a. Connect negative lead of DVM to chassis and positive lead to the anode A2CR12.	Normal: DVM indicates 28 V ± 4 volts. Abnormal: Turn off 9000 Series radio, remove coupler control cable. Turn on radio and with DVM negative lead to pin h and positive lead to pin s of control cable, measure for +28 VDC ±4 volts. If voltage is incorrect, check +28 VDC in radio and/or control cable. If voltage from radio and cable are correct, turn off radio and reconnect control cable and disconnect P3 from Computer Board A2. Turn radio on. Connect DVM negative lead to chassis and positive lead to ribbon connector J3 pin 13. If DVM reads +28 VDC, check for defect between P3 pin 13 and anode CR12. If no defect is found, turn off radio and remove Detector/Relay

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
		Pad Assembly A3. With DVM still connected to J3 pin 13 and chassis, turn on radio. If DVM reads +28 VDC, check for defective A3 assembly (see Section 4.3). If voltage is still incorrect, check the Input Connector Assembly A1, in particular the "Soft Start" Circuit.
2. 5 V Supply	a. Connect positive lead of DVM to Computer Board connector A2P3 pin 15 or 17.	Normal: DVM indicates 5 V ± .5 V. Abnormal: Unplug Computer Board. If DVM reads 5V, check for shorts on the board. If it still reads the wrong voltage, check or repair the 5 V regulator U2 mounted on the Input Connector Assembly A1.
3. 6.144 MHz Clock Oscillator	a. Connect oscilloscope probe to U1 pin 1.	Normal: Frequency = 6.144 MHz square wave, 4 V p-p minimum. Abnormal: Replace U2.
4. Tune Command Circuit	a. Connect scope probe to CR2 anode. Depress 'CPLR TUNE' button on radio.	Normal: Scope indicates a momentary +0 VDC to +12 VDC Low to High change. Coupler tunes. Abnormal: Check Input Connector Assembly A1. Check control cable between radio and coupler. Check radio for proper inputs to coupler.
	b. Connect scope probe to Q2 base. Depress 'CPLR TUNE' button on radio.	Normal: Scope indicates a +1 V level Q2 base. This level remains until coupler has tuned, then indicates 0 V. Abnormal: Check Q2 and associated circuitry.
	c. Connect scope probe to Q2 collector. Depress 'CPLR TUNE' button on radio.	Normal: Scope indicates a voltage level of 0 V at Q2 collector while tuning. Level should remain Low until coupler has completed the tune cycle. Scope indicates a +28 V level. Abnormal: Repair or replace Q2 or associated circuitry. Check Keyline Relay on Detector/Relay Pad Assembly A3. Refer to Section 4.3.7.

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	d. Connect scope probe to U1 pin 8. Depress 'CPLR TUNE' button on radio.	Normal: Scope indicates momentary 0 V to +5 VDC pulse. Coupler tunes. Abnormal: Check U7E, U7F, and repair or replace.
5. +10 VDC	a. Connect DVM negative lead to ground (chassis) and connect positive lead TP3.	Normal: DVM indicates a reading of approximately 10.2 to 11 VDC. Abnormal: If voltage is off by more than .8 V check U39 circuitry for defective component. Check voltage at CR12 cathode, it should be approximately +28 VDC. Anode reading should be approximately 16V. If these are correct, replace U39.
6. Detector Reference	a. Connect DVM negative lead to ground (chassis) and connect positive lead to TP4.	Normal: DVM indicates a reading one-half (½) of the reading in Step 5 NORMAL. Abnormal: Check voltage divider R82 and R83. Repair or replace as necessary.
Turn 9000 Series Radio Equipment OFF. Remove and set aside Detector/Relay Pad Assembly A3. Leave Computer Board A2 on extender card. Turn 9000 Series radio equipment ON.		
7. Phase and Magnitude Comparators (Static)	a. Connect scope probe to U45 pin 6, jumper voltage from TP3 to P2 pin 5.	Normal: Scope indicates a +5 VDC level. When TP3's voltage is applied to P2 pin 5, +5 Volt level on scope drops to 0 Volts. Remove voltage to P2 pin 5 and momentarily scope level will return to +5 VDC level. Abnormal: Check circuitry related to U45C, U42B and U41A. Repair or replace as necessary.
	b. Connect scope probe to U45 pin 8, jumper voltage from TP3 to P2 pin 5.	Normal: Scope indicates 0 VDC level. When TP3's voltage is applied to P2 pin 5, scope level will go to +5 VDC. Remove voltage to P2 pin 5 and momentarily scope level will return to 0 VDC. Abnormal: Check circuitry related to U45D, U42A and U41A. Repair or replace as necessary.

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	c. Connect scope probe to U45 pin 10, jumper voltage from TP3 to P2 pin 4.	Normal: Scope indicates a +5 VDC level. When TP3's voltage is applied to P2 pin 4, scope level will drop to 0 Volts. Remove voltage to P2 pin 4 and momentarily scope level will return to +5 VDC level. Abnormal: Check circuitry related to U45E, U42C and U41B. Repair or replace as necessary.
	d. Connect scope probe to U45 pin 12, jumper voltage from TP3 to P2 pin 4.	Normal: Scope indicates 0 VDC level. When TP3's voltage is applied to P2 pin 4, scope level will raise to +5 volt level. Remove voltage to P2 pin 4 and momentarily scope level will return to 0 volt level. Abnormal: Check circuitry related to U45F, U42D and U41B. Repair or replace as necessary.
8. VSWR Faults: TUNING VSWR FAULT	a. Connect scope probe to U45 pin 4, jumper voltage from TP4 to P2 pin 1.	Normal: Scope indicates a +5 VDC level. When TP4's voltage is applied to P2 pin 1, scope level will drop to 0 Volts. Remove voltage to P2 pin 1 and scope level will return to +5V. Abnormal: Check circuitry related to U45B, U37D. Repair or replace as necessary.
OPERATING VSWR FAULT	b. Connect scope probe to U45 pin 2, jumper voltage from TP4 to P2 pin 9.	Normal: Same as for step a. above. Abnormal: Check circuitry related to U45A, U37C. Repair or replace as necessary.
OPERATING VSWR FAULT	c. Connect scope probe to U8 pin 11, place a ground on the cathode of CR13. Jumper voltage from TP4 to P2 pin 9.	Normal: Scope indicates 0V level. When TP4's voltage is applied to P2 pin 9, scope level will go to +5V. Remove voltage to P2 pin 9 and scope will return to 0V. (Will also cause a toggling action if voltage is left on P2 pin 9 and ground to CR13 is removed and replaced.) Abnormal: Check circuitry related to U8D, U7C, U7D and U43A. Repair or replace as necessary.

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
9. $\overline{\text{RF Present}}$	a. Connect scope probe to U8 pin 8, jumper voltage from TP4 to P2 pin 2.	Normal: Scope indicates a +5V level. When TP4's voltage is applied to P2 pin 2, scope level will drop to 0V. Remove voltage applied to pin 2 and scope will return to +5V level. Abnormal: Check circuitry related to U8C, and Q5. Repair or replace as necessary.
	b. With scope probe connected to U8 pin 8, jumper voltage from TP4 to P2 pin 7.	Normal: Same as for step a. above. Abnormal: Check circuitry related to U8C, and Q4. Repair or replace as necessary.
10. Coupler Reflected Power	a. Connect scope probe to U38 pin 14, jumper voltage from TP3 to P2 pin 1.	Normal: Scope indicates a 0V level. When TP3's voltage is applied to P2 pin 1, scope level will rise to approximately +1.5V. Remove voltage applied to P2 pin 1, scope will return to 0V. Abnormal: Check circuitry related to U38, U37B and Q3. Repair or replace.
	b. Leave scope probe connected to U38 pin 14, connect TP4's voltage to base of Q3, and jumper voltage from TP3 to P2 pin 9.	Normal: Scope indicates 0V. When TP3's voltage is applied to P2 pin 9, scope level will rise to approximately +1.5V. Remove voltage to P2 pin 9, scope will return to 0V. Abnormal: Check circuitry related to U38, U37A and Q3. Repair or replace.

Remove test equipment leads and voltage jumpers, turn 9000 Series radio equipment OFF. Replace Detector/ Relay Pad Assembly A3. Leave Computer Board A2 on extender card. Turn 9000 Series radio equipment ON.

Table 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
11. $\overline{\text{Fan Control}}$	a. Place radio in AM mode. Depress 'CPLR TUNE' pushbutton on radio.	Normal: Coupler will tune and display will indicate 'SYSTEM READY'. Abnormal: Check Symptom and Corrective Action in Table 5.1 Fault Analysis.
	b. With "SYSTEM READY" displayed, key microphone PTT button.	Normal: In approximately three (3) seconds the fans in the CU-9100 will come on and will remain on until PTT is released. Abnormal: Check circuitry related to U32G, U8B, U7B and C, U6C, U26B and U43A. Check FAN Relay on the A3 Assembly. Refer to Section 4.3.8. Repair or replace.
12. FAULT Circuit	a. Connect scope probe to U36 pin 5. Turn 9000 Series radio power OFF. Wait approximately 4 seconds and turn power back ON.	Normal: Scope will show a 0V level indication when radio is turned back on and 'COUPLER UNTUNED' is displayed on radio. Depress `CPLR TUNE' pushbutton on radio. When coupler tunes, scope will show a +12V level with 'SYSTEM READY' displayed. Abnormal: Check U36B, U13, and associated circuitry. Check control cable between coupler and radio. Repair or replace.
13. READY Circuit	a. Connect scope probe to U36 pin 3. Depress 'CPLR TUNE' pushbutton on radio.	Normal: Scope will show 0V when tune cycle is complete and 'COUPLER READY' is displayed on radio. Turn radio OFF and wait approximately 4 seconds, then back ON. Scope will show +12V and 'COUPLER UNTUNED' is displayed on radio. Abnormal: Check U6B, U36A, U13 and associated circuitry. Check control cable between coupler and radio. Repair or replace.

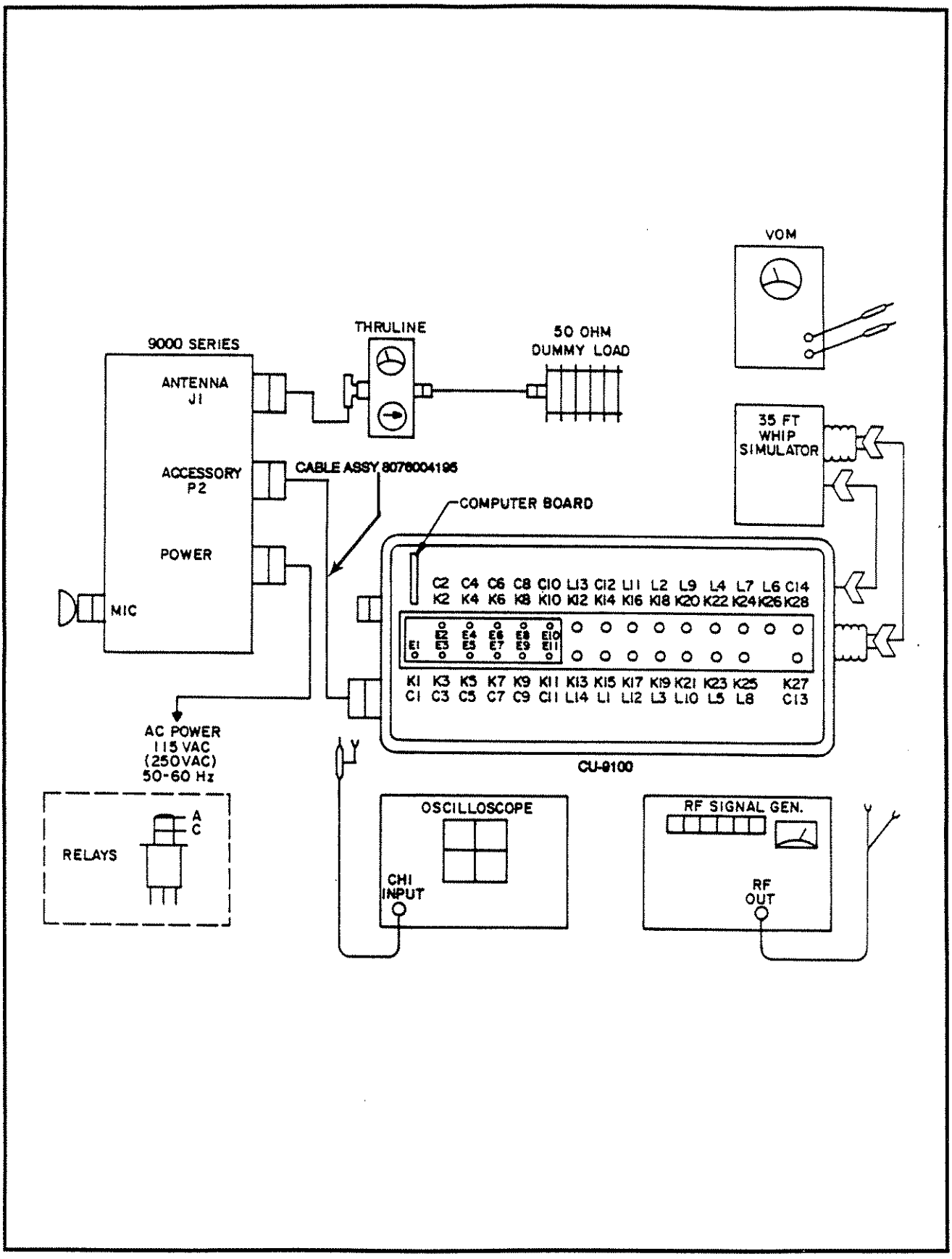


Figure 5.11 Coupler Test Setup for Checking Relays K1 thru K28.

Table 5.2.1 COUPLER TEST.

PRELIMINARY SETUP FIGURE 5.11

Connect equipment as shown in Figure 5.11. Remove Computer Board A2 from coupler. On the Computer Board, remove EPROM U4 and replace with test EPROM P/N 8104038290. Place CPU extender board, P/N 8092039097 in coupler and reinstall A2 on extender board. Reconnect ribbon cable.

1. Turn 9000 Series Exciter/Transceiver ON and select CHANNEL 00.
   a. Coupler relays will energize. The test EPROM causes the coupler to go into "pipeline" where all the capacitors and inductors are placed out of the RF circuit by relays K1 through K28.
   b. The following table lists the conditions of the coupler's RF circuitry according to the channel selected. See Table 5.2.2 for Fault Analysis and Troubleshooting.

CHANNEL NUMBER SELECTED	RELAY NUMBER AND STATUS OF CONTACTS A AND C	ELEMENT THAT IS PLACED IN RF CIRCUIT
01	K1 Closed	C1 IN
02	K2 Closed	C2 IN
03	K3 Closed	C3 IN
04	K4 Closed	C4 IN
05	K5 Closed	C5 IN
06	K6 Closed	C6 IN
07	K7 Closed	C7 IN
08	K8 Closed	C8 IN
09	K9 Closed	C9 IN
10	K10 Closed	C10 IN
11	K11 Closed	C11 IN
12	K12 Open	L13 IN
13	K13 Open	L14 IN
14	K14 Open	C12 IN
15	K15 Open	L1 IN
16	K16 Open	L11 IN
17	K17 Open	L12 IN
18	K18 Open	L2 IN
19	K19 Open	L3 IN
20	K20 Open	L9 IN
21	K21 Open	L10 IN
22	K22 Open	L4 IN
23	K23 Open	L5 IN
24	K24 Open	L7 IN
25	K25 Open	L8 IN
26	K26 Open	L6 IN
27	K27 Closed	C13 IN
28	K28 Closed	C14 IN

NOTE: Only one (1) element is in the RF circuit at each channel.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5.

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1. Network Relay Drivers	Select Channel 00 on Radio	
1a. C1	a. Set VOM on 1 ohm scale and connect probes to E1 on Capacitor Board A4 and chassis ground.	Normal: VOM will indicate an open. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Latch U34 and Driver U35. For further information on Latches and Drivers, see Section 4.5.10.11. Repair or replace.
	b. Select Channel 01 on 9000 series Exciter/Transceiver.	Normal: Will hear relay K1 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U29 and Latch U30. Check relay K1 on Relay Board Assembly A5. Repair or replace.
		NOTE: To remove Relays K1 through K11, see Section 5.5 disassembly instructions.
	c. Select Channel 02.	Normal: Will hear relay K1 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a.
	d. Select Channel 01.	Same as step 1a.b.
1b. C2	a. Connect VOM probes to E2 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 02.	Normal: Will hear relay K2 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K2.
	c. Select Channel 03.	Normal: Will hear relay K2 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K2.
	d. Select Channel 02.	Same as step 1b.b.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1c. C3	a. Connect VOM probes to E3 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 03.	Normal: Will hear relay K3 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K3.
	c. Select Channel 04.	Normal: Will hear relay K3 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K3.
	d. Select Channel 03.	Same as step 1c.b.
1d. C4	a. Connect VOM probes to E4 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 04.	Normal: Will hear relay K4 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K4.
	c. Select Channel 05.	Normal: Will hear relay K4 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K4.
	d. Select Channel 04.	Same as step 1d.b.
1e. C5	a. Connect VOM probes to E5 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 05.	Normal: Will hear relay K5 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K5.
	c. Select Channel 06.	Normal: Will hear relay K5 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K5.
	d. Select Channel 05.	Same as step 1e.b.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1f. C6	a. Connect VOM probes to E6 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 06.	Normal: Will hear relay K6 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K6.
	c. Select Channel 07.	Normal: Will hear relay K6 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K6.
	d. Select Channel 06.	Same as step 1f.b.
1g. C7	a. Connect VOM probes to E7 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.a.
	b. Select Channel 07.	Normal: Will hear relay K7 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.b. Also check relay K7.
	c. Select Channel 08.	Normal: Will hear relay K7 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.a. Also check relay K7.
	d. Select Channel 07.	Same as step 1g.b.
1h. C8	a. Connect VOM probes to E8 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U15 and RAM U13. For further information on the RAM, see paragraph 4.5.11.2. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 08.	Normal: Will hear relay K8 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U32 and Latch U33. Check relay K8 on Relay Board Assembly A5. Repair or replace.
	c. Select Channel 09.	Normal: Will hear relay K8 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1h.a. Also check relay K8.
	d. Select Channel 08.	Same as step 1h.b.
1i. C9	a. Connect VOM probes to E9 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1h.a.
	b. Select Channel 09.	Normal: Will hear relay K9 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1h.b. Also check relay K9.
	c. Select Channel 10.	Normal: Will hear relay K9 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1h.a. Also check relay K9.
	d. Select Channel 09.	Same as step 1i.b.
1j. C10	a. Connect VOM probes to E10 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1h.a.
	b. Select Channel 10.	Normal: Will hear relay K10 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1h.b. Also check relay K10.
	c. Select Channel 11.	Normal: Will hear relay K10 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1h.a. Also check relay K10.
	d. Select Channel 10.	Same as step 1j.b.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1k. C11	a. Connect VOM probes to E11 on A4 Board and chassis ground.	Normal: VOM will indicate an open. Abnormal: Same as step 1h.a.
	b. Select Channel 11.	Normal: Will hear relay K11 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1h.b. Also check relay K11.
	c. Select Channel 12.	Normal: Will hear relay K11 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1h.a. Also check relay K11.
	d. Select Channel 11.	Same as step 1k.b.
	e. Remove VOM leads from E11.	
1m. L13	a. Adjust RF signal generator for 4.000 MHz at 1.0 VRMS output. Set scope to measure 2V per c/m A.C.	
	b. Connect RF signal generator and scope across relay K12's solder connections A and C. (Active leads to A and ground leads to C.)	Normal: Scope will display a 0 volt signal. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U19 and Latch U20. Repair or replace.
	c. Select Channel 12.	Normal: Will hear relay K12 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U27 and Latch U28. Check relay K12 and inductor L13. Repair or replace. NOTE: To remove relays K12 through K28 they have to be unsoldered from their RF circuit, and two or three screws removed, before unplugging them from the A5 Board. See Section 5.5.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	d. Select Channel 13.	Normal: Will hear relay K12 "LATCH CLOSE" and scope will display a 0 volt signal. Abnormal: Same as step 1m.b. Also check relay K12 and inductor L13.
	e. Select Channel 12.	Same as step 1m.b.
1n. L14	a. Adjust RF signal generator for 2.000 MHz at 1 VRMS output. Set scope to measure 2 volts per c/m A.C. and connect across relay K13's A and C contacts.	Normal: Scope will display a 0 volt signal. Abnormal: Same as step 1m.b.
	b. Select Channel 13.	Normal: Will hear relay K13 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts. Abnormal: Same as step 1m.c. Also check relay K13 and inductor L14.
	c. Select Channel 14.	Normal: Will hear relay K13 "LATCH CLOSE" and scope will display a 0 volt signal. Abnormal: Same as step 1m.b. Also check relay K13 and inductor L14.
	d. Select Channel 13.	Same as step 1n.b.
	e. Remove test equipment leads from relay K13.	
1o. C12	a. Set VOM on 1 ohm scale and connect leads across solder connections A and C of relay K14.	Normal: VOM will indicate a short. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U32 and Latch U33. Repair or replace.
	b. Select Channel 14.	Normal: Will hear relay K14 "LATCH OPEN" and VOM will indicate an open. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U15 and RAM U13. Check relay K14 on Relay Assembly A5 and capacitor C12. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	c. Select Channel 15.	Normal: Will hear relay K14 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1o.a. Also check relay K14 and capacitor C12.
	d. Select Channel 14.	Same as step 1o.b.
	e. Remove VOM leads from relay K14.	
1p. L1	a. Adjust RF signal generator for 29.900 MHz at 1 VRMS output. Set scope to measure 1 volt per c/m A.C. and connect test equipment across relay K15's A and C contacts as in step 1m.b.	Normal: Scope will display a 0.32 volt signal. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U16 and Latch U17. Repair or replace.
	b. Select Channel 15.	Normal: Will hear relay K15 "LATCH OPEN" and scope will display a signal approximately 0.5 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U23 and Latch U24. Check relay K15 and Inductor L1. Repair or replace.
	c. Select Channel 16.	Normal: Will hear relay K15 "LATCH CLOSE" and scope will display a signal of approximately 0.32 volts. Abnormal: Same as step 1p.a. Also check relay K15 and Inductor L1.
	d. Select Channel 15.	Same as step 1p.b.
1q. L11	a. Set RF signal generator for 12.000 MHz at 1.0 VRMS output. Set scope to measure 2 volts per c/m A.C. and connect test equipment across relay K16's contacts A and C as in step 1m.b.	Normal: Scope will display a 0 volt signal. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U19 and Latch U20. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 16.	Normal: Will hear relay K16 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U27 and Latch U28. Also check relay K16 and inductor L11. Repair or replace.
	c. Select Channel 17.	Normal: Will hear relay K16 "LATCH CLOSE" and scope will display a 0 volt signal. Abnormal: Same as step 1q.a. Also check relay K16 and inductor L11.
	d. Select Channel 16.	Same as step 1q.b.
1r. L12	a. Change frequency of RF signal generator to 3.000 MHz at 1.0 VRMS output. Set scope to measure 2 volts A.C. per c/m and connect test leads across K17's solder connections A and C as in step 1m.b.	Normal: Scope will display a 0 volt signal. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U19 and Latch U20. Repair or replace.
	b. Select Channel 17.	Normal: Will hear relay K17 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts. Abnormal: Same as step 1q.b. Also check relay K17 and inductor L12.
	c. Select Channel 18.	Normal: Will hear relay K17 "LATCH CLOSE" and scope will display a 0 volt signal. Abnormal: Same as step 1r.a. Also check relay K17 and inductor L12.
	d. Select Channel 17.	Same as step 1r.b.
1s. L2	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS output. Set scope to measure 0.2 volts A.C. per c/m and connect across relay K18's solder connections A and C as in step 1m.b.	Normal: Scope will display approximately 0.3 volt signal. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U16 and Latch U17. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 18.	Normal: Will hear relay K18 "LATCH OPEN" and scope will display a signal of approximately 0.7 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U23 and Latch U24. Also check relay K18 and inductor L2. Repair or replace.
	c. Select Channel 19.	Normal: Will hear relay K18 "LATCH CLOSE" and scope will display a signal of approximately 0.3 volts. Abnormal: Same as step 1s.a. Also check relay K18 and inductor L2.
	d. Select Channel 18.	Same as step 1s.b.
1t. L3	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS output. Set scope to measure 0.2 volts A.C. per c/m and connect across relay K19's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.35 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U16 and Latch U17. Repair or replace.
	b. Select Channel 19.	Normal: Will hear relay K19 "LATCH OPEN" and scope will display a signal of approximately 1.0 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U23 and Latch U24. Also check relay K18 and inductor L3. Repair or replace.
	c. Select Channel 20	Normal: Will hear relay K19 "LATCH CLOSE" and scope will display a signal of approximately 0.35 volts. Abnormal: Same as step 1s.a. Also check relay K19 and inductor L3.
	d. Select Channel 19.	Same as step 1t.b.
1u. L9	a. Set RF signal generator to 23.000 MHz at 1.0 VRMS output. Set scope to measure 1.0 volt A.C. per c/m and connect test equipment across K20's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U19 and Latch U20. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 20.	Normal: Will hear relay K20 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U27 and Latch U28. Also check relay K20 and inductor L9. Repair or replace.
	c. Select Channel 21.	Normal: Will hear relay K20 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same as in step 1u.a. Also check relay K20 and inductor L9.
	d. Select Channel 20.	Same as step 1u.b.
1v. L10	a. Set RF signal generator for 23.000 MHz at 1.0 VRMS output. Set scope to measure 1.0 volts A.C. per c/m and connect test equipment across K21's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U19 and Latch U20. Repair or replace.
	b. Select Channel 21.	Normal: Will hear relay K21 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts. Abnormal: Same as in step 1u.b. Also check relay K21 and inductor L10. Repair or replace.
	c. Select Channel 22.	Normal: Will hear relay K21 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same as in step 1v.a. Also check relay K21 and inductor L10.
	d. Select Channel 21.	Same as step 1v.b.
1w. L4	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS output. Set scope to measure 1.0 volts A.C. per c/m and connect test equipment across K22's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U16 and Latch U17. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 22.	Normal: Will hear relay K22 "LATCH OPEN" and scope will display a signal of approximately 1.5 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U23 and Latch U24. Also check relay K22 and inductor L4. Repair or replace.
	c. Select Channel 23.	Normal: Will hear relay K22 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same as in step 1w.a. Also check relay K22 and inductor L4.
	d. Select Channel 22.	Same as step 1w.b.
1x. L5	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS output. Set scope to measure 1.0 volts A.C. per c/m and connect test equipment across relay K23's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Same as step 1w.a.
	b. Select Channel 23.	Normal: Will hear relay K23 "LATCH OPEN" and scope will display a signal of approximately 2.5 volts. Abnormal: Same as step 1w.b. Also check relay K23 and inductor L5.
	c. Select Channel 24.	Normal: Will hear relay K23 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same as step 1w.a. Also check relay K23 and inductor L5.
	d. Select Channel 23.	Same as step 1x.b.
1y. L7	a. Set RF signal generator for 27.000 MHz at 1.0 VRMS output. Set scope to measure 1.0 volt A.C. per c/m and connect test equipment across K24's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Same as step 1w.a.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 24.	Normal: Will hear relay K24 "LATCH OPEN" and scope will display a signal of approximately 4.2 volts. Abnormal: Same as step 1w.b. Also check relay K24 and inductor L7.
	c. Select Channel 25.	Normal: Will hear relay K24 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same as step 1w.a. Also check relay K24 and inductor L7.
	d. Select Channel 24.	Same as step 1y.b.
1z. L8	a. Set RF signal generator for 24.000 MHz at 1.0 VRMS output. Set scope to measure 1.0 volts A.C. per c/m and connect test equipment across K25's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.3 volts. Abnormal: Check for +29 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U19 and U20. Repair or replace.
	b. Select Channel 25.	Normal: Will hear relay K25 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U27 and U28. Also check relay K25 and L8. Repair or replace.
	c. Select Channel 26.	Normal: Will hear relay K25 "LATCH CLOSE" and scope will display a signal of approximately 0.3 volts. Abnormal: Same as step 1z.a. Also check relay K25 and inductor L8.
	d. Select Channel 25.	Same as step 1z.b.
1a.1. L6	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS output. Set scope to measure 1.0 volts A.C. per c/m and connect test equipment across K26's solder connections A and C as in step 1m.b.	Normal: Scope will display a signal of approximately 0.4 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U16 and U17. Repair or replace.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 26.	Normal: Will hear relay K26 "LATCH OPEN" and scope will display a signal of approximately 3.4 volts. Abnormal: Check for +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U23 and U24. Also check relay K26 and inductor L6. Repair or replace.
	c. Select Channel 27.	Normal: Will hear relay K26 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. Abnormal: Same ás in step 1a.1.a. Also check relay K26 and inductor L6.
	d. Select Channel 26.	Same as step 1a.1b.
	e. Remove test equipment leads from relay K26.	
1a.2. C13	a. Set VOM to 1 ohm scale and connect leads across solder connections A and C of relay K27.	Normal: VOM will indicate an open. Abnormal: Check for +29 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U14 and U13. Repair or replace.
	b. Select Channel 27.	Normal: Will hear relay K27 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.2.a. Also check relay K27 and capacitors C13A and B. Repair or replace.
	c. Select Channel 28.	Normal: Will hear relay K27 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.2.a. Also check relay K27 and capacitor C13.
	d. Select Channel 27.	Same as step 1a.2b.
1a.3. C14	a. Connect VOM leads across solder connections A and C of relay K28.	Normal: VOM will indicate an open. Abnormal: Same as step 1a.2.a.

Table 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5 (Cont...).

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
	b. Select Channel 28.	Normal: Will hear relay K28 "LATCH CLOSE" and VOM will indicate a short. Abnormal: Same as step 1a.2.a. Also check relay K28 and capacitors C14A, B and C.
	c. Select Channel 29.	Normal: Will hear relay K28 "LATCH OPEN" and VOM will indicate an open. Abnormal: Same as step 1a.2.a. Also check relay K28 and capacitors C14A, B and C.

NOTE: This completes the test of relays K1-K28 and their related circuitry. Turn OFF 9000 Series Exciter/Transceiver and remove computer board A2 from coupler. Replace EPROM U4, reinstall A2 board in coupler. Return coupler to test configuration in Figure 5.5 to further check out coupler operation.

5.7 SCHEMATICS AND PARTS LISTS

The following are schematics and parts lists for the CU-9100, see Table 5.3.

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER
ASSEMBLY	SUBASSEMBLY		
A1		INPUT CONNECTOR BOARD	8104019091
A2		COMPUTER BOARD	8092030090
A3		DETECTOR BOARD	8092020094
	A3A2	PAD BOARD	8092024090
A4		CAPACITOR BOARD	8092042098
A5		RELAY BOARD	8092041091
A6		CHASSIS ASSEMBLY	8092041099

Table 5.3 CU-9100 Table of Assemblies.

Parts Lists which comprise CU-9100
Final Assembly and
Chassis Assembly

FINAL ASSEMBLY CU-9100

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A3J2/A4J1	FINAL ASSEMBLY CU-9100	8104001256
A3J1	COAX CABLE ASSY, DETECTOR OUT	8092003599
J1	COAX CABLE ASSY, DETECTOR IN	8092003793
	CONNECTOR, RF, N UG-680/U	0756030005
	VALVE, BREATHER	1000090035
	CORD, O-RING, .210 DIA NEOPR	1006990038
	INSULATOR, SLEEVE, RF	6029102303
	RING, RETAINER	6029102401
	CONDUCTOR, RF	6029102508
	WELDMENT, CASE, GRY	8092010412
	COVER, ANTENNA COUPLER, GRY	8092010510
	PROTECTIVE COVER, CLEAR	8092014507
	PC ASSY, DETECTOR A3	8092020094
	PC ASSY, COMPUTER A2	8092030090
	PC ASSY, INPUT CONNECTOR A1	8104019091

CHASSIS ASSEMBLY CU-9100 (A6)

REF SYMBOL	DESCRIPTION		SUNAIR PART NO.
A6	CHASSIS ASSEMBLY CU-9100		8092010099
C12	CAP. 30PF, 7.5 KV, NPO		1004730012
C13A	CAP. 100PF, 5KV, N750		0290440009
C13B	CAP. 100PF, 5KV, N750		0290440009
C14A	CAP. 100PF, 5KV, N750		0290440009
C14B	CAP. 100PF, 5KV, N750		0290440009
C14C	CAP. 100PF, 5KV, N750		0290440009
C15	CAP. 75PF, 7.5KV, N750		0290560004
C16A	CAP. 100PF, 15KV, N750		0275470008
C16B	CAP. 100PF, 15KV, N750		0275470008
C16C	CAP. 100PF, 15KV, N750		0275470008
FAN1	FAN, 24VDC, MUFFIN XL-DC		1009130005
FAN2	FAN, 24VDC, MUFFIN XL-DC		1009130005
L1	INDUCTOR, L1		8092011206
L2	INDUCTOR, L2		8092011702
L3	INDUCTOR, L3		8092012202
L4	INDUCTOR, L4		8092012709
L5	INDUCTOR, L5		8092013209
L6	INDUCTOR, L6		8092013705
L7	INDUCTOR ASSY, L7	3A1A7	8092018090
L8	INDUCTOR ASSY, L8	3A1A8	8092017093
L9	INDUCTOR ASSY, L9	3A1A9	8092016097
L10	INDUCTOR ASSY, L10	3A1A10	8092015091
L11	INDUCTOR ASSY, L11	3A1A11	8092014094
L12	INDUCTOR ASSY, L12	3A1A12	8092013098
L13	INDUCTOR ASSY, L13	3A1A13	8092012091
L14	INDUCTOR ASSY, L14	3A1A14	8092011095
	CARD GUIDE, PLASTIC		1005870039
	CONNECTOR, BLOCK, 2 PIN FEM		1008060038
	RELAY, VACUUM, HV, LATCHING		1009250001
	BRACKET, FAN, LEFT		8092012504
	BRACKET, FAN, RIGHT		8092012601
	PLATE, CAPACITOR MTG., ANT.		8092012806
	PLATE, CAPACITOR MTG., NTWK		8092012903
	SHIELD, CPU BOARD		8092013501
	SHIELD, BOARD COMPARTMENT		8092014205
	PLATE,RELAY MOUNTING		8092015406
	CABLE ASSY, 20 CONDUCTOR		8092019592
	CABLE ASSY, 10 CONDUCTOR (P7)		8092019690
	CABLE ASSY, 14, CONDUCTOR (P4, P5)		8092019797
	PC ASSY, RELAY BD		8092041091
	PC ASSY, CAPACITOR BOARD		8092042098
	CHASSIS RELAY ASSY		8092050091

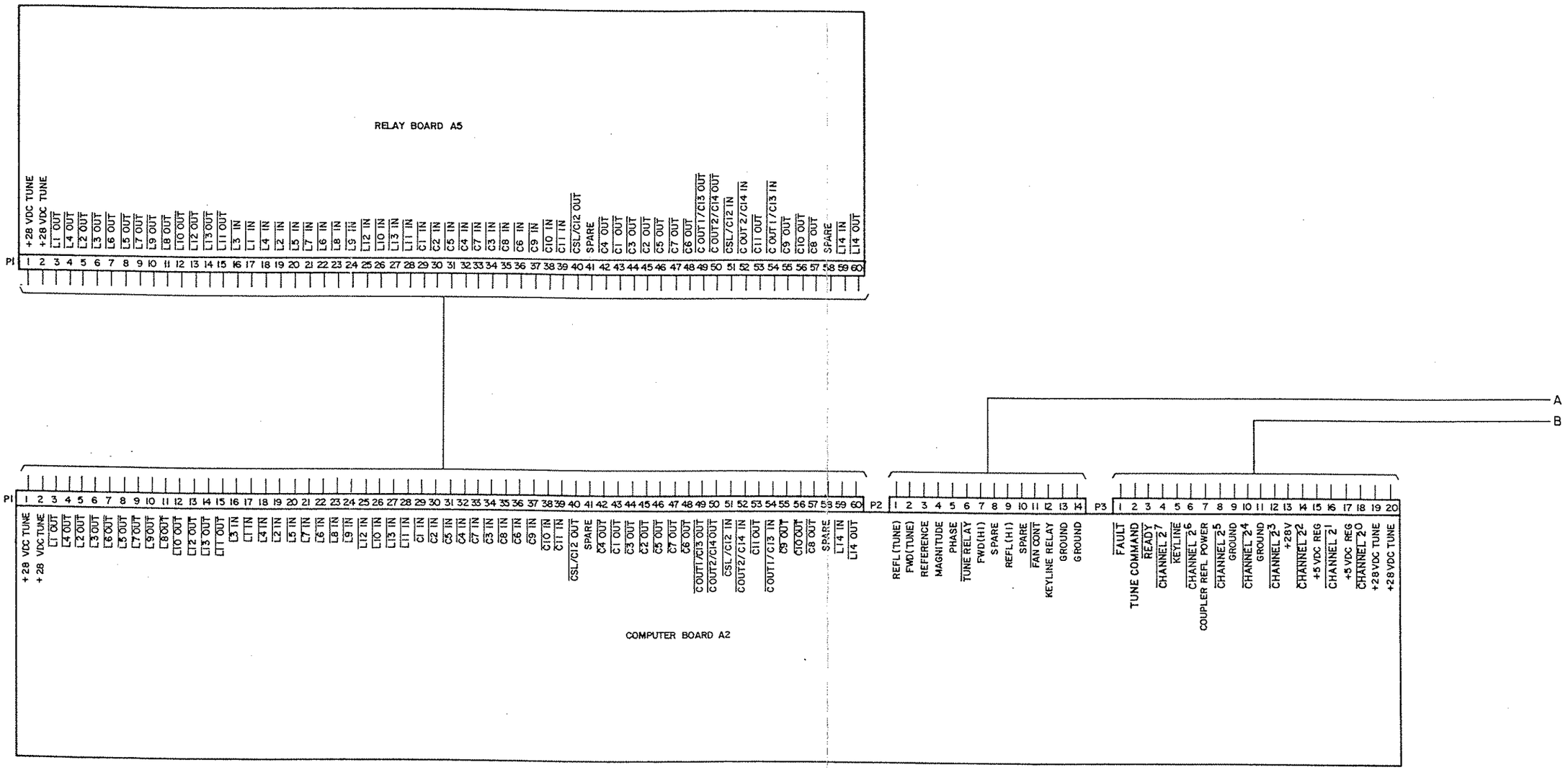


Figure 5.12 CU-9100 Wiring Diagram (Sheet 1 of 2).

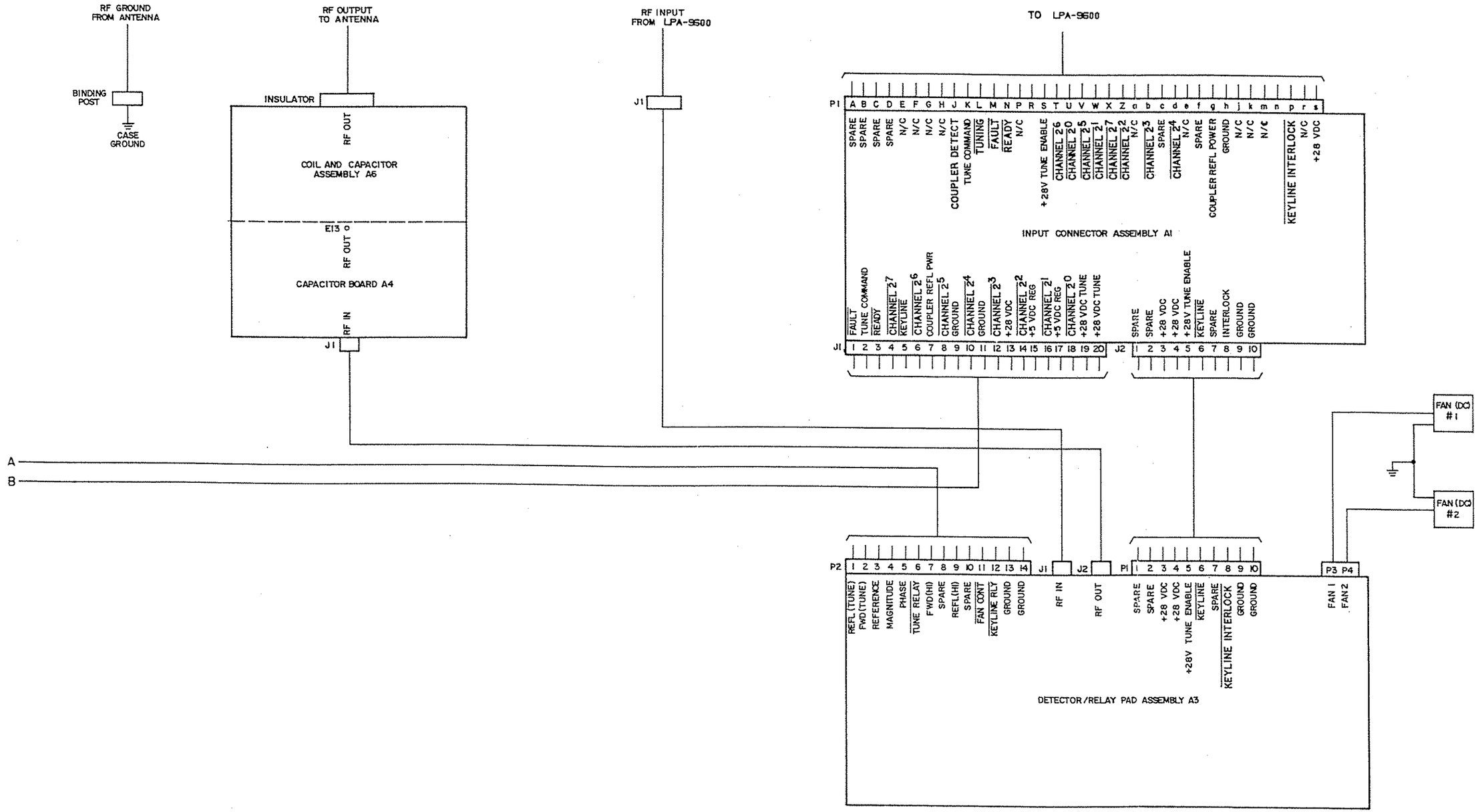
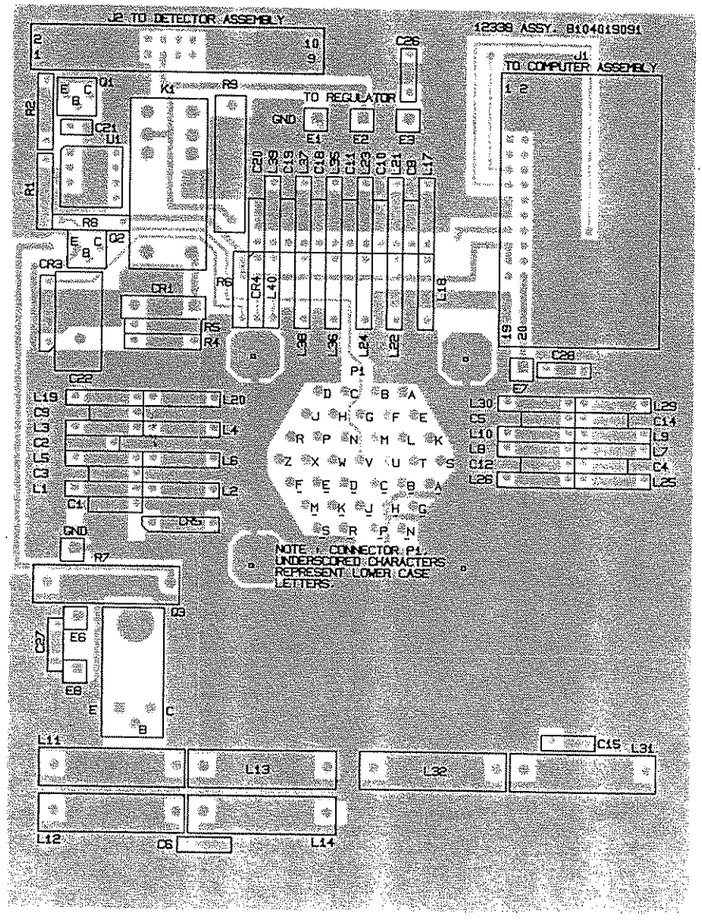
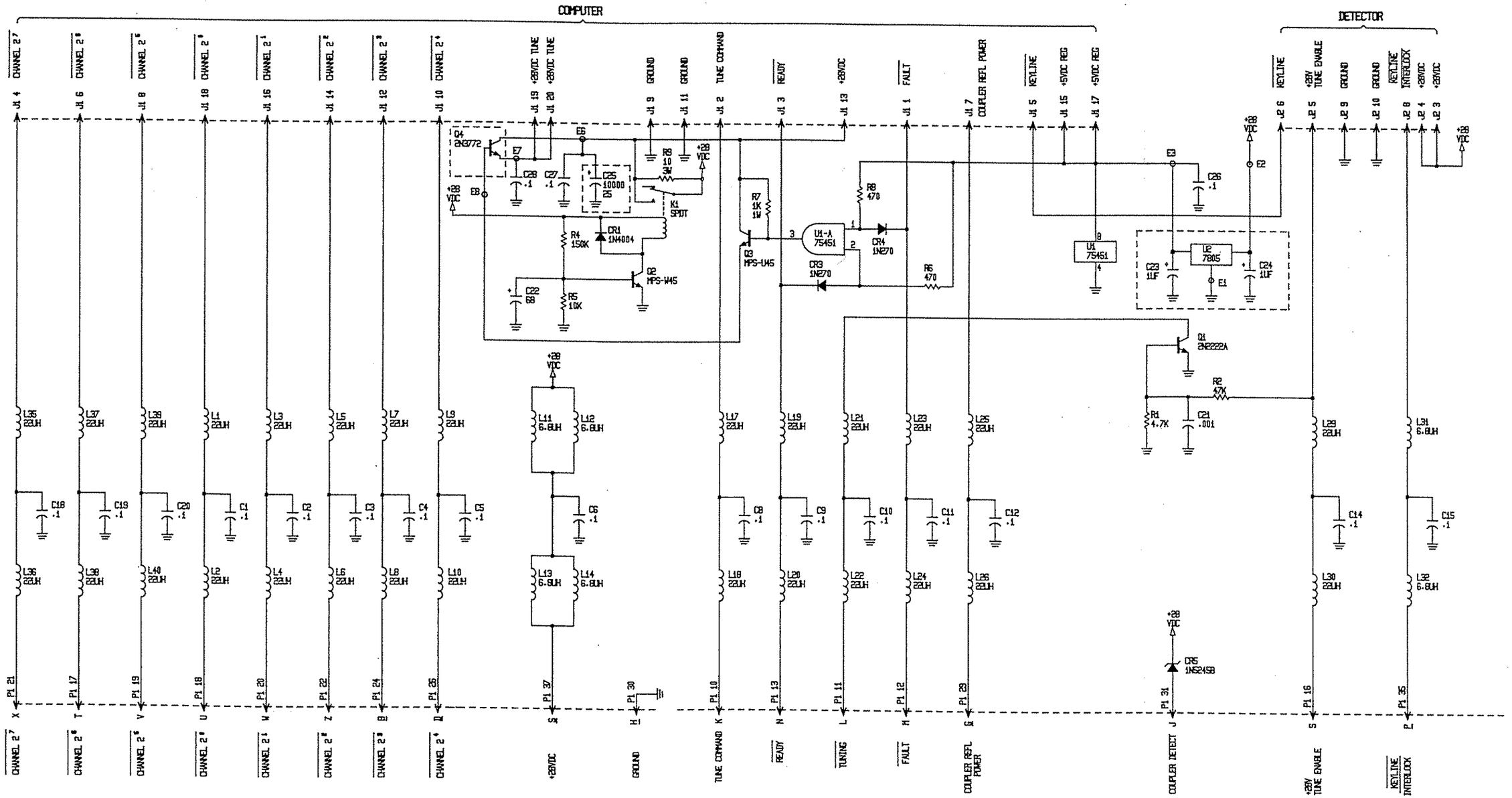


Figure 5.12 CU-9100 Wiring Diagram (Sheet 2 of 2).



PC ASSEMBLY, INPUT CONNECTOR (A1)

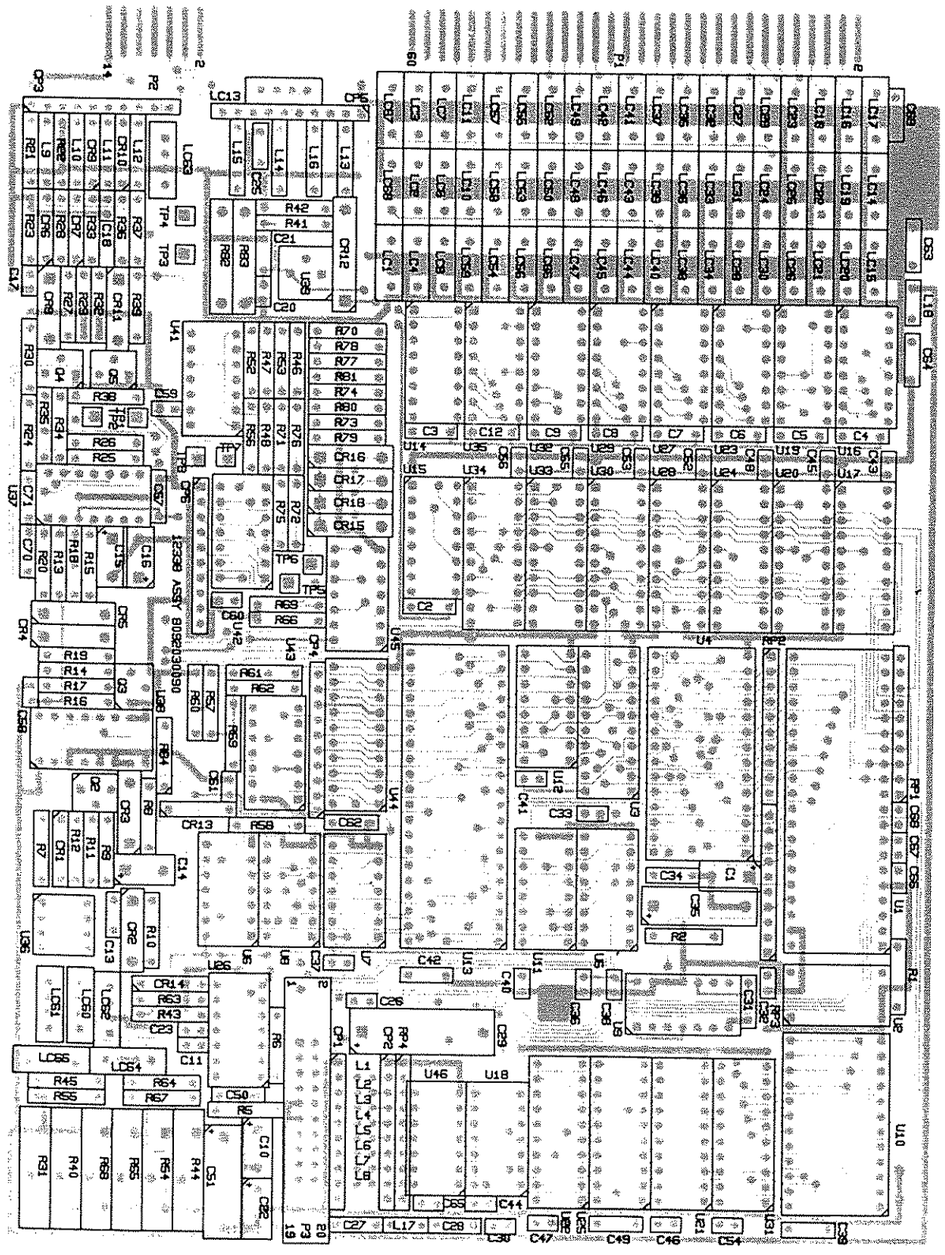
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A1	PC ASSEMBLY, INPUT CONNECTOR	8104019091
C1	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C2	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C3	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C4	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C5	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C6	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C7	NOT USED	-
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. 0.1μF, 50V, X7R, 20%	0281610002
C16	NOT USED	-
C17	NOT USED	-
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. 0.001μF, 100V, X7R, 20%	0281630003
C22	CAP. 68μF, 25V, T368	0282150005
C23	CAP. 1μF, 50V, 198D	0280910002
C24	CAP. 1μF, 50V, 198D	0280910002
C25	CAP. 10000 μF, 50V	1001120027
C26	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C27	CAP. 0.1μF, 50V, X7R, 20%	0281610002
C28	CAP. 0.1μF, 50V, X7R, 20%	0281610002
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, RECTIFIER 1N4004	0405180004
CR3	DIODE, SIGNAL, GERM. 1N270	0405510004
CR4	DIODE, SIGNAL, GERM. 1N270	0405510004
CR5	DIODE, ZENER 1N5245B	0405210001
J1	CONNECTOR, 10 PIN DUAL	1009140001
J2	CONNECTOR, PC, 10 PIN HEADER	1008070009
K1	RELAY, SPDT, 24VDC, 10 AMP	1008290009
L1	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L2	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L3	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L4	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L5	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L6	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L7	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L8	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L9	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L10	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L11	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L12	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L13	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L14	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L15	NOT USED	-
L16	NOT USED	-
L17	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L18	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L19	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L20	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L21	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L22	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L23	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L24	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L25	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L26	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L27	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L28	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L29	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L30	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L31	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L32	INDUCTOR, MOLDED, 6.8μH, 10%	0652200001
L33	NOT USED	-
L34	NOT USED	-
L35	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L36	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L37	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L38	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L39	INDUCTOR, MOLDED, 22μH, 10%	0664060005
L40	INDUCTOR, MOLDED, 22μH, 10%	0664060005
P1	CONNECTOR, 37 PIN,TAPPED SHELL	1009330004
Q1	TRANSISTOR, NPN, SI. 2N2222A	0448580004
Q2	TRANSISTOR, NPN, SI MPSW45	1009320009
Q3	TRANSISTOR, NPN, SI MPSU45	0448570009
Q4	TRANSISTOR, NPN, SI. 2N3772	0448370000
R1	RESISTOR 4.7K, 5%, 1/4W	0170770001
R2	RESISTOR 47K, 10%, 1/4W	0171060008
R3	RESISTOR 1K, 10%, 1/4W	0171560001
R4	RESISTOR 150K, 10%, 1/4W	0176750002
R5	RESISTOR 150K, 10%, 1/4W	0176750002
R6	RESISTOR 470, 10%, 1/4W	0172610001
R7	RESISTOR 1K, 10%, 1W	0165160004
R8	RESISTOR 470, 10%, 1/4W	0172610001
R9	RESISTOR 3, 5% 3W	1004600003
U1	IC. DIGITAL 75451B	1003950035
U2	IC. LINEAR, VOL.REG. MC7805CK	0447190008
	MICA INS. TO-3 TRANSISTOR	0440940001
	SOCKET, TRANSISTOR TO-3	0841550000
	KEY, POLARIZING	1008070033
	PLATE, HEATSINK, REGULATOR	8092040508



NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL INDUCTORS ARE 22UH AND ALL CAPACITORS ARE 0.1UF.
2. UNDERSCORED CHARACTERS REPRESENT LOWER CASE LETTERS.
   Q4, U2, C23-C25 MOUNTED OFF BOARD.

REFERENCE DESIGNATORS	
LAST USED	NOT USED
C28	C7,17,13,16
CR5	CR2
E8	
J2	
K1	
L40	L15,16,25,28,33,34
P1	
Q4	
R9	R3
U2	

Figure 5.13 Input Connector Assembly A1.



PC ASSEMBLY, COMPUTER CU-9100 (A2)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A2	PC ASSEMBLY, COMPUTER	8092030090
C1	CAP. 1µF, 50V, 198D	0280910002
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. 1µF, 50V, 198D	0280910002
C11	CAP. .01µF, 50V, X7R 20%	0281730008
C12	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C13	CAP. .47µF, 50V, X7R 20%	0283377771
C14	CAP. 6.8µF, 25V 20%	1005050031
C15	CAP. 6.8µF, 25V 20%	1005050031
C16	CAP. 6.8µF, 25V 20%	1005050031
C17	CAP. .01µF, 50V, X7R 20%	0281730008
C18	CAP. .01µF, 50V, X7R 20%	0281730008
C19	NOT USED	-
C20	CAP. .01µF, 50V, X7R 20%	0281730008
C21	CAP. .01µF, 50V, X7R 20%	0281730008
C22	CAP. 1µF, 50V, 198D	0280910002
C23	CAP. .01µF, 50V, X7R 20%	0281730008
C25	CAP. .47µF, 50V, X7R 20%	0283377771
C26	CAP. 0.001µF, 100V, X7R, 20%	0281630003
C27	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C28	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C29	CAP. 150µF, 16V	1006150013
C30	CAP. .01µF, 50V, X7R 20%	0281730008
C31	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C32	CAP. .01µF, 50V, X7R 20%	0281730008
C33	CAP. .01µF, 50V, X7R 20%	0281730008
C34	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C35	CAP. 10µF, 25V	1006150005
C36	CAP. .01µF, 50V, X7R 20%	0281730008
C37	CAP. .01µF, 50V, X7R 20%	0281730008
C38	CAP. .01µF, 50V, X7R 20%	0281730008
C39	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C40	CAP. .01µF, 50V, X7R 20%	0281730008
C41	CAP. .01µF, 50V, X7R 20%	0281730008
C42	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C43	CAP. .01µF, 50V, X7R 20%	0281730008
C44	CAP. .01µF, 50V, X7R 20%	0281730008
C45	CAP. .01µF, 50V, X7R 20%	0281730008
C46	CAP. .01µF, 50V, X7R 20%	0281730008
C47	CAP. .01µF, 50V, X7R 20%	0281730008
C48	CAP. .01µF, 50V, X7R 20%	0281730008
C49	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C50	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C51	CAP. 10µF, 25V	1006150005
C52	CAP. .01µF, 50V, X7R 20%	0281730008
C53	CAP. .01µF, 50V, X7R 20%	0281730008
C54	CAP. .01µF, 50V, X7R 20%	0281730008
C55	CAP. .01µF, 50V, X7R 20%	0281730008
C56	CAP. .01µF, 50V, X7R 20%	0281730008
C57	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C58	CAP. .01µF, 50V, X7R 20%	0281730008
C59	CAP. .01µF, 50V, X7R 20%	0281730008
C60	CAP. .01µF, 50V, X7R 20%	0281730008

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C61	CAP. .01µF, 50V, X7R 20%	0281730008
C62	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C63	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C64	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C65	CAP. .01µF, 50V, X7R 20%	0281730008
C66	NOT USED	-
C67	CAP. .01µF, 50V, X7R 20%	0281730008
C68	CAP. .01µF, 50V, X7R 20%	0281730008
C69	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C70	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C71	CAP. 0.1µF, 50V, X7R, 20%	0281610002
CP1	CAPACITOR, NTWK, 10 PIN, .1 µF	1006580018
CP2	CAPACITOR, NTWK, 10 PIN, .1 µF	1006580018
CP3	CAPACITOR, NTWK, 10 PIN, .01µF	1006540016
CP4	CAPACITOR, NTWK, .001 µF	1008020001
CP5	CAPACITOR, NTWK, 10 PIN, .01µF	1006540016
CP6	CAPACITOR, NTWK, 10 PIN, .1 µF	1006580018
CR1	DIODE, HOT CARRIER 1N6263	0405610009
CR2	DIODE, RECTIFIER 1N4004	0405180004
CR3	DIODE, RECTIFIER 1N4004	0405180004
CR4	DIODE, RECTIFIER 1N4004	0405180004
CR5	DIODE, RECTIFIER 1N4004	0405180004
CR6	DIODE, HOT CARRIER 1N6263	0405610009
CR7	DIODE, HOT CARRIER 1N6263	0405610009
CR8	DIODE, RECTIFIER 1N4004	0405180004
CR9	DIODE, HOT CARRIER 1N6263	0405610009
CR10	DIODE, HOT CARRIER 1N6263	0405610009
CR11	DIODE, RECTIFIER 1N4004	0405180004
CR12	DIODE, ZENER 1N5349A	0405380003
CR13	DIODE, SIGNAL, GERM. 1N270	0405510004
CR14	DIODE, SIGNAL, GERM. 1N270	0405510004
CR15	DIODE, RECTIFIER 1N4004	0405180004
CR16	DIODE, RECTIFIER 1N4004	0405180004
CR17	DIODE, RECTIFIER 1N4004	0405180004
CR18	DIODE, RECTIFIER 1N4004	0405180004
L1	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L2	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L3	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L4	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L5	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L6	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L7	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L8	INDUCTOR, MOLDED, 33µH, 5%	0659690004
L9	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L10	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L11	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L12	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L13	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L14	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L15	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L16	INDUCTOR, MOLDED, 22µH, 5%	0650000005
L17	FERRITE BEAD .047ID .138 OD	0564510009
L18	FERRITE BEAD .047ID .138 OD	0564510009
LC1	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC2	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC3	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC4	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC5	NOT USED	-
LC6	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC7	FILTER,EMI PI NTWK,0.5A 50V	1009100009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
LC8	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC9	NOT USED	-
LC10	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC11	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC12	NOT USED	-
LC13	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC14	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC15	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC16	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC17	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC18	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC19	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC20	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC21	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC22	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC23	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC24	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC25	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC26	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC27	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC28	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC29	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC30	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC31	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC32	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC33	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC34	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC35	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC36	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC37	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC38	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC39	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC40	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC41	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC42	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC43	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC44	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC45	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC46	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC47	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC48	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC49	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC50	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC51	NOT USED	-
LC52	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC53	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC54	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC55	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC56	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC57	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC58	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC59	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC60	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC61	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC62	FILTER,EMI PI NTWK,0.1A 50V	1009110004
LC63	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC64	FILTER,EMI PI NTWK,0.1A 50V	1009110004
LC65	FILTER,EMI PI NTWK,0.1A 50V	1009110004
LC66	FILTER,EMI PI NTWK,0.5A 50V	1009100009
LC67	FILTER,EMI PI NTWK,0.5A 50V	1009100009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
LC68	FILTER,EMI PI NTWK,0.5A 50V	1009100009
P1	NOT USED	-
P2	NOT USED	-
P3	CONNECTOR, PC, 20 PIN, STR.	1008120014
Q1	NOT USED	-
Q2	TRANSISTOR, NPN, SI. 2N2222A	0448580004
Q3	TRANSISTOR, NPN, SI. 2N4124	0448010003
Q4	TRANSISTOR, NPN, SI. 2N4124	0448010003
Q5	TRANSISTOR, NPN, SI. 2N4124	0448010003
R1	RESISTOR 470, 5%, 1/4W	0184110009
R2	RESISTOR 100K, 10%, 1/4W	0170390004
R3	NOT USED	-
R4	NOT USED	-
R5	RESISTOR 10K, 10%, 1/4W	0170410005
R6	RESISTOR 1M, 10%, 1/4W	0170650006
R7	RESISTOR 1K, 10%, 1/4W	0171560001
R8	RESISTOR 220, 10%, 1/4W	0171320000
R9	RESISTOR 1.2K, 10%, 1/4W	0181860007
R10	RESISTOR 6.8K, 5%, 1/4W	0174810008
R11	RESISTOR 820, 10%, 1/4W	0178210005
R12	RESISTOR 22K, 5%, 1/4W	0172230004
R13	RESISTOR 1K, 10%, 1/4W	0171560001
R14	RESISTOR 8.2K, 5%, 1/4W	0181620006
R15	RESISTOR 8.2K, 5%, 1/4W	0181620006
R16	RESISTOR 27K, 10%, 1/4W	0171200004
R17	RESISTOR 10K, 10%, 1/4W	0170410005
R18	RESISTOR 1K, 10%, 1/4W	0171560001
R19	RESISTOR 8.2K, 5%, 1/4W	0181620006
R20	RESISTOR 8.2K, 5%, 1/4W	0181620006
R21	RESISTOR 470, 5%, 1/4W	0184110009
R22	RESISTOR 10K, 10%, 1/4W	0170410005
R23	RESISTOR 15K, 5%, 1/4W	0172350000
R24	RESISTOR 15K, 5%, 1/4W	0172350000
R25	RESISTOR 2.2M, 10%, 1/4W	0176870008
R26	RESISTOR 4.7K, 5%, 1/4W	0170770001
R27	RESISTOR 22K, 5%, 1/4W	0172230004
R28	RESISTOR 1.5K, 10%, 1/4W	0172470005
R29	RESISTOR 100K, 10%, 1/4W	0170390004
R30	RESISTOR 15K, 5%, 1/4W	0172350000
R31	POT. 100K, 10% 3/4W, 15 TURNS	0338490051
R32	RESISTOR 15K, 5%, 1/4W	0172350000
R33	RESISTOR 15K, 5%, 1/4W	0172350000
R34	RESISTOR 2.2M, 10%, 1/4W	0176870008
R35	RESISTOR 4.7K, 5%, 1/4W	0170770001
R36	RESISTOR 22K, 5%, 1/4W	0172230004
R37	RESISTOR 15K, 5%, 1/4W	0172350000
R38	RESISTOR 150K, 10%, 1/4W	0176750002
R39	RESISTOR 15K, 5%, 1/4W	0172350000
R40	POT. 100K, 10% 3/4W, 15 TURNS	0338490051
R41	RESISTOR 80.6, 1%, 1/8W	0195200004
R42	RESISTOR 604, 1%, 1/8W	0193980002
R43	RESISTOR, 1.8M, 10%, 1/4W	1011300001
R44	POT. 1K, 10% 3/4W, 15 TURNS	0338490019
R45	NOT USED	-
R46	RESISTOR 6.8K, 5%, 1/4W	0174810008
R47	RESISTOR 6.8K, 5%, 1/4W	0174810008
R48	RESISTOR 2.2K, 5%, 1/4W	0178070009
R49	NOT USED	-
R50	NOT USED	-
R51	NOT USED	-

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R52	RESISTOR 6.8K, 5%, 1/4W	0174810008
R53	RESISTOR 6.8K, 5%, 1/4W	0174810008
R54	POT. 1K, 10% 3/4W, 15 TURNS	0338490019
R55	NOT USED	-
R56	RESISTOR 2.2K, 5%, 1/4W	0178070009
R57	RESISTOR 10K, 10%, 1/4W	0170410005
R58	RESISTOR 2.7K, 10%, 1/4W	0186670001
R59	RESISTOR 10K, 10%, 1/4W	0170410005
R60	RESISTOR 39K, 10%, 1/4W	0177800003
R61	RESISTOR 100K, 10%, 1/4W	0170390004
R62	RESISTOR 4.7K, 5%, 1/4W	0170770001
R63	RESISTOR 10K, 10%, 1/4W	0170410005
R64	RESISTOR 10K, 1%, 1/8W	1003050026
R65	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R66	RESISTOR 10.7K 1%, 1/8W	1004070012
R67	RESISTOR 10K, 1%, 1/8W	1003050026
R68	POT. 5K, 10% 3/4W, 15 TURNS	0338490086
R69	RESISTOR 10.7K 1%, 1/8W	1004070012
R70	RESISTOR 4.7K, 5%, 1/4W	0170770001
R71	RESISTOR 22M, 10%, 1/4W	0180950002
R72	RESISTOR 22M, 10%, 1/4W	0180950002
R73	RESISTOR 4.7K, 5%, 1/4W	0170770001
R74	RESISTOR 4.7K, 5%, 1/4W	0170770001
R75	RESISTOR 22M, 10%, 1/4W	0180950002
R76	RESISTOR 22M, 10%, 1/4W	0180950002
R77	RESISTOR 4.7K, 5%, 1/4W	0170770001
R78	RESISTOR 100K, 10%, 1/4W	0170390004
R79	RESISTOR 100K, 10%, 1/4W	0170390004
R80	RESISTOR 100K, 10%, 1/4W	0170390004
R81	RESISTOR 100K, 10%, 1/4W	0170390004
R82	RESISTOR 220, 10%, 1/2W	0172850002
R83	RESISTOR 220, 10%, 1/2W	0172850002
R84	RESISTOR 100K, 10%, 1/4W	0170390004
RP1	RES NTWK 10 PIN SIP 10K COM	1006130021
RP2	RES NTWK 10 PIN SIP 10K COM	1006130021
RP3	RES NTWK 10 PIN SIP 10K COM	1006130021
RP4	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
TP8	VERTICAL JACK, WHITE	1006200029
U1	IC. DIGITAL ID8085AH	1006410007
U2	CRYSTAL OSCILLATOR, 6.144 MHZ	1008180033
U3	IC. DIGITAL 74HC373	1006480030
U4	EPROM, W/SOFTWARE	8092033293
U5	IC. DIGITAL 74HC139	1006770038
U6	IC. DIGITAL 74HC32	1006470026
U7	IC. DIGITAL 74HC14	1006490027
U8	IC. DIGITAL 74HC08	1006490019
U9	IC, DIGITAL 74HC74	1008000019
U10	IC.DIGITAL X2816A	1009020005
U11	IC. DIGITAL 74HC138	1006480013
U12	IC. DIGITAL 74HC138	1006480013
U13	IC. DIGITAL 81C55	1007390026
U14	IC. DIGITAL ULN2003A	1005630038
U15	IC. DIGITAL ULN2003A	1005630038

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
U16	IC. DIGITAL ULN2003A	1005630038
U17	IC. DIGITAL 74HC374	1006450033
U18	IC. DIGITAL 74HC14	1006490027
U19	IC. DIGITAL ULN2003A	1005630038
U20	IC. DIGITAL 74HC374	1006450033
U21	IC. DIGITAL 74HC244	1006460039
U22	IC. DIGITAL 74HC374	1006450033
U23	IC. DIGITAL ULN2003A	1005630038
U24	IC. DIGITAL 74HC374	1006450033
U25	IC.DIGITAL 74HC688	1009050001
U26	IC. LINEAR 556C/3456	1005620032
U27	IC. DIGITAL ULN2003A	1005630038
U28	IC. DIGITAL 74HC374	1006450033
U29	IC. DIGITAL ULN2003A	1005630038
U30	IC. DIGITAL 74HC374	1006450033
U31	IC. DIGITAL 74HC374	1006450033
U32	IC. DIGITAL ULN2003A	1005630038
U33	IC. DIGITAL 74HC374	1006450033
U34	IC. DIGITAL 74HC374	1006450033
U35	IC. DIGITAL ULN2003A	1005630038
U36	IC. DIGITAL 75452B	1003960014
U37	IC. LINEAR LM139	1007490004
U38	IC. DIGITAL CD4053BE	1005520020
U39	IC. LINEAR LM117	1006440011
U40	NOT USED	-
U41	IC. LINEAR UA747ADMQB	1006430024
U42	IC. LINEAR LM139	1007490004
U43	IC. LINEAR LM139	1007490004
U44	IC. DIGITAL 74HC541	1009040006
U45	IC. DIGITAL 74HC14	1006490027
U46	IC. DIGITAL 74HC14	1006490027
XU1	SOCKET, IC, 40 PIN TAILLESS	1006620010
XU4	SOCKET, IC, 28 PIN TAILLESS	1006620001
XU10	SOCKET, IC, 24 PIN	1006240021
XU13	SOCKET, IC, 40 PIN TAILLESS	1006620010
	MOUNTING PAD, TRANSISTOR	0502710004
	KEY, POLARIZING	1008070033

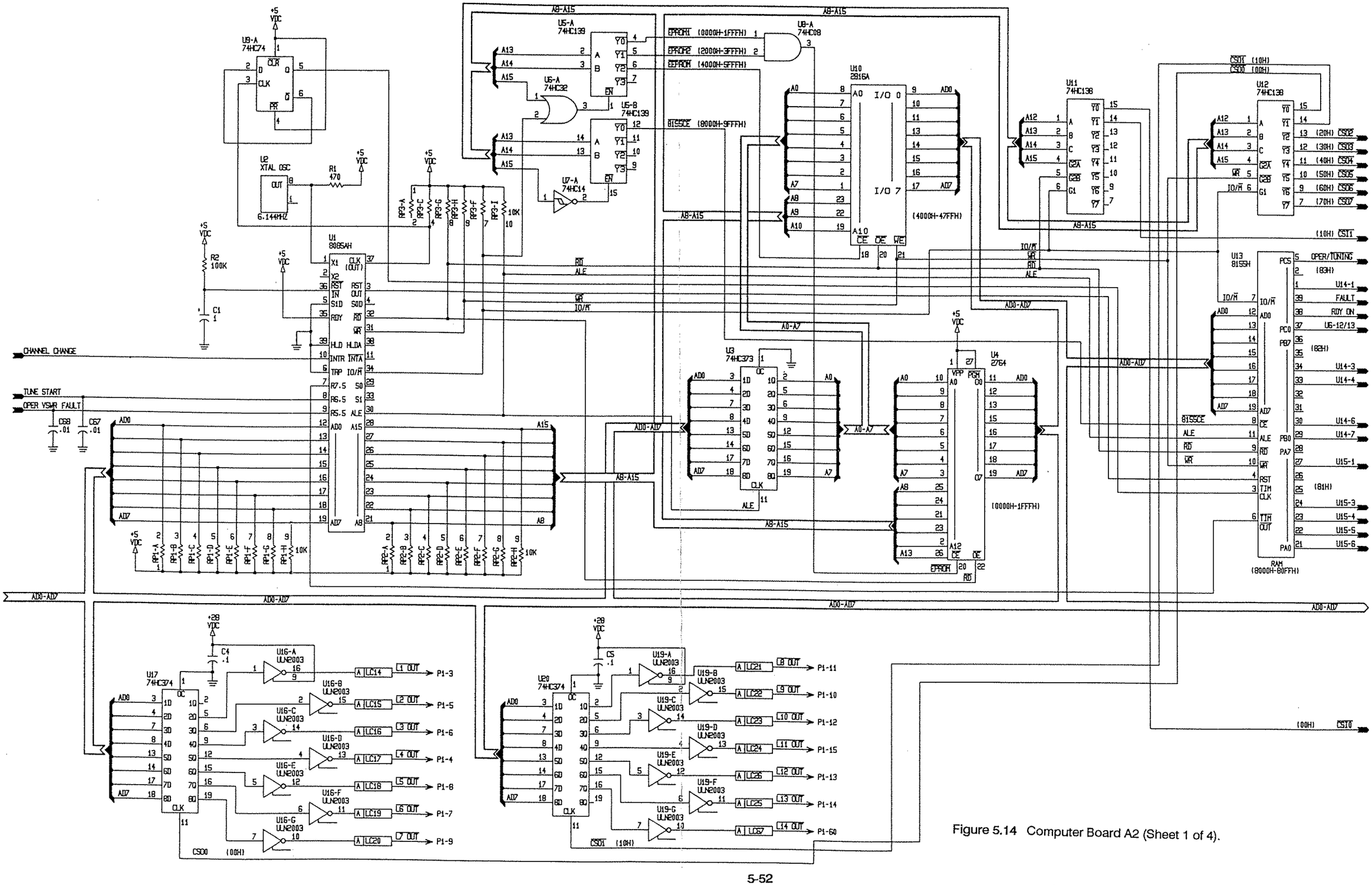


Figure 5.14 Computer Board A2 (Sheet 1 of 4).

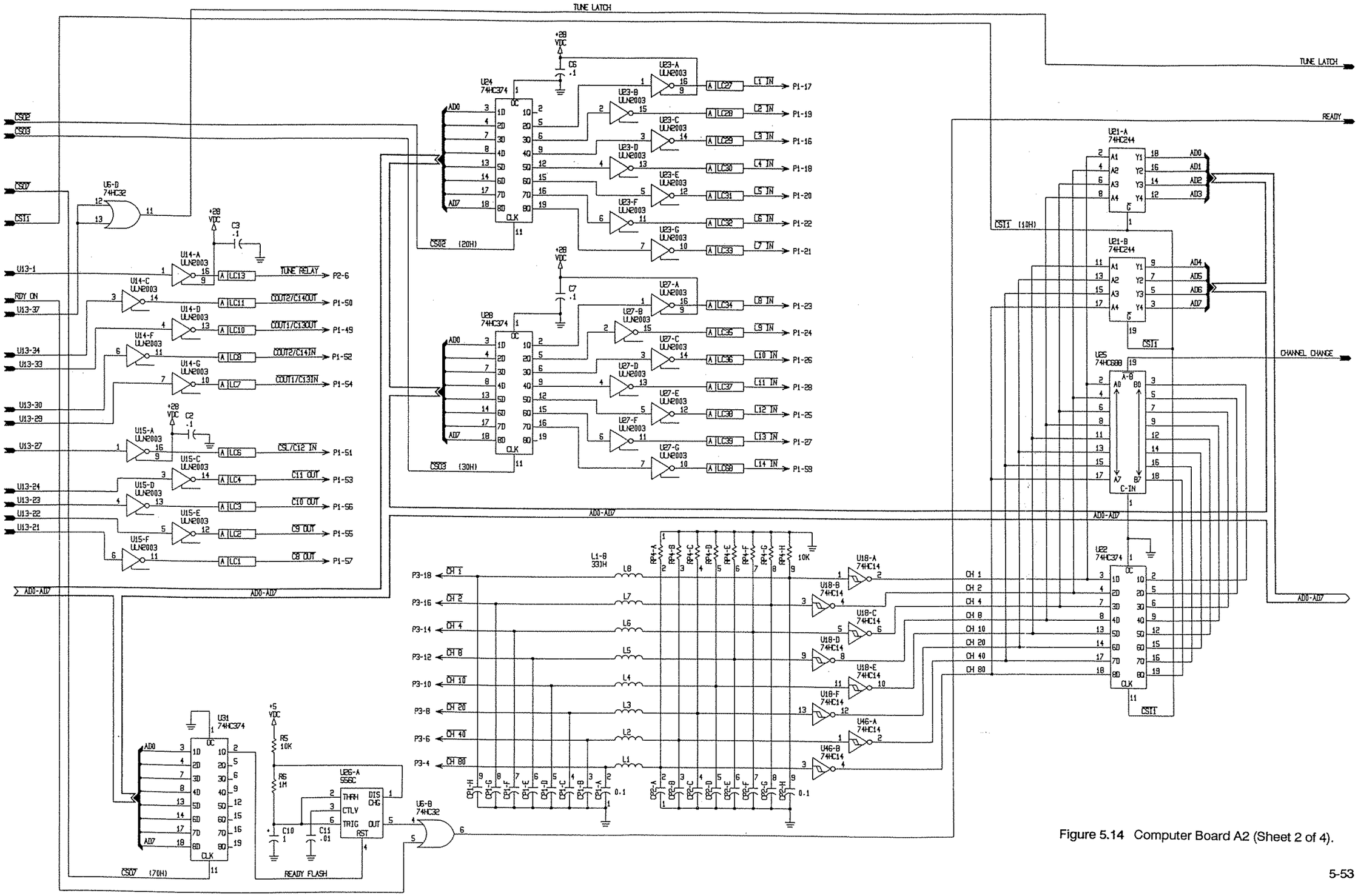


Figure 5.14 Computer Board A2 (Sheet 2 of 4).

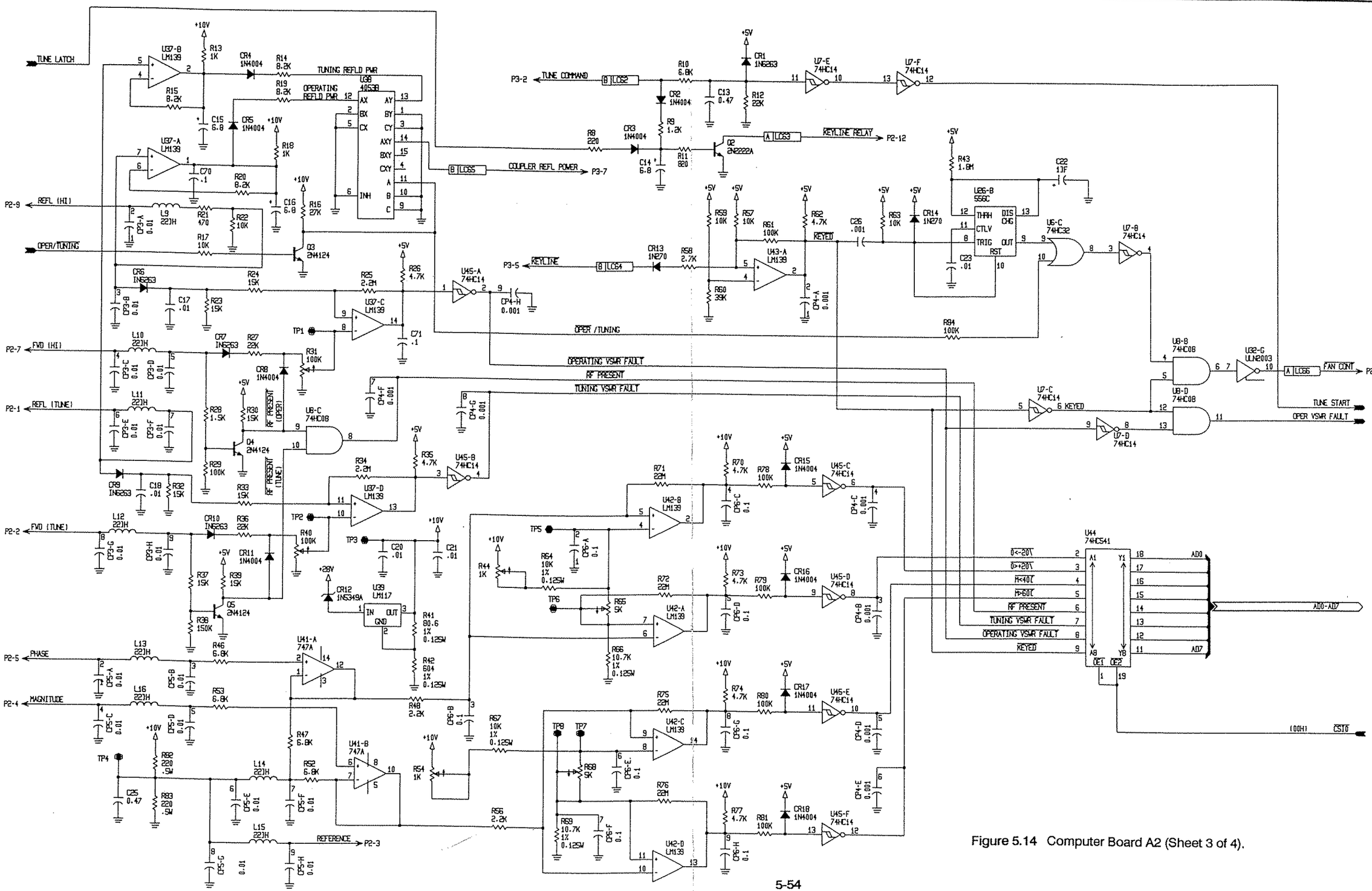
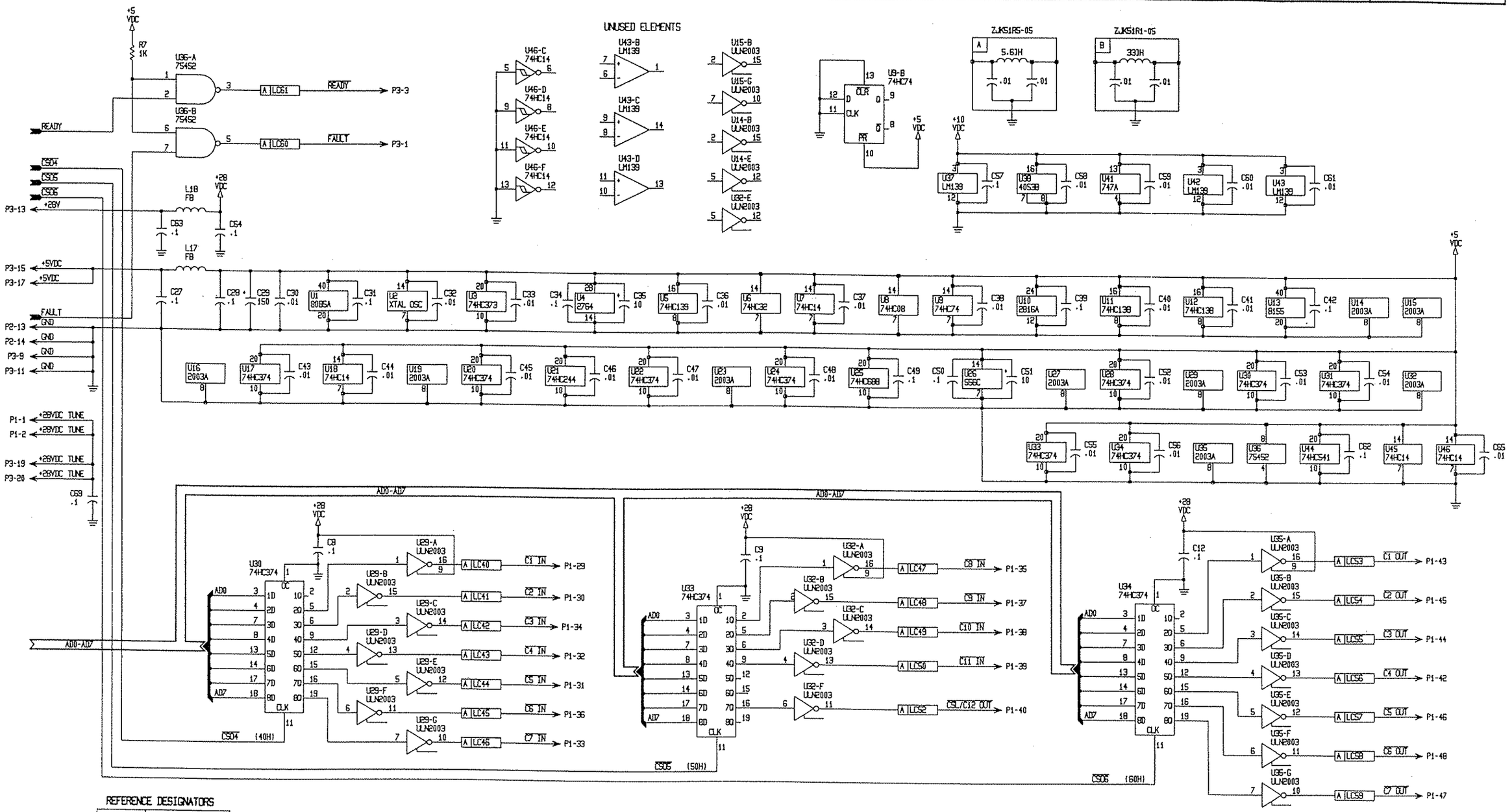


Figure 5.14 Computer Board A2 (Sheet 3 of 4).



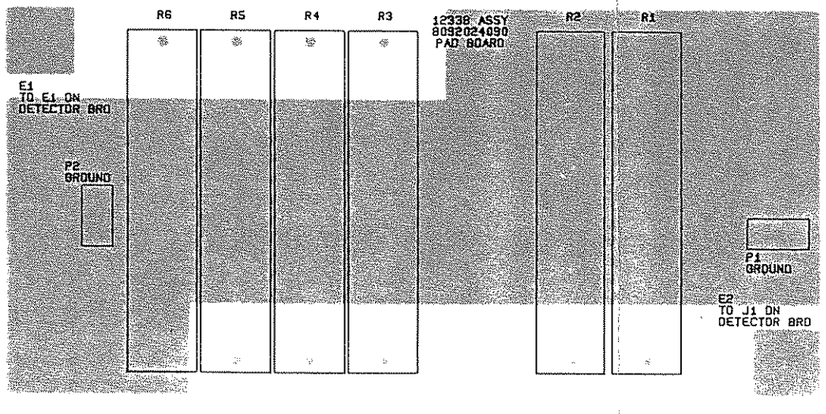
REFERENCE DESIGNATORS

LAST USED	UNUSED
U46	U40
R83	R3,4,45,49-51,55
RP4	
Q5	Q1
C71	C19,24,66
CR18	
L18	
LC68	LC5,LC9,LC12,LC51
CP6	

Figure 5.14 Computer Board A2 (Sheet 4 of 4).

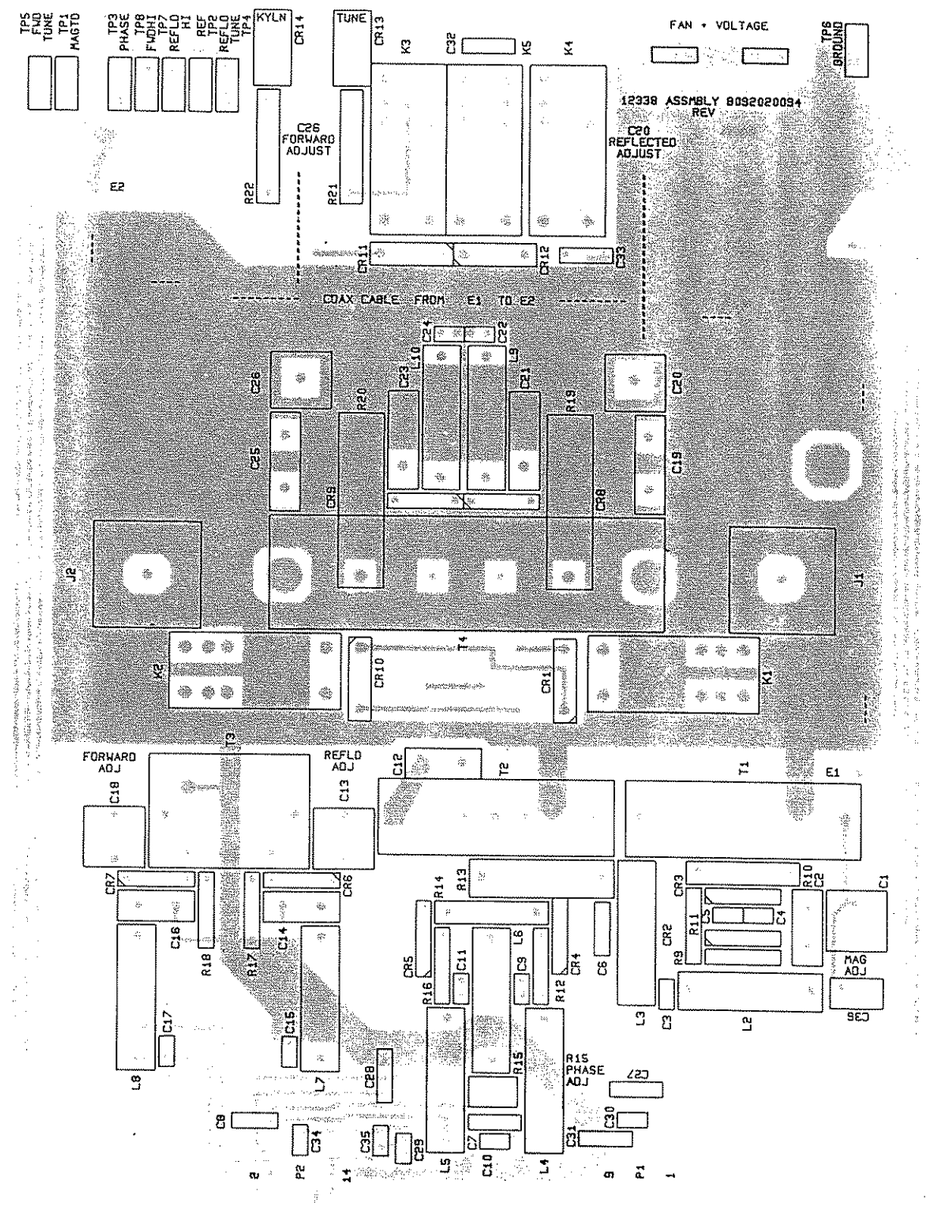
PC ASSEMBLY, DETECTOR CU-9100 (A3)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A3	PC ASSEMBLY, DETECTOR CU-9100	8092020094
C1	CAP. 5.5-18PF, 500V	1009460005
C2	CAP. 390PF, 500V, DM15, 5%	0286000008
C3	CAP. .01µF, 50V, X7R 20%	0281730008
C4	CAP. .01µF, 50V, X7R 20%	0281730008
C5	CAP. .01µF, 50V, X7R 20%	0281730008
C6	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C7	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C8	CAP. .47µF, 50V, X7R 20%	0283377771
C9	CAP. .01µF, 50V, X7R 20%	0281730008
C10	CAP. .01µF, 50V, X7R 20%	0281730008
C11	CAP. .01µF, 50V, X7R 20%	0281730008
C12	CAP. 12PF, 500V, DM15	1005320039
C13	CAP. 2-8PF, 350V, NPO	0268220000
C14	CAP. 91PF, 500V, DM15, 5%	0298740001
C15	CAP. .01µF, 50V, X7R 20%	0281730008
C16	CAP. 91PF, 500V, DM15, 5%	0298740001
C17	CAP. .01µF, 50V, X7R 20%	0281730008
C18	CAP. 2-8PF, 350V, NPO	0268220000
C19	CAP. DISC, 4.7 PF, 3KV NPO	1007150025
C20	CAP. 15/60 PF NPO	1007160004
C21	CAP. 360PF, 500V, DM19, 2%	0282650008
C22	CAP. .01µF, 50V, X7R 20%	0281730008
C23	CAP. 360PF, 500V, DM19, 2%	0282650008
C24	CAP. .01µF, 50V, X7R 20%	0281730008
C25	CAP. DISC, 4.7 PF, 3KV NPO	1007150025
C26	CAP. 15/60 PF NPO	1007160004
C27	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C28	CAP. 0.1µF, 50V, X7R, 20%	0281610002
C29	CAP. .01µF, 50V, X7R 20%	0281730008
C30	CAP. .01µF, 50V, X7R 20%	0281730008
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. .01µF, 50V, X7R 20%	0281730008
C35	CAP. .01µF, 50V, X7R 20%	0281730008
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR3	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR4	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR5	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR6	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR7	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR8	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR9	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR10	DIODE, RECTIFIER 1N4004	0405180004
CR11	DIODE, RECTIFIER 1N4004	0405180004
CR12	DIODE, RECTIFIER 1N4004	0405180004
CR13	DIODE,LED,GRN	1009000004
CR14	DIODE,LED,GRN	1009000004
J1	CONNECTOR, RF, BNC	0753490005
J2	CONNECTOR, RF, BNC	0753490005
K1	RELAY, SPDT, 24VDC, 10 AMP	1008290009
K2	RELAY, SPDT, 24VDC, 10 AMP	1008290009
K3	RELAY, SPDT, 24VDC, 10 AMP	1008290009
K4	RELAY, SPDT, 24VDC, 10 AMP	1008290009
K5	RELAY, SPDT, 24VDC, 10 AMP	1008290009
L1	NOT USED	-
L2	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L3	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L4	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L5	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L6	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L7	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L8	INDUCTOR, MOLDED, 1000µH, 5%	0643310002
L9	INDUCTOR, MOLDED, 2000µH, 5%	0653590008
L10	INDUCTOR, MOLDED, 2000µH, 5%	0653590008
R9	RESISTOR 12K, 10%, 1/4W	0183180003
R10	RESISTOR 18, 5%, 1/2W	0184730007
R11	RESISTOR 12K, 10%, 1/4W	0183180003
R12	RESISTOR 220, 10%, 1/4W	0171320000
R13	RESISTOR 100, 10%, 1W	0165540001
R14	RESISTOR 56, 10%, 1/2W	0168890003
R15	POT. 10K, 10% 1/4W, 12 TURNS	0346500001
R16	RESISTOR 220, 10%, 1/4W	0171320000
R17	RESISTOR 27, 10%, 1/4W	0172590001
R18	RESISTOR 27, 10%, 1/4W	0172590001
R19	RESISTOR 22, 10%, 2W	0169940004
R20	RESISTOR 22, 10%, 2W	0169940004
R21	RESISTOR 2.7K, 10%, 1/2W	0165780002
R22	RESISTOR 2.7K, 10%, 1/2W	0165780002
T1	TRANSFORMER, AMPL. DETECTOR	6035040802
T2	TRANSFORMER, PHASE DETECTOR	6035040900
T3	TRANSFORMER, CURRENT	8080003602
T4	TOROID/SHIELD ASSY.	5025130204
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
TP6	TEST POINT, WHITE	0753640007
TP7	TEST POINT, WHITE	0753640007
TP8	TEST POINT, WHITE	0753640007
	CONNECTOR, PC, 2 PIN	1008060020
	PC ASSY, PAD	8092024090



PC ASSEMBLY, PAD CU-9100 (A3A2)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A3A2	PC ASSEMBLY, PAD CU-9100	8092024090
R1	RESISTOR 400, 5%, 14W	0197380000
R2	RESISTOR 400, 5%, 14W	0197380000
R3	RESISTOR 75, 5%, 14W	0191300004
R4	RESISTOR 75, 5%, 14W	0191300004
R5	RESISTOR 75, 5%, 14W	0191300004
R6	RESISTOR 200, 5%, 14W	0197410006
	TERMINAL, PC MOUNT, 1/4" MALE	1008330035



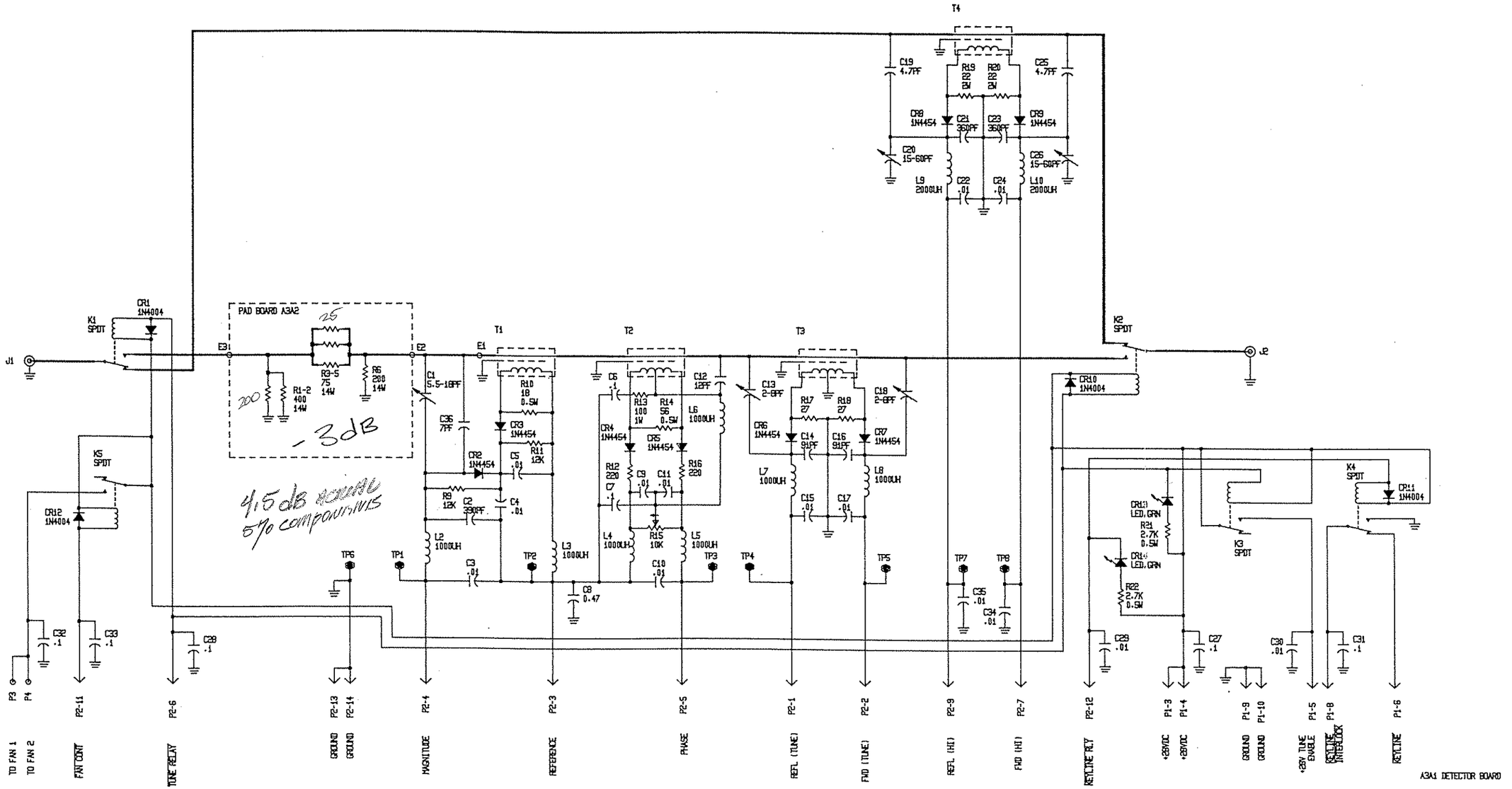
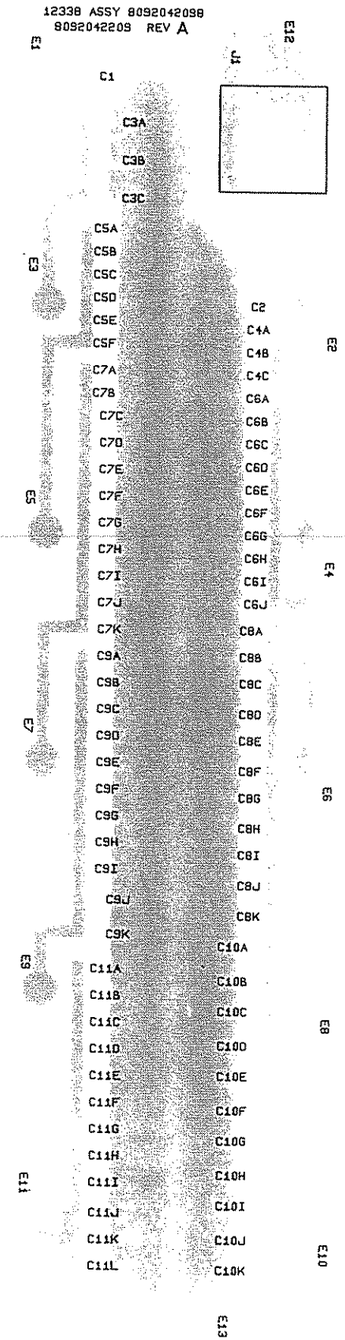


Figure 5.15 Detector/Relay Pad Assembly A3.

PC ASSEMBLY, CAPACITOR BOARD CU-9100 (A4)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
A4	PC ASSY, CAPACITOR BOARD	8092042098
C1	CAP. 10PF, 1000V, N750	0250480000
C2	CAP. 24PF 2KV N750	1008470031
C3A	CAP. 15 PF, 2KV, N750	1008220001
C3B	CAP. 15 PF, 2KV, N750	1008220001
C3C	CAP. 15 PF, 2KV, N750	1008220001
C4A	CAP. 27PF, 1000V, N750	0250620006
C4B	CAP. 27PF, 1000V, N750	0250620006
C4C	CAP. 33 PF, 2KV, N750	1008230022
C5A	CAP. 22PF, 1000V, N750	0250500001
C5B	CAP. 27PF, 1000V, N750	0250620006
C5C	CAP. 27PF, 1000V, N750	0250620006
C5D	CAP. 27PF, 1000V, N750	0250620006
C5E	CAP. 27PF, 1000V, N750	0250620006
C5F	CAP. 27PF, 1000V, N750	0250620006
C6A	CAP. 27PF, 1000V, N750	0250620006
C6B	CAP. 27PF, 1000V, N750	0250620006
C6C	CAP. 27PF, 1000V, N750	0250620006
C6D	CAP. 27PF, 1000V, N750	0250620006
C6E	CAP. 27PF, 1000V, N750	0250620006
C6F	CAP. 27PF, 1000V, N750	0250620006
C6G	CAP. 27PF, 1000V, N750	0250620006
C6H	CAP. 33 PF, 2KV, N750	1008230022
C6I	CAP. 33 PF, 2KV, N750	1008230022
C6J	CAP. 33 PF, 2KV, N750	1008230022
C7A	CAP. 50 PF, 2KV, N750	1008240010
C7B	CAP. 50 PF, 2KV, N750	1008240010
C7C	CAP. 43PF, 3KV, NP0	0288180003
C7D	CAP. 43PF, 3KV, NP0	0288180003
C7E	CAP. 43PF, 3KV, NP0	0288180003
C7F	CAP. 43PF, 3KV, NP0	0288180003
C7G	CAP. 43PF, 3KV, NP0	0288180003
C7H	CAP. 43PF, 3KV, NP0	0288180003
C7I	CAP. 43PF, 3KV, NP0	0288180003
C7J	CAP. 43PF, 3KV, NP0	0288180003
C7K	CAP. 43PF, 3KV, NP0	0288180003
C8A	CAP. 91 PF, 2KV N750	1008250023
C8B	CAP. 91 PF, 2KV N750	1008250023
C8C	CAP. 91 PF, 2KV N750	1008250023
C8D	CAP. 91 PF, 2KV N750	1008250023
C8E	CAP. 100PF 2KV N750	1008250031
C8F	CAP. 100PF 2KV N750	1008250031
C8G	CAP. 100PF 2KV N750	1008250031
C8H	CAP. 100PF 2KV N750	1008250031
C8I	CAP. 100PF 2KV N750	1008250031
C8J	CAP. 100PF 2KV N750	1008250031
C8K	CAP. 100PF 2KV N750	1008250031
C9A	CAP. 150PF, 1000V, N750	0291230008
C9B	CAP. 150PF, 1000V, N750	0291230008
C9C	CAP. 150PF, 1000V, N750	0291230008
C9D	CAP. 150PF, 1000V, N750	0291230008
C9E	CAP. 150PF, 1000V, N750	0291230008
C9F	CAP. 150PF, 1000V, N750	0291230008
C9G	CAP. 150PF, 1000V, N750	0291230008
C9H	CAP. 150PF, 1000V, N750	0291230008
C9I	CAP. 150PF, 1000V, N750	0291230008
C9J	CAP. 160PF 2KV N750	1008270032
C9K	CAP. 160PF 2KV N750	1008270032
C10A	CAP. 270PF 2KV N750	1008280020
C10B	CAP. 270PF 2KV N750	1008280020
C10C	CAP. 270PF 2KV N750	1008280020
C10D	CAP. 330PF 2KV N750	1008280038
C10E	CAP. 330PF 2KV N750	1008280038
C10F	CAP. 330PF 2KV N750	1008280038
C10G	CAP. 330PF 2KV N750	1008280038
C10H	CAP. 330PF 2KV N750	1008280038
C10I	CAP. 270PF 2KV N750	1008280020
C10J	CAP. 270PF 2KV N750	1008280020
C10K	CAP. 270PF 2KV N750	1008280020
C11A	CAP. 270PF 2KV N750	1008280020
C11B	CAP. 330PF 2KV N750	1008280038
C11C	CAP. 270PF 2KV N750	1008280020
C11D	CAP. 330PF 2KV N750	1008280038
C11E	CAP. 270PF 2KV N750	1008280020
C11F	CAP. 330PF 2KV N750	1008280038
C11G	CAP. 270PF 2KV N750	1008280020
C11H	CAP. 330PF 2KV N750	1008280038
C11I	CAP. 270PF 2KV N750	1008280020
C11J	CAP. 330PF 2KV N750	1008280038
C11K	CAP. 270PF 2KV N750	1008280020
C11L	CAP. 330PF 2KV N750	1008280038
	CONNECTOR, RF, BNC	0753490005



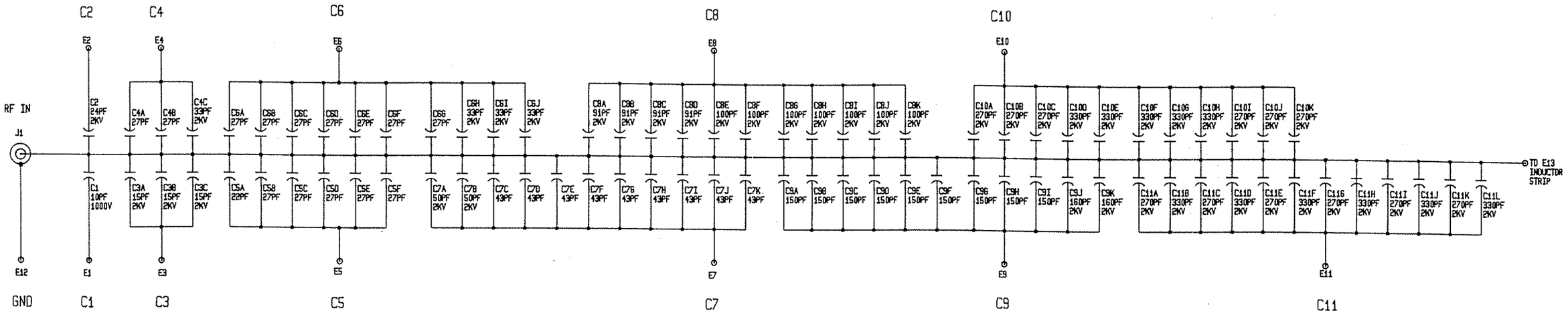
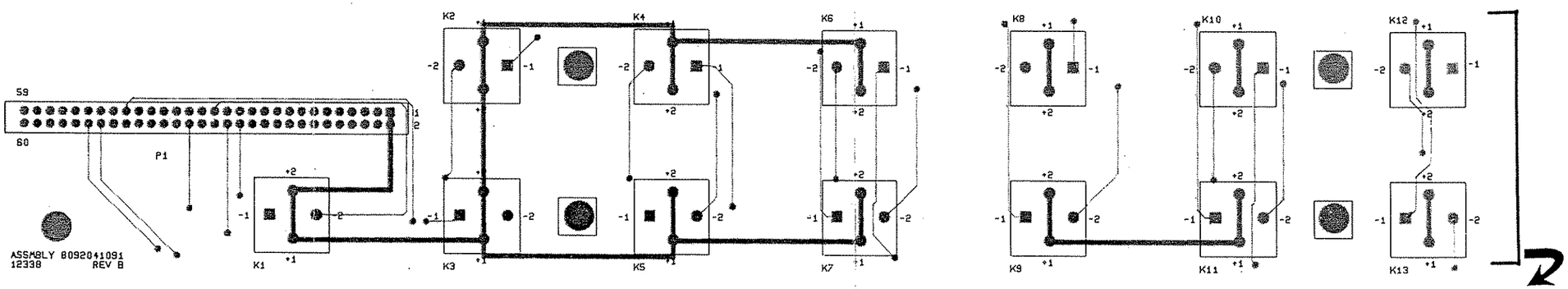
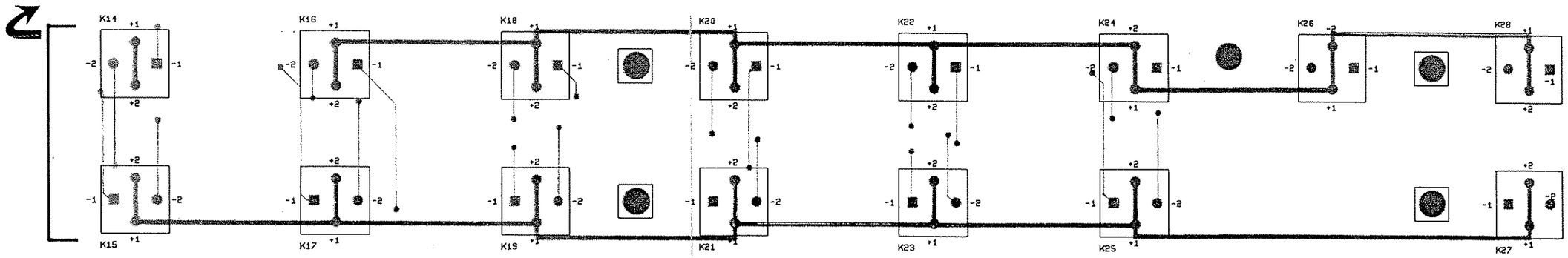


Figure 5.16 Capacitor Board.


S9
S0
P1
ASSEMBLY 8092041091
12338 REV B
K1
K2
K3
K4
K5
K6
K7
K8
K9
K10
K11
K12
K13


K14
K15
K16
K17
K18
K19
K20
K21
K22
K23
K24
K25
K26
K27
K28

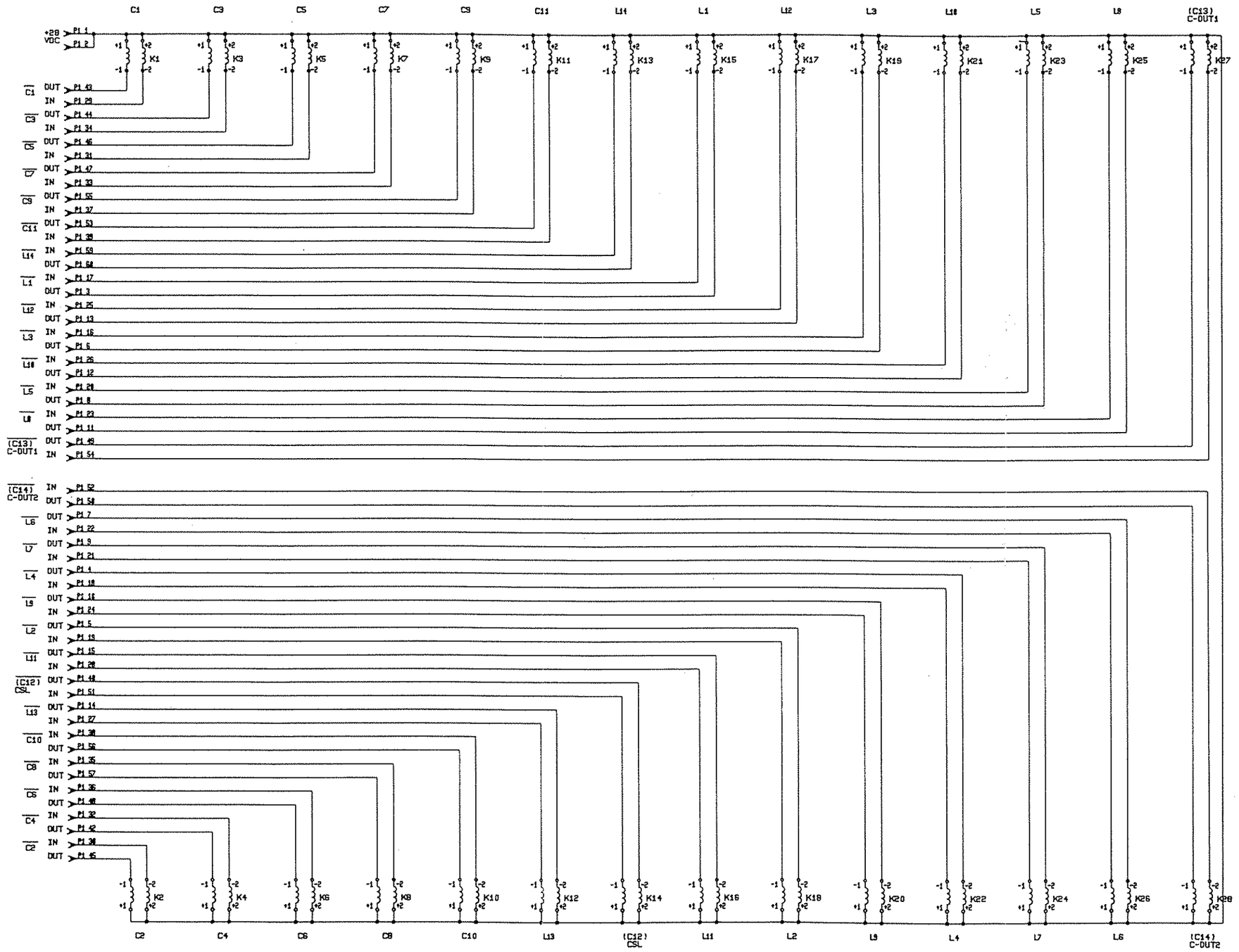
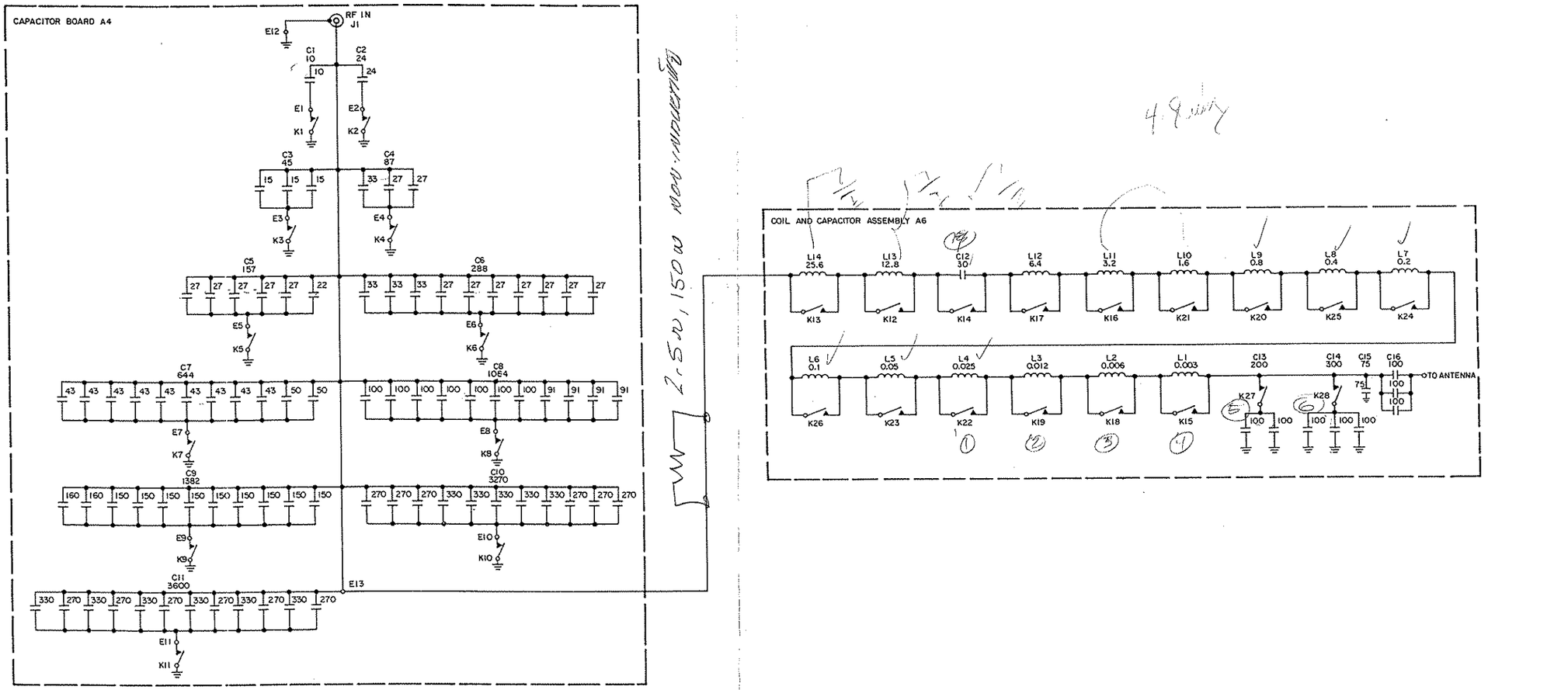


Figure 5.17 Relay Assembly A5.



NOTES UNLESS OTHERWISE SPECIFIED:

1. CAPACITORS ARE IN PICOFARADS.
2. INDUCTORS ARE IN MICROHENRIES.

Figure 5.18 Coil and Capacitor (RF Sections) Assembly A4, A5, and A6.