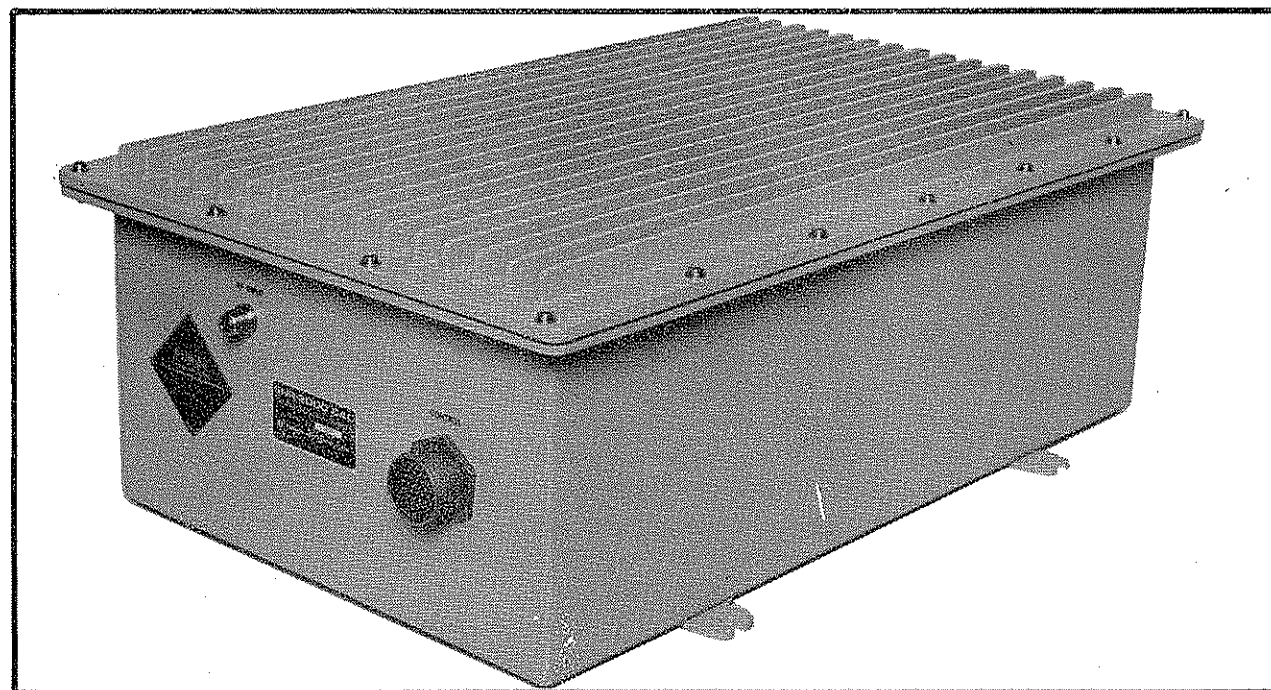




sunair electronics, inc.

3101 S.W. Third Avenue, Fort Lauderdale, Florida 33315-3389 USA



OPERATION AND
MAINTENANCE MANUAL

SNR-2000DAC

DIGITAL AUTOMATIC
1KW ANTENNA COUPLER

TRAINING PROGRAMS

Sunair offers Training Programs of varying lengths to cover operation, service, and maintenance of all Sunair manufactured equipment. Up to eight technicians can be accomodated in these programs.

For more information, contact:

Product Services/Training Supervisor
Sunair Electronics, Inc.
3101 S.W. Third Avenue
Fort Lauderdale, Florida 33315-3389
U.S.A.

Telephone: (305) 525-1505
Telex: 51-4443
Cable: Sunair FTL

IN CASE OF DIFFICULTY

If your Sunair Electronics, Inc. equipment, develops a malfunction, please follow the steps outlined below to expedite your equipment repair.

1. Note all of the symptoms of the problem, i.e, when does it occur; how often; which modes of operation work, which do not; and anything else which might assist in problem solving.
2. Note model number and serial number.
3. When and from whom (dealer, representative or factory) equipment was acquired.
4. Note peripheral equipment being used in conjunction with the Sunair equipment. Is the peripheral equipment working properly?

After determining the answers to the above, contact your dealer or representative and discuss the problem with him, he may be able to fix the problem locally, avoiding shipping delays. If it becomes necessary to return the equipment to the factory, please follow the procedures outlined in Section II of this manual.

TABLE OF CONTENTS

SECTION	PAGE	SECTION	PAGE
I	GENERAL INFORMATION	IV	THEORY OF OPERATION
1.1	Scope.....1-1	4.1	General.....4-1
1.2	Description.....1-1	4.2	Antenna Tuning Network.....4-1
1.3	Specifications.....1-2	4.3	Detector/Relay Pad Assembly A3.....4-3
1.4	Equipment Supplied.....1-2	4.4	Chassis Assembly.....4-5
1.5	Equipment Required, Not Supplied.....1-3	4.5	Computer Board Assembly A2..4-6
1.6	Optional Equipment, Not Supplied.....1-3		
II	INSTALLATION	V	MAINTENANCE AND REPAIR
2.1	General.....2-1	5.1	General.....5-1
2.2	Unpacking and Inspection....2-1	5.2	Preventive Maintenance.....5-1
2.3	Return of Equipment to Factory.....2-1	5.3	Inspection.....5-1
2.4	Power Requirements.....2-2	5.4	Repair or Replacement.....5-1
2.5	Installation Considerations and Mounting Information....2-2	5.5	Disassembly Instructions....5-2
2.6	Antennas and Ground Systems.2-3	5.6	Performance Test.....5-3
2.7	Checks after Installation...2-4		
III	OPERATION		
3.1	General.....3-1		
3.2	Control Panel 1A2.....3-1		
3.3	Operating the SNR-2000DAC...3-1		
3.4	Operation of SNR-2000DAC with Exciters/Transceivers and Linear Power Amplifiers Other Than Sunair Models....3-4		

LIST OF ILLUSTRATIONS

FIGURE		PAGE
2-1	SNR-2000DAC Control Cable p/n 8092500096.....	2-5
2-2	Outline Dimensions.....	2-6
2-3	SNR-2000 w/SNR-2000DAC, 35 FT Antenna.....	2-7
2-4	SNR-2000 w/SNR-2000DAC, NON-Resonant Antenna.....	2-8
2-5	SNR-2000 w/SNR-2000DAC with Auxiliary TR Relay.....	2-9
2-6	KW Longwire Antenna Kit.....	2-10
4-1	SNR-2000DAC Block Diagram.....	4-3
4-2	Computer Board A2 Block Diagram....	4-4
5-1	Computer A2 and Detector/Relay Pad A3 Boards Extended.....	5-5
5-2	Computer A2 and Detector/Relay Pad A3 Boards Removed.....	5-6
5-3	SNR-2000DAC with Capacitor Board A4 Removed, View 1.....	5-7
5-4	SNR-2000DAC with Capacitor Board A4 Removed, View 2.....	5-8
5-5	Coupler Test Setup.....	5-9
5-6	Computer Board A2 Extended.....	5-10
5-7	Detector/Relay Pad Alignment Setup (Forward Power Detectors).....	5-11
5-8	Detector/Relay Pad Assembly A3 Extended.....	5-12
5-9	Detector/Relay Pad Alignment Setup (Reflected Power Detectors, Mag and Phase Detectors).....	5-13
5-10	35FT Whip Antenna Simulator.....	5-14
5-11	Coupler Test Setup for Checking Relays K1 thru K28.....	5-26
5-12	SNR-2000DAC Wiring Diagram.....	5-46
5-13	Input Connector Assembly A1.....	5-49
5-14	Computer Board A2.....	5-52
5-15	Detector/Relay Pad Assembly A3.....	5-59
5-16	Capacitor Board A4.....	5-63
5-17	Relay Assembly A5.....	5-65
5-18	Coil & Capacitor (RF Sections) Assembly A6.....	5-69
5-19	Control Panel 1A2 p/n 80661600XX...	5-71
5-20	Control Panel 1A2 p/n 80661700XX...	5-73
5-21	Control Panel 1A2 p/n 80661800XX...	5-75

LIST OF TABLES

TABLE		PAGE
4-1	Magnitude Discriminator Truth Table.....	4-11
4-2	Phase Discriminator Truth Table....	4-11
4-3	Truth Table BCD Channels 1-10.....	4-12
4-4	Truth Table BCD Channels 11-20....	4-12
5.1	Fault Analysis.....	5-15
5.1.1	SNR-2000DAC Alignment Procedures for Computer Board A2.....	5-17
5.1.2	SNR-2000DAC Alignment Procedures for Detector/Relay Pad Assembly A3...	5-18
5.2	Fault Analysis and Troubleshooting Computer Board A2.....	5-20
5.2.1	Coupler Test.....	5-27
5.2.2	Fault Analysis and Troubleshooting of Computer Board A2 and Relays K1 through K28 on Relay Board A5...	5-3

SECTION I

GENERAL INFORMATION

1.1 SCOPE

This manual contains information necessary to install, operate, maintain and repair the SNR-2000DAC 1 KW Automatic Digital Antenna Coupler.

1.2 DESCRIPTION

The SNR-2000DAC 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 SNR-2000 1 KW Solid State Linear Amplifier.

The SNR-2000DAC is designed to operate at separations of up to 250 feet from the transceiver. The coupler control panel is normally located in the front panels of Sunair GSB-900 Series Exciters/Transceivers and the SCANCALL® SC-10 Transceiver, but may be readily adapted for use with other exciters or transceivers. Manual tuning cycles are initiated by depressing the TUNE START pushbutton on the coupler control panel. Automatic tuning cycles are initiated by transceivers with the ability to do so. Tuning status lamps, TUNE START pushbutton and a meter for indicating forward and reflected power are located on the coupler control panel (some panels provide remote KW ON/OFF capability). 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 100 watt exciter/transceiver if low power operation is desired or the linear amplifier is off-line.

The SNR-2000DAC 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 SNR-2000DAC, the exciter/transceiver and the SNR-2000 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 SNR-2000DAC.

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.

SUNAIR SNR-2000DAC

1.2.1.6 Coil and Capacitor Assembly A6

The Coil and Capacitor Assembly contains the binary variable 14 inductor and 3 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 msec from memory. Channel Memory, 100 channels

TUNE POWER REQUIRED: 25 Watts 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: (Inches) 28.8L X 17.9W X 9.6H
(CM) 73.15L X 45.47W X 24.38H

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

SNR-2000DAC Automatic Digital Antenna Coupler

8092001057 Gray
8092001090 Green

Connector Kit

8092000298

Consisting of:

- Bushing, Telescoping, .56ID
- Bushing, Telescoping, .62ID
- Bushing, Telescoping, .75ID
- Connector, Power, 37 Pin Round
- Connector, RF, N UG-21B/U

0700550054
0700550062
0700550071
0747640009
0754140008

Operation and Maintenance Manual

8092000506

SUNAIR SNR-2000DAC

1.5 EQUIPMENT REQUIRED - NOT SUPPLIED**SUNAIR PART NUMBER**

1. Control Cable Assembly
Order by length desired. Contains
Connector Kit 8092000298, cable 0588680001,
SNR-2000 mating connector and hardware.

8092500096

1.6 OPTIONAL EQUIPMENT - NOT SUPPLIED**SUNAIR PART NUMBER**

1. Linear Amplifier/Exciter/Transceiver

Consult Sunair Mar-
keting Dept.

2. Coupler Control Panel 1A2
for use with GSB-900 Series Exciters/
Transceivers

8066160054 Gray
8066160097 Green

3. Coupler Control Panel 1A2
for use with GSB-900SC/R Transceivers

8066170050 Gray
8066170092 Green

4. Coupler Control Panel 1A2
for use with SC-10 Transceivers

8066180055 Gray
8066180098 Green

5. Service Kit, contains PC Assy Card Extenders
and test EPROM

8092907595

6. Depot Spares Kit

8092900094

7. Field Module Kit

8092905797

8. 35 Foot Fiberglass Antenna

0715850008

9. Feed-Thru, Antenna Mount, 1 KW

1004890001

10. KW Longwire Antenna Kit

1003090010

11. Control Cable Assembly
Used to connect coupler directly to
exciter/transceiver

6035004008

CAUTION

TO INSURE THAT CABLE HAS NOT BEEN DAMAGED DURING SHIPMENT, ALL CABLE ASSEMBLIES MUST BE CHECKED FOR CONTINUITY OR SHORTS, FROM PIN TO PIN, BETWEEN CONNECTORS BEFORE INITIAL RADIO OR SYSTEM POWER UP.

WARNING

CONNECTORS INSTALLED BY THE CUSTOMER MUST BE WIRED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED IN THE OPERATION AND MAINTENANCE MANUAL. THE CABLE MUST BE CONTINUITY CHECKED AFTER INSTALLATION AND PRIOR TO RADIO OR SYSTEM POWER UP.

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 SNR-2000DAC 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:

SUNAIR SNR-2000DAC

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 SNR-2000DAC 1 KW Automatic Digital Coupler is supplied from a companion exciter/transceiver and coupler control panel via the control cable. See Figure 2-1 for control cable connections. If an exciter/transceiver other than a Sunair model is used, an external power source of +28VDC at 1.0 amp is required to power the coupler control panel.

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 installations.
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 15kv potential. As an alternative, copper tubing with an outside diameter of at least $\frac{1}{4}$ " 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 dimen-

sions.

The mounting position for the SNR-2000DAC 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 & 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 (V.S.W.R.) of 2:1. When used with the SNR-2000DAC 1 KW Automatic Digital Antenna Coupler alone or with the SNR-2000 Linear Amplifier, the system will match antennas 35 feet and longer. The SNR-2000DAC 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'T's" 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, 2-5, 2-6

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 $\frac{1}{4}$

SUNAIR SNR-2000DAC

wave long at the lowest operating frequency. (Radial length in feet = $246/\text{frequency in MHz}$) The whip's radiation pattern is omni-directional in the azimuthal plane.

The longwire antenna, illustrated in Figure 2-6, 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 SNR-2000DAC 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 pop-

ular longwire antennas, (75 and 150 foot) available from Sunair, exhibit excellent low frequency radiation efficiency.

2.7 CHECKS AFTER INSTALLATION

Follow steps outlined in OPERATION SECTION III paragraph 3.3 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.

02-26-88

① SNR-2000 P4 MODIFICATION:

(A) MOVE W TO (T)

② SNR-2000 DAC P2 MODIFICATION:

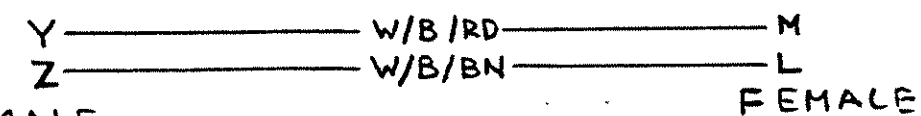
(A) MOVE R TO (A)

JUMPERS FOR USE WITHOUT DAC

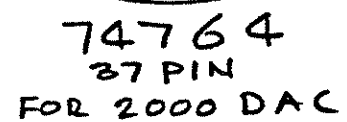
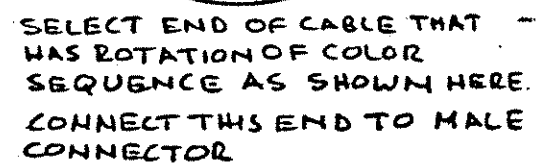
(1) KEYLINE \bar{m} TO \bar{p}

(2) COUPLER PRESENT A TO \bar{h}

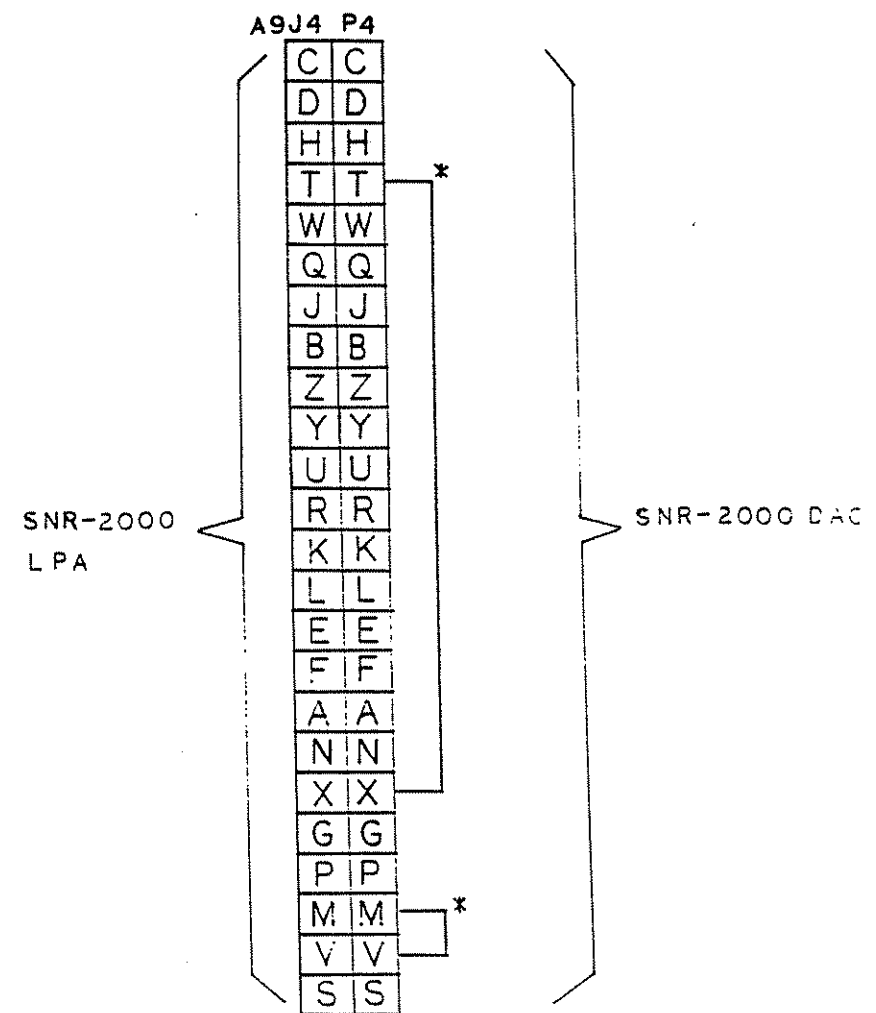
This info given to Tuck Palmer - This is done
to the 8092 cable - The jumpers are for use
on the bulkhead connector. 2/26/88 SRR



FOR SNR 2000

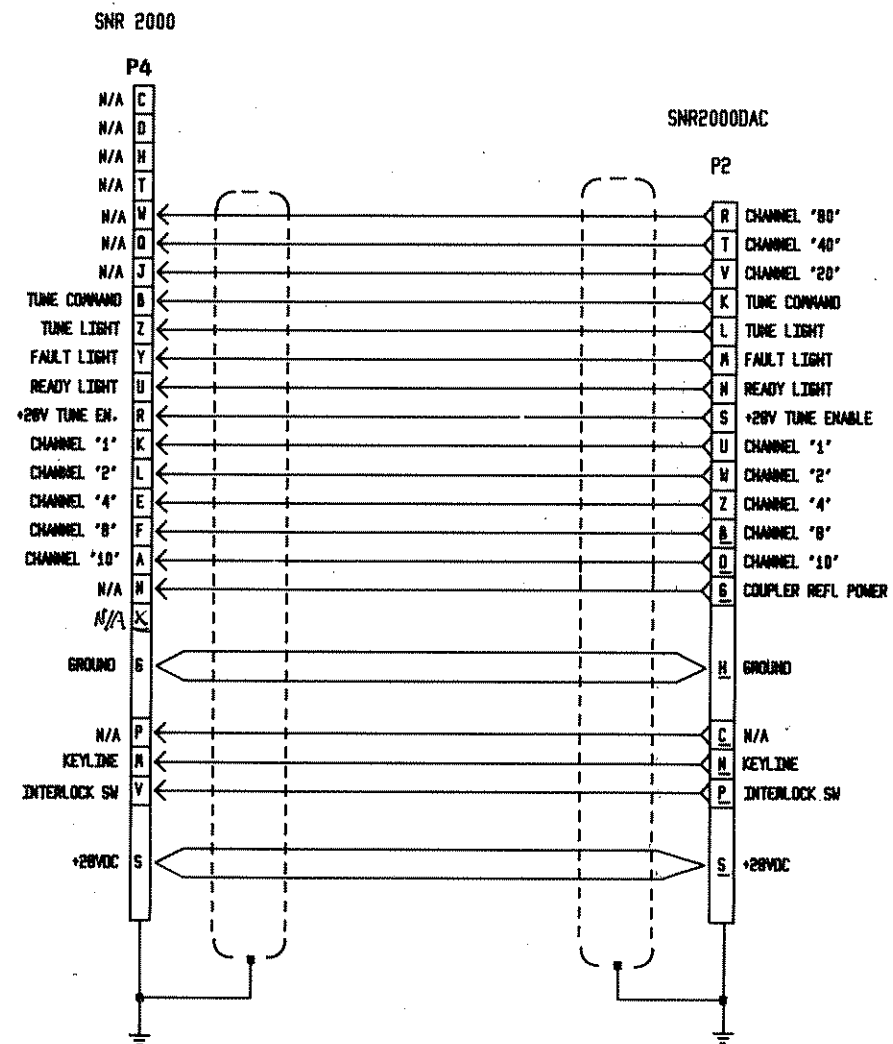


REV.
(B/M)
3



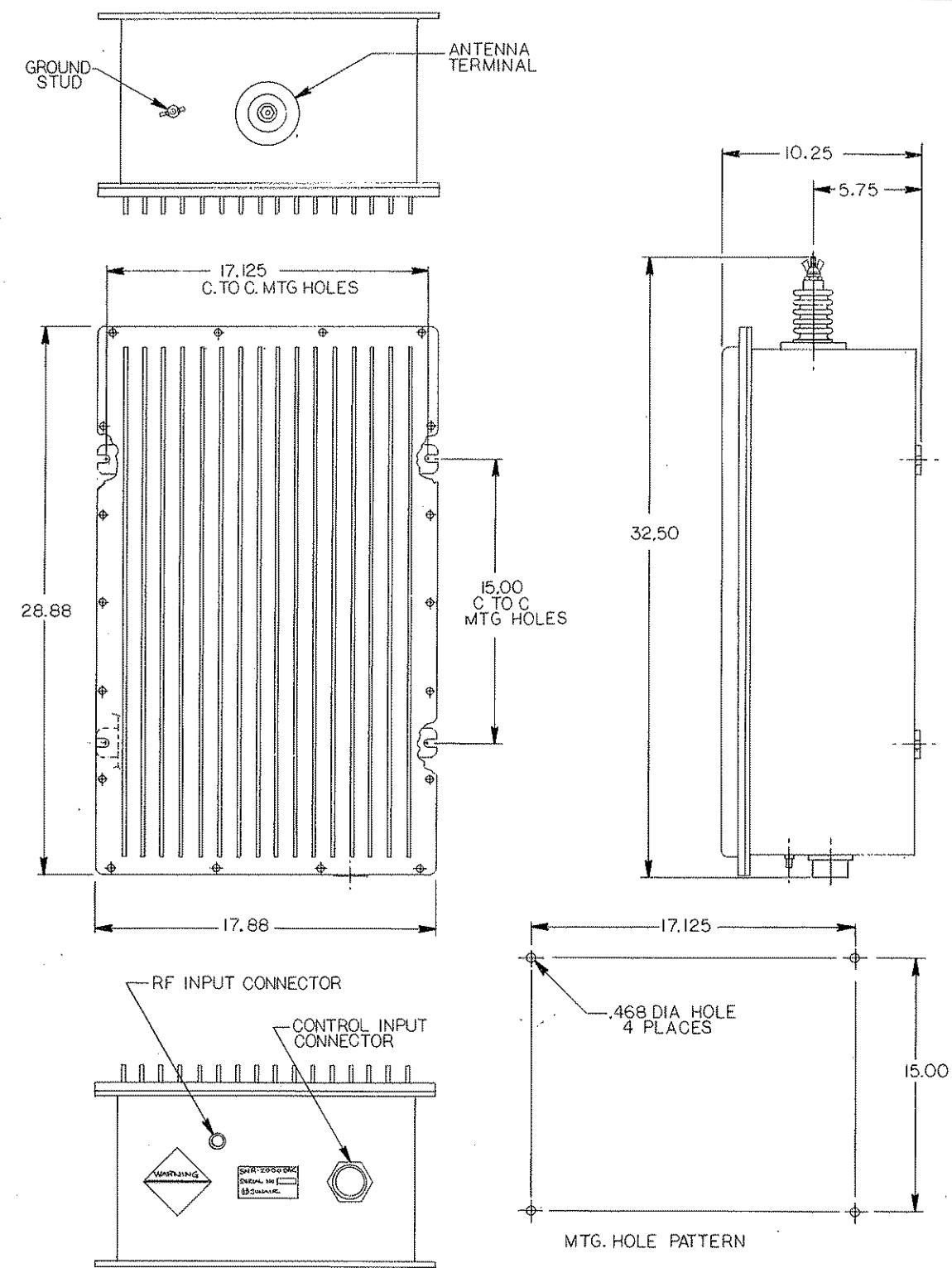
* JUMPER AS SHOWN WHEN
COUPLER IS NOT USED

SUNAIR SNR-2000DAC



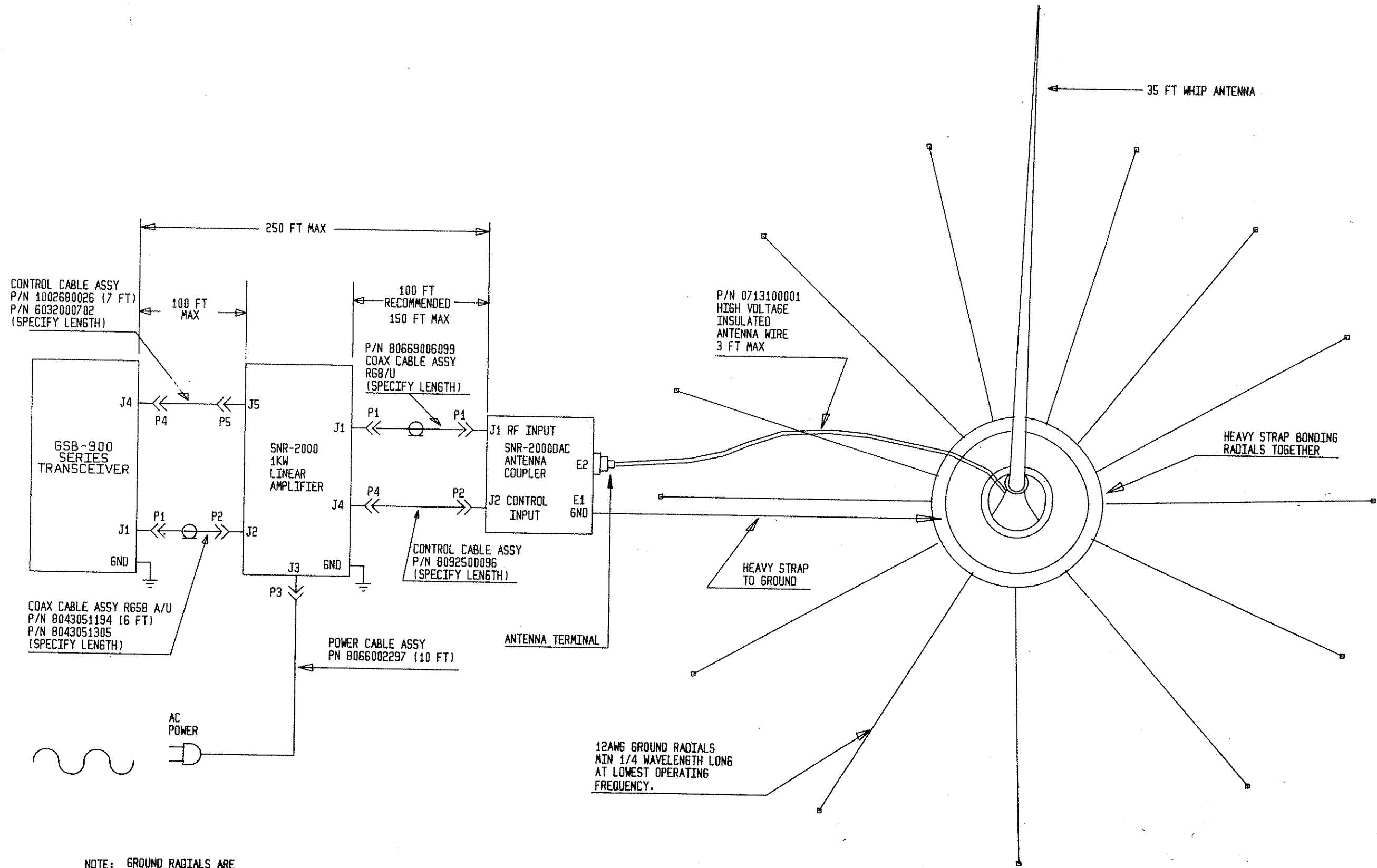
NOTE:
1. UNDERSCORED CHARACTERS REPRESENT LOWER CASE CHARACTERS

FIGURE 2-1 SNR-2000DAC CONTROL CABLE P/N 8092500096



DIMENSIONS IN INCHES

FIGURE 2-2 OUTLINE DIMENSIONS



NOTE: GROUND RADIALS ARE
PART OF THE ANTENNA.
RECOMMEND MINIMUM
OF 12 TO ENHANCE
RADIATION PATTERN.

FIGURE 2-3 SNR-2000/WSNR-2000DAC, 35 FT ANTENNA

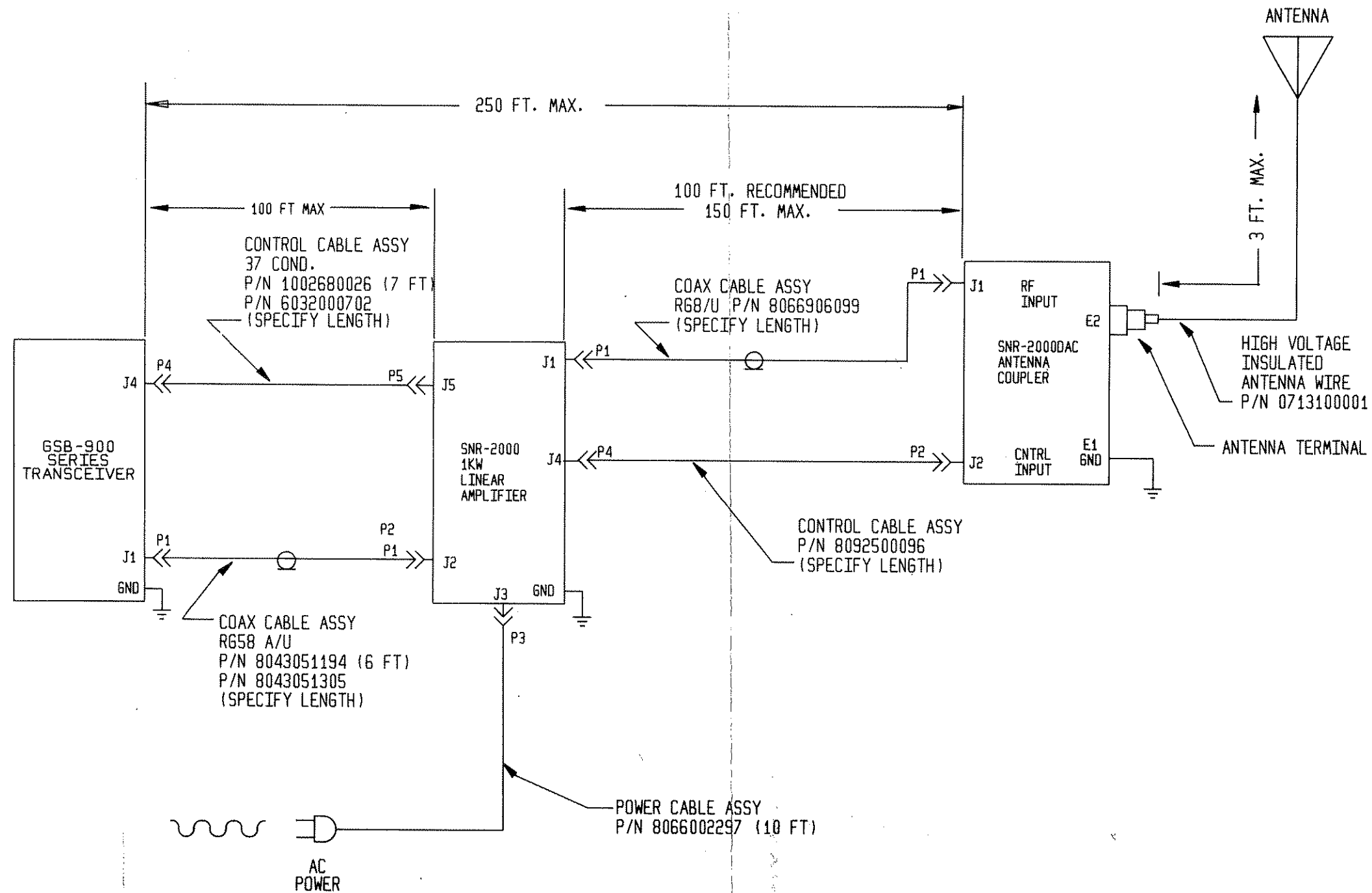
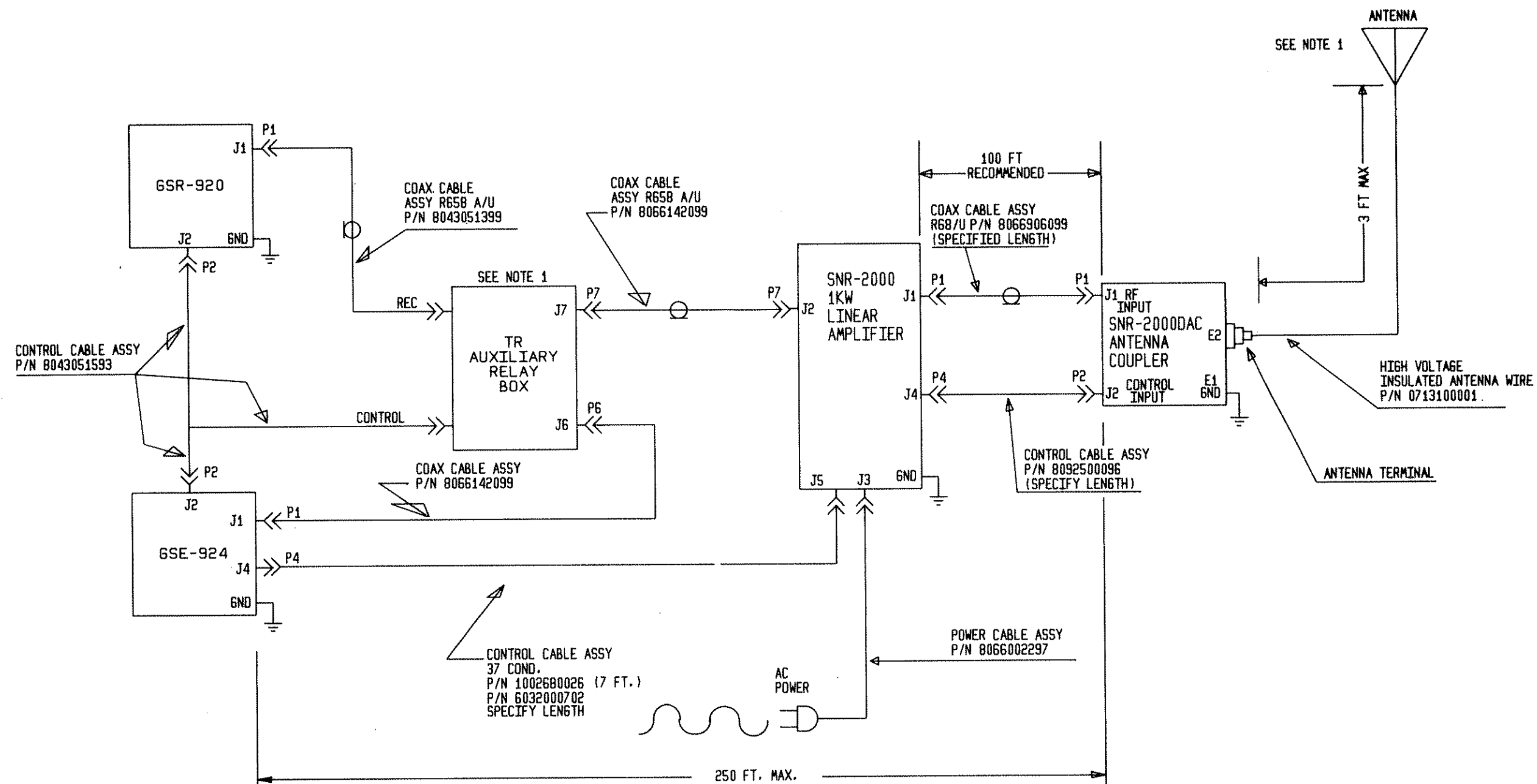
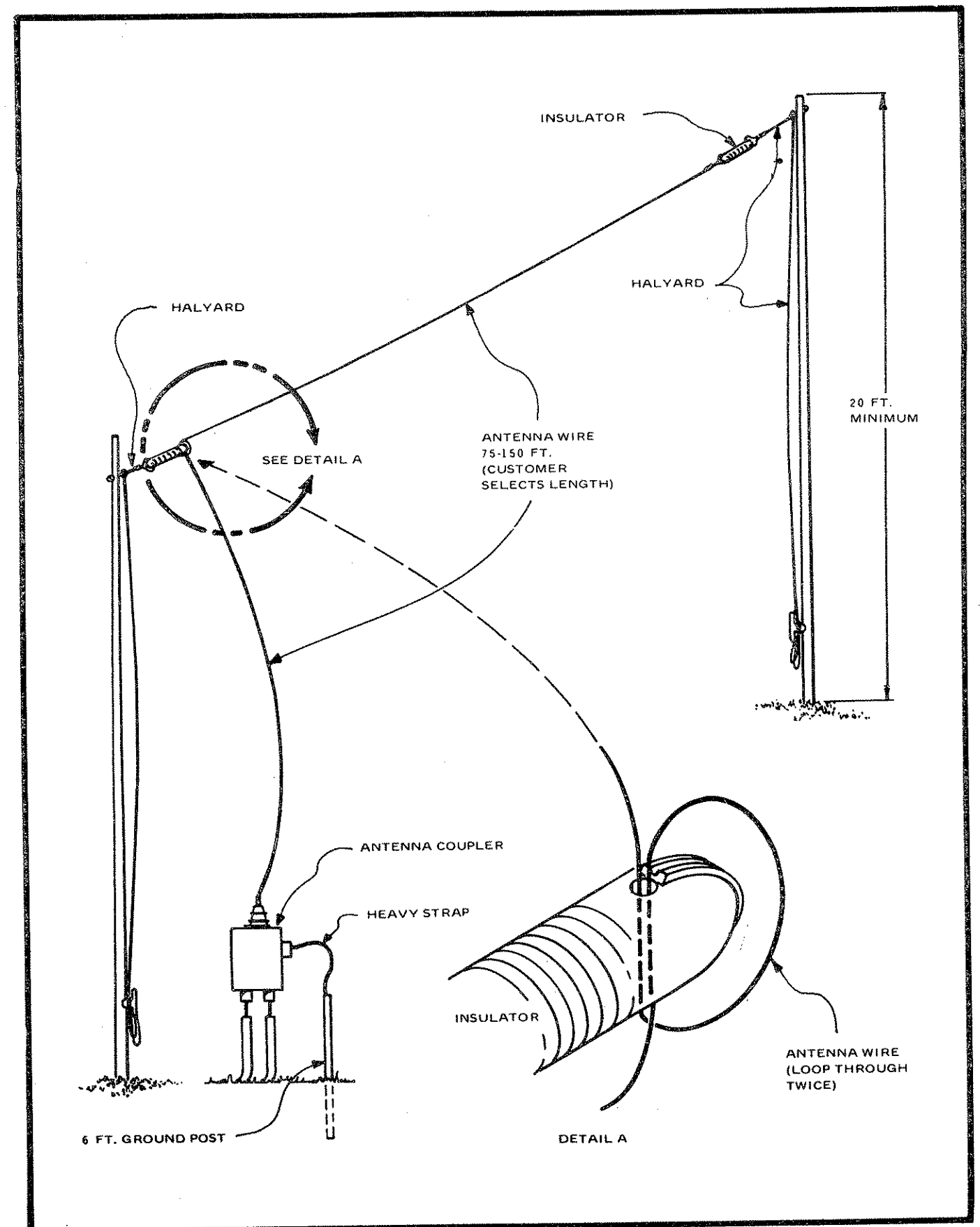


FIGURE 2-4 SNR-2000 W/SNR-2000DAC, NON-RESONANT ANTENNA



NOTES:
1. TRANSMIT/RECEIVE RELAY KIT
P/N 8066140096

FIGURE 2-5 SNR-2000 W/SNR-2000DAC WITH AUXILIARY TR RELAY



SECTION III

OPERATION

3.1 GENERAL

The SNR-2000DAC Automatic Digital Antenna Coupler operates as a "slave" unit to the SNR-2000 1KW Solid State Linear Power Amplifier or to GSB-900 Series Exciters/Transceivers and the SCANCALL® SC-10. Refer to the SNR-2000 manual and/or the applicable exciter/transceiver manual for operation considerations peculiar to the individual unit.

3.2 CONTROL PANEL 1A2

The Control Panel 1A2 mounts in the space provided in the front panel of the exciter/transceiver. The panel provides status lights and forward and reflected power information (some provide KW remote ON/OFF capability). See Section I of this manual or the SNR-2000 manual, for the control panel required for your equipment configuration.

3.3 OPERATING THE SNR-2000DAC

3.3.1 OPERATION WITH GSB-900MK6, GSB-900DX, GSB-900SC, GSE-924

Insure that the exciter/transceiver, SNR-2000 and SNR-2000DAC are installed properly. Refer to Section II of the applicable manuals.

- a) Apply power to the exciter/transceiver and SNR-2000.
- b) Place ON/OFF switch on the 1A2 Control Panel to ON (if the panel has this capability).
- c) On the SNR-2000, the green POWER lamp will light and the LCD will display system message: "FAULT: COUPLER UNTUNED, METER: FWD, PWR LVL: 1 KW".
- d) All lamps on the 1A2 Control Panel will flash momentarily and then the red FAULT lamp will burn steadily.

- e) Select desired operating frequency on exciter/transceiver.

- f) Place exciter/transceiver MODE switch in AM or KW/CPLR TUNE position. Depress the TUNE START pushbutton on the 1A2 Control Panel.

- g) On the 1A2, the amber TUNING lamp will light. On the SNR-2000 LCD, the following system messages will be displayed: "COUPLER TUNING", "COUPLER TUNED", "KW SYSTEM OPERATIONAL".

- h) After completion of tune (typically 1 to 2 seconds), the green READY lamp on the 1A2 will light. Place the exciter/transceiver MODE switch to desired mode of operation and begin operation of the system.

- i) If during a tune attempt the red FAULT lamp lights, the SNR-2000DAC will attempt a retune automatically. If at the end of this retune the red FAULT lamp burns steadily, this indicates a fault in the exciter/transceiver, coupler, antenna or antenna feed line. Depress the TUNE START pushbutton on the 1A2 again and allow the system to retune. If FAULT does not clear, see Section V of this manual, and the exciter/transceiver manual.

- j) If red FAULT lamp flashes, this indicates a fault in the SNR-2000. Reset SNR-2000, attempt to retune. If fault does not clear, see Section V of the SNR-2000 manual.

NOTE

Coupler tuning is not required with each frequency change. However, coupler tuning is recommended to prevent loss of first syllables when microphone PUSH-TO-TALK button is depressed.

3.3.2 OPERATION WITH SCANCALL® SC-10

Insure the SC-10, SNR-2000 and SNR-2000DAC are installed properly. Refer to Section II of the applicable manuals.

- a) Apply power to SC-10 and SNR-2000.
- b) Place ON/OFF KW switch on the 1A2 Control Panel to ON.
- c) On the SNR-2000, the green POWER lamp will light and LCD will display system message: "FAULT: COUPLER UNTUNED, METER: FWD, PWR LVL: 1 KW".
- d) All lamps on the 1A2 Control Panel will flash momentarily and then the red FAULT lamp will burn steadily.
- e) Select desired operating frequency on the SC-10.
- f) Depress the TUNE START pushbutton on the 1A2.
- g) On the 1A2, the amber TUNING lamp will light. On the SNR-2000 LCD, the following system messages will be displayed: "COUPLER TUNING", "COUPLER TUNED", "KW SYSTEM OPERATIONAL".
- h) After completion of tune (typically 1 to 2 seconds) the green READY lamp will light on the 1A2. The system is ready for operation on this frequency. If system is to be used in the scanning mode of operation, manually tune each channel to be used by selecting the channel and frequency, and depressing the TUNE START pushbutton on the 1A2. This will place up to ten (10) scan channels into the memory of the SNR-2000DAC. (Refer to the SC-10 manual for information concerning the scanning mode of operation.)
- i) If during a tune attempt the red FAULT lamp lights, the SNR-2000DAC will attempt a retune automatically. If at the end of this retune the red FAULT lamp burns steadily, this indicates a fault in the SC-10, coupler, antenna

or antenna feed line. Depress the TUNE START pushbutton on the 1A2 again and allow the system to retune. If FAULT does not clear, see Section V of this manual, and the SC-10 manual.

- j) If red FAULT lamp flashes, this indicates a fault in the SNR-2000. Reset SNR-2000, attempt to retune. If fault does not clear, see Section V of the SNR-2000 manual.

3.3.3 OPERATION WITH GSB-900SC/R AND GRC-901 REMOTE CONTROL HEAD

Insure that the GSB-900SC/R, GRC-901, SNR-2000 and SNR-2000DAC are installed properly. Refer to Section II of the applicable manuals.

3.3.3.1 Local Operation

- a) Apply power to the GSB-900SC/R and SNR-2000. Depress the LOCAL pushbutton on the 1A2 Control Panel.
- b) The SNR-2000 green POWER lamp will light and the LCD will display system message: "FAULT: COUPLER UNTUNED, METER: FWD, PWR LVL: 1 KW:."
- c) All lamps on the 1A2 Control Panel will flash momentarily and then the red FAULT lamp will burn steadily.
- d) Select desired operating frequency on GSB-900SC/R.
- e) Place GSB-900SC/R MODE switch in AM or KW/CPLR TUNE position. Depress the TUNE START pushbutton on the 1A2.
- f) On the 1A2, the amber TUNING lamp will light. On the SNR-2000 LCD, the following system message will be displayed: "COUPLER TUNING", "COUPLER TUNED", "KW SYSTEM OPERATIONAL".
- g) After completion of tune (typically 1 to 2 seconds), the green READY lamp will light on the 1A2 Control Panel. Place the GSB-900SC/R MODE switch to desired mode of operation and begin operation of system.

h) If during a tune attempt the red FAULT lamp lights, the SNR-2000DAC will attempt a retune automatically. If at the end of this retune the red FAULT lamp burns steadily, this indicates a fault in GSB-900SC/R, coupler, antenna or antenna feed line. Depress the TUNE START pushbutton on the 1A2 again and allow the system to retune. If FAULT does not clear, see Section V of this manual, and the GSB-900SC/R manual.

j) If the red FAULT lamp flashes, this indicates a fault in the SNR-2000. Reset SNR-2000, attempt to retune. If fault does not clear, see Section V of the SNR-2000 manual.

NOTE

Coupler tuning is not required with each frequency change. However, coupler tuning is recommended to prevent loss of first syllables when microphone PUSH-TO-TALK button in depressed.

3.3.3.2 Remote Operation from GRC-901

a) Turn the GRC-901 Remote Control Head power switch to the ON position.

NOTE

The GSB-900SC/R MODE switch must be in the LSB, USB, or AM position and the SNR-2000 circuit breaker must be ON at the local site.

The amber WAIT lamp will light and then extinguish and the red FAULT lamp will burn steadily.

b) Select the desired operating channel and mode on the GRC-901 front panel.

c) Depress the PUSH-TO-TALK pushbutton on the microphone. The following will occur on the GRC-901 front panel:

1. The amber WAIT lamp will light.
2. Upon completion of tune (typically 1 to 2 seconds), the green READY lamp will burn steadily.

The system is now tuned and ready for operation.

d) If during a tune attempt the red FAULT lamp burns steadily, this may indicate one of the following:

1. SNR-2000 malfunction.
2. SNR-2000DAC or antenna system malfunction.
3. Invalid frequency has been loaded into the GSB-900SC/R.
4. No power to the GSB-900SC/R.
5. Malfunction in the GSB-900SC/R or GRC-901.

Attempt to clear FAULT by depressing PUSH-TO-TALK button on the microphone to retune system, or turn the GRC-901 OFF for approximately 40 seconds, then back ON. This will reset the SNR-2000. If FAULT does not clear, refer to Section V of the applicable manuals.

3.3.4 OPERATION WITH THE GRC-970() SYSTEM

The SNR-2000 and SNR-2000DAC can be used with the GRC-970 System Cases I thru IV. However, each case requires different modifications to be made to the system's components. Consult Sunair's Marketing and/or Product Services Departments for the specific modifications required for your system.

3.4 OPERATION OF SNR-2000DAC WITH EXCITERS/TRANSCIVERS AND LINEAR POWER AMPLIFIERS OTHER THAN SUNAIR MODELS

If another model exciter/transceiver or linear power amplifier is to be used with the SNR-2000DAC, adjustments and control cable connections may differ. Consult manufacturer's manuals and this manual for installation considerations and instructions.

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

The SNR-2000DAC is a fully automatic digital antenna coupler designed for use with the SNR-2000 1 KW Solid State Linear Power Amplifier, Sunair Exciters, GSB-900 Series Transceivers, SCANCALL® SC-10 Transceivers, or their equivalents. 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' long-wires. The command to tune is generated by the exciter/transceiver. (See Section III for Operation details.)

A 100 channel non-volatile memory is provided within the coupler for use with transceivers providing channel information to the coupler. The coupler also remembers the "ten last tuned" channels for instant recall.

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 SNR-2000DAC 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 μ h. 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

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 Assembly A2 (Figure 5-14). (Note that the output of the magnitude discriminator is floating and is referenced to +5 VDC, not ground. So all measurements of the Magnitude detector must be referenced to + 5 VDC.)

4.3.3 PHASE DISCRIMINATOR

The phase discriminator consists of transformer T2 and its associated components. It provides a means of measuring the relative phase angle at the input to the tuning network by comparing the phase of the line voltage with that of the line current. The discriminator output is zero when the transmission line voltage and current samples are in phase (pure resistance terminating the transmission line). The voltage sample is derived by C12, R13, C6, which shifts it in phase by 90°. The current sample is generated by transformer T2 and is in phase with the line current. The voltage sample is fed to T2 center tap, and the resulting output is detected by CR4, CR5 to produce a DC voltage proportional to the phase difference between the voltage on the transmission line and the current in the line. R15 is the phase discriminator balance control and is adjusted so the phase output is nulled (relative to +5 VDC) when the transmission line is terminated with a 50 ohm non-inductive load.

The sensing of the phase discriminator is established to provide a positive output for inductive loads (positive phase angle) and a negative output for capacitive loads (negative phase angle). The output of this discriminator is fed to differential amplifier U41A on Computer Board Assembly A2.

4.3.4 TUNE FORWARD AND REFLECTED POWER DETECTOR

The TUNE Forward and Reflected Power Detector consists of T3 and its associated components. The reflected power voltage sample obtained from C13, C14 is combined with the current sample obtained from T3, at CR6 to provide a DC voltage proportional to reflected RF power on the transmission line. This detector compares both phase and magnitude of the voltage and current samples. Its output is always one polarity, i.e. positive with respect to ground, and is a minimum when the coupler network has tuned the

antenna to provide a 50 ohm resistive load to the transmitter. C13 provides an adjustment to null the output when the transmission line is terminated with a 50 ohm, non-reactive load.

The forward power voltage sample from C16, C18 is combined with the current sample from T3 at CR7 to provide a DC voltage proportional to forward power on the transmission line. It operates in much the same way as the reflected power detector, and its output is also positive with respect to ground, but maximum when the transmission line is terminated with a 50 ohm, non-reactive load.

This output is used for two functions: (1) to tell the microprocessor when RF energy is present, and (2) to provide a reference against which the reflected power is compared for the detection of Voltage Standing Wave Ratio (VSWR). The VSWR is used as an indication of the quality of the "tune" and is acceptable for values of 1.5:1 or better. If the VSWR exceeds 1.5:1, the red FAULT lamp will be illuminated, indicating that a tune command is required. (See Section III for information on clearing fault conditions.)

4.3.5 HIGH POWER FORWARD AND REFLECTED POWER DETECTOR

The High Power Forward and Reflected Power Detector consists of T4 and its associated components. The reflected power voltage sample obtained from C19, C20 is combined with the current sample obtained from T4, at CR8 to provide a DC voltage proportional to reflected RF power on the transmission line. This detector compares both phase and magnitude of voltage and current samples. Its output is always one polarity, i.e. positive with respect to ground, and is a minimum when the coupler network has been tuned to provide a 50 ohm resistive load to the transmitter. C20 provides an adjustment to null the output when the transmission line is terminated with a 50 ohm non-reactive load.

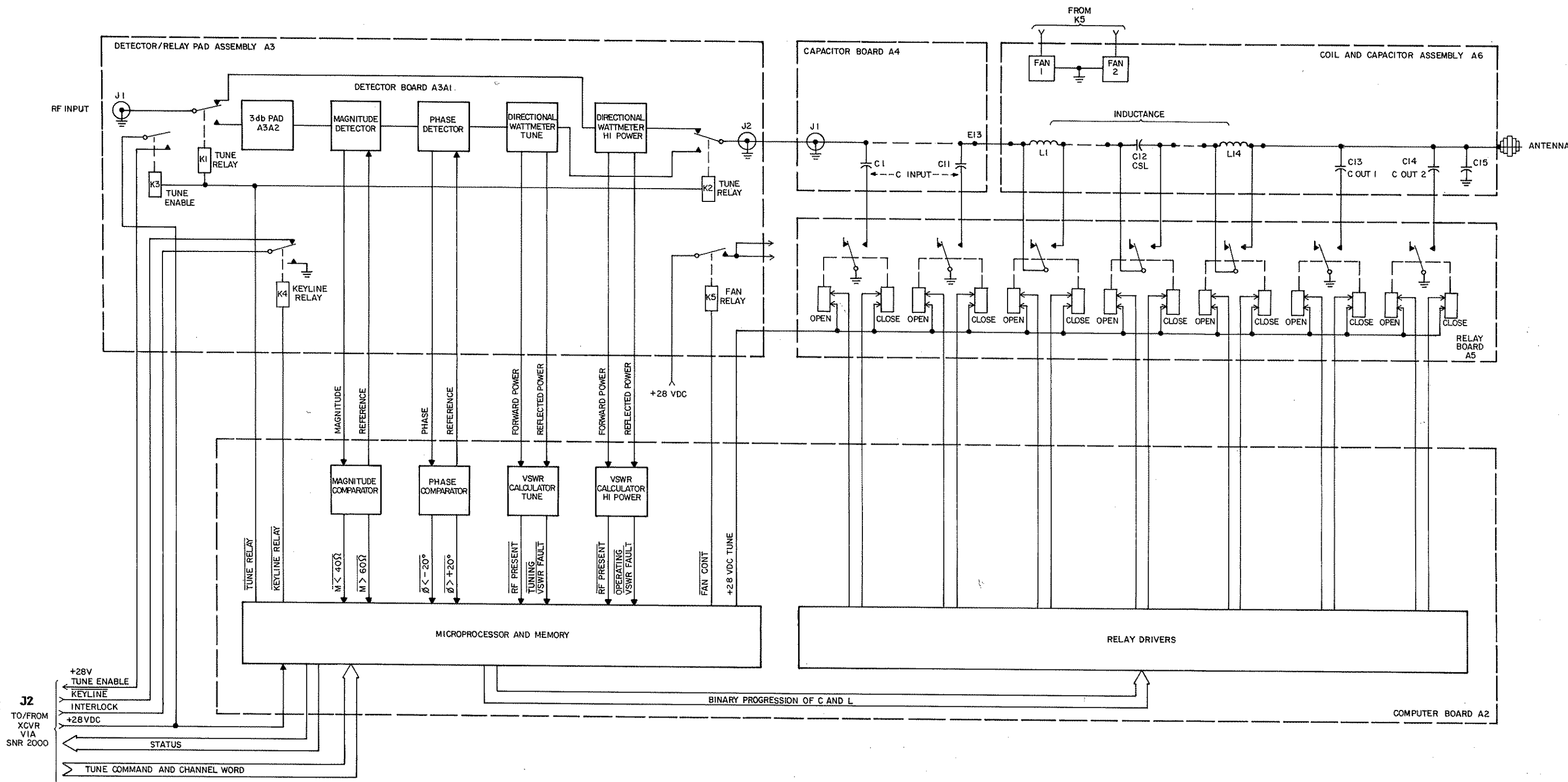


FIGURE 4-1 SNR-2000DAC BLOCK DIAGRAM

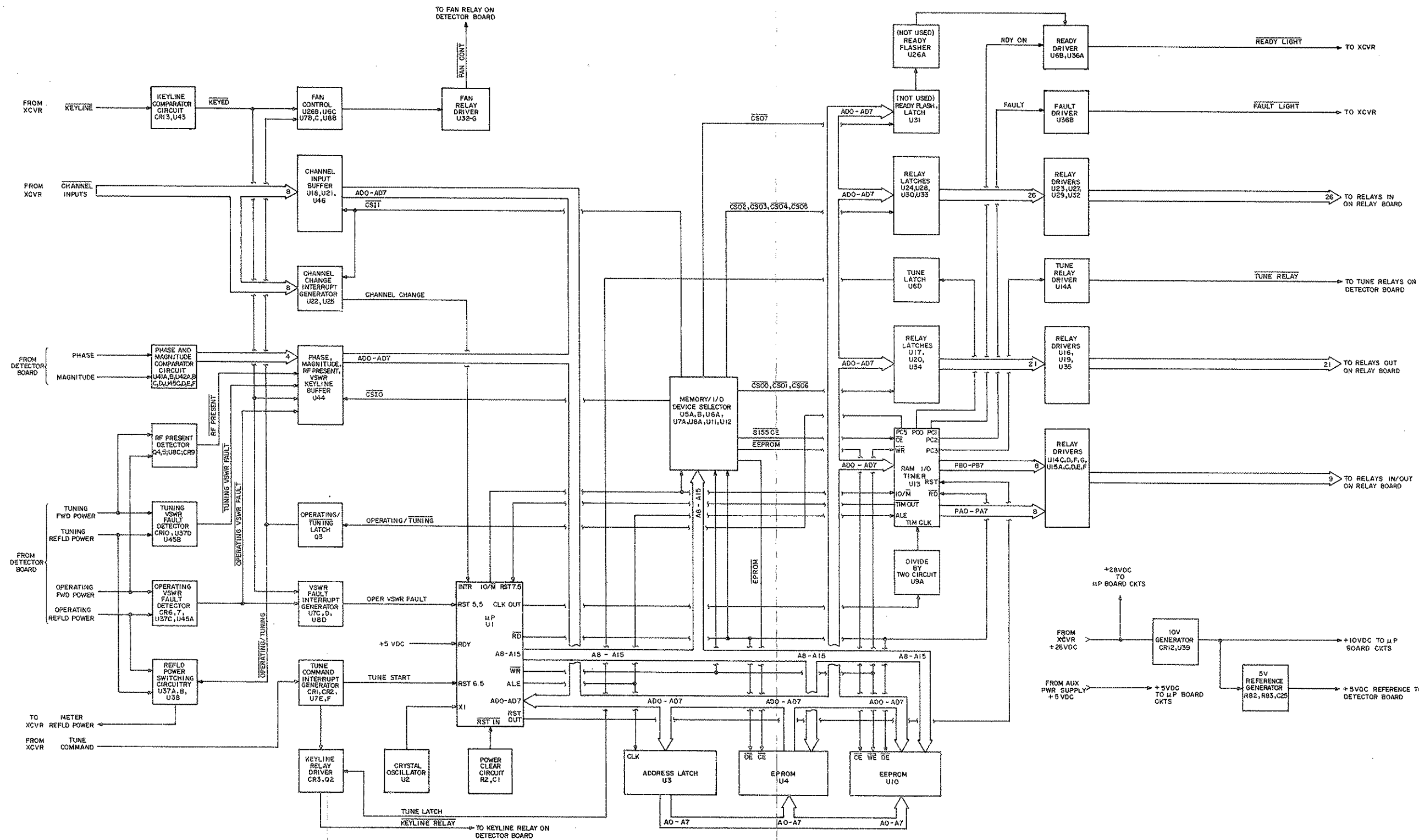


FIGURE 4-2 COMPUTER BOARD A2 BLOCK DIAGRAM

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 of 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 a tune cycle to reduce the VSWR to an acceptable level. When an acceptable tune condition has been found, U1 will return coupler to operate and go back to sleep.

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 green READY lamp will come on and 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, grounding the transceiver keyline interlock line, putting the transceiver in transmit mode, disabling the keyline, and supplying a +28 V TUNE ENABLE signal to the transceiver. This TUNE ENABLE signal is used in the SC-10 Transceiver to supply AM carrier for coupler tuning. (In the standard GSB-900, GSB-900DX, GSB-900SC, and GSE-924, the MODE switch must be turned to AM and the TUNE START button depressed, to supply the carrier power.) When the tune cycle has been terminated, the tune and keyline relays are deenergized allowing normal keyline operation through the deenergized contacts of K4.

4.3.8 FAN RELAY

The Fan Relay K5 is energized by 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

The Input Connector Assembly serves as the interconnection between the SNR-2000/900 Series Radios, the Detector/-

Relay Pad Assembly A3, the Computer Board A2 and the Coupler Control Panel 1A2. The +28 VDC used throughout the SNR-2000DAC comes from the 900 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 thru 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 READY LIGHT and FAULT LIGHT 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 TUNE LIGHT line during a coupler tune sequence, and to illuminate the yellow TUNING lamp on Coupler Control Panel 1A2.

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 PHASE $> +20^\circ$ 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 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 PHASE $> +20^\circ$ and PHASE $< -20^\circ$ lines

are High, indicating to the micro-processor 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 MAG >60 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 MAG <40 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 MAG <40 ohm line to U44.

4.5.4 RF PRESENT DETECTOR

AND gate U8C provides a Low 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 (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 (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 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.

U37C, U45A, U7D and U8D provide a High to microprocessor U1 on pin 9 when OPERATING VSWR exceeds 1.5:1, and equipment is keyed, U1 pin 9 is an interrupt input. This High awakens U1, permitting it to initiate a tune cycle, (due to the Low on pin 8 OPERATING VSWR FAULT of U44) to reduce the VSWR to an acceptable level. Normally U1 sleeps, keeping its DATA BUS and ADDRESS BUS quiet to eliminate any possible radiated BUS noise.

4.5.6 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 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 provide 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 that lights the FAULT LAMP on the Coupler Control Panel 1A2.

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 on the Coupler Control Panel 1A2.

4.5.8 VOLTAGE SOURCES

The +28VDC used through out the coupler comes from the 900 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 +28 VDC is applied to +5 volt regulator

U2. This +5 VDC regulated voltage is sent to Computer Board A2 to supply +5 VDC 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 +28 VDC 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 "brains" of the SNR-2000DAC. 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 ADO thru AD7, a multiplexed address/data bus containing either data or address information. The second bus is A8 thru 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 ADO 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 ADO 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 ADO 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 ADO thru AD7 lines. \overline{WR} is used by U1 when it wishes to give (write) information to a device on the ADO 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 ADO thru AD7 lines into the Address Latch U3 to select an instruction from EPROM U4. When data is present on the ADO 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 illuminates the green READY lamp on the Coupler Control Panel 1A2. U1 then stops all BUS activity and goes to sleep to eliminate any possible radiated BUS noise. U1, while sleeping, continuously monitors the TUNE START pushbutton, a CHANNEL CHANGE (if used with a transceiver which supplies channel information), and an OPERATING VSWR FAULT condition. Any one of these conditions awakens U1 causing it to take the proper action before going back to sleep. If following a good tune condition, the antenna load should change for any reason, U1 will initiate a retune cycle to correct the mismatch. If a load cannot be tuned or a coupler failure occurs, the FAULT lamp on the Coupler Control Panel 1A2 will be illuminated. If the fault condition is only temporary, it may be cleared by placing the 900 Series Radio MODE switch in AM and depressing the TUNE START pushbutton on the Coupler Control Panel 1A2. In transceivers with the ability to do so, retune can be accomplished automatically. Very short duration faults, caused by OPERATING VSWR FAULTS during voice modulation are ignored by U1. When power is initially applied, the FAULT lamp is automatically illuminated, indicating that the status of the coupler to the selected frequency is unknown. A TUNE START command from the Coupler Control Panel 1A2 with the MODE switch in AM, is required to clear the initial FAULT lamp.

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 SNR-2000DAC. The circuit provides a Low on pin 36 of U1 for a time after the power is applied to the SNR-2000DAC. 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 U51A 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 $\overline{Y1}$, the $\overline{CS11}$ line. This $\overline{CS11}$ 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 ADO-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 ADO-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 the 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, PHASE >+20°, PHASE <-20°, MAG >60 ohm, MAG <40 ohm, RF PRESENT, TUNING VSWR FAULT, OPERATING VSWR FAULT, and KEYED. Signals PHASE >+20°, PHASE <-20° are the phase comparator interface outputs, and MAG >60 ohm, MAG <40 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.

TABLE 4-1

MAGNITUDE DISCRIMINATOR TRUTH TABLE

	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

*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.

TABLE 4-2

PHASE DISCRIMINATOR TRUTH TABLE

	U44 PIN 3 PHASE >+20°	U44 PIN 2 PHASE <-20°
**Illegal	0	0
>+20°	0	1
<-20°	1	0
In the window	1	1

**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 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. The OPERATING VSWR and KEYLINE are used to awaken U1 during transmissions by placing a LOW into U7D and U7C. This places two Highs on AND gate U8D causing it's output to go High, awakening U1. If the OPERATING VSWR FAULT line into U44 is Low after U1 awakens, a retune is initiated by U1.

4.5.10.10 Channel Input Buffers U18, U21, U46A and B

There are eight channel lines coming into the SNR-2000DAC in the form of inverted binary coded decimal (BCD) numbers representing channels 1 thru 80. Table 4-3 shows the Truth Table for channels 1-10, the simplex channels, and Table 4-4 shows the Truth Table for Channels 11-20, the duplex channels. The truth tables are 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

TABLE 4-3 TRUTH TABLE BCD CHANNELS 1-10

CHANNEL #	CH 80	CH 40	CH 10	CH 8	CH 4	CH 2	CH 1
1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	0
3	1	1	1	1	1	0	1
4	1	1	1	1	1	0	0
5	1	1	1	1	0	1	1
6	1	1	1	1	0	1	0
7	1	1	1	1	0	0	1
8	1	1	1	1	0	0	0
9	1	1	1	0	1	1	1
10	1	1	0	0	1	1	0

TABLE 4-4 TRUTH TABLE BCD CHANNELS 11-20

CHANNEL #	CH 80	CH 40	CH 10	CH 8	CH 4	CH 2	CH 1
11	1	1	0	1	1	1	1
12	1	1	0	1	1	1	0
13	1	1	0	1	1	0	1
14	1	1	0	1	1	0	0
15	1	1	0	1	0	1	1
16	1	1	0	1	0	1	0
17	1	1	0	1	0	0	1
18	1	1	0	1	0	0	0
19	1	1	0	0	1	1	1
20	1	1	0	0	1	1	0

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.)

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 ADO-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 the READY lamp on Coupler Control Panel 1A2. 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 illuminating the READY lamp on the Coupler Control Panel 1A2.

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 (PBO-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 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 FAULT lamp if a satisfactory tune is not accomplished within ten seconds. The timer is reset whenever a new tune command is received. If a proper tune is achieved, the timer is disabled, and the READY lamp is illuminated on the Coupler Control Panel 1A2.

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 $\overline{TIMER OUT}$ 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 illuminates the FAULT lamp. If a proper tune is achieved, U1 turns off the $\overline{TIMER OUT}$ signal issued by U13, illuminates the READY lamp and 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 $\overline{Y0}$ pin 12 of U5B go Low. While $\overline{Y0}$ is Low, U1 will issue a Low on the IO/M line, the code it wants stored in RAM on the ADO-AD7 lines and a Low going write pulse on the \overline{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. With non-channelized radios the memory capacity is ten channels and with channelized radios, memory capacity is 100 channels. This provides extremely fast tuning, on the order of 10 msec, or less. If channel information is not available to the coupler, the storage memory takes the tuning element information anyway, and stores it in a sequential memory section. It has the capacity to remember the last ten "tunes", so if a previous frequency is repeated, the tuning data already exists in memory, and is extracted first, rather than requiring a complete tuning cycle. Tunes obtained in this manner typically take less than 100 msec. When the "ten last tuned" memory is filled, the next new tune information will be stored in the #1 memory location, all previous data will move down one memory location, and the data previously stored in memory location #10 will be dropped. Whenever a TUNE command is initiated from the TUNE START pushbutton, and no channel information is available from units that provide it, the ten last tuned channels are polled first, before the coupler begins a tuning cycle. If a retune is called for, i.e. a FAULT condition following a previous READY, the 10 channels are bypassed and the coupler is forced to retune.

4.5.11.4 Keyline Comparator

U43B and associated circuitry make up the keyline comparator. It is used to make sure the coupler sees a KEYED condition for a low input on the radio equipment 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 FAN ON and OPERATE VSWR FAULT.

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 KEYED from U43B 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 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.

SECTION V

MAINTENANCE AND REPAIR

5.1 GENERAL

This section provides test procedures and evaluation of overall performance for the SNR-2000DAC 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 SNR-2000DAC.

5.3 INSPECTION

If the SNR-2000DAC 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 connector. Check for loose, or poorly soldered connections to terminals or connectors. Tighten or solder as required.
3. Inspect wiring of chassis and subassemblies for any signs of physical damage or charring. Any damaged wires must be replaced.
4. Inspect for leaky, blistered, charred, or cracked capacitors, resistors, or diodes. Check for loose or

corroded terminal connections. Obviously damaged components should be replaced.

5. Inspect for cold soldered or resin joints. Bad joints can be recognized by a dull, porous appearance. Resolder.

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 it 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 with 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: pin 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, 5-4

- 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 removed first.) Remove retaining nut from J2, the 37 pin connector on the front of the SNR-2000DAC. 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 $\frac{1}{2}$ 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

The following tests will provide overall performance data on the SNR-2000DAC as well as aid in determining specific problems.

NOTE

Various types of digital and linear logic devices are used in the SNR-2000DAC. 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 measure 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 measure between 0 and 0.5 volts.

5.6.1 TEST EQUIPMENT

The following test equipment or equiva-

lent 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 p/n 8092907595

12. Transceiver to Coupler Test Cable: Sunair Cable Assembly p/n 6035004008

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.

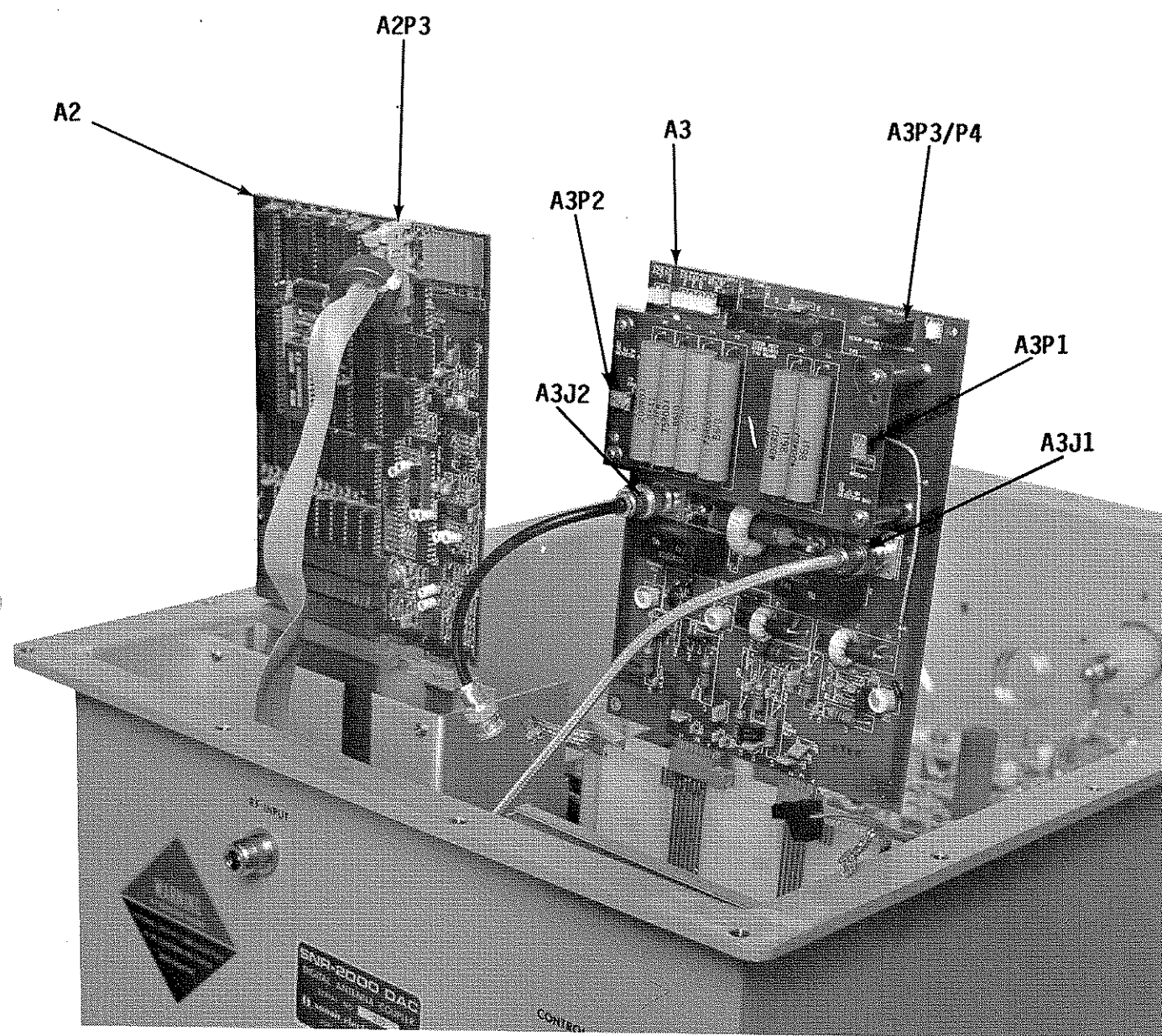


FIGURE 5-1 COMPUTER A2 AND DETECTOR/RELAY PAD A3 BOARDS EXTENDED

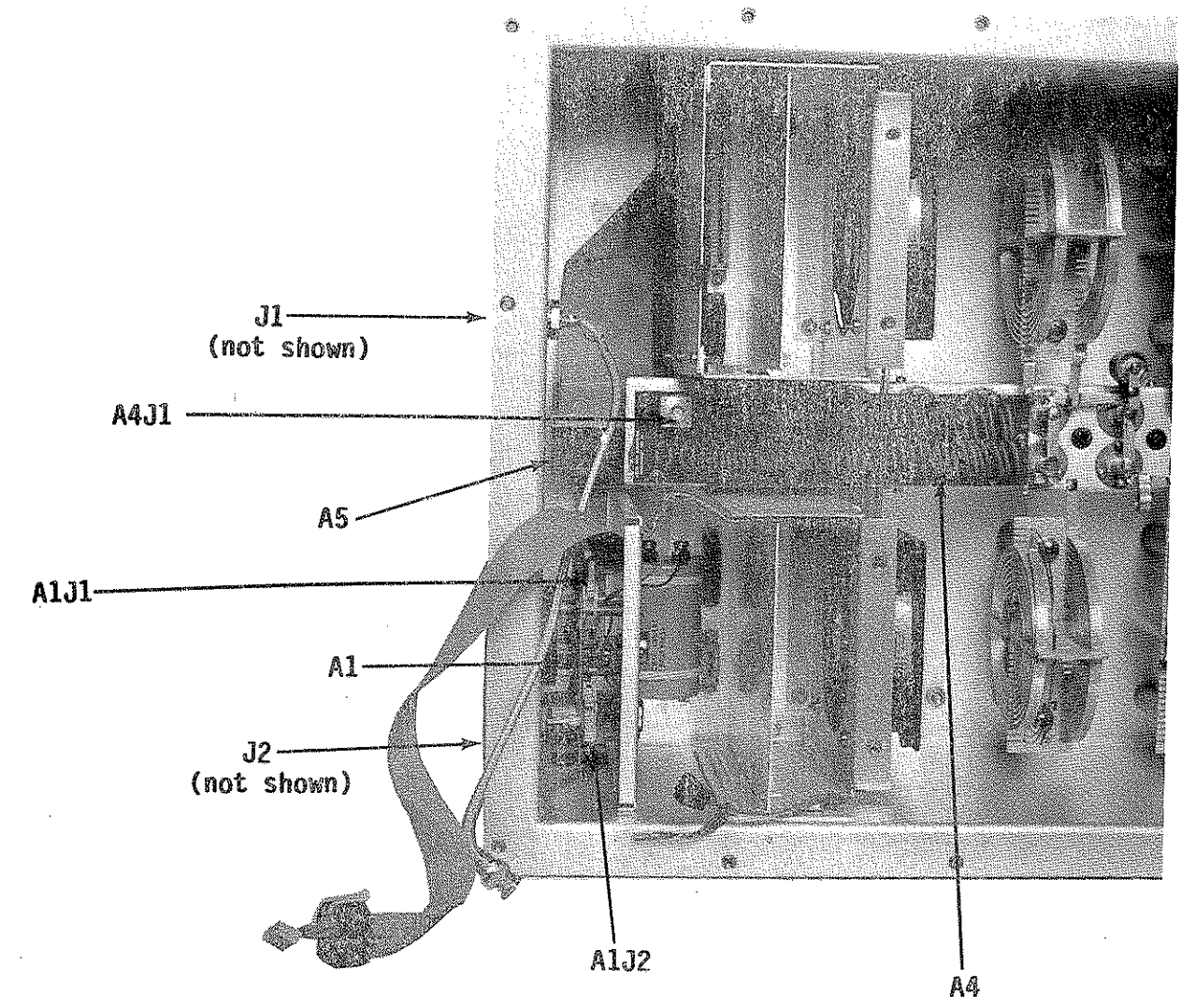


FIGURE 5-2 COMPUTER A2 AND DETECTOR/RELAY PAD A3 BOARDS REMOVED

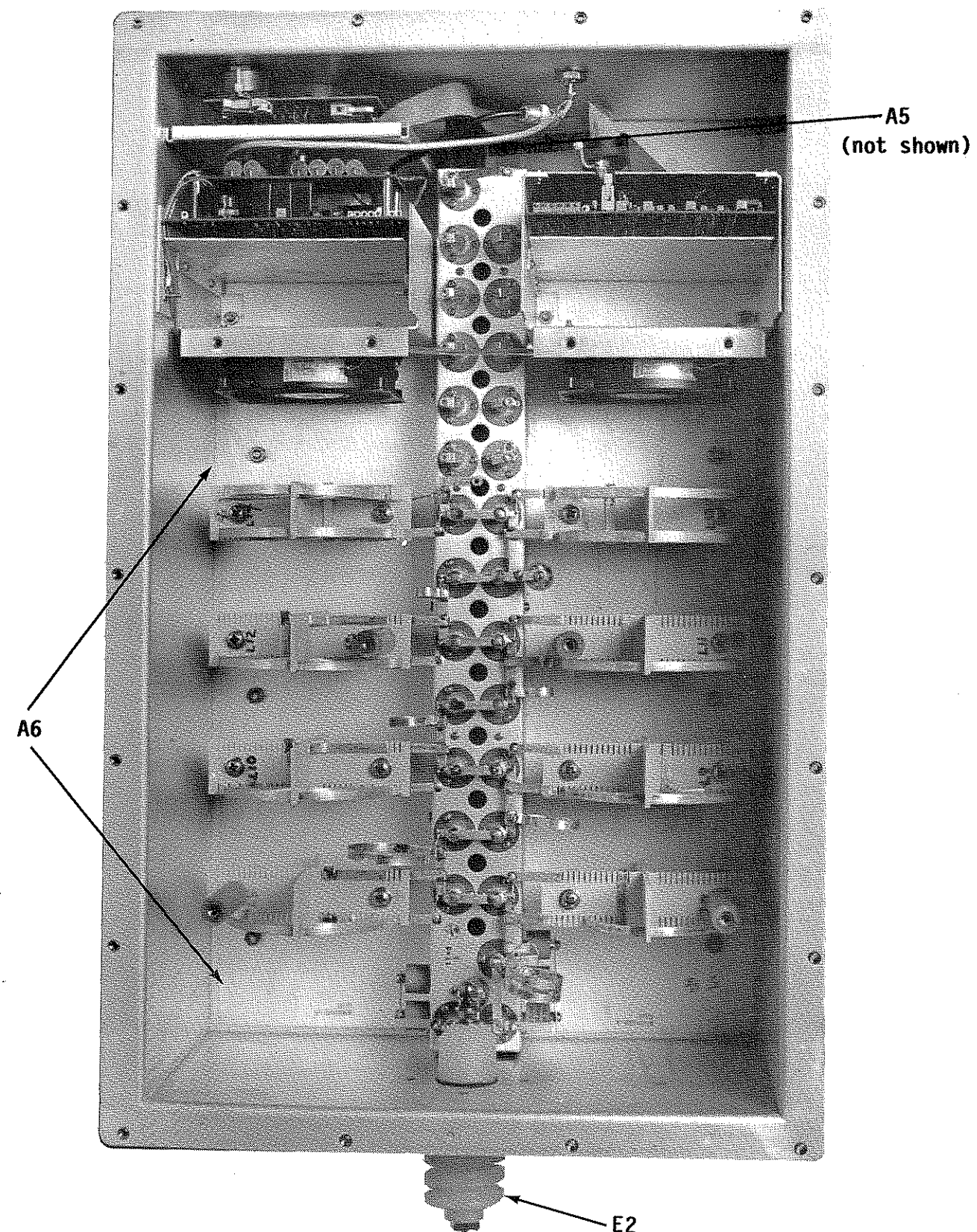


FIGURE 5-3 SNR-2000DAC WITH CAPACITOR BOARD A4 REMOVED (VIEW 1)

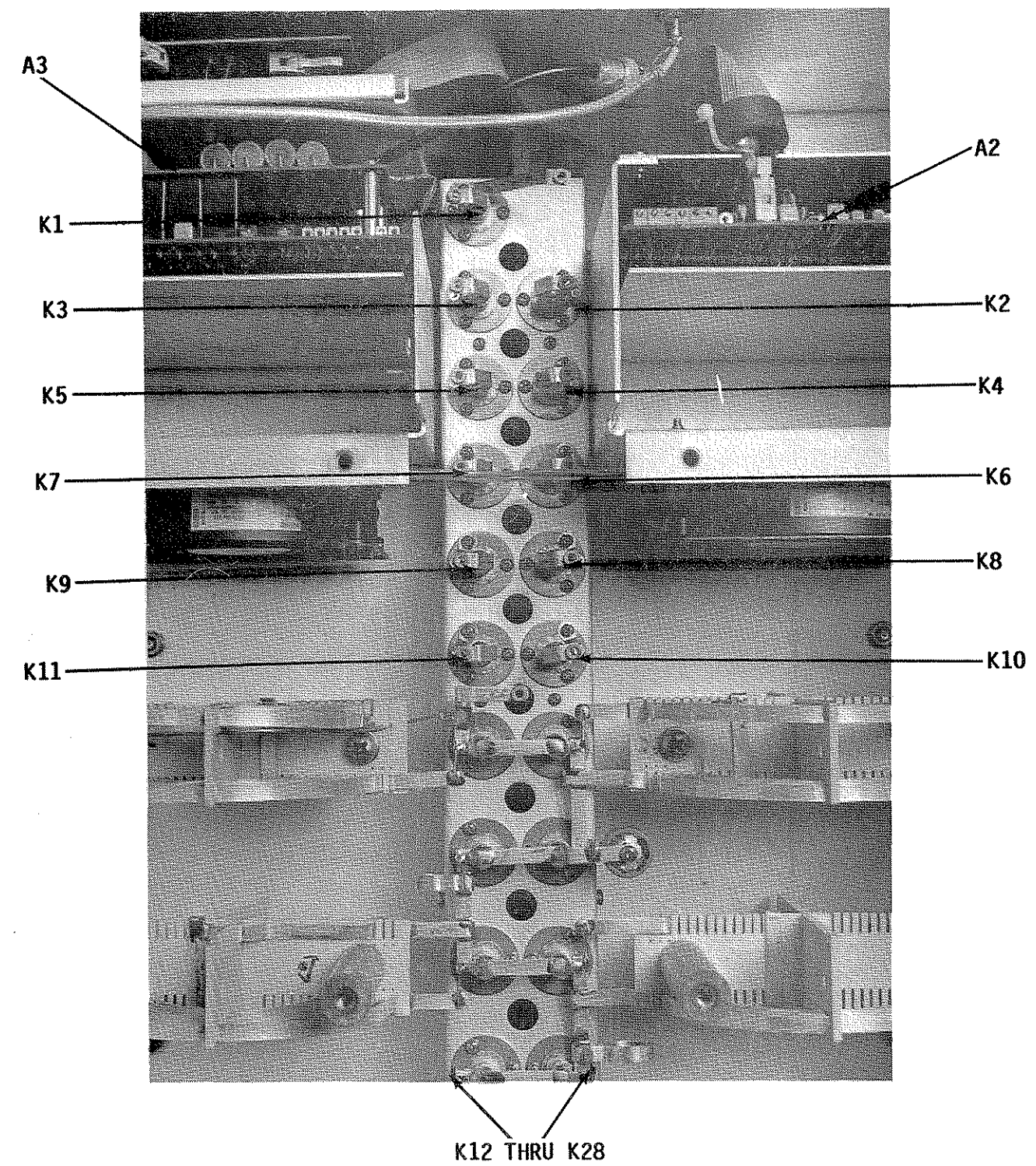


FIGURE 5-4 SNR-2000DAC WITH CAPACITOR BOARD A4 REMOVED (VIEW 2)

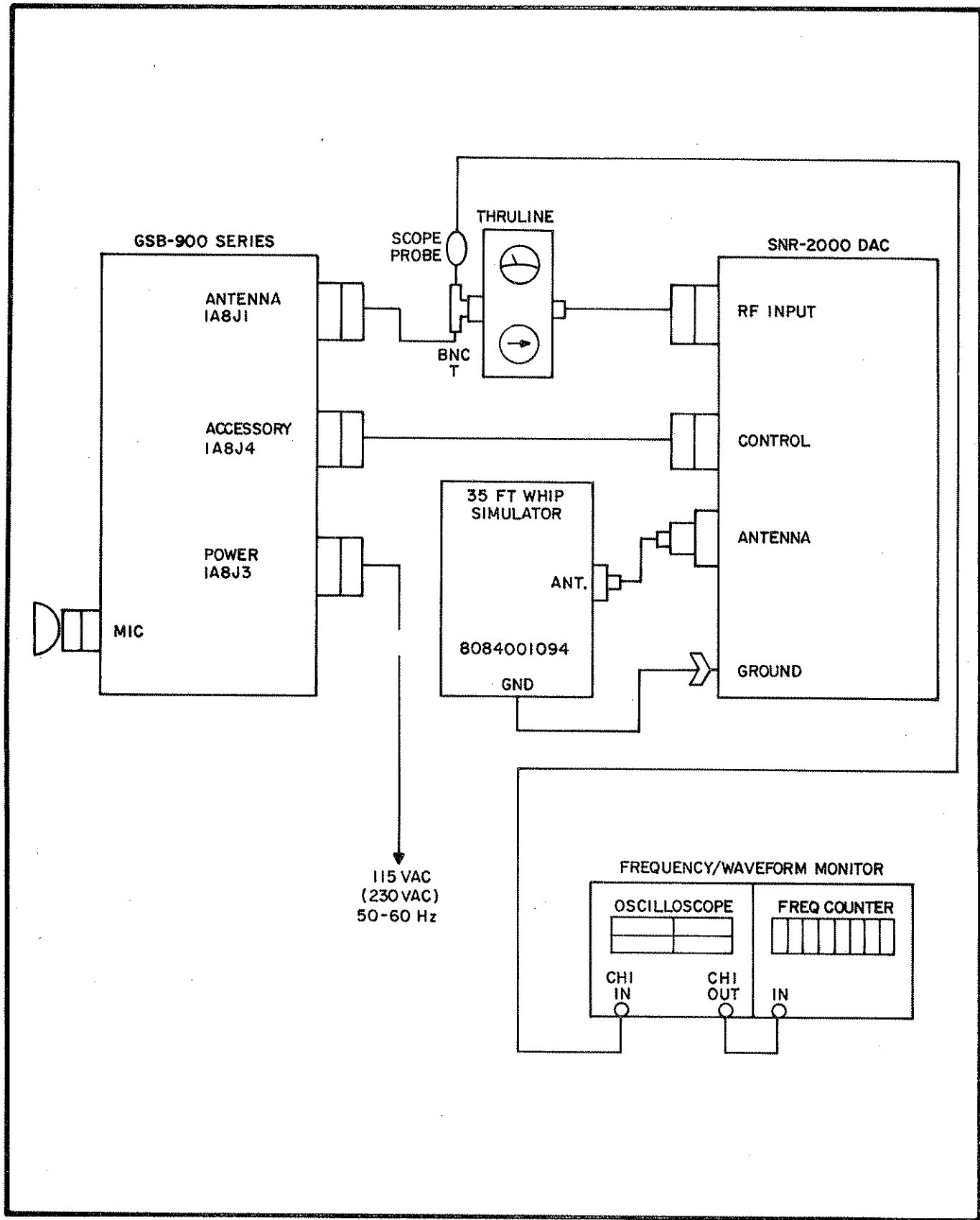


FIGURE 5-5 COUPLER TEST SETUP

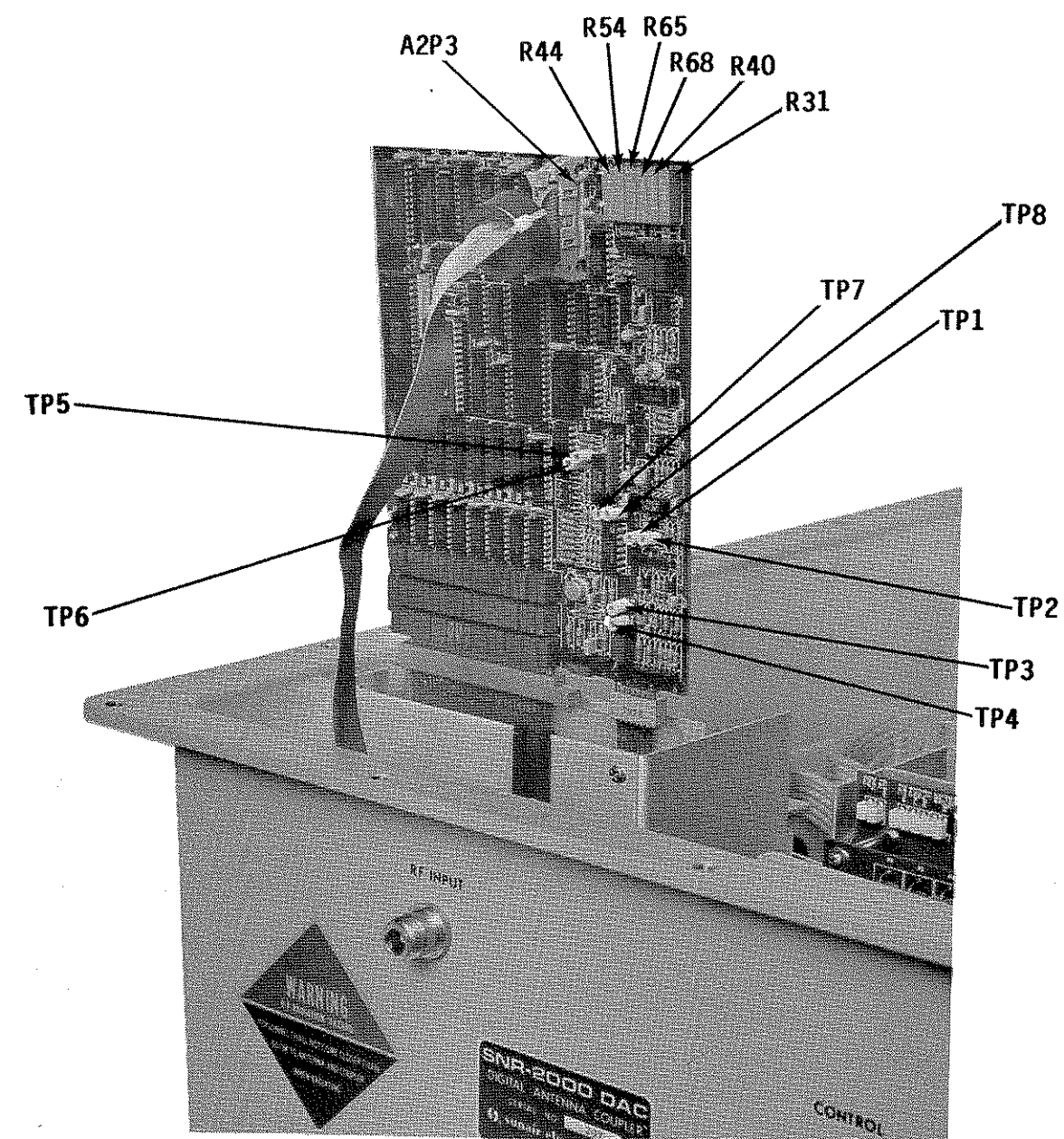


FIGURE 5-6 COMPUTER BOARD A2 EXTENDED

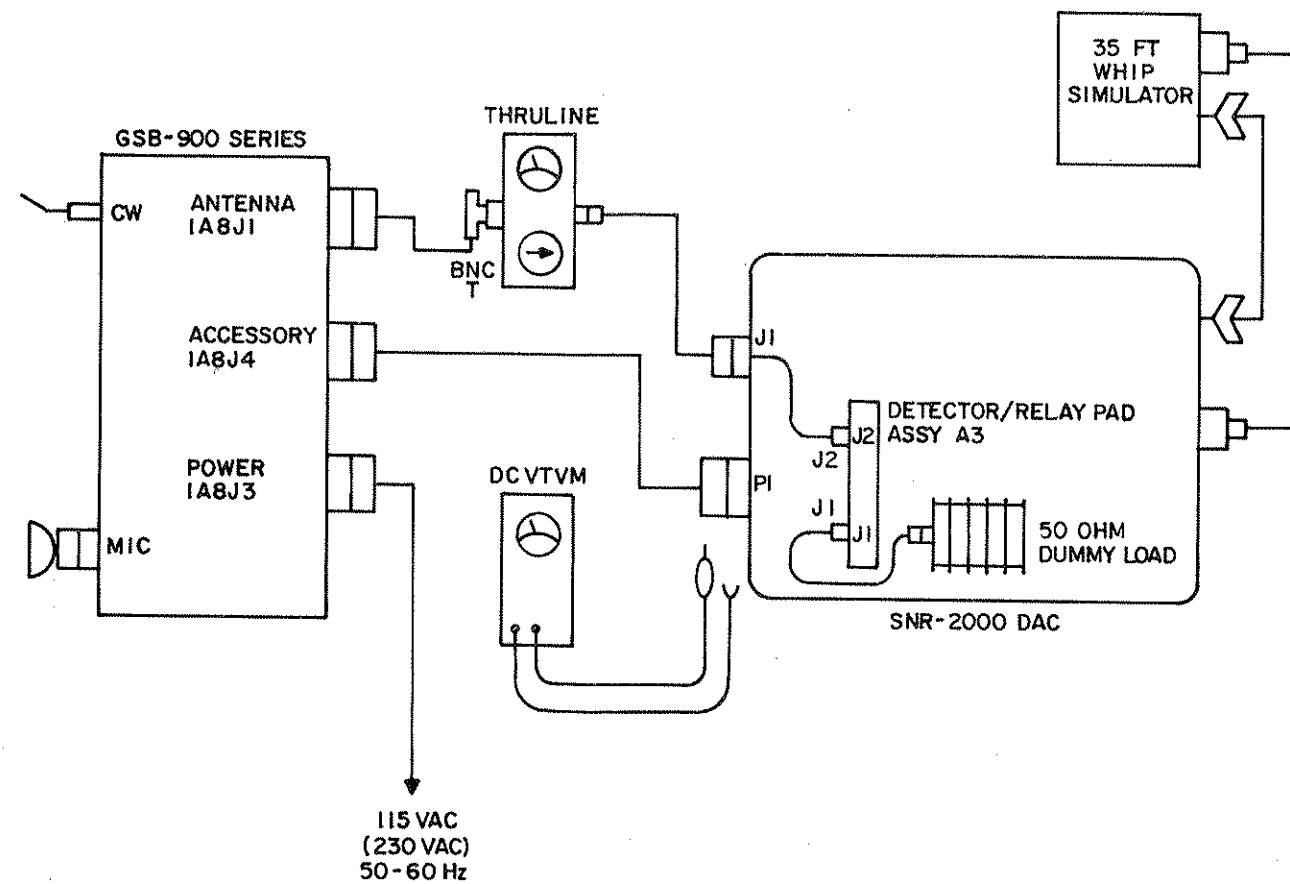


FIGURE 5-7 DETECTOR/RELAY PAD ALIGNMENT SETUP (Forward Power Detectors)

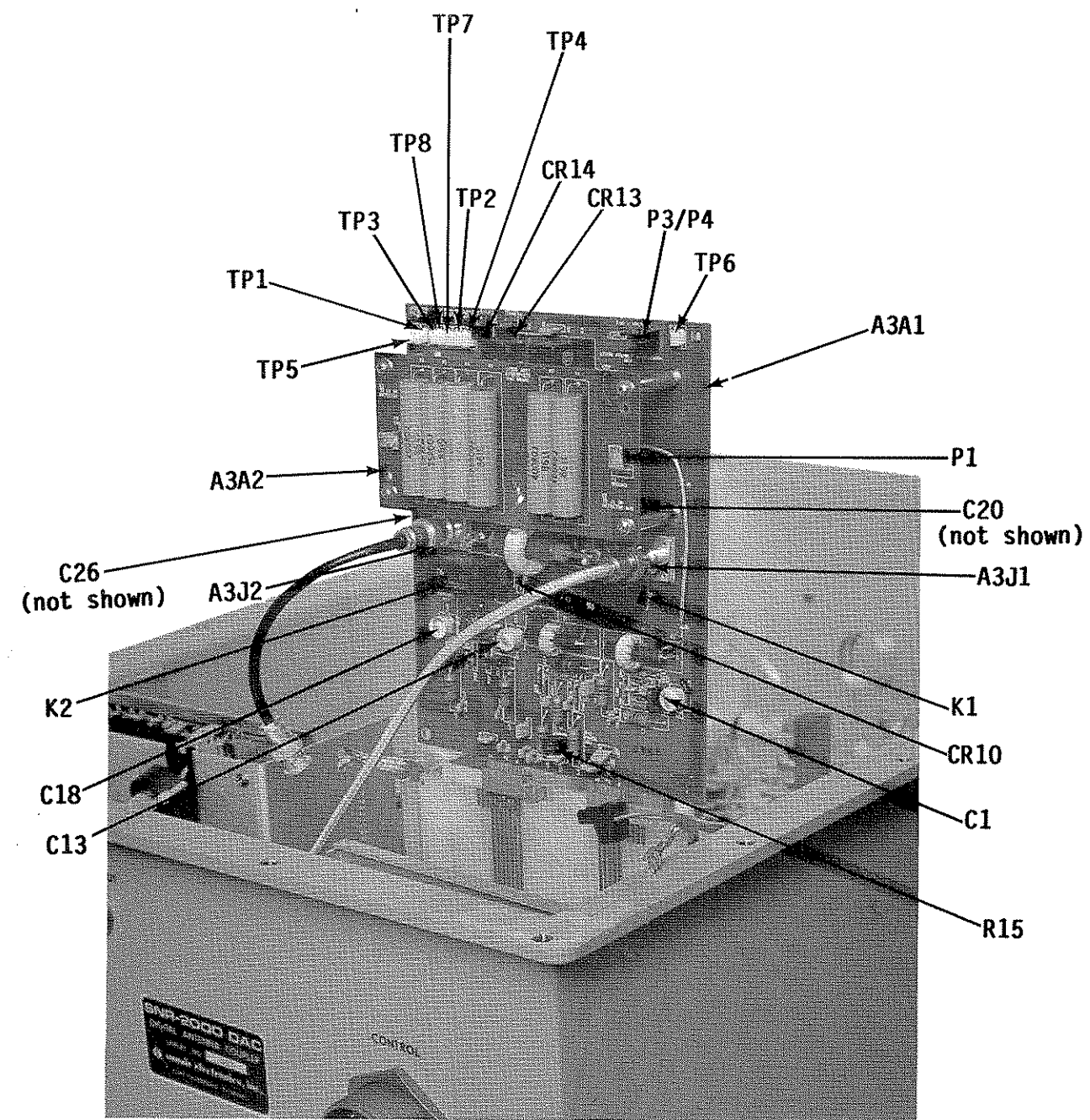


FIGURE 5-8 DETECTOR/RELAY PAD ASSEMBLY A3 EXTENDED

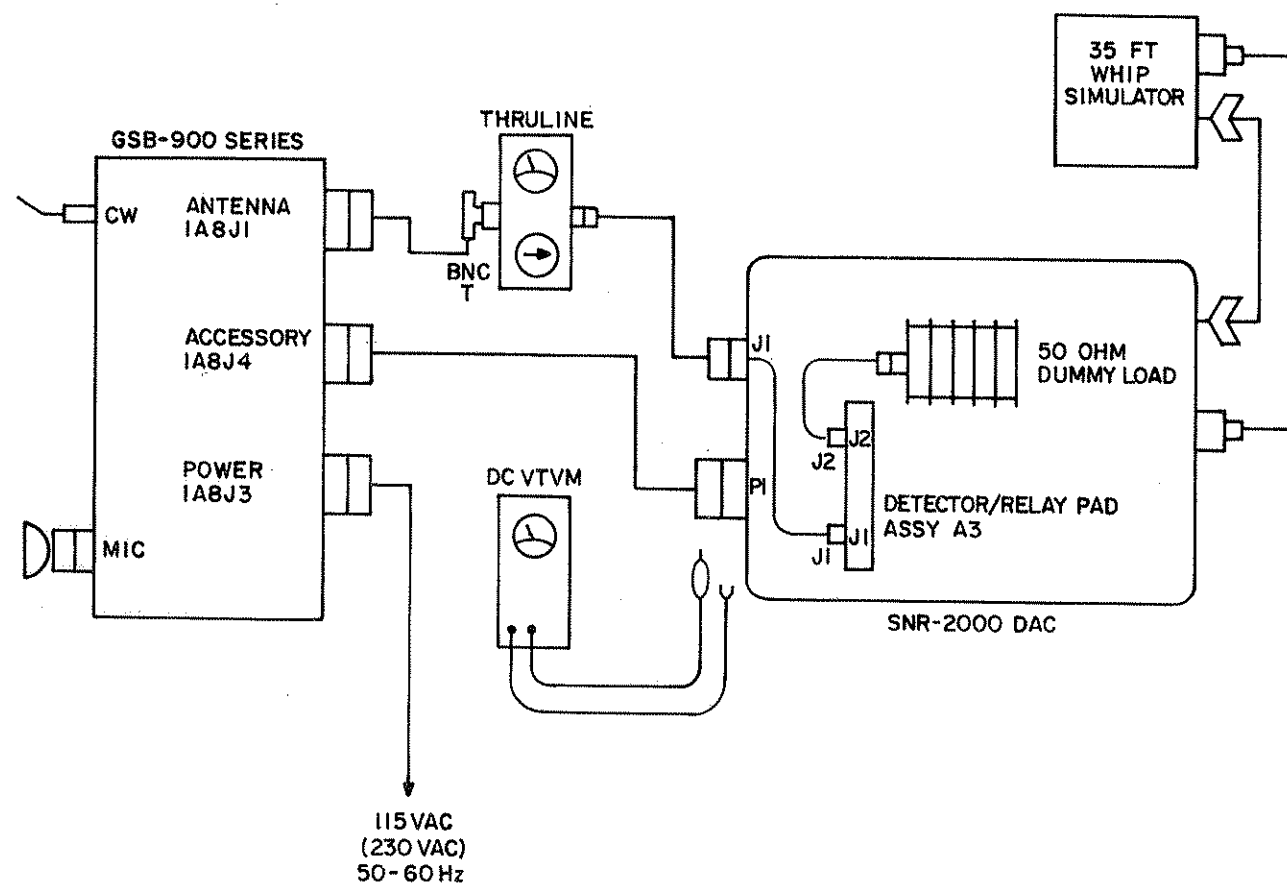


FIGURE 5-9 DETECTOR/RELAY PAD ALIGNMENT SETUP
(Reflected Power Detectors, Mag & Phase Detectors)

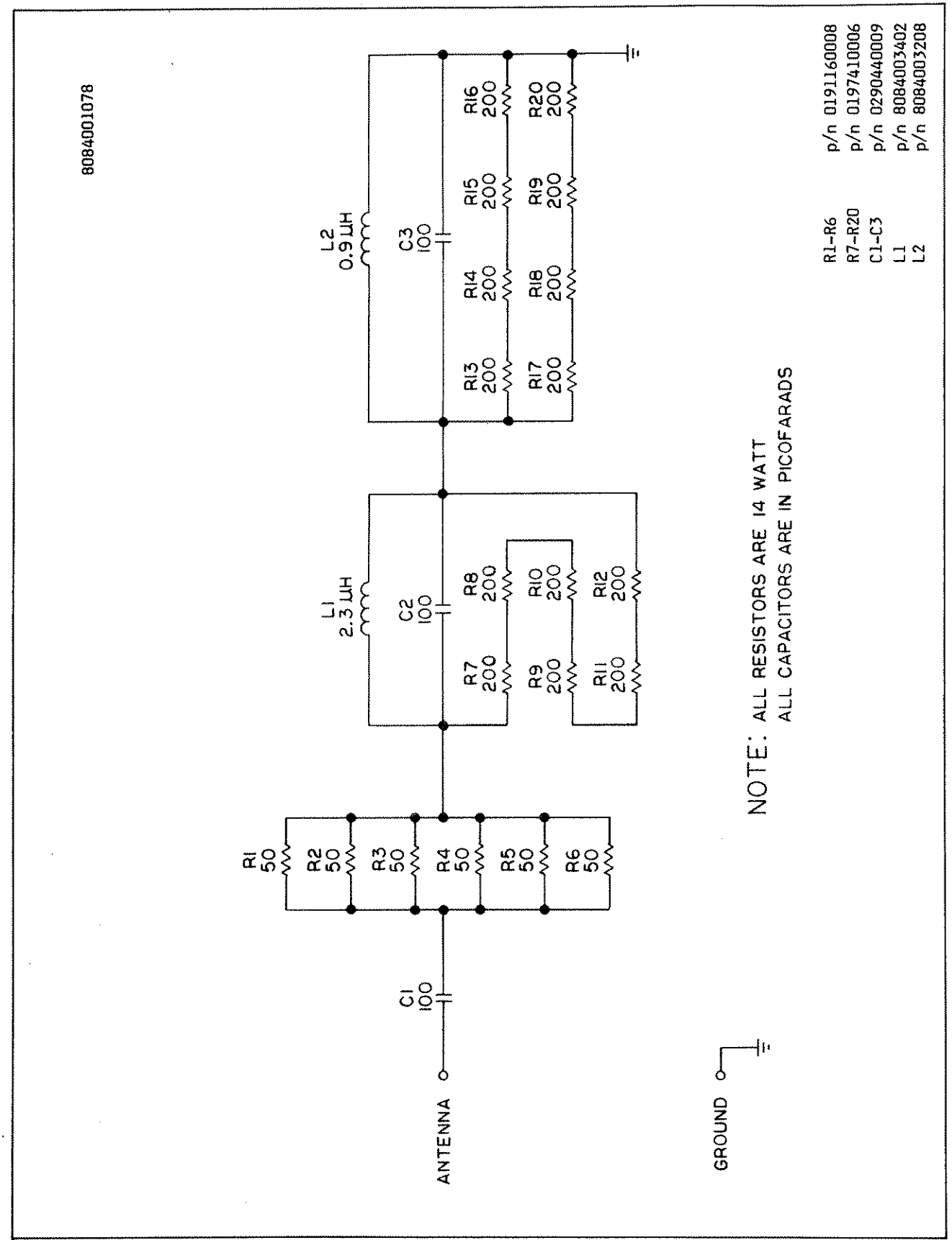


FIGURE 5-10 35FT. WHIP ANTENNA SIMULATOR

SUNAIR SNR-2000DAC

TABLE 5.1 FAULT ANALYSIS

SYMPTOM	POSSIBLE TROUBLE	CHECKS/CORRECTIVE ACTION
FAULT lamp on at initial power turn on.	a. Operation is normal and indicates status of coupler is unknown.	a. Depress TUNE START pushbutton with MODE switch in AM or KW/CPLR TUNE position. Yellow TUNING lamp on the Coupler Control Panel 1A2 will light. In 10 seconds or less, green READY lamp will light, indicating coupler is tuned and ready for operation. If red FAULT lamp lights, follow through fault analysis procedures to determine fault.
No Coupler Control Panel meter readings in FWD or REF position, coupler faults 10 seconds after TUNE command.	a. No RF output from 900 Series Exciter/Transceiver. MODE switch not in AM or KW/CPLR TUNE positions for tuning. (MODE switch position not critical in SC-10 Transceiver units.) b. No RF output from 900 Series Exciter/Transceiver. c. No TUNE ENABLE to SC-10 Transceiver.	a. (1) Before pushing TUNE START pushbutton, is MODE switch in AM or KW/CPLR TUNE positions? (2) No carrier is generated in USB, LSB, (keyed up) positions in 900 Series Exciter/Transceiver. b. Defective Exciter/Transceiver. Refer to Operation and Maintenance Manual for defective unit. c. Defective Detector/Relay Pad Assembly A3. Repair or replace.
Control Panel meter reads normally in FWD position. No reading in REF position. Coupler faults 10 seconds after TUNE command.	a. No RF to coupler. b. Coupler Detector/Relay Pad Assembly A3 defective. c. Coupler reflected power circuitry on Computer Board A2 defective.	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. Repair or replace. c. Repair or replace.
Control Panel meter reads normally in both FWD and REF positions. Coupler faults 10 seconds after TUNE command.	a. Computer Board A2 out of alignment or defective. b. Detector/Relay Pad Assembly A3, out of alignment or defective. c. Defective component on Capacitor Assembly A4 or Coil and Capacitor Assembly A6. d. Defective relays K1-K28.	a. Align A2 Board according to Table 5.1.1. If unable to align, repair or replace Computer Board A2. b. Align A3 Board according to Table 5.1.2. If unable to align, repair or replace A3 Board. c. Check components for damage and/or severe discoloration. Replace as required. d. Check out relay operation in Table 5.2.2.

TABLE 5.1 FAULT ANALYSIS (Con't)

SYMPTOM	POSSIBLE TROUBLE	CHECKS/CORRECTIVE ACTION
None of the coupler status lights on.	a. +28 VDC in exciter/transceiver is shut off.	a. Recycle exciter/transceivers power switch (wait 30 seconds before turning on again). Check for +28 VDC at RF Power Amplifier connector 1A8P1, pin D. 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. (1) Try to retune with MODE switch in CW position and CW key down (1000W). (2) If tune is not satisfactory or 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.
TUNE lamp and READY lamp blinks on and off.	a. TUNE command line is held High by exciter/transceiver.	a. Exciter/transceiver defective. Check exciter/transceiver manual for corrective action.

SUNAIR SNR-2000DAC

TABLE 5.1.1 SNR-2000DAC ALIGNMENT PROCEDURE FOR COMPUTER BOARD A2

NOTE: If upon completion of the Fault Analysis Tables 5.1, the SNR-2000DAC 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 900 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 $\frac{1}{2}$ of measured voltage in Step 4 above.
6. Measure voltage at TP1. Adjust R31 until voltage is $+2.60 \text{ VDC} \pm .01 \text{ VDC}$.
7. Measure voltage at TP2. Adjust R40 until voltage is $+300 \text{ mv} \pm 5 \text{ mv}$.
8. Connect negative lead to TP8 and positive lead to TP7. Adjust R68 until a reading of $+300 \text{ mv} \pm 5 \text{ mv}$ is obtained.
9. Connect negative lead to TP4 and positive lead to TP7. Adjust R54 until a reading of $+150 \text{ mv} \pm 5 \text{ mv}$ is obtained. Move positive lead to TP8, voltage should read $-150 \text{ mv} \pm 5 \text{ mv}$. 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 $+300 \text{ mv} \pm 5 \text{ mv}$ is obtained.
11. Connect negative lead to TP4 and positive lead to TP5. Adjust R44 until a reading of $+150 \text{ mv} \pm 5 \text{ mv}$ is obtained. Move positive lead to TP6, voltage should read $-150 \text{ mv} \pm 5 \text{ mv}$. 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 SNR-2000DAC ALIGNMENT PROCEDURE FOR DETECTOR/RELAY PAD ASSEMBLY A3

NOTE: If upon completion of the Fault Analysis Procedures of Table 5.1, the SNR-2000DAC is still not operating properly, accomplish the following alignment procedure. All measurements and adjustments 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

1. Turn MODE switch on 900 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:
 - a. RF coax cable connection on A4J1
 - b. 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).
2. Once the A3 board is reinstalled on its extender board, make the following connections for ALIGNMENTS A and B. See Figure 5-7.
 - a. Disconnect RF coax cables at A3J1 and J2.
 - b. Connect RF coax cable removed from A3J1 to A3J2 (RF input to coupler.)
 - c. Connect an RF test coax cable with BNC connectors on each end to A3J1 and to the 50 ohm Dummy Load.
 - d. Connect an 8 inch clip lead between A3A2P1 and its ground strap.
3. Turn MODE switch to AM (necessary to supply power to coupler). Set frequency dials to 29.9000 MHz.

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. (Depending on exciter/transceiver type, this can be accomplished by either holding the microphone PTT depressed or by placing the MODE switch to CPLR TUNE/KW position.)
 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 MODE switch to CW, and key radio.
 3. Adjust C26 for a dip on the VTVM.
 4. Unkey radio and place MODE switch to AM.
 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 V 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.
3. Key radio, with microphone PTT or MODE switch in KW/CPLR TUNE.
4. Adjust C13 for a dip on the VTVM.
5. 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 or MODE switch in KW/CPLR TUNE.
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 to TP1.

E. MAGNITUDE DISCRIMINATOR

1. Key radio, with microphone PTT or MODE switch in KW/CPLR TUNE.
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 MODE switch in CW, and key radio.
3. Adjust C20 for a dip on the VTVM.
4. Unkey radio and turn MODE 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. 100 WATT OPERATION CHECKOUT

1. Turn MODE switch to AM. Depress TUNE START pushbutton on Coupler Control Panel 1A2 and check to see if coupler will tune 29.9 MHz. If a good tune is accomplished, then continue tuning through the HF spectrum from 29.9 MHz to 1.6 MHz in 1 MHz steps. If coupler completes all these tunes, it should operate throughout the entire frequency range.

H. 1000 WATT OPERATIONAL CHECKOUT

1. Use Section III, paragraph 3.3, to check out system at 1000 watts.

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.

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	<p>a. Test equipment: Freq/wave-form monitor, Figure 5-5 and a digital voltmeter (DVM).</p> <p>b. Exciter/Transceiver: AM Mode of operation.</p> <p>c. Connect 35 ft. whip antenna simulator to couplers antenna terminal.</p> <p>d. Place Computer Board A2 on extender board p/n 8092039097.</p>	
	<p>NOTE: When instructed to change exciter/transceiver frequency, be sure to change frequency by no less than 2 MHz.</p>	
1. 28 V Supply	<p>a. Connect negative lead of DVM to chassis and positive lead to the anode of A2CR12.</p>	<p>NORMAL: DVM indicates 28 V \pm 4 volts.</p> <p>ABNORMAL: Turn off 900 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 \pm 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 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 still voltage is incorrect, check the Input Connector Assembly A1, in particular the "Soft Start" Circuit.</p>
2. 5 V Supply	<p>a. Connect positive lead of DVM to Computer Board connector A2P3 pin 15 or 17.</p>	<p>NORMAL: DVM indicates 5 V \pm .5V.</p> <p>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.</p>

TABLE 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Con't)

3. 6.144 MHz Clock Oscillator	a. Connect oscilloscope probe to U1 pin 1.	<p>NORMAL: Frequency = 6.144 MHz square wave, 4 V p-p minimum.</p> <p>ABNORMAL: Replace U2.</p>
4. Tune Command Circuit	a. Connect scope probe to CR2 anode. Depress TUNE START button on Coupler Control Panel 1A2.	<p>NORMAL: Scope indicates a momentary +0 VDC to +12 VDC Low to High change. Coupler tunes.</p> <p>ABNORMAL: Check Input Connector Assembly A1. Check control cable between radio and coupler. Check radio for proper inputs to coupler.</p>
	b. Connect scope probe to Q2 base. Depress TUNE START button on Coupler Control Panel 1A2.	<p>NORMAL: Scope indicates a +1 V level at Q2 base. This level remains until coupler has tuned, then indicates 0V.</p> <p>ABNORMAL: Check Q2 and associated circuitry.</p>
	c. Connect scope probe to Q2 collector. Depress TUNE START button on Coupler Control Panel 1A2.	<p>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.</p> <p>ABNORMAL: Repair or replace Q2 or associated circuitry. Check Keyline Relay on Detector/-Relay Pad Assembly A3. Refer to Section 4.3.7.</p>
	d. Connect scope probe to U1 pin 8. Depress TUNE START button on Coupler Control Panel 1A2.	<p>NORMAL: Scope indicates momentary 0V to +5 VDC pulse. Coupler tunes.</p> <p>ABNORMAL: Check U7E, U7F, and repair or replace.</p>
5. +10 VDC	a. Connect DVM negative lead to ground (chassis) and connect positive lead to TP3.	<p>NORMAL: DVM indicates a reading of approximately 10.2 to 11 VDC.</p> <p>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.</p>

TABLE 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Con't)

6. Detector Reference	a. Connect DVM negative lead to ground (chassis) and connect positive lead to TP4.	<p>NORMAL: DVM indicates a reading one half ($\frac{1}{2}$) of the reading in Step 5 NORMAL.</p> <p>ABNORMAL: Check voltage divider R82 and R83. Repair or replace as necessary.</p>
Turn 900 Series Radio Equipment OFF. Remove and set aside Detector/Relay Pad Assembly A3. Leave Computer Board A2 on extender card. Turn 900 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.	<p>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.</p> <p>ABNORMAL: Check circuitry related to U45C, U42B and U41A. Repair or replace as necessary.</p>
	b. Connect scope probe to U45 pin 8, jumper voltage from TP3 to P2 pin 5.	<p>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.</p> <p>ABNORMAL: Check circuitry related to U45D, U42A and U41A. Repair or replace as necessary.</p>
	c. Connect scope probe to U45 pin 10, jumper voltage from TP3 to P2 pin 4.	<p>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.</p> <p>ABNORMAL: Check circuitry related to U45E, U42C and U41B. Repair or replace as necessary.</p>
	d. Connect scope probe to U45 pin 12, jumper voltage from TP3 to P2 pin 4.	<p>NORMAL: Scope indicates a 0 volt 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.</p> <p>ABNORMAL: Check circuitry related to U45F, U42D, and U41B. Repair or replace as necessary.</p>

TABLE 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Con't)

8. VSWR Faults

TUNING VSWR FAULT

a. Connect scope probe to U45 pin 4 and jumper voltage from TP4 to P2 pin 1.

NORMAL: Scope indicates a +5V 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 and 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 a 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 U43B. Repair or replace as necessary.

9. 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.

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.

TABLE 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Con't)

10. COUPLER REFLECTED POWER	a. Connect scope probe to U38 pin 14 and jumper voltage from TP3 to P2 pin 1.	<p>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.</p> <p>ABNORMAL: Check circuitry related to U38, U37B, and Q3. Repair or replace.</p>
	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.	<p>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.</p> <p>ABNORMAL: Check circuitry related to U38, U37A and Q3. Repair or replace.</p>
<p>Remove test equipment leads and voltage jumpers, turn 900 Series radio equipment OFF. Replace Detector /Relay Pad Assembly A3. Leave Computer Board A2 on extender card. Turn 900 series radio equipment ON.</p>		
11. FAN CONTROL	a. Place radio MODE switch in AM. Depress TUNE START pushbutton on Coupler Control Panel 1A2.	<p>NORMAL: Coupler will tune and green READY light on Coupler Control Panel will light.</p> <p>ABNORMAL: Check Symptom and Corrective Action in Table 5.1 Fault Analysis.</p>
	b. With the green READY light on, key microphone PTT button.	<p>NORMAL: In approximately three (3) seconds the fans in the SNR-2000DAC will come on and will remain on until PTT is released.</p> <p>ABNORMAL: Check circuitry related to U32G, U8B, U7B and C, U6C, U26B and U43B. Check FAN Relay on the A3 Assembly. Refer to Section 4.3.7. Repair or replace.</p>
12. FAULT Light Circuit	a. Connect scope probe to U36 pin 5. Turn 900 Series radio power OFF. Wait approximately 4 seconds and turn power back ON.	<p>NORMAL: Scope will show a 0V level indication when radio is turned back on and red FAULT light on 1A2 panel is lit. Depress TUNE START pushbutton on the 1A2. When coupler tunes, scope will show a +12V level with green READY light on.</p> <p>ABNORMAL: Check U36B, U13, and associated circuitry. Check FAULT Light on Coupler Control Panel 1A2, replace if necessary. Check control cable between coupler and radio. Repair or replace.</p>

TABLE 5.2 FAULT ANALYSIS AND TROUBLESHOOTING, COMPUTER BOARD A2 (Con't)

13. READY Light Circuit	<p>a. Connect scope probe to U36 pin 3. Depress TUNE START pushbutton on Coupler Control Panel 1A2.</p>	<p>NORMAL: Scope will show 0V when tune cycle is complete and green READY light on 1A2 is lit. Turn radio OFF and wait approximately 4 seconds, then back ON. Scope will show +12V and READY light is OFF.</p> <p>ABNORMAL: Check U6B, U36A, U13 and associated circuitry. Check READY lamp on 1A2. Replace if necessary. Check control cable between coupler and radio. Repair or replace.</p>
-------------------------	---	---

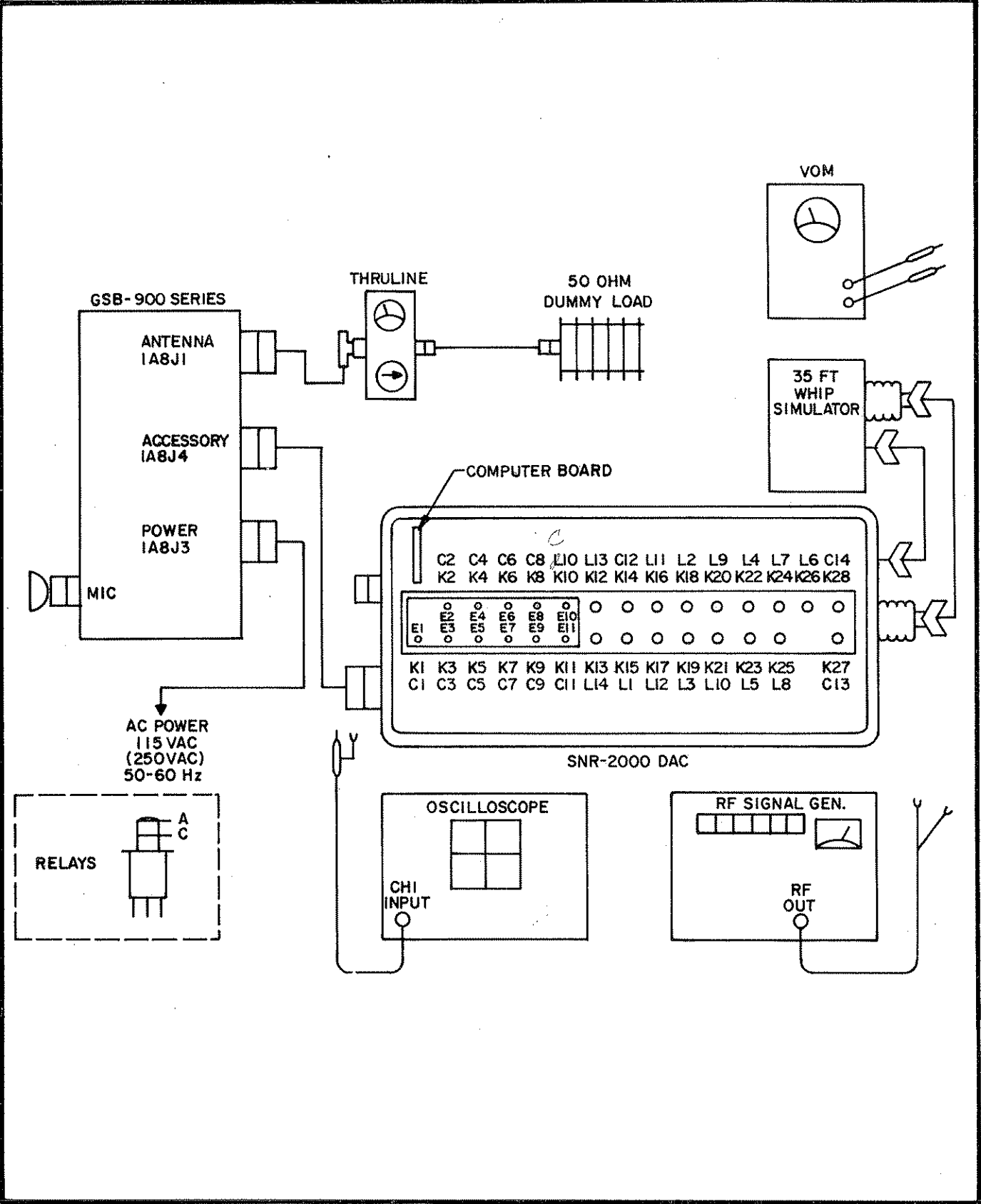


FIGURE 5-11 COUPLER TEST SETUP FOR CHECKING RELAYS K1 THRU K28

TABLE 5.2.1 COUPLER TEST

PRELIMINARY SETUP FIGURE 5-11

Refer to Figure 5-18.

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 8092038295. Place CPU extender board, p/n 8092039097 in coupler and reinstall A2 on extender board. Reconnect ribbon cable.

1. Turn 900 Series Exciter/Transceiver ON.

a. Coupler relays will energize. Coupler Control Panel 1A2 installed in radio will momentarily light the READY and FAULT lights. 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.
2. Push the TUNE START pushbutton on the coupler control panel, one time. The test EPROM will "LATCH CLOSE" relay K1, placing C1 in the RF circuit. Push the TUNE START once more, and the test EPROM will "LATCH OUT" relay K1 taking C1 out of the circuit. The following table lists the conditions of the couplers RF circuitry according to the number of pushes of the TUNE START button. See Table 5.2.2 for Fault Analysis and Troubleshooting.

NUMBER OF TIMES TUNE START IS PUSHED	RELAY NUMBER AND STATUS OF CONTACTS A AND C	ELEMENT THAT IS PLACED IN/OUT OF RF CIRCUIT
1	K1 Closed	C1 IN
2	K1 Open	C1 OUT
3	K2 Closed	C2 IN
4	K2 Open	C2 OUT
5	K3 Closed	C3 IN
6	K3 Open	C3 OUT
7	K4 Closed	C4 IN
8	K4 Open	C4 OUT
9	K5 Closed	C5 IN
10	K5 Open	C5 OUT
11	K6 Closed	C6 IN
12	K6 Open	C6 OUT
13	K7 Closed	C7 IN
14	K7 Open	C7 OUT
15	K8 Closed	C8 IN

TABLE 5.2.1 COUPLER TEST (Con't)

16	K8 Open	C8 OUT
17	K9 Closed	C9 IN
18	K9 Open	C9 OUT
19	K10 Closed	C10 IN
20	K10 Open	C10 OUT
21	K11 Closed	C11 IN
22	K11 Open	C11 OUT
23	K12 Open	L13 IN
24	K12 Closed	L13 OUT
25	K13 Open	L14 IN
26	K13 Closed	L14 OUT
27	K14 Open	C12 IN
28	K14 Closed	C12 OUT
29	K15 Open	L1 IN
30	K15 Closed	L1 OUT
31	K16 Open	L11 IN
32	K16 Closed	L11 OUT
33	K17 Open	L12 IN
34	K17 Closed	L12 OUT
35	K18 Open	L2 IN
36	K18 Closed	L2 OUT
37	K19 Open	L3 IN
38	K19 Closed	L3 OUT
39	K20 Open	L9 IN

TABLE 5.2.1 COUPLER TEST (Con't)

40	K20 Closed	L9 OUT
41	K21 Open	L10 IN
42	K21 Closed	L10 OUT
43	K22 Open	L4 IN
44	K22 Closed	L4 OUT
45	K23 Open	L5 IN
46	K23 Closed	L5 OUT
47	K24 Open	L7 IN
48	K24 Closed	L7 OUT
49	K25 Open	L8 IN
50	K25 Closed	L8 OUT
51	K26 Open	L6 IN
52	K26 Closed	L6 OUT
53	K27 Closed	C13 IN
54	K27 Open	C13 OUT
55	K28 Closed	C14 IN
56	K28 Open	C14 OUT

NOTE: Pushing "TUNE START" the 57th time, will return to 1 again, allowing the stepping through of the 28 relays to begin again. If the number of times the "TUNE START" has been depressed, is forgotten, or for some other reason you want to start at the beginning again, turn OFF the radio, wait 15 seconds then turn the radio back ON. This places the coupler back into "pipeline", ready for the first push of "TUNE START" to close K1.

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2
AND RELAYS K1 THROUGH K28 ON RELAY BOARD A5

NOTE: To insure proper sequencing, **DO NOT** deviate from sequence of tune steps.

CIRCUIT UNDER TEST	INSTRUCTIONS	RESULT/ACTION
1. Network Relay Drivers		
1a. C1	a. Set VOM on 1 ohm scale and connect probes to E1 on Capacitor Board A4 and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>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. Repair or replace.</p>
	b. Push "TUNE START" on Coupler Control Panel 1A2, once.	<p>NORMAL: Will hear relay K1 "LATCH CLOSE" and VOM will indicate a short.</p> <p>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.</p>
	c. Push "TUNE START", once.	<p>NORMAL: Will hear relay K1 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
1b. C2	a. Connect VOM probes to E2 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K2 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as in step 1a.b. Also check relay K2.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K2 "LATCH OPEN" and VOM will indicate and open.</p> <p>ABNORMAL: Same as in step 1a.a. Also check relay K2.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1c. C3	a. Connect VOM probes to E3 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K3 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as in step 1a.b. Also check relay K3</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K3 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as in step 1a.a. Also check relay K3.</p>
1d. C4	a. Connect VOM probes to E4 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K4 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as in step 1a.b. Also check relay K4.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K4 "LATCH OPEN" and VOM will indicate a open.</p> <p>ABNORMAL: Same as in step 1a.a. Also check relay K4.</p>
1e. C5	a. Connect VOM probes to E5 on A4 board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a. above.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K5 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as step 1a.b. Also check relay K5.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K5 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a. Also check relay K5.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1f. C6	a. Connect VOM probes to E6 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K6 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as step 1a.b. Also check relay K6.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K6 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a. above. Also check relay K6.</p>
1g. C7	a. Connect VOM probes to E7 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K7 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as step 1a.b. Also check relay K7.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K7 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as step 1a.a. Also check relay K7.</p>
1h. C8	a. Connect VOM probes to E8 on A4 Board and chassis ground.	<p>NORMAL: VOM will indicate an open.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K8 "LATCH CLOSE" and VOM will indicate a short.</p> <p>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. Repair or replace.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K8 "LATCH OPEN" and VOM will indicate an open.</p> <p>ABNORMAL: Same as in step 1h.a. Also check relay K8.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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. Push "TUNE START" once.	NORMAL: Will hear relay K9 "LATCH CLOSE" and VOM will indicate a short. ABNORMAL: Same as in step 1h.b. above. Also check relay K9.
	c. Push "TUNE START" once.	NORMAL: Will hear relay K9 "LATCH OPEN" and VOM will indicate an open. ABNORMAL: Same as in step 1h.a. Also check relay K9.
1j. C10	a. Connect VOM probes to E10 on A4 Board and chassis ground.	NORMAL: VOM will indicate an open. ABNORMAL: Same as in step 1h.a.
	b. Push "TUNE START" once.	NORMAL: Will hear relay K10 "LATCH CLOSE" and VOM will indicate a short. ABNORMAL: Same as in step 1h.b. Also check relay K10.
	c. Push "TUNE START" once.	NORMAL: Will hear relay K10 "LATCH OPEN" and VOM will indicate an open. ABNORMAL: Same as in step 1h.a. Also check relay K10.
1k. C11	a. Connect VOM probes to E11 on A4 Board and chassis ground.	NORMAL: VOM will indicate an open. ABNORMAL: Same as in step 1h.a.
	b. Push "TUNE START" once.	NORMAL: Will hear relay K11 "LATCH CLOSE" and VOM will indicate a short. ABNORMAL: Same as in step 1h.b. Also check relay K11.
	c. Push "TUNE START" once.	NORMAL: Will relay K11 "LATCH OPEN" and VOM will indicate an open. ABNORMAL: Same as in step 1h.a. Also check relay K11.
	d. Remove VOM leads from E11.	

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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.)	<p>NORMAL: Scope will display a 0 volt signal.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K12 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts.</p> <p>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.</p> <p>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.</p>
	d. Push "TUNE START" once.	<p>NORMAL: Will hear relay K12 "LATCH CLOSE" and scope will display a 0 volt signal.</p> <p>ABNORMAL: Same as in step 1m.b. above. Also check relay K12 and inductor L13.</p>

SUNAIR SNR-2000DAC

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1n. L14

- | | |
|---|---|
| a. Adjust RF signal generator for 2.000 MHz, 1 VRMS output. Set scope to measure 2 volts per c/m, A.C. and connect across relay K13's A and C contacts. | <p>NORMAL: Scope will display a 0 volt signal.</p> <p>ABNORMAL: Same as step 1m.b.</p> |
| b. Push "TUNE START" once. | <p>NORMAL: Will hear relay K13 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts.</p> <p>ABNORMAL: Same as in step 1m.c. Also check relay K13 and inductor L14.</p> |
| c. Push "TUNE START" once. | <p>NORMAL: Will hear relay K13 "LATCH CLOSE" and scope will display a 0 volt signal.</p> <p>ABNORMAL: Same as in step 1m.b. Also check relay K13 and inductor L14.</p> |
| d. 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. | <p>NORMAL: VOM will indicate a short.</p> <p>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.</p> |
| b. Push "TUNE START" once. | <p>NORMAL: Will hear relay K14 "LATCH OPEN" and VOM will indicate an open.</p> <p>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.</p> |
| c. Push "TUNE START" once. | <p>NORMAL: Will hear relay K14 "LATCH CLOSE" and VOM will indicate a short.</p> <p>ABNORMAL: Same as step 1o.a. Also check relay K14 and capacitor C12.</p> |
| d. Remove VOM leads from relay K14. | |

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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 contacts A and C as in step 1m.b..	<p>NORMAL: Scope will display a 0.32 volt signal.</p> <p>ABNORMAL: Check for +28 VDC at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U16 and Latch U17. Repair or replace.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K15 "LATCH OPEN" and scope will display a signal approximately 0.5 volts.</p> <p>ABNORMAL: Check for +28 VDC at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of Driver U23 and Latch U24. Also check relay K15 and inductor L1. Repair or replace.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K15 "LATCH CLOSE" and scope will display a signal of approximately 0.32 volts.</p> <p>ABNORMAL: Same as step 1p.a. Also check relay K15 and Inductor L1.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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.	<p>NORMAL: Scope will display a 0 volt signal.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K16 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K16 "LATCH CLOSE" and scope will display 0 volt signal.</p> <p>ABNORMAL: Same as step 1q.a. Also check relay K16 and inductor L11.</p>
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.	<p>NORMAL: Scope will display 0 volt signal.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K17 "LATCH OPEN" and scope will display a signal of approximately 6.0 volts.</p> <p>ABNORMAL: Same as step 1q.b. Also check relay K17 and inductor L12.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K17 "LATCH CLOSE" and scope will display a 0 volt signal.</p> <p>ABNORMAL: Same as step 1r.a. Check relay K17 and inductor L12.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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 connector across relay K18's solder connections A and C as in step 1m.b.

NORMAL: Scope will display approximately a 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.

b. Push "TUNE START" once.

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. Push "TUNE START" once.

NORMAL: Will hear relay K18 "LATCH CLOSE" and scope will display a signal of approximately 0.3 volt.

ABNORMAL: Same as step 1s.a. Also check relay K18 and inductor L2.

SUNAIR SNR-2000DAC

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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.	<p>NORMAL: Scope will display a signal of approximately 0.35 volts.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K19 "LATCH OPEN" and scope will display a signal of approximately 1.0 volts.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K19 "LATCH CLOSE" and scope will display a signal of approximately 0.35 volts.</p> <p>ABNORMAL: Same as in step 1s.a. Also check relay K19 and inductor L3.</p>
1u. L9	a. Set RF signal generator for 23.000 MHz at 1.0 VRMS output. Set scope to measure 1.0 volt A.C. per c/m and connect across K20's solder connections A and C as in step 1m.b.	<p>NORMAL: Scope will display a signal of approximately 0.4 volts.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K20 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K20 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as in step 1u.a. Also check relay K20 and inductor L9.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1v. L10	a. Set RF signal generator for 23.000 MHz at 1.0 VRMS. 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. Push "TUNE START" once.	NORMAL: Will hear relay K21 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts. ABNORMAL: Same as 1v.b. Also check relay K21 and inductor L10. Repair or replace.
	c. Push "TUNE START" once.	NORMAL: Will hear relay K21 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. ABNORMAL: Same as 1v.a. Also check relay K21 and inductor L10.
1w. L4	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS. 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 U17. Repair or replace.
	b. Push "TUNE START" once.	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 U24. Also check relay K22 and inductor L4. Repair or replace.
	c. Push "TUNE START" once.	NORMAL: Will hear relay K22 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts. ABNORMAL: Same as step 1w.a. Also check relay K22 and inductor L4.

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1x. L5	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS. Set scope to measure 1.0 volts A.C. per c/m and connect across K23's solder connections A and C as in step 1m.b.	<p>NORMAL: Scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as in step 1w.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K23 "LATCH OPEN" and scope will display a signal of approximately 2.5 volts.</p> <p>ABNORMAL: Same as in step 1w.b. Also check relay K23 and inductor L5.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K23 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as in step 1w.a. Also check relay K23 and inductor L5.</p>
1y. L7	a. Set RF signal generator for 27.000 MHz at 1.0 VRMS. Set scope to measure 1.0 volts A.C. per c/m and connect across K24's solder connections A and C as in step 1m.b.	<p>NORMAL: Scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as in step 1w.a.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K24 "LATCH OPEN" and scope will display a signal of approximately 4.2 volts.</p> <p>ABNORMAL: Same as in step 1w.b. Also check relay K24 and inductor L7.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K24 "LATCH CLOSE" and scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as in step 1w.a. Also check relay K24 and inductor L7.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

1z. L8	a. Set RF signal generator for 24.000 MHz at 1.0 VRMS. Set scope to measure 1.0 volts A.C. per c/m and connect across K25's solder connections A and C as in step 1m.b.	<p>NORMAL: Scope will display a signal of approximately 0.3 volts.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K25 "LATCH OPEN" and scope will display a signal of approximately 5.0 volts.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K25 "LATCH CLOSE" and scope will display a signal of approximately 0.3 volts.</p> <p>ABNORMAL: Same as step 1z.a. Also check relay K25 and inductor L8.</p>
1a.1. L6	a. Set RF signal generator for 29.900 MHz at 1.0 VRMS. Set scope to measure 1.0 volts A.C. per c/m and connect across K26's solder connections A and C as in step 1m.b.	<p>NORMAL: Scope will display a signal of approximately 0.4 volts.</p> <p>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.</p>
	b. Push "TUNE START" once.	<p>NORMAL: Will hear relay K26 "LATCH OPEN" and scope will display a signal of approximately 3.4 volts.</p> <p>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.</p>
	c. Push "TUNE START" once.	<p>NORMAL: Will hear relay K26 "LATCH OPEN" and scope will display a signal of approximately 0.4 volts.</p> <p>ABNORMAL: Same as step 1a.1.a. Also check relay K26 and inductor L6.</p>

TABLE 5.2.2 FAULT ANALYSIS AND TROUBLESHOOTING OF COMPUTER BOARD A2 (Con't)

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 +28 VDC TUNE at P1 pins 1 and 2 of Computer Board A2. Check related circuitry of U14 and U13. Repair or replace.
	b. Push "TUNE START" once.	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. Push "TUNE START" once.	NORMAL: Will hear relay K27 "LATCH OPEN" and VOM will indicate an open. ABNORMAL: Same as 1a.2.a. Also check relay K27 and capacitor C13.
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 in step 1a.2.a.
	b. Push "TUNE START" once.	NORMAL: Will hear relay K28 "LATCH CLOSE" and VOM will indicate a short. ABNORMAL: Same as in step 1a.2.a. Also check relay K28 and capacitors C14A, B and C.
	c. Push "TUNE START" once.	NORMAL: Will hear relay K28 "LATCH OPEN" and VOM will indicate an open. ABNORMAL: Same as in 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 900 Series Exciter/Transceiver and return the coupler to test configuration in Figure 5-5 to further checkout coupler operation.

80920013XXC FINAL ASSEMBLY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FINAL ASSEMBLY	80920013XX
	Conductor, RF	6029102508
	Connector, RF, N UG-680/U	0756030005
	Coax Cable Assy, Detector In	8092003793
	Coax Cable Assy, Detector Out	8092003599
	Insulator, Sleeve, RF	6029102303
	PC Assy, Computer A2	8092030090
	PC Assy, Detector A3	8092020094
	PC Assy, Input Connector A1	8092019096
	Ring, Retainer	6029102401
	Weldment, Case	80920104XX

80920012XXC FINAL ASSEMBLY TESTED

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FINAL ASSEMBLY TESTED	80920012XX
	Cord, O Ring, 1/4 DIA, NEOPR. 7.3ft	1006990038
	over	80920105XX
	Final Assembly	80920013XX
	Protective Cover, Clear	8092014507

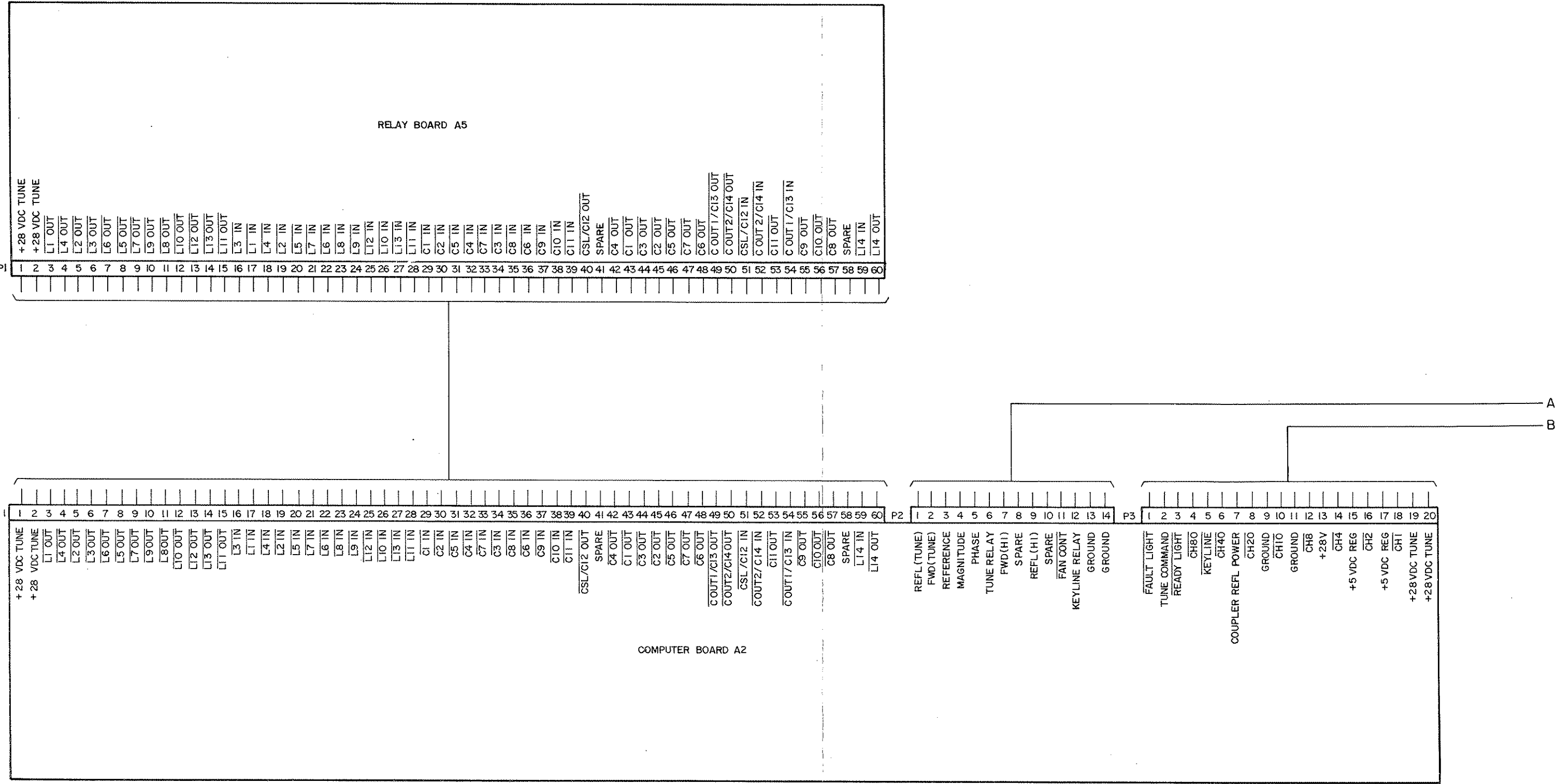


FIGURE 5-12 SNR-2000DAC WIRING DIAGRAM (Sheet 1 of 2)

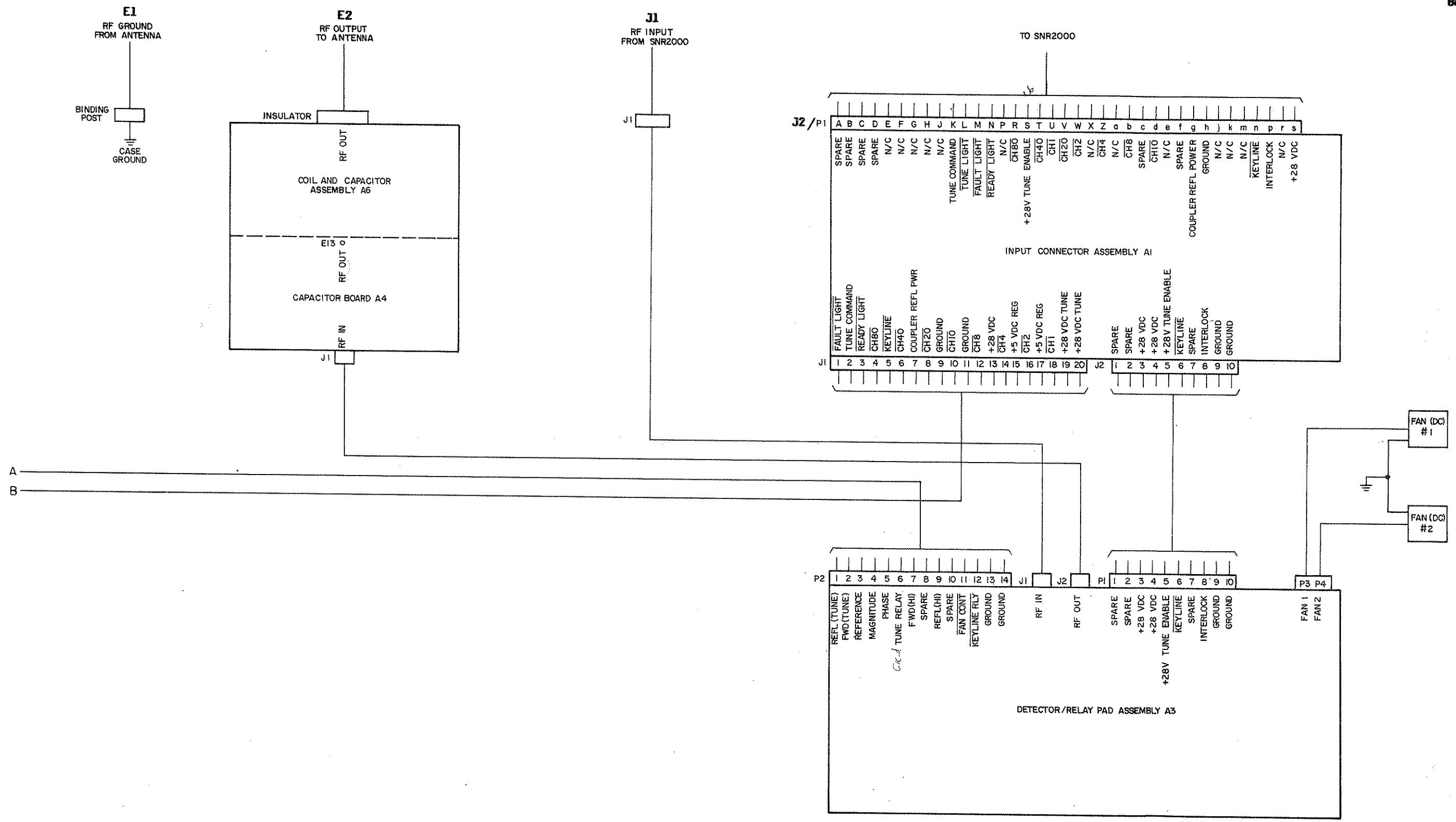
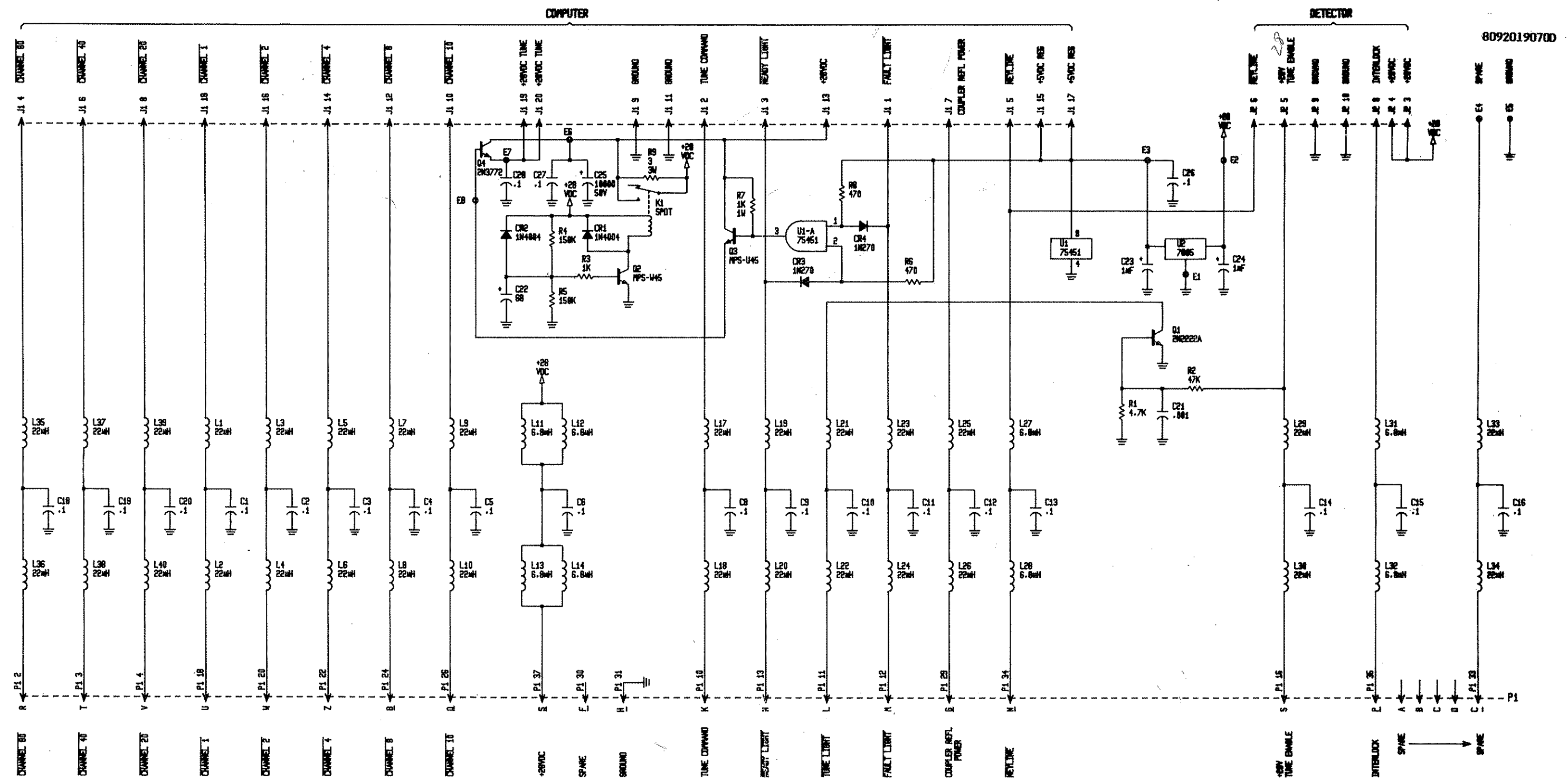


FIGURE 5-12 SNR-2000DAC WIRING DIAGRAM (Sheet 2 of 2)



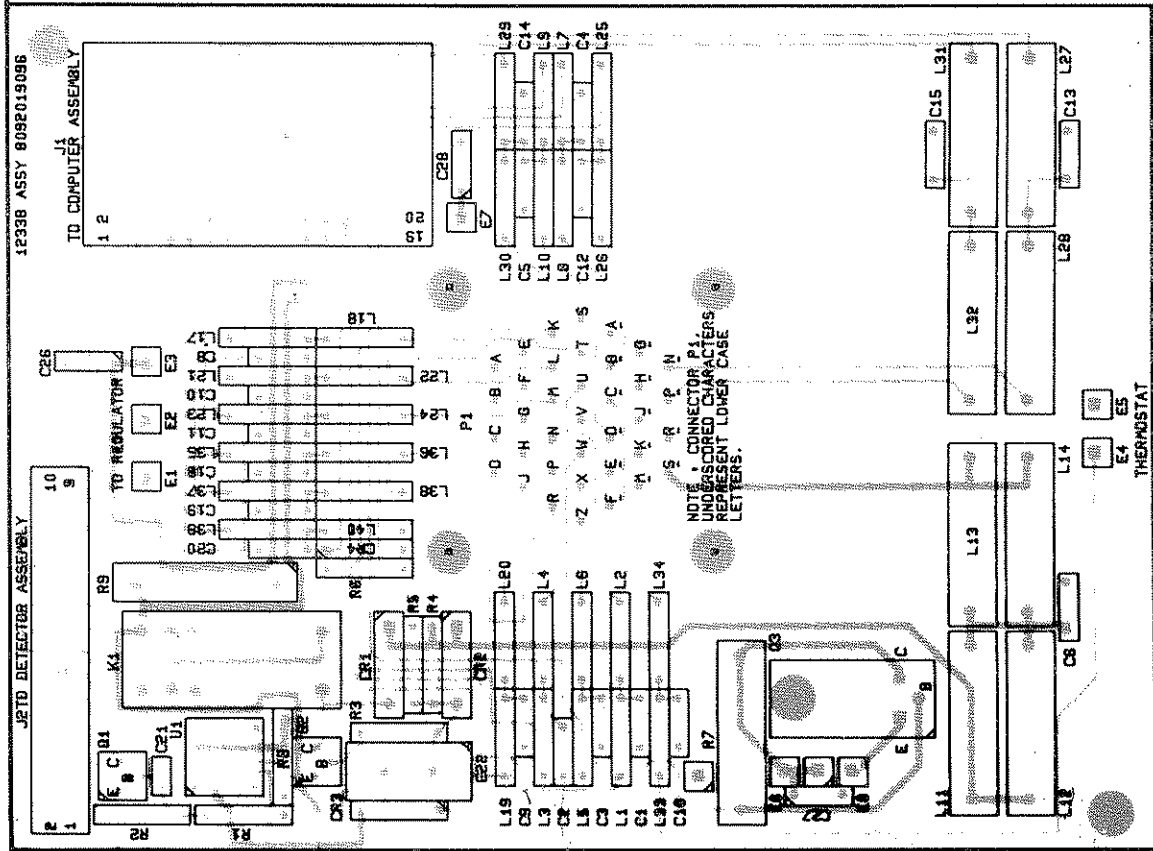
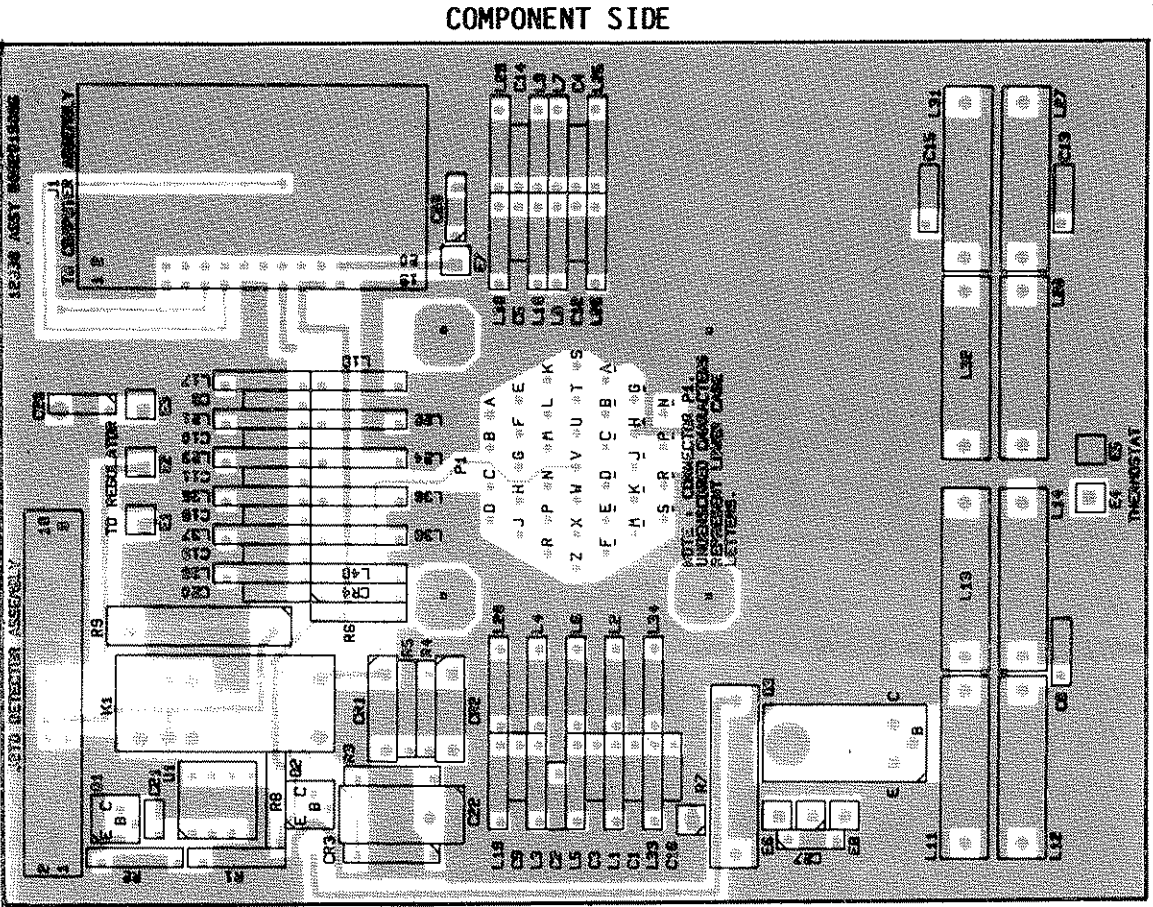
- NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL INDUCTORS ARE 220H AND ALL CAPACITORS ARE 0.1UF.
 2. UNDERSCORED CHARACTERS REPRESENT LOWER CASE LETTERS.
 3. D4 MOUNTED OFF BOARD.

REFERENCE DESIGNATORS	
LAST USED	NOT USED
C28	C7,17
CR4	
EB	
J2	
K1	
L48	L15,16
P1	
Q4	
R8	
U2	

FIGURE 5-13 INPUT CONNECTOR ASSEMBLY A1

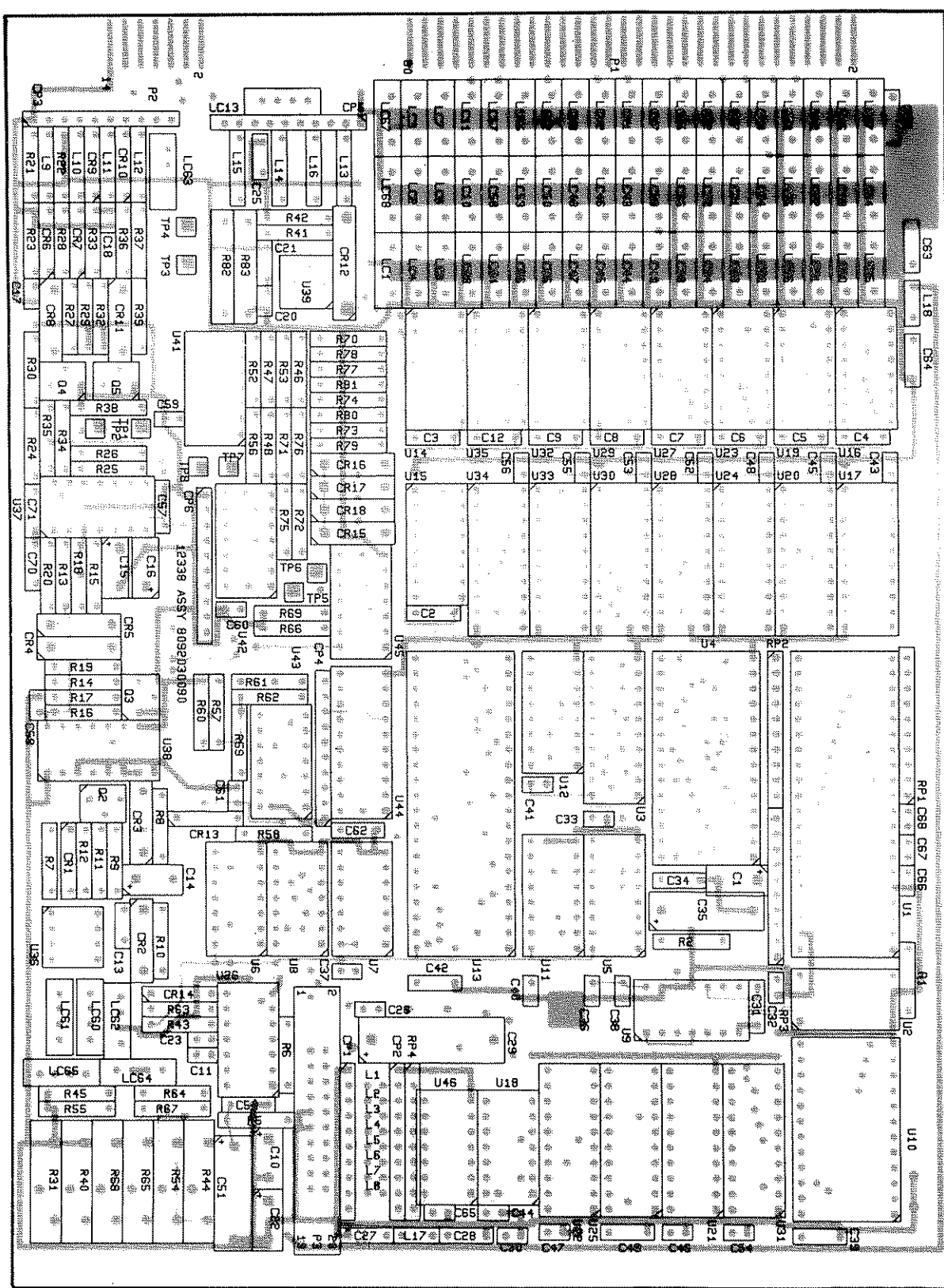
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY INPUT CONNECTOR	8092019096
C1	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C3	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C6	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C8	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C9	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C10	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C11	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C12	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C13	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C14	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C15	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C16	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C18	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C19	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C20	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C21	Capacitor, 0.001µf, 100V, X7R, 20%	0281630003
C22	Capacitor, 68µf, 25V, T368	0282150005
C23	Capacitor, 1µf, 50V, 1980	0280910002
C24	Capacitor, 1µf, 50V, 1980	0280910002
C25	Capacitor, 10,000µf, 50V	1001120027
C26	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C27	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C28	Capacitor, 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
J1	Connector, 10 Pin Dual	1009140001
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 1080ma	0652200001
L12	Inductor, Molded, 6.8µh 1080ma	0652200001
L13	Inductor, Molded, 6.8µh 1080ma	0652200001
L14	Inductor, Molded, 6.8µh 1080ma	0652200001
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 1080ma	0652200001
L28	Inductor, Molded, 6.8µh 1080ma	0652200001
L29	Inductor, Molded, 22µh, 10%	0664060005
L30	Inductor, Molded, 22µh, 10%	0664060005
L31	Inductor, Molded, 6.8µh 1080ma	0652200001
L32	Inductor, Molded, 6.8µh 1080ma	0652200001
L33	Inductor, Molded, 22µh, 10%	0664060005
L34	Inductor, Molded, 22µh, 10%	0664060005
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

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L40	Inductor, Molded, 22µh, 10%	0664060005
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 SN75451BP	1003950035
U2	IC. Linear, Vol. Reg. MC7805CK	0447190008
MISCELLANEOUS		
	Connector, 37 Pin, Tapped Shell	1009330004
	Connector, PC, 10 Pin Header	1008070009
	Key, Polarizing	1008070033
	Mica Ins. T0-3 Transistor	0440940001
	Plate, Heatsink, Regulator	8092040508
	Socket, Transistor T0-3	0841550000

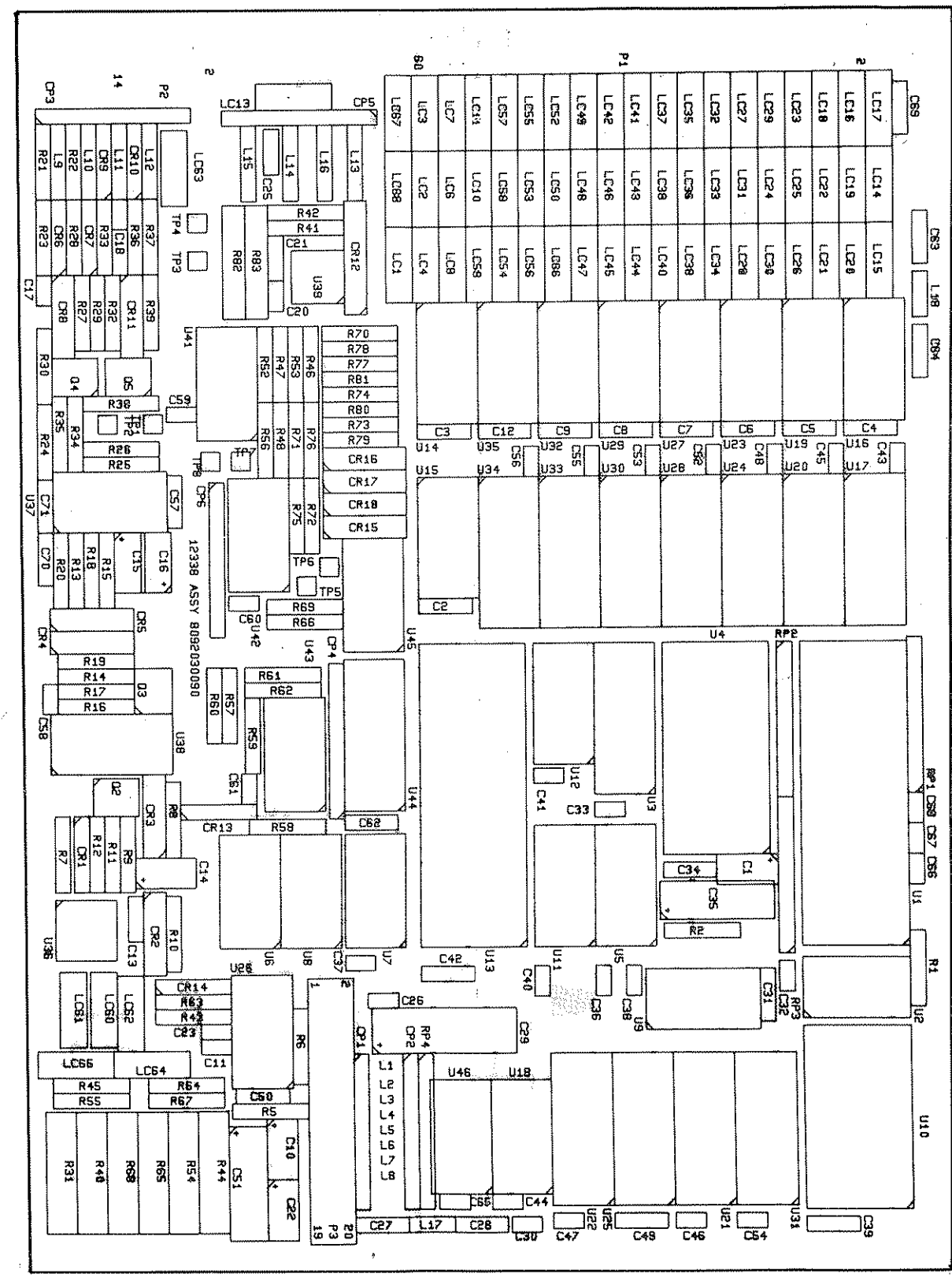


Rev C 8092-032A 6/12/77
Rev D 8092-061 7/08/77

SUNAIR SNR-2000DAC



COMPONENT SIDE



CIRCUIT SIDE

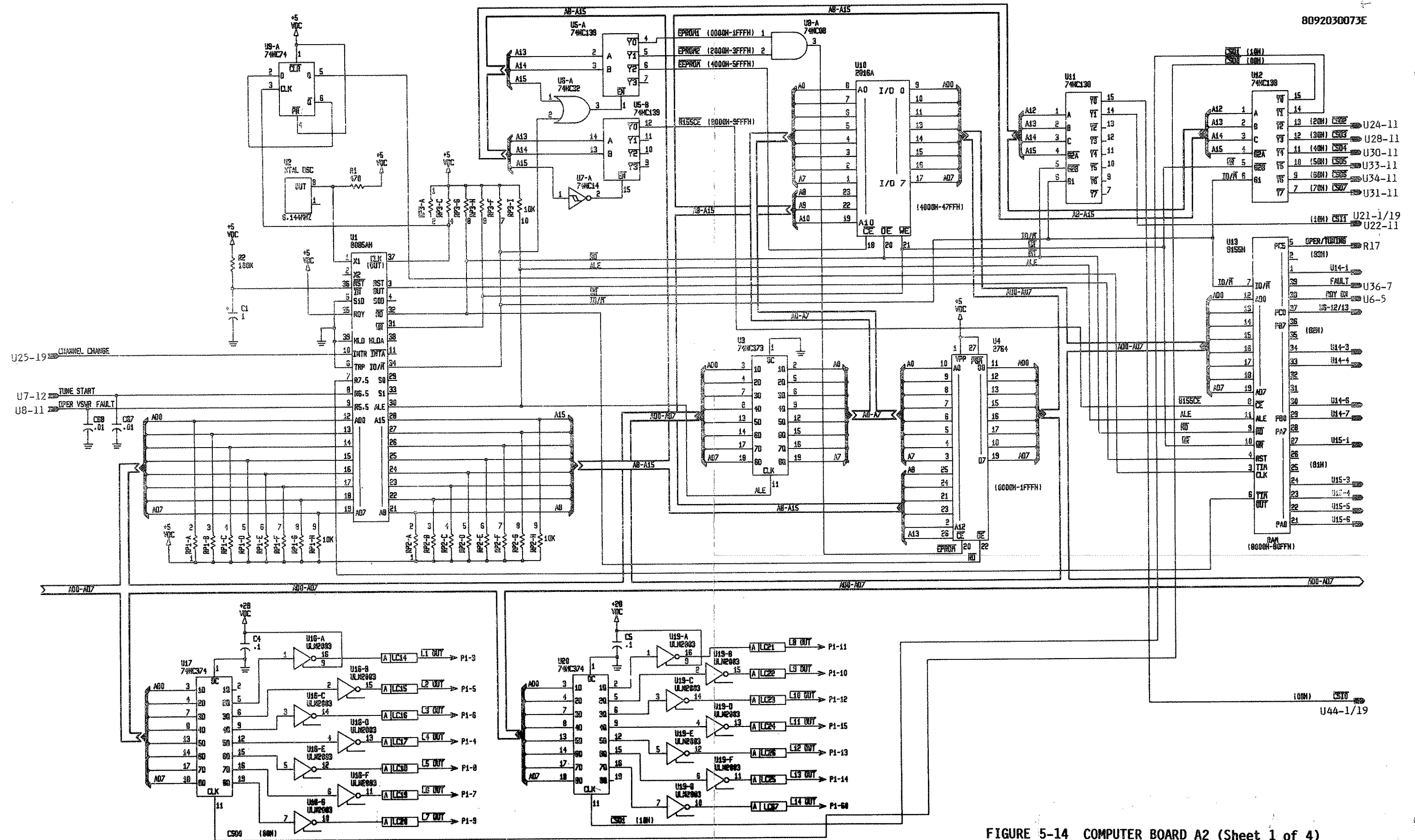
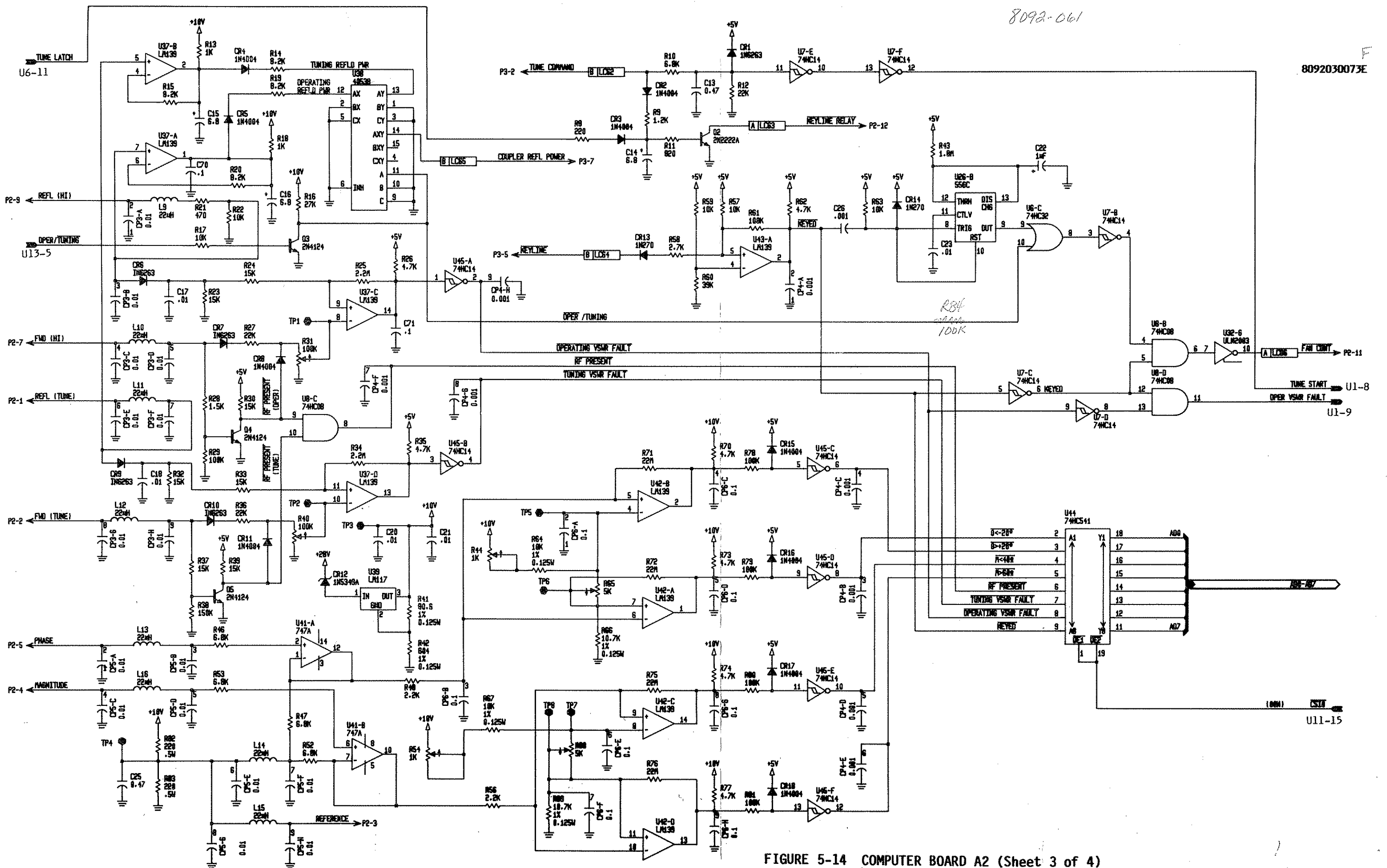
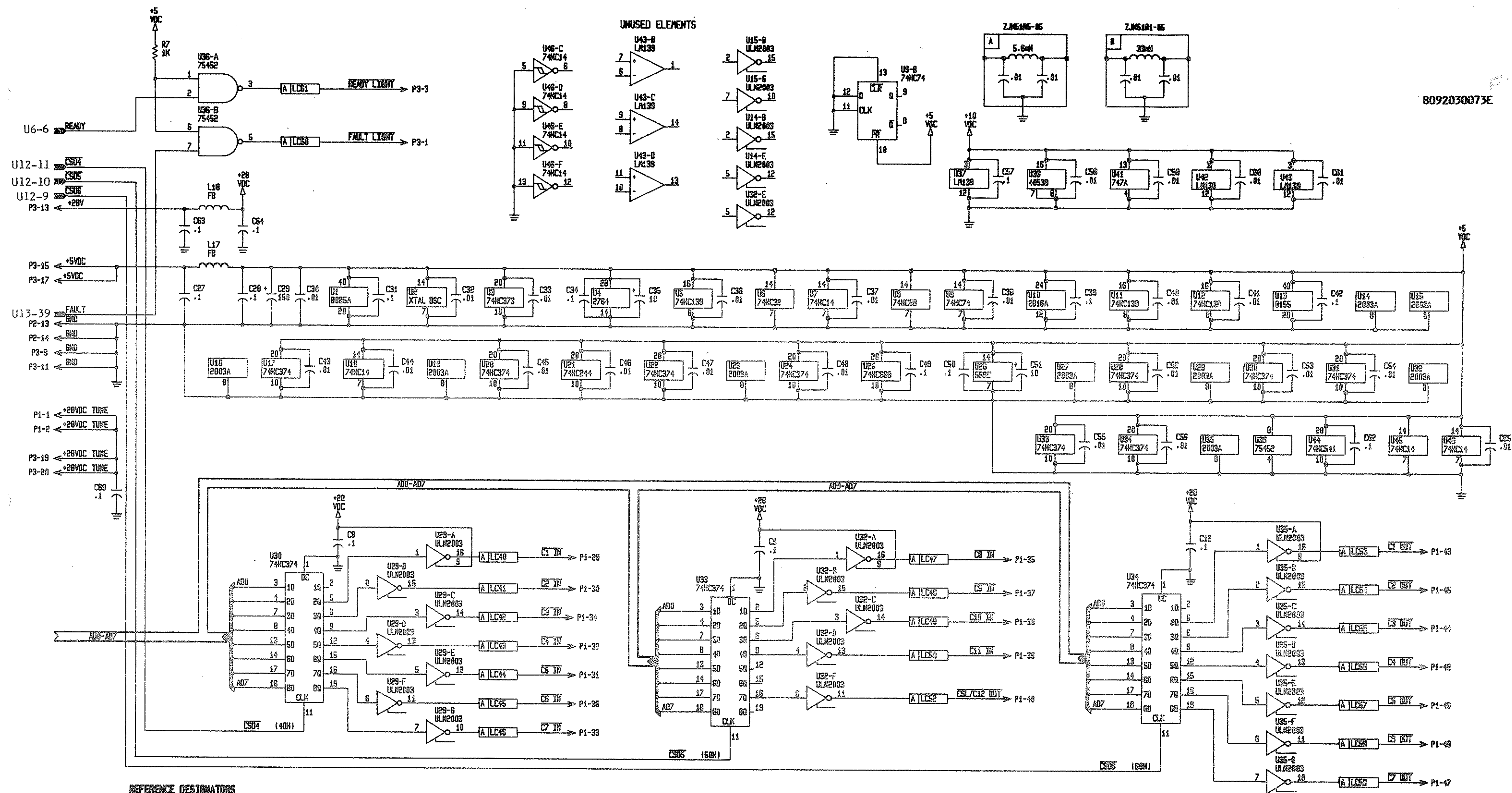


FIGURE 5-14 COMPUTER BOARD A2 (Sheet 1 of 4)



5-53





REFERENCE DESIGNATORS

LAST USED	UNUSED
U46	U40
R83	R3, 4, 45, 49, 51, 55
RP4	
U5	D1
C71	C19, 24, 66
CR10	
L10	
LC50	LC5, LC9, LC12, LC51
CP6	

FIGURE 5-14 COMPUTER BOARD A2 (Sheet 4 of 4)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY COMPUTER	8092030090
C1	Capacitor, .1µf, 50V, 198D	0280910002
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C3	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C6	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C7	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C8	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C9	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C10	Capacitor, .1µf, 50V, 198D	0280910002
C11	Capacitor, 0.1µf, 50V, X7R, 20%	0281730008
C12	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C13	Capacitor, .47µf, 50V, X7R, 20%	0283377771
C14	Capacitor, 6.8µf, 25V, 20%	1005050031
C15	Capacitor, 6.8µf, 25V, 20%	1005050031
C16	Capacitor, 6.8µf, 25V, 20%	1005050031
C17	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C18	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C20	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C21	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C22	Capacitor, .1µf, 50V, 198D	0280910002
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, .47µf, 50V, X7R, 20%	0283377771
C26	Capacitor, 0.001µf, 100V, X7R, 20%	0281630003
C27	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C28	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C29	Capacitor, 150µf, 16V	1006150013
C30	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C31	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C32	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C33	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C34	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C35	Capacitor, 10µf, 25V	1006150005
C36	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C37	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C38	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C39	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C40	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C41	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C42	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C43	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C44	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C45	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C46	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C47	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C48	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C49	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C50	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C51	Capacitor, 10µf, 25V	1006150005
C52	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C53	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C54	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C55	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C56	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C57	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C58	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C59	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C60	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C61	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C62	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C63	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C64	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C65	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C67	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C68	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C69	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C70	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C71	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
CP1	Capacitor, Ntwk, 10 Pin, .1µf	1006580018

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CP2	Capacitor, Ntwk, 10 Pin, .1µf	1006580018
CP3	Capacitor, Ntwk, 10 Pin, .01µf	1006540016
CP4	Capacitor, Ntwk, .001µf	1008020001
CP5	Capacitor, Ntwk, 10 Pin, .01µf	1006540016
CP6	Capacitor, Ntwk, 10 Pin, .1µf	1006580018
CR1	Diode, Pin 1N6263	0405610009
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Pin 1N6263	0405610009
CR7	Diode, Pin 1N6263	0405610009
CR8	Diode, Rectifier 1N4004	0405180004
CR9	Diode, Pin 1N6263	0405610009
CR10	Diode, Pin 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 .1380D	0564510009
L18	Ferrite Bead .047ID .1380D	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
LC6	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
LC7	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
LC8	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
LC10	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
LC11	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
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

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
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
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
LC68	Filter, EMI PI Ntwk, 0.5A 50V	1009100009
P3	Connector, PC, 20 Pin, Str.	1008120014
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%, 1/8W	0184110009
R2	Resistor, 100K, 10%, 1/8W	0170390004
R5	Resistor, 10K, 10%, 1/8W	0170410005
R6	Resistor, 1M, 10%, 1/8W	0170650006
R7	Resistor, 1K, 10%, 1/8W	0171560001
R8	Resistor, 220, 10%, 1/8W	0171320000
R9	Resistor, 1.2K, 10%, 1/8W	0181860007
R10	Resistor, 6.8K, 5%, 1/8W	0174810008
R11	Resistor, 820, 10%, 1/8W	0178210005
R12	Resistor, 22K, 5%, 1/8W	0172230004
R13	Resistor, 1K, 10%, 1/8W	0171560001
R14	Resistor, 8.2K, 10%, 1/8W	0181620006
R15	Resistor, 8.2K, 10%, 1/8W	0181620006
R16	Resistor, 27K, 10%, 1/8W	0171200004
R17	Resistor, 10K, 10%, 1/8W	0170410005
R18	Resistor, 1K, 10%, 1/8W	0171560001
R19	Resistor, 8.2K, 10%, 1/8W	0181620006
R20	Resistor, 8.2K, 10%, 1/8W	0181620006
R21	Resistor, 470, 5%, 1/8W	0184110009
R22	Resistor, 10K, 10%, 1/8W	0170410005
R23	Resistor, 15K, 10%, 1/8W	0172350000
R24	Resistor, 15K, 10%, 1/8W	0172350000
R25	Resistor, 2.2M, 10%, 1/8W	0176870008
R26	Resistor, 4.7K, 5%, 1/8W	0170770001
R27	Resistor, 22K, 5%, 1/8W	0172230004
R28	Resistor, 1.5K, 10%, 1/8W	0172470005
R29	Resistor, 100K, 10%, 1/8W	0170390004
R30	Resistor, 15K, 10%, 1/8W	0172350000
R31	Pot. 100K, 10%, 1/8W, 15 Turns	0338490051
R32	Resistor, 15K, 10%, 1/8W	0172350000

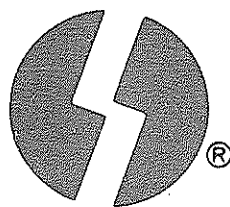
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R33	Resistor, 15K, 10%, 1/8W	0172350000
R34	Resistor, 2.2M, 10%, 1/8W	0176870008
R35	Resistor, 4.7K, 5%, 1/8W	0170770001
R36	Resistor, 22K, 5%, 1/8W	0172230004
R37	Resistor, 15K, 10%, 1/8W	0172350000
R38	Resistor, 150K, 10%, 1/8W	0176750002
R39	Resistor, 15K, 10%, 1/8W	0172350000
R40	Pot. 100K, 10%, 1/8W, 15 Turns	0338490051
R41	Resistor, 80.6, 1%, 1/8W	0195200004
R42	Resistor, 604, 1%, 1/8W	0193980002
R43	Resistor, 1.8M, 10%, 1/8W	1009300008
R44	Pot. 1K, 10%, 1/8W, 15 Turns	0338490019
R46	Resistor, 6.8K, 5%, 1/8W	0174810008
R47	Resistor, 6.8K, 5%, 1/8W	0174810008
R48	Resistor, 2.2K, 5%, 1/8W	0178070009
R52	Resistor, 6.8K, 5%, 1/8W	0174810008
R53	Resistor, 6.8K, 5%, 1/8W	0174810008
R54	Pot. 1K, 10%, 1/8W, 15 Turns	0338490019
R56	Resistor, 2.2K, 5%, 1/8W	0178070009
R57	Resistor, 10K, 10%, 1/8W	0170410005
R58	Resistor, 2.7K, 10%, 1/8W	0186670001
R59	Resistor, 10K, 10%, 1/8W	0170410005
R60	Resistor, 39K, 10%, 1/8W	0177800003
R61	Resistor, 100K, 10%, 1/8W	0170390004
R62	Resistor, 4.7K, 5%, 1/8W	0170770001
R63	Resistor, 10K, 10%, 1/8W	0170410005
R64	Resistor, 10K, 1%, 1/8W	1003050026
R65	Pot. 5K, 10%, 1/8W, 15 Turns	0338490086
R66	Resistor, 10.7K, 1%, 1/8W	1004070012
R67	Resistor, 10K, 1%, 1/8W	1003050026
R68	Pot. 5K, 10%, 1/8W, 15 Turns	0338490086
R69	Resistor, 10.7K, 1%, 1/8W	1004070012
R70	Resistor, 4.7K, 5%, 1/8W	0170770001
R71	Resistor, 22M, 10%, 1/8W	0180950002
R72	Resistor, 22M, 10%, 1/8W	0180950002
R73	Resistor, 4.7K, 5%, 1/8W	0170770001
R74	Resistor, 4.7K, 5%, 1/8W	0170770001
R75	Resistor, 22M, 10%, 1/8W	0180950002
R76	Resistor, 22M, 10%, 1/8W	0180950002
R77	Resistor, 4.7K, 5%, 1/8W	0170770001
R78	Resistor, 100K, 10%, 1/8W	0170390004
R79	Resistor, 100K, 10%, 1/8W	0170390004
R80	Resistor, 100K, 10%, 1/8W	0170390004
R81	Resistor, 100K, 10%, 1/8W	0170390004
R82	Resistor, 220, 10%, 1/8W	0172850002
R83	Resistor, 220, 10%, 1/8W	0172850002
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
JP1	Vertical Jack, White	1006200029
JP2	Vertical Jack, White	1006200029
JP3	Vertical Jack, White	1006200029
JP4	Vertical Jack, White	1006200029
JP5	Vertical Jack, White	1006200029
JP6	Vertical Jack, White	1006200029
JP7	Vertical Jack, White	1006200029
JP8	Vertical Jack, White	1006200029
U1	IC Digital 74HC08SAH	1006410007
U2	Crystal Oscillator, 6.144 MHz	1008180033
U3	IC Digital 74HC373	1006480030
U4	EPROM, W/SNR-2000DAC 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 X2816AP	1009020005
U11	IC Digital 74HC138	1006480013
U12	IC Digital 74HC138	1006480013

SUNAIR SNR-2000DAC

8098-061 REVE

R84 Resistor, 100K, 10% 1/4W C170390004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
U13	IC Digital ID8155H/M81C55	1006420002
U14	IC Digital ULN2003A	1005630038
U15	IC Digital ULN2003A	1005630038
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/3456P	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 SN75452BP	1003960014
U37	IC Linear LM139	1007490004
U38	IC Digital CD4053BE	1005520020
U39	IC Linear LM117	1006440011
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
<u>MISCELLANEOUS</u>		
	Key, Polarizing	1008070033
	Mounting Pad, Transistor	0502710004



sunair service bulletin

3101 S.W. THIRD AVENUE
CABLE: SUNAIR

FT. LAUDERDALE, FLORIDA
PHONE: 305 525-1505

NO: 2000DAC-188
DATE: 25 February 1988

ATTENTION: All Dealers and Customers
EQUIPMENT: SNR-2000DAC
SUBJECT: PC Assembly Detector p/n 8092020094
REFERENCE: Manual p/n 8092000506, page 5-59

PURPOSE: To increase the reliability of diodes CR2 thru CR9.

TEXT: A small percentage of Hot Carrier Diodes, 1N6263 p/n 0405610009, procured for use on Detector Assembly p/n 8092020094, are experiencing failures. To preclude the possibility of continuing failures, Sunair is changing the diodes CR2 thru CR9 to Silicon Signal Diodes, 1N4454 p/n 0405270003 on all assemblies.

If failure occurs, diodes CR2 thru CR9 should be changed to 1N4454.
NO RETUNING OF ASSEMBLY IS NECESSARY.

If replacement diodes are required, Sunair will provide them. Call the Product Services Department and provide the serial number of the SNR-2000DAC, and replacements will be sent.

PRODUCT SERVICES DEPARTMENT
SUNAIR ELECTRONICS, INC.

TELEPHONE: (305) 525-1505
TELEX: 51-4443
FAX: (305) 765-1322

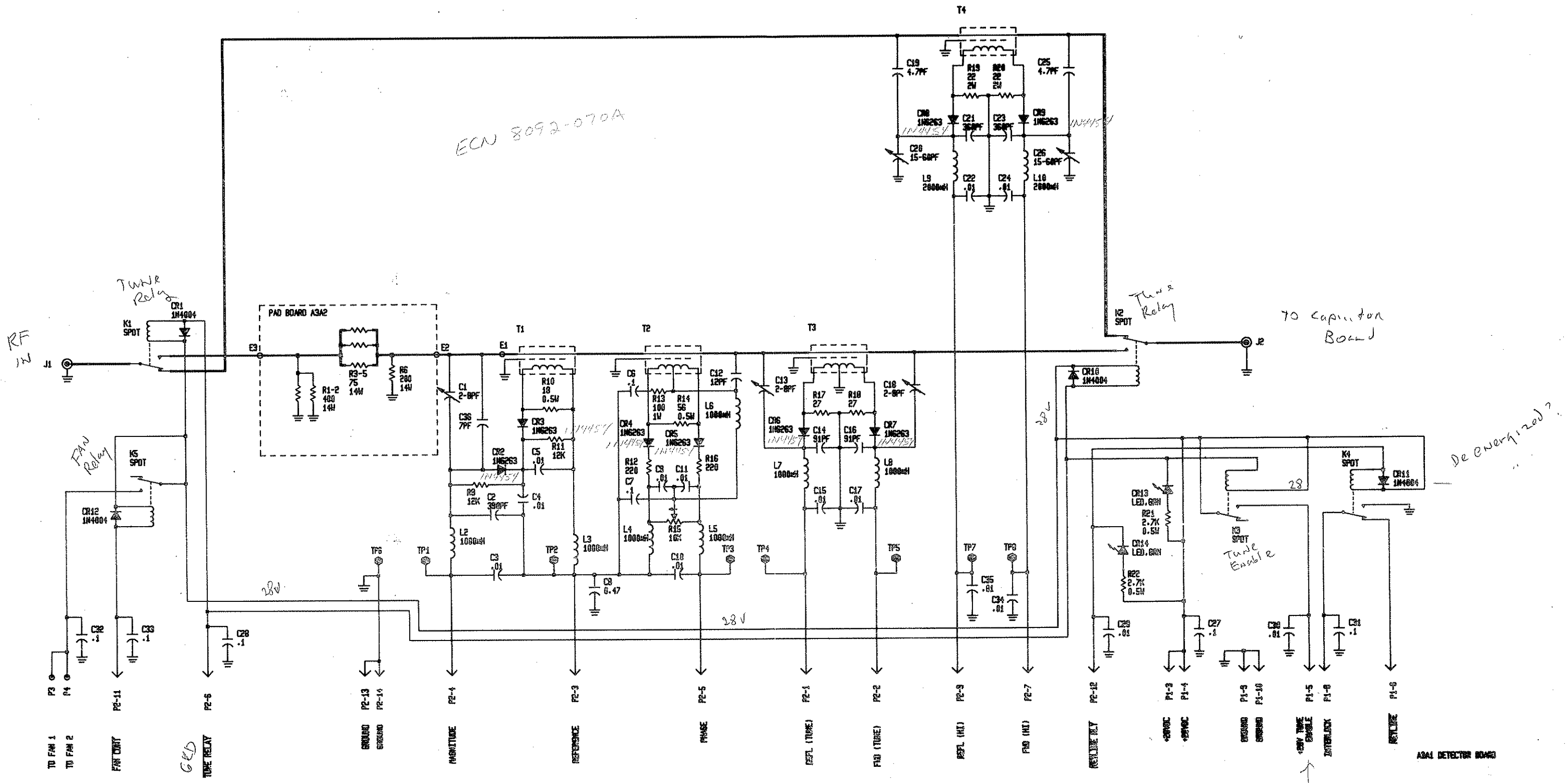
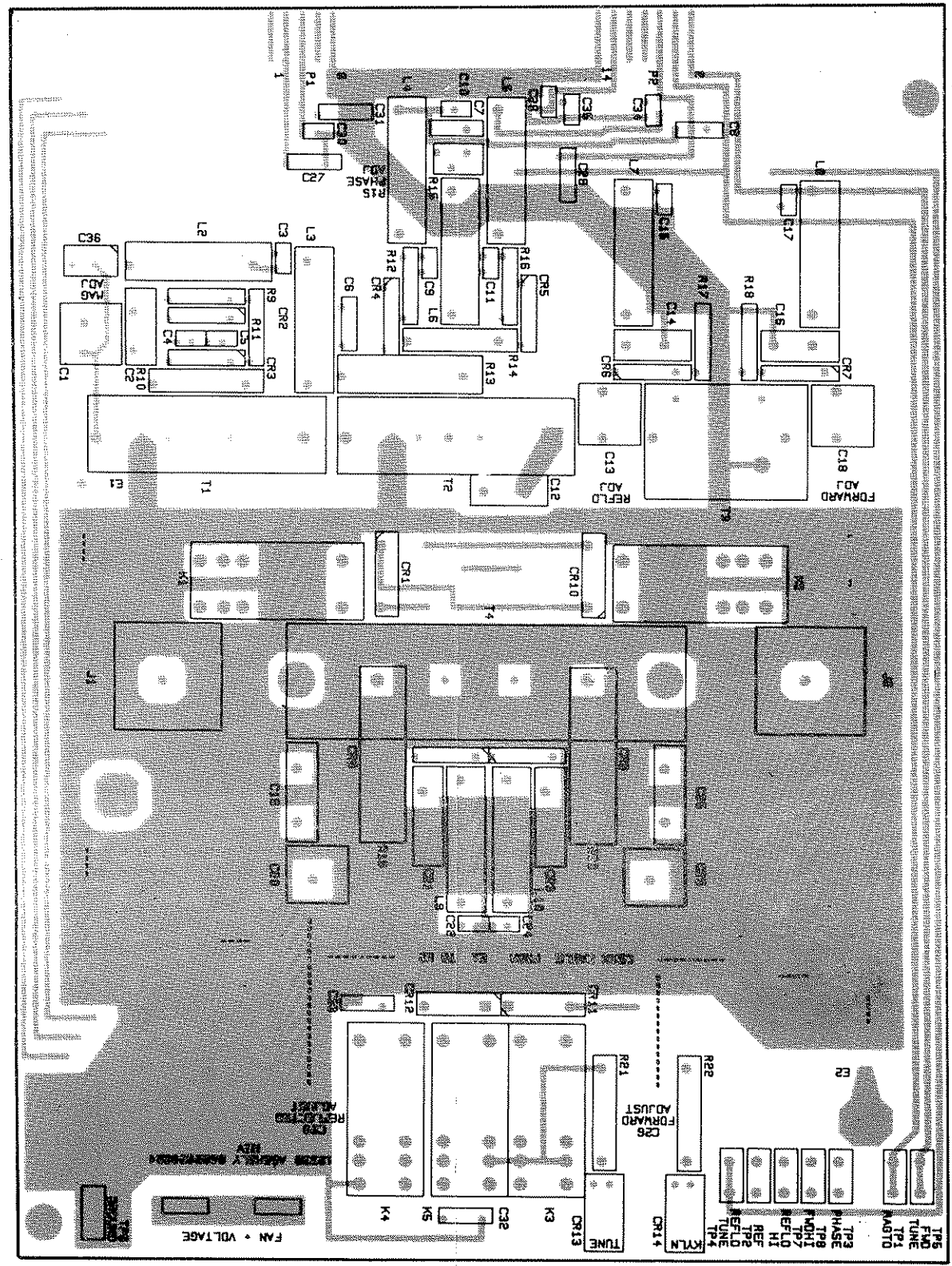
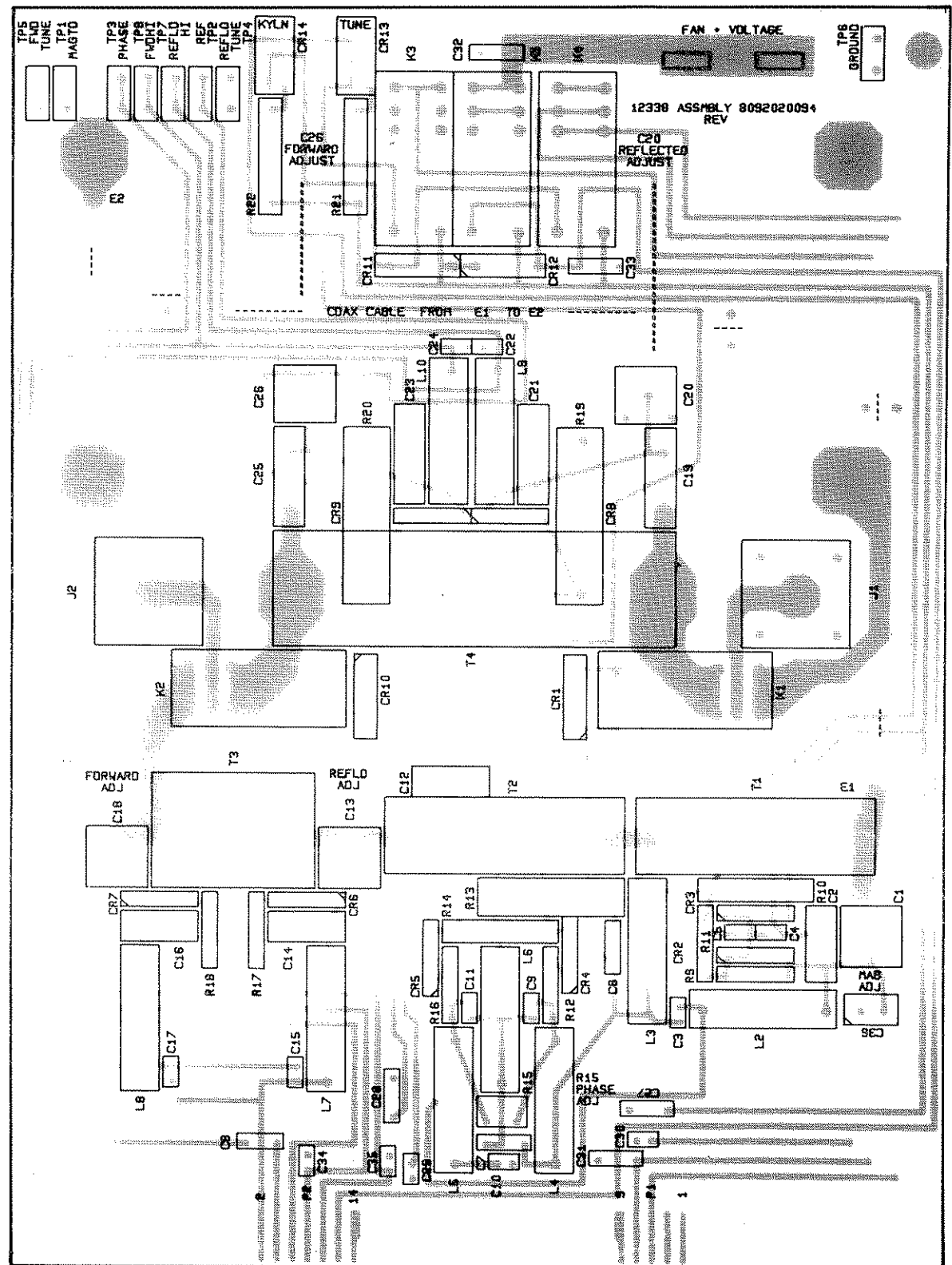


FIGURE 5-15 DETECTOR/RELAY PAD ASSEMBLY A3

REV E 8092-050A 6/16/87



COMPONENT SIDE



CIRCUIT SIDE

8092-055 4/21/87

80920200940 PC ASSY DETECTOR A3

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	PC ASSY DETECTOR A3A1	8092020094
C2	Capacitor, 2-8pf, 350V, NPO	0268220000
C3	Capacitor, 390pf, 500V, DM15, 5%	0286000008
C4	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C5	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C6	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C7	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C8	Capacitor, .47uf, 50V, X7R, 20%	0283377771
C9	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C10	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C11	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C12	Capacitor, 12pf, 500V, DM15	1005320039
C13	Capacitor, 2-8pf, 350V, NPO	0268220000
C14	Capacitor, 91pf, 500V, DM15, 5%	0298740001
C15	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C16	Capacitor, 91pf, 500V, DM15, 5%	0298740001
C17	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C18	Capacitor, 2-8pf, 350V, NPO	0268220000
C19	Capacitor, Disc, 4.7pf, 3KV NPO	1007150025
C20	Capcitor, 15/60pf, NPO	1007160004
C21	Capacitor, 360pf, 500V, DM19, 2%	0282650008
C22	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C23	Capacitor, 360pf, 500V, DM19, 2%	0282650008
C24	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C25	Capacitor, Disc, 4.7pf, 3KV, NPO	1007150025
C26	Capcator, 15/60pf, NPO	1007160004
C27	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C28	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C29	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C30	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C31	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C32	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C33	Capacitor, .01uf, 50V, X7R, 20%	0281610002
C34	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C35	Capacitor, .01uf, 50V, X7R, 20%	0281730008
C36	Capacitor, 7pf, 500V, DM10	0292400004
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	Conenctor, RF, BNC	0753490005
K1	Relay, SPDT, 24VDC, 10Amp	1008290009
K2	Relay, SPDT, 24VDC, 10Amp	1008290009
K3	Relay, SPDT, 24VDC, 10Amp	1008290009
K4	Relay, SPDT, 24VDC, 10Amp	1008290009
K5	Relay, SPDT, 24VDC, 10Amp	1008290009
L2	Inductor, Molded, 1000uh, 5%	0643310002
L3	Inductor, Molded, 1000uh, 5%	0643310002
L4	Inductor, Molded, 1000uh, 5%	0643310002
L5	Inductor, Molded, 1000uh, 5%	0643310002
L6	Inductor, Molded, 1000uh, 5%	0643310002
L7	Inductor, Molded, 1000uh, 5%	0643310002
L8	Inductor, Molded, 1000uh, 5%	0643310002
L9	Inductor, Molded, 2000uh, 5%	0653590008
L10	Inductor, Molded, 2000uh, 5%	0653590008
P3/P4	Connector, PC, 2 Pin	1008060020
R9	Resistor, 12K, 10%, 1/4W	0183180003
R10	Resistor, 18, 5%, 1/4W	0184730007

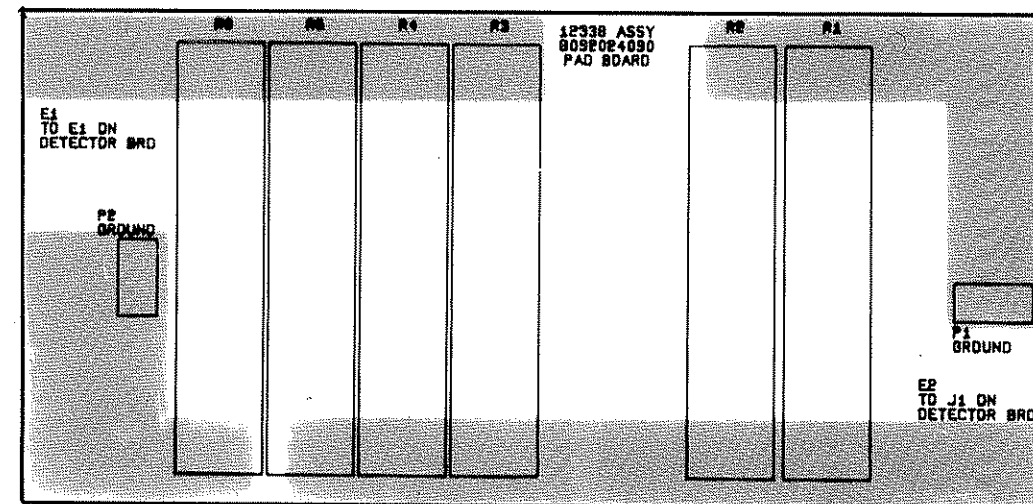
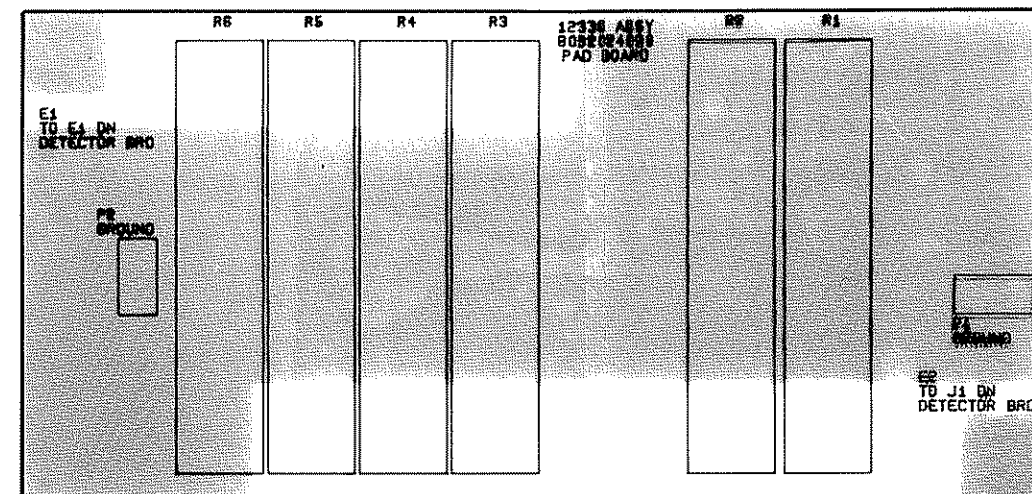
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R11	Resistor, 12K, 10%, 1/4W	0183180003
R12	Resistor, 220, 10%, 1/4W	0171320000
R13	Resistor, 100, 10%, 1W	0165540001
R14	Resistor, 56, 10%, 1/4W	0168890003
R15	Pot. 10K, 5%, 0.6W, 15 Turns	0344410005
R16	Resistor, 220, 10%, 1/4W	0171320000
R17	Resistor, 33, 10%, 1/4W	0182530001
R18	Resistor, 33, 10%, 1/4W	0182530001
R19	Resistor, 22, 10%, 2W	0169940004
R20	Resistor, 22, 10%, 2W	0169940004
R21	Resistor, 2.7K, 10%, 1/4W	0165780002
R22	Resistor, 2.7K, 10%, 1/4W	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
MISCELLANEOUS		
PC Assy Pad A3A2		8092024090

ECN 8092-070 02/22/88
Return CR1 - CR9 to IN 4454
0405180009 Service Bulletin 2000DAC-188

8092024090B PC ASSY PAD A3A2

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R1	PC ASSY PAD	8092024090
R2	Resistor, 400, 5%, 1/4W	0197380000
R3	Resistor, 400, 5%, 1/4W	0197380000
R4	Resistor, 75, 5%, 1/4W	0191300004
R5	Resistor, 75, 5%, 1/4W	0191300004
R6	Resistor, 200, 5%, 1/4W	0197410006
MISCELLANEOUS		
Terminal, PC Mount, 1/8" Male		1008330035

SUNAIR SNR-2000DAC



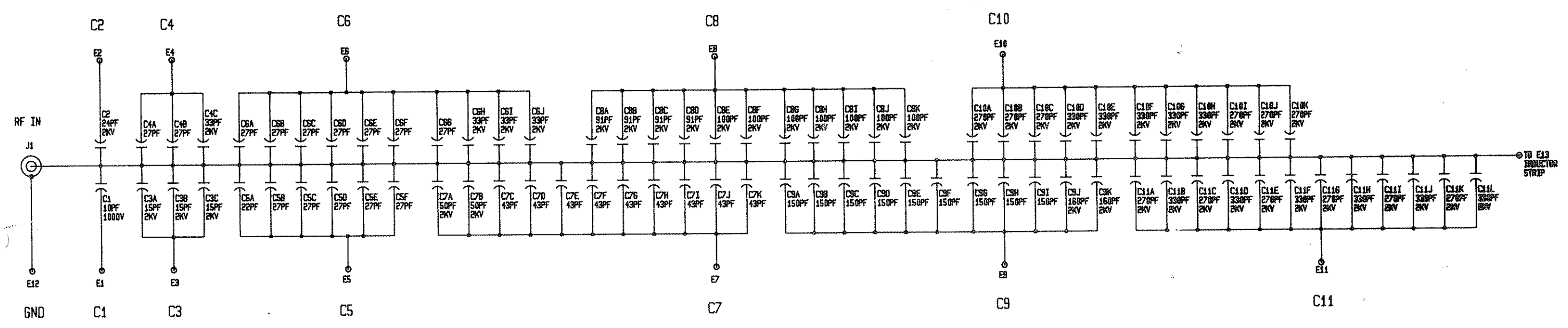
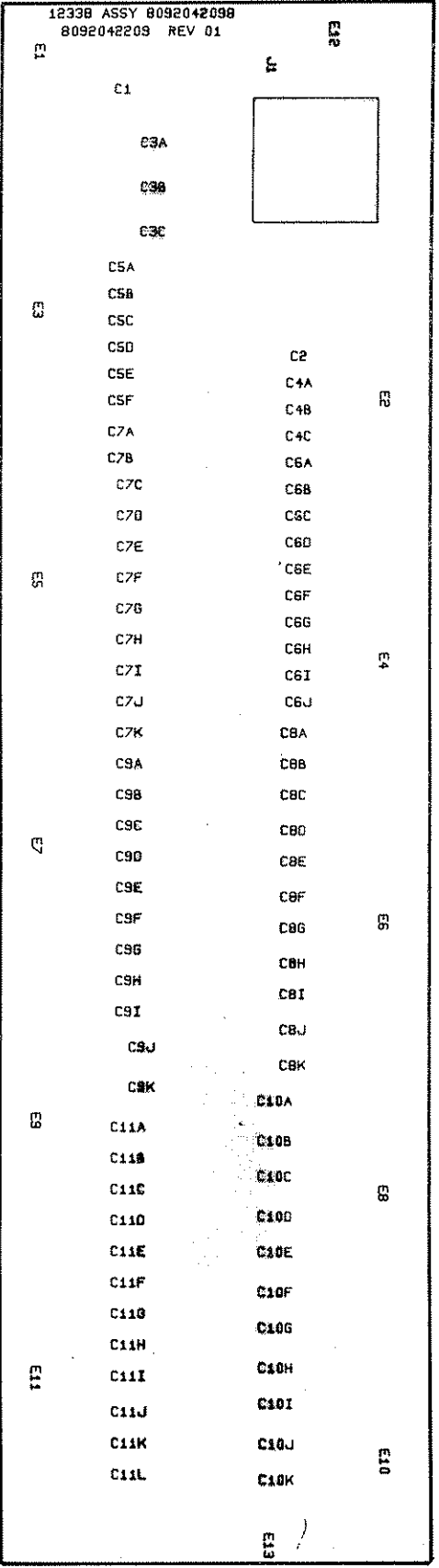
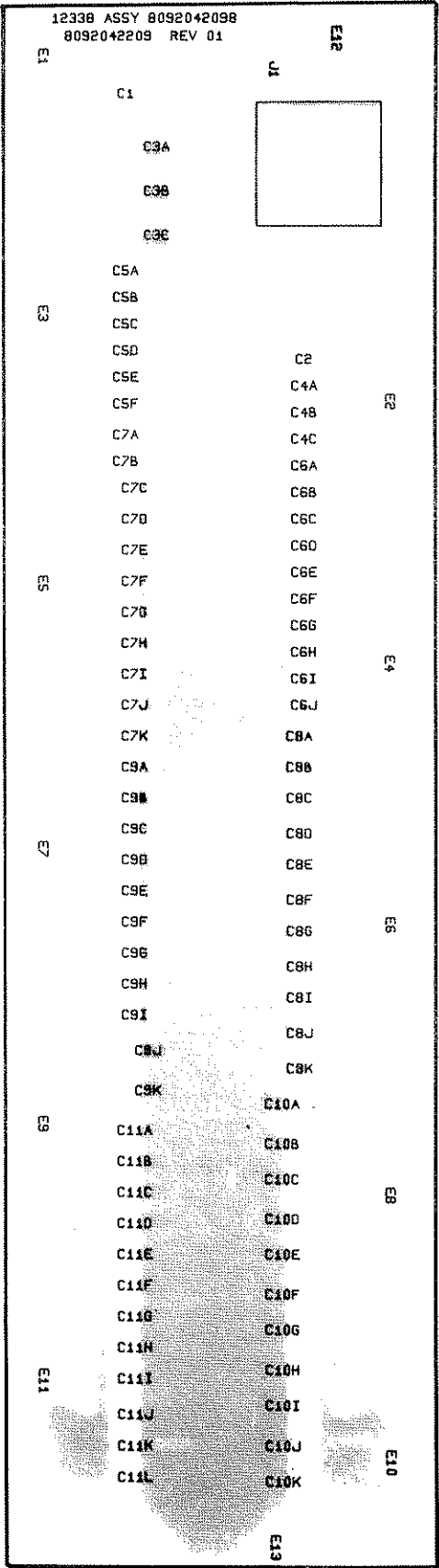


FIGURE 5-16 CAPACITOR BOARD A4

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

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C11B	Capacitor, 330pf, 1000V, NPO	1008280038
C11C	Capacitor, 270pf, 1000V, NPO	1008280020
C11D	Capacitor, 330pf, 1000V, NPO	1008280038
C11E	Capacitor, 270pf, 1000V, NPO	1008280020
C11F	Capacitor, 330pf, 1000V, NPO	1008280038
C11G	Capacitor, 270pf, 1000V, NPO	1008280020
C11H	Capacitor, 330pf, 1000V, NPO	1008280038
C11I	Capacitor, 270pf, 1000V, NPO	1008280020
C11J	Capacitor, 330pf, 1000V, NPO	1008280038
C11K	Capacitor, 270pf, 1000V, NPO	1008280020
C11L	Capacitor, 330pf, 1000V, NPO	1008280038
	MISCELLANEOUS	
	Connector, RF, BNC	0753490005

SUNAIR SNR-2000DAC



80920410758

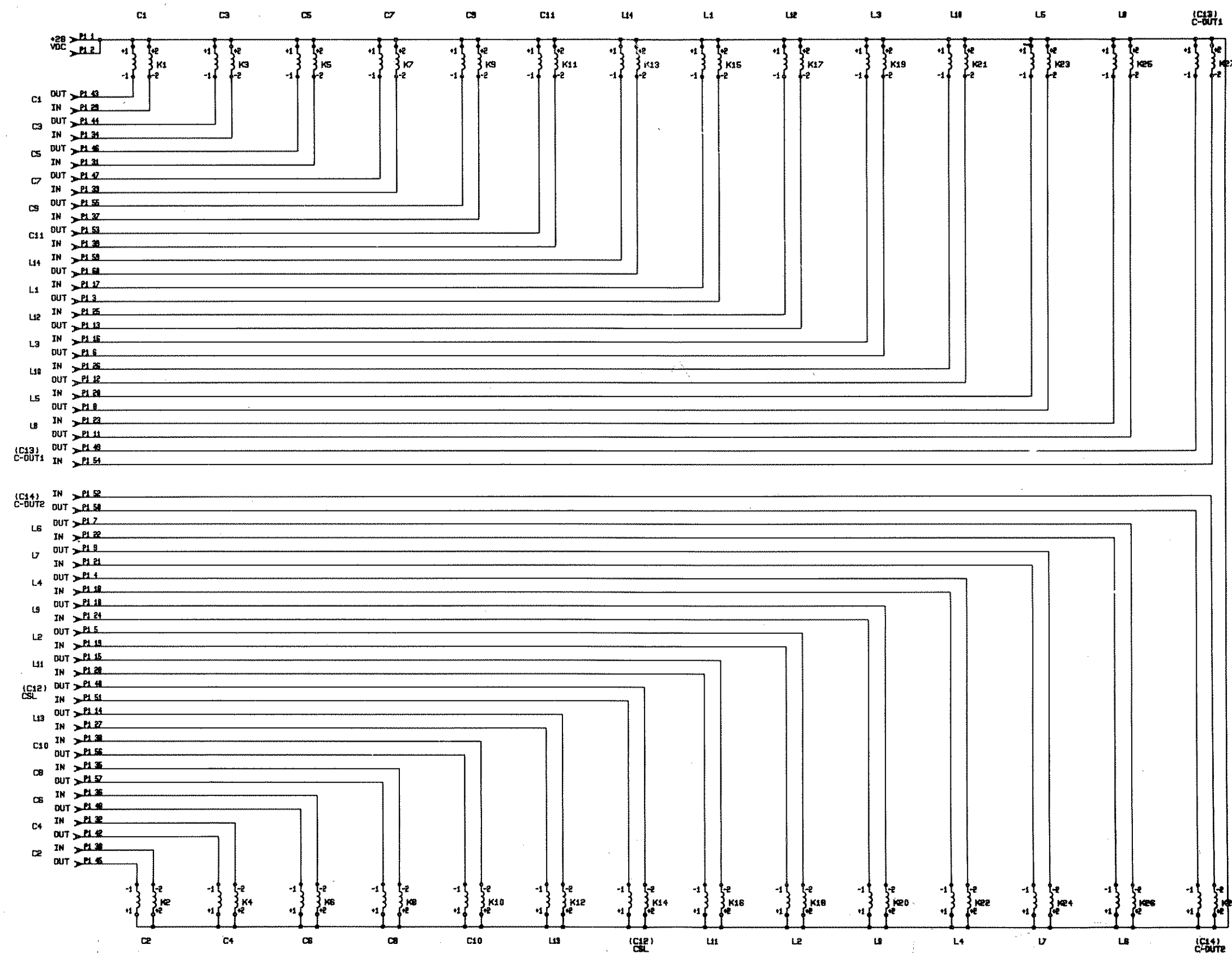
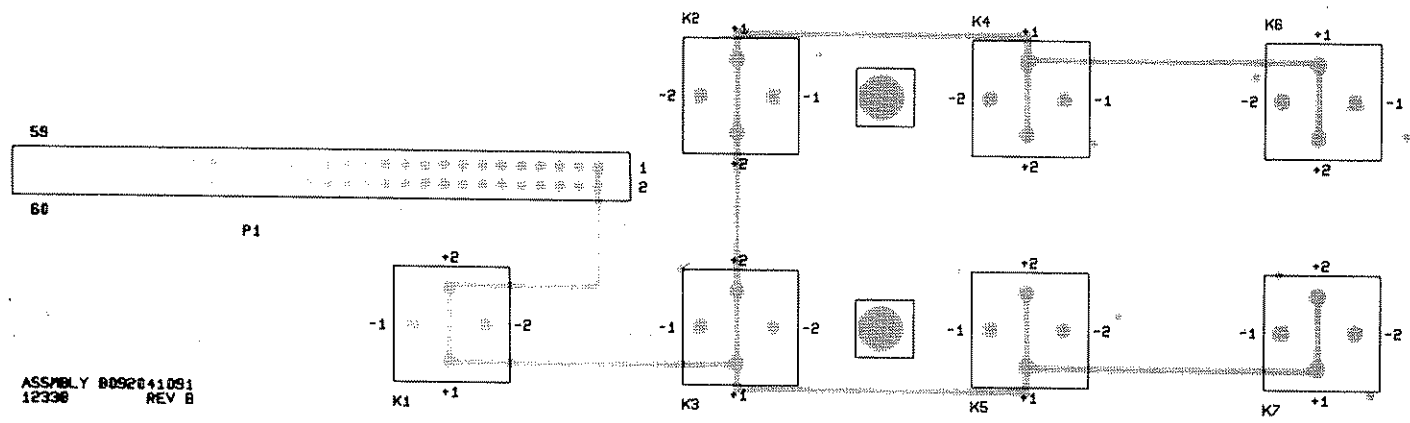
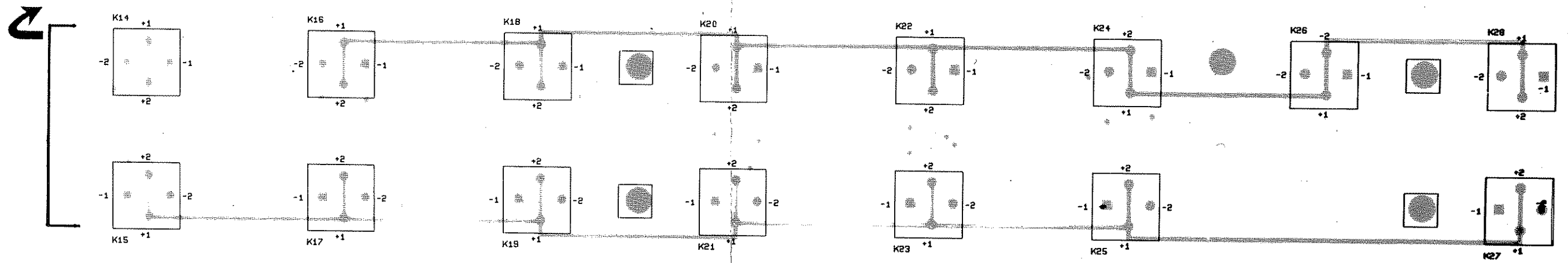
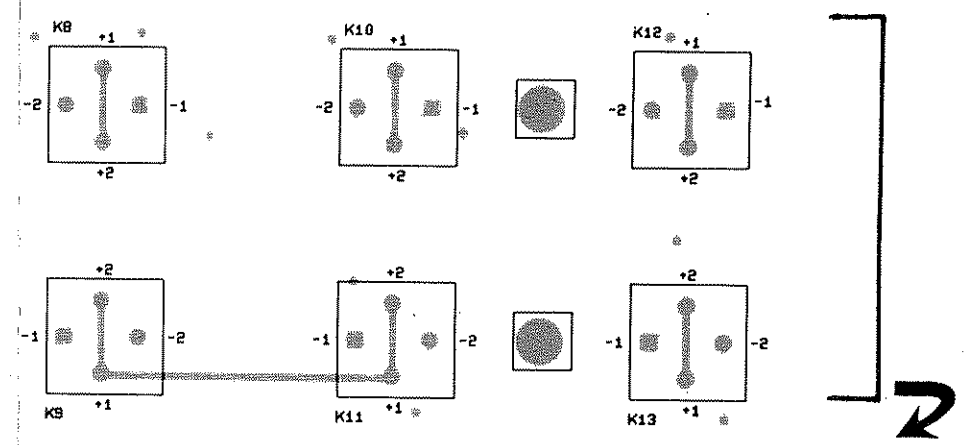
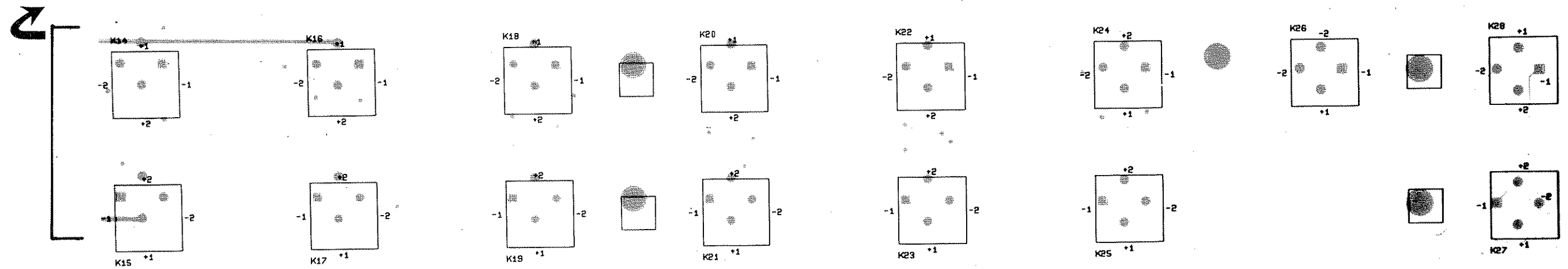
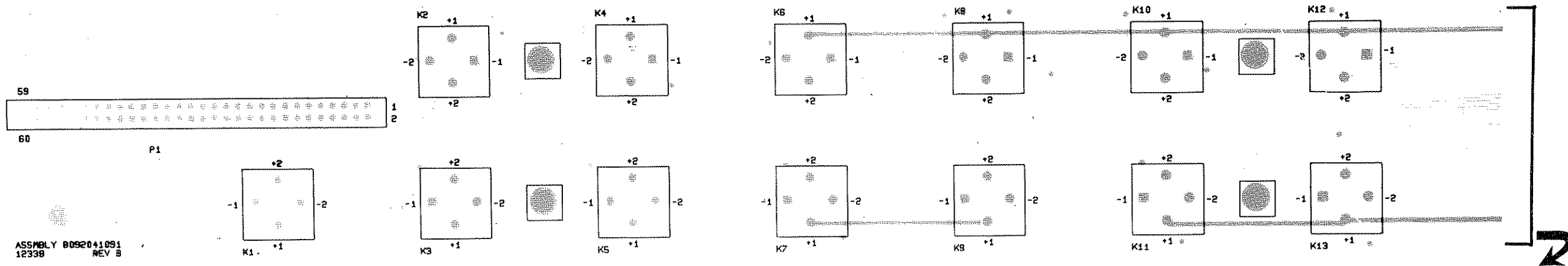


FIGURE 5-17 RELAY ASSEMBLY A5



ASSEMBLY 80920+1091
12338 REV B





SUNAIR SNR-2000DAC

8092010099H CHASSIS ASSY A6

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CHASSIS ASSY	8092010099
C12A	Capacitor, 25pf, 7.5KV, NPO	0290320003
C12B	Capacitor, 5 pf, 5KV, NPO	1004710003
C13A	Capacitor, 100pf, 5KV, N750	0290440009
C13B	Capacitor, 100pf, 5KV, N750	0290440009
C14A	Capacitor, 100pf, 5KV, N750	0290440009
C14B	Capacitor, 100pf, 5KV, N750	0290440009
C14C	Capacitor, 100pf, 5KV, N750	0290440009
C15	Capacitor, 75pf, 7.5KV, N750	0290560004
FAN 1	Fan, 24 VDC, Muffin XL-DC	1009130005
FAN 2	Fan, 24 VDC, Muffin XL-DC	1009130005
L1	Inductor	8092011206
L2	Inductor	8092011702
L3	Inductor	8092012202
L4	Inductor	8092012709
L5	Inductor	8092013209
L6	Inductor	8092013705
L7	Inductor Assembly	8092018090
L8	Inductor Assembly	8092017093
L9	Inductor Assembly	8092016097
L10	Inductor Assembly	8092015091
L11	Inductor Assembly	8092014094
L12	Inductor Assembly	8092013098
L13	Inductor Assembly	8092012091
L14	Inductor Assembly	8092011095
	<u>MISCELLANEOUS</u>	
	Bracket, Fan, Left	8092012504
	Bracket, Fan, Right	8092012601
	Cable Assy, 10 Conductor (P7)	8092019690
	Cable Assy, 14 Conductor (P4, P5)	8092019797
	Cable Assy, 20 Conductor	8092019592
	Card Guide, Plastic	1005870039
	Connector, Block, 2 Pin Female	1008060038
	PC Assy, Relay Board A5	8092041091
	PC Assy, Capacitor Board A4	8092042098
	Plate, Relay Mounting	8092015406
	Relay, Vacuum, HV, Latching (28 each)	1009250001
	Shield, Board Compartment	8092014205
	Shield, CPU Board	8092013501

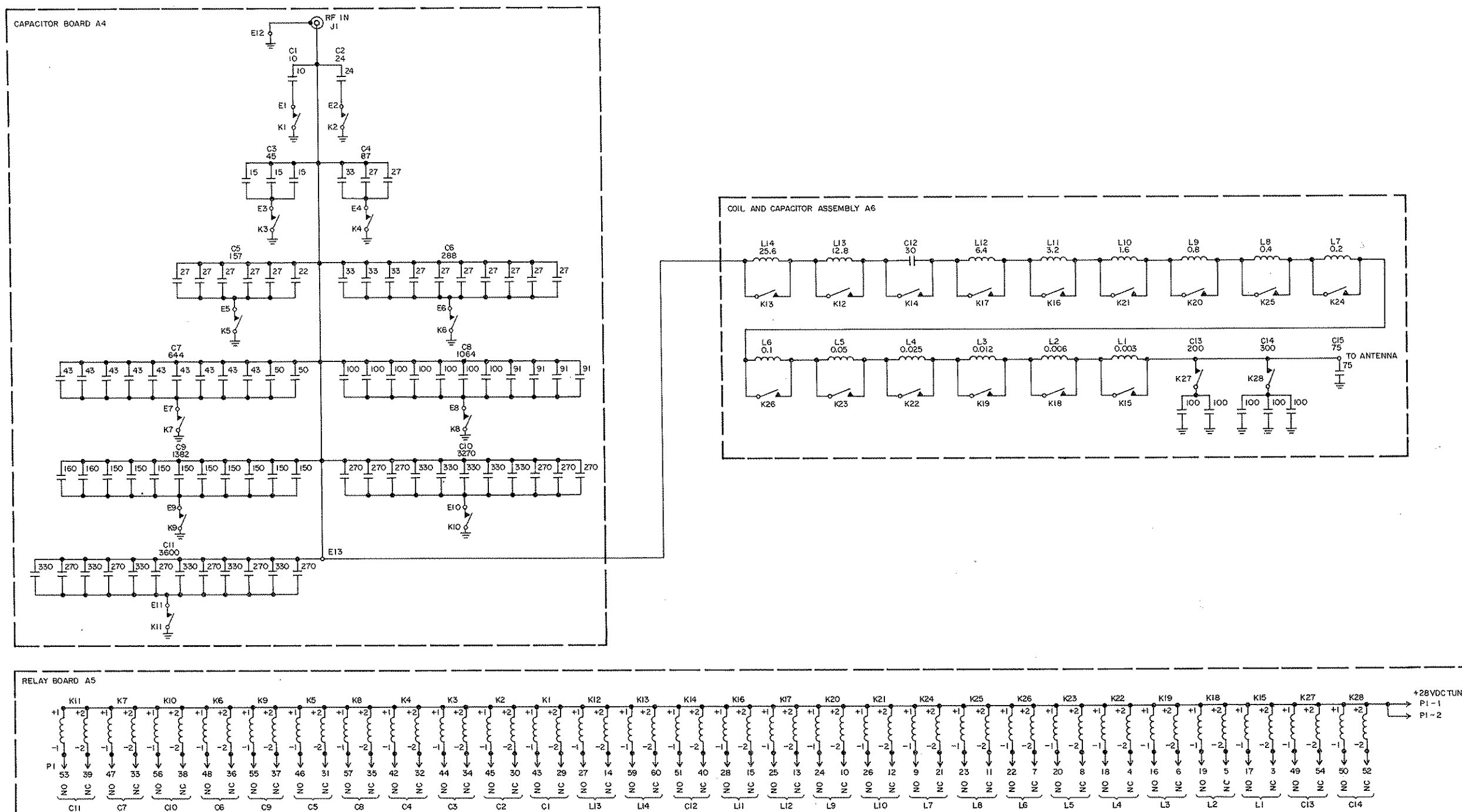


FIGURE 5-18 COIL AND CAPACITOR (RF Sections) ASSEMBLY A6

R

R

R

80661600XXB KW CONTROL PANEL ASSY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A2	KW CONTROL PANEL ASSY	80661600XX
1A2P2	Plug, Phone Tip, Red	0753680009
1A2S1	Switch, Toggle, DPDT	0334610001
1A2S2	Switch, Pushbutton, SPST, N.O.	0346520002
C1	Capacitor, .01 μ f, 50V, W5R 20%	0281730075
C2	Capacitor, .01 μ f, 50V, W5R 20%	0281730075
C3	Capacitor, .01 μ f, 50V, W5R 20%	0281730075
C4	Capacitor, .01 μ f, 50V, W5R 20%	0281730075
CR1	Diode, Zener 1N5242B	0400120003
DS1	Lamp Assy Green	0841480001
DS2	Lamp Assy Red	0841490007
DS3	Lamp Assy Amber	0841500002
M1	Meter	5024042204
R1	Resistor, 4.7K, 5%, $\frac{1}{4}$ W	0170770001
	Boot, Pushbutton Switch $\frac{1}{2}$ -40	0346530008
	Boot, Toggle Switch $\frac{1}{2}$ -40	0531120007
	Connector, Power, 36 Pin Rect.	0754070000
	Gasket, Panel	5024043308
	Gasket, Plug In Panel Lamps	1003324100
	Socket, Cartridge Lamp	1003322000

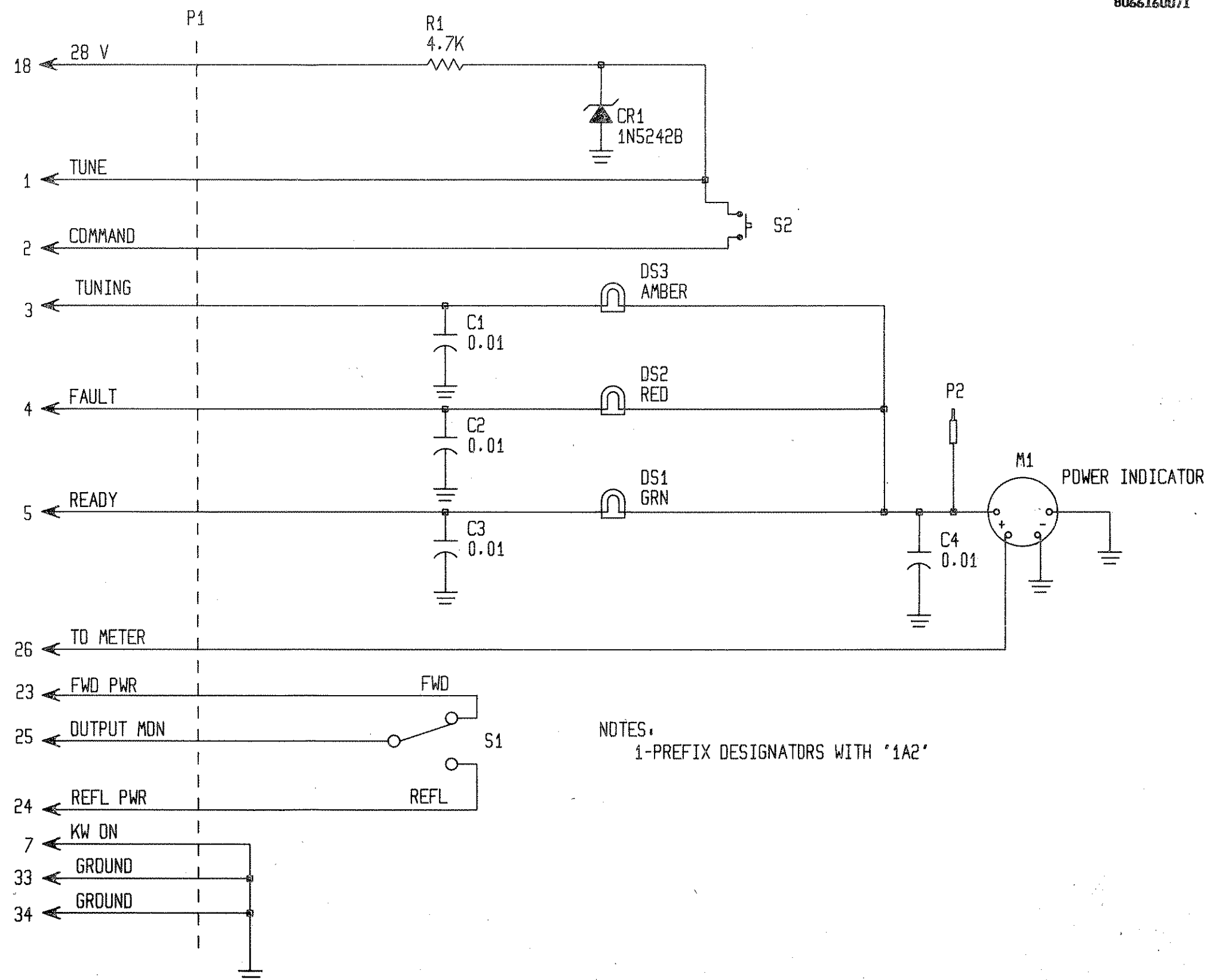


FIGURE 5-19 CONTROL PANEL 1A2 P/N 80661600XX

80661700XB KW CONTROL PANEL ASSY

8066170076

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A2	KW CONTROL PANEL ASSY	80661700XX
1A2P1	Connector, Power, 36 Pin Rect.	0754070000
1A2P2	Plug, Phone Tip, Red	0753680009
1A2S1	Switch, Toggle, DPDT	0334610001
1A2S2	Switch, Pushbutton, SPST, N.O.	0346520002
1A2S3	Switch, Pushbutton, SPST, N.O.	0346520002
CR1	Diode, Zener 1N962B	0404640001
CR2	Diode, Zener 1N962B	0404640001
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Zener 1N962B	0404640001
DS1	Lamp Assy Green	0841480001
DS2	Lamp Assy Red	0841490007
DS3	Lamp Assy Amber	0841500002
DS4	Lamp Assy White	1003324703
M1	Meter	5024042204
R1	Resistor, 10K, 10%, 1/4W	0170410005
R2	Pot. 10K, 10%, 1/8 Shaft	0335900003
R3	Resistor, 15K, 10%, 1/4W	0172350000
R4	Resistor, 82K, 10%, 1/4W	0171680006
R5	Resistor, 82K, 10%, 1/4W	0171680006
R6	Resistor, 4.7K, 5%, 1/4W	0170770001
1B2	Terminal, Insul. 4-40 Female	0506390004
	Boot, Pushbutton Switch 1/4-40	0346530008
	Boot, Toggle Switch 1/4-40	0531120007
	Connector, PC 12 Pin Female	1003321402
	Gasket, Panel	5024043308
	Gasket, Plug In Panel Lamps	1003324100
	Socket, Cartridge Lamp	1003322000

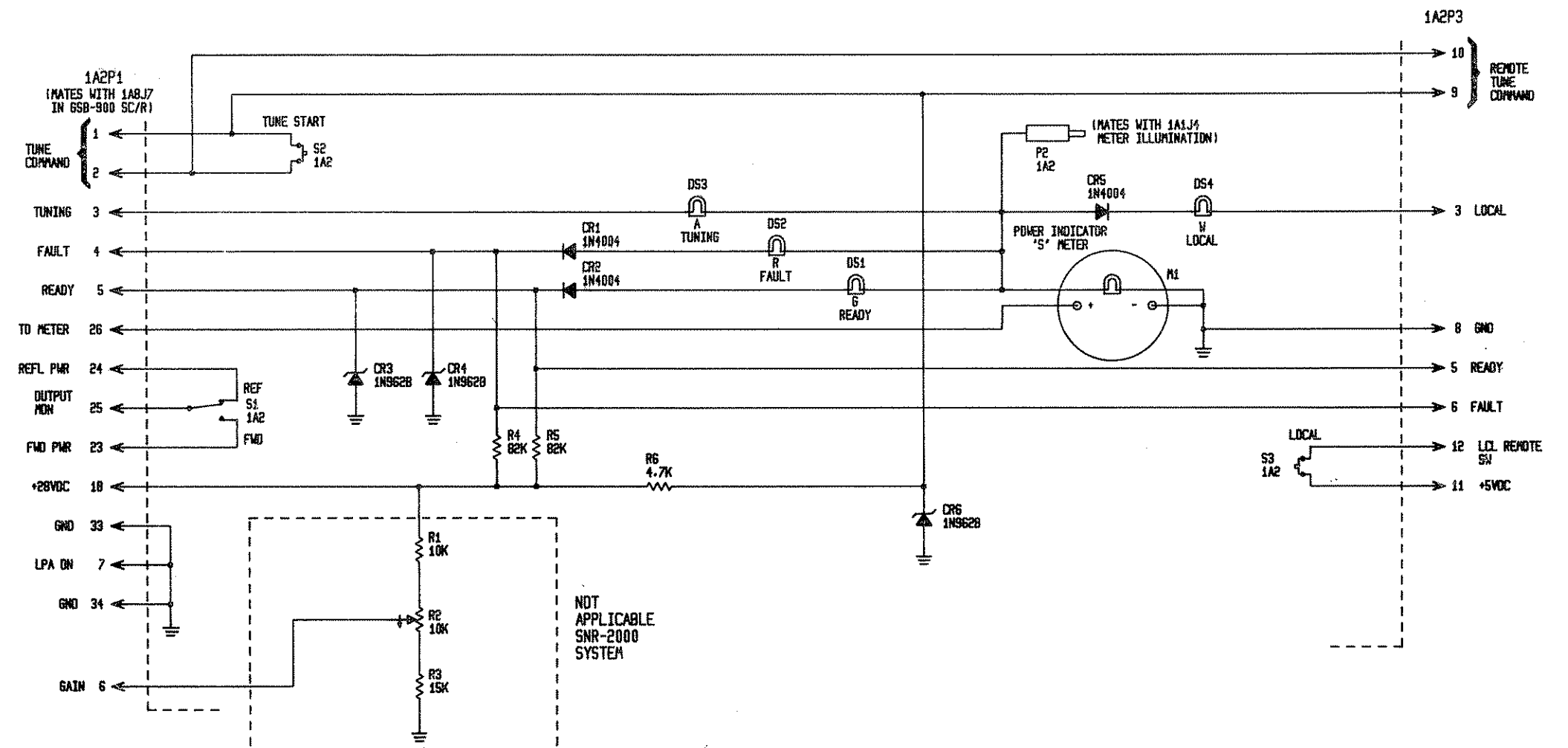


FIGURE 5-20 CONTROL PANEL 1A2 P/N 80661700XX

8066180071

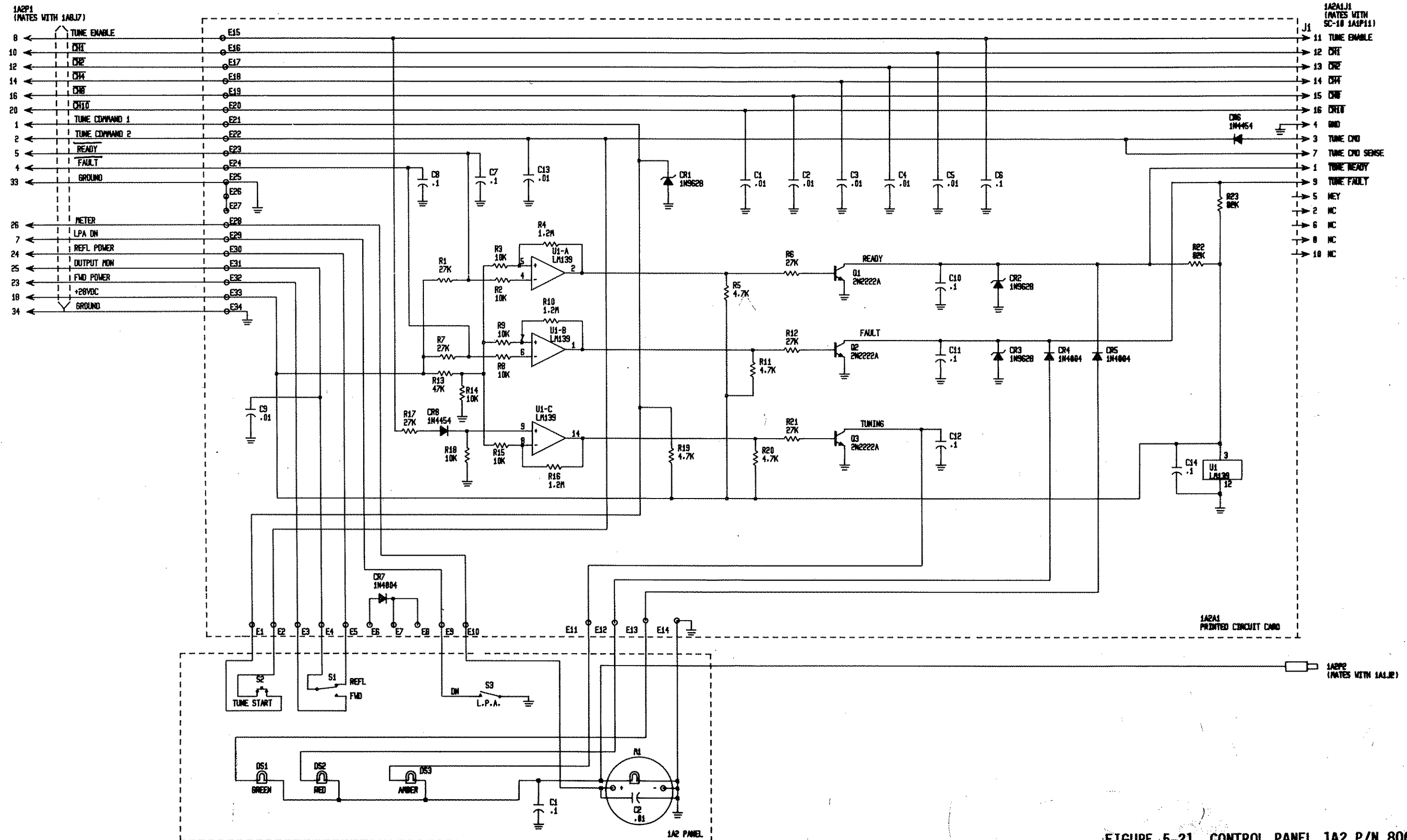
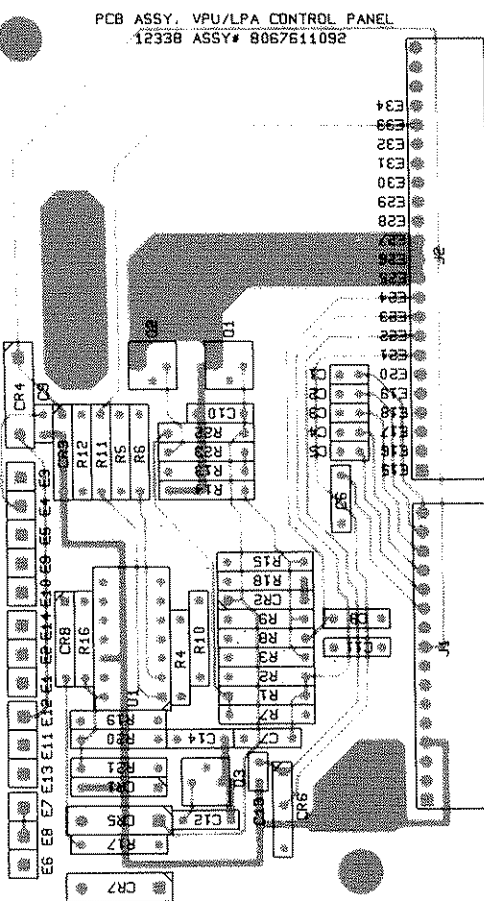
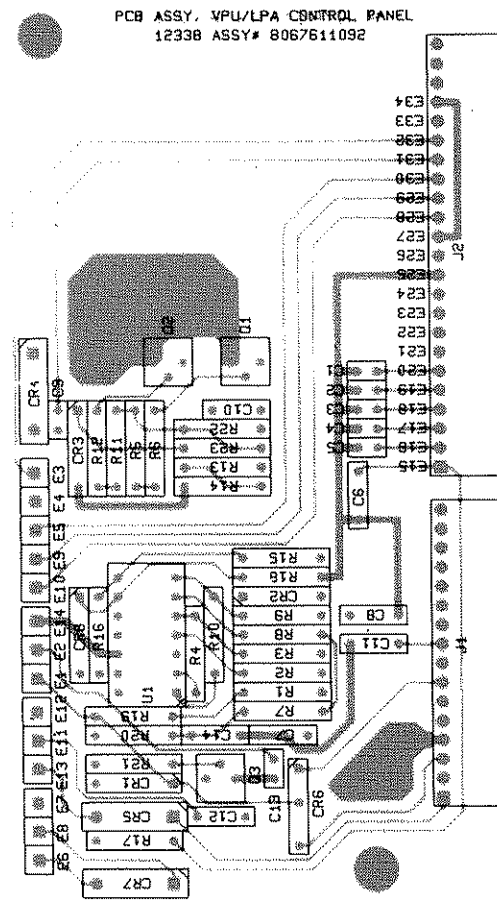


FIGURE 5-21 CONTROL PANEL 1A2 P/N 80661800XX



COMPONENT SIDE



CIRCUIT SIDE

SUNAIR SNR-2000DAC

80661800XXA KW CONTROL PANEL ASSY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A2	KW CONTROL PANEL ASSY	80661800XX
1A2A1	PC Assy Interface	8067611092
1A2P1	Connector, Power, 36 Pin Rect.	0754070000
1A2P2	Plug, Phone Tip, Red	0753680009
1A2S1	Switch, Toggle, DPDT	0334610001
1A2S2	Switch, Pushbutton, SPST, N.O.	0346520002
1A2S3	Switch, Toggle, DPDT	0334610001
C1	Capacitor, 0.1μf, 50V	1001070027
C2	Capacitor, .01μf, 50V, W5R 20%	0281730075
DS1	Lamp Assy Green	0841480001
DS2	Lamp Assy Red	0841490007
DS3	Lamp Assy Amber	0841500002
MJ	Meter	5024042204
	Boot Toggle Switch 1-40	0531120007
	Gasket, Plug In Panel Lamps	1003324100
	Gasket, Panel	5024043308
	Socket, Cartridge Lamp	1003322000

8067611092A PC ASSY INTERFACE

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY INTERFACE	8067611092
C1	Capacitor, .01μf, 50V, X7R 20%	0281730008
C2	Capacitor, .01μf, 50V, X7R 20%	0281730008
C3	Capacitor, .01μf, 50V, X7R 20%	0281730008
C4	Capacitor, .01μf, 50V, X7R 20%	0281730008
C5	Capacitor, .01μf, 50V, X7R 20%	0281730008
C6	Capacitor, 0.1μf, 50V	1001010027
C7	Capacitor, 0.1μf, 50V	1001010027
C8	Capacitor, 0.1μf, 50V	1001010027
C9	Capacitor, .01μf, 50V, X7R 20%	0281730008
C10	Capacitor, 0.1μf, 50V	1001010027
C11	Capacitor, 0.1μf, 50V	1001010027
C12	Capacitor, 0.1μf, 50V	1001010027
C14	Capacitor, 0.1μf, 50V	1001010027
C13	Capacitor, .01μf, 50V, X7R 20%	0281730008
C14	Capacitor, 0.1μf, 50V	1001010027
CR1	Diode, Zener 1N962B	0404640001
CR2	Diode, Zener 1N962B	0404640001
CR3	Diode, Zener 1N962B	0404640001
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Signal, SIL 1N4454	0405270003
CR7	Diode, Rectifier 1N4004	0405180004
CR8	Diode, Signal, SIL 1N4454	0405270003
Q1	Transistor, NPN, SI. 2N2222A	0448580004
Q2	Transistor, NPN, SI. 2N2222A	0448580004
Q3	Transistor, NPN, SI. 2N2222A	0448580004
R1	Resistor, 27K, 10%, 1/4W	0171200004
R2	Resistor, 10K, 10%, 1/4W	0170410005
R3	Resistor, 10K, 10%, 1/4W	0170410005
R4	Resistor, 1.2M, 10%, 1/4W	0174930003
R5	Resistor, 4.7K, 5%, 1/4W	0170770001
R6	Resistor, 27K, 10%, 1/4W	0171200004
R7	Resistor, 27K, 10%, 1/4W	0171200004
R8	Resistor, 10K, 10%, 1/4W	0170410005
R9	Resistor, 10K, 10%, 1/4W	0170410005
R10	Resistor, 1.2M, 10%, 1/4W	0174930003
R11	Resistor, 4.7K, 5%, 1/4W	0170770001
R12	Resistor, 27K, 10%, 1/4W	0171200004
R13	Resistor, 47K, 10%, 1/4W	0171060008
R14	Resistor, 10K, 10%, 1/4W	0170410005
R15	Resistor, 10K, 10%, 1/4W	0170410005
R16	Resistor, 1.2M, 10%, 1/4W	0174930003
R17	Resistor, 27K, 10%, 1/4W	0171200004
R18	Resistor, 10K, 10%, 1/4W	0170410005
R19	Resistor, 4.7K, 5%, 1/4W	0170770001
R20	Resistor, 4.7K, 5%, 1/4W	0170770001
R21	Resistor, 27K, 10%, 1/4W	0171200004
R22	Resistor, 82K, 10%, 1/4W	0171680006
R23	Resistor, 82K, 10%, 1/4W	0171680006
U1	IC, Linear LM139	1007490004