CU-380
Antenna Coupler

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Rockwell
International

Collins instructions

CU-380
Antenna Coupler

Collins Telecommunications
Products Division
Defense Electronics Operations
Rockwell International
Cedar Rapids, Iowa 52498

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CU-380 Antenna Coupler (622-3573-001)

Rockwell International

instructions

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1. DESCRIPTION

1.1 General

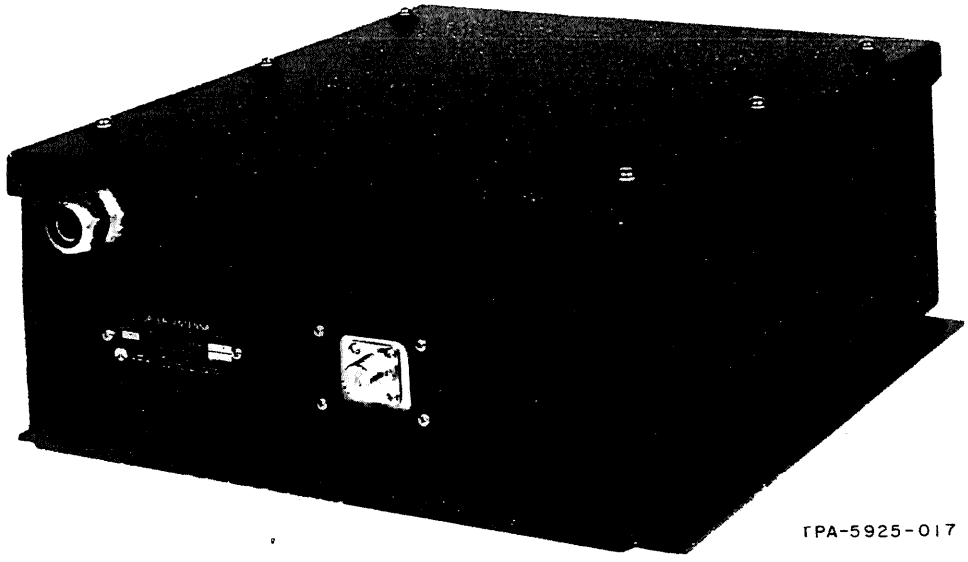
The CU-380 Antenna Coupler, a companion antenna coupler for the HF-282/282V, HF-380, and KWM-380 Transceivers, matches various antennas to the 50-ohm impedance of the transceivers. The antenna coupler (refer to figure 1) is specifically designed for use with 2.7-m (9-ft) mobile whip antennas, 4.9-m (16-ft) and 11-m (36-ft) vertical antennas, and 15.2-m (50-ft) and 30.3-m (100-ft) long-wire antennas. Rf power handling capacity is 125 watts, peak and average. The required dc primary power is obtained from the associated transceiver.

The antenna coupler is automatically tuned when a frequency is selected and the transceiver is keyed. The antenna coupler microprocessor uses discriminator outputs to develop the control signals for selecting appropriate impedance matching elements.

The antenna coupler consists of three major circuit cards/subassemblies: rf plate A1 (651-4323-001), rf card A1A1 (646-5871-001), and control A1A2 (646-5867-001).

1.2 Specifications

Equipment specifications are listed in table 1.



CU-380 Antenna Coupler
Figure 1

Table 1. CU-380 Antenna Coupler Equipment Specifications.

CHARACTERISTIC	SPECIFICATION
Electrical	
Frequency range	1.6 - 30.0 MHz
Input impedance	50 ohm with 2:1 vswr, maximum, when tuned
Number of channels	Continuous tuning
Tuning time	15 s maximum; receive bypass, 50 ms
Rf power input	
Tune	20 to 35 watts
Operate	125 watts, pep and average
Duty cycle	Continuous
Antenna matching capability	1.6 to 30 MHz for 15.2- and 30.5-m (50- and 100-ft) long wires; 1.8 to 30 MHz for 11-m (36-ft) vertical; 2.0 to 30 MHz for 4.9-m (16-ft) vertical; 3.5 to 30 MHz for 2.7-m (9-ft) whip
Primary power (supplied by transceiver)	12-15 V (13.5 nominal) 2.5 A maximum, 2 A nominal
Control interface	Compatible with HF-282, HF-282V, HF-380, and KWM-380
Environmental	
Ambient temperature	-20 to +50 °C (-4 to +122 °F), operating
Altitude	0 to 3768 m (0 to 12 000 ft)
Vibration	1.5 g, 5.5 to 55 Hz
Shock	15 g, 11 milliseconds
Humidity	100% RH - Not recommended for use in salt spray environments
Physical	
Size (excluding connectors and mounting brackets)	Width - 36.7 cm (14.45 in) Height - 14.2 cm (5.60 in) Length - 31.6 cm (12.45 in)
Weight	7.28 kg (16.0 pounds), max
Cooling provisions	Natural convection and conduction through mounting surfaces
Type of construction	Formed and welded aluminum sheet

Table 1. CU-380 Antenna Coupler Equipment Specifications (Cont).

CHARACTERISTIC	SPECIFICATION
Connectors	
Rf output	#10 stud on conical ceramic standoff insulator
Rf input	SO-239 coaxial connector
Control/power	Terminal lugs

1.3 Associated Equipment

A list of transceivers, antennas, rf and control cables and ground radial kits for use with the antenna coupler is given in table 2.

2. INSTALLATION

2.1 General Requirements

To use a single antenna for different frequencies, a matching circuit is required between the transmitter output and the antenna. This is the function of the antenna coupler.

A number of different types of antennas for both fixed and mobile use are available from Rockwell-Collins. General information is given here for installing the antenna coupler with a long wire for fixed-station use, and with a vertical or whip antenna for either fixed- or mobile-station use.

2.1.1 Long-Wire Antennas

Figure 2 shows a typical long-wire antenna installation. The antenna coupler should be mounted as close as possible to the grounding system. In the installation, note that the wire from the coupler to the section of antenna between insulators is also a part of the antenna. This wire is to be the same size and type as the rest of the antenna and must be considered when determining the length of the antenna.

Make a drip loop in the wire to the antenna where the wire attaches to the antenna coupler rf output.

DO NOT use the coupler output connector as one antenna support. Leave sufficient wire slack between the supporting insulator and the antenna coupler to prevent mechanical stress on the antenna coupler connector.

Be sure the antenna coupler is properly grounded. The recommended ground system is a set of radial wires such as the Rockwell-Collins AC-2820. These radials should be 1/4 wavelength long at the lowest frequency to be used and should be attached to the coupler base. Use a minimum of eight radials. If the ground radials cannot be connected directly to the coupler base, connect them together and attach a ground strap to the common connection. Then connect the ground strap to the antenna coupler ground lug on the side of the case. The ground strap should be approximately 51-mm (2-in) wide and not more than 305-mm (12-in) long.

2.1.2 Fixed Vertical Antennas

A typical fixed-station vertical antenna installation is shown in figure 3. The Rockwell-Collins AC-2810 or AC-2811 is recommended. (The AC-2810 will tune down to 2.0 MHz, and the AC-2811 to 1.8 MHz.) Attach a minimum of eight radial wires, 1/4 wavelength (λ) long at the lowest frequency used, to the antenna mounting base.

$$1/4\lambda = \frac{75}{f(MHz)} \text{ m, or } = \frac{246}{f(MHz)} \text{ ft}$$

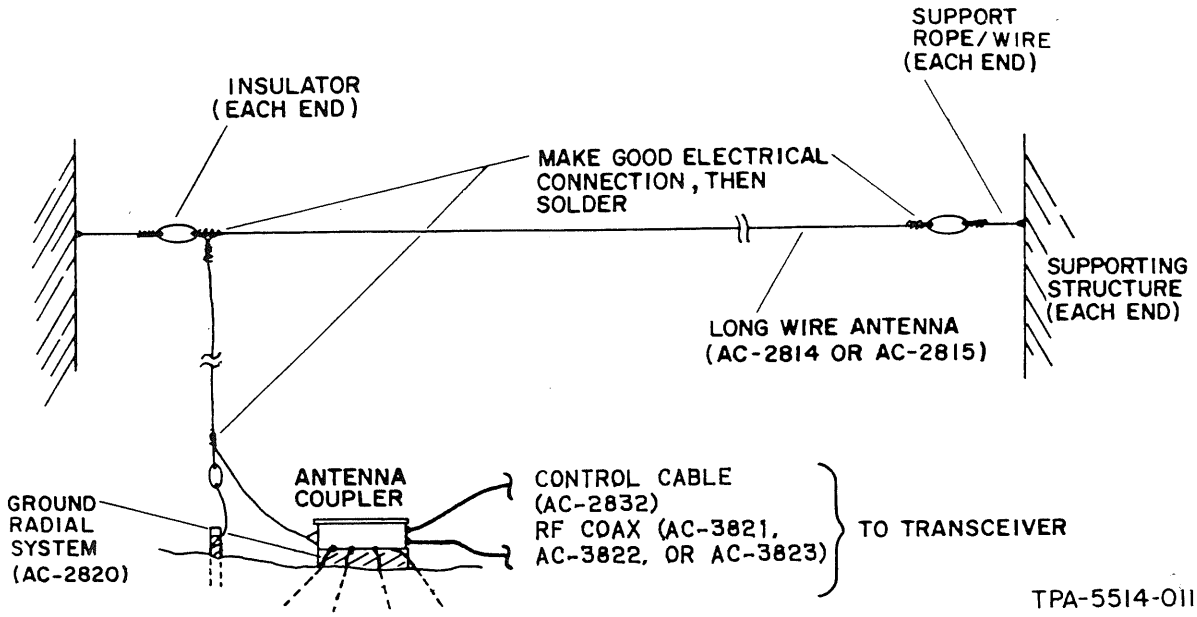
where f(MHz) = lowest operating frequency expressed in MHz.

More than eight radial wires should be used if possible, to increase antenna efficiency. Extend the wires straight out from the attaching points at the base and bury them approximately 15 cm (6 in) under the earth's surface. A radial kit, AC-2820, is recommended. The AC-2820 contains 91.5 m (300 ft) of wire for the radials.

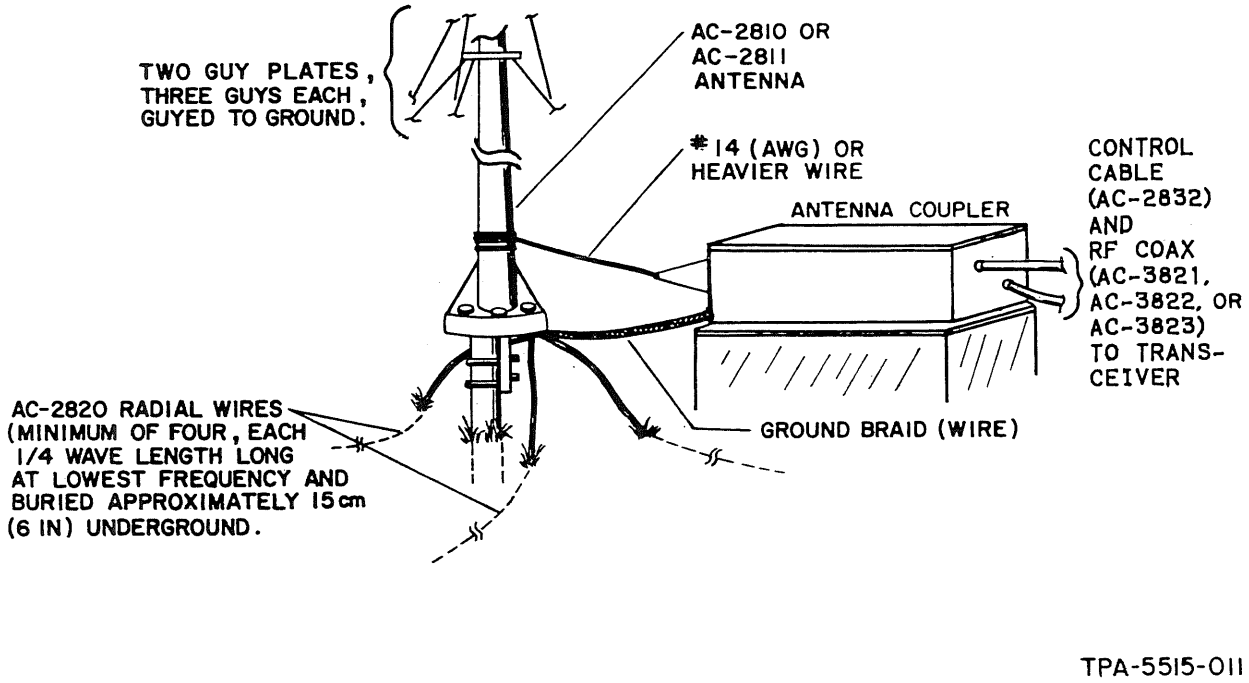
The antenna coupler should be mounted adjacent to the antenna base. Using ground strap, connect the antenna coupler ground lug to the antenna ground

Table 2. Equipment Associated With the CU-380 Antenna Coupler.

EQUIPMENT	DESCRIPTION
HF-282 HF Transceiver	1.600 to 29.999 MHz transceiver with 20 programmed fixed-frequency channels; sideband and CW modes; 125-W, pep and average, rf output power; for fixed-station use.
HF-282V HF Transceiver	Similar to HF-282, but for mobile use. Does not have built-in ac power supply.
HF-380 HF Transceiver	Similar to HF-282 but with full, continuous coverage of 1.60000 to 29.99999 MHz frequency range.
KWM-380 HF Transceiver	Similar to HF-380 but with transmit frequencies limited to Amateur Radio Service ("ham") and Military Affiliate Radio Service (MARS) coverage. Receive frequency is continuous coverage from 1.60000 to 29.99999 MHz.
AC-2810 Vertical Antenna Kit	4.9-m (16-ft) vertical antenna
AC-2811 Vertical Antenna Kit	11-m (36-ft) vertical antenna
AC-2814 Long-Wire Antenna kit	15.2-m (50-ft) long-wire antenna
AC-2815 Long-Wire Antenna kit	30.6-m (100-ft) long-wire antenna
AC-2816 Whip Antenna Kit	2.7-m (9-ft) mobile whip antenna with mounting spring and base insulator
AC-2818 Lightning Arrester	Lightning arrester for inserting in rf coaxial cable interconnection
AC-2819 Grounding Kit	Three 1.8-m (6-ft) copper clad steel ground rods with clamps and wire
AC-2820 Radial Kit	91.4 m (300 ft) of wire and lugs
AC-3821 Transceiver-to-Coupler RF Cable	RG-58 coaxial cable assembly terminated with PL-259 connectors. Lengths up to 20 m (66 ft)
AC-3822 Transceiver-to-Coupler RF Cable	RG-213 coaxial cable assembly terminated with PL-259 connectors. Lengths from 10 m (33 ft) to 60 m (200 ft)
AC-3823 Transceiver-to-Coupler RF Cable	Low-loss heliax coaxial cable assembly terminated with uhf series connectors. Lengths from 60 m (200 ft) to 120 m (400 ft)
AC-2832 Transceiver-to-Coupler Control Cable	Multiconductor cable terminated with connector/terminals attached. Lengths up to 60 meters (197 ft)
AC-3809 HF/KWM-380 to Standard Interface Adapter	Adapter unit for interfacing CU-380 to HF-380 or KWM-380 Control Interface Connector



Long-Wire Antenna Installation
Figure 2



Fixed Vertical Antenna Installation
Figure 3

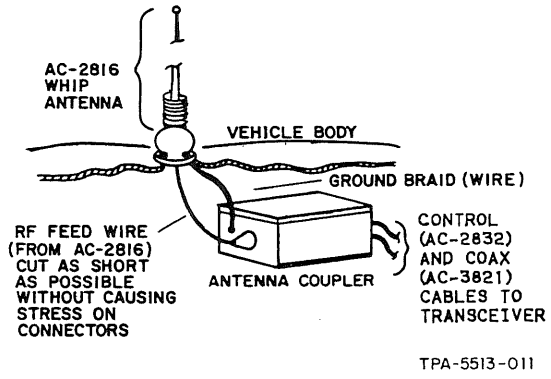
system. Connect the antenna coupler rf output connector to the antenna with #14 AWG, or heavier, stranded wire. Make a drip loop in the wire to the antenna where the wire attaches to the antenna coupler rf output connector.

Note

The antenna proper and the mounting base are insulated from each other. Do not connect any conductive materials between these. Doing so will short out the antenna.

2.1.3 Mobile Whip Antennas

The AC-2816 whip antenna (which tunes down to 3.5 MHz) is for vehicular use and is to be mounted on the vehicle body. Do not mount it on the bumper. The body metal of the vehicle serves the same purpose as the radial wires in a fixed-station whip installation. Figure 4 shows how the antenna is mounted on the vehicle body and connected to the antenna coupler.



Mobile Whip Antenna Installation
Figure 4

Mount the antenna coupler as near the antenna mount as practical. Maximum recommended distance away is not over approximately 30 cm (12 in). The coupler-to-antenna rf connection is #14 AWG, or heavier, insulated, stranded wire run in a short, direct path. Leave only enough slack to avoid mechanical stress due to tension or vibration. Make sure there is adequate clearance (approximately 25 mm (1 in)) on all sides of the rf wire up to the antenna base.

Be sure the ground strap between the antenna base and antenna coupler is connected to clean, bare metal of the vehicle body at the antenna base.

2.2 Location

The antenna coupler must be located at the base of the vertical or whip antenna, or at one end of the long-wire antenna, and mounted horizontally (base down) if located out of doors. Although the antenna coupler is housed in a weather resistant case, a protective shelter is recommended for outside installations. A simple cover to protect from direct sunlight, rain, or snow is sufficient.

The antenna coupler is not recommended for use in salt spray environments.

Distance between the antenna coupler and associated transceiver should not be farther away than 120 m (400 ft).

2.3 Interconnections

2.3.1 HF-380, KWM-380 Interface

Use of the antenna coupler with an HF-380 or KWM-380 transceiver requires the AC-3809 HF/KWM-380 to Standard Interface Adapter. The AC-3809 adapts the control interface connector on the transceiver to the connector required by the antenna coupler. The adapter is not required when the HF-282 or HF-282V Transceiver is used.

Connect the AC-3809 input connector to the control interface connector on the rear panel of the HF-380 or KWM-380 transceiver. Connect the transceiver-to-coupler control cable (AC-2832) to the adapter CONTROL B output connector. The control cable is then connected to the antenna coupler as discussed in paragraph 2.3.2.

2.3.2 Interconnecting Cabling

2.3.2.1 Control Cable

For the HF-282 or HF-282V, connect the multipin connector on the AC-2832 control cable directly to J3 on the rear panel of the transceiver. For the HF-380 or KWM-380, connect the multipin connector on the cable to the CONTROL B connector on the AC-3809 adapter, which is connected to the transceiver.

Extend the control cable to the antenna coupler by the most direct route available.

Remove the top cover of the antenna coupler. Loosen the compression nut on the bushing and insert the control cable through the bushing.

Interconnect the cable terminals to the coupler terminal strip as shown in figure 5.

Position the cable to leave a moderate amount of slack in the wires, then tighten the bushing compression nut until it is finger tight plus one-fourth turn.

Replace the antenna coupler cover.

2.3.2.2 RF Coaxial Cable

Caution

For increased protection of equipment from lightning, a lightning arrester should be inserted in the rf coaxial cable interconnection between the antenna coupler and associated transceiver. The Rockwell-Collins AC-2818 Lightning Arrester Kit is recommended.

The rf coaxial cable has a connector on each end to mate with type SO-239 connectors. The rf cable connects directly to coaxial connectors on the transceiver or lightning arrester and the antenna coupler.

Determine the length of rf coaxial cable required. The following list gives recommended cable kits (cable with connectors attached, ready for use) and indicates various lengths available.

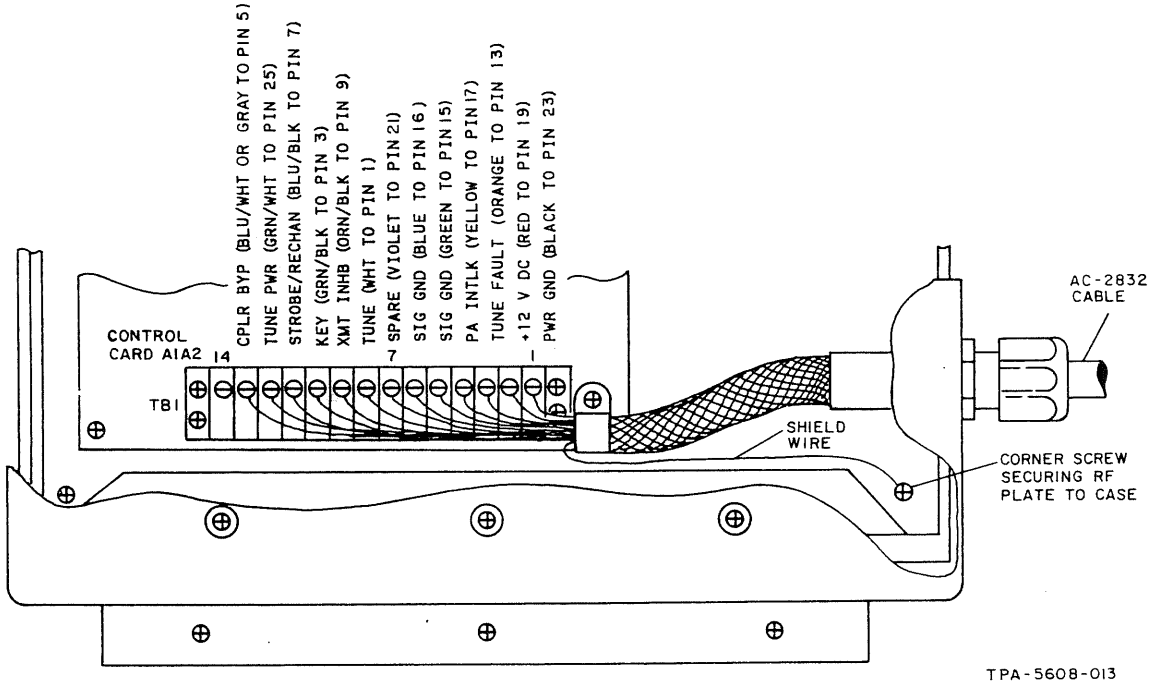
RF Cable	Lengths	Increments
AC-3821	1, 3, 10, 20 m (3.3, 10, 33, 66 ft)	
AC-3822	10 - 60 m (33 - 198 ft)	10 m (33 ft)
AC-3823	60 - 200 m (198 - 660 ft)	10 m (33 ft)

Extend the rf coaxial cable by the most direct route available from the lightning arrester to the antenna coupler. Connect the cable to the antenna coupler and to the AC-2818 lightning arrester at the outside of the building. Make a drip loop in the rf cable from the antenna coupler to the lightning arrester where the cable attaches to the lightning arrester. Connect an appropriate length of rf coaxial cable between the transceiver and the lightning arrester connection inside the building.

Refer to instructions supplied with the AC-2818 for proper installation of the lightning arrester.

2.3.2.3 Antenna Coupler-to-Antenna RF Connection

Connect the antenna coupler rf output connector (#10 stud at end of conical ceramic insulator) to the antenna with #14 AWG, or larger diameter, stranded wire. Keep this wire as short as practical, but not



Transceiver-to-Antenna Control Cable Wiring
Figure 5

longer than 30 cm (12 in). Leave a slight amount of slack to prevent stress on the connections.

The wire from the rf output connector radiates rf energy. Make sure there is adequate clearance (approximately 25 mm (1 in)) around the wire for its entire length, from the antenna coupler to the antenna connection.

2.3.2.4 Antenna Coupler to Ground

The antenna coupler must be connected to a good earth ground, if in fixed station use; or vehicle ground, if in mobile station use. Refer to information supplied with the antenna, radial, and grounding kits listed in table 3 (paragraph 5.3).

Connect 12-mm (1/2-in) wide, or larger, braided ground strap directly from the antenna coupler grounding lug (near the nameplate) to the grounding system. Use the shortest path possible for this connection.

In vehicular installations, make sure the ground connections to the vehicle body are made to bare metal. Scrape away any paint or other foreign material necessary to make a good ground connection.

2.4 Installation Checkout

After the installation is complete but before attempting operation of the antenna coupler, check all cables for proper connections, make sure connectors are firmly mated, and ensure that a proper antenna is connected to the antenna coupler rf output.

Check for adequate mechanical support of the interconnecting control and rf coaxial cables. There should be no tension on any of the connectors.

After the electrical and mechanical checks have been made, perform the following operational check.

a. Turn on power to the transceiver and select an authorized mode and frequency of operation.
b. Momentarily key the transceiver. (Depress and release the microphone ptt switch or the CW key.)
c. Listen for a random-beep audio tone (approximately 800 Hz pulsed in a random order) that is output from the transceiver as the transceiver is automatically momentarily keyed in the tune power mode for antenna coupler tuning.
d. Within 15 seconds from keying the tone should stop, indicating a tuned condition. The transceiver/antenna coupler is then ready for normal operation. If a rapid, steady beeping of the tone (approximately 10 times per second) is heard, a fault condition exists.
e. If the fault signal is heard, turn off transceiver power and recheck all connections. If the cabling connections and antenna coupler installation are correct, refer to paragraph 5 and perform the test and troubleshooting procedures on the antenna coupler.

3. OPERATING PROCEDURES

3.1 General

Operation of the antenna is automatically initiated when the associated transceiver is tuned and keyed. The antenna coupler tuning is carried out by a microprocessor which takes control of the transceiver from the time of being keyed until the antenna coupler is tuned. The microprocessor causes the transceiver to be automatically keyed on an intermittent basis as rf is needed to sense the tune-condition of the antenna coupler. When tuning is complete, the microprocessor relinquishes control of the transceiver to permit normal operation.

Since primary power is supplied by the transceiver, the antenna coupler power is on any time the transceiver power is turned on.

3.2 Procedures

The following steps outline the procedures for operating the antenna coupler.

a. Turn On

   Turn on the transceiver power switch. This also applies primary power to the antenna coupler.

b. Frequency Selection or Change

   Initially select or change the transceiver operating frequency in the normal manner.

c. Antenna Coupler Tuning

   Momentarily key the transceiver by depressing and releasing the microphone ptt switch or CW key. The key signal causes the antenna coupler to begin the tuning process. The transmitter is automatically keyed and held at tune-power output, as needed for tuning, until tuning is complete. When complete, the automatic keying function is released.

During tuning, the transceiver sidetone signal (800 Hz) will be heard in random pulses. This is caused by the antenna coupler automatically keying the transmitter for sporadic pulses of rf needed to sense the tuned condition. When tuning is complete, the transmitter key signal from the antenna coupler is turned off, stopping the sidetone output.

If a tuning fault occurs during tune-up, the sidetone becomes a rapid beeping tone occurring at a 10-Hz rate. In the event that this occurs, turn off the transceiver and perform troubleshooting procedures. One possibility of a tuning fault is a "tune hole". This is a very narrow frequency range that, because of the peculiarities of the individual antenna installation, the antenna coupler cannot tune to achieve 2:1, or better, vswr. Making a simple adjustment in the length or orientation of the antenna normally eliminates the tune hole.

d. Transmit/Receive Operation

Once the antenna coupler has completed tuning, there is no change in procedures from those normally used with the transceiver for transmitting and receiving.

Changing the transmitter frequency by 10 kHz or more causes the antenna coupler to switch to the bypass mode. The next time the transmitter is keyed, the antenna coupler checks the vswr and automatically retunes if necessary. Under some conditions, tuning away from the operating frequency by 5 kHz or so then tuning back to the operating frequency can cause the antenna coupler to retune.

e. Turn Off

Turn off the transceiver power switch. This also removes primary power from the antenna coupler.

4. PRINCIPLES OF OPERATION

4.1 General

Antenna coupler tuning is automatically controlled by a microprocessor. Discriminator outputs, analogs of the antenna voltage, impedance, phasing, and vswr are input to the microprocessor to indicate the tuned condition of the antenna/antenna coupler combination. The microprocessor outputs commands to relay drivers, causing the affected relays to add or remove inductors or capacitors from the rf path to the antenna. When the discriminator circuits sense a nominal 50-ohm, nonreactive antenna/antenna coupler combination, the microprocessor releases control of the transceiver to permit normal transceiver operation.

When the associated transceiver is turned on, the antenna coupler microprocessor resets and generates outputs to cause the tuning elements to be bypassed. Once this is accomplished, the central processor unit (CPU) is placed in the halt mode. This permits rf reception through the untuned antenna/antenna coupler combination.

At the time transceiver is keyed, the microprocessor immediately takes control of the transceiver key line. This is done through the transmit inhibit signal. The CPU next commands a short rf output pulse from the transceiver (at tune power level). Discriminator outputs, developed from the rf signal, are applied through input/output (I/O) circuits to the CPU. Following microprocessor program instructions, a coarse approximation is made to determine the required tuning elements (inductors and capacitors). The CPU commands relays associated with these inductors and capacitors to energize, placing impedances in the rf path. After this is done, the CPU commands another rf output pulse from the transceiver. The resulting discriminator outputs are again processed to determine further tuning needs. The CPU commands additional associated relays to energize or deenergize to achieve a closer approximation to the correct tuned condition. This sequence continues until the antenna coupler senses a tune fault condition, or the antenna/antenna coupler combination presents a nominal 50-ohm, nonreactive load to the transceiver.

When the microprocessor senses the tuned condition, the xmt inh (transmit inhibit), $\overline{\text{tune}}$, and $\overline{\text{tune pwr}}$ signals are released so normal transceiver operation can occur.

In the event the antenna coupler cannot properly tune with the antenna being used, or if voltage to the antenna exceeds a predetermined level, the microprocessor outputs a tune fault signal.

When the transceiver frequency is changed during the same operating period, keying the transceiver again gives control to the microprocessor. The CPU

commands a short rf pulse from the transceiver to check for a tuned condition. If the frequency change has not been great enough to require additional antenna coupler tuning, the CPU permits immediate normal operation. If tuning is required, the sequence previously described is repeated to tune the antenna/antenna coupler for the new frequency.

In addition to 14-volt primary power to the antenna coupler from the associated transceiver, the antenna requires the following inputs: key—to initiate antenna coupler tuning when a frequency is first selected and the transmitter keyed; strobe—to indicate that a frequency change has occurred at the transceiver; and set bypass—to activate relays that bypass the antenna coupler tuning elements to permit straight-through operation. Outputs from the antenna coupler to the transceiver are the tune, tune power, transmit inhibit, and tune fault signals discussed in the previous paragraphs.

4.2 Functional Theory (Refer to figure 6)

4.2.1 Power-on Reset

Turning on the transceiver applies power to the antenna coupler. This causes a reset circuit in the antenna coupler to output a momentary reset command. The reset command initializes the CPU and the I/O circuits of the microprocessor. Initialization causes the CPU to command the home state, which energizes the antenna coupler bypass relays, then to revert to the halt mode until further inputs are received.

4.2.2 Transceiver Keying

To initiate antenna coupler tuning, the transceiver must be momentarily keyed. The key signal from the transceiver is applied through a logic level comparator to a half logic circuit and to the microprocessor I/O circuits. The halt logic circuit releases the CPU from the halt mode when the key signal is received. With the CPU operating, the microprocessor addresses the I/O port associated with the key signal and applies the signal to the data bus. Once the key signal is sensed, the program instructions cause the microprocessor to output the $\overline{\text{tune}}$, $\overline{\text{tune pwr}}$, and $\overline{\text{xmt inh}}$ signals. $\overline{\text{Tune}}$ keeps the transceiver keyed, $\overline{\text{tune pwr}}$ causes the transceiver rf output to be at a low-power (nominally 20- to 35-watt) output, and xmt inh enables or inhibits the transceiver rf output as needed for tuning, even though the transceiver remains keyed (by $\overline{\text{tune}}$). These signals are output from the coupler through buffer/driver stages.

4.2.3 Discriminator Outputs

As the microprocessor intermittently keys the transceiver, rf power is applied through discriminator circuits in the antenna coupler. The discriminators sense impedance, phase, resistance, and forward and reflected power on the attached antenna. These signals are output to comparators.

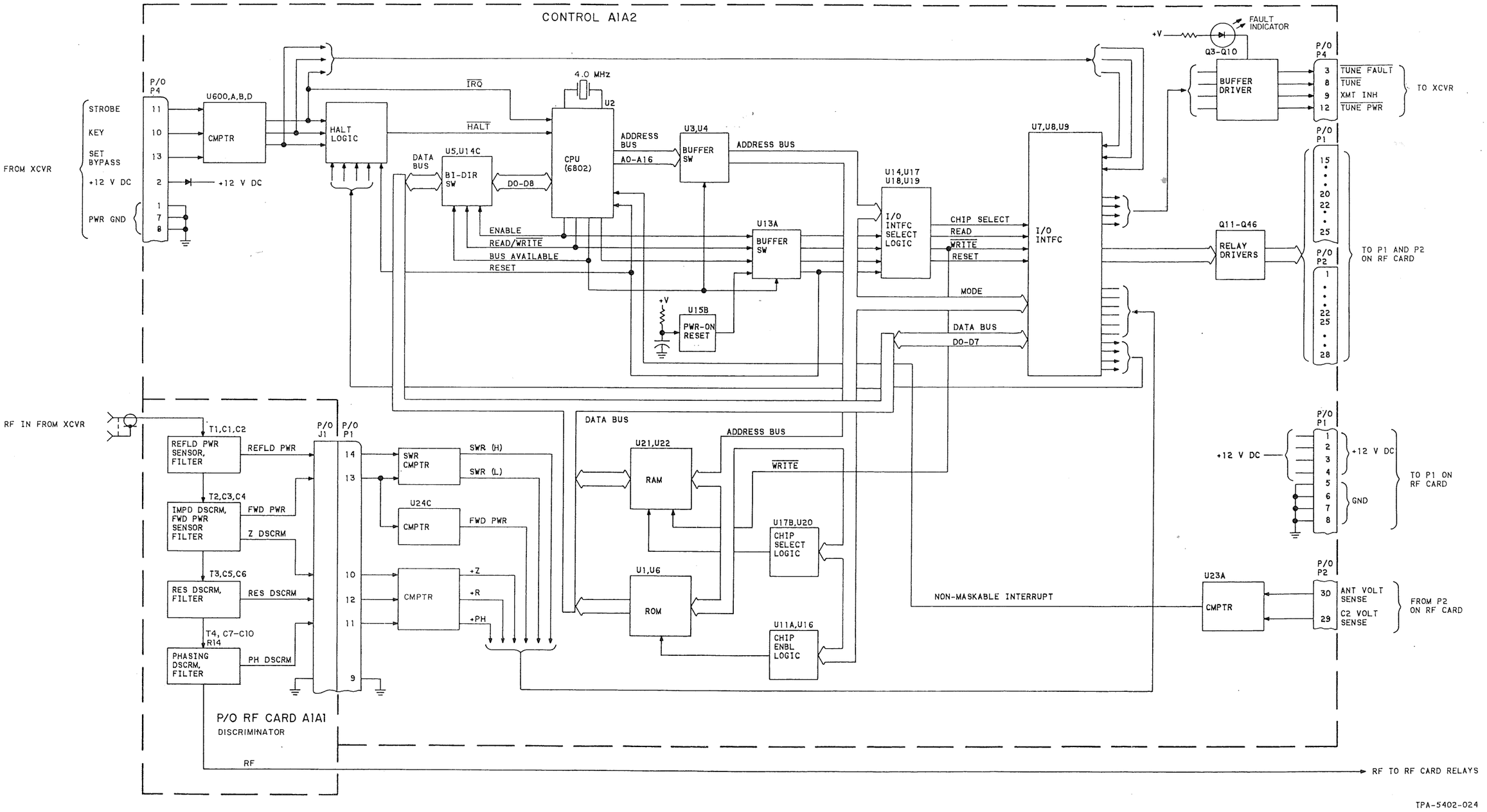
The comparators output a forward power signal, as well as combine the forward and reflected power analogs to develop high and low vswr signals. The impedance, phase, and resistance signals are also compared with a ground reference and applied to the microprocessor I/O circuits as logic 1 or logic 0 signals.

4.2.4 Microprocessor

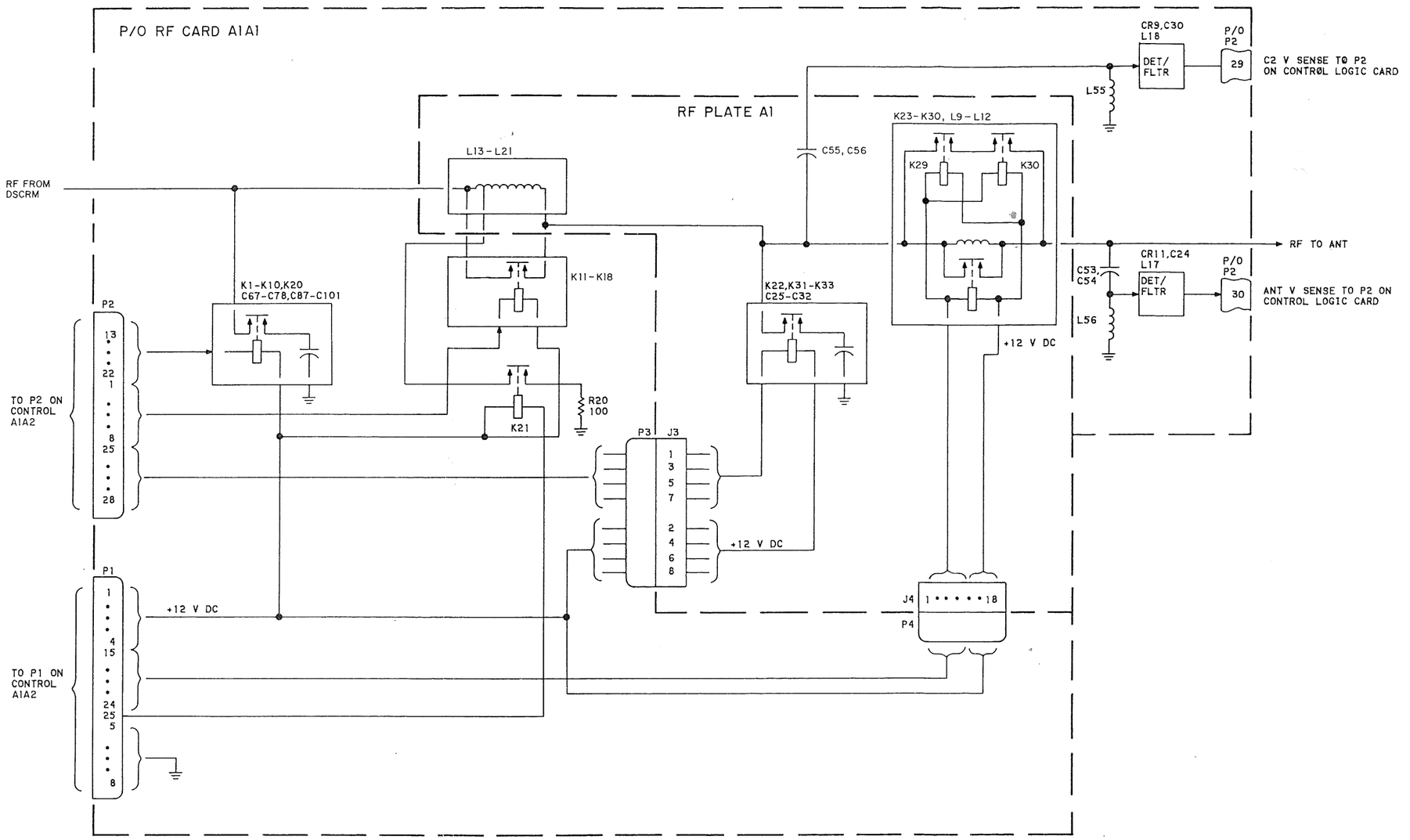
The microprocessor instructions set, contained in a read-only-memory (ROM), directs the operation of the CPU. The CPU outputs addresses, and both inputs and outputs (reads and writes) data. The data, on the data bus, is read from or written into circuits enabled by the address signal on the address bus. Additionally, the CPU performs computations on the input data and outputs the new data to the addressed location.

With the transceiver held keyed (by the $\overline{\text{tune}}$ signal from the antenna coupler), rf power, on command of the xmt inh signal, is coupled through the discriminator circuits. The discriminator outputs are applied to the data bus when the applicable I/O circuit ports are addressed by the CPU. The discriminator output data is compared with the value of data (in the ROM) that indicates a matched condition. From this, the ROM instuctions command certain tuning element relays to be energized. When this command is on the data bus, the CPU outputs an address signal. This causes the I/O ports connected to the associated relay drivers to be enabled. The relay drivers enable relays that connect the applicable tuning elements to the rf line.

With the tuning elements in the rf line, the CPU, through the xmt inh signal, again commands a short burst of rf from the transceiver. The discriminator signals (from this rf) are again applied to the data bus. The CPU compares this new data with that for a matched condition. Appropriate commands are again output to the data bus to enable tuning element relays. This operation continues until the discriminator data corresponds to that which indicates an acceptably matched condition between the transceiver and antenna/antenna coupler.



CU-380 Functional Block Diagram
Figure 6 (Sheet 1 of 2)



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CU-380 Functional Block Diagram
Figure 6 (Sheet 2)

When the antenna coupler is tuned, the microprocessor instructions cause the tune and tune pwr outputs to unkey the transceiver and remove the tune power restriction from the rf output. The transceiver/antenna coupler combination is then ready for normal operation.

Rf voltage signals from the C25 - C32 tuning capacitors (C2 volt sense) and the output to the antenna (ant volt sense) are rectified and filtered. The resulting dc analog voltages are compared with preset voltages. In the event of excessive voltage sense signals, the comparator outputs a CPU interrupt signal. This halts the tuning operation, causing the transceiver to be unkeyed and a tune fault signal to be output from the antenna coupler. In addition to the tune fault signal, an LED indicator on the antenna coupler control logic card is turned on, indicating a malfunction.

4.2.5 Tuning Elements

The capacitive and inductive tuning elements are switched into or out of the rf signal path by relays. When the relay associated with a capacitor is energized, the capacitor is inserted in the rf path between the rf line and ground. When the relay associated with an inductor is energized, the inductor is shorted so that the rf signal bypasses that inductor. Power for the tuning element relays is switched by relay driver transistors—one driver for each relay. The relay drivers are turned on and off by data signals output by the microprocessor I/O circuits when commanded by the CPU.

5. TESTING/TROUBLESHOOTING

5.1 General

Caution

Control A1A2 contains electrostatic discharge sensitive (ESDS) components. Refer to paragraph 6 for special handling requirements before removing or repairing the card.

To test the entire antenna coupler, perform all of the table 4 (paragraph 5.5). If only one functional area is to be tested, go to that test in the table. Tests are arranged such that each test presumes that circuits checked in the previous tests are operational. If the previous tests have not been performed, do so as part of the troubleshooting procedures.

The tests will isolate a malfunction to the probable major subassembly of the antenna coupler. With reference to the schematic diagram and by standard troubleshooting techniques, a malfunction can be isolated to a specific functional circuit.

Because of the requirements for specialized test equipment, including automatic testers, the discriminator and microprocessor circuits are not considered user-repairable. If a malfunction is isolated to either of these circuits, return the antenna coupler to the factory or authorized repair center for repair.

5.2 Disassembly/Reassembly

5.2.1 Disassembly

Note

Save all hardware removed during disassembly for use in reassembly.

5.2.1.1 Cover

Remove the cover by removing six screws and washers from the top. Lift the cover directly away from the unit.

5.2.1.2 Control A1A2

Disconnect cables from the circuit card. Remove six nuts and washers securing the card to standoff posts. Lift the card up and directly away from the standoff posts.

5.2.1.3 RF Plate A1

Disconnect the control cable from A1A2TB1. Remove four screws securing the rf input connector to the chassis. Remove six screws and washers securing the rf plate to the chassis lips.

Caution

Use care in lifting the rf plate from the chassis. Relays and inductors near the plate edge may be damaged if scraped against the chassis lips.

Lift the rf plate upward a small distance, then tip upward the edge opposite the control cable bushing. Carefully maneuver the rf plate past the chassis lips and lift it free of the housing.

5.2.1.4 RF Card A1A1

Remove the rf card as follows:

a. At rf card (near C54 (figure 10, item 8)), unsolder bus wire going to relay K29 (figure 10, item 12).
b. To prevent damage to circuit card, cut short length of bus wire from circuit card to relay K22 (figure 10, item 2).

Note

After removal of the circuit card, unsolder the cut wire ends from the circuit board and the relay. Use a new piece of #12 AWG bus wire the same length as the original piece when reinstalling the circuit card.

c. At rf card, unsolder bus wire going to C54 (figure 10, item 8).
d. Remove screw from top of C55 (figure 10, item 49) to disconnect solder lug from bus to C55.
e. Remove three screws and washers securing edge of circuit card (opposite relays K24 through K28) to standoff posts.
f. Remove control A1A2. (Refer to paragraph 5.2.1.2.)

Caution

In performing the following step, do not permit the rf plate to rest on inductors on relays.

g. Turn rf plate over and remove nine screws, lockwashers, and flat washers that secure standoff posts (to which rf card A1A1 is mounted) to rf plate.
h. Carefully lift rf card and disconnect four ribbon cables from bottom side of card.
i. Lift rf card away from rf plate.

5.2.1.5 Plate-Mounted Components

Remove rf plate A1 from the chassis. (Refer to paragraph 5.2.1.3.) Remove rf card A1A1 from rf plate. (Refer to paragraph 5.2.1.4.) With the rf card removed, the plate-mounted components are directly accessible for disassembly. Tag, or otherwise identify, all connections to components to be removed. Note lead dress and strap placement.

5.2.2 Reassembly

5.2.2.1 Plate-Mounted Components

Reassemble components removed in paragraph 5.2.1.5 in proper position on rf plate. Secure components to rf plate with hardware removed during disassembly.

Caution

During reassembly, make sure all solder connections in the rf path are smooth. Any sharp edges or points in the rf path may cause arcing.

Refer to identification and notes made during disassembly and reconnect components.

5.2.2.2 RF Card A1A1

Install the rf card as follows:

a. On bottom of circuit card, connect four ribbon connectors.

Caution

In performing the following step, do not permit the rf plate to rest on inductors or relays.

b. Position circuit card in place on rf plate. Turn rf plate over and replace nine flat washers, lockwashers, and screws that secure standoff posts (to which circuit card is mounted) to rf plate.
c. Replace control A1A2. (Refer to paragraph 5.2.2.4.)
d. Replace three screws and washers securing edge of circuit card (opposite relays K24 through K28) to standoff posts.
e. Position solder lug in place on C55 (figure 10, item 49) and replace screw securing lug to capacitor.
f. At rf card, resolder bus wire going to C54 (figure 10, item 8).
g. Using #12 AWG bus wire, replace and solder wire (removed in step 5.2.1.4.b) between circuit card and relay K22 (figure 10, item 2).
h. At rf card (near C54 (figure 10, item 8)), resolder bus wire going to K29 (figure 10, item 12).

5.2.2.3 RF Plate A1

Caution

Use care in installing the rf plate in the chassis. Relays and inductors near the plate edge may be damaged if scraped against the chassis lips.

Starting with the rf input connector-edge of the rf plate tipped downward, carefully maneuver the rf plate into place on the chassis lips.

Replace the four screws securing the rf input connector to the chassis. Replace five of the six screws and washers securing the rf plate to the chassis lips. Do not yet install the (sixth) screw and washer in the chassis corner nearest the control cable connector, A1A2TB1.

If control A1A2 is installed, refer to paragraph 2.3.2.1 and install the control cable. Attach the control cable shield wire to the rf plate with the sixth screw and washer used to secure the rf plate to the chassis lips.

5.2.2.4 Control A1A2

Reconnect the ribbon cable connectors to the card. Position the card in place on the rf plate standoff posts. Install six nuts and washers to secure the card to the posts. Refer to paragraph 2.3.2.1 and install the control cable.

5.2.2.5 Cover

Place the cover in position on the chassis and secure to the chassis with the six screws and washers removed in paragraph 5.2.1.1.

5.3 Test Equipment

Table 3 lists the test equipment required to perform the test procedures.

5.4 Test Setup

Connect the test equipment as follows before performing any of the test procedures except test number 4: Rf path relays, inductors, and capacitors. Test 4 does not require a transceiver; only a vector impedance meter is used.

a. Make sure the transceiver primary power switch is turned off.
b. Using the AC-2832, or similar control cable, connect the antenna coupler to the transceiver control interface connector. (Refer to figure 5.) The AC-3809 adapter must also be used if the transceiver is an HF-380 or KWM-380.
c. Using RG-58 coaxial cable with PL-259, or similar, connectors, connect the transceiver rf output connector to the antenna coupler rf input connector.
d. Using the specially fabricated cable shown in figure 7, connect the antenna coupler rf output connector and ground lug to a 50-ohm, 100-W rf dummy load.
e. Remove the top of the antenna coupler for access to test points.
f. Make sure the transceiver is not keyed by any means until instructed to do so in the test procedures.

5.5 Test Procedures

Note

Potentiometers A1A2P61 and A1A2R62 are adjusted during factory test and are not to be readjusted during maintenance shop repair.

Table 4 gives the test procedures. The procedures are written so individual tests can be performed separately. For each test, perform the steps in the PROCEDURES column. The NORMAL INDICATION column gives the expected results. If results are not as expected, perform the troubleshooting procedures given in the IF INDICATION IS ABNORMAL column.

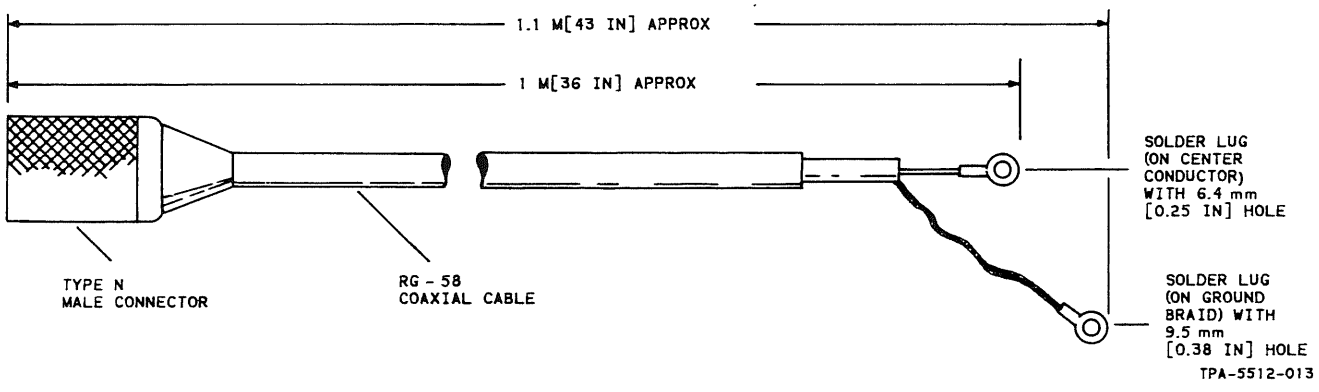
All reference designators in the table refer to the antenna coupler unless otherwise specified.

For test numbers 1 through 5, perform the test setup given in paragraph 5.4, then proceed to table 4. For test number 6, disconnect the antenna coupler from all equipment, remove the antenna coupler cover, then proceed to the test in the table.

Figures 13 through 15 are the interconnect and schematic diagrams of the antenna coupler. Use these as an aid in troubleshooting.

Table 3. Test Equipment Required.

ITEM	MINIMUM SPECIFICATIONS	REPRESENTATIVE TYPE
	Note Substituted equipment should be equivalent to or exceed listed specifications.	
Dc voltmeter	0 to 15 V dc, 10 kilohms/volt	Fluke 8600A
Rf dummy load	50 ohms, 100 W, 2 to 30 MHz	Bird 8164
Oscilloscope	1 V/div, vertical; 1 ms/div, horizontal	Tektronix 465
Vector impedance meter	10 to 1000 ohms, +90 to -90 degrees, 1.5 to 13 MHz	Hewlett-Packard 4815A
Transceiver	No substitute	Rockwell-Collins HF-282, HF-282V, HF-380, or KWM-380
Control cable	13-wire, shielded cable with type DBM-25P on one end and lugs on the other. Length as required (1 m (3 ft) suggested).	Rockwell-Collins AC-2832
Rf coaxial cable	RG-58 (length practical for shop use), type PL-259, or similar, connectors	Locally fabricate for shop use.
Special rf cable	Refer to figure 7.	Locally fabricate by figure 7 for shop use.
Relay switch box	Refer to figure 8.	Locally fabricate by figure 8 for shop use.



Fabrication Instructions for Special RF Cable, CU-380 RF Output to 50-Ohm RF Dummy Load
Figure 7

PARTS LIST

21 SPST TOGGLE SWITCHES
(CPN 266-5321-150)

2 BANANA JACKS
(CPN 372-2240-010)

457 mm (18 IN), NOMINAL
26-COND RIBBON CABLE
(CPN 424-0307-040)

457 mm (18 IN), NOMINAL
34-COND RIBBON CABLE
(CPN 424-0307-010)

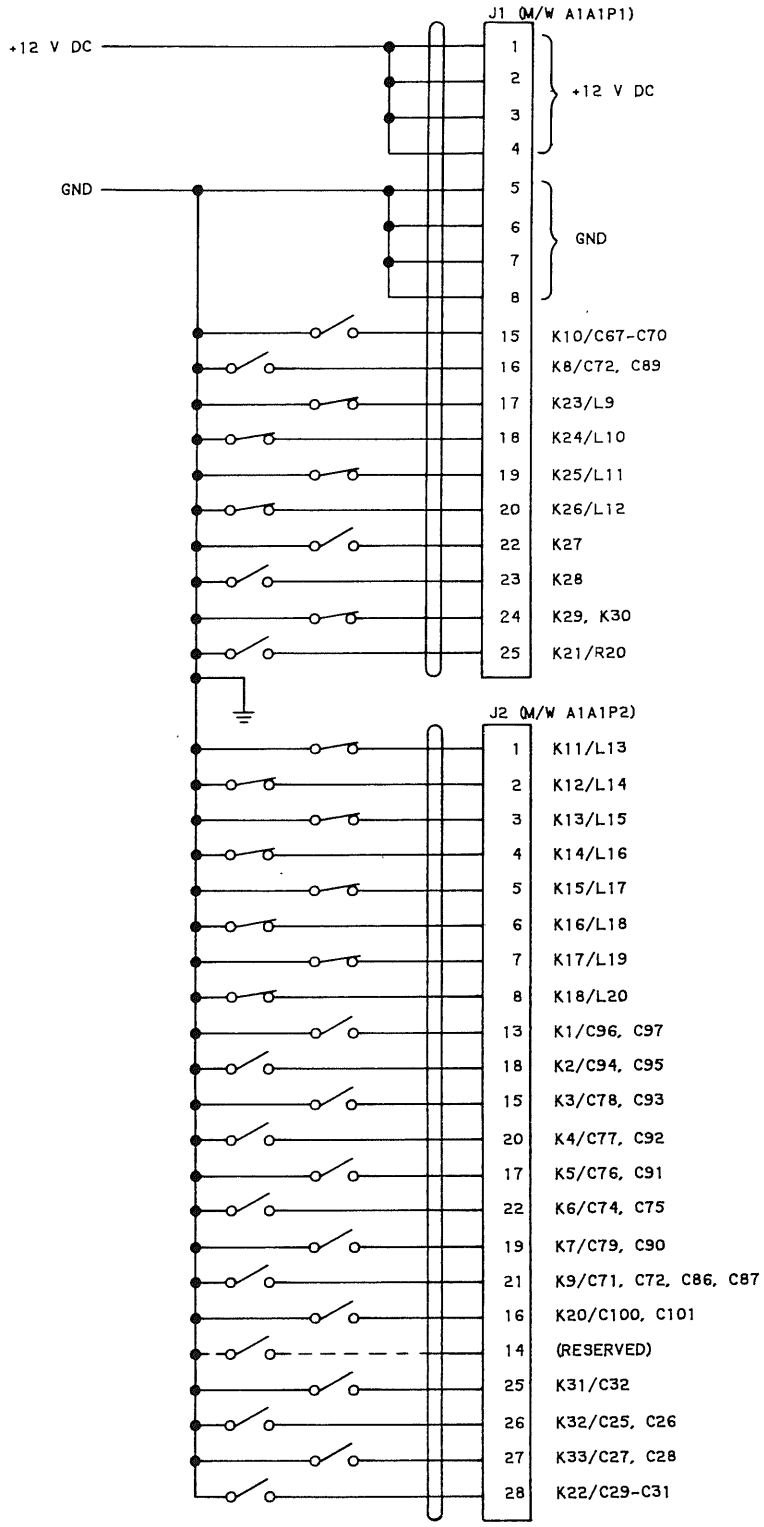
1 26-PIN RIBBON CONNECTOR
(CPN 372-2634-060)

1 34-PIN RIBBON CONNECTOR
(CPN 372-2634-070)

1 CHASSIS, SIZE AS DESIRED.

CONSTRUCTION NOTE

MOUNT SWITCHES SO THAT DOWN-POSITION OF TOGGLE GIVES SWITCH OPEN OR CLOSED STATE AS SHOWN ON SCHEMATIC.



Fabrication Diagram for Relay Switch Box
Figure 8

Table 4. CU-380 Antenna Coupler Testing and Troubleshooting.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Primary power	a. Turn on transceiver primary power switch.		
	b. Measure dc voltage between P4-2 (+) and chassis ground.	+13 ±1 V	Check control cable and connections to transceiver. (Check transceiver.)
	c. Measure dc voltage between P1-1, -2, -3, or -4 (+) and chassis ground.	+13 ±1 V	Check control A1A2.
	d. Measure dc voltage between P5-1 or -2 (+) and chassis ground.	+13 ±1 V	Check control A1A2.
	e. Measure dc voltage between P5-5 or -6 (+) and chassis ground.	+5 ±0.5 V	Check 5-V regulator on rf plate A1.
	f. If no further tests are to be performed, turn off transceiver primary power and disconnect equipment. Otherwise, go to next test.		
2. Transceiver control signals	a. Turn on transceiver primary power switch.		
	b. Connect dc voltmeter between P4-10 (+) and chassis ground.		
	c. Key transceiver and measure dc voltage while keyed.	0 ±0.5 V	Check control A1A2. (Check transceiver.)
	d. Unkey transceiver and remove dc voltmeter.		
	e. Connect oscilloscope vertical input between P4-11 (high) and chassis ground.		
	f. Change transceiver frequency while observing oscilloscope display.	Momentary negative-going pulse, 5-V (nom), 2 ±1 ms wide. (MHz-increment changes cause two pulses.)	Check control A1A2. (Check transceiver.)
	g. Disconnect oscilloscope P4-11 and connect it to P4-8.		
	h. Momentarily key transceiver while observing oscilloscope display.	Tune signal goes from +5 ±0.5 V (logic 1) before keying to +0.5 ±0.5 V (logic 0) while tuning.	Check control A2A1, rf plate A1, and rf card A1A2.
(Cont)	i. Disconnect oscilloscope from P4-8 and connect it to P4-12.		

Table 4. CU-380 Antenna Coupler Testing and Troubleshooting (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	***Note*** In performing steps j through l, the antenna coupler must be in the tun- mode. If tuning has been completed before the steps are performed or finished, change the transceiver frequency by 100 kHz or more and momentarily key it.		
	j. Momentarily key transceiver while observing oscilloscope display.	Tune pwr signal goes from +5 ±0.5 V (logic 1) before keying to +0.5 ±0.5 V (logic 0) while keyed. Width of logic 0 pulse varies with tune time.	Check control A1A2.
	k. Disconnect oscilloscope from P4-12 and connect it to P4-9.		
	l. Observe oscilloscope display while antenna coupler is tuning.	Xmt inh signal goes from +0.5 ±0.5 V (logic 0) to +5 ±0.5 V (logic 1) in random order as micro- processor commands rf output from transceiver. (Logic 1 corre- sponds to trans- ceiver sidetone output signal.)	Check control A1A2.
	m. With transceiver unkeyed, disconnect rf input from transceiver to antenna coupler.		
	n. Disconnect oscilloscope from P4-9 and connect it to P4-3.		
	o. Change transceiver frequency by 100 kHz or more.		
	p. Momentarily key transceiver while observing oscilloscope display.	Within 15 seconds after keying, tune fault signal goes from +5 ±0.5 V (logic 1) to +0.5 ±0.5 V (logic 0) for approximately 5 s. (Transceiver side- tone output is rapidly-beeping fault signal.)	
(Cont)			

Table 4. CU-380 Antenna Coupler Testing and Troubleshooting (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2. (Cont)	q. If no further tests are to be performed, turn off transceiver primary power and disconnect equipment. Otherwise, go to next test.		
3. Discriminator	a. Turn off transceiver primary power switch and disconnect rf connections to antenna coupler. Remove rf plate from antenna coupler case.		
	b. On rf card, A1A1, remove jumper wire installed adjacent to BNC connector next to (discriminator) shielded area.		
	c. Reconnect rf coax from transceiver to antenna coupler rf input. Connect 50-ohm rf dummy load to P5 through 50-ohm (RG-58) cable.		
	d. Turn on transceiver primary power.		
	e. Tune transceiver to frequencies listed below and measure voltage between chassis ground (-) and indicated pin of A1A1P1 (+) for each frequency. Key transceiver before measuring voltage and unkey before changing frequency. ***Note*** If transceiver does not tune to exact frequency listed, tune to closest frequency.	Voltages listed below are nominal.	For P1-10, check or adjust Z discriminator. For P1-11, check or adjust ∅ discriminator. For P1-12, check or adjust R discriminator. For P1-13, check or adjust forward power detector. For P1-14, check or adjust reflected power detector.
	f. Turn off transceiver primary power, remove coax cables to antenna coupler, and reconnect jumper removed in step b. Unless test 4 is to be performed next, replace rf plate in antenna coupler case.		
	g. If no further tests are to be performed, disconnect equipment. Otherwise, reconnect rf dummy load to antenna coupler rf output and go to next test.		

		Frequency, MHz			
		1.6	8.0	14.0	29.9
(Z loading)	P1-10	-203 mV	-202 mV	-188 mV	-114 mV
(Phasing)	P1-11	varies within -100 to +60 range			
(R loading)	P1-12	295 mV	924 mV	275 mV	204 mV
(Fwd pwr)	P1-13	860 mV	850 mV	820 mV	820 mV
(Refl pwr)	P1-14	54 mV	35 mV	21 mV	11 mV

Table 4. CU-380 Antenna Coupler Testing and Troubleshooting (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4. Rf path relays, inductors, and capacitors	a. Turn off transceiver primary and disconnect equipment setup. b. Remove rf plate and disconnect ribbon cable connectors from A1A1P1 and P2. c. Connect the locally fabricated relay switch box ribbon cable connectors to A1A1P1 and P2. d. Connect rf vector impedance meter to antenna coupler rf input connector. Disconnect any terminations from antenna coupler rf output connector. e. Apply 12 V dc to relay switch box power input terminals. f. Set relay switch box switches and rf vector impedance meter frequency as shown in the following list. After the test, turn off power, disconnect equipment and reassemble antenna coupler.	Impedance ohms and degrees as indicated in the following list. Impedance changes for each relay change.	Refer to schematic diagram and check components associated with selected relays. Check relay being switched for faulty operation if impedance does not change.

Table 4. CU-3380 Antenna Coupler Testing and Troubleshooting (Cont).

TEST	PROCEDURE																												NORMAL INDICATION		IF INDICATION IS ABNORMAL
	RELAY SWITCH BOX																												RF VECTOR IMPEDANCE METER		
TEST	K10	K8	K23	K24	K25	K26	K27	K28	K29	K21	K11	K12	K13	K14	K15	K16	K17	K18	K1	K2	K3	K4	K5	K6	K7	K9	K20	K31	K32	K33	K22	FREQ (MHz)	OHMS	DEGREES
INITIAL SETUP	O	O	X	X	X	X	O	O	X	O	X	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	13.0	82	+12
K11	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	85	+12
K12	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.0	88	+13
K13	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	86	+16
K14	-	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.0	88	+19
K15	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.0	98	+26
K16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	74	+29
K17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	71	+33
K18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	73	+37
K23	-	-	O	X	X	X	X	X	O	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	122	+55
K24	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	210	+65
K25	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	510	+70
K26	-	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	590	+74
STRAY C	-	-	-	-	-	X	O	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	740	-90
K20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	2.0	640	-90
K1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	O	-	-	-	-	2.0	590	-90
K2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	-	-	-	-	-	2.0	510	-90
K3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	-	-	-	-	2.0	400	-90
K4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	-	-	-	2.0	305	-90
K5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	-	-	2.0	200	-90
K6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	-	2.0	130	-90
K7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	-	-	-	-	2.0	80	-90
K8	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-	2.0	47	-89
K9	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	2.0	26	-88
K10	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	2.0	14	-86
INTERNAL R	O	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	100	-6
K31	-	-	-	-	-	-	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	2.0	490	-90
K32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	-	2.0	390	-90
K33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	-	2.0	290	-90
K22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	X	2.0	200	-90

SWITCH SETTINGS:
X = CLOSED
O = OPEN
- = NO CHANGE FROM PREVIOUS SETTING

TPA-5961-014

6. REPAIR

6.1 Electrostatic Discharge Sensitive Devices Precautions

A static charge is produced by friction between, and separation of, dissimilar materials. Potentials of 1 to 20 kilovolts are commonly generated on the human body or insulated surfaces. Voltages of this magnitude can produce both immediate and latent failure in electrostatic discharge sensitive (ESDS) devices.

Note

Dry weather (relative humidity less than 30 percent) multiplies the accumulation of static charges on a surface. In a low-humidity environment, the handling procedures specified are of greater importance and should be adhered to without exception.

6.1.1 Handling of ESDS Devices

Caution

Do not use gloves made of nylon or other synthetic material when handling ESDS devices. Excessive static can build up on this type of material. Handle ESDS devices by their case whenever possible. Avoid touching the leads or contacts even though grounded.

The transport of circuit board or module subassemblies containing ESDS devices requires that contact with exposed subassemblies be prevented. Conductive plastic bags, not clear polyvinyl, are well suited to this purpose. After the subassembly containing ESDS devices is installed in the top level unit, normal ESDS devices handling is adequate.

6.1.2 Testing of Subassemblies Containing ESDS Devices

Observe the following precautions when testing any subassembly containing ESDS devices.

a. Remove power from test fixtures of equipment before inserting/removing any ESDS device or subassembly containing an ESDS device.
b. Ensure all test equipment is well grounded.
c. Apply dc source power to ESDS device or subassembly containing an ESDS device before applying any signal voltages.
d. Remove signal voltages from ESDS device or subassembly containing an ESDS device before removing dc source power.
e. Dielectric strength or insulation resistance checks are not recommended for any ESDS device or subassembly containing an ESDS device.

6.2 Postcoating

6.2.1 General

The control and rf cards are coated with postcoating material upon completion of manufacture to protect them from damage and humidity. This material is HumiSeal 1B31. The coating must be removed from both sides of the circuit card in the area to be repaired. To restore protection from humidity, repostcoat the circuit card as specified in paragraph 6.3.2.

6.2.2 HumiSeal 1B31 Removal

Use small brush or pipe cleaner and apply solvent (Freon TMC or equivalent) to remove the HumiSeal 1B31 postcoating from the component lead and mounting pad on both sides of the circuit card.

6.2.3 HumiSeal 1B31 Replacement

a. After component removal and replacement, apply solvent to resoldered areas on both sides of circuit card. Allow card to air dry 4 hours at room temperature or bake it for 20 minutes at 71 °C (160 °F) before applying postcoating. This prevents bubbles from occurring in newly applied postcoating.

Warning

Postcoating should be performed only in a well-ventilated area.

b. Use small brush and apply HumiSeal 1B31 liberally (but not excessively) to replaced component and both sides of circuit card (mounting pads, holes, and adjacent areas of board). Ensure that coverage is complete and new coating overlays existing coating on adjacent areas of board.

Note

HumiSeal 1B31 is runny when first applied and somewhat soft when hot. Be careful not to damage postcoating during the drying or cool-down period.

c. If only a small area of the circuit card has been repostcoated, air dry for 4 hours at room temperature. If entire circuit card has been repostcoated, bake it for 45 minutes at 80 to 100 °C (176 to 212 °F).

7. PARTS LIST/DIAGRAMS

7.1 Group Assembly Parts List

7.1.1 Introduction

7.1.1.1 General

The purpose of this parts list is for identification and requisition of parts.

Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

7.1.1.2 Group Assembly Parts List

FIG - ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers assigned in sequence to correspond with item numbers on the illustrations.

PART NO Column — Listed are MIL standard, vendor, or Collins part numbers. Collins part numbering system consists of 10 digits as follows: a 3-digit family number, a 4-digit serial number, and a 3-digit dash number.

INDENT Column — Items are coded 1, 2, 3, etc, to indicate the relationship to the next higher assembly.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, federal manufacturer's code, reference designation, attaching part (AP), reference to other figures, and effectivities.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by the following methods: MCN (Manufacturer Control Number) 101 and up; CI (Configuration Identifier) 5-digit number; REV (Revision Identifier) dash (-) denotes original, letter A first change, letter B second change, etc. One of the above identifiers is listed on each chassis and/or replaceable assembly. Service Bulletins are identified by SB 1, SB 2, etc.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

UNITS PER ASSY Column — Quantities specified are per item number. Letters AR denote the selection of parts as required. Letters RF refer to an assembly completely assembled on a preceding figure and illustration.

7.1.1.3 Numerical Index

PART NUMBER Column — Part numbers are listed in alphanumeric sequence.

FIG - ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers.

TTL REQ Column — Listed is the total quantity of parts or assemblies covered in the Group Assembly Parts List.

7.1.1.4 Reference Designation Index

REFERENCE DESIGNATION Column — Reference designations are listed in alphanumeric sequence.

FIG - ITEM Column — Digits preceding the dash refer to figure numbers. Digits following the dash are item numbers.

PART NUMBER Column — Part numbers listed are for items that have reference designations assigned.

7.1.1.5 How To Use This Parts List

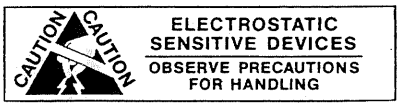
To locate a part number if the assembly in which the part is used is known, find the figure for the assembly in which the part is used. Locate the part and its index number on the illustration and find the index number on the Group Assembly Parts List page to determine its description and part number.

To locate the illustration for a part if the part number is known, refer to the Numerical Index and find the part number. Turn to the Group Assembly Parts List and find the first figure and index number indicated in the Numerical Index for that part. If this figure shows the part in a section or system of the equipment other than the one desired, refer to the other figure numbers listed in the Numerical Index.

To locate the illustration for a part if the reference designation is known, refer to the Reference Designation Index and find the symbol; turn to the Group Assembly Parts List and find the figure and index number indicated in the index.

7.1.1.6 Electrostatic Sensitive Devices

This equipment contains electrostatic devices (ESDS). Special handling methods and materials must be utilized to prevent equipment damage. Refer to the testing/troubleshooting paragraph for this equipment before assembly/disassembly or repair is performed.



7.1.1.7 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
02660	BUNKER RAMO CORP AMPHENOL NORTH AMERICA DIV 2801 S 25TH AVE BROADVIEW IL 60153
05690	BARKER AND WILLIAMSON INC 10 CANAL ST BRISTOL PA 19007
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
21052	HIGH ENERGY CORP LOWER VALLEY RD PARKESBURG PA 19305
25184	PRECISION RUBBER PRODUCTS CORP HARTMAN DRIVE LEBANON TN 37087
28478	DELTROL CONTROLS DIV DELTROL CORP 2745 S 19TH ST MILWAUKEE WI 53215
59730	THOMAS AND BETTS CORP HWY 218 S IOWA CITY IA 52240
79807	WROUGHT WASHER MFG INC 2100 S BAY ST MILWAUKEE WI 53207
81349	MILITARY SPECIFICATIONS
83330	SMITH HERMAN H INC 812 SNEDIKER AVE BROOKLYN NY 11207
88044	AERONAUTICAL STANDARD
91886	MICRODOT MANUFACTURING INC MALCO MFG DIV 12 PROGRESS DR MONTGOMERYVILLE PA 18936
96906	MILITARY STANDARD
71400	MCGRAW-EDISON CO BUSSMANN MFG DIV 502 EARTH CITY PLAZA P O BOX 14460 ST LOUIS MO 63178
73905	ITT JENNINGS 970 MC LAUGHLIN AVE SAN JOSE CA 95116
77147	PATTON-MACGUYER CO DIV OF AVID CORP 17 VIRGINIA AVE PROVIDENCE RI 02905
77250	ALLIED PRODUCTS CORP PHEOLL MFG CO DIV 5700 W ROOSEVELT RD CHICAGO IL 60650

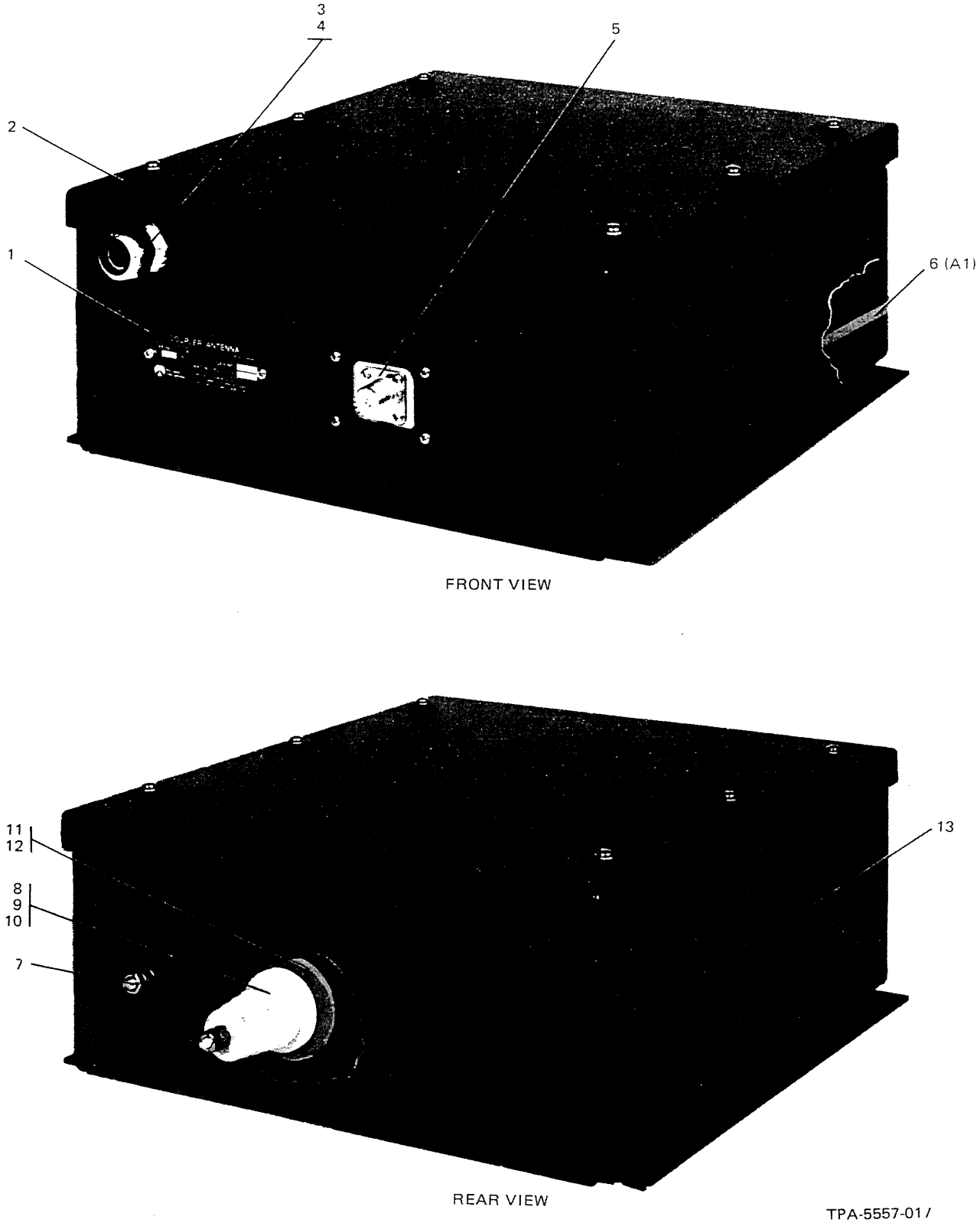
7.1.1.8 Reference Designation Prefixes

PREFIX	UNIT PART NUMBER	FIG-ITEM
A1	651-4323-001	2

7.1.1.9 Configuration Identifiers

CI/ REV LTR	UNIT PART NUMBER	FIG-ITEM
E	622-3573-001	9
B	651-4323-001	10

7.1.2 Group Assembly Parts List

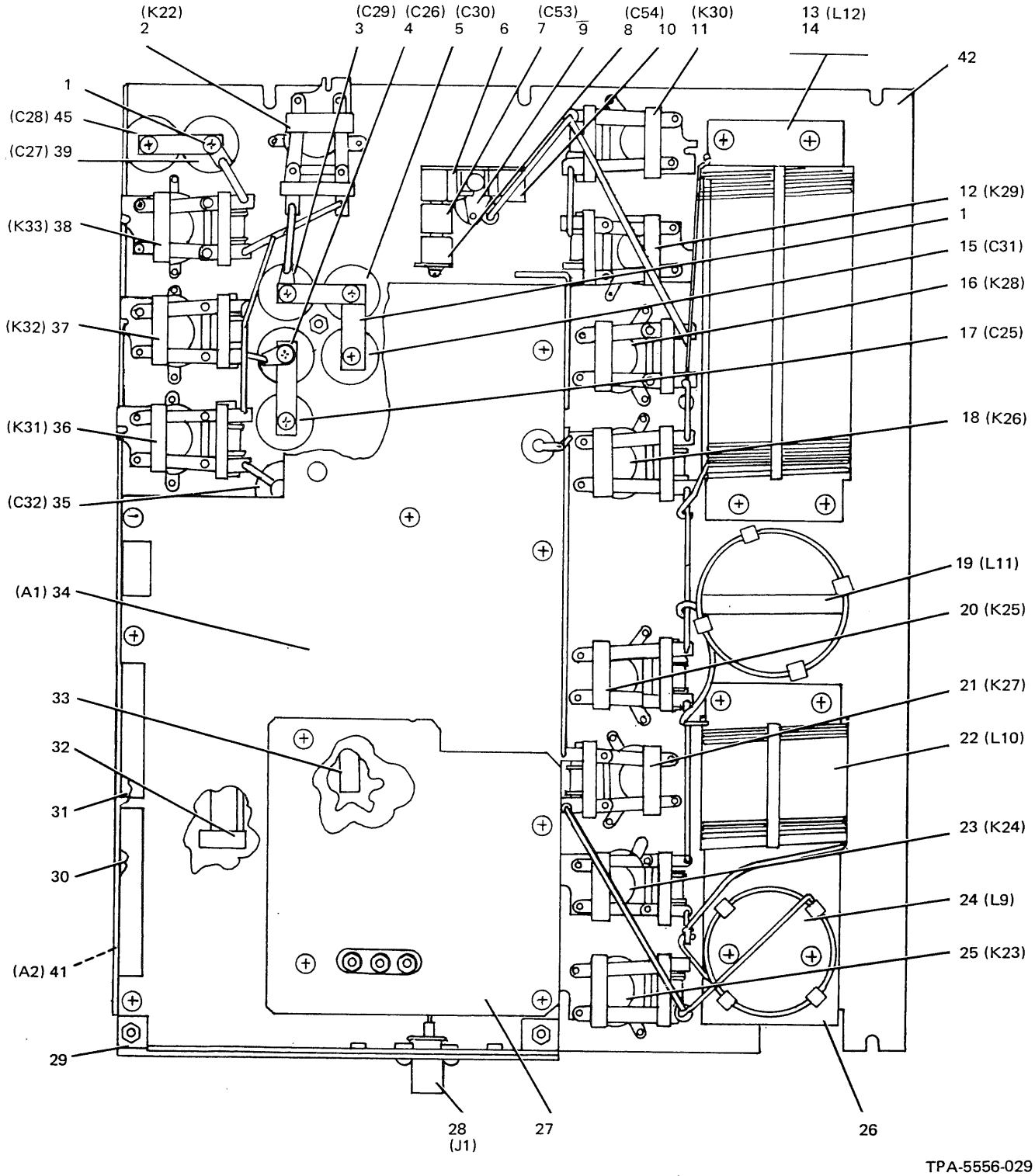


CU-380 Antenna Coupler
Figure 9

GROUP ASSEMBLY PARTS LIST

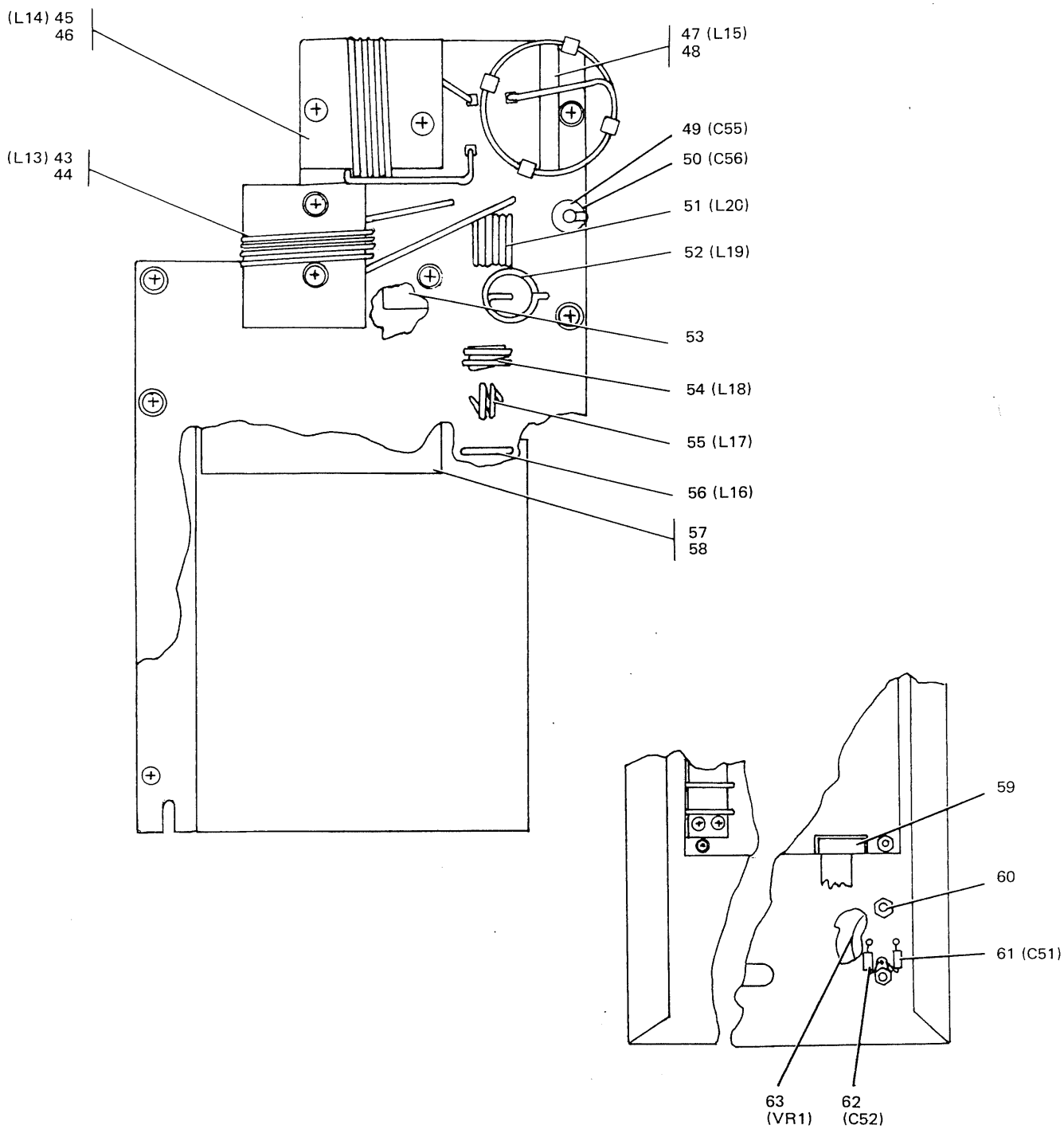
FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
9-	622-3573-001	1	COUPLER, ANTENNA-CU 380	1	
1	642-0082-000	2	PLATE,IDENT	1	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	2	
2	651-4363-001	2	COVER	1	
	110-8	2	WASHER,SEALING CD PL STL, 0.234 ID X 0.364 OD (25184) 310-0442-000 (AP)	6	
	MS51957-46	2	SCREW,MACHINE SST, 8-32 X 5/8 (96906) 343-0190-000 (AP)	6	
3	141	2	LOCKNUT,ELEC CN (59730) 019-0098-000	1	
4	2522	2	CONNECTOR, PLUG ELEC (59730) 019-0747-000	1	
5	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000	4	
6	651-4323-001	2	PLATE,RF A1 (SEE FIG 2)	1	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	6	
	MS51957-28	2	SCREW,MACH SST, 6-32 X 3/8 (96906) 343-0169-000 (AP)	6	
7	P343-0368-000	2	SCREW,MACH NP BRS, 1/4-20 X 3/4 (77250) 343-0368-000	1	
	P313-0148-000	2	NUT,PLAIN,HEX NP BRS, 1/4-20 (77250) 313-0148-000 (AP)	2	
	MS35338-101	2	WASHER,SPRING CD PL BRZ, 0.255 ID X 0.489 OD (96906) 310-0102-000 (AP)	2	
8	9548	2	INSULATOR,FEEDT (83330) 190-0266-000	1	
	P313-0056-000	2	NUT,PLAIN,HEX NP BRS, 10-32 (77250) 313-0056-000 (AP)	1	
	MS35338-100	2	WASHER,SPRING CD PL BRZ, 0.194 ID X 0.334 OD (96906) 310-0100-000 (AP)	1	
	AN961-10T	2	WASHER,FLAT TP BRS, 0.203 ID X 0.438 OD (88044) 310-0751-020 (AP)	2	
9	652-0669-002	2	GASKET	1	
10	652-0669-001	2	GASKET	1	
11	651-4526-001	2	PLATE,NON-TURN	1	
12	651-4369-001	2	CONTACT,ELECTRICAL	1	
13	651-4331-001	2	CASE,PRESSED	1	

GROUP ASSEMBLY PARTS LIST



RF Plate A1
Figure 10 (Sheet 1 of 2)

GROUP ASSEMBLY PARTS LIST



RF Plate A1
Figure 10 (Sheet 2)

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
10-	651-4323-001	1	RF PLATE A1 [SEE FIG 1-6 FOR NHA]	REF	
1	651-4420-001	2	LEAD,ELECTRICAL	4	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	4007-6HT	2	TERMINAL,LUG (77147) 304-0016-000 (AP)	4	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
2	21702-71	2	RELAY,ARMATURE (28478) 970-0500-020 A1K22	1	
3	J1HT50UJ101J502	2	CAPACITOR,FIXED CER DIEL, 100PF, 5%, 5000V (73905) 913-0833-000 A1C29	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
4	J1HT50CG500J502	2	CAPACITOR,FIXED CER DIEL, 50PF, 5%, 5000V (73905) 913-0834-000 A1C26	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
5	J1HT50UJ101J502	2	CAPACITOR,FIXED CER DIEL, 100PF, 5%, 5000V (73905) 913-0833-000 A1C30	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
6	651-4368-001	2	BLOCK,INSULATOR	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	2	
7	HT54T109DK	2	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V (21052) 913-0756-000 A1C53	1	
8	HT54T109DK	2	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V (21052) 913-0756-000 A1C54	1	
	4040-2HT	2	TERMINAL,LUG (77147) 304-0014-000 (AP)	2	
	MS15795-802	2	WASHER,FLAT CRES, 0.094ID X 0.250 OD (96906) 310-0779-020 (AP)	1	
	P312-0222-000	2	STUD,CONT THD BRS, 2-56 X 3/16 (77250) 312-0222-000 (AP)	1	
	310-0070-000	2	WASHER,LOCK SST, 0.097 ID X 0.165 OD (79807) (AP)	3	
	MS51957-5	2	SCREW,MACH SST, 2-56 X 3/8 (96906) 343-0126-000 (AP)	1	
	MS51957-2	2	SCREW,MACH SST, 2-56 X 3/16 (96906) 343-0123-000 (AP)	1	
9	5960-07	2	CLIP,ELEC (71400) 265-1005-000	1	
	MS35338-138	2	WASHER,LOCK SST, 0.194 ID X 0.334 OD (96906) 310-0284-000 (AP)	1	
	MS51958-60	2	SCREW,MACH SST, 10-32 X 5/16 (96906) 343-0225-000 (AP)	1	
10	2115	2	TERMINAL,LUG (91886) 304-1466-010	2	
11	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K30	1	
12	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K29	1	
13	3027-3907-1	2	INDUCTOR (05690) 980-0150-010 A1L13	1	
14	651-4410-001	2	SUPPORT,COIL	1	
	500-8928-001	2	POST (AP)	4	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	4	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	8	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	8	
15	J1HT50UJ800J502	2	CAPACITOR,FIXED CER DIEL, 80PF, 5%, 5000V (73905) 913-0848-000 A1C31	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
16	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K28	1	
17	J1HT50CG400J502	2	CAPACITOR,FIXED CER DIEL, 40PF, 5%, 5000V (73905) 913-0836-000 A1C25	1	

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
10-	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
18	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K26	1	
19	3027-3907-1	2	INDUCTOR (05690) 980-0150-010 A1L11	1	
20	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K25	1	
21	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K27	1	
22	3027-3907-1	2	INDUCTOR (05690) 980-0150-010 A1L10	1	
23	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K24	1	
24	3027-3907-1	2	INDUCTOR (05690) 980-0150-010 A1L9	1	
25	21702-70	2	RELAY,ARMATURE (28478) 970-0500-010 A1K23	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	12	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	12	
26	651-4411-001	2	SUPPORT,COIL	1	
	500-8928-001	2	POST,HEX (AP)	4	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	8	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	4	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	4	
27	651-3868-001	2	PLATE,SHIELD	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	8	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	4	
27	540-9209-000	2	POST HEX	4	
	P312-0075-000	2	STUD,CONT THD STL, 8-32 X 1/2 (77250) 312-0075-000 (AP)	3	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	5	
28	83-798	2	CONNECTOR,RCPT ELEC (02660) 357-9005-000 A1J1	1	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	4	
29	651-4367-001	2	BRACKET,CONNECTOR	1	
	MS15795-803	2	WASHER,FLAT CRES, 0.125ID X 0.250 OD (96906) 310-0779-030 (AP)	2	
	MS51957-14	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0134-000 (AP)	2	
30	651-4324-002	2	ASSEMBLY,CABLE-NO 2	1	
31	651-4324-001	2	ASSEMBLY,CABLE-NO 1	1	
32	651-3550-001	2	ASSEMBLY,CABLE-NO 3	1	
33	651-3851-001	2	ASSEMBLY,CABLE-NO 4	1	
34	646-5871-001	2	CARD, RF A1A1	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	20	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	9	
	540-9225-003	2	POST,HEX (AP)	12	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	20	
35	J1HT50CG500J502	2	CAPACITOR,FIXED CER DIEL, 50PF, 5%, 5000V (73905) 913-0834-000 A1C32	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
36	21702-71	2	RELAY,ARMATURE (28478) 970-0500-020 A1K31	1	
37	21702-71	2	RELAY,ARMATURE (28478) 970-0500-020 A1K32	1	
38	21702-71	2	RELAY,ARMATURE (28478) 970-0500-020 A1K33	1	
39	J1HT50UJ800J502	2	CAPACITOR,FIXED CER DIEL, 80PF, 5%, 5000V (73905) 913-0848-000 A1C27	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
40	J1HT50UJ800J502	2	CAPACITOR,FIXED CER DIEL, 80PF, 5%, 5000V (73905) 913-0848-000 A1C28	1	

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
10-	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-26	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0167-000 (AP)	2	
41	646-5867-001	2	CARD,CONTROL A1A2	1	
	P313-0132-000	2	NUT,PLAIN,HEX SST, 4-40 (77250) 313-0132-000 (AP)	6	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	12	
	MS15795-803	2	WASHER,FLAT CRES, 0.125ID X 0.250 OD (96906) 310-0779-030 (AP)	6	
	540-9162-003	2	POST,ELEC-MECH (AP)	6	
	MS51957-18	2	SCREW,MACH STL, 4-40 X 5/8 (96906) 343-0138-000 (AP)	5	
42	651-4379-001	2	PLATE,RELAY	1	
43	3022	2	INDUCTOR (05690) 980-0150-030 A1L13	1	
44	651-3836-001	2	SUPPORT,COIL	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	2	
45	3022	2	INDUCTOR (05690) 980-0150-030 A1L14	1	
46	651-3854-001	2	SUPPORT,COIL	2	
	500-8926-001	2	POST (AP)	4	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	8	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	8	
	MS51957-30	2	SCREW,MACH SST, 6-32 X 1/2 (96906) 343-0171-000 (AP)	4	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	4	
47	3022	2	INDUCTOR (05690) 980-0150-030 A1L15	1	
48	651-3854-001	2	SUPPORT,COIL	1	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS15795-805	2	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP)	2	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	2	
49	HT54T109DK	2	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V (21052) 913-0756-000 A1C55	1	
50	HT54T109DK	2	CAPACITOR,FXD CER DIEL, 1PF, PORM 0.5PF, 500V (21052) 913-0756-000 A1C56	1	
	4040-2HT	2	TERMINAL,LUG (77147) 304-0014-000 (AP)	1	
	310-0070-000	2	WASHER,LOCK SST, 0.097 ID X 0.165 OD (79807) (AP)	3	
	MS15795-802	2	WASHER,FLAT CRES, 0.094ID X 0.250 OD (96906) 310-0779-020 (AP)	1	
	P312-0222-000	2	STUD,CONT THD BRS, 2-56 X 3/16 (77250) 312-0222-000 (AP)	1	
	MS51957-2	2	SCREW,MACH SST, 2-56 X 3/16 (96906) 343-0123-000 (AP)	2	
51	651-3846-001	2	COIL A1L20	1	
52	651-3845-001	2	COIL A1L19	1	
53	651-3867-003	2	PAD,RUBBER	1	
54	651-3844-001	2	COIL A1L18	1	
55	651-3843-001	2	COIL A1L17	1	
56	651-3842-001	2	COIL A1L16	1	
57	651-3867-001	2	PAD,RUBBER	1	
58	651-3867-002	2	PAD,RUBBER	1	
59	651-3852-001	2	ASSEMBLY,CABLE-NO 5	1	
60	MS77068-2	2	TERMINAL,LUG (96906) 304-3120-010	1	
	P313-0045-000	2	NUT,PLAIN,HEX SST, 6-32 (77250) 313-0045-000 (AP)	2	
	MS35338-136	2	WASHER,LOCK SST, 0.141 ID X 0.250 OD (96906) 310-0282-000 (AP)	2	
	MS51957-29	2	SCREW,MACH SST, 6-32 X 7/16 (96906) 343-0170-000 (AP)	2	
61	CK06BX104K	2	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 100VDC (81349) 913-5019-440 A1C51	1	
62	CK06BX684K	2	CAPACITOR,FIXED CER DIEL, 0.68UF, 10%, 50VDC (81349) 913-5019-540 A1C52	1	
63	UA78H05SC	2	INTEGRATED CIRCUIT VOLTAGE REGULATOR (ESDS) (07263) 351-1342-010 A1VR1	1	

7.1.3 Numerical Index

PART NUMBER	FIG-ITEM	TTL REQ
AN961-10T	9-8	2
CK06BX104K	10-61	1
CK06BX684K	10-62	1
HT54T109DK	10-7	
	10-8	
	10-49	
	10-50	4
J1HT50CG400J502	10-17	1
J1HT50CG500J502	10-4	
	10-35	2
J1HT50UJ101J502	10-3	
	10-5	2
J1HT50UJ800J502	10-15	
	10-39	
	10-40	3
MS15795-802	10-8	
	10-50	2
MS15795-803	10-29	
	10-41	8
MS15795-805	9-6	
	10-14	
	10-26	
	10-27	
	10-34	
	10-46	
	10-48	37
MS35338-100	9-8	1
MS35338-101	9-7	2
MS35338-135	10-41	12
MS35338-136	10-1	
	10-3	
	10-4	
	10-5	
	10-6	
	10-14	
	10-15	
	10-17	
	10-25	
	10-26	
	10-27	
	10-34	
	10-35	
	10-39	
	10-40	
	10-44	
	10-46	
	10-48	
	10-60	90
MS35338-138	10-9	1
MS51957-14	9-1	
	9-5	
	10-28	
	10-29	12
MS51957-18	10-41	5
MS51957-2	10-8	
	10-50	3
MS51957-26	10-1	
	10-3	
	10-4	
	10-5	
	10-15	
	10-17	
	10-27	
	10-35	
	10-39	
	10-40	23
MS51957-28	9-6	6
MS51957-29	10-6	
	10-14	
	10-25	
	10-26	
	10-34	
	10-44	
	10-46	
	10-48	
	10-60	56
MS51957-30	10-46	4
MS51957-46	9-2	6
MS51957-5	10-8	1
MS51958-60	10-9	1
MS77068-2	10-60	1
P312-0075-000	10-27	3
P312-0222-000	10-8	
	10-50	2
P313-0045-000	10-60	2
P313-0056-000	9-8	1
P313-0132-000	10-41	6
P313-0148-000	9-7	2
P343-0368-000	9-7	1
UA78H05SC	10-63	1
019-0098-000	9-3	1
019-0747-000	9-4	1
110-8	9-2	6
141	9-3	1
190-0266-000	9-8	1
2115	10-10	2
21702-70	10-11	
	10-12	
	10-16	
	10-18	
	10-20	
	10-21	
	10-23	
	10-25	8
21702-71	10-2	
	10-36	
	10-37	
	10-38	4
2522	9-4	1
265-1005-000	10-9	1
3022	10-43	
	10-45	

NUMERICAL INDEX

PART NUMBER	FIG-ITEM	TTL REQ
3022	10-47	3
3027-3907-1	10-13	
	10-19	
	10-22	
	10-24	4
304-0014-000	10-8	
	10-50	3
304-0016-000	10-1	4
304-1466-010	10-10	2
304-3120-010	10-60	1
310-0070-000	10-8	
	10-50	6
310-0100-000	9-8	1
310-0102-000	9-7	2
310-0279-000	10-41	12
310-0282-000	10-1	
	10-3	
	10-4	
	10-5	
	10-6	
	10-14	
	10-15	
	10-17	
	10-25	
	10-26	
	10-27	
	10-34	
	10-35	
	10-39	
	10-40	
	10-44	
	10-46	
	10-48	
	10-60	90
310-0284-000	10-9	1
310-0442-000	9-2	6
310-0751-020	9-8	2
310-0779-020	10-8	
	10-50	2
310-0779-030	10-29	
	10-41	8
310-0779-050	9-6	
	10-14	
	10-26	
	10-27	
	10-34	
	10-46	
	10-48	37
312-0075-000	10-27	3
312-0222-000	10-8	
	10-50	2
313-0045-000	10-60	2
313-0056-000	9-8	1
313-0132-000	10-41	6
313-0148-000	9-7	2
343-0123-000	10-8	
	10-50	3
343-0126-000	10-8	1
343-0134-000	9-1	
	9-5	
	10-28	
	10-29	12
343-0138-000	10-41	5
343-0167-000	10-1	
	10-3	
	10-4	
	10-5	
	10-15	
	10-17	
	10-27	
	10-35	
	10-39	
	10-40	23
343-0169-000	9-6	6
343-0170-000	10-6	
	10-14	
	10-25	
	10-26	
	10-34	
	10-44	
	10-46	
	10-48	
	10-60	56
343-0171-000	10-46	4
343-0190-000	9-2	6
343-0225-000	10-9	1
343-0368-000	9-7	1
351-1342-010	10-63	1
357-9005-000	10-28	1
4007-6HT	10-1	4
4040-2HT	10-8	
	10-50	3
500-8926-001	10-46	4
500-8928-001	10-14	
	10-26	8
540-9162-003	10-41	6
540-9209-000	10-27	4
540-9225-003	10-34	12
5960-07	10-9	1
622-3573-001	9-	1
642-0082-000	9-1	1
646-5867-001	10-41	1
646-5871-001	10-34	1
651-3550-001	10-32	1
651-3836-001	10-44	1
651-3842-001	10-56	1
651-3843-001	10-55	1
651-3844-001	10-54	1
651-3845-001	10-52	1
651-3846-001	10-51	1
651-3851-001	10-33	1
651-3852-001	10-59	1
651-3854-001	10-46	
	10-48	3
651-3867-001	10-57	1
651-3867-002	10-58	1
651-3867-003	10-53	1
651-3868-001	10-27	1
651-4323-001	9-6	1
	10-	REF
651-4324-001	10-31	1
651-4324-002	10-30	1
651-4331-001	9-13	1
651-4363-001	9-2	1
651-4367-001	10-29	1
651-4368-001	10-6	1

NUMERICAL INDEX

PART NUMBER	FIG-ITEM	TTL REQ	PART NUMBER	FIG-ITEM	TTL REQ
651-4369-001	9-12	1			
651-4379-001	10-42	1			
651-4410-001	10-14	1			
651-4411-001	10-26	1			
651-4420-001	10-1	4			
651-4526-001	9-11	1			
652-0669-001	9-10	1			
652-0669-002	9-9	1			
83-798	10-28	1			
913-0756-000	10-7				
	10-8				
	10-49				
	10-50	4			
913-0833-000	10-3				
	10-5	2			
913-0834-000	10-4				
	10-35	2			
913-0836-000	10-17	1			
913-0848-000	10-15				
	10-39				
	10-40	3			
913-5019-440	10-61	1			
913-5019-540	10-62	1			
9548	9-8	1			
970-0500-010	10-11				
	10-12				
	10-16				
	10-18				
	10-20				
	10-21				
	10-23				
	10-25	8			
970-0500-020	10-2				
	10-36				
	10-37				
	10-38	4			
980-0150-010	10-13				
	10-19				
	10-22				
	10-24	4			
980-0150-030	10-43				
	10-45				
	10-47	3			

7.1.4 Reference Designation Index

REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER	REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER
A1	9-6	651-4323-001			
A1	10-	651-4323-001			
A1A1	10-34	646-5871-001			
A1A2	10-41	646-5867-001			
A1C25	10-17	J1HT50CG400J502			
A1C26	10-4	J1HT50CG500J502			
A1C27	10-39	J1HT50UJ800J502			
A1C28	10-40	J1HT50UJ800J502			
A1C29	10-3	J1HT50UJ101J502			
A1C30	10-5	J1HT50UJ101J502			
A1C31	10-15	J1HT50UJ800J502			
A1C32	10-35	J1HT50CG500J502			
A1C51	10-61	CK06BX104K			
A1C52	10-62	CK06BX684K			
A1C53	10-7	HT54T109DK			
A1C54	10-8	HT54T109DK			
A1C55	10-49	HT54T109DK			
A1C56	10-50	HT54T109DK			
A1J1	10-28	83-798			
A1K22	10-2	21702-71			
A1K23	10-25	21702-70			
A1K24	10-23	21702-70			
A1K25	10-20	21702-70			
A1K26	10-18	21702-70			
A1K27	10-21	21702-70			
A1K28	10-16	21702-70			
A1K29	10-12	21702-70			
A1K30	10-11	21702-70			
A1K31	10-36	21702-71			
A1K32	10-37	21702-71			
A1K33	10-38	21702-71			
A1L10	10-22	3027-3907-1			
A1L11	10-19	3027-3907-1			
A1L13	10-13	3027-3907-1			
A1L13	10-43	3022			
A1L14	10-45	3022			
A1L15	10-47	3022			
A1L16	10-56	651-3842-001			
A1L17	10-55	651-3843-001			
A1L18	10-54	651-3844-001			
A1L19	10-52	651-3845-001			
A1L20	10-51	651-3846-001			
A1L9	10-24	3027-3907-1			
A1VR1	10-63	UA78H05SC			

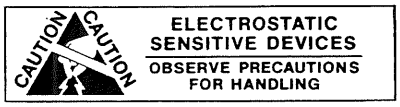
7.2 Padmaster Parts List

7.2.1 Introduction

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the testing/troubleshooting paragraph for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All parts list illustrations containing ESDS items are shown with the following symbol:



This paragraph assists in identification and requisition of parts. A parts location illustration, schematic diagram, parts list tabulation, and modification history are included. The parts location illustration is a design engineering drawing that shows exact component placement on the circuit cards.

Use the reference designator indicated on the schematic and parts location diagram to locate parts in the parts list tabulation. The description, Collins part number, usable on code, manufacturer's code and manufacturer's part number are listed for each reference designator.

7.2.2 Parts List

REF DES Column — Reference designators of each part/subassembly are listed in alphanumeric sequence. These are the reference designators shown on the parts location drawing and schematic diagram.

DESCRIPTION Column — Lists the noun name, modifier, descriptive information, and modification.

Modifications are identified by an alphanumeric identifier assigned to each design change. These identifiers are referenced in the DESCRIPTION column of the parts list in parentheses and on the schematic diagram inside an arrow that points to the change. Each change relates to the revision identifier (REV) stamped on the circuit card/subassembly and is listed in the EFFECTIVITY column of the modification history. NA (not applicable) in the REVISION IDENT column indicates a documentation change only. The change does not affect the circuit card/subassembly components.

COLLINS PART NUMBER Column — Lists the Collins part number for each item in the parts list.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

MFR CODE Column — Lists the manufacturer's code from which selected parts can be procured.

MFR PART NUMBER Column — Lists the manufacturer's part number for the selected parts.

Listed below are manufacturer's names and addresses for the manufacturer's codes found in this parts list.

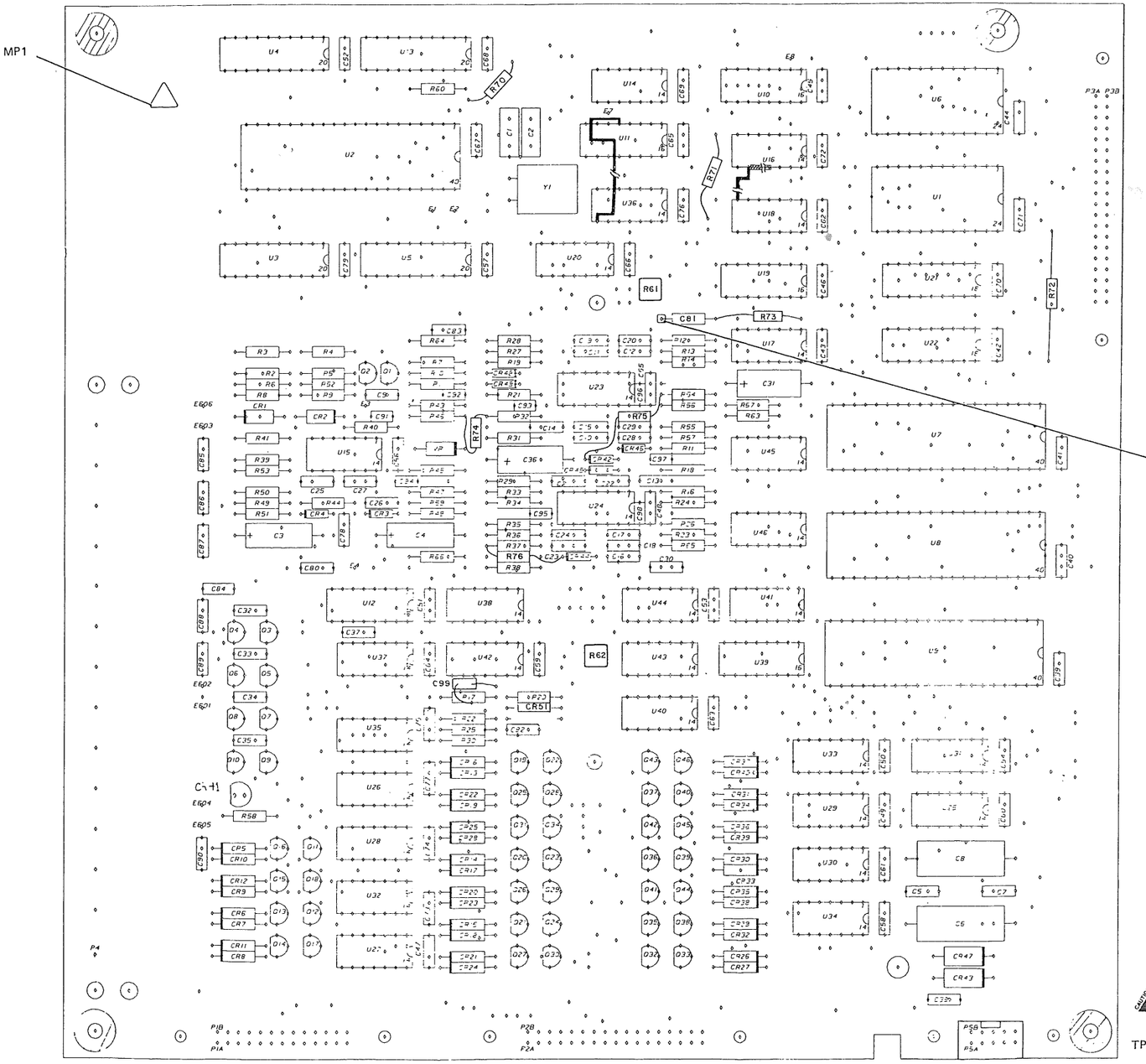
MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
00853	SANGAMO WESTON INC SANGAMO CAPACITOR DIV SANGAMO RD P O BOX 128 PICKENS SC 29671
01121	ALLEN-BRADLEY CO 1201 SOUTH 2ND ST MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP 13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49 DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION ROUTE 202 SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT W GENESEE ST AUBURN NY 13021
04713	MOTOROLA INC SEMICONDUCTOR GROUP 5005 E MCDOWELL RD PHOENIX AZ 85008

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV SUB OF SCHLUMBERGER LTD NORTH AMERICAN SALES MAIL STOP 14-1053 401 ELLIS ST P O DRAWER 7284 MOUNTAIN VIEW CA 94042
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
14099	SEMTECH CORP 652 MITCHELL ROAD NEWBURY PARK CA 91320
14433	ITT SEMICONDUCTOR DIV WEST PALM BEACH FL
14936	GENERAL INSTRUMENT CORP DISCRETE SEMI CONDUCTOR DIV 600 W JOHN ST HICKSVILLE NY 11802
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP 500 BROADWAY P O BOX 168 LAWRENCE MA 01841
19647	CADDOCK ELECTRONICS INC 1717 CHICAGO AVE RIVERSIDE CA 92507
28480	HEWLETT-PACKARD CO CORPORATE HQ 3000 HANOVER ST PALO ALTO CA 94304
31039	NATIONAL SCREW PRODUCTS CO INC 14401 W 11 MILE RD P O BOX 3815 OAK PARK MI 48237
34335	ADVANCED MICRO DEVICES 901 THOMPSON PL SUNNYVALE CA 94086
34649	INTEL CORP 3585 SW 198TH AVE ALOHA OR 97005
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
71785	TRW INC TRW CINCH CONNECTORS DIV 1501 MORSE AVE ELK GROVE VILLAGE IL 60007
73899	JFD ELECTRONICS COMPONENTS CORP 112 MOTT ST OCEANSIDE NY 11572
75037	MINNESOTA MINING AND MFG CO ELECTRO PRODUCTS DIV 3M CENTER ST PAUL MN 55101
80294	BOURNS INSTRUMENTS INC 6135 MAGNOLIA AVE RIVERSIDE CA 92506
81349	MILITARY SPECIFICATIONS
81350	JOINT ARMY NAVY
81483	INTERNATIONAL RECTIFIER 9220 SUNSET BLVD P O BOX 2321 TERMINAL ANNEX LOS ANGELES CA 90054
93790	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO 1605 RODNEY FRENCH BLVD NEW BEDFORD MA 02741
94696	MAGNECRAFT ELECTRIC CO 5575 N LYNCH AVE CHICAGO IL 60630
96906	MILITARY STANDARD

7.2.3 Equipment Covered

Listed below are the circuit cards/subassemblies with the latest effectivity covered by these instructions.

CIRCUIT CARD/ SUBASSEMBLY	COLLINS PART NUMBER	LATEST EFFECTIVITY
Rf card	646-5871-001	D
Control	646-5867-001	D



Control
Figure 11 (Sheet 1 of 2)

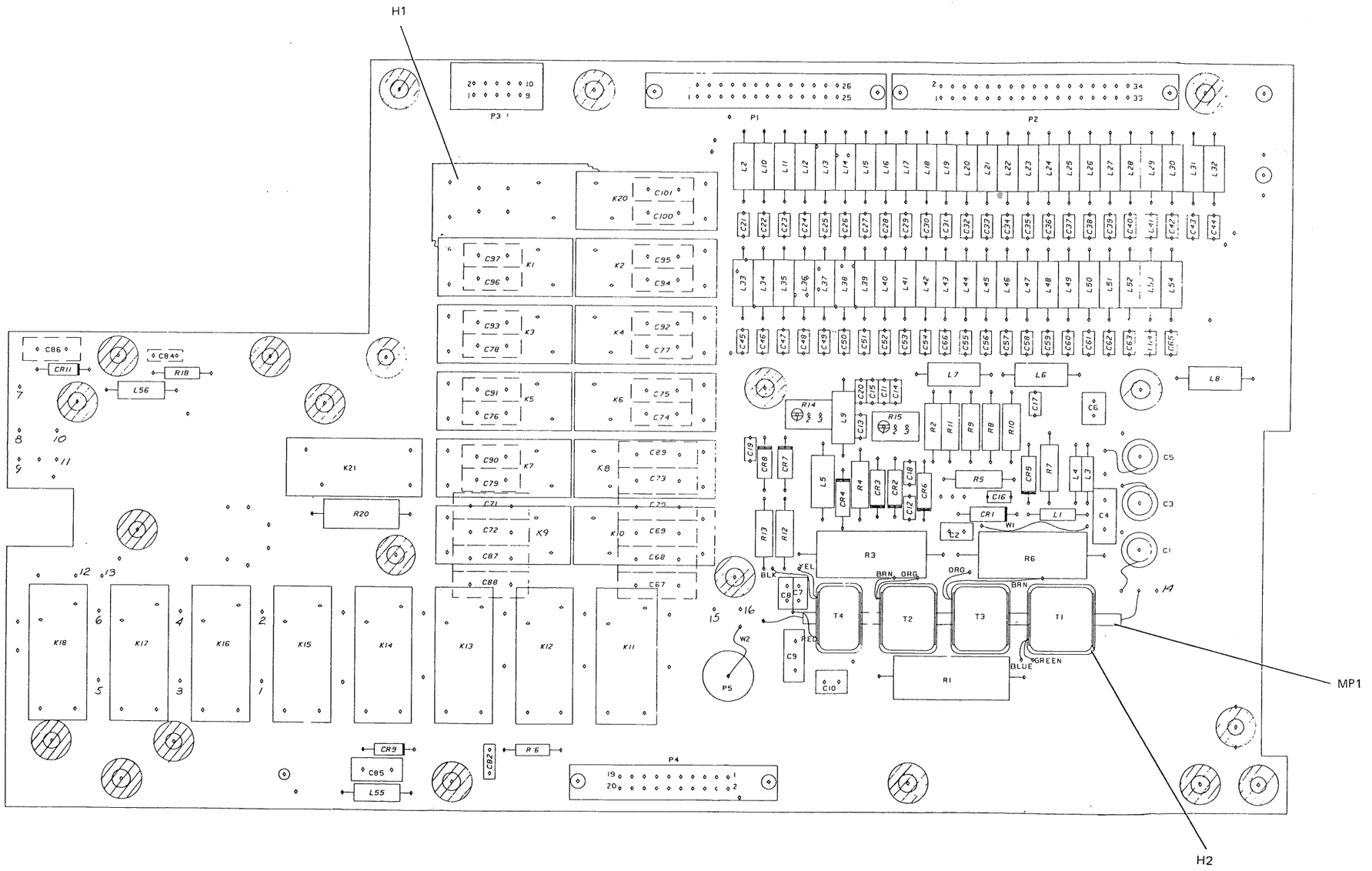
PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	CONTROL A1A2 (ESDS)	646-5867-001			
CR1,CR2	SEMICOND DEVICE	353-2607-000		15238	1N645
CR3,CR4	SEMICOND DEVICE (ESDS)	353-3691-010		28480	1N5711
CR5-CR40	SEMICOND DEVICE	353-6442-020		14433	1N4002
CR41	DIODE,LIGHT EMI	353-0293-040		14936	MV5053
CR42	SEMICOND DEVICE (ESDS)	353-3691-010		28480	1N5711
CR43	SEMICOND DEVICE	353-3718-040		14099	1N5550
CR44-CR46	SEMICOND DEVICE (ESDS)	353-3691-010		28480	1N5711
CR47	SEMICOND DEVICE	353-3718-040		14099	1N5550
CR48-CR51	SEMICOND DEVICE (ESDS)	353-3691-010		28480	1N5711
C1,C2	CAPACITOR,FXD MICA DIEL, 27PF, 2%, 500V	912-2773-000		81349	CM05ED270G03
C3,C4	CAPACITOR,FIXED ELCTLT, 10UF, P100ZM20%, 16VDC	183-1471-250		56289	500D106G016BA5
C5	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 50VDC	913-5019-320		81349	CK05BX104K
C6	CAPACITOR,FXD AL ELCTLT, 68UF, P75%M10%, 25V	183-1510-030		56289	500D686G025CB5
C7	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 50VDC	913-5019-320		81349	CK05BX104K
C8	CAPACITOR,FXD AL ELCTLT, 68UF, P75%M10%, 25V	183-1510-030		56289	500D686G025CB5
C9	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C10	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C11,C12	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C13	NOT USED				
C14-C16	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C17	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C18	NOT USED				
C19,C20	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C21	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C22	NOT USED				
C23	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C24,C25	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C26	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C27	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C28	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C29,C30	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C31	CAPACITOR,FIXED ELCTLT, 10UF, P100ZM20%, 16VDC	183-1471-250		56289	500D106G016BA5
C32-C35	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C36	CAPACITOR,FIXED ELCTLT, 10UF, P100ZM20%, 16VDC	183-1471-250		56289	500D106G016BA5
C37-C90	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C91-C98	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V	913-4018-000		81349	CK05BX102K
C99	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 50VDC	913-5019-320		81349	CK05BX104K
MP1	LABEL,PRESS SENS (ESDS)	280-2745-040		12998	280-2745-040
MP2	CONTACT,ELECTRICAL (QTY 7)	372-2601-040			372-2601-040
P1	HEADER,PCB	372-0084-130		75037	3429-2303
P2	HEADER,PCB	372-0084-140		75037	3431-2303
P3	HOUSING,CONN,EL	372-0043-480		00779	87478-7
P4	TERMINAL STRIP	367-0022-000		71785	353-18-14-001
P5	HOUSING,CONN,EL	372-0043-330		00779	87478-2
Q1-Q10	TRANSISTOR	352-5501-010		04713	MPS2222A
Q11-Q46	TRANSISTOR	352-5035-010		04713	MPS-A14
R1	RESISTOR,FIXED CMPSN, 15K, 10%, 1/4W	745-0791-000		81349	RCR07G153KS
R2	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R3	RESISTOR,FIXED CMPSN, 0.10MEGO, 10%, 1/4W	745-0821-000		81349	RCR07G104KS
R4	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R5	RESISTOR,FIXED CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R6	RESISTOR,FIXED CMPSN, 15 OHMS, 10%, 1/4W	745-0683-000		81349	RCR07G150KS
R7	RESISTOR,FIXED CMPSN, 150 OHMS, 10%, 1/4W	745-0719-000		81349	RCR07G151KS
R8	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R9	RESISTOR,FIXED CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R10	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R11	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R12	NOT USED				
R13	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R14	RESISTOR,FXD FILM, 51.1 OHMS, 1%, 1/8W	705-0934-000		81349	RN55D51R1F
R15	RESISTOR,FIXED FILM, 18.7K, 1%, 1/8W	705-1057-000		81349	RN55D1872F
R16	RESISTOR,FIXED CMPSN, 2.7MEGO, 10%, 1/4W	745-0872-000		81349	RCR07G275KS
R17	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R18	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R19	RESISTOR,FXD FILM, 402 OHMS, 1%, 1/8W	705-0977-000		81349	RN55D4020F
R20	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R21	RESISTOR,FIXED FILM, 18.7K, 1%, 1/8W	705-1057-000		81349	RN55D1872F
R22	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R23	RESISTOR,FIXED CMPSN, 2.7MEGO, 10%, 1/4W	745-0872-000		81349	RCR07G275KS
R24	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R25	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R26	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R27,R28	RESISTOR,FIXED FILM, 10K, 1%, 1/8W	705-1044-000		81349	RN55D1002F
R29	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R30	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R31	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R32	RESISTOR,FIXED CMPSN, 2.7MEGO, 10%, 1/4W	745-0872-000		81349	RCR07G275KS
R33	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R34	RESISTOR,FXD FILM, 17.8K, 1%, 1/8W	705-1054-000		81349	RN55D1782F
R35	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R36	RESISTOR,FIXED CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R37	RESISTOR,FXD FILM, 115K, 1%, 1/8W	705-1095-000		81349	RN55D1153F
R38	RESISTOR,FXD FILM, 2.74K, 1%, 1/8W	705-1017-000		81349	RN55D2741F
R39	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R40	RESISTOR,FIXED FILM, 301K, 1%, 1/8W	705-1115-000		81349	RN55D3013F
R41	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R42	RESISTOR,FXD FILM, 51.1 OHMS, 1%, 1/8W	705-0934-000		81349	RN55D51R1F
R43	RESISTOR,FXD FILM, 6.98K, 1%, 1/8W	705-3605-400		81349	RN55D6981F
R44	RESISTOR,FIXED CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS

PARTS LIST (Cont)

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
R45,R46	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R47	RESISTOR,FIXED CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R48	RESISTOR,FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN55D1472F
R49	RESISTOR,FXD FILM, 3.92K, 1%, 1/8W	705-3605-280		81349	RN55D3921F
R50	RESISTOR,FIXED FILM, 301K, 1%, 1/8W	705-1115-000		81349	RN55D3013F
R51	RESISTOR,FXD FILM, 51.1 OHMS, 1%, 1/8W	705-0934-000		81349	RN55D51R1F
R52	RESISTOR,FXD FILM, 6.98K, 1%, 1/8W	705-3605-400		81349	RN55D6981F
R53	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R54	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R55	RESISTOR,FIXED FILM, 14.7K, 1%, 1/8W	705-1052-000		81349	RN55D1472F
R56	RESISTOR,FIXED CMPSN, 1MEGO, 10%, 1/4W	745-0857-000		81349	RCR07G105KS
R57	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R58	RESISTOR,FIXED CMPSN, 680 OHMS, 10%, 1/4W	745-0743-000		81349	RCR07G681KS
R59	RESISTOR,FIXED FILM, 1K, 1%, 1/8W	705-0996-000		81349	RN55D1001F
R60	RESISTOR,FIXED CMPSN, 4.7K, 10%, 1/4W	745-0773-000		81349	RCR07G472KS
R61,R62	RESISTOR,VARIABLE NON-WW,20K, 10%	382-0052-470		80294	3292W-CE8-RC203
R63-R66	RESISTOR,FIXED CMPSN, 22K, 10%, 1/4W	745-0797-000		81349	RCR07G223KS
R67	RESISTOR,FIXED FILM, 1.78K, 1%, 1/8W	705-1008-000		81349	RN55D1781F
R68	NOT USED				
R69	RESISTOR,FXD FILM, 51.1 OHMS, 1%, 1/8W	705-0934-000		81349	RN55D51R1F
R70	RESISTOR,FIXED CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R71	RESISTOR,FIXED CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
R72	RESISTOR,FIXED CMPSN, 1K, 10%, 1/4W	745-0749-000		81349	RCR07G102KS
R73	RESISTOR,FIXED CMPSN, 270 OHMS, 10%, 1/4W	745-0728-000		81349	RCR07G271KS
U1	INTEGRATED CIRCUIT MEMORY (ESDS)	351-8872-010		34649	D2732
U2	MICROPROCESSOR (ESDS)	351-8676-020		04713	MC6802CP
U3,U4	INTEGRATED CIRCUIT BUFFER/LINE DRIVER	351-1841-020		01295	SN54LS244J
U5	INTEGRATED CIRCUIT TRANSCEIVER,OCTAL BUS(ESDS)	351-1849-010		01295	SN54LS245J
U6	INTEGRATED CIRCUIT MEMORY (ESDS)	351-8872-010		34649	D2732
U7-U9	INTEGRATED CIRCUIT MEMORY (ESDS)	351-8439-050		34649	MD8255A
U10-U12	INTEGRATED CIRCUIT BUFFER (ESDS)	351-8197-010		02735	CD4049UBF
U13	INTEGRATED CIRCUIT BUFFER/LINE DRIVER	351-1841-020		01295	SN54LS244J
U14	INTEGRATED CIRCUIT LOGIC GATE	351-1523-050		04713	SN54LS10J
U15	INTEGRATED CIRCUIT COMPARATOR	351-1122-030		01295	LM139J
U16,U17	INTEGRATED CIRCUIT LOGIC GATE	351-1523-050		04713	SN54LS10J
U18	INTEGRATED CIRCUIT LOGIC GATE	351-1523-100		04713	SN54LS27J
U19	MICROCIRCUIT DECODER	351-1526-010		04713	SN54LS138J
U20	INTEGRATED CIRCUIT LOGIC GATE	351-1523-020		04713	SN54LS02J
U21,U22	INTEGRATED CIRCUIT MEMORY (ESDS)	351-8413-060		34335	AM9114DM
U23,U24	INTEGRATED CIRCUIT AMPLIFIER,QUAD OPRTNL	351-1141-020		34335	LM224D
U25-U30	RESISTOR NETWORK DUAL-IN-LINE, 22K, 2%, 125V	350-4027-510		01121	314B223
U31-U34	RESISTOR NETWORK DUAL-IN-LINE, 220K, 2%, 125V	350-4027-990		01121	314A224
U35,U36	RESISTOR NETWORK DUAL-IN-LINE, 4.7K, 2%, 125V	350-4027-070		01121	314B472
U37	RESISTOR NETWORK DUAL-IN-LINE, 150 OHMS, 2%, 125V	350-4027-010		01121	314B151
U38	RESISTOR NETWORK DUAL-IN-LINE, 10K, 2%, 125V	350-4027-120		01121	314A103
U39	MICROCIRCUIT (ESDS)	351-8208-010		07263	4050BDM
U40	INTEGRATED CIRCUIT MOS (ESDS)	351-8160-030		31039	SCL4013BC
U41	INTEGRATED CIRCUIT MOS (ESDS)	351-8160-080		31039	SCL4011BC
U42	INTEGRATED CIRCUIT COMPARATOR	351-1122-030		01295	LM139J
U43	INTEGRATED CIRCUIT MOS (ESDS)	351-8160-080		31039	SCL4011BC
U44	INTEGRATED CIRCUIT MOS (ESDS)	351-8160-030		31039	SCL4013BC
U45,U46	RESISTOR NETWORK DUAL-IN-LINE, 220K, 2%, 125V	350-4027-990		01121	314A224
VR1	SEMICOND DEVICE	353-2704-000		81483	1N748A
Y1	CRYSTAL UNIT,QTZ 4.000000MHZ	289-7082-020		81349	CR64U4-00000MHZ

Control
Figure 11 (Sheet 2)



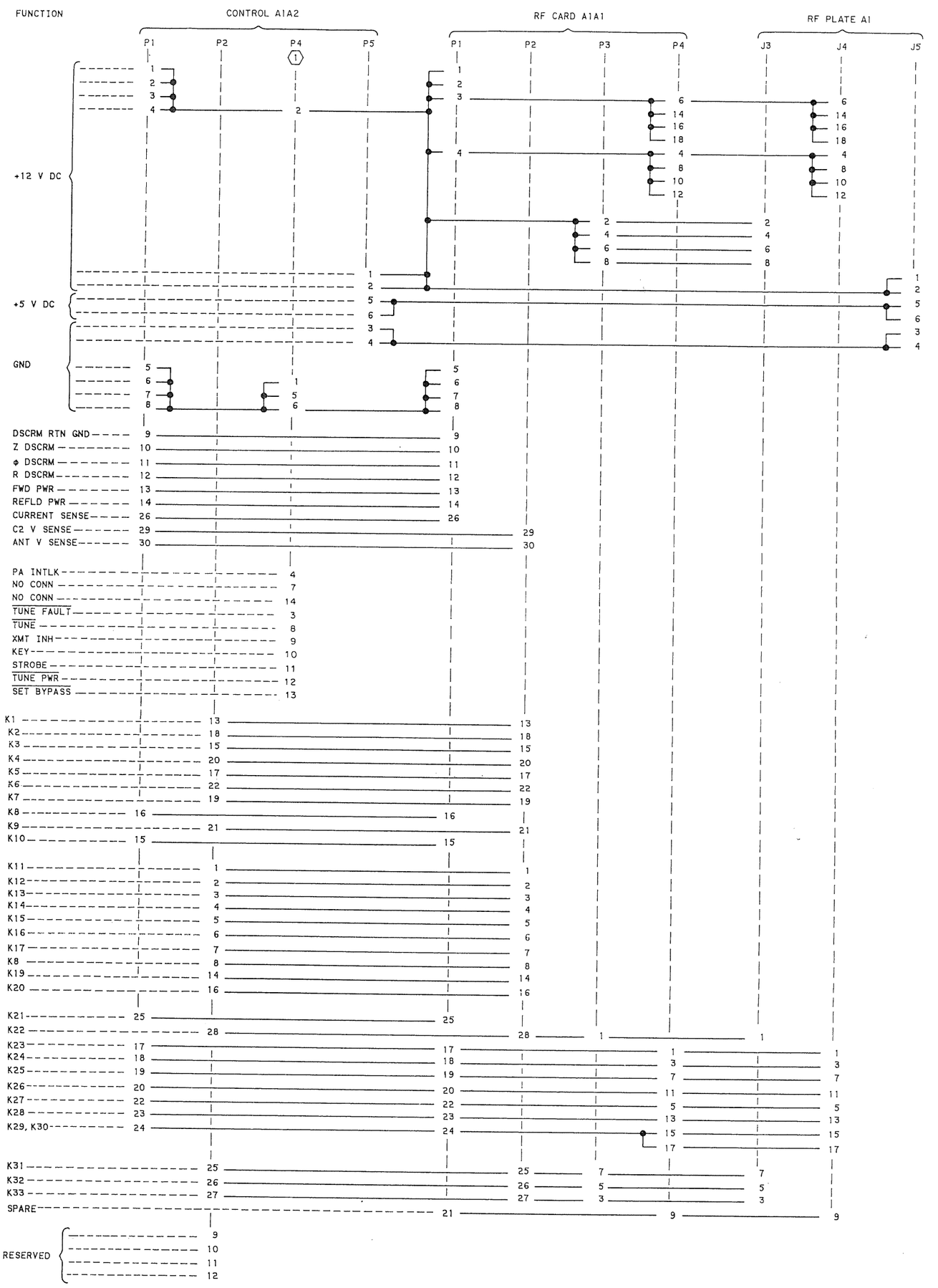
TPA-5603-018

RF Card
Figure 12 (Sheet 1 of 2)

PARTS LIST

REF DES	DESCRIPTION	COLLINS PART NUMBER	USABLE ON CODE	MFR CODE	MFR PART NUMBER
	RF CARD A1A1	646-5871-001			
CR1	SEMICOND DEVICE	353-3338-000		81350	JAN1N914
CR2,CR3	DIODE 1N914 (MATCHED PAIR)	637-1960-001			637-1960-001
CR4-CR6	SEMICOND DEVICE	353-3338-000		81350	JAN1N914
CR7,CR8	DIODE 1N914 (MATCHED PAIR)	637-1960-001			637-1960-001
CR9	SEMICOND DEVICE	353-3404-000		03508	1N3064
CR10	NOT USED				
CR11	SEMICOND DEVICE	353-3404-000		03508	1N3064
C1	CAPACITOR,VAR GL DIEL, 1 TO 8.5PF, 750V	922-3031-020		73899	VCJ1849
C2	CAPACITOR,FIXED MICA DIEL, 82PF, 5%, 50V	912-4141-350		93790	CD5EY820J0
C3	CAPACITOR,VAR GL DIEL, 1 TO 8.5PF, 750V	922-3031-020		73899	VCJ1849
C4	CAPACITOR,FXD MICA DIEL, 390PF, 5%, 500V	912-2858-000		81349	CM05FD391J03
C5	CAPACITOR,VAR GL DIEL, 1 TO 8.5PF, 750V	922-3031-020		73899	VCJ1849
C6	CAPACITOR,FIXED MICA DIEL, 390PF, 5%, 50V	912-4141-510		93790	CD5FY391J0
C7,C8	CAPACITOR,FIXED MICA DIEL, 18PF, PORM 0.5PF, 100V	912-4141-140		93790	CD5CA180D0
C9	CAPACITOR,FXD MICA DIEL, 10PF, PORM 0.5PF, 500V	912-2753-000		81349	CM05CD100D03
C10	CAPACITOR,FIXED MICA DIEL, 300PF, 5%, 50V	912-4141-480		93790	CD5FY301J0
C11-C66	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC	913-5019-200		81349	CK05BX103K
C67-C70	CAPACITOR,FIXED MICA DIEL, 1200PF, 5%, 500V	912-3007-000		81349	CM06FD122J03
C71	CAPACITOR,FIXED MICA DIEL, 680PF, 5%, 500V	912-2989-000		81349	CM06FD681J03
C72	CAPACITOR,FIXED MICA DIEL, 620PF, 5%, 500V	912-2986-000		81349	CM06FD621J03
C73	CAPACITOR,FIXED MICA DIEL, 750PF, 5%, 500V	912-2992-000		81349	CM06FD751J03
C74,C75	CAPACITOR,FXD MICA DIEL, 240PF, 5%, 500V	912-2843-000		81349	CM05FD241J03
C76	CAPACITOR,FXD MICA DIEL, 150PF, 5%, 500V	912-2828-000		81349	CM05FD151J03
C77	CAPACITOR,FXD MICA DIEL, 75PF, 5%, 500V	912-2807-000		81349	CM05ED750J03
C78	CAPACITOR,FXD MICA DIEL, 43PF, 5%, 500V	912-2789-000		81349	CM05ED430J03
C79	CAPACITOR,FXD MICA DIEL, 430PF, 5%, 500V	912-2861-000		00853	D155F431J0
C80,C81	NOT USED				
C82	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K
C83	NOT USED				
C84	CAPACITOR,FIXED CER DIEL, 0.1UF, 10%, 100VDC	913-5019-440		81349	CK06BX104K
C85,C86	CAPACITOR,FXD MICA DIEL, 300PF, 5%, 500V	912-2849-000		81349	CM05FD301J03
C87,C88	CAPACITOR,FIXED MICA DIEL, 680PF, 5%, 500V	912-2989-000		81349	CM06FD681J03
C89	CAPACITOR,FIXED MICA DIEL, 750PF, 5%, 500V	912-2992-000		81349	CM06FD751J03
C90	CAPACITOR,FXD MICA DIEL, 430PF, 5%, 500V	912-2861-000		00853	D155F431J0
C91	CAPACITOR,FXD MICA DIEL, 120PF, 5%, 500V	912-2822-000		81349	CM05FD121J03
C92	CAPACITOR,FXD MICA DIEL, 75PF, 5%, 500V	912-2807-000		81349	CM05ED750J03
C93	CAPACITOR,FXD MICA DIEL, 43PF, 5%, 500V	912-2789-000		81349	CM05ED430J03
C94,C95	CAPACITOR,FXD MICA DIEL, 24PF, 5%, 500V	912-2771-000		81349	CM05ED240J03
C96	CAPACITOR,FXD MICA DIEL, 12PF, 5%, 500V	912-2756-000		81349	CM05CD120J03
C97	CAPACITOR,FXD MICA DIEL, 15PF, 5%, 500V	912-2759-000		81349	CM05CD150J03
C98,C99	NOT USED				
C100	CAPACITOR,FXD MICA DIEL, 5PF, PORM 0.5PF, 500V	912-2750-000		81349	CM05CD050D03
C101	CAPACITOR,FXD MICA DIEL, 10PF, PORM 0.5PF, 500V	912-2753-000		81349	CM05CD100D03
H1	PLATE,INSULATOR	651-4303-001			
H2	WASHER,TEFLON (QTY 8)	544-8802-003			544-8802-003
K1-K18	RELAY	970-2601-010		94696	76URCPCX-4
K19	NOT USED				
K20,K21	RELAY	970-2601-010		94696	76URCPCX-4
L1	COIL,RF 0.82UH	240-2022-000		96906	MS75083-12
L2	COIL,RF 2.2UH	240-2715-170		96906	MS75088-5
L3	COIL,RF 1UH	240-2023-000		96906	MS75083-13
L4	COIL,RF 2.20UH	240-2027-000		96906	MS75084-04
L5-L9	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
L10,L11	COIL,RF 4.70UH	240-2715-210		96906	MS75088-9
L12-L15	COIL,RF 1.50UH	240-2025-000		96906	MS75084-02
L16-L54	COIL,RF 4.70UH	240-2715-210		96906	MS75088-9
L55,L56	COIL,RF 390UH	240-2715-440		96906	MS75089-18
MP1		424-0148-010			
P1	HEADER,PCB	372-0084-130		75037	3429-2303
P2	COIL,RF 1000UH	240-2540-000		96906	MS90539-15
P3	HOUSING,CONN,EL	372-0043-330		00779	87478-2
P4	HEADER,PCB	372-0084-120		75037	3428-2303
P5	CONNECTOR,RCPT ELEC	357-9670-000		81349	M39012-21-0001
R1	RESISTOR,FXD FILM, 34.8 OHMS, 1%, 8W	714-3187-000		19647	MS231-34-8-1PCT
R2	RESISTOR,FIXED FILM, 1.33K, 1%, 1/4W	705-6602-000		81349	RN60D1331F
R3	RESISTOR,FXD FILM, 19.6 OHMS, 1%, 8W	714-3186-000		19647	MS231-19-6-1PCT
R4,R5	RESISTOR,FXD FILM, 12.1K, 1%, 1/4W	705-6648-000		81349	RN60D1212F
R6	RESISTOR,FXD FILM, 19.6 OHMS, 1%, 8W	714-3186-000		19647	MS231-19-6-1PCT
R7	RESISTOR,FXD FILM, 19.6 OHMS, 1%, 1/4W	705-6514-000		81349	RN60D19R6F
R8,R9	RESISTOR,FXD FILM, 12.1K, 1%, 1/4W	705-6648-000		81349	RN60D1212F
R10,R11	RESISTOR,FXD FILM, 3.83K, 1%, 1/4W	705-6624-000		81349	RN60D3831F
R12,R13	RESISTOR,FXD FILM, 4.64K, 1%, 1/4W	705-6628-000		81349	RN60D4641F
R14,R15	RESISTOR,VARIABLE NON-WW,20K, 10%	382-0052-470		80294	3292W-CE8-RC203
R16	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R17	NOT USED				
R18	RESISTOR,FIXED CMPSN, 10K, 10%, 1/4W	745-0785-000		81349	RCR07G103KS
R19	NOT USED				
R20	RESISTOR,FXD CMPSN, 100 OHMS, 10%, 1W	745-3310-000		81349	RCR32G101KS
T1	TRANSFORMER	756-8257-004			756-8257-004
T2,T3	TRANSFORMER	756-8258-004			756-8258-004
T4	TRANSFORMER	756-8308-004			756-8308-004

RF Card
Figure 12 (Sheet 2



NOTES:

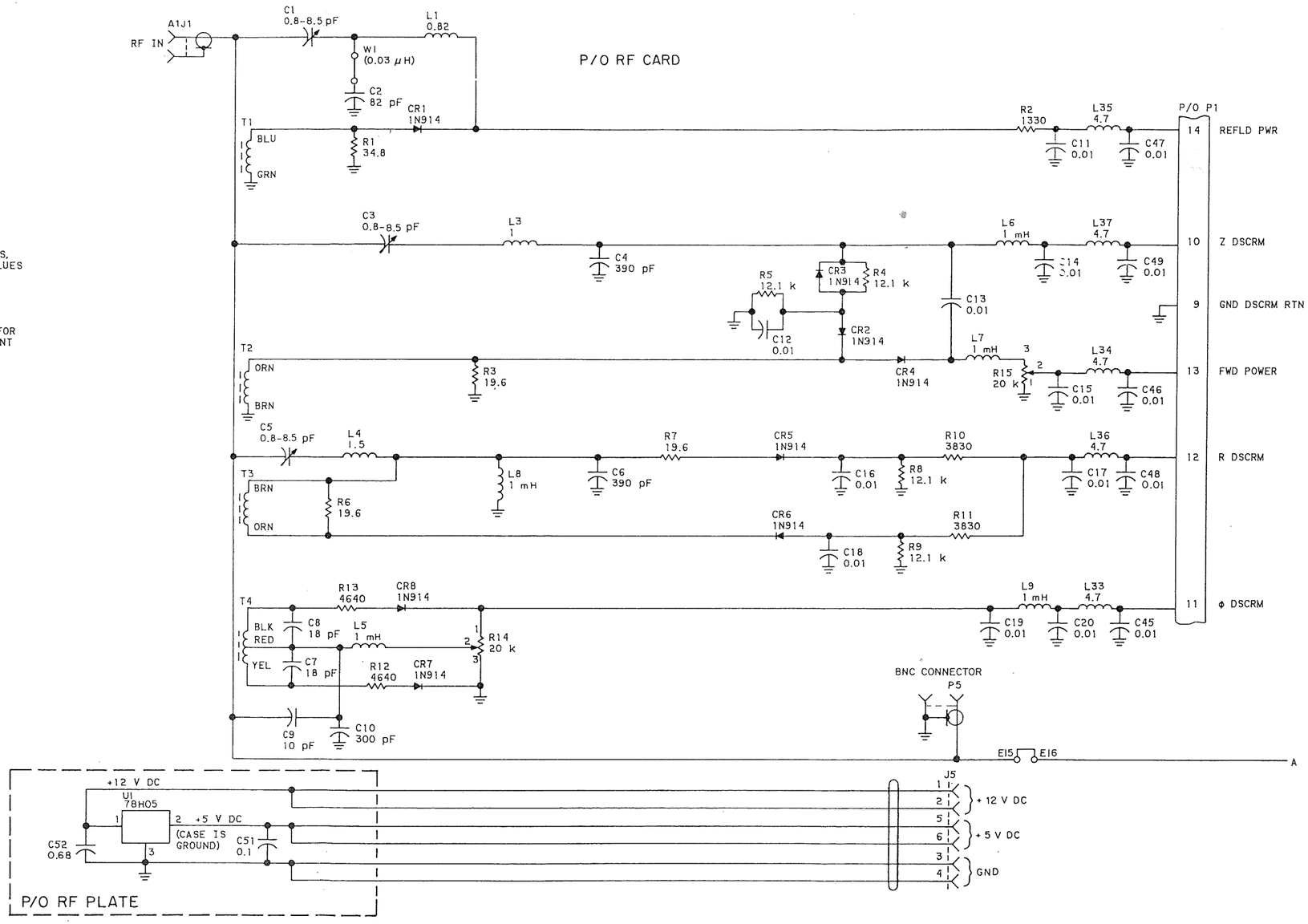
1. CONTROL CABLE TO/FROM TRANSCEIVER CONNECTS TO A1A2P4.
2. CONNECTOR A1A2P3 IS USED FOR FACTORY TESTING ONLY.

CU-380 Interconnect Diagram
Figure 13

TPA-5533-014

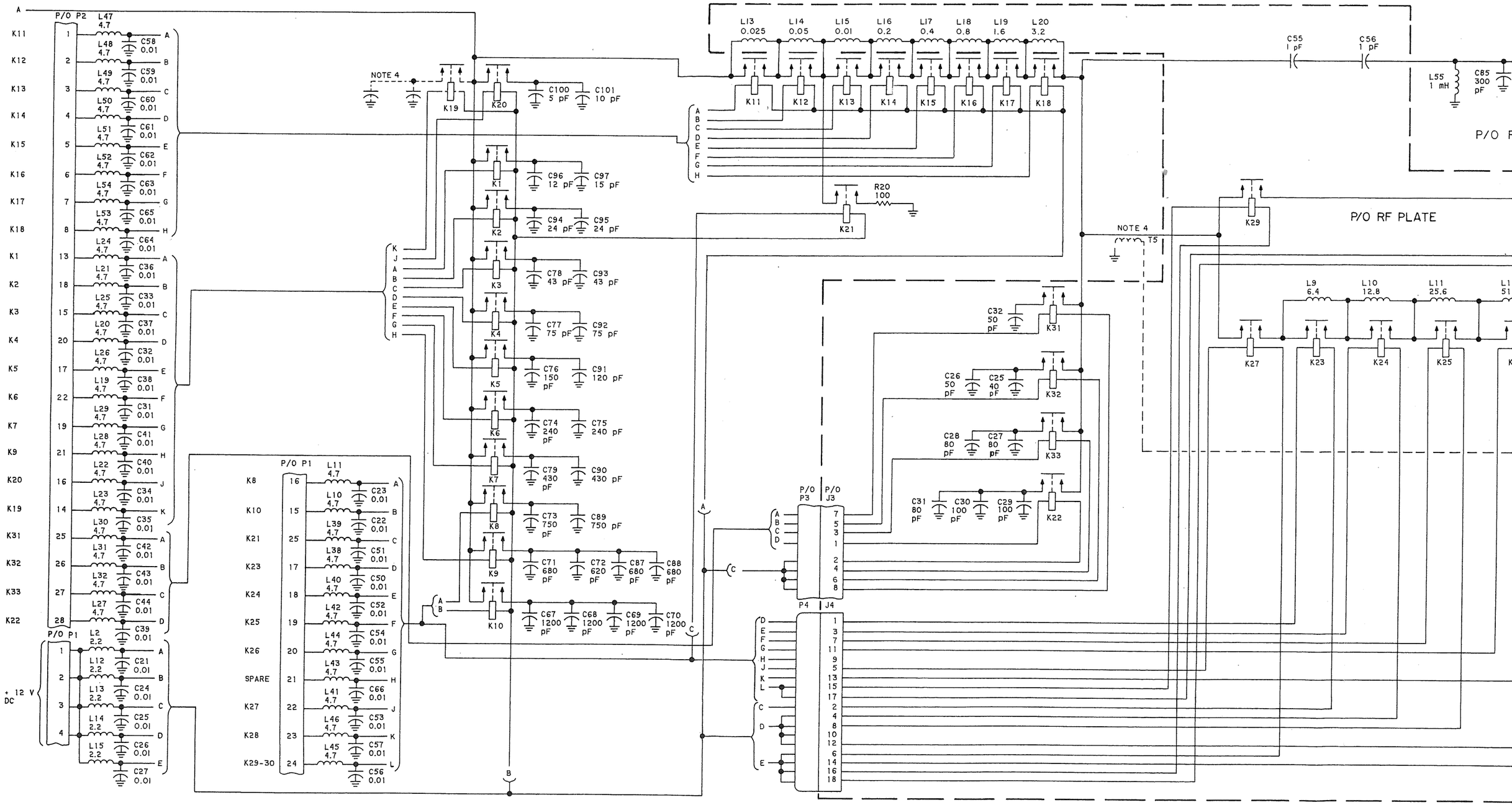
NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS AND INDUCTANCE VALUES ARE IN MICROHENRYS.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT NUMBER AND/OR ASSEMBLY DESIGNATION.
3. TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
4. COMPONENTS SHOWN IN DASHED LINES ARE OPTIONAL AND MAY NOT APPEAR ON ALL EQUIPMENT.



651-5067
TPA-5171-025

RF Plate A1 and RF Card A1A1
Schematic Diagram
Figure 14 (Sheet 1 of 2)


P/O P2
P/O P1
P/O P3
P/O J3
P4 J4
NOTE 4
T5
P/O RF PLATE
+ 12 V DC
SPARE
K29-30
R20 100
L47 4.7
L48 4.7
L49 4.7
L50 4.7
L51 4.7
L52 4.7
L54 4.7
L53 4.7
L24 4.7
L21 4.7
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L30 4.7
L31 4.7
L32 4.7
L27 4.7
L2 2.2
L12 2.2
L13 2.2
L14 2.2
L15 2.2
L11 4.7
L10 4.7
L39 4.7
L38 4.7
L40 4.7
L42 4.7
L44 4.7
L43 4.7
L41 4.7
L46 4.7
L45 4.7
L13 0.025
L14 0.05
L15 0.01
L16 0.2
L17 0.4
L18 0.8
L19 1.6
L20 3.2
L55 1 mH
L9 6.4
L10 12.8
L11 25.6
C55 1 pF
C56 1 pF
C85 300 pF
C100 5 pF
C101 10 pF
C96 12 pF
C97 15 pF
C94 24 pF
C95 24 pF
C78 43 pF
C93 43 pF
C77 75 pF
C92 75 pF
C76 150 pF
C91 120 pF
C74 240 pF
C75 240 pF
C79 430 pF
C90 430 pF
C73 750 pF
C89 750 pF
C71 680 pF
C72 620 pF
C87 680 pF
C88 680 pF
C67 1200 pF
C68 1200 pF
C69 1200 pF
C70 1200 pF
C32 50 pF
C26 50 pF
C25 40 pF
C28 80 pF
C27 80 pF
C31 80 pF
C30 100 pF
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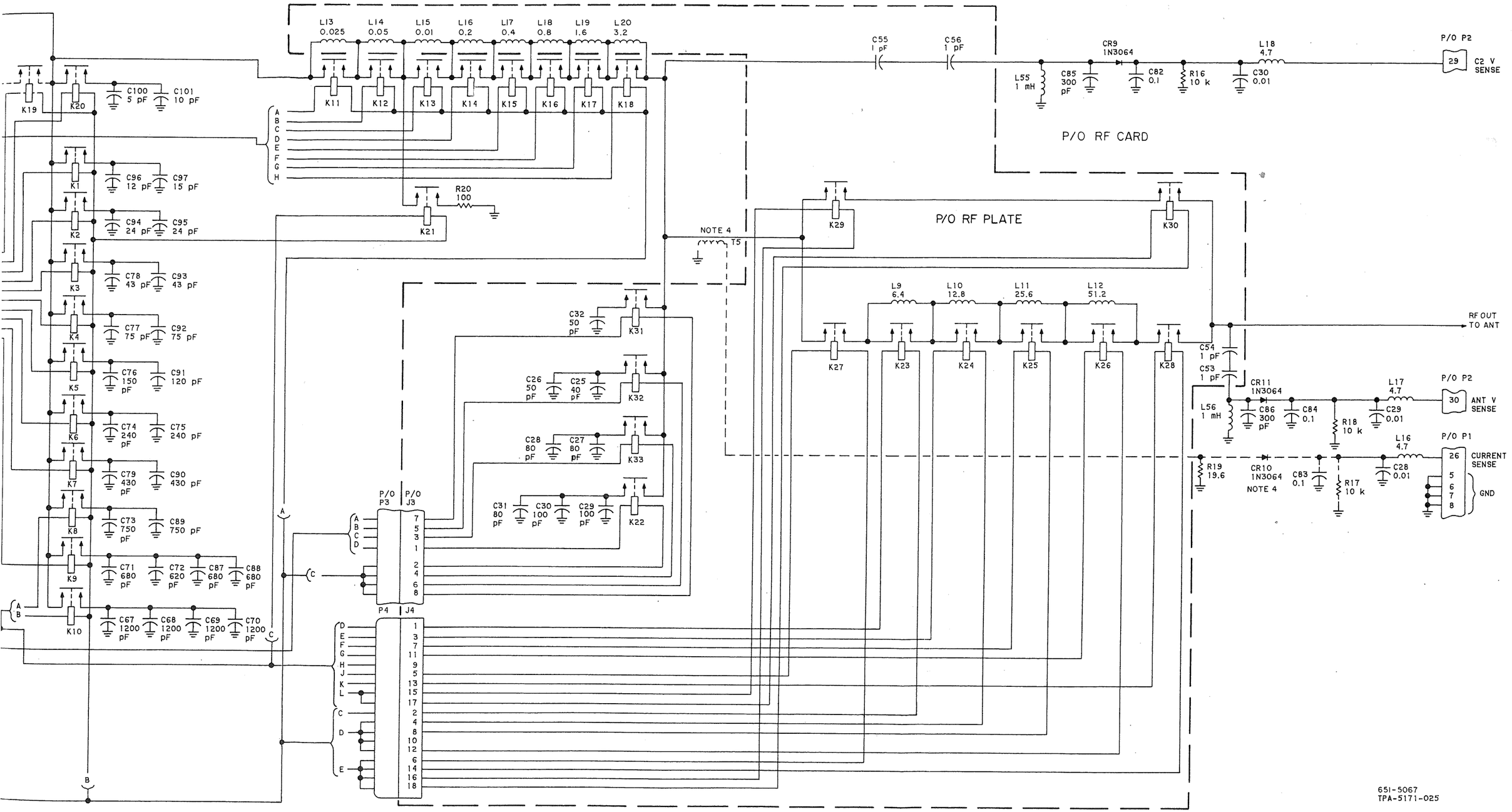
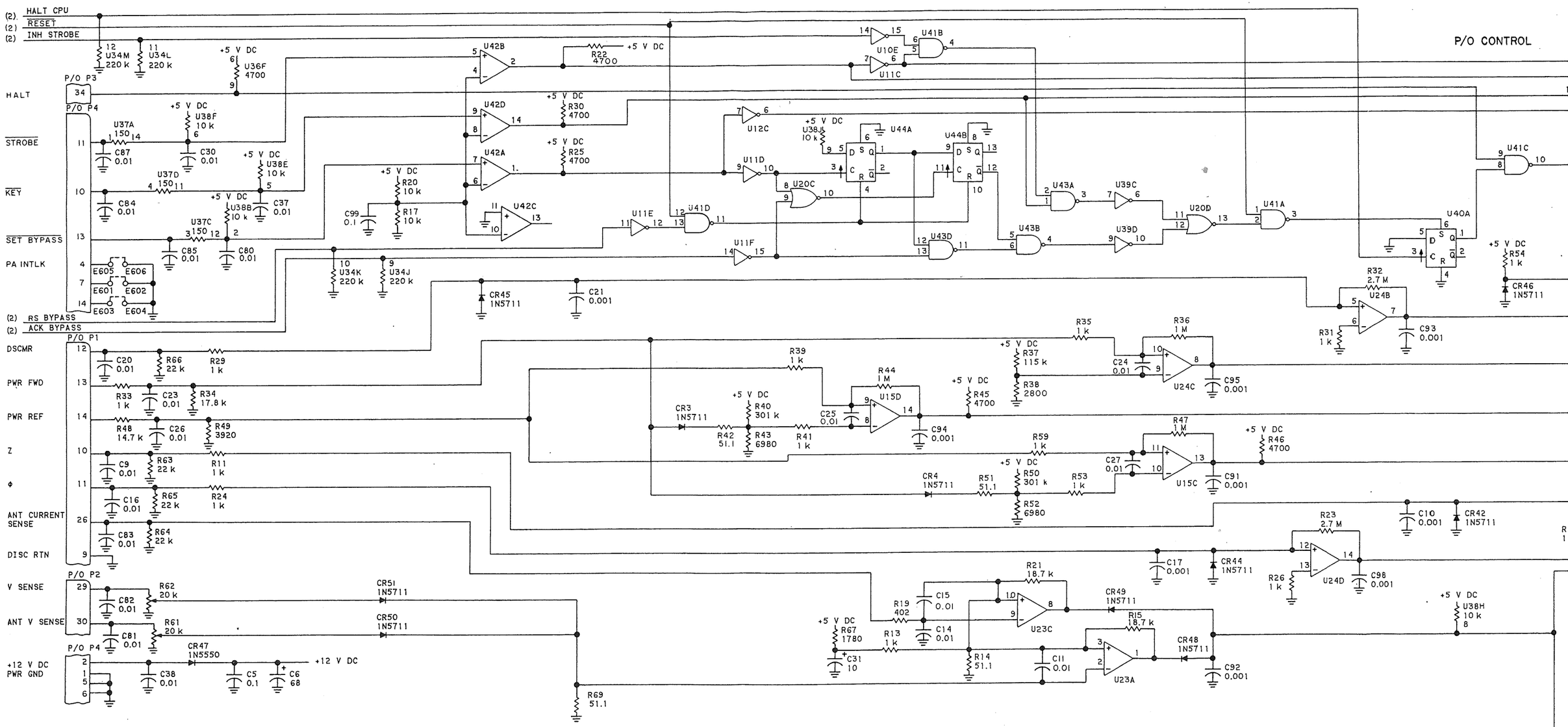
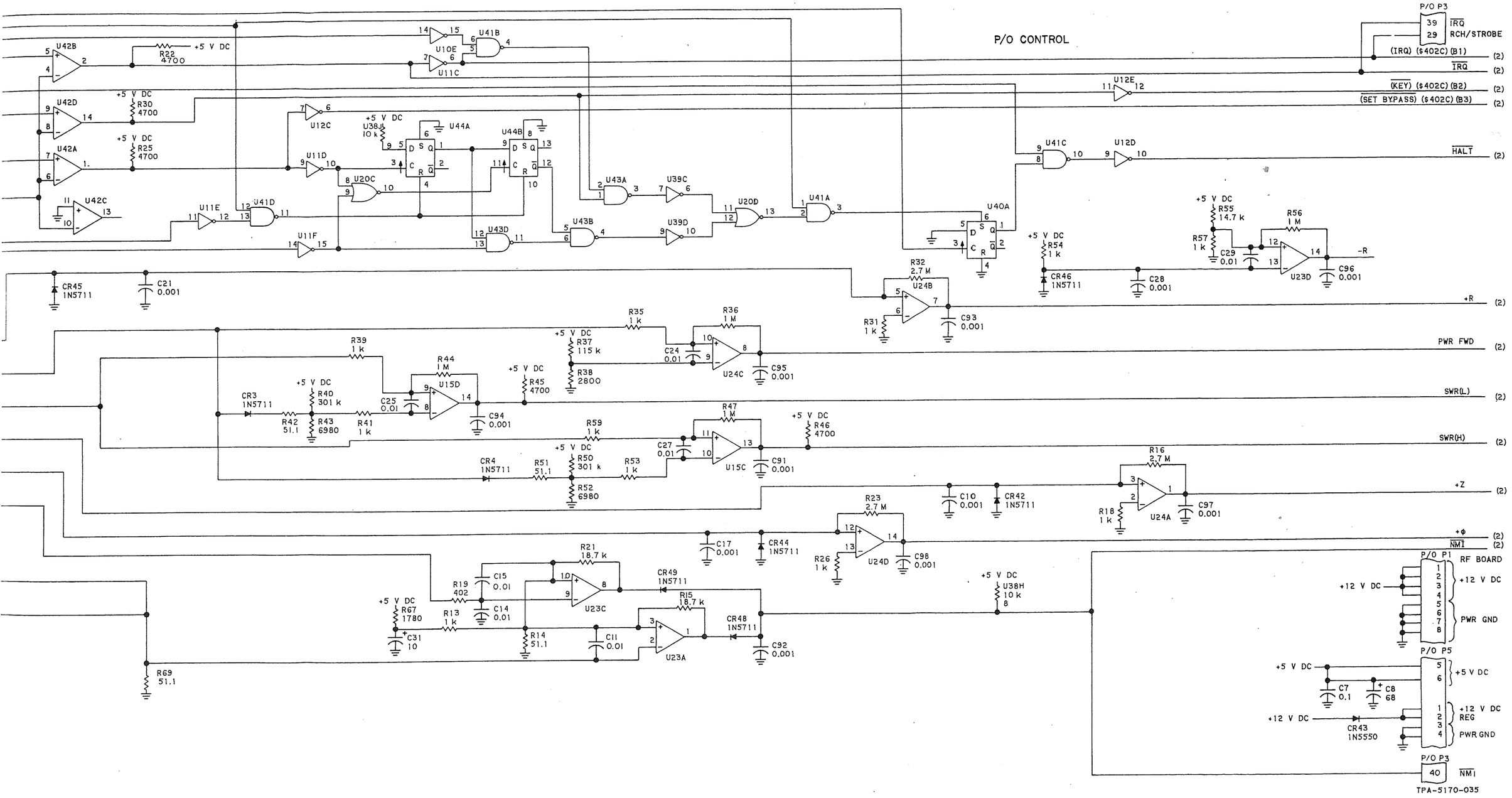
K32
K33



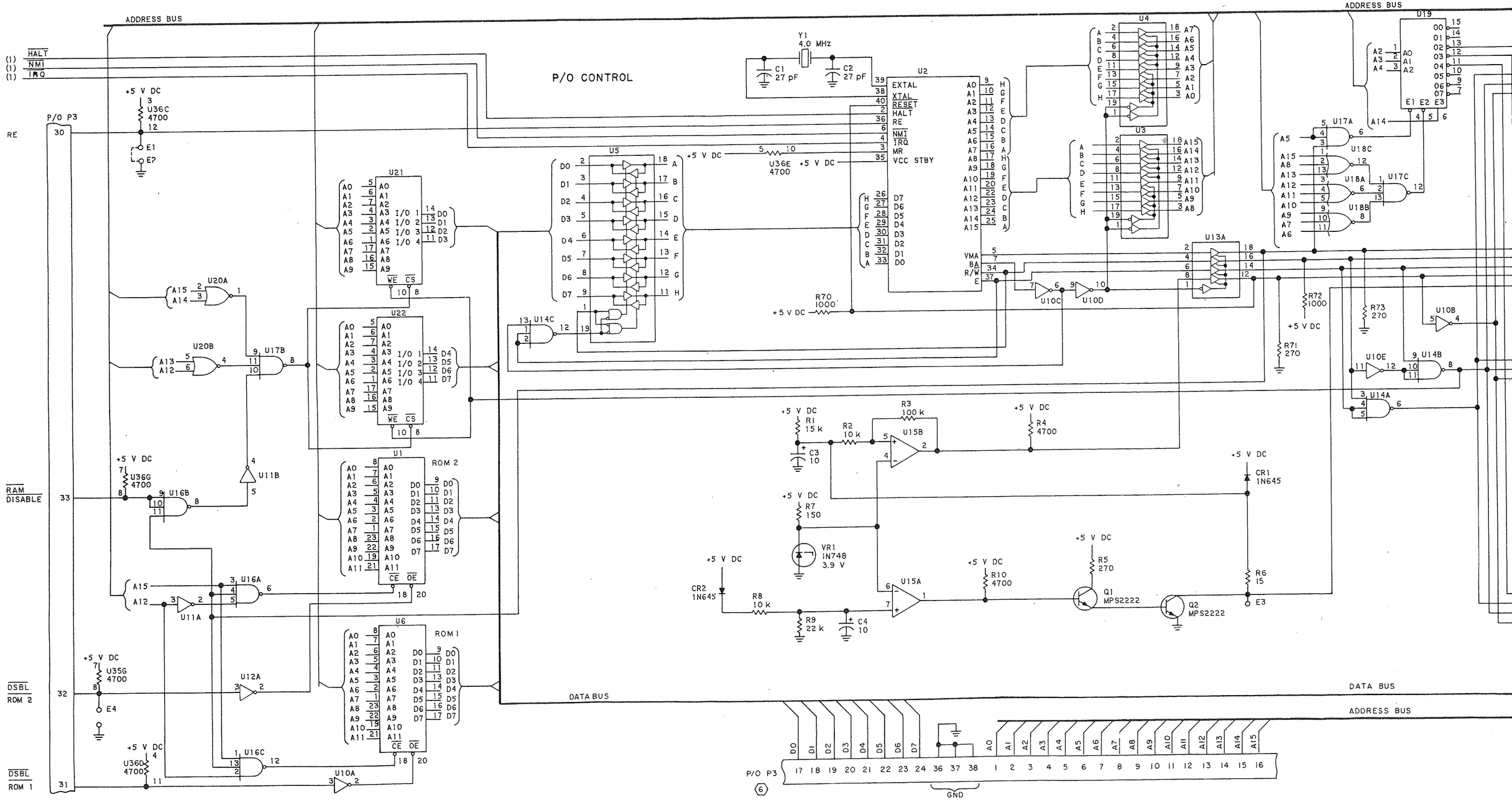
651-5067
TPA-5171-025

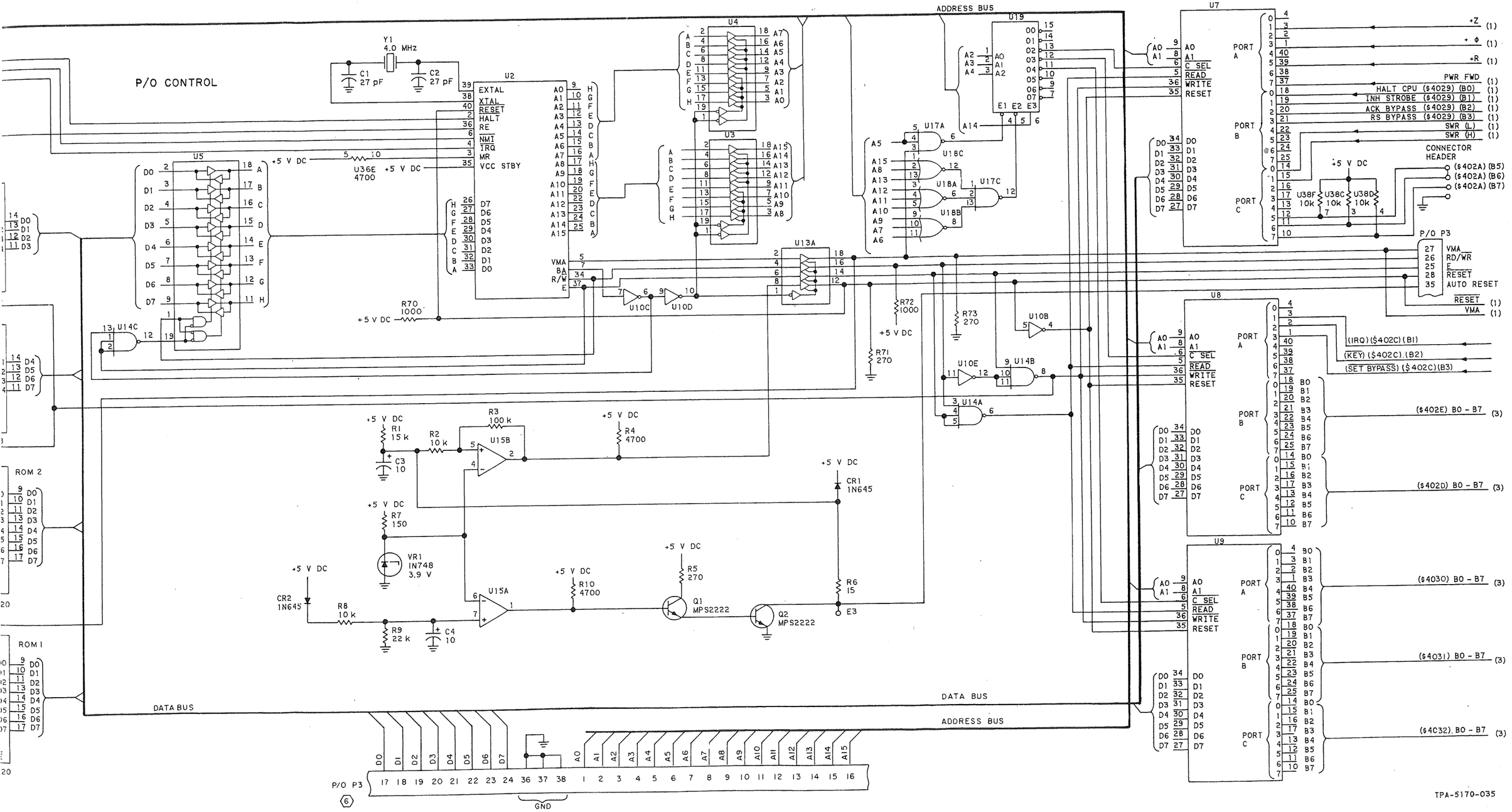
RF Plate A1 and RF Card A1A1
Schematic Diagram
Figure 14 (Sheet 2)


P/O CONTROL
(2) HALT CPU
(2) RESET
(2) INH STROBE
HALT
STROBE
KEY
SET BYPASS
PA INTLK
(2) RS BYPASS
(2) ACK BYPASS
DSCMR
PWR FWD
PWR REF
Z
Φ
ANT CURRENT SENSE
DISC RTN
V SENSE
ANT V SENSE
+12 V DC PWR GND
P/O P1
P/O P2
P/O P3
P/O P4
+5 V DC
+12 V DC
U42B
U42D
U42A
U42C
U41B
U41C
U41D
U41A
U40A
U43A
U43B
U43D
U39C
U39D
U44A
U44B
U20C
U20D
U11E
U11F
U11D
U12C
U10E
U11C
U15D
U15C
U24B
U24C
U24D
U23C
U23A
R22 4700
R30 4700
R25 4700
R36 1 M
R35 1 k
R44 1 M
R47 1 M
R32 2.7 M
R23 2.7 M
R21 18.7 k
R15 18.7 k
R69 51.1
CR45 1N5711
CR46 1N5711
CR42 1N5711
CR44 1N5711
CR49 1N5711
CR48 1N5711
CR51 1N5711
CR50 1N5711
CR47 1N5550
CR3 1N5711
CR4 1N5711
C21 0.001
C93 0.001
C95 0.001
C94 0.001
C91 0.001
C10 0.001
C17 0.001
C98 0.001
C92 0.001
E605
E606
E601
E602
E603
E604

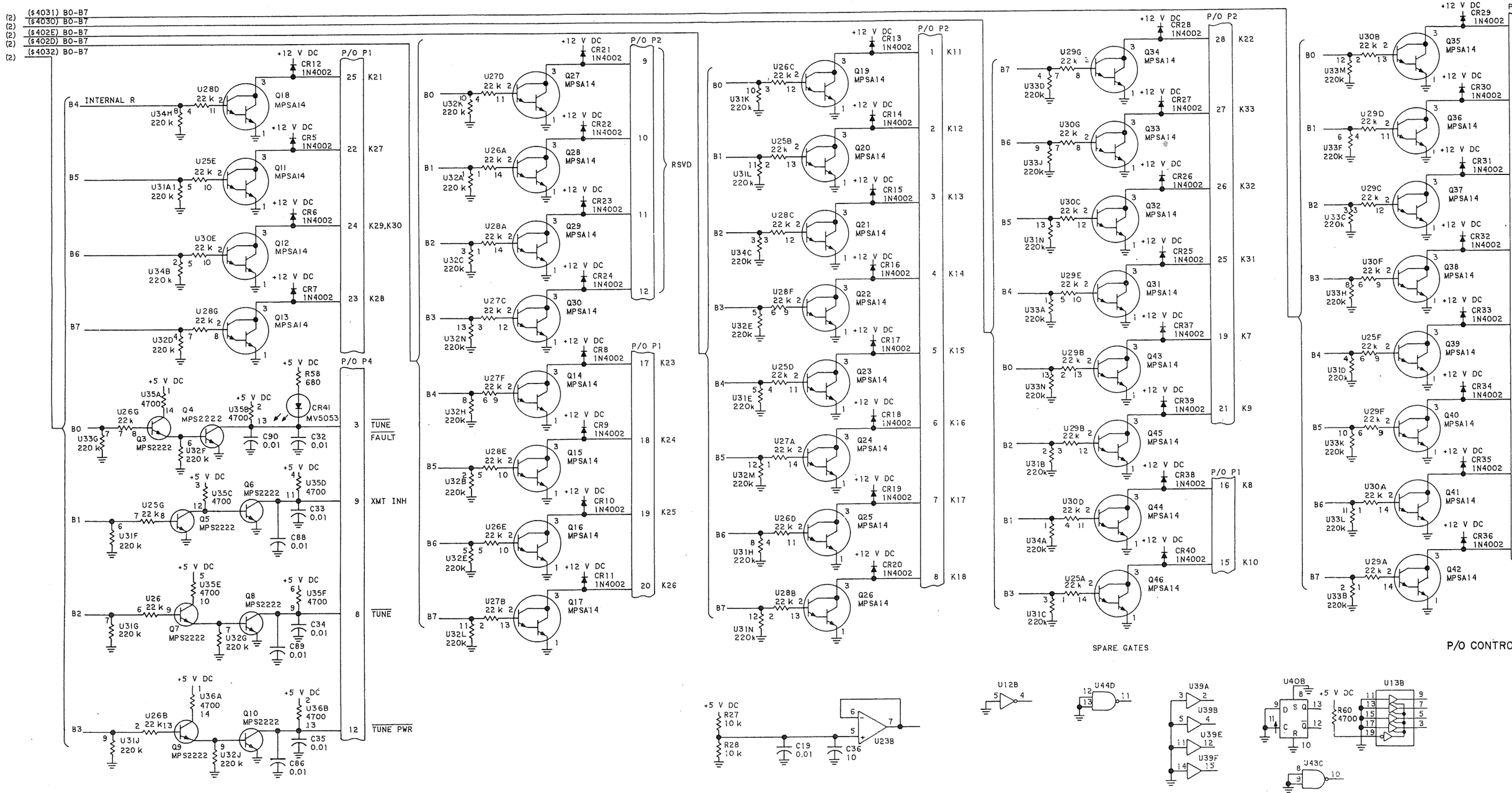


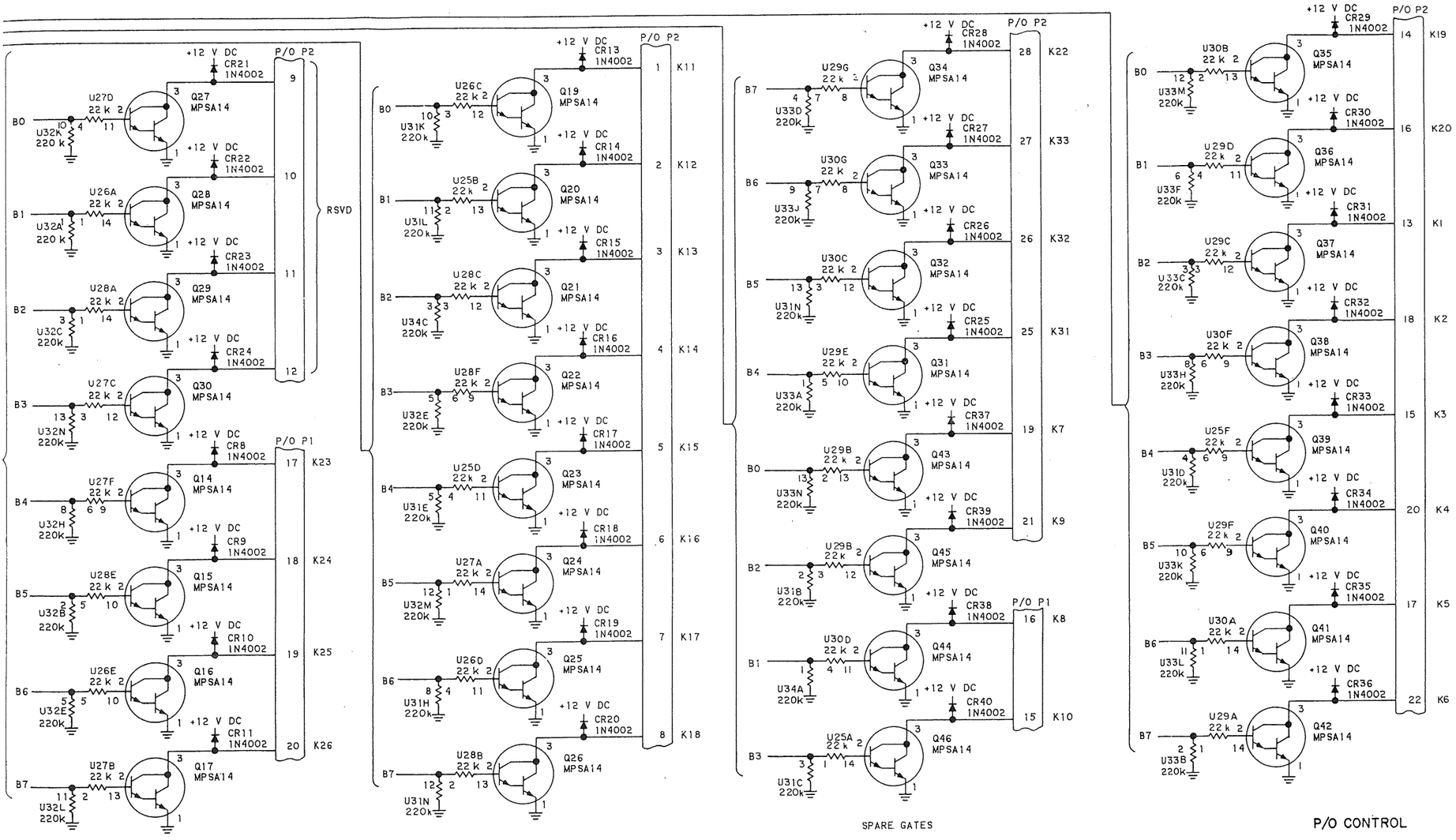
Control A1A2 Schematic Diagram
Figure 15 (Sheet 1 of 3)

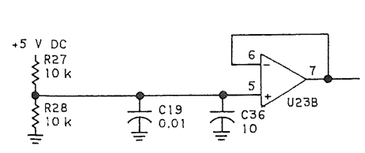

ADDRESS BUS
P/O CONTROL
(1) HALT
(1) NMI
(1) IRQ
RE
P/O P3
30
+5 V DC
U36C 4700
E1
E2
Y1 4.0 MHz
C1 27 pF
C2 27 pF
U2
EXTAL
XTAL
RESET
HALT
RE
NMI
IRQ
MR
VCC STBY
VMA
BA
R/W
E
U36E 4700
R70 1000
U5
U4
U3
U19
U17A
U18C
U18A
U18B
U17C
U13A
U10C
U10D
R72 1000
R73 270
R71 270
U10B
U10E
U14B
U14A
U20A
U20B
U17B
U21
U22
U1
ROM 2
U6
ROM 1
U11B
U16B
U16A
U11A
U12A
U16C
U10A
RAM DISABLE
33
DSBL ROM 2
32
DSBL ROM 1
31
U36G 4700
U35G 4700
U36D 4700
E4
U13C
U14C
R1 15 k
R2 10 k
R3 100 k
C3 10
U15B
R4 4700
R7 150
VR1 1N748 3.9 V
CR1 1N645
CR2 1N645
R8 10 k
R9 22 k
C4 10
U15A
R10 4700
R5 270
Q1 MPS2222
Q2 MPS2222
R6 15
E3
DATA BUS
P/O P3
6
GND

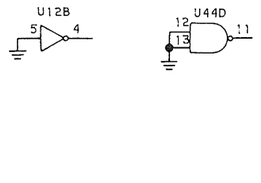


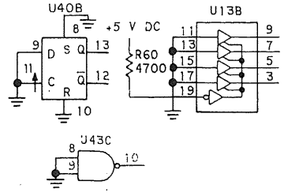
Control A1A2 Schematic Diagram
Figure 15 (Sheet 2)


(2) ($4031) B0-B7
(2) ($4030) B0-B7
(2) ($402E) B0-B7
(2) ($402D) B0-B7
(2) ($4032) B0-B7
INTERNAL R
U28D
Q18 MPSA14
U25E
Q11 MPSA14
U30E
Q12 MPSA14
U28G
Q13 MPSA14
+12 V DC
CR12 1N4002
CR5 1N4002
CR6 1N4002
CR7 1N4002
P/O P1
25 K21
22 K27
24 K29,K30
23 K28
P/O P4
+5 V DC
R58 680
CR41 MV5053
U35A 4700
U35B 4700
U26G 22k
Q4 MPS2222
Q3 MPS2222
U33G 220k
U32F 220k
C90 0.01
C32 0.01
3 TUNE FAULT
U35C 4700
U35D 4700
U25G 22k
Q5 MPS2222
Q6 MPS2222
U31F 220k
C33 0.01
C88 0.01
9 XMT INH
U35E 4700
U35F 4700
U26 22k
Q7 MPS2222
Q8 MPS2222
U31G 220k
U32G 220k
C34 0.01
C89 0.01
8 TUNE
U36A 4700
U36B 4700
U26B 22k
Q9 MPS2222
Q10 MPS2222
U31J 220k
U32J 220k
C35 0.01
C86 0.01
12 TUNE PWR
U27D
Q27 MPSA14
U26A
Q28 MPSA14
U28A
Q29 MPSA14
U27C
Q30 MPSA14
U27F
Q14 MPSA14
U28E
Q15 MPSA14
U26E
Q16 MPSA14
U27B
Q17 MPSA14
U32K 220k
U32A 220k
U32C 220k
U32N 220k
U32H 220k
U32B 220k
U32E 220k
U32L 220k
CR21 1N4002
CR22 1N4002
CR23 1N4002
CR24 1N4002
CR8 1N4002
CR9 1N4002
CR10 1N4002
CR11 1N4002
9
10
11
12 RSVD
17 K23
18 K24
19 K25
20 K26
U26C
Q19 MPSA14
U25B
Q20 MPSA14
U28C
Q21 MPSA14
U28F
Q22 MPSA14
U25D
Q23 MPSA14
U27A
Q24 MPSA14
U26D
Q25 MPSA14
U28B
Q26 MPSA14
U31K 220k
U31L 220k
U34C 220k
U31E 220k
U32M 220k
U31H 220k
U31N 220k
CR13 1N4002
CR14 1N4002
CR15 1N4002
CR16 1N4002
CR17 1N4002
CR18 1N4002
CR19 1N4002
CR20 1N4002
1 K11
2 K12
3 K13
4 K14
5 K15
6 K16
7 K17
8 K18
U29G 22k
Q34 MPSA14
U30G 22k
Q33 MPSA14
U30C 22k
Q32 MPSA14
U29E 22k
Q31 MPSA14
U29B 22k
Q43 MPSA14
U29B 22k
Q45 MPSA14
U30D 22k
Q44 MPSA14
U25A 22k
Q46 MPSA14
U33D 220k
U33J 220k
U31N 220k
U33A 220k
U33N 220k
U31B 220k
U34A 220k
U31C 220k
CR28 1N4002
CR27 1N4002
CR26 1N4002
CR25 1N4002
CR37 1N4002
CR39 1N4002
CR38 1N4002
CR40 1N4002
28 K22
27 K33
26 K32
25 K31
19 K7
21 K9
16 K8
15 K10
SPARE GATES
U30B 22k
Q35 MPSA14
U29D 22k
Q36 MPSA14
U29C 22k
Q37 MPSA14
U30F 22k
Q38 MPSA14
U25F 22k
Q39 MPSA14
U29F 22k
Q40 MPSA14
U30A 22k
Q41 MPSA14
U29A 22k
Q42 MPSA14
U33M 220k
U33F 220k
U33C 220k
U33H 220k
U31D 220k
U33K 220k
U33L 220k
U33B 220k
CR29 1N4002
CR30 1N4002
CR31 1N4002
CR32 1N4002
CR33 1N4002
CR34 1N4002
CR35 1N4002
CR36 1N4002
P/O CONTRO
R27 10 k
R28 10 k
C19 0.01
C36 10
U23B
U12B
U44D
U39A
U39B
U39E
U39F
U40B
U43C
R60 4700
U13B







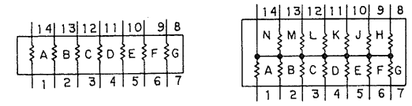


NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. TYPE DESIGNATIONS SHOWN MAY BE GENERIC IN FORM AND ARE FOR REFERENCE ONLY. SEE APPLICABLE PARTS LIST FOR REPLACEMENT PARTS.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATIONS, PREFIX WITH UNIT NUMBER AND/OR ASSEMBLY DESIGNATION.
4. THIS EQUIPMENT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. SPECIAL HANDLING METHODS AND MATERIALS MUST BE USED TO PREVENT EQUIPMENT DAMAGE.
5. U25 - U38 AND U45 - U46 ARE RESISTOR ARRAYS WITH CONFIGURATIONS SHOWN BELOW WITH R VALUES:

U25 - U30 - 22 k
U35 - U36 - 4700
U37 - 150

U31 -U34,U45, U46 - 220 k
U38 - 10 k



6. CONNECTOR P3 IS USED FOR FACTORY TEST ONLY.

MICROCIRCUIT INFORMATION

U NO	TYPE	POWER (V DC) +5	+12	GND
U1	2732	24		12
U2	6802	8		21,1
U3	54LS244	20		10
U4	54LS244	20		10
U5	54LS245	20		10
U6	2732	24		12
U7	8255	26		7
U8	8255	26		7
U9	8255	26		7
U10	4049	1		8
U11	4049	1		8
U12	4049	1		8
U13	54LS244	20		10
U14	54LS10	14		7
U15	LM139		3	12
U16	54LS10	14		7
U17	54LS10	14		7
U18	54LS27	14		7
U19	54LS138	16		8
U20	54LS02	14		7
U21	2114	18		9
U22	2114	18		9
U23	LM124	4		11
U24	LM124	4		11
U25	RES ARRAY			
U26	RES ARRAY			
U27	RES ARRAY			
U28	RES ARRAY			
U29	RES ARRAY			
U30	RES ARRAY			
U31	RES ARRAY			
U32	RES ARRAY			
U33	RES ARRAY			
U34	RES ARRAY			
U35	RES ARRAY			
U36	RES ARRAY			
U37	RES ARRAY			
U38	RES ARRAY			
U39	4050	1		8
U40	4013	14		7
U41	4011	14		7
U42	LM139	3		12
U43	4011	14		7
U44	4013	14		7
U45	RES ARRAY			
U46	RES ARRAY			

TPA-5170-035

Control A1A2 Schematic Diagram
Figure 15 (Sheet 3)