

EQUIPMENT MANUAL (CLASS B)

**INSTALLATION, OPERATION AND MAINTENANCE
INSTRUCTIONS WITH PARTS LIST**

**HF RECEIVER
TYPE RA6830-516**

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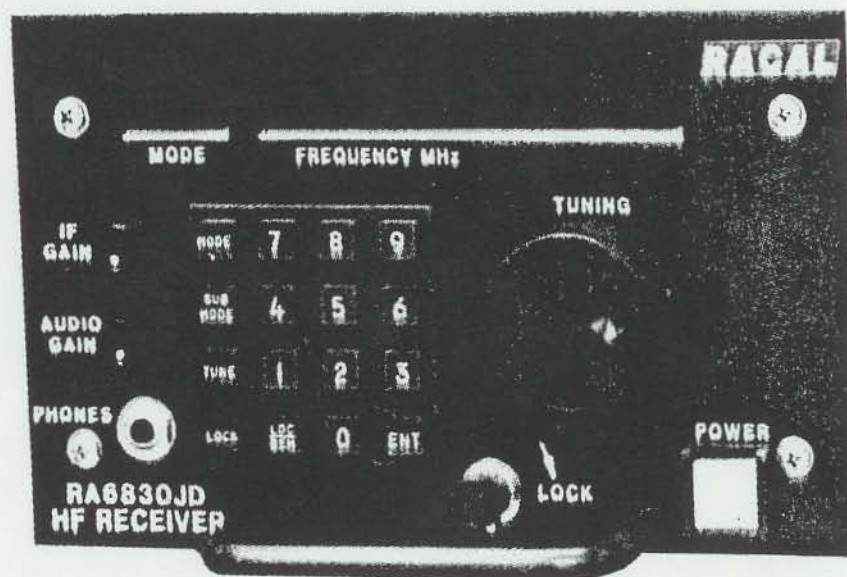
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| B | IEEE-488C Remote Control Interface
Circuit Card Assembly (A3-3) |
| C | Binary Protocol IEEE-488C Interface |
| D | Protocol For High-Speed Serial I/O |



Frontispiece: RA6830 HF Receiver

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This Section provides general information on the RA6830 HF Receiver. This information describes the equipment, gives its purpose, specifications and capabilities. Figure 1-1 shows an overall view of the RA6830 HF Receiver. A list of the equipment supplied and equipment required but not supplied is also contained in this Section.

1.2 GENERAL DESCRIPTION

The following paragraphs provide a general electrical and mechanical description of the receiver.

1.2.1 Electrical Description

The RA6830 HF Receiver is a fully synthesized, microcomputer-based, solid state Receiver with optional remote control. It receives CW, AM, LSB, USB, and FM signals over the frequency range of 500 kHz to 29.99 MHz. Frequency tuning is accomplished by keypad entry or tuning knob control with selectable tuning rates down to 1 Hz increments. The Receiver also incorporates a synthesized BFO with a tuning range of ± 8 kHz in 10 Hz increments. The front panel displays up to 8 LED digits for tuned frequency or 3 digits and sign for BFO offset. Front panel mode/submode data is displayed by four LED characters. Other front panel display selections are detection mode, BFO frequency, RF/AUDIO metering selection, IF bandwidth, AGC, internal/external frequency reference, BITE fault code and LOCAL/REMOTE control indication.

The tuning circuitry of the Receiver includes a 1st LO Synthesizer which tunes to a resolution of 1 Hz. The BFO synthesizer tunes ± 8 kHz in 10 Hz increments.

The Receiver accommodates up to five IF bandpass filters in the IF filter module assembly A10. Selectable bandwidths are available from 50 Hz to 100 kHz. Filter types include

symmetrical, LSB, and USB. Symmetrical filters may be used for LSB and USB operation. Quartz crystal and mechanical filters are available.

Rear panel features include BNC connectors for the RF input signal, for external/internal frequency reference signal, and for 455 KHz IF output. A 25-pin, D-type connector carries audio, AGC and fault indicator signals. An optional second multi-pin connector provides the remote control interface. An MS circular connector is used as the AC power receptacle.

Audio output appears at the PHONES jack on the front panel and at the AF OUT connector on the rear panel. The PHONES jack nominal output level is 10 milliwatts maximum into 600 ohms and is adjustable using the front panel AF GAIN control. The AF OUT connector provides a nominal 1 milliwatt 600 ohm balanced line output (internally adjustable ± 10 dB) and a nominal 0.5 watt output into 8 ohms, suitable for a loudspeaker.

Built-In-Test Equipment (BITE) is provided in the Receiver to detect, identify and locate hardware faults to the lowest replaceable unit (LRU) in either local or remote control mode. A special software routine exercises most receiver functions. The test may be run anytime and is less than one minute in duration. The receiver is not operational during the BITE test routine.

Optional full remote control of all receiver parameters is provided by a byte-serial, bit parallel IEEE standard 488C-1978 compatible controller.

A rear panel connector provides the input/output port for data/control signals.

1.2.2 Mechanical Description

The RA6830 Receiver mounts within a dual receiver enclosure assembly which is turn is mounted in a standard 19-inch equipment rack. The receiver occupies 5.25 inches (13.34 cm) (3 rack units) of vertical space, 9.5 inches (24.13 cm) of horizontal space (half rack width) and 22.5 inches (57.2 cm) of depth exclusive of connectors and cable dress. Overall weight of the receiver is approximately 25 pounds (11.3 kg).

An aluminum chassis containing an epoxy-glass parent board comprises the main frame

of the Receiver. Receiver modules are mounted to the parent board by means of PC connectors. The chassis is compartmentalized using divider shields for RFI isolation, and has guide pins to facilitate mounting in the dual receiver enclosure. The front, rear and side panels are attached by means of standard Phillips-head screws. All modules are accessible for maintenance and can be removed and replaced using a screwdriver. Power and some signals are distributed via parent board. The side panels contain channels for coaxial cables and a ribbon cable and the space below the parent board is occupied by several cables of various types, including coaxial, shielded, unshielded, and ribbon.

1.3 RECEIVER SPECIFICATIONS

Receiver specifications are listed in Table 1-1.

Table 1-1. Receiver Specifications

CHARACTERISTICS	PERFORMANCE CRITERIA
Frequency Range	0.5 MHz to 29.999999 MHz
Frequency Resolution	1 Hz
Frequency Tuning	Direct entry via keypad. Manual tuning via tuning control with selectable rates using 100 Hz, 10 Hz, and 1 Hz tuning increments.
Frequency Indication	LED readout of tuned frequency (number of digits displayed indicates tuning rate).
Frequency Stability	± 5 parts per 10^8 per 10°C for ambient temperature 0° to 50°C .
Detection Modes	CW, AM, USB, LSB, and FM.
Synthesized BFO	Variable ± 8 kHz in 10 Hz steps relative to IF center frequency in CW mode.
Noise Figure	15 dB maximum from 0.5 to 30 MHz for ambient temperature 0° to 35°C .

Table 1-1. Receiver Specifications (Cont.)

CHARACTERISTICS	PERFORMANCE CRITERIA
IF Selectivity:	
<u>BW Position</u>	<u>-3 dB BW</u> <u>Shape Factor</u> <u>3:60 dB</u>
BW1	0.3 kHz $\pm 10\%$ 7:1, maximum
BW2	1.0 kHz $\pm 10\%$ 4:1, maximum
BW3	3.0 kHz $\pm 10\%$ 2.5:1, maximum
BW4	6.0 kHz $\pm 10\%$ 1.5:1, maximum
Receiver Outputs	
IF:	455 kHz at -10 dBm nominal into 50 ohms; BNC connector.
LBIF:	6.4 kHz at -10 dBm ± 3 dB nominal into 50 ohms; BNC Connector.
Monitor:	1 milliwatt into 600 ohm balanced line in all modes with less than 2% distortion. Internally adjustable ± 10 dB. 25 pin D connector (rear panel).
Headphone:	10 milliwatts maximum into 600 ohm load in all modes with less than 5% distortion. Front panel adjustable to zero power. Jack at front panel.
Reference:	+3 dBm ± 3 dB (50 ohms) selectable internal/external reference frequency of either 1, 5 or 10 MHz. Rear panel BNC connector.
Detection Modes	AM, FM, USB, LSB, CW
Receiver Inputs	
RF:	0.5 to 29.999999 MHz 50 ohms nominal 2.5:1 VSWR maximum; BNC connector.
Reference:	0 dBm ± 16 dB, 50 ohms. Rear panel BNC connector.
Gain Control Range	
AGC Mode:	An input signal increase of 110 dB above AGC threshold results in an output change of less than 3 dB.

Table 1-1. Receiver Specifications (Cont.)

CHARACTERISTICS	PERFORMANCE CRITERIA
MAN Mode:	The RF GAIN control yields a minimum of 120 dB of gain control range.
AGC Fixed Threshold	Standard setting -113 dBm, adjustable internally to -100 dBm.
AGC Variable Threshold	Manually adjustable -113 dBm to -10 dBm.
AGC Time Constants	Attack: 20 ms. maximum for a 30 dB step. Decay: 30 ms. maximum (short) for a 30 dB step. 200 ms. (medium) ± 100 ms for a 30 dB step. 3.75 sec. (long) ± 1.25 s for a 30 dB step.
Intermodulation (out-of-band) 0° to 35°C	
3rd Order Intercept	+30 dBm minimum relative to two -10 dBm signals, spaced at least 100 kHz apart.
2nd Order Intercept	+60 dBm minimum for two -10 dBm signals, at least 100 kHz removed from the receiver tuned frequency.
Intermodulation (in band) 0° to 35°C	-50 dBm minimum relative to two -10 dBm signals, separated by a minimum of 100 Hz with receiver in LONG AGC Mode.
Blocking:	
ON Tune:	A desired AM signal of +13 dBm, 30% modulated, has less than 10% distortion measured at the Line Audio output.
OFF Tune:	No blocking effects on a 30% modulated on-tune signal when in the presence of a +23 dBm unmodulated carrier at least 50 kHz off-tune.
Internal Spurious Responses	Less than -124 dBm equivalent input signal, except a maximum of 10 less than -116 dBm, a maximum of two less than -110 dBm.
Image Rejection	80 dB minimum for signals spaced ± 50 kHz.
IF Rejection	80 dB minimum for -20 dBm signals.
Receiver Internal Control	Microprocessor control unit with 16 K RAM.

Table 1-1. Receiver Specifications (Cont.)

CHARACTERISTICS	PERFORMANCE CRITERIA
Remote Control	Optional, through rear panel 25-pin connector. Available control formats are compatible with MIL-188C, RS-232C and IEEE 488.
Input Power	115 VAC $\pm 10\%$, 48-420 Hz, single phase.
Dimensions, nominal, per receiver unit, rack-mounted	Height: 5.25 inches (13.34 cm) 3 rack units Width: 9.50 inches (24.13 cm) $\frac{1}{2}$ rack width Depth: 22.50 inches (57.15 cm) not including connectors and cable dress.
Weight	25 lbs. (11.3 kg), approximately.
Operating Temperature Range	0 to 50 degrees C ambient. Forced-air cooling recommended above $+25^{\circ}\text{C}$.
Operating Humidity Range	10 to 95%, relative (non-condensing).
Environmental Ratings	Conforms to MIL-STD-810C, Methods 508.1, 514.2, category F, and 516.2, Procedure I.
Power Consumption	55 watts, maximum.
EMI/EMC	Designed to MIL-STD-461B, Requirements RS02, RS03, CS02, CS06, and CE03.

1.4 LIST OF ITEMS SUPPLIED

Items supplied with the Receiver are listed in Table 1-2.

Table 1-2. List of Items Supplied

ITEM	QUANTITY	RACAL PART NUMBER
Model RA6830 HF Receiver	1 ea.	RA6830
Technical Manual	1 ea.	EM(B)-6830JD(16)
Line Cord	1 ea.	3500314-501
Mating AF Output Connector IDC, Male, 25 Pin, 'D'	1 ea.	61285

1.5

LIST OF ITEMS REQUIRED BUT NOT SUPPLIED

Items required for the Receiver, but not supplied, are listed in Table 1-3.

Table 1-3. List of Items Required But Not Supplied

ITEM	QUANTITY	RACAL PART NUMBER
Extender Board, Analog	1 ea.	4100049-501
Extender Board, Digital	1 ea.	4100049-502
Male-Female SMB Coax Extender Cable Assembly	4 ea	3500114-501
RF Antenna, 0.1 to 30 MHz	1 ea.	(supplied by user)
Mating Remote Control		
Interface Connector, RS232C Female, 25 pin, 'D'	1 ea.	61248
Headset, 600 ohm	1 ea.	(supplied by user)

SECTION II

INSTALLATION

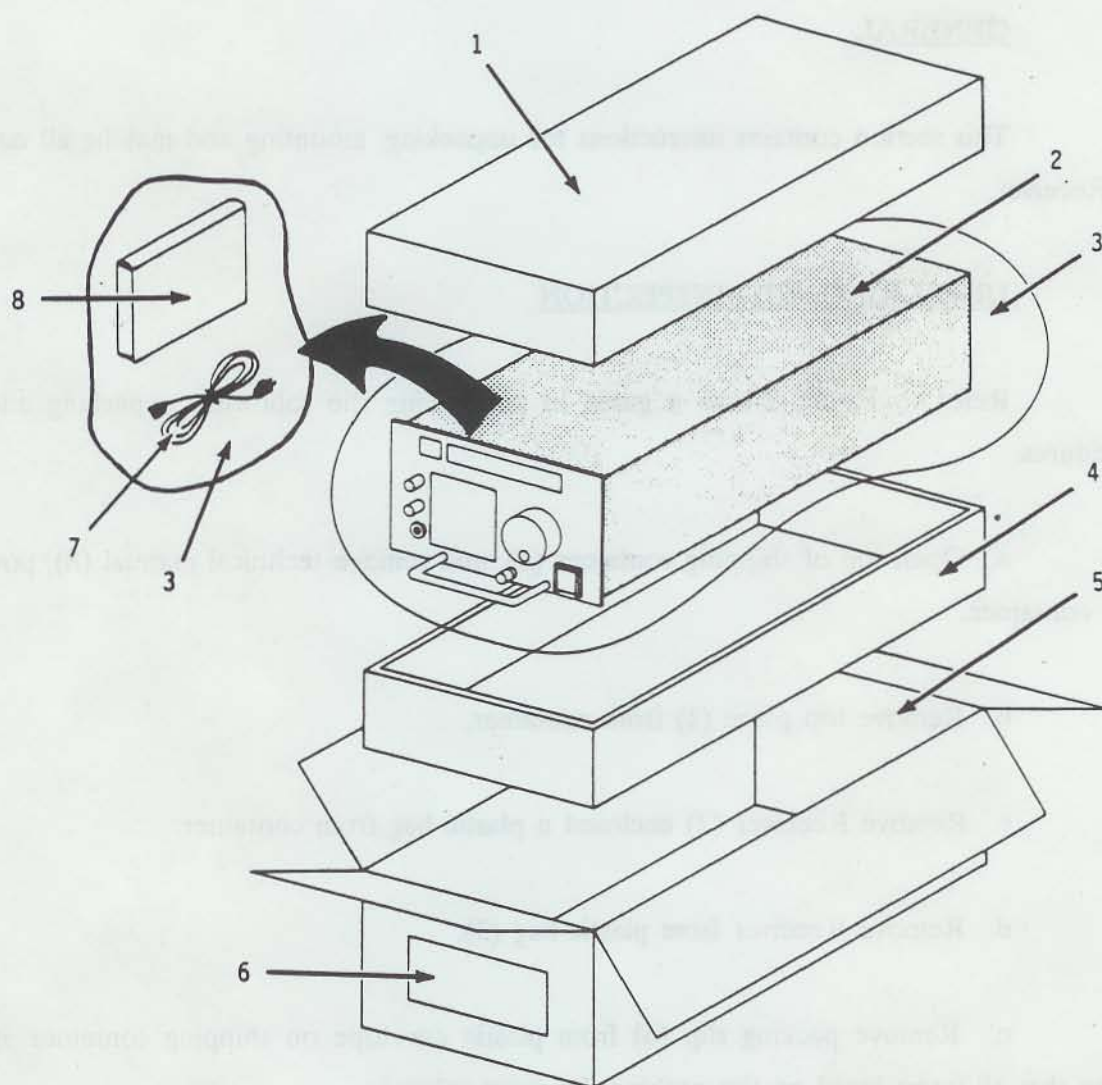
2.1 GENERAL

This section contains instructions for unpacking, mounting and making all connections to the Receiver.

2.2 UNPACKING AND INSPECTION

Refer to Figure 2-1 as a guide in performing the following unpacking and inspection procedures.

- a. Open top of shipping container (5), and remove technical manual (8), power cord (7) from container.
- b. Remove top piece (1) from container.
- c. Remove Receiver (2) enclosed in plastic bag from container.
- d. Remove Receiver from plastic bag (3).
- e. Remove packing slip (6) from plastic envelope on shipping container and check to ensure that all items listed on the packing slip were received.
- f. Store all packing materials in shipping container and store shipping container for re-use.
- g. Inspect top and bottom, both sides, and both front and rear panels of equipment for dents, scratches or any visually identifiable structural damage.
- h. Inspect controls and indicators on front panel for broken or cracked lenses and for damaged knobs or levers.



- | | |
|-----------------|-----------------------|
| 1. Top Piece | 5. Shipping Container |
| 2. Receiver | 6. Packing Slip |
| 3. Plastic Bag | 7. Power Cord |
| 4. Bottom Piece | 8. Technical Manual |

Figure 2-1. Receiver Shipping Container

- i. Inspect jacks and other rear panel mounted devices for damage.

2.3 POWER REQUIREMENTS

The receiver operates from 115 VAC, 48 to 63 Hz. It is factory set for operation from 115 VAC.

A 3-wire NEMA AC power cord is provided with the unit. Ensure that the AC power source has three wire provisions with the center conductor (U-slot on the NEMA plug) grounded to prevent accidental shock.

2.4 MOUNTING

The receiver is designed for mounting within a specially designed dual receiver enclosure assembly, which may be installed in an equipment rack on angle supports or by slide mounting. the following paragraphs describe procedures for installing the Receiver.

2.4.1 Dual Receiver Enclosure

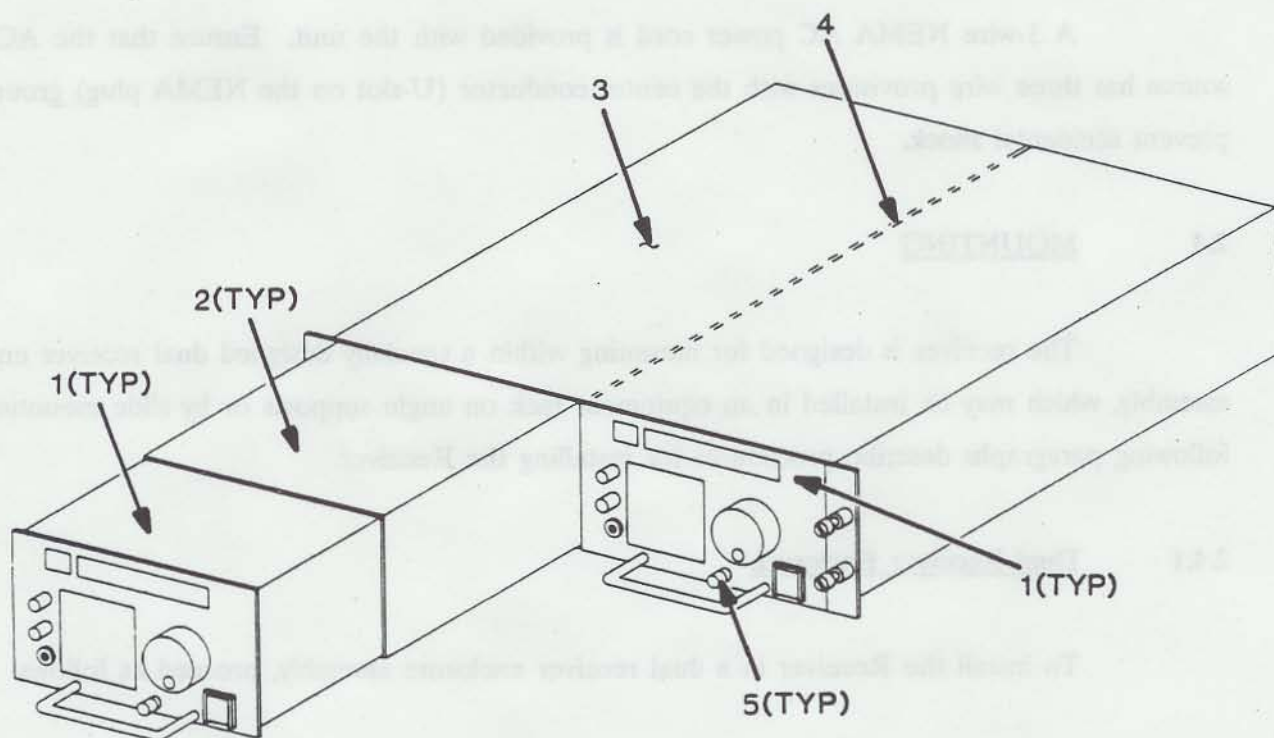
To install the Receiver in a dual receiver enclosure assembly, proceed as follows:

- a. Place dual receiver enclosure assembly (3, Figure 2-2) on flat work surface.
- b. Align Receiver with either half-section of (4) dual receiver enclosure assembly and slide into place.

NOTE

The Receiver incorporates two guide pins mounted to the rear panel to facilitate proper alignment within the dual receiver enclosure assembly.

- c. Connect AC power cord to AC power receptacle (7, Figure 2-6)
- d. On receiver front panel, manually rotate LOCK device (5) in a clockwise direction to secure Receiver within dual receiver enclosure assembly, as required.



- | | |
|-------------------------------------|-----------------|
| 1. Receiver | 4. Half-Section |
| 2. Receiver Shield Assembly | 5. LOCK Device |
| 3. Dual Receiver Enclosure Assembly | |

Figure 2-2. Dual Receiver Enclosure Assembly Installation

2.4.2

Angle Support Installation

To mount the receiver enclosure in a rack using angle supports, proceed as follows:

- a. Open rear door of equipment rack (1, Figure 2-3) and ensure that cables will not interfere with dual receiver enclosure assembly (8) installation.
- b. Set rear right and left sides of dual receiver enclosure assembly (8) on angle supports (2) and slide into rack.
- c. Align four front panel screw-type fasteners (7) with mounting holes on both sides of rack and secure.

2.4.3

Slide Installation

To mount the receiver enclosure in a rack using straight extension rack slides, proceed as follows:

- a. Open rear door of equipment rack (1, Figure 2-3) and ensure that cables will not interfere with dual receiver enclosure assembly (8) installation.
- b. Align and insert both intermediate sections (5) of slide into stationary sections (3) and push dual receiver enclosure assembly into rack until slides catch on spring retainers (4).
- c. Ensure all cables are clear of door and close door on rear of rack.
- d. Align four front panel screw-type fasteners (7) with mounting holes on both sides of rack and secure.

2.5

INPUT POWER

This receiver operates from 115 VAC only.

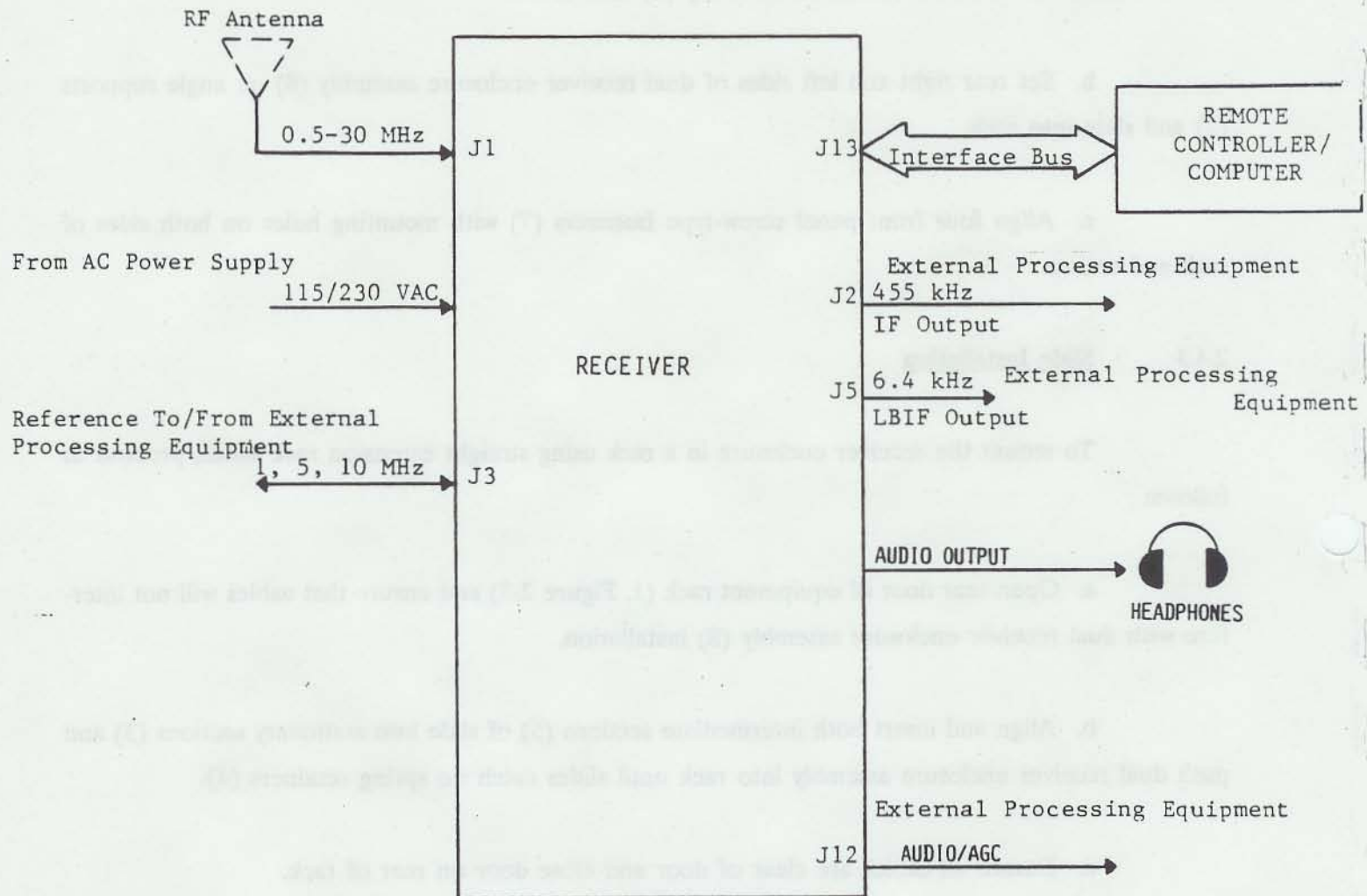


Figure 2-4. System Application

2.6.2

Cabling Procedures

The following steps describe the procedures for connecting power and signal cables to the Receiver. Refer to Figure 2-5 as an aid in locating the connection points referred to in the following steps.

- a. Connect a No. 10 ground wire between the GND terminal on the Receiver and suitable ground.
- b. Connect AC power cord between AC power receptacle on receiver and AC power source.
- c. Connect RF input cable between RF IN (J1) connector on receiver and RF antenna, or other RF signal source, as appropriate.
- d. Connect output signal cable between IF OUT (J2) connector on receiver and ancillary spectrum monitoring/processing equipment, if applicable.
- e. Connect output signal cable between BASEBAND OUT J5 connector on receiver and external processing equipment, if applicable.
- f. Obtain appropriate cable and mating connector to interface with audio frequency output connector J12. Connect cable to the appropriate pins as shown in Table 2-1.
- g. Connect AF output interface cable between AF OUT connector J12 on receiver and ancillary equipment, if applicable.
- h. Connect remote control interface cable between optional remote control interface connector J13 on receiver and remote controller.

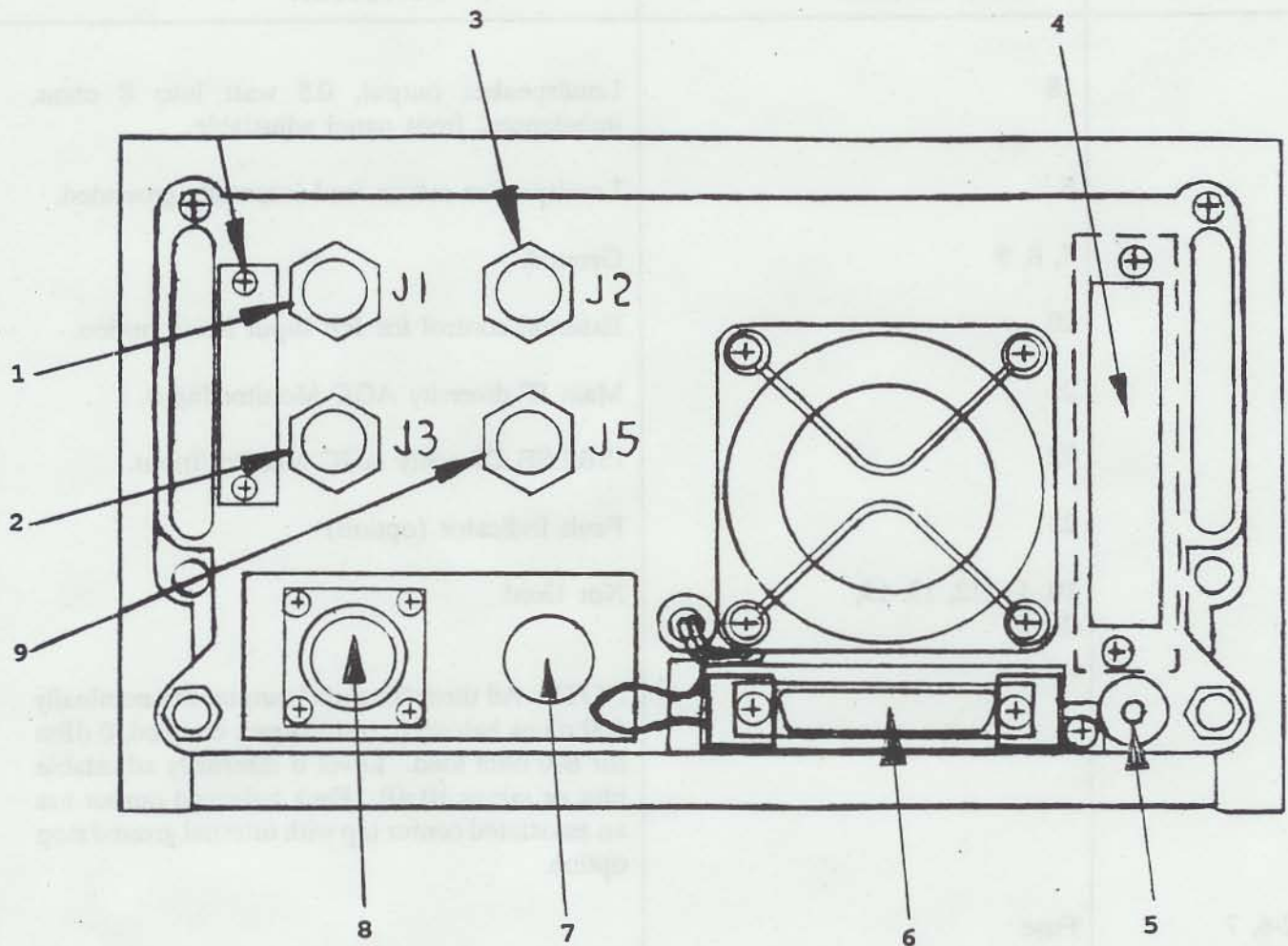
Table 2-1. Input/Output Connectors

FIGURE & INDEX NO.	CONNECTOR	FUNCTION
2-6, 1	RF IN Connector J1 (BNC)RF	Signal input to Receiver impedance 50 ohms nominal, VSWR 2:1 nominal, for the frequency range 0.1 to 30 MHz.
2-6, 2	REF IN/OUT Connector J3 (BNC)	Accepts 1, 5, or 10 MHz external frequency reference signal of 0 dBm (plus 13 dB minus 20 dB), or provides internally generated reference signal of 1, 5, or 10 MHz at 0 dBm. Internal/External mode and frequency choice of 1, 5, or 10 MHz is selected via front panel or remote control option. Impedance: 50 ohms. See paragraph 3-17.
2-6, 3	IF OUT Connector J2 (BNC)	Provides an IF signal output, centered at 455 kHz, output signal level of -10 dBm $\pm$ 2 dB for all CW input signals within the range of -113 dBm to +13 dBm with AGC selected; output impedance of 50 ohms with VSWR of 1.5:1.
2-6, 4	Remote Control Interface Connector J13 - Optional	Provides for interfacing the Receiver, via appropriate remote control interface or control bus standard, with a remote controller/computer.
2-6, 5	GND Terminal	Provides chassis grounding for connection to a suitable earth grounding source.
2-6, 6	AF OUT Connector J12 (Cannon-Type DB-25P)	Provides audio, and AGC output signals for monitoring. The following outputs are available:
	<u>Pin Number</u>	<u>Function</u>
	1, 14 2	USB Line Out, ISB only Center Tap.
	3, 15 16	LSB Line Out, ISB only Center Tap.
	4, 17 5	Audio Line Out (Monitor) for AM, FM, CW, USB, LSB Center Tap

Courtesy of <http://BlackRadios.terryo.org>

Table 2-1. Input/Output Connectors (Cont.)

FIGURE & INDEX NO.	CONNECTOR	FUNCTION
	18	Loudspeaker output, 0.5 watt into 8 ohms, unbalanced, front panel adjustable.
	6	Loudspeaker return lead internally grounded.
	7, 8, 9	Ground.
	20	External control for RF Input Mute option.
	21	Main IF diversity AGC Monitor/Input.
	22	ISB/LSB Diversity AGC Monitor/Input.
	23	Fault Indicator (option)
	10, 11, 12, 13, 19, 24, 25	Not Used
		NOTE: All three "line out" outputs are nominally 600 ohms balanced, transformer coupled, 0 dBm for 600 ohm load. Level is internally adjustable plus or minus 10 dB. Each balanced output has an associated center tap with internal ground stop option.
2-6, 7	Fuse	
2-6, 8	AC Power Receptacle	Provides AC power source input connection.
2-6, 9	BASEBAND OUT Connector J5 (BNC)	Provides a baseband signal output, centered at 6.4 kHz, output signal level of -10 dBm $\pm$ 2 dB for all CW input signals within the range of -113 dBm to +13 dBm with AGC selected; output impedance of 50 ohms with VSWR of 1.5:1.



- | | |
|---|------------------------------|
| 1. RF IN Connector J1 | 5. GND Terminal |
| 2. REF IN/OUT Connector J3 | 6. AF Out Connector J12 |
| 3. IF OUT Connector J2 | 7. Fuse |
| 4. Remote Control Interface Connector J13 | 8. AC Power Receptacle |
| | 9. BASEBAND OUT Connector J5 |

Figure 2-5. Rear Panel Details

2.7

MINIMUM PERFORMANCE CHECK

The minimum performance check is an operational quick-check to verify operation of the receiver. This check should be performed prior to placing the receiver into operational status. Should a fault be encountered during this procedure refer to Section V for troubleshooting procedures. Proceed as follows:

- a. Depress POWER switch to the on position. Front Panel displays and indicators should illuminate.
- b. Press LOC/REM switch until REM disappears in the FREQUENCY MHz display.
- c. Enter BITE mode by pressing LOCK, hold, press 1, then release both buttons.
- d. If the receiver is operational, BITE will restore receiver operation after about 30 seconds.
- e. If receiver is defective, a 2-digit fault code will be displayed within about 30 seconds. Refer to Section V.

SECTION III

OPERATION

3.1 INTRODUCTION

This section provides an operational overview of the Receiver, and identifies and describes the associated controls and indicators, operating instructions and special operational applications.

3.2 OPERATIONAL OVERVIEW

The Receiver can be operated in either a local or remote control mode. The Receiver incorporates both a primary and secondary operational control state which can be selected in either the local control mode of operation through the use of the front panel controls, or through a remote mode of operation by either a user operated remote controller/computer or through use of pré-programmed instructions by a remote computer. The two operational control states include a mode and submode control of specific operating parameters. The primary mode operational control state allows selection of the critical operating parameters for obtaining RF signal detection and demodulation. These mode control operating parameters include: frequency tuning within the high frequency range of the Receiver; RF signal detection mode selection; beat frequency oscillator (BFO) tuning; radio and audio frequency metering functions; IF bandpass filter bandwidth selection; and gain control selection. In addition, the associated displays as viewed at the MODE display for each of the operating parameters are as follows: FREQ, DET, BFO, MTR, FLT and AGC respectively. The secondary submode operational control state allows selection of the specific operating parameter within the primary mode operational control state. These submode control operating parameters are listed below for each specific primary mode operational control state. As shown in Table 3-1, the primary mode and secondary submode operating parameters selectable at the front panel controls include the following: five standard detection modes AM, FM, CW, USB and LSB; up to five IF bandpass filters may be selected to accommodate the various detection modes; manual gain control (MGC), external gain control (EGC) and automatic gain control (AGC); BFO tuning frequency; RF and AF metering functions.

Table 3-1. Mode/Submode Control Parameter Selection and Associated Displays

MODE PARAMETER/ DISPLAY	SUBMODE PARAMETER	FREQUENCY MHz DISPLAY
FREQ	Enter Frequency View Frequency	FREQUENCY LOK 02.570153 LOK (example)
DET	AM Detection Mode Selection FM Detection Mode Selection CW Detection Mode Selection USB Detection Mode Selection LSB Detection Mode Selection	AM LOK FM LOK CW LOK USB LOK LSB LOK
BFO (only if CW detection mode is selected)	View BFO Selection Tune BFO Selection Zero BFO Selection	+4.11 kHz LOK (example) +4.11 kHz (example) +0.00 kHz LOK
MTR	RF Metering Selection Audio Frequency (AF) Metering Selection	RF LOK AUDIO LOK
FILT* (skipped if USB or LSB detection mode is selected)	IF Bandwidth No. 1 (FL1) IF Bandwidth No. 2 (FL2) IF Bandwidth No. 3 (FL3) IF Bandwidth No. 4 (FL4) IF Bandwidth No. 5 (FL5)	.3 kHz LOK 1.0 kHz LOK 3.0 kHz LOK 6.0 kHz LOK 16.0 kHz LOK
AGC	Manual Gain Control (MGC) Selection Short AGC Selection Medium AGC Selection Long AGC Selection	MANUAL LOK SHORT LOK MEDIUM LOK LONG LOK
(manual threshold set)	Short Variable AGC Selection Medium Variable AGC Selection Long Variable AGC Selection	SHORT VAR LOK MEDIUM VAR LOK LONG VAR LOK

*NOTE: Filter submodes displayed in ascending order of IF bandpass filter bandwidths not FL1-FL5 slot number; NULL filters (empty slots) are not displayed as submodes.

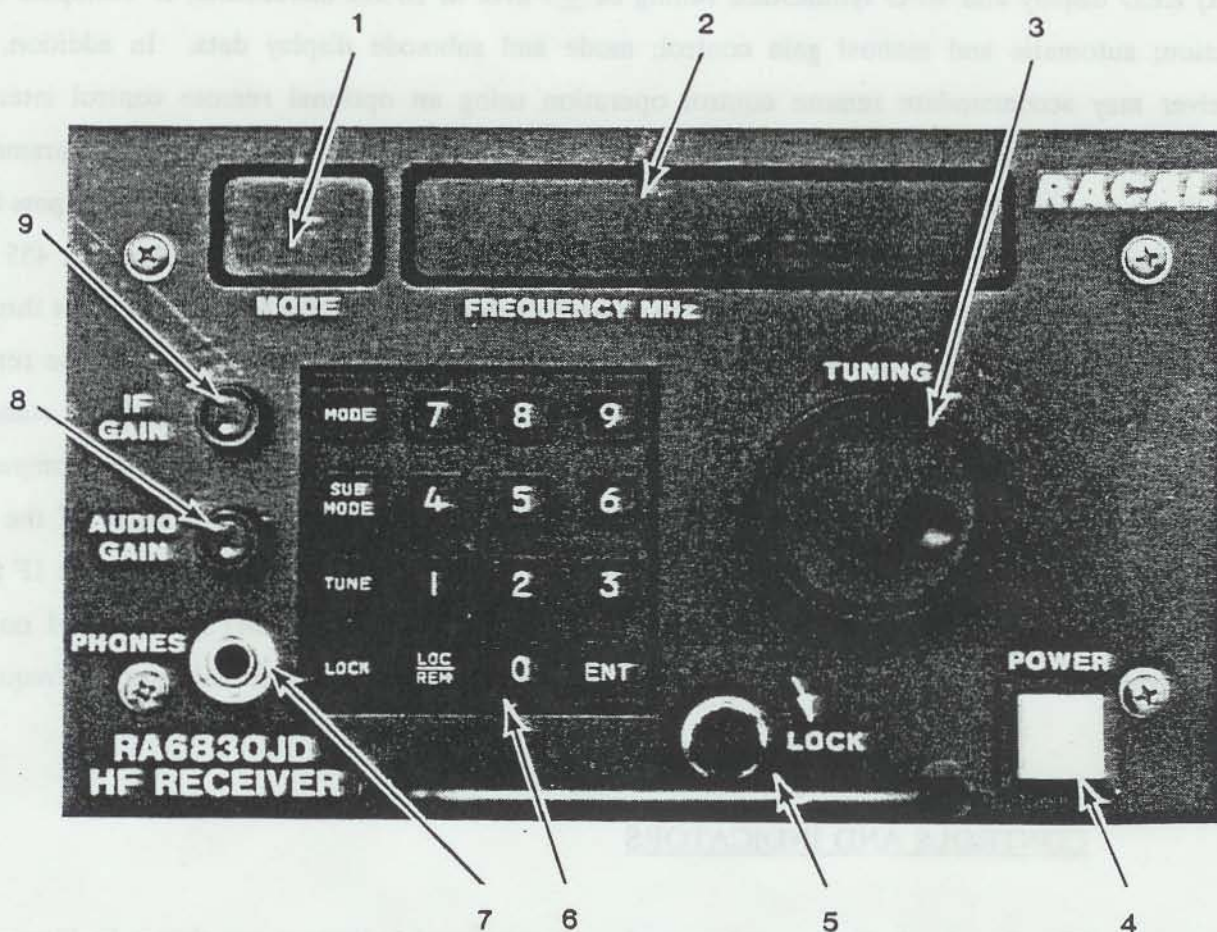
3.2.1 The Receiver integrates a single phase-lock-loop local oscillator (LO) synthesizer, referenced to either the front panel selectable 1, 5, or 10 MHz internal or external frequency reference, to allow precise tuning control. An internal microprocessor circuit card assembly (A2) provides control of all receiver control functions including: keypad entry with multiple tuning rates, and/or manual control tuning of frequency utilizing an alpha-numeric, twelve-digit (including decimal point) LED display and BFO synthesized tuning of ± 8 kHz in 10 Hz increments; IF bandpass filter selection; automatic and manual gain control; mode and submode display data. In addition, the Receiver may accommodate remote control operation using an optional remote control interface circuit card assembly (A3). In the local control mode, the operator can select operating parameters including frequency, detection mode, BFO frequency, RF/AUDIO metering functions, IF bandpass filter selection and gain control. In the local control mode, the operator may monitor the Receiver 455 kHz IF output using a spectrum monitor; in addition to audio monitoring, using a standard headset through front panel PHONES jack, or through AF OUT connector on receiver rear panel. In the remote control mode of operation, the operator can monitor the output of the Receiver using a standard headset and/or by observing the front panel displays without interfering with the remote computer's control. Provision is made, via the receiver control circuitry, to allow operator entry of the five nominal IF bandpass filter bandwidths; performed when the original filters mounted on the IF filter circuit card assembly (A10) are changed, or random access memory (RAM) is corrupted on the microprocessor circuit card assembly (A2) and, for operator entry of internal/external frequency reference.

3.3 CONTROLS AND INDICATORS

The Receiver's front panel controls and associated indicators are shown in Figure 3-1, and their operational functions are described in Table 3-2.

3.4 OPERATING INSTRUCTIONS

Normal Receiver operation consists of local or remote control operation as described in the following paragraphs. Because of the many different primary mode and secondary submode operating parameters associated with receiver operation, a normal operating procedure is presented for local control of operation and is to be used as a guide line for operator familiarization only. The operator should first become familiar with the controls and indicators, and then may implement signal detection and monitoring.



- | | |
|---|--|
| 1. MODE Display | 6. Keypad Switches (0-9, ENT, LOC/REM, LOCK, TUNE, SUB-MODE, MODE) |
| 2. FREQUENCY MHz Display | 7. PHONES Jack |
| 3. TUNING Control | 8. AUDIO GAIN Control |
| 4. POWER Switch with Control Indicator Lamp | 9. IF GAIN Control |
| 5. LOCK Device | |

Figure 3-1. Front Panel Controls and Indicators

Table 3-2. Controls and Indicators

FIGURE INDEX NO.	CONTROL/INDICATOR	FUNCTION
3-1, 1	MODE Display (4-Digit Red LED Indicator)	Displays the selected mode parameter, to indicate that either tuned frequency, detection mode, BFO tuned frequency, RF/AF metering function, IF bandpass filter bandwidth, automatic/manual gain control, BITE operation, or internal/external reference frequency functions are to be implemented. This display confirms that any of the applicable submode operating parameters for the primary mode operational control state may be selected through use of the SUBMODE key-switch for display in the FREQUENCY MHz display.
2	FREQUENCY MHz Display (12-Digit Red LED Indicator)	Display the selected submode operating parameter, through actuation of the SUBMODE key-switch, to indicate the tuned frequency, detection mode, BFO tuned frequency, RF/AF metering function, IF bandpass filter bandwidth, gain control function, or frequency reference being performed. This display confirms which submode operating parameter within the specific primary mode operational control state is selected and locked into operation.
3	TUNING Control	Provides for selection of receiver operating frequency or BFO frequency. (Refer to TUNE and SUBMODE key-switches.) The rate of change of the frequency depends on the increment selected by using the TUNE key-switch.

Table 3-2. Controls and Indicators (Cont.)

FIGURE INDEX NO.	CONTROL/INDICATOR	FUNCTION
4	POWER Switch with Control Indicator Lamp	Applies AC input power to the unit.
5	LOCK Device	Locks the Receiver within the dual receiver enclosure assembly.
6	Keypad Switches (0-9, ENT, LOC/REM, LOCK, TUNE, SUB-MODE, MODE)	Provides for selection of the following: 0-9, entering selected detection mode tuning frequency, BFO tuning frequency (BFO-only if CW detection mode is selected), operator entry of nominal IF bandpass filter bandwidths, and internal/external reference frequency selection, in addition, when either 1-3, 5 or 6 numeric key-switch is pressed in conjunction with LOCK key-switch, one of the three special operational applications is initiated (refer to paragraphs 3.7 through 3.9, as appropriate); ENT, when pressed initializes various secondary submode operating parameters including frequency tuning direct from keypad, operator entry of nominal IF bandpass filter bandwidths, and internal/external reference frequency selection; LOC/REM, allows selection of either local or remote control mode of operation by alternately pressing; LOCK, when pressed during keypad entry of tuning frequency initiates de-selection of the tuning control; TUNE, when pressed actuates frequency selection mode (FREQ in mode display) without stepping the Receiver through the various primary mode operating parameters cycle using MODE key-switch; SUBMODE, when pressed allows for

Table 3-2. Controls and Indicators (Cont.)

FIGURE INDEX NO.	CONTROL/INDICATOR	FUNCTION
		stepping through the various secondary submode operating parameters within the primary mode operating parameter (refer to Table 3-1); MODE, when pressed allows for stepping through the six primary operating parameters (cycle). (Refer to Table 3-1)
7	PHONES Jack	Provides a 600 ohm headset connection for output audio signal monitoring.
8	AUDIO GAIN Control (Potentiometer)	Provides for receiver audio gain control of the PHONES jack and the loudspeaker output supplied by AF OUT connector J12. This control does not affect the LINE output level from J12.
9	IF GAIN Control	Provides IF gain control when the Receiver is operated in the manual gain control mode and sets the threshold level when the Receiver is operated in the variable automatic gain control (AGC) mode. This control affects the IF signal level output at the IF OUT connector J2 on the rear panel and the audio signal level output through PHONES jack on front panel. This control is completely in operative during remote operation, and normal AGC mode.

EM(B)-6830JD(16)

Remote control operation is implemented through use of a remote controller/computer by commands sent as preprogrammed instructions, or manually sent by an operator at the remote controller/computer. These commands from the remote device may initialize Receiver operation after power up, provide setup instructions for specific operating parameters, and/or request receiver status reports.

3.5

LOCAL/MANUAL CONTROL OPERATION

To set up the Receiver for operation from the front panel controls, perform the following procedures:

a. Ensure that the POWER switch is set to the off position and that the proper AC power source is connected to the AC power receptacle (3, Figure 2-5) on the rear panel of the Receiver.

b. In addition, ensure that the Receiver is strapped for the correct AC power source in accordance with paragraph 2.9 before proceeding.

c. On Receiver front panel depress POWER switch (4, Figure 3-1) to on position and observe that associated indicator lamp illuminates.

d. On Receiver front panel, press LOC/REM key-switch (6) until REM disappears in FREQUENCY MHz display. If LOK appears in the FREQUENCY MHz display, the Receiver is in the local control mode of operation. Initiate BITE operation procedures of paragraph 3-6. If any indication required by BITE or the following operating procedure is not obtained, refer to the maintenance procedures in Section 5.

3.5.1

Normal Receiver Operation

Paragraphs 3.5.1.1 through 3.5.1.3 describe the normal operating procedure for the Receiver; special operational applications are provided in paragraphs 3.6 through 3.9. These procedures are presented in the order in which they should be performed under normal operation. Implement all procedures from the front panel controls of the Receiver unless otherwise stated.

3.5.1.1

Frequency Tuning

Tuning the Receiver to a specific selected frequency is accomplished by using either of two methods. These include: keypad entry and/or by tuning knob control. The following paragraphs explain both methods of tuning.

a. Keypad Entry

1. Press TUNE key-switch, observe that FREQ appears in MODE display and LOK disappears from FREQUENCY MHz display. The last selected tuning frequency will be present in the FREQUENCY MHz display, in addition to, either the RF or AF metering function (indicated by illuminated vertical bar LED's in far right hand side of display). It should be noted, that at the discretion of the operator, the frequency mode operating parameter may be obtained by stepping through the primary mode operating parameters using the MODE key-switch, or by using the TUNE key-switch.

2. Press SUBMODE key-switch and observe that FREQUENCY LOK appears in FREQUENCY MHz display. This display indicates that the last selected tuning frequency is present and locked in.

3. Press appropriate numeric key-switches (0-9) in MHz and observe that frequency selected appears in FREQUENCY MHz display. The most significant digit must be entered first followed by the least significant digits i.e. for a frequency of 1 MHz, press sequentially 0,1,0,0,0,0,0.

4. Press ENT key-switch and observe that frequency selected and LOK appears in FREQUENCY MHz display. The Receiver is now tuned and locked to the selected tuning frequency.

b. TUNING Control

1. Press TUNE key-switch and observe that FREQ appears in MODE display, and that, the letters LOK and the last selected tuning frequency will be displayed in the FREQUENCY MHz display; However, LOK will disappear with one subsequent press of the TUNE key-switch and this allows the tuning control to be activated. The Receiver incorporates three tuning rates which include: fast (100 Hz), slow (10 Hz), and fine (1 Hz).

2. Press TUNE key-switch once again or as desired until appropriate tuning rate (step size) appears in MODE display. This will be indicated by the position of the last significant digit appearing in the FREQUENCY MHz display. Repeated pressing of the TUNE key-switch will step through the most to least significant digits available for tuning rate control.

3. Rotate tuning control in either a clockwise or counter-clockwise direction while observing FREQUENCY MHz display to obtain selected tuning frequency. If it is desired to change the tuning rate press TUNE key-switch until desired tuning rate is obtained.

4. Press LOCK key-switch and observe that the selected tuning frequency remains and LOK appears in FREQUENCY MHz display. LOK indicates that the tuning control is inoperative (locked out). Lockout of the tuning control occurs automatically whenever either the LOCK, MODE, or SUBMODE key-switch is pressed.

3.5.1.2 DETECTION MODE SELECTION

The Receiver provides five detection modes which include: AM, FM, CW, USB and LSB. The following procedures should be performed to accomplish selection in each mode as follows: Implement step a-e as appropriate, for desired detection mode.

a. AM Detection Mode

NOTE

If the Receiver is already in the detection mode of operation (as indicated by DET appearing in MODE display), proceed to step 2; otherwise perform step 1.

1. Press MODE key-switch until DET appears in MODE display, as appropriate. The previous selected detection mode and the letters LOK will appear in the FREQUENCY MHz display.

2. Press SUBMODE key-switch until AM LOK appears in FREQUENCY MHz display, as appropriate.

3. Press MODE key-switch until FILT appears in MODE display. The previous IF bandpass filter bandwidth selected and LOK will appear in the FREQUENCY MHz display. The Receiver is now ready to be defined a particular IF bandwidth for detection mode selection.

4. Press SUBMODE key-switch until desired IF bandwidth appears in FREQUENCY MHz display. The filters (FL1-FL5) will always be selected and displayed in order of ascending bandwidths followed by LSB and USB, if they are installed. Empty, or NULL, slots are not displayed. If a full complement of filters (5) has been installed and a no-number bandwidth display condition appears (except for USB and LSB), RAM has been corrupted and the procedures in paragraph 3.9 must be performed to re-define the nominal IF bandpass filter bandwidths. If less than a full complement of filters has been installed, the no-number bandwidth display condition for one or more IF bandwidths is a normal indication.

5. Press MODE key-switch until AGC appears in MODE display and observe that the selected operating parameter and LOK appears in FREQUENCY MHz display. There are three choices for IF gain control which include: automatic gain control (AGC), manual gain control (MGC), and automatic gain control with variable threshold. AGC establishes and maintains, through operator selected response times (SHORT, MEDIUM and LONG), a constant IF signal level, and the time it takes for the AGC circuitry to respond to the IF signal level changes. Refer to Table 3-1 for the available IF gain control submodes. If AGC is desired, proceed to step 6; otherwise implement step 7 for MGC. If AGC with variable threshold is desired, proceed to step 10. Ensure that both IF GAIN and AUDIO GAIN controls are adjusted counter-clockwise.

6. Press SUBMODE key-switch until either SHORT LOK, MEDIUM LOK, or LONG LOK appears in the FREQUENCY MHz display, as desired. It should be noted that the IF GAIN control has no effect over AGC. Proceed to monitor the output signal per paragraph 3.6 and/or change selected tuning frequency in accordance with paragraph 3.5.1.1 as appropriate.

7. Press SUBMODE key-switch until MANUAL LOK appears in FREQUENCY MHz display. MGC allows the operator to set a desired IF signal level and disables the automatic response time and adjustments to changes in the IF signal level.

8. Press MODE key-switch until MTR appears in MODE display, then press

c. CW Detection Mode**NOTE**

If the Receiver is already in the detection mode of operation (as indicated by DET appearing in MODE display), proceed to step 2; otherwise perform step 1.

1. Press MODE key-switch until DET appears in MODE display, as appropriate. The previous selected detection mode and the letters LOK will appear in the FREQUENCY MHz display.
2. Press SUBMODE key-switch until CW LOK appears in FREQUENCY MHz display.
3. Press MODE key-switch until BFO appears in MODE display and last selected BFO function parameter (in kHz) and LOK appears in FREQUENCY MHz display. The BFO (Beat Frequency Oscillator) frequency range is ± 8.00 kHz and can be operated in either of two conditions: BFO tuning and BFO zero. The BFO tuning condition allows the operator to tune the BFO manually to achieve the desired audio frequency for the received CW signals. The BFO zero condition allows the operator to automatically zero-beat (fine tune the Receiver to the exact RF) received CW signal. Proceed to step 4 for BFO tuning condition; otherwise, implement step 7 for BFO zero condition.
4. Press SUBMODE key-switch until LOK disappears in FREQUENCY MHz display.
5. Rotate tuning control in either direction to select desired BFO tuning frequency.
6. Press LOCK key-switch and observe that LOK appears in FREQUENCY MHz display. The BFO tuning frequency is now locked by de-activation of the tuning control. To change BFO tuning frequency again, implement steps 4-6.
7. Press SUBMODE key-switch and observe that LOK appears in FREQUENCY MHz display. The Receiver is now tuned to the BFO zero condition. An RF/AF meter level may be present in the FREQUENCY MHz display.

8. Implement step a (AM Detection Mode), steps 3-11, as appropriate.

d. USB Detection Mode

NOTE

If the Receiver is already in the detection mode of operation (as indicated by DET appearing in MODE display), proceed to step 2; otherwise perform step 1.

1. Press MODE key-switch until DET appears in MODE display, as appropriate. The previous selected detection mode and the letters LOK will appear in the FREQUENCY MHz display.
2. Press SUBMODE key-switch until USB LOK appears in FREQUENCY MHz display. The Receiver is now locked into the upper sideband (USB) detection mode.
3. Implement step a, (AM Detection Mode) steps 5-11, as appropriate.

e. LSB Detection Mode

NOTE

If the Receiver is already in the detection mode of operation (as indicated by DET appearing in MODE display), proceed to step 2; otherwise perform step 1.

1. Press MODE key-switch until DET appears in MODE display, as appropriate. The previous selected detection mode and the letters LOK will appear in the FREQUENCY MHz display.
2. Press SUBMODE key-switch until LSB LOK appears in FREQUENCY MHz display. The Receiver is now locked in to the lower sideband (LSB) detection mode.
3. Implement step a (AM Detection Mode), steps 5-11, as appropriate.

3.5.1.3 REMOTE/AUTOMATIC CONTROL OPERATION

During remote control operation, a remote controller/computer initializes Receiver operation, provides setup instructions, and request status reports. Perform the following procedures to initiate remote control operation.

- a. Ensure that remote control interface cable from the remote controller/computer is connected to remote control interface connector J13 (5, Figure 2-5) on rear panel of Receiver.

NOTE

Refer to Appendix A for RS232C cabling instructions. Refer to Appendix B for IEEE-488C cabling instructions.

- b. On front panel of Receiver, depress POWER switch (4, Figure 3-1) to on position and observe that associated control indicator lamp illuminates.

- c. Depress LOC/REM key-switch (6) on front panel of Receiver and observe that REM appears in FREQUENCY MHz display (for RS232 only).

NOTE

If LOK appears in FREQUENCY MHz display, press again until REM appears.

- d. Observe status of MODE and FREQUENCY MHz displays on front panel. The displays on the front panel of the Receiver will be appropriately illuminated as the remote controller/computer initializes automatic control of operation. Refer to Appendix A for remote control protocol and commands when implementing remote control, via RS232C, Receiver operation. Refer to Appendix B for remote control protocol and commands when implementing remote control, via IEEE-488C, Receiver operation.

c. Press LOCK and numeral 3 key-switches simultaneously and observe that previous operating parameters appear in MODE and FREQUENCY MHz displays. If an error code is displayed, note the two-digit code, then refer to Section 5 to look-up module assembly/circuit card assembly malfunction.

3.8

INTERNAL/EXTERNAL REFERENCE USE

A standard source or synthesizer may be used in place of the Receiver's internal frequency reference at the option of the operator. The standard source or synthesizer used must be capable of providing either a sinusoidal 1, 5, or 10 MHz signal at an input level of -30 dBm into 50 ohms with a VSWR less than 1.5. The Receiver is normally set to supply a 1 MHz frequency reference o/p at the factory. Implement the following procedures to change the internal frequency reference, or to change to an external frequency reference of 1, 5, or 10 MHz, as appropriate.

a. On front panel of Receiver, depress POWER switch (4, Figure 3-1) to on position and observe that associated control indicator lamp illuminates.

NOTE

Implement steps b-h to select external frequency reference of either 1, 5, or 10 MHz, or steps i-k to change to internal frequency reference output of either 1, 5, or 10 MHz, as appropriate.

b. Obtain external source or synthesizer (Table 1-4), and connect AC power cord.

c. On rear panel of Receiver, connect source or synthesizer input cable to REF IN/OUT connector J3 (2, Figure 2-5).

d. Apply power and set up external source or synthesizer controls as follows: frequency at 1, 5, or 10 MHz and output level at 0 dBm.

e. Press LOCK and numeral 6 key-switches simultaneously and observe that REF appears in MODE display.

f. Press SUBMODE key-switch until EXTERNAL LOK appears in FREQUENCY MHz display.

NOTE

The FREQUENCY MHz display may indicate EXTERNAL REF FAULT or REF FAULT. If EXTERNAL REF FAULT is present, ensure that a secure connection has been made in accordance with step c, however, if REF FAULT is present, this indicates that the Receiver is not receiving the correct external frequency reference from the standard source or synthesizer.

g. Press ENT key-switch and observe FREQUENCY MHz display. This display will indicate the internal/external frequency reference (1, 5, or 10 MHz) previously selected. If this is correct, press ENT key-switch again to return to normal operation. If this is not the internal/external frequency reference to be used in this application, proceed to step 8.

h. Press SUBMODE key-switch until desired frequency reference appears in FREQUENCY MHz display. The FREQUENCY MHz display at this time will indicate either 1 MHz LOK, 5 MHz LOK, or 10 MHz LOK. Resume normal receiver operation in accordance with paragraphs 3.5.1.1 or 3.5.1.2.

i. Press SUBMODE key-switch until INTERNAL LOK appears in FREQUENCY MHz display.

j. Perform steps g and h.

k. Proceed to paragraphs 3.5.1.1. through 3.5.1.3 for normal operation.

3.9

IF BANDPASS FILTER BANDWIDTH COMPLEMENT SETUP

These procedures are to be performed when the IF bandpass filters are installed or changed, or if RAM has been corrupted.

a. Press LOCK and numeral 5 key-switches simultaneously and observe that IF bandpass filter bandwidth installed in FL1 slot is present in FREQUENCY MHz display.

NOTE

The display will actually indicate the IF filter bandwidth installed in either slot FL1-FL5, i.e. FL1 = 3.2 kHz. If the bandwidth is correct proceed to step b, if incorrect implement steps c-e.

b. Press ENT key-switch and observe that IF bandpass filters bandwidth installed in FL2 slot is present in FREQUENCY MHz display.

NOTE

If this is correct, repeat step b for FL3-FL5, however, if any IF bandwidth display is incorrect implement steps c-e.

c. Press SUBMODE key-switch and observe that FL1 = ____ . ____ (or as appropriate for IF bandpass filter slot selected) appears in FREQUENCY MHz display.

NOTE

It is now possible to enter the appropriate numerical bandwidth of the selected filter slot (FL1-FL5) beginning with the most significant digit i.e. to select 16 kHz press 1, 6, 0 numeral key-switches. If it is desired to enter USB or

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LSB, repeat pressing SUBMODE key-switch until the FREQUENCY MHz display indicates i.e. FL1 = USB, however, if no filter is installed in a slot, repeat pressing SUBMODE key-switches until i.e. FL1 = NULL.

d. Press appropriate numerical key-switches (most significant digit to least significant digit in sequence) for IF bandpass filter bandwidth, or press SUBMODE key-switch until USB, LSB or NULL appears in FREQUENCY MHz display.

e. Press ENT key-switch and observe that next filter slot (FL1 - FL5) appears in FREQUENCY MHz display.

NOTE

The preceding step defines the particular filter slot IF filter bandwidth, USB, LSB, or NULL (no filter) to software of the microprocessor circuit card assembly (A2-X). In addition, the next filter slot (FL1-FL5) with a particular bandwidth, NULL, USB or LSB will be displayed in the FREQUENCY MHz display. If the filter/bandwidth is correct, repeat step e to cycle through all filter slots and return to normal operation, otherwise, repeat steps c-e as appropriate. It should also be noted that no matter which filter is in a particular filter slot (FL1-FL5), the filter slots will always be displayed in ascending numerical order, followed by USB; LSB, NULL filter slots are not displayed.

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

This section describes the general theory of operation of the receiver. A receiver functional block diagram is provided to show functional signal flow through the receiver. The receiver functional description is followed by individual block-diagram descriptions of each receiver module.

4.2 FUNCTIONAL DESCRIPTION

Figure 4-1 is a functional block diagram of the receiver. This diagram will be used in the following paragraphs to describe the functional signal flow through the receiver. The signal and control functions of the synthesizer and digital control sections will be included where necessary to understand receiver functional signal flow.

4.2.1 RF Input Circuit Card Assembly, A13

Signals from the rear panel RF INPUT jack are routed to the input of A13. The module contains an input protection circuit, a ninth-order elliptic 30 MHz low pass filter, and an RF test signal used for the BITE automatic self-test function. The output from this module is routed to the signal input of the 1st Mixer, Module A12.

4.2.2 1st Mixer Circuit Card Assembly, A12

RF signals in the frequency of 0.5 to 29.99 MHz from the RF Input (A13) are passed through a 30 MHz low pass filter and applied to the 1st Mixer. The first mixer combines the RF input signals with the 1st LO signal from A5. The 1st LO signal varies from 40.955 to 70.455000 MHz as the receiver tuning varies from 0.5 to 29.99 MHz. The 1st mixer output is the 1st IF signal at 40.455 MHz. The 1st IF signal is then filtered by a bandpass filter centered at 40.455 MHz with a bandwidth of 25 kHz and passed on to the 2nd Mixer (A11).

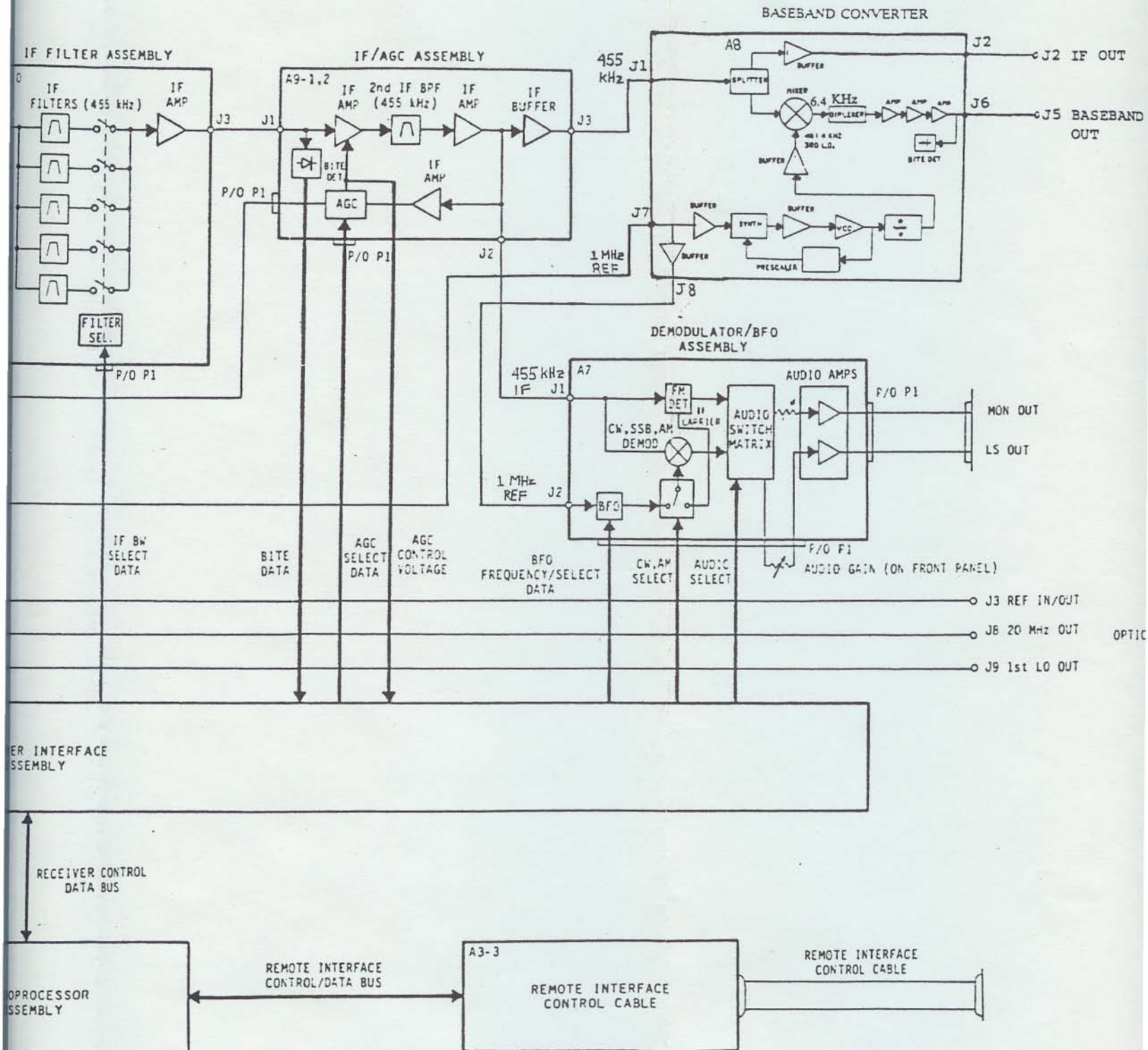
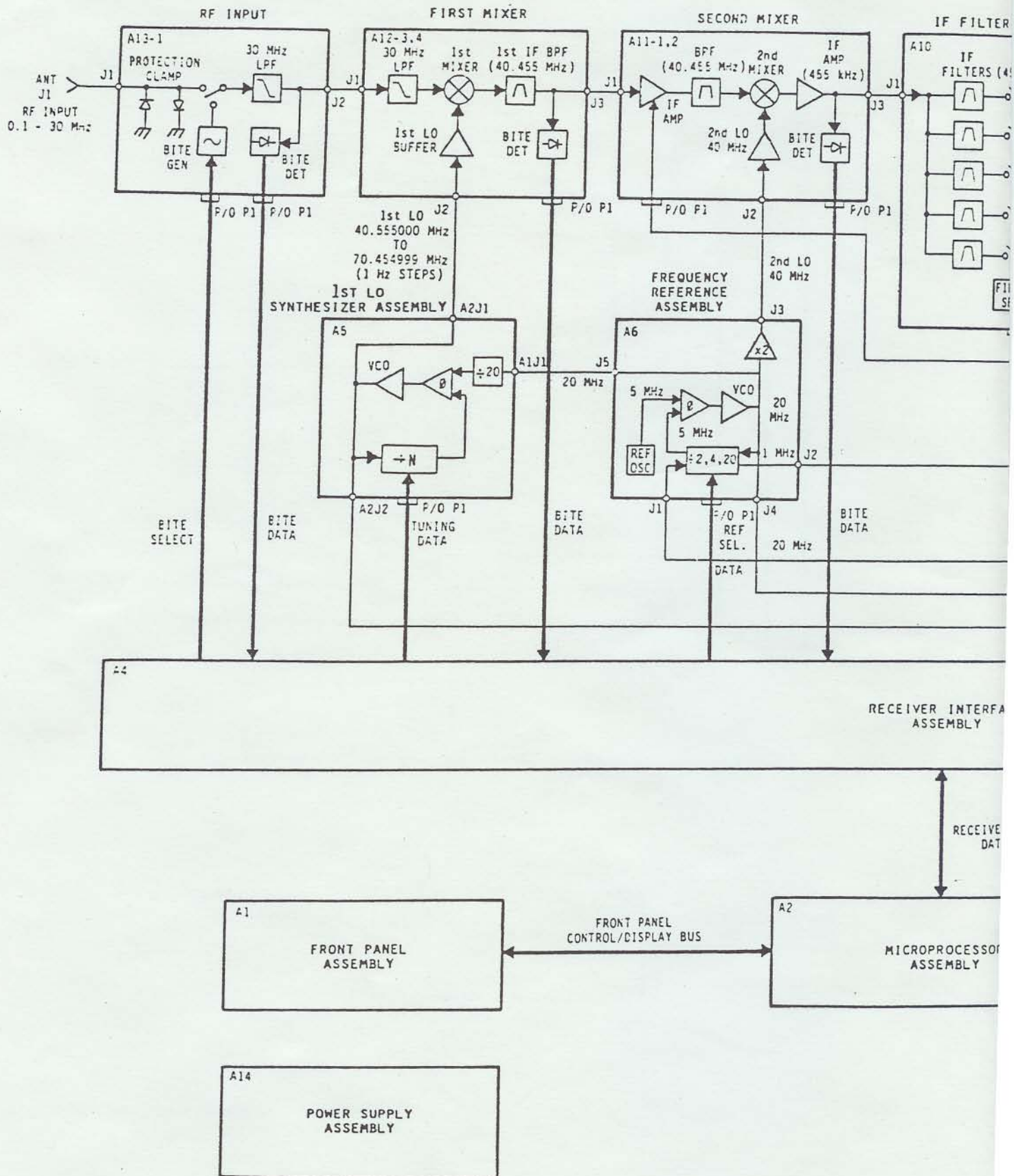


Figure 4-1. Overall Receiver Functional Block Diagram



4.2.3 2nd Mixer, A11

The 1st IF signal from the 1st Mixer (A12) is amplified by a fixed gain IF amplifier. The actual gain of the IF amplifier is controlled by the AGC circuitry on the IF/AGC (A9). The 1st IF is then filtered by a bandpass filter centered at 40.455 MHz with a bandwidth of 100 kHz and applied to the 2nd Mixer. The 2nd Mixer combines the 1st IF with the 2nd LO signal, 40.000000 MHz, from A6. The 2nd Mixer output is the 2nd IF at 455 kHz which is amplified by an IF amplifier and passed on to the IF Filter Assembly (A10).

4.2.4 IF Filter Assembly, A10

The 2nd IF output from the 2nd Mixer (A11) is coupled directly to five IF bandwidth filters in the IF Filter Assembly (A10). These filters establish the receiver effective bandwidth. Each filter output is routed through a diode switch to an output IF buffer. The filter select circuit, driven from the Receiver Interface (A4), selects one of the five IF filters according to the front panel bandwidth selection. The following IF bandwidths are available: 300 Hz, 1.0 kHz, 3.0 kHz, and 6.0 kHz.

The 2nd IF signal passes through the selected IF filter, is buffered and passes on to the IF/AGC (A9).

4.2.5 IF/AGC Circuit Card Assembly, A9

The 2nd IF signal from the output of the IF Filter Assembly (A10) is amplified by a two-stage variable gain IF amplifier. The gain control voltage is derived from the AGC circuitry on the A9. The amplified 2nd IF signal then passes through a bandpass filter centered at 455 kHz with a bandwidth of 40 kHz. The filtered signal is then split two ways. One path is through a buffer where the signal goes to both the Demodulator/BFO input (A7) and the AGC detector (A9). The other path is through a buffer/amplifier to the Baseband Converter (A8).

The AGC detector develops a DC voltage proportional to the signal strength of the input signal. This DC voltage is applied to the two-stage IF amplifier on the A9 and is also output to the variable gain amplifier on the 2nd Mixer (A11).

The AGC time constants, manual and remote gain voltages and variable thresholds are

controlled from the microprocessor through the Receiver Interface(A4) via the motherboard bus.

4.2.6 Baseband Demodulator, A8

The Baseband Converter (A8) converts the 455 kHz IF to 6.4 kHz at -10 dBm into 50 ohms. This assembly provides a third IF output frequency on the rear panel BASEBAND OUT connector J5, as well as 455 kHz on the rear panel IF OUT connector J2. Link LK1 on assembly A8 provides the option of additional conversion frequencies.

4.2.7 Demodulator/BFO, A7

The 2nd IF signal from the IF/AGC (A9) is applied to the FM Detector and the CW, SSB, AM Demodulator. The audio output of the FM Detector drives the input of the Audio Switch Matrix. When FM Mode is selected, the Audio Select Line from the Receiver Interface (A4) routes the FM audio to the Monitor and Loudspeaker audio amplifiers.

When CW or SSB Modes are selected, the CW, SSB, AM Demodulator is driven from the BFO through the CW, AM, SSB Select Switch. This enables the Demodulator to function as a product detector. The demodulated audio output is routed through the Audio Switch Matrix to the Monitor and Loudspeaker audio amplifiers.

When AM Mode is selected, the CW, SSB, AM Demodulator is driven by an IF carrier sample from the FM Detector through the CW, SSB, AM Select Switch. This enables the Demodulator to function as a synchronous AM detector. The demodulated audio output is routed through the Audio Switch Matrix to the Monitor and Loudspeaker audio amplifiers.

The operation of the BFO is controlled by the Receiver Interface (A4) through the BFO Frequency/Select Data lines entering A7. The operating frequency of the BFO is locked to the receiver reference oscillator through the 1 MHz REF signal from the Frequency Reference (A6).

4.2.8 Synthesizer Assembly, A5

The Synthesizer Assembly (A5) produces the 1st LO signal which drives the 1st Mixer (A12). The 1st LO output frequency varies from 40.955 MHz to 70.445 MHz in 1 Hz steps.

A voltage controlled oscillator (VCO) generates the basic 1st LO frequency. The 1st LO frequency drives a divide-by-N counter programmed by a frequency control word from the Receiver Interface (A4). The output of the counter is compared with a 1 MHz reference signal by the phase detector. The divide-by-N counter and the phase detector force the VCO to generate a precise frequency as dictated by the frequency control word from the Receiver Interface (A4).

A 20 MHz reference signal from the Frequency Reference (A6) drives a divide-by-20 counter within A5 to produce the 1 MHz reference signal used by the phase detector.

4.2.9 Frequency Reference Interface Assembly, A6

The Frequency Reference (A6) generates the 2nd LO signal which drives the 2nd Mixer (A11) and also the stable reference signals required by other receiver modules.

An oven-controlled crystal oscillator (OCXO) operating at 5 MHz forms the time-base reference generator for the receiver. The output of this oscillator is used as a reference for a voltage-controlled oscillator (VCO) which generates the basic 20 MHz reference frequency.

The 20 MHz VCO signal is divided by 2, 4 and 20 to produce selectable output frequencies of 10, 5 and 1 MHz. The selection is made via microprocessor control either remotely or from the front panel. The 5 MHz signal from the VCO dividers is also routed to a phase comparator where it is compared to the 5 MHz time-base reference. The phase comparator output is used to derive a compensating DC voltage for the VCO.

The 20 MHz VCO output is sent to the Synthesizer Assembly (A5) as a reference signal for the 1st LO phase detector. It is also doubled to 40.000000 MHz and sent to the 2nd Mixer (A11) as a 2nd LO. The 1 MHz signal from the VCO dividers is routed to the Demodulator/BFO (A7) as a reference for the BFO synthesizer, and to the Baseband Converter (A8) as a reference for the 461.4 kHz LO Synthesizer.

An input/output line is supplied to the rear panel REF IN/OUT connector (J3) from the Frequency Reference module. When the receiver is operating in the internal time-base, a reference signal of 1, 5, or 10 MHz (selectable from the Front Panel) is output on this line. An

external reference signal of 1, 5, or 10 MHz may be supplied to the Reference board as a time-base when external mode is selected from the Front Panel.

4.2.10 Receiver Control

Receiver control is accomplished by the Front Panel (A1), the Microprocessor Circuit Card Assembly (A2), the Remote Interface Circuit Card Assembly (A3) and the Receiver Interface Circuit Card Assembly (A4). The Receiver Control section sets the receiver operational parameters (frequency, bandwidth, detection mode and AGC) and also displays receiver operational status on the front panel.

The Microprocessor directs receiver operations by interfacing with the Front Panel, the Remote Interface and the Receiver Interface modules. Operations are executed from the control program stored in an EPROM. The Microprocessor performs the following basic functions:

- a. Read local input signals from front panel controls.
- b. Update front panel displays.
- c. Computes and sends receiver tuning and operating data to the appropriate receiver modules via the Receiver Interface (A4).
- d. Receives commands from the remote controller via the Remote Interface module (A3) and upon request return receiver status.

The Front Panel Circuit Card Assembly (A1) contains the Light Emitting Diode Displays (LEDs) and keypad switches for entering and displaying receiver operational data. Instructions are entered via the keypad and sent to the Microprocessor via the front panel I/O interface. At the same time, display data from the Microprocessor are routed through a display driver to update the front panel readouts.

The Remote Interface (A3) interfaces the external remote controller (when used) with the Microprocessor. In the Remote Mode, operational request are not entered via the Front Panel keypad. Instead, operational requests enter the receiver from the remote controller via the Remote

Interface. The Microprocessor interprets these remote requests in the same manner as Front Panel keypad requests.

4.2.11 Power Supply Assembly, A14

The Power Supply module is mounted near the rear panel and contains an AC input filter, a toroidal transformer, and additional output regulation and filter circuits. The DC outputs of +5 V, +8 V, +15 V, -15 V, and +20 V are connected to the Parent board by a short ribbon cable. The AC input connector, voltage selection, and fusing are in a compact subassembly integral with the Power Supply. A switch cable connects the module to the front panel power switch.

4.2.12 Built-In Test Equipment (BITE) Description

The BITE system uses a special software-driven self-test routine, in conjunction with a built-in test signal generator on the RF INPUT module, and several test signal detectors and other hardware elements distributed among the modules. The test sequence starts by verifying RAM (A2), in-lock status of Reference, 1st LO, and BFO oscillator circuits (A6, A5, and A7), and the ability to exercise and measure the RF gain control voltage (A4 and A9). The integrity and functionality of the signal path is then verified using the test signal generator on A13 and test signal detectors associated with A13, A12, A11, A10, A9 and A7. The signal path test exercises the following control functions and test variables:

Signal Generator:	off, -50 dBm, -10 dBm
RF Muting:	control and indicator
Receiver Tuning:	100 kHz (on tune test), 15.55 MHz (off tune test)
Manual Gain Control:	minimum and maximum
Automatic Gain Control:	SHORT, MED, LONG, SHORT VAR
RF Meter:	no signal, -50 dBm, -10 dBm
AF Meter:	standard level for CW operation under AGC
Demodulator:	AM, FM, CW, LSB, and if used: LSB, USB
IF Filters:	all filters checked, as specified by filter data.

If no fault is detected during the BITE sequence, the receiver returns to pre-BITE status. The complete test takes less than one minute. If a fault is detected, test execution stops and the fault code number is displayed until BITE is cleared by the operator.

4.3 DETAILED FUNCTIONAL DESCRIPTION

The following paragraphs provide a detailed functional description of each of the Receiver modules. Simplified block diagrams are used throughout the text to simplify the description. These block diagrams should be used in conjunction with the schematic diagrams in Section VII.

4.3.1 Front Panel Circuit Card Assembly, A1

The keyboard is read and displays are updated in conjunction with the CPU card (A2). If appropriate, the tuning wheel is checked. Regulated, isolated, power is provided for digital circuits. Refer to Figure 4-2, Front Panel Block Diagram, as an aid in understanding the following description. The front panel contains a sixteen-button keypad switch set, two ten-digit LED Bar Graphs, four four-character alphanumeric displays, IF and AUDIO GAIN controls, and an optical encoder for generating frequency tuning information. All of these circuits, except IF and AUDIO GAIN, interface directly with the CPU, A2, via an eight-bit data bus.

The front panel provides a Keyboard to enter commands. To display internal status of the radio receiver, the Front panel uses Alpha-numeric displays and a Bar Graph display. In addition the A1A1 provides conditioned outputs from the tuning wheel, a 5 volt regulator, and control to adjust volume and IF gain.

A1A1 contains a voltage regulator. In order to isolate digital noise on the power lines from the rest of the receiver, the digital circuits are fed a source of 8 volts. This 8 V is regulated down to 5 V by U28 and its associated components. In turn all 4 digital cards are powered by this source.

4.3.1.1 FRONT PANEL SWITCHES

Mechanically the keypad is a 4 by 4 matrix attached to the front panel. Electrically the keypad is a 16 pole (normally off) single throw switch. It is connected to A1A1 via J2. Each switch line, on A1A1, is pulled high and connected to an input port (U9 and U11).

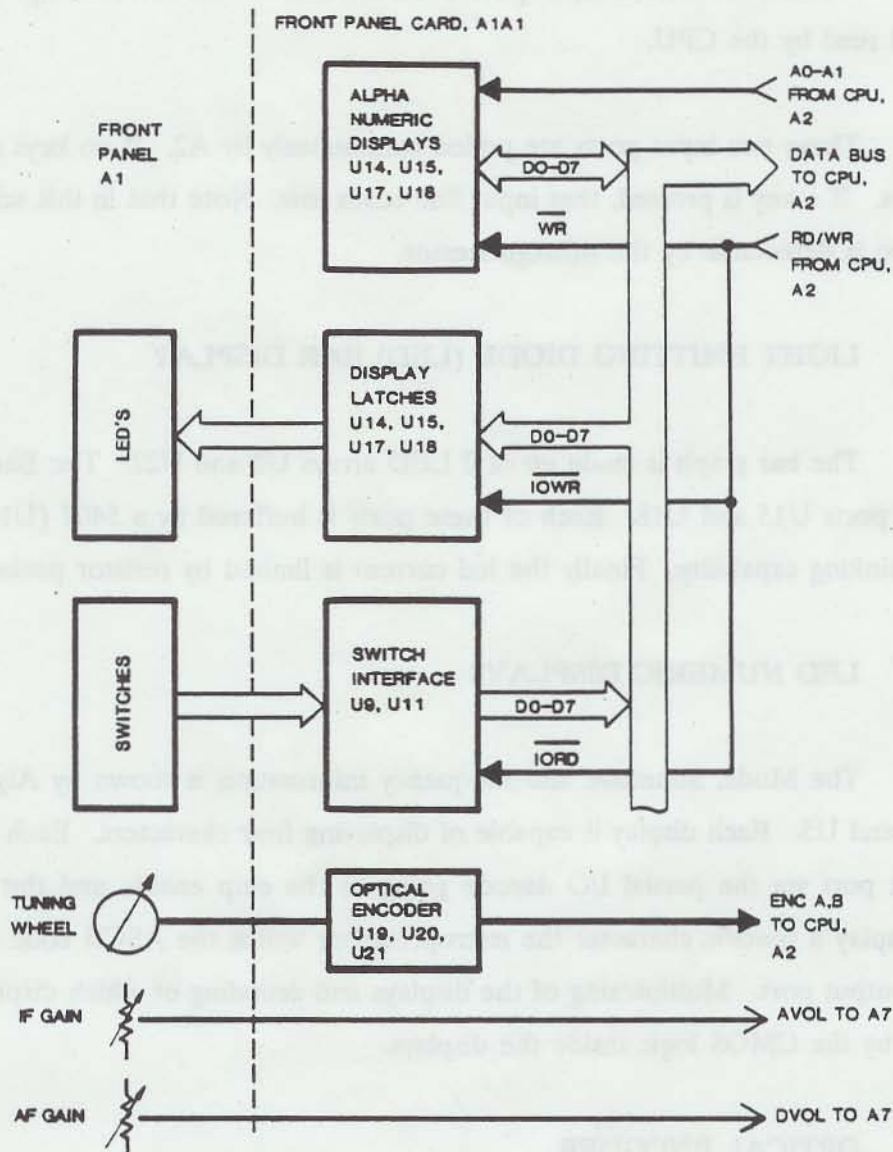


Figure 4-2. Front Panel, A1, Block Diagram

EM(B)-6830JD(16)

Depressing any switch brings its input low to the Switch Interface. The output of the Switch Interface, representing a coded equivalent of the position of the depressed switch, is read by the CPU, A2. When the switch input port is read the Switch Interface output is enabled onto the data bus and read by the CPU.

These two input ports are polled continuously by A2. If no keys are pressed the CPU reads all ones. If a key is pressed, that input line reads low. Note that in this scheme more than one switch closure is detectable by the microprocessor.

4.3.1.2 LIGHT EMITTING DIODE (LED) BAR DISPLAY

The bar graph is made up of 2 LED arrays U2 and U22. The Bar Graph is controlled via 2 output ports U15 and U18. Each of these ports is buffered by a 5407 (U15 and U17) to boost the current sinking capability. Finally the led current is limited by resistor packs U13 and U16.

4.3.1.3 LED NUMERIC DISPLAYS

The Mode, Submode and Frequency information is shown by Alpha-Numeric displays U2, U3, U4 and U5. Each display is capable of displaying four characters. Each character is decoded as an output port via the partial I/O decode going to the chip enable and the bottom two address lines. To display a specific character the microprocessor writes the ASCII code for that character to the proper output port. Multiplexing of the displays and decoding of which display segments to light, are handled by the CMOS logic inside the displays.

4.3.1.4 OPTICAL ENCODER

The tuning wheel is an optical encoder. The optical sensors U19 and U21 are conditioned by schmitt triggers comprised of parts of U20 and associated components. The outputs ENCA and ENCB, when active, are in quadrature, and are connected to an input port on A2. The CPU is capable of determining the direction and amount of rotation of the tuning wheel.

The Optical Encoder consists of a 25-segment disk operating in conjunction with two photo sensors and square wave amplifiers. Light from the sensors is reflected from the segments of the disk as it is rotated. The reflected light produces two pulse waveforms, ENC A and ENC B, at

the output of the conditioning amplifiers. The two sensors are physically offset from each other. When the wheel is rotated clockwise, ENC A leads ENC B by 90 degrees. When the wheel is rotated counterclockwise, ENC A lags ENC B by 90 degrees. These two lines are interfaced directly to the CPU to indicate the speed and direction of turning for the tuning wheel.

4.3.1.5 IF AND AUDIO GAIN CONTROLS

The IF and AUDIO GAIN CONTROL potentiometers are physically mounted on the Front Panel circuit card assembly. However, processing of signals controlled by these potentiometers is not performed on this circuit card. The IF GAIN control is routed to the A9, IF/AGC circuit card and the AUDIO GAIN control is interfaced directly with the A7, Demodulator/BFO.

4.3.2

Microprocessor Circuit Card Assembly, A2

Refer to Figure 4-3, Microprocessor Block Diagram, as an aid in understanding the following description. The Microprocessor Circuit Card Assembly, A2, consists of a CPU, an address latch, a data latch, memory decode, ROM, RAM, I/O decode and interrupt control circuitry. The Microprocessor Circuit Card Assembly controls receiver operation by reading the operating program in ROM and routing data and control signals via an eight-bit data bus a 16 bit address bus and a control bus. The data bus is common to the Front Panel Circuit Card Assembly, A1, Receiver Interface, A4, and the Remote Interface, A3. The CPU is an NSC-800 (A2) chip.

The A2 is a general purpose microcomputer with 12 K byte of program storage and 2 K byte ram. The processor used is an NSC800 and is CMOS. The NSC800 has a 16 bit address range and a 8 bit data bus. The CPU executes sequential instructions, stored in the EPROMS reading and writing variables to RAM. The micro is capable of making simple decisions and may direct itself to execute alternative instructions, based on external conditions. The microprocessor is diverted, from its present task, by an external process. This is done by an interrupt. An example might be a request by a terminal to pass a character to the microprocessor. After the task is done the micro returns to the location in program being executed before the interrupt. The microprocessor communicates with other assemblies by using Input/Output ports (I/O ports).

4.3.2.1

CPU

The following two paragraphs describe an OPCODE FETCH. The CPU reads instructions from memory and executes them. To read an instruction in an EPROM, the CPU puts the address of the instruction on the address bus. The lower 8 bits of the address share the same pins as the data bus. While these bits hold a valid address, Address Latch Enable (ALE) is supplied. ALE is used to latch the address in U13.

The EPROMS (U16, U17 and U18) store the program. An ADDRESS DECODER is used to select the proper EPROM. The ADDRESS DECODER looks at the upper address bits to determine if a memory read is indicated by the CPU. (Memory read is indicated by $\bar{R}\bar{D}$ low and $IO/\bar{M}$ low.) If both of these conditions are true the ADDRESS DECODER brings one of its output lines low selecting a memory. The address lines connected to the selected memory are further decoded inside the memories. After the access time of the memory the EPROM places the decoded byte on

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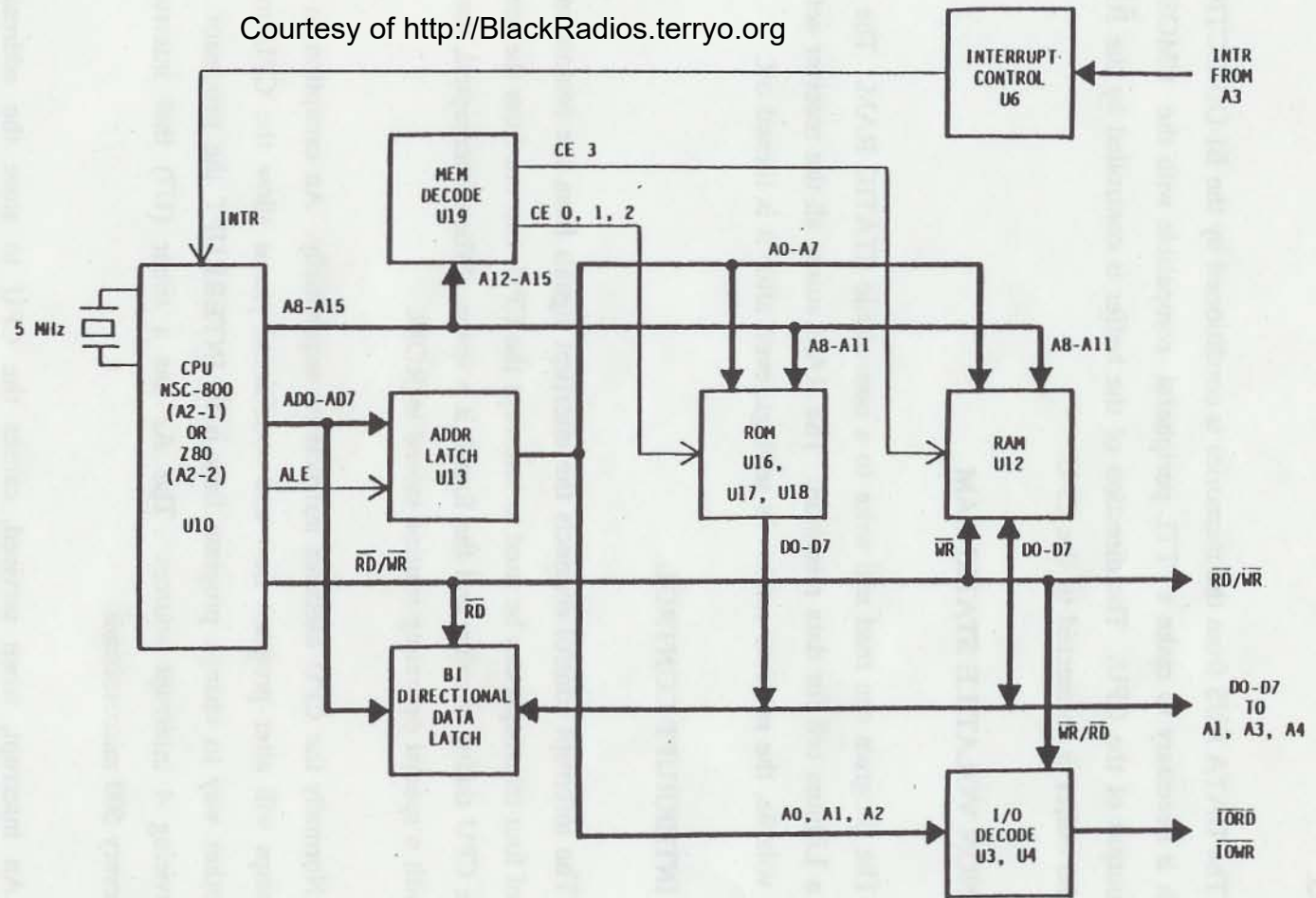


Figure 4-3. Microprocessor Block Diagram

the DATA BUS.

The DATA BUS from the memories is conditioned by the BI-DIRECTIONAL DATA BUFFER. This is necessary to make a TTL peripheral compatible with the CMOS CPU and to BUFFER the output of the CPU. The direction of the buffer is controlled by the $\overline{RD}$ line. Finally the output of the buffer is connected to the CPU.

4.3.2.2 NON VOLATILE STATIC RAM

The program can read and write to a nonvolatile STATIC RAM. The ram is 2 K by eight and uses a Lithium cell for data retention. The RAM stores all the receiver settings. Because the ram is non volatile, the receiver retains its settings, even after it is turned off.

4.3.2.3 INTERRUPT CONTROL

The interrupt control connects the interrupt signals from the remote interface to the CPU. A total of four interrupts can be used to interrupt the CPU: two are from the remote interface, one is from the CPU timing circuitry and the fourth is a spare. When interrupted, the CPU services the interrupt with a special operating routine stored in ROM.

Normally the CPU executes instructions sequentially. An exception to this is a jump instruction. Jumps will alter program flow and conditional jumps allow the CPU to make simple decisions. Another way to change program flow is to INTERRUPT the processor. The CPU is capable of servicing 4 interrupt sources. The A2 has a timer (U7) that interrupts the CPU approximately every 500 microseconds.

An interrupt, when serviced, causes the CPU to store the address of the next instruction, to be executed, in RAM. The CPU goes to the location 38 Hex (the beginning address of an interrupt routine) to service the interrupt. After the program services the interrupt, it goes back to the address in RAM. There it continues execution where it left off. Other interrupt lines are used by other assemblies. U6B 'ORS' the interrupt lines so any of the interrupts will be passed on to the processor.

4.3.2.4 I/O DECODERS

The I/O decode is used to coordinate the transfer between the CPU and the receiver circuits and front panel. The output of the I/O decode consists of 8 I/O RD lines and 8 I/O WR lines. The I/O RD lines are used to input data from the receiver circuits, and the I/O WR lines are used to send data to the receiver circuits. The I/O RD bus is active when the CPU RD line is low going into the I/O decode. The I/O WR lines are active when the CPU WR line is low. Address lines A0-A7 select which of the I/O read or write lines are active.

The CPU talks and listens to other assemblies with I/O PORTS. U1, U2, U3, and U4 are I/O PORT DECODERS. U4 decodes 8 input port strobes. These are used to tell an external buffer to place its contents on the data bus. U3 decodes 8 output strobes. These strobes are used to clock the data on the DATA BUS into a latch. U1 and U2 are I/O DECODERS. Each strobe from these decoders are true for four adjacent I/O ports. They are decoded completely on other boards.

4.3.2.5 ADDRESS LATCH

The address latch is used to address the lower 8 bits of ROM and RAM is also passed along to the I/O decoders. The CPU outputs an address on the AD0-AD7 bus and follows by bringing the Address Latch Enable (ALE) high. This transfers the address to the address bus (A0-A7). If ROM or RAM is to be addressed, the CPU selects either via the memory decode (Para. 4.3.2.4.) If an I/O decoder is to be addressed, the CPU directs it via the WR/RD lines and the lower eight bits of the Address bus.

4.3.2.6 DATA LATCH

The data latch is used to transfer data between the CPU AD0-AD7 bus and the receiver address bus, A0-A7. Data is transferred from the CPU to the receiver when the $\overline{WR}$ line is low, and is transferred from the receiver to the CPU when the $\overline{RD}$ line is low.

4.3.2.7 MEMORY DECODE

The memory decoder is used by the CPU to select either ROM or RAM. The upper

four bits of address, A12-A15, are decoded to produce a low level (0 V) on $\overline{CE0}$, $\overline{CE1}$ or $\overline{CE2}$ for ROM select or CE3 for RAM select.

4.3.2.8 EPROM

The ROM consists of three 27C32-35 EPROMS. Each EPROM contains 4 K 8-bit words for a total of 12 K x 8 of program memory. The ROM is addressed by A0-A7 from the address latch, and A8-A11 from the CPU. It is selected by $\overline{CE0}$, $\overline{CE1}$ or $\overline{CE2}$ from the memory decoder. The output of the EPROMS, D0-D7 is placed on the receiver data bus after the access time.

4.3.2.9 RAM

The RAM consists of one 5516 random access memory. It contains 2 K 8-bit words. The RAM is addressed by A0-A7 from the address latch, A8-A11 from the CPU and is selected by $\overline{CE3}$ from the memory decoder. The RAM data input/output, D0-D7, is connected to the receiver data bus.

4.3.3 IEEE-488C Interface Circuit Card Assembly, A3

The A3 IEEE-488 Remote Control Interface, when used with appropriate software, allows byte serial bit parallel general purpose interface bus (GPIB) compatability. U1 is the TMS9914A GPIB Controller. Refer to IEEE-488C Interface Block Diagram Figure 4-4 and Figure 7-4. Y1 provides the high speed clock for this device. In order to read and write to U1 it is mapped into the I/O space of the CPU. $\overline{IO7}$ and $\overline{IO8}$ are ORED by U5A. After inversion by U5B, they decode to 8 read and 8 write ports. In order to determine whether an I/O read is to be done U5C inverts $\overline{RD}$ resulting in DBIN. Likewise $\overline{WE}$ would indicate a write to U1. RS2, RS1, AND RS0 tell the controller which of the 8 possible registers to address. U4 decodes an input port address for U6. S1 is set to the GPIB talk/listen address for the receiver. The TMS9914A interfaces to the GPIB bus with transceivers U2 and U3. The controller automatically listens and handshakes the bus. If addressed, A3 will interrupt the processor. The CPU is only interrupted for characters, simplifying software. If commanded to talk, the processor outputs characters to the controller until interrupts are disabled.

The controller allows the software to ignore GPIB protocols. It can then talk and listen on the bus when addressed.

4.3.3.1 BUS TRANSCEIVERS

The sixteen bus lines from the remote controller/computer are applied through connector J2 and enter the 2 octal transceivers, U2 and U3 (75160 and 75161). Signal flow direction through each line in the transceivers is determined by a corresponding TE and $\overline{CONTROLLER}$ input.

The IEEE-488C interface bus lines, through the transceivers, connect to their corresponding terminals on the GPIA (U2). Microprocessor connections are made through connector P1 to the GPIA. Initialization of the GPIA is activated through the RESET line. GPIA operation is controlled through fourteen internal registers which are written on and/or read out by the microprocessor, being addressed through CS, RS0, RS1 and RS2.

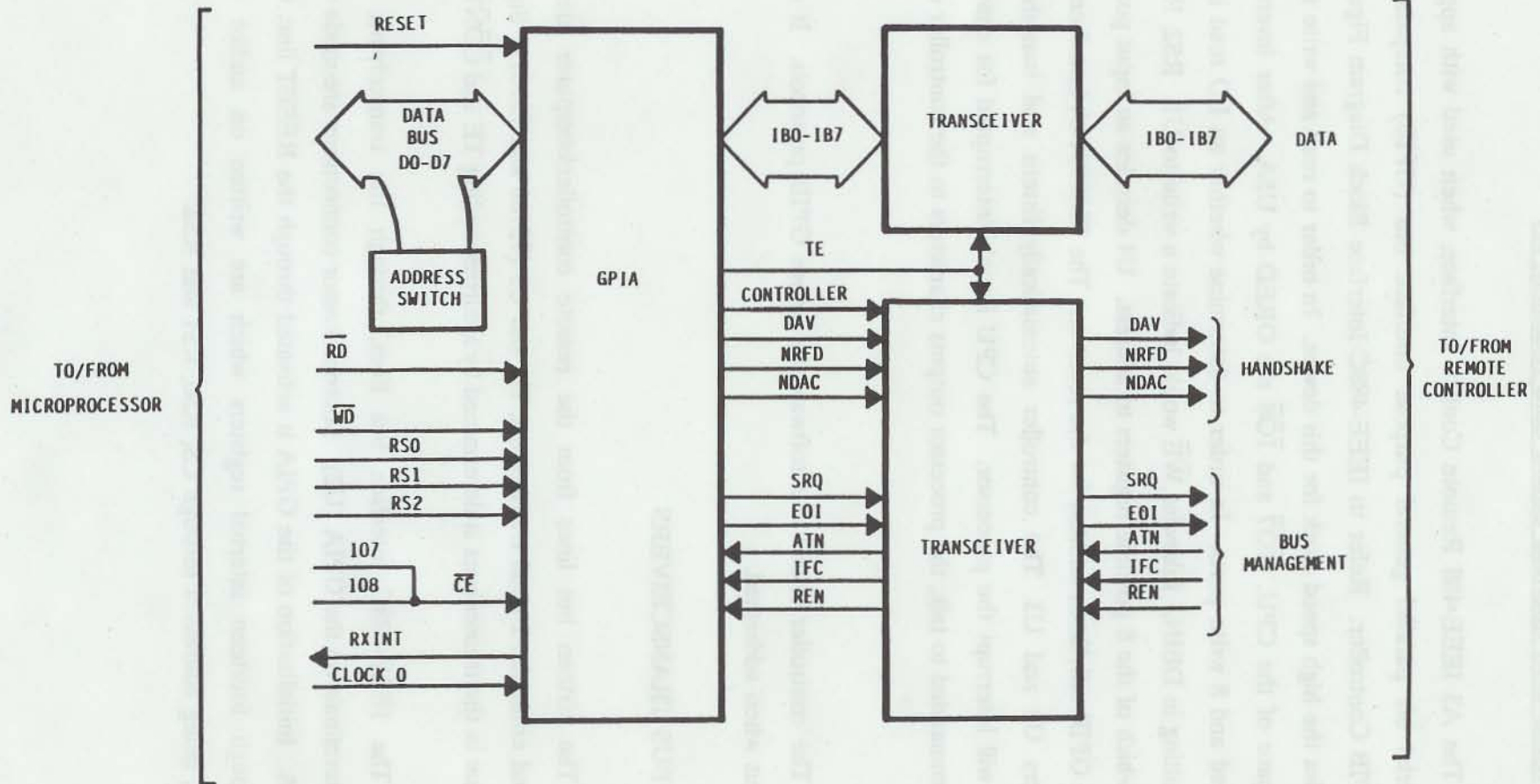


Figure 4-4. IEEE-488C Remote Control Interface Functional Block Diagram

4.3.3.2 ADDRESSING AND INTERRUPT

When the remote controller/computer sets the $\overline{ATN}$ line true and sends the receiver address on the data lines DI01-DI08, the GPIA recognizes this and gives an output on the $\overline{INT}$ terminal. This initiates an interrupt request which is a request to the microprocessor to stop normal processing and to force processing to an interrupt routine which will consider that data being received.

4.3.3.3 LISTENER OPERATION

The remote control interface circuit acts as a listener while waiting to be addressed by the remote controller/computer and when directed by the microprocessor during a microprocessor routine. During these times, the GPIA outputs TE and $\overline{CONTRÖLLER}$ and sets the transceivers so that the remote control interface circuit accepts remote controller commands and data from the IEEE-488C interface bus. Here, data on lines DI01-DI08 is sent directly through to the GPIA from the remote controller/computer, and the handshaking line $\overline{DAV}$ (data available) signal is sent directly through from the remote controller/computer to the GPIA, while handshaking lines NRFD (not ready for data) and NDAC (not data accepted) signals are sent directly through from the GPIA to the remote controller/computer.

The GPIA acts on the data and/or sends it on to the microprocessor. It also performs the required handshaking protocol with the remote controller/computer, as directed by the microprocessor, through the GPIA internal registers.

4.3.3.4 TALKER OPERATION

The remote controller/computer addresses the remote control interface circuit to talk by placing the talk address of the circuit on data lines DI01-DI08 with the ATN line true. The GPIA decodes the data as its talk address and requests status information from the microprocessor. Data is transferred from the microprocessor to the GPIA. The GPIA outputs TE and $\overline{CONTRÖLLER}$ set the transceivers so that the remote control interface sends data from the GPIA on to the IEEE-488C interface bus and thus to the remote controller/computer. Here, data on lines DI01-DI08 is sent directly through from the GPIA to the remote controller/computer, and the handshaking line $\overline{DAV}$ signal is sent directly through from the GPIA to the remote controller/computer while handshaking

lines NRFD (not ready for data) and NDAC (not data accepted) signals are sent directly through to the GPIA from the remote controller.

The GPIA transfers data from the microprocessor to the remote controller/computer and also performs the required handshaking protocol with the remote controller/computer as directed by the microprocessor.

4.3.3.5 BUS MANAGEMENT LINES

ATN, IFC, REN, SRQ and EOI are the IEEE-488C interface bus management lines. ATN, IFC and REN have their associated transceivers hardwired for direction of signal flow from the remote controller/computer to the GPIA only. As indicated earlier, ATN is set true by the remote controller/computer when it wants to clear lines to send a message. IFC is used by the remote controller/computer to set the interface system into a known quiescent state. REN is used by the controller/computer to select one of two alternative sources of device programming data, local or remote. EOI is bidirectional, controlled by the GPIA, and is sometimes used to indicate the end of a message either to the remote controller/computer or the remote control interface circuit.

4.3.4 Receiver Interface Circuit Card Assembly, A4

Refer to Figure 4-5, Receiver Interface Block Diagram, as an aid in understanding the following description. Receiver Interface A4 is the interface between the CPU and the analog section of the receiver. A4 provides latched control lines to control the analog portion of the receiver. This is done to avoid bus noise in the rest of the receiver. In addition A4 provides digital inputs for monitoring of receiver status. An 8 bit DAC is on board. It provides an analog control line to the rest of the receiver and, in conjunction with analog comparators, provides a software driven analog to digital converter.

U1, U2, U3, U4 and U5 are output port latches that set up the receiver. U10 is an input port for digital BITE and fault signals. U6 is also an input port. U8 and U9 are buffers forming a switchable bus to analog circuitry. It is active only when it needs to be. It controls the receivers two synthesizers and crosspoint switch. U18 is a 8 bit digital to analog converter. U14, U15, U18, and U7 form the software driven analog to digital converter.

The receiver interface consists of receiver control latches, BITE monitoring circuitry, receiver status signal interface and LO frequency data latches and an I/O decoder. The receiver interface interconnects the receiver circuits to the data bus, D0-D7, which is controlled by the Microcomputer, A2. This enables the Microcomputer to direct and monitor the activities of the receiver circuits.

4.3.4.1 RECEIVER CONTROL LATCHES

The receiver control latches output commands to the receiver circuits to control BITE, and attenuation selection. A specific command from the Microcomputer via the data bus is latched through the proper receiver control latch by a select signal from the I/O decoder (para. 4.3.4.5).

4.3.4.2 BITE MONITOR

When BITE has been selected by the Microcomputer, the BITE latch activates the BITE generator in the Receiver RF input. DC sample voltages from the BITE detector outputs, in the Receiver, drive the inputs of the BITE comparators. The BITE comparators are referenced by

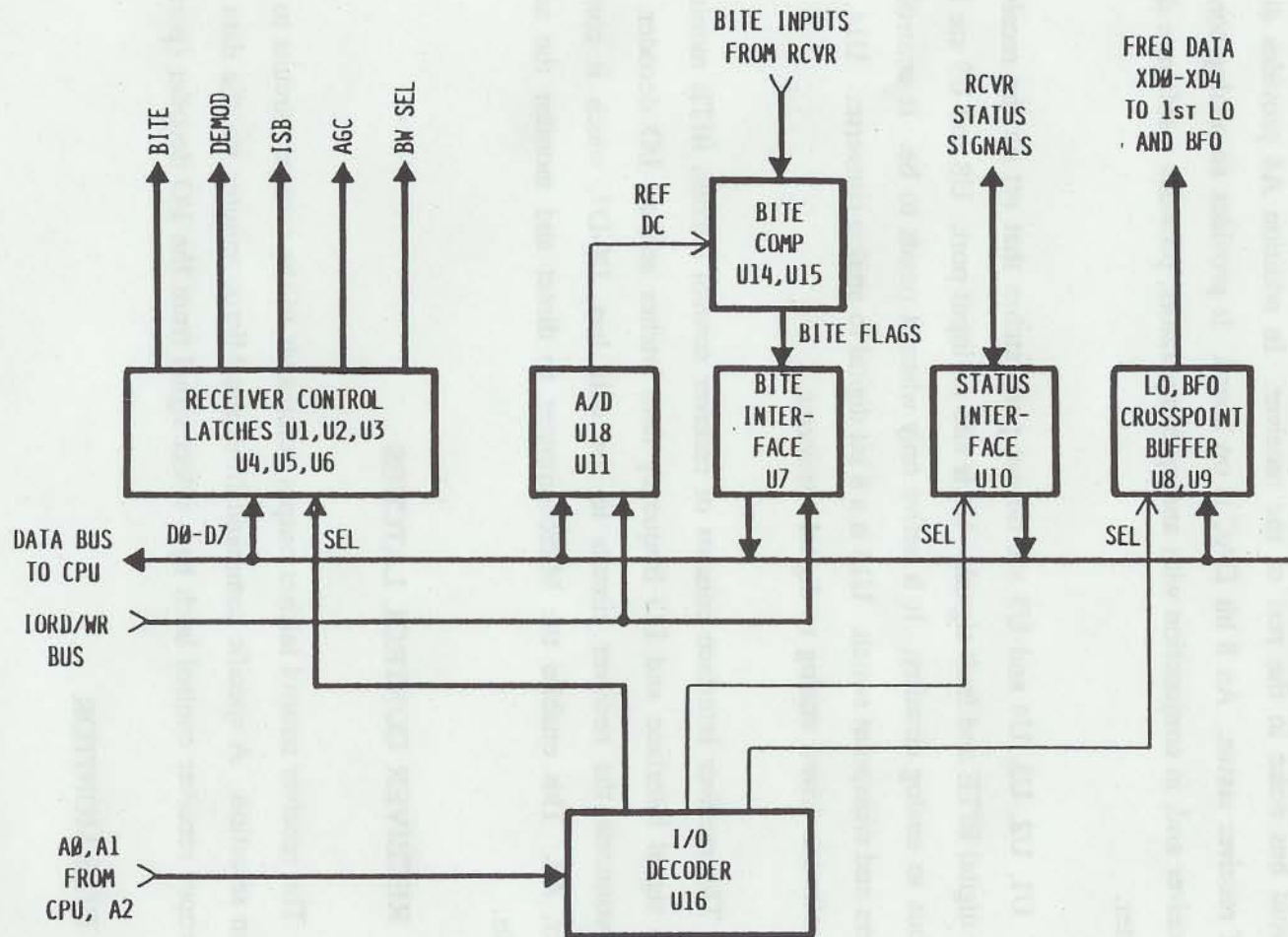


Figure 4-5. Receiver Information Interface, A4, Block Diagram

a DC voltage derived from the A/D converter. Each BITE comparator has a unique DC reference level which is programmed by the Microcomputer via the data bus through the A/D converter the BITE comparator compares the BITE detector outputs with their respective DC reference levels. Any output which is below the reference level corresponding to that output causes the BITE comparator to set a BITE flag output. The BITE flag outputs are latched to the data bus, to be read by the Microcomputer, through the BITE interface. Transfer of BITE flag data to the data bus is coordinated by the IO RD/WR lines from the Microcomputer.

4.3.4.3 RECEIVER STATUS SIGNAL INTERFACE

Receiver status signals from the receiver circuits are placed on to the data bus, to be read by the Microcomputer, A2, through the status interface. The transfer of data to the data bus is coordinated by select signals from the I/O address decoder.

4.3.4.4 LO FREQUENCY DATA BUFFER/CROSS POINT

Receiver tuned frequency data from the Microprocessor, A2, is routed to the LO frequency data buffer via the data bus. Receiver tuned frequency data consists of 10 separate bytes of data which are sent to the 1st LO, A5, to program the 1st LO frequency. BFO frequency data consists of ten separate bytes of data which are sent to the Demodulator/BFO, A7, to program the BFO frequency. These bytes of data are sequentially strobed through the frequency data buffer to the LO and the BFO. Transfer of frequency data is coordinated by select signals from the I/O decoder.

4.3.4.5 I/O DECODER

The I/O decoder is used by the Microcomputer, A2, to control the receiver control latches, status interface and frequency buffer. Address bits A0 and A1 from the CPU are used by the I/O decoder to generate select signals to strobe the desired latches. The Microcomputer outputs the proper address on A0 and A1 which drives the input of the address decoder. The address decoder responds by strobing the correct select signal to the latch requested by the Microcomputer.

4.3.5 1st LO Synthesizer, A5

The 1st local oscillator (LO) synthesizer, A5, generates the 1st LO frequency of 40.955 MHz to 70.445 MHz. The description of the 1st LO consists of a simplified overview discussion followed by a detailed functional description.

4.3.5.1 1ST LO SIMPLIFIED OVERVIEW

Refer to Figure 4-6, 1st LO Simplified Block Diagram, as an aid in understanding the following description. The basic 1st LO configuration consists of a Voltage Controlled Oscillator (VCO), a divider capable of dividing the VCO output by an integral number, a phase/frequency detector, an analog-to-digital converter and a loop filter.

The 1st LO as configured in Figure 4-6 is locked to a reference frequency of 1 MHz. This is accomplished by comparing the VCO output frequency to the 1 MHz reference, generating a correction current proportional to the instantaneous phase difference between the VCO frequency and the reference frequency, and integrating that current over time to produce a correction voltage that will change the VCO frequency so that it is the same phase (and frequency) as the reference.

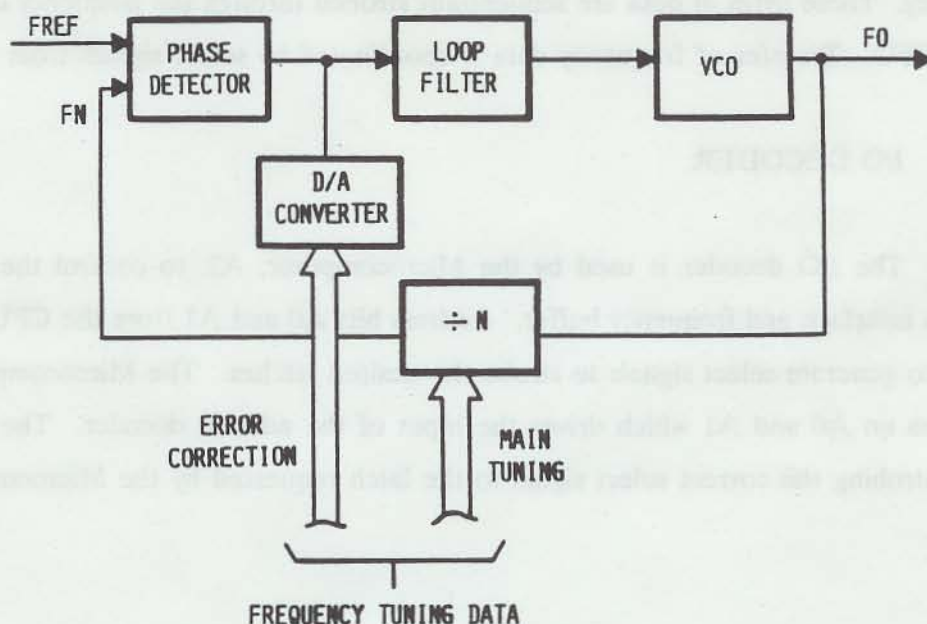


Figure 4-6. 1st LO Simplified Block Diagram

Tuning, or incrementing the LO tuned frequency is accomplished by dividing the VCO output frequency by an integer amount before it is input to the phase/frequency comparator. This integer amount is controlled by the Microcomputer (A2) through the Digiphase Computing chip. The Digiphase chip will output a two digit BCD digital value to the N divider that will set the even MHz portion of VCO frequency. To generate the fractional portion (sub MHz) of the VCO frequency, the Digiphase chip will periodically change the integer value written to the N divider by + or - 1 so that the average divide ratio is equal to the tuned frequency down to 1 Hz resolution. For example, if the frequency set by the Microcomputer is 45.75 MHz then the Digiphase chip will set the N divider to 46 for three counts of the reference clock and 45 for 1 count. The average divide ratio will be 45.74 MHz.

Periodically, changing the divide ratio will cause the VCO to first lock at one frequency and then at another. This will cause frequency jitter which will appear as sidebands on the VCO output. The Racal Digiphase process uses two methods to eliminate these sidebands. The Digiphase chip will first add and then subtract 1 from the divide ratio. This will have no net effect on the average VCO frequency because every addition of 1 will be followed by a subtraction of 1, however this will increment the phase of output of the N divider so that the phase/frequency comparator will produce a smaller correction current to the integrator when the VCO is at an average frequency different from the reference frequency. A smaller current to the integrator will produce less frequency jitter and lower sidebands out of the VCO. The second method used to correct for sidebands is to compute the instantaneous current that will be produced by the phase/frequency comparator and then add a current that is equal and opposite to the phase/frequency comparator current so that the resulting output current is 0. The Digiphase chip does this by outputting an 8 bit digital value to an digital-to-analog converter whose output is differentiated and summed with the phase/frequency converter output. Also phase/frequency converter current outputs that are greater than about 500 Hz in frequency will be reduced by the loop filter.

4.3.5.2 1ST LO DETAILED DESCRIPTION

Refer to Figure 4-7, 1st LO Detailed Block Diagram, and Figures 7-6 - 7-8, A5 Schematics, as an aid in understanding the following description. The 1st LO consists of a computing chip, a divide-by-N counter, a digital-to-analog converter, a phase frequency detector, an integrator, a loop filter, a voltage controlled oscillator (VCO) and a speed up circuit.

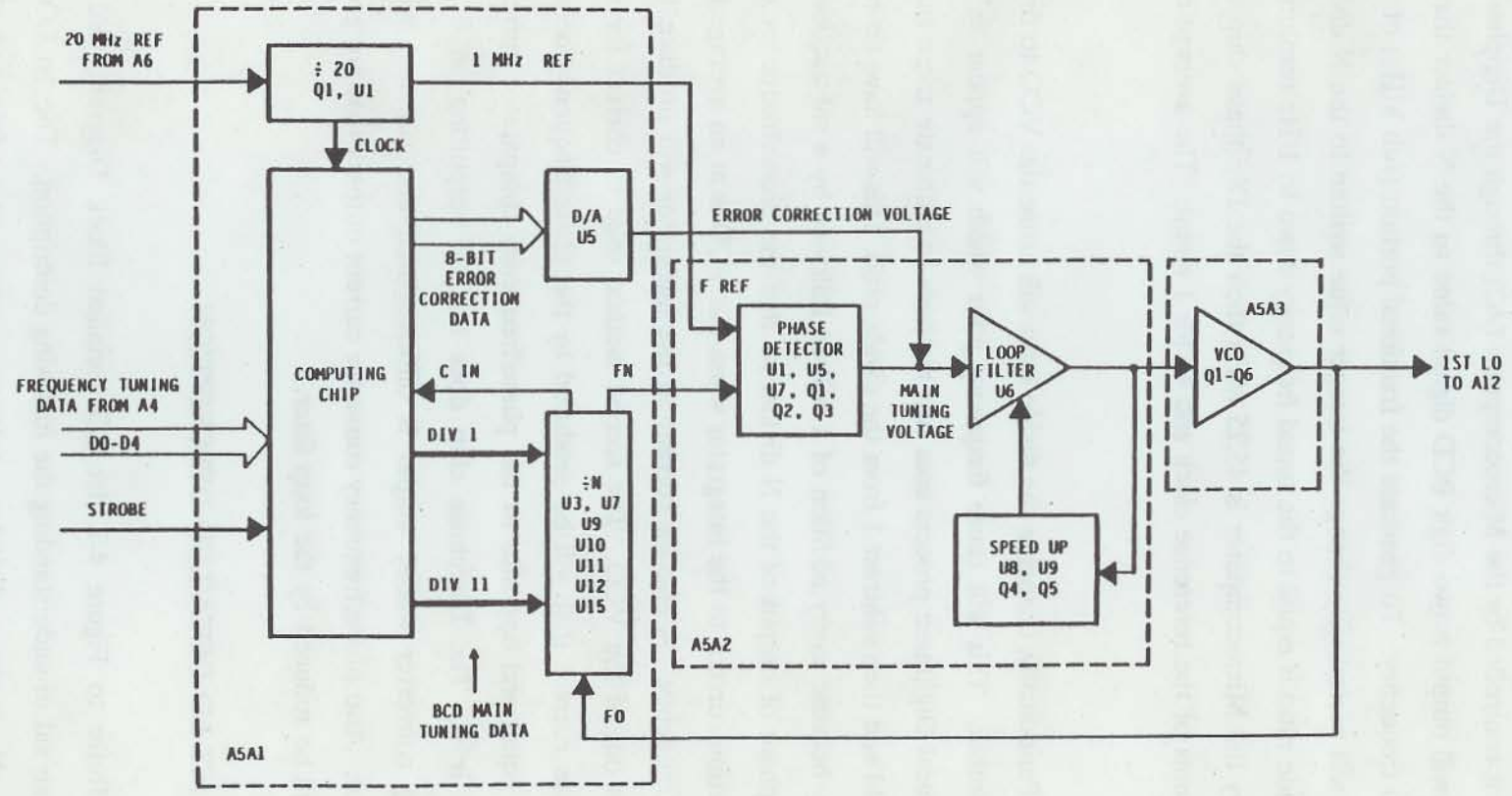


Figure 4-7. 1st LO Detailed Block Diagram

4.3.5.2.1 Digiphase Computing Chip

The Digiphase computing chip receives frequency data from the Microcomputer and generates the frequency word (divide-by-N control word) to program the 1st LO counting circuits. It also generates the correction word used by the digital-to-analog converter, a phase frequency detector, an integrator, a loop filter, a Voltage Controlled Oscillator, and a speed up circuit.

The frequency data is a string of ten 5-bit characters and are strobed into the Digiphase chip by a high going pulse on the write input to U2 (pin 17). The frequency data is entered one BCD value at a time from the least significant digit (1 Hz) to the most significant (10 MHz). When the last digit is written the MHz portion of the data is transferred to the DIV1 to DIV11 outputs of the chip (pins 1-11) and the chip begins making corrections to the DIV outputs for the fractional portion of the frequency data. The DIV outputs are connected directly to the inputs of the divide-by-N counter. The digiphase chip also supplies a digital output to the digital-to-analog converter (U5) from pins 26-33. Both the DIV and the DAC outputs of the Digiphase chip is the reference clock input for 5 MHz. The reference is internally divided by 5 to produce a 1 MHz output on pin 1. U1 divides the 20 MHz reference frequency from the reference board (A6) by four to produce 5 MHz. U4 reclocks the reference out of the Digiphase chip to provide a stable output to the phase/frequency detector.

4.3.5.2.2 Divide-By-N Counter

The VCO frequency is fed back to the A5A1 at J2. U15 is a line receiver that will reject extraneous noise and digitally shape the VCO output. U9, U10, U14, and U11 form the divide-by-N counter such that the frequency at U11 pin 15 will be the VCO frequency divided by the digital value set on the DIV 1-8 lines from the Digiphase chip. Q4 and U13 restore the original pulse width from the VCO and Q5 and U12 reclock the divider output to provide a stable transition to the phase/frequency detector.

4.3.5.2.3 Digital-To-Analog Converter

The digital-to-analog converter (U5) takes the DA outputs from the Digiphase chip and produces a current at pin 2 proportional to that digital value and the reference voltage on pin 14. The current flows to ground through R10 and R11 and produces a voltage drop proportional to the current

output and the value of R11. R11 is used to adjust the voltage that is fed to the phase/frequency detector.

4.3.5.2.4 Phase/Frequency Detector

The phase/frequency detector consists of U1, U5, U4, Q1, Q2, CR1-4, C13, and associated components. When a high going transition occurs on U1 pin 3 the output at pin 5 goes high as will the input to U4 pin 2 and the emitter of Q1. Likewise a high going transition on U5 pin 3 will set U5 pin 5 and U4 pin 3 high. U5 pin 6 will go low simultaneously as will the collector of Q2. When both inputs to the nand gate U4 are high simultaneously the output, pin 1, will go low resetting U1 and U5 to their original states. The net effect of this is that if the reference transition occurs before the VCO transition the output of U1 will stay high until the next VOC transition and the output of U5 will be high only long enough to reset both flip-flops. U1 pin 5 being high indicates that the reference phase leads the VCO phase by the amount of time that U1 pin 5 is high. This also indicates that the reference frequency is higher than the divided down VCO frequency. Conversely, if the VCO transition occurs before the reference transition, U5 pin 5 will be high longer and this indicates that the reference lags the VCO.

When the VCO is locked to the reference both outputs of U1 and U5 will occur simultaneously and only a very short pulse will be output. The CR2 will be forward biased by the positive output of U2 pin 1, and CR3 and CR4 will be forward biased by the low voltage output of U7 pin 8. C13 will be charged to the voltage between CR4 and CR2. Should the VCO phase begin to lag the reference phase, the emitter of Q1 will be at a high voltage for a certain period each cycle. This high voltage will reverse bias CR1 and eliminate the current path from U2 pin 1 to ground. C13 will then begin charging through CR2 and the voltage at the CR4, CR2 junction will start to increase. If the VCO phase should lead the reference phase, the emitter of Q2 will be low for a period of time, reverse biasing CR3. C13 will then start to discharge through CR4 to U7 pin 8 and the voltage at the junction of CR4, CR2 will start to fall. The net effect of all this is that when the reference phase is leading the divided down VCO phase, the output voltage will increase and when the reference is lagging the output voltage will decrease. The circuit formed by Q3, CR7, and CR8 detects the frequency of the VCO by the pulse width out of the divide-by-N circuit. This voltage is filtered by U7B and goes to U7A and U2A to maintain constant phase/frequency detector linearity at any lock frequency.

4.3.5.2.5 Integrator

The integrator consists of U6 and C7. U6 pin 3 is set at a nominal 3.4 volts by adjusting R44, and U6 pin 2 will be at the same voltage when the VCO is locked to the reference. Should the VCO go out of lock the voltage at pin 2 will be changed by the phase/frequency detector and the output of U6 will change to flow from C13, through R15, C7, and R11 so that R15 will drop enough voltage to return pin 2 to the same voltage as pin 3. The longer the voltage difference exists between C13 and U6 pin 3, the greater the charge on C7 that will be developed and the greater the voltage change on U6 pin 6. This will continue until C13 returns to the same voltage as U6 pin 3, at which time U6 pin 6 will stop changing and will be stable at a new voltage.

4.3.5.2.6 Loop Filter

The loop filter consists of R18, R28, R29, and C18. U2B buffers the output from the integrator and feeds it to R18. The loop filter is a simple RC filter with the output taken at a certain voltage drop above the capacitor. This provides a filter with a "double knee" response to allow damping in the loop to increase lock speed and to decrease the likelihood of loop oscillations. The output of the filter is taken between R18 and R26 and is fed to the VCO.

4.3.5.2.7 VCO

Q1 is the oscillator gain element and L4 and CR1, and CR2 form the resonant circuit. Voltage from the loop filter is applied to the junction between CR1 and CR2 which are tuning diodes. As the input voltage changes the resonant frequency (and the oscillator frequency) changes. Q3 and Q2 form the output amplifier/buffer whose output is bandpass filtered by L1, L2, C5, C6, C9, C10, and C11. R5, R6, and R7 form an attenuator and U1 splits the output into two equal signals. One of the outputs is routed to the receiver first mixer. The Q4, Q5, Q6 circuit is an amplifier/buffer for feedback to the divide-by-N circuit.

4.3.5.2.8 Speed Up Circuit

In order to increase lock speed, a circuit to detect out of lock conditions and speed up the voltage slew rate is included. When the Microcomputer changes the tuned frequency, an immediate error voltage is produced at the output of the phase/frequency detector. This voltage will

be transferred to the loop filter and will cause a current change into or out of C18. This current will be detected by the circuit formed by U9A, B, and C which form a voltage detector and a low pass filter. U9A is a comparator that changes the low pass filter output to a digital level. When U9 pin 1 goes high all four analog switches in U3 are closed which does the following. U3A shunts R11 with R7 to increase the integrator time constant. U3B and A bias U8 to charge or discharge C18 quickly through Q4 or Q5. U3D closes to turn on the LED DS1 and indicate an out of lock condition to the Microcomputer through U4.

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4.3.6 Frequency Reference, A6

Refer to Figure 4-8, Frequency Reference Block Diagram, as an aid in understanding the following description. The Frequency Reference consists of an internal reference oscillator, an internal/external reference select circuit, a reference frequency select circuit, a phase comparator, a loop filter, a variable crystal oscillator (VCXO) and a divide by 2, 4, 20 counter. The Frequency Reference generates the time base signals for the receiver and the 40 MHz 2nd LO signal.

4.3.6.1 REFERENCE OSCILLATOR

The Reference Oscillator is a 5 MHz crystal oscillator mounted in a temperature stable housing. The output of the oscillator is coupled to the internal/external reference select circuit.

4.3.6.2 INTERNAL/EXTERNAL REFERENCE SELECT

The internal/external reference select circuit is a diode switch programmed by the INT/EXT REF SEL line from A4. When INT is selected, the 5 MHz signal from the reference oscillator is routed to the Shaper Circuit. At the same time, the 1, 5 or 10 MHz reference signal from the Reference Frequency Select circuit is routed to the rear panel INT/EXT REF jack. When EXT is selected, the Reference Oscillator is disabled and the diode switch is changed to route an external reference signal from the rear panel INT/EXT REF jack to the Shaper.

4.3.6.3 REFERENCE FREQUENCY SELECT

During Internal (INT) reference mode, the Reference Frequency Select circuitry permits selection of 1, 5 or 10 MHz from the divide-by-N counters and routes the signal through the Internal/External Select circuitry to the INT/EXT REF jack (J3) on the rear panel. In this mode, 5 MHz is always routed to the phase comparator for comparison with the internal time-base.

When External (EXT) reference mode is chosen, the Reference Frequency Select circuitry routes 1, 5, or 10 MHz to the phase comparator allowing for the use of an external reference at those frequencies. The external reference is input through the INT/EXT REF jack (J3) or the rear panel.

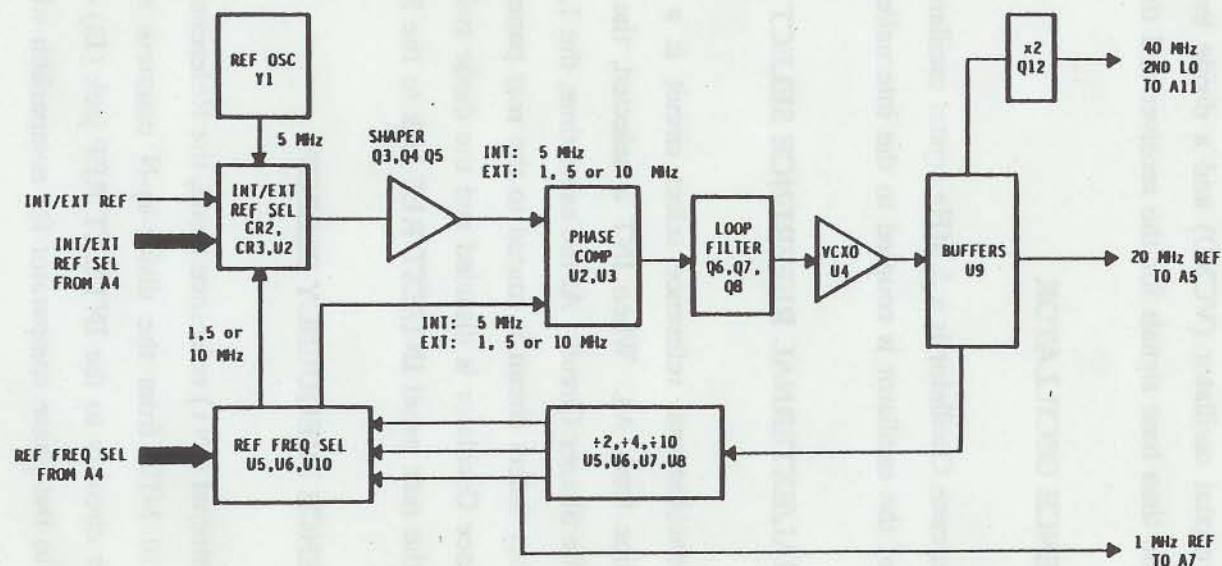
Courtesy of <http://BlackRadios.terryo.org>

Figure 4-8. Frequency Reference Block Diagram

4.3.6.4 PHASE COMPARATOR

The Phase Comparator is the main control element in the oscillator loop. It compares the 5 MHz internal time-base signal with the 5 MHz reference signal from the divide-by-N circuits when in the internal reference mode. If external reference mode is selected, it compares a 1, 5, or 10 MHz external time-base signal with 1, 5 or 10 MHz from the divide-by-N counters. The output of the phase comparator, representing the frequency difference between the incoming references, is a d.c. level that passes through the loop filter. The loop filter is a lowpass filter that establishes the effective response time of the VCO loop.

4.3.6.5 VARIABLE CRYSTAL OSCILLATOR (VCXO)

The VCXO consists of a 20 MHz crystal oscillator with a varactor diode in the crystal circuit. The varactor permits slight varying of the actual oscillation frequency of the crystal. The dc output from the loop shifts causes the varactor to shift the frequency of the VCXO to make the actual output frequency an exact integer multiple (4X) of the reference oscillator frequency of 5 MHz. The output of the VCXO is doubled to 40 MHz by a frequency doubler and sent to the A11 as the 2nd LO signal.

4.3.6.6 VCXO OUTPUT

The VCXO output is split four ways and buffered to provide the various reference frequencies required. One buffered 20 MHz signal is doubled to supply the 40 MHz 2nd LO to the A11 second mixer. A second buffer output provides a 20 MHz reference to the A5 synthesizer module while another 20 MHz output is available as a spare reference. The last buffer output passes to the divide-by-N circuitry to continue the phase-locked-loop.

4.3.6.7 DIVIDE-BY-N COUNTER

A buffered 20 MHz output of the VCXO is sent to the dividers where it is divided by 2.4 and 20 to yield 10.5 and 1 MHz signals. These three frequencies are routed through the Reference Frequency Select circuit which handles them as explained in paragraph 4.3.6.3.

In addition, the 1 MHz signal is sent to the A7, Demodulator/BFO as the reference for the BFO oscillator.

4.3.7 Demodulator/BFO, A7

Refer to Figure 4-9, Demodulator/BFO Block Diagram, as an aid in understanding the following description. The Demodulator/BFO consists of a product detector, an FM discriminator, a detector select switch, an audio crosspoint switch, a BFO synthesizer and an RF select switch. The Demodulator/BFO provides for demodulation of AM, CW, SSB, and FM modulated signals. Demodulated audio signals are routed to the proper audio outputs through the crosspoint switch.

4.3.7.1 BFO

The BFO consists of a voltage controlled oscillator (VCO) and a programmable divider. Varactor diodes in the VCO tuned circuit permit varying the oscillation frequency. The output of the BFO goes through a main programmable divider. This divider consists of an integer division ratio divide-by-N counter to provide 1 kHz coarse steps in VCO frequency and a fractional division ratio counter to provide 10 Hz fine steps in VCO frequency. The main programmable counter is driven by the BFO frequency data word from A4. The output of the counter drives the phase detector which compares it with the 1 MHz reference signal from A6.

When BFO frequency front panel setting calls for -8.00 kHz, the main programmable divider is set for an effective division ratio of 4.47. This in conjunction with the phase detector, forces the VCO to oscillate at 2235 kHz. When the BFO frequency front panel setting calls for +8.00 kHz, the main programmable divider is set for an effective division ratio of 4.63. This in conjunction with the phase detector forces the VCO to oscillate at 2315 kHz. The VCO output is routed through a divide-by-5 counter, giving a BFO output frequency range of 447.00 to 463.00 kHz in 10 Hz steps. The BFO output is applied to the input of the RF switch.

4.3.7.2 RF SWITCH

The RF switch is programmed by the Detector Select data from A4. When AM or FM mode has been selected, the 2nd IF input signal from A9 is passed through the switch to the FM detector (para. 4.3.7.3). When CW or SSB mode has been selected, the BFO signal is passed through the RF switch to the FM detector.

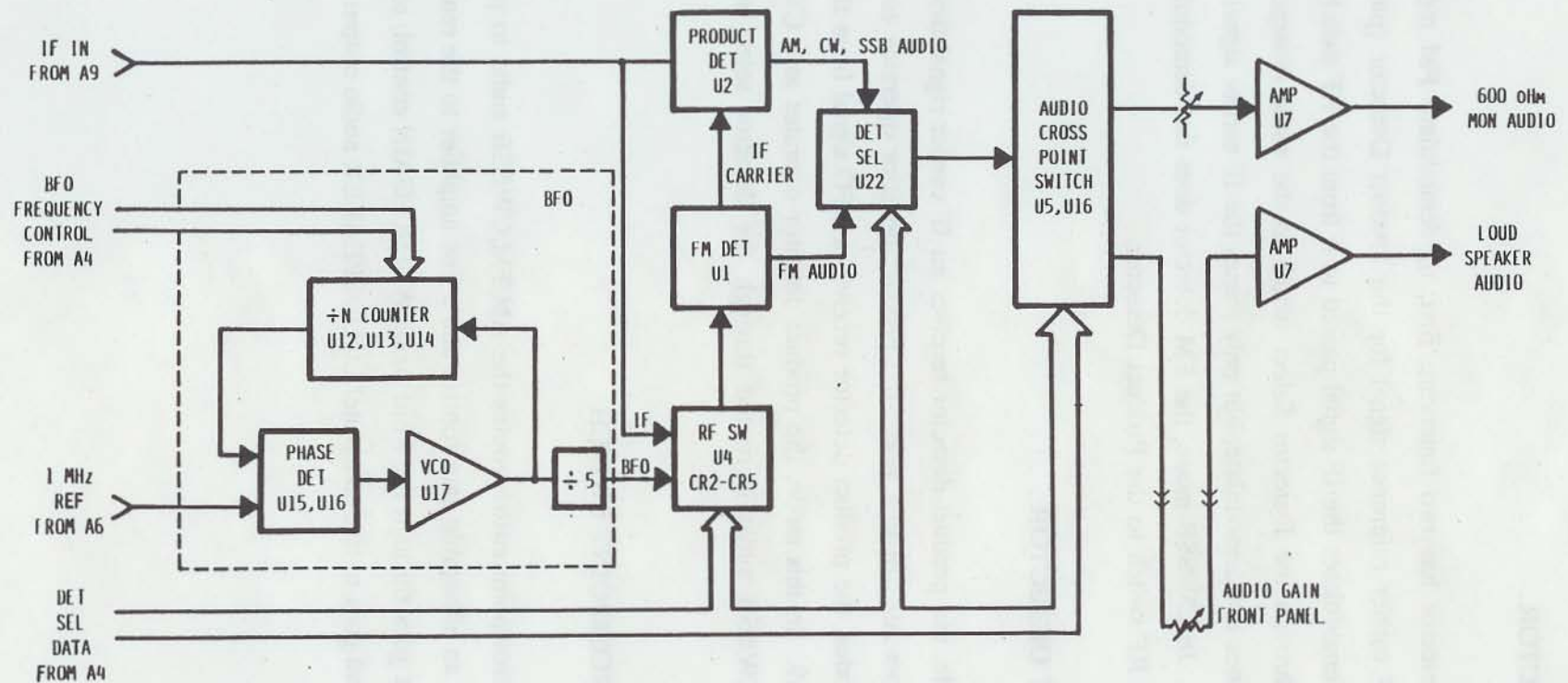


Figure 4-9. Demodulator/BFO Simplified Block Diagram

4.3.7.3 FM DETECTOR

The FM detector has two functions: first, to demodulate FM modulated signals and second, to provide an IF carrier reference signal for the Product Detector (para. 4.3.7.4). In FM mode, the FM detector demodulates the IF signal passed to it from the RF switch. The demodulated audio output is routed through the Detector Select switch to the audio crosspoint switch. In AM mode, the FM detector does not demodulate, but only passes the IF carrier signal from the RF switch to the Product Detector. In CW/SSB mode, the FM detector does not demodulate, but only passes the BFO signal from the RF switch to the Product Detector.

4.3.7.4 PRODUCT DETECTOR

In AM mode, the product detector receives an IF carrier signal from the FM Detector and the 2nd IF signal from A9. In this mode, the product detector operates as a synchronous AM detector. In CW/SSB modes, the product detector receives a BFO signal from the FM detector and the 2nd IF signal from A9. In this mode, the product detector operates as a CW/SSB demodulator. The demodulated AM/CW/SSB audio is routed through the detector select switch to the audio crosspoint switch.

4.3.7.5 AUDIO CROSSPOINT SWITCH

The audio crosspoint switch routes the AM/FM/CW/SSB audio to provide two outputs. One output goes through an adjustable gain control and a line amplifier to the rear panel MON audio output. The other output goes through the front panel AUDIO GAIN control, returns to A7, passes through a line amplifier and goes to the rear panel LOUDSPEAKER audio output and the front panel phone jack.

4.3.8

Baseband Converter, A8-3

Refer to Figure 4-10, Baseband Converter Block Diagram, as an aid in understanding the following description. The Baseband Converter converts the 455 kHz IF to 6.4 kHz at -10 dBm into 50 ohms. The 455 kHz IF frequency from assembly A9 is applied to A8J1 (input to pin 1 of splitter U1). This signal is applied to IF output circuit (A1-A3) and mixer U2. The IF output circuit compensates for losses in the splitter before feeding it to the rear panel IF OUTPUT connector J2. LO frequency (461.4 kHz) for mixer U2 is provided by VCO and phase locked looped circuits using the receiver reference frequency from Assembly A6. The PLL circuit consists of U6 (an amplifier and driver), U7 (divider), U8 (Prescaler), and U10 (digital divider and phase detector). The VCO circuit consists of CR1, CR2, CR24, CR25, L6 (tuning), Q4, A5 (emitter follower), Q6 (digital shaper) and U9 (filter and integrator).

The reference frequency is applied to J7 (input to U6). U6d provides reference frequency to the programmable synthesizer U10. U6e and f provide the reference frequency to J8 REF OUT (output to assembly A7). Frequency determining data from the Receiver microprocessor is fed to shift register U11. U11 converts the serial data on pins A5, B5 of P1 to parallel data to control the dividing constants N, A and R of the synthesizer. This compares the VCO frequency and the reference frequency producing a control voltage coarse adjust (U10 pin 1) and fine adjust (U10 pin 2). These are fed to U9 of the VCO circuit. The VCO produces a signal of 23.07 MHz which is fed to the prescaler U8 and divider U7, which divides it by 50 to produce 461.4 kHz. U8 produces divide signal for the digital divider and phase detector U10. The phase locked output of U7 is applied to LO drivers U6a, U6b, and U6c. This signal is fed through LK1 to pin 8 of mixer U2 as LO signal of 461.4 kHz at +17.0 dBm. Note that LK1 can be repositioned to test LO output or an external LO input.

The typical range of the VCO is 22.0-28.0 MHz. This provides LO frequencies of 440.0-560 kHz. The VCO circuit is tuned by L6 (adjusted to provide the lock on voltage applied to the varactors CR1 and CR2). Adjustment is approximately 6.0 volts (mid range between 2.0 to 10.0 volts). The IF frequency from the output of the mixer is fed to a low-pass filter (L3, C8, L4, C9 and C10). The filtered IF is applied to the high gain amplifier (U3). A high-pass filter (L1, L2, L3, R18, C5, C6 and C7) passes the high frequencies to ground, eliminating the LO frequency and its harmonics from the input to amplifier U3. R25 is offset adjust for amplifier U3. The amplified signal passes through LK2 to the final output stage of amplification (U5). R26 is gain adjust for the Baseband

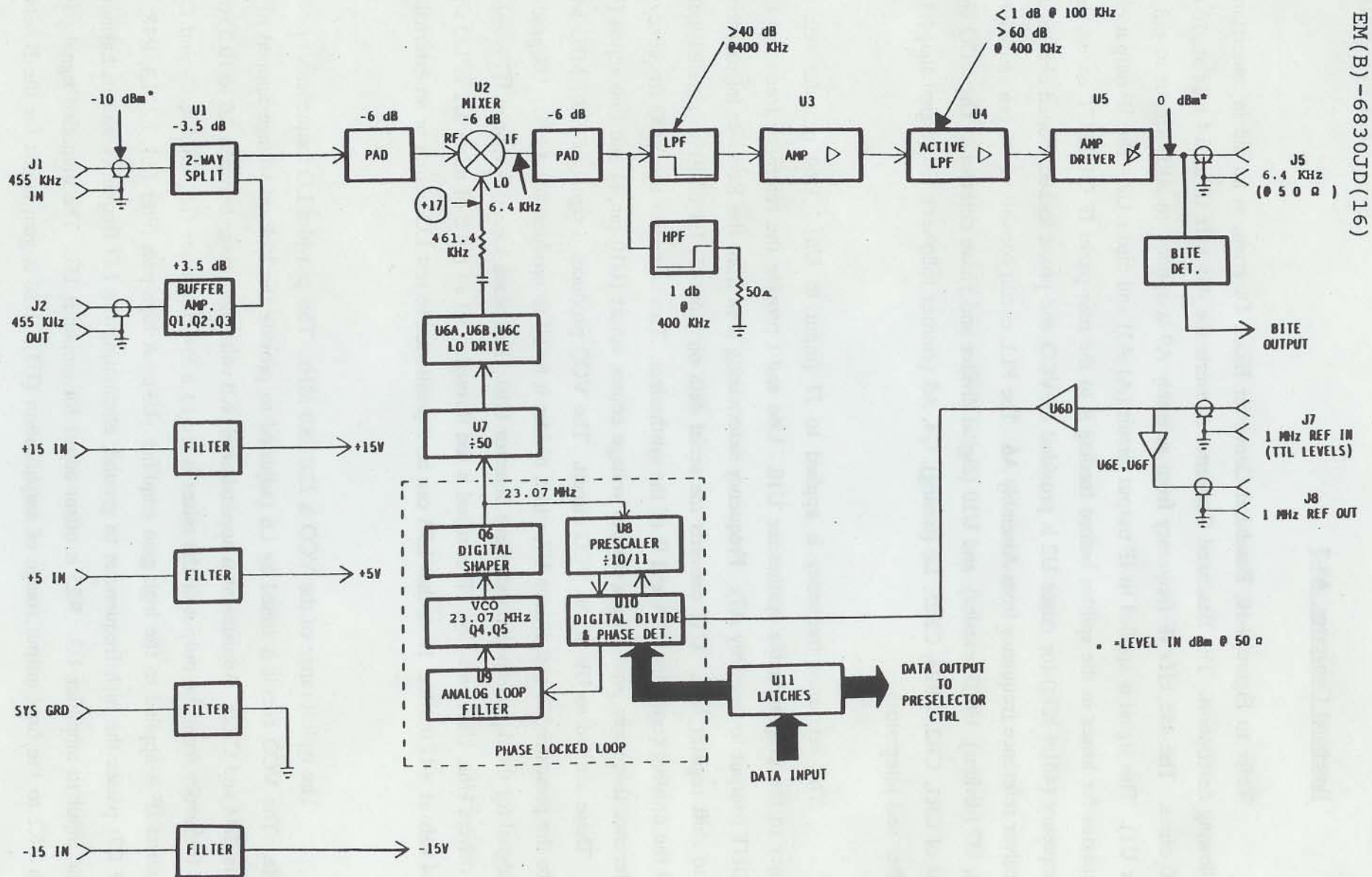


Figure 4-10. Baseband Converter (A8) Functional Block Diagram

Converter. R25 is used for zero volt balance (DC offset) adjustment. The output signal from U5 pin 6 is applied to A8J6 connected to rear panel BASEBAND OUT (J5). LK2, LK3, J4 and J5 are provided for testing purposes. U12A is part of a BITE circuit which feeds the BITE signal to the microprocessor.

4.3.9 IF/AGC, A9

Refer to Figure 4-11, IF/AGC Block Diagram, as an aid in understanding the following description. The IF/AGC consists of a variable gain IF amplifier, IF output buffers, AGC detectors, an integrator and AGC filter, a gain control distribution amplifier, AGC control circuitry, and a BITE detector.

4.3.9.1 VARIABLE GAIN IF AMPLIFIER

The 2nd IF input signal from A10 drives a variable gain IF amplifier. The actual gain of this amplifier is adjusted by AGC control circuitry (para. 4.3.9) in response to the RF signal input level to the receiver. The output from this amplifier goes through a buffer amplifier to drive the input to Demodulator/BFO, A7. The output of the buffer goes through a second buffer amplifier to drive the input to the Baseband Converter, A8.

4.3.9.2 AGC DETECTORS

The 2nd IF output signal from the first buffer amplifier goes through a second buffer amplifier to drive the AGC detectors. The peak detector develops a dc voltage proportional to the peak amplitude of the 2nd average amplitude of the 2nd IF signal. The average detector output in conjunction with the AGC control circuit, drives the time constant circuit. The time constant circuit sets the time constant of the peak detector to the optimum value for the signal being received. The output of the peak detector drives the integrator through the MAN/AGC select switch.

4.3.9.3 INTEGRATOR AND AGC FILTER

The integrator is a high gain, slow response time amplifier. In AGC mode, dc from the peak detector is processed and amplified by the integrator. In Manual mode, the peak detector is disconnected and the Manual Gain input from the front panel IF Gain control is processed and amplified by the integrator. The integrator output is processed by the AGC filter, which, in conjunction with the average detector and time constant circuit, sets the receiver AGC overall response time.

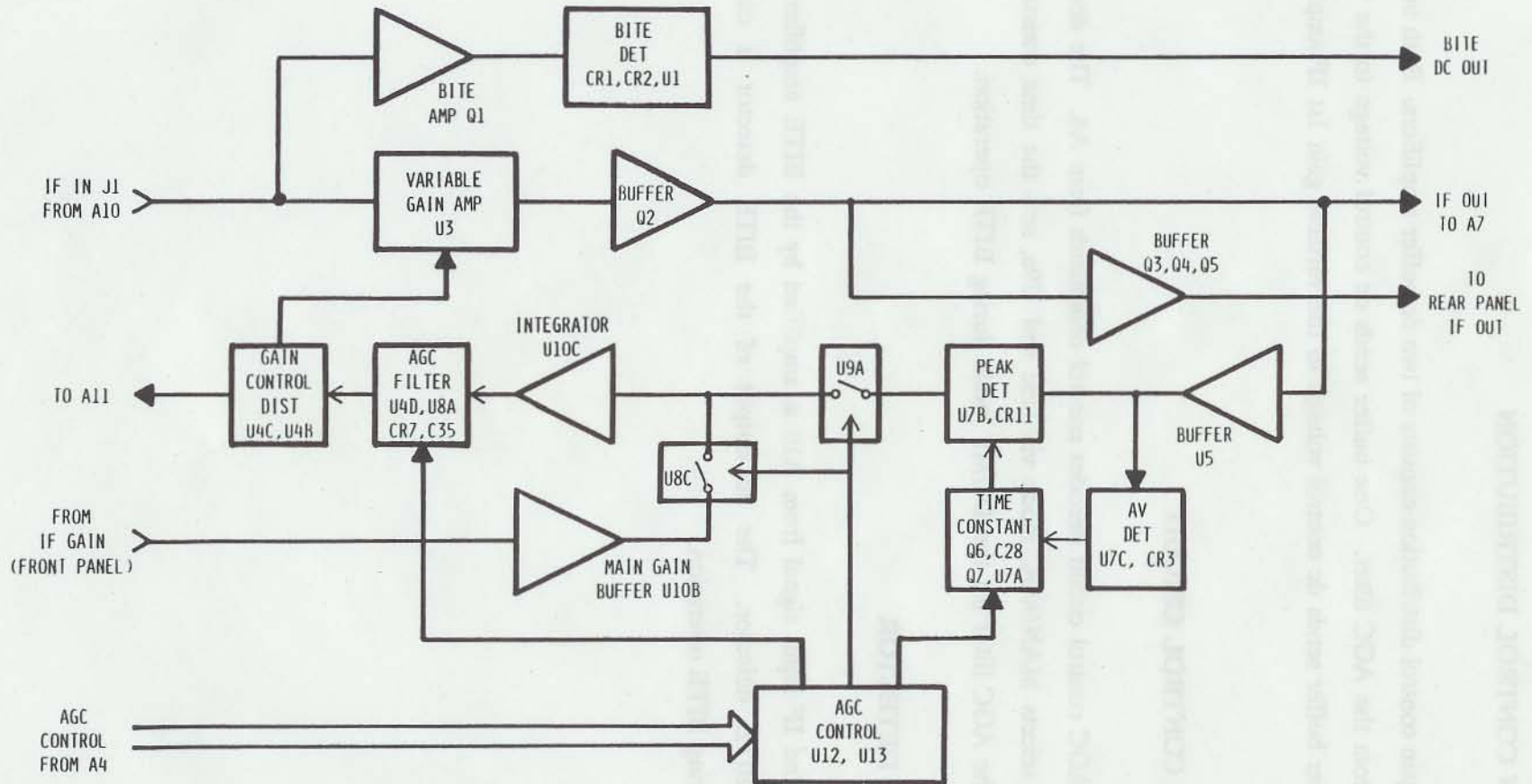


Figure 4-11. IF/AGC Simplified Block Diagram

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4.3.9.4 GAIN CONTROL DISTRIBUTION

The gain control distribution consists of two dc buffer amplifiers. Both buffers are driven by the dc output from the AGC filter. One buffer sends dc control voltage to the variable gain IF amplifier. The other buffer sends dc control voltage to the variable gain 1st IF amplifier in the 2nd Mixer, A12.

4.3.9.5 AGC CONTROL CIRCUIT

The AGC control circuit decodes control commands from A4. The decoded output of the control circuit selects MAN/AGC mode via U8c and U9a, sets the time constant of the peak detector and sets the AGC filter for the DUMP mode during BITE operation.

4.3.9.6 BITE DETECTOR

The 2nd IF input signal from A10 is amplified by the BITE amplifier. This signal is detected by the BITE detector. The dc output of the BITE detector is examined by the Microcomputer during BITE operation.

4.3.10 IF Filter, A10

Refer to Figure 4-12, IF Filter Block Diagram, as an aid in understanding the following description. The IF filter consists of five bandpass filters, five diode switches, an output buffer and a bandpass select circuit.

4.3.10.1 **BANDPASS FILTER**

The 2nd IF output signal from A11 drives the inputs of up to five bandpass filters simultaneously. Each bandpass filter has a symmetrical bandpass centered at 455.000 kHz. The bandwidths are 300 kHz, 1.0 kHz, 3.0 kHz, and 6.0 kHz.

4.3.10.2 **BITE DETECTOR**

The 2nd IF output of A10 is amplified by the BITE amplifier Q1. This signal is detected by the BITE Detector, CR1 and CR2, and amplified by buffer U1A. The dc output of U1A is examined by the Microcomputer during BITE operation.

4.3.10.3 **BANDWIDTH SELECT CIRCUIT**

Each bandpass filter output passes through a diode select switch. The switches are controlled by the bandwidth select decoder which receives bandwidth select data from A4. When a particular filter is selected, the diodes in its output switch are forward biased, passing the 2nd IF input signal through that filter and on to the output buffer. The diodes in the output switches for filters not selected are back-biased, thus blocking the 2nd IF signal from passing.

The bandpass limited 2nd IF signal is passed through a unity-gain buffer amplifier and on to the IF/AGC, A9.

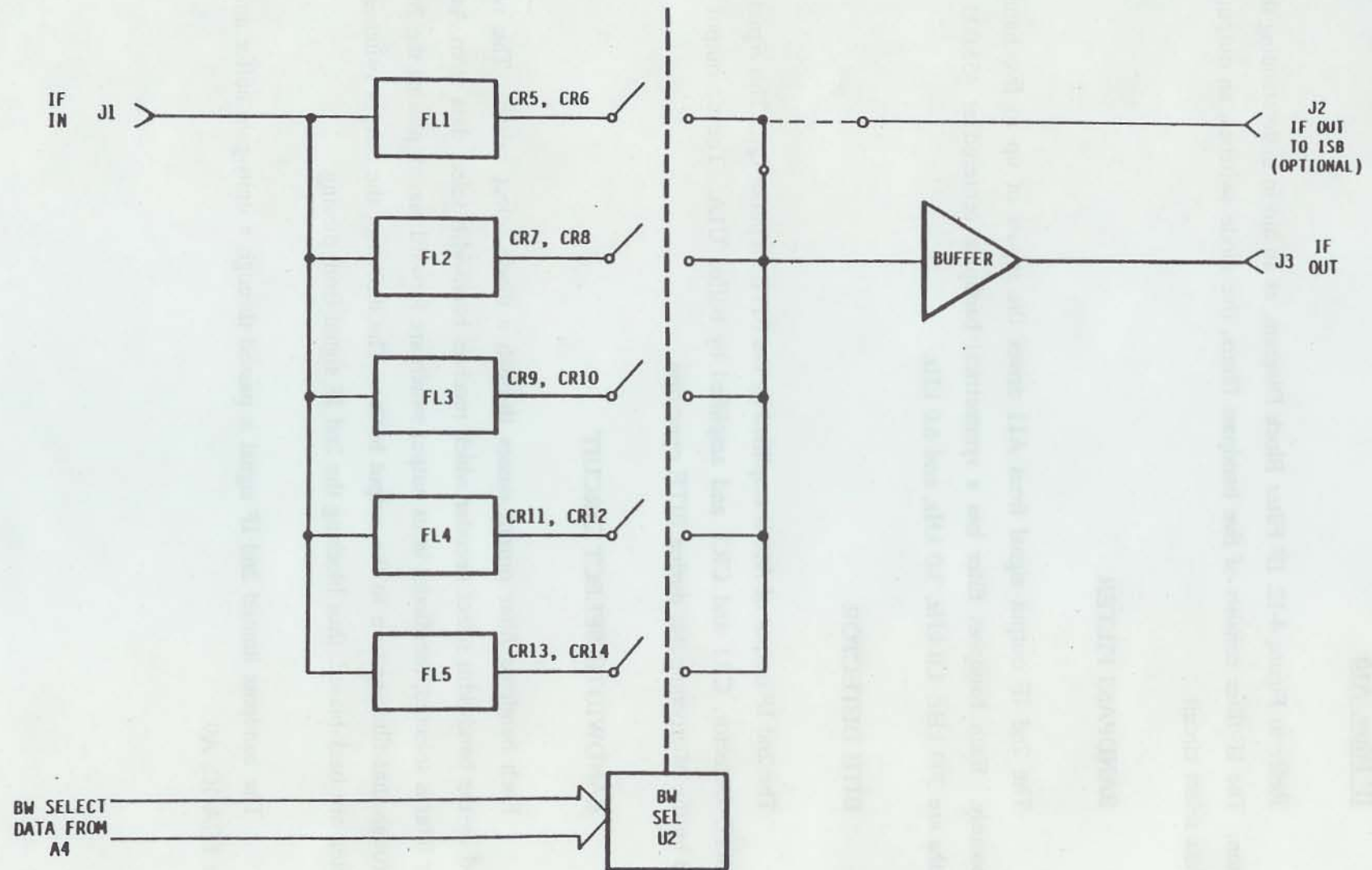


Figure 4-12. IF Filter Simplified Block Diagram

4.3.11 2nd Mixer, A11

Refer to Figure 4-13, 2nd Mixer Block Diagram, as an aid in understanding the following description. The 2nd Mixer consists of a tuned IF amplifier, a bandpass filter, a mixer, a filter and output buffer, and a BITE detector.

4.3.11.1 TUNED IF AMPLIFIER

The 1st IF input signal from A12 is amplified by a fixed gain IF amplifier. The bandwidth of the amplifier is controlled by the AGC input control signal from A9. The bandwidth of the amplifier is 25 kHz as determined by a bandpass filter at the output of the amplifier. The amplified 1st IF signal drives the input of the 2nd fixed gain IF amplifier.

4.3.11.2 2ND MIXER

The 2nd Mixer is an active balanced modulator. It combines the 1st IF signal, 40.455 MHz, with the 40 MHz 2nd LO signal from A6. The mixed output, 455 kHz, is filtered by a bandpass filter, amplified by an output buffer, and passed on to the IF filter, A10.

4.3.11.3 BITE DETECTOR

The 2nd IF output signal is amplified by the BITE amplifier and sent to the BITE detector. The dc output voltage of the BITE detector is amplified by a dc buffer. The BITE dc output is examined by the Microcomputer during BITE operation.

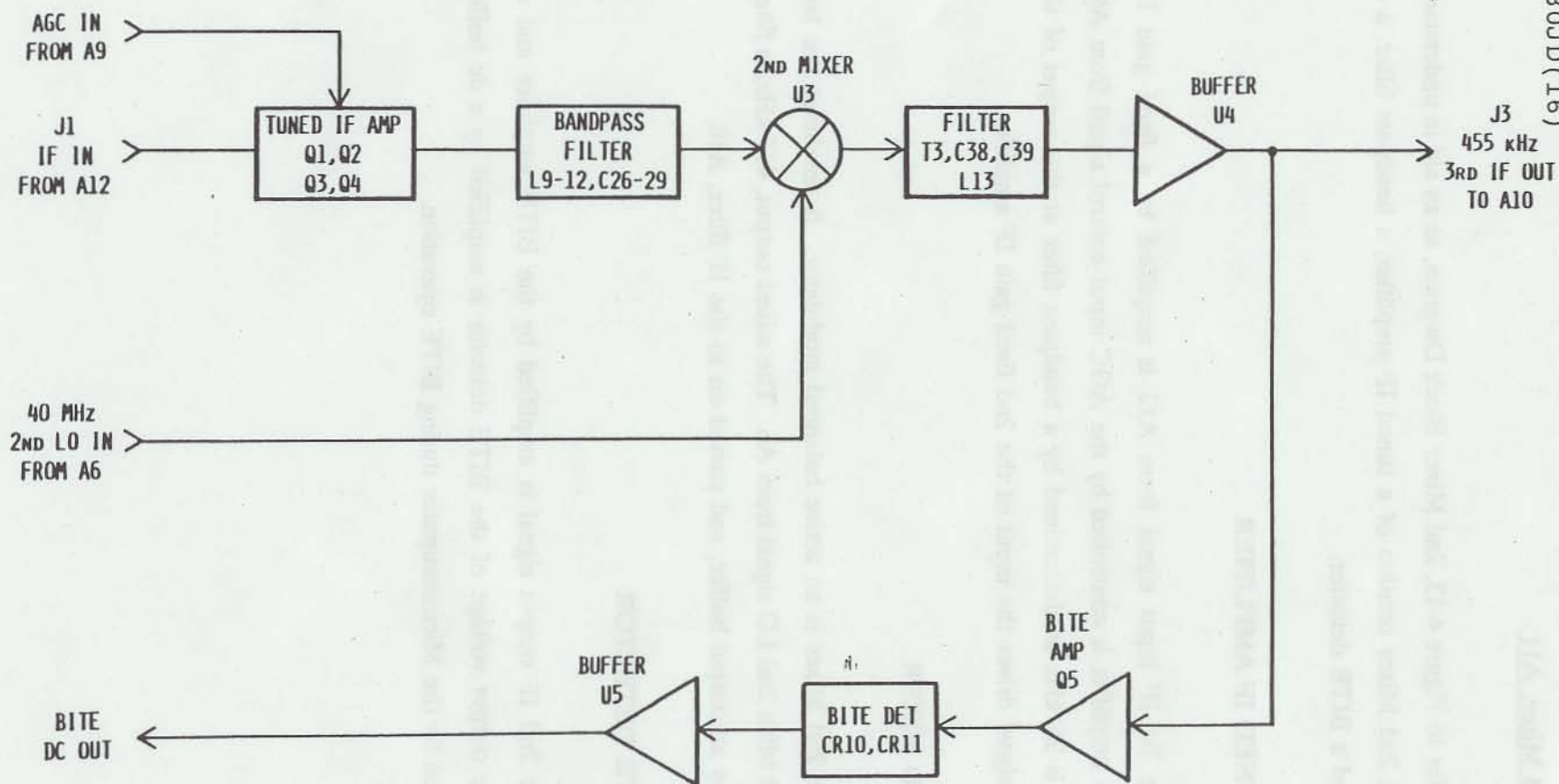


Figure 4-13. 2nd Mixer Simplified Block Diagram

4.3.12 1st Mixer, A12

Refer to Figure 4-14, 1st Mixer Block Diagram as an aid in understanding the following description. The 1st Mixer consists of an input bandpass filter, a mixer, a 1st LO amplifier, an output bandpass filter and a BITE detector.

4.3.12.1 **BANDPASS FILTER**

RF input signals from the RF Input, A13, are passed through a bandpass filter with a response pass band from 0.5 to 30 MHz. The filter is a 50 ohm elliptic configuration giving high attenuation to signals above 35 MHz. The filter output drives the 1st mixer.

4.3.12.2 **1ST LO AMPLIFIER**

The 1st LO signal, 40.955 to 70.454999 MHz, first passes through a 40.455 MHz Notch Filter. This filter eliminates any 1st LO noise components that may exist at 40.455 MHz and which might pass through the 1st mixer into the 1st IF passband. The 1st LO signal is then amplified by a buffer, filtered by a high pass filter to remove low frequency noise components and amplified by a second buffer. The high level 1st LO output of the second buffer drives the LO input of the 1st mixer.

4.3.12.3 **1ST MIXER**

The first mixer is a double balanced passive mixer with a 50 ohm characteristic impedance. The first mixer combines RF input signals with the 1st LO signal. The 1st mixer output, 40.455 MHz, is filtered by a 25 kHz bandwidth filter and is sent to the 2nd mixer, A11.

4.3.12.4 **BITE DETECTOR**

The filtered 1st IF output is amplified by the BITE amplifier and drives the BITE detector. The dc output of the BITE detector is amplified by a dc buffer amplifier. The BITE dc output is examined by the Microcomputer during BITE operation.

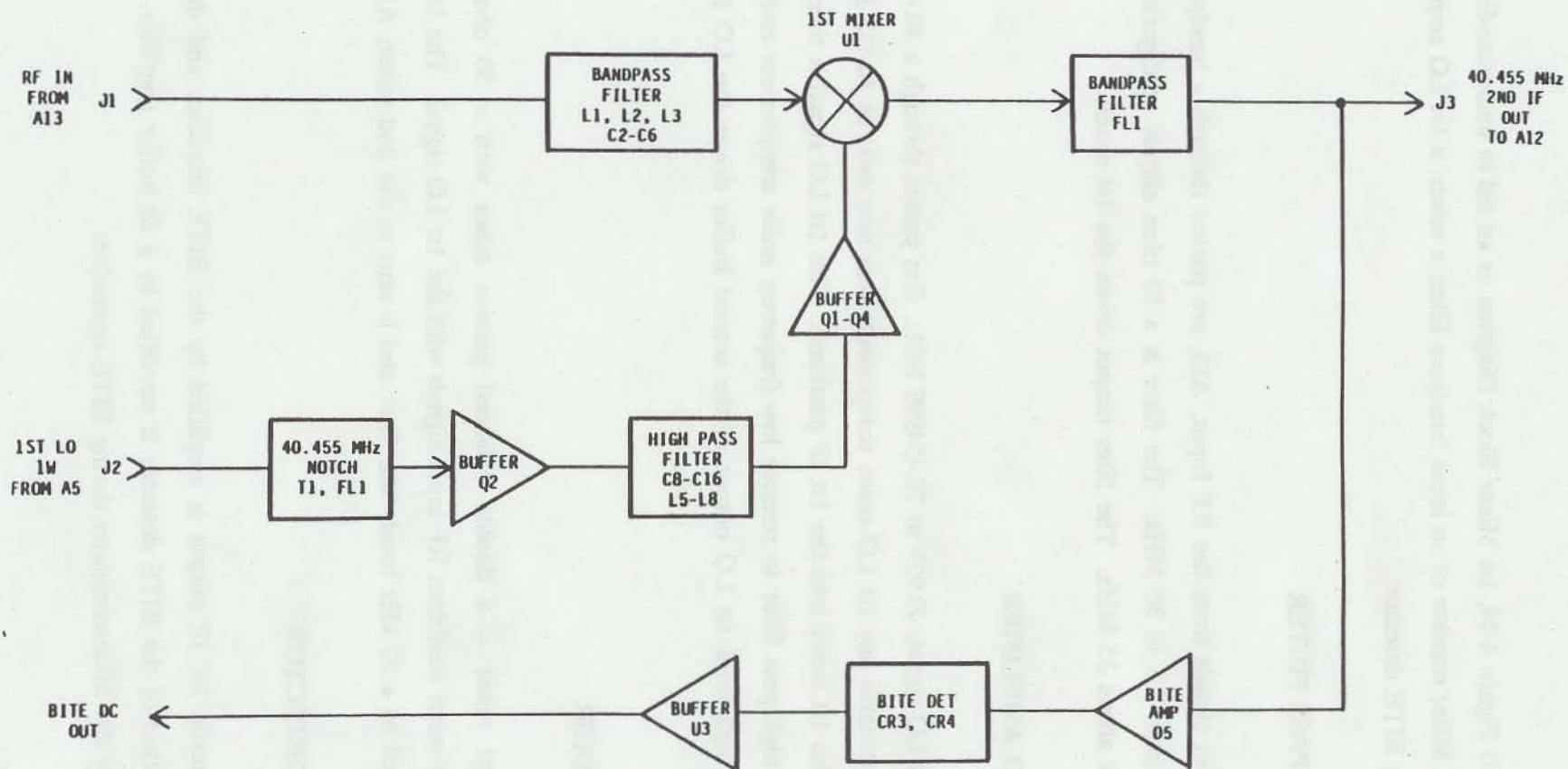
Courtesy of <http://BlackRadios.terryo.org>

Figure 4-14. 1st Mixer Simplified Block Diagram

4.3.13 RF Input, A13

Refer to Figure 4-15, RF Input Block Diagram, as an aid in understanding the following description. The RF input consists of an input protection clamp, a BITE relay, a 30 MHz low pass filter, a BITE generator, and a BITE detector.

4.3.13.1 INPUT PROTECTION

The input signal path starts with a 230 V spark gap to absorb and limit high voltage transients. Next a high voltage 50 MHz low-pass filter attenuates pulses shorter than 4 nano-seconds and out-of-band high-power RF which would not be handled effectively by the clamping network. A high-voltage static discharge path (140 K ohm) and 660 VAC rated self-healing capacitor provide DC and ELF blocking. The clamping network passes signals of +23 dBm without clipping and limits input signals up to 20 watts, 0-35 MHz, to +30 dBm. The overload indicator operates in the presence of input signals greater than about +30 dBm. A TTL external muting control line appears at rear panel AF OUT connector (XXMT). Internally controlled muting operates via front panel or remote control. Muting and test signal selection is by means of an RF relay located in the signal path between the clamping network and the 30 MHz low-pass filter.

4.3.13.2 LOWPASS FILTER

RF input signals from the Input Protection circuit then pass through a 30 MHz low-pass filter. This ninth-order elliptic 50 ohm filter exhibits less than 1 dB insertion loss from 0-30 MHz and, along with the 60 MHz low-pass filter, exhibits greater than 80 dB of attenuation from 50 to 250 MHz. The RF output from the Low Pass Filter is sent to the 1st Mixer, A12.

4.3.13.3 BITE TEST SIGNAL GENERATOR

The Test signal generator is controlled by the Microcomputer via the Receiver Interface, A4. The output level stability of the generator is better than +/-0.5 dB. A 100 kHz low pass filter removes harmonic content. Power is applied to the generator only when BITE is active, and the TEST/MUTE relay isolates the RF input (J1) from the test signal.

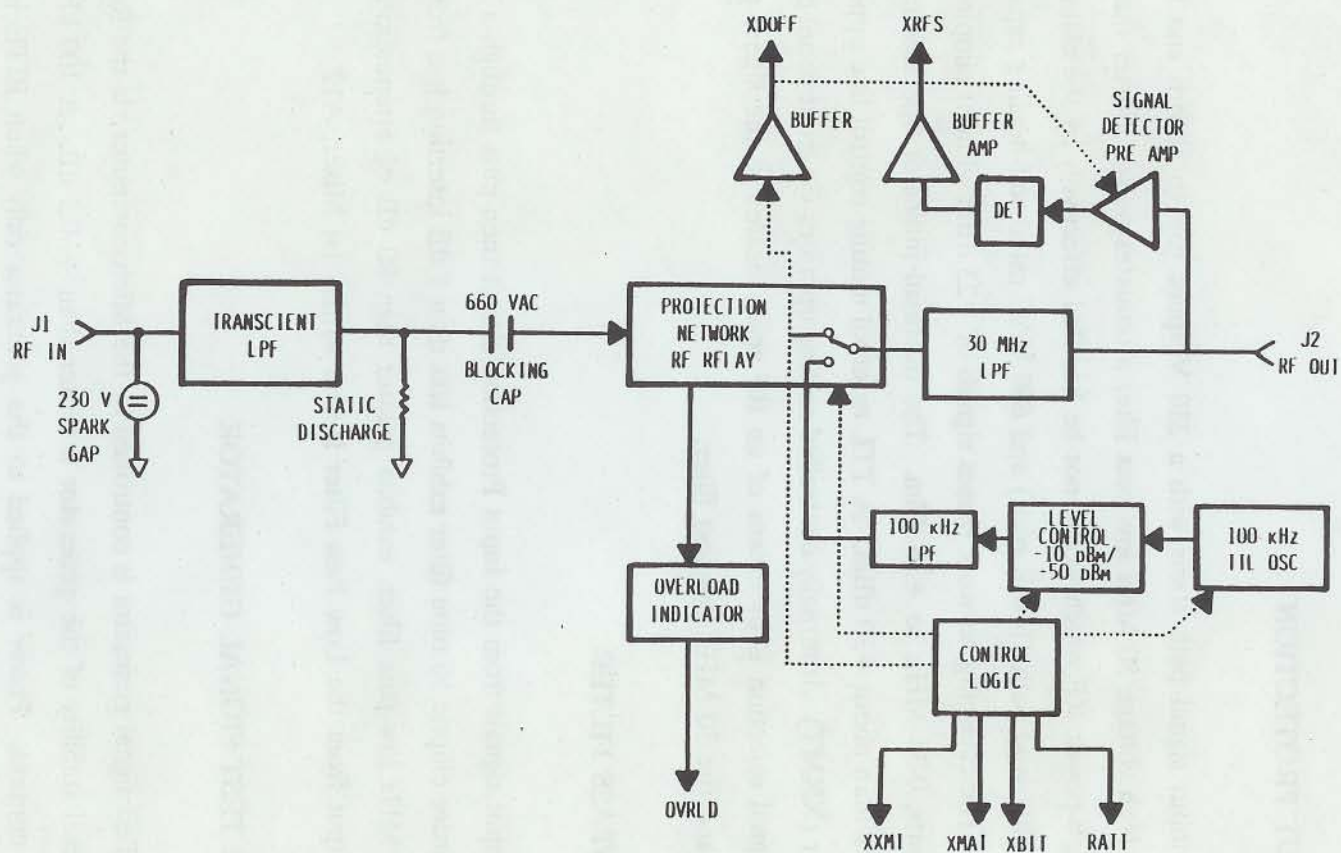


Figure 4-15. RF Input Simplified Block Diagram

4.3.13.4 BITE TEST SIGNAL DETECTOR

The BITE test signal detector is tapped into the signal path at J2, the output of A13. The detector yields +5 VDC output in the presence of the -10 dBm 100 kHz test signal from the BITE Generator. The BITE detector DC output is examined by the Microcomputer during BITE operation.

4.3.14 Linear Power Supply, A14

Refer to Figure 4-16, Power Supply Block Diagram, as an aid in understanding the following description. The Power Supply consists of the Power Supply Assembly, A1 and the Regulator Assembly, A2. The Power Supply operates on 115 VAC. A power transformer, rectifiers and regulators supply the dc voltages used by the Receiver.

4.3.14.1 POWER SUPPLY ASSEMBLY, A14A1

AC input voltage of 115 VAC passes through an RF line filter to the primary winding of the transformer. The secondary windings of the transformer with rectifiers and filter capacitors produce DC output voltages of +28 V, +18 V, -18 V, and +8 V, nominal.

4.3.14.2 POWER SUPPLY REGULATOR ASSEMBLY, A14A2A1

The Regulator Assembly routes the AC input voltage from the rear panel through fuse F1 to the Power Supply Assembly, A1. The +28 V, +18 V, +8 V, and -18 V outputs from the Power Supply Assembly are filtered and regulated to yield output voltages of +20 V, +15 V, +5 V and -15 V. The +8 V output from the Power Supply Assembly is independently filtered but not regulated, to produce the +8 V output. All output voltages are routed to the Parent Board via a 26 conductor ribbon cable.

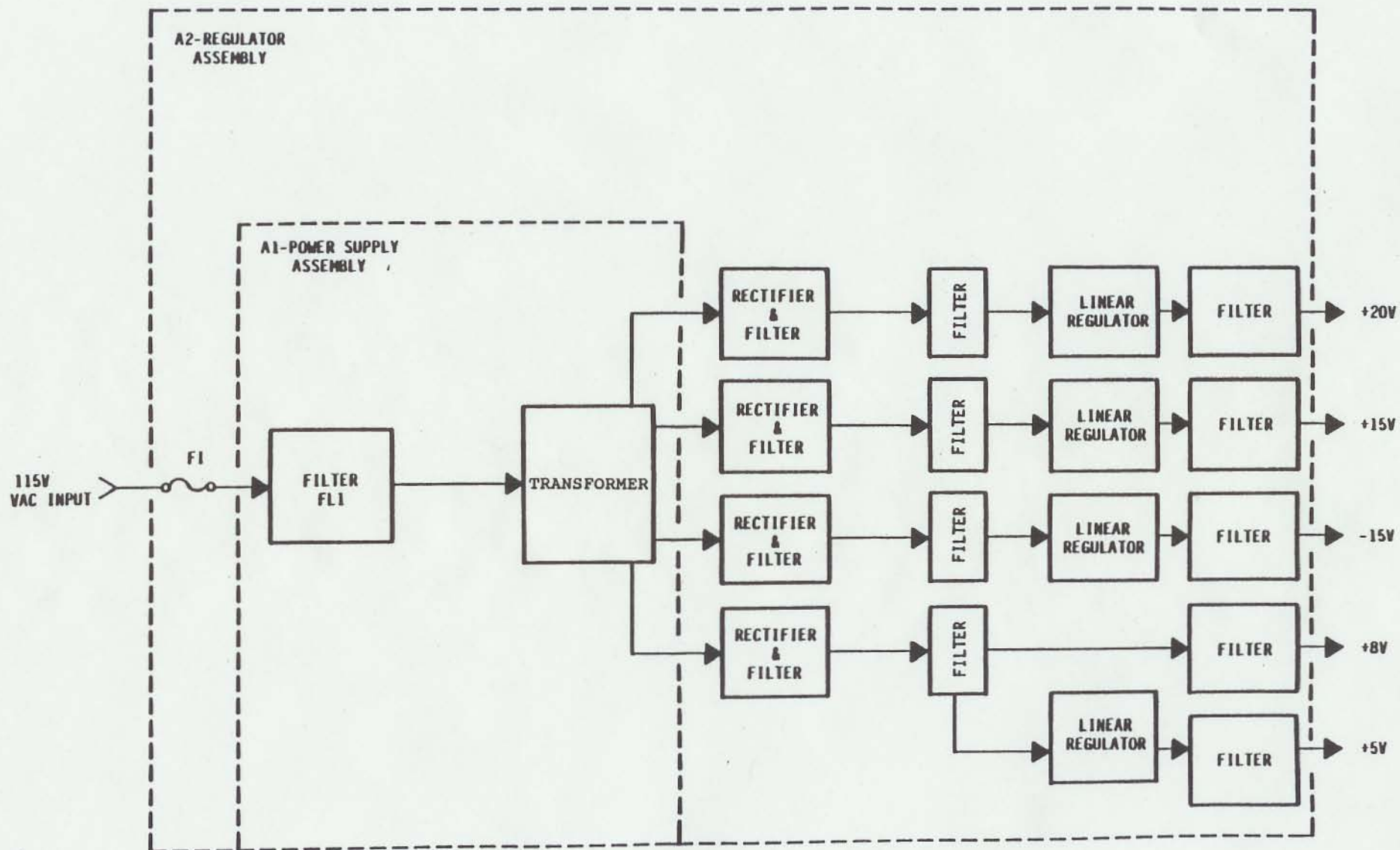


Figure 4-16. Linear Power Supply (A14) Functional Block Diagram

SECTION V

MAINTENANCE

5.1 GENERAL

This section contains maintenance instructions for the Receiver. These instructions include preventive maintenance, performance tests, troubleshooting and module replacement instructions. Troubleshooting instructions are presented in sufficient detail to allow fault isolation to the individual module.

5.2 PREVENTIVE MAINTENANCE

The following paragraphs detail the preventive maintenance procedures to be used for routine servicing of the Receiver.

5.2.1 Inspection for Damage or Wear

Many potential or existing faults can be detected by making a visual inspection of unit. For this reason, a complete visual inspection should be made on a routine basis and whenever the receiver is inoperative. At a minimum, the following items should be visually inspected.

1. Inspect the equipment covers and front panel for condition of finish and panel marking.
2. Inspect for dents, punctures, or warped areas.
3. Inspect quarter-turn fasteners and receptacles.
4. Inspect the external surfaces for loose or missing screws or washers.
5. Inspect the receptacles for condition of pins, contacts, and mounting.

6. Inspect the internal components for signs of deterioration, discoloration, or charring. Check for melted insulation and damaged, cracked or broken components.

7. Inspect the printed circuit boards for damaged tracks, loose connections, corrosion, or other signs of deterioration.

8. Inspect the PC connectors, interface connectors, and chassis wiring for excessive wear, looseness, misalignment, corrosion, or other signs of deterioration.

5.2.2

Cleaning

Cleaning should be performed to remove accumulated dust, grease, and other contamination, and to ensure trouble-free operation.

WARNING

Solvents may be flammable and toxic to skin, eyes, and respiratory tract. Eye and skin protection may be required. Good general ventilation is normally adequate.

CAUTION

Avoid the use of chemical cleaning agents containing benzene, toluene, xylene, acetone, or similar solvents. These chemicals may damage the plastics used in this receiver.

1. Exterior - Dust the cabinet off with a soft cloth. Dust the front panel controls with a small-bristled paint brush. Dirt clinging to the cabinet may be removed with a clean, lint-free cloth dampened with a mild detergent and water solution. Avoid using abrasive cleaners. They will scratch the front panel.

2. Interior - Dust in the interior of the unit should be removed before it builds up enough to cause arcing and short circuits during periods of high humidity. Dust is best removed

by dry, low-pressure air. Dirt clinging to surfaces may be removed with a soft-bristled paint brush or a clean, lint-free cloth dampened with a mild detergent and water solution. Use a cotton-tipped applicator for cleaning in narrow spaces and on the circuit boards. Do not disturb the settings of adjustable components.

5.2.3 Lubrication

No lubrication is required for the Receiver.

5.3 REQUIRED TEST EQUIPMENT

The test equipment or its equivalent required to test and troubleshoot the receiver is listed in Table 5-1. No special tools other than those normally contained in a technician's toolbox are required.

Table 5-1. Required Test Equipment

EQUIPMENT	MANUFACTURER
Extender Board, Analog	Racal 4100049-501
Extender Board, Digital	Racal 4100049-502
Male-Female SMB Coax Extender Cable Assembly	Racal 3500114-501
Standard Technicians Tool Kit	
Digital Multimeter	Fluke 8010A
Oscilloscope	Tektronix 465
Signal Generator	HP 8640B
RF Voltmeter	Boonton 92B
AC Voltmeter	HP 400

5.4 OPERATIONAL CHECKOUT PROCEDURE

The Operational Checkout Procedure should be performed to determine that the overall performance of the Receiver is satisfactory. The procedure consists of an initial check followed by a Receiver BITE (Built In Test Equipment) check. If any substandard conditions or malfunctions are found through the checkout procedure, the troubleshooting procedures in paragraph 5.5 should be performed to isolate and correct the problem.

Receiver BITE is designed to provide a thorough operational check of the analog processing modules A5-A13. Modules A1-A4, A14 and A15 are not specifically tested by the BITE. However, almost all aspects of receiver operation, including BITE, are controlled by these 6 modules. A failure of any of these six modules will either prevent the use of BITE or will give a fault code normally associated with modules A5-A13. An intermittent fault may result in a misleading fault code display. If an intermittent fault is suspected, repeat the BITE check several times. A solid fault should yield the same fault code each time. In all cases, an understanding of the receiver functional block diagram operation (Section IV) will assist in interpreting the fault code results of the BITE check.

5.4.1

Initial Check

- a. Energize the receiver by depressing the POWER ON switch to the ON position. The POWER ON switch should illuminate and the LED displays should show some alphanumeric data.
- b. Depress the LOCAL/REMOTE button several times in succession. Observe that the words LOK and REM alternately appear in the display.
- c. Ensure that the receiver is in local mode (LOK is displayed).
- d. Press TUNE, then SUBMODE buttons and observe that FREQ appears in MODE display and FREQUENCY LOK appears in FREQUENCY MHz display.
- e. Press the following numeric key sequence and observe that the numbers pressed appear in the FREQUENCY MHz display: 1, 2, 3, 4, 5, 6, 7, 8.
- f. Press the MODE button and observe that DET appears in the MODE display and that AM, FM, CW, USB or LSB appears in the FREQUENCY MHZ display. Push SUBMODE button repeatedly to cycle through all detector modes. Stop at DET AM.
- g. Press the MODE button repeatedly and observe the MODE display cycle. The actual modes available depend on which DET mode is selected. See Section III, Operation, for more information.

5.4.2

BITE Check

a. Ensure that the Initial Check procedures have been successfully accomplished.

b. To enter the BITE mode, press and hold LOCK, press 1, then release both buttons. BITE takes less than one minute to run. If no fault is detected, BITE runs through to completion then automatically restores normal receiver operation. Until normal operation resumes, BITE will appear in MODE display window.

c. If a fault is encountered during the BITE check, the BITE sequence will stop and a numeric fault code will appear in the FREQUENCY MHZ display. The fault code represents a failure to achieve a specific BITE test result. Refer to paragraph 5.5 to locate and correct the cause of the fault.

d. The BITE Check may be aborted and normal operation restored by pressing LOCK and 2 if the BITE is running, or by pressing LOCK and 3 if BITE has stopped and a fault code is displayed.

e. The BITE routine may be reentered after it has found a fault and has stopped. By pressing LOCK and 4, the BITE routine resumes at the next step and continues until another fault or the end of the routine is encountered.

5.5

TROUBLESHOOTING AND FAULT ISOLATION

This paragraph contains the instructions necessary to isolate receiver malfunctions to a replaceable module. These instructions are intended to be used by skilled technicians thoroughly familiar with receiver operation and circuit descriptions.

5.5.1

Procedure

To troubleshoot a suspected malfunctioning receiver, proceed as follows:

a. Perform the Initial Check, paragraph 5.4.1. If the receiver fails this check, the Power Supply A14, or the digital control modules A1-A4 are at fault. Check or replace these modules

(paragraph 5.7) and reperform the Initial Check. If display is flashing, see comment under fault codes 2, 3, and 4 before checking or replacing A1-A4 or A14.

b. Perform the BITE Check, paragraph 5.4.2. If the Receiver fails this check, as evidenced by the display of a numeric fault code, refer to paragraph 5.5.2 for instructions in using the BITE Summary Table to isolate a defective module. Replace any indicated modules and perform the BITE Check.

c. As a final check, verify all corrective action by performing the Initial Check and BITE Check. The receiver can not be returned to service with confidence if it fails either test.

5.5.2

Fault Code List

The Fault Code List, Table 5-2, is a list of all possible Fault Code numbers with recommended diagnostic and corrective actions. The recommended actions are listed in order of probability of being effective. The following guidelines should be observed while using Table 5-2:

a. Where indicated, module replacement (paragraph 5.7) is the first corrective action to be taken. Run the BITE routine after module replacement to confirm corrective action.

b. Where module replacement is either inappropriate or fails to correct the fault, additional information is provided to assist fault isolation. Proper use of this information will aid in locating the faulty module or other cause of receiver failure.

c. Modules should never be replaced with POWER ON.

d. When BITE stops at a particular fault code, the control state associated with that fault is frozen. This enables convenient troubleshooting of the fault via signal tracing, test point checking, etc. It may be necessary to de-energize the receiver, place the module to be tested on an extender, re-energize the receiver and reperform the BITE.

e. While the Receiver is operating, do not touch any parts of the PC boards of modules A2, A3 or A4. This may disrupt microprocessor operation. If this happens, power-cycle the Receiver to restore proper operation. Check REF INT/EXT and filter data as RAM contents may

have been corrupted or lost. Re-enter data as necessary.

5.5.3 Additional Troubleshooting Aids

Properly used, BITE will locate most Receiver faults. In some cases, additional troubleshooting effort will be required beyond that stated in Table 5-2. The use of the Test Equipment in Table 5-1, Circuit Descriptions in Section IV, Schematic Diagrams in Section VII and conventional signal tracing techniques should resolve any difficulties not corrected by the use of BITE.

5.6 RECEIVER ALIGNMENT

No alignment procedures are specified for the Receiver. Replacement of any defective modules is sufficient to return the Receiver to an operational condition.

Table 5-2. Fault Code List

FAULT CODE 1

- ACTION:
- A. Replace A2. Run BITE.
 - B. Replace A14. Run BITE.
 - C. Replace A1. Run BITE.

DELAY: 0 Sec.

CONDITIONS: TSG OFF (test signal generator)
FL5, INT REF, AGC SHORT, SW

TEST: Read and write test data from all locations of RAM on A2.

COMMENT: Failure most likely due to individual bit errors on RAM IC. This fault code will rarely be seen since most faults on A2 will prevent receiver operation and/or BITE operation.

FAULT CODE 2

- ACTION:
- A. Replace A6. Run BITE.
 - B. With A6 on extender, run BITE, and when fault code 2 is displayed, check for:

Table 5-2. Fault Code List (Cont.)

FAULT CODE 2 (Cont.)

1. ROOL (A6A28) = HI
2. RIE (A6A10) = LO
3. A5 FAULT LED ON
4. A7 FAULT LED ON

If any of the above conditions are not met, there is a fault outside A6.
If 1 or 2 are not met, replace A4 and run BITE.

- C. Power down. Install known good A6. Power up. Do not run BITE.
Check for display flashing "2ND LO FAULT". If so, either

1. A6 is out-of-lock, or
2. Out-of-lock indication is false.

NOTE: check REF INT/EXT status (LOCK 6). INTERNAL REF should be in effect for this test.

If display does not show REF FAULT, run BITE. If BITE again stops at fault code 2, a software problem is indicated.

DELAY: 0 Sec.

CONDITIONS: TSG OFF, FL5, INT REF, AGC SHORT, CW

TEST: Check for ROOL (A6A28) = LO < +1.0 V

NOTE: ROOL = HI implies REF OUT-OF-LOCK

COMMENTS: If REF is out-of-lock, display should flash REF FAULT on power-up. Check that REF is set to internal. (LOCK 6, INT to check and return, SUBMODE to change)

FAULT CODE 3

- ACTION:
- A. Replace A5. Run BITE.
 - B. Replace A6. Run BITE.
 - C. Replace A4. Run BITE.
 - D. Put A5 on extender, run BITE, and when fault code 3 is displayed, check for:
 1. LOOL (A5A22) = HI (indicates out-of-lock).

Table 5-2. Fault Code List (Cont.)

FAULT CODE 3 (Cont.)

2. 20 MHz REF signal at A5A1J1. Remove W8 from J1 and connect W8 to 50 ohm analyzer input. Level should be between about 0 dBm and +3 dBm. Reference signal must be present for A5 to operate.
3. LO output at A5A2J2 and J3. Connect each output jack to 50 ohm analyzer input. Receiver is tuned to 100 kHz at this step, so check for 40.555 MHz at 0 dBm +1, -2 dB.
4. Check for proper power supply voltages at A5P1:

<u>Voltage</u>	<u>Pin Nos.</u>
+15	A13, 14
+ 5	A16, 17
-15	A19, 20
+ 8	A25, 26
+20	A28, 29

- D. Put A5 on extender, power up, do not run BITE. Using a logic analyzer, oscilloscope, or logic probe, monitor the input data and write strobe lines:

<u>Signal</u>	<u>A5P1 Pin No.</u>
LW	A11
XD4	A10
XD3	A9
XD2	A8
XD1	A7
XD0	A6

Enter a frequency via keyboard or front panel (see operating instructions). When the ENT button is pressed, a series of frequency data bytes should flow to A5 via the lines listed above. The same thing should happen continually as the radio is tuned using the front panel tuning knob. Frequency data should also be transmitted on power-up. If this data is not reaching A5, check for it on A4.

DELAY: 0 Sec.

CONDITIONS: TSG OFF, FL5, INT REF AGC SHORT, CW

TEST: Check for LOOL (A5A22) = LO < +1.0 V
NOTE: LOOL = HI implies A5 is out-of-lock

COMMENT: If A5 is out-of-lock, display should flash SYNTH FAULT on power-up. Also, the LED on A5 lights to indicate out-of-lock.

Table 5-2. Fault Code List (Cont.)

FAULT CODE 4

- ACTION:**
- A. Replace A7. Run BITE.
 - B. Replace A6. Run BITE.
 - C. Replace A4. Run BITE.
 - D. Put A7 on extender, run BITE, and when fault code 4 is displayed, check for:
 - 1. DBOL (A7B2) = LO (indicates out-of-lock)
 - 2. 1 MHz TTL reference input at A7J2. Use scope probe at A7J2.
 - 3. Approximately 455 kHz sq. wave, approximately 130 mV p-p at A7J3 BFO OUT.

NOTE: J3 is a test jack and does not normally have a cable connected.

 - 4. BFO OUT-OF-LOCK LED (A7DS1) is on.
- E. Put A7 on extender, power up, do not run BITE. Use a logic analyzer, logic probe, or scope to monitor the input and write strobe lines:

<u>Signal</u>	<u>A7P1 Pin No.</u>
DBW	B11
XD4	B10
XD3	B9
XD2	B8
XD1	B7
XD0	B6

Tune BFO frequency using front panel tuning knob or step change BFO using SUBMODE button. See operating instructions. A series of frequency data bytes should flow at A7 whenever BFO frequency changes. If this data is not reaching A7, check for it at A4.

Table 5-2. Fault Code List (Cont.)

FAULT CODE 4 (Cont.)

DELAY: 0 Sec.

CONDITIONS: TSG OFF, FL5, INT REF AGC SHORT, CW

TEST: Check for DBOL (A7B2) = HI > +1.0V

NOTE: DBOL = LO implies BFO is out-of-lock

COMMENT: If BFO is out-of-lock, display should flash BFO FAULT on power up. Also, the LED on A7 lights to indicate BFO out-of-lock.

FAULT CODE 5

ACTION:

- A. Replace A8. Run BITE.
- B. Replace A6. Run BITE.
- C. Replace A4. Run BITE.
- D. Put A8 on extender, run BITE, and when fault code 5 is displayed, check for the following:
 - 1. ISBF (A8B31) = HI (indicates out-of-lock)
 - 2. Voltage at A8B31 < +1.0V
 - 3. If correct voltage not at A8, check for it at A4A27 (< +1.0V).

DELAY: 0 Sec.

CONDITIONS: TSG OFF, FL5, INT REF AGC SHORT, CW

TEST: Check for ISBF (A8B31) = LO < +1.0V

NOTE: ISBF = HI implies A8 is out-of-lock.

COMMENT: If A8 is out-of-lock, LED on A8 lights to indicate out-of-lock.

Table 5-2. Fault Code List (Cont.)

FAULT CODES 6 AND 7

- ACTION:**
- A. Replace A9. Run BITE.
 - B. Replace A11. Run BITE.
 - C. Replace A4. Run BITE.
 - D. Put A9 and A4 on extenders. Power up. Do not run BITE. Select AGC MANUAL mode. Monitor ARFM (A9B26, 27) and/or ARFM (A4C10) with voltmeter and scope. Vary front panel IF GAIN pot. Voltage at ARFM should change smoothly from about +2.2 volts for pot full CCW to about +11.5 volts for pot full CW, if A4 and A9 are functioning properly. (Some receivers exhibit an adjustment range of +4 volts to +10 volts.) If not, check the DAC line: XDAC (A9B5,6) and (A4A13). Monitor XDAC with scope while varying IF GAIN pot on front panel. XDAC is a multi-purpose time-multiplexed analog control line, software-driven from A4. The voltage on XDAC will vary cyclically. The time slot associated with MANUAL IF GAIN control is indicated by a pulse on ADAC (A9A3,4) and (A4C6). Trigger the scope on ADAC, monitor XDAC, and vary front panel IF GAIN pot. XDAC strobed by ADAC should follow pot setting. Check ADAC and XDAC both with A9 present and with A9 removed.

CONDITIONS: TSG OFF, FL5, INT REF AGC MANUAL, CW

<u>Fault Code</u>	<u>Delay</u>	<u>Condition</u>	<u>Test</u>
6	1 sec	XDAC=4.0V	ARFM<8.5V
7	1 sec	XDAV=9.5V	ARFM>5.0V

COMMENT: The purpose of steps 6 and 7 is to test ability to set gain control voltage in AGC MANUAL mode.

FAULT CODE 8

- ACTION:**
- A. Replace A13. Run BITE.
 - B. Replace A4. Run BITE.
 - C. Put A13 on extender. Run BITE. When fault code number 8 appears, perform the following checks:

Table 5-2. Fault Code List (Cont.)

FAULT CODE 8 (Cont.)

1. The following signals must all be HI:
XMAT (A13A26,27)
XXMT (A13A7,8)
NOTE: If XXMT is LO, unplug AF output cable at rear panel and run BITE.
XBIT (A13A22,23)
2. If one or more of them is LO, remove A13 (don't power down) and check again. All three signals should be HI. If the same one is LO, the fault is not with A13. Re-install A13. Run BITE. When fault code 8 is displayed, check XIND (A13A29,30). It should be LO. IF XIND is HI, the fault is not with A13.
3. Check XMAT (A13A26,27). It should be LO. If not, the fault is not with A13.
4. Check XRFS (A13A4,5). If $XRFS < +1$ volt, fault is not with A13. If $XRFS = +1$ volt, check for XBIT (A13A22,23) = HI. If XBIT is LO, fault is not with A13. Otherwise check for:
XBIT (A13A22,23) = LO
RATT (A13A24,25) = HI
If either RATT or XBIT is not as listed, fault is not with A13.
5. Check $XRFS > +2$ volts. If yes, fault is not with A13. Otherwise check for:
XBIT = LO
RATT = LO
XMAT = LO
If not, fault is not with A13.
6. Check $XRFS < +8$ volts. If yes, fault is not with A13. Otherwise, the fault may be due to one of the following:
 - a. A13 output J2 is not loaded by A12 input J1. Check W3 continuity and connections.
 - b. A12 input J1 is not properly loading A13 output J2 due to lack of first LO signal at A12J2.

Table 5-2. Fault Code List (Cont.)

FAULT CODE 8 (Cont.)

- c. XRFS sensitivity adjustment pots (A13R20, A13R24) set incorrectly. Pots should be adjusted for -10 dBm (A13R20) and -50 dBm (A13R24) when BITE is stopped at fault code 8. To artificially stop BITE at 8, ground XRFS, run BITE, then unground XRFS when BITE stops at 8. A13 must be properly loaded by A12 during this adjustment as described.
- d. Check XRFS < +1 volt. If so, fault is not with A13. Otherwise check for:
 XBIT = HI
 RATT = LO
 XMAT = LO
 If not, fault is not with A13.

CONDITIONS: INT REF, AGC SHORT, CW, FL5

<u>Delay</u>	<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
	<u>XBIT</u>		
	<u>RATT</u>		
	<u>XMAT</u>		
0	1 1 1	XIND=1	RF input mute is off. Check mute indicator off.
0.1	1 1 0	XIND=0	RF muting is on. Check mute indicator is on.
0	1 1 0	XRFS<+1V	A13 test sig.det. disabled TSG off. Check detector off.
0.1	0 1 0	XRFS<+1V	A13 test sig.det. enable. TSG -50 dBm. Check detector off.
0.1	0 0 0	XRFS>+2V	TSG=-10 dBm. Check detector in valid range.
0	0 0 0	XRFS<+8V	TSG=-10 dBm. Check detector in valid range.
1	1 0 0	XRFS<+1V	TSG off. Check detector off.

FAULT CODE 9

- ACTION: A. Replace A11. Run BITE.
- B. Replace A4. Run BITE.

Table 5-2. Fault Code List (Cont.)

FAULT CODE 9 (Cont.)

- C. Put A11 on extender. Run BITE. If BITE stops at fault code 9, check for signal input at A11J1 of 40.455 MHz at -59 dBm ± 4 dBm, and check for 2nd LO input at A11J2 of 40 MHz at 0 dBm +1dB, -2 dB. If not, fault is not with A11.
- Next, clear BITE (LOCK 3) and select AGC manual. Monitor XAGCA with voltmeter. Vary front panel IF GAIN pot. With pot near full CCW, XAGCA should be about +0.6 volts. Near full CW, XAGCA should be about +13 volts, and vary smoothly in between. If not, remove A11 and check again. XAGCA is driven from A9, and controls the gain of A11. To further test A11, put A11 and A4 on extender boards and apply a 100 kHz - 50 dBm signal to RF INPUT jack on rear panel. Select AGC MANUAL, SW, and tune to 100 kHz. Monitor XAGCA (A11A11,12) with voltmeter and adjust front panel IF GAIN pot for XAGCA = +7.6 volts. Connect voltmeter to SOS (A11A3,4) and adjust IF GAIN pot (A11R51) for SOS between +3V and +7V (approximately +5V). Now check ARFM (4C10). ARFM should be between +5.7 and +8.3 volts.

CONDITIONS: TSG = -50 dBm, INT REF, AGC MANUAL (software controlled), CW, FL5.

<u>Delay</u>	<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
0.1 Sec. per increment	Set gain control to +7V initially	3V SOS < 7V	Adjust gain control voltage in increments until 3V < SOS < 7V.
0		ARFM > 5.7	Check gain control in valid range.
0		ARFM < 8.3	Check gain control in valid range.

FAULT CODE 10

- ACTION:
- A. Check that there is a symmetrical filter installed in location FL5 (left-most position) on A10. If not, install one. Verify filter data and correct if necessary, then run BITE.
- B. Replace A9. Run BITE.
- C. Replace A10. Run BITE.
- D. Put A10 on extender. Run BITE. When BITE stops at 10, check signal FL5 (A10A25). If FL5 is not HI replace A4 and run BITE. Otherwise, check integrity of signal path from A11J3 to A10J1 (W11) and A10J3 to A9J1 (W12).

Table 5-2. Fault Code List (Cont.)

FAULT CODE 10 (Cont.)

CONDITIONS: TSG = -50 dBm, INT REF, AGC MANUAL (software controlled), CW, FL5.

<u>Delay</u>	<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
0.1 Sec. per increment	Set gain control to +7V initially	3V < A11S < 7V	Adjust gain control voltage in steps until 3V < A11S < 7V, 31 steps max (A9R5 = +5V).
0		ARFM > 5.7	Check gain control in valid range.
0		ARFM < 8.3	Check gain control in valid range.

FAULT CODE 11

- ACTION:
- A. Replace A9. Run BITE.
 - B. Replace A11. Run BITE.
 - C. Replace A4. Run BITE.
 - D. Put A9 on extender and run BITE. When fault code stops at 9, monitor ARFM (A9B26) > +1V @ -10 dBm input with AGC.

CONDITIONS: INT REF, CW, FL5

<u>Delay</u>	<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
	<u>XBIT</u>		
	<u>RATT</u>		
	<u>AGC</u>		
	<u>THRSHLD</u>		
0.5	0 0 SHORT	ARFM 4V	TSG = -10 dBm. Check ARFM is in valid range.
0	0 0 SHORT	ARFM > 6V	TSG = -10 dBm.
0.1	0 0 MED	ARFM > 4V	TSG = -10 dBm.
0	0 0 MED	ARFM > 4V	TSG = -10 dBm.
0.1	0 0 LONG	ARFM > 4V	TSG = -10 dBm.
0	0 0 LONG	ARFM > 6V	TSG = -10 dBm.
0.5	0 1 SHORT 10.0V VAR	ARFM > 5.7V	TSG = -50 dBm. Check ARFM in valid range.

Table 5-2. Fault Code List (Cont.)

FAULT CODE 11 (Cont.)

<u>Delay</u>	<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
	<u>XBIT</u>		
	<u>RATT</u>		
	<u>AGC</u>		
	<u>THRSHLD</u>		
0	0 1 SHORT 10.0V VAR	ARFM<8.3V	TSG=-50 dBm.
0.5	1 1 SHORT 10.0V VAR	ARFM>8.3V	TSG Off. Check for ARFM near max.

FAULT CODE 12

- ACTION:
- A. Replace A8. Run BITE.
 - B. Replace A4. Run BITE.
 - C. Put A8 on extender, run BITE, and when fault code 12 appears, check for the following:
 - 1. IMET (A8A3) > +2.5V. If yes, fault not at A8.
IMET (A4A10) > +2.5V.
 - 2. Threshold detector A8R59 = -10 dBm. If not, adjust to -10 dBm.

CONDITIONS: INT REF, AGC SHORT, CW FL5

<u>Conditions</u>	<u>Test</u>	<u>Comment</u>
Set threshold detector A8R59 for -10 dBm.	IMET>2.5V	Adjust threshold detector if out of range.

FAULT CODE 99

ACTION: Recall and set pre-BITE settings.

CONDITION: BITE passes all tests.

5.7 RECEIVER ASSEMBLY AND DISASSEMBLY PROCEDURES

The following paragraphs outline the procedures for removal and installation of the individual circuit card assemblies used in the RA6830JD HF Receiver. A complete list of these assemblies is contained in Section VI, Replacement Parts List, of this instruction manual.

5.7.1 Preliminary Procedure

Prior to removing or installing any assembly it is necessary to disconnect the receiver from its power source. It is also necessary to remove the Receiver from the system (except to replace the fuse).

WARNING

Prior to the removal or replacement of any circuit card assembly, ensure the power ON/OFF switch is in the OFF position. Removal or replacement with the power ON presents an electrical shock hazard to the technician and possible damage to the equipment.

NOTE

Ensure that all system cables are disconnected from the Receiver prior to removing the Receiver from its mounts. Place the Receiver on a suitable work space large enough to allow for positioning the Receiver either horizontally or vertically as required for removal of the desired board. The only tool required for LRU removal or installation is a crossed recess (#1 Phillips) screw driver, except A1 and A14 which also require a #0 Phillips and/or a flat-bladed screw driver. Adequate light should be available for ease in reading internal cable, jack, and connector numbers, and for aligning LRU mounting holes with corresponding mounting fixtures on the

Receiver chassis.

5.7.2 Receiver Shield Assembly

Prior to the removal on installation of any of the receiver modules (A1-A14), the receiver shield assembly must be removed. The procedures for removing the shield assembly is as follows:

- a. Position the receiver horizontally.
- b. Disengage the modified adjustable grip latch by turning counter clockwise until unlocked.
- c. Remove the two large screws located on the upper left and upper right corners of the rear panel.

5.7.3 A1 Module Assembly

The following procedure applies to the removal, replacement and handling of the A1 module assembly.

a. Removal

1. Remove for four (4) pan head screws and washer located on the front panel.
2. Disconnect the ribbon cable from A1A1.
3. Disconnect power cable A14A1W1. Use #0 Phillips screw driver.
4. Carefully pull module A1 from the receiver.

b. Replacement

1. Align the repaired or replacement module and slide back into the receiver.

2. Reconnect power cable A14A1W1.
3. Reconnect the ribbon cable from A1A1.
4. Reinstall the four pan head screws and washer on the front panel.

5.7.4 A2 Module Assembly

The following procedure applies to the removal, replacement and handling of the A2 module assembly.

a. Removal

1. Remove the two pan head screws and washer securing the A2 module to the chassis.
2. Carefully pull module A2 from receiver.

b. Replacement

1. Align the repaired or replacement module and slide back into the receiver.
2. Reinstall the four pan head screws and washers removed in Removal procedure.

5.7.5 A3 Module Assembly

The following procedure applies to the removal, replacement and handling of the A3 module assembly.

a. Removal

1. First perform part a. of paragraph 5.7.4 (removal of A2 Module Assembly).

2. Remove the two pan head screws and washers securing the A3 module to the chassis.
3. Disconnect ribbon cable W18 from A3J1.
4. Carefully lift the A3 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A3 slot and slide into the connectors on the parent board. Use enough force to firmly seat the A3 module into the parent board connectors.
2. Reconnect ribbon cable W18 to A3J1.
3. Perform part b. of paragraph 5.7.4 (replacement of A2 Module Assembly).
4. Secure the A3 module to the chassis with the two pan head screws and washers removed in step a.

5.7.6 A4 Module Assembly

The following procedure applies to the removal, replacement and handling of the A4 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A4 module to the chassis.
2. Carefully lift the A4 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A4 slot and slide into the connectors on the parent board. Use enough force to firmly seat the A4 module into the parent board connectors.

2. Secure the A4 module to the chassis with the two pan head screws and washers removed in step a.

5.7.7 A5 Module Assembly

The following procedure applies to the removal, replacement and handling of the A5 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A5 module to the chassis.

2. Disconnect cable (W8) from A5A1J1.

3. Disconnect cable (W5) from A5A2J3.

4. Carefully lift the A5 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A5 slot and slide partway into receiver.

2. Reconnect cable (W5) to A5A2J3.

3. Reconnect cable (W8) to A5A1J1.

4. Carefully slide A5 all the way into A5 slot and into the connectors on the parent board. Use enough force to firmly seat the A5 module into the parent board connectors.

5. Secure the A5 module to the chassis with the two pan head screws and washers removed in step a.

5.7.8 A6 Module Assembly

The following procedure applies to the removal, replacement and handling of the A6 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A6 module to the chassis and slide A6 partway out of chassis.

2. Disconnect cable (W9) from A6J1.

3. Disconnect cable (W6) from A6J2.

4. Disconnect cable (W8) from A6J5.

5. Disconnect cable (W10) from A6J3.

6. Carefully lift the A6 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A6 slot and slide partway into chassis.

2. Reconnect cable (W10) at A6J3.
3. Reconnect cable (W8) at A6J5.
4. Reconnect cable (W6) at A6J2.
5. Reconnect cable (W9) at A6J1.
6. Slide A6 all the way into chassis and into the connectors on the parent board.

Use enough force to firmly seat the A6 module into the parent board connectors.

7. Secure the A6 module to the chassis with the two pan head screws and washers removed in step a.

5.7.9

A7 Module Assembly

The following procedure applies to the removal, replacement and handling of the A7 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A7 module to the chassis.
2. Disconnect cable (W13) A7J1.
3. Disconnect cable (W6) A7J2.
4. Carefully lift the A7 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A7 slot and slide into the

connectors on the parent board. Use enough force to firmly seat the A7 module into the parent board connectors.

2. Reconnect cable (W6) A7J2.

3. Reconnect cable (W13) A7J1.

4. Secure the A7 module to the chassis with the two pan head screws and washers removed in step a.

5.7.10 A8 Module Assembly

The following procedure applies to the removal, replacement and handling of the A8 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A8 module to the chassis.

2. Disconnect cables (W5, W20, W21, W22 and W23).

3. Carefully lift the A8 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A8 slot and slide into the connectors on the parent board. Use only enough force to firmly seat the A8 module into the parent board connectors.

2. Reconnect cables (W5, W20, W21, W22 and W23).

3. Secure the A8 module to the chassis with the two pan head screws and washers

removed in step a.

5.7.11 A9 Module Assembly

The following procedure applies to the removal, replacement and handling of the A9 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A9 module to the chassis.
2. Disconnect cable (W14) A9J3.
3. Disconnect cable (W13) A9J2.
4. Disconnect cable W12 from A9J1.
5. Carefully lift the A9 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A9 slot without inserting module into connectors on parent board.
2. Reconnect cable (W12) to A9J1.
3. Reconnect cable (W13) to A9J2.
4. Reconnect cable (W14) to A9J3.
5. Slide into the connectors on parent board. Use only enough force to firmly seat the A9 module into the parent board connectors.

6. Secure the A9 module to the chassis with the two pan head screws and washers removed in step a.

5.7.12 A10 Module Assembly

The following procedure applies to the removal, replacement and handling of the A10 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A10 module to the chassis.
2. Disconnect cable (W11) A10J1.
3. Disconnect cable (W12) A10J2.
4. Carefully lift the A10 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A10 slot and slide partway into chassis.
2. Reconnect cable (W12) A10J2.
3. Reconnect cable (W11) A10J1.
4. Secure the A10 module to the chassis with the two pan head screws and washers removed in step a.

5.7.13

A11 Module Assembly

The following procedure applies to the removal, replacement and handling of the A11 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A11 module to the chassis.
2. Disconnect cable (W11) from A11J3.
3. Disconnect cable (W10) from A11J2.
4. Disconnect cable (W4) from A11J1.
5. Carefully lift the A11 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A11 slot and slide part way into the connectors on the parent board. Use only enough force to firmly seat the A11 module into the parent board connectors.
2. Reconnect cable (W14) to A11J1.
3. Disconnect (W4) to A12J3.
4. Disconnect (W5) to A12J2 located under the parent board.
5. Secure the A11 module to the chassis with the two pan head screws and washers removed in step a.

5.7.14 A12 Module Assembly

The following procedure applies to the removal, replacement and handling of the A12 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A12 module to the chassis.
2. Disconnect (W3) from A12J1.
3. Disconnect (W4) from A12J3.
4. Disconnect (W5) from A12J2 located under the parent board.
5. Carefully lift the A12 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A11 slot and slide into the connectors on the parent board. Use only enough force to firmly seat the A11 module into the parent board connectors.
2. Reconnect (W5) A12J2 to the under side of the parent board.
3. Reconnect (W4) to A12J3.
4. Reconnect (W3) to A12J1.
5. Secure the A12 module to the chassis with the two pan head screws and washers removed in step a.

5.7.15 A13 Module Assembly

The following procedure applies to the removal, replacement and handling of the A13 module assembly.

a. Removal

1. Remove the two pan head screws and washers securing the A13 module to the chassis.
2. Disconnect (W1) from A13J1.
3. Disconnect (W3) from A13J2.
4. Carefully lift the A13 module from the top of the receiver. Use only enough force to disengage the assembly from the parent board connectors.

b. Replacement

1. Align the repaired or replacement module into the A13 slot and slide into the connectors on the parent board. Use only enough force to firmly seat the A13 module into the parent board connectors.
2. Reconnect (W3) to A13J2.
3. Reconnect (W1) to A13J1.
4. Secure the A13 to the chassis with the two pan head screws and washers removed in step a.

5.7.16 A14 Module Assembly

The following procedure applies to the removal, replacement and handling of the A14

module assembly.

a. Removal

1. Remove the two pan head screws, washers and pin guides securing the A14 module to the chassis rear panel and remove rear panel.
2. Remove the eight pan head screws and washers securing the module to the chassis side panels.
3. Disconnect A14A1W1.
4. Disconnect A1W3P1.
5. Carefully lift the A14 module from the top of the receiver.

b. Replacement

1. Align the repaired or replacement module into its position in the chassis.
2. Reconnect A1W3P1.
3. Reconnect A14A1W1.
4. Secure the module to the chassis side panels with the eight pan head screws and washers removed in step a.2.
5. Secure the rear panel to the module with the two pan head screws, washers and pin guides removed in a step a.1.

SECTION VI

PARTS LIST

6.1 INTRODUCTION

This section contains a list of replaceable parts for the Receiver.

6.2 PARTS LIST DESCRIPTION

The list of replaceable parts consists of illustrations and tables which divide the overall equipment into groups of assemblies, subassemblies and sub-subassemblies. This subdivision facilitates the location, identification and requisitioning of replacement parts for the Receiver.

Each table of the parts list is arranged in a five column format and is headed by the respective equipment/assembly/circuit card assembly nomenclature, followed by the associated part number and/or reference designator. The first column contains a reference to the figure of the associated illustration on which the part is shown and including index numbers. The second column provides the sub-assembly or component part reference designators. The third column provides a listing and description of each end item/assembly and subordinate sub-assemblies and/or parts with indentions to indicate subordinate relationship. The fourth column lists the Receiver manufacturers part number. The quantity (per item) is listed in the fifth column. Special effectivities will be covered through the use of difference data sheets appended to the rear of this document.

6.3 CONFIGURATION NOTICE

It should be noted that assemblies and parts installed at the time the end item (Receiver) was manufactured are listed and identified in this parts list. When an assembly or part (including vendor items), which is different from the original, was installed during the manufacture of a later series or mode, all such parts are listed. However, when the original assembly or part does not have continued application (no spares of the original were procured for replacement), only the preferred assembly or part is listed.

6.4

PART ORDERING

When ordering replacement parts for the Receiver, specify the reference designation and part number and provide a complete component description. Specifying the name and part number of the assembly and/or subassembly on which the part is mounted may also be useful to ensure correct part identification. If a part contained in this parts list is not the same part as installed in an assembly or subassembly, the part called out in the parts list may be used or a duplicate of the actual part in the equipment may be used, either of which will provide satisfactory equipment operation.

6.5

PARTS SUPPLIERS

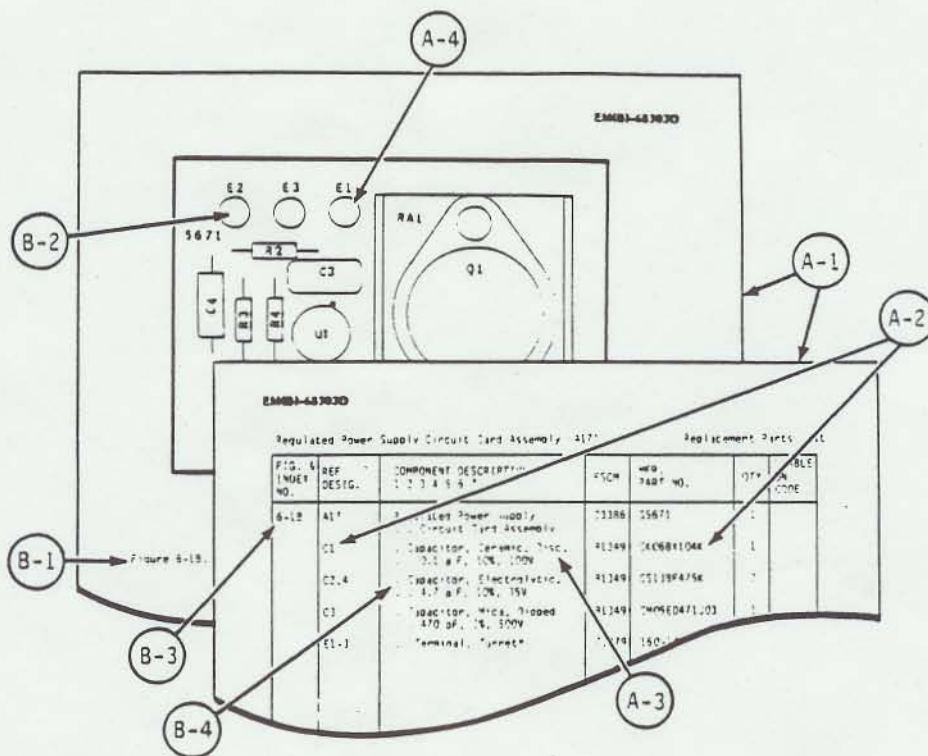
Replacement parts may be obtained from any vendor for convenience, as long as they meet the required military, industrial, or equipment design specifications. However, it is recommended that replacement parts be obtained from the Receiver manufacturer (Racal Communications, Inc.) for best results. To order replacement parts from the manufacturer, address all parts orders to Racal Communications, Inc., 5 Research Place, Rockville, Maryland, 20850.

6.6

PARTS LIST USE

Location of a part in the following list may be accomplished when either the major assembly and part reference designation/part number or part location is known, as demonstrated in the attached instructions entitled "How to Use The Illustrated Parts List".

How To Use The Illustrated Parts List

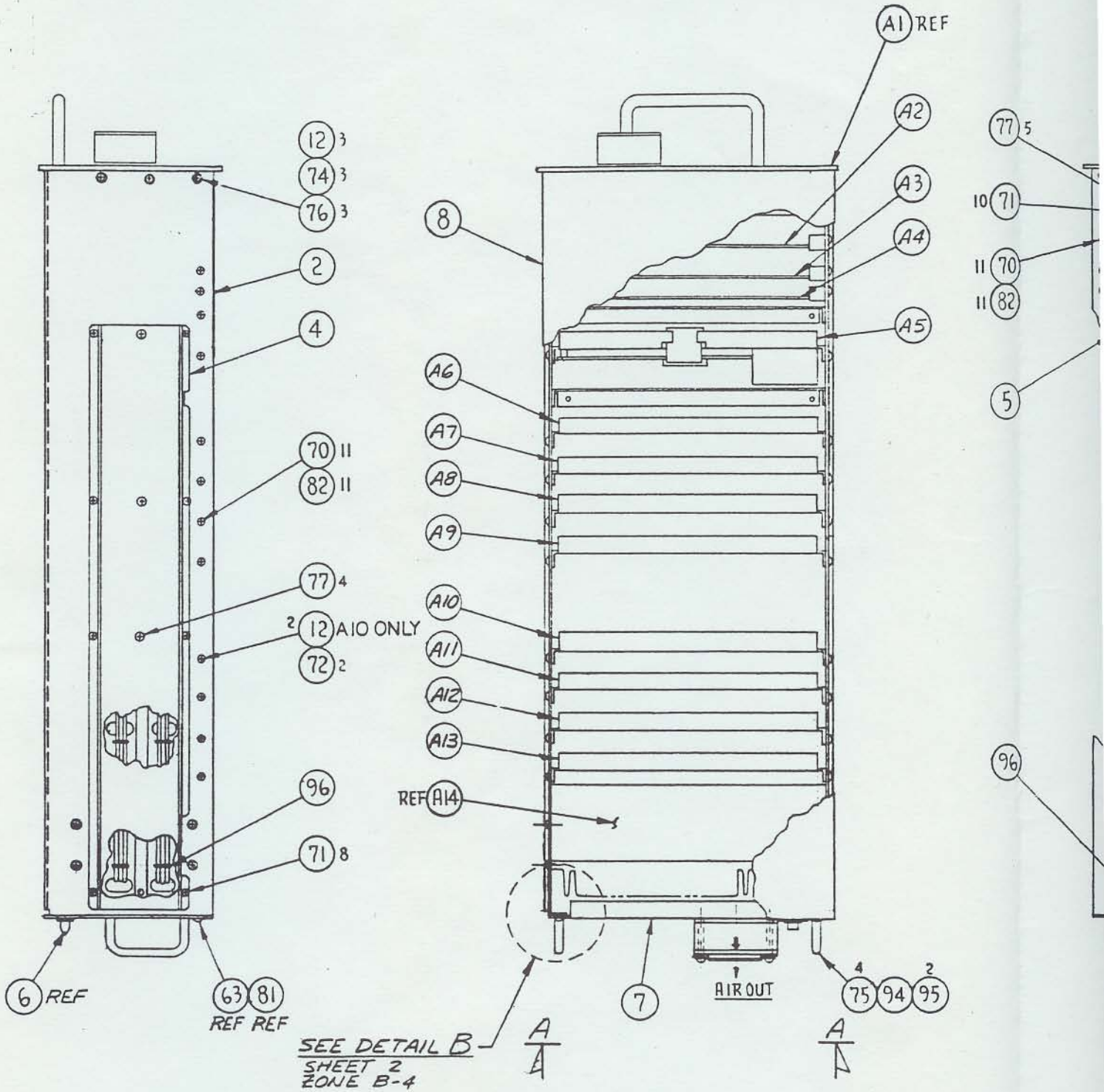


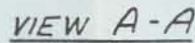
WHEN MAJOR ASSEMBLY AND PART REFERENCE DESIGNATION/PART NUMBER IS KNOWN (SEE LOCATOR A.)

1. In parts list, select appropriately titled table and associated illustration.
2. In table, locate reference designation or part number.
3. Find associated figure/index number (as applicable), component description, and quantity as required.
4. On associated illustration find reference designation of part and locate and identify part.

WHEN PART LOCATION IS KNOWN (SEE LOCATOR B.)

1. In list of illustrations, select appropriately titled figure and associated page number.
2. Turn to figure selected and locate reference designation of part.
3. Turn to parts list and find figure and reference designation of part.
4. Find associated component description, part number and quantity as required.





RA6830-516 HF Receiver
Assembly Diagram
(RA6830-516) (Sheet 1 of 2)

Courtesy of <http://BlackRadios.terryo.org>

CABLE ASSY HOOK-UP LIST			
WIRE DES	FROM	TO	REMARKS
W1	A13J1	J1	
W2			
W3	A13J2	A12J1	
W4	A12J3	A11J1	
W5	A12J2	A5A3J3	
W6			
W7			
W8	A5A1J1	A6J5	
W9	A6J1	J3	
W10	A11J2	A6J3	
W11	A11J3	A10J1	
W12	A10J3	A9J1	
W13	A9J2	A7J1	
W14			
W15			
W16			
W17			
W18			
W19			
W20	A8J8	A7J2	
W21	A9J3	A8J1	
W22	A8J6	J5	
W23	A8J2	J2	
W24	A8J7	A6J2	

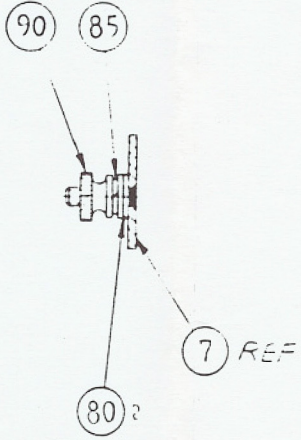
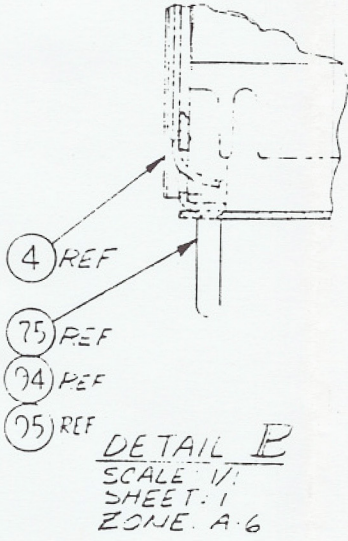
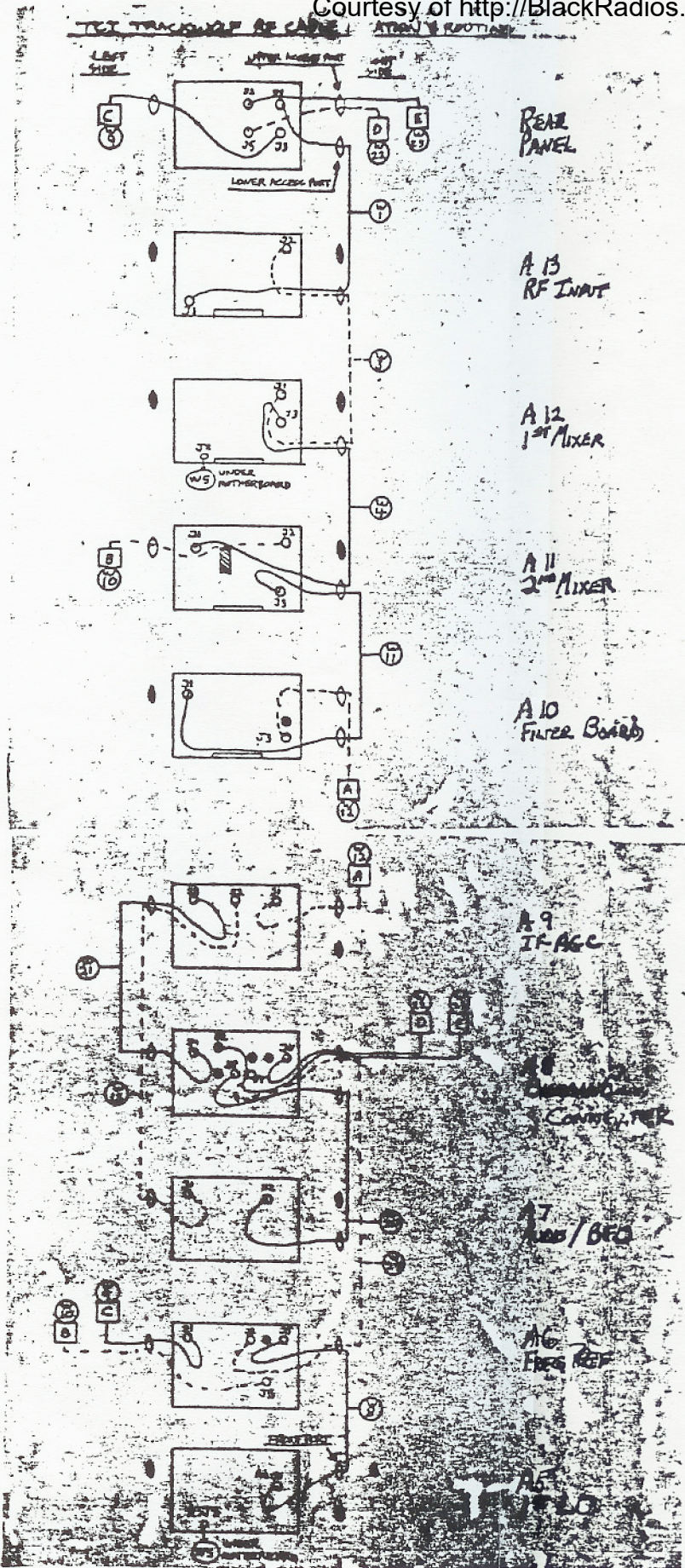


Figure 6-1. RA6830-516 HF Receiver Assembly Diagram (RA6830-516) (Sheet 2 of 2)

**Table 6-1. RA6830-516 HF Receiver Assembly
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
		Main Chassis Assembly	6830-516	
1		Interconnect Diagram, RA6830-516	4200395	Ref
2		Chassis Assembly	4100197-510	1
3		Test Specification, RA6830-516	RA6830-516-TS	Ref
4		Cover Assembly Cable (RH)	3100125-501	1
5		Cover Assembly Cable (LH)	3100469-501	1
6		Pin Guide	2400061-1	2
7		Panel, Rear	4100635-501	1
8		Shield Assembly Receiver	3100472-501	1
9		Grommet, .250 Hole, .13 ID .34 OD .09 Groove	81204	1
10		Finger Guard, Fan	42771	1
11		Screw, PHN X Rec, .138-32 X 1.375 SST	79177	4
12		Washer, Flat .138 SST	75024	12
13		Sleeving, 3/32	59545	A/R
51		Kit Accessory	1100028-502	1
63		Screw, Pnh X Rec .164-32 x .375 SST	77644	2
70		Screw, Pnh X Rec .112-40 x .313 SST	77613	26
71		Screw, Pnh X Rec .112-40 x .250 SST	77612	18
72		Screw, Pnh X Rec .138-32 x .313 SST	77627	2
74		Washer, Spring Crscnt, .144 ID .28 OD	75111	6
75		Screw, Flh X Rec 100 deg .164-32 x .438 SST	77845	4
76		Screw, PNH X Rec .138-32 x .44 SST	77629	6

Table 6-1. RA6830-516 HF Receiver Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
77		Screw, Flh X Rec 100 deg .112-40 x .375 SST	77814	9
80		Washer, Flat .190 SST	75027	2
81		Washer, Flat .164 SST	75026	2
82		Washer, Flat .112 SST	75022	26
85		Washer, Lock-Spring .190 SST	75005	1
90		Nut, Plain Knurled .190-32 BRS NP	75448	1
94		Adhesive Sealant THD Lock	91122	A/R
95		Handle, Bow, RD 2.00 Centers, SST	817559	2
96		Lacing Tape, Black Nylon .090 WD 500 Yds.	59600	A/R
97		Grommet	2400331-1	3
98		Plate, Nomenclature (RA6830JD)	2400328-1	1
99		Firmware, RA6830-516 RE6819.Z	1600205-1	1
100		Test and Alignment Procedure (RA6830-516/518)	1900014	Ref
101		Adhesive, Cyanoacrylate Anaerobic	91005	A/R
102		Screw, Thrd Cutting Phd X Rec .086-32 x .188	79142	2
	A1	Front Panel Assembly (RA6830)	4100122-510	1
	A2	CCA Microprocessor	4100116-501	1
	A3	CCA IEEE-488 Remote Control	4100521-501	1
	A4	CCA Receiver Interface	4100138-501	1
	A5	Module Assembly, Synthesizer	4100516-501	1
	A6	CCA Frequency Reference	4100054-501	1
	A7	CCA Demod/BFO	4100061-501	1
	A8	CCA Baseband Converter	4100515-503	1
	A9	CCA IF/AGC	4100058-501	1
	A10	Module Assembly, IF Filter	3100116-504	1
	A11	CCA Second Mixer	4100052-501	1

Table 6-1. RA6830-516 HF Receiver Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION							RACAL PART NO.	QTY.
		1	2	3	4	5	6	7		
	A12	CCA First Mixer							4100247-501	1
	A13	Module Assembly, RF Input							4100189-501	1
	A14	Module Assembly, Linear								
		Power Supply (Mil Conn)							4100617-504	1
	A15	CCA Parent Board							4100618-501	1
	B1	Fan, DC Brushless, 24VDC							42770	1
	W1	Cable Assembly, Coax							3500058-510	1
	W3	Cable Assembly, Coax							3500059-501	1
	W4	Cable Assembly, Coax (W4)							3500059-502	1
	W5	Cable Assembly, Coax							3500263-501	1
	W8	Cable Assembly, Coax							3500059-505	1
	W9	Cable Assembly, Coax							3500227-501	1
	W10	Cable Assembly, Coax							3500059-506	1
	W11	Cable Assembly, Coax (W11)							3500059-507	1
	W12	Cable Assembly, Coax							3500059-508	1
	W13	Cable Assembly, Coax							3500228-502	1
	W20	Cable Assembly, Coax (W20)							3500059-552	1
	W21	Cable Assembly, Coax							3500228-503	1
	W22	Cable Assembly, Coax							3500058-565	1
	W23	Cable Assembly, Coax							3500058-566	1
	W24	Cable Assembly, Coax (W24)							3500059-551	1

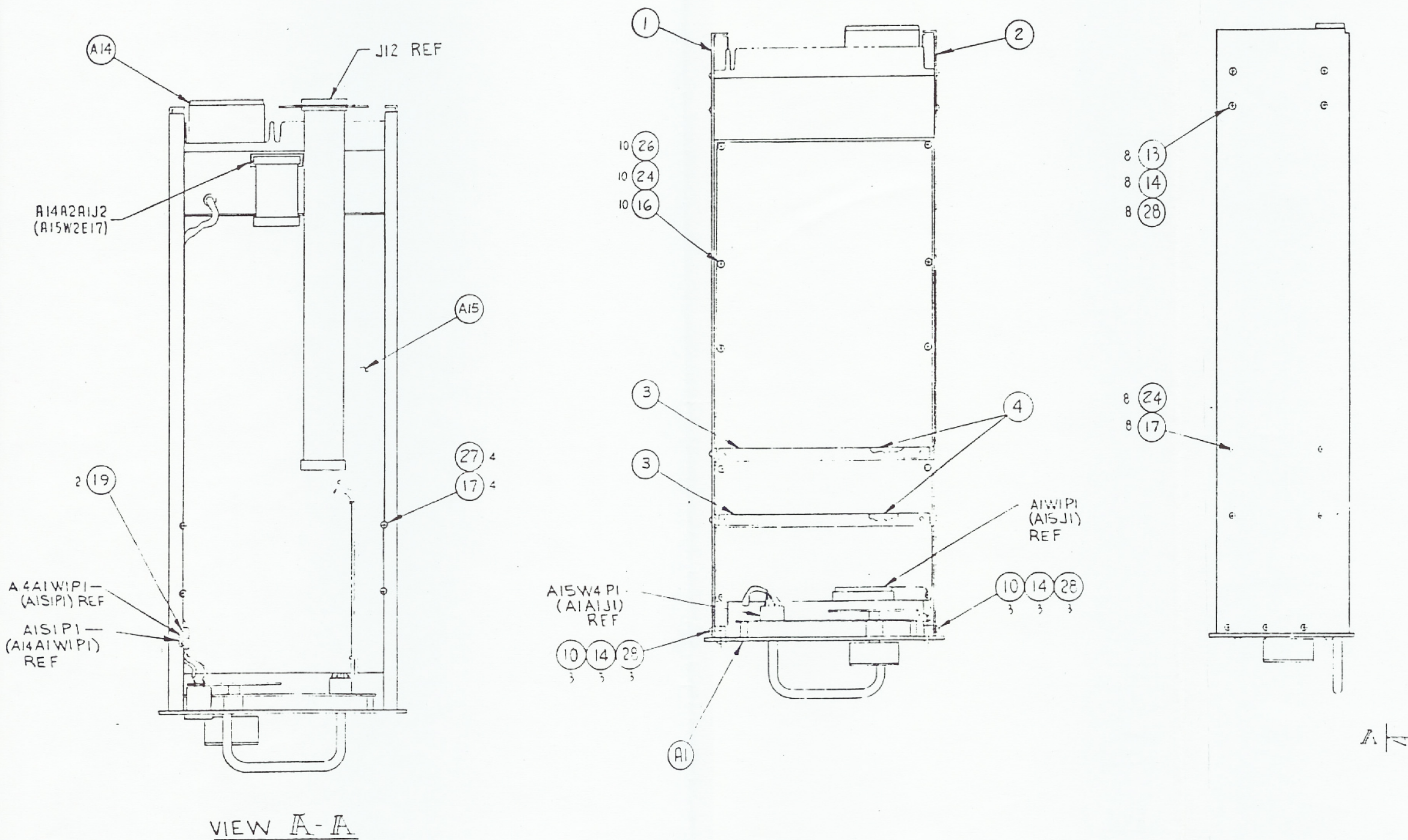
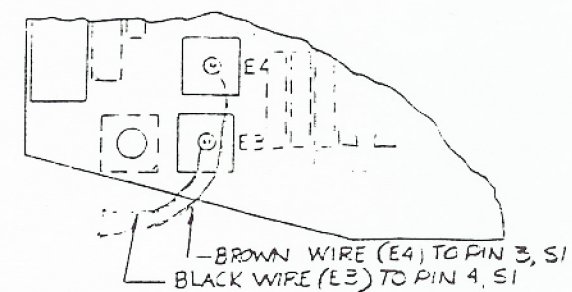
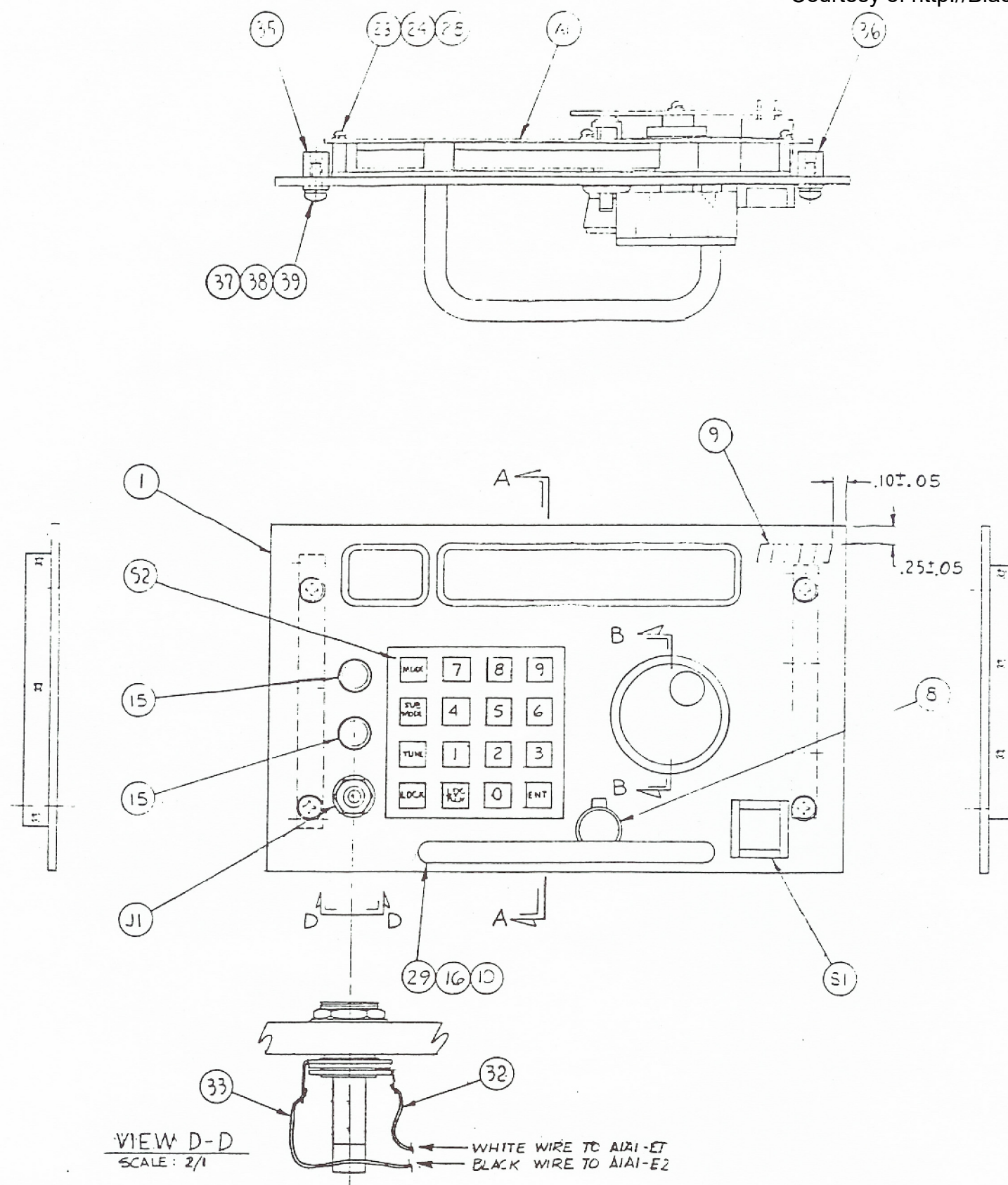
Courtesy of <http://BlackRadios.terry.org>

Figure 6-2.

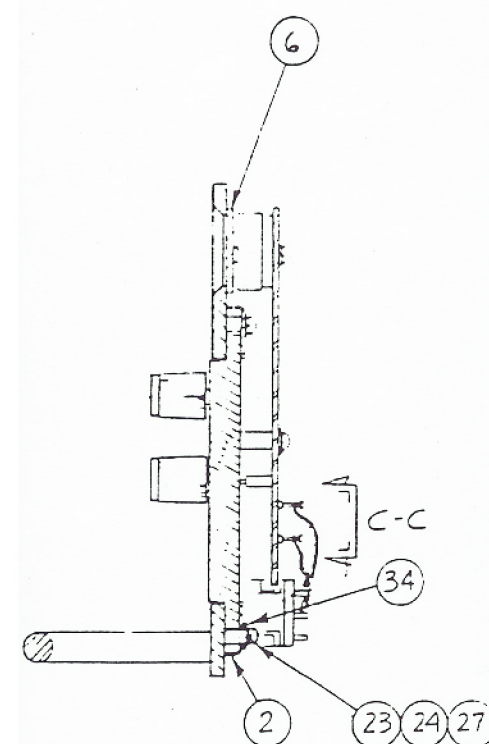
6830-516 Chassis Assembly
Diagram (4100197)

Table 6-2. 6830-516 Chassis Assembly
Replacement Parts List

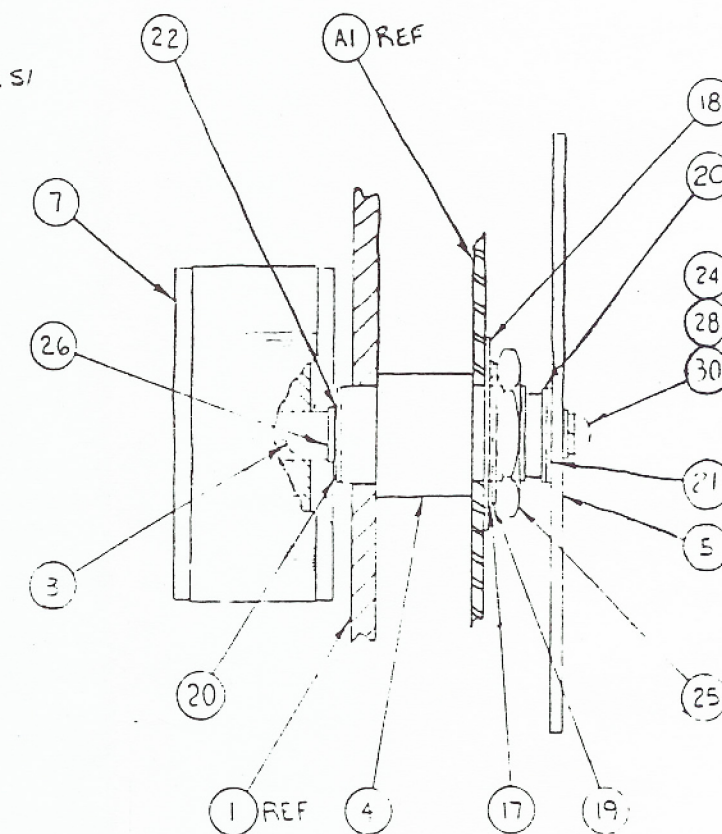
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-2		Chassis Assembly	4100197-510	
1		Panel Assembly Side, LH	5100020-501	1
2		Panel Assembly Side, RH	5100020-502	1
3		Shield Assembly Divider	3100119-501	2
4		Insulator Shield	2400088-1	2
10		Screw, Pnh X Rec .138-32 x .44 SST	77629	6
13		Screw, Pnh X Rec .138-32 x .313 SST	77627	8
14		Washer, Flat, .138 SST	77024	14
16		Screw, Pnh X Rec .112-40 x .438 SST	77615	10
17		Screw, Pnh X Rec .112-40 x .313 SST	77613	12
19		Screw, Flh 82 X Rec .086-56 x .44 SST	77912	2
24		Washer, Flat .112 SST	75022	18
26		Washer, Lock-Spring .112 SST	75002	10
27		Washer, Flat .112 SST	750203	4
28		Washer, Spr Crscnt .144 ID, .28 OD	75111	14
	A1	Front Panel Assembly (RA6830)	4100122-510	1
	A14	Module Assembly, Linear Power Supply (Mil Conn)	4100617-504	1
	A15	CCA Parent Board	4100618-501	1



VIEW C-C
SCALE: 2/1



SECTION A-A



SECTION B-B
SCALE: 2/1

Figure 6-3. Front Panel (A1) Assembly
Digargam (4100122)

**Table 6-3. Front Panel (A1) Assembly
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-3		Front Panel A1	4100122-510	
1		Panel Assembly, Front	4100188-510	1
2		Bracket, Keypad Support	2400062-1	2
3		Shaft Encoder	3400020-1	1
4		Bushing, Encoder Shaft	3400019-1	1
5		Disc Encoder	8194	1
6		Window Display	2400109-1	1
7		Knob, Modified	2400016-1	1
8		Latch, Modified	2400108-1	1
9		Logo	5000-3	1
10		Adhesive, Sealant Thd Lock	91122	A/R
15		Knob Control, RD Shrted .5Dia	81056	2
16		Handle, 5/16 Dia X 4.0 O.C. Mtg X 2.0 High	817531	1
17		Washer, Shim .504 ID SST	75131	1
18		Washer, Flat .503 ID Nylon	75132	1
19		Washer, Spring Wave .505 ID BeCu	75129	1
20		Washer, Flat .252 ID 500 OD .024 Thick SST	75106	1
21		Washer, Cylindrically Curved Spring, 1/4" Steel	75133	1
22		Shim, .257 ID 375 OD .005 Thick PH Brz	75100	A/R
23		Washer, Flat .112 SST	75022	10
24		Washer, Lock-Spring .112 SST	75002	11
25		Nut, Plain Hex .500-20 BRS NP	75461	1
26		Ring, Retaining 1/4" ID	75116	1
27		Screw, Pnh X Rec .112-40 x .118 SST	77611	4
28		Screw, Pnh X Rec .112-40 x .313 SST	77613	7

Table 6-3. Front Panel (A1) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
29		Screw, Flh X Rec 100 deg .190-32 x .50 SST	778650	2
30		Washer, Flat .112 SST	75023	1
32		Wire, Hookup, 22AWG White, 7 Strd PVC	55013	A/R
33		Wire, Hookup, 22AWG Black, 7 Strd PVC	55001	A/R
34		Washer, Flat .138 SST	75024	4
35		Bar, Mounting (LH)	3400226-1	1
36		Bar, Mounting (RH)	3400226-2	1
37		Screw, PHN X Rec .164-32 X .164-32 x .44 SST Blk Oxide	79173	4
38		Washer, Flat .164 SST Blk Oxide	75157	4
39		Washer, Lock-Spring, .164 SST Blk Oxide	75011	4
	A1	PCA Front Panel	4100128-501	1
	J1	Jack, 2 Conductor Open CKT MIL JJ034 SW-C C-11	61502	1
	S1	Switch Assembly	2500014-501	1
	S2	Keypad	3600045-1	1

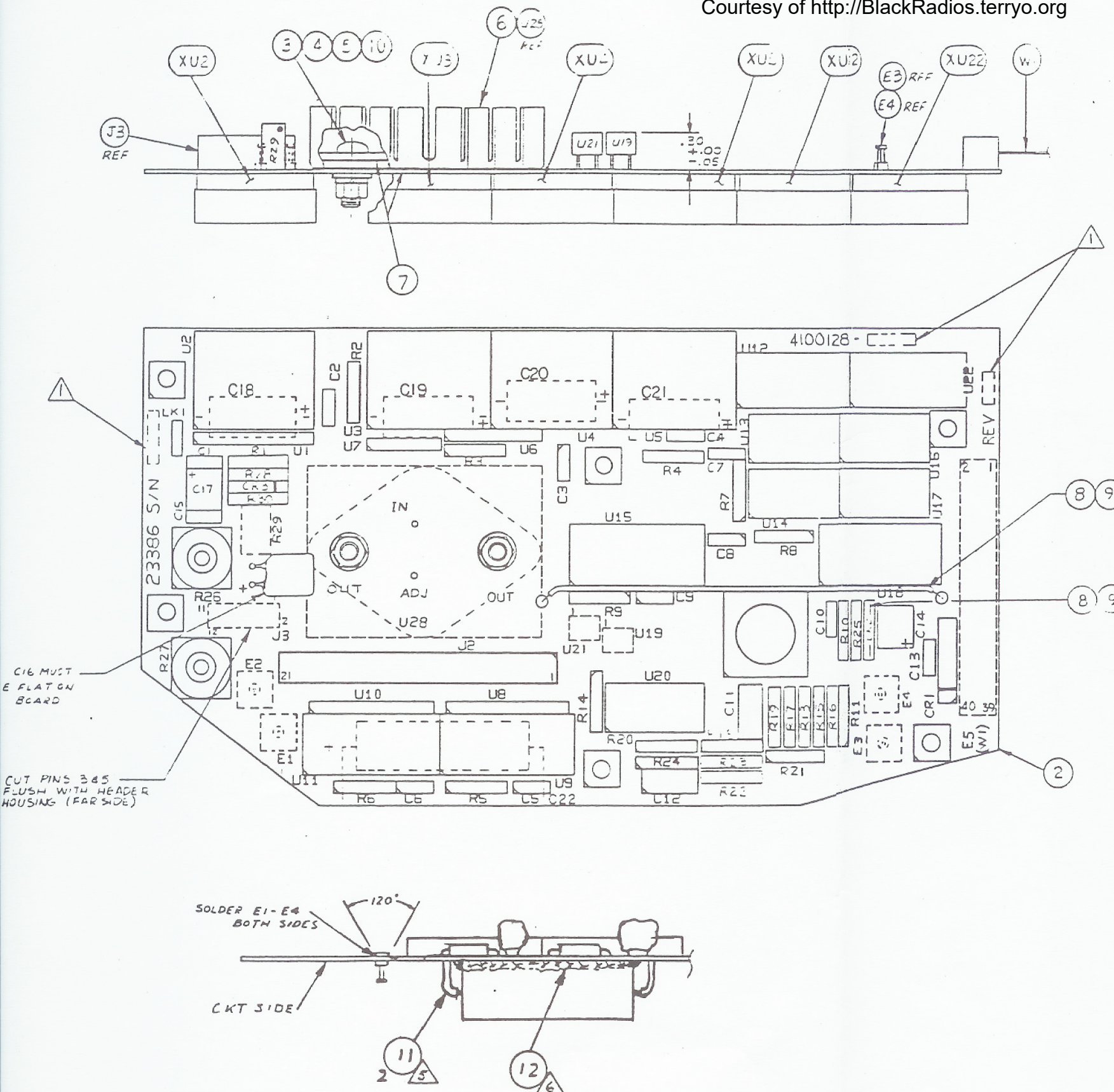


Figure 6-4. Front Panel (A1A1) Assembly Diagram (4100128)

**Table 6-4. Front Panel (A1A1) Assembly
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-4	A1A1	CCA Front Panel	4100128-501	
1		Schematic, Front Panel	4200073	Ref
2		PCB, Front Panel	4300054-1	1
3		Screw, PNH X Rec .138-32 X .500 SST	77630	2
4		Nut, Plain HEX .138-32 SST	75205	2
5		Washer, Flat .138 SST	75025	2
6		Heat Sink, TO-3	70819	1
7		Insulator, TO-3	70813	2
8		Wire, Bus, 22 AWG, Tinned Copper	58006	A/R
9		Insulation, Sleeving TFE, 22 AAWG, Natural	59537	A/R
10		Washer, Lock-Spring, .138 SST	75003	2
11		Tubing, TFE 20 AWG	59536	A/R
12		Adhesive, RTV Clear	91087	A/R
	C1-C10,	Capacitor, FXD CER Z5U		
	C13, C15	.1 μ F, 20%, 50V	21795-104	12
	C11, C12	Capacitor, FXD Mica 100 pF, 2%, 500V	22372-101	2
	C14	Capacitor, FXD Tant 15 μ F, 20%, 20V	25062-156	1
	C16	Capacitor, FXD Tant 47 μ F, 20%, 20V	25062-476	1
	C17	Capacitor, FXD Tant 4.7 μ F, 20%, 10V	25064-475	1
	C18-C21	Capacitor, FXD ELCTLT 220 μ F, -10/+50%, 16V	24067	4
	C22	Capacitor, FXD ELCTLT 470 μ F, -10/+50%, 25V	24058	1
	CR1	Diode, 1N6373 Suppressor, 5V Vr	36022-5	1
	CR3	Diode, 1N4002 Rectifier, 100 PIV	35529	1

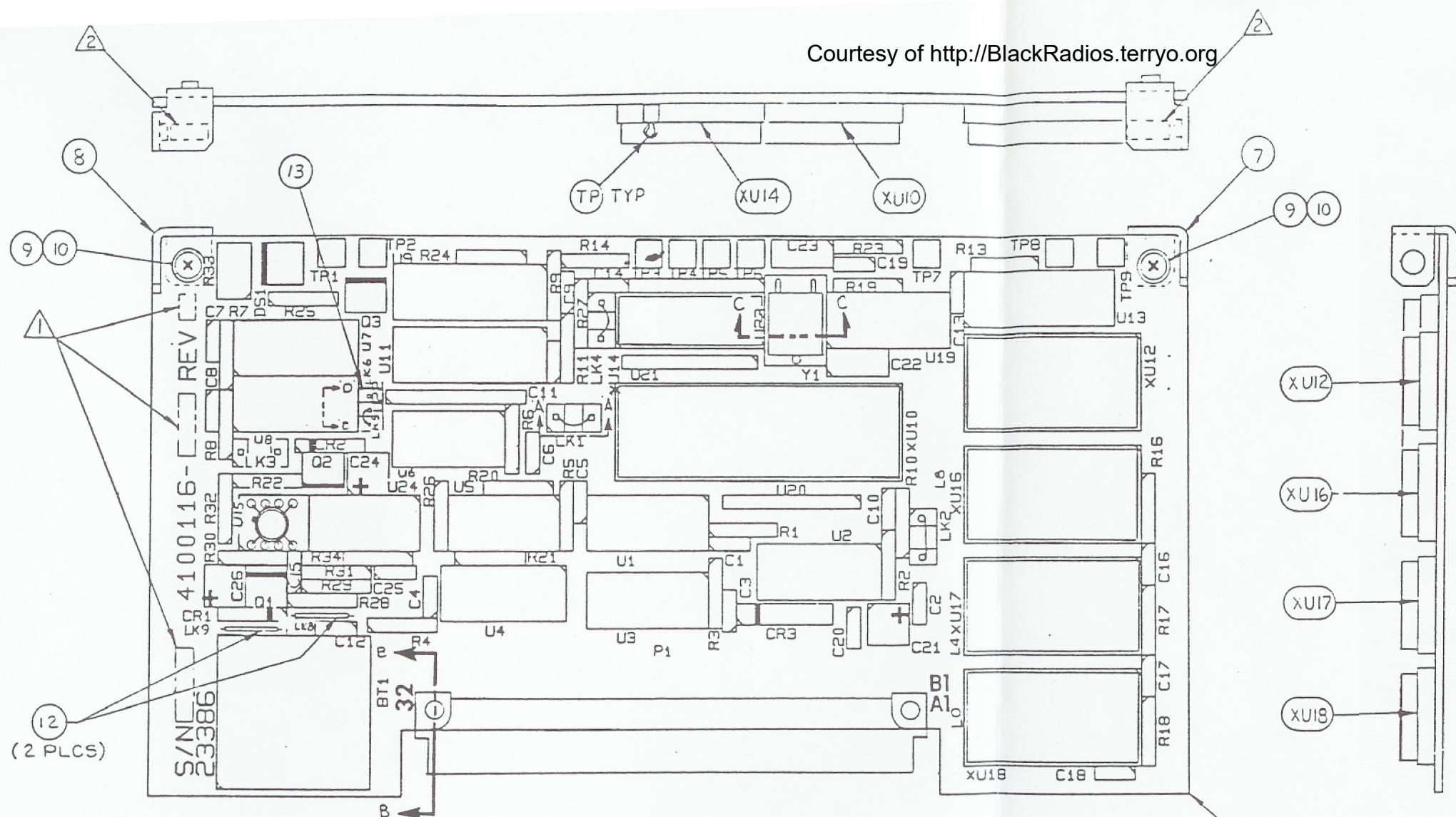
**Table 6-4. Front Panel (A1A1) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	E1-E4	Terminal Stud, SWG 2 Turret .064 Mtg .062 BD	70145	4
	J2	Connector, PCB Mount, Female 21 Count	61460	1
	J3	Connector, HDR S-Row, 12 Cont	61371-12	1
	R1-R10,	Resistor, FXD Film		
	R14	10 Ohm, 2%, 1/4W	12161-100	11
	R11, R19	Resistor, FXD Film 180 Ohm, 2%, 1/4W	12161-181	2
	R13, R24	Resistor, FXD Film 1.0M Ohm, 2%, 1/4W	12161-105	2
	R15, R22	Resistor, FXD Film 100K Ohm, 2%, 1/4W	12161-104	2
	R16, R21	Resistor, FXD Film 4.7K Ohm, 2%, 1/4W	12161-472	2
	R17, R18,	Resistor, FXD Film		
	R23	10K Ohm, 2%, 1/4W	12161-103	3
	R20	Resistor, FXD Film 2.2K Ohm, 2%, 1/4W	12161-222	1
	R25	Resistor, FXD Film 470 Ohm, 2%, 1/4W	12161-471	1
	R26	Resistor, Var 10K, 20%, .5W LIN (SCD)	3600042-1	1
	R27	Resistor, Var 20K, 20%, .25W LIN (SCD)	3600043-1	1
	R28	Resistor, FXD Film 1.0K Ohm, 2%, 1/4W	12161-102	1
	R29	Resistor, Var PCB M-Turn 500 ohm, 10%, 1/2W	16104-501	1
	R30	Resistor, FXD Film 3.3K Ohm, 2%, 1/4W	12161-332	1

Courtesy of <http://BlackRadios.terryo.org>

**Table 6-4. Front Panel (A1A1) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U1, U8, U10	Resistor Network, 10 SIP 100K ohm X 9 bussed	19323-104	3
	U2-U5	Display, DL2416 Red LED, 4-Deg, 16-Seg	365021	4
	U6	Resistor Network, 8 SIP 100K ohm X 7 bussed	19321-104	1
	U7	Resistor Network, 6 SIP 100K ohm X 5 bussed	19324-104	1
	U9, U11	Microcircuit, Dgtl, 74HC244 Octal 3-ST Driver	365022-244	2
	U12, U22	LED, OBG-1000 Light Bar	41051	2
	U13, U16	Resistor Network, 14 DIP 270 ohm X 7 isolated	19320-271	2
	U14, U17	IC, 5407 HEX Buffer/Driver	365023	2
	U15, U18	Microcircuit, Dgtl, 75HC374 Octal D-Type F-F	365022-374	2
	U19, U21	Reflective Object Sensor OPB706A	36754	2
	U20	Microcircuit, Lin, LM339 Quad Voltage Comptr	36693	1
	U28	Microcircuit, Lin, LM317K Steel Vr Pos 1.2-37V	365062	1
	W1	Cable Assembly (A1W1)	3500046-501	1
	XU2-XU5	Socket, DIP	70643	4
	XU12, XU22	Socket, DIP	70644	2



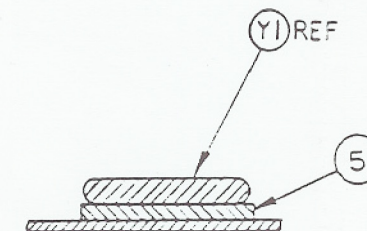
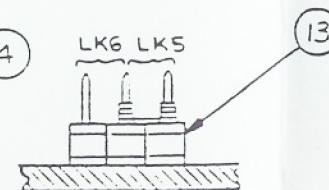
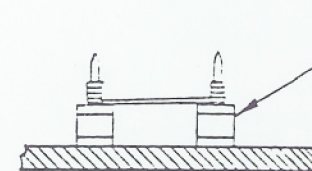
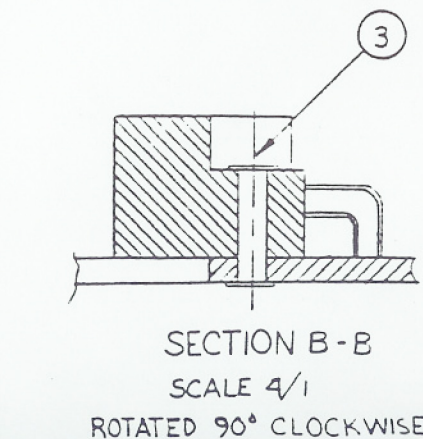
NOTES:

1 MARK APPLICABLE DASH NO., REV LETTER, AND SERIAL NO APPROX. WHERE SHOWN .095 MIN HIGH PERMANENT BLACK CHARACTERS PER MIL-STD-130.

2 MARK BRACKETS WITH APPLICABLE REFERENCE DESIGNATIONS .12 HIGH BLACK PERMANENT CHARACTERS IN ACCORDANCE WITH MIL-STD-130. SEE TABULATION

DASH NO	MARKING
501	A2-1

3. INSTALL LINKS PER PARTS LIST.



Courtesy of <http://BlackRadios.terryo.org>

Table 6-5. Microprocessor Assembly (A2)
Replacement Part List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-5		CCA Microprocessor	4100116-501	1
1		. Schematic CPU	4200070	Ref
2		. PWB Microprocessor	4300050-1	1
3		. Eyelet .089 Dia x .37 Lg Gilding NP	75921	2
4		. Connector, HDR Post S-Row 1 Cont	61385-01	8
5		. Tape, White Double Faced Adhesive	91125	A/R
7		. Bracket, Card Locking	2100015-501	1
8		. Bracket, Card Locking	2100015-502	1
9		. Screw, PNH x Rec .112-40 x .250 SS	77612	2
10		. Washer, Flat .112 SS	75022	2
12		. Insulation, Sleeving TFE 24 AWG, Natural	59538	A/R
13		. Connector, HDR Post S-Row 3 Cont	61385-03	1
14		. Test, Spec Microprocessor	TS497	Ref
	BT1	. Battery, Lithium Iodine Cell PCB Mtg	42520	1
	C1-C20	. Capacitor, FXD, Cer Z5U, .1 μ f, 20%, 50V	21795-104	21
	C25			
	C21,C24	. Capacitor, FXD, Tant, 15 μ F, 20%, 20V	25062-156	2
	C22	. Capacitor, FXD, Mica, 22 pF, 5%, 500V	22371-220	1
	C23	. Capacitor, FXD, Mica, 56 pF, 2%, 500V	22372-560	1
	C26	. Capacitor, FXD, Tant, 100 μ F, 20%, 10V	25064-107	1
	CR1,CR2	. Diode, 1N916 Rectifier	35514	2

**Table 6-5. Microprocessor Assembly (A2)
Replacement Part List (Cont.)**

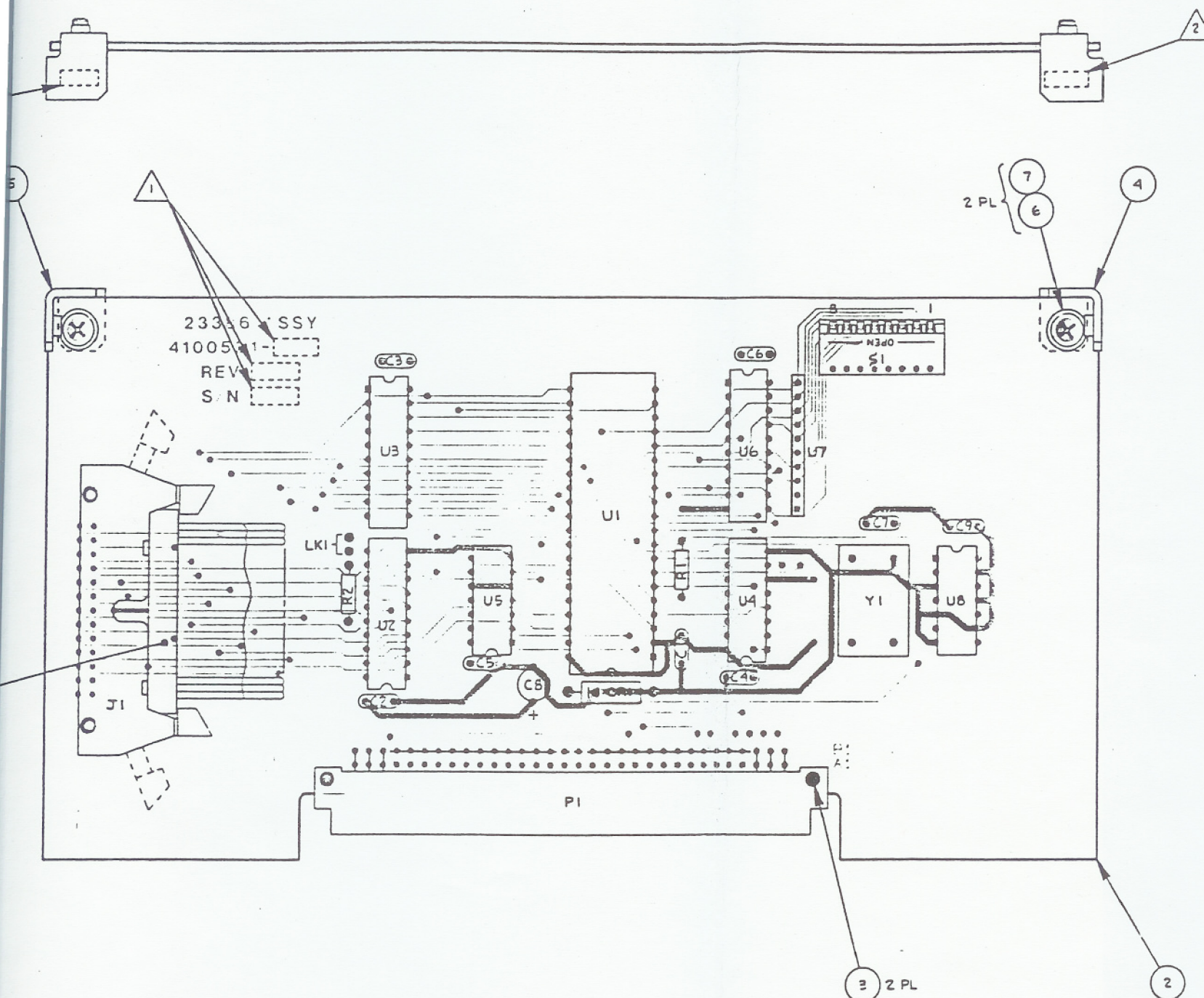
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	CR3	. Diode, 1N6373, Suppressor, 5V Vr	36022-5	1
	DS1	. Led, SLB-22UR	41052	1
	LK1,LK2, LK4,LK6	. Wire, WW 30 AWG, Kynar WHT	59071	A/R
	LK8,LK9	. Wire, Bus, 24 AWG, Tinned Copper	58007	A/R
	P1	. Connector, DIN, PCB, Male, Rtang, Row A+B	61437-64	1
	Q1	. Transistor, 2N3906 PNP, Low Power	32037	1
	Q2,Q3	. Transistor, 2N3904 NPN, Low Power	32036	2
	R1-R11, R13,R14, R16-R19, R34	. Resistor, FXD, Film, 10 ohm, 2%, 1/4W	12161-100	18
	R20-R22 R24,R26, R27	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	6
	R23	. Resistor, FXD, Film, 1.0M ohm, 2%, 1/4W	12161-105	1
	R25	. Resistor, FXD, Film, 220 ohm, 2%, 1/4W	12161-221	1
	R28	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	12161-102	1
	R29	. Resistor, FXD, Film, 470 ohm, 2%, 1/4W	12161-471	1
	R30	. Resistor, FXD, Film, 2.2 Meg, 5%, 1/4W	10768-225	1
	R31	. Resistor, FXD, Film, 61.9K ohm, 1%, 1/10W	12166-6192	1

Table 6-5. Microprocessor Assembly (A2)
Replacement Part List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R32	. Resistor, FXD, Film, 15.8K ohm, 1%, 1/10W	12166-1582	1
	R33	. Resistor, Var, PCB, M-Turn, 5K ohm, 10%, 1/2W	16110-502	1
	TP1-TP9	. Terminal, Test Point Assy	70114	9
	U1-U4	. Microcircuit, DGTL, 74HC138, 1-of-8 Decoder	365022-138	4
	U5	. IC, 74HC00, Quad, 2-INP, Nand Gate	365022-00	1
	U6	. Microcircuit, DGTL, 74HC4002, Dual 4-I Nor Gate	365022-4002	1
	U7,U8	. Microcircuit, DGTL, 74HC4040, Binary Counter	365022-4040	2
	U9,U13	. Microcircuit, DGTL, 74HC374, Octal, D-Type F-F	365022-374	2
	U10,U12	. Microcircuit, Miprcs, NSC800, CPU	365034	2
	U11	. Microcircuit, DGTL, 74HC244, Octal, 3-ST Driver	365022-244	1
	U14	. Microcircuit, DGTL, 74HCT245, Octal, Bus XCVR	365078-245	1
	U15	. Microcircuit, Lin, ICL8212, LO Voltage, Indicator	365025	1
	U19	. Microcircuit, DGTL, 74HC139, 1-of-4 Decoder	365022-139	1
	U20	. Resistor, Network, 10 SIP, 10K ohm x 9 Bussed	19323-103	1
	U21,U22	. Resistor, Network, 10 SIP, 100K ohm x 9 Bussed	19323-104	2
	U23	. Resistor, Network, 10 SIP, 1K ohm x 9 Bussed	19323-102	1

**Table 6-5. Microprocessor Assembly (A2)
Replacement Part List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U24	. IC, 74HC02, Quad, 2-INP, NOR Gate	365022-02	1
	XU10	. Socket, IC, 40 Cont, DIP PCB	70636-40	1
	XU12, XU16-18	. Socket, IC, 24 Cont, DIP PCB	70636-24	4
	XU14	. Socket, IC, 20 Cont, DIP PCB	70636-20	1
	Y1	. XTAL, 4 MHz	37059	1

Courtesy of <http://BlackRadios.terryo.org>

NOTES:

- 1 MARK APPLICABLE DASH NO., REVISION LETTER AND SERIAL NO. APPROXIMATELY WHERE SHOWN, .09 HIGH PERMANENT LEGIBLE CHARACTERS PER MIL-STD-130.
- 2 MARK BRACKETS WITH APPLICABLE REFERENCE DESIGNATION IN .12 HIGH PERMANENT LEGIBLE CHARACTERS WHERE SHOWN PER MIL-STD-130. SEE TABLE 1.
3. THIS ASSEMBLY (4100521-501) IS BACKWARD COMPATIBLE WITH ASSEMBLY 4100156-501.

-501	A3
DASH NUMBER	REFERENCE DESIGNATION

TABLE 1

Figure 6-6.

IEEE-488 Remote Interface
(A3) Assembly Diagram
(4100521)

Table 6-6. IEEE-488 Remote Interface Assembly (A3)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-6		PCA IEEE-488 Remote Interface	410052-501	
1		. Schematic	4200091	Ref
2		. PCB	4300251-1	1
3		. Eyelet, .089 Dia x .38 LG BR NKL PL	75921	2
4		. Bracket, Card LKG	2100015-501	1
5		. Bracket, Card LKG	2100015-502	1
6		. SCR, PNH x Rec .112-40 x .25 SS	77612	2
7		. Washer, Flat .112 SS	75022	2
8		. Wire, Bus No .24 AWG (Ref LK1)	58007	A/R
9		. Sleeving, PTFE .022 ID (Ref LK1)	59538	A/R
	C1-C7, C9	. Capacitor, FXD, Cer Z57, 1 uF, 20%, 50V	21795-104	8
	C8	. Capacitor, FXD, Tant, 15 uF, 20%, 20V	25062-156	1
	CR1	. Voltage, Suppressor, 1N6373	36022-5	1
	J1	. Connector, PCB, HDR RTANG, 26 Cont	61456-26	1
	LK1	. Ref Items No. 8 & No. 9		Ref
	P1	. Connector, PCB, Male, 64 Cont	61437-64	1
	R1	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	1
	R2	. Resistor, FXD, Film, 1K ohm, 2%, 1/4W	12161-102	1
	S1	. Switch, DIP 8 Pos	52470	1
	U1	. IC, 9914A, GPIB Controller	36881	1
	U2	. IC, 75160, OCTL Interface Bus Transceiver	36882	1
	U3	. IC, 75161, OCTL Interface Bus Transceiver	36883	1

**Table 6-6. IEEE-488 Remote Interface Assembly (A3)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U4	. IC, 74HC138 1-of-8 Decoder	365022-138	1
	U5	. IC, 74HC00, Quad 2-Input Nand Gate	365022-00	1
	U6	. IC, 74HC244, OCTL 3-State Driver	365022-244	1
	U7	. Resistor, Network, 10 SIP, 9 x 10K, 2%	19323-103	1
	U8	. IC, 74HC04, Hex Inverter	365022-04	1
	W18	. Cable, Assy, IEEE-488	3500115-501	1
	Y1	. OSC, Clock 4 MHz	37046	1

**Table 6-6. 125 kB Remote Control Interface Circuit Card Assembly (A3-2)
Replacement Parts List**

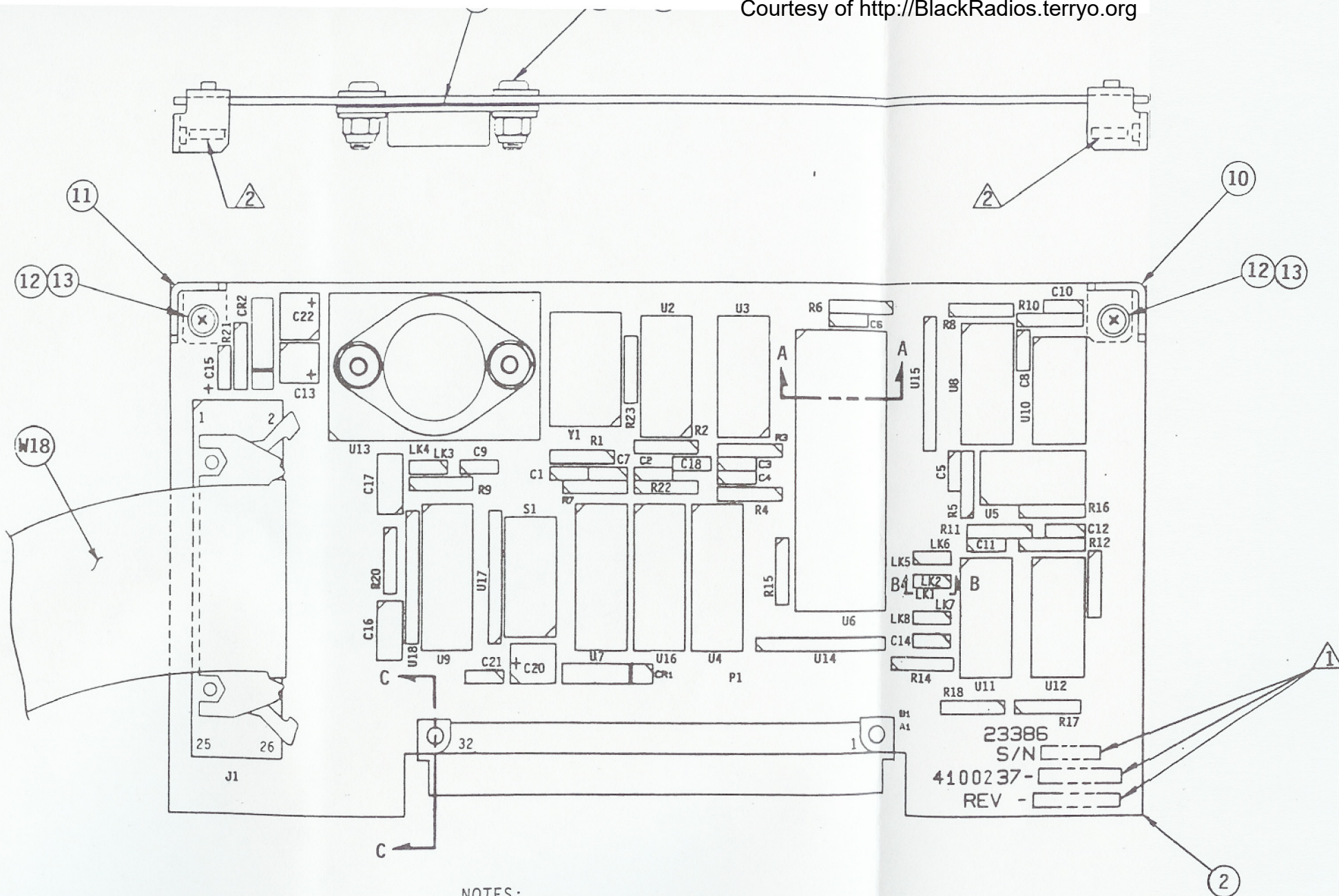
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-6	A3-2	125 kB Remote Control Interface Circuit Card Assembly (A3-2)	4100142	1
	C1, C2, C4-C8, C10-C13, C25, C33, C35	• Capacitor, Fixed, Ceramic, Z5U, .1 μ F, 20%, 50 V	21795-104	14
	C3, C9, C39	• Capacitor, Fixed, Ceramic, Z5U, 1 μ F, 20%, 50 V	21748	3
	C30	• Capacitor, Fixed, Tantalum, 1.0 μ F, 20%, 20 V	25062-225	1
	C31	• Capacitor, Fixed, Tantalum, 1.0 μ F, 20%, 35 V	25060-105	1
	C32, C34	• Capacitor, Fixed, Tantalum, 15 μ F, 20%, 20 V	25062-156	2
	C36	• Capacitor, Fixed, Mica, 39 pF, 2%	22372-390 (22100)	1
	C37	• Capacitor, Fixed, Mica, 33 pF, 2%	22372-330 (22106)	1
	C38	• Capacitor, Fixed, Mica, 330 pF, 2%	22372-331 (22117)	1
	C1-C24 C26-C29	• Not Used		
	CR1	• Suppressor, Voltage, MPTE-5	36022-5 (36009)	1
	CR2	• Suppressor, Voltage, MPTE-15	36022-15	1
	J1	• Connector, PCB, Hdr 26 Contact, Male	61456-26	1
	P1	• Connector, PCB, Male, 64 Contact	61437-64	1
	R38	• Resistor, Fixed, Film, 10 ohm, 2%, 1/4 W	12161-100	1
	R26-R29	• Resistor, Fixed, Film, 10 K, 2%, 1/4 W	12161-103	4

Table 6-6. 125 kB Remote Control Interface Circuit Card Assembly (A3-2)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R30	• Resistor, Fixed, Film, 10 M, 5%, 1/4 W	10768-106	1
	R31, R36, R37	• Resistor, Fixed, Film, 1 K, 2%,	12161-102	3
	R32, R33	• Resistor, Fixed, Film, 470 ohm, 2%, 1/4 W	12161-471	2
	R1-R25, R34-R35	• Not Used		
	U1	• Integrated Circuit, 26LS32, Quad Diff. Line Receiver	36798	1
	U2, U3	• Integrated Circuit, 74HC164, Shift Register	365022-164	2
	U4-U6	• Integrated Circuit, 74HC688 Magnitude Comp.	365022-688	3
	U7-U10	• Integrated Circuit, 74HC374, Octal D-Type, F-F	365022-374	4
	U11	• Integrated Circuit, 74HC00, Quad Nand Gate	365022-02	2
	U12, U21	• Integrated Circuit, 74HC02, Quad, 2-Input Nor Gate	365022-02	2
	U13, U16, U22	• Integrated Circuit, 74HC74, Dual D F-F	365022-74	3
	U14, U19	• Integrated Circuit, 74HC161, 4-Bit Binary Counter	365022-161	2
	U15	• Integrated Circuit, 74HC139, Dual 1-of-4 Decoder/Multiplexer	365022-165	1
	U17	• Integrated Circuit, 74HC165, Shift Reg.	365022-165	1
	U18	• Integrated Circuit, 26LS30, Line Driver	36797	1
	U23	• Integrated Circuit, 74HCU04, Hex Inverter	365022-U04	1

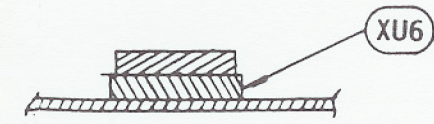
**Table 6-6. 125 kB Remote Control Interface Circuit Card Assembly (A3-2)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U24	• Integrated Circuit, 74HC4040, 12-Bit Binary Counter	365022-4040 (36585)	1
	U25	• Integrated Circuit, LM320K-5.0, VR-5V	365044	1
	U26	• Integrated Circuit, Resistor Network, 10 SIP Film 9 x 100 K, 2%	19323-104	1
	U20	• Not Used		
	Y1	• Transmittal, 4.0 MHz	37059	1
		• Bracket, Card, Lkg	2100015-501	1
		• Bracket, Card, Lkg	2100015-502	1
		• Terminal, WW, 2 Cont. (Ref LK5-LK6)	61371-2	2
		• Nut, Hex, Lkg, .138 SS	75483-632	2
		• Screw, Panhead X-Rec, .138 x .44 SS	77629	2
		• Washer, Flat, .112 SS	75022	2
		• Rivet, Oval Head, Tubular Brass Nickle Plated	75548	2
		• Tape, Foam, Adhesive	91125	A/R



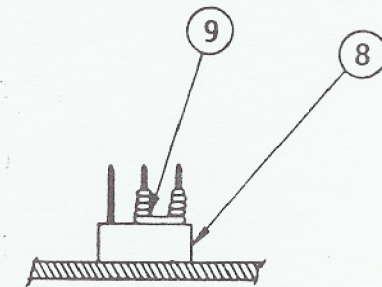
NOTES:

- 1 MARK APPLICABLE DASH NO, REV LETTER, AND SERIAL NO APPROX WHERE SHOWN, .093 MIN HIGH BLACK CHARACTERS.
- 2 MARK BRACKETS WITH APPLICABLE SYMBOL NUMBERS .12 HIGH BLACK PERMANENT CHARACTERS IN ACCORDANCE WITH MIL-STD-130.



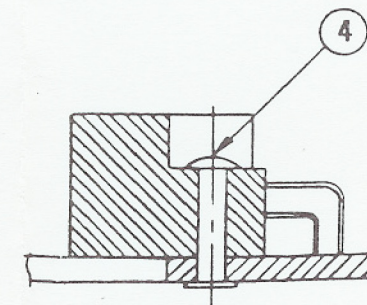
SECTION A-A

SCALE: 2/1



VIEW B-B

SCALE: 3/1



SECTION C-C

SCALE: 4/1
ROTATED 90° CLOCKWISE

Figure 6-7. RS-232 Remote Control Interface Circuit Card Assembly (A3-4)

Courtesy of <http://BlackRadios.terryo.org>Table 6-7. RS-232 Remote Control Interface Circuit Card Assembly (A3-4)
Replacement Parts List

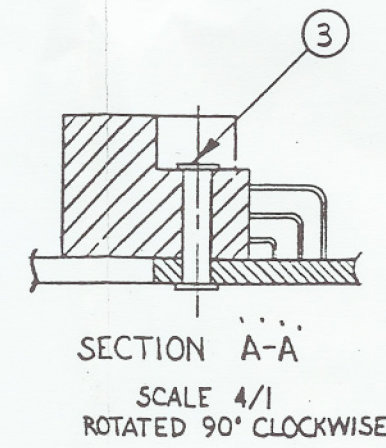
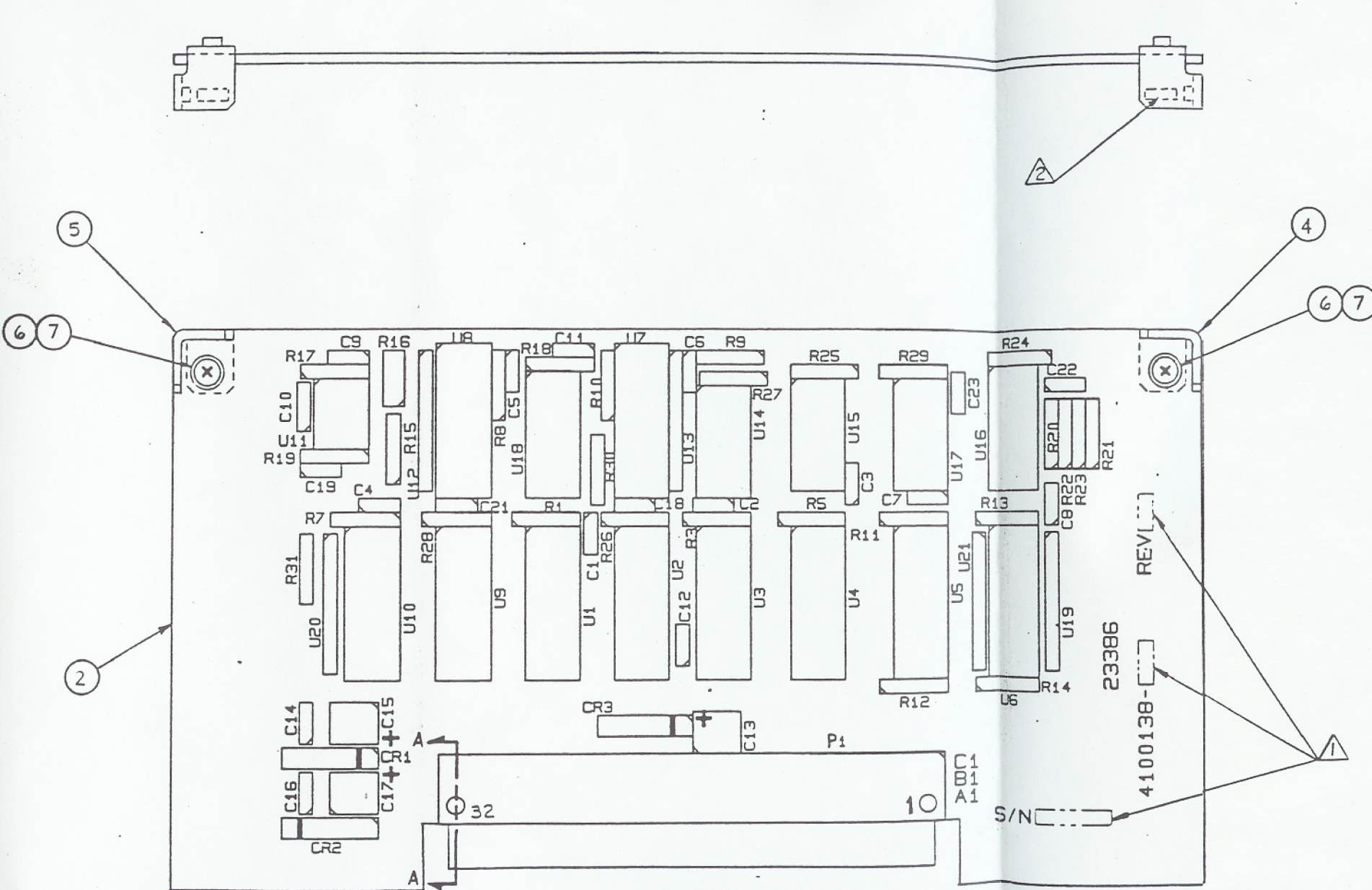
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-7	A3-4	RS-232 Remote Control Interface Circuit Card Assembly	4100237	1
	C1-C14, C18, C21	• Capacitor, Fixed, Ceramic, Z5U, 20%, 50 V	21795-104	15
	C13	• Capacitor, Fixed, Tantalum, 2.2 μ F, 20 V	25062-225	1
	C15	• Capacitor, Fixed, Tantalum, 1 μ F, 20%, 35 V	25060-105	1
	C16, C17	• Capacitor, Fixed, Mica, 100 pF, 2%	22372-101 (22109)	2
	C20, C22	• Capacitor, Fixed, Tantalum, 10 μ F, 20%, 25 V	25061-106	2
	C19	• Not Used		
	CR1	• Suppressor, Voltage, MPTE-5	36022-5 (36009)	1
	CR2	• Suppressor, Voltage, MPTE-15	36022-15	1
	J1	• Connector, PCB, HDR 26, Contact Male	61459	1
	P1	• Connector, PCB, Male, 64 Contact DIN	61437-64	1
	R1-R12, R14, R22	• Resistor, Fixed, Film, 10 ohm, 2%, 1/4 W	12161-100	14
	R15, R16	• Resistor, Fixed, Film, 330 ohm, 2%, 1/4 W	12161-331	2
	R17-R19	• Resistor, Fixed, Film, 10 K, 2%, 1/4 W	12161-103	3
	R20-R21	• Resistor, Fixed, Film, 470 ohm, 2%, 1/4 W	12161-471	2
	R23	• Resistor, Fixed, Film, 1 K, 2%, 1/4 W	12161-102	1
	R13	• Not Used		
	S1	• Switch, PCB, DIP 8 Position	52434-8	1
	U2	• Integrated Circuit, 4040B, 12-Bit Center	36889-040 (36585)	1

**Table 6-7. RS-232 Remote Control Interface Circuit Card Assembly (A3-4)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U3	• Integrated Circuit, 74HC151, Single, 8-1 Mux	365022-151	1
	U4	• Integrated Circuit, 74HC374, Octal D-Type F-F, Tri-State	365022-374	1
	U5	• Integrated Circuit, 74HC00, Quad, 2-1 N, Nand Gate	365022-00	1
	U6	• Integrated Circuit, 1M6402, Uart	36667	1
	U7, U9, U16	• Integrated Circuit, 74HC244, Octal, 3-State Driver	365022-244	3
	U8	• Integrated Circuit, 74HC139, Dual, 1-of-4, Decoder/Multiplexer	365022-139	1
	U10	• Integrated Circuit, 74HC04, Hex Inverter	365022-04	1
	U11	• Integrated Circuit, AM26LS30, Line Driver	36797	1
	U12	• Integrated Circuit, AM26LS32, Line Receiver	36798	1
	U13	• Integrated Circuit, LM320KC-5, 5 VR	365044	1
	U14-U15	• Resistor, Network, 10 SIP, Film, 9 x 100 K, 2%	19323-104	2
	U17, U18	• Resistor, Network, 10 SIP, Film, 9 x 2 K, 2%	19323-223	2
	U1, U9	• Not Used		
	W18	• Cable Assembly	3500049-501	1
	XU6	• Socket, 40 Contact	70636-40	1
	Y1	• Oscillator, Clock, 1.2288 MHz	37029	1
		• Insulator	70813	1
		• Rivet, Oval Head, Tubular Brass Nickel Plated, .089 Dia. x .344 Lg.	75548	2
		• Washer, Flat, SS, No. 6	75024	4
		• Nut, Hex, SS, Self-Locking, 6-32	75483-632	2

Table 6-7. RS-232 Remote Control Interface Circuit Card Assembly (A3-4)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
		• Terminal, WW, E Contact (Ref. LK1-LK8)	61371-03	4
		• WW Wire	59071	A/R
		• Bracket, Card, Lkg	2100015-501	1
		• Bracket, Card, Lkg	2100015-502	1
		• Screw, Panhead, X-Rec., 4-40 x .25 SS	77612	2
		• Washer, Flat, No. 4 SS	75022	2



501	A4-1
DASH NO	2 MARKING

NOTES:

- 1 MARK APPLICABLE DASH NO, REV LETTER, AND SERIAL NO. APPROX. WHERE SHOWN, .093 MIN. HIGH BLACK CHARACTERS.
- 2 MARK BRACKETS WITH APPLICABLE REF. DESIGNATION NUMBERS .12 HIGH BLACK PERMANENT CHARACTERS IN ACCORDANCE WITH MIL-STD-130. SEE TABULATION.

Figure 6-7.

Receiver Interface (A4)
Assembly Diagram
(4100138)

**Table 6-7. Receiver Interface Assembly (A4)
Replacement Parts List**

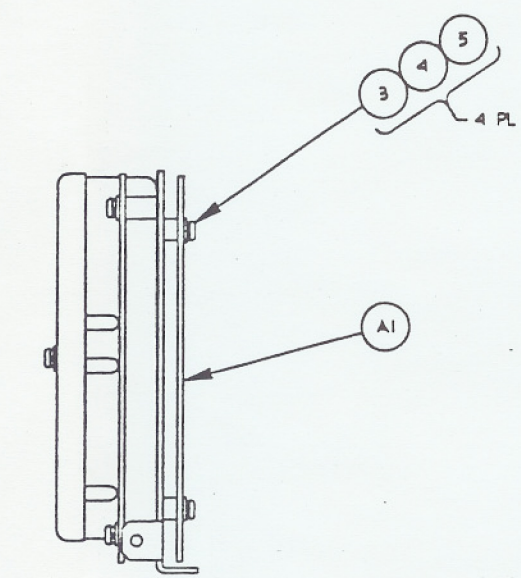
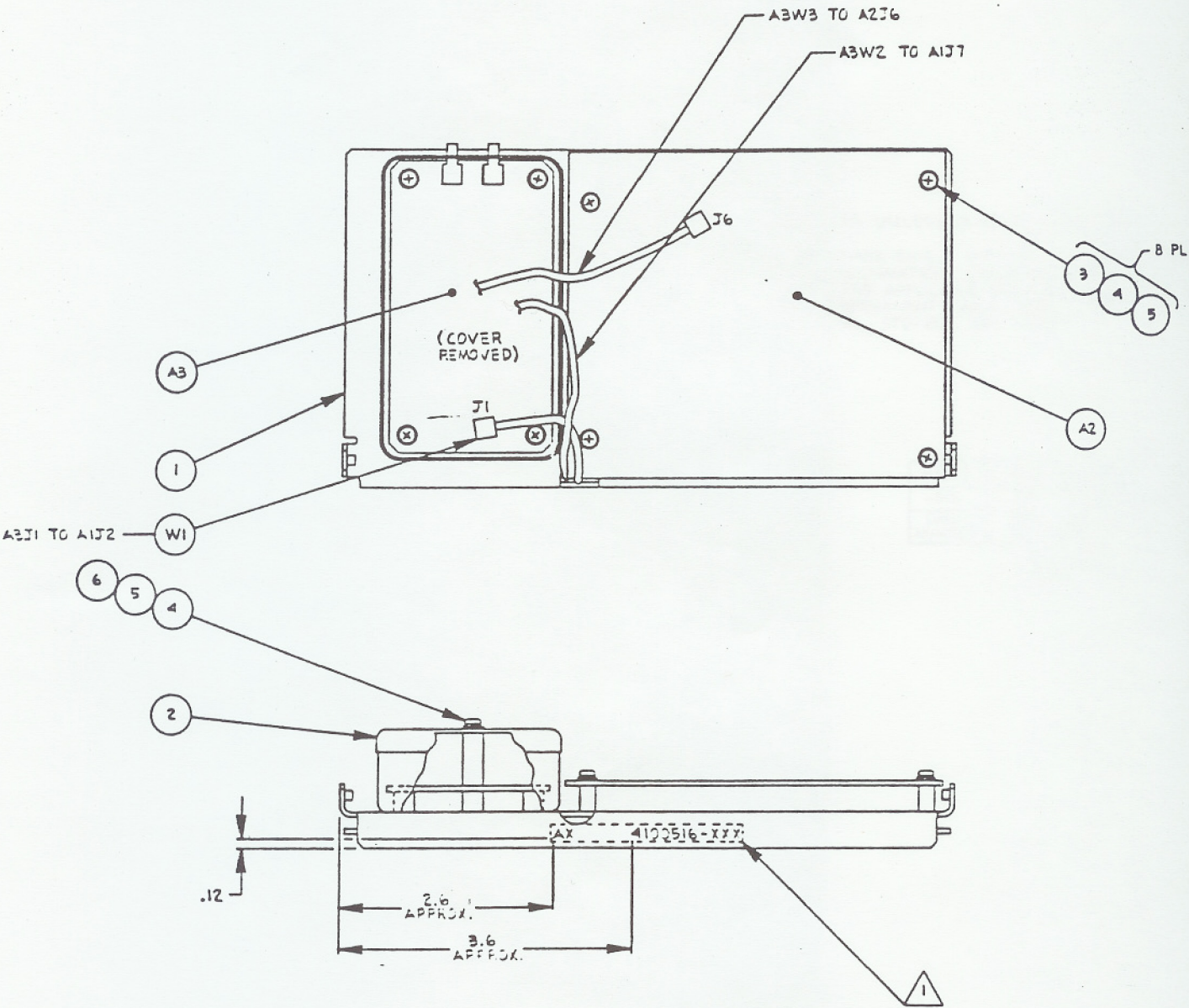
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-7		Receiver Interface Assembly	4100138-501	
1		. Schematic Receiver Interface	4200075	Ref
2		. PWB, RCVR Interface	4300056-1	1
3		. Eyelet, .089 Dia x .37 Lg Gilding NP	75921	2
4		. Bracket, Card Locking	2100015-501	1
5		. Bracket, Card Locking	2100015-502	1
6		. Screw, PNH x Rec, .112-40 x .250 SS	77612	2
7		. Washer, Flat .112 SS	75022	2
8		. Test Specification Receiver Interface	TS499	Ref
	C1-C9, C11,C12, C14,C16, C18,C19, C21-C23	. Capacitor, FXD, Cer, Z5U, .1 uF, 20%, 50V	21795-104	18
	C10	. Capacitor, FXD, Mica, 10 pf, ±.5 pF, 500V	22371-100	1
	C13,C15, C17	. Capacitor, FXD, Tant, 15 uF, 20%, 20V	25062-156	3
	CR1,CR2	. Diode, 1N6377, Suppressor, 5V Vr	36022-15	2
	CR3	. Diode, 1N6373, Suppressor, 5V Vr	36022-5	1
	P1	. Connector, DIN PCB, Male, Rtang, Row A+B+C	61437-96	1
	R1,R3, R5,R7-R9, R11,R13, R18,R21, R26,R28, R29	. Resistor, FXD, Film, 10 ohm, 2%, 1/4W	12161-100	13

**Table 6-7. Receiver Interface Assembly (A4)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R10,R12, R14,R20, R24,R30	. Resistor, FXD, Film, 22K ohm, 2%, 1/4W	12161-223	6
	R15	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	1
	R16	. Resistor, VAR, PCB, M-Turn, 10K ohm, 10%, 1/2W	16110-103	1
	R17,R19, R25,R27	. Resistor, FXD, Film, 33 ohm, 2%, 1/4W	12161-330	4
	R22,R23 R31	. Resistor, FXD, Film, 100K ohm, 2%, 1/4W	12161-104	3
	U1-U10	. Microcircuit, DGTL, 74HC374, Octal, D-Type F-F	365022-374	10
	U11	. Microcircuit, LIN, TL082, OP-AMP, JFET-Input	36895	1
	U12,U13	. Resistor, Network, 10 SIP, 10K ohm x 9 Bussed	19323-103	2
	U14,U15	. Microcircuit, LIN, LM339, Quad Voltage Computer	36693	2
	U16	. Microcircuit, DGTL, 74HC139, 1-of-4 Decoder	365022-139	1
	U17	. Microcircuit, DGTL, 74HC04, Hex Inverter	365022-04	1
	U18	. Microcircuit, Interface, 7524, 8-Bit DAC	365027	1
	U19-U21	. Resistor, Network, 10 SIP, 100K ohm x 9 Bussed	19323-104	3

**Table 6-7. Receiver Interface Assembly (A4)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R10,R12, R14,R20, R24,R30	. Resistor, FXD, Film, 22K ohm, 2%, 1/4W	12161-223	6
	R15	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	1
	R16	. Resistor, VAR, PCB, M-Turn, 10K ohm, 10%, 1/2W	16110-103	1
	R17,R19, R25,R27	. Resistor, FXD, Film, 33 ohm, 2%, 1/4W	12161-330	4
	R22,R23 R31	. Resistor, FXD, Film, 100K ohm, 2%, 1/4W	12161-104	3
	U1-U10	. Microcircuit, DGTL, 74HC374, Octal, D-Type F-F	365022-374	10
	U11	. Microcircuit, LIN, TL082, OP-AMP, JFET-Input	36895	1
	U12,U13	. Resistor, Network, 10 SIP, 10K ohm x 9 Bussed	19323-103	2
	U14,U15	. Microcircuit, LIN, LM339, Quad Voltage Computer	36693	2
	U16	. Microcircuit, DGTL, 74HC139, 1-of-4 Decoder	365022-139	1
	U17	. Microcircuit, DGTL, 74HC04, Hex Inverter	365022-04	1
	U18	. Microcircuit, Interface, 7524, 8-Bit DAC	365027	1
	U19-U21	. Resistor, Network, 10 SIP, 100K ohm x 9 Bussed	19323-104	3



NOTES UNLESS OTHERWISE SPECIFIED:
1 MARK SHIELD WITH APPLICABLE REFERENCE DESIGNATION, CIRCUIT CARD ASSEMBLY NUMBER AND APPLICABLE DASH NUMBER IN .12 HIGH PERMANENT CHARACTERS WHERE SHOWN PER MIL-STD-130. SEE TABLE 1.

-502	A5	4100516-502
-501	A5	4100516-501
DASH NUMBER	REF DES	CIRCUIT CARD ASSEMBLY NUMBER

TABLE 1

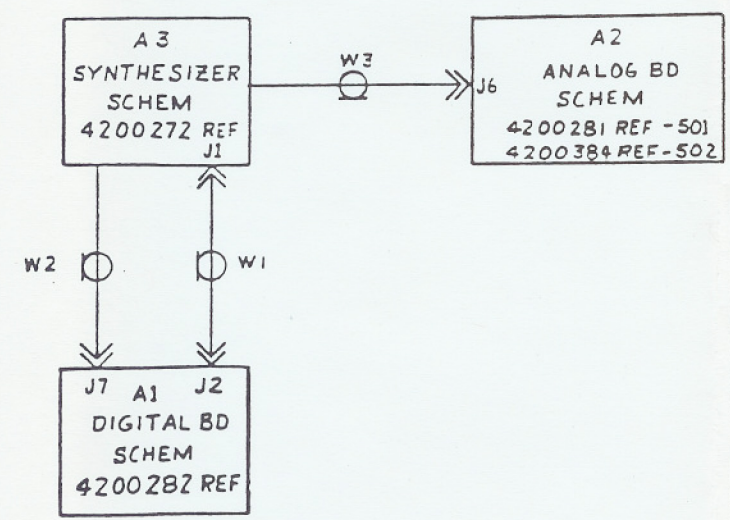


Figure 6-8. Synthesizer Module (A5) Assembly Diagram (4100516)

**Table 6-8. Synthesizer Module (A5)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-8		Module Assembly Synthesizer	4100516-501	
1		. Shield, Assy, Synthesizer	3100155-502	1
2		. Cover, Assy	2100044-501	1
3		. Screw, PNH, x Rec .112-40 x .313 SS	77613	12
4		. Washer, Flat .112 SS	75022	13
5		. Washer, Lock-Spring .112 SS	75002	13
6		. Screw, PNH x Rec .112-40 x 1.0 SS	77620	1
7		. Test Spec 1st LO Synthesizer	TS736	Ref
8		. Schematic, Synthesizer, Analog	4200281	Ref
9		. Schematic, Synthesizer, DGTL	4200282	Ref
10		. Schematic, Synthesizer	4200272	Ref
	A1	. CCA, Synthesizer, Digital Bd	4100522-501	1
	A2	. CCA, Synthesizer, Analog Board	4100523-501	1
	A3	. CCA, Synthesizer	3100146-502	1
	W1	. Cable, Assy, Coax	3500059-517	1

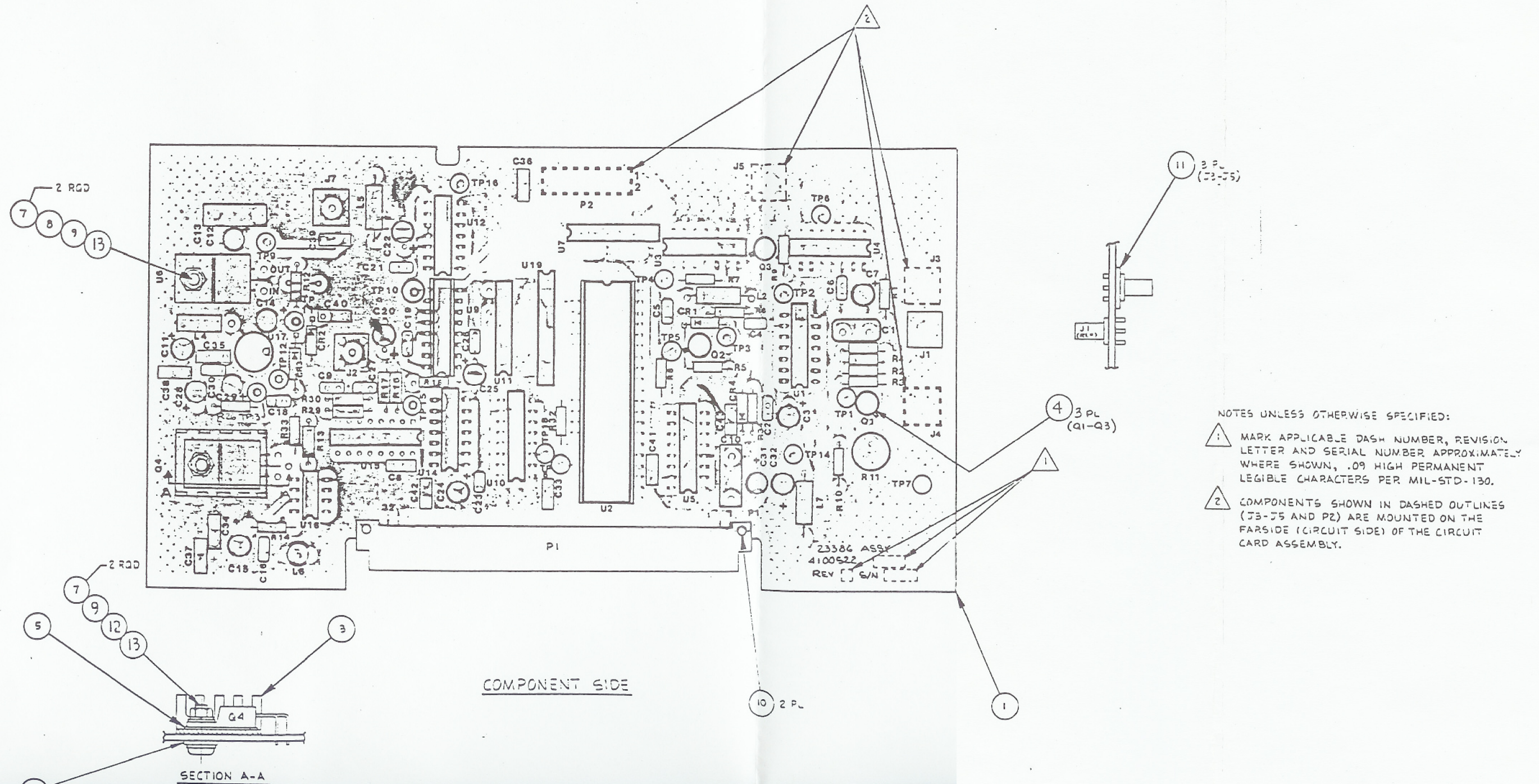


Figure 6-9. Synthesizer Digital Board (A5A1) Assembly Diagram (4100522)

**Table 6-9. Synthesizer Digital Board Assembly (A5A1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-9		CCA Synthesizer Digital Board	4100522-501	
1		. PWB, Synthesizer Digital	4300252-1	1
3		. Heat, Sink TO-220	70812	1
4		. Mounting, Pad for TO-18, 4 Lead .20 OD .020 THK	70805	3
5		. Insulator, TO-220 Silicone	70810	1
6		. Washer, Shldr .126 ID .312 OD, Nylon	75158	1
7		. Washer, Flat .112 SS	75022	4
8		. Screw, PNH x Rec .112-40 x .313 SS	77613	1
9		. Nut, Plain, Hex .112-40 SS	75203	2
10		. Eyelet, .089 Dia x .37 LG, Gilding NP	75921	2
11		. Washer, Insulating, Nylon (Modified)	2400239-1	3
12		. Screw, PNH x Rec .112-40 x .375 SS	77614	1
13		. Washer, Lock-Spring .112 SS	75002	2
		. Schematic, Synthesizer, DGTL	4200282	Ref
	C1	. Capacitor, FXD, Mica, 36 pF, 2%, 500V	22372-360	1
	C2,C5, C6,C9, C19,C21, C23,C26, C27,C30	. Capacitor, FXD, CER, X7R, .01 uF, ±10%, 100V	21799-103	10
	C3,C7, C20,C22, C24,C25	. Capacitor, FXD, Tant, 6.8 uF, 20%, 35V	25060-685	6
	C4,C18	. Capacitor, FXD, Cer, X75, 1000 pF, 10%, 100V	21798-102	2

**Table 6-9. Synthesizer Digital board Assembly (A5A1)
Replacement Parts List (Cont.)**

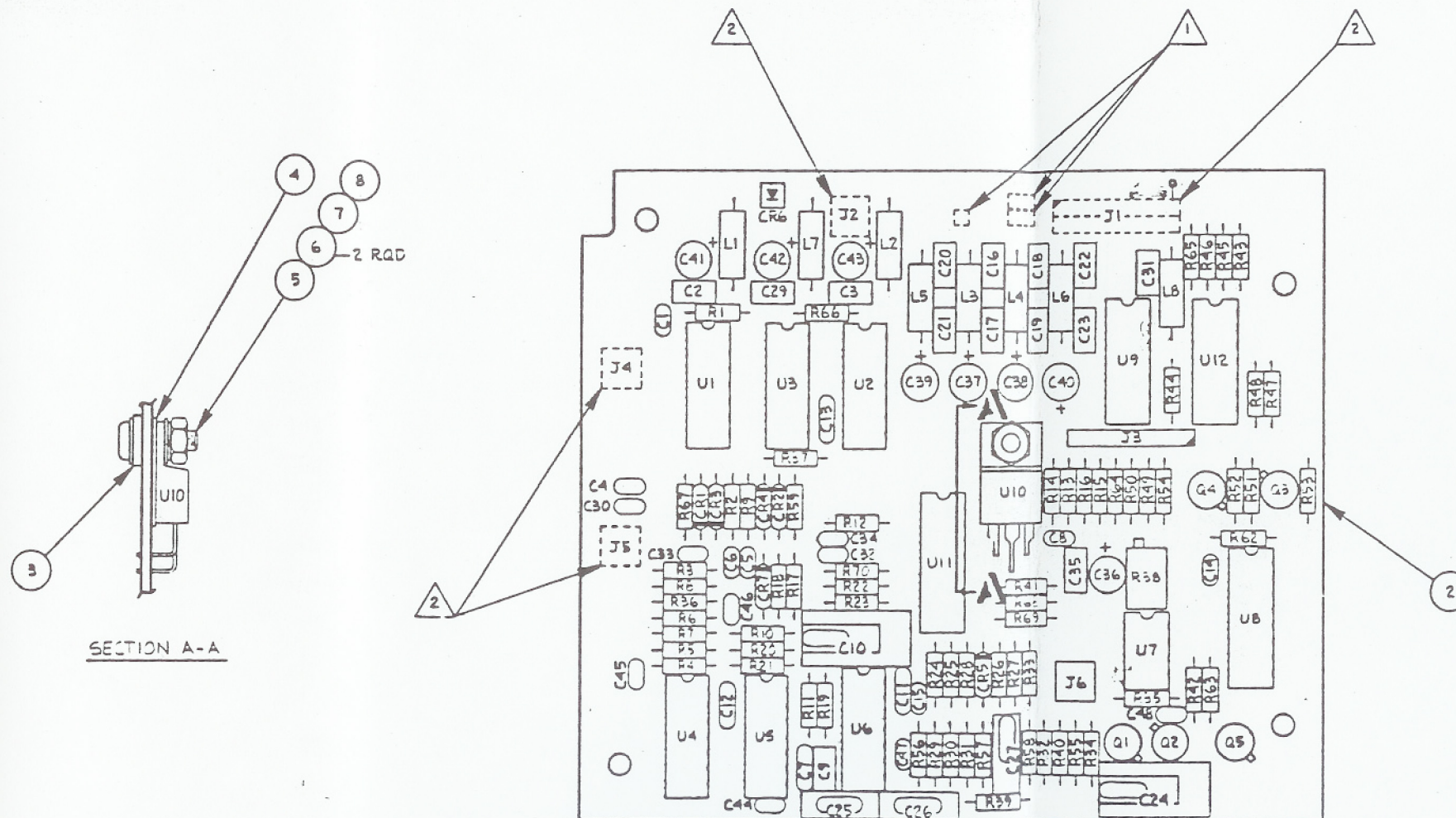
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C8, C33-C43	. Capacitor, FXD, Cer, Z5U, .1 uF, 20%, 50V	21795-104	12
	C10,C13	. Capacitor, FXD, Film, .1 uF, 10%, 100V	26871	2
	C11,C12 C14	. Capacitor, FXD, Tant, 1.0 uF, 20%, 35V	25060-105	3
	C15	. Capacitor, FXD, Tant, 100 uF, 20%, 10V	25064-107	1
	C16	. Capacitor, FXD, Cer, Z5U, .22 uF, 20%, 50V	21742	1
	C28,C29 C31,C32	. Capacitor, FXD, Tant, 4.7 uf, 20%, 35V	25060-475	4
	CR1	. Diode, 5082-2811, HP Hot Carrier Type	36002	1
	CR2	. Diode, 1N757A, Zener, 9.1V, ±5%, 400 mW	33544	1
	CR3	. Diode, 1N4001, Rectifier, 50V, PIV	35525	1
	CR4	. Diode, 1N4149, Switching	35528	1
	J1,J2, J7	. Connector, RF SMB PCB, Jack	60044	3
	J3-J5	. Connector, RF SMS PCB STR, Male	60119	3
	L1	. Coil, RF, FXD, 1.8 uH, 10%	43062-1R8	1
	L2	. Coil, RF, FXD, 47 uH, 5%	43063-470	1
	L4, L7	. Coil, RF, FXD, 15 uH, 10%	43063-150	2
	L5, L6	. Coil, RF, FXD, 100 uH, 5%	43063-101	2
	P1	. Connector, DIN, PCB, Male, RTANG, Row A	61437-32	1
	P2	. Connector, PCB, Recpt, D-Row, 16 Cont	61418-16	1

**Table 6-9. Synthesizer Digital Board Assembly (A5A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	Q1,Q2, Q4	. Transistor, 2N2369, NPN, Low Power	32255	3
	Q3	. Transistor, BC109, NPN, Low Power	32024	1
	R1	. Resistor, FXD, Film, 330 ohm, 2%, 1/4W	12161-331	1
	R2,R6	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	16161-102	2
	R3	. Resistor, FXD, Film, 3.9K ohm, 2%, 1/4W	12161-392	1
	R4,R16, R17,R29	. Resistor, FXD, Film, 470 ohm, 2%, 1/4W	12161-471	4
	R5,R8	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	2
	R7,R13 R33	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	3
	R9	. Resistor, FXD, film, 3.3K ohm, 2%, 1/4W	12161-332	1
	R10	. Resistor, FXD, Film, 150 ohm, 2%, 1/4W	12161-151	1
	R11	. Resistor, VAR, PCB, S-Turn, 200 ohm, 20%, 1/2W	16105-201	1
	R12,R30	. Resistor, FXD, film, 100 ohm, 2%, 1/4W	12161-101	2
	R14,R26	. Resistor, FXD, Film, 10 ohm, 2%, 1/4W	12161-100	2
	R18	. Resistor, FXD, Film, 220 ohm, 2%, 1/4W	12161-221	1
	R32	. Resistor, FXD, Film, 18K ohm, 2%, 1/4W	12161-183	1
	R34	. Resistor, FXD, film, 4.7K ohm, 2%, 1/4W	12161-472	1

**Table 6-9. Synthesizer Digital Board Assembly (A5A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	TP1-TP16 TP18	.Terminal, Test Point Assy	70114	17
	U1,U4	. IC, 74AC74, Dual D Flip-Flop	365139-74	2
	U2	. Microcircuit, Digiphase, Processor	36991	1
	U3	. Microcircuit, DGTL, CMOS, 4013B, Dual D Flip-Flop	36889-013	1
	U5	. Microcircuit, Lin, DAC-08, D-A Converter	365038	1
	U6	. Microcircuit, Lin, 7812, VR Pos 12V 1A TO-220	36916-12	1
	U7	. IC, 4527B, BCD Rate Multiplier	36889-527	1
	U9	. Microcircuit, MC12009, Prescaler, Divide by 5/6	365036	1
	U10,U11	. Microcircuit, DGTL, 74LS169, Syn Bin U/D Counter	36885-169	2
	U12	. IC, 74ACT74, Dual D Flip-Flop	365269-74	1
	U14	. IC, 74HCT27, TPL 3 INP NOR Gate	365078-27	1
	U15	. Microcircuit, DGTL, 10115, Quad, Line Receiver	36805	1
	U16	. Microcircuit, Lin, OP-27G, OP-Amp	36924	1
	U17	. Microcircuit, Lin, LH0071-OH Volt Ref	365058	1
	U19	. Microcircuit, DGTL, 74HC374, Octal, D-Type F-F	365022-374	1
	XU2	. Socket, IC, 40 Cont, Dip PCB	70636-40	1
	XU9	. socket, IC, 16 Cont, Dip PCB	70636-16	1



NOTES UNLESS OTHERWISE SPECIFIED:

- 1 MARK APPLICABLE DASH NUMBER, REVISION LETTER AND SERIAL NUMBER APPROXIMATELY WHERE SHOWN, .09 HIGH PERMANENT LEGIBLE CHARACTERS PER MIL-STD-130.
- 2 COMPONENTS SHOWN IN DASHED OUTLINES (J1, J2, J4 AND J5) ARE MOUNTED ON THE FAR SIDE (CIRCUIT SIDE) OF THE CIRCUIT CARD ASSEMBLY.
3. SEE PARTS LIST PL4100523 FOR COMPONENTS NOT USED ON -501 OR -502 ASSEMBLIES.

Figure 6-10. Synthesizer Analog Board (A5A2) Assembly Diagram (4100523)

Table 6-10. Synthesizer Analog Board Assembly (A5A2)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-10		CCA Synthesizer Analog Board	4100523-501	
2		. PWB, Synthesizer Analog	4300250-1	1
		. Schematic, Synthesizer, Analog	4200281	Ref
	C2,C3, C7,C12, C13	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	5
	C4-C6, C8	. Capacitor, FXD, Cer, X7R, 1000 pF, 10%, 100V	21798-102	4
	C9, C16-C23, C29,C31	. Capacitor, FXD, Cer, Z5U, 1.0 μ F, 20%, 50V	21748	11
	C10	. Capacitor, FXD, Cer, BX .033 μ F, 10%, 50V	21792-333	1
	C11	. Capacitor, 200-100-NPO-102G	21371-102	1
	C14,C15	. Capacitor, FXD, Cer, X7R, .01 μ F, $\pm$ 10%, 100V	21799-103	2
	C24	. Capacitor, FXD, Film, .22 μ F, 5%, 100V	26933	1
	C30	. Capacitor, FXD, Cer, NPO, 22 pF, 5%, 100V	21360-220	1
	C37-C43	. Capacitor, FXD, Tant, 6.3 μ F, 20%, 35V	25060-685	7
	C44-C47	. Capacitor, FXD, Cer, NPO, 100 pF, $\pm$ 5%, 100V	21360-101	4
	C48	. Capacitor, FXD, Cer, Z5U, .0047 μ F, 20%, 50V	21789-472	1
	CR1-CR5, CR7	. Diode, 1N4149, Switching	35528	6
	CR6	. Led, 3LB-22UR	41052	1
	J1A,J1B J3	. Connector, HDR, 5-Row, 8 Cont	61371-08	3

**Table 6-10. Synthesizer Analog Board Assembly (A5A2)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	J2,J4, J5	. Connector, RF, SMS, PCB, STR, Female	60120	3
	J6	. Connector, RF, SMB, PCB, Jack	60044	1
	L1-L8	. Coil, RF, FXD, 1.0 μ H, 10%	43063-1R0	8
	Q1,Q5	. Transistor, 2N2369, NPN, Low Power	32255	2
	Q2	. Transistor, 2N2907/2N2907A, PNP, Low Power	32258	1
	R1,R39 R59,R67 R70	. Jumper, Zero (0) ohm	10769	5
	R2,R9 R23	. Resistor, FXD, Film, 22K ohm, 2%, 1/4W	12161-223	3
	R3,R8, R24,R34	. Resistor, FXD, Film, 100 ohm, 2%, 1/4W	12161-101	4
	R4-R7 R35,R36	. Resistor, FXD, Film, 47K ohm, 2%, 1/4W	12161-473	6
	R10	. Resistor, FXD, Film, 56K ohm, 2%, 1/4W	12161-563	1
	R11,R12, R18	. Resistor, FXD, Film, 100K ohm, 2%, 1/4W	12161-104	3
	R13,R22, R37	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	12161-102	3
	R14	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	1
	R15	. Resistor, FXD, Film, 3.9K ohm, 2%, 1/4W	12161-392	1
	R16	. Resistor, FXD, Film, 8.2K ohm, 2%, 1/4W	12161-822	1
	R17;R55	. Resistor, FXD, Film, 680 ohm, 2%, 1/4W	12161-681	2

Table 6-10. Synthesizer Analog Board Assembly (A5A2)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION						RACAL PART NO.	QTY.
		1	2	3	4	5	6		
	R19	.	Resistor, FXD, Film, 22 ohm,					12161-220	1
			2%, 1/4W						
	R20,R21, R25,R26, R30,R38, R63	.	Resistor, FXD, Film, 10K ohm,					12161-103	7
			2%, 1/4W						
	R27	.	Resistor, FXD, Film, 18K ohm,					12161-183	1
			2%, 1/4W						
	R26,R31, R42	.	Resistor, FXD, Film, 15K ohm,					12161-153	3
			2%, 1/4W						
	R29	.	Resistor, FXD, Film, 12K ohm,					12161-123	1
			2%, 1/4W						
	R32	.	Resistor, FXD, Film, 68K ohm,					12161-683	1
			2%, 1/4W						
	R33	.	Resistor, FXD, Film, 470K ohm,					12161-474	1
			2%, 1/4W						
	R40	.	Resistor, FXD, Film, 10 ohm,					12161-100	1
			2%, 1/4W						
	R62	.	Resistor, FXD, Film, 220K ohm,					12161-224	1
			2%, 1/4W						
	R66	.	Resistor, FXD, Film, 330 ohm,					12161-331	1
			2%, 1/4W						
	U1,U2	.	IC, 74AC74, Dual D Flip-Flop					365139-74	2
	U3	.	IC, 74AC00, Quad 2-INP, Nand Gate					365139-00	1
	U4,U5	.	Microcircuit, Lin OP-227, Dual OP-Amp Matched					365155	2
	U6	.	Microcircuit, Lin, OP-237, Dual OP-Amp					365141	1
	U7	.	Microcircuit, Lin, OP37, OP-Amp, Low Noise					365138	1
	U8	.	IC, 4538B, Dual MNSTBMV					36889-538	1

[illegible]



1. MARK APPLICABLE DASH NO, SERIAL NO, AND LETTER .09 HIGH PERMANENT BLACK CHARACTERS PER MIL-STD-130.
2. INSTALL ITEM 6 TO CAPACITORS AND RESISTORS AS REQUIRED.

6-57 / (6-58)

Table 6-11. Synthesizer No. 3 (A5A3) Assembly
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-11		Synthesizer Board No. 3	3100146-502	1
2		. PCB, Synth Bd. No. 3	3300024-1	1
3		. Wire Bus, 24 AWG, Tinned Copper	58007	A/R
4		. Mounting Pad for TO-5/TO-18	70809	2
5		. Mounting Pad for TO-18		
		4 Lead, .20 OD, .020 Thk	70805	3
6		. Bead Glass	70854	A/R
	C1, C3,	. Capacitor, FXD TANT		
	C19	4.7 μ F, 20%, 35V	25060-475	3
	C8, C4,	. Capacitor, FXD CER X7R		
	C22, C24	.01 μ F, $\pm$ 10%, 100V	21799-103	4
	C5	. Capacitor, FXD CER NPO		
		15 pF, 5%, 100V	21360-150	1
	C6	. Capacitor, FXD CER NPO		
		51 pF, $\pm$ 5%, 100V	21360-510	1
	C7, C12,	. Capacitor, FXD CER X7R		
	C17, C18,	1000 pF, 10%, 100V	21798-102	6
	C20, C21			
	C8	. Capacitor, FXD TANT		
		6.8 μ F, 20%, 35V	25060-685	1
	C9	. Capacitor, FXD CER NPO		
		68 pF, $\pm$ 5%, 100V	21360-680	1
	C10	. Capacitor, FXD CER NPO		
		82 pF, $\pm$ 5%, 100V	21360-820	1
	C11	. Capacitor, FXD CER NPO		
		47 pF, $\pm$ 5%, 100V	21360-470	1
	C13	. Capacitor, FXD CER NPO		
		5.1 pF, $\pm$.25 pF, 100V	21360-519	1
	C14, C15	. Capacitor, 200-100-NPO-102G	21371-102	2
	C16, C23	. Capacitor, FXD CER NPO		
		10 pF, $\pm$.25 pF, 100V	21360-100	2

Table 6-11. Synthesizer No. 3 (A5A3) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	CR1, CR2	. Diode, KV2201 Varactor Ct=50 pF @4V/1MHz	29016	2
	E1-E6	. Terminal Stud, SWG 2 Turret .064 Mtg .062 BD	70145	6
	J1	. Connector, RF SMB PCB Jack	60044	1
	J2, J3	. Connector, RF SMB PCB Rtang	60107	2
	L1	. Coil Assembly, RF Toroid, .12 μ H	2100041-501	1
	L2	. Coil Assy, RF Toroid, .08 μ H	2100041-502	1
	L3	. Coil, RF FXD 6.8 μ H, 10%	43063-6R8	1
	L4	. Coil Assembly	9255	1
	Q1	. Transistor 2N4416 FET N-Channel	32508	1
	Q2, Q3	. Transistor 2N3866 NPN High-Power	32019	2
	Q4-Q6	. Transistor 2N2369 NPN Low-Power	32255	3
	R1, R3	. Resistor, FXD Film 68 Ohm, 2%, 1/4W	12161-680	2
	R2	. Resistor, FXD Film 22 Ohm, 2%, 1/4W	12161-220	1
	R4, R18, R21	. Resistor, FXD Film 1.0K Ohm, 2%, 1/4W	12161-102	3
	R5, R7	. Resistor, FXD Film 120 Ohm, 2%, 1/4W	12161-121	2
	R6	. Resistor, FXD Film 51 Ohm, 2%, 1/4W	12161-510	1
	R8, R14, R17, R19, R22	. Resistor, FXD Film 100 Ohm, 2%, 1/4W	12161-101	5
	R9	. Resistor, FXD Film 47 Ohm, 2%, 1/4W	12161-470	1
	R10	. Resistor, FXD Film 680 Ohm, 2%, 1/4W	12161-681	1

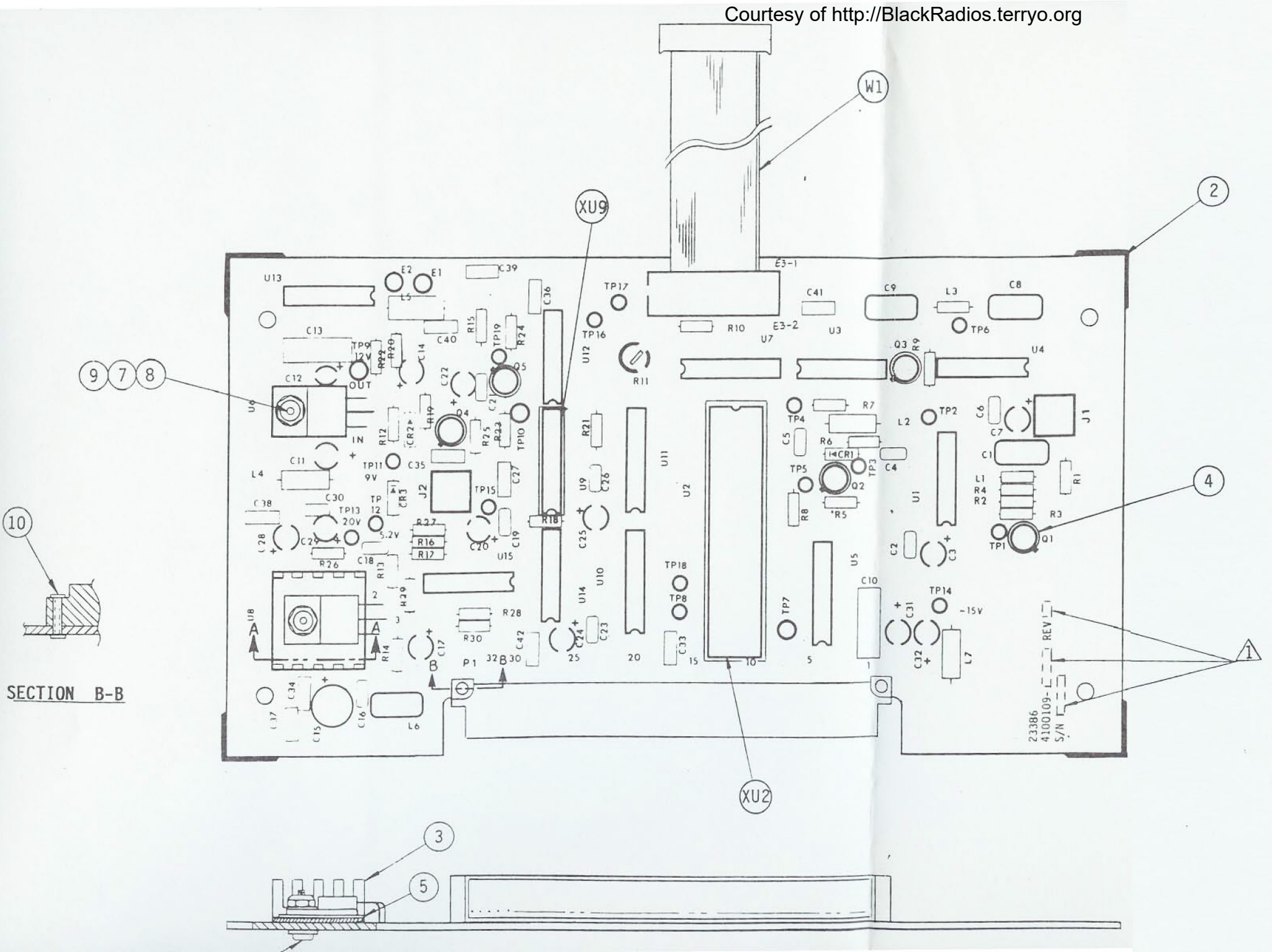
**Table 6-11. Synthesizer No. 3 (A5A3) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R11, R15,	. Resistor, FXD Film		
	R16	10 Ohm, 2%, 1/4W	12161-100	3
	R12	. Resistor, FXD Film		
		360 Ohm, 2%, 1/4W	12161-361	1
	R13, R20	. Resistor, FXD Film		
		39 Ohm, 2%, 1/4W	12161-390	2
	R23	. Resistor, FXD Film		
		2.2K Ohm, 2%, 1/4W	12161-222	1
	T1	. Transformer Assembly, RF FXD	8502	1
	TP1-TP4	. Terminal, Test Point Assembly	70114	4
	U1	. Divider, Power	84521	1
	W1	. Cable Assembly	1500031-501	1
	W2	. Cable Assembly	1500031-502	1

Table 6-9. Synthesizer Module Assembly (A5-1)
Replacement Parts List

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-9	A5-1	Synthesizer Module Assembly	3100118-501	1
	A1	• Synthesizer No. 1 Circuit Card Assembly (PCA)	4100109-501	1
	A2	• Synthesizer No. 2 Circuit Card Assembly (PCA)	4100110-501	1
	A3	• Synthesizer No. 3 Circuit Card Assembly (PCA)	3100146-501	1
	W1	• Cable Assembly, Coaxial	3500059-517	1
	W2-W3	• Cable Assembly, Coax, RD178	57051	2
1		• Shield Assembly	3100155-501	1
2		• Cover Assembly	2100044-501	1
3		• Screw, Pan Head, X-Rec., .112-40 x .312 Lg. S.S.	77613	12
6		• Screw, Pan Head, X-Rec, S.S. .112-40 x 1.00 Lg. S.S.	77620	1
4		• Washer, Flat, .112 S.S.	75022	13
5		• Washer, Split, .112 S.S.	75002	11

Courtesy of <http://BlackRadios.terry.org>



NOTES:

- 1 MARK APPLICABLE DASH NO, REV LETTER, AND SERIAL NO APPROX WHERE SHOWN, .093 MIN HIGH BLACK CHARACTERS.

Figure 6-10. Synthesizer No.1 Circuit Card Assembly (A5A1)

**Table 6-10. Synthesizer No.1 Circuit Card Assembly (A5A1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-10	A5A1	Synthesizer No. 1 Circuit Card Assembly (PCA)	4100109-501	1
2		• Printed Circuit Card Wiring Assembly (PCB), Synthesizer No. 1	4300047-1	1
	C1	• • Capacitor, Fixed, Mica, 36 pF, 2%	22372-360	1
	C2, C5, C6, C19, C21, C23, C26, C30	• • Capacitor, Fixed, Ceramic, X7R, 0.01 μ F, 10%, 100 V	21799-103	8
	C3, C7, C20, C22, C24, C25	• • Capacitor, Fixed, Tantalum, 6.8 μ F, 20%, 35 V	25060-685	6
	C4, C18	• • Capacitor, Fixed, Ceramic, X7R, 1000 pF, 10%, 50 V	21798-102	2
	C8, C9	• • Capacitor, Fixed, Mica, 15 pF, 5%	22371-150	2
	C10, C13	• • Capacitor, Fixed, Polycarb, 0.1 μ F, 20%, 100 V	26871	2
	C11, C12, C14	• • Capacitor, Fixed, Tantalum, 1.0 μ F, 20%, 35 V	25060-105	3
	C15	• • Capacitor, Fixed, Tantalum, 100 μ F, 20%, 10 V	25064-107	1
	C16	• • Capacitor, Fixed, Ceramic, Z5U, 0.22 μ F, 20%, 50 V	21742	1
	C17, C28, C29, C31, C32	• • Capacitor, Fixed, Tantalum, 4.7 μ F, 20%, 35 V	25060-475	5
	C27, C33, C34-C42	• • Capacitor, Fixed, Ceramic, Z5U, 0.1 μ F, 20%, 50 V	21795-104	11
	CR1	• • Diode, HP5082-2811	36002	1
	CR2	• • Diode, 1N757A, 9.1 V, Zener	33544	1
	CR3	• • Diode, 1N4001	35525	1

**Table 6-10. Synthesizer No.1 Circuit Card Assembly (A5A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	E1, E2	•• Terminals	70145	2
	J1, J2	•• Connector, SMB, PCB	60044	2
	L1	•• Coil, RF, Fixed, 1.8 μ H, 10%	43062-1R8	1
	L2	•• Coil, RF, Fixed, 47 μ H, 5%	43063-470	1
	L3	•• Coil, RF, Fixed, 33 μ H, 10%	43062-330	1
	L4, L7	•• Coil, RF, Fixed, 15 μ H, 10%	43063-150	2
	L5	•• Coil, RF, Fixed, 100 μ H, 5%	43063-101	1
	L6	•• Coil, RF, Fixed, 100 μ H, 5%	43069-101	1
	P1	•• Connector, PCB, 32 Contact	61437-32	1
	Q1, Q2, Q5	•• Transistor, 2N2369	32255	3
	Q3	•• Transistor, BC109	32024	1
	Q4	•• Transistor, 2N2907	32258	1
	R1	•• Resistor, Fixed, Film, 330 ohm, 2%, 1/4 W	12161-331	1
	R2, R6, R20, R21, R25	•• Resistor, Fixed, Film, 1 K, 2%, 1/4 W	12161-102	5
	R3, R23	•• Resistor, Fixed, Film, 3.9 K, 2%, 1/4 W	12161-392	2
	R4, R16, R17, R24, R27-R29	•• Resistor, Fixed, Film, 470 ohm, 2%, 1/4 W	12161-471	7
	R5, R8	•• Resistor, Fixed, Film, 10 K, 2%, 1/4 W	12161-103	2
	R7	•• Resistor, Fixed, Film, 2.2 K, 2%, 1/4 W	12161-222	1
	R9	•• Resistor, Fixed, Film, 3.3 K, 2%, 1/4 W	12161-332	1
	R10	•• Resistor, Fixed, Film, 150 ohm, 2%, 1/4 W	12161-151	1
	R11	•• Resistor, Variable, PCB, Composition, Single-Turn, 100 ohm, 20%, 1 W	16090-101	1

**Table 6-10. Synthesizer No.1 Circuit Card Assembly (A5A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R12, R30	• • Resistor, Fixed, Film, 100 ohm, 2%, 1/4 W	12161-101	2
	R13	• • Resistor, Fixed, Film, 200 ohm, 2%, 1/4 W	12161-201	1
	R14	• • Resistor, Fixed, Film, 12 ohm, 2%, 1/4 W	12161-120	1
	R15	• • Resistor, Fixed, Film, 680 ohm, 2%, 1/4 W	12161-681	1
	R18, R22	• • Resistor, Fixed, Film, 220 ohm, 2%, 1/4 W	12161-221	2
	R19	• • Resistor, Fixed, Film, 39 ohm, 2%, 1/4 W	12161-390	1
	R26	• • Resistor, Fixed, Film, 10 ohm, 2%, 1/4 W	12161-100	1
	TP1-TP19	• • Test Points	70114	19
	U1, U4, U12	• • Integrated Circuit, 74F74, Dual D-Type, Flip-Flop	365035-74	3
	U2	• • Integrated Circuit, RMSL-019A, Dialphase Processor	36991	1
	U3	• • Integrated Circuit, 4013B, D-Type Flip-Flop	36889-013	1
	U5	• • Integrated Circuit, DAC-08, Digital-to-Analog Converter	365038	1
	U6	• • Integrated Circuit, 7812, Voltage Regulator, 12 V	36916-12	1
	U7	• • Integrated Circuit, BCD, Rate Multiplier	36889-527	1
	U8	• • Integrated Circuit, LM340T-5, Voltage Regulator, 5 V	365037	1
	U9	• • Integrated Circuit, MC12009, Prescaler, 5.6	365036	1

**Table 6-10. Synthesizer No.1 Circuit Card Assembly (A5A1)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U10, U11	• • Integrated Circuit, 74LS169, Presettable Binary Counter	36885-169	2
	U13	• • Integrated Circuit, Dual Input Nand Gate	365039	1
	U14	• • Integrated Circuit, 74LS27 Triple Input Nor Gate	36885-27	1
	U15	• • Integrated Circuit, MC10115, Quad Line Receiver	36805	1
	XU1, XU3, XU4-XU8	• • Not Used		
	XU2	• • Socket, DIP, 40 Pin	76036-40	1
	XU9	• • Socket, DIP, 16 Pin	70636-16	1
	W1	• • Cable Assembly	2500013-501	1
3		• Heat Sink (Ref. U8)	70812	1
4		• Transister Pad (Ref. Q1-Q5)	70805	5
5		• Insulator, (Ref. U6, U8)	70810	2
6		• Washer, Shoulder, Nylon	75113	1
7		• Washer, Flat, .112 S.S.	75022	3
8		• Screw, Panhead, .112-40 x .375 S.S.	77615	2
9		• Nut, Hex, Locking, .112-40 S.S.	75483-440	2
10		• Eyelet	75921	2

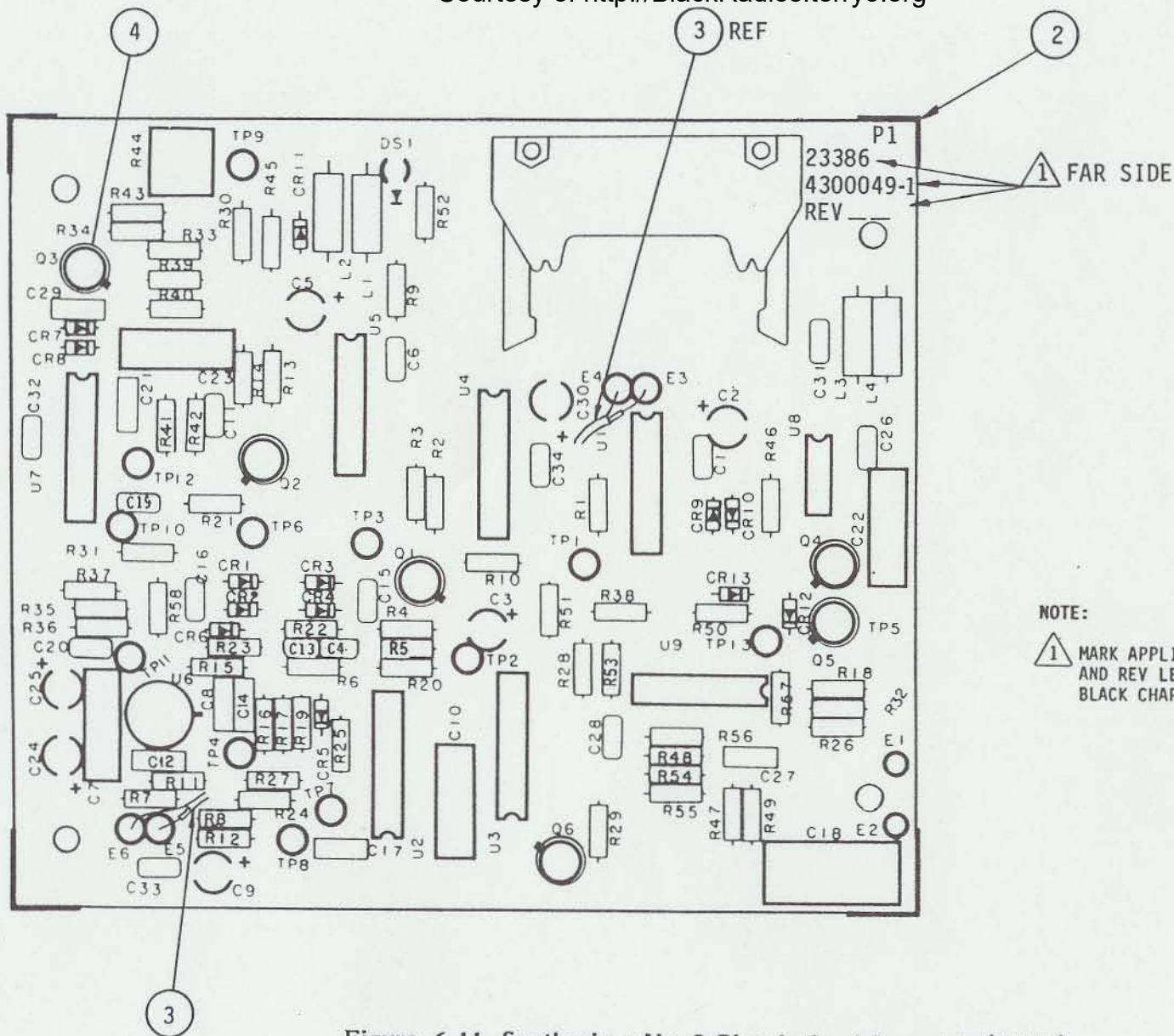


Figure 6-11. Synthesizer No. 2 Circuit Card Assembly (A5A2)

**Table 6-11. Synthesizer No. 2 Circuit Card Assembly (A5A2)
Replacement Parts List**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-11	A5A2	Synthesizer No. 2 Circuit Card Assembly (PCA)	4100110-501	1
2		• Printed Circuit Card Wiring Assembly (PCB), Synthesizer No. 2	4300049-1	1
	C1, C6, C13, C19, C31-C34	• • Capacitor, Fixed, Ceramic, X7R, .01 μ F, 10%, 100 V	21799-103	8
	C2, C5, C30	• • Capacitor, Fixed, Tantalum, 6.8 μ F, 20%, 35 V	25060-685	3
	C3	• • Capacitor, Fixed, Tantalum, 1.0 μ F, 20%, 35 V	25060-105	1
	C4, C15, C16	• • Capacitor, Fixed, Ceramic, NPO, 100 pF, 5%, 100 V	21360-101	3
	C7	• • Capacitor, Fixed, Polycarbonate, .047 μ F, 10%, 250 V	26896	1
	C8	• • Capacitor, Fixed, Polycarbonate, 1500 pF, 2%, 30 V	26912-152	1
	C9, C24, C25	• • Capacitor, Fixed, Tantalum, 4.7 μ F, 20%, 35 V	25060-475	3
	C10, C22, C23	• • Capacitor, Fixed, Polycarbonate, .1 μ F, 20%, 100 V	26871	3
	C11	• • Capacitor, Fixed, Ceramic, NPO, 22 pF, 5%, 100 V	21360-220	1
	C12, C29	• • Capacitor, Fixed, Ceramic, Z5U, .1 μ F, 20%, 50 V	21795-104	2
	C14, C17	• • Capacitor, Fixed, Polycarbonate, 1000 pF, 2%, 30 V	26912-102	2
	C18	• • Capacitor, Fixed, Polycarbonate, 1 μ F, 20%, 100 V	26875	1
	C20, C26, C28	• • Capacitor, Fixed, X7R, 1000 pF, 10%, 100 V	21798-102	3

Table 6-11. Synthesizer No.2 Circuit Card Assembly (A5A2)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C21	• • Capacitor, Fixed, Polycarbonate, .047 μ F, 2%, 30 V	26912-473	1
	C27	• • Capacitor, Fixed, Polycarbonate, .033 μ F, 2%, 30 V	21912-333	1
	CR1, CR2, CR7, CR8	• • Diode, HP 5082-2811	36002	4
	CR3-CR6, CR9-CR13	• • Diode, 1N4149	35528	9
	DS1	• • Lamp, LED Red	41052	1
	E1-E2	• • Terminal	70145	2
	L1	• • Coil, RF, Fixed, .47 μ H, 20%	43063-R47	1
	L2, L3	• • Coil, RF, Fixed, .1 μ H, 10%	43063-1R0	2
	L4	• • Coil, RF, Fixed, 1.5 μ H, 10%	43063-1R5	1
	P1	• • Connector, PCB, 16 Contact	61456-16	1
	Q1-Q3	• • Transistor, 2N2369	32255	3
	Q4	• • Transistor, BC109	32024	1
	Q5	• • Transistor, 2N2907	32258	1
	Q6	• • Transistor, 2N2222A	31511	1
	R1, R16, R30, R36	• • Resistor, Fixed, Film, 100 ohm, 2%, 1/4 W	12161-101	4
	R2, R13, R33	• • Resistor, Fixed, Film, 3.9 K, 2%, 1/4 W	12161-392	3
	R3-R5, R14, R34, R37, R47	• • Resistor, Fixed, Film, 1 K, 2%, 1/4 W	12161-102	7
	R6, R8, R17, R22, R24, R25, R41, R57	• • Resistor, Fixed, Film, 10 K, 2%, 1/4 W	12161-103	8
	R7, R9, R28, R51, R53	• • Resistor, Fixed, Film, 680 ohm, 2%, 1/4 W	12161-681	5

**Table 6-11. Synthesizer No. 2 Circuit Card Assembly (A5A2)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R10, R21, R39	• • Resistor, Fixed, Film, 300 ohm, 2%, 1/4 W	12161-301	3
	R11, R19, R20, R42, R50	• • Resistor, Fixed, Film, 15 K, 2%, 1/4 W	12161-153	5
	R15, R29	• • Resistor, Fixed, Film, 22 ohm, 2%, 1/4 W	12161-220	2
	R12	• • Resistor, Fixed, Film, 12 K, 2%, 1/4 W	12161-123	1
	R18, R56	• • Resistor, Fixed, Film, 220 K, 2%, 1/4 W	12161-224	2
	R23, R31, R40	• • Resistor, Fixed, Film, 22 K, 2%, 1/4 W	12161-223	3
	R26	• • Resistor, Fixed, Film, 10 ohm, 2%, 1/4 W	12161-100	1
	R27	• • Resistor, Fixed, Film, 18 K, 2%, 1/4 W	12161-183	1
	R32, R46, R49	• • Resistor, Fixed, Film, 47 K, 2%, 1/4 W	12161-473	3
	R35	• • Resistor, Fixed, Film, 3.3 K, 2%, 1/4 W	12161-332	1
	R38, R52	• • Resistor, Fixed, Film, 220 ohm, 2%, 1/4 W	12161-221	2
	R43	• • Resistor, Fixed, Film, 68 ohm, 2%, 1/4 W	12161-680	1
	R44	• • Resistor, Variable, Comp., M-Turn, 2 K, 2%, 1/4 W	16104-202	1
	R45	• • Resistor, Fixed, Film, 1.2 K, 2%, 1/4 W	12161-122	1
	R48	• • Resistor, Fixed, Film, 6.8 K, 2%, 1/4 W	12161-682	1

Table 6-11. Synthesizer No. 2 Circuit Card Assembly (A5A2)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
3	R54, R55	• • Resistor, Fixed, Film, 2.2 K, 2%, 1/4 W	12161-222	2
	R58	• • Resistor, Fixed, Film, 68 K, 2%, 1/4 W	12161-683	1
	TP1-TP16	• • Test Points	70114	16
	U1, U5	• • Integrated Circuit, 74F74 Dual-Type Flip-Flop	365035-74	2
	U2, U7	• • Integrated Circuit, LM324N, Op-Amp	36784	2
	U3	• • Integrated Circuit, 201 Quad SPST Switch	36815	1
	U4	• • Integrated Circuit, 7401 Nand Gate	365039	1
	U6	• • Integrated Circuit, AD518, Op-Amp	36765	1
	U8	• • Integrated Circuit, 3140 Op-Amp	36817	1
	U9	• • Integrated Circuit, LM339 Voltage Composition	36693	1
	3	• • Cable, Coax, RD178	57051	1(A/R)
	4	• • Transistor Pad	70805	6

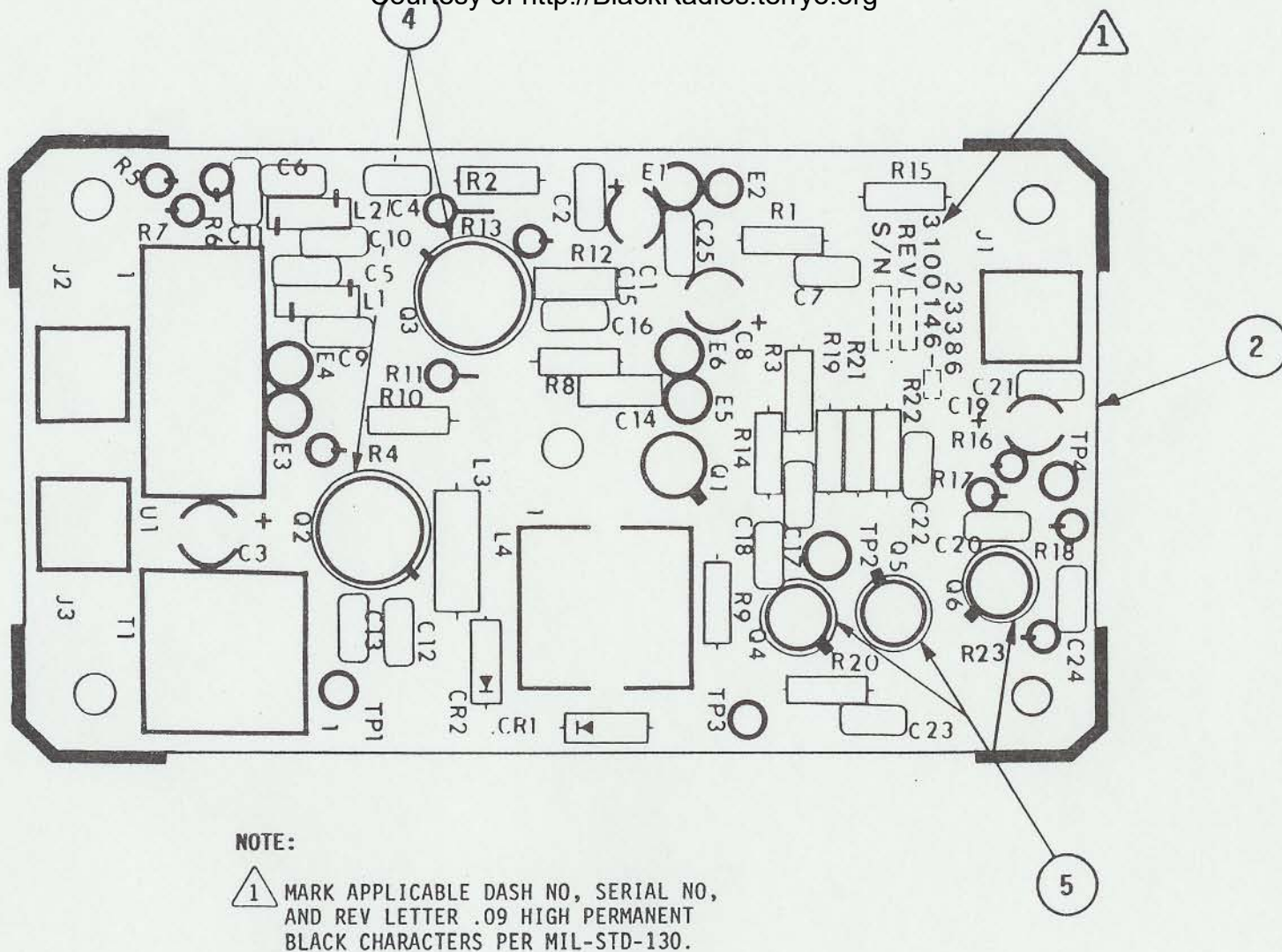
Courtesy of <http://BlackRadios.terryo.org>

Figure 6-12. Synthesizer No. 3 Circuit Card Assembly (A5A3)

**Table 6-12. Synthesizer No. 3 Circuit Card Assembly (A5A3)
Replacement Parts List**

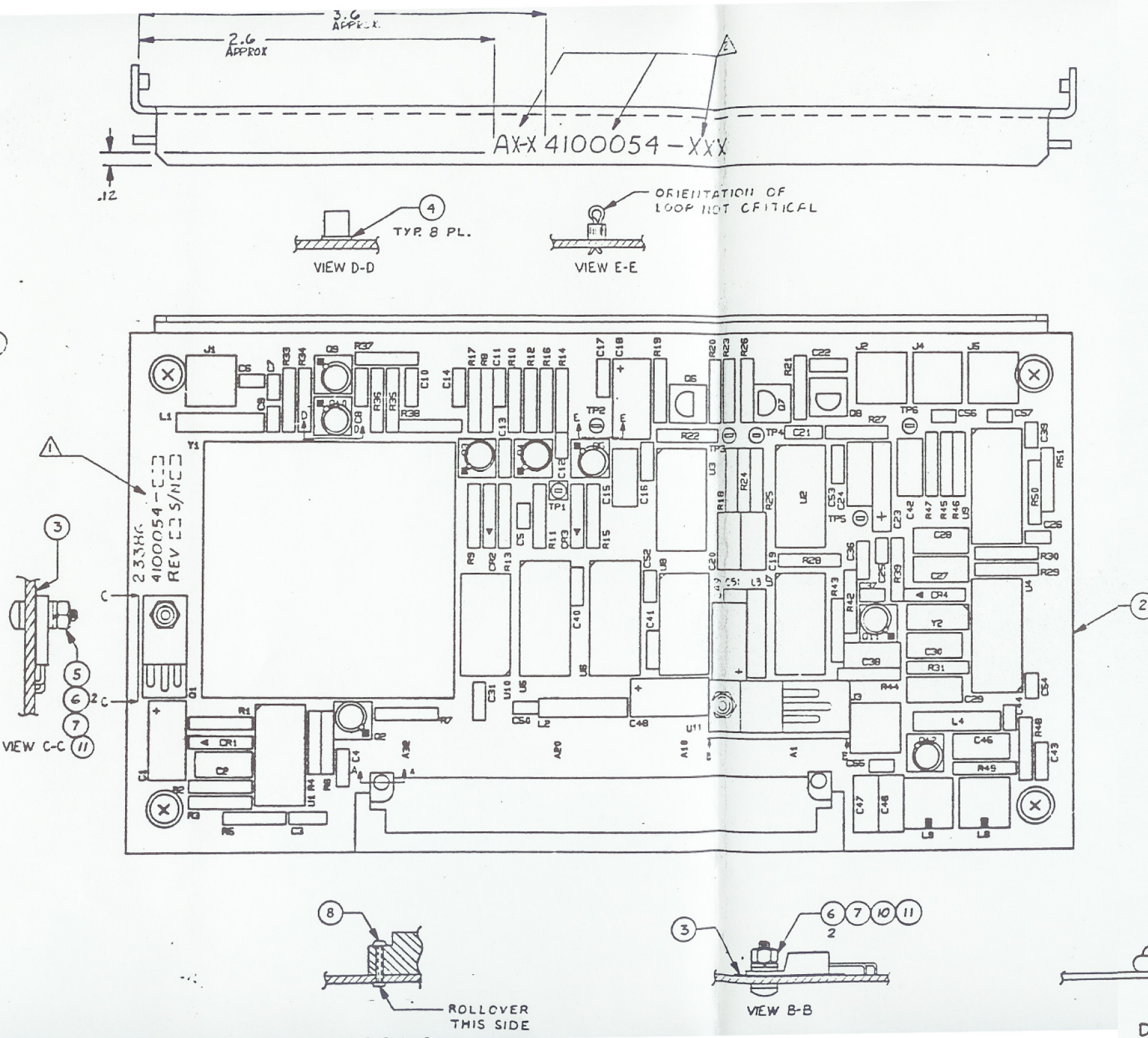
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-12	A5A3	Synthesizer No. 3 Circuit Card Assembly (PCA)	3100146-501	1
2		• Printed Circuit Card Wiring Assembly (PCB), Synthesizer No. 3	3200024-1	1
	C1, C3, C19	• • Capacitor, Fixed, Tantalum, 4.7 μ F, 20%, 35 V	25060-475	3
	C2, C4, C22, C24	• • Capacitor, Fixed, Ceramic, X7R, .01 μ F, 20%, 100 V	21799-103	4
	C5	• • Capacitor, Fixed, Ceramic, NPO, 15 pF, 5%, 100 V	21360-150	1
	C6	• • Capacitor, Fixed, Ceramic, NPO, 51 pF, 5%, 100 V	21360-510	1
	C7, C12, C17, C18, C20, C21	• • Capacitor, Fixed, Ceramic, X7R, 1000 pF, 10%, 50 V	21798-102	6
	C8	• • Capacitor, Fixed, Tantalum, 6.8 μ F, 20%, 35 V	25060-685	1
	C9	• • Capacitor, Fixed, Ceramic, NPO, 68 pF, 5%, 100 V	21360-680	1
	C10	• • Capacitor, Fixed, Ceramic, NPO, 82 pF, 5%, 100 V	21360-820	1
	C11	• • Capacitor, Fixed, Ceramic, NPO, 47 pF, 5%, 100 V	21360-470	1
	C13	• • Capacitor, Fixed, Ceramic, NPO, 5.1 pF, 5%, 100 V	21360-519	1
	C14	• • Capacitor, Fixed, Polycarbonate, .033 μ F, 2%, 50 V	26912-333	1
	C15	• • Capacitor, Fixed, Polycarbonate, 1000 pF, 2%, 30 V	26912-102	1
	C16, C23	• • Capacitor, Fixed, Ceramic, NPO, 10 pF, $\pm$.25 pF, 100 V	21360-100	2
	CR1-CR2	• • Diode, Varactor, KV2201	29016	2

Table 6-12. Synthesizer No. 3 Circuit Card Assembly (A5A3)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	E1-E6	•• Terminals	70145	6
	J1	•• Connector, SMB, PCB	60044	1
	J2, J3	•• Connector, SMB, PCB, Right-Angle	60107	2
	L1	•• Coil, RF Fixed, Toroid, .12 μ H	2100041-501	1
	L2	•• Coil, RF Fixed, Toroid, .08 μ H	2100041-502	1
	L3	•• Coil, RF Fixed, 6.8 μ H, 10%	43063-6R8	1
	L4	•• Coil, Assembly	D09255	1
	LK1	•• Link - (Ref. Index No. 3)	-	1
	Q1	•• Transistor, 2N4416	32508	1
	Q2, Q3	•• Transistor, 2N3866	32019	2
	Q4-Q6	•• Transistor, 2N2369	32255	3
	R1, R3	•• Resistor, Fixed, Film, 68 ohm, 2%, 1/4 W	12161-680	2
	R2	•• Resistor, Fixed, Film, 22 ohm, 2%, 1/4 W	12161-220	1
	R4, R18, R21	•• Resistor, Fixed, Film, 1 K, 2%, 1/4 W	12161-102	3
	R5, R7	•• Resistor, Fixed, Film, 120 ohm, 2%, 1/4 W	12161-121	2
	R6	•• Resistor, Fixed, Film, 51 ohm, 2%, 1/4 W	12161-510	1
	R8, R14, R17, R19, R22	•• Resistor, Fixed, Film, 100 ohm, 2%, 1/4 W	12161-101	5
	R9	•• Resistor, Fixed, Film, 47 ohm, 2%, 1/4 W	12161-470	1
	R10	•• Resistor, Fixed, Film, 680 ohm, 2%, 1/4 W	12161-181	1
	R11, R15, R16	•• Resistor, Fixed, Film, 10 ohm, 2%, 1/4 W	12161-100	3

**Table 6-12. Synthesizer No. 3 Circuit Card Assembly (A5A3)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R12	• • Resistor, Fixed, Film, 360 ohm, 2%, 1/4 W	12161-361	1
	R13	• • Resistor, Fixed, Film, 75 ohm, 2%, 1/4 W	12161-750	1
	R20	• • Resistor, Fixed, Film, 39 ohm, 2%, 1/4 W	12161-390	1
	R23	• • Resistor, Fixed, Film, 2.2 K, 2%, 1/4 W	12161-222	1
	T1	• • Transformer, RF	D08502-1	1
	TP1-TP4	• • Test Points	70114	4
	U1	• • Power Splitter	84521	1
		• Wire, Bus, 24 AWG (Ref. Link E3, E4)	58007	1(A/R)
		• Transistor Pad (Q2, Q3)	70809	2
		• Transistor Pad (Q4, Q5, Q6)	70805	3

Courtesy of <http://BlackRadios.terryo.org>

NOTES:

1. MARK APPLICABLE DASH NUMBER, REVISION LETTER, AND SERIAL NUMBER APPROXIMATELY WHERE SHOWN .09 HIGH BLACK CHARACTERS PER MIL-STD-130.
2. MARK SHIELD WITH APPLICABLE REFERENCE DESIGNATION AND PRINTED CIRCUIT ASSEMBLY NUMBER WITH APPLICABLE DASH NUMBER IN 12 HIGH PERMANENT CHARACTERS WHERE SHOWN IN ACCORDANCE WITH MIL-STD-130. SEE TABLE

DASH NO	MARKING
501	AG-1

3. EDN NO. 263 EFFECTIVE ON SN 201 THRU 310

4. ADD ITEM 12 TO CAPACITORS AS REQUIRED.

Figure 6-12. Frequency Reference (A6)
Assembly Diagram
(4100054)

Courtesy of <http://BlackRadios.terry.org>

Table 6-12. Frequency Reference Assembly (A6)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-12		CCA Frequency Reference Assembly	4100054-501	
1		. Schematic Frequency Ref	5200012	Ref
2		. PWB, Frequency Ref	4300022-1	1
3		. Insulator, TO-220, Silicone	70810	2
4		. Mounting Pad For TO-18, 4 Lead, .20 OD .020 THK	70805	8
5		. Screw, PNH x Rec .112-40 x .375 SS	77614	1
6		. Washer, Flat .112 SS	75022	8
7		. Nut, Plain, Hex .112-40 SS	75203	2
8		. Eyelet, .089 Dia x .37 LG Gilding NP	75921	1
9		. Shield, PC Board	3100107-501	1
10		. Screw, PNH x Rec .112-40 x .313 SS	77613	5
11		. Washer, Lock-Spring .112 SS	75002	6
12		. Bead, Glass	70854	A/R
13		. Test Spec Frequency Ref	TS501	A/R
	C1,C18	. Capacitor, FXD, Tant, 6.8 μ F, 20%, 35V	25060-685	4
	C48,C49			
	C2,C27- C29	. Capacitor, FXD, Mica, 100 pF, 2%, 500V	22372-101	3
	C3,C4, C8,C10, C11,C13, C14,C16, C17,C21	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	18
	C22,C31, C36,C40, C41,C43, C52,C53			

**Table 6-12. Frequency Reference Assembly (A6)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C5,C9, C12,C25, C39,C50, C51,C54- C57	. Capacitor, FXD, Cer, Z5U, .01 μ F, 20%, 50V	21789-103	11
	C6,C7	. Capacitor, FXD, Cer, Z5U, .047 μ F, 20%, 50V	21789-473	2
	C15	. Capacitor, FXD, Mica, 12 pF, 5%, 500V	22371-120	1
	C19,C20	. Capacitor, FXD, Mica, 39 pF, 2%, 500V	22372-390	2
	C23	. Capacitor, FXD, Tant, 3.3 μ F, 10%, 15V	25089-335	1
	C24	. Capacitor, FXD, Film, .1 μ F, 10%, 100V	26871	1
	C26,C37 C44	. Capacitor, FXD, Cer, Z5U, 1000 pF, 20%, 50V	21756	3
	C30	. Capacitor, FXD, Mica, 5 pF, $\pm$.5 pf, 500V	22371-050	1
	C38	. Capacitor, FXD, Mica, 150 pF, 2%, 500V	22372-151	1
	C42,C45	. Capacitor, FXD, Mica, 68 pF, 2%, 500V	22372-680	2
	C46	. Capacitor, FXD, Mica, 82 pF, 2%, 500V	22372-820	1
	C47	. Capacitor, FXD, Mica, 330 pF, 2%, 500V	22372-331	1
	CR1	. Diode, 1N4001, Rect, 50V, PIV	35525	1
	CR2,CR3	. Diode, 1N916 Rectifier	35514	2
	CR4	. Diode, MV1634, Varactor Ct = 22 pF, @4V, 1 MHz	29013	1
	J1-J5	. Connector, RF, SMB, PCB, Jack	60044	5

**Table 6-12. Frequency Reference Assembly (A6)
Replacement Parts List (Cont.)**

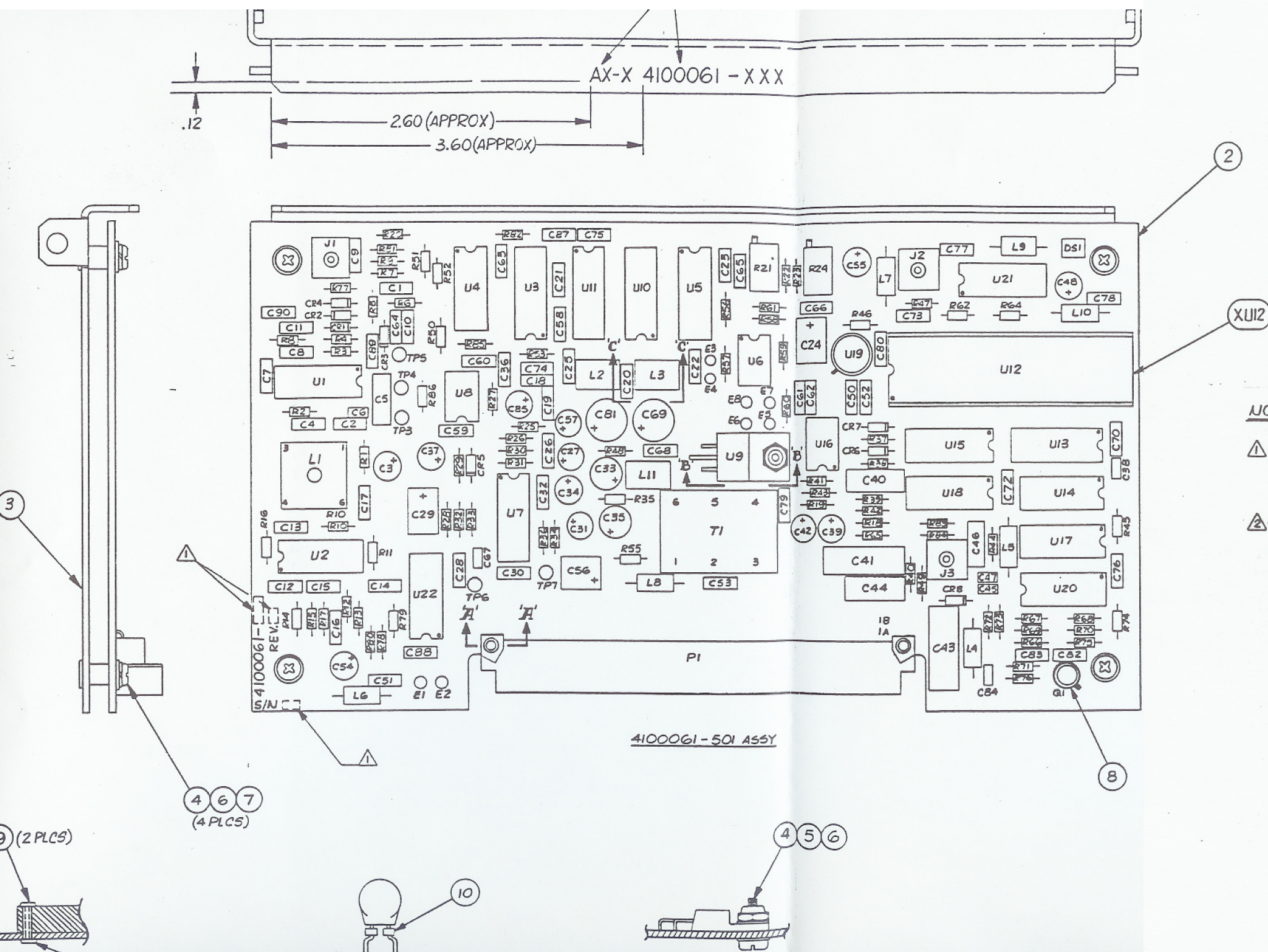
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	L1	. Coil, RF, FXD, 100 μ H, 5%	43063-101	1
	L2,L3	. Coil, RF, FXD, 5.6 μ H, 10%	43063-5R6	2
	L4	. Coil, RF, FXD, 1.0 μ H, 10%	43063-1R0	1
	L8,L9	. Coil, Assy, RF, Var	8522	2
	P1	. Connector, Din, PCB, Male, RTANG, Row A	61437-32	1
	Q1	. Transistor, 2N4921, NPN, High Power	32039	1
	Q2-Q5 Q9-Q12	. Transistor, 2N2369, NPN, Low Power	32255	8
	Q6,Q7	. Transistor, 2N3904, NPN, Low Power	32036	2
	Q8	. Transistor, 2N4126, PNP, Low Power	31508	1
	R1	. Resistor, FXD, Film, 1.0 ohm, 5%, 1/4W	12153	1
	R2,R49	. Resistor, FXD, Film, 3.9K ohm, 2%, 1/4W	12161-392	2
	R3	. Resistor, FXD, Film, 6.8K ohm, 2%, 1/4W	12161-682	1
	R4,R18 R33	. Resistor, FXD, Film, 47 ohm, 2%, 1/4W	12161-470	3
	R5,R21, R22,R26	. Resistor, FXD, Film, 680 ohm, 2%, 1/4W	12161-681	4
	R6,R27	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	2
	R7,R14 R15	. Resistor, FXD, Film, 4.7K ohm, 2%, 1/4W	12161-472	3
	R8,R10, R23	. Resistor, FXD, Film, 3.3K ohm, 2%, 1/4W	12161-332	3
	R9,R11	. Resistor, FXD, Film, 1.8K ohm, 2%, 1/4W	12161-182	2

**Table 6-12. Frequency Reference Assembly (A6)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R12,R19	. Resistor, FXD, Film, 820 ohm, 2%, 1/4W	12161-821	2
	R13,R24, R25,R28- R30,R35, R38,R43	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	12161-102	9
	R16,R36	. Resistor, FXD, Film, 330 ohm, 2%, 1/4W	12161-331	2
	R17,R37	. Resistor, FXD, Film, 10 ohm, 2%, 1/4W	12161-100	2
	R20,R39	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	2
	R31,R42 R44,R46 R50,R51	. Resistor, FXD, Film, 470 ohm, 2%, 1/4W	12161-471	6
	R34	. Resistor, FXD, Film, 33 ohm, 2%, 1/4W	12161-330	1
	R45	. Resistor, FXD, Film, 56 ohm, 2%, 1/4W	12161-560	1
	R47	. Resistor, FXD, Film, 220 ohm, 2%, 1/4W	12161-221	1
	R48	. Resistor, FXD, Film, 100 ohm, 2%, 1/4W	12161-101	1
	TP1-TP6	. Terminal, Test Point Assy	70114	6
	U1	. Microcircuit, Lin, 723, VR 2-37 V .15 A Plastic	36728	1
	U2	. IC, 74LS00, Quad 2-INP Nand Gate	36885-00	1
	U3,U7	. IC, 74LS74, Dual D, Flip-Flop	36885-74	2
	U4,U9	. IC, 10115, ECL, Line Receiver	36921-0115	2
	U5,U6	. Microcircuit, DGTL, 74LS151, 8-Input Multiplexer	36885-151	2

**Table 6-12. Frequency Reference Assembly (A6)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U8	. Microcircuit, DGTL, 74LS90, Decade Counter	36885-90	1
	U10	. IC, 74LS04, Hex Inverter	36885-04	1
	U11	. Microcircuit, Lin, 7805, VR Pos, 5V, 1A TO-220	36916-05	1
	Y1	. OCXO, 5 MHz	8289	1
	Y2	. Crystal, 20.000 MHz per Spec Control Dwg	37039	1

Courtesy of <http://BlackRadios.terryo.org>**NOTES:**

- ① - MARK APPLICABLE DASH No., REV. LETTER, AND SERIAL No. APPROX. WHERE SHOWN .093 HIGH BLACK CHARACTERS PER MIL-STD-130.
- ② - MARK SHIELD WITH APPLICABLE REFERENCE DESIGNATION AND PRINTED CIRCUIT BOARD ASSY. No. WITH APPLICABLE DASH No. IN .12 HIGH PERMANENT BLACK CHARACTERS WHERE SHOWN IN ACCORDANCE WITH MIL-STD-130 (SEE TABLE).

Figure 6-13. Demodulator/BFO (A7)
Assembly Diagram
(4100061)

Courtesy of <http://BlackRadios.terryo.org>Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-13		CCA Demodulator/BFO A7	4100061-501	
1		Schematic, Demod and BFO	5200029	Ref
2		PWB Demod and BFO	4300310-1	1
3		Shield PC Board	3100107-501	1
4		Screw, PNH X Rec .112-40 X .313 SST	77613	5
5		Nut, Self-Locking Hex .112-40 SST	75483-440	1
6		Washer, Flat .112 SST	75022	6
7		Washer, Lock-Spring .112 SST	75002	4
8		Mounting Pad for TO-18 4 lead .20 OD .020 Thk	70805	1
9		Eyelet, .089 Dia X .37 LG Gilding NP	75921	2
10		Bead, Glass	70854	6
	C1, C2, C8-C11, C13-C17, C23, C25, C32, C51- C53, C59- C64, C68, C70, C72, C74-C76, C79, C80, C87, C88 C90	Capacitor, FXD CER Z5U .22 μ F, 20, 50V	21797-224	34
	C3, C57, C85 C4 C5	Capacitor, ELCTLT TANT 100 μ F, 20%, 20V Capacitor, FXD CER NPO 3300 pF, 2%, 100V Capacitor, FXD MICA 100 pF, 2%, 500V	25099-107 21371-332 22373-101	3 1 1

**Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C6	Capacitor, FXD CER X7R, .01 μ F, +/- 10%, 100V	21799-103	1
	C7, C12, C26, C36 C73, C83 C89	Capacitor, FXD CER X7R, .1 μ F, +/- 10%, 50V	21799-103	7
	C18, C21 C28, C30 C58, C65 C66	Capacitor, FXD CER Z5U 2.2 μ F, 20%, 50V	21766	7
	C19, C22	Capacitor 300-100-NPO-562G	21372-562	2
	C20	Capacitor 300-100-NPO-103G	21372-103	1
	C24, C29	Capacitor, FXD TANT 220 μ F, 20%, 10V	25101-227	2
	C27, C31 C37, C42	Capacitor, FXD TANT 6.8 μ F, 20%, 35V	25060-685	4
	C33, C35	Capacitor, FXD ELCTLT 220 μ F, 16V 61275 SSM220M16S	24104	2
	C34, C54 C55	Capacitor, FXD TANT 47 μ F, 20%, 20V	25062-476	3
	C38, C45 C74, C84	Capacitor, FXD CER 1000 pF, 10%, 100V	21798-102	4
	C39, C48	Capacitor, FXD TANT 22 μ F, 20%, 15V	25063-226	2
	C40, C44	Capacitor, .01 μ F, 20%, 400V MEPCO C280-MCF-A10K	26870	2
	C41, C43	Capacitor, FXD Film, .47 μ F, 10%, 100V	26874	2
	C46	Capacitor, FXD MICA 240 pF, 2%, 500V	22372-241	1
	C50	Capacitor, FXD CER Z5U 1.0 μ F, 20%, 50V	21748	1

**Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C56	Capacitor, FXD TANT 100 μ F, 20%, 10V	25064-107	1
	C67	Capacitor, FXD CER X7R, 330 pF, +/- 10%, 100V	21798-331	1
	C69, C81	Capacitor, FXD ELCTLT 220 μ F, -10/+30%, 25V	24092	2
	C77, C78, C82	Capacitor, FXD CER X7R, .47 μ F, +/- 10%, 50V	21797-474	3
	CR1-CR5	Diode, 1N916 Rectifier	35514	5
	CR6, CR7	Diode, 1N4149 Switching	35528	2
	CR8	Diode, MV1650, Varactor, Ct=100 pF @4V/1MHz	29006	1
	DS1	LED, SLB-22UR	41052	1
	J1-J3	Connector, RF SMB PCB Jack	60044	3
	L1	Coil, Assy	8531	1
	L2, L3	Coil, RF Fxd 27 MH, 10%	43069-273	2
	L4	Coil, RF Fxd 2200 uH, 10%	43068-222	1
	L5	Coil, RF Fxd 68 uH, 5%	43063-680	1
	L6-L8	Coil, RF Fxd 100 uH, 5%	43063-101	3
	L9, L10	Coil, RF Fxd 47 uH, 50	43063-470	2
	L11	Coil, RF Fxd 3.9 MH, 10%	43069-392	1
	P1	Connector, DIN PCB Male Rtang Row A & B	61437-64	1
	Q1	Transistor, 2N2222A NPN Low Power	31511	1
	R1, R48	Resistor, FXD Film 10 Ohm, 2%, 1/4W	12161-100	2
	R2	Resistor, FXD Film 820 Ohm, 2%, 1/4W	12161-821	1
	R3, R7, R85	Resistor, FXD Film 4.7K Ohm, 2%, 1/4W	12161-472	3

Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R4, R5	Resistor, FXD Film		
	R8, R50-	10K Ohm, 2%, 1/4W	12161-103	12
	R52, R62			
	R69, R70			
	R74, R83			
	R6, R9	Resistor, FXD Film		
		1.0K Ohm, 2%, 1/4W	12161-102	3
	R10	Resistor, FXD Film		
		6.8K Ohm, 2%, 1/4W	12161-682	1
	R11	Resistor, FXD Film		
		470 Ohm, 2%, 1/4W	12161-471	1
	R12, R80	Resistor, FXD Film		
		1.8K Ohm, 2%, 1/4W	12161-182	2
	R13-R15,	Resistor, FXD Film		
	R17, R77	3.3K Ohm, 2%, 1/4W	12161-332	5
	R16, R47	Resistor, FXD Film		
		1.2K Ohm, 1%, 1/10W	12161-122	2
	R19, R84	Resistor, FXD Film		
		270 Ohm, 2%, 1/4W	12161-271	2
	R20, R44	Resistor, FXD Film		
	R49, R64	2.2K Ohm, 2%, 1/4W	12161-222	7
	R75, R78			
	R82			
	R21, R24	Resistor, VAR PCB M-Turn		
		5K Ohm, 10%, 1/2W	16104-502	2
	R22, R23	Resistor, FXD Film		
	R55, R71	100 Ohm, 10%, 1/2W	16104-502	2
	R25-R27,	Resistor, FXD Film		
	R31-R33,	100K Ohm, 2%, 1/4W	12161-104	12
	R36, R43			
	R45, R56			
	R59, R72			

Courtesy of <http://BlackRadios.terryo.org>Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R28, R38	Resistor, FXD Film 39K Ohm, 2%, 1/4W	12161-393	2
	R29	Resistor, FXD Film 68K Ohm, 2%, 1/4W	12161-683	1
	R30	Resistor, FXD Film 12K Ohm, 2%, 1/4W	12161-123	1
	R34, R57	Resistor, FXD Film 27K Ohm, 2%, 1/4W	12161-273	3
	R60	Resistor, FXD Film 150 Ohm, 2%, 1/4W	12161-151	1
	R35	Resistor, FXD Film 8.2K Ohm, 2%, 1/4W	12161-822	1
	R37	Resistor, FXD Film 47K Ohm, 2%, 1/4W	12161-473	4
	R39, R40	Resistor, FXD Film 220 Ohm, 2%, 1/4W	12161-221	2
	R65, R86	Resistor, FXD Film 15K Ohm, 2%, 1/4W	12161-153	1
	R41, R46	Resistor, FXD Film 22K Ohm, 2%, 1/4W	12161-223	3
	R42	Resistor, FXD Film 18K Ohm, 2%, 1/4W	12161-183	1
	R58, R61	Resistor, FXD Film 7.5K Ohm, 2%, 1/4W	12161-752	1
	R73	Resistor, FXD Film 2.7K Ohm, 2%, 1/4W	12161-272	1
	R66	Resistor, FXD Film 330 Ohm, 2%, 1/4W	12161-331	1
	R67	Resistor, FXD Film 680K Ohm, 2%, 1/4W	12161-681	1
	R68	Resistor, FXD Film 4.7K Ohm, 2%, 1/4W	12161-472	1
	R76	Resistor, FXD Film		
	R79	Resistor, FXD Film		
	R81	Resistor, FXD Film		

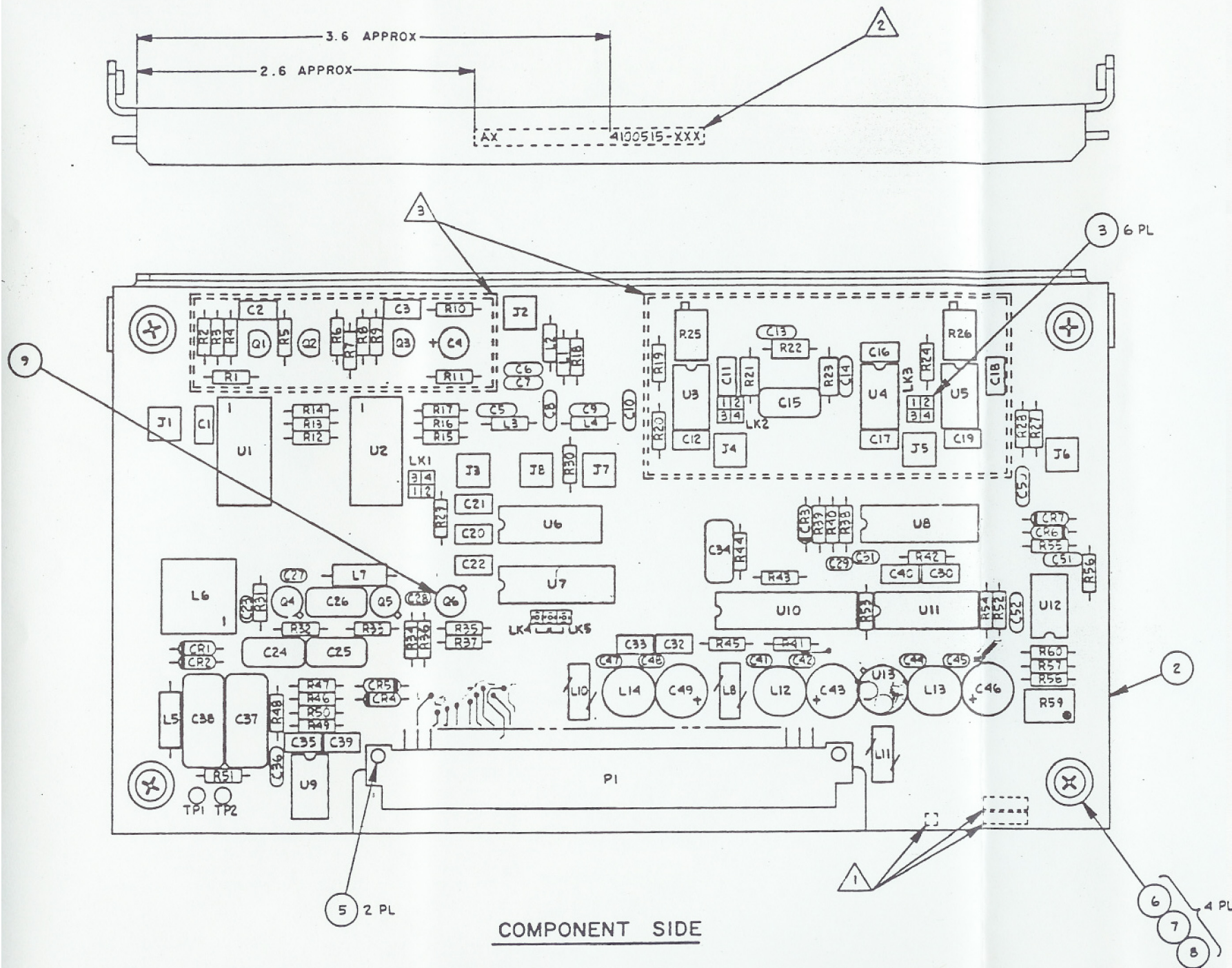
**Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	T1	Trans, Audio, 4-0100, ADC	44519	1
	TP3-TP7	Terminal, Test Point Assy	70114	5
	U1	Microcircuit, LIN, MC1357 FM Detector	36631	1
	U2	Microcircuit, LIN, 1496 BAL MOD/DEM0D	36748	1
	U3	Microcircuit, DGTL, 4053B Anlg MUX/DEMUX 2 ch	36889-053	1
	U4, U21	IC 7406 Hex Inverter	36601	2
	U5	Microcircuit, LIN, 22100 4X4, XPT, SW W/CONT MEM	36802	1
	U6	Microcircuit, LIN, 1458 Op-Amp	36673	1
	U7	Microcircuit, LIN, LM1877 Dual Power Audio Ampl	365073	1
	U8	Microcircuit, LIN, TL072CP Op Amp	36950	1
	U9	Microcircuit, LIN, 7812 VR Pos 12V, 1A TO-220	36916-12	1
	U10, U11	Microcircuit, Digital, 40109B Lo-Hi V Interface	36889-0109	2
	U12	Microcircuit, Digiphase Processor	36991	1
	U13	IC, 74C163N Binary Counter, W/Syn Clear	36891-163	1
	U14, U15	Microcircuit, Digital, CMOS 4013B Dual D Flip-Flop	36889-013	2
	U16	Microcircuit, LIN, CA3140 Op-Amp	36817	1
	U17	Microcircuit, Digital, CMOS 4001B NOR Gate	36889-001	1
	U18	IC, 74C90, 4-Bit Decade Counter	36891-90	1
	U19	Microcircuit, LIN, LM317, Pos Vr Adj TO-39	36907	1

Courtesy of <http://BlackRadios.terryo.org>

**Table 6-13. Demodulator/BFO (A7) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U20	Microcircuit, LIN, TL074, BIFET Op-Amp	365020	1
	U22	Microcircuit, Digital, 4066B Bilateral Switch	36889-066	1
	XU12	Socket, IC, 40 Cont DIP PCB	70636-40	1

Courtesy of <http://BlackRadios.terry.org>

NOTES:

UNLESS OTHERWISE SPECIFIED:

- ① MARK APPLICABLE DASH NO REVISION LETTER AND SERIAL NO. APPROXIMATELY WHERE SHOWN, .09 HIGH PERMANENT LEGIBLE CHARACTERS PER MIL-STD-130.
- ② MARK SHIELD WITH APPLICABLE REFERENCE DESIGNATION, CIRCUIT CARD ASSEMBLY NUMBER AND APPLICABLE DASH NUMBER IN .12 HIGH PERMANENT CHARACTERS WHERE SHOWN IN ACCORDANCE WITH MIL-STD-130. SEE TABLE 1.
- ③ DASHED LINES INDICATE LOCATION OF SHIELD BOXES FOR OPTIONAL FUTURE USE.
- ④ PINS 1 AND 2 OF LKS 1, 2 AND 3 ALWAYS JUMPED.

-503	AB	4100515-503
-502	AB	4100515-502
-501	AB	4100515-501
DASH- NUMBER	REF DES	CIRCUIT CARD ASSEMBLY NUMBER

TABLE 1

Figure 6-14.

Baseband Converter (A8)
Assembly Diagram
(4100515)

Courtesy of <http://BlackRadios.terryo.org>

Table 6-14. Baseband Converter Assembly (A8)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-14		Baseband Converter	4100515-503	1
2		. PWB Baseband Converter	4300249-1	1
3		. Connector HDR S-Row 2 Cont	61371-02	6
4		. Shield PC Board	3100107-501	1
5		. Eyelet .089 Dia X .37 LG Gilding NP	75921	2
6		. Screw, Pnh X Rec .112-40 x .313 SS	77613	4
7		. Washer, Flat .112 SS	75022	4
8		. Washer, Lock-Spring .112 SST	70805	1
9		. Mounting Pad for TO-18 4 lead .20 OD .020 Thk	70805	1
10		. Connector HDR S-Row 3 Cont	61371-03	1
	C1-C3, C11, C12, C16-C22, C30, C32, C33, C35, C39, C40	. Capacitor, FXD CER X7R .1 μ F $\pm$ 10%, 50V	21797-104	18
	C4	. Capacitor, FXD TANT 15 μ F, 20%, 20V	25062-156	1
	C5	. Capacitor, 200-050-223K	21796-223	1
	C6, C14	. Capacitor 300-050-124K	21797-124	2
	C7, C13	. Capacitor 300-100-NPO-103G	21372-103	2
	C8	. Capacitor 200-050-273K	21796-273	1
	C9	. Capacitor, FXD CER NPO 2200 pF, 2%, 100V	21371-222	1
	C10	. Capacitor 300-100-NPO-123G	21372-123	1
	C15	. Capacitor, FXD MICA 68 pF, 2%, 500V	22372-680	1
	C23, C27- C29, C31	. Capacitor, FXD CER Z5U .01 μ F, 20%, 50V	21789-103	5

**Table 6-14. Baseband Converter Assembly (A8)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C24	Capacitor, FXD MICA 56 pF, 2%, 500V	22372-560	1
	C25, C26	Capacitor, FXD MICA 100 pF, 2%, 500V	22372-101	2
	C34	Capacitor, FXD MICA 1000 pF, 2%, 100V	22372-102	1
	C36	Capacitor, FXD CER Z5U 1.0 μ F, 20%, 50V	21748	1
	C37, C38	Capacitor, FXD MICA 1500 pF, 2%, 500V	22373-152	2
	C41, C42,	Capacitor, FXD CER Z5U		
	C44, C45	.1 μ F, 20%, 50V	21795-104	9
	C47, C48,			
	C50-C52			
	C43, C46	Capacitor, FXD TANT		
	C49	68 μ F, 20%, 25V	25061-686	3
	CR1, CR2	Diode, MV1650 Varactor Ct=100 pF @4V/1MHz	29006	2
	CR3-CR7	Diode, MA47266 PIN	36023	5
	J1-J8	Connector, RF SMB PCB Jack	60044	8
	L1	Coil, RF Fxd 47 uH, 10%	43062-470	1
	L2	Coil, RF Fxd 27 uH, 10%	43062-270	1
	L3	Coil, RF Fxd 33 uH, 10%	43062-330	1
	L4	Coil, RF Fxd 68 uH, 10%	43062-680	1
	L5, L7	Coil, RF Fxd 33 uH, 10%	43063-330	2
	L6	Coil Assembly	8525	1
	L8, L10	Coil Assembly	2100129-501	3
	L11			
	L12-L14.	Coil, RF Fxd 220 uH, 10%	43069-221	3
	LK1-LK3,	Connector, Plug Jumper .1 Ctrs	70124	4
	LK5			

Table 6-14. Baseband Converter Assembly (A8)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	P1	. Connector, DIN PCB Male Rtang Row A & B	61437-64	1
	Q1-Q3	. Transistor, 2N5089 NPN Low Power	32021	3
	Q4, Q5	. Transistor, 2N3823 FET N Channel	32511	2
	Q6	. Transistor, 2N2369 NPN Low Power	32255	1
	R1, R2, R30, R36, R49, R50, R52, R56, R57	. Resistor, FXD Film 10K Ohm, 2%, 1/4W	12161-103	9
	R3, R10, R11, R18, R27	. Resistor, FXD Film 47 Ohm, 2%, 1/4W	12161-470	5
	R4, R6, R7, R47, R60	. Resistor, FXD Film 1.0K Ohm, 2%, 1/4W	12161-102	5
	R5, R43	. Resistor, FXD Film 3.9K Ohm, 2%, 1/4W	12161-392	2
	R8, R20	. Resistor, FXD Film 6.8K Ohm, 2%, 1/4W	12161-682	2
	R9, R24, R37	. Resistor, FXD Film 470 Ohm, 2%, 1/4W	12161-471	3
	R12, R14, R15, R17	. Resistor, FXD Film 150 Ohm, 2%, 1/4W	12161-151	4
	R13, R16, R29	. Resistor, FXD Film 39 Ohm, 2%, 1/4W	12161-390	3
	R19, R42, R45	. Resistor, FXD Film 1.5K Ohm, 2%, 1/4W	12161-152	3
	R21-R23	. Resistor, FXD Film 475 Ohm, 1%, 1/10W	12166-4750	3
	R25, R26	. Resistor, Var PCB M-Turn 10K Ohm, 10%, 1/2W	16110-103	2

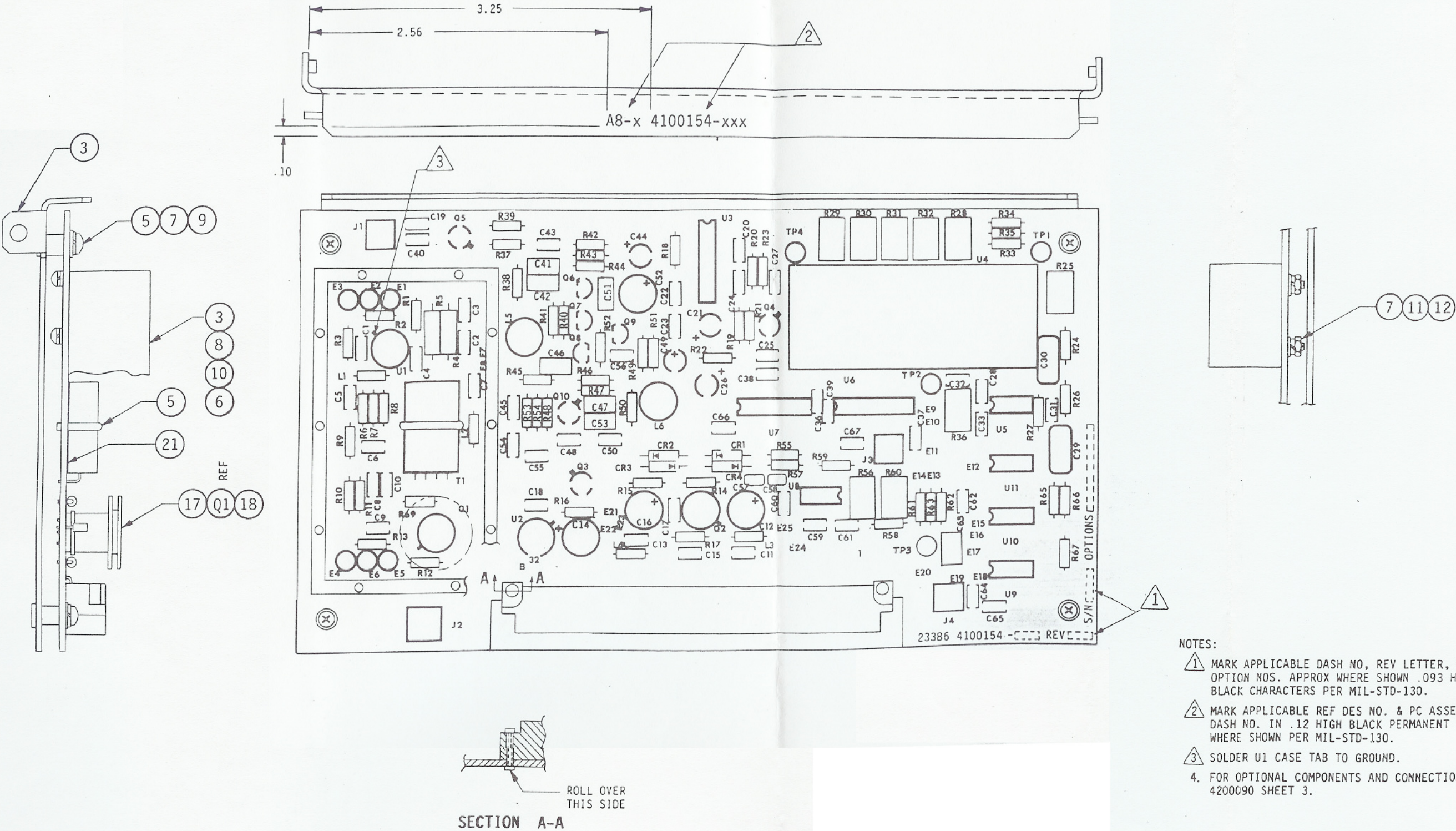
**Table 6-14. Baseband Converter Assembly (A8)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R28	. Resistor, FXD Film 2.2K Ohm, 2%, 1/4W	12161-222	1
	R31, R33	. Resistor, FXD Film 560K Ohm, 2%, 1/4W	12161-564	2
	R32, R38,	. Resistor, FXD Film		
	R40	680 Ohm, 2%, 1/4W	12161-681	3
	R34	. Resistor, FXD Film 330 Ohm, 2%, 1/4W	12161-331	1
	R35, R51	. Resistor, FXD Film 4.7K Ohm, 2%, 1/4W	12161-472	2
	R39	. Resistor, FXD Film 68 Ohm, 2%, 1/4W	12161-680	1
	R41	. Resistor, FXD Film 560 Ohm, 2%, 1/4W	12161-561	1
	R44	. Resistor, FXD Film 39K Ohm, 2%, 1/4W	12161-393	1
	R46	. Resistor, FXD Film 470K Ohm, 2%, 1/4W	12161-474	1
	R48	. Resistor, FXD Film 2.7K Ohm, 2%, 1/4W	12161-272	1
	R53-R55,	. Resistor, FXD Film		
	R58	100K Ohm, 2%, 1/4W	12161-104	4
	R59	. Resistor, VAR PCB M-Turn 10K Ohm, 10%, 1/2W	16132-103	1
	TP1, TP2	. Terminal Test Point Assembly	70114	2
	U1	. Power Splitter/Combiner 2 kHz - 60 MHz	84543	1
	U2	. Mixer, 10 kHz to 50 MHz (If BW DC - 50 MHz)	84538	1
	U3-U5	. Microcircuit, LIN LT1037 Op-Amp Low-Noise	365159	3
	U6	. IC 74HCT04 Hex Inverter	365078-04	1

**Table 6-14. Baseband Converter Assembly (A8)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U7	. Microcircuit, Digital 74HC390 Dual 4-Bit Counter	365022-390	1
	U8	. Microcircuit, Digital SP8695B Prescaler	365165	1
	U9	. Microcircuit, LIN OP-27G Op-Amp	36924	1
	U10	. Microcircuit, NJ8821B Freq Synth	365164	1
	U11	. Microcircuit, Digital 74HC164 8-Bit S-Register	365022-164	1
	U12	. Microcircuit, LIN LM358N Op-Amp Dual Low-Power	365122	1
	U13	. Microcircuit, LIN 78M05 VR 5V, 500MA	365176	1

Courtesy of <http://BlackRadios.terryo.org>



- NOTES:
- 1 MARK APPLICABLE DASH NO, REV LETTER, SERIAL NO, AND OPTION NOS. APPROX WHERE SHOWN .093 HIGH PERMANENT BLACK CHARACTERS PER MIL-STD-130.
 - 2 MARK APPLICABLE REF DES NO. & PC ASSEMBLY NO. WITH DASH NO. IN .12 HIGH BLACK PERMANENT CHARACTERS WHERE SHOWN PER MIL-STD-130.
 - 3 SOLDER U1 CASE TAB TO GROUND.
 - 4. FOR OPTIONAL COMPONENTS AND CONNECTIONS SEE DWG 4200090 SHEET 3.

Figure 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)

Table 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)
Replacement Parts List

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-15	A8-6	Specialized Demodulator Circuit Card	4100154	1
	C1, C2, C4-C11, C13, C15, C17-C20, C22-C25, C27, C28, C31-C33, C36-C40, C43, C45, C48, C50, C54-C56, C59-C66	• Capacitor, Fixed, Ceramic, Z5U, .22 μ F, 50 V	21795-224	45
	C63	• Capacitor, Fixed, Film, .15 μ F, 10%, 63 V	26914-154	4
	C3, C51, C53, C67	• Capacitor, Fixed, Ceramic, Z5U, 1.0 μ F, 20%, 50 V	21748	4
	C12, C16	• Capacitor, Fixed, Tantalum, 68 μ F, 20%, 25 V	25061-686	2
	C14, C52	• Capacitor, Fixed, Tantalum, 100 μ F, 20%, 20 V	25062-107	2
	C21, C26, C44, C49	• Capacitor, Fixed, Tantalum, 6.8 μ F,	25060-685	4
	C29	• Capacitor, Fixed, Mica, 47 pF, 2%	22372-470	1
	C30	• Capacitor, Fixed, Mica, 160 pF, 2%	22372-161	1
	C41, C42, C46, C47, C57, C58	• Capacitor, Fixed, Ceramic, X7R, • Capacitor, Fixed, Ceramic, X7R, .01 μ F, 10%, 50 V	21797-104 21799-103	4 2
	C34, C35, C68-C71	• Not Used		

**Table 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	CR1-CR4	• Diode, 1N270	35538	4
	J1-J4	• Connector, SMB, Jack, PCB	60044	4
	L1	• Coil, Fixed, RF, 120 μ H, 10%	43062-121	1
	L2	• Coil, Fixed, RF, 100 μ H, 10%	43062-101	1
	L3	• Coil, Fixed, RF, .47 μ H, 10%	43062-R47	1
	L4	• Coil, Fixed, 4.7 μ H, 10%	43062-R47	1
	L5	• Coil, Fixed, 1.0 ohm, 10%	43069-102	1
	L6	• Coil, Fixed, RF, 10 MH, 10%	43069-103	1
	L7, L8	• Not Used		
	P1	• Connector, DIN, PCB, 64 Contact, Male	61437-64	1
	Q1	• Transistor, 2N3866	32019	1
	Q2	• Transistor, 2N2905	32020	1
	Q3, Q4	• Transistor, 2N2222A	31511	2
	Q5, Q10	• Transistor, 2N3823	32511	2
	Q6, Q7	• Transistor, 2N3906	32037	2
	Q8, Q9	• Transistor, 2N3904	32036	1
	R1, R3, R6, R8	• Resistor, Fixed, Film, 68 ohm, 2%, 1/4 W	12161-680	4
	R2, R7	• Resistor, Fixed, Film, 150 ohm, 2%, 1/4 W	12161-151	2
	R4	• Resistor, Fixed, Film, 75 ohm, 2%, 1/2 W	12161-750	1
	R5	• Resistor, Fixed, Film, 68 ohm, 2%, 1/2 W	12161-680	1
	R9	• Resistor, Fixed, Film, 1 K, 2%, 1/4 W	12161-102	1
	R10, R57, R59	• Resistor, Fixed, Film, 560 ohm, 2%, 1/4 W	12161-561	3
	R11	• Resistor, Fixed, Film, 1.8 K, 2%,	12161-182	1
	R12, R17, R39	• Resistor, Fixed, Film, 10 ohm, 2%,	12161-100	3

Table 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)
Replacement Parts List (Cont.)

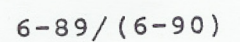
FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R13, R64, R68, R70, R71	• Resistor, Fixed, Film, 27 ohm, 2%, 1/4 W	12161-270	4
	R14	• Resistor, Fixed, Film, 2.7 K, 2%, 1/4 W	12161-272	1
	R15, R55	• Resistor, Fixed, Film, 437 K, 2%, 1/4 W	12161-472	2
	R16, R18, R33, R45, R46-R48, R54, R67	• Resistor, Fixed, Film, 10 K, 2%, 1/4 W	12161-103	9
	R19, R21, R24	• Resistor, Fixed, Film, 22 K, 2%, 1/4 W	12161-223	3
	R20, R34	• Resistor, Fixed, Film, 470 ohm, 2%, 1/4 W	12161-471	2
	R22, R23	• Resistor, Fixed, Film, 47 ohm, 2%, 1/4 W	12161-470	2
	R25	• Resistor, Variable, PCB, 50 K, 10%, 1/2 W	16104-503	1
	R26	• Resistor, Fixed, Film, 56 K, 2%, 1/2 W	12161-563	1
	R27	• Resistor, Fixed, Film, 82 K, 2%, 1/4 W	12161-823	1
	R28-R32	• Resistor, Variable, PCB, 100 K, 10%, 1/2 W	16104-104	5
	R35	• Resistor, Fixed, Film, 150 K, 2%, 1/4 W	12161-154	1
	R36	• Resistor, Variable, PCB, 50 K, 10%, 1/2 W	16103-503	1
	R37	• Resistor, Fixed, Film, 100 K, 2%, 1/2 W	12161-104	1

**Table 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)
Replacement Parts List (Cont.)**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R38, R42, R42, R44, R50, R51, R53, R61, R62 R40, R41	• Resistor, Fixed, Film, 100 ohm, 2%, 1/4 W • Resistor, Fixed, Film, 33 K, 2%, 1/4 W	12161-101 12161-333	8 2
	R43, R49, R65 R52	• Resistor, Fixed, Film, 3.3 K, 2%, • Resistor, Fixed, Film, 10 M, 2%, 1/4 W	12161-332 12161-106	3 1
	R56, R60	• Resistor, Variable, PCB, 10 K, 10%, 1/2 W	16103-103	2
	R58, R63, R33 R66	• Resistor, Fixed, Film, 5.6 K, 2%, 1/4 W • Resistor, Fixed, Film, 2.0 K, 2%, 1/4 W	12161-562 12161-202	2 1
	R69	• Resistor, Fixed, Film, 1.5 K, 2%, 1/4 W	12161-152	1
	T1	• Transformer Assembly	2100024-502	1
	TP1-TP4	• Testpoint	70114	4
	U1	• Integrated Circuit, MWA130, RF Amplifier	36902	1
	U2	• Integrated Circuit, 79M05, VR, -5 V	365019	1
	U3	• Integrated Circuit, 1357, FM Det	36631	1
	U4	• Discriminator, 2 kHz, (SCD)	1600046-1	1
	U5-U11	• Integrated Circuit, TL072 Op-Amp	36950	5
	U6, U7	• Integrated Circuit, CD40663, Analog Switch	36889-066	2
	W19	• Cable Assembly, Coax	3500058-508	1
	W20	• Cable Assembly, Coax	3500058-509	1

Table 6-15. Specialized Demodulator Circuit Card Assembly (A8-6)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	W22	• Cable Assembly, Coax	3500059-511	1
	W23	• Cable Assembly, Coax	3500058-507	1
		• Printed Circuit Board	4300072-2	1
		• Shield Assembly	3100107-501	1
		• Housing Shield	2400087-1	1
		• Screw, Panhead .112-40 x .312 SS	77613	4
		• Screw, Panhead .086-56 x .25 SS	77602	10
		• Washer, Flat, .112 SS	75022	4
		• Washer, Flat, .086 SS	75021	8
		• Washer, Split, .112 SS	75002	4
		• Washer, Split, .086 SS	75001	10
		• Washer, Spring, .112 SS	75112	2
		• Nut, Hex, .112-40 SS	75214	2
		• Loctite (Use: U4)	91063	A/R
		• Rivet, Oval Head Tubular Brass Nickle Plated .089 Dia. x .344 Lg.	75548	2
		• Mouserail Retainer	59643-2	1
		• Transistor Pad (Q3, Q4, Q5)	70805	3
		• Transistor Pad (Q1, Q2, U2)	70809	3
		• Heatsink	70801	1
		• Buswire	58007	A/R
		• Tubing	59538	A/R
		• Adhesive Sealant (RTV 108)	91013	A/R



Courtesy of <http://BlackRadios.terryo.org>
**Table 6-15. IF/AGC (A9) Assembly
 Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-15		CCA IF/AGC A9	4100058-501	
1		Schematic, IF and AGC	4200044	Ref
2		PWB IF/AGC	4300026-1	1
3		Eyelet, .089 Dia X .37 LG Gilding NP	75921	2
4		Mounting Pad for TO-18 4 lead .20 OD .020 Thk	70805	2
5		Shield PC Board	3100107-501	1
6		Screw, PNH X Rec .112-40 X .313 SST	77613	4
7		Washer, Flat .112 SST	75022	4
8		Washer, Lock-Spring .112 SST	75002	4
	C1, C3, C6, C7, C9-C13, C16, C18, C20, C21, C23, C24, C32, C34, C39, C41, C43, C45, C53	Capacitor, FXD CER Z5U .1 μ F, 20%, 50V	21795-104	29
	C2, C4, C5, C19, C30, C33, C36 C8	Capacitor, FXD CER Z5U .01 μ F, 20%, 50V Capacitor, FXD TANT 68 μ F, 20%, 15V	21789-103	7
	C14, C17	Capacitor, FXD MICA 1500 pF, 2%, 500V	25063-686	1
	C15	Capacitor, FXD MICA 82 pF, 2%, 500V	22373-152	2
			22372-820	1

Table 6-15. IF/AGC (A9) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C22, C26	Capacitor, FXD TANT		
	C31, C40	15 μ F, 20%, 20V	25062-156	6
	C42, C44			
	C25	Capacitor, FXD CER X7R		
		1000 pF, 10%, 100V	21798-102	1
	C27	Capacitor, FXD TANT		
		.022 μ F, +/- 10%, 100V	21799-223	1
	C28, C35	Capacitor, FXD TANT		
		6.8 μ F, 20%, 35V	25060-685	2
	C29	Capacitor, FXD MICA		
		120 pF, 2%, 500V	22372-121	1
	C37, C38	Capacitor, FXD CER Z5U		
	C54	1.0 μ F, 20%, 50V	21748	3
	CR1, CR2	Diode, 1N5711 Hot Carrier	36003	2
	CR3-CR13	Diode, 1N9169 Rectifier	35514	11
	J1-J4	Connector, RF SMB PCB Jack	60044	4
	L1	Coil, RF Fxd 1000 uH, 5%	43064-102	1
	L2, L3	Coil, Assy	8485	2
	L4-L6	Coil, RF Fxd 100 uH, 5%	43063-101	3
	P1	Connector, DIN PCB Male		
		Rtang Row A & B	61437-64	1
	Q1	Transistor, 2N4416, FET N-Channel	32503	1
	Q2-Q7	Transistor, 2N5089, NPN Low Power	32021	6
	Q8	Transistor, 2N2222, NPN Low Power	31512	1
	R1, R59,	Resistor, FXD Film		
	R82	1.0M Ohm, 2%, 1/4W	12161-105	3
	R2	Resistor, FXD Film		
		10 Ohm, 2%, 1/4W	12161-100	1
	R3	Resistor, FXD Film		
		120 Ohm, 2%, 1/4W	12161-121	1
	R4	Resistor, FXD Film		
		2.7K Ohm, 2%, 1/4W	12161-272	1

**Table 6-15. IF/AGC (A9) Assembly
Replacement Parts List (Cont.)**

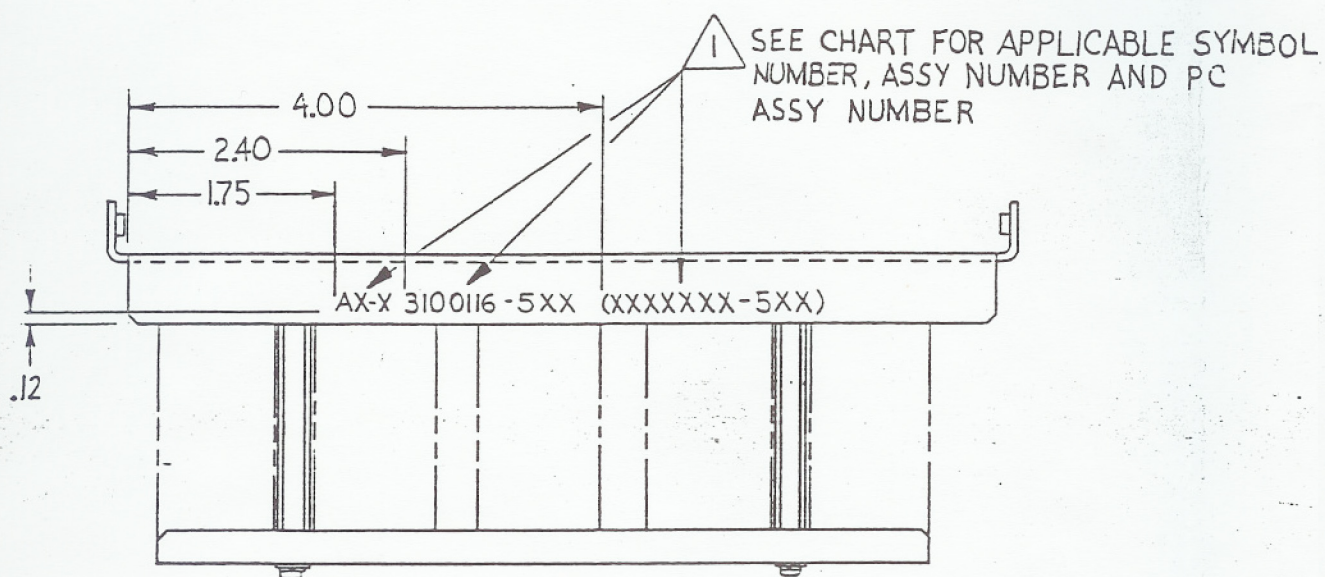
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R5	Resistor, VAR PCB M-Turn 100K, 1/4W	16159-104	1
	R7	Resistor, VAR PCB M-Turn 2K, 1/4W	16159-202	1
	R8, R13, R24, R25 R28	Resistor, FXD Film 47 Ohm, 2%, 1/4W	12161-470	5
	R9	Resistor, FXD Film 4.7K Ohm, 2%, 1/4W	12161-472	1
	R10, R11 R31, R37 R39, R48 R52	Resistor, FXD Film 10K Ohm, 2%, 1/4W	12161-103	7
	R12, R18 R20, R21 R49, R54 R5, R57, R64 R14	Resistor, FXD Film 1.0K Ohm, 2%, 1/4W	12161-102	9
	R15, R33	Resistor, Var PCB M-Turn 50K Ohm, 1/4W	16159-503	1
	R16, R29 R67, R77 R17	Resistor, FXD Film 680 Ohm, 2%, 1/4W	12161-681	2
	R19, R51 R66, R74 R22, R55 R23, R30	Resistor, FXD Film 2.2K Ohm, 2%, 1/4W	12161-222	4
		Resistor, FXD Film 100 Ohm, 2%, 1/4W	12161-101	1
		Resistor, FXD Film 15K Ohm, 2%, 1/4W	12161-153	4
		Resistor, FXD Film 6.8K Ohm, 2%, 1/4W	12161-682	2
		Resistor, FXD Film 470 Ohm, 2%, 1/4W	12161-471	2

Table 6-15. IF/AGC (A9) Assembly
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R26, R35	Resistor, FXD Film		
	R44-R46,	22K Ohm, 2%, 1/4W	12161-223	9
	R53, R60			
	R75, R81			
	R28, R72	Resistor, FXD Film		
		3.3K Ohm, 2%, 1/4W	12161-332	2
	R32, R38	Resistor, FXD Film		
	R40, R47,	47K Ohm, 2%, 1/4W	12161-473	7
	R61, R68,			
	R76			
	R34, R36	Resistor, FXD Film		
	R50, R80	1.5K Ohm, 2%, 1/4W	12161-152	4
	R41, R62	Resistor, FXD Film		
	R78, R79	100K Ohm, 2%, 1/4W	12161-104	4
	R42	Resistor, FXD Film		
		330K Ohm, 2%, 1/4W	12161-334	1
	R43, R70	Resistor, FXD Film		
	R84	27K Ohm, 2%, 1/4W	12161-273	3
	R58, R71	Resistor, FXD Film		
		18K Ohm, 2%, 1/4W	12161-183	2
	R63, R69	Resistor, FXD Film		
		12K Ohm, 2%, 1/4W	12161-123	2
	R65	Resistor, FXD Film		
		180K Ohm, 2%, 1/4W	12161-184	1
	R73	Resistor, Var PCB M-Turn		
		10K Ohm, 1/4W	16159-103	1
	R83	Resistor, FXD Film		
		5.6K Ohm, 2%, 1/4W	12161-562	1
	TP1-TP11	Terminal, Test Point Assy	70114	11
	U1	IC, LF442CN Dual Op-Amp	365030	1
	U2	Microcircuit, LIN, 78L12		
		Var Pos 12V .1A TO-92	36760	1

**Table 6-15. IF/AGC (A9) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U3	Microcircuit, LIN, 757 Gain Control IF Ampl	36541	1
	U4, U7, U10	Microcircuit, LIN, 324 Quad, Op-Amp	36784	3
	U5	Microcircuit, LIN, 3046 Transistor Array	36785	1
	U6	Microcircuit, Digital, 4049UB Hex Inverter/Buffer	36889-049	1
	U8, U9	Microcircuit, Digital, 4066B Bilateral Switch	36889-066	2
	U11	Microcircuit, Digital, CMOS 4013B Dual D Flip-Flop	36889-013	1
	U12, U13	Microcircuit, Digital, 40109B Dual D Flip-Flop	36889-0109	2



1 MARK SHIELD WITH APPLICABLE NUMBERS .12 HIGH BLACK PERMANENT CHARACTERS IN ACCORDANCE WITH MIL-STD-130

MARKING CHART					REF	
DASH	SYMBOL	ASSY NO.	PC ASSY	USED ON	FUNCTION	REV
501	A10-1	3100116-501	(4100046-501)	RA6830	IF FILTER	C
502	A10-2	3100116-502	(4100046-502)	RA6830	IF FILTER	C
503	A10	3100116-503	(4100046-503)	RA6830-511	IF FILTER	C
504	A10	3100116-504	(4100046-504)	RA6830	IF FILTER	D

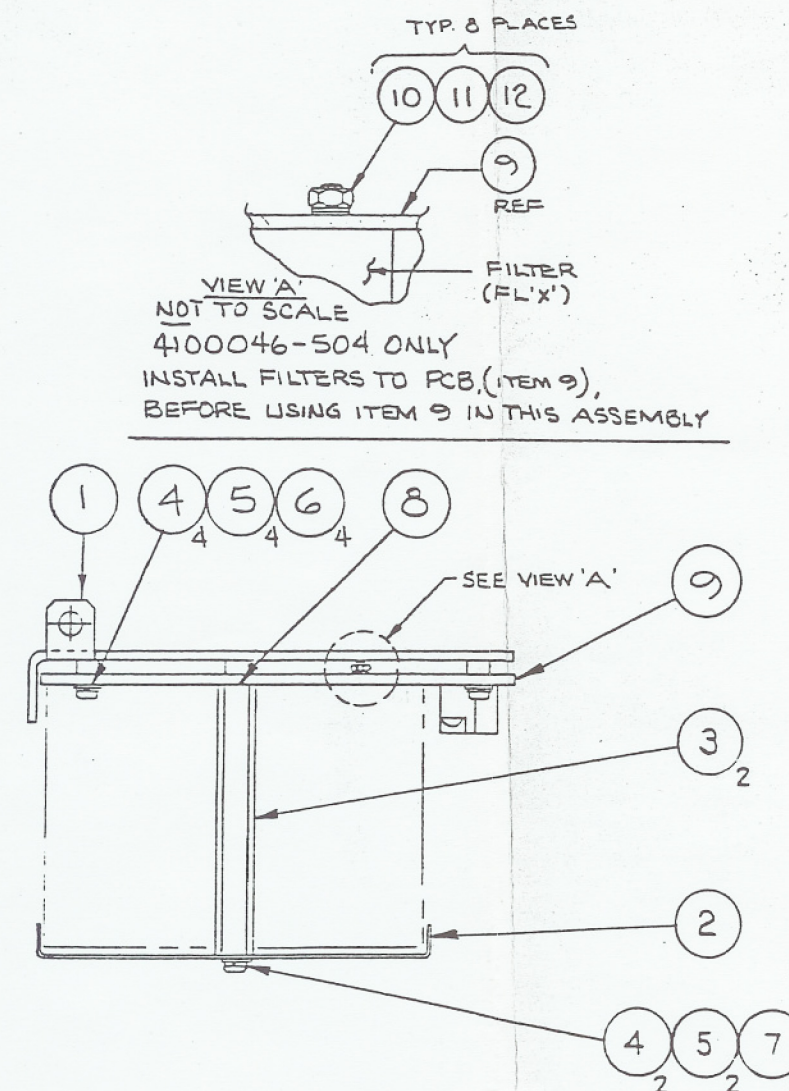
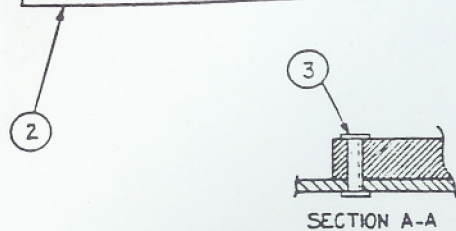
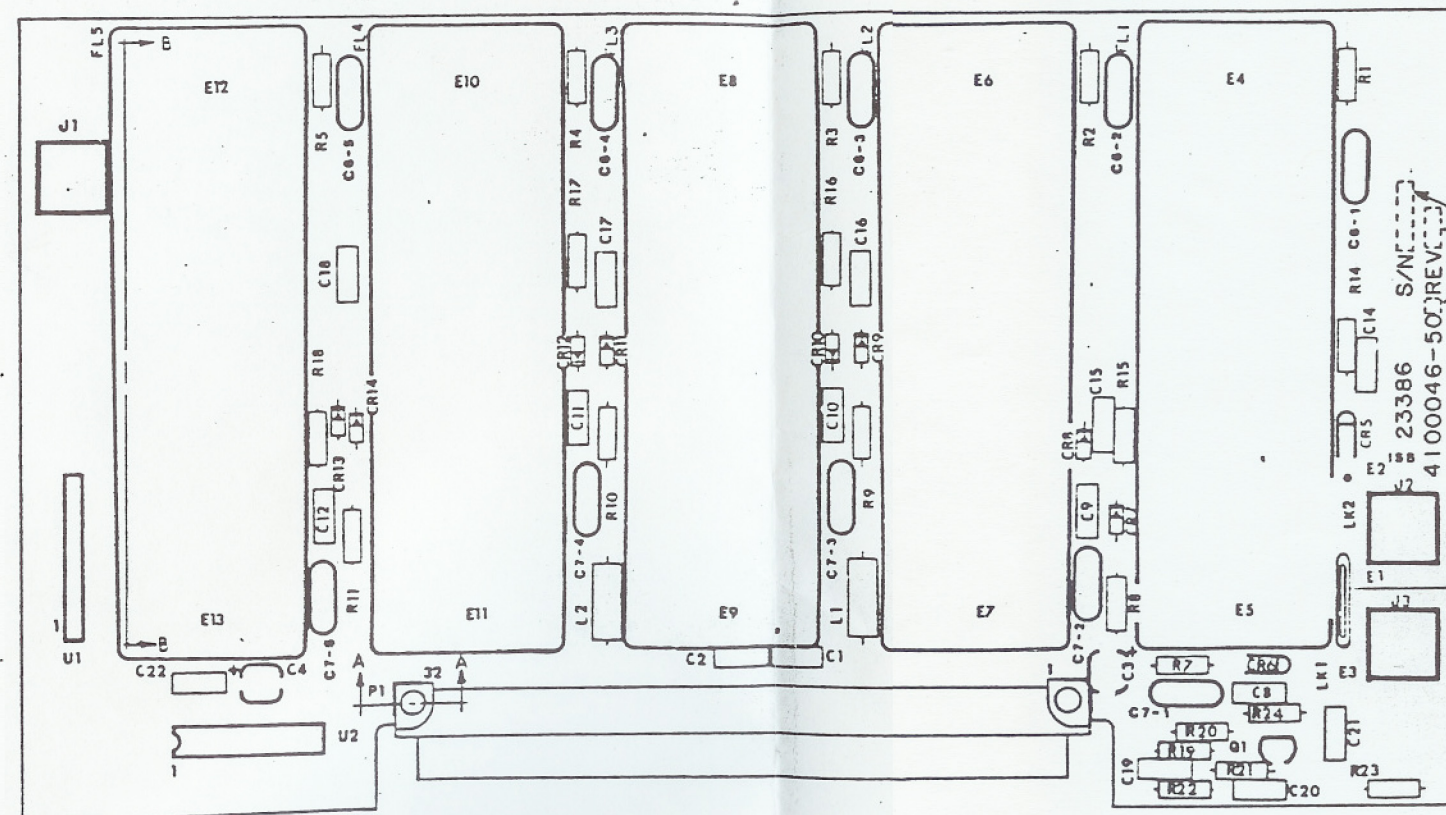
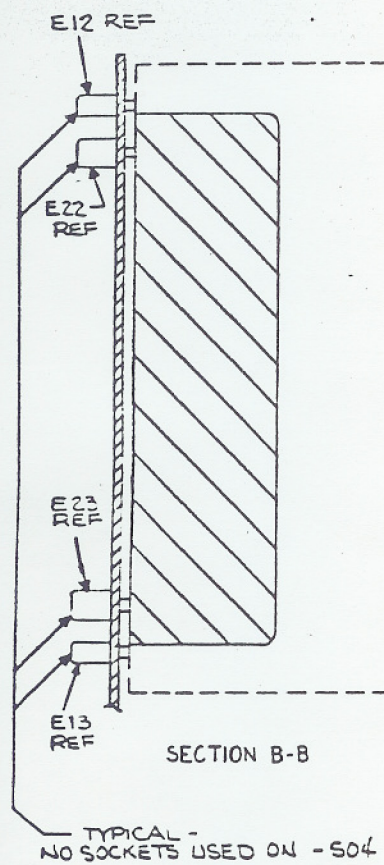


Figure 6-16. IF Filter Module (A10) Assembly Diagram (3100116)

Table 6-16. IF Filter Module Assembly (A10)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-16		IF Filter Module Assembly	3100116-504	
1		. Shield Filter Board	3100114-501	1
2		. Bracket	3400075-1	1
3		. Standoff	SP03-062	2
4		. Washer, Flat .112 SS	75022	6
5		. Washer, Lock-Spring .112 SS	75002	6
6		. Screw, PNH x Rec .112-40 x .375 SS	77614	4
7		. Screw, PNH x Rec .112-40 x .313 SS	77613	2
8		. Adhesive, Sealant THD Lock	91032	A/R
9		. CCA, IF Filter	4100046-504	1
10		. Nut, Plain, Hex .112-40 SS	75203	8
11		. Washer, Flat .112 SS	750203	8
12		. Washer, Cres .127 ID 176 OD .010 THK BeCu	75103	8
	FL1	. Filter, H455K000BP3000D25G6H	1600201-1	1
	FL2	. Filter, H455K000BP0300G70G6H	1600199-1	1
	FL3	. Filter, H455K000BP1000G40G6H	1600200-1	1
	FL4	. Filter, H455K000BP6000G15G6H	1600202-1	1



NOTES:

1. MARK APPLICABLE DASH NO, REV. LETTER AND SERIAL NO. APPROX WHERE SHOWN, .09 HIGH CHARACTERS.
2. ENG. DEVIATION NOTICE # 259 EFFECTS ASSY SERIAL #'S 201 THRU 312.

Figure 6-17.

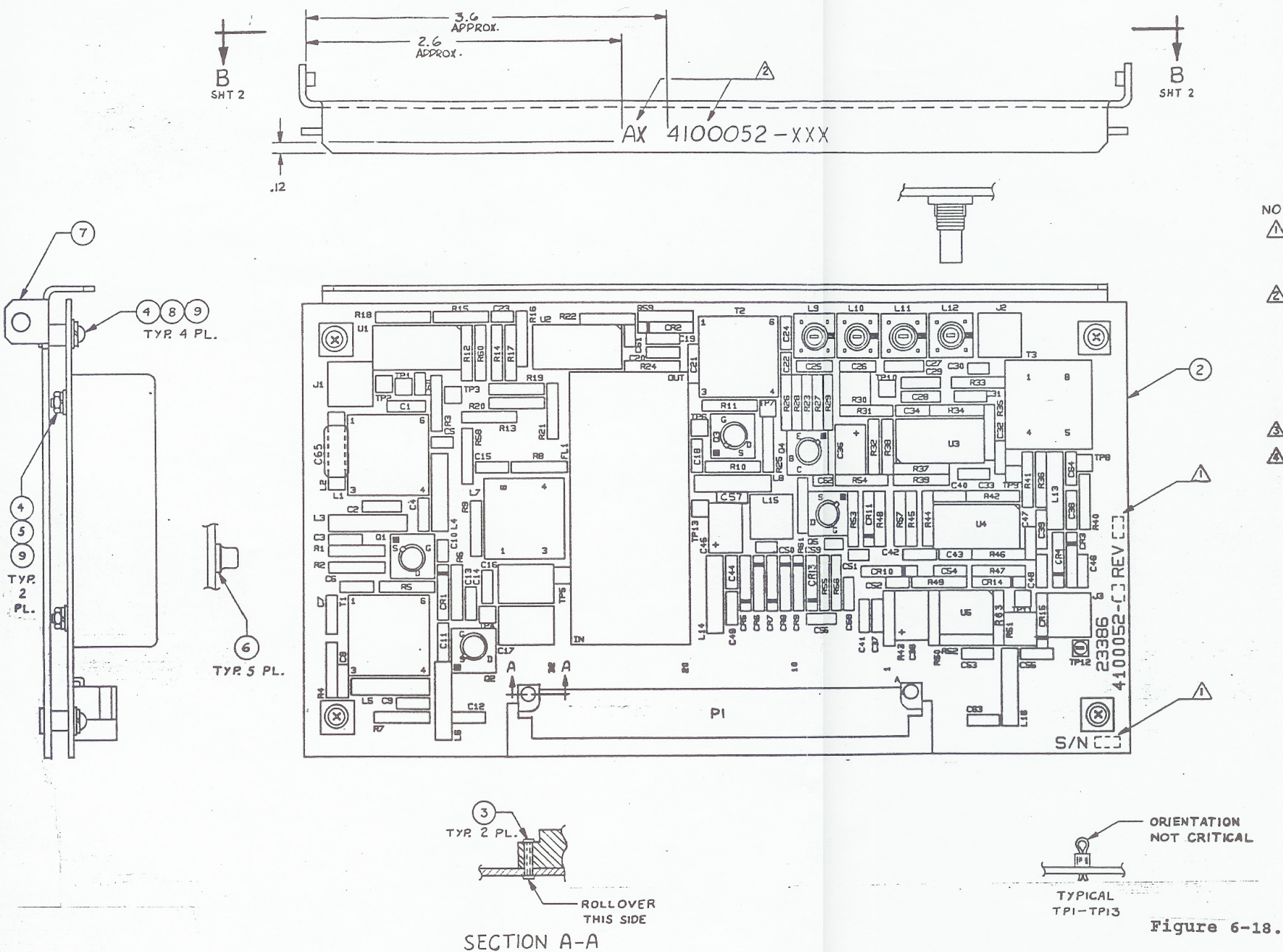
IF Filter Board (A10#9)
Assembly Diagram
(4100046)

Table 6-17. IF Filter Assembly (A10#9)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-17		IF Filter Assembly	4100046-504	
1		. Schematic IF Filter	4200020	Ref
2		. PCB Hi-Density Rcvr, RF, Fltr	4300307-1	1
3		. Eyelet .089 Dia x .37 LG Gilding NF	75921	2
	C1,C2, C8-C12, C14-C22	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	16
	C3,C4	. Capacitor, FXD, Tant, 15 μ F, 20%, 20V	25062-156	2
	CR5-CR14	. Diode, 1N916B, Rectifier	35541	10
	E1-E3	. Socket, .040 Pin	61177	3
	J1-J3	. Connector, Rf, SMB, PCB, Jack	60044	3
	L1,L2	. Coil, RF, FXD, 100 μ H, 5%	43063-101	2
	LK1	. Plug, Shorting 461-3771-01- 03-16 Cambion	61451	1
	P1	. Connector, Din, PCB, Male Rtang, Row A	610023	1
	Q1	. Transistor, 2N5089, NPN, Low Power	32021	1
	R1-R5	. Resistor, FXD, Film, 4.7K ohm, 2%, 1/4W	12161-472	5
	R7-R11, R21	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	6
	R14-R18 R22,R24	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	12161-102	7
	R19	. Resistor, FXD, Film, 220 ohm, 2%, 1/4W	12161-221	1
	R20,R23	. Resistor, FXD, Film, 47 ohm, 2%, 1/4W	12161-470	2
	U1	. Resistor, Network, 8 Sip, 10K ohm x 7 bussed	19321-103	1

Table 6-17. IF Filter Assembly (A10#9)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U2	IC, 74C906	36891-906	1

Courtesy of <http://BlackRadios.terryo.org>

NOTES:

- 1 MARK APPLICABLE DASH NUMBER, REVISION LETTER, AND SERIAL NUMBER APPROXIMATELY WHERE SHOWN IN .093 HIGH PERMANENT BLACK CHARACTERS.
- 2 MARK SHIELD WITH APPLICABLE REFERENCE DESIGNATION AND PRINTED CIRCUIT ASSEMBLY NUMBER WITH APPLICABLE DASH NUMBER IN .12 HIGH PERMANENT CHARACTERS WHERE SHOWN IN ACCORDANCE WITH MIL-STD-130. SEE TABLE
- | DASH NO | MARKING |
|---------|---------|
| 501 | All |
| 502 | All |
| 503 | All |
- 3 ADD ITEM 10 TO CAPACITORS AS REQUIRED.
- 4 REMOVE ADHESIVE PROTECTIVE LINERS OF ITEM 11 AND POSITION AS SHOWN AND PRESS DOWN SECURELY.

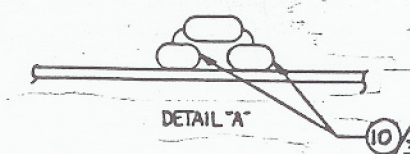


Figure 6-18.

Second Mixer (A11)
 Assembly Diagram
 (4100052) (Sheet 1 of 2)

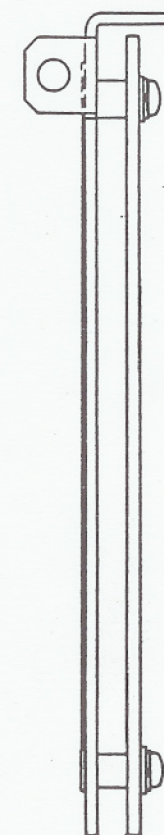
Courtesy of <http://BlackRadios.terry.org>

Figure 6-18.

Second Mixer (A11)
Assembly Diagram
(4100052) (Sheet 2 of 2)

Courtesy of <http://BlackRadios.terryo.org>Table 6-18. Second Mixer (A11) Assembly
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-18		CCA Second Mixer A11	4100052-501	
1		Schematic, Second Mixer	4200033	Ref
2		PWB Second Mixer	4300020-1	1
3		Eyelet, .089 Dia X .37 LG Gilding NP	75921	2
4		Washer, Flat .112 SST	75022	6
5		Nut, Plain Hex .112-40 SST	75203	2
6		Mounting Pad for TO-18 4 lead .20 OD .020 Thk	70805	5
7		Shield PC Board	3100107-501	1
8		Screw, PNH X Rec .112-40 X .313 SST	77613	4
9		Washer, Lock-Spring .112 SST	75002	6
10		Bead, Glass	70854	A/R
	C1	Capacitor, FXD MICA 360 pF, 2%, 500V	22372-361	1
	C2, C38,	Capacitor, FXD MICA		
	C39	22 pF, 5%, 500V	22371-220	3
	C3, C4,	Capacitor, FXD CER Z5U		
	C6, C8,	.1 μ F, 20%, 50V	21795-104	32
	C9, C12-			
	C15, C18,			
	C19, C24,			
	C31, C32,			
	C34, C37,			
	C40-C44,			
	C46-C49,			
	C53-C56,			
	C58, C63			
	C64			

**Table 6-18. Second Mixer (A11) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C5, C22, C23, C30, C51, C52, C59, C60, C62	Capacitor, FXD CER Z5U .01 μ F, 20%, 50V	21789-103	9
	C7, C21	Capacitor, FXD MICA 27 pF, 2%, 500V	22372-270	2
	C10, C61	Capacitor, FXD CER Z5U 1000 pF, 20%, 50V	21756	2
	C11	Capacitor, FXD MICA 20 pF, 5%, 500V	22371-200	1
	C16, C17	Capacitor, VAR CER, 2.5-23 pF	28041	2
	C20, C33	Capacitor, FXD CER Z5U 1.1 μ F, 20%, 50V	21748	2
	C25-C27	Capacitor, FXD MICA 68 pF, 2%, 500V	22372-680	3
	C28	Capacitor, FXD MICA 330 pF, 2%, 500V	22372-331	1
	C29	Capacitor, FXD MICA 82 pF, 2%, 500V	22372-820	1
	C35, C36, C45	Capacitor, FXD TANT 15 μ F, 20%, 20V	25062-156	3
	C50	Capacitor, FXD CER NPO 56 pF, +/- 5%, 100V	213>0-560	1
	CR1, CR2	Diode, MA47110 or KS8379	35557	2
	CR3-CR9, CR13	Diode, 1N916 Rectifier	35514	3
	CR10-CR11	Diode, 1N5711 Hot Carrier	36003	2
	FL1	Filter	8576	1
	J1-J3	Connector, RF SMB PCB Jack	60044	3
	L1, L7	Coil Assy, Fixed Toroid	4100185-501	2
	L2, L3	Coil, RF Fxd 68 uH, 10%	43063-R68	2

**Table 6-18. Second Mixer (A11) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	L4, L5, L8, L13	Coil, RF Fxd 15 uH, 10%	43063-150	4
	L6	Coil, RF Fxd .82 uH, 10%	43063-R82	1
	L9-L12	Coil Assy, RF Var	8522	4
	L14	Coil, RF Fxd 100 uH, 5%	43063-101	1
	L15	Coil, RF Fxd 4.7 MH, 10%	43069-472	1
	L16	Coil, RF Fxd 1000 uH, 5%	43064-102	1
	P1	Connector, DIN PCB Male Rtang Row A	61437-32	1
	Q1-Q3	Transistor, U310 N-Channel FET	32507	3
	Q4	Transistor, 2N918 NPN UHF Ampl	31500	1
	Q5	Transistor, 2N4416 FET N-Channel	32508	1
	R1, R7,	Resistor, FXD Film		
	R10	180 Ohm, 2%, 1/4W	12161-181	3
	R2, R11	Resistor, FXD Film		
	R36, R53	10 Ohm, 2%, 1/4W	12161-100	4
	R3, R8,	Resistor, FXD Film		
	R26, R28,	100 Ohm, 2%, 1/4W	12161-101	7
	R37, R58,			
	R60			
	R4, R13,	Resistor, FXD Film		
	R59	220 Ohm, 2%, 1/4W	12161-221	3
	R5, R24,	Resistor, FXD Film		
	R39, R63	10K Ohm, 2%, 1/4W	12161-103	4
	R6, R22,	Resistor, FXD Film		
	R34, R35,	1.0K Ohm, 2%, 1/4W	12161-102	5
	R47			
	R12, R49,	Resistor, FXD Film		
	R55, R61	100K Ohm, 2%, 1/4W	12161-104	4
	R14	Resistor, FXD Film		
		220K Ohm, 2%, 1/4W	12161-224	1
	R15, R17,	Resistor, FXD Film		
	R18	22K Ohm, 2%, 1/4W	12161-223	3

**Table 6-18. Second Mixer (A11) Assembly
Replacement Parts List (Cont.)**

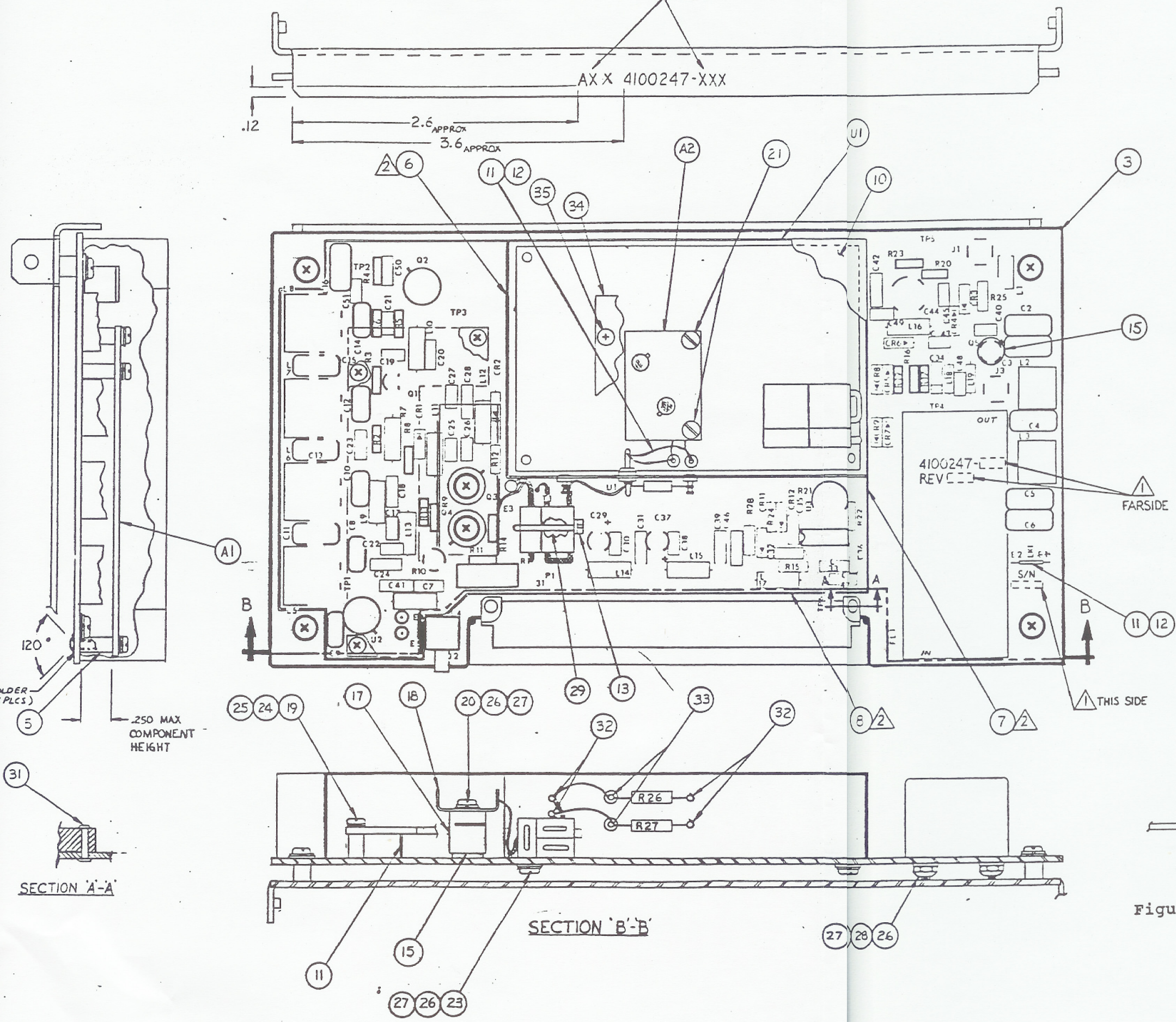
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R16, R25	Resistor, FXD Film 4.7K Ohm, 1%, 1/10W	12161-472	2
	R19, R27	Resistor, FXD Film 2.2K Ohm, 2%, 1/4W	12161-222	2
	R20	Resistor, FXD Film 27 Ohm, 2%, 1/4W	12161-270	1
	R21	Resistor, FXD Film 560 Ohm, 2%, 1/4W	12161-561	1
	R23	Resistor, FXD Film 39K Ohm, 2%, 1/4W	12161-393	1
	R29	Resistor, FXD Film 56 Ohm, 2%, 1/4W	12161-560	1
	R30	Resistor, VAR PCB S-Turn 500 Ohm, 20%, 1/2W	16105-501	1
	R31-R33, R42, R43	Resistor, FXD Film 47 Ohm, 10%, 1/2W	16104-470	6
	R48			
	R40, R41	Resistor, FXD Film 1.2K Ohm, 2%, 1/4W	12161-122	2
	R44, R57	Resistor, FXD Film 330 Ohm, 2%, 1/4W	12161-331	2
	R45, R46	Resistor, FXD Film 1.5K Ohm, 2%, 1/4W	12161-152	2
	R50, R51	Resistor, FXD Film		
	R56	1.0M Ohm, 2%, 1/4W	12161-105	3
	R52	Resistor, FXD Film 470K Ohm, 2%, 1/4W	12161-474	1
	R54	Resistor, FXD Film 120 Ohm, 2%, 1/4W	12161-121	1
	T1, T2	Coil Assy	8503	2
	T3	Trans Assy	8530	1
	TP1-TP13	Terminal, Test Point Assy	70114	13

Courtesy of <http://BlackRadios.terryo.org>

**Table 6-18. Second Mixer (A11) Assembly
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	U1	Microcircuit, LIN 324 Quad Op-Amp	36784	1
	U2	Microcircuit, LIN, 3046 Transistor Array	36785	1
	U3	Microcircuit, LIN, 1496 Bal MOD/DEM0D	36748	1
	U4	Microcircuit, LIN 733 Diff Vid Amp	36747	1
	U5	Microcircuit, LIN, LF442CN Dual Op-Amp	365030	1

Courtesy of <http://BlackRadios.terryo.org>



- NOTES
- 1 MARK APPLICABLE DASH NO, REV LETTER, AND SERIAL NO. .093 HIGH PERMANENT BLACK CHARACTERS IN ACCORDANCE WITH MIL-STD 130.
 - 2 ITEMS 6,7,8, MUST BE SOLDERED TO EACH OTHER & ALL AROUND TO ITEM 3.
 - 3 MARK SHIELD WITH APPLICABLE REF DESIGNATION AND PRINTED CIRCUIT ASSEMBLY NUMBER WITH APPLICABLE DASH NUMBER IN .12 HIGH PERMANENT CHARACTERS WHERE SHOWN IN ACCORDANCE WITH MIL-STD-130. SEE TABLE
 - 4 C8,C9,C10,C12 & C14 SHALL BE MOUNTED AS FLUSH TO THE P.C. AS FEASIBLE. Q1,C24 & C41 SHOULD BE INSTALLED AT AN ANGLE AS TO ALLOW FOR THE MOUNTING OF THE NOTCH FILTER P.C. BD.
 - 5. SOLDER CONNECTORS J1,J2 & J3 ON BOTH SIDES OF P.C. BD.
 - 6. ADD ITEM 36 TO CAPACITORS AS REQUIRED.

502	A12-4
501	A12-3
DASH NO	3 MARKING

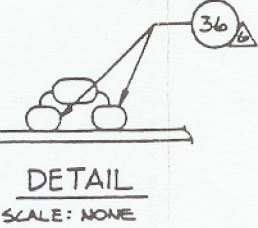


Figure 6-19. First Mixer (A12) Assembly Diagram (4100247)

Table 6-19. 1st Mixer Assembly (A12)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-19		1st Mixer Assembly	4100247-501	
1		. Schematic 1st Mixer Base Bd	4200186	Ref
2		. Schematic 1st Mixer	4200110	Ref
3		. PWB 1st Mixer	4300083-1	1
4		. Shield, PC Board	3100107-501	1
5		. Spacer	2400072-1	3
6		. Shield, 1st Mixer	4400030-1	1
7		. Shield, 1st Mixer	4400030-2	1
8		. Shield, 1st Mixer	4400030-3	1
10		. Cover, Assy	3100153-501	1
11		. Wire, Bus, 24 Awg, Tinned Copper	58007	A/R
12		. Insulation Sleeving, TFE, 24 AWG, Natural	59538	A/R
13		. Strap, Tie Down	59617	1
15		. Mounting Pad for TO-5/TO-18	70809	4
17		. Heatsink TO-5	70784	2
18		. Heatsink	9226	1
19		. Screw, PNH x Rec .086-56 x .250 SS	77602	3
20		. Screw, PNH x Rec .112-40 x .188 SS	77611	2
21		. Screw, PNH SLTD .112-40 x .25 Nyl	79092	2
22		. Screw, PNH x Rec .112-40 x .313 SS	77613	4
23		. Screw, PNH x Rec .112-40 x .375 SS	77614	4
24		. Washer, Flat .086 SS	75035	3
25		. Washer, Lock-Spring .086 SS	75001	3
26		. Washer, Flat .112 SS	75022	12
27		. Washer, Lock-Spring .112 SS	75002	12

Courtesy of <http://BlackRadios.terryo.org>
 Table 6-19. 1st Mixer Assembly (A12)
 Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
28		. Nut, Plain hex .112-40 SS	75203	2
29		. Adhesive/Sealant, Silicone, Rubber, White	91086	A/R
31		. Eyelet, .089 Dia x .37 LG Gilding NP	75921	2
32		. Terminal, Stud 2-Turret .067 Mtg Style SE-30	70121	4
33		. Terminal, FD-Thru, TFE, Press Mtg	70025	2
34		. Plate, Access	2400173-1	1
35		. Screw, FLH x Rec 100°, .086-56 x .188 SS	77801	9
37		. Test Spec 1st Mixer Module	TS507	Ref
	A1	. CCA, Notch, Filter, 40.455 MHz	3100148-501	1
	A2	. CCA, Mixer, FET, IC	3100070-501	1
	C2,C4	. Capacitor, FXD, Mica, 100 pF, 2%, 500V	22372-101	2
	C3	. Capacitor, FXD, Mica, 91 pF, 2%, 500V	22372-910	1
	C5	. Capacitor, FXD, Mica, 43 pF, 2%, 500V	22372-430	1
	C6,C26, C48	. Capacitor, FXD, Mica, 68 pF, 2%, 500V	22372-680	3
	C7,C18, C20,C23, C31-C33, C35,C36, C39,C42, C46,C47, C50	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	14
	C8,C10	. Capacitor, FXD, Mica, 82 pF, 2%, 500V	22370-820	2

Courtesy of <http://BlackRadios.terry.org>
Table 6-19. 1st Mixer Assembly (A12)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C9,C14	. Capacitor, FXD, Mica, 150 pF, 2%, 500V	22370-151	2
	C11	. Capacitor, FXD, Mica, 18 pF, 5%, 500V	22371-180	1
	C12	. Capacitor, FXD, Mica, 270 pF, 2%, 500V	22370-271	1
	C13	. Capacitor, FXD, Mica, 10 pF, ±.5 pF, 500V	22371-100	1
	C15	. Capacitor, FXD, Mica, 30 pF, 2%, 500V	22372-300	1
	C16	. Capacitor, FXD, Mica, 240 pF, 2%, 500V	22372-241	1
	C17,C19, C21,C30 C34,C38, C40,C43, C45	. Capacitor, FXD, Cer, Z5U, .01 μ F, 20%, 50V	21789-103	9
	C22,C27	. Capacitor, FXD, Cer, Z5U, 1000 pF, 20%, 50V	21756	2
	C24,C41	. Capacitor, FXD, Cer, Z5U, .47 μ F, ±20%, 50V	21761	2
	C25	. Capacitor, FXD, Cer, NPO, 39 pF, ±5%, 100V	21360-390	1
	C28	. Capacitor, FXD, Cer, Z5U, 1.0 μ F, 20%, 50V	21748	1
	C29,C37	. Capacitor, FXD, Tant, 15 μ F, 20%, 20V	25062-156	2
	C44	. Capacitor, Var, Cer, 2.5-23 pF	28041	1
	C51	. Capacitor, FXD, Cer, NPO, 27 pF, ±5%, 100V	21360-270	1

Table 6-19. 1st Mixer Assembly (A12)
Replacement Parts List (Cont.)

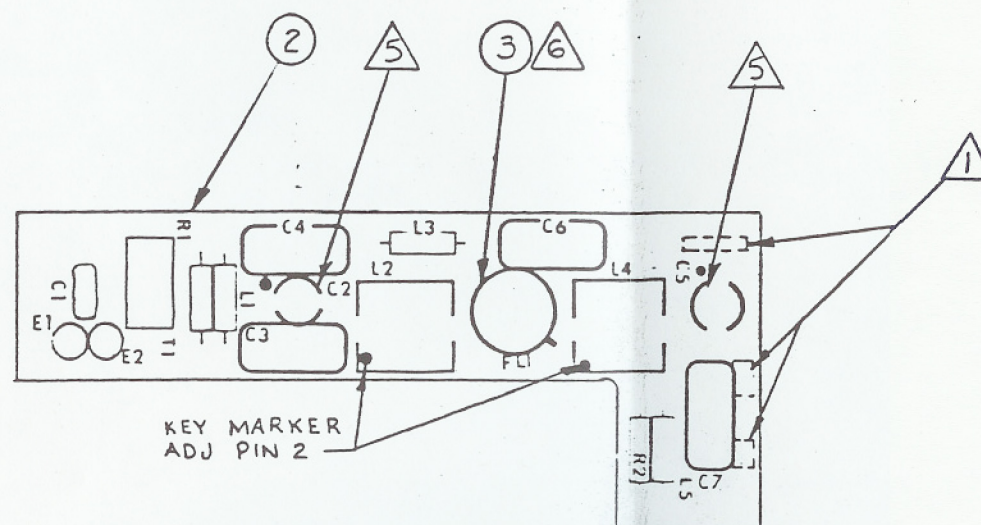
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	CR1,CR2 C5-C9, C11	. Diode, 1N916, Rectifier	35514	8
	CR3,CR4	. Diode, 1N5711, Hot Carrier	36003	2
	CR12	. Diode, 1N752A, Zener, 5.6V, 5%, 400 MW	33543	1
	E1-E3	. Terminal, Eyelet, SWG, .055 Mtg .062 Bd	70028	3
	FL1	. Filter	8404	1
	J1,J3	. Connector, RF, SMB, PCB, Jack	60044	2
	J2	. Connector, RF, SMB, PCB, Rtang	60107	1
	L1	. Coil, Assy, Toroidal	2100023-501	1
	L2,L3	. Coil, RF, Var, .198-.245 μ H	47048-R22	2
	L4	. Coil, RF, FXD, 2.2 μ H, 10%	43063-2R2	1
	L5	. Coil, Assy, RF, Var	8500-1	1
	L6	. Coil, Assy, RF, Var	8500-2	1
	L7	. Coil, Assy, RF, Var	8500-3	1
	L8	. Coil, Assy, RF, Var	8500-4	1
	L9,L11- L15	. Coil, RF, FXD, 10 μ H, 10%	43063-100	6
	L10	. Coil, RF, FXD, .10 μ H, 10%	43062-R10	1
	L16	. Coil, RF, FXD, .47 μ H, 20%	43063-R47	1
	L17	. Coil, RF, FXD, 1000 μ H, 10%	43062-102	1
	L18	. Coil, RF, FXD, .33 μ H, 10%	43062-R33	1
	P1	. Connector, Din, PCB, Male, Rtang, Row A	61437-32	1
	Q1	. Transistor, 2N4126, PNP, Low Power	31508	1
	Q2,Q4	. Transistor, JANTX2N3866, NPN Power	32046	2
	Q3	. Transistor, 2N5160, PNP, High Power	32027	1

Table 6-19. 1st Mixer Assembly (A12)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	Q5	. Transistor, 2N4416, FET, N-Channel	32508	1
	R1	. Resistor, FXD, CMPSN, 150 ohm, 5%, 1W	11243	1
	R2,R6, R23	. Resistor, FXD, Film, 1.0K ohm, 2%, 1/4W	12161-102	3
	R3	. Resistor, FXD, Film, 5.6K ohm, 2%, 1/4W	12161-562	1
	R4	. Resistor, FXD, Film, 47 ohm, 2%, 1/4W	12161-470	1
	R5	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	1
	R7	. Resistor, FXD, CMPSN, 15 ohm, 5%, 1/2W	10919	1
	R8,R12	. Resistor, FXD, Film, 220 ohm, 2%, 1/4W	12161-221	2
	R9,R11	. Resistor, FXD, Film, 1.2K ohm, 2%, 1/4W	12161-122	2
	R10	. Resistor, Var, PCB, 5.0K ohm, 20%, 1/2W, S-Turn	16090-502	1
	R13,R14, R19	. Resistor, FXD, Film, 10 ohm, 2%, 1/4W	12161-100	3
	R15,R24	. Resistor, FXD, Film, 100K ohm, 2%, 1/4W	12161-104	2
	R16	. Resistor, FXD, Film, 1.0M ohm, 2%, 1/4W	12161-105	1
	R17	. Resistor, FXD, Film, 120 ohm, 2%, 1/4W	12161-121	1
	R20	. Resistor, FXD, Film, 22K ohm, 2%, 1/4W	12161-223	1
	R21	. Resistor, Var PCB S-Turn, 1M ohm, 20%, 1/2W	16105-105	1

Table 6-19. 1st Mixer Assembly (A12)
Replacement Parts List (Cont.)

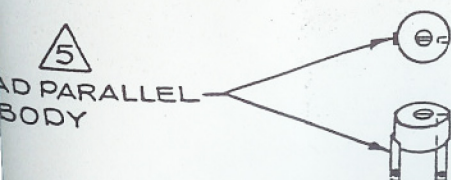
FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R22	. Resistor, FXD, Film, 47K ohm, 2%, 1/4W	12161-473	1
	R25	. Resistor, FXD, Film, 2.7K ohm, 2%, 1/4W	12161-272	1
	R26,R27	. Resistor, FXD, CMPSN, 150 ohm, 5%, 1/2W	10943	2
	R28	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	1
	T1	. Transformer, Assy, RF	8501	1
	TP1-TP6	. Terminal, Eyelet, SWG .055 Mtg .062 Bd	70028	6
	U1	. CCA, 1st Mixer Base Bd	4100139-502	1
	U2	. Microcircuit, Lin, MWA130, F Ampl 0.1-400 MHz	36902	1
	U3	. IC, LF442, Dual Op-Amp	365030	1

Courtesy of <http://BlackRadios.terry.org>

NOTES:

- 1 MARK APPLICABLE DASH NO., REV LETTER, AND SERIAL NO. APPROX WHERE SHOWN. .08" HIGH PERMANENT BLACK CHARACTERS PER MIL-STD-130.
2. TRIM COMPONENT LEADS TO .032 MAX ON CIRCUIT SIDE.
3. ASSEMBLE IN ACCORDANCE WITH RACAL WORKMANSHIP STANDARDS.
4. THIS DRAWING USED IN CONJUNCTION WITH SCHEMATIC 4200110 P.C. BOARD 330002S-1
- 5 ASSEMBLE C2 & C5 WITH (PARALLEL) LEAD ADJACENT TO LOCATING DOT ON THE SILKSCREEN.
- 6 USE ITEM 3 (MTG. PAD) IN PLACE OF THE ONE SUPPLIED WITH ITEM FL1.

TOP VIEW OF C2 & C5 CAPACITORS



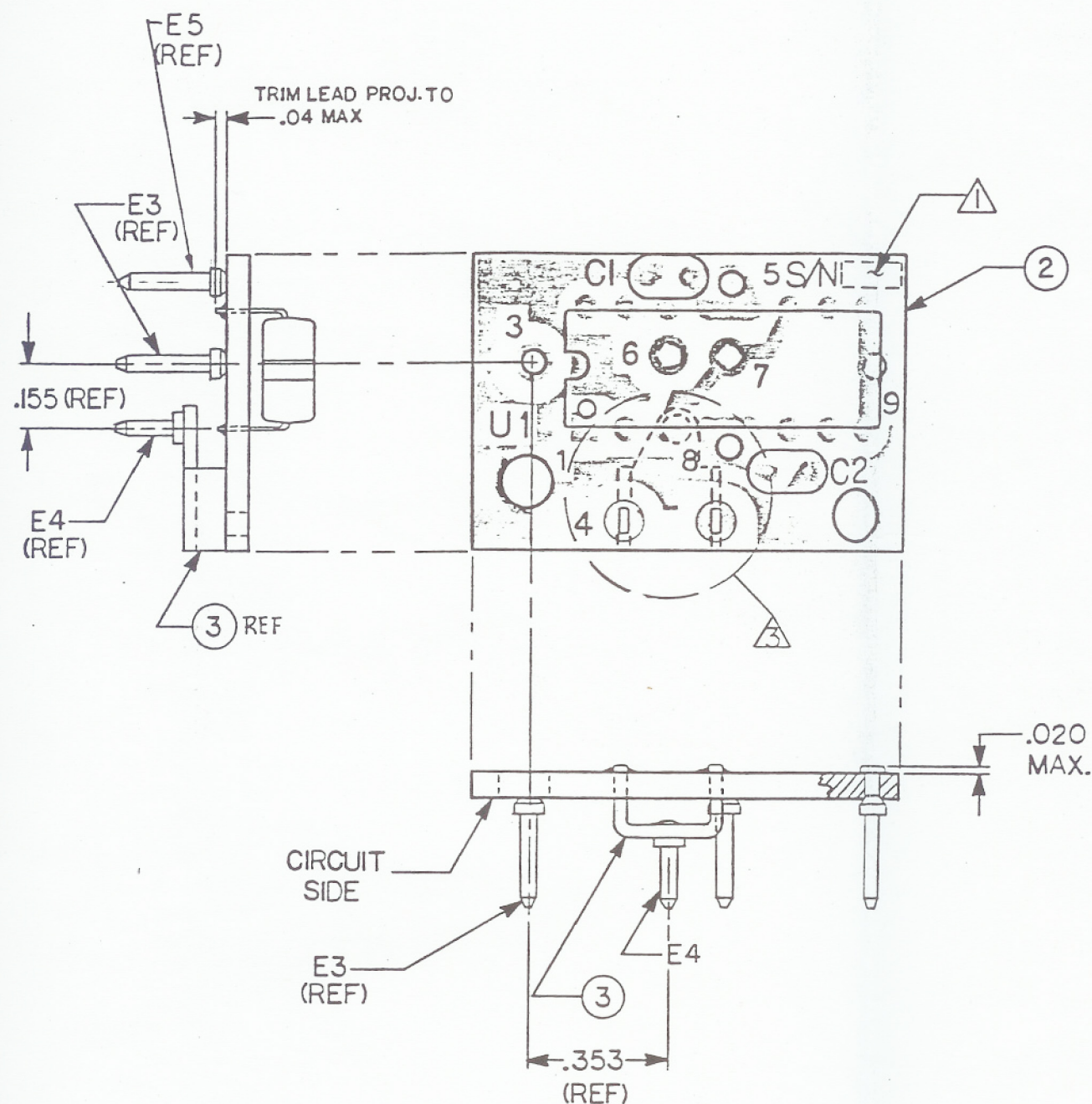
SIDE VIEW OF C2 & C5 CAPACITORS

Figure 6-20.

40.455 MHz Notch Filter
(A12A1) Assembly Diagram
(3100148)

Table 6-20. 40.455 MHz Notch Filter (A12A1)
Replacement Part List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-20		40.455 MHz Notch Filter	3100148-501	
1		. Schematic 1st Mixer	4200110	Ref
2		. PWB, Notch Filter	3300025-1	1
3		. Mounting Pad for TO-5	70806	1
	C1	. Capacitor, FXD, Cer, Z5U, .01 μ F, 20%, 50V	21789-103	1
	C2	. Capacitor, Var, Cer, 2.5 - 9.0 pF	28038	1
	C3,C6	. Capacitor, FXD, Mica 8 pF, $\pm$.5 pF, 500V	22371-080	2
	C4,C7	. Capacitor, FXD, Mica 62 pF, 2%, 500V	22372-620	2
	C5	. Capacitor, Var, Cer 2.5 - 9.0 pF	28038	1
	FL1	. Filter, 40.455 MHz/8 kHz	37041	1
	L1,L5	. Coil, RF, FXD, .18 μ H, 10%	43062-R18	2
	L2,L4	. Coil, RF, Var, 1.08-1.36 μ H	47048-1R2	2
	L3	. Coil, RF, FXD, 1.0 μ H, 10%	43062-4R0	1
	R1	. Resistor, FXD, Film, 100 ohm, 2%, 1/4W	12161-101	1
	R2	. Resistor, FXD, Film, 27 ohm, 2%, 1/4W	12161-270	1
	T1	. Transformer, RF	2100043-501	1



NOTE:

1. MARK SERIAL NO. APPROX. WHERE SHOWN WITH .08 HIGH LEGIBLE PERMANENT CHARACTERS PER MIL-STD-130.
2. BAG & TAG COMPLETED ASSY. MARK TAG WITH 3100070-XXX, APPROPRIATE DASH NO.
3. OBSERVE PHANTOM LINES AS VIEWED FROM COMPONENT SIDE OF BD. TO INSURE PROPER BENDING AND INSTALLATION OF CLIP ADAPTER, ITEM 3.
4. (-503 ASSY ONLY) CONFORMAL COAT COMPLETED ASSY PER RCI INSTRUCTIONS 1900005-1.

Figure 6-21.

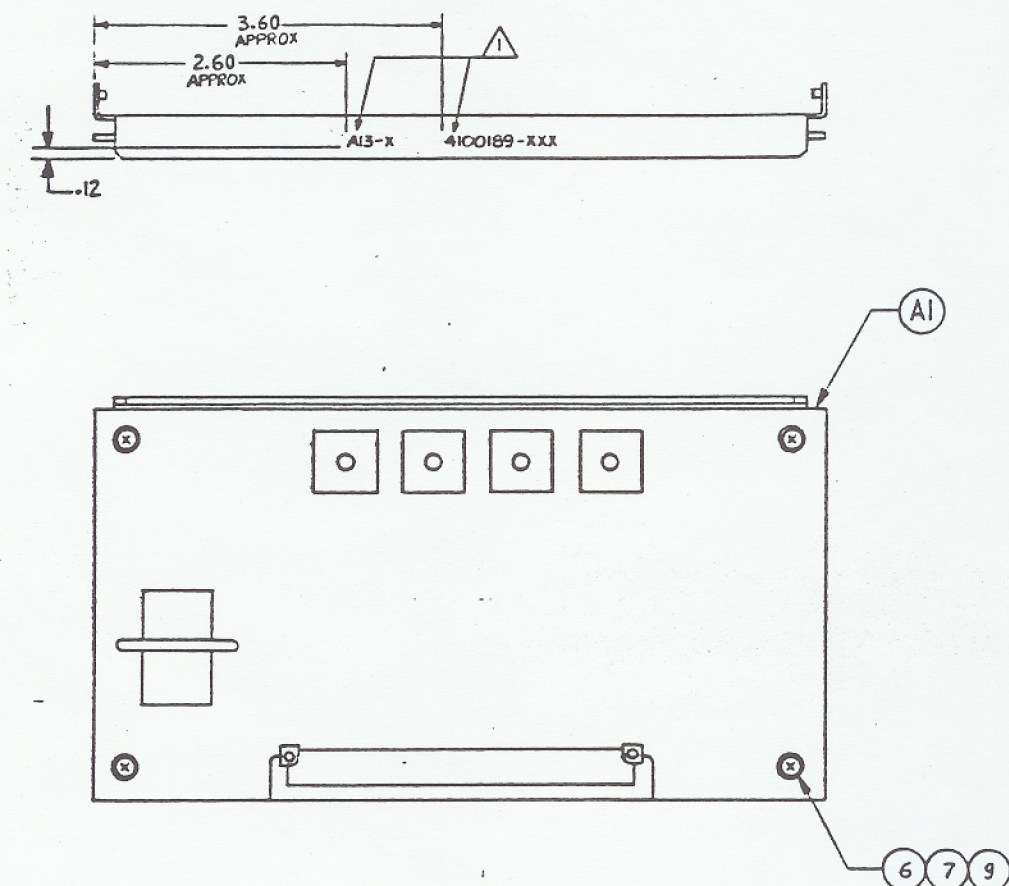
FET (I.C.) Board (A12A2)
Assembly Diagram
(3100070)

**Table 6-21. FET (IC) (A12A2)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-21		FET (IC)	3100070-501	
1		. Schematic, FET (IC) Board	3200030	Ref
2		. PWB, Mixer FET IC	3300029-1	1
3		. Clip, Adapter	2400144-1	1
	E3,E5-E9	. Terminal, Stud .048 Mtg, .062 PCB	70108	6
	E4	. Connector, PCB, Cont, Male, .040 Dia .031 PCB	70167	1
	U1	. Microcircuit, Lin SD5000, Quad FET	365079	1

NOTES:

- 1 MARK APPLICABLE REF DES, MODULE ASSY NUMBER AND DASH NUMBER WHERE SHOWN, .12 HIGH PERMANENT BLACK CHARACTERS PER MIL-STD-130, SEE MARKING TABLE.



MARKING TABLE 1

-501	A13-1	4100189-501
-502	A13-2	4100189-502
-503	A13-3	4100189-503
-504	A13-4	4100189-504
-506	A13	4100189-506
-505	A13	4100189-505
-507	A13	4100189-507

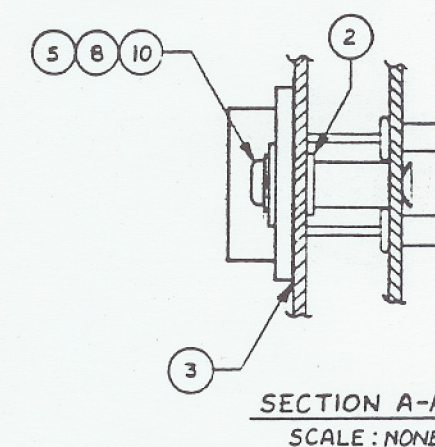
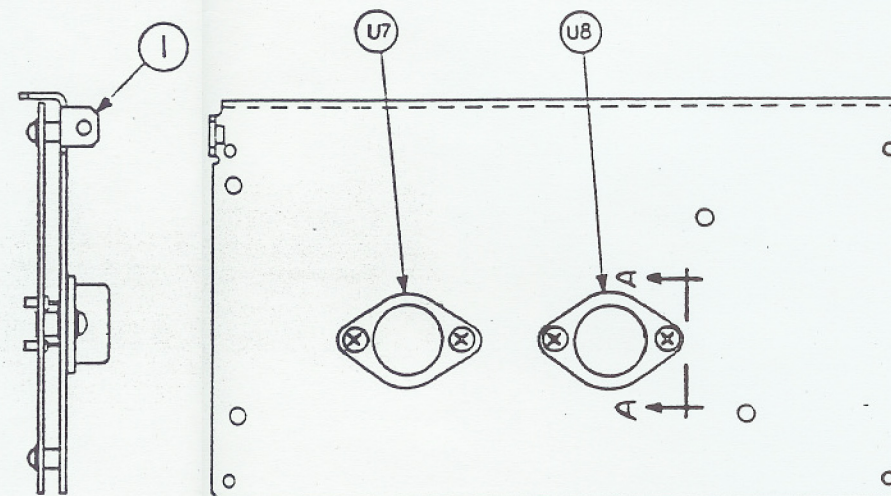
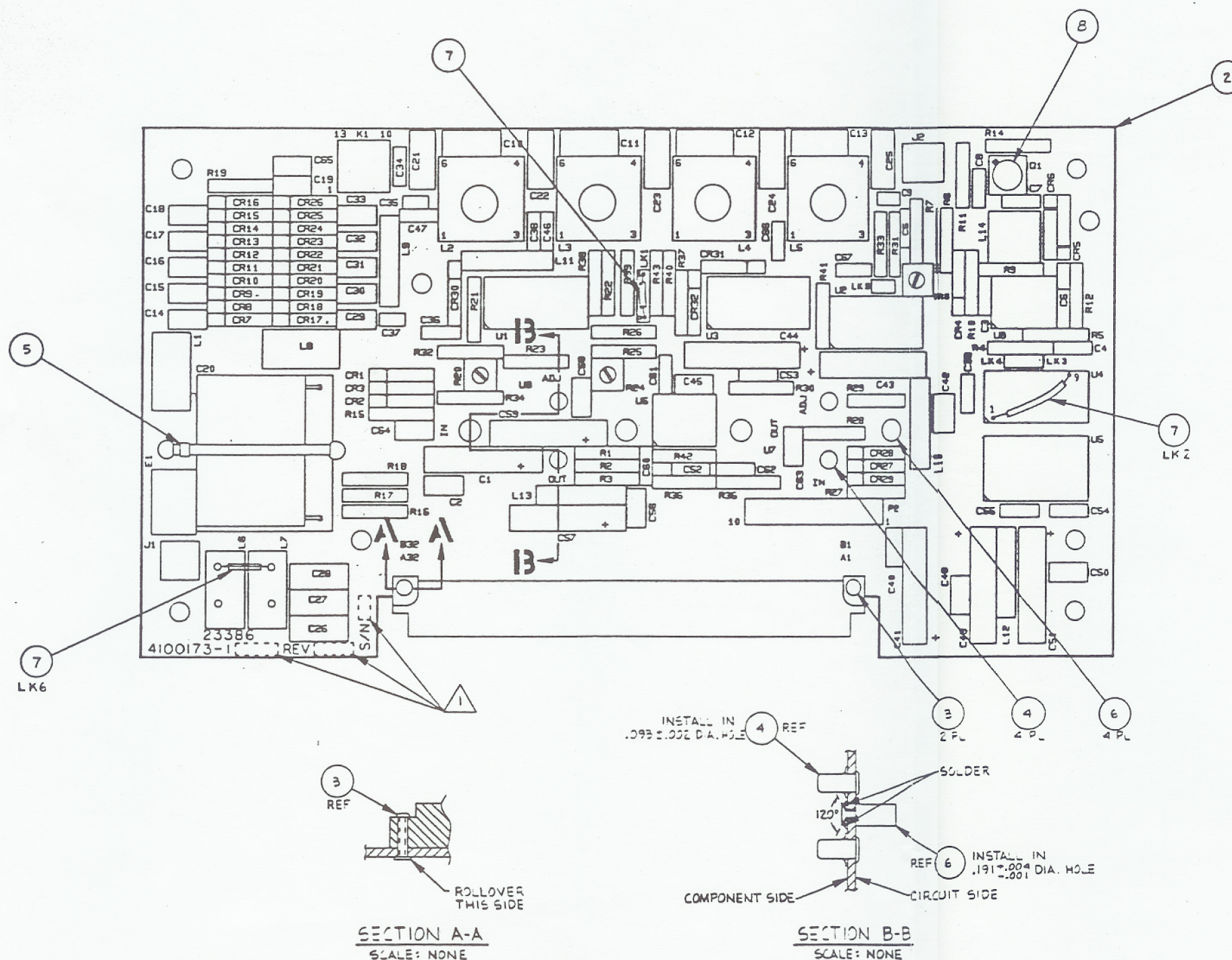


Figure 6-22.

RF Input Module (A13)
Assembly Diagram
(4100189)

**Table 6-22. RF Input Module Assembly (A13)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-22		RF Input Module Assembly	4100189-501	
1		. Shield, Assy	3100147-501	1
2		. Washer, Shoulder #6 Nylon Seastrom 5607-168	75142	4
3		. Insulator, TO-3	70813	2
5		. Screw, PNH x Rec .138-32 x .44 SS	77629	4
6		. Screw, PNH x Rec .112-40 x .313 SS	77613	4
7		. Washer, Flat .112 SS	75022	4
8		. Washer, Flat .138 SS	75024	4
9		. Washer, Lock-Spring .112 SS	75002	4
10		. Washer, Lock-Spring .138 SS	75003	4
	A1	. CCA, RF, Input (A13-1)	4100173-501	1
	U7	. IC, Lin, LM317K, Steel VR Pos 1.2-37V TO-3 Nat	365062	1
	U8	. IC, Lin, LM337K, Steel VR Neg 1.2-37V TO-3 Nat	365066	1



NOTES UNLESS OTHERWISE SPECIFIED:

1. MARK APPLICABLE DASH NUMBER, SERIAL NUMBER, AND REVISION LETTER .09 HIGH LEGIBLE PERMANENT CHARACTERS PER MIL-STD-130.
2. EDN 277 EFFECTIVE ON SN. 203, 204, 205, AND 207. } REF -501
3. EDN 25 EFFECTIVE ON SN. 201-221.
4. THE FOLLOWING CAPACITORS ARE NOT TO HAVE MOUNTING BEADS ON LEADS: C10 - C13 AND C21 - C28.
5. INSTALL LINKS SPECIFIED ON APPLICABLE PARTS LIST.
6. ASSEMBLE ONLY PARTS SPECIFIED ON APPLICABLE PARTS LIST.

Figure 6-23. RF Input Board (A13A1)
Assembly Diagram
(4100173)

**Table 6-23. RF Input Board Assembly (A13A1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-23		RF Input Board Assembly	4100173-501	
1		. Schematic, RF Input	4200093	Ref
2		. PWB, RF Input	4300077-1	1
3		. Eyelet, .089 Dia x .37 LG Gilding NP	75921	2
4		. Socket, PCB (.040)	61491	4
5		. Strap, Tiedown	59641	1
6		. Standoff, SWG .138-32 x .125 .25 RD Brs	SP02-094	4
7		. Insulation, Sleeving TFE, 24 Awg, Natural	59538	A/R
8		. Mounting Pad for TO-18, 4 Lead .20 OD .020 THK	70805	1
	C1,C41	. Capacitor, FXD, Tant, 15 μ F, 20%, 20V	25088-156	8
	C43,C44			
	C49,C51,			
	C57,C59			
	C2,C14-	. Capacitor, FXD, Cer, Z5U, 1.0 μ F, 20%, 50V	21748	22
	C19,C29-			
	C33,C40,			
	C42,C45,			
	C48,C50,			
	C56,C58,			
	C63-C65			
	C3-C5,	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	20
	C7,C8,			
	C34,C36,			
	C38,C39,			
	C46,C47,			
	C52-C55,			
	C60-C62,			
	C66,C67			

**Table 6-23. RF Input Board Assembly (A13A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	C6	. Capacitor, FXD, Cer, Z5U .01 μ F, 20%, 50V	21789-103	1
	C9	. Capacitor, FXD, Cer, NPO, 68 pF, $\pm$ 5%, 100V	21360-680	1
	C10	. Capacitor, FXD, Mica, 30 pF, 2%, 500V	22372-300	1
	C11	. Capacitor, FXD, Mica, 62 pF, 2%, 500V	22372-620	1
	C12	. Capacitor, FXD, Mica, 47 pF, 2%, 500V	22372-470	1
	C13	. Capacitor, FXD, Mica, 12 pF, 5%, 500V	22371-120	1
	C20	. Capacitor, FXD, Paper, .1 μ F, 20%, 1600V	26913	1
	C21	. Capacitor, FXD, Mica .75 pF, 2%, 500V	22372-750	1
	C22,C23	. Capacitor, FXD, Mica, 130 pF, 2%, 500V	22372-131	2
	C24	. Capacitor, FXD, Mica, 150 pF, 2%, 500V	22372-151	1
	C25	. Capacitor, FXD, Mica, 91 pF, 2%, 500V	22372-910	1
	C26-C28	. Capacitor, FXD, Mica, 270 pF, 2%, 500V	22372-271	3
	C35,C37	. Capacitor, FXD, Cer, Z5U, .022 μ F, 20%, 50V	21762	2
	CR1-CR3, C27-C29	. Diode, 1N4002, Rectifier, 10 PIV	35529	6
	CR4,CR30- C32	. Diode, 1N916, Rectifier	35514	4
	CR5-CR6	. Diode, 1N5711, Hot Carrier	36003	2

Courtesy of <http://BlackRadios.terryo.org>

Table 6-23. RF Input Board Assembly (A13A1)
Replacement Parts List (Cont.)

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	CR14-CR16, CR24-CR26	. Diode, 1N3600, Switching	35555	6
	E1	. Arrestor, Lightning	64001	1
	J1	. Connector, Coax (Modified)	2400027-1	1
	J2	. Connector, RF, SMB, PCB, Jack	60044	1
	K1	. Relay, PCB, 2 Form C	51841	1
	L1,L8	. Coil, Assy	2100026-501	2
	L2,L4	. Coil, Assy, RF, Var	8477-7	2
	L3	. Coil, Assy, RF, Var	8477-4	1
	L5	. Coil, Assy, Rf, Var	8477	1
	L6	. Coil, Assy, Toroid .105 μ H	2100131-501	1
	L7	. Coil, Assy, Toroid .205 μ H	2100130-501	1
	L9	. Coil, RF, FXD, 47 μ H, 5%	43063-470	1
	L10,L13	. Coil, RF, FXD, 220 μ H, 5%	43063-221	2
	L11,L12	. Coil, RF, FXD, 5.6 μ H, 10%	43063-5R6	2
	L14	. Coil, RF, FXD, 4.7 mH, 10%	43069-472	1
	LK1,LK3	. Wire, Bus, 24 Awg, Tinned Copper	58007	2
	P1	. Connector, Din, PCB, Male, Rtang, Row A+B	61437-64	1
	P2	. Connector, PCB, Fem, 10 Cont, S-Row	61492-10	1
	Q1	. Transistor, 2N4416, FET, N-Channel	32508	1
	R1,R8	. Resistor, FXD, Film, 1.5K ohm, 2%, 1/4W	12161-152	2
	R2,R3, R26,R29,	. Resistor, FXD, Film, 2.2K ohm, 2%, 1/4W	12161-222	5
	R30 R4,R37	. Resistor, FXD, Film, 22K ohm, 2%, 1/4W	12161-223	2

**Table 6-23. RF Input Board Assembly (A13A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R5,R12, R22,R31, R33,R38- R41,R43 R6,R7	. Resistor, FXD, Film, 10K ohm, 2%, 1/4W	12161-103	10
	R8	. Resistor, FXD, Film, 100K ohm, 2%, 1/4W	12161-104	2
	R9	. Resistor, Var, PCB, 50K ohm, 20%, 1/2W, S-Turn	16090-503	1
	R10	. Resistor, FXD, Film, 100 ohm, 2%, 1/4W	12161-101	1
	R11	. Resistor, FXD, Film, 4.7K ohm, 2%, 1/4W	12161-472	1
	R14	. Resistor, FXD, Film, 1.0M ohm, 2%, 1/4W	12161-105	1
	R15,R27	. Resistor, FXD, Film, 120 ohm, 2%, 1/4W	12161-121	1
	R16-R19	. Resistor, FXD, Film, 22 ohm, 2%, 1/4W	12161-220	2
	R20	. Resistor, FXD, Film, 47K ohm, 2%, 1/4W	12161-473	4
	R21	. Resistor, Var, PCB, 1K ohm, 20%, 1/2W, S-Turn	16090-102	1
	R23	. Resistor, FXD, Film, 180 ohm, 2%, 1/4W	12161-181	1
	R24	. Resistor, FXD, Film, 15K ohm, 2%, 1/4W	12161-153	1
	R25	. Resistor, Var, PCB, 20K ohm, 20%, 1/2W, S-Turn	16090-203	1
	R32	. Resistor, FXD, Film, 8.2K ohm, 2%, 1/4W	12161-822	1
		. Resistor, FXD, Film, 470 ohm, 2%, 1/4W	12161-470	1

**Table 6-23. RF Input Board Assembly (A13A1)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	R34,R35	. Resistor, FXD, Film, 390 ohm, 2%, 1/4W	12161-391	2
	R36,R42	. Resistor, FXD, Film, 27K ohm, 2%, 1/4W	12161-273	2
	U1,U2	. IC, 7406, Hex Inverter OC	36601	2
	U3	. IC, 74LS10, TPL 3 INP, Nand Gate	36885-10	1
	U4	. IC, Dig, 74LS393, Dual Module 16 counter F Mot N	36885-393	1
	U5	. Oscillator, Clock 4.0 MHz	37046	1
	U6,U9	. IC, LF442, Dual Op-Amp	365030	2

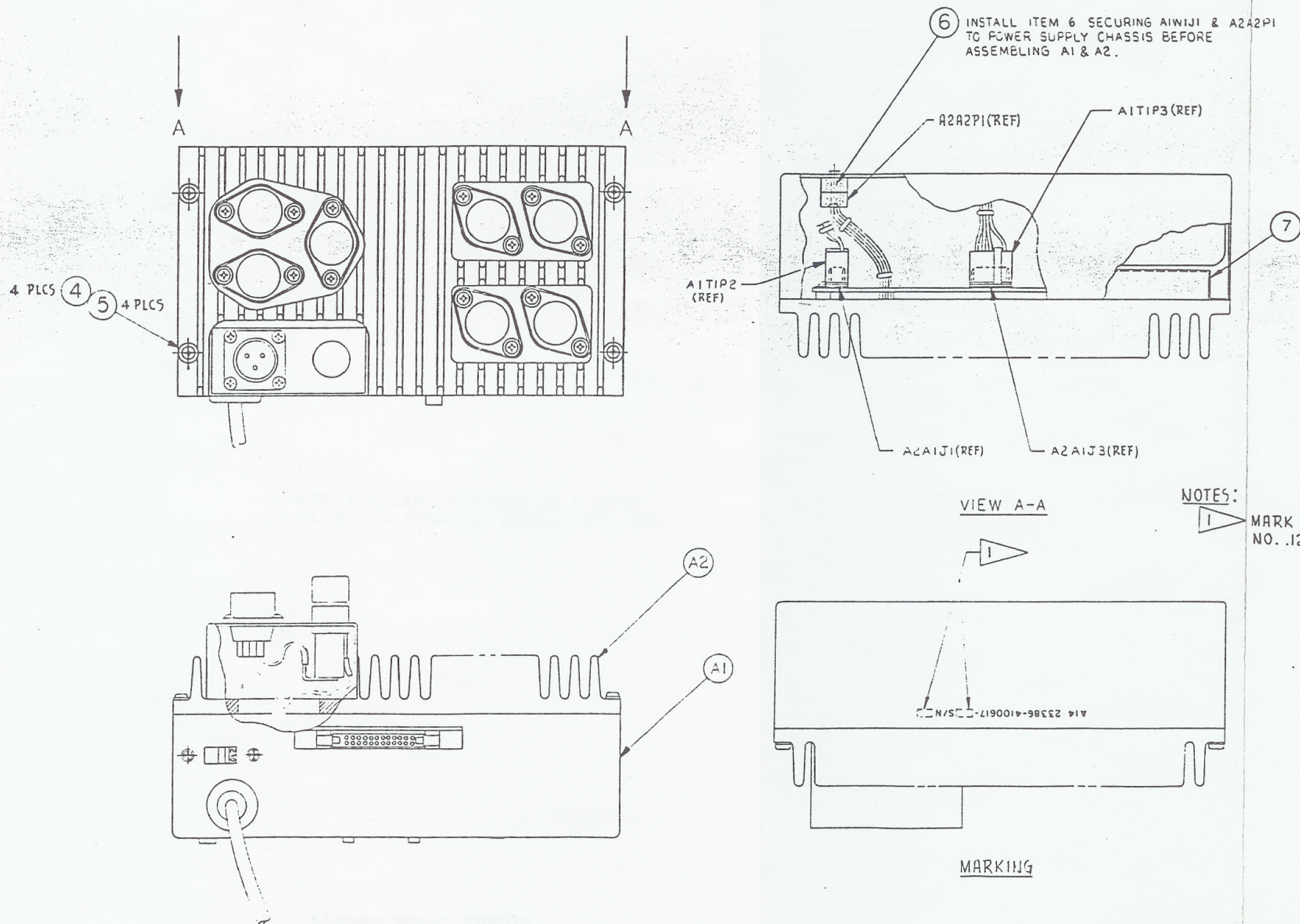
Courtesy of <http://BlackRadios.terryo.org>

Figure 6-24. Linear Power Supply Module (A14) Assembly Diagram (4100617)

Table 6-24. Linear Power Supply Module Assembly (A14)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-24		Linear Power Supply Assembly	4100617-504	
1		. Intcon, Diag, Lin, Power Supply (MIL)	4200372	Ref
3		. Test Spec Power Supply	4100617-501-TS	Ref
4		. Screw, PNH x Rec .112-40 x .438 SS	77615	4
5		. Washer, Flat .112 SS	75022	4
6		. Screw, Flh 82 x Rec .086-56 x .62 SS	77914	1
7		. Shield, Magnetic	3400227-1	1
	A1	. Chassis, Assy, Power Supply	4100603-502	1
	A2	. Regulator, Assy, Power Supply	4100607-504	1

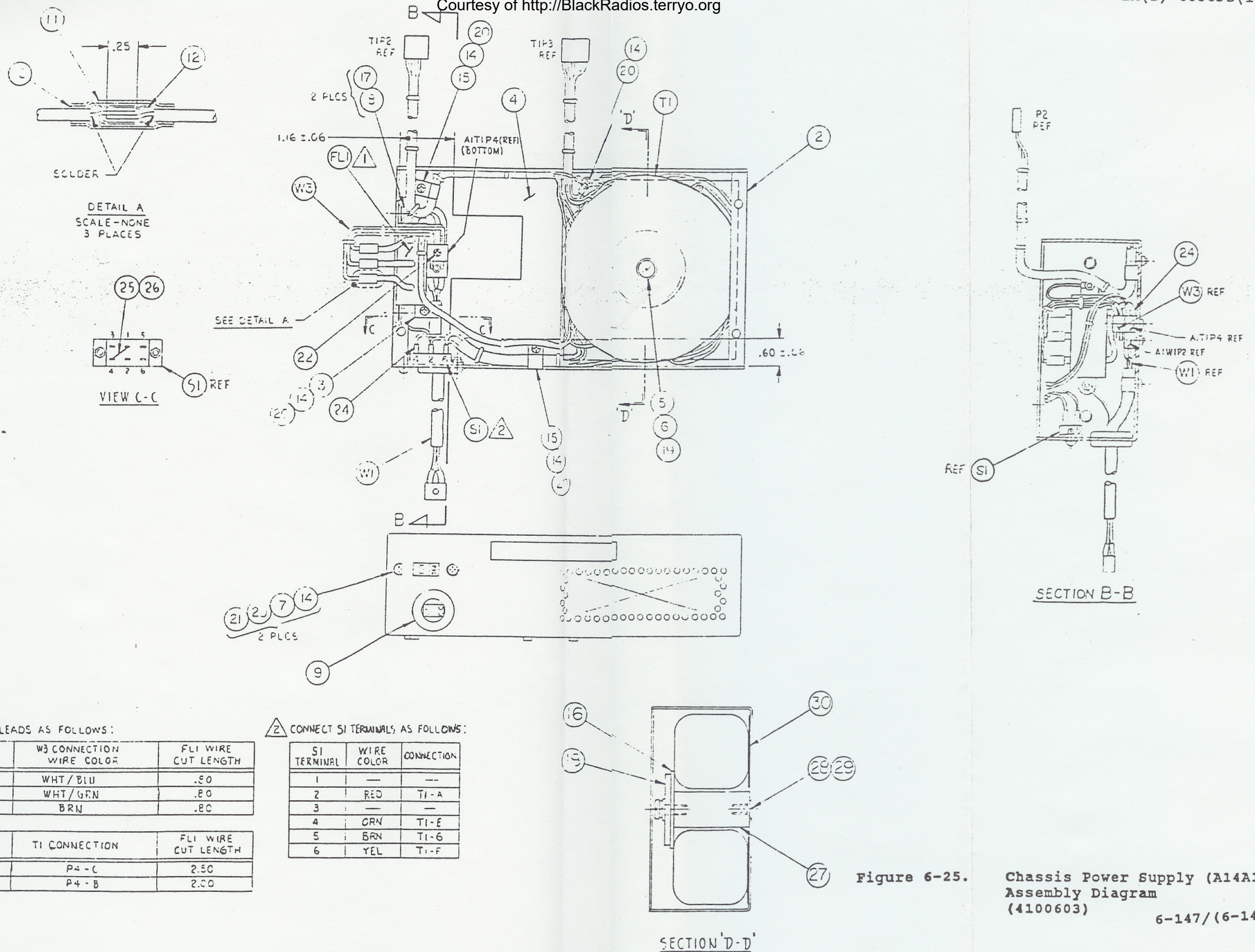
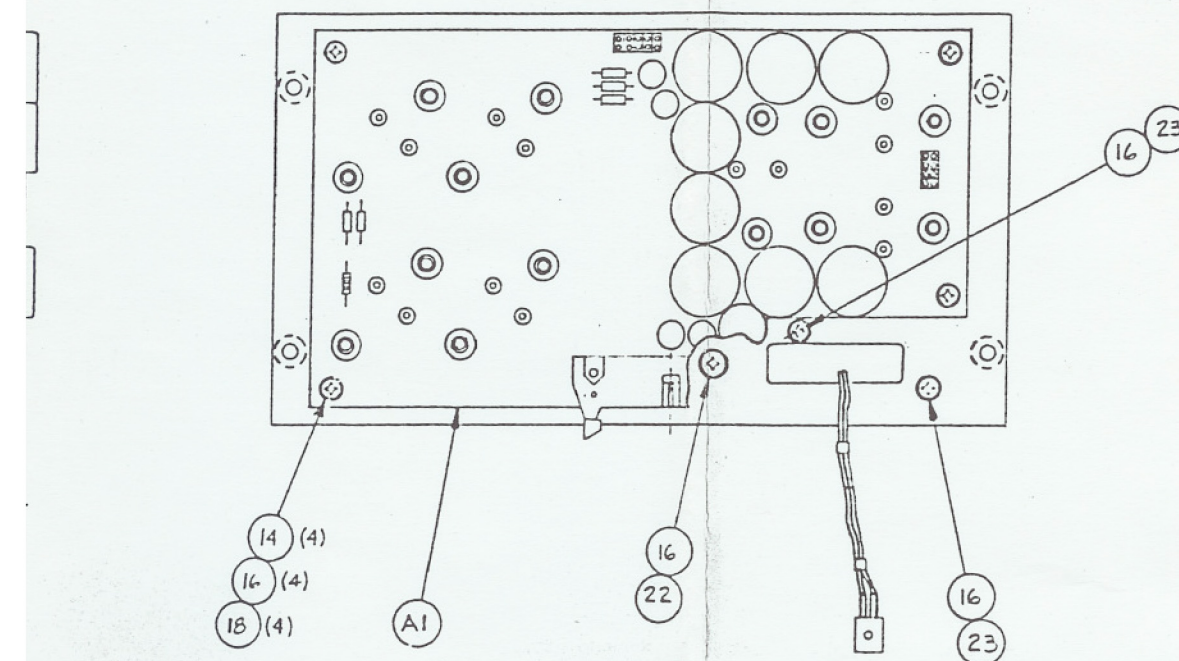
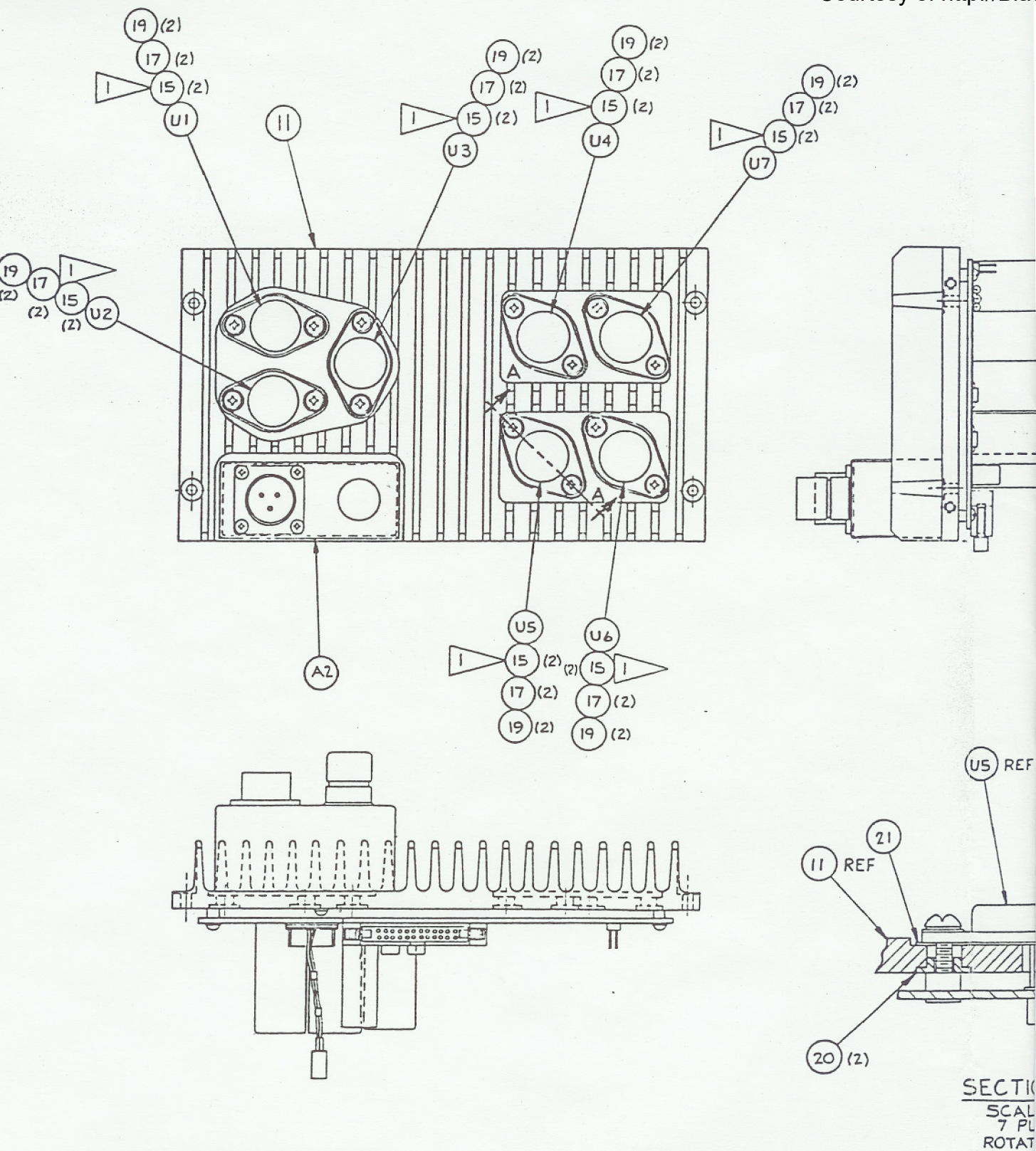
Courtesy of <http://BlackRadios.terryo.org>

Figure 6-25.

Chassis Power Supply (A14A1)
Assembly Diagram
(4100603)

6-147/(6-148)

Courtesy of <http://BlackRadios.terryo.org>

NOTES:

1 U1 THRU U7 MOUNTING SCREWS, ITEM 15, TO BE TORQUED TO 8 INCH-POUNDS.

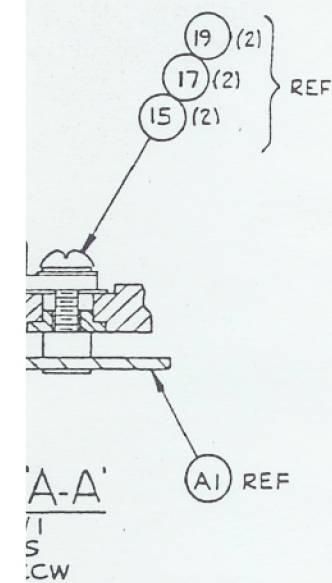


Figure 6-26. Power Supply Regulator Assembly (A1A2) Assembly Diagram (4100607)

**Table 6-26. Power Supply Regulator Assembly (A14A2)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-26	A14A2	Power Supply Regulator Assembly	4100607-504	
1		. Schematic Diagram Reulator	4200301	Ref
2		. Regulator, Assy Power Supply	4100607-504	Ref
11		. Heatsink, Assy Regulator	4100608-501	1
14		. Screw, PNH x Rec .112-40 x .313 SS	77613	4
15		. Screw, PNH x Rec .138-32 x .625 SS	77631	4
16		. Washer, Flat, .112 SS	75022	7
17		. Washer, Flat, .138 SS	75024	14
18		. Washer, Lock-Spring .112 SS	75002	4
19		. Washer, Lock-Spring .138 SS	75003	14
20		. Washer, Shoulder .138 Nylon	70826	14
21		. Insulator TO-3	70813	7
22		. Screw, PNH x Rec .112-40 x .375 SS	77614	1
23		. Screw, PNH x Rec .112-40 x .500 SS	77616	2
	A1	. CCA Regulator	4100592-502	1
	A2	. Interface Assy AC Power	4100361-504	1
	U1,U3	. Diode, Rectifier, Assy, R711X Common Cathode	35596	2
	U2	. Diode, Rectifier, Assy, R711XA Common Anode	35597	1
	U4	. Microcircuit, Lin, LT1083CK, VR POS ADJ	365208	1
	U5	. Microcircuit, Lin, LAS1815X, VR 5V POS	365210	1
	U6	. Microcircuit, Lin, LM340K-5, VR 5V POS	365211	1
	U7	. Microcircuit, Lin, LT1085CK, VR POS ADJ	365209	1

NOTES

- ① MARK APPLICABLE DASH NO., REV LETTER, AND SERIAL NO. IN .09 HIGH PERMANENT LEGIBLE CHARACTERS, PER MIL-STD-130 NEARSIDE.
- ② CUT PIN 4 OF J1 AND PIN 9 OF J3 FLUSH WITH BODY.
- ③ ITEMS 10 & LK1 NOT USED ON -501 ASSY

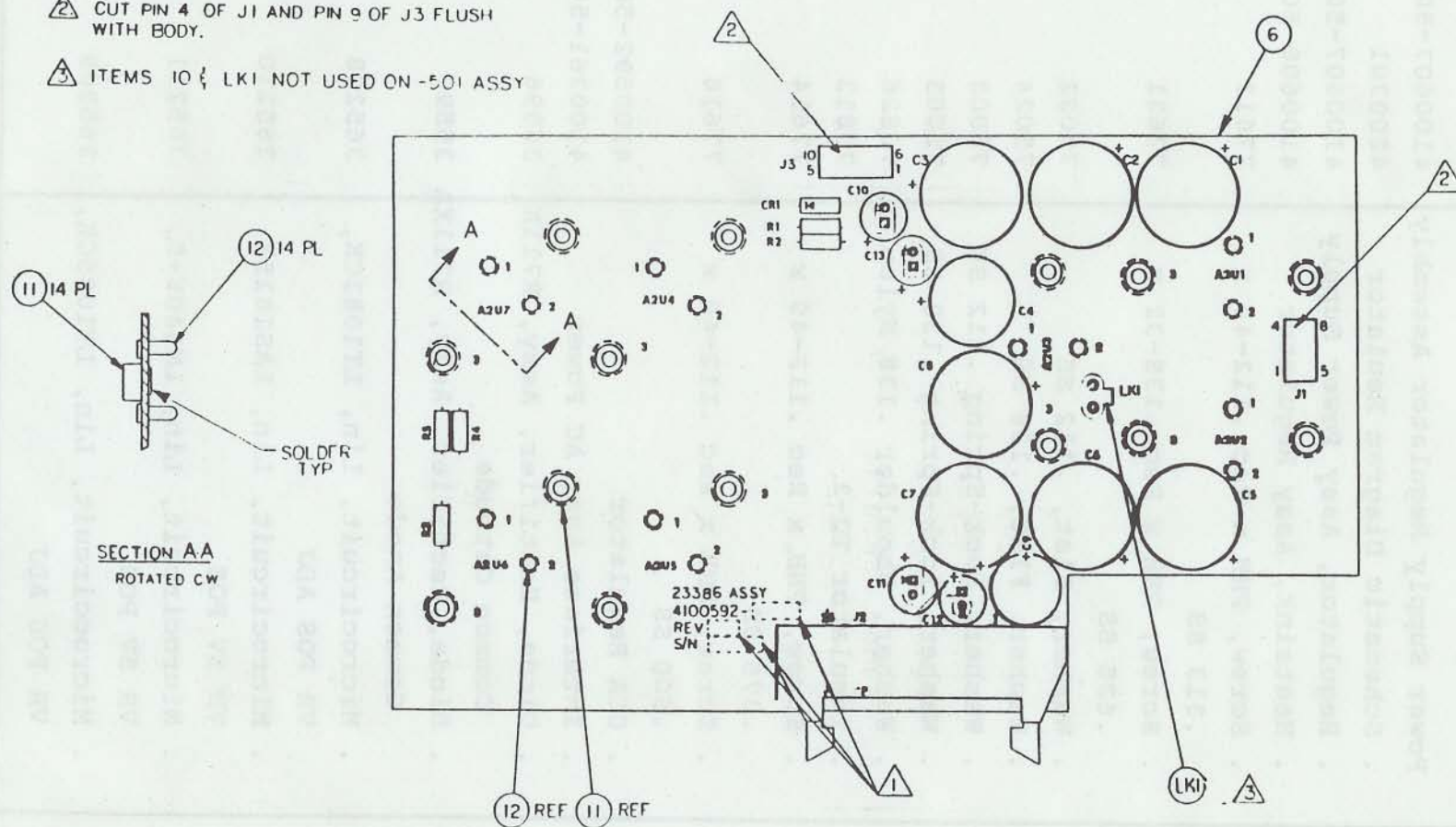


Figure 6-27. Regulator (A14A2A1)
Assembly Diagram
(4100592)

**Table 6-27. Regulator Assembly (A14A2A1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-27	A14A2A1	Regulator Assembly	4100592-502	1
1		. Schematic Diagram, Regulator	4200301	Ref
6		. PWB, Regulator	4300278-1	1
11		. Standoff, SWG .138-32 x .125, .25 RD 8RS	AP02-094	14
12		. Socket, PCB (.040)	61491	14
	C1-C3, C5	. Capacitor, FXD AL ELECTLT 4700 μ F, 20%, 25V	24125	4
	C4, C6	. Capacitor, FXD AL ELECTLT 3900 μ F, 20%, 16V	24126	2
	C7, C8	. Capacitor, FXD AL ELECTLT 8200 μ F, 20%, 16V	24127	2
	C9	. Capacitor, FXD AL ELECTLT 1500 μ F, 20%, 35V	24128	1
	C10-C13	. Capacitor, FXD AL ELECTLT 120 μ F, 20%, 25V	24129	4
	CR1	. Diode, 1N4002 Rectifier,	35529	1
	J1A,J1B	. Connector, HDR S-Row, 4 Cont	61371-04	2
	J2	. Connector, PCB, Mount 3M #3429-5202	61459	1
	J3A,J3B	. Connector, HDR S-Row, 5 Cont	61371-05	2
	LK1	. Wire, Bus 24 AWG, Tinned Copper	58007	A/R
	R1,R4	. Resistor, FXD, Film, 121 ohm, 1%, 1/10W	12166-1210	2
	R2	. Resistor, FXD, Film, 1.33K ohm, 1%, 1/10W	12166-1331	1
	R3	. Resistor, FXD, Film, 33 ohm, 2%, 1/4W	12161-330	1
	R5	. Resistor, FXD, Film, 1.82K ohm, 1%, 1/10W	12166-1821	1

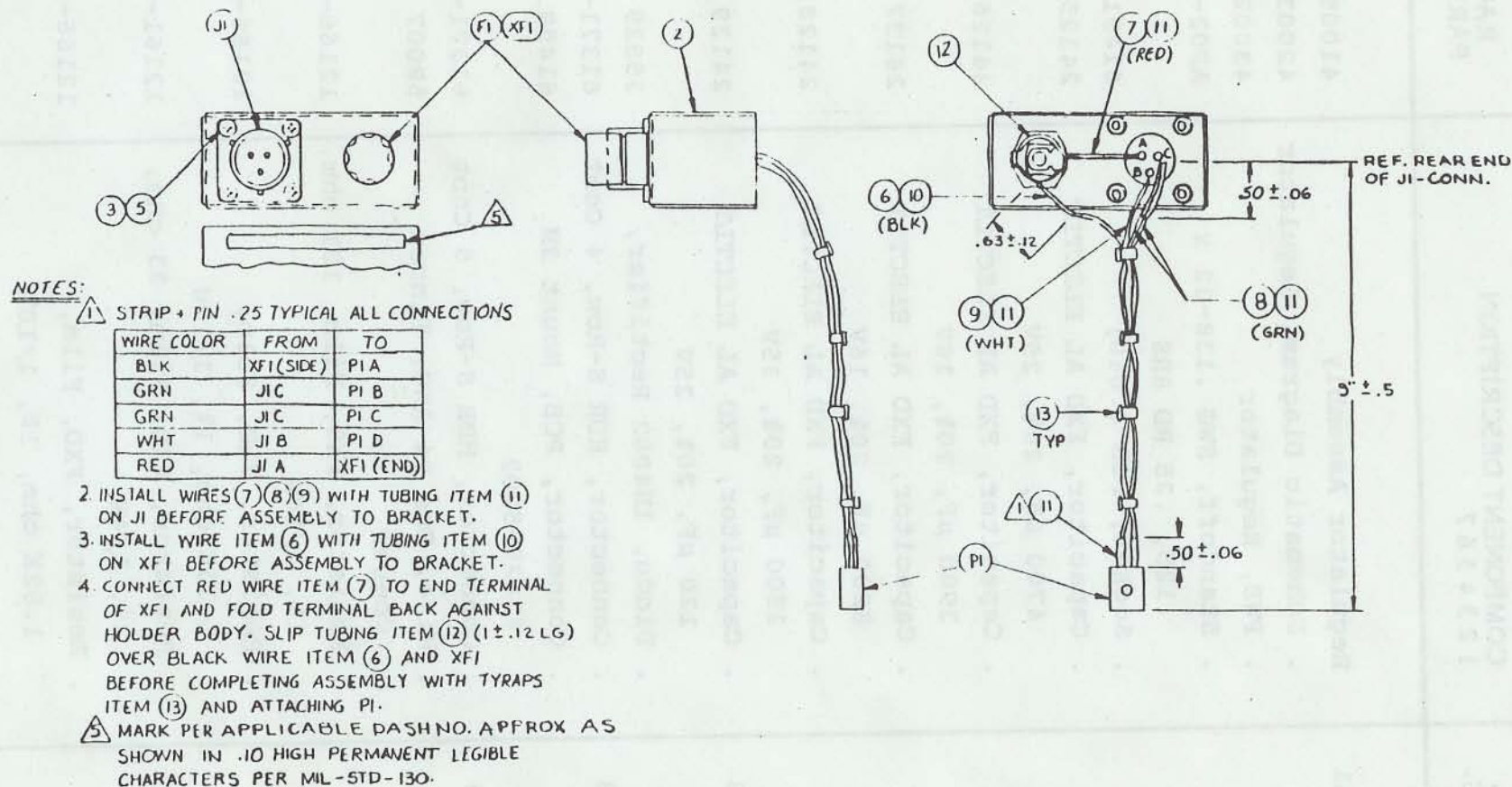


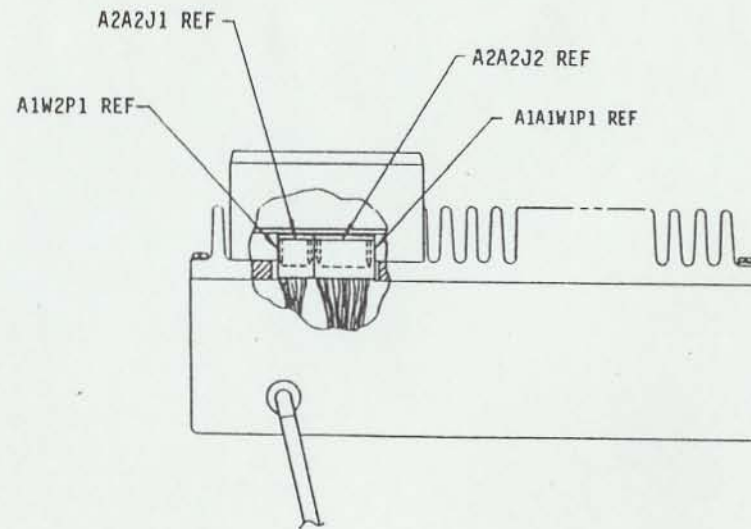
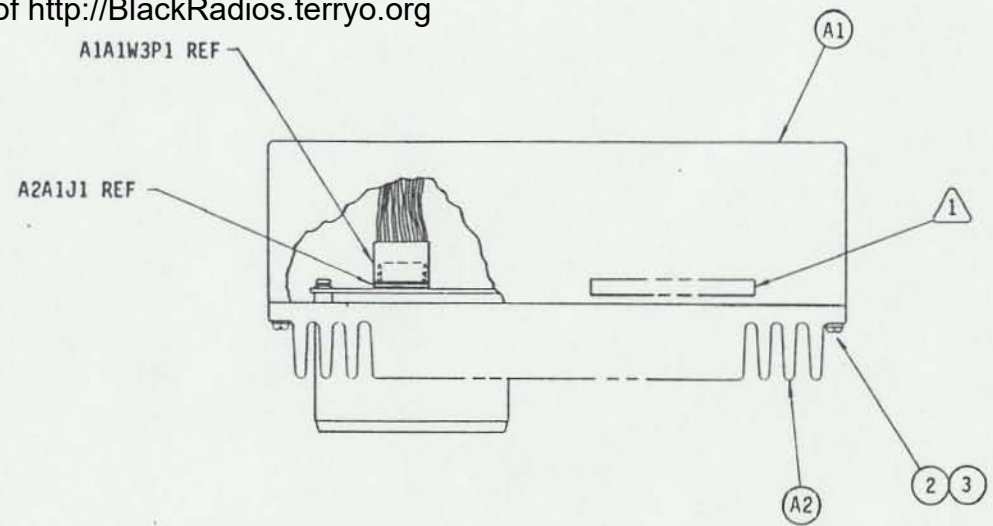
Figure 6-28. AC Power Interface
(A14A2A2) Assembly
Diagram (3100361)

**Table 6-28. AC Power Interface Assembly (A14A2A2)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-28		AC Power Interface Assembly Bd	3100361-504	
2		. Bracket Assy., Conn. Mounting	3100246-504	1
3		. Screw, Pnh X Rec .112-40 x .313 SS	77613	4
5		. Washer, Flat .112 SS	75022	4
6		. Wire Hookup, 20 AWG Black 7/28 Strd PVC	55060	A/R
7		. Wire Hookup, 20 AWG Red 7/28 Strd PVC	55062	A/R
8		. Wire Hookup, 20 AWG Green 7 Strd PVC	55065	A/R
9		. Wire Hookup, 20 AWG White 7/28 Strd PVC	55059	A/R
10		. Insulation Sleeving, Shrink .187/.093 Clear	595002-187-C	A/R
11		. Insulation Sleeving, Shrink .125/.062 Clear	595002-125-C	A/R
12		. Insulation Sleeving, Shrink .500/.252 Clear	595002-500-C	A/R
13		. Strap, Tie Down	59617	4
	F1	. Fuse, 3AG, 1 Amp, 250V, Slo-Blo	40012	1
	J1	. Connector, Circ Bay Box Mtg 3 Cont. Male	61072	1
	P1	. Connector, Cable Receptacle 4 Cont. Winchester JF2S-2S	61473	1
	XF1	. Fuseholder, Panel 3 AG	40500	1

NOTES:

- 1 MARK PART NO AND REF DESIG APPROX WHERE SHOWN USING APPROPRIATE DASH NO IN .12 HIGH PERMANENT LEGIBLE BLACK CHARACTERS PER MIL-STD-130.



VIEW A-A

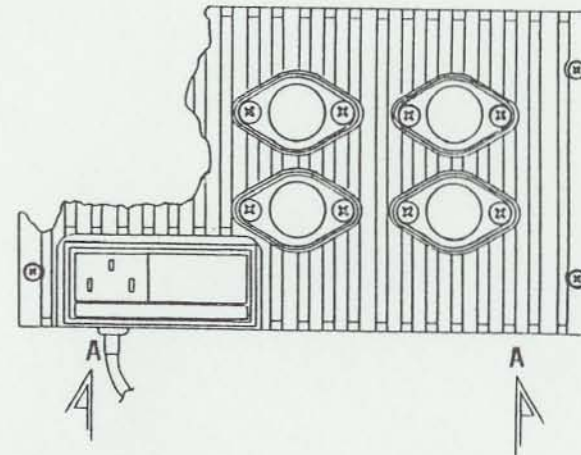


Figure 6-24. Power Supply Module Assembly (A14-1)

**Table 6-24. Power Supply Module Assembly (A14-1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-24	A14-1	Power Supply Module Assembly	4100212-501	1
	A1	• Power Supply Assembly	4100192-501	1
	A2	• Power Supply Regulator Assembly	4100195-501	1
2		• Screw, Pan Head x Rec. 4-40 x .44 S.S.	77615	4
3		• Washer, Flat, .112 S.S.	75022	4
		• Shield Assembly	3100150-501	1

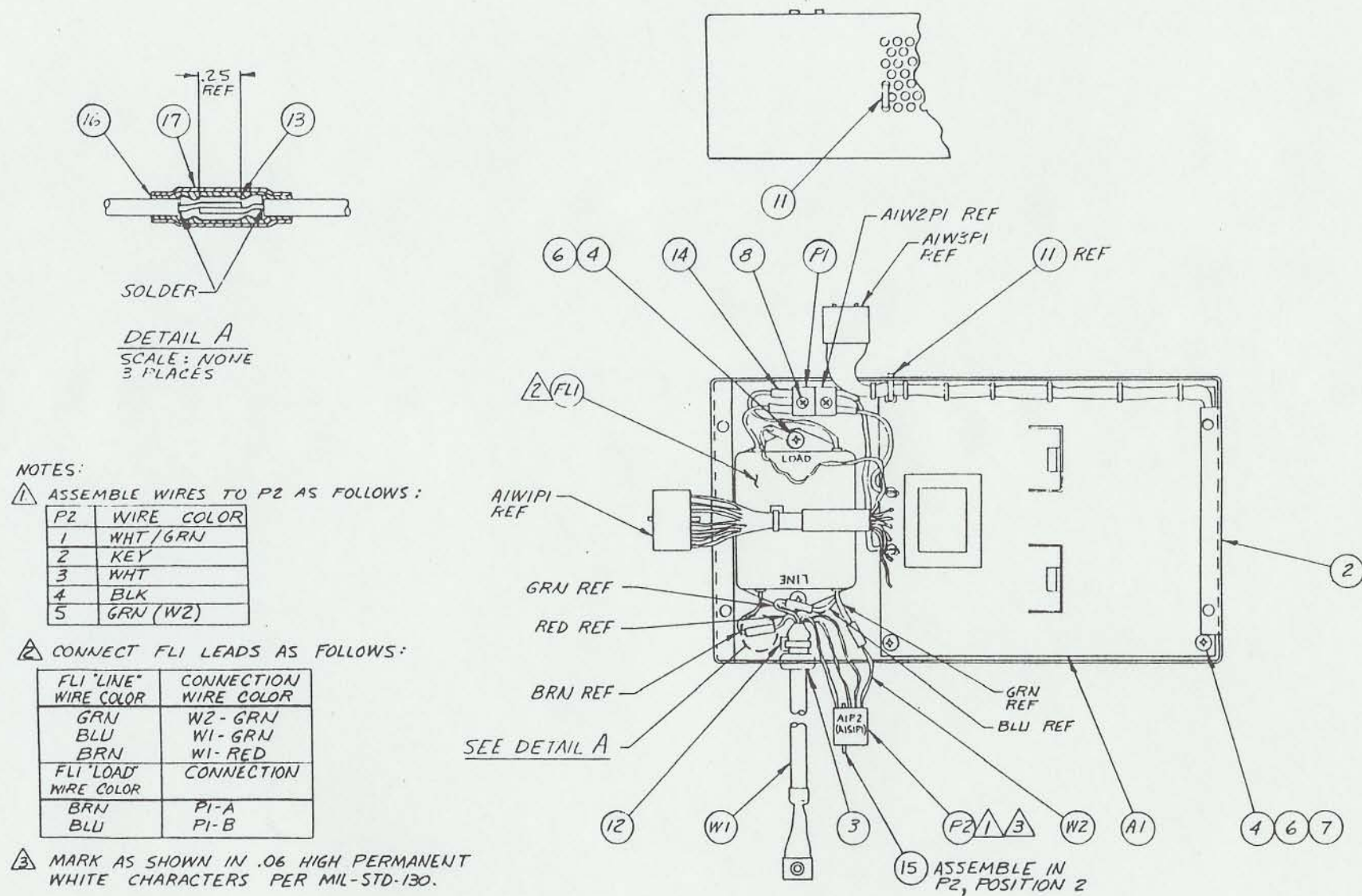


Figure 6-25. Power Supply Assembly (A14A1)

Table 6-25. Power Supply Assembly (A14A1)
Replacement Parts List

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-25	A14A1	Power Supply Assembly	4100192-501	1
	A1	• Switch Mode Power Supply Assembly	4100193-501	1
	FL1	• Filter, RFI, Power Line	53010	1
	P1	• Connector, Receptacle, 2 Contact	61475	1
	P2	• Housing, Plug, 5 Position	61358-05	1
	W1	• Cable Assembly (A1W1)	3500050-501	1
	W2	• Wire Assembly (A1W2)	2500015-501	1
2		• Chassis, Power Supply Assembly	4100218-501	1
3		• Grommet	81161	1
4		• Screw, Pan Head, .138-32 x .31, S.S.	77627	6
6		• Washer, Flat, .138 S.S., MS15795-805	75024	6
7		• Washer, Split, Lock, .138 S.S., MS35338-136	75003	4
8		• Screw, Flat Head, 82 Deg., .086 x .50 S.S.	77913	2
11		• Tyrap	58617	1(A/R)
12		• Tyrap	59641	1
13		• Splice, Crimp, I.D.	70161	3
14		• Tubing Shrink, .19 I.D. (BLK)	59577	1(A/R)
15		• Key, Polarizing/Latching	61457	1
16		• Tubing Shrink, .19 I.D. (CLR)	59572	1(A/R)
17		• Tubing Shrink, .25 I.D. (CLR)	59562	1(A/R)

W1		
FROM	TO	COLOR
W1P1-1	T1-1	BRN
W1P1-2	T1-2	RED
W1P1-3	T1-3	ORN
W1P1-4	T1-4	YEL
W1P1-5	KEY	---
W1P1-6	J1-C5	BLU
W1P1-7	GND LUG	GRN
W1P1-8	J1	GRY

W2		
FROM	TO	COLOR
W2P1-A	T1-1(AC)	BRN
W2P1-B	T1-4(AC)	BLU

W3		
FROM	TO	COLOR
W3P1-1	+8 VDC	ORN
W3P1-2	+8 VDC	ORN
W3P1-3	KEY	---
W3P1-4	RTN	BLK
W3P1-5	+28 VDC	RED
W3P1-6	+28 VDC	RED
W3P1-7	RTN	BLK
W3P1-8	RTN	BLK
W3P1-9	KEY	---
W3P1-10	RTN	BLK
W3P1-11	+VDC	YEL
W3P1-12	+VDC	YEL
W3P1-13	-VDC	BLU
W3P1-14	-VDC	BLU

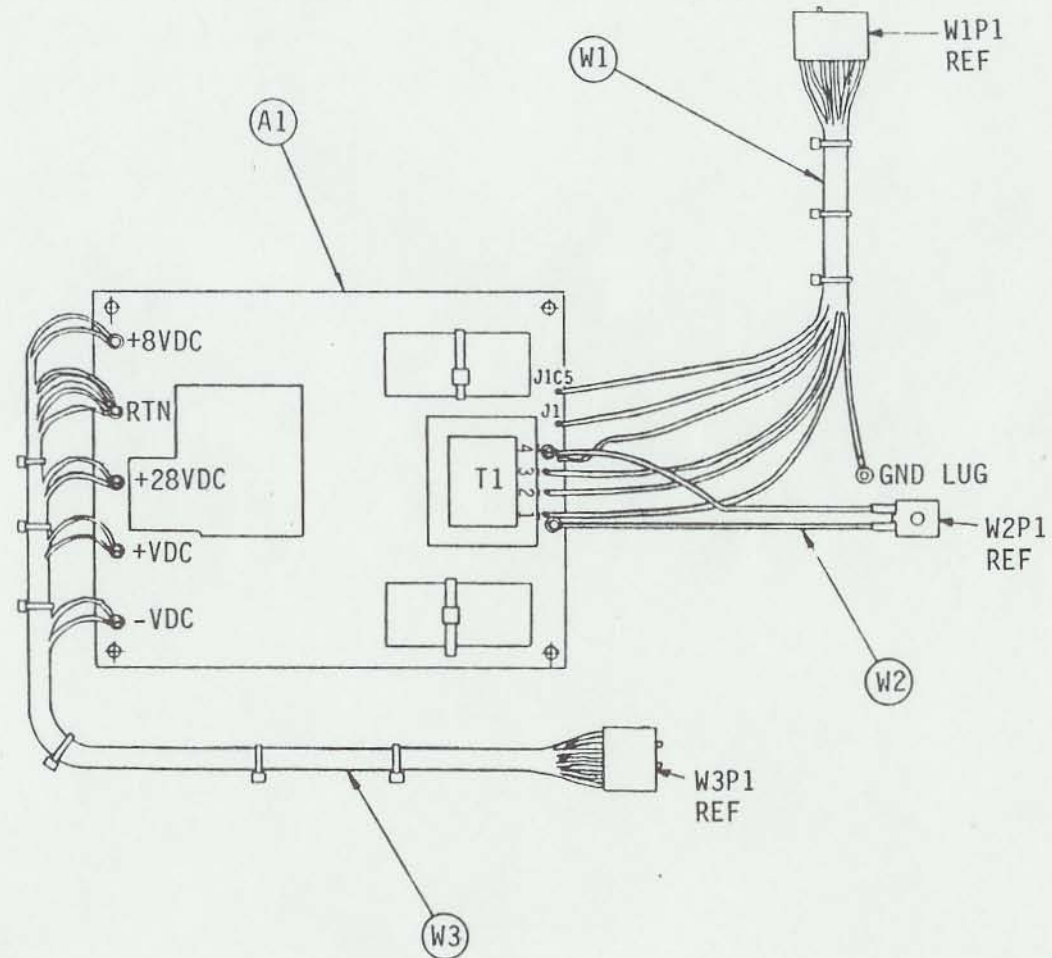


Figure 6-26. Switch Mode Power Supply Assembly (A14A1A1)

**Table 6-26. Switch Mode Power Supply Assembly (A14A1A1)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-26	A14A1A1	Switch Mode Power Supply Assembly	4100193-501	1
	A1	• Power Supply Switch Mode	4100194-501	1
	W1	• Cable Assembly	3500053-501	1
	W2	• Cable Assembly	3500055-501	1
	W3	• Cable Assembly	3500055-501	1

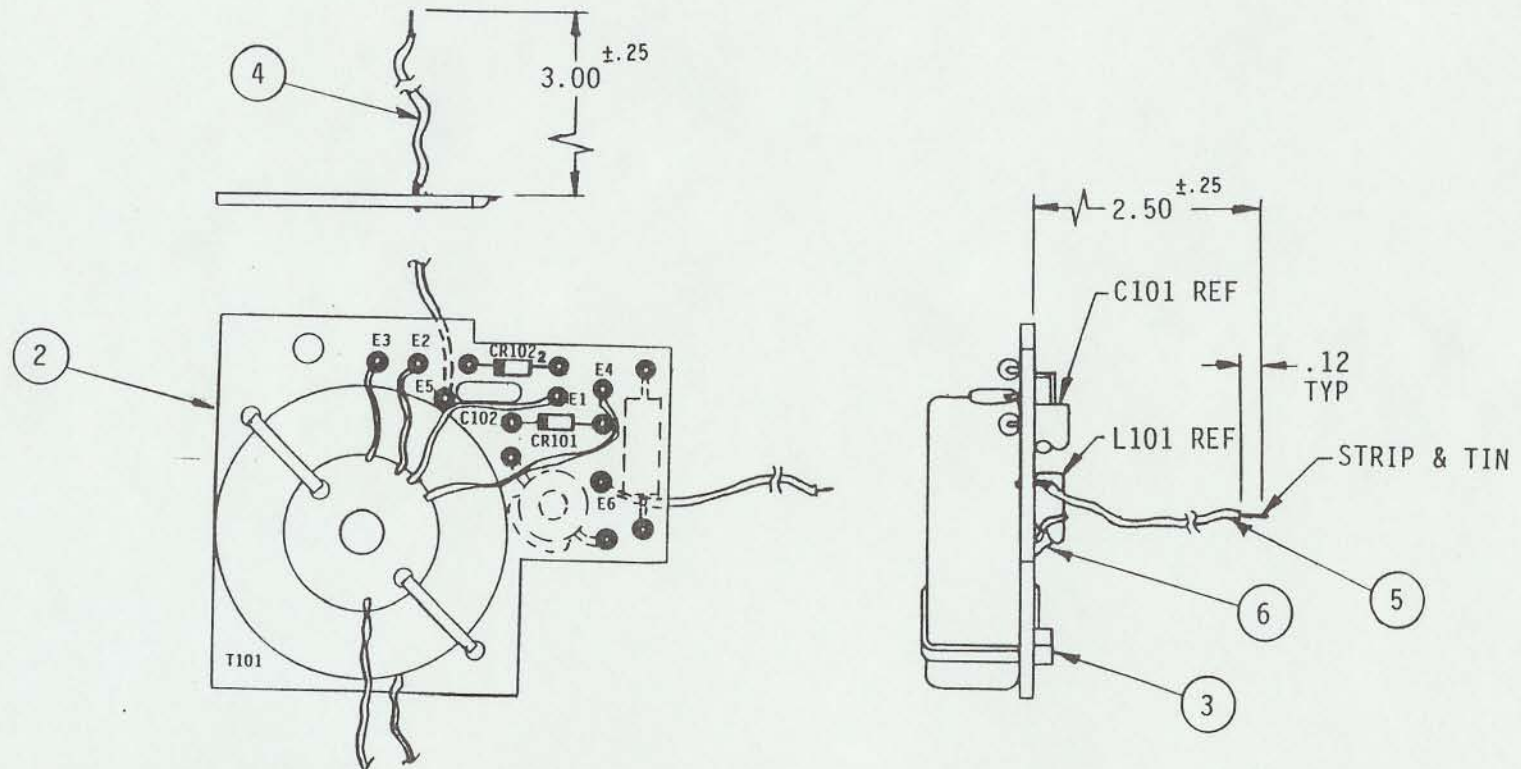


Figure 6-27. Printed Circuit Assembly (+28 VDC) (A14A1A1A1)

Table 6-27. Printed Circuit Card Assembly +28 VDC Assembly (A14A1A1A1)
Replacement Parts List

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	A14A1A1A1	Printed Circuit Card Assembly +28 VDC	3200023	1
	C101	• • Capacitor, Fixed, 4.7 μ F, 20%, 50 V	25096-475	1
	C102	• • Capacitor, Fixed, Ceramic, X7R, .022 μ F, 10%, 100 V	21768	1
	CR101, CR102	• • Diode, 1N4003	35535	2
	L101	• • Coil, RF Fixed, 27 μ H	2100026-501	1
	T101	• • Transformer, Toroid	3100058-501	1
		• Ty-Rap	59617	A/R
		• Wire, Hook-Up, 22 AWG, Blk	55001	A/R
		• Wire, Hook-Up, 22 AWG, Red	55010	A/R
		• RTV (Use: L101)	91013	A/R

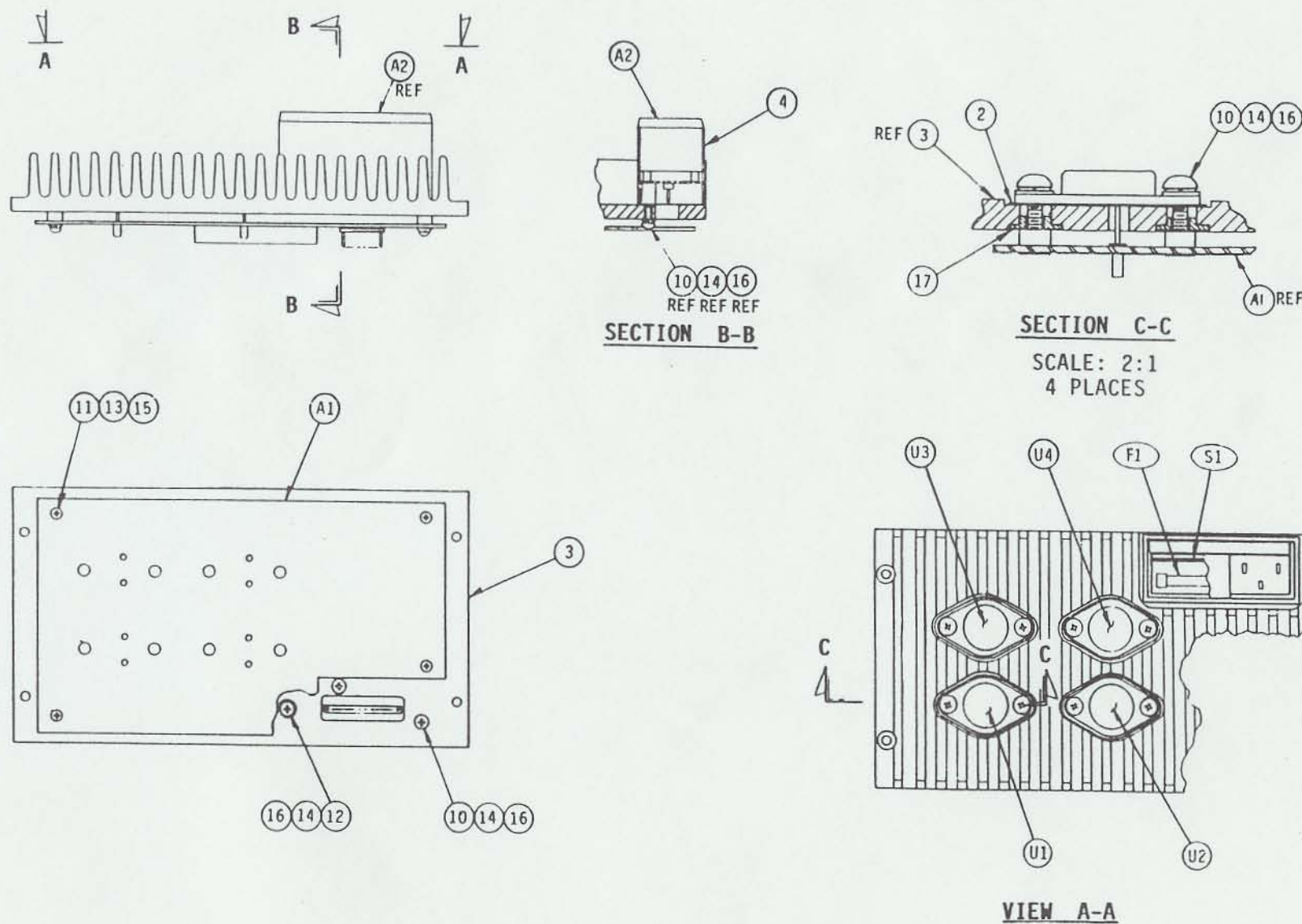


Figure 6-28. Power Supply Regulator Assembly (A14A2)

Table 6-28. Power Supply Regulator Assembly (A14A2)
Replacement Parts List

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-28	A14A2	Power Supply Regulator Assembly	4100195-501	1
	A1	• Regulator Circuit Card Assembly (PCA)	4100198-501	1
	A2	• AC Power Interface Circuit Card Assembly (PCA)	2100016-501	1
	F1	• Fuse, 3 Amp, Type 3AG	40033	1
	S1	• PCB, Voltage Selector	2300001-1	1
	U1	• Integrated Circuit, LM337K, Voltage Regulator	365066	1
	U2	• Integrated Circuit, LM117K, Voltage Regulator	365061	1
	U3, U4	• Integrated Circuit, LM317K, Voltage Regulator	365062	2
2		• Insulator, TO - 3	70813	4
3		• Heat Sink Assembly, Power Supply	4100219-501	1
4		• Shield, Power, Connector	2400068-1	1
10		• Screw, Pan Head, .138-32 x .75 S.S.	77632	10
11		• Screw, Pan Head, .112-40 x .31 S.S.	77613	4
12		• Screw, Pan Head, .138-32 x .63 S.S.	77631	1
13		• Washer, Flat, .112 S.S.	75022	4
14		• Washer, Flat, .138 S.S.	75024	11
15		• Washer, Split, Lock, .112 S.S.	75002	4
16		• Washer, Split, Lock, .138 S.S.	75003	11
17		• Washer, Shoulder, Nylon	70826	8

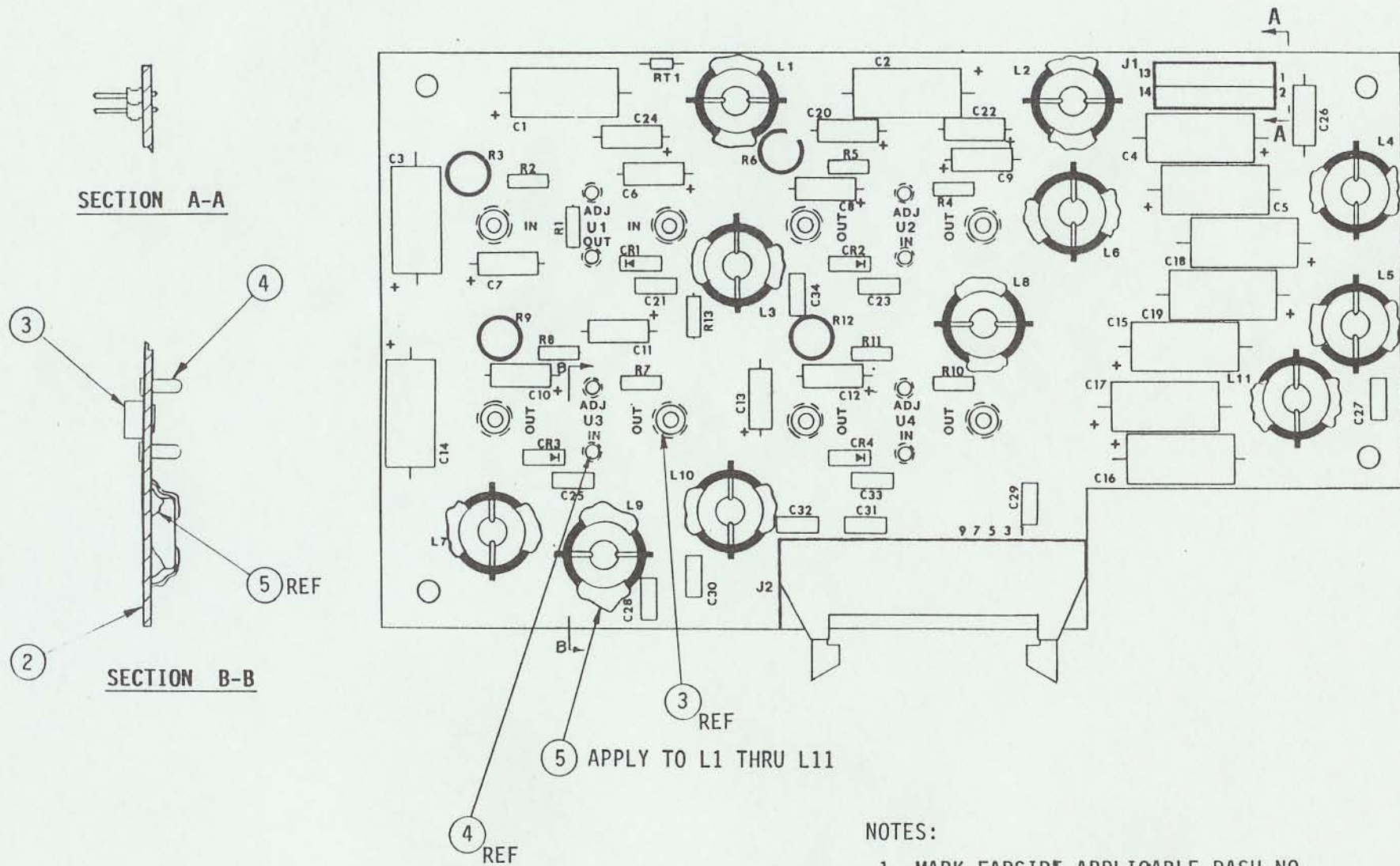


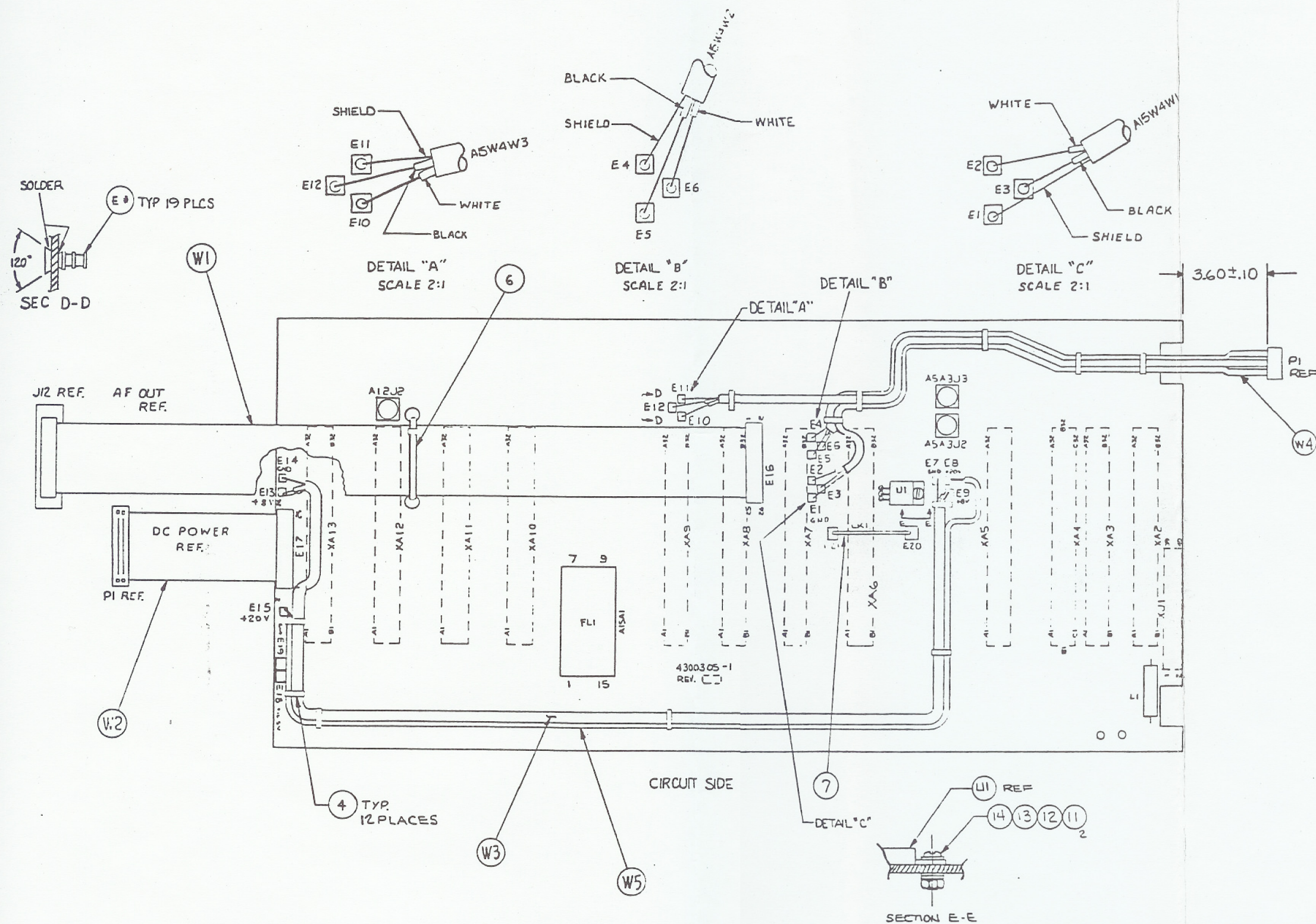
Figure 6-29. Regulator Circuit Card Assembly (A14A2A1)

**Table 6-29. Regulator Circuit Card Assembly (A14A2A1)
Replacement Parts List**

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-29 2	A14A2A1	Regulator Circuit Card Assembly (PCA)	4100198-501	1
		• Printed Circuit Card Wiring Assembly (PCB), Regulator	4300079-1	2
	C1-C3	• Capacitor, Fixed, Tantalum, 22 μ F, 20%, 50 V	25096-226	3
	C4, C5, C18, C19	• Capacitor, Fixed, Tantalum, 150 μ F, 20%, 15 V	25090-157	4
	C6-C11	• Capacitor, Fixed, Tantalum, 6.8 μ F, 20%, 35 V	25086-685	6
	C12, C13, C26	• Capacitor, Fixed, Tantalum, 15 μ F, 20%, 20 V	25088-156	3
	C14, C15	• Capacitor, Fixed, Tantalum, 100 μ F, 20%, 20 V	25088-107	2
	C16	• Capacitor, Fixed, Tantalum, 47 μ F, 20%, 35 V	25086-476	1
	C17	• Capacitor, Fixed, Tantalum, 220 μ F, 20%, 10 V	25092-227	1
	C20, C22, C24	• Capacitor, Fixed, Tantalum, 4.7 μ F, 20%, 50 V	25096-475	3
	C21, C23, C25, C27, C28-C34	• Capacitor, Fixed, Tantalum, 1 μ F, 20%, 50 V	21748	11
	CR1-CR4	• Diode, 1N4002	35529	4
	J1	• Connector, Male, Header, PCB, 7 Contact	61371-07	2
	J2	• Connector, PCB, 26 Contact	61459	1
	L1-L11	• Coil, RF, Fixed, 27 μ H	2100026-501	11
	R1, R4, R10	• Resistor, Fixed, Film, 220 ohm, 2%, 1/4 W	12161-221	3
	R2, R5	• Resistor, Fixed, Film, 2.2 K, 2%, 1/4 W	12161-222	2

Table 6-29. Regulator Circuit Card Assembly (A14A2A1)
Replacement Parts List (Cont.)

FIG. & INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
3 4	R3, R6	• • Resistor, Variable, 500 ohm, 20%, 1/2 W	16090-501	2
	R7	• • Resistor, Fixed, Film, 270 ohm, 2%, 1/4 W	12161-271	1
	R8	• • Resistor, Fixed, Film, 3.3 K, 2%, 1/4 W	12161-332	1
	R9	• • Resistor, Variable, 1 K, 20%, 1/2 W	16090-102	1
	R11	• • Resistor, Fixed, 560 ohm, 2%, 1/4 W	12161-561	1
	R12	• • Resistor, Variable, 200 ohm, 20%, 1/2 W	16090-201	1
	R13	• • Resistor, Fixed, 39 K, 2%, 1/4 W	12161-393	1
	RT1	• • Thermistor, 100 K, 10%	19338	1
		• Spacer, Swage, 6-32	SP02-094	8
		• Receptacle	61491	8

Courtesy of <http://BlackRadios.terryy.org>

**Table 6-29. Parent Board Assembly (A15)
Replacement Parts List**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
6-29		Parent Board Assembly	4100618-502	1
1		. Schematic Diagram Parent Board	4200393	Ref
2		. PWB, Parent Board	4300305-1	1
3		. Digi-Klip	70855	29
4		. Strap, Rubber Ret'ner 1"	59643-1	11
5		. Standoff, SWG .086-56 .125 LG RD Brs	SPO2-091	2
6		. Strap, Tiedown	59641	1
7		. Insulation, Sleeve TFE 22 AWG, Natural	59537	A/R
8		. Eyelet, .089 Dia x .25 LG, Brass NP	75920	24
10		. Insulator	2400276-1 1	
11		. Washer, Flat .112 SS	75022	2
12		. Washer, Lock-Spring .112 SS	75002	1
13		. Nut, Plain, Hex .112-40 SS	75203	1
14		. Screw, PNH x Rec .112-40 x .375 SS	77614	1
	C1-C32	. Capacitor, FXD, Cer, Z5U, .1 μ F, 20%, 50V	21795-104	32
	C33,C34	. Capacitor, Tant, Dipped, 1 μ F, 20%, 35V	25097-105 2	
	E1-E15, E18-E21	. Terminal, Stud, SWG, DBL, Tur, .064 Mtg .094 Bd	70151	19
	FL1	. CCA, Data Line Filter	3100093-501	1
	J1	. Connector, HDR, PCB, 40 Male, Count	61455-40	1
	L1	. Coil, RF, FXD, 27 μ H, 10%	43067-270	1
	LK1	. Wire, Bus, 22 AWG, Tinned Copper	58006	1
	U1	. Microcircuit, Lin, 7805, VR Pos, 5V, 1A TO-220	36916-05	1

**Table 6-29. Parent Board Assembly (A15)
Replacement Parts List (Cont.)**

FIG.& INDEX NO.	REF. DESIG.	COMPONENT DESCRIPTION 1 2 3 4 5 6 7	RACAL PART NO.	QTY.
	W1	. Cable, Assy Ribbon	3500231-501	1
	W2	. Cable, Assy, DC Power	3500044-501	1
	W3	. Cable, Assy	2500011-501	1
	W4	. Cable, Assy	3500081-501	1
	W5	. Cable, Assy, +20V	2500012-501	1
	XA2,XA3, XA6-XA9, XA13	. Connector, Din, PCB, Fem, Str, Row A+B	61438-64	7
	XA4	. Connector, Din, PCB, Fem, Str, Row A+B+C	61438-96	1
	XA5, XA10-XA12	. Connector, Din, PCB, Fem, Str, Row A	61438-32	4

SECTION VII**ENGINEERING DRAWINGS****7.1 INTRODUCTION**

This section contains engineering drawings for the Receiver, including an overall main chassis assembly interconnecting wiring diagram, and the schematic and logic diagrams of the various subassemblies and sub-subassemblies, as may be applicable.

7.2 DRAWING INDEX

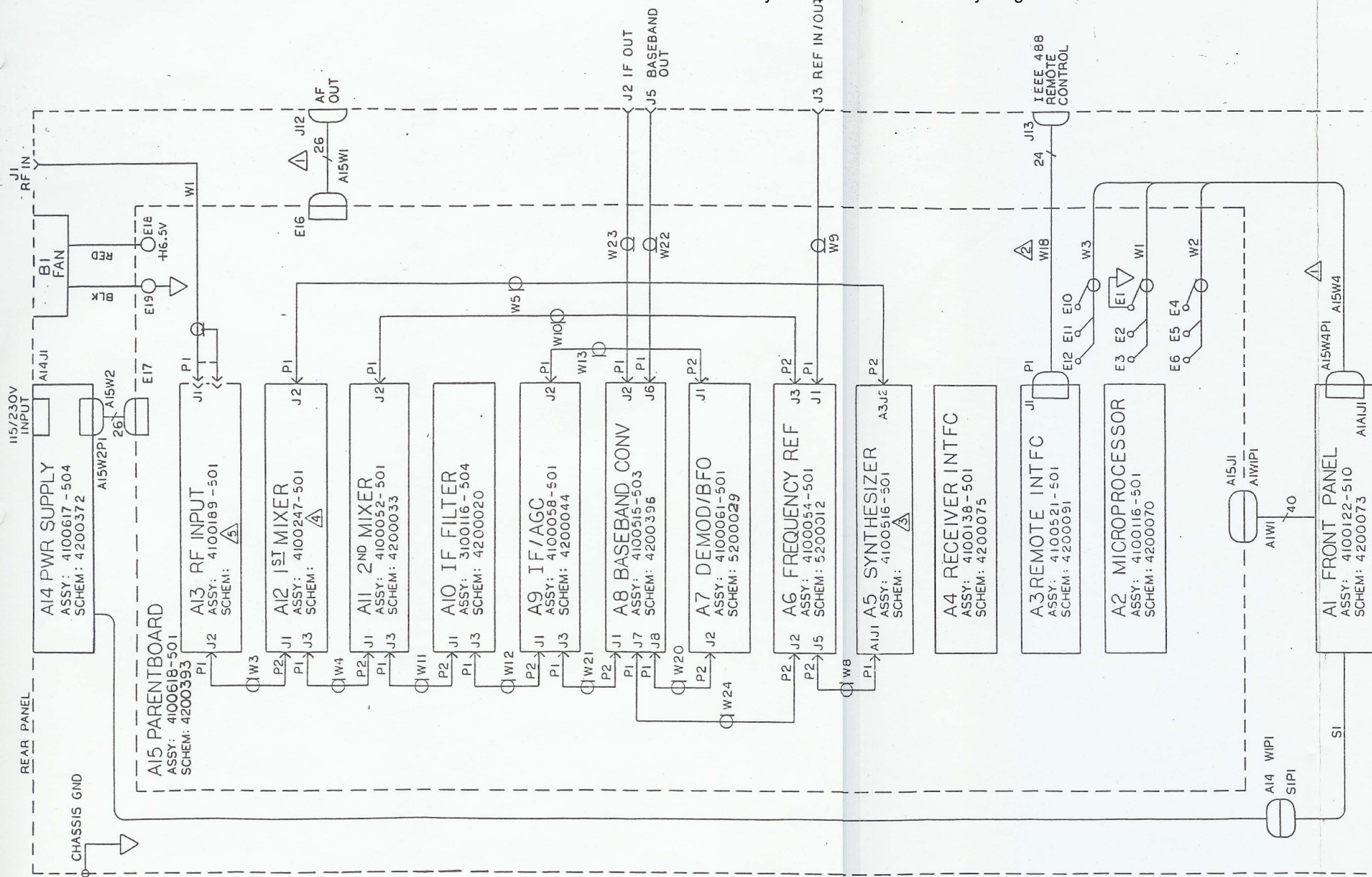
An index of those drawings contained in this section is provided below.

DRAWING INDEX

- Figure 7-1. RA6830-516 HF Receiver Interconnecting Wiring Diagram (4200395)
- Figure 7-2. Front Panel Assembly A1A1, Schematic Diagram (4200073)
- Figure 7-3. Microprocessor A2, Schematics Diagram (4200070)
- Figure 7-4. IEEE-488 Remote Control Interface A3, Schematic Diagram (4200091)
- Figure 7-5. Receiver Interface A4, Schematic Diagram (4200075)
- Figure 7-6. Synthesizer Digital Board A5A1, Schematic Diagram (4200282)
- Figure 7-7. Synthesizer Analog Board A5A2, Schematic Diagram (4200281)
- Figure 7-8. Synthesizer Board No. 3 A5A3, Schematic Diagram (4200272)
- Figure 7-9. Frequency Reference A6, Schematic Diagram (5200012)
- Figure 7-10. Demodulator/BFO A7, Schematic Diagram (5200029)
- Figure 7-11. Baseband Converter A8, Schematic Diagram (4200396)
- Figure 7-12. IF/AGC A9, Schematic Diagram (4200044)
- Figure 7-13. IF Filter A10, Schematic Diagram (4200020)
- Figure 7-14. 2nd Mixer A11, Schematic Diagram (4200033)
- Figure 7-15. 1st Mixer A12, Schematic Diagram (4200186)

DRAWING INDEX (Cont.)

- Figure 7-16. 40.455 MHz Notch Filter A12A1, Schematic Diagram (4200110)
- Figure 7-17. FET (IC) A12A2, Schematic Diagram (3200030)
- Figure 7-18. RF Input Module A13, Schematic Diagram (4200093)
- Figure 7-19. Linear Power Supply A14, Schematic Diagram (4200372)
- Figure 7-20. Power Supply Regulator Assembly A14A2, Schematic Diagram (4200301)
- Figure 7-21. Parent Board A15, Schematic Diagram (4200393)

Courtesy of <http://BlackRadios.terryo.org>

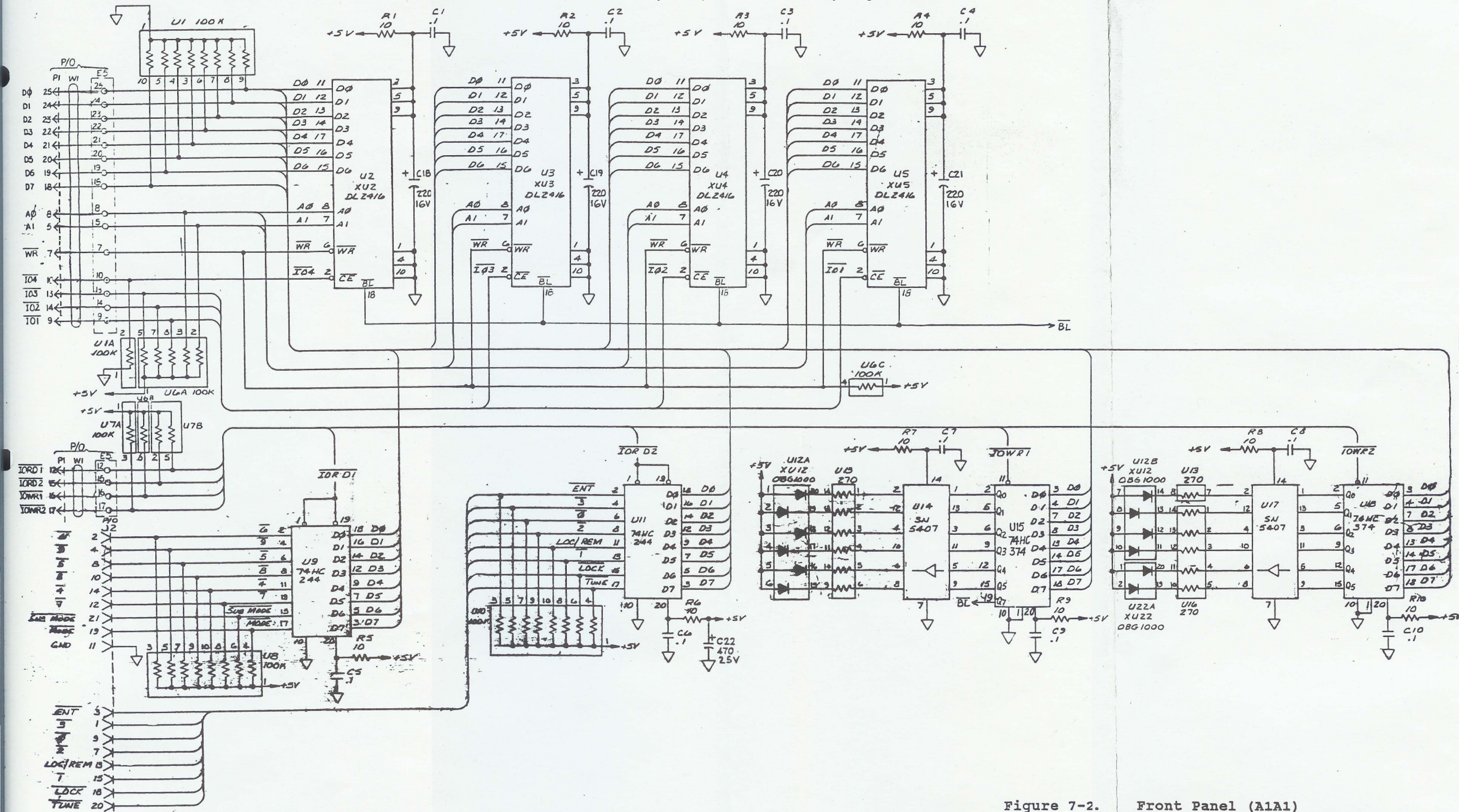
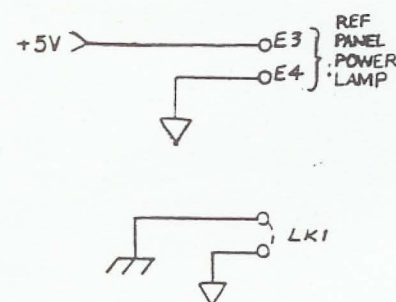


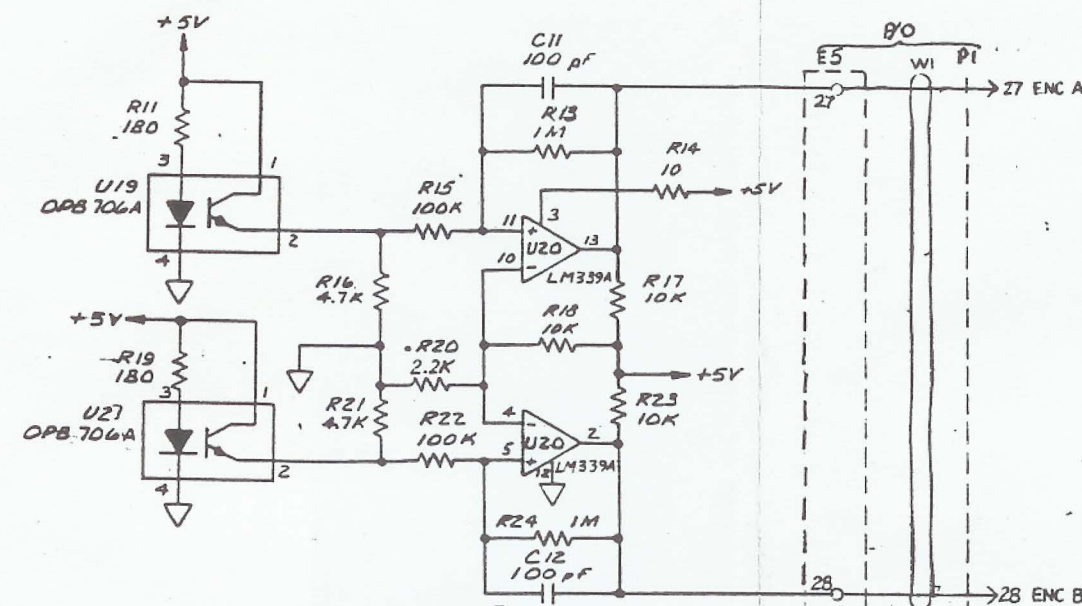
Figure 7-2.

Front Panel (A1A1)
Schematic Diagram (4200073)
(Sheet 1 of 2)

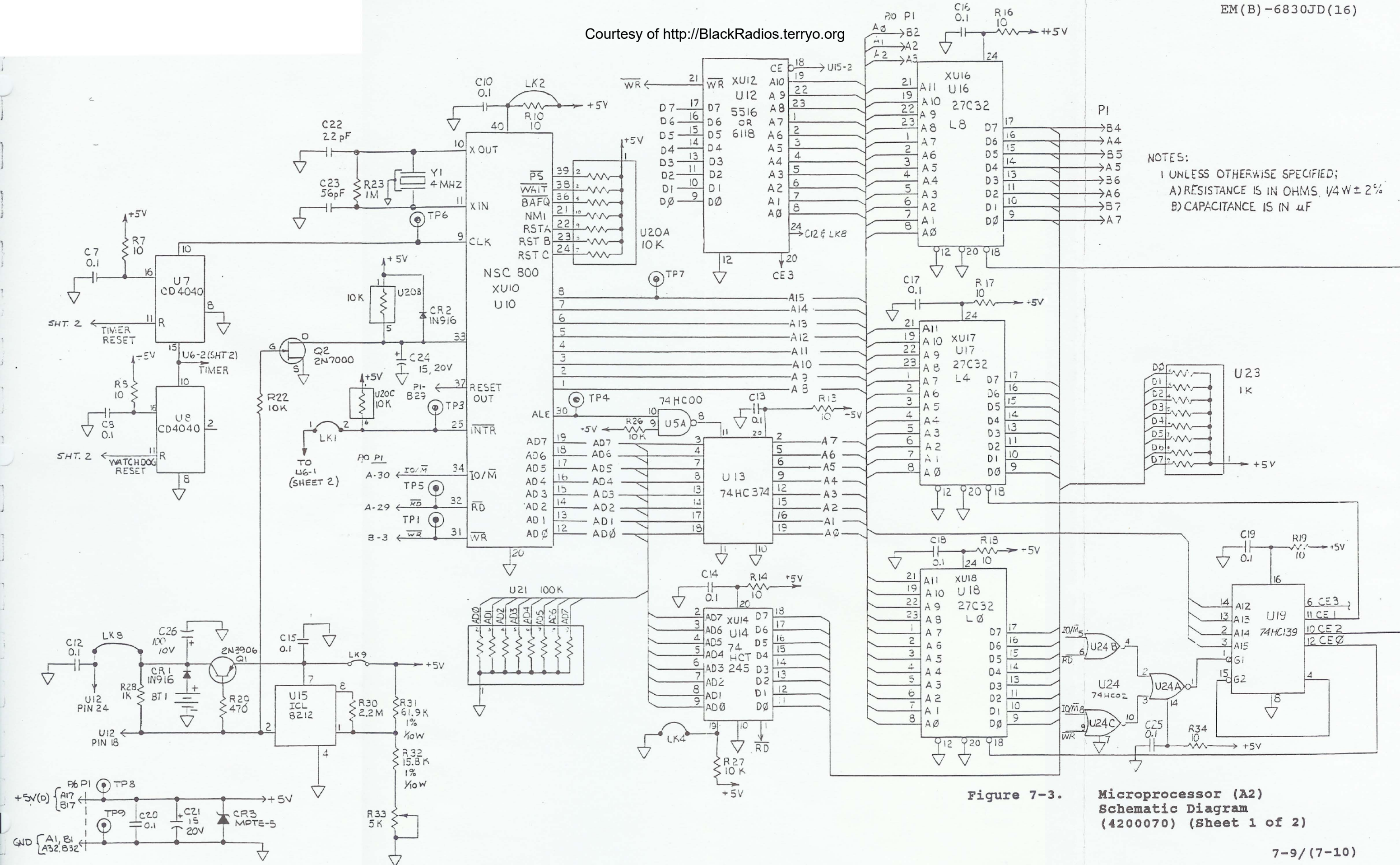


1) UNLESS OTHERWISE SPECIFIED :

- A) RESISTANCE IS IN OHMS $\frac{V}{A}$, 2%.
- B) CAPACITANCE IS IN μf



Front Panel (A1A1)
Schematic Diagram (4200073)
(Sheet 2 of 2)

Courtesy of <http://BlackRadios.terryo.org>

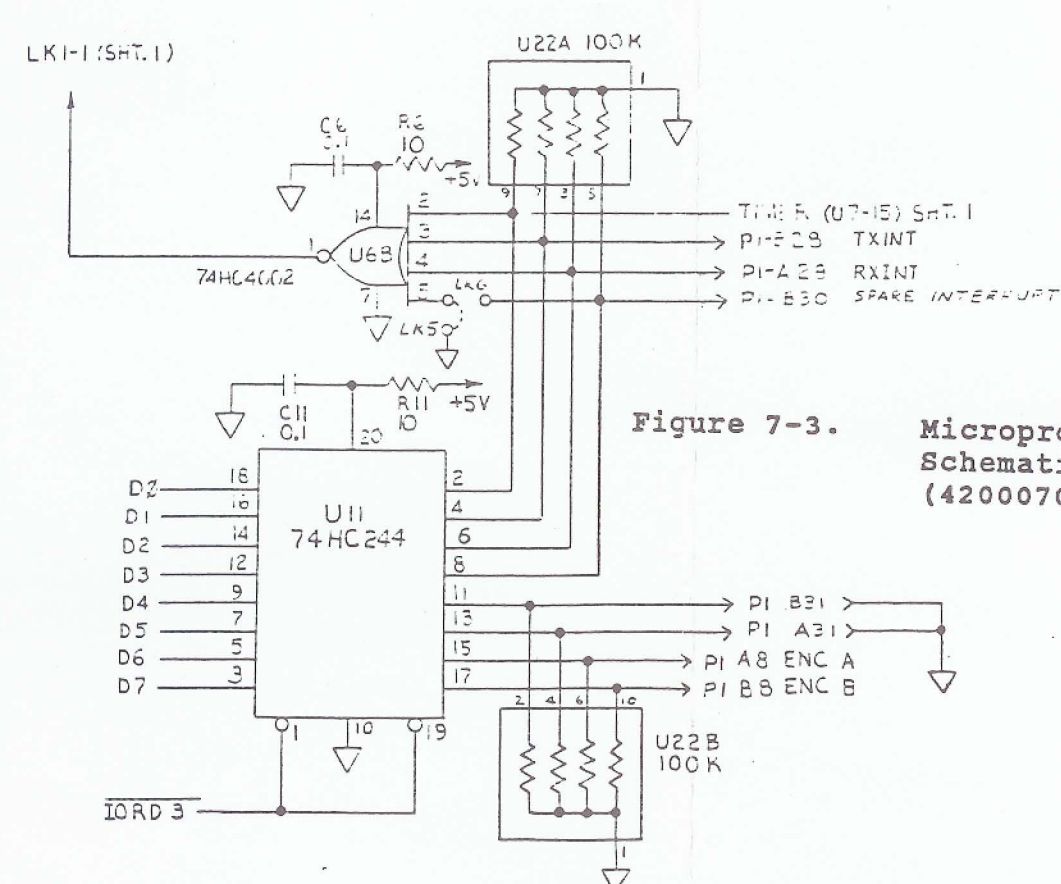
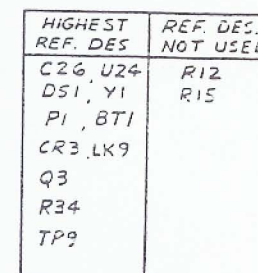


Figure 7-3. Microprocessor (A2)
Schematic Diagram
(4200070) (Sheet 2 of 2)

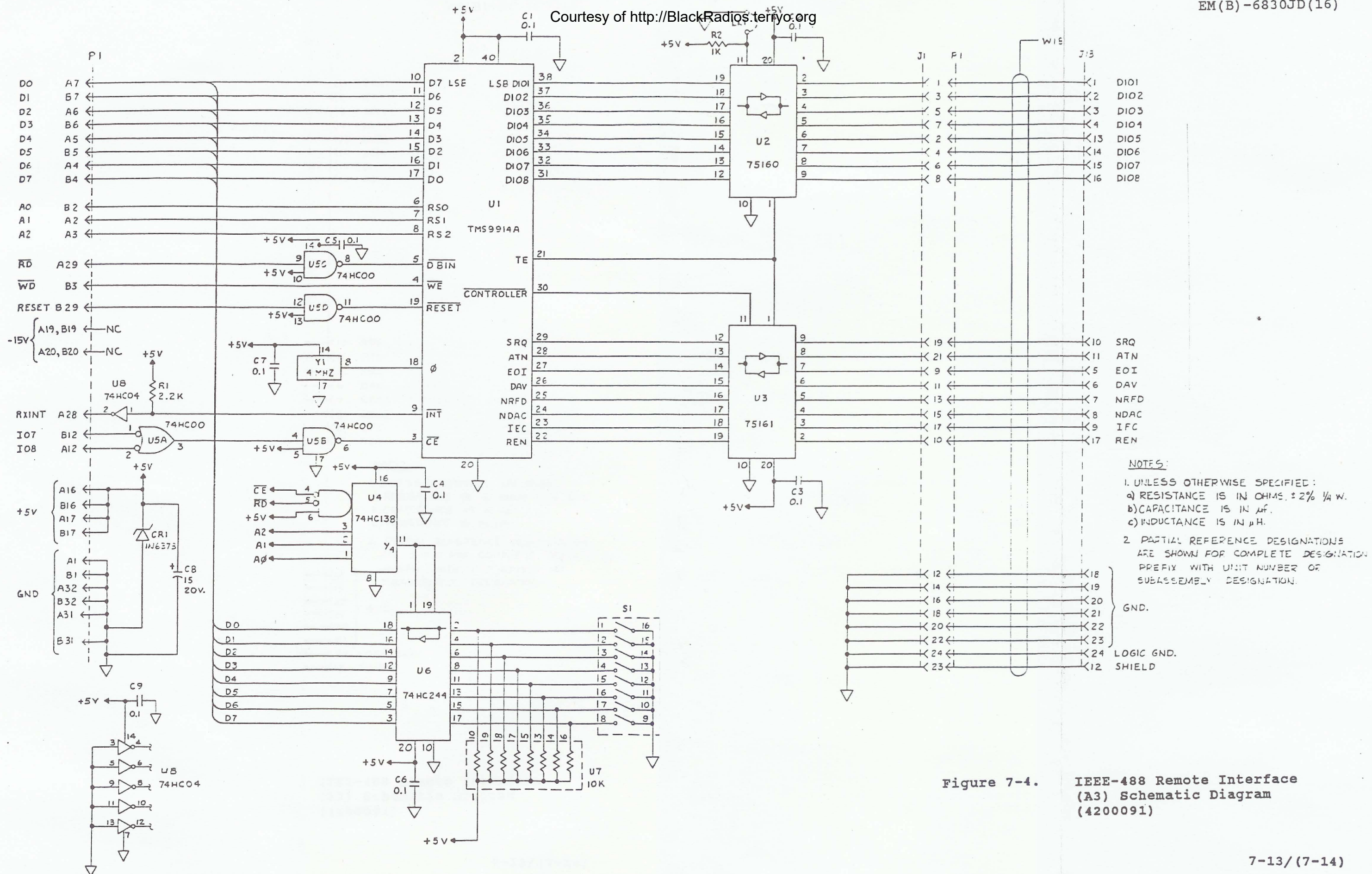
Courtesy of <http://BlackRadios.terry.org>

Figure 7-4.

IEEE-488 Remote Interface
(A3) Schematic Diagram
(4200091)

SEE
SHEET 2

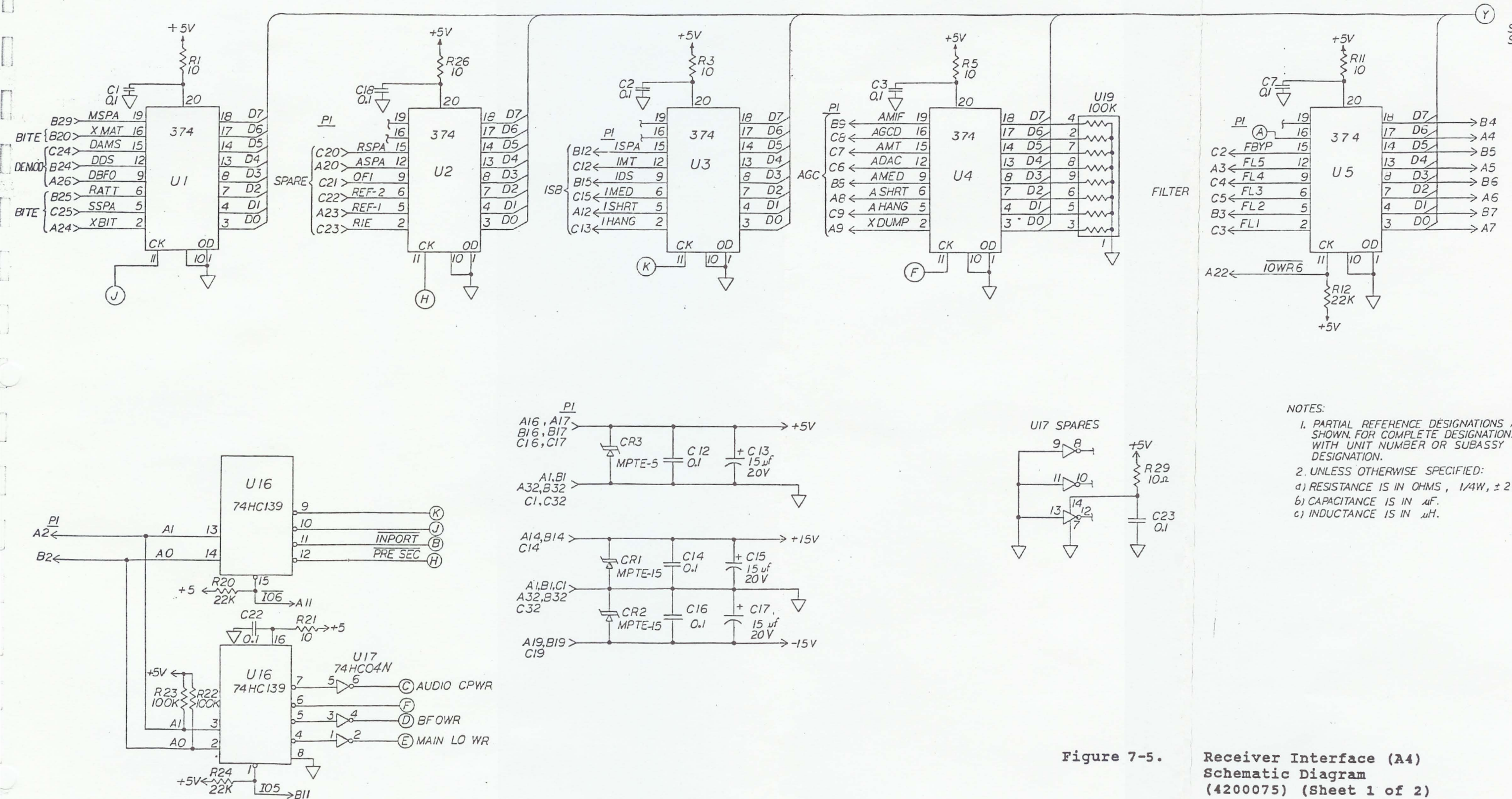


Figure 7-5.

Receiver Interface (A4)
Schematic Diagram
(4200075) (Sheet 1 of 2)

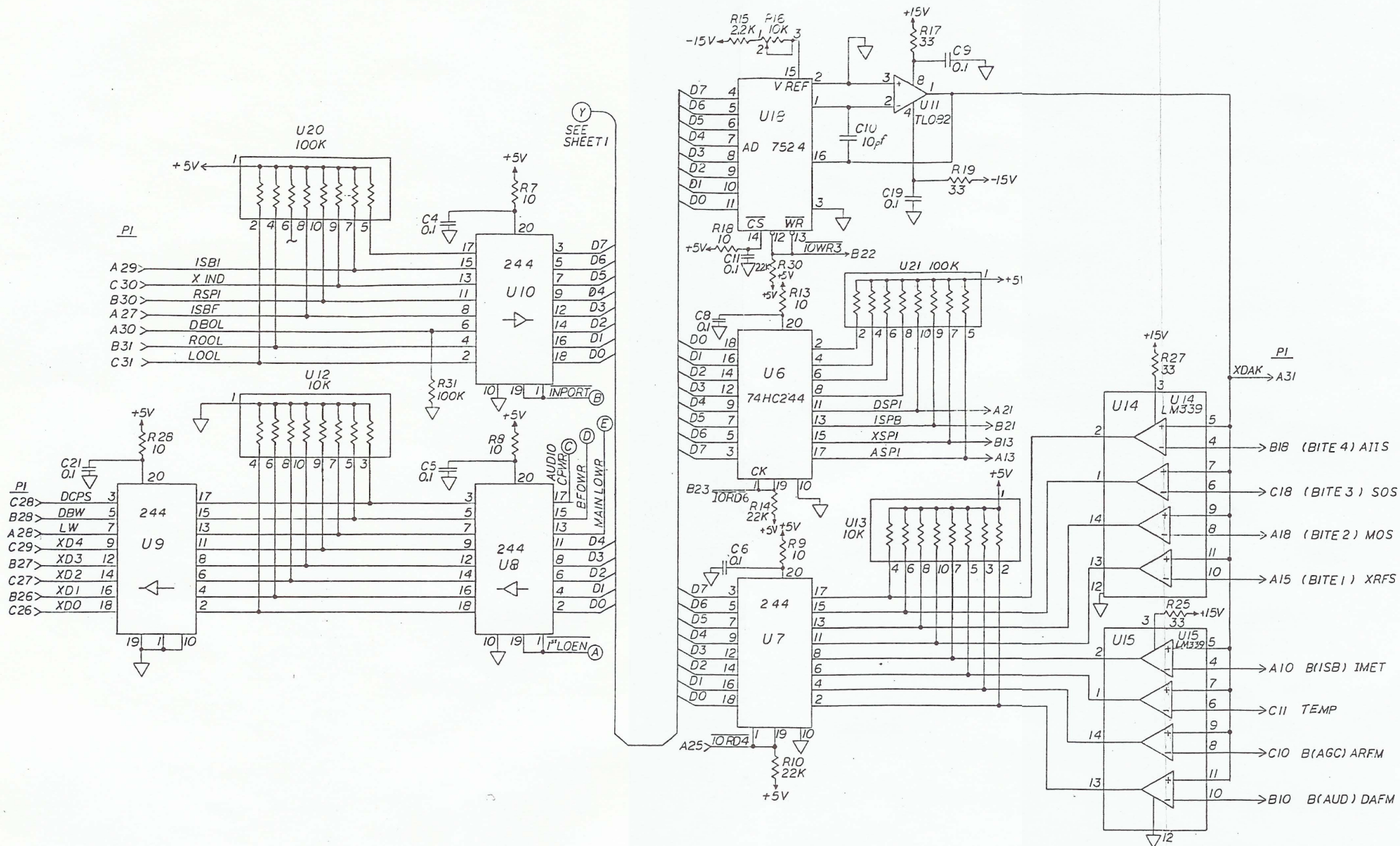
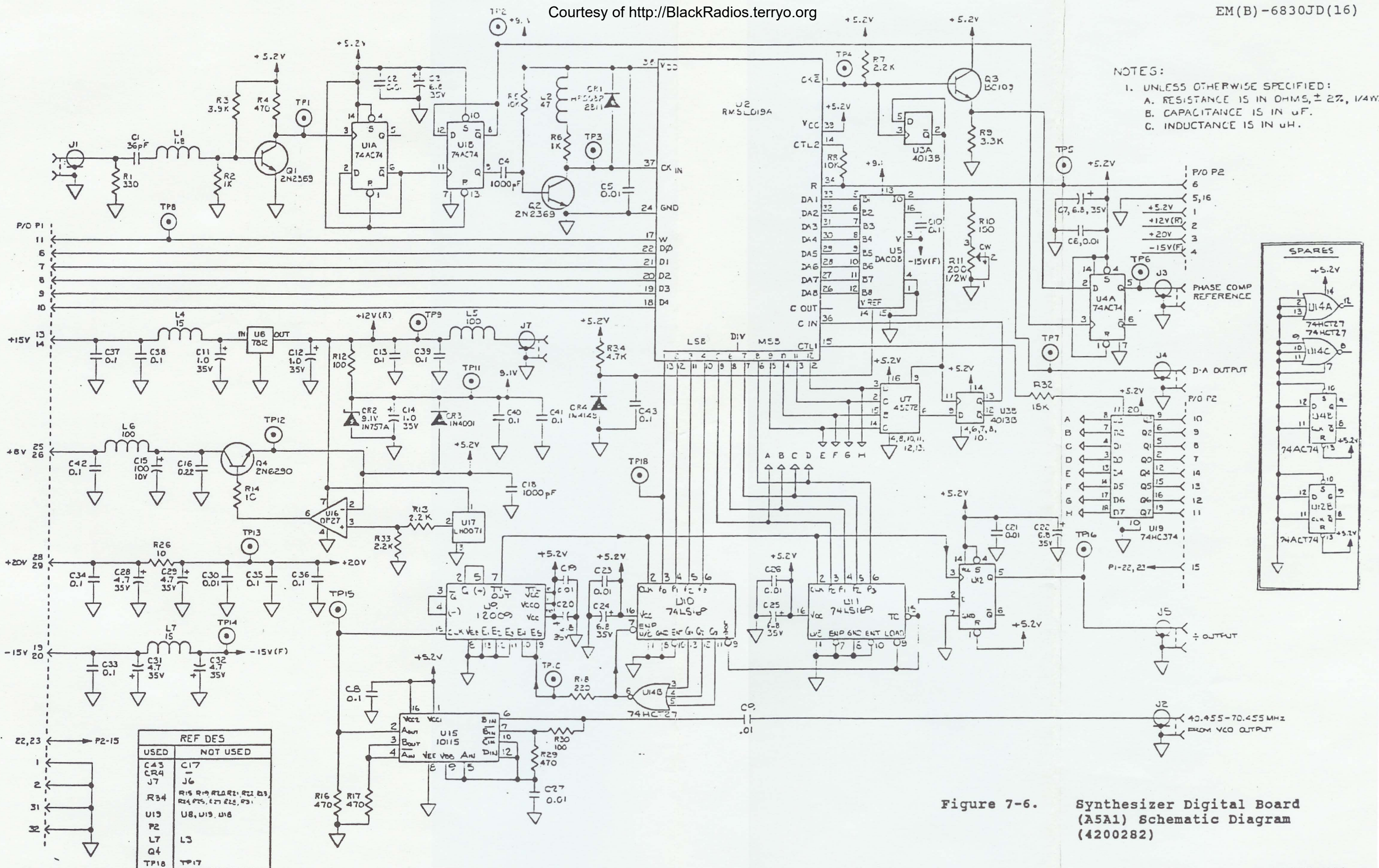
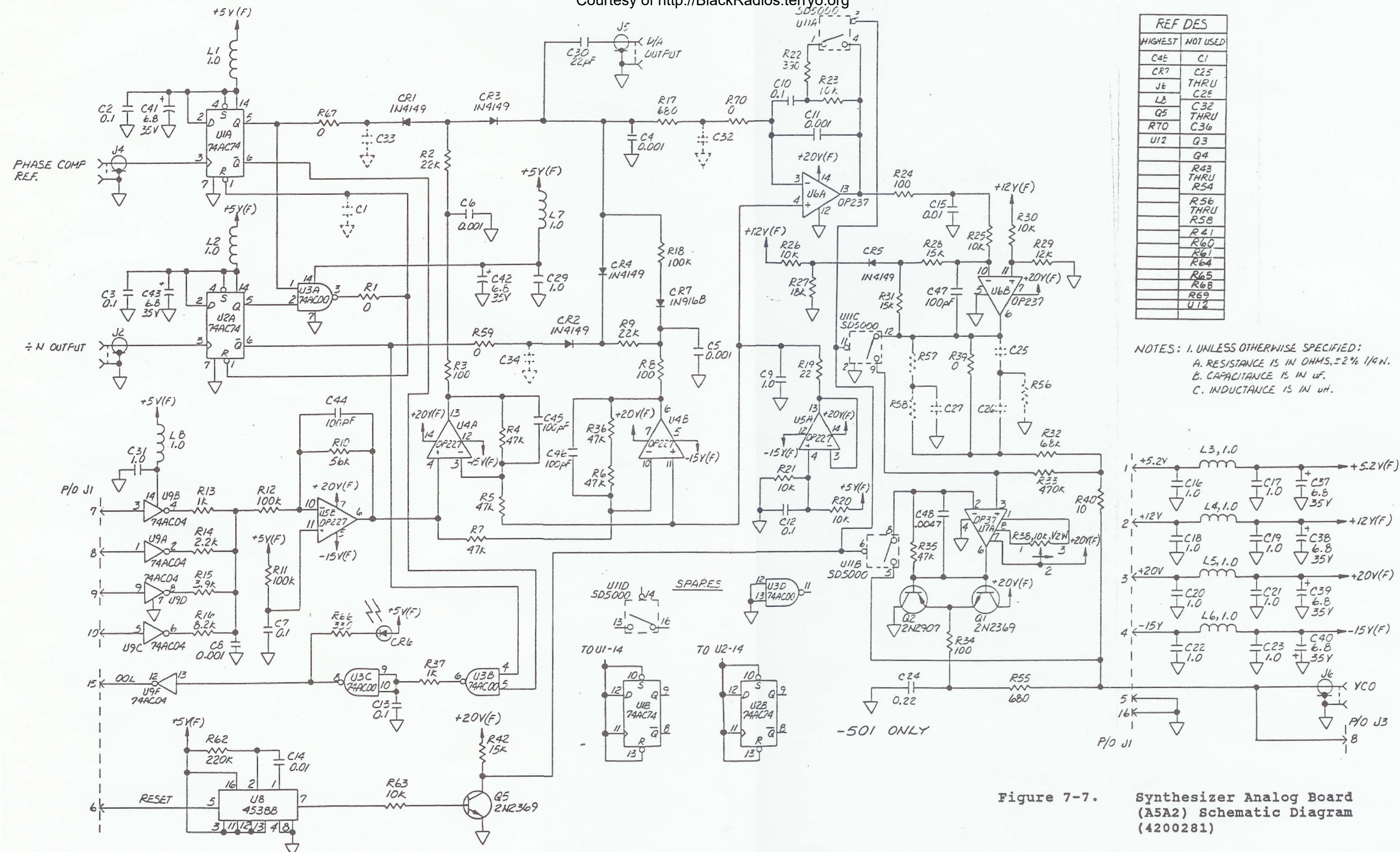
Courtesy of <http://BlackRadios.terryo.org>

Figure 7-5. Receiver Interface (A4)
Schematic Diagram
(4200075) (Sheet 2 of 2)



Courtesy of <http://BlackRadios.terryo.org>

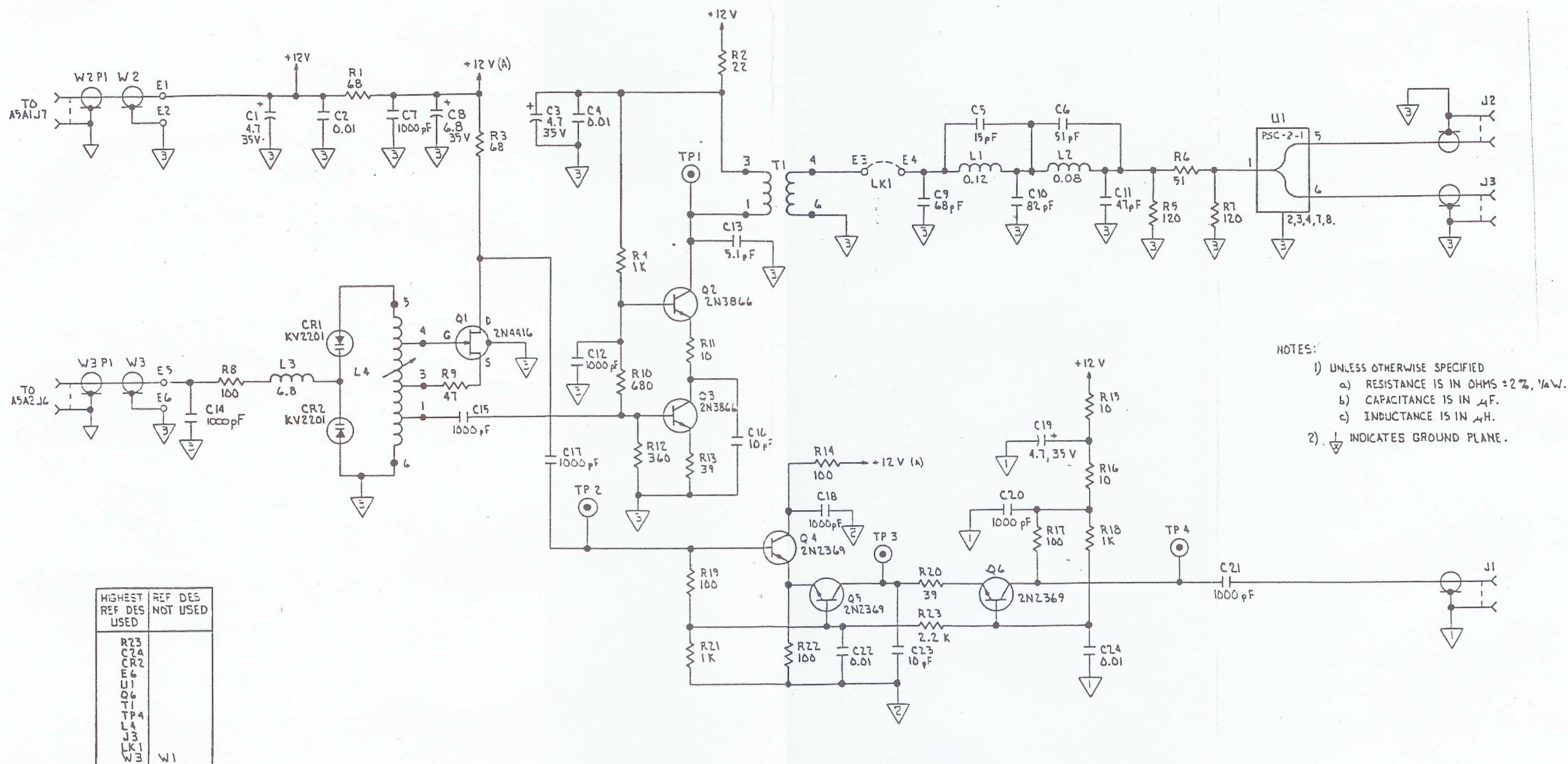
Courtesy of <http://BlackRadios.terryo.org>

Figure 7-8.

Synthesizer Board No. 3
(A5A3) Schematic Diagram
(4200272)

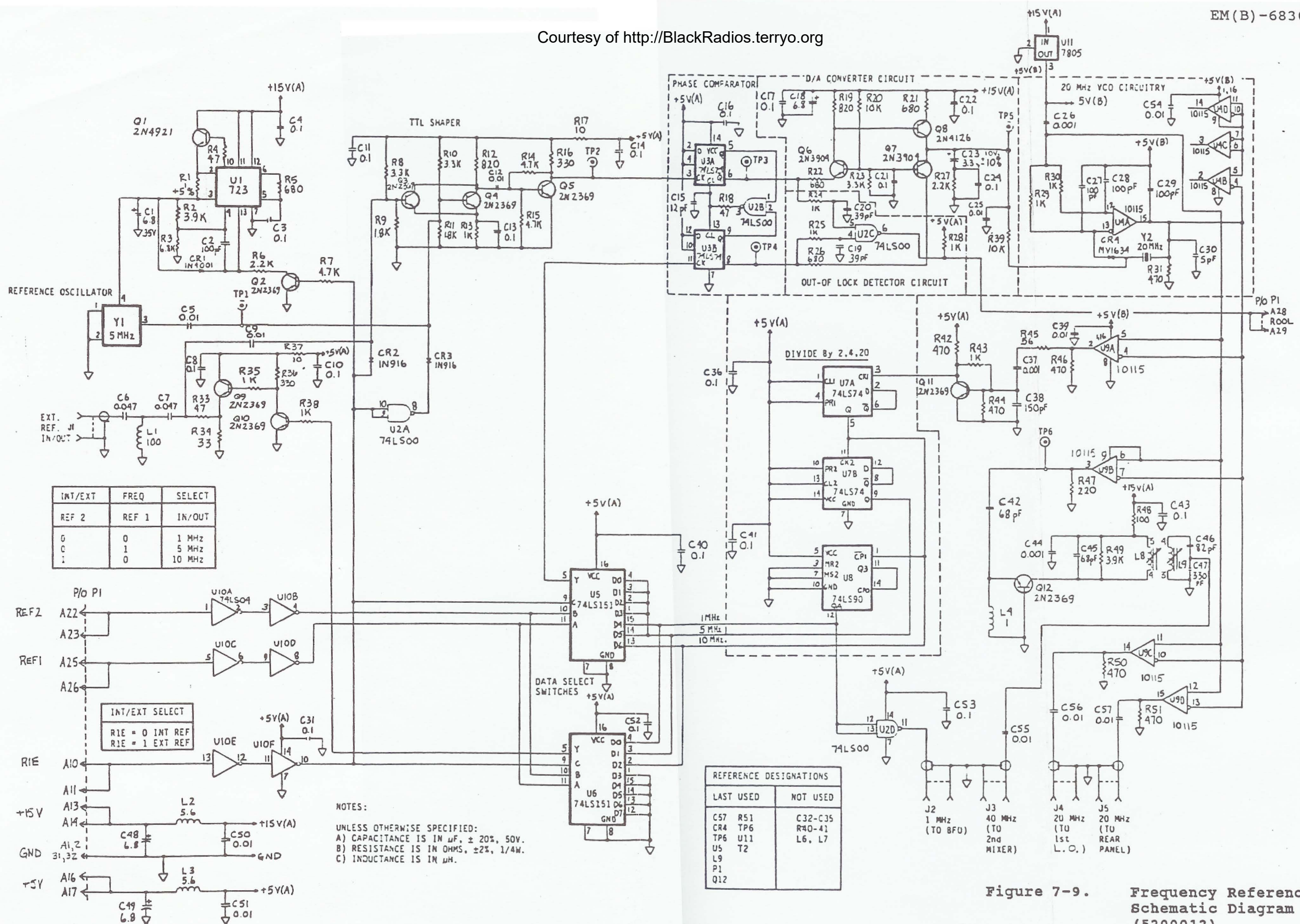
Courtesy of <http://BlackRadios.terryo.org>

Figure 7-9. Frequency Reference (A6) Schematic Diagram (5200012)

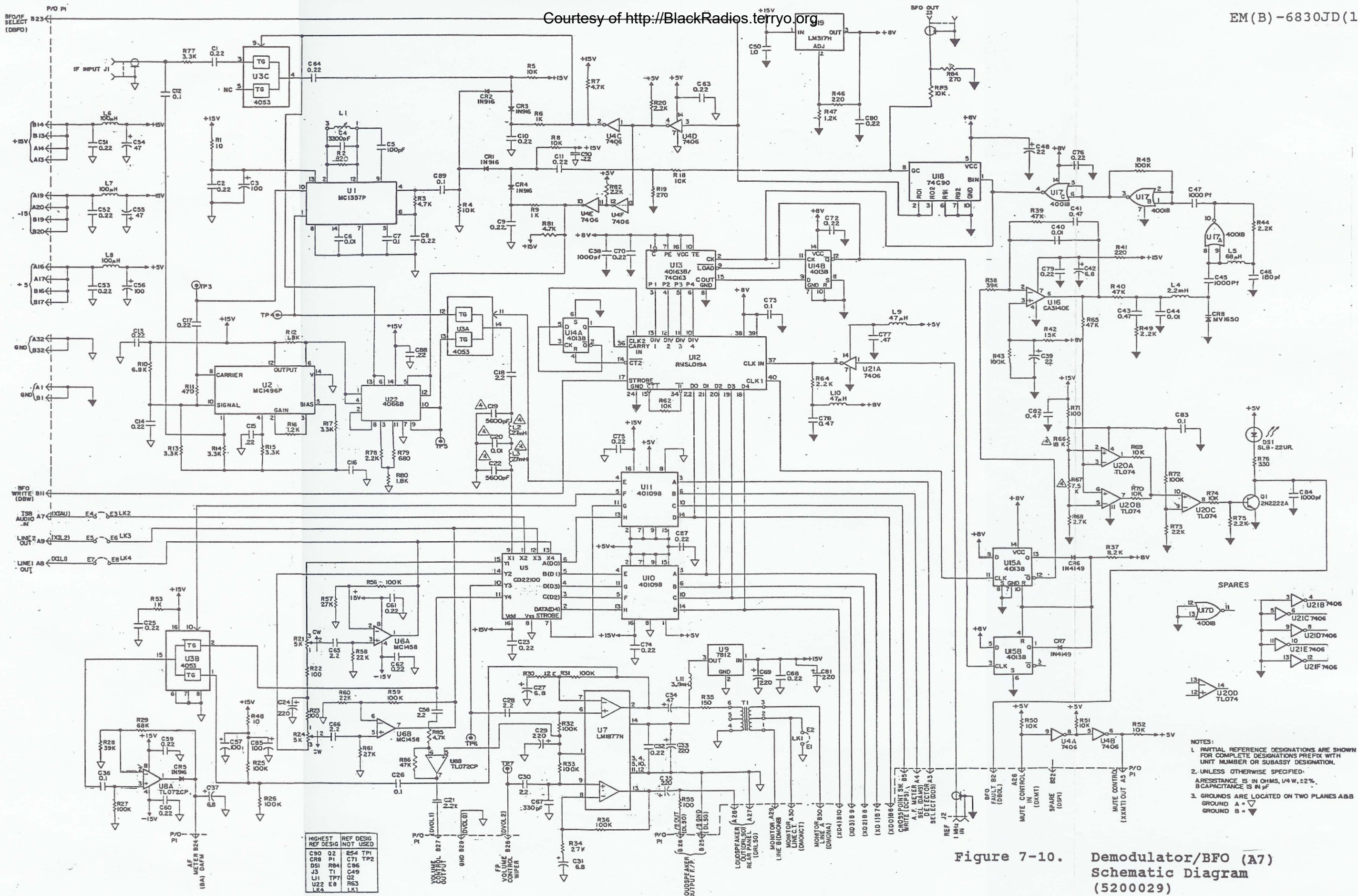


Figure 7-10. Demodulator/BFO (A7) Schematic Diagram (5200029)

REFERENCE DESIGNATIONS

LAST USED NOT USED

C52 CR7 J8

L14 LK5 P1

Q6 R60 TP2

U13

Courtesy of <http://BlackRadios.terry.org>

SPB6

U12B

6 LM358

7

NOTES:

1. UNLESS OTHERWISE SPECIFIED:

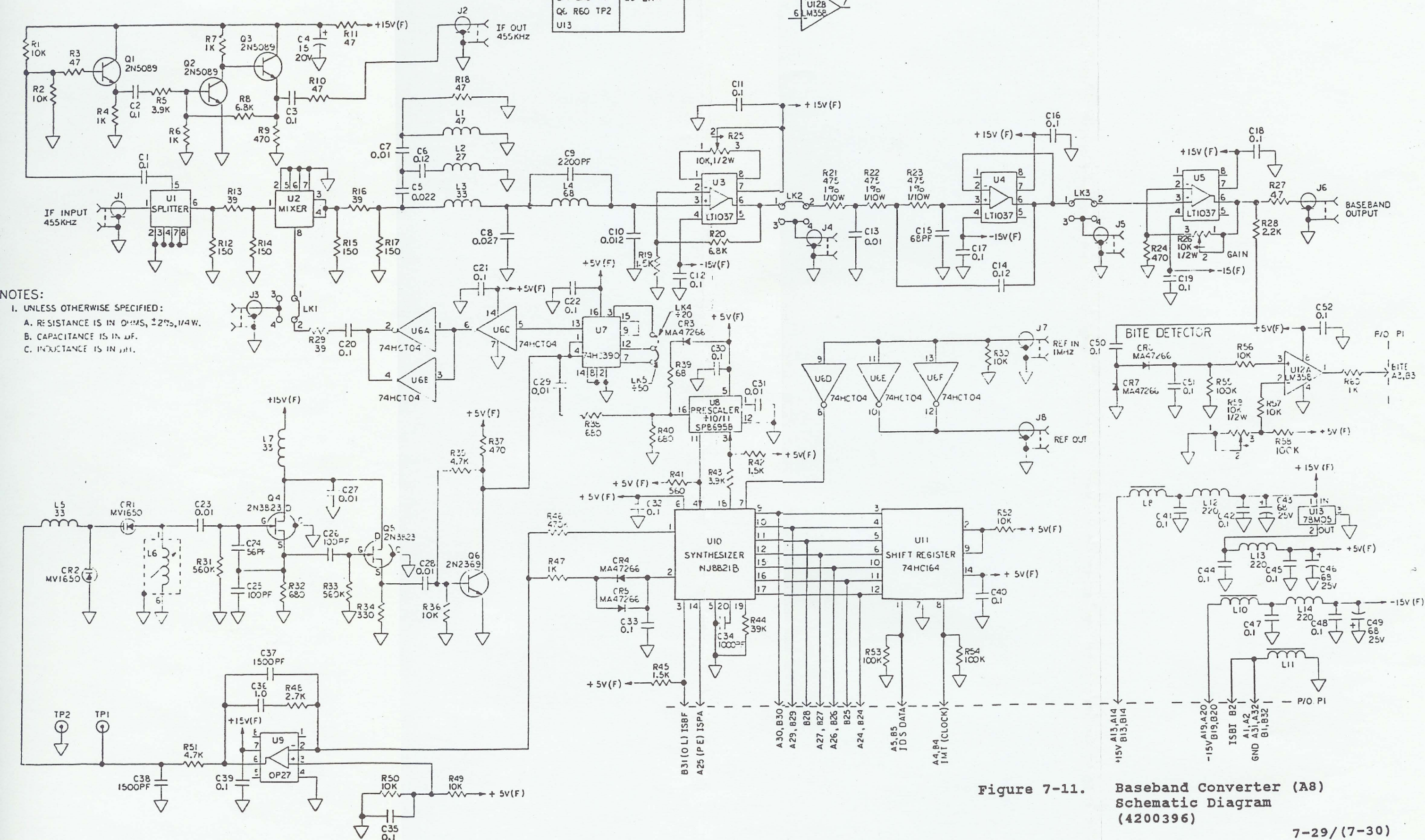
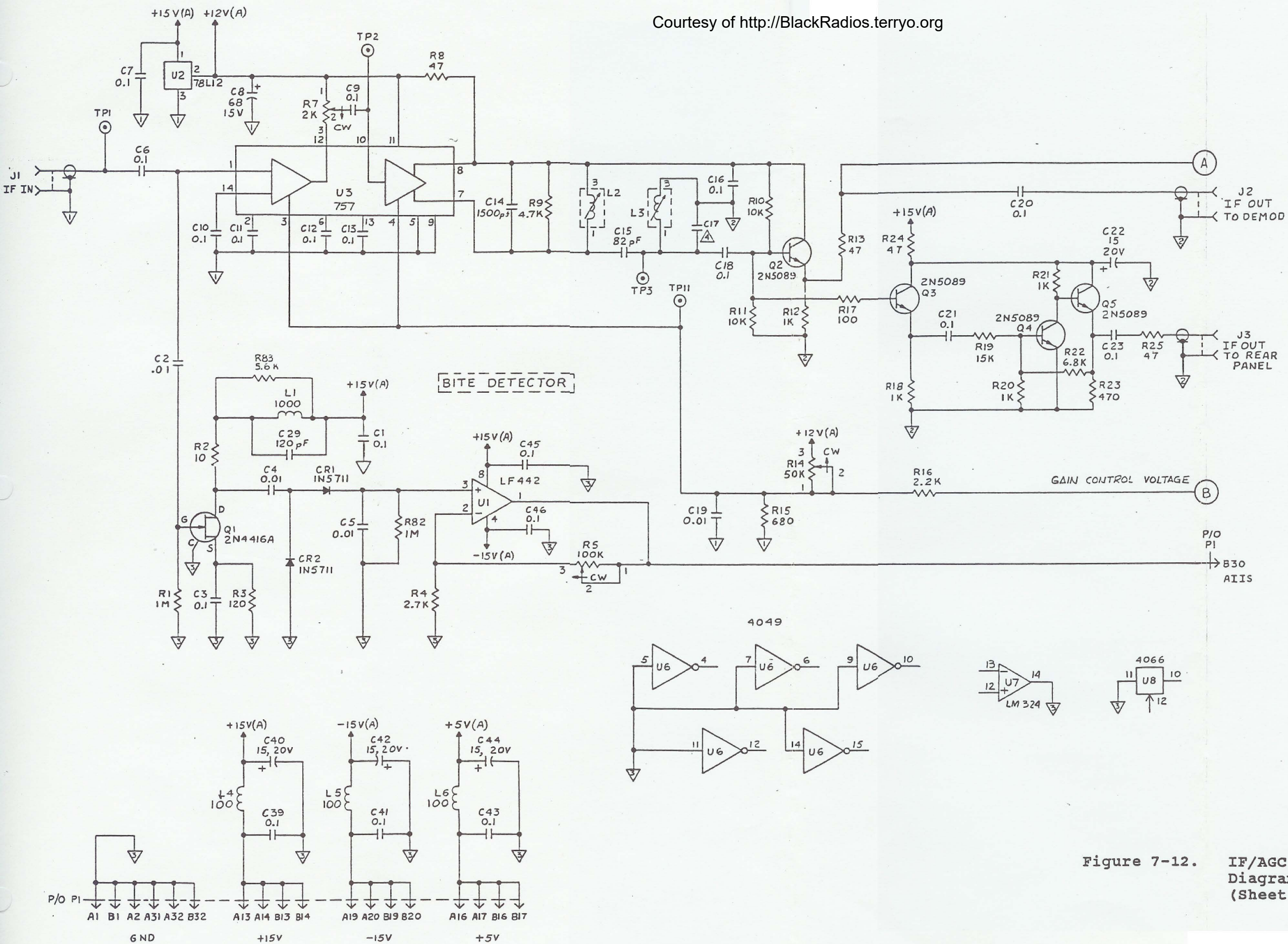
A. RESISTANCE IS IN OHMS, $\pm 2\%$, 1/4W.B. CAPACITANCE IS IN μ F.C. INDUCTANCE IS IN μ H.

Figure 7-11.

Baseband Converter (A8)
Schematic Diagram
(4200396)

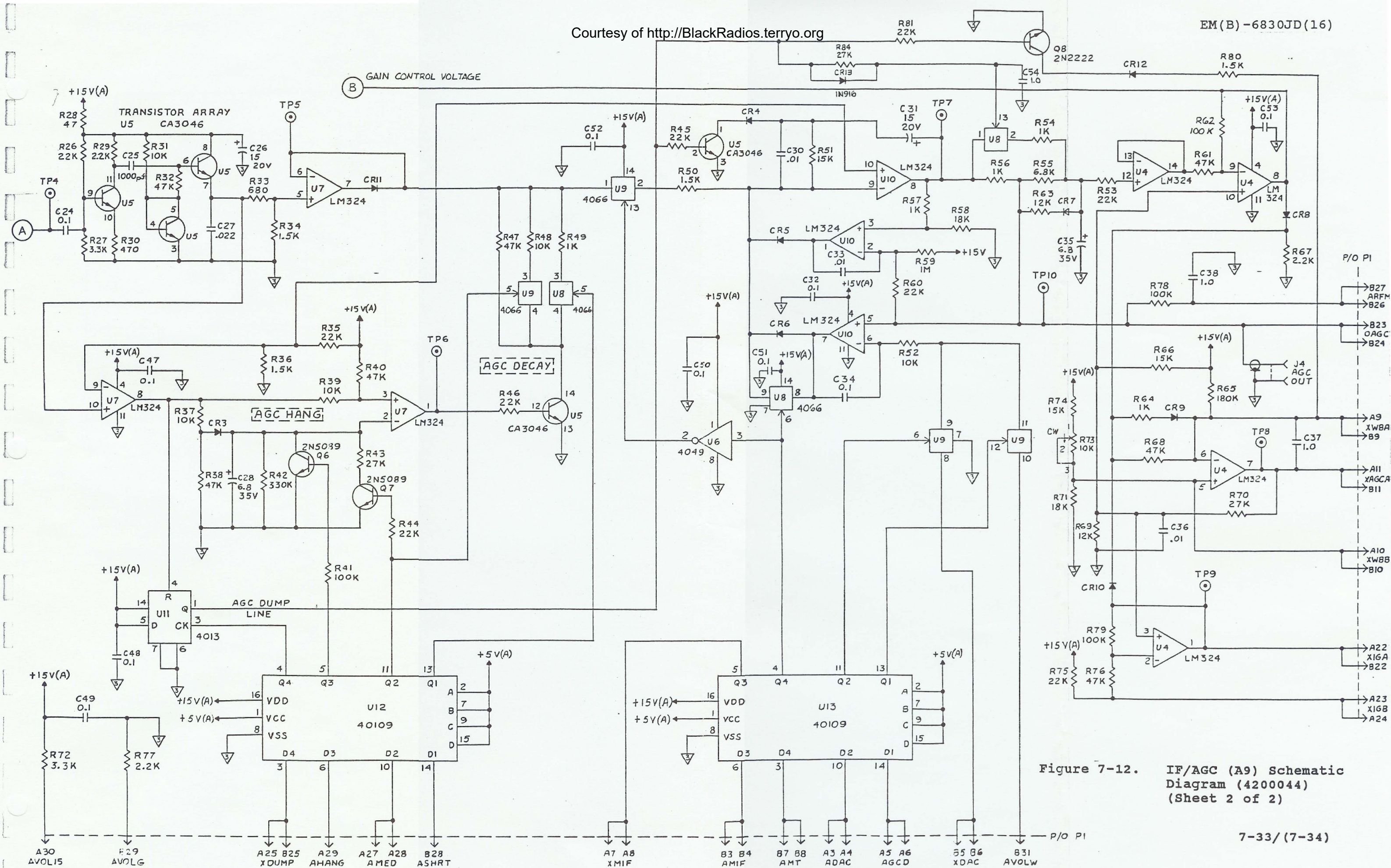
Courtesy of <http://BlackRadios.terryy.org>

NOTES:

- UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS IN OHMS, $\pm 2\%$, 1/4W.
B) CAPACITANCE IS IN μF .
C) INDUCTANCE IS IN μH .
D) DIODES ARE IN916.
- SEE SCHEMATIC 4200116 FOR BOARDS BEARING SERIAL NUMBERS 101 THRU 200 INCLUSIVE.
- INDICATES GROUND PLANE CONNECTION.

Δ -501 C17 IS 1500 pF
-502 C17 IS 330 pF

Figure 7-12. IF/AGC (A9) Schematic Diagram (4200044) (Sheet 1 of 2)



Courtesy of <http://BlackRadios.terryo.org>

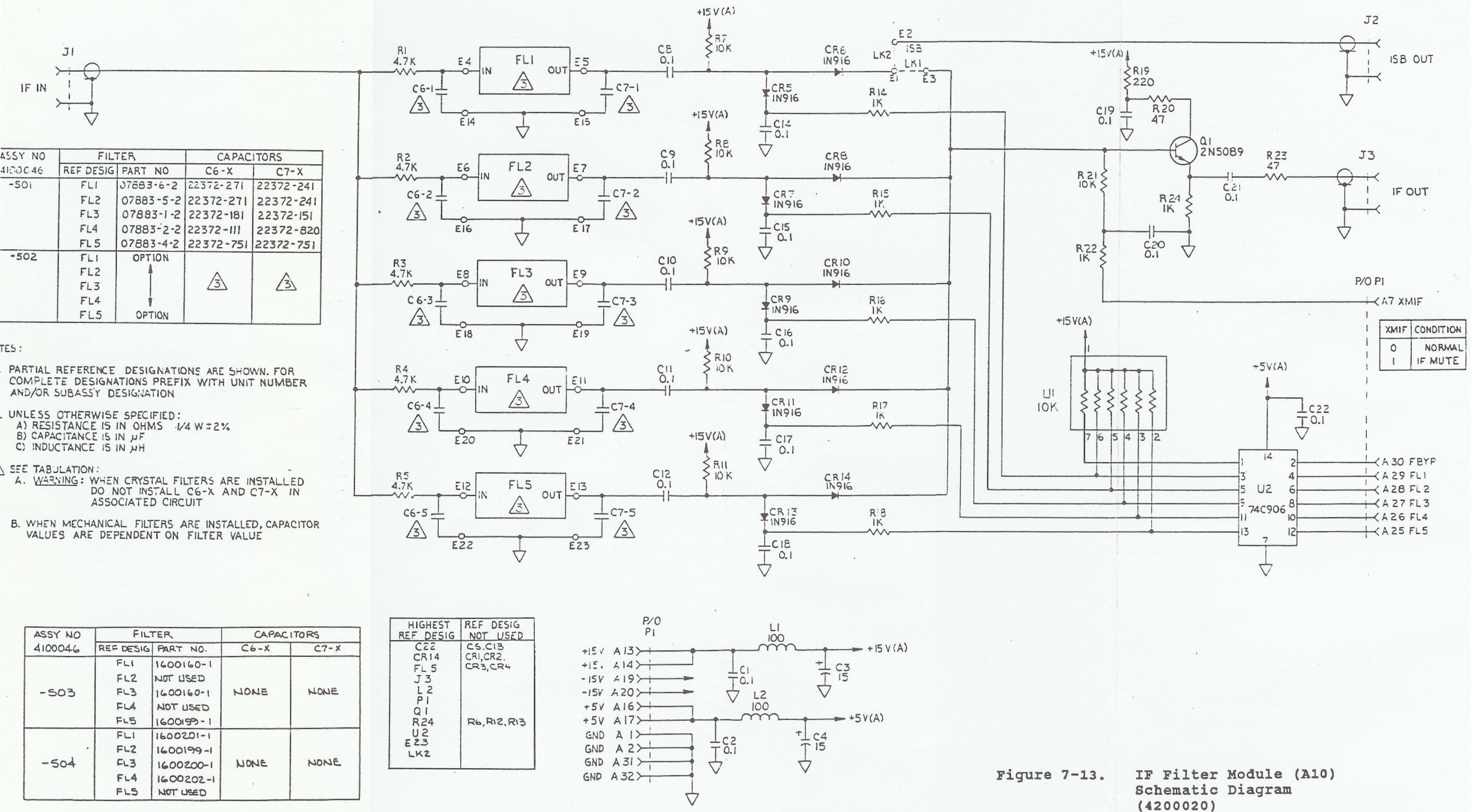
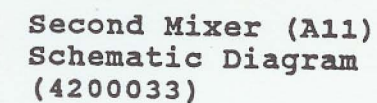
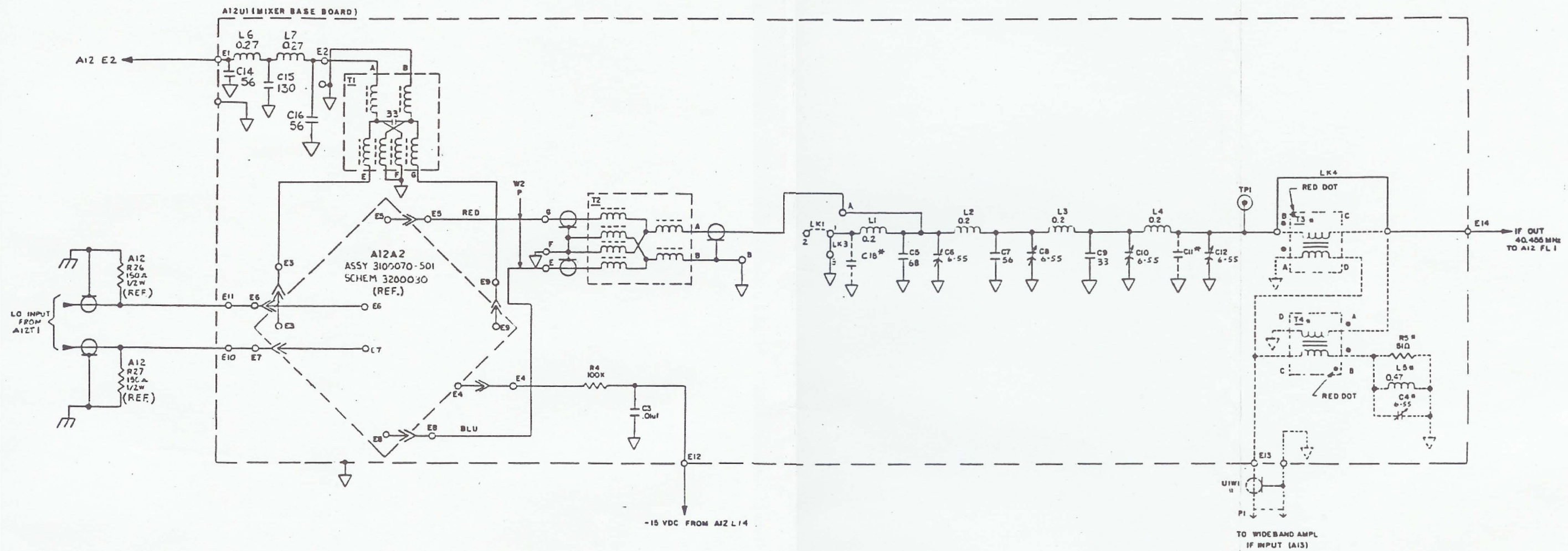


Figure 7-13. IF Filter Module (A10) Schematic Diagram (4200020)

•  PENOTES USED ON -502 ONLY



**NOTES:**

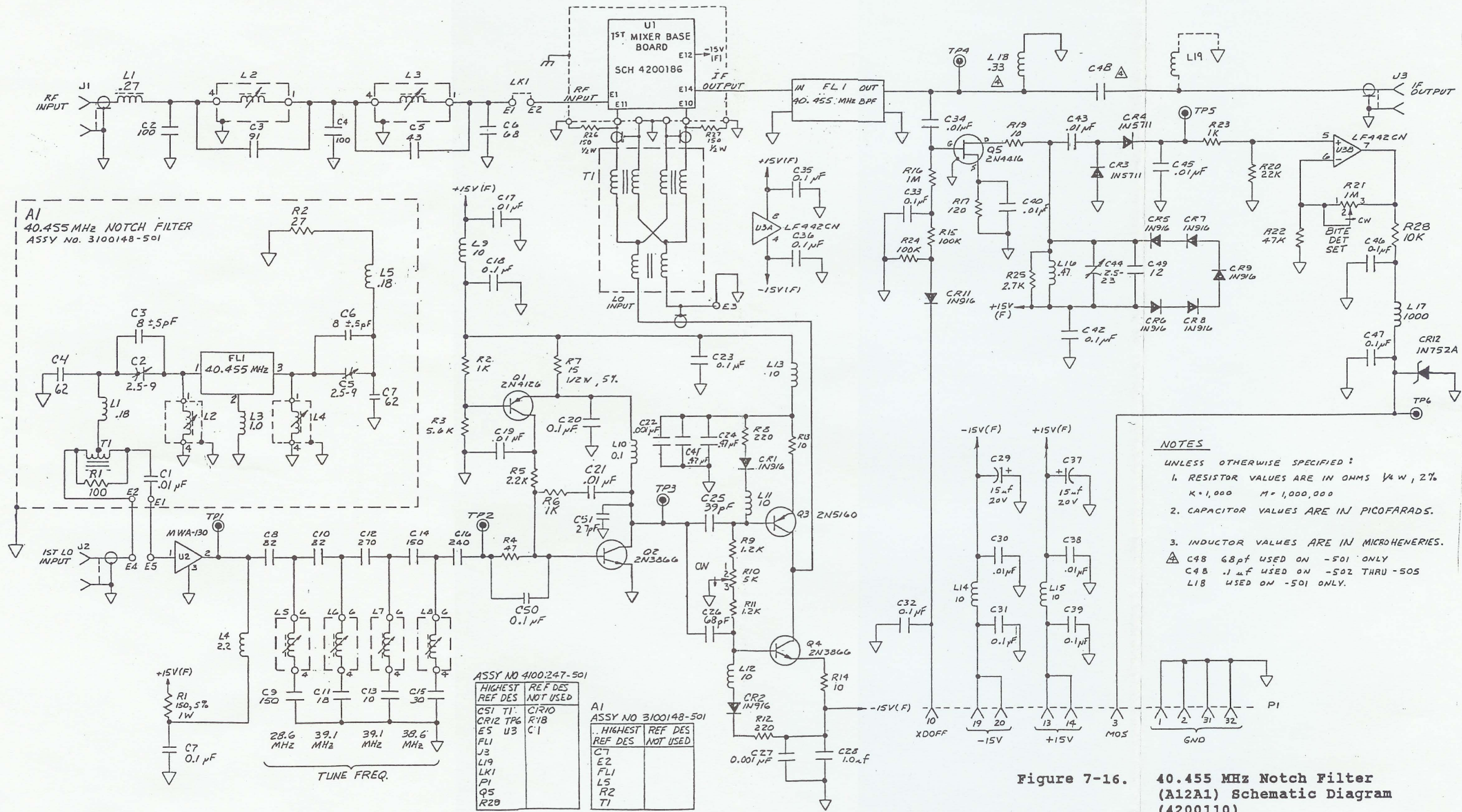
UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITORS IN PF, $\pm 5\%$
2. ALL RESISTORS ARE $\frac{1}{4}W$, $\pm 2\%$
3. ALL INDUCTANCE IS IN μH , $\pm 5\%$
- * NOT USED

Figure 7-15.

First Mixer (A12)
Schematic Diagram
(4200186)

Courtesy of <http://BlackRadios.terryo.org>



- NOTES**
- UNLESS OTHERWISE SPECIFIED:
 - 1. RESISTOR VALUES ARE IN OHMS 1/4 W, 2%
K = 1,000 M = 1,000,000
 - 2. CAPACITOR VALUES ARE IN PICO FARADS.
 - 3. INDUCTOR VALUES ARE IN MICROHENRIES.
 - △ C48 68pF USED ON -501 ONLY
C48 .1 μF USED ON -502 THRU -505
L18 USED ON -501 ONLY.

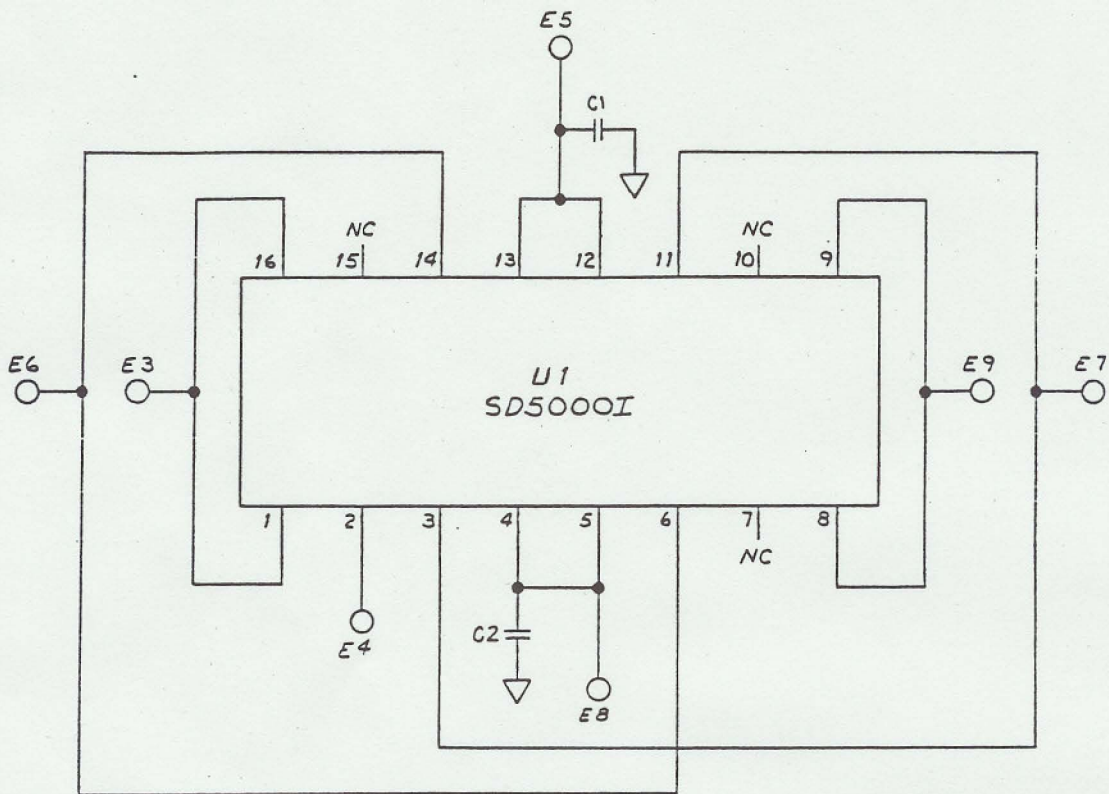
ASSY NO 4100:247-501

HIGHEST REF DES	REF DES NOT USED
C51 T1	C10
CR12 TP6	R18
E5 U3	C1
FL1	
J3	
L19	
LK1	
P1	
Q5	
R28	

AI ASSY NO 3100148-501

HIGHEST REF DES	REF DES NOT USED
C7	
E2	
FL1	
L5	
R2	
T1	

Figure 7-16. 40.455 MHz Notch Filter (A12A1) Schematic Diagram (4200110)



NOTES:

1. SEE PARTS LIST 3100C70-XXX FOR APPROPRIATE VALUES OF C1 AND C2.

HIGHEST REF DES USED	REF DES NOT USED
C2 E9 U1	E1, E2

Figure 7-17. FET (I.C.) Board (A12A2)
Schematic Diagram
(3200030)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
 - a) RESISTANCE IS IN OHMS, 1/4W, $\pm 2\%$
 - b) CAPACITANCE IS IN μF , 50V
 - c) INDUCTANCE IS IN μH .
 - d) DIODES CR7 THRU CR26 ARE IN3600
2. INSTALLED ON NEXT ASSEMBLY LEVEL.
3. * INDICATES PARTS NOT USED ON -501.

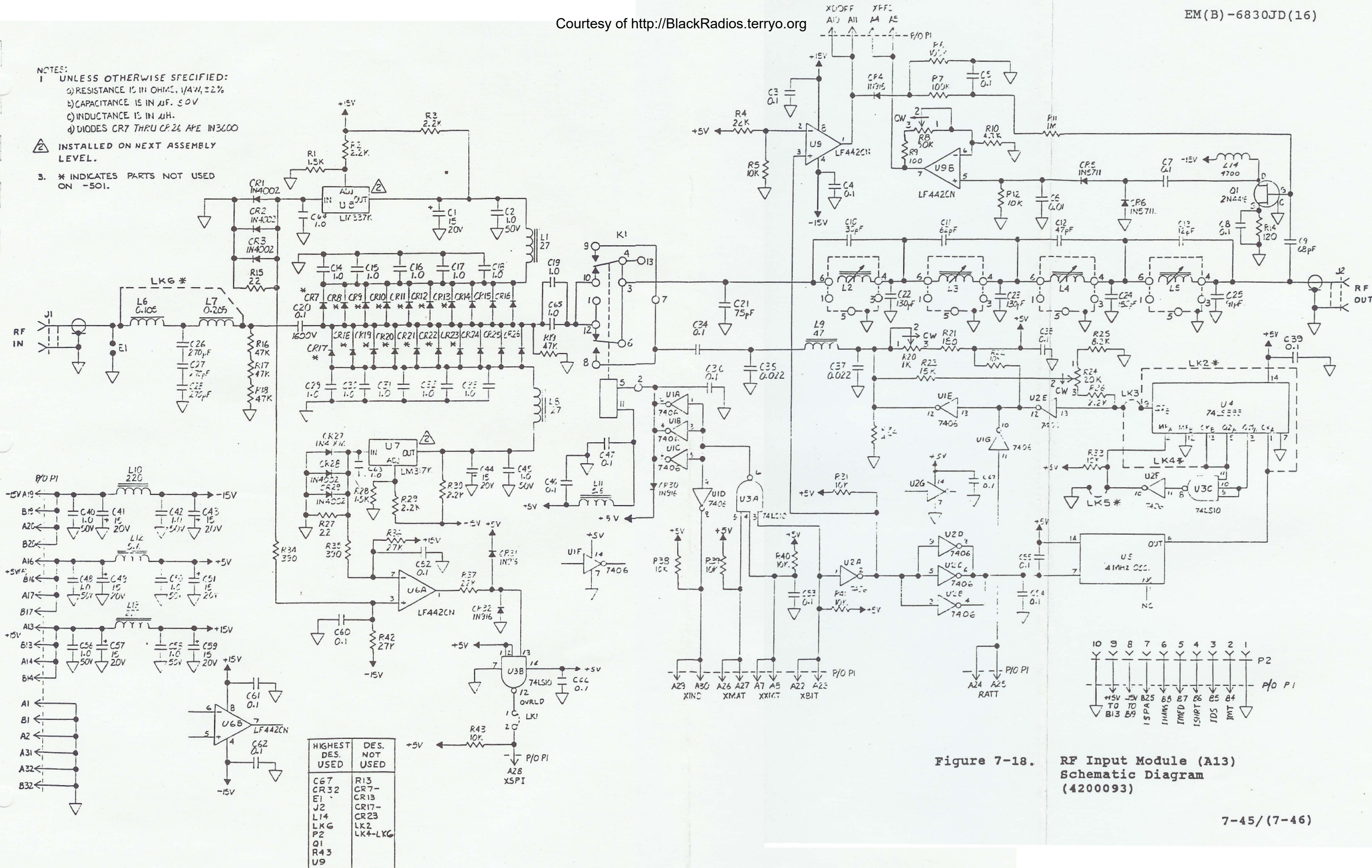
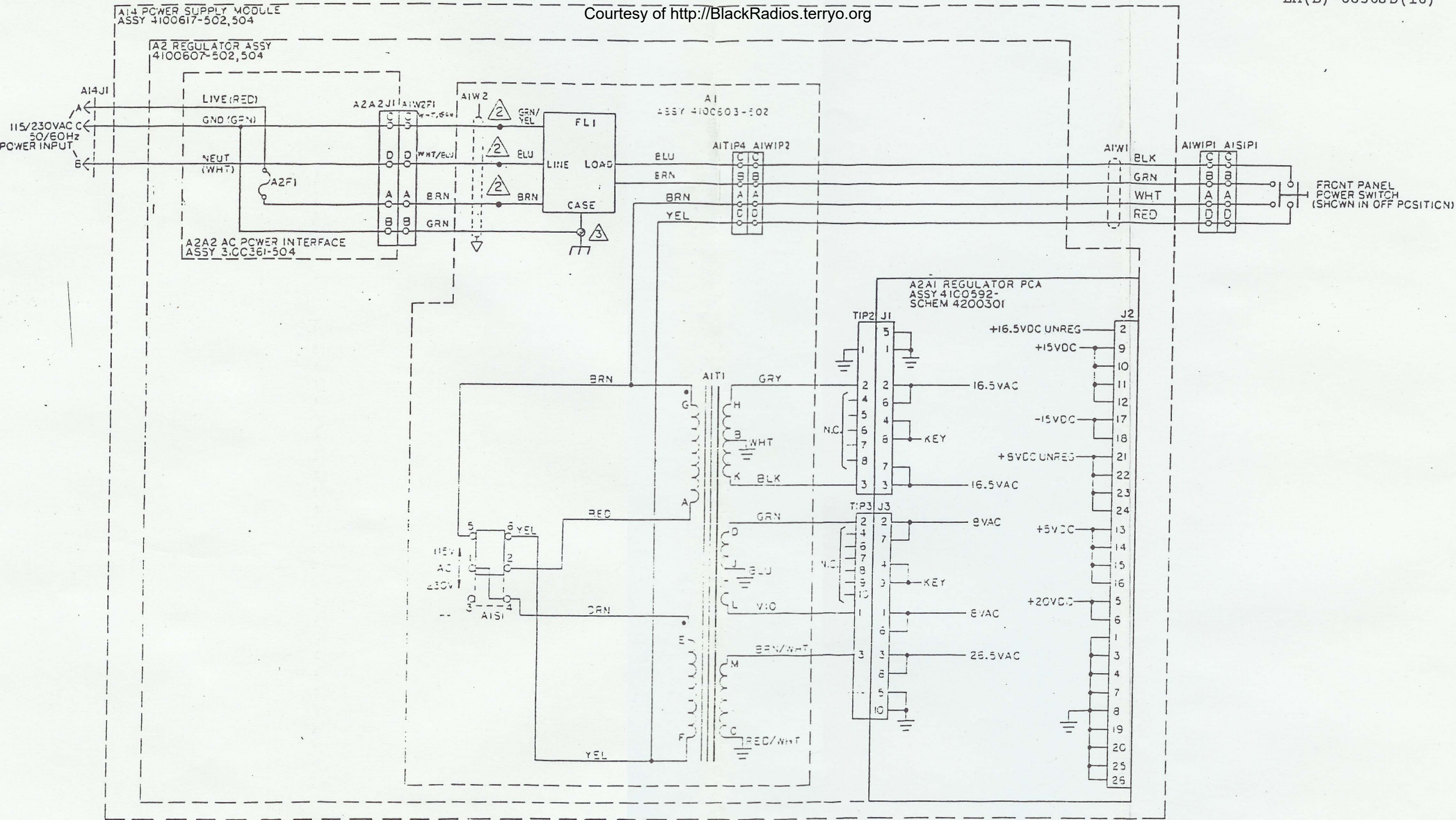


Figure 7-18.

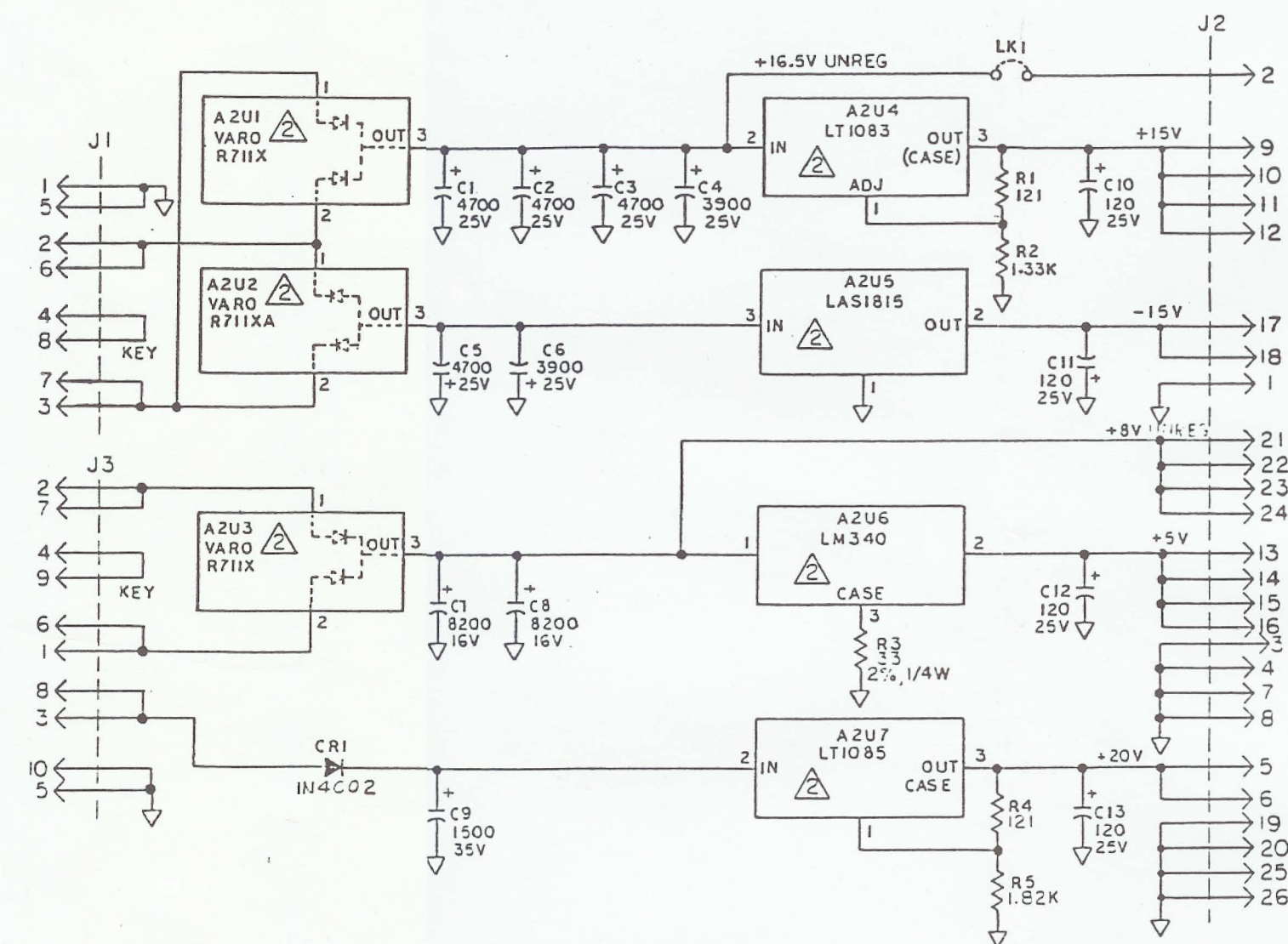
RF Input Module (A13)
Schematic Diagram
(4200093)

Courtesy of <http://BlackRadios.terryo.org>



- NOTES:
1. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. PREFIX THE DESIGNATION WITH A14 ASSEMBLY DESIGNATION.
- ② — INDICATES IN LINE SPLICE.
- ③ — DENOTES MOUNTING SCREW USED WITH SOLDER LUGS TO PROVIDE CHASSIS GROUND.

Figure 7-19. Linear Power Supply (A14) Schematic Diagram (4200372)

Courtesy of <http://BlackRadios.terryo.org>

NOTES

1. UNLESS OTHERWISE SPECIFIED -
RESISTANCE IS IN OHMS, 1/10W $\pm 1\%$
CAPACITANCE IS IN μF .

2. ASSEMBLED AT NEXT ASSY

Figure 7-20. Power Supply Regulator Assembly (A14A2) Schematic Diagram (4200301)



Figure 7-21.

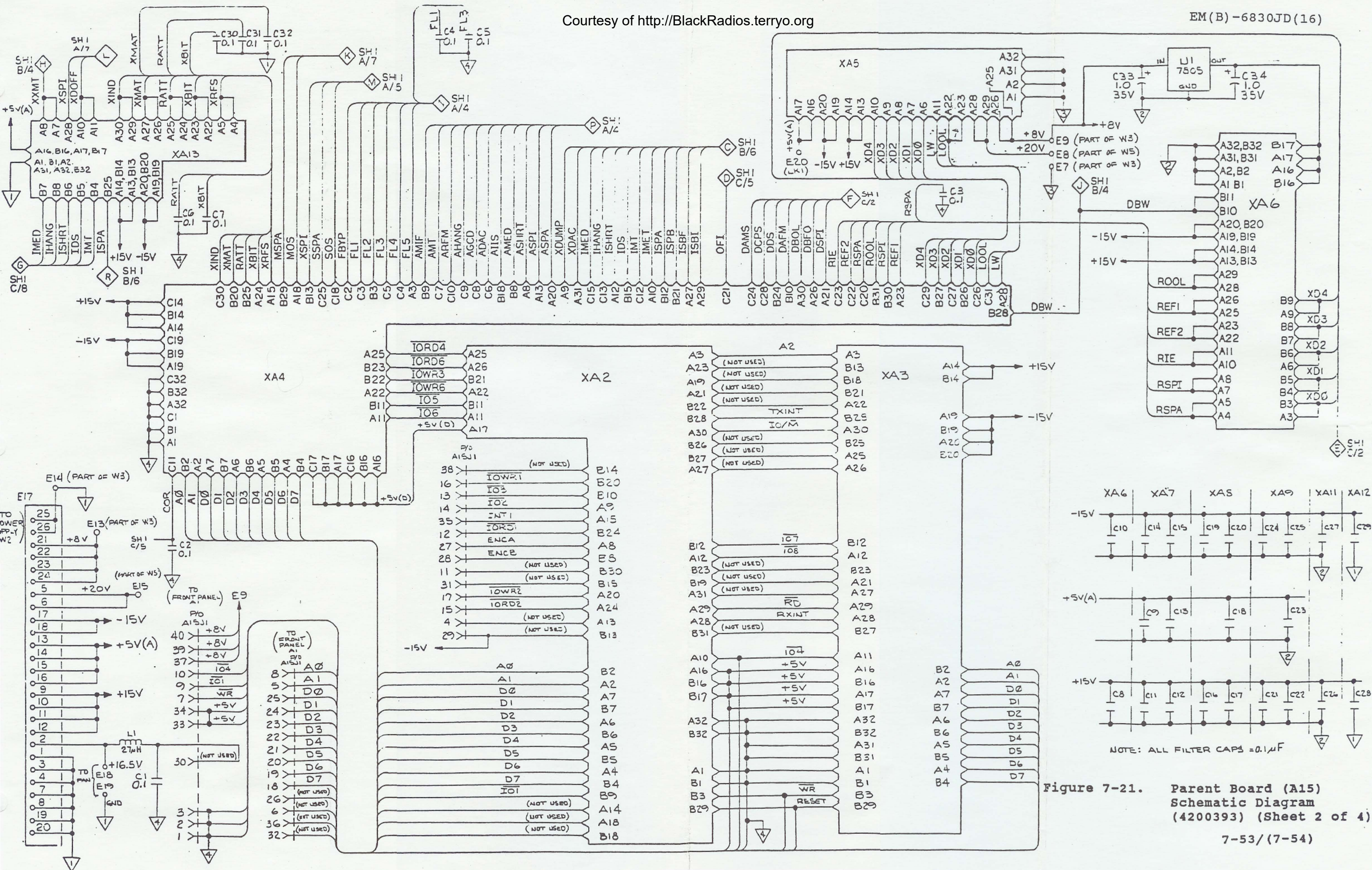


Figure 7-21. Parent Board (A15) Schematic Diagram (4200393) (Sheet 2 of 4)



Parent Board (A15)
Schematic Diagram
(4200393) (Sheet 3 of 4)

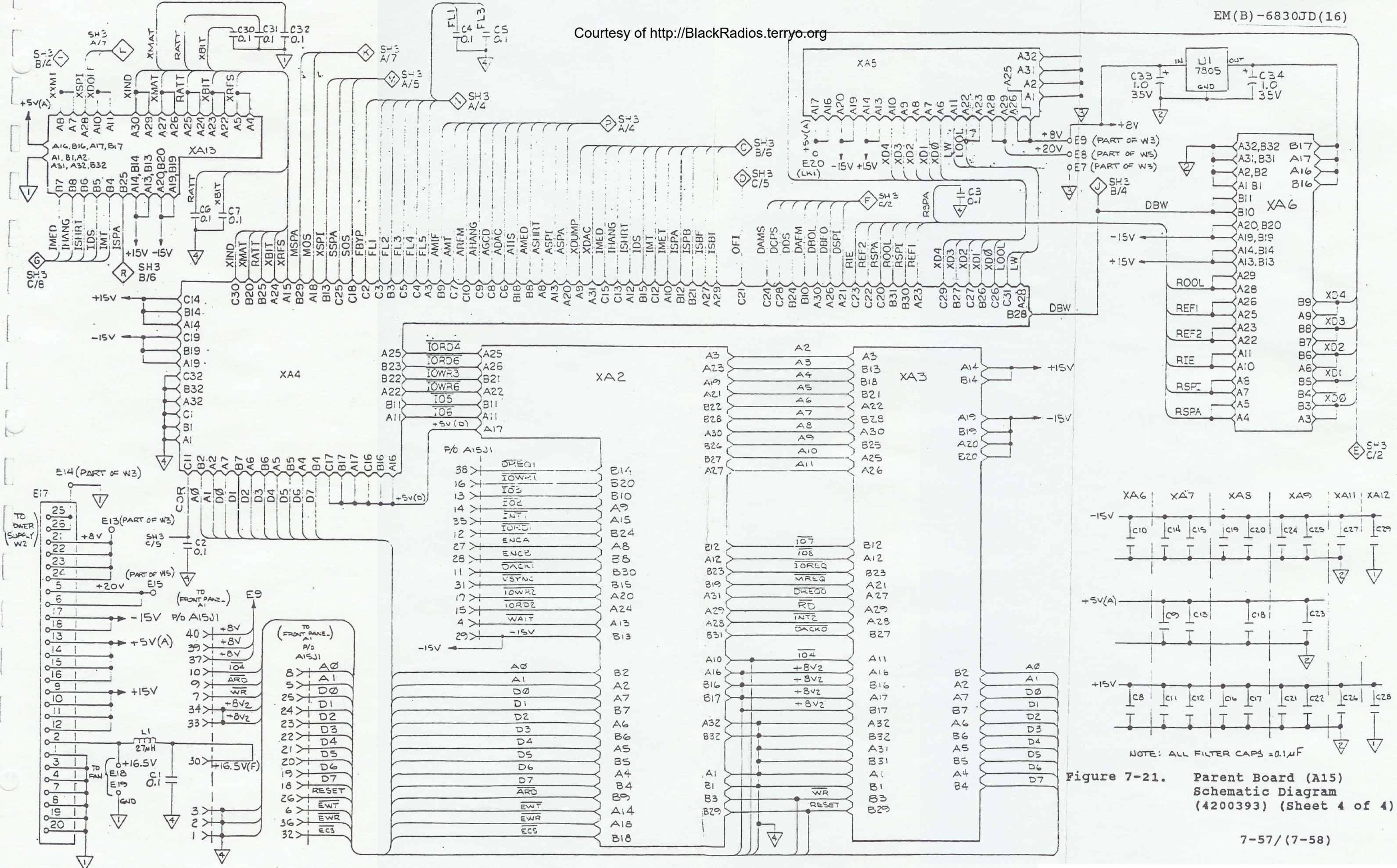
Courtesy of <http://BlackRadios.terryo.org>

Figure 7-21. Parent Board (A15)
Schematic Diagram
(4200393) (Sheet 4 of 4)

APPENDIX A

REMOTE CONTROL INTERFACE CIRCUIT CARD ASSEMBLY (A3-1/4)

A.1 Command and Monitor Data and Format

A.1.1 Receiver Number (\$85)

The ASCII "\$" followed by two optional numeric characters shall select the receivers to respond to this and all subsequent commands, until changed by another "\$" command.

The "S" character followed by no numbers is a system wide unlisten command. Multiple receivers may be addressed with one command sequence by separating the receiver numbers with commas. Multiple addressing may not be used to set control modes or to specify a talker.

A.1.2 Frequency (F3.415926)

The main tune frequency is entered in MHz in up to eight digits with an optional decimal point. Leading and trailing zeros may be removed from the command. The frequency given is the true carrier frequency except for the sideband detection modes, when the frequency is that of the virtual carrier.

A.1.3 Detector (D3)

The detection mode of the receiver is set with this command. The modal commands are:

- 1 - Amplitude Modulation (AM)
- 2 - Frequency Modulation (FM)
- 3 - Continuous Wave, Variable Offset (CW)
- 4 - Continuous Wave, Center Tuned (CW)
- 5 - Independent Sideband, if installed (ISB)
- 6 - Lower Sideband (LSB)
- 7 - Upper Sideband (USB)

The detection mode contains 3 non modal commands which may be used for maintenance and test purposes. These commands are distinguished from the modal commands by the "=" placed between the letter and the command number. (D=1).

- =1 - Envelope Detector
- =2 - Continuous Wave Detector
- =3 - Frequency Modulation Detector

When an override command is given here it must also be used to select the IF bandpass filter.

A.1.4 IF Bandwidth (I6)

The IF bandwidth is specified in kilohertz. The receiver selects the bandwidth closest to the one requested. The monitor data shows the actual bandwidth picked.

In override mode the command becomes I=3, where the number is the filter slot number from one to 5. When in ISB override mode, the I= command must be used to select the USB filter.

A.1.5 AGC Mode (M2)

The AGC mode and rate are specified as follows:

- 1 - Short AGC time constant
- 2 - Medium AGC time constant
- 3 - Long AGC time constant
- 4 - Manual IF attenuation
- 5 - Short time constant Variable Threshold mode
- 6 - Medium time constant Variable Threshold mode
- 7 - Long time constant Variable Threshold mode

A.1.6 BFO Frequency (B-1.32)

The BFO offset from center frequency, specified in kHz, is entered with this command. The data is used in the modal system in CW only.

A.1.7 Attenuation (A30)

The attenuation number defines the amount of attenuation placed in the signal path during the manual attenuation AGC mode, or the minimum attenuation during the variable threshold modes. The attenuation varies from zero (no attenuation) to 150 (maximum attenuation) with no change between numbers greater than 3 dB.

A.1.8 Status (S5)

The status command, when sent to the receiver, controls the operating status. In the monitor mode, the status provides summary error indication.

A. Status Command

Command status may only be sent to one receiver, since commands 5 and 6 create monitor data streams. The status commands are:

- 1 - Set the receiver to local control
- 2 - Set the receiver to remote control
- 3 - Execute the BITE self-test routine
- 4 - Terminate the BITE self-test routine
- 5 - Report currently installed IF bandpass filter bandwidths
- 6 - Report BITE results
- 7 - Force bandwidth setup
- 8 - Enable remote AGC dump
- 9 - Inhibit remote AGC dump

Command 1 - Sets the receiver to local control mode. This command is invalid in the override mode.

Command 2 - Sets the receiver to remote control mode.

Command 3 - Starts receiver BITE (Built-in-Test Equipment) routine. This command, when accepted, causes the receiver to output a colon (:) until BITE is finished; it will output a colon response to any talk command.

Command 4 - Terminate BITE. Causes the receiver to assume a pre-BITE status.

Command 5 - Report current bandwidths. This command causes the receiver to list the installed IF bandpass filter bandwidths, in slot number order, followed by a carriage return (CR).

(FL1), (FL2), (FL3), (FL4), (FL5), (CR)

A typical output might be L,, 6.2, U, .4 (CR) which reports the following:

SLOT	FILTER/FUNCTION
1	Lower Sideband Filter
2	Nothing
3	1.2 kHz Symmetric Filter
4	Upper Sideband Filter
5	400 Hz Filter

Command 6 - Report results of last BITE. This command is not cleared after having been read, nor does it cause another BITE cycle. To get a new BITE cycle and report, start with command S3 then go to S6.

GOOD response - OK XX (CR)

BAD response - 4 End XX (CR)

While the numbers indicate a failed test, and XX is the system receiver number. The BITE error test codes are provided in the RA6830JD Manual.

Command 7 - Force IF Bandpass Filter Bandwidth Setup. This command is used to force a particular filter complement in RA6830 receiver. Allowable codes are L for Lower Sideband, U for Upper Sideband, N for None, and bandwidths up to 20 kHz in kHz with a resolution of 100 Hz. Symmetric bandwidths in kHz are terminated with a comma.

The string may contain all five filters (FL1-FL5) or it may end early with a (CR). Slots not entered will not be altered by the S7 command.

The command - S7LU1.7, .4, N (CR) - sets up the following:

SLOT	FILTER/FUNCTION
1	Lower Sideband
2	Upper Sideband
3	1.7 kHz symmetric filter
4	400 Hz symmetric filter
5	Unused setting

Command 8 - Enable AGC Dump. This command causes all subsequent commands containing receiver data to cause an automatic AGC dump.

Command 9 - Inhibit AGC Dump. This command causes the AGC command dump to be disabled. This would be used when free tuning the receiver by remote control.

B. Monitor Summary Status

The following monitor summary status is appended to all other monitor data streams:

- 1 - Receiver operating in remote control
- 2 - Synthesizer out-of-lock
- 4 - Receiver in override remote control mode
- 8 - Last command sequence had a character transmission error
- 16 - Last command sequence had data error
- 32 - Lost data error in last sequence

The indicators above are added together to form the summary status. For instance 17 indicates remote operation with a data error in the last command stream.

A.1.9 Monitor Command G (G)

This command is the overall monitor command. All data relevant to the current status is returned on receipt of the trigger.

A.1.10 Monitor Command T (TFI)

This is the selective monitor command which allows the controller to specify the data to be returned in the monitor data stream and is generated following the carriage return trigger.

The monitor commands will be ignored unless sent to only one receiver.

The selective monitor command must immediately precede the carriage return to avoid confusion with the data commands which use the same letter control characters.

A.1.11 Override Mode

The override mode gives the remote controller functional level control of the receiver. That is, the 1st local oscillator is always tuned to 40.455 MHz above the entered frequency. The IF slot is always enabled regardless of the type of filter installed. It is up to the controller to decide what the filter should be used for, the type of detection mode to employ, and the BFO offset to receive a signal. For instance, in sideband detection with a symmetrical filter, the first local oscillator and BFO must be properly offset to correctly demodulate the signal. The controller also assumes the responsibility for insuring that the filter is installed in the selected slot, since an empty slot will cause a dead receiver.

The override mode blanks the display. In addition, override signals cannot be handed off to the operator, since the machine has no way of deciding the difference between a sideband signal with virtual carrier offset or a CW signal with a copy BFO offset. Consequently status command S1 is invalid in override mode.

The override mode is invoked when both detector and bandwidth are sent in the same command with the equal (=) sign. Sending either without the equal sign, stores the = data, but leaves the receiver in the modal command mode.

A.1.12 AGC Level Return (R30).

This number is appended to all status returns and represents an AGC level in the range 0 (minimum signal) to 150 (maximum signal). It is sent to the remote controller regardless of the AGC mode setting, i.e., whether in MAN, SHORT, or any combination of the same.

A.2 REMOTE CONTROL SERIAL ASYNCHRONOUS INTERFACE CONNECTIONS (A3-1/4) - The Receiver is supplied with a mating connector for the remote control interface connector Table A-1 illustrates the pin designations and assigned functions. The pins designated on Table A-2 vary in function according to the interface being used, as is shown. The remaining pins are the same for all the listed interfaces. Table A-3 lists the baud rate selection bit associated with switch positions on S1 for different data rates. Table A-4 lists the required link configurations on the A3-1/4 circuit card assembly for the different interfaces.

To make the required connections:

1. Slide the mating connector shell over the cable to be used for the remote control.
2. Solder the wires to the appropriate connector pins in accordance with Table A-1 and Tables A-2 for the interface to be used. (J13 must be strapped for the receiver address). The connector pins are designated on the front of the connector.
3. After carefully checking all wiring, slide the connector into the connector shell and secure the cable clamp. Attach and secure the connector to A3-1/4 J13.
4. Visually inspect the A3-1/4 circuit card assembly to insure that all jumpers are installed in accordance with Table A-4 and S1 is set per Table A-3.

NOTE

The MIL-STD-188C and RS-232-C interfaces are electrically compatible. The distinction between the two is the polarity definition for "MARK" or "LOGIC 1." RS-232-C defines "MARK" as a negative potential while MIL-STD-188C defines "MARK" as positive. Therefore, pin functions (Figure 2-11, Table 2-5) marked DATA IN A/DATA OUT A are "MARK" negative and DATA IN B/DATA OUT B are "MARK" positive.

Table A-1. Standard RS232 Asynchronous Data for RA6830

Connector Pin Designations	
1	Protective Ground
2	Data In "A"
3	Data Out "A"
4	Request to Send (RTS)
5	Clear to Send (CTS)

Table A-4. Standard RS232 Asynchronous Data for RA6830

Connector Pin Designations	
6 -	NC (Not Connected)
7 -	Ground (GND)
8 -	+5V (Internally Limited to 5 mA)
9 -	Address 0
10 -	Address 1
11 -	Address 2
12 -	Address 3
13 -	Address 4
14 -	NU (Not Used)
15 -	NU
16 -	NU
17 -	NU
18 -	GND
19 -	Data In "B"
20 -	NC
21 -	Data Out "B"
22 -	-5 V (Limited Internally to 5 mA)
23 -	Address 5
24 -	Address 6
25 -	Address 7

Table A-5. Data Connection Interface Compatibility

DB 25 PINS	MS 188C	RS 232C RS 423	RS422
1	GND	GND	GND
2	JUMPER TO PIN 7	DATA IN	DATA IN A
3	NU	DATA OUT	DATA OUT
7	JUMPER TO 2	JUMPER TO 19	NU
18	DATA IN/OUT GND	DATA IN/OUT GND	NU
19	DATA IN	JUMPER TO PIN 7	DATA IN
21	DATA OUT	NU	DATA OUT

Table A-6. S1 Selection

										BAUD RATE		
										3	2	1
	8	7		6		5		4				
7 BITS 8 BITS	1 1	0 1	NO PARITY	1	EVEN	1	2 STOP BIT	1	19.2	0	0	0
			PARITY	0	ODD	0	1 STOP BIT	0	9.6	0	0	1
									4.8	0	1	0
									2.4	0	1	1
									1.2	1	0	0
									.6	1	0	1
									.3	1	1	0
									.15	1	1	1
0 = ON/CLOSED 1 = OFF/OPEN												

NOTE

S1 position 8 is to remain in the OPEN position.

Table A-7. Link Selection

	<u>RS423/RS232C/188C</u>	<u>RS422</u>
LK2	INSTALL	DELETE
LK4	INSTALL	DELETE
LK7	INSTALL	DELETE
LK8	DELETE	INSTALL
	NO DATA/ CONSTANT MARK	NO DATA/ TRISTATE O/P
LK5	DELETE	INSTALL
LK6	INSTALL	DELETE
LK1	DELETE	
LK3	DELETE	

APPENDIX B

IEEE-488C REMOTE CONTROL INTERFACE CIRCUIT CARD ASSEMBLY (A3-3)

B.1 INTRODUCTION

The Remote Control Interface provides remote control operation, via an IEEE-488C data/control bus, in accordance with the Institute of Electrical and Electronic Engineers (IEEE) standard 488C-1978 for equipment employing bit parallel, byte serial data interchange. Installation and removal of IEEE-488C Remote Control Interface Circuit Card Assembly A3-3 is covered in Section V paragraph 5.7.5. Refer to RA6830 manual Figure 2-6 for rear panel connector J13 and address switch A3-3 S1. Location of A3-3 is shown in Figure 6-1 of the RA6830 manual.

B.2 ADDRESSING

B.2.1 IEEE-488C Remote Control Interface Circuit Card Assembly A3-3 - The IEEE-488C remote control interface circuit card assembly provides an electrical interface for communication with a remote controller/computer via a suitable interface bus. In addition, interconnections between the receiver and the remote controller/computer are made through a multi-pin remote control interface connector J13, located on the receiver rear panel.

Communication between the remote controller/computer and the receiver is achieved through messages composed of data words (bytes) in serial strings. Each string of data is prefixed with a primary address for talker and/or listener operation (MTA or MLA byte). Refer to Table B-1 for MLA and MTA address switch settings when the receiver is used as either a listener or talker. To initialize communication, the remote controller/computer sends a binary address code to the receiver. This binary address must be preset on a miniature eight position address switch (A3-3 S1) located on remote control interface circuit card assembly before installation of the equipment.

The IEEE-488C remote control interface circuit comprises 2 functional elements which include; a bus driver/receiver circuit, general-purpose interface adaptor (GPIA) circuit. A3-3 implements control operations utilizing eight data lines DI01-DI08, three handshake lines DAV, NDAC and NRFD, and five bus-management lines EOI, IFC, SRQ, ATN and REN. Detailed information on the IEEE-488C remote control interface is contained in the specifications publication IEEE-STD-488C-1978 (the IEEE Standard Digital Interface for Programmable Instrumentation). Copies are available from the IEEE, 345 East 47th Street, New York, NY, 10018.

Table B-1. Address Switch Programming

ADDRESS SWITCH					TALK ADDRESS CHARACTER	LISTEN ADDRESS CHARACTER
A ₅	A ₄	A ₃	A ₂	A ₁		
0	0	0	0	0	@	SP
0	0	0	0	1	A	!
0	0	0	1	0	B	"
0	0	0	1	1	C	#
0	0	1	0	0	D	\$
0	0	1	0	1	E	%
0	0	1	1	0	F	&
0	0	1	1	1	G	'
0	1	0	0	0	H	(
0	1	0	0	1	I	)
0	1	0	1	0	J	*
0	1	0	1	1	K	+
0	1	1	0	0	L	,
0	1	1	0	1	M	-
0	1	1	1	0	N	.
0	1	1	1	1	O	/
1	0	0	0	0	P	0
1	0	0	0	1	Q	1
1	0	0	1	0	R	2
1	0	0	1	1	S	3
1	0	1	0	0	T	4
1	0	1	0	1	U	5
1	0	1	1	0	V	6
1	0	1	1	1	W	7
1	1	0	0	0	X	8
1	1	0	0	1	Y	9
1	1	0	1	0	Z	:
1	1	0	1	1	[	;
1	1	1	0	0	/	<
1	1	1	0	1	[	=
1	1	1	1	0	)	>

B.3 Remote Control Interface Connector J13 - The remote control interface connector, an Amphenol or Cinch microribbon Type 57, 24-pin trapezoidal shell connector, provides an electrical interface for operation of the receiver to be controlled by a remote controller/computer via an interface bus. As shown in Table B-2, pin out designations for the remote control interface connector are provided.

B.4 Remote Control Interface Addressing Instructions - To allow the receiver to interface with the remote controller/computer via the IEEE-488C input/output port on the IEEE-488C remote control interface circuit card assembly (A3-3) the receiver is assigned a binary address code. This binary coded address is preset before installation.

1. Obtain five digit binary coded system address for receiver from agency responsible for remote controller/computer.

2. Set address switch A3-3 S1 on IEEE-488C remote control interface circuit card assembly to proper address, as appropriate.

NOTE

The ON position is referred to as a logic 0 and the OFF position as a logic 1.

Table B-2. Pin Number/Reference Signal Designation Chart

PIN NO.	SIGNAL DESIG.	PIN NO.	SIGNAL DESIG.
1	DI01	13	DI05
2	DI02	14	DI06
3	DI03	15	DI07
4	DI04	16	DI08
5	EOI	17	REN
6	DAV	18	Signal Gnd (DAV)
7	NRFD	19	Signal Gnd (NRFD)
8	NDAC	20	Signal Gnd (NDAC)
9	IFC	21	Signal Gnd (IFC)
10	SRQ	22	Signal Gnd (SRQ)
11	ATN	23	Signal Gnd (ATN)
12	Shield	24	Signal Gnd (EOI, REN)

B.5 OPERATION

B.5.1 Remote Control Operation - In the remote mode of operation, the receiver operating in the listener mode can be commanded by the remote controller/computer to set specific operating parameters which may be set all at one time (full setup) or set one at a time. In addition, the remote controller/computer (in remote or local mode of operation) may at any time command the modified receiver to supply operating parameter status by functioning as a talker, and request status on all operating parameters at one time (full status), or request status on only one selected operating parameter at a time.

Communication between the remote controller/computer and the receiver is accomplished through a string of data words. Each word consists of a letter indicating the function and several numbers identifying the particular value of the function. This string of data words must be prefixed with the receiver address for talker or listener functions, and terminated with a line feed to indicate the end of the message.

B.5.1.1 Command and Monitor Data/Format - The following information addresses the command and monitor data/format associated with receiver remote control operation. Refer to Table B-3 for a typical example of the command word format. Note that since the receiver address prefix is an IEEE-488 bus control function, it is not shown as text to be sent.

1. Receiver Address -(See Table B-1 and IEEE-488C specifications).

2. Frequency Selection (F3.315926) - The selected (tuned) frequency is entered in MHz in up to eight digits with an optional decimal point with this command.

Leading and trailing zeros may be removed from the command. The frequency selected is the true carrier frequency except for the sideband detection modes, when the frequency is that of the virtual carrier.

3. Detection Mode (D3) - The detection mode of the receiver is set with this command; the modal commands are as follows:

- 1 - Amplitude modulation (AM)
- 2 - Frequency modulation (FM)

Table B-3. Command Word Format (Listener) (Cont.)

SP F29.6571 D3 I3.2 M4 A7 B 1.74 LF

Receiver Address (See Table B-1
and IEEE Specifications)

Selected Frequency (in Megahertz)

Detector

- 1 AM
- 2 FM
- 3 CW Variable
- 4 CW Fixed (BFO set to center frequency)
- 5 LSB
- 6 USB

IF Bandwidth (in kHz)

(Receiver will choose IF
bandpass filter with band-
width closest to value
transmitted.)

AGC Mode

- 1 Short
- 2 Medium
- 3 Long
- 4 Manual
- 5 Short Var.
- 6 Medium Var.
- 7 Long Var.

IF Attenuation (Used with AGC
modes 4-7)

0-150 (0 corresponds to maximum
gain)

BFO Frequency (+1.74 kHz)

Line Feed (End of Message)

- 3 - Continuous wave, variable offset (CW with BFO)
- 4 - Continuous wave, center tuned (CW with BFO CENTER)
- 5 - Lower sideband (LSB)
- 6 - Upper sideband (USB)

The detection mode contains 3 non-modal override commands which may be used for maintenance and test purposes. These commands are distinguished from the modal commands by the equal to sign (=) placed between the letter and the command number i.e., D=1.

- =1 - Envelope detector
- =2 - Continuous wave detector
- =3 - Frequency modulation detector

To fully initiate an override command, the command must also include an IF bandpass filter selection in the I = format.

4. IF Bandwidth (I6) - The IF bandwidth, specified in kilohertz, is entered with this command. This command will allow the receiver to select the bandwidth of the IF bandpass filter closest to the one requested, however, the monitor data only presents the actual bandwidth picked. In the override mode, a typical command would be I=3; the number represents the filter-slot number (FL1-FL5) position from one to five.

5. AGC Mode (M2) - The AGC mode and rate are specified as follows:

- 1 - Short AGC time constant
- 2 - Medium AGC time constant
- 3 - Long AGC time constant
- 4 - Manual IF attenuation
- 5 - Short time constant, variable-threshold mode
- 6 - Medium time constant, variable-threshold mode
- 7 - Long time constant, variable-threshold mode

6. BFO Frequency (B-1.32) - The BFO offset from center frequency, specified in kHz, is entered with this command. The data is used in the modal system for CW only.

7. Attenuation (A30) - The attenuation command defines the amount of attenuation placed in the signal path during the manual-attenuation AGC mode, or the minimum attenuation during the variable-threshold modes. The attenuation varies from zero (no attenuation) to 150 (maximum attenuation) with actual attenuation between numbers representing no more than 3 dB.

8. Status (S5) - The status command controls the receiver operating status. In the monitor mode, the status provides a summary error indication.

a. Status Command

The status command 5 and 6 shown below may only be sent to a single receiver at a time, since commands 5 and 6 create data streams for monitoring. The status commands are as follows:

- 1 - Enable remote AGC dump
- 2 - Inhibit remote AGC dump
- 3 - Execute BITE self-test routine
- 4 - Terminate BITE self-test routine
- 5 - Report currently installed IF bandwidths
- 6 - Report BITE results
- 7 - Force IF bandpass filter bandwidth setup

Command 1 - Enable AGC Dump. This command causes all subsequent commands containing receiver data to cause an automatic AGC dump.

Command 2 - Inhibit AGC Dump. This command causes the AGC command dump to be disabled and would be used when free tuning the receiver by remote control.

Command 3 - Start BITE. Initiates receiver BITE (Built-In-Test Equipment) routine.

Command 4 - Terminate BITE. Causes the receiver to assume pre-BITE status.

Command 5 - Report current bandwidth. This command causes the receiver to list the installed IF filter bandwidths in slot-number order, followed by a line feed, i.e. (FL1), (FL2), (FL3), (FL4), (FL5), (LF).

A typical output might be L, , 6.2, U, .4, (LF) which reports the following:

<u>Slot</u>	<u>Filter/Function</u>
1	Lower sideband filter
2	Nothing
3	6.2 kHz symmetric filter
4	Upper sideband filter
5	400 Hz filter

Command 6 - Report results of last BITE. Note that this is not cleared after having been read, nor does it cause another BITE cycle. To initialize a new BITE cycle report, start with S3, then go to S6. When this command is sent the results are indicated on remote terminal only in remote mode.

GOOD response - OK XX (LF)

BAD response - END XX (LF)

The above number indicate a failed test, and XX is the receiver number (in decimal). Refer to RA6830 manual Table 5-2 Fault Code List for BITE test error codes.

Command 7 - Force IF Bandpass Filter Bandwidth Setup. This command is used to force a particular IF bandpass filter bandwidth complement in the receiver. The allowable codes are L for lower sideband, U for upper sideband, N for none, and IF bandwidths up to 20 kHz (in kHz) with a resolution of 100 Hz. Symmetric bandwidths (in kHz) are terminated with a comma. The string may contain all five IF bandwidth filters or may end early with an (LF). Slots not entered are not altered by the S7 command.

The command is as follows:

S7LU1.7,.4,N(LF)

The preceeding command sets up the following:

<u>Slot</u>	<u>Filter/Function</u>
1	Lower sideband
2	Upper sideband
3	1.7 kHz symmetric
4	400 Hz symmetric
5	Unused

b. Monitor Status

The following summary status is appended to all other monitor data streams:

- 1 - Receiver operating in remote control
- 2 - Synthesizer out-of-lock
- 4 - Receiver in override remote control mode
- 8 - Last command sequence has data error

The indicators above are added together to form the summary status, i.e. 9 indicates remote control operation with a data error in the last command stream.

9. AGC Level (R30) - This indicates the level of a received signal. The range is 0 (minimum signal strength) to 150. This is appended prior to the status word in all monitor data streams.

10. Monitor Command G (G) - This is the overall monitor which allows all data relevant to the current status to be returned on receipt of the line-feed (LF) trigger.

11. Monitor Command T (TF) - This is the selective monitor command which allows the remote controller/computer to specify the data to be returned in the monitor data stream which is generated following the LF trigger. This command must immediately precede the line feed to avoid confusion with the data commands which use the same letter control characters.

12. Override Mode - The override mode gives the remote controller/computer functional level control of the receiver. In this case, the first local oscillator (LO) is always tuned to 40.455 MHz above the tuned frequency. The IF bandpass filter is always enabled regardless of the type of filter installed and allows the remote controller/computer

to decide what the filter should be used for; the type of detection mode to employ, and the BFO offset to receive a signal, i.e., in single sideband (SSB) detection with a symmetrical filter, the 1st LO and BFO must be properly offset to correctly demodulate the signal. The remote controller/computer also assumes responsibility for ensuring that the IF bandpass filter is installed in the selected filter slot, since an empty slot will cause in-operation.

B.5.2 Command Word Format for Listener - When the remote controller/computer commands the receiver to function as a listener, the command words may be formatted as shown in Table B-3, or in a more simplified format. For example, the command F1 LF will cause the receiver to tune to 1 MHz without changing any other operating parameter, and the command F20.5 D2 LF will cause the receiver to tune to 20.5 MHz and select the FM detection mode. Note that the remote controller/computer needs only to provide commands for the parameters that are to be changed. If an invalid command is received (i.e. specifying an operating parameter that is not compatible with the selected mode), the mode command will be implemented while the operating parameter is held, but not used until the proper mode is selected. The command D5 I3.2 LF will command the receiver to select ISB detector mode, selecting the IF bandpass filter closest to 3.2 kHz that is installed, therefore, the receiver will switch to the ISB mode, with its associated filter, however, the next time the receiver was operated in the AM, FM, or CW mode, it would automatically switch to the IF bandwidth filter closest to 3.2 kHz that is installed, unless the mode command included a different IF bandpass filter command. In a similar manner, the command D4B-1.8 LF will instruct the receiver to select the CW fixed mode with a BFO set at zero, however, the next time the receiver is set to the CW variable mode, the BFO will automatically be set to -1.80 kHz. Note that no extraneous data, such as leading and/or trailing zeros, spaces, or unnecessary decimal points, need be sent.

B.5.3 Command Words for Talker - The remote controller/computer can request status information from any receiver on the bus by addressing the receiver as a talker and specifying the type of status data required. As shown in Table B-4 the letter G in the command word from the controller/computer will cause the receiver to respond with a complete status update. As previously mentioned, the remote controller/computer commands to the receiver as a listener may be either in the full format as shown in Table B-3 or in a simplified format as described in paragraph B.5.1.1. With the Receiver operating as a talker, the format shown in Table B-4 is supplied to the remote controller/computer. The receiver also blocks any "illogical" status data. That is, if the

receiver is in the CW fixed mode, no BFO data will be supplied; in the ISB, USB, or LSB modes, no IF bandwidth filter data will be given; and in the AGC Long, Medium, or Short modes, no IF attenuation data will be given.

The remote controller/computer can also command the receiver to supply only selected data. As shown in Table B-4 the letter T in the command word followed by the

Table B-4. Command Word Format (Talker)

STATUS REQUEST FOR ALL PARAMETERS	STATUS REQUEST FOR SELECTED PARAMETERS
Remote Controller Command: G LF	Controller/Computer Command: TFD LF
Receiver Response: F12.345678 D1 I1 M1 B1.23 A12 <u>R43 S1 LF</u>	Receiver Response: F12.345678 D1 <u>R43 S1 LF</u>

Note 1. Underlined portion of message always sent by receiver.

A. AGC level (R43)

Indicates the level of the received signal. The range is 0 to 150.

B. Status (S1)

Indicates the status of the receiver.

- 1 - Receiver operating in remote
- 2 - Synthesizer out-of-lock
- 4 - Receiver in override remote-control mode
- 8 - Last command had data error

The indicators are added together to form status, i.e. S9 indicated last command error and receiver in remote control.

C. LF

Line Feed. Indicates end of message.

Note 2. IF Bandwidth given in kilohertz.

Note 3. No leading or trailing zeros or plus signs are sent. Data is transmitted without spaces between items.

letters of the designed parameters cause the receiver to respond only to those parameters. Any invalid requests (such as requesting BFO data in the CW fixed mode, IF bandwidth data in the sideband mode, or IF attenuation data in a fixed AGC mode) cause the receiver to respond only with the applicable data. For example, the receiver will respond that it is in the CW fixed mode and not supply any BFO data. In addition, a status bit, indicating whether the receiver is in local or remote control, is always supplied in the last status word.

Table B-4. Command Word Format (Table)

STATUS REQUEST FOR SELECTED PARAMETERS	STATUS REQUEST FOR ALL PARAMETERS
Controller/Computer Command: TFD LF Receiver Response: FIZ JASVZ DI BAZ SI LF	Remote Controller Command: D LP Receiver Response: FIZ JASVZ DI BAZ SI LF

Note 1. Underlined portion of message always sent by receiver.

A. AGC level (RD)

Indicates the level of the received signal. The range is 0 to 120.

B. Status (SU)

Indicates the status of the receiver.

- 1 - Receiver operating in remote
- 2 - Receiver out-of-lock
- 3 - Receiver in standby remote-control mode
- 4 - Last command had error

The indicators are added together to form status, i.e. 23. Indicated last command error and receiver in remote control.

C. LF

Line Feed. Indicates end of message.

Note 2. IF Bandwidth given in kHz/Hz.

Note 3. No leading or trailing zeros or plus signs are sent. Data is transmitted without spaces between items.

APPENDIX C

BINARY PROTOCOL IEEE-488C INTERFACE

C.1 INTRODUCTION

The Remote Control Interface provides remote control operation, via an IEEE-488C data/control bus, in accordance with the Institute of Electrical and Electronic Engineers (IEEE) standard 488C-1978 for equipment employing bit parallel, byte serial data interchange. Installation and removal of IEEE-488C Remote Control Interface Circuit Card Assembly A3-3 is covered in Section V paragraph 5.7.5. Refer to RA6830 manual Figure 2-6 for rear panel connector J13 and address switch A3-3 S1. Location of A3-3 is shown in Figure 6-1 of the RA6830 manual.

C.2 ADDRESSING

C.2.1 IEEE-488C Remote Control Interface Circuit Card Assembly A3-3 - The IEEE-488C remote control interface circuit card assembly provides an electrical interface for communication with a remote controller/computer via a suitable interface bus. In addition, interconnections between the receiver and the remote controller/computer are made through a multi-pin remote control interface connector J13, located on the receiver rear panel.

Communication between the remote controller/computer and the receiver is achieved through messages composed of data words (bytes) in serial strings. Each string of data is prefixed with a primary address for talker and/or listener operation (MTA or MLA byte). Refer to Table C-1 for MLA and MTA address switch settings when the receiver is used as either a listener or talker. To initialize communication, the remote controller/computer sends a binary address code to the receiver. This binary address must be preset on a miniature eight position address switch (A3-3 S1) located on remote control interface circuit card assembly before installation of the equipment.

The IEEE-488C remote control interface circuit comprises 2 functional elements which include; a bus driver/receiver circuit, general-purpose interface adaptor (GPIA) circuit. A3-3 implements control operations utilizing eight data lines DI01-DI08, three handshake lines DAV, NDAC and NRFD, and five bus-management lines EOI, IFC, SRQ, ATN and REN. Detailed information on the IEEE-488C remote control interface is contained in the specifications publication IEEE-STD-488C-1978 (the IEEE Standard Digital Interface for Programmable Instrumentation). Copies are available from the IEEE, 345 East 47th Street, New York, NY, 10018.

Table C-1. Address Switch Programming

ADDRESS SWITCH					TALK ADDRESS CHARACTER	LISTEN ADDRESS CHARACTER
A ₅	A ₄	A ₃	A ₂	A ₁		
0	0	0	0	0	@	SP
0	0	0	0	1	A	!
0	0	0	1	0	B	"
0	0	0	1	1	C	#
0	0	1	0	0	D	\$
0	0	1	0	1	E	%
0	0	1	1	0	F	&
0	0	1	1	1	G	'
0	1	0	0	0	H	(
0	1	0	0	1	I	)
0	1	0	1	0	J	*
0	1	0	1	1	K	+
0	1	1	0	0	L	,
0	1	1	0	1	M	-
0	1	1	1	0	N	.
0	1	1	1	1	O	/
1	0	0	0	0	P	0
1	0	0	0	1	Q	1
1	0	0	1	0	R	2
1	0	0	1	1	S	3
1	0	1	0	0	T	4
1	0	1	0	1	U	5
1	0	1	1	0	V	6
1	0	1	1	1	W	7
1	1	0	0	0	X	8
1	1	0	0	1	Y	9
1	1	0	1	0	Z	:
1	1	0	1	1	[	;
1	1	1	0	0	/	<
1	1	1	0	1	[	=
1	1	1	1	0	(	>

C.3 Remote Control Interface Connector J13 - The remote control interface connector, an Amphenol or Cinch microribbon Type 57, 24-pin trapezoidal shell connector, provides an electrical interface for operation of the receiver to be controlled by a remote controller/computer via an interface bus. As shown in Table C-2, pin out designations for the remote control interface connector are provided.

C.4 Remote Control Interface Addressing Instructions - To allow the receiver to interface with the remote controller/computer via the IEEE-488C input/output port on the IEEE-488C remote control interface circuit card assembly (A3-3) the receiver is assigned a binary address code. This binary coded address is preset before installation.

1. Obtain five digit binary coded system address for receiver from agency responsible for remote controller/computer.

2. Set address switch A3-3 S1 on IEEE-488C remote control interface circuit card assembly to proper address, as appropriate.

NOTE

ON = 0

OFF = 1

Table C-2. Pin Number/Reference Signal Designation Chart

PIN NO.	SIGNAL DESIG.	PIN NO.	SIGNAL DESIG.
1	DI01	13	DI05
2	DI02	14	DI06
3	DI03	15	DI07
4	DI04	16	DI08
5	EOI	17	REN
6	DAV	18	Signal Gnd (DAV)
7	NRFD	19	Signal Gnd (NRFD)
8	NDAC	20	Signal Gnd (NDAC)
9	IFC	21	Signal Gnd (IFC)
10	SRQ	22	Signal Gnd (SRQ)
11	ATN	23	Signal Gnd (ATN)
12	Shield	24	Signal Gnd (EOI, REN)

C.5 OPERATION

C.5.1 Remote Control Operation - In the remote mode of operation, the receiver operating in the listener mode can be commanded by the remote controller/computer to set operating parameters. In addition, the remote controller/computer (in remote or local mode of operation) may at any time command the modified receiver to supply operating parameter status by functioning as a talker, and request status on all operating parameters.

Communication between the remote controller/computer and the receiver is accomplished through a string of binary data words. This string of data words must be prefixed with the receiver address for talker or listener functions.

C.5.1.1 Command and Monitor Data/Format - The following information addresses the command and monitor data/format associated with receiver remote control operation. Refer to Figure C-1. Refer to Paragraph 5.2 for a typical example of the command word format. Note that since the receiver address prefix is an IEEE-488 bus control function, it is not shown as text to be sent.

1. Receiver address (see Table C-1 and IEEE-488C specifications).
2. Mode word - from controller to RA6830 - Sets Receiver Status.
 - Bit 0 1 = Remote
0 = Local
 - Bit 1 1 = Request Data Return
0 = No Data Return
 - Bit 2 1 = Internal Reference
0 = External Reference
 - Bit 3 Always Zero
 - Bit 4 Reserved for Bite Control (Not Yet Implemented)
 - Bit 5 Reserved for Bite Control
 - Bit 6 Sync Bit - Always One
 - Bit 7 Always 0
3. Frequency words 10 kHz thru 10 MHz.
4. Attenuation Word - Sets Digital Attenuator in 2 dB steps.

A. TRANSMISSION FORMAT (BOTH DIRECTIONS):

MSB				LSB				
0	1	X	X	X	X	X	X	MODE
0	0	0	0	X	X	X	X	10 KHz
0	0	0	0	X	X	X	X	100 KHz
0	0	0	0	X	X	X	X	1 MHz
0	0	0	0	X	X	X	X	10 MHz
0	0	X	X	X	X	X	X	ATTENUATION

FREQ CODED PER FORMULA
 $K = F \text{ (MHz)} + 40.455$

63 STEPS OF 2 DB, 0 TO 124 DB
 00 HEX = 0 DB, 3E HEX = 124 DB

B. MODE WORD BIT DEFINITIONS:

CONTROLLER TO RA6830:

0	1	END BITE	START BITE	0	INT REF	REQ DATA	REMOTE	(LSB)
---	---	----------	------------	---	---------	----------	--------	-------

RA6830 TO CONTROLLER:

0	1	BITE ACTIVE	BITE OK	DATA ERROR	INT REF	OUT OF LOCK	REMOTE	(LSB)
---	---	-------------	---------	------------	---------	-------------	--------	-------

C. SERIAL POLL STATUS BYTE FORMAT:

0	1	0	0	DATA ERROR	X	OUT OF LOCK	REMOTE	(LSB)
---	---	---	---	------------	---	-------------	--------	-------

NOTE: EOI IS NOT USED

Figure C-1. IEEE-488 DATA I/O FORMAT

If the RA6830 detects Bit 1 of the mode word set, it accepts the remainder of the setup. It then waits until it is addressed as a talker. Once addressed it responds with the following receiver status.

1. Mode Word

Bit 0 1 = Remote

0 = Local

Bit 1 1 = Reference or 1st LO is Out of Lock

0 = Both reference and 1st LO In Lock

Bit 2 1 = INT Reference

0 = EXT Reference

Bit 3 1 = Data Error During Last Transmission

0 = No Errors

Bit 4 Reserved for BITE

Bit 5 Reserved for BITE

Bit 6 Always One

Bit 7 Always Zero

2. Receiver Tune Frequency 10 kHz - 10 MHz.

3. Receiver Attenuation in 2 dB steps - If one of the synthesizers is out of lock, or there was a data error in the last command sequence, a service request (SRQ) will be asserted in accordance with the IEEE-488C specification.

For bit 1 of the SRQ Responses, a one indicates an out of lock condition. Zero indicates an in lock condition.

For Bit 3 of the SRQ Response a one indicates a data error. A zero indicates no errors.

C.6 ENCODING/DECODING

The frequency information is given in the following example. Refer to Table C-3.

As an example, for a tune frequency of 14.315 add 40.455

$$\begin{array}{r} 14.315 \\ + 40.455 \\ \hline 54.770 \end{array}$$

Look up 54 MHz in the synthesizer look up table.

$$\begin{array}{rcl} \text{for 54 MHz} & 10 \text{ MHz} = & 9 \\ & 1 \text{ MHz} = & 4 \end{array}$$

So the encoded digits that would be sent are:

7 10 kHz
7 100 kHz
4 1 MHz
9 10 MHz

Table C-3. Synthesizer Look Up Table

1st LO Freq.	1 MHz No.	10 MHz No.
40-41	5	6H
41-42	1	7H
42	2	7H
43	3	7H
44	4	7H
45	5	7H
46	1	8H
47	2	8H
48	3	8H
49	4	8H
50	5	8H
51	1	9H

Table C-3. Syntehsizer Look Up Table (Cont.)

1st LO Freq.	1 MHz No.	10 MHz No.
52	2	9H
53	3	9H
54	4	9H
55	5	9H
56	1	0AH
57	2	0AH
58	3	0AH
59	4	0AH
60	5	0AH
61	1	0BH
62	2	0BH
63	3	0BH
64	4	0BH
65	5	0BH
66	1	0CH
67	2	0CH
68	3	0CH
69	4	0CH
70	5	0CH

APPENDIX D

PROTOCOL FOR HIGH-SPEED SERIAL I/O

APPENDIX D

PROTOCOL FOR HIGH-SPEED SERIAL I/O

D.1 GENERAL

The following is a summary of the bit oriented command protocol to be used on Racal HF Receiving equipment when fitted with the High-Speed Serial Synchronous Interface Assembly.

D.2 PHYSICAL LEVEL-L CONSIDERATIONS

The interface is designed to accept a bit-oriented data stream at rates of up to 125 kilobit. An external master clock is required, timed such that the serial data is valid on negative-edge of the master clock "A" signal. The master clock maximum frequency is 125 kHz.

Both data and clock inputs to the Interface Assembly are selectable for compliance with either unbalanced - line RS423 or balanced - line RS422 requirements. See detailed External Connector Configuration (Paragraph D.4.1)

D.3 DATA FORMAT

The data protocol is defined as follows, note that return data can be requested from the receiver by control of the status byte.

The data word sent to the receiver can be of three fixed lengths.

Minimum length is 16 bits

Frequency only length is 48 bits

Complete set up is 96 bits

D.3.1 Synchronizing Word

SYNC	STATUS	AGC DUMP	ADDRESS	
			MSD	LSD
0 1 1 1 1 1 0	S ₁ S ₂	D	A ₂ A ₄	a ₁ a ₂ a ₄ a ₈

First Bit Transmitted

This word must precede any data sent to the interface with the first bit transmitted as shown.

Addressing capability is provided, however, to nullify its effect the system can use the "All-Call" address which is 00. The maximum available address is 29.

D.3.2 Data Words

The hierarchical position of each word in the data field and the information bit pattern is shown in Table D-1. Each specialized word in the table is described below.

D.3.2.1 Main Frequency: Bits 16 thru 47 inclusive

The frequency sent to the receiver via this interface must include the first Intermediate Frequency Offset as defined by the following calculation:

$$F + 40.45500 = K(\text{MHz}) \quad \text{Equation 1}$$

where F is the RF signal of interest

K is the data to be sent

The resulting numbers in the MHz digits are then converted using the look-up table shown in Table D-2. The 100 Hz through 1 Hz digits are used as calculated in Equation 1. Note that the frequency data is sent inverted, (1 Hz first) see Table D-1.

Suppose desired frequency is 12.345678 MHz. First add 12.345678 to 40.455 MHz.

$$\begin{array}{r} 12.345678 \\ +40.455000 \\ \hline 52.800678 \end{array}$$

Note that the MHz portion of the answer is 52 MHz. Next go to Table D-2 (MHz Look Up Table). According to this Table the data for 52 MHz is

Digit	10 MHz	1 MHz
Data	3	2

Thus the data to be given to the synthesizer is

8	1 Hz
7	10 Hz
6	100 Hz
0	1 kHz
0	10 kHz
8	100 kHz
2	1 MHz
3	10 MHz

(For 100 kHz and below just use the digits as calculated)

Table D-1. Data and Information Bit Pattern

STATUS ONLY LIMIT	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0															
	2 ⁸ 2 ⁴ 2 ² 2 ¹				2 ² 2 ¹		X	S ₂ S ₁		0 1 1 1 1 1 0						
	LSD				MSD		AGC DUMP	STATUS	SYNC							
	ADDRESS (BCD)															
SHORT DATA (FREQUENCY) LIMIT	31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16															
	8 4 2 1				8 4 2 1				8 4 2 1				8 4 2 1			
	1 KHz				100 Hz				10 Hz				1 Hz			
	MAIN FREQUENCY															
	47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32															
	8 4 2 1				8 4 2 1				8 4 2 1				8 4 2 1			
	10 MHz				1 MHz				100 KHz				10KHz			
	SEE TABLE D-2															
	MAIN FREQUENCY															
	63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48															
Ø 4 2 1 Ø 4 2 1 Ø 4 2 1 Ø 4 2 1																
AGC 2 (ISB IF)				AGC 1 (MAIN IF)				BW (BCD)				DET (BCD)				
79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64																
				X	Ø Ø		1	8 4 2 1				8 4 2 1				
OPEN NORMALLY SET Ø				IN LOCK 1 =			100'S	TENS (BCD)				UNITS (BCD)				
								ATTENUATION								
95 94 93 92 91 90 89 88 87 86 85 84 83 82 81 80																
8 4 2 1				8 4 2 1				8 4 2 1				Ø	4 2 1			
10 Hz				100 Hz				1 KHz				3 = + 7 = - SIGN				
BFO																

Table D-2. MegaHertz Look-Up Table

k (MHz)	Data Req.		k (MHz)	Data Req.	
	1 MHz	10 MHz		1 MHz	10 MHz
40 to 40.9999	5	0	56	1	4
41 to 41.9999	1	1	57	2	4
42	2	1	58	3	4
43	3	1	59	4	4
44	4	1	60	5	4
45	5	1	61	1	5
46	1	2	62	2	5
47	2	2	63	3	5
48	3	2	64	4	5
49	4	2	65	5	5
50	5	2	66	1	6
51	1	3	67	2	6
52	2	3	68	3	6
53	3	3	69	4	6
54	4	3	70	5	6
55	5	3			

D.3.2.2 Status : Bits 7 and 8

- | | |
|-----------------------------|--------------------------|
| 0 - Expect Freq. Data only | No return data requested |
| 1 - Expect Full Data set up | No return data requested |
| 2 - No Data for RCVR | Send full return word |

D.3.2.3 O.O.L.: Bit 75

Used only by return word when status 2 selected

- 1 - System OK
- 0 - System Fault

D.3.2.4 Detector: Bits 48, 49 and 50

- 1 - AM
- 2 - FM
- 3 - CW
- 4 - USB
- 5 - LSB
- 6 - ISB (Upper Audio)
- 7 - ISB (Lower Audio)

D.3.2.5 Bandwidth: Bits 52, 53 and 54

- 1 - Filter Slot 1
- 2 - Filter Slot 2
- 3 - Filter Slot 3
- 4 - Filter Slot 4
- 5 - Filter Slot 5

D.3.2.6 AGC: Bits 56, 57, 58, 60, 61 and 62

AGC 1 is the main AGC path
AGC 2 is the ISB AGC path (when fitted)

- 0 - Manual
- 1 - Short 30 MS Decay
- 2 - Medium 200 +100 MS Decay
- 3 - Long 4.0 Second Decay Time
- 4 - Variable Short
- 5 - Variable Medium
- 6 - Variable Long

Note that Manual is used with the Attenuation set in bits 64 to 72 inclusive.

D.3.2.7 Attenuation: Bits 64 to 72

Two BCD digits with possible values from 000 to 150, causing the receiver IF path to be stepped from minimum (150) to maximum gain (00) in 151 steps. Each step is approximately 1 dB $\pm$ 1 dB. This facility is used in conjunction with the AGC function.

D.3.2.8 BFO: Bits 80 to 95

Three BCD digits with sign. The MSD can be set to a maximum of 8 and the other two digits 0 to 9. The sign function is represented by a 3 for positive sign and a 7 for negative.

D.3.3 Data Return

If the status bits are set for a BCD 2 such that a message of 16 bits in length is sent to the interface, the receiver will transmit back to the controlling device a full 94 bit long data word. All bits will be valid except for bits 7, 8, 73, 74 and 76 thru 79.

D.4.1 External Connector Configuration (Table D-3)

D.4.1.1 General

The external control that utilizes the data format described in Data Format section, is provided via four primary cable pairs connected to a 25-pin D-type connector located on the rear panel of the equipment. These four pairs are used for Transmit Data, Receive Data and Receive and Transmit Synchronizing Clocks.

Table D-3. External Control Connector Configuration

Chassis - 25 Pin D-type connector (Female) (screw lock retainers)

Mate - 25 Pin D-type connector (Male)

Recommended Shell/strain relief - Cannon DB51226-1A

Pin Designations

- 1 - Protective Ground
- 2 - Received Data "A"
- 3 - Transmitted Data "A"
- 4 - NU (Not Used)
- 5 - NU
- 6 - NU
- 7 - GND (Ground)
- 8 - +5 V (Internally limited to 5 mA)
- 9 - Address 0
- 10 - Address 1
- 11 - Address 2
- 12 - Address 3
- 13 - Address 4
- 14 - RX Data Clock "B"
- 15 - RX Data Clock "A"
- 16 - TX Data Clock "A"
- 17 - TX Data Clock "B"
- 18 - GND
- 19 - Receive Data "B"
- 20 - NU
- 21 - Transmit Data "B"
- 22 - -5 V (Internally limited to 5 mA)
- 23 - Address 5
- 24 - NU
- 25 - NU

D.4.2 Pin-Out Description

D.4.2.1 Transmitted Data (Pins 3 and 21)

The "A" connection is used for unbalanced operation, RS232C and RS423.

The "B" connection is used for MIL-STD-118C type protocols where signal inversion is required.

Both A and B are used for the balanced interface type RS422.

Note that the voltage limit on the output signal in all the above modes is ± 5 V.

D.4.2.2 Received Data (Pins 2 and 19)

Those pins should be used in a similar manner to those described in paragraph D.4.2.1. Unused pins should be grounded.

D.4.2.3 Receive and Transmit Synchronous Clocks (Pins 14, 15, 16 and 17)

These pins should be used in a similar manner to the method described in paragraph D.4.2.1. The clock signals should have a frequency of the bit rate and can be either gated (coincident with data burst) or continuous. See timing diagram in Figure D-1.

D.4.2.4 Address Control (Pins 9, 10, 11, 12, 13 and 23)

Each receiver can be bussed using these pins to recognize address selective data. Each control is pulled-up to an internal +5 V. Addresses 0 through 3 should be selected in BCD format to represent the units portion of the address. Addresses 4 and 5 are used in BCD for the tens digit of the address. Up to 29 selective addresses are available. Do not use 00 as this is the All-Call default.

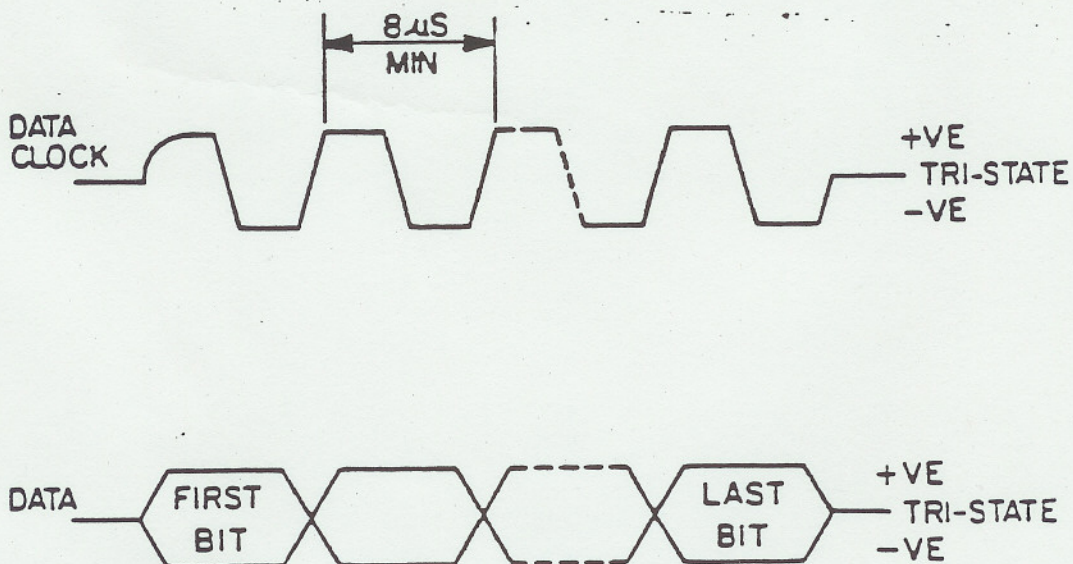


Figure D-1. Timing Diagram

**SUPPLEMENT S1 FOR RCI, RA6830(JD) RECEIVER
IEEE-488C REMOTE CONTROL INTERFACE
CIRCUIT CARD ASSEMBLY (A3-3)**

S1.1 INTRODUCTION

S1.2 This supplement provides technical information for the IEEE-488C Remote Control Interface for the RA6803(JD) receiver.

S1.3 The Remote Control Interface provides remote control operation, via an IEEE-488C data/control bus, in accordance with the Institute of Electrical and Electronic Engineers (IEEE) standard 488C-1978 for equipment employing bit parallel, byte serial data interchange. Installation and removal of IEEE-488C Remote Control Interface Circuit Card Assembly (A3-3) is covered in EM(B)6830JD manual paragraph 5.7.5. Refer to EM(B)-6830JD Figure 2-6 for rear panel connector J13 and address switch A3-3-S1. Location of A3-3 and A2 are shown in Figure 6-1 of the EM(B)-6830JD manual.

S1.4 ADDRESSING

S1.5 IEEE-488C Remote Control Interface Circuit Card Assembly (A3-3) - The IEEE-488C remote control interface circuit card assembly provides an electrical interface for communication with a remote controller/computer via a suitable interface bus. In addition, interconnections between the modified receiver and the remote controller/computer are made through a multi-pin remote control interface connector J13, located on the modified receiver rear panel.

S1.6 Communication between the remote controller/computer and the modified receiver is achieved through messages composed of data words (bytes) in serial strings. Each string of data is prefixed with a primary address for talker and/or listener operation (MTA or MLA byte). Refer to Table S1-1 for MLA and MTA address switch settings when the modified receiver is used as either a listener or talker. To initialize communication, the remote controller/computer sends a binary address code to the modified receiver. This binary coded decimal (BCD) address must be preset on a miniature eight position address switch assembly (S1), located on the IEEE-488C remote control interface circuit card assembly before installation of the equipment.

Table S1-1. Address Switch Programming

ADDRESS SWITCH					TALK ADDRESS CHARACTER	LISTEN ADDRESS CHARACTER
A ₅	A ₄	A ₃	A ₂	A ₁		
0	0	0	0	0	@	SP
0	0	0	0	1	A	!
0	0	0	1	0	B	"
0	0	0	1	1	C	#
0	0	1	0	0	D	\$
0	0	1	0	1	E	%
0	0	1	1	0	F	&
0	0	1	1	1	G	'
0	1	0	0	0	H	(
0	1	0	0	1	I	)
0	1	0	1	0	J	*
0	1	0	1	1	K	+
0	1	1	0	0	L	,
0	1	1	0	1	M	-
0	1	1	1	0	N	.
0	1	1	1	1	O	/
1	0	0	0	0	P	0
1	0	0	0	1	Q	1
1	0	0	1	0	R	2
1	0	0	1	1	S	3
1	0	1	0	0	T	4
1	0	1	0	1	U	5
1	0	1	1	0	V	6
1	0	1	1	1	W	7
1	1	0	0	0	X	8
1	1	0	0	1	Y	9
1	1	0	1	0	Z	:
1	1	0	1	1	[	;
1	1	1	0	0	/	<
1	1	1	0	1	]	=
1	1	1	1	0	(	>

S1.7 The IEEE-488C remote control interface circuit comprises three functional elements which include; a bus driver/receiver circuit, general-purpose interface adaptor (GPIA) circuit, and microprocessor interrupt circuit. This circuit implements control operations utilizing eight data lines DI01-DI08, three handshake lines DAV, NDAC and NRFD, and five bus-management lines EOI, IFC, SRQ, ATN and REN. Detailed information on the IEEE-488C remote control interface is contained in the specifications publication IEEE-STD-488C-1978 (the IEEE Standard Digital Interface for Programmable Instrumentation). Copies are available from the IEEE, 345 East 47th Street, New York, NY, 10018.

S1.8 Remote Control Interface Connector J13 - The remote control interface connector, an Amplenol or Cinch microribbon Type 57, 24-pin trapezoidal shell connector, provides an electrical interface for operation of the modified receiver to be controlled by a remote controller/computer via an interface bus. As shown in Table S1-2, pin out designations for the remote control interface connector are provided.

Table S1-2. Pin Number/Reference Signal Designation Chart

PIN NO.	SIGNAL DESIG.	PIN NO.	SIGNAL DESIG.
1	DI01	13	DI05
2	DI02	14	DI06
3	DI03	15	DI07
4	DI04	16	DI08
5	EOI	17	REN
6	DAV	18	Signal Gnd (DAV)
7	NRFD	19	Signal Gnd (NRFD)
8	NDAC	20	Signal Gnd (NDAC)
9	IFC	21	Signal Gnd (IFC)
10	SRQ	22	Signal Gnd (SRQ)
11	ATN	23	Signal Gnd (ATN)
12	Shield	24	Signal Gnd (EQI, REN)

S1.9 Remote Control Interface Addressing Instructions - To allow the modified receiver to interface with the remote controller/computer via the IEEE-488C input/output port on the IEEE-488C remote control interface circuit card assembly (A3-3) the modified receiver is assigned a binary address code. This binary coded address is preset before installation.

1. Obtain five digit binary coded system address for modified receiver from agency responsible for remote controller/computer.
2. Set address switch A3-3-S1 on IEEE-488C remote control interface circuit card assembly to proper address, as appropriate.

NOTE

Normally, the ON position is referred to as a logic 1 and the OFF position as a logic 0, however, verify this from responsible agency.

S1.10 OPERATION

S1.11 Remote Control Operation - The modified receiver is equipped with an IEEE-488C remote control interface circuit card assembly (A3-3) to provide for communication with a remote controller/computer. In the remote mode of operation, the modified receiver operating in the listener mode can be commanded by the remote controller/computer to set specific operating parameters which may be set all at one time (full setup) or set one at a time. In addition, the remote controller/computer (in remote or local mode of operation) may at any time command the modified receiver to supply operating parameter status by functioning as a talker, and request status on all operating parameters at one time (full status), or request status on only one selected operating parameter at a time.

S1.12 Communication between the remote controller/computer and the modified receiver is accomplished through a string of data words. Each word consists of a letter indicating the function and several numbers identifying the particular value of the function. This string of data words must be prefixed with the modified receiver address for talker or listener functions, and terminated with a carriage return/line feed to indicate the end of the message.

S1.13 Command and Monitor Data/Format - The following information addresses the command and monitor data/format associated with modified receiver remote control operation. Refer to Table S1-3 for a typical example of the command word format. Note that since the modified receiver address prefix is an IEEE-488 bus control function, it is not shown as text to be sent.

Table S1-3. Command Word Format (Listener) (Cont.)

SP	F29.6571	D3	I3.2	M4	A7	B	1.74	CRLF	
									Receiver Address (See Table S1-1 and IEEE Specifications)
									Selected Frequency (in Megahertz)
									Detector
									1 AM
									2 FM
									3 CW Variable
									4 CW Fixed (BFO set to center frequency)
									6 LSB
									7 USB
									IF Bandwidth (in kHz)
									(Receiver will choose IF bandpass filter with bandwidth closest to value transmitted.)
									AGC Mode
									1 Short
									2 Medium
									3 Long
									4 Manual
									5 Short Var.
									6 Medium Var.
									7 Long Var.
									IF Attenuation (Used with AGC modes 4-7)
									0-150 (0 corresponds to maximum gain)
									BFO Frequency (+1.74 kHz)
									Carriage Return/Line Feed (End of Message)

1. Receiver Address - (See Table 1 and IEEE-488C specifications).

2. Frequency Selection (F3.315926) - The selected (tuned) frequency is entered in MHz in up to eight digits with an optional decimal point with this command.

Leading and trailing zeros may be removed from the command. The frequency selected is the true carrier frequency except for the sideband detection modes, when the frequency is that of the virtual carrier.

3. Detection Mode (D3) - The detection mode of the modified receiver is set with this command; the modal commands are as follows:

- 1 - Amplitude modulation (AM)
- 2 - Frequency modulation (FM)
- 3 - Continuous wave, variable offset (CW with BFO)
- 4 - Continuous wave, center tuned (CW with BFO CENTER)
- 6 - Lower sideband (LSB)
- 7 - Upper sideband (USB)

The detection mode contains four non-modal override commands which may be used for maintenance and test purposes. These commands are distinguished from the modal commands by the equal to sign (=) placed between the letter and the command number i.e., D=1.

- =1 - Envelope detector
- =2 - Continuous wave detector
- =3 - Frequency modulation detector

To fully initiate an override command, the command must also include an IF bandpass filter selection in the I = format.

4. IF Bandwidth (I6) - The IF bandwidth, specified in kilohertz, is entered with this command. This command will allow the modified receiver to select the bandwidth of the IF bandpass filter of the IF bandpass filter closest to the one requested, however, the monitor data only presents the actual bandwidth picked. In the override mode, a typical command would be I=3; the number represents the filter-slot number (FL1-FL5) position from one to five.

5. AGC Mode (M2) - The AGC mode and rate are specified as follows:

- 1 - Short AGC time constant
- 2 - Medium AGC time constant
- 3 - Long AGC time constant
- 4 - Manual IF attenuation
- 5 - Short time constant, variable-threshold mode
- 6 - Medium time constant, variable-threshold mode
- 7 - Long time constant, variable-threshold mode

6. BFO Frequency (B-1.82) - The BFO offset from center frequency, specified in kHz, is entered with this command. The data is used in the modal system for CW only.

7. Attenuation (A30) - The attenuation command defines the amount of attenuation placed in the signal path during the manual-attenuation AGC mode, or the minimum attenuation during the variable-threshold modes. The attenuation varies from zero (no attenuation) to 150 (maximum attenuation) with actual attenuation between decimal (arabic) numbers representing no more than 3 dB.

8. Status (S5) - The status command controls the modified receiver operating status. In the monitor mode, the status provides a summary error indication.

a. Status Command

The status command 5 and 6 shown below may only be sent to a single receiver at a time, since commands 5 and 6 create data streams for monitoring. The status commands are as follows:

- 1 - Enable remote AGC dump
- 2 - Inhibit remote AGC dump
- 3 - Execute BITE self-test routine
- 4 - Terminate BITE self-test routine
- 5 - Report currently installed IF bandwidths
- 6 - Report BITE results
- 7 - Force IF bandpass filter bandwidth setup

Command 1 - Enable AGC Dump. This command causes all subsequent commands containing modified receiver data to cause an automatic AGC dump.

Command 2 - Inhibit AGC Dump. This command causes the AGC command dump to be disabled and would be used when free tuning the modified receiver by remote control.

Command 3 - Start BITE. Initiates modified receiver BITE (Built-In-Test) routine.

Command 4 - Terminate BITE. Causes the modified receiver to assume pre-BITE status.

Command 5 - Report current bandwidth. This command causes the modified receiver to list the installed IF filter bandwidths in slot-number order, followed by a line feed, i.e. (FL1), (FL2), (FL3), (FL4), (FL5), (LF).

A typical output might be L, , 6.2, U, .4, (LF) which reports the following:

<u>Slot</u>	<u>Filter/Function</u>
1	Lower sideband filter
2	Nothing
3	6.2 kHz symmetric filter
4	Upper sideband filter
5	400 Hz filter

Command 6 - Report results of last BITE. It should be noted that this is not cleared after having been read, nor does it cause another BITE cycle. To initialize a new BITE cycle report, start with S3, then go to S6.

GOOD response - OK XX (LF)

BAD response - 4, END XX (LF)

The above number indicates a failed test, and XX is the modified receiver number (in decimal). Refer to Table 5-2 in EM(B)6830JD manual for BITE fault codes.

Command 7 - Force IF Bandpass Filter Bandwidth Setup. This command is used to force a particular IF bandpass filter bandwidth complement in the modified receiver. The allowable codes are L for lower sideband, U for upper sideband, N for none, and IF bandwidths up to 20 kHz (in kHz) with a resolution of 100 Hz. Symmetric bandwidths (in kHz) are terminated with a comma. The string may contain all seven IF bandwidth filters or may end early with an (LF). Slots not entered will not be altered by the S7 command.

The command is as follows:

S7LU1.7,.4,N,(LF)

The preceeding command sets up the following:

<u>Slot</u>	<u>Filter/Function</u>
1	Lower sideband
2	Upper sideband
3	1.7 kHz symmetric
4	400 Hz symmetric
5	Unused

b. Monitor Status

The following summary status is appended to all other monitor data streams:

- 1 - Modified receiver operating in remote control
- 2 - Synthesizer out-of-lock phase condition
- 4 - Modified receiver in override remote control mode
- 8 - Last command sequence has data error

The indicators above are added together to form the summary status, i.e. 9 indicates remote control operation with a data error in the last command stream.

9. AGC Level (R30) - This indicates the level of a received signal. The range is 0 (minimum signal strength) to 150. This is appended prior to the status word in all monitor data streams.

10. Monitor Command G (G) - This is the overall monitor which allows all data relevant to the current status to be returned on receipt of the line-feed (LF) trigger.

11. Monitor Command T (TF) - This is the selective monitor command which allows the remote controller/computer to specify the data to be returned in the monitor data stream which is generated following the LF trigger. This command must immediately precede the line feed to avoid confusion with the data commands which use the same letter control characters.

12. Override Mode - The override mode gives the remote controller/computer functional level control of the modified receiver. In this case, the first local oscillator (LO) is always tuned to 40.455 MHz above the tuned frequency. The IF bandpass filter is always enabled regardless of the type of filter installed and allows the remote controller/computer to decide what the filter should be used for; the type of detection mode to employ, and the BFO offset to receive a signal, i.e., in single sideband (SSB) detection with a symmetrical filter, the 1st LO and BFO must be properly offset to correctly demodulate the signal. The remote controller/computer also assumes responsibility for ensuring that the IF bandpass filter is installed in the selected filter slot, since an empty slot will cause in-operation.

S1.14 Command Word Format for Listener - When the remote controller/computer commands the modified receiver to function as a listener, the command words may be formatted as shown in Table S1-3, or in a more simplified format. For example, the command F1 CRLF will cause the modified receiver to tune to 1 MHz without changing any other operating parameter, and the command F20.5 D2 CRLF will cause the modified receiver to tune to 20.5 MHz and select the FM detection mode. It should be noted that the remote controller/computer needs only to provide commands for the parameters that are to be changed. If an invalid command is received (i.e. specifying an operating parameter that is not compatible with the selected mode), the mode command will be implemented while the operating parameter is held, but not used until the proper mode is selected. The command D5 I3.2 CRLF will command the modified receiver to select ISB detector mode, selecting the IF bandpass filter closest to 3.2 kHz that is installed, therefore, the modified receiver will switch to the ISB mode, with its associated filter, however, the next time the modified receiver was operated in the AM, FM, or CW mode, it would automatically switch to the IF bandwidth filter closest to 3.2 kHz that is installed, unless the mode command included a different IF bandpass filter command. In a similar manner, the command D4B-1.8 CRLF will instruct the modified receiver to select the CW fixed mode with a BFO

set at zero, however, the next time the modified receiver is set to the CW variable mode, the BFO will automatically be set to -1.80 kHz. It should be noted that no extraneous data, such as leading and/or trailing zeros, spaces, or unnecessary decimal points, need be sent.

S1.15 Command Words for Talker - The remote controller/computer can request status information from any receiver on the bus by addressing the Receiver as a talker and specifying the type of status data required. As shown in Table S1-5 the letter G in the command word from the controller/computer will cause the Receiver to respond with a complete status update. As previously mentioned, the remote controller/computer commands to the Receiver as a listener may be either in the full format as shown in Table S1-3 or in a simplified format as described in paragraph S1.14. With the Receiver operating as a talker, the format shown in Table S1-4 will be supplied to the remote controller/computer. The Receiver will also block any "illogical" status data. That is, if the Receiver is in the CW fixed mode, no BFO data will be supplied; in the ISB, USB, or LSB modes, no IF bandwidth filter data will be given; and in the AGC Long, Medium, or Short modes, no IF attenuation data will be given.

S1.16 The remote controller/computer can also command the Receiver to supply only selected data. As shown in Table S1-4 the letter T in the command word followed by the letters of the designed parameters will cause the Receiver to respond only to those parameters. Any invalid requests (such as requesting BFO data in the CW fixed mode, IF bandwidth data in the sideband mode, or IF attenuation data in a fixed AGC mode) will cause the Receiver to respond only with the applicable data. For example, the Receiver will respond that it is in the CW fixed mode and not supply any BFO data. In addition, a status bit, indicating whether the Receiver is in local or remote control, is always supplied in the last status word.

S1.17 THEORY OF OPERATION

S1.18 The remote control interface circuit consists of circuitry which include; an address switch, the IEEE-488C interface bus transceiver, the general purpose interface adapter (GPIA), and the microprocessor interrupt circuitry. Refer to Figure S1-1. The address switch sets the receiver address. Transceivers provide compatible bi-directional connections to the IEEE-488C interface bus. The GPIA initiates an interrupt request upon receipt of the receiver address from the remote controller/computer. The interrupt circuitry requests the interruption of the microprocessor processing and directs the microprocessor to an interrupt vector address for a specific interrupt routine.

Table S1-4. Command Word Format (Talker)

STATUS REQUEST FOR ALL PARAMETERS	
Remote Controller Command:	G CRLF
Receiver Response:	F12.345678 D1 I1 M1 B1.23 A12 <u>R43 S1</u> CRLF
STATUS REQUEST FOR SELECTED PARAMETERS	
Controller/Computer Command:	TFD CRLF
Receiver Response:	F12.345678 D1 <u>R43 S1</u> CRLF

Note 1. Underlined portion of message always sent by receiver.

A. AGC level (R43)

Indicates the level of the received signal. The range is 0 to 150.

B. Status (S1)

Indicates the status of the receiver.

- 1 - Receiver operating in remote
- 2 - Synthesizer out-of-lock
- 4 - Receiver in override remote-control mode
- 8 - Last command had data error

The indicators are added together to form status, i.e. S9 indicated last command error and receiver in remote control.

C. CRLF

Carriage Return, Line Feed. Indicates end of message.

Note 2. IF Bandwidth given in kilohertz.

Note 3. No leading or trailing zeros or plus signs are sent. Data is transmitted without spaces between items.

Figure S1-1

To Be Supplied

21.19 Bus Transceiver - The sixteen bus lines from the remote controller/computer are applied through connector J2 and two octal transceivers U2 and U3 (75160 & 75161). Signal flow direction through each line in the transceivers is determined by a corresponding TE & CONTROL input is controlled by GPA.

21.20 General Purpose Interface Adapter (GPIA) - The IEEE-488C interface bus lines through the transceivers, connect to their corresponding terminals on the GPA (U2). Microprocessor connections are made through connector P1 to the GPA. These connections include data lines D0-D7, clock ϕ , read-write (R/W), and chip select (CS). Initialization of the GPA is activated through the RESET line. GPA operation is controlled through fourteen internal registers which are written on and/or read out by the microprocessor, being addressed through C2, R20, R21 and R22.

21.21 Addressing and Interrupt - When the remote controller/computer sets the ATN line true and sends the register address on the data lines D0-D15, the GPA recognizes this and gives an output on the INT terminal. This indicates an interrupt request which is a request to the microprocessor to stop normal processing and to force processing to an interrupt routine which will consider that data being received. The interrupt circuitry not only provides the interrupt request but also provides the microprocessor with the interrupt vector, the program memory address at which the interrupt routine starts.

21.22 Listener Operation - The remote control interface circuit acts as a listener while waiting to be addressed by the remote controller/computer and when directed by the microprocessor during a microprocessor routine. During these times, the GPA outputs TE and CONTROL to the transceivers so that the remote control interface circuit accepts remote control commands and data from the IEEE-488C interface bus. Here, data on lines D0-D15 is sent directly through to the GPA from the remote controller/computer, and the handshaking line DA (data available) signal is sent directly through from the remote controller/computer to the GPA, while handshaking lines NRFD (not ready for data) and NDAC (not data accepted) signals are sent directly through from the GPA to the remote controller/computer.

21.23 The GPA acts on the data and sends it on to the microprocessor. It also performs the required handshaking protocol with the remote controller/computer, as directed by the microprocessor, through the GPA internal registers.

S1.19 Bus Transceivers - The sixteen bus lines from the remote controller/computer are applied through connector J2 and enter the two octal transceivers U2 and U3 (75160 & 75161). Signal flow direction through each line in the transceivers is determined by a corresponding TE & CONTROLLER input. This input is controlled by GPIA.

S1.20 General Purpose Interface Adapter (GPIA) - The IEEE-488C interface bus lines, through the transceivers, connect to their corresponding terminals on the GPIA (U2). Microprocessor connections are made through connector P1 to the GPIA. These connections include data lines D0-D7, clock ϕ , read-write (R/W), and chip select (CS). Initialization of the GPIA is activated through the RESET line. GPIA operation is controlled through fourteen internal registers which are written on and/or read out by the microprocessor, being addressed through CS, RS0, RS1 and RS2.

S1.21 Addressing and Interrupt - When the remote controller/computer sets the ATN line true and sends the receiver address on the data lines DI01-DI08, the GPIA recognizes this and gives an output on the IRQ terminal. This initiates an interrupt request which is a request to the microprocessor to stop normal processing and to force processing to an interrupt routine which will consider that data being received. The interrupt circuitry not only provides the interrupt request but also provides the microprocessor with the interrupt vector, the program memory address at which the interrupt routine starts.

S1.22 Listener Operation - The remote control interface circuit acts as a listener while waiting to be addressed by the remote controller/computer and when directed by the microprocessor during a microprocessor routine. During these times, the GPIA outputs TE and CONTROLLER set the transceivers so that the remote control interface circuit accepts remote controller commands and data from the IEEE-488C interface bus. Here, data on lines DI01-DI08 is sent directly through to the GPIA from the remote controller/computer, and the handshaking line DAV (data available) signal is sent directly through from the remote controller/computer to the GPIA, while handshaking lines NRFD (not ready for data) and NDAC (not data accepted) signals are sent directly through from the GPIA to the remote controller/computer.

S1.23 The GPIA acts on the data and/or sends it on to the microprocessor. It also performs the required handshaking protocol with the remote controller/computer, as directed by the microprocessor, through the GPIA internal registers.

S1.24 Talker Operation - The remote controller/computer addresses the remote control interface circuit to talk by placing the talk address of the circuit on data lines DI01-DI08 with the ATN line true. The GPIA decodes the data as its talk address and requests status information from the microprocessor. Data is transferred from the microprocessor to the GPIA. The GPIA outputs TE and CONTROLLER, set the transceivers so that the remote control interface sends data from the GPIA on to the IEEE-488C interface bus and thus to the remote controller/computer. Here, data on lines DI01-DI08 is sent directly through from the GPIA to the remote controller/computer, and the handshaking line DAV signal is sent directly through from the GPIA to the remote controller/computer while handshaking lines NRFD (not ready for data) and NDAC (not data accepted) signals are sent directly through from the GPIA to the remote controller.

S1.25 The GPIA transfers data from the microprocessor to the remote controller/computer and also performs the required handshaking protocol with the remote controller/computer as directed by the microprocessor.

S1.26 Bus Management Lines - ATN, IFC, REN, SRQ and EOI are the IEEE-488C interface bus management lines. ATN, IFC and REN have their associated transceivers hardwired for direction of signal flow from the remote controller/computer to the GPIA only. As indicated earlier, ATN is set true by the remote controller/computer when it wants to clear lines to send a message. IFC is used by the remote controller/computer to set the interface system into a known quiescent state. REN is used by the controller/computer to select one of two alternative sources of device programming data, local or remote. EOI is bidirectional, controlled by the GPIA, and is sometimes used to indicate the end of a message either to the remote controller/computer or the remote control interface circuit.

S1.27. MAINTENANCE - Maintenance for the modified receiver is the same as that for the standard receiver. Refer to EM(B)6830JD manual for location of replaceable components on A3-3 and circuit details.

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APPLICATION			REVISIONS			
ASSY	NEXT ASSY	USED ON	REV	DESCRIPTION	DATE	APPROVED
	-516/-518	RA6830	A	PRODUCTION RELEASE.		

CONTRACT OR ORDER NO.		 RACAL COMMUNICATION, INC ROCKVILLE, MARYLAND
DRAWN <i>[Signature]</i>	DATE 8-11-89	
CHECKED		
MECH ENGR <i>G. Rosa</i>	8-23-89	
TELE ENGR <i>[Signature]</i>	8-11-89	TEST & ALIGNMENT PROCEDURE FOR THE RA6830-516/518 HIGH FREQUENCY RECEIVER
APPROVAL (CUSTOMER)		A CODE IDENT 23386 DRAWING NO. 1900014 REV A
APPROVAL (PROJECT) <i>[Signature]</i> 8-23-89		PARTS LIST SHEET 1 OF 1 SHEETS

0.0 POWER CONSUMPTION: using a Variac apply power to the UUT. Current Draw should read approximately 0.5 Amps and should be about 45W. (It may be required to turn unit off and on to reset microprocessor.)

Voltage tests: Check the voltages at the following test points.

A4A14 - +15.0 +/- 0.5 Volts

A4A16 - + 5.0 +/- 0.3 Volts

A4A19 - -15.0 +/- 0.5 Volts

E9 - + 9.0 +/- 1.5 Volts

E8 - +20.0 +/- 0.5 Volts

1.0 Verify front panel operation by selecting all [MODES] and [SUBMODES]. Install the filter BW's using [lock] & [5] keys. Select 10 MHz Internal Reference using [lock] & [6] keys.

1.0 Connect a signal generator to J1 on the rear panel. Set the generator for 15.55 MHz @ -80 dBm and set the radio to 15.55 MHz, CW +1.00 kHz, Max Manual Gain, and 3.24 kHz filter BW.

5.0 Connect the analyzer to J3 on the A10 board. Set the analyzer for 455 kHz center frequency and put A11 onto an extender board. Connect all cables to their respective jacks. Adjust T1, T2, L9 thru L12 on the A11 for maximum output on the analyzer. Reinstall A11 into chassis, paying attention to cable layout to avoid undo strain on cables.

6.0 Check that the output level is at least -43.0 dBm. If not, check A10, A11, A12, & A13 for proper gain. The gain to this point in the radio is critical for all specifications and must be sufficient to proceed further.

7.0 Install the A9 board onto an extender board, connect the analyzer to J3 on the A9 board and reconnect W12 to J3 on the A10 board. Set the signal generator for -114 dBm and set the radio for Short AGC.

8.0 Preset the A9 pots: R7 to midrange, R14 CCW, and R73 CCW. Disconnect the sig gen, adjust R16 on the A4 module for 10.00 Volts measured at TP 10 on the A9 board.

9.0 Reconnect the sig gen to J1 on the radio and set the receiver to maximum Manual Gain, adjust R7 for an indication of -10.0 dBm on the analyzer.

10.0 Set the receiver for Short AGC, and adjust the sig gen for -83 dBm. Adjust R14 for 8.5 Volts @ TP 10 on the A9 board, or as low as possible, note this voltage for use in next step.

11.0 Set the receiver to Manual Gain, set the IF Gain pot to obtain the same voltage @ TP 10 on the A9 board as noted in Step 10. Note the IF output on the analyzer, adjust R73 on the A9 board until there is a slight increase in the output level, then decrease R73 just until the original level is reached.

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12.0 Set AGC short and check the A9 board for about 8.5 Volts, readjust R14 on the A9 if necessary. Reinstall A9. Monitor audio line output for 1 mW into 600 ohms, adjust R21 on A7 if necessary.

13.0 Baseband Board (A8) Setup: Install Module onto an extender board and set up equipment as shown in Figure 1. Turn Radio off and on, this will send the frequency set up instructions to the module. Then measure the VCO control voltage @ TP 1, adjust T1 for a voltage of approximately 6 Volts. Set the radio to 15.55 MHz, Short AGC, CW, 3 kHz Filter, and set the generator to 15.55 MHz, -47 dBm output, unmodulated. Measure the IF output at J2 and verify the level @ 455 kHz is approx is -10 dBm, Then measure the LBIF output at J6, adjust R26 for a level of approx 70 dBm @ 6.4 kHz. Set the radio to manual gain and adjust the gain for an output of -10 dBm on the LBIF, connect the DMM + to Pin A3 on the extender and - to ground, adjust R59 just until the threshold detector goes high (above 1 Volt). using the manual gain reduce the level to -13 dBm the detector should go low and should again go high @ -10 dBm, if necessary readjust R59. Disconnect the input @ J1 and connect J6 to the oscilloscope. set the oscilloscope to DC input @ 10 mV/Div, ground the input and adjust the position for a center trace. Switch the input back to DC and adjust R25 for a DC offset of less than 10 mV. Re-install the A8 into the radio.

14.0 Run BITE monitor, [lock] & [0] keys, (the first two digits in the display indicate the test BITE is on, BITE can be advanced by pressing [LOCK] & [0] again) check and adjust voltages if necessary at BITE Tests 8, 9, 10, 11, & 13, using the BITE Code Table (TABLE 1), with the A4 on an extender for voltage readings. Make adjustments only where necessary.

NOTE: THE FOLLOWING INTERMOD ALIGNMENTS ARE REQUIRED ONLY FOR TEST PROBLEMS!

15.0 In-Band intermodulation problems: In-Band intermods are usually caused by impedance mismatches within the second mixer (A11), but can also be be a product of the gain being too high. If any adjustments are made to the second mixer, which affect overall gain of the radio, in the process of testing the receiver any gain related tests must be rechecked so as not to affect the overall performance of the radio and the AGC setup must be reset. This procedure need only be followed if problems are encountered in the testing of this unit.

15.1 Alignment Procedure: Install the A11 onto an extender board and set up equipment as shown in Figure 2. Set the equipment as follows.

Generator - 40.0 MHz, +7 dBm, unmodulated

Spec An - CF 455 kHz, 50 kHz Span, RBW Preset, Tracking Gen 0dBm

Attenuator - 70 dB

Adjust the analyzer to indicate the top of the filter shape within the top section of the display and set the analyzer to 1 dB/Div. Adjust R30, T2, L9 thru L12 for max gain. Then for maximum gain, < 1 dB flatness, sharpest roll off, and minimum +/- 10 kHz 1 dB BW adjust T1, C16, & C17. These adjustments are critical for the proper matching of

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15.1 Alignment Procedure (Continued)

Courtesy of <http://BlackRadios.terry.org>

the filter to the circuitry. Usually a very sharp roll off will give the best intermod performance. But this alignment may require several attempts before optimum results are obtained. Intermods should be checked using the procedure in Section 15.2. If the filter alignment can not correct intermods first try lowering the gain of the board by 2 dB using R30. If these adjustments fail to correct intermods check for correct cap values within the signal path and then try replacing and realigning the filter.

15.2 Board Level Intermod Check

Set up equipment as shown in Figure 2A. Set the equipment as follows.

Sig Gen 1 - 40.4548, -15 dBm, unmodulated

Sig Gen 2 - 40.4552, -15 dBm, unmodulated

Spec An - CF 455 KHz, Span 2 kHz, RBW, VBW, & ST Preset

Receiver - All on Extender Board, Long AGC, CW, 3 kHz Filter

Adjust the level of the generators thru the Amp/Combiner to individually give a level of -20 dBm for each Sig Gen. Verify the radio displays the main carriers at -15 dBm. Measure the intermodulation levels, which are at 454.4 kHz and 455.6 kHz, these should be below -66 dBm in order to work correctly in the radio.

15.3 After any alignment of the A11 board reset the AGC gain setting of the radio using steps 7.0 thru 12.0. Then retest radio using test procedure.

16.0 Out-of-Band Intermodulation problems: Out-of-Band intermods are usually caused by impedance mismatches within the First Mixer (A12) and occasionally within the RF Input board (A13). A13 problems can usually be isolated by directly inserting the RF signal into the First Mixer, if the intermod problems still exist the problem lies within the First Mixer. If the problems are gone check Capacitor values in the Low Pass filter and check the BITE detector circuit for possible problems. If any adjustments are made to the First Mixer, in the process of testing the radio, any gain related tests must be rechecked and the AGC set up must be reset.

16.1 Procedure: Install the A12 onto an extender board and set up equipment as shown in Figure 3. Set the equipment as follows:

Generator - 70.455 MHz, 0 dBm, unmodulated

Spectrum Analyzer - CF 30 MHz, Span 100 kHz, RBW, VBW, & ST Preset

Receiver - 29.999999 MHz, CW

Adjust the Spec An to indicate the top of the filter shape within the top of the display and then set the analyzer to 1 dB/Div. Adjust C6, C8, C10, C12, L2, & L3 for maximum gain, < 1 dB flatness, sharpest roll off, and a minimum of +/- 10 kHz 1 dB bandwidth. These adjustments are critical for the correct matching of the mixer and filter. Usually a very sharp roll off will give the best intermod performance. Intermods should be checked using the procedure in 16.2. If these procedures fail to correct the intermods try replacing and realigning the filter.

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LTR

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16.2 For 2nd Order Intermods set up equipment as in Figure 3A. Set equipment as follows:

Courtesy of <http://BlackRadios.terryb.org>

Spec Anal - RBW-VBW-ST Preset, span 2 kHz, .850 MHz or .650 MHz
Receiver - 1.5 MHz, CW 0.00 kHz, 3.24 kHz BW, Manual AGC
Sig Gen 2 - .85 MHz, unmodulated, level as required
Sig Gen 3 - .65 MHz, unmodulated, level as required
Step Attenuator - 0 dB

Connect the amplifier/combiner output and adjust each sig gen output for a level of -10 dBm on the analyzer. Then connect the amp/combiner to the step attenuator, and connect the IF output of the radio to the analyzer, then set the analyzer center frequency to 455 kHz. Adjust the receiver manual gain to obtain a level indication of -10 dBm on the spectrum analyzer. Turn off Sig Gen 3, set attenuator to 70 dB, set Sig Gen 2 to the radio tuned frequency, adjust attenuator to obtain a -10 dBm +/-1 dB level on the spectrum analyzer. If the attenuator is less than 70 dB then the intermod is failing. Adjustment of R10 in the lower left hand section of the module usually will correct 2nd order problems, however if the pot is at the limit of it's adjustment there is probably a problem with the LO amplifier. If R10 is adjusted retest at all of the test frequencies.

Repeat for the following frequencies.

SECOND ORDER INTERMODULATION TEST FREQUENCIES

<u>Receiver</u>	<u>Sig Gen 2</u>	<u>Sig Gen 3</u>
1.5	0.85	0.65
5.5	3.25	2.25
15.5	8.25	7.25
29.5	13.25	16.25

16.3 Repeat the 16.2 procedure for 3rd Order Intermods for the following frequencies to test the 3rd Order Intermodulation levels using a minimum attenuation level of 80 dB for acceptable intermods. Usually a small adjustment of C6, C8, C10, & C12 will correct 3rd Order intermods, however if these caps are adjusted a recheck of the filter shape is required. Also all frequencies must be checked for intermods if adjustments are made.

THIRD ORDER INTERMODULATION TEST FREQUENCIES

<u>Receiver</u>	<u>Sig Gen 2</u>	<u>Sig Gen 3</u>
1.85	1.65	1.75
5.85	5.65	5.75
15.85	15.65	15.75
29.85	29.65	29.75

16.4 After any alignment of the A12 board reset the AGC gain setting of the radio using steps 7.0 thru 12.0. Then retest radio using test procedure.

RACAL

RACAL COMMUNICATIONS, INC.
Rockville, Maryland

CODE IDENT

23386

OWG

A
SIZE

DRAWING NUMBER

1900014

LTR

SHEET 5 OF 9

BITE CODE TABLE RA6830-516/518

<u>CODE</u> <u>TEST</u> <u>DESCRIPTION</u>	<u>ADJUSTMENTS</u>
[01] RAM TEST	N/A
[02] REF OOL	CHECK OUTPUT "ROOL" A6A28 or A4B31 < 1.0 VOLT
[03] 1st LO OOL	CHECK OUTPUT "LOOL" A5A22 or A4C31 < 1.0 VOLT
[04] BFO OOL	CHECK OUTPUT "DBOL" A7B2 or A4A30 > 1.0 VOLT
[05] 3RD LO OOL	CHECK OUTPUT "ISBF" A8B31 or A4A27 < 1.0 VOLT
[06] A9 AGC CHECK	CHECK "ARFM" A9B26 or A4C10 < 8.5 VOLT @ 4.0V DAC
[07] A9 AGC CHECK	CHECK "ARFM" A9B26 or A4C10 > 5.0 VOLT @ 9.5V DAC
[08] A13 BOARD DETECTOR	CHECK "XRFS" A13A5 or A4A15 > 1.0 VOLT ADJUST A13R20 FOR -10dBm OUTPUT ADJUST A13R24 FOR -50dBm OUTPUT ADJUST A13R8 FOR > 4.0 VOLT (detector)
[09] A12 BOARD DETECTOR	CHECK "MOS" A12A3 or A4A18 > 1.0 VOLT ADJUST A12R21 & A12C44 FOR > 3.0 VOLT
[10] A11 BOARD DETECTOR	CHECK "SOS" A11A3 or A4C18 3V< SOS <7V ADJUST A11R51 FOR > 5.0 VOLT
[11] A9 BOARD DETECTOR	CHECK "AIIS" A9B30 or A4B18 3V< AIIS <7V ADJUST A9R5 FOR APPROX 5.0 VOLT
[12] FINAL AGC CHECK	CHECK "ARFM" A9B26 or A4C10 > 1V @ -10 dBm INPUT w/AGC
[13] A8 BOARD LEVEL DET.	CHECK "IMET" A8A3 or A4A10 > 2.5 VOLT ADJUST THRESHOLD DETECTOR A8R59 FOR SIGNAL OF AT LEAST -10 dBm.
[99] RETURN TO NORMAL	RECALL AND SET PRE-BITE SETTINGS

TABLE 1

 RACAL COMMUNICATIONS, INC. Rockville, Maryland				
SHEET 6 OF 9	CODE IDENT	OWG	DRAWING NUMBER	LTR
	23386	A	1700014	
	SIZE			

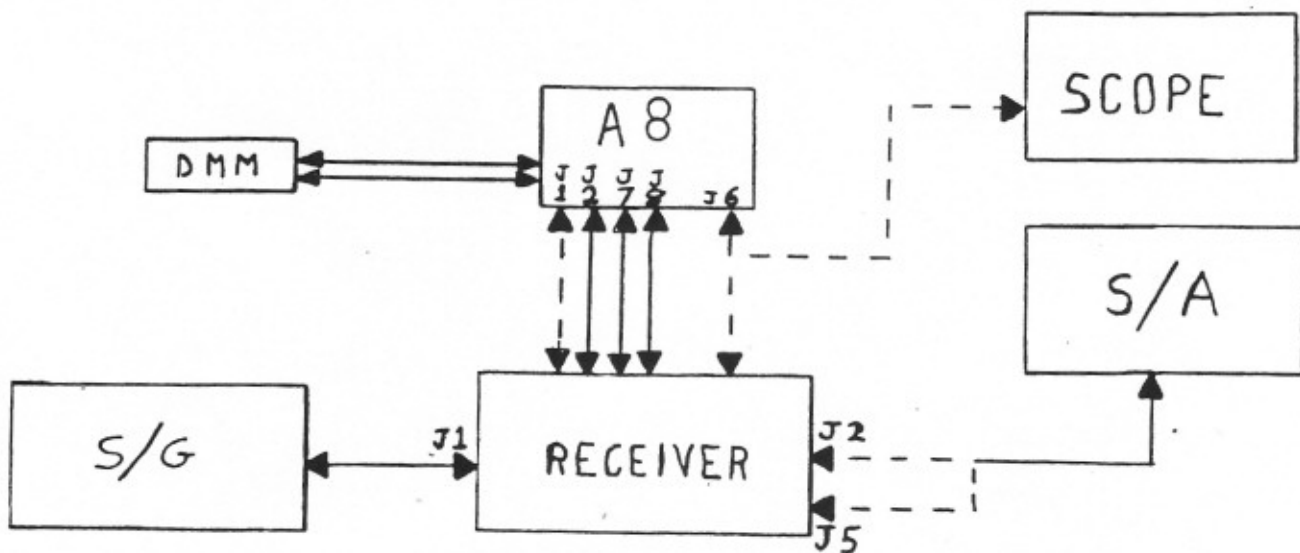


FIGURE 1

RACAL RACAL COMMUNICATIONS, INC. Rockville, Maryland			
SHEET 7 OF 9	CODE IDENT 23386	DWG A SIZE	DRAWING NUMBER 1900014
			LTR A

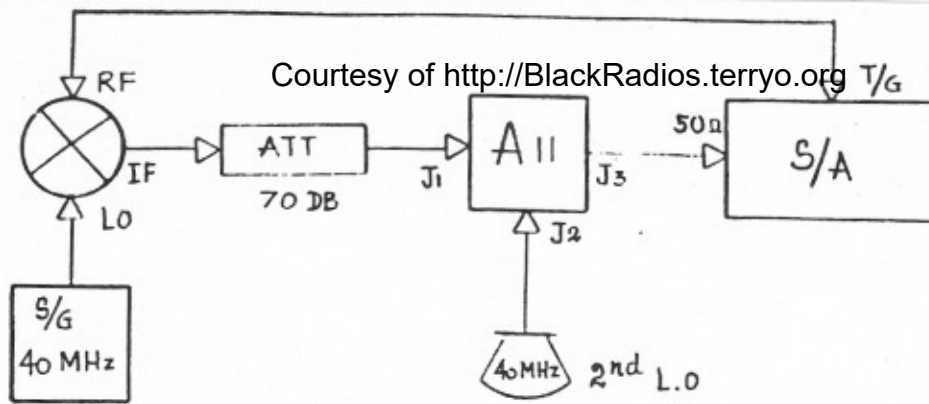


FIGURE 2.

Handwritten notes:
 J1 RFin
 RF Track
~~IF~~ Rcvr
 gen in
 10 RE on Rcvr
 for 10⁰⁰ 64

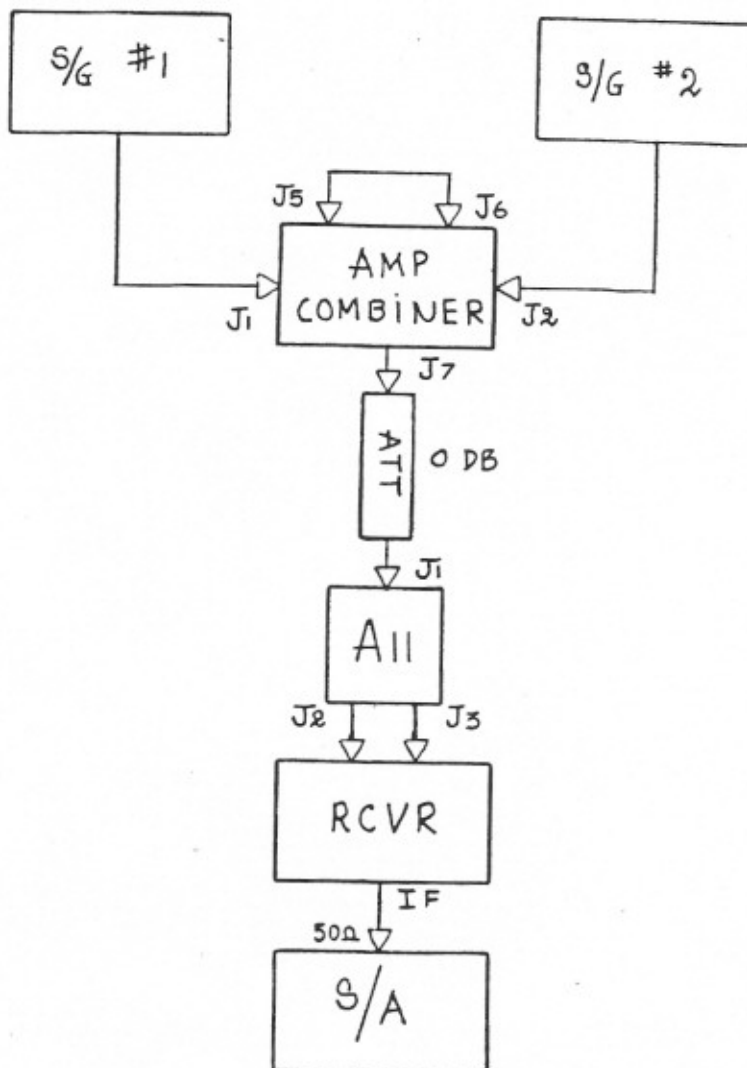


FIGURE 2.A.

RACAL

RACAL COMMUNICATIONS, INC.
 Rockville, Maryland

CODE IDENT
23386

DWG
A
 SIZE

DRAWING NUMBER
 1900014

LTR
A

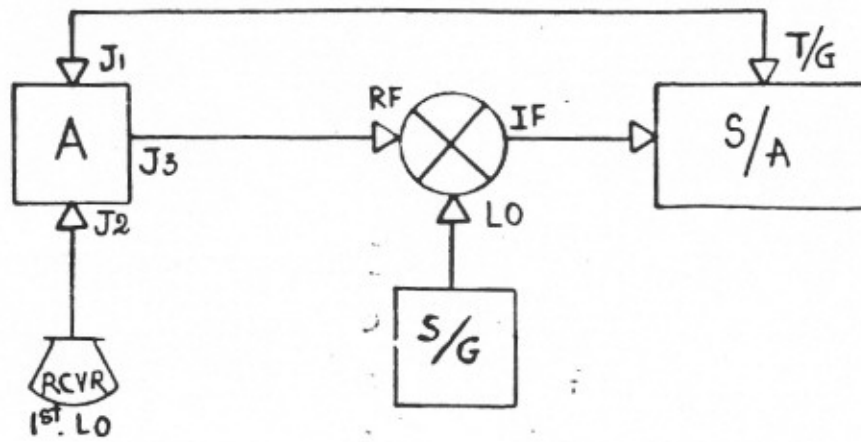


FIGURE 3

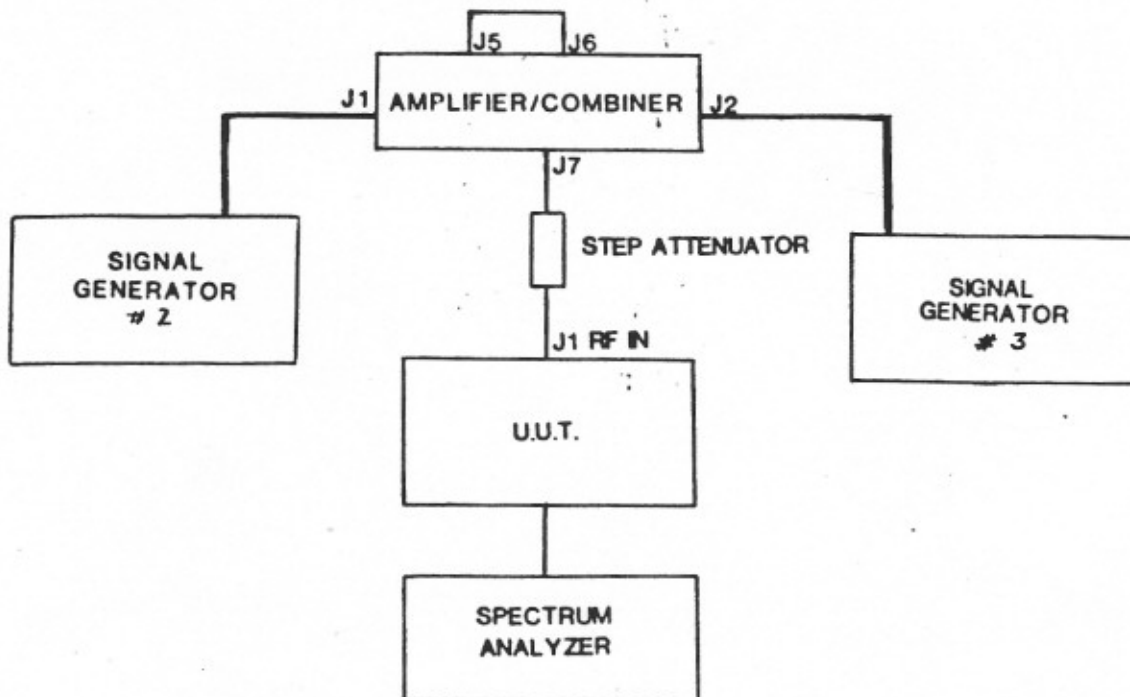


FIGURE 3A

RACAL

RACAL COMMUNICATIONS, INC.
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CODE IDENT

23386

DWG

A

SIZE

DRAWING NUMBER

1900014

LTR

A

SHEET 9 OF 9

SECTION VII

ENGINEERING DRAWINGS

7.1 INTRODUCTION

This section contains engineering drawings for the Receiver, including an overall main chassis assembly interconnecting wiring diagram, and the schematic and logic diagrams of the various subassemblies and sub-subassemblies, as may be applicable.

7.1 DRAWING INDEX

An index of those drawings contained in this section is provided below.

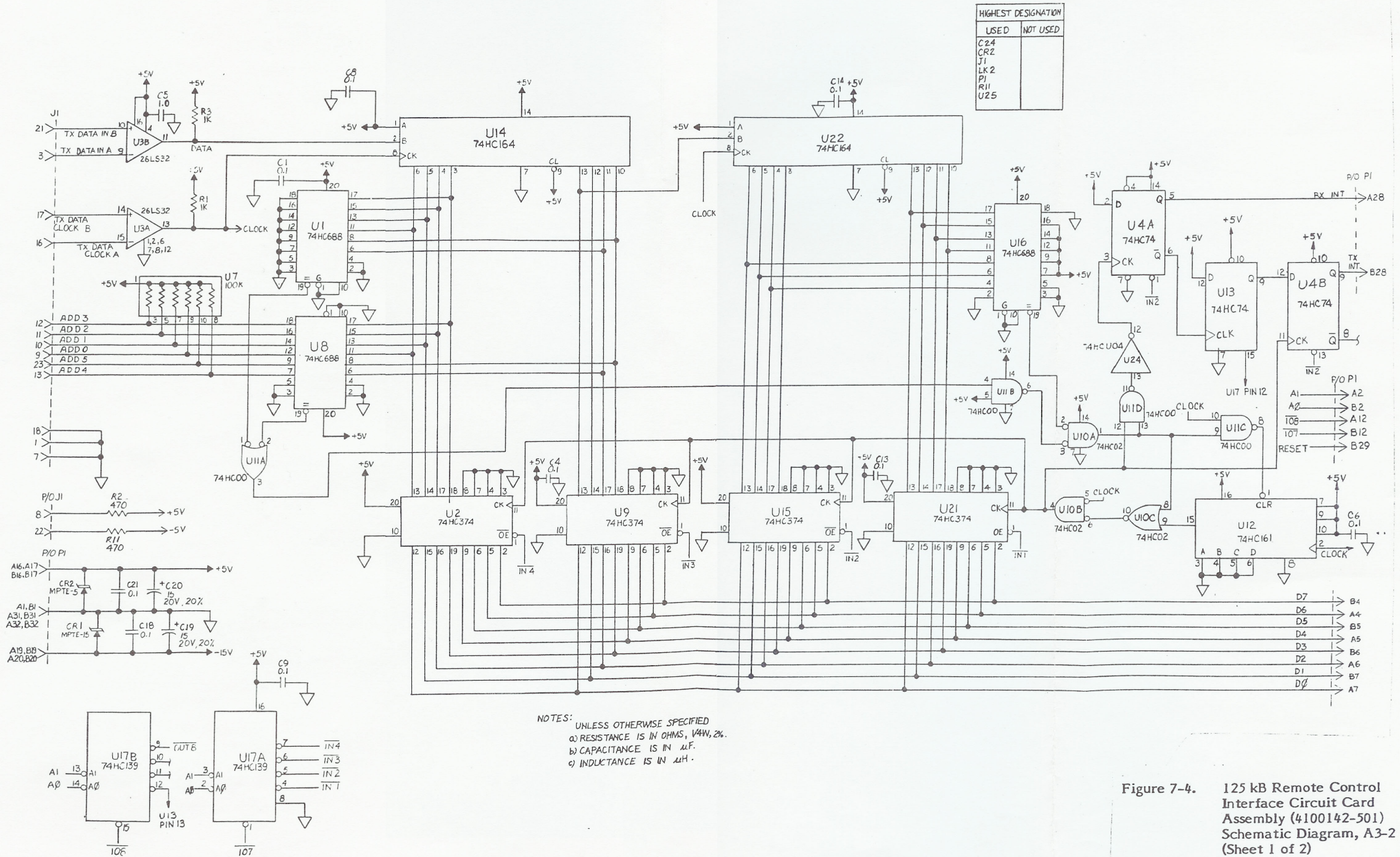
DRAWING INDEX

- Figure 7-1. Main Chassis Assembly Interconnecting Wiring Diagram
- Figure 7-2. Front Panel Circuit Card Assembly (4100128-501) Schematic Diagram, A1A1
- Figure 7-3. Microprocessor Circuit Card Assembly (4100116-501) Logic Diagram, A2-1
- Figure 7-4. 125 kB Remote Control Interface Circuit Card Assembly (4100142-501) Schematic Diagram, A3-2
- Figure 7-5. RS-232C Remote Control Interface Circuit Card Assembly (4100237-501) Schematic Diagram, A3-4
- Figure 7-6. Receiver Interface Circuit Card Assembly (4100138-501) Logic Diagram, A4-1
- Figure 7-7. Synthesizer Module Assembly (3100118-501) Schematic Diagram, A5-1
- Figure 7-8. Frequency Reference Circuit Card Assembly (4100054-501) Schematic Diagram, A6-1
- Figure 7-9. Demodulator/BFO Circuit Card Assembly (4100061-501) Schematic Diagram, A7-1
- Figure 7-10. Specialized Demodulator (6 kHz FM) Circuit Card Assembly (4100154-501) Schematic Diagram, A8-6

DRAWING INDEX (Cont.)

- Figure 7-11. IF/AGC Circuit Card Assembly (4100058-501) Schematic Diagram, A9-1
- Figure 7-12. IF Filter Circuit Card Assembly (3100116-502) Schematic Diagram, A10-2
- Figure 7-13. 2nd Mixer Circuit Card Assembly (4100052-501) Schematic Diagram, A11-1
- Figure 7-14. 1st Mixer Circuit Card Assembly (4100247-501) Schematic Diagram, A12-3
- Figure 7-15. RF Input Circuit Card Assembly (4100189-501) Schematic Diagram, A13-1
- Figure 7-16. Power Supply Module Assembly (4100212-501) Schematic Diagram, A14



Courtesy of <http://BlackRadios.terryo.org>

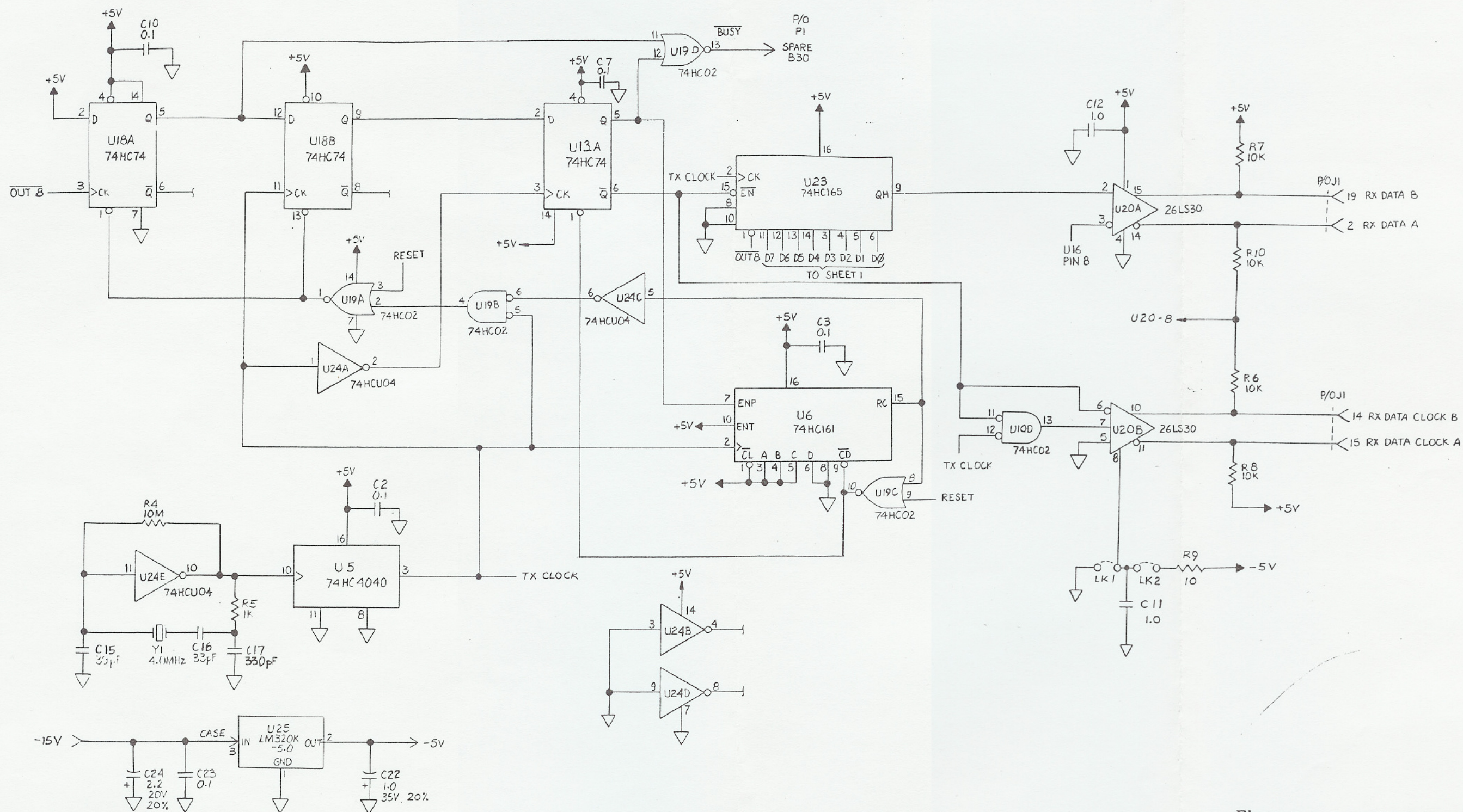


Figure 7-4. 125 kB Remote Control Interface Circuit Card Assembly (4100142-501) Schematic Diagram, A3-2 (Sheet 2 of 2)

2. CAPACITOR VALUES ARE IN PICO FARADS.

Courtesy of <http://BlackRadios.terryo.org>

NOTES:
 UNLESS OTHERWISE SPECIFIED
 a) RESISTANCE IS IN OHMS, $\frac{1}{4}W, \pm 2\%$
 b) CAPACITANCE IS IN μF .
 c) INDUCTANCE IS IN μH .

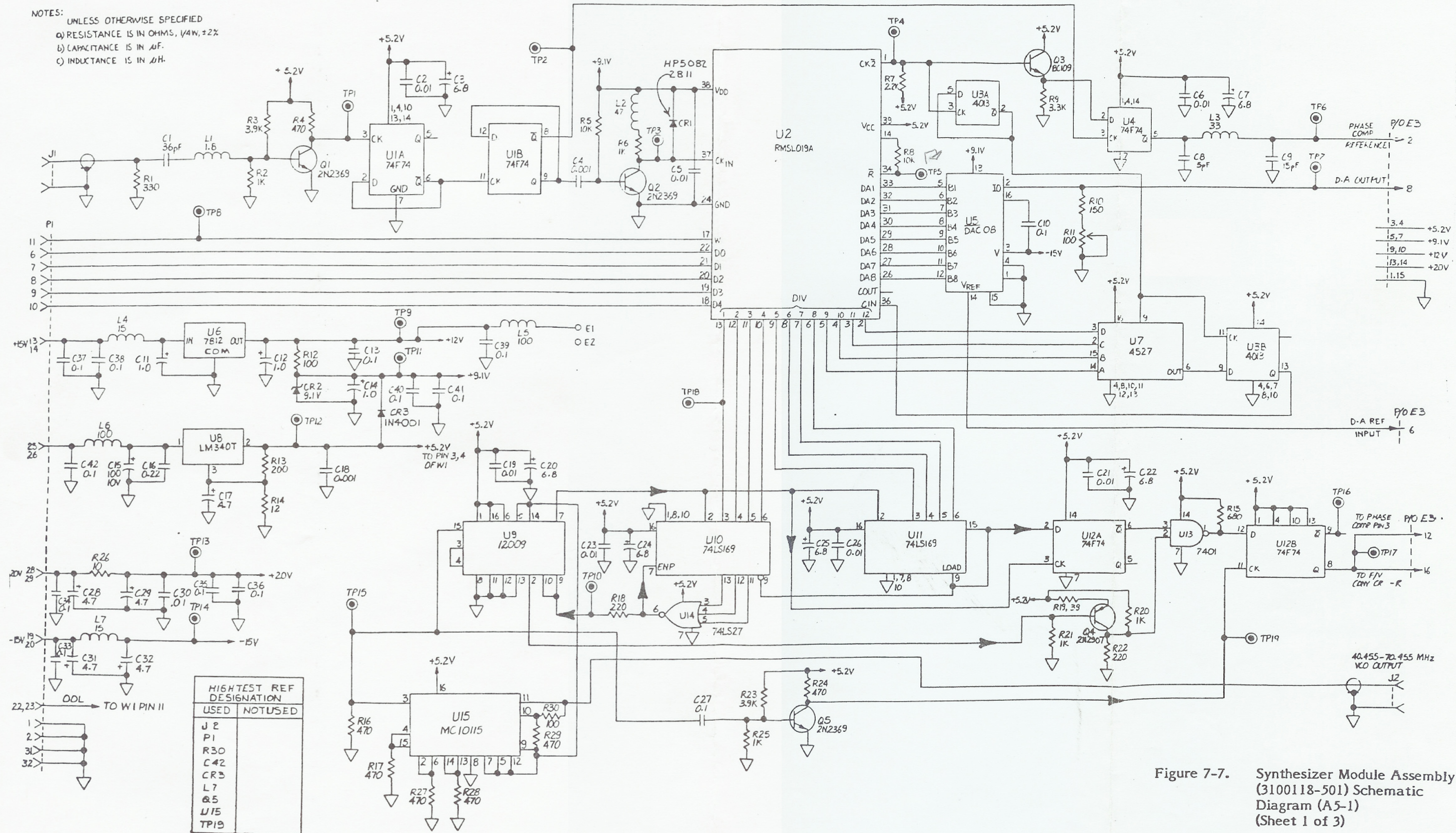
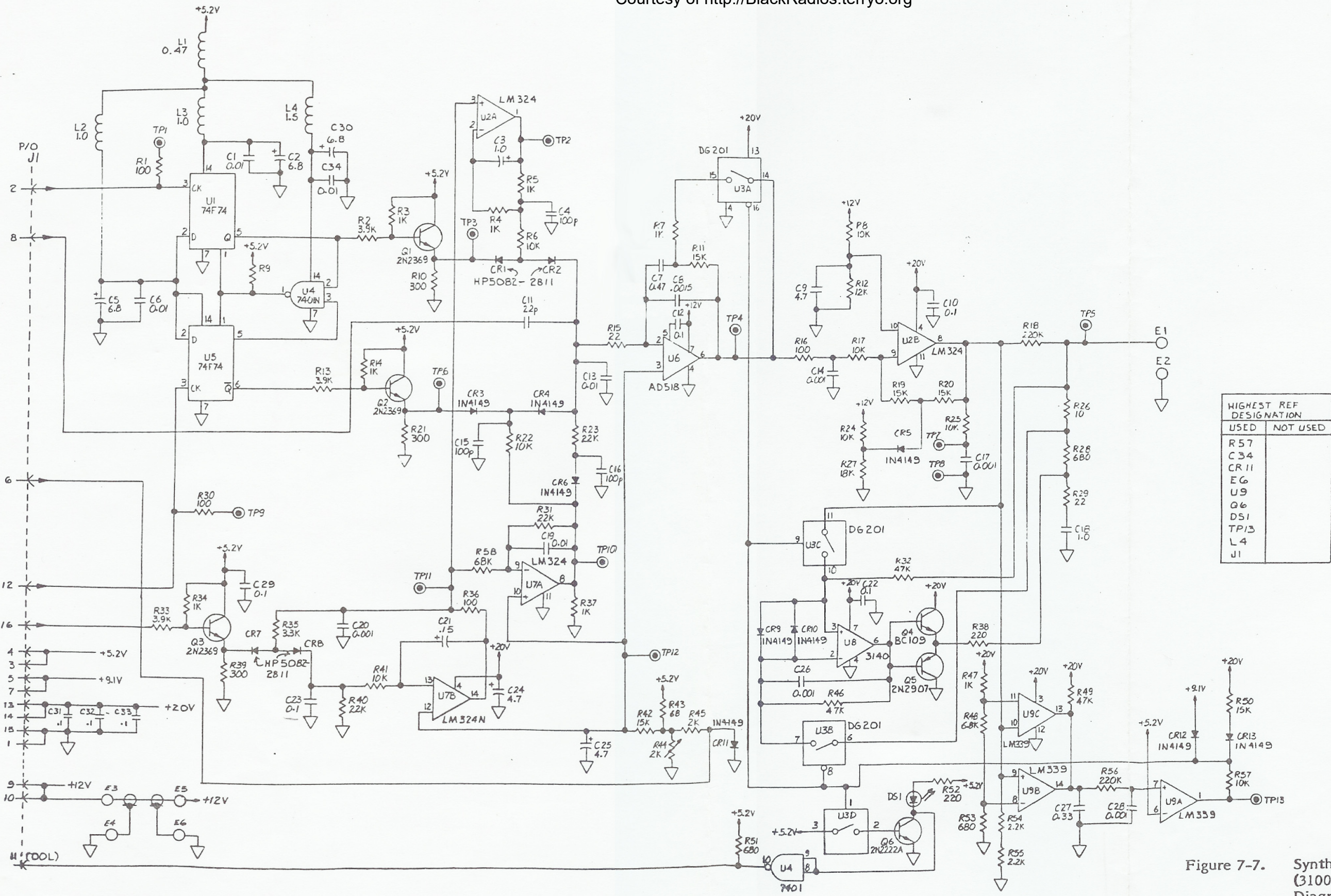


Figure 7-7. Synthesizer Module Assembly (3100118-501) Schematic Diagram (A5-1) (Sheet 1 of 3)

Courtesy of <http://BlackRadios.terryo.org>



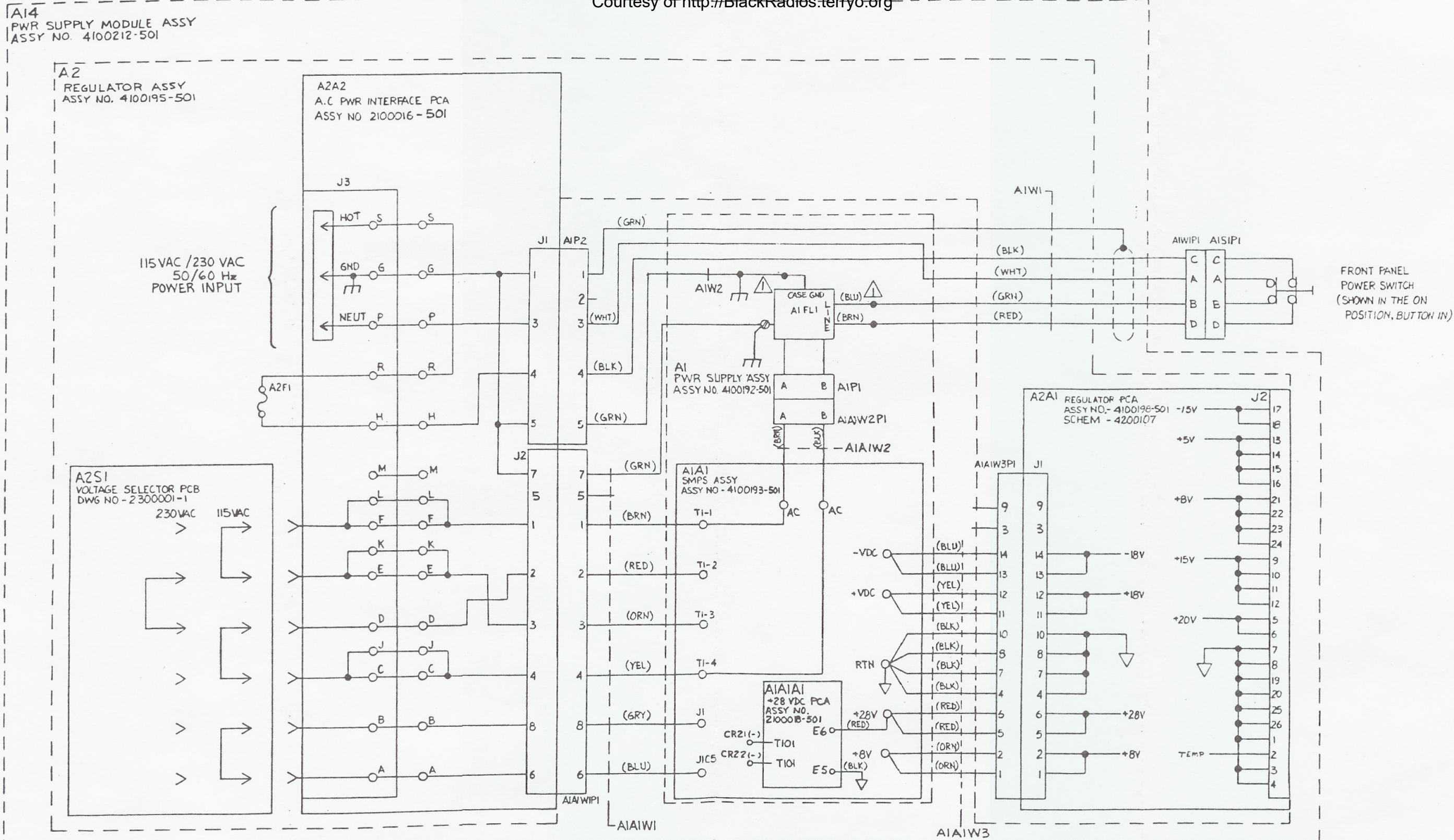
HIGHEST REF DESIGNATION	
USED	NOT USED
R57	
C34	
CR11	
E6	
U9	
Q6	
DS1	
TP13	
L4	
J1	

Figure 7-7. Synthesizer Module Assembly (3100118-501) Schematic Diagram (A5-1) (Sheet 2 of 3)

Figure 7-10. Specialized Demodulator
(6 kHz FM) Circuit Card
Assembly (4100154-501)
Schematic Diagram, A8-6
(Sheet 2 of 3)

OPTION LIST					
SPECIALIZED DEMODULATOR A8					
OPTION	FUNCTION	CHARACTERISTICS	COMPONENT REQUIREMENTS (REF.) Δ	CIRCUIT CONFIGURATIONS	
01	IF OUTPUT (J2)	OUTPUT LEVEL: +13 dBm	R1, R3, R6 & R8 ARE 220 Ω , 2%, 1/4W R2 & R7 ARE 22 Ω , 2%, 1/4W		
02	IF OUTPUT (J2)	OUTPUT LEVEL: -10 dBm (BUFFERED)	R1, R3, R6 & R8 ARE 68 Ω , 2%, 1/4W R2 & R7 ARE 150 Ω , 2%, 1/4W		
03 METHOD 1	IF OUTPUT (J2)	OUTPUT LEVEL: -10 dBm (UNBUFFERED)			METHOD 1: WITH AMPLIFIER CIRCUITRY INSTALLED
03 METHOD 2	IF OUTPUT (J2)	OUTPUT LEVEL: -10 dBm (UNBUFFERED)	DELETE: R1 THRU R13, R69, C1 THRU C10, L1 & L2 J1, Q1, T1, ITEMS 3, 6, 8, 10, 15, 17, 18 & 21		METHOD 2: WITHOUT AMPLIFIER CIRCUITRY INSTALLED
04	NBFM DEMOD	NBFM ACTIVE ONLY WHEN FM MODE IS SELECTED BY FRONT PANEL OR REMOTE			
05	NBFM DEMOD	NBFM ACTIVE REGARDLESS OF FRONT PANEL MODE SELECT			
06	NBFM DEMOD	DC COUPLED OUTPUT (Z OUT $\approx$ 50 Ω)	R70 IS 27 Ω $\pm$ 2% 1/4W		
07	NBFM DEMOD	AC COUPLED OUTPUT	C34 IS 15 μ F $\pm$ 20% 20V TANT C35 IS 15 μ F $\pm$ 20% 20V TANT		
08	NBFM DEMOD	RESONANT OUTPUT	C68 L7		
09	AM DETECTOR	DC COUPLED OUTPUT (Z OUT $\approx$ 50 Ω)	R71 IS 27 Ω $\pm$ 2% 1/4W		
10	AM DETECTOR	AC COUPLED OUTPUT	C69 C70		
11	AM DETECTOR	RESONANT OUTPUT	C71 L8		
12	NO NBFM OUTPUT	NO NBFM OUTPUT	DELETE: C19 THRU C33, C36 THRU C39, C64 THRU C67, R18 THRU R36, R65, R66, R67, Q4, U3 THRU U7, U9 THRU U11, TP1, TP2, TP4, J3, W20		

Figure 7-10. Specialized Demodulator (6 kHz FM) Circuit Card Assembly (#100154-501) Schematic Diagram, A8-6 (Sheet 3 of 3)

Courtesy of <http://BlackRadios.terryo.org>

NOTES:

1. DENOTES SPLICE
2. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. PREFIX THE DESIGNATION WITH 'A14' ASSEMBLY DESIGNATION.
3. RTN () FLOATS FROM CHASSIS GND (rt) IN THIS MODULE.

Figure 7-16. Power Supply Module Assembly (4100212-501) Schematic Diagram, A14