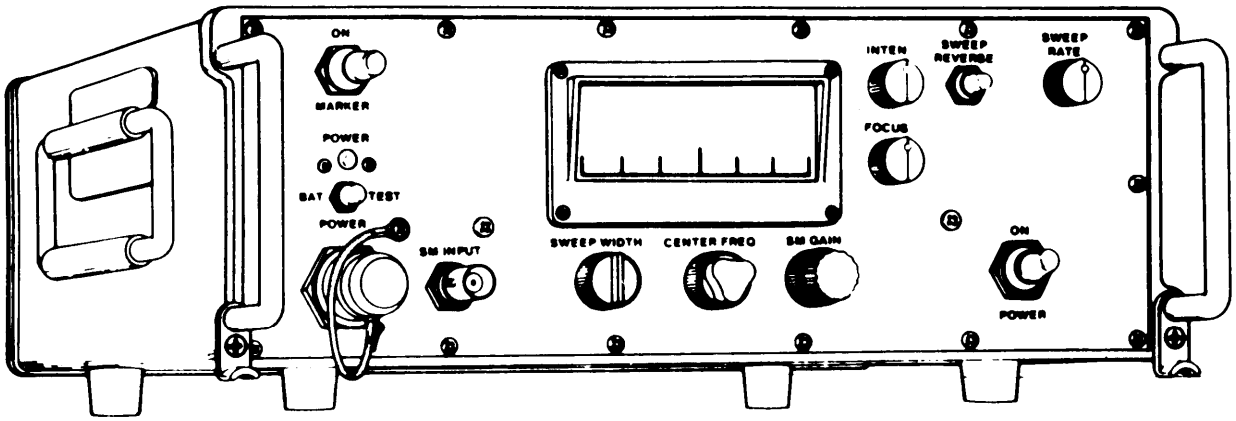
TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



PANORAMIC INDICATOR IP-1355/GRR-8(V) (NSN 5820-01-073-1604)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 MARCH 1988

WARNING

The Panoramic Indicator uses voltages which may be fatal if contacted. Do not be misled by the term "Low Voltage." Potentials as low as 50 volts may cause death under adverse conditions. Extreme caution should be exercised when working this equipment. Death on contact may result if personnel fail to observe safety precautions.

1. Do not work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who incompetent in administering first aid.
2. Whenever possible, turn off the-power supply to the equipment before beginning maintenance on the equipment.
3. Do not remove the protective covers to the equipment unless you are authorized to do so.
4. When technicians are aided by operators, they must be warned about dangerous areas. Aperiodic review of safety precautions in TB 385-4, Safety Precautions For Maintenance of Electrical/Electronic Equipment, is recommended.
5. Seek advice from your supervisor whenever you are in doubt about electrical safety conditions.
6. For Artificial Respiration, refer to FM 21-11.

WARNING

The batteries used in the Panoramic Indicator are hazardous and may cause serious injury to personnel if safety precautions are not observed.

1. Remove batteries when receiver is not in operation. Leaving batteries in the equipment when it is not in use may result in a leakage or explosion.
2. Do not crush, puncture, dissemble, or otherwise mutilate batteries.
3. Do not attempt to recharge alkaline batteries.
4. Observe extreme caution when recharging nickel cadmium batteries by ensuring proper electrical connections and keeping chargers away from other equipment that may spark and cause explosion.

WARNING

Pins 3,4,5, and 8 on the CRT plug contain dangerous voltages. Use extreme caution when working near this plug. Use only a high voltage probe when checking these pins.

TECHNICAL MANUAL

NO. 11-5895-1227-14-3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 March 1988

Operator, Organizational, Direct Support and General Support Maintenance Manual

PANORAMIC INDICATOR IP-1355/GRR-8(V)

(NSN 5895-01-073-1604)

REPORTING ERRORS AND REC0Mh4BNDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000. A reply will be furnished direct to you.

Section O
INTRODUCTION

Section I
GENERAL DESCRIPTION

*This manual supersedes TM 11-5895-1227-14-3, 1 September 1984.

Section II
INSTALLATION AND OPERATION

Section III
CIRCUIT DESCRIPTION

Section IV
MAINTENANCE

Section V
REPLACEMENT PARTS LIST

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Input	BNC
Input Impedance	50 ohms, nominal
Input Frequency	10 MHz
Range of Center Frequency	50 kHz
Sweep Width	O to 1 MHz
Sweep Linearity	Linear overall to within 5% of total sweep width
Sweep Rate	5 Hz to 25 Hz nominal, continuously variable
Resolution	Using approximately 50 kHz sweep width, two signals 5 kHz apart will be displayed with at least a 6 dB valley between the peaks
Oscillator Frequency:	
1st LO	12 MHz
2nd LO	2.205 MHz
Sensitivity	10 UV input at 10 MHz produces at least 3/4 of an inch vertical deflection on CRT
Image Rejection	60 dB, minimum
IF Rejection	60 dB, minimum
Gain Control	60 dB, minimum
Vertical Display Response	3 dB
Marker Frequency	10 MHz +/-0.01 %
Operating Temperature Range*	0° c to 50° c
Power Input - WJ-9180	11 to 16 Vdc
Power Input - WJ-91 80-1	11 to 16 Vdc, 16 to 30 Vdc via External Power Source Connector
Power Consumption	10 watts, approximately
Front Panel Controls	Center frequency, sweep width, sweep rate, sweep reversing, SM gain, marker ON/OFF, power ON/OFF, intensity, focus, battery test
Dimensions	4.2 inches high, 11.38 inches wide, and 11.75 inches deep. Add 2.5 inches to the depth for the standard battery pack; add 5.5 inches for optional battery pack with built-in charger
Weight	18 pounds, approximately (without batteries)

*Operation within specifications guaranteed at 25°C +/-5°C

SECTION O

INTRODUCTION

0.1 SCOPE

0.1.1 TYPE OF MANUAL. This is an Operator, Organizational, Direct Support and General Support Maintenance commercial manual.

0.1.2 MODEL NUMBERS AND EQUIPMENT NAMES. Panoramic Indicator, 1P-1355/GRR-8(V) is the official nomenclature of the WJ-9180-1 Signal Monitor. This unit is part of the Radio Receiver Direction Finder Set, AN/PRD-l 1. The other units of this set include the Direction Finder Antenna, AS-3732/PRD-l 1 or AS-3733/PRD-l1, the Processor Display Control, C-11495/PRD-l1, and the Receiver, AN/GRR-8(V). This manual cover two models of the signal monitor: WJ-9180 and WJ-9180-1. The panoramic indicator will be referred to as the signal monitor or by the manufacturer model numbers, WJ-9180 and WJ-9180-1. A complete cross reference of common equipment names and nomenclatures used in this manual is provided in paragraph 0.7.

0.1.3 PURPOSE OF EQUIPMENT. As part of the radio receiver direction finder set, the signal monitor provides a visual waveform display of tuned frequency signal activity. The signal monitor aids an operator in determining the amplitude and type of signal being detected and in fine tuning a signal.

0.2 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA pam 25-30 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

0.3 MAINTENANCE FORMS, RECORDS AND REPORTS

0.3.1 REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Managment Update.

0.3.2 REPORT OF PACAKGING AND HANDLING DEFICIENCIES. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-1l-2/DLAR 4140.55 /NAVMATINST 4355.73B/AFR 40054/MCO 4430.3H.

0.3.3 DISCREPANCY IN SHIPMENT REPORT (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

0.4 DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

0.5 ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed before storing. When removing the equipment from administrative storage preventive maintenance should be performed to assure operational readiness. Preparing equipment for reshipment and storage is covered in paragraph 2.4.

0.6 TOOL AND TEST EQUIPMENT

Maintenance of the Signal Monitor requires no special tools. Test equipment required for troubleshooting and maintenance of the signal monitor is listed in paragraph 4.4.

0.7 NOMENCLATURE CROSS-REFERENCE LIST

The list below will help you identify the official nomenclature of the major equipment items used with the signal monitor. It also provides the common name used in the manual when it is different from the official nomenclature. Official nomenclature must be used when completing forms or when looking up technical manuals.

Common Name	Official Nomenclature
D-Cell battery	Battery, BA-30
Battery charger	Battery Charger, WJ-8640/BC
Df antenna	Antenna, Direction Finder, AS-3732/PRD-l1 Antenna, Direction Finale r, AS-37331PRD-11
Df processor	Control, Processor Display, C-11495/PRD-11
Direction Finder Set	Direction Finder Set, Radio Receiver, AN/PRD-l1
Dry cell battery	Battery, Dry, BA-4386/PRC-25
Lithium battery	Battery, non-rechargeable, Lithium $S0_2$, BA-5598/U
Magnesium battery	Battery, BA-4386
ManPack Receiver, WJ-8640	Receiver, AN/GRR-8(V)
Nicad battery	Battery, Storage, BB-586/U
Signal Monitor, WJ-9180-1	Indicator, Panoramic, IP-1355/GRR-8(V)

0.8 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your Signal Monitor needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency report). Mail it to Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, NJ 07703-5000. We'll send you a reply.

0.9 WARRANTY INFORMATION

The Signal Monitor is warranted by Watkins-Johnson Company for a period of 1 year following delivery. It starts on the date found in block 23, DA Form 2408-9, in the logbook. This warranty may contain repair restrictions. Report all defects in material or workmanship to your supervisor.

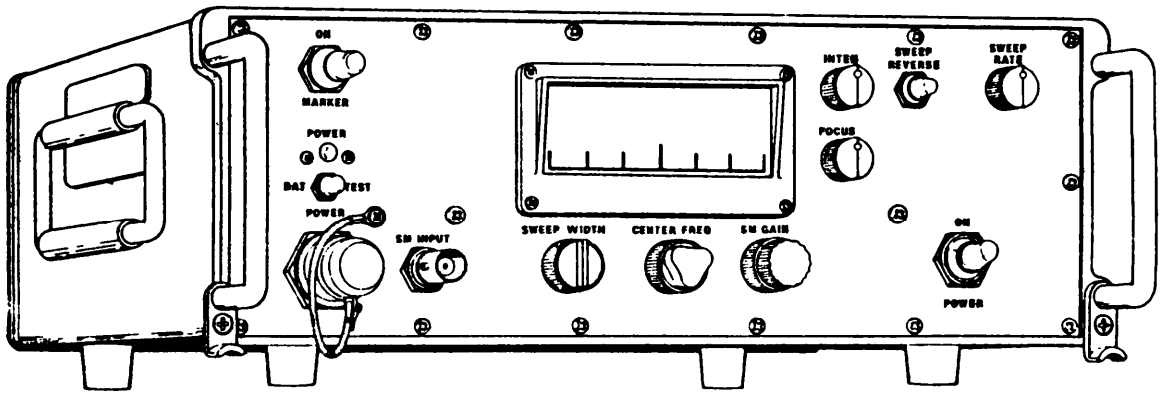


FIGURE 1-1. Type WJ-9180-1 Signal Monitor

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

Type WJ-9180 and WJ-9180-1 Signal Monitors are designed to operate in conjunction with the WJ-8640 Manpack Receiver, The WJ-9180 and WJ-9180-1 each monitor AM, FM and CW signals with a center frequency of 10 MHz. They receive the 10 MHz signal from the WJ-8640 SM output jack and provide a visual spectrum display of signal activity around the tuned frequency. The display can be used to determine frequency, amplitude, and the type of signal being received. Sweep width of the signal monitor can be varied from O to 1 MHz by means of the front panel SWEEP WTDTH potentiometer. A variable SWEEP RATE control is provided, which permits the operator to set the sweep rate for optimum resolution at the sweep width being used, to prevent loss of sensitivity by sweeping too fast. The signal monitor resolution is such that two signals 5 kHz apart will be displayed with at least a 6 dB valley between the peaks.

The WJ-9180 and WJ-9180-1 operate from a detachable battery pack which holds either magnesium BA-4386 or Alkaline (D cell) batteries. As an option, the battery pack is offered with a built -in charger that operates from a 115/220 VAC source. In the WJ-9180-1, Signal Monitor power can also be supplied by a vehicle battery or similar source by means of the front panel EXTERNAL POWER INPUT jack. When the power jack is utilized, an 11-16 Vdc or 16-30 Vdc source can be used to power the signal monitor. The WJ-9180 Signal Monitor does not have the vehicle battery option.

To provide the visual display on the WJ-9180/9180-l CRT screen, oscillator frequencies of 12 MHz and 2.205 kHz are employed. The signal monitor converts the input signal down to a video frequency of 205 kHz. A 10 µV input at 10 MHz from the WJ-8640 Manpack Receiver will produce at least 3/4 of an inch vertical deflection on the CRT screen.

1.2 MECHANICAL CHARACTERISTICS

A front view of the Signal Monitor is shown in Figure 1-1. The controls and indicators appearing on the front panel are: SWEEP WIDTH, CENTER FREQ, SM GAIN, SWEEP RATE, FOCUS and INTENSITY, MARKER ON/OFF Switch, pushbutton BAT TEST, SWEEP REVERSE Switch, POWER ON/OFF Switch, and the CRT screen. Front panel rotary controls are located directly below the corresponding labels. Rubber covered switches provide for easy handling and prevent environmental damage. The 10 MHz signal from the WJ-8640 is connected to the front panel BNC SM INPUT jack.

The rear panel power jack mates directly to the battery pack. A front panel power jack is also employed in the WJ-9180-1 Signal Monitor for use with

an external power source. To determine if the battery cLarge has diminished, the pushbutton BAT TEST switch is utilized. When pushed in the BAT TEST Lamp must remain lighted. The BAT TEST Lamp will no longer light when the charge on the battery has diminished by approximately 25%.

The WJ-9180 and WJ-9180-1 main chassis, front panel, and rear panel are fabricated of aluminum, and the exterior is painted with green enamel. White silk-screen characters for easy control identification are provided. The signal monitor contains five etched circuits boards. Two of these circuit boards (IF amplifier boards) are mounted inside the brass chassis located underneath the CRT. Another circuit board, Sweep Generator and Horizontal Amplifier, is mounted at the rear of the CRT. The DC to DC converter board located near the left rear of the main chassis, is mounted in a nickel plated brass box that has been gold flashed. Potentiometers on this module can be asjusted at the rear panel of the signal monitor. The find circuit board, DC-A C Converter, is located at the right side of the main chassis.

Contained in an aluminum box painted with green enamel, the battery pack is attached to the rear of the signal monitor and can easily be installed and removed when necessary. The battery box contains an aluminum bracket which holds the ten "D" cell batteries. This bracket is removed entirely if a magnesium BA-4386 cell is to be used. Plug P1 will mate directly with the socket on the "D" cell battery carrier or the socket on the magnesium cell.

Overall dimensions for the signal monitors are: 11.38 inches wide, 4.2 inches high, and 11.75 inches deep (add 2.5 inches to depth for standard battery pack or 5.5 inches for optional battery pack with built-in charger).

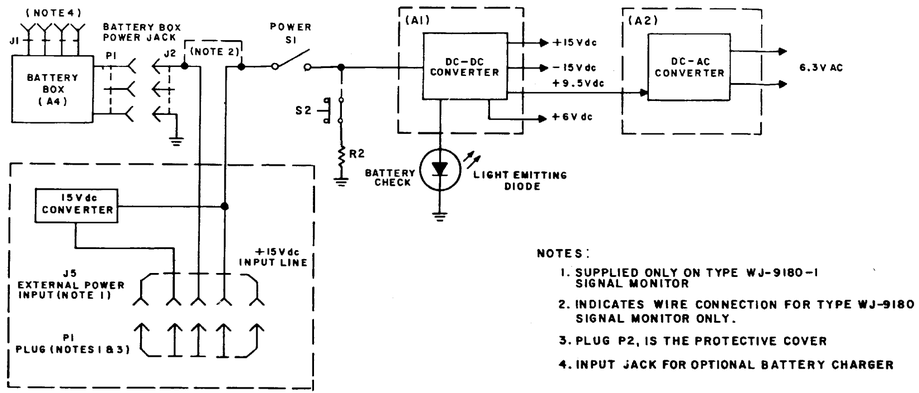
1.3 EQUIPMENT SUPPLIED

The only equipment supplied is the WJ-9180 or WJ-9180-1 Signal Monitor with detachable battery pack, and f rent panel dust cover.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The WJ-9180 and WJ-9180-1 Signal Monitors are designed to operate incon-juction with the WJ-8640 ManPack Receiver. This receiver is the only required equip-ment, together with a BNC/BNC interconnect cable.

NOTES



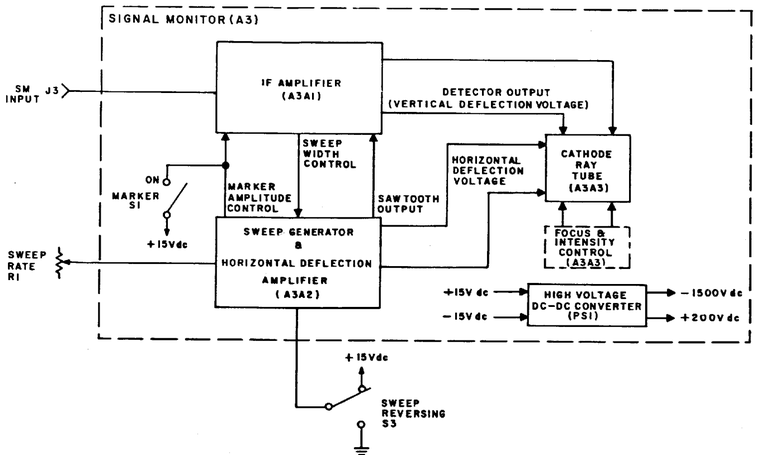


Figure 1-2. Type WJ-9180/9180-1 Signal Monitor, Simplified Block Diagram

Reverse Blank

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

2.1.1 Examine the shipping carton for damage before the equipment is unpacked. If the carton has been damaged, try to have the carrier's agent present when the equipment is unpacked. If not, retain the shipping carton and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

2.1.2 See that the equipment is complete as listed on the packing slip. Contact Watkins-Johnson Company, CE1 Division, or your Watkins-Johnson representative with details of any shortage.

2.1.3 The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. It is, therefore, ready for use upon receipt. After uncrating and checking contents against the packing slip, visually inspect all exterior surfaces for dents and scratches. If external damage is visible, inspect the internal components for apparent damage. Check the internal cables for loose connections. See that plug-in items, such as etched circuit cards, are securely mounted in their receptacles.

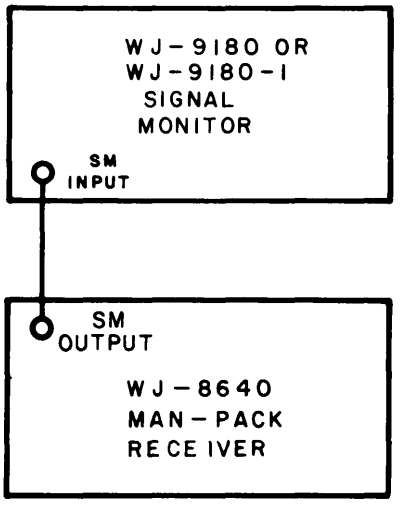
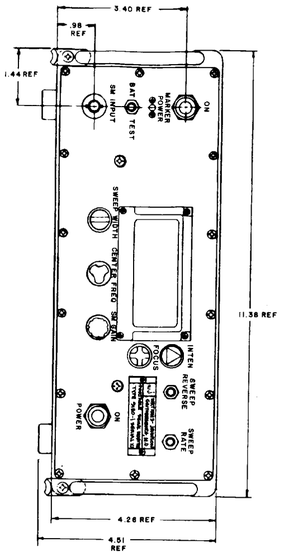
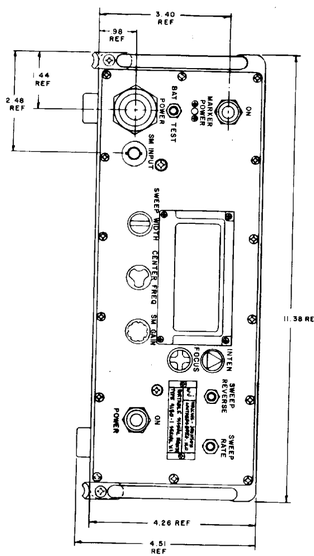


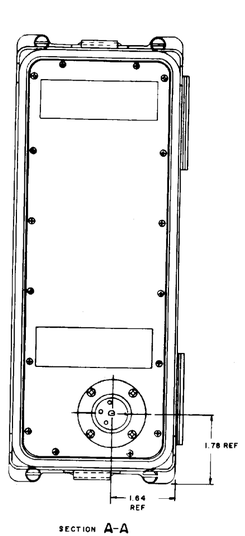
Figure 2-1. Signal Interconnection Diagram

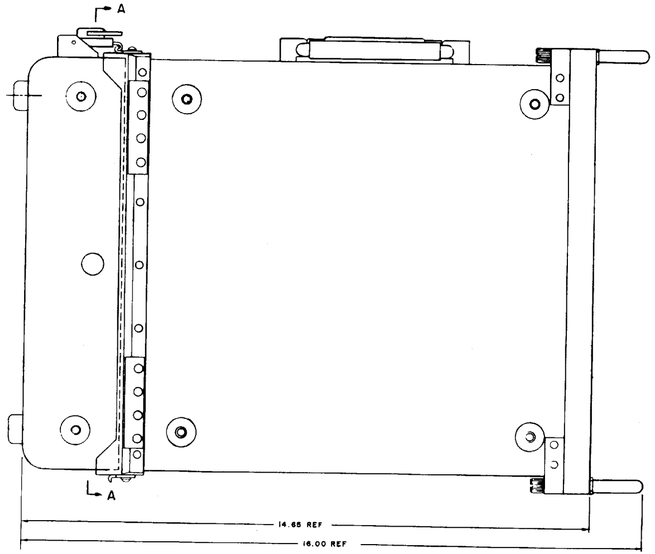


Type WJ-9180



Type WJ-9180-1





Type WJ-9180/WJ-9180-1

Figure 2-2. Type WJ-9180/9180-1 Critical Dimensions Drawing.

2.2 INSTALLATION

The WJ-9180 and WJ-9180-1 Signal Monitors are rugged portable units designed to operate in an outdoor environment. No special environmental considerations are necessary. The units will operate at temperatures between 0^0 and 50° C. Installation requirements consist of the mounting of the battery pack to the rear of the equipment. On the WJ-9180-1 only, the connection of an external power source to the EXTERNAL POWER INPUT Jack J-5 on the front panel is provided if a vehicle battery or equivalent source of power is to be used. Both the WJ-9180 and WJ-9180-1 then require an input signal connected to the SM INPUT from a WJ-8640 receiver as shown in Figure 2-1.

2.2.1 BATTERY INSTALLATION AND BATTERY PACK CONNECTION

The information listed below will provide the necessary instructions needed for battery installation and battery pack connection.

2.2.1.1 Battery Installation

(1) Remove the front panel dust cover. Place the signal monitor on a clean flat surface so that it is resting on the protective handles extending from the front panel.

(2) Turn the latch handles on the side of the rear cover fully counter-clockwise and pull the latches away from the sides of the signal monitor.

(3) Remove the rear cover and lift the old battery off the rear of the signal monitor case.

(4) Plug the new battery into the receptacle on the rear of the case.

(5) Put the dust cover over the battery. Fold the latches against the sides of the case.

(6) Turn the handles on the latches fully clockwise, making sure the latches properly engage the hooks on the signal monitor case.

(7) Return the signal monitor to its upright position. Turn the unit on, the red light above the BAT TEST pushbutton should be lighted. Press the BAT TEST pushbutton on the front panel. The red lamp should remain lighted indicating that the battery is good under load.

NOTE

Do not continue to press in the pushbutton as this would cause an unnecessary battery drain.

2.2.1.2 Installation of D-Cells in the D-Cell Insert

(1) Remove the D- Cell Insert from inside the rear cover of the signal monitor as in steps (1) through (3) above.

(2) Unclip the black cardboard tubes and old D cells (if any) from the holders in the insert.

(3) Remove the cells from the cardboard tubes.

(4) Slide the new D cells into the cardboard tubes, making sure that the cells in each tube point in the same direction.

(5) Clip the cardboard tubes and D cells back into their holders, making sure that the cells face in the direction indicated on each of the holders.

(6) Replace the D cell insert by following steps (4) through (6) of paragraph 2.2.1.1.

2.2.2 EXTERNAL POWER CONNECTION

Figure 2-3 shows the proper pin connections to externally apply power to the WJ-9180-1. Figure 2-3a shows the pin connections for a battery source in the range of+ llV to +16 Vdc. A battery source in excess of +16 Vdc should be connected as shown in Figure 2-3b. A mating external power connector is supplied with the WJ-9180-1 Signal Monitor, and is located in the front panel dust cover. The shorting cap supplied with the unit must be inserted into J5 to provide the jumper between pins E and F necessary when using the WJ-9180-1 with the battery pack supplied with the signal monitor.

2.2.3 INPUT CONNECTIONS

The BNC SM Input on the front panel of the signal monitor is connected to the SM output on the front panel of the WJ-8640 using a BNC/BNC cable. Figure 2-1 shows the interconnection of the Signal Monitor and the WJ-8640 Manpack Receiver.

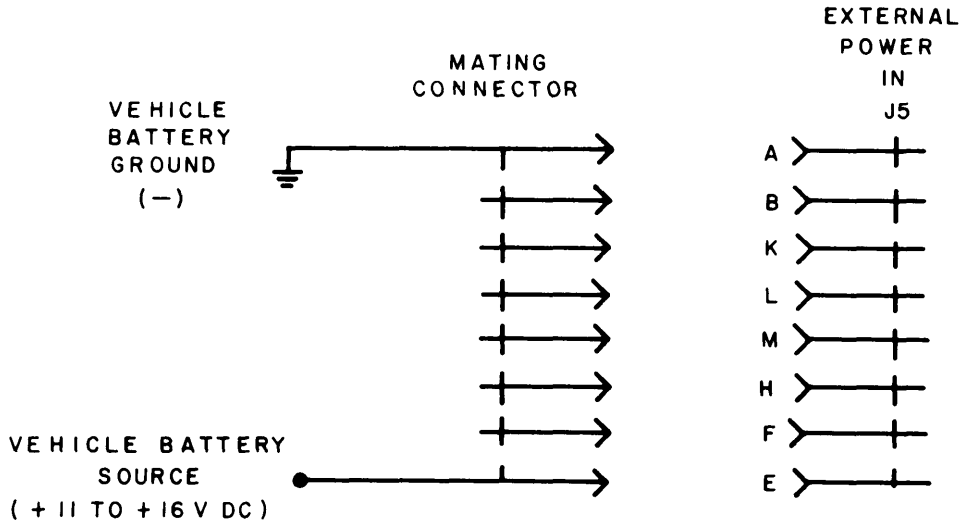


Figure 2-3A. Connection for Battery Source of ll to 16VDC

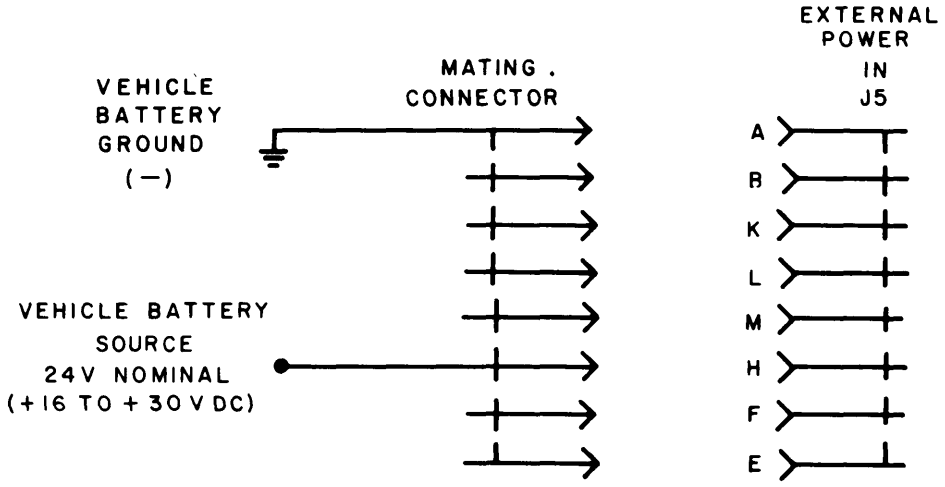


Figure 2-3B. Connection for Battery Source of 16 to 30VDC

Figure 2-3. WJ-9180-1 External Power Connection

2.3 OPERATION

Before operating the WJ-9180/9180-l Signal Monitor, turn the unit on and check to see if the battery voltage is sufficient as follows: Press the BAT TEST pushbutton on the front panel. The red POWER ON light above the pushbutton should remain lighted, indicating the battery is good. Refer to Section 2.2.1 if the battery is not good.

2.3.1 POWER ON/OFF SWITCH

Placing the POWER toggle switch in the up position supplies power to the signal monitor. The red pilot light above the BAT TEST pushbutton should be lighted.

2,3.2 BATTERY TEST SWITCH

When pushed in, the pushbutton BAT TEST switch monitors the battery voltage. The lamp above the switch will remain lighted if the battery has sufficient charge. When the battery voltage drops below 11 Vdc, the lamp will not light indicating a need for battery replacement or recharging.

2.3.3 INTENSITY CONTROL

The brilliance of the trace on the CRT screen may be varied by the INTENSITY.

2.3.4 FOCUS CONTROL

The FOCUS control provides a means of obtaining a sharp trace on the CRT screen.

2.3.5 SM GAIN CONTROL

The SM GAIN control varies the height of the pips displayed on the face of the CRT.

2.3.6 CENTER FREQUENCY CONTROL

The CENTER FREQ control changes the horizontal position of the signal pips on the CRT screen. During normal operation this control is used to center the frequency spectrum being displayed under the center mark on the screen.

2.3.7 SWEEP WIDTH CONTROL

The SWEEP WIDTH control varies the width of the frequency spectrum being viewed. When this control is in the maximum clockwise position, a maximum bandwidth of 1 MHz is being displayed.

2.3.8 SWEEP RATE CONTROL

The SWEEP RATE control varies the rate at which the CRT trace sweeps across the display screen. The sweep rate is variable from 5 Hz to 25 Hz.

2.3.9 SWEEP REVERSE SWITCH

When this toggle switch is pushed up, the CRT will display low frequencies to high frequencies from left to right. To display high frequencies to low frequencies from left to right, the SWEEP REVERSE switch is pushed down.

2.3.10 MARKER SWITCH

Placing the MARKER toggle switch in the up position places a center frequency marker on the CRT screen to indicate the center of the IF bandpass.

2.3.11 INTERPRETATION OF SIGNALS

The following list is presented as a guide for interpretation of various signals and waveforms that might appear on the CRT.

(1) An unmodulated carrier without noise or random distubances will appear as a deflection with fixed height.

(2) A carrier that is amplitude modulated will appear as a deflection of variable height. If the modulation rate is high, sidebands may appear.

(3) A single tone-modulated FM signal will appear as a group of spikes corresponding to the center frequency and the sidebands.

(4) Noise appears as varying irregularities or "grass" along the base line and may be eliminated by a reduction of the SM GAIN control setting.

2.4 PREPARATION FOR RESHIPMENT AND STORAGE

If the unit must be prepared for reshipment, the packaging methods should follow the pattern established in the original shipment. If retained, the original materials can be reused to a large extent or will at a minimum provide excellent guidance for the repackaging effort. Conditions during storage and shipment should normally be limited as follows:

(1) Maximum humidity: 95% (no condensation)

(2) Temperature range: -30° C to +85° C.

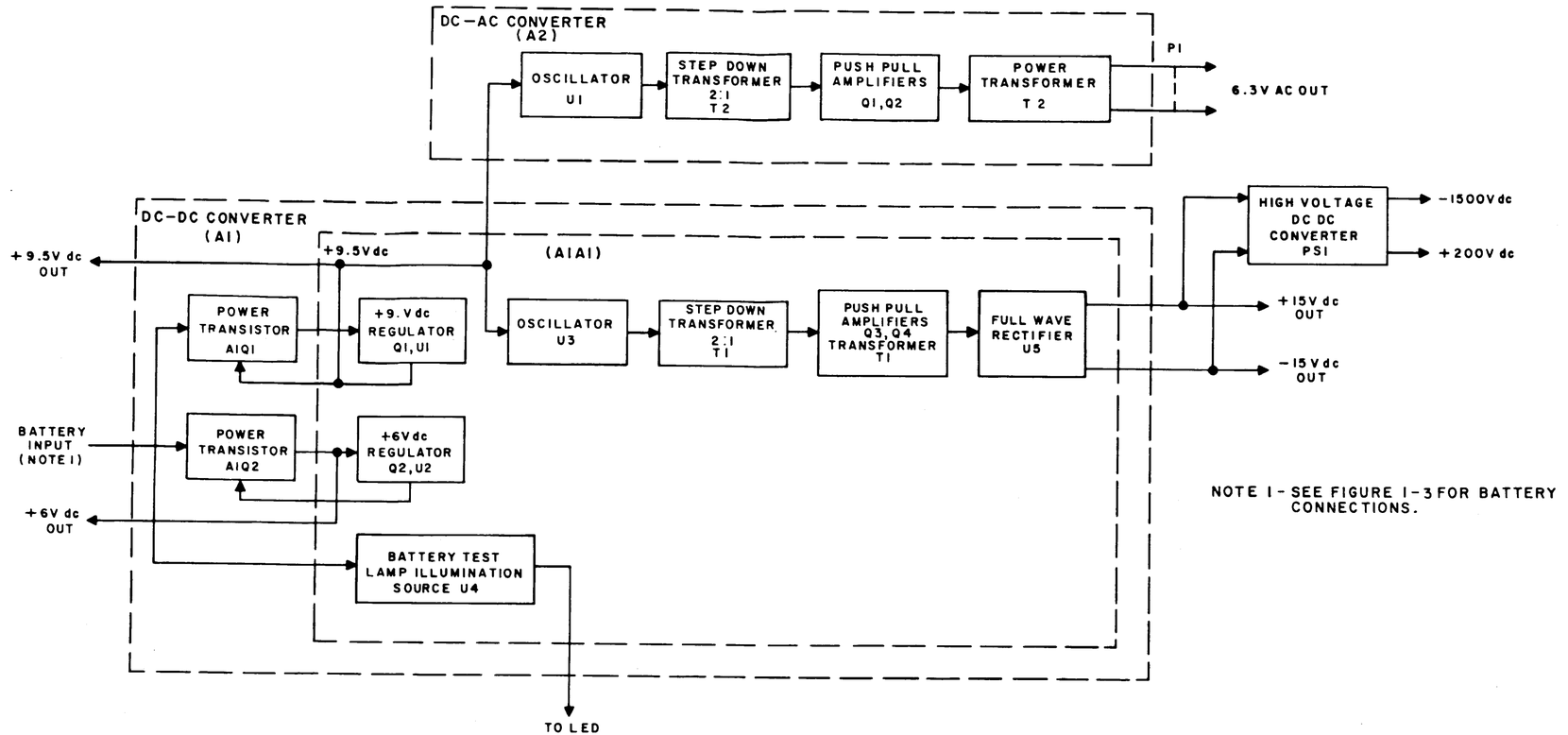


Figure 3-1. Functional Block Diagram, Power Supply Circuits

SECTION III

CIRCUIT DESCRIPTION

3.1 GENERAL

This paragraph gives a concise description of each module. Reference should be made to the simplified block diagram Figure 1-3 in Section I of this manual.

3.1.1 EXTERNAL POWER SOURCE FOR WJ-9180-1

The WJ-9180-1 only, has provision for an additional external power source from a vehicle battery or equivalent supply. Input supply voltages from 11 Vdc to 30 Vdc are fed through input socket J5. Supply voltages over 16 vdc are regulated down to 15 vdc by a voltage regulator on the main chassis.

3.1.2 TYPE 791794 DC-DC CONVERTER (Al)

The 11-16 Vdc battery output is applied to the DC-DC converter for conversion to voltage levels of +15 Vdc, -15 Vdc, + 6 vdc, and +9.5 Vdc. This module also tests the battery. When the BAT TEST pushbutton on the front panel of the signal monitor is pressed, the power on lamp above the button will remain lighted indicating that the battery is good. If the lamp does not remain lighted, the battery voltage is below the 11 V threshold.

3.1.3 TYPE 76239 DC-AC CONVERTER (A2)

This module converts the +9. 5 Vdc output from Al to 6.3 vat. This module also provides high voltage isolation for the CRT filaments since the 6.3 Vac is used to power the CRT heater.

3.1.4 TYPE 791554 SIGNAL MONITOR (A3)

This module contains the major part of the signal monitor circuitry. The modules contained in A3 are described below.

3.1.4.1 Type 8121-4 IF Amplifier (A3Al)

This module receives the 10 MHz IF signal from the associated receiver's SM output. The IF amplifier provides the vertical deflection voltage to the cathode ray tube in order to display signal activity at and around the WJ-8640 tuned frequency. Employing two stages of mixing and five stages of amplification, the IF amplifier converts the 10 MHz IF signal to a 205 kHz signal. This signal is then applied to a push-pull detector to generate the vertical deflection voltage.

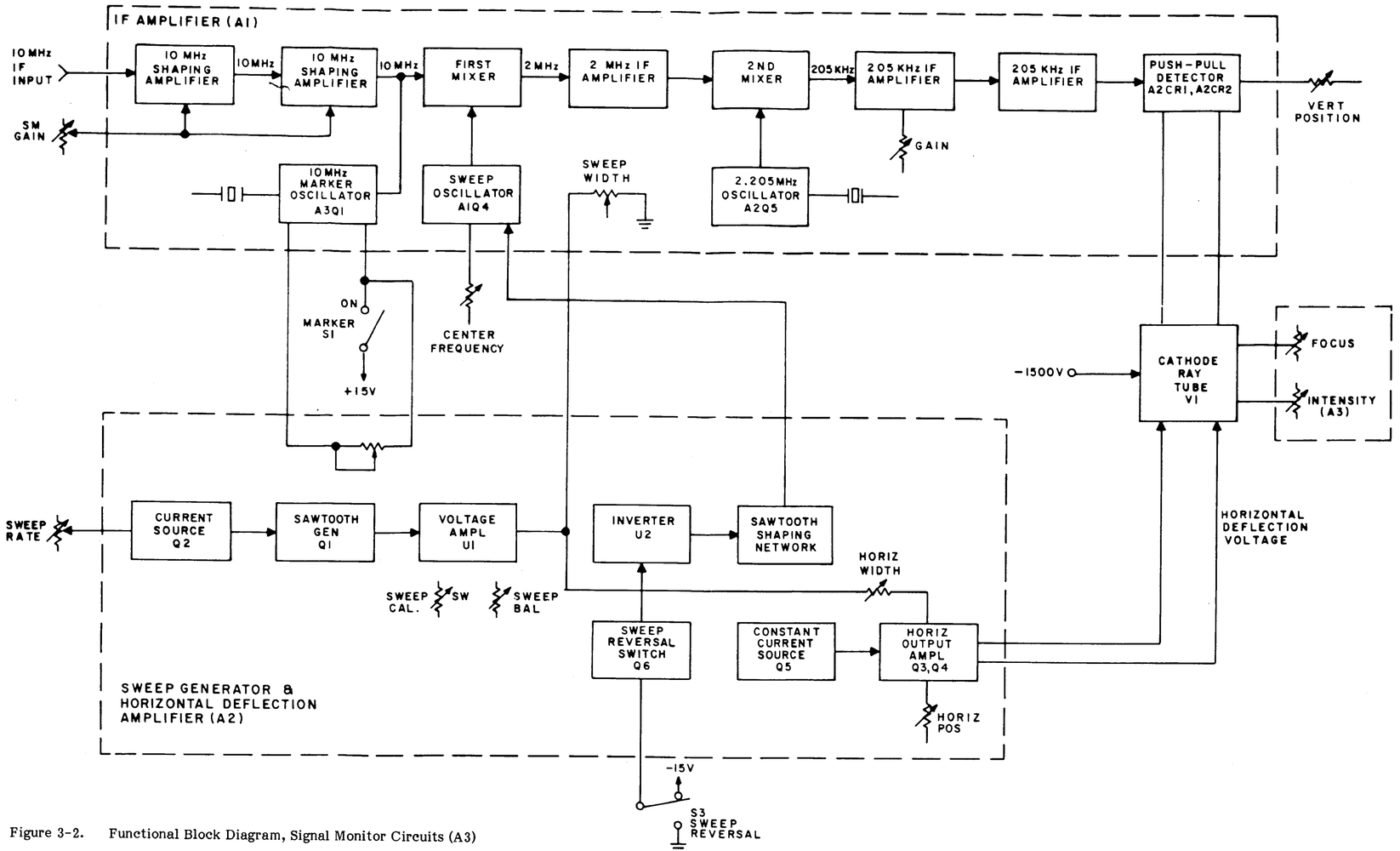


Figure 3-2. Functional Block Diagram, Signal Monitor Circuits (A3)

3.1.4.2 Type 8266 Sweep Generator and Horizontal Deflection Amplifier (A3A2)

This module has two main functions. It generates a sawtooth wavetrain and produces the horizontal deflection voltage for the CRT. The sawtooth wavetrain is used in the horizontal deflection circuitry and is also applied to the IF Amplifier board where it is used to control the sweep of a voltage controlled oscillator. This module provides the sweep reversing and variable sweep rate capabilities by means of SWEEP RATE potentiometer, RI, and SWEEP REVERSING switch, S3.

3.1.4.3 Part 12688 Focus and Intensity Control (A3A3)

This module contains potentiometers connected directly to the front panel FOCUS and INTENSITY controls. These controls adjust the brilliance and sharpness of the CRT trace by varying the potential on the cathode and the focus grid of the CRT.

3.1.4.4 Type 76199 DC-DC Converter (PSl)

This high voltage DC-DC converter produces -1500 Vdc for the CRT control grid and +200 Vdc for the SWEEP GENERATOR and HORZ DEFLECTION amplifier circuitry in A3A2.

3.1.4.5 Cathode Ray Tube (A3Vl)

Cathode ray tube, VI, provides a visual display of the input spectrum. The WJ-9180 and WJ-9180-1 Signal Monitors employ a low power type CRT to prevent unnecessary battery drain.

3.1.5 TYPE 791795 BATTERY BOX (A4)

The battery box, that clips to the rear of the WJ-9180 and WJ-9180-1, contains ten “D” cell batteries. The plug J2 connects to the battery carrier or, when a magnesium cell B-4386 is used, will connect to the magnesium cell, the “D” cell carrier being removed.

3.2 FUNCTIONAL DESCRIPTION

A detailed functional description appears in the following paragraphs. Reference should be made to Figures 3-1 and 3-2. The unit numbering system is used for electrical components which means that parts on subassemblies and on plug-in modules carry a prefix before the usual class letter and number of the item (such as A3A2Q6). These prefixes are omitted in most of the text and on illustrations except in cases where confusion might result from their omission.

Battery voltage is applied through J2, Cl, the jumper J5E-F in the WJ-9180-1, CR1 and the main power switch S1 to circuitry in the DC-DC Converter, Al. This

voltage is used as the collector supply for power transistor A1Q1 which obtains its base bias from regulator circuitry consisting of transistor A1A1Ql, and operational amplifier, AlAlU1. The regulator circuitry continually samples the +9.5 Vdc output from power transistor A1Ql. If the voltage is higher than +9.5V, the regulator circuitry decreases the base bias on A1Ql causing its output to decrease back to +9.5 Vdc. If the supply voltage decreases, the regulator circuitry increases the base bias on A1Ql. The +6 Vdc supply circuitry operates identically to the +9.5 Vdc supply circuitry except for a smaller base bias on power transistor A1Q2 to produce the +6 Vdc output.

Timer, A1A1U3, oscillates at a frequency of approximately 20 kHz and has a symmetrical square wave output of about 9.5 V peak to peak. U3 output is applied to 2:1 step down transformer, T1, to obtain the correct bias on transistors Q3 and Q4. These transistors operate in a push pull configuration, biased at saturation for one-half of the input cycle and at cut-off for the other half. Q3 and Q4 place a voltage across the primary of transformer, T2, which induces a 15V peak signal in each half of the grounded center tapped secondary. A full wave rectifier, U5. converts the square wave secondary signals to dc levels of +15V and -15V, respectively.

The +9. 5 Vdc output from module Al is applied to the DC - AC Converter A2. The circuitry on this module operates identically to that of the ±15 Vdc converter circuitry described above except that timer U1 oscillates at approximately 2 kHz. When conducting, each push pull amplifier places approximately 9 V across one-half of the center tapped primary of T2 inducing 6.3 Vac in its secondary.

The signal monitor A3 receives its input from the WJ-8640 Manpack Receiver. This signal, which is the 10 MHz SM output from the RF tuner, is fed to the base of A3AlAlQl, the first of two 10 MHz shaping amplifiers. The second amplifier stage, A3AlAlQ2, is coupled to the first through a double-tuned network. The output from A3A1A1Q2 is fed to the first mixer through another double-tuned circuit. The bandwidth of the response at the mixer input is 1 MHz, a result of combining the response curve produced by the two interstage networks with that of the mixer output in the RF tuner. The first mixer combines the incoming signal with the output of the sweep oscillator A3Al A1Q4, to produce the first signal monitor IF frequency of 2 MHz.

A sawtooth wavetrain which is used to drive the sweep oscillator originates in the sweep generator and horizontal deflection amplifier A3A2. The sawtooth generator, A3A2Q1, in conjunction with constant current through voltage amplifier A3A2U1 and the horizontal width control to the horizontal deflection amplifiers, A3A2Q3 and A3A2Q4. Transistor A3A2Q5 functions as a current source for the horizontal output circuit which operates in a differential amplifier configuration. The output from this circuit is used to drive the horizontal deflection plates in the CRT. A portion of the sawtooth output from A3A2U1 is connected to the SWEEP WIDTH control on the front panel. This control varies the amplitude of the sawtooth before it is applied to the sweep oscillator thereby providing the 0-1 MHz sweep width capability. A modification of the shape of the sawtooth signal is made by a shaping network on this module

before it reaches the sweep oscillator. This is done to compensate for the non-linear characteristics of the varactor modulator in the sweep oscillator network.

The fact that the waveform that controls the horizontal trace and the sweep oscillator is derived from a common source helps to explain how synchronization is obtained between the various signals in the incoming RF spectrum and their position on the CRT screen. A horizontal positioning control, located in the horizontal deflection circuit provides a means of centering the trace on the CRT. The sweep oscillator, A3AlAlQ4, has a normal center (or resting) frequency of 12 MHz. This is 2 MHz higher than the incoming 10 MHz IF signal. Selecting the maximum sweep width 1 MHz and having the combination of an incoming signal frequency of 9.500 MHz and a sweep oscillator frequency of 11.500 MHz results in a 2 MHz output from the mixer. This is the first IF frequency for the signal monitor. An incoming signal of 10.500 MHz and an oscillator frequency of 12.500 MHz also combine to produce a 2 MHz difference frequency. These conditions are noted to explain the relationship between the signal monitor IF, the sweep oscillator frequency, and the position of a signal in the incoming spectrum. The modified waveform from the sawtooth network is applied to a voltage-variable capacitor (varactor) in the sweep oscillator circuit. The capacitance of the varactor is changed by the impression of the modified sawtooth waveform volt age, thus causing the sweep oscillator frequency to move up and down in conformance with the amplitude of the impressed voltage. Therefore, a 2 MHz signal is developed in the first mixer output circuit as the sweep oscillator changes in frequency and differs from the incoming signal by exactly 2 MHz. Since the horizontal movement of the trace on the CRT is controlled by this same sawtooth wave, the signals from the mixer ultimately appear as vertical pips across the face of the tube in a position which corresponds to their original position in the input spectrum.

The 2 MHz signal from the first mixer is fed through IF amplifier A3AlA2Ql to the second mixer A3A1A2Q2. It is then heterodyned with the output of the 2.205 MHz crystal oscillator A3A1A2Q5, to produce the second IF frequency of 205 kHz. Transistor A3A1A2Q3 amplifies the signal and applies it to a voltage-doubling, push-pull detector circuit. The output from the detector consists of two signals of equal amplitude, but of opposite polarity, which are applied to the vertical deflection plates of the CRT.

The gain of the signal monitor is controlled by the front-panel SM GAIN potentiometer A3A1R1, which varies the bias on the bases of the 10 MHz shaping amplifiers. Controlling the gain of these stages sets the amplitude of the pips on the screen. The vertical position of the trace on the CRT screen is adjusted by the vertical position control A3AlA2R25, which functions in conjunction with the push-pull detector circuit. The marker switch, A3S1, activates the 10 MHz marker oscillator, A3AlA3Q1, and results in a pip on the CRT screen which represents the center of the IF response. This aids in receiver tuning and in determining the frequency of incoming signals. The CENTER FREQ control A3AlR3, varies the bias level on the varactor modulator to provide vernier control of the sweep oscillator center frequency.

High voltage for the CRT is provided by a DC-DC Converter, PSI, which is located on the top of the signal monitor chassis. The remaining voltages required for operation of the unit are provided by the signal monitor power supply.

3.3 DETAILED CIRCUIT DESCRIPTION

There follows, in the paragraphs below, a detailed description of the circuitry in the WJ-9180 and WJ-9180-1. Both units are electrically identical except that the WJ-9180-1 can also take its power from a vehicle battery or similar source by means of the front panel external power in jack. Reference should be made to schematic diagrams in Section VI as indicated in each sub-paragraph.

3.3.1 TYPE 791794 DC-DC CONVERTER ASSEMBLY (Al)

The reference designation prefix for this module is Al; its schematic diagram is Figure 6-1. Four main circuits contained on this module are; +9.5 volt regulated DC Converter, +6 volt regulated DC Converter, battery test lamp illumination source, and +15 volt DC-DC Converter. Two of these circuits, the 9.5 V and 6 V regulated DC Converters, are identical with the exception of an added resistor and their respective output voltage levels. The DC-DC Converter assembly uses the 11 to 16 Vdc supplied by the battery pack to generate the dc voltages described above. Etched circuit board A1Al in the DC-DC Converter assembly contains the major part of the circuitry associated with this assembly. Power transistor A1Ql and AlQ2 are mounted on the nickel plated brass box housing the DC-DC Converter.

3.3.1.1 Redated +9.5 V DC Converter

Battery voltage at terminal E4 is applied to a filter network consisting of resistor A1A1Rl and capacitors, A1AlCl through A1AlC4, to block battery supply transients from entering the regulator circuitry. Resistor A1AlR8 and zener diode VR1 establish a +6.8 Vdc reference at the inverting input of operational amplifier U1. This input is held at +6.8 Vdc by capacitor C7. To obtain regulation, potentiometer R14 is adjusted to apply +6.8 Vdc to the non-inverting input of U1 when the correct supply voltage (+9.5 Vdc) is present at terminal E2. The operational amplifier will produce the output voltage level that is necessary to maintain +6.8 Vdc at its non-inverting input. Transistors, A1A1Ql and A1Ql, create a feedback loop from the operational amplifier's output to its non-inverting input. When both inputs of U1 are at +6.8 V, its output voltage will set the bias on PNP transistor A1AIQl such that the transistors collector voltage is approximately 10.1 Vdc. The collector of Q1 is connected to the base of power transistor, A1Ql through terminal E3. With 10.1 volts at the base of Q1, 9.5 V will be present at the emitter due to the .6 V drop across the BE junction. A tap **is** taken off the emitter of Q1 to the output of the DC-DC Converter assembly to provide power to modules in the WJ-9180 Signal Monitor. Regulator action of the +9.5V supply is described as follows. If the voltage at terminal

E2 drops below 9.5 V, the voltage at pin 3 of Ul drops below 6.8V causing the output of Ul to decrease. This decrease in voltage will cause PNP transistor Q1 to conduct more, producing a larger voltage at its collector and in turn, at the base of power transistor A1Q1. The voltage at the emitter of Q1, which is .6V less positive than the base, will increase back to +9.5Vdc. Regulator action for increases in the +9.5Vdc supply will occur as the reverse of the above. If the voltage at terminal E2 goes above +9.5v, the output voltage of U1 will increase causing Q1 to conduct less which applies a lower voltage on the base of A1Q1. The supply voltage coupled through AlC3 will decrease back to +9.5 Vdc.

3.3.1.2 +6V Regulated DC Converter

This circuit operates identically to the +9.5 Vdc supply except for the reference voltage level and bias voltage levels. A reference voltage of 3.4 Vdc is used for operational amplifier U2 which sets the bias on PNP transistor Q2 such that its collector voltage is approximately 6.6 Vdc. The +6 Vdc supply voltage at the emitter of Q2 is coupled through Cl and applied to modules in the signal monitor.

3.3.1.3 +15V DC-DC Converter

The +9.5 Vdc supply voltage is applied to timer A1U3. This timer operates in the astable mode with an oscillating frequency around 20 kHz. The timer's free running frequency and duty cycle are controlled by resistors R18 through R20 and capacitor C8. C8 charges through R19 and R20 and discharges through R20 and R18. The timer retriggers itself causing capacitor C8 voltage to oscillate between 1/3 (9. 5 V) and 2/3 (9.5V).

Potentiometer R18 is adjusted so that the discharge time constant of C8 is equal to the charging time constant to produce a symmetrical waveform at the output of the timer. The resulting timer output waveform will be approximately a 20 kHz square wave with a low voltage level of 0V and a high voltage level of 9.5 V. This square wave is impressed on the primary of 2:1 step down transformer T1. A square wave is induced in the secondary of T1 which causes push pull transistor, Q3 and Q4, to alternately conduct. Diodes CR2 and CR3 clamp the base circuit of the turned off transistor at -. 6V. During one half cycle of the input, +3.9V is applied to the base circuit of Q3 driving the transistor into saturation and causing a voltage drop of approximately .5V across the CE junction. During the next half cycle Q2 will conduct in the same manner. Transformer T2 develops 9V across the center tapped primary during each cycle of the input signal. Approximately a 30 V peak to peak signal is induced in each half of the grounded center tapped secondary of step up transformer T2. Full wave rectifier U5 converts the 30 V peak to peak secondary signals to +15 Vdc and -15Vdc respectively.

3.3.1.4 Batterv Test Lamp Illumination Source

Operational amplifier AlAlU4 and its associated circuitry is used to light the battery test lamp located on the front panel of the WJ-9180 signal monitor. This

amplifier is in the open loop configuration with the battery voltage used as the positive supply and the negative supply pin grounded. A 6.8 V zener diode AlAlVR2 holds the non-inverting input of U2 at 6.8 volts. When the battery voltage remains above 11 volts, the output voltage of U4 will be close to the supply voltage. Potentiometer R27 is set such that approximately 6.5 V will be applied to the non-inverting input of U4 when the battery voltage at R26 drops to 11 Vdc. To prevent the f rent panel battery test lamp from flickering when the battery voltage is at the threshold of 11 volts resistor R24 is employed for hysteresis. U4 output is applied to resistor R23, diode CR1, and the f rent panel LED. When the battery voltage drops below 11 volts, the output of U4 will decrease to approximately 2V. After part of the 2V is dropped across R23 and CRl, the voltage level present at the LED is not enough to light it.

3.3.2 TYPE 76239 DC-AC CONVERTER (A2)

The reference designation prefix for this module is A2; its schematic diagram is Figure 6-2. This module converts the +9.5 Vdc input to 6.3 Vac and provides high voltage isolation for the CRT filaments.

3.302.1 Conversion Circuitry

This circuit operates identically to the ±15 Vdc-dc converter described in Section 3.3.1.3. Timer Ul oscillates at a frequency of approximately 2-3 kHz. Less current is required from this module than in the ±15 Vdc converter circuitry, therefore, resistor R5 and R6 are of higher value and have lower wattage ratings. Transformer T2 developes 9V across the center tapped primary during each half cycle of the input signal producing a 6.3 Vac output at its secondary. T2 has a very high voltage insulation rating because the 6.3 Vac rides on a -1500 Vdc level.

3.3.3 TYPE 791554 SIGNAL MONITOR (A3)

The reference designation prefix for this assembly is A3; its schematic diagram is Figure 6-3. This assembly contains three modules, a high voltage DC-DC Converter (PS1), and the cathode ray tube. Modules on this assembly are: IF Amplifier (Al), Sweep Generator and Horizontal Deflection Amplifier, (A2), and Focus and Intensity Control (A3). The components and modules comprising this assembly are described in the following paragraphs.

3.3.3.1 Type 8121 IF Amplifier

The IF Amplifier used in the signal monitor carries the reference designation prefix A3A1; its schematic diagram is Figure 6-4. The IF amplifier is composed of three etched-circuit boards. Board No. 1 mounts the shaping amplifiers, first mixer and sweep oscillator. Figure 6-5 is the schematic diagram for this board; its reference designation prefix is A3AlA1. Board No. 2 contains the crystal oscillator, second mixer and associated amplifiers, and the push-pull detector. The schema-

tic diagram for this board is Figure 6-6; its reference designation prefix is A3AlA2. The 10 MHz marker oscillator is contained on the third etched circuit board. Its reference designation prefix is A3A1A3. The schematic for this circuit is shown on Figure 6-4.

3.3.3.1.1 Shaping Amplifiers

(Refer to Figure 6-5). The 10 MHz output signal from the impedance-matching network in the receiver's IF strip is fed through de-blocking capacitor Cl to the base of Q1, the first of two 10 MHz shaping amplifiers. Resistor R1 terminates the input. The signal from the collector of Q1 is fed through a double-tuned, overcoupled network to the base of the second shaping amplifier Q2. An out-of-phase signal voltage is provided at the junction of C5 and L1 that is fed back to the base of Q1 through capacitor C2 to neutralize the stage. This same method of neutralization is used for Q2. Resistors R5 and Rl1 in the collectors of Q1 and Q2, respectively, are parasitic suppressors. The bandwidth of the response produced by the two shaping amplifiers, when combined with that of the mixer output in the RF tuner, is a flat, 1 MHz wide response. A high-impedance detector is included in the collector circuit of Q2 to provide a signal voltage at test point TP1 that can be viewed on an oscilloscope and used as an aid during alignment of the interstate network. The output from Q2 is fed through the second double-tuned network to the source of the first mixer, Q3.

3.3.3.1.2 Sweep Oscillator

The sweep oscillator, Q4 is basically a Clapp circuit that has its output frequency swept across a maximum range of 1 MHz. The oscillator has a nominal center frequency of 12 MHz. The sweeping action is controlled by CR2, a voltage-variable capacitor (varactor). The capacitance of this semiconductor varies inversely with the reverse bias applied across it. The bias voltage is obtained from CENTER FREQ potentiometer R3. Rotation of this control in the clockwise direction increases the reverse bias and decreases the capacitance of the varactor. Counter clockwise rotation decreases the bias and increases the capacitance. The varactor is connected in series with the sweep oscillator tank circuit and controls the center frequency by varying the tank circuit capacitance. The voltage applied to the anode of the varactor has a modified sawtooth waveform. This voltage is obtained from sweep generator and horizontal amplifier board A3A2. It is passed through a sawtooth shaping network prior to its application to CR2. The shaping network distorts the linear sawtooth waveform to compensate for the non-linear changes in capacity of the varactor with respect to the applied voltage. Thus, the sawtooth voltage changes at a non-linear rate resulting in a sweep oscillator frequency that varies at a linear rate. The output of the sweep oscillator is taken at the base of Q4 and coupled to the gate of the first mixer through C18.

3.3.3.1.3 First Mixer and 2 MHz IF Amplifier

The first mixer, Q3, beats the input signal from the shaping amplifiers with the sweep oscillator signal to produce the 2 MHz first IF frequency. The mixer utilizes a type 3N128 MOS FET. A FET is used as the mixer to minimize the generation of spurious signals in the mixing process. The IF signal is applied to the source element and the sweep oscillator signal is applied to the gate. The 2 MHz first IF frequency is taken from the drain and fed through a double-tuned, under-coupled network to the base of the 2 MHz IF amplifier, A3A1A2Q1 (See Figure 6-6). The output from A3AlA2Ql is coupled through a second double-tuned network to the base of the second mixer A3A142Q2.

3.3.3.1.4. 2.205 MHz Oscillator

Transistor A2Q5 operates in a crystal-cent rolled Colpitts configuration at a frequency of 2.205 MHz. The operating frequency is determined by crystal A1Yl which is mounted on top of the brass chassis. Regenerative feedback is taken at the junction of capacitors A3AlA2C30 and A3AlA2C31 and fed to the emitter through A3AlA2R34. The output signal is taken from the emitter and fed through A3A2C28 to the second mixer.

3.3.3.1,5 Second Mixer

The second mixer A3A2Q2 receives the 2 MHz IF signal and the 2.205 MHZ oscillator signal on its base. The mixer heterodynes these signals to produce the 205 kHz second IF frequency, which is taken at the collector. This second IF frequency is fed to the base of the first 205 kHz IF amplifier.

3.3.3.1.6 205 kHz IF Amplifier

The input to the first 205 kHz amplifier A3AlA2Q3 is from a capacitive impedance-matching network consisting of A3AlMCI1 and A3AlA2C12. Potentiometer A2R11 sets the gain of the stage by varying the amount of forward bias applied to the base. This control is set at the factory to produce a on-inch vertical deflection when a 10 µV signal is applied to the signal monitor input (A4P1). The output from A2Q3 is fed through a second double-tuned circuit to the base of A2Q4. The selectivity necessary for a good resolution is provided by the 2 kHz bandwidth response at the input to A2Q4. The signal from the collector of this stage is fed through a single-tuned circuit to the input of the push-pull detector circuit.

3.3.3.1.7 Push-Pull Detector

The push-pull detector circuit, consisting of diodes A3AlA2CRl through A3A1A2CR4, produces two outputs of equal amplitude but of opposite polarity. The positive output is taken from A3A1A2R29 and fed to the other deflection plate. The

diodes are connected as half-wave voltage doublers to obtain the required output. Since the two circuits are basically similar, only the network associated with the positive output will be discussed. During the negative-going half cycle of the input signal, diode A3A1A2CR1 is forward biased and capacitor A3A1A2C22 charges to the peak value of the applied voltage less the drop across the diode. The current flow through A3A1A2C22 results in a voltage at the junction of the two diodes that is more positive than the voltage at the opposite end. During the positive-going half cycle, diode A3A1A2CR3 is forward biased permitting capacitor A3A1A2C27 to charge to the peak voltage less the drop across A3AlA2CR3. However, since A3A1A2C22 is already charged to approximately the peak of the voltage, and since it is in series with the input, its charge is added to that across A3A1A2C27. Thus, the charge across A3A1A2C27 is twice the peak applied voltage. An offset voltage, supplied from the resistive divider made up of A3AIA2R24, A3AlA2R25, and A3A1A2R28 is also applied across A3A1A2C27 which results in a dc voltage at the output of approximately 80 volts. The offset voltage applied to the negative doubler circuit is obtained from the arm of the vertical position potentiometer, A3AlA2R25. This permits the trace to be positioned near the bottom of the CRT screen. The offset voltage at this point is variable from approximately 80 to 100 volts.

3.3.3.1.8 Marker Oscillator

(Refer to Figure 6-4). The marker oscillator A3AlA3Ql, provides a reference pip on the CRT trace to indicate the center of the signal monitor bandpass. The marker oscillator is contained in a shielded module mounted on the IF amplifier chassis. It is crystal controlled and operates at 10 MHz. Potentiometer A3A2R6 is used to set the amplitude of the marker pip by varying the supply voltage to A3A1A3QI. The output from A3A1A3Q1 is fed through A3A1A3C2 and A3AlA3El, to the source element of the first mixer, A3AlAlQ3.

3.3.3.2 Type 8266 Sweep Generator and Horizontal Deflection Amplifier

Figure 6-7 is the schematic diagram for this board. It carries the reference designation prefix A3A2.

3.3.3.2.1 Sawtooth Generator

The sawtooth waveform which is used to control the horizontal CRT trace and the sweep oscillator frequency is provided by sawtooth generator, Q1, a uni-junction transistor. Capacitor Cl charges from the +15V supply through constant current source Q2. This configuration assures a maximum linearity of the sawtooth waveform. The charging action of Cl produces the leading edge of the sawtooth. When the charge across Cl reaches sufficient potential, the pin l-to-pin 2 (emitter-base one) junction of Q1 is forward biased and the uni-junction conducts. Capacitor Cl then discharges rapidly through Q1 to ground, creating the trailing edge of the waveform. The frequency of the waveform is determined by the setting of the front panel sweep rate

potentiometer R1 in the emitter circuit of Q2. The sawtooth wavetrain taken from the collector of Q2 is connected to the non-inverting input of operational amplifier U1. This IC provides the gain required to drive the horizontal deflection and sweep oscillater circuits and the dc offset needed to remove the dc component of the sweep. The sweep balance control, R9, and the sweep calibration control, R12, are adjusted in conjunction with one another to produce a symmetrical, balanced waveform at the output of U1. Terminal E1, marked Sweep Sample on the schematic diagram, provides a test point for use during these adjustments.

3.3.3.2.2 Horizontal Output Amplifier

The sawtooth wavetrain from pin 6 of U1 is coupled through R15 to the horizontal width control, R16. This potentiometer provides a means of adjusting the width of the sweep trace so that it extends across the entire face of the CRT. Transistors Q3 and Q4 form a differential amplifier that directly drives the horizontal deflection plates. High-voltage transistors are used to provide sufficient output voltage to deflect the electron beam across the face of the CRT without using a step-up transformer. The sawtooth wavetrain is applied to the base of Q3 from the arm of R16. The positive-going emitter signal on Q3 will cause Q4 to conduct less since the emitters are connected together. The positive collector signal on Q4 is connected directly to one of the horizontal deflection plates in the CRT. As a result of the increased potential on the collector of Q4 and the decreased positive level on the collector of Q3, the electron beam will be attracted toward the deflection plate connected to Q4. The trailing edge of the sawtooth will cause the collector of Q3 to suddenly become more negative than the collector of Q4 and the electron beam will be returned to the plate attached to Q3. The horizontal position of the trace can be changed by R25. This control determines the quiescent current through Q4 and thus the no-signal voltage on the deflection plates. For example, if R25 is rotated in the clockwise direction, the voltage on the base of Q4 becomes more positive causing the transistor to conduct harder. The positive emitter signal will cause Q3 to conduct less increasing the collector voltage at terminal E3. The sweep trace will now shift in the direction of the deflection plate connected to Q3.

3.3.3.2.3 Sweep Reversal

In order to continue to display the frequency spectrum high frequency to low frequency from left to right on the screen when a double conversion of the RF input signal occurs, a sweep reversal is required. This is accomplished through the use of operational amplifier U2 and sweep reversal switch Q6. The sawtooth wavetrain from the arm of the front-panel SWEEP WIDTH potentiometer A3A1R6 is connected to terminal E12 and is coupled through resistors R30 and R31 to the non-inverting and inverting inputs, respectively of U2. When the single-conversion tuning head is used, a -15v level is applied to terminal E8. This voltage turns off Q6 resulting in the sweep input being connected to pin 3. The input to pin 2 is eliminated as a result of the feedback through R32. Non-inverted sawtooth signals from pin 6 are connected

to terminal E13. If the double-conversion tuning head is used the -15V level at E8 is removed and Q6 conducts. Pin 3 of U2 is clamped at ground and the sweep input to pin 2 is inverted and connected to terminal E13. An external jumper wire connects the sweep signal from E13 to E15, the input to the sawtooth shaping network.

3.3.3.2.4 Sawtooth Shaping Network

As mentioned in paragraph 3.3.1.2, the dispersion of the sweep oscillator is controlled by a varactor. Since the capacitance-versus-voltage curve for varactors is extremely non-linear at low voltages, modification of the impressed sawtooth wave-train is required. This is done by passing the sawtooth through a diode-resistive network which rounds off both the positive and negative going peaks. When the sawtooth goes negative diode CR3 conducts followed by Zener diodes VR2 and VR1. The shunting effect of adding R34 and R35 in parallel across R36 causes the attenuation to decrease as the voltage increases resulting in an increase in the slope of the negative output. During the Positive going portion, diode CR4 conducts followed by Zener diode VR3. Resistor R38 is paralleled with the series string containing R39 and R40, rounding off the positive portion. Potentiometer R39 provides a means of adjusting the positive network to compensate for differences in characteristics of various varactor diodes. Shaped output signals are taken from terminal E16 and connected to the sweep oscillator circuit.

3.3.3.3 High Voltage DC-DC Converter PS1

This circuit does not have a reference designation as it is encapsulated and individual components cannot be checked or replaced. If this circuit proves to be faulty it must be replaced in its entirety. This module receives +15V and -15v from module A3A1 at pins 1 and 2 respectively. It provides +200V and-1500 Vdc outputs at pins 3 and 4 respectively.

3.3.3.4 Part 12688 Focus and Intensity Control (A3A3)

The schematic diagram for this circuit is Figure 6-3. The -1500 volt output from PS1 is applied to a voltage divider on the module consisting of resistor R1 through R6. The intensity of the light beam on the face of the CRT is adjusted by INTENSITY control , R2, which varies the potential between the CRT control grid and cathode. The FOCUS control, R4, is utilized to obtain a sharp trace on the CRT screen by varying the potential on the CRT focus grid.

3.3.3.5 Cathode Ray Tube (A3V1)

This component appears on schematic diagram Figure 6-3. The CRT, V1, provides the visual display of the input spectrum. It has a rectangular face with a green plexiglass overlay which is inscribed with a horizontal base line, a vertical center marker, and five smaller vertical markers.

3.3.4 BATTERY POWER SOURCE

Refer to schematic diagrams Figure 6-8 and Figure 6-10. The battery power enters the main chassis of the WJ-9180 from the clip-on Battery Box (A4) through plug J2. It passes through diode CRl and capacitor Cl to the main power switch S1. Cl filters voltage transients from the battery voltage and CRl protects the Signal Monitor circuitry in the event that the batteries were inadvertently reversed in polarity. If the batteries were reversed Cl would be reverse biased and thus block the supply current.

The WJ-9180-1 Signal Monitor (Figure 6-9) has an external power input jack J5 on the front panel. When the Battery Box is being used, plug P2, which is tied to the front panel, must be inserted into J5 to complete the jumper between E and F of J5. The supply current then passes through Cl and CR1 as in the WJ-9180 Signal Monitor. When use of an external power source is desired P2 is disconnected and a mating plug wired as foI1ows is inserted. If an 11.0 to 16.0 Vdc power source is to be used it must be wired between pins E and A with the high side connected to E. It then passes through CRl and 3/4A fuse F1 to S1. If a power source between 16. O and 30.0 Vdc is to be used it must be wired between pins H and A with the high side connected to H. It then passes through diode CR3 to pin 1 of voltage regulator VR1. CR3 serves the same function as cm. Voltage regulator VRl regulates the source voltage down to 15.0 Vdc. Capacitors C2 and C3 are filters to improve the transient response of the regulator. The regulated 15.0 Vdc output is taken from pin 2 and fed through CR4 to main power switch Sl. Diode CR4 blocks input source voltage, when J5 pin E is being used, from the output circuit of VRl. CR4 is reverse biased under such a condition.

A 3/4 amp fuse A4F1 in the plus line of the Battery Pack protects the WJ-9180 circuitry, and the WJ-9180-1 circuitry when the Battery Pack is being used. A 3/4 amp fuse F1 (Figure 6-9) between CRl and S1 provides protection to the WJ-9180-1 circuitry when an external power source is being used.

3.4 DESCRIPTION OF LINEAR INTEGATED CIRCUITS

The WJ-9180 and WJ-9180-1 Signal Monitor contains No types of linear-integrated circuits as described in the following paragraphs.

3.4.1 TIMER

This device is used in the signal monitor as a multivtbrator for dc to ac and dc to dc conversion. External resistors and a capacitor determine the duty cycle and free running frequency of the timer. The control voltage and reset pins of the timer are not utilized in the multivibrator application. With the trigger pin (2) connected to the threshold pin (6), the timer will trigger itself and free run. In this mode of operation, the external capacitor charges between 1/3 Vcc and 2/3 Vcc. The timer is shown in Figure 3-3.

FIGURE 3-3
FIGURE 3-4

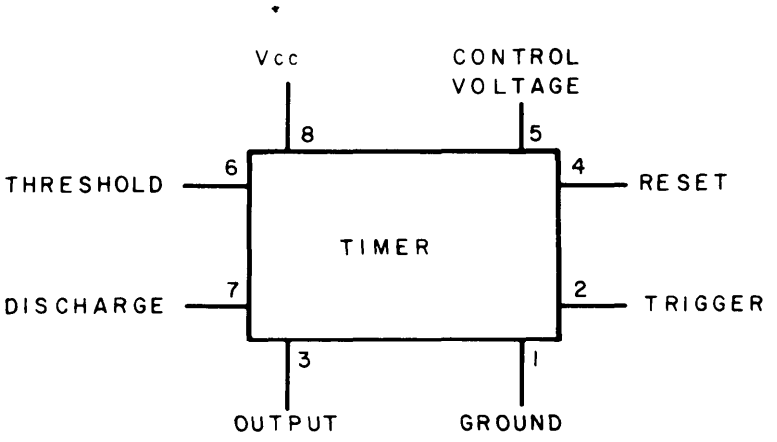


Figure 3-3. NE555 Timer Pin-Out Diagram

3.4.2 VOLTAGE REGULATOR

This device is used in the WJ-9180-1 Signal Monitor only. Its functions to regulate an input power source from 16 Vdc to 30 Vdc down to a 15 Vdc level. The regulator is a fixed 15 Vdc output. It provides for input and load regulation, with internal short circuit current limiting protection. The device has three connections as shown in Figure 3-4.

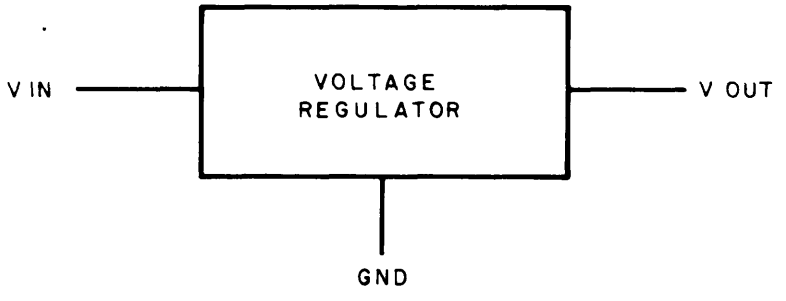


Figure 3-4. MC7815CK Voltage Regulator Pin-Out Diagram

SECTION IV

MAINTENANCE

4.1 GENERAL

The Type WJ-9180 and WJ-9180-1 Signal Monitor has been designed to operate for extended periods of time with little or no routine maintenance required. An occasional cleaning and inspection are the only preventive maintenance operations recommended. The intervals for these operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the circuit descriptions found in Section III. Reference should also be made to the block diagrams in Figure 3-1 and 3-2 and to the schematic diagrams found in Section VI. A complete parts list and illustrations showing part location can be found in Section V.

4.2 CLEANING AND LUBRICATION

The Signal Monitor should be kept free of dust, moisture, grease and foreign matter. If available, use low velocity compressed air to blow accumulated dust from the exterior and interior of the unit. A clean, dry cloth a soft bristled brush, or a cloth saturated with cleaning compound may also be used. The WJ-9180 and WJ-9180-1 Signal Monitor does not need lubrication.

4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indication of mechanical and electrical defects on a periodic basis, or whenever the unit is inoperative. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Damage to parts due to heat is often the result of other less apparent troubles in the circuit. It is essential that the cause of overheating be determined and corrected before replacing the damaged parts Mechanical parts and front panel controls and switches should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4.4 TEST EQUIPMENT REQUIRED

WARNING

Be very careful when working on the Signal Monitor with power applied. High voltage exists on the circuits for the CRT and can be fatal if contacted.

4.4.1 DEPOT TEST EQUIPMENT

The following instruments, or their equivalents, are required to properly troubleshoot, adjustor align the WJ-9180 and WJ-9180-1 Signal Monitor at the depot level.

(1) Sweep Generator, Hewlett Packard Mode1 675

(2) Signal Generator, Hewlett Packard Mode1 606B

(3) Signal Generator, Hewlett Packard 200 CD

(4) Oscilloscope, Tektronix Mode1 503

(5) Mixer, Relcom MIA

(6) Frequency Counter, Hewlett Packard Mode1 5245L

(7) Voltmeter, RCA-WV986

4.4.2 DIRECT SUPPORT TEST EQUIPMENT

The following instruments, or their equivalents, are required to properly troubleshoot the WJ-9180 and WJ-9180-1 Signal Monitor at the direct support level.

(1) Multimeter, Digital, AN/PSM-45.

(2) Voltmeter, RF, Boonton 92C.

(3) Power Supply, PP-6547/U.

(4) Oscilloscope, ANJUSM-28lC.

(5) Signal Generator, SG-ll12(V)I/U

4.5 TROUBLESHOOTING AND REPAIR

Troubleshooting efforts should first redirected toward localizing the problem to a particular module or circuit group. As aids in the process the manual contains a troubleshooting chart, Table 4-1, and a complete circuit description , Section HI. Once the faulty module has been located, the defective component should be isolated using data obtained from the circuit descriptions, the voltage readings, Table 4-2 and 4-3, and the schematic diagrams, Figure 6-1 through 6-10.

4.5.1 LOCALIZING TROUBLE

The chart presented in Table 4-1 lists some probable troubles that may occur. The symptoms listed are typical and the remedies listed are representative of logical methods that should be applied in most cases. Initial efforts directed toward the major subassembly level are recommended.

4.5.2 FAILURE ANALYSIS

Once the trouble has been localized, the signal monitor can usually be returned to service by substituting a spare module known to be in good operating condition of the equipment. Before a faulty module is repaired, a review should be made of the procedures followed up to this point to determine exactly why the failure occurred.

4.6 EQUIPMENT PERFORMANCE CHECKS

The performance checks outlined in the following paragraphs enable the technician to ascertain the operating condition of the equipment. These checks should be made in conjunction with locating troubles or whenever the correct operation of the equipment is in doubt. The performance checks should also be made after any realignment (paragraph 4.7) has been necessary to ensure the equipment is performing correctly.

NOTE

Paragraphs 4.6.1 through 4.6.6 are the performance tests performed at the depot maintenance facility only. Paragraph 4.6.7 contains the performance tests to be performed at the direct support level.

4.6.1 VOLTAGE CHECKS

This test verifies that proper voltages levels are supplied to the Signal Monitor CRT and other circuitry.

4.6.1.1 Equipment Setup

1) Apply +15 Vdc to pin B of battery input jack J2.

2) Ground J2 pin A.

4.6.1.2 Test Measurements

1) With an RCA-WV986 (or equivalent) measure the voltage at A3A1C4. This voltage should be 200 ±20 Vdc.

2) With an RCA-W986 and a high voltage probe, measure the voltage at PSl pin 4 (see Figure 6-3). This voltage should be between -1400 Vdc and -1700 Vdc.

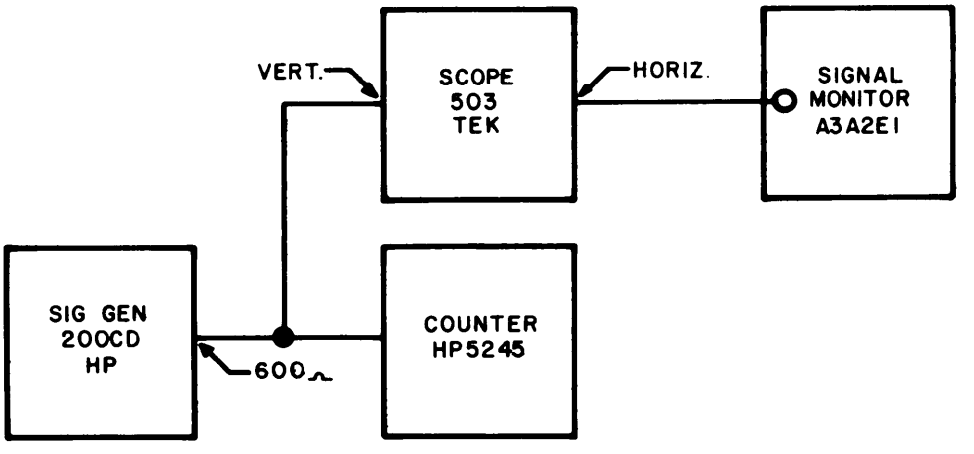


Figure 4-1. Equipment Setup for Sweep Rate Test 4.6.2

4.6.2 SWEEP RATE

This test establishes that the sweep rate is within specifications and calibrated to the graticules on the Signal Monitor CRT face.

4.6.2.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-1.

2) Adjust the control of the oscilloscope so that a trace appears.

3) Adjust the signal generator so that a single stable cycle of sine-wave appears on the oscilloscope.

4.6.2.2 Test Measurement

1) Record the frequency of the counter.

2) This is the sweep rate and it shall be not less than 5 Hz with the Sweep Rate control fully CCW, nor greater than 25 Hz, with the Sweep Rate control fully CW.

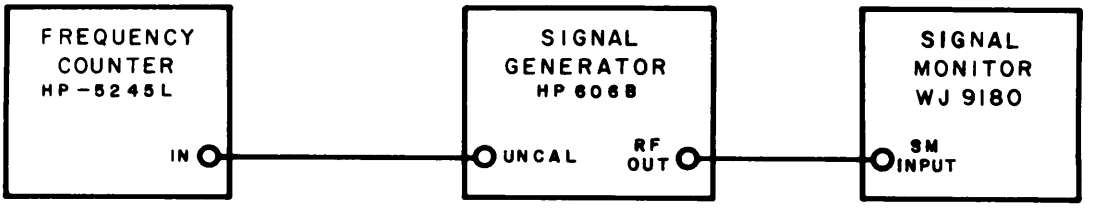


Figure 4-2. Equipment Setup for Performance Tests 4.6.3 through 4.6.6

4.6.3 SENSITIVITY AND GAIN CONTROL RANGE

This test determines that the signal monitor meets the sensitivity requirements in Table 1-1 and that the gain control range is sufficient.

4.6.3.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-2.

2) Set the signal generator frequency to 10.00 MHz, CW at -100 dBm.

3) Rotate the Signal Monitor SM GAIN control fully clockwise.

4) Set the Signal Monitor SWEEP WIDTH and CENTER FREQ controls so that the signal appears at the center of the CRT screen and the sweep is at maximum dispersion.

4.6.3.2 Test Measurements

1) Adjust the signal generator output level for full scale deflection (1 inch) on the signal monitor screen.

2) Record the output level of the generator. This level should be a maximum of -87.0 dBm.

3) Rotate the SM Gain control fully counter-clockwise.

4) Adjust the signal generator output level for full scale deflection on the Signal Monitor screen. Note the signal generator output level.

5) Determine the difference in power level (in dB) of steps 2 and 4. This difference should be a minimum of 60 dB.

6) Set the signal generator output level to -27 dBm.

7) Adjust the SM GAIN control for full scale deflection with the SWEEP WIDTH control at its maximum CW position.

8) Decrease the signal generator output level until the signal is no longer discernible from the noise.

9) Determine the difference between the level of step 8 and 6 (-27 dBm} This difference should be a minimum of 20 dB.

4.6.4 RESOLUTION AND MARKER ACCURACY

This test verifies that the signal monitor displays signals accurately and that the marker is positioned at 10 MHz.

4.6.4.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-2.

2) Turn the Signal Monitor MARKER switch ON.

3) Adjust the SWEEP WIDTH and the CENTER FREQ controls so that the marker appears in the center of the CRT screen and is two divisions wide at its base.

4.6.4.2 Test Measurements

1) Adjust the signal generator frequency and output level so that its signal is equal in amplitude and position to that of the marker.

2) Note the frequency displayed on the frequency counter. This frequency should be 10.000 MHz ±1.0 kHz.

3) Change the signal generator frequency until the valley between the signal and the marker is l/2 of full scale.

4) Determine the difference between the signal generator frequency in step 2 and step 3. This difference should be a maximum of 6.0 kHz.

4.6.5 FREQUENCY RESPONSE

This test verifies that the signal Monitor operates correctly throughout its display range.

4.6.5.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-2.

2) Rotate the Signal Monitor SWEEP WIDTH and SM GAIN controls fully counter-clockwise.

4.6.5.2 Test Measurements

1) Tune the signal generator from 9.5 MHz to 10.5 MHz and determine the point of maximum and minimum sensitivity.

2) Determine the power level required for full scale deflection at the maximum point and the minimum point.

3) Determine the difference in power levels of the maximum and minimum point. This difference should be no greater than 2 dB.

4) Turn the MARKER switch ON.

5) Adjust the CENTER FREQ control so that the marker is on the center line of the CRT.

6) Adjust the signal generator frequency so that the signal appears at the far left hand gradicule on the CRT screen. The signal generator frequency should be 9.5 ±0.10 MHz. Record this frequency.

7) Adjust the signal generator frequency so that the signal appears at the far right hand gradicule on the CRT screen. The signal generator frequency should be 10.5 ±0.10 MHz. Record this frequency.

8) Subtract the signal generator frequency in step 6 from the frequency in step 7. This difference should be 1.0±.l MHz.

4.6.6 IMAGE AND SPURIOUS REJECTION

This test verifies that the Signal Monitor rejects image frequency and spurious signals.

4.6.6.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-2.

2) Set the signal generator to 14.0 MHz, CW.

3) Set the WJ-9180 SM GAIN control fully clockwise.

4) Adjust the signal generator output level so that the signal can be seen on the CRT screen.

5) Adjust the SWEEP WIDTH and CENTER FREQUENCY controls so that the signal appears at the center of the CRT screen and the sweep is at maximum dispersion.

4.6.6.2 Test Measurements

1) Measure the power level required for full scale deflection of the 14.0 MHz signal. Record this measurement.

2) Repeat steps 2 through 6 for a signal generator frequency of 10 MHz.

3) Determine the difference between the power levels of step 1 (14.0 MHz signal) and step 2 (10 MHz signal). This difference should be a minimum of 60 dB.

4) Set the output level of the signal generator 60 dB above the level required for full scale deflection of the 10 MHz signal generator signal.

5) Vary the frequency of the signal generator from 8 MHz to 14 MHz.

6) Verify that there are no spurious signals having full scale deflection except those listed below:

a. 9.922 MHz, a minimum of 55 dB down.

b. 9.65 MHz, a minimum of 55 dB down.

4.6.7 DIRECT SUPPORT PERFORMANCE TEST

1) Test signal monitor voltage.

a. Energize signal monitor using power supply.

NOTE:
Power supply must provide a minimum of 1.0 amp.

b. Power may be connected to front panel power jack J-5 at 24 VDC or rear power plug J-8 at 12.6 VDC.

c. Turn power switch ON.

d. Using multimeter check voltages. Negative (-) lead connects to chassis ground; positive (+) lead to test points:

A1C4 = 15 VDC
A1C5 = -15 VDC
A1C1 = 6 VDC
A1C3 = 9.5 VDC

2) Test signal monitor's ability to center marker.

a. Turn MARKER switch ON.

b. Adjust FOCUS and INTENSITY controls until sweep is visible.

c. Adjust CENTER FREQUENCY control until 10 MHz marker is centered on display.

d. Adjust SWEEP WIDTH control fully counterclockwise, opening marker into straight line.

e. Adjust CENTER FREQUENCY control until line is just visible at top of display.

f. Adjust SWEEP WIDTH control clockwise verifying marker centered on display.

3) Test signal monitor 1 MHz display width.

a. Set signal generator for 10 MHz output level of -87 dbm continuous wave.

b. Connect signal generator to SM INPUT (J3) on front panel of signal monitor.

c. Set SM GAIN control fully clockwise.

d. Observe marker, amplitude should be maximum on signal monitor display.

e. Adjust signal generator for 10.5 MHz.

f. Observe marker, should move to far left of display.

g. Flip SWEEP REVERSE switch

h. Observe marker, should move to far right of display.

i. Flip SWEEP REVERSE switch

j. Adjust signal generator for 9.5 MHz.

k. Observe marker, should move to far right of display.

l. Flip SWEEP REVERSE switch

m. Observe marker, should move to far left of display.

4) Test signal monitor for centered marker.

a. Adjust signal generator for 10 MHz.

b Set MARKER switch to OFF.

c. Adjust SM GAIN for a marker amplitude of half screen.

d. Set MARKER switch to ON.

e. Observe marker, amplitude should double, SM marker and signal generator marker should overlap.

f. A double set of 10 MHz markers indicates SM alignment required.

5) Replace unit cover.

4.7 ALIGNMENT AND ADJUSTMENT PROCEDURES

NOTE

Alignment and adjustment procedures are not to be performed at the direct support maintenance level. Replacement assemblies and subassemblies are pre-aligned at the manufacturing plant. No further alignment is required upon installation

4.7.1 GENERAL

The alignment procedure for the WJ-9180 and WJ-9180-1 Signal Monitors is described below. Alignment should be performed after a repair has been made or when the equipment does not meet the specifications shown in Table 1-1. Qualified technicians using equipment with the degree of accuracy needed should perform the alignment procedure. The test equipment necessary to perform the alignment is shown in paragraph 4.7.2. If this equipment is not available, a comparable type can be used.

WARNING

The Signal Monitor employs voltages which may be fatal if contacted. Extreme caution should be exercised when working with the equipment.

4.7.2 EQUIPMENT

The following equipment, or its equivalent, is required to perform the alignment procedure.

1) Sweep Generator, Hewlett Packard 675A

2) Signal Generator, Hewlett Packard 606B (2)

3) Oscilloscope, Tektronix 503

4) Mixer, Relcom M1A

5) Frequency Counter, Hewlett Packard 5245L

4.7.3 PRELIMINARY SWEEP GENERATOR AND HORIZONTAL AMPLIFIER ALIGNMENT A3A2

Proceed as follows:

1) Remove the Signal Monitor cover.

2) Locate terminal El on Sweep Generator and Horizontal Deflection Amplifier A3A2.

3) Set the oscilloscope time base to 50 m see/cm and the vertical amplitude control to 5V/cm.

4) Connect the positive (+) oscilloscope vertical input to terminal El.

5) Apply power to the Signal Monitor.

6) Set both vertical input switches to the GND position.

7) Adjust the oscilloscope vertical position control to place the oscilloscope trace on the center horizontal gradicule (0.0V).

8) Set the positive (+) vertical input stitch to the DC position.

9) See Figure 5-13 to locate potentiometers R9 and R12.

10) Adjust potentiometers R9 (Sweep Balance) and R12 (Sweep Calibration) to obtain a sawtooth waveform exactly ±10V in amplitude (20Vp-p) about the zero horizontal gradicule.

11) Observe the trace on the Signal Monitor screen. The trace should extend across the entire face of the CRT screen. If the trace does not extend across the screen, adjust potentiometers R16 (Horizontal Width) and R25 (Horizontal Position) to obtain a full trace.

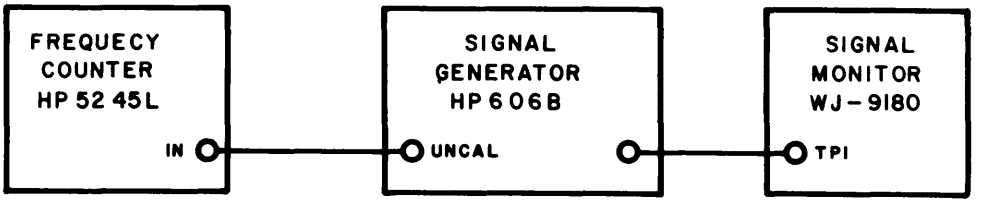


Figure 4-3. Equipment Setup for 205 kHz IF Amplifier Alignment

4.7.4 205 kHz IF AMPLIFIER ALIGNMENI'

Proceed as follows:

4.7.4.1 Equipment Setup

1) Remove the bottom cover from the Signal Monitor chassis.

2) Connect the equipment as shown in Figure 4-3 A3AlA2TPl is located on the center partition of the chassis.

3) Using the frequency counter, calibrate the signal generator for a 205.000 kHz, CW output.

4) Adjust the signal generator output level to produce a slight vertical shift (positive) of the CRT trace.

4.7.4.2 Adjustments

Adjust inductor A1A2L7, A1A2L6, AlA2L5, AlA2L4 and AlA2L3 in the order given, for maximum positive shift of the CRT trace. Decrease the signal generator output level if necessary, to keep the CRT trace on the screen.

4.7.5 SWEEP OSCILLATOR ADJUSTMENT

Proceed as follows:

4.7.5.1 Equipment Setup

1) Set the Signal Monitor CENTER FREQ control to midrange.

2) Turn the marker switch ON.

3) Rotate the SWEEP WIDTH control fully counter-clockwise.

4.7.5.2 Adjustments

Carefully adjust inductor A1A1L9 to obtain maximum positive shift of the CRT trace and centering of the marker on the screen.

4.7.6 2 MHz IF ALIGNMENT

Proceed as follows:

4.7.6. 1 Equipment Setup

1) Connect the output of the HP 606B Signal Generator to A3A1A1TP1. See Figure 5-10 to locate A3A1A1TP1.

2) Set the signal generator frequency to 2 MHz, CW.

3) Increase the signal generator output level until a slight positive shift of the CRT baseline is observed.

4.7.6.2 Adjustments

Adjust inductors A1A2L2, A1A2L1, A1A1L8 and A1A1L7 in the order given, for maximum positive shift of the CRT trace. Decrease the signal generator output level as necessary, to keep the CRT trace on the screen.

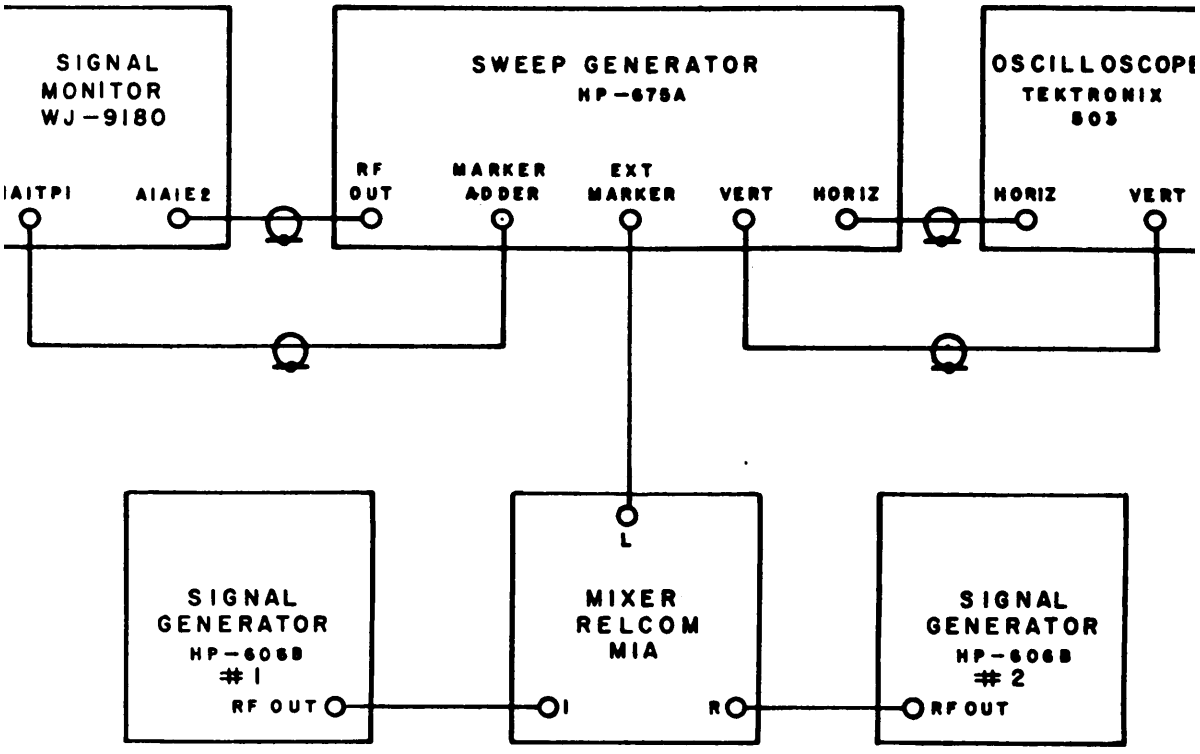


Figure 4-4. Equipment Setup for IF Amplifier Board #l Alignmeti

4.7.7 IF AMPLIFIER BOARD NO. 1 ALIGNMENT

Proceed as follows:

4.7.7.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-4.

2) Rotate the SWEEP WIDTH and SWEEP RATE controls fully counter clochwise.

3) Set the sweep generator center frequency to 10 MHz and its output level to -57 dBm.

4) Set signal generator No. 1 to 500 kHz.

5) Set signal generator No. 2 to 10 MHz.

6) Adjust the output level of signal generator No. 1 and No. 2 to produce suitable markers on the oscilloscope.

7) Set the oscilloscope vertical control to 10 mV/cm.

8) Adjust the sweep generator and oscilloscope controls to display a response curve.

4.7.7.2 Adjustments

Tune inductors A1A1Ll, AlAl13 and A1A1L4 for a maximum amplitude, slightly over-coupled response curve as shown in Figure 4-5. The response ripple should be no greater than 2 dB. Disconnect the test equipment.

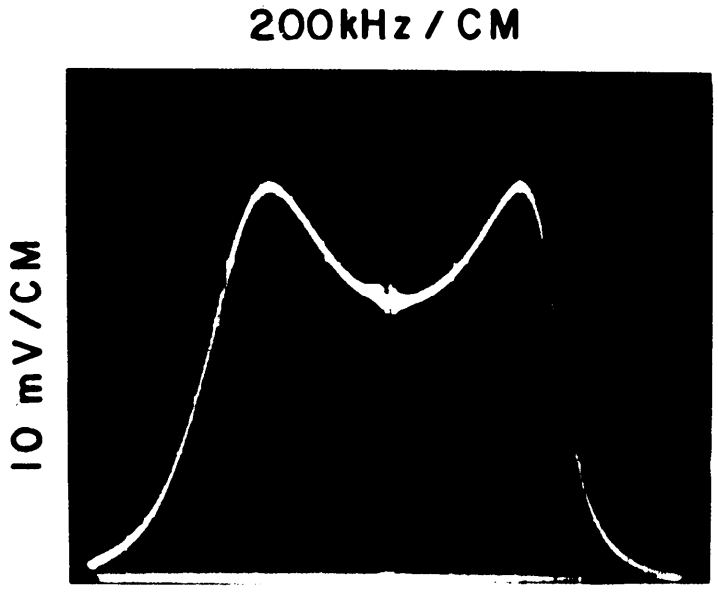


Figure 4-5. IF Amplifier Board #l Typical Response Curve

4.7.8 OVERALL IF ALIGNMENT

Proceed as follows:

4.7.8.1 Equipment Setup

1) Connect the equipment as shown in Figure 4-1.

2) Set the signal generator frequency to 10.0 MHz, CW mode.

3) Set the signal generator and Signal Monitor control as required for a display on the CRT.

4) Rotate the Signal Monitor SM Gain control fully clockwise.

4. 7.8.2 Adjustments

1) Adjust inductors AlA2L2, A1A2L1, AlAlL8, A1AlL7, A1A2L7, AlA2L6, AM2L5, A1AIL4 and A1A2L3, in the order given for maximum amplitude of the CRT trace.

2) Set the signal generator for an output level of -87 dBm. Adjust AlA2Rll for full scale deflection of the pip. Disconnect the test equipment.

3) Adjust the sweepwidth for approximately 200 kHz dispertion. Turn marker on. Adjust marker amplitude potentiometer A3A2R6 for full scale deflection of the marker trace.

4) Return the sweep width to maximum and observe that the marker amplitude does not drop by more than 5 dB.

4.7.9 HORIZONTAL POSITION, HORIZONTAL WIDTH AND SWEEP CALIBRATION ADJUSTMENT

Proceed as follows:

4.7.9.1 Equipment Setup

1) Rotate the Signal Monitor SWEEP WIDTH control fully clockwise.

2) Using the frequency counter, set the HP 606B Signal Generator frequency to 10.000 MHz.

3) Connect the signal generator RF output to the Signal Monitor input.

4) Adjust the signal generator output level for full-scale deflection of the signal pip on the CRT screen.

4.7.9.2 Adjustments

1) Adjust the horizontal position potentiometer, A3A2R25, to center the signal pip on the CRT screen.

2) Observe the horizontal CRT trace. It should reach across the full width of the screen but at least one end should be barely visible. If not, adjust the horizontal width potentiometer A3A2R16 until the trace appears as described. Repeat steps 1 and 2.

3) Increase the signal generator frequency to 10.500 MHz. The signal pip should appear beneath the fifth vertical mark to the right of the center line. If necessary, adjust sweep calibration potentiometer A3A2R16 to position the pip as described.

4) Decrease the signal generator frequency to 9.500 MHz. The signal pip should appear beneath the fifth vertical mark to the left of the center line. Adjust sweep shaper potentiometer A3A2R39 to position the pip as described.

5) Repeat steps 3 and 4 to verify proper sweep adjustment.

4.8 SUBASSEMBLY REMOVAL, REPAIR AND REPLACEMENT

The three basic modules, DC-DC Converter, DC-AC Converter and the Signal Monitor are each readily removed from the main chassis as described below. In addition, subassemblies and piece parts requiring resoldering are listed. Locations are referenced to the front panel when the unit is in its normal operating position. Repair by replacement of an assembly, subassembly or piece part must include retest of the replaced part.

4.8.1 DC-DC CONVERTER (Al)

The DC-DC Converter Board is mounted in a gold flashed nickel plated brass box at the left rear of the main chassis. Potentiometers on this module can be adjusted through the rear apron of the main chassis. Three phillips head screws secure the box to the rear apron. AlP1 must be unplugged to remove the module from the unit.

4.8.2 DC-AC CONVERTER (A2)

The DC-AC Converter Board is secured by five phillips head **screws** to the top right hand side of the main chassis. It is necessary to unsolder two wires at A2E1 and A2E2 and unplug A2Pl to remove the module from the unit.

4.8.3 SIGNAL MONITOR MODULE (A3)

The Signal Monitor Module Chassis is located in the center of the Main Chassis with the CRT. The two IF Boards are located on the underside of the Signal Monitor Module Chassis. These are hardwired and must be unsoldered to be removed. The Sweep Generator and Horizontal Amplifier Board is mounted at the rear of the CRT. It is hardwired and secured by four mounting screws to the Signal Monitor Module Chassis. The DC-DC Converter (PSl) is mounted to the Signal Monitor Module chassis on the top side to the right of the CRT. It is secured by two phillips head screws. Four wires must be unsoldered for its removal.

4. 8.3.1 Signal Monitor Module Removal

The Signal Monitor Module can be removed from the main chassis by following the steps below.

1) Remove the Intensity and Focus control knobs by loosening the allen head set screws directly behind the front panel. Remove the knobs with the extenders.

2) Remove the Sweep Width, Center Freq and SM Gain control knobs by loosening the allen head set screws in the knobs.

3) Unplug A3Jl and A3J2. Located to the right of the CRT neck.

4) Unsolder the two wires from MARKER ON/OFF switch S1 .

5) Disconnect the RF input coaxial cable on the underside of the chassis.

6) Turn the equipment and stand it up on one side. Remove the four phillips head mounting screws located around the Signal Monitor moduIe.

7) Carefully tilt the rear of the Signal Monitor module through the bottom of the main chassis and remove in a backward motion so that the control knob shafts clear the front panel.

4.8.3.2 Cathode Ray Tube Removal

If it is found necessary to remove the CRT from the magnetic shield, extreme caution must be exersized. The CRT is very fragile; structural failure would result in an implosion of the glass envelope. Safety glasses, at least, should be worn. The Signal Monitor Module chassis must first be removed. See paragraph 4.8.3.1. The CRT ts removed by the following steps.

1) Unplug the high voltage return lead on the side of the CRT.

2) Unplug the CRT socket from the end of the tube.

3) Remove the phillips head screws on either side of the front portion of the magnetic shield.

4) Pull the magnetic shield with the CRT forward from the chassis.

5) Remove nylon tilt adjust screws from the top front of the magnetic shield.

6) While holding the face end of the CRT and shield, carefully slide CRT forward from the magnetic shield by slowly applying pressure to the CRT plug.

Reinstall by the reverse procedure, ensuring that the neck grommet is replaced securely.

4.8.3.3 IF Amplifier Board #l (A3AlAl) Removal

IF amplifier board #1 is removed through the bottom chassis by unscrewing 6 phillips screws, removing 6 flat and split lockwashers and resoldering the following points:

Solder Point	Wire Color or Description
El	W bite
E2	Coax core
E3	Coax shield
E4	Green
ES	Blue
E6	White
E7	Yellow/White
E8	22 k ohm resistor
E9	5.1 ohm resistor

4.8.3.4 IF Amplifier Board #2 (A3A1A2) Removal

IF amplifier board #2 is removed through the bottom chassis by unscrewing 5 phillips screws, removing 5 flat and split lockwashers aid resoldering the following points:

Solder Point	Wire Color
El	Clear
E2	Green
E3	Blue
E4	Green
ES	Clear
E6	W bite/Red/Yellow
E’7	Clear
E9	Blue
E10	Clear

4.8.3.5 10 MHz Oscillator (A3A1A3)

The 10 MHz oscillator is removed through the top chassis by unscrewing each securing screw and desoldering the 22 k ohm resistor from E8 of A3AlA1, the white connecting wire and the blue connecting wire.

4.8.3.6 Focus and Intensity Control (A3A3) Removal

The focus and intensity control board is removed through the top chassis by unscrewing 4 phillips screws, removing 4 flat and split lockwashers removing the two shafts connected to the board and resoldering the following points:

Solder Point	Wire Color
El	White/Yellow/Violet (2 wires)
E2	White/Yellow/Violet
E3	White/Yellow/Violet
E4	White/Yellow/Violet

4.8.3.7 PS1 1500 V Power Supply Removal

The PS1 1500 V power supply is removed through the top chassis by unscrewing 2 phillips screws, removing 2 flat and split lockwashers and resoldering the following points:

Solder Point	Wire Color
1	White/Brown/Blue
2	White/Brown/Violet (2 wires)
3	White/Yellow/Red
4	White/Yellow/Violet

4.8.3.8 DC-AC Power Supply (A2) Removal

The DC-AC power supply is removed through the top chassis by unscrewing 6 phillips screws and resoldering the following points:

Solder Point	Wire Color
E3	White/Yellow/Violet
E4	White/Yellow/Violet
El	White/Blue/Violet
E2	Black

4.8.3.9 Signal Monitor Battery Jack (J2) Removal

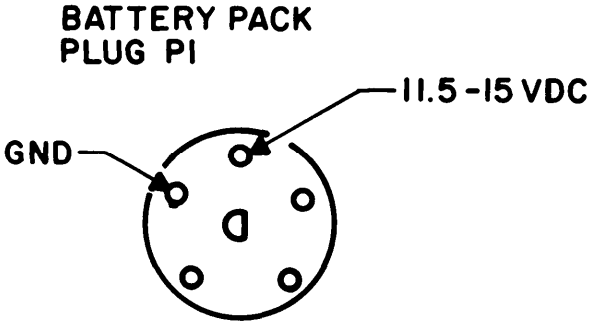
The signal monitor battery jack is removed through the rear of the rear panel by unscrewing each securing screw and resoldering the jack's 1 white wire.

4.8.3.10 Marker ON/OFF Switch (A3S1) Removal

The marker ON/OFF switch is removed through the rear of the front panel by unscrewing the switch's securing nut on the front panel and resoldering the switch's 2 wires of white/brown/blue and white/brown/green.

4.8.3.11 Battery Pack plug (P1) Removal

The battery pack plug is removed from the battery pack by unscrewing each securing screw, sliding the plug out and resoldering the plug's 3 white wires.



4.8.3.12 Power ON/OFF Switch (S1) Removal

The power ON/OFF switch is removed through the rear of the front panel by unscrewing the switches securing nut on the front panel and resoldering the switch's 2 yellow wires and 1 white wire.

4.8.3.13 Sweep Rate Control Switch (R 1) Removal

The sweep rate control switch is removed through the rear of the front panel by removing the SWEEP RATE knob, nut and washer on the front panel and resoldering the switch's 2 black wires, 1 brown wire and 1 red wire.

4.8.3.14 Sweep Reversing Switch (S3) Removal

The sweep reversing switch is removed through the rear of the front panel by unscrewing the switch's securing nut on the front panel and resoldering the switch's 2 white/brown/violet wires, 1 white wire and 1 black wire.

4.8.3.15 Battery Check Lamp (CR2) Removal

The battery check lamp is removed through the rear of the front panel by unscrewing each lamp's securing screws on the front panel and desoldering the lamp board's 1 orange wire at E1.

4.8.3.16 Battery Test Switch (S2) Removal

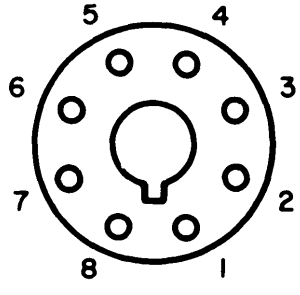
The battery test switch is removed through the rear of the front panel by removing the switch's securing nut on the front panel and resoldering the switch's yellow and blue wires.

Table 4-1. Type WJ-9180 and WJ-9180-l
Direct Support Troubleshooting Chart

SYMPTOM	TROUBLESHOOTING PROCEDURE PAGE
No trace on CRT	4-27
No RF signal on CRT	4-41
POWER lamp does not light	4-51
No marker on CRT	4-63

WARNING

Pins 3, 4,5, and 8 on the CRT plug contain dangerous voltages. Use extreme caution when working near this plug. Use only a high voltage probe when checking these pins



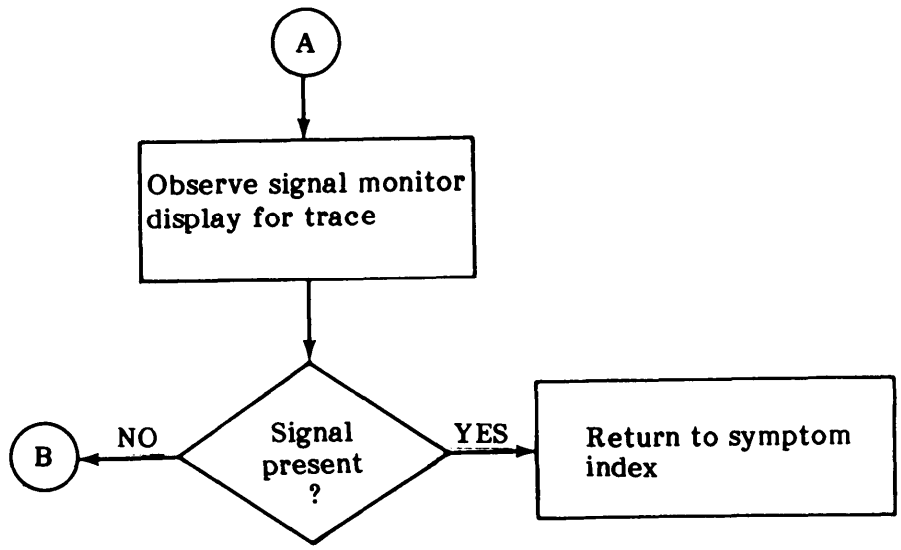
NO TRACE ON CRT

INITIAL SETUP

Test Equipment		Equipment Condition
Multimeter	AN/PsM-45	POWER switch (S1) set to ON.
High Voltage Probe	5kV-Simpsom 00053	INTEN control (A3R2) set fully clockwise.
Power Supply	PP 6547/U	FOCUS control (A3R4) set to mid-range.
Tools		
4 inch flat tip screwdriver,	5120-00-222-8852	SM GAIN control (A1R1) set to mid-range.
		CENTER FREQ control (A1R3) set to mid-range.
Replacement Parts		
DC-DC Converter {Al)	791794	SWEEP RATE control (R1) set to mid-range.
DC-AC Converter (Al)	76239	
CRT (Vi)	M152OP31	SWEEP WIDTH control (A1R6) set fully clockwise.
DC-DC Converter (PS1)	76199	
Focus and Intensity Control (A3A3)	12688	SWEEP REVERSE switch (S3) set in UP position.
		MARKER switch (A3S1) set to OFF.
General Safety Instructions		Protective covers removed.
Pins 3, 4, 5, and 8 on the CRT plug contain dangerous voltages.		Power supply set to 24 Vdc connected-to J5.

NOTE

Minimum of 30 minutes warm-up time is required prior to starting trouble shooting procedures,


A
Observe signal monitor display for trace
Signal present ?
NO
B
YES
Return to symptom index

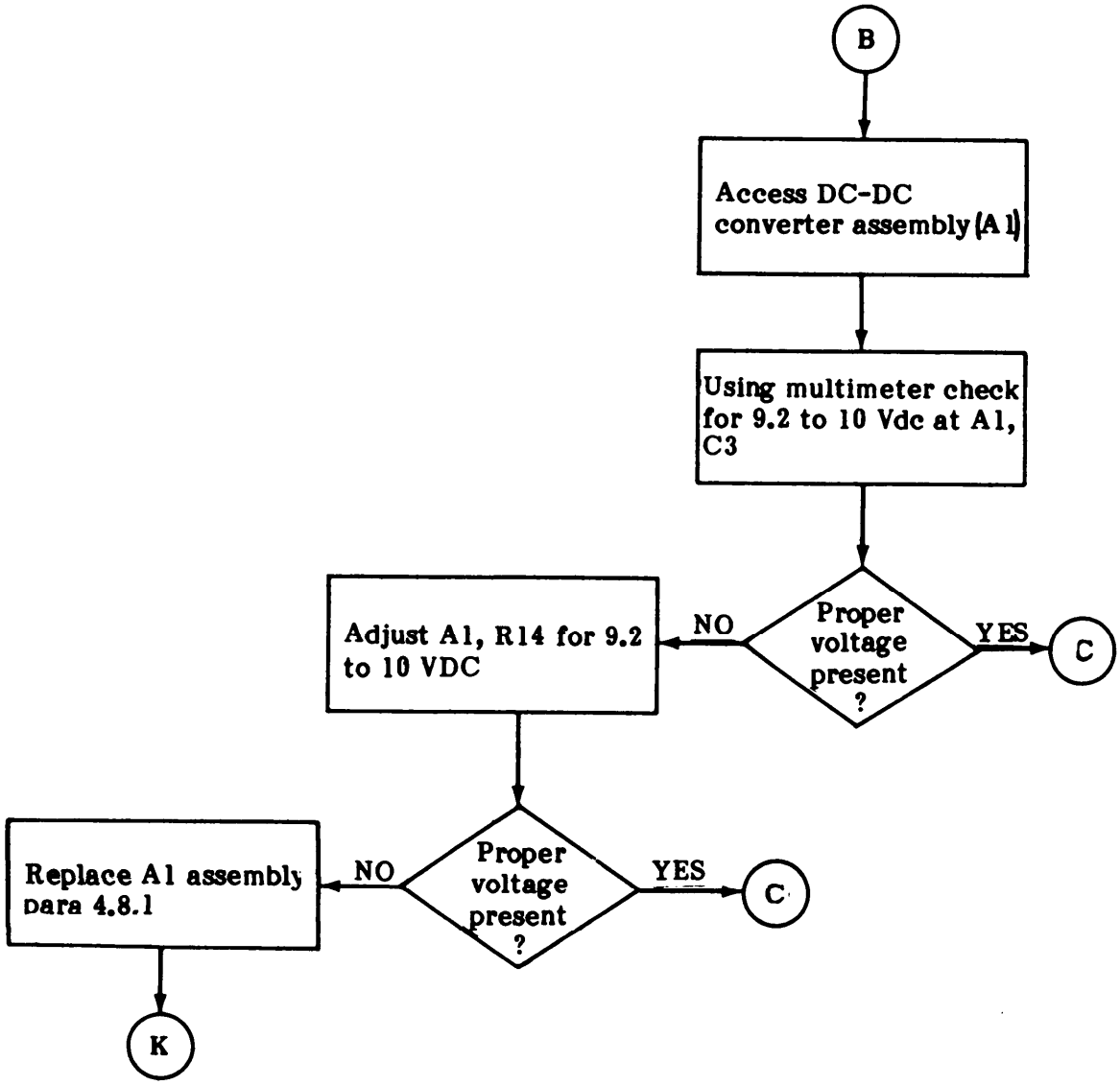
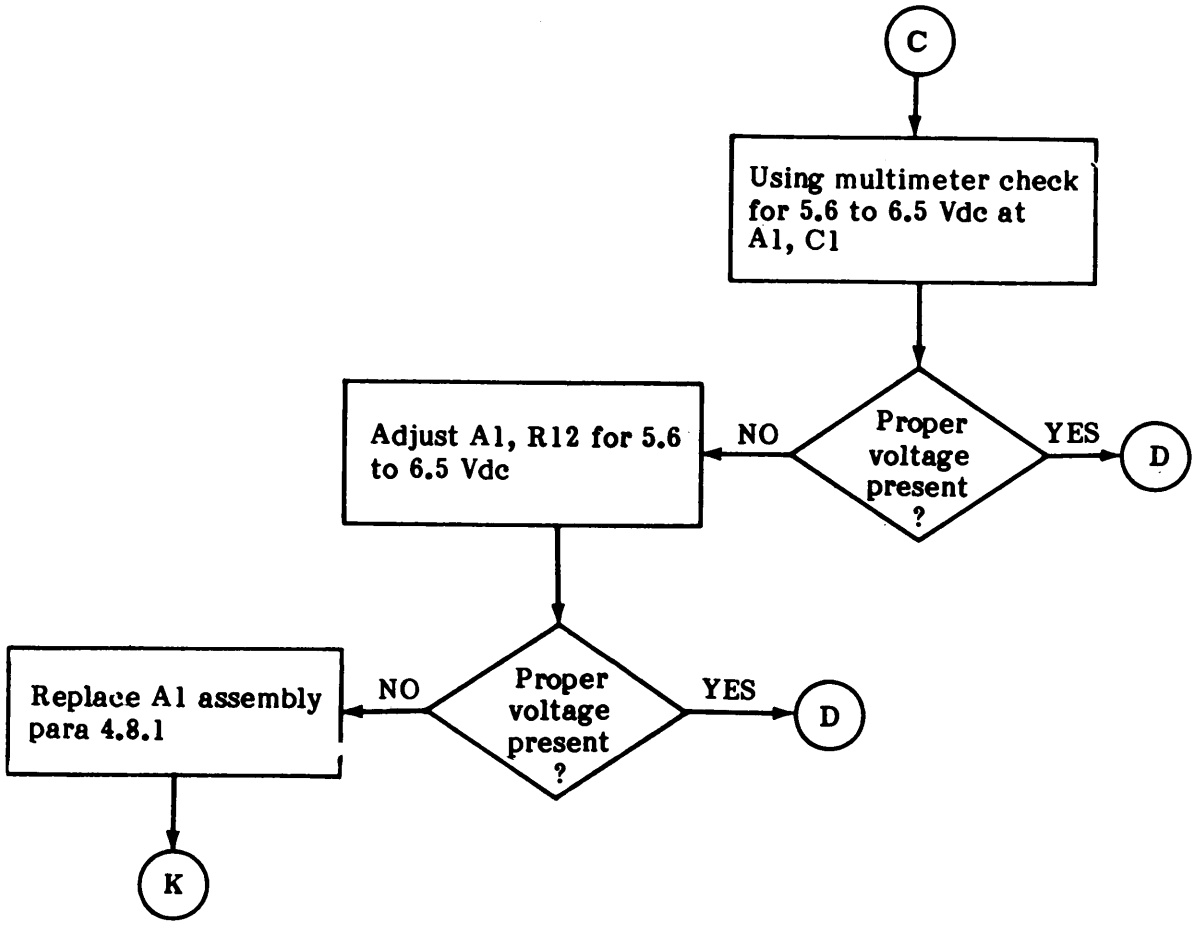

B
Access DC-DC converter assembly (A1)
Using multimeter check for 9.2 to 10 Vdc at A1, C3
Proper voltage present ?
NO
YES
C
Adjust A1, R14 for 9.2 to 10 VDC
Proper voltage present ?
NO
YES
C
Replace A1 assembly para 4.8.1
K

TABLE 4-1


C
Using multimeter check for 5.6 to 6.5 Vdc at A1, C1
Proper voltage present ?
NO
YES
D
Adjust A1, R12 for 5.6 to 6.5 Vdc
Proper voltage present ?
NO
YES
D
Replace A1 assembly para 4.8.1
K

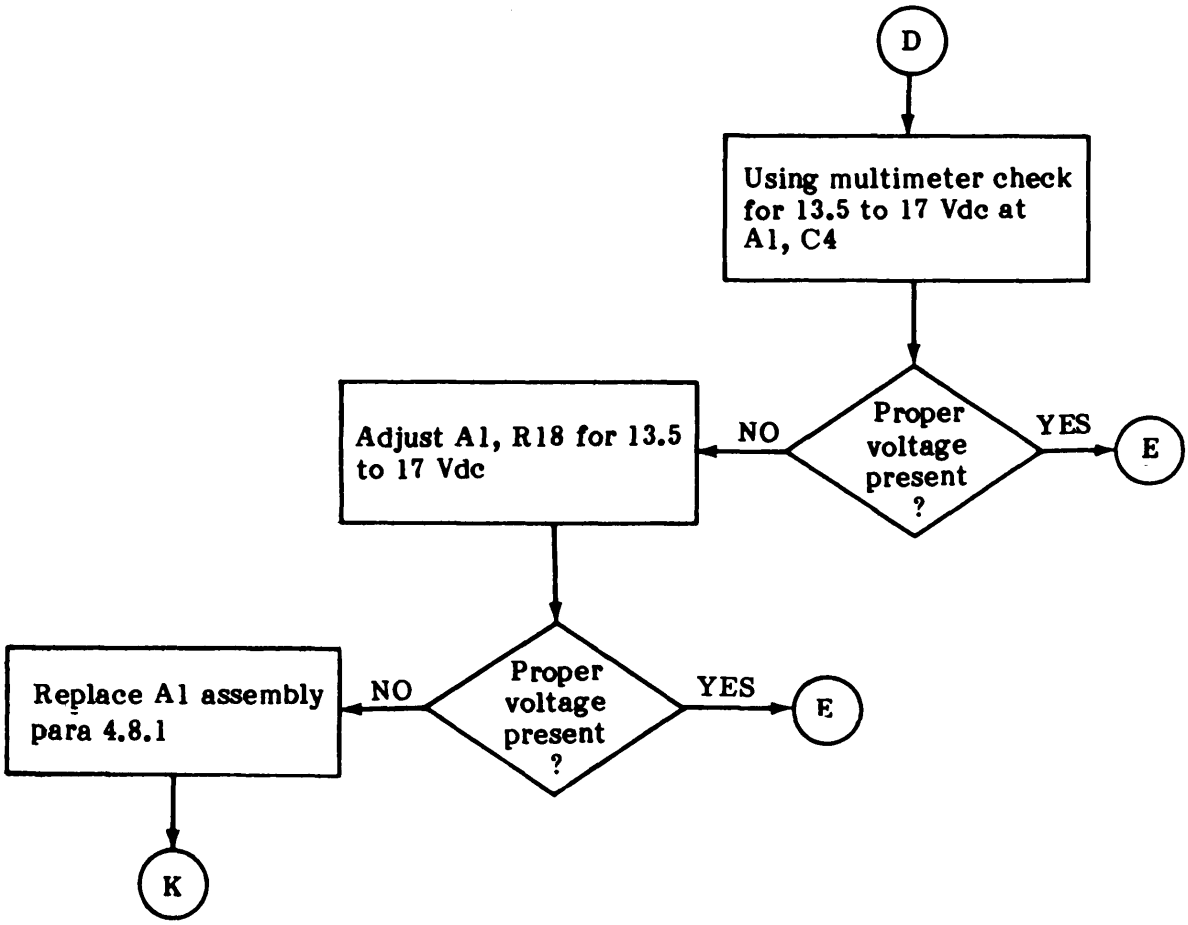
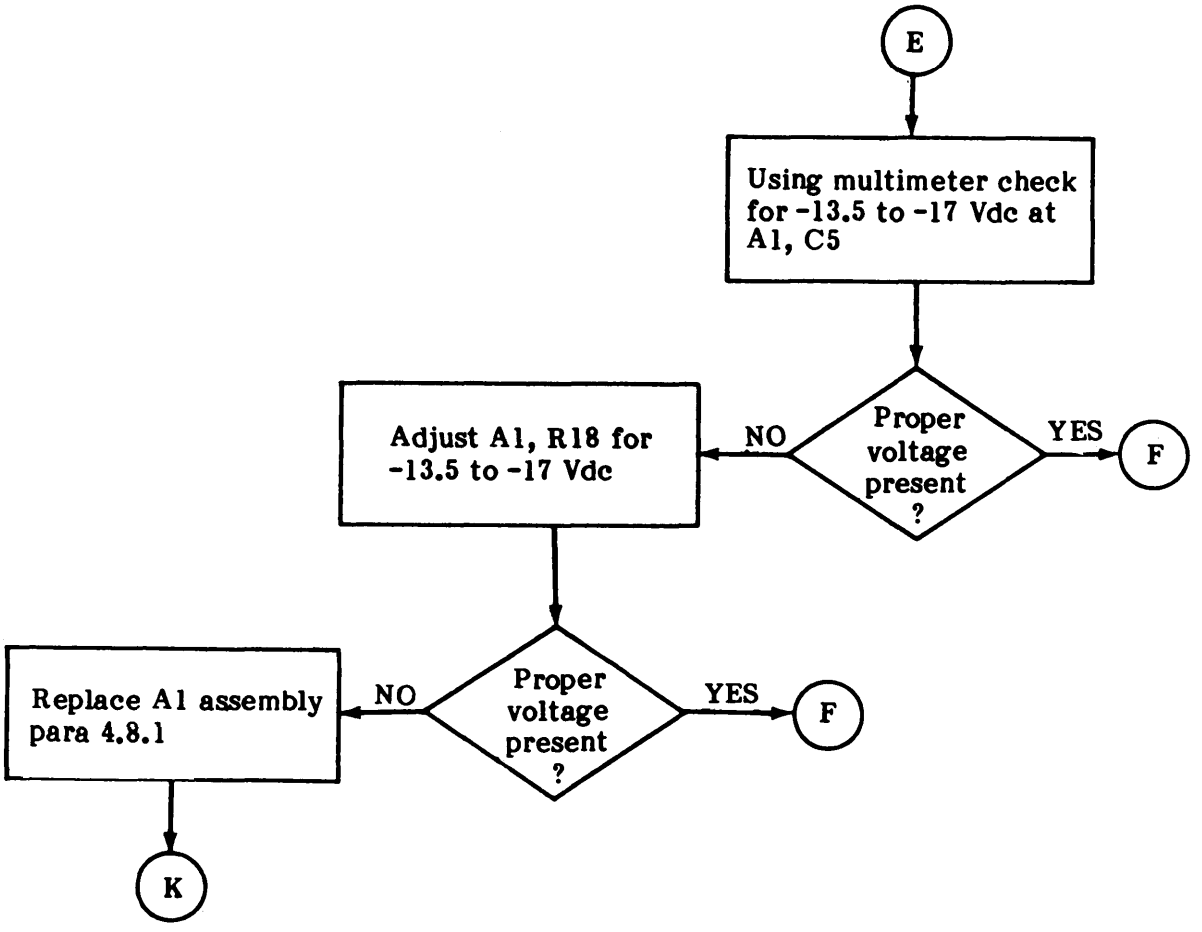

D
Using multimeter check for 13.5 to 17 Vdc at A1, C4
Proper voltage present ?
NO
YES
E
Adjust A1, R18 for 13.5 to 17 Vdc
Proper voltage present ?
NO
YES
E
Replace A1 assembly para 4.8.1
K

TABLE 4-1


E
Using multimeter check for -13.5 to -17 Vdc at A1, C5
Proper voltage present ?
NO
YES
F
Adjust A1, R18 for -13.5 to -17 Vdc
Proper voltage present ?
NO
YES
F
Replace A1 assembly para 4.8.1
K

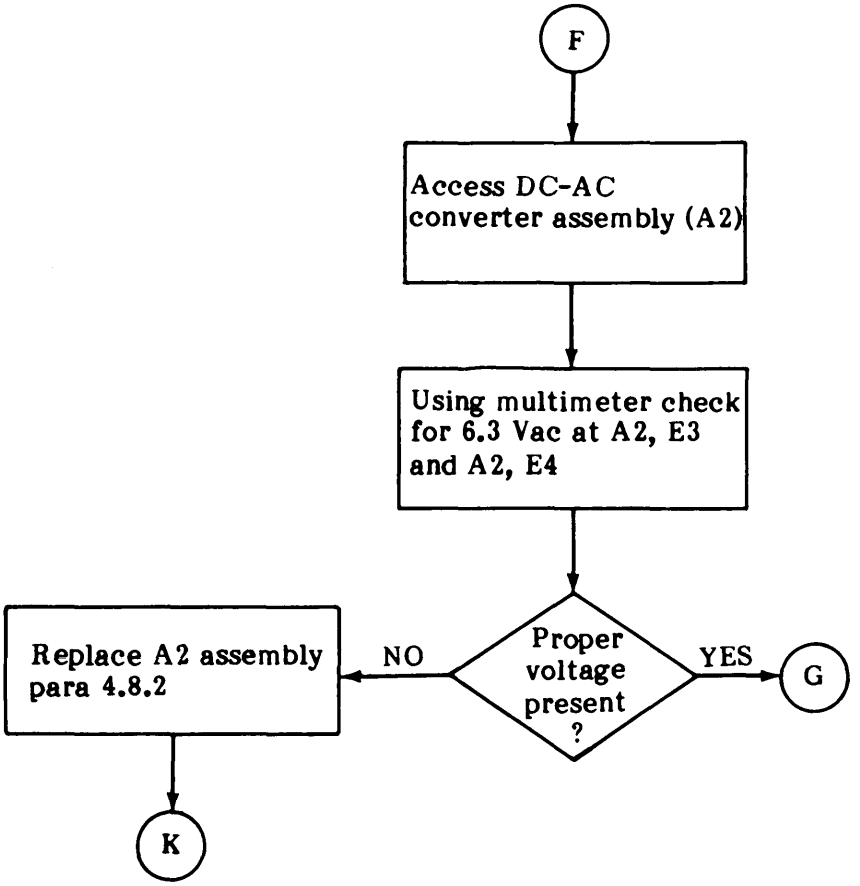
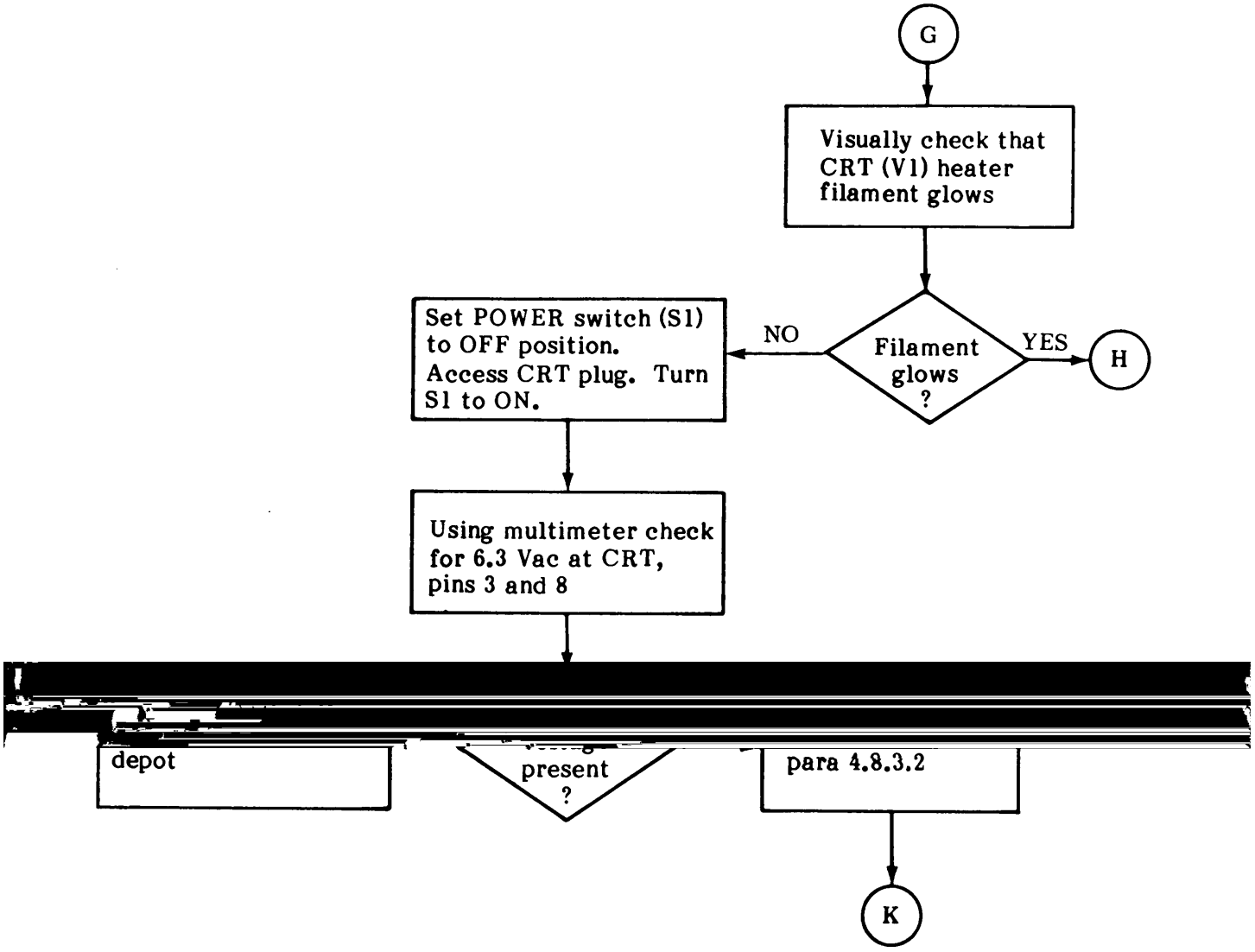
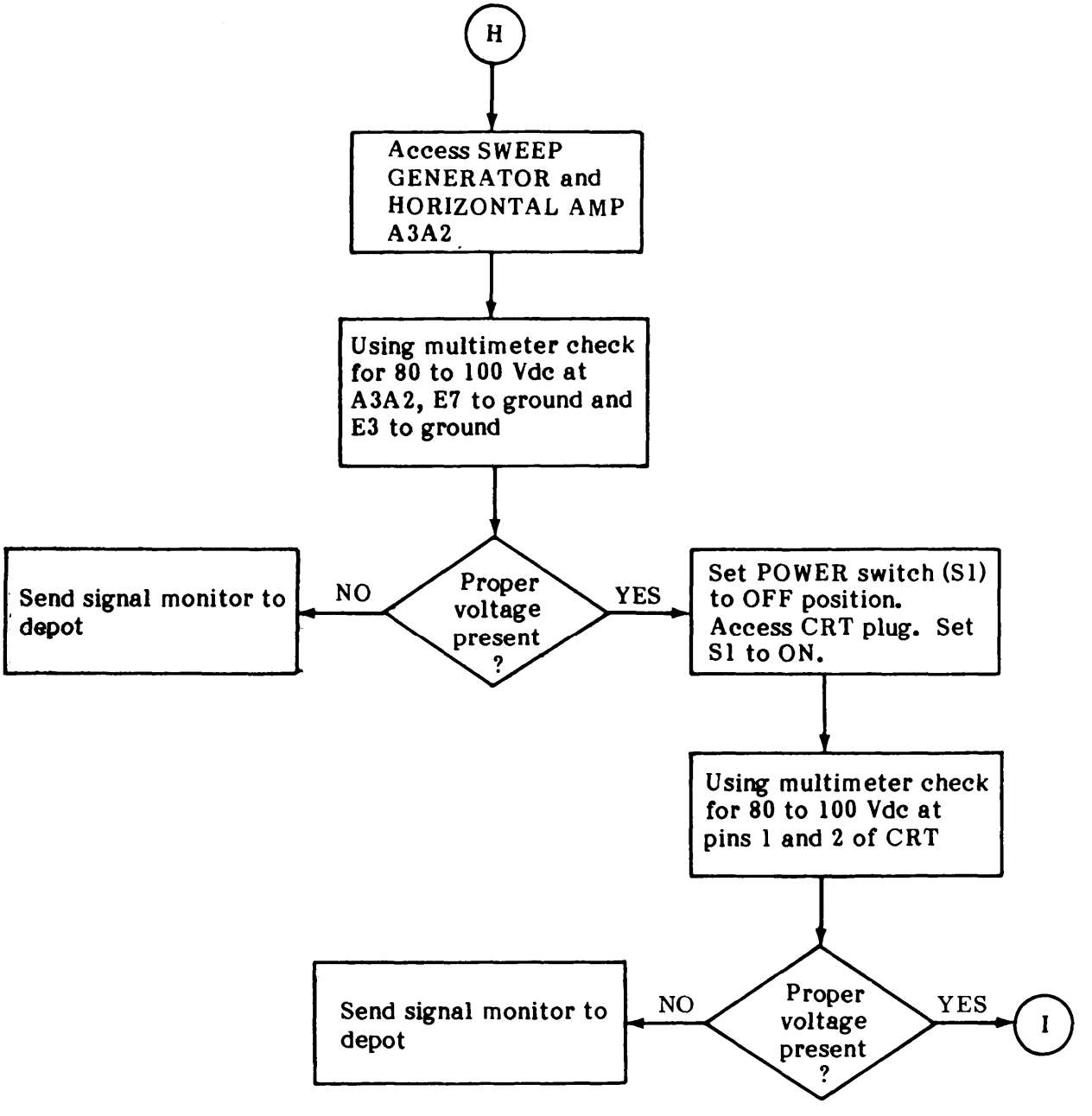
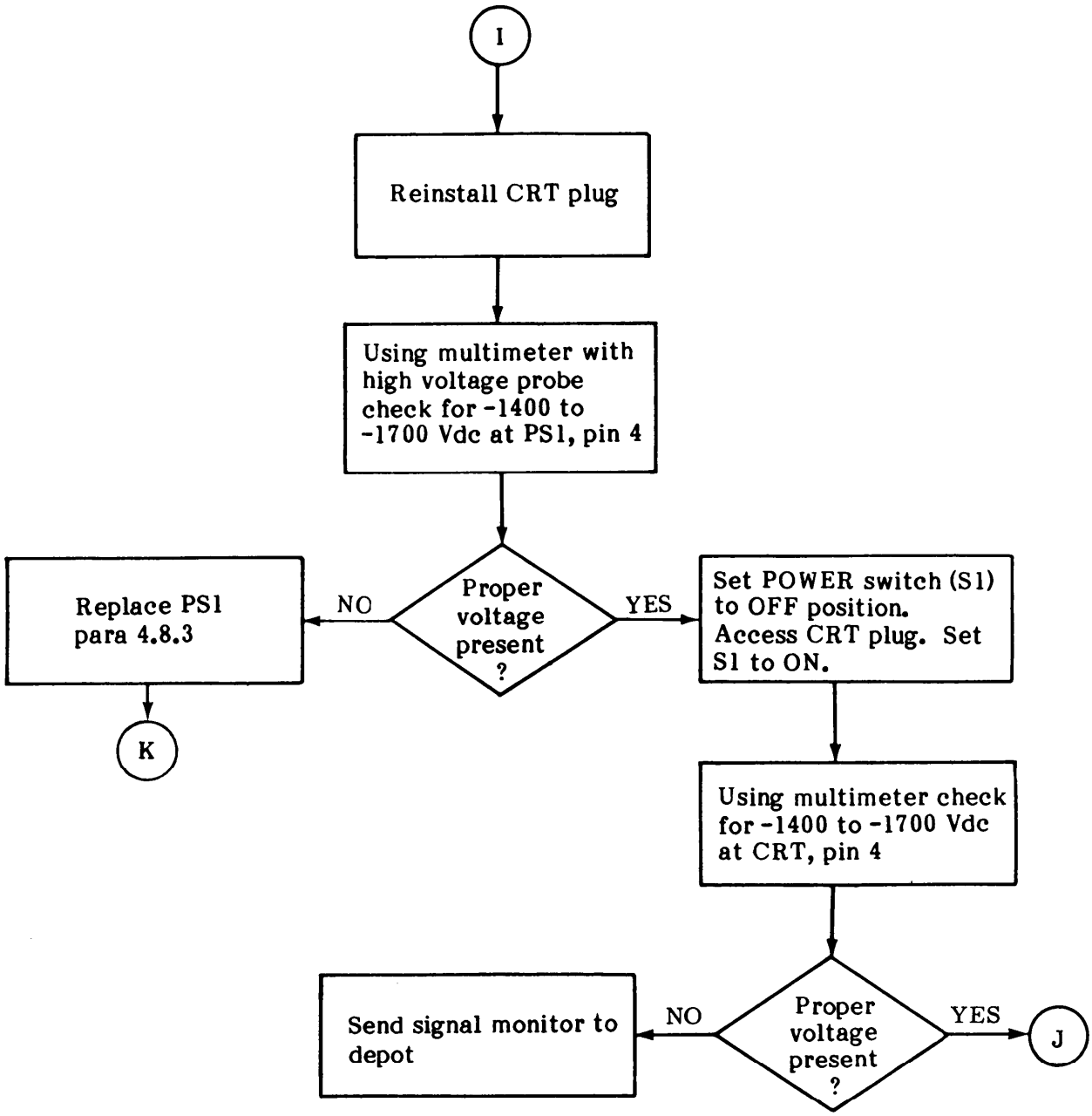

F
Access DC-AC converter assembly (A2)
Using multimeter check for 6.3 Vac at A2, E3 and A2, E4
Proper voltage present ?
NO
YES
G
Replace A2 assembly para 4.8.2
K

TABLE 4-1


G
Visually check that CRT (V1) heater filament glows
Filament glows ?
NO
YES
H
Set POWER switch (S1) to OFF position. Access CRT plug. Turn S1 to ON.
Using multimeter check for 6.3 Vac at CRT, pins 3 and 8
depot
present ?
para 4.8.3.2
K


H
Access SWEEP GENERATOR and HORIZONTAL AMP A3A2
Using multimeter check for 80 to 100 Vdc at A3A2, E7 to ground and E3 to ground
Proper voltage present ?
NO
Send signal monitor to depot
YES
Set POWER switch (S1) to OFF position. Access CRT plug. Set S1 to ON.
Using multimeter check for 80 to 100 Vdc at pins 1 and 2 of CRT
Proper voltage present ?
NO
Send signal monitor to depot
YES
I


I
Reinstall CRT plug
Using multimeter with high voltage probe check for -1400 to -1700 Vdc at PS1, pin 4
Proper voltage present ?
NO
YES
Replace PS1 para 4.8.3
K
Set POWER switch (S1) to OFF position. Access CRT plug. Set S1 to ON.
Using multimeter check for -1400 to -1700 Vdc at CRT, pin 4
Proper voltage present ?
NO
YES
Send signal monitor to depot
J

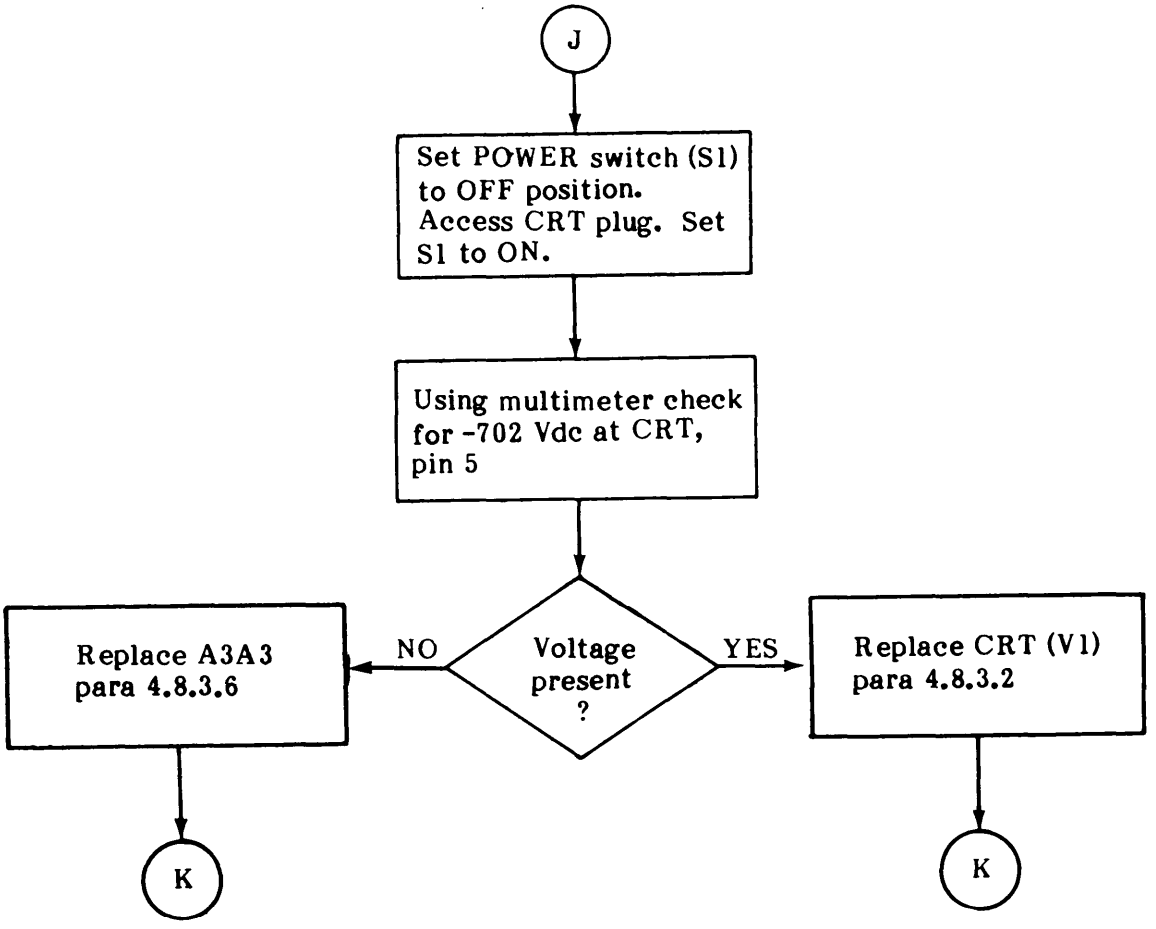
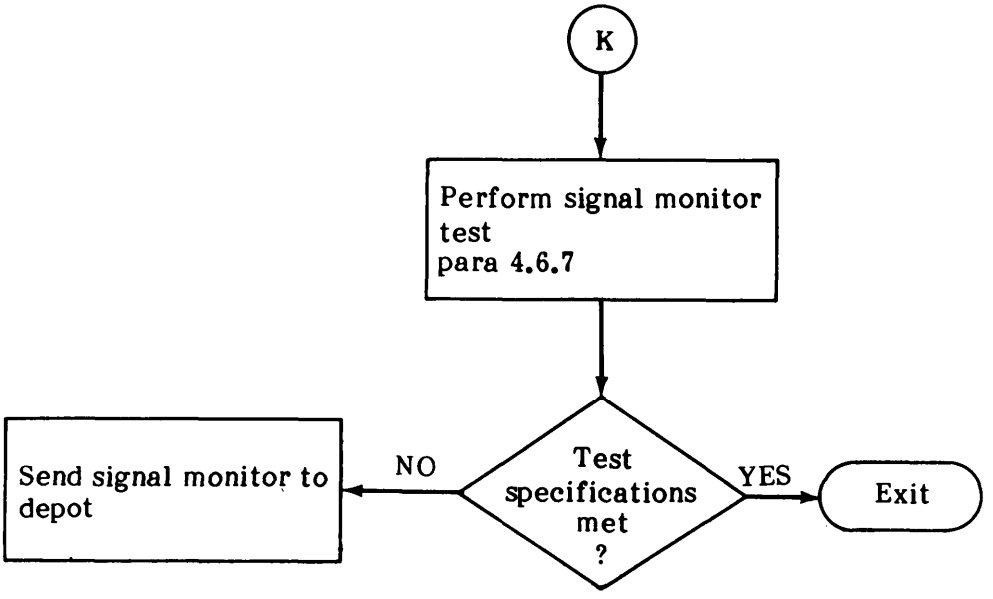

J
Set POWER switch (S1) to OFF position. Access CRT plug. Set S1 to ON.
Using multimeter check for -702 Vdc at CRT, pin 5
Voltage present ?
NO
YES
Replace A3A3 para 4.8.3.6
Replace CRT (V1) para 4.8.3.2
K
K

TABLE 4-1


K
Perform signal monitor test para 4.6.7
Test specifications met ?
NO
YES
Send signal monitor to depot
Exit

NO RF SIGNAL ON CRT

INITIAL SETUP

Test Equipment

Signal Generator	SG-1112(V) I/U
RF Voltmeter	Boonton 92C
Power Supply	PP 6547/U

Tools

No. 1 Phillips Screwdriver	5120-00-240-8716
4 Inch Flat Tip Screwdriver	5120-00-222-8852

Replacement Parts

FAmp #1 (A3A1A1)	370542-2
IF Amp #2(A3AlA2)	370543-2

General Safety Instructions

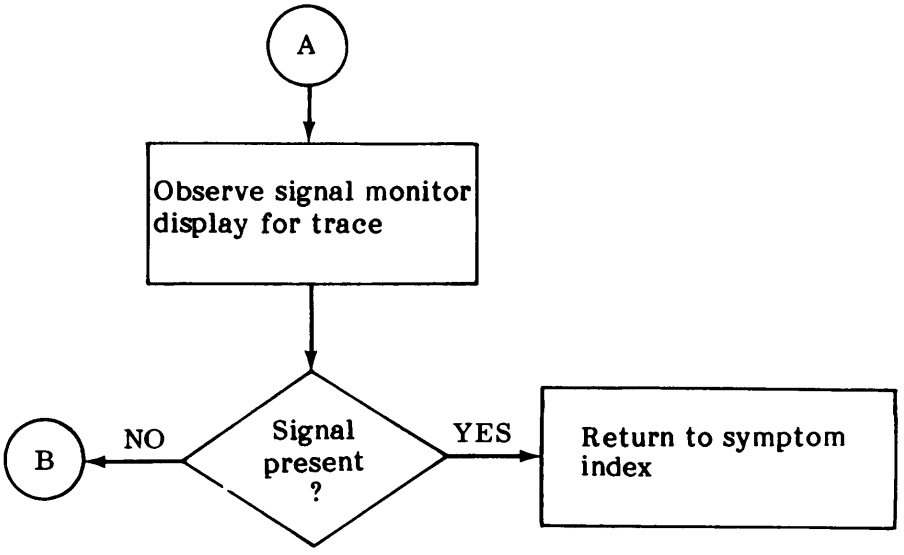
None

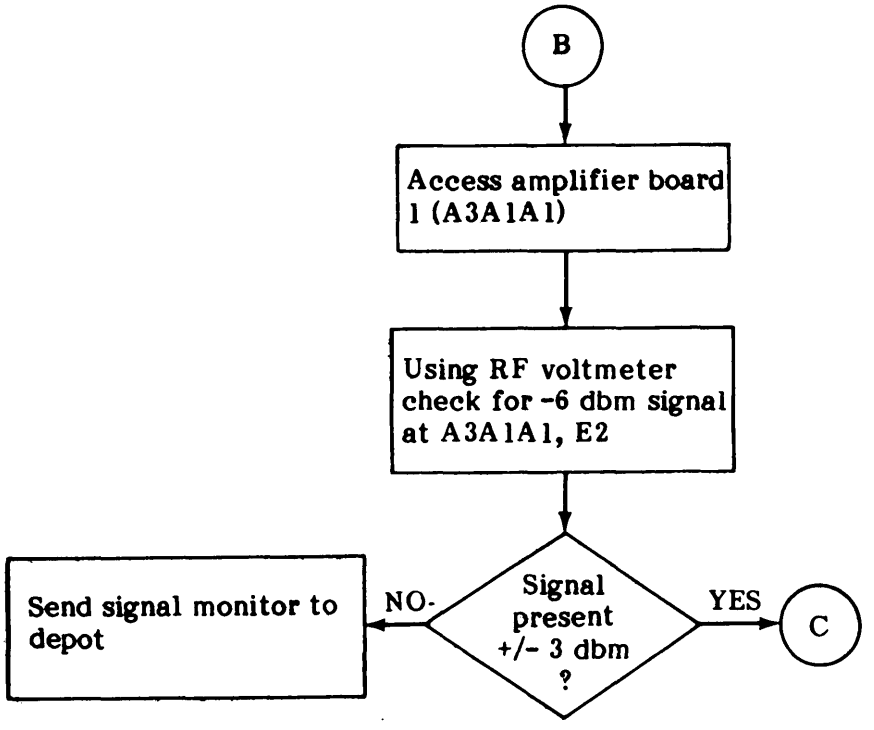
Equipment Condition

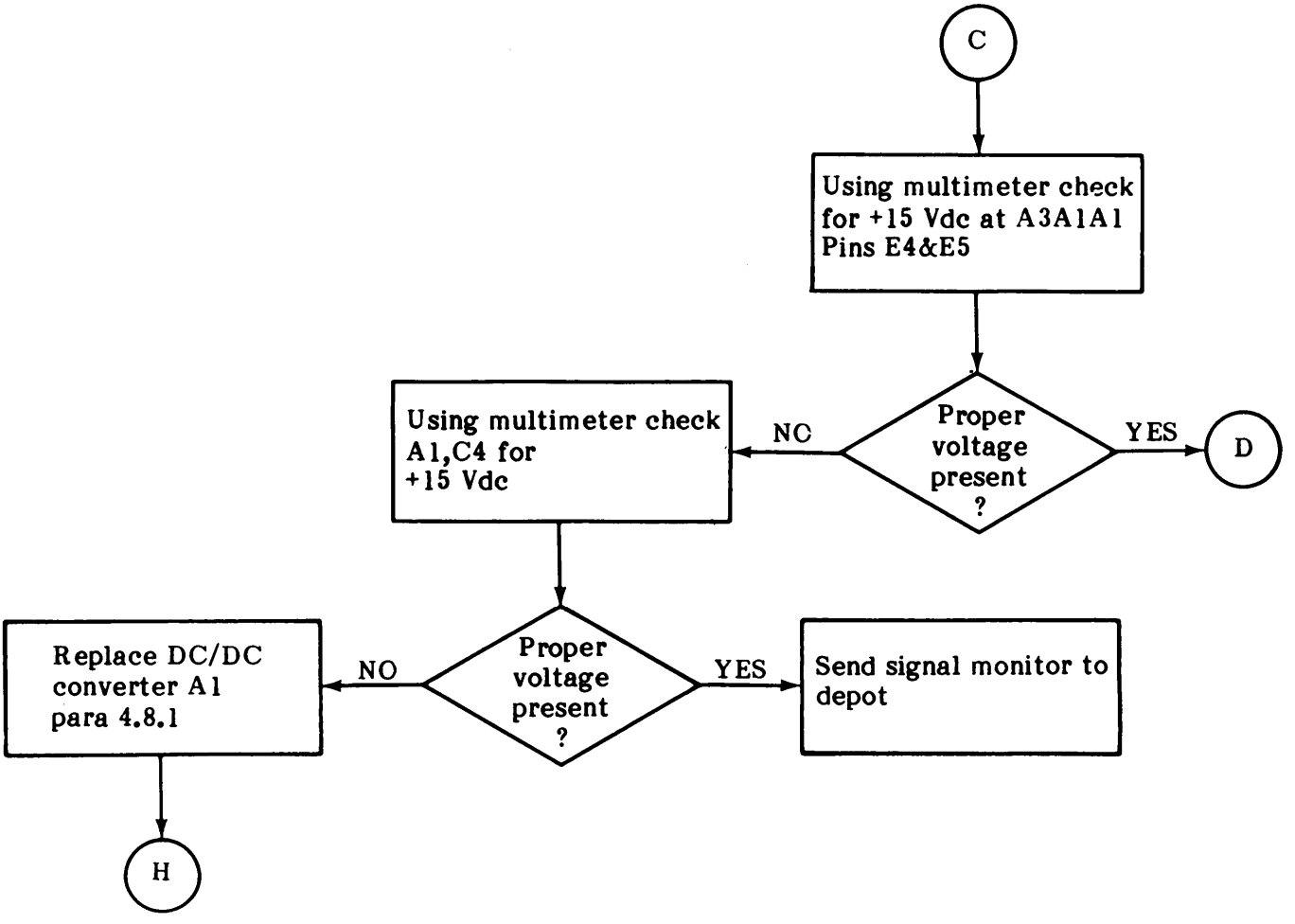
POWER switch (Sl) set to ON.
Signal generator set to 10 MHz @-10dbm.
Signal generator connected to SM IN (J3).
INTEN control (A3R2) set fully clockwise.
Focus control (A3R4) set to mid-range.
SM GAIN Control (AIR1) set to mid-range.
CENTER FREQ control (Rl) set to mid-range.
SWEEP RATE control (Rl) set to mid-range.
SWEEP WIDTH control (A1R6) set fully clockwise.
SWEEP REVERSE switch (S3) set in UP position.
MARKER switch (A3S1) set to OFF.
Protective covers removed.
Power supply set to 24 Vdc connected to J 5.

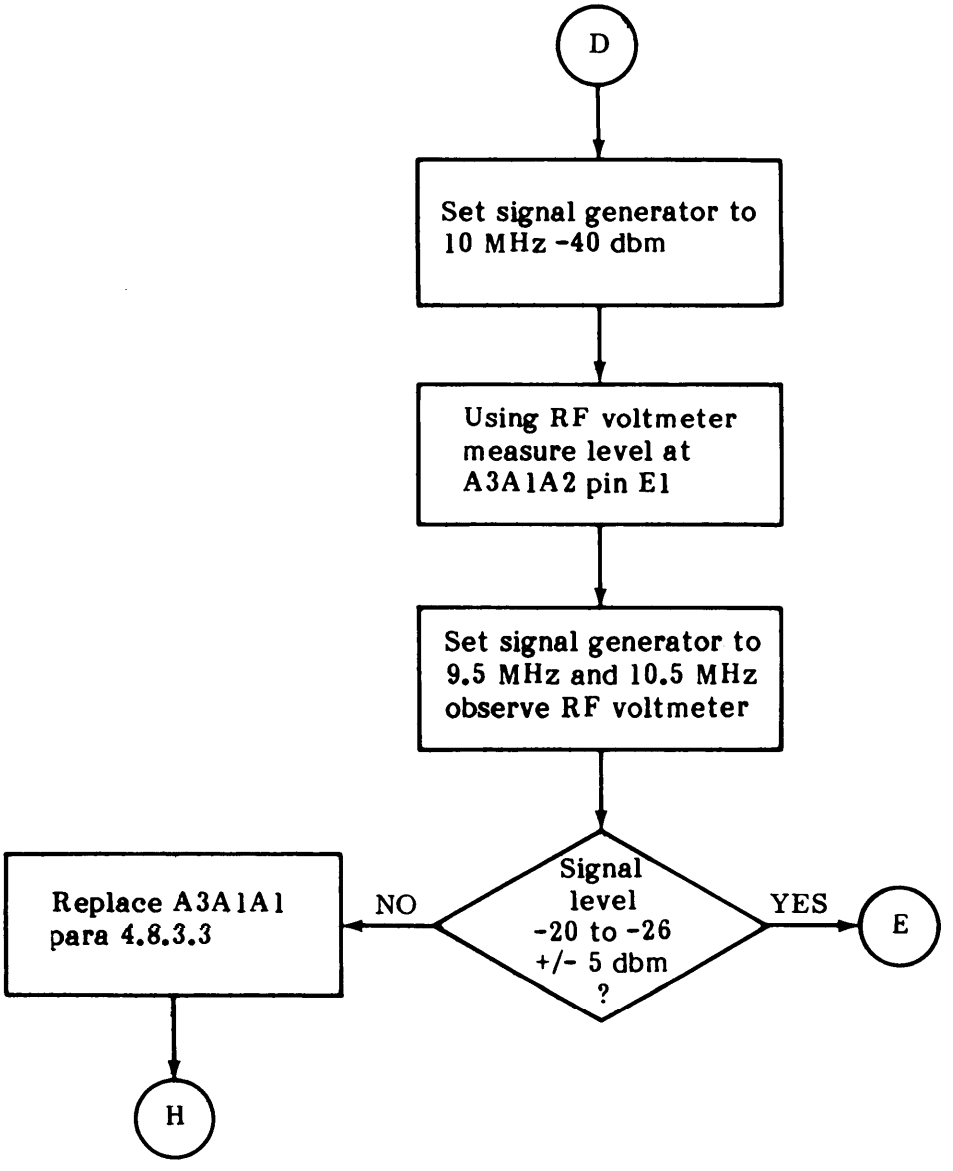
NOTE

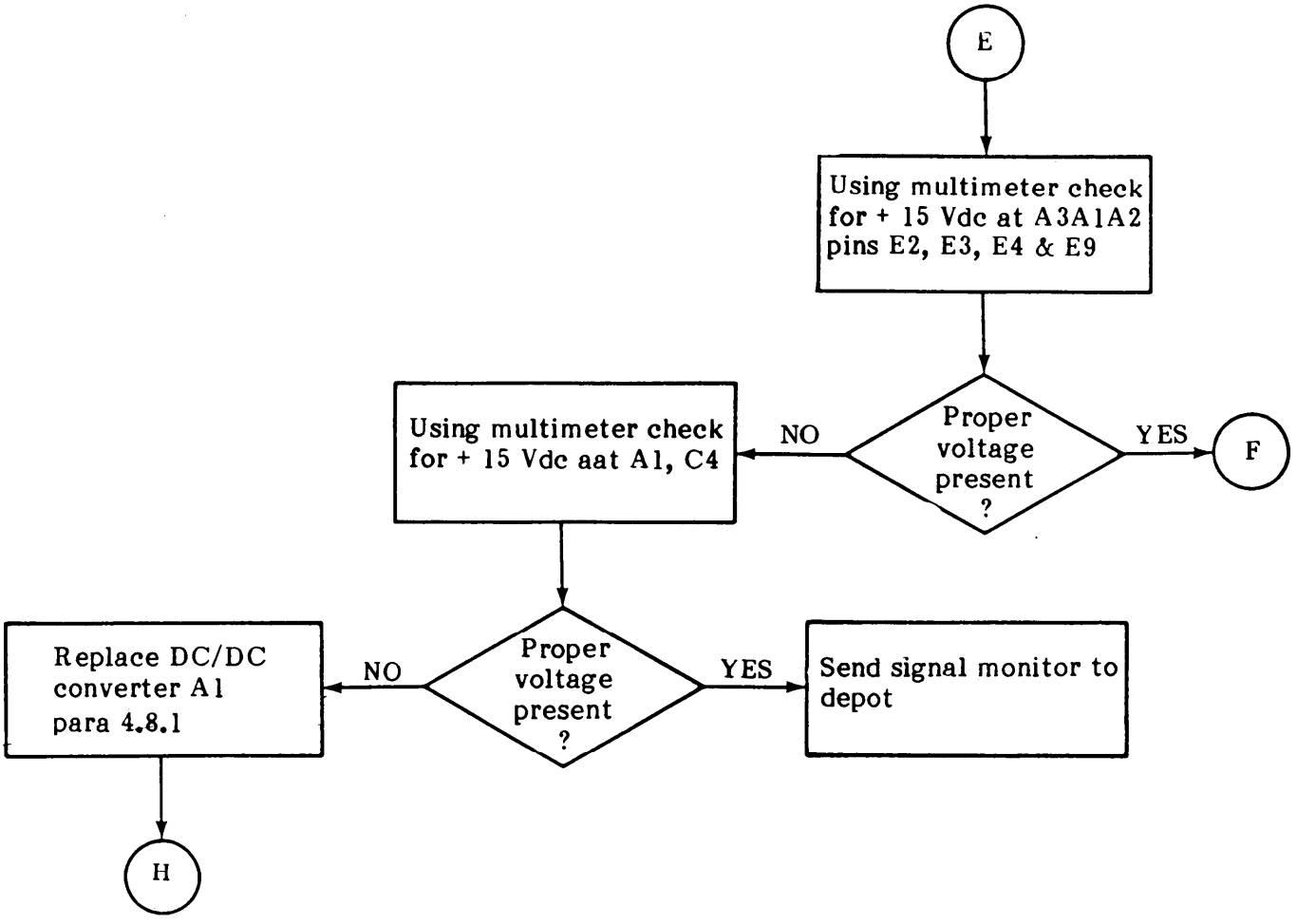
Minimum of 30 minutes warm-up time is required prior to starting trouble shooting procedures.

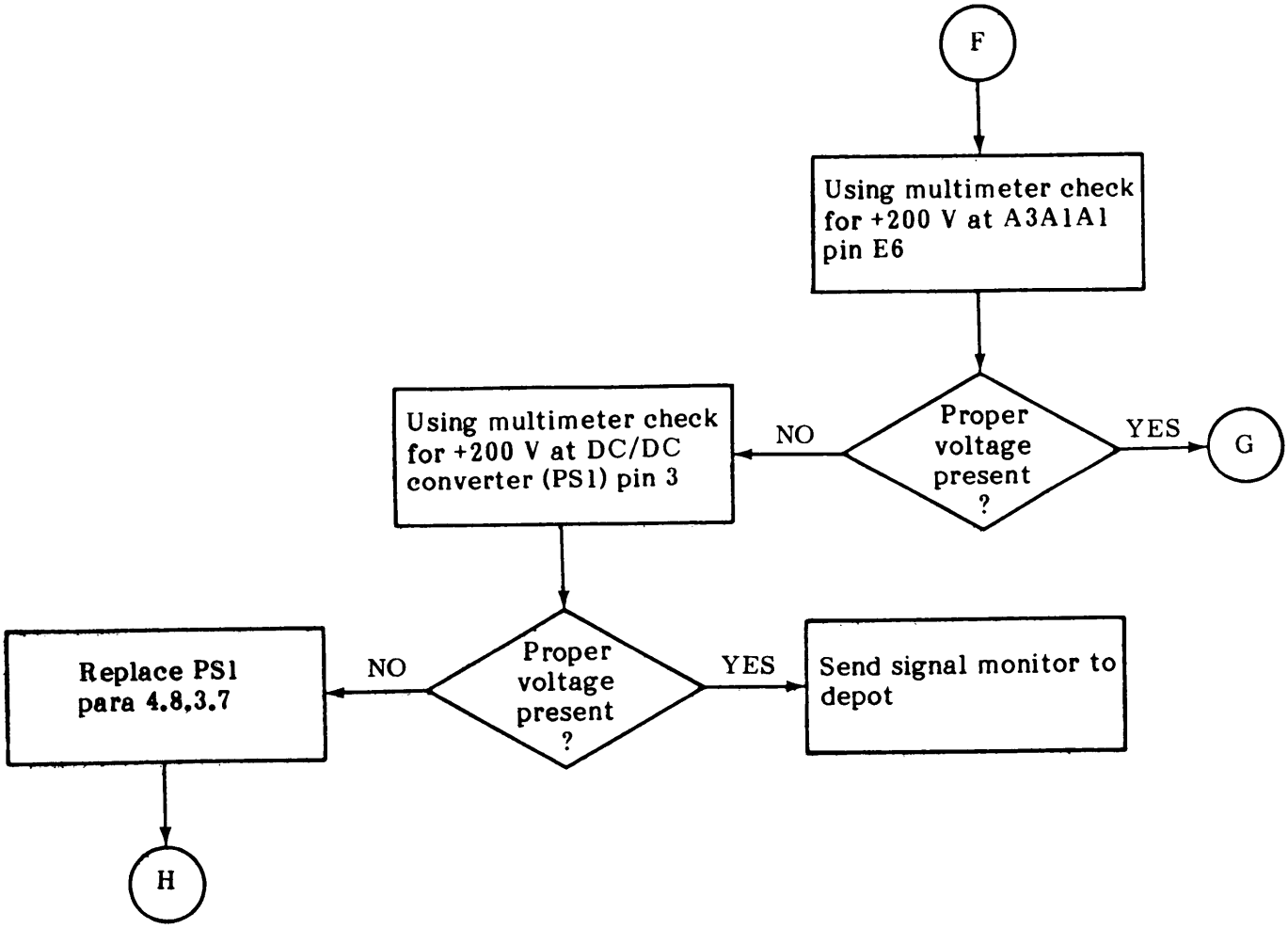

A
Observe signal monitor display for trace
Signal present ?
NO
B
YES
Return to symptom index

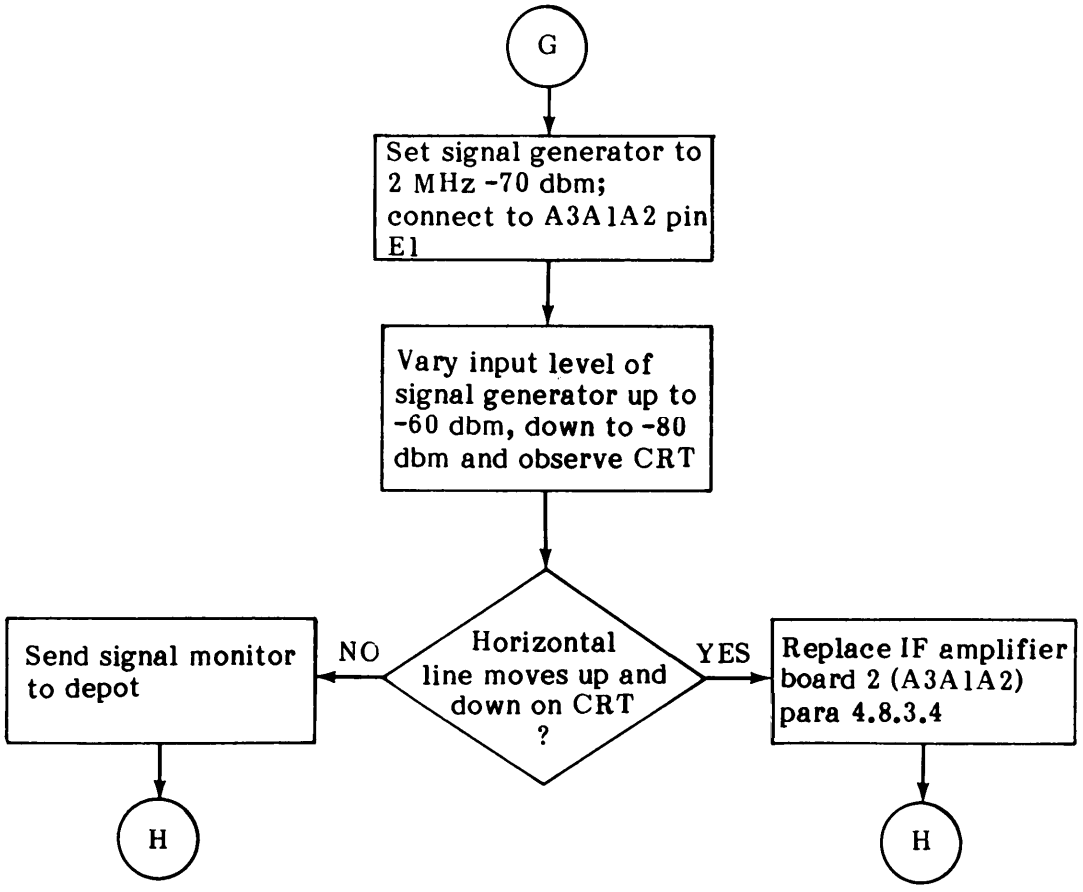

B
Access amplifier board 1 (A3A1A1)
Using RF voltmeter check for -6 dbm signal at A3A1A1, E2
Signal present +/- 3 dbm ?
NO
YES
Send signal monitor to depot
C


C
Using multimeter check for +15 Vdc at A3A1A1 Pins E4&E5
Proper voltage present ?
NO
YES
D
Using multimeter check A1,C4 for +15 Vdc
Proper voltage present ?
NO
YES
Replace DC/DC converter A1 para 4.8.1
Send signal monitor to depot
H


D
Set signal generator to 10 MHz -40 dbm
Using RF voltmeter measure level at A3A1A2 pin E1
Set signal generator to 9.5 MHz and 10.5 MHz observe RF voltmeter
Signal level -20 to -26 +/- 5 dbm ?
NO
YES
E
Replace A3A1A1 para 4.8.3.3
H


E
Using multimeter check for + 15 Vdc at A3A1A2 pins E2, E3, E4 & E9
Proper voltage present ?
NO
YES
F
Using multimeter check for + 15 Vdc aat A1, C4
Proper voltage present ?
NO
YES
Replace DC/DC converter A1 para 4.8.1
Send signal monitor to depot
H


F
Using multimeter check for +200 V at A3A1A1 pin E6
Proper voltage present ?
YES
G
NO
Using multimeter check for +200 V at DC/DC converter (PS1) pin 3
Proper voltage present ?
YES
Send signal monitor to depot
NO
Replace PS1 para 4.8.3.7
H


G
Set signal generator to 2 MHz -70 dbm; connect to A3A1A2 pin E1
Vary input level of signal generator up to -60 dbm, down to -80 dbm and observe CRT
Horizontal line moves up and down on CRT ?
NO
YES
Send signal monitor to depot
Replace IF amplifier board 2 (A3A1A2) para 4.8.3.4
H
H

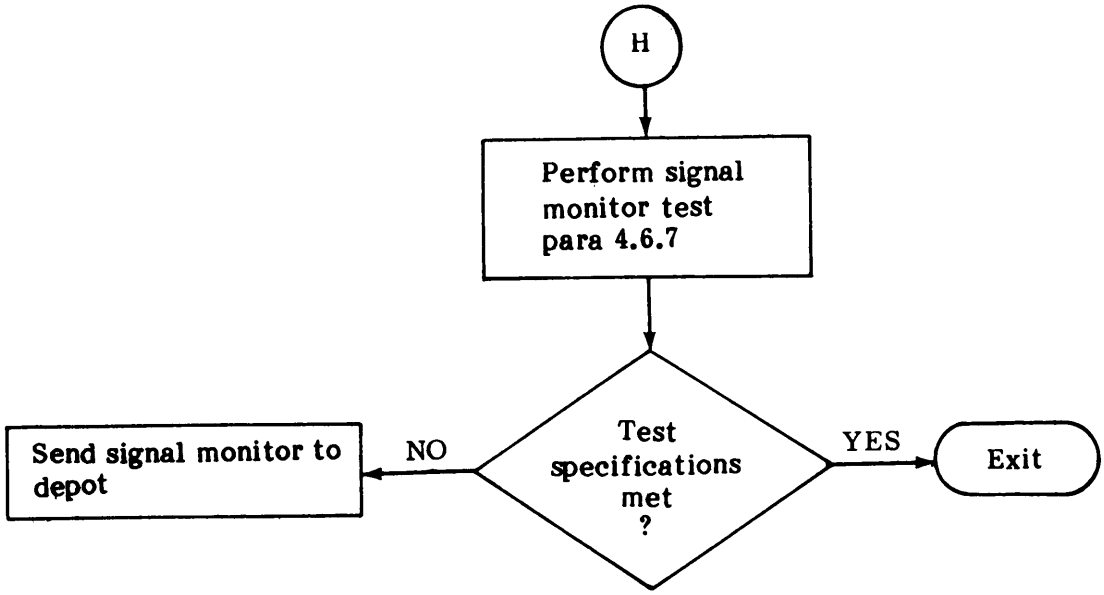

H
Perform signal monitor test para 4.6.7
Test specifications met ?
NO
Send signal monitor to depot
YES
Exit

TABLE 4-1

POWER LAMP DOES NOT LIGHT

INITIAL SETUP

Test Equipment		Equipment Condition
Multimeter	AN/PSM-45	POWER switch (S1) set to ON.

Tools	
4 Inch Flat Tip Screwdriver	5120-00-222-8852

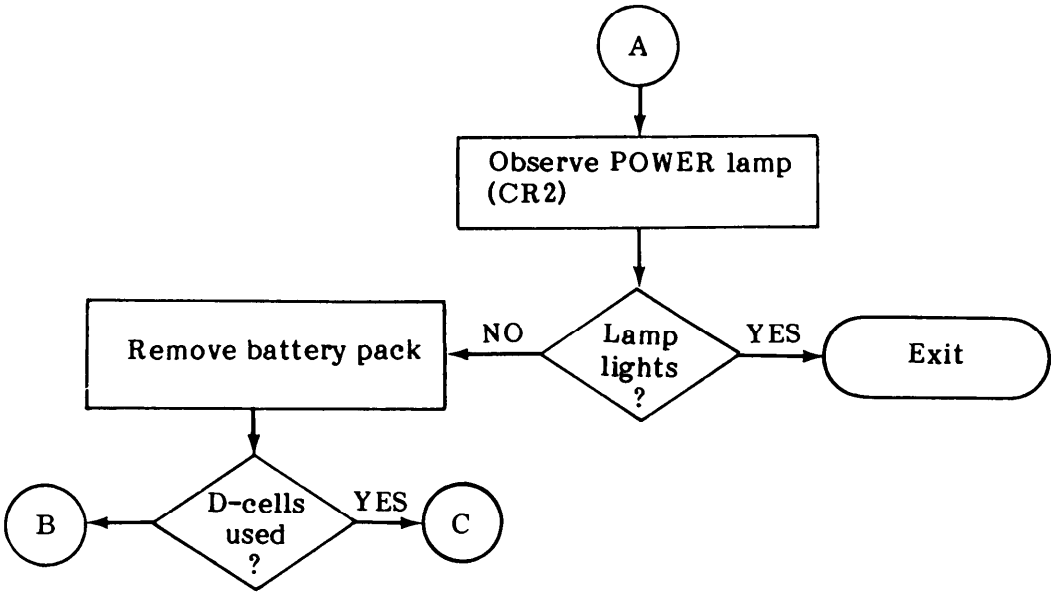
Replacement Parts	
Battery	BA-4386/PRC-25
D-Cells	BA 30
Battery Pack	
Fuse (Fl)	MDL-3/4
Plug (P1)	103-1
Jack (J2)	GC075
Signal Monitor	
Fuse (Fl)	MDL-3/4
Power Switch (S1)	8280K16
Battery Test Switch (S2)	30-1
DC-DC Converter (Al)	791794
Power Lamp (CR2)	5D82-4860

General Safety Instructions

None

NOTE

Minimum of 30 miniutes warm-up time is required prior to starting trouble shooting procedures.


A
Observe POWER lamp (CR2)
Lamp lights ?
NO
YES
Exit
Remove battery pack
D-cells used ?
YES
B
C

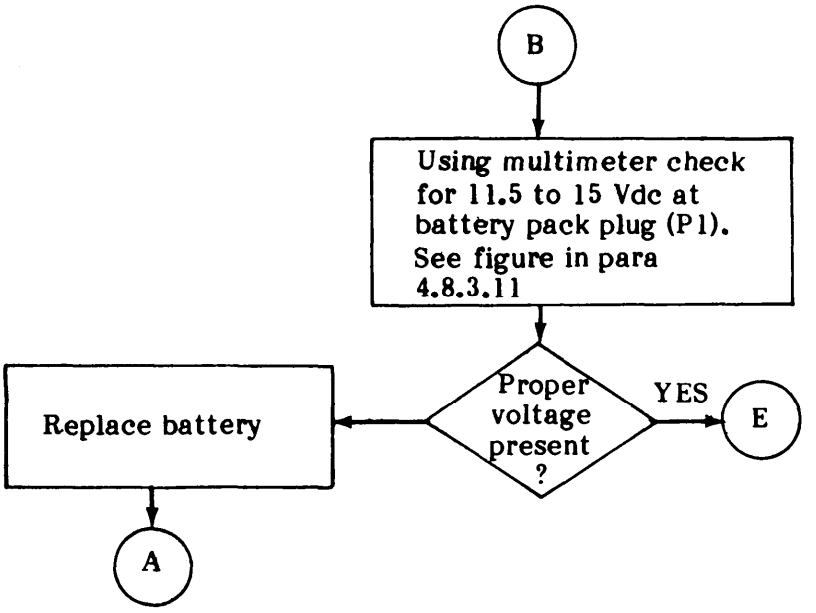
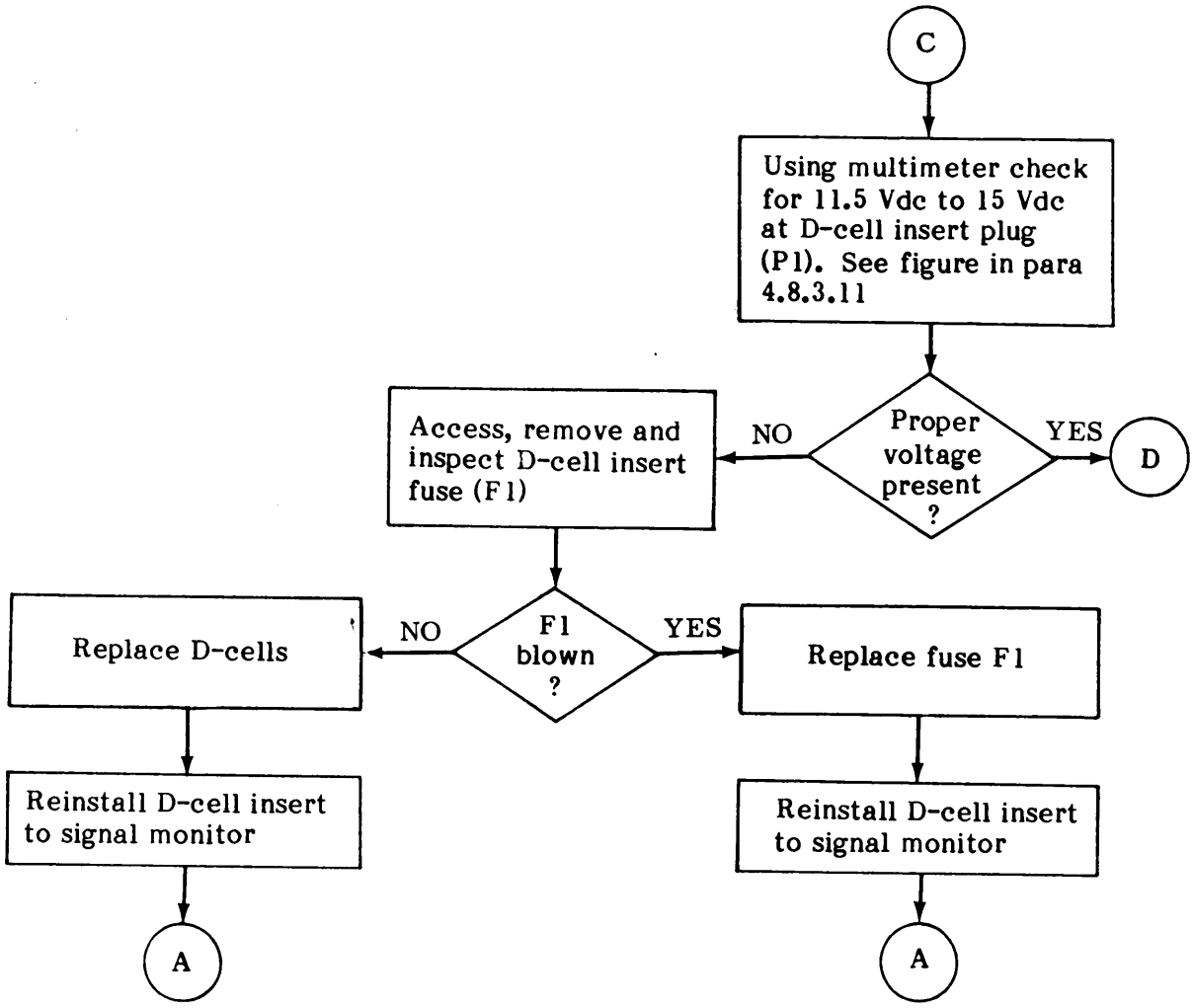
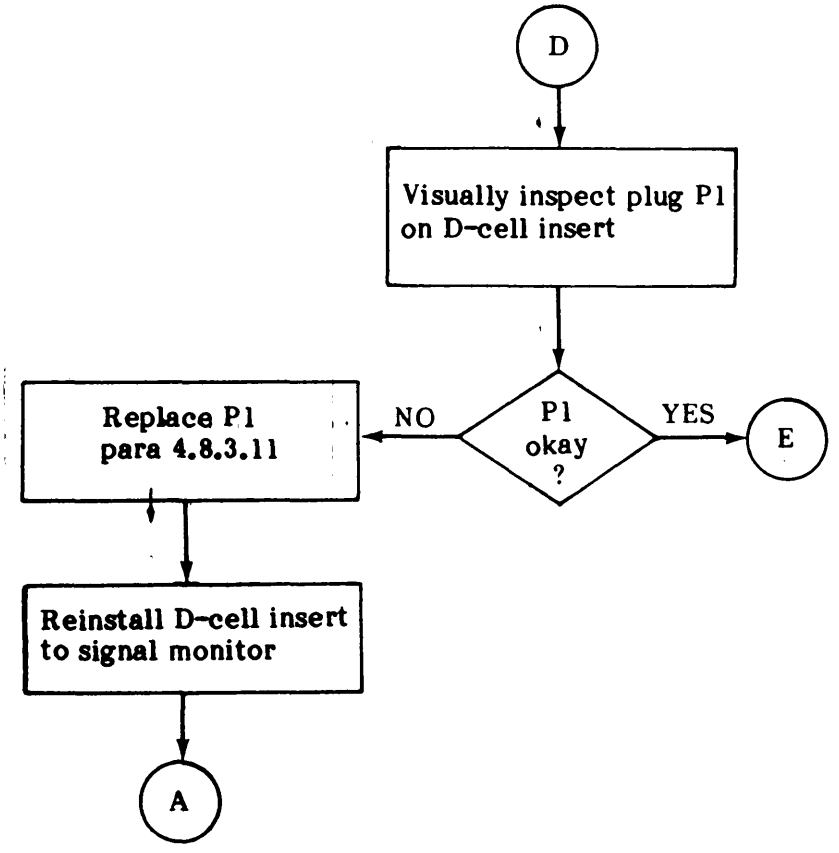
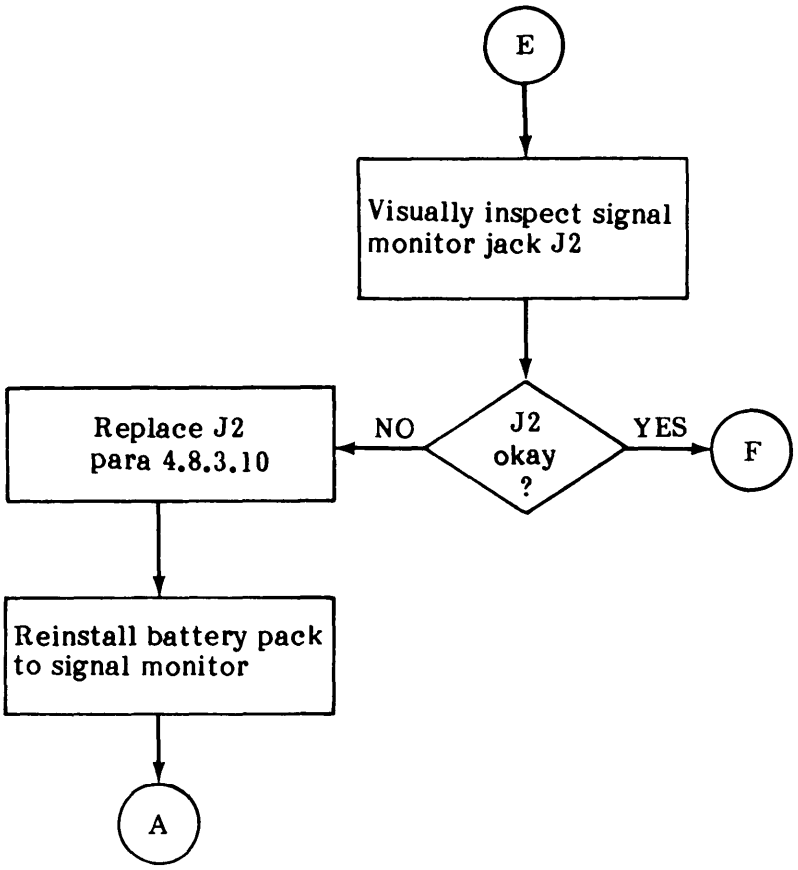
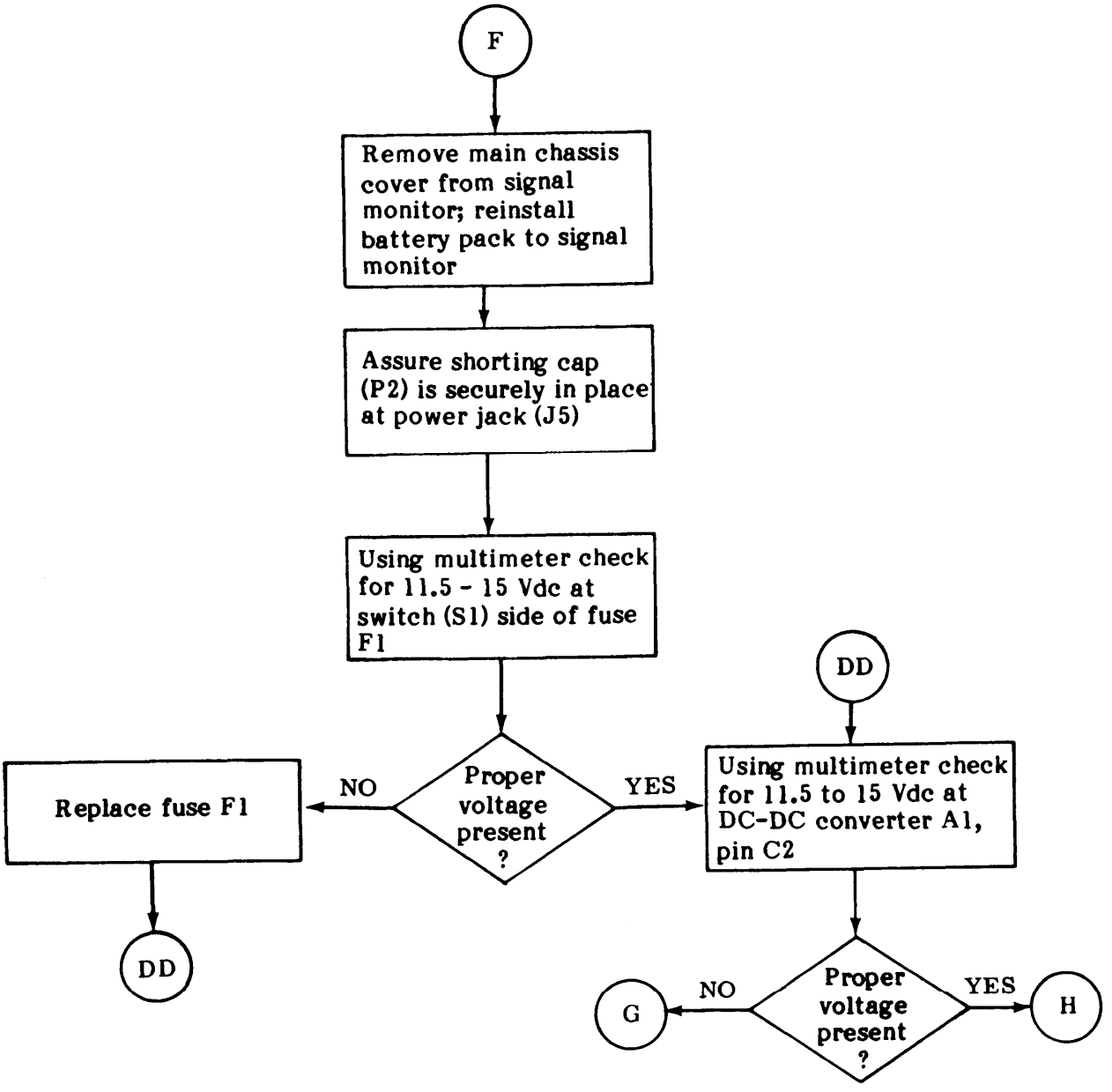

B
Using multimeter check for 11.5 to 15 Vdc at battery pack plug (P1). See figure in para 4.8.3.11
Proper voltage present ?
YES
E
Replace battery
A

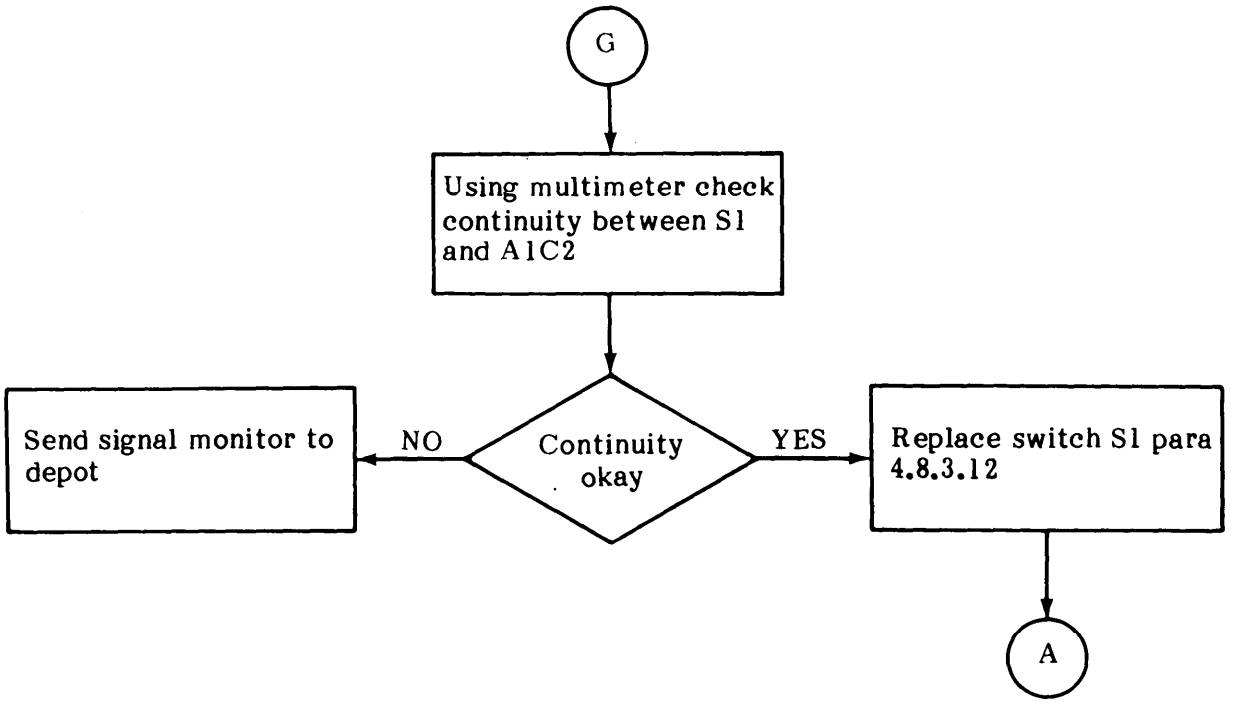
TABLE 4-1


C
Using multimeter check for 11.5 Vdc to 15 Vdc at D-cell insert plug (P1). See figure in para 4.8.3.11
Proper voltage present ?
NO
YES
D
Access, remove and inspect D-cell insert fuse (F1)
F1 blown ?
NO
YES
Replace D-cells
Replace fuse F1
Reinstall D-cell insert to signal monitor
Reinstall D-cell insert to signal monitor
A
A


D
Visually inspect plug P1 on D-cell insert
P1 okay ?
NO
YES
E
Replace P1 para 4.8.3.11
Reinstall D-cell insert to signal monitor
A


E
Visually inspect signal monitor jack J2
J2 okay ?
NO
YES
F
Replace J2 para 4.8.3.10
Reinstall battery pack to signal monitor
A


F
Remove main chassis cover from signal monitor; reinstall battery pack to signal monitor
Assure shorting cap (P2) is securely in place at power jack (J5)
Using multimeter check for 11.5 - 15 Vdc at switch (S1) side of fuse F1
Proper voltage present ?
NO
YES
Replace fuse F1
DD
DD
Using multimeter check for 11.5 to 15 Vdc at DC-DC converter A1, pin C2
Proper voltage present ?
NO
YES
G
H


G
Using multimeter check continuity between S1 and A1C2
Continuity okay
NO
Send signal monitor to depot
YES
Replace switch S1 para 4.8.3.12
A

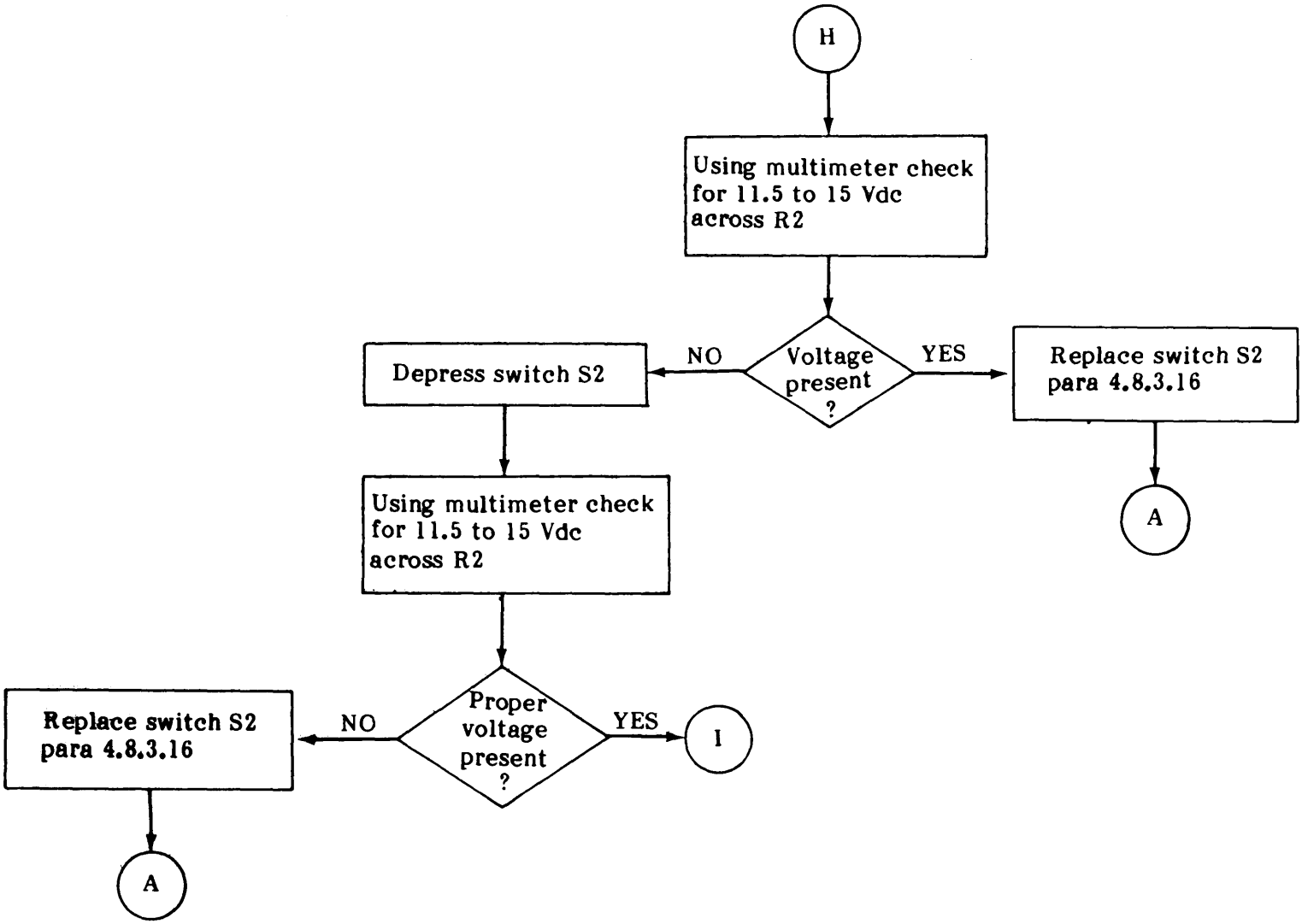
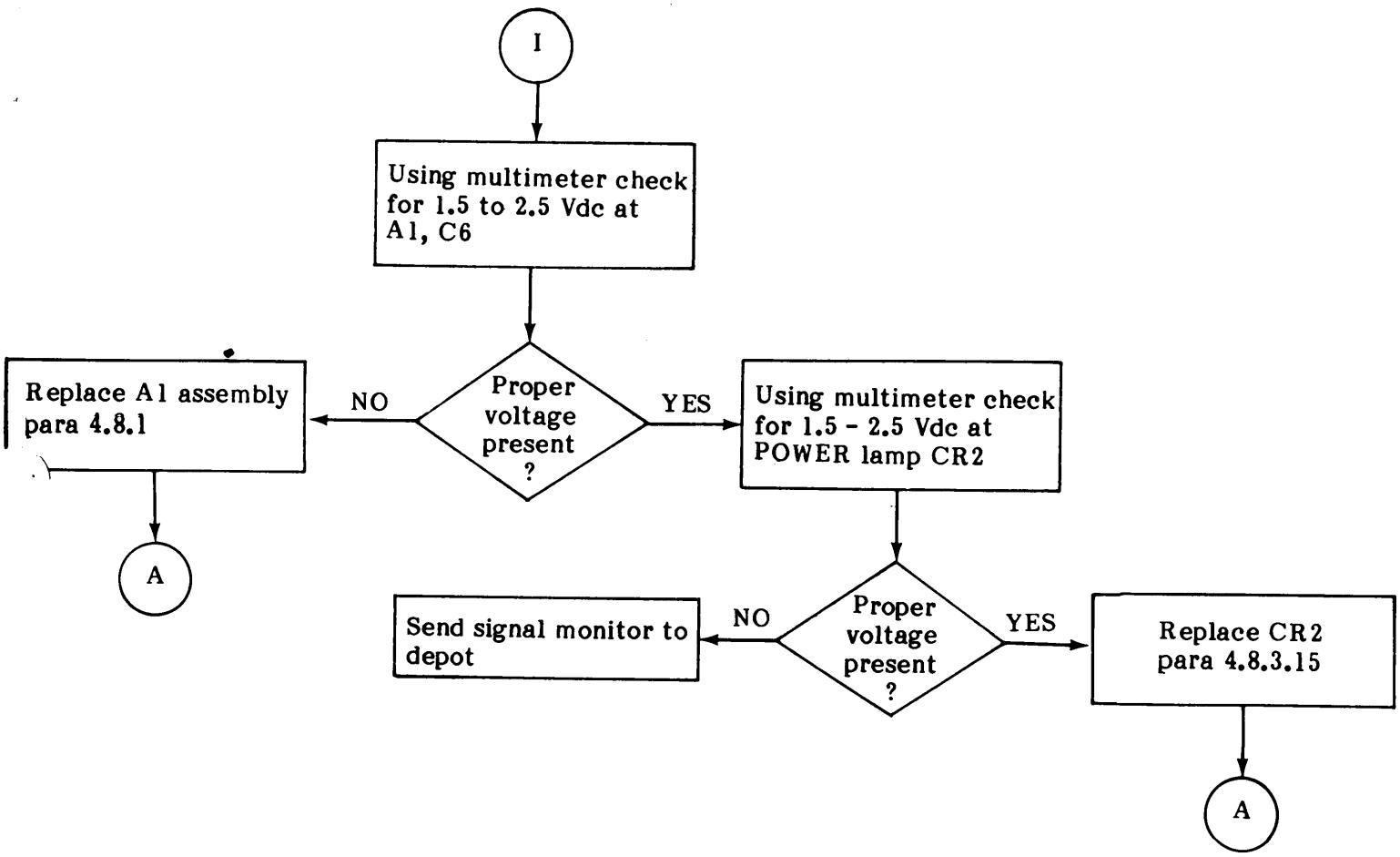

H
Using multimeter check for 11.5 to 15 Vdc across R2
Voltage present ?
NO
YES
Depress switch S2
Replace switch S2 para 4.8.3.16
A
Using multimeter check for 11.5 to 15 Vdc across R2
Proper voltage present ?
NO
YES
Replace switch S2 para 4.8.3.16
I
A

TABLE 4-1


I
Using multimeter check for 1.5 to 2.5 Vdc at A1, C6
Proper voltage present ?
NO
Replace A1 assembly para 4.8.1
A
YES
Using multimeter check for 1.5 - 2.5 Vdc at POWER lamp CR2
Proper voltage present ?
NO
Send signal monitor to depot
YES
Replace CR2 para 4.8.3.15
A

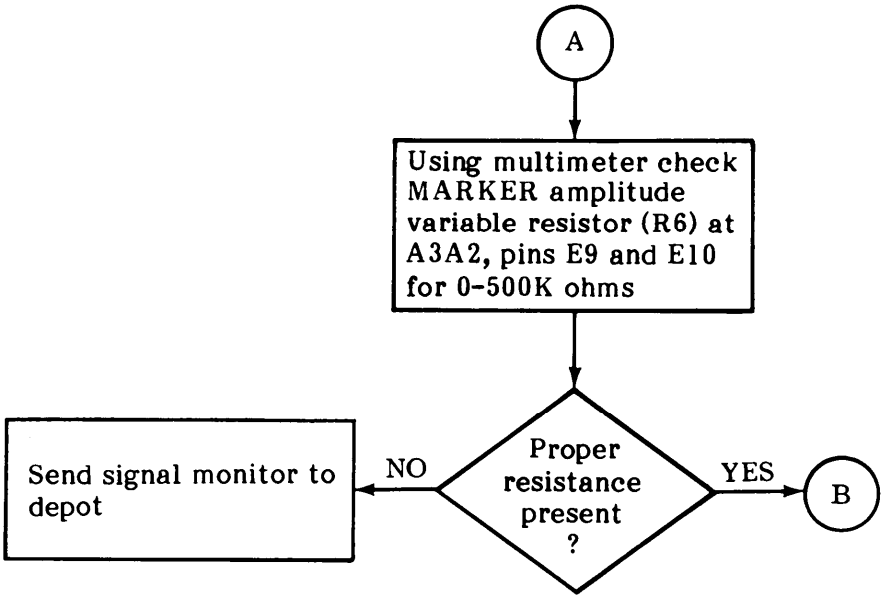
NO MARKER ON CRT

INITIAL SETUP

Test Equipment		Equipment Condition
Multimeter	AN/USM-45	POWER switch set to OFF.
Test Lead Set	Simpson 00577	INTEN control set fully clockwise.
Power Supply	PP-6647/U	Focus control set to mid-range.
Oscilloscope	AN/USM-281C	SM GAIN control set to mid-range.
Voltage Probe	10X TEK P6006	CENTER FREQ control set to mid-range.
Tools		SWEEP RATE control set to mid-range.
4 Inch Flat Tip Screwdriver	5120-00-222-8852	SWEEP WIDTH control set fully clockwise.
Replacement Parts		SWEEP REVERSE switch set in up position.
Marker Switch (A3S1)		MARKER switch set to ON.
General Safety Instructions		Protective covers removed.
None		Power supply set to 24 Vdc and connected to J5.

NOTE

Minimum of 30 minutes warm-up time is required prior to starting trouble shooting procedures.


A
Using multimeter check MARKER amplitude variable resistor (R6) at A3A2, pins E9 and E10 for 0-500K ohms
Proper resistance present ?
NO
YES
Send signal monitor to depot
B

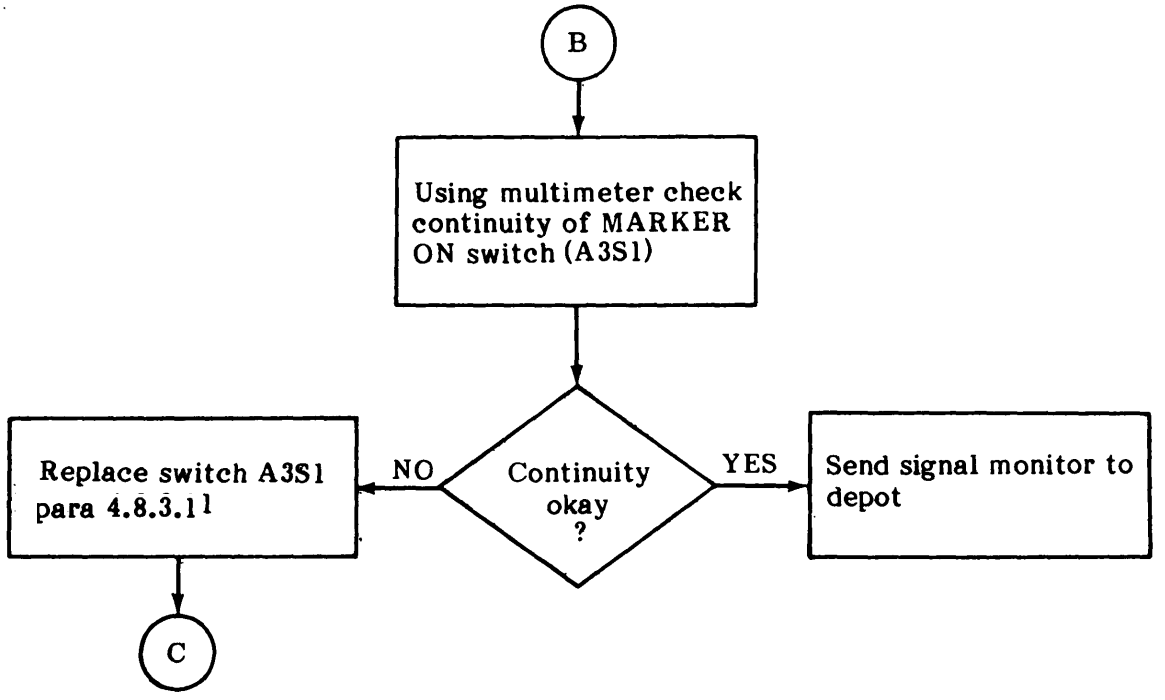
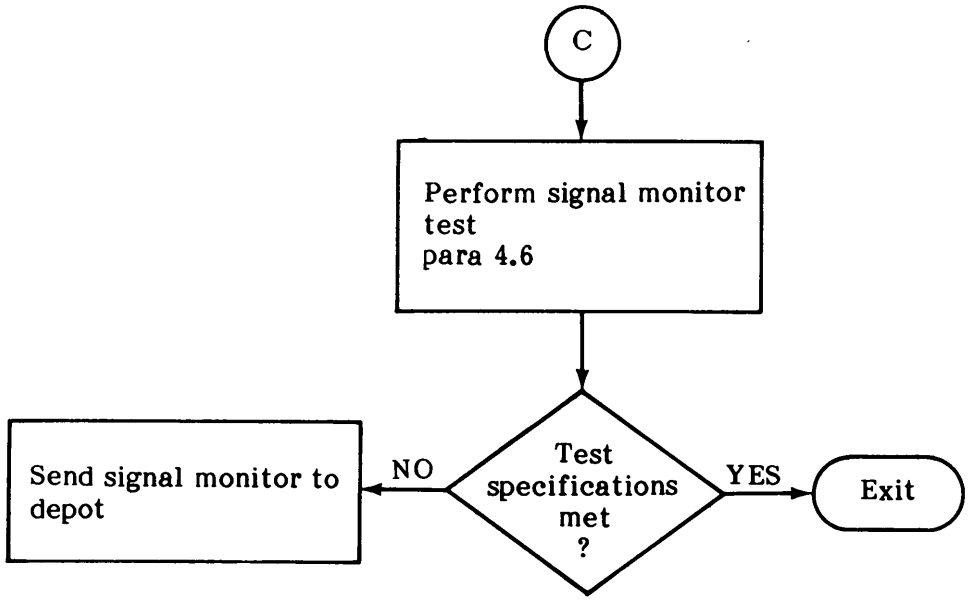

B
Using multimeter check continuity of MARKER ON switch (A3S1)
Continuity okay ?
NO
YES
Replace switch A3S1 para 4.8.3.11
Send signal monitor to depot
C

TABLE 4-1


C
Perform signal monitor test para 4.6
Test specifications met ?
NO
YES
Send signal monitor to depot
Exit

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit method follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consists of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Refe~ence Designation Prefixes are provided on drawings and illustrations in parenthesis within the figure titles.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
00629	Eby Sales Company, Inc. 148-05 Archer Avenue Jamaica, New York 11435
01121	Allen-Bradley Company l201 South 2nd Street Milwaukee, Wisconsin 53204
01281	TRW Semiconductors, Inc. 14520 Aviation Boulevard Lawndale, California 90260
02114	Ferroxcube Corporation P. O. Box 359 Mt. Marion Road Saugerties, New York 12477
02735	RCA Corporation Solid State Division Route 202 Somerville, New Jersey 08876
04013	Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530

Mfr. Code	Name and Address
04713	Motorola Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, Arizona 85008
07263	Fairchild Camera & Instr. Corp. Semiconductor Division 464 Ellis Street Mountain View, California 94040
07700	Technical Wire Products, Inc. 129 Dermody Street Cranford, New Jersey 07016
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20760
16237	Connector Corporation 6025 N. Keystone Avenue Chicago, Illinois 60646
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, California 94086
25350	Donald Bruce and *Company* 3600 N. Talman Street Chicago, Illinois 60618
27193	Cutler-Hammer, Incorporated Specialty Products Division 402 North 27th Street Milwaukee, Wisconsin 53216
33095	Spectrum Control Inc. 152 E. Main Street Fairview, Pennsylvania 16415
34156	Semicoa 333 McCormick Avenue Costa Mesa, California 92626
37942	P.R. Mallory and Company, Inc. 3029 E. Washington Street Indianapolis, Indiana 46206
49956	Raytheon Company 141 Spring Street Lexington, Massachusetts 02173
56289	Sprague Electric Company Marshall Street North Adams, Massachusetts 01247
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, Massachusetts 02138
71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 W. University Street St. Louis, Missouri 63107
72136	Electro Motive Mfg. Co., Inc. South Park & John Streets Willimantic, Connecticut 06226
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, California 92634

Mfg. Code	Name and Address
74306	Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013
74868	Bunker Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75042	TRW Electronic Components IRC Fixed Resistors 401 North Broad Street Philadelphia, Pennsylvania 19108
75915	Littelfuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76055	Mallory Controls Division P. O. Box 327 State Road 28 W Frankfort, Indiana 46041
80058	Joint Electronic Type Designation System
80131	Electronic Industries Assocation 2001 Eye Street, N. W. Washington, D. C. 20006
80294	Bourns, Incorporated Instrument Division 6135 Magnolia Avenue Riverside, California 92506
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525
81312	Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779
81349	Military Specifications
84411	TRW Electric Components TRW Capacitors 112 W. First Street Ogallala, Nebraska 069153
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
91767	Mite Corporation 466 Blake Street New Haven, Connecticut 06515
93332	Sylvania Electric Products, Inc. Semiconductor Products Division 100 Sylvan Road Woburn, Massachusetts 01801
94144	Raytheon Company Components Division 465 Centre Street Quincy, Massachusetts 02169
95121	Quality Components, Inc. P. O. Box 113 St. Mary's, Pennsylvania 15857

Mfg. Code	Name and Address
95146	Alco Electronics Products Inc. P. O. Box 1348 Lawrence, Massachusetts 01842
95712	Bendix Corporation Microwave Devices Plant Hurricane Road Franklin, Indiana 46131
97539	APM-Hexseal Corporation 44 Honeck Street Englewood, New Jersey 07631

5.4 PARTS LIST

The parts list which follows contains all electrical parts used in the equipment and certain mechanical parts which are subject to unusual wear or damage. When ordering replacement parts from Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in paragraph 5.3 and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semi-conductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semi-conductors designated in the manual may be substituted in every case with satisfactory results.

FIGURE 5-1
FIGURE 5-2

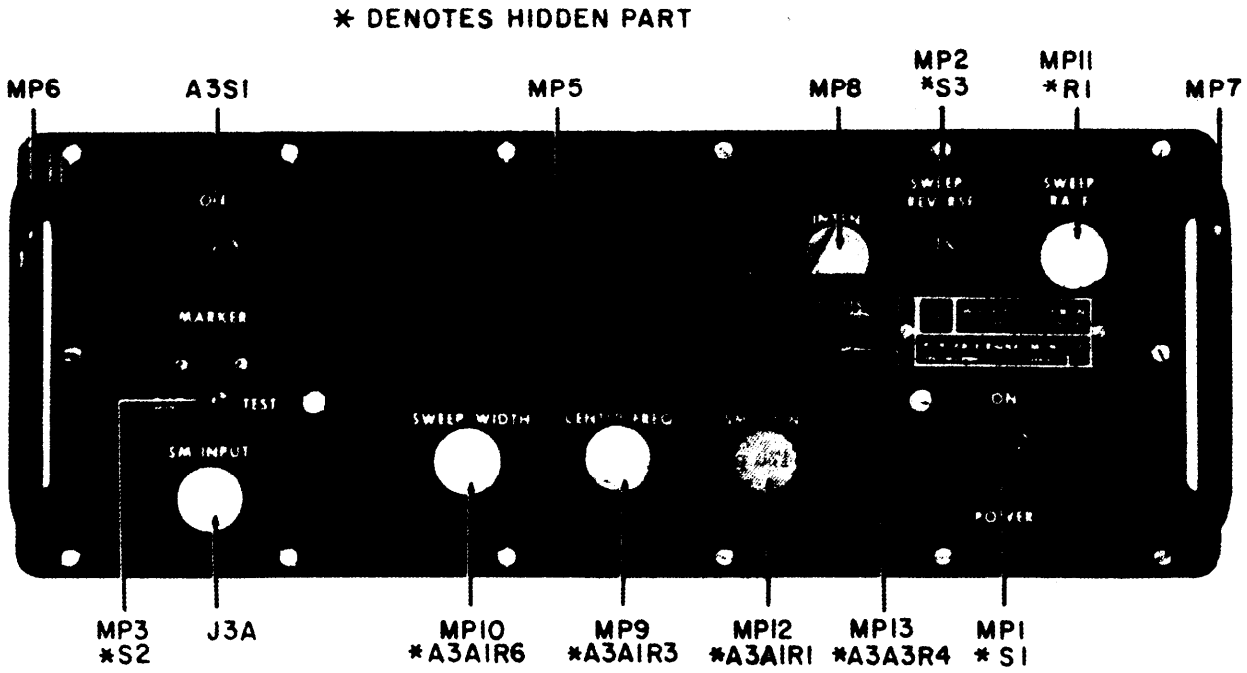


Figure 5-1. Type WJ-9180 Signal Monitor, Front View, Location of Components

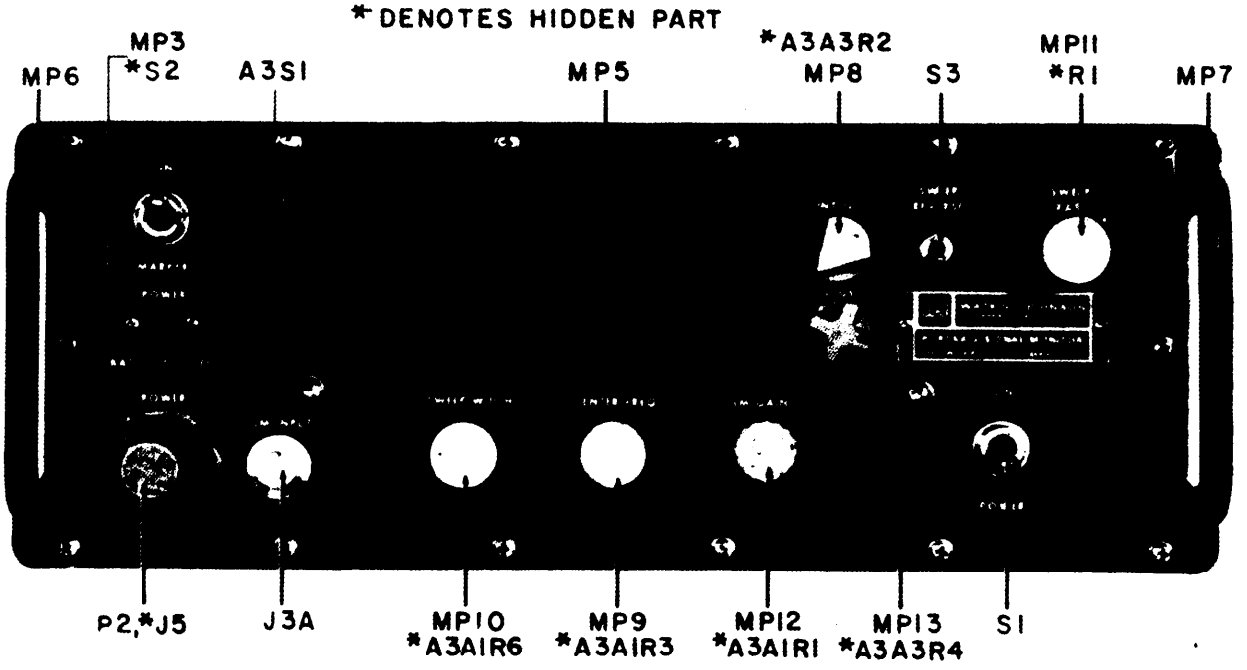


Figure 5-2. Type WJ-9180-1 Signal Monitor, Front View, Location of Components

5.5 WJ-9180 & 9180-1 PORTABLE SIGNAL MONITOR, MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
A1	DC-DC Converter	1	791794	14632	
A2	DC-AC Converter	1	76239	14632	
A3	Signal Monitor	1	791554	14632	
A4	Battery Box (Black) (WJ-9180 only)	1	791795-2	14632	
A4	Battery Box (Olive Drab) (WJ-9180-1 only)	1	791795-1	14632	
C1	Capacitor, Ceramic, Feedthru: 470 pF, 20%, 500 V	1	54-794-009-471M	33095	
C2	Capacitor, Electrolytic, Tantalum: 1 μF, 20%, 35 V (WJ-9180-1 only)	2	196D105X0035HE3	56289	
C3	Same as C2 (WJ-9180-1 only)				
CR1	Diode (WJ-9180 only)	1	1N4003	80131	04713
CR1	Diode (WJ-9180-1 only)	3	1N4003	80131	04713
CR2	Diode	1	5082-4860	28480	
CR3	Same as CR1 (WJ-9180-1 only)				
CR4	Same as CR1 (WJ-9180-1 only)				
F1	Fuse Cartridge: 3/4 AMP, 3 AG, Slow Blow (WJ-9180-1 only)	1	MDL3/4	71400	
J1	Connector, Receptacle, Multipin	1	SRE14SNSS	81312	
J2	Connector, Receptacle, Multipin	1	GC075	25350	
J3A	Connector, Jack: BNC Series	1	UG492A/U	80058	
J3B	Same as J3A				
J4	Not Used				
J5	Connector, Receptacle, Multipin (WJ-9180-1 only)	1	GC/U318/1	25350	
MP1	Toggle, Switch, Boot	2	31-86447	07700	
MP2	Same as MP1				
MP3	Pushbutton, Boot	1	N5040G	97539	
MP4	Toggle, Switch, Boot	1	N5030LRF	97539	
MP5	Window, EMI Shield	1	24040-1	14632	
MP6	Handle Modified	2	18685-1	14632	
MP7	Same as MP6				
MP8	Knob, Round	2	50-2WD-1G	94144	
MP9	Knob, Ring Skirt: Orange	1	70-2-2G-2	94144	
MP10	Knob, Ring Skirt: White	2	70-2-2G-3	94144	
MP11	Same as MP10				
MP12	Knob, Ring Skirt: Red	1	70-2-2G-4	94144	
MP13	Same as MP8				

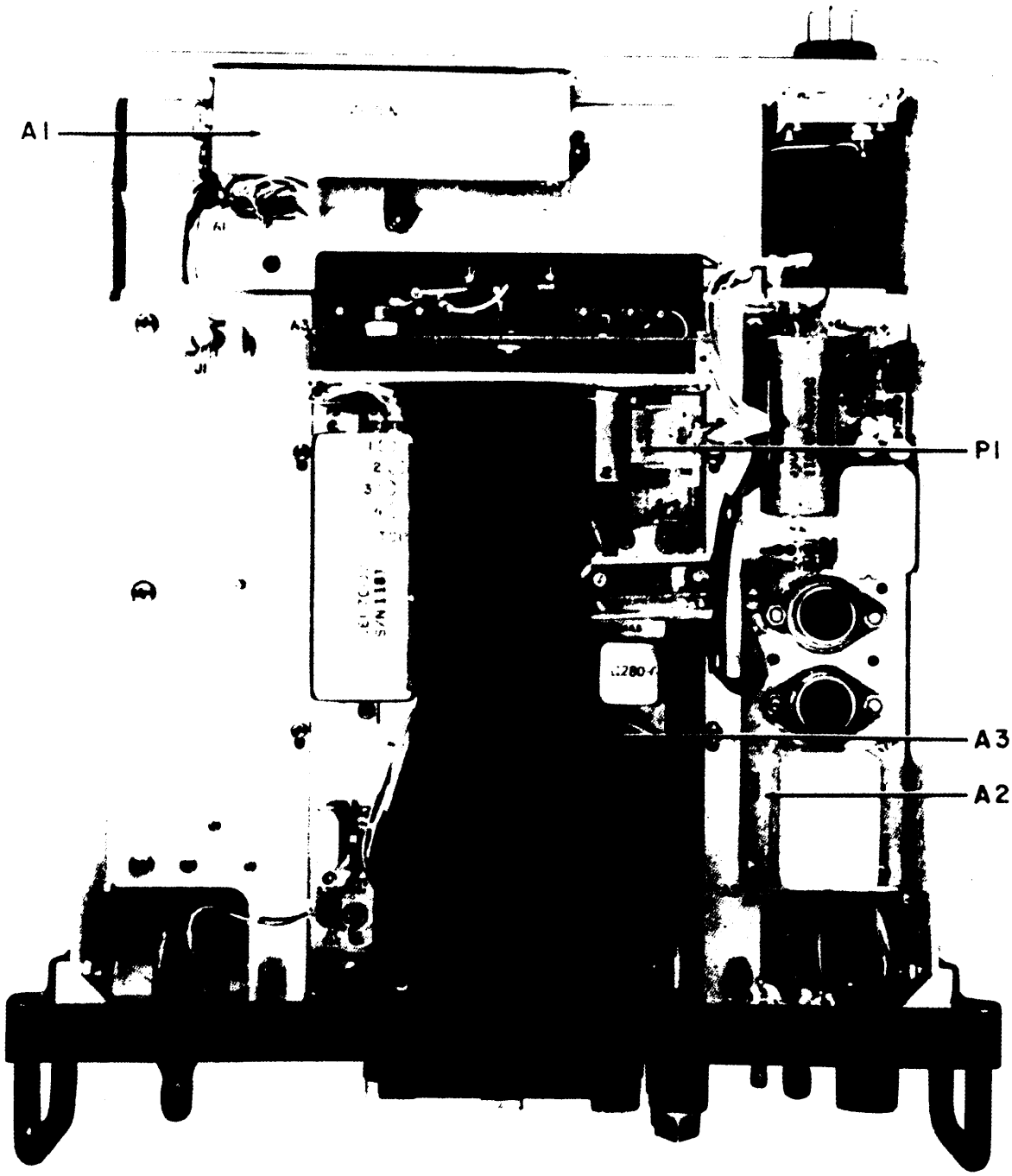


Figure 5-3. Type WJ-9180 Signal Monitor, Top View, Location of Components

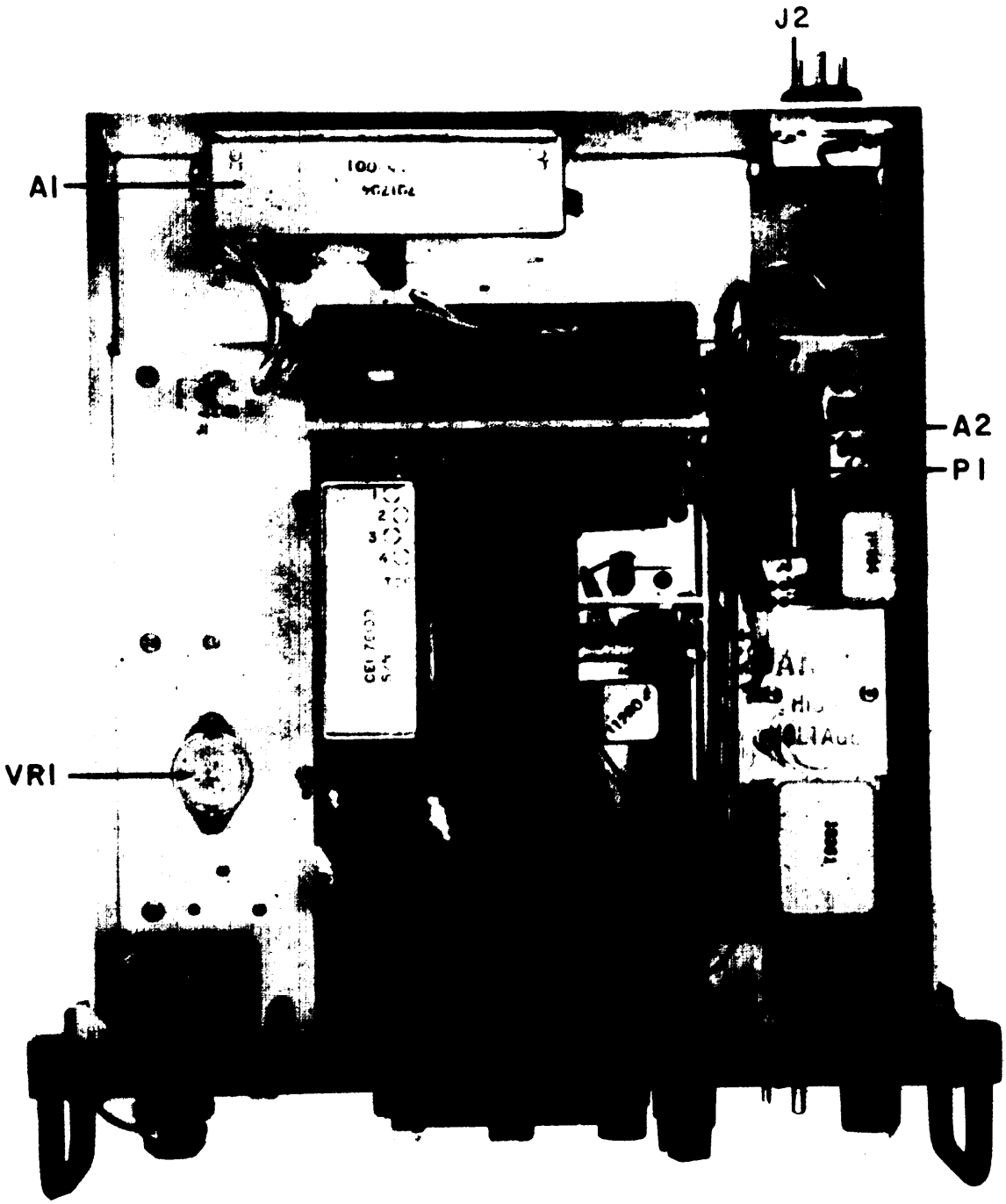


Figure 5-4. Type WJ-9180-1 Signal Monitor, Top View, Location of Components

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
MP14	Handle Modified	1	24287	14632	
MP15	Cover	1	34951-1	14632	
P1	Connector, Plug, Multipin (WJ-9180-1 only)	1	SRE7SNSS	81312	
P2	Connector, Plug, Multipin (WJ-9180-1 only)	1	GC/U317/l	25350	
P3	Not Used				
R1	Resistor, Variable, Composition: 50 kΩ, 10%, 1W	1	70A3N056L503U	01121	
R2	Resistor, Fixed, Wire-Wound: 20 Ω, 1%, 5 W (WJ-9180-1 only)	1	RH5(20)F	91767	
S1	Switch, Toggle	1	8280K16	27193	
S2	Switch, Pushbutton: SPST	1	.30-1	81073	
S3	Switch, Toggle	1	MTA106D	95146	
VRl	+15 V Voltage Regulator (WJ-9180-1 only)	1	MC7815CK	04713	
XF1	Fuseholder (WJ-9180-1 only)	1	357001	75915	
	Accessory Item Shipped With Equipment				
AIl	Connector, Plug, Multipin (WJ-9180-1 only)	1	U316/U	25350	

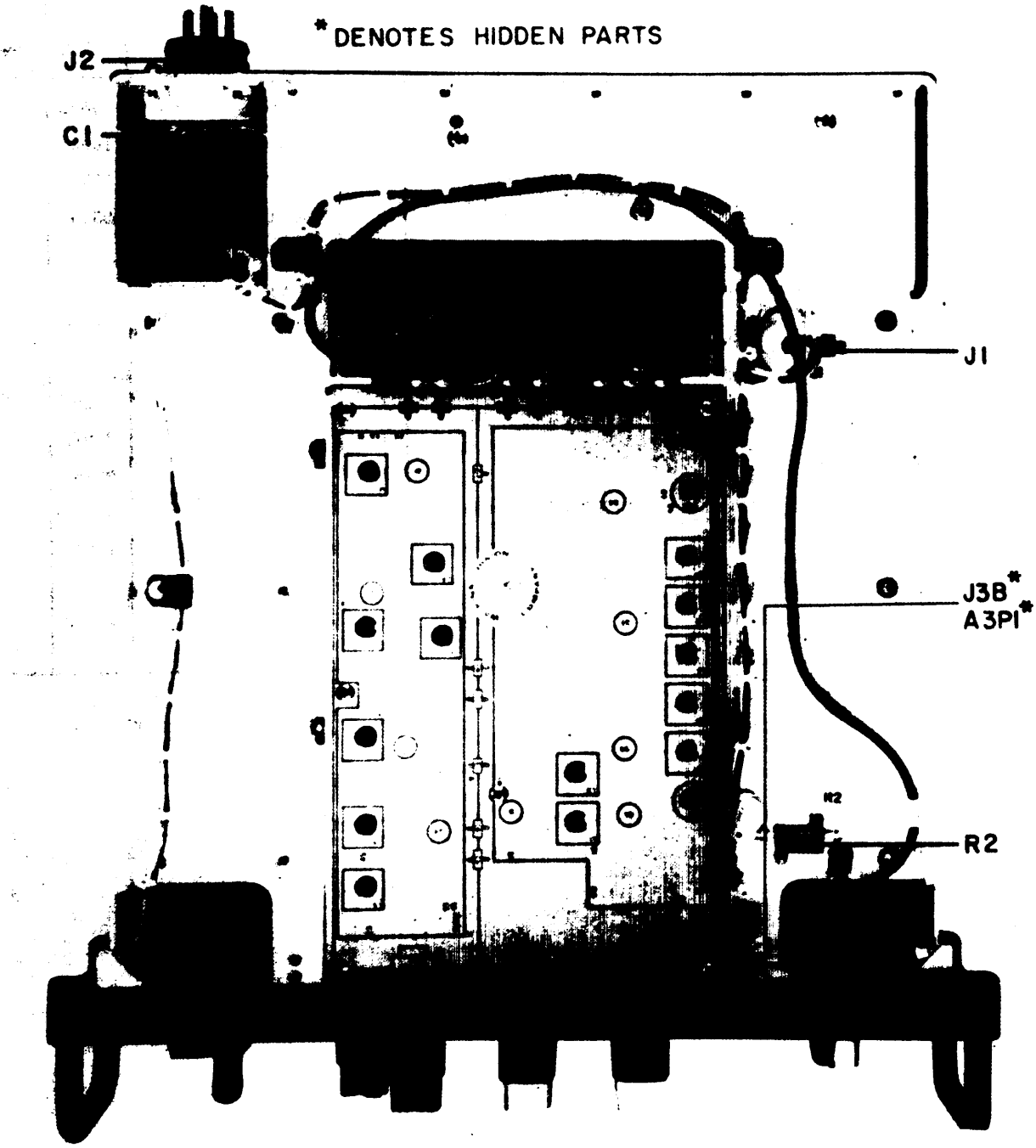


Figure 5-5. Type WJ-9180 Signal Monitor, Bottom View, Location of Components

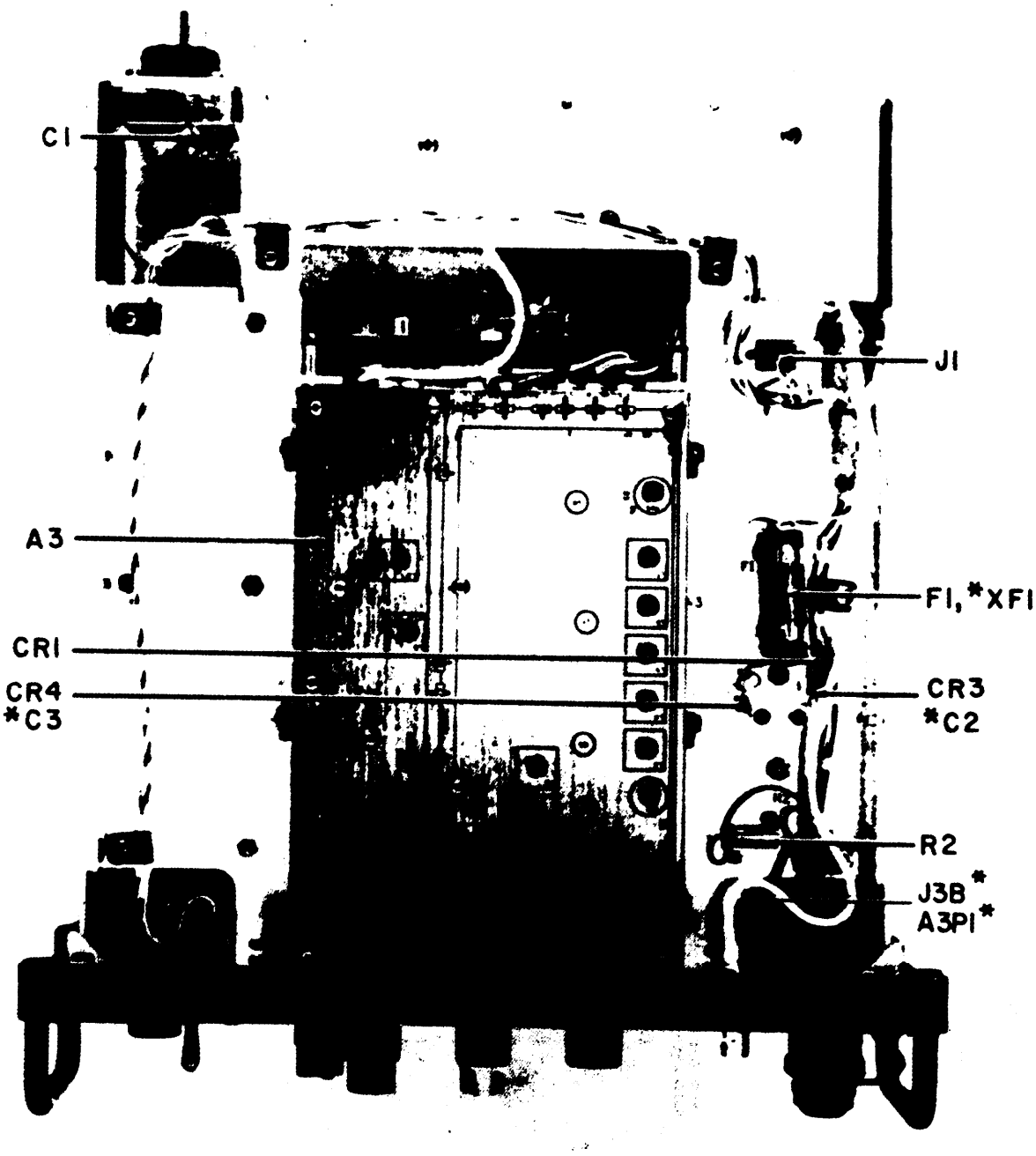


Figure 5-6. Type WJ-9180-l Signal Monitor, Bottom View, Location of Components

5.5.1 TYPE 791794 DC-DC CONVERTER REF DESIG PREFIX Al

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Al	DC-DC Converter	1	24998-1	14632	
Cl	Capacitor, Ceramic, Feed Thru: 470 pF, 20%, 500 v	6	54-794-009-471M	33095	
C2 Thru C6	Same as Cl				
C7	Capacitor, Electrolytic, Tantalum: 220 µF, 10 V	2	196D227XOO1OMA3	56289	
C8	Same as C7				
P1	Connector, Plug, Multipin	1	SRE14PNSS	81312	
Q1	Transistor	2	2N3054	80131	02735
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 100 kΩ1%, 1 W	2	RN55C1OO3F	81349	75042
R2	Same as R1				

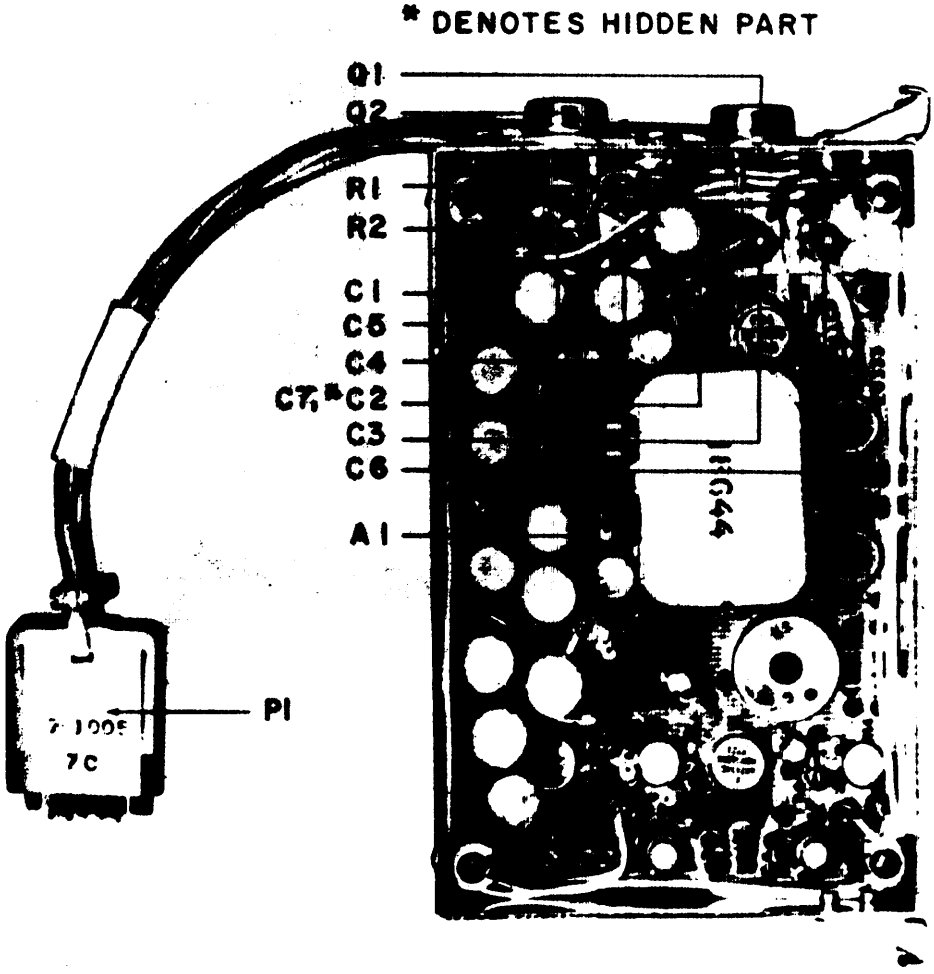


Figure 5-7. Type 791794 DC-DC Converter (Al), Location of Components

5.5.1.1 Type 24998-1 DC-DC Converter REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Electrolytic, Tantalum: 100 μF, 20%, 20 V	8	196D107X0020TE4	56289	
C2	Same as C1				
C3	Same as C1				
C4	Same as C1				
C5	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	3	CM05FD331G03	81349	72136
C6	Same as C5				
C7	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	2	196D225X0035JE3	56289	
C8	Same as C5				
C9	Same as C7				
C10	Capacitor, Electrolytic, Tantalum: 220 μF, 20%, 10 V	4	196D227X0010MA3	56289	
C11	Same as C10				
C12	Capacitor, Ceramic, Disc: 0.01 μF, 10%, 200 V	2	CK068X103K	81349	56289
C13	Same as C12				
C14 Thru C17	Same as C1				
C18	Same as C10				
C19	Same as C10				
CR1	Diode	3	1N4446	80131	93332
CR2	Same as CR1				
CR3	Same as CR1				
E1	Terminal	9	140-1941-02-01	71279	
E2 Thru E9	Same as E1				
Q1	Transistor	2	2N3251	80131	04713
Q2	Same as Q1				
Q3	Transistor	2	2N2270	80131	02735
Q4	Same as Q3				
R1	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	3	RCR07G470JS	81349	01121
R2	Resistor, Fixed, Film: 1.1 kΩ, 1%, 1/10 W	4	RN55C1101F	81349	75042
R3	Same as R2				
R4	Same as R2				
R5	Same as R2				
R6	Resistor, Fixed, Film: 619 kΩ, 1%, 1/4 W	2	CC6193/F	01121	
R7	Same as R6				
R8	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	4	RN55C1002F	81349	75042

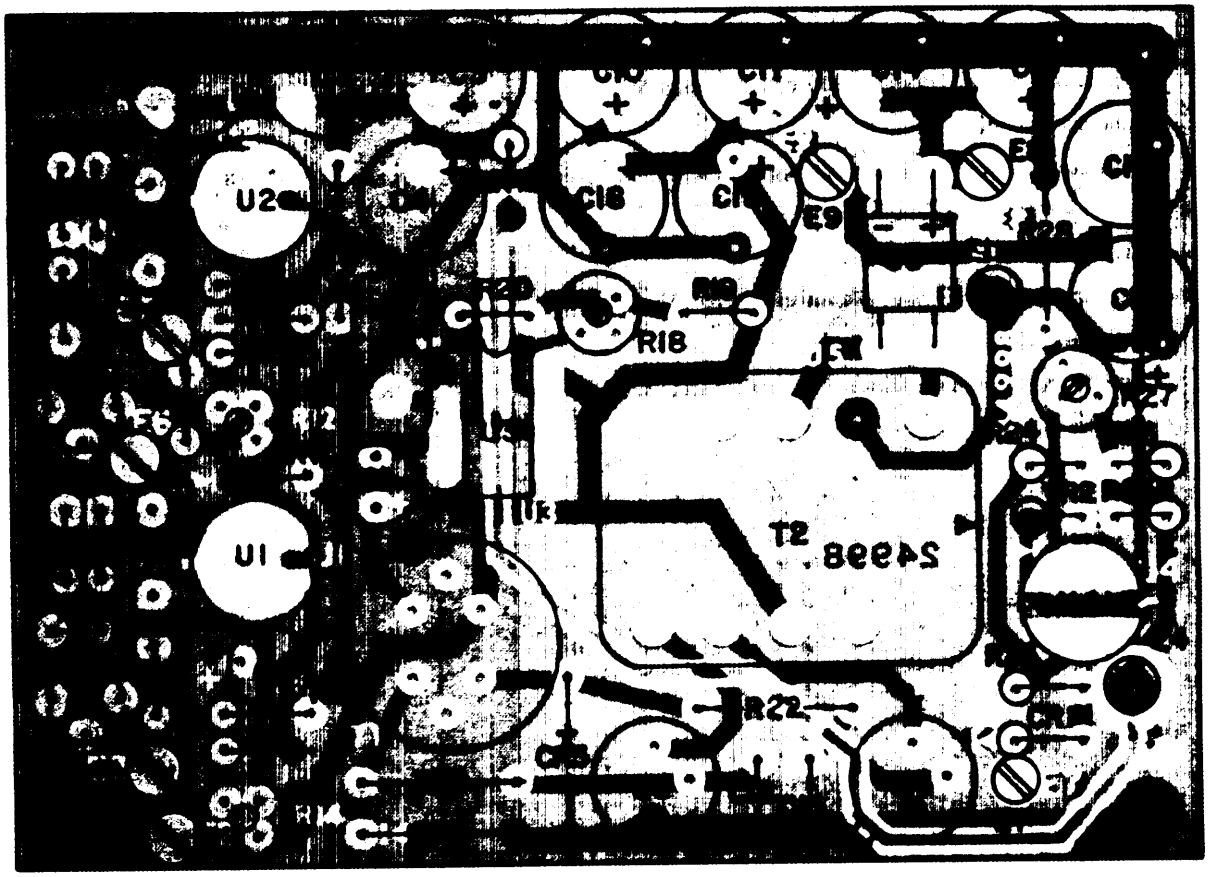


Figure 5-8. Type 24998-1 DC-DC Converter (AlAl), Location of Components

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R9	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	2	RN55C2211F	81349	75042
R10	Same as R9				
R11	Same as R8				
R12	Resistor, Variable, Film: 5 kΩ, 10%, 1/2 W	2	62PR5K	73138	
R13	Resistor, Fixed, Film: 15 kΩ, 1%, 1/10 W	2	RN55C1502F	81349	75042
R14	Resistor, Variable, Film: 10 kΩ, 10%, 1/2 W	1	62PR10K	73138	
R15	Same as R13				
R16	Resistor, Fixed, Film: 22.1 kΩ, 1%, 1/10 W	3	RN55C2212F	81349	75042
R17	Same as R16				
R18	Resistor, Variable, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R19	Same as R8				
R20	Resistor, Fixed, Film: 90.9 kΩ, 1%, 1/10 W	1	RN55C9092F	81349	75042
R21	Same as R1				
R22	Same as R1				
R23	Resistor, Fixed, Film: 3.32 kΩ, 1%, 1/10 W	1	RN55C3321F	81349	75042
R24	Resistor, Fixed, Film: 1 MΩ, 1%, 1/4 W	1	CC1004F	01121	
R25	Same as R16				
R26	Resistor, Fixed, Film: 4.75 kΩ, 1%, 1/10 W	1	RN55C4751F	81349	75042
R27	Same as R12				
R28	Same as R8				
T1	Transformer	1	30312-268	14632	
T2	Transformer	1	18644	14632	
U1	Integrated Circuit	3	741HC	07263	
U2	Same as U1				
U3	Integrated Circuit	1	SE555V	18324	
U4	Same as U1				
U5	Rectifier Assembly	1	MDA920A3	04713	
VR1	Diode, Zener: 6.8 V	2	1N754A	80131	04713
VR2	Same as VR1				

5.5.2 TYPE 76239 DC-AC CONVERTER REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Electrolytic, Tantalum: 220 μF, 20%, 10 V	2	196D227X0010TE4	56289	
C2	Capacitor, Electrolytic, Aluminum: 1100 μF, -10+75%, 40 V	1	39D118G040HL4	56289	
C3	Capacitor, Ceramic, Disc: 0.01 μF, 20%, 200 V	3	8131A200Z5U103M	72982	
C4	Capacitor, Mica, Dipped: 6200 pF, 2%, 300 V	1	DM19-622G	72136	
C5	Capacitor, Electrolytic, Tantalum: 100 μF, 20%, 20 V	1	196D107X0020TE4	56289	
C6	Same as C1				
C7	Same as C3				
C8	Same as C3				
CR1	Diode	2	1N4446	80131	93332
CR2	Same as CR1				
P1	Connector, Plug	1	SM2P	81312	
Q1	Transistor	1	2N6055	80131	04713
Q2	Same as Q1				
R1	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R2	Resistor, Variable, Film: 1 kΩ, 10%, 1/2 W	1	62PR1K	73138	
R3	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	1	RCR07G473JS	81349	01121
R4	Resistor, Fixed, Composition: 22 Ω, 5%, 1/4 W	1	RCR07G220JS	81349	01121
R5	Resistor, Fixed, Composition: 150 Ω, 5%, 1/4 W	2	RCR07G151JS	81349	01121
R6	Same as R5				
T1	Transformer	1	18364	14632	
T2	Transformer	1	18361	14632	
U1	Integrated Circuit	1	NE555V	18324	

Figure 5-9. Type 76239 DC-AC Converter (A2), Location of Components

5.5.3 TYPE 791554 SIGNAL MONITOR REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	IF Amplifier	1	8121-4	14632	
A2	Sweep Generator and Horizontal Amplifier	1	8266	14632	
A3	Focus and Intensity Control	1	12688	14632	
J1	Connector, Receptacle, Multipin	1	SM2SN	81312	
J2	Connector, Plug, Multipin	1	SRE7PNSS	81312	
P1	Connector, Plug	1	PL20-5	14949	
PS1	Converter, DC-DC	1	76199	14632	
S1	Switch, Toggle	1	8280K16	27193	
V1	Tube, CRT	1	M1520P31	20183	

5.5..3.1 Type 370542-8121-4 IF Amplifier Board No. 1 REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	IF Amplifier Board No. 1	1	370542-2	14632	
A2	IF Amplifier Board No. 2	1	370543-2	14632	
A3	Crystal Marker Module	1	11280-6	14632	
C1	Not Used				
C2	Not Used				
C3	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	11	54-794-009-102W	33095	
C4	Same as C3				
C5	Capacitor, Ceramic, Feedthru: 33 pF, 10%, 500 V	3	54-794-001-3301	33095	
C6 Thru C10	Same as C3				
C11	Same as C5				
C12	Same as C5				
C13	Same as C3				
C14	Same as C3				
C15	Same as C3				
C16	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	3	8131M100651104M	72982	
C17	Capacitor, Ceramic, Standoff: 1000 pF, GMV, 500 V	3	54-803-009-102W	33095	
C18	Same as C17				
C19	Same as C16				
C20	Same as C16				
C21	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 35 V	1	MTP107M035P1C	76055	
C22	Same as C3				
C23	Same as C17				
E1	Terminal, Feedthru, Insulated	1	SFU16Y	04013	
FB1	Ferrite Bead	1	56-590-65-4A	02114	
L1	Inductor: 63 µH	2	1131-37	14632	
L2	Same as L1				
R1	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	2	70A3G108L103U	01121	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R3	Same as R1				
R4	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R5	Resistor, Fixed, Composition: 5.1 Ω, 5%, 1/4 W	1	RCR07G5R1JS	81349	
R6	Resistor, Variable, Composition: 100 kΩ, 10%, 1 W	1	70A3G108L104U	81349	
R7	Not Used				
R8	Not Used				
R9*	Resistor, Fixed, Composition: 22 kΩ, 5%, 1/4 W	1	CF1/4-22K/J	09021	
XY1	Socket, Crystal	1	8000AG9	91506	
Y1	Crystal, Quartz	1	CR18AU2.205MHz	80058	
	*Nominal value, final value factory selected.				

5.5.3.1.1 Part 370542-2 IF Amplifier Board No. 1 REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	9	8131A200Z5U103M	72982	
C2 Thru C4	Same as C1				
C5	Capacitor, Mica, Dipped: 36 pF, 2%, 500 V	2	CM05ED360G03	81349	72136
C6	Same as C1				
C7	Capacitor, Mica, Dipped: 75 pF, 2%, 500 V	3	CM05ED750G03	81349	72136
C8	Same as C7				
C9 Thru C11	Same as C1				
C12	Same as C5				
C13	Capacitor, Ceramic, Tubular: 2.0 pF ±0.25 pF, 500 V	1	301-000C0K0-209C	72982	
C14	Capacitor, Ceramic, Tubular: 1.0 pF ±0.25 pF, 500 V	1	301-000C0K0-109C	72982	
C15	Capacitor, Mica, Dipped: 43 pF, 2%, 500 V	1	CM05ED430G03	81349	72136
C16	Capacitor, Mica, Dipped: 270 pF, 2%, 500 V	1	CM05FD271G03	81349	72136
C17	Same as C1				
C18	Capacitor, Mica, Dipped: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C19	Capacitor, Ceramic, Tubular: 1.5 pF ±0.25 pF, 500 V	1	301-000C0K0-159C	72982	
C20	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	2	CM05FD331G03	81349	72136
C21	Capacitor, Mica, Dipped: 1600 pF, 2%, 500 V	1	CM06FD162G03	81349	72136
C22	Capacitor, Mica, Dipped: 39 pF, 2%, 500 V	1	CM05ED390G03	81349	72136
C23	Capacitor, Electrolytic, Tantalum: 10 µF, 20%, 30 V	1	MTP106M030P1A	76055	
C24	Capacitor, Electrolytic, Tantalum: 1 µF, 20%, 35 V	1	196D105X0035HE3	56289	
C25	Same as C20				
C26	Capacitor, Ceramic, Tubular: 7.5 pF ±0.5 pF, 500 V	1	301-000C0H0-759D	72982	
C27	Capacitor, Mica, Dipped: 120 pF, 2%, 500 V	1	CM05FD121G03	81349	72136
C28	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	72136
C29	Same as C7				
CR1	Diode	1	1N198A	80131	93332
CR2	Diode, Varicap	1	1N5145	81350	
L1	Coil, Variable	4	31662-4	14632	
L2	Coil, Fixed, Molded: 43 µH, 5%	1	1537-58	99800	
L3 Thru L5	Same as L1				
L6	Coil, Variable	2	31662-6	14632	
L7	Same as L6				
L8	Coil, Variable	1	31662-22	14632	
Q1	Transistor	2	841001-1	14632	
Q2	Same as Q1				
Q3	Transistor	1	3N128	80131	02735

REF DESIG PREFIX A3A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q4	Transistor	1	2N2857	80131	02735
R1	Resistor, Fixed, Film: 300 Ω, 5%, 1/4 W	2	CF1/4-300 OHMS/J	09021	
R2	Resistor, Fixed, Film: 680 kΩ, 5%, 1/4 W	2	CF1/4-680K/J	09021	
R3	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	3	CF1/4-47K/J	09021	
R4	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R5	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R6	Resistor, Fixed, Film: 56 Ω, 5%, 1/4 W	2	CF1/4-56 OHMS/J	09021	
R7	Resistor, Fixed, Film: 27 kΩ, 5%, 1/4W	4	CF1/4-27K/J	09021	
R8	Same as R7				
R9	Resistor, Fixed, Film: 180 Ω, 5%, 1/4 W	1	CF1/4-180 OHMS/J	09021	
R10	Same as R2				
R11	Same as R2				
R12	Same as R3				
R13	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	1	CF1/4-1.8K/J	09021	
R14	Same as R6				
R15	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/4 W	1	CF1/4-3.9K/J	09021	
R16	Resistor, Fixed, Film: 15 kΩ, 5%, 1/4 W	1	CF1/4-15K/J	09021	
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R18	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/4 W	1	CF1/4-1.5K/J	09021	
R19	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF1/4-1K/J	09021	
R20	Resistor, Fixed, Composition: 470 kΩ, 5%, 1/4 W	1	RCR07G1474JS	81349	01121
R21	Same as R19				
R22	Resistor, Fixed, Film: 1.0 kΩ, 1%, 1/10 W	1	RN55C1001F	81349	01121
R23	Same as R7				
R24	Resistor, Fixed, Film: 210 kΩ, 1%, 1/4 W	1	RN60D2103F	81349	01121
R25	Resistor, Fixed, Film: 47.5 kΩ, 1%, 1/10 W	1	RN55C4752F	81349	01121
R26	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	1	RN55C1003F	81349	01121
R27	Resistor, Fixed, Film: 49.9 Ω, 1%, 1/10 W	1	RN55C49R9F	81349	01121
R28	Resistor, Fixed, Film: 20 Ω, 1%, 1/4 W	1	RN60D20R0F	81349	01121
R29	Resistor, Fixed, Film: 4.64 kΩ, 1%, 1/10 W	1	RN55C4641F	81349	01121
R30	Resistor, Fixed, Film: 28.7 kΩ, 1%, 1/10 W	1	RN55C2872F	81349	01121
R31	Same as R7				
R32	Resistor, Fixed, Film: 18 Ω, 5%, 1/4 W	1	CF1/4-18 OHMS/J	09021	
R33	Same as R1				
TP1	Jack/Tip: Vertical Ceramic	1	TJ358W	49956	
VR1	Diode Zener: 12 V	1	1N759A	80131	04713

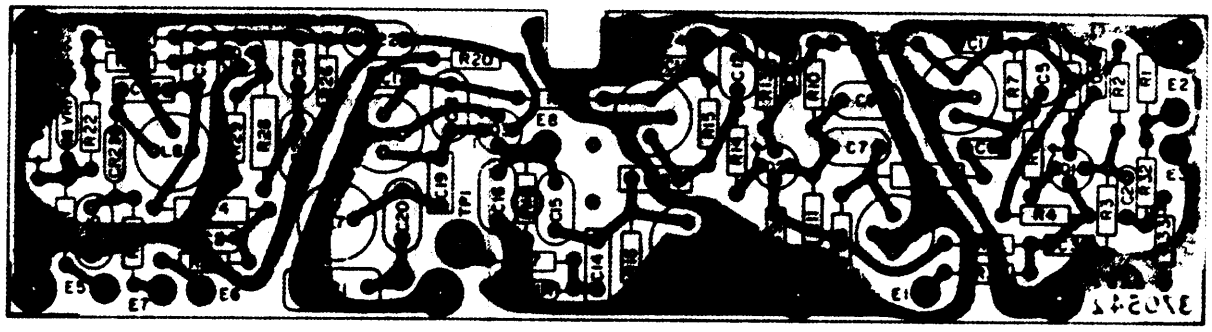


Figure 5-10. Part 370542 -2 Amplifier Board l (A3AlAl),
Location of Components

5.5.3.1.2 Part 370543-2 IF Amplifier Board No. 2 REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Mica, Dipped: 300 pF, 2%, 500 V	1	CM05FD301G03	81349	72136
C2	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 200 V	3	8131A200Z5U103M	72982	
C3	Same as C2				
C4	Capacitor, Ceramic, Tubular: 2.4 pF ±0.25 pF, 500 V	1	301-000C0J0-249C	72982	
C5	Capacitor, Mica, Dipped: 330 pF, 2%, 500 V	1	CM05FD331G03	81349	72136
C6	Capacitor, Mica, Dipped: 3000 pF, 2%, 500 V	1	CM06FD302G03	81349	72136
C7	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 100 V	11	8131M100-651-104M	72982	
C8	Same as C7				
C9	Capacitor, Mica, Dipped: 1800 pF, 2%, 500 V	2	CM06FD182G03	81349	72136
C10	Capacitor, Ceramic, Tubular: 10 pF ± 0.5 pF, 500 V	2	301-000C0H0-100D	72982	
C11	Capacitor, Mica, Dipped: 2200 pF, 2%, 500 V	3	CM06FD202G03	81349	72136
C12	Capacitor, Ceramic, Disc: 0.022 µF, 10%, 100 V	2	CK06BX223K	81349	
C13	Same as C7				
C14	Same as C7				
C15 Thru C18	Not used				
C19	Same as C11				
C20	Same as C12				
C21	Same as C7				
C22	Same as C7				
C23	Same as C9				
C24	Capacitor, Mica, Dipped: 270 pF, 2%, 500 V	2	CM05FD271G03	81349	72136
C25	Same as C24				
C26	Same as C7				
C27	Same as C7				
C28	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	5	CM05FD101G03	81349	72136
C29	Same as C28				
C30	Same as C7				
C31	Same as C28				
C32	Same as C28				
C33	Same as C28				
C34	Same as C10				
C35	Same as C7				
C36	Same as C11				
C37	Same as C7				
C38	Same as C2				
CR1	Diode	4	1N198A	80131	93332
CR2 Thru CR4	Same as CR1				

REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR5	Diode	1	1N462A	80131	93332
L1	Coil, Variable	2	31662-6	14632	
L2	Same as L1				
L3	Pot Core Assembly	4	370544	14632	
L4	Same as L3				
L5	Same as L3				
L6	Not Used				
L7	Not Used				
L8	Same as L3				
Q1	Transistor	3	2N2857	80131	02735
Q2	Transistor	1	2N706	80131	
Q3	Transistor	1	841001-1	14632	
Q4	Transistor	1	U310	17856	
Q5	Same as Q1				
Q6	Same as Q1				
R1	Resistor, Fixed, Film: 82 kΩ, 5%, 1/4 W	1	CF1/4-82K/J	09021	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	2	CF1/4-10K/J	09021	
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	4	CF1/4-2.2K/J	09021	
R4	Resistor, Fixed, Film: 3.9 kΩ, 5%, 1/4 W	1	CF1/4-3.9K/J	09021	
R5	Resistor, Fixed, Film: 560 Ω, 5%, 1/4 W	4	CF1/4-560 OHMS/J	09021	
R6	Same as R5				
R7	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	6	CF1/4-47K/J	09021	
R8	Same as R7				
R9	Same as R7				
R10	Same as R2				
R11	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	3	CF1/4-1.0K/J	09021	
R12	Same as R3				
R13	Same as R7				
R14	Resistor, Variable, Film: 200 Ω, 10%, 1/2 W	1	62PR200	73138	
R15	Not Used				
R16	Not Used				
R17	Same as R7				
R18	Resistor, Fixed, Composition: 5.1 kΩ, 5%, 1/4 W	2	RCR07G512JS	81349	01121
R19	Same as R5				
R20	Resistor, Fixed, Film: 18 Ω, 5%, 1/4 W	1	CF1/4-18 OHMS/J	09021	
R21	Resistor, Fixed, Film: 39 kΩ, 5%, 1/4 W	1	CF1/4-39K/J	09021	
R22	Resistor, Fixed, Film: 100 Ω, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R23	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	2	CF1/4-220K/J	09021	
R24	Resistor, Fixed, Film: 220 kΩ, 5%, 1/4 W	1	CF1/4-200K/J	09021	
R25	Resistor, Variable, Film: 50 kΩ, 10%, 1/2 W	1	62PR50K	73138	

REF DESIG PREFIX A3A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R26	Resistor, Fixed, Film: 240 kΩ, 5%, 1/4 W	1	CF1/4-240K/J	09021	
R27	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R28	Same as R23				
R29	Same as R27				
R30	Same as R3				
R31	Resistor, Fixed, Composition: 470 kΩ, 5%, 1/4 W	3	RCR07G474JS	81349	01121
R32	Same as R31				
R33	Same as R3				
R34	Same as R11				
R35	Same as R18				
R36	Same as R11				
R37	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF1/4-120K/J	09021	
R38	Same as R7				
R39	Same as R31				
R40	Same as R5				
R41	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	1	CF1/4-3.3K/J	09021	
T1	Coil, Toroidal	1	21428-83	14632	
U1	Mixer, Balanced	1	M6A	27956	
VR1	Not Used				
VR2	Diode Zener: 12 V	1	1N759A	80131	04713
Y1	Crystal, Quartz: 2.205 MHz	1	CR18AU2.205MHz	80058	
XY1	Socket, Crystal	1	8000AG9	91506	

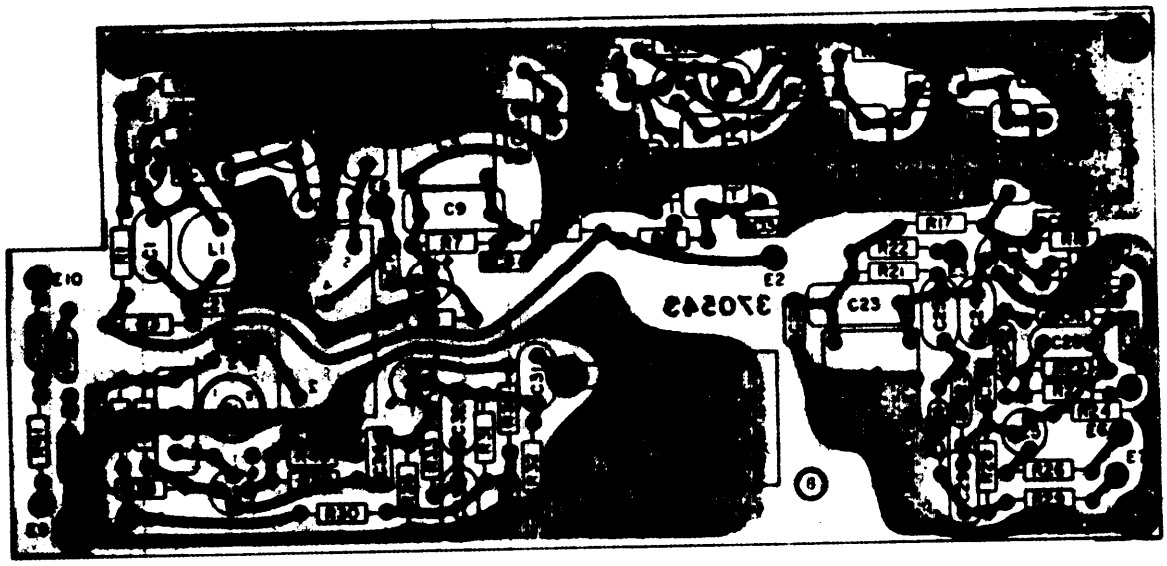


Figure 5-11. Part 370543-2 IF Amplifier Board 2 (A3A1A2),
Location of Compments

5.5.3.1.3 Part 11280-6 Crystal Marker Module REF DESIG PREFIX A3A1A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 500 V	1	54-794-009-102W	33095	
C2	Capacitor, Composition, Tubular: 0.43 pF, 10%, 500 V	1	QC(0.43 pF, K)	95121	
C3	Capacitor, Mica, Dipped: 43 pF, 2%, 500 V	1	CM04ED430G03	81349	72136
C4	Capacitor, Mica, Dipped: 68 pF, 2%, 500 V	1	CM04ED680G03	81349	72136
C5	Capacitor, Ceramic, Disc: 470 pF, 10%, 200 V	1	CK05BX471K	81349	56289
E1	Terminal, Feedthru, Insulated	1	SFU16Y	04013	
Q1	Transistor	1	2N706	80131	04713
R1	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	1	RCR07G103JS	81349	01121
R2	Resistor, Fixed, Composition: 470 kΩ, 5%, 1/4 W	1	RCR07G474JS	81349	01121
Y1	Crystal, Quartz	1	CR64U 10.000MHz	80058	74306

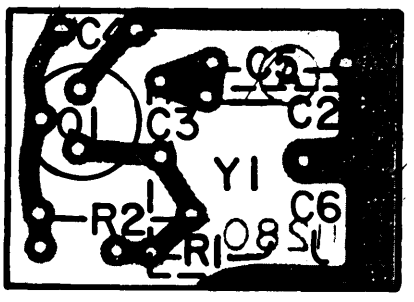


Figure 5-12. Part 11280-6 Crystal Marker Module (A3A1A3), Location of Components

5.5.3.2 Type 8266 Sweep Generator and Horizontal Amplifier REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Electrolytic, Tantalum: 1.0 μF, 10%, 35 V	1	CS13BF105K	81349	56289
CR1	Diode	4	1N462A	80131	93332
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Same as CR1				
Q1	Transistor	1	2N2646	80131	04713
Q2	Transistor	1	2N3251	80131	04713
Q3	Transistor	2	2N3440	80131	04713
Q4	Same as Q3				
Q5	Transistor	1	2N929	80131	04713
Q6	Transistor	1	U1899E	15818	
R1	Resistor, Fixed, Composition: 680 Ω, 5%, 1/4 W	1	RCR07G681JS	81349	01121
R2	Resistor, Fixed, Composition: 2.2 kΩ, 5%, 1/4 W	1	RCR07G222JS	81349	01121
R3	Resistor, Fixed, Composition: 22 kΩ, 5%, 1/4 W	1	RCR07G223JS	81349	01121
R4	Resistor, Fixed, Composition: 6.2 kΩ, 5%, 1/4 W	1	RCR07G622JS	81349	01121
R5	Not Used				
R6	Resistor, Variable, Film: 500 kΩ, 20%, 1/5 W	1	3068P1-504	80294	
R7	Not Used				
R8	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R9	Resistor, Variable, Film: 1 kΩ, 10%, 3/4 W	1	3069P1-102	80294	
R10	Resistor, Fixed, Composition: 120 Ω, 5%, 1/4 W	1	RCR07G121JS	81349	01121
R11	Resistor, Fixed, Composition: 47 kΩ, 5%, 1/4 W	5	RCR07G473JS	81349	01121
R12	Resistor, Variable, Film: 100 kΩ, 20%, 1/5 W	3	3068P1-104	80294	
R13	Same as R11				
R14	Resistor, Fixed, Composition: 10 kΩ, 5%, 1/4 W	2	RCR07G103JS	81349	01121
R15	Same as R11				
R16	Same as R12				
R17	Resistor, Fixed, Composition: 47 Ω, 5%, 1/4 W	1	RCR07G470JS	81349	01121
R18	Resistor, Fixed, Composition: 180 kΩ, 5%, 1/4 W	2	RCR07G184JS	81349	01121
R19	Same as R18				
R20	Resistor, Fixed, Composition: 220 kΩ, 5%, 1/4 W	2	RCR07G224JS	81349	01121
R21	Same as R20				
R22	Resistor, Fixed, Composition: 6.8 kΩ, 5%, 1/4 W	2	RCR07G682JS	81349	01121
R23	Same as R22				
R24	Same as R11				
R25	Same as R12				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
R26	Same as R11				
R27	Resistor, Fixed, Composition: 4.7 kΩ, 10%, 1/2 W	2	RCR07G472JS	81349	01121
R28	Same as R14				
R29	Same as R27				
R30	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	5	RCR07G104JS	81349	01121
R31	Same as R30				
R32	Same as R30				
R33	Same as R30				
R34	Resistor, Fixed, Composition: 33 kΩ, 5%, 1/4 W	1	RCR07G333JS	81349	01121
R35	Resistor, Fixed, Composition: 240 kΩ, 5%, 1/4 W	2	RCR07G244JS	81349	01121
R36	Resistor, Fixed, Composition: 130 kΩ, 5%, 1/4 W	1	RCR07G134JS	81349	01121
R37	Same as R35				
R38	Resistor, Fixed, Composition: 620 kΩ, 5%, 1/4 W	1	RCR07G624JS	81349	01121
R39	Resistor, Variable, Film: 1 MΩ, 10%, 1/2 W	1	62PR1M	73138	
R40	Same as R30				
U1	Integrated Circuit	2	741HC	07263	
U2	Same as U1				
VR1	Diode, Zener: 4.3 V	1	1N749A	80131	04713
VR2	Diode, Zener: 3.3 V	2	1N746A	80131	04713
VR3	Same as VR2				
XU1	Socket, Integrated Circuit	2	8058-1G49	91506	
XU2	Same as XU1				

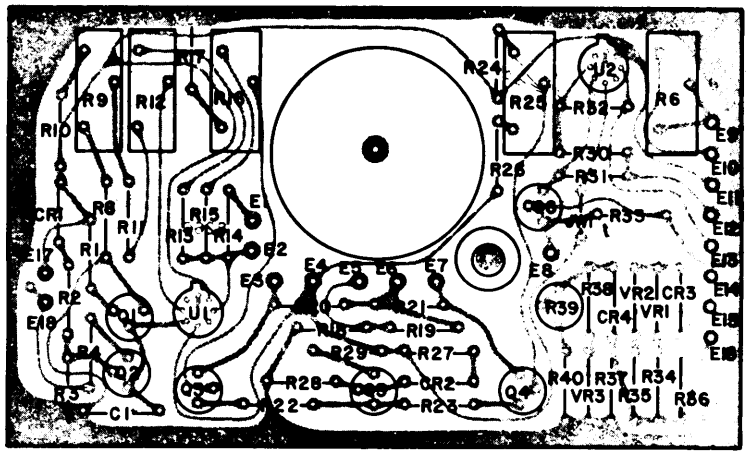


Figure 5-13. Type 8266 Sweep Generator and Horizontal Amplifier (A3A2), Location of Components

5.5.3.3 Type 12688 Focus and Intensity Control REF DESIG PREFIX A3A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.05 μF, 20%, 500 V	1	33C17A	56289	
R1	Resistor, Fixed, Composition: 100 kΩ, 5%, 1/4 W	1	RCR07G104JS	81349	01121
R2	Resistor, Variable, Composition: 500 kΩ, 20%, 1/4 W	1	70-09172	37942	
R3	Resistor, Fixed, Composition: 3.3 MΩ, 5%, 1/2 W	1	RCR20G335JS	81349	01121
R4	Resistor, Variable, Composition: 2.5 MΩ, 20%, 1/4 W	1	70-10548	37942	
R5	Resistor, Fixed, Composition: 3.9 MΩ, 5%, 1/2 W	1	RCR20G395JS	81349	01121
R6	Resistor, Fixed, Composition: 4.7 MΩ, 5%, 1/2 W	1	RCR20G475JS	81349	01121

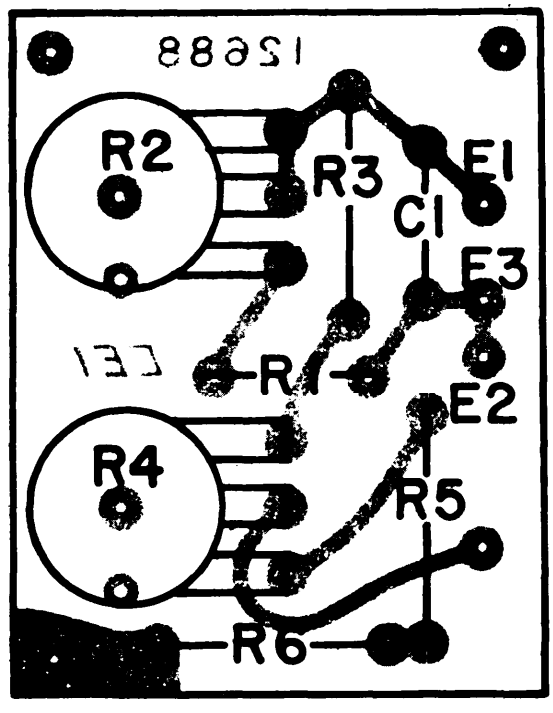


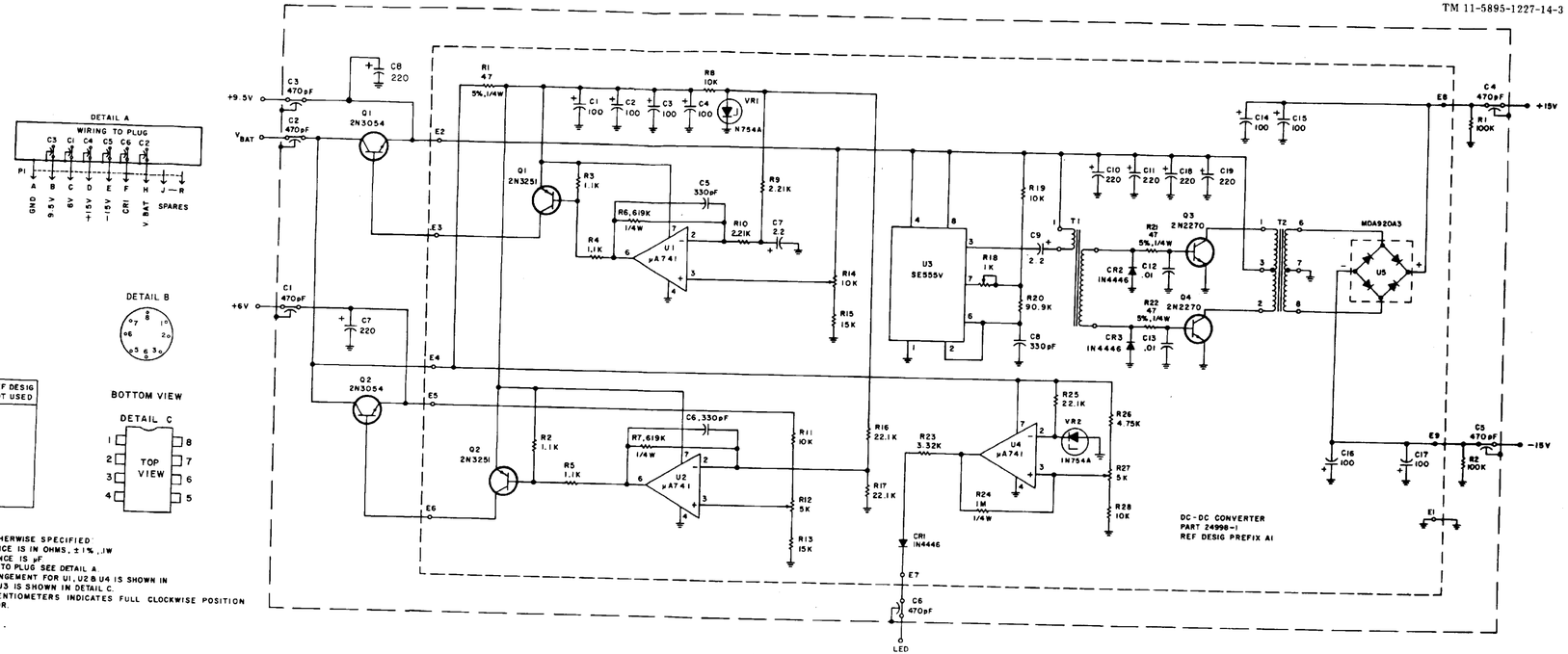
Figure 5-14. Type 12688 Focus and Intensity Control (A3A3), Location of Components

5.5.4 TYPE 791795-1. -2 BATTERY PACK REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
A1	D–Cell Insert	1	791792–1	14632	

5.5.4.1 Type 791792-1 D-Cell Insert REF DESIG PREFIX A4A1

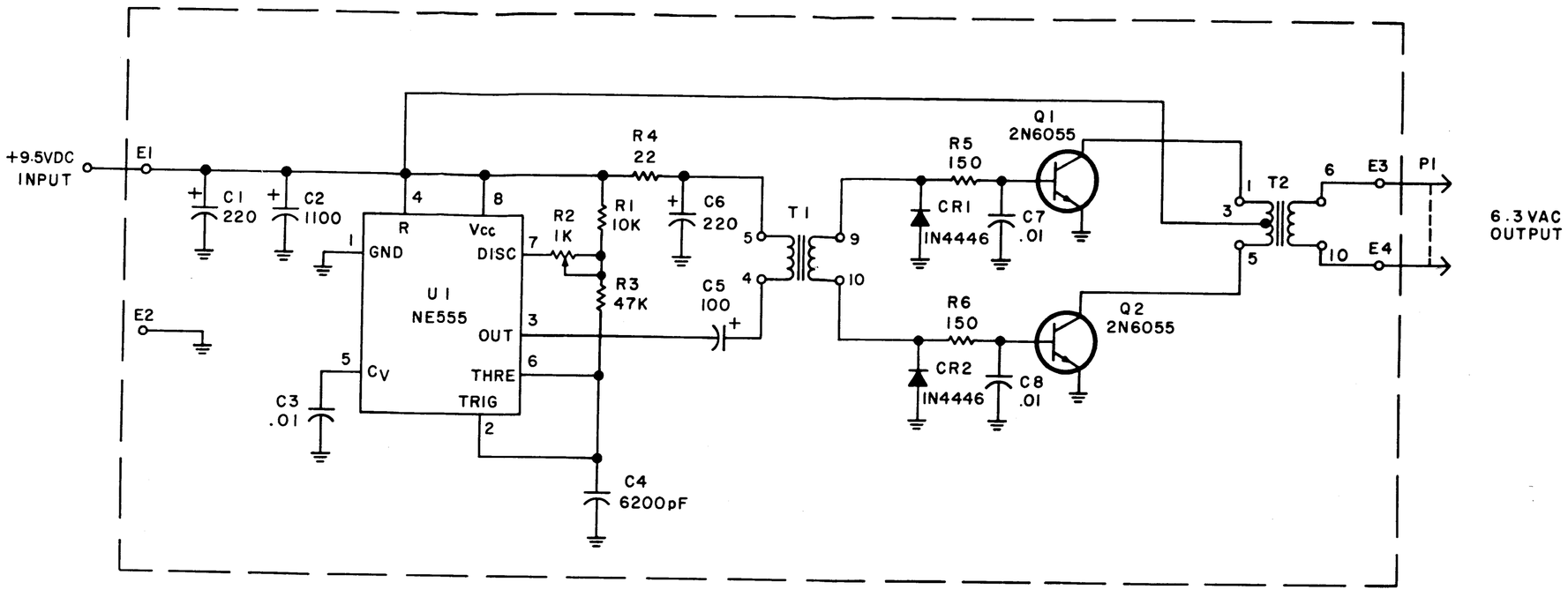
REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
F1	Fuse Cartridge: 3/4 AMP, 3 AG, Slow Blow	1	MDL3/4	71400	
J1	Connector, Receptacle	1	M4SLRN	81312	
P1	Connector, Plug, Multipin	1	103-1	16237	
XF1	Fuse Holder	1	357001	75915	
	Note: Batteries shown on schematic, but not supplied with unit.				



HIGHEST REF DESIG USED	REF DESIG NOT USED
A1	
Q4	C7
R28	Q2
T2	P1
U5	A1
VR2	R2
C19	
E9	
CR3	

NOTES
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±1%, .1W
   b) CAPACITANCE IS μF.
2. FOR WIRING TO PLUG SEE DETAIL A.
3. LEAD ARRANGEMENT FOR U1, U2 & U4 IS SHOWN IN DETAIL B ; U3 IS SHOWN IN DETAIL C.
4. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.

Figure 6-1. Type DC-DC Converter (A1), Schematic Diagram 51264



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS μF.
2. LEAD ARRANGEMENT FOR U1 IS SHOWN IN DETAIL A.

DETAIL A

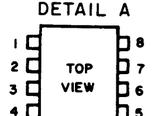


Figure 6-2. Type 76239 DC-AC Converter (A2), Schematic Diagram 34294

FIGURE 6-3

NOTES:
1. UNLESS OTHERWISE SPECIFIED,
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS μF.
2. CW ON POTENTIOMETERS INDICATES FULL CLOCKWISE POSITION OF ACTUATOR.
3. ▭ INDICATES FRONT PANEL CONTROL.

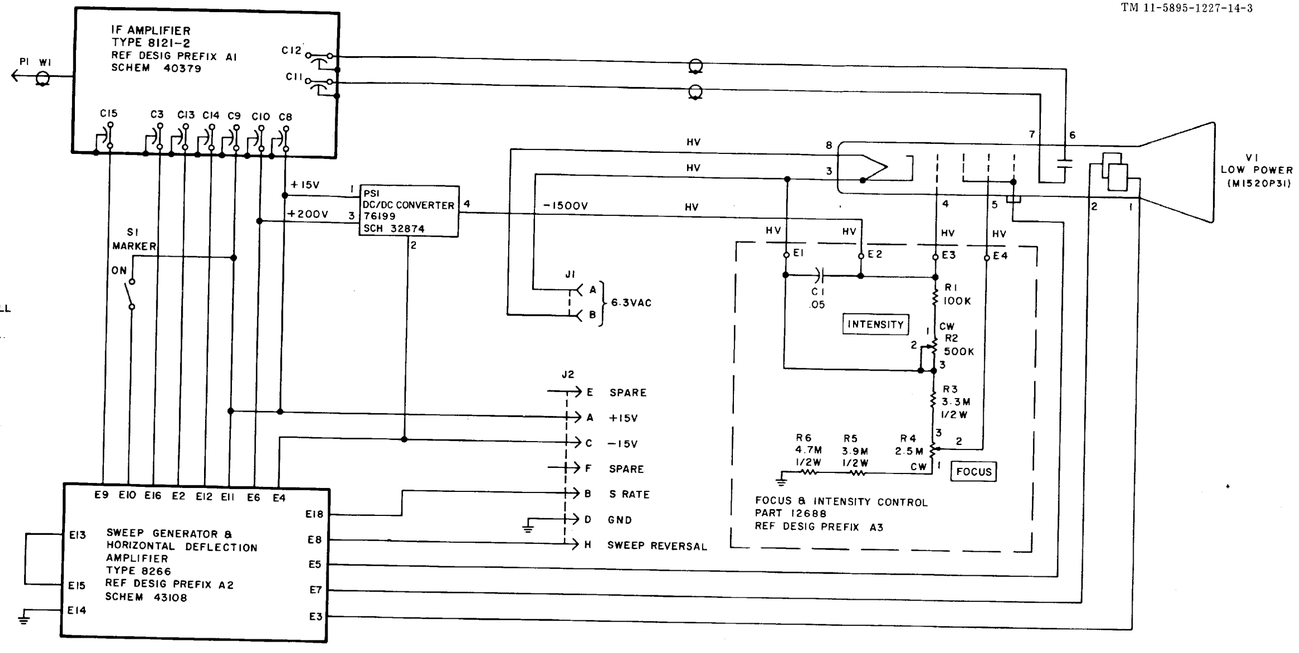


Figure 6-3. Type 791554 Signal Monitor (A3), Schematic Diagram 43167

NOTES:

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS MEASURED IN pf
2. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   CW INDICATES CLOCKWISE ROTATION
   INDICATES FRONT PANEL CONTROL
3. NOMINAL VALUE. FINAL VALUE FACTORY SELECTED
4. DIFFERENCE BETWEEN -1, -2 IS LISTED IN TABLE A.

TABLE A

TYPE	R4	R8	(C8)+V	A1	A2
8121-1	82K	62K	+24V	13748-1	13750-1
8121-2	68K	OMIT	+15V	13748-2	13750-2

NOTE OMITTING R8 FOR -2, REQUIRES CONNECTING R3-1 TO A2E10.

TYPE	C3	C9	C13	C14	C15
8121-1	A4A2E2	+18	A4A2E6	A4A2E1	A4A2E8
8121-2	A3A2E16	+15	A3A2E2	A3A2E12	A3A2E9

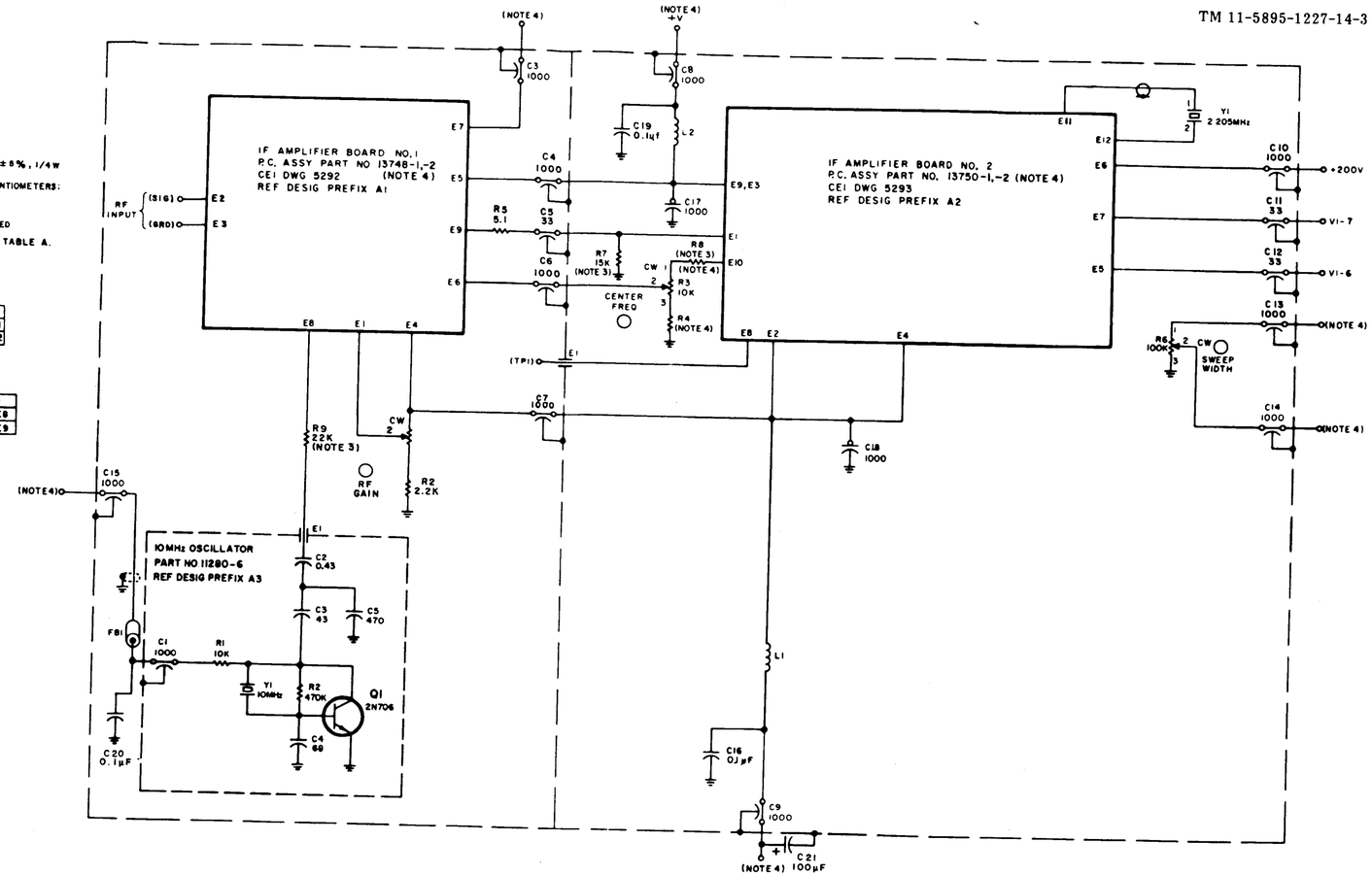


Figure 6-4. Type 8121-4 IF Amplifier (A3A1), Schematic Diagram 40379

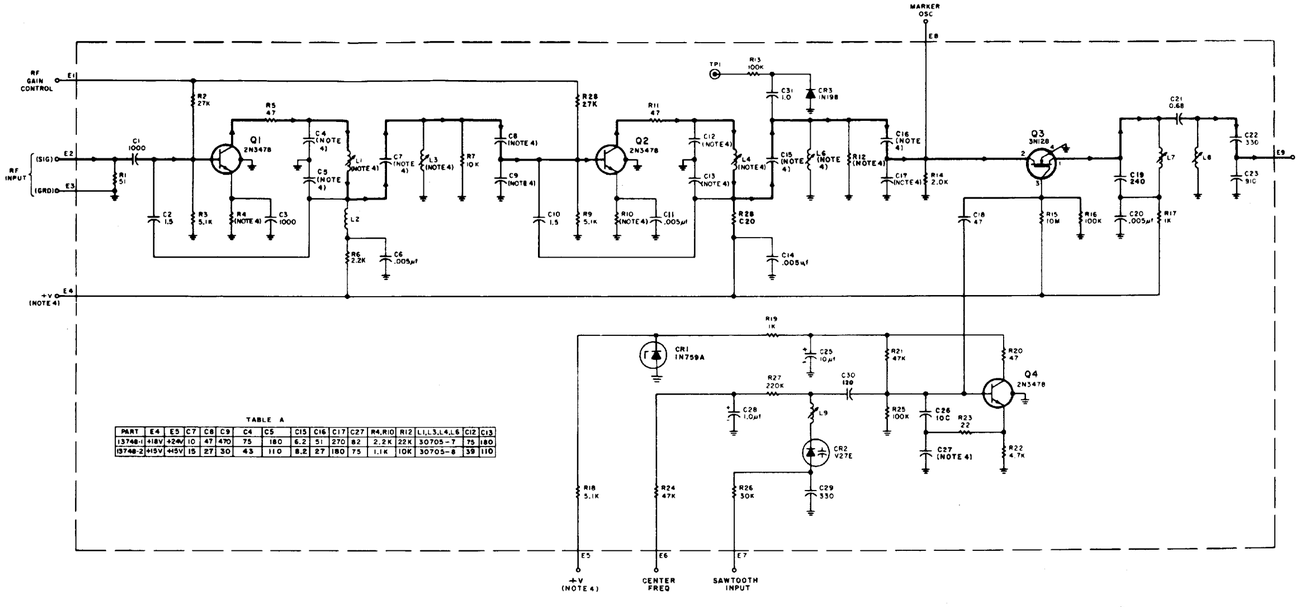


TABLE A

PART	E4	E5	C7	C8	C9	C4	C5	C15	C16	C17	C27	R4,R10	R12	L1,L3,L4,L6	C12	C13
13748-1	+18V	424V	10	47	470	75	180	6.2	51	270	82	2.2K	22K	30705-7	75	180
13748-2	+15V	+15V	15	27	30	43	110	8.2	27	180	75	1.1K	10K	30705-8	59	110

NOTES:

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS MEASURED IN pf
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN PREFIX THE PART DESIGNATION WITH A1OSA1A1
3. HEAVY LINE INDICATES MAIN SIGNAL PATH
4. DIFFERENCE BETWEEN -1,-2 IS LISTED IN TABLE A

Figure 6-5. Type 13748-2 IF Amplifier Board No. 1 (A3A1A1), Schematic Diagram 5292

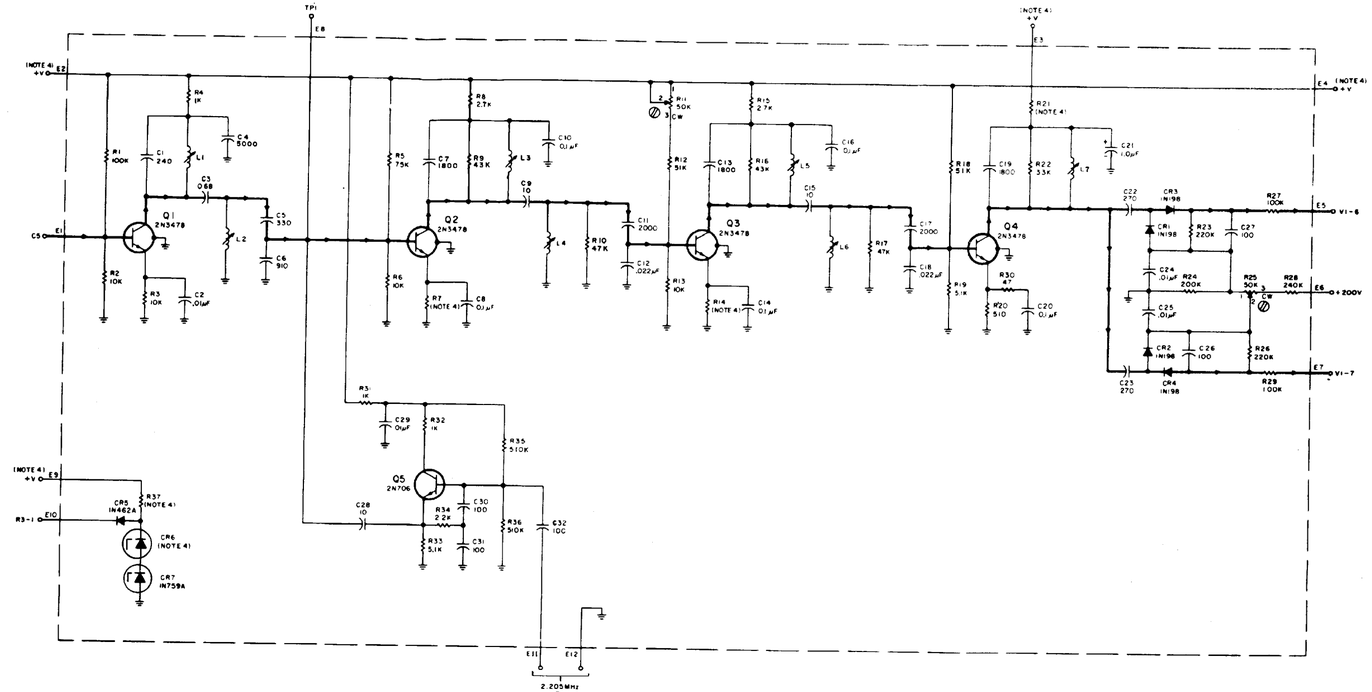


TABLE A

TYPE	R37	CR6	E3, E9	E2, E4	R7	R14	R21
13750-1	10K	IN754A	+24V	+18V	5.1K	5.1K	3.3K
13750-2	3.3K	OMIT	+15V	+15V	2.2K	1K	100

NOTE OMITTED CR6 FOR -2, REQUIRES JUMPER-WIRE JW1

NOTES:

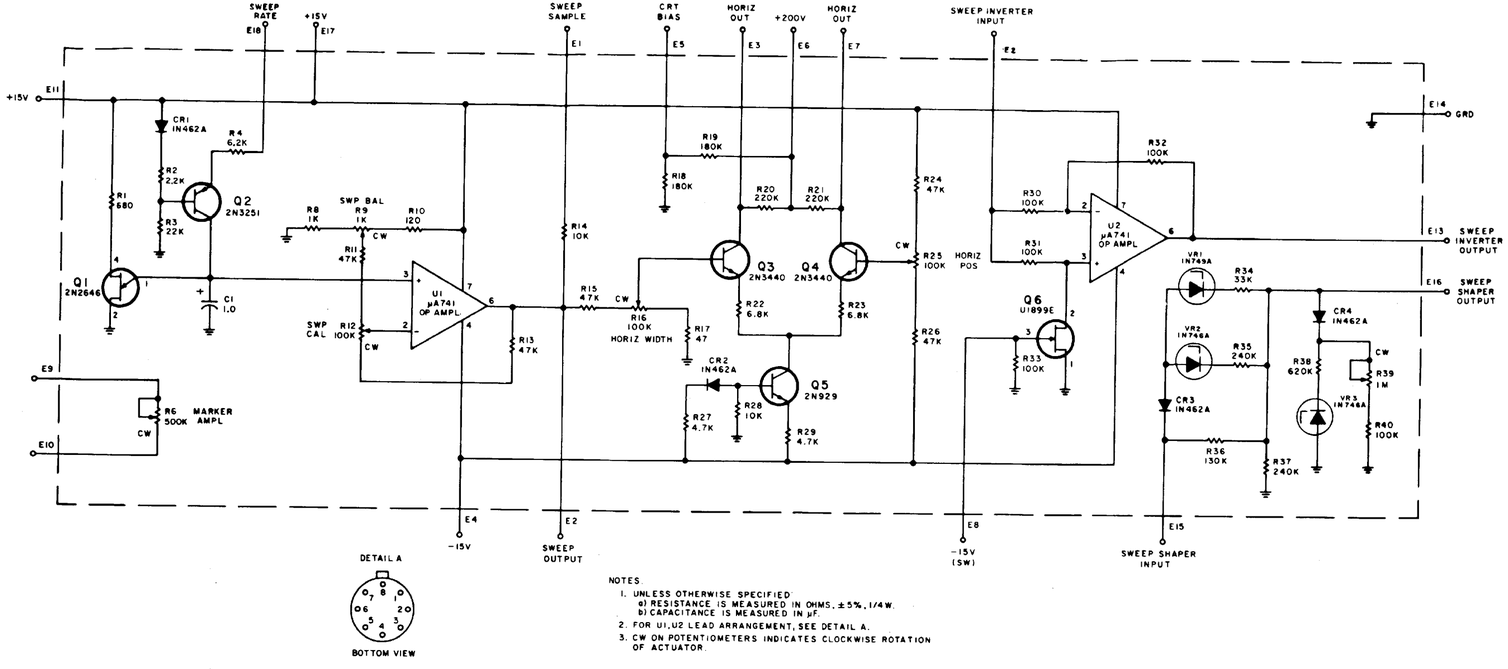
1 UNLESS OTHERWISE SPECIFIED
A RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
B CAPACITANCE IS MEASURED IN pF

2 HEAVY LINE INDICATES MAIN SIGNAL PATH

3 THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS
CW INDICATES CLOCKWISE ROTATION OF CONTROL KNOB
⊘ INDICATES SCREWDRIVER ADJUSTMENT

4 DIFFERENCE BETWEEN -1, -2 IS LISTED IN TABLE A

Figure 6-6. Type 13750-2 IF Amplifier Board No. 2 (A3A1A2), Schematic Diagram 5293



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. FOR U1,U2 LEAD ARRANGEMENT, SEE DETAIL A.
3. CW ON POTENTIOMETERS INDICATES CLOCKWISE ROTATION OF ACTUATOR.

Figure 6-7. Type 8266 Sweep Generator and Horizontal Amplifier (A3A2), Schematic Diagram 43108

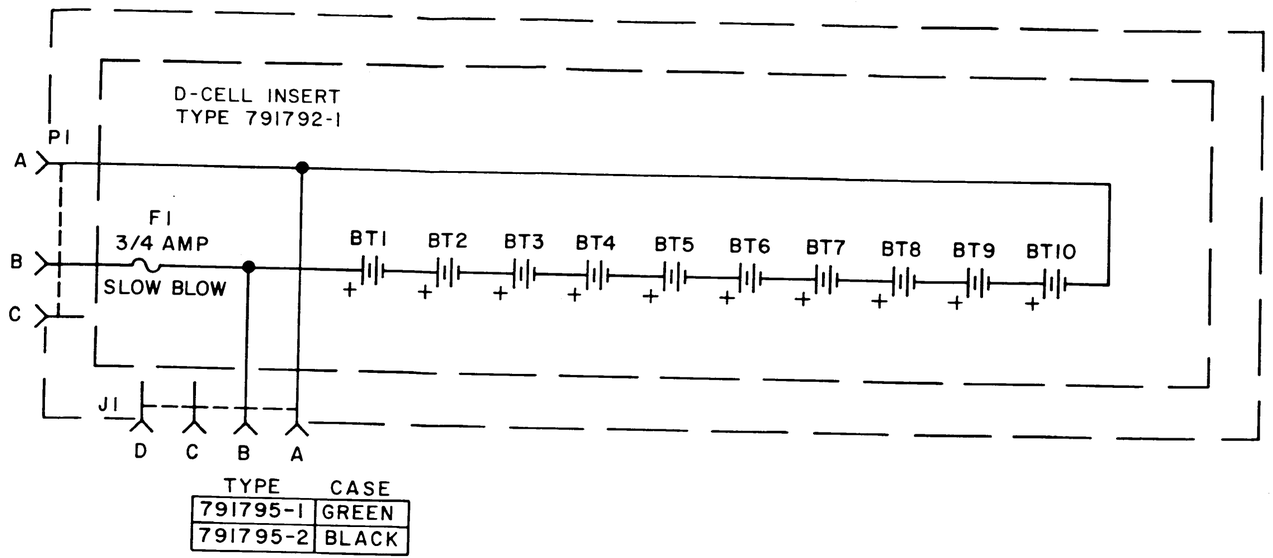


Figure 6-8. Type 791795-2 Battery Pack (A4), Schematic Diagram 24985

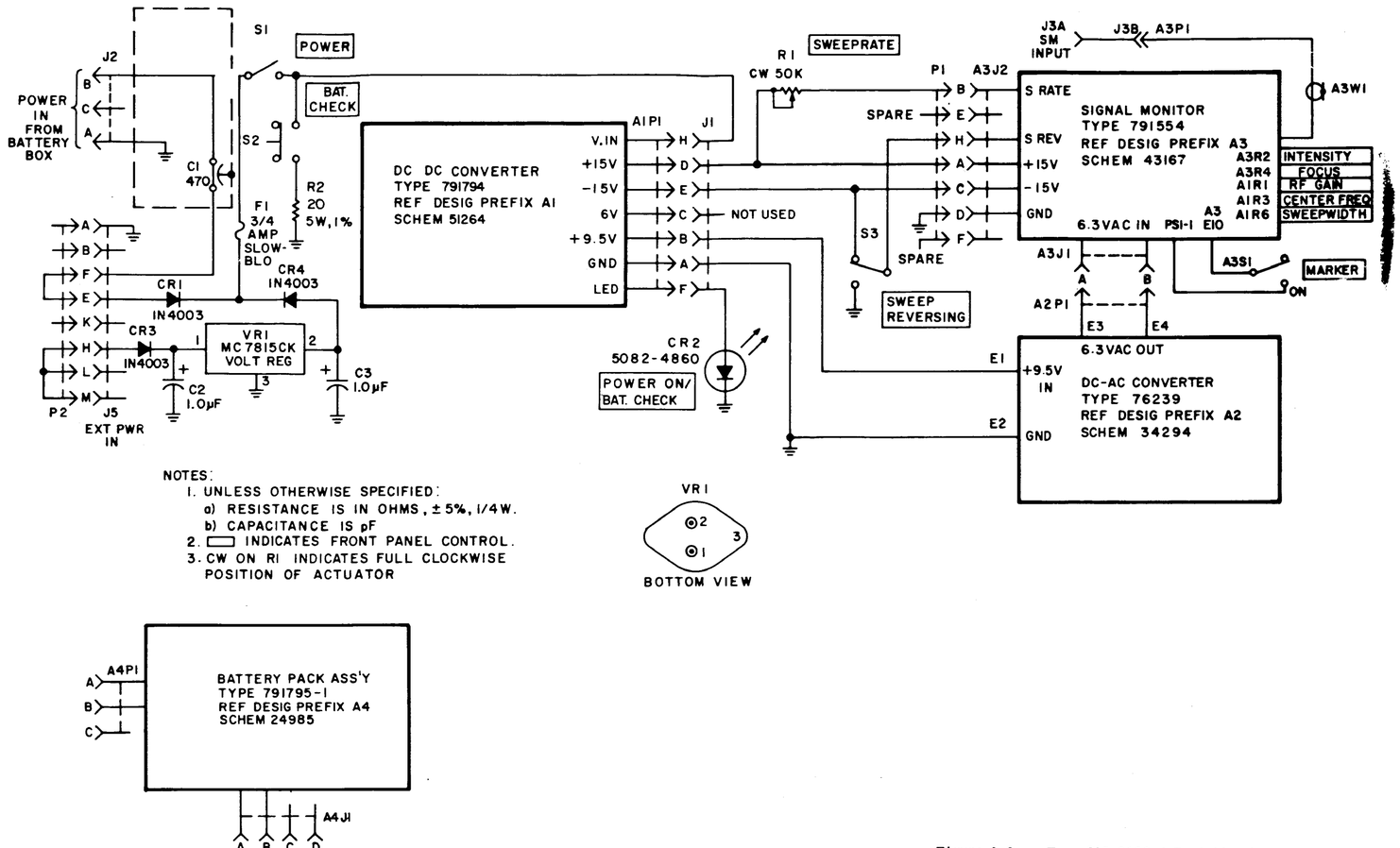


Figure 6-9. Type WJ-9180-1 Portable Signal Monitor, Main Chassis, Schematic Diagram 34882

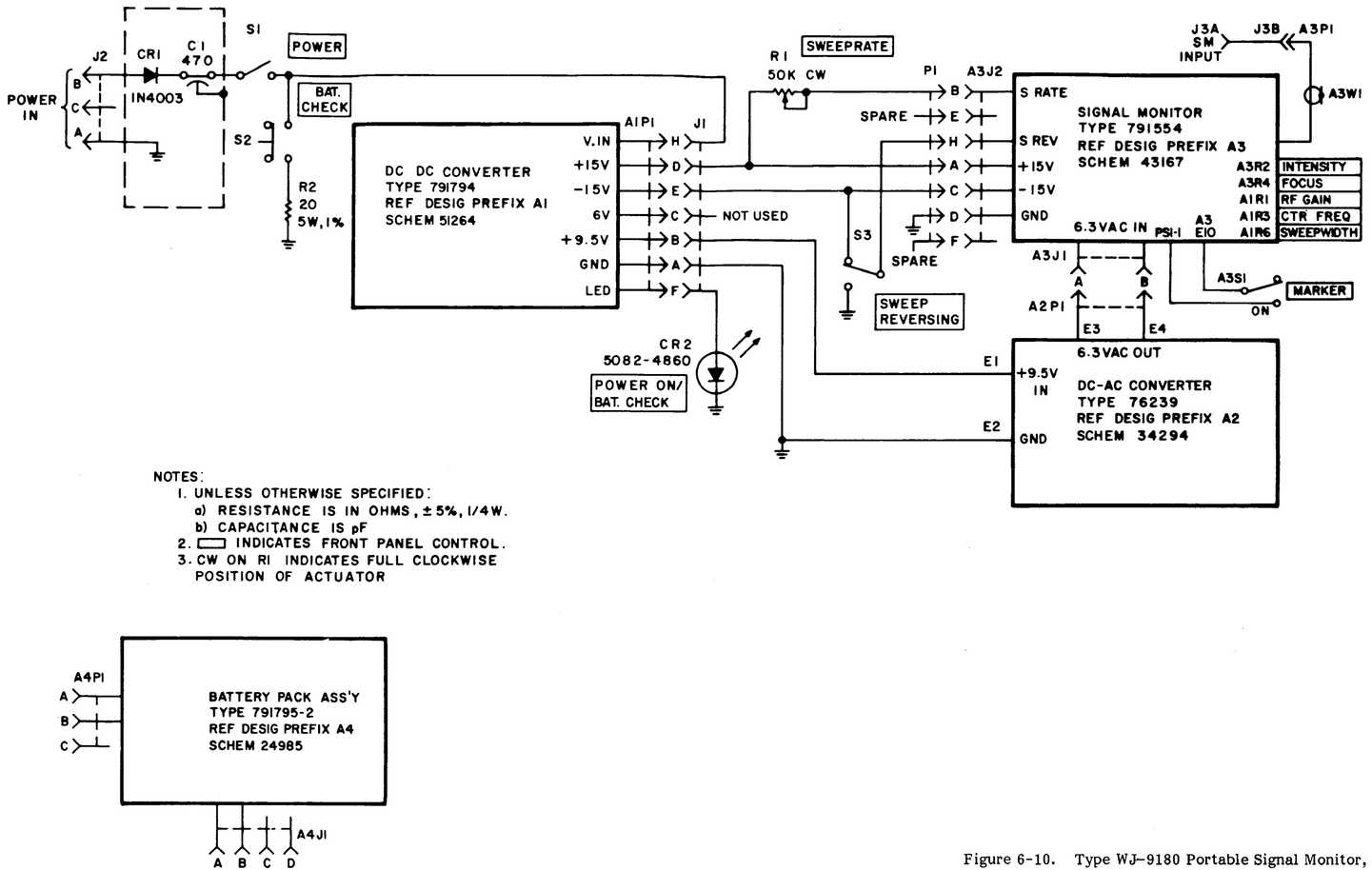


Figure 6-10. Type WJ-9180 Portable Signal Monitor, Main Chassis, Schematic Diagram 34366

APPENDIX A

REFERENCES

Refer to TM 11-5895-1227-14-1 for references.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL

This appendix provides a summary of the maintenance operations for the Panoramic Indicator, IP-1355/GRR8(V). It authorizes categories of maintenance on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations

B-2. MAINTENANCE FUNCTION

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters,

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) for an unserviceable counterpart.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

B-2. MAINTENANCE FUNCTIONS - Continued

i. Repair. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting *specific* damage, fault, malfunction or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e. DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. COLUMN ENTRIES

a. Column 1, Group Number. Column 1 lists group number the purpose of which is to identify componentts, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn, the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each
category. The number of task hours specified by the work time figure represents the average time required to restore an item to serviceable condition under typical field operating Conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

c	Operator or crew
o	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

B-3. COLUMN ENTRIES-Continued

e. Column 5, Tools and Equipment. Column **5** specifies by code, those common tools sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetical code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. TOOL AND TEST EQUIPMENT REQUIREMENTS (Section III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column in the MAC. The numbers indicate the applicable tool or test equipment for the maintenance function.

b. Maintenance Category. The code in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equip—merit required to perform the maintenance functions

d. National/NATO Stock Number. This column lists the National/NATO stock number of the Speclflc tool or test equipment.

e. Tool Number. This column lists the manufacturers part number of the tool followed by the Federal Supply Code for manufacturers (5 digit) in parentheses

B-5. REMARKS

a. Reference Code. This code refers to the appropriate item in section 11, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarity items appearing in section IL

Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools and Equipment	(6) Remarks
			C	O	F	H	D		
02	Signal Monitor	Inspect		0.1					
		Inspect			0.1				
		Inspect					—	—	
		Replace		0.2				6	
		Repair			0.3			6	J
		Repair					1.0	6	O
		Test			2.5			2-5,7-11	V
		Test					1.5	2-3,4-5 8-11	O
		Alignment					3.5	10-14	
0201	DC/DC Converter (A1)	Replace			0.3			6	
		Repair			0.2			6	O
		Repair					0.5	6	
		Test			0.4			2-3,8-9	
0202	DC/AC Converter (A2)	Replace			0.3			6	
		Repair					0.5	6	O
0203	Signal Monitor (A3)	Repair			0.4			6	K
		Repair					1.0	6	O
		Test			0.3			2-3,7-13	
020301	IF Amplifier (A3A1)	Repair			0.3			6	L
		Repair					0.5	6	O
		Test			0.5			4-5,8-11	
		Test					0.5	4-5,8-11	O
0204	D-Cell Insert (A4A1)	Replace			0.2			1	
		Repair			0.3			6	D
		Repair					0.5	6	O
		Test			0.3			2-3	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National Stock Number	(5) Tool Number
1	O	Tool Kit, Electronic Equipment, TK-100/G	5180-00-605-0079	
2	O,F,D	Multimeter, Digital, AN/PSM-45	6625-01-134-2512	
3	O,F,D	Test Lead Set, Simpson Catalog No. 00577	N/A	
4	O,F,D	Voltmeter, RF, Boonton 92C	6625-01-116-9500	
5	O,F,D	High Frequency Probe, Boonton 91-21F	N/A	
6	F,D	Tool Kit, Electronic Equipment, TK-105/G	5180-00-510-8177	
7	F	High Voltage Probe, 5 KV, Simpson Cat. No. 00053	N/A	
8	F,D	Power Supply, PP-6547/U	6625-01-823-5359	
9	F	Power Supply Leads, *Local Manufacturer	N/A	
10	F,D	Generator, Signal, SG-1112(V)I/U, w/options 001,002,003 (2 required)	6625-00-500-6525	
11	F,D	Cable, RF, 50 ohms, 4 ft., BNC-BNC, HP-1053A (9 required)	5995-00-070-8747	
12	F,D	Oscilloscope, AN/USM-281C	6625-00-106-9622	
13	F,D	Voltage Probe, 10X, TEK P6006	6625-00-524-0572	
14	F,D	Counter, Frequency, TD-1225A(V)I/U	6625-00-079-1426	

*Power Supply Leads, (+24 VDC at less than 1 amp) Banana Plug-to a U-316/U, 14 pin plug with power (Red) Lead to pin A (Ground), Red Lead to pin E. The ground wire (BLACK) to pin A

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS - Continued

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National Stock Number	(5) Tool Number
14	F,D	Counter, Frequency TD-1225A(V)1/U	6625-00-498-8946	

Section IV. REMARKS

Reference Code	Remarks
D	Batter Pack (Reciever, DF and Sign Monitor) Repair is accomplished by removal and replacement of throwaway batteries and fuses, and the battery pack power plug (A4P1- Signal Monitor.
J	Signal Monitor Repair is accomplished by removal and replacement of selected throwaway modules and circuit cards, intraconnecting cables, and chassis mounted piece parts
K	Signal Monitor (A3) Repair is accomplished by removal and replacement of throwaways, Focus and Intensity Control (A3A3) and selected piece parts.
L	IF Amplifier (A3A1) Repair is accomplished by removal and replacement of throwaways, IF Amp. Board (A3A1A1) and IF Amp. Board (A3A1A2).
O	Depot Tools and Equipment listed are an engineering estimate of the minimum requirement.
V	LRU level testing to identify a defective assembly or subassembly.

APPENDIX C

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists the basic issue items for the signal monitor to help you inventory items required for safe and efficient operation There are no components of end items.

C-2. GENERAL

The Basic Issue Item (BII) has the minimum essential items required to replace the signal monitor in operation, to operate it and to perform emergency repairs. Although shipped separately packaged, BII must be with the equipment during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition BII based on Table of Organization and Equipment/Modified Table of Organization and Equipment (TOE/MTOE) authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column 1, National Stock Number. This column indicates the national stock number assignged to the item and will be used for requisitioning purposes

b. Column 2, Description, FSCM and Part Number. This column indicates the federal item name and, when applicable, a brief description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

c. Column 3, Unit of Measure. This column indicates the measure used in performing the actual operation/maintenance function This measurement is expressed by a two character alphabetical abbreviation

d. Column 4, Quantity Required. This column indicates the quantity of the item authorized to be used with/on the equipment.

Section II. BASIC ISSUE ITEMS LIST

(1) National Stock Number	(2) Description FSCM Part Number	(3) Unit of Measure	(4) Quantity Required
5895-01-073-1604	Indicator, Panoramic, 80058 WJ-9180 and IP-1355/GRR-8(V) WJ-9180-1	Ea.	1
5895-01-073-6839	Power Supply/BA, 14632 WJ-8640-l/BC PP-7566/GRR-8(V)	Ea.	1
N/A	Battery, 09823 CD10 Nickel Cadmium	Ea.	10
N/A	publication N/S TM 11-5825-278-12-2 80058 N/A	Ea.	1
N/A	Publication N/S TM 11-5895-1227 -14-3 80058 N/A	Ea.	1

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FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703-5007

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

SAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
SSG I. M. DeSpiritof

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