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New

TECHNICAL MANUAL

for

Dual VLF/HF Active Vertical Antenna

Model AVA-4-2X8

The Technical Materiel Corporation

Mamaroneck, New York 10543-2300

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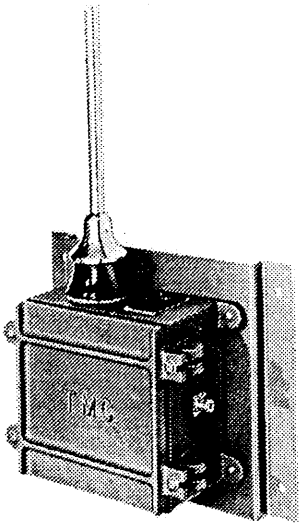
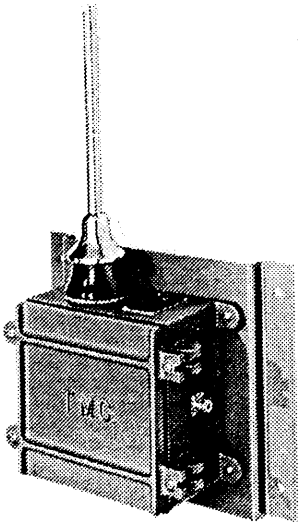
THE TECHNICAL MATERIEL CORPORATION

COMMUNICATIONS ENGINEERS

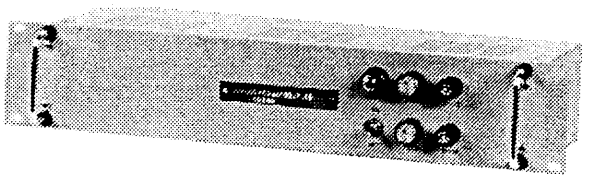
Model AVA-4-2X8 Active Vertical Antenna System



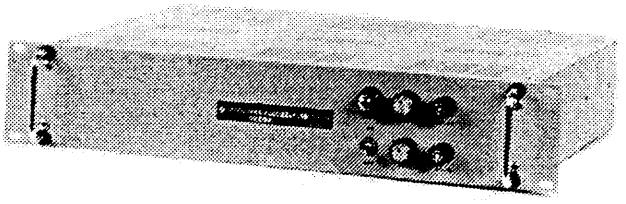
VLF/LF ANTENNA (VAA-3)



HF ANTENNA (VAA-1)



POWER SUPPLY (PSP-13)



MULTICOUPLER (DMC-2X8)

The designation "AVA-4" is used herein to refer interchangeably to the AVA-4-2X4, AVA-4-2X8 and AVA-4-2X16. Any exceptions or variations to this convention are noted.

Table of Contents

List of Illustrations

List of Tables

Record of Revisions

REV 01 _____

REV 02 _____

REV 03 _____

REV 04 _____

REV 05 _____

REV 06 _____

REV 07 _____

REV 08 _____

REV 09 _____

REV 10 _____

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment - except electron tubes, semi-conductor devices, fuses, lamps, batteries, and articles made of glass or other fragile or expendable materials - purchased hereunder to be free from defect in workmanship and materials under normal use and service, when used for the purposes for which the same is designed, for a period of ONE YEAR from the date of delivery FOB factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, FOB factory, which may fail within the stated warranty period, provided:

- Any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction;
- The defect is not the result of damage incurred in shipment from or to the factory;
- The equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise; and
- Any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

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Section 1 - General Description

1.1 Functional Description

The AVA-4 Active Vertical Antenna System is essentially an interconnection of four elemental subsystems: 1) an active vertical whip optimized for the 2-30MHz HF region; 2) an active vertical whip optimized for the 10-200kHz VLF/LF region; 3) a dual-input active receiving multicoupler consisting of two multiple-output sections, one configured for HF and the other for VLF operation; and 4) a dual-output coaxial power supply that provides operating voltages for the active antennas over the RF input lines.

The antenna can be configured as a four, eight or sixteen dual-output system. The model number identifies the configuration by a three-character suffix, e.g. AVA-4-2X8 for the dual eight-channel system. For purposes of clarity, the subsystems will be referenced in this text as follows: HF/VLF antenna mast, multicoupler and power supply.

1.1.1 VLF/LF and HF Antennas

1.1.1.1 Model Designation

The antenna model numbers assigned to the AVA-4 vertical antenna assemblies are VAA-3 for the VLF /LF antenna and VAA-1 for the HF antenna.

1.1.1.2 Overview

The antenna assemlies are vertical receiving whips that are used in installations where a convenient broadband device is needed to provide a suitable mast for reception and an impedance match to monitor receivers operating over a wide range in the VLF, LF and HF spectrum.

1.1.1.3 Physical Charateristics

The VAA-1 and VAA-3 units are vertical receiving antenna with internal pre-amplifiers and impedance matching networks that are used with receivers operating in the 2-30MHz and 10-200kHz frequency ranges, respectively. Both models of the VAA use the same antenna mast which consists of 16 feet of seamless aluminum tubing in three sections. Each section telescopes into the section below it to reduce th overall transport length of the antenna. Alternatively, the antenna assembly can be provided in stainless steel (telescoping) or fiverglass (three-section).

1.1.1.4 Component Assemblies

Each VAA assembly consists of three elements: the vertical monopole mast mounted directly on a post at the top of a cast aluminm case; an internal broadband matching network; and an RF preamplifier with optional overload sense control. The matching network, preamplifier and overload control are housed in the weatherproofed aluminum case as protection against severe environmental conditions. Operating voltage to the active elements is provided by an associated power supply (PSP-13) via the coaxial antenna input cable. In the event that operating power is lost, the preamplifier is automatically bypassed so that communications can proceed at reduced gain with minimal interruption of service.

1.1.1.5 Preamplifier Module

The preamplifiers are rugged, conservatively-rated linear networks which deliver a nominal 15dB gain in the VAA-1 and 30dB gain in the VAA-3 throughout their respective frequency ranges. Each unit is broadband that accepts the input from the receiving antenna and provides a 50-ohm unbalanced output to the associated receiving multicoupler. Both have a wide dynamic range and low noise characteristic.

1.1.1.6 Bypass Module (Option)

The antenna assembly can be equipped with an RF overload module that is used to detect high-energy fields at the antenna. This module is particularly useful in transmitter-receiver systems that utilize a common antenna. The module acts to bypassthe preamplifier circuits and prevent damage by either lightning or transmitted RF energy.

1.1.1.7 Matching Network

The matching network used to couple the antenna to the preamplifier assembly has a frequency response which is flat within +/-1.5dB over the operating range. However, it is important to remember that impedance matching over such a wide frequency range, using a fixed-length antenna, is of necessity a compromise. In this case, the optimum match is provided at the approximate mid-point of the frequency band and the efficiency on either side of this point may vary.

1.1.1.8 Input/Output Characteristics

The input and output characteristic impedance is 50 ohms, with a VSWR better than 1.5-to-1. Optionally, 70 ohms impedance can be provided. A change in the characteristic impedance of the antenna will not adversely affect the operation of the preamplifier which provides a nominal 15dB gain across the frequency range in the VAA-1 and 30dB in the VAA-3.

1.1.1.9 RF Terminations

Input/output connectors, other than the N-type normally installed, may be substituted depending on the interconnect required at the receiving site. A wide range of terminating connectors are available including BNC, C and UHF.

1.1.2 LF/HF Receiving Multicoupler

1.1.2.1 Model Designation

The dual-input VLF/HF receiving antenna multicoupler is assigned the module number DMC-2X4 for the (dual) four-channel unit; DMC-2X8 for the (dual) eight-channel unit and DMC-2X16 for the (dual) sixteen-channel unit.

1.1.2.2 Overview

The multicoupler is a broadband coupling unit used to simultaneously couple up to four, eight or sixteen communication receivers to two antennas - one operating in the VLF/LF region and the other in the HF region. The multicoupler provides a nominal 2dB gain from antenna to receiver with a wide dynamic range and low noise characteristic over the operating frequencies. The equipment is designed to provide excellent isolation from receiver to receiver and from each receiver to antenna. All components used in the multicoupler are solid state.

1.1.2.3 Major Assemblies

The multicoupler consists of two input preamplifiers, one output buffer amplifier for each RF output port, and a regulated power supply. The input preamplifiers are connected to the output amplifiers via an RF distribution line.

1.1.2.4 Input/Output Characteristics

The input and output characteristic impedance is 50 ohms, with a VSWR better than 1.5-to-1. Optionally, 70 ohms impedance can be provided. Isolation is maintained to a minimum of -40dB between each receiver terminal and -55dB from each receiver terminal to the antenna inputs.

1.1.2.5 RF Outputs

The multicoupler provides HF and VLF/LF output distribution from each of two associated antennas. Input/output connectors are normally BNC although other types may be substituted depending on the interconnect required at the receiving site.

1.1.3 System Power Supply

1.1.3.1 Model Designation

The dual-output power supply and regulator used to provide operating voltages for the VAA-( ) antenna assemblies is assigned the model number PSP-13.

1.1.3.2 Overview

The power supply converts a 115/230-volt AC line voltage at 47-63Hz into a regulated (-)24-volt DC supply voltage which is passed to each VAA-( ) assembly via the coaxial antenna line. Each line is fed independently; if a failure of the power supply occurs, however, both lines will operate in tandem All components used in the power supply are solid state.

1.2 Physical Description

1.2.1 DMC-2X( ) and PSP-13 Layout

The DMC-2X( ) multicoupler and PSP-13 power supply both mount to a standard 19-inch rack. The operating controls are located on the front panel. The input connector, output connectors and primary power socket are mounted on the rear panel. All electronic components are mounted on printed circuit boards or in the case of larger power supply components, strapped down and securely fastened to an anodized aluminum chassis.

1.2.2 VAA-( ) Case Layout (Internal)

The preamplifier, matching network and optional overload control mount internally to a standard TMC cast-aluminum alloy case. There are no operating controls on any VAA assembly, all of which are pre-set at the factory for optimum performance. The optional RF overload control module is mounted adjacent to the preamplifier assembly in the same case. The RF input connector is mounted on a plate securely attached to the side of the case. All circuits are mounted on printed circuit boards which are in turn securely fastened to the individual modules. Grounding is provided through the modules to the case which in turn is provided with an external ground lug. An internal spark gap assembly is provides protection of the multicoupler and personnel from lightning hazards.

1.2.3 VAA-( ) Antenna Layout

The antenna can be a 16-foot free-standing fiberglass, aluminum (standard) or stainless steel whip. The aluminum and stainless-steel antennas are telescopic (one section is inserted into the larger section preceding it) and the fiberglass antennas are in sections that screw securely together.

1.2.4 VAA-( ) Antenna Mounting

The antenna is mounted directly to an insulated post on top of the cast aluminum case. Due to the placement of the input connector, the case may be mounted vertically (upright) to a horizontal plate for roof-top mounting, vertically to a pole using straps or vertically to a bulkhead using the mounting bolts provided.

1.2.5 Semiconductor Complement

A list of the semiconductors used in the AVA-4 are listed in Table 1.1.

Table 1.1 - Semiconductor and Intergrated Circuit Complement

DMC-2X( ) Power Supply and Regulator

Rectifier Bridge	NW10005
Bias Regulator	1N758A
Bias Regulator	1N456A
Current Regulator	TX10001
Voltage Regulator	2N5086
Voltage Regulator	2N3055

DMC-2X( ) Preamplifier and Output Circuits

Bias Regulator	1N456A
Buffer	2N3866
Current Amplifier	2N5160

PSP-13 Power Supply and Regulator

Rectifier Bridge	NW10005
Bias Regulator	1N2986

1.3 Technical Specifications

High Frequency (HF) Range 500kHz-40MHz no filter; 2-30MHz with bandpass filter; 500-2000kHz with low pass filter; other filters including broadcast stop-band filter are available.

Low Frequency (LF) Range 10-200kHz no filter; broadcast stopband filter is available.

Number of Outputs

AVA-4-2X4	4-VLF/LF and 4-HF
AVA-4-2X8	8-VLF/LF and 8-HF
AVA-4-2X16	16-VLF/LF and 16-HF

Input/Output Impedance Nominal 50 ohms, unbalanced. 70 ohms is available. BNC-type output connectors from DMC-2X( ); N-type connectors from PSP-13 to VAA-3/VAA-1 antenna assemblies. Other types are available.

Insertion Gain Nominal +15dB for VAA-1; +30dB for VAA-3.

Frequency Response +/-1.0dB

Offband Rejection Greater than -60dB, DC to 10kHz (LF) and 10-100kHz (HF), depending on filter. Greater than -30dB, 46-1000MHz (HF) and 6-1000MHz (LF).

Noise Figure Less than +7dB, nominally +5dB.

Output/Output Isolation Greater than -40dB

Output/Input Isolation Greater than -55dB

Phase Differential +/-1 degree maximum, output-output

Desensitization For a 0.4-volt peak input, 10% removed from the operating frequency, a 100 microvolt received signal drops less than 3dB.

Intermodulation Distortion For 50-ohm units: Second order is greater than -60dB for a 0.4-volt input; Third order is greater than -65dB.

VSWR Output is better than 1.2-to-1; Input is better than 1.5-to-1.

Mean-Time-Between-Failure Nominal 20,000 hours (RADC reliability tables).

1.3 Technical Specifications (Continued)

Operating Features

Cooling Convection, no fans or moving parts

Ambient Conditions -20°C to +50°C; Up to 95% R.H. Storage -40°C to +80°C

Primary Power 115VAC standard/230VAC optional, 48-400Hz, single phase. PSP-13 is a coaxial power supply that provides -24VDC operating voltage to the preamplifiers located at the base of the VLF/LF and HF antennas.

Power Consumption

VAA-3, VAA-1	10 watts nominal each
DMC-2X4	25 watts nominal
DMC-2X8	65 watts nominal
DMC-2X16	85 watts nominal
PSP-13	40 watts nominal

Antenna Mast Vertical aluminum, sainless steel or fiberglass, sectional

Type Mast	16-foot	32-foot	35-foot
Fiberglass	2.0 lbs	--	65 lbs
Aluminum	2.5 lbs	55 lbs	--
Stainless Steel	4.0 lbs	85 lbs	--

Size and Weight

VAA-3, VAA-1	Case: 9H x 11.5W x 5.5D inches
	Antenna: 2.0 dia inches x 16L feet (6'-4" collapsed)
DMC-2X4	1.75H x 19W x 16D inches, 8lbs (3.6kg)
DMC-2X8, DMC-2X16	3.5H x 19W x 16D inches, 10lbs (4.6kg)
PSP-13	3.5H x 19W x 7D inches, 4lbs (1.8kg)

Line Filters Greater than 40dB attenuation, 14KHz-150MHz.

Special Features

Monitoring Indicating fuseholders display status of primary power circuits. An optional LED indicator is provided when overload RF triggers the preamplifier bypass circuits, removing the VAA-( ) preamplifier from the receive RF path.

Safety Fuse and front-end overload protection, preventing circuit failure from high RF voltages at the input. High voltage points are covered and labelled.

Components and Construction Totally solid state circuits mounted to an aluminum alloy chassis. External hardware is stainless steel. Track slides are optional and due to weight distribution, are usually not required.

Antenna Case Mounting Bulkhead or rooftop mount using 13 x 16-inch flanged plate. Optional pole mount direct to case.

1.4 AVA Product Group

AVA-1	LF/MF Active Receiving Antenna (100-500kHz)
AVA-1-4	LF/MF Active Receiving Antenna, 4-output
AVA-1-8	LF/MF Active Receiving Antenna, 8-output
AVA-1-16	LF/MF Active Receiving Antenna, 16-output
AVA-1-32	LF/MF Active Receiving Antenna, 32-output
AVA-2	HF Active Receiving Antenna (2-30MHz)
AVA-2-4/8/16/32	HF Active Receiving Antenna, 4/8/16/32-output
AVA-3	VLF/LF Active Receiving Antenna (10-200kHz)
AVA-3-4/8/16/32	VLF/LF Active Receiving Antenna, 4/8/16/32-output
AVA-4	VLF/HF Dual-Input Active Antenna (10-200kHz, 2-30MHz)
AVA-4-2X4	Dual-Input VLF/HF Active Receiving Antenna, 2X4-output
AVA-4-2X8	Dual-Input VLF/HF Active Receiving Antenna, 2X8-output
AVA-4-2X16	Dual-Input VLF/HF Active Receiving Antenna, 2X16-output
AVA-5	VHF/UHF Active Receiving Antenna
AVA-5-8	VHF/UHF Active Receiving Antenna, 8-output

Input RF Filter Options: (excluding AVA-5 series)
Note: z=5 for 50-ohm operation; z=7 for 70-ohm operation.

/zF2 Low pass filter (fc=2MHz)
/zF4 Broadcast stopband filter (fo=1MHz)
/zF5 HF Bandpass filter, 2-32MHz
/zF6 LF Bandpass filter, 300-600KHz
/zF7 HF High pass filter (fc=2MHz)

Additional Options:
/A Internal attenuator to reduce gain
/C C-type coaxial output connectors
/N N-type coaxial output connectors
/P Coaxial power supply
/T RF overload transfer control
/U UHF-type coaxial output connectors

When ordering, specify both model and option. Example: AVA-4-2X8/NP

2.1 Initial Inspection

2.1.1 General

Every AVA-4 undergoes a thorough testing and calibration prior to shipment. Upon receipt of the system, check each packing case and its contents for obvious damage. Unpack the equipment carefully to reduce the risk of damage and to avoid misplacing any parts shipped as loose items.

2.1.2 Damage By Carrier

With respect to equipment damage for which the carrier is liable, TMC will assist in describing methods of repair as well as furnishing replacement parts.

2.2 Loose Items Supplied

The following list itemizes those loose items supplied with the AVA-4 system.

Technical Manual	AVA-4	1 each	210325-4
Power Cable Assembly	DMC-2X( )	1 each	CA10625
Power Cable Assembly	PSP-13	1 each	CA555-4
RF Mating Connectors (For RG-8 coaxial cable)	PSP->VAA	4 each	UG 00B/U
Split Washer		4 each	LW537MSS
Plate Moutning Unit		1 each	MS543
Brackets for Mounting Unit		4 each	MS619
Lag Bolts		16 each	SC111-2
Machine Bolts		4 each	SCHH3716
Coaxial RF Cable	DMC->PSP	2 each	CA480-183-6

2.3 Mechanical Installation

The VAA antenna assembly is designed for mounting on a wall, roof, pole or vehicle. For pole mounting, two straps are required; the necessary lag bolts are provided as loose items. For vertical plane mounting or horizontal plane mounting, a universal mounting plate is provided. This is the configuration provided for in the standard VAA mount. Figures 2.1 through 2.6 depict installation details and outline dimensions, respectively, and should be studied to determine the best mounting for the desired location of the antenna.

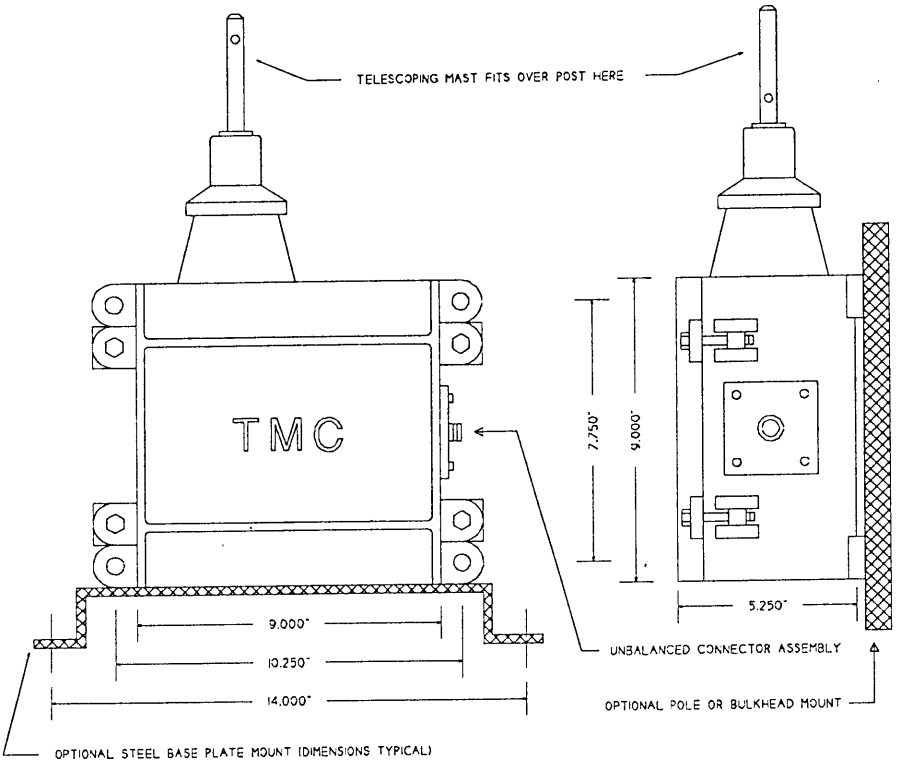


Figure 2.1 VAA-1/VAA-3 Antenna Installation/Dimensions

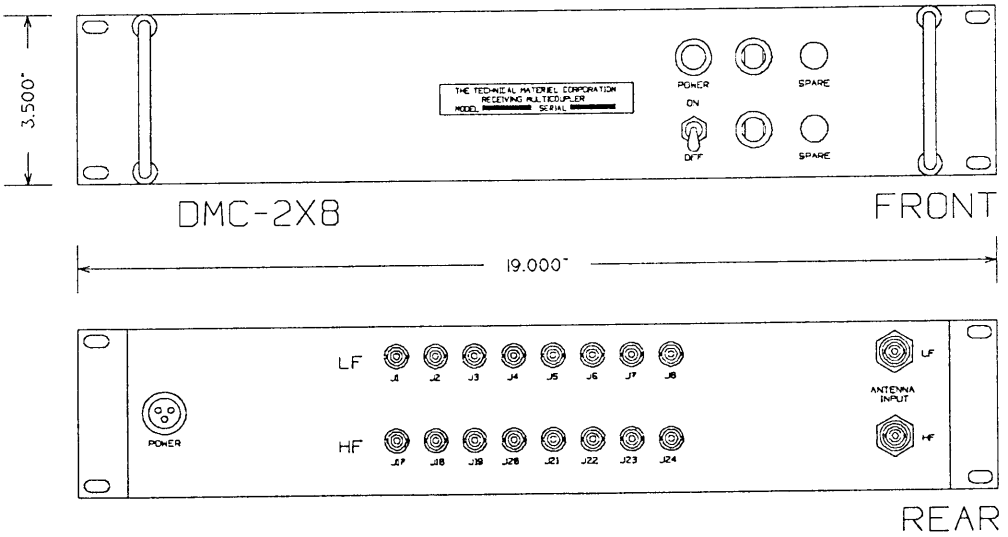


Figure 2.2 DMC-2X8 Multicoupler Installation/Dimensions

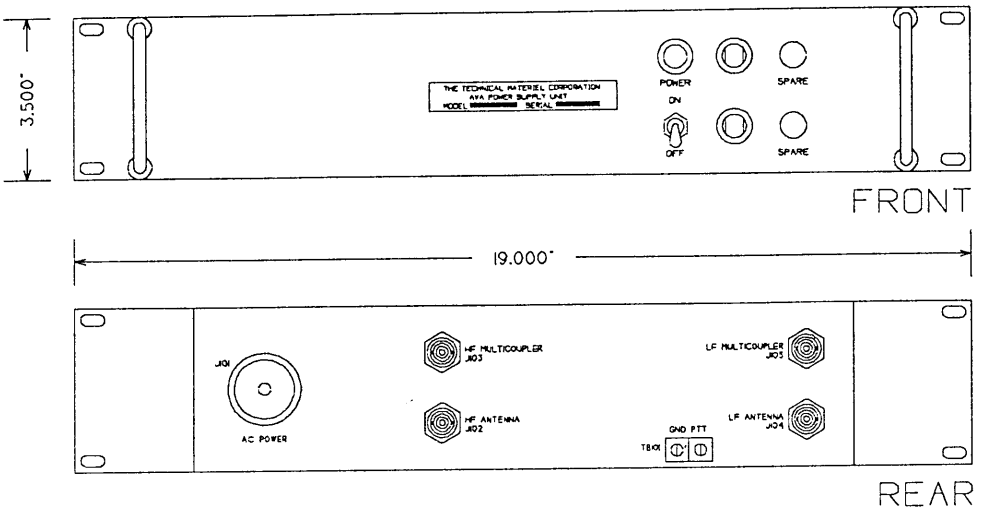


Figure 2.3 PSP-13 Power Supply Installation/Dimensions

2.4 Electrical Installation

2.4.1 Primary Power

The DMC-2X( ) and PSP-13 both operate from a 115VAC, 48 to 400Hz power source. Optionally, the unit may be wired for 230VAC, which will be noted by a decal on the rear panel adjacent to the input power connector. Primary power is applied to the DMC-2X( ) through connector J34 on the rear panel. Primary power is applied to the PSP-13 through connector J101 on the rear panel. The correct power cables are provided as loose items. See Figure 2.7 for a diagram of the electrical interconnections.

2.4.2 External Connections

The following external connections must be made to the DMC-2X( ) after it has been installed in an equipment rack:

Antenna

The HF and LF antenna cables are fitted with BNC-type and N-type connectors to mate properly with the RF input jacks on the DMC-2X( ) and PSP-13 units. The BNC connectors on the cables mate to J1 (LF) and J18 (HF) on the DMC-2X( ) . The N-type connectors on the cables mate to J105 (LF) and J103 (HF) on the PSP-13. All jacks are located on the rear panel of the respective units.

Power

Connect primary power to each unit by plugging the supplied power cable assembly into POWER connector J34 on the rear panel of the DMC-2X( ) and J101 on the rear panel of the PSP-13. Ensure that the plug is properly oriented with the socket; use the keyway as a guide.

Multicoupler Outputs

Connect the RF outputs of the DMC-2X( ) multicoupler to the assocated receivers via the BNC-type connectors mounted on the rear panel. Outputs J1 through J9 are connected to the HF section while output J10 through J17 are connected to the LF secion. RF coaxial cables, terminated with the proper mating connectors, are required for this connection.

Power Supply (RF) Outputs

Connect the RF coaxial outputs of the PSP-13 power supply to RF coaxial cables terminated with N-type mating connectors (supplied as loose items). These cables are connected to J102 for the HF antenna and J104 for the LF antenna. The cables terminate at the input connectors on the VAA-1 and VAA-3 antenna assemblies. Mating connectors are also provided as loose items for the VAA end of the coaxial cable (supplied by the customer). All RF connections to the PSP-13 are made on the rear panel.

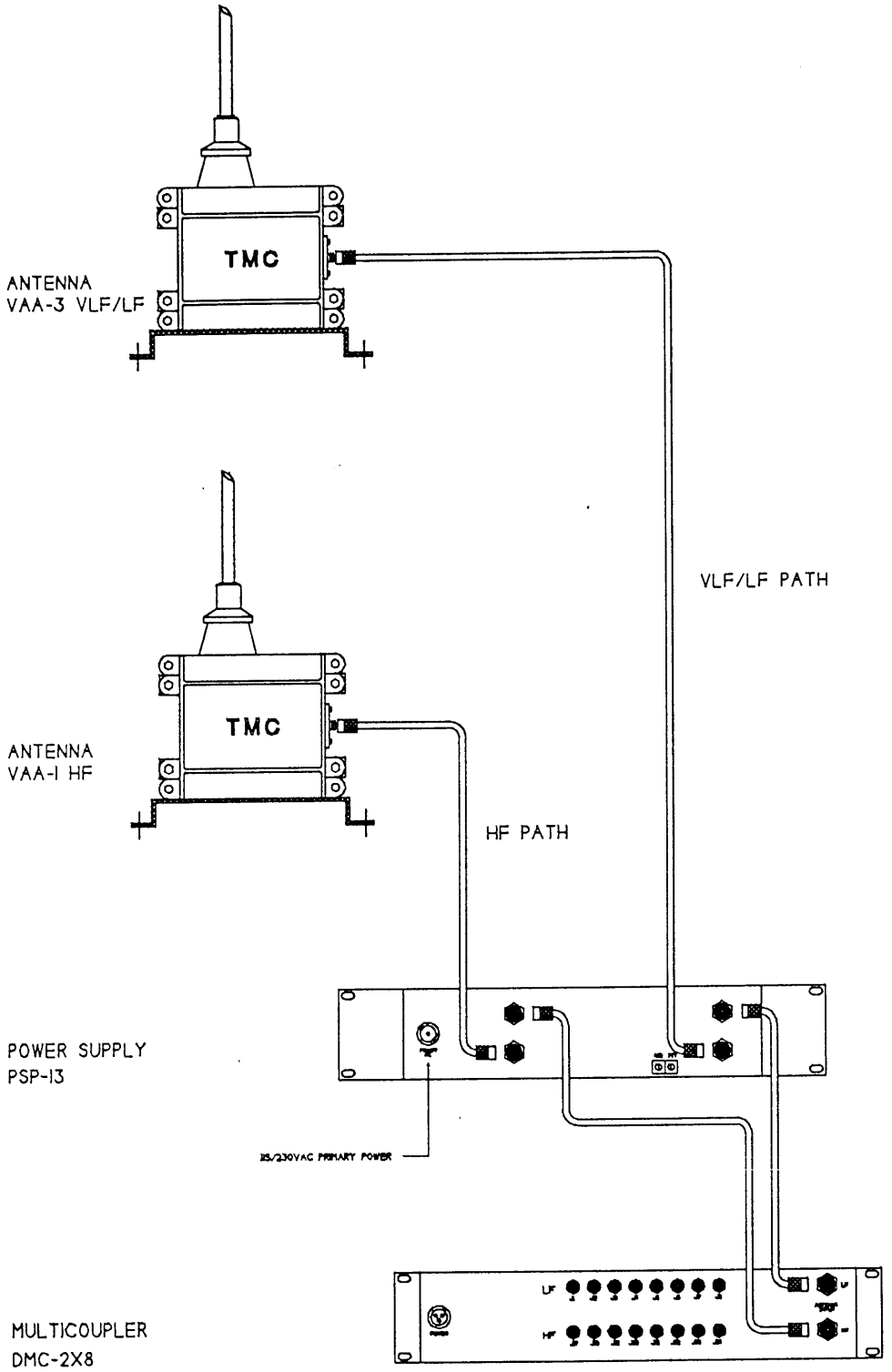


Figure 2.4 AVA-4-2X8 Interconnect Cabling

2.4.3 DMC/PSP Requirements

The DMC-2X( ) multicoupler and PSP-13 power supply should be located in such a way that sufficient clearance is obtained at the rear of the unit for making all RF and AC power connections. The front panel controls should also be within easy reach of an operator. The solid state design of both units reduce heat problems, allowing "stacking" of the units, one above the other, in the same rack. Good installation practice dictates that to reduce the possibility of failure from heat-related stresses, the units should have at least one A-panel (1.75 inch) vertical spacing between them to allow dissipation of heat.

2.4.4 VAA Requirement

The antenna is extended or attached in sections, depending on the model selected. The fiberglass sections are screwed together while the aluminum and stainless sections are extended and secured by turning the bushings located along its length. Once extended, the antenna rod must be inserted onto the antenna post located on the top of the antenna case. Align the holes at the base of the rod with the holes on the post. Anchor the antenna with the bolts provided by inserting the bolts in the holes at right angles to each other. This procedure provides both mechanical and electrical connections.

2.4.5 Grounding

Connect the VAA outer case to a good physical ground, preferably a simple counter-poise or at least one eight-foot, copper ground rod imbedded in moist earth. The connector assembly on the side of the case is normally the best location to attach this ground. The DMC and PSP units are grounded through the anodized aluminum chassis to the station grounding system.

2.5 Performance Check

2.5.1 DMC-2X( ) Multicoupler

When the appropriate power and RF connections have been made to the DMC-2X( ), turn POWER ON by toggling the front-panel switch 1S1. The POWER lamp 1DS1 will light, indicating that the unit is ready for use. No further checks are required.

2.5.2 PSP-13 Power Supply

When the appropriate power and RF connections have been made to the PSP-13, turn POWER ON by toggling the front-panel switch 1S1. The POWER lamp will light, indicating that the PSP-13 is operating and voltages are supplied to the VAA-3 amd VAA-1 antenna assemblies. No further checks are required.

2.5.3 VAA-3 and VAA-1 Antennas

When the appropriate electrical connections have been made to the VAA-3 and VAA-1 antennas, they are fully operational and ready for immediate operation. Since all components are fixed, no adjustments are needed and no further checks are required.

3.1 Controls and Indicators

Table 3.1 contains a list of the operating controls and indicators that are located on the front panel of the DMC-2X( ) and PSP-13 units.

Table 3.1 Controls and Indicators

Power ON/OFF switch	Controls primary power application
POWER lamps	Lights when primary power is applied and switch is turned ON.
FUSE holder/indicator	Indicates failure of fuse by illumination of the fuseholder.
SPARE fuse	Two spare fuses are contained in spare fuseholders located on the front panel.
TRANSMIT indicator (Optional)	An LED indicator is provided on the front panel of the PSP-13. It fires when high RF is detected at the antenna or the PTT line is grounded. The RF overload control circuit is triggered to remove the VAA networks from the received RF signal path.

3.2 Procedures

After connecting the antenna cables, communication receiver(s) and power supply, and switching the POWER switch to the ON position, no further operating procedures are required. The AVA-4 is now fully operational without further adjustment.

4.1 General

4.1.1 Capabilitiies

The AVA-4-2X( ) dual-input VLF/HF active receiving antenna is a broadband monopole antenna system designed to couple two antennas - one operating in the HF region and the second in the VLF/LF region - to the antenna inputs of two sets of four, eight or sixteen communication receivers operating in their respective regions.

4.1.2 Input/Output

Both the input and the output impedance of the system is nominally 50 ohms and optionally 75 ohms. The standing wave ratio characteristic is better than 1.5-to-1 over either frequency range.

4.1.3 Salient Performance Features

The AVA-4 provides a nominal insertion gain of 15dB from the HF antenna input to each connected receiver operating in the HF range. A nominal 30dB insertion gain is provided through the VLF/LF path. The complete system is designed to ensure minimum noise generation while providing a high degree of intermodulation rejection and isolation between the acconected receivers. The rejection and isolation figures for this equipment are stated in the Technical Spections section of the manual.

4.2 VAA-1/VAA-3 System Antenna Assemblies

4.2.1 Capabilities

The VAA-1 and VAA-3 receiving Rf preamplifiers are brodaband antenna amplifiers designed to provide either 15dB or 30dB of linear gain in the HF and VLF/LF paths, respectively, between the antenna mast and the associated communications receiver. The input and output impedance of the preamplifiers is nominally 50 ohms (optionally 75 ohms). The standing wave ratio (SWR) characteristic is better than 1.5-to-1 over the frequency ranges.

4.2.2 Salient Performance Features

The preamplifiers provide anominal insertion gain of 15dB and 30dB in the HF and VLF/LF paths, respectively. They are designed to ensure minimum noise generation and to provide a high degree of intermodulation rejection. The applicable operating parameters are listed in the Technical Specification section.

4.2.3 Location and Features

Each preamplifier is mounted on a printed ciruit board which is securely fastened to a tin-plated steel module. It is a low-noise, wideband amplifier having a 50-ohm impedance and nominal voltage gain of either 15dB (HF) or 30dB (VLF/LF). Figure 2.2 depicts its location in the mounting case. The case, along with the bypass control network, is sealed in the module and is cooled by convection through the metallic surfaces.

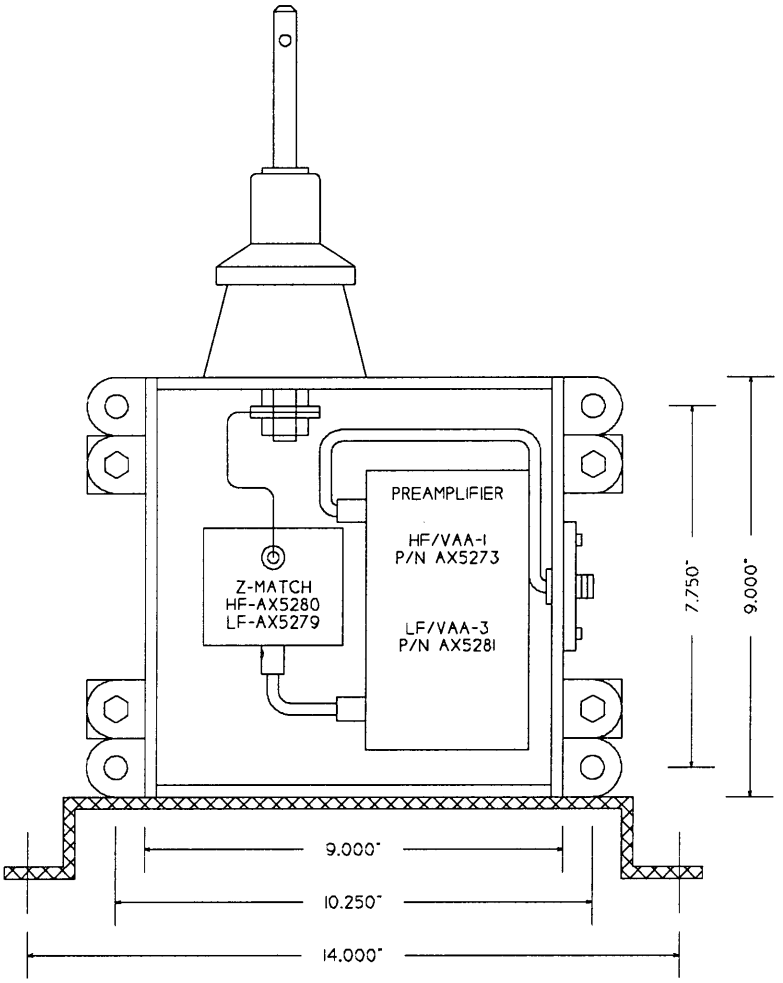


Figure 4.1 VAA-( ) Antenna Module Diagram

4.2.4 Power Distribution

Power for the preamplifier is derived from the PSP-13, a -24vDC regulated supply located in the receiver cabinet immediately before the receiving multicoupler in the input RF chain. The DC voltage is heavily decoupled to prevent distortion from the rectified power supply.

4.3 DMC-2X( ) System Multicoupler Unit

The DMC-2X( ) multicoupler consists of three major sections as shown in the System Block Diagram (Figure 4.2) and described in the following paragraphs. The multicoupler sections consist of the VLF/LF and HF preamplifier subassemblies, output buffer assemblies, and regulated power supply.

4.3.1 Preamplifier

4.3.1.1 Location and Features

The VLF/LF and HF preamplifiers are each mounted on a printed circuit board. They provide low-noise, wideband amplification with a 50-ohm nominal input impedance and nominal voltage gain of 8.5dB. Figure 4.2 depicts the location in the multicoupler chassis, while schematic and component location diagrams are in Section 6.

4.3.1.2 Circuit Analysis

The input to each preamplifier is RC-coupled through 1A2R1/1A2C1. This input drives a grouneded emitter-buffer amplifier 1A2Q1. The buffer amplifier is followed by a parallel amplifier 1A2Q2/1A2Q3, which provides minimum intermodulation of higher order products. Negative feedback is accomplished through 1A2R8/1A2C11 with a vbootstrap connection through 1A2C10. Temperature compensation is obtained with diodes 1A2CR1/1A2CR2 in the bias circuit consisting of 1A2R4/1A2R5/1A2R6. 1A2R7/1A2C12 provide bias for the buffer amplifier 1A2Q1.

4.3.1.3 Power Distribution

Power for the preamplifier is obtained from the -28vDC regulated supply 1A1. This DC voltage is heavily decoupled through 1A2C2/C3/C5/C6/C7/C13/C14 and 1A2L1 to prevent distortion from the rectified power supply.

4.3.2 Output Buffer Amplifier

4.3.2.1 Location and Features

The RF distribution line parallel feeds identical buffer amplifier assemblies, as shown in Figure 4.2 and in Section 6. Each amplifier assembly consists of emitter-follower amplifiers with an output impedance of 50 ohms and an attenuation of 6.5dB. The overall nominal multicoupler insertion gain is therefore +2dB between the antenna input and any one output port.

4.3.2.2 Circuit Analysis

The input from the RF distribution line is RC-coupled through 1A3R11/C11 to the base of emitter-follower 1A3Q11. Bias is obtained with 1A3R12/R13. The output of the emitter-follower is applied to the output termianl through a matched 50-ohm load circuit 1A3R15/C13.

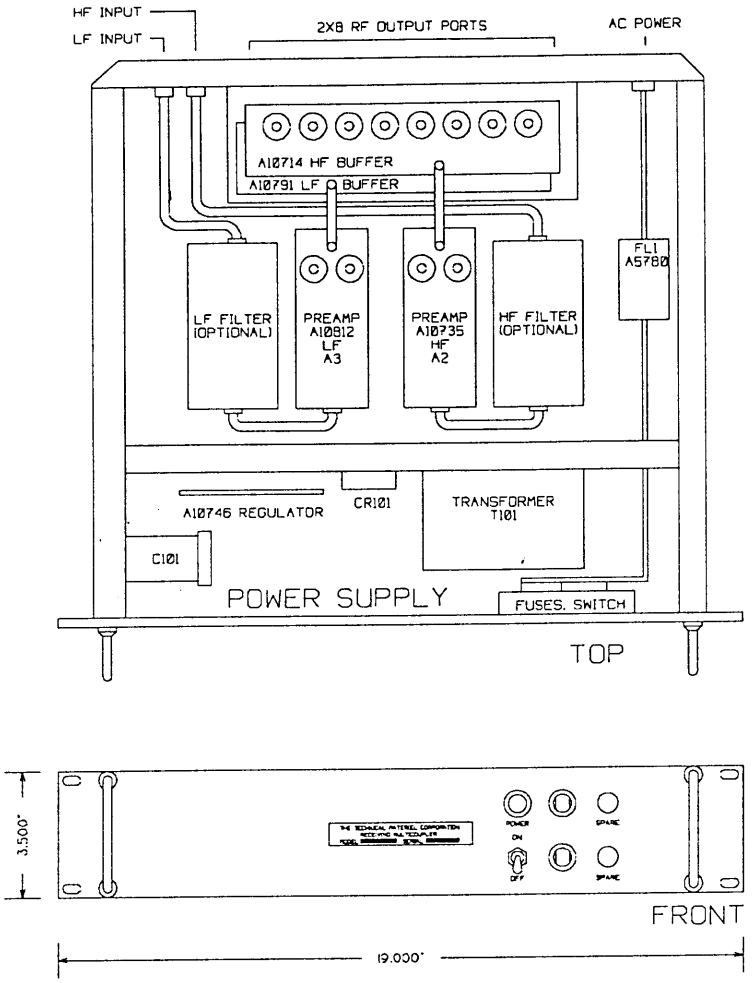


Figure 4.2 DMC-2X8 Multicoupler Module Diagram

4.3.2.3 Power Distribution

The -20vDC power is obtained from the regulated power supply 1A1 and is filtered through 1A3C1/C2/L11 to the decoupling capacitor 1A3C12 and load compensator 1A3L12 via 1A3R14 to the 2N3866 transistor.

4.3.3 Power Supply and Regulator

4.3.3.1 Location and Features

The components comprising the power supply are all chassis mounted except for the regulator circuit which is mounted on circuit assembly 1A1. The latter is described in the following paragraphs (See Figure 4.2 and Section 6).

4.3.3.2 Circuit Analysis

Primary power is supplied through two AC line RF filters (1FL1/2) to the ON/OFF switch 1S1.When 1S1 is in the ON position, power is supplied through the two fuses 1F1/2 to the power transformer 1T1 and the front indicator lamp 1DS1. The secondary of transformer 1T1 produces 29vAC, which is rectified by bridge rectifier 1Z1 and filtered by capacitor 1C1.

4.3.3.3 Current and Voltage Regulation

The regulator bard and transistor 1Q1 provide the voltage and current regulation required for the -20v supply. All components in this section with the exception of transistor 1Q1 are mounted on printed ciruit assembly 1A1. Potentiometer 1A1R7 is used to set up the intial -28v required by the DMC. Transistor 1A1Q1 and diodes 1A1CR1/CR2/CR3 form a voltage reference circuit (sensisitive to temperature and load changes) which in turn control Darlington-connected transistors 1A1Q1/Q2. In addition to providing short-circuit protection, this network also provides the necessary voltage and current regulation for the power supply. The -29vAC output from Pin 6 of the regulator board is filtered through 1L1/1C1, which are chassis-mounted and then fed to the circuit boards.

4.4 PSP-13 System Power Supply Unit

4.4.1 Location and Features

The components comprising the power supply are all chassis mounted to a standard 19-inch rack panel. Optionally, the PSP-13 can be mounted in a small module for customized fitting to a primary chassis or cabinet. See Section 6 for applicable schematics and component locations.

4.4.2 Circuit Analysis

Primary power is applied directly to the main power ON/OFF switch located on the front panel. When this switch is in the ON position, power is applied through line fuses F1/F2 to the power transformer T1 and front panel indicator lamp DS101. The secondary of transformer T1 delivers 29vAC, which is full wave rectified by bridge rectifier CR101 and then filtered by capacitors C101/C102. The -28 volt output is regulated by a 28vDC Zener and then fed to a decoupling circuit. This circuit is designed to present a direct short to any RF comping from the antenna and to prevent any low frequency power supply hum from entering the RF path. The incoming RF at J102 is shunted directly to the receiver via J103 through C104.

5.1 General

5.1.1 Test Equipment Requirements

This section describes preventive maintenance, troubleshooting and repair procedures for the AVA-4. The following equipment is suggested in order to perform these procedures properly:

- Function Generator - H/P Model 3312A or equivalent
- Oscilliscope - H/P Model 54501A or equivalent
- Digital Multimeter - H/P Model 3468B or equivalent

5.1.2 Component Location

For aid in the location of components, refer to Section 6 for part lists, component location digrams and schematics.

5.2 Preventive Maintenance

5.2.1 General Cleaning Methods

Preventive maintenance for the AVA-4 consists of performing such routine functions as visual inspection and cleaning. Periodic cleaning is recommended as dust may build up on components,reducing the efficiency of the coupling network and possibly causing circuit failure depending on the type of contaminant present. To clean the unit, use a vacuum cleaner, a low-pressure (filtered) compressed air suuply, and a damp spong with mild detergent.

5.2.2 Visual Check and Adjustments

A simple visual check of the unit when it is opened up for servicing or cleaning often reveals potential trouble spots. Signs of trouble include discoloration of components, warping of printed ciruit boards and damaged or frayed wiring. Any damaged component should be replaced immediately. Remember to tighten all hardware during visual inpections.

5.2.3 Dessicant Replacement or Restoration (VAA-1 and VAA-3)

The dessicant package used to remove moisture within the antenna case is held by a flexible metal strap fastened to the interior wall of the case. Change the dessicant every six months or more frequently when operating in extremely humid or wet conditions. If replacement is not possible, remove the dessicant bag and dry it in an oven at 250°F for about one hour. The AVA-4 will operate properly without the dessicant bag in place but long-term use without the drying agent should be avoided.

5.2.4 Spark Gap Setting (VAA-1 and VAA-3)

To maintain rpoper protection of the VAA-1 and VAA-3 from static electricity discharge, spark gaps are provided adjacent to the antenna posts inside the case. The spark gaps should be checked periodically for proper spacing and the points inspected for obvious signs of deterioration. The distance between the point and the circular metal wafer on the antenna post should be no greater than 1/32-inch (0.032"). Adjustment is made by lossening the set screw holding the spark gap needle in place on its binding post. Make certain this set screw is securely tightened when the adjustment is completed.

5.3 Troubleshooting

5.3.1 General Failure Symptoms

During operation of the AVA-4, the following symptoms of a system failure may be observed:

- No signal output from one or all receivers
- Weak or noisy signals from one or all receivers

5.3.2 Fault Localization

The primary of the troubleshooting procedure is to localize the fault to a particular section of the antenna system. Table 5.1 provides a guide to locating and correcting the possible failures. Remember that many faults are caused by simple errors of omission. Even the best engineer can forget to check the DC continuity of an RF coaxial cable or miss a blown line fuse or even fail to apply main power. FIRST CHECK THE INSTALLATION and then proceed with the Troubleshooting Procedures listed below.

Table 5.1 - Troubleshooting Procedures

Symptom: No signal output at one or more receivers

Possible Cause:	Receiver failure (one multicoupler output affected)
Remedial Action:	Refer to receiver manual
Possible Cause:	Interconnection - multicoupler to receiver (one output affected)
Remedial Action:	Check the RF cable between the receiver and multicoupler Check RF cabling between multicoupler and power supply Check RF cabling between power supply and antenna
Possible Cause:	Power supply failure in the multicoupler (all outputs affected)
Remedial Action:	If POWER ON lamp 1DS1 is not illuminated, check for power input failure or defective input filters 1FL1/FL2. If POWER ON lamp is illuminated, check idicating fuses 1F1/F2 and replace with spare if necessary. If both fuses are intact, proceed to check the power transformer T1, bridge rectifier Z1 and voltage regulator 1A1. A -28vDC should be available at terminal 6 of the regulator board for proper operation.

Possible Cause:	Output buffer amplifier failure (one output affected)
Remedial Action:	If DC voltage is present at the output of the regulator and at the output of the buffer amplifier, possible failure of a component on the output amplifier board is indiacted. Remove, test and replace component or repair module 1A4 or 1A5 as necessary.
Possible Cause:	Failure of input preamplifier (all outputs affected)
Remedial Action:	If DC voltage is present at the output of the regulator and at the preamplifier, possible failure of a component in the preamplifier or failure in the input antenna circuit is indicated. For repair of the preamplifier, remove and test module 1A2 or 1A3 as necessary.

Symptom: Weak or noisy signals to ALL receivers

Possible Cause:	Antenna fault
Remedial Action:	Connect the antenna lead-in directly to the antenna input of the receiver, bypassing the system power supply unit. If the symptom persists, check for a fault in the antenna system.
Possible Cause:	Faulty preamplifier
Remedial Action:	If the cause cannot be attributed to the antenna, possible failure of a component in the preamplifier module is indicated. Remove, test and replace module 1A2 or 1A3 may be necessary.

Symptom: Weak or noisy signal in ONE receiver

Possible Cause:	Receiver noise
Remedial Action:	Refer to receiver manual
Possible Cause:	Interconnection - coupler to receiver
Remedial Action:	Check the RF cable between the multicoupler and receiver.
Possible Cause:	Faulty output buffer amplifier
Remedial Action:	Connect the receiver to another output termianl of the same module (1A4/1A5). If the symptom persists, the probable cause will be found in the power supply circuit of the module. If the symptom is no longer present, the fault will be found in the directly-associated buffer amplifier circuit or output connection. Remove, test and replace the module as necessary if the fault is not in the connection.

5.4 Repair

Repair work generally consists of replacing a defective component or module. The following cautions should be observed:

- Make certain the replacement component is an exact duplicate of the defective one. It must have the same form, fit and function. This is particularly important in the amplifier modules.
- Place any new component in the same location as the component it replaces. The dressing of any wire runs should not be lengthened, shortened or in any other way altered.
- Observe standard practice when replacing semiconductor components by using a low-wattage soldering iron and appropriate heat-sink tools.
- Avoid damage to the printed circuit wiring when handling or repairing amplifier and regulator modules.

5.5 Adjustments

5.5.1 Output Voltage Trim

Only one adjustment may be required and that is located in the DMC-2X( ) multi-coupler. Power supply regulator 1A1 contains a screwdriver-adjustable potentiometer (R7) that is pre-set, prior to shipment, to provide a -28vDC level. If this operating voltage requires adjustment, use an accurate voltmeter and reset the voltage to -28vDC by rotating the pot(entiometer) control clockwise to reduce voltag or counter-clockwise to raise voltage.

Amplifier Trim

The preamplifiers and power supplies do not require any adjustments since all components are fixed.

Section 6 - Parts Lists and Diagrams

6.1 Vertical Antenna Assembly, Models VAA-1 and VAA-3

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
VAA-1		Vertical Active Antenna, HF		
A5882		Antenna Assembly, VAA-( )	1EA	
AX5273		Amplifier Assembly, HF	1EA	
AX5280		Matching Network Assembly, HF	1EA	

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
VAA-3		Vertical Active Ant,LF/Hi-Gain		
A5882		Antenna Assembly, VAA-( )	1EA	
AX5279		Matching Network Assbly,LF/VLF	1EA	
AX5281		Amplifier Assembly, LF/Hi-Gain	1EA	

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A5882		Antenna Assembly, VAA-( )		
AW100-3		Antenna Mast, Aluminum/3-sec	1EA	
BS100		Solder, Soft	1X	
CA1904		Cable, Coaxial Assembly	1EA	
CA1905		Cable, Coaxial Assembly	1EA	
FW2520HBN		Flat, Washer	4EA	
GA103		Gasket	1EA	
GA136-4		Gasket, Neoprene	1EA	
GA136-3		Gasket, Neoprene	1EA	
GA138-5		Gasket	1EA	
GA149-4		Gasket	1EA	
GL101-2		Cement, Pliobond	1X	
MS545		Base, Mounting	1EA	
MS7260		Plate, Mtg Comp.	1EA	
NS131		Insulator, Stand-off	1EA	
PM100		Nut, Barrel	4EA	
PM105		Cover, Machining	1EA	
PM119		Flange	1EA	
PM717		Case, Machining	1EA	
PO215		Cap	1EA	
PO216		Post, Antenna	1EA	
PX612		Insulator, Support	1EA	
SCHH2520SS32		Screw, Machine	4EA	
UG58A/U		Connector, Receptacle, RF	1EA	
WI131		Wire, Electrical	1X	

6.2 Receiving Antenna Multicoupler, Model DMC-2X8

6.2.1		System Schematic Diagram
6.2.2	A10739	Front Panel Assembly
6.2.3	A10746	Regulator Assembly
6.2.4	A10791	Buffer Amplifier Assembly (LF Section)
6.2.5	A10714	Buffer Amplifier Assembly (HF Section)
6.2.6	A10812	Preamplifier Assembly (LF Section)
6.2.7	A10735	Preamplifier Assembly (HF Section)
6.2.8	A5780	Line Filter Assembly

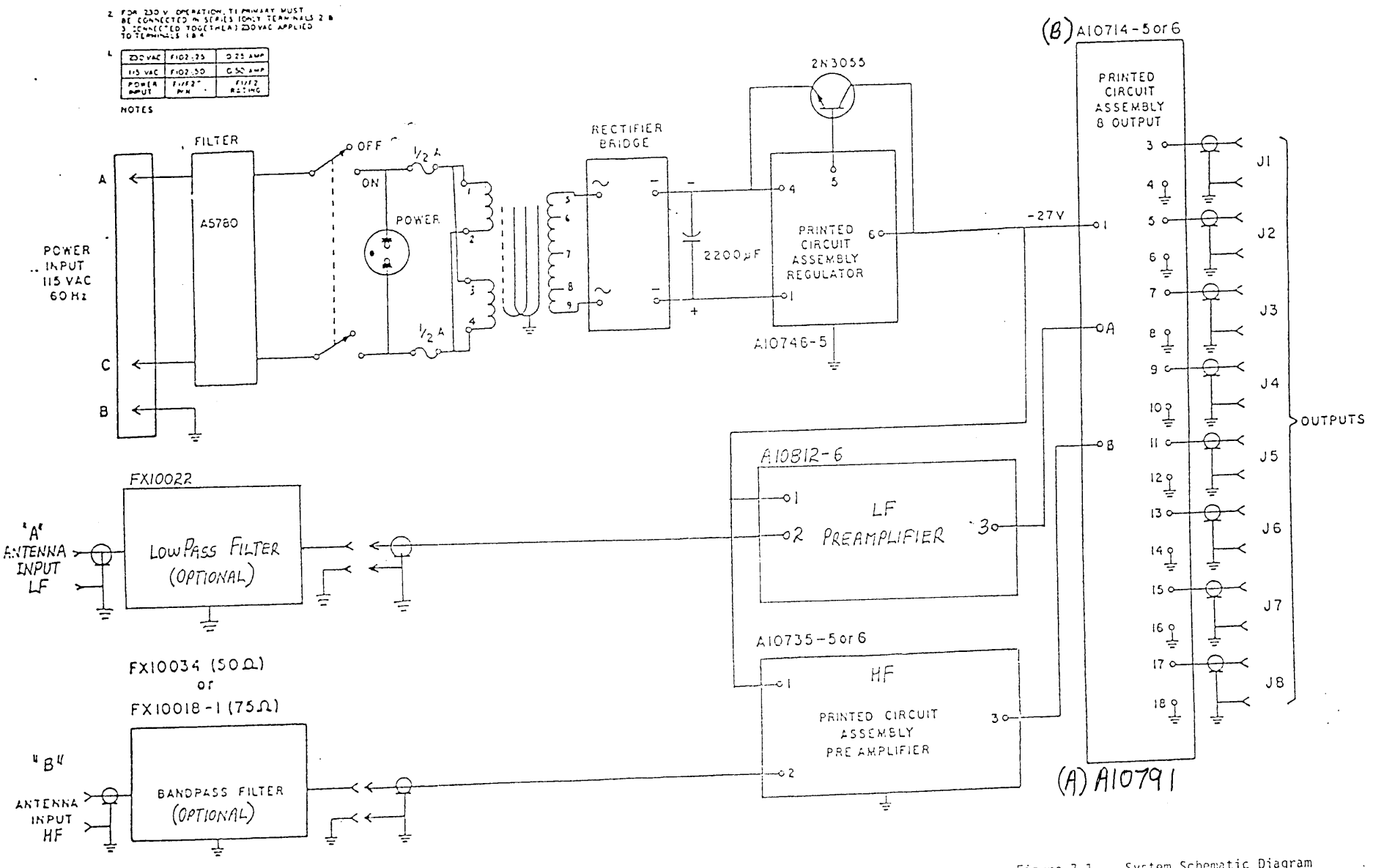
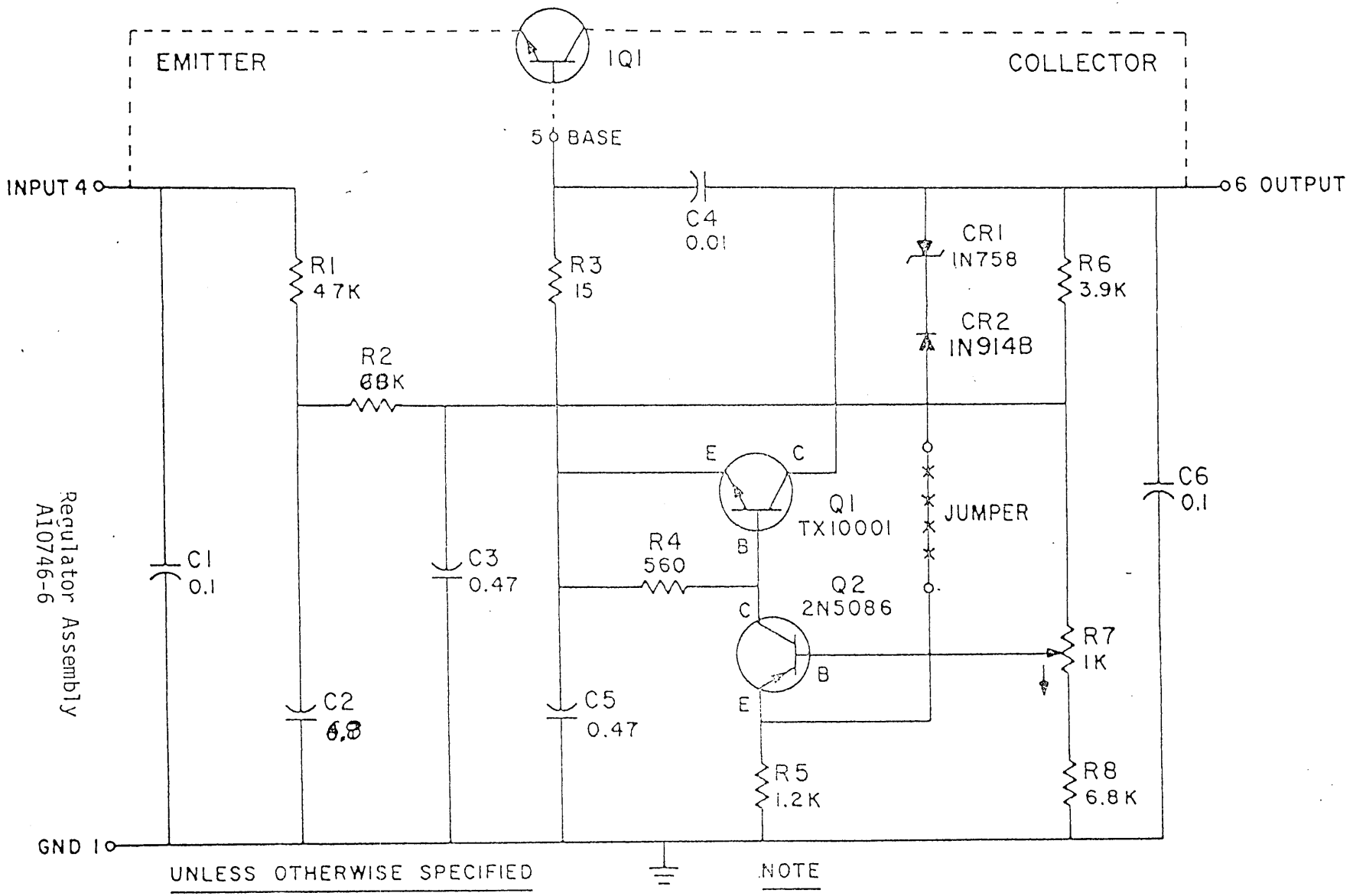


Figure 7.1 System Schematic Diagram

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10739		Panel Assembly		
BI100-51		Lamp, Glow	1EA	
FH103		Fuseholder	2EA	
FH104-3		Fuseholder	2EA	
FU102-.250		Fuse, Cartridge FOR 230VAC OPERATION ONLY	4EA	
FU102-.500		Fuse, Cartridge FOR 115VAC OPERATION ONLY	4EA	
LD10307/MS10932		Panel, Front	1EA	
ST22K		Switch, Toggle	1EA	
TS106-2		Light, Indicator	1EA	



UNLESS OTHERWISE SPECIFIED

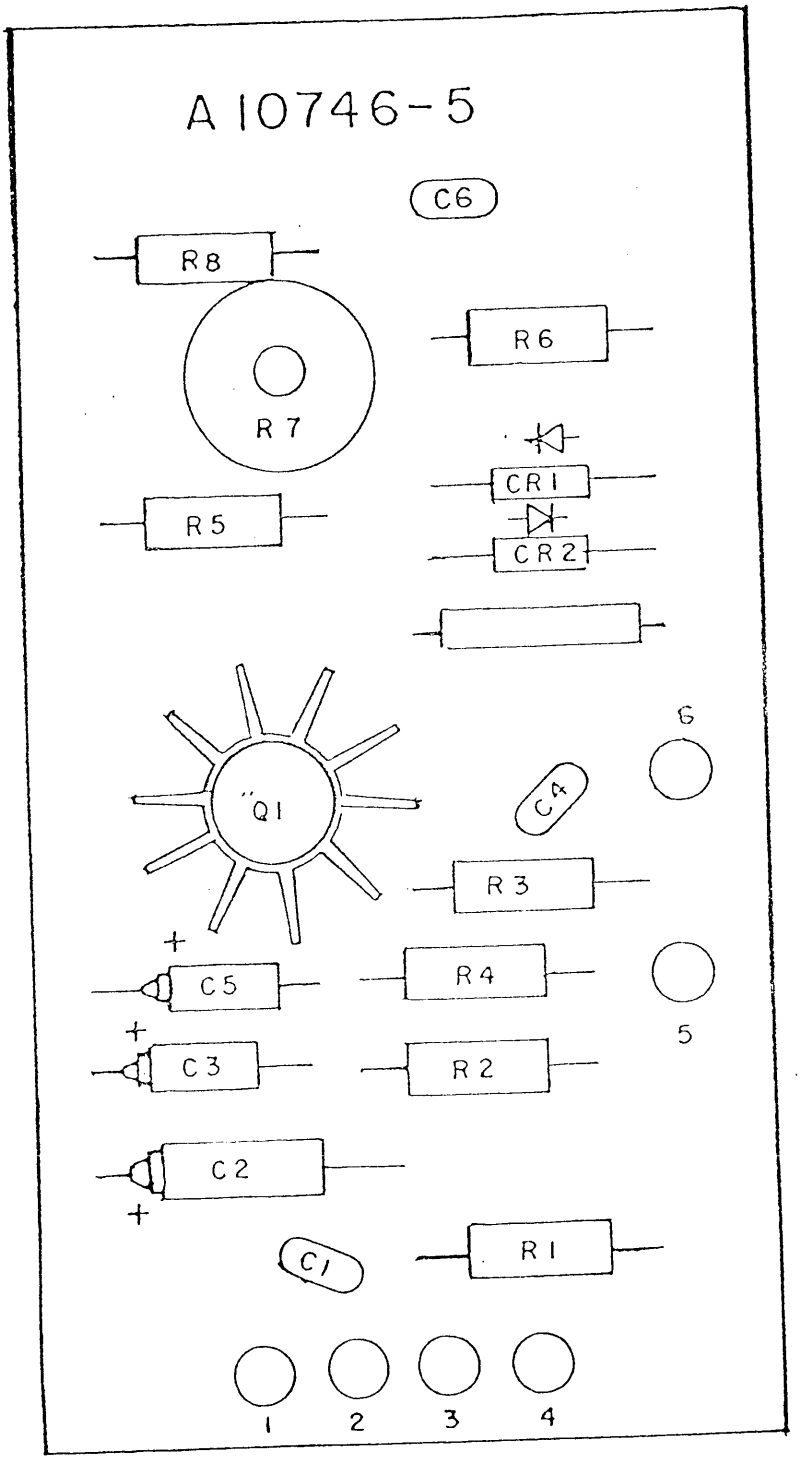
RESISTANCE IN OHMS 5%, 1/2W

CAPACITANCE IN μF

INDUCTANCE IN μh

NOTE

ALL COMPONENTS PREFIXED BY FIGURES 1A1 IN PARTS LIST

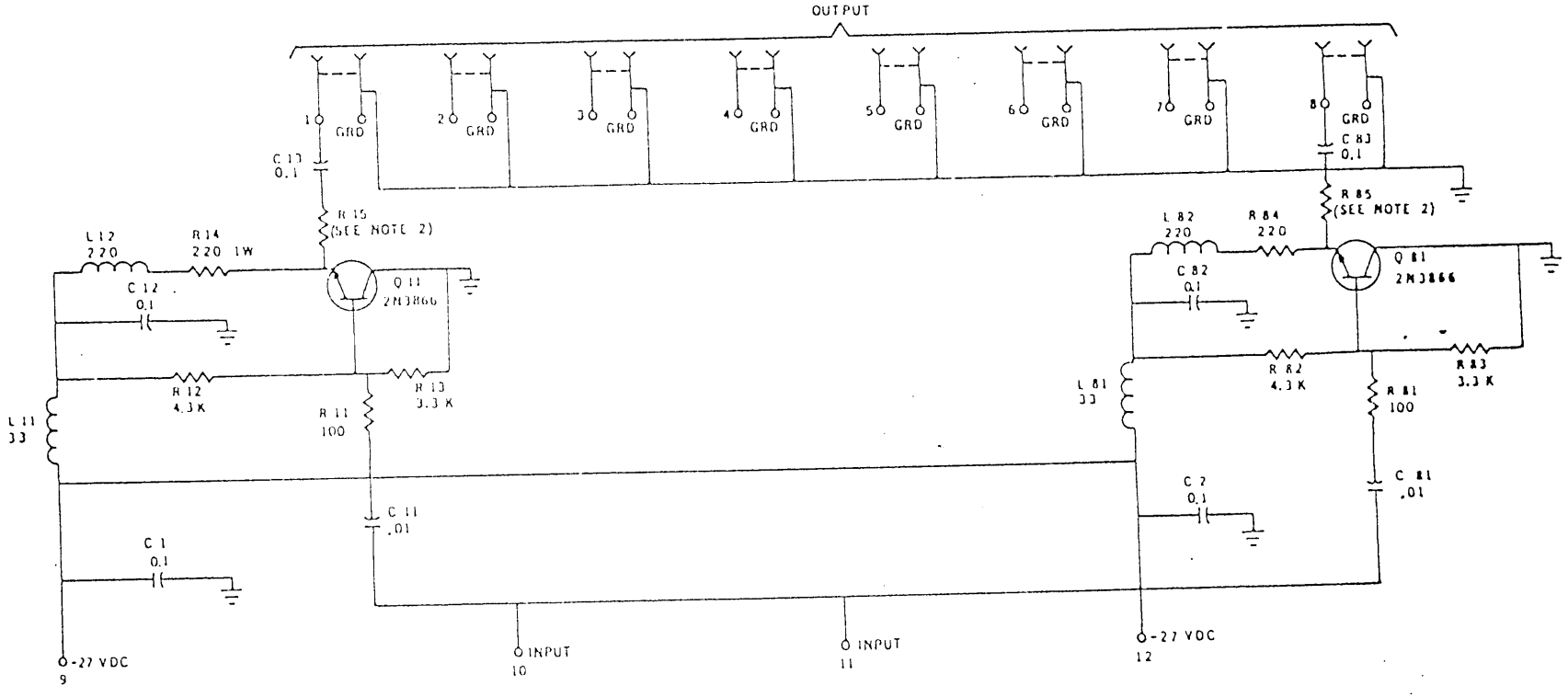


Regulator Assembly

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10746-5		Printed Circuit Board Assembly		
1N758		Diode, Zener	1EA	
1N914B		Diode, Silicon	1EA	
2N5086		Transistor, Silicon, PNP	1EA	
A10746-4		Printed Circuit Board	1EA	
CC131-32		Capacitor, Fixed, Ceramic	1EA	
CC131-39		Capacitor, Fixed, Ceramic	2EA	
CSR13G474ML		Capacitor, Fixed, Ceramic	2EA	
CSR13G685ML		Capacitor, Fixed, Ceramic	1EA	
HD10002-7		Heat Sink	1EA	
PX829-1		Insulator, Transistor Pad	1EA	
RC20GF122J		Resistor, Fixed, Composition	1EA	
RC20GF150J		Resistor, Fixed, Composition	1EA	
RC20GF392J		Resistor, Fixed, Composition	1EA	
RC20GF473J		Resistor, Fixed, Composition	1EA	
RC20GF561J		Resistor, Fixed, Composition	1EA	
RC20GF682J		Resistor, Fixed, Composition	1EA	
RC20GF683J		Resistor, Fixed, Composition	1EA	
RV111U102A		Resistor, Variable, Non-W/W	1EA	
TX10001		Transistor, Germanium, NPN	1EA	

Buffer Amplifier Assembly
A10714-6 Assembly
A10791-6 Assembly

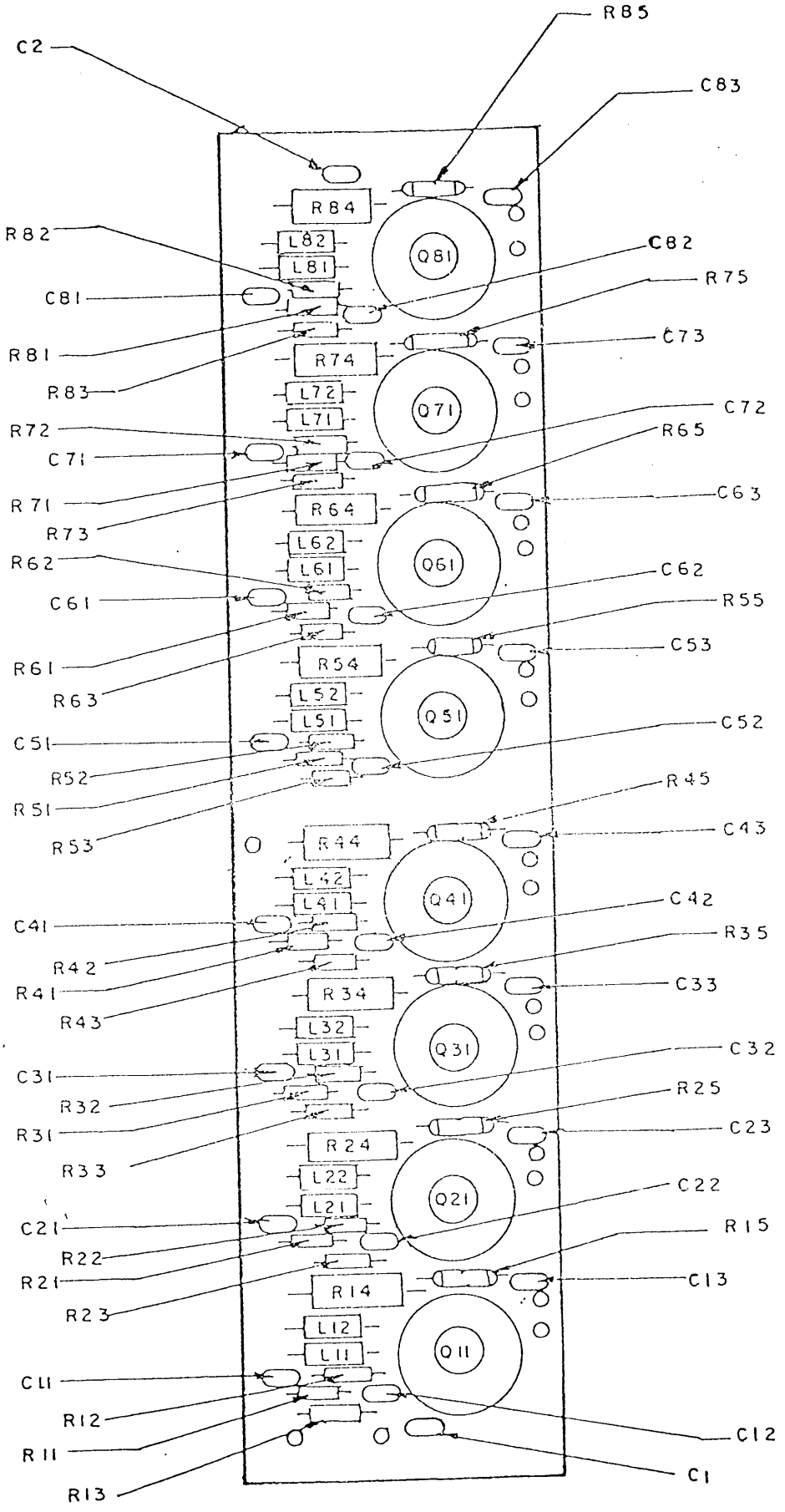


1 INDUCTANCE IN MICROHENRIES
CAPACITANCE IN MICROFARADS
RESISTANCE IN OHMS
UNLESS OTHERWISE STATED:

2

MODEL	R 15		R 85		ASSEMBLY No	ASSEMBLY No
	50 Ω	75 Ω	50 Ω	75 Ω	50 Ω	75 Ω
DMC	52.3	71.5	52.3	71.5	A-10714-6	A-10714-5

NOTES:



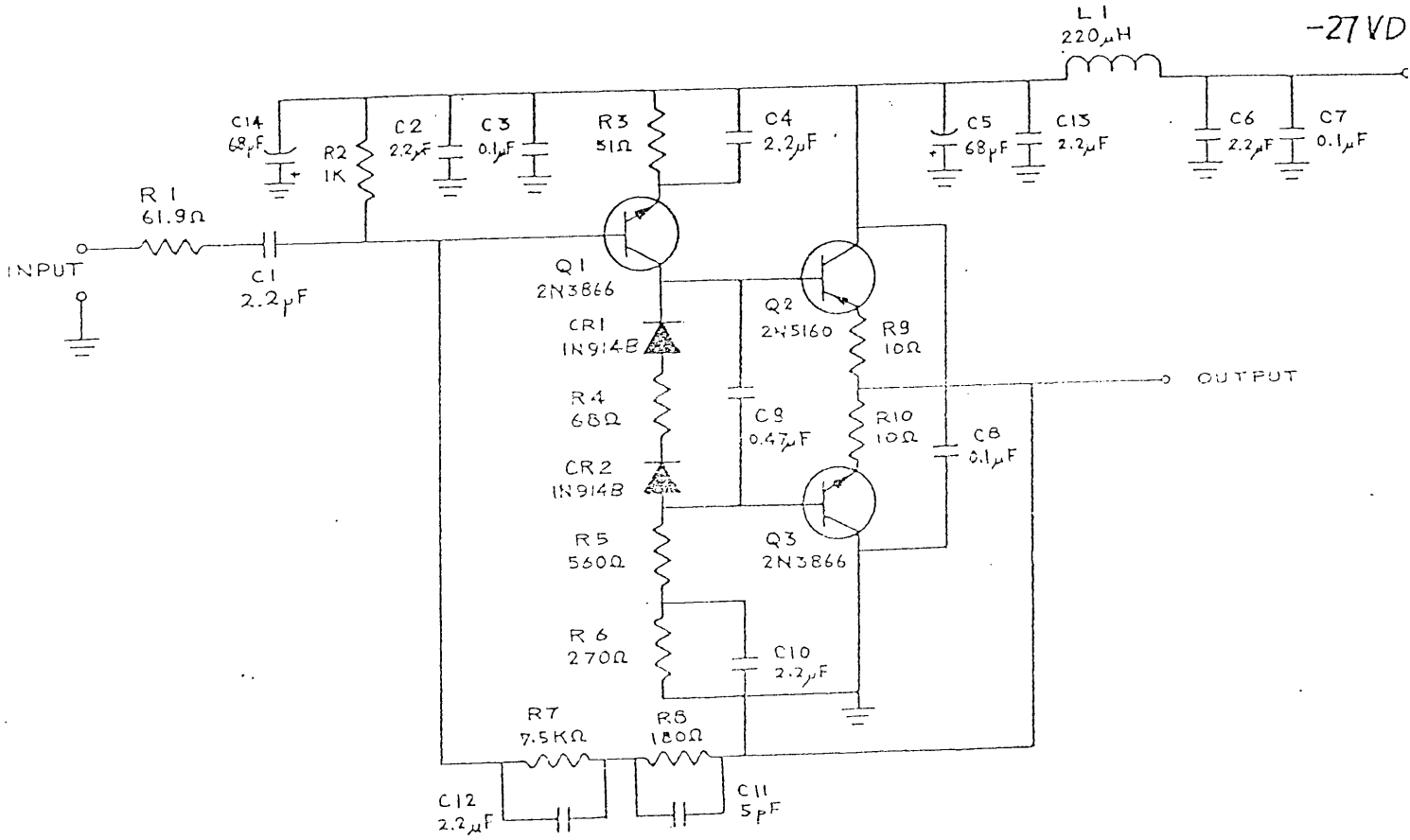
Buffer Amplifier

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10714-5		Printed Cky Board Assy, 75 Ohm		
2N3866		Transistor, Silicon, NPN	8EA	
A10714-4		Printed Circuit Board	1EA	
CC131-32		Capacitor, Fixed, Ceramic	8EA	
CC131-39		Capacitor, Fixed, Ceramic	18EA	
CL275-221		Coil, Fixed RF	8EA	
CL275-330		Coil Assembly, RF, Tuned	8EA	
FW02HSS		Washer, Flat	16EA	
HD10004		Heat Sink	8EA	
LWS02MSS		Washer, Spring Tension	16EA	
RC07GF101J		Resistor, Fixed, Composition	8EA	
RC07GF332J		Resistor, Fixed, Composition	8EA	
RC07GF432J		Resistor, Fixed, Composition	8EA	
RC42GF221J		Resistor, Fixed, Composition	8EA	
RN60D71R5F		Resistor, Fixed, Film	8EA	
SCBP0256BN4		Screw, Machine	16EA	

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10791-6		Printed Circuit Board Assembly		
2N3866		Transistor, Silicon, NPN	8EA	
A10791-4		Printed Circuit Board	1EA	
CC10018		Capacitor, Fixed, Ceramic	18EA	
CC131-41		Capacitor, Fixed, Ceramic	8EA	
CL275-222		Coil Assembly, RF, Tuned	8EA	
CL275-221		Coil	8EA	
HD10004		Heat Sink	8EA	
RC07GF432J		Resistor, Fixed, Composition	8EA	
RC07GF332J		Resistor, Fixed, Composition	8EA	
RC07GF101J		Resistor, Fixed, Composition	8EA	
RC42GF181J		Resistor, Fixed, Composition	8EA	
RN60D52R3F		Resistor, Fixed, Film	8EA	

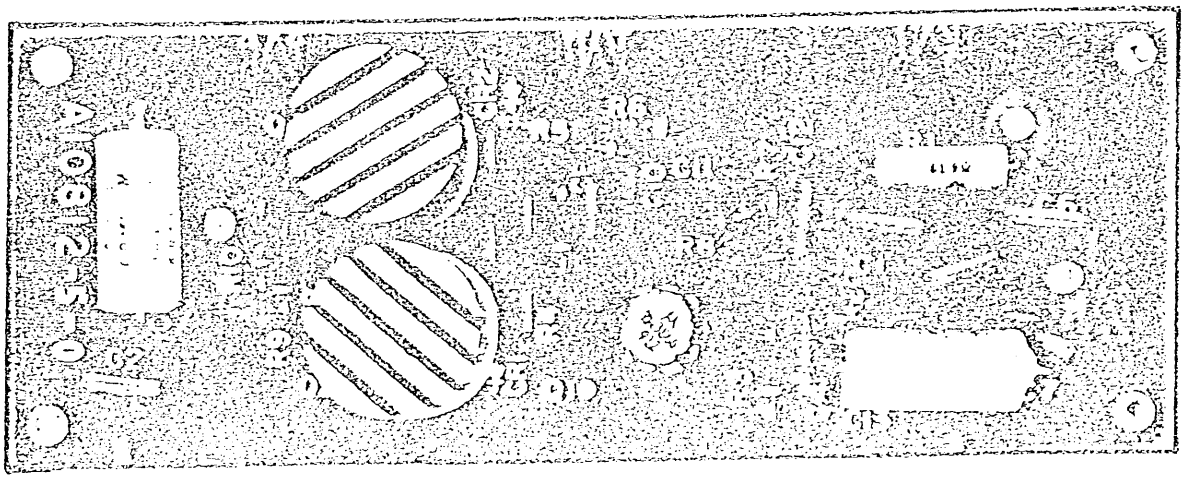


2. A10812-6
   R1 VALUE SELECTED ON TEST
   FOR 50Ω INPUT IMPEDANCE

1. UNLESS OTHERWISE STATED
   INDUCTANCE IN MICROHENRIES
   CAPACITANCE IN MICROFARADS
   RESISTANCE IN OHMS

NOTES

Preamplifier Assembly
A10812-6 LF-Section



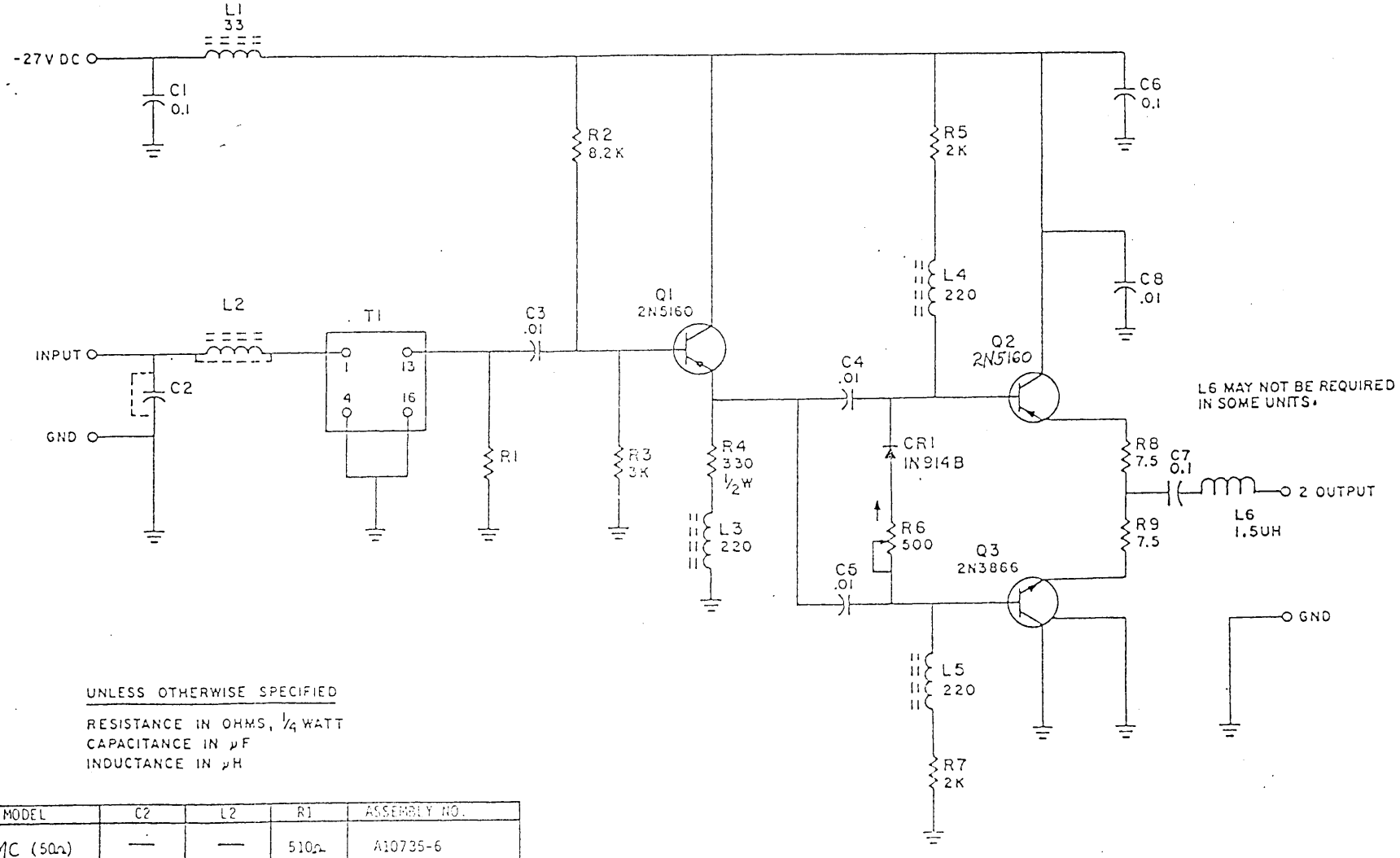
Preamplifier Assembly
Component Location

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10812-5		Printed Circuit Board Assembly		
1N456A		Diode, Silicon	2EA	
2N3866		Transistor, Silicon, NPN	2EA	
2N5160		Transistor, Silicon, PNP	1EA	
A10812-4		Printed Circuit Board	1EA	
CC10018		Capacitor, Fixed, Ceramic	7EA	
CC10020		Capacitor, Fixed, Ceramic	3EA	
CC10021		Capacitor, Fixed, Ceramic	1EA	
CC10009		Capacitor, Fixed	1EA	
CL275-221		Coil, Fixed RF	1EA	
CM04ED050J03		Capacitor, Fixed, Mica	1EA	
FW02HBN		Washer, Flat	4EA	
GL138		Compound,Heatsink	1X	
HD10002-7		Heat Sink	1EA	
HD10004		Heat Sink	2EA	
LWS02MRN		Washer, Spring Tension	4EA	
PX829-1		Insulator, Transistor Pad	1EA	
RL07S102G		Resistor, Fixed, Composition	1EA	
RL07S510G		Resistor, Fixed, Composition	1EA	
RL07S680G		Resistor, Fixed, Composition	1EA	
RL07S561G		Resistor, Fixed, Composition	1EA	
RL07S271G		Resistor, Fixed, Composition	1EA	
RL07S752G		Resistor, Fixed, Composition	1EA	
RL07S181G		Resistor, Fixed, Composition	1EA	
RL07S100G		Resistor, Fixed, Composition	2EA	

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10812-5		Printed Circuit Board Assembly		
RN65D61R9F		Resistor, Fixed, Film	1EA	
SCBP0256BN4		Screw, Machine	4EA	

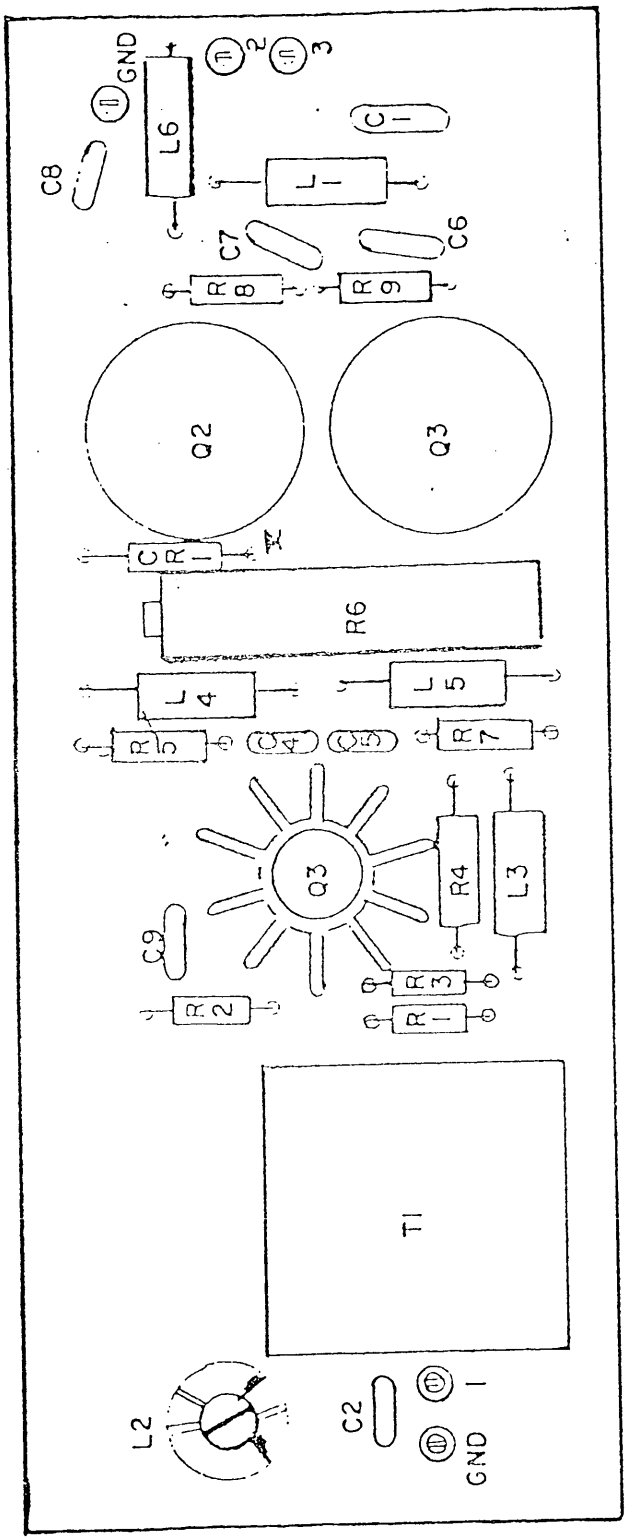


UNLESS OTHERWISE SPECIFIED

RESISTANCE IN OHMS, ¼ WATT
CAPACITANCE IN μF
INDUCTANCE IN μH

MODEL	C2	L2	R1	ASSEMBLY NO.
DMC (50Ω)	—	—	510Ω	A10735-6
DMC (75Ω)	47pf	.33uh	910Ω	A10735-5

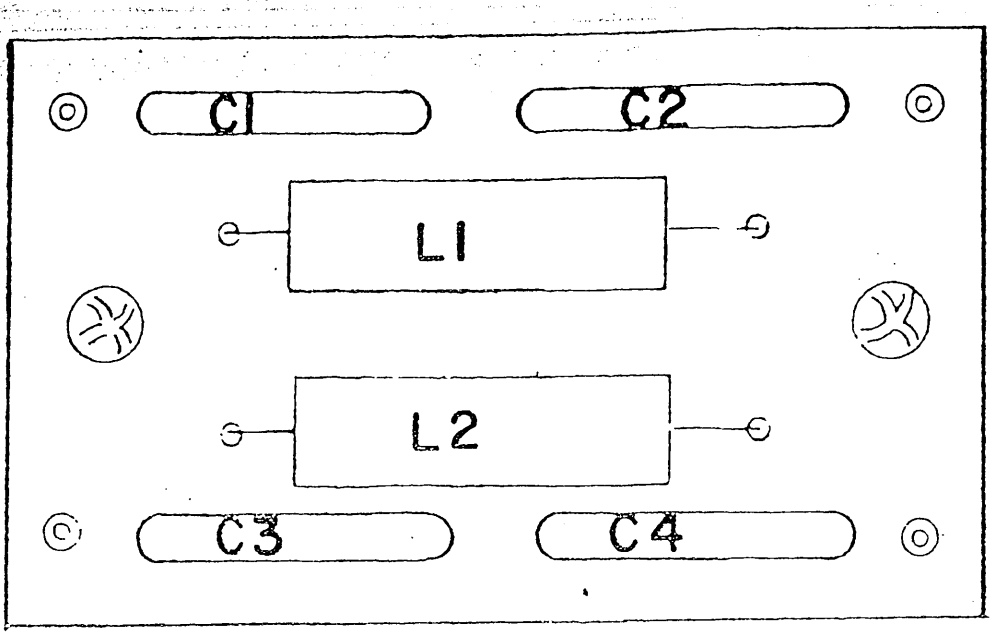
Preamplifier Assembly
A10735-6 HF Section



Preamplifier Assembly

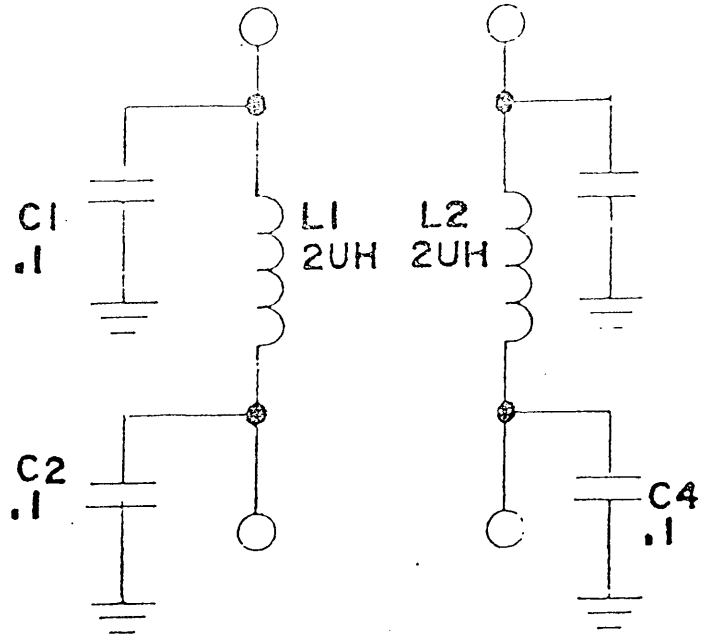
Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A10735-5		Printed Circuit Board Assembly		
1N914B		Diode, Silicon	1EA	
2N3866		Transistor, Silicon, NPN	1EA	
2N5160		Transistor, Silicon, PNP	2EA	
A10735-4		Printed Circuit Board	1EA	
CC131-39		Capacitor, Fixed, Ceramic	3EA	
CC131-32		Capacitor, Fixed, Ceramic	5EA	
CL10044		Coil,RF	1EA	
CL275-330		Coil Assembly, RF, Tuned	1EA	
CL275-221		Coil, Fixed RF	3EA	
FW02MRN		Washer, Flat	4EA	
HD10004		Heat Sink	2EA	
HD10002-7		Heat Sink	1EA	
LWE02MRN		Lockwasher, External Tooth	4EA	
PX829-1		Insulator, Transistor Pad	1EA	
RC07GF7R5J		Resistor, Fixed, Composition	2EA	
RC20GF331J		Resistor, Fixed, Composition	1EA	
RL07S202G		Resistor, Fixed, Composition	2EA	
RL07S302G		Resistor, Fixed, Composition	1EA	
RL07S911G		Resistor, Fixed, Composition	1EA	
RL07S822G		Resistor, Fixed, Composition	1EA	
RV10009-501AP		Resistor, Variable, Non-W/W	1EA	
SCBP0256BN4		Screw, Machine	4EA	
TE10023-3		Terminal Lug, Solder	5EA	
TR10005		Transformer, RF	1EA	



A5780
(FL1)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1,C2 C3,C4	CAPACITOR: Fixed	CC100-32
L1,L2	COIL: Fixed	CL105-1

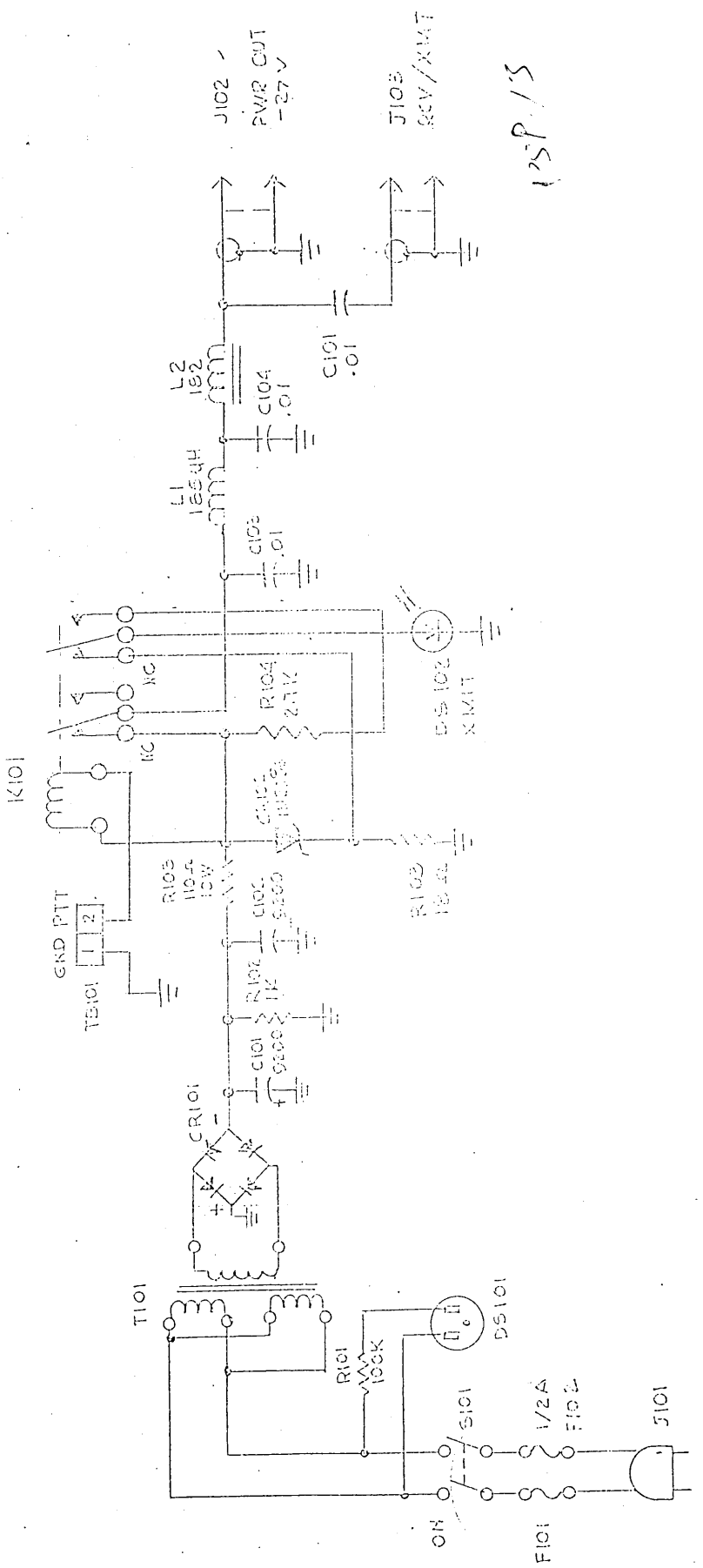


Line Filter Assembly

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
A5780		Printed Circuit Board Assembly		
CC100-32		Capacitor, Fixed, Ceramic	4EA	
CL105-1		Coil Assembly, RF, Tuned	2EA	
PC818		Printed Circuit Board	1EA	

6.3 System Power Supply, Model PSP-13



Schematic Diagram, Model PSP-13 Power Supply

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
PSP-13		Coaxial Power Supply		
1N2986		Diode	1EA	
A5885		Line Filter Assembly	1EA	
BI100-51		Lamp, Glow	1EA	
BI132		Lamp, Incandescent	1EA	
CA1903		Cable Harness	1EA	
CA555-4		Cable Assembly, Electrical	1EA	
CC131-53		Capacitor, Fixed	3EA	
CC131-48		Capacitor, Fixed, Ceramic	3EA	
CE112-20		Capacitor, Electrolytic	2EA	
CK2319		Schematic Diagram	1EA	
CL178		Coil Assembly, RF, Tuned	2EA	
CL502		Coil Assembly, RF Tuned	2EA	
CU139-2B		Clamp	2EA	
CU145B1		Clamp	2EA	
DD146-3		Rectifier, Semiconductor Dev	1EA	
FH103		Fuseholder	2EA	
FH104-3		Fuseholder	2EA	
FU102-.5		Fuse, Cartridge	2EA	
FU102-1		Fuse, Cartridge	2EA	
HA102-1BN		Handle	2EA	
MS7242/LD3171		Panel, Front	1EA	
MS7959/LD3177		Chasis & Covers	1EA	
PX337-2		Insulator, Therm., Strip	1EA	
RC20GF104J		Resistor, Fixed, Composition	1EA	

Item Material Listing

Item/Part Number	Rev	Description	Qty	Notes
PSP-13		Coaxial Power Supply		
RC20GF272J		Resistor, Fixed, Composition	1EA	
RC42GF102J		Resistor, Fixed, Composition	1EA	
RC42GF180J		Resistor, Fixed, Composition	1EA	
RL197		Relay, Armature	1EA	
RW109-8		Resistor, Fixed, Wire-Wound	1EA	
ST22K		Switch, Toggle	1EA	
TF443		Transformer	1EA	
TM100-2		Terminal Board, Barrier	1EA	
TS106-2		Socket, Indicator lamp	1EA	
UG21B/U		Connector, Plug, RF	4EA	
UG58A/U		Connector, Receptacle, RF	4EA	