UNCLASSIFIED

TECHNICAL MANUAL

for

ANTENNA MULTICOUPLER AMC-20

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

IN-8019

Issue Date: 1 April, 1966

UNCLASSIFIED

TECHNICAL MANUAL

for

ANTENNA MULTICOUPLER AMC-20

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

IN-8019 Issue Date: 1 April, 1966

CHANGE NO. IN

INSTRUCTION BOOK CHANGE NOTICE

Date 9/8/67

Manual affected: Antenna Multicoupler AMC-20 IN 8019

Make the following corrections to Table 1-1.

WAS:

TMC PART NO.	ITEM	QTY.
UG - 625 B/U	Coaxial Mating Connectors, Output	1 per output

NOW:

TMC PART NO.	ITEM	QTY.
UG - 88 /u	Coaxial Mating Connectors, Output	1 per output

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

TABLE OF CONTENTS

SECTION 1—GENERAL DESCRIPTION

SECTION 2—INSTALLATION

SECTION 3—OPERATOR'S SECTION

SECTION 4—PRINCIPLES OF OPERATION

SECTION 5—TROUBLESHOOTING

SECTION 6—MAINTENANCE

SECTION 7—PARTS LIST

SECTION 8—SCHEMATIC

LIST OF ILLUSTRATIONS

SECTION 1—GENERAL DESCRIPTION

SECTION 2—INSTALLATION

SECTION 3—OPERATOR'S SECTION

SECTION 4—PRINCIPLES OF OPERATION

SECTION 5—TROUBLESHOOTING

SECTION 8—SCHEMATIC

LIST OF TABLES

SECTION 1—GENERAL DESCRIPTION

SECTION 3—OPERATOR'S SECTION

SECTION 5—TROUBLESHOOTING

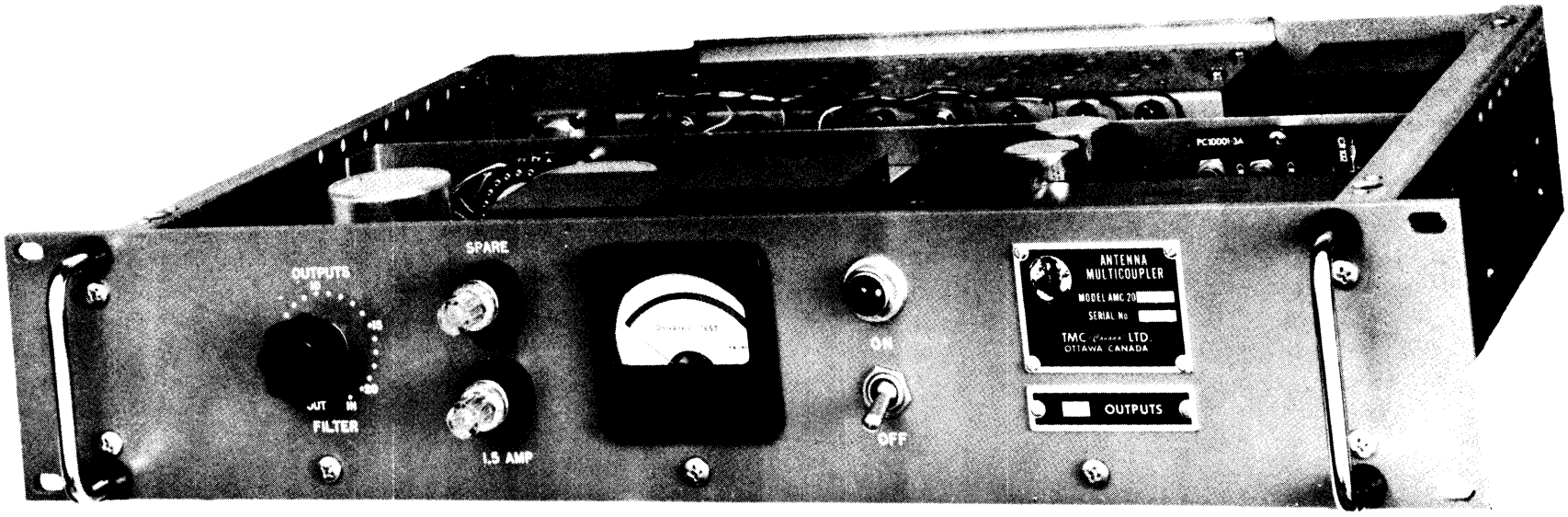


Figure 1-1. Antenna Multicoupler Model AMC-20, Front View

Figure 1-2. Antenna Multicoupler Model AMC-20, Rear View

SECTION 1

GENERAL DESCRIPTION

1.1 PURPOSE AND BASIC PRINCIPLES

The Technical Materiel Corporation's Antenna Multicoupler, Model AMC-20 is a broadband antenna-to-receiver coupling device developed for use where it is desirable to employ a common antenna for a number of communication receivers.

The AMC-20 consists of a broadband vacuum tube pre-amplifier, a transistorized driver stage, and a varying number of transistorized output stages. An internal power supply furnishes all voltages required to operate the various stages within the unit.

The attenuation of high level signals, by the use of pads in the front to achieve greater handling capabilities, has been avoided to preserve the Signal/Noise plus noise ratio of low level signals, which are of prime importance to the Communicator.

The basic AMC-20 provides 16 separate output stages for coupling a single antenna to sixteen receivers. Inherent in the design of the AMC-20 is the capability of reducing or increasing the number of outputs in increments of four stages so that units with 4, 8, and 16 outputs are readily available. Other models with 20 and 24 outputs are available on special request with a slight overall deteriation in the performance. These Models are referred to as AMC-20-4, AMC-20-8, AMC-20-16, etc.

Expansion of the capabilities of an AMC-20 Multicoupler with a lesser number of outputs may be accomplished solely by adding plug-in output modules in increments of two modules (four stages).

Unless otherwise noted this manual will describe the AMC-20-16 (with sixteen separate receiver connections). However, the different units may be considered identical with reference to theory, operation, trouble-shooting, maintenance, etc.

An internal high-pass filter is used to attenuate all signals below 2 MHz. When this filter is connected in the input circuitry of the Multicoupler, the optimum range of frequencies over which the unit will operate lies in the 2.0 to 32.0 MHz band. However, the Multicoupler is normally usable up to 40 MHz and down to 500 KHz with the filter out.

The AMC-20 has a nominal input impedance of 50 ohms, unbalanced, and was designed to operate from the non-resonant type of antenna.

Output impedance of the receiver coupling stages is standard at 50 ohms, unbalanced. As outlined in the OPERATOR'S INSTRUCTIONS (SECTION 3) and PRINCIPLES OF OPERATION (SECTION 4), termination at the output stages impedances of other than 50 ohms, may result in varying readings with the incorporated test meter, but will only slightly affect the overall performance of the Multicoupler.

When the AMC-20 is used in a receiving system, it results in a general improvement in the noise factor with no loss of system gain.

Spurious response generated in the Multicoupler are kept to a minimum and the design of the AMC-20 results in a considerable reduction in the amplitude of signals re-radiated from receiver to receiver or receiver to the common antenna system. The AMC-20 has inherent protection features against overloading by strong RF signals.

If operation of more than 24 receivers from a common antenna is desired, the AMC-20 Multicouplers may be cascaded by connecting the individual outputs of one AMC-20 to the input (antenna) receptacles of additional Multicouplers. Thus, it is possible to operate 24 x 24 or 576 receivers from a single antenna through 25 Multicouplers. Cascading the units in this manner does not seriously impair their performance.

1.2 DESCRIPTION OF UNIT

The AMC-20 Antenna Multicoupler is shown in Fig. 1-1. It requires a total of 3 1/2 inches of panel space and 14 inches of depth in a standard 19 inch rack or cabinet. The unit is supported by its own front panel.

Controls and switches for the operation of the AMC-20 are located on the front panel. All vacuum tubes and semiconductors are readily accessible. The output stages are plug-in modular transistorized units; two outputs per module.

The equipment is manufactured in accordance with JAN/MIL specifications wherever practicable. All

parts and assemblies meet or exceed highest quality standards.

The front panel OUTPUTS/FILTER selector switch provides a by-pass of the high-pass filter. Positions 1 to 16 of this switch, together with the panel meter, provide a dynamic testing facility of each output branch while the equipment is in operation.

All coaxial receptacles carrying RF signals to or from the unit are located on the rear apron of the chassis.

Strapping options at the primary of the power transformer allow the AMC-20 Multicoupler to be used on 115 or 230 volts AC, 50 to 400 cps, single phase. The POWER ON/OFF switch, pilot lamp, main and spare fuse holders are mounted on the front panel. The power input receptacle (3-wire, including a ground connection) is located on the rear apron of the chassis.

TABLE 1-1

TMC Part No.	*Item*	*Qty.*
CA555-4	AC Power Cord Assembly	1
DL-100-4	Coaxial Load plugs	25% of the total outputs
UG-625B/U	Coaxial mating connectors, output	1 per output
PL-259A	Coaxial mating connector, input	1
A-10366	Output Module Extender Card	1

Loose items shipped with the AMC-20 Antenna Multicoupler

1.3 REFERENCE DATA

The crated dimensions of the AMC-20 Antenna Multicoupler are 9 inches by 21 inches by 27 inches. It weighs 28 pounds gross packed for shipment.

Tables 1-2 through 1-4 contain additional reference data pertinent to the AMC-20 Antenna Multicoupler.

Figures 1-3 through 1-5 illustrate technical performance characteristics.

TABLE 1-2 ELECTRICAL CHARACTERISTICS, AMC-20 ANTENNA MULTICOUPLER

Connectors:	
Antenna Input	Coaxial Receptacle, Type UHF
Power Input	Receptacle, JJ-175
RF Outputs	Coaxial Receptacles, Type BNC
Frequency Range:	2 to 32 MHz (with filter IN). Usable from 500 kHz to 40 MHz (with filter OUT).
Gain:	Nominal 0 db
Frequency Response:	± 1 db., 2 to 32 MHz.
Noise figure:	Average 7 db.
VSWR:	1.5:1, referred to nominal impedance
Input Impedance:	50 ohms unbalanced.
Output Impedance:	50 ohms unbalanced.
Number of Outputs:	Minimum 4. Standard models have 8 or 16 outputs. Models with 20 or 24 outputs are available on special order.

TABLE 1-2. ELECTRICAL CHARACTERISTICS, AMC-20 ANTENNA MULTICOUPLER (Cont'd.)

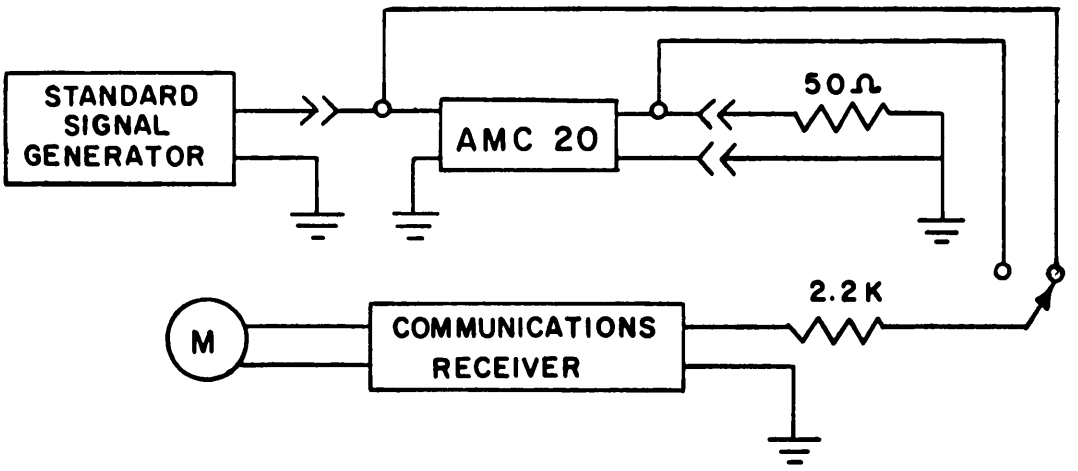
Intermodulation Distortion:	In no case are 2nd and 3rd order intermodulation products less than 60db below two 0.25v RMS signals applied at the input. However typical 2nd order products are 70db down and all products fall within the shaded area of the graph shown. See Figure 1-4.
Harmonic Distortion:	Negligible at test levels stated above.
Back-to-Front Isolation:	Better than 70 db.
Output-to-Output Isolation:	Average 50 db.
Output Phasing Between Jacks:	± 1°
Broadcast Filter	A switchable broadcast filter is incorporated which provides at least 55 db attenuation at 1.2 MHz.
Desensitization:	A 1.0v RMS (10% removed in frequency) input signal will reduce a low level signal by no more than 3 db.
Overload:	10v RMS continuous or 75v for 5 second intervals when applied at the input receptacle will not cause component failure or subsequent degradation of performance.

TABLE 1-3. VACUUM TUBE AND SEMICONDUCTOR COMPLEMENT

Type	Function	Quantity
5842/417A	Pre-Amplifiers	2
1N68	Metering Diodes	1 per output
2N2219A	Driver and Output Stages	1 driver plus 1 per output
2N2084	Test Oscillator	1
1N547	High Voltage Rectifiers	2
1N1613	Low Voltage Rectifiers	4

TABLE 1-4. ELECTRICAL CHARACTERISTICS — POWER SUPPLY

Input Requirements:	115 or 230 VAC, ± 10%, 50 to 400 cps, single phase approximately 40 watts.
Output Voltages:	+ 145 VDC Unregulated − 21.5 VDC Unregulated 6.3 VAC



TEST SET-UP

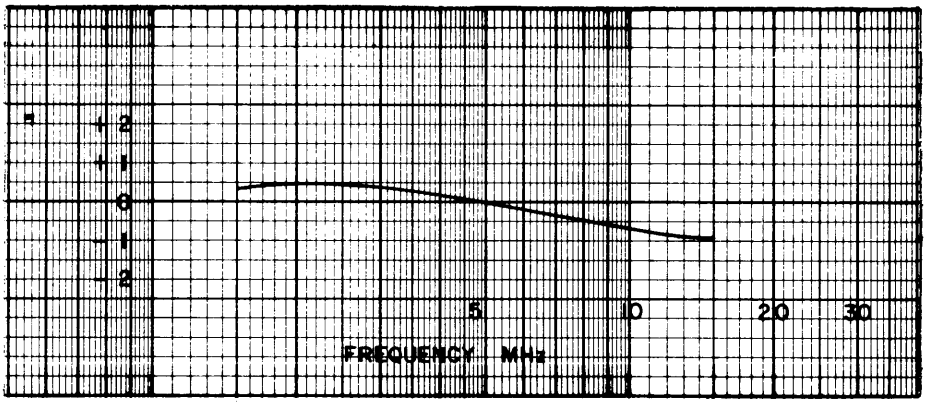


Figure 1-3. Typical Insertion Gain Characteristics, AMC 20

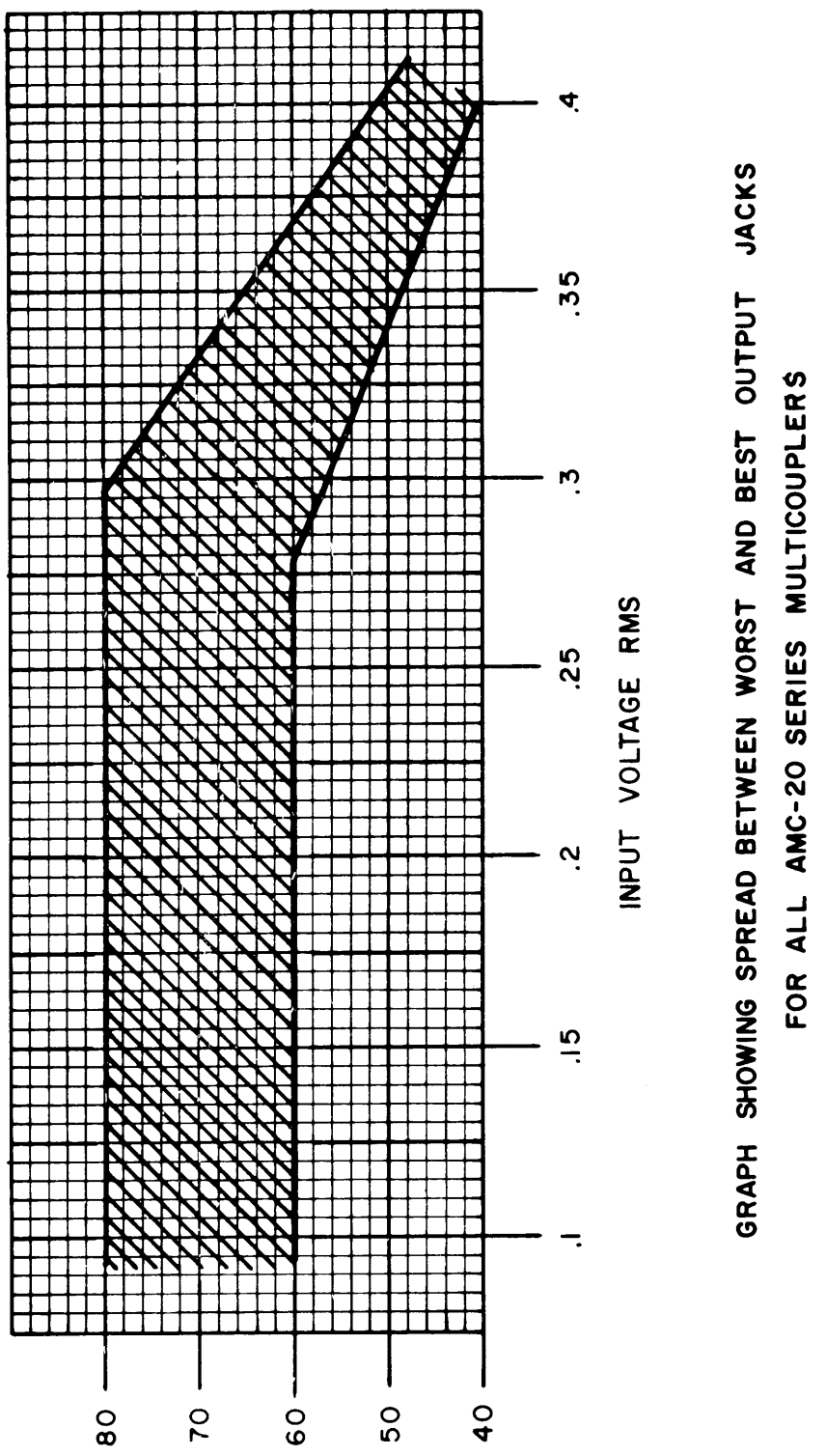


Figure 1-4. Typical Cross Modulation Characteristics, AMC-20

SECTION 2

INSTALLATION

2.1 INITIAL INSPECTION

Each AMC-20 Antenna Multicoupler has been thoroughly tested and calibrated at the factory before shipment.

Upon receipt at the operating site, the packing case and its contents should be inspected immediately for possible damage.

Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as loose items (see paragraph 1.2).

Although the carrier is liable for any damage to the equipment The Technical Materiel Corporation will assist in describing and providing for repair or replacement of damaged items. Note that the Standard Warranty does not cover replacement of parts damaged in shipment.

The equipment is shipped with vacuum tubes installed. Check to ensure that these tubes are properly seated in their sockets.

2.2 115/230 VOLT POWER SUPPLY CONNECTIONS

The power supply transformer primary is wound to accept 115 or 230 volts AC, single phase, 50 to 400 cps. It is normally factory wired for 115V input. If 230 volt operation is required, disconnect the jumper wires between terminals 1 to 2 and 3 to 4 of the power transformer T101, connect a jumper wire between terminals 2 and 3. The connections are shown in Figure 2-1.

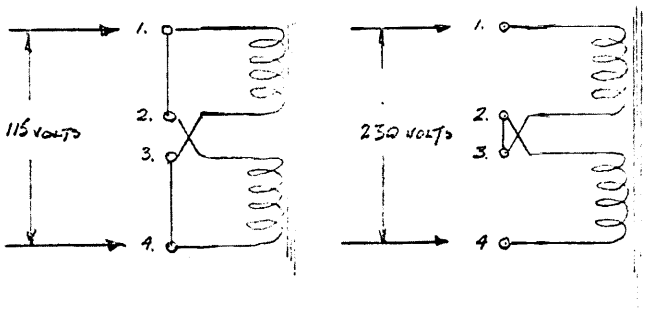


Figure 2-1. Installation Diagram Showing 115 and 230 Volt Power Transformer Connections.

NOTE

For 230 volt operation, the power fuse, F101 should be changed to a slow-blow fuse rated at 0.6 amperes.

2.3 INSTALLATION PROCEDURES

Install the AMC-20 Antenna Multicoupler in a standard 19 inch rack cabinet or other housing as desired. The equipment may be mounted by its front panel and requires no additional support. Figure 2-2 is an outline dimensional drawing of the AMC-20.

Attach the male type UHF coaxial plug furnished with the AMC-20 to the antenna cable. Insert this plug into the ANTENNA JACK J-102 at the rear of the unit.

Attach the male type BNC coaxial connectors to the 50 ohm single conductor coaxial cables which are to be connected to the antenna input terminals of the associated receivers.

If the receiver inputs are other than 50 ohms, it may be desirable to install impedance matching transformers between the cables and the receivers (*at the receivers*). Insert the cable connectors into the output jacks at the rear of the chassis of the Multicoupler.

When attaching the coaxial plugs to the coaxial cables, both the inner and outer conductors should be soldered to ensure trouble-free service.

The DL-100-4 Dummy Load plugs should be installed on any output jacks which are not actually connected to a receiver.

When connections are made from the Multicoupler to the associated receivers through a patch panel or other antenna switching facility, the Dummy Load plugs need not be used even though a Multicoupler output may thus be unterminated for long periods.

Determine the main power input voltage and check the power supply for correct transformer connections (refer to paragraph 2.2). Ensure that a correctly rated fuse is inserted into the Main Fuse holder on the front panel:

For 115-volt operation, use a 1.2 ampere, slow-blow, 125-volt fuse.

For 230-volt operation, use a 0.6 ampere, slow-blow, 250-volt fuse.

With POWER ON/OFF switch in the OFF position, connect the AMC-20 Antenna Multicoupler to the main AC power by installing the power cord assembly (TMC Part No. CA-555-4) furnished with the unit. Connect the female plug to the receptacle J101 at the rear of the chassis, locking plug by rotating it in a clockwise direction. Connect the male plug to the main power source. The unit may then be turned on by moving the POWER switch to the ON position. Illumination of the POWER lamp will indicate proper installation.

Refer to SECTION 3 — OPERATOR'S INSTRUCTIONS for operating and performance evaluating procedures.

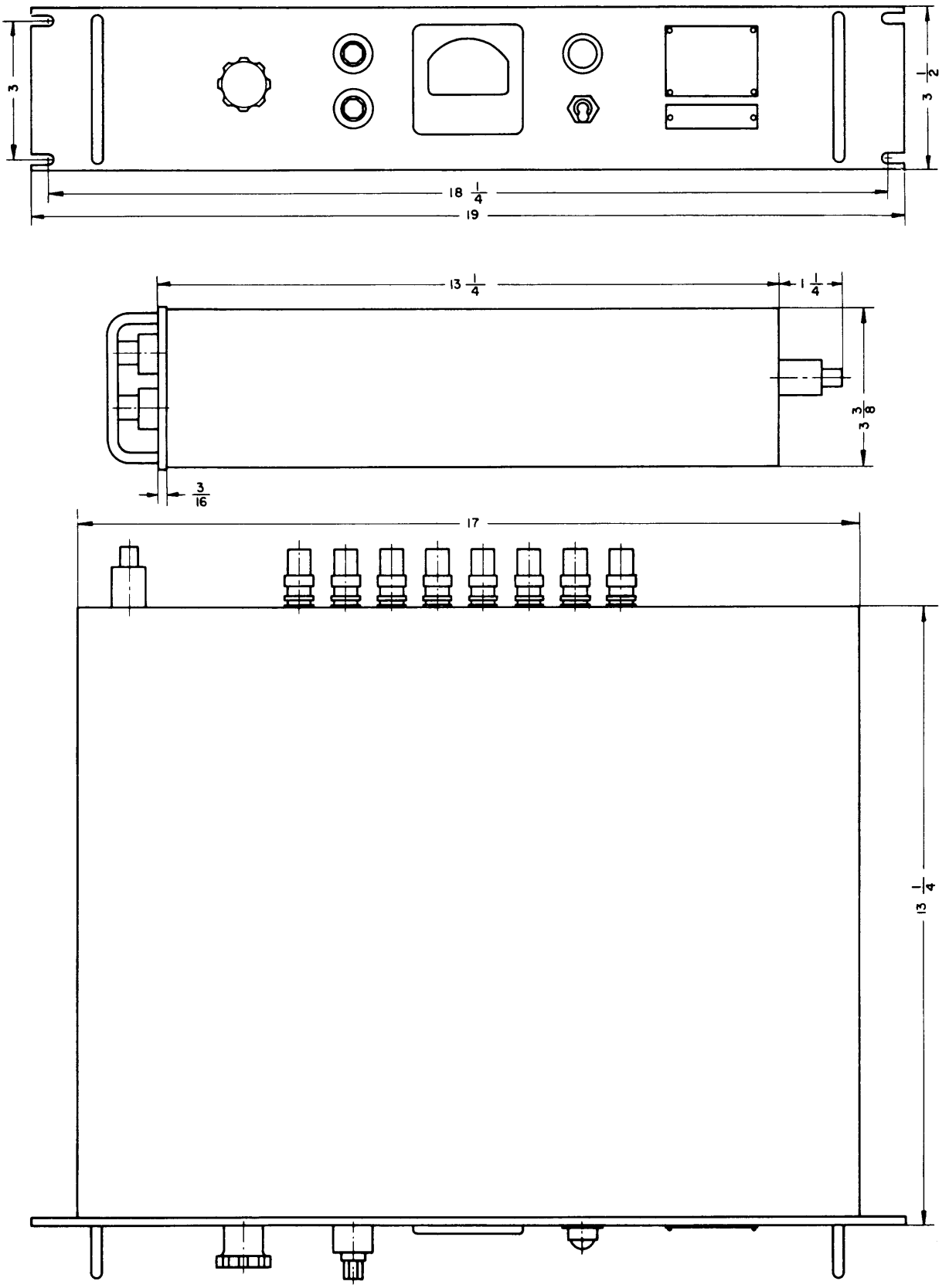


FIGURE 2-2, OUTLINE DIMENSIONS, AMC-20

SECTION 3

OPERATOR'S SECTION

3.1 OPERATOR'S INSTRUCTIONS

Table 3-1 lists the operating controls, indicators and fuse holders on the front panel of the AMC-20 as shown in Figure 3-1. Also included are the component reference designations used on the schematic, Figure 8-1.

During the initial installation and operation phase, and at periodic intervals, the Multicoupler should be checked by means of the internal testing oscillator. This oscillator inserts a 10 mc signal into the Multicoupler for dynamically checking the performance of each branch of the unit.

Rotation of the OUTPUTS/FILTER control (1) through all the output positions will indicate on the METER (6) the relative performance of each branch under actual signal conditions. The meter pointer should come to rest within the green sector of the scale.

NOTE

The meter is calibrated for proper indication when the output under test has been terminated in a load (approximately 50 ohms.)

Most receivers have a very wide variation in input impedance. When checking an output that is connected to a receiver, the meter pointer may not fall within the green sector. If this happens, it is necessary to disconnect the receiver and terminate the output branch with the terminating connector provided at the rear panel. Only if the meter pointer does not fall within the green sector when the output is properly terminated is maintenance indicated.

The Multicoupler incorporates a high-pass filter which is used to alternate signals below 2 MHz. This filter is switched IN or OUT of the circuit by means of the OUTPUTS/FILTER control (1).

When it is desired to tune an associated receiver below 2 MHz., the OUTPUTS/FILTER control should be placed in the OUT position. At all other times this control should be left in the IN position as the filter serves to reduce any cross modulation caused by a high-level signal generated by a local broadcast station.

NOTE

Only when the OUTPUTS/FILTER CONTROL (1) is placed in the OUT or IN position is the antenna connected to the input amplifier of the multicoupler. All outputs of the unit are in-operative during the dynamic testing of any single branch.

3.2 OPERATOR'S MAINTENANCE

The operators should note the general condition of panel switches and observe whether the POWER indicator lamp (2) lights. The location of the tubes and transistors are indicated in the tube and semiconductor location diagram of Figure 5-1. There are tubes only in the pre-amplifier circuit of the multicoupler. If checking of tubes is indicated, use the substitution method.

Power is supplied for operation of the multicoupler by throwing the POWER ON/OFF switch (3) to the ON position. The "ON" condition is indicated by the illuminated POWER indicator lamp (2) on the front panel. Failure of this lamp to light may be due to failure of the AC mains power, a defective switch, burnt out pilot lamp or blown main power fuse. Failure of the fuse is indicated by illumination of the main fuse holder (4) on the front panel.

CAUTION

Do not replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the trouble has been located and corrected.

TABLE 3-1. EQUIPMENT CONTROL DESIGNATIONS

Reference Fig. 3-1	Panel Designation Fig. 3-1	Component Reference Designation Fig. 8-1
1.	OUTPUTS/FILTER Control Knob (Out, 1-24, IN)	Rotary Switch
2.	Power Indicator	Lamp, I
3.	ON/OFF Toggle Switch	Switch, S
4.	Fuse Holder, Main	Fuse, F
5.	Fuse Holder, Spare	
6.	Meter	Meter, M

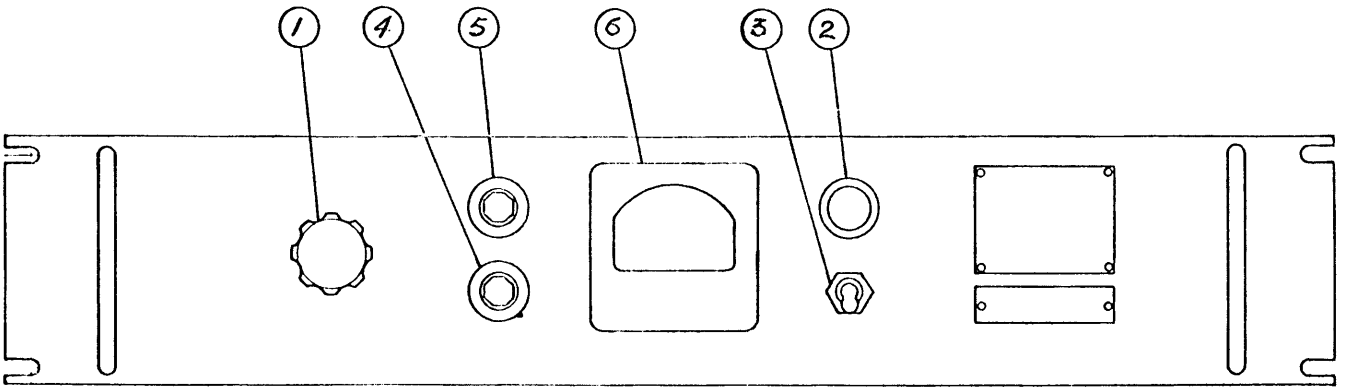


Figure 3-1. Operating Controls Antenna Multicoupler, AMC-20

SECTION 4

PRINCIPLES OF OPERATION

4.1 GENERAL

The AMC-20 Antenna Multicoupler is a broadband distribution system interposed between an antenna and the antenna terminals of a group of conventional communications receivers. Impedances into and out of the Multicoupler are flat over the specified operating frequency range to ensure high performance when used in a communication receiving system.

The Multicoupler has five major sections as shown in the block diagram, Figure 4-1. These sections are described in detail in Paragraphs 4.2 through 4.6.

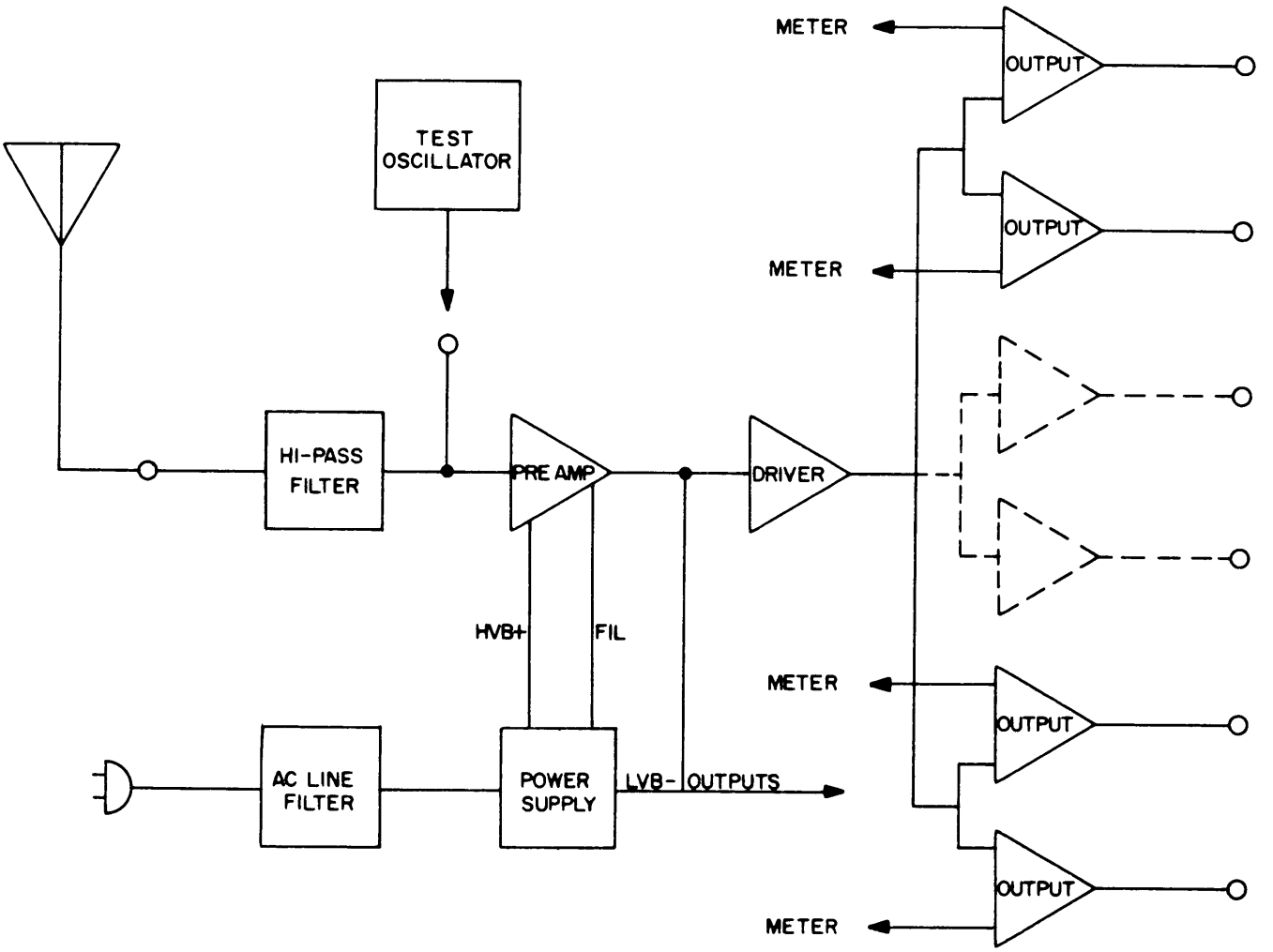


Figure 4-1. Block Diagram AMC-20

4.2 INPUT AND PRE-AMPLIFIER SECTIONS

The Multicoupler is normally furnished with an input impedance of 50 ohms, other input impedances may be furnished upon special request. Refer to Figure 4-2.

The antenna is connected through a filter and a rotary switch to the Pre-amplifier. The purpose of the switch is four-fold, it permits operation with or without a filter, it turns the dynamic test oscillator on and off and when in the test position is selects the output module to be dynamically tested.

The filter is designed for a maximum attenuation to broadcast band signals.

The Pre-Amplifier employs a grounded grid push-pull configuration with excellent broadband characteristics. Low noise tubes are used and the balancing (R111) circuit ensures the minimum cross modulation products at the Pre-Amplifier output. The Pre-Amplifier is transformer coupled to the driver stage. The gain of the Pre-Amplifier is nominally 12db and its band-pass characteristics are flat within ± 1db from 2 to 32 megahertz. The Pre-Amplifier does not exceed a 6db noise figure across its operating range.

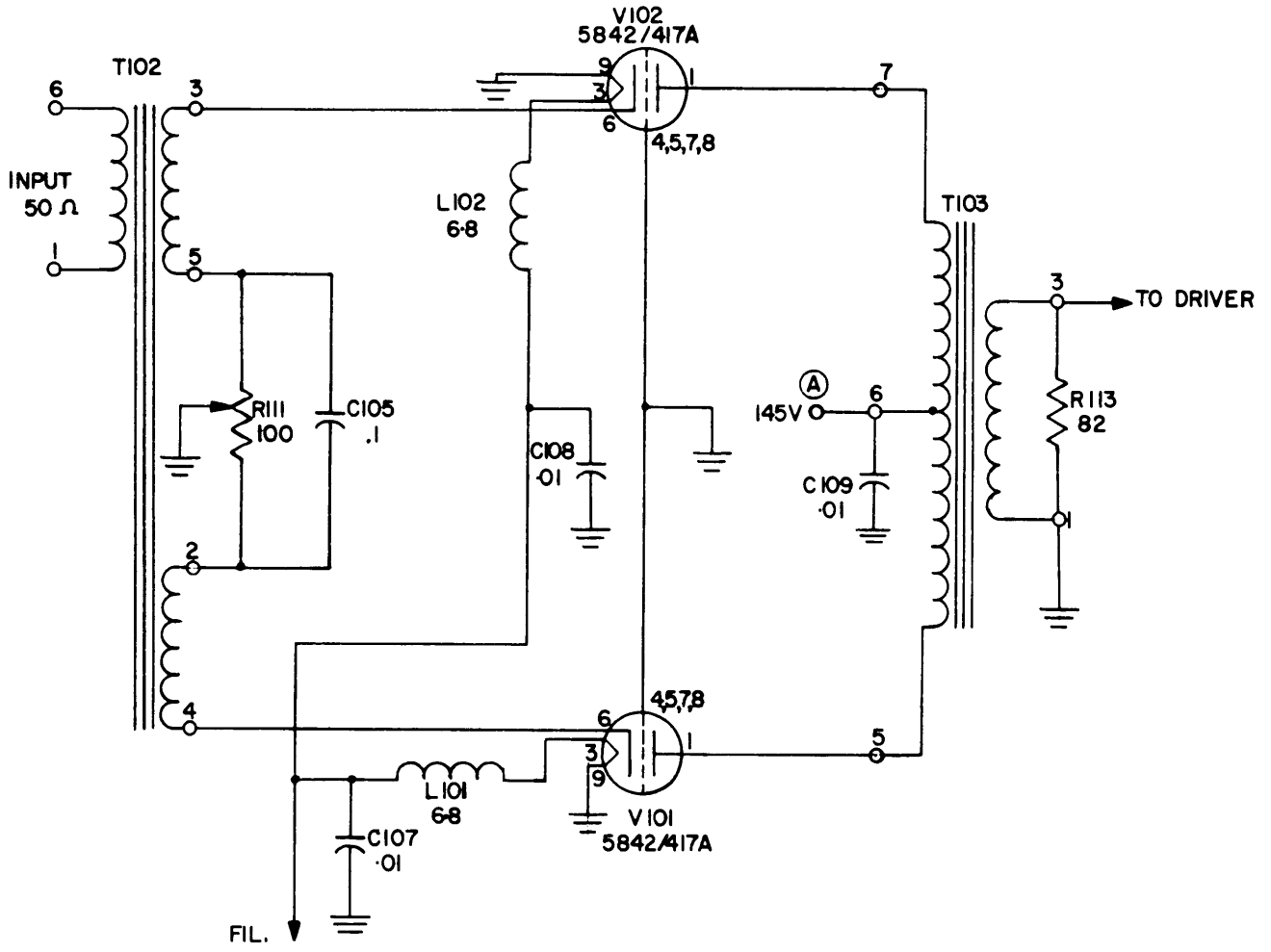


Figure 4-2. Simplified Schematic — Input and Pre-Amplifier

4.3 DRIVER SECTION

(Refer to Fig. 4-3).

The Driver stage is transistorized and uses an emitter follower configuration to ensure low noise and distortion. No inductive components are used in this stage thus ensuring good broadband characteristics. The output of the driver is RC coupled to the distribution line feeding the output modules. The 2N2219 transistor is operated well below its maximum ratings to ensure low noise and long term reliability.

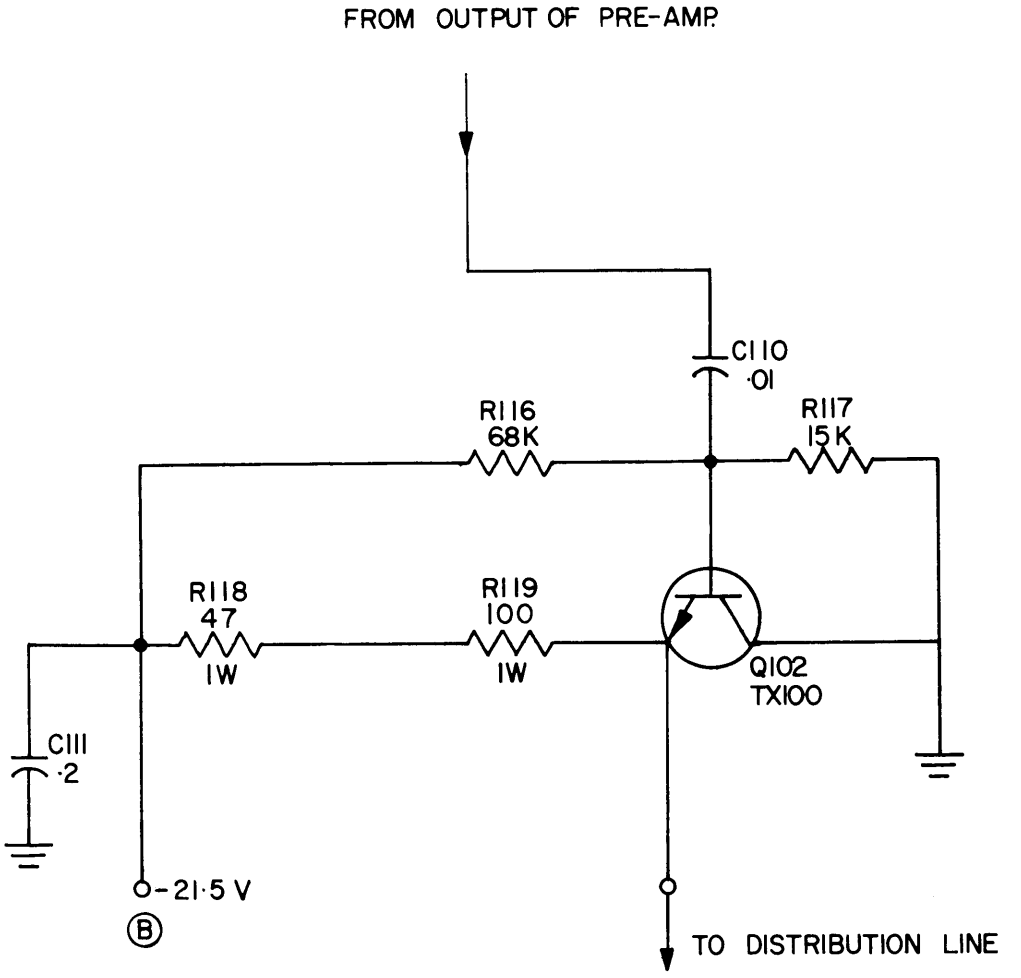


Figure 4-3. Simplified Shematic — Driver Section

4.4 OUTPUT MODULES

(Refer to Fig. 4-4).

Each output module contains the combined circuitry of two output channels. Each channel consists of a transistorized emitter follower circuit together with a diode pick-off for dynamic testing. No transformers are employed in the output modules thus ensuring good VSWR ratios and low phase differences between output channels. The modules are fully interchangeable so that any one may be plugged into any position. The nominal output impedance is 50 ohms unbalanced but other impedances may be provided for upon request. Dummy loads are provided for correct termination of any output channel not connected to a receiver.

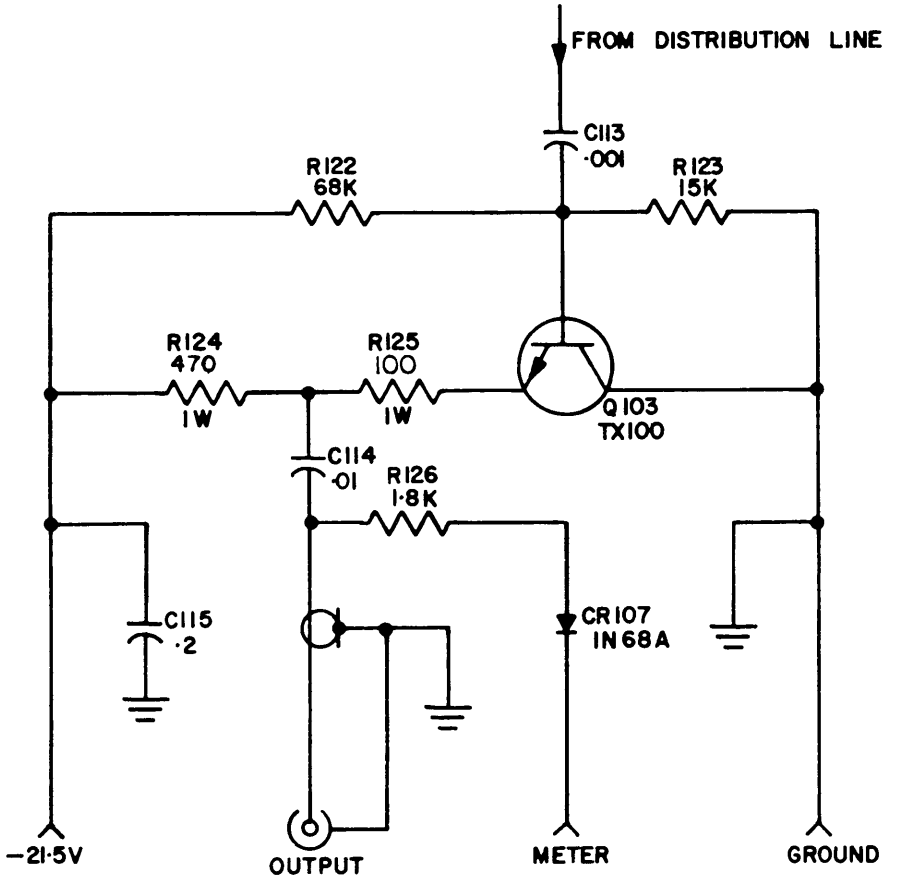


Figure 4-4. Simplified Schematic — Typical Output Stage

4.5 DYNAMIC TEST OSCILLATOR SECTION

(Refer to Fig. 4-5).

A transistorized 10 megahertz oscillator generates the test signal for the dynamic checking of the Multicoupler. The test signal is injected at the input of the Pre-Amplifier and the rotary switch selects the rectified output of any one of the output channels for display on the front panel meter. This method of checking the signal from the Pre-Amplifier input to any one of the output stages results in a reliable indication of the actual operating conditions of the Multicoupler from input to anyone of the outputs. The level of the test signal may be varied by adjustment of a small trimmer (C122) located on the oscillator circuit board.

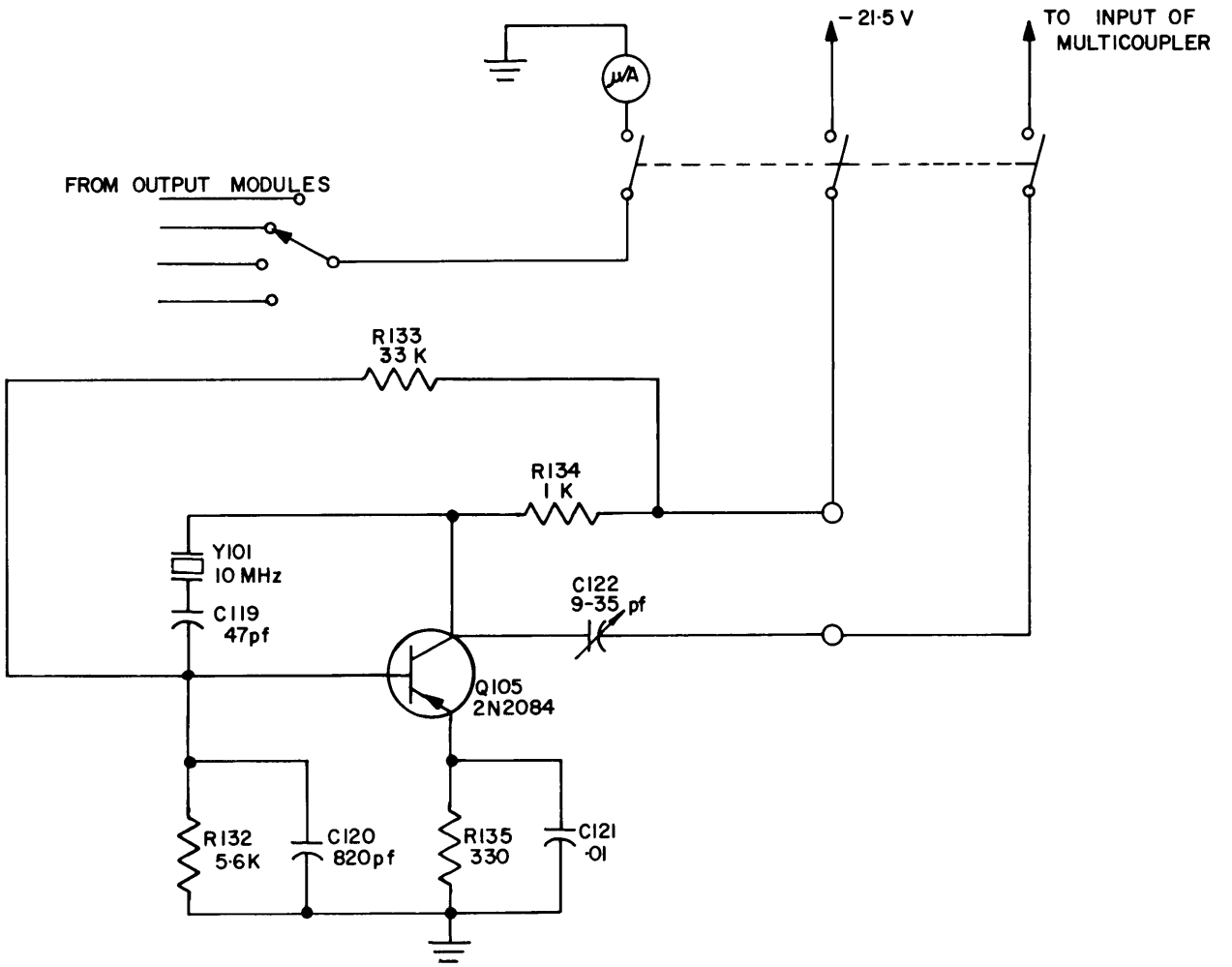


Figure 4-5. Simplified Schematic — Dynamic Testing

4.6 POWER SUPPLY

(Refer to Fig. 4-6).

An unregulated power supply provides operating voltages for both the Pre-Amplifier tubes and all of the subsequent transistorized stages. Conservatively rated semi-conductor diodes and a three-section RC filter are employed in the high voltage section of the Power Supply. A full wave bridge using semi-conductor diodes feeds into a string of series dropping resistors which are connected to the filter section. The series dropping resistors may be bridged or left in the circuit as required to provide the correct operating voltage should additional modules be put into service.

All of the power supply components are conservatively rated to ensure long term reliability and to reduce the Multicoupler noise figure to a minimum. The Power transformer has provision for operation from either 115 or 230 volts, 50 to 400 cycle mains supply.

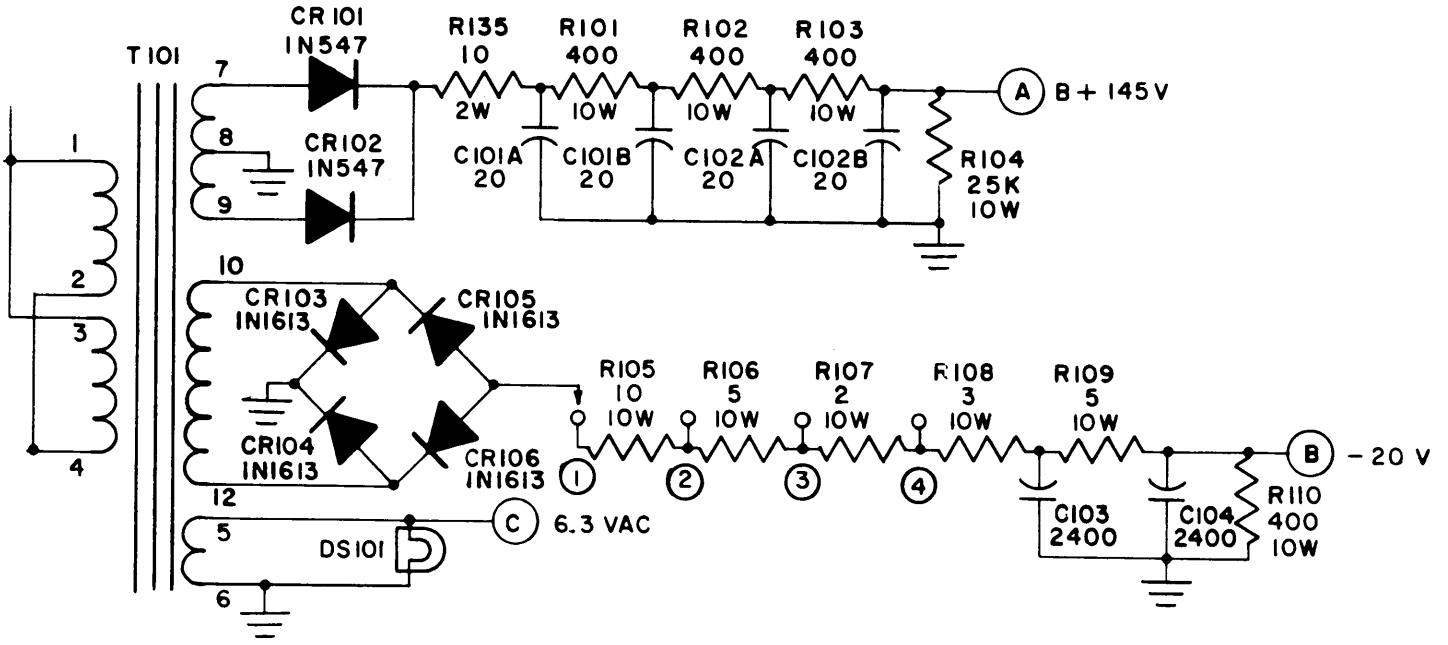


Figure 4-6. Simplified Schematic — Power Supply

SECTION 5

TROUBLE-SHOOTING

5.1 INTRODUCTION

This section explains how to locate and diagnose equipment troubles and possible incorrect or faulty inter-equipment connections. The information necessary to remedy troubles and maladjustments will be found in Section 6 of this manual under the heading "MAINTENANCE".

NOTE

Due to the broadband characteristics inherent in the AMC-20 Antenna Multicoupler, there are no "RF alignment" procedures to be followed.
The following aids to trouble-shooting are provided:

(a) General trouble-shooting procedure (see paragraph 5.2).

(b) Trouble-shooting based on operational procedures (see paragraph 5.3).

(c) Voltage and Resistance charts (see paragraph 5.4 and Tables 5-1, 5-2, and 5-3).

(d) Trouble-shooting based on circuit sectionalization (see paragraph 5.5).

5.2 GENERAL TROUBLE-SHOOTING PROCEDURES

When an AMC-20 Antenna Multicoupler has been working satisfactorily and suddenly fails, the cause of failure may be readily apparent either because of circumstances occurring at the time of failure or because of symptoms analogous to past failures.

Abnormal conditions external to the Multicoupler occurring at the time of failure should be immediately suspected as a cause of other-than-normal operation. Thus:

(a) AC mains over-voltage surge:

1. Check circuit breakers and/or switches external to the Multicoupler.
2. Check Multicoupler main fuse.
3. Check internal Multicoupler voltages (Table 5-1) for possible damage to tubes or semiconductors.

(b) Lightning strike on antenna or other reasons for loss of antenna.

1. Connect antenna terminal directly to operational receiver and compare output with output received through Multicoupler.
2. Check internal Multicoupler voltages (Table 5-1) for possible damage to tubes or semiconductors.

NOTE

When checking tubes and semiconductors within the AMC-20 Antenna Multicoupler, the voltage chart, Table 5-1, should be considered as the primary source of performance evaluation. Faulty components must indicate faulty readings. When replacement is indicated, actual performance after installation in the Multicoupler should be the performance criteria rather than dependence on a tube or transistor checker.

A second short-cut in trouble-shooting although very obvious, is sometimes overlooked by otherwise competent technicians. This is to ascertain that all *associated* equipment and circuitry, such as main power circuit breakers or switches, individual rack circuit breakers or fuses and individual unit fuses are operating properly and/or in good condition; and that the Multicoupler is, in fact, receiving the proper supply voltage and is connected in the proper manner to the antenna and associated equipment.

A third short-cut is to examine the equipment, section by section, for burned out elements, charring, corrosion, arcing, excessive heat, dirt, dampness, etc. Component defects may be internally or externally caused and the unit should not be returned to service until the actual cause of the failure is determined.

5.3 TROUBLE-SHOOTING BASED ON OPERATIONAL PROCEDURE

The general purpose of this paragraph is to narrow the area of trouble to one or more sections of the Multicoupler in order to minimize the labour of locating the source of trouble. An orderly evaluation of symptoms will usually result in malfunction location in a very short time. During operation of the AMC-20 Antenna Multicoupler the following symptoms may be noted:

1. Failure of one or more outputs.
2. Weak or noisy signals in *all* receivers.
3. Weak or noisy signals in *one* receiver.
4. Complete loss of signals in all receivers.

The following information is based upon specific troubles that may be encountered during operation of the AMC-20 Antenna Multicoupler.

(a) Failure of one or more outputs. If low output is observed at one output when tested with the OUTPUT/FILTER switch or when connected to a specific receiver, failure of a particular output stage is indicated. Semiconductors and other components in the faulty output stage should be tested utilizing the output module extender card and Table 5-1.

(b) Weak or noisy signals in *all* receivers. If weak or noisy signals occur in *all* receivers, make a rough check of the antenna system by connecting the antenna lead-in directly to the antenna terminals of a receiver. If the weakness or noise disappears, check the pre-amplifier and driver section of the Multicoupler for security of interconnecting cables or for noisy or low emission tubes (Table 5-1).

(c) Weak or noisy signals in *one* receiver. When only one receiver in the system evinces faulty performance, check:

1. The receiver itself.
2. The connections between the Multicoupler and the receiver, or
3. The particular output section as outlined in paragraph 5.3 as above.

(d) Complete loss of signals in *all* receivers. If the system fails, (indicated by loss of signals in all receivers), the method discussed in paragraph 5.3(b) above may be used to determine if the trouble is actually in the AMC-20. If this appears to be the case, determine that pre-amplifier tube filaments are lit and that all other stages are receiving proper operating voltages (Table 5-1).

Then test the Multicoupler by means of its internal dynamic checking circuit. Low output at all jacks indicates failure of the pre-amplifier or driver circuits or defective interconnecting cables.

5.4 VOLTAGE AND RESISTANCE CHECKING

Figures 5-1 and 5-2 will assist in locating major components during trouble-shooting. Table 5-1 indicates voltages that are to be found at indicated tube, semiconductor and power supply terminals.

CAUTION

Continual reference to Figure 8-1, the complete unit schematic should be made while using Table 5-1 as a diagnostic aid. Capacitors and other devices may break down during operating conditions, yet exhibit normally high resistance when checked with an ohmmeter. Where abnormally low voltage (using Table 5-1) is encountered at a point where a normal resistance measurement is made, a capacitor or diode malfunction or breakdown is indicated.

5.5 TROUBLE-SHOOTING BASED ON CIRCUIT SECTIONALIZATION

When no output signal is present at an output jack with the internal test oscillator turned on, that output module should be withdrawn for bench testing.

If all output jacks are dead, the test signal should be traced back from the output jack to the antenna input jack.

Tests should be made at the following points in the order shown.

(1) The output module connector

(2) The base of the driver stage

(3) Cathodes of Pre-Amp

(4) The antenna input jack

Using this procedure the section giving trouble will be readily ascertained.

Tube	Type	Function	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-101	5842	Pre-Amplifier	145	—	6.4*	0	0	—	0	0	0
V-102	5842	Pre-Amplifier	145	—	6.4*	0	0	—	0	0	0

Voltages measured to chassis ground using standard VTVM. * A.C. voltage.

Transistor	Type	Function	Base	Collector	Emitter
Q102	2N2219A	Driver	—7.8	0	—8.4
Q105	2N2084	Oscillator	—2.75	—16.5	—3.75
All others	2N2219A	Output Stages	—2.7	0	—2.7

Voltages measured to chassis ground using standard VTVM.

Table 5-1. Tube and Transistor Operating Voltages

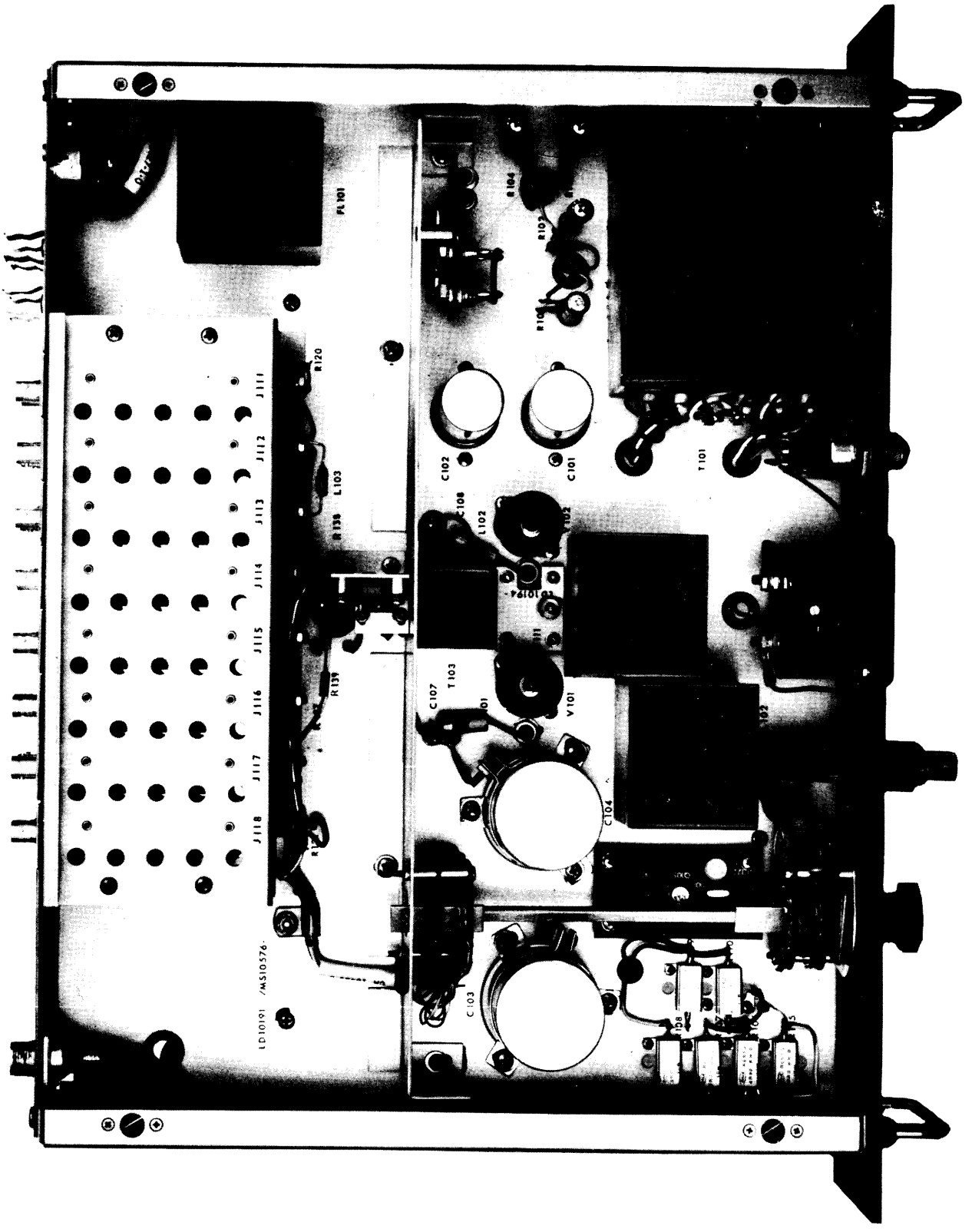


Figure 5-1. Location Diagram, Major Components, Top View

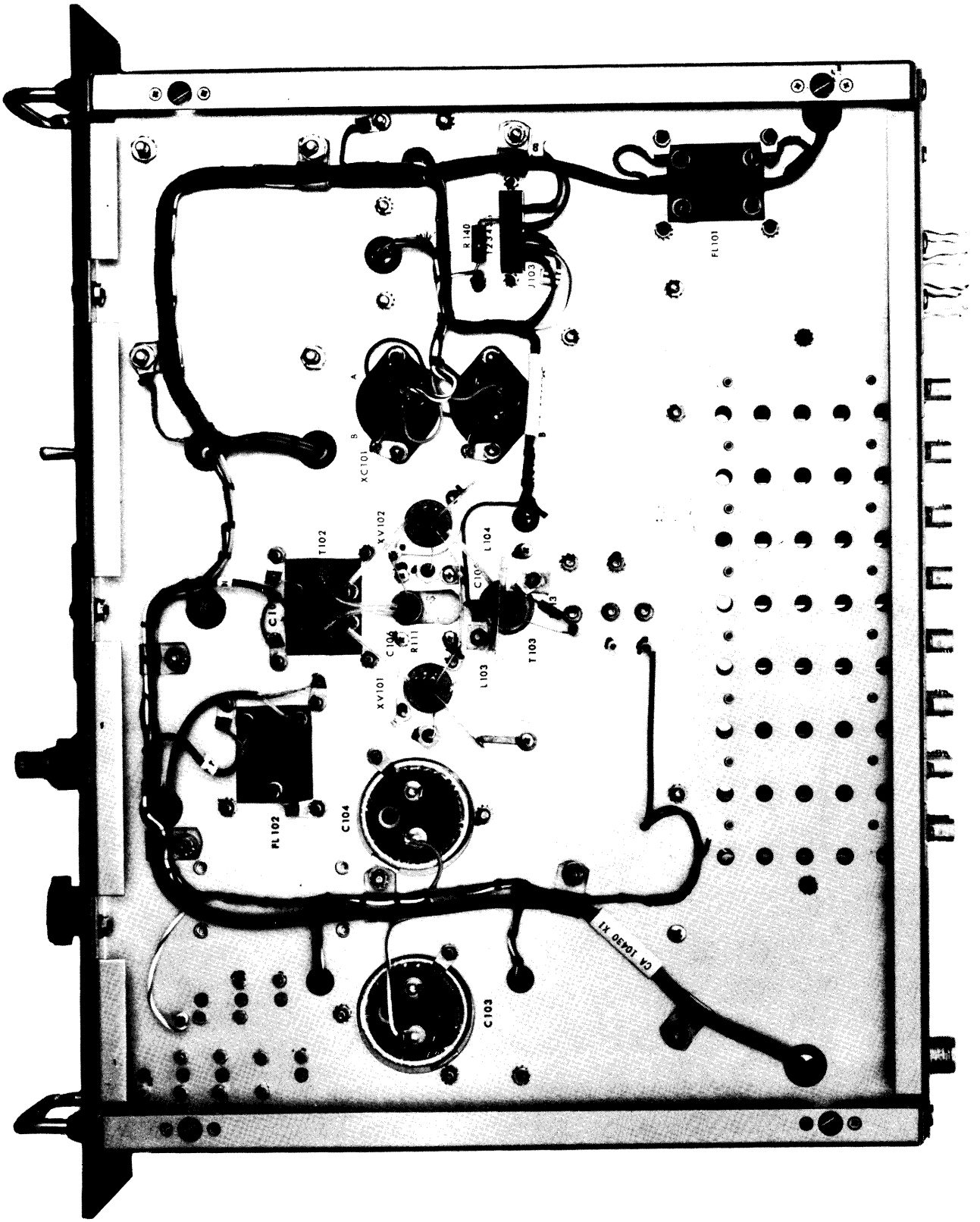


Figure 5-2. Location Diagram, Major Components, Bottom View

SECTION 6

MAINTENANCE

6.1 INTRODUCTION

Maintenance may be divided into three categories: Operator's maintenance, Preventive maintenance and Corrective maintenance. Operator's maintenance is discussed in SECTION 3.

Corrective maintenance may be considered as consisting of information useful in locating and diagnosing troubles and maladjustments, existing and/or pending, and information necessary to remedy the troubles and maladjustments.

For reasons stated in SECTION 5, the remedial type of information is presented under corrective maintenance (SECTION 6) while the diagnostic type of information is presented under trouble-shooting (SECTION 5).

The AMC-20 Antenna Multicoupler is designed to provide long-term, trouble-free operation under continuous duty conditions. Any necessary maintenance should be performed by a competent maintenance technician.

If trouble cannot be corrected by following the procedures outlined in this manual, it is recommended that the AMC-20 be returned to The Technical Materiel Corporation for servicing. To expedite the return of the serviced equipment to you, it is recommended that the equipment be shipped to us by Air Freight and that we be authorized to return it in the same way.

6.2 PREVENTIVE MAINTENANCE

In order to prevent failure of the AMC-20 Antenna Multicoupler due to corrosion, dust or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to. The recommended time interval is every 6 to 12 months, depending on the amount of vibration or exposure encountered in service.

The AMC-20 should be removed from the relay rack or other enclosure and placed on a well-lighted clean workbench for cleaning and inspection. All accessible covers should be removed.

The metalwork, wiring and all components should be inspected for dust, corrosion, charring, discolouring or grease. In particular, tube sockets, module connectors, wafer switch contacts and fuse holders should be carefully inspected for deterioration.

Dust may be removed with a soft brush or a vacuum cleaner if one is available. Remove dirt or grease from electrical parts with trichlorethylene. Remove dirt or grease from other parts with any good dry-cleaning fluid.

WARNING

When using trichlorethylene, make certain that adequate ventilation exists. Avoid prolonged contact with skin.

Carefully inspect for loose solder connections, especially those on solder lugs. Colour codes or printed values on resistors should be easily read. If not, check the component for abnormal heating. Inspect all types of capacitors for signs of discolouration, leading, bulging or cracking.

The output modules and other printed circuit cards should be wiped with a clean, dry cloth.

NOTE

Periodic checking of tubes and semiconductors is not recommended. Testing devices for these components cannot present a truly valid test result. Only when trouble-shooting, as outlined in SECTION 5, indicates a faulty tube or semiconductor should these units be replaced. The substitution method of testing is recommended where conditions indicate testing is required.

SECTION 7

PARTS LIST

7.1 INTRODUCTION

Reference designations have been assigned to identify all maintenance parts of the AMC-20 Antenna Multicoupler. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list.

The letters of a reference designation indicate the kind of part (generic group) such as a resistor, capacitor, electron tube, etc. The number differentiates between parts of the same generic group.

Sockets associated with a particular plug-in device, such as an electron tube or fuse, are identified by reference designations which include the reference designation of the plug-in device. For example, the socket for tube V101 is designated XV101.

Column 1 of the parts list gives reference designations of the parts in alphabetical and numerical order.

Column 2 gives the name and describes the various parts. Major part assembies are listed in their entirety; subparts of a major assembly are listed in alphabetical and numerical order with reference to its major assembly.

Column 3 indicates how the part is used within a major component.

Column 4 lists each Technical Materiel Corporation part number.

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
C101 (AB)	CAPACITOR: dual electrolytic, 20-20 uf, 450 wvdc.	H.V. Filter	CE10004
C102 (AB)	Same as C101.	Same as C101	
C103 (AB)	CAPACITOR: electrolytic, 2400 uf, 35 wvdc.	L.V. Filter	CE10005
C104 (AB)	Same as C103.	Same as C103	
C105	CAPACITOR: disc., ceramic, 0.1 uf, + 80 - 20%, 100 wvdc.	R.F. Bypass	CC100-28
C106	Not used.		
C107	CAPACITOR: disc., ceramic, .01 uf, GMV, 500 wvdc.	Heater Decoupling	CC100-16
C108	Same as C107.	Same as C107	
C109	Same as C107.	B + Decoupling	
C110	Same as C107.	R.F. Coupling	
C111	CAPACITOR: fixed, ceramic, disc, 0.2 uf, 25 wvdc.	B − Decoupling	CC100-33
C112	Same as C107.	R.F. Coupling	
C113	CAPACITOR: disc., ceramic, .001 uf, ±10%, 500 wvdc.	R.F. Coupling	CC100-9
C114	Same as C107.	R.F. Coupling	
C115	Same as C111.	B − Decoupling	
C116	Same as C113.	R.F. Coupling	
C117	Same as C107.	R.F. Coupling	
C118	Same as C111.	B − Decoupling	
C119	CAPACITOR: mica, 47 uuf, ±5%, 500 wvdc.	DC Collector Blocking	CM15C470J
C120	CAPACITOR: mica, 820 uuf, ±5%, 500 wvdc.	R.F. Bypass	CM20C821J
C121	Same as C107.	Emitter Bypass	
C122	CAPACITOR: variable ceramic, 9-35 uuf, 100 wvdc.	R.F. Coupling	CV112-2

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
C123	Same as C107.	R.F. Coupling	
CR101	DIODE: 1N547.	H.V. Rectifier	1N547
CR102	Same as CR101.	Same as CR101	
CR103	DIODE: 1N1613.	L.V. Rectifier	1N1613
CR104	Same as CR103.	Same as CR103	
CR105	Same as CR103.	Same as CR103	
CR106	Same as CR103.	Same as CR103	
CR107	DIODE: 1N68A.	Meter Rectifier	1N68A
CR108	Same as CR107.	Same as CR107	
DS101	LAMP: incadescent, bayonet base, 6-8 volt, .25A, T-3 1/4.		BI101-44
F101	FUSE: cartridge, 1.5A, slo-blo, 250 volt.	Primary Power	FU102-1.5
FX101	FILTER: non-repairable item.	A.C. Line	FX10013
FX102	FILTER: high pass, non-repairable item.	Broadcast Attenuation	FX10003
J101	CONNECTOR: twistlock, male, polarized.	A.C. Input Jack	JJ175
J102	CONNECTOR: female, coaxial, UHF series.	Ant. Input Jack	SO239
J103	CONNECTOR: female, 6 contact, PCB receptacle.	Rectifier Jack	JJ285-6
J111	Same as J103.	Module Jack	
J112	Same as J103.	Same as J111	
J113	Same as J103.	Same as J111	
J114	Same as J103.	Same as J111	
J115	Same as J103.	Same as J111	
J116	Same as J103.	Same as J111	

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
J117	Same as J103.	Same as J111	
J118	Same as J103.	Same as J111	
J119 THRU J135	Connector, Coaxial, BNC	Output Jacks	UG-625B/U
L101	Choke, R.F., 6.8 uh.	Filament Choke	CL10005-1
L102	Same as L101.		
L103	Coil, peaking.		CL10031
L104	Not used.		
M101	METER: D.C., 50 ua, special scale.	Dynamic Check Indicator	MR10004
Q102	TRANSISTOR: silicon, NPN, JEDEC type 2N2219A. Transistor with beta linearity characteristics.	Driver	TX100
Q103	Same as Q102.	Output	
Q104	Same as Q102.	Same as Q103	
Q105	TRANSISTOR: germanium, PNP, JEDEC type 2N2084 transistor with type TO33 case.	Oscillator	2N2084
R101	RESISTOR: fixed, wirewound, 400 ohm, ±5%, 10 w.	Voltage Dropping	RW109-17
R102	Same as R101.	Same as R101	
R103	Same as R101.	Same as R101	
R104	RESISTOR: fixed, wirewound, 25K ohm, ± 5%, 10 w.	Bleeder	RW109-38
R105	RESISTOR: fixed, wirewound, 10 ohm, ± 1%, 10 w.	Voltage Dropping	RE65G10R0
R106	RESISTOR: fixed, wirewound, 4 ohm, ± 1%, 10 w.	Same as R105	RE65G4R99
R107	RESISTOR: fixed, wirewound, 2 ohm, ± 1%, 10 w.	Same as R105	RE65G2R00

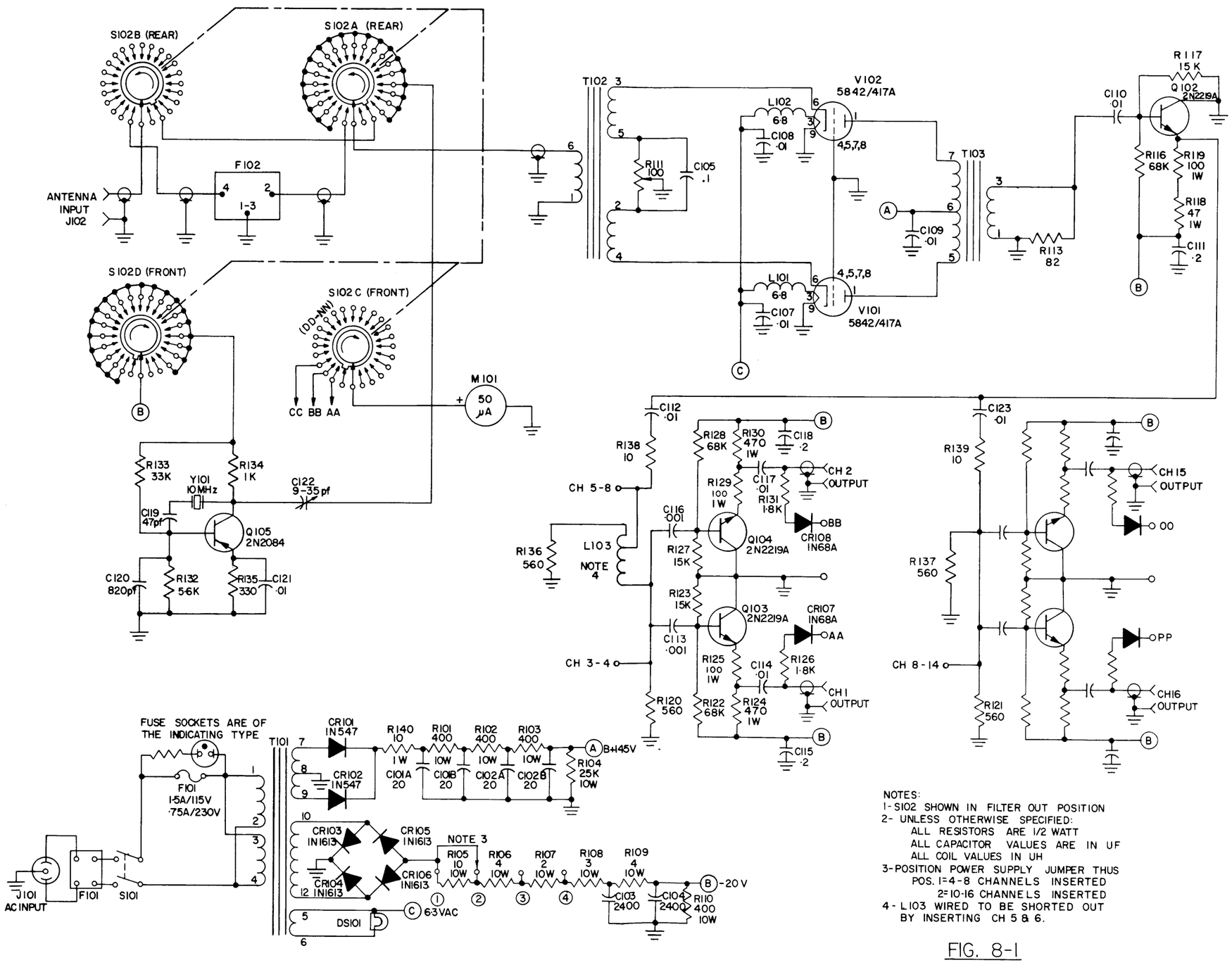
SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
R108	RESISTOR: fixed, wirewound, 3 ohm, ± 1%, 10 w.	Same as R105	RE65G3R01
R109	Same as R106.	Same as R105	
R110	RESISTOR: fixed, wirewound, 400 ohm, ± 1%, 10 w.	Bleeder	RE65G4000
R111	RESISTOR: variable, composition, 100 ohm, ± 10%, ½ w.	D.C. Balance	RV106UX8B101A
R112	Not used.		
R113	RESISTOR: fixed, composition, 82 ohm, ± 5%, ½ w.	Preamp. Load	RC20GF820J
R116	RESISTOR: fixed, composition, 68K ohm, ± 5%, ½ w.	Bias	RC20GF683J
R117	RESISTOR: fixed, composition, 15K ohm, ± 5%, ½ w.	Same as R116	RC20GF153J
R118	RESISTOR: fixed, composition, 47 ohm, ± 5%, 1 w.	Emitter Voltage	RC32GF470J
R119	RESISTOR: fixed, composition, 100 ohm, ± 5%, 1 w.	Same as R118	RC32GF101J
R120	RESISTOR: fixed, composition, 560 ohm, ± 5%, ½ w.	Distribution	RC20GF561J
R121	Same as R120.	Same as R120	
R122	Same as R116.	Same as R116	
R123	Same as R117.	Same as R116	
R124	RESISTOR: fixed, composition, 470 ohm, ± 5%, 1 w.	Same as R118	RC32GF471J
R125	RESISTOR: fixed, composition, 68 ohm, ± 5%, 1 w.	Same as R118	RC32GF680J
R126	RESISTOR: fixed, composition, 1.8K ohm, ± 5%, ½ w.	Meter Isolation	RC20GF182J
R127	Same as R117.	Same as R116	
R128	Same as R116.	Same as R116	
R129	Same as R125.	Same as R118	
R130	Same as R124.	Same as R118	

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
R131	Same as R126.	Same as R126	
R132	RESISTOR: fixed, composition, 5.6K ohm, ± 5%, ½ w.	Bias	RC20GF562J
R133	RESISTOR: fixed, composition, 33K ohm, ± 5%, ½ w.	Same as R132	RC20GF333J
R134	RESISTOR: fixed, composition, 1K ohm, ± 5%, ½ w.	Collector Load	RC20GF102J
R135	RESISTOR: fixed, composition, 330 ohm, ± 5%, ½ w.	Emitter Bias	RC20GF331J
R136	Same as R120.		
R137	Same as R120.		
R138	RESISTOR: fixed, composition, 10 ohm, ± 5%, ½ w.		RC20GF100J
R139	Same as R138.		
R140	RESISTOR: fixed, composition, 10 ohm, ± 5%, 1 w.	Voltage Dropping	RC32GF100J
S101	SWITCH: toggle, DPDT.	Power ON-OFF	ST22K
S102	SWITCH: rotary, 4 section, 24 position.	Output/Filter	SW10022
T101	TRANSFORMER: power, single phase, non-repairable item, primary 115-230v, 60 to 400 cps; secondary 350 vct at 75 dc, 28v at 1.5 adc, 6.4v + la.	AC Power	TF10026
T102	TRANSFORMER: RF; broadband, 2-30 mc/s. Non-repairable item.	Preamp. Input	TR082
T103	TRANSFORMER: RF; broadband, 2-30 mc/s. Non-repairable item.	Preamp. Output	AX10003
V101	TUBE: electron, triode, receiving type, 9 pin premium quality.	Preamplifier	5842/417A
V102	Same as V101.	Same as V101	
XC101	PLATE: capacitor mounting, 3-pin, bakelite.	Socket C101	P/O C101

SYM.	DESCRIPTION	FUNCTION	TMC DWG. OR PART NO.
XC102	Same as XC 101.	Socket C102	
XC103	PLATE: capacitor, mounting, 4-pin, bakelite.	Socket C103	P/O C103
SC104	Same as XC103.	Socket C104	
XDS101	LIGHT: red indicator, miniature bayonet.	Lamp Socket	TS106-1
XF101	HOLDER: fuse, lamp indicating, clear.	Fuse Holder	FH104-2
Y101	Crystal, quartz, 10 mcs.	Test Oscillator	CR110-3-10.0

SECTION 8

SCHEMATIC DIAGRAM



NOTES:
1- S102 SHOWN IN FILTER OUT POSITION
2- UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE 1/2 WATT
ALL CAPACITOR VALUES ARE IN UF
ALL COIL VALUES IN UH
3- POSITION POWER SUPPLY JUMPER THUS
POS. 1=4-8 CHANNELS INSERTED
2=10-16 CHANNELS INSERTED
4- L103 WIRED TO BE SHORTED OUT BY INSERTING CH 5 & 6.

FIG. 8-1