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★
TECHNICAL MANUAL

for

REMOTE GAIN CONTROL

AX614



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO

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NOTICE

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THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

W a r r a n t y

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,*fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship 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 F.O.B. 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, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That 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.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That 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.
4. That 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.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York



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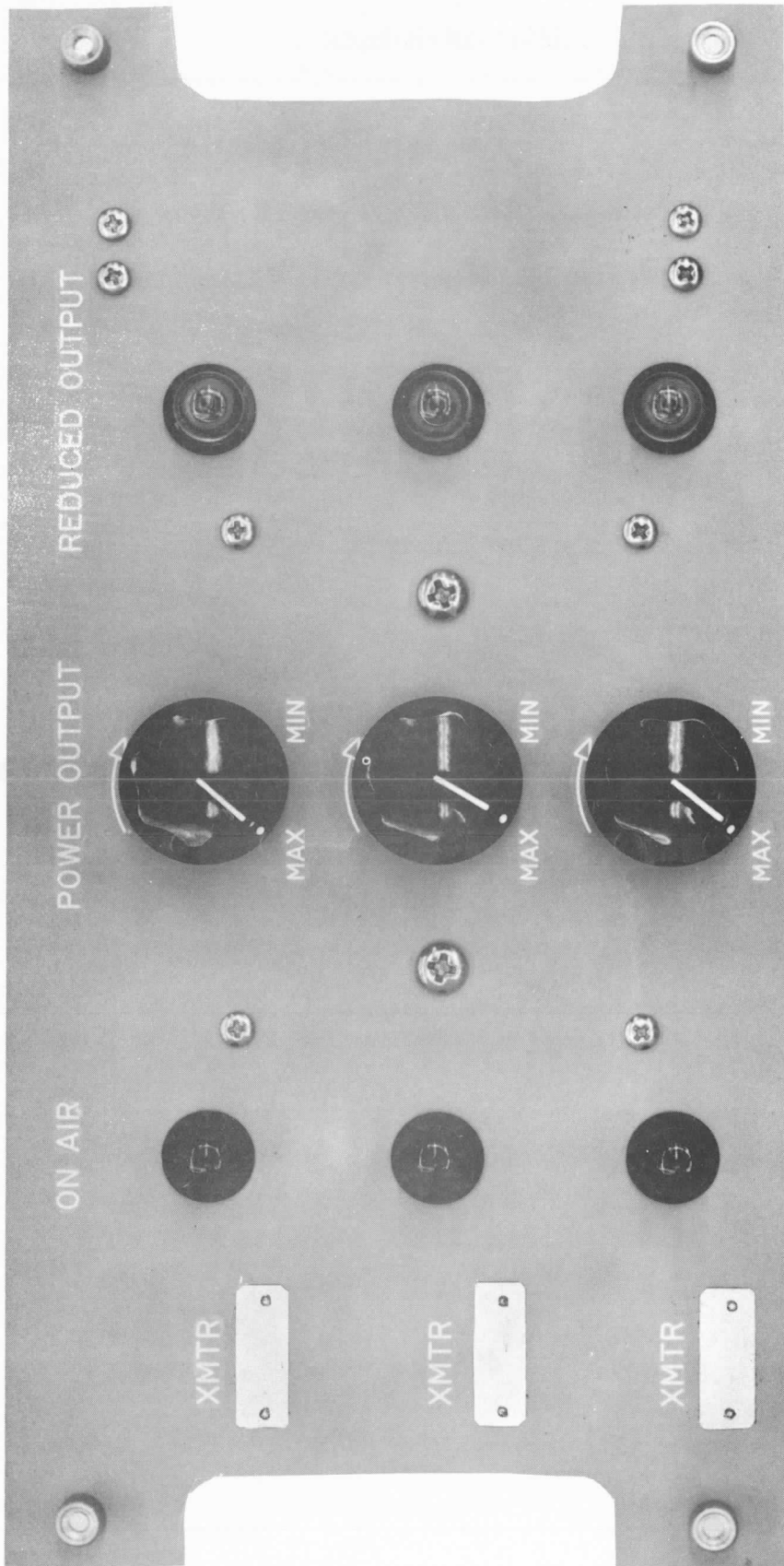


Figure 1-1. Remote Gain Control, AX614

SECTION 1 GENERAL DESCRIPTION

1-1. INTRODUCTION.

Remote Gain Control, AX614 (figure 1-1) is a modular component of Transmitter Control, Model LRCM-1.

The AX614 is a remote gain control module, used to remotely vary the output power level of a TMC TechniMatiC* transmitter system from 10 kw PEP to 0 kw PEP. Each AX614 is capable of individually controlling three separate transmitters.

1-2. PHYSICAL DESCRIPTION.

Due to the compact design and construction of the AX614, a 9-15/32 inch wide by 4-47/64 inch high front panel is used. This compact design enables two AX614 units to be mounted side by side on a specially designed mounting panel, for mounting into any standard 19 inch wide equipment rack or console. The mounting panel A5037 is designed to support eight AX614 units or any other similar sized units. Figure 2-1 provides a complete outline dimensional drawing of the AX614 and its associated mounting panel A5037. Table 3-1, used in conjunction with figure 3-1, provides a description of the various controls and functions of the AX614.

*Trademark applied for.

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION

Each AX614 unit has been thoroughly checked and tested at the factory before shipment. Upon arrival at the operating site, inspect the packing case and its contents immediately for possible damage. Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as loose items.

With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

2-2. MECHANICAL INSTALLATION

The AX614 is equipped with a 9-15/32 inch wide front panel. To mount the AX614 onto a standard 19 inch wide equipment rack or console, a mounting panel A5037 (figure 2-1) must be used.

The above mentioned mounting panel is designed to provide mounting space for eight AX614 units or any combination of other similar sized units. The mounting panel is screw-fastened to an equipment rack or console in the same manner as any other modular component. When the mounting panel has been securely mounted in the desired space, the AX614 unit may be mounted directly onto the mounting panel by means of the four captive screws attached to the unit front panel. Figure 2-2 illustrates a typical mounting technique of the AX614.

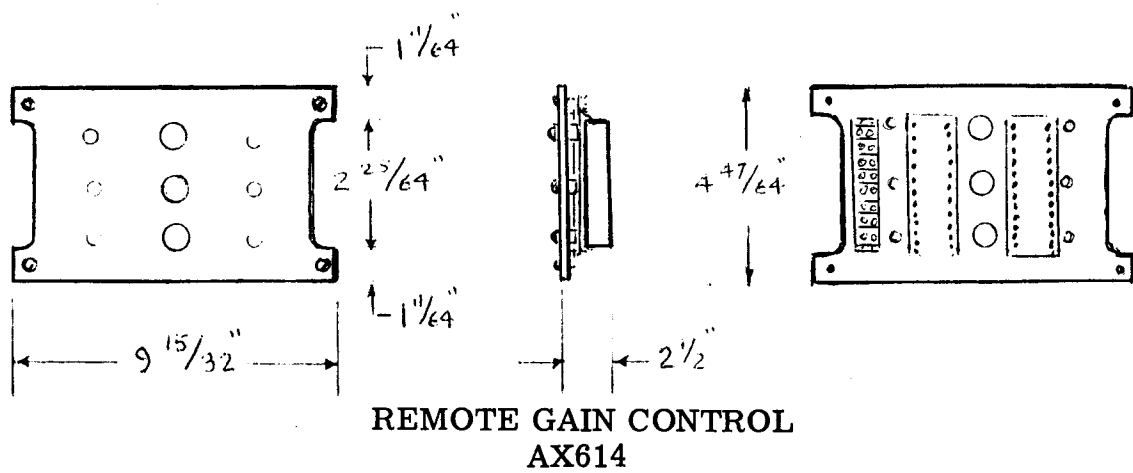
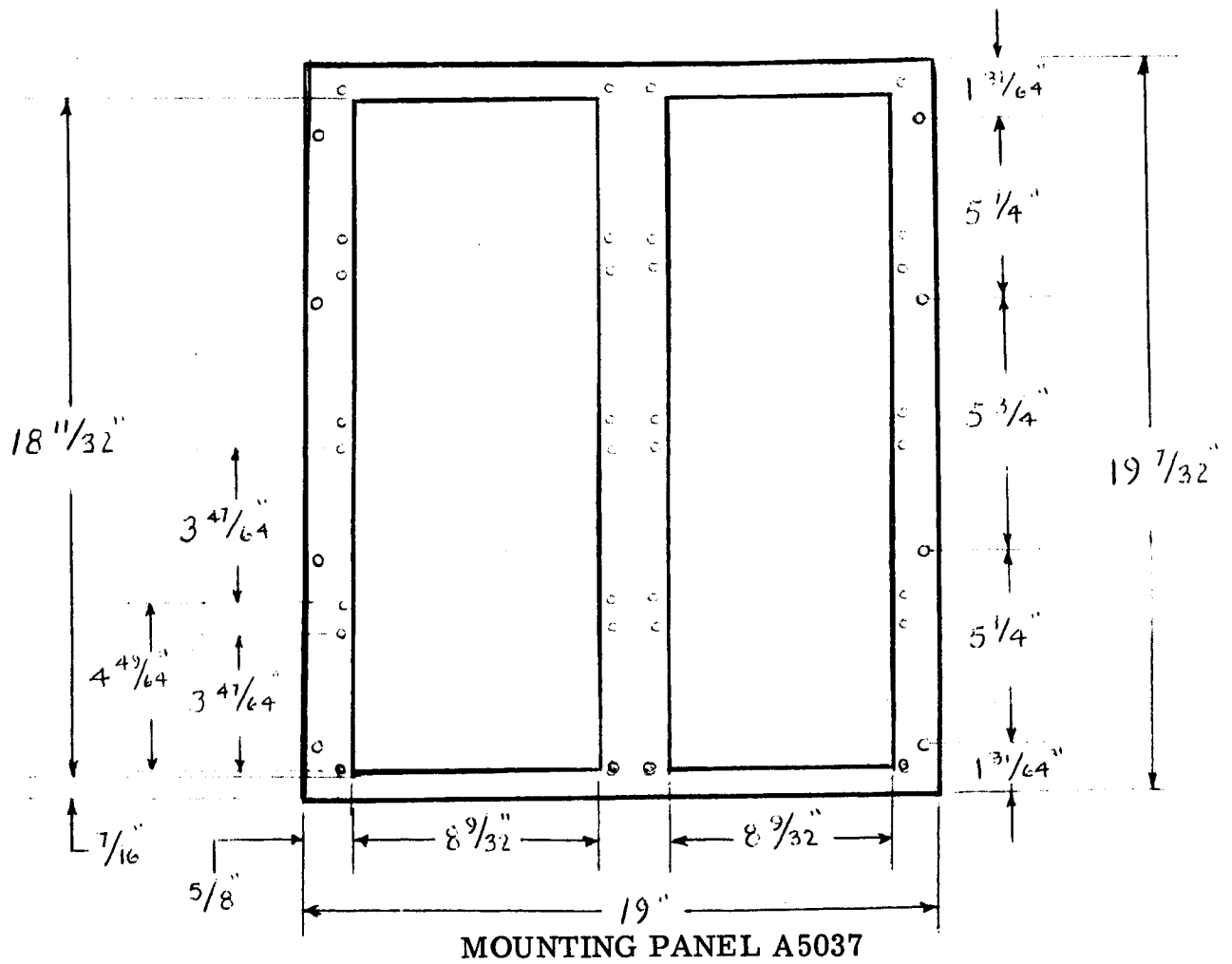


Figure 2-1. Outline Dimensional Drawing

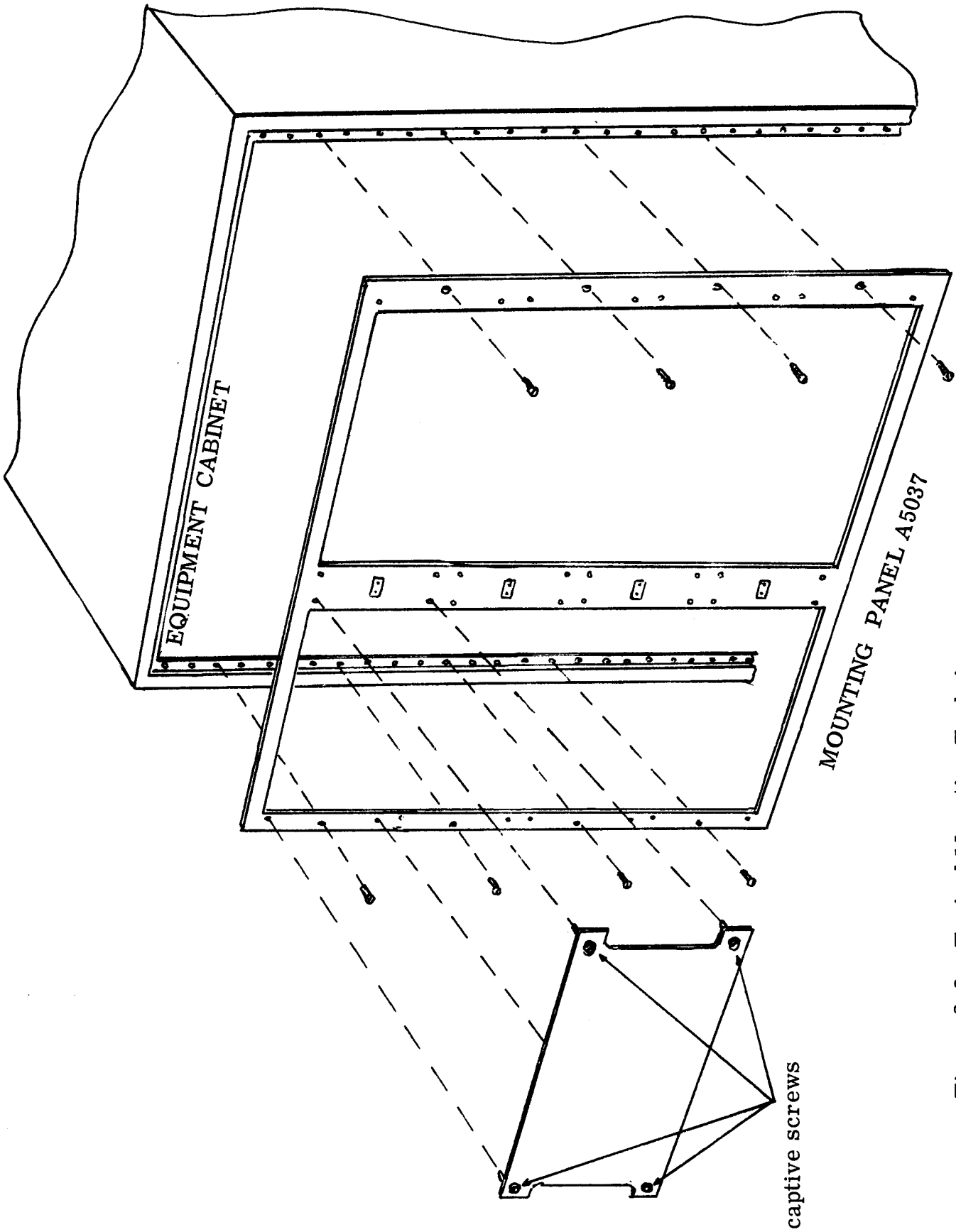


Figure 2-2. Typical Mounting Technique

2-3. ELECTRICAL INSTALLATION.

The rear panel mounted terminal board TB4101 provides termination points for connection of the AX614 to an associated transmitter system comprising three transmitters. The input connections, (operating voltages from three separate transmitters) and output connections, (negative control voltages to three separate transmitters) are made as shown in figure 2-3.

NOTE

Before installing the interconnecting cable wires, the installer must first establish proper AX614 and transmitter correspondence, noting this correspondence on the AX614 front panel XMTR identification plate. For example, AX614 XMTR identification plate marked XMTR #1 will function in conjunction with transmitter #1 in a three transmitter system.

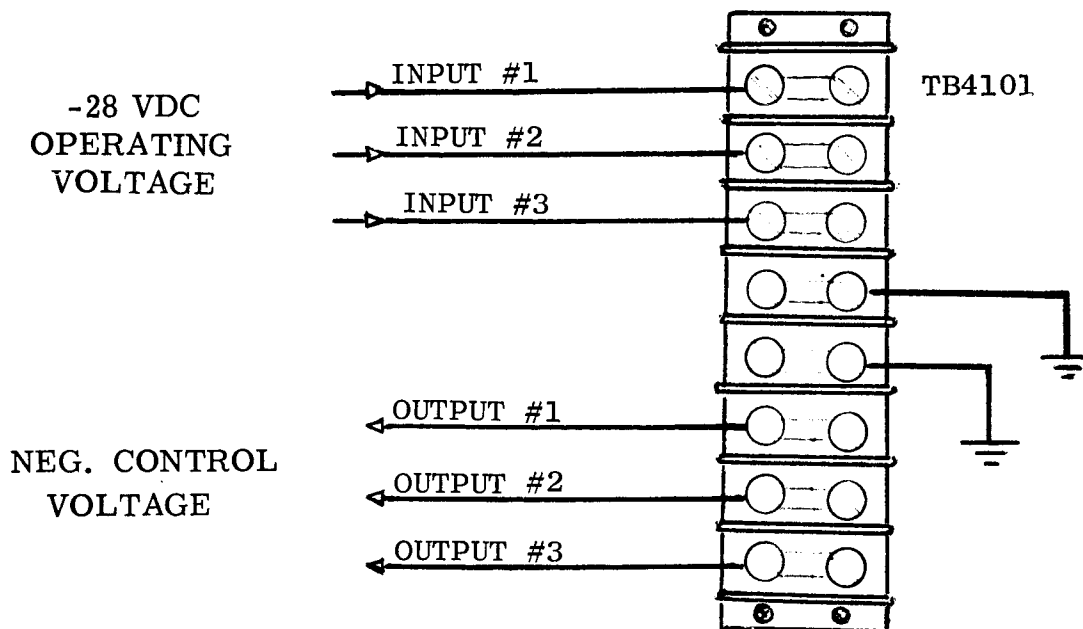


Figure 2-3. Electrical Installation

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL.

The AX614 enables an operator to remotely control the power output of an associated remote transmitter. Each AX614 is functionally designed and operated as three individual power output control units, enabling one AX614 to control three transmitters individually.

All front panel controls and indicators are functionally grouped and identified for the particular transmitter which they control. See table 3-1, in conjunction with figure 3-1, for front panel control and indicator data.

3-2. OPERATOR'S INSTRUCTIONS.

The POWER OUTPUT potentiometer/switch control is used to remotely adjust the power output level of a remote transmitter from 10 kilowatts PEP to zero kilowatts PEP.

Activation is accomplished by turning the POWER OUTPUT control in a clockwise direction (from MAX to MIN). Clockwise rotation switches on the POWER OUTPUT control circuit, lighting the REDUCED OUTPUT amber indicator lamp. Further clockwise rotation reduces the associated transmitter's power output level from 10 KW PEP to zero KW PEP (at MIN or fully clockwise rotation). Visual indication or monitoring of the associated transmitter's power output level is available at the associated transmitter remote control module AX568.

The ON AIR green indicator lamp, connected in parallel with the on-air indicator located on the associated AX568 unit, will light when the associated transmitter is operational or "on-the-air".

3-3. OPERATOR'S MAINTENANCE.

The operator may, at certain times, be required to perform various aspects of operator's maintenance. This type of maintenance may consist of simply keeping the unit clean and observing for normal panel indications and secure interconnections. However, should normal operating procedures produce unsatisfactory results, a check of the interconnecting cables and associated equipment levels to the AX614 may clear the fault. See figure 2-3.

When an indicator lamp is known to be defective, the operator is to replace the defective lamp. Refer to Section 6, Parts List for proper replacement lamp part number and type.

Table 3-1. Controls and Indicators.

Ref. Desig.	Panel Designation	Component Description	Function
1 4 7	ON AIR	Indicator lamp, green	Lights when associated transmitter is operational or " on the air ".
2 5 8	POWER OUTPUT	Potentiometer control with on/off switch	Permits adjustment of transmitter power output from 10 KW PEP to 0 KW PEP from MAX to MIN position.
3 6 9	REDUCED OUTPUT	Indicator lamp, amber	Lights when POWER OUTPUT control is switched on and associated transmitter is operational.

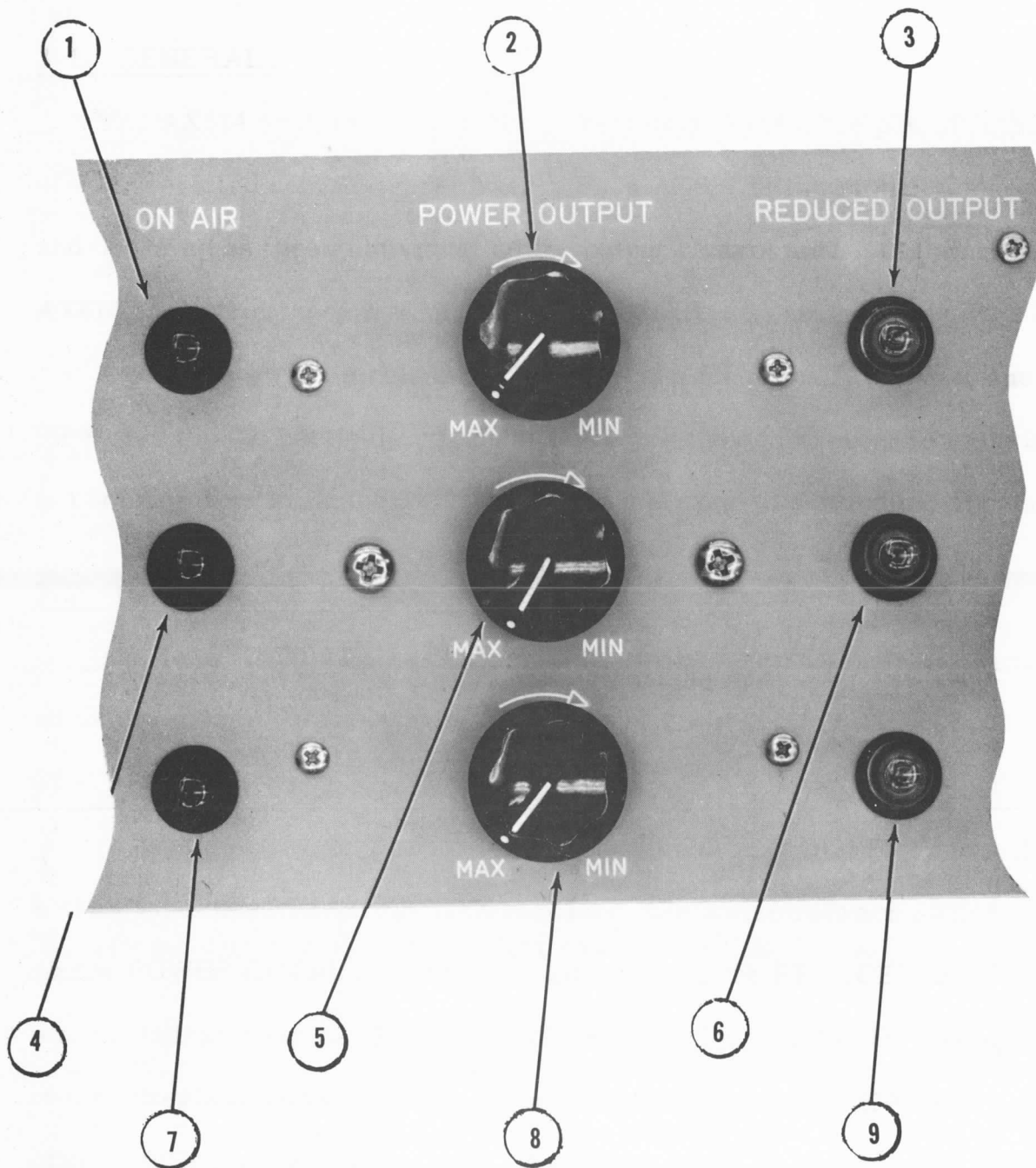


Figure 3-1. Controls and Indicators.

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

The AX614 is a remote control panel enabling an operator to remotely adjust the output power level of three separate transmitters. This is accomplished by introducing a variable negative d-c control voltage into the ALDC (Automatic Load and Drive Control) line of a transmitter. This action effectively varies or reduces the output power level of a transmitter from 10 kilowatts PEP to zero kilowatts PEP. See figure 4-1.

4-2. CIRCUIT DESCRIPTION.

An input negative 28 volts d-c potential is applied to the AX614 by its associated transmitter, lighting the ON AIR indicator lamp. This negative 28 volts d-c potential is applied across a zener diode, dropping the d-c potential to a negative 20 volts. Activation or switching-on the POWER OUTPUT control will cause the REDUCED OUTPUT indicator lamp to light and route the negative d-c control voltage across the POWER OUTPUT potentiometer. Varying the POWER OUTPUT potentiometer will vary the negative control voltage level at the AX614 output.

This variable negative control voltage, monitored on the associated AX568 transmitter control module panel meter, is introduced into the ALDC line of the associated transmitter via a "T" connector.

Figure 4-1 illustrates a functional block diagram of the AX614 and its associated interconnected units.

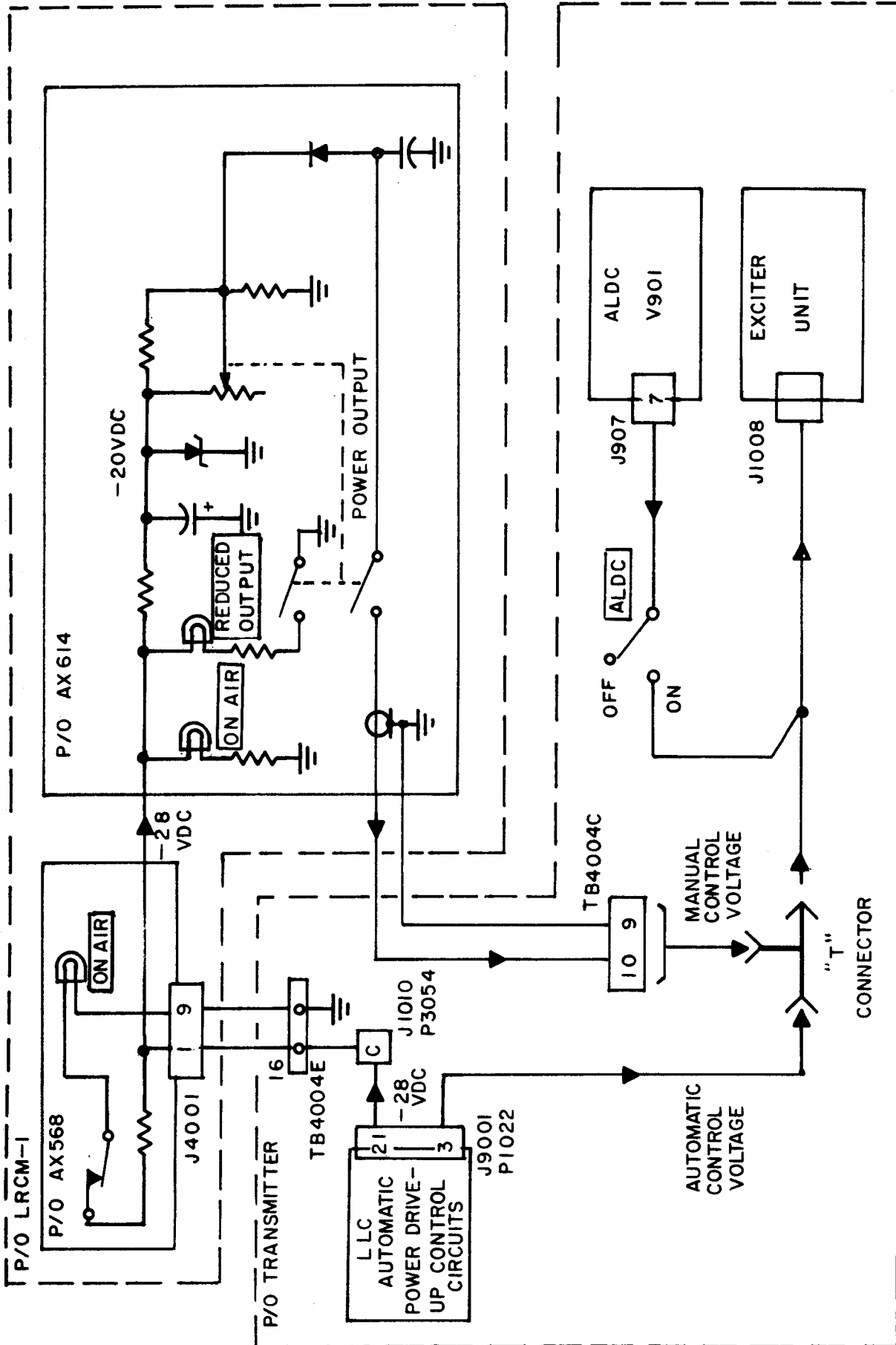


Figure 4-1. Functional Block Diagram

SECTION 5 MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to. Such schedules may vary in accordance with unit environmental operating conditions.

At periodic intervals (at least every six months under normal duty conditions), the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work," etc. is prohibited in the immediate area.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces, due to its paint removing effects.

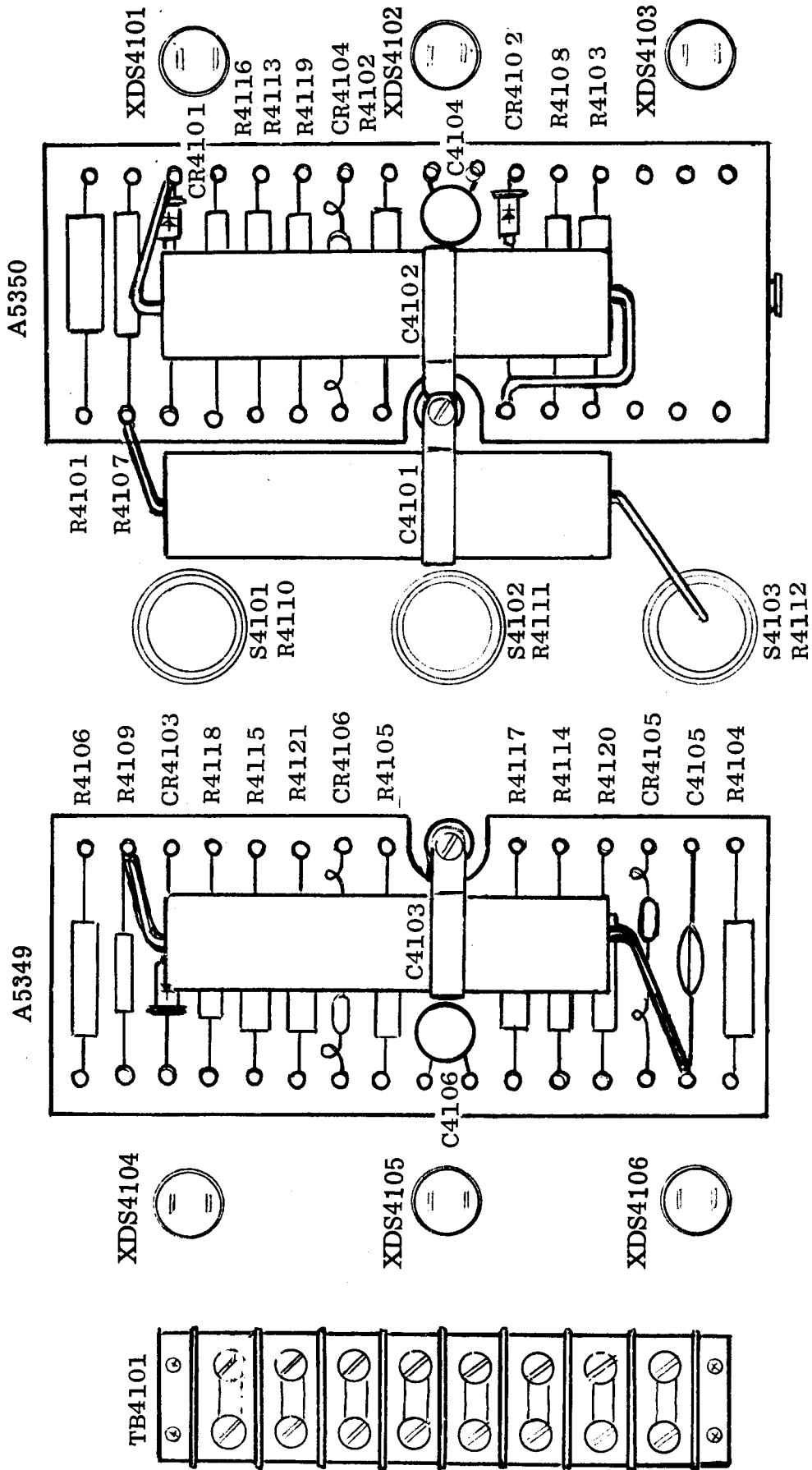
5-2. TROUBLESHOOTING.

Due to the simplicity in construction and design of the AX614, troubleshooting will consist of simple point-to-point continuity checks. By use of the schematic diagram (figure 7-1) and the functional block diagram (figure 4-1), the technician may trace the signal line path, from the input terminating point to the output termination, observing for proper continuity conditions and component physical and electrical conditions.

5-3. REPAIR AND REPLACEMENT.

Maintenance of the AX614 will consist mainly of component replacement. It should be noted that when replacing components, the technician should observe for exact or equivalent replacements by referring to the parts list in section 6. Polarity and positioning of certain components should be observed before removing so that the replacement component will fit and operate properly.

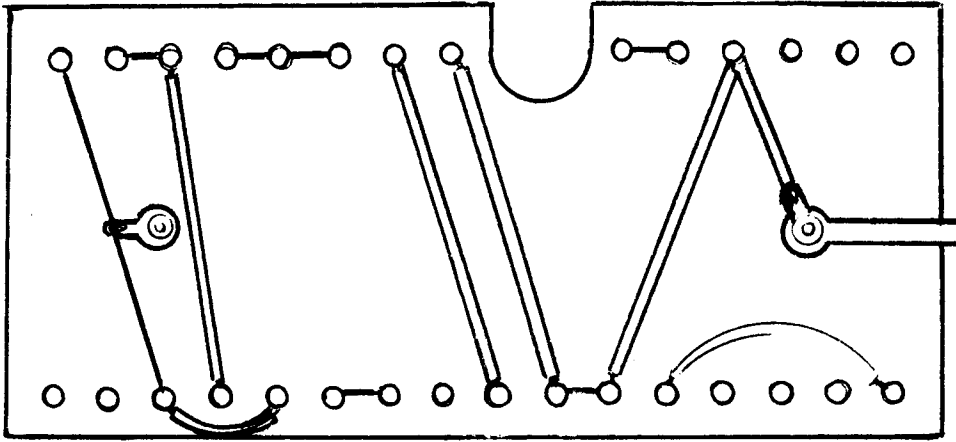
See figures 5-1 and 5-2 for component board layout and wiring.



Rear Panel View

Figure 5-1. Parts Location

A5350
BOTTOM VIEW



A5349
BOTTOM VIEW

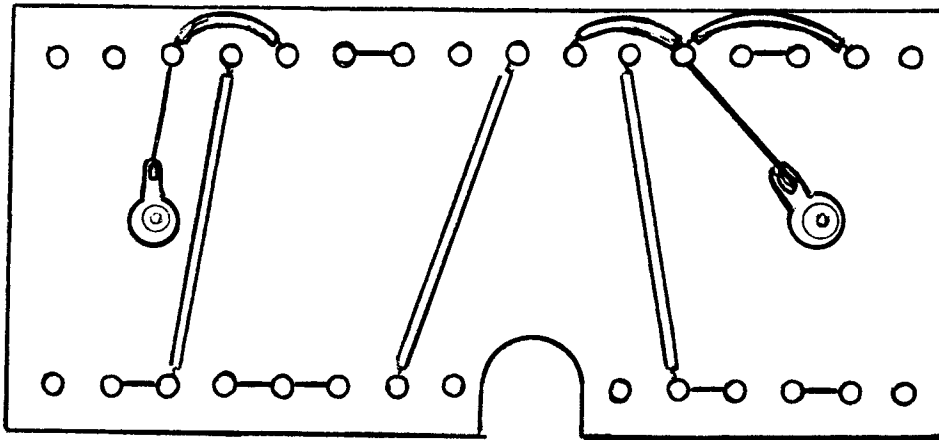


Figure 5-2. Component Board Wiring

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

The parts list presented in this section is a cross-reference list of parts identified by reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Generic name.
- b. Reference designation.
- c. TMC part number.
- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to the warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C4101	CAPACITOR, FIXED, ELECTROLYTIC: polarized 2000 uf; 25 EVDC; max. temp. range 0-85°C; hermetically sealed aluminum case w/clear vinyl plastic sleeve.	CE116-5VN
C4102	Same as C4101.	
C4103	Same as C4101.	
C4104	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C4105	Same as C4104.	
C4106	Same as C4104.	
CR4101	SEMICONDUCTOR DEVICE, DIODE: nominal Zener reference voltage 20 volts; max. dynamic impedance 13 ohms; current rated for 15 ma; power dissipation 1 watt at 25°C; max. temperature 175°C.	1N3027
CR4102	Same as CR4101.	
CR4103	Same as CR4101.	
CR4104	SEMICONDUCTOR DEVICE, DIODE: operational voltage 230 volts; max. dynamic impedance 13 ohms; min. forward current 3 ma, max. reverse current 0.025 ma; min. forward voltage 1 volt, max. reverse voltage 175 volts; max. power dissipation 1 watt at 25°C; operating temperature 150°C.	1N463
CR4105	Same as CR4104.	
CR4106	Same as CR4104.	
DS4101	LAMP, INCANDESCENT: 28.0 volts; 0.04 amps; single contact, flange base; T-1-3/4 bulb.	BI110-7
DS4102 thru DS4106	Same as DS4101.	
R4101	RESISTOR, FIXED, COMPOSITION: 150 ohms, ±5%; 1 watt.	RC32GF151J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R4102 thru R4106	Same as R4101.	
R4107	RESISTOR, FIXED, COMPOSITION: 560 ohms, $\pm 5\%$; 1/2 watt.	RC20GF561J
R4108	Same as R4107.	
R4109	Same as R4107.	
R4110	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, $\pm 10\%$; nom. power rating 2 watts at 70°C; linear taper. Consists of S4101.	RV4NCYSD-503AYY
R4111	Same as R4110. Consists of S4102.	
R4112	Same as R4110. Consists of S4103.	
R4113	RESISTOR, FIXED, COMPOSITION: 39,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF393J
R4114	Same as R4113.	
R4115	Same as R4113.	
R4116	RESISTOR, FIXED, COMPOSITION; 100,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF104J
R4117	Same as R4116.	
R4118	Same as R4116.	
R4119	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF102J
R4120	Same as R4119.	
R4121	Same as R4119.	
S4101	Part of R4110.	
S4102	Part of R4111.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S4103	Part of R4112.	
TB4101	TERMINAL BOARD, BARRIER: 8 double screw type terminals; 6-32 thd. x 1/4" long binder head screws; phenolic body.	TM102--8
XDS4101	LIGHT, INDICATOR: w/green transparent lens; sub-miniature type; accepts single contact, flange base T-1-3/4 bulb.	TS153-2
XDS4102	Same as XDS4101.	
XDS4103	Same as XDS4101.	
XDS4104	LIGHT, INDICATOR: w/amber transparent lens; sub-miniature type; accepts single contact, flange base T-1-3/4 bulb.	TS153--3
XDS4105	Same as XDS4104.	
XDS4106	Same as XDS4104.	

SECTION 7
SCHEMATIC DIAGRAMS

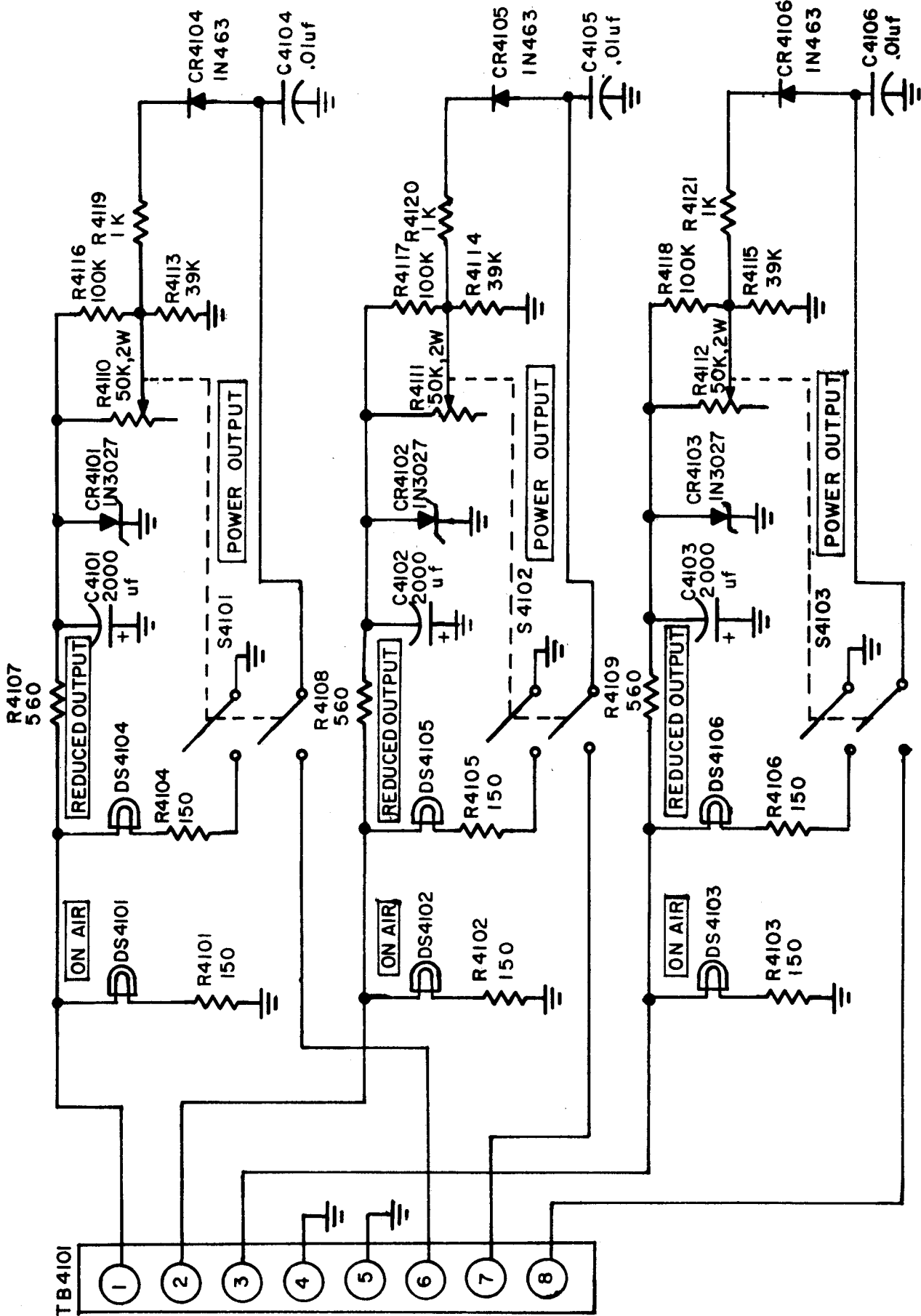


Figure 7-1. Schematic Diagram, AX614