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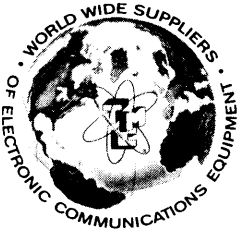
## **TECHNICAL MANUAL**

**for**

**Antenna Terminator/Dummy Load (25KW)**

**Model TER-25K**

**The Technical Materiel Corporation**  
700 Fenimore Road  
Mamaroneck, New York 10543-0142 U.S.A.



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## Warranty

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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.

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 and the TMC RETURN AUTHORIZATION number clearly marked on the package. Electron tube warranty claims should be made directly to the manufacturer of such tubes since tubes furnished by TMC bear only the manufacturer's warranty.

No warranties, expressed 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 purchaser's 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 such equipment, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

All inquiries should be directed to the following:

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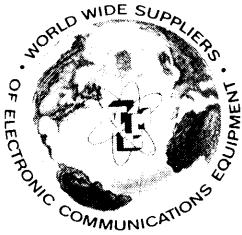
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# Antenna Terminator/Dummy Load

## Model TER-25K

### *DC to 30MHz Operation*

### *Handles RF Power to 50KW PEP*

### *Minimum Reactance Over Range*

### *Nomenclature Assigned*

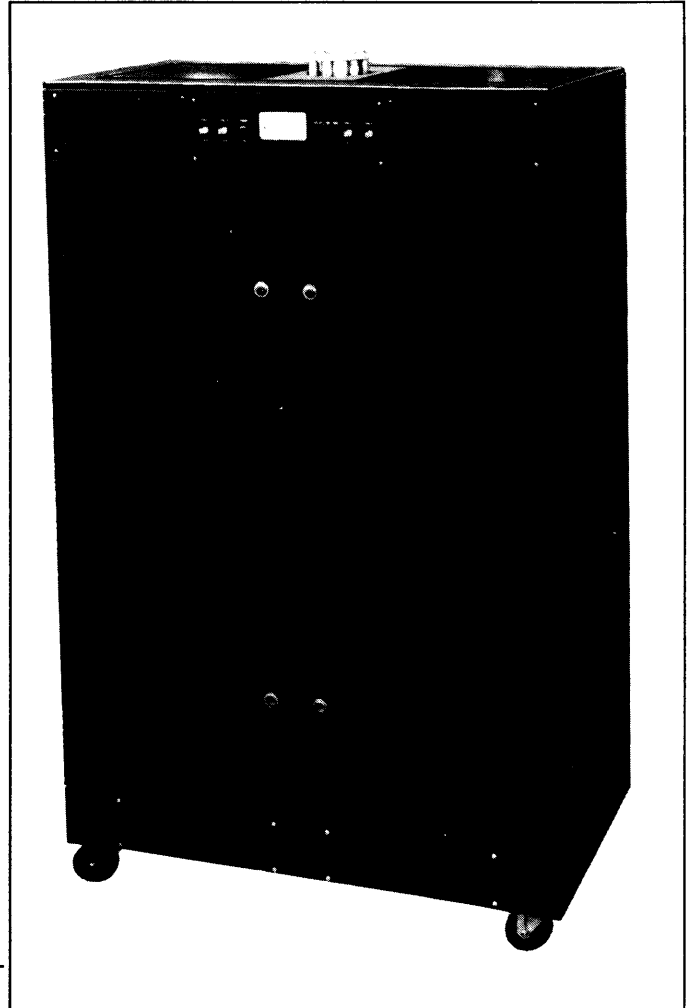
### *Optional Weatherproofing*

The TER Series of Transmitting Antenna Terminators and Dummy Loads provide high-purity resistive terminations for routine off-the-air tuning of transmitters and for rhombic, sloping-V or other antenna systems. Designed for power levels of 50kW PEP and 25kW average, the TER-25K is conservatively rated and can handle higher power on a limited duty cycle basis.

The TER-25K provides highly resistive termination with a minimum of reactance over the entire range of DC to 30MHz. The unit is ideally suited for any make transmitter - whether designed by TMC or not - and will mate to many standard transmission systems. The frequency response curve over the operating range is exceptionally flat.

Users are given added flexibility with these units since the unbalanced RF coaxial terminations are easier to install and re-route within transmitter buildings. The RF cables can easily be terminated on quick-disconnect patch panels, such as the TMC series of QDP/SSP switching patch panels. The appropriate RF path can then be selected, either to the antenna for transmission or to the TER-25K Dummy Load for test.

This well-engineered TMC product requires no maintenance to perform consistently within specification. Special ceramic cylinders with the resistive element electrofused on to its surfaces are protected with a baked silicone coating. The resistor assemblies are constructed to ensure even heat dissipation and a long service life. Silver contact bands provide fixed, positive connections. The entire assembly is mounted on a rugged, aluminum frame and enclosed with steel access doors. For hostile outdoor conditions, the dummy load can be installed in a weatherproof case that is constructed of reinforced fiberglass.





# Section 1 - General Description

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## 1.1 Functional Description

### 1.1.1 Overview

The TER-25K Transmitting Antenna Coupler is a broadband, high-capacity dummy load used for routine off-the-air testing of a transmitter or as a purely resistive termination for rhombic or other antenna systems. The TER-25K is capable of dissipating RF energy in the order of 25,000 watts average or 50,000 watts PEP over the frequency range of DC to 30MHz. This power rating is conservative since the TER-25K can operate at higher levels on a limited duty cycle. Cooling of internal load resistors is accomplished by means of four base-mounted fans. Optional accessories include a directional RF wattmeter to monitor input and reflected power for computation of load VSWR.

### 1.1.2 Major Assemblies

The TER-25K coupler consists of six low-reactance ceramic/glass resistors mounted onto a re-inforced aluminum frame enclosed by steel skins for operation in any ambient environment from -50°C to +75°C. Safety interlock switches provide protection against accidental entry by station personnel. Since maintenance requirements are minimal, the dummy load may be placed in any isolated area, such as an antenna farm. Outline and mounting dimensions of the TER-25K are shown in Figure 2.2.

### 1.1.3 Input/Output Characteristics

Several models of the TER-25K are available: a 600-ohm balanced version and 300-ohm, 50-ohm or 70-ohm unbalanced versions. The models are differentiated by an option number added to the TER-25K designation. These options, listed in Section 1.4, reflect the configuration of internal resistors used.

## 1.2 Physical Description

### 1.2.1 Equipment Mounting

The TER-25K is designed for floor mounting and is equipped with four, heavy-duty casters for mobility. Special adapters are available for exterior mounting to walls, bulkheads or poles.

### 1.2.2 Balanced RF Connections (600-ohm model)

The balanced connectors consist of two Mycroy<sup>R</sup> bowls mounted on the top of the dummy load case. Standard threaded rods with stainless steel nuts and flat washers are used to secure the feed lines. The center-tapped ground lug is positioned between the two bowls.

### 1.2.3 Unbalanced RF Connections

Several unbalanced connectors are available for the unbalanced TER units and are mounted at the top of the TER case. Although a standard 3-1/8 inch EIA flange assembly is normally provided, different choices are available depending on the installation. Refer to Section 1.4 or the TMC Connector Products Catalog for other connector assemblies.

## 1.3 Technical Specifications

**Frequency Range** DC to 30MHz

**RF Power Dissipation Rating** 50kW PEP/25kW Average. Higher ratings under limited duty cycles.

**Terminating Impedance Ratings** 600-ohm balanced, center-tapped  
Optional: 300-ohm, 50-ohm or 70-ohm unbalanced.

Other ratings are available to suit specific applications.

**RF Fittings - Unbalanced Coaxial** 3-1/8 inch EIA Flange

Optional RG85/U, QDL or LC type assemblies with others available depending on application. (See chart Section 1.4)

**RF Fittings - Balanced Bowls** Twin Mycroy<sup>R</sup> bowls on 12-inch centers.  
Center-tapped lug to ground.

**Mean-Time-Between-Failure** In excess of 100,000 hours.

### Operating Features

**Cooling** Four internal, base-mounted fans, each with 740cfm free-air delivery at 3400rpm.

**Ambient and Storage Conditions** -50°C to +75°C; Up to 100% R.H.

**Primary Power** 115/230 volts AC, 47-63Hz, single-phase, 400 watts for cooling fans. Resistive elements are passive.

#### **Size and Weight**

44W x 22D x 70H inches (111.8W x 55.9D x 177.8H cm)

Input/output terminals extend six (6) inches off top

420 pounds (190.9 kg); Shipping weight approximately 625 lbs.

Shipping cube approximately 52 cu.ft.

**Mounting** Floor-based on four (4) heavy-duty casters. Optional bulkhead or pole bracket supports.

**Monitoring Circuits** Monitor panel lights at top indicate circuit conditions. Internal take-off coil with mating connector for ease in monitoring output. Optional metering circuit for calculating VSWR at output.

### Special Features

**Safety** All access plates and doors are protected with safety interlock switches that open high voltage lines from an associated transmitter.

**Components and Construction** Solid state resistor assembly mounted internally to a reinforced aluminum frame and enclosed with protective steel skins. External hardware is stainless steel.

## 1.4 TER Product Group

TER-500	Antenna Terminator/Dummy Load, 500W Average
TER-1.8K	Antenna Terminator/Dummy Load, 1.8KW Average
TER-4K	Antenna Terminator/Dummy Load, 4KW Average
TER-5K	Antenna Terminator/Dummy Load, 5KW Average
TER-18K	Antenna Terminator/Dummy Load, 18KW Average
TER-25K	Antenna Terminator/Dummy Load, 25KW Average
TER-100K	Antenna Terminator/Dummy Load, 100KW Average
TER-300K	Antenna Terminator/Dummy Load, 300KW Average

Note: Unless options are specified, all models except the TER-100K and TER-300K are 600-ohm balanced and use twin MicroyR bowl assemblies. The TER-100K and TER-300K are 50-ohm unbalanced and are supplied with 6-1/8 inch EIA flange assemblies.

Unbalanced Operation:		50-ohm	70-ohm	300-ohm
Microy <sup>R</sup> Bowl		N/A	N/A	/30U
C connector	Note 1	/286-1	/286-3	N/A
HN connector	Note 1	/285-1	/285-3	N/A
QDS connector	Note 1	/289-1	/289-3	N/A
UHF connector	Note 1	/281-1	/281-3	N/A
1-5/8 inch EIA flange	Note 2	/272-1	/271-1	N/A
LC -type connector	Note 2	/287-1	/287-5	N/A
	Note 3	/276	/277	N/A
QDL-type connector	Note 2	/273-1	/273-3	N/A
	Note 3	/300	/301	N/A
3-1/8 to 1-5/8 adapter	Note 3	/278	/279	N/A
<b>VSWR Monitoring</b>	Notes 2,3	/M	/M	/M
	Note 1	Model TER-500 only.		
	Note 2	Models TER-500, TER-1.8K and TER-5K		
	Note 3	Models TER-18K and TER-25K		

To order, specify both model and option. Example: TER-5K/272-1.

## Section 2 - Installation

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### 2.1 Initial Inspection

#### 2.1.1 General

The TER-25K is shipped in one container and is completely assembled at the time of delivery from the factory. Every TER-25K undergoes a thorough testing prior to shipment. Upon receipt of the unit, check the 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. See Table 2.1 for a list of the 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 Electrical Installation

#### 2.2.1 General

Each unit has been factory tested and arrives ready for immediate installation and operation. Unless otherwise specified at the time of the order, TER-25K cooling fans are wired to operate from a 115VAC line voltage. If 230VAC line voltage is used, change the four 2A fan fuses to 1A fuses and make the simple wiring modifications per Figure 3.1. Fans must be on to dissipate more than 18kw. Terminal J103 is available for a safety interlock system with the transmitter. Opening either the left or right door disables the transmitter and the XFTR lamp goes out. If the power switch is in the OFF position, the transmitter is also disabled. Jack J104 is located in the vicinity of the output with mating plug P104 for monitoring output on an ammeter. This circuit is designed to develop a representative voltage across a 50-ohm impedance instrument load.

#### 2.2.2 Mounting

The TER-25K is designed to be used indoors, mainly for off-the-air tuning of high-power transmitters. It is equipped with four heavy-duty casters for ease in moving to transmitters or RF test panels. Optional mounting brackets attached to the unit cabinet are used with two angle face plates for mounting to a pole or bulkhead. Figure 2.2 illustrates the necessary outline and mounting dimensions of the TER-25K. Figure 2.1 is a schematic illustration of a typical application of the TER-25K.

#### 2.2.3 External Balanced Connections (Standard)

The two input leads are connected to the two insulator bowl terminal connectors of the TER-25K. These bowls are located on the top of the TER case.

#### 2.2.4 External Unbalanced Connections (Optional)

The coaxial lead-in cable is connected to the TER-25K RF connector assembly located on the top of the case.

## 2.3 Performance Check

### 2.3.1 General

The TER-25K is ready for use when the following connections are made:

**RF** Coaxial cable or balanced line to the antenna or the transmitter output

**POWER** Main power to a 115 or 230VAC source

**INTERLOCK** Twin-wire to the transmitter/antenna interlock circuits.

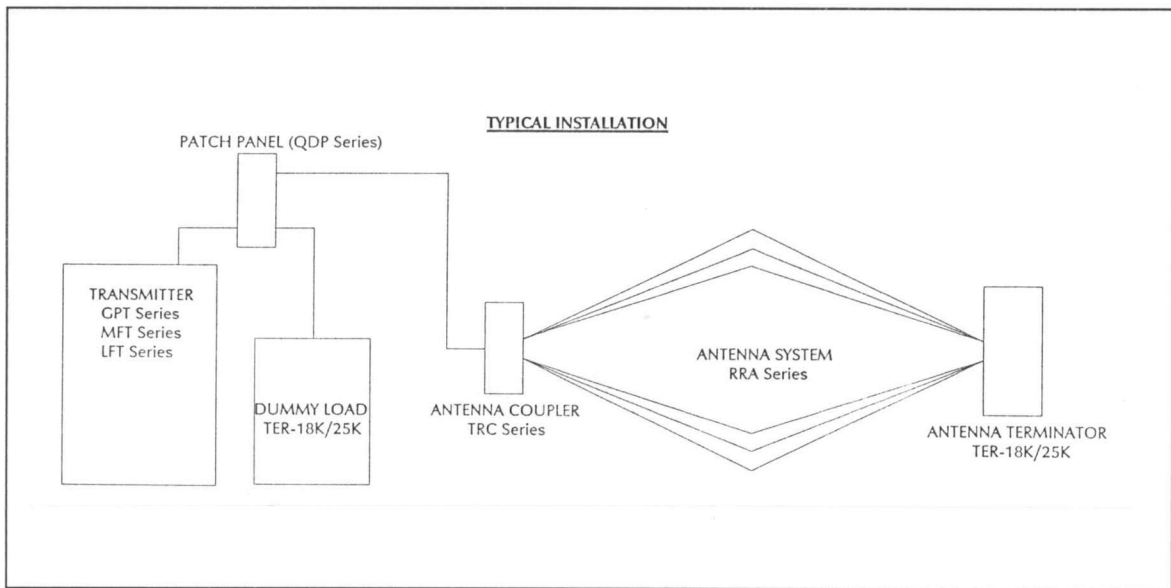


Figure 2.1 Schematic Diagram, Typical TER-25K Application

Table 2.1 Loose Items Supplied

TMC Part Number	Description	Quantity
PM727-1	3-1/8 inch Adapter Ring	1 each
CA645-1-10	Power Cable	1 each
210312-25K	Technical Manual	1 each
PL149	Monitor Connector	1 each
MS3106B-14S-2S	Connector, Remote	1 each

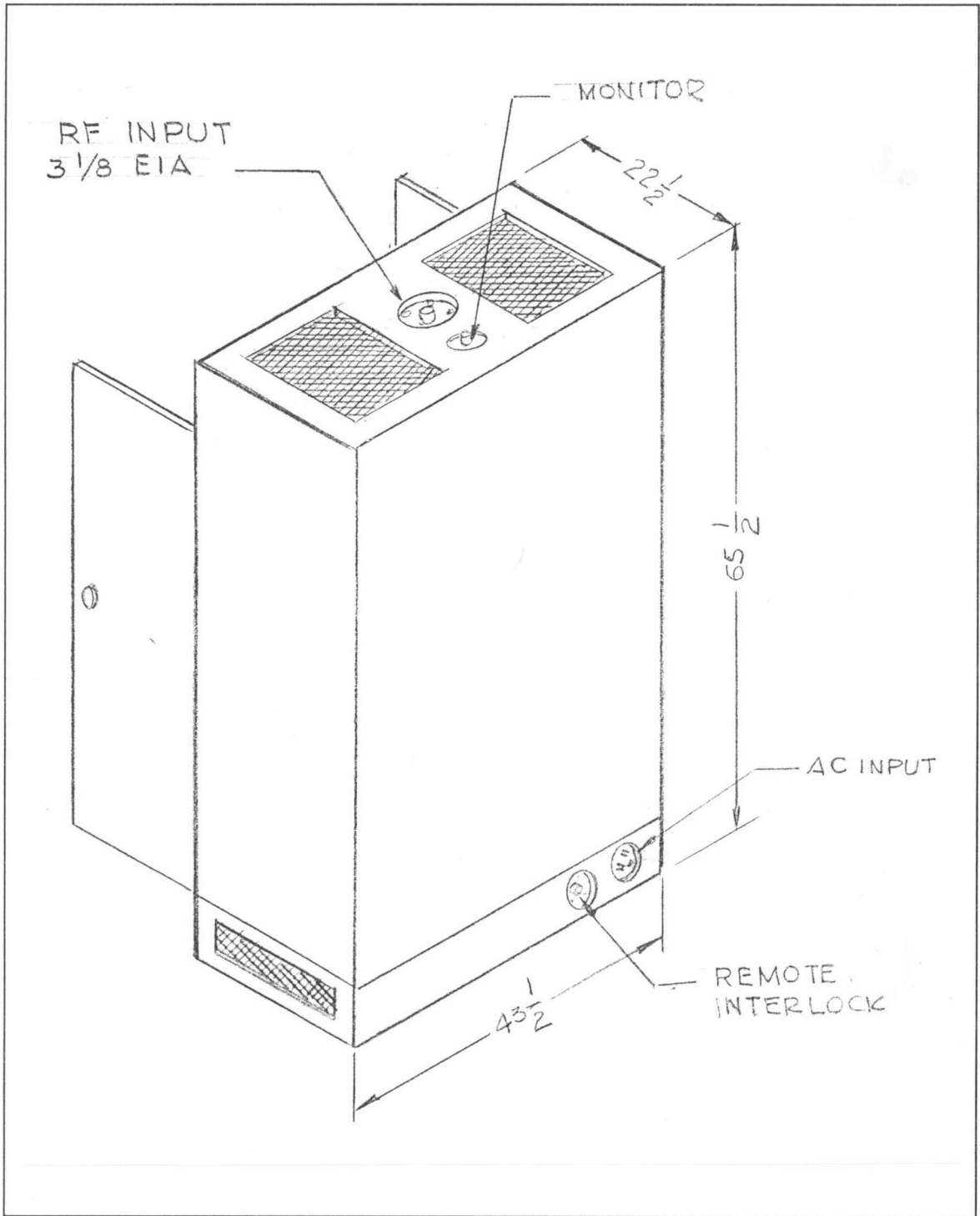


Figure 2.2 Outline Drawing with Mounting Dimensions

## Section 3 - Operation

### 3.1 General

After connecting the balanced or coaxial RF leads, the power line cord and the interlock lines, as described in **Section 2 - Installation**, the TER-25K is fully operational without further adjustment.

### 3.2 Indicator Circuits

Lights on the front monitor panel at the top of the cabinet indicate circuit conditions as described in Table 3.1. Optionally, a wattmeter can be added with switches which allow measurement of forward and reflected power; both power measurements are used to calculate VSWR.

### 3.3 Operating Conditions

Both the left and right front doors must be closed and the AC switch in the on (UP) position before the TER-25K operates properly. In the UP (on) position, the AC switch supplies line voltage to the four cooling fans and enables the transmitter. As a safety feature, opening either door disables the transmitter although the blowers remain on. With the doors closed, setting the AC switch to the OFF position, disables the transmitter and turns the fans off.

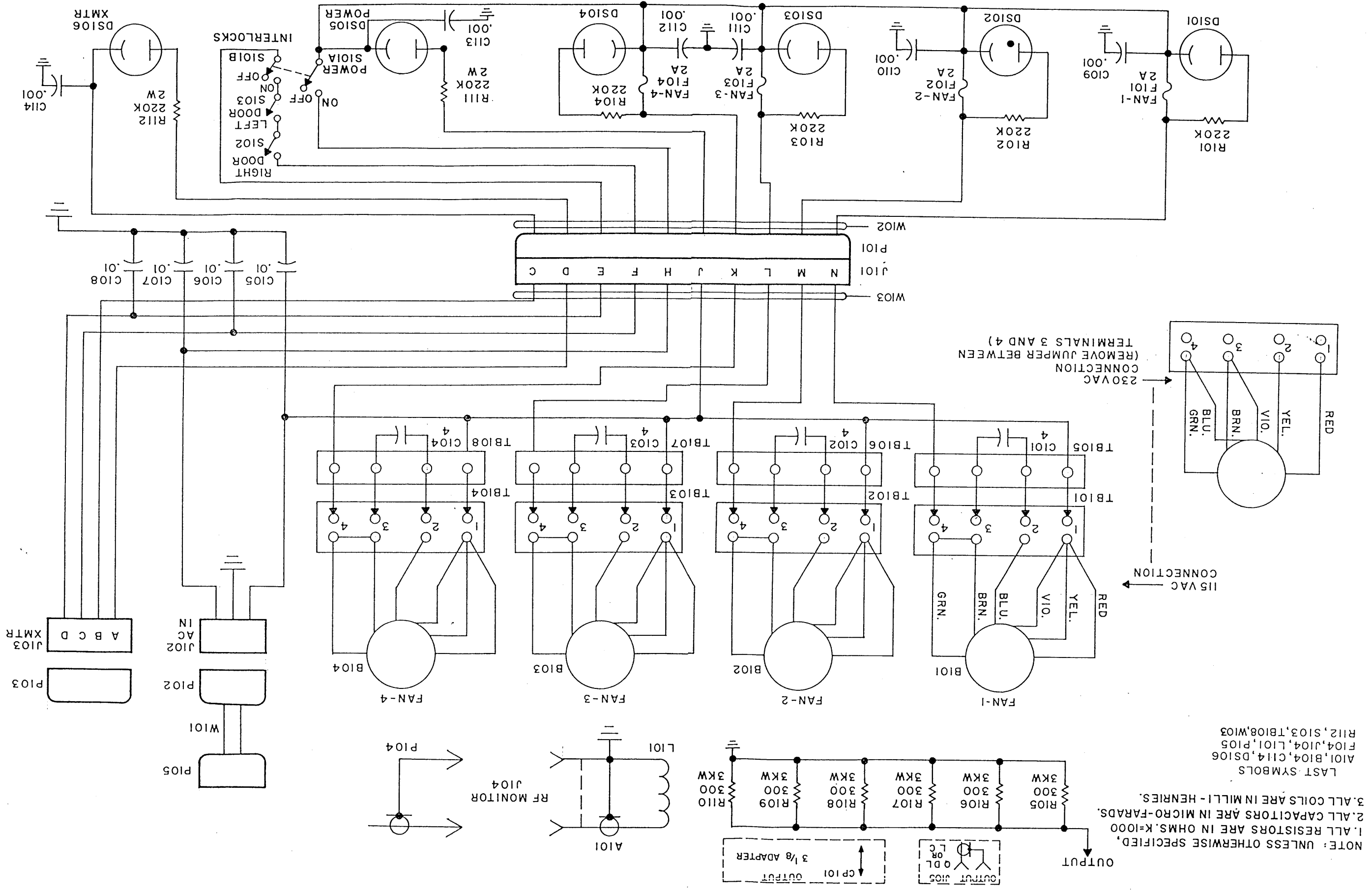
### 3.4 Theory

J103 is part of the interlock circuit designed to interrupt power in the transmitter when doors of the TER-25K are opened. Power present in the TER-25K is indicated by DS105 while transmitter operation is indicated by DS106. Each fan has a protective fuse with neon bulb to indicate a blown fuse. In certain models, an optional wattmeter (M101) samples RF output through directional coupler (DC101). This meter works together with S104 to indicate forward and reflected power. Jack J104 and plug P104 are included for output monitoring purposes. J104 has an internal coil mounted to it in the vicinity of the output. A current is induced in the coil and a voltage representative of the input/output is developed when a 50-ohm low-impedance measuring device is connected via plug P104.

**Table 3.1 Indicator Lights**

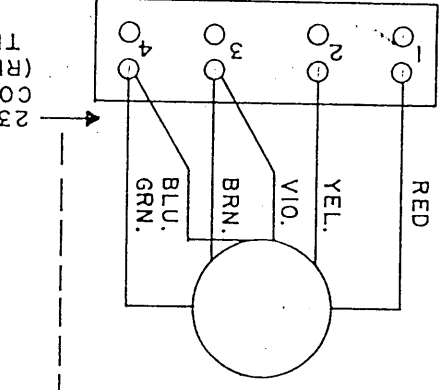
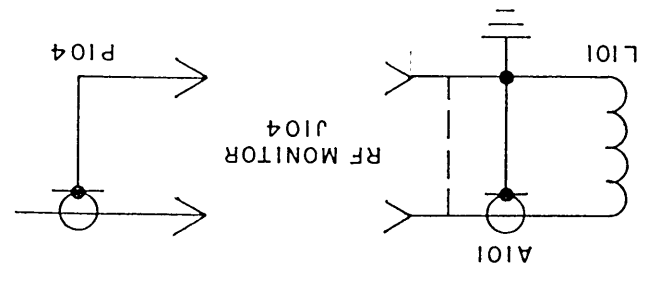
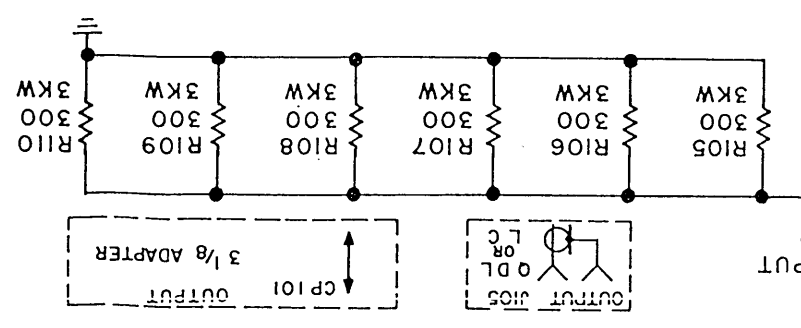
Panel Marking	Symbol	Function
FAN-1	DS101	ON: Fan #1 fuse is blown; fan is off
FAN-2	DS102	ON: Fan #2 fuse is blown; fan is off
POWER	DS105	AC power is supplied to fans
XMTR	DS106	Transmitter is in operation
FAN-3	DS103	ON: Fan #3 fuse is blown; fan is off
FAN-4	DS104	ON: Fan #4 fuse is blown; fan is off

Figure 3.1 Overall Schematic Diagram



NOTE: UNLESS OTHERWISE SPECIFIED,  
 1. ALL RESISTORS ARE IN OHMS. K=1000  
 2. ALL CAPACITORS ARE IN MICRO-FARADS.  
 3. ALL COILS ARE IN MILLI-HENRIES.

LAST SYMBOLS  
 A101, B104, C114, DS106  
 F104, J104, L101, P105  
 R112, S103, TB108, W103



115 VAC CONNECTION

230 VAC CONNECTION  
 (REMOVE JUMPER BETWEEN  
 TERMINALS 3 AND 4)



## Section 4 - Maintenance

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### 4.1 General

Due to the simplicity of construction and design of the TER-25K, maintenance may simply consist of looking for secure connections and unit cleanliness.

### 4.2 Preventive Maintenance

#### 4.2.1 General Cleaning Methods

Preventive maintenance for the TER consists of routine functions such as visual inspection and cleaning. Periodic cleaning is recommended as dust may build up on components, reducing the efficiency of the unit and possibly causing circuit failure. To facilitate cleaning the unit, use a vacuum cleaner or a low-pressure filtered compressed-air supply.

#### 4.2.2 Visual Check

A simple visual check of the unit when it is opened up for servicing or cleaning will often reveal potential trouble spots and thereby reduce downtime due to component failure. Signs of trouble may be found in discoloration, warped printed circuit boards and damaged wiring or cables. Any deteriorating component should be replaced immediately. All hardware should be checked for tightness during preventive maintenance inspections.

#### 4.2.3 Filters, Interlocks and Fans

The TER-25K contains four oil-coated filters. The filters should be removed and cleaned at set time intervals depending on environmental conditions at the equipment location. To clean the filters, wash them in a solvent that will cut the oil. Dry and re-coat the filters with oil (SAE Type 30W).

Incorporated in each fan circuit is a 2.0A protective fuse with a neon bulb to indicate the location of a blown fuse. In the event that a fuse should blow, replace it with one that has the same ampere rating.

A periodic check of interlock switches should be made to insure personnel safety. The interlock switches are wired in series so opening either the right or left hand door on the TER-25K will disable the transmitter even though the power switch is in the ON position.

The TER-25K is air cooled by four fans. In the event that a fan breaks down, replace it. When ordering a new fan, refer to the parts list for the appropriate part number. When installing the fan, make sure it is wired properly: 115 or 230VAC operation, depending on the primary input voltage rating.

## 4.3 Troubleshooting

### 4.3.1 General Failure Symptoms

During operation of the TER, the following failure symptoms may be observed:

#### High VSWR at the transmitter

Possible Cause: Transmitter failure (Output affected)

Remedial Action: Refer to transmitter or transceiver manual

Possible Cause: Interconnection, dummy load to transmitter

Remedial Action: Check the RF coaxial cable between the transmitter and load.

Possible Cause: Interconnection, antenna termination

Remedial Action: Check the twin RF leads between the load and the antenna.

Possible Cause: Antenna fault

Remedial Action: Check for a fault in the antenna system. Make certain all of the RF connections are securely fastened.

#### Transmitter fails to operate

Possible Cause: The door interlock switches are not closed.

Remedial Action: Reseat the door after checking interlock switches on frame.

#### Fan fails to operate

Possible Cause: Associated fuse is blown (Neon lamp is on)

Remedial Action: Replace fuse with same rating

Possible Cause: Fan motor circuit is open

Remedial Action: Check all circuit connections. If good, motor winding may be burned out requiring replacement of motor. Make DC continuity check of motor winding (should be 0-5 ohms) and make certain main shaft spins freely when no power is applied.

## 4.4 Repair

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

- Make sure the replacement component is an exact duplicate of the defective one.
- Place any new component in the same location as the component it replaces.

## Section 5 - Parts Lists

Reference designations have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (normally adjacent to the part identified) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (family), e.g. resistor, capacitor, transistor, etc. The number differentiates between parts of the same family or generic group. A socket associated with a particular plug-in device, such as a fuse, is identified by a reference designation which includes the designation of the plug-in device, e.g. XF101 for the socket which receives fuse F101. Major part assemblies are listed in their entirety. Sub-parts are listed in alphanumeric order with reference to their major assemblies.

**Table 5.1 Replacement Spare Parts List**

Symbol	Part Number	Description
A101	AJ100	Probe assembly
B101,B102,B103,B104	BL108	Axial blower, 3400rpm
C101,C102,C103,C104	CP41B1FF405K	Fixed capacitor, 4uf/600wvdc
C105,C106,C107,C108	CM35B103K	Fixed capacitor, .01uf/500wvdc
C109,C110,C111,C112	CM20B102K	Fixed capacitor, .001uf/500wvdc
C113,C114	CM20B102K	Fixed capacitor, .001uf/500wvdc
DS101,DS102,DS103,DS104	FH104-3	Lamp assembly
DS105,DS106	BI100-51	Neon lamp
F101,F102,F103,F104	FU102-2	Cartridge fuse, 2A/slo-blow
J101	JJ242-4S	Connector receptacle
J102	PL133-NG	Connector receptacle
J103	MS3102A-14S-2P	Connector receptacle
P101	PL255-4P	Connector plug
P102	PL134-NG	Connector plug
P103	MS3106B14S-2S	Connector plug
P104	PL149	Connector plug
P105	PL135-NG	Connector plug
R105,R106,R107	RR142-8-300	Fixed resistor, 300-ohm/3kW
R108,R109,R110	RR142-8-300	Fixed resistor, 300-ohm/3kW
R111,R112	RC42GF224K	Fixed resistor, 220k/2W
S101A,S101B	ST103-25-73	Toggle switch, DPDT, 6A @ 125V
S102,S103	SW230	Micro switch, SPDT, 15A @120V
W101	CA645-1	Power cable assembly
W102	CA643	Cable harness assembly
W103	CA644	Base cable harness assembly
XDS105,XDS106	TS106-1	Neon lamp socket
XF101,XF102,XF103,XF104	FH104-3	Fuse holder assembly

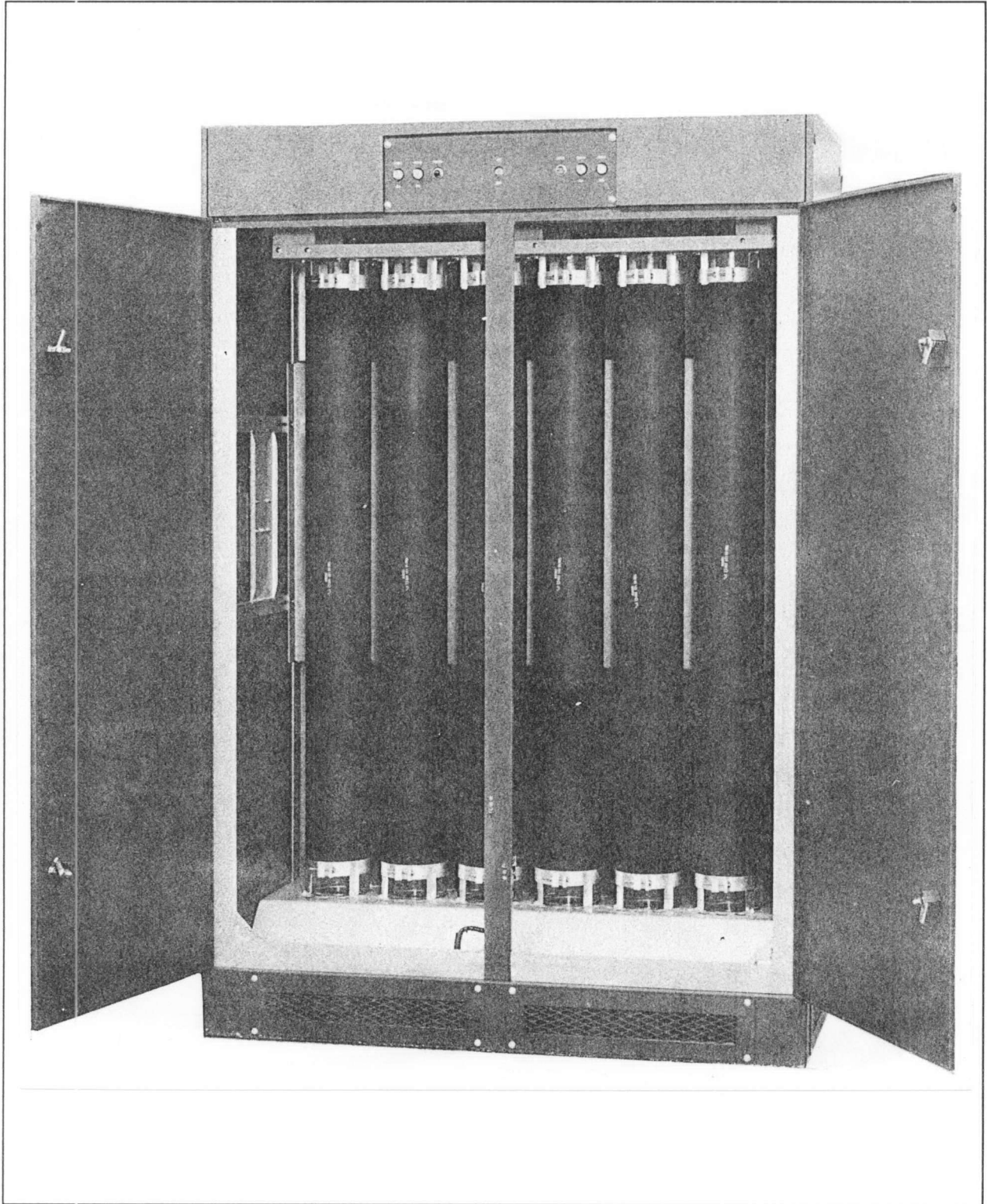


Figure 5.1 Interior View, Model TER-25K