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**TECHNICAL MANUAL**

for

**Transmitting Antenna Coupler**

**Model TRC-3.5K**

**(TRC-3500)**

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



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**THE TECHNICAL MATERIEL CORPORATION**  
COMMUNICATIONS ENGINEERS

**PLEASE READ THIS FIRST**

Dear **TMC** product user:

Thank you for purchasing the TMC Model TRC-3.5K Transmitting Antenna Coupler. This model is one of a series of five different types that provide balanced-to-unbalanced coupling of transmitters or transceivers to antenna systems. The complete series operate in the 2 to 30MHz frequency range at power ratings from 500 watts to 50,000 watts.

The antenna coupler, or BALUN as it is frequently called, is described in detail in the enclosed technical manual. This publication provides important information about using TMC equipment. Please read it.

If you need additional data or some specific technical information, please give our Customer Service a call at (914) 698-4800 or return the business reply form provided in this package. Our FAX (facsimile) number is (914) 698-4805.

If you are missing any items, please contact TMC directly or through your local TMC sales office.

Thank you for selecting the TMC Model TRC-3.5K antenna coupler.

**The Technical Materiel Corporation**  
Product Marketing

## 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:

**THE TECHNICAL MATERIEL CORPORATION**

700 Fenimore Road

Mamaroneck, New York 10543 U.S.A.

Telephone 914-698-4800 \* Facsimile (FAX) 914-698-4805

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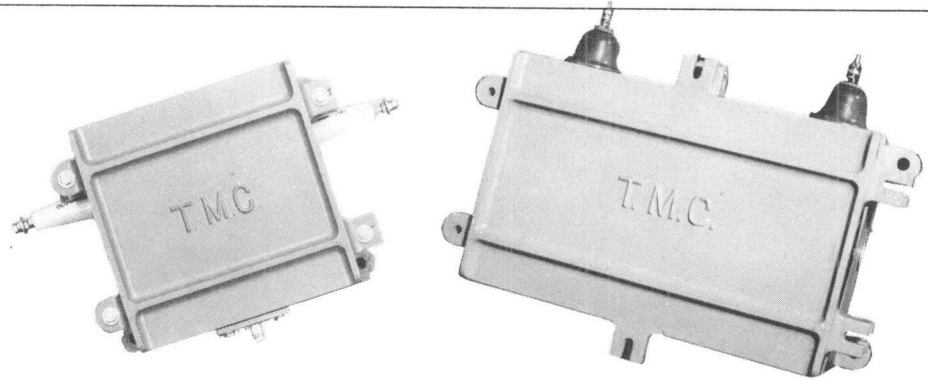
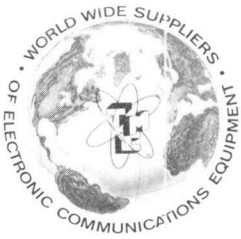
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<b>Overleaf</b>	<b>Photographic prints of TRC-500 and TRC-3.5K couplers</b>
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**Model TRC-500 Antenna Coupler**

500 watts PEP/250 watts Average  
Frequency Range 2-30 MHz  
50 or 70-ohm/600-ohm BALUN  
Unbalanced-to-Balanced Coupling

**Model TRC-3.5K Antenna Coupler**

3600 watts PEP/1800 watts Average  
Frequency Range 2-30MHz  
50 or 70-ohm/600 BALUN  
Unbalanced-to-Balanced Coupling



# Section 1 - General Description

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## 1.1 Functional Description

### 1.1.1 Overview

The TRC-3.5K HF Transmitting Antenna Coupler is a broadband transformer coupling unit used for matching coaxial transmission lines to rhombic or other antenna systems requiring a 600-ohm impedance. Use of the TRC-3.5K at a transmitting facility will allow uniform coaxial transmission and coaxial antenna transfer by providing the proper impedance match at the transmitting antenna. The TRC-3.5K provides an efficient means of coupling to match RF impedances at power levels of 1,800 watts average or 3,600 watts PEP over the frequency range of 2 to 30MHz. It provides an insertion loss less than 1dB over this range.

### 1.1.2 Major Assemblies

The TRC coupler consists of one broadband transformer housed in a cast aluminum alloy case for operation in any ambient environment from -50°C to +75°C. Brackets can be provided for either pole or wall mounting. Since no maintenance is required, the coupler may be placed in any isolated area, such as an antenna farm. Outline and mounting dimensions of the TRC-3.5K are shown in Figure 2.2.

### 1.1.3 Input/Output Characteristics

Two basic models of the TRC-3.5K are available: a 50-ohm version used to match a 50-ohm unbalanced impedance to a 600-ohm balanced impedance and a 70-ohm version used to match a 70-ohm unbalanced impedance to a 600-ohm balanced impedance. The models are differentiated by option numbers added to the TRC-3.5K designation. These options, listed in Section 1.4, reflect the type of unbalanced connector assembly used.

## 1.2 Physical Description

### 1.2.1 Equipment Mounting

The TRC-3.5K is designed for either pole or wall mounting. The necessary lag bolts are provided for either type mounting.

### 1.2.2 Balanced RF Connections

The balanced connectors consist of two Mycroy<sup>R</sup> bowls mounted through the top surface of the coupler case. Standard threaded rods with stainless steel nuts and flat washers are used to secure the antenna feed lines.

### 1.2.3 Unbalanced RF Connections

Several unbalanced connectors are available for the TRC units and are mounted at the bottom of the TRC case. Although a standard 1-5/8 inch EIA flange assembly is normally provided, different choices are available depending on the antenna installation. Refer to Section 1.4 or the TMC Connector Products Catalog for other connector assemblies.

## 1.3 Technical Specifications

**Frequency Range** 2 - 30 MHz

**Insertion Loss** Less than 1dB over operating range

**RF Power Rating** 3.6KW PEP/1.8KW Average

**Impedance Matching Capability** 50 ohms unbalanced to 600 ohms balanced.

Optional: 70 ohms unbalanced to 600 ohms balanced.

**RF Fittings - Unbalanced Coaxial** 1-5/8 inch EIA Flange standard

Optional RG85/U, QDL, LC, others. (See chart Section 1.4)

**RF Fittings - Balanced Bowls** Twin Mycroy<sup>R</sup> bowls on 12-inch centers.

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

### Operating Features

**Cooling** Convection, no fans or moving parts

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

**Primary Power** Passive device. No external power is required.

**Size and Weight** 16.5W x 5.5D x 12H inches, 30lbs

41.9W x 14.0D x 30.5H cm, 13.6Kg. Shipping cube/weight 2.3 cu.ft./36 lbs.

### Special Features

**Components and Construction** Totally solid state transformer assembly, mounted internally to a cast aluminum alloy case that is sealed for protection against the environment. External hardware is stainless steel.

## 1.4 TRC Product Group

<b>TRC-500</b>	<b>HF Transmitting Antenna Coupler, 500W</b>
<b>TRC-3.5K</b>	<b>HF Transmitting Antenna Coupler, 3.5KW</b>
<b>TRC-5K</b>	<b>HF Transmitting Antenna Coupler, 5KW</b>
<b>TRC-10K</b>	<b>HF Transmitting Antenna Coupler, 10KW</b>
<b>TRC-20K</b>	<b>HF Transmitting Antenna Coupler, 20KW</b>

### Unbalanced Connector Assembly Options:

	<b>Operation:</b>	<b>50-ohm</b>	<b>70-ohm</b>	
• BN connector	(Note 1)	/283-1	/283-3	
• BNC connector	(Note 1)	/284-1	/284-3	
• C connector	(Note 1)	/286-1	/286-3	
• HN connector	(Note 1)	/285-1	/285-3	
• N connector	(Note 1)	/259-1	/259-3	
• QDS connector	(Note 1)	/289-1	/289-3	
• 1-5/8 inch EIA flange	(Note 2)	/272-1	/271-1	
• LC -type connector	(Note 3)	/287-1	/287-5	
• QDL-type connector	(Note 3)	/273-1	/273-3	
• 3-1/8 inch EIA flange	(Note 4)	/501	/701	
• 3-1/8 to 1-5/8 adapter	(Note 4)	/278	/279	
• RG85/U mounting flange	(Note 5)	/274-1	/274-3	
• No connector assembly		/500	/700	

Note 1 Model TRC-500 only.

Note 2 Models TRC-3.5K and TRC-5K

Note 3 Models TRC-500, TRC-3.5K and TRC-5K

Note 4 Model TRC-20K only.

Note 5 Model TRC-5K only.

<b>To order, specify both model and option. Example: TRC-3.5K/272-1.</b>
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## Section 2 - Installation

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### 2.1 Initial Inspection

#### 2.1.1 General

The TRC-3.5K is shipped in one container and is completely assembled at the time of delivery from the factory. Every TRC-3.5K 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. No preliminary adjustments are necessary.

#### 2.2.2 Mounting

The TRC-3.5K is designed for either pole or wall mounting. For pole mounting, two mounting straps are needed. For wall mounting, four mounting brackets attached to the unit case are required. Figure 2.2 illustrates the necessary outline and mounting dimensions of the TRC-3.5K. Figure 2.1 is a schematic illustration of a typical rhombic antenna system in conjunction with the TRC-3.5K.

#### 2.2.3 External Antenna Connections

The two antenna input leads are connected to the two insulator bowl terminal connectors of the TRC-3.5K. These bowls are located on the top surface of the case.

#### 2.2.4 External Coaxial Connections

The coaxial lead-in cable is connected to the TRC-3.5K RF connector assembly located on the bottom of the case.

### 2.3 Performance Check

#### 2.3.1 General

When the appropriate RF connections to the antenna and the coaxial lead-in cable have been made, the TRC-3.5K is ready for use. No further steps are required.

**Table 2.1 - Loose Items Supplied**

TMC Part Number	Description	Quantity
SCHH3118SS20	Machine Bolt	4 each
NTH3118SS16	Hexagonal Nut	4 each
FW31HSS	Flat Washer	8 each
LWS31MSS	Split Lock Washer	4 each

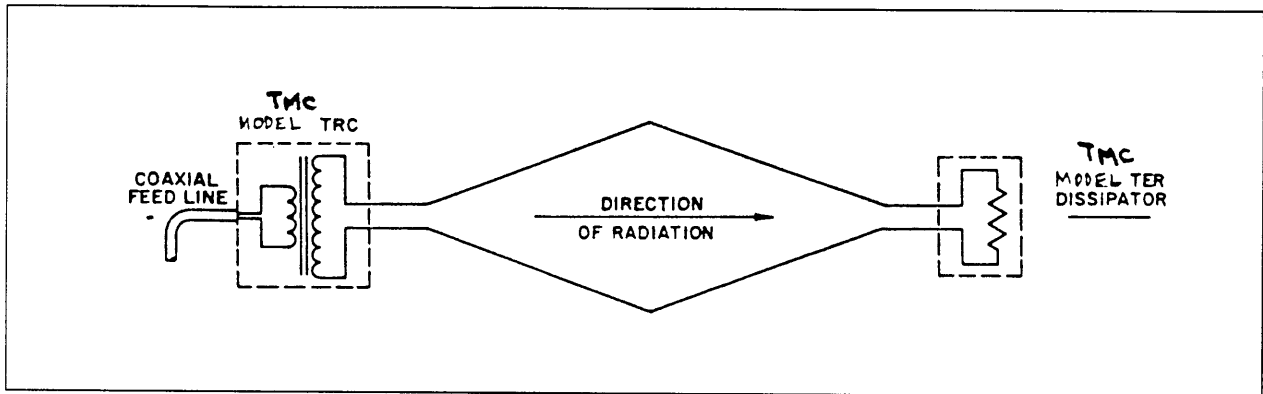


Figure 2.1 Schematic Diagram, Typical Rhombic Antenna System

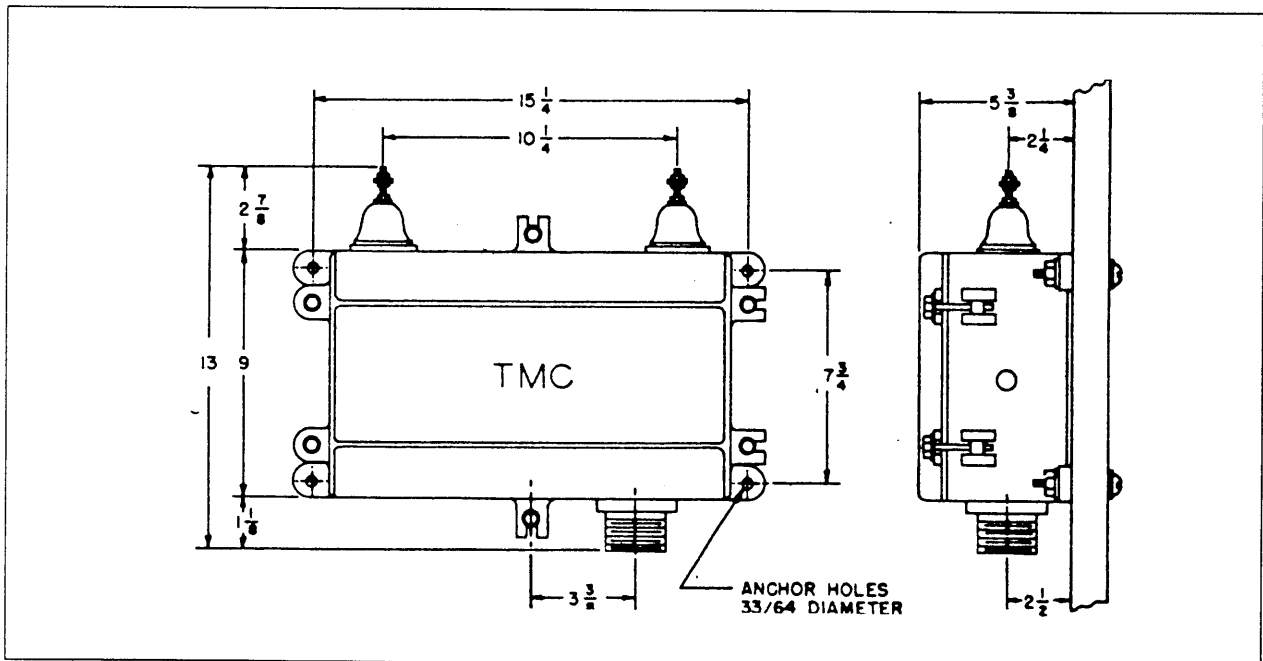


Figure 2.2 Outline Drawing with Mounting Dimensions

# Section 3 - Operation

## 3.1 General

After connecting the antenna leads and coaxial lead-in cable, as described in **Section 2 - Installation**, no further operating procedures are required. The TRC-3.5K is now fully operational without further adjustment.

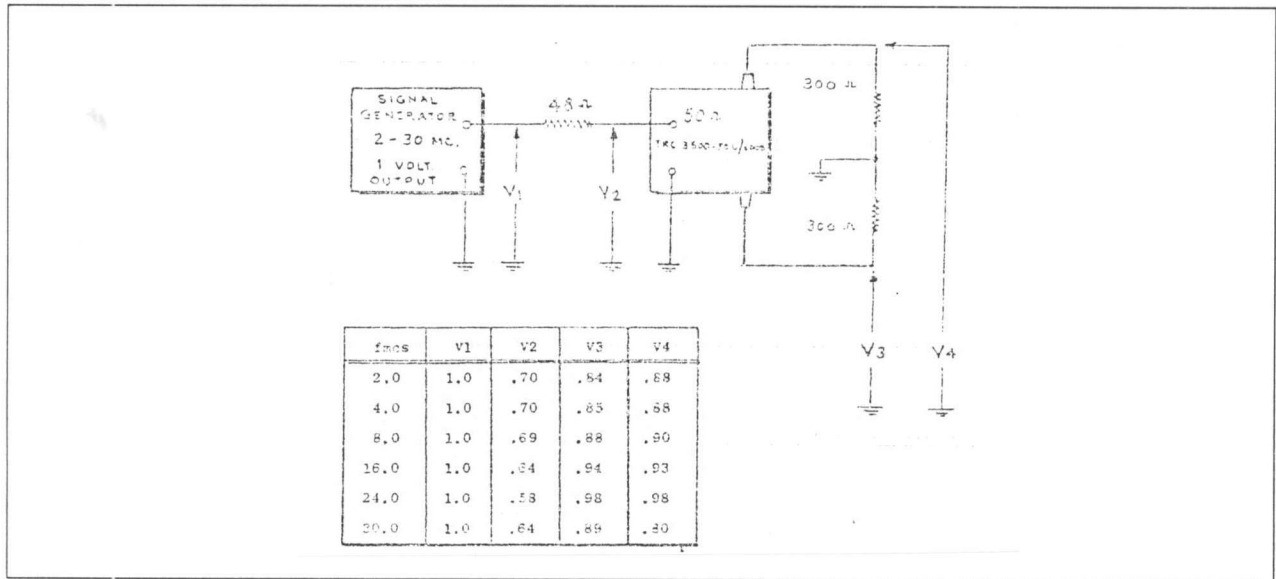


Figure 3.1 Frequency Response Test Setup (50-ohm)

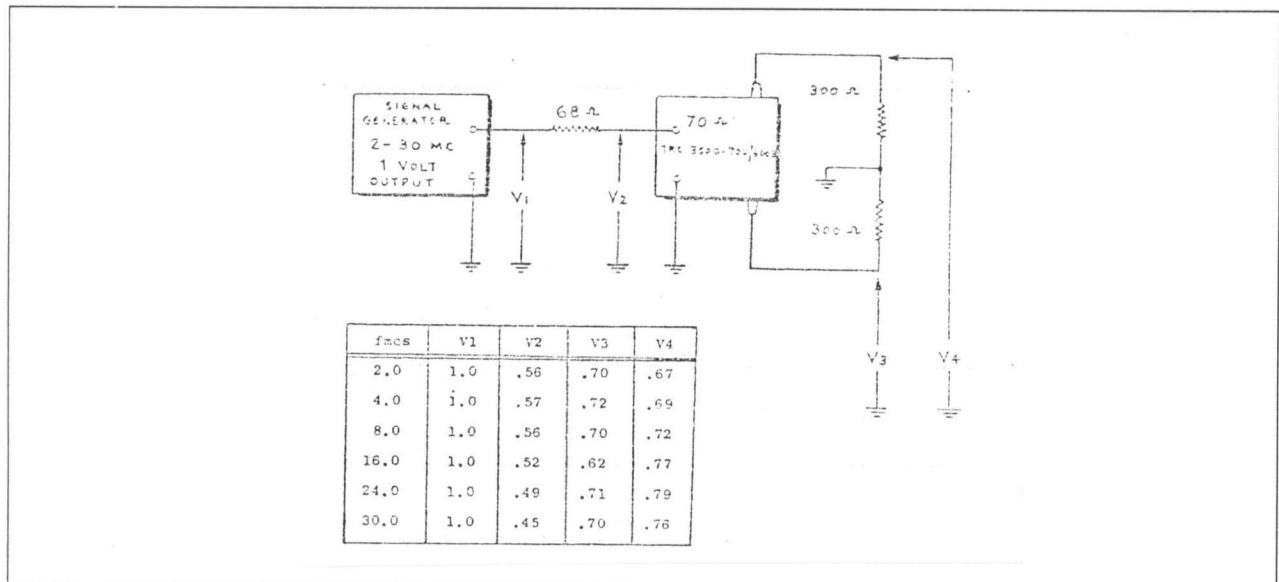


Figure 3.2 Frequency Response Test Setup (70-ohm)

## Section 4 - Maintenance

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### 4.1 General

Due to the simplicity of construction and design of the TRC-3.5K, 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 TRC 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 coupler 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.

### 4.3 Troubleshooting

During operation of the TRC, the following failure symptom may be observed:

- No signal output or weak signal to the antenna system.

Possible Cause: Transmitter failure (Output affected)  
Remedial Action: Refer to transmitter or transceiver manual

Possible Cause: Interconnection, coupler to transmitter  
Remedial Action: Check the RF coaxial cable between the transmitter and coupler.

Possible Cause: Interconnection, coupler to antenna  
Remedial Action: Check the twin RF leads between the coupler 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.

## 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.

**The TRC-3.5K is unique in that only one electrical assembly is used. Other than external components such as the hardware, repair is rarely needed. In the event the internal transformer fails - a direct lightning hit would do it - the case may be opened and the entire assembly replaced. Factory repair of the TRC-3.5K is also available directly from TMC.**

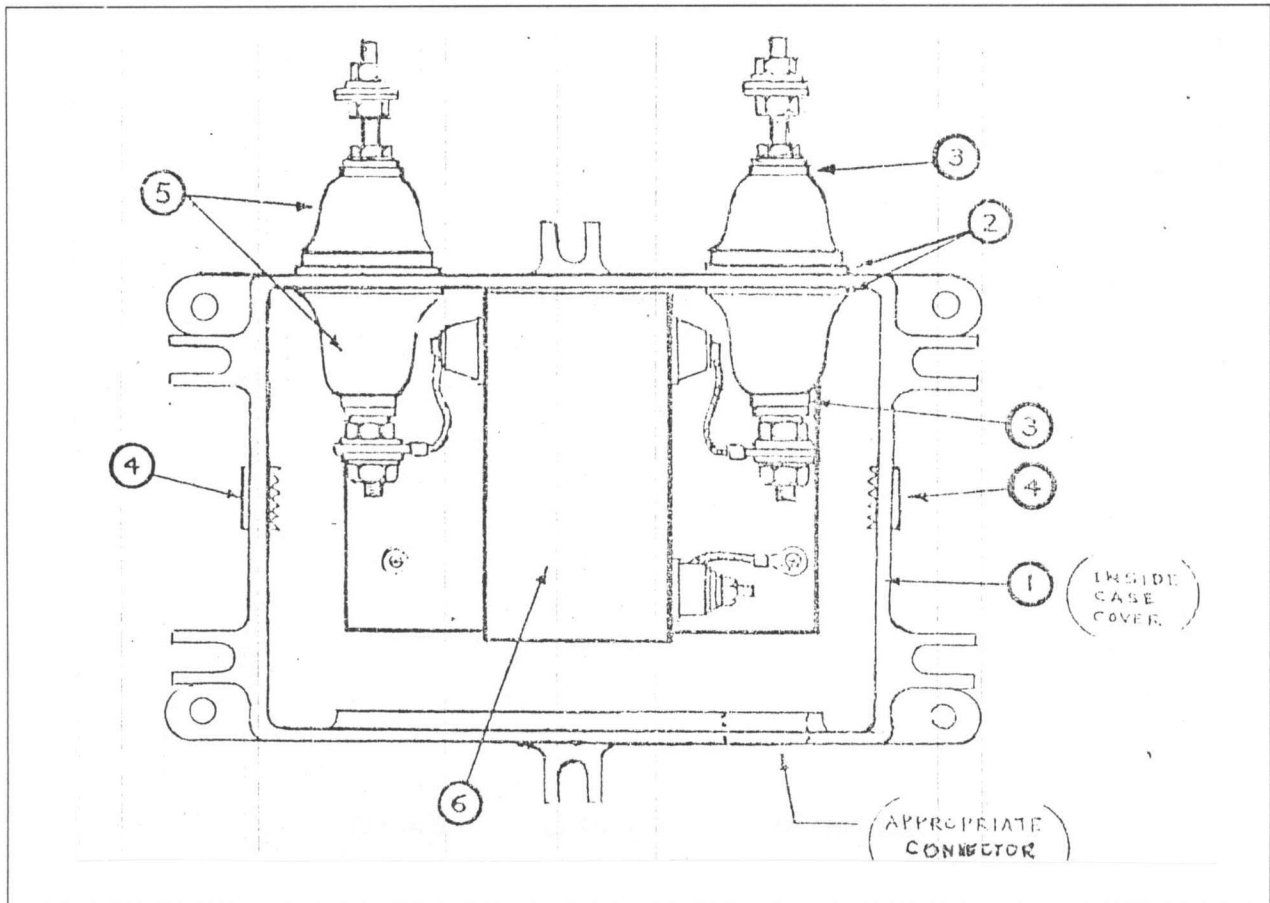


## Section 5 - Parts Lists

**Table 5.1 Replacement Spare Parts List**

(Refer to Figure 5.1 for CALL-OUT of parts by item number.)

Item	TMC Part Number	Description	Quantity
1	GA107	Gasket, flange, neoprene	1 each
2	GA126	Gasket, flange, neoprene	4 each
3	RY112	Gland, neoprene	4 each
4	HB103	Plug, screened button	2 each
5	NS115	Insulator, bowl type	4 each
6	TR149 (70-ohm)	Transformer, broadband RF	1 each
	TR153 (50-ohm)	Transformer, broadband RF	1 each



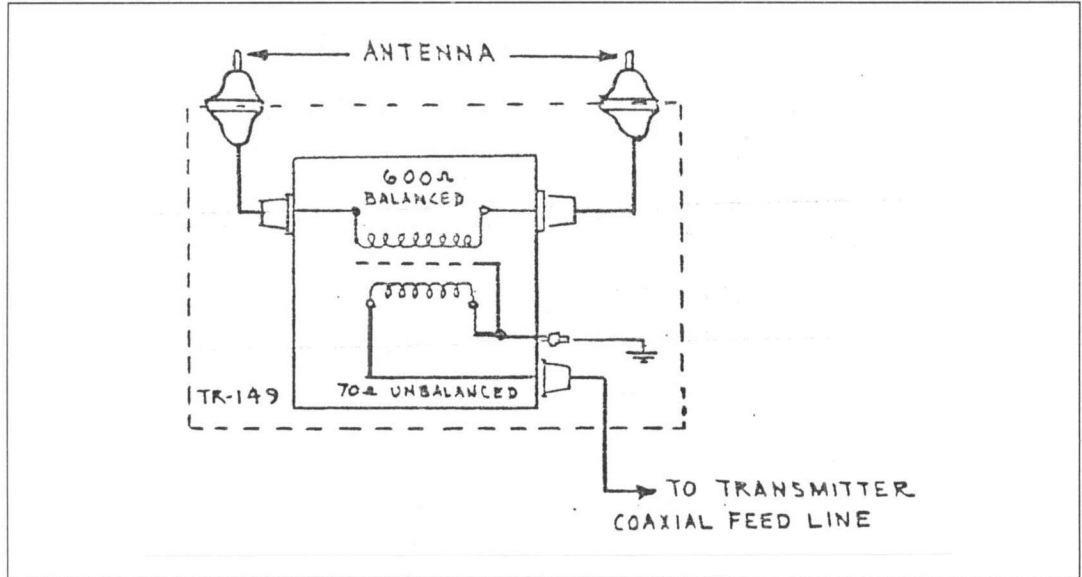


Figure 5.2 Schematic Diagram, Model TRC-3.5K