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UNCLASSIFIED

TECHNICAL MANUAL

for

ANTENNA TUNER

MODEL TTC-1



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N. Y.

OTTAWA, CANADA

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IN- 0136

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THE TECHNICAL MATERIEL CORPORATION

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700 FENIMORE ROAD

MAMARONECK, N. Y.

W a r r a n t y

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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.
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*Electron tubes also include semi-conductor devices.

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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



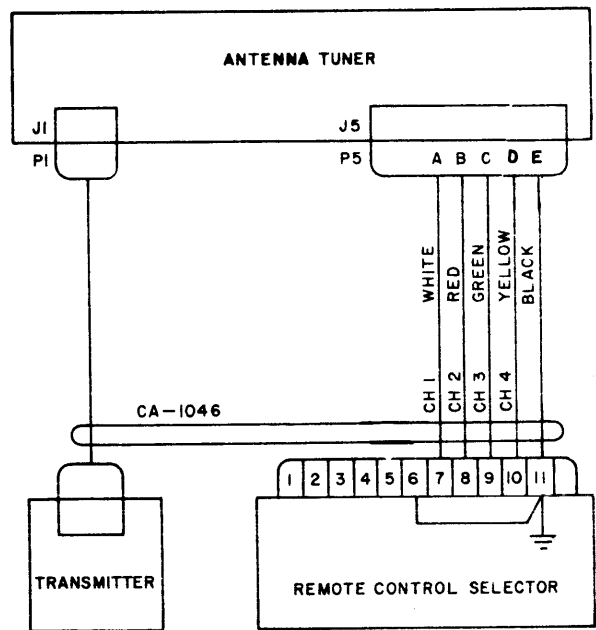
INSTRUCTION BOOK CHANGE NOTICE

Date 1/11/66

Manual affected: Antenna Tuner, Model TTC-1 IN -136

(Issue Date: 30 August 1965)

Change figure 7-1 to comply with figure 1 of this change notice.



0136-10

Figure 1.

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.

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INTRODUCTION

This manual presents all information necessary to understand, operate, and maintain the Antenna Tuner, Model TTC-1.

Wherever practicable abbreviations and symbols are in accordance with MIL-STD-12 and MIL-STD-15, respectively.

NOTES

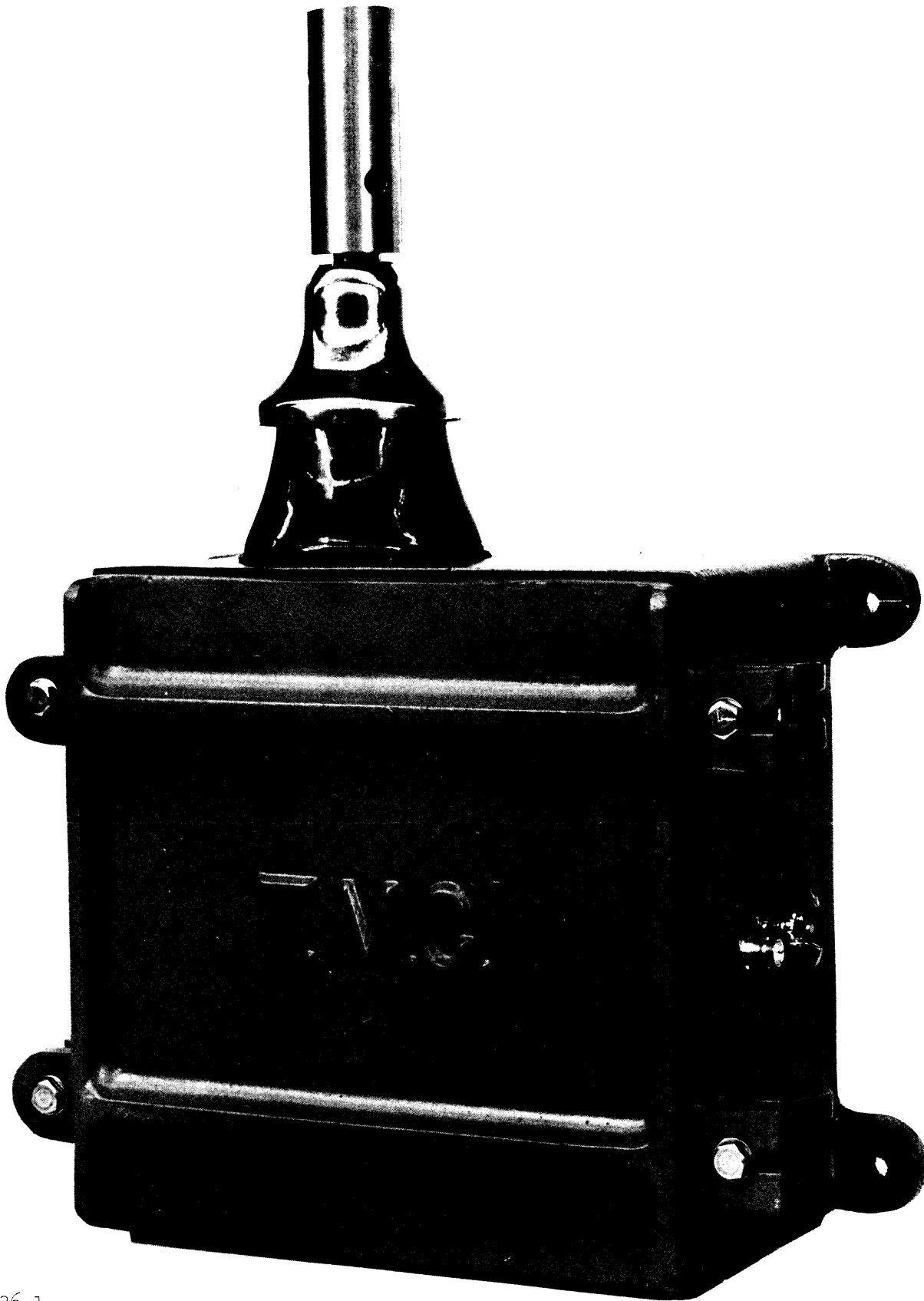
Notes used in this manual, contain conditions that should be highlighted.

CAUTION

Cautions used in this manual, contain conditions which if not strictly observed, will result in equipment damage or destruction.

WARNING

Warnings used in this manual, contain conditions which if not strictly observed, will result in personnel injury or loss of life.



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0136-1

Figure 1-1. Antenna Tuner, Model TTC-1

SECTION 1 GENERAL INFORMATION

1-1. PURPOSE AND DESCRIPTION.

The Antenna Tuner, Model TTC-1 (commonly called the antenna tuner or TTC), figure 1-1, is a fixed-four-channel manually or remotely controlled impedance matching device. It matches the 50-ohm output of any 100-watt PEP (peak envelope power) transmitter to an 8-, 18-, or 35-foot vertical whip antenna, using a 50-ohm transmission line.

Initially, the TTC is set up so that it inserts the necessary inductance or capacitance to resonate the antenna to any four transmitter frequencies or channels, in the 2- to 32-megacycle range.

For manual control, the operator sets a switch on the TTC to the position that corresponds to one of the four preset transmitter frequencies. If the transmitter frequency is switched to one of the other three frequencies, the TTC switch must be correspondingly positioned.

For remote control, the TTC is dependent upon d-c control voltages applied by a fixed-four-channel remote control selector (see figure 1-2). The application of a d-c control voltage, corresponding to one of the four preset transmitter frequencies, automatically positions the TTC switch. If the transmitter frequency is switched, the TTC switch must be correspondingly positioned by the remote control selector.

The antenna tuner is housed in a weatherproof metal container that has a removable side. A sleeve, located on top of the antenna tuner, accommodates the antenna; holes in the sleeve permit the antenna to be bolted securely in place. The antenna tuners case has mounting flanges, and holes on the back and bottom. These mounting provisions, in addition to the mounting plate and brackets provided, permit the case to be mounted either on a roof, wall, or pole.

1-2. LEADING PARTICULARS.

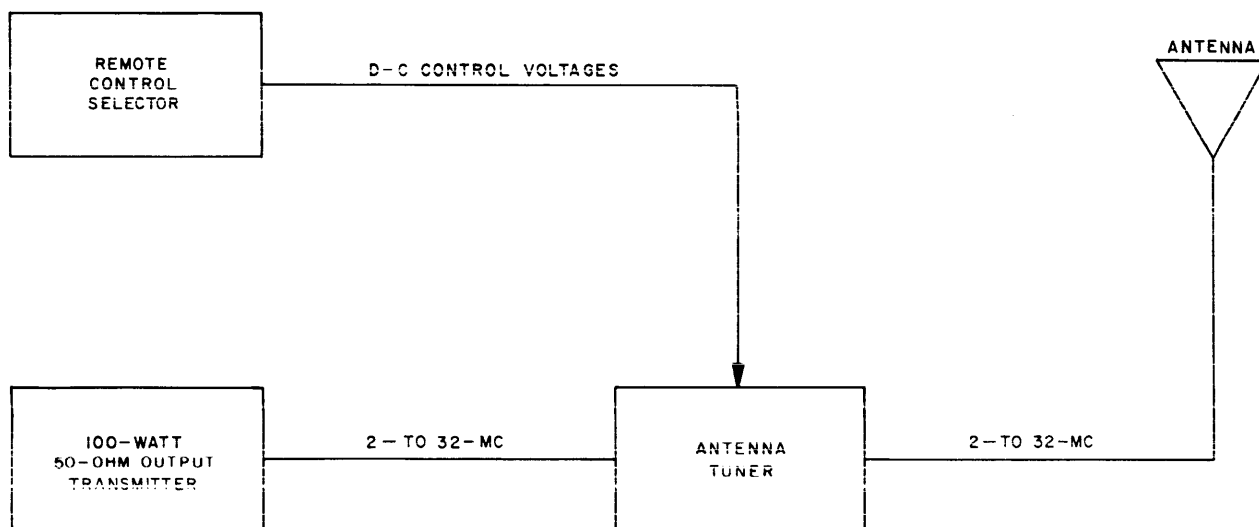
Table 1-1 lists logistic type of leading particulars of the antenna tuner. Characteristics listed cover nomenclature, input power, overall dimensions, and uncrated weight. Some of the data represents nominal values.

1-3. CAPABILITIES AND LIMITATIONS.

Table 1-2 lists operational capabilities and limitations of the antenna tuner. Data listed covers specific functional and environmental characteristics.

1-4. EQUIPMENT SUPPLIED.

Table 1-3 lists all major equipment supplied by quantity, TMC part number, and reference symbol. Also a brief function of each item is provided. Sub-assemblies of assemblies listed are not called-out; identification of subassemblies can be obtained by referring to Section 7. Spare parts and peripheral equipment are not included.



0136-2

Figure 1-2. Antenna Tuning, Simplified Block Diagram

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Table 1-4 lists equipment required to install and maintain the antenna tuner. The list covers

non-specialized installation and maintenance tools, test equipment, and peripheral equipment. Non-specialized items are not supplied since an equipped maintenance shop should contain them.

TABLE 1-1. LEADING PARTICULARS

NOMENCLATURE		POWER REQUIREMENT					DIMENSIONS IN INCHES			WEIGHT IN LB
FORMAL	COMMON	VOLTS	AMP	W	PH	FREQ. IN CPS	HGT	W	D	
Antenna Tuner, Model TTC-1	Antenna tuner or TTC	a	-	-	-	-	16-7/8	11-1/2	5-3/4	20-1/2
Cable CA-1046	Transmission line	a	-	-	-	-	b	-	-	10 ^c

^aPassive device

^bLength specified by customer

^cApproximate weight for 100-feet

TABLE 1-2. CAPABILITIES AND LIMITATIONS

CAPABILITIES	LIMITATIONS
Functional characteristics:	
Frequency range	2- to 32-megacycles
Control voltages	Plus 85- to 100-volts d-c power each channel
Impedance:	
Antenna tuner	Nominally 50-ohm input (unbalanced); output matches an 8-, 18-, or 35-foot antenna
Transmission line	Nominally 50-ohms.
Voltage standing wave ratio	2 to 1 or less
Maximum length of transmission line	100 feet
Environmental characteristics:	
Operating temperature	Minus 40° to plus 50°C (Minus 40° to 122°F).
Relative Humidity	Up to 95%

TABLE 1-3. EQUIPMENT SUPPLIED

CRATE	EQUIPMENT	QTY	DESIGNATION		FUNCTION
			TMC P/N	SYMBOL	
1	1. Antenna Tuner, Model TTC-1	1	Model TTC-1	000 to 099	Impedance match antenna to 50-ohm output, 100-watt, transmitter, using 50-ohm transmission line.
	2. Cable	1	CA-1046	(none)	50-ohm transmission/remote control cable.
	3. Case Support	1	MS-545	(none)	Mounting plate for roof or wall installation.
	4. Mounting Bracket	4	MS-619	(none)	Mounting brackets for pole installation.
	5. Mounting Hardware: Lockwasher Hexhead Screw Lag Bolt	4 4 8	LWS37MSS SCHH3716SS16 SC-111-2	(none)	Mounting hardware for roof, wall, and pole installation.

TABLE 1-4. EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	EQUIPMENT	PURPOSE
1	Copperweld Wire AWG 14, 6 to 12 35-foot lengths	Antenna counterpoise radials for roof installations
2	Drill, Electric	Drill mounting holes
3	Bits, Drill (sizes: 3/16 and 3/8)	Used with item 2
4	Spin tights (assorted sizes)	Maintenance
5	Screwdrivers, Flat Blade and Phillips Head (assorted sizes)	Maintenance
6	Socket Wrench Set (1/4 inch drive ratchet and sockets, assorted sizes)	Installation and maintenance
7	100-Watt Soldering Gun or equivalent	Maintenance
8	Resin-core Solder	Used with item 7
9	Vacuum Tube Voltmeter, 0- to 300-volts ac/dc, 20,000 ohms/volt	Alignment and maintenance
10	Low-Capacitance R-f Voltmeter Probe, 2- to 32-megacycles	Maintenance
11	Insulated Wire AWG 18, 64 inches or 8 8-inch pieces	Jumpers
12	16 Spade Lugs, small diameter	Used with item 11
13	Whip Antenna, 8-, 18-, or 35-feet long	Operation

SECTION 2 INSTALLATION

2-1. GENERAL.

The equipment supplied has been inspected and tested before shipment. Only minor preparations are required for installation and operation.

2-2. PACKAGING DATA.

The equipment supplied (refer to paragraph 1-4) is packed in one crate. Table 2-1 lists crated weights and dimensions.

TABLE 2-1. CRATED WEIGHTS AND DIMENSIONS.

CRATE	WEIGHT IN LB	DIMENSIONS IN INCHES		
		HGT	W	D
1	52	25-7/8	17-7/8	18-1/2

2-3. INSPECTION.

Immediately after receipt of the equipment, inspect the case. Carefully unpack the equipment and inspect for possible damage. Inspect all packing material for parts which may have been shipped as loose items or come loose during shipment.

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

2-4. CONSIDERATIONS IN MOUNTING EQUIPMENT.

Before mounting the equipment, consider the following:

- a. The maximum length of the transmission line is 100 feet.
- b. The size of antenna to be used.
- c. If ground conductivity is poor, 6 to 12 counter-poise radials must be used (refer to table 1-4 and figure 2-1).
- d. Holes in walls for routing the transmission line must be made.
- e. Mounting surfaces for fastening the transmission line and antenna tuner.
- f. The height of the antenna used and its switch in high winds vs possible obstructions.
- g. Possible use of drip loops for the transmission line entry into the building or shelter.

h. Installation of the equipment on a roof, wall, or pole.

i. Accessibility for installation and maintenance personnel.

j. Personnel requirements (refer to paragraph 2-5).

2-5. PERSONNEL REQUIREMENTS.

Installation personnel must be able to use all of the installation tools listed in table 1-4. Also, they should be electromechanically oriented with transmitters and peripheral equipment. Approximately 3 to 4 people will be required; more people does not mean the job will be done faster.

2-6. APPROXIMATE ASSEMBLY TIME.

Qualified personnel, totally unfamiliar with the equipment, should be able to assemble the equipment in four to six hours. This time includes unpacking and assumes the procedure is followed.

2-7. INSTALLATION.

The following procedure is for installing the equipment. To prevent unnecessary steps, follow the procedure; DO NOT anticipate instructions. A complete list of installation equipment is indicated in

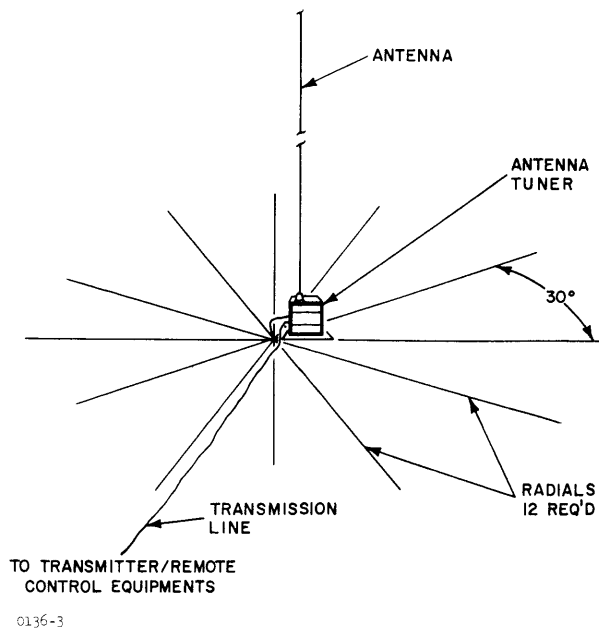


Figure 2-1. Positioning Equipment,
Installation Diagram

paragraphs 1-4 and 1-5. If any damage is encountered, refer to paragraph 2-3; DO NOT continue until the trouble is corrected.

a. Route the transmission line between the transmitter/remote control equipments and the intended point of antenna tuner installation; secure with cable clamps if desired.

NOTE

The end of the transmission line that has two plugs is connected to the antenna tuner.

b. Position and mount the antenna tuner as desired (see figure 2-2).

c. Assemble and attach the antenna to the antenna tuner (see figure 2-3).

d. If applicable, lay out 6 to 12 counterpoise radials (about 60° apart for six radials or 30° for 12 radials) beneath the antenna tuner (see figure 2-1).

e. Connect a ground wire between the ground connection, a wing nut on the side of the TTC, and ground or, junction of the counterpoise radials.

NOTE

Soldering the junction of the radials and ground wire is recommended.

f. Respectively connect both ends of the transmission line to the transmitter/remote control equipments and antenna tuner (refer to the inter equipment cabling diagram in Section 7).

g. Adjust the antenna tuner as follows:

(1) Temporarily open the removable cover on the antenna tuner.

(2) Depending on the desired operating channel and antenna used, determine the proper primary and secondary coil jumper connections as indicated in table 2-2.

(3) Fabricate 8 8-inch insulated jumper wires with spade lugs on all ends.

(4) Make jumper connections as determined in step b. For example: Channel one is 14 megacycles and a 35-foot antenna is used. Back-out PRIMARY and SECONDARY screws labeled 1 on the TTC (refer to figure 3-1). Back-out screws labeled 8 and 7 (these numbers were determined from table 2-2). Using the jumpers fabricated in step (3), jump out the following pairs of numbered screws: 1 (PRIMARY) and 8, and 1 (SECONDARY) and 7; secure jumper connections by tightening screws.

(5) Turn on the transmitter and set up the operating channel that was used in step (2).

(6) Connect a voltmeter to REFL and GRD jacks on the antenna tuner (refer to figure 3-1).

(7) Depending on the channel (1, 2, 3, or 4), adjust corresponding capacitor (CH 1, CH 2, CH 3, or CH 4) until a minimum indication is observed on the voltmeter.

NOTE

Record the voltage indication obtained in step (7); it shall be used in step (8).

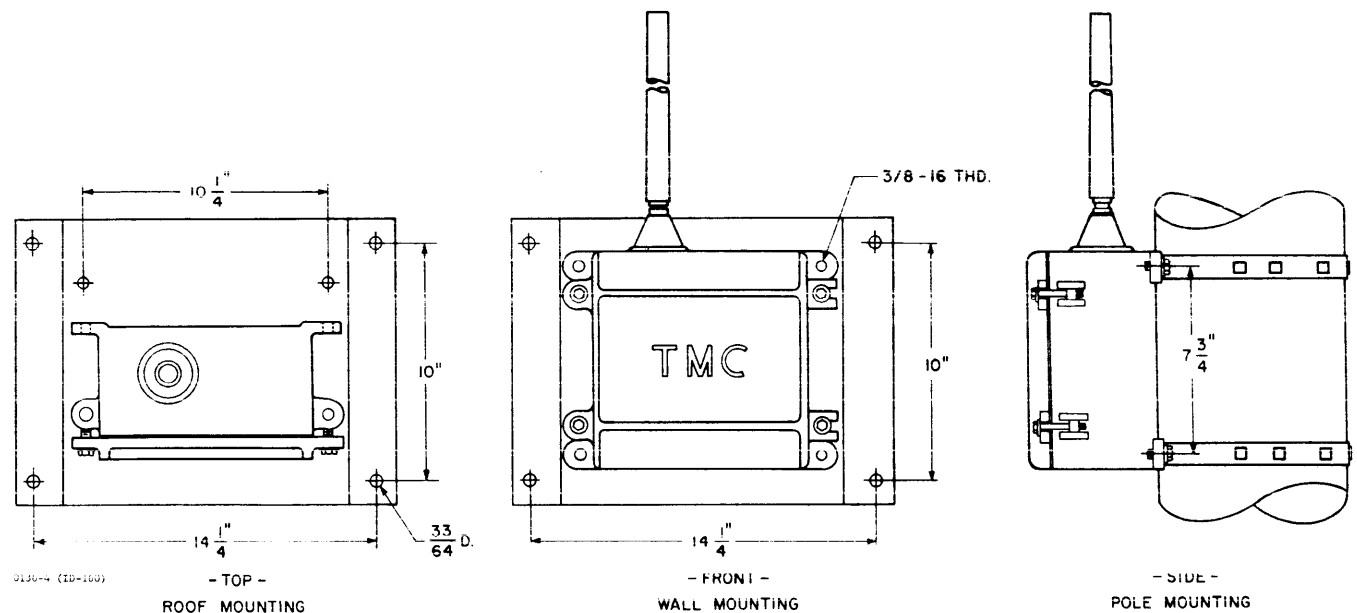
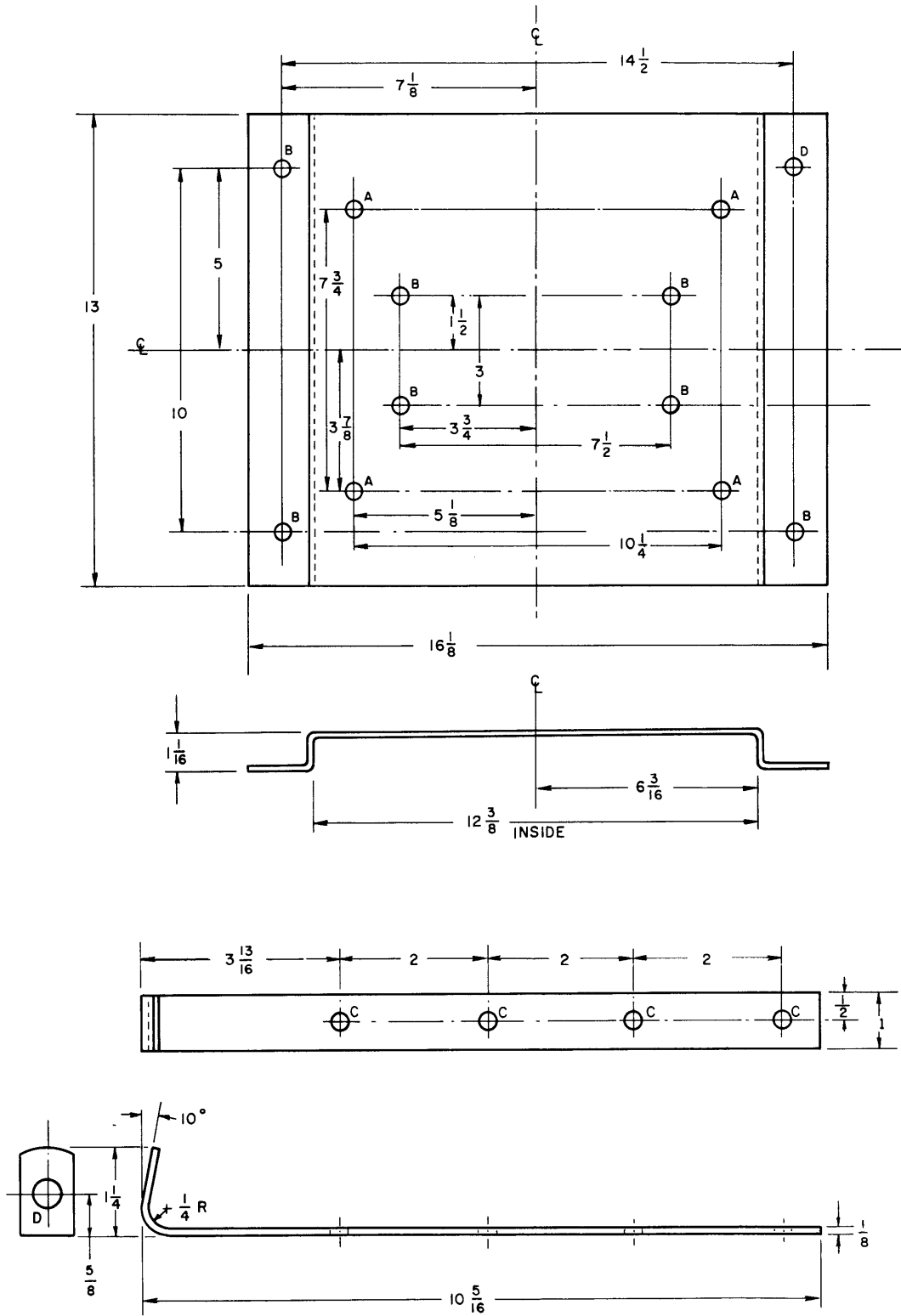


Figure 2-2. Roof, Wall, or Pole Mounting Dimensions, Installation Diagram (Sheet 1 of 2)



NOTES:

1. THE "A" HOLES ARE 1/2-INCH DIAMETER.
2. THE "B" HOLES ARE 7/16-INCH DIAMETER.
3. THE "C" HOLES ARE 9/32-INCH DIAMETER.
4. THE "D" HOLES ARE 13/32-INCH DIAMETER.

Figure 2-2. Roof, Wall, or Pole Mounting Dimensions, Installation Diagram (Sheet 2 of 2)

(8) Compute vswr (voltage standing wave ratio), as follows:

(a) Connect a voltmeter to FWD and GRD jacks on the antenna tuner, and record the voltage.

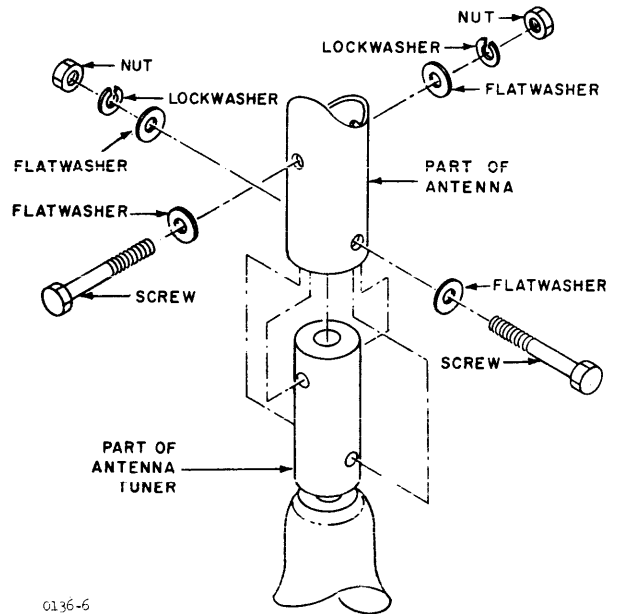
(b) Compute vswr by using recorded reflected and forward voltage indications in the following formula:

$$vswr = \frac{V_{FWD} + V_{REFL}}{V_{FWD} - V_{REFL}}$$

NOTE

If the computed vswr is greater than 2, the numbered terminal(s) connected to PRIMARY and SECONDARY terminal(s) have to be moved to the next higher- or lower-numbered terminal.

(9) Switch the antenna tuner to next channel; repeat steps g(1) through (8) for each of the other three channels.



0136-6

Figure 2-3. Mounting the Antenna on the Antenna Tuner, Installation Diagram

TABLE 2-2. ANTENNA TUNER OPERATING FREQUENCY VS JUMPER CONNECTIONS.

FREQ IN MC	35-FT WHIP ANTENNA		18-FT WHIP ANTENNA		8-FT WHIP ANTENNA	
	TERMINAL NUMBER CONNECTED TO		TERMINAL NUMBER CONNECTED TO		TERMINAL NUMBER CONNECTED TO	
	PRIMARY TERMINAL 1, 2, 3, or 4	SECONDARY TERMINAL 1, 2, 3, or 4	PRIMARY TERMINAL 1, 2, 3, or 4	SECONDARY TERMINAL 1, 2, 3, or 4	PRIMARY TERMINAL 1, 2, 3, or 4	SECONDARY TERMINAL 1, 2, 3, or 4
2	4	12	2	12	4	12
2.5	1	11	1	11	1	11
3	1	10	1	10	1	10
3.5	1	8	1	11	1	8
4	1	8	1	8	1	8
5	1	4	1	4	1	6
6	4	6	1	4	1	3
7	4	6	4	6	4	6
8	1	3	6	2	1	3
9	1	3	1	3	1	3
10	1	3	1	5	4	6
11	4	9	4	9	4	9
12	4	9	1	3	4	9
13	1	3	4	7	1	3
14	8	7	4	7	2	3
15	2	3	6	3	6	3
16	4	5	6	3	6	3
17	6	3	6	3	6	3
18	6	3	6	3	6	5
19	6	5	6	3	6	3
20	6	5	6	5	6	5
21	6	5	4	3	2	3
22	6	5	4	3	2	3
23	4	3	4	3	2	3
24	4	3	4	5	2	3
25	2	3	4	5	2	3
26	2	3	4	5	2	3
27	2	3	4	5	4	5
28	4	5	4	5	4	5
29	4	5	4	5	4	5
30	4	5	6	3	4	5
32	4	3	6	3	6	3

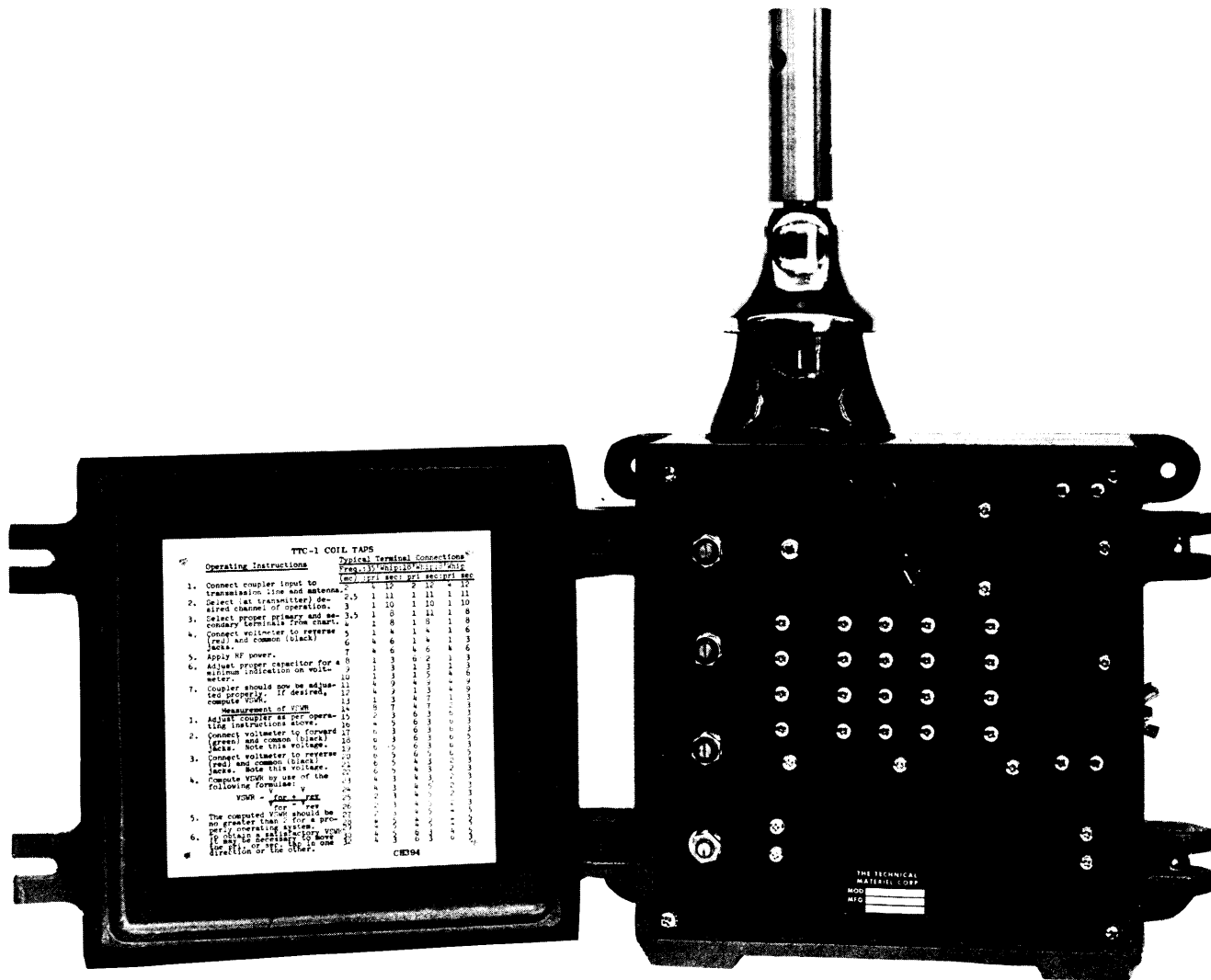
SECTION 3 OPERATION

3-1. OPERATING INSTRUCTIONS.

There are no operating instructions for the antenna tuner. Once the equipment has been completely installed, the TTC is automatically operated by the remote control selector, in conjunction with switching transmitter operating channels.

In case of an emergency, the remote control selector fails, the removable cover on the antenna tuner may be opened and proper channels manually selected (refer to figure 3-1).

If any of the four channels, initially set up during installation, is changed, the antenna tuner must be adjusted (refer to paragraph 2-7g).



0136-7

Figure 3-1. Antenna Tuner Internal Connection Terminals, Installation Diagram

SECTION 4 PRINCIPLES OF OPERATION

4-1. GENERAL.

The antenna tuner coupler, figure 4-1, impedance-matches an antenna to the r-f output of a transmitter so that the antenna will be resonant at the output frequency of the transmitter.

The impedance-matching range is covered in four channels that are selected by a motorized switch. The switch is remote-controlled by voltages from a remote-control channel selector, or can be manually controlled at the TTC.

The antenna tuner includes a vswr detector circuit that provides d-c output voltages that are proportional to forward and reflected r-f power.

4-2. SIMPLIFIED SCHEMATIC ANALYSIS.

Functionally, the antenna tuner consists of three sections: impedance-matching, the motorized switch section, and the vswr detector section. Operation of the antenna coupler will be discussed in these three sections.

a. IMPEDANCE-MATCHING SECTION. An r-f signal, applied to r-f input jack J1, is routed by motorized switch S1 through the impedance-matching network consisting of coil L1 and capacitors C3, C4, C5, and C6 to coupling capacitor C11, and through C11 to r-f output terminal E1. Resistor R3 and antenna-loading capacitors C7, C8, C9, and C10 are used to match the coupler to the antenna at the

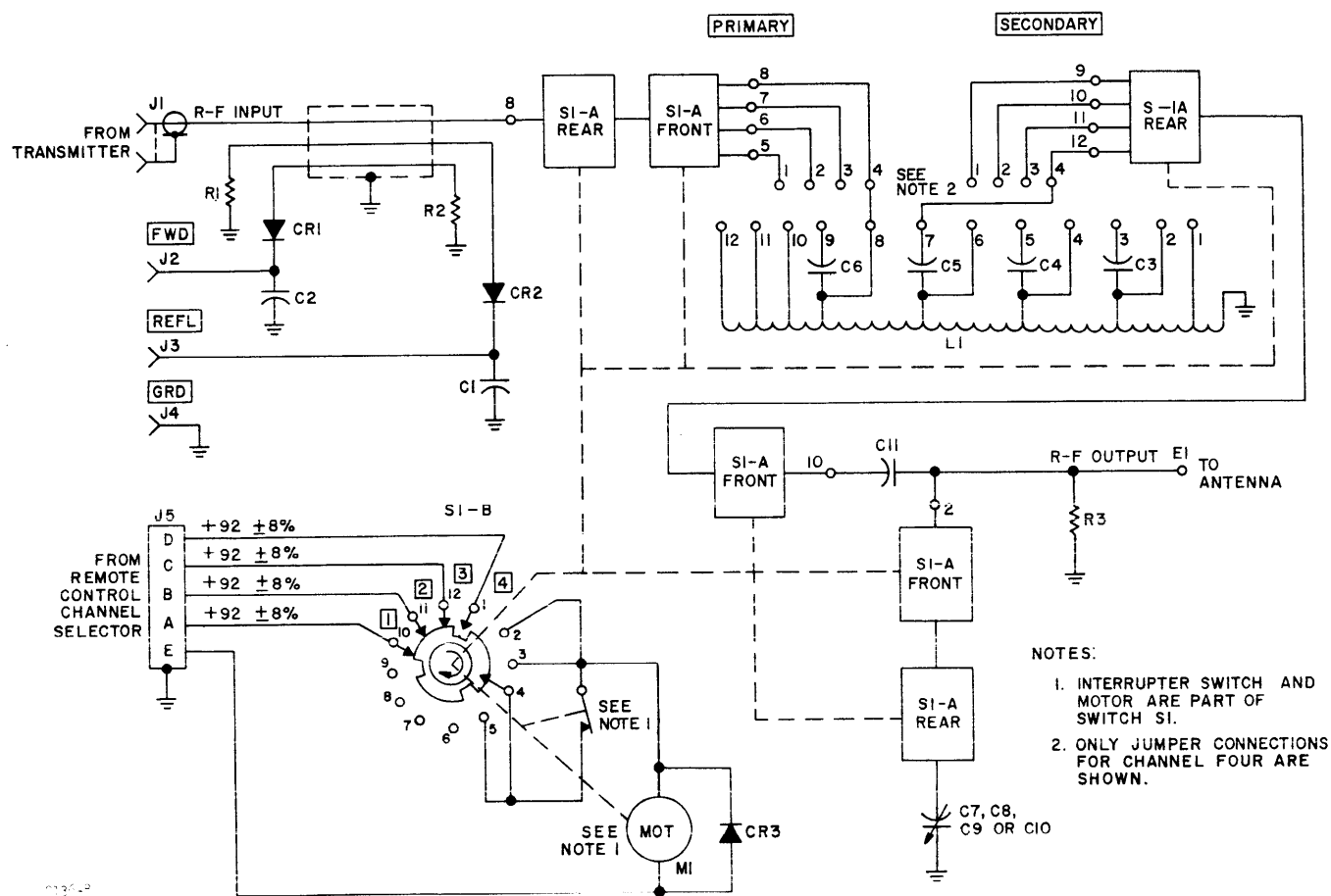


Figure 4-1. Antenna Tuner, Simplified Schematic Diagram

frequency to be transmitted in each of the four channels. The part of the impedance-matching network and the antenna-loading capacitor used depends upon the setting of motorized switch S1.

b. **MOTORIZED SWITCH SECTION.** A d-c voltage from a remote control channel selector is connected through jack J5 pin A, B, C, or D to, respectively, the channel 1, 2, 3, or 4 contact of motorized-switch section S1-B.

This voltage is then applied through the wafer segment and wiper of S1-B, and through the normally-closed interrupter switch to one side of switch motor M1. The other side of the switch motor is connected via jack J1 pin E to an external ground.

Diode CR3 is an arc suppressor for the switch motor.

When the d-c voltage is applied, the motor rotates, turning all sections of switch S1. A few degrees before the desired position of S1 is reached, a cam (not shown on figure 4-1), on switch S1 opens the interrupter switch. This action removes the d-c voltage

from motor M1, and inertia causes the switch to coast the few degrees to the desired position. At this point, the cam allows the interrupter switch to close. The switch contact bearing the d-c voltage is now aligned with a gap in the wafer segment of switch section S1-B, opening the d-c circuit and preventing the motor and switch from turning past the desired channel position.

c. **VSWR DETECTOR CIRCUIT.** Forward and reflected r-f power passing through the antenna coupler induce currents in the vswr detector circuit. These currents are rectified by diodes CR1 and CR2 and d-c voltages are developed across resistors R1 and R2. Capacitors C1 and C2 smooth these voltages.

The d-c voltage at the junction of CR1 and C2 (FWD jack J2) is proportional to forward power. The voltage at the junction of CR2 and C1 is proportional to reflected power. Jack J4 (GRD) provides a convenient ground return connection. When a voltmeter is connected to these jacks, during alignment, the voltage indications obtained are used to compute vswr.

SECTION 5 MAINTENANCE

5-1. GENERAL.

This section presents information on preventive maintenance, troubleshooting, repair and replacement, and alignment. For a list of required maintenance tools and test equipment, refer to paragraph 1-4. Circuit diagrams for the antenna tuner are presented in Section 7. If a part needs to be replaced, refer to Section 6.

5-2. PREVENTIVE MAINTENANCE.

a. In order to prevent equipment failure due to dust, dirt, and other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

b. At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. All components and wiring should be inspected for dirt, corrosion, charring, discoloring, or grease. Remove dust with a soft brush or vacuum cleaner.

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing, contact with skin, and painted surfaces (some solvents remove paint). 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.

Remove dirt or grease from other parts with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichloroethylene or methyl chloroform may be used, providing the necessary precautions are observed.

5-3. TROUBLESHOOTING.

Most causes of trouble (i. e. burned, corroded, or dirty switch contacts, mechanical defects, loose electro-mechanical connections, or defective solder connections) can be determined by visual inspection and remedied without the use of test equipment. Other common causes of trouble and their remedy are listed in table 5-1. For component identification,

refer to figure 5-1. Once the fault has been located and repair or replacement indicated, refer to paragraph 5-4.

5-4. REPAIR AND REPLACEMENT.

Repair and replacement techniques for the antenna tuner are relatively easy for a skilled technician. As a reminder however, adhere to the following generalized techniques:

a. Make sure all power inputs have been disconnected before proceeding.

b. Do not damage good parts when working on a defective part.

c. Replace defective parts with their prescribed replacement.

d. Do not be inquisitive; leave good parts alone.

e. Use an adequate heat sink (e. g. long-nose plier or alligator clip) when soldering or unsoldering semi-conductor devices.

f. Use only resin-core solder and a 100-watt soldering device.

g. Use the proper tool(s); do not improvise.

5-5. ALIGNMENT.

If the physical operation position, size or type of antenna, or one (or more) of the previously aligned transmitter channels are changed, the antenna tuner must be aligned. The necessary procedure, covering all these conditions, is indicated in the installation procedure; refer to and perform steps indicated in paragraph 2-7.

The spark gap adjustment (see figure 5-1) is performed by unloosening the adjustment setscrew and setting gap (between E1 and spark-gap rod) to 1/8 (0.125) inches.

TABLE 5-1. TROUBLESHOOTING.

NO.	SYMPTOM	PROBABLE TROUBLE	CORRECTIVE ACTION
1	With r-f input applied, forward voltage indication cannot be obtained at J2.	Diode CR1, resistor R2, or capacitor C2 defective.	Check and replace defective component.
2	With r-f input applied, reflected voltage indication cannot be obtained at J3.	Diode CR2, resistor R1, or capacitor C1 defective.	Check and replace defective component.
3	Channels cannot be switched by remote control.	Switch S1, motor M1 (part of S1), or diode CR3 defective.	<p>a. With r-f input applied, try manually cycling S1 through its positions; if it cannot be operated remove CR3 and replace S1; if it can be operated proceed to b.</p> <p>b. Remove r-f input; disconnect one side of CR3 from circuit; measure forward and reverse resistance; if CR3 is open or shorted, replace it; if CR3 is okay, motor or interrupter switch is defective—replace S1.</p>
4	Channel selector switch skips positions when remote controlled.	Interrupter switch defective.	Replace S1.
5	With r-f input applied, adjusting capacitor C7 (CH 1), C8 (CH 2), C9 (CH 3), or C10 (CH 4) has no effect on voltage indication at J2 or J3.	Capacitor C7, C8, C9, or C10 defective.	<p>a. Switch S1 to another position and set up same conditions as defective position; if symptom is still present, proceed to b; if new position checks out okay, replace capacitor in defective position.</p> <p>b. Change r-f input frequency and accordingly change jumper connections. Check for symptom; if still present, proceed to c; if symptom is not present, check L1 and/or capacitor (C3, C4, C5, or C6) with respect to previous jumper terminal connections.</p> <p>c. Remove r-f input and all jumper connections. Measure 100K ohms from E1 to ground; if measurement is extremely low or zero, replace R3. If measurement is correct, replace C11.</p>

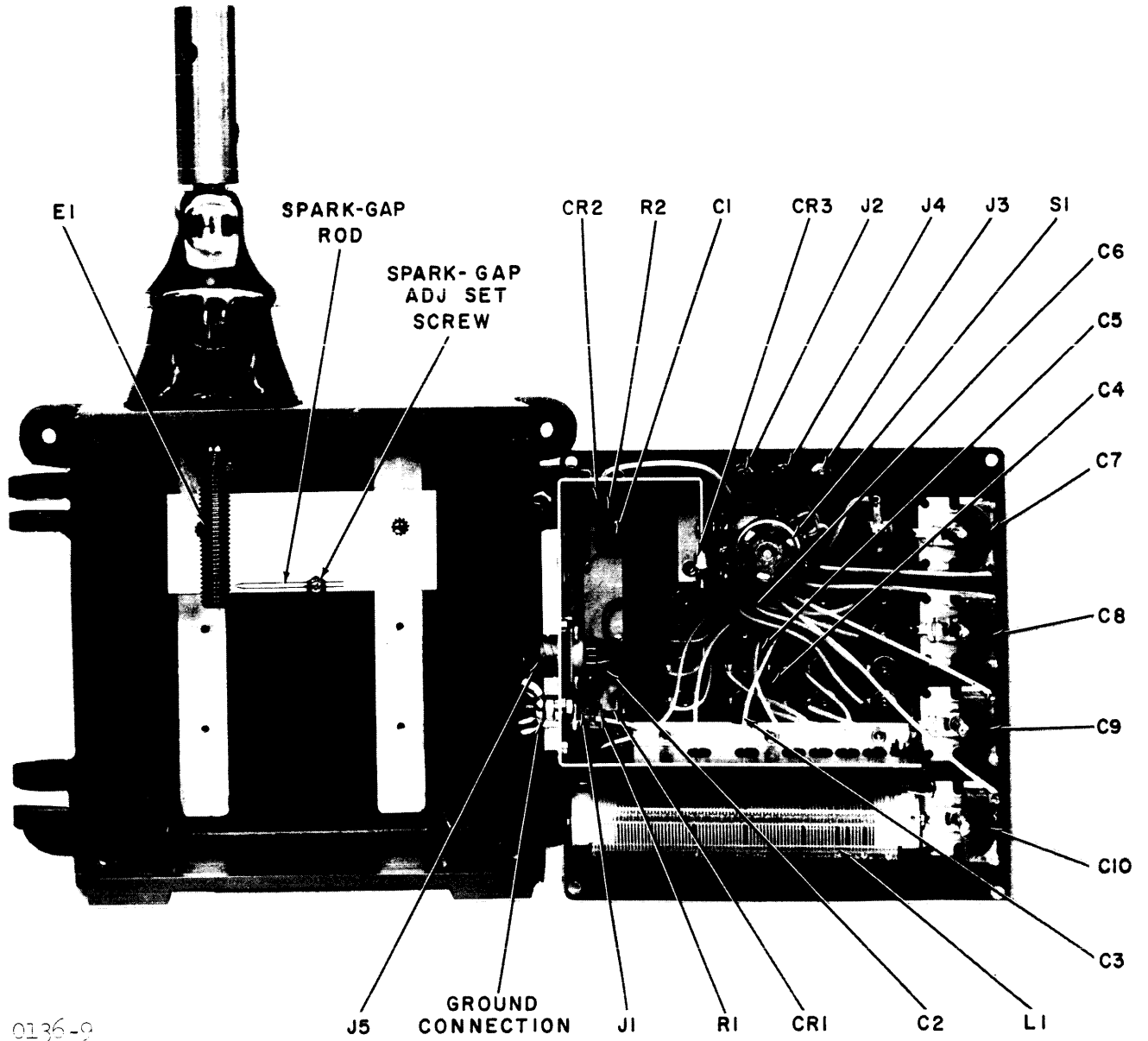


Figure 5-1. Antenna Tuner, Component Identification

SECTION 6 PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a 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 warranty sheet in front of manual), address all purchase orders to:

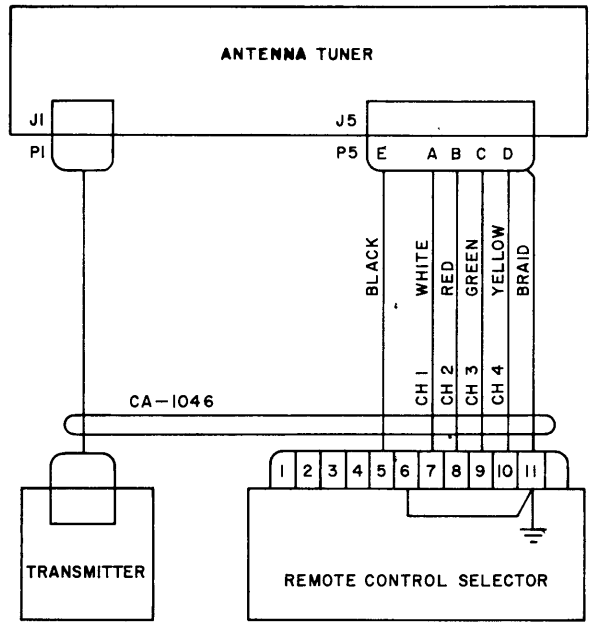
The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C2	Same as C1.	
C3	CAPACITOR, FIXED, MICA DIELECTRIC: 150 uuf, $\pm 5\%$; 500 WVDC.	CM15F151J
C4	Same as C3.	
C5	Same as C3.	
C6	Same as C3.	
C7	CAPACITOR, VARIABLE, AIR DIELECTRIC: 1 section, 10 uuf min. to 210 uuf max. per section; 180° rotation; straight tuning capacity; AC peak voltage 1,000 V.	CB169-1
C8	Same as C7.	
C9	Same as C7.	
C10	Same as C7.	
C11	CAPACITOR, FIXED, MICA DIELECTRIC: 510 uuf, $\pm 3\%$; 500 WVDC; straight wire leads.	CM111E511H5S
CR1	SEMICONDUCTOR DEVICE, DIODE: germanium; max. peak inverse voltage 60 volts; continuous average forward current 50 ma; max. peak forward current 150 ma; max. surge current 500 ma; max. inverse current 500 ua at 50 volts or 30 ua at 10 volts.	1N34
CR2	Same as CR1.	
CR3	SEMICONDUCTOR DEVICE, DIODE: silicon; 600 V max. peak inverse voltage; 0.75 max. DC forward amperes at 150°C.	1N547

PARTS LIST (CONT)

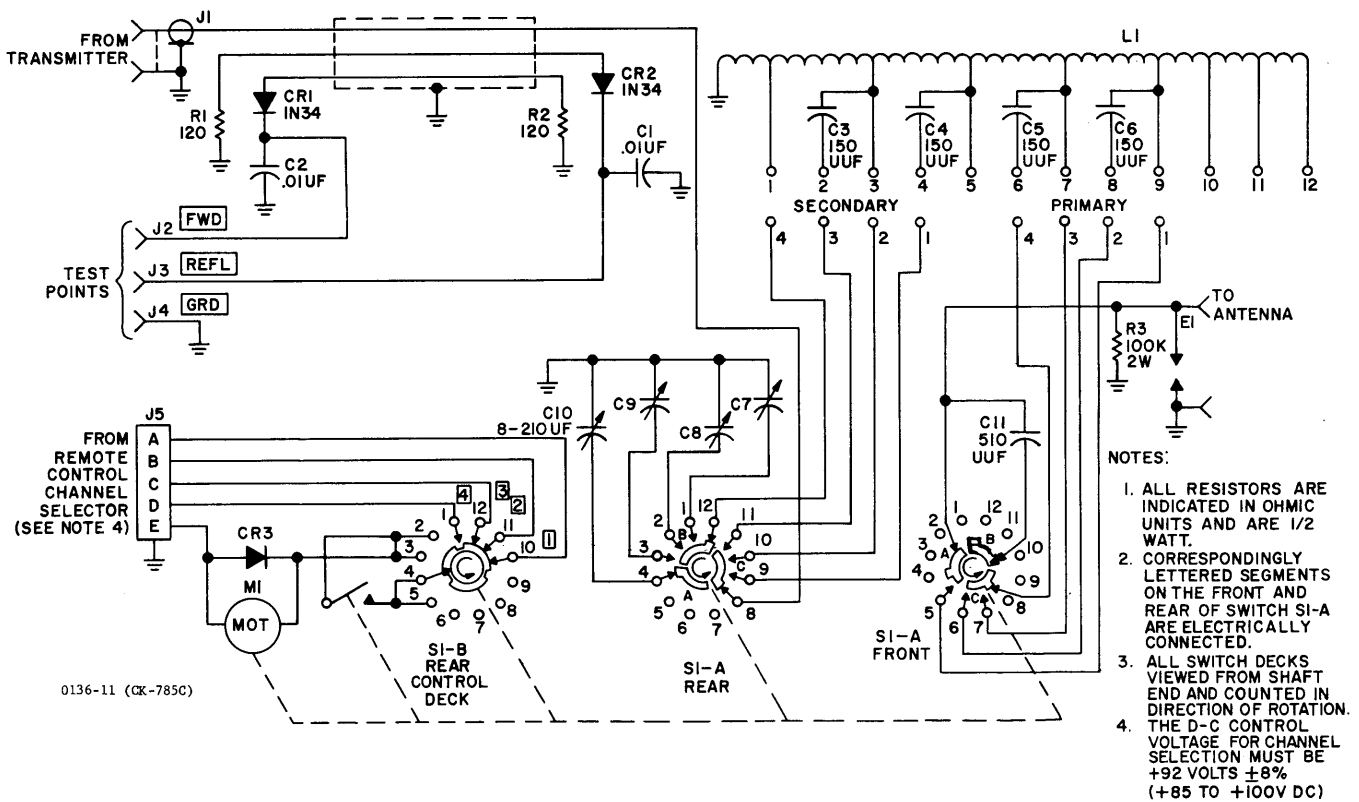
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E1	FUSE CLIP: for NEC-30 type fuse; nickel plated.	FC102-4XXN
J1	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact; straight type; 52 ohms; series BNC to BNC.	UG625B/U
J2	JACK, TIP: 1 female contact, phosphor bronze, silver plated; current rating 10 amps, 5,000 VDC; nylon body with brass, nickel plated jacket; red body.	JJ114-2
J3	Same as J2.	
J4	JACK, TIP: 1 female contact, phosphor bronze, silver plated; current rating 10 amps, 5,000 VDC; nylon body with brass, nickel plated jacket; black body.	JJ114-3
J5	CONNECTOR, RECEPTACLE, ELECTRICAL: 5 number 20 socket type contacts; nom. current rating 7.5 amps, 500 V RMS.	JJ200-6
L1	COIL, RADIO FREQUENCY: fixed; inductance, (#1) 0.47u, (#2) 2.47u, (#3) 4.72u, (#4) 5.82u, (#5) 9.86u, (#6) 19.4u, (#7) 28.3u, (#8) 48.5u; approx. DC resistance 0.2 ohms; current rating 2 amps at 30 mc, 3 amps at 2 mc; polystyrene coil form bars.	CL346
M1	Non-replaceable item. Part of S1.	
R1	RESISTOR, FIXED, COMPOSITION: 120 ohms, $\pm 10\%$; 1/2 watt.	RC20GF121K
R2	Same as R1.	
R3	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 10\%$; 2 watts.	RC42GF104K
S1	SWITCH-SOLENOID, ROTARY	SW378

SECTION 7
SCHEMATIC DIAGRAMS



0136-10

Figure 7-1. Inter-equipment Cabling Diagram



0136-11 (CX-785C)

Figure 7-2. Antenna Tuner, Schematic Diagram