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TECHNICAL MANUAL

for

MULTI-CHANNEL TRANSMITTER/RECEIVER

MODEL MCTR-350

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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IN-0374 Issue Date: 27 Dec. 1966

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

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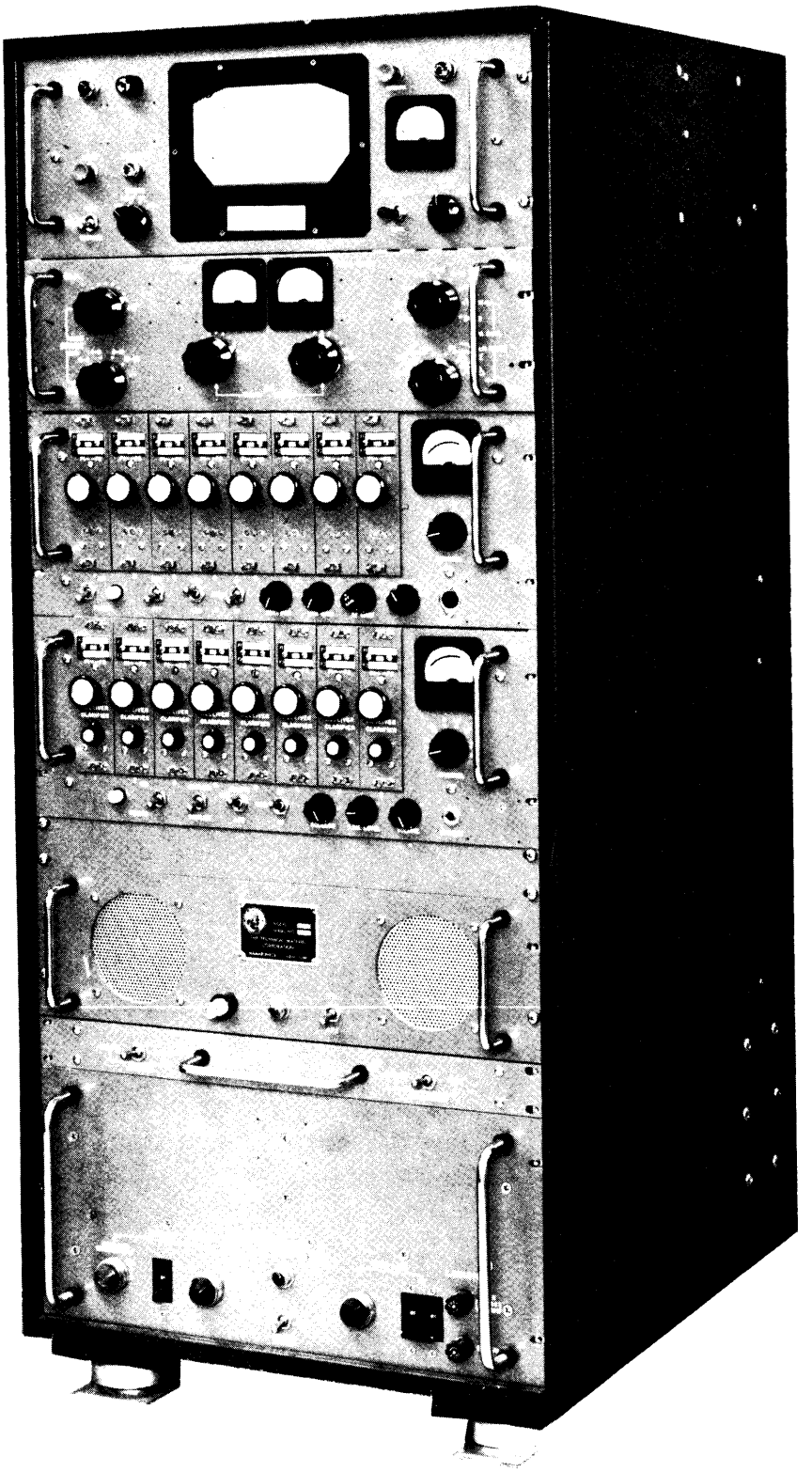

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Figure 1-1. Multi-channel Transmitter/Receiver, Model MCTR-350

SECTION 1
GENERAL INFORMATION

1-1. GENERAL

Multi-channel Transmitter/Receiver, Model MCTR-350 (figure 1-1) is a 350 watts PEP transmitter and receiver operating in the frequency range of 2 to 32 megacycles.

The MCTR is basically designed for SSB voice, simplex operation. The receiver section and exciter portion of the transmitter are provided with fixed-tuned modules for selective reception on any one of eight pre-determined channels, remotely selectable by use of a remote telephone switching unit.

1-2. DESCRIPTION

The MCTR consists of eight (8) rack-mounted units and two (2) associated external units. See table 1-1 in conjunction with figure 1-2. Units which comprise the MCTR are as follows.

a. Monitor Control Unit, Model MCU-2 (part of ATS-2 subsystem)- Monitor Control Unit MCU has two meters, controlling switches, and an overload protection circuit. A triple-scale meter indicates the position of the motor-driven short on the helical transmission line, the position of the antenna resistance selector switch or the humidity in the unit. A large dual-pointer meter indicates: (1) forward-and reflected transmitter power; (2) voltage standing wave ratio (vswr) at the intersection of the two pointers. Switches are located on the front panel to remotely control the motors in the antenna tuner. An overload circuit will disable the transmitter to prevent damage to the equipment when the vswr or transmitter power exceed pre-set levels.

b. Linear RF Amplifier, Model RFA-1A (part of PAL-350A subsystem). - Linear RF Amplifier RFA requires a maximum of 100 milliwatts excitation to produce full output. A choice of input connections is provided to accommodate inputs between 100 milliwatts and 1 watt. The output connections on the RFA consist of 2 type C coaxial connectors, one of which provides full r-f output, the other provides 1/300th of the r-f output for monitoring purposes. The monitoring output may be terminated in any resistive load of 70 ohms or higher.

The RFA coveres a frequency range of 2 to 32 megacycles, and is band-switched. All tuning and operating adjustments are accomplished from the front of the unit. Complete metering capabilities are provided by a MULTIMETER and a PA PLATE meter.

The RFA, which operates as a class ABl linear amplifier, uses a pair of 4CX250B beam-power amplifiers in parallel to a pi network to provide an unbalanced output of 50 or 70 ohms. The final amplifiers are driven by a pentode driver stage which employs r-f feedback to improve linearity. The driver stage is preceded by an automatic load and drive control (ALDC) to limit the distortion produced when high peaks or load changes occur.

c. Solid State Exciter, Model SME-1. - Solid State Exciter SME is a completely transistorized, 8-channel, superheterodyne communications exciter that operates on any crystal-controlled frequency in the range of 2 to 32 mc.

The SME provides up to 250-mw excitation for amplitude modulation equivalent (AME), continuous wave (CW), facsimile (FAX), frequency shift keying (FSK), modulated continuous wave (MCW), and single sideband (SSB) operating modes.

NOTE

Additional equipment is required to provide FAX and FSK input signals.

The SME uses fixed-tuned plug-in modules (Model TTRT) for its r-f section. These modules have two, selectable, local-oscillator frequencies that permit transmission on one of two closely adjacent frequencies (F1 and F2) that are within the module's r-f bandpass.

Plug-in Module	Frequency Range
TTRT-1	2-4
TTRT-2	4-8
TTRT-3	8-16
TTRT-4	16-32

d. Solid State Receiver, Model SMRA-1. - Solid State Receiver SMRA is a completely transistorized, superheterodyne, communications receiver that operates on any one of eight selectable crystal-controlled channels in the range of 2 to 32 mc. Channel selection may be accomplished manually or remotely (using a remote control unit such as Telephone Remote Control TPC).

The SMR is capable of receiving amplitude modulation equivalent (AME), continuous wave (CW), facsimile (FAX), frequency shift keying (FSK), modulated continuous wave (MCW), and single sideband (SSB) transmissions.

NOTE

Converter equipment is required to process FAX and FSK signals.

Operating frequencies for the r-f section of the SMR are obtained from fixed-tuned, crystal-controlled, plug-in modules (Model TTRR). Various combinations of these modules may be used to provide frequency coverage in accordance with operating requirements.

Each TTRR module employed in the SMR has two selectable local oscillator frequencies that permit transmission on either of two frequencies (F1 or F2) within the r-f bandpass of the module without realignment.

Plug-in Module	Frequency Range
TTRR-1	2-4
TTRR-2	4-8
TTRR-3	8-16
TTRR-4	16-32

e. Speaker Panel, Model LSP-6X. - Speaker Panel LSP is a dual speaker panel used for audio monitoring the receiver output. A master control stepping switch in the LSP controls a slave stepping switch (channel selector) in the system receiver unit (SMRA). This automated stepping switch arrangement provides for channel monitoring of any of eight pre-determined frequency channels in the associated receiver unit (SMRA) by means of a remote telephone control unit (TPC).

f. Equipment Connect Panel, Model ECPA-1. - Equipment Connect Panel ECPA is an equipment switching panel, enabling local or remote switching for tuning or operating the system. The REMOTE/TUNE switch will lock-key the exciter (SME when set at TUNE (push-to-talk circuit) and enable linear amplifier (RFA) and antenna tuning.

g. Power Supply, Model PSP-350A (part of PAL-350A subsystem). - Power Supply PSP is of a conservative design containing mercury vapor high-voltage rectifiers (type 866A). Rectification is full wave and is followed by a choke input filter network providing a plate voltage of 2000 volts to the final r-f stage. Excellent regulation of the power supply is maintained due to the low internal impedance of the mercury vapor rectifiers.

The low voltage power supply contains a high vacuum, full wave rectifier. This supply provides a voltage of 150 volts to the plates of the ALDC and driver stages, a voltage of -150 volts (regulated) bias voltage for the final amplifier, and screen voltage to the

driver stage.

A time delay relay prevents the application of high voltage to the mercury vapor rectifiers until their filaments have been allowed to warm up sufficiently for operation.

The plate overload breaker removes all B+ voltages when the current drawn from the high voltage supply becomes excessive, thus protecting the final amplifier tubes.

h. Directional Coupler Unit, Model CU-2 (part of ATS-2 subsystem). - Directional Coupler Unit CU is a balanced radio-frequency bridge, and is calibrated to operate with a 50-ohm coaxial line. Balancing and equalizing controls are provided.

i. Antenna Tuner Unit, Model TU-2 (part of ATS-2 subsystem). - Antenna Tuner Unit TU employs (1) a helical transmission line as an inductance tuning element whose electrical length is varied by a motor-driven rolling contact, (2) a fixed air-dielectric capacitor, (3) a ferrite core auto-transformer with taps selected by a motor-driven rotary switch, used to match various antenna resistance values, and (4) a humidity sensing circuit.

j. Telephone Remote Control, Model TPC-11. - Telephone Remote Control TPC permits a transmitter-receiver, compatibly equipped, to be remotely controlled. Also provided is a remote simplex transmit/receive capability.

Pushbutton control on the TPC, permits the USB (upper sideband) or LSB (lower sideband) of any one of eight fixed frequencies to be selected. Also on the TPC is a telephone handset with a pushbutton that permits an operator to talk or listen to the selected fixed frequency. If the handset is not used, a loudspeaker on the TPC permits an operator to monitor the selected channel.

1-3. TECHNICAL SPECIFICATIONS

Frequency Range:	Transmitter: 2-32 mc, divided into four bands using TTRT modules (8 channels). Receiver: 2-32 mc, divided into four bands using TTRR modules (8 channels, remote selectable).
Power Output:	350 watts PEP.
Frequency Control:	Crystal-controlled.
Audio Bandwidth:	2.75 kc $\pm$2 db between 250 and 3000 cps.
Intermediate Frequency:	Transmitter: Double conversion from 250 kc to 1.75 mc on all bands. Receiver: Double conversion from 1.75 mc to 250 kc on all bands.
Power Dissipation:	Antenna Tuner: 1000 watts continuous at 100% modulation. Directional Coupler: 1000 watts continuous at 100% modulation for vswr up to 2.5 to 1.
Input Power Requirements:	System wired for an input of 115 volts a-c, 50/60 cps, single phase power.

Table 1-1. Equipment Complement, MCTR-350

ITEM	NOMENCLATURE	
1	Cabinet, Electrical Equipment, RAK-106	
2	Monitor Control Unit, Model MCU-2	Part of ATS-2 subsystem
3	Linear RF Amplifier, Model RFA-1A	Part of PAL-350A subsystem
4	Solid State Exciter, Model SME-1	
5	Solid State Receiver, Model SMRA-1	
6	Speaker Panel, Model LSP-6X	
7	Equipment Connect Panel, Model ECPA-1	
8	Power Supply, Model PSP-350A	
9	Telephone Remote Control, Model TPC-11	
10	Directional Coupler Unit, Model CU-2	Part of ATS-2 subsystem
11	Antenna Tuner Unit, Model TU-2	Part of ATS-2 subsystem

See figure 1-2 for equipment locations.

Table 1-2. Electron Tube and Semiconductor Complement

UNIT	12AT7	6CL6	6146	5R4GY	866	4CX250B	OA2	OB2	2N2001	2N1039	2N1190	2N697	TX106/ 2N1308	TX107/ 2N1370-4	TX108/ 2N1370-7	TX109/ 2N2084
MCU	1							1								
RFA		1	1			2										
PSP				1	2		2	2								
SME									1				2	5		9
SMRA									1	2	1	1	1	7	1	7

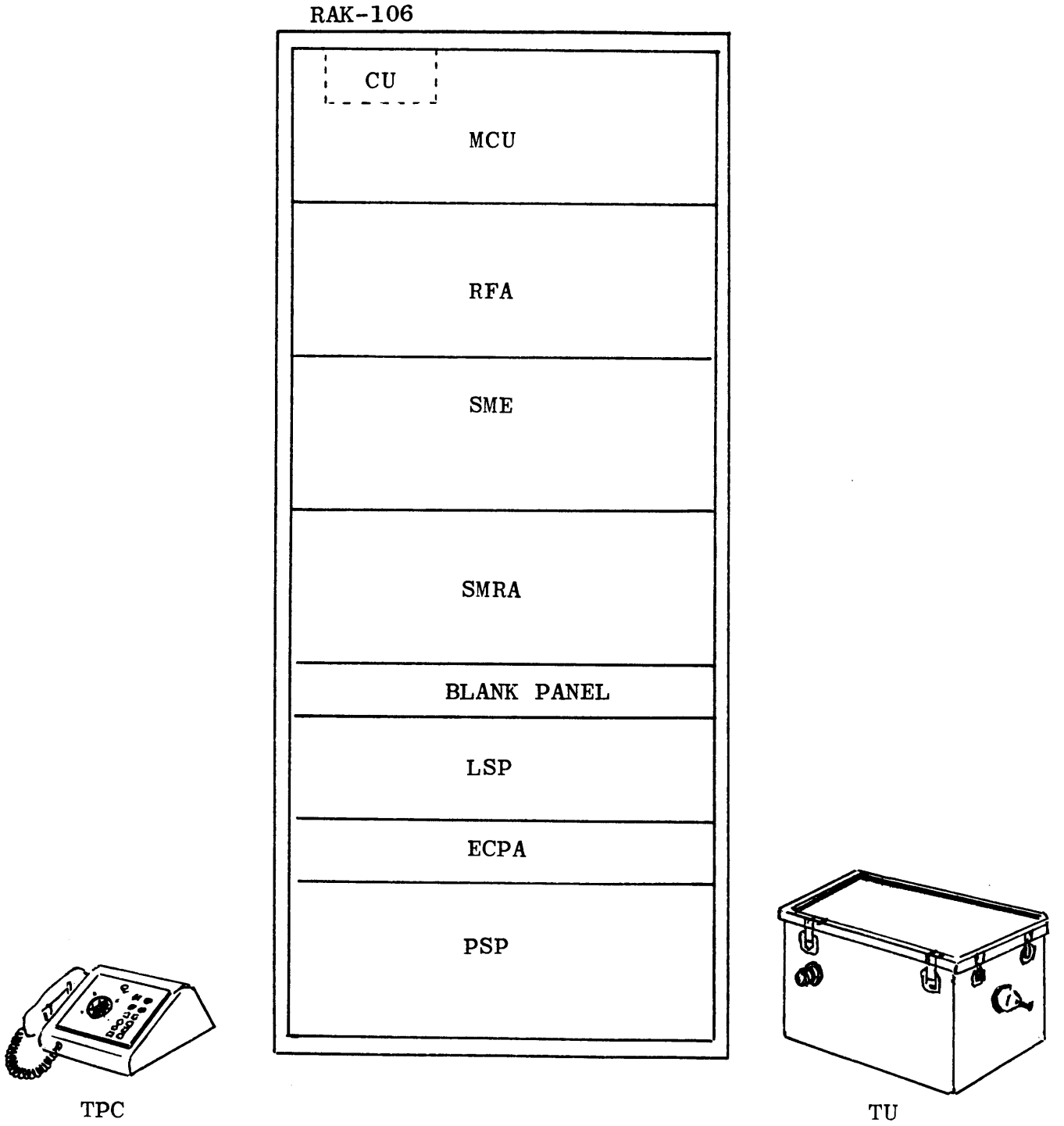

Figure 1-2. Equipment Locations, MCTR

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING

Each modular unit contained in the MCTR system has been thoroughly inspected and tested at the factory before shipment. Upon arrival of the equipment, inspect each unit 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. INSTALLATION

All of the modular units used in the MCTR are equipped with standard width 19-inch front panels. These units are to be mounted in the rack as shown in figure 1-2. Externally located units (TPC and TU) should be connected and physically located at the users choice location. Figures 2-2 and 2-4 illustrate electrical interconnections of the MCTR modular units. Refer to the individual technical and subsystem manuals for detailed connection and installation procedures.

a. INSTALLATION OF MODULAR UNITS. - Refer to figure 1-2 for modular unit mounting locations. All major units are slide-mounted on tilt-lock drawer slides. To install any slide-mounted unit in its compartment, proceed as follows:

(1) Untape or unstrap cable assemblies and all other components fastened to the rack frame for shipment.

CAUTION

Start by installing bottom units first in order to avoid rack tipping over from extended center of gravity.

(2) Pull center section of associated compartment track out until it locks in an extended position.

(3) Position slide mechanisms of modular unit in tracks, and ease modular unit forward into rack until release buttons engage holes in track.

(4) Make necessary cable and electrical connections as shown in figures 2-2 and 2-3. To prevent the cables from snagging, utilize the cable retractor located inside the rack in the rear (see figure 2-1).

(5) Depress release buttons and slide modular unit completely into compartment.

(6) Secure front panel of modular unit to rack with screws.

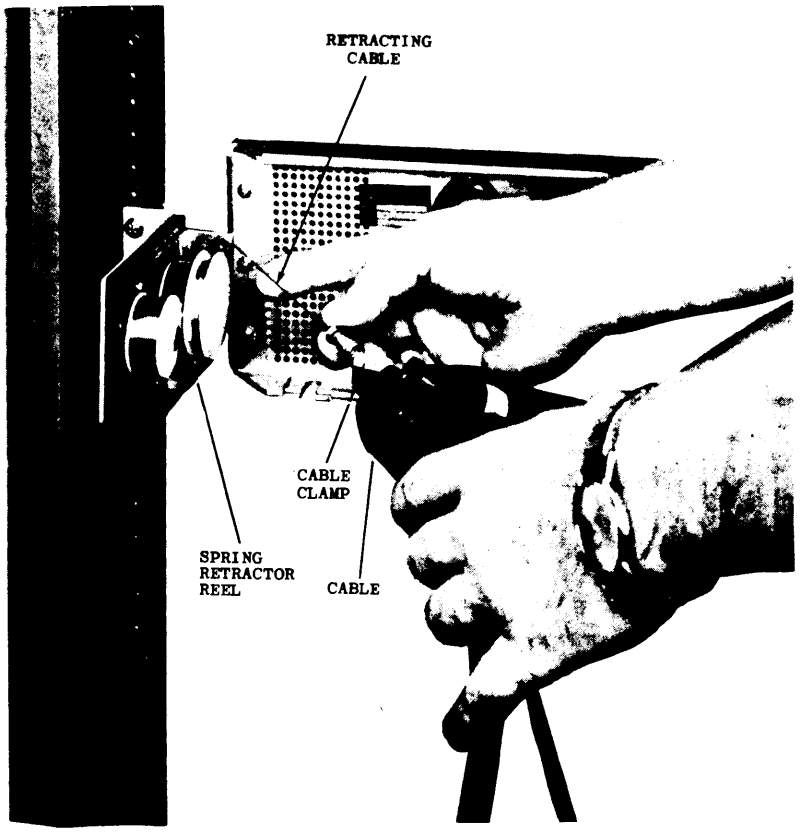

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Figure 2-1. Attaching Cable Retractor

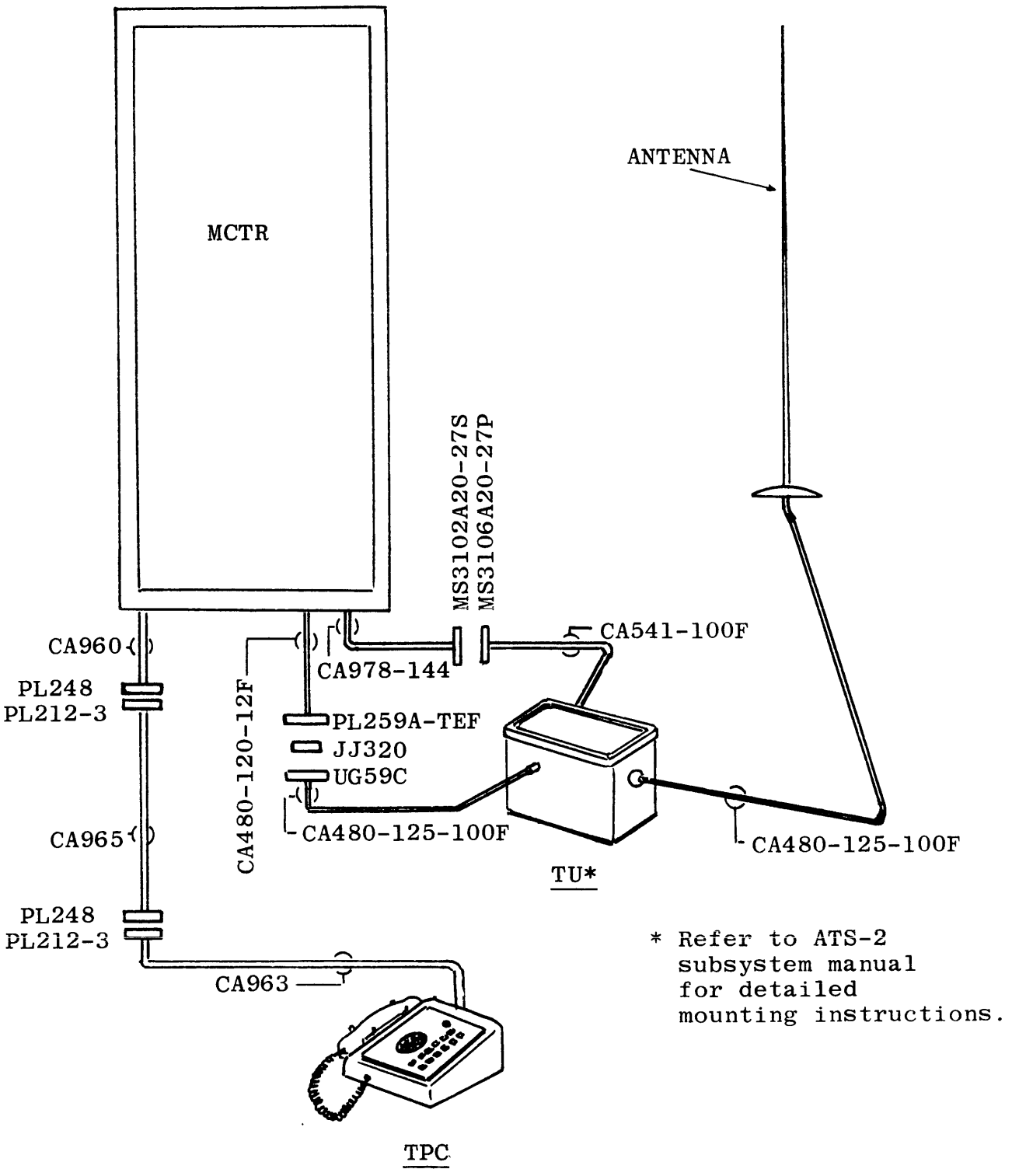

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Figure 2-2. External Cabling Connection Diagram.

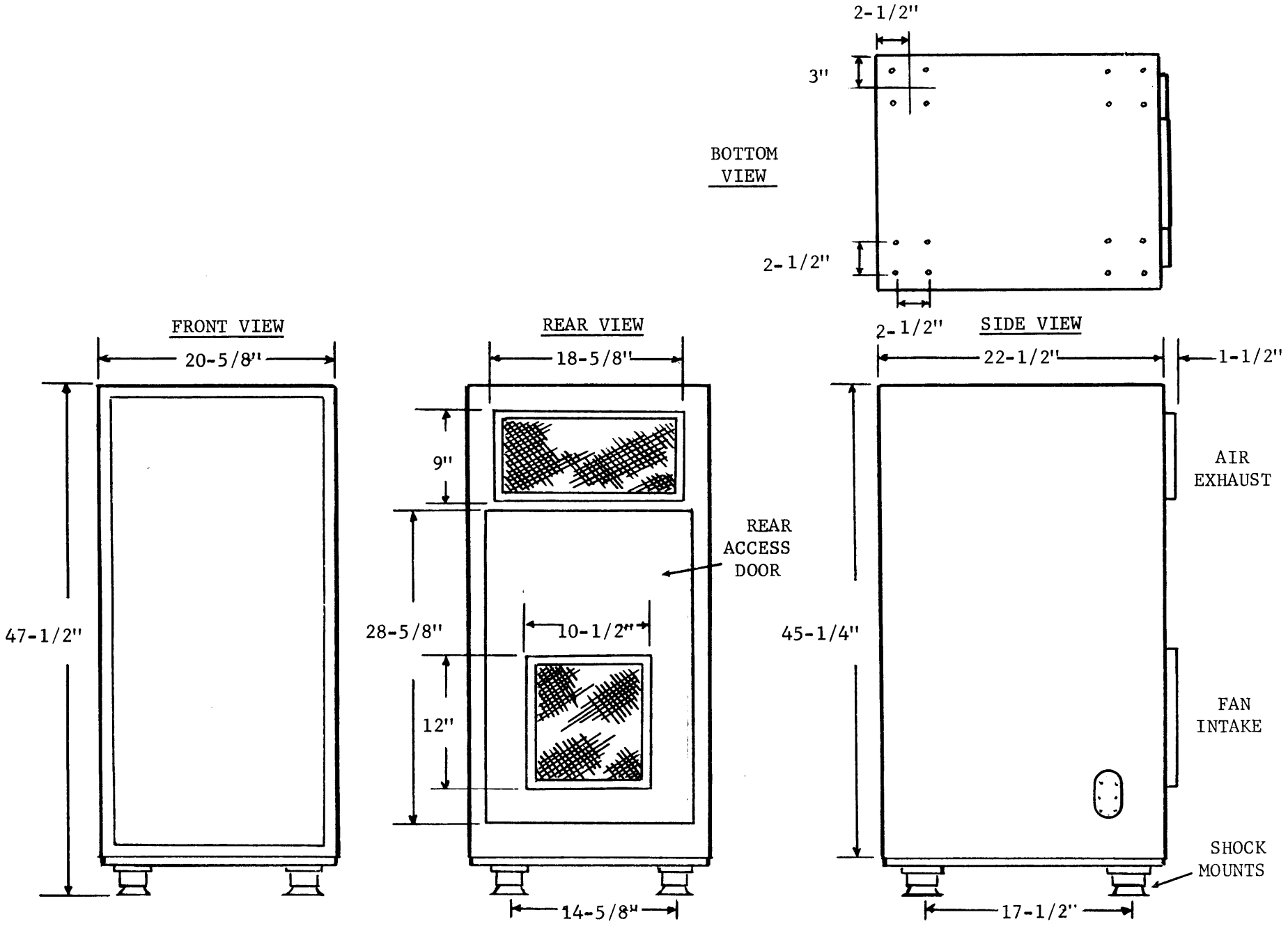


Figure 2-3. Outline Dimensional Diagram

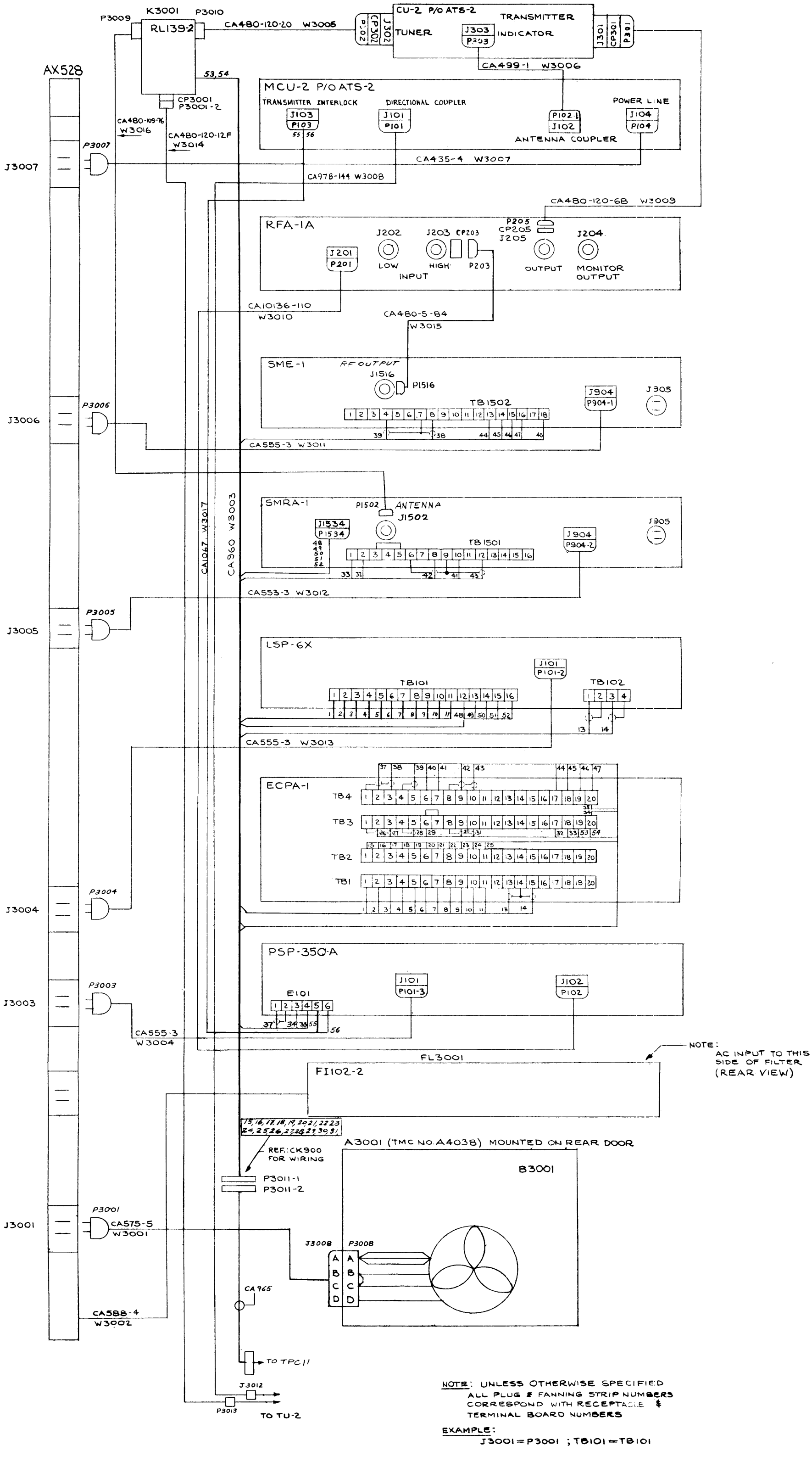
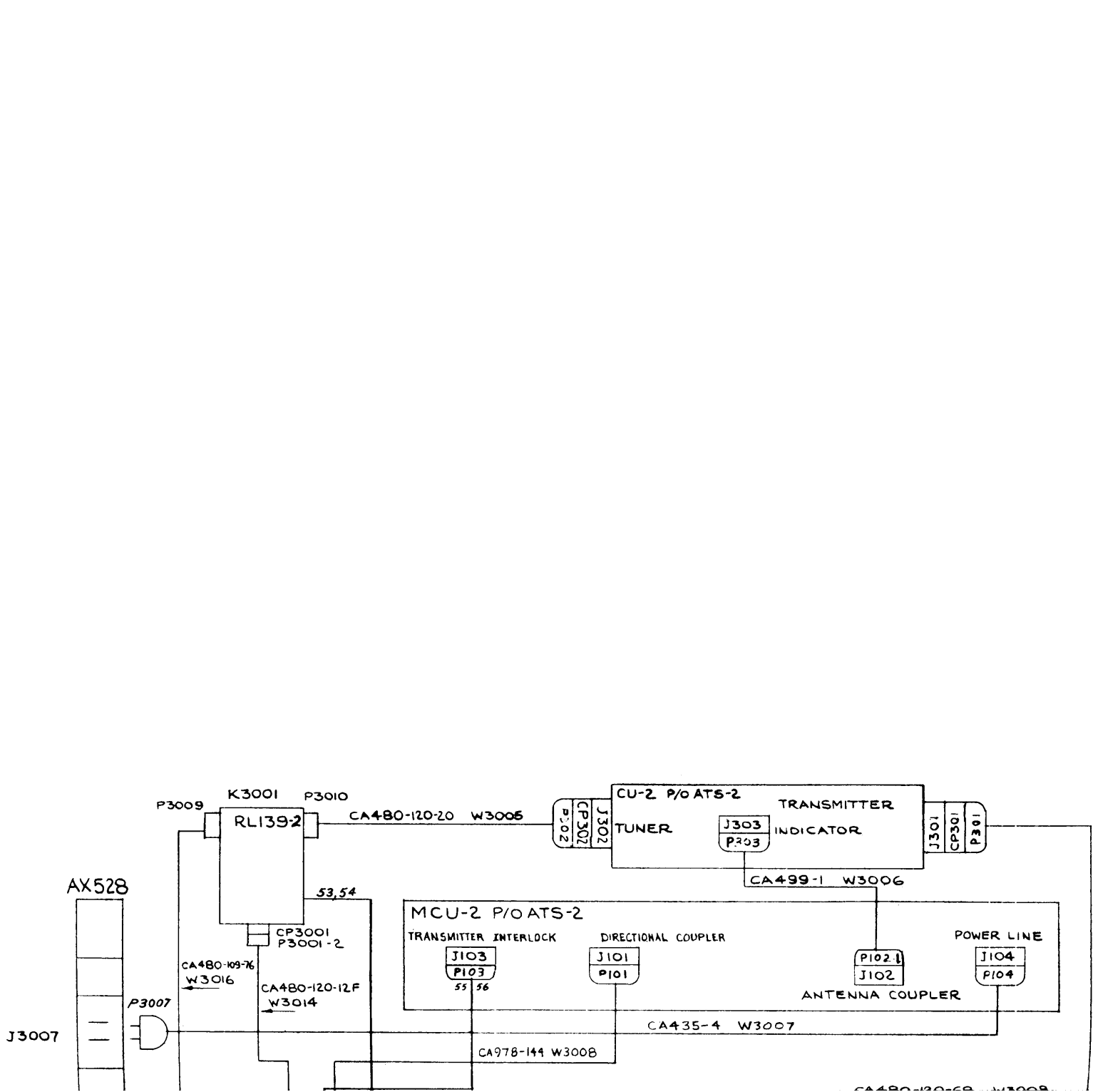


Figure 2-4. Interconnection Diagram, MCTR

CK831B


K3001
P3009
RL139-2
P3010
CA480-120-20 W3005
CU-2 P/O ATS-2
TRANSMITTER
TUNER
J303
P303
INDICATOR
J302
CP302
P302
J301
CP301
P301
CA499-1 W3006
AX528
53,54
MCU-2 P/O ATS-2
TRANSMITTER INTERLOCK
DIRECTIONAL COUPLER
POWER LINE
J103
P103
55 56
J101
P101
P102-1
J102
ANTENNA COUPLER
J104
P104
CP3001
P3001-2
CA480-109-76
W3016
CA480-120-12F
W3014
P3007
J3007
CA435-4 W3007
CA978-144 W3008

b. PRIMARY POWER INPUT CONNECTION - Primary input power to the MCTR is connected via radio interference filter FL3001. The a-c input cable (customer supplied) should be connected to the input terminals of FL3001 as shown in figure 2-5.

Radio interference filter FL3001 is a hermetically sealed unit, physically mounted at the bottom-rear of the equipment cabinet.

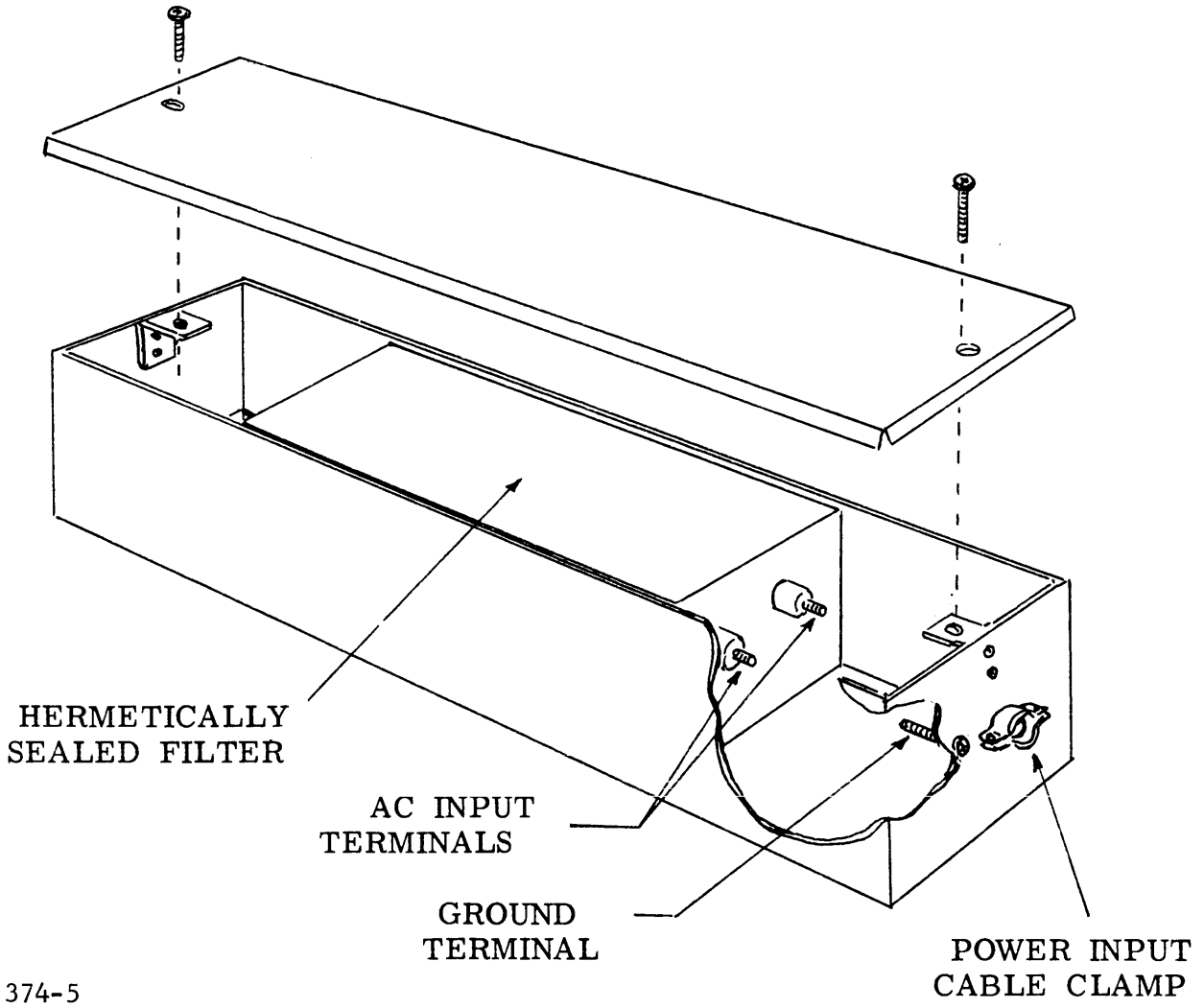


Figure 2-5. Input Power Connections.

2-3. PRE-OPERATIONAL CHECKOUT

The following pre-operational checkout procedures are to be performed after final installation is completed. See table 2-1 for test equipment supplied. Further checkout procedures for the individual modular units are presented in their associated technical manuals.

a. PRELIMINARY.

1. Connect main a-c power cable to 115 volts a-c power source.

2. Connect dummy load to antenna coax connector of antenna switching relay K3001 (RL-139-2) and connect signal generator across load.

3. Plug connector of TPC to appropriate MCTR connector, located at bottom rear of cabinet.

4. Connect two-tone generator output to terminals 1 and 3 of SME terminals strip E1501; connect shield to terminal 2.

b. OPERATIONAL CHECK.

1. Set MAIN LINE switch of PSP at ON. Air blower of PSP should be audible and associated switch lamp (green) should light.

2. Set TRANSMITTER PLATES switch of PSP at ON. After approximately 1 minute, the HV LINE/OVERLOAD indicator lamp should light.

3. Set TRANSMITTER PLATES switch of PSP at STANDBY REMOTE.

4. Set HV LINE switch at ON.

5. Depress XMTR ON pushbutton of TPC; HV LINE indicator lamp (red) should light.

6. Depress XMTR STANDBY pushbutton of TPC; HV LINE indicator lamp (red) should go out.

7. Set HV LINE switch of PSP at OFF; yellow indicator lamp should

Table 2-1. Test Equipment Required.

ITEM	MANUFACTURER	SPECIFICATIONS
R-f signal generator	Measurements Model 82 or equivalent.	
*R-f spectrum analyzer	TMC Model FSA or equivalent.	
*Two-tone generator	TMC Model TTG or equivalent.	Two r-f tones-1999 kc and 2001 kc. Two audio tones-935 cps and 2805 cps.
*Variable frequency oscillator	TMC Model VOX or equivalent.	R-f-2-64mc. Ifo-3.2-3.9mc. Bfo-300-500kc.
Voltmeter	Hewlett-Packard Model 410 or equivalent.	
A-c voltmeter	Ballantine Model 314 or equivalent.	
Carbon resistor	Any manufacturer meeting the necessary requirements.	4-ohms, 1-watt.
Dummy load	Bird Termaline or equivalent.	50-ohms, 500-watts.
Dummy load	Any manufacturer meeting the necessary requirements.	50-ohms, 1-watt, carbon composition with BNC connector.

*These units also available as a combined test equipment package, TMC Model PTE-3.

light when XMTR ON pushbutton on TPC is depressed.

8. Set POWER toggle switches of SME and SMRA at ON; associated POWER indicator lamps should light.

9. Set toggle switch of LSP at ON; XMTR STANDBY pushbutton indicator lamp on TPC should light.

NOTE

The LSP toggle switch, when set at ON, supplies operating voltages to the TPC lamp circuitry and to the SMRA motorized stepping switch circuitry.

10. At the TPC, depress eight channel selector pushbuttons, one at a time, noting that channel indicator lamps light and that the channel selector indicator on SMRA front-panel indicates appropriate channel as selected at TPC.

c. INTERLOCK CHECK.

1. With the HV LINE switch of the PSP set at OFF and XMTR ON pushbutton of the TPC depressed, remove and replace (one at a time) top and bottom covers of RFA. Each time a cover is removed, HV OVERLOAD indicator lamp should go out.

2. Repeat step 1 procedure with the PSP top cover, noting that yellow indicator lamp goes out.

d. TRANSMITTER TUNING AND LOADING.

1. Making certain that the TRANSMITTER toggle switch of ECPA is set at REMOTE and TPC handset not keyed, select the desired frequency SME by setting the CHANNEL selector switch at the appropriate channel position.

2. Set DRIVER/TUNING control of RFA at appropriate band position.

3. Set PA TUNING control of RFA at appropriate band position.

4. Set MULTIMETER selector switch of RFA at DR position 0-50V.

5. Set mode selector switch of SME at AME (reinserts carrier for tuning).

6. Set TRANSMITTER toggle switch of ECPA at TUNE.

7. Set METER toggle switch SME at RF and adjust RF GAIN control for an indication of the SME panel meter.

8. Set TRANSMITTER PLATES switch of PSP at ON.

9. Adjust DRIVER/TUNING control of RFA for maximum indication on multimeter.

10. Reduce drive to PA with RF GAIN control of SME so as not to overdrive while tuning.

11. On PSP, set HV LINE and TRANSMITTER PLATES switches at ON.

12. Increase SME RF GAIN enough to dip plate current of RFA.

13. Alternately increase drive, load with loading control and dip plate current with PA tuning until required output is reached as indicated on VSWR output meter.

REQUIREMENT: 175 watts or 93 volts across 50 ohms.

14. Set RF GAIN control of SME at minimum (counterclockwise).

15. Set HV LINE switch of PSP at OFF.

16. Set TRANSMITTER toggle switch of ECPA at REMOTE.

e. DISTORTION TEST.

1. With two-tone generator and Ballantine a-c voltmeter connected to terminal strip E1501, terminals 1 and 3 of SME, adjust two-tone generator

for an output of 77.5 mv. Remove a-c voltmeter and connect shield to terminal 2 of E1501.

2. Adjust AF GAIN control on SME for -12 dB indication on front-panel meter (set at AF position).

3. Set ANTI-VOX and VOX GAIN controls to minimum (counterclockwise).

4. Set mode selector switch of SME at SSB.

5. Set LSB/USB toggle switch at USB.

6. Set VOX/PTT switch at PTT.

7. Set TRANSMITTER toggle switch of ECPA at TUNE.

8. Set METER switch of SME at RF.

9. Set HV LINE switch of PSP at ON.

10. Adjust RF GAIN control of SME for full PEP output indication on output meter.

REQUIREMENT: 175 watts or 93 volts across 50 ohms.

11. With r-f spectrum analyzer appropriately adjusted to monitor transmitted frequency, measure distortion.

REQUIREMENT: 35 dB down from either tone of a standard two-tone test.

12. Set USB/LSB toggle switch of SME at LSB; distortion product should be the same as for USB.

13. Set USB/LSB toggle switch of SME at USB.

14. Set TRANSMITTER toggle switch of ECPA at REMOTE.

15. Depress LSB pushbutton on TPC; sideband should shift.

NOTE

Make certain that the LSB/USB REMOTE switch of SMRA is set at USB REMOTE after TPC test.

16. Set TRANSMITTER PLATES switch of PSP at STANDBY REMOTE and depress handset button of TPC.

17. Holding TPC handset button closed, depress LSB pushbutton on TPC. Note if sidebands shift on r-f spectrum analyzer screen.

18. Set HV LINE switch of PSP at OFF.

19. With TRANSMITTER toggle switch of ECPA set at REMOTE, repeat steps in paragraphs d and e for all 8 channels. Make certain that the SME is unkeyed while selecting channels, i.e., place r-f drive control to minimum and TRANSMITTER toggle switch of ECPA set at REMOTE.

20. Upon completion of step 15, set up transmitter and check out ATS subsystem as described in ATS subsystem technical manual.

21. This completes the transmitter section checkout. Remove all test equipment and set up for receiver section checkout. Remove all test equipment and set up for receiver section checkout.

f. OPERATIONAL RECEIVER CHECKOUT.

1. Disconnect coax lead from connector J1502 of SMRA and connect test setup as shown in figure A.

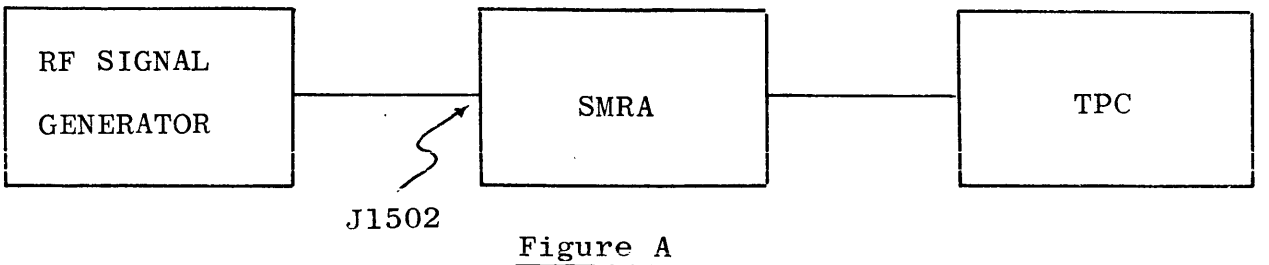


Figure A

2. Adjust signal generator and SMRA to the channel frequency to be checked.

3. Adjust signal generator for 100 mv modulated at 1000 output.

4. Set volume controls maximum clockwise of SMRA and TPC.

5. Set SIMPLEX/DUPLEX toggle switch of SMRA at SIMPLEX.

6. Set sideband selector toggle switch of SMRA at USB REMOTE.

7. Set SPEAKER toggle switch of ECPA at REMOTE.

NOTE

At this point, make certain that the sideband selector switches on both the SMRA and SME are set at USB.

8. Set SQUELCH control of SMRA maximum clockwise.

9. Modulated tone from signal generator should be audible at TPC speaker.

10. Adjust audio output for a comfortable listening level.

11. Depress LSB pushbutton of TPC. Tone should still be audible with slight re-adjustment of signal generator, indicating sidebands have shifted.

12. Turn off signal generator. Tone should stop and receiver noise should be audible.

13. Adjust SQUELCH control of SMRA counterclockwise until receiver noise is no longer audible.

14. Turn on signal generator set for 100 mv modulated.

15. Tone from signal generator should be audible.

16. Vary RECEIVER CLARIFIER control of SMRA TTRR module and note variation in tone.

17. Reset SQUELCH control of SMRA fully clockwise. This completes the receiver operational check.

g. SENSITIVITY CHECK.

1. Disconnect TPC from its connector and set the LSP toggle switch at OFF.

2. Connect test setup as shown in figure B.

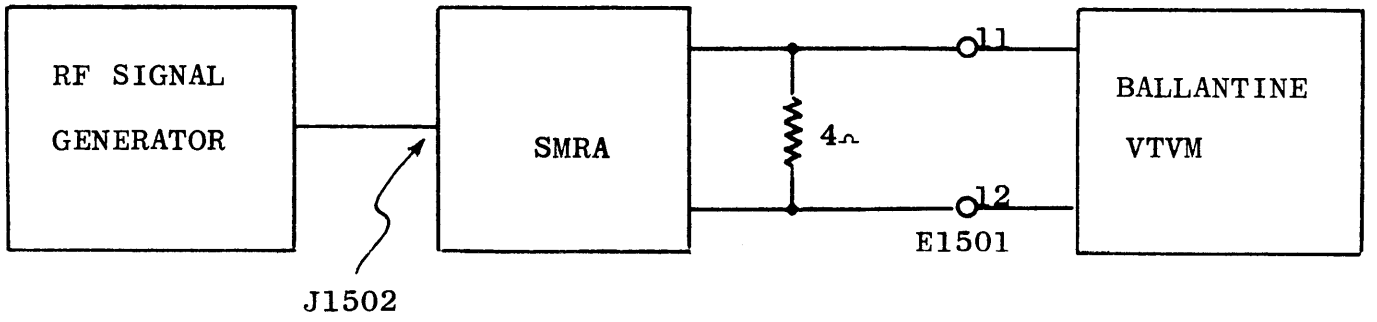


Figure B

3. With the SMRA controls set as outlined in steps 1 through 15 of the preceding paragraph f., adjust the signal generator for an output of 100 microvolts at the desired frequency.

4. Set SPEAKER toggle switch of ECPA at **LOCAL.**

5. Tune signal generator until a beat is audible at the speaker.

6. Reduce signal generator output until beat note just exceeds noise.

NOTE

Some retuning of the signal generator may be required as output is reduced.

7. Set SPEAKER toggle switch of ECPA at **REMOTE.**

8. Readjust volume control to obtain reading on Ballantine a-c voltmeter.

9. Adjust signal generator output for 1 microvolt.

10. Set Ballantine a-c voltmeter to the 1 volt full scale position and adjust volume control for a meter reading of .78 V. This is the signal plus noise level,

read in db.

11. Remove signal generator from antenna connector J1502 and connect 50 ohm dummy load.

12. Read output now indicated on Ballantine a-c voltmeter using signal plus noise level as db reference. This reading is noise level in db.

$$\frac{\text{Signal + Noise}}{\text{Noise}} = \text{Ratio}$$

REQUIREMENT: Above ratio shall not exceed 20 db.

13. Repeat preceding procedure for all channels. Select channels manually, turning clockwise.

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL

The MCTR is a single sideband voice, simplex operation transmitter and receiver system, able to be operated remotely by means of Telephone Remote Control, Model TPC. The TPC provides pushbutton selection of any one of eight pre-determined receiver frequency channels, monitored either by the TPC speaker or handset earpiece. Selection of either sideband (USB or LSB) of the selected receiver channel is also provided.

The transmitter section also provides eight separate transmit frequencies, but are not remotely selectable. Transmitter "standby" and transmitter "on" functions are also remote pushbutton selectable.

3-2. OPERATOR'S INSTRUCTIONS

Operation of the MCTR may be divided into two modes: remote control and local control.

a. REMOTE CONTROL. - Remote control of the MCTR employs use of Telephone Remote Control, Model TPC. To activate the TPC, the operator must set the POWER toggle switch on the Speaker Panel, Model LSP at ON. This action activates the LSP power supply, providing operating voltages to the TPC indicator lamp circuitry and to the channel selector stepping switch motor in the Solid State Receiver, Model SMRA. The SPEAKER and TRANSMITTER toggle switches on the Equipment Connect Panel, Model ECPA must be set at REMOTE. The remaining modular unit controls must be set for single sideband (SSB), simplex, push-to-talk (PTT) operation. Refer to table 3-1, used in conjunction with figure 3-1, for MCTR controls and indicators

locations and functions.

Refer to the individual modular unit technical manuals for associated operating instructions.

b. LOCAL CONTROL. - Local control of the MCTR requires de-activation of the remote control unit (TPC) and removal of all automatic control voltages accomplished by de-activating the power supply in the LSP; POWER toggle switch set at OFF. This action removes the remote control voltage source from the SMRA channel selector stepping switch motor and the operating voltage of the TPC. Local receiver audio monitoring is accomplished by the LSP speakers. This is accomplished by setting the SPEAKER toggle switch on ECPA at LOCAL. The TRANSMITTER toggle switch on the ECPA, when set at TUNE, provides a lock-key condition to the Solid State Exciter, Model SME, enabling tuning of the Linear RF Amplifier, Model RFA and the antenna.

Table 3-1. Controls and Indicators

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	MCU	
1	TUNE-OPERATE switch	Toggle switch that limits transmitter output power to 100 watts when in TUNE position.
2	POWER(ON-SHORT-X10-X1)	Four-position rotary switch that turns on monitor control, selects watts scales factors, and shorts power meter coils.
3	RESET switch	Push-button switch that operates relay K103 to return it to the latched position if it has tripped due to excessive vswr or transmitter output.
4	OVERLOAD indicator	Indicator that lights to indicate that relay K103 has tripped, interrupting transmitter main power.
5	POWER indicator	Indicator that lights to indicate that monitor control is turned on.
6	2A fuse	Protect power supply a-c input circuits.
7	POWER meter (Standing wave indicating meter)	Dual-pointer meter with scales calibrated for forward-watts, reflected-watts, and VSWR (voltage standing wave ratio). The watts scales are calibrated 0 to 100. The scale readings are multipled by 10 when the POWER (ON-SHORT-Z10-X1) switch is in the X10 position. The VSWR on the transmission line is indicated by the point of intersection of the meter pointers.
8	RESISTANCE-OPERATE switch	Push-button switch that controls and unidirectional motor that drives the selector switch in the antenna tuner for selection of autotransformer taps to match antenna resistance. The selector switch contacts resistance positions 1 to 6 in a clockwise direction and repeats the cycle.
9	STOP indicator	Indicator that indicates when maximum or minimum inductances of the variable inductor in the antenna tuner have been reached. Micro-

Table 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	MCU (CONT)	
		switches are incorporated in the antenna tuner to prevent the reactance changing motor from overdriving at either end of the moving contact travel. These switches interrupt the motor power and energize the STOP indicator.
10	Resistance, reactance, humidity meter	Three-scale meter that indicates reactance on an upper black scale calibrated 0 to 100, resistance on a middle red scale calibrated 1 to 6, and humidity on a lower scale.
11	REACTANCE (INCR. - DECR.) lever action switch	Three-position level action switch that returns to a neutral-center open circuit position when released. Controls and direction of the reversible motor that drives the contact on the variable inductance in the antenna tuner. When the switch is held in the INCR. position, the motor shaft rotates in a direction to increase the inductance of the DECR. position, motor shaft rotates in a direction to decrease the inductance of the variable inductor.
12	METERS (RES. - REACT. - HUM.) selector switch	Three-position rotary switch that returns to REACT. position when released. When in RES. position, read the red RESISTANCE scale of meter M102, calibrated 1 to 6. When in REACT. position, read the upper black reactance scale of meter M102, calibrated 0 to 100. When in HUM. position, read the lower humidity scale of meter M102.
	RFA	
13	DRIVER/BAND	Selects in and out various coils to change the resonate frequency of the driver plate tank.
14	PA/TUNING	Varies the main PA tuning capacitor to resonate the circuit to the desired frequency.
15	DRIVER/TUNING	Varies the driver tuning capacitors to resonate the circuit to the desired frequency.

Table 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	RFA (CONT)	
16	PA PLATE	Indicates PA plate current.
17	MULTIMETER	Indicates selected readings of MULTIMETER (20) switch positions.
18	PA BAND	Sets PA tank to the proper band by selecting the appropriate tap on the PA tank coil.
19	PA/LOADING	Adjusts the amount of coupling to the load.
20	MULTIMETER	Permits selective indications of PA filament voltage, PA screen grid current, PA d-c plate voltage, RF input and output voltage of PA.
	SME	
21	POWER toggle switch	When set ON connects primary power to unit power supply.
22	POWER lamp	Lights when primary power is applied to power supply.
23	VOX/PTT toggle switch	When set at VOX, enables exciter to be keyed by input audio signal. When set at PTT, enables push-to-talk switch to key exciter.
24	LSB/USB toggle switch	Selects either upper sideband or lower sideband operation.
25	METER toggle switch	When set at AF, panel meter responds to AF GAIN control settings. When set at RF, panel meter responds to RF GAIN control settings.
26	No identification. Screwdriver controlled trimmer on TTRT module.	Permits fine adjustment of output frequency.
27	F1/F2 switch (on TTRT module)	Selects one of two closely adjacent operating frequencies as noted on TTRT front panel.
28	Panel meter	Used to monitor AF and RF levels, selected by METER toggle switch (25).
29	CHANNEL selector switch.	Selects one of eight operating frequency channels (one of eight TTRT modules).

Table 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	SME (CONT)	
30	ANTI-VOX control	Selects level of receiver audio output signal required to cancel action of VOX circuit.
31	VOX GAIN control	Selects level of audio input signal required to key exciter when VOX/PTT switch 23 is set at VOX.
32	AF GAIN/OFF control	Clockwise rotation connects power supply to primary power and increases gain of audio amplifier. Full counterclockwise rotation disconnects primary power.
33	CW/SSB/20 DB/ AM/MCW switch	Selects mode of operation. 1. CW (keyed carrier telegraph). 2. SSB (single sidebanc, suppressed carrier.) 3. 20 DB (single sideband, reduced carrier.) 4. AM (single sideband, full carrier.) 5. MCW (keyed tone telegraphy.)
34	HANDSET jack	Permits connection of handset to exciter.
	HANDSET/LINE switch (located on rear of unit)	When set at HANDSET, enables compression circuit of audio amplifier. When set at LINE, disables compression circuit.
	SMRA	
35	POWER lamp	Lights when receiver's power supply is energized.
36	POWER switch	When set at ON, energizes receiver power supply circuit.
37	SIMPLEX/DUPLEX switch	When set at SIMPLEX, enables remote controlled receiver muting circuit, when set at DUPLEX, disables muting circuit.
38	LSB/USB REMOTE switch	Selects lower sideband or upper sideband reception; when set at USB REMOTE, sideband may be selected remotely.

Table 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	SMRA (CONT)	
39	METER switch	Connects meter (item 2) to indicate r-f input level or 600-ohm audio output level.
40	RECEIVER CLARIFIER control (one on each TTRR module)	Permits fine tuning of HFO in TTRR module.
41	F1/F2 switch (one on each TTRR module)	Selects operating frequency in conjunction with CHANNEL switch.
42	Meter	Indicates r-f input level or 600-ohm audio output level as selected by METER switch.
43	CHANNEL switch	Selects operating frequency with F1/F2 switches.
44	SQUELCH control	Determines level of r-f input signal required to enable loudspeaker and phone audio output circuits.
45	LINE LEVEL control	Controls level of audio signal applied to 600-ohm output.
46	VOLUME control	Controls level of audio signal applied to speaker and PHONES jack.
47	PHONES jack	Permits connection of headphones to receiver; when phones are used, the speaker output is disabled.
	LSP	
48	Fuse, indicator type	A-c input line voltage protective fuse, 1-amp slo-blow.
49	Lamp, neon	A-c input power indicator; lights when power is applied to unit.
50	ON/OFF, toggle switch	When set at ON, applies a-c input power to unit, enabling channel selector pushbuttons on TPC to select desired SMRA receiver channel. When set at OFF, disables automated stepping switch circuits, enabling local (manual) receiver channel selection.

TABLE 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	ECPA	
51	SPEAKER, toggle switch	When set at REMOTE, speaker audio output is applied to a remote speaker (Telephone Remote Control). When set at LOCAL, audio output is applied to local speaker (LSP-6X).
52	TRANSMITTER, toggle switch	When set at REMOTE, the transmitter is controlled by a remote unit (Telephone Remote Control). When set at TUNE, the transmitter is removed from remote control and may be manually tuned.
	PSP	
53	HV LINE/OVERLOAD	Indicates overload in HV line when lit.
54	HV LINE ON/OFF	When set at ON, applies HV to final plate circuits when TRANSMITTER PLATES switch (52) is set at ON.
55	HV LINE	Indicates HV present when HV LINE ON/OFF switch (50) is set at ON.
56	TRANSMITTER PLATES	When set at ON, plate and screen voltages are applied to the driver, ALDC and final plates (HV LINE switch at ON). When HV LINE switch (50) is set at OFF, plate and screen voltages are applied to the driver and ALDC stages only. STANDBY/REMOTE position permits remote control of these functions.
57	TRANSMITTER PLATES	Indicates, when lit, TRANSMITTER PLATES switch (52) set ON.
58	MAIN LINE	Indicates, when lit, line voltage is applied when MAIN LINE ON/OFF switch (55) is set ON.
59	MAIN LINE ON/OFF	When set ON, line voltage is applied to unit with line overload protection.

TABLE 3-1. Controls and Indicators (Cont)

ITEM NO.	CONTROLS AND INDICATORS	FUNCTION
	PSP (CONT)	
60	LV SUPPLY/MAIN	Input line voltage protective fuse; 1A/11VAC, .5A/230VAC.
61	LV SUPPLY/B	Power supply output voltage protective fuse; .125A.
	TPC	
62	Handset Cradle Switch	When cradle is down (handset properly seated in cradle), receiver audio output is monitored on TPC base speaker. When handset is removed from cradle, audio is monitored on handset earpiece.
63	VOLUME control	Used to adjust receiver audio output level (volume) at TPC base speaker.
64	XMTR ON pushbutton switch	When depressed, activates associated transmitter.
65	XMTR STANDBY pushbutton switch	When depressed, sets associated transmitter at a standby condition.
66	USB pushbutton switch	When pressed, selects upper sideband operation of selected receiver channel.
67	LSB pushbutton switch	When pressed, selects lower sideband operation of selected receiver channel.
68	CHAN pushbutton switches (8)	When any one of the 8 channel pushbuttons are depressed, that selected channel number, corresponding to the associated receiver channels, will be activated and monitored.
69	Transmit/Receive handset switch	When handset is used, switch permits operator to talk (with button pressed) and listen (with button released).

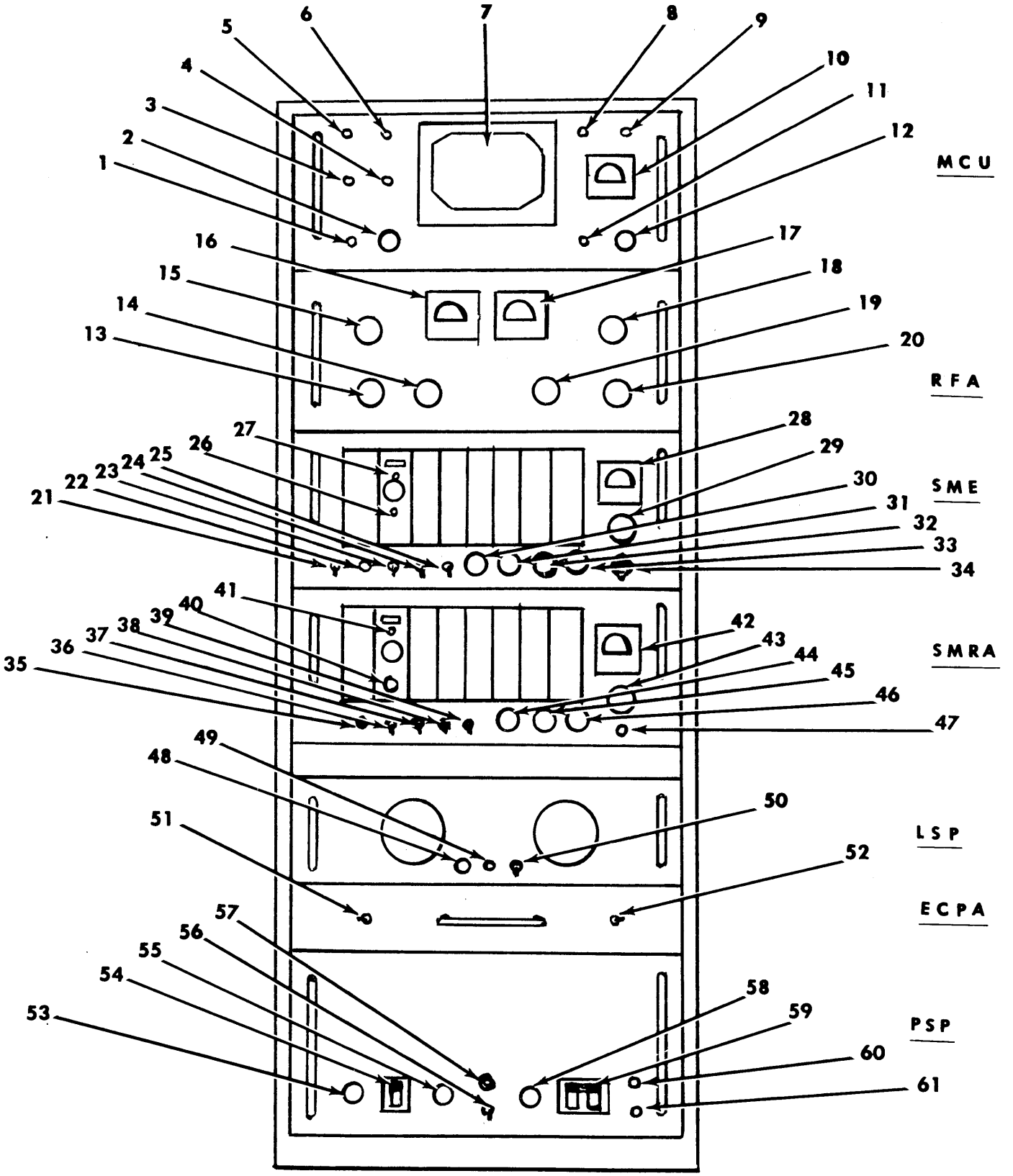


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Figure 3-1. Controls And Indicators (sheet 1 of 2)

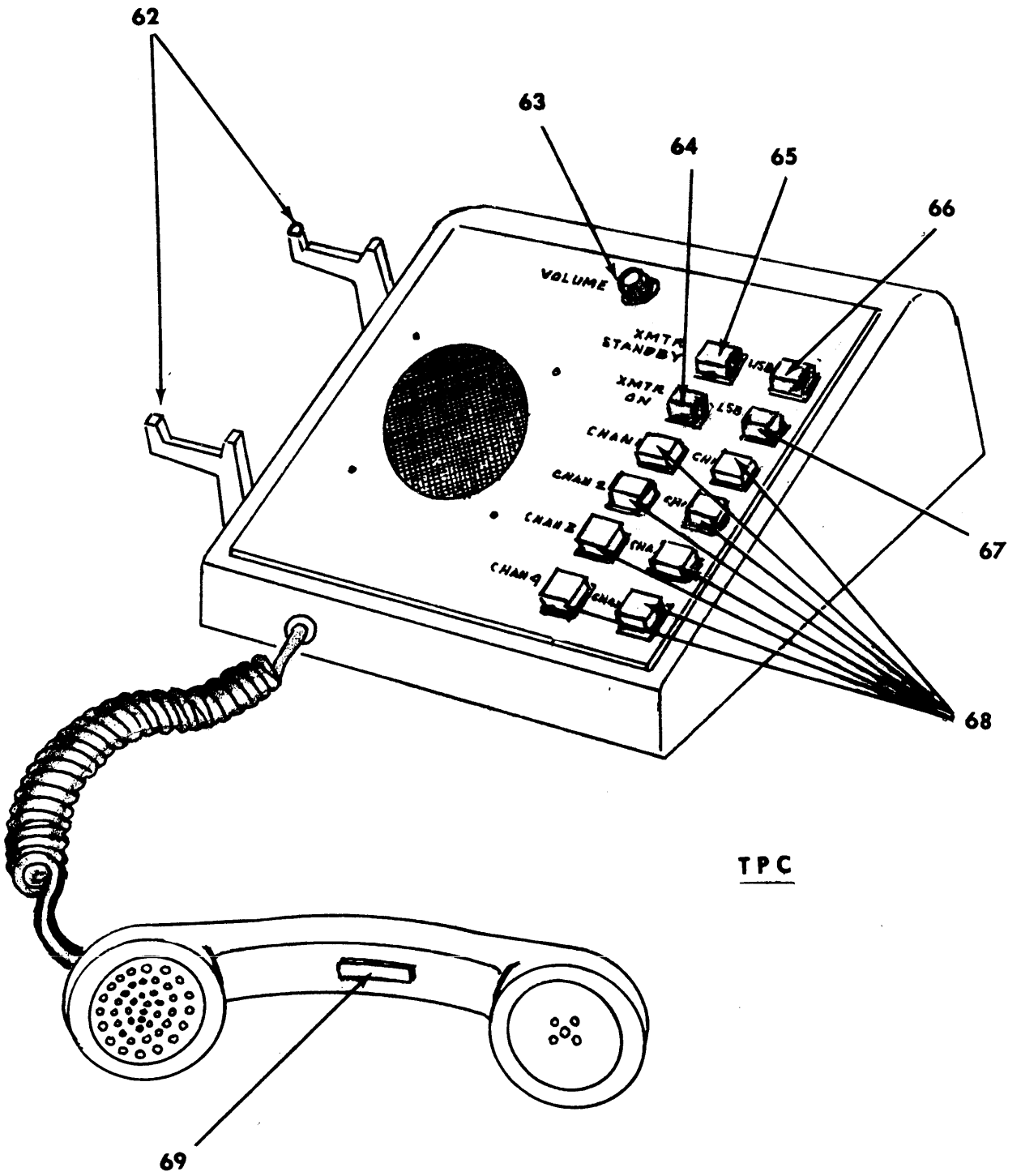

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Figure 3-1. Controls And Indicators (sheet 2 of 2)

SECTION 4
PRINCIPLES OF OPERATION

4-1. INTRODUCTION

The MCTR is a transmitter/receiver system, operating from a single, switchable-input antenna arrangement. The transmitter exciter and receiver tuner sections provide a frequency coverage in the range of 2 to 32 mc. The transmit and receive frequencies, separated into eight channels, may be preselected within the 2 to 32 mc range. When operating, the transmitter frequency channels must be local or manually selected, whereas the receiver frequency channels may be selected either manually or automatically by means of a remote control unit.

The transmitter section incorporates an overload protective circuit, disabling the transmitter when the VSWR or transmitter power exceed the pre-set levels.

4-2. CIRCUIT DESCRIPTION

The following circuit description is discussed in reference to the simplified block diagram figure 4-1. Further detailed circuit descriptions may be obtained from the individual modular unit and subsystem technical manuals.

a. Receiver Section. - The received signal, from a vertical whip antenna, is applied to the receiver section via Antenna Tuner Unit TU (part of ATS subsystem), through normally closed contacts of Antenna Changeover Relay RL139-2 (K3001), to the antenna input connector of Solid State Receiver SMRA.

Within the SMRA the incoming signal is applied to one of eight receiver channel plug-in r-f modules (TTRR) through a normally closed contact of simplex/duplex relay K1502 and a CHANNEL selector

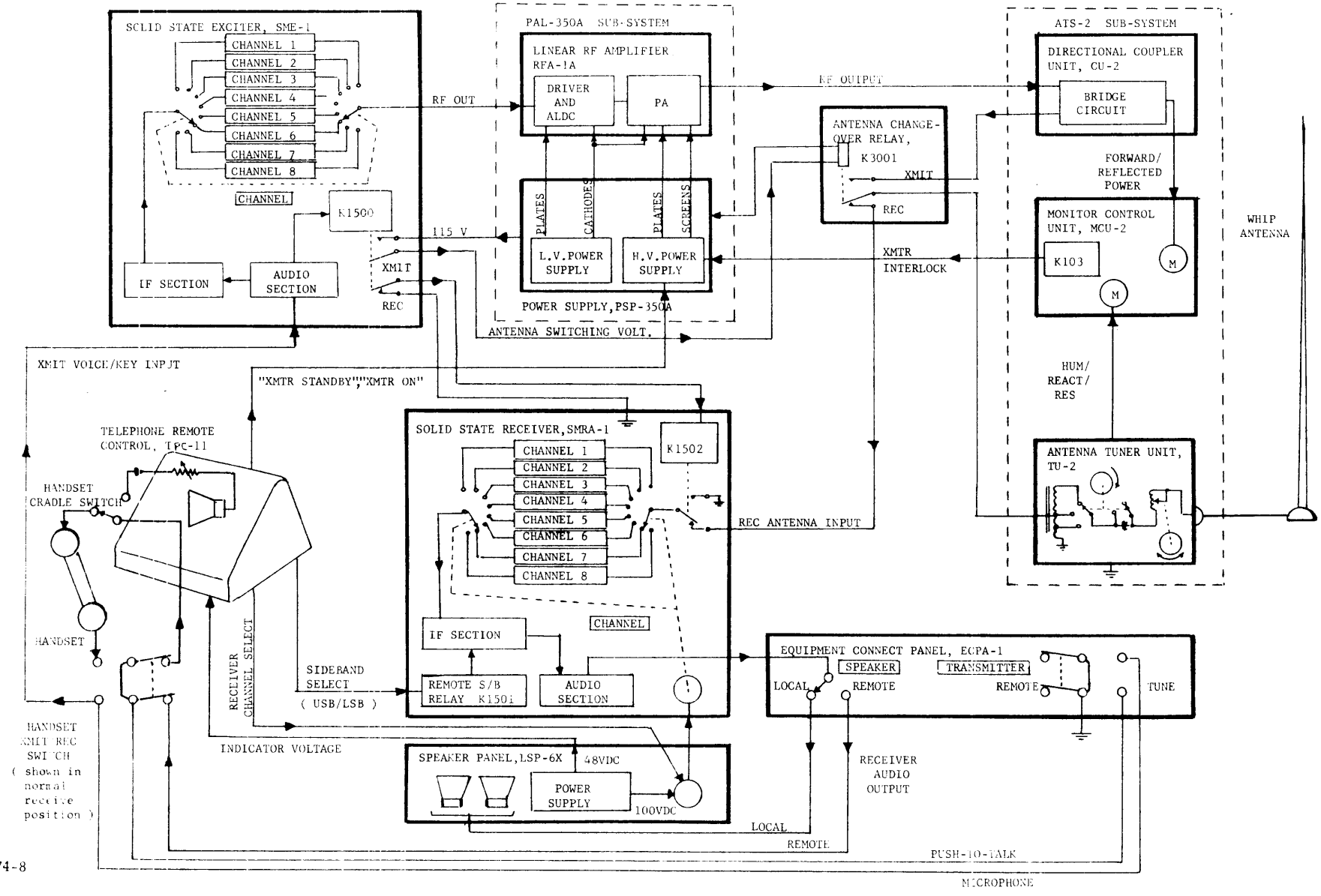


Figure 4-1. System Block Diagram, MCTR

switch.

Each TTRR module is fixed-tuned to a different frequency so that the SMRA can receive signals on any one of eight frequencies (determined by the TTRR module selected by the CHANNEL selector switch). Additional sections of the CHANNEL selector switch provide operating voltages and delayed agc voltage to the selected TTRR module.

Selection of a particular frequency channel (TTRR module) may be accomplished either manually, by setting the CHANNEL selector switch to the desired channel number, or remotely by use of channel select pushbuttons on Telephone Remote Control, TPC. Depressing any one of the eight channel-select pushbuttons on the TPC will send a corresponding channel-select positioning signal to a master motor-controlled stepping switch in Speaker Panel LSP. The master motor-controlled stepping switch in the LSP routes the selected channel-positioning voltage to the slave motor-controlled CHANNEL selector stepping switch in the SMRA. The resulting action positions the CHANNEL selector switch of Solid State Receiver SMRA to correspond with the channel-select pushbutton depressed at the TPC.

In simplex operation, the SMRA is muted when the MCTR is transmitting and is activated when the MCTR is receiving. This is accomplished by the transmit/receive relay in Solid State Exciter SME. The transmit/receive relay (K1500) in the SME is configured so that when the transmitter is keyed, the simplex/duplex relay K1502 in the SMRA energizes, grounding the receiver antenna input to Solid State Receiver SMRA. Thus, the receiver is muted during transmission and activated when receiving.

Receiver sideband selection may be accomplished either manually, by use of the SMRA sideband select switch, or remotely by use of

the SMRA sideband select switch, or remotely by use of USB or LSB pushbuttons on Telephone Remote Control TPC. Depressing either the USB or LSB pushbuttons on the TPC will initiate a signal to the remote sideband relay K1501 in Solid State Receiver SMRA, placing the SMRA in a USB or LSB reception mode.

The amplified receiver audio output is applied to the SPEAKER switch on Equipment Connect Panel ECPA. For local receiver audio monitoring, the SPEAKER switch is set at LOCAL, thus routing the receiver audio output to Speaker Panel LSP.

For remote monitoring, the SPEAKER switch is set at REMOTE, thus routing the receiver audio output to Telephone Remote Control TPC.

The receiver audio output, at the TPC, may be monitored by the volume-controlled TPC speaker or by the handset earpiece. When the handset is resting on its cradle, the receiver audio output is applied to the TPC speaker. When the handset is lifted from its cradle, the cradle switch disconnects the audio from the speaker and applies it to the handset earpiece. A handset push-to-talk switch, normally closed for reception, will disconnect the audio from the TPC when depressed, allowing voice transmission via the handset mouthpiece (microphone), i.e., simplex push-to-talk operation.

b. Transmitter Section - Transmission is accomplished by use of the Telephone Remote Control TPC handset microphone feeding into any one of eight manually selected transmit-frequency channels of Solid State Exciter SME. The selected transmit frequency r-f output from the SME is applied to Linear RF Amplifier for power amplification, and is then routed to Directional Coupler Unit CU. The CU, in turn, applies a portion of the r-f output to Monitor Control Unit MCU, for power meter monitoring, and to Antenna Changeover

Relay RL139-2 (K3001). The r-f output, at K3001 is routed to Antenna Tuner Unit TU for connection to the associated vertical whip antenna.

When transmitting, the TRANSMITTER switch on Equipment Connect Panel ECPA, must be set at REMOTE, giving full transmit control capabilities to Telephone Remote Control TPC.

Transmitter activation is accomplished by the XMTR STANDBY and XMTR ON pushbuttons on the TPC. These pushbuttons control the high-voltage power-supply section in Power Supply PSP (part of PAL sub-system) which provides plate and screen voltages to the final PA section in Linear RF Amplifier RFA (part of PAL sub-system).

With the RFA activated (XMTR ON pushbutton of TPC depressed), the transmitter section is ready for keying. Keying is accomplished by depressing the transmit/receive pushbutton switch (push-to-talk) of the TPC handset and speaking into the handset mouthpiece (microphone). The keyed transmit voice output from the TPC handset is applied to an audio section in Solid State Exciter SME, routed through an IF section and to the input of any one of eight manually selected (via CHANNEL selector switch) transmit-frequency channels.

The transmit-frequency channels are fixed-tuned, frequency pre-selected modules (TTRT) each containing a local oscillator, a balanced mixer and three r-f amplifiers. The bandpass of the r-f amplifiers in the TTRT modules are sufficient to pass either the upper or lower sidebands.

When Solid State Exciter SME is keyed, a transmit/receive relay K1500 in the SME energizes, causing the simplex/duplex relay in the Solid State Receiver SMRA to deenergize, muting the receiver.

A second set of contacts of transmit/receive relay K1500, energized when keyed, routes a relay energizing voltage, from the Transmitters High Voltage Power Supply to the solenoid of Antenna Changeover Relay K3001. With K3001 energized, the associated vertical whip antenna is disconnected from the receiver, and switched over to the transmit position.

The selected transmitter frequency output, voice modulated, is applied to the input of Linear RF Amplifier for power amplification. The amplified r-f output from the RFA is applied to the input of Directional Coupler Unit CU (part of ATS sub-system).

The CU contains a bridge circuit, separating the transmitter r-f output for distribution to the antenna and to Monitor Control Unit MCU (part of ATS sub-system) for forward and reflected power-output meter monitoring.

The CU r-f antenna output is applied through the closed contacts of Antenna Changeover Relay K3001, energized when the SME is keyed, to the input of Antenna Tuner Unit TU (part of ATS subsystem).

The TU provides antenna resistance matching, balancing and neutralizing by use of a unidirectional motor-controlled autotransformer, and a reversible motor-controlled variable inductance network. The TU feeds, to Monitor Control Unit MCU, positioning readings of hum, reactance and resistance settings.

The MCU contains a set/reset relay circuit which controls the high-voltage power-supply section of Power Supply PSP. Should the power output or vswr exceed preset levels, the transmitter will be deactivated by disabling the high-voltage power-supply of the PSP.

If the transmitter is to be tuned, the TRANSMITTER switch on

Equipment Control Panel ECPA must be set at TUNE. This action effectively grounds the push-to-talk and microphone circuits of Telephone Remote Control TPC, providing a lock-key condition to the exciter (SME) for tuning purposes.

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.

At periodic intervals, 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 breathing of the vapor. 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

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to symptoms of past failures or due to component aging.

The first step in troubleshooting is to ascertain that proper equipment voltages are present, interconnecting cables are secure, and that all fuses are in functional condition. Refer to table 5-1, used in conjunction with figure 5-1, for system fuse locations and functions.

NOTE

Never replace a fuse with one of a higher rating unless brief continued operation is more important than probable equipment damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

If the above mentioned checks fail to locate the fault, perform the pre-operational checkout procedure shown in paragraph 2-3. Use of this procedure will help localize the particular fault at hand.

Visual troubleshooting of the modular unit chassis components and tube conditions may also help localize the fault. Refer to the individual modular unit technical manuals for associated unit troubleshooting procedures.

The following troubleshooting aids are provided:

a. External cabling connections (Figure 2-2).

b. Interconnection diagram (Figure 2-4).

c. Pre-operational checkout procedures (Paragraph 2-3).

d. System block diagram (Figure 4-1).

e. Fuse functions (Table 5-1).

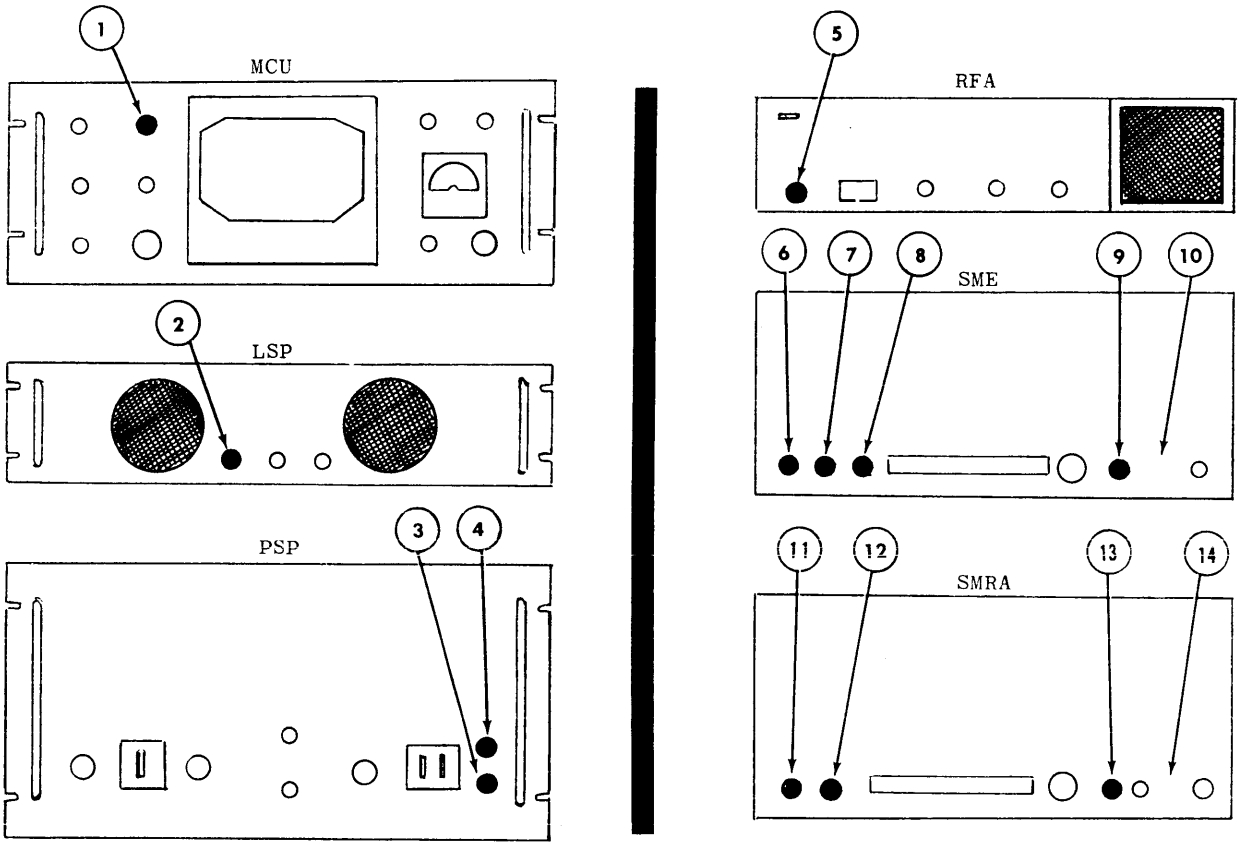
f. Cable assembly diagram, CA960 (Figure 5-3).

5-3. REPAIR AND REPLACEMENT

Maintenance of the MCTR will consist mainly of component replacement. It should be noted that when replacing components having many wires connected, such as switches, relays, etc., the wires should be tagged and marked for accurate identification when replacing .

When replacing components, the technician should observe for exact or equivalent replacements by referring to the parts list of the appropriate modular unit technical manual.

Polarity and positioning of certain components should be observed before removing so that the replacement component will fit and operate correctly.



FRONT PANEL FUSE LOCATIONS

REAR PANEL FUSE LOCATIONS

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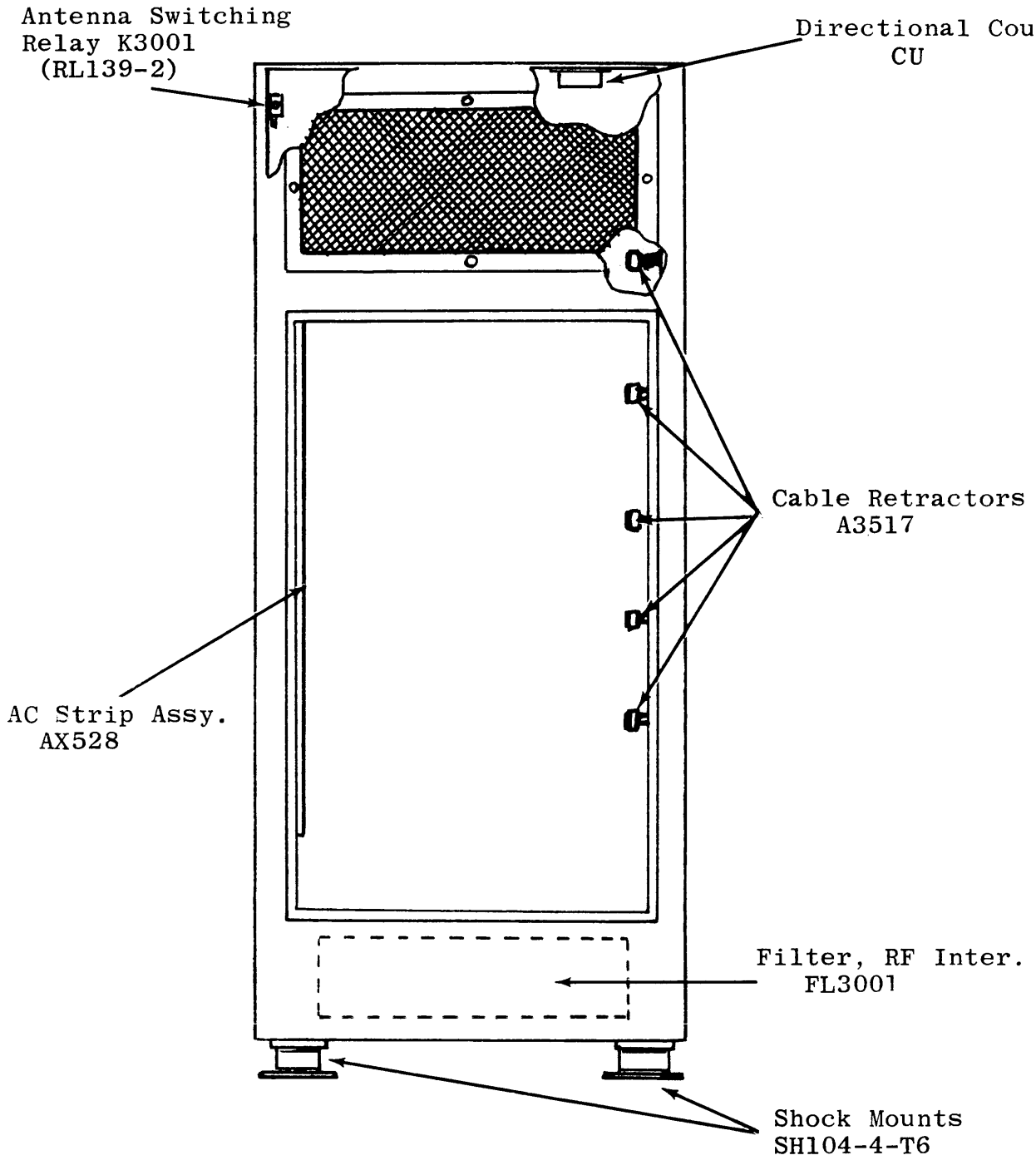
Figure 5-1. Fuse Locations

TABLE 5-1. FUSE FUNCTIONS, MCTR

ITEM NO. Figure 5-1	REFERENCE SYMBOL NO.	UNIT	FUSE RATING	CIRCUIT PROTECTED
(1)	F101	MCU	2A/115V	Power supply a-c input circuit.
(2)	F101	LSP	1A/SLO-BLOW	Power supply a-c input circuit.
(3)	F101	PSP	1A/115V	Low-voltage supply a-c input circuit.
(4)	F102	PSP	.187A	Low-voltage supply d-c output circuit.
(5)	F201	RFA	1A/115V	A-c input circuit.
(6)	F911	SME	.125A	Negative 36-volts d-c power supply.
(7)	F910	SME	.125A	Positive 12-volts d-c power supply.
(8)	F909	SME	.125A	Negative 12-volts d-c power supply.
(9)	F907	SME	.125A/ 115V	Power supply a-c input circuit.
(10)	F908	SME	SEE NOTE	Crystal oven input.
(11)	F910	SMRA	.250A	Positive 12-volts d-c power supply.
(12)	F909	SMRA	.250A	Negative 12-volts d-c power supply.
(13)	F907	SMRA	.125A/ 115V	Power supply a-c input circuit.
(14)	F908	SMRA	SEE NOTE	Crystal oven input.

NOTE: Fuse values for F908 in the SME and SMRA units are dependent upon the type of crystal oven used.



RAK-106 REAR VIEW

374-10

Figure 5-2. Equipment Cabinet Components.

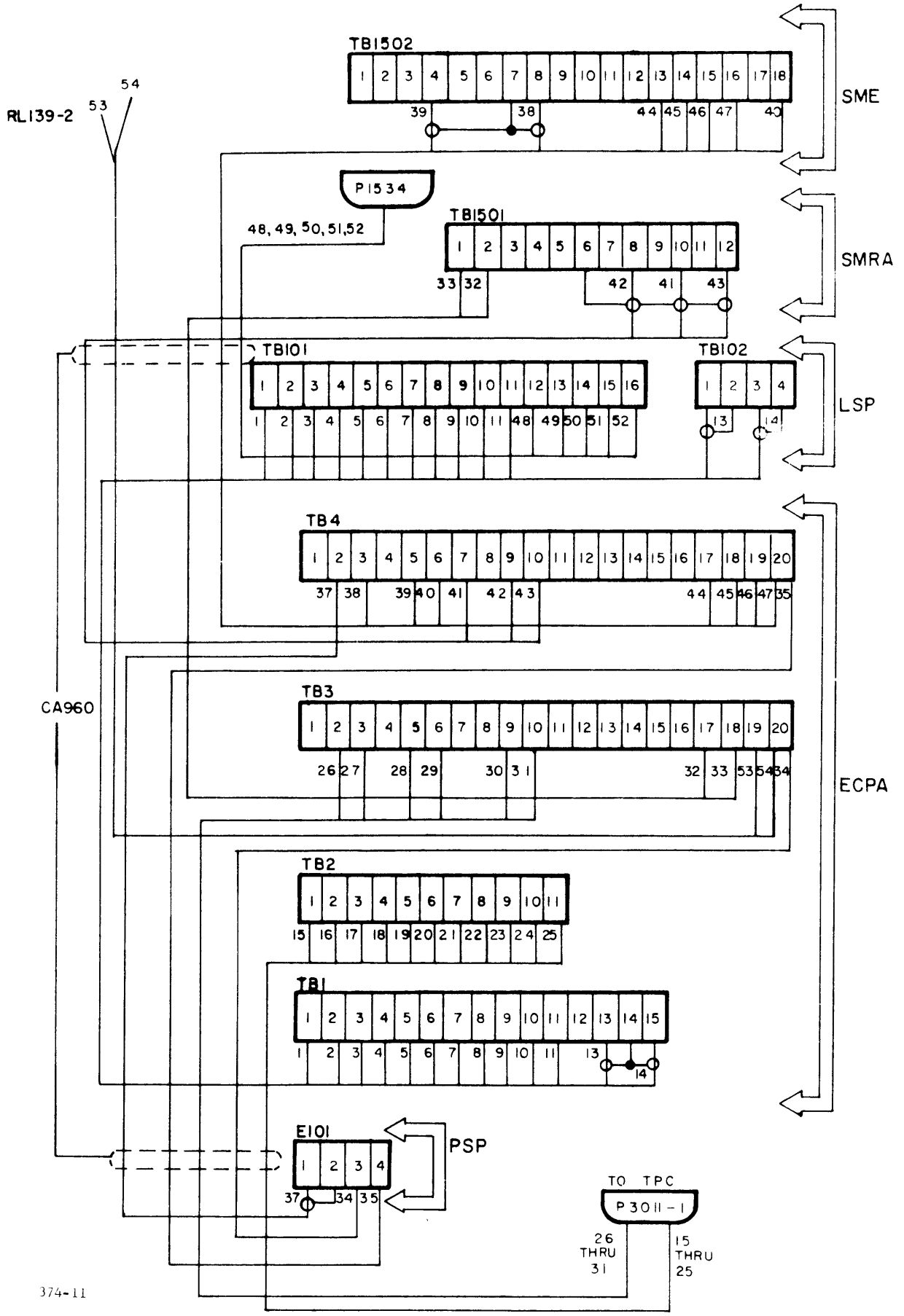


Figure 5-3. Cable Assembly, CA960

SECTION 6
PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference lis 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. Reference symbol.

b. Description as indicated in parts list.

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 order to:

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

PARTS LIST

for

CABINET, ELECTRICAL EQUIPMENT RAK-106

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A3001	FAN/CONNECTOR ASSEMBLY	A4038
B3001	FAN, AXIAL: 115/230 VAC; single phase, 50/60 cps; nominal RPM 3,400. Part of A4038.	BL123
C3000 thru C3017	NOT USED	
C3018	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uuf, ±10%; 600 WVDC; Part of A4038.	CP41B1FF405K
CP200 thru CP202	NOT USED	
CP203	ADAPTER, CONNECTOR, ELECTRICAL: BNC	UG306*/U
CP204	NOT USED	
CP205	ADAPTER, CONNECTOR, ELECTRICAL: UHF	UG646*/U
CP301	ADAPTER, CONNECTOR, ELECTRICAL: HN	UG212*/U
CP302	Same as CP301.	
CP3001	Same as CP205.	
FL3001	FILTER, RADIO INTERFERENCE: current rating 20 amps at 250 VAC/600 VDC; power frequency 0 thru 400 cps.	FI102
J3001	CONNECTOR, RECEPTACLE, ELECTRICAL: AC; 2 female contacts rated for 10 amps at 250 VAC or 15 amps at 125 VAC; polarized. Part of AC strip assembly AX528.	JJ294
J3002 thru J3007	Same as J3001.	
J3008	CONNECTOR, RECEPTACLE, ELECTRICAL: female. Part of W3001.	MS3102A14S2S
J3009 thru J3011	NOT USED	
J3012	CONNECTOR, RECEPTACLE, ELECTRICAL: female. Part of W3008.	MS3102A20-27S

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K3001	RELAY, ARMATURE: RF	RL139-2-110 AC
MP3001	FILTER, AIR CONDITIONING: replaceable type.	AD103-2
MP3002	RETRACTING ASSEMBLY, SPRING	A3517
MP3003 thru MP3006	Same as MP3002.	
P101-1	CONNECTOR, PLUG, ELECTRICAL: male. Part of W3008.	MS3106A20-27P
P101-2	CONNECTOR, PLUG, ELECTRICAL: 2 female contacts, rated for 10 amps at 250 V; polarized. Part of W3013.	PL176
P101-3	Same as P101-2. Part of W3004.	
P102-1	CONNECTOR, PLUG, ELECTRICAL: male. Part of W3006.	MS3106A14S2P
P102-2	CONNECTOR, RECEPTACLE, ELECTRICAL: Part of W3010.	PL160P
P103	CONNECTOR, RECEPTACLE, ELECTRICAL: Part of W3017.	MS3106A14S1S
P104	CONNECTOR, PLUG, ELECTRICAL: 2 female contacts, rated for 10 amps at 250 VAC or 15 amps at 125 VAC; polarized; Part of W3007.	PL100
P201	CONNECTOR, RECEPTACLE, ELECTRICAL: Part of W3010.	PL160S
P202	NOT USED	
P203	CONNECTOR, PLUG, ELECTRICAL: BNC. Part of W3015.	UG88*/U
P204	NOT USED	
P205	CONNECTOR, PLUG, ELECTRICAL: UHF. Part of W3009.	PL259A-TEF
P301	CONNECTOR, PLUG, ELECTRICAL: HN. Part of W3005.	UG59*/U
P302	Same as P301. Part of W3009.	
P303	CONNECTOR, PLUG, ELECTRICAL: Part of W3006.	MS3106A14S2S
P901 thru P903	NOT USED	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P904-1	Same as P101-2. Part of W3011.	
P904-2	Same as P101-2. Part of W3012.	
P1501	NOT USED	
P1502	Same as P203. Part of W3016.	
P1503 thru P1515	NOT USED	
P1516	Same as P203. Part of W3015.	
P1517 thru P1533	NOT USED	
P1534	CONNECTOR, PLUG, ELECTRICAL: 5 contacts, rated for 1,900 V RMS at sea level; current rating 7.5 amps; sub-miniature type. Part of W3003.	PL225-7S
P3001	CONNECTOR, PLUG, ELECTRICAL: AC; 3 prong plug with removeable ground connection; polarized; Part of W3001.	PL218
P3001-1	NOT USED	
P3001-2	Same as P301. Part of W3014.	
P3002	NOT USED	
P3003	Same as P3001. Part of W3004.	
P3004	Same as P3001. Part of W3013.	
P3005	Same as P3001. Part of W3012.	
P3006	Same as P3001. Part of W3011.	
P3007	Same as P3001. Part of W3007.	
P3008	Same as P102-1. Part of Fan Connector Assy. A4038.	
P3009	Same as P205. Part of W3016.	
P3010	Same as P205. Part of W3005.	
P3011-1	CONNECTOR, PLUG, ELECTRICAL	PL248-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P3012	NOT USED	
P3013	Same as P205. Part of W3014.	
TB101	TERMINAL BOARD, FANNING: 6 angle type terminals; left end feed.	TM105-6AL
TB101-1	TERMINAL BOARD, FANNING: 16 angle type terminals, left end feed.	TM105-16AL
TB102	TERMINAL BOARD, FANNING: 4 angle type terminals, left end feed.	TM105-4AL
TB1501	Same as TB101-1.	
TB1502	TERMINAL BOARD, FANNING: 18 angle type terminals, left end feed.	TM105-18AL
W3001	CABLE ASSEMBLY, ELECTRICAL: AC power; consists of 2 connectors J3008, P3001.	CA575-5
W3002	CABLE ASSEMBLY, ELECTRICAL: AC power.	CA588-4
W3003	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 1 connector, five fanning strips TB101, TB101-1, TB102, TB1501, TB1502.	CA960
W3004	CABLE ASSEMBLY, ELECTRICAL: power; consists of 2 connectors P101-3, P3003.	CA555-3
W3005	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P301, P3010.	CA480-120-20
W3006	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: consists of 2 connectors P102-1, P203.	CA499-1
W3007	CABLE ASSEMBLY, ELECTRICAL: power; consists of 2 connectors P104, P3007.	CA435-4
W3008	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: consists of 2 connectors P101-1, J3012.	CA978-144
W3009	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P205, P302.	CA480-120-68
W3010	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P102-2, P201.	CA10136-110

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W3011	Same as W3004. consists of 2 connectors P904-1, P3006.	
W3012	Same as W3004. consists of 2 connectors P904-2, P3005.	
W3013	Same as W3004. consists of 2 connectors P101-2, P3004.	
W3014	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P3001-2, P3013.	CA480-120-12F
W3015	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P203, P1516.	CA480-5-84
W3016	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 2 connectors P1502, P3009.	CA480-109-76
W3017	CABLE ASSEMBLY, ELECTRICAL: power; consists of 1 connector P103.	CA1067