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REVISION (MARINE CORPS) TM-02968A-12A

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TECHNICAL MANUAL
OPERATION

COMMUNICATIONS
CENTRAL
AN/TSC-15

F34601-72-D-0655

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DEPARTMENT OF THE NAVY
Headquarters, U.S. Marine Corps
Washington, D. C. 20380

22 September 1971

1. This Manual is effective upon receipt and contains operating instructions for the Communications Central AN/TSC-15. It supersedes and cancels TM-02968A-12 in its entirety.
2. Notice of discrepancies and suggested changes to this Manual should be forwarded to the Commandant of the Marine Corps (Code CSY).

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

OFFICIAL



G. W. TROXLER
Colonel, U.S. Marine Corps
Director, Technical Division
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DEPARTMENT OF THE NAVY
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15 September 1971

1. This document is classified "Secret" and contains information of a confidential nature. It is to be controlled and its distribution is to be restricted.

2. The purpose of this document is to provide information to the Bureau of Naval Personnel regarding the status of the Department of the Navy's policy on the use of force.

BY ORDER OF THE COMMANDANT OF THE MARINE CORPS

Official

W. W. TROTT
Lieutenant Colonel
United States Marine Corps
Bureau of Naval Personnel

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RECORD OF CHANGES

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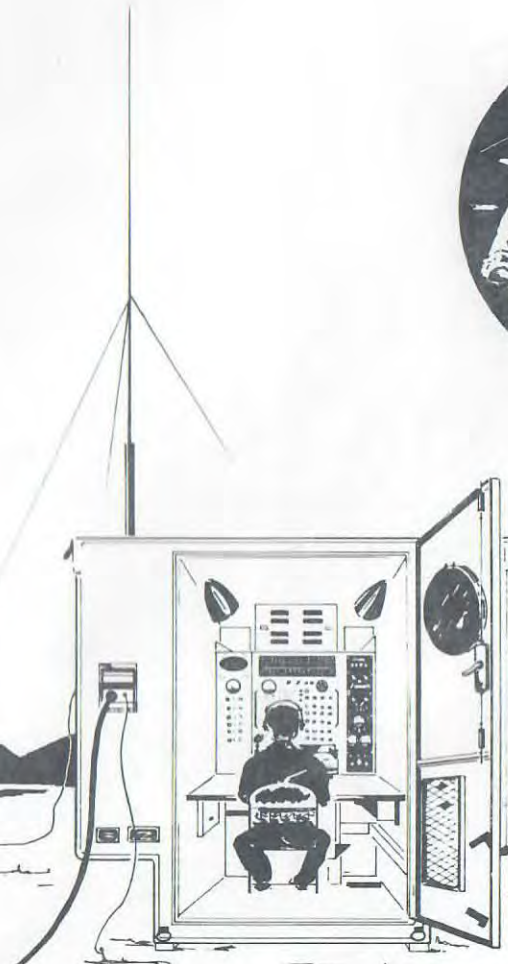
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SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position, due to charges retained by capacitors. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into or enter the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

The following cautions and warnings appear in the text in this volume, and are repeated here for emphasis.

WARNING

All external loop circuits are at +120 volts dc potential. Do not contact exposed loop circuit connections.
(Page 2-56.)

WARNING

When Telegraph Terminal Group AN/TGA-1 is on and the channel OFF-ON switches on Telegraph Line Control C-3533/TSC-15 are on, the signal entry panel contains 120 volts dc on some of the terminals of the panel and presents voltages dangerous to human life.
(Page 3-9.)

SAFETY SUMMARY (Con.)

CAUTION

Connect only a matched antenna which presents 50 ohms load impedance to the antenna coupler. A mismatched antenna will cause a high vswr which will burn the connector and cause serious damage to the antenna coupler. (Page 2-8.)

CAUTION

Do not operate the console equipment for extended periods of time with the radio equipment panel doors open. This can cause overheating resulting in possible damage to equipment. (Page 2-47.)

CAUTION

Do not allow the loop current of any channel to exceed 60 milliamperes. Higher loop current may damage the teletypewriter equipment and cause excessive power dissipation in the Telegraph Terminal Group AN/TGA-1. When a channel is turned on, immediately check and adjust the transmit and receive loop current. (Page 2-55.)

CAUTION

To prevent damage to gears of the Teletypewriter Set AN/TGC-14A(V), never slide the keyboard with the motor running. (Page 2-57.)

CAUTION

All of the power for the teletypewriter loop circuits is supplied by the AN/TGA-1. Do not attempt to operate teletypewriters that supply their own loop circuit power with AN/TGA-1 loop circuits. Also, do not attempt to use an external loop circuit power supply for loop power. Loop currents in excess of 60 milliamperes may damage the teletypewriter equipment and cause excessive power dissipation in the Telegraph Terminal Group AN/TGA-1. (Page 3-12.)

SAFETY SUMMARY (Con.)

CAUTION

Do not replace a faulty fuse with new fuse of larger current rating. Damage to equipment may occur.
(Page 3-12.)

CAUTION

Tighten fuse holder only finger tight. Do not use a screwdriver to tighten fuse holder. This may result in damage to the fuse holder.
(Page 3-12.)

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1-21-55 5PM

SAFETY REMINDER (001)

CAUTION

Do not touch the controls of the
instrument while the power is on.
If the power is on, the instrument
may be damaged.

CAUTION

Do not touch the controls of the
instrument while the power is on.
If the power is on, the instrument
may be damaged.

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This manual contains operating and service instructions for Communications Central AN/TSC-15. The Communications Central AN/TSC-15, hereafter called Communication Central System, is shown in figure 1-1. The manual consists of three sections: Section I, General Information; Section II, Operating Instructions; and Section III, General Maintenance Instructions. Refer to TM-02968A-15, -34 and -50 Maintenance Manual for Communications Central AN/TSC-15, for detailed installation, maintenance and overhaul procedures.

1-3. Communications Central System is an exchange for radio, telephone, and teletype-writer communications. It can be transported by truck or helicopter. The equipment contains the circuits which control, interconnect, switch, and operate five remote telephone lines, four radio channels, five remote teletypewriters, and the local operator's equipment which includes a microphone, a CW key, Teletypewriter Set AN/TGC-14A(V), a headset, and a speaker. During operation, only the primary power supply and the two whip antennas, with the necessary connecting cables and ground stakes, are outside the shelter.

1-4. Depending upon the choice of operational modes (duplex or simplex) selected on Radio Set Control C-3532/TSC-15, various combinations of capabilities are established.

1-5. OPERATIONAL MODES.

1-6. The AN/TSC-15 is capable of either simplex or duplex operation. Simplex operation does not allow the simultaneous transmission and reception of intelligence. Duplex operation does allow the simultaneous transmission and reception of intelligence. During simplex operation, only one channel of information can be handled at one time. During duplex operation, as many as seven channels

of information can be handled simultaneously. The capabilities of simplex operation are:

Upper sideband, suppressed carrier

Lower sideband, suppressed carrier

Compatible AM

Twin sideband

1-7. Duplex operating capabilities include all the capabilities listed under simplex operation plus independent sideband, suppressed carrier. A maximum of seven individual intelligence signals may be transmitted at one time during duplex operation.

1-8. UPPER SIDEBAND. Upper sideband is the frequency spectrum between 400 Hz and 3000 Hz above the carrier frequency.

1-9. LOWER SIDEBAND. Lower sideband is the frequency spectrum between 400 Hz and 3000 Hz below the carrier frequency.

1-10. COMPATIBLE AM. Compatible AM is transmission of an upper sideband plus a reinserted carrier and reception of a conventional 6-kHz bandwidth, amplitude-modulated signal.

1-11. TWIN SIDEBAND. Twin sideband, suppressed carrier is transmission and reception in the frequency range of 400 Hz to 3000 Hz above and below the carrier frequency. Both sidebands contain the same intelligence.

1-12. INDEPENDENT SIDEBAND. Independent sideband is transmission and reception in the frequency range of 400 Hz to 3000 Hz above and below the carrier frequency. Each sideband contains different intelligence.

1-13. CW TELEGRAPH. CW telegraph operation is transmission and reception of a keyed 800-Hz tone above or below the carrier frequency.

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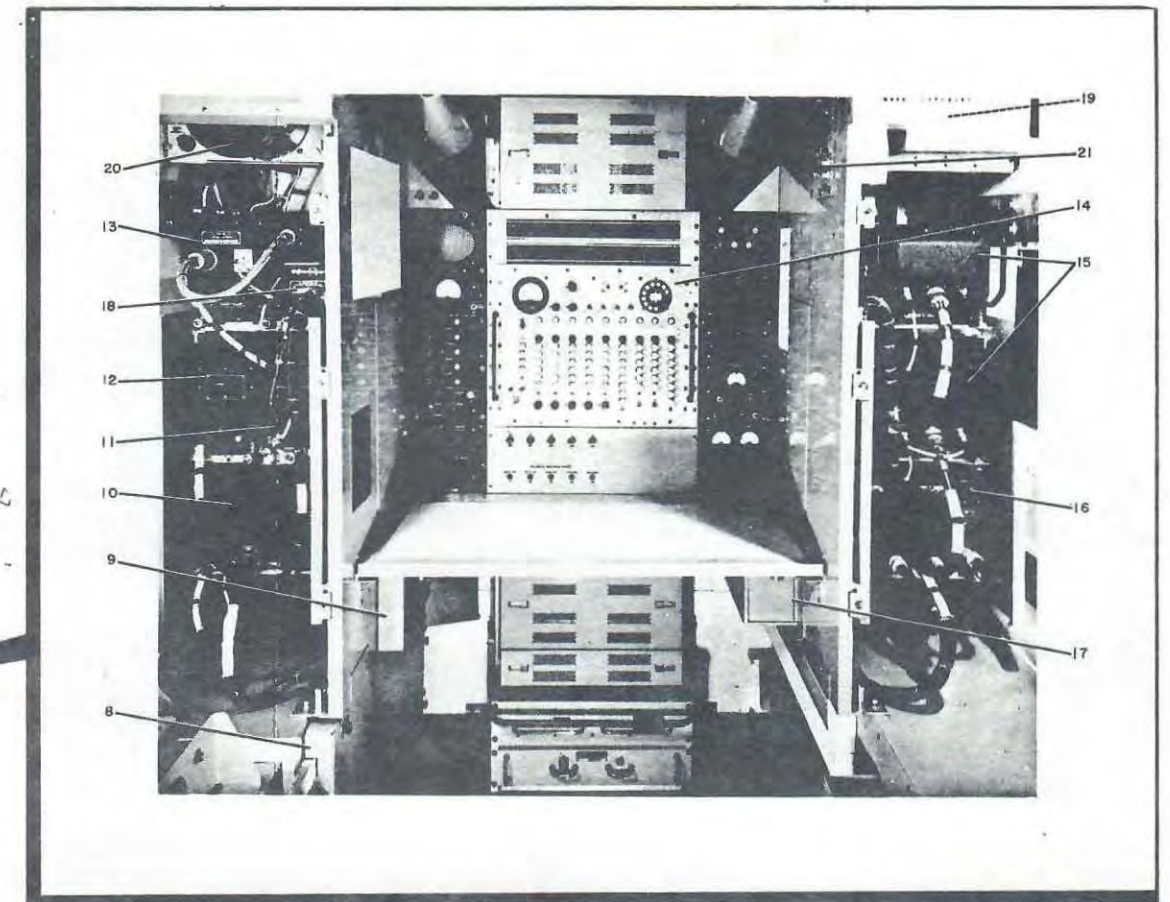
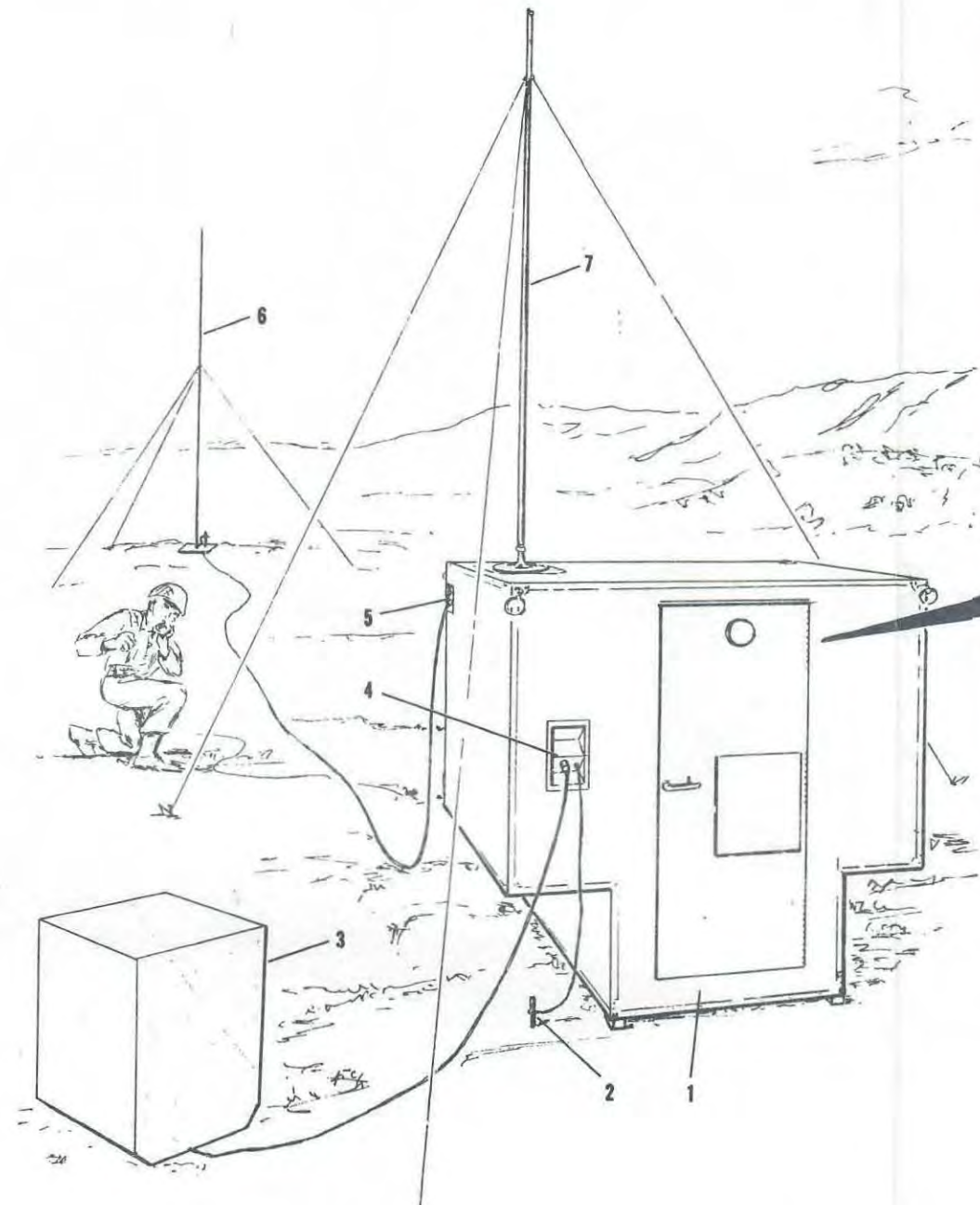
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LEGEND

- | | |
|--|--|
| 1. Electrical Equipment Shelter S-208/TSC-15, Unit 1 | 13. Antenna Coupler CU-749/TRC-75, Unit 2A3 |
| 2. Shelter Ground Rod | 14. Communication Control Console OA-3129/TSC-15, Unit 3 |
| 3. Generator | 15. Radio Receiver R-761/ARC-58, Units 2A7 and 2A8 |
| 4. A-C Power Entry Panel, Unit 5 | 16. Telegraph Terminal Group AN/TGA-1, Unit 2A9 |
| 5. Antenna Entry Panel, Unit 6 | 17. 20-Cycle Ringer |
| 6. Ground-Mounted Antenna | 18. Antenna Coupler Control C-2848/TRC-75, Unit 2A4 |
| 7. Shelter-Mounted Antenna | 19. Centrifugal Fan HD-441/TSC-15, Unit 2A10 (Receiver Blower) |
| 8. Junction Box, Unit 1A1 | 20. Vaneaxial Fan HD-442/TSC-15, Unit 2A6 (Transmitter Blower) |
| 9. Accessory Box, Unit 1A2 | 21. Telephone Test Set TS-1635/TSC-15, Unit 2A12 |
| 10. Radio Transmitter T-730/TRC-75, Unit 2A1 | |
| 11. Band Pass Filter F-508/U, Unit 2A2 | |
| 12. Converter-Multiplexer CV-976/U, Unit 2A11 | |

Figure 1-1. Communications Central AN/TSC-15

1-14. 850-HZ FSK. The 850-Hz FSK operation is the transmission and reception of FSK (frequency-shift-keyed) tones on either upper or lower sideband.

~~1-15. FOUR-CHANNEL, 85-HZ MULTIPLEX. Four-channel, 85-Hz multiplex operation is transmission and reception of four frequency-shift-keyed, teletypewriter channels within one sideband in a frequency range of 1500 Hz to 3000 Hz above or below the carrier frequency.~~

1-16. FOUR-CHANNEL, VOICE MULTIPLEX. Four-channel, voice multiplex is transmission and reception of two voice channels in the frequency range of 400 Hz to 3000 Hz above the carrier frequency and two voice channels in the frequency range of 400 Hz to 3000 Hz below the carrier frequency.

1-17. CAPABILITIES.

~~1-18. The maximum capability of the system is two voice channels and four 85-Hz multiplex teletypewriter channels. Capabilities of this system are shown in figure 1-2.~~

1-19. POWER REQUIREMENTS.

1-20. The input power to Communications Central AN/TSC-15 is supplied by a diesel engine generator. The generator supplies 3-phase, 115-volt, $\pm 10\%$, 400 ± 20 Hz, 4-kw wye-connected input power.

1-21. ANTENNA REQUIREMENTS.

1-22. Two 32-foot, Fiberglass, vertical antennas are supplied. One antenna, used for transmitting in duplex and for transmitting and receiving in simplex, is mounted on Electrical Equipment Shelter S-208/TSC-15. The other antenna, used for receiving in duplex, is mounted on a ground plane and is erected a minimum distance of 100 feet from, but within a 200-foot radius of, the shelter. Both antennas are supported by guy ropes.

1-23. GENERAL DESCRIPTION.

1-24. The Communications Central System is intended to be used as a link between two or more radio communication systems. The system also provides communication between

field telephone and teletypewriter facilities and the local system operator. (Refer to table 1-1 for unit breakdown.)

1-25. COMMUNICATION CONTROL CONSOLE OA-3129/TSC-15. The communication control console is the control center of the system. The console controls the local teletypewriter, the remote teletypewriters, the radio equipment, the operator's equipment, and the remote telephones.

1-26. BAND PASS FILTER F-508/U. Band Pass Filter F-508/U, shown in figure 1-1, functions as a frequency selecting circuit between the duplex antenna and the duplex receiver input of Communications Central System. The band pass filter can be automatically tuned to 28,000 frequencies from 2.0 to 29.999 MHz in 1 KHz increments. The band pass filter is also capable of continuous operation. It is remotely controlled by Filter Control C-3595/U. The filter control provides power, frequency selection, and overload reset control to the band pass filter. The filter control includes an indicator lamp which lights when a band pass filter overload occurs. The band pass filter operates at a nominal 28-volts dc. All internal operating voltages required are provided by a self-contained power supply.

1-27. RADIO EQUIPMENT. The radio equipment consists of two Radio Receivers R-761/ARC-58, Radio Transmitter T-730/TRC-75, two Radio Set Controls C-3141/TRC-75, Radio Set Control C-3532/TSC-15, Antenna Coupler CU-749/TRC-75, Antenna Coupler Control C-2848/TRC-75, and Band Pass Filter F-508/U with Filter Control C-3595/U. Radio Receiver R-761/ARC-58, unit 2A7, controlled by Radio Set Control C-3141/TRC-75, unit 3A4A1, functions as a simplex receiver/exciter. In simplex operation, unit 2A7 operates as an exciter for Radio Transmitter T-730/TRC-75 during transmit or as a radio receiver during receive. During duplex operation, unit 2A7 functions as an exciter only. Radio Receiver R-761/ARC-58, unit 2A8, is controlled by Radio Set Control C-3141/TRC-75, unit 3A4A3. Unit 2A8, which is identical to unit 2A7, functions only during duplex operation as the duplex radio receiver. The exciter circuits of unit 2A8 are not used.

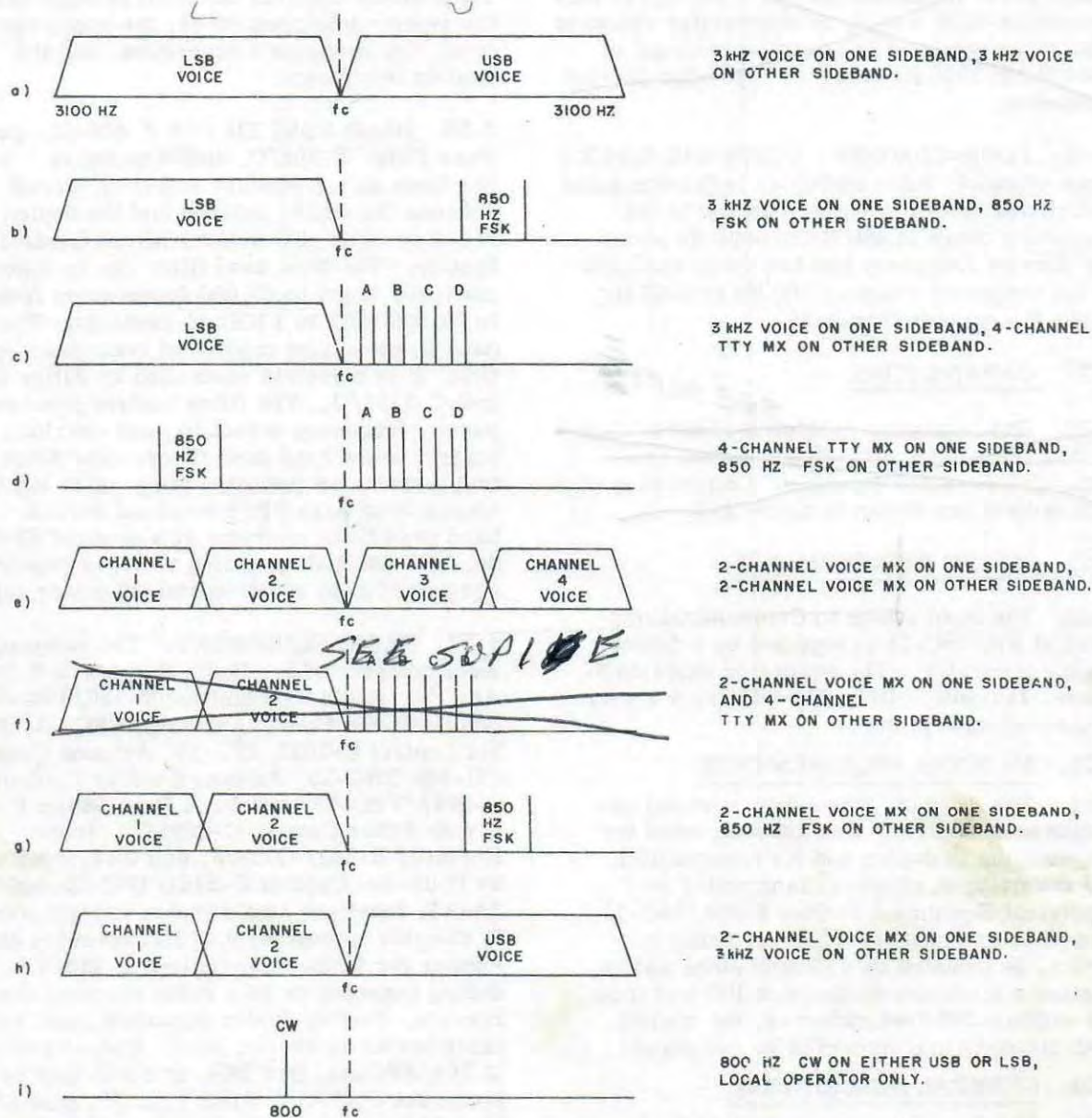


Figure 1-2. Communications Central AN/TSC-15 Capabilities

Table 1-1. Communications Central AN/TSC-15, Unit Breakdown

UNIT	DESIGNATION	NAME
1	S-208/TSC-15	Electrical Equipment Shelter
1A1		Junction Box
1A2		Accessory Box
1A3	HD-443/TSC-15	Ventilating Propeller Fan
1A4	HD-443/TSC-15	Ventilating Propeller Fan
1A5		Reflected Power Protective Circuit
2A1	T-730/TRC-75	Radio Transmitter
2A1A1	AM-1733/URC	Servo Amplifier
2A1A2	AM-1525/URC	Electronic Control Amplifier
2A2	F-508/U	Band Pass Filter
2A3	CU-749/TRC-75	Antenna Coupler
2A3A1	CV-531/URC	Discriminator
2A4	C-2848/TRC-75	Antenna Coupler Control
2A4A1	AM-1525/URC	Electronic Control Amplifier
2A4A2	AM-1525/URC	Electronic Control Amplifier
2A4A3	RE-284/URC	Relay Assembly
2A5	RF-133/TSC-15	Loading Coil Relay
2A6	HD-442/TSC-15	Vaneaxial Fan
2A7	R-761/ARC-58	Radio Receiver
2A7A1	MD-286/URC	Balanced Modulator
2A7A1A1		Modulator Subassembly
2A7A1A2		Modulator Subassembly
2A7A2	AM-1524/URC	Electronic Control Amplifier
2A7A3	AM-1528A/URC	Mixer Amplifier
2A7A4	AM-1527/URC	Detector Amplifier
2A7A5	AM-1579/URC	Frequency Multiplier Amplifier
2A7A6	AM-1734/URC	Electronic Control Amplifier
2A7A7	AM-1526/URC	Detector Amplifier
2A7A8	SG-179/URC	Reference Signal Generator
2A7A9	PP-1574/URC	Power Supply
2A7A10	AM-1522/URC	Control Amplifier
2A7A11	AM-1523/URC	Detector Amplifier
2A7A12	CV-466/URC	Frequency Divider
2A7A13	AM-1529/URC	Radio Frequency Amplifier

Table 1-1. Communications Central AN/TSC -15, Unit Breakdown (Con.)

UNIT	DESIGNATION	NAME
2A7A14	CV-465A/URC	Mixer Oscillator
2A7A14A1		Radio Frequency Oscillator
2A7A14A2		Converter-Oscillator
2A7A14A3		Frequency Mixer Stage
2A7A14A4		Relay Amplifier
2A7A14A5		Interpolation Oscillator Subassembly
2A7A14A6		4-kHz Spectrum Generator
2A7A14A7		Intermediate Frequency Amplifier
2A8	R-761/ARC-58	Radio Receiver
2A8A1	MD-286/URC	Balanced Modulator
2A8A1A1		Modulator Subassembly
2A8A1A2		Modulator Subassembly
2A8A2	AM-1524/URC	Electronic Control Amplifier
2A8A3	AM-1528/URC	Mixer Amplifier
2A8A4	AM-1527/URC	Detector Amplifier
2A8A5	AM-1579/URC	Frequency Multiplier Amplifier
2A8A6	AM-1734/URC	Electronic Control Amplifier
2A8A7	AM-1526/URC	Detector Amplifier
2A8A8	SG-179/URC	Reference Signal Generator
2A8A9	PP-1574/URC	Power Supply
2A8A10	AM-1522/URC	Control Amplifier
2A8A11	AM-1523/URC	Detector Amplifier
2A8A12	CV-466/URC	Frequency Divider
2A8A13	AM-1529/URC	Radio Frequency Amplifier
2A8A14	CV-465A/URC	Mixer Oscillator
2A8A14A1		Radio Frequency Oscillator
2A8A14A2		Converter-Oscillator
2A8A14A3		Frequency Mixer Stage
2A8A14A4		Relay Amplifier
2A8A14A5		Interpolation Oscillator Subassembly
2A8A14A6		4-kHz Spectrum Generator
2A8A14A7		Intermediate Frequency Amplifier
2A9	AN/TGA-1	Telegraph Terminal Group
2A9A1	CV-1086/TGA-1	Converter Oscillator

Table 1-1. Communications Central AN/TSC-15, Unit Breakdown (Con.)

UNIT	DESIGNATION	NAME
2A9A1A1	C-3539/TGA-1	Indicator Control
2A9A1A2	KY-305/URC	Keyer
2A9A1A3	O-895/TGA-1	Audio Frequency Oscillator
2A9A1A4	CV-865/URC	Frequency Shift Converter
2A9A1A5		2000-Hz Receive Band Pass Filter
2A9A2	OA-3138/TGA-1	Converter-Oscillator Group
2A9A2A1	PP-2894/TGA-1	Power Supply
2A9A2A2	C-3538/TGA-1	Indicator Control
2A9A2A3	AM-2901/TGA-1	Audio Frequency Amplifier
2A9A2A4	O-873/TGA-1	Audio Frequency Oscillator
2A9A2A5	O-874/TGA-1	Audio Frequency Oscillator
2A9A2A6	O-875/TGA-1	Audio Frequency Oscillator
2A9A2A7	O-876/TGA-1	Audio Frequency Oscillator
2A9A2A8	CV-1221/TGA-1	Frequency Shift Converter
2A9A2A9	CV-1222/TGA-1	Frequency Shift Converter
2A9A2A10	CV-1223/TGA-1	Frequency Shift Converter
2A9A2A11	CV-1224/TGA-1	Frequency Shift Converter
2A9A2A12	KY-305/URC	Keyer
2A9A2A13	KY-305/URC	Keyer
2A9A2A14	KY-305/URC	Keyer
2A9A2A15	KY-305/URC	Keyer
2A9A2A16		765-Hz Transmit Band Pass Filter
2A9A2A17		1275-Hz Transmit Band Pass Filter
2A9A2A18		2125-Hz Transmit Band Pass Filter
2A9A2A19		2635-Hz Transmit Band Pass Filter
2A9A2A20		765-Hz Receive Band Pass Filter
2A9A2A21		1275-Hz Receive Band Pass Filter
2A9A2A22		2125-Hz Receive Band Pass Filter
2A9A2A23		2635-Hz Receive Band Pass Filter
2A10	HD-441/TSC-15	Centrifugal Fan
2A11	CV-976/U	Converter-Multiplexer
2A11A1		Power Supply
2A11A2		Oscillator
2A11A3		Demultiplexer Subassembly

Table 1-1. Communications Central AN/TSC -15, Unit Breakdown (Con.)

UNIT	DESIGNATION	NAME
2A11A4		Demultiplexer Subassembly
2A11A5		Multiplexer Subassembly
2A11A6		Multiplexer Subassembly
2A12	TS-1635/TSC -15	Telephone Test Set
3	OA-3129/TSC -15	Communication Control Console
3A1	C-3535/TSC -15	Telephone Terminal Control
3A1A1	MX-3726/TSC -15	Hybrid Circuit Network
3A1A2	MX-3726/TSC -15	Hybrid Circuit Network
3A1A3	MX-3726/TSC -15	Hybrid Circuit Network
3A1A4	AM-2898/TSC -15	Audio Frequency Amplifier
3A1A5	AM-2898/TSC -15	Audio Frequency Amplifier
3A1A6	AM-2898/TSC -15	Audio Frequency Amplifier
3A1A7	AM-2898/TSC -15	Audio Frequency Amplifier
3A2		20-Cycle Ringer
3A3	TA-408/TSC -15	Telephone Jack Assembly
3A4		Radio Set Control Panel
3A4A1	C-3141/TRC -75	Radio Set Control
3A4A2	C-3532/TSC -15	Radio Set Control
3A4A3	C-3141/TRC -75	Radio Set Control
3A4A4	C-3595/U	Filter Control
3A4A5	C-3534/TSC -15	Power Supply Control
3A5	MT-2445/TSC -15	Amplifier Mounting Plate
3A5A1	AM-1975/U	Audio Frequency Amplifier
3A5A2	AM-1975/U	Audio Frequency Amplifier
3A5A3	AM-1975/U	Audio Frequency Amplifier
3A5A4	AM-1975/U	Audio Frequency Amplifier
3A5A5	AM-1975/U	Audio Frequency Amplifier
3A5A6	AM-3172/TSC -15	Amplifier Assembly
3A6	SB-1248/TSC -15	Manual Telephone Switchboard
3A6A1		Component Board No. 1
3A6A2		Component Board No. 2
3A6A3		Component Board No. 3
3A6A4		Component Board No. 4
3A6A5		Component Board No. 5

Table 1-1. Communications Central AN/TSC -15, Unit Breakdown (Con.)

UNIT	DESIGNATION	NAME
3A6A6		Component Board No. 6
3A6A7		Component Board No. 7
3A6A8		Component Board No. 8
3A6A9		Component Board No. 9
3A6A10		Component Board No. 10
3A6A11		Component Board No. 11
3A6A12		Component Board No. 12
3A6A13		Light No. 1 Component Board
3A6A14		Light No. 2 Component Board
3A6A15		Operator's 4W/4W Bridge Subassembly
3A6A16		Conference Bridge Subassembly
3A6A17		Call Amplifier Circuit Board
3A6A18		Call Amplifier Circuit Board
3A6A19		Call Amplifier Circuit Board
3A6A20		Call Amplifier Circuit Board
3A6A21		Meter Board Assembly
3A7	- C-3533/TSC -15	Telegraph Line Control
3A8	MT-2446/TSC -15	Amplifier Mounting Plate
3A8A1	AM-1968/U	Audio Frequency Amplifier
3A8A2	AM-1975/U	Audio Frequency Amplifier
3A8A3	AM-1975/U	Audio Frequency Amplifier
3A8A4	AM-1975/U	Audio Frequency Amplifier
3A8A5	AM-1975/U	Audio Frequency Amplifier
3A8A6	AM-1975/U	Audio Frequency Amplifier
3A8A7	AM-1975/U	Audio Frequency Amplifier
3A8A8	AM-1975/U	Audio Frequency Amplifier
3A8A9	AM-1975/U	Audio Frequency Amplifier
3A8A10	AM-1975/U	Audio Frequency Amplifier
3A9	RE-502/TSC -15	Detector Relay Assembly
3A10	- PP-2869/TSC -15	Power Supply
3A11	- PP-2868/U	Power Supply
3A13		Console Accessory Panel
3A13A1	DT-254/TSC -15	Audio Frequency Detector
3A13A2	DT-254/TSC -15	Audio Frequency Detector

Table 1-1. Communications Central AN/TSC-15, Unit Breakdown (Con.)

UNIT	DESIGNATION	NAME
3A13A3	DT-254/TSC-15	Audio Frequency Detector
3A13A4	DT-254/TSC-15	Audio Frequency Detector
3A13A5	DT-254/TSC-15	Audio Frequency Detector
3A13A6	O-949/TSC-15	Audio Frequency Oscillator
3A13A7	AM-3200/U	Audio Frequency Amplifier
3A13A8	AM-3200/U	Audio Frequency Amplifier
3A13A9	AM-3200/U	Audio Frequency Amplifier
3A13A10	AM-3200/U	Audio Frequency Amplifier
3A13A11	RE-591/TSC-15	Relay Assembly
4		Signal Entry Panel
5		AC Power Entry Panel
5A1		AC Power Entry Junction Box
5A1A1		AC Power Entry Protective Device
6		Antenna Entry Panel
8	AN/TGC-14A(V)	Teletypewriter Set

1-28. VOICE MULTIPLEX UNIT. The voice multiplex unit, Converter-Multiplexer CV-976/U, makes it possible to use two 3-kHz radio channels for four narrow band voice circuits. Each voice circuit is limited to a frequency range of approximately 300 to 1575 Hz.

SEE SUP 10E

1-29. TELETYPEWRITER MULTIPLEX. Telegraph multiplexing is provided by Telegraph Terminal Group AN/TGA-1. The AN/TGA-1 is a nonsynchronous, FSK telegraph terminal used as part of the Communications Central System. The AN/TGA-1 is capable of operating with any standard 60-milliampere teletypewriter up to a distance equivalent to a loop resistance of 850 ohms. The AN/TGA-1 provides five channels of simultaneous telegraph communications by means of two 3-kHz single sideband radio circuits operating in the hf (high frequency) band. The basic unit consists of one 850-Hz shift FSK and four 85-Hz shift FSK channels.

SEE SUP 10E

1-30. Converter-Oscillator Group OA-3138/TGA-1. Converter-Oscillator Group OA-3138/TGA-1 contains four 85-Hz shift FSK tele-

760 SEESUP 10E

graph channels that are multiplexed into a single audio channel for operation on a single sideband radio circuit. Any four of eight available channels may be used in the equipment by selection of the appropriate plug-in modules. The OA-3138/TGA-1 provides simultaneous operation of four standard 60-milliampere teletypewriters operating in either half-duplex or full-duplex modes at speeds up to 100 words per minute.

1-31. Converter-Oscillator CV-1086/TGA-1. Converter-Oscillator CV-1086/TGA-1 contains one 850-Hz shift FSK telegraph channel that operates on one sideband of a single sideband high frequency radio circuit. The audio circuits of this unit operate independently from those of Converter-Oscillator Group OA-3138/TGA-1. This equipment derives its power and control functions from Converter-Oscillator Group OA-3138/TGA-1. Converter-Oscillator CV-1086/TGA-1 provides for the operation of one standard 60-milliampere teletypewriter operating in either the half-duplex or full duplex mode at speeds up to 100 words per minute.

1-32. EQUIPMENT LISTS.

1-33. EQUIPMENT SUPPLIED. The equipment supplied with Communications Central System is listed in table 1-2 and illustrated in figure 1-1.

1-34. EQUIPMENT REQUIRED BUT NOT SUPPLIED. All equipment required for operation of Communications Central System is supplied, except the power source.

1-35. ACCESSORY EQUIPMENT. There is no accessory equipment required for operation of Communications Central System that is not supplied.

1-36. TUBE AND SEMICONDUCTOR COMPLEMENT. Table 1-3 is a list of the tubes and semiconductors used in Communications Central System.

1-37. PUBLICATIONS. Table 1-4 is a list of all publications applicable to Communications Central System.

1-38. TECHNICAL CHARACTERISTICS.

1-39. Technical characteristics of the Communication Central System contain general, transmitting, receiving, and band pass filter characteristics, and are listed in table 1-5.

1-40. COMMUNICATIONS CENTRAL SYSTEM BLOCK DIAGRAM DESCRIPTION.

1-41. A description of the block diagrams illustrated in figure 1-3 and 1-4 is given in paragraphs 1-42 through 1-47.

1-42. DESCRIPTION OF SIMPLEX OPERATION. (Refer to Figure 1-3.)

1-43. TRANSMIT OPERATION. During simplex operation a single antenna is used and messages cannot be transmitted and received simultaneously. Transmit signals originate from the operator's audio section (or teletypewriter) or from remote telephone and teletypewriter lines. The remote audio is applied through telephone line circuits to the audio switching circuits. Local audio signals are applied directly to the audio switching circuit. The local and remote teletypewriter signals are applied to the audio switching circuits through the teletypewriter multiplex circuits. After the transmit signal is routed in the audio

switching circuit, it is applied to the voice multiplex circuit, where the signal is amplified and converted. It is then coupled to the radio receiver which functions as an exciter for the transmitter. The transmit signal, amplified by the radio transmitter, is coupled through the antenna circuits and applied to the shelter-mounted antenna. The radio set control circuit provides facilities for selecting various operating parameters of the transmitter and receiver.

1-44. RECEIVE OPERATION. The Communications Central System uses transceiver principles in some of its circuits for both transmit and receive operation. In the simplex mode, signals are received by the shelter-mounted antenna and applied to the antenna circuits which couple the signal to the receiver. The signal is then applied to the voice multiplex circuit or the teletypewriter multiplex circuits. Signal from the voice multiplex circuit is applied to the audio switching section and switched to telephone line circuits or operator's audio circuits. Signal from the teletypewriter multiplex circuit is applied to the local teletypewriter or telephone line circuits. Refer to TM-0298A-15 Communications Central AN/TSC-15 Maintenance Manual for a detailed description.

1-45. DESCRIPTION OF DUPLEX OPERATION. (Refer to Figure 1-4.)

1-46. TRANSMIT OPERATION. Duplex radio operation permits simultaneous transmission and reception of radio messages to and from one or more remote radio operators. The transmit operation is performed by the simplex circuitry. (Refer to paragraph 1-43.)

1-47. RECEIVE OPERATION. A second radio receiver and a separate receiving antenna are used during duplex operation. The signals are received by the ground-mounted antenna and coupled through the band pass filter to the duplex receive circuitry. The band pass filter rejects all frequencies separated by greater than ± 10 percent from the frequency to which the band pass filter is tuned. This prevents transmitted signals from distorting received intelligence. The duplex radio receiver operates only in the receive mode (the exciter portion is not used). Figure 1-5 shows the location of major units in the Communication Control Console OA-3129/TSC-15. Refer to TM-02968A-15, Communications Central AN/TSC-15 Maintenance Manual for a detailed description.

Table 1-2. Equipment Supplied

QTY PER EQUIP.	NOMENCLATURE		OVER-ALL DIMENSIONS (Inches)			WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	
1	Electrical Equipment Shelter	S-208/TSC -15	73 1/16	74 3/16	78 1/2	500.0
1	Radio Transmitter	T-730/TRC -75	7 5/8	10 1/8	23 7/16	50.5
2	Radio Receiver	R-761/ARC -58	7 5/8	10 1/4	23 7/16	49.75
1	Antenna Coupler	CU-749/TRC -75	8 3/16	7	16 1/16	18.25
1	Antenna Coupler Control	C-2848/TRC -75	7 13/16	3 11/16	14 1/2	10.5
1	Telegraph Terminal Group	AN/TGA -1	7 5/8	10 1/8	19 9/16	55
1	Band Pass Filter	F-508/U	7 5/8	4 7/8	19 9/16	18.5
1	Converter Multiplexer	CV-976/U	7 3/16	5	19 9/16	27.5
1	Shelter-Mounted Antenna Kit					
1	Ground-Mounted Antenna Kit					
1	Ground Stake Kit					
1	Antenna Mast Base Assembly					
1	Communication Control Console	OA-3129/TSC -15	66	34	15	
	consisting of:					
1	Manual Telephone Switchboard	SB-1248/TSC -15	13 3/4	12 13/16	18 11/32	
1	Operator Desk					
1	Filter Control	C-3595/U	2 1/4	5 3/8	4 3/4	1.75
2	Radio Set Control	C-3141/TRC -75	5 1/4	5 3/4	7 9/16	
1	Telephone Terminal Control	C-3535/TSC -15	10 7/32	16 1/2	8 1/2	
1	Radio Set Control	C-3532/TSC -15	4 1/8	5 3/4	6	
1	Power Supply Control	C-3534/TSC -15	5 5/8	5 3/4	4 27/32	
1	Telegraph Line Control	C-3533/TSC -15	27 1/4	7 3/8	7	
1	Amplifier Mounting Plate	MT-2445/TSC -15	10 7/32	16 1/2	8 1/2	

Table 1-2. Equipment Supplied (Con.)

QTY PER EQUIP.	NOMENCLATURE		OVER-ALL DIMENSIONS (Inches)			WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	
1	Amplifier Mounting Plate	MT-2446/TSC-15	10 7/32	16 1/2	8 1/2	
1	Console Accessory Panel		6 9/32	20 13/32	6 19/32	
	consisting of:					
5	Audio Frequency Detector	DT-254/TSC-15	6	1 15/16	5 15/16	
1	Audio Frequency Oscillator	O-949/TSC-15	4 1/2	1 15/16	5 15/16	
1	Relay Assembly	RE-591/TSC-15	6	1 15/16	5 15/16	
4	Audio Frequency Amplifier	AM3200/U	3 3/16	1 51/64	2 59/64	
1	Telephone Jack Assembly	TA-408/TSC-15	5	18 11/32	8	
1	Detector Relay Assembly	RE-502/TSC-15	3 15/32	18 11/32	8	
1	Power Supply	PP-2868/U	3 1/2	19	8	
1	Power Supply	PP-2869/TSC-15	4 1/4	19	8 1/2	
1	Chair					
1	Desk Microphone with Cord Assembly					
1	Two-Circuit and Three-Circuit Test Cords					
2	Ground Rods with Wire Straps and Clamps					
1	Power Cable (50-Foot)					
1	20-Cycle Ringer					
2	RF Cable Assembly (125-Foot)					
1	Clock (8-Day)					
1	Compass, M2					
1	Teletypewriter Set with Cord Assembly	AN/TGC-14A(V)				

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Table 1-2. Equipment Supplied (Con.)

QTY PER EQUIP.	NOMENCLATURE		OVER-ALL DIMENSIONS (Inches)			WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	
1	Fire Extinguisher					2 1/2
1	Trolley Assembly with Winch (1-Foot)					
1	Sledge Hammer (8-Pound)					8
1	First Aid Kit					
1	Equipment Repair Parts Kit <i>SEE SUPPLY</i>					
1	Electric Lantern					
2	Ventilating Propeller Fans	HD-433/TSC-15				
1	Centrifugal Fan	HD-441/TSC-15				
1	Vaneaxial Fan	HD-442/TSC-15				
1	Footswitch with Cable					
1	CW Key with Cable					
1	Headset with Cable					
1	Pencil Sharpener					
1	Telephone Test Set	TS-1635/TSC-15	9 1/4	6 3/4	5 1/8	

Table 1-3. Communications Central AN/TSC-15, Electron Tubes, Semiconductor or Complement

[illegible]

Table 1-3. Communications Central AN/TSC-15, Electron Tubes, Semiconductor or Complement (Con)

[illegible]

Table 1-4. Publications Applicable to Communications Central AN/TSC-15

PUBLICATION NUMBER	TITLE
TM-02968A-12A	Communications Central AN/TSC-15 Operation
TM-02968A-15, -34 and -50	Maintenance Manual for Communications Central AN/TSC-15, Volume I, Volume II and Volume III
TM-00490A-12	Radio Set AN/TRC-75 Operation
TM-00490A-15, -34 and -50	Maintenance Manual for Radio Set AN/TRC-75, Volume I, Volume II and Volume III
TM-03308-15	Technical Manual for Teletypewriter Set AN/TGC-14A(V)
TM-03411-A	Technical Manual for Converter-Multiplexer CV-976/U
TM-02968A-35/2	Maintenance and Overhaul Manual for Telegraph Terminal Group AN/TGA-1
TM-02968A-35/3	Maintenance Prints for AN/TSC-15
TM-02968A-35/4	Maintenance Prints for AN/TGA-1

Table 1-5. Technical Characteristics

GENERAL.

Frequency range	2.0 to 29.999 MHz
Frequency channels	28,000 channels available at 1-kHz increments.
Tuning	Automatic, servo-controlled tuning (radios); autopositioner (bandpass filter).
Modulation	Voice, CW, teletypewriter tones.
Operation modes	AM, independent sideband, upper sideband, lower sideband, and twin sideband.
Frequency selection	Four control knobs with direct-reading indicator.
Channel selection time	20 to 60 seconds.
Frequency stability	One part per million per month.
Antennas	Two 32-foot whip antennas.

Audio characteristics

Input	Low impedance dynamic or military field phones.
Output	Low impedance 9-ohm headset or 4-ohm speaker or remote field telephone.
Primary power required	115 volts, 400 Hz, three-phase, 4-wire wye, 4 kw min.
Weight	Approximately 2,000 pounds.
Size	74 inches wide, 73 inches high, 76 inches long.

Environmental conditions

Temperature range	+50°C (+122°F) to -40°C (-40°F).
Ambient humidity	0 to 95 percent.
Altitude	10,000 feet.

TRANSMITTING CHARACTERISTICS.

Noise output	50 dB.
High-power output	
SSB	900 watts PEP 2 to 15 MHz, 750 watts PEP 15 to 29.999 MHz.

Table 1-5. Technical Characteristics (Con.)

TRANSMITTING CHARACTERISTICS (Con.)

High-power output (Con.)

AM 180 watts.

CW and FSK 700 watts.

Low-power output

SSB 100 to 300 watts PEP.

AM 40 to 80 watts.

CW and FSK 100 watts.

Spurious output

Undesired sideband 40 dB.

Harmonic spurious 40 dB.

All others 50 dB.

Duty cycle

SSB Continuous.

AM 50 percent, 5 minutes maximum.

FSK or CW Continuous.

RECEIVING CHARACTERISTICS.

Sensitivity

SSB 3.0 μ v maximum for 10-dB signal plus noise-to-noise ratio.AM 7.5 μ v maximum for 10-dB signal plus noise-to-noise ratio.

Selectivity

SSB 3.0-kHz minimum at 6-dB points; 5.5-kHz maximum at 60-dB points.

AM 6-kHz minimum at 6-dB points; 10.8-kHz maximum at 55-dB points.

Audio distortion 15 percent maximum.

Table 1-5. Technical Characteristics (Con.)

BAND PASS FILTER F-508/U.

Frequency range	2,000 to 29,999 MHz in 1-kHz increments.
Frequency control	Frequency selection units are motor-driven units electrically controlled by Filter Control C-3595/U.
Type of rf signals passed	AM, SSB, TSB, CW.
Signal input impedance	50 ohms, unbalanced.
Signal output impedance	50 ohms, unbalanced.
Maximum rf signal input	100 volts peak.
Selectivity	The half bandwidth at ± 1 dB points below the center frequency reference is at least 0.3 percent of center frequency.
2 to 8 MHz	At least -70 dB attenuation at ± 10 percent of center frequency.
8 to 12 MHz	At least -65 dB attenuation at ± 10 percent of center frequency.
12 to 20 MHz	At least -60 dB attenuation at ± 10 percent of center frequency.
20 to 29,999 MHz	At least -50 dB attenuation at ± 10 percent of center frequency.
Voltage gain	Not greater than 5 or less than 0.5 at center frequency.
Intermodulation	All harmonic and intermodulation distortion at least 50 dB below a 10-mv PEV output.
Cross modulation	At least 10 dB below a desired 2-mv CW signal when receiving an undesired 91-volt peak signal (modulated 30 percent with 400 Hz) at least ± 10 percent away from the desired frequency.
Input operating voltage	22 to 30 volts dc.
Power consumption	
Normal operation	50 watts maximum.
During tuning	100 watts maximum.

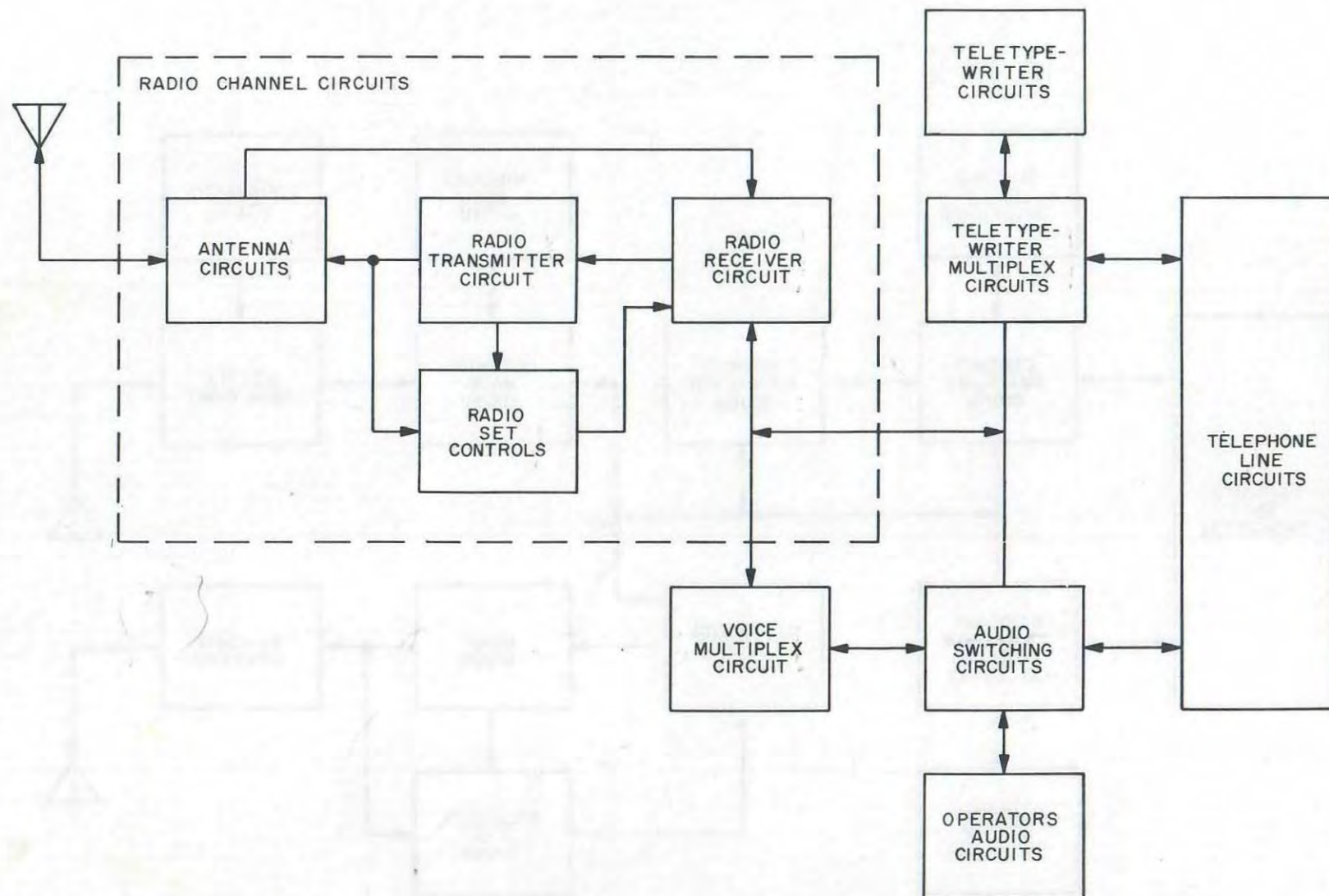


Figure 1-3. Communications Central System Block Diagram (Simplex Operation)

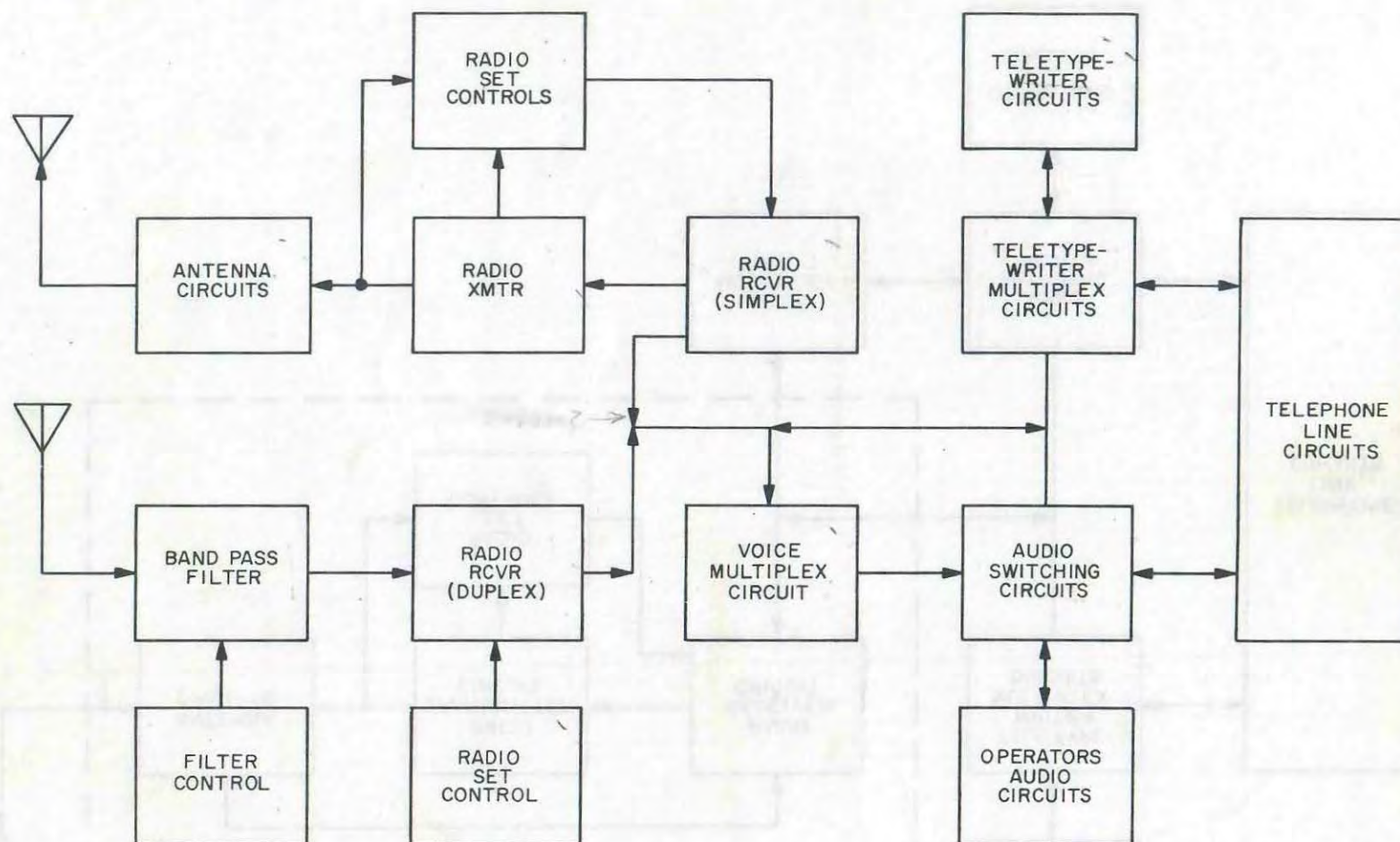


Figure 1-4. Communications Central System Block Diagram (Duplex Operation)

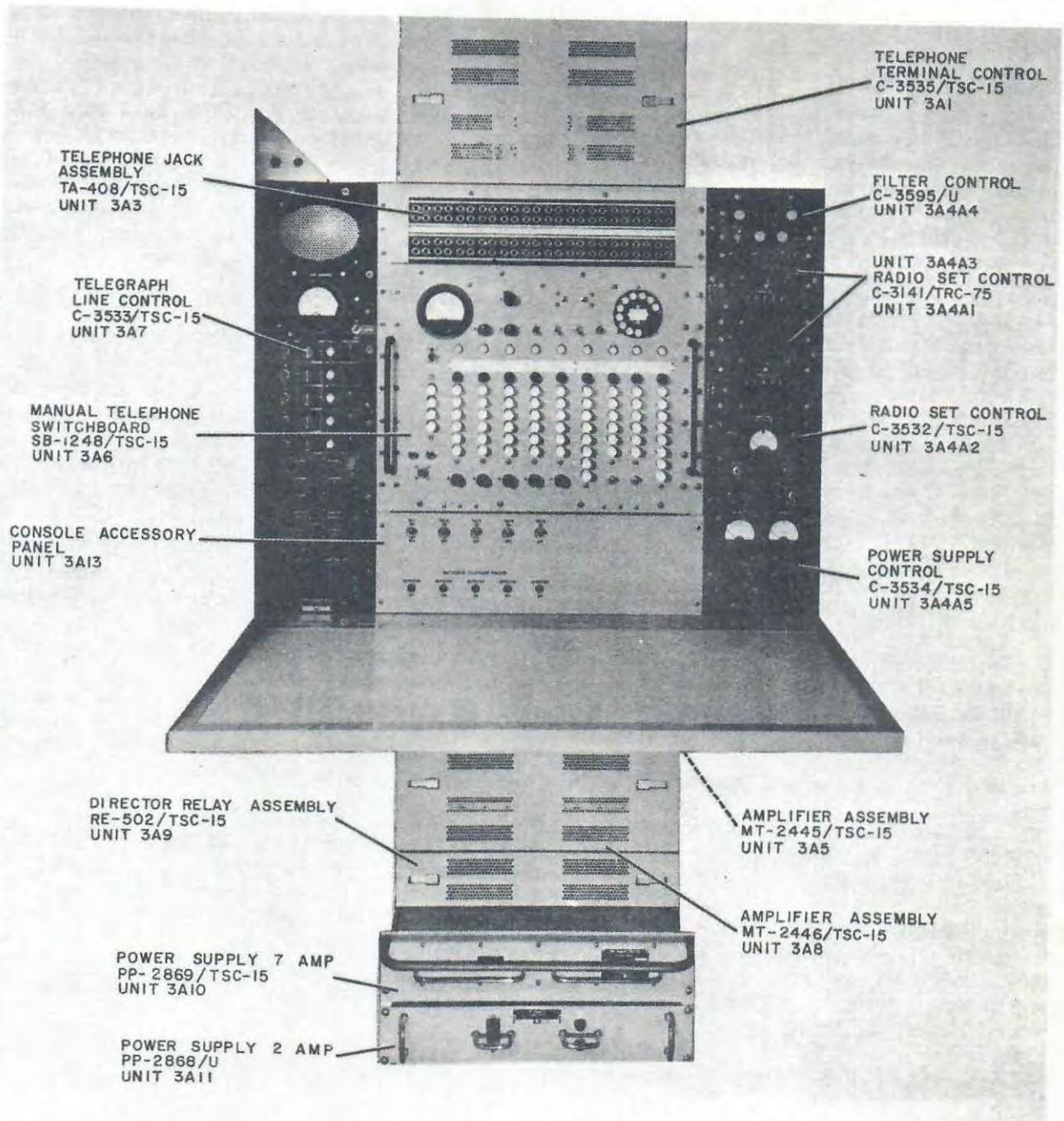
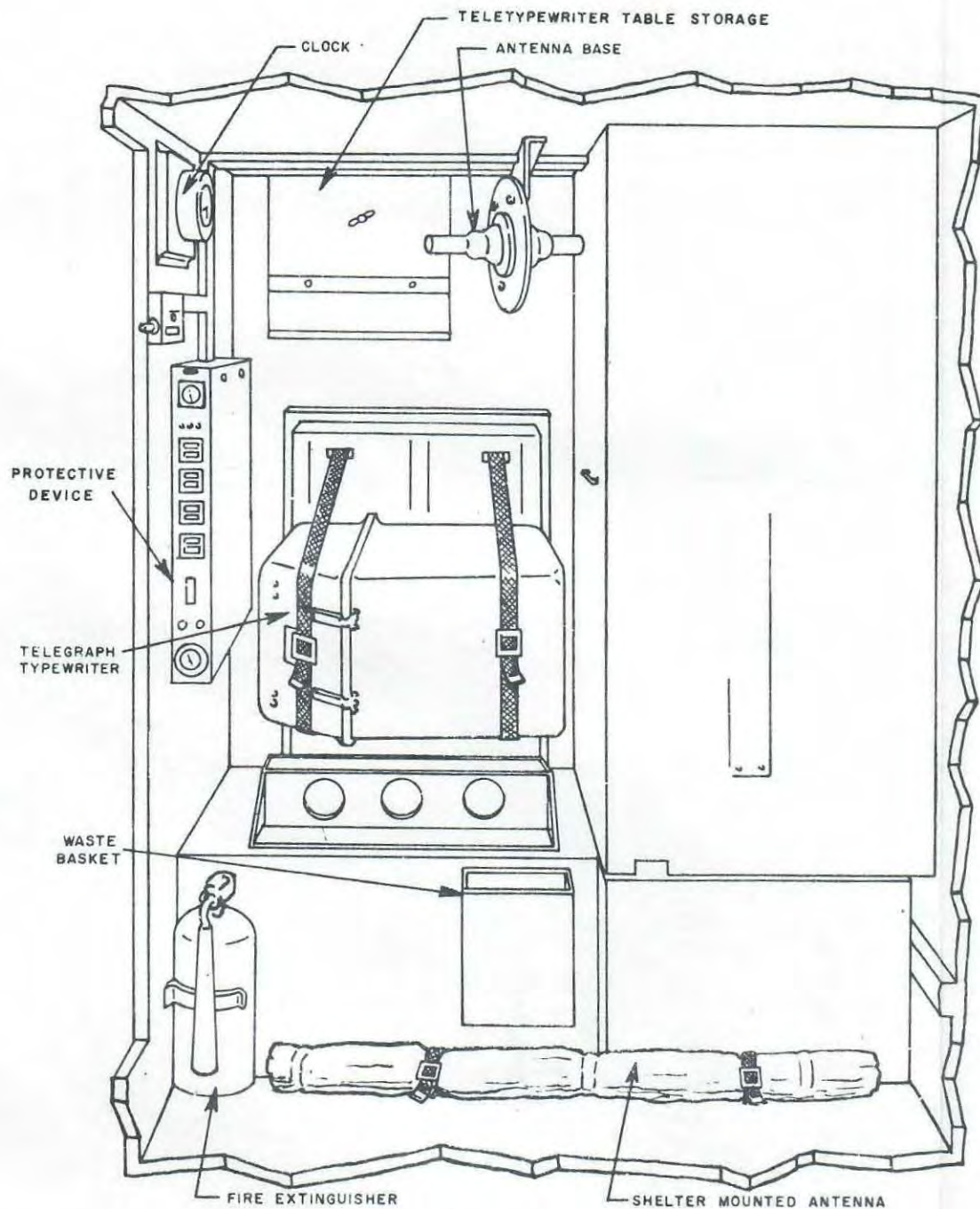


Figure 1-5. Communication Control Console OA-3129/TSC-15, Unit 3, Unit Locations

K5URG



LEFT SIDE

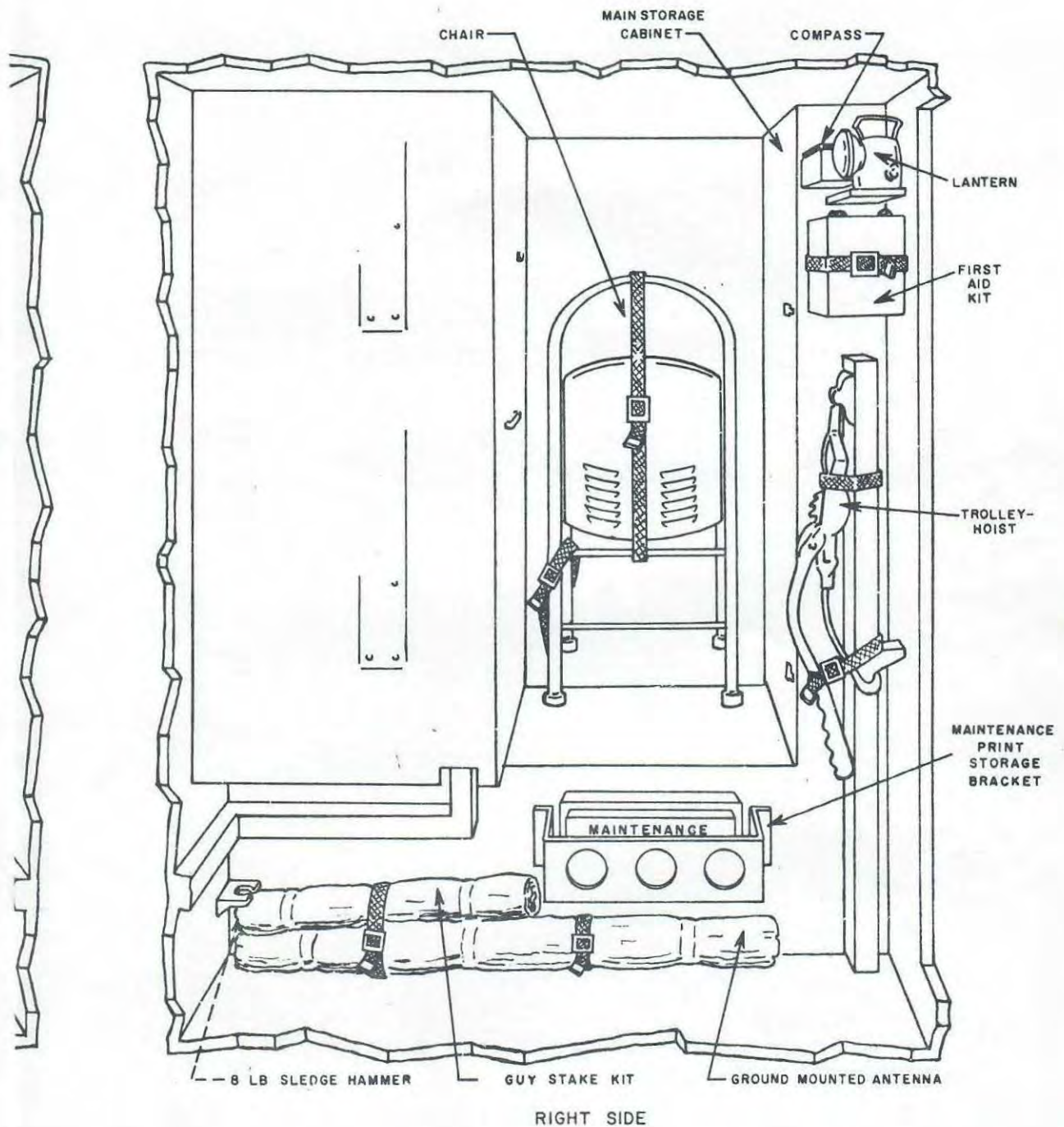


Figure 2-1. Shelter Stowage

SECTION II

OPERATING INSTRUCTIONS

2-1. GENERAL.

2-2. This section contains preparation for use and stowage instructions, a description of operating controls and indicators, and operating procedures for the Communications Central System.

2-3. PREPARATION FOR USE.

2-4. Before Communications Central System is set up, the tactical situation and local terrain conditions should be surveyed. The area should be well drained and clear of obstacles, such as hills, buildings, cliffs, steel bridges, underpasses, power lines, and wooded areas which absorb rf energy. Valleys and other low places are poor locations and should only be used when camouflage is the determining factor.

2-5. Communications Central System is transported with its complete operating equipment self-contained within the shelter. The shelter may be transported to the installation site by any of the following means:

Air transport (fixed wing aircraft)

Air transport (rotary wing aircraft)

Rail transport

Vehicular transport

2-6. All of the slings and hardware necessary to secure the system for transportation are contained in the lift and tie-down sling assembly. Instructions for use of the tie-down assembly are provided on two plates located to the left of the shelter door. Four long turnbuckle assemblies and a large round connection ring are used to lift the shelter. One turnbuckle assembly is hooked to each of the four corner rings at the top of the shelter. The opposite ends of the turnbuckle assemblies are fastened to the large connection ring. The shelter is then lifted by connecting the crane or lifting device to the ring. The two forward turnbuckle assemblies must be shorter than

the rear two, to compensate for the center of gravity, which is not centrally located. To shorten the turnbuckle assemblies, adjust the turnbuckles. The lift and tie-down sling assembly consists of the following items, contained in a canvas bag normally stored in a retainer attached to the floor of the shelter:

4 eyebolts

4 retaining brackets

4 spacers

4 cable retainers

1 round connection ring

4 short turnbuckle assemblies

4 long turnbuckle assemblies

4 connecting links

2-6A SEE SUP IF 1 NOV 77
2-7. When a shelter is received at a site, this canvas bag and retainer should be removed from the floor of the shelter. The slings and hardware used in transport should be removed from the shelter, disassembled, and put into the canvas bag. The canvas bag and the retainer should then be stowed in a convenient place.

2-8. SHELTER-MOUNTED ANTENNA AND SHELTER GROUND ROD. The shelter-mounted antenna and associated hardware are stowed in a canvas bag which is strapped to the floor of the shelter along the left wheel well (figure 2-1). Remove the two web straps securing the bag to the floor and remove the bag from the shelter. The shelter-mounted antenna bag contains two 4-foot ground rods, two ground rod clamps, one antenna guy rope ring assembly, three guy ropes, and eight 4-foot sections of antenna. Remove one of the two 4-foot ground rods from this stowage bag. The ground rod should be located not more than seven feet from the ac power entry panel. The ac power entry panel is located on the rear outside wall of the shelter, to the left of the

access door (figure 1-1, item 4). Remove the 8-pound sledge hammer which is stowed inside the shelter along the right wheel well. Using the 8-pound sledge hammer, drive the 4-foot ground rod from 3 to 3-1/2 feet into the ground. If the immediate area around the ground rod is excessively dry, wet the surrounding ground with water to provide positive grounding. The ground rod is connected to the shelter by a cable. Remove the connecting cable from the main storage cabinet. The ground cable is 9-feet long with a lug connector on one end and the insulation removed 3 inches from the other end. Remove the ground rod clamp from the shelter-mounted antenna stowage bag. Place the clamp over the protruding end of the ground rod and place the bare end of the ground connecting cable between the rod and the clamp. Tighten the bolt on the clamp. It may be necessary to use a 1/2-inch wrench. The lug end of the connecting cable is connected to a terminal marked GROUND on the ac power entry panel on the shelter. The ac power entry panel is illustrated in figure 2-2.

2-9. INSTALLATION OF SHELTER-MOUNTED ANTENNA. Before the shelter-mounted antenna can be installed on the shelter, the antenna mast base must be installed on the top of the shelter. The antenna mast base is stored on the inside left wall and the ceiling of the shelter. Refer to figure 2-1. Unbolt the antenna mast base from the storage bracket located on the wall and ceiling by removing the three wing nuts which secure it. Remove the antenna mast base cover located outside on the top left forward corner of the shelter. Remove the four nuts which secure the cover to the shelter. After the cover is removed, inspect the silver plated cup-mating surface in the antenna mast base receiving receptacle for dirt or foreign matter. The silver plated cup-mating surface mates with the silver plated cone on the antenna mast base. These mating surfaces provide electrical connection between the shelter equipment and the antenna. Inspect the silver plated cone on the antenna mast base for dirt or foreign matter. With extreme care, place the antenna mast base into the antenna mast base receptacle. Align the four holes in the antenna mast base with the four bolts in the shelter and replace the four nuts. Tighten the four nuts with a 9/16-inch wrench to prevent water leakage into the shelter. The antenna may now be assembled. Remove the eight

4-foot sections from the shelter-mounted antenna stowage bag. Each section has a right-hand threaded male fitting on one end and a female fitting on the other end. Starting with the sections which have the largest diameters, clean the threads, join the sections, and secure them hand-tight.

NOTE

Do not use mechanical means to tighten the antenna sections.

2-10. After the eight sections of antenna are assembled, remove the guy rope antenna ring assembly from the shelter-mounted antenna stowage bag, place the ring assembly (a sleeve and a ring) over the small end of the antenna, and slide it down until it seats against the antenna.

2-11. Remove the three nylon guy ropes from the shelter-mounted antenna stowage bag. Snap the snap-ends of the three guy ropes into the holes in the antenna ring. Mount the antenna by threading it into the antenna mast base. Extend the three guy ropes from the antenna to the ground 15 feet from the base of the antenna. Remove three guy rope stakes from the guy stake stowage bag. The stowage bag is stored inside the shelter along the right wheel well on the shelter floor (figure 2-1). Remove the web strap which secures the stake bag to the floor and remove the bag. The guy stake bag contains six stakes. The stakes should be placed 15 feet from the base of the antenna and 120 degrees apart. Drive the three stakes into the ground using the 8-pound sledge hammer, leaving approximately six inches of stake extending above the ground. Snap the slack adjuster end of the guy ropes to the holes in the stakes and remove the slack from the guy ropes by adjusting the guy ropes. After the guy ropes are secured, each guy rope should be adjusted until the antenna is straight and the guy ropes are without slack. The operator should set the antenna selector switch, located inside the left radio equipment cabinet (figure 2-3), to the ROOF WHIP ANTENNA position.

2-12. GROUND-MOUNTED ANTENNA. The ground-mounted antenna is a 32-foot Fiberglass whip antenna. Refer to figure 1-1, item 6. The ground-mounted antenna is used only for full duplex receiving. It is assembled in the same manner as the shelter-mounted antenna.

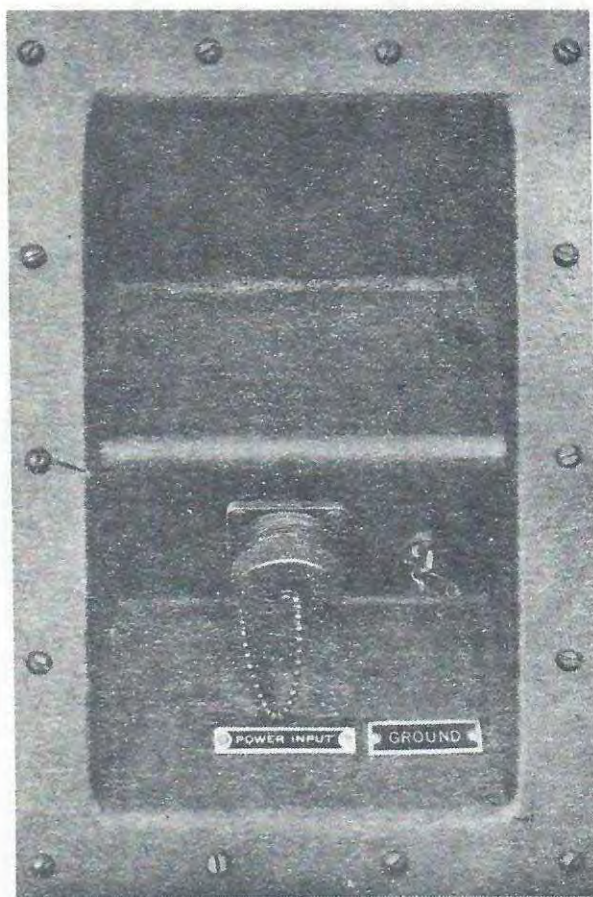


Figure 2-2. AC Power Entry, Unit 5

The ground-mounted antenna may be erected between 100 and 250 feet from the shelter. A high terrain located as far from the shelter as possible is preferable.

2-13. The ground-mounted antenna is stored in a canvas bag inside the shelter along the right wheel well on the floor and is secured to the floor by two web straps. Unbuckle the web straps and remove the ground-mounted antenna stowage bag. The ground-mounted antenna stowage bag contains one antenna guy rope ring, three guy ropes, one antenna base adapter, and eight 4-foot sections of antenna. The ground-mounted antenna base is stowed on the shelter access door. Remove the base by turning the four knurled thumb screws counter-clockwise. Lift the antenna base from its

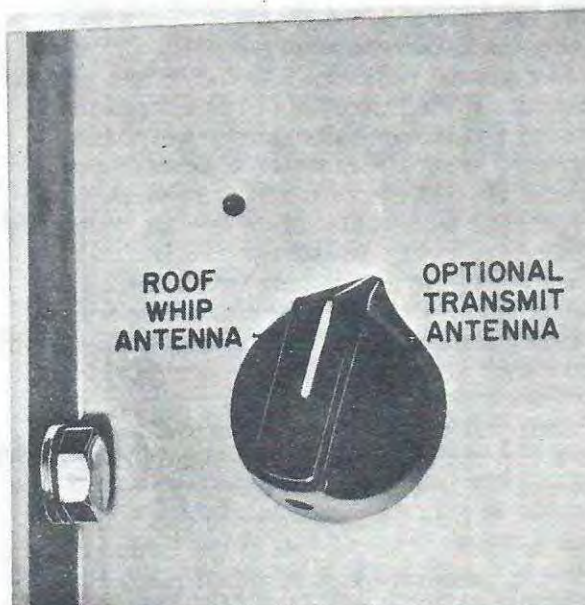


Figure 2-3. Antenna Selector Switch

stowage position. The ground-mounted antenna may be erected within a 250-foot radius but at least 100 feet from the shelter. Place the antenna base firmly on the ground.

2-14. Remove the eight 4-foot sections of antenna from the antenna stowage bag. Each section has a right-hand threaded male fitting on one end and a female fitting on the other end. Starting with the sections which have the largest diameters, clean the threads, join the sections, and secure them hand-tight.

NOTE

Do not use mechanical means to tighten the antenna sections.

2-15. Remove the three guy rope stakes from the guy stake stowage bag. Place the stakes 15 feet from the antenna base and 120 degrees apart (refer to figure 1-1). Drive the three stakes into the ground using the 8-pound sledge hammer, leaving approximately 6 inches of stake extending above the ground. Remove the antenna adapter from the ground-mounted antenna stowage bag, and place the adapter on the antenna. Remove the guy rope antenna ring from the ground-mounted antenna stowage bag,

place the ring over the small end of the antenna, and slide the ring down until it seats against the antenna. Remove the three guy ropes from the antenna stowage bag, and snap them to the antenna guy rope ring. Extend the guy ropes from the antenna to the guy rope stakes, and snap the guy ropes to the holes in the stakes. Raise the antenna and insert the base end of the antenna adapter into the ground-mounted antenna base. Remove the slack from the guy ropes by adjusting the guy ropes until the antenna is straight and the guy ropes are without slack. Remove the four-foot ground rod from the shelter-mounted antenna stowage bag. Drive the ground rod 3 to 3-1/2 feet into the ground, through one of the holes in the ground-mounted antenna base. If the immediate area around the ground rod is excessively dry, wet the surrounding ground with water to provide a positive ground. The ground rod is connected to the antenna adapter by a connecting cable. Remove the connecting cable from the main storage cabinet and connect the lug end of the cable to the bolt on the antenna adapter. Remove a ground rod clamp from the shelter-mounted antenna stowage bag, and place it over the ground rod. Place the bare end of the ground connecting cable between the cable clamp and the ground rod and tighten the cable clamp bolt. Tighten the bolt with a 1/2-inch wrench to ensure a good connection.

2-16. The ground-mounted antenna is connected to the shelter antenna entry by one or two antenna entry coaxial cables (depending on the distance the antenna is located from the shelter). Each cable is 125 feet long. The coaxial cables are stored on a reel attached to the access door. To remove the cable from the reel, unsnap the web belts holding the cable to the reel, snap the belts to the backing plate, and roll off the cable. A retractable handle is provided on the cable reel. Connect one end of the cable to antenna entry receptacle J2 REC ANTENNA. Fasten the cable strain relief chain to the lug provided on the antenna entry panel mounting. The antenna entry is located on the left outside wall toward the

front of the shelter. Connect the opposite end of the antenna cable to the connector on the ground-mounted antenna. Loop the strain relief chain around the antenna adapter, and fasten the chain back onto itself, using the snap. The receiving antenna is now connected for operation.

2-17. OPTIONAL TRANSMIT ANTENNAS. The XMIT ANTENNA jack, J1, on antenna entry panel unit 6 is shown in figure 2-4. Any matched antenna which presents a 50-ohm load impedance to the antenna coupler, such as a logarithmic periodic antenna, can be connected to XMIT ANTENNA jack J1 for use as an optional transmit antenna.

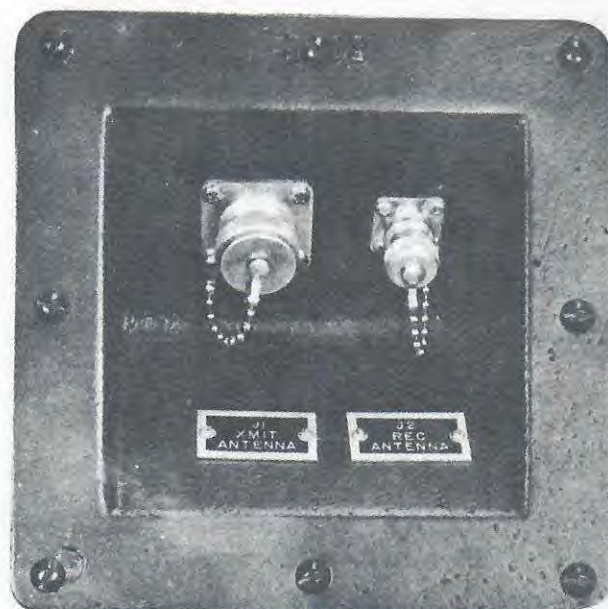


Figure 2-4. Antenna Entry Panel, Unit 6

CAUTION

Connect only a matched antenna which presents 50 ohms load impedance to the antenna coupler. A mismatched antenna will cause a high vswr which will burn the connector and cause serious damage to the antenna coupler.

2-18. A 50-ohm rf dummy load, such as Dummy Load DA-173/GRM-10, can be connected to XMIT ANTENNA jack J1 for test and maintenance purposes. Whenever XMIT ANTENNA jack J1 is used, either for an optional transmit antenna connection or for a dummy load connection, position the antenna selector switch shown in figure 2-3 to OPTIONAL TRANSMIT ANTENNA.

2-19. Other types of antennas which do not present a 50-ohm load to the antenna coupler can be used with Communications Central AN/TSC-15. However, these types of antennas must be connected to the roof whip antenna connector, not to XMIT ANTENNA jack J1. The following types of antennas can be connected to the roof whip antenna connector:

2-20. Whip Antennas. Other whip antennas from 15 to 32 feet in length can be used. However, as the length of the whip antenna decreases, the lowest tunable operating frequency increases. A 15-foot whip antenna will not tune reliably below 3.5 MHz because of the low inductance of the load coil.

2-21. Long-Wire Antennas. Long-wire antennas which are 45 feet or longer can be connected to the roof whip antenna connector. Long-wire antennas should be end-fed and connected to the roof whip antenna connector with high voltage, open lead-in wire.

2-22. High-Gain Directional Antennas. Rhombic and V antennas can be used with Communications Central AN/TSC-15. These types of antennas should also be connected to the roof whip antenna connector with high voltage, open lead-in wire.

NOTE

When a long-wire, rhombic, or V antenna is used as an optional transmit

antenna, it may be necessary to short circuit the load coil when operating at frequencies below 3.0 MHz. This can easily be accomplished by removing the connection to junction box terminal 1A1TB1-45.

2-23. SIGNAL ENTRY PANEL. Telephone and telegraph input facilities to the shelter are available at the signal entry panel. The signal entry panel is located on the outside front wall of the shelter. The entry panel itself is protected from the weather by a cover. This cover is secured to the shelter by a hinge at the top of the panel and three wing nuts at the bottom. Access to the panel is gained by unscrewing the three wing nuts and lifting the cover upward. Turn the side protecting covers in the lid downward to support the cover in the raised position. When the shelter is loaded on a 3/4-ton truck, the signal entry panel cover can not be raised because of limited space between the shelter and the truck cab. In this case, the cover must be removed to gain access to the entry panel. Loosen the three screws at the bottom of the signal entry panel. Remove the two hinge pins (one from each side), and lift the cover upward. Slide the cover between the cab and the shelter to the outside of the shelter, rotate 180 degrees, and replace the cover in the open position. Replace the hinge pins.

2-24. The signal entry panel provides input for five telephone lines (2-wire or 4-wire), five teletypewriter lines (2-wire or 4-wire), two possibilities for remote push-to-talk lines, two pairs of auxiliary phone lines, and six spare pairs (refer to figure 2-5).

2-25. Teletypewriter Lines. For 2-wire teletypewriter lines, the operator will connect each pair to the CHANNEL XMIT/2W terminals (figure 2-5). For 4-wire teletypewriter lines, the operator will connect the transmit pair to the CHANNEL XMIT/2W terminals and the receive pair to the RECEIVE terminals. If the wires from the remote teletypewriter are marked, the positive wire should always be connected to the uppermost terminal of the pair. If the wires are not marked, polarity must be determined and the wires connected accordingly.

2-26. Telephone Lines. Two-wire telephone lines will be connected to the TELEPHONE LINE XMIT/2W pair of terminals (figure 2-5).

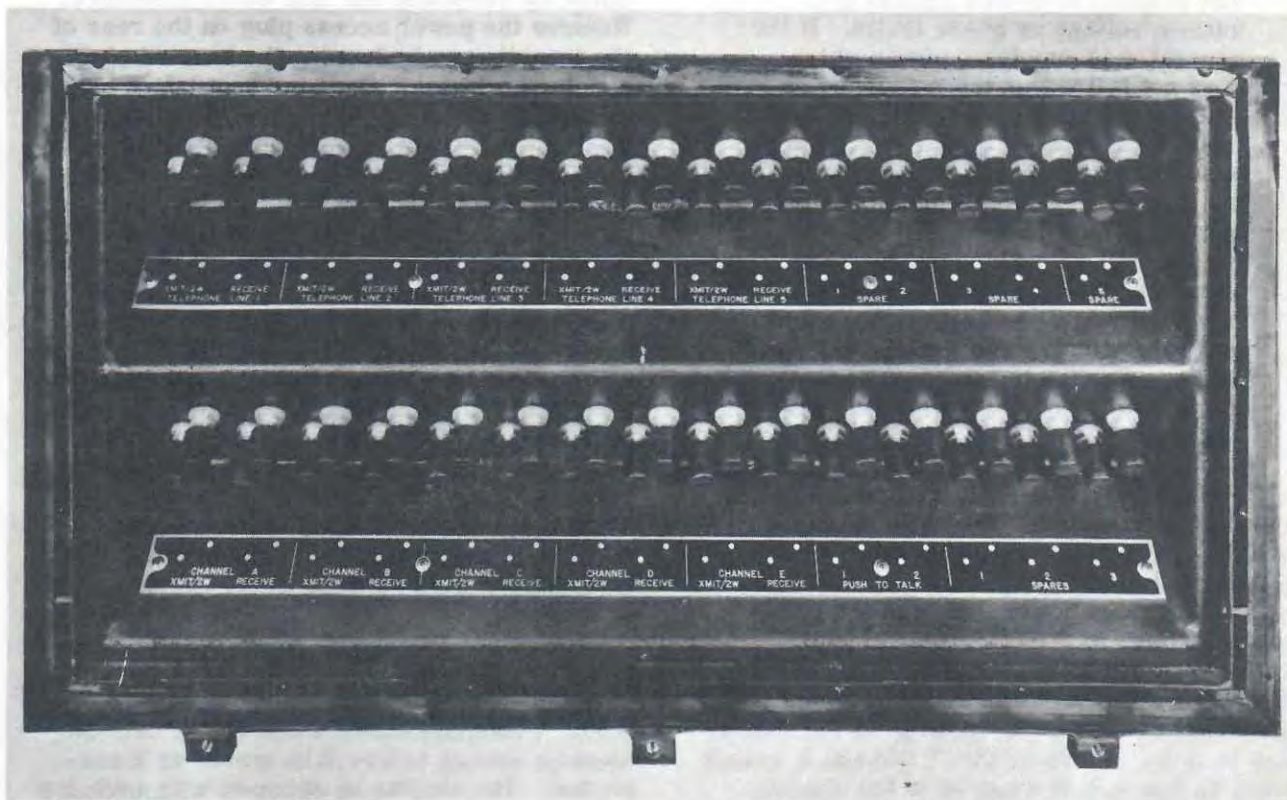


Figure 2-5. Signal Entry Panel, Unit 4

For 4-wire type lines, the transmit pair will be connected to the XMIT/2W terminals and the receive pair to the RECEIVE pair of terminals.

2-27. SHELTER. Before checking the equipment in the shelter, the antennas should be set up, the power generator should be connected to the shelter and started, and the telephone and telegraph lines should be connected to the signal entry panel. With the power generator running and the circuit breaker on the generator closed, power is applied to the ac power entry panel in the shelter.

2-28. Check the three neon phase lights on the ac power entry panel to see if they are lighted. These lamps should be lighted when the generator is connected and operating. If the phase lamps are lighted, set MAIN circuit breaker to ON. Check FREQ/VOLT FAULT and PHASE FAULT lamps on the protective device, (located on the lower portion of the AC power entry panel). If either of the fault lamps are lighted, a fault exists, and power cannot be applied to the shelter. If one or both of the fault lamps are lighted, the fault must be corrected before power can be applied to the shelter.

NOTE

The protective device detects frequency/voltage or phase faults. If the generator is supplying power which does not fall within the frequency or voltage limits of the AN/TSC-15 system, the frequency detector will sense an error and disconnect power from the shelter. If the frequency varies more than ± 20 Hz from 400 Hz, the shelter will be disconnected. The phase detector will sense phase reversal (wrong sequence, which would make the blowers run backward), open phase, or phase to neutral reversal (which would apply 208 volts to 115-volt line).

2-29. There are five circuit breakers on the ac power entry panel. They are MAIN, LIGHTS CONVENIENCE, EXHAUST FANS, RADIO, and CONSOLE. The MAIN circuit breaker provides power, through the protective device, to the other four circuit breakers on the ac entry panel. The LIGHTS CONVENIENCE circuit breaker provides power to the shelter lights and outlets. If the shelter door is open, the BLACKOUT DISABLE switch (refer to figure 2-6) must be in the disable position before power can be applied to the shelter lights and convenience outlets. There are also individual switches on the four shelter lights.

2-30. Before turning on the EXHAUST FANS circuit breaker, see that the three ventilation doors on the outside of the shelter are open. Two doors are located on the front of the shelter and the other is at the rear of the shelter on the access door. Placing the EXHAUST FANS circuit breaker in the ON position applies power to the exhaust blower switches on the ac power entry panel.

2-31. Remove the headset, footswitch, microphone, CW key and cable, and teletypewriter cable from the shelter storage cabinet. Remove the teletypewriter from its storage bracket by removing the two web straps which secure it to the bracket on top of the left wheel well. Remove the teletypewriter table from its stowage position on the left shelter wall. (Refer to figure 2-1.) Place the table on the teletypewriter stowage bracket, making sure that the two pins in the base of the stowage bracket protrude through the holes in the

teletypewriter table. Place teletypewriter on this table. Remove the teletypewriter front cover by releasing the four cover fasteners. Remove the power access plug on the rear of the transit case by turning the knurled plug counterclockwise. Open the ventilation plug by turning its knurled nut counterclockwise. The teletypewriter power cable should now be connected between the teletypewriter and the AUXILIARY MITE CONNECTOR which is located on the left wall of the shelter (refer to figure 2-7). The teletypewriter also may be set up on the folding desk. In this case it should be connected to the Telegraph Line Control C-3533/TSC-15. Plug the microphone and headset into Manual Telephone Switchboard SB-1248/TSC-15. Plug the footswitch into the jack marked FOOT SWITCH on the accessory box (figure 1-1, item 9). Remove the operator's chair from the right wall of the shelter (see figure 2-1) by disconnecting the two web straps which hold it in position. This completes the installation of the operator's equipment.

2-32 STOWAGE.

2-33. Communications Central AN/TSC-15 must be stowed before it is moved or transported. The shelter is equipped with eyebolts for lifting or securing the shelter during transporting. The shelter may be transported by 3/4-ton, 4 x 4, M37 truck, or 2-1/2-ton M35 truck, as well as by fixed wing or rotary wing air transport or by rail.

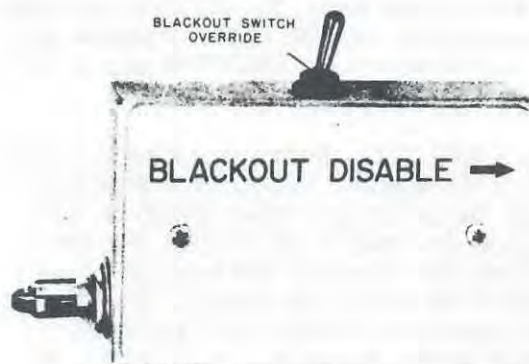


Figure 2-6. Blackout Disable Switch

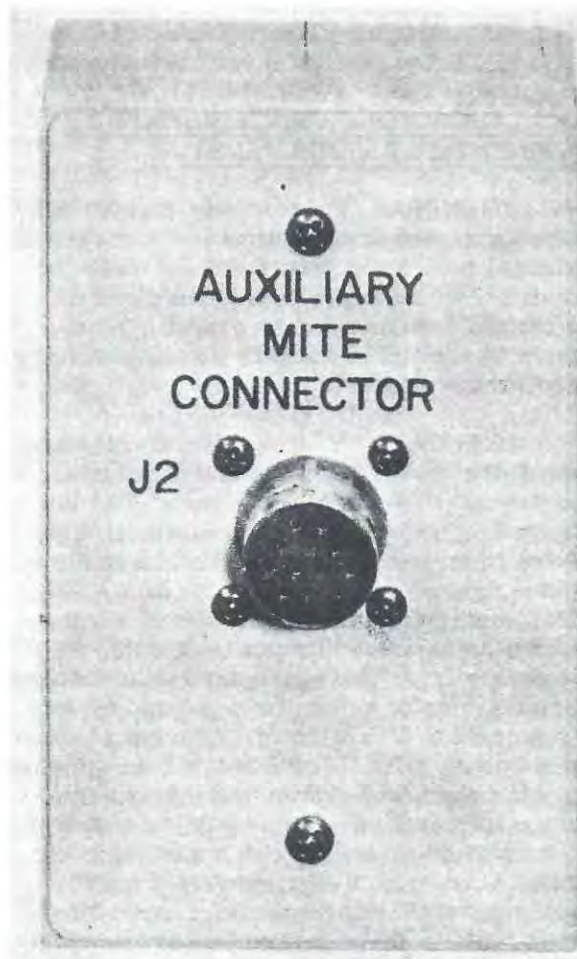


Figure 2-7. Auxiliary Teletypewriter Connector

2-34. SHELTER. Place the RADIO and CONSOLE circuit breakers located on the ac power entry panel in OFF. This removes power to the console and all radio equipment. Disconnect the teletypewriter cable and store the teletypewriter in its storage bracket. Remove the teletypewriter table from its bracket and store the table in its stowage position on the left rear wall (see figure 2-1). Disconnect the microphone, CW key, footswitch, and headset, and store in the shelter storage cabinet. Fold the chair and secure it by the two web straps to the right shelter wall (figure 2-1). Turn off the switches on the shelter blowers and shelter lights. Place the

EXHAUST FANS, LIGHTS CONVENIENCE and MAIN circuit breakers in OFF. Close the ventilation doors on the shelter door and the rear of the shelter. Turn off the generator.

2-35. GROUND-MOUNTED ANTENNA. Disconnect the strain relief chain from the antenna adapter. Disconnect the coaxial cable from the connector at the ground-mounted antenna base. Disconnect the strain relief chain from the antenna entry panel. Disconnect the coaxial cable from the antenna entry panel on the shelter. Store the antenna cable on the shelter door. Lift the antenna from the antenna base plate and lay it on the ground. Loosen the three guy ropes and remove them from the guy rope stakes. Remove the stakes by gently tapping on each side alternately with the 8-pound sledge hammer and pulling out by hand. Store the stakes in the guy stake stowage bag. Disconnect the guy ropes and slip the guy rope antenna ring over the small end of the antenna. Store the guy ropes and guy rope antenna ring in the ground-mounted antenna stowage bag. Remove the ground cable from the antenna adapter and store the adapter in the ground-mounted antenna stowage bag. Disassemble the antenna by separating the eight 4-foot sections. Store the antenna sections in the ground-mounted antenna stowage bag. Remove the ground cable. Use the T-handle (stored in the guy stake stowage bag) to remove the ground rod. Place the handle over the rod, tighten the screw, twist on the handle, and pull the rod from the ground. Store the ground rod in the shelter-mounted antenna stowage bag. Place the ground-mounted antenna stowage bag along the left wheel well and strap it to the floor. Store the ground cable in the main storage cabinet. Store the antenna base plate on the shelter access door.

2-36. SHELTER-MOUNTED ANTENNA. Loosen the three guy ropes, and remove from the shelter-mounted guy rope stakes. Remove the stakes by gently tapping on each side alternately with the 8-pound sledge hammer and pulling out by hand. Store the stakes in the guy stake stowage bag. Separate the antenna from the antenna mast base by twisting the antenna counterclockwise. Lay the antenna on the ground. Disconnect the guy ropes from the antenna and slip the guy rope antenna ring assembly over the small end of the antenna. Store the guy rope antenna ring assembly and the guy ropes in the shelter-mounted antenna stowage bag. Disassemble the antenna by

separating the 4-foot sections and store the sections in the shelter-mounted antenna stowage bag. Remove the four nuts which secure the antenna mast base to the shelter. Lift the antenna mast base straight out of the antenna mast base receptacle. Replace the base receptacle cover, and secure it to the shelter with the four nuts provided. Replace the antenna mast base to its storage position inside left wall and ceiling of the shelter (see figure 2-1). Secure the base with four wing nuts.

2-37. **SHELTER GROUND ROD.** Disconnect the ground cable by removing the clamp from the ground rod and disconnecting the lug from the shelter ac power entry panel. Store the ground rod clamp in the shelter-mounted antenna stowage bag. Store the ground cable in the main storage cabinet. Use the T-handle (stored in the guy stake stowage bag) to remove the ground rod. Place the handle over the rod, tighten the screw, twist on the handle, and pull the rod from the ground. Store the ground rod in the shelter-mounted antenna bag. Stow the 8-pound sledge hammer inside the shelter along the right wheel well (see figure 2-1). Store the guy stake stowage bag along the right wheel well on top of the shelter-mounted antenna stowage bag (see figure 2-1). Secure the two stowage bags to the floor using the web straps provided.

2-38. **SIGNAL ENTRY PANEL.** Disconnect the telephone and telegraph lines from the signal entry panel. Close and secure the signal entry panel cover.

2-39. DESCRIPTION OF CONTROLS.

2-40. Operating controls, indicators, and connectors, contained on the panels of the Communication Central Systems are listed in table 2-1 through 2-15 and shown in figures 2-8 through 2-22.

2-41. OPERATING PROCEDURES.

2-42. The following paragraphs contain operating procedures for each major unit in the Communications Central System. Refer to tables 2-1 through 2-15 and figures 2-8 through 2-22 for names, locations, and functions of the radio set operating controls, indicators and connectors. Before turning on the Communications Central System, perform

before use operating instructions listed in Section III, General Maintenance Instructions.

2-43. OPERATING PROCEDURE FOR AC POWER ENTRY PANEL, UNIT 5.

2-44. **GENERAL.** The ac power entry panel contains switches and indicators to control all external power which enters the AN/TSC-15 shelter. With the generator running and the ac circuit breaker on the generator closed, power is applied directly to the ac power entry panel in the shelter.

2-45. **OPERATION.** The three neon indicator lamps designated ØA, ØB, and ØC indicate the presence of three-phase power. The indicators will light when the generator is connected to the shelter and the circuit breakers on the generator are closed. The ELAPSED TIME meter measures the number of hours and tenths of hours that power is applied to the equipment. The frequency meter indicates the frequency of the power being supplied by the generator. Frequency of the input power must be 400 ± 20 Hz. The MAIN circuit breaker supplies electrical power to the protective device, (located on the lower portion of the AC power entry panel), and if operating conditions are correct, the protective device supplies power to the remaining circuit breakers located on the entry panel. Power cannot be applied to any part of the equipment unless the MAIN circuit breaker is first set to ON. The LIGHTS CONVENIENCE circuit breaker applies power to the four shelter lights and the convenience outlets. Each shelter light is provided with a toggle switch. The RADIO circuit breaker applies power to the radio equipment and the rack blowers inside the equipment cabinets. The radio equipment then may be controlled by Radio Set Controls C-3141/TRC-75 and C-3532/TSC-1. With the RADIO circuit breaker set to ON and the simplex radio turned on, one of the antenna-selected lights (located directly above Telegraph Line Control C-3533/TSC-15) should come on. These two lamps correspond to the position of the antenna selector switch which is located inside the left equipment cabinet on the blower mounting bracket. The EXHAUST FANS circuit breaker applies power to the VENTILATING FAN ON-OFF switches on the ac power entry panel. The ventilating fans then may be controlled by these switches. The CONSOLE circuit breakers apply primary

Table 2-1. AC Power Entry Panel, Unit 5, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-8)	LOCATION	FUNCTION
MAIN circuit breaker			Applies power to the protective device (located on the lower portion AC power entry of the panel) which, in turn, applies power to remaining circuit breakers if frequency of the power source and connections to power source are correct.
LIGHTS CONVENIENCE circuit breaker			Applies power to shelter lights and convenience outlets.
FREQUENCY Meter			Indicates frequency of source power.
Phase A indicator light			Indicates presence of power.
Phase B indicator light			Indicates presence of power.
Phase C indicator light			Indicates presence of power.
RADIO circuit breakers			Apply power to terminals in junction box and radio equipment blowers.
EXHAUST FANS circuit breaker			Applies power to exhaust fans OFF-ON switches on ac power entry panel.
CONSOLE circuit breaker			Applies power to regulated and unregulated 28-volt dc supplies in console.
VENTILATING FAN OFF-ON switches			Apply power to ventilating fans located on front wall inside equipment cabinets to exhaust air out of shelter. EXHAUST FANS circuit breaker must be in ON position before power is applied to VENTILATING FAN OFF-ON switches.
ELAPSED TIME meter			Indicates total time equipment has been energized.

Table 2-1. AC Power Entry Panel, Unit 5, Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-8)	LOCATION	FUNCTION
EMERGENCY switch			Bypasses three-phase input power lines around ac protection device during an emergency.
Fault indicators FREQ/VOLT			Indicates primary power supplies by generator is not within allowable frequency or voltage limits.
PHASE			Indicates primary power supplied by generator is incorrectly connected to AN/TSC-15.

Table 2-2. Power Supply Control C-3534/TSC-15 Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-9)	LOCATION	FUNCTION
F1			Fuse, 5 amp, for Band Pass Filter F-508/U, console accessory panel unit 3A13, and Filter Control C-3595/U.
F2			Fuse, 1.5 amp, for Detector Relay Assembly RE-502/TSC-15, teletypewriter circuits, and 20-cycle ringer.
F3			Fuse, 1 amp, for Telephone Terminal Control C-3535/TSC-15.
F4			Fuse, 2 amp, for Audio Frequency Amplifiers AM-2898/TSC-15, AM-1974/U, AM-1975/U, AM-1968/U, and AM-3200/U, Telephone Test Set TS-1635/TSC-15, and call amplifiers and VU

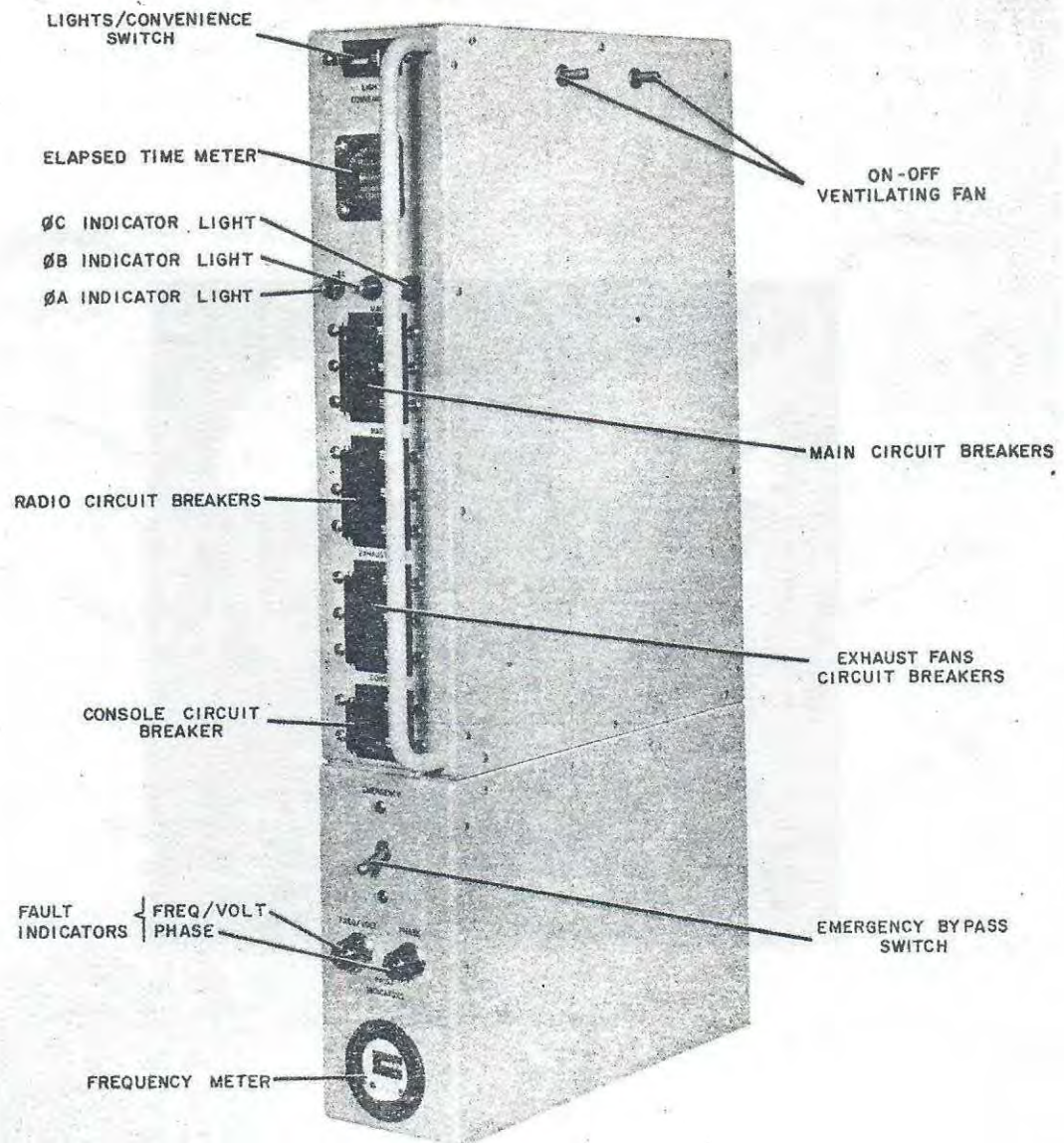


Figure 2-8. AC Power Entry Panel, Unit 5, Controls and Indicators

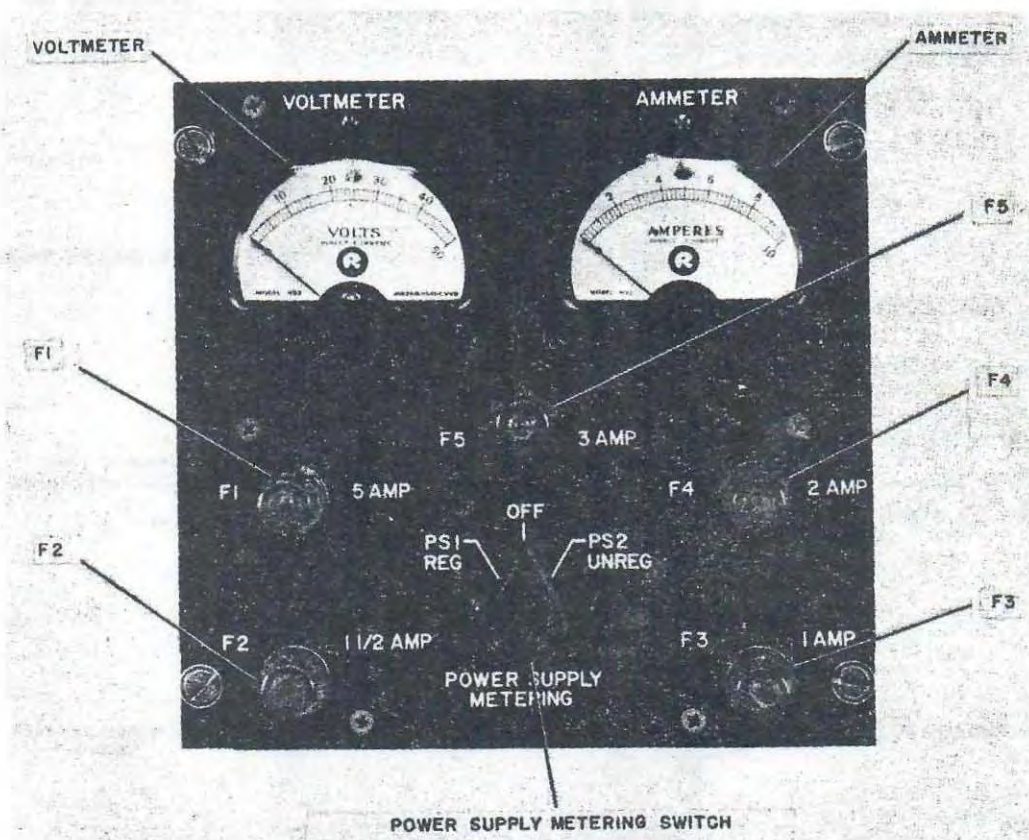


Figure 2-9. Power Supply Control C-3534/TSC-15, Unit 3A4A5, Controls and Indicators

Table 2-2. Power Supply Control C-3534/TSC-15 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-9)	LOCATION	FUNCTION
F5			amplifier of Manual Telephone Switchboard SB-1248/TSC-15.
POWER SUPPLY METERING switch OFF			Fuse, 3 amp, for Manual Telephone Switchboard SB-1248/TSC-15.
PS1 REG			Both power supplies are out of the metering circuit.
PS2 UNREG			Meter indicates voltage and current supplied by Power Supply PP-2868/U.
VOLTMETER			Meter indicates voltage and current supplied by Power Supply PP-2869/TSC-15.
AMMETER			Indicates the output voltage of the power supply selected by POWER SUPPLY METERING switch.
			Indicates the load current being drawn from the power supply selected by the POWER SUPPLY METERING switch.

Table 2-3. Power Supply PP-2869/TSC-15, Unit 3A10 Controls

CONTROL OR INDICATOR	LEGEND (FIGURE 2-10)	LOCATION	FUNCTION
ON-OFF switch			Applies power to power supply and serves as a protective device.

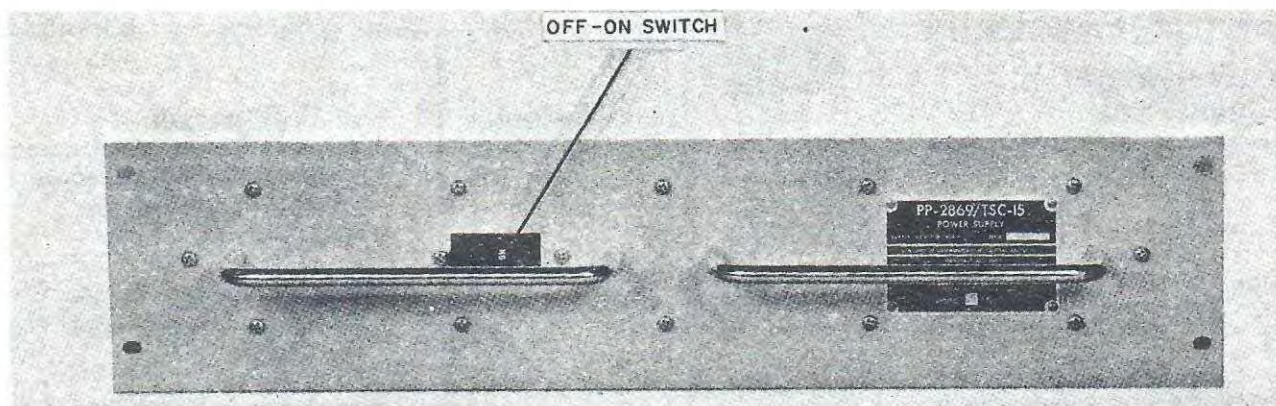


Figure 2-10. Power Supply PP-2869/TSC-15, Unit 3A10, Controls

Table 2-4. Power Supply PP-2868/U, Unit 3A11, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-11)	LOCATION	FUNCTION
ON-OFF switch			Applies power to unit and serves as protective device.
POWER ON indicator			Indicates ON-OFF switch is set to ON and power applied to unit.
THERMAL OVERLOAD indicator			Indicates unit operating under thermal overload condition.
DC VERNIER control			Adjusts level of dc output.

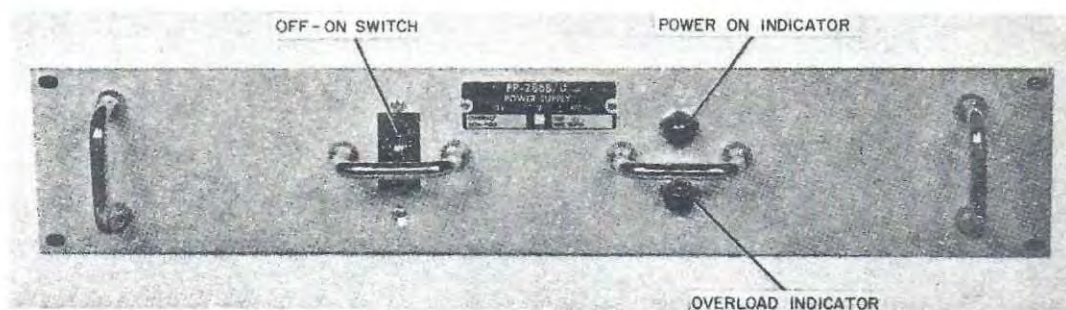


Figure 2-11. Power Supply PP-2868/U, Unit 3A11, Controls and Indicators

Table 2-5. Radio Set Control C-3141/TRC-75, Units 3A4A1 and 3A4A3, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-12)	LOCATION	FUNCTION
OFF-ON switch (L) Frequency selection knobs (N) (P) (R) (S) VOL control (M) AM-U-L-TWIN switch (K) FREQ KC			Applies power to radio equipment. Automatic release feature turns off radio set when a circuit fault exists. Provide selection of operating frequencies from 2.0 to 29.999 MHz in steps of 1-, 10-, 100-, and 1000-kHz, and initiates automatic coarse tuning when radio set is tuned on. Controls rf gain of radio set. Switch is not wired for use in the AN/TSC-15 system. Mode selection is accomplished by mode selector switch on Radio Set Control C-3532/TSC-15. Indicates frequency in kilocycles.

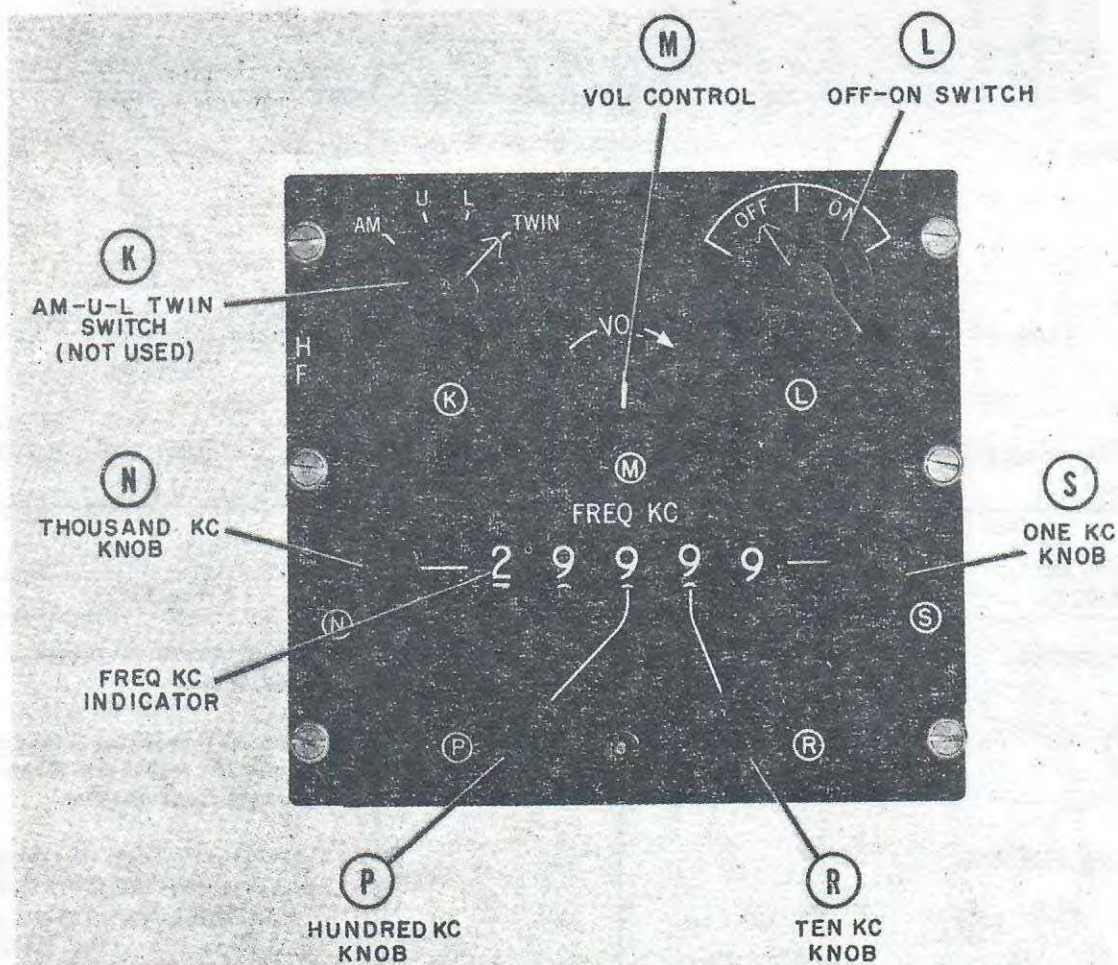


Figure 2-12. Radio Set Control C-3141/TRC-75, Units 3A4A1 and 3A4A3, Controls and Indicators

Table 2-6. Radio Set Control C-3532/TSC-15, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-13)	LOCATION	FUNCTION
DIRECTIONAL WATT meter			Indicates amount of rf power transmitted or reflected.
READY indicator			Indicates transmitter is ready for operation.
XMTR KEYED indicator			Indicates when transmitter is keyed.
Transmitter power switch			
H PWR			Activates circuitry capable of providing 1000 watts of rf power output.
L PWR			Activates circuitry capable of providing 100 watts of rf power output.
Meter selector switch			
FWD 1 KW			Switches directional watt-meter to read forward output power on upper FWD 1 KW scale.
REFLECTED 100 W			Switches directional watt-meter to read reflected power or lower 100-watt scale.
SIMPLEX-DUPLEX switch			Switches radio system between simplex and duplex operation.
Transmitter key switch			
PTT			Allows push-to-talk operation of transmitter.
RADIO SILENCE			Prevents transmitter from being keyed.
VOX			Allows transmitter to be keyed by voice.

Table 2-6. Radio Set Control C-3532/TSC-15, Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-13)	LOCATION	FUNCTION
Mode selector switch			
AM			Allows radio to operate in AM (amplitude modulated) mode.
IND			Allows radio to operate in independent sideband mode.
TWIN			Allows radio to operate in twin sideband mode.

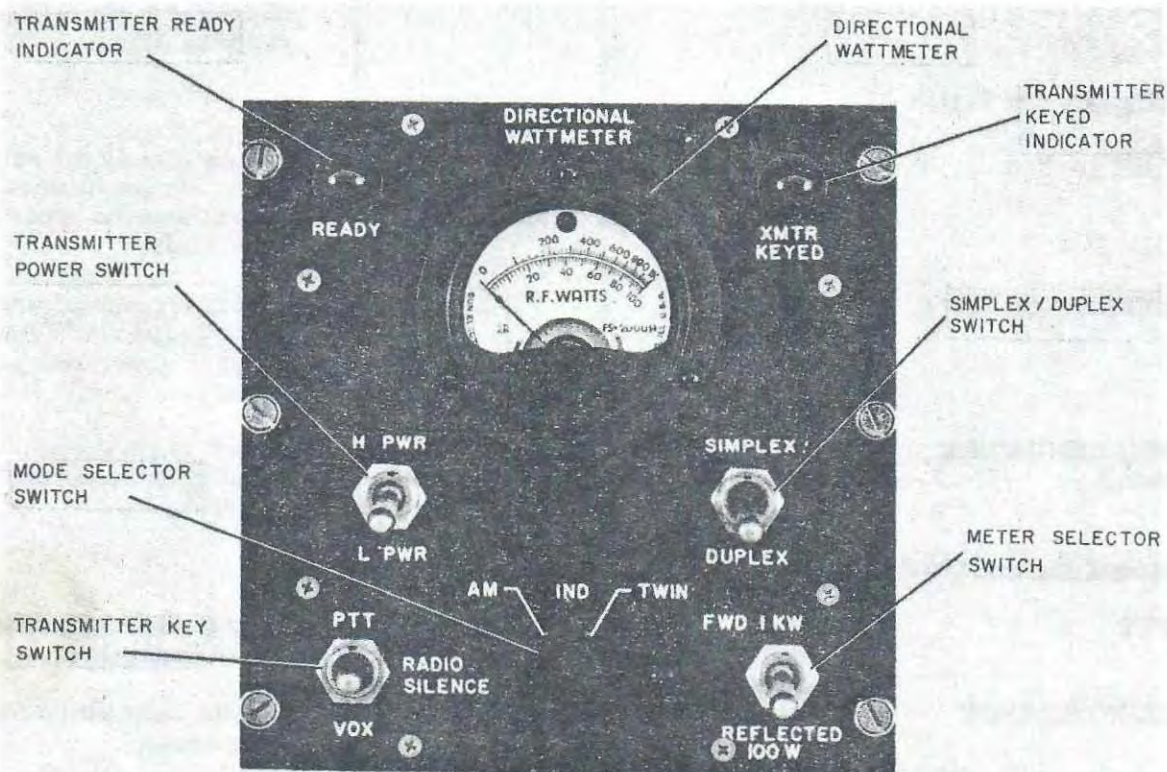


Figure 2-13. Radio Set Control C-3532/TSC-15, Unit 3A4A2, Controls and Indicators

Table 2-7. Filter Control C-3595/U, Unit 3A4A4, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-14)	LOCATION	FUNCTION
OFF-ON switch			Turns band pass filter on and off.
S5			Panel lamps light when turned to ON position if simplex radio is tuned on.
OVLD RESET lamp and switch S6			A pushbutton switch with built-in indicator lamp. Lamp lights when band pass filter overload occurs. When pressed, switch restores normal band pass filter operation, unless overload is still present.
Megacycle switch S1			A 28-position rotary switch used to select band pass filter frequency from 2 to 29 MHz in 1-MHz increments.
100-kilocycle switch S2			A 10-position rotary switch used to select band pass filter frequency from 0.0 to 0.9 MHz in 0.1-MHz increments.
10-kilocycle switch S3			A 10-position rotary switch used to select band pass filter frequency from 0.00 to 0.09 MHz in 0.01 MHz increments.
1-kilocycle switch S4			A 10-position rotary switch used to select band pass filter frequency from 0.000 to 0.009 MHz in 0.001 MHz increments.
Frequency indicator			Indicates frequency (in MHz) selected by filter control switches S1, S2, S3, and S4.

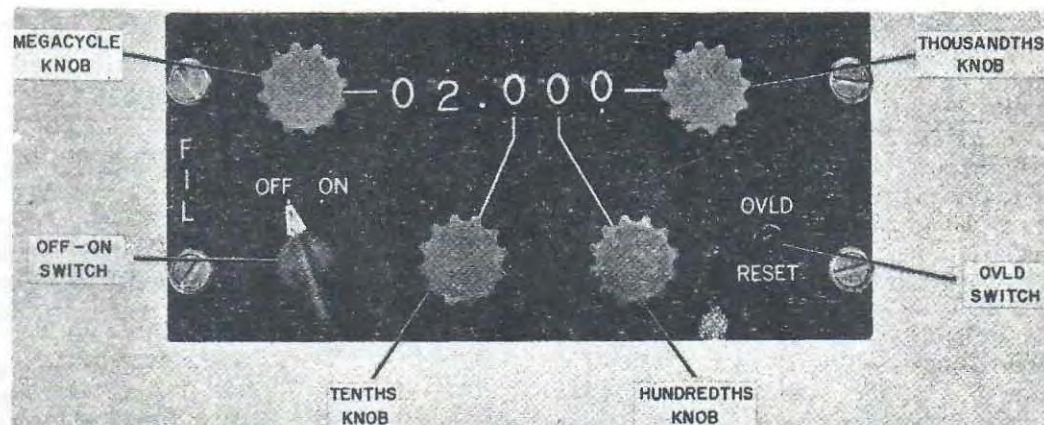


Figure 2-14. Filter Control C-3595/U, Unit 3A4A4, Controls and Indicators

Table 2-8. Detector Relay Assembly RE502/TSC-15, Unit 3A9, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-15)	LOCATION	FUNCTION
ON-OFF switch			
ON			Completes class C control line from single tone detector. Applies ground to class C control line in power amplifier when single tone switching sequence has been established.
OFF			Breaks class C control line so power amplifier can operate only in class A.

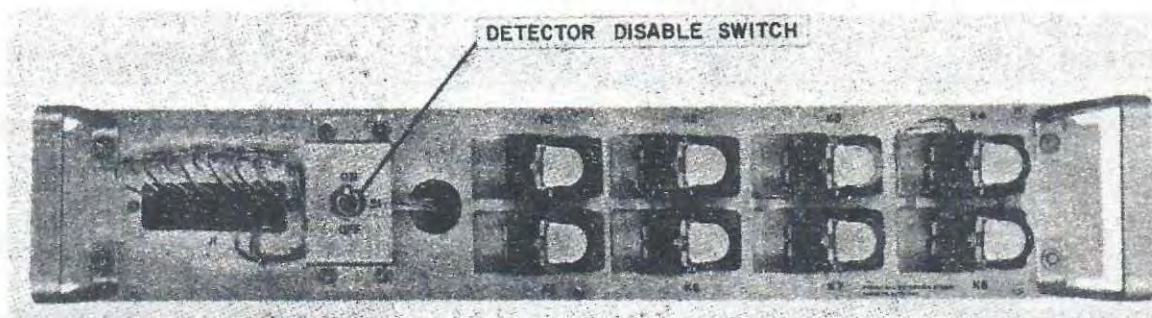


Figure 2-15. Detector Relay Assembly RE-502/TSC-15, Unit 3A9, Controls and Indicators

Table 2-9. Telegraph Line Control C-3533/TSC-15, Unit 3A1 Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-16)	LOCATION	FUNCTION
LOOP CURRENT meter			Measures dc loop current in teletypewriter circuits.
SPKR ON-OFF			Turns local speaker on or off.
Channel ON-OFF switches			Turn corresponding teletype-writer channels on or off.
Channel operation indicators			Indicate presence of transmit and receive loop current in closed loop.
Channel CALL indicators			Indicate incoming calls on remote wire lines.
Channel HOLD RESET buttons			Reset call circuits.
CHANNEL selector switches			Allow operator to select desired TTY channel to monitor or use.
MONITOR switch			Permits operator to monitor any teletypewriter transmit or receive loops.

Table 2-9. Telegraph Line Control C-3533/TSC-15, Unit 3A1 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-16)	LOCATION	FUNCTION
2W-4W line selector switch			Connects necessary bridging circuits, allowing local machine to operate with either two-wire or four-wire remove teletypewriter lines.
Mode selector switch			Connects local teletypewriter into remote teletypewriter loops or radio equipment (AN/TGA-1).
Loop current controls			Adjust loop current of circuits used with local teletypewriter.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Power and loop current TEST METER	1	Top of 3/4 ATR front panel	Indicates the magnitude of the +26-volt and the +120-volt outputs of the internal power supply, and indicates the loop current for the selected loop circuit. Any one of the five transmit or five receive teletypewriter loop currents can be monitored.
Selector switch for TEST METER	2	Top of 3/4 ATR front panel	Selects the +26-volt bus or +120-volt bus to monitor the power supply output, or connects meter to desired loop circuit to monitor loop current in any of the 10 loop circuits.
Channel E +26-volt fuse CH-E FUSES 1/10A	3	Top of 3/4 ATR front panel	Fuses the +26-volt power for channel E.
Channel E +120-volt fuse CH-E FUSES 1/4A	4	Top of 3/4 ATR front panel	Fuses the +120-volt power for channel E.

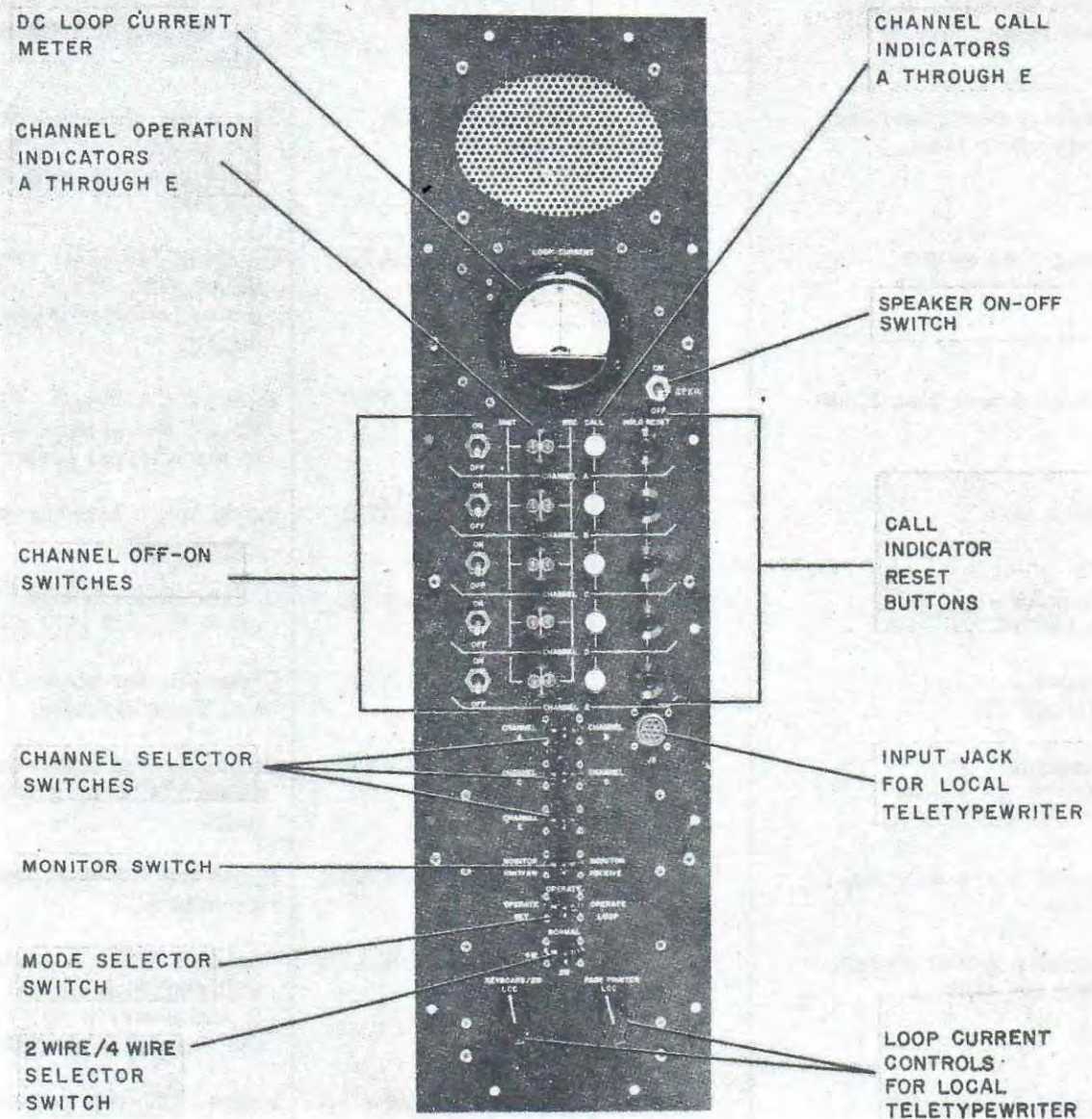


Figure 2-16. Telegraph Line Control C-3533/TSC-15, Unit 3A7, Controls and Indicators

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Output amplifier module (A6) Power fuse 1/10A	5	Top of 3/4 ATR front panel	Fuses the +26-volt power for the output amplifier module.
Auxiliary teletypewriter power fuse 1/4A	6	Top of 3/4 ATR front panel	Fuses the +120-volt power for an external (AUX) teletypewriter loop circuit (60 ma).
Main power switch AC PWR ON-OFF	7	Bottom of 3/4 ATR front panel	Controls 115-volt, single-phase, 400-Hz primary power to internal power supply.
Main ac power fuse 2.5A	8	Bottom of 3/4 ATR front panel	Fuses the 115-volt, 400-Hz, single-phase input power to the internal power supply.
SPARE fuse	9	Bottom of 3/4 ATR front panel	Holds spare fuse for main ac power fuse.
Connector J9 INPUT	10	Bottom of 3/4 ATR front panel	Connector for power, loop circuits, and indicators.
Connector J10 INPUT	11	Bottom of 3/4 ATR front panel	Connector for power, control, and audio circuits.
Connector J11 CH-E	12	Bottom of 3/4 ATR front panel	Connector for interconnecting cable 3/4 ATR to 1/4 ATR units.
Channel A +26-volt fuse 1/10A	13	Left side of 3/4 ATR front panel	Fuses the +26-volt power for channel A.
Channel A power switch PWR ON-OFF	14	Left side of 3/4 ATR front panel	Controls +26-volt and +120-volt power (from the internal power supply) to the channel A circuits.
Channel A +120-volt fuse 1/4A	15	Left side of 3/4 ATR front panel	Fuses +120-volt power for channel A.
Channel A loop-adjust rheostat XMIT LOOP ADJ	16	Left side of 3/4 ATR front panel	Adjusts channel A transmit teletypewriter loop current.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Channel A loop-adjust rheostat REC LOOP ADJ	17	Left side of 3/4 ATR front panel	Adjusts channel A receive teletypewriter loop current.
Channel A transmit loop monitor jack MONITOR XMIT	18	Left side of 3/4 ATR front panel	Monitors channel A transmit loop current with an external meter or TTY printer.
Channel A receive loop monitor jack MONITOR REC	19	Left side of 3/4 ATR front panel	Monitors channel A receive loop current with an external meter or TTY printer.
Channel B +26-volt fuse 1/10A	20	Left center of 3/4 ATR control panel	Fuses +26-volt power for channel B.
Channel B power switch PWR ON-OFF	21	Left center of 3/4 ATR control panel	Controls +26-volt and +120-volt power (from internal power supply) to channel B circuits.
Channel B +120-volt fuse 1/4A	22	Left center of 3/4 ATR control panel	Fuses +120-volt power for channel B.
Channel B loop adjust rheostat XMIT LOOP ADJ	23	Left center of ATR control panel	Adjusts channel B transmit teletypewriter loop current.
Channel B loop adjust rheostat REC LOOP ADJ	24	Left center of 3/4 STR control panel	Adjusts channel B receive teletypewriter loop current.
Channel B transmit loop monitor jack MONITOR XMIT	25	Left center of 3/4 ATR control panel	Monitors channel B transmit loop current with an external meter or TTY printer.
Channel B receive loop monitor jack MONITOR REC	26	Left center of 3/4 ATR control panel	Monitors channel B receive loop current with external meter on TTY printer.
Channel C +26-volt fuse 1/10A	27	Right center of 3/4 ATR control panel	Fuses +26-volt power for channel C.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Channel C power switch PWR ON-OFF	28	Right center of 3/4 ATR control panel	Controls +26-volt and +120-volt power (from internal power supply) to channel C circuits.
Channel C +120-volt fuse 1/4A	29	Right center of 3/4 ATR control panel	Fuses +120-volt power for channel C.
Channel C loop adjust rheostat XMIT LOOP ADJ	30	Right center of 3/4 ATR control panel	Adjusts channel C transmit teletypewriter loop current.
Channel C loop adjust rheostat REC LOOP ADJ	31	Right center of 3/4 ATR control panel	Adjusts channel C receive teletypewriter loop current.
Channel C transmit loop monitor jack MONITOR XMIT	32	Right center of 3/4 ATR front panel	Monitors channel C transmit loop current with an external meter of TTY printer.
Channel C receive loop monitor jack MONITOR REC	33	Right center of 3/4 ATR front panel	Monitors channel C receive loop current with an external meter or TTY printer.
Channel D +26-volt fuse 1/10A	34	Right side of 3/4 ATR front panel	Fuses +26-volt power for channel D.
Channel D power switch PWR OFF-ON	35	Right side of 3/4 ATR front panel	Controls +26-volt and +120-volt power (from internal power supply) to channel D circuits.
Channel D +120-volt fuse 1/4A	36	Right side of 3/4 ATR front panel	Fuses +120-volt power for channel D.
Channel D loop adjust rheostat XMIT LOOP ADJ	37	Right side of 3/4 ATR front panel	Adjusts channel D transmit teletypewriter loop current.
Channel D loop adjust rheostat REC LOOP ADJ	38	Right side of 3/4 ATR front panel	Adjust channel D receive teletypewriter loop current.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Channel D transmit loop monitor jack MONITOR XMIT	39	Right side of 3/4 ATR front panel	Monitors channel D transmit loop current with an external meter of TTY printer.
Channel D receive loop monitor jack MONITOR REC	40	Right side of 3/4 ATR front panel	Monitors channel D receive loop current with an external meter or TTY printer.
Channel E loop adjust rheostat XMIT-LOOP	41	Top of 1/4 ATR front panel	Adjusts channel E transmit teletypewriter loop current.
Channel E transmit loop monitor jack XMIT	42	Top of 1/4 ATR front panel	Monitors channel E transmit loop current with an external meter or TTY printer.
Channel E receive loop monitor jack REC	43	Top of 1/4 ATR front panel	Monitors channel E receive loop current with an external meter or TTY printer.
Channel E fuses 1/10A - 1/2A	44	Center of 1/4 ATR front panel	NOT USED - Both 1/10A and 1/2A fuses on front panel of 1/4 ATR unit are not used when single channel telegraph terminal is used as part of Telegraph Terminal Group AN/TGA-1. These fuse holders should be left empty.
Channel E spare fuses	45		Spare fuse holders for 1/10A and 1/2A fuses on Converter-Oscillator CV-1086/TGA-1.
Channel E power switch PWR ON-OFF	46	Center of 1/4 ATR front panel	Controls +26-volt and +120-volt power to channel E circuits.
Channel E loop adjust rheostat REC-LOOP	47	Bottom of 1/4 ATR	Adjusts channel E receive teletypewriter loop current.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
Connector J12 CH-E	48	Bottom of 1/4 ATR	Connector for interconnecting cable 3/4 ATR to 1/4 ATR units.
Power fuse +26-volt MAIN 1/2A type 8AG	49	(Internal) Inside power supply module A6 in Converter-Oscillator Group, OA-3138/TGA-1	Fuses +26-volt section in power supply.
Power fuse +120-volt MAIN 1A type 8AG	50	(Internal) Inside power supply module A6 in Converter-Oscillator Group, OA-3138/TGA-1	Fuses +120-volt section in power supply.
OPTION SWITCHES			
Channel A 2-wire/ 4-wire loop switch CH-A 2W-4W	51	Left-hand side on top of 1 ATR unit	Switch channel A loop circuits to either 2-wire or 4-wire teletypewriter loop operation.
Channel B 2-wire/ 4-wire loop switch CH-B 2W-4W	52	Center on top of 1 ATR unit	Switches channel B loop circuits to either 2-wire or 4-wire teletypewriter loop operation.
Channel C 2-wire/ 4-wire loop switch CH-C 2W-4W	53	Left of center on top to 1 ATR unit	Switches channel C loop circuits to either 2-wire or 4-wire teletypewriter loop operation.
Channel D 2-wire/ 4-wire loop switch CH-D 2W-4W	54	Right-hand side on top of 1 ATR unit	Switches channel D loop circuits to either 2-wire or 4-wire teletypewriter loop operation.
Channel E 2-wire/ 4-wire loop switch CH-E 2W-4W	55	Right-hand side on top of 1 ATR unit	Switches channel E loop circuits to either 2-wire or 4-wire teletypewriter loop operation.

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
OPTION SWITCHES (Con.)			
Channels A and C diversity and non-diversity switch	56	Left-hand side on top of 1 ATR unit	Switches channels A and C to either diversity or non-diversity operation.
Channels B and D diversity and non-diversity switch. CH-B and D DIV/ NON-DIV	57	Center on top of 1 ATR unit	Switches channels B and D to either diversity or non-diversity operation.
Remote indicators and controls and Loop indicators TTY loop indicators		Telegraph Line Control C-3533/ TSC-15	Indicates operation of TTY loop circuits. There are two indicator lamps (neon) per channel; one for each TRANSMIT loop and one for each RECEIVE loop. The lamp is on for 60-ma dc loop current and off for no loop current in transmit and receive circuits.
Channel power switches		Telegraph Line Control	Provides remove operation of power for each channel. Each channel is turned on or off from communication control console.
CHANNEL-A PWR		C-3533/	
CHANNEL-B PWR		TSC-15	
CHANNEL-C PWR			
CHANNEL-D PWR			
CHANNEL-E PWR			
Audio (transmit level adjust) AUDIO LEVEL SET MX		Manual Telephone Switchboard SB-1248/TSC-15	Variable pad to set transmit AUDIO level into SSB transmitter from 4-channel multiplex unit (channels A thru D).

Table 2-10. Telegraph Terminal Group AN/TGA-1, Unit 2A9 Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-17)	LOCATION	FUNCTION
OPTION SWITCHES (Con.)			
Audio (transmit level adjust) AUDIO LEVEL SET 850-cps channel		Manual Telephone Switchboard SB-1248/TSC-15	Variable pad to set AUDIO into SSB transmitter from single channel unit (channel E).

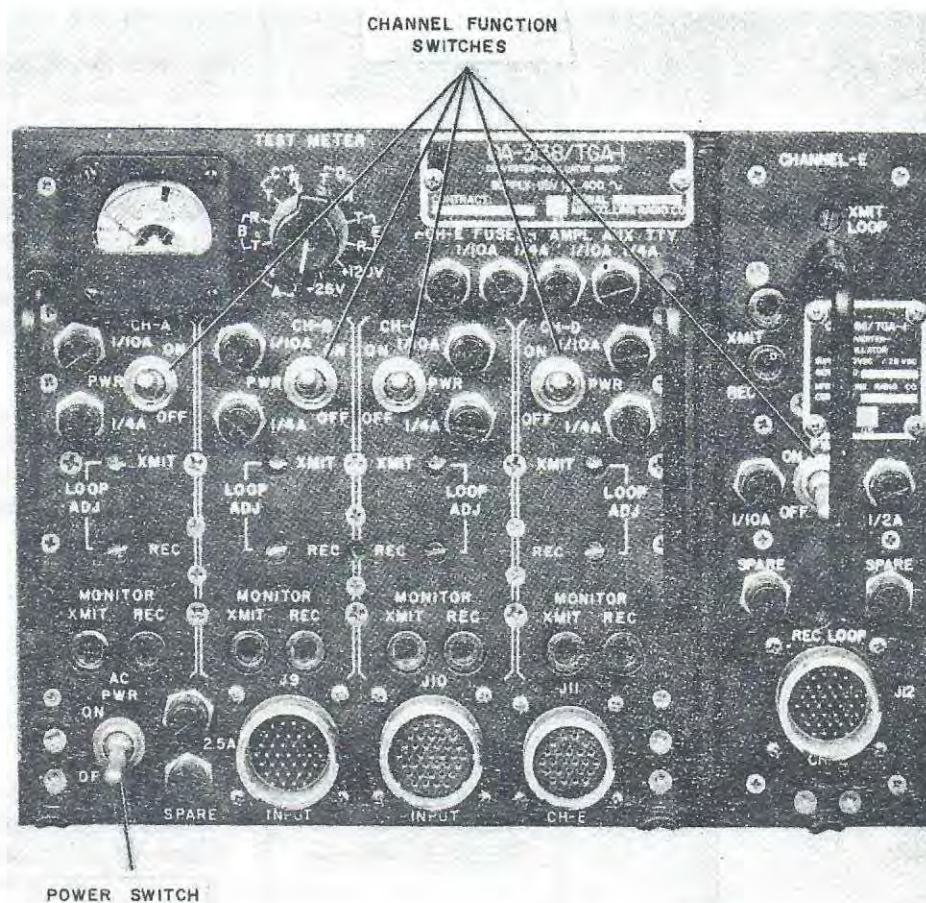


Figure 2-17. Telegraph Terminal Group AN/TGA-1, Unit 2A9, Controls and Indicators (Sheet 1 of 2)

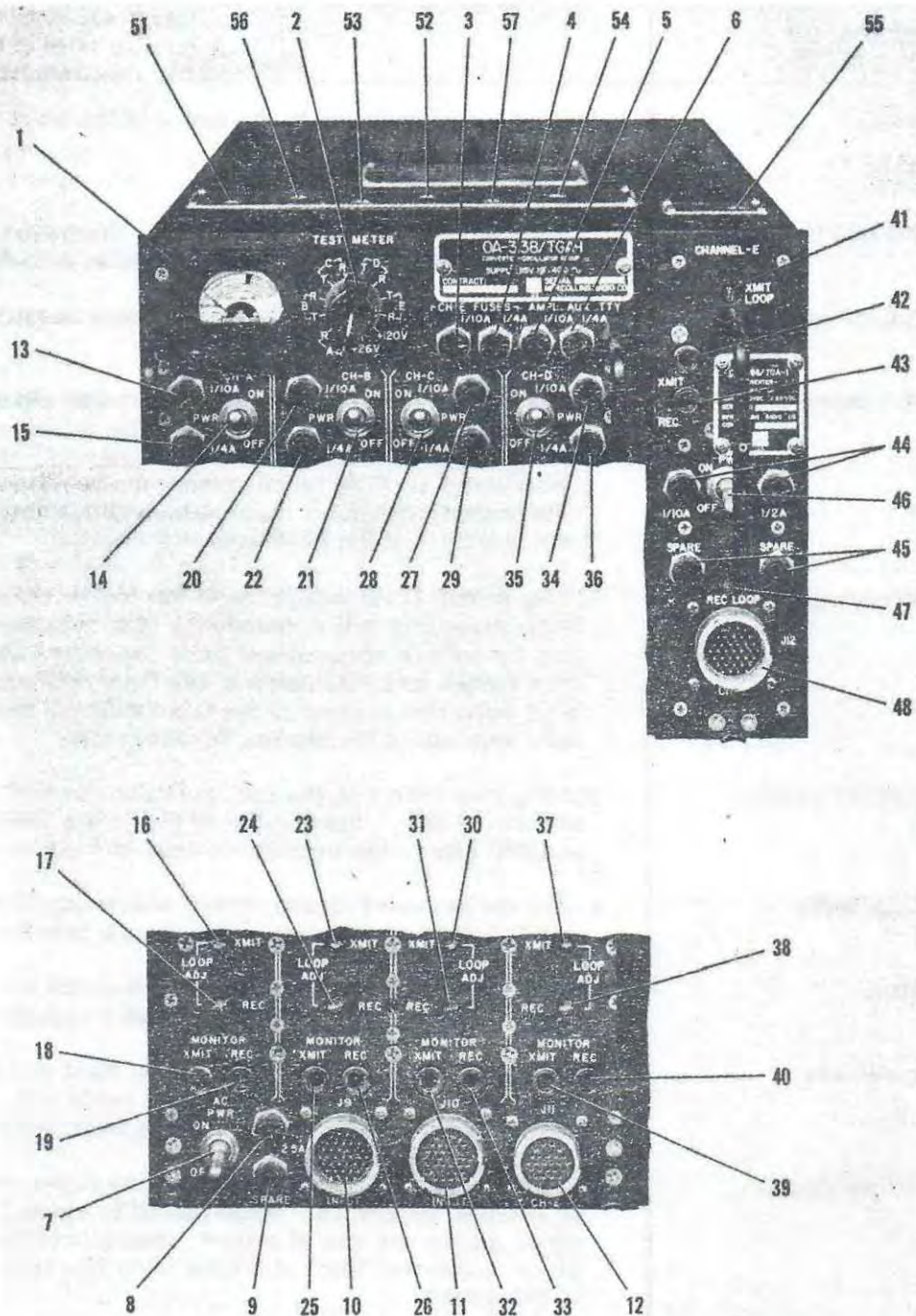


Figure 2-17. Telegraph Terminal Group AN/TGA-1, Unit 2A9, Controls and Indicators (Sheet 2 of 2)

Table 2-11. Teletypewriter Set AN/TGC-14A(V), Unit 8,
Controls and Indicators (Refer to Figure 2-18)

CONTROL OR INDICATOR	FUNCTION
MOTOR switch	Applies primary power to the motor of the printer.
LAMP switch	Applies power to copy lights.
Line feed control ($\equiv$)	Feeds paper upward one or two lines, depending upon the adjustment of the line feed single-double adjustment lever.
Carriage return control (L)	Returns the type cylinder to the left-hand margin and holds it there while the key is depressed.
Figure shift control ($\dagger$)	Allows a shift from lowercase to uppercase characters. Depressing this button causes the type cylinder to shift into the figures segment and print uppercase characters even though no FIGS function has been received. It is used when line garbles cause false shifts in the lower-case segment of the sending teletypewriter.
Letter shift control ($\dagger$)	Allows a shift from uppercase to lowercase characters. Depressing this button causes the type cylinder to shift into the letters segment and print lowercase characters even though no LTRS function has been received. It is used when line garbles cause false shifts in the upper-case segment of the sending teletypewriter.
SEND-REC/REC switch	Placing this switch in the REC position allows the machine to receive only. Placing the switch in the SEND-REC position allows the machine to send as well as receive.
Keyboard lock lever	Locks the keyboard closed circuit which opens the signal line to interrupt a transmission from a remote station.
BREAK switch	Opens a normally closed circuit which opens the signal line to interrupt a transmission from a remote station.
Paper lock-release lever	Releases the paper when moved to the right and locks the paper in place when lever is moved to the left. Lever is located under LIFT panel at front of teletypewriter.
Line feed single-double lever	Allows the line feed control to move the paper either one or two spaces upward. When placed in single, the paper moves one line at a time; when placed in double, the paper moves two lines at a time when line feed control is depressed.

Table 2-11. Teletypewriter Set AN/TGC-14A(V), Unit 8,
Controls and Indicators (Refer to Figure 2-18)

CONTROL OR INDICATOR	FUNCTION
KEYBOARD CONTROLS	
LTRS key	Places the machine in a condition for printing lowercase characters (those characters which appear on the lower half of the 26 alphabet keys).
FIGS key	Places the machine in a condition for printing uppercase characters (those characters which appear on the lower half of the 26 alphabet keys).
CAR RET key	Causes the printing cylinder to return to the left-hand margin.
LINE FEED key	Causes the paper to move upward one or two lines, depending on the setting of line feed single-double control lever.
Blank key	Used for special purposes, such as selective station calling. (Located at extreme right end of bottom row of keys.)
Spare bar	Provides means of advancing print hammer electrically to provide spaces between words or to align characters in columns.
BELL key	Causes bell to ring once at local and remote machines only when key is stuck with machine in FIGS (uppercase) condition. This provides means of alerting operators for important messages or summoning operator to a normally unattended machine. This is the only on-line function which does not work in either uppercase or lowercase conditions.
REP key	Causes transmission of last previously transmitted character to be repeated continuously while REP key is depressed. It is not necessary to hold down any other key during repeat cycle.

Table 2-12. Telephone Terminal Control C-3535/TSC-15, Unit 3A1
Controls (Refer to Figure 2-19)

CONTROL OR INDICATOR	FUNCTION
2W-4W controls S2 through S5	Properly connect external TEL 1 through TEL 5 lines to the AN/TSC-15 voice circuits.

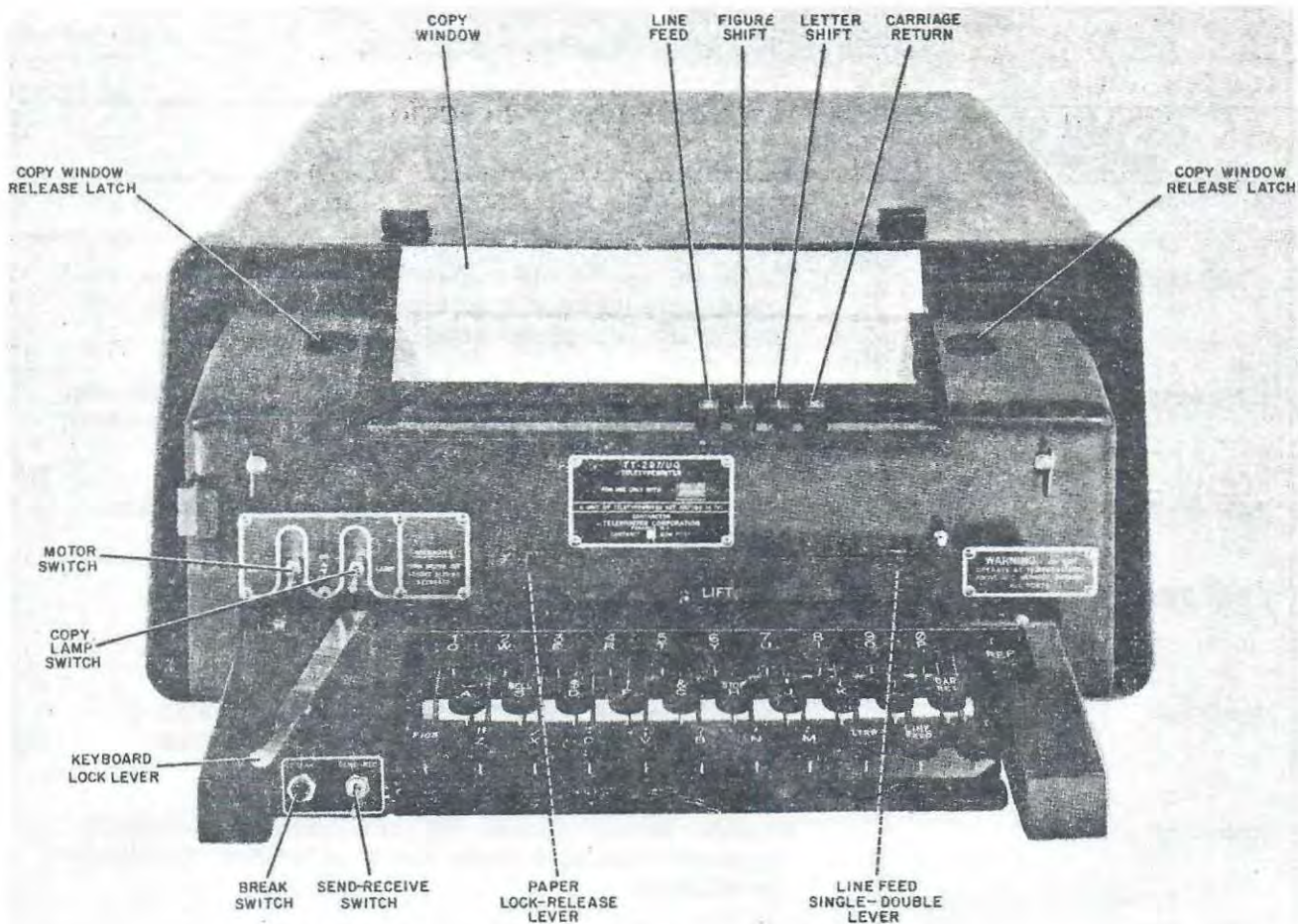


Figure 2-18. Teletypewriter Set AN/TGC-14A(V), Unit 8, Controls and Indicators

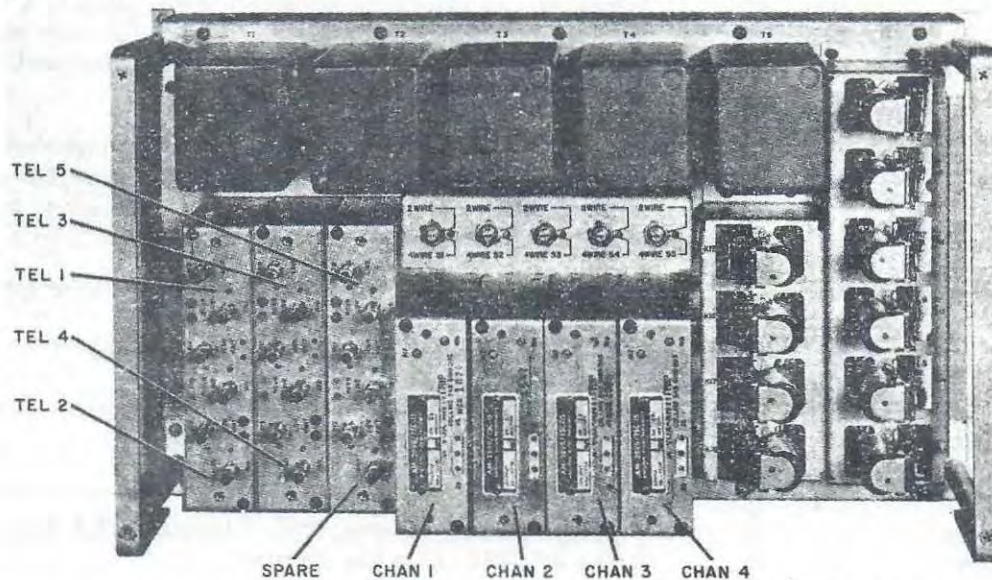


Figure 2-19. Telephone Terminal Control C-3535/TSC-15, Unit 3A1, Controls

Table 2-13. Console Accessory Panel, Unit 3A13, Controls (Refer to Figure 2-20)

CONTROL OR INDICATOR	FUNCTION
TEL 1 through TEL 5 ON-OFF controls	Activates appropriate circuitry to enable automatic telephone ringing on TEL line 1 through TEL line 5.
	NOTE The automatic telephone ringing circuit of a telephone line will not operate when associated telephone line ANSWER button is pressed on Manual Telephone Switchboard SB-1248/TSC-15.

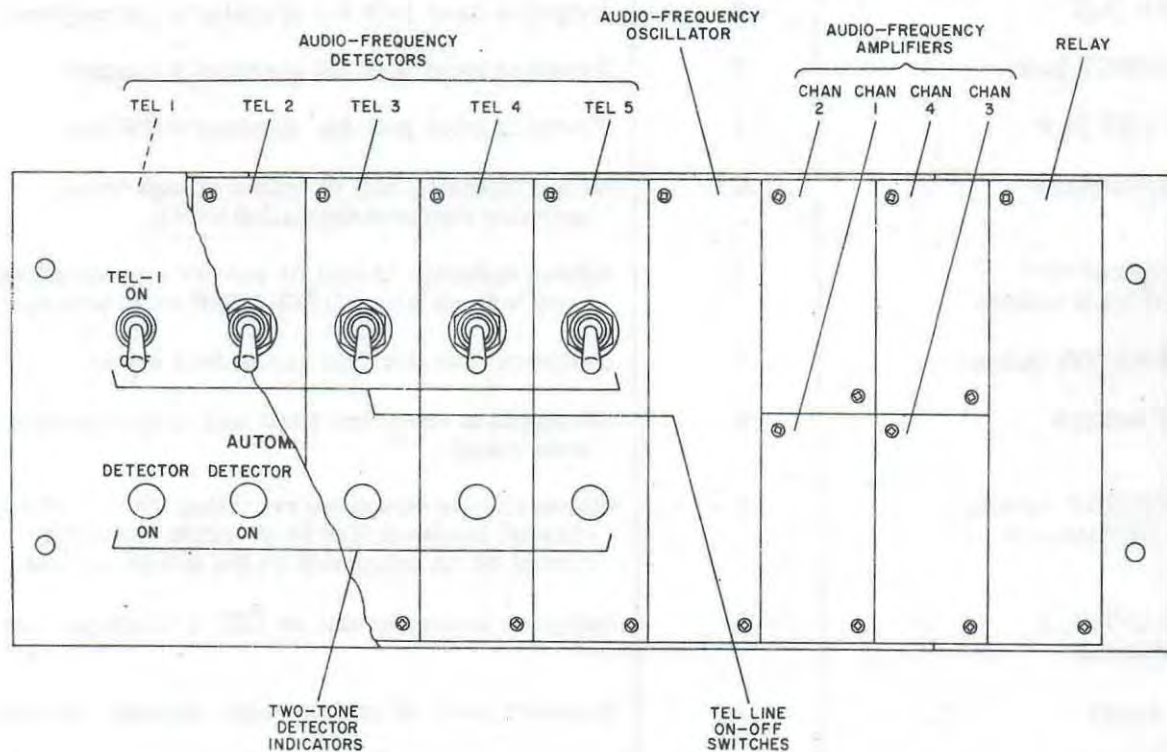


Figure 2-20. Console Accessory Panel, Unit 3A13, Controls

Table 2-14. Manual Telephone Switchboard SB-1248/TSC-15,
Unit 3A6, Controls and Indicators

CONTROL OR INDICATOR	LEGEND (FIGURE 2-21)	FUNCTION
GAIN (telephone gain controls)	1	Adjusts level of incoming signals on transmit pair of telephone lines at input of telephone line amplifiers. NOTE Telephone GAIN controls are used to adjust telephone transmit levels only when the TEL lines are not patched into a radio voice channel. When TEL lines are patched into a radio voice channel, GAIN controls are turned fully clockwise.
MIKE jack	2	Provides input jack for operator's microphone.
HEADSET jack	3	Provides input jack for operator's headset.
CW KEY jack	4	Provides input jack for operator's CW key.
HOLD buttons	5	Keeps incoming call in active circuit while operator contacts the called party.
Telephone line ANSWER buttons	6	Allows operator to call or answer any telephone lines without using OPERATOR cord buttons.
OPERATOR buttons	7	Connects operator into any of four cords.
OFF buttons	8	Disconnects telephone lines and radio channels from cords.
OVERRIDE switch A-NORMAL-B	9	Opens remote telephone receiving line or voice channel transmit line to override instability caused by an unbalance on the telephone line.
CALL-TEL 1 indicator	10	Indicates incoming call on TEL 1 telephone line.
VU meter	11	Indicates level of various audio signals selected.
MIKE GAIN control	12	Controls gain in operator's microphone circuit.
CALL-TEL 2 indicator	13	Indicates incoming call on TEL 2 telephone line.
VU meter selector switch	14	Selects signal which VU meter is to monitor and determines range of VU meter.

Table 2-14. Manual Telephone Switchboard SB-1248/TSC-15,
Unit 3A6, Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-21)	FUNCTION
SPKR GAIN control	15	Controls gain of local headset and speaker circuits.
CALL-TEL 3 indicator	16	Indicates incoming call on TEL 3 telephone line.
VOICE-CW selector switch	17	Selects mode of operation for local operator.
CALL-TEL 4 indicator	18	Indicates incoming call on TEL 4 telephone line.
NIGHT ALARM-OFF switch	19	Controls night alarm circuitry in TEL CALL circuits of switchboard and teletypewriter circuits in Telegraph Line Control C-3533/TSC-15.
CHAN E adjustment	20	Adjusts level of the transmit signal from TTY MX on teletypewriter channel E.
CALL-TEL 5 indicator	21	Indicates incoming call on TEL 5 telephone line.
CONFERENCE-OFF switch	22	Controls conference capability of the switchboard.
CHAN A-D adjustment	23	Adjusts level of transmit signal from AN/TGA-1 on teletypewriter channels A through D.
CALL-CHAN 1 indicator	24	Indicates incoming call on CHAN 1 voice channel. Also lights when vox circuit in CHAN 1 is energized.
DIAL-OFF - RING switch	25	
DIAL		Connects a standard telephone dial for calling to a dial system.
RING		Applies a 20-Hz ringing signal to telephone line which has answer button pushed in when automatic telephone ringing circuits are not energized.
CALL-CHAN 2 indicator	26	Indicates incoming call on CHAN 2 voice channel. Also lights when vox circuit in CHAN 2 is energized.
Dial	27	Standard telephone dial which allows local operator to dial commercial telephone lines.
CALL-CHAN 3 indicator	28	Indicates incoming call on CHAN 3 voice channel. Also lights when vox circuit in CHAN 3 is energized.

Table 2-14. Manual Telephone Switchboard SB-1248/TSC-15,
Unit 3A6, Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-21)	FUNCTION
CALL-CHAN 4 indicator	29	Indicates incoming call on CHAN 4 voice channel. Also lights when vox circuit in CHAN 4 is energized.
CORD 1	30	Allows operator to connect telephone and radio channels together (2 to a cord plus operator). The cord pushbuttons serve same purpose as manual operator's cord on a normal switchboard.
CORD 2	31	
CORD 3	32	
CORD 4	33	
Buttons		
TTY FSK button (upper sideband)	34	Connects 850-Hz TTY FSK signal from AN/TGA-1 into upper-sideband radio channel.
TTY MX button (upper sideband)	35	Connects the four-channel multiplex signals from AN/TGA-1 to the upper-sideband radio channel.
CHAN 4 ANSWER button	36	Allows operator to call or answer CHAN 4 radio circuit.
CHAN 4 MON button	37	Allows operator to monitor CHAN 4 receive circuit.
CHAN 3 MON button	38	Allows operator to monitor CHAN 3 receive circuit.
USB switch	39	
3 KC		Routes all signals through radio channel 4 (radio channel 3 is disconnected) for standard single sideband operation on upper sideband.
MX		Connects both channel 3 and channel 4 into Converter Multiplexer CV-976/U for MX operation.
CHAN 3 ANSWER button	40	Allows operator to call or answer CHAN 3 radio circuit.
CHAN 2 ANSWER button	41	Allows operator to call or answer CHAN 2 radio circuit.
LSB switch	42	
3 KC		Routes all signals through radio channel 1 (radio channel 2 is disconnected) for standard single sideband operation on lower sideband.

Table 2-14. Manual Telephone Switchboard SB-1248/TSC-15,
Unit 3A6, Controls and Indicators (Con.)

CONTROL OR INDICATOR	LEGEND (FIGURE 2-21)	FUNCTION
MX		Connects both channels 1 and 2 into Converter Multiplexer CV-976/U for MX operation.
TTY FSK button (lower sideband)	43	Connects 850-Hz TTY FSK signal from AN/TGA-1 into lower sideband radio channel.
CHAN 1 MON button	44	Allows operator to monitor channel 1 receive circuit.
CHAN 1 ANSWER button	45	Allows operator to call or answer CHAN 1 radio circuit.
TTY MX button (lower sideband)	46	Connects four-channel TTY MX signals from AN/TGA-1 into lower sideband radio circuit.
CHAN 2 MON button	47	Allows operator to monitor CHAN 2 receive circuit.

Table 2-15. Telephone Test Set TS-1635/TSC-15, Unit 2A12, Controls and Indicators
(Refer to Figure 2-22)

CONTROL OR INDICATOR	FUNCTION
FREQUENCY selector switch	
SET OFF	Turns off Telephone Test Set TS-1635/TSC-15.
OSC OFF	Turns off test oscillator, but leaves telephone test set energized.
300 ~	Sets frequency of test oscillator at 300 Hz.
600 ~	Sets frequency of test oscillator at 600 Hz.
3000 ~	Sets frequency of test oscillator at 3000 Hz.
AUDIO LEVEL control	Adjusts output level of test audio oscillator.

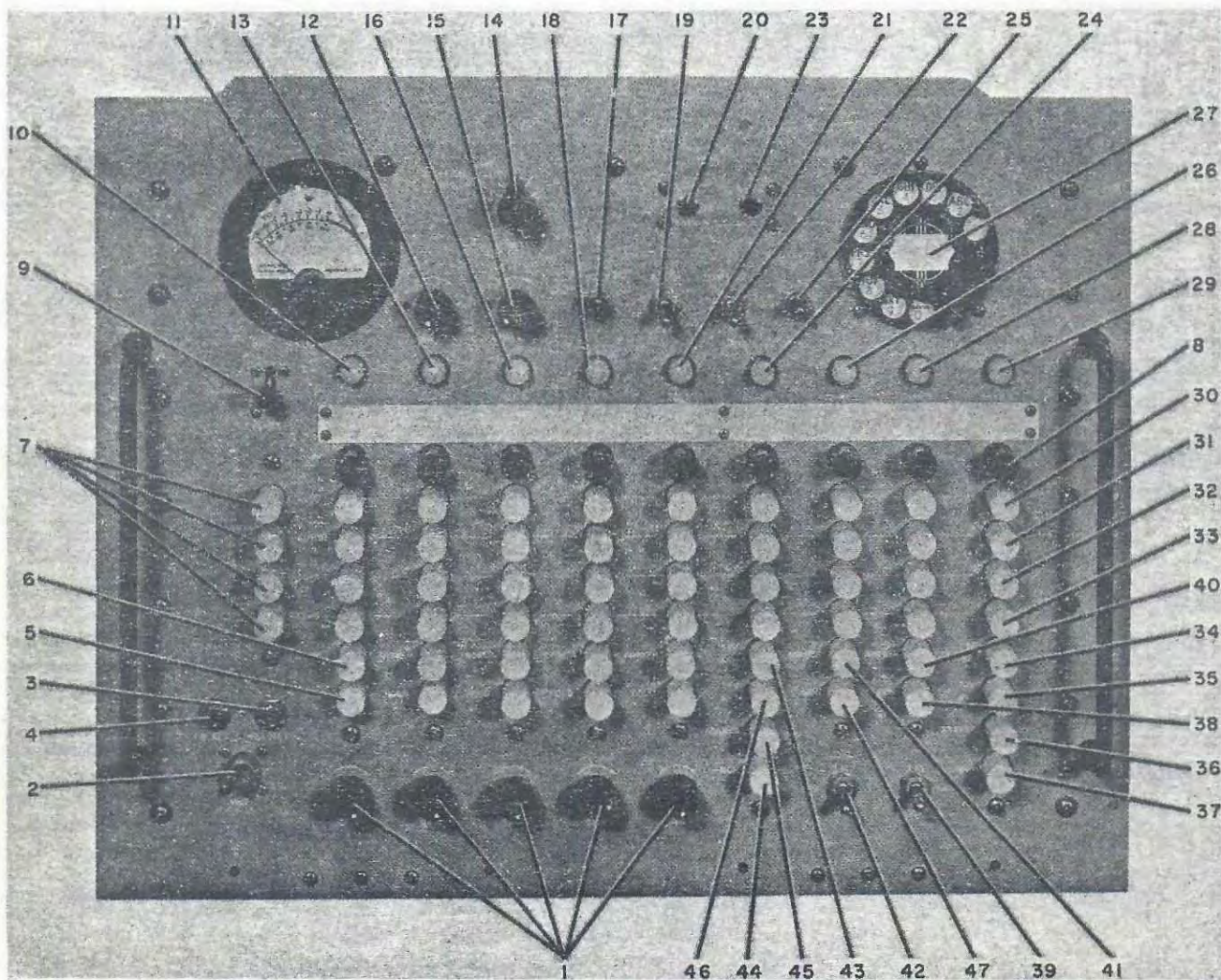
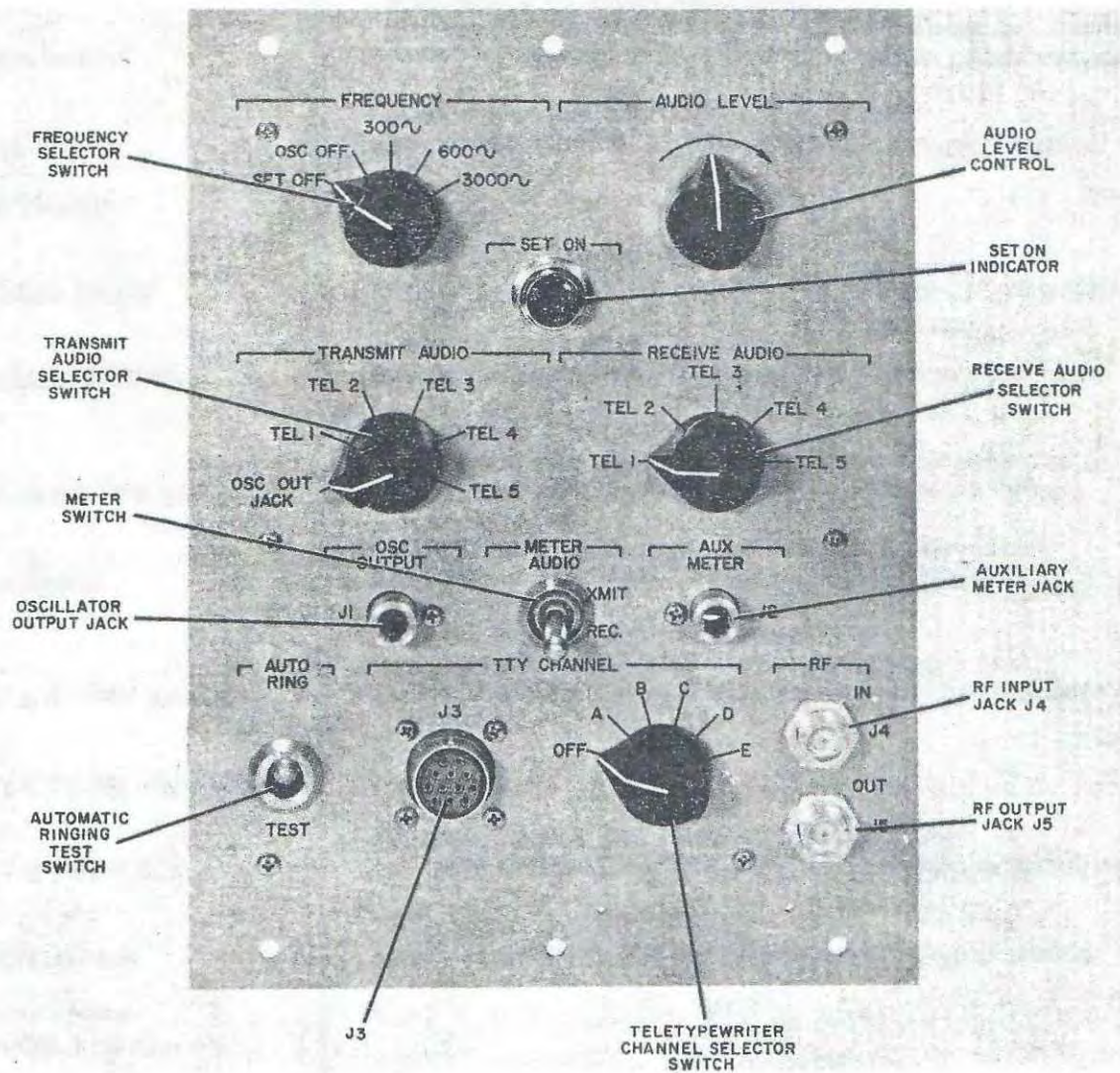


Figure 2-21. Manual Telephone Switchboard SB-1248/TSC-15,
Unit 3A6, Controls and Indicators

Table 2-15. Telephone Test Set TS-1635/TSC-15, Unit 2A12, Controls and Indicators
(Refer to Figure 2-22) (Con.)

CONTROL OR INDICATOR	FUNCTION
SET ON indicator	Indicates when TS-1635/TSC-15 has been turned on.
TRANSMIT AUDIO selector switch	
OSC OUT JACK	Connects output of test oscillator (if oscillator is turned on) to OSC OUTPUT jack J1.
TEL 1 through TEL 5	Connects output of test oscillator (if oscillator is turned on) to one of 5 TEL line transmit pairs selected.
RECEIVE AUDIO selector switch	
TEL 1 through TEL 5	Works in conjunction with METER switch to place telephone test set meter circuitry in parallel with TEL line receive pairs of telephone line selected.
METER switch	Connects telephone test set meter circuitry in parallel with either telephone line transmit or receive pairs.
OSC OUTPUT jack J1	Allows telephone test set oscillator output to be patched externally when TRANSMIT AUDIO selector switch is in the OSC OUT JACK position.
AUX METER jack J2	Allows use of an auxiliary meter and works in conjunction with METER switch.
AUTO RING switch	Provides test signal for automatic telephone ringing circuitry when set to TEST position.
TTY CHANNEL	
Jack J3	Allows connection of Teletypewriter Set AN/TGC-14A(V) to telephone test set for 4-wire operation.
Selector switch	Connects telephone test set connector J3 for Teletypewriter Set AN/TGC-14A(V) in parallel with teletypewriter channels A through E on signal entry panel.
RF	
IN jack J4	Allows input to be connected to 60-dB rf attenuator of telephone test set.
OUT jack J5	Allows output to be taken from 60-dB rf attenuator of telephone test set.

Figure 2-22. Telephone Test Set TS-1635/TSC-15, Unit 2A12, Controls and Indicators



power to Power Supplies PP-2868/U and PP-2869/TSC-15. When these power supplies are placed in operation, 28-volt dc power is supplied to the console equipment.

CAUTION

Do not operate the console equipment for extended periods of time with the radio equipment panel doors open. This can cause overheating resulting in possible damage to equipment.

2-46. OPERATING PROCEDURE FOR POWER SUPPLY CONTROL C-3534/TSC-15, UNIT 3A4A5.

2-47. GENERAL. Power Supply Control C-3534/TSC-15 contains five fuses, a power supply metering switch, a voltmeter, and an ammeter. The voltmeter and ammeter are used to check the voltage and current supplied by Power Supply PP-2868/U or PP-2869/TSC-15.

2-48. OPERATION. When POWER SUPPLY METERING switch is set to PS1 REG, the voltage and current of Power Supply PP-2868/U are measured by the VOLTMETER and AMMETER respectively. The VOLTMETER should indicate 28 volts; the AMMETER should indicate approximately 1.5 amperes. With POWER SUPPLY METERING switch set to PS2 UNREG, the voltage and current of Power Supply PP-2869/TSC-15 are measured. The VOLTMETER should indicate 25 to 31 volts; the AMMETER should indicate 0.5 to 2.0 amperes.

The five fuses on the C-3534/TSC-15 panel are indicating fuses; that is, if the fuse burns out, the lamp in the indicating fuse holder lights. Fuse F1 is a 5-ampere fuse between the unregulated dc power supply, the automatic telephone ringing modules, and the band pass filter. Fuse F2 is a 1.5-ampere fuse between the unregulated dc voltage supply Detector Relay Assembly RE-502/TSC-15, Telegraph Line Control C-3533/TSC-15, and the 20-cycle ringer. Fuse F3 is a 1-ampere fuse for the unregulated voltage supplied to Telephone Terminal Control C-3535/TSC-15. Fuse F4 is a 2-ampere fuse in series with the regulated dc voltage to Audio Frequency Amplifiers AM-1975/U, AM-1968/U, AM-1974/U, AM-3200/U, AM-2898/TSC-15,

Telephone Test Set TS-1635/TSC-15, and the call amplifiers and VU amplifiers in Manual Telephone Switchboard SB-1248/TSC-15. Fuse F5 is a 3-ampere fuse for the unregulated dc voltage to Manual Telephone Switchboard SB-1248/TSC-15.

2-49. OPERATING PROCEDURE FOR POWER SUPPLY PP-2869/TSC-15, UNIT 3A10.

2-50. GENERAL. Power Supply PP-2869/TSC-15 supplies unregulated 28-volt dc voltage to the AN/TSC-15. The unit contains a circuit breaker, transformer, full-wave diode rectifier, LC filter section, and bleeder network.

2-51. OPERATION. The ON-OFF switch located on the front panel of the power supply serves two purposes. It acts as a circuit breaker (10-ampere, 120-volt, 400-Hz) to protect the unit, and it applies 115-volt primary power to the unit.

2-52. OPERATING PROCEDURE FOR POWER SUPPLY PP-2868/U, UNIT 3A11.

2-53. GENERAL. Power Supply PP-2868/U is a series-regulating dc power source which supplies operating voltages to Communications Central AN/TSC-15. The power supply requires a 105- to 120-volt, 50- to 400-Hz ac input, and the output of the unit is adjusted to 28 volts dc. The output may be adjusted by use of the DC VERNIER control between 0 and 32 volts dc.

2-54. OPERATION. Power is applied to Power Supply PP-2868/U by setting the ON-OFF switch to ON. This switch is a magnetic circuit breaker which provides short circuit or overload protection as well as controlling the operation of the unit. Additional protection is provided by a fuse at the rear of the unit. A manual reset thermostat, located at the rear, provides thermal overload protection. The THERMAL OVERLOAD indicator on the front of the power supply lights when a thermal overload exists. The overload must be removed and the reset circuit must be manually activated to place the unit in normal operation after a thermal overload. A POWER ON indicator lights when the ON-OFF switch is set to ON.

NOTE

Refer to TM-02968A-50 Communications Central AN/TSC-15 Maintenance Manual for output voltage adjustments of Power Supply PP-2868/U.

2-55. OPERATING PROCEDURE FOR RADIO SET CONTROL C-3141/TRC-75, UNITS 3A4A1 AND 3A4A3.

2-56. GENERAL. The AN/TSC-15 console has two Radio Set Controls C-3141/TRC-75 which control the frequency selection of the radio equipment for simplex and duplex operation. The C-3141/TRC-75 units are identical, and their functions are identified on the console. During simplex operation, the SIMPLEX XCVR/DUPLEX XMTR control is used; during duplex operation, both controls are used.

NOTE

Simplex and 2-wire voice operation do not allow simultaneous transmission and reception of intelligence. Duplex and 4-wire voice operation do allow simultaneous transmission and reception of intelligence. During simplex operation, only one channel of information can be handled at one time. During duplex operation, as many as seven channels of information can be handled simultaneously.

2-57. OPERATION. The operating frequency of the radio set is selected by setting a combination of four front panel knobs to obtain the desired frequency on a direct-reading dial. Frequency selection initiates operation of a servo follow-up system which coarse-tunes the AN/TSC-15 equipment. The servo system is driven by a signal from a series of switches and precision resistors which are controlled by the four frequency selection knobs. Other front panel controls on the C-3141/TRC-75 are an ON-OFF switch and a VOL (rf gain) control. The ON-OFF switch is coupled to a magnetic-release mechanism which automatically returns the switch to OFF if a fault exists in the radio set. If a fault prevents proper tuning of the transmitter, the ON-OFF switch automatically returns to OFF after a continuous tuning time of two minutes.

NOTE

The mode selector switch (control marked AM-U-L-TWIN) is not used in the AN/TSC-15 operation.

The audio output of Radio Receiver R-761/ARC-58 is controlled by three screwdriver adjustments located on the receiver front panel. Adjustment of these controls should not be attempted without proper test equipment. Refer to TM-02968A-50, Communications Central AN/TSC-15 Maintenance Manual for the adjustment procedure and the test equipment required.

2-58. OPERATING PROCEDURE FOR RADIO SET CONTROL C-3532/TSC-15, UNIT 3A4A2.

2-59. GENERAL. Radio Set Control C-3532/TSC-15 contains a directional wattmeter, a transmitter power switch, a simplex-duplex switch, a meter selector switch, a transmitter key switch, a mode selector switch, and two indicator lamps.

2-60. OPERATION. The SIMPLEX-DUPLEX switch determines the mode of operation of the AN/TSC-15 system (simplex or duplex).

NOTE

If the local operator wishes to change from simplex to duplex mode or vice-versa, while operating, the radio channel OFF buttons must be pushed, and the radio circuit must be re-established after the SIMPLEX-DUPLEX switch has been set to a new position.

2-61. Three modes of transmission, AM (amplitude modulation), IND (independent sideband), or TWIN (twin sideband), can be selected by the mode selector switch.

NOTE

Teletypewriter or CW operation should not be attempted with the mode selector switch on AM.

2-62. The transmitter key switch provides two positions for selecting the method of keying the transmitter. The PTT position allows the transmitter to be keyed by pressing the microphone switch or footswitch.

NOTE

If remote field equipments are to be used in the PTT mode of operation, push-to-talk control lines must be installed between the remote equipment and Communications Central AN/TSC-15.

2-63. The VOX position allows the transmitter to be keyed by use of voice-operated circuits. The RADIO SILENCE position prevents the transmitter from being keyed by any method. This position is used when a radio-silence condition is being observed or to prevent the transmitter from being accidentally keyed during repair or maintenance.

NOTE

If a new frequency is selected when the transmitter key switch is in RADIO SILENCE, the receiver will tune to the new frequency, and reception is possible. However, the transmitter will coarse-tune only, and fine tuning of the transmitter will not occur until the transmitter key switch is placed in PTT or VOX (and voice-operated circuits are energized).

2-64. The READY indicator lights when the transmitter has completed both its coarse and fine tuning cycles and is ready for normal operation. The XMTR KEYED indicator lights when the transmitter is keyed. The DIRECTIONAL WATTMETER is used to indicate forward and reflected output power. The meter face is calibrated in two scales; the unit of measure on both scales is watts. The scale used is determined by the position of the meter selector switch. The top scale indicates transmitter output power delivered to the antenna and is calibrated in 100-watt steps from zero to 1000 watts. To obtain a reading of forward power (top scale), the meter selector switch must be in FWD 1 KW. The bottom scale indicates reflected transmitter power due to a mismatch between the radio transmitter and the antenna. This scale is calibrated in 10-watt steps from zero to 100

watts. To obtain a reading of reflected power, the meter selector switch must be in REFLECTED 100 W. Comparison of the top and bottom scale readings yields the swr (standing-wave ratio). The swr for Communications Central AN/TSC-15 should not exceed 1.3 to 1. Refer to the operator's manual for Radio Set AN/TRC-75 for instructions on computing the standing-wave ratio using the readings obtained on the DIRECTIONAL WATTMETER. With the meter selector switch in REFLECTED 100 W, the system tuning cycle may be observed. The tuning cycle of the AN/TSC-15 system occurs in two parts, coarse and fine tuning. The coarse tuning cycle occurs immediately after the selection of the desired frequency on the radio set control. The transmitter must be keyed before the fine tuning cycle begins. To observe the fine tuning cycle, place the meter selector switch in REFLECTED 100 W, place the transmitter key switch in PTT, and key the transmitter with the microphone switch or the footswitch. An immediate indication of approximately 100 watts will be observed on the DIRECTIONAL WATTMETER. As the antenna coupler approaches a tuned condition with the selected antenna, the reflected power indication on the DIRECTIONAL WATTMETER will decrease to zero. At the end of the fine tuning cycle, the READY indicator will light.

2-65. The H PWR-L PWR switch selects the transmitter output power. With the switch in H PWR, approximately 1000 watts of power will be transmitted. With the switch in L PWR, approximately 100 watts of power will be transmitted. The value of rf power being transmitted can be observed on the upper scale of the DIRECTIONAL WATTMETER by placing the meter selector switch in FWD 1 KW.

2-66. OPERATING PROCEDURE FOR FILTER CONTROL C-3595/U, UNIT 3A4A4.

2-67. GENERAL. Filter Control C-3595/U controls the operation of Band Pass Filter F-508/U. Controls on the unit include an ON-OFF switch, four frequency selection knobs, a direct-reading dial, and an overload reset button.

2-68. OPERATION. Band Pass Filter F-508/U is a frequency-selective circuit connected between the duplex antenna and the input of

the duplex receiver/of Communications Central AN/TSC-15. The band pass filter is tuned automatically to any of 28,000 frequencies from 2.0 to 29.999 megacycles in 1-kilocycle increments. The band pass filter is controlled remotely by Filter Control C-3595/U. The filter control selects the operating frequency of the band pass filter. Radio-frequency input signals to the band pass filter (at levels higher than 100 volts peak and at frequencies greater than ± 10 percent away from the selected frequency) are eliminated by an off-frequency protection circuit. Radio frequency input signals greater than two volts peak and at frequencies within ± 10 percent of the selected frequency are eliminated by an on-frequency protection circuit. When either an off-frequency or an on-frequency overload occurs, one of the protection circuits operates to open the rf circuits within the band pass filter. When an overload occurs, the operator is warned by the OVLD RESET indicator lamp on Filter Control C-3595/U.

NOTE

Do not set the frequency of Band Pass Filter F-508/U closer than ± 10 percent of the transmitter frequency.

2-69. To operate Filter Control C-3595/U, set ON-OFF switch to ON. Select the operating frequency by turning the megacycle, 100-kilocycle, 10-kilocycle, and kilocycle controls to the desired frequency. Allow 15 seconds for tuning. The band pass filter then is tuned and ready for normal operation. If a band pass filter overload occurs, first remove the excessive rf input voltage, then push OVLD RESET button to restore band pass filter to normal operation.

NOTE

Band Pass Filter F-508/U is protected by a circuit breaker mounted on its front panel. If the equipment fails to operate properly, check this circuit breaker.

2-70. The power to Band Pass Filter F-508/U is supplied by the unregulated 28-volt dc power supply in Communication Control Console OA-3129/TSC-15. The CONSOLE circuit breaker must be set to ON before the band pass filter will operate.

NOTE

Do not switch the megacycle knob of Filter Control C-3595/U quickly to determine if the filter is on frequency. Always allow two to three seconds when switching the megacycle dial for the filter to tune to the new frequency. If the knob is moved more quickly, the filter will go off the original frequency, but will not have time to seek the new frequency.

2-71. OPERATING PROCEDURE FOR DETECTOR RELAY ASSEMBLY RE-502/TSC-15, UNIT 3A9.

2-72. GENERAL. Detector Relay Assembly RE-502/TSC-15 prevents the power amplifier from being overdriven when a single tone is present at the input of the power amplifier. Detector Relay Assembly RE-502/TSC-15 does not detect an audio tone, but simply controls the power amplifier by means of switching.

2-73. OPERATION. Detector Relay Assembly RE-502/TSC-15 applies a ground to the class C control line of the power amplifier (T-730/TRC-75) when a single tone is applied to the input of the power amplifier. The ground on the class C control line merely shorts out the alc (automatic load control) circuits of the power amplifier. The power amplifier is self-biasing, but since the alc circuits will not operate on a single tone, the circuit must be broken to prevent the power amplifier from operating due to noise. The ON-OFF switch on the front of Detector Relay Assembly RE-502/TSC-15 makes or breaks the class C control line to the power amplifier. In normal operation, the ON-OFF switch is in the ON position. In the OFF position, the detector relay assembly function is removed from the system, and the power amplifier operates only in class A (linear). The operation of the power amplifier and the condition of Detector Relay Assembly RE-502/TSC-15 depend upon the mode of operation of Manual Telephone Switchboard SB-1248/TSC-15 and Telegraph Line Control C-3533/TSC-15.

2-74. OPERATING PROCEDURE FOR TELEGRAPH LINE CONTROL C-3533/TSC-15, UNIT 3A7.

2-75. GENERAL. Telegraph Line Control C-3533/TSC-15 provides the necessary controls

for communications with any of five remote teletypewriter channels or any of five radio channels using the local teletypewriter. When operated with Manual Telephone Switchboard SB-1248/TSC-15, any or all of the remote channels may be relayed through the AN/TSC-15 system. Channels A through D are 85-cycle FSK channels, and channel E is an 850-cycle FSK channel. Any of the five channels may be operated as 2- or 4-wire loops. The 2- or 4-wire operation of a specific channel will be determined when the remote teletypewriter is installed.

NOTE

Two-wire operation does not allow the simultaneous transmission and reception of intelligence. Four-wire operation allows the simultaneous transmission and reception of intelligence.

2-76. OPERATION. Telegraph Line Control C-3533/TSC-15 has five channel ON-OFF switches. These switches provide dc voltage to their channels from the power supply in Telegraph Terminal Group AN/TGA-1. The channel ON-OFF switch must be set to ON before a channel is capable of operation. The channel operation indicators show loop current in the transmit and receive loops of the operating channel. The intensity of the indicator varies with the current in the loop, which is controlled by mark and space information. The indicator lights during transmit or receive mark data and go out during space data.

2-77. If the NIGHT ALARM-OFF switch on Manual Telephone Switchboard SB-1248/TSC-15 (see figure 2-21) is on, it sounds a buzzer and provides an audio tone in the headset and speaker when an incoming teletypewriter call is received on any of the remote teletypewriter channels. The specific calling channel is indicated visually by the channel CALL indicator of the calling channel. The CALL indicator shows the local operator that a remote operator is trying to contact him. The remote operator lights the CALL indicator by holding down the break key on the remote teletypewriter. The CALL lamp goes out when the local operator pushes the CALL indicator HOLD RESET button of the appropriate channel. The call indicator HOLD RESET button resets the channel call indicator and night alarm circuits.

2-78. Jack J5 provides an input for connecting the local teletypewriter to Telegraph Line Control C-3533/TSC-15. The mode selector switch controls the mode of operation of the local teletypewriter. If a contact is to be made with any of the five remote loop operators, the mode selector switch should be set to OPERATE LOOP. If one of the radio channels is to be used, the mode selector switch is set to OPERATE SET. The monitor switch allows the local operator to monitor any of the teletypewriter transmit or receive loops. The channel selector switches allow the local operator to connect to a remote teletypewriter circuit or a radio channel. These switches are interlocked to prevent the selection of more than one channel at a time. The loop current controls are used to adjust the loop current of the local teletypewriter circuits as indicated on the LOOP CURRENT meter. The 2W - 4W selector switch changes the mode of operation of the local teletypewriter to match the operation of the remote teletypewriter or radio channel. Both the local and remote teletypewriter must be operating in the same mode, 2- or 4-wire (2W or 4W). In 2-wire operation, one 60-milliamper loop circuit consisting of two wires is used with the local keyboard and printer connected in series. The 60-milliamper loop current is adjusted using the KEYBOARD/2W LCC control while observing the dc LOOP CURRENT milliammeter. In 4-wire operation, two separate 60-milliamper loop circuits are used, one transmit and one receive. The receive loop circuit is used for the local keyboard, and the transmit loop circuit is used for the local printer, permitting simultaneous transmission and reception of TTY data. Use the following procedure to adjust the 4-wire loop current to 60 milliamperes.

NOTE

The loop current controls (LCC) on Telegraph Line Control C-3533/TSC-15 can be used to adjust the teletypewriter loop current only when the local machine is operating into the loop or into the set. The loop current controls must be turned fully counterclockwise before any mode of operation on the C-3533/TSC-15 is changed, and then the controls are readjusted for 60 milliamperes loop current. The loop current of the remote loops, when operating into the set, are adjusted by the channel loop current controls on Telegraph Terminal Group AN/TGA-1 (see figure 2-17).

2-79. Adjust the loop current to 60 milliamperes using the PAGE PRINTER LCC control while observing the LOOP CURRENT meter. Patch the dc ma jack to the REC SERIES LOOP jack of the remote channel or the XMIT SERIES SET jack of the radio channel on the Telephone Jack Assembly TA-408/TSC-15. Using the KEYBOARD/2W LCC control and the LOOP CURRENT meter, adjust the loop current to 60 milliamperes. The level of the speaker, mounted on the top of the panel, is controlled by the SPKR GAIN control on Manual Telephone Switchboard SB-1248/TSC-15. The SPKR ON-OFF switch, located on the C-3533/TSC-15, allows the local operator to control the operation of the speaker.

NOTE

When the microphone is keyed, the speaker is out of the circuit, and audio is present only in the headset.

2-80. OPERATING PROCEDURE FOR TELEGRAPH TERMINAL GROUP AN/TGA-1, UNIT 2A9.

SEE SUP 10E

~~2-81. GENERAL. Telegraph Terminal Group AN/TGA-1 provides five channels of simultaneous telegraph communications using two single-sideband radio circuits operating in the high-frequency band. The AN/TGA-1 has one 850-cycle FSK channel and four 85-cycle FSK channels. The unit must be connected to Communications Central AN/TSC-15 to form an operational system. Table 2-16 lists optional operating procedures.~~

2-82. NORMAL OPERATION. The TEST METER on the AN/TGA-1 front panel is a dual-purpose meter. The meter can indicate either the current in the TTY loops or the output voltages of internal Power Supply PP-2894/TGA-1. The lower scale of the meter indicates LOOP CURRENT 60 MADDC. Only one position is shown on the scale for loop current, a line directly below the center of the black sector (3/5th of full scale). In the closed loop condition, the loop current should be exactly 60 milliamperes. If the meter indication is to the right or left of the 60 MADDC position, the loop current should be adjusted to read 60 milliamperes. In the open loop condition, the meter indication should be zero (far left of meter scale). The upper scale of the meter indicates POWER SUPPLY

± 26 VDC and $+120$ VDC. The power supply voltage reading should always be in the black sector (3/5th of full scale). The black sector represents the voltage tolerance for both the $+26$ VDC and the $+120$ VDC readings. The center of the black sector is exactly $+26$ VDC or $+120$ VDC. The TEST METER selector switch is used to connect the TEST METER into the circuit to be monitored. There is a position for each of the 5 transmit loops and 5 receive loops and a position for each of the two power supply voltages.

2-83. The LOOP CIRCUIT INDICATORS consist of a group of lamps with a transmit lamp and a receive lamp for each channel. Both lamps are on (for the channel energized) when the loops are complete (60 ma dc) and both lamps are off when the loops are open (no loop current). The automatic oscillator control circuit in the AN/TGA-1 turns off the oscillators under steady-state loop conditions (open or closed). They remain off until a transition from a steady-state loop condition takes place. This transition is made at the start of any transmission. The system returns to the steady-state condition automatically about five seconds after the end of a message transmission. The channel operating frequencies of the AN/TGA-1 are listed in table 2-17.

2-84. To place Telegraph Terminal Group AN/TGA-1 in standby, proceed as follows:

1. Set all PWR ON-OFF switches to OFF. There are six power switches on Telegraph Terminal Group AN/TGA-1 and five power switches on Communication Control Console OA-3129/TSC-15.
2. Turn all 10 LOOP-ADJ controls for the transmit and receive teletypewriter loop circuits fully counterclockwise.
3. Set the OPTION SWITCHES (located on top of the Telegraph Terminal Group AN/TGA-1 case) to 2-wire or 4-wire (2W or 4W) loop operation and diversity or nondiversity operation (DIV/NON-DIV).
4. Connect the teletypewriter equipment to the appropriate external loop circuits.

Table 2-16. Telegraph Terminal Group AN/TGA-1,
Optional Operating Procedures

NOTE: 1. Turn off ac power before operating option switches. 2. Note the polarity of the teletypewriter equipment when it is connected into the loop circuit.			
CHANNEL	LOOP OPTION SWITCH POSITION	DIV/NON-DIV OPTION SWITCH POSITION	TELETYPEWRITER EQUIPMENT CONNECTIONS
A, B, C, D	4 wire	NON-DIV	Connect one teletypewriter keyboard in each of the four transmit loops (4 total) and one TTY printer in each of the four receive loops (4 total).
A, B, C, D	2 wire	NON-DIV	Connect one teletypewriter (a unit capable of keying and printing in each of the four transmit loops (4 total)). No data is available in the receive loop.
A and C	2 wire	DIV	Connect one teletypewriter (a unit capable of keying and printing) into channel A transmit loop. No data is available in channel A receive loop and channel C receive and transmit loops.
A and C	4 wire	DIV	Connect one teletypewriter keyboard into channel A transmit loop and one TTY printer into channel A receive loop. No data is available in channel C receive and transmit loops.
B and D	2 wire	DIV	Connect one teletypewriter (a unit capable of keying and printing) into channel D transmit loop. No data is available in channel D receive and channel B receive and transmit loops.
B and D	4 wire	DIV	Connect one teletypewriter keyboard into channel D transmit loop and one TTY printer into channel D receive loop. No data is available in channel B receive and transmit loops.

Table 2-16. Telegraph Terminal Group AN/TGA-1,
Optional Operating Procedures (Con.)

CHANNEL	LOOP OPTION SWITCH POSITION	DIV/NON-DIV OPTION SWITCH POSITION	TELETYPEWRITER EQUIPMENT CONNECTIONS
E	4 wire	Not applicable	Connect one teletypewriter keyboard into channel E transmit loop and one TTY printer into channel E receive loop.
E	2 wire	Not applicable	Connect one teletypewriter (a unit capable of keying and printing) into channel E transmit loop. No data is available in channel E receive loop.

Table 2-17. Channel Operating Frequencies of AN/TGA-1

CHANNEL	CHANNEL CENTER FREQUENCY	MARK FREQUENCY	SPACE FREQUENCY
A	765	807.5	722.5
B	1265	1317.5	1232.5
C	2125	2167.5	2082.5
D	2635	2677.5	2592.5
E	2000	2425	1575

NOTE

The external loop circuits should not be connected to a common bus; each loop circuit from each channel (both transmit and receive) must be electrically separate from all other circuits. Polarity must be observed when connecting the TTY equipment to Telegraph Terminal Group AN/TGA-1 loop circuits. Incorrect polarity will not damage the equipment, but some TTY equipment will not print if polarity is reversed.

5. Set TEST METER selector switch to +120V.

6. Set AC PWR switch to ON.

7. Check TEST METER indication for +120-volt dc reading. Check the POWER SUPPLY section on the TEST METER face; the reading should be in the black sector for the proper voltage.

8. Set TEST METER selector switch to +26V.

9. Check the TEST METER indicator for +26-volt dc reading. Check the POWER SUPPLY section on the TEST METER face; the reading should be in the black sector for the proper voltage.

10. Apply power to the desired channel by setting its associated power switches to ON. There is one power switch on Communication Control Console OA-3129/TSC-15 and one on Telegraph Terminal Group AN/TGA-1. Both switches must be on.

CAUTION

Do not allow the loop current of any channel to exceed 60 milliamperes. Higher loop current may damage the teletypewriter equipment and cause excessive power dissipation in the Telegraph Terminal Group AN/TGA-1. When a channel is turned on, immediately check and adjust the transmit and receive loop current as directed in steps 11 through 15.

11. Set TEST METER selector switch to T position associated with selected channel.

NOTE

The TEST METER selector switch has a T (transmit) and an R (receive) position for channels A through E.

12. Adjust the XMIT LOOP ADJ control of the selected channel for exactly 60 ma, as indicated on the lower scale of the TEST METER (LOOP CURRENT 60 MADC). The pointer should be exactly on the line under the black sector of the meter scale.

13. Set TEST METER selector switch to R position associated with selected channel.

NOTE

Omit step 14 if selected channel is operated in the 2-wire mode.

14. Adjust the REC LOOP ADJ control of the selected channel for exactly 60 milliamperes as indicated by the TEST METER.

15. Repeat steps 10 through 14 to place the remaining channels in operation.

16. Monitor each TTY channel with the local teletypewriter to assure that each channel is operating properly.

2-83. FREQUENCY DIVERSITY OPERATION. Frequency diversity operation is the transmission of the same signal at slightly different frequencies. At a given location, the signal received on one frequency may weaken momentarily, but the signal strength at the same location may become stronger for a frequency a few hundred cycles removed. Alternate channels of Converter-Oscillator Group OA-3138/TGA-1 may be paralleled to provide frequency diversity operation. The independent channel of Converter-Oscillator CV-1086/TGA-1 can provide diversity operation but it requires the use of additional plug-in modules. To provide frequency diversity operation of Converter-Oscillator Group OA-3138/TGA-1, perform the following steps:

1. Set AC PWR switch to OFF.

2. Set the two DIV/NON-DIV option switches (accessible through the top of the AN/TGA-1 case) to DIV. This parallels alternate channels of Converter-Oscillator Group OA-3138/TGA-1. Setting the option switches to NON-DIV puts each multiplex channel into independent operation (nondiversity operation).

2-84. In DIV/4W operation, CH-C transmits exactly the same information as that transmitted on CH-A, and CH-B transmits exactly the same information as CH-D. However, in DIV operation, external teletypewriters can not be connected to channels C and B. Channel E diversity can be obtained by the addition of optional modules in the CV-1086/TGA-1 and by connecting the audio output from an auxiliary receiver to terminals 237 and 308 of junction box, unit 1A1. The required equipment for channel E diversity operation is not supplied as a part of Communications Central AN/TSC-15.

NOTE

Refer to sections 4 and 6 of Maintenance and Overhaul Manual for Telegraph Terminal Group AN/TGA-1, TM-02968A-35/2, for a complete discussion of diversity operation principles and tests.

2-85. PRECAUTIONS. Observe the following precautions when operating Telegraph Terminal Group AN/TGA-1:

1. Observe operating instructions for primary power source.
2. Turn off unit when connecting or disconnecting any cables.
3. Turn off the dc power to the appropriate channel or channels for any of the following reasons:
 - a. When channel is not in use.
 - b. When TTY equipment is being changed, inserted into, or removed from the TTY loop circuits (except where jacks are provided).
 - c. When the external loop circuits are being added or removed.
 - d. When fuses are being changed.
 - e. When the TTY OPTION SWITCHES are operated.
 - f. When changing modules.
 - g. When there is a channel malfunction.

WARNING

All external loop circuits are at +120 volts dc potential. Do not contact exposed loop circuit connections.

4. If a channel is turned on when data is being received, turn the RECEIVE LOOP ADJ control fully counterclockwise, then turn clockwise approximately one-third turn. If the channel is turned on when data is being transmitted, turn the TRANSMIT LOOP ADJ control fully counterclockwise; then turn clockwise approximately one-fourth turn. Do not attempt to adjust the loop current using the TEST METER when data is being received or transmitted.

2-86. OPERATING PROCEDURE FOR
TELETYPEWRITER SET AN/TGC-14A (V),
UNIT 8.

2-87. GENERAL. Teletypewriter Set AN/TGC-14A(V) is a communications printing

telegraph machine which provides a means of exchanging messages between two remote locations over landlines or radio circuits. Since it contains its own signal line power supply, it also may be used as an electric typewriter. The keyboard is similar to a typewriter keyboard, except that all necessary characters are contained in only three rows of keys, with the numerals and various punctuation marks located in the upper-case position on the keys. The keyboard also contains a group of special keys for electrically performing such functions as carriage return, line feed, and uppercase and lowercase shift at both the sending and receiving printers. The AN/TGA-14A(V) generates and receives standard 5-level, 7.42 Baudot code to make it fully compatible with all other teletypewriter equipment using this code. The characters printed by the machine are the 26 letters of the alphabet printed in capitals, the digits 1 through 0, usual punctuation marks, and some special characters. Various operating speeds are possible, and gears for 100 wpm, 75 wpm, and 60 wpm are provided with each machine. Other gears for 66 wpm and 65 wpm are available. The machine normally comes equipped for 60-wpm operation with the 100-wpm gear and the 75-wpm gear mounted on a spare gear post on the left-hand corner of the machine. Printing is accomplished by means of a print hammer striking the paper through a ribbon. The small, lightweight print cylinder is positioned behind the paper so that the character is directly beneath the print hammer. This allows the machine to be operated in any plane or attitude. The keyboard touch differs from a typewriter slightly, and the machine will operate best with rhythmical typing. This is common to all teletypewriter equipment and is more of a requirement at lower speeds, such as 60 wpm, than at 100 wpm.

2-88. PREPARATION FOR OPERATION. To prepare the teletypewriter for operation proceed as follows:

1. Remove the teletypewriter from its storage bracket by removing the two web straps which secure it to the bracket on top of the left wheel well. Remove the teletypewriter case cover by releasing the four cover latches. Remove the teletypewriter table from its stowage position on the left shelter wall. Place the table on the teletypewriter table bracket, making sure the two pins in the base of the stowage

bracket protrude through the holes in the teletypewriter table. Place the teletypewriter on the teletypewriter table.

2. Remove the power access plug on the rear of the case by turning the knurled plug counterclockwise. Open the ventilation plug by turning its knurled nut counterclockwise. Connect the teletypewriter power cable between the teletypewriter and the AUXILIARY MITE CONNECTOR which is located on the left wall of the shelter.

3. The equipment is factory-patched for operation with an external battery, and all fuses are installed at the factory. The equipment is patched for duplex external battery operation. For complete wiring options, refer to the technical manual for Teletypewriter Set AN/TSC-14A(V). The proper patching for external duplex battery is strap J1 to J2, strap J3 to J6, and strap J4 to J7.

4. For shipping purposes, the keyboard is recessed within the electrical chassis. Insert the left index finger underneath the front cover, just to the right of the SEND-REC/REC switch, and press the curved portion of the keyboard lock lever to the right; at the same time, pull gently forward on the space bar until the bottom row of keys comes into view. Release the lock lever and continue to pull on the space bar with both hands until it locks into operating position. If it passes the operating position before the lock lever is released, push back on the two keyboard cover ends until it locks into operating position.

CAUTION

To prevent damage to gears of the Teletypewriter Set AN/TGC-14A(V), never slide the keyboard with the motor running.

5. Teletypewriter Set AN/TGC-14A(V) will accommodate standard 8 1/2-inch-wide rolls of teletypewriter paper with a diameter up to and including five inches (with one-inch hollow core). When used in the equipment, the roll is mounted on two paper spool bearings which are connected by a paper roll bar. This bar is permanently connected to one of the two paper spool bearings and is threaded into the

other. To mount a roll of paper, remove the paper roll mounting rod by holding one bearing and turning the other counterclockwise until they are separated. Insert the rod into the paper roll, and rethread into the second bearing. Make sure both bearings are firmly set in the ends of the paper roll. Install the roll so that the paper feeds off the bottom toward the front of the machine. Thread the paper through the machine.

6. Set the MOTOR switch to ON. The motor will start, and the printer will run closed; that is, none of the clutches will operate if the control panel and all signal loops are set up properly. Refer to paragraph 2-83 for loop setup procedure. Set the LAMP switch to ON. The copy lights should illuminate the interior of the equipment.

7. Strike the LTRS key and type the following test sentence: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK.

8. Strike the FIGS key and type the following uppercase test: 1 2 3 4 5 6 7 8 9 0 (').

9. If no error occurs, the equipment is now ready for use in the Communications Central AN/TSC-15 circuit.

10. If the equipment fails to operate properly, check the fuses, the primary power, and cable connections. Ensure that the signal line is closed. Check all signal loops and Telegraph Line Control C-3533/TSC-15 to see that they are set up properly. The fuses for 115-volt ac operation are as follows:

FUSE NUMBER	USE	RATING
1A1F1	Main power	4.0 amperes
1A1F2	Motor	1.0 ampere
1A1F3	Power supplies primaries	0.5 ampere
1A1F4	Signal line	0.25 ampere

11. Connect the equipment to the signal line, and measure the current to make certain it is

within the limits of the range prescribed. If the equipment does not operate properly, reverse the signal line. Although the AN/TGC-14A(V) is not polarity sensitive, some of the equipment that it will be used with is, and it may be necessary to reverse the signal line to comply with the requirements of these units.

2-89. OPERATING PROCEDURES.

2-90. Description of Controls and Indicators.

2-91. General. Refer to figure 2-18 and table 2-11 for location and description of controls and indicators.

2-92. On-Line Functions. On-line functions are those which are the result of electrical impulses transmitted over the signal line. These functions apply to both the send and receive machines, and are associated with the keyboard characters and controls.

2-93. Off-Line Functions. Off-line functions are those which are not electrically transmitted, but are mechanical operations which affect only the local machine and do not interfere with the incoming or outgoing electrical signals. The four buttons above the keyboard, (line feed, carriage return, figure shift, and letter shift) are off-line functions.

2-94. Line Length. Teletypewriter Set AN/TGC-14A(V) normally prints 76 characters per line but is adjustable for 72 characters per line. Automatic carriage return and line feed are normally activated at the count for which the machine is set.

2-95. Paper. Teletypewriter Set AN/TGC-14A(V) is designed to accommodate a standard large-size roll of 8 1/2-inch-wide paper. The paper roll is mounted and threaded through the printer as follows: Draw the paper off the bottom of the paper roll and over the dancer rollers. Feed it across the top of the printer directly behind the type cylinder yoke clamp. Make certain that the positioning cables are in front of the paper and that the paper lock lever is positioned to the right to remove pressure from the paper. Push the paper down far enough so that it is caught between the paper feed roll and pressure roll. Move the paper feed pressure lever to the left, and feed the paper up by turning the manual paper feed knob by hand; or, with the motor turned on,

actuate the off-line feed control. The paper should then feed upward and be guided between the type cylinder and the ribbon.

2-95. Starting Procedure. Before starting the machine, ensure that it is connected properly and patched as outlined in paragraph 2-88. Set the MOTOR switch to ON. The motor should start, and the machine should run closed. If the machine runs open (that is, clutches operate), first check all signal lines, Telegraph Line Control C-3533/TSC-15, and then refer to troubleshooting procedures in the Teletypewriter Set AN/TGC-14A(V) technical manual. Set the LAMP switch to ON. The copy lamps should light and illuminate the interior of the machine. If the machine is to be used for receive only, the SEND-REC/REC switch should be placed in the down position. If both send and receive operation is desired, the switch must be in the up position. Removing the keyboard or placing it in storage will automatically place the machine in the receive only condition.

2-96. Changing Speed. To change the printing speed it is necessary only to replace the speed change gear. This is accomplished by loosening the idler gear lock knob just enough to allow it to swing away from the change gear. The change gear lock knob (identified by the 6 black dots engraved on its surface) is unscrewed and removed. Then the speed change gear is removed. The replacement gear, which is normally mounted on the replacement gear post, is placed on the speed gear shaft with the slotted side inward, engaging the two pins extending outward from the shaft. Make certain the gear is seated properly; replace the lock knob on the shaft with the black dots outward, and tighten. Swing the idler gear upward against the speed change gear and mesh the two. Holding the gears meshed with one hand, tighten the idler gear lock knob. Run the motor and readjust the idler gear if excessive gear noise indicates too much or too little backlash. Each gear is identified by the wpm rate engraved on the face of the gear. The larger the gear, the faster the speed.

2-97. Ribbon Change. Remove the equipment from the case by loosening the two wing nuts on the front of the machine, pulling the top of the cover toward the front and lifting up. Then slide the machine from the case. Remove the paper from the paper feed mechanism and

remove the paper guide plate. To remove the paper guide plate over the top of the printer, insert fingers simultaneously under both sides of the plate and lift the front upward to disengage the front edge from the mounting posts; then move in an arc toward the rear so that the rear mounting pins are disengaged from their matching holes in the rear plate. Remove the old ribbon, saving the empty spool (refer to figure 2-23).

NOTE

The letter-number combinations in parentheses in the following instructions refer to the keyed parts of figure 2-23.

2-98. Place a full spool of Underwood 1/2-inch-wide ribbon (1L) on post (2L) making certain the pin (3L) engages the slot in the spool. Pass ribbon in front of arm (4L), behind roller (5L), through fork in sensing arm (6L), behind and around roller (7L), around outside of roller (8L), and through left vibrator link (9L) (by passing ribbon first downward through slit and then bringing it upward while hooking it under the down-pointing tab). Pass the ribbon across the front of the printer, through the right vibrator link (9R), across and around the outside of roller (8R), around and behind roller (7R), through fork in sensing arm (6R), and behind roller (5R). At this point, engage the free end of the ribbon in the empty spool and wind it in a counterclockwise direction. Sufficient turns must be made to ensure that the eyelet (10R) is in that portion of the ribbon which is wound around the empty spool. Place spool (1R) on post (2R), engaging pin (3R) in slot in spool. Make certain that the ribbon passes in front of arm (4R), and then take up all slack in the ribbon by winding it up on the free-turning spool. To reverse the direction of ribbon travel, manually, when the motor is running, push outward on either sensing arm (6L or 6R). Replace the paper guide plate and the front cover. Slide the equipment into the case.

2-99. Ranging the Printer. Since the printer will operate most efficiently when the range dial is set to the midpoint of the reception range, it is necessary to adjust for this point before operation. If possible, adjustment should be made on a signal being transmitted from a distant point; if not, the local keyboard or other type of signal generator, such as a

transmitter-distributor, may be used. In either case, transmit the characters R and Y alternately. With the range dial lock knob turned clockwise to loosen the range dial, turn it in either direction until errors appear in the typed copy. Slowly rotate the dial in the opposite direction until errors disappear. Note the reading on the dial under the copper pointer. Rotate the dial in the opposite direction until errors again appear. Note this reading. The optimum setting will usually be the midpoint of these two readings. The dial should be turned to this point and the range dial lock knob tightened counterclockwise. If either extreme takes the indicator beyond the calibrated portion of the dial, unscrew the range dial lock knob fully; pull the range dial away from the printer to the point where the gear teeth are no longer engaged. The copper pointer has enough spring to allow this action. Reposition the dial so that both extremes of range fall within the calibrated portion of the dial, reengage the drive shaft gear teeth with the teeth on the range dial shaft and tighten the lock knob.

2-100. Line Feed. Teletypewriter Set AN/TGC-14A(V) has provisions for either single- or double-line feed control. The single condition provides six lines per inch. The double position provides three lines per inch. The line-feed mechanism may be activated electrically as an on-line function (by depressing the line feed key), mechanically as an off-line function (by depressing the line feed control on top of the machine), automatically when the 76th character in a line has been reached, and manually by turning the manual paper feed knob.

2-101. Paper Clamping. The paper may be straightened and centered by the following procedure. Move the two copy window release latches (see figure 2-18) outward, and open the copy window. Move the paper lock lever to the unlock (right-hand) position. Grasp the paper with both hands and line up the edges. Then, while holding the edges in the proper position, slide the paper to the right or left until centered. Continue to hold the lock lever to the lock (left-hand position). Release the paper, hold the copy window release latches outward, close the copy window, and release the latches which then lock the window.

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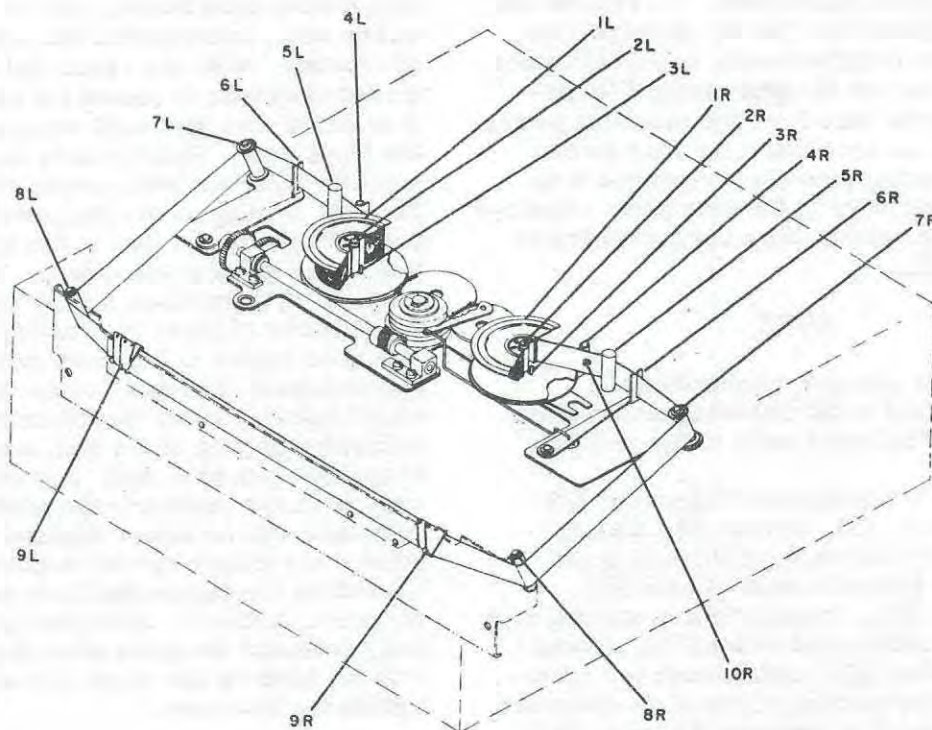


Figure 2-23. Teletypewriter Set AN/TGC-14A(V), Unit 8, Ribbon Change

**2-102. OPERATING PROCEDURE FOR
TELEPHONE TERMINAL CONTROL C-3535/
TSC-15, UNIT 3A1.**

2-103. GENERAL. Access to the modules of Telephone Terminal Control C-3535/TSC-15 is gained by removing the snap-on dust cover. The unit contains four Audio Frequency Amplifiers AM-2898/TSC-15, four associated keying relay circuits, three Hybrid Circuit Networks MX-3726/TSC-15 (each containing two identical hybrid circuits), and associated circuitry for proper connection to five external telephone lines. A hybrid circuit is a device used to convert a two-wire source to a four-wire source. The four-wire terminating set consists of a form of bridge which is called a hybrid. The hybrid circuit is arranged so that the two-wire line and a balancing network form one pair of conjugate arms of the bridge. The four-wire input and output circuits are connected to form another pair of conjugate arms of the bridge. The amount of coupling between the

input and output circuits at any frequency is determined by the degree of match between the impedances of the balancing network and the two-wire termination. The hybrid circuit in the AN/TSC-15 has a normal isolation of 50 dB between the transmit and receive pairs of the four-wire line.

NOTE

The 50-dB isolation in the hybrid circuit is possible only after Hybrid Circuit Networks MX-3726/TSC-15 have been adjusted properly.

2-104. OPERATION. Before connecting the external telephone lines to the signal entry panel, the 2W-4W switch in that line should be placed in the appropriate position (depending on the connection made to the panel, 2-wire or 4-wire). This assures that the

telephone line is connected properly to the AN/TSC-15 voice circuits. When a remote field phone or switchboard is connected (2-wire) into the AN/TSC-15, the hybrid circuit network for that line must be balanced to achieve optimum results.

NOTE

In a simplex or duplex 2-wire circuit, voice information can not be transmitted and received simultaneously. For a full duplex telephone circuit (that is, simultaneous transmission and reception of voice information), 4-wire circuits must be used.

2-105. If a single field phone is connected to a TEL line input, the hybrid is balanced to the field phone, and if a switchboard is connected, the hybrid is balanced to the switchboard. The balance of the circuit must be checked each time a new external connection is made to the signal entry panel. Before attempting to balance the hybrid circuit for a particular telephone line, the field instrument on that line must not be hung up. If the end instrument is a switchboard, the switchboard operator's equipment must be connected to the telephone line. Refer to paragraph 2-143 for adjustment of Hybrid Circuit Networks MX-3726/TSC-15.

2-106. OPERATING PROCEDURE FOR CONSOLE ACCESSORY PANEL, UNIT 3A13.

2-107. GENERAL. The console accessory panel contains the necessary modules to provide automatic telephone ringing for the five telephone lines and automatic audio level control for the four radio voice channels.

2-108. OPERATION. The local operator selects automatic telephone ringing for a particular telephone line by placing the AUTOMATIC TELEPHONE RINGING switch for that TEL line to the ON position. There are five TEL ON-OFF controls on the accessory panel, one for each TEL line. Setting the AUTOMATIC TELEPHONE RINGING switch to ON activates all of the circuitry for automatic ringing. The operator must also connect the TEL line to the proper voice channel by use of the pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15. Refer to paragraph 2-111 for detailed setup procedure on the switchboard pushbuttons. When the operator

has set the AN/TSC-15 for automatic ringing, a 20-cycle ringing voltage from the remote field phone will energize a two-tone oscillator. The output of the oscillator will be transmitted by radio to another AN/TSC-15 which is also set for automatic telephone ringing. A detector in the second AN/TSC-15 will detect the two-tone signal and turn on the 20-cycle ringer, which will send a 20-Hz, 90 to 110-volt signal to a remote TEL line to energize the 20-cycle alarm circuit on the field phone. The automatic level control consists of four Audio Frequency Amplifiers AM-3200/U, one for each of the radio channels. The amplifiers produce a constant audio output level over a wide range of audio inputs and they eliminate the need to adjust the TEL line gain controls when the TEL lines are connected to voice channels. There are no operator controls on Audio Frequency Amplifiers AM-3200/U.

2-109. TWENTY-CYCLE RINGER ASSEMBLY.

2-110. The 20-cycle ringer assembly is a 28-volt dc to 90-volt, 20-Hz converter which is controlled by the local operator or by the automatic telephone ringing circuitry. The 90-volt 20 Hz tone is used to energize the ringing circuitry in the remote field phones.

2-111. OPERATING PROCEDURE FOR MANUAL TELEPHONE SWITCHBOARD SB-1248/TSC-15, UNIT 3A6.

2-112. GENERAL. Manual Telephone Switchboard SB-1248/TSC-15 allows interconnection of external telephone lines and radio voice channels by use of pushbutton-operated electrical-cord circuitry. A maximum of five telephone lines (TEL lines) and four radio channels can operate into Manual Telephone Switchboard SB-1248/TSC-15. The front panel of the switchboard contains 10 vertical rows of pushbuttons. The first row on the left consists of four OPERATOR pushbuttons which are used to place the local operator into the circuit of a particular CORD, 1 through 4. A CORD is merely the electrical equivalent of the operator's cord used on a normal manual switchboard. The next five vertical rows consist of operating pushbuttons for TEL 1, TEL 2, TEL 3, TEL 4, and TEL 5, in that order. The last four vertical rows are operating pushbuttons for CHAN 1, CHAN 2, CHAN 3, and CHAN 4 radio voice circuits in the associated radio equipment. The operator should

completely familiar with all of the options of Manual Telephone Switchboard SB-2248/TSC-15 and his COM plan (or other designated plan of operation) before attempting to operate the switchboard. Detailed patching information is given in table 2-20.

2-113. PREPARATION FOR USE. To prepare the equipment for telephone communications, connect the remote telephone lines into the signal entry panel as follows: connect the appropriate lines to TEL 1 through TEL 5 of the signal entry panel on the upper row of terminal pairs. Either 2- or 4-wire capabilities may be used with the telephone communications system. The 2-wire transmit pairs on the signal entry panel are always the left-hand set of terminals for any TEL line. Connect a pair to the transmit 2-wire pair and a pair to the receive 2-wire pair for a 4-wire system. The telephone lines for a pair can be connected without reference to polarity. For optimum AN/TSC-15 performance, the maximum telephone line length should not exceed eight miles for dry wire or four miles for wet wire.

NOTE

In a simplex or duplex 2-wire circuit, voice information can not be transmitted and received simultaneously. For a full duplex telephone circuit (that is, simultaneous transmission and reception of voice information), 4-wire circuits must be used. Refer to paragraph 2-143 for alignment of Hybrid Circuit Networks MX-3726/TSC-15 which must be checked each time a remote telephone line is connected into the signal entry panel.

2-114. Some typical operating procedures will be outlined to familiarize the operator with the use of Manual Telephone Switchboard SB-1248/TSC-15.

2-115. TELEPHONE OPERATION. Assume that a remote telephone operator (connected to a 2-wire circuit) wants to place a call through Communications Central AN/TSC-15 and that the remote operator is connected into TEL 1 when the remote ringer is energized. The TEL 1 CALL lamp above the second vertical row of pushbuttons will light. The local operator will then take the following action.

1. Press the ANSWER pushbutton in the second row of vertical pushbuttons. This connects the local operator's microphone, headset, and speaker into the circuit to permit a conversation with the remote operator on TEL 1.

NOTE

During any voice operation by the local operator, the VOICE-CW switch on Manual Telephone Switchboard SB-1248/TSC-15 must be set to VOICE.

2. Adjust the audio level of the local operator's equipment. The MIKE GAIN control adjusts the audio level of the microphone amplifier circuit. To adjust the local operator's microphone level, set the VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to OPERATE XMIT, and adjust MIKE GAIN control for 0 VU peak reading. The SPKR GAIN control adjusts the audio level of the speaker and headset circuits.

NOTE

The speaker is disconnected when the microphone is keyed, and audio is present only in the headset.

3. Determine the following in accordance with a communications plan: (a) the individual to be contacted by the remote operator, (b) the location of the individual to be contacted, and (c) the type of communication desired by the remote operator and/or required by existing factors which may include:

Voice communication by use of radio channels.

Voice communication by use of another telephone line.

A message to be relayed by the local operator over the radio channels by CW transmission.

A message to be relayed by the local operator over the radio channels by teletypewriter multiplex.

A message to be relayed by the local operator by voice communications on the radio channels.

A message to be relayed by the local operator over the radio channels by teletypewriter FSK.

A message to be relayed by the local operator by use of another telephone line.

A conference call to include the local operator and as many as four persons on the telephone lines or the radio channels.

4. Assume that the remote operator wishes to speak to a person at the far end of the radio link in channel 1. The following action must be taken by the local operator: Press the TEL 1 CORD 1 pushbutton in the second vertical row of pushbuttons and the CHAN 1 CORD 1 pushbutton in the seventh row of vertical pushbuttons. This completes a circuit connecting the remote operator on TEL 1 into the local radio on voice channel 1 through CORD 1 circuitry. The TEL 1 and CHAN 1 red OFF buttons will light, indicating that these circuits are in use.

5. Two modes of operation may be selected in the lower sideband, MX or 3 KC, by use of the LSB switch under the eighth vertical row of pushbuttons. Channel 1 and channel 2 are lower sideband; channel 3 and channel 4 are upper sideband. If the person to be called is on channel 3 or 4, the two available modes of upper sideband operation are MX or 3 KC. Assume that 3 KC operation is selected for channel 3. Set the USB toggle switch to 3 KC to provide the remote operator on TEL 3 the entire upper sideband for a full 3-kc bandwidth.

NOTE

When the LSB or USB switches are set to MX, as many as four voice channels (the full capacity of Manual Telephone Switchboard SB-1248/TSC-15) may be utilized. A separate telephone line may be connected into each of the cords, and each cord may be connected to a separate voice channel.

6. Set the transmitter key switch on Radio Set Control C-3532/TSC-15 to VOX and the TEL 1 GAIN control to extreme clockwise position.

NOTE

Each radio channel has automatic audio level control; therefore, when a TEL line is operating into a radio channel, the TEL line GAIN control is always set to the extreme clockwise position.

7. For adjustments of the vox circuits, refer to the Communications Central AN/TSC-15 Maintenance Manual, TM-02968A-50.

8. The circuit which has been established may be left unattended until a call from either the voice channel or the telephone channel is received asking that the circuit be disconnected. The local operator may monitor the circuit by pressing the MONITOR pushbutton in channel 1 or by pressing the OPERATOR CORD 1 pushbutton. The MONITOR pushbutton in channel 1 allows the operator to listen only to received audio from channel 1. The OPERATOR CORD 1 pushbutton allows the operator to join into the conversation and monitor the audio transmitted through channel 1 in addition to the received audio.

9. When the TEL 1 operator has finished his conversation, the local operator must either press the TEL 1 OFF pushbutton or remove the TEL 1 line from CORD 1.

NOTE

The remote operator must inform the local operator when his conversation has been completed, since the local operator will, in most cases, be too busy to monitor all calls.

2-116. NIGHT ALARM OPERATION. If the local operator places the NIGHT ALARM switch in NIGHT ALARM, incoming calls from the TEL lines or teletypewriter loops will be indicated by a lamp, a buzzer, and an audio tone in the headset. Assume that the NIGHT ALARM switch is in NIGHT ALARM and a call is received on TEL 2. The TEL 2 CALL lamp lights, the buzzer sounds, and audio is supplied to the headset. The local operator should take the following action:

1. Press the TEL 2 ANSWER pushbutton and answer the remote operator on TEL

2. Assume that the TEL 2 operator wants to speak to the same person with whom the remote operator on TEL 1 is presently speaking. Since the remote operator on TEL 2 cannot be connected into the circuit immediately, the HOLD pushbutton in the TEL 2 vertical row is pushed. This keeps the TEL 2 circuit active and reminds the local operator that the TEL 2 operator is holding.

2. When the TEL 1 operator has finished his conversation, the local operator must either press the TEL 1 OFF pushbutton or remove the TEL 1 line from CORD 1.

NOTE

The remote operator must inform the local operator when his conversation has been completed, since the local operator will, in most cases, be too busy to monitor all calls.

3. After the remote operator on TEL 1 has been disconnected, the local operator may connect the TEL 2 operator to channel 1 by pressing the TEL 2 CORD 1 pushbutton.

4. When the local operator is signaled that the conversation has ended, both the TEL 2 and the CHAN 1 connections are removed by pressing the respective OFF pushbuttons in the TEL 2 and CHAN 1 vertical row.

2-117. AUTOMATIC RINGING OPERATION. Assume that the local operator wants to set up TEL 1 and voice CHAN 1 for automatic ringing. The following steps should be performed:

1. Set the TEL 1 AUTOMATIC TELEPHONE RINGING switch (on the console accessory panel) to ON.

2. Connect TEL 1 into an unused CORD by depressing the TEL 1 CORD pushbutton.

3. Press the CHAN 1 CORD pushbutton in the same CORD used in step 2.

4. Turn the TEL 1 GAIN control fully clockwise.

2-118. The circuit which has been established can now be left unattended. The two parties on TEL 1 and voice CHAN 1 may contact each other by means of the automatic ringing circuitry.

2-119. MANUAL RINGOUT OPERATION. A DIAL-OFF-RING switch is provided to call any of the remote telephone operators from the local equipment. To initiate a call, perform the following steps:

1. Set the AUTOMATIC TELEPHONE RINGING switch (on the console accessory panel) of the TEL line to be called to OFF.

2. Press the ANSWER pushbutton in the particular TEL line to be called.

3. Momentarily hold (5 or 10 seconds) the DIAL-OFF-RING switch in RING to energize the ringer on the remote telephone handset.

2-120. The DIAL portion of the DIAL-OFF-RING switch is used only when a pair of commercial telephone lines are connected into the signal entry panel. When a call is received from a remote operator who wishes to place a commercial call, the ANSWER button in that TEL line should be pressed and the DIAL-OFF-RING switch should be set to DIAL. The desired number can then be dialed by use of the DIAL on the Manual Telephone Switchboard SB-1248/TSC-15. An external commercial telephone connected to the signal entry panel can dial the number assigned to Communications Central AN/TSC-15. This lights the CALL lamp on that TEL line of Manual Telephone Switchboard SB-1248/TSC-15.

2-121. CONFERENCE CALL OPERATION. When a remote operator on either the telephone lines or a radio channel calls the local operator and requests a conference call, he may ask for any of the following to be included in the conference call:

Four TEL lines and the local operator.

Four radio channels and the local operator.

Two TEL lines, two radio channels, and the local operator.

Three TEL lines, one radio channel, and the local operator.

Three radio channels, one TEL line, and the local operator.

2-122. The conference combinations are available with the following limitations:

A maximum of two CORDS, including CORD 2, must be used.

NOTE

In all conference calls, CORD 2 must always be used.

No more than two persons, other than the local operator, may be connected to a single cord.

The local operator must be connected to a CORD, other than CORD 2, by means of the OPERATOR'S CORD pushbutton.

2-123. Conference calls may include as many as five persons, including the local operator. The two persons connected to the same CORD may be from two radio channels, two TEL lines, or one from each, if the previous conditions are met.

2-124. Assume that a person on CHAN 1 calls the local operator and requests a conference call with TEL 1, TEL 2, CHAN 3, and the local operator. The following procedure will be used.

1. Call TEL 1 using the procedure discussed for calling remote telephones.
2. Tell the individual on TEL 1 to stand by and pass TEL 1 HOLD pushbutton.
3. Repeat the procedure of steps 1 and 2 for TEL 2.
4. Call CHAN 3, using the procedure discussed for calling remote radio channels, and tell the individual on CHAN 3 to stand by.
5. Press the CHAN 1 CORD 2 pushbutton to place the CHAN 1 circuit into CORD 2.
6. Set the conference switch to the CONFERENCE position.
7. Press the TEL 1 CORD 2 pushbutton to place the TEL 1 circuit into CORD 2.
8. Since CORD 2 now holds two circuits, another CORD must be used for the two remaining parties. Press either the TEL 2 CORD 1, TEL 2 CORD 3, or the TEL 2 CORD 4 pushbuttons. This connects the TEL 2 circuit into the cord chosen. Assume that TEL 2 CORD 1 is pushed.

9. Press the CHAN 3 CORD 1 pushbutton.

10. Press the OPERATOR CORD 1 pushbutton. A normal five-way conference circuit has been established, including TEL 1 and CHAN 1 in CORD 2, CHAN 3, TEL 2, and the local operator in CORD 1.

11. Inform the parties on the conference call to begin their conversation.

NOTE

The local operator must leave the OPERATOR CORD pushbutton pressed into the CORD with which CORD 2 is conferenced or the conference circuit will be disconnected. If a call is received on another line during a conference call, the local operator can push the ANSWER button on the calling line, speak to the calling operator, and connect the remote line into an unused cord without disconnecting the conference circuit. Under all circumstances, however, the local operator must leave the OPERATOR CORD pressed during a conference.

2-125. CORD 2 must be used in a conference circuit because it is the only cord connected directly with the conference bridge through the conference relay. When the conference switch is in CONFERENCE, CORD 2 is connected to the operator's bridge through the conference bridge.

2-126. OVERRIDE OPERATION. The OVERRIDE switch is used to disable one pair of the 4-wire pair when the two parties involved in a conversation have trouble understanding each other due to crosstalk between the two pairs of the 4-wire pair. The operation of the OVERRIDE circuit depends on the sequence with which the two parties are connected into a cord. Assume that TEL 1 is placed into CORD 1, and then CHAN 1 is placed into CORD 1. TEL 1 is then in stepper 1 of CORD 1 and CHAN 1 is in stepper 2 of CORD 1. If the two parties inform the local operator of trouble during their conversation, the local operator will push OPERATOR CORD 1 and monitor the conversation. The local operator will then try to eliminate the trouble by using the OVERRIDE switch. Setting the OVERRIDE switch to

position A disables the receive pair of the 4-wire pair at the telephone output of the circuit. Setting the OVERRIDE switch to B disables the transmit audio input on the 4-wire pair at the radio input. Either pair of wires can be disabled, depending on the position of the OVERRIDE switch. Assume the remote operator on TEL 1 is speaking and the CHAN 1 operator is listening. To disable the inactive pair of wires, which in this case are the wires connecting the TEL 1 receive to the received input from CHAN 1, set the OVERRIDE switch to A. When the person on CHAN 1 wants to speak to the person on TEL 1, the OVERRIDE switch is set to B, disabling the wires connecting the TEL 1 transmit pair to the transmitted audio into CHAN 1. The local operator must monitor the conversation and position the OVERRIDE switch to disable the unused pair of the 4-wire pair. If the sequence in which the two parties were placed into the cord had been reversed (CHAN 1 placed in first, then TEL 1), the sequence of operating the OVERRIDE switch would have been reversed.

2-127. CW OPERATION. During any voice operation by the local operator, the VOICE-CW switch on Manual Telephone Switchboard SB-1248/TSC-15 must be in VOICE. If CW operation is desired, perform the following steps:

1. Set VOICE-CW selector switch to CW.
2. Determine which channel and which cord to use.
3. Press the OPERATOR pushbutton in the particular cord, and press the particular CHAN pushbutton in that cord.
4. Connect the CW key into the CW jack on Manual Telephone Switchboard SB-1248/TSC-15.
5. Set transmitter key switch to VOX, and begin transmitting, using the CW key.

2-128. RADIO OPERATION. When a call is received from a radio voice channel, an audio detector applies an output voltage which causes the appropriate channel CALL lamp to light on Manual Telephone Switchboard SB-1248/TSC-15. The brilliance of the CALL lamp varies directly with the amount of audio the detector

senses. When transmit audio causes the keying relay to energize, 28 volts dc is applied to the CALL lamp. Vox operation is distinguished from a normal voice channel call by the brilliance of the CALL lamp. The lamp is brighter during vox operation. The ANSWER pushbuttons in the radio channels serve the same purpose and operate in the same manner as the ANSWER pushbuttons of the telephone circuits which are described in paragraph 2-115.

2-129. TELETYPEWRITER OPERATION.

When the local operator wants to transmit teletypewriter information, he places the information into the radio channels by use of the switches located in the CHAN 1 and CHAN 4 vertical pushbutton rows. To operate the teletypewriter through the four-channel multiplex circuits, channels A through D, the TTY MX pushbutton must be pressed. If TTY MX operation in the upper sideband is desired, the TTY MX pushbutton in channel 4 must be pressed. For TTY MX operation in lower sideband, the TTY MX pushbutton in channel 1 must be pressed.

2-130. The 850-cycle TTY FSK, or channel E, is controlled by the TTY FSK pushbuttons in channel 1 or channel 4. To operate 850-cycle FSK, the TTY FSK pushbutton in the sideband selected must be pressed, and the USB or LSB switch for the sidebands selected must be in 3 KC.

NOTE

To transmit or receive 850-cycle FSK information, the LSB or USB switches must be placed in the 3 KC position.

2-131. The controls designated CHAN A-D and CHAN E are used to adjust the output levels of the teletypewriter multiplex circuits. The CHAN E control should be adjusted for an output level of -4 VU on the VU meter, and the CHAN A-D control should be adjusted for an output level of -4 VU on the VU meter. To check the outputs of the TTY FSK and TTY MX circuits, use the following procedure:

NOTE

The oscillators in CHAN A-D and CHAN E will remain on for only a few seconds. The operator must be ready to make the measurement quickly, and the ON-OFF switches must be set to ON simultaneously.

1. TTY MX: Patch lower TTY MX jack, VU METER jack, and 600 OHM jack into MULTIPLE NO. 1 on Telephone Jack Assembly TA-408/TSC-15. Set VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to 0. Set all channel switches (A through D) to ON simultaneously, and check for a VU meter reading of -4 VU.

2. TTY FSK: Patch lower TTY FSK jack, VU METER jack, and 600 OHM jack into MULTIPLE NO. 1 on Telephone Jack Assembly TA-408/TSC-15. Set VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to 0. Set CHAN E switch to ON, and check for a VU meter reading of -4 VU.

NOTE

Normally the multiplex output levels are not adjusted by the operator. Refer to the Maintenance Manual for Communications Central AN/TSC-15, TM-02968A-50, for complete adjustment procedures and a list of special test equipment required.

2-132. OPERATING PROCEDURE FOR TELEPHONE JACK ASSEMBLY TA-408/TSC-15, UNIT 3A3.

2-133. GENERAL. Telephone Jack Assembly TA-408/TSC-15 is divided into two sections with 48 jacks in each section. The 48 jacks on the left side of the assembly (black portion) are TTY TEST PANEL jacks and are tip-sleeve jacks. The 48 jacks on the right side of the assembly (red portion) are AUDIO TEST PANEL jacks and are ring-tip-sleeve-jacks. Use only red plugs at the AUDIO TEST PANEL and only black plugs at the TTY TEST PANEL. No data can be coupled through an incorrect patch cord. Refer to figure 2-24 for location of the jacks and their functional titles. For a complete description of the various patching combinations available on Telephone Jack Assembly TA-408/TSC-15, refer to the Maintenance Manual for Communications Central AN/TSC-15, TM-02968A-34.

2-134. OPERATION. Telephone Jack Assembly TA-408/TSC-15 provides the local operator access to all audio circuits connected to Manual Telephone Switchboard SB-1248/TSC-15. The TA-408/TSC-15 provides the local

operator access to all teletypewriter circuits connected to Telegraph Line Control C-3533/TSC-15. Multiple connections for providing two and three connections to any jack on the assembly are provided. There are two 600-ohm impedance jacks available for termination.

2-135. OPERATING PROCEDURE FOR TELEPHONE TEST SET TS-1635/TSC-15, UNIT 2A12.

2-136. GENERAL. Telephone Test Set TS-1635/TSC-15 enables the local operator to check the performance of the AN/TSC-15 completely without the use of external test equipment or external lines. When used in conjunction with Communication Control Console OA-3129/TSC-15, the telephone test set enables the local operator to check (1) telephone line-to-radio channel-to-telephone line combinations for both normal and automatic telephone ringing, (2) all teletypewriter-to-radio channel-to-teletypewriter channel combinations, and (3) local operator's equipment. All telephone line and teletypewriter channel tests are performed in full duplex 4-wire mode of operation to facilitate testing. To achieve full duplex operation, the duplex exciter (unit 2A7) is connected through a 60-dB rf attenuator in the TS-1637/TSC-15 to J24 on duplex receiver unit 2A8.

2-137. Telephone Test Set TS-1635/TSC-15 contains a three-tone oscillator which enables the operator to balance the telephone line hybrid circuits for optimum performance. The oscillator can also be used as an audio tone source to trouble shoot the AN/TSC-15 when used with Telephone Jack Assembly TA-408/TSC-15. Circuitry is provided to enable the operator to meter the oscillator output to the telephone line transmit pairs and the audio received on the telephone line receive pairs by use of the VU meter on Manual Telephone Switchboard SB-1248/TSC-15. Necessary connectors and a selector switch on the TS-1635/TSC-15 allow the operator to connect Teletypewriter Set AN/TGC-14A(V) to any of the teletypewriter channels. All test procedures can be performed without transmitting a signal and without the use of remote telephone or teletypewriter lines.

2-138. PREPARATION FOR USE. The following steps should be performed each time

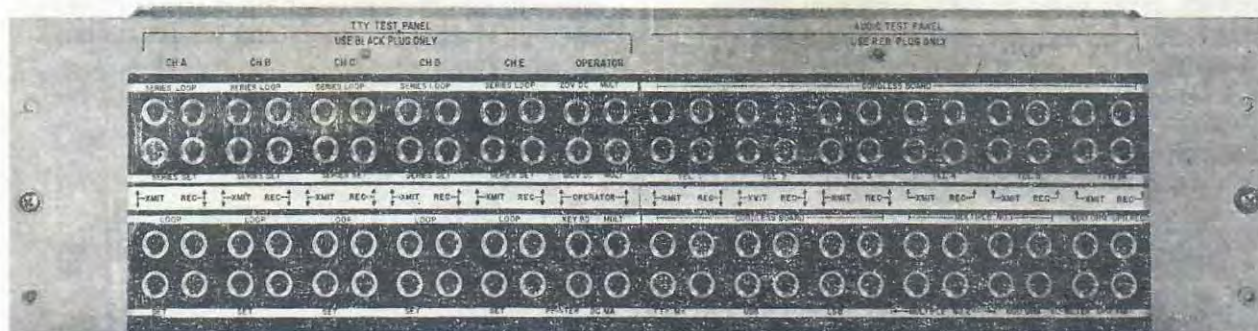


Figure 2-24. Telephone Jack Assembly TA-408/TSC-15, Unit 3A3

Telephone Test Set TS-1635/TSC-15 is to be used to check out the AN/TSC-15:

1. Disconnect all external wires from the signal entry panel.
2. Press all of the OFF pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15.
3. Set all 2W-4W switches on Telephone Terminal Control C-3535/TSC-15 and Telegraph Terminal Group AN/TGA-1 to the 4W position.
4. Set the radio equipment for duplex operation as outlined in table 3-1.
5. Connect test cable No. 1 between J25 on the duplex exciter (unit 2A7) and J4 on Telephone Test Set TS-1635/TSC-15.
6. Connect one of the 125-foot lengths of duplex antenna cable between J24 on the duplex receiver unit 2A8 and J5 on Telephone Test Set TS-1635/TSC-15.
7. Tune the duplex receiver, unit 2A8, to the same frequency as the duplex exciter, unit 2A7.

2-139. TELEPHONE LINE-TO-RADIO-TO-TELEPHONE OPERATION. The following steps should be used to check the telephone line-to-radio-to-telephone line operation of the AN/TSC-15:

1. Set TRANSMIT AUDIO switch on Telephone Test Set TS-1635/TSC-15 to TEL 1. Set RECEIVE AUDIO switch to TEL 1.
2. Press the TEL 1 CORD 1 and CHAN 1 CORD 1 pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15.
3. Set USB and LSB switches on Manual Telephone Switchboard SB-1248/TSC-15 to MX.
4. Set METER switch on telephone test set to XMIT.
5. Rotate AUDIO LEVEL control on telephone test set fully counterclockwise.
6. Set the FREQUENCY switch on the telephone test set to 600
7. Set the VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to -10 VU.
8. Turn the AUDIO LEVEL control on the telephone test set clockwise until a reading of -10 VU is obtained on the VU meter.
9. Turn the TEL 1 GAIN control on Manual Telephone Switchboard SB-1248/TSC-15 fully clockwise.
10. Set the VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to +10 VU.

11. Set the METER switch on the telephone test set to REC.

12. Set the transmitter key switch on Radio Set Control C-3532/TSC-15 to VOX.

13. Turn the VOL control on the duplex Radio Set Control C-3141/TRC-75 fully clockwise.

14. Check the reading on the VU meter of Manual Telephone Switchboard SB-1248/TSC-15.

15. The meter should read approximately ~~15~~ ^{SEE SCOPING} ~~20~~ ^{20V ± 10V} ~~30~~ ^{30V} ~~40~~ ^{40V} ~~50~~ ^{50V} ~~60~~ ^{60V} ~~70~~ ^{70V} ~~80~~ ^{80V} ~~90~~ ^{90V} ~~100~~ ^{100V} ~~110~~ ^{110V} ~~120~~ ^{120V} ~~130~~ ^{130V} ~~140~~ ^{140V} ~~150~~ ^{150V} ~~160~~ ^{160V} ~~170~~ ^{170V} ~~180~~ ^{180V} ~~190~~ ^{190V} ~~200~~ ^{200V} ~~210~~ ^{210V} ~~220~~ ^{220V} ~~230~~ ^{230V} ~~240~~ ^{240V} ~~250~~ ^{250V} ~~260~~ ^{260V} ~~270~~ ^{270V} ~~280~~ ^{280V} ~~290~~ ^{290V} ~~300~~ ^{300V} ~~310~~ ^{310V} ~~320~~ ^{320V} ~~330~~ ^{330V} ~~340~~ ^{340V} ~~350~~ ^{350V} ~~360~~ ^{360V} ~~370~~ ^{370V} ~~380~~ ^{380V} ~~390~~ ^{390V} ~~400~~ ^{400V} ~~410~~ ^{410V} ~~420~~ ^{420V} ~~430~~ ^{430V} ~~440~~ ^{440V} ~~450~~ ^{450V} ~~460~~ ^{460V} ~~470~~ ^{470V} ~~480~~ ^{480V} ~~490~~ ^{490V} ~~500~~ ^{500V} ~~510~~ ^{510V} ~~520~~ ^{520V} ~~530~~ ^{530V} ~~540~~ ^{540V} ~~550~~ ^{550V} ~~560~~ ^{560V} ~~570~~ ^{570V} ~~580~~ ^{580V} ~~590~~ ^{590V} ~~600~~ ^{600V} ~~610~~ 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18. Repeat steps 6 through 13 for channels A through D.

19. Press the CHAN 4 TTY-FSK pushbutton on Manual Telephone Switchboard SB-1248/TSC-15. Set the USB switch to 3 KC. Repeat steps 6 through 13 for channel E.

20. Press the CHAN 4 OFF pushbutton on Manual Telephone Switchboard SB-1248/TSC-15.

21. Set the TTY CHANNEL selector switch on the telephone test set to OFF.

22. Turn off Teletypewriter Set AN/TGC-14A(V).

23. Set all channel selector switches on Telegraph Line Control C-3533/TSC-15 to OFF.

2-141. AUTOMATIC TELEPHONE RINGING TEST OPERATION. The following steps should be used to check the automatic telephone ringing operation of the AN/TSC-15:

1. Perform the steps outlined in paragraph 2-138.
2. Set the TRANSMIT AUDIO switch on Telephone Test Set TS-1635/TSC-15 to TEL 1.
3. Set the RECEIVE AUDIO switch to TEL 2.
4. Set the FREQUENCY switch to OSC OFF.
5. Set the TEL 1 AUTOMATIC TELEPHONE RINGING switch on console accessory panel to ON.
6. Press the TEL 1 CORD 1 and CHAN 1 CORD 1 pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15.
7. Set the USB and LSB switches on Manual Telephone Switchboard SB-1248/TSC-15 to MX.
8. Press the TEL 2 ANSWER pushbutton on Manual Telephone Switchboard SB-1248/TSC-15.
9. Depress and hold the AUTO RING switch on the telephone test set to the TEST position.

NOTE

The AUTO RING switch is a momentary contact switch.

10. Set the DIAL-OFF-RING switch on Manual Telephone Switchboard SB-1248/TSC-15 to RING, and hold for approximately 1 to 2 seconds.

11. If the TEL 1 automatic ringing circuitry is performing properly, the following indications should be observed: (1) the TEL 1 CALL indicator will light, (2) the CHAN 1 CALL indicator will light, (3) the TEL 1 DETECTOR ON indicator on the console accessory panel will light.

12. Release the AUTO RING switch on the telephone test set.

13. Repeat steps 2, 4 through 7, and 9 through 12 for TEL 3, 4, and 5 using TEL 1 as the ringing line.

14. Repeat steps 2 through 12 for TEL line 2.

2-142. OPERATOR CIRCUITS TO 2-WIRE TEL LINE OPERATION. The following steps should be used to check the 2-wire telephone line-to-operator circuits in the AN/TSC-15:

1. Set the 2W-4W switches on Telephone Terminal Control C-3535/TSC-15 to 2W.
2. Press all of the OFF pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15.
3. Press the TEL 1 CORD 1 and OPERATOR CORD 1 pushbuttons on Manual Telephone Switchboard SB-1248/TSC-15.
4. Check that the VOICE-CW switch on Manual Telephone Switchboard SB-1248/TSC-15 is in VOICE.
5. Turn the AUDIO LEVEL control on the telephone test set fully counterclockwise.
6. Set the METER switch on the telephone test set to XMIT.
7. Set the TRANSMIT AUDIO switch on the telephone test set to TEL 1.

8. Set the VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to -10 VU.

9. Set the FREQUENCY switch on the telephone test set to 600 ~.

10. Adjust the AUDIO LEVEL control on the telephone test set clockwise until the VU meter indicates -10 VU.

11. Adjust the SPKR GAIN control on Manual Telephone Switchboard SB-1248/TSC-15 until a tone is heard in the headset.

12. Set the FREQUENCY switch on the telephone test set to OSC OFF.

13. Speak into the microphone and adjust the MIKE GAIN control on Manual Telephone Switchboard SB-1248/TSC-15 until a reading is obtained on the VU meter.

14. Repeat steps 2 through 13 for TEL lines 2 through 5.

15. Repeat steps 2 through 13 for CORD 2 through CORD 4.

2-143. HYBRID CIRCUIT ADJUSTMENT. The following steps should be used to balance Hybrid Circuit Networks MX-3726/TSC-15 using Telephone Test Set TS-1635/TSC-15:

1. Connect a field telephone to the telephone line associated with the hybrid circuit network to be adjusted, either directly or through Switchboard SB-22. Lift the handset off the hook.

2. Connect a patch cord between OSC OUTPUT jack J1 on telephone test set and REC jack (lower row) of the TEL line being checked on Telephone Jack Assembly TA-408/TSC-15.

3. Connect a patch cord between AUX METER jack J2 on telephone test set and XMIT jack (lower row) of the TEL line being checked on Telephone Jack Assembly TA-408/TSC-15.

4. Set the METER switch of telephone test set to REC.

5. Set TRANSMIT AUDIO switch on telephone test set to OSC OUT JACK. Set RECEIVE AUDIO switch to TEL line being checked.

6. Turn GAIN control (of line being checked) on Manual Telephone Switchboard SB-1248/TSC-15 fully clockwise.

7. Set VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to 0.

8. Press ANSWER pushbutton of TEL line being checked.

9. Set FREQUENCY switch on telephone test set to 300 ~. Adjust AUDIO LEVEL control for midscale reading on VU meter of Manual Telephone Switchboard SB-1248/TSC-15.

10. Adjust LOW balance control on Hybrid Circuit Network MX-3726/TSC-15 for minimum reading on VU meter.

11. Set VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to 0.

12. Set the FREQUENCY switch on the telephone test set to 600 ~.

13. Adjust the LINE balance control on Hybrid Circuit Network MX-3726/TSC-15 for a minimum reading on the VU meter.

14. Set the VU meter selector switch on Manual Telephone Switchboard SB-1248/TSC-15 to 0.

15. Set the FREQUENCY switch on the telephone test set to 3000 ~.

16. Adjust the HIGH balance control on Hybrid Circuit Network MX-3726/TSC-15 for a minimum reading on the VU meter.

17. Repeat steps 5 through 15 until the VU meter reading will decrease no more for steps 9, 12, and 15.

18. Repeat steps 5 through 16 for each TEL line to be checked.

19. Set the FREQUENCY switch on the telephone test set to SET OFF.

2-144. SUMMARY OF OPERATING PROCEDURES.

2-145. Tables 2-18 through 2-23 outline the summary of operating procedures for Communications Central Systems. Prior to operating the system, perform the before-use procedures listed in Section III, General Maintenance Instructions. After the equipment has been prepared for the desired mode of operation, use tables 2-18 through 2-23 as a guide for the corresponding operation procedures. For example, if the equipment is operating and information is desired on an incoming radio voice call, refer to table 2-18, part 1, RADIO VOICE. If the equipment is operating and information is desired on an outgoing teletypewriter call over wire, refer to table 2-19, part 6, WIRE TELETYPEWRITER. Use the following index to locate the information necessary to operate the system.

Table 2-18. Incoming Calls.

1. Radio Voice.
2. Radio Teletypewriter.
3. Radio CW.
4. Telephone.
5. Wire Teletypewriter.

Table 2-19. Outgoing Calls.

1. Radio Voice.
2. Radio Teletypewriter.
3. Radio CW.
4. Field Telephone.
5. Commercial Telephone.
6. Wire Teletypewriter.

Table 2-20. Manual Telephone Switchboard SB-1248/TSC-15 Patching.

1. Radio-To-Telephone.
2. Radio-To-Radio.
3. Telephone-To-Radio.
4. Telephone-To-Telephone.
5. Radio Monitoring.
6. Telephone Monitoring.

Table 2-21. Conferencing.

Table 2-22. Override Operation.

Table 2-23. Automatic Telephone Ringing.

Table 2-18. Communications Central AN/TSC-15, Summary
Of Operation, Incoming Calls

STEP	EQUIPMENT	OPERATION
1. RADIO VOICE		
NOTE The procedures of table 3-1 and the procedures of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) should be performed before operating the equipment. The first indication of an incoming radio voice call will be the CHAN CALL indicators on Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21). The CHAN CALL indicator of the calling channel will light.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Set the VOICE-CW switch to VOICE.
2	SB-1248/TSC-15	If the CALL indicator in channel 1 lights, set the LSB switch to either the 3 KC or MX position, depending on the desired mode of operation. If the CALL indicator in channel 2 lights, set the LSB switch to the MX position. If the CALL indicator in channel 3 lights, set the USB switch to the MX position. If the CALL indicator in channel 4 lights, set the USB switch to either the 3 KC or MX position, depending on the desired mode of operation.
3	SB-1248/TSC-15	Push the ANSWER pushbutton under the calling channel. The OFF pushbutton of the calling channel will light.
4	Radio Set Control C-3141/TRC-75 (figure 2-12)	Adjust the VOL control (M) to a level which gives acceptable listening level with a minimum of noise.
NOTE If you are operating in duplex, adjust the DUPLEX RCVR unit 3A4A3 control. If you are operating in simplex, adjust the DUPLEX XMTR/SIMPLEX XCVR unit 3A4A1 control.		
5	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Adjust the SPKR GAIN to a comfortable level in the headset or speaker.
6	SB-1248/TSC-15	Set VU meter selector switch to XMIT.
7	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set the mode selector switch to the preassigned position.

Table 2-18. Communications Central AN/TSC-15, Summary
Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
1. RADIO VOICE (Con.)		
8	C-3532/TSC-15	Set the transmitter key switch to the preassigned position.
9	C-3532/TSC-15	Set the transmitter power switch to the pre-determined H PWR or L PWR position.
10	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Depress the microphone switch and speak at a normal level into the microphone, answering the calling channel. Adjust the MIKE GAIN control for an indication of 0 VU peak on the VU meter. Normal communications can now be carried on with the calling party.
NOTE		
The microphone or footswitch must be released to receive.		
2. RADIO TELETYPEWRITER		
NOTE		
The procedures of table 3-1 and the procedures of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) should be performed before operating the equipment.		
The first indication of an incoming radio teletypewriter call will be the CHAN CALL indicators on Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21). The CHAN CALL indicator of the calling channel will light.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	If the CALL indicator in channel 1 lights, set the LSB switch to either the 3 KC or MX position, depending on the predetermined mode of operation. If the CALL indicator in channel 4 lights, set the USB switch to either the 3 KC or the MX position, depending on the desired mode of operation.
2	SB-1248/TSC-15	Push the TTY FSK or the TTY MX pushbutton under the calling channel, depending upon the previously selected mode of operation. If TTY FSK is selected, the LSB or USB switch must be in 3 KC.

Table 2-18. Communications Central AN/TSC-15, Summary
Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
2. RADIO TELETYPEWRITER (Con.)		
3	Right radio equipment rack Telegraph Terminal Group AN/TGA-1 (figure 2-17)	Remove the right radio equipment rack door, and check that the five channel function switches and the power switch on the front panel of Telegraph Terminal Group AN/TGA-1 are set to ON.
4	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	Set the channel ON-OFF switch to ON.
5	C-3533/TSC-15	Note which of the REC loop indicators is flashing, and set the channel selector switch to the position corresponding to the flashing channel indicator.
6	C-3533/TSC-15	Set the mode selector switch to OPERATE SET.
7	C-3533/TSC-15	Set the 2W-4W selector switch to 2W or 4W, depending on the AN/TGA-1 switch positions.
8.	Teletypewriter Set AN/TGC-14A(V) (figure 2-20)	Set the MOTOR switch to ON.
9	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	If 2W operation was selected in step 7, adjust the loop current in the transmit loop to 60 ma, using the KEYBOARD/2W LCC control and the dc LOOP CURRENT milliammeter. If 4W operation was selected in step 7, adjust the receiver LOOP current to 60 ma, using the PAGE PRINTER LCC control and observing the dc LOOP CURRENT milliammeter. On Telephone Jack Assembly TA-408/TSC-15, patch the DC MA jack to the XMIT SERIES SET jack (see figure 2-24) of the calling channel. Using the KEYBOARD/2W LCC control on the C-3533/TSC-15, adjust the transmit loop current to 60 ma, as observed on the dc LOOP CURRENT milliammeter on the C-3533/TSC-15.
10	C-3533/TSC-15	Set the transmitter power switch to the predetermined H PWR or L PWR position.
11		Proceed with normal communications with the calling channel, using Teletypewriter Set AN/TGC-14A(V).

Table 2-18. Communications Central AN/TSC-15, Summary
Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
3. RADIO CW		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is performing simplex or duplex) should be performed before operating the equipment. The first indication of an incoming radio CW call will be the CHAN CALL indicators on Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21). The CHAN CALL indicator of the calling channel will light.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	If the CALL indicator on channel 1 lights, set the LSB switch to either the 3 KC or MX position, depending on the desired mode of operation. If the CALL indicator on channel 2 lights, set the LSB switch in the MX position. If the CALL indicator on channel 3 lights, set the USB switch to MX. If the CALL indicator on channel 4 lights, set the USB switch to either 3 KC or MX, depending upon the desired mode of operation.
2	SB-1248/TSC-15	Push any of the four CORD pushbuttons which are not being used under the calling channel.
3	SB-1248/TSC-15	Push the OPERATOR pushbutton corresponding to the CORD pushbutton selected in step 2.
4	SB-1248/TSC-15	Set the VOICE-CW switch to CW.
5	Radio Set Control C-3141/TRC-75 (figure 2-12)	Adjust the VOL control (M) to a level which gives an acceptable listening level with a minimum of noise.
NOTE If the equipment is operating in duplex, adjust the DUPLEX RCVR control. If the equipment is operating in simplex, adjust the DUPLEX XMTR/SIMPLEX XCVR control.		
6	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Adjust the SPKR GAIN control for a comfortable level in the speaker or headset.

Table 2-18. Communications Central AN/TSC-15, Summary
Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
3. RADIO CW (Con.)		
7	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set the transmitter power switch to its pre- determined H PWR or L PWR position.
		NOTE To achieve CW transmission in PTT, the operator must hold either the footswitch depressed or close the switch on the microphone during transmission.
8		Normal CW communication can now be performed using the CW key.
4. TELEPHONE		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment. The first indication of an incoming telephone call will be the TEL CALL indicators on Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21). The TEL CALL indicator of the calling TEL line will light. If the NIGHT ALARM-OFF switch is on, the night alarm will sound and audio will be present in the headset.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	If the night alarm circuit is energized, set the NIGHT ALARM-OFF switch to OFF.
2	SB-1248/TSC-15	Push the ANSWER pushbutton of the calling telephone line.
3	SB-1248/TSC-15	Set the VU meter selector switch to XMIT.
4	SB-1248/TSC-15	Depress the microphone switch and speak at a normal level into the microphone answering the calling TEL line. Adjust the MIKE GAIN control for an indication of 0 VU peak on the VU meter.
5	SB-1248/TSC-15	Adjust the SPKR GAIN control for a desirable level. Normal communication by telephone may now be carried on with the calling party.

Table 2-18. Communications Central AN/TSC-15, Summary Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
5. WIRE TELETYPEWRITER		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment. The first indication of an incoming teletypewriter call will be the CALL light on Telegraph Line Control C-3533/TSC-15 (figure 2-16). The CALL lamp will light. If the NIGHT ALARM-OFF switch is on, the night alarm buzzer will sound, and audio will be present in the headset.		
1	Manual Telephone Switch-board SB-1248/TSC-15 2-21)	If the night alarm circuit is energized, set NIGHT ALARM-OFF switch to OFF.
2	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	Set the appropriate channel selector switch to the position corresponding with the channel on which the incoming call has appeared.
3	C-3533/TSC-15	Set the mode selector switch to OPERATE LOOP.
4	C-3533/TSC-15	Set the 2W-4W selector switch to the mode of operation, 2W or 4W, designated for the particular remote unit calling.
5	C-3533/TSC-15	Push the HOLD RESET pushbutton of the calling channel.
6	Teletypewriter Set AN/TGC-14A(V) (figure 2-18)	Set MOTOR switch to ON.
7	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	If 2W operation was selected in step 4, adjust the loop current in the transmit loop to 60 ma, using KEYBOARD/2W LCC control and observing the dc LOOP CURRENT milliammeter. If 4W operation was selected in step 4, adjust the transmit loop current to 60 ma, using the PAGE PRINTER LCC control and observing the dc LOOP CURRENT milliammeter. On Telephone Jack Assembly TA-408/TSC-15, patch the DC MA jack to the REC SERIES LOOP jack (see figure 2-24) of the calling channel. Using the KEYBOARD/2W LCC control on the C-3533/TSC-15, adjust the receive loop current to 60 ma, as observed on the dc LOOP CURRENT milliammeter of the C-3533/TSC-15.

Table 2-18. Communications Central AN/TSC-15, Summary Of Operation, Incoming Calls (Con.)

STEP	EQUIPMENT	OPERATION
5. WIRE TELETYPEWRITER (Con.)		
		Proceed with normal communication with the calling channel using Teletypewriter Set AN/TGC-14A(V).

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls

STEP	EQUIPMENT	OPERATION
1. RADIO VOICE		
NOTE		
The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	If transmission is desired in channel 1, set the LSB switch to either the 3 KC or MX position, depending upon the desired mode of operation. If transmission is desired in channel 2, set the LSB switch to MX. If transmission is desired in channel 3, set the USB switch to MX. If transmission is desired in channel 4, set the USB switch to either 3 KC or MX, depending upon the mode of operation desired.
2	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set the transmitter key switch to the pre-determined PTT, RADIO SILENCE, or VOX position.
3	C-3532/TSC-15	Set the transmitter power switch to its pre-determined H PWR or L PWR position.
4	C-3532/TSC-15	Set the mode selector switch to its predetermined AM, IND, or TWIN position.
5	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Set the VOICE-CW switch to VOICE.

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
1. RADIO VOICE (Con.)		
6	SB-1248/TSC-15	Push one of the four OPERATOR pushbuttons using any unused CORD.
7	SB-1248/TSC-15	Push the desired CHAN button in the CORD selected in step 6.
		NOTE If no unused CORD exists, the ANSWER circuit of the calling channel may be used.
8	Radio Set Control C-3532/TSC-15 (figure 2-13)	Check the transmitter READY indicator. The indicator should be lighted.
9	Manual Telephone Switchboard SB-1248/TSC-15	Set the VU meter selector switch to XMIT.
10	SB-1248/TSC-15	Depress the microphone switch, and speak at a normal level into the microphone. Adjust the MIKE GAIN control for an indication of 0 VU peak on the VU meter. If the operator is operating in push-to-talk mode (see step 2), the XMTR KEYED indicator on Radio Set Control C-3532/TSC-15 should light when the microphone or footswitch is depressed. If the operation is VOX (see step 2), the XMTR KEYED indicator on Radio Set Control C-3532/TSC-15 and the CHAN CALL indicator on the SB-1248/TSC-15 should light when the microphone switch or footswitch is depressed and the operator speaks into the microphone.
11		Begin voice communications into the microphone.
2. RADIO TELETYPEWRITER		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment.		
1	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	Set the channel function switch to ON.

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
2. RADIO TELETYPEWRITER (Con.)		
2	C-3533/TSC-15	Set the channel selector switch to the position corresponding to the channel in which operation is desired.
3	C-3533/TSC-15	Set the 2W-4W selector switch to 2W or 4W depending on the switch settings of Telegraph Terminal Group AN/TGA-1.
4	C-3533/TSC-15	Set the mode selector switch to OPERATE SET.
5	Manual Telephone Switch-board SB-1248/TSC-15 (figure 2-21)	Push the TTY FSK or TTY MX pushbutton under CHAN 1 if LSB operation is desired, or under CHAN 4 if USB operation is desired. If TTY FSK operation is selected, the desired sideband switch must be set to 3 KC.
6	Teletypewriter Set AN/TGC-14A(V) (figure 2-18)	Set the MOTOR switch to ON.
7	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	If 2W operation was selected in step 3, adjust the loop current in the transmit loop to 60 ma, using KEYBOARD/2W LCC control and the dc LOOP CURRENT meter. If 4W operation was selected in step 3, adjust the receiver loop current to 60 ma, using PAGE PRINTER LCC control and observing the dc LOOP CURRENT milliammeter. On Telephone Jack Assembly TA-408/TSC-15, patch the DC MA jack to the XMIT SERIES SET jack (see figure 2-24) of the called channel. Using KEYBOARD/2W LCC control, on the C-3533/TSC-15, adjust the transmit loop current to 60 ma as indicated on the dc LOOP CURRENT meter of the C-3533/TSC-15.
8		Proceed with communications using Teletypewriter AN/TGC-14A(V).

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
3. RADIO CW		
NOTE		
The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment.		
1	Manual Telephone Switch-board SB-1248/TSC-15 (figure 2-21)	If operation on channel 1 is desired, set the LSB switch to either 3 KC or MX, depending on mode of operation. If operation on channel 2 is desired, set the LSB switch to MX. If operation on channel 3 is desired, set the USB switch to MX. If operation on channel 4 is desired, set the USB switch to 3 KC or MX, depending on mode of operation.
2	SB-1248/TSC-15	Set VOICE-CW switch to CW.
3	SB-1248/TSC-15	Push any of the four CORD pushbuttons which are not being used under the CHAN which is to be used for transmission.
4	SB-1248/TSC-15	Push the OPERATOR pushbutton corresponding to the CORD pushed in step 3.
5	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set the mode selector switch to the preassigned position.
6	C-3532/TSC-15	Set the transmitter key switch to the appropriate position.
NOTE		
To achieve CW transmission in PTT, the operator must hold either the footswitch depressed or close the switch on the microphone during transmission.		
7	C-3532/TSC-15	Set the transmitter power switch to the preassigned position.
8		Begin communications using the CW key.

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
4. FIELD TELEPHONE		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before the equipment is operated.		
1	Manual Telephone Switch-board SB-1248/TSC-15 (figure 2-21)	Push the ANSWER pushbutton of the TEL line with which communication is desired.
2	Console accessory panel (figure 2-20)	Set the AUTOMATIC TELEPHONE RINGING ON-OFF switch, for the TEL line to be used, to OFF.
3	Manual Telephone Switch-board SB-1248/TSC-15	Set the VOICE-CW switch to VOICE.
4	SB-1248/TSC-15	Hold the DIAL-OFF-RING switch in the RING position for approximately five seconds.
5	SB-1248/TSC-15	Set the VU meter selector switch to XMIT.
6	SB-1248/TSC-15	Depress the microphone switch and speak at a normal level into the microphone. Adjust MIKE GAIN control for an indication of 0 VU peak on the VU meter.
7	SB-1248/TSC-15	Hold down the microphone switch and speak into the microphone. If the remote operator does not answer, repeat step 4.
8	SB-1248/TSC-15	Adjust the SPKR GAIN control for a desirable level. Normal communication by telephone may now be performed.
5. COMMERCIAL TELEPHONE		
NOTE The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment.		
1	Manual Telephone Switch-board SB-1248/TSC-15 (figure 2-21)	Push the ANSWER pushbutton of the TEL line to be used.

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
5. COMMERCIAL TELEPHONE (Con.)		
2	Console accessory panel (figure 2-20)	Set the AUTOMATIC TELEPHONE RINGING ON-OFF switch for the TEL line to be used to OFF.
3	Manual Telephone Switch-board SB-1248/TSC-15	Set the VOICE-CW switch to VOICE.
4	SB-1248/TSC-15	Set the DIAL-OFF-RING switch to DIAL.
5	SB-1248/TSC-15	Dial the commercial number used on the dial on the SB-1248/TSC-15.
6	SB-1248/TSC-15	Set the DIAL-OFF-RING switch to OFF, and wait for the called party to answer.
7	SB-1248/TSC-15	Set the VU meter selector switch to XMIT.
8	SB-1248/TSC-15	Depress the microphone switch, and speak at a normal level into the microphone. Adjust the MIKE GAIN control for an indication of 0 VU peak on the VU meter.
9	SB-1248/TSC-15	Adjust the SPKR GAIN control for a desirable level. Normal communications by commercial telephone may now be performed.
6. WIRE TELETYPEWRITER		
NOTE		
The procedures of table 3-1 and those of either table 3-2 or 3-3 (depending on whether the set is operating simplex or duplex) must be performed before operating the equipment.		
1	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	Set the channel ON-OFF switch of the channel to be called to ON.
2	C-3533/TSC-15	Set the channel selector switch to the channel being used.
3	C-3533/TSC-15	Set the mode selector switch to OPERATE LOOP.

Table 2-19. Communications Central AN/TSC-15, Summary Of Operation, Outgoing Calls (Con.)

STEP	EQUIPMENT	OPERATION
6. WIRE TELETYPEWRITER (Con.)		
4	C-3533/TSC-15	Set the 2W-4W selector switch to the mode of operation, 2W or 4W, as indicated for the remote unit to be called.
5	Teletypewriter Set AN/TGC-14A(V) (figure 2-18)	Set the MOTOR switch to ON.
6	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	If 2W operation was selected in step 4, use the KEYBOARD/2W LCC control to adjust the transmit loop current to 60 ma as observed on the dc LOOP CURRENT meter. If 4W operation was selected in step 4, adjust the transmit loop current to 60 ma, using the PAGE PRINTER LCC control and observing the dc LOOP CURRENT milliammeter. On Telephone Jack Assembly TA-408/TSC-15 (see figure 2-24), patch the DC MA jack to the REC SERIES LOOP jack of the channel being used. Using the KEYBOARD/2W LCC control on the C-3533/TSC-15, adjust the receive loop current for 60 ma as observed on the dc LOOP CURRENT milliammeter on the C-3533/TSC-15.
7	Teletypewriter Set AN/TGC-14A(V) (figure 2-18)	Press the FIGS and BELL keys and hold the REP key down for approximately 10 seconds.
8		Proceed with normal communication using Teletypewriter Set AN/TGC-14A(V).

Table 2-20. Communications Central AN/TSC-15, Summary of Operation,
Manual Telephone Switchboard Patching

STEP	EQUIPMENT	OPERATION
NOTE		
The following procedures assume that the radio circuits are in properly assigned modes of operation and that automatic telephone ringing is not being used.		
1. RADIO-TO-TELEPHONE		
NOTE		
The following procedures explain the action to be taken by the local operator when a remote operator calls in to the AN/TSC-15 on a radio channel and requests to speak to a remote operator on a telephone line.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Push the appropriate CHAN ANSWER pushbutton.
2		Press the microphone switch, and tell the calling operator to stand by.
3	SB-1248/TSC-15	Push one of the four CORD buttons under the calling CHAN (CORD must not be in use).
4	SB-1248/TSC-15	Push the OPERATOR CORD pushbutton in the same CORD as selected in step 3.
5	SB-1248/TSC-15	Push the TEL line pushbutton in the same CORD as selected in step 3.
6	SB-1248/TSC-15	Momentarily hold the DIAL-OFF-RING switch in RING.
7	SB-1248/TSC-15	Set the telephone line GAIN control fully clockwise.
8		Momentarily monitor the circuit to determine that the proper connections have been made.
2. RADIO-TO-RADIO		
NOTE		
The following procedures explain the action taken by the local operator when a call is received on a radio channel requesting that the calling party be connected to another radio channel.		
1	Manual Telephone Switchboard SB-1248/TSC-15	Push an unused CORD pushbutton under the CHAN CALL indicator which is lighted.

Table 2-20. Communications Central AN/TSC-15, Summary of Operation,
Manual Telephone Switchboard Patching (Con.)

STEP	EQUIPMENT	OPERATION
2. RADIO-TO-RADIO (Con.)		
2	SB-1248/TSC-15	Contact the desired party as outlined in table 2-19, outgoing calls.
3	SB-1248/TSC-15	Press the CORD pushbutton for the called CHAN in the same CORD as the one depressed for the calling party.
4	SB-1248/TSC-15	Monitor the circuit to make sure that proper connections have been made.
3. TELEPHONE-TO-RADIO		
NOTE		
The following procedures explain the action to be taken by the local operator when the remote operator on one of the TEL lines requests to be connected with a radio channel.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Push the HOLD button in the calling TEL line column.
2	SB-1248/TSC-15	Contact the desired party as outlined in table 2-19, outgoing calls.
3	SB-1248/TSC-15	Select an unused CORD, and press the TEL line CORD pushbutton in that CORD and the corresponding CORD pushbutton in the proper CHAN.
4	SB-1248/TSC-15	Turn the telephone line GAIN control fully clockwise.
5		Momentarily monitor the conversation to make sure the proper connections have been made.
4. TELEPHONE-TO-TELEPHONE		
NOTE		
The following procedures outline the action to be taken by the local operator when a call is received on one of the TEL lines and the calling party requests to be connected to another TEL line.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Push the HOLD pushbutton in the calling TEL line column.

T.O. 31R2-2TSC15-1Table 2-20. Communications Central AN/TSC-15, Summary of Operation,
Manual Telephone Switchboard Patching (Con.)

STEP	EQUIPMENT	OPERATION
4. TELEPHONE-TO-TELEPHONE		
2	SB-1248/TSC-15	Contact the desired party as outlined in table 2-19, outgoing calls.
3	SB-1248/TSC-15	Push the TEL line CORD pushbutton in an unused CORD for the called party.
4	SB-1248/TSC-15	Press the corresponding CORD pushbutton in the calling TEL line column.
5	SB-1248/TSC-15	Press the OPERATOR pushbutton in the CORD to be used.
6	SB-1248/TSC-15	Set the VU meter selector switch to OPERATOR RECEIVE, and adjust the telephone line GAIN controls for 0 VU peak on the VU meter.
7		Monitor the circuit momentarily to see that connections have been made properly.
5. RADIO MONITORING		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Press the CHAN MON pushbutton for the channel or channels being used.
2		Listen to the conversation using either the headset or the speaker.
6. TELEPHONE MONITORING		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Press the OPERATOR CORD pushbutton in the CORD being used.
2		Listen to the conversation using either the headset or the speaker. The operator may converse with either party connected to the CORD being monitored.

Table 2-21. Communications Central AN/TSC-15, Summary of Operation, Conferencing

STEP	EQUIPMENT	OPERATION
NOTE		
The conferencing facilities provide for a normal conversation between five parties, one of which must be the local operator. The other four parties must include two on CORD 2 and two on any other CORD.		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Contact all four parties as outlined in table 2-19.
2	SB-1248/TSC-15	Connect two of the parties through CORD 2.
3	SB-1248/TSC-15	Connect the other two parties through the same CORD (for example, CORD 4).
4	SB-1248/TSC-15	Set the CONFERENCE-OFF switch to CONFERENCE.
5	SB-1248/TSC-15	Push the CORD 4 OPERATOR CORD (or the CORD selected in step 3).
6		The conference may now begin.
NOTE		
The local operator must leave the OPERATOR CORD pushbutton pressed into the CORD with which CORD 2 is conferenced, or the conference circuit will be disconnected. If a call is received on another line during a conference call, the local operator can push the ANSWER pushbutton on the calling line, speak to the calling party, and connect the remote line into an unused CORD without disconnecting the conference circuit. Under all circumstances, however, the local operator must leave the OPERATOR CORD pushbutton depressed into the proper CORD during a conference.		

Table 2-22. Communications Central AN/TSC-15, Summary of Operation, Override Operation

STEP	EQUIPMENT	OPERATION
NOTE The VERRIDE circuit operates according to the sequence with which two parties are connected into a CORD. Assume that the operators on TEL 1 and CHAN 1 are speaking over the network established by CORD 1. Assume that TEL 1 was placed into CORD 1 first. TEL 1 is then in stepper 1, and CHAN 1 is in stepper 2 of CORD 1. When the two parties experience difficulty with communication, the local operator must take the following action:		
1	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Press the OPERATOR CORD 1 pushbutton and listen to the conversation.
2	SB-1248/TSC-15	Assume the operator in TEL 1 is talking and the person on CHAN 1 is listening. To disable the inactive pair of wires, which in this case is the pair connecting TEL 1 receive to the received input from CHAN 1, set the VERRIDE switch to position A.
3	SB-1248/TSC-15	Assume the person on CHAN 1 desires to talk to the person on TEL 1. Set the VERRIDE switch to position B, disabling the wires connecting the TEL 1 transmit pair to the transmitted audio into CHAN 1.
4	SB-1248/TSC-15	Monitor the conversation, and use the VERRIDE switch to disconnect the unused wire pair. Setting the VERRIDE switch to position A disables the receive pair of the 4-wire pair at the telephone output of the circuit. Setting the VERRIDE switch to position B disables the transmit audio input on the 4-wire pair at the radio input.
NOTE If the sequence with which the two parties were placed in the CORD had been reversed (if CHAN 1 had been placed into CORD 1 first, and TEL 1 into CORD 1 second), the sequence of operating the VERRIDE switch would also be reversed. The switch would be placed in position B when the person on TEL 1 is talking and position A when the person on CHAN 1 is talking.		

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 Table 2-23. Communications Central AN/TSC-15, Summary of Operation,
 Automatic Telephone Ringing

STEP	EQUIPMENT	OPERATION
NOTE		
This procedure assumes that the operator has received instructions to connect a specific telephone line to a specific channel with automatic telephone ringing capabilities.		
1	Console accessory panel (figure 2-20)	Set the AUTOMATIC TELEPHONE RINGING ON-OFF switch for the specified TEL line to ON.
2	Manual Telephone Switchboard SB-1248/TSC-15 (figure 2-21)	Press the specified TEL line into an unused CORD.
3	SB-1248/TSC-15	Press the specified CHAN into the CORD selected in step 2.
4	SB-1248/TSC-15	Set the specified telephone line GAIN control fully clockwise.
5		The circuit which has been established may now be left unattended.
NOTE		
When automatic telephone ringing is in progress from the TEL line to the radio channel, the TEL line CALL lamp will light, and the night alarm buzzer will sound if the NIGHT ALARM-OFF switch is on.		

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DATE	DESCRIPTION	OPERATION
	The primary objective of this project is to develop a system that will enable the user to access and manipulate data in a secure and efficient manner. The system will be designed to meet the following requirements:	The primary objective of this project is to develop a system that will enable the user to access and manipulate data in a secure and efficient manner. The system will be designed to meet the following requirements:
1	The system shall be able to handle a minimum of 100,000 records per second.	The system shall be able to handle a minimum of 100,000 records per second.
2	The system shall be able to handle a minimum of 100,000 transactions per second.	The system shall be able to handle a minimum of 100,000 transactions per second.
3	The system shall be able to handle a minimum of 100,000 queries per second.	The system shall be able to handle a minimum of 100,000 queries per second.
4	The system shall be able to handle a minimum of 100,000 updates per second.	The system shall be able to handle a minimum of 100,000 updates per second.
5	The system shall be able to handle a minimum of 100,000 deletes per second.	The system shall be able to handle a minimum of 100,000 deletes per second.
6	The system shall be able to handle a minimum of 100,000 inserts per second.	The system shall be able to handle a minimum of 100,000 inserts per second.
7	The system shall be able to handle a minimum of 100,000 selects per second.	The system shall be able to handle a minimum of 100,000 selects per second.
8	The system shall be able to handle a minimum of 100,000 updates per second.	The system shall be able to handle a minimum of 100,000 updates per second.
9	The system shall be able to handle a minimum of 100,000 deletes per second.	The system shall be able to handle a minimum of 100,000 deletes per second.
10	The system shall be able to handle a minimum of 100,000 inserts per second.	The system shall be able to handle a minimum of 100,000 inserts per second.
11	The system shall be able to handle a minimum of 100,000 selects per second.	The system shall be able to handle a minimum of 100,000 selects per second.
12	The system shall be able to handle a minimum of 100,000 updates per second.	The system shall be able to handle a minimum of 100,000 updates per second.
13	The system shall be able to handle a minimum of 100,000 deletes per second.	The system shall be able to handle a minimum of 100,000 deletes per second.
14	The system shall be able to handle a minimum of 100,000 inserts per second.	The system shall be able to handle a minimum of 100,000 inserts per second.
15	The system shall be able to handle a minimum of 100,000 selects per second.	The system shall be able to handle a minimum of 100,000 selects per second.
16	The system shall be able to handle a minimum of 100,000 updates per second.	The system shall be able to handle a minimum of 100,000 updates per second.
17	The system shall be able to handle a minimum of 100,000 deletes per second.	The system shall be able to handle a minimum of 100,000 deletes per second.
18	The system shall be able to handle a minimum of 100,000 inserts per second.	The system shall be able to handle a minimum of 100,000 inserts per second.
19	The system shall be able to handle a minimum of 100,000 selects per second.	The system shall be able to handle a minimum of 100,000 selects per second.
20	The system shall be able to handle a minimum of 100,000 updates per second.	The system shall be able to handle a minimum of 100,000 updates per second.

SECTION III

GENERAL MAINTENANCE INSTRUCTIONS

3-1. GENERAL.

3-2. Operator's maintenance consists of performing before-, during-, and after-use checks, preventive maintenance checks, operational checks, cleaning, lamp and fuse replacement as required, and any emergency maintenance. Refer to the following paragraphs for checks and procedures to be performed by the operator.

3-3. BEFORE USE.

3-4. Prior to operating the system, perform the following preliminary inspection.

1. Remove any slack in the antenna guy ropes. Check the connectors on the ground-mounted antenna base for good connections. Inspect the groundmounted antenna cable connector at the antenna entry panel for a good connection.

2. Inspect the shelter and duplex antenna ground rods. See that the rods are firmly in the ground and that the connecting cables are attached properly to assure good grounds to the system.

3. Inspect the generator, see that the unit is level and on solid ground. Check the fuel in the fuel tank. Check the oil level of the engine with the lube-oil dipstick. Assure that a good connection is made between unit and its power cable and between the power cable and the shelter.

4. Inspect the signal entry panel. Check for tight connections to all telephone and telegraph lines.

5. Open the three ventilation doors on the rear and front of the shelter. These doors must be opened before the ventilating fans are turned on.

6. Set the five circuit breakers on the ac power entry panel to OFF.

7. Set the circuit breakers on the two console mounted power supplies to OFF.

8. Remove the left-hand radio cabinet cover. The antenna selector switch is located near the top of the compartment on the blower mounting bracket. Set the selector switch to the position corresponding to the antenna in use.

NOTE

The proper antenna selector light (located above the speaker on the control console) comes on only after the RADIO circuit breaker has been turned on and the simplex radio is turned on.

9. The two radio control heads and the band pass filter control head are mounted on the right-hand side of the console. Set their respective ON-OFF switches to OFF.

10. Set the transmitter key switch, located on Radio Set Control C-3532/TSC-15, to RADIO SILENCE.

11. Ensure that the headset, microphone, CW key, footswitch, and teletypewriter are connected properly (see paragraph 2-17).

3-5. DURING USE.

3-6. During-use checks consist of performing the steps listed in table 3-1, Preparation For Readiness; table 3-2, Simplex Radio Setup; and table 3-3 Duplex Radio Setup.

NOTE

Depending on the mode of operation chosen (simplex or duplex) the operator shall perform only the steps of the appropriate table.

Table 3-1. Communications Central AN/TSC-15, Summary of Operation,
Preparation for Readiness

STEP	EQUIPMENT	OPERATION
ELECTRICAL EQUIPMENT SHELTER S-208/TSC-15		
1	AC power entry panel (figure 2-8)	Observe the three neon indicator lamps, A, B, and C. These indicators should be lighted.
2	AC power entry panel	Set MAIN circuit breaker to ON. Check the FAULT INDICATORS on the protective device for possible faults. If a fault exists, turn off power and correct fault.
3	AC power entry panel	Observe the frequency meter. It should indicate 400 $\pm$ 20 Hz.
4	AC power entry panel	Set the LIGHTS CONVENIENCE circuit breaker to ON.
5	BLACKOUT DISABLE switch (figure 2-6)	The shelter is provided with four interior lights. Any of the four may now be turned on by the individual switches. If the lights fail to come on, check the BLACKOUT DISABLE switch to the left of the shelter door. Unless the operating area is in a blackout condition, the BLACKOUT DISABLE switch should be set to ON.
6	AC power entry panel	Set EXHAUST FANS circuit breaker to ON.
7	AC power entry panel	Open the three ventilation doors on the rear and front of the shelter. Turn on the two VENTILATION fans using the individual switches on the ac power entry panel.
8	AC power entry panel	Set CONSOLE circuit breaker to ON.
9	Power Supply PP-2869/ TSC-15 (figure 2-10)	Set ON-OFF circuit breaker to ON.
10	Power Supply PP-2868/U (figure 2-11)	Set ON-OFF circuit breaker to ON. The red POWER ON lamp should light.
11	Power Supply Control C- 3534/TSC-15 (figure 2-9)	Set POWER SUPPLY METERING switch to PS1 REG.
12	C-3534/TSC-15	Check the VOLTMETER for an indication of 28 volts.

Table 3-1. Communications Central AN/TSC -15, Summary of Operation,
Preparation for Readiness (Con.)

STEP	EQUIPMENT	OPERATION
ELECTRICAL EQUIPMENT SHELTER S-208/TSC-15 (Con.)		
13	C-3534/TSC-15	Check the AMMETER for a slight indication of current being drawn (0.5 to 2.0 amperes).
14	C-3534/TSC-15	Set POWER SUPPLY METERING switch to PS2 UNREG.
15	C-3534/TSC-15	Check VOLTMETER for indication of 28 ± 3 volts.
16	C-3534/TSC-15	Check AMMETER for a slight indication of current being drawn (approximately 1 ampere).
17	Radio Set Controls C-3141/ TRC-75 (figure 2-12)	Check that on ON-OFF switches on both controls are set to OFF.
18	C-3141/TRC-75	Turn the VOL (M) control fully clockwise on both units.
19	Filter Control C-3595/U (figure 2-14)	Set ON-OFF switch to OFF.
20	Manual Telephone Switch- board SB-1248/TSC-15 (figure 2-21)	Set DIAL-OFF-RING switch (25) to OFF.
21	SB-1248/TSC-15	Set CONFERENCE-OFF switch (22) to OFF.
22	SB-1248/TSC-15	Set NIGHT ALARM-OFF switch (19) to OFF.
23	SB-1248/TSC-15	Set VOICE-CW switch (17) to VOICE.
24	SB-1248/TSC-15	Set SPKR GAIN control (15) to midposition.
25	SB-1248/TSC-15	Set MIKE GAIN control (12) to midposition.
26	SB-1248/TSC-15	Set OVERRIDE switch (9) to NORMAL.
27	SB-1248/TSC-15	Set VU meter selector switch (14) to OPERATOR RECEIVE.
28	SB-1248/TSC-15	Push the OFF pushbuttons (8) of each TEL line and voice CHAN.
29	Console accessory panel (figure 2-20)	Set AUTOMATIC TELEPHONE RINGING switches for each TEL line to OFF.

Table 3-1. Communications Central AN/TSC-15, Summary of Operation, Preparation for Readiness (Con.)

STEP	EQUIPMENT	OPERATION
ELECTRICAL EQUIPMENT SHELTER S-208/TSC-15 (Con.)		
30	Telegraph Line Control C-3533/TSC-15 (figure 2-16)	Set ON-OFF channel function switches to OFF.
31	C-3533/TSC-15	Set the three channel selector switches to midposition.
32	C-3533/TSC-15	Set MONITOR switch to OPERATE.
33	C-3533/TSC-15	Set mode selector switch to NORMAL.
34	C-3533/TSC-15	Set 2W-4W switch to 2W.
35	C-3533/TSC-15	Turn KEYBOARD/2W LCC and PAGE PRINTER LCC controls fully counterclockwise.
36	Telephone Test Set TS-1635/TSC-15 (figure 2-22)	Set FREQUENCY switch to SET OFF.
37	AC power entry panel (figure 2-8)	Set RADIO circuit breaker to ON, and listen for the two radio equipment blowers to start.
38	Signal entry panel (figure 2-5)	Connect teletypewriter and telephone lines to signal entry panel, and adjust Hybrid Circuit Networks MX-3726/TSC-15 as outlined in paragraph 2-143.
39	Telephone Test Set TS-1635/TSC-15 (figure 2-22)	Test system as outlined in paragraph 2-135.

Table 3-2. Communications Central AN/TSC-15, Summary of Operation, Simplex Radio Setup

STEP	EQUIPMENT	OPERATION
1	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set SIMPLEX-DUPLEX switch to SIMPLEX.
2	Radio Set Control C-3141/TRC-75 (figure 2-12)	SET ON-OFF switch (L) to ON.

Table 3-2. Communications Central AN/TSC-15, Summary of Operation,
Simplex Radio Setup (Con.)

STEP	EQUIPMENT	OPERATION
3	Communication Control Console OA-3129/TSC-15 (figure 1-5)	Check that ROOF WHIP antenna indicator is lighted.
4	Radio Set Control C-3141/TRC-75 (figure 2-12)	Set the predetermined assigned frequency on the SIMPLEX XCVR unit 3A4A1 by turning the thousand kc (N), hundred kc (P), ten kc (R) and one kc (S) control knobs until the desired frequency appears in the FREQ KC window. NOTE Although the desired frequency may appear in the FREQ KC indicator window when Radio Set Control C-3141/TRC-75 is turned on, the frequency knobs must be turned off frequency and returned to the desired frequency to ensure proper tuning of the radio equipment.
5	Radio Set Control C-3532/TSC-15 (figure 2-13)	Set the transmitter power switch to H PWR.
6	C-3532/TSC-15	Set the meter selector switch to FWD 1 KW.
7	C-3532/TSC-15	Set the transmitter key switch to PTT.
8		Allow a minimum of 20 minutes warmup from the time step 2 was performed.
9	C-3532/TSC-15	Depress the footswitch or the microphone switch. Check that XMTR KEYED indicator lights. The DIRECTIONAL WATTMETER should indicate approximately 100 watts on the upper scale of the meter.
10	C-3532/TSC-15	Release the footswitch or microphone switch and observe that XMTR KEYED indicator goes out. The DIRECTIONAL WATTMETER indication should fall to zero. The READY indicator should light.
11	C-3532/TSC-15	Set transmitter key switch to RADIO SILENCE.
12		The simplex radio is now completely tuned and ready for operation. Each time a new frequency is to be selected, steps 3 through 11 of this table must be performed.

T.O. 31R2-2TSC15-1Table 3-3. Communications Central AN/TSC-15, Summary of Operation,
Duplex Radio Setup

STEP	EQUIPMENT	OPERATION
NOTE In a simplex or duplex 2-wire circuit, voice information cannot be transmitted and received simultaneously. For a full duplex telephone circuit (simultaneous transmission and reception of voice information), 4-wire circuits must be used.		
1	Radio Set Control C-3532/ TSC-15 (figure 2-13)	Set the SIMPLEX-DUPLEX switch to DUPLEX.
2	Radio Set Control C-3141/ TRC-75 (figure 2-12)	Set the ON-OFF switch (L) on the DUPLEX XMTR/SIMPLEX XCVR unit 3A4A1 control to ON.
3	C-3141/TRC-75	Set the predetermined assigned frequency of the DUPLEX XMTR/SIMPLEX XCVR unit 3A4A1 control by turning the thousand kc (N), hundred kc (P), ten kc (R), and one kc (S) control knobs until the desired frequency appears in the FREQ KC indicator window.
NOTE Although the desired frequency may appear in the FREQ KC indicator window when Radio Set Control C-3141/TRC-75 is turned on, the frequency knobs must be turned off frequency and returned to the desired frequency to ensure proper tuning of the equipment.		
4	Radio Set Control C-3532/ TSC-15 (figure 2-13)	Set the transmitter power switch to H PWR.
5	C-3532/TSC-15	Set the meter selector switch to FWD 1 KW.
6	C-3532/TSC-15	Set the transmitter key switch to PTT.
7		Allow a minimum of 20 minutes warmup from the time step 2 was performed.
8	C-3532/TSC-15	Depress the footswitch or microphone switch. Check that XMTR KEYED indicator lights. The DIRECTIONAL WATTMETER should indicate approximately 100 watts on its upper scale.

Table 3-3. Communications Central AN/TSC-15, Summary of Operation, Duplex Radio Setup (Con.)

STEP	EQUIPMENT	OPERATION
9	C-3532/TSC-15	Release footswitch or microphone switch and observe that the XMTR KEYED lamp goes out. The READY indicator should light. The DIRECTIONAL WATTMETER indication should fall to zero.
10	C-3532/TSC-15	The DUPLEX XMTR now is completely tuned and ready for operation. Set the transmitter key switch to RADIO SILENCE.
11		Each time a new frequency is selected, steps 2 through 10 must be repeated.
12	Radio Set Control C-3141/TRC-75 (figure 2-12)	Set the ON-OFF switch (L) on the DUPLEX RCVR unit 3A4A3 control to ON.
13	C-3141/TRC-75	Set the predetermined assigned frequency on the DUPLEX RCVR unit 3A4A3 by turning the thousand kc (N), hundred kc (P), ten kc (R), and one kc (S) control knobs until the desired frequency appears in the FREQ KC indicator window.
		NOTE
		Although the desired frequency may appear in the FREQ KC indicator window when Radio Set Control C-3141/TRC-75 is turned on, the frequency knobs must be turned off frequency and returned to the desired frequency to ensure proper tuning of the radio equipment.
14	Left equipment rack	Remove the left equipment rack door, and make sure the circuit breaker on Band Pass Filter F-508/U is set to ON.
15	Filter Control C-3595/U (figure 2-14)	Set the ON-OFF switch to ON.
16	C-3595/U	Set the same frequency in the frequency indicator window as was set on the DUPLEX RCVR unit 3A4A3 Radio Set Control C-3141/TRC-75 in step 13.

Table 3-3. Communications Central AN/TSC-15, Summary of Operation, Duplex Radio Setup (Con.)

STEP	EQUIPMENT	OPERATION
16 (Con.)		NOTE The frequency selected on Filter Control C-3595/U and the DUPLEX RCVR unit 3A4A3 must be separated from the frequency selected on the DUPLEX XMTR/SIMPLEX XCVR unit 3A4A1 control by at least 10 percent.
17		Duplex receiver unit 2A8 is now completely tuned and ready for operation. Each time a new frequency is selected, steps 13 and 16 must be performed.

3-7. EMERGENCY OPERATION FOR EQUIPMENT OTHER THAN TELEGRAPH TERMINAL GROUP AN/TGA-1.

3-8. EMERGENCY SIMPLEX OPERATION. The Radio Receivers R-761/ARC-58 are available in the shelter. If the simplex Radio Receiver R-761/ARC-58 (unit 2A7) becomes inoperative in a field situation, operation can still be maintained by replacing the simplex set with duplex Radio Receiver R-761/ARC-58 (unit 2A8). Only simplex operation is available under these circumstances. Operation would be limited to one mode of operation at a time and transmission and reception could not occur at the same time.

3-9. EMERGENCY USE OF AUDIO FREQUENCY AMPLIFIERS AM-1975/U. Thirteen Audio Frequency Amplifiers AM-1975/U are available in the shelter; eight on Amplifier Mounting Plate MT-2446/TSC-15, and five on Amplifier Mounting Plate MT-2445/TSC-15. These modules are identical, except for the values of the pads which are inserted into the modules. These pads can be removed. If it is determined that an amplifier critically needed for operation has become defective, one of the amplifiers that is seldom used can be utilized to replace the critically needed amplifier. The amplifiers used least are the two bridge amplifiers and the two conference amplifiers. These amplifiers normally are used only when

it is desired to set up a conference circuit and any one of these four amplifiers could be used to replace the one that is defective. Operation for that line can be restored to normal by inserting either the pad removed from the defective module or another pad of the same value and size.

3-10. EMERGENCY USE OF AUDIO FREQUENCY AMPLIFIERS AM-2898/TSC-15. Four identical Audio Frequency Amplifier AM-2898/TSC-15 modules are used in Radio Set Control C-3532/TSC-15. If it is urgent that communications be maintained on a particular channel and it is determined that Audio Frequency Amplifier AM-2898/TSC-15 in that channel is defective, an identical module can be removed from an unused channel to replace the defective module.

3-11. EMERGENCY USE OF HYBRID CIRCUIT NETWORKS MX-3726/TSC-15. Three identical Hybrid Circuit Networks MX-3726/TSC-15 are used in Radio Set Control C-3532/TSC-15. If it is urgent that communications be maintained on a particular TEL line and it is determined that the hybrid circuit network module in that line is defective, an identical module can be removed from an unused TEL line to replace the defective module. Actually, each of the three hybrid circuit network modules contain two identical hybrid circuits. Two telephone lines are connected to both of

(TWIN), changing the operating rf frequency, or use of modulation modes may be effective.

3-26. OPERATION DURING CIRCUIT FAILURE. If the AN/TGA-1 becomes inoperative because of circuit failure, the nature of the circuit failure determines if communication can continue.

1. Check the +120-volt and +26-volt output of the internal power supply with the TEST METER.
2. If both voltages are satisfactory then:
 - a. Attempt operation on a different TTY channel.
 - b. Change teletypewriter equipment to different loop circuits.
 - c. Attempt operation in a different mode; that is, 2-wire, 4-wire, diversity, or non-diversity.
 - d. Replace the teletypewriter equipment.
3. If both voltages are low, check the primary power source voltage and frequency.
4. If one power supply voltage is satisfactory and the other is zero, check fuses in Power Supply PP-2894/TGA-1 module.
5. If both voltages are zero, check AC PWR fuse on front panel of unit. Check primary power source. Check internal power supply fuses.

NOTE

The AN/TGA-1 may operate properly with the power supply voltages slightly above or below the black sector on the TEST METER.

3-27. AFTER USE.

3-28. Use the following procedure to prepare the equipment for a condition where it will be left unattended, or when the system is to be shut down completely:

1. Fold and replace the chair in its storage position on the right shelter wall as illustrated in figure 2-1.

2. Place the headset, microphone, CW key, and footswitch inside the console stowage cabinet.

3. Replace the teletypewriter cover and remove the teletypewriter from its table. Stow the teletypewriter table and the teletypewriter on the left wall of the shelter as shown in figure 2-1.

4. Set the transmitter key switch on Radio Set Control C-3532/TSC-15 to RADIO SILENCE.

5. Set the two radio set controls (C-3141/TRC-75) and Filter Control C-3595/U to OFF.

6. Set the circuit breakers on the two console-mounted power supplies (PP-2868/U and PP-2869/TSC-15) to OFF.

7. Set the individual ventilating fan switches on the ac power entry panel to OFF.

8. Set the five circuit breakers on the ac power entry panel to OFF.

9. Close the three ventilation doors on the rear and front of the shelter.

10. Set all the circuit breakers on the generator to OFF, and turn off the generator.

11. Close the shelter door.

3-29. OPERATORS MAINTENANCE FOR EQUIPMENT OTHER THAN TELEGRAPH TERMINAL GROUP AN/TGA-1.

3-30. OPERATING CHECKS AND ADJUSTMENTS. The operating checks listed in paragraphs 3-7 and 3-22 are all applicable for use by the operator prior to or during operation. The procedures listed in TM-02968A-15, -34 and -50 Maintenance Manual for Communications Central AN/TSC-15, are all applicable for use by the operator prior to or during operation.

3-31. EMERGENCY MAINTENANCE. The procedures listed in paragraph 3-7 include the procedures for emergency equipment maintenance which may be expected to be performed by operating personnel.

going through Manual Telephone Switchboard SB-1248/TSC-15. The same procedure can be performed in lower sideband using the appropriate jacks. The procedure applies to all telephone lines.

3-17. This is a normal 4-wire or duplex circuit, but it does not allow the operator to monitor the conversation. The local operator can monitor the conversation by use of the VU meter on Manual Telephone Switchboard SB-1248/TSC-15 using the following procedure.

1. Patch between the TEL 1 XMIT jack on the telephone side and the MULTIPLE jack.
2. Patch between the USB XMIT jack on the radio side and the MULTIPLE jack.
3. Patch between the VU meter jack and the MULTIPLE jack. Conversation in the circuit is indicated by fluctuations on the VU meter. When fluctuations have ceased, the patch can be removed.

3-18. If it is desired to use the 4-channel TTY multiplex equipment in the upper sideband, the following steps should be performed.

1. Patch between the TTY MX XMIT jack on the multiplex side and the USB XMIT jack on the radio side.
2. Patch between the TTY MX REC jack on the multiplex side and the USB REC jack on the radio side.

3-19. Normal 4-channel multiplex can now be operated through the upper-sideband radio channel without going through Manual Telephone Switchboard SB-1248/TSC-15. The same procedure can be performed in lower sideband using the appropriate jacks.

3-20. If it is desired to use teletypewriter FSK operation, the following steps should be performed.

1. Patch between the TTY FSK XMIT jack and the USB REC jack on the radio side.
2. Patch between the TTY FSK REC jack and the USB REC jack on the radio scale.

3-21. Normal teletypewriter FSK can be operated into the upper sideband channel of the radio equipment without going through Manual Telephone Switchboard SB-1248/TSC-15. The same procedure can be performed in lower sideband using the appropriate jacks.

3-22. EMERGENCY OPERATION FOR TELEGRAPH TERMINAL GROUP AN/TGA-1.

3-23. GENERAL. During the operation of the AN/TGA-1, conditions such as radio silence, circuit failure, atmospheric disturbances, or jamming may be encountered. Since these are not normal conditions, procedures other than normal are necessary to permit continual operation.

3-24. OPERATION DURING RADIO SILENCE. During periods of radio silence, only reception is permissible. Since the radio transmitter is off during this mode of operation, teletypewriter data may be received, but not transmitted, on the radio circuit. However, teletypewriter data between the AN/TSC-15 shelter and remote teletypewriter equipments via dc loop circuits may be transmitted and received during radio silence.

3-25. OPERATION DURING ATMOSPHERIC DISTURBANCES OR JAMMING. The procedures which may reduce or eliminate the effects of atmospheric disturbances or jamming consist of changing operational modes in the AN/TGA-1 and/or the T-730/TRC-75 and R-761/ARC-58. Telegraph Terminal Group AN/TGA-1 may be operated in the diversity modes to achieve a frequency diversity without operating the radio equipment on TWIN sideband. During heavy noise conditions or jamming, adjust the receive signal level into the AN/TGA-1 to the lowest level that will permit satisfactory copy. This will provide the best signal-to-noise response in the receive audio circuits. During fading conditions, adjust the receive signal level to the maximum. During severe fading, use the diversity operational modes in the AN/TGA-1. In addition, the use of various operating modes in the radio equipment will help reduce or eliminate atmospheric or jamming problems. Upper or lower sideband, or double sideband

Table 3-4. Telegraph Terminal Group AN/TGA-1 Preventive Maintenance,
Daily and Weekly Checks

STEP	CHECK
1	Check for completeness and general condition of Telegraph Terminal Group AN/TGA-1.
2	Inspect the cables and cords of operating equipment for cuts, breaks, fraying, deterioration, kinks, and strain.
3	Inspect switches and indicator lamps on Communication Control Console OA-3129/TSC-15 and fuses, switches, jacks, connectors, and meter on the Telegraph Terminal Group AN/TGA-1.
4	Inspect the mounting nuts and safety wire.
5	Check cable connections on Telegraph Terminal Group AN/TGA-1 front panel.
6	Check the Telegraph Terminal Group AN/TGA-1 for normal operation.

3-32. OPERATORS MAINTENANCE FOR TELEGRAPH TERMINAL GROUP AN/TGA-1.

3-33. GENERAL. This section covers operating checks and adjustments prior to and during operation of the AN/TGA-1, and covers preventive maintenance and replacement of fuses. Routine check charts are in table 3-4.

3-34. OPERATING CHECKS AND ADJUSTMENTS.3-35. Before Use.

1. Check the power and audio cable connectors for tightness on the front panel of AN/TGA-1.

2. Before connecting teletypewriter test meters or auxiliary teletypewriter equipment into the TTY loop circuits, make certain that the proper polarities have been observed and that the cords and jacks are in good condition.

CAUTION

All of the power for the teletypewriter loop circuits is supplied by the AN/TGA-

1. Do not attempt to operate teletypewriters that supply their own loop circuit power with AN/TGA-1 loop circuits. Also, do not attempt to use an external loop circuit power supply for loop power. Loop currents in excess of 60 milliamperes may damage the teletypewriter equipment and cause excessive power dissipation in the Telegraph Terminal Group AN/TGA-1.

3-36. During Use. Check the output voltages of the AN/TGA-1 internal power supply with the TEST METER on the front panel of the telegraph terminal. The voltage should be +120 volts dc and +26 volts dc within the tolerance shown on the TEST METER.

3-37. PREVENTIVE MAINTENANCE. Preventive maintenance generally is performed during periods when there is no expected use of Telegraph Terminal Group AN/TGA-1. A routine daily and weekly preventive maintenance chart is shown in table 3-4.

3-38. REPLACEMENT OF FUSES. Telegraph Terminal Group AN/TGA-1 contains 12 externally mounted fuses on the Converter-Oscillator CV-1086/TGA-1 which is located in Converter-Oscillator Group OA-3138/TGA-1.

NOTE

Do not remove and replace fuses during preventive maintenance checks unless there is reason to indicate that the fuse may have blown. The four fuse holders on the Converter-Oscillator CV-1086/TGA-1 are not used in this equipment application, and should remain empty.

CAUTION

Do not replace a faulty fuse with new fuse of larger current rating. Damage to equipment can occur.

3-39. Miniature Fuses. Turn fuse holder counterclockwise several turns, and remove fuse holder and fuse. Insert new fuse and replace fuse holder and turn in clockwise direction several turns until fuse holder is snug.

CAUTION

Tighten fuse holder only finger tight. Do not use a screwdriver to tighten fuse holder.

3-40. Fuses in Power Supply PP-2894/TGA-1.

1. Remove Power Supply PP-2894/TGA-1 from Converter-Oscillator Group OA-3138/TGA-1.

2. Remove power supply dust cover.

3. Remove fuses from the fuse clips and replace with the proper fuses (type 8AG only).

4. Replace dust cover and replace the power supply in Converter-Oscillator Group OA-3138/TGA-1.

3-41. EMERGENCY MAINTENANCE. No emergency maintenance is recommended. If the given maintenance procedures do not restore the equipment to operation, more extensive maintenance work is required.

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Table 1-1: Summary of the results of the analysis of the data from the 10-10-55 10:15 AM survey.

Category	Value
1. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	1.0
2. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	2.0
3. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	3.0
4. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	4.0
5. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	5.0
6. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	6.0
7. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	7.0
8. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	8.0
9. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	9.0
10. The results of the analysis of the data from the 10-10-55 10:15 AM survey are as follows:	10.0

SUPPLEMENT
TECHNICAL MANUAL
OPERATION
COMMUNICATIONS CONTROL
AN/TSC-15

31 MAY 1977

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24

FILED
6 JUN 1977

THIS PUBLICATION REPLACES T.O. SUPPLEMENTS 31R2-2TSC15-1C DATED 4 NOVEMBER 1976 AND 31R2-2TSC15-1D DATED 10 FEBRUARY 1977 AND SUPPLEMENTS T.O. 31R2-2TSC15-1, DATED 22 SEPTEMBER 1971. Reference to this supplement will be made on the title page of the basic manual by personnel responsible for maintaining the publication in current status.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

5 MAY 1977

1. PURPOSE.

The purpose of this supplement is to reflect corrective action of AFTO Form(s) 22 against the basic manual.

2. INSTRUCTIONS.

a. On page 1-5, paragraph 1-15 is changed to read:

1-15. FOUR-CHANNEL, 160-HZ MULTIPLEX. Four-channel, 160-Hz multiplex operation is transmission and reception of four frequency-shift-keyed, teletypewriter channels within one sideband in a frequency range of 1500 Hz to 3000 Hz above or below the carrier frequency. On some versions there is one (1) 850 Hz FSK and four (4) 85 Hz FSK channels.

b. On page 1-5, paragraph 1-18, first sentence is changed to read: The maximum capability of the system is three voice channels and four multiplex teletypewriter channels.

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g. On page 2-52, paragraph 2-81 is changed to read:

2-81. GENERAL. Telegraph Terminal Group AN/TGA-1 provides five channels of simultaneous telegraph communications using two single-side band radio circuits operating in the high-frequency band. The AN/TGA-1 has one 850 Hz FSK channel and four 160 Hz shift FSK channels. On some versions there is one (1) 850 Hz channel and four (4) 85 Hz shift FSK channels. The unit must be connected to Communications Central AN/TSC-15 to form an operational system. Table 2-16 lists optional operating procedures.

h. On page 2-69, paragraph 2-139, step 14 is changed to read:

14. Check the reading on the VU meter of Manual Telephone Switchboard SB-1248/TSC-15. The meter should read $-2VU \pm 1VU$.

i. On page 2-69, paragraph 2-139, Step 16 is changed to read:

16. Check the reading on the VU meter. The reading should be $-2VU \pm 1VU$.

THE END

e. On page 1-6, Fig 1-2, illustration f) is changed as shown in Fig. 1.

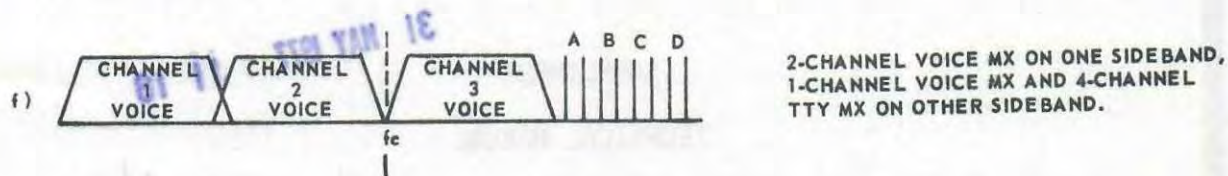


FIGURE 1.

d. On page 1-12, paragraph 1-29 is changed to read:

1-29. TELETYPEWRITER MULTIPLEX. Telegraph multiplexing is provided by Telegraph Terminal Group AN/TGA-1. The AN/TGA-1 is a nonsynchronous, FSK telegraph terminal used as part of the Communications Central System. The AN/TGA-1 is capable of operating with any standard 60-milliampere teletypewriter up to a distance equivalent to a loop resistance of 850 ohms. The AN/TGA-1 provides five channels of simultaneous telegraph communications by means of two 3-kHz single sideband radio circuits operating in the hf (high frequency) band. The basic unit consists of one 850 Hz shift FSK and four 160 Hz shift FSK channels. On some versions of the AN/TSC-15, there is one 850 Hz FSK and four 85 Hz FSK channels.

e. On page 1-12, paragraph 1-30 is changes to read:

1-30. Converter-Oscillator Group OA-3138/TGA-1. Converter-Oscillator Group OA-3138/TGA-1 contains four 160-Hz shift FSK telegraph channels that are multiplexed into a single audio channel for operation on a single sideband radio circuit. Some versions of the CV-1086/TGA-1 contain four 85 Hz FSK channels. Any four of eight available channels may be used in the equipment by selection of the appropriate plug-in modules. The OA-3138/TGA-1 provides simultaneous operation of four standard 60-milliampere teletypewriters operating in either half-duplex or full-duplex modes at speeds up to 100 words per minute.

f. On page 1-16, Table 1-2, equipment repair parts kit and qty per equip for this item from the table is deleted.

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THIS PUBLICATION SUPPLEMENTS T.O. 31R2-2TSC15-1 DATED 22 SEPTEMBER 1971. Reference to this supplement will be made on the title page of the basic manual by personnel responsible for maintaining the publication in current status.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AF PERSONNEL.

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1 NOVEMBER 1977

1. PURPOSE.

To reflect changes to the basic manual.

2. INSTRUCTIONS.

On page 2-1/(2-2 Blank), prior to paragraph 2-7, a new paragraph 2-6A. is added to read:

~~2-6~~A. Place the shelter in an off level condition at the rate of 1 inch per 10 feet, to insure water drainage and reduce possibilities of moisture intrusion into the inner walls.

Methods for unleveling, listed in order of preference are:

- a. Having the low point at a corner.
- b. Having the low point along the shorter side of the rectangular roof surface.
- c. Having the low point along the longer side of the rectangular roof surface.

THE END

1/(2 Blank)

