

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM11-2258

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

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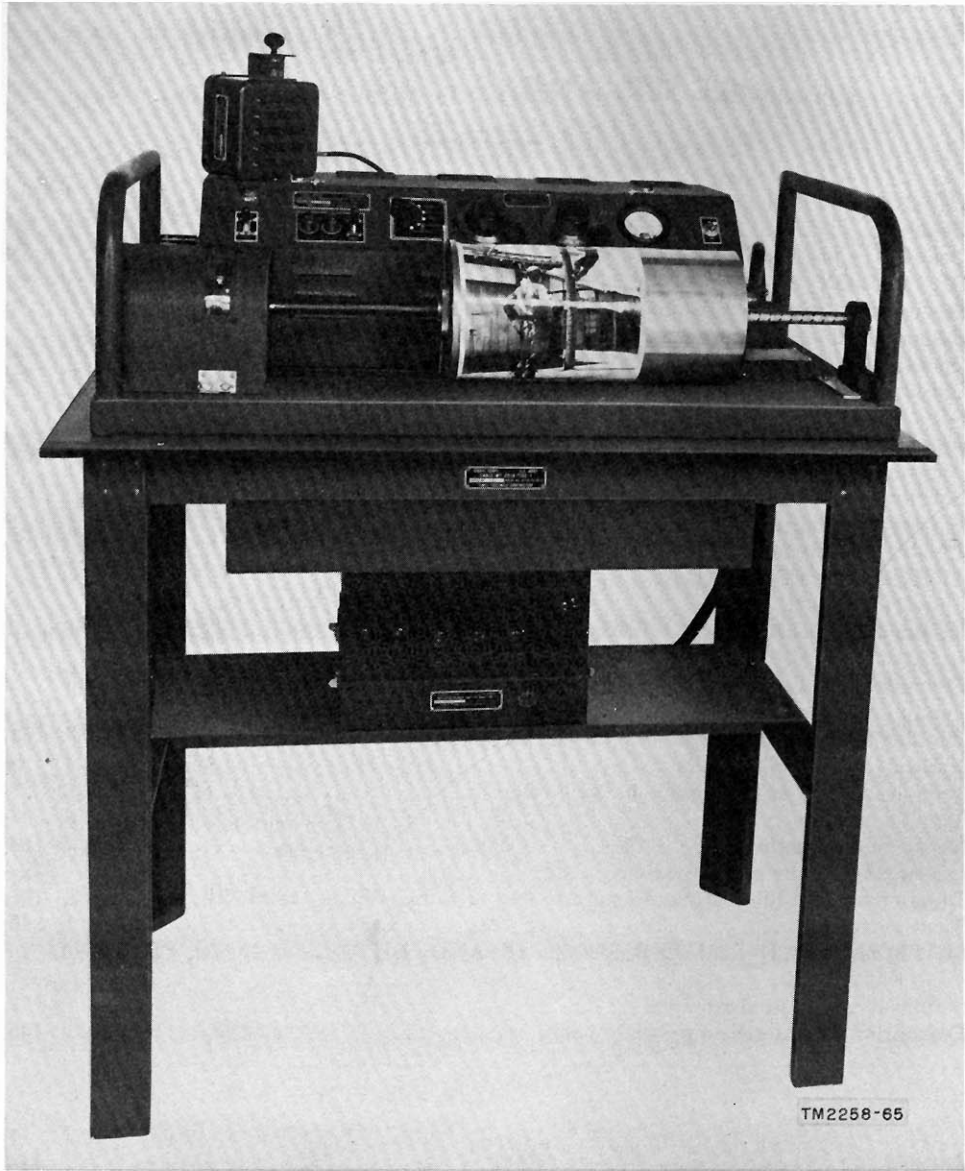
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FACSIMILE SETS  
AN/TXC-1, -1A, -1B,  
-1C, -1D, -1E, AND -1F



*DEPARTMENTS OF THE ARMY AND THE AIR FORCE*

*MAY 1955*



*Figure 1. Facsimile sets AN/TXC-1, -1A, -1B, and -1C*

# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1. Scope

a. This manual contains instructions for the installation, operation, maintenance, and repair of Facsimile Set AN/TXC-1(\*) (figs. 1 and 2). Descriptions of and data for Facsimile Set AN/TXC-1(\*) and auxiliary equipment also are included.

b. Official nomenclature followed by the symbol (\*) is used to indicate all models of the item of equipment included in this manual. Facsimile Set AN/TXC-1(\*) refers to Facsimile Sets AN/TXC-1, -1A, -1B, -1C, and -1D. Facsimile Transceiver TT-1(\*)/TCX-1 refers to Facsimile Transceivers TT-1/TXC-1, TT-1A/TXC-1, TT-1B/TXC-1, TT-1C/TXC-1, TT-1D/TXC-1, TT-1E/TXC-1, and TT-1F/TXC-1; Rectifier Power Unit PP-86(\*)/TXC-1 refers to Rectifier Power Units PP-86/TXC-1, PP-86A/TXC-1, PP-86B/TXC-1, and PP-86E/TXC-1; Table MT-252(\*)/TXC-1 refers to Tables MT-252/TXC-1, MT-252A/TXC-1, and MT-252B/TXC-1.

c. Forward comments on this publication directly to: Commanding Officer, The Signal Corps Publications Agency, Fort Monmouth, New Jersey, ATTN: Standards Division.

#### 2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army equipment and in performing preventive maintenance.

a. DD Form 6 (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in SR 745-45-5 (Army) and AFR-71-4 (Air Force).

b. DA Form 468 (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

c. DD Form 535 (Unsatisfactory Report) will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio as prescribed in SR 700-45-5 and AF TO 00-35 -54.

d. DA Form 11-238 (Operator First Echelon Maintenance Check List for Signal Corps Equipment—Radio Communication, Direction Finding, Carrier, Radar) will be prepared in accordance with instructions on the back of the form (fig. 24).

e. DA Form 11-239 (Second and Third Echelon Maintenance Check List for Signal Corps Equipment—Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form (fig. 25).

f. Use other forms and records as authorized.

### Section II. DESCRIPTION AND DATA

#### 3. Purpose and Use

Facsimile Set AN/TXC-1(\*) is an electro-mechanical-optical facsimile set of the revolving drum type for the transmission and reception of page copy. It is used for transmission of maps, photographs, sketches, and printed or handwritten text over regular voice communication channels, either wire or radio, between fixed stations. Although colored copy may be transmitted, the reproduction is always in black, white, and intermediate shades of gray. Received copy is recorded

either directly on chemically coated paper or photographically in either negative or positive form. The equipment will transmit or receive a page of copy 12 by 18 inches in 20 minutes; Facsimile Sets AN/TXC-1D, -1E, and -1F have provisions for transmitting or receiving copy at half speed. When set for half-speed operation, they will transmit or receive one page of copy in 40 minutes. Principal components of Facsimile Set AN/TXC-1(\*) (figs. 1 and 2) are Facsimile Transceiver TT-1(\*)/TXC-1 which serves either as transmitter or receiver (depending on the setting

of a front panel selector switch) and Rectifier Power Unit PP-86(\*)/TXC-1 (fig. 3) which supplies operating power to the transceiver and dust removal blower and operates from an alternating-current (ac) source of 115 volts at 60 cycles per second (cps).

#### 4. Application of Facsimile Set AN/TXC-1(\*)

Facsimile Set AN/TXC-1(\*) may be used with either wire or radio communication circuits.

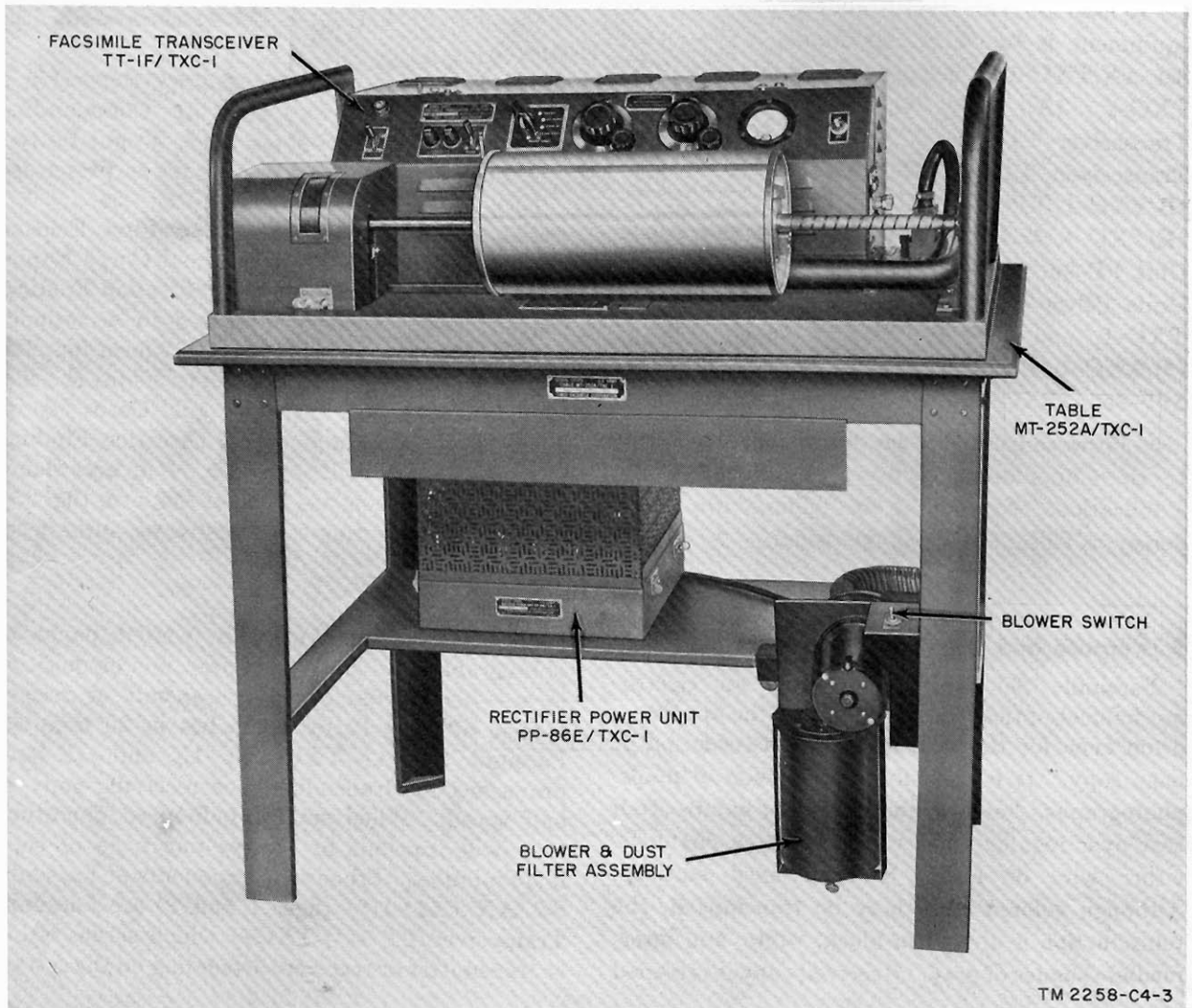
*a. Wire Circuits.* When used with wire lines, the facsimile transceiver can be connected directly to the line by one of several input and output terminals of various impedances and levels. The transceiver also can be connected to the line through a coupling coil, which may be coupled magnetically to the receiver of a conventional

telephone handset or which may be coupled inductively to certain types of lines that have no ringing or signaling circuits. An amplitude-modulated (am.) 1,800-cycle carrier is transmitted and received.

*b. Radio Circuits.* When used with radio communication circuits, the facsimile transceiver can be connected in several ways with auxiliary equipment to produce different types of radio signals.

(1) *Subcarrier amplitude modulation (SCAM).*

When transmitting, the facsimile transceiver is connected to the microphone circuit of a conventional am radiotelephone transmitter to produce an am radio signal. When receiving, the output of a conventional am radio receiver



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Figure 2. Facsimile set AN/TXC-1D.

is connected to the input of the facsimile transceiver.

- (2) *Subcarrier frequency modulation (SCFM).* When the facsimile transceiver is connected to such auxiliary equipment as Converter CV-2(\*)/TX, the converter output is fed into a conventional am radiotelephone transmitter and the radio signals are described as narrow band subcarrier frequency modulation. The radio signals consist of a radio-frequency (rf) carrier modulated by a constant-amplitude audio signal, the frequency of which is varied to carry facsimile intelligence. When this system is used for receiving, a conventional am radio receiver, the same converter, and the same facsimile transceiver are used. The converter changes the subcarrier fm signals back to am signals, which are required for operation of the transceiver.
- (3) *Frequency-shift modulation.* When Facsimile Transceiver TT-1(\*)/TXC-1 is used with two auxiliary equipments,

Converter CV-2C/TX and Exciter Unit O-5B/FR (earlier models must be modified) frequency-shift signals can be transmitted over a conventional continuous-wave (cw) radio transmitter. When transmitting, the am output of Facsimile Transceiver TT-1(\*)/TXC-1 is fed into the converter. A varying direct-current (dc) output is taken from the converter and fed into frequency-shift Exciter Unit O-5B/FR. The output of the exciter unit excites the cw transmitter and a frequency-shift radio signal is transmitted. When receiving, a stable am communication receiver with a crystal-controlled, high-frequency (hf) oscillator and the converter are used to convert the frequency-shift signals to am signals. When using receivers that do not use crystal-controlled conversion, the stable output of additional auxiliary equipment Frequency Meter BC-221 is required and is used with Converter CV-2C/TX to receive frequency-shift signals.

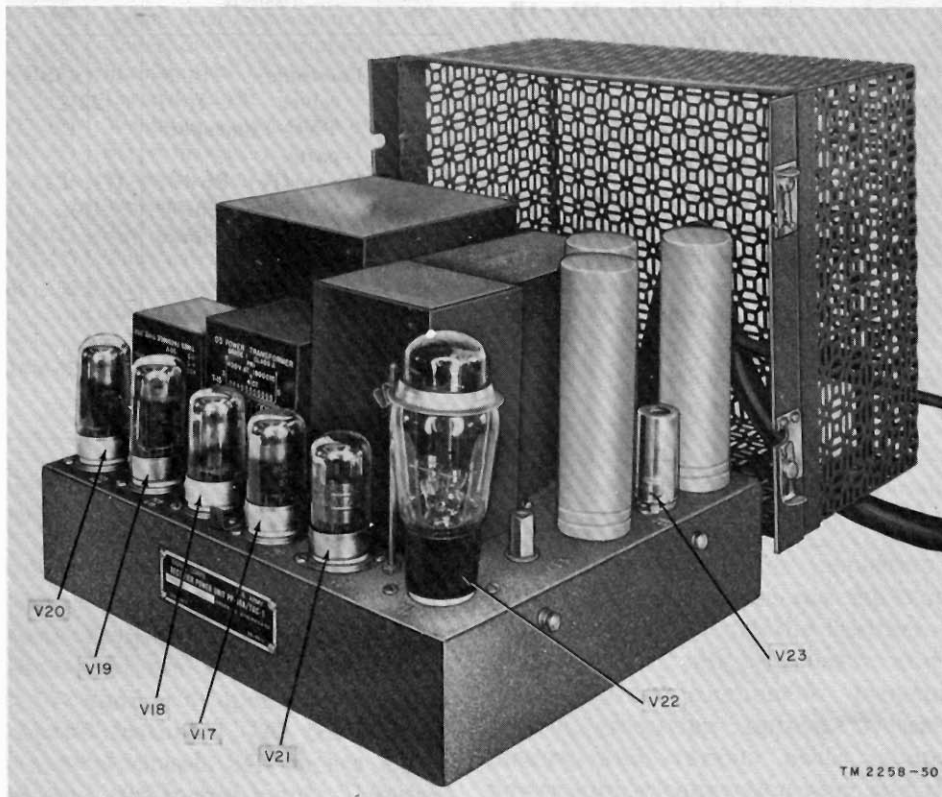


Figure 3. Rectifier power units PP-86/TXC-1, PP-86A/TXC-1, or PP-86B/TXC-1, cover removed.

## 5. Technical Characteristics

### a. Facsimile Transceiver TT-1(\*)/TXC-1.

Type of equipment.....	Rotating drum type.
Functions.....	Transmitting or receiving signals.
Type of copy.....	Page.
Maximum size of copy.....	12 by 18 <sup>11</sup> / <sub>16</sub> inches.
Size of scanning spot.....	<sup>1</sup> / <sub>96</sub> inch.
Type of recording.....	Direct, or photographic positive or negative.
Drum diameter.....	6 inches.
Speed of drum:	
Rotation.....	1 revolution per second in the -1, -1A, -1B, and -1C models; <sup>1</sup> / <sub>2</sub> or 1 revolution per second in the -1D, -1E, and -1F models.
Lateral movement.....	12 inches in 20 minutes in -1, -1A, -1B, and -1C models; 12 inches in 20 minutes or 40 minutes in -1D, -1E, and -1F models.
Scanning lines per inch.....	96.
Index of cooperation.....	576.
Number of tubes.....	18 in -1, -1A, -1B, and -1C models; 19 in -1D, -1E, and -1F models.
Audio carrier frequency.....	1,800 cps.
Type of modulation.....	Am.
Frequency bandwidth.....	1,800 cps maximum.
Frequency band limits.....	900 to 2,700 cps.
Drum speed control.....	Synchronous motor controlled by 1,800-cps fork oscillator, or 900-cps multivibrator (or external audio source).
Signals levels:	
Input (for reception).....	-45 to 0 dbm.
Output (for transmission).....	0 to +26 dbm.

### b. Rectifier Power Unit PP-86(\*)/TXC-1.

Number of tubes.....	7.
Input requirements:	
Power source.....	100 to 130 v, 50 to 65 cps; 250 w; at 115 v.
Signal source.....	1,800 cps from fork oscillator.
Output:	
Unregulated plate supply.....	450 v at 270 ma.
Filament supply.....	6.5 v, ac at 6.25 amperes.
Start motor supply.....	115 v, ac at .5 ampere.
Exciter lamp supply.....	Regulated 6 v, 1,800 cps at 2.74 amperes, ±.1 v.
Dust removal blower.....	115 v, 60 cps, 3 amperes.

## 6. Packaging Data

When packaged for export shipment, the components of Facsimile Set AN/TXC-1(\*) are placed in water-vaporproofed containers and are packed in four wooden crates. Typical packaging procedure of Facsimile Transceiver TT-1(\*)/TXC-1 is shown in figure 7. The size, weight, and volume of each crate are indicated in the following chart:

*Note.* Items may be packaged in a manner different from that shown, depending on the supply channel.

Box No.	Contents	Dimensions (in.)	Volume (cu ft)	Weight (lb)
1 of 4	Facsimile Transceiver TT-1(*)/TXC-1 and spare parts.	40 <sup>1</sup> / <sub>2</sub> x 15 <sup>1</sup> / <sub>2</sub> x 22 <sup>1</sup> / <sub>2</sub> .	8. 1	218
2 of 4	Rectifier Power Unit PP-86(*)/TXC-1 and spare parts.	17 <sup>1</sup> / <sub>2</sub> x 15 x 15 <sup>1</sup> / <sub>4</sub> .	2. 3	89
3 of 4	Photographic Equipment PH-549/TXC-1.	40 x 26 x 26.	15. 6	339
4 of 4	Table MT-252(*)/TXC-1.	40 x 26 x 41.	11. 5	137

## 7. Table of Components

(figs. 1-6)

Facsimile set					Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Volume (cu ft)	Unit weight (lb)
AN/TXC-1	AN/TXC-1A	AN/TXC-1B	AN/TXC-1C	AN/TXC-1D							
(*)					Facsimile Transceiver TT-1/TXC-1	1	10 $\frac{3}{4}$	17 $\frac{5}{8}$	34 $\frac{5}{8}$	3.5	85
	(*)				Facsimile Transceiver TT-1A/TXC-1	1	10 $\frac{3}{4}$	17 $\frac{5}{8}$	34 $\frac{5}{8}$	3.5	85
		(*)			Facsimile Transceiver TT-1B/TXC-1 or TT-1C/TXC-1	1	10 $\frac{3}{4}$	17 $\frac{5}{8}$	34 $\frac{5}{8}$	3.5	85
			(*)		Facsimile Transceiver TT-1D/TXC-1 or TT-1E/TXC-1	1	10 $\frac{3}{4}$	17 $\frac{5}{8}$	34 $\frac{5}{8}$	3.5	85
				(*)	Facsimile Transceiver TT-1F/TXC-1	1	10 $\frac{3}{4}$	17 $\frac{5}{8}$	34 $\frac{5}{8}$	3.5	85
(*)	(*)	(*)	(*)	(*)	Rectifier Power Unit PP-86(*)/TXC-1	1	9	10	12	.62	48
(*)	(*)	(*)	(*)	(*)	Photographic Equipment PH-549/TXC-1	1					83
(*)	(*)	(*)	(*)	(*)	Table MT-252(*)/TXC-1	1	32	22	37	4.7	86
(*)	(*)	(*)	(*)	(*)	Paper, direct recording	1					
(*)	(*)	(*)	(*)	(*)	Paper, direct recording, hectograph process	1					
(*)	(*)	(*)	(*)	(*)	Cord CD-1018	1			120		
(*)	(*)	(*)	(*)	(*)	Cord CD-1019	1			96		
(*)	(*)	(*)	(*)	(*)	Cable assembly, special purpose	1			66		
(*)	(*)	(*)	(*)	(*)	Cable assembly, special purpose, electrical	1			6		
(*)	(*)	(*)	(*)	(*)	Clips, alligator	2					
(*)	(*)	(*)	(*)		Coupler, induction, UC	1	4 $\frac{1}{4}$	2	6		18
(*)	(*)	(*)	(*)	(*)	Cover, dust (transceiver)	1					
(*)	(*)	(*)	(*)	(*)	Cover, dust (power unit)	1					
	(*)	(*)	(*)	(*)	Loudspeaker LS-11	1	4	2	4		
			(*)	(*)	Lamp LM-52	1					
(*)	(*)	(*)	(*)	(*)	Weighing scale 2 to 24 ounces (avoirdupois)	1					
(*)	(*)	(*)	(*)	(*)	Screw driver	1			2 $\frac{1}{2}$		
			(*)	(*)	Wrench, Allen #6	1					
(*)	(*)	(*)	(*)		Wrench, TL-567/U	1					
(*)	(*)	(*)	(*)	(*)	TM 11-2258	2					
(*)	(*)	(*)	(*)	(*)	Tube extractor	1					
				(*)	Fuse, 3 amperes	6					
					Blower and dust filter assembly including filter bag	5					
					Can of activated carbon	2					
					Flexible hose	1					
					Hose clamps	2					

Note. This list is for information only. See appropriate supply publications for information pertaining to requisitioning of spare parts.

## 8. Description of Components

a. *Facsimile Transceiver TT-1(\*)/TXC-1.* All models of Facsimile Transceiver TT-1(\*)/TXC-1 are similar in size, weight, and appearance. They differ slightly in the number of operating controls and in certain circuit features. The transceiver is mounted on a steel chassis 34 $\frac{5}{8}$  inches long, 17 $\frac{5}{8}$  inches deep, and 10 $\frac{3}{4}$  inches high. Tubular guards, 1 inch in diameter, are welded to each end of the chassis to serve as carrying handles and to protect the equipment when it is turned on its

side, back, or top for inspection and repair. Mounted to the chassis are the motor assembly, bearings that support the lead screw and drum, fork oscillator unit, regulator unit, signal and phasing circuit components, transmitting optical system, receiving optical system, indicating meters, and various other components. The power supply connection plug and the panel supporting the operating controls and terminal panel also are mounted on the chassis. Operating controls are located on a sloping portion of the front

panel, behind the drum. The terminal panel for input and output connections is on the right side of the panel assembly. An output jack for connecting an external speaker in the voice communication (talk-back) circuit is located on the left side of the panel assembly on all transceiver units except Facsimile Transceiver TT-1/TXC-1 (refer to note in *g* below). The transceiver is provided with a metal base cover, which is attached to the chassis with machine screws and which has four metal supporting feet. Metal covers that protect the motor and clutch assembly and the rear, side, and top of the transceiver are held in place with slide fasteners. A canvas cover is provided to protect the transceiver from dust when it is not in use. Facsimile Transceiver TT-1F/TXC-1 has an exhaust duct that runs from the vicinity of the stylus to the right rear of the chassis.

*b. Rectifier Power Unit PP-86(\*)/TXC-1.* The rectifier power unit (fig. 3) is constructed on a metal chassis 12 inches long by 10 inches wide by 2½ inches high (some chassis are 3 inches high). All components are mounted on top of the chassis. The chassis is shielded and protected by a metal ventilated top cover and by a bottom cover plate with four metal feet. Two cables emerge from an opening in the top cover; one is a power cable for connecting to the ac line, and the other is a power cable that is terminated in a Jones plug attached to the transceiver. The rectifier power unit is provided with a canvas cover for protection during shipping. Rectifier Power Unit PP-86E/TXC-1 has a receptacle (J10) with a ground stud for the dust removal blower cord. The fuse holder which housed the spare fuse in all former models of the rectifier power unit now is used for the 3 amp 3AG dust removal blower fuse (XF4, fig. 156).

**Caution:** Do not leave the cover on the power unit during operation or components will overheat.

*c. Table MT-252(\*)/TXC-1.* The collapsible metal table (fig. 1) furnished with each facsimile set is 32 inches high, 22 inches deep, and 37 inches long. It can be disassembled by removing the metal screws in the legs and side braces. The table has a masonite top on which Facsimile Transceiver TT-1(\*)/TXC-1 is mounted. A bottom shelf supports Rectifier Power Unit PP-86(\*)/TXC-1 and auxiliary equipments Converter CV-2(\*)/TX and Exciter Unit 0-5(\*)/FR (when used). A hole in the top of the table permits easy connection of the power cable plug to the transceiver. It also permits passage of the flexible

hose for the dust removal system from the duct on the transceiver to the blower and canister assembly which is clamped to the bottom shelf and right-hand leg brace of the table (fig. 2). A metal drawer is provided for storing a supply of recording paper.

*d. Photographic Equipment* (fig. 4). Photographic Equipment PH-549/TXC-1 is supplied with Facsimile Transceiver AN/TXC-1\*. This equipment consists of one thermometer, four Bottles PH-22, and four trays.

*e. Cords and Leads.* The following cords and leads (fig. 5) are furnished with Facsimile Set AN/TXC-1(\*):

- (1) Cord CD-1018, a 10-foot, two-conductor, shielded, rubber-jacketed cord, terminated at each end with Plug PL-55. It is used in making input connections to the transceiver.
- (2) Cord CD-1019 an 8-foot, three-conductor, shielded, rubber-jacketed cord, terminated at each end with Plug PL-68. It is used in making output connections from the transceiver.
- (3) A 5½-foot test lead terminated on one end with a two-prong plug that fits the 1V and 6V jacks on the coupling coil (fig. 6), and on the other end with two alligator clips. It is used in making input and output connections to the transceiver when a high-level signal is required for certain types of wire lines.
- (4) A 6-inch test lead a two-conductor cord terminated at one end with PL-55, and at the other end with two alligator clips. It is used in connecting a wire line into the RADIO RCVR jack during reception of high-level signals.

*f. UC Coupling Unit.* This coupling unit (fig. 6) is used to make input and output connections to the transceiver through a telephone receiver, and is supplied with a phosphor-bronze clamp for holding it in place on the telephone handset. The primary impedance is 600 ohms and matches the output of the transceiver. The full 10-ohm secondary provides an open-circuit output of 6 volts; the secondary also has a 2-ohm tap that provides an open-circuit voltage of 1 volt. The secondary terminates in two female type plugs for selection of the desired level. This unit is not used with Facsimile Transceiver TT-1F/TXC-1.

*g. Loudspeaker LS-11* (fig. 5). This loudspeaker is used in the talk-back circuit of Facsimile

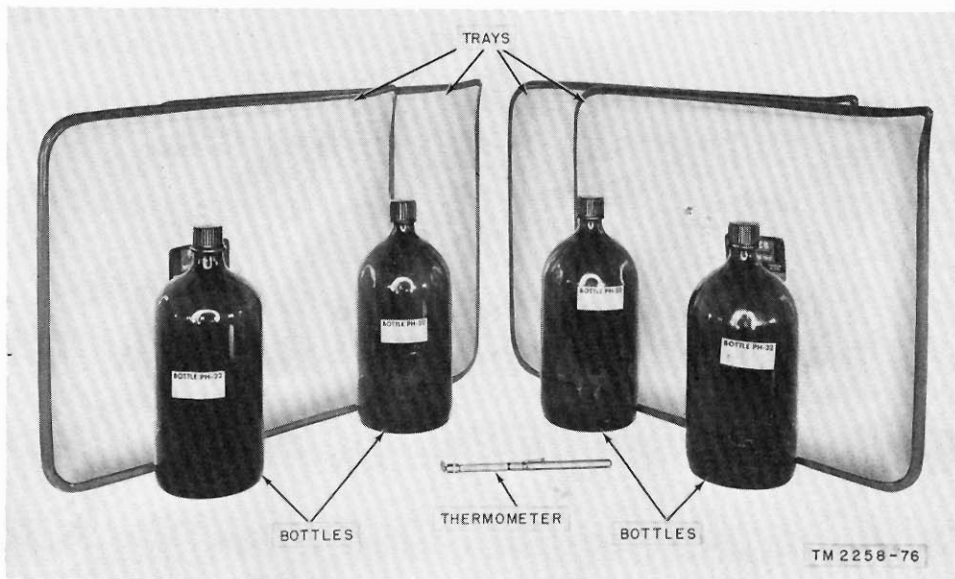


Figure 4. Photographic equipment PH-549/TXC-1.

Sets AN/TXC-1B, -1C, and -1D, and also in Facsimile Set AN/TXC-1A when modified according to MWO SIG 11-375B-(1), Modification of Facsimile Set AN/TXC-1A to Provide an External Loudspeaker (par. 11).

*Note.* Facsimile Set AN/TXC-1 contains no talk-back circuit. MWO SIG 11-2258-1, Modification of Facsimile Sets AN/TXC-1 to Provide an Audible Signaling Device, gives instructions for connecting a jack to add a loudspeaker to Facsimile Set AN/TXC-1. The tones that precede a facsimile transmission will then be audible to the receiving operator. This external speaker is of the permanent magnetic type, 4 inches in diameter, with a 250-ohm output transformer to match the impedance of the transceiver talk-back circuit. The speaker and transformer are contained within a steel box which is 4½ inches high, 4½ inches wide, and 2 inches deep. This box is fitted with a mounting clamp.

*h. Recording Paper* (fig. 5). Two special types of direct recording paper are furnished for use with Facsimile Transceiver TT-1(\*)/TXC-1.

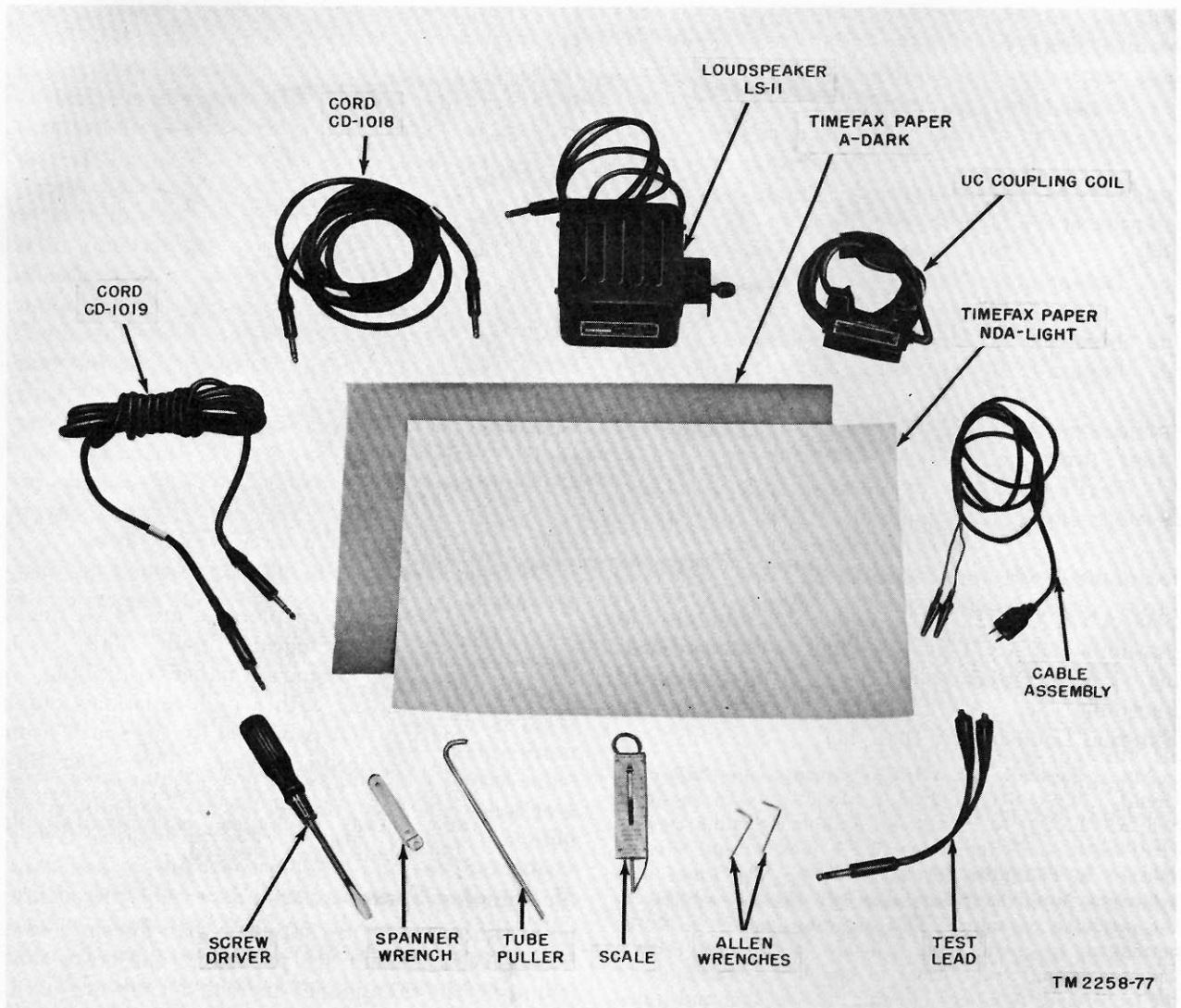
- (1) Teledeltos paper or Timefax NDA is used in direct recording. They are dry papers with dark undercoating and light top coating. The coating is burned off by a spark from the transceiver stylus during the direct recording operation. The paper furnished is 12 inches by 18½ inches in size. Four packages, each containing 250 sheets of Teledeltos grade H, or Timefax NDA, are furnished. This paper is nonduplicating.
- (2) Timefax A paper is used in the direct recording process when multiple copies

of the received pictures are to be made with a hectograph pad. This is a specially prepared paper containing a dye coating with a high-resistance outer coating that is burned by the spark from the transceiver stylus. The paper furnished is 12 inches by 18½ inches in size. Two packages, each containing 250 sheets, are furnished.

## 9. Running Spares

Running spares are supplied with Facsimile Set AN/TXC-1(\*) and are packed in the crate that contains the component in which they are used. Spares are supplied for all normally expendable items such as tubes, pilot lamps, and fuses. The following is a list of the items supplied:

- 1 tube, type 1B46
- 1 tube, type 1B47
- 1 tube, type 6AC5GT/G
- 3 tubes, type 7C5
- 1 tube, type 7C7
- 3 tubes, type 7L7
- 2 tubes, type 7N7
- 1 tube, type 7S7
- 1 tube, type 5Z3
- 1 tube, type 884
- 2 tubes, type RMA R1130B
- 2 tubes, type 1635
- 1 tube, type 1645
- 4 tubes, type 5651
- 1 tube, type 5652
- 1 tube, type 5879



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Figure 5. Facsimile set AN/TXC-1\*, accessories.

- 100 styluses
- 12 fuses,  $\frac{1}{8}$ -ampere
- 5 fuses, 3-ampere
- 6 fuses, 5-ampere
- 6 lamps, 6 to 8 volts
- 2 sets split nuts
- 1 reduction worm gear\*
- 1 motor shaft worm gear\*
- 1 worm gear taper screw\*
- 4 filter bags
- 1 can of activated carbon

## 10. Differences in Models

Facsimile Sets AN/TXC-1, -1A, -1B, -1C, and -1D are similar in purpose, operation, and ap-

\*Gears not replaceable in Facsimile Sets AN/TXC-1, -1A, and -1B.

pearance. The later models (1A, 1B, 1C, and 1D) include a number of improvements which are listed in *a* through *g* below and in table I.

*a. Fork Oscillator Unit.* This unit is unsealed in Facsimile Set AN/TXC-1, serial numbers up to 105, on Order No. 2695-MPD-45. Starting with serial number 105, a sealed fork oscillator unit is used in the transceiver of the remaining models of Facsimile Set AN/TXC-1 and in all models of Facsimile Sets AN/TXC-1A, -1B, -1C, and -1D. The sealed fork unit includes a revised tube line-up. The fork is sealed against changes in pressure and humidity. Details of both sealed and unsealed units are given in paragraphs 69 and 70. The two units are interchangeable electrically and mechanically.



Figure 6. UC coupling coil.

b. *Talk-Back Circuit.* Facsimile Set AN/TXC-1 includes no talk-back circuit. Communication between transmitting and receiving operators is by means of external telephones, which may use the same wire or radio circuit as the facsimile equipment. All models of Facsimile Set AN/TXC-1A originally were produced with a built-in loudspeaker serving as both microphone and loudspeaker, the change-over of function being accomplished by a STANDBY-MON-TALK switch on the front panel. All models of Facsimile Set AN/TXC-1A modified by MWO SIG 11-375B-(1) contain a jack into which an external Loudspeaker LS-11 may be plugged to improve the quality of voice communication. Refer to figure 165 for details of this modification. All models of Facsimile Sets AN/TXC-1B, -1C, and -1D have only the external Loudspeaker LS-11. The built-in speaker and speaker transformer used in Facsimile Transceiver TT-1A/TXC-1 have been eliminated. The STANDBY-MON-TALK switch is used on Facsimile Sets AN/TXC-1A, -1B, -1C, and -1D.

c. *Synchronous Motor.* Motors on all four equipments are interchangeable mechanically, but motor parts are not interchangeable. All are synchronous motors, controlled by an 1,800-cps signal generated in the fork oscillator unit, and

are increased in power by the motor amplifier tubes. Facsimile Transceivers TT-1B/TXC-1 through TT-1F/TXC-1 each use an induction-type start motor that operates from a 115-volt, 60-cps source supplied by Rectifier Power Unit PP-86A/TXC-1, PP-86B/TXC-1, or PP-86E/TXC-1. Facsimile Transceivers TT-1/TXC-1 and TT-1A/TXC-1 originally used start motors that operated from a 9-volt, 60-cps supply, applied when the START button on the transceiver is pressed. Starting voltage for these motors was supplied by Rectifier Power Unit PP-86/TXC-1. All of the 9-volt KBA-1 motors in Facsimile Transceivers TT-1/TXC-1 and TT-1A/TXC-1 were replaced with 115-volt ac induction-type KBA-2 motors similar to those used in the later models, and Rectifier Power Unit PP-86/TXC-1 was modified to supply the 115-volt starting voltage. These modifications were accomplished by application of MWO SIG 11-2258-2, Modification of Facsimile Sets AN/TXC-1 and AN/TXC-1A to Eliminate Motor and Tube Failure and to Improve Voltage Regulation.

d. *Resistance and Capacitance Values.* Values of resistors and capacitors in Facsimile Set AN/TXC-1 were based on old standards. The

value of numerous individual components has changed slightly in Facsimile Sets AN/TXC-1A, -1B, -1C, and -1D to conform with American War Standards values. In most cases, the differences are less than the plus or minus 10 percent tolerances of the components, and are of no significance.

*e. Rectifier Power Unit PP-86(\*)/TXC-1.* Rectifier Power Unit PP-86/TXC-1, a component of Facsimile Sets AN/TXC-1 and AN/TXC-1A, will operate Facsimile Transceiver TT-1/TXC-1 or TT-1A/TXC-1, but will not operate Facsimile Transceiver TT-1B/TXC-1, TT-1C/TXC-1, TT-1D/TXC-1, TT-1E/TXC-1, or TT-1F/TXC-1, unless modified. Rectifier Power Units PP-86A/TXC-1 and PP-86B/TXC-1 will operate Facsimile Sets AN/TXC-1 through AN/TXC-1C. Rectifier Power Unit PP-86E/TXC-1 will operate all models of the transceiver and has provision for supplying power for the dust removal blower supplied with Facsimile Set AN/TXC-1D.

*f. Table MT-252A/TXC-1.* Tables MT-252A/TXC-1 and MT-252B/TXC-1 are the same size as Table MT-252/TXC-1. The construction and method of dismantling the three models differ slightly.

*g. Transceiver Differences.* Facsimile Transceiver TT-1F/TXC-1 is similar to Facsimile Transceiver TT-1E/TXC-1 as listed in table I, except in the following respects. In the -1F model, an automatic stop circuit is incorporated to de-energize the synchronous drive motor and ground the amplified facsimile signal at the end of drum travel. A duct has been placed to help remove dust from the vicinity of the stylus during the record direct operation. The paper clamp bar is plastic insulated to reduce spurious rf radiation generated as the stylus passes across the clamp bar. This model includes R64, R71, R107, and R318 controls. Differences in Facsimile Transceivers TT-1/TXC-1 through TT-1E/TXC-1 are listed in table I.

## 11. Modifications

Certain parts of Facsimile Set AN/TXC-1(\*) and Rectifier Power Unit PP-86/TXC-1 have been modified as listed below. To determine whether or not the equipment in use has been modified, indications will be shown by markings on modified equipment or by the schematic diagrams found on the bottom plates of transceivers and rectifier power units.

*a. MWO SIG 11-375B-(1)* (fig. 165).

(1) The purpose of this modification is to provide an external loudspeaker for Facsimile Transceiver AN/TXC-1A.

(2) The talk-back circuit is the part modified.

*b. MWO SIG 11-2258-1.*

(1) The purpose of this modification is to make audible to the receiving operator the tones that precede a facsimile transmission. This is accomplished by re-wiring the existing standby circuit to include a loudspeaker in Facsimile Set AN/TXC-1.

(2) The receiving and standby circuits are modified.

*c. MWO SIG 11-2258-2* (fig. 163).

(1) The purposes of this modification are:

(a) To eliminate motor failure by providing a new and improved type motor.

(b) To install a meter and a control for proper motor current indication and adjustment.

(c) To prevent possible failure of amplifier tubes by installing a voltage dropping resistor and replacing tubes type 6AG5GT/G with tubes type 1635.

(d) To prevent fluctuation of the input signal to the motor power tubes by incorporating an adjustment control, indicating meter, and new regulating lamp in the regulated B+ voltage circuit.

(2) Facsimile Transceivers TT-1/TXC-1 and -1A and Rectifier Power Unit PP-86/TXC-1 are the major items affected.

*d. MWO SIG 11-2258-3.*

(1) The purpose of this modification is to provide a replaceable worm and gear, when the worm and worm gear become worn out, and when it is necessary to replace the decoupling springs between the synchronizing and start rotors with springs of improved design.

(2) Facsimile motor model KBA-1 is the major item affected.

*e. MWO SIG 11-2258-5.*

(1) The purpose of this modification is to provide an improved type motor and new mounting studs to be used on Facsimile Transceiver TT-1C/TXC-1 as made by Espey.

(2) Facsimile Transceiver TT-1C/TXC-1 is the major item affected.

Table I. Transceiver Differences

Item	Facsimile transceiver					
	TT-1/TXC-1	TT-1A/TXC-1	TT-1B/TXC-1	TT-1C/TXC-1	TT-1D/TXC-1	TT-1E/TXC-1
Fork oscillator unit.	Unsealed fork on serial No. up to 105 on Order No. 2695-MPD-45; sealed on later models.	Sealed.	Sealed.	Sealed.	Sealed.	Sealed.
Talk-back circuit.	None (external Loudspeaker LS-11 added by MWO SIG 11-2258-1 for monitoring tones preceding facsimile transmissions).	Internal speaker; external Loudspeaker LS-11 added by MWO SIG 11-375B-(1).	External Loudspeaker LS-11 only. R98 added as stabilizer.	External Loudspeaker LS-11 only. R98 added as stabilizer.	External Loudspeaker LS-11 only. R98 added as stabilizer.	External Loudspeaker LS-11 only. R98 added as stabilizer.
Start motor.	9-volt ac brushes. (110-volt ac no brushes MWO SIG 11-2258-2). Type KB-1.	9-volt ac brushes. (110-volt ac no brushes MWO SIG 11-258-2). Type KB-1.	115-volt ac brushes 110-volt eliminated. Type KBA-1.	115-volt ac brushes eliminated. Type KBA-1 or KBA-2.	115-volt ac brushes eliminated. Type KBA-1 or KBA-2.	115-volt ac brushes eliminated. Type KBA-1 or KBA-2.
Drum friction mechanism.	No (Yes, MWO SIG 11-2258-2).	No (Yes, MWO SIG 11-2258-2).	Yes.	Yes.	Yes.	Yes.
Motor fuse.	None (on front panel MWO SIG 11-2258-2).	On front panel.	On front panel.	On front panel.	On front panel.	On front panel.
Meters.	Single DB METER. (MOTOR CURRENT (M2) and RB+ voltmeter (M3) added by MWO SIG 11-2258-2).	Single DB METER. (MOTOR CURRENT (M2) and RB+ voltmeter. (M3) added by MWO SIG 11-2258-2).	1. DB METER M1. 2. MOTOR CURRENT meter M2. 3. RB+ voltmeter M3.	1. DB METER M1. 2. MOTOR CURRENT meter M2. 3. RB+ voltmeter M3.	1. DB METER M1. 2. MOTOR CURRENT meter M2. 3. RB+ voltmeter M3.	1. DB METER M1. 2. MOTOR CURRENT meter M2. 3. RB+ voltmeter M3.
Motor amplifier output tubes V5 and V6.	6AC5GT/G. (1635, MWO SIG 11-2258-2).	6AC5GT/G. (1635, MWO SIG 11-2258-2).	1635.	1635.	1635.	1635.
Record output amplifier tube V14.	6AC5GT/G. (1635, MWO SIG 11-2258-2).	6AC5GT/G. (1635, MWO SIG 11-2258-2).	1635.	1635.	1635.	1635.
Reference voltage regulator V25.	R1160, or JAN-1B46 (5651, MWO SIG 11-2258-2).	R1160 or JAN-1B46 (5651, MWO SIG 11-2258-2).	5651.	5651.	5651.	5651.
Pilot lamp on front panel.	No.	Yes.	Yes.	Yes.	Yes.	Yes.
RB+ potentiometer.	None (R96 MWO SIG 11-2258-2).	None (R96 MWO SIG 11-2258-2).	R96.	R96.	R96.	R96.
Motor current potentiometer.	None (R93 MWO SIG 11-2258-2).	None (R93 MWO SIG 11-2258-2).	R93.	R93.	R93.	R93.
Cathode potentiometer for tube V13.	None.	None.	R97.	R97.	R97.	R97.
Condensing lens.	Yes.	Yes.	Yes.	No.	No.	No.
Photo cell V24.	1645.	1645.	1645.	1645.	5652.	5652.
Selector switch for 30- or 60-rpm operation of drum.	None.	None.	None.	None.	S4.	S4.
Multivibrator V26.	None.	None.	None.	None.	7N7.	7N7.
First signal amplifier.	None.	7C7.	7C7.	7C7.	7C7.	5879.
Rectifier power unit.	Any power units will function with any set providing Rectifier Power Unit PP-86/TXC-1 is modified in accordance with MWO SIG 11-2258-2.					

f. *MWO SIG 11-2258-6* (fig. 162).

- (1) The purpose of this modification is to provide an exhaust system for the removal of dust and odors when recording on Teledeltos or Timefax A paper.
- (2) Facsimile Sets AN/TXC-1, -1A, -1B, and -1C are the major items affected.

g. *MWO SIG 11-2258-7* (fig. 170).

- (1) The purposes of this modification are:
  - (a) To eliminate excessive wear of the screw and damage to the drum by providing an automatic end of copy stop. The

automatic stop actuates a relay that removes the power to the synchronous motor and grounds the input to the signal amplifier when the drum reaches the end of travel.

- (b) To eliminate shock hazard by providing a protective guard and insulating sleeves for the synchronous motor terminals.
- (2) Facsimile Sets AN/TXC-1, -1A, -1B, and -1C are the major items affected.

# CHAPTER 4

## AUXILIARY EQUIPMENT

### Section I. CONVERTER CV-2C/TX

#### 59. Block Diagram

(fig. 27)

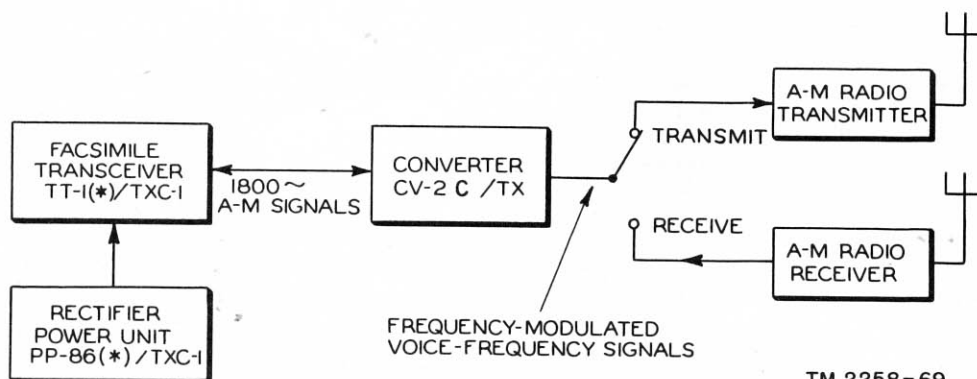
Converter CV-2C/TX is an electronic device which is used between the facsimile transceiver and the radio circuit in transmission and reception of facsimile signals by the subcarrier frequency modulation (SCFM) method. Figure 27 is a block diagram that shows Converter CV-2C/TX connected in an am SCFM application. When transmitting, the converter changes 1,800-cps am signals from the facsimile transceiver into frequency-modulated voice-frequency signals which modulate a conventional radiotelephone transmitter. The transmitted signal consists of a rf carrier on which is superimposed a constant level af modulation. The frequency of the af modulation is varied in accordance with the facsimile signals. When receiving, the radio signal is picked up by a conventional am communication receiver. The receiver output, which is fed into the converter, consists of voice-frequency signals. The converter changes these signals into am signals, which are fed to the receiving facsimile transceiver. This type of circuit is less affected by fading and interference than transmissions using conventional am. Complete information on Converter CV-2C/TX is contained in TM 11-2252A.

#### 60. Application

*a. Connections.* Locate Facsimile Transceiver TT-1(\*)/TXC-1 and Converter CV-2C/TX so that the front panel controls of both units can be operated easily. The tuning eye on the front panel of the converter must be in view.

(1) *Normal operation.*

- Insert the input cord of Converter CV-2C/TX into the LINE jack on the right-hand end of Facsimile Transceiver TT-1(\*)/TXC-1.
- Insert the connector plug of the ac power cord into the socket (PS1) on the rear panel of the converter.
- Insert the plug on the other end of the ac cord into a 115-volt, 60-cps, ac source.
- Insert one end of Cord CD-1019 into the RADIO XMTR jack on the front panel of the converter and the other end to the carbon microphone input of the radio transmitter.
- Strap the GND and adjacent LINE terminal on the terminal board at the rear of the converter.
- Plug one end of Cord CD-1018 into the RADIO REC. jack (J5) on the front



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Figure 27. Am-SCFM transmission and reception of facsimile signals, block diagram.

panel of the converter. Plug the other end of this cord into the high-level audio output termination on the radio receiver.

*Note.* When Converter CV-2C/TX is used in a radio facsimile circuit, the talk-back circuit of Facsimile Transceiver TT-1(\*)/TXC-1 is inoperative. However, carbon Microphone T-17 (or equivalent) and Headset HS-30 (or equivalent) are plugged into the converter CARBON MIC. and MONITOR jacks, respectively, for voice communication and transmitter control.

(2) *Remote operation of radio transmitter.*

If the radio transmitter is remotely located, use shielded two-conductor cable in place of Cord CD-1019 to connect it to the radio transmitter.

(a) If the distance is great, connection to the radio transmitter must be made from the LINE terminals at the rear of the converter. Remove the strap that connects the GND terminal and the adjacent LINE terminal, and use a telephone line or field wire to connect the output of the converter to the radio transmitter.

(b) In either case, the line must be limited to a length which will provide equal modulation of the radio transmitter at the 1,500- or 3,000-cps shift limits.

*Note.* The microphone plugged into the converter cannot be used when connection is made from the LINE terminals. A separate line to the transmitter must be used under these conditions.

*b. Transmitting.* Adjust Facsimile Transceiver TT-1(\*)/TXC-1 in accordance with the type transmission to be made. Refer to paragraph 17.

(1) Operate power ON-OFF switch S4 to the ON position, REC.-SEND switch S1 to the SEND position, SET MIN.-SET MAX. switch S5 to SET MAX., SEND-STANDBY switch S6 to STAND-

BY, and 1500 2300-1800 3000 switch S2 to 1500 2300 position.

(2) With maximum signal being delivered by Facsimile Transceiver TT-1(\*)/TXC-1, adjust *FREQ. ADJ.* control R2 for maximum closure of the tuning eye on Converter CV-2C/TX (+2 db reading on the DB METER).

(3) Operate the SET MIN.-SET MAX. switch to the SET MIN. position.

(4) Set Facsimile Transceiver TT-1(\*)/TXC-1 to deliver minimum signal. The tuning eye on the converter should be at maximum closure. If not, adjust the transceiver CONTRAST control for maximum closure.

(5) Return the SET MIN.-SET MAX. switch to the SET MAX. position. The tuning eye should be maximum closure with a +2 db reading on the DB METER. If not, readjust the *FREQ. ADJ.* control.

(6) Operate the SEND-STANDBY switch to the SEND position.

(7) Adjust SEND GAIN control R21 on Converter CV-2C/TX for proper modulation of the transmitter.

(8) The transceiver and converter now are adjusted properly. Proceed as outlined in paragraph 23c and d.

*c. Receiving.*

(1) Operate REC.-SEND switch S1 to the REC. position.

(2) Tune in the carrier signal (maximum indication on receiver). Adjust the rf and audio controls for a clear signal with minimum background noise.

(3) When the transmission begins (maximum and minimum signals), adjust Facsimile Transceiver TT-1(\*)/TXC-1 for normal operation as outlined in paragraph 28.

(4) If correct contrast cannot be obtained, increase the radio receiver audio output by advancing the audio gain control.

## Section II. EXCITER UNIT O-5B/FR

### 61. General

Exciter Unit O-5B/FR is an electronic device which is used in place of the oscillator section of a cw transmitter to excite the transmitter with frequency-shift signals according to a varying dc or audio voltage which is fed into the exciter unit.

The exciter unit is used with Converter CV-2C/TX to permit transmission of frequency-shift facsimile signals over a cw radiotelegraph transmitter when using Facsimile Set AN/TXC-1(\*). Complete information on Exciter Unit O-5B/FR is contained in TM 11-2205A.

Note. Exciter Unit O-5/FR or O-5A/FR can be used with Converter CV-2/TX or CV-2A/TX after minor changes have been made in the circuit. Complete information on Exciter Units O-5/FR and O-5A/FR is contained in TM 11-2205.

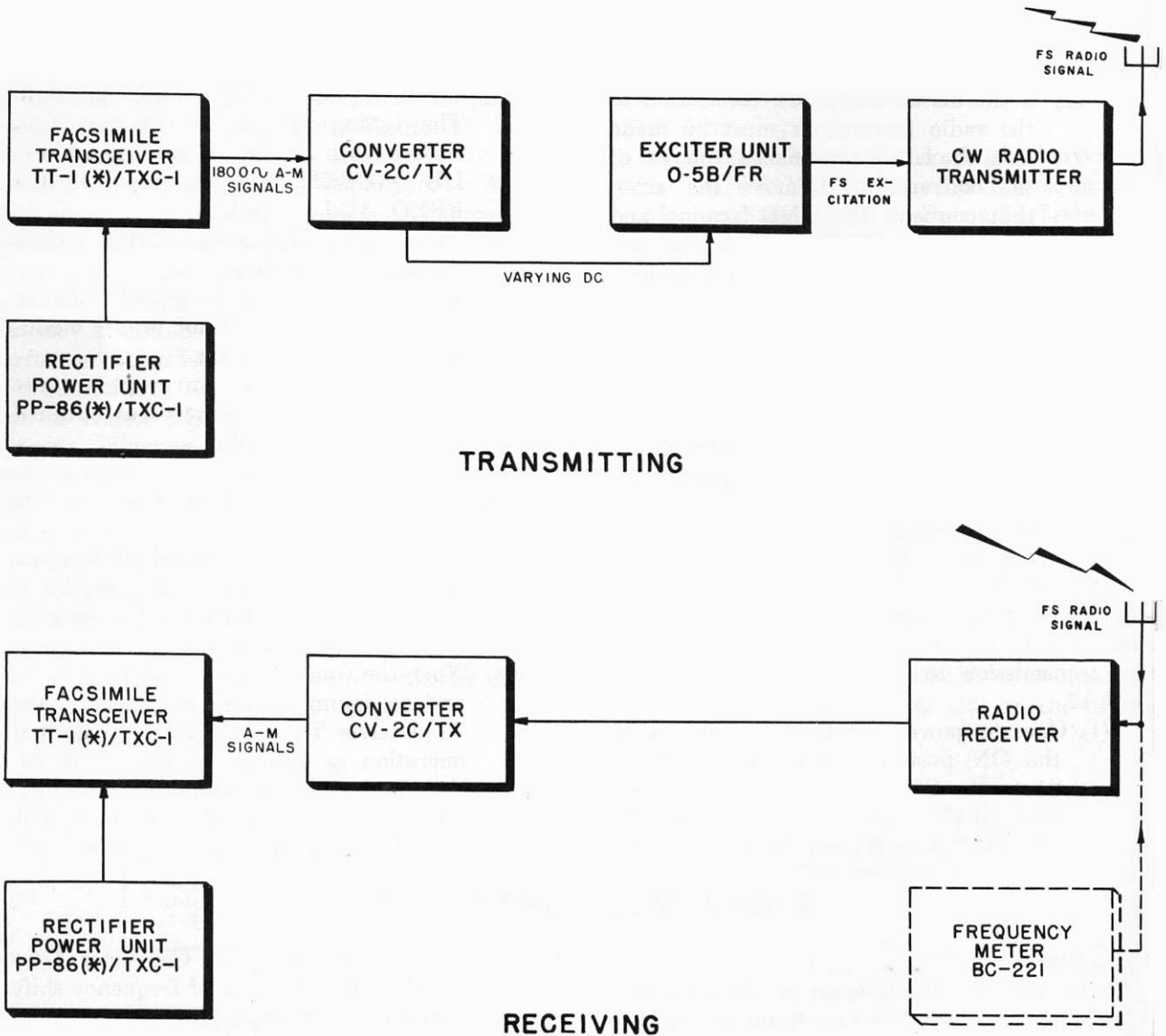
### 62. RF Oscillator O-86/FRT

RF Oscillator O-86/FRT is similar to Exciter Unit O-5/FR or O-5A/FR that already has been modified for use with Converter CV-2/TX or CV-2A/TX. It can be used in place of Exciter Unit O-5/FR or O-5A/FR without modification. Refer to TM 11-2205 for complete information on RF Oscillator O-86/FRT.

### 63. Application

Figure 28 is a block diagram which shows how Converter CV-2C/TX and Exciter Unit O-5B/FR are used in frequency-shift transmission and reception of facsimile signals.

a. *Transmitting.* When transmitting, the 1,800-cycle am signals from Facsimile Transceiver TT-1(\*)/TXC-1 are fed into Converter CV-2C/TX, where they are rectified. The output from the converter is in the form of a varying dc signal that represents the envelope of the modulated, 1,800-cycle carrier. This varying dc signal is applied to the oscillator control tube in Exciter



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Figure 28. Frequency-shift transmission and reception of facsimile signals, block diagram.

Unit O-5B/FR. The output of the exciter unit is a frequency-shift rf signal which shifts above and below a center frequency by an amount proportional to the varying dc signal produced by rectification of the 1,800-cps signal. This serves as the rf excitation for the cw transmitter. The transmitter output is a frequency-shift signal, shifting a total of 800 cycles between picture white and picture black; 400 cycles above and 400 cycles below the assigned carrier frequency (a total of 1,200 cps,  $\pm 600$  cycles under the old shift limits) (fig. 29). Frequency-shift transmissions are advantageous because they are affected less by fading and interference than transmissions using conventional am and, in addition, the rf channel width required is less than when using am SCFM.

*b. Receiving.* When receiving frequency-shift facsimile signals, a conventional communication receiver that has a crystal-controlled temperature compensated hf oscillator and a stabilized beat-frequency oscillator should be used. Radio Receiver R-390/URR or Radio Receivers BC-779, BC-794, and BC-1004 modified in accordance with MWO SIG 11-866-4, Modification of Radio Receivers BC-779-(\*), BC-794-(\*), and BC-1004-(\*), to provide for improved stability of the high frequency oscillator circuit, are suitable in this application. However, a conventional receiver may be used to pick up the frequency-shift radio signal with a stable rf signal applied to its input from Frequency Meter BC-221. Therefore, the beat-frequency oscillator will not be required. In both methods, the incoming signal is heterodyned with the local oscillator signal to produce an output in the af range swinging from 1,500 to 2,300 cps or from 1,800 to 3,000 cps, depending on which shift limit is used (fig. 29). These fm voice-frequency signals are applied to the input of Converter CV-2C/TX which converts them into am af signals which are fed into the input of the receiving facsimile transceiver.

## 64. Operation

After the equipments have been connected as shown in figure 28, apply the following operating instructions when using an 800-cps shift (1,500 to 2,300 cps). Detailed instructions for connecting and adjusting Exciter Unit O-5B/FR are given in TM 11-2205A. Audio Oscillator TS-382A/U and Electronic Multimeter TS-505/U may be used to assist in properly setting up the equipment for operation.

*a. Setting Controls.* The following procedure sets the controls of the facsimile transceiver, the converter, and the exciter unit to produce the required carrier shift:

- (1) With maximum signal of +2 db from the facsimile transceiver, adjust the exciter unit and the **FREQ. ADJ. (R2)** control of the converter so that the transmitter output frequency is 400 cps above the assigned carrier frequency. Check by using Audio Oscillator TS-382A/U and tuning for zero beat.
- (2) With minimum signal from the facsimile transceiver, adjust the facsimile transceiver until the transmitter output is 400 cps below the assigned carrier frequency. This will require adjustment of the **CONTRAST** and **GAIN** controls of the facsimile transceiver. While adjusting transceiver controls, check again to be sure that the maximum transceiver signal is maintained at +2 db. Do not make any further frequency control adjustments on the exciter unit or the converter. Use Audio Oscillator TS-382A/U to see that the change from minimum facsimile signal to maximum facsimile signal increases the transmitter output frequency by 800 cps. To do this, leave the oscillator tuned as described in (1) above, and measure the frequency of the beat note produced by the beating of the oscillator signal with the transmitter output signal. Use the beat note method to measure the frequency of this 800-cycle note either on a direct reading af meter or by comparison with an 800-cycle signal from an audio oscillator.
- (3) To check the accuracy of the adjustments and to assist the receiving operator in adjusting the station, send a series of maximum and minimum level signals (high- and low-frequency signals), followed by a series of phasing pulses. Repeat this sequence two or three times before actually transmitting the copy.

*Note.* Allow at least  $\frac{1}{2}$ -hour warm-up period before making operating adjustments.

*b. Transmitting.* Negative transmission of facsimile copy is preferable, although copy may be transmitted either negative or positive. The

controls of the facsimile transceiver are used in their normal manner to select either positive or negative transmission as required. In either case, adjust the system so that a minimum amplitude signal output from the facsimile transceiver produces the lowest output frequency from exciter Unit O-5B/FR and a maximum amplitude signal output from the facsimile transceiver produces the highest output frequency from Exciter Unit O-5B/FR. The frequency and frequency deviation at the output of Exciter Unit O-5B/FR will be multiplied by the radio transmitter frequency multipliers, but the transmitter output frequency must be kept to a maximum frequency swing of 800 cps. This requires that the transmitter output frequency be 400 cps below the assigned carrier frequency when a minimum facsimile signal is sent, and 400 cps above the assigned carrier frequency when a maximum facsimile signal is sent. The actual output frequency of the transmitter will vary between these two extremes from instant to instant in accordance with the brightness or darkness of the transmitted copy being scanned on the facsimile transceiver drum. The following chart shows the actual transmitter output frequencies for minimum and maximum facsimile signals (when the assigned rf carrier is 7,500 kilocycles (kc)), when either positive or negative facsimile transmissions are being made:

Assigned carrier frequency	Amplitude of facsimile signal	Transmitter output frequency
7,500 kc-----	Minimum-----	7,499.6 kc.
7,500 kc-----	Maximum-----	7,500.4 kc.

*c. Receiving* (fig. 29). The receiving station must be adjusted so that the highest received frequency is interpreted as a maximum amplitude signal at the receiving facsimile transceiver, and the lowest received frequency is interpreted as a minimum amplitude signal at the receiving facsimile transceiver. To obtain this desired relationship, the output of the receiver hf oscillator must be on the hf side of the received rf signal. This will produce an af beat note (2,300 cps) at the receiver output when the received rf signal is at its lowest frequency, and a low-frequency beat note (1,500 cps) at the output of the receiver when the received rf signal is at its highest frequency. The received carrier frequencies are the same as those assumed for the transmitting station, and

they produce the desired facsimile signals at the input of the facsimile transceiver. The received carrier swings over a total of 800 cycles and normal heterodyning action of the beat-frequency oscillator in the receiver produces a receiver output which varies from 2,300 to 1,500 cps. The low-pass filter in Converter CV-2C/TX changes the 2,300-cps signal into a minimum amplitude output signal and the 1,500-cps signal into a maximum amplitude signal. Received carrier frequencies between the low extremity (7,499.6 kc) and the high extremity (7,500.4 kc) produce amplitudes in between minimum and maximum, which the receiving facsimile transceiver prints as intermediate shades of gray between black and white. If the receiver hf oscillator output is set to the low side of the received carrier, the received picture tones will be reversed. A positive transmission will be received as a negative, and vice versa.

Frequency of received carrier	Frequency of receiver hf oscillator	Frequency of receiver output	Amplitude of recovered facsimile signal
7,499.6 kc----	7,501.9 kc---	2,300 cps---	Minimum.
7,500.4 kc----	7,501.9 kc---	1,500 cps---	Maximum.

- (1) When using receivers that do not use crystal-controlled conversion, front-end insertion of a highly stable heterodyning signal is a necessity for satisfactory results. The constant frequency output of Frequency Meter BC-221 is ideal as a substitute for crystal-controlled hf oscillator injection. The following procedure sets Frequency Meter BC-221 to the high side of the received carrier:
  - (a) Tune in the facsimile signal and zero beat the frequency meter to this signal.
  - (b) Reduce the receiver rf gain control for a reading of approximately 1 on the receiver S-meter.
  - (c) Couple the output of Frequency Meter BC-221 to the receiver at the receiver antenna terminal.
  - (d) Without disturbing the receiver rf gain control, adjust the injection level by adjusting the coupling to the receiver for a full-scale reading on the receiver S-meter (direct coupling, although not recommended, may be necessary).

*Note.* The exact level will vary slightly for different receivers and can be determined best by the overall performance of the system.

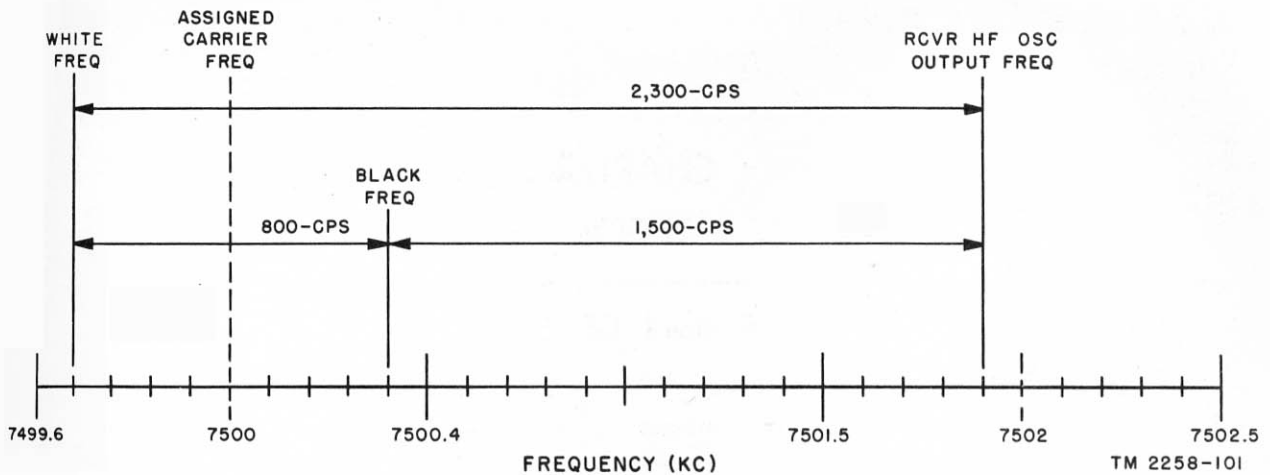


Figure 29. Receiver rf relationships during reception of frequency-shift facsimile transmissions.

- (e) With the transmitting operator sending a steady minimum signal (7,499.6 kc in this example), adjust Frequency Meter BC-221 until the af output signal from the radio receiver is exactly 2,300 cps. Check to see that the frequency meter is tuned 2,300 cps (2.3 kc) above the incoming signal (to 7,501.9 kc in this example). Check this by varying the frequency meter dial through zero beat and by turning it to the highest frequency setting of the two settings that will produce a 2,300-cps receiver output signal. Check the accuracy of the 2,300-cps signal either on a direct reading of meter or by comparing it with the signal from an audio oscillator.
- (f) With the transmitting operator sending a steady maximum signal (7,500.4 kc in this example), and without changing the setting of the frequency meter, the receiver output signal should be exactly 1,500 cps. This can be checked with the direct reading of meter or by

comparison with the signal from an audio oscillator.

*Note.* The facsimile transceiver produces an audible oscillation which is highly accurate. This can be used for checking the 1,800-cycle signal from the receiver when the 1,800- to 3,000-cps shift limit is used.

- (g) Check the accuracy of the adjustments by listening to the series of maximum signals, minimum signals, and phasing pulses which the transmitter operator will repeat two or three times.
- (h) When phasing pulses are being received on positive transmissions (maximum signal on black), the radio receiver output will be a steady 1,500-cps tone, interrupted once each second by a 2,300-cps pulse. On negative transmissions, during phasing, the radio receiver output will be a steady 2,300-cps tone, interrupted once each second by a 1,500-cps pulse.
- (2) Set up Facsimile Transceiver TT-1(\*)/TXC-1 as outlined in paragraph 28.