DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-2222

This manual supersedes TM 11-2222, 24 August 1945, including 1, 14 September 1948; and rescinds TM 11-2221, 5 March 1945, and TB 11-2221-1, 13 January 1948.

RECEIVING TRANSMITTER DISTRIBUTORS TT-12/FGQ-1, TT-13/FGC-1 AND TRANSMITTER DISTRIBUTORS TT-21/FG, TT-25/FG TT-26/FG, TT-52/FG

(INCLUDING OTHER TELETYPE MODEL 14 TRANSMITTER DISTRIBUTORS)



DEPARTMENT OF THE ARMY • *MAY 1951*

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WASHINGTON 25, D. C., *29 May 1951*

TM 11-2222 is published for the information and guidance of all concerned.

[AG 413.48 (14 May 51)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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TECHNICAL MANUAL

RECEIVING TRANSMITTER DISTRIBUTORS TT-12/FGQ-1, TT-13/FGQ-1 AND TRANSMITTER DISTRIBUTORS TT-21/FG, TT-25/FG, TT-26/FG, TT-52/FG

(Including Other Teletype Model 14 Transmitter Distributors)

TM 11-2222
CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *23 August 1955*

TM 11-2222, 29 May 1951, is changed as follows:

The third line of the title is changed to read: TT-12/FGQ-1, TT-13/FGQ-1.

CHAPTER 1
INTRODUCTION

Note. (Added) The XD200 type transmitter distributor purchased on Order No. 29647-Phila-53 is the same as the XD86 type transmitter distributor procured on previous orders with the exception of the governor contact filter.

14. Differences in Units

* * * * * * *

c. Receiving Transmitter Distributors.

* * * * * * *

(2) *Principal motor differences in model 14 (XD82 and XD86) transmitter distributors.*

	Motor		Gear		Pinion		Target		Speed		Tuning fork		Governor contact filter
Code No.	Part No.	Type	Part No.	Teeth	Part No.	Teeth	Part No.	Spots	Opm	Motor rpm	Part No.	Vps	Part No.
*		*	*		*			*		*		*	
XD86FR---	6708 or 107151	A-c series-governed.	77036	40	77034	7	7105	10	368. 1 *404	2102 2308	130628 104984	87. 6 96. 19	105475
[d] **XD200FR--**	**122295 or 107151**	**A-c series-governed.**	**77036**	**40**	**77034**	**7**	**7105**	**10**	**368. 1** ***404**	**2102** **2308**	**130628** **104984**	**87. 6** **96. 19**	**106160**

* * * * * * *

[d] (Added) Code designation used by manufacturer for XD86FR procured on Order No. 29647-P-53 with alternate motor and a different governor contact filter.

19. Power Supply

All model 14 * * * under different conditions.

* * * * *

d. (Added) *Transmitter Distributor TT–52/FG in Use with 230 or 460-volt Power Supply.* A double-wound transformer is used with the TT–52/FG (XD200) supplied on Order No. 29647–Phila–53. The transformer (fig. 18.1) permits operation of the 115-volt transmitter distributor motor when the power source is 230-volts, 50 to 60 cps ac or 460-volts, 50 to 60 cps ac.

(1) *Preparation.* Position the transformer as indicated by the marking "THIS END UP." Fasten it in place with screws passed through the mounting brackets (fig. 18.1). The transformer should be clear of obstructions so that the vents may function properly to avoid overheating. Either or both of the knockout plugs may be removed to allow for conduit connections. Strip, clean, and tin the ends of the wires to be connected.

(2) *Connections.*

(*a*) *230-volt input.* Connect one side of the line leads to the two wires that pass through the card holes marked H1 and H3 and the other line lead to the two wires that pass through the card holes marked H2 and H4 (A, fig. 18.2). Connect one of the load leads to wires marked X1 and X3 and the other load lead to wires marked X2 and X4. Solder and tape all connections.

(*b*) *460-volt input.* Connect one side of the line leads to the wire marked H1 and the other side of the line leads to the wire marked H4. Connect wires marked H2 and H3 together. The wires marked X2 and X3 and one load lead should be connected together and the remaining load lead may be connected to either X1 or X4. Solder and tape all connections.

27. Operating Checks and Adjustments

Transmitter distributors are * * * not been changed:

* * * * *

a. (Superseded) *Motor Speed.* Because motor speed is an important factor in teletypewriter communications, all new or recently installed equipment containing motors must be checked

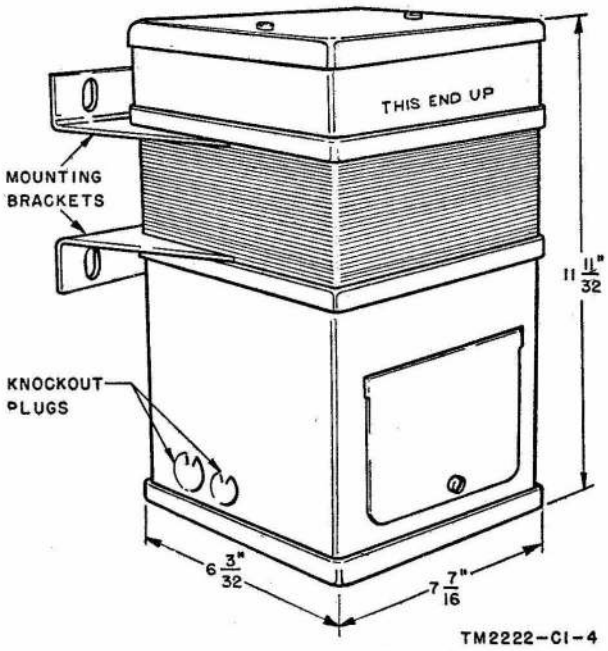
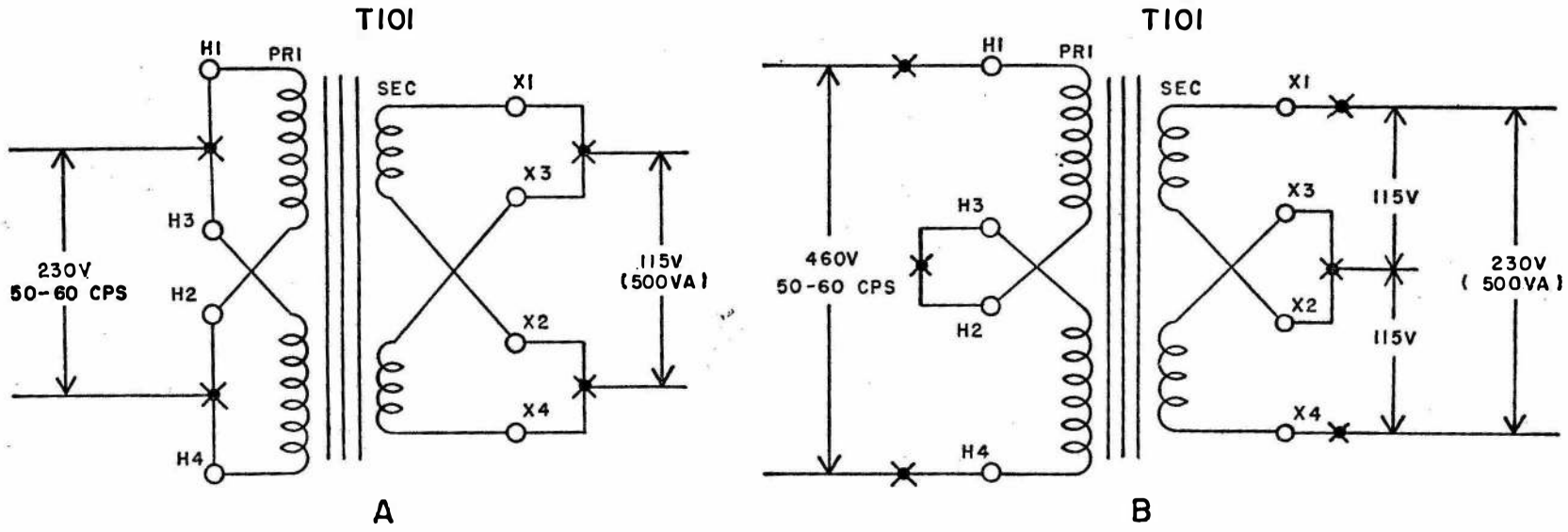


Figure 18.1. (Added) *Double-wound transformer 105152.*

for proper motor speed. This check must not be overlooked by maintenance personnel during installation of the equipment and also during periodic routine maintenance visits.

(1) *Preliminary check.* Before starting the motor of a new or recently installed transmitter-distributor, hand-turn the motor in the direction of normal rotation (distributor brushes moving clockwise) to check for binding or excessive backlash between the motor pinion and the main shaft gear, and for binding in other parts of the unit. Do not turn the motor backward; this may cause the brushes to catch on the commutator segment edges and may result in broken or bent brushes.

(2) *Motor speed check.* When governed-type motors are used, a tuning fork (par. 24) is necessary for periodic checks of the motor speed by qualified maintenance personnel. To check the motor speed, tap the tuning fork lightly to make it vibrate. Hold the fork so that the shutters are close to the eye and, with the target illuminated, view the target through the openings of the vibrating shutters. If the motor is running at the correct speed, the target spots will appear stationary. If the motor spe[illegible] is too fast, the spots will appear to



LEGEND ✕ STRIPPED ENDS OF WIRING TO BE SPLICED, SOLDERED AND TAPED

NOTES:

PRIMARY LINE		CONNECTIONS
230V	A	CONNECT H1 AND H3 TO ONE LINE LEAD CONNECT H2 AND H4 TO OTHER LINE LEAD
460V	B	CONNECT H2 AND H3 TOGETHER SOLDER AND TAPE THE CONNECTION CONNECT H1 TO ONE LINE LEAD CONNECT H4 TO OTHER LINE LEAD

SECONDARY LOAD		CONNECTIONS
115V	A	CONNECT X1 AND X3 TO ONE LOAD LEAD CONNECT X2 AND X4 TO OTHER LOAD LEAD
230V	B	CONNECT X2 AND X3 TOGETHER SOLDER AND TAPE THE CONNECTION CONNECT X1 TO ONE LOAD LEAD CONNECT X4 TO OTHER LOAD LEAD
115-230V	B	SAME AS ABOVE AND CONNECT NEUTRAL TO X2 AND X3 FOR 115V

TM2222-CI-3

Figure 18.2. (Added) *Transformer wiring diagram.*

moving in the direction of motor rotation. If the motor speed is too slow, the spots will appear to move in the opposite direction.

(3) *Speed adjustment.* To adjust the speed of a governed motor in a transmitter-distributor, stop the motor and rotate the speed adjusting wheel (fig. 73) slightly; check the speed after each adjustment until the correct speed is obtained.

Note. Incorrect motor speed adjustment is possible with a tuning fork if the speed is set at any multiple of one fourth of the desired speed. Under this incorrect condition, the target spots also will appear stationary. The experienced technician can recognize the difference in sound made by a motor running at an incorrect multiple. Test transmission of a message to a printer operating at the correct speed is another method used to determine whether a motor is running at any multiple of the desired speed.

* * * * *

95. Stop-Arm Pilot Screws

(**A**, fig. 53)

* * * * *

b. Requirements.

(1) The upper edges of the stop arm should overlap the upper edge of the stop cam .002 to **.050 inch.**

* * * * *

Figure 53. .002" to .030" is changed to read: .002" to .050".

97. Stop-Arm Spring Tension

(**B**, fig. 53)

* * * * *

103.1. Tape Retaining Lid Latch-Wearing Strip

(fig. 57.1)

(Added)

a. Preparation. No preparation is required for this adjustment.

b. Requirements.

(1) With a .003-inch thickness gage placed between the retaining lid and the front guide rail on the tape-guide plate, the latch should not close freely.

(2) With the gage removed and the retaining lid held against the front guide rail on the tape-guide plate, the latch should operate freely under its own spring tension.

c. Adjustment. Increase or decrease the number of shims installed under the tape transmitter top plate between the latch-wearing strip and the top plate.

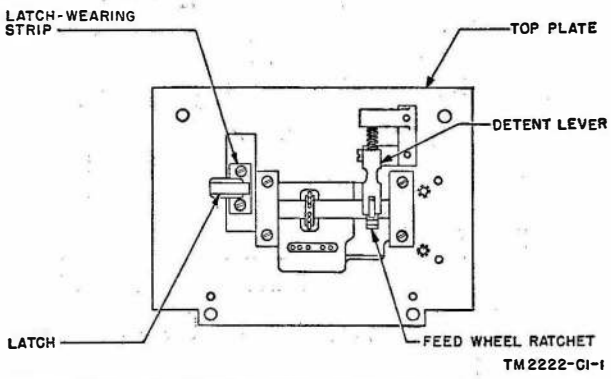


Figure 57.1. (Added) *Latch-wearing strip under top plate.*

119. Tight-Tape Stop (Auto-Stop) Mechanism

(figs. 65, 66, and 67)

* * * * *

b. Requirements.

(1) *New style* (fig. 65).

(*a*) When the contacts are held closed by the contact operating post, the bottom of the tight-tape stop lever should be horizontal **(front end approximately 1 inch below horizontal if the transmitter-distributor operates faster than the unit that prepares the tape)** and the tight-tape stop shaft should protrude approximately 1/16 inch beyond the clamp (A, fig. 65).

* * * * *

120. Carbon Distributor Brushes

(fig. 68)

a. (Superseded) *Preparation.* Turn the main shaft until the stop cam lug is engaged fully by the stop arm. Receiving transmitter distributors should be further prepared by lining up the leading edge of the No. 5 segment with point 60 on the orientation scale. To do this, loosen the three screws that mount the outer distributor disk and aline the adjustable disk.

b. Requirements.

(1) The point of * * * the distributor disk. **The brushes should remain within the edges of their respective rings throughout a complete revolution of the main shaft.**

* * * * *

122.1. Operating Cam Adjustment (Receiving Only)
(Added)

a. Preparation. Turn the main shaft until the lug of the stop cam is against the end of the stop arm (fig. 50). Loosen the mounting screws of the outer distributor disk and move the adjustable disk until the brush rests in the middle of the small segment to the left of the stop segment. Tighten the screws.

b. Requirements. The operating cam must be positioned to meet the following requirements.

(1) The No. 1 contacts must close when the leading edge of the brush reaches the middle of the third segment to the left of the stop segment.

(2) The marking contacts will not open until the trailing edge of the brush has passed beyond the end of the No. 5 segment at least .060 inch.

c. Adjustment. Loosen the operating cam mounting screws (fig. 20), position the cam, and then retighten the screws and check for the requirement.

Note. When moving the adjustable disk, be careful that the brush does not catch in the slots between the segments.

127.1. Governor Contacts
(figs. 44, 73, and 77)
(Added)

a. Preparation. Remove the target and governor cover (par. 83*c*). The governor also may be removed for inspection or repair. Place a small piece of white paper in back of the contacts to aid in viewing them. Adjust the retractile spring tension adjusting screw to cause the contacts to make or to its limit.

b. Requirements.

(1) The contact edges should be alined with the top contact directly above the bottom contact.

(2) The contact surfaces should be parallel and meet squarely when the contacts are just touching (fig. 77).

Note. Check between the edges of the contacts with a .002-inch (smaller if available) gage to see whether the gage enters equally on all sides or does not enter.

(3) The surface of the contacts should be free of buildups.

c. Adjustment.

(1) To line up the edges (fig. 44), loosen the hinge mounting screw and position the floating contact.

(2) To obtain squareness from right to left (fig. 44) (if the governor shell has elongated mounting holes), loosen the mounting screws and position the fixed contact bracket. To obtain squareness from front to back, twist the floating contact hinge by applying pressure to the arm near the contact.

(3) Replace worn contacts and springs with new ones. Do not attempt to make temporary adjustment by filing, stoning, or burnishing the old contacts or by changing the position of the contacts, except for emergency operation.

132. Governor Brush-Spring Plate Bracket
(fig. 74)

This adjustment does not apply to synchronous motors or motors equipped with peripheral ring governors.

* * * * *

b. Requirements.

(1) (Superseded) A line established by the center of the outer disk and the center of one of the brushes should pass through some portion of the other brush (B, fig. 74).

* * * * *

136. Governor Contacts
Rescinded.

138. Starting Switch

Note. This adjustment applies * * * out of adjustment.

* * * * *

b. Requirements.

(1) Hook an 8-ounce scale in the end of the brush-holder spring. A pull of **2 to 2½ ounces** (60-cycle motors) or **1¾ to 2 ounces** (50-cycle motors) should be required to stretch the spring to a length of 5 inches.

* * * * *

Figure 137. The following note is added:

THE 8539 SCREWS WITH THEIR ASSOCIATED 2191 LOCKWASHERS AND THE 80335 PLATE ARE

NOT INCLUDED AS PART OF THE 106865 ASSEMBLY.

Figure 137. 86853 or 106865 governor brush bracket assembly (same for all types).

Figure 141. 2986 BUSHING-BAKELITE is changed to read: 93035 BUSHING-BAKELITE. 122–276 STRAP is changed to read: 125013 STRAP.

Figure 143. 77911 BRUSH CAP is changed to read: 70873 BRUSH-CAP. 2247 WASHER is changed to read: 7002 WASHER. 2191 LOCKWASHER is added under 7002 WASHER. 2247 WASHER (BETWEEN BRACKET AND FILTER ASSEMBLY) is added under 84990 SCREW. 33–110 SCREW is changed to read: 110434 SCREW. 103–27 WASHER is changed to read: 125011 WASHER. 95326 MOTOR-GOVERNOR FILTER UNIT ASSEMBLY is changed to read: 95326 or 106160 MOTOR-GOVERNOR FILTER UNIT ASSEMBLY. The following note is added to the lower illustration:

THE 70873 BRUSH CAP, 1266 SCREW, 7002 WASHER, AND 2191 LOCKWASHER ARE NOT INCLUDED AS PART OF THE 106160 ASSEMBLY.

Figure 147. 1100 SCREW is changed to read: 116992 SCREW. 2449 LOCKWASHER is changed to read: 104451 LOCKWASHER. 126–123 BUSHING RUBBER is changed to read: 125016 GROMMET. 34–59 NUT is changed to read: 125009 NUT.

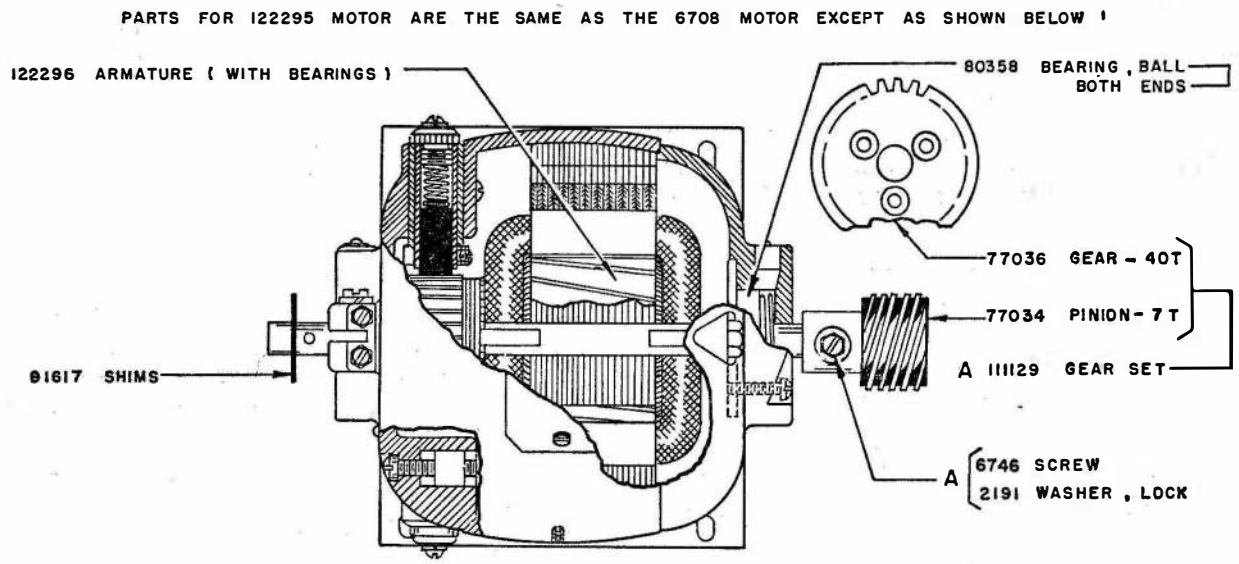


Figure 147.1. (Added) *122295 ac series motor.*

BY ORDER OF THE SECRETARY OF THE ARMY:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

OFFICIAL:

JOHN A. KLEIN,
Major General, United States Army,
The Adjutant General.

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Ft & Cp (2)
Gen & Br Svc Sch (5) except Sig Sch (25)
Gen Depots (2) except Atlanta Gen Depot (None)
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Sig Depots (20)
POE (2)
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Sig Fld Maint Shops (3)
Sig Lab (5)
Mil Dist (1)
Units organized under following TOE's:
11-7R, Sig Co Inf Div (2)
11-16R, Hq & Hq Co, Sig Bn, Corps or Abn Corps (2)
11-57R, Armd Sig Co (2)
11-127R, Sig Rep Co (2)
11-128R, Sig Depot Co (2)
11-500R (AA-AE), Sig Svc Org (2)
11-557R, Abn Sig Co (2)
11-587R, Sig Base Maint Co (2)
11-592R, Hq & Hq Co, Sig Base Depot (2)
11-597R, Sig Base Depot Co (2)
32-51R, Hq & Hq Co, Comm Recon Gp (2)
32-55R, Comm Recon Bn (2)
32-57R, Comm Recon Opr Co (2)

NG: State AG (6); units—same as Active Army except allowance is one (1) copy to each unit.
USAR: None.
For explanation of abbreviations used, see SR 320-50-1.

U. S. GOVERNMENT PRINTING OFFICE: 1959

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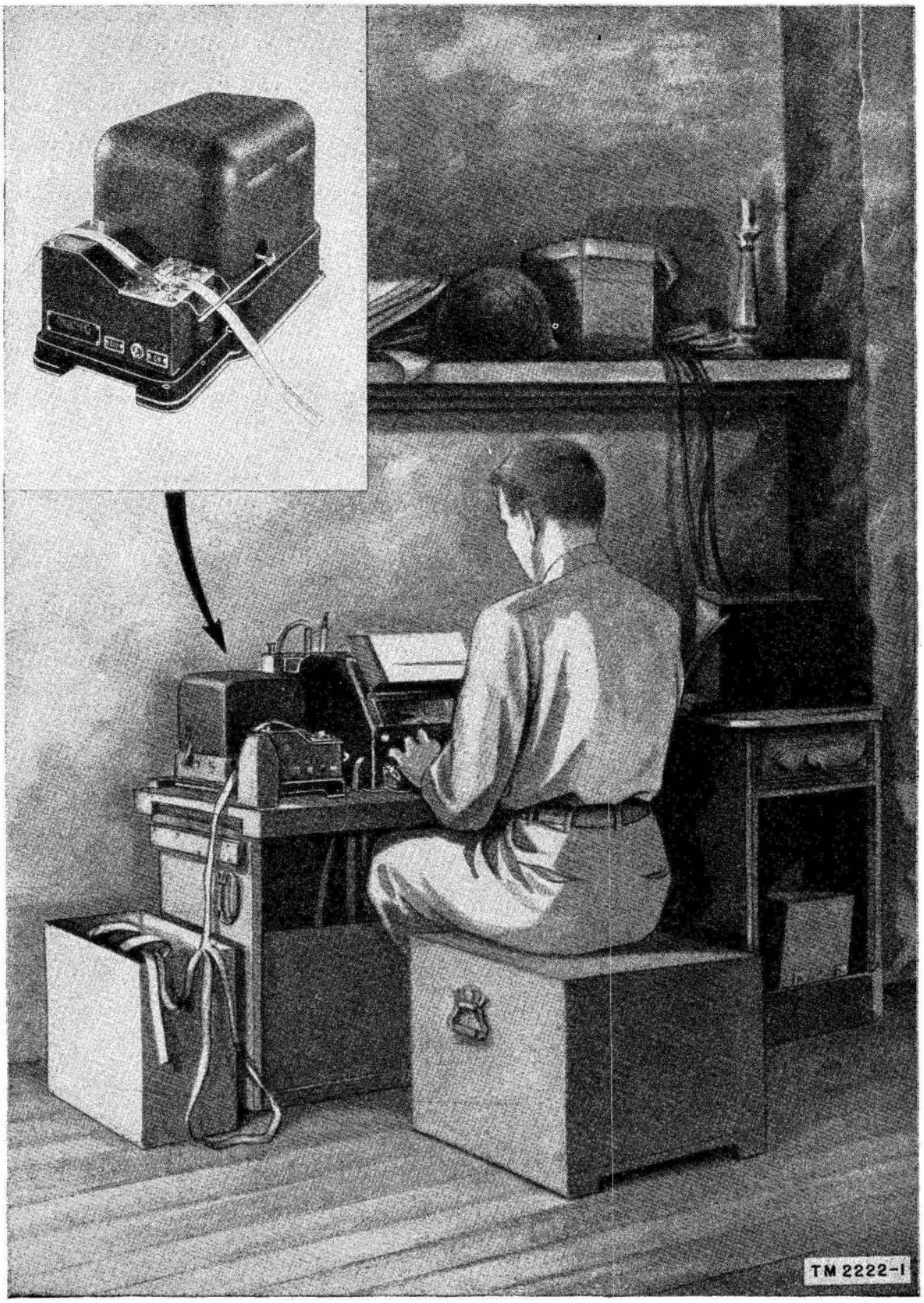


Figure 1. Transmitter distributor, Teletype model 14, in position for operation.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this equipment is issued. They contain information covering the description, installation, operation, maintenance and repair of transmitter distributors, Teletype model 14.

b. This manual is prepared in six chapters and two appendixes. The first appendix contains a list of pertinent references and the second appendix contains an identification table of parts.

2. Forms and Records

The following standard 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 (Army), NAV DEPT SERIAL 85P00 (Navy), and AFR 71–4 (Air Force).

b. DA AGO 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. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

d. DA AGO Form 419, Preventive Maintenance Checklist for Signal Corps Equipment, will be prepared in accordance with instructions on the back of the form.

e. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Use

a. GENERAL. Teletype model 14 transmitter distributors are motor-driven devices which translate code perforations recorded in paper tape into electrical impulses and then transmit these impulses as five-unit, start-stop teletypewriter code to one or more receiving stations. Electrical impulses produced by a transmitter distributor are suitable for transmission by either d-c (direct-current) wire lines, carrier, or radio channels. The model 14 transmitter distributors are designed particularly for automatic operation when large amounts of traffic must be handled with a minimum of delay. There are several types of model 14 transmitter distributors. In many ways, they are mechanically and electrically alike and many of their parts are interchangeable. Some of these transmitter distributors have Signal Corps nomenclature; others are known by the manufacturer's code designations.

b. TYPES XD82 AND XD86. The types of model 14 transmitter distributors in most general use are the XD82 and XD86 types. Signal Corps nomenclature of Transmitter Distributor TT–52/FG has been given the XD86 type, which is used with fixed plant equipment. Type XD82 has been adapted for military tactical use. Both types normally are used as parts of complete teletypewriter sets or systems and are not intended for use as independently operated units. Some XD82 type transmitter distribu-

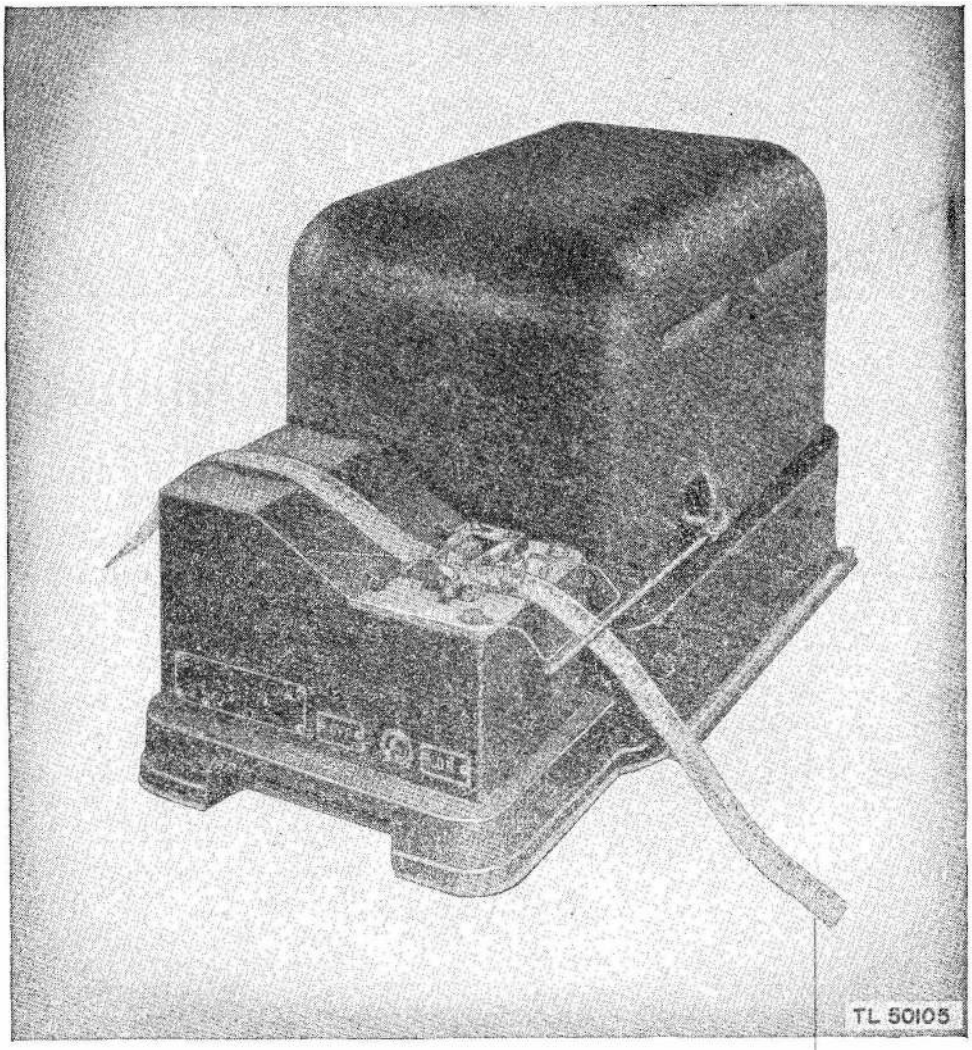


Figure 2. Model 14 transmitter distributor, complete with cover.

tors are modified to include a break-lock mechanism. When so modified they are known as XD99 type transmitter distributors. Paragraph 4*c* describes this mechanism. Figure 134 shows parts used in this modification.

c. TWO-CHANNEL TYPES.

(1) Two-channel transmitter distributors, also model 14's, bear Signal Corps nomenclature of Transmitter Distributor TT-26/FG. These transmitter distributors have manufacturer's code designations of XD91 and XD93.

(2) These transmitter distributors utilize a circuit in order to provide two-channel transmission of messages from two separate perforated tapes (either chadless or fully perforated) at 368.1 opm (operations per minute) on each channel. At receiving stations, standard start-stop page-printing teletypewriters or reperforators connected in series are used to receive messages sent by the transmitter distributors.

(3) By arrangement of the transmitting mechanism in a two-channel transmitter distributor, it is possible to transmit two messages, alike or different, simultaneously, or to send only a single message, using only one of the channels while the second channel remains idle.

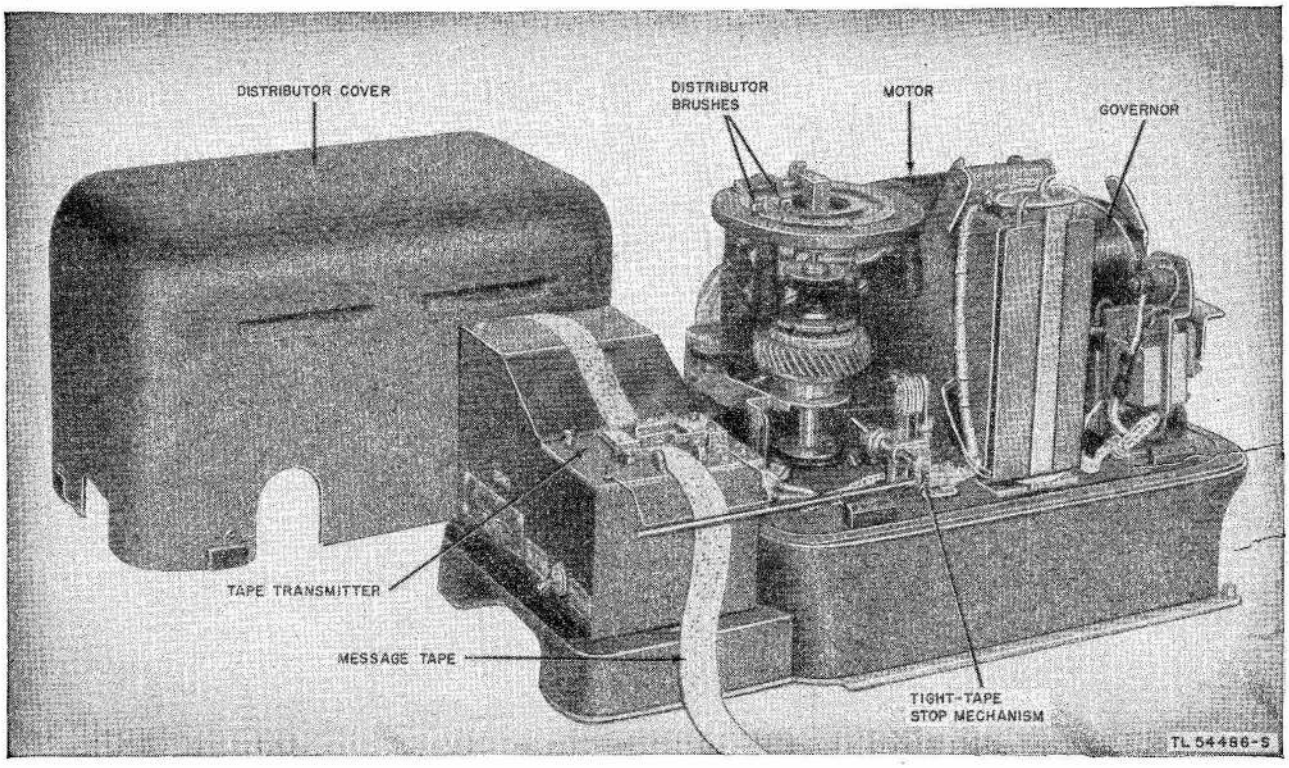


Figure 3. Transmitter Distributor TT-52/FG (type XD86), cover removed.

d. RECEIVING TRANSMITTER DISTRIBUTORS.

(1) In addition to the transmitter distributors mentioned in *b* and *c* above, there are several other transmitter distributors known as model 14's. These are receiving transmitter distributors (fig. 5) and vary only slightly. The principal differences are in their motor arrangements. Their basic Teletype code designations are XD79, XD95, and XD100. Suffixes such as EZ, EY, EX, and GW indicate the types of motors used with the transmitter distributors. The various types of motor arrangements operate the main shaft of a transmitter distributor at 420 rpm with a transmitting speed of 368 opm.

(2) An EZ motor arrangement includes a 110-volt, 60-cycle a-c synchronous motor operating at 1,800 rpm. Such a motor is equipped with a 7-tooth pinion and 30-tooth gear on the main shaft. An EY motor arrangement has a 110-volt, 60-cycle, series-wound, a-c governed motor operating at 2,102 rpm, and the motor is equipped with a 10-spot target, a 300-ohm governor resistor, a 9-tooth pinion and a 45-tooth gear on the main shaft. An EX motor arrangement has the same characteristics as an EY arrangement, except that it has a 110-volt, shunt-wound, d-c governed motor equipped with a 500-ohm governor resistor. A GW motor arrangement is like the EY arrangement, but includes a 106160 filter.

(3) Two of this type transmitter distributors, Transmitter Distributor TT-21/FG and Transmitter Distributor TT-25/FG, are identical with the exception that a tape-feed suppression mechanism is included in TT-21/FG. TT-21/FG is known under the manufacturers' code designations of XD-100GW and 14ABM-1. TT-25/FG is known under the manufacturers' code designations of XD95GW and 14ABM.

(4) Receiving Transmitter Distributor TT-12/FGQ-1 and Receiving Transmitter Distributor TT-13/FGQ-1 are

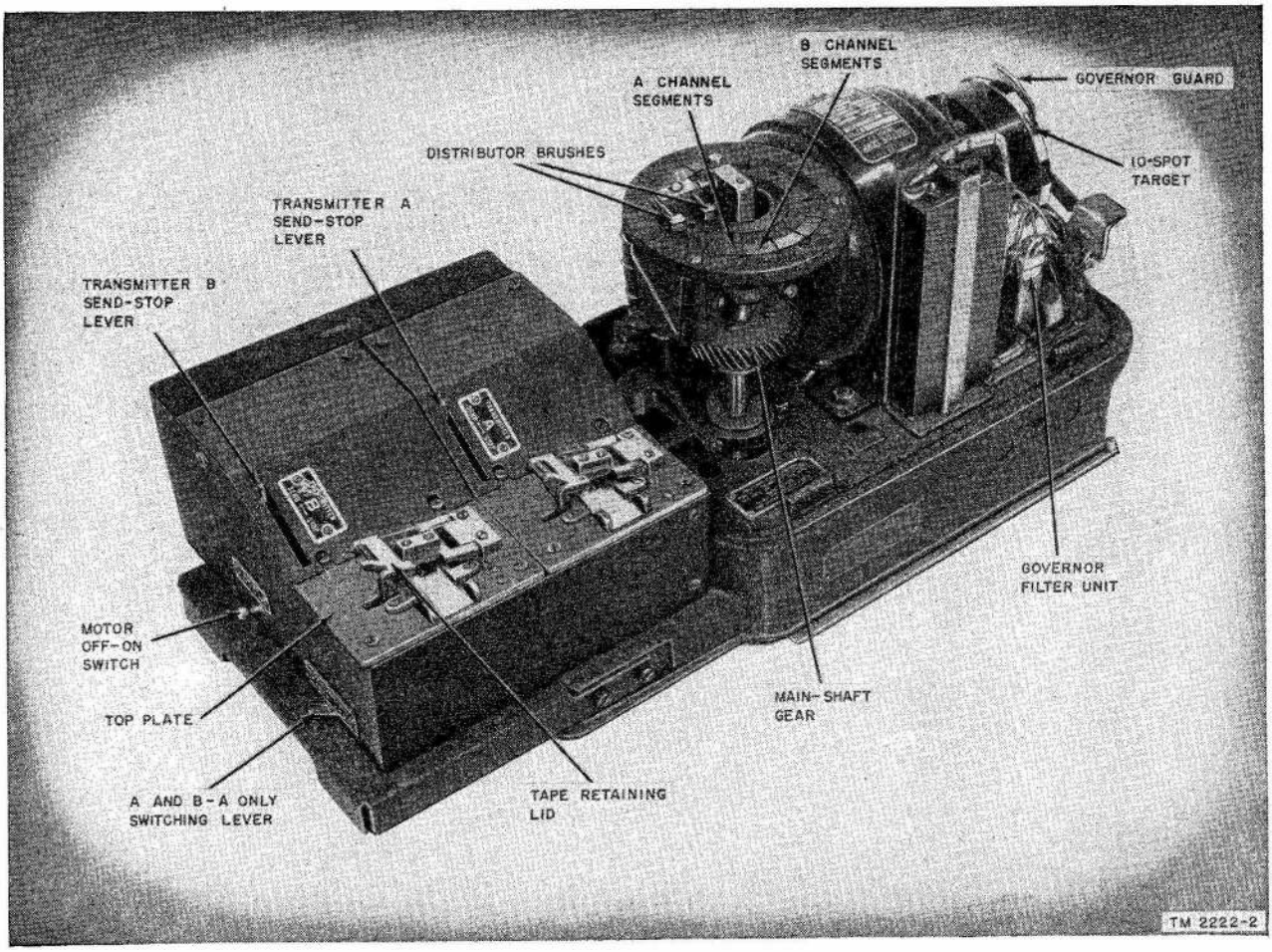


Figure 4. Transmitter Distributor TT-26/FG (two-channel), cover removed.

other receiving type transmitter distributors. TT-12/FGQ-1 has an EY motor arrangement and bears the manufacturers' code designations of XD79EY and 14AB, and TT-13/FGQ-1 has an EZ motor arrangement and bears the manufacturers' code designations of XD79EZ and 14AA.

(5) All these transmitter distributors translate code combinations from fully perforated or chadless tape into electrical impulses which are set up locally and then are combined with impulses from an external source. The combined signals then are used in teletypewriter transmitting and receiving circuits in which cryptographic equipment is installed. Differences in motor arrangements of the different transmitter distributors are shown in paragraph 14.

Note. XD in the manufacturer's code designation of a transmitter distributor indicates that the equipment is manufactured by Teletype Corporation. 14AB, 14AD, etc., in the manufacturer's code designation, indicates that the equipment has been provided in accordance with Western Electric Company specifications.

4. System Application

Model 14 transmitter distributors are used in teletypewriter circuits to replace keyboard transmission. However, means such as typing or nontyping reperforators to produce the required perforated tape must be available. A model 14 transmitter distributor does not contain a relay in its signal circuit; therefore, it can be inserted into any signal line by making the proper connections. Most model 14 transmitter distributors used by the Army are wired for *neutral* operation to conform with other Army teletype-

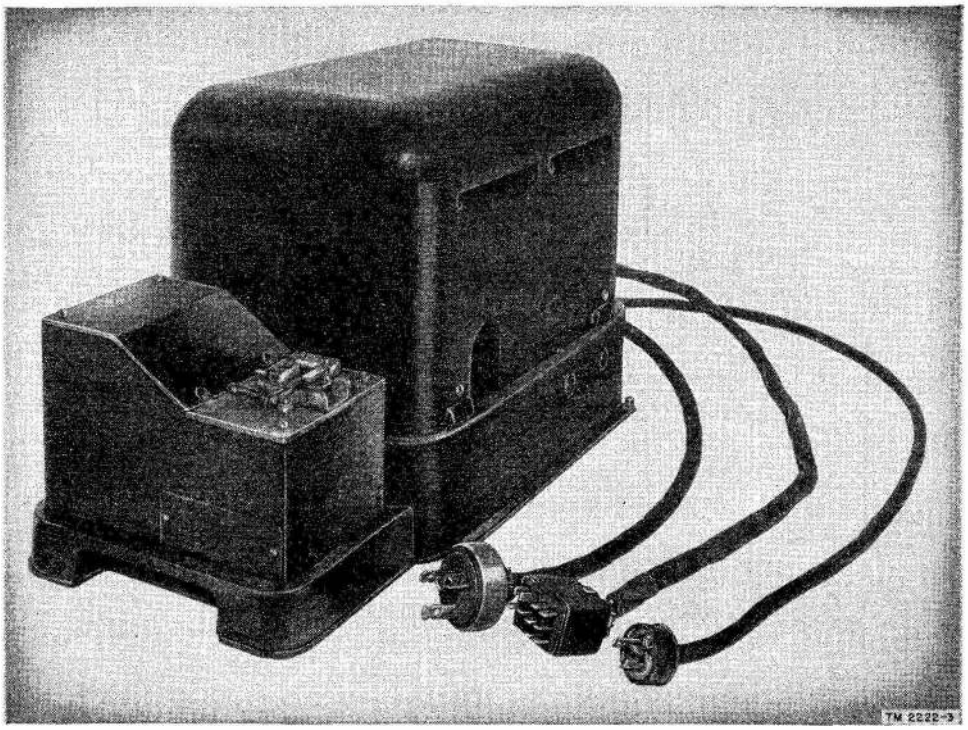
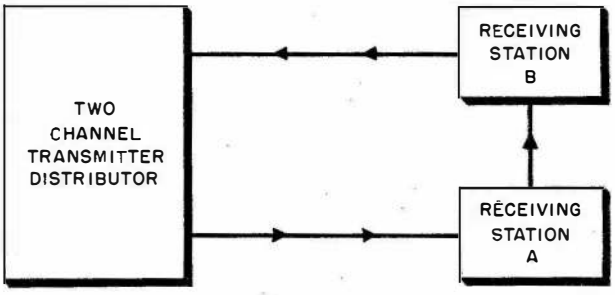


Figure 5. Transmitter Distributor TT–25/FG (receiving transmitter distributor).

writer equipment. A transmitter distributor may be operated in polar circuits by placing such equipment as Repeater TG–30 or similar repeaters in circuits and making minor wiring changes. Polar operation directly from a transmitter distributor is not recommended for military use, except in emergencies. If units receiving from two-channel transmitter distributors are equipped with selectors of the pulling magnet type rather than with selectors of the holding magnet type, or if it is desirable to use spare receiving units interchangeably on all channels without reorientation, a pair of repeaters is connected in series with the line, and each repeater is oriented to its respective channel. The repeaters, since they have the holding magnet feature, provide maximum orientation range for two-channel operation. The regenerated impulses relayed to receiving units are of the required length to provide normal orientation range for the selectors. This arrangement facilitates interchange of receiving units. Figure 6 is a block diagram showing a two-channel transmitter distributor with receiving stations equipped with holding magnet type selector mechanisms.

a. USE WITH MODEL 19 TELETYPEWRITER SETS (fig. 7). When Transmitter Distributor TT–52/FG (XD86) is used with Teletypewriter



NOTES:

1. RECEIVING STATION A OPERATES ON SIGNALS FROM CHANNEL A WHEN RANGEFINDER AT RECEIVING STATION A IS ORIENTED TO MOST FAVORABLE POSITION ON HIGH PART OF RANGE SCALE.
2. RECEIVING STATION B OPERATES ON SIGNALS FROM CHANNEL B WHEN RANGEFINDER AT RECEIVING STATION B IS ORIENTED TO MOST FAVORABLE POSITION ON LOW PART OF RANGE SCALE.
3. BOTH SETS OF SIGNALS TRAVEL THE ENTIRE CIRCUIT, BUT THE ARRANGEMENT OF THE DISTRIBUTOR FACE AND THE RECEIVING EQUIPMENT ALLOW CHANNEL A TO OPERATE RECEIVING STATION A ONLY AND CHANNEL B TO OPERATE STATION B ONLY.
4. THIS DIAGRAM ILLUSTRATES RECEIVING STATIONS EQUIPPED WITH THE HOLDING MAGNET TYPE SELECTOR MECHANISM.

TM 2222-14

Figure 6. Operation of two-channel transmitter distributor, block diagram.

TT–7/FG or TT–8/FG (model 19 teletypewriter sets), it furnishes a facility for continuous transmission to one or more receiving stations. In addition to making the most efficient use of a signal circuit, the transmitter distributor leaves the teletypewriter keyboard to be used for perforating additional message tapes without interfering with the message being transmitted to the signal circuits. TM 11–2216 gives detailed information on Teletypewriters TT–7/FG and TT–8/FG.

b. USE WITH TELETYPEWRITER TT–10/FG OR TELETYPEWRITER SET AN/TGC–3 (fig. 8). When Transmitter Distributor TT–52/FG



Figure 7. Transmitter Distributor TT–52/FG used with Teletypewriter TT–7/FG or TT–8/FG.

(XD86) is used with Teletypewriter TT–10/FG or Teletypewriter Set AN/TGC–3, it provides means of transmission to radio transmitters, to other Teletypewriters TT–10/FG or Teletypewriter Sets AN/TGC–3, or to code room circuits using such equipment as Repeater Mixer AN/GCQ–1. Keyboards are not provided with Teletypewriters TT–10/FG or Teletypewriter Sets AN/TGC–3. TM 11–2210 contains detailed information on Teletypewriter TT–10/FG, and TM 11–2214 covers Teletypewriter Set AN/TGC–3.

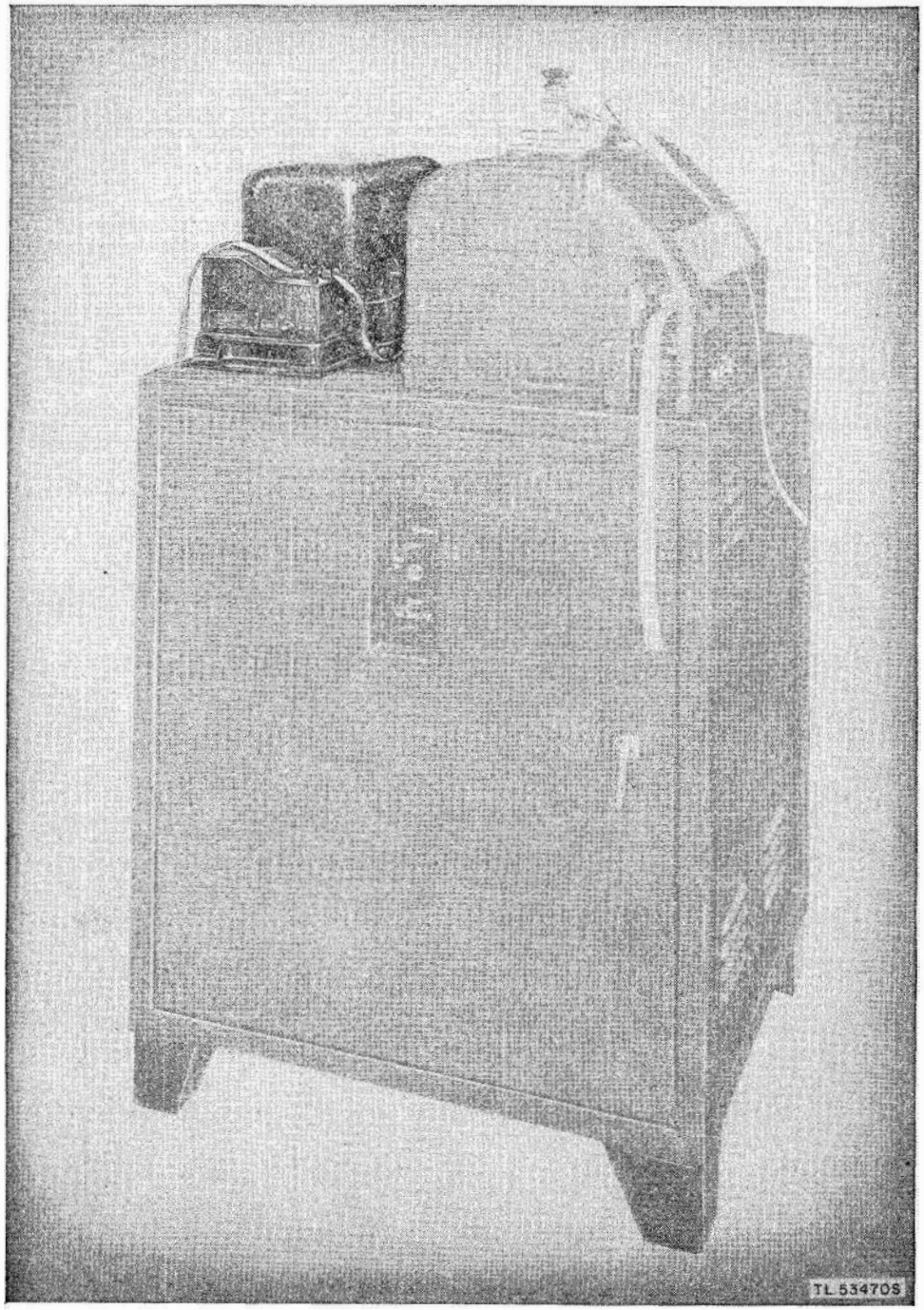


Figure 8. Transmitter Distributor TT–52/FG, in use with Teletypewriter Set AN/TGC–3.

c. USE AS PART OF REPERFORATOR TRANSMITTERS TG–26–A, TG–26–B, OR TG–27–A (fig. 9). The XD82 type of transmitter distributor which is used as part of Reperforator Transmitter TG–26–A, TG–26–B, or TG–27–A provides a means of transmission necessary in handling heavy message center traffic in the field. While these reperforator transmitters are designed for field use, they also are used in circuits similar to the circuits in which Teletypewriter TT–10/FG and Teletypewriter Set AN/TGC–3 are operated. The XD82 trans-

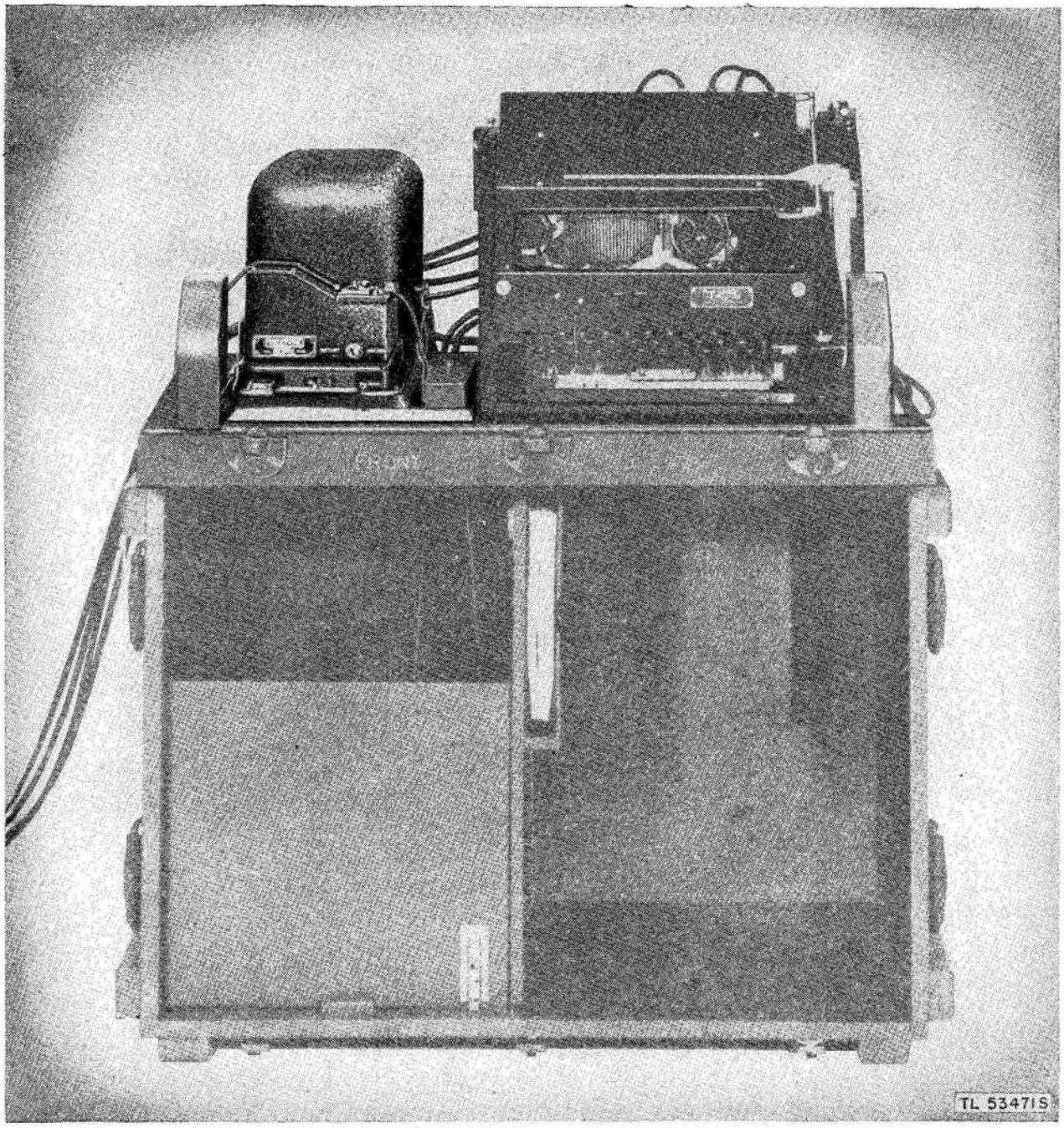


Figure 9. Model 14 transmitter distributor (XD82), used as part of Reperforator Transmitter TG–26–A, TG–26–B, or TG–27–A.

mitter distributor used as a component of Reperforator Transmitter TG–26–A, –B, or TG–27 sometimes is modified to provide a break-lock mechanism as in Reperforator Transmitter TG–26–B. This enables a receiving station to stop transmission from the transmitter distributor by use of a break signal. This mechanism also can be used to prevent transmission from the transmitter distributor in an open circuit. This type of transmitter distributor is known as the XD99 type. The mechanism has a disabling device so that it may be made inoperative if desired.

d. USE AS PART OF PERFORATOR-TRANSMITTER TT–56/MGC. Some XD82 type transmitter distributors have been modified slightly for use as components of Perforator-Transmitters TT–56/MGC, part of Radio Set AN/GRC–26, medium-power, vehicular radio station that provides radioteletype, voice or c-w (continuous-wave) communication. This perforator-transmitter is a Reperforator Transmitter TG–26–A that has been modified for noise suppression by the addition of a .01-uf (microfarad) capacitor, a bypass to ground at the junction of two 500-ohm resistors and the motor field winding of the transmitter distributor.

e. USE OF RECEIVING TRANSMITTER DISTRIBUTORS IN CODE ROOM OPERATION. The several different types of receiving transmitter distributors are used in conjunction with code room equipment and until quite recently were classified on the same level as the code room equipment with which they were used.

f. OTHER USES. Sometimes transmitter distributors may be removed from associated equipment and may be grouped into a bank of transmitter distributors with wiring to provide transmission only on each outgoing circuit (different circuits for incoming traffic). Arrangements like this are highly efficient in handling heavy traffic.

5. Technical Characteristics of Transmitter Distributors

Types of installation	Portable or fixed station; sending: wire or radio.
Type of feed for tape	Mechanical.
Signaling code	5-unit, start-stop.
Type of signals	Neutral.
Speed (sending)	368.1 or 404 opm.
Motor and governor:	
Type of motor	Varies (par. 14).
Rpm[1]	1,800 in cases of synchronous motor; 2,102 and 2,308 in cases of series-governed motors.
Governor	Reduces motor current when motor speed exceeds critical rate and increases motor current when motor speed drops below critical rate on series-governed motors.
Tuning forks	Stroboscopic; 87.6 vps (vibrations per second) for 368.1 opm and 96.19 vps for 404 opm.
Power sources:	
Motor:	
Volts	105–125.
Frequency	25–60 cps (cycles per second) for series-governed motors and 50-60 cps for synchronous motors.
Types of tape used	Chad or chadless.
Total weight installed	Approximately 28 pounds for single-channel transmitter distributors and 42 pounds for two-channel transmitter distributors.

6. General Functioning

a. GENERAL. Model 14 transmitter distributors all function in the same general manner with the exception of the receiving transmitter distributors which are designed as parts of secret signal communication systems. All transmit five-unit, start-stop teletypewriter code impulses which are electrically identical with the code impulses transmitted from the keyboard of an ordinary teletypewriter operating at the same speed. Figure 10 shows the relationship between the characters on the teletypewriter keyboard and typing unit, the line signals, and the perforations in tape.

b. TAPE TRANSMITTER. Perforated tape inserted into the tape transmitter is advanced one row of perforations (corresponding to one character or function) at a time by the tape-feed mechanism. Tape sensing pins move upward and press against the tape when there are no perforations in the tape above the pins, but when there are perforations in the tape,

[1] Speed change for synchronous motors requires change of motor pinion and main-shaft gear. On series-governed motors, speed is changed by use of governor adjustment.

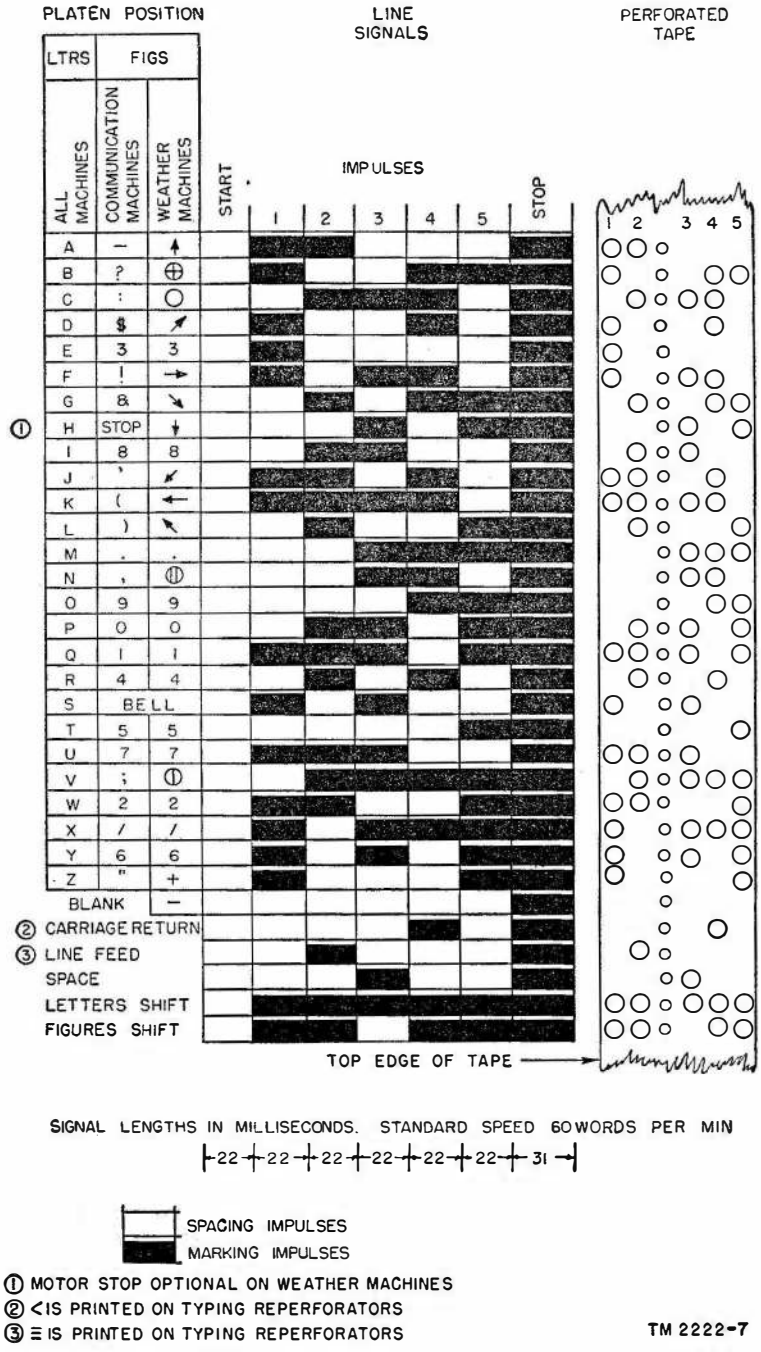


Figure 10. Teletypewriter five-unit, start-stop code.

the pins pass through the perforations. When a tape sensing pin passes through a perforation, the contact tongue associated with that pin makes contact with its lower (marking) contact screw. When there is no perforation, the tape sensing pin is held down by the tape, and this in turn holds the associated contact tongue against its upper (spacing) contact screw. Each contact tongue is wired directly to its associated segment on the distributor disk face.

c. DISTRIBUTOR. The distributor transmits to the signal line, in the proper sequence and speed, the marking and the spacing impulses

set up by the contact tongues of the tape transmitter.

d. CONTROL CIRCUIT. Transmission is controlled by a local circuit within a transmitter distributor consisting of a stop magnet, a switch, and one or two sets of contacts, all wired in series. The circuit is closed to start transmission and is opened by a switch or any one of the pairs of contacts, either by hand or automatically, to stop transmission. When a transmitter distributor is used with certain associated equipment, the control circuit extension consists of another pair of contacts connected in series with the wiring of the transmitter distributor.

7. Packaging Data

The type of equipment with which a transmitter distributor is to be used to some extent dictates the manner in which the transmitter distributor is packed. The XD82 type transmitter distributors which are used as part of Reperforator Transmitter TG–26–A, TG–26–B, or TG–27–A are mounted permanently on the base of a chest with other components, and the entire equipment is packed in a single box. Details of the packing of this equipment are given in TM 112201. Transmitter Distributors TT–52/FG used with fixed plant equipment usually are packed in separate boxes. When

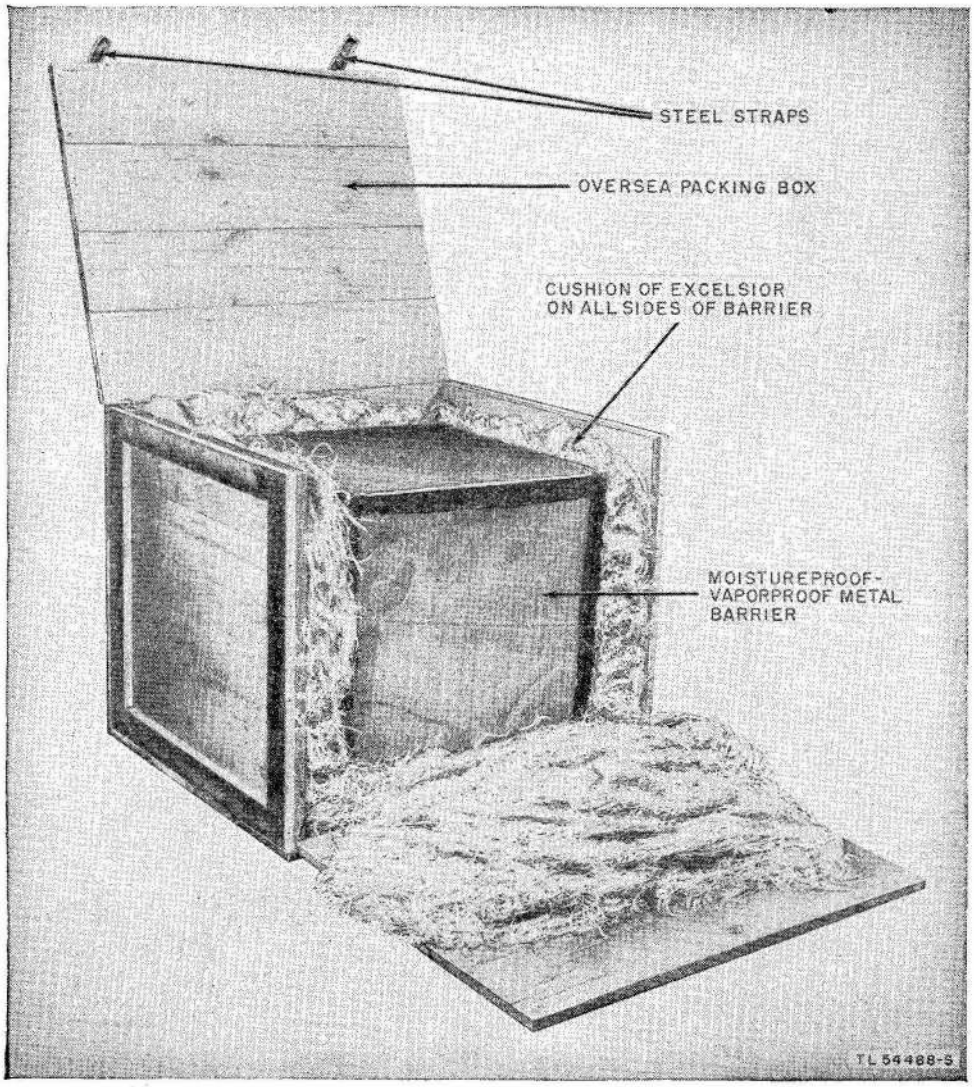


Figure 11. Typical packing for oversea shipment.

fixed plant teletypewriter sets are packed for export shipment, several of the individual items are placed frequently in one waterproof metal container, and this container in turn is packed in a larger wooden box. A layer of excelsior between the metal container and the wooden box protects the contents during transportation. Figure 11 shows a container used for export shipment.

8. Detailed Description of Transmitter Distributor TT–52/FG (XD86)

a. GENERAL. All model 14 transmitter distributors adapted for use with fixed plant teletypewriter equipment such as Teletypewriters TT–7/FG and TT–8/FG (model 19 teletypewriter sets), Teletypewriters TT–10/FG and Teletypewriter Set AN/TGC–3, and similar teletypewriter sets are alike in appearance and are self-contained units identified by the basic code designation XD86. There are different versions of motors and gears. These necessarily vary to operate the transmitter distributors from different power supplies and at different operating speeds (368.1 opm or 404 opm). These different versions are identified by two letters following the basic designation. The principal versions covered in this manual are XD86AJ, XD86EQ, and XD86FR. The differences are indicated in paragraph 14. Certain other differences such as old style parts and optional features that do not affect the code designations of the equipment are also indicated in paragraph 14.

b. BASE. The base consists of a sturdy, metal casting arranged to provide secure mounting for the other parts. External wiring for the

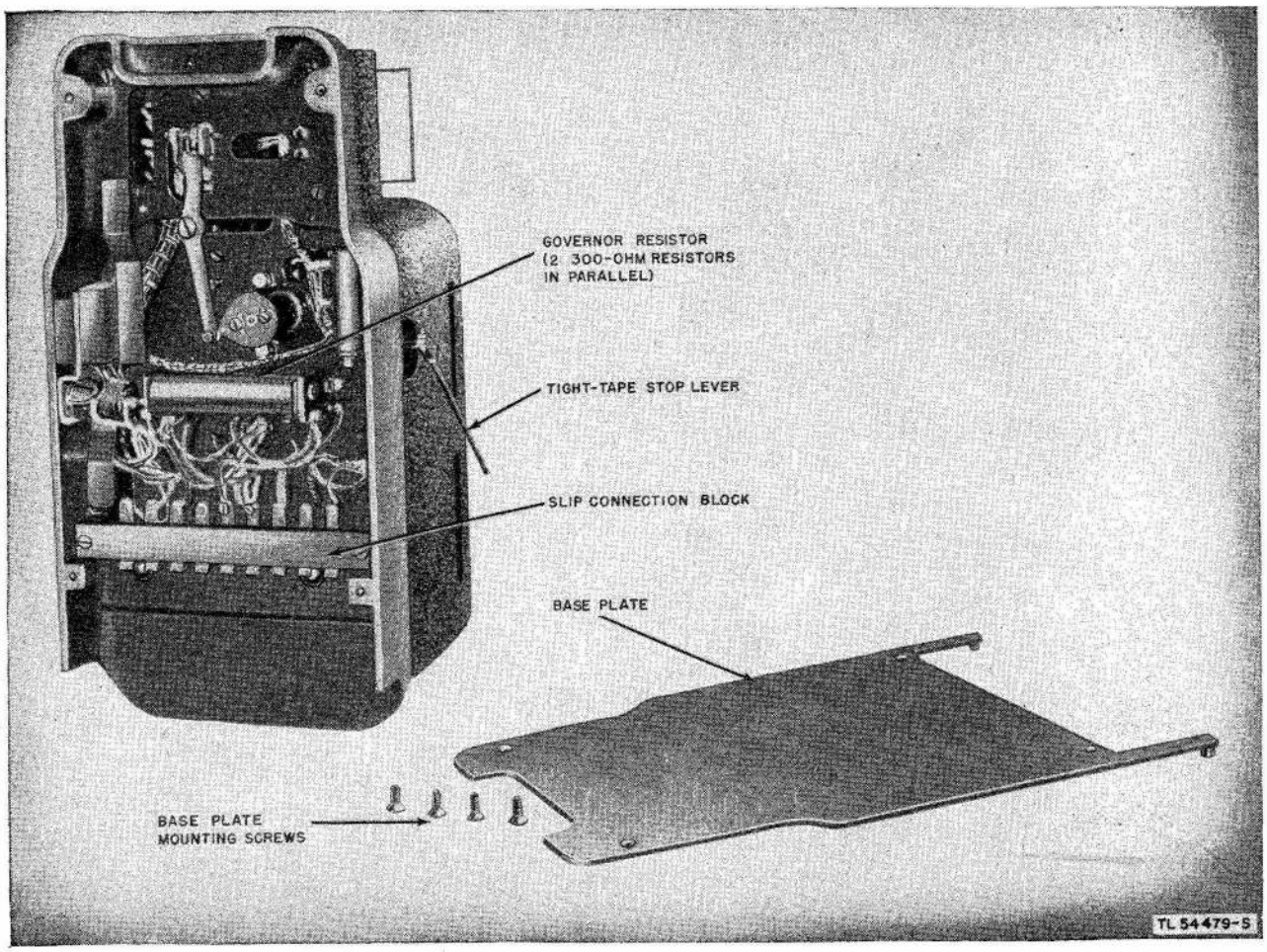


Figure 12. Transmitter Distributor TT–52/FG, base plate removed, bottom view.

power and signal lines and the control circuit of the transmitter distributor terminate at a slip connection block on the bottom of the base where contact is made with associated connections of the equipment on which the transmitter distributor is mounted. The bottom of the base is flanged so that the base slides firmly into position on a mounting plate on the associated equipment. This arrangement permits the installation or the removal of a transmitter distributor without aid of tools. Certain resistors and capacitors used in the various circuits are located in a hollow space in the bottom of the base (fig. 12).

c. MOTOR. The motor is mounted on the base with four easily removable mounting screws. When Transmitter Distributor TT–52/FG is to operate on either 115-volt dc or 115-volt, 25- to 60-cycle ac, (alternating current) a series-governed motor is supplied. The motors furnished with the XD86EQ type transmitter distributors have a correct speed of 1,800 rpm (revolutions per minute) and are not satisfactory for interoperation with British teleprinter equipment. XD86FR transmitter distributors are supplied with motors which can be adjusted for either 2,102 or 2,308 rpm and may be used for interoperation with British equipment. XD86AJ transmitter distributors equipped with synchronous motors are intended for use when a regulated source of 115-volt, 60-cycle a-c power is available. These motors have a speed of 1,800 rpm and are not intended for interoperation with British equipment.

d. TAPE TRANSMITTER. The tape transmitter is located at one end of the base, for easy access, and is inclosed by a separate removable snap panel. The tape-stop switch is at the front and bears the designations OFF-ON. The tight-tape stop lever extends along the right-hand side but is not fastened to the tape transmitter. A hinged tape retaining lid assembly located on the top of the tape transmitter holds the message tape in place. The tape transmitter is designed so that either of two types of tape may be used by the change of a few minor parts. An explanation and illustrations of the two types of tape are given in paragraph 12 and figures 17 and 18. An end-of-tape stop mechanism (sometimes called tape-out mechanism) is used to stop transmission when there is no tape in the transmitter. Without this end-of-tape stop mechanism, a transmitter distributor transmits signals continuously whenever the tape runs out, until the equipment is turned off.

e. DISTRIBUTOR. The distributor assembly is mounted on the base between the motor and the tape transmitter. The assembly includes a distributor disk, a distributor brush assembly, main shaft and associated gear, clutch, cams, and other parts necessary to control actual transmission of the various five-unit, start-stop teletypewriter code impulses produced by the transmitter distributor.

f. DISTRIBUTOR COVER. The metal distributor cover incloses the motor and distributor and fits snugly on the base to protect the moving parts. The cover is not fastened and can be removed easily by lifting it straight up from the base.

9. Detailed Description of XD82 Type Transmitter Distributor
(fig. 13)

a. GENERAL. This type of transmitter distributor is adapted for use with tactical teletypewriter equipment such as Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A. Two letters which follow the basic code designation of XD82 identify the type of motor used. The XD82 type transmitter is mounted permanently on the base of a wooden chest with other teletypewriter equipment. The principal variations within the XD82 type classification are designated XD82FS and XD82FU.

b. BASE. Three shock-absorbing mountings are used to fasten the base securely in place on the chest with which the base is associated. External wiring for the transmitter distributor is connected to a terminal board located in a hollow space in the bottom of the base.

c. MOTOR. Series-governed motors furnished with XD82 transmitter distributors are arranged to operate on either 115-volt dc or 115-volt, 25- to 60-cycle ac when a power selector switch on associated equipment is set properly. This type of transmitter distributor equipped with General Electric motors is designated XD82FS, and those equipped with Holtzer Cabot motors are designated XD82FU. The

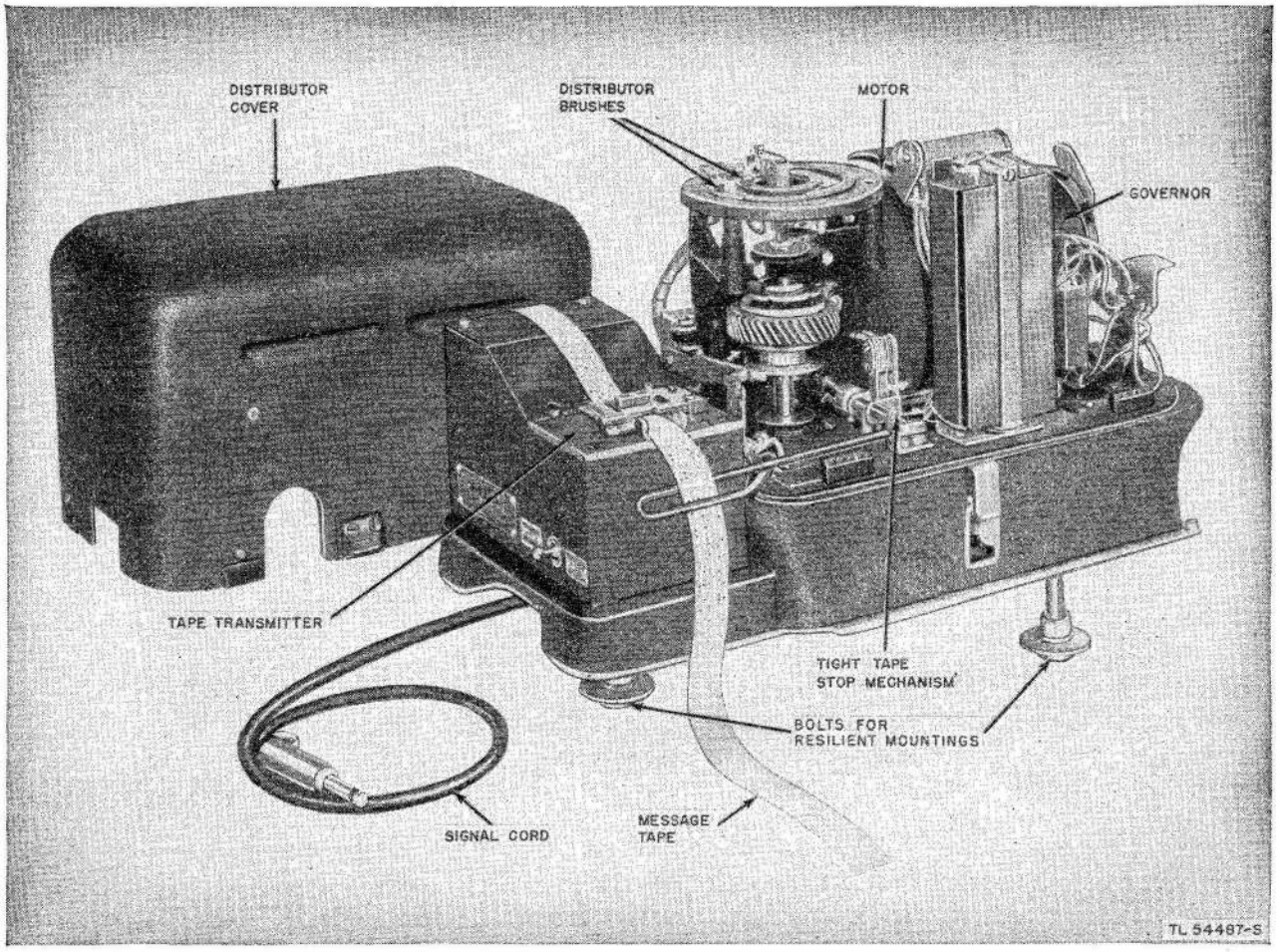


Figure 13. XD82 type transmitter distributor, cover removed.

motors are interchangeable. Because the motors may be adjusted for either 2,102 or 2,308 rpm, these transmitter distributors may be used for interoperation with British teleprinter equipment. The gears, the target, and the tuning fork required for use with these motors are listed in paragraph 14. The motors are the same as those supplied with Printer TG–7–A and Teletypewriters TG–7–B and TG–37–B and thus facilitate replacement of motors in the field.

d. Tape Transmitter and Distributor. The parts and assemblies of the tape transmitter and the distributor are the same as those used in the XD86 type transmitter distributor. The end-of-tape stop mechanism is *not* used on XD82 type transmitter distributors that are a part of Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A.

e. Cover. The distributor cover is equipped with latches with which to fasten the cover securely to the base. A metal plate and web strap designed to hold signal cords during transportation is located on the top of the distributor cover on recent models of the XD82 type transmitter distributor.

10. Detailed Description of Transmitter Distributor TT–26/FG (Two-channel)

a. A two-channel transmitter distributor (fig. 4) includes two tape sensing and two transmitting mechanisms and a special distributor commutator. This commutator has 13 segments: 5 pairs of segments for the transmission of intelligence impulses, a start segment, a stop segment, and an X segment which is located between the start and stop segments. A single-channel transmitter distributor has only seven segments. Since no distributor clutch is provided, the distributor brushes rotate continu-

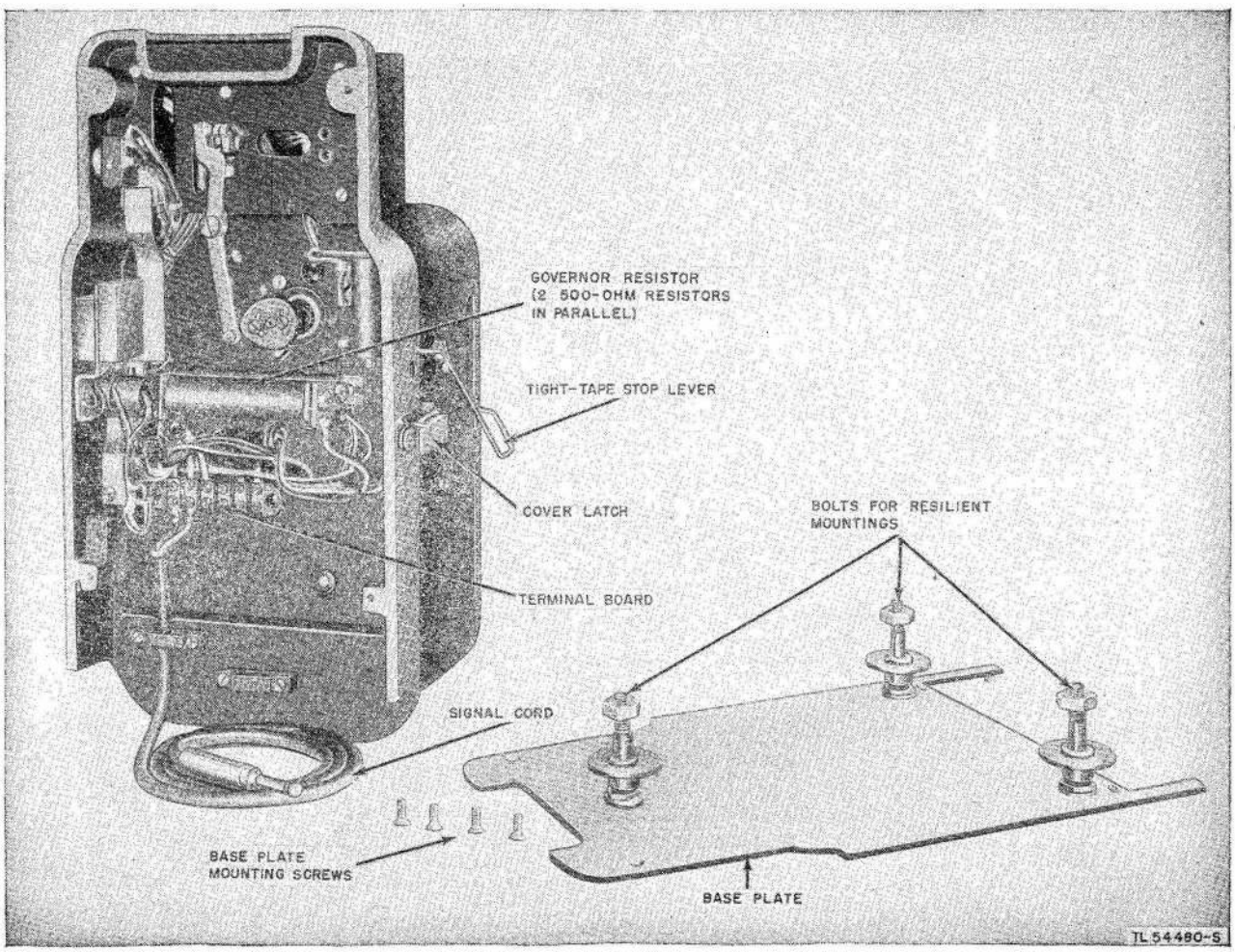


Figure 14. XD82 type transmitter distributor, base plate removed.

ously with the motor. This arrangement requires fully attended service in which the operator inserts the message tape and starts and stops the transmitter manually. No tight-tape or end-of-tape stop mechanism is provided. A switch lever, on the lower front portion of the unit, switches the distributor circuits in preparation for either single-channel or two-channel transmission. A SEND—STOP lever associated with each tape transmitter mechanism controls transmission on individual channels. During single-channel operation, only the A channel transmitter is used. The idling channel (B channel) then transmits blank signals in the case of the XD91 type, and LTRS (letters) combinations in the case of the XD93 type. A toggle switch controls the starting and the stopping of the motor.

b. Two-channel transmitter distributors are furnished with what are known as GL and GM motor arrangements. The GL motor arrangement includes a 110-volt, 60-cycle, series-wound, a-c governed motor which operates at 2,102 rpm and is equipped with a 10-spot target, two 500-ohm governor resistors, a 7-tooth pinion, and a 40-tooth gear on the main shaft. Motor speed is checked by a 87.6-vps (vibration per second) tuning fork for a speed of 368.1 opm. The GM motor arrangement includes a 110-volt, 60-cycle synchronous motor which operates at 1,800 rpm and is equipped with a 9-tooth pinion and a 44-tooth gear on the main shaft to give a speed of 368.1 opm. For synchronous motor operation, the frequency must be 60 cycles regulated within plus or minus .75 percent.

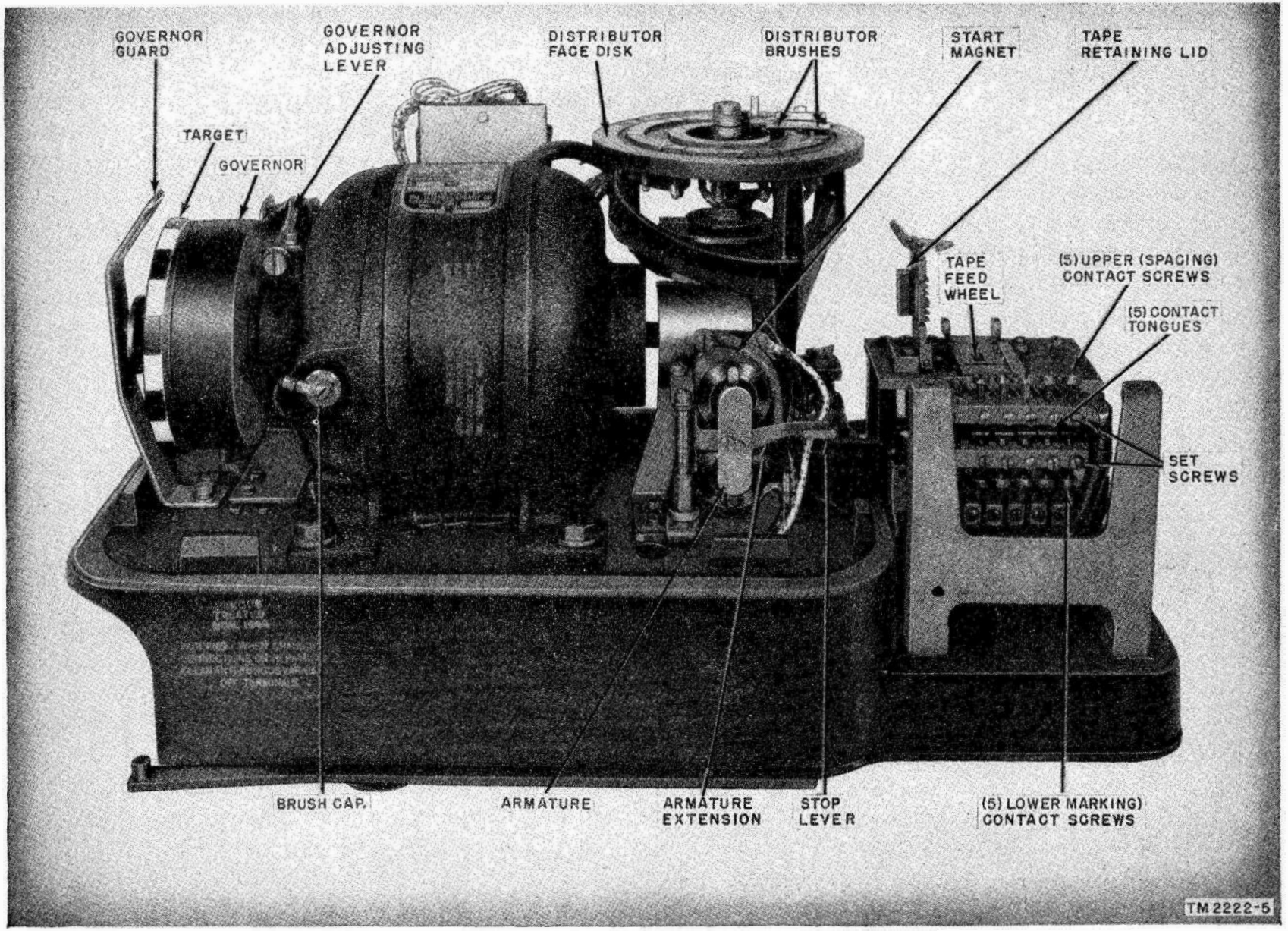


Figure 15. XD95 type transmitter distributor, side view.

11. Detailed Description of Receiving Transmitter Distributors
(figs. 15 and 16)

a. In most respects, this type of transmitter distributor is like the XD82 and XD86 types of single-channel transmitter distributors. The face of the distributor disk in a receiving transmitter distributor, however, is considerably different. Instead of 7 segments on the face of the distributor disk (the number on disk faces of distributors used on the XD82 and XD86 types), a receiving transmitter distributor has a disk face in which there are 15 separate segments. This arrangement permits the special type of code room operation for which a receiving transmitter distributor is used. The arrangement of these segments is shown in the wiring diagram for the XD95 type of transmitter distributor (fig. 99).

b. Transmitter Distributor TT–21/FG, known also as types XD100GW and 14ABM–1, differs from other receiving transmitter distributors in that there is incorporated in it a tape-feed suppression mechanism. The tape-feed suppression mechanism is mounted in the tape transmitter on the base casting and connects with the contact-lever bail and tape-feed lever. The mechanism consists of a lever assembly, a restoring blade, and tape-feed lever extension. The lever assembly is mounted on the base of the casting near the right bracket of the tape transmitter and is positioned so that the trip-off lever extension is to the right of the unit. The trip-off lever extends through a cut-out in a walnut snap panel and is the means by which the tape-feed suppression mechanism is operated manually. The restoring blade is mounted over the contact-lever bail. A step in the rear extension of the restoring lever (part of the lever assembly) fits over the upper edge of the restoring blade. A spring clip is mounted over

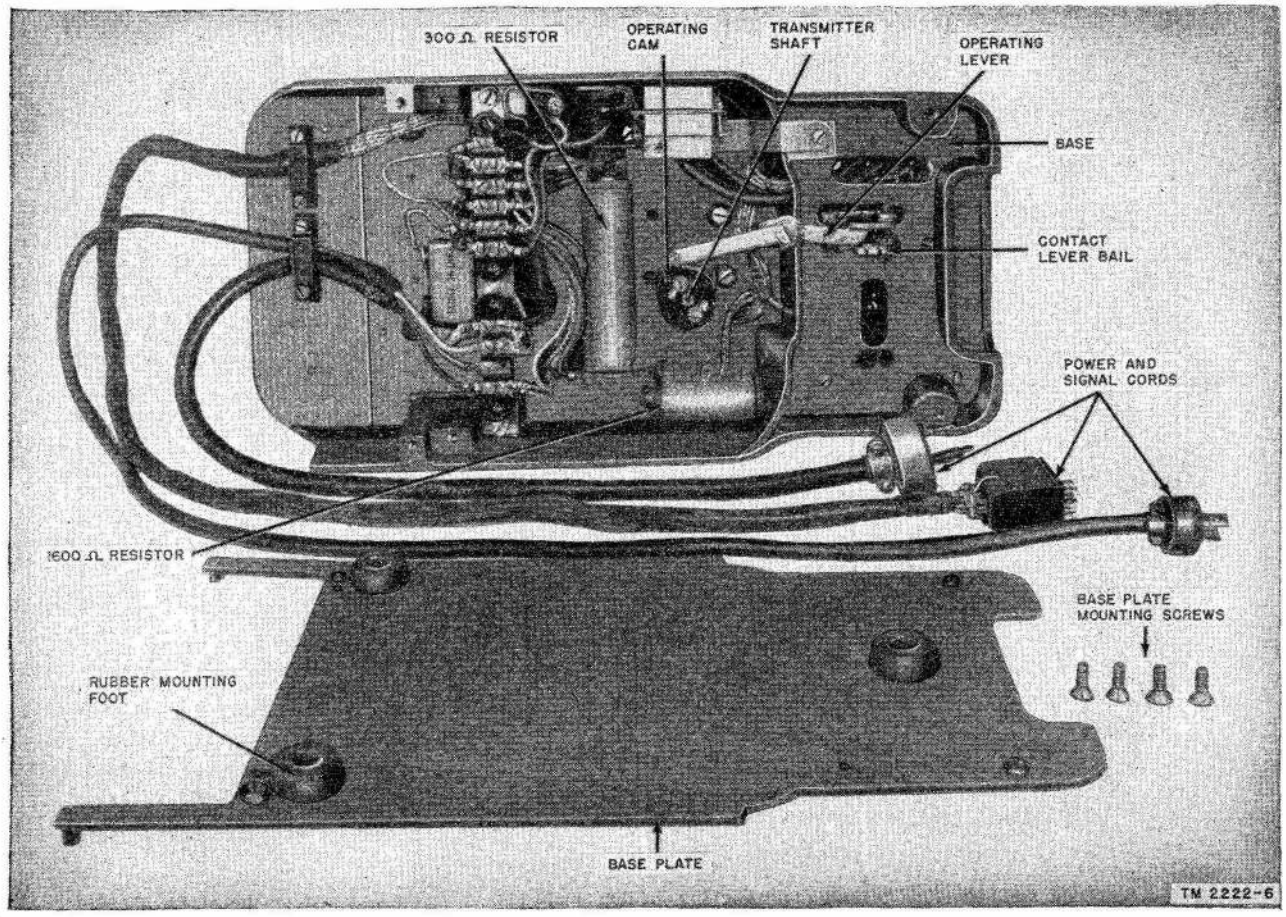


Figure 16. Transmitter Distributor TT–25/FG, bottom view, base plate removed.

the front hole of the restoring blade. A restoring blade spring is attached at the spring clip. The tape-feed lever extension is mounted on the forward extension of the tape-feed lever over a tape-feed pawl stud which is used to mount the feed pawl and its spring. When the tape-feed suppression mechanism is operated, the tape-feed lever extension is blocked by a tape-feed lever latch assembly to prevent tape-feeding operations. Within their group classification, the main differences in the receiving transmitter distributors are in the types of motors with which they are equipped.

12. Description of Message Tapes
(figs. 17 and 18)

Message tapes bearing messages transmitted by a transmitter distributor are either of two types of perforated tape. Regular perforated tape (fig. 17) is tape in which small pieces of the paper or *chads* are removed completely from the tape, leaving clean round holes. Chadless perforated tape (fig. 18) is tape in which small pieces of the paper or *chads* are cut about 75 percent of their circumference and remain attached to the tape by their leading edges. These edges form lids for holes (or perforations) in the tape. The latter type of tape is used when it is desired to print messages on the tape as well as to perforate the tape.

13. Weights and Dimensions

a. TYPES XD82 AND XD86. Each of these transmitter distributors weighs approximately 28 pounds and is 8¼ inches wide, 9 inches high, and 15½ inches long.

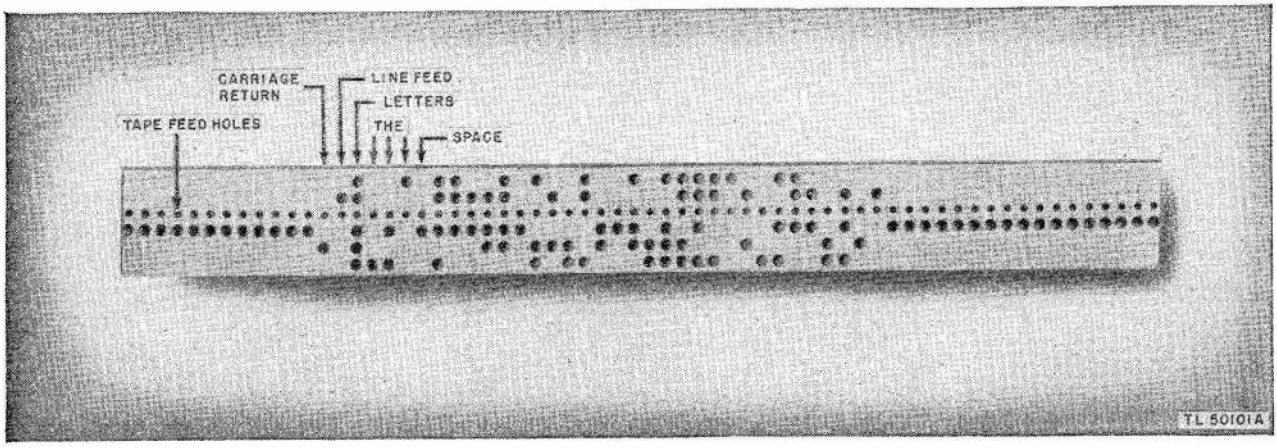


Figure 17. Example of regular perforated tape.

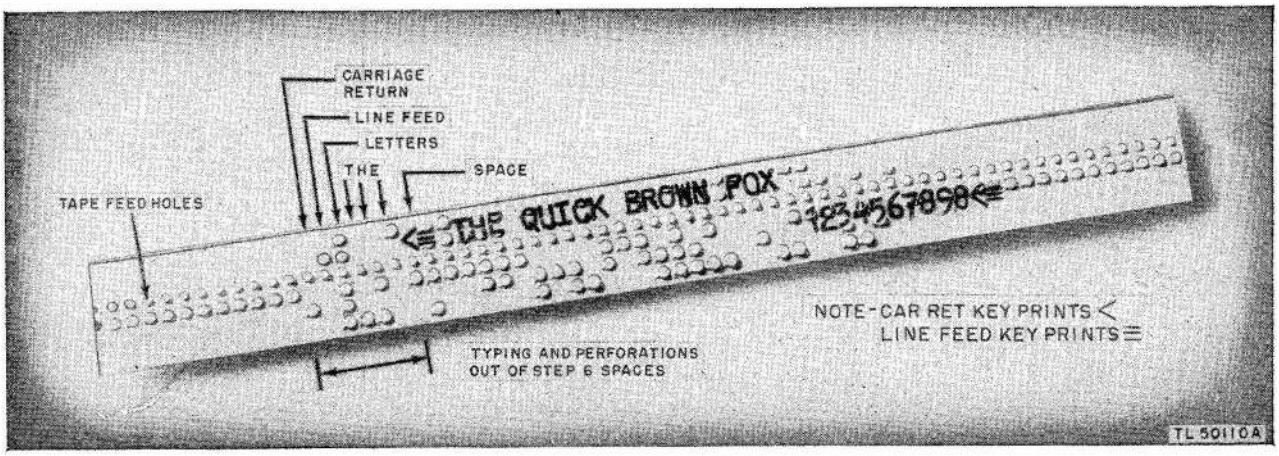


Figure 18. Example of chadless perforated tape.

b. TYPES XD91 AND XD93. Each of these transmitter distributors weighs 42 pounds and is 8⅜ inches wide, 9 inches high, and 19 inches long.

c. RECEIVING TRANSMITTER DISTRIBUTORS. These distributors are approximately the same in size and weight as the XD82 and XD86 types.

14. Differences in Units

a. XD82 AND XD86 TYPES. Listed in (2) on page 20 are the different motors, gears, targets, speeds, tuning forks, and governor contact filters used with XD82 and XD86 transmitter distributors. All the motors listed, whether designed for 1,800 rpm or not, are equipped with gears and targets for running the transmitter distributors at 368.1 opm, the speed used in American teletypewriter equipment when the motors are operating at their rated speeds. The synchronous motors cannot be adjusted for interoperation with British teleprinters which operate at 404 opm and, therefore, must be replaced with motors which are designed for 2,102 rpm. The 2,102-rpm motors may be adjusted to the 2,308-rpm speed which is required for interoperation with British equipment.

(1) *Mechanical differences.* The differences in parts of transmitter distributors operating on chadless tape and those operating on regular tape are indicated in appendix II. No change in the code designations of the transmitter distributors is involved because of changing from one type of tape to the other. XD86 type transmitter distributors may include certain added features such as a contact assembly (for load compensation) and a tape-guide wire. Some parts have been redesigned so that there are both old style and new style parts in use. Some of these changes are—peripheral ring governor, parts changed in tight-tape stop mechanism, carbon distributor brushes substituted for braided copper brushes, and filters which have been modified. Variations of this nature do not involve change in code designations. Refer to the parts identification illustrations in appendix II for comparisons of the various old and new style parts.

b. TWO-CHANNEL TRANSMITTER DISTRIBUTORS.

(1) *Combinations transmitted.* The model known as the XD91 transmits blank combinations when one channel is idling; the XD93 model transmits LTRS combinations when one channel is idling. The models have either GL or GM motor arrangements. The list on page 21 shows the differences in these motor types.

c. RECEIVING TRANSMITTER DISTRIBUTORS.

(1) *Differences.* The principal differences in receiving transmitter distributors involve the motor arrangements. The XD100GW type has the added feature of a tape-feed suppression mechanism and a new walnut snap panel. The tape-feed suppression mechanism is described in paragraph 116. The table on page 22 shows the differences.

(2) *Principal motor differences in model 14 (XD82 and XD86) transmitter distributors.*

	Motor		Gear		Pinion		Target		Speed		Tuning fork		Governor contact filter
Code No.	Part No.	Type	Part No.	Teeth	Part No.	Teeth	Part No.	Spots	Opm	Motor rpm	Part No.	Vps	Part No.
XD82FS	77953	A-c series-governed	77036	40	77034	7	7105	10	368.1 [a]404	2102 2308	103628 104984	87.6 96.19	105475
XD82FU	104038	A-c series-governed	77036	40	77034	7	7105	10	368.1 [a]404	2102 2308	103628 104984	87.6 96.19	105475
XD86AJ	82283	60-cycle a-c synchronous	80165	44	80166	9	----------	----------	368.1	1800	----------	----------	----------
[b]XD86EQ	102969	A-c series-governed	80165	44	80166	9	93903	35	368.1	1800	103628	87.6	103080
[c]XD86FR	6708 or 107151	A-c series-governed	77036	40	77034	7	7105	10	368.1 [a]404	2102 2308	130628 104984	87.6 96.19	105475

[a]Speed for interoperation with British (Creed) equipment.

[b]XD86AJ may be converted to XD86EQ by use of No. 103559 set of parts. This equipment should not be operated at 404 opm.

[c]XD86AJ may be converted to XD86FR by use of No. 105523 set of parts.

(2) *Principal motor differences in XD91 and XD93 (two-channel) units.*

	Motor		Gear		Pinion		Target		Speed		Tuning fork		Governor contact filter
Code No.	Part No.	Type	Part No.	Teeth	Part No.	Teeth	Part No.	Spots	Opm	Motor rpm	Part No.	Vps	Part No.
XD91GL	105927	A-c series-governed	84357	40	77034	7	7105	10	368.1	2102	103628	87.6	105475
XD91GM	105915	60-cycle synchronous	87222	44	80166	9			368.1	1800			
*XD93GL													
*XD93GM													

*Motors correspond to those in XD91 models; GL indicates a-c series-governed motors and GM indicates synchronous type motors. For synchronous motor operation, the frequency must be 60 cycles regulated within plus or minus .75 percent.

(2) *Principal differences in XD79EZ, XD79EY, XD79EX, XD95GW, and XD100GW receiving transmitter distributors.*

	Motor		Gear		Pinion		Target		Speed		Tuning fork		Governor contact filter
Code No.	Part No.	Type	Part No.	Teeth	Part No.	Teeth	Part No.	Spots	Opm	Motor rpm	Part No.	Vps	Part No.
XD79EZ	104675	60-cycle a-c synchronous	104580	30	104579	7	----------	----------	368.1	1800	----------	----------	----------
XD79EY	104674	A-c series-governed	104658	45	104659	9	7105	10	368.1	2102	103628	87.6	----------
XD79EX	104673	D-c governed	104658	45	104659	9	----------	----------	368.1	2102	----------	----------	----------
XD95GW	111604	A-c series-governed	104658	45	104659	9	7105	10	368.1	2102	103628	87.6	95326
XD100GW	111604	A-c series-governed	104658	45	104659	9	7105	10	368.1	2102	103628	87.6	95326

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

15. Siting

Place the packing case in which a transmitter distributor is received as near the operating position or workbench as is convenient. Never unpack the equipment in locations where it will be exposed to rain, snow, or mud. Exposure to such conditions may require the need for a complete overhaul before the equipment can be put into operation, or may even render the equipment completely useless. Since a transmitter distributor usually is a component of a sizable communication center, either fixed plant or tactical, the disposition for installation of the other and larger pieces of equipment generally will dictate the location of the transmitter distributor.

16 Uncrating, Unpacking, and Checking

Refer to TM 11–2201 for instructions for unpacking transmitter distributors which are used as components of Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A. These transmitter distributors are mounted permanently on the bases of chests with the other components, and the entire equipment is packed in a single box. Unless they are packed for export shipment, other transmitter distributors are packed separately in small wooden boxes and are unpacked easily. Several individual items of equipment may be packed separately and then are placed in a waterproof container, which, in turn, is packed in a larger wooden box for export shipment. For unpacking containers designed for export shipment, follow the procedure outlined below:

a. Place the packing case as near the operating position or workbench as is convenient.

b. Cut the steel straps around the packing case.

c. Remove the nails, using a nail puller, and remove the sides and top of the packing case. Prying the sides and top off may result in damage to the equipment.

d. Remove the foil-lined bag or metal moistureproof barrier and any corrugated paper that covers the equipment within the box.

e. Remove the equipment from its inner case and place it on the workbench or near where ts final location is to be.

f. Thoroughly inspect the equipment for possible damage during shipment.

g. Check contents of the packing case against the master packing slip.

h. When the equipment is being unpacked and assembled, check its general over-all physical condition and remove any accumulations of wood fiber or packing paper. Check carefully any parts that appear to be bent, broken, or otherwise damaged or out of place. Clean the terminals or the slip connection block, whichever is used.

Caution: Do not attempt to run the equipment under power before making the preoperational checks and adjustments outlined in paragraph 27.

17. Assembly and Installation

a. Type XD82 transmitter distributors require no assembly procedure when they are unpacked; they are installed already as components of associated equipment.

b. Transmitter Distributor TT–52/FG used with fixed plant equipment is shipped complete in a separate box and must be mounted on tables of associated equipment at the time the equipment is installed. Lift the transmitter distributor carefully and place it between the rails on the equipment table. Slide the transmitter distributor back toward the slip connections until the base drops down behind the heads of the front rail mounting screws.

c. A two-channel transmitter distributor is assembled with its associated equipment as is Transmitter Distributor TT–52/FG (*b* above).

d. Transmitter Distributors TT–21/FG and TT–25/FG and others of the receiving type are placed in position on tables of associated equipment. Refer to paragraph 18 for instructions on how they are connected.

18. Equipment Connections

a. XD82 AND TRANSMITTER DISTRIBUTOR TT–52/FG (XD86) UNITS. XD82 type transmitter distributors used as part of Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A are wired completely to associated equipment at the factory. They do not require additional wiring and are connected when the plug of the transmitter distributor signal cord is placed in one of the circuit jacks (line or local) on the jack box of associated equipment. Transmitter Distributor TT–52/FG, used with fixed plant equipment, is packed as a separate unit. Circuit connections between Transmitter Distributor TT–52/FG and its mounting plate on associated equipment are made automatically; the transmitter distributor is slipped into position on the mounting plate. All other wiring connections are made on associated equipment. Refer to the technical manuals covering associated equipment when making connections.

b. TRANSMITTER DISTRIBUTOR TT – 26/FG (XD91 AND XD93) (TWO-CHANNEL) UNITS. As is the case with Transmitter Distributor TT–52/FG units, all circuit connections for this type transmitter distributor between the unit and its mounting plate on the associated equipment are made automatically when the transmitter distributor is slipped into position on the mounting plate.

c. RECEIVING TRANSMITTER DISTRIBUTORS. Connections for transmitter distributors of this type are made by power and signal cords attached permanently to the transmitter distributors. Some models have two such cords; others have three. Since these transmitter distributors are used with other teletypewriter equipment to provide a teletypewriter secrecy system, instructions for the use of these connection cords are included in the equipment instructions covering the over-all equipment.

19. Power Supply

All model 14 transmitter distributors are designed to operate in conjunction with associated equipment. Power for the transmitter distributor motor, tape-stop magnet, and signal circuit generally is furnished through associated equipment. Motors furnished with the transmitter distributors are interchangeable to operate on either ac or dc at specific voltage (and frequency in the case of ac). However, when the available power supply is different than that described on the nameplate data on the motors, the motors may be connected to the power supply through the medium of multiple-voltage, multiple-frequency rectifiers or other voltage-adjusting equipment usually furnished with associated equipment. Refer to the technical manuals for associated equipment or complete sets for information covering the different types of power supply that may be used under different conditions.

a. XD82 UNITS AS PART OF REPERFORATOR TRANSMITTERS TG–26–A, TG–26–B, AND TG–27–A. Motors on XD82 units used as part of these reperforator transmitters operate on 115-volt, 50- to 60-cycle ac. A three-position switch on the associated equipment puts resistors into the motor and control circuits which permit operation on 115-volt dc and 115-volt, 25- to 40-cycle ac in addition to the type of power mentioned above. *Always be sure to position the three-position switch on associated equipment to match the local power supply before connecting the power cords.*

b. TRANSMITTER DISTRIBUTOR TT–52/FG (XD86) UNITS IN USE WITH TELETYPEWRITERS TT–7/FG AND TT–8/FG. Motors used in Teletypewriters TT–7/FG and TT–8/FG are designed to operate on 115-volt, 50- to 60-cycle ac. Use of multiple-voltage, multiple-frequency rectifiers permits operation of the motors on any 95- to 125-volt and 190- to 250-volt, 25- to 60-cycle a-c power supply. Adjust the taps on the rectifier to agree with the local power supply before connecting the power cord to the power supply. In addition, strap the No. 86951 resistor in the transmitter distributor control circuit to agree with the type of power supplied to the control circuit. Teletypewriters TT–7/FG and TT–8/FG may be operated with the motors

of many different types and power requirements. Be sure to check motor ratings and the circuit of the equipment before connecting the power cord to the power supply.

c. USE WITH TELETYPEWRITER TT–10/FG OR TELETYPEWRITER SET AN/TGC–3. Motors of these teletypewriters and of the transmitter distributors may be either of two types: synchronous motors for operation on 115-volt, 60-cycle regulated ac, or series-governed motors for operation on 115-volt, 50- to 60-cycle ac. Use of multiple-voltage, multiple-frequency rectifiers permits the series-governed motors to be operated from 95- to 125-volt and 190- to 250-volt, 25- to 60-cycle ac. Adjust the taps on the rectifier to agree with the local power supply before connecting the power cord to the power supply, and strap the No. 86951 resistor in the transmitter distributor control circuit to match the type of power supplied to the control circuit.

20. Grounding

Each transmitter distributor is grounded through its associated equipment. This is done for the protection of personnel against shock.

21. Signal Line Connections

A transmitter distributor is not connected directly to the signal line. The connection to the signal line is accomplished through the connections to associated equipment. In many instances, the transmitter distributor and the associated equipment have matching slip connection facilities. Refer to the technical manuals covering the associated equipment for instructions on connections to the signal line.

22. Service Upon Receipt of Used or Reconditioned Equipment

Instructions for service upon receipt of used or reconditioned equipment vary slightly from those which apply to the receipt of new equipment given in paragraph 16. However, installation personnel should check a used or reconditioned transmitter distributor against a new one if a new one is available. If one is not available, then check against the descriptive and statistical data given in this technical manual. Be careful to check whether a reconditioned unit has been lubricated properly and make frequent reference to lubrication instructions given in this manual. *Be sure to make lubrication checks before the unit is put in operation.*

23. Controls

a. XD82 AND XD86 UNITS. Controls on these units are described below:

Control	Location	Function
OFF-ON (STOP—SEND) switch.	On front of unit...	Controls operation of the control circuit. At ON (SEND) position, permits transmission. At OFF (STOP), stops transmission.
Tight-tape stop mechanism.	Right-hand side of unit.	When unit is transmitting, and adjacent equipment is cutting tape, stops feeding of tape when tape-cutting equipment ceases to operate and slack in tape is taken up.
End-of-tape stop mechanism.	On top of unit, under tape retaining lid (on XD86 only).	Stops transmission when the end of the tape is reached.
Motor ON-OFF switch.	On XD82, located on left side of unit. For XD86, motor is controlled by switch on associated equipment.	Stops and starts motor.

b. TWO-CHANNEL (XD91 AND XD93) UNIT CONTROLS.

Control	Location	Function
MOTOR ON-OFF switch.	Left front of unit.	Starts and stops motor.
TRANSMITTER A and B—A ONLY lever.	Right front of unit.	Controls operation of the control relay which, in turn, permits either single- or two-channel service.
TRANSMITTER A SEND—STOP lever.	Top of transmitting unit.	Starts or stops transmission on channel A. See note below.
TRANSMITTER B SEND—STOP lever.	On top of transmitting unit.	Starts or stops transmission on channel B. See note below.

Note. On the XD91 type two-channel transmitter distributor, when there is but one channel transmitting, the channel idling sends blank combinations continuously. On the XD93 type two-channel transmitter distributor, when only one channel is in use, the channel idling sends LTRS combination continuously. When both channels are idling and both levers are at STOP position, line-shorting contacts shunt the distributor segments out of the circuit and connect marking battery to the signal line. This action results in receiving equipments running closed and consequently reduces unnecessary wear on them.

c. RECEIVING TRANSMITTER DISTRIBUTORS. The only control on this type of transmitter distributor is the end-of-tape stop mechanism located on the top of the transmitting unit under the tape retaining lid. This control stops transmission when the end of the tape is reached. Other controls for operation of this type of transmitter distributors are parts of associated equipment.

24. Instruments

Tuning forks issued with the various types of transmitter distributors are highly necessary to insure efficient operation of the motors. There are two such tuning forks for checking and adjusting motor speed of series-governed motors equipped with targets having alternate black and white spots. One of these forks will vibrate 87.6 times per second; it is used to check speed of motors used with American teletypewriter equipment (368.1 opm). A second tuning fork which will vibrate 96.19 times per second is used to check motor speed for interoperation with British teleprinter equipment (404 opm). These tuning forks are made of flexible metal and are equipped with slit shutters at one end. By striking the side of the tuning fork against the hand, the shutter is made to vibrate. By holding the slit in the shutter close to the eye, the spots on the target may be viewed. This is called scanning. When the proper fork is used, and the proper speed maintained, the spots will appear to be motionless.

25. Preliminary Starting and Stopping Procedures

a. FOR TRANSMITTER DISTRIBUTOR TT–52/FG (XD86) AND RECEIVING TRANSMITTER DISTRIBUTORS. Switches which control operation of the motors in these types of transmitter distributors are located in the tables of associated equipment. This associated equipment also has located in its tables a power switch which controls operation of other equipment than the transmitter distributors. Before starting or stopping operation of a transmitter distributor of these types, and its associated equipment, be sure that the switch on the table of associated equipment which controls operation of the transmitter distributor is turned off.

b. FOR TRANSMITTER DISTRIBUTOR TT–26/FG (TWO-CHANNEL) AND XD82 TYPE TRANSMITTER DISTRIBUTORS. On these types of transmitter distributors, the switch which controls starting or stopping the transmitter distributor motor is located on the transmitter distributor. The switch should always be turned to the OFF position before the associated equipment is turned on by its own power switch.

26. Starting Procedure

a. FOR TRANSMITTER DISTRIBUTOR TT–52/FG (XD86). When the power switch on the associated equipment is turned on, operate the transmitter distributor motor switch to the ON position. The motor of the transmitter distributor should run. If it does not, refer to the equipment performance checklist (par. 46) and correct the trouble. Then insert a message tape in the tape transmitter. Be sure that the tight-tape stop lever is in its horizontal position. Operate the ON-OFF switch to the ON position. The tape should feed to the left. If it does not, check the end-of-tape stop contacts; see that the end-of-tape stop pin closes the contacts when the tape is in the tape guide and the tape-retaining lid is closed. Check the tight-tape stop contacts to see that they are clean and that they make contact with each other. If this fails to remedy the trouble, refer to the trouble-analysis chart (par. 76).

b. FOR TRANSMITTER DISTRIBUTORS OF THE XD82 TYPE. After associated equipment is turned on, operate the transmitter distributor motor switch to the ON position. The transmitter distributor motor should run. If it does not, refer to the equipment performance checklist (par. 46) and remedy the trouble. Insert a message tape and operate the SEND—STOP lever to SEND. The tape should feed to the left. If it does not, check the tight-tape stop mechanism to see that it is operating properly. If this fails to remedy the trouble, refer to the trouble-analysis chart (par. 76).

c. FOR TRANSMITTER DISTRIBUTOR TT–26/FG (TWO-CHANNEL). After the power switch on the associated equipment is turned on, operate the transmitter distributor power switch to the ON position. The motor of the transmitter distributor should start to run. If it does not, refer to the equipment performance checklist (par. 47) and remedy the trouble. Because the two-channel transmitter distributors are not equipped with main-shaft friction clutches, the main shafts rotate continuously with the motors.

(1) Operate the TRANSMITTER A and B—A ONLY switch lever to A ONLY. Insert a message tape in transmitter A and operate the TRANSMITTER A SEND—STOP lever to SEND. The tape should feed to the left. If it does not, refer to the trouble-analysis chart (par. 76).

(2) Operate the TRANSMITTERS A and B—A ONLY switch lever to A and B (fig. 4). Insert a message tape in transmitter B and operate the TRANSMITTER B SEND — STOP lever to SEND. The tape should feed to the left. If it does not, refer to paragraph 76.

(3) With the SEND — STOP levers at SEND position and the TRANSMITTERS A and B—A ONLY switch lever at A and B, both tapes will feed to the left. To stop either tape, operate the SEND—STOP lever for its transmitter to STOP.

(4) To send with TRANSMITTER B only, its SEND—STOP lever must be placed at SEND, the TRANSMITTERS A and B—A ONLY switch lever must be at A and B, and the TRANSMITTER A SEND — STOP lever must be at STOP.

d. FOR RECEIVING TRANSMITTER DISTRIBUTORS. The motor and signal circuits of the receiving transmitter distributors operate directly with associated equipment. Since this equipment is classified, operation with associated equipment is not described in detail here.

27. Operating Checks and Adjustments

Transmitter distributors are supposed to be delivered in proper adjustment, but *before* either a new or used transmitter distributor is put into operation, inspect it and lubricate it if lubrication is necessary. *Never overlubricate.* If definite information is lacking as to the exact condition of a unit, check the following parts to be sure that proper adjustments have not been changed:

a. MOTOR. Turn the motor by hand in the direction of normal rotation (distributor brushes moving clockwise) to make sure that there is no bind or excessive backlash between the motor pinion and the mainshaft gear, and that there is no bind in other parts of the equipment. Paragraph 24 describes the method of adjusting the speed of the motor. This procedure should be performed only by qualified maintenance personnel. *Never turn the motor backward. To do so may cause the brushes to catch on edges of the commutator segments and consequently become broken or badly bent.*

b. DISTRIBUTOR BRUSHES. See that the brushes are making contact with the commutator segments and that they have proper tension and position with respect to the reference line on the distributor disk.

c. TAPE-STOP ARM. The tape-stop arm should clear the stop cam lug when the stop magnet is held in its operated position, and the stop arm should engage the stop cam lug fully when the armature is released.

d. TAPE-FEED MECHANISM. Put a piece of perforated tape in the tape transmitter. Then, turn the motor by hand, in the direction of rotation, and observe whether the tape advances one full row of perforations for each complete turn of the main shaft. If the tape moves either more or less than one full row of perforations, readjust it to meet requirements.

e. TAPE SENSING MECHANISM. Put a piece of tape with repeated LTRS combinations in it in the tape transmitter and turn the motor as instructed in *d* above. Observe whether all the tape pins pass through the associated perforations in the tape. If a tape pin fails to pass through a hole, check for a bind in the associated contact lever and readjust the lever according to requirements.

f. CONTROL CIRCUIT. Make a check of the strapping on the No. 86951 resistor and, if necessary, arrange the strappng to meet requirements for the power supply. Straps are not placed directly on this resistor in transmitter distributors used as part of Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A. Terminals of the resistor are wired to the terminal board, and any necessary changes are made automatically by setting the power selector switch on the associated equipment.

28. Stopping Procedure

a. STOPPING TRANSMISSION. The procedure outlined in (1) through (3) below deals with stopping transmission momentarily to a standby condition, which is done to correct errors or to change message tapes.

(1) Transmission by Transmitter Distributor TT–52/FG and on the XD82 type transmitter distributor is accomplished by operating the ON-OFF (SEND —STOP) switch to the OFF (STOP) position. It also can be stopped by manually operating the tight-tape stop lever upward. Transmission on Transmitter Distributor TT–52/FG stops automatically when the end of the tape is reached. This is because the tape moves off the end-of-tape stop pin and the contact spring opens the end-of-tape stop contacts. This feature is *not* included in the XD82 type transmitter distributor.

(2) Transmission by Transmitter Distributor TT–26/FG (two-channel) never is stopped completely when the motor of the transmitter distributor

is running (*b* below). When either channel is idling, the transmitter distributor transmits blank signals in the case of the XD91 type, and LTRS signals in the case of the XD93 type. Transmission of message tapes can be stopped on either channel, however, by operating the SEND—STOP lever of the channel to STOP. When this is done, that channel transmits blank or LTRS signals depending on the type of transmitter distributor.

(3) Stopping transmission by receiving transmitter distributors usually is accomplished through the equipment associated with the transmitter distributor. For instructions for stopping transmission on a receiving transmitter distributor, refer to the technical manuals covering the equipment with which the transmitter distributor is used.

b. COMPLETE SHUT-DOWN. Transmitter distributors are shut down completely when it is apparent that there will be no traffic for some time or when a circuit is closed to traffic such as at night, etc.

(1) For a complete shut-down of Transmitter Distributor TT–52/FG and receiving type transmitter distributors operate the motor power switch of the transmitter distributor to the OFF position. In the case of these equipments, the motor power switch is located on the table upon which the associated equipment is mounted. If complete shut-down for an entire circuit is desired, operate the power switch for the associated equipment to the OFF position. *Do this only when the transmitter distributor motor power switch has been turned off.*

(2) For complete shut-down of Transmitter TT–26/FG (two-channel) and the XD82 type transmitter distributor, operate the motor power switch to the OFF position. This switch, for the XD82 type, is located on the left side of the transmitter distributor, and the switch for the two-channel transmitter distributor is located on the left front of the transmitter distributor. When complete shut-down is desired for an entire circuit in which either of these types of transmitter distributors are used, operate the power switch on the associated equipment to the OFF position. *Do this only after the motor power switch for the transmitter distributor has been operated to the OFF position.*

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

29. Operation in Arctic Climates

In extremely cold climates, keep the room in which the transmitter distributor is operating as near normal room temperature as possible. If the room is allowed to become too cold, the transmitter distributor will not function properly.

30. Operation in Tropical Climates

Guard against conditions that cause the wiring to become partially grounded or shorted; these conditions cause disablement of the transmitter distributor, or at least its inefficient operation. Guard against the growth of fungi and the presence of insects and corrosion.

31. Operation in Desert Climates

Keep the room in which a transmitter distributor is operating as free from dust as possible. In areas where there are duststorms and sandstorms, be careful to prevent dust from entering the equipment. These precautions will reduce greatly the amount of maintenance and repair work on equipment.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

32. Preventive Maintenance Tools and Materials

Tool Equipments TE–50 and TE–50–A, which are designed especially for maintenance of teletypewriter equipment, are supplied to organizations responsible for the maintenance of transmitter distributors covered in this manual. In Tool Equipment TE–50, Test Unit I–236 is a component. In Tool Equipment TE–50–A, the test unit is replaced by Multimeter TS–297/U (fig. 19). For complete information on Test Unit I–236, refer to TM 11–2056. Detailed information on the use of Multimeter TS–297/U is included in TM 11–5500.

33. Special Tools

Special tools necessary for maintenance procedures on the transmitter distributors are available to field teletypewriter maintenance personnel. Such tools are described in paragraph 63.

Section II. PREVENTIVE MAINTENANCE SERVICES

34. Definition of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed periodically on equipment to maintain top efficiency in performance, to minimize unwanted interruptions in service, and to eliminate major breakdowns. To understand what is meant by preventive maintenance, it is necessary to distinguish preventive maintenance from trouble shooting and repair. The primary function of preventive maintenance is to prevent breakdowns and the need for repair. On the other hand, the primary function of trouble shooting and repair is to locate and correct existing defects. Preventive maintenance is of utmost importance. The usefulness of the entire system of communication depends on equipment being ready to operate at peak efficiency when needed.

35. General Preventive Maintenance Techniques

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten or brush with Solvent, dry-cleaning (SD); then wipe the parts with a dry cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a cloth, and burnish them.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 psi (pounds per square inch) to remove dust from inaccessible places; be careful, however, or mechanical damage from the air blast may result.

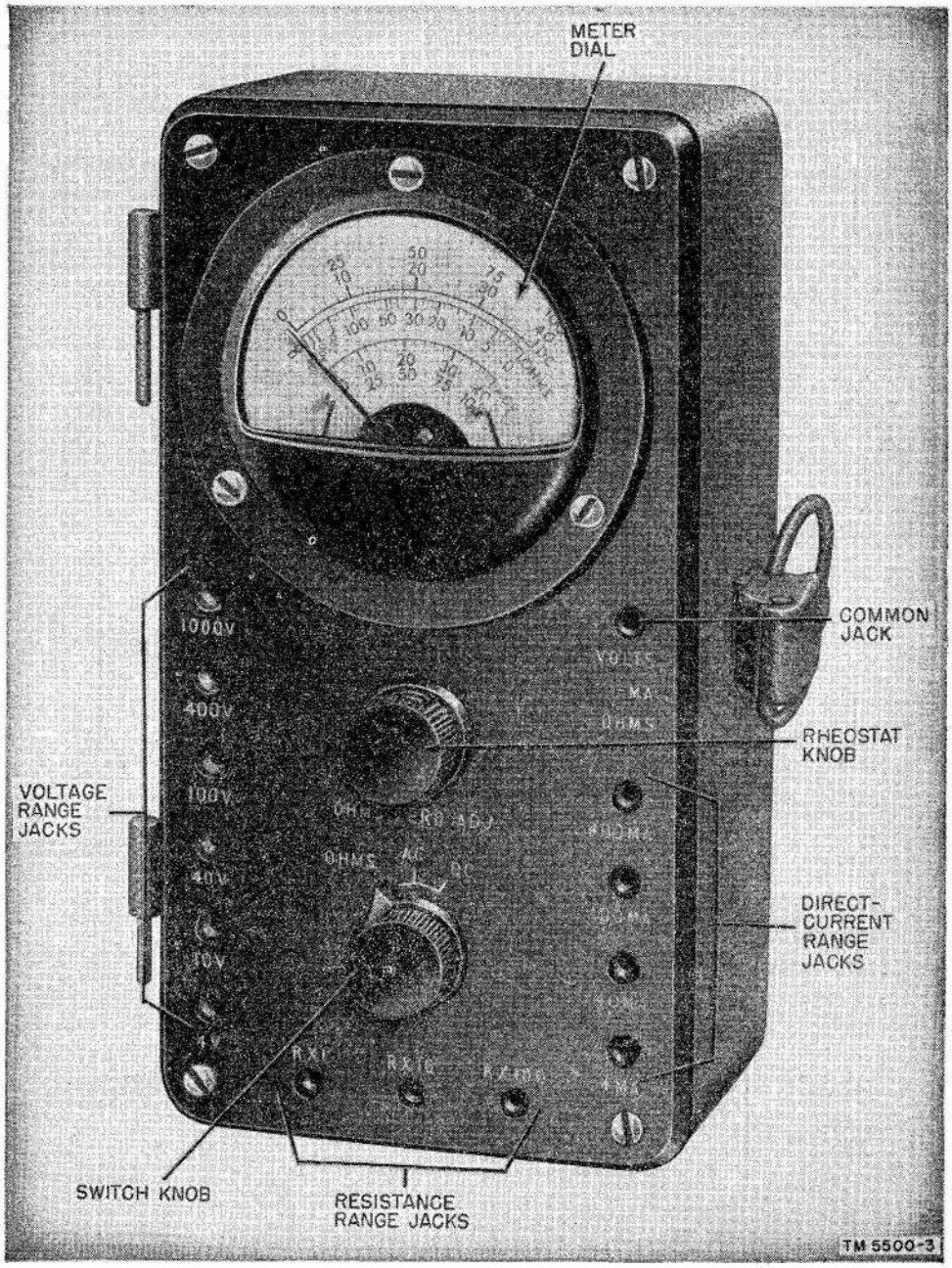


Figure 19. Multimeter TS-297/U.

36. Preventive Maintenance Checklist

Item No.	What to check	When to check*	How to check	Precautions
1	Motor bearings.	X	Feel the bearing housings of the motor to see if they are too hot.	
2	Distributor disk.	X	Check for dirt, worn or grooved segments, and for carbon or metallic particles between segments. Remove oil, grease, gummy deposits, or foreign matter from the face of the distributor disk with a clean cloth moistened with carbon tetrachloride.	Do not polish the face of the disk to remove discoloration.
3	Distributor brush assembly.	X	See that the brushes are aligned correctly and have proper tensions (pars. 120, 121, and 122).	
4	Start Magnet and stop lever.	X	Check the spring tension. It should be enough to latch the stop lever with the lug on the stop cam when the start magnet is de-energized.	Be careful not to stretch or break the springs and wiring.
5	Main-shaft friction clutch.	X	Check the clutch locknut for looseness. Tighten the locknut if it is loose. Check torque.	If this nut is not tight, the main-shaft gear may jam and damage the motor. If the gear jams, the motor will stall. Then, if fuse protection fails, the motor will burn out.
6	Contact screws and contact tongues.	X	Check for cleanliness and good condition. When it is absolutely necessary to clean transmitting contacts, fold a single thickness of clean cloth over the end of a contact burnisher and dip the cloth and burnisher in carbon tetrachloride. Wipe the contacts and let them dry. When the contacts are dry, burnish them until they are bright. If build-ups are present, remove them with a contact file before burnishing. After cleaning, remove any filings and lint deposited near the contacts.	Contact tongues should move between contact screws without binding. Never clean contacts (contact screws and tongues) unless inspection shows definite need for cleaning. Contact tongues are delicate; unnecessary cleaning may cause trouble.
7	Governor	X	Clean internal parts with a clean dry cloth. Fold the cloth over a screwdriver blade to clean hard-to-reach places. Remove grease, dirt, or foreign matter from outside the governor shell by wiping with a clean dry cloth. To remove gummy deposits, dampen the cloth with solvent (SD). Clean the governor brush springs and mounting bracket and governor adjusting bracket.	Do not take the governor apart for cleaning unless there is reason to believe that it is very dirty internally and that the dirt may be causing the trouble.
8	Motor speed.	X	Check that the motor speed is correct and the governor holds its setting.	Do not attempt unauthorized adjustments.

*See footnotes at end of table.

Item No.	What to check	When to check*	How to check	Precautions
9	Motor commutator and brushes.	X	Check for wear on the commutator and for accumulations of dirt, grease, or gummy deposits. Check the condition of the motor brushes and brush holders. Remove the commutator brushes from the motor. Clean the brushes and the insides of the brush holders with a clean cloth moistened with carbon tetrachloride.	When a carbon brush is removed, scratch an identifying mark on its upper surface so that the brush may be replaced in the correct brush holder and in the correct position. If brushes look as though they may not last until the next scheduled inspection, install new ones.
10	Capacitors and resistors.	X	Look for loose or corroded connections, cracked or damaged insulation, and for discoloring or bulging, which indicates overheating. With a clean dry cloth, remove oil, grease, or excessive moisture. Clean the dirty or corroded connections.	
11	Terminal boards.	X	Look for loose connections, cracks, breaks, and dirt. Tighten all loose mounting and terminal board screws. With a dry brush, remove loose foreign matter. With a clean dry cloth, wipe off excessive moisture. Remove oil, grease, or gummy deposits with a clean cloth moistened with solvent (SD).	Before tightening any screw, nut, or bolt, determine whether it is part of some adjustment. If so, only tighten in accordance with the requirements and adjustments described in chapter 5.
12	Wiring, cabling, and plugs.	X	Look for cracked, frayed or torn insulation, loose connections, dirty contacts, and faulty lacing. Look for wiring which may be in contact with moving parts. Examine the prongs of the cord plugs for dirt and corrosion. Wipe grease, oil, and moisture from the wiring, cabling, and cords with a clean dry cloth. Clean corrosion or stains from the plug prongs with metal polish.	Be careful not to stretch or break the springs and wiring.
13	Exterior of equipment.	Daily	Inspect the exterior of the equipment for presence of paper lint, dust, dirt, or other foreign matter, and for bent, broken, or missing parts. Remove dirt, dust, and lint by wiping with a clean dry cloth moistened with solvent (SD) to remove oil, grease, or gummy deposits. Use the solvent sparingly.	
14	Mechanical parts.	X	Check all mechanisms for the condition and the amount of lubrication. Clean all mechanical parts with a clean dry cloth. Fold the cloth over a screw-driver blade to clean hard-to-reach places.	

* See footnotes at end of table.

Item No.	What to check	When to check*	How to check	Precautions
15	Entire mechanism.	X	If there is evidence that any mechanism is maladjusted, check it in accordance with adjustments and requirements outlined in chapter 5. Lubricate in accordance with the instructions given in paragraph 40.	

*The letter X in *When to check* column is determined by average hours of use of the equipment:

Average hours of use	*In normal temperatures*	*In tropical temperatures*
Up to 8 hours a day.	X = every 30 days.	X = every 15 days.
8 to 12 hours a day.	X = every 15 days.	X = every 10 days.
12 to 24 hours a day.	X = every 10 days.	X = every 7 days.

Section III. LUBRICATION

37. Lubricants and Cleaner

Listed below are lubricating and cleaning materials necessary for servicing transmitter distributors.

Symbol	Standard nomenclature
GL	Grease, lubricating, special.
GG	Grease, graphite, soft.
PL-SPECIAL	Oil, lubricating, preservative, special*.
OE 10	Oil, engine.
SD	Solvent, dry-cleaning.

*When the temperature is so high that the oil (PL-SPECIAL) runs off the parts, use engine oil (OE 10).

38. Methods of Applying Grease

a. FILLING GREASE GUN. Fill the grease gun furnished as part of Tool Equipment TE–50 or TE–50–A as follows:

(1) Unscrew the lubricant tube from the cap casting.

(2) Place the open end of the lubricant tube over the opening in the filling washer in the can of lubricant. Press down the lubricant tube until the tube is filled. If the cans of lubricant on hand are not equipped with filling washers, press the metal follower against the back end of the lubricant tube and fill the tube by using a clean wooden paddle or the fingers. Tamp the lubricant down solidly in the tube by pounding the closed end sharply against the palm of the hand. Continue to add lubricant and tamp until the tube is filled.

(3) Screw the lubricant tube back into the cap casting just enough to hold the tube in place. Insert a rod, screw driver, pencil, or similar object through the perforated end of the lubricant tube, and press the metal follower into the tube to expel any air that may be trapped in the tube. When the lubricant begins to ooze past the threads, screw the lubricant tube securely into the cap casting.

(4) Operate the handle back and forth until the lubricant comes from the nozzle. The grease gun now is ready for use. If the lubricant does not flow from the nozzle in a solid stream when the handle is operated, air is still in the tube. Invert the gun and pound the cap casting end against the palm of the hand to jar the lubricant into the pump cylinder.

b. GREASING PRESSURE FITTINGS. To grease the two motor oilers, place the nozzle of the grease gun squarely against the grease fittings and operate the handle. Test the grease gun before greasing pressure fittings to find out how much grease is injected for each full operation of the handle. *Do not overlubricate.*

c. GREASING FLAT SURFACES. To grease flat surfaces, hold the nozzle of the grease gun against the surface, tilted at an angle of about 45°. Operate the handle until enough grease is ejected. If the surface is long, operate the handle slowly and, at the same time, move the nozzle of the gun along the surface to form a

continuous ribbon of lubricant. Pump the lubricant out onto the fingers or the end of a screw driver to place the grease in hard-to-reach places.

39. Methods of Applying Oil

a. FILLING OILER. Fill the oiler furnished as part of the tool equipment by unscrewing the top and by removing the pump. Fill the tube with the proper lubricant, replace the pump, and tighten the top.

b. USING OILER. After filling the oiler, or when starting to use it after it has been standing for some time, operate the pump handle until oil is forced out of the nozzle, and then adjust the stop beneath the pump handle for the desired flow of oil. Turn the adjusting screw counterclockwise to reduce the flow of oil and clockwise to increase the flow. The adjustable stop beneath the pump handle may be moved to one side to make the stop inoperative.

c. APPLYING OIL WITH WIRE. Dipping a piece of No. 22 B and S gage wire one-half-inch into the oil and immediately touching it to the lubrication point is an approved method of applying 1 or 2 drops of oil. The main advantage of this method is that it avoids overlubrication.

d. WHEN TO LUBRICATE. Lubricate the transmitter distributors before they are placed in service for the first time, before returning them to operation following an extended period (3 months or longer) of idleness or storage, and before they are returned for storage for an extended period of idleness.

e. PREPARATION FOR LURICATION. With a soft clean brush or a clean lint-free cloth lightly dampened with solvent (SD), clean all parts to be lubricated. Allow the parts to dry thoroughly before lubricating. After lubricating, wipe off excess lubricant with a clean lint-free cloth.

40. Lubrication Chart

Once a month or more frequently, if climatic or operating conditions warrant, apply lubricants, as indicated, to the parts listed in the chart below. Figures 20, 21, and 22 show lubrication points.

Item No.	Item	Lubricant	Method and quantity
See figure 20 for items No. 1 through 21.			
1	Contact springs	PL-Special	Do not lubricate the ends of the contact lever springs; since they are soldered at each end, there is no wearing action. A very thin film of oil may be applied to coil springs to prevent rust.
2	Feed-lever spring	PL-Special	1 drop at each end.
3	Friction clutch feltwashers	PL-Special, GG	Saturate with oil; coat with grease.
4	Main-shaft bearings	PL-Special	1 or 2 drops to each bearing.
5	Bearings of contact levers and feed lever.	PL-Special	1 or 2 drops to each bearing.
6	Feed pawl bearing	PL-Special	1 or 2 drops.
7	Feed-roll bearings	PL-Special	1 or 2 drops to each bearing.
8	Detent lever bearing	PL-Special	1 or 2 drops.
9	Detent roller bearing	PL-Special	1 or 2 drops.
10	Stop lever spring	PL-Special	1 or 2 drops to each end. (A very thin film may be applied to the coil springs to prevent rust.)
11	Motor bearing oilers (two)	GL	1 or 2 strokes of the grease gun plunger.
12	End-of-tape stop contact pin at guide bracket.	PL-Special	1 drop.

Item No.	Item	Lubricant	Method and quantity
13	Operating lever bearing (oil-hole runs between the top of the base casting and the operating lever bearing).	PL-Special	1 or 2 drops.
14	Contact-lever bail bearings	PL-Special	1 or 2 drops to each bearing.
15	Tape retaining lid bearings	PL-Special	1 or 2 drops to each bearing.
16	Tape retaining lid latch bearings.	PL-Special	1 or 2 drops to each bearing.
17	Stop lever bearings	PL-Special	1 or 2 drops on each bearing.
18	Stop cam lug (latching and camming surfaces).	PL-Special, GG	1 or 2 drops of oil, thin film of grease, then 1 or 2 more drops of oil.
19	Main-shaft gear and motor pinion.	GL	Thin film.
20	Operating cam periphery	GL	Thin film.
21	Operating lever adjusting screw head.	GL	Thin film.
See figure 21 for items No. 22 through 25.			
22	Stop lever felts	PL-Special, GG	Saturate with oil; coat with grease.
23	Latching steps of stop lever	GG	Thin film.
24	Reset extension of stop lever	PL-Special, GG	1 or 2 drops of oil, thin film of grease, then 1 or 2 more drops of oil.
25	Entire length of armature retractive spring.	GG	Thin film.
See figure 22 for items No. 26 through 38.			
26	Upper edge of restoring blade.	GL	Thin film.
27	Step end of restoring lever	GL	Thin film.
28	Step of nonrepeat lever	GL	Thin film.
29	Trip-off latch extension (between nonrepeat and trip-off levers).	GL	Thin film.
30	Tooth of tape-feed lever latch.	GL	Thin film.
31	Step of trip-off lever	GL	Thin film.
32	Contact surface of tape-feed lever extension.	PL-Special	Thin film.
33	Both loops of each spring	PL-Special	1 or 2 drops to each loop.
34	Pivot point of trip-off lever	PL-Special	1 or 2 drops.
35	Pivot point of nonrepeat lever.	PL-Special	1 or 2 drops.
36	Pivot point of restoring lever	PL-Special	1 or 2 drops.
37	Pivot point of restoring lever	PL-Special	1 or 2 drops.
38	Pivot point of tape-feed lever latch.	PL-Special	1 or 2 drops.

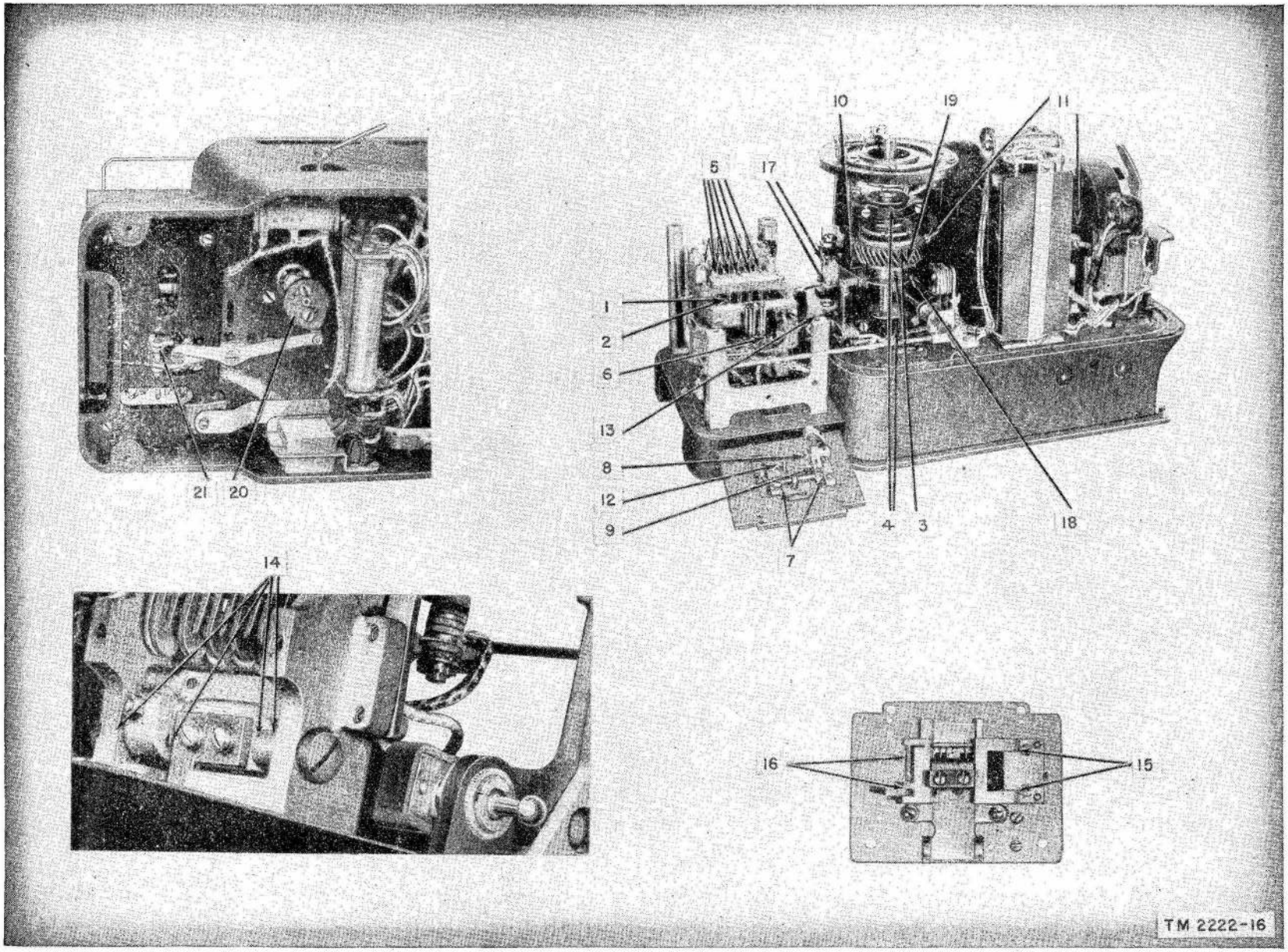


Figure 20. Transmitter distributor lubrication points.

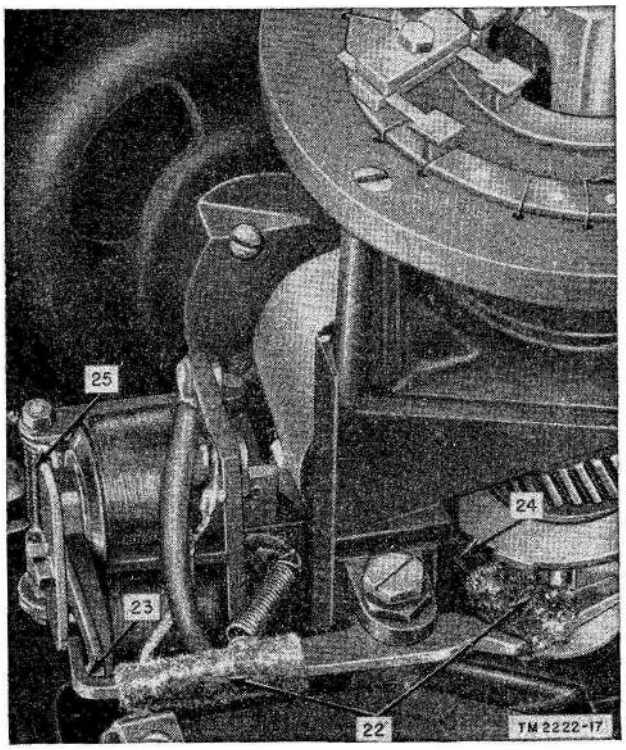


Figure 21. Stop lever (receiving type transmitter distributors) lubrication points.

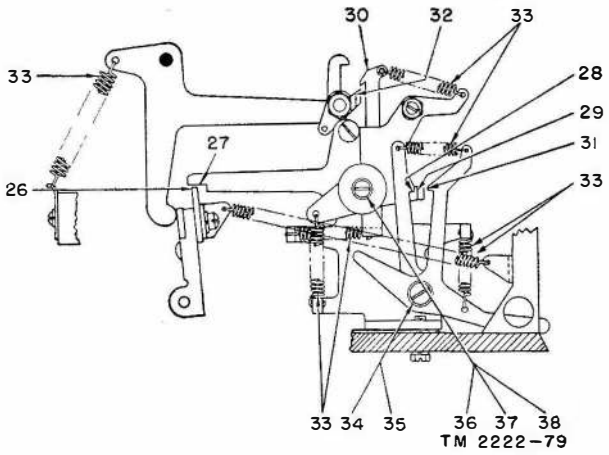


Figure 22. Transmitter Distributor TT-21/FG (XD100-GW), tape-feed suppression mechanism lubrication points.

Section IV. WEATHERPROOFING

41. Weatherproofing

a. GENERAL.

(1) Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

(2) In any climate where moisture conditions are extreme, preventive measures must be taken against corrosion and rust. Frequently coat with a light film of oil (PL-Special) all metal surfaces that are not painted or plated except where such a coating will affect the mechanical or electrical operation of the equipment.

b. TROPICAL MAINTENANCE. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13 and TB SIG 72.

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained fully in TB SIG 66.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained fully in TB SIG 75.

42. Rustproofing and Painting

a. When the finish on a transmitter distributor has been scarred or damaged badly, rust and corrosion can be prevented by touching up bared surfaces. Use No. 00 or No. 000 sandpaper to clean the surface down to the bare metal. Obtain a bright smooth finish.

Caution: Do not use steel wool. Minute par-

ticles frequently enter components and cause harmful internal shorting or grounding of the circuits.

b. When a touch-up job is necessary, apply paint with a small brush. When numerous scars and scratches warrant complete repainting, remove the components, mask the parts on which the presence of paint will affect electrical operation; then spray paint over the unmasked parts.

Section V. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

43. General

Trouble shooting at the organizational maintenance level requires that trouble be traced to a faulty part as quickly as possible. It then must be determined whether the part can be repaired at the organizational level or must be sent to a field repair shop. Within the scope of the personnel and tools available, follow trouble-shooting and repair instructions contained in chapter 5.

44. Visual Inspection

a. Failure of a transmitter distributor to operate properly usually is caused by one or more of the following faults, which ordinarily can be identified by visual inspection:

(1) Improper connections to associated equipment.
(2) Burned-out fuses.
(3) Worn, broken, burned-out, or disconnected cord or plug.
(4) Broken wires.
(5) Visibly worn or damaged mechanical parts.

b. When failure or troublesome operation occurs and the cause is not immediately apparent, check as many of the foregoing items as practicable before starting a detailed examination of the transmitter distributor and associated parts of a system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred.

c. Visually inspect as much of the line system as possible for obvious abnormalities.

45. Trouble Shooting (Using Equipment Performance Checklists)

a. GENERAL. The equipment performance checklists (pars. 46, 47, and 48) will help in locating trouble. These lists give the items to be checked, the normal indications, and the corrective measures that can be taken by the operator. *To use these lists, follow the items in numerical sequence.*

b. ACTION OR CONDITION. For some items, the information given in the *Action or condition* column consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the *Normal indication* column.

c. NORMAL INDICATIONS. The normal indications listed include the visible and audible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. CORRECTIVE MEASURES. The corrective measures listed are those which the operator can make without turning in the equipment for repairs. If the set is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained, and if the set is not completely inoperative, the operator must keep the set in operation as long as it is possible to do so.

46. Equipment Performance Checklist for Transmitter Distributor TT–52/FG and XD82 Type Transmitter Distributors

	Item No.	Item	Action or condition	Normal indication	Corrective measures
PREPARATORY	1	Installation and line connections.	Install transmitter distributor with associated equipment and plug in the signal cord.	All circuit connections between the XD86 transmitter distributor and the associated equipment are made automatically when the transmitter distributor is slipped into position on the mounting plate. XD82 is wired at the factory.	
START	2	Power switches	Operate associated equipment and motor power switches to ON.	Transmitter distributor motor runs.	Check power supply and connections.
EQUIP PERF	3	Sending messages	Insert message tape.		
			Operate tape-stop switch to ON.	Tape feeds through transmitter distributor.	Check the switch setting, tight-tape stop mechanism, and end-of-tape stop mechanism.
STOP	4	Tape stop	Operate tape-stop switch to OFF.	Tape stops feeding through transmitter distributor.	
	5	Power	Operate motor power switch to OFF.	Transmitter distributor motor stops.	

47. Equipment Performance Checklist for Transmitter Distributor TT–26/FG (Two-Channel)

	Item No.	Item	Action or condition	Normal indication	Corrective measures
PREPARATORY	1	Installation and line connections.	Assemble transmitter distributor with associated equipment.	All circuit connections between the transmitter distributor and the associated equipment are made automatically when the transmitter distributor is slipped into position on the mounting plate.	
START	2	Power switch _____	Operate associated equipment power switch to ON and the MOTOR ON-OFF switch of the transmitter distributor to ON.	Transmitter distributor motor runs.	Check power supply and connections.
	3	Sending messages_	Insert message tapes in A and B transmitters.		
EQUIP PERF	4	Transmission on A channel only.	Operate A and B — A ONLY switch to A ONLY. Operate A SEND — STOP lever to SEND.	Tape feeds through transmitter A only.	Check switch and lever settings.
	5	Transmission on A and B channels.	Operate A and B — A ONLY switch to A and B. Operate A SEND — STOP and B SEND — STOP levers to SEND.	Tape feeds through transmitters A and B (double-channel operation).	Check switch and lever settings.
STOP	6	SEND — STOP levers.	Operate A SEND — STOP and B SEND — STOP levers to STOP.	Tape stops feeding.	
	7	Power switch_____	Operate MOTOR ON-OFF switch to OFF.	Transmitter distributor motor stops.	

48. Equipment Performance Checklist for Receiving Transmitter Distributors

	Item No.	Item	Action or condition	Normal indication	Corrective measures
PREP	1	Line connections__	Connect in accordance with the instructions given with associated equipment.		
START	2	Power switch_____	Operate associated equipment power switch to ON.	Transmitter distributor motor runs.	Check power connections.
PERF	3	Sending messages_	Insert message tape.		
EQUIP	4		Start magnet operates with associated equipment.	Tape feeds one row of perforations with each operation of the start magnet.	Check power connections and adjustments as described in chapter 5.
STOP	5	Power switch_____	Operate associated equipment power switch to OFF.	Transmitter distributor motor stops.	

CHAPTER 4

THEORY

Section I. THEORY OF TAPE TRANSMITTING MECHANISMS

49. Tape Transmitters

All model 14 transmitter distributors, with the exception of Transmitter Distributor TT–21/FG (XD100GW) (receiving), have similar tape transmitting mechanisms. Transmitter Distributor TT–21/FG has a tape-feed suppression mechanism which is not a feature in the other types. The tape sensing mechanism and the tape-feed mechanism in all units are closely associated.

50. Tape Sensing Mechanism

a. With the exception of the two-channel transmitter distributors, all units have similar tape sensing mechanisms. Each tape sensing mechanism, except those in the two-channel units, has a group of five similarly shaped contact levers with associated contact tongues, a contact block with five pairs of contact screws (five marking and five spacing), and a group of parts consisting of the contact-lever bail, operating lever, roller, and operating cam. Two-channel transmitter distributors have two such mechanisms.

b. Figure 23 shows the contact lever. The lever has three irregularly shaped extensions, A, B, and C, and is pivoted as indicated by the designation S. Extension C is turned up at one end, and a small tape pin, projecting vertically upward, is set into the end of the extension. Extension B extends vertically downward and engages the contact-lever bail. The contact tongue assembly is attached to extension A by a pivot located at the rear edge of the contact tongue. The five contact levers are mounted on the same shaft S, and are spaced so that the distance between the tape pins is the same as the distance between the perforations in the tape.

c. In nontransmitting position, the operating lever roller is on the peak of the operating cam and, in this position, through the medium of the operating lever and the contact-lever bail, holds the contact levers in such a way that the tape pins are below the upper surface of the tape guide, and the contact tongues rest against the spacing (upper) contact screws. The contact tongue assemblies are pivoted at their edges on the contact levers. The front edges of the contact tongue assemblies are held against the contact levers by tension in the contact-lever springs.

(1) As a single character (or function) is transmitted by the transmitter distributor, the cycle or operation of the tape sensing mechanism starts when the stop arm is moved out of engagement with the lug on the stop cam (either by hand or electrically) (fig. 25). This allows the main shaft (including the operating cam and the distributor brush assembly) (figs. 24 and 25) to start turning.

(2) Immediately after the main shaft begins to turn, the operating lever roller rides off the peak of the operating cam (fig. 24) and releases pressure on the contact-lever bail (figs. 24 and 25). When pressure on the bail is released, the contact-lever springs rotate the contact levers on shaft S (fig. 23), so that the tape pins move upward through the openings in the transmitter top plate. If there is a perforated tape in the transmitter as the tape pins move upward, those pins which have holes above them in the tape pass through the holes and continue to move upward until the associated contact tongues rest against their marking (lower) contact screws.

(3) If there is no hole in the tape directly above a contact pin, the upward movement of the pin is blocked by the tape, and the associated contact remains against its spacing (upper)

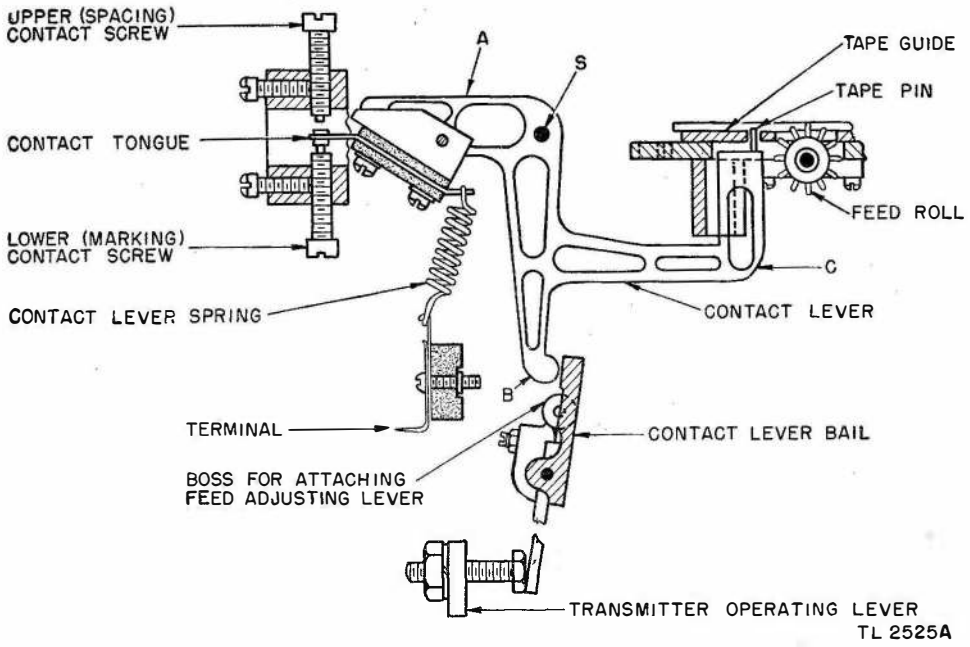


Figure 23. Tape sensing mechanism, cross section.

contact screw. The moving of the tape pins and the positioning of the contact tongues take place during the transmission of the start impulse, and they retain their positions during the transmission of impulses No. 1, 2, 3, 4, and 5. At the beginning of the *stop* impulse, the operating lever roller begins to ride up to the peak of its cam and causes pressure on the contact lever bail. This pressure causes the contact levers to rotate on shaft S until the tape pins are pulled below the surface of the tape guide, and the contact tongues are moved against the spacing (upper) contact screws.

(4) The transmitting cycle ends when the operating lever roller reaches the peak of its cam. Because of the small amount of separation between the contact tongues and the contact screws, the transition from the marking to the spacing contacts takes place before the contact pins recede below the surface of the tape guide. The contact tongues stop moving upon striking the spacing (upper) contact screws, but the contact levers continue to move until the operating lever roller rests on the peak of its cam. The difference in movements is absorbed by the contact lever springs.

51. Tape-Feed Mechanism
(fig. 26)

The principle of operation of the tape-feed mechanism is the same for all model 14 transmitter distributors except Transmitter Distributor TT–21/FG in which a tape-feed suppression mechanism is incorporated. Therefore, the principle of operation of all tape-feed mechanisms except the one in Transmitter Distributor TT–21/FG is explained in *a* below; that for Transmitter Distributor TT–21/FG is discussed in *b* below.

a. Pivoted on shaft S with the five contact levers is a sixth lever known as the feed lever. The feed lever moves in unison with the contact levers since extension B of the feed lever extends vertically downward and engages the contact lever bail in the same manner as the five contact levers. When the operating lever roller rides off the peak of its cam, the feed lever rotates on shaft S under tension of its spring in the same manner as the contact levers. The upward movement of extension C of the feed lever enables the feed pawl to engage a tooth in the

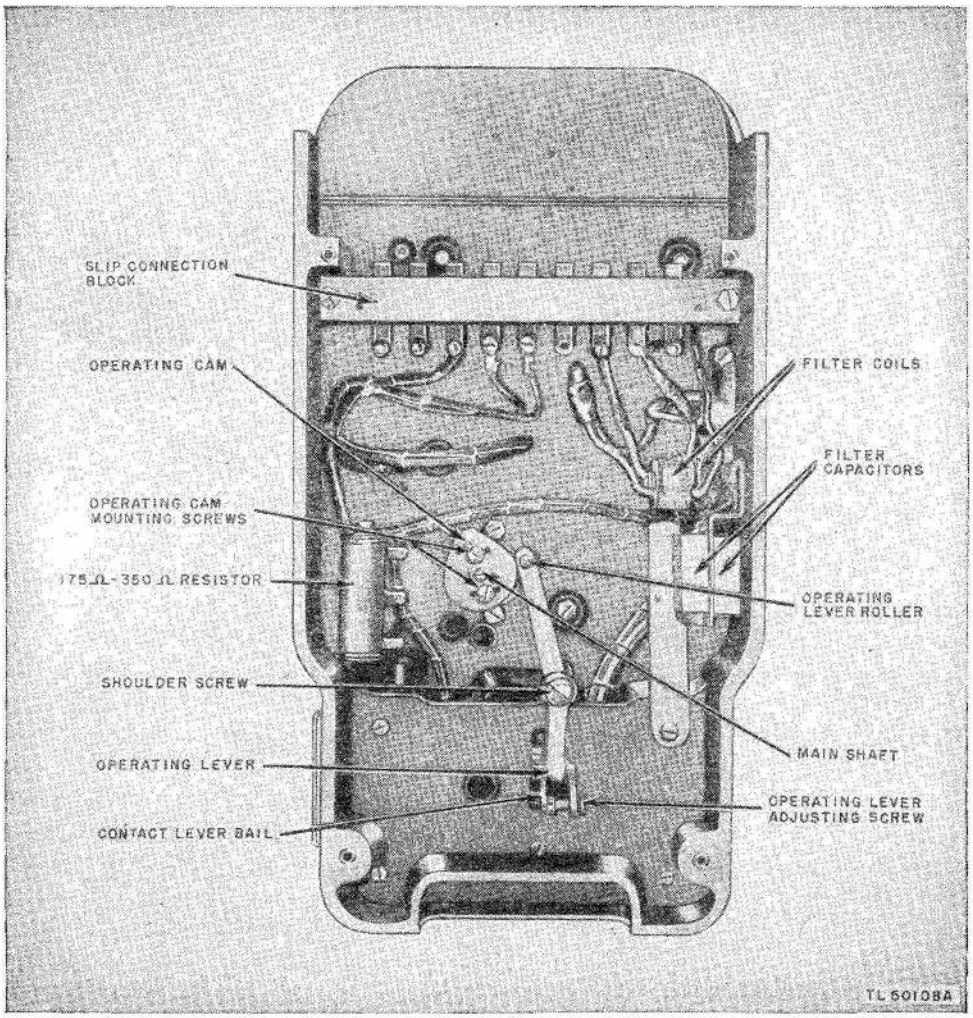


Figure 24. Transmitter Distributor TT-52/FG, bottom view, base plate removed.

feed-roll ratchet. The downward movement of extension C, as the operating lever roller rides up to the peak of its cam, causes the feed pawl to exert pressure on a ratchet tooth and thereby turns the feed roll a distance corresponding to that between two teeth on the feed-roll ratchet. A detent roller, which bears upon the ratchet teeth, is provided to insure even movement of the feed roll. The tape-feed mechanism is designed so that the feed pawl does not engage a ratchet tooth until the tape pins have been pulled below the surface of the tape guide. This action prevents tearing of the tape by making certain that it does not move before the pins are withdrawn. In the two-channel type transmitter distributor, each of the two tape transmitters operates in the same manner as described above; whether they operate simultaneously or separately depends on the manual setting of levers which determines whether there should be single- or two-channel operation.

b. The tape-feed mechanism in Transmitter Distributor TT–21/FG (XDIOOGW) (fig. 27) functions in the same manner as the feed mechanism in other model 14 transmitter distributors, except at such times as a manually operated lever, which extends through the unit's walnut snap panel, is operated to suppress tape feeding. The stepping action of the tape-feed mechanism is suppressed one step each time this lever is depressed. A more detailed description of the tape-feed suppression mechanism is given in paragraph 11.

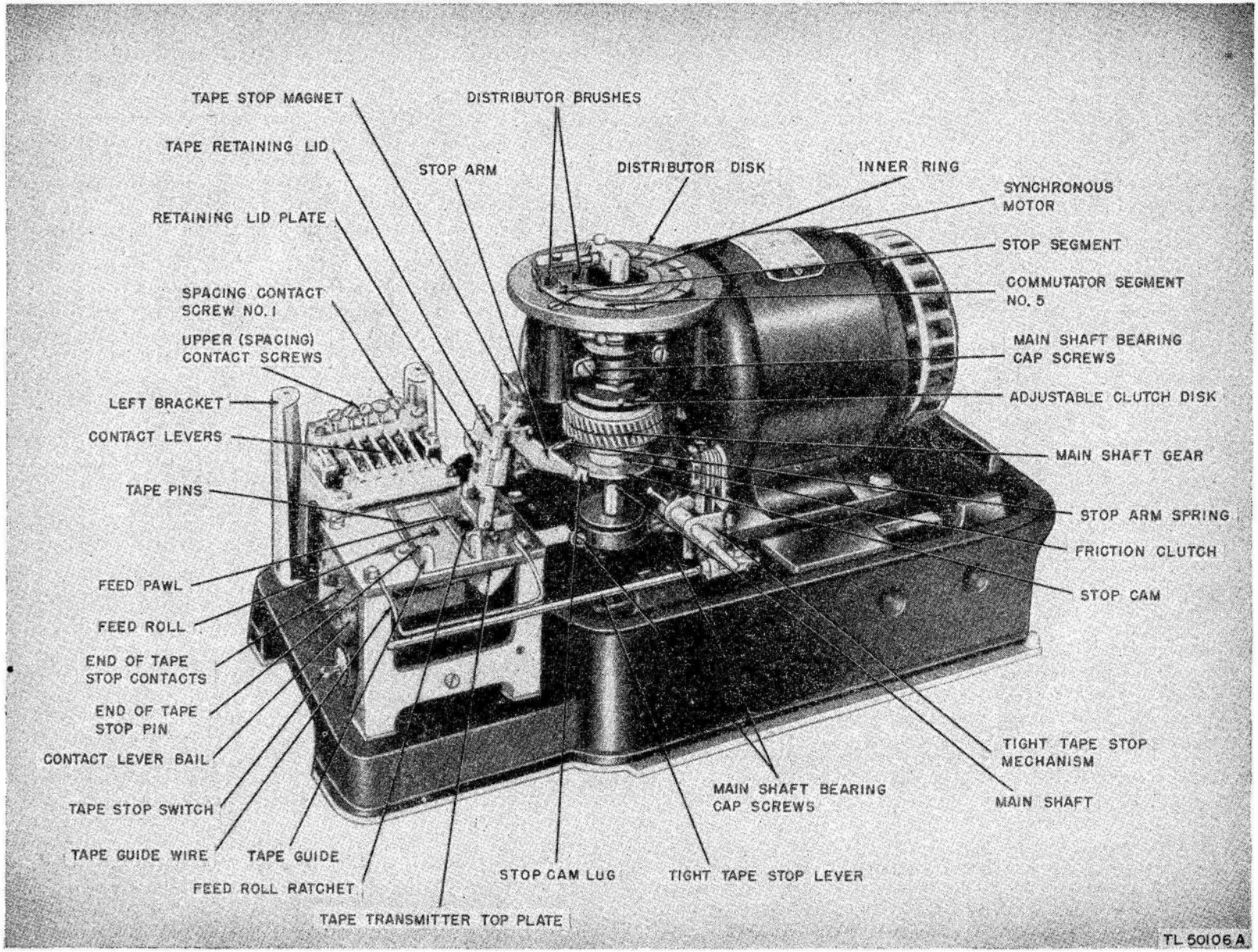


Figure 25. Transmitter Distributor TT-52/FG, covers removed.

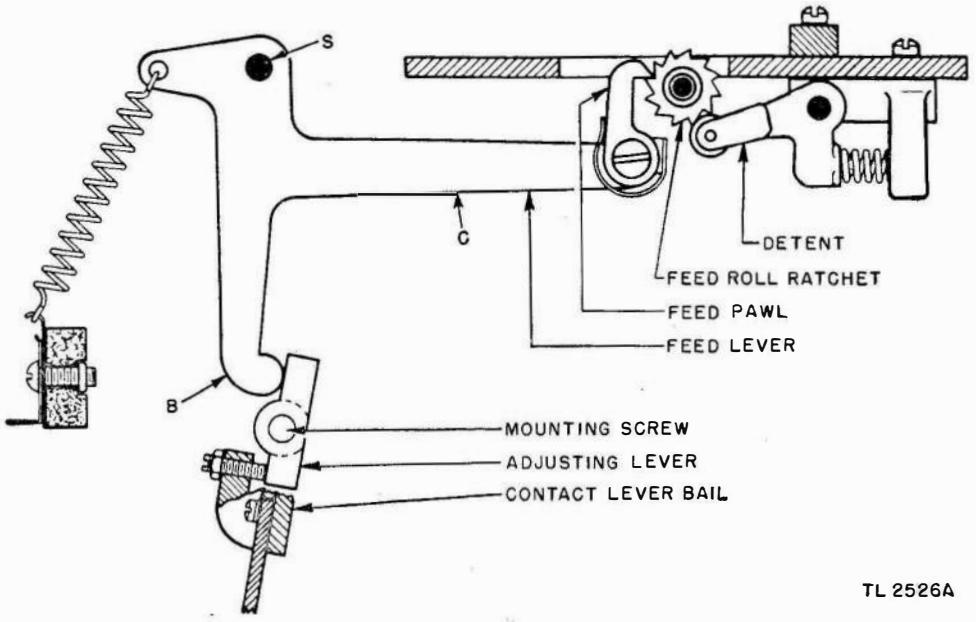


Figure 26. Tape-feed mechanism, cross section.

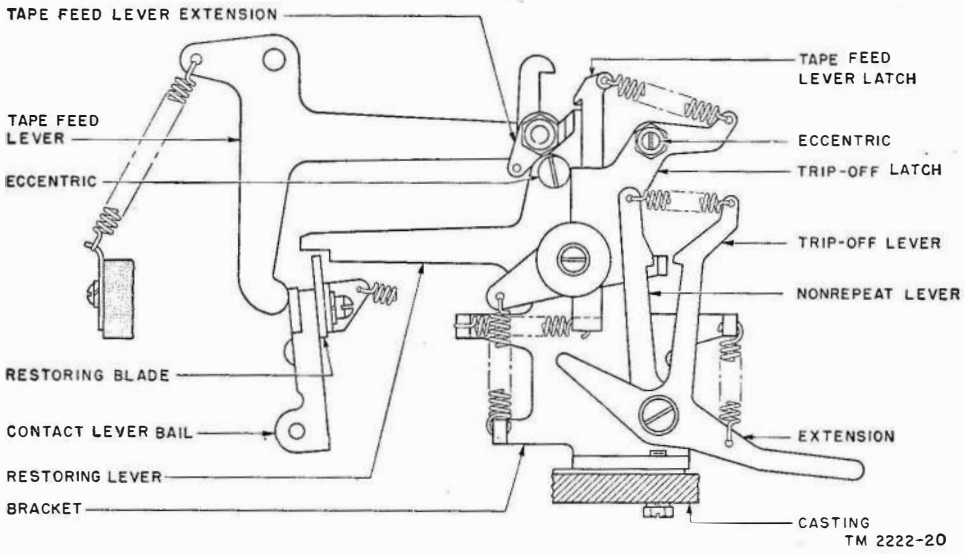


Figure 27. Transmitter Distributor TT-21/FG (receiving) tape-feed suppression mechanism.

Section II. THEORY OF DISTRIBUTOR DISKS

52. Transmitter Distributor TT-52/FG and XD82 Type Transmitter Distributors

The distributor consists of the distributor disk and the distributor brush assembly (fig. 25). The distributor disk consists of two concentric conducting rings mounted on a disk of insulating material. The outer ring is divided into seven segments; the inner ring is a continuous conductor. Segments of the outer ring correspond to the impulses of the teletypewriter code; that is, a start segment, five code segments, and a stop segment. The start segment precedes the No. 1 segment, and the stop segment follows the No. 5 segment (fig. 28).

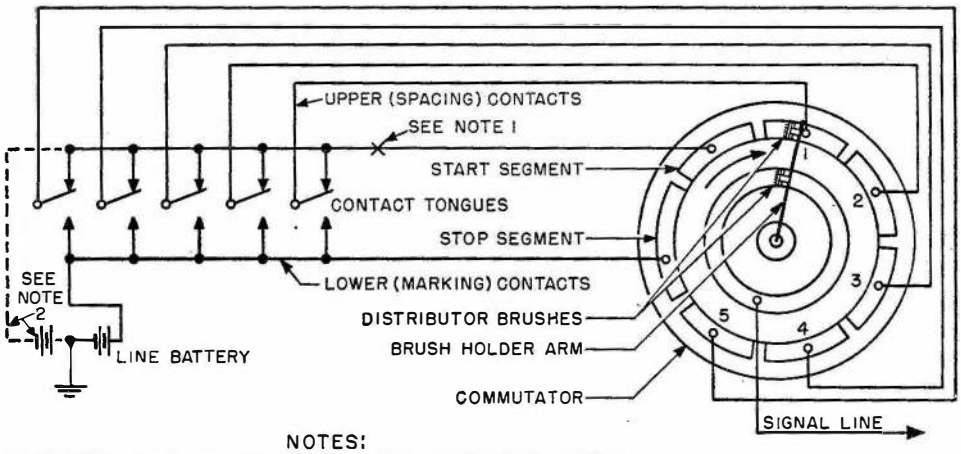
a. The distributor brush assembly consists of

a pair of brushes clamped in a metal brush holder. The brush holder is attached to the brush holder arm, which is mounted on the upper end of the main shaft. The brushes are spaced in the brush holder the same distance apart as the concentric rings on the distributor disk, and they revolve with the main shaft.

b. The distributor brush assembly makes one complete revolution to transmit the code combination for each character or function (fig. 10). When the distributor brush passes over the start segment, a spacing impulse always is transmitted; when the brush passes over the stop segment, a marking impulse always is transmitted. These two impulses keep the transmitter distributor and the receiving teletypewriter equipment in step or in synchronism by control of the starting and stopping of the receiving teletypewriter mechanisms. The receiving mechanisms start to revolve when they receive the start impulse from the transmitter distributor. If all teletypewriter motors in the circuit are operating at the proper speed, the receiving mechanisms select the No. 1 impulse while the distributor brush is passing over the No. 1 segment. The Nos. 2, 3, 4, and 5 impulses are selected as the distributor brush passes over the Nos. 2, 3, 4, and 5 segments in a like manner. The receiving mechanism stops after receiving the stop impulse from the transmitter distributor. Because the receiving mechanisms revolve slightly faster than the distributor brush assembly, the receiving mechanisms come to a complete stop before the brush assembly completes the revolution and sends the next start impulse. Therefore, slight differences in speed are not accumulated because the distributor brush assembly and receiving teletypewriter mechanisms start together at the beginning of the transmission of each character or function.

c. Figure 28 is a schematic diagram of the signal circuit of Transmitter Distributor TT–52/FG and the XD82 type transmitter distributor. The signal line connects to the inner (continuous) ring on the distributor disk; the seven segments of the outer ring connect to the five contact tongues and the marking battery (start segment is not connected in neutral operation but is connected to spacing battery in polar operation). The distributor brush assembly closes the circuit between the rings on the distributor disk. One terminal of the line battery usually is grounded. The signal line and the line battery are connected to the transmitter distributor through the slip connection block or terminal board. Figures 96 and 97 show actual wiring.

d. Coils and capacitors are used as filters and are placed in the leads between the terminals of a slip connection block (or terminal board) and the inner ring of a distributor disk and the contact screws. These filters suppress sparking of the distributor brushes which can cause noise in radio receivers.



NOTES:
1. ON SOME MACHINES THIS STRAP HAS BEEN CUT AND TAPED OR ENTIRELY REMOVED FOR NEUTRAL OPERATION.
2. EXTRA BATTERY AND WIRING REQUIRED IN ADDITION TO STRAP IN NOTE 1 FOR POLAR OPERATION.

TL 2524A

Figure 28. Signal circuit of Transmitter Distributor TT–52/FG and XD82 type.

53. Disks on Transmitter Distributor TT–26/FG (Two-Channel)
(fig. 29)

a. Since the frequency of transmitted impulses over a single channel by a transmitter distributor for 368.1 opm is 23 cycles, the frequency for two-channel operation must be 46 cycles. This is made possible, in large part, by the design of the face of the distributor disk; the number of segments in the disk face of a two-channel transmitter distributor is 13 as compared with 7 in the disk face of a single-channel transmitter distributor. The segments in a two-channel transmitter distributor disk face are wired to two sets of contact tongues; whereas, in a single-channel transmitter distributor, the segments are wired to a single set of contact tongues. In a two-channel transmitter distributor, a manually operated relay controls whether transmission should be on one or two channels. The switch lever (fig. 4) with which the relay is operated is located in the lower front portion of the unit.

b. At receiving stations, standard start-stop page-printing teletypewriters or reperforators connected in series are used to receive messages sent by the transmitter distributors. The receiving units preferably should be equipped with selectors of the holding magnet type rather than with selectors of the pulling magnet type to provide maximum orientation range. Signals from channel A are recorded on receiving units upon which the index arms of rangefinders are oriented to the most favorable position on the upper portion of their range scales. Signals over channel B are recorded on receiving units upon which index arms of rangefinders are oriented to the most favorable position on the lower portion of their range scales. Briefly, what occurs is that a two-channel transmitter distributor sends out two sets of impulses; each impulse is split so that instead of one set, there are two sets. One of these sets of impulses will operate selector magnets of some receiving units, and the other set of impulses will operate the selector magnets of other receiving equipments. If units at the receiving stations are of a type equipped with selectors of the pulling magnet type rather than the holding magnet type, or if it is desirable to use spare receiving units interchangeably on all channels without reorientation, a pair of repeaters is connected in series with the line, and each repeater is oriented to its respective channel. The repeater units, since they have the holding magnet feature, provide maximum orientation range for two-channel operation. The regenerated impulses relayed to the receiving units are of the required length to provide normal orientation range for the selectors. This arrangement facilitates interchange of receiving units between associated start-stop channels and circuits. Figure 6 is a block diagram which shows the two-channel transmitter distributor with receiving stations that are equipped with holding magnet type selector mechanisms.

c. While teletypewriter transmission is usually on the basic allowance of 22 milliseconds duration for each intelligence impulse, receiving equipments use only 20 percent of 22 milliseconds or 4.4 milliseconds of each impulse. Therefore, 80 percent or 17.6 milliseconds are not used in single-channel operation. The settings on the rangefinders of receiving equipment determine which portion of the impulse will be used. Rangefinders with settings at the lower portion of their range scales will utilize the first portion of the impulse, and rangefinders with settings at the upper portion of their range scales will use the latter portion of the impulse. In two-channel operation, however, two sets of impulses are transmitted, each impulse half the length of the usual 22-millisecond impulse, or 11 milliseconds. Because the receiving equipment uses only 4.4 milliseconds of each impulse, these shortened impulses are of sufficient length to operate the receiving equipment. These impulses are called A and B impulses. The B impulse is equivalent to the first portion of the basic 22-millisecond impulse, and the A impulse is equivalent to the latter portion of the basic impulse. Therefore, receiving equipments with rangefinder settings at the lower portion of their range scales will operate on B impulses only, and receiving equipment with rangefinder settings at the upper portion of their range scales will operate on A impulses only.

d. By arrangement of the transmitting mechanism in a two-channel transmitter distributor, it is possible to transmit two messages simultaneously. The messages may be alike or they may be different. Since each message is

transmitted at the rate of 60 words per minute on each channel, 120 words per minute can be transmitted.

e. In a two-channel type transmitter distributor, no distributor clutch is provided, so that the distributor brushes rotate continuously with the motor. Interposed in the circuits between the transmitter tongues and distributor code segments are the contacts of the transmission control relay, which is controlled by operation of the switch lever located on the lower front portion of the unit. When the relay is energized (the lever switch positioned to the left (A AND B)), its contacts connect the five tongues of the B channel transmitter to the B segments of the distributor. The tongues of the A channel transmitter are connected directly to the A segments. Parallel paths from the A tongues lead to open contacts on the relay. Under this condition, the rotating distributor brush alternately connects B and A channel transmitter tongues to the signal line; this provides two-channel transmission.

(1) The code impulses transmitted depend on the positions of the transmitter tongues with relation to their upper and lower contact screws. The lower contact screws of each transmitter are connected permanently to marking line battery. No battery is applied to the upper contact screws when the transmitters are sending neutral telegraph impulses. Spacing battery is applied to these contact screws when polar impulses are sent. Means are provided for switching the upper contacts of each transmitter on the XD93 type transmitter distributor to marking battery when one channel is idling. The stop segment is connected permanently to marking battery; the start segment is connected to spacing battery. The center solid ring of the distributor is connected to the signal line. During two-channel transmission, the relay contacts connect the X segment to the stop segment. Start and stop impulses then transmitted are effective on both channels. The line frequency is doubled because intelligence impulses are one-half their normal length. Selectors of receiving units will register corresponding reductions in orientation range.

(2) When the transmission control relay is de-energized (switch lever to the right, A ONLY) the B transmitter tongues are disconnected from the B segments and the A and B segments of each pair are joined electrically through the contacts of the relay. The X segment is switched from the stop to the start segment. This lengthening of the start segment causes an upward shift of the orientation range with reference to the range scale on receiving units. The B channel receiving unit will be out of range, and the normal single-channel impulses then transmitted will be presented to the A channel receiving unit, so timed that a change in the index arm position is unnecessary.

(3) When the SEND—STOP lever of either transmitter on the XD91 type is placed in the STOP position, the blank combination is transmitted repeatedly on its associated channel, provided that one channel only is idle; on the XD93, the LTRS combination is transmitted repeatedly. On both the XD91 and XD93 types, with both SEND—STOP levers in the STOP position, line-shorting contacts associated with these levers unite to close a line-shorting circuit. This circuit shunts the distributor segments and connects marking battery directly to the signal line to prevent transmission of impulses during idle rotations of the brush. A set of control relay timing contacts located in the circuit leading to the transmission control relay winding, and actuated by mechanism associated with the main shaft, prevents channel switching except during the time in which the brush is traversing the stop segment.

54. Receiving Transmitter Distributors

In this type of transmitter distributor, the distributor brush arm is mounted on the upper

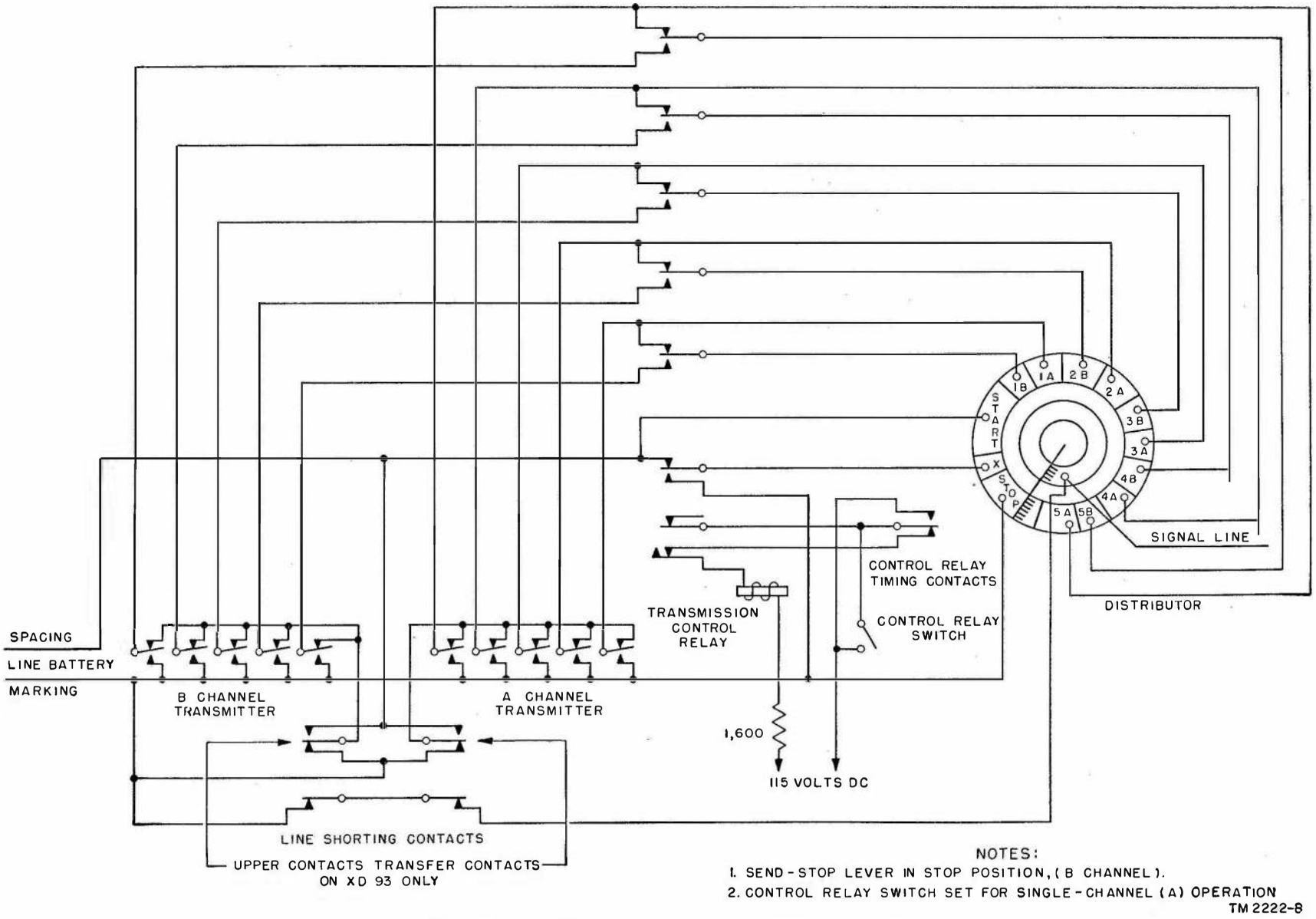


Figure 29. Signal circuit of two-channel transmitter distributor, schematic.

end of the main shaft and is driven by a gear through the medium of a friction clutch.

a. The distributor commutator (fig. 30) is made up of two concentric conducting rings mounted on an insulated disk. The outer ring is divided into 5 large and 10 small segments as compared to 7 on the corresponding ring of the XD82 and XD86 types and 13 for the XD91 and XD93 types. The inner ring has two segments: one is a small segment, and the other is a large segment which forms most of the ring. The brushes on the brush arm wipe over the rings and thereby connect the inner segments to the outer segments.

b. In the normal unoperated position, the main shaft is held stationary, because the lug of the stop cam is against the end of the stop lever. Under this condition, the brush arm is positioned so that the one brush rests on the large inner ring segment, and the other brush is on one of the small segments to the left of the stop segment on the outer segment ring. When a start impulse is received, positive battery is applied to the operating magnet coils through the large inner ring segment and the small segment on the outer ring. This energizes the operating magnet coils so that the stop lever is unlatched from the armature extension and is held out of the way of the lug on the stop cam, which permits the main shaft to rotate.

c. When the brush reaches the start segment, it closes a path to transmit a start or positive battery signal. When the brush reaches the No. 1 segment, the line signal will be connected to the No. 1 contact tongue. The same procedure takes place when the brush reaches the Nos. 2, 3, 4, and 5 segments on the outer ring. When the brush reaches the stop segment on the outer ring, negative battery is supplied to the stop segment from the small segment on the inner ring. When the brush reaches the rest segment on the outer ring, the stop lever is latched on the operating armature extension by means of the rest extension of the stop lever which rides on the lug on the stop cam; this resets the stop lever so that it will be latched during the time the operating magnet armature is in its unoperated position.

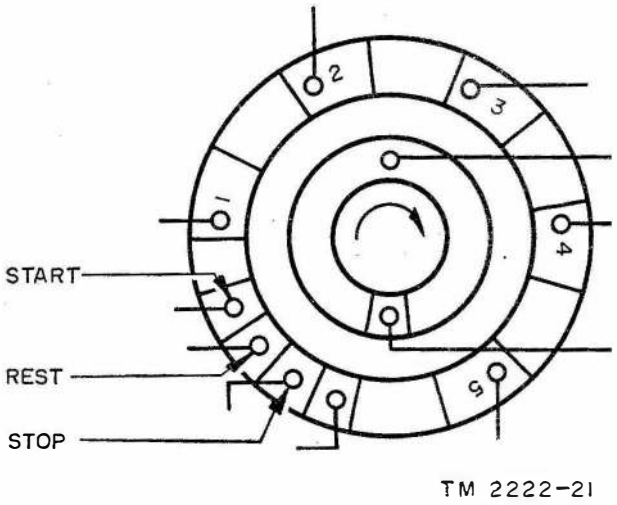


Figure 30. Transmitter Distributor TT-25/FG (receiving), distributor disk face.

Section III. THEORY OF TRANSMISSION CONTROL

55. General

A transmitter distributor motor furnishes power to the main shaft by use of the motor pinion, main-shaft gear, and a friction clutch (except in the two-channel type, which has no friction clutch). When the motor is running, transmission is stopped by blocking the rotation of the main shaft and is started by unblocking it. The blocking is done by the stop arm which is under control of the tape-stop magnet and the stop-arm spring. The tape-stop magnet, when energized, holds the stop arm out of engagement with the stop cam lug, which permits the main shaft to revolve. When the magnet is de-energized, the spring pulls the stop arm against the stop cam in the path of the stop cam lug of the stop cam. The main shaft stops revolving when the stop cam lug engages the stop arm. Operation of the tape-stop magnet is controlled by closing or opening the series circuit which includes the tight-tape stop mechanism, tape-stop switch, the end-of-tape stop mechanism (when used), and the No. 86951 resistor. Each is described in the following paragraphs. The transmission control circuit for Transmitter Distributor TT-52/FG and XD82 type transmitter distributors is shown in figure 31.

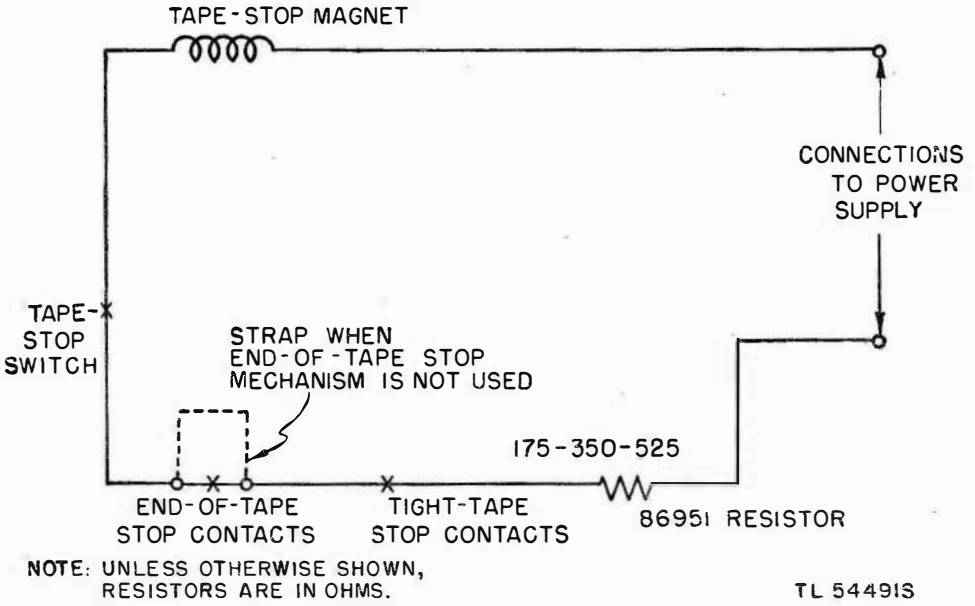


Figure 31. Transmission control circuit for Transmitter Distributor TT-52/FG and XD82 type transmitter distributor, schematic diagram.

56. Transmission Control of Transmitter Distributor TT-52/FG and XD82 Type Transmitter Distributors

a. TAPE-STOP SWITCH. The tape-stop switch is provided so that transmission can be stopped by hand. The opening of this switch de-energizes the tape-stop magnet, which allows the stop arm to engage the stop cam lug and stop transmission. It is wired in series with the tape-stop magnet, the tight-tape stop contacts, and the end-of-tape stop contacts. Designation plates on the transmitter distributor snap panel show switch positions as ON and OFF or SEND and STOP.

b. TIGHT-TAPE STOP MECHANISM. The tight-tape stop mechanism (sometimes called the auto-stop mechanism) is designed to stop transmission automatically if the tape which is feeding into the transmitter becomes tangled or if all the slack is taken up in the tape; thus mutilation of the tape-feed holes is prevented. The normal operating position of the tight-tape stop lever is approximately parallel to the base of the transmitter distributor. The contact operating post bears against the tight-tape stop (fig. 32) contact insulator and holds the contact closed. When the slack in the tape is taken up, or a tangle in the tape reaches the tight-tape stop lever, the lever is raised, which permits the tight-tape stop contacts to open and the transmission is stopped (*a* above). In some teletypewriter installations, tape-guide wires are mounted on the transmitter distributors to guide slack tape close to the tight-tape stop lever. The tape-guide wires are desirable, but are not necessary for satisfactory operation.

c. END-OF-TAPE STOP MECHANISM. The end-of-tape stop mechanism is used on transmitter distributors in some teletypewriter installations to stop transmission automatically when a length of tape has passed through the transmitter. The mechanism consists of a pair of contacts and an end-of-tape stop pin. The pair of contacts is mounted beneath the tape transmitter top plate (fig. 25) and wired in series with the tape-stop switch and the tight-tape stop contacts. The end-of-tape stop pin extends from the contacts upward through a hole in the transmitter top plate into a hole in the tape-retaining lid. As long as there is tape in the transmitter and the tape-retaining lid is closed, the end-of-tape stop pin is forced down and holds the end-of-tape stop contacts closed. As soon as the end of the tape passes the end-of-tape stop pin, the pin moves upward into the recess in the tape-retaining lid. The movement of the pin allows the contacts to open; thus

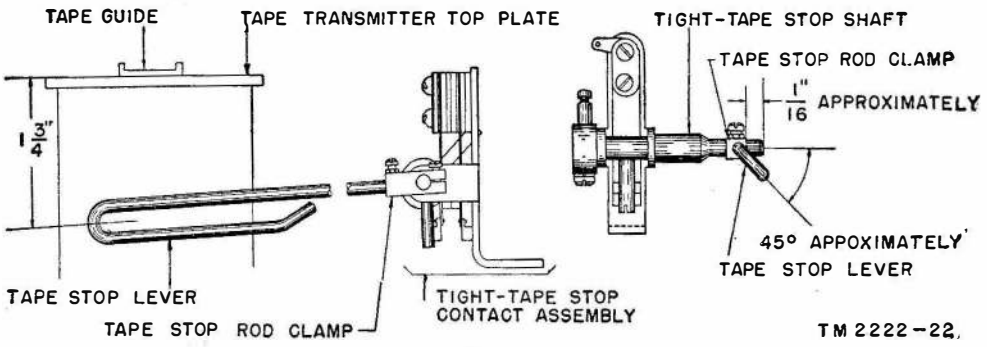


Figure 32. Loop-style tight-tape stop mechanism.

the control circuit opens and transmission stops (*a* above). The end-of-tape stop mechanism is not furnished with the XD82 type transmitter distributor.

57. Transmission Control of Transmitter Distributor TT-26/FG (Two-Channel)

Since a two-channel type transmitter distributor is not equipped with a transmission control circuit, the main shaft rotates continuously with the motor. However, transmission may be controlled in the following manner: by the motor stop switch, the TRANSMITTERS A AND B—A ONLY switch lever, the TRANSMITTER A SEND—STOP lever, and the TRANSMITTER B SENDS—STOP lever. These controls are described as follows:

a. MOTOR STOP SWITCH. This control, labeled MOTOR OFF-ON is located on the lower left front portion of the transmitter distributor. It is wired in the motor circuit and controls the power to the motor. When in OFF position, power to the motor is cut off and the motor stops; thus transmission is stopped.

b. TRANSMITTERS A AND B — A ONLY SWITCH LEVER. This lever controls the transmission control relay which is placed in the circuits between the transmitter tongues and the distributor code segments. When the lever is thrown to A AND B (two-channel) position, the relay is energized; its contacts connect the five tongues of the B channel transmitter to the five code segments of the B channel distributor. The tongues of the A channel transmitter are connected directly to the segments of the A channel distributor. Under these conditions, the rotating distributor brush will connect alternately B and A channel transmitter tongues to the signal line. During two-channel transmission, the relay contacts connect the X segment to the stop segment. The start and stop impulses then transmitted are effective on both channels; the frequency on the signal line is doubled because intelligence impulses are one-half their normal length. When the lever is thrown to the A ONLY position, the transmission control relay is de-energized, and the B channel transmitter tongues are disconnected from the B segments. The A and B segments then are joined electrically through the contacts of the relay, and the X segment is switched from the stop to the start segment. This lengthens the start impulse and raises the orientation range with respect to the range scale of the receiving units. The B channel will be out of range and the normal single channel impulses then transmitted will be presented to the A channel receiving unit. This control is found on all XD91 and XD93 type transmitters distributors.

c. TRANSMITTER A SEND—STOP LEVER AND TRANSMITTER B SEND—STOP LEVER. These levers, located on all XD91 and XD93 type transmitter distributors, are manually operated controls for each separate channel. When operated to the STOP position, tape feeding is stopped for that particular channel. The XD91 transmits blank signals by the idle channel if only one channel is idle, and the XD93 transmits LTRS signals by the idle channel. When both the SEND—STOP levers are in the STOP position, line-shorting contacts, associated with the levers, close a circuit, which shunts the

distributor segment out of the signal line and connects marking battery directly to the line. This is done to prevent the sending of impulses during idle rotation of the distributor brush.

58. Transmission Control of Receiving Transmitter Distributors

The transmission control circuits for receiving transmitter distributors extend into the equipment used with this type unit. This equipment is used in code room circuits: therefore, it is classified. Complete information which covers the transmission control circuit for receiving transmitter distributors will be found in the instructions which cover its associated equipment.

Section IV. THEORY OF MOTORS, MOTOR GOVERNORS FOR SERIES-GOVERNED MOTORS, STARTING SWITCH FOR SYNCHRONOUS MOTORS, AND MAIN-SHAFT FRICTION CLUTCH

59. General

a. Motors used in model 14 transmitter distributors are mounted directly on the base casting. The series-governed motors are designed for operation on either dc or 25- to 60-cycle ac. Synchronous motors require regulated power (usually 60-cycle ac). Resistors and capacitors which form the governor contact filters used with series-governed motors are mounted within the base casting. The filters suppress sparking of the governor contacts; this prevents noise that interferes with reception by nearby radio apparatus. A stop arm contact assembly is built into some of the transmitter distributors with series-governed motors for the purpose of absorbing the sudden change in motor load and to maintain proper motor speed during this change. A resistor is inserted in series with the motor when the main shaft is revolving and is shunted when the load of the friction clutch is added to the motor. Figures 33 and 34 are schematic diagrams of motor circuits in which series-governed motors are used; figures 96 and 97 include wiring diagrams of these circuits.

b. Figure 98 includes wiring diagrams which show motor arrangements for the two-channel type transmitter distributor; figure 99 is a wiring diagram which includes motor arrangements for receiving Transmitter Distributor TT–25/FG; figure 100 is a wiring diagram which shows various motor arrangements for the XD79 types of receiving transmitter distributors.

60. Motor Governor

The governor mechanism on series-governed motors used in the transmitter distributors to maintain proper operating speed consists, essentially, of a pair of centrifugally controlled contacts which shunt a resistor in the motor circuit. When the motor is not running, the contacts are closed, and a low-resistance path is connected across the terminals of the governor resistor. When the motor is connected to the power supply, the armature begins to turn, and its speed increases until the centrifugal force causes the governor contacts to open. The speed at which the contacts just open is called the critical speed. The opening of the contacts removes the low-resistance path across the governor resistor. This increase in the resistance of the motor circuit reduces the current through the motor and causes a drop in speed. When the speed drops below the critical speed, the contacts close, and the cycle repeats. The contacts open and close several times each second; this produces an average speed that is nearly constant. The critical speed can be changed by varying the tension of the No. 6323 governor contact spring with the speed adjusting wheel. This method of changing critical speed provides the means of obtaining the correct average speed of the motor.

61. Starting Switch (Synchronous Motors)

The starting switch for the synchronous type motor is operated centrifugally and is mounted

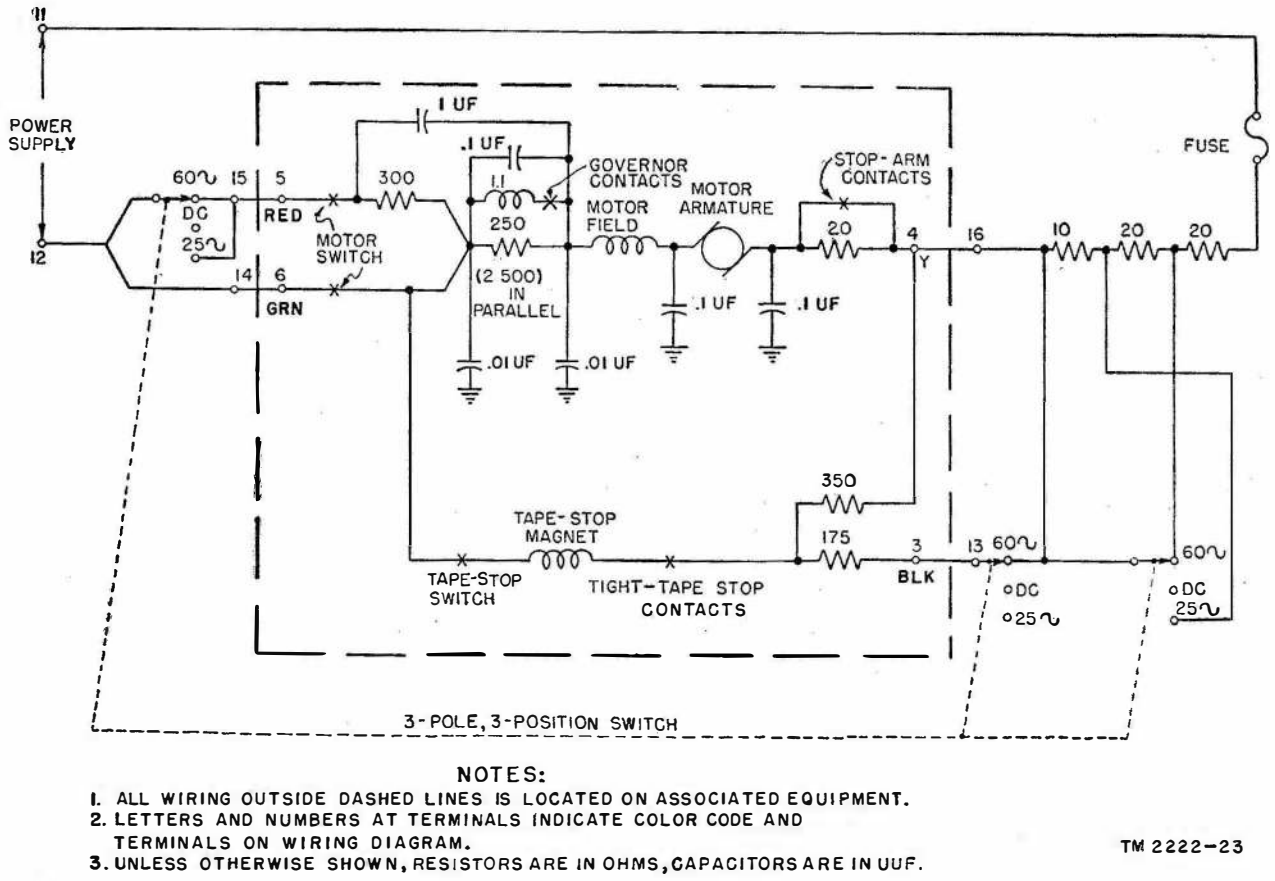


Figure 33. XD82 transmitter distributor, schematic diagram of motor circuit.

on the armature of the motor. The switch automatically disconnects the starting winding of the motor when the armature reaches a predetermined speed. When the armature speed drops approximately 300 rpm, the starting switch reconnects the starting winding.

62. Main-Shaft Friction Clutch

All model 14 transmitter distributors, except those of the two-channel type, have main-shaft friction clutches (fig. 25). The man-shaft friction clutch transmits power to the tape transmitter and distributor; it consists of the main-shaft gear and two felt washers (one on each side of the gear) mounted on the main shaft between the hub of the main shaft and a friction disk. A friction spring exerts pressure on the friction disk, which presses the felt washers tightly against the revolving main-shaft gear. The friction between the parts exerts a torque on the stationary main shaft, which causes it to turn when the stop arm is moved out of engagement with the stop cam lug. The amount of torque transmitted by the friction clutch depends on the pressure exerted by the friction spring. The pressure is increased or decreased by loosening a locknut and tightening or loosening an adjustable clutch disk, or by the amount of lubrication on the felt friction clutch washers. Since no friction clutch is provided in the two-channel type transmitter distributor, the distributor brushes rotate continuously with the motor. On all other models, because of the presence of the main-shaft friction clutch, the main shaft may stop rotating, even though the main-shaft gear, which is not attached permanently to the shaft, continues to be rotated by the motor pinion with which it is meshed. When the main shaft stops rotating, the distributor brush assembly also stops; thus transmission is stopped.

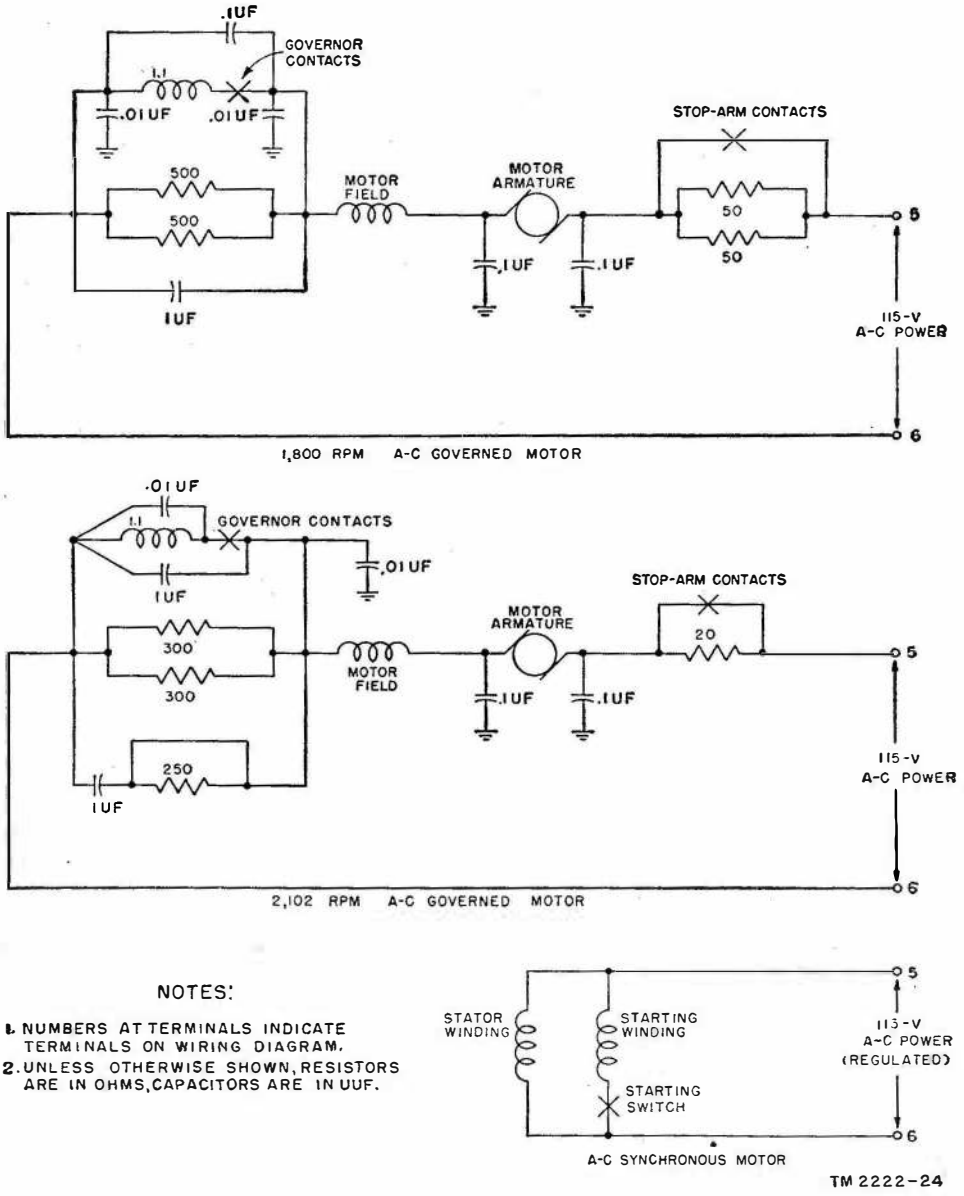


Figure 34. Transmitter Distributor TT-52/FG, schematic diagram of motor circuits.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Note. This chapter contains information for field maintenance. The amount of repair that can be performed by units which have field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.

Section I. PREREPAIR PROCEDURES

63. Tools, Materials, and Test Equipment

a. Repair procedures require the use of the maintenance tools described in chapter 3, plus a few additional tools, which usually are available at field maintenance and repair shops. Among these special tools is the No. 84020 bearing puller shown in figure 35. The bearing puller is designed for removing all types of armature bearings. Also among the special tools needed is the No. 76289 tool (fig. 36), which is used to hold the main-shaft friction clutch when the locknut is tightened against the clutch, and a spanner wrench (fig. 37), which is used to hold the adjustable clutch disk when the locknut is tightened against it. There also should be available a set of various-sized drills of either carbon or high speed steel, a set of taps and dies for several common sizes of screws and bolts, clamps of numerous sizes, a hand or electric drill for making new parts or reworking old parts, and equipment for welding and brazing broken parts.

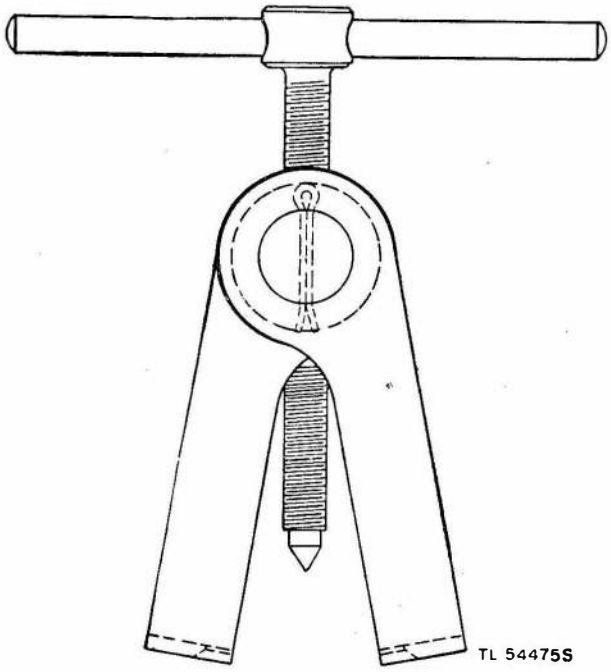


Figure 35. Bearing puller.

b. The electrical circuits in a transmitter distributor can be tested satisfactorily for current flow, continuity, insulation, or resistance with any of the more commonly used volt-ohm-milliammeters. Test Unit I–236, part of Tool Equipment TE–50, is designed to check continuity in teletypewriter circuits, to differentiate between a-c and d-c voltages, to check fuses, and to test capacitors. This test unit is covered in TM 11–2056. Multimeter TS–297/U (fig. 19), part of Tool Equipment TE–50–A, which replaces the test unit in Tool Equipment TE–50, is a multirange instrument for measuring voltage, dc, and resistance. It is designed primarily for use in the maintenance and repair of electronic equipment, but it may be used to check any voltage, current, or resistance within its range. Through the addition of a capacitor, it also may be used as an output meter. The multimeter is covered in detail in TM 11–5500.

c. Test Set TS–2/TG (fig. 38), which is used widely in teletypewriter repair shops, is a portable, motor-driven unit arranged to transmit normal or distorted signals for testing teletypewriter circuits and checking the efficiency of start-stop selector units on teletypewriter equipment. By using this test set in a teletypewriter circuit, it readily can be determined

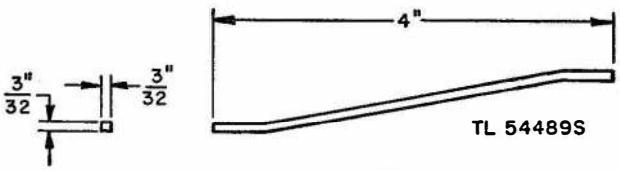


Figure 36. No. 76289 tool.

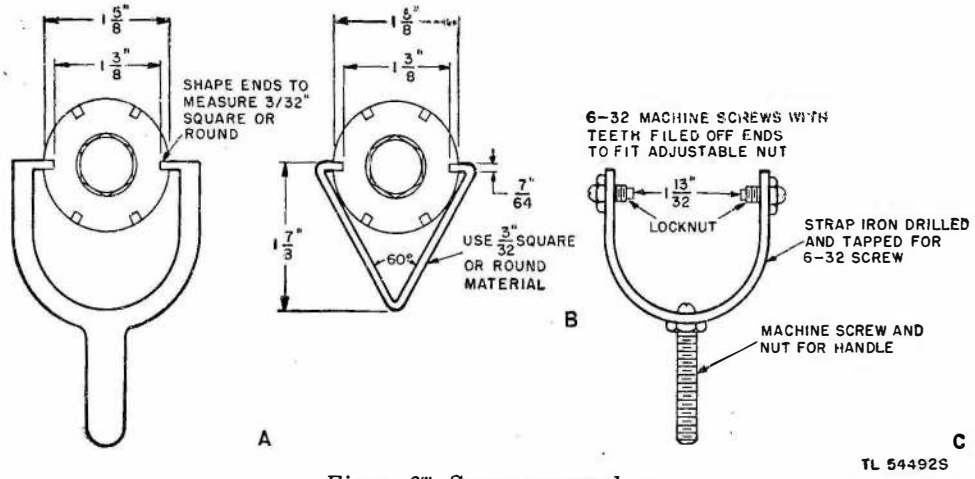


Figure 37. Spanner wrenches.

whether the trouble is in the transmitting unit or in the receiving unit. It sets up two types of distortion: marking or spacing bias, and marking or spacing end distortion. Any one of four test signals, R, Y, SPACE, or a test message, may be transmitted continuously by the test set, which is covered in detail in TM 11–2208.

d. In larger teletypewriter repair shops, Distortion Test Set TS–383/GG (fig. 39) commonly is used. It will transmit the Y, T, O, M, V, and LTRS characters and functions. These characters and functions may be sent undistorted or with a controlled degree of distortion up to approximately 100 percent. It also will receive and analyze distortion in the transmitting circuit of a teletypewriter system. Refer to TM 11–2217 for complete coverage of the test set.

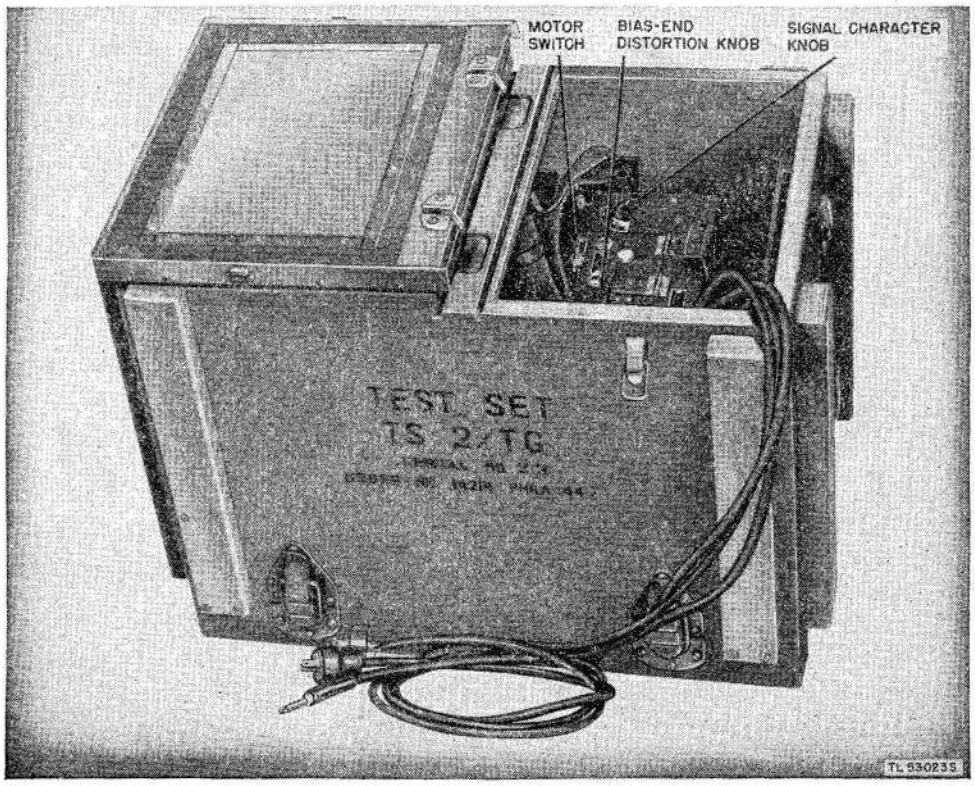


Figure 38. Test Set TS-2/TG.

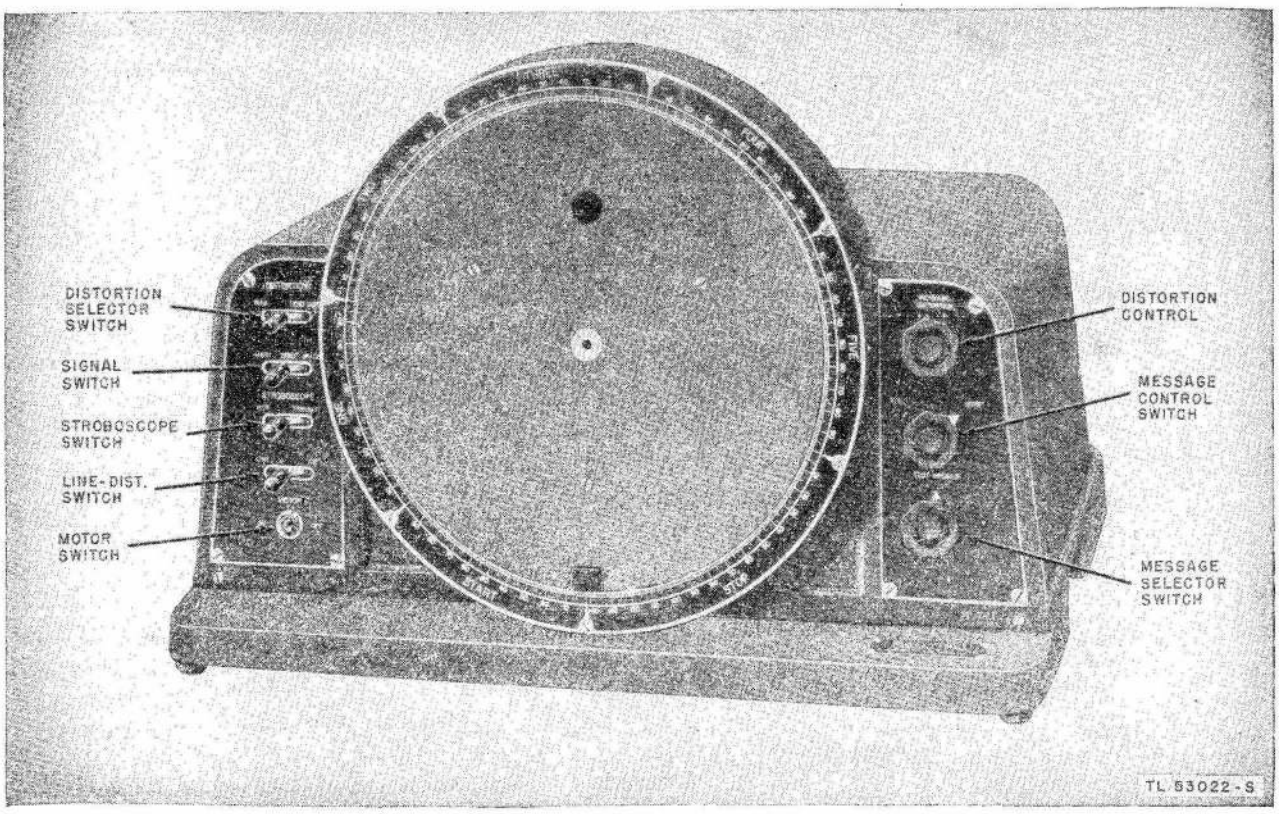


Figure 39. Distortion Test Set TS-383/GG.

64. Removal of Pluck-Out Parts

Certain parts of the transmitter distributors can be removed without unsoldering the various connections. These are called *pluck-out* parts. They do not require complicated disconnection procedures. Among such parts are the main shaft, the transmitter top plate, and the contact banks. Detailed information for the removal and replacement of these parts is contained in section III of this chapter.

65. Inspecting, Cleaning, and Testing Removed Parts

When parts are removed for any reason, each such part should be inspected thoroughly, cleaned, and tested. Oftentimes, when this procedure is followed, chances of inefficient operation are minimized; timely maintenance lessens the need for what may later amount to major repairs. Section III of this chapter contains detailed information for inspection and cleaning, and chapter 3 lists the lubricants and cleaning materials approved for use.

66. Cleaning and Inspecting the Chassis Assembly

Inspect the chassis assembly of a transmitter distributor, when it is in daily use, at least once a day. See that there is no accumulation of dust, paper lint, and excess grease and oil. Check for indications of overheating of resistors and capacitors and places where the finish may have become chipped or rusted. Check the main-shaft clutch felt washers to see that they are saturated thoroughly with oil and that the main shaft does not bind. Check the cleanliness of marking and spacing contacts and the contact tongues.

Section II. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

67. Trouble-Shooting Procedures

The first step in servicing a defective equipment is to sectionalize the fault. Sectionalizing means tracing the fault to a major component or circuit. The second step is to localize the fault. Localization means tracing the fault to a defective part. Some faults can be located by smell, sight, or hearing, such as burned-out resistors, arcing, shorted transformers, etc. Many faults must be localized, however, by checking voltage and resistance.

68. Trouble-Shooting Data

Frequent reference to illustrations throughout this manual which show various parts and to schematic diagrams which show the various circuits will prove helpful in locating trouble. Among such illustrations and diagrams are—illustrations of the parts in appendix II and figures 96 through 100.

69. General Precautions

Repair personnel should avoid rough use of equipment during times when the equipment is being subjected to tests and when repairs are made. Many of the parts used in transmitter distributors are parts which have extremely delicate adjustments to insure the most efficient operation; rough use can cause levers and other parts to be bent and otherwise damaged, so that it will be necessary to replace them with new parts. Do not allow drops of solder to fall into sections of a transmitter distributor where these drops could cause shorting and eventual serious damage to the equipment.

70. Operational Tests

When a transmitter distributor is a component of a teletypewriter set, it may be the source of trouble. Refer to the equipment performance checklists when tracing trouble. Frequently an examination of these checklists will indicate the general location of the trouble. Paragraph 27 describes operational tests which will be helpful. A good way to determine whether a transmitter distributor in a set is really defective and the cause of troublesome operation is to substitute for it one known to be in good condition. This method oftentimes shows whether the trouble is in the transmitting or in the receiving equipment.

71. Additional Trouble-Shooting Information

Localizing trouble within a component is performed in accordance with instructions below.

a. LOCALIZING ELECTRICAL TROUBLES. Electrical circuits of model 14 transmitter distributors are wired to the slip connections on the base, except the XD82 and receiving types of transmitter distributors. Various circuits are described in chapter 4 to aid the trouble-shooter.

b. LOCALIZING MECHANICAL TROUBLES. A large number of mechanical troubles may occur in transmitter distributors. However, there should not be too much difficulty in locating the source of faulty operation by reference to sequences discussed in the following paragraphs.

72. Electrical Troubles

a. TAPE TRANSMITTER. The probability of electrical troubles in the tape transmitter is slight. When they do occur, however, they present the same symptoms as do many improper mechanical adjustments. When a transmitter distributor is operating in a neutral system, an open circuit in any lead from the contact tongues to the distributor disk causes the impulse with which it is associated to be transmitted as a spacing impulse regardless of tape perforations. In a polar system, each impulse associated with an open contact tongue circuit fails, and the line is opened for the duration of the impulse. The result of such a condition usually is the same as the preceding impulse, because the armature of the receiving relay remains in the same position in the absence of any line current to change the position of the armature. In both cases, the open circuit causes garble in the copy at the receiving equipment.

(1) A break in a solder connection between the ends of the contact-lever springs and the contact tongues and terminals (fig. 23) will cause opens in the signal circuit. Sometimes a re-

sultant jitter may be enough to garble copy at the receiving equipment. Only marking impulses are affected by jitter in a neutral system; both marking and spacing impulses are affected in equipment operating in polar systems.

(2) When an open circuit occurs in wiring between the spacing (upper) contact screws and the spacing battery terminal on the slip connection block or terminal board (whichever is used), it has no effect on the proper operation of a transmitter distributor in a neutral system. In a polar system, the open circuit causes no current to flow in the signal circuit during each spacing impulse; this results in garbled copy at the receiving teletypewriters.

(3) When there is an open circuit in wiring between the marking (lower) contact screws and the marking battery terminal on the slip connection block or terminal board, no current flows, and all receiving equipment runs open in a neutral system. In a polar system, receiving equipment may produce garbled copy and run open, depending on the action of the receiving polar relays.

b. DISTRIBUTOR. Excessive sparking and shorts between segments are the most common troubles in this section of a transmitter distributor. Particles of metal and carbon may accumulate between ends of the segments and between the concentric rings on the commutator disk. If the accumulations become great enough to short the segments, false impulses are transmitted. If there are shorts in the concentric rings, steady marking signals are transmitted even though the message tape is passing through the tape transmitter, and the distributor brush assembly is revolving.

(1) Brushes that are worn excessively or that are seating improperly can cause excessive sparking in the distributor; the commutator surfaces may be too rough or too grooved.

(2) There can be varied types of motor electrical troubles because of the different types of motors in use. However, the most frequent troubles are caused by worn or dirty motor brushes or worn and burned governor contacts.

(3) An open may develop in any one of several parts of the control circuit (fig. 31). Check the stop magnet, the tape-stop switch, and the resistor. Sometimes the tight-tape stop contacts and the end-of-tape stop contacts get dirty and fail to close a circuit completely. The control circuit may extend through slip connections to another piece of equipment for the purpose of controlling the transmitter distributor in relation to the other equipment. Check such circuit extensions, especially whether proper connections are made. Check slip connections for dirty or bent contact springs.

73. Tape Transmitter Mechanical Troubles

a. If the tape fails to feed properly, remove it and inspect the feed holes to see if they are torn out or otherwise damaged.

b. If the leading edges of the feed holes in the tape are pulled or torn, the feed roll is being turned before the tape pins are withdrawn from the perforations. Adjustment of the feed-lever adjusting screw to requirements will correct this trouble.

c. Improper adjustment of the operating lever adjusting screw can cause the tape to fail to feed or to feed partially forward and then return to its former position. The cause of this type of trouble is failure of the feed pawl to move the feed-roll ratchet far enough; a tooth on the feed-roll ratchet moves forward such a short distance that it does not pass the center of the detent roller. This causes the feed roll to return to its former position by force exerted on a feed-roll ratchet tooth by the detent roller. Correct this trouble by adjustment of the operating lever adjustment screw.

d. When tape fails to feed, it is an indication that the feed pawl is not engaging the teeth on the feed-roll ratchet, or that there is no motion imparted to the feed lever. Watch the motion of the parts while turning the main shaft by hand to observe which part fails to function. If the feed lever moves properly, the trouble is in the feed pawl. The feed pawl spring

tension may be too little, the feed pawl spring may be broken, or the feed pawl or feed-roll ratchet may be damaged. If the feed lever is not moving or is not moving a proper distance, the trouble may be due to improper adjustment of the feed-lever adjusting screw, feed-lever spring, or both. The feed-lever adjusting screw may be so far back that the feed lever cannot raise the feed pawl enough to engage the next tooth on the feed-roll ratchet. The tension of the feed-lever spring may be so small that it cannot force the lower arm of the feed lever to follow the motion of the adjusting lever. If so, the horizontal arm of the feed lever cannot raise the feed pawl enough to engage the next tooth on the feed-roll ratchet. Check that there are no broken parts.

e. Adjustments of the detent bracket and the retaining lid plate may be the cause of trouble. If there is maladjustment, the transmitter contact tongues will fail to make contact with the marking (lower) contact screws when a tape perforated with the LTRS combination is run through the transmitter distributor. When any adjustment of the detent bracket or the retaining lid plate is made, always check interrelated adjustments. Be sure that contacts are clean and alined properly.

f. Check the alinement of the contact tongues when one or more of the transmitted code impulses never change regardless of the code perforated in the tape corresponding to that impulse. Contact tongues may be bent so badly that they do not leave contact screws against which they are supposed to rest, regardless of the position of the contact lever.

g. Trouble may arise from improper adjustment of contact screws. Some of these troubles include spacing (upper) or marking (lower) contact screws being too high or too low, or in any combination of high and low positions, set screws loose, contact screws missing or in such positions that their points cannot make contact with the contact tongues, and broken leads to contact lugs. Check for the conditions (except loose set screws) by visual inspection. Try set screws with a screw driver.

74. Mechanical Troubles in Distributor

a. A whining noise near the main-shaft gear and the motor pinion can indicate wrong positioning of the motor on the distributor base, or that the gears are meshed too closely. Be sure that there is no bind between the motor pinion and the main-shaft gear, and that there is a minimum of backlash.

b. The stop arm may be positioned too high or too low in its bracket, the stop-arm pilot screws may be either too loose or too tight, or the stop-arm spring may be broken or unhooked if the stop arm seems to be out of adjustment. When the stop arm is affixed too low in its bracket or the pilot screws and their bearings are badly worn, the upper edge of the stop arm may be so low that the stop arm does not bear on the stop cam but passes below it. If tape continues to feed, or the brushes continue to revolve when the tight-tape stop lever is raised, or the tape-stop switch is opened, the stop arm may not be engaging the stop cam lug. Look for a broken or unhooked stop-arm spring, and check whether the stop arm is binding in its pivots so much that the stop arm spring does not move properly.

c. Turn the main shaft until the operating lever roller just begins to ride up the high part of the operating cam to check the position and adjustment of the main shaft. The main shaft is too low if the operating lever bears against the operating cam at any part of its revolution. If the operating lever roller rides only the lower portion of the camming surface of the operating cam, the main shaft is too high.

d. Wrong timing of contact tongues is caused by improper adjustment of the operating cam; this can cause shortening of the No. 5 (the last) impulse in the code group. An indication of improper timing is given when a receiving teletypewriter turns out correct copy from a transmitter distributor in a local test circuit, but produces garbled copy when signals are transmitted over a signal line of reasonable length. Garbling can be caused also by wrong positioning of distributor brushes, the brush arm, or both. The operating cam may be very late; that is, its peak must be moved in the direction of rotation of the main shaft to bring it into correct adjustment. When the operating cam is very late, the tape does not feed and the tape sensing pins do not rise through the tape perforations until the distributor brushes have passed over approximately 60 percent of the start segment. This does not affect impulses in the code group.

e. On the other hand, the operating cam may be very early; that is, its peak must be moved in the opposite direction of main-shaft rotation to bring it into correct adjustment. When the operating cam is very early, the tape sensing pins are pulled down and the tape feeds when the distributor brushes have passed over approximately 30 percent of the No. 5 impulse. If the No. 5 impulse is marking, this impulse is shortened to approximately 30 percent of its normal length. A marking-to-spacing transition is produced by the movement of the contact tongue away from the contact screw during the time allotted to the No. 5 impulse and a spacing-to-marking transition is produced by the movement of the distributor brushes on the stop segment at the end of the time allotted for the No. 5 impulse. Hence, the receiving teletypewriter may select the No. 5 impulse incorrectly, because the impulse is shortened. Only the spacing-to-marking transition by action of the distributor brushes occurs if the No. 5 impulse is spacing, and this transition occurs at the proper time.

f. Wrong alinement of the brushes can affect the length of the Nos. 1 and 5 impulses of each code group, because voltage may be placed across the Nos. 1 and 5 contact screws and the contact tongues during their operation.

g. With the old style tight-tape stop mechanism, a loose set screw in the tight-tape stop shaft collar generally causes trouble because one of the tight-tape stop contacts fails to close, thereby resulting in the transmitter distributor failing to run. A cause of frequent trouble on the new style tight-tape stop mechanism can be loose clamping screw on the stop lever clamp; the contacts open when the clamping screw becomes loose enough to allow the shaft to turn in the clamp. Improper adjustment or damage to the contact springs and accumulations of dirt on contact points are other causes of trouble.

75. Trouble Analysis

The trouble analysis chart (par. 76) lists troubles that occur most often with model 14 transmitter distributors. It also describes the corrective action which may be taken.

76. Trouble-Analysis Chart

Condition	Probable trouble and remarks	Corrective action
Motor fails to start	Power switch turned off	Turn power switch on.
	Fuse in power supply burned out	Replace fuse.
	Fuse in associated equipment burned out; does not apply to equipment tested on workbench during repair.	Replace fuse.
Motor starts but runs too fast or governor cannot be adjusted.	Governor contacts shorted	Clean or replace contacts.
Motor runs but main shaft fails to turn.	Tape-stop magnet not energized	Check circuit.
	Stop arm not clearing stop cam lug when magnet is energized.	Adjust magnet bracket.
	Operating lever bent or adjusted so that operating cam cannot rotate.	Replace or straighten, and adjust.
	Friction clutch not exerting torque	Adjust and lubricate.
	Main-shaft gear teeth worn or missing	Replace.
Motor runs but tape-stop magnet not energized.	Tight-tape stop contacts dirty or out of adjustment	Clean. Adjust.
	End-of-tape stop contacts dirty or out of adjustment	Clean or adjust.

Condition	Probable trouble and remarks	Corrective action
	Tape-stop switch defective or not thrown to ON (or SEND).	Check switch and its position.
	Control circuit wiring or parts other than above items (such as stop magnet, resistor, etc.) open or not strapped to power supply.	Check circuit.
Motor runs but tape-stop magnet vibrates on ac.	No. 86951 resistor not properly strapped (too much resistance); does not apply to Reperforator Transmitters TG-26-A and TG-27-A.	Check circuit.
	Terminal block not properly strapped (too much resistance); applies only to Reperforator TransmittersTG-26-A and TG-27-A operated on workbench; on associated equipment straps set automatically by power selector switch.	Check circuit.
Motor runs and main shaft rotates but cannot transmit.	Signal line not connected, shorted, or open	Check connections and circuit.
	Line current not furnished by associated equipment	Check line current supply.
	Distributor brushes not making contact with commutator segments.	Adjust; replace if worn.
	Contact screws and contact tongues dirty or not in adjustment.	Clean or adjust.
	Contact-lever springs broken, missing, or weak	Replace and adjust.
	Operating lever adjusting screw improperly adjusted	Adjust.
	Operating lever bent or binding	Straighten, clean, and lubricate.
Motor runs but only blank signal transmitted.	Message tape perforated with feed hole only	None required.
	Tape-feed mechanism improperly adjusted so that the perforations are not above the tape pins; therefore, the tape pins strike the paper between the rows of holes which produces the same effect as unperforated tape.	Adjust tape-feed mechanism.
	Marking contact screws and contact tongues dirty or out of adjustment.	Clean or adjust.
	Contact levers binding so that they do not move when the contact-lever bail releases pressure on them; weak or broken contact-lever springs also may produce the same result.	Clean and lubricate or replace spring and adjust.
Motor runs but certain impulses are transmitted as marking impulses regardless of the tape perforations.	Contact-lever tape pin broken or missing	Replace contact lever and adjust.
	Marking contact screw tightened until there is no contact separation, or the contact tongue bent until it does not leave the marking contact regardless of the movement of the contact lever.	Adjust.

Condition	Probable trouble and remarks	Corrective action
	Commutator segment shorted to stop segment; this usually is limited to No. 5 segment and the start segment; however, two or more may be shorted in a row. In the most extreme case all seven segments in the outer ring are shorted together which is the equivalent of an unbroken ring transmitting a steady marking signal.	Clear the short.
	Commutator segments; one or more shorted to inner distributor ring.	Clear the short.
	Note. In polar operation, conditions 2 and 3 above usually result in blown fuses in the line current supply.	
Motor runs but certain impulses are transmitted as spacing impulses regardless of the tape perforations.	Contact lever binding, or contact-lever spring weak or broken.	Clean and lubricate, or replace spring and adjust.
	Marking contact screw with too much contact separation, or contact tongue bent until it does not make contact regardless of the movement of the contact lever; contacts may be dirty.	Clean or adjust.
	Leads between contact tongues and commutator segments open.	Reconnect the leads.
Motor runs but speed is erratic.	Governor contacts dirty or pitted	Clean, burnish, or replace.
	Load-compensating circuit resistor open, or stop-arm contacts dirty or out of adjustment; contacts may be bent so that they fail to open.	Close circuit; clean and adjust contacts.
Transmitter distributor appears to transmit correctly but receiving machine runs closed and fails to receive.	Inner distributor disk ring shorted with stop segment	Clear the short.
	Signal line partially shorted	Clear the short.
Transmitter distributor appears to transmit correctly but receiving machine prints garbled copy.	Commutator start segment shorted with stop segment, resulting in the receiving machine starting too late to receive all the transmitted impulses of each character.	Clear the short.
	Operating cam maladjusted; No. 5 impulse may be garbled.	Adjust.
	Stop segment has open circuit between segment and marking contact screw.	Close the circuit.
	Motor speed is too fast or too slow	Check and adjust the motor speed.
	Gears: improper motor pinion and main-shaft gear being used.	Change to correct gears.
Motor runs and main shaft turns but fails to stop.	Tape-stop switch shorted, or tight-tape stop contacts and end-of-tape stop contacts (when used) may be shorted.	Clear short.
	Stoparm spring broken, missing, or weak	Replace.

Condition	Probable trouble and remarks	Corrective action
	Stoparm binding, bent or broken	Straighten or replace; adjust and lubricate.
	Tape-stop magnet bracket improperly positioned	Adjust.
	Stop cam lug broken or worn	Replace.
Motor runs and main shaft turns but tape does not feed properly.	Detent roller and bracket improperly positioned	Adjust.
	Feed pawl spring broken	Replace and adjust.
	Feed pawl broken	Replace.
	Feed-lever spring broken, missing, or weak	Replace and adjust.
	Feed-lever adjusting screw improperly adjusted	Adjust.
	Feed adjusting lever missing	Replace and adjust.
	Operating lever adjusting screw improperly adjusted	Adjust.
	Operating lever bent or binding	Straighten, clean, and lubricate.
Motor runs and equipment transmits properly but produces a growling or whining noise.	Motor pinion and main-shaft gear improperly meshed	Adjust.
	Motor bearings not lubricated, binding, or full of grit	Clean, lubricate, and replace (if necessary).
	Motor armature shaft bent	Replace armature.
	Note. Carbon distributor brushes and motor brushes often cause a shrill whining noise that is not an indication of trouble.	

Section III. REPAIRS

77. Dismantling Prior to Repair

Most assemblies of transmitter distributors need not be removed from bases of the units before their disassembly for repair, but the motor and main shaft must be removed before they can be taken apart. To repair the main-shaft bracket, it is necessary to remove it from the base.

a. REMOVING MOTOR. Remove the motor from the base for all repairs except replacement of brushes on the series-governed type of motors. Follow the procedure below:

(1) Loosen the governor brush spring plate bracket mounting screws (on units equipped with end-ring governors) until there is room enough to turn the motor mounting screws with the No. 4838 wrench.

(2) Remove the two tight-tape stop mechanism mounting screws and move the entire assembly to one side. Be careful not to break the leads or damage any of the parts.

(3) Unscrew or unsolder the motor leads and clip any waxed string or other lacing which holds the wiring to the base. Remove any assemblies, such as resistors, etc., which may be mounted on the motor frame. The governor and motor pinion need not be removed until the motor is off the base. Tag disconnected leads, so that parts may be properly reassembled.

(4) Remove the motor mounting screws and lift the motor off the base. Be careful not to damage or break any of the nearby wiring or parts.

b. REMOVING MAIN SHAFT FROM BASE.

(1) Loosen the brush-holder mounting screw and lift the brush holder straight up until it clears the end of the main shaft.

(2) Remove the three distributor disk mounting screws and clip any waxed string which laces the wiring to the main-shaft bracket. Place the distributor disk to one side.

(3) Remove the four main-shaft bearing cap screws and the two bearing brackets.

(4) Apply slight pressure on top of the main shaft in a horizontal direction away from the main-shaft bracket. Tilt the main shaft to an angle of about 60° and lift up, turn the shaft to the right or left until the operating cam clears the opening in the base, and lift out the main shaft.

c. REMOVAL OF MAIN-SHAFT BRACKET FROM BASE.

(1) Remove the main shaft by following the procedure described in *b* above.

(2) Remove the transmitter distributor base plate.

(3) Remove the three main-shaft bracket mounting screws from the under side of the base and lift the bracket off the base.

d. DISASSEMBLY OF MAIN SHAFT (fig. 40).

(1) Remove the main shaft.

(2) Remove the upper bearing retaining nut and lockwasher, and slip off the bearing cover, spacer washers, and the bearing. Remove the operating cam hub and the lower bearing retaining nut and lockwasher. Slip off the lower bearing, spacing washer, and the bearing cover.

(3) Place a No. 76289 tool in a notch of the adjustable disk of the friction clutch. Loosen the locknut. Unscrew both the locknut and the adjustable disk and slip off the friction spring, friction disk, upper felt friction washer, main-shaft gear, and the lower felt friction washer.

e. MOTOR DISASSEMBLY.

(1) Remove the motor from the base.

(2) Remove the motor pinion and the governor (on series-governed motors) or fan (on synchronous motors); be careful not to lose any of the shims that may be on the armature shaft between the governor hub and the end frame casting of the motor.

(3) Remove any external bearing retainer screws.

(4) Remove the brush-holder caps and remove the brushes. This applies to series-governed motors only.

(5) Remove the motor frame bolts or screws and separate the parts; pry gently with the blade of a screw driver. Lift out the armature. *Be careful not to drop the armature or damage the windings.* Do not lose any of the parts such as bearing retainers, springs, washers, etc.

(6) Use the bearing puller to remove the armature bearings. On bearings which have a built-in dust shield, be careful in the use of the bearing puller. To make sure that the shield will not be crushed, place the puller so that pressure is exerted only on the outer bearing race. Never try to pry the bearings off with a screw driver.

f. REMOVAL OF TRANSMITTER TOP PLATE.

(1) To remove the transmitter snap panel place the fingers in the notched edges

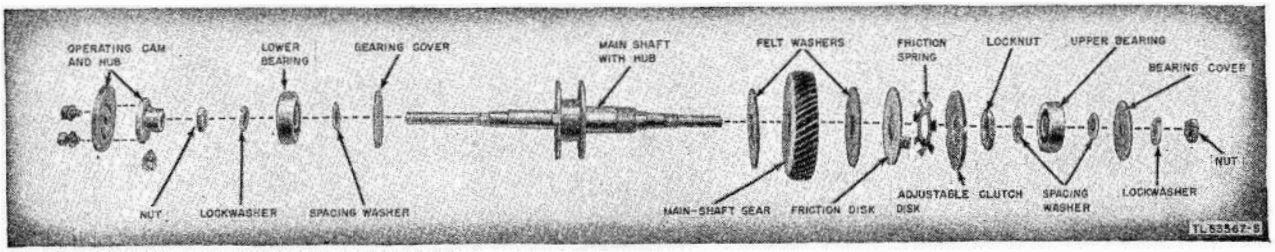


Figure 40. Main shaft, disassembled.

of the panel and pull outward and toward the front.

(2) To remove the transmitter cover, remove the two mounting screws and move the cover upward and to the left.

(3) Remove the four mounting screws and then the transmitter top plate by moving the tape-feed pawl away from the tape-feed roll ratchet and raising the top plate upward and outward. Be careful not to lose the end-of-tape stop pin.

g. REMOVING THE MARKING AND SPACING CONTACT BANKS.

(1) Remove the transmitter snap panel and the transmitting cover as described in *f* above.

(2) Remove the transmitter distributor base plate.

(3) Remove the left mounting bracket by removing the two mounting screws that mount the bracket to the base.

(4) Remove the upper (spacing) contact bank by removing the two mounting screws that mount it to the frame.

(5) Remove the lower (marking) contact bank by removing the two mounting screws that mount it to the frame; be careful not to damage the wiring.

78. Cleaning

Parts which have been disassembled for repair or rebuilding can be cleaned thoroughly with a cloth dampened with appropriate cleaning material and by immersing the parts or brushing them in containers of prescribed cleaning material. Be careful not to immerse, dampen, or brush excessively the motor windings, armatures, equipment wiring, capacitors, or resistors.

a. Use solvent (SD) to remove oil, grease, gummy deposits, and small amounts of soluble materials such as dirt, dust, mud, paper lint, etc. Do not use the solvent on rubber products or for cleaning items for which carbon tetrachloride is specified. After using solvent (SD), wipe the equipment dry so that a white film or residue is not left when the solvent dries.

b. Oil, fuel, Diesel may be used for cleaning external surfaces and other nonelectrical items. Be sure that after it is used, the object on which it is used is dried thoroughly; fuel oil (DA) does not evaporate readily. Do not use this on rubber products.

c. Carbon tetrachloride is used for cleaning electrical contacts, slip connections, switches, distributor disks, and motor commutators.

d. Type II paint and varnish remover is used for removing paint and varnish from metal surfaces.

e. Cleaning compound (Sig C stock No. 6G236) can be used to remove accumulations of oil, grease, gummy deposits, or other foreign material from mechanical parts only. Immerse the parts to be cleaned. When parts have soaked from 10 to 15 minutes, take them from the cleaning compound and flush them thoroughly with hot water. Be careful not to dampen motor windings, wiring, capacitors, or resistors. When parts are washed or flushed with water, dry all parts in an oven or under heat lamps for 1 or 2 hours at 160° F. if possible. Air blast also may be used to dry parts that have been cleaned with water or solvent (SD). When air blast is used, be careful not to lose parts or injure nearby personnel as a result of flying parts.

79. Cleaning Motors Internally

With a clean, dry sash brush, which is furnished with Tool Equipment TE–50 or TE–50–A, clean all dust, paper lint, nonoily dirt, etc., from the armature and field windings. To clean oil, grease, or gummy deposits from the face of the armature and field cores, wipe with a piece of clean cheesecloth dampened with solvent (SD). Clean the end frame sections, bearings, motor pinion, and any other all-metal parts by immersing them in a container holding appropriate cleaning fluid. Be sure to dry and then lubricate the parts. Clean cheese cloth dampened with carbon tetrachloride may be used to clean dirt, dust, oil, grease, and gummy deposits from the commutator. *Be sure not to damage windings.* Commutator segments sometimes become discolored because carbon particles become imbedded in the segments. Unless a commutator needs total refinishing, do not attempt to remove such discoloration.

80. Repair of Motor Armature

a. Because of long periods of steady opera-

tion, commutators of series-governed motors often become so worn and grooved by the brushes that they need resurfacing. However, sometimes excessive sparking of brushes on a commutator that is not grooved or pitted may be observed. In cases of this kind, remove the armature and clean the commutator with a clean cloth dampened with carbon tetrachloride. If cleaning in this manner does not correct the sparking, mount the armature between the centers of a lathe or between other fixed centers and rotate the armature at 200 to 300 rpm. Loop a strip of clean No. 000 or No. 0000 sandpaper around the commutator and hold an end of the sandpaper in each hand. Hold the sandpaper against the commutator surface so as to keep it tight against the commutator; then slide the sandpaper back and forth lengthwise. Be careful to keep the sandpaper square with the surface of the commutator. Continue the sanding until the commutator is bright and smooth. Determine whether it is necessary to undercut the insulators between the segments of the commutator. When insulators show above the surface of the commutator segments, the insulators raise the brushes off the segments every time the insulators pass under the brushes. Operation of this kind will cause excessive sparking and increased wear on the segments. A condition like this is overcome by turning down the commutator and undercutting the insulators.

b. Only personnel familiar with the use of metal-turning lathes and undercutting tools should make this kind of repair. The armature is mounted between the centers of the metal-turning lathe, then revolved in the lathe and checked to be sure that the shaft is not out of line. Make a series of light cuts across the entire width of the commutator; start the cuts on the side of the commutator nearest the winding and feed toward the outside end of the commutator so as to avoid possible damage to the windings in the case of overfeeding. Continue the cuts until all grooves and pits are removed.

c. When the last cut across the commutator has been made, polish the commutator with a strip of fine sandpaper as described in subparagraph a above. Commutators that have been turned down then must be undercut until the top of the segment insulators are $\frac{1}{64}$ to $\frac{1}{32}$ inch below the surface of the adjoining segments.

d. If a standard undercutting tool is not available, an undercutting tool may be improvised from a piece of thin hack-saw blade. Grind the sides of the teeth so that the total width of the teeth is a little less than the width of the commutator slots. Hold this tool at an angle so that only one or two teeth are in contact with the mica, and draw the tool in a direction away from the windings. Repeat the process until the surface of the segment insulator is $\frac{1}{64}$ to $\frac{1}{32}$ inch below the surface of adjoining segments. Repeat this process for all other segments. Be sure no slivers of metal remain in the slots; they could short commutator segments and burn out the windings once a motor is started.

81. Motor Brushes

a. When brushes are removed from a motor, mark them so that when they are dressed and are ready for replacement, they may be put in their original holders with the same sides uppermost. The repairman must be able to tell readily which is the right brush and which is the left. Inspection should indicate that at least $\frac{5}{8}$ inch of the brush material remains, that at least one-third of the brush face contacts the commutator, and that brushes make contact across at least three-fourths of the long dimension of the brush face. If either brush does not meet these requirements, substitute a new brush.

b. A brush face may be shaped to the proper curvature in the following manner:

(1) Wrap a piece of No. 0000 sandpaper around a section of the commutator under the brush holder and hold it in position with a piece of string.

(2) Put the brush in the holder, the numbered or marked side up, bearing against the sandpaper under the normal pressure of the brush spring.

(3) Turn the commutator (around which the sandpaper is wrapped) back and forth by hand until the brush surface has the proper curvature. The last turning of the armature should be in the normal direction of rotation. Lift the brush as it passes over the gap between the ends of the sandpaper.

(4) Remove the brush and bevel the edges slightly with sandpaper.
(5) Wipe off the brush with a piece of cloth dampened with carbon tetrachloride.
(6) Check to see that the pigtail inside of the brush spring is intact, free from kinks, and will allow the brush spring to extend properly.
(7) Clean any grit or dust from the brush holder with a cloth dampened with carbon tetrachloride and wrapped around a screw-driver blade or similar shaped tool.
(8) Put old brushes back in the same brush holders from which they were removed.
(9) When a new brush is inserted, insert it with the numbered side up.
(10) The brush should move freely in the brush holder. Check the pressure of the brush springs to see that they meet specified requirements.

82. Replacing Starting Switch (Synchronous Motor)

If trouble occurs in a starting switch of a synchronous motor usually it is better to replace the switch than to try and repair it. A new switch should be installed in this manner—

a. Disassemble the motor.

b. Unsolder the two leads which connect the switch to the starting winding.

c. Remove the two screws that hold the starting switch and lift out the starting switch.

d. Install the new switch; tighten the two mounting screws.

e. Solder the two leads that extend from the starting winding to the new switch.

f. Reassemble the motor and check its operation to see that the new switch is functioning properly.

g. Before the motor is reassembled, clean it thoroughly and be sure that it is dry. Be sure that the bearings are free from dirt and that the motor is properly lubricated.

h. Position the bearing retainer so that the holes match the position of the retainer screws.

i. Insert the armature into the field so that the bearing opposite the switch end of the shaft enters the end frame. Do not use force; the bearing should enter the frame without excessive effort.

j. Replace the motor frame bolts and tighten the sides alternately, a little at a time, so as not to skew the end frames.

k. With a toothpick or piece of stiff wire, move the bearing retainer ring into position so that the retainer ring screws can be started. Insert and tighten the retainer screws.

l. Replace the motor pinion.

83. Governor Repairs

Serious trouble can result from governor contacts that are not in proper condition. When contacts are in good condition they have an over-all grayish color. Contacts cause trouble when they become too pitted, or the grayish color does not cover at least 75 percent of the contacting surfaces. When they reach this condition, replace them. Contacts should always be replaced in pairs. *Never touch the contacting surfaces with the fingers: even small deposits of dirt or moisture will cause arcing and pitting.*

a. Governor contacts may be covered with small mounds and craters, yet operate satisfactorily. A, figure 41 shows an enlarged view of a pair of contacts with small mounds and craters which operate satisfactorily. The mounds or hills on one contact almost entirely match the craters on the opposite contact and, in this condition, provide a maximum of contacting surface. Unless trouble is encountered in securing and maintaining proper speed adjustment, such contacts need not be replaced.

b. Trouble with contacts due to poor contact surfacing quite frequently is caused by previous attempts to burnish or file a new surface on an old contact. The mounds or hills have been removed, but the craters continue to exist as illustrated in B, figure 41. The result is that the amount of contacting surface is reduced. A shift in the position of either contact will result in mounds or hills and craters being created as shown in C, figure 41.

c. To disassemble the governor, proceed as follows:

(1) Remove the two governor guard mounting screws and the governor guard.
(2) Loosen the two governor brush assembly mounting screws and slip the gov-

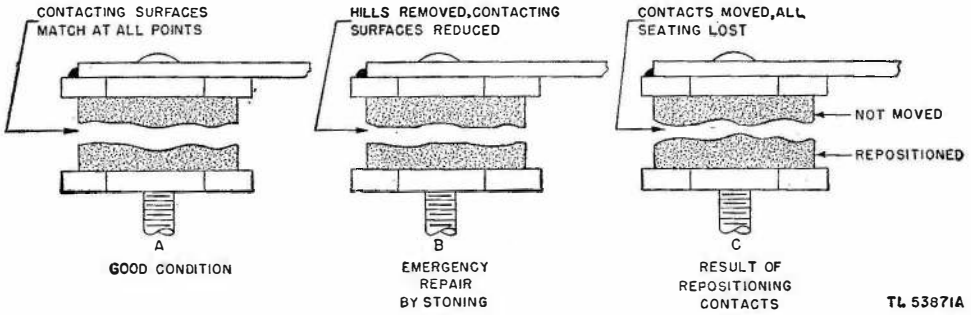


Figure 41. Governor contact surfaces (enlarged).

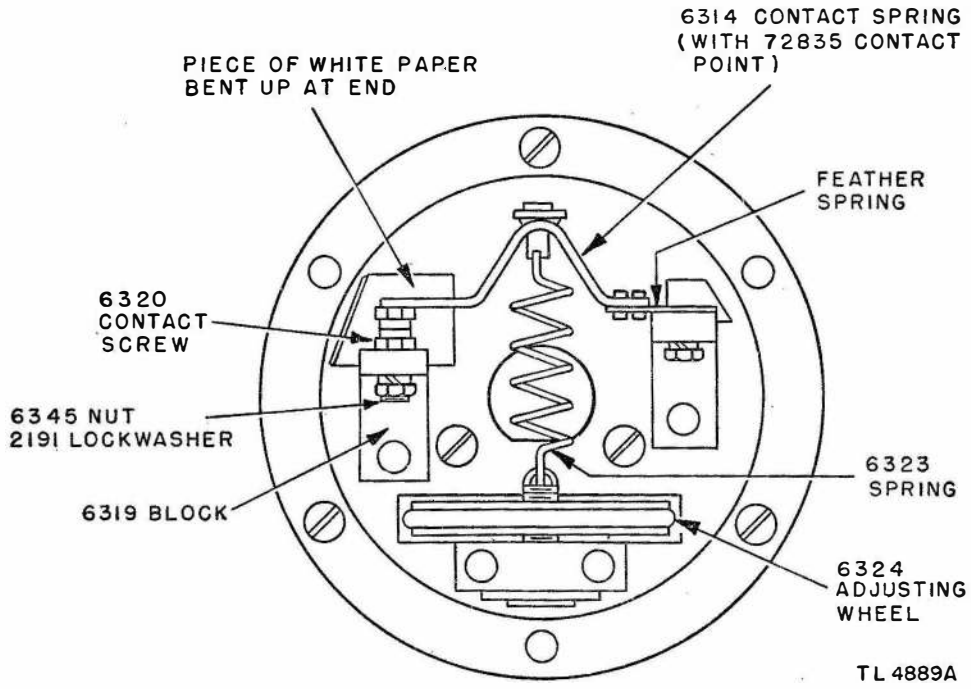


Figure 42. Governor, internal view.

ernor brush assembly to the left so as to clear the edge of the governor.

(3) Remove the screw which holds the governor to the motor shaft and slip off the governor.

(4) Remove the screws which secure the target and governor cover and remove the target and the cover.

(5) Unhook the No. 6323 spring.

(6) Loosen the screw which clamps the feather spring on the end of the No. 6314 contact spring (fig. 42) and lift the contact spring out of the governor shell.

(7) Remove the nut and lockwasher on the No. 6320 contact screw (fig. 42) and lift out the contact screw.

d. Governor contact points are made of tungsten. They are attached to a contact screw by solder. To remove old contact points, heat them with a soldering iron to free them from the contact screws. If one contact of a pair needs replacement, replace both contacts to avoid difficulty in obtaining proper seating of the contacts. Solder the new points onto the contact screw and spring. The new point on the contact screw is alined properly when the contacting surface of the new point is perpendicular to a

line through the center of the contact screw (fig. 43). The new point of the contact spring is alined properly when there is no appreciable gap between any part of the contacting surface of the new point and a straight edge when checked as illustrated in figure 43. In some early models, contact springs were equipped with contact points that screwed into the spring and were then bonded by a drop of solder at the end of the spring. New style springs are not threaded and are fastened only by solder.

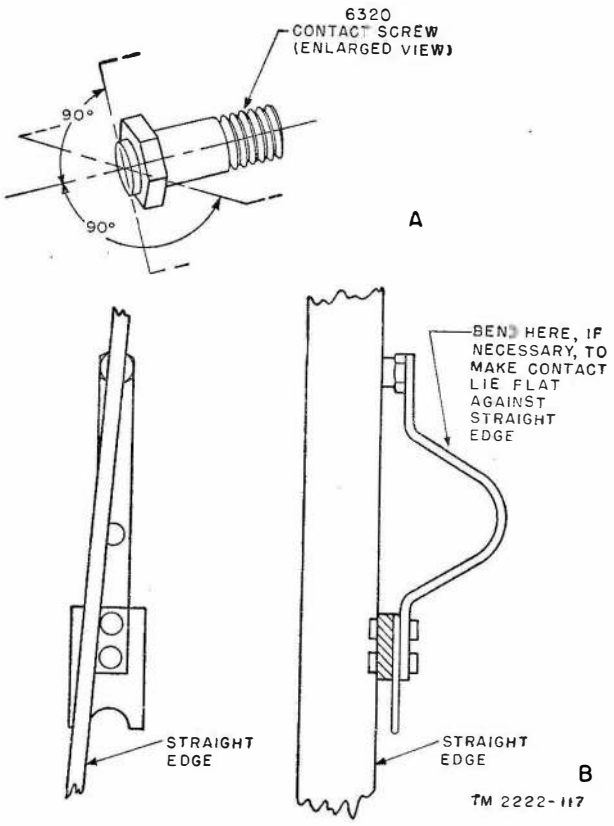


Figure 43. Alinement of governor contact points.

e. If emergency operation is necessary even though trouble is experienced because of build-ups or pitting and new contact points are not available, remove both contacts and dress them lightly with the fine carborundum stone furnished in Tool Equipment TE–50 or TE–50–A. If a build-up is particularly large, it may be necessary to knock it off with a screw driver and then dress the surface with a carborundum stone. This treatment may make emergency operation possible, but replace both contacts with new ones as soon as possible.

f. To reassemble the governor proceed as follows:

(1) Place the No. 6320 contact screw in the hole in its mounting block. Put a No. 2191 lockwasher and a No. 6345 nut on the end of the contact screw. Tighten the nut securely.

(2) Place the feather spring of the No. 6314 contact spring under the clamp on its mounting block and tighten the clamp screw until the contact spring is held friction-tight. The contact should remain slightly separated (about .005 inch).

(3) Hook the No. 6323 spring onto the contact spring and turn the adjusting wheel until all tension is released. Contacts should return to the slightly separated position.

(4) Insert a piece of white paper behind the contacts (fig. 42).

(5) Illuminate the contacts with a flashlight or other small lamp and turn the adjusting wheel until the contacts just touch.

(6) Slide the contact spring to the right or left until the sides of the upper and lower contact points are in line. If a gap can be seen on either side of the contacts, loosen the contact mounting block retaining screw and move the top of the block to the right or left. At the same time shift the contact spring to keep the contact points in line (fig. 44). Tighten both the contact spring clamp screw and the contact mounting block retaining screw.

(7) If gaps at the front or back of the contacts are noticed, use long-nosed pliers to twist the feather spring on the end of the contact spring (fig. 44). Repeat any of the operations that may be required until the contacts meet all the requirements for position.

(8) Turn the adjusting wheel so that the tension of the No. 6323 spring is near the midpoint of its range.

(9) Reassemble the governor cover and the target on the governor and remount the governor on the motor.

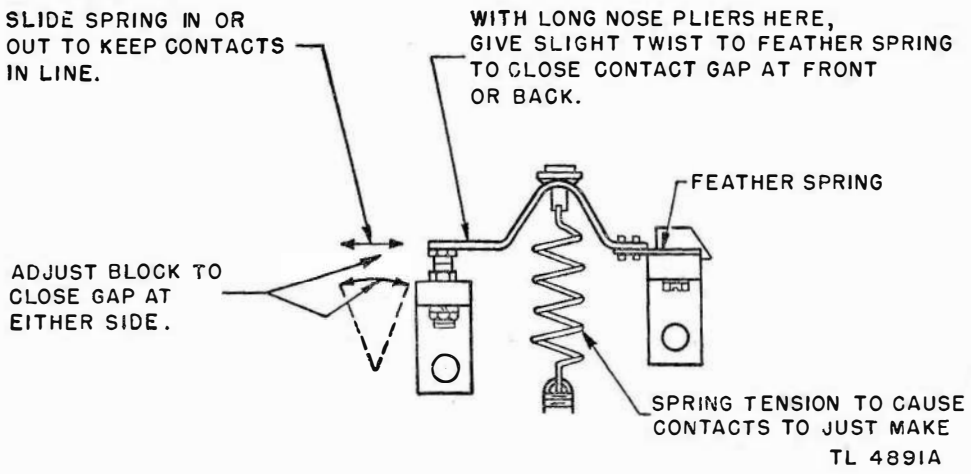


Figure 44. Positioning governor contacts

g. Use a piece of clean cheesecloth moistened with carbon tetrachloride to clean governor contact disks. The smooth, even gray coating of oxide on the disks is a desirable condition; do not disturb the contact disks unless there is excessive sparking at the brushes. Use No. 0000 sandpaper to remove pits or burned spots from the contact disks. Use a piece of cloth to wipe off cuttings and particles. Do not touch the surface of the contact disks with the hands; even the least bit of moisture or dirt can cause arcing.

h. Replace the carbon brushes (No. 78403) on the tips of the end-ring governor contact springs when the brushes have worn down to $\frac{1}{16}$ inch. To replace individual brushes without replacing an entire brush assembly, unsolder the old brush from the spring. Clean any solder remaining in the hole from which the brush is removed. Insert the new brush in the hole and solder firmly in place. Place the governor brush assembly in the proper position and tighten the mounting screws.

i. When the governor is reassembled completely, and new contacts are seated, run the motor under test for an hour. Check the speed every 15 minutes. Investigate any quick change in the speed of the motor. If the speed is erratic, disassemble the governor and recheck the contacts for build-ups and alinement. If there are build-ups, replace the contacts. Then test the motor again. If there is no appreciable change in the speed during an hour's test, the condition of the governor is satisfactory.

84. Armature Bearings

a. When armature bearings are burned, cracked, badly worn, or injured, replace them with new ones. Be careful when removing and replacing bearings that no dirt gets inside the bearing races. All bearings should be properly lubricated before they are replaced on the shaft. Sometimes a paper washer placed over the exposed side of a bearing will help keep out dirt. Always be sure, however, to remove the paper washer before inserting the armature in the end frames. In most large teletypewriter repair shops, there will be available some type of arbor press or bench type vise which can be used to press the bearings onto the armature shaft. Slip the bearings onto the armature shaft as far as they will go fingertight with the dust covers nearest the windings.

b. Prepare two blocks of wood of equal length and about an inch longer than the shaft extension. Place one of these blocks on each side of the shaft, with one end bearing against the inner bearing race and the other end against the rear vise jaw. Place another block between the other end of the armature shaft and the other jaw of the vise. Tighten the vise slowly until there is an even pressure exerted on both sides of the bearings and until the bearing is pressed completely against the shoulder of the armature shaft. *Do not bend the shaft.* Repeat the procedure to mount the bearing on the other end of the armature shaft. Figure 45 illustrates the use of a vise in pressing a bearing on the shaft.

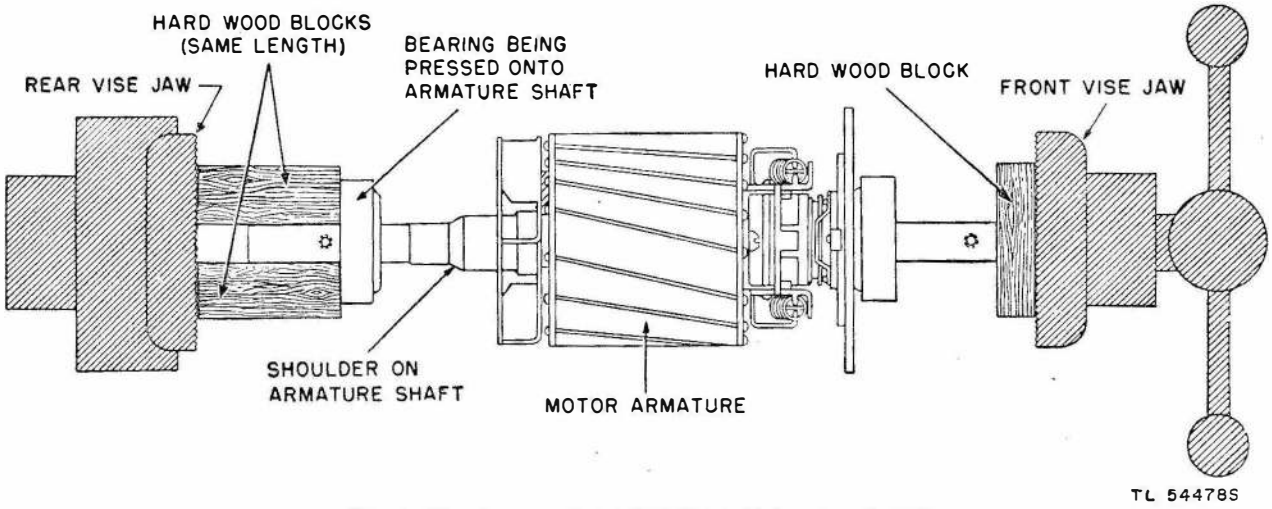


Figure 45. Bearing pressed onto shaft by use of vise.

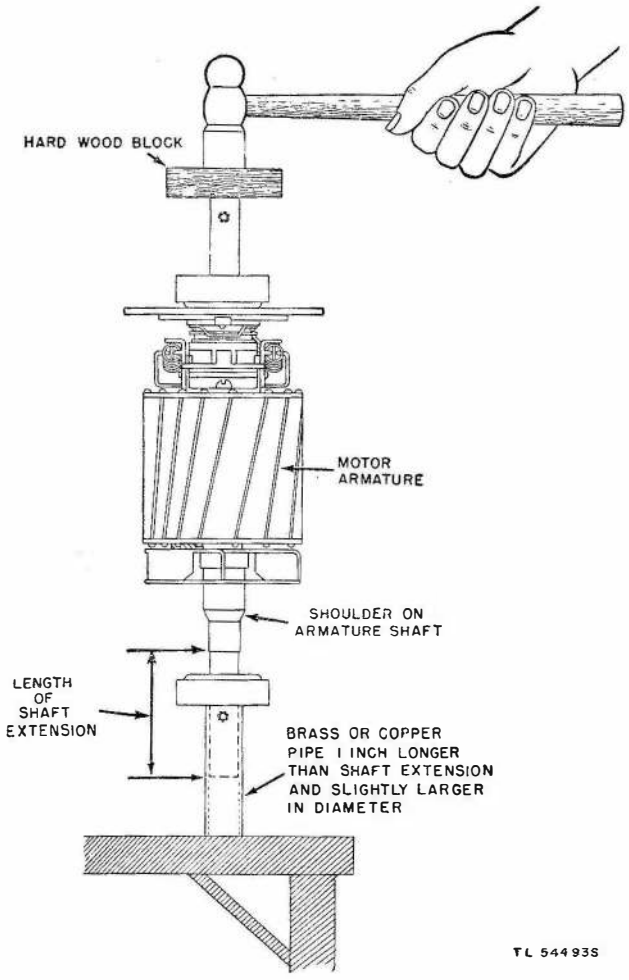


Figure 46. Bearing pressed onto shaft by use of hammer.

c. If a suitable type of vise is not available, install the bearings on the motor shaft in the following manner:

(1) Slide the bearings onto the armature shaft as far as they will go fingertight with the dust covers (when provided) placed nearest the winding.

(2) Prepare a piece of copper or brass pipe which is about an inch longer than the shaft extension and which has an inside diameter slightly larger than the diameter of the armature shaft. Slip the copper or brass pipe onto the shaft so that it bears against the inner bearing race. If copper or brass pipe is not available, use iron pipe and a brass washer to avoid damaging the inner bearing race.

(3) Stand the armature on end with the pipe resting on the bench or work table (fig. 46).

(4) Place a block of hardwood over the other end of the armature shaft and pound with careful, even strokes until the bearing is forced firmly against the shoulder of the shaft.

85. Distributor Disks

a. Remove the brush arm assembly by loosening the brush arm retaining screw. Wrap a piece of clean, dry cheesecloth around the main shaft and main-shaft bracket below the distributor disk to catch any particles of grit from sandpaper. Then wrap a piece of No. 000

sandpaper around a block of soft wood having dimensions of about 2 by 5 by ¾ inches. Place the block on the distributor disk and press down with the fingers (fig. 47). Revolve the block about the axis of the main shaft; at the same time, avoid undue pressure at any one point. As soon as the segments are almost smooth, remove the No. 000 sandpaper and replace it with No. 0000 sandpaper. Repeat the finishing procedure until the surface of the segments are smooth and polished. Do not remove any more metal from the segments than is necessary. Remove any dust or metal particles that may have accumulated between the segments.

b. Particles from carbon brushes at times become imbedded into the surfaces of the copper commutator segments and cause them to become dark. The discoloration resulting is a form of case-hardening and greatly increases the life of the segments. Unless the segments are deeply grooved, do not remove this discoloration.

c. When the distributor disk is refinished, trim off any burrs that have formed on the ends of the segments. Such burrs can cause the carbon brushes to chip or break pieces out of the braided copper brushes. A coat of insulating paint or varnish may be placed on the ends of the segments to prevent carbon dust or copper particles from shorting the segments. Do not allow paint to get on the upper surface of the segments where it would be picked up by the distributor brushes.

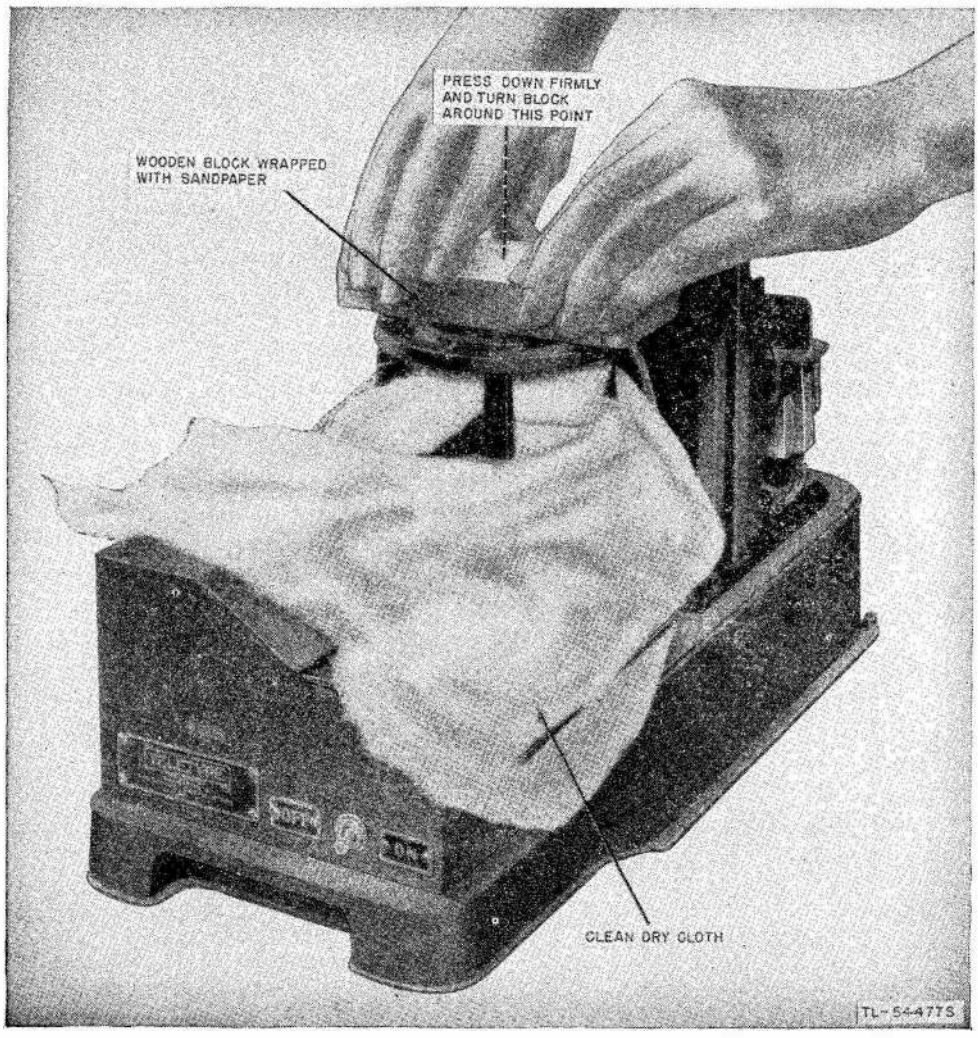


Figure 47. Method of refinishing distributor disk.

86. Cleaning Transmitter Top Plate

With a dry, clean sash brush, clean dust, paper lint, nonoily dirt, etc., from around the tape-retaining lid, tape-feed roll, and tape guide. To clean oil, grease, or gummy deposits from the transmitter top plate, wipe a piece of clean cheesecloth dampened with solvent (SD).

87. Cleaning Marking and Spacing Contact Banks

With a piece of clean cheesecloth moistened with carbon tetrachloride, wipe off the contacts and the contact screws. If a deposit of carbon is found on any of the contacts, polish *lightly* with a contact burnisher. Be sure not to remove too much of the contact. *These contacts are made of a very soft material and, if care is not taken, can be rendered useless.*

88. Emergency Repairs on Main-Shaft Bracket

When a replacement bracket is not available, broken stop-arm pilot screw lugs may be required. File the remainder of a broken lug until it is flush with the bracket. Cut an L-shaped piece of brass to the size of the broken lug. Clamp the brass piece in position and drill two mounting holes through both the brass piece and the bracket casting. Remove the brass piece; then tap the holes in the bracket casting to receive the machine screws for mounting the brass piece. Enlarge and countersink the holes in the brass piece so that the machine screws will pass through the holes and the screw heads are flush with the surface. Drill and tap the shoulder of the brass piece to receive the stop-arm pilot screw. The finished emergency repair is illustrated in figure 48.

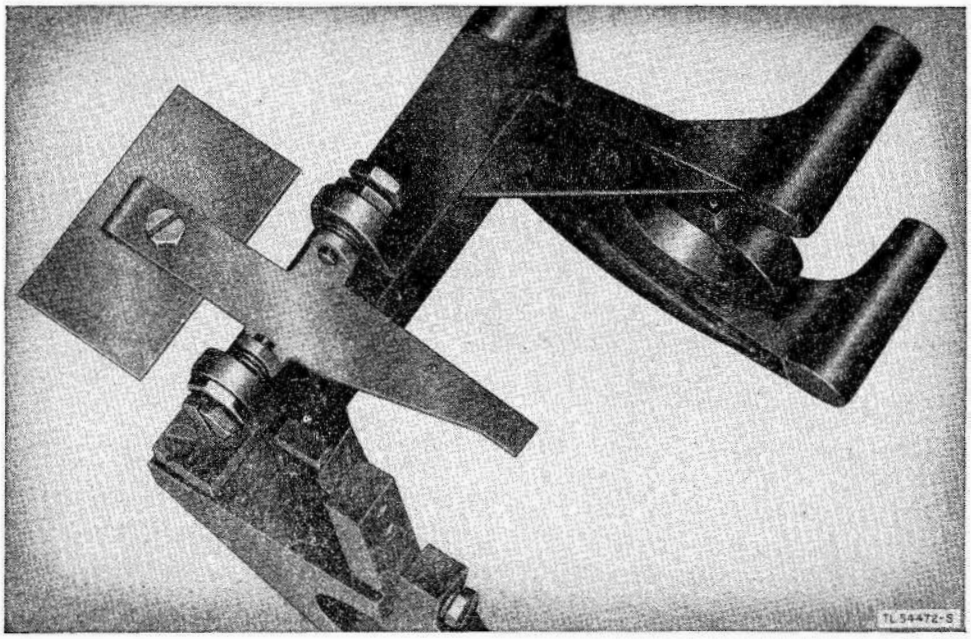


Figure 48. Emergency repair on main-shaft bracket.

Section IV. APPARATUS ADJUSTMENTS

89. General

a. The information covering adjustments given in this section is arranged in a sequence that usually is followed by teletypewriter repair personnel when a complete readjustment of a transmitter distributor is undertaken. It is important that this be kept in mind by the repair or maintenance man because a change in a single adjustment may affect several other adjustments. When an adjustment is changed, check all related adjustments.

b. Spring tension values given in this technical manual are readings that should be obtained when scales are used. Springs that cannot meet requirements and those for which no adjustment instructions are given should be replaced with new springs. They may be ordered through usual supply channels.

c. Before starting adjustments, remove the following parts: distributor cover, transmitter cover, tape exit guide, tape transmitter top plate, tape transmitter snap panel, distributor base plate, and left bracket from the transmitter assembly. When reference is made regarding the left, right, rear, clockwise, or counterclockwise direction, the unit is viewed from the front or the transmitter end unless otherwise specified.

d. Never rotate the governor or fan in a counterclockwise direction; this will cause the transmitting shaft to rotate backward, and mutilation of the distributor brushes will result. To avoid this, loosen the brush-holder clamp screw and turn the brush holder so as to lift the brushes from the disk. When reference is made regarding rotation of the main shaft, disengage the stop lever from the stop lug on the stop cam and rotate the governor or the fan in a clockwise direction.

e. Instructions regarding adjustments usually are given in three parts: preparation, requirements, and adjustments. At times, a requirement can be checked or an adjustment can be made without making any preparation, such as turning the main shaft, removing a guard, etc. In such cases, the preparatory step is omitted. In cases where adjustments pertain only to receiving transmitter distributors, attention is called to the fact.

(1) Preparation gives the necessary instructions for arranging to check certain adjustments.

(2) Requirements give the measurements, spring tensions, settings, etc., that give best results in operation. Some requirements have very small working margins; others have large working margins.

(3) Adjustments are described which are necessary to make the equipment meet requirements for the best operation. Adjustments vary in nature and include replacement of an old spring with a new one, bending a weak spring with a spring bender, repositioning the operating cam, and many others. Because of the inherent characteristics of various machines of the same model, some machines function better when clearances are adjusted to minimum values, whereas, other machines give better results with clearances adjusted at maximum limits. Requirements are described in detail and, when adjusting a machine for the first time, all adjustments should be made toward the midpoint between the maximum and the minimum values, but maximum and minimum

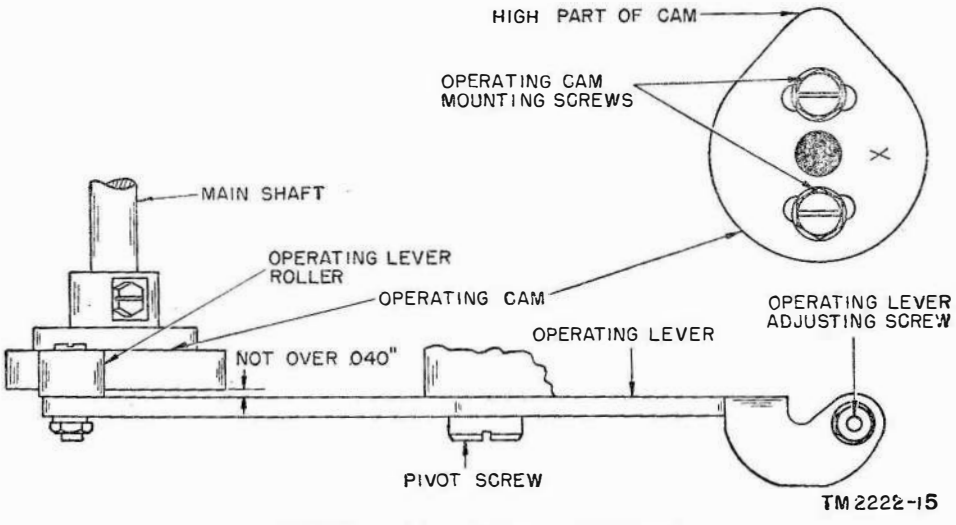


Figure 49. Main-shaft requirements.

values should not be mixed haphazardly.

90. Main-Shaft Adjustment
(fig. 49)

a. PREPARATION. Rotate the main shaft until the operating lever roller just starts to ride up the high part of the cam.

b. REQUIREMENT. Position the main shaft so that there is some clearance between the lower surface of the cam and the upper surface of the operating lever when all the play of the operating lever is taken up in a direction to make the clearance a minimum. With the play in the operating lever taken up in a direction to make the clearance a maximum, this clearance should not exceed .040 inch.

c. ADJUSTMENT. Loosen the main-shaft bearing cap screws and raise or lower the main shaft. Tighten the screws.

91. Motor Position

a. PREPARATION. None required.

b. REQUIREMENT. There should be a minimum amount of backlash between the motor pinion and the main-shaft gear throughout the complete revolution of the main shaft.

c. ADJUSTMENT. Loosen the four motor mounting screws and reposition the motor. Tighten the screws and recheck the requirement.

92. Tape-stop Magnet Bracket (Universal Magnet)
(fig. 50)

This adjustment applies to transmitter distributors equipped with a tape-stop magnet having only one coil designed for operation on either ac or dc.

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) The air gap between both the upper and lower pole faces of the magnet yoke and the face of the armature should be approximately equal and should measure from .010 to .020 inch when the magnet armature is resting against the core.

(2) There should be .004- to .012-inch clearance between the stop cam lug and the end of the stop arm when the armature is resting against the magnet core and the stop cam lug is opposite the end of the stop arm. Also, both the upper and lower pole faces of the magnet yoke should be parallel to the face of the armature, and the pole faces should not extend beyond either side of the armature.

(3) The side of the tape-stop magnet armature, stamped *C*, designates heavy chrome plating. This side should be next to the magnet core when the

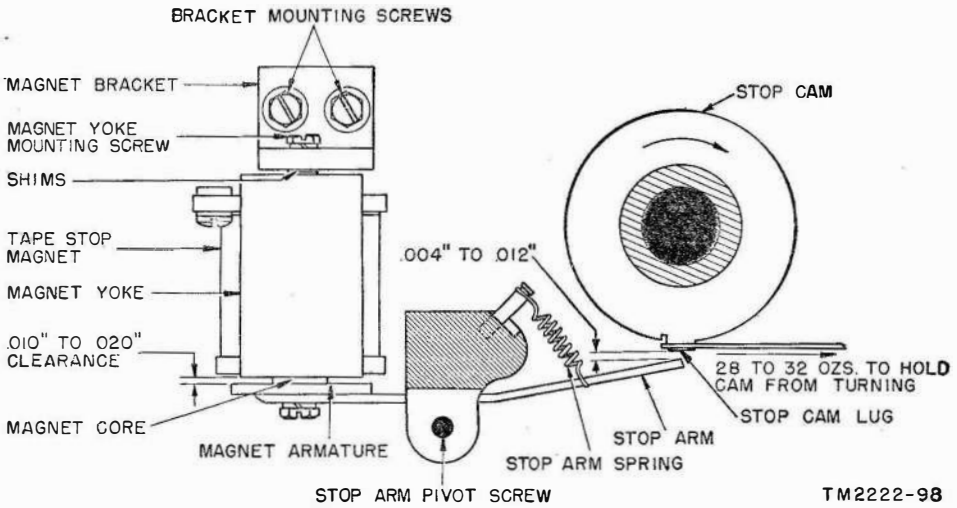


Figure 50. Tape-stop magnet bracket (universal magnet) requirements.

unit is wired for d-c operation of the magnet. When the wiring is for a-c operation, the *C* side should be away from the magnet core to reduce chatter and a-c hum.

c. ADJUSTMENTS.

(1) Increase or decrease the number of shims on the magnet yoke mounting screws between the magnet yoke and the magnet bracket to adjust for equal air gap. Increase or decrease the number of shims between the magnet core and the yoke to adjust for the .010- to .020-inch air gap.

(2) Loosen the two magnet bracket mounting screws and reposition the magnet bracket.

93. Tape-stop Magnet Bracket (D-c Magnet)
(fig. 51)

This adjustment does not apply to transmitters used as part of Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A, but applies to equipment using transmitter distributors equipped with a tape-stop magnet having two coils designed for operation on dc only.

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) There should be .004- to .012-inch clearance between the stop cam lug and the end of the stop arm when the magnet armature is held against the magnet cores and the stop cam lug is opposite the end of the stop arm.

(2) There should not be more than .010-inch separation between the armature and one magnet core when the armature is resting against the other magnet core. Also, the magnet cores should not extend beyond the sides of the armature.

c. ADJUSTMENT. Loosen the two magnet bracket mounting screws and reposition the magnet bracket. Tighten the mounting screws.

94. Magnet Core Adjustment (Receiving Transmitter Distributors)
(fig. 52)

a. PREPARATION. None required.

b. REQUIREMENTS. The armature should strike both pole faces simultaneously and any air gap between the armature and the pole faces (when the armature is held against the pole faces) should not exceed .006 inch. The armature plate should cover fully the pole faces.

c. ADJUSTMENTS. To adjust, loosen the start magnet core mounting screws and position the magnet core. Tighten the screws.

95. Stop-arm Pilot Screws A
(fig. 53)

a. PREPARATION. Turn the main shaft until the end of the stop arm engages the stop cam lug.

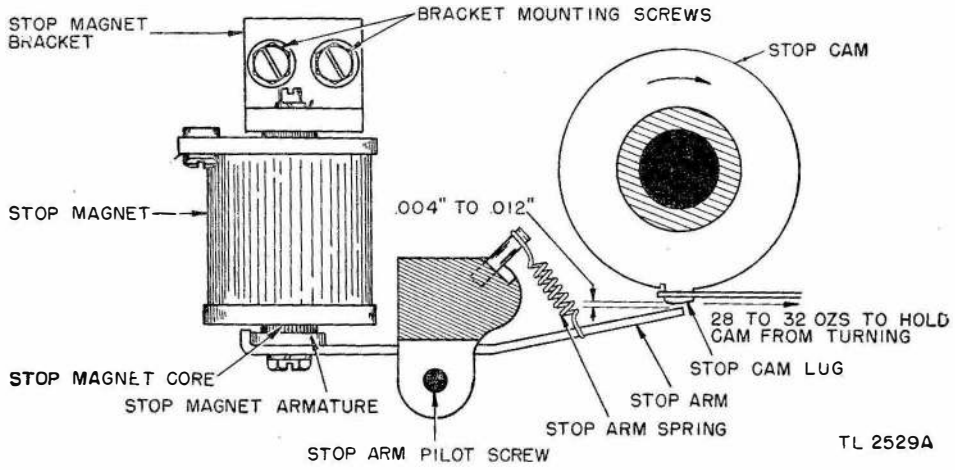


Figure 51. Tape-stop magnet bracket (d-c magnet) requirements.

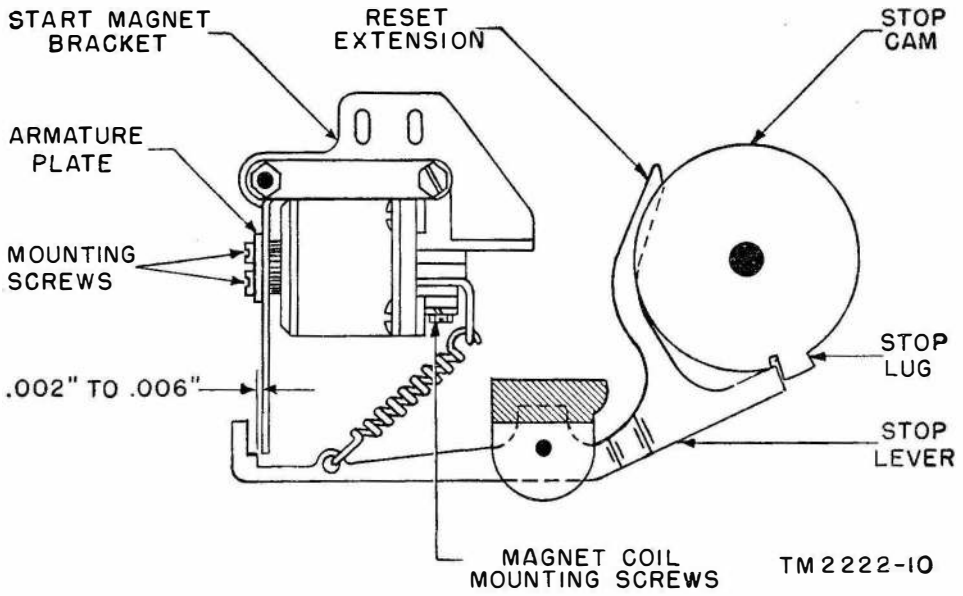


Figure 52. Magnet core (receiving transmitter distributors) requirements.

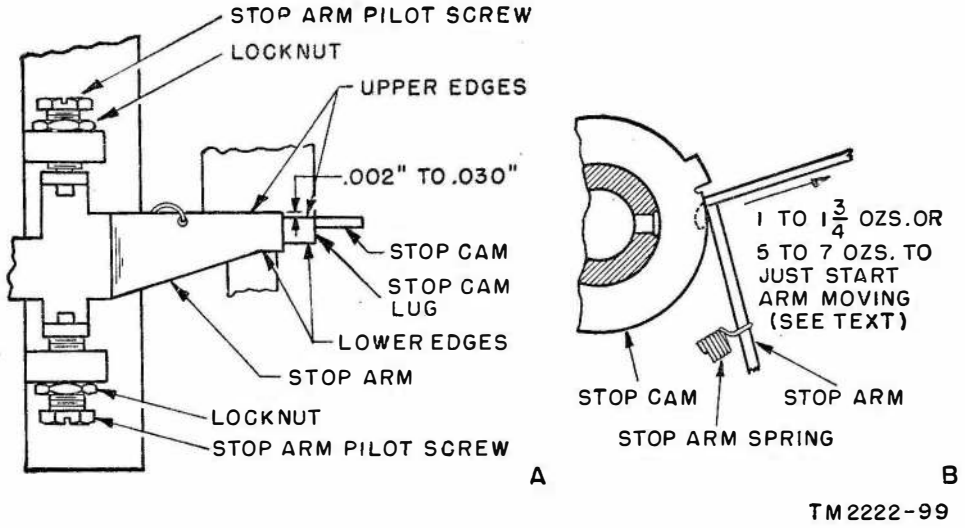


Figure 53. Tape-stop arm requirements.

b. REQUIREMENTS.

(1) The upper edges of the stop arm should overlap the upper edge of the stop cam .002 to .030 inch.

(2) The stop arm should be free on its bearings, but it should not have any perceptible play.

c. ADJUSTMENT. Loosen the locknut on each of the two stop-arm pilot screws. Turn the pilot screws up or down as required. Tighten the locknuts.

96. Stop Lever Pilot Screws Adjustment (Receiving Transmitter Distributors)

(fig. 52)

a. Requirements and adjustments are given to cover both types of cams shown in figure 54.

When the reset extension is resting on the high part of the stop lug of the type shown in A, figure 54, there should be from .010-inch to .020-inch clearance between the top surface of the stop lever and the lower surface of the stop cam at the closest point. The stop lever should be free in its bearings, but it should not have perceptible play. To adjust, loosen the stop lever pilot screw locknuts and position the stop lever. Tighten the locknuts.

b. When the type of stop cam lugs shown in *B*, figure 54 is against the end of the stop lever shown figure 52, the bottom edge of the stop lever should be flush with or not more than .010 inch above the bottom edge of the lug on the stop cam. The stop lever should be free in its bearings, but it should not have perceptible play. To adjust, loosen the stop lever pilot screw locknuts and position the stop lever. Tighten the locknuts.

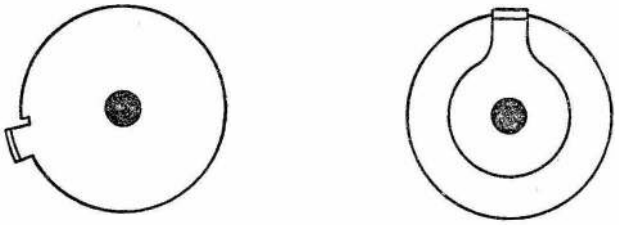


Figure 54. Types of stop cams used on receiving transmitter distributors.

97. Stop-arm Spring Tension B (fig. 53)

a. PREPARATION. Turn the main shaft until the stop arm rests on the low part of the stop cam; however, the stop arm should not engage the stop cam lug.

b. REQUIREMENTS.

(1) Series-governed motors. Hook an 8-ounce scale over the end of the stop arm and pull at a right angle to the stop arm. A pull of 1 to 1¾ ounces should be required to start the stop arm moving away from the low part of the stop cam. The contact spring of the No. 86960 contact assembly should be held away from the stop arm when measuring the spring tension.

Note. Equipments that use series-governed motors but are not equipped with No. 86960 contact assemblies require a stop-arm tension of 5 to 7 ounces.

(2) Synchronous motors. Hook an 8-ounce scale over the end of the stop arm and pull at a right angle to the stop arm. A pull of 5 to 7 ounces should be required to start the stop arm moving away from the lowest part of the stop cam.

c. ADJUSTMENT. Replace the old spring with a new spring.

98. Start Magnet Bracket Adjustment (Receiving Transmitter Distributors) (fig. 52)

a. PREPARATION. See that the armature is against the pole pieces and that the armature extension rests on the bottom of the unlatch step of the stop lever.

b. REQUIREMENTS. There should be from .002- to .006-inch clearance between the right edge of the unlatch step and the left edge of the armature extension at the closest point. The right edge of the latch step of the stop lever must be parallel to the left edge of the armature extension in its unlatched position. With the armature in the latched position, the rear edge of the stop lever should be flush with, or not more than, .010 inch in front of the rear edge of the stop cam lug.

c. ADJUSTMENT. To adjust, loosen the start magnet bracket mounting screws and position the bracket. Tighten the screws.

99. Armature Spring Tension Adjustment (Receiving Transmitter Distributors) (fig. 55)

a. PREPARATION. See that the armature extension is in its latched position (armature not attracted) and that the stop lever is held away from the end of the armature extension.

b. REQUIREMENTS. A pressure of 3 to 3½ ounces should be required to start the armature moving when the push end of an 8-ounce scale is applied horizontally to the armature between the screws.

c. ADJUSTMENT. Tighten or loosen the armature torsion spring by using the bearing stud.

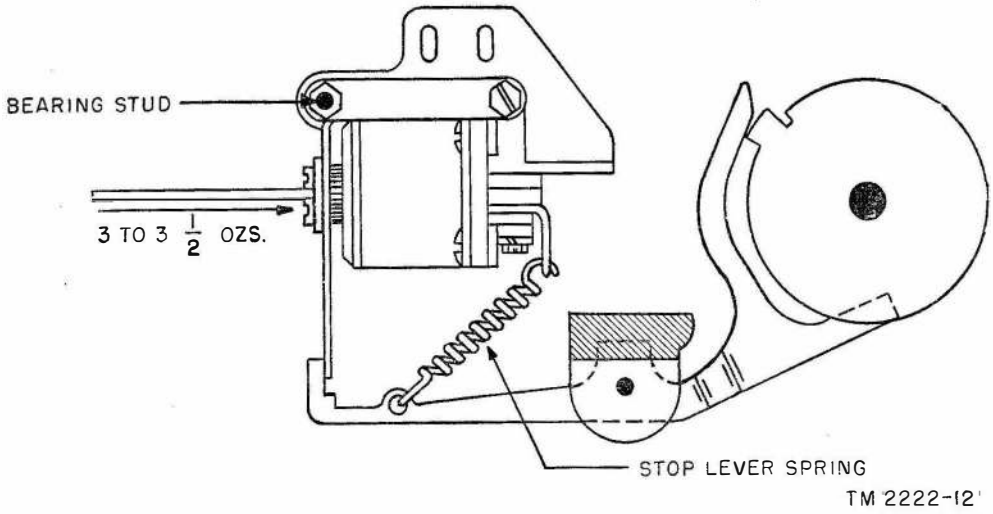


Figure 55. Armature spring tension requirements (receiving transmitter distributors).

100. Stop Lever Spring Tension (Receiving Transmitter Distributors) (fig. 55)

a. PREPARATION. With the armature in its latched position, hook a 32-ounce scale over the left end of the stop lever and pull horizontally at right angles to the stop lever.

b. REQUIREMENTS. It should require from 12 to 16 ounces to start the lever moving.

c. ADJUSTMENT. If the required tension is not present, replace the spring.

101. Tape-feed Pawl Spring Tension (fig. 56)

a. PREPARATION. Turn the main shaft until the feed pawl is in its uppermost position. Remove the four transmitter top plate mounting screws and lift the top plate straight up. Do not lose the end-of-tape stop pin (if used).

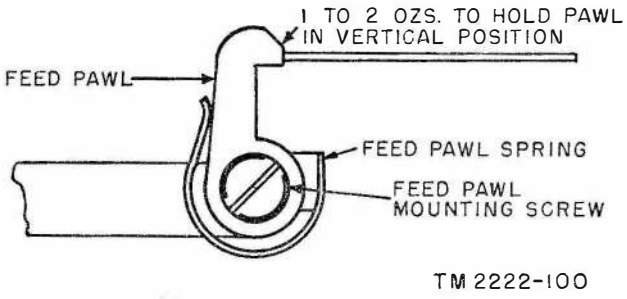


Figure 56. Tape-feed pawl spring tension requirements.

b. REQUIREMENTS. Apply the push end of an 8-ounce scale to the feeding tip of the tape-feed pawl and push horizontally toward the left. A push of 1 to 2 ounces should be required to hold the feed pawl in a vertical position.

c. ADJUSTMENT. Loosen the feed pawl mounting screw and reposition the spring. Tighten the mounting screw.

102. Detent Lever Spring Tension (fig. 57)

a. PREPARATION. Hold the transmitter top plate upside down and in a horizontal plane. Make sure that the detent roller is resting in the hollow between two teeth of the feed-roll ratchet.

b. REQUIREMENTS. Hook a 32-ounce scale over the end of the detent lever and pull horizontally against the tension of the spring. A pull of 15 to 18 ounces should be required to start the detent lever moving, when the detent lever is provided with a rounded surface opposite the round boss for the spring as shown in figure 57. When a new style detent lever, having a protruding rib to facilitate hooking for the scale, is provided, the spring tension should measure 12 to 15 ounces.

c. ADJUSTMENT. Replace the old spring with a new spring.

Note. This adjustment should be checked with the tape transmitter top plate removed.

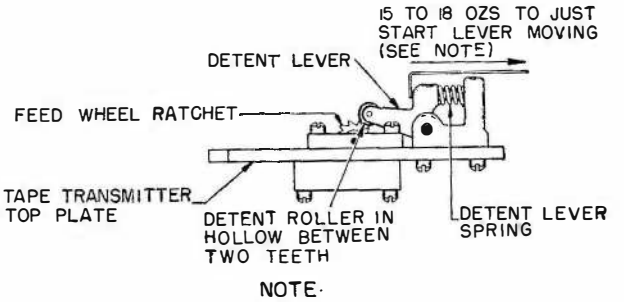


Figure 57. Detent lever spring tension requirements.

103. Feed-roll Shaft Bearings
(fig. 57)

a. PREPARATION. Hold the transmitter top plate upside down.

b. REQUIREMENTS. The feed-roll shaft shall be free in its bearings, and should have some end play but not more than .002 inch.

c. ADJUSTMENT. Loosen the four feed-roll shaft bearing mounting screws and reposition the bearings. Tighten the mounting screws.

Note. This adjustment should be checked with the tape transmitter top plate removed.

104. Tape Space Adjustment
(B, fig. 58)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) *Chadless tape.* There should be a clearance of .011 to .014 inch between all points of the tape guide and the retaining lid plate when the retaining lid is latched closed, and the end play should be taken in a direction to make this clearance a minimum.

(2) *Regular tape.* There should be a clearance of .006 to .008 inch between all points of the tape guide and the retaining lid plate when the retaining lid is closed and latched.

c. ADJUSTMENT. Remove the two tape-retaining lid plate mounting screws and add or remove the shims. Replace the mounting screws.

105. Tape Guide
(A, fig. 58)

a. PREPARATION. None required.

b. REQUIREMENTS. There should be equal clearance between the edges of the tape and

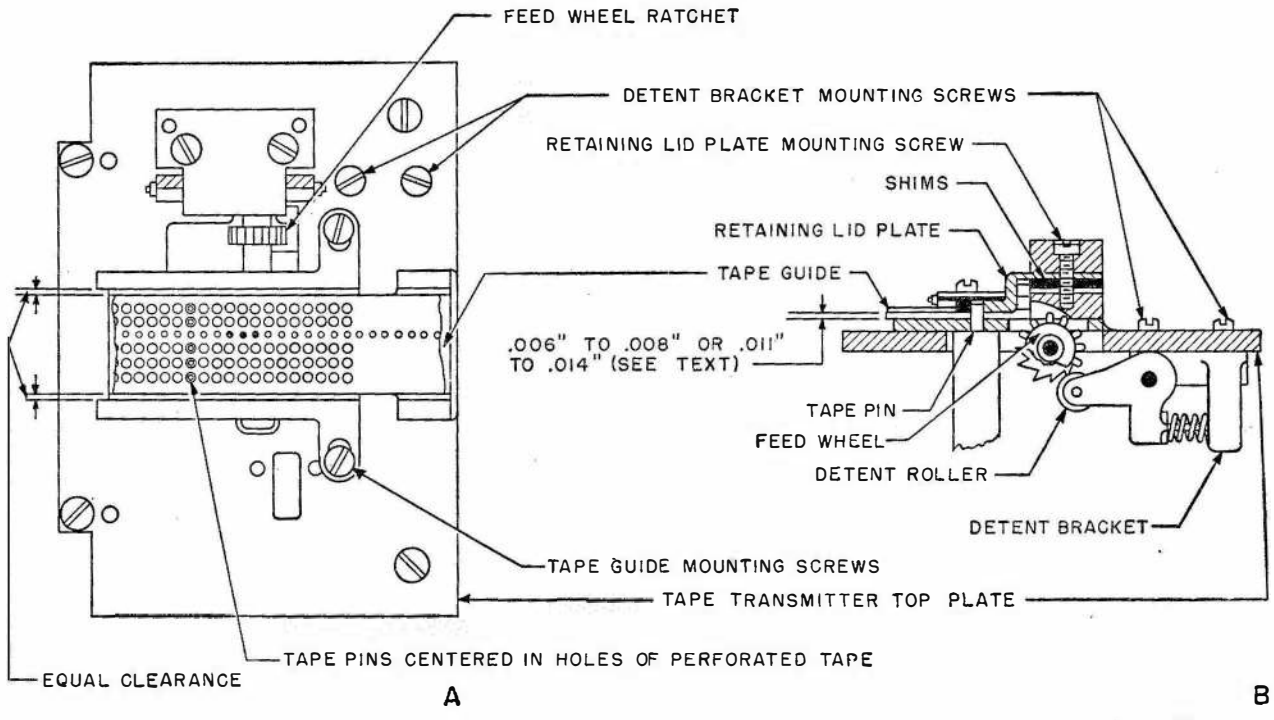


Figure 58. Tape space requirements.

the tape guide when the feed roll pins fully engage the tape-feed holes.

c. ADJUSTMENT. Loosen the two tape-guide mounting screws and reposition the tape guide. Tighten the mounting screws.

Note. Replace the tape transmitter top plate. When replacing this top plate, hold up the feed pawl so that it engages the feed roll ratchet. If the unit is equipped with the end-of-tape stop mechanism, hold the end-of-tape stop pin to prevent it from falling from its guide.

106. End-of-tape Stop Pin Guide (When Used) (fig. 59)

a. PREPARATION. Remove the transmitter top plate. Be careful not to lose the end-of-tape stop pin.

b. REQUIREMENTS.

(1) Old style parts. There should be a clearance of .010 to .020 inch between the end-of-tape stop pin and the shoulder of the tape-guide plate when the side play of the pin is taken up in a direction to make the clearance a minimum.

(2) Improved style parts. The end-of-tape pin should be centered in the small hole of the tape-retaining lid. The improved tape guide has a recess milled in the shoulder opposite the end-of-tape stop pin.

c. ADJUSTMENT.

(1) Old style parts. Loosen the end-of-tape stop pin guide mounting screws and reposition the guide. Locate the feed-roll shaft bearings so that the feed-roll shaft is free, with not over .002-inch end play, before tightening the mounting screws. Replace the transmitter top plate.

(2) Improved style parts. Loosen the end-of-tape stop pin guide mounting screws and reposition the guide until the end-of-tape stop pin is positioned in the center of the small hole in the tape retainer lid as gaged by eye. Locate the feed-roll shaft bearings so that the feed-roll shaft is free with not over .002-inch end play before tightening the mounting screws. Replace the transmitter top plate.

107. End-of-tape Stop Contact Spring (fig. 59)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) Place a straightedge across the top of the tape guide directly over the end-of-tape stop pin. There should be a clearance of .020 to .025 inch between the

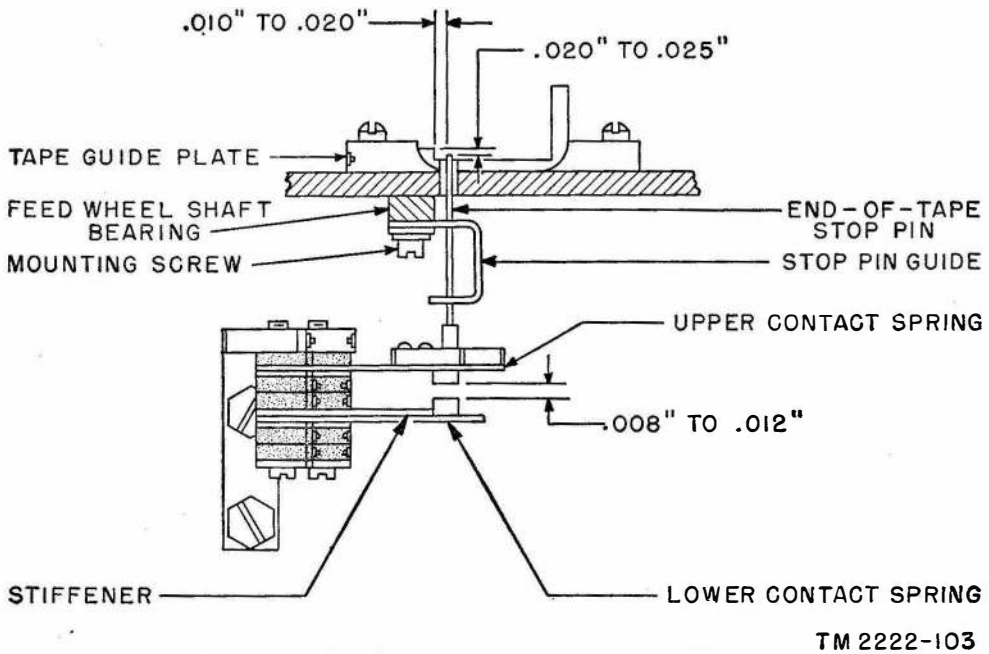


Figure 59. End-of-tape stop mechanism requirements.

bottom of the straightedge and the upper end of the stop pin.

(2) There should be a gap of .008 to .012 inch between the end-of-tape stop contacts when the lower spring is resting against its stiffener.

(3) Place a piece of tape in the tape guide and close the tape-retaining lid. A pressure of 20 to 25 grams (measured with a gram gage Sig C stock No. 60870H or equal) should be required to open the contacts. Measure the pressure at the contact point.

c. ADJUSTMENT.

(1) Bend the upper contact spring with a spring bender. Avoid any sharp bends or kinks.

(2) Bend the lower contact spring stiffener.

(3) Bend the lower contact spring with a spring bender. Avoid sharp bends or kinks. Remove the tape and recheck the requirements (*b* (2) above).

108. Feed Pawl Spring Position

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) There should be a clearance of at least .020 inch between the side of the feed pawl spring and the contact lever guide.

(2) There should be a clearance of at least .025 inch between the top edge of the feed pawl spring and the feed-roll ratchet when the feed pawl is in its uppermost position.

c. ADJUSTMENT. Modify the tape-feed pawl spring tension adjustment within its specified limits. Be sure to recheck all related adjustments.

109. Detent Bracket

(B, fig. 58)

a. PREPARATION. Obtain a piece of tape that has been perforated with a series of LTRS combinations. Either a regular or chadless tape may be used, but if chadless tape is used, the chads (or lids) of one row of perforations should be bent back so that they do not obstruct the holes. Check the tape carefully to be sure that the perforations are spaced 10 to the inch. Place the perforated tape in the tape guide so that the feed holes are engaged fully by the feed-roll teeth, and the row of unobstructed perforations are directly above the tape pins. With the detent roller resting in the hollow between two teeth of the feed-roll ratchet, turn the main shaft backward until the tape pins are flush with the bottom of the tape. Be careful not to damage the distributor brushes when turning the main shaft backwards.

b. REQUIREMENTS. When the play of the tape on the feed-roll teeth is taken up toward the left (direction of normal tape travel), the tape pin farthest to the right should just clear the right edge of the associated code perforation.

c. ADJUSTMENT. Loosen the two detent bracket mounting screws and reposition the detent bracket. Tighten the mounting screws.

110. Tape-retaining Lid Plate

(fig. 60)

There are three types of tape-retaining lid plates in use. Either regular or chadless perforated tape may be used with types shown in A and B, but only regular perforated tape can be used with the type shown in C. Types A and B are interchangeable on units designed to operate with chadless tape. Type C can be used only on units designed to transmit regular tape. Type A is designed to accommodate spliced chadless tape.

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) *Chadless tape.* Type A and B tape-retaining lid plates should be positioned so that the plate does not interfere with the chads of the chadless tape pins. Also, the edges of the plate should be parallel to the tape guide. When checking this requirement for type B plates, take up the play between the tape-feed holes and the feed-roll detent resting in the hollow between two teeth on the ratchet.

(2) *Regular tape.* Type A, B, or C tape-retaining lid plates should be positioned so that the edges of the plate are parallel to the tape guide, and the openings in the plate are located cen-

trally with respect to the tape pins when the pins are in the uppermost position.

c. ADJUSTMENT. Loosen the two tape-retaining lid plate mounting screws and reposition the plate. Tighten the mounting screws.

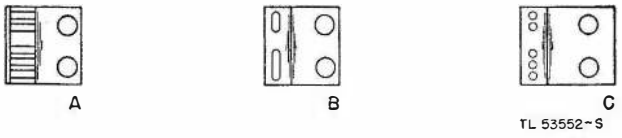


Figure 60. Types of tape-retaining lid plates.

111. Tape-retaining Lid Latch Spring Tension

a. PREPARATION. None required.

b. REQUIREMENTS. With the sloping surface of the tape-retaining lid latch resting against the transmitter top plate but not latched, hook an 8-ounce scale over the upper end of the latch and pull at right angles to the formed upper end of the latch. A pull of 1½ to 7 ounces should be required to start the latch moving on its pivot.

c. ADJUSTMENT. Remove the spring and shorten slightly by bending a new tip at the end. Replace the spring and recheck the requirement.

112. Feed-lever Adjusting Screw (fig. 61)

a. PREPARATION. None required.

b. REQUIREMENTS. When the contact lever bail is operated slowly by hand, the feed pawl should engage the first tooth above the horizontal center of the feed-roll ratchet at the same instant the tape pins are flush with the upper surface of the tape guide.

c. ADJUSTMENTS. Loosen the feed-lever adjusting screw locknut. Turn the adjusting screw counterclockwise if the tape pins extend above the top surface of the tape guide when the feed roll starts to move.

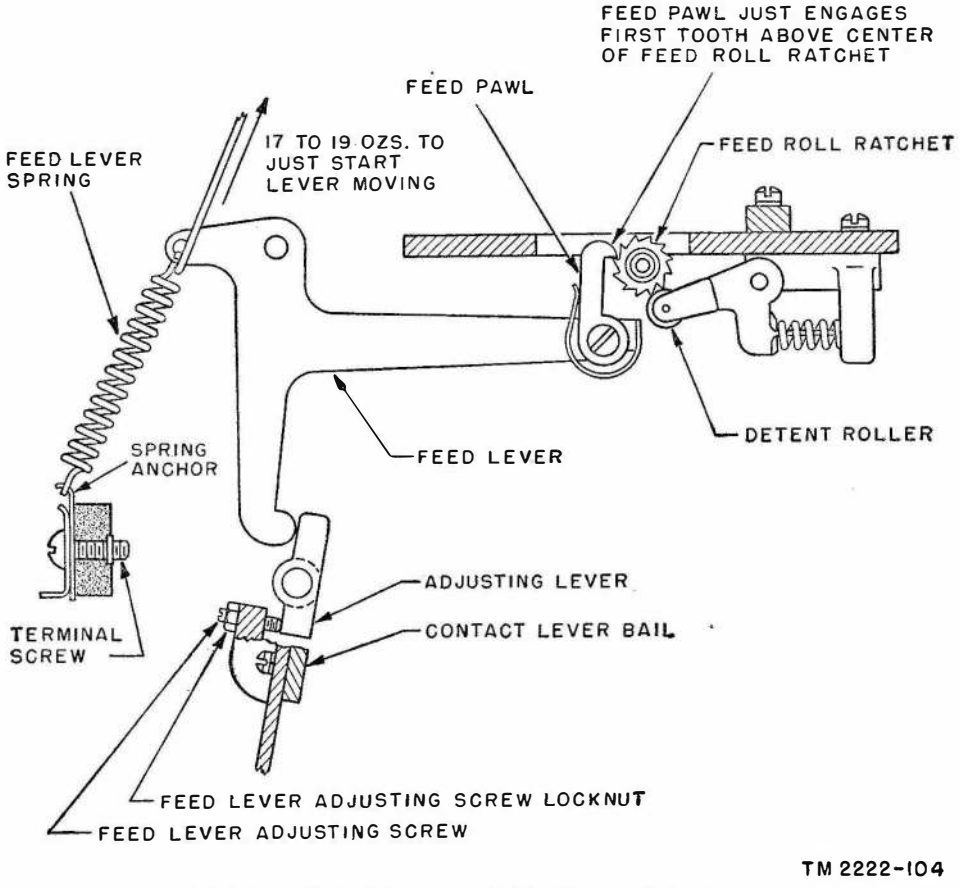


Figure 61. Feed-lever adjusting screw requirements.

113. Operating Lever Adjusting Screw (fig. 62)

a. PREPARATION. None required.

b. REQUIREMENTS. There should be some clearance, but not more than .010 inch, between the face of a tooth on the feed-roll ratchet and the face of the feed pawl when the operating lever roller is on the peak of its cam and the detent roller is resting in the hollow between two teeth on the feed-roll ratchet.

c. ADJUSTMENT. Loosen the operating lever adjusting screw locknut and turn the adjusting screw (fig. 64) in or out as necessary. Tighten the locknut and recheck the requirement.

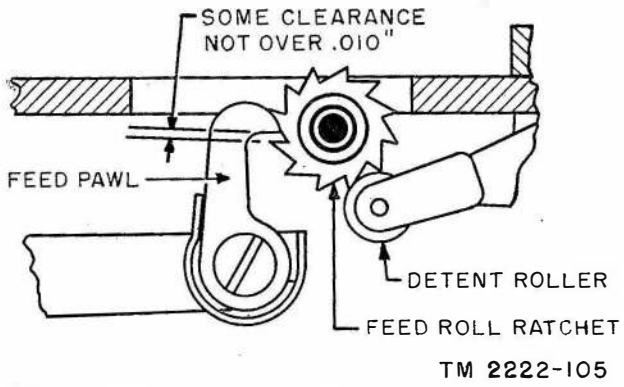


Figure 62. Operating lever adjusting screw requirements.

114. Feed-lever Upstop (fig. 63)

This adjustment applies only to transmitter distributors that are equipped to use chadless tape and have an operating cam stamped with letter X on one surface.

a. PREPARATION. Turn the main shaft until the detent roller rests in the hollow between two teeth on the feed-roll ratchet and the operating lever roller is on the low part of the operating cam.

b. REQUIREMENTS.

(1) With the operating lever roller on the low part of the operating cam and the detent roller resting in the notch between two teeth of the feed wheel ratchet, there should be 0.050- to 0.070-inch clearance between the face of the feed pawl and the face of the first tooth above the horizontal center line of the feed wheel ratchet. The feed lever should be in contact with the blocking surface or the feed-lever upstop.

(2) Rotate the motor manually until the adjusting lever just contacts the lobe of the feed lever (fig. 63). With the contact lever bail in this position, there should be at least 0.002-inch clearance between the bail and each contact lever lobe. With the operating lever on the low part of the operating cam, there should be at least 0.010-inch clearance between the radius of feed pawl or the feed spring and the feed wheel ratchet. If this clearance does not exist, refine the feed-lever upstop adjustment.

c. ADJUSTMENT. Loosen the feed-lever upstop mounting screw and reposition the upstop. Tighten the mounting screw.

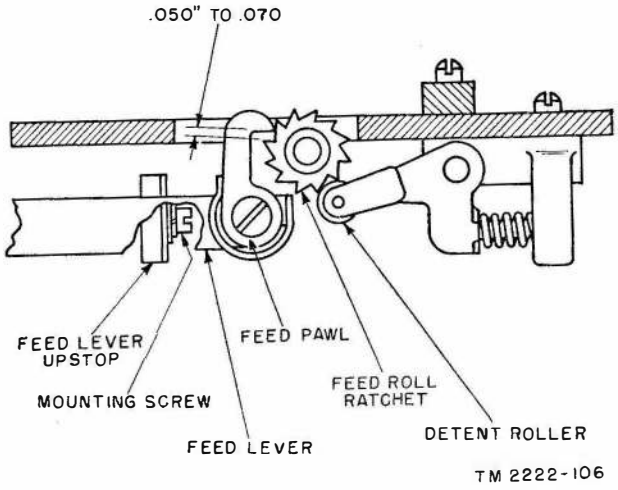


Figure 63. Feed-lever upstop requirements.

115. Marking (Lower) Contact Screws (fig. 64)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) *Chadless tape.*

(a) There should be a clearance of 0.020 to 0.025 inch between the bottom of the straightedge and the top of each tape pin.

(b) There should be a clearance of at least 0.002 inch between the contact lever bail and the lobe of each contact lever.

(2) *Regular tape.* Requirements for units that are designed to use regular perforated tape exclusively cannot be checked directly. The adjustment must be made to be sure the requirements are met.

c. ADJUSTMENT.

(1) *Chadless tape.* Loosen the set screws of both the marking (lower) and the spacing (upper) contact screws and back off the spacing contact screws. Turn the marking contact screws in or out, as necessary. Tighten the set screws of the marking contact screws.

(2) *Regular tape.* A straightedge is not required. Loosen the set screws and back off both the marking (lower) and the spacing (upper) contact screws. Advance each of the marking contact screws until their contact points just touch the points on the contact tongues; then advance each of the marking contact screws one additional full turn. Tighten the set screws of the marking contact screws.

116. Spacing (Upper) Contact Screws
(fig. 64)

a. PREPARATION. None required.

b. REQUIREMENTS. There should be a contact gap of 0.006 to 0.010 inch between the contact point of each spacing contact screw and its associated contact tongue when the operating lever roller is on the low part of the operating cam.

c. ADJUSTMENT. Loosen the set screws of the spacing (upper) contact screws if they have not been loosened as part of the adjustment given in paragraph 115. Turn each of the spacing contact screws in or out, as necessary. Tighten the set screws.

117. Contact-lever Spring Tension
(fig. 64)

a. PREPARATION. Turn the main shaft until the operating lever roller rests on the low part of its cam. Connect a test lamp across the contacts to determine when they separate. A suitable test lamp may be made from a small bulb and battery connected in series across the contacts. Test Unit I–236 or Multimeter TS–297/U can be used also to make this test.

b. REQUIREMENTS.

(1) *Chadless tape.* Hook an 8-ounce scale under the horizontal portion of each of the contact levers (the scale rod just clearing the contact tongue pivotal mounting) and pull vertically upward. A pull of 6 or 7 ounces should

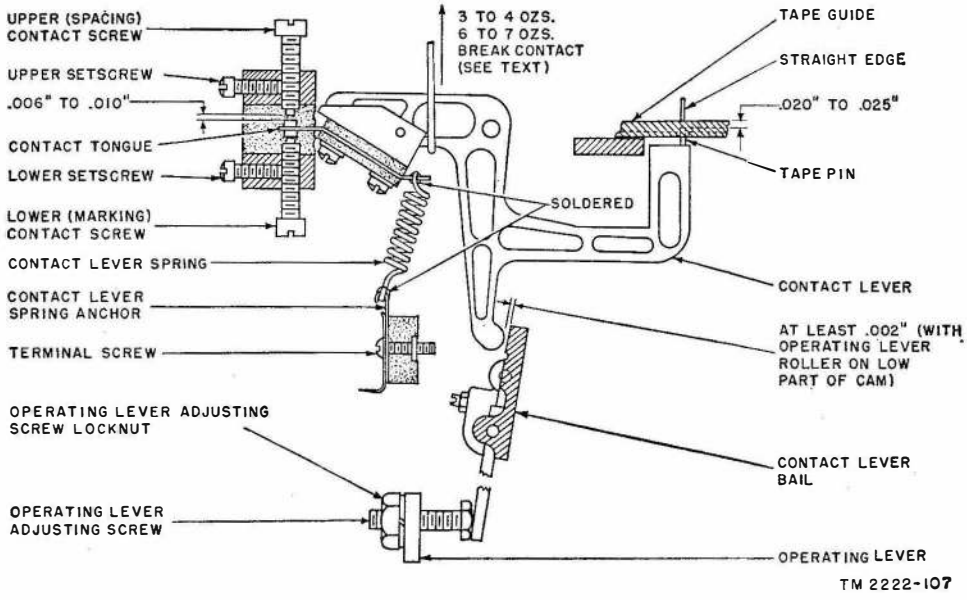


Figure 64. Contact screw and contact-lever spring tension requirements.

be required to separate the contact tongues from the marking contacts.

(2) *Regular tape.* Requirements for regular tape are the same as for chadless tape except that a pull of 3 to 4 ounces should be required to separate the contacts.

c. ADJUSTMENT. Loosen the contact-lever spring anchor terminal screws and reposition the anchors. Tighten the terminal screws. Replace weak springs with new springs.

118. Feed-lever Spring Tension
(fig. 61)

a. PREPARATION. Turn the main shaft until the operating lever roller rests on the low part of its cam.

b. REQUIREMENTS. Hook a 32-ounce scale over the end of the feed lever (just below the spring hole) and pull upward in a line with the spring. A pull of 17 to 19 ounces should be required to start the feed lever moving.

c. ADJUSTMENT. Loosen the terminal screw and reposition the spring anchor. Tighten the terminal screw.

119. Tight-tape Stop (Auto-stop) Mechanism
(figs. 65, 66, and 67).

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) *New style* (fig. 65).

(a) When the contacts are held closed by the contact operating post, the bottom of the tight-tape stop lever should be horizontal and the tight-tape stop shaft should protrude approximately 1/16 inch beyond the clamp (A, fig. 65).

(b) There should be a clearance of 0.015 to 0.025 inch between the contact points and a clearance of 0.015 to 0.025 inch between the right contact spring insulator and the tight-tape stop mechanism bracket when the contact operating post is held away from the left contact spring insulator (B, fig. 65).

(2) *Old style* (fig. 66).

(a) When the tight-tape stop lever is held so that the contact operating post is in a horizontal position, the tight-tape stop lever spring also should be in a horizontal position

(b) There should be a clearance of 0.015 to 0.025 inch between the contact points and a clearance of 0.015 to 0.025 inch between the right contact spring insulator and the tight-tape stop mechanism bracket.

(3) *Loop style* (fig. 67).

(a) The loop of the tight-tape stop lever should be positioned to the right and downward so that it makes an angle of approximately 45° with the top of the transmitter.

(b) The distance between the top surface of the transmitter top plate and the middle of the bend of the tight-tape stop lever should be 1¾ inches when the contacts are held closed by the contact operating post. Also, the tight-tape stop lever should protrude approximately 1/16 inch beyond the tight-tape stop lever clamp.

(c) There should be a clearance of 0.015 to 0.025 inch between the right contact spring insulator and the tight-tape stop mechanism bracket when the contact operating post is held away from the left contact spring insulator.

c. ADJUSTMENT.

(1) *New style.*

(a) Loosen the tight-tape stop lever clamp screw and reposition the clamp. Tighten the clamp screw.

(b) Bend the contact springs to the right or left, as required, using a spring bender. Do not make any sharp bends or kinks in the springs.

(2) *Old style.*

(a) Loosen the tight-tape stop shaft collar set screw and reposition the collar. Tighten the set screw.

(b) Bend the contact springs to right or left, as required; use a spring bender. Do not make any sharp bends or kinks in the springs.

(3) *Loop style.*

(a) Loosen the tight-tape stop lever clamp locknut and set screw. Position the lever and tighten the set screw and locknut.

(b) Loosen the tight-tape stop lever clamp screw and position the lever. Tighten the clamp screw.

(c) Bend the contact springs to right or left, as required; use a spring bender. Do not make any sharp bends or kinks in the springs.

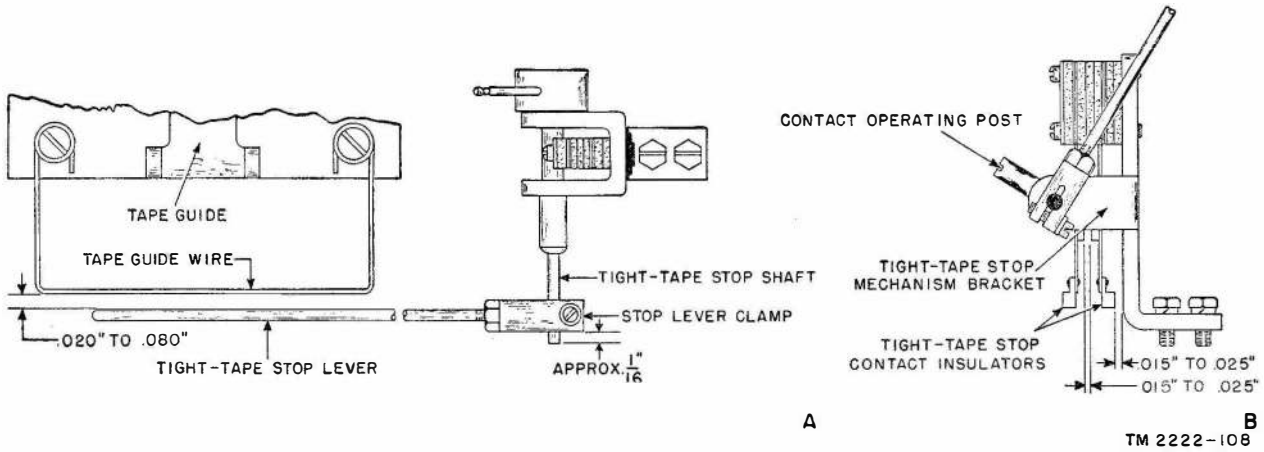


Figure 65. New style tight-tape stop mechanism requirements.

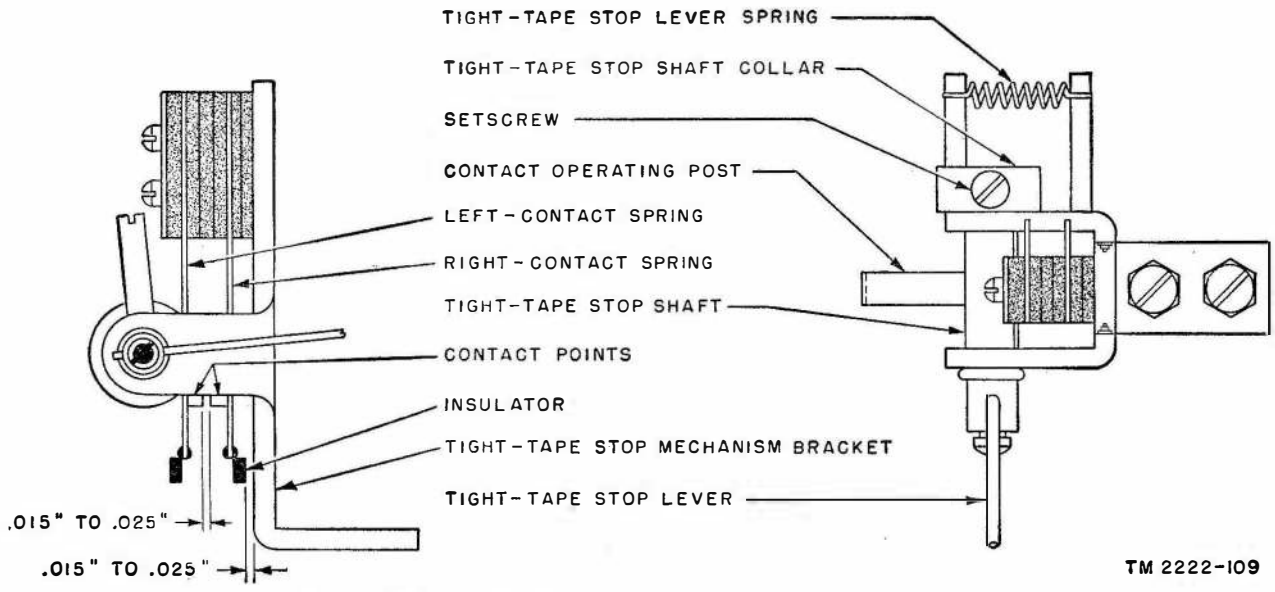


Figure 66. Old style tight-tape stop mechanism requirements.

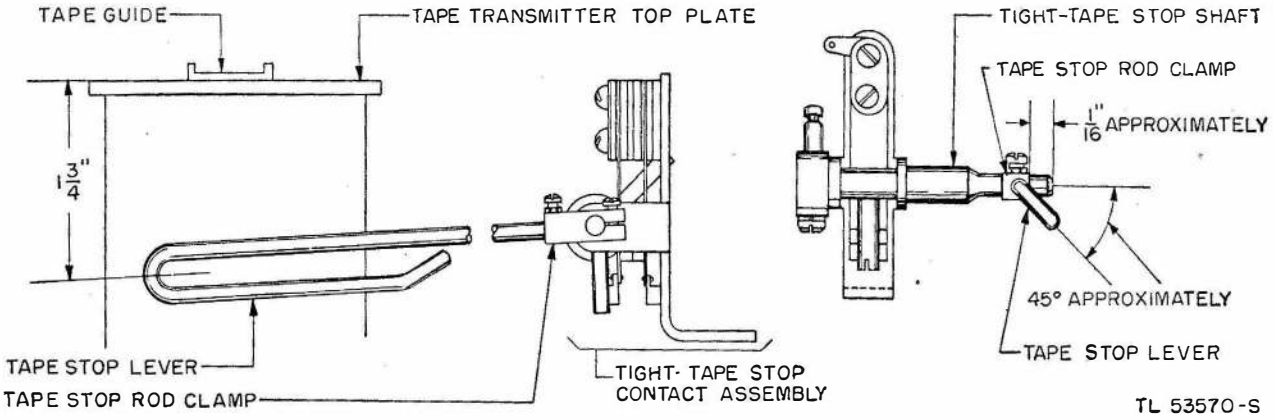


Figure 67. Loop style tight-tape stop lever requirements.

120. Carbon Distributor Brushes (fig. 68)

a. PREPARATION. Turn the main shaft until the stop cam lug is engaged fully by the stop arm. Connect a test lamp or ohmmeter to the slip connection terminals No. 2 and 3 in the base of the transmitter distributor to determine when the brush leaves the segment.

b. REQUIREMENTS.

(1) The point of contact of each of the distributor brushes with its associated segment should be in line with the reference mark on the face of the distributor disk. The brushes also should be located centrally with respect to their associated segments.

(2) Hook an 8-ounce scale under the end of each distributor brush spring and pull upward at a right angle to the end of the brush spring. A pull of 2½ to 3½ ounces should be required to lift the brush from its segment.

c. ADJUSTMENT.

(1) Loosen the brush-spring clamp screw and reposition the brushes. Tighten the clamp screw.

(2) Loosen the brush-holder clamp screw so that the brush holder is friction-tight. Turn the brush holder counterclockwise until the brushes are lifted from their segments. Bend the brush springs slightly, if necessary, until the contact surfaces of the brushes are equidistant from and parallel to the segments. Rotate the brush holder clockwise until the brushes rest against the segments with a pressure of about 3½ ounces and tighten the clamp screw. Place a piece of fine sandpaper (No. 000 or No. 0000), approximately 1 inch wide, on the distributor disk between the brushes and the segments (rough side next to the brushes). Draw the brushes over the sandpaper two or three times until the bottoms of the brushes are parallel to the surfaces of the segments. Recheck the brush-spring tension requirements and reposition the brush holder, if necessary. Replace the brushes when they have worn down to within 1/16 inch of the spring. Whenever it is found necessary to reposition the brush-holder to obtain proper spring tension, the brushes should be resurfaced as described above.

121. Braided Copper Distributor Brushes (Low Brush Arm) (fig. 69)

a. PREPARATION. Turn the main shaft until the stop cam lug is engaged fully by the stop arm. Loosen the brush-holder clamp screw until the brush holder is friction-tight. Connect an ohmmeter or test lamp to slip connection terminals No. 2 and 3 in the base of the transmitter distributor. Then turn the brush holder counterclockwise until the ends of the brushes just leave the associated segments as indicated by a reading of zero on the ohmmeter or by the test lamp flickering and going out. Touch each brush lightly in turn to see whether the circuit is re-

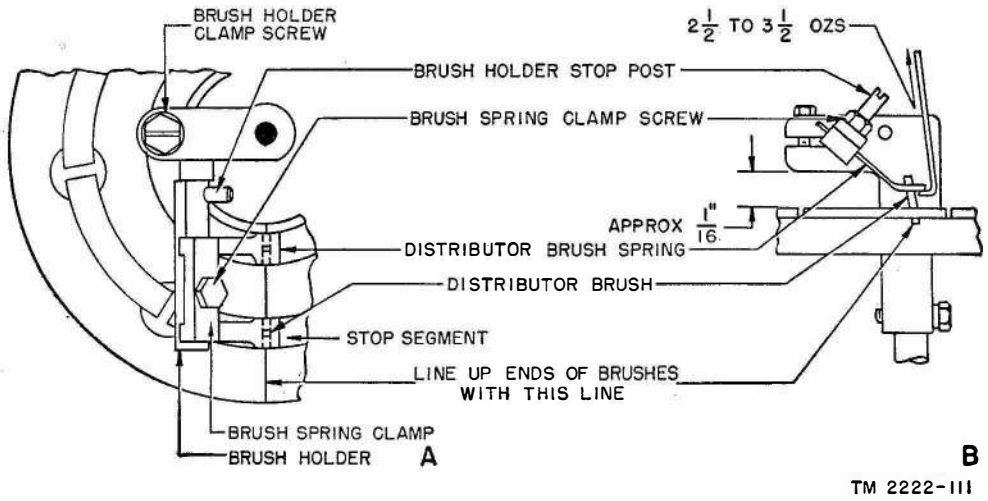


Figure 68. Carbon distributor brush requirements.

stored. If the circuit cannot be restored by touching one brush at a time, the indication is that both brushes have left their segments simultaneously. Then turn the brush holder counterclockwise until the ends of the brushes just touch the associated segments.

b. REQUIREMENTS.

(1) The brushes should be straight and the point of contact of each of the distributor brushes, with its associated segment, should be in line with the reference mark on the face of the distributor disk. The brushes also should be located centrally with respect to their associated segments.

(2) There should be a clearance of 0.015 to 0.020 inch between the brush-holder stop post and the eccentric stop when the brushes are straight and just touching the commutator segments.

c. ADJUSTMENTS.

(1) Loosen the brush clamp screw and reposition the brushes. Tighten the clamp screw.

(2) With the brushes just touching the associated segments, loosen the eccentric stop mounting screw and reposition the eccentric stop. Tighten the mounting screw. Turn the brush holder clockwise until its stop post is in contact with the eccentric stop and tighten the brush-holder clamp screw.

Note. Braided copper brushes frequently fray, and the small individual wires break off. This condition, in most cases, may be overcome by flowing a very small amount of solder into the brush to hold it in shape. Be careful to avoid the use of excessive amounts of solder and to prevent the solder from accumulating at the end of the brush which contacts the distributor disk.

122. Braided Copper Distributor Brushes (High Brush Arm)

(fig. 70)

a. PREPARATION. Turn the main shaft until the stop cam lug is engaged fully by the stop arm. Connect an ohmmeter or test lamp to slip connection terminals No. 2 and 3 in the base of the transmitter distributor. Then turn the brush holder counterclockwise until the ends of the brushes just leave the associated segments as indicated by a reading of zero on the ohmmeter or by the test lamp flickering and going out. Touch each brush lightly in turn to see whether the circuit is restored. If the circuit cannot be restored by touching one brush at a time, it indicates that both brushes have left their segments simultaneously. Then turn the brush holder clockwise until the brushes just touch the associated segments.

b. REQUIREMENTS.

(1) The brushes and stiffeners should be straight and in contact with each other throughout their length. The point of contact of each of the distributor brushes with its associated segment should be in line with the reference mark on the face of the distributor disk. The brushes should be located

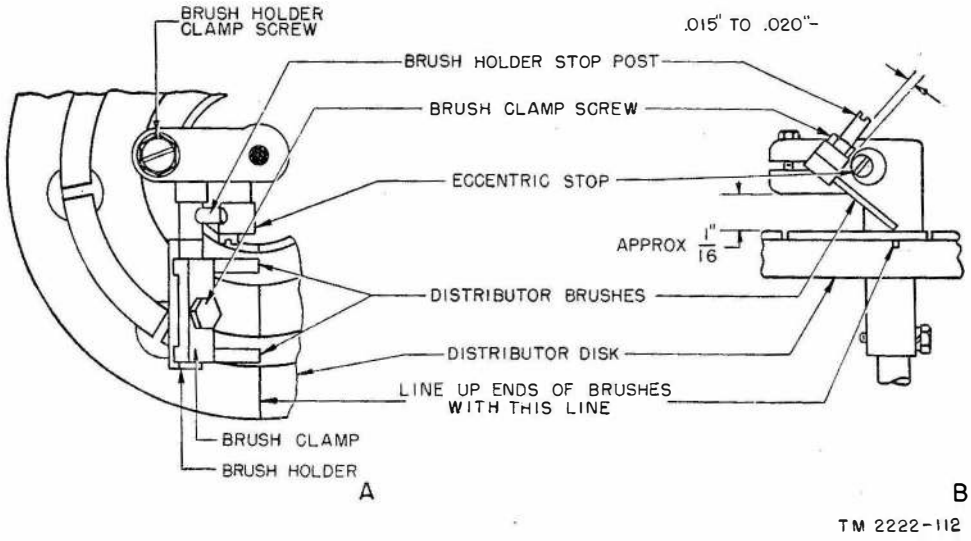


Figure 69. Braided copper distributor brush (low brush arm) requirements.

centrally with respect to their associated segments and the ends of the brush stiffeners should be $\frac{3}{32}$ to $\frac{1}{8}$ inch from the trimmed ends of the brushes.

(2) There should be a clearance of 0.020 to 0.025 inch between the brush-holder stop post and the eccentric stop when the brushes are straight and just touching the commutator segments.

c. ADJUSTMENT.

(1) Loosen the brush clamp screw and reposition the brushes and the stiffeners. Tighten the clamp screw.

(2) With the brushes just touching the associated segments, loosen the eccentric stop mounting screw and reposition the eccentric stop. Tighten the mounting screw. Then turn the brush holder clockwise, until its stop post is in contact with the eccentric stop, and tighten the brush-holder clamp screw.

123. Operating Cam

a. PREPARATION. None required.

b. REQUIREMENTS. The operating cam should be positioned so that the No. 5 transmitter contact tongue leaves the marking (lower) contact screw when the distributor brush is on the stop segment and the trailing edge of the brush is $\frac{1}{32}$ to $\frac{1}{16}$ inch from the leading edge of the stop segment (fig. 71).

c. ADJUSTMENT. Loosen the two operating cam mounting screws and reposition the cam. Tighten the mounting screws.

124. Main-shaft Clutch Torque

a. PREPARATION. Connect the transmitter distributor to the power supply and start the motor. If the equipment is not warm from operation, let the motor run for 10 minutes with the main shaft held in its normal stop position by the stop arm. The operating cam should be relieved of the operating lever load by removing the operating lever pivot screw and the operating lever.

b. REQUIREMENTS. With the motor running, hook a 32-ounce scale over the stop cam lug as shown in figure 51. A pull of 28 to 32 ounces should be required to hold the cam stationary.

c. ADJUSTMENT. Stop the motor and loosen the adjustable clutch disk locknut. Turn the adjustable clutch disk clockwise to increase the torque or counterclockwise to decrease the torque. Hold the clutch disk in its final position and tighten the locknut against it. Use a No. 76289 tool or a spanner wrench, if one is available, to hold the adjustable clutch disk while tightening the locknut. If a No. 76289 tool is not available, improvise a spanner wrench or hold the clutch disk by hand with the aid of a screw driver and turn the locknut down friction-tight. Turn the main shaft by hand until the stop cam lug is engaged fully by the stop arm. With the

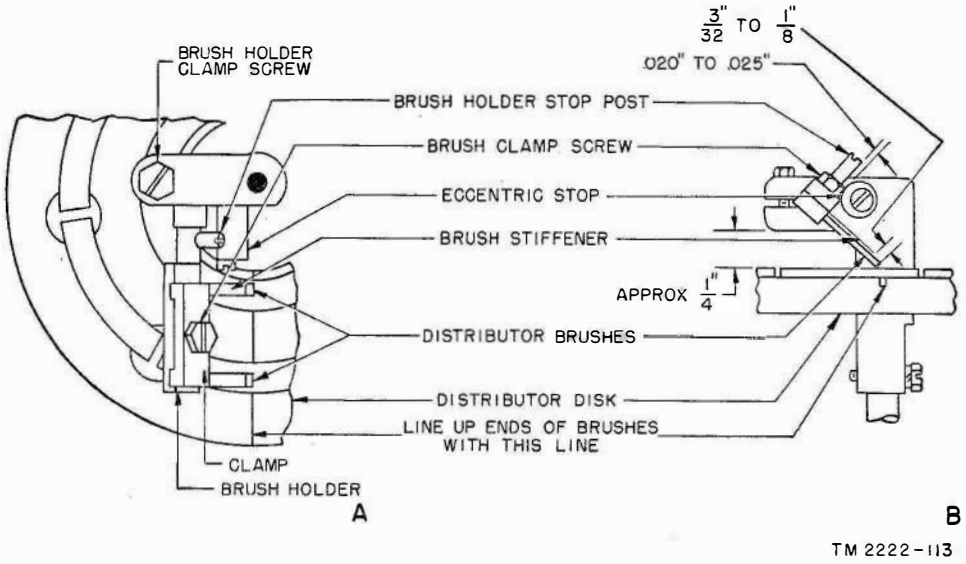


Figure 70. Braided copper distributor brush (high brush arm) requirements.

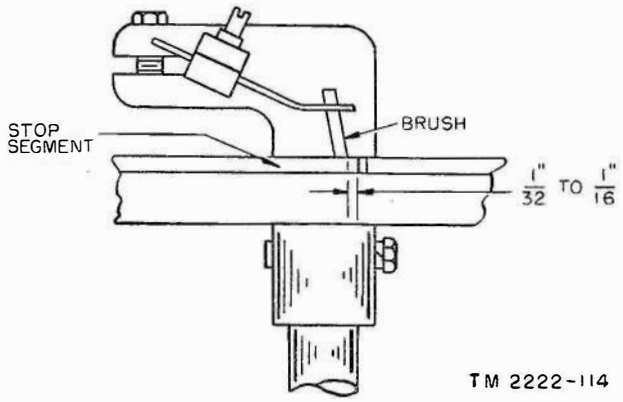


Figure 71. Position of distributor brush on STOP segment when check is made of operating cam requirements.

movement of the main shaft blocked in this manner, tighten the locknut securely. Be careful not to exert enough pressure to break any of the parts. *Be sure to tighten the locknut before starting the motor, since the gears or the motor, or both, may be damaged if this is not done.* Replace the contact operating lever.

125. Tape Guide Wire
(A, fig. 65)

This adjustment does not apply to transmitter distributors used with Reperforator Transmitters TG–26–A and TG–27–A. Transmitter distributors used with other equipment may or may not be equipped with this feature.

a. PREPARATION. None required.

b. REQUIREMENTS. There should be a clearance of 0.020 to 0.080 inch between the tight-tape stop lever and the right-hand portion of the tape guide wire when the tight-tape stop lever is in the horizontal position. Also, the lower edge of the tight-tape stop lever should be even with the lower side of the tape guide wire.

c. ADJUSTMENT. Loosen the tape guide wire mounting screws and reposition the guide wire. Tighten the mounting screws.

126. Stop-arm Contact Spring Tension
(A, fig. 72)

This adjustment does not apply to transmitter distributors that use synchronous motors. Some equipment that uses governed motors may not have this load-compensating feature.

a. PREPARATION. None required.

b. REQUIREMENTS. Hook an 8-ounce scale over the end of the contact spring and pull horizontally away from the stop arm. A pull of 2 to 2¾ ounces should be required to separate the contacts. When checking this requirement, be sure that the bakelite extension on the contact spring does not touch the stop arm. Shift the contact bracket, if necessary.

c. ADJUSTMENT. Bend the contact spring to

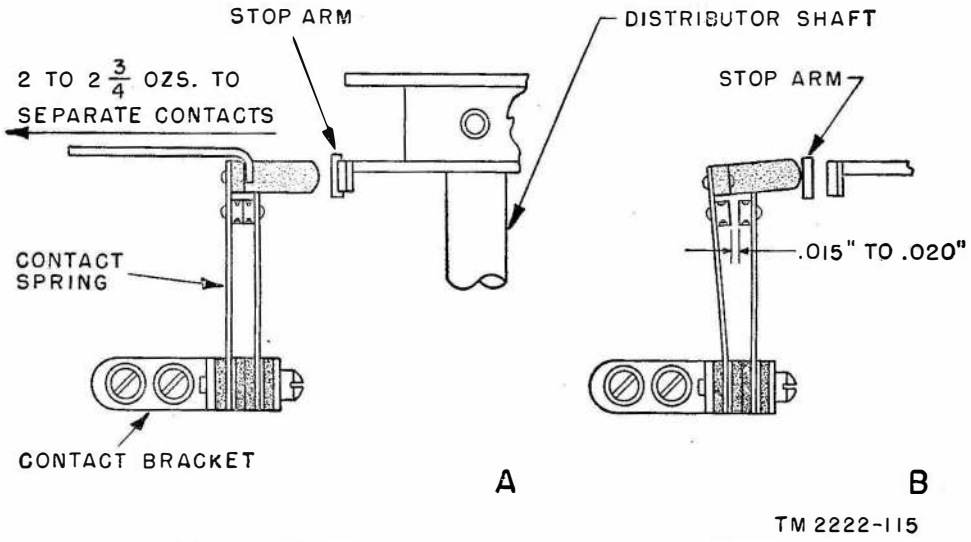


Figure 72. Stop-arm contact spring and gap requirements.

the right or left, as required, using a spring bender. Avoid sharp bends or kinks.

127. Stop-arm Contact Gap
(B, fig. 72)

This adjustment does not apply to transmitter distributors using synchronous motors. Some equipment using governed motors may not have this load-compensating feature.

a. PREPARATION. None required.

b. REQUIREMENTS. There should be a gap of 0.015 to 0.020 inch between the stop-arm contacts when the tape stop magnet armature is held against magnet cores.

c. ADJUSTMENT. Loosen the two contact bracket mounting screws and reposition the contact bracket. Tighten the mounting screws.

128. Governor Speed Adjusting Wheel Friction Washer
(fig. 73)

This adjustment does not apply to equipment with synchronous motors.

a. PREPARATION. A preliminary adjustment must be made in order to check the requirements. Remove the target and governor cover. Turn the speed adjusting wheel to the right or left until a pull of 13 to 14 ounces just separates the governor contacts. Hook a 32-ounce scale over the contact spring near the contact (fig. 73) and pull in line with the speed adjusting spring.

b. REQUIREMENTS. Hook a 32-ounce scale over a bank pin inserted radially in the leather of the speed adjusting wheel and pull at right angles to the radius. A pull of 16 to 24 ounces should be required to start the wheel moving.

c. ADJUSTMENT. Remove the friction washer and bend the large projections as required.

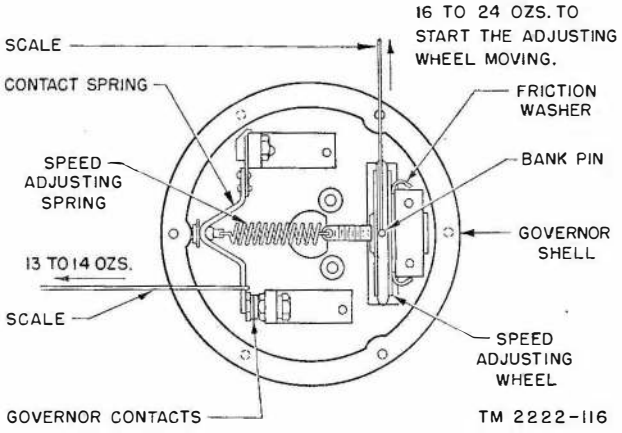


Figure 73. Governor speed adjusting wheel friction washer requirements.

129. Governor Adjusting Lever Stop Plate
(A, fig. 74)

This adjustment does not apply to synchronous motors.

a. PREPARATION. None required.

b. REQUIREMENTS. There should be a clearance of 0.006 to 0.050 inch between the speed adjusting wearing strip and the governor shell

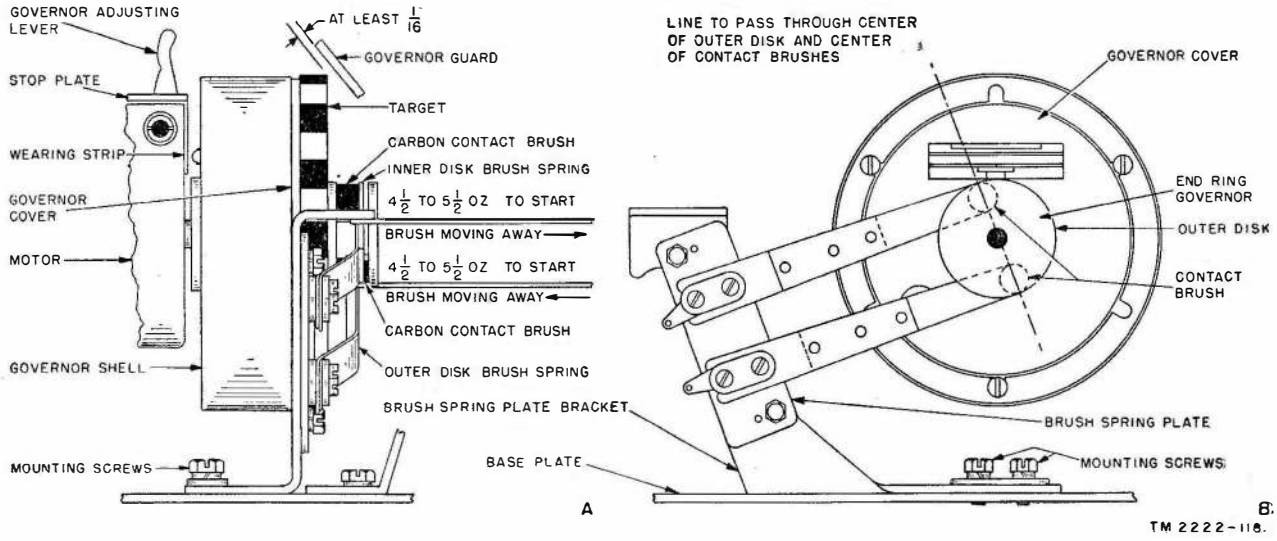


Figure 74. End-ring governor requirements.

when the speed adjusting lever is held against the stop plate.

c. ADJUSTMENT. Loosen the two stop plate mounting screws and reposition the stop plate. Tighten the mounting screws.

130. Governor Shims
(fig. 74)

This adjustment does not apply to synchronous motors.

a. PREPARATION. None required.

b. REQUIREMENTS. With the governor speed adjusting lever in its unoperated position, there should be a clearance of at least 0.006 inch between the speed adjusting wearing strip and the adjusting wheel when the adjusting wheel is opposite the wearing strip and all the end play of the motor armature is taken up in a direction to make the clearance a minimum.

c. ADJUSTMENT. Increase or decrease the number of shims on the armature shaft between the governor hub and the end frame casting of the motor (A, fig. 74).

131. Governor Inner and Outer Disk Contact Springs
(fig. 75)

This adjustment does not apply to synchronous motors or to motors equipped with peripheral ring governors.

a. PREPARATION. Remove the governor guard, the brush-spring plate, and the governor cover (fig. 74).

b. REQUIREMENTS.

(1) The distance from the inner surface of the governor cover to the highest point on the contact springs should be $^{25}/_{32}$ to $^{27}/_{32}$ inch.

(2) Place a D socket wrench over the nut located in the center of the governor cover. Measure the radial distance from the vertical surface of the wrench to the point where the scale touches the curved surface of the inner disk contact spring; use a 6-inch scale. This distance should measure $^{17}/_{32}$ to $^{19}/_{32}$ inch.

(3) Measure the distance from the wrench to a point of contact on the outer disk contact spring in the same manner as prescribed in (2) above. This distance should measure $^{7}/_{16}$ to $^{1}/_{2}$ inch.

c. ADJUSTMENT. Bend the inner and outer disk contact spring as required. Avoid any sharp bends or the springs may break. Replace the governor cover.

132. Governor Brush-spring Plate Bracket
(fig. 74)

This adjustment does not apply to synchronous motors or motors equipped with peripheral ring governors.

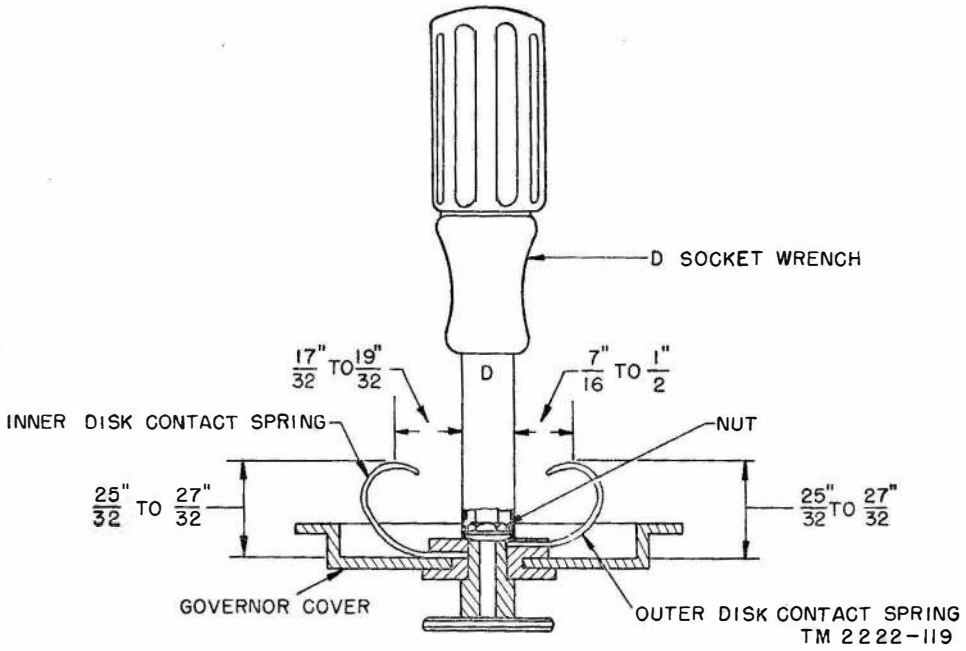


Figure 75. Governor inner and outer disk contact spring requirements.

a. PREPARATION. Remount the brush-spring plate if it was not remounted as part of the previous adjustment.

b. REQUIREMENTS.

(1) A line through the center of the outer disk should pass through the center of each carbon contact brush (B, fig. 74).

(2) The surface of the brush-spring plate bracket on which the brush-spring plate is mounted should be in line with the outer surface of that part of the governor cover on which the target is mounted (A, fig. 74).

(3) The brush-spring plate bracket should be parallel to the edge of the motor base plate.

c. ADJUSTMENT. Loosen the two brush-spring plate bracket mounting screws and reposition the bracket. Tighten the mounting screws.

133. Governor Brush-spring Pressure (fig. 74)

Note. This adjustment does not apply to synchronous motors or to motors equipped with peripheral ring governors.

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) Apply an 8-ounce scale to the brush springs near the carbon brush and push (or pull) horizontally in line with the armature shaft. A push (or pull) of 4½ to 5½ ounces should be required to start each brush moving away from its associated disk.

(2) Both carbon brushes should lie flat against their associated disks, and the outer edges of the brushes should be flush with or not more than $\frac{3}{64}$ inch inside of the outer edge of the disks.

c. ADJUSTMENT. Loosen the two brush-spring clamping screws and slip out the brush springs. Bend the springs as necessary. Remount the springs and position them properly. Tighten the clamping screws.

134. Governor Guard (A, fig. 74)

Note. This adjustment does not apply to synchronous motors or to motors equipped with peripheral ring governors.

a. PREPARATION. None required.

b. REQUIREMENTS. There should be a clearance of at least $\frac{1}{16}$ inch between the governor guard and the edge of the target.

c. ADJUSTMENT. Bend the governor guard until the requirement is met.

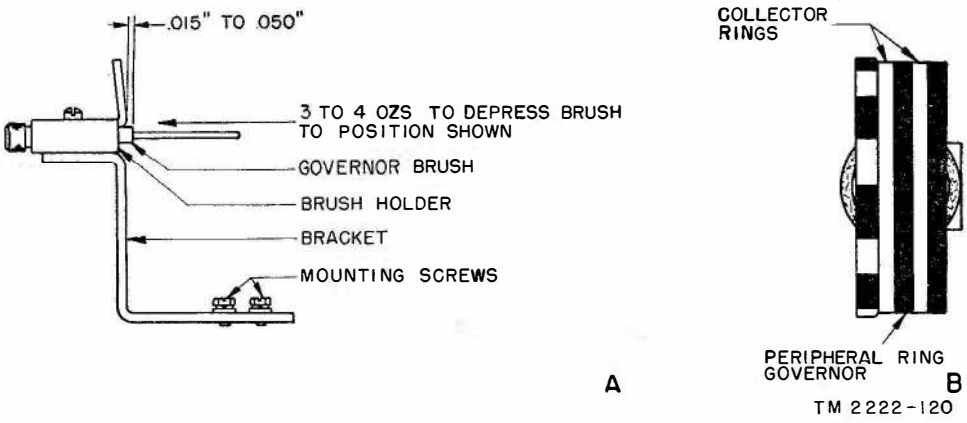


Figure 76. Peripheral ring governor brush requirements.

135. Governor Brush-spring Tension
(A, fig. 76)

Note. This adjustment does not apply to synchronous motors or to motors equipped with end-ring governors.

a. PREPARATION. Remove the brush holder from its bracket.

b. REQUIREMENTS. Apply the push end of an 8-ounce scale to the end of each brush and push in line with the brush. A push of 3 to 4 ounces should be required to depress each brush to within 0.015 to 0.050 inch of the brush holder.

c. ADJUSTMENT. Replace the brushes that have weak springs with new brushes and springs. Remount the brush holder on its bracket.

136. Governor Contacts
(fig. 77)

a. PREPARATION. Remove the target and governor cover. The governor also may be removed to facilitate inspection or repair. Place a small piece of white paper behind the contacts to aid in viewing them.

b. REQUIREMENTS.

(1) The contacts should be positioned so that the top contact is directly above the bottom contact. The edges should be in line.

(2) The bottom surface of the upper contact and the top surface of the lower contact should be parallel when the contacts are touching (not touching on one side only).

(3) The surface of the contacts should be free of build-ups but may have small pits.

c. ADJUSTMENT. The adjustments of governor contacts generally are treated as a major repair since they must either be resurfaced or replaced with new contact screws and springs. Do not attempt to make temporary adjustments by filing, stoning or burnishing the contacts, or by changing the position of the contacts except for emergency operation.

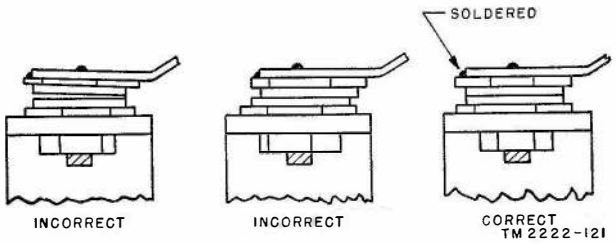


Figure 77. Governor contact alinement.

137. Motor Brushes

This adjustment does not apply to synchronous motors.

a. PREPARATION. Remove the brush-holder caps.

b. REQUIREMENTS.

(1) The motor brushes should be free in their holders without excessive play and should be at least 5/8 inch long, not including the brush spring or the spring-mounting extension.

(2) At least one-third of the area of the ends of the brushes should be in contact with the commutator.

c. ADJUSTMENT.

(1) Replace excessively worn or damaged brushes and brushes that have weak springs with new brushes and springs.

(2) Resurface the ends of the brushes; use fine sandpaper.

138. Starting Switch

Note. This adjustment applies only to synchronous motors. *Do not check this adjustment unless there is reason to believe the starting switch is out of adjustment.*

a. PREPARATION.

(1) Remove the motor from the base and then remove the fan and motor pinion.

(2) Remove the end shield screws on the switch-commutator mounting screws. Then slip off the end shield.

(3) Slip the rotor out of the stator, until the brush-holder spring is accessible, and remove the spring.

b. REQUIREMENTS.

(1) Hook an 8-ounce scale in the end of the brush-holder spring. A pull of 3 to 3¾ ounces (60-cycle motors) or 1½ to 2½ ounces (50-cycle motors) should be required to stretch the spring to a length of 5 inches.

(2) The brush holders should be mounted by the center set of mounting holes and should be free of bind.

(3) The brush-holder stop pins should be well within the holes of the fiber disk when all play in the brush holders has been taken up in a direction which which make a minimum engagement of the pins with the fiber disk.

c. ADJUSTMENT.

(1) Replace a broken or weak spring with a new spring.

(2) Reposition the brush holders.

(3) If there is too much play and a small washer does not cause the brush holder to meet its requirement, replace the brush holder with a new one. Reassemble the motor and check thoroughly. Make an additional check by applying the push end of a 12-pound scale to the fan end of the motor shaft and push in line with the shaft. A push of at least 7 pounds should be required to start the shaft moving. Remount the motor on the base and adjust its position.

139. Break-Lock Mechanism

A break-lock mechanism has been developed which permits a receiving station to stop transmission from a transmitter distributor by use of the break signal. This mechanism is part of XD82 transmitter distributors used in Reperforator Transmitter TG–26–B.

Note. For transmitter distributors equipped with a break-lock mechanism that provides means for stopping transmission in response to a break signal which may be transmitted from receiving stations, or when steady signal line current has decreased to some predetermined value, make the adjustments given in paragraphs 140 through 150.

140. Mounting Plate
(fig. 78)

a. PREPARATION. The distributor brush arm should be in the stop position.

b. REQUIREMENTS. The end of the shunt contact lever should rest on its cam $\frac{1}{32}$ inch (plus or minus $\frac{1}{64}$ inch) from the edge of its notch in the cam.

c. ADJUSTMENT. Unhook the contact pawl spring from its spring post and position the mounting plate by means of its elongated holes. Rehook the spring.

141. Magnet Bracket
(fig. 78)

a. PREPARATION. Position the armature as indicated in *b* below.

b. REQUIREMENTS.

(1) With the armature held against the core of the magnet, both faces of the core should be flush against the armature.

(2) With the armature lever held against the high part of its cam by its spring, there should be a 0.002- to 0.003-inch clearance between the magnet core faces and the armature.

c. ADJUSTMENT.

(1) For the first requirement, bend the magnet bracket at a point near the mounting plate.

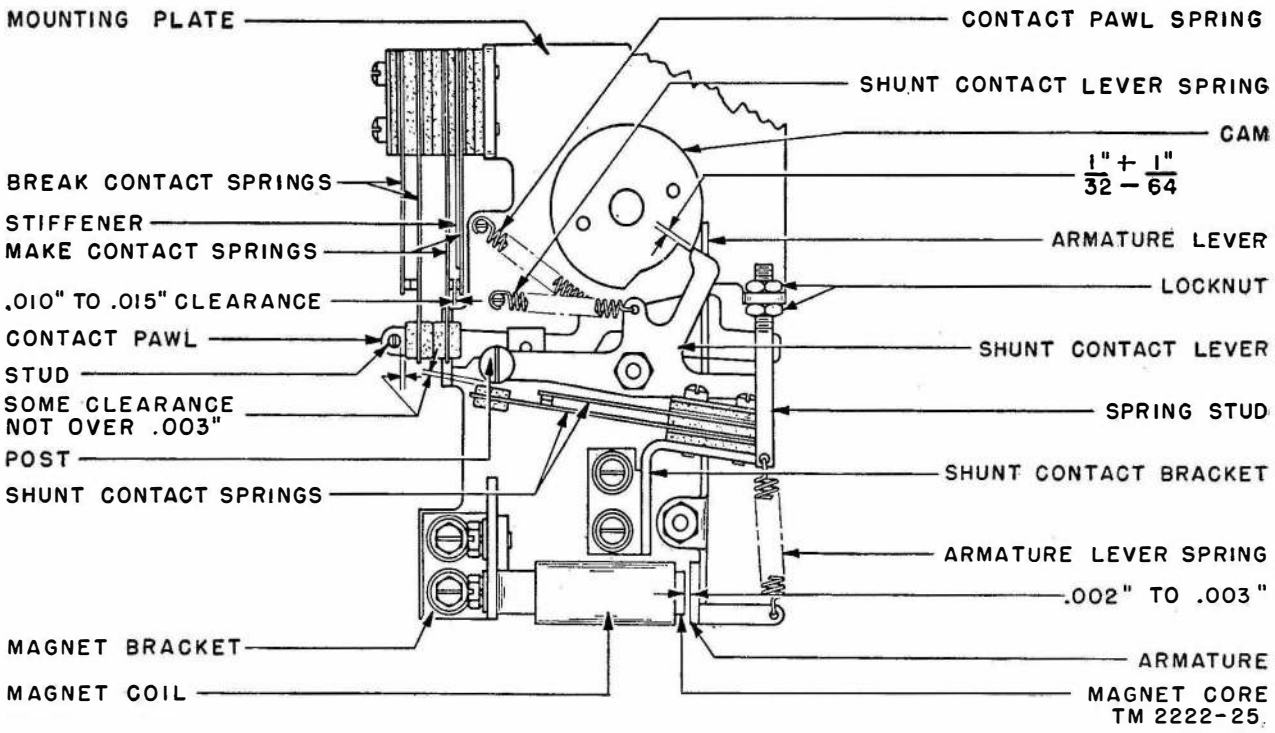


Figure 78. Mounting plate requirements.

(2) For the second requirement, position the magnet bracket by use of its enlarged mounting holes.

142. Magnet Core
(fig. 78)

a. PREPARATION. The armature should be in its attracted position.

b. REQUIREMENTS. The magnet core should be approximately equidistant from the ends and the sides of the armature.

c. ADJUSTMENT. Position the magnet core by use of the enlarged holes in the magnet bracket. Recheck the magnet bracket adjustments.

143. Shunt Contact
(fig. 79)

a. PREPARATION. Remove the shunt contact bracket from the mounting plate.

b. REQUIREMENTS. Hook an 8-ounce scale to the insulator on the long contact spring and pull at right angles to the insulator. A pull of 1 to 2 ounces is required to separate the contact points.

c. ADJUSTMENT. Bend the long contact spring. Replace the bracket.

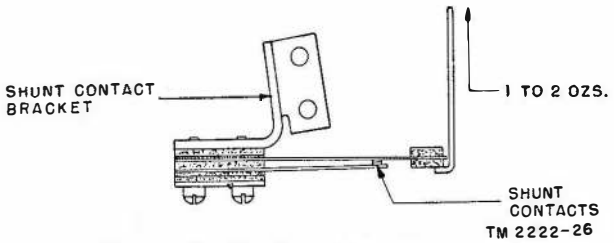


Figure 79. Shunt contact requirement.

144. Shunt Contact Bracket
(fig. 78)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) With the shunt contact lever on the high part of its cam, there should be some clearance (not over 0.003 inch) between the post on the shunt contact lever and the insulator on the long shunt contact spring.

(2) Rotate the motor shaft by hand until the shunt contact lever just falls into the indent in its cam. With the contact pawl kept in the unlatched posi-

tion, the shunt contact lever post should exert pressure on the insulator of the long contact spring and provide a contact gap of 0.010 to 0.020 inch.

c. ADJUSTMENTS. For both requirements, position the shunt contact bracket by use of the enlarged mounting holes.

145. Push Rod Lock
(fig. 80)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) With the stop pin of the push rod resting against its lock (in the unlocked position), the end of the push rod should rest in the bearing in the mounting plate and should not extend more than $\frac{1}{32}$ inch beyond it.

(2) With the push rod in the disabled position, the contact lever should be disengaged from its cam.

c. ADJUSTMENTS. For both requirements, position the push rod lock by use of its elongated mounting holes.

146. Break Contact
(fig. 81)

a. PREPARATION.

(1) With the contact pawl in the unlatched position and the push rod in its disabled position, initially tension the long break contact spring against its short contact spring.

(2) With the contact pawl in the unlatched position, hold the insulator on the long make contact spring away from the insulator on the long break contact spring.

b. REQUIREMENTS.

(1) Under the condition stated in *a* (1) above, there should be some clearance (not over 0.003 inch) between the insulator of the long break contact spring and the stud on the contact pawl (fig. 78).

(2) Under the condition stated in *a* (2) above, hook an 8-ounce scale to the insulator on the long break contact spring and pull at right angles to the spring. A pull of 1 to 2 ounces is required to separate the contacts and both contacts should break approximately simultaneously.

c. ADJUSTMENTS.

(1) Bend the short break contact spring.

(2) Bend the long break contact spring. Recheck the requirement.

147. Make Contact
(fig. 78)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) With the contact pawl in the unlatched position, the insulator on the long make contact spring should just make contact with the insulator on the long break contact spring.

(2) With the contact pawl in the unlatched position, initially tension the short make contact spring against the stiffener. Under this condition, the make contact gap should be from 0.010 to 0.015 inch. It will be necessary to remove the 111456 cam while checking the following requirement.

(3) With the contact pawl in the unlatched position and the armature held against the magnet core, hook an 8-ounce scale to each prong of the bifurcated short make contact spring at a point next to its contact, and pull at right angles to the spring. A pull of 1 to 2 ounces is required to break contact on each prong of the bifurcated spring.

c. ADJUSTMENTS.

(1) Bend the long make contact spring (*b* (1) above).

(2) Bend the short make contact spring. Recheck the requirement in *b* (2) above. Replace the cam.

148. Contact Pawl Spring
(fig. 78)

a. PREPARATION. Unhook the contact spring from the contact pawl and its spring post, and attach the loop of one end of the spring to some convenient object.

b. REQUIREMENTS. With an 8-ounce scale hooked to the free loop, a pull of 3½ to 4 ounces

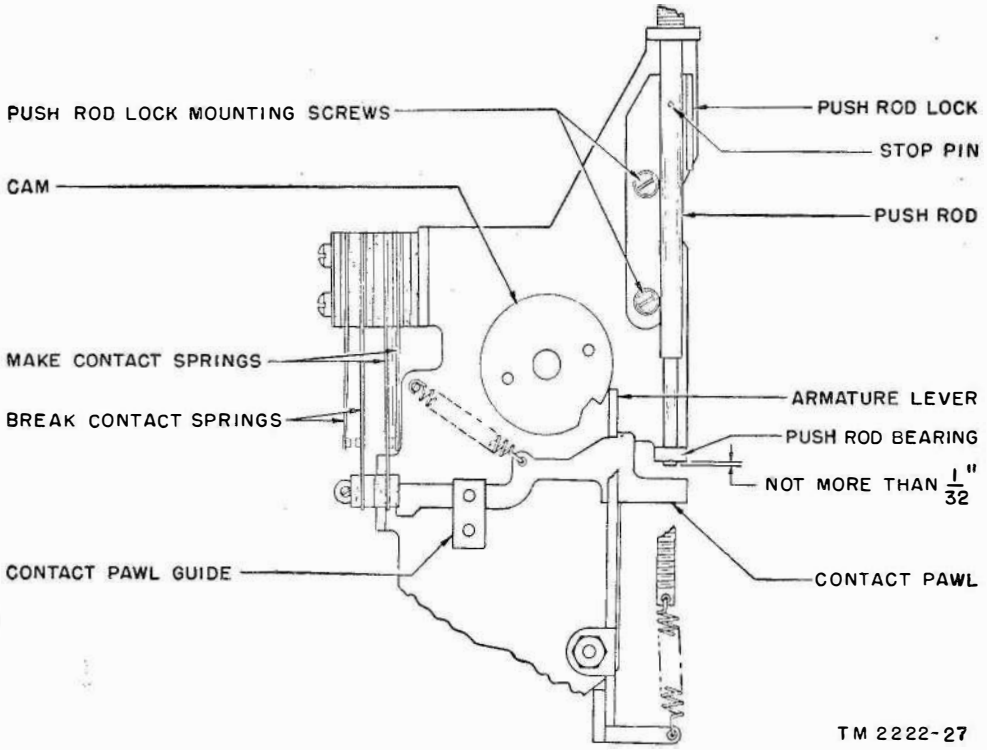


Figure 80. Push rod lock requirement.

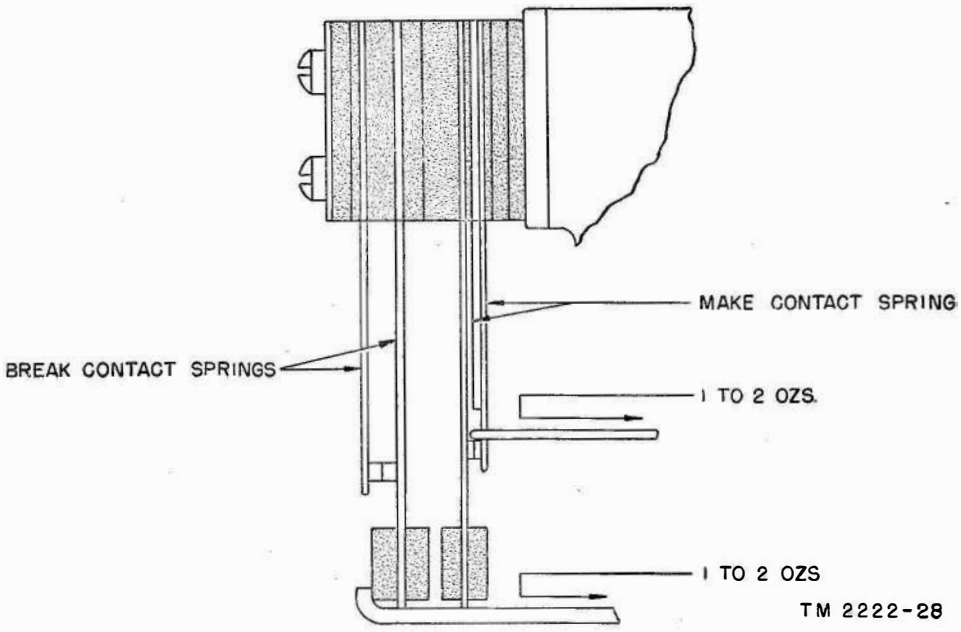


Figure 81. Break contact requirements.

is required to extend the spring to a length of $1\frac{1}{32}$ inch when pulling horizontally.

c. ADJUSTMENT. Replace the spring.

149. Shunt Contact Lever Spring
(fig. 78)

a. PREPARATION. The shunt contact lever should be on the high part of its cam.

b. REQUIREMENTS. Hook an 8-ounce scale to the lever (just under the point of engagement of the shunt contact lever with the cam) and pull in a direction parallel to the side of the base casting. A pull of 6 to 8 ounces is required to start the shunt contact lever moving away from the cam.

c. ADJUSTMENT. None required.

150. Armature Lever Spring
(fig. 78)

a. PREPARATION. None required.

b. REQUIREMENTS.

(1) The armature lever spring tension is set at the factory for use on 0.060-ampere, signal line circuits, with the break-lock mechanism operating so as to stop transmission if the signal line current is reduced to 0.020 ampere or less. A pull of 11 to 13 ounces is required to extend the spring to a length of $1\frac{1}{2}$ inches when pulling horizontally (fig. 78).

(2) The spring setting and operation of the break-lock mechanism must be checked by operating the transmitter distributor with its signal circuit in series with a local test (or comparable) circuit consisting of a source of 115 volts dc, a milliammeter, a variable resistor of approximately 6,000 ohms, and a jack, all in series. Adjust the resistor so that 0.020 ampere flows through the test circuit. Start the transmitter distributor in operation. If the transmitter distributor is equipped with an end-of-tape stop feature, it will be necessary to short-circuit the associated contact or to run tape through the transmitter. The break-lock mechanism should operate and stop transmission within 2 revolutions of the distributor after each restarting with the push rod. When properly adjusted, the break-lock mechanism should stop transmission when the signal line current is .020 ampere or less, but should not stop transmission at any time when the steady current is 0.025 to 0.030 ampere.

c. ADJUSTMENT. Loosen the two nuts which lock the armature lever spring stud and position the stud.

Note. If it is desired to use the break-lock mechanism on .020-ampere line circuits, the armature lever spring tension should be adjusted to such a value as to cause the mechanism to operate and stop transmission if the signal line current is reduced to some value below .020 ampere. A procedure similar to that outlined in the requirement described in *b* (2) above should be followed.

151. Tape-feed Suppression Mechanism (Transmitter Distributor TT-21/FG) (Receiving)

Adjust the tape-feed suppression mechanism after adjusting the end-of-tape stop contact spring and before replacing the top plate.

a. TAPE-FEED LEVER ADJUSTMENT (fig. 82).

(1) *Requirement.* With the operating lever roller on the peak of its cam and the latching tooth on the tape-feed lever latch held in line with the edge of the tape-feed lever extension, there should be a 0.005- to 0.020-inch clearance between the tape-feed lever latch and the tape-feed lever extension.

(2) *Adjustment.* Increase or decrease the number of shims between the lever mounting bracket and the distributor base casting.

b. TRIP-OFF LATCH ECCENTRIC ADJUSTMENT (fig. 83).

(1) *Requirement.* With the operating lever roller on the peak of its cam and the trip-off latch locked by the trip-off lever, there should be approximately 0.062-inch clearance between the tape-feed lever extension and the tape-feed lever latch.

(2) *Adjustment.* Loosen the trip-off latch eccentric locknut and position the eccentric. Tighten the locknut.

c. RESTORING LEVER ECCENTRIC ADJUSTMENT (fig. 82).

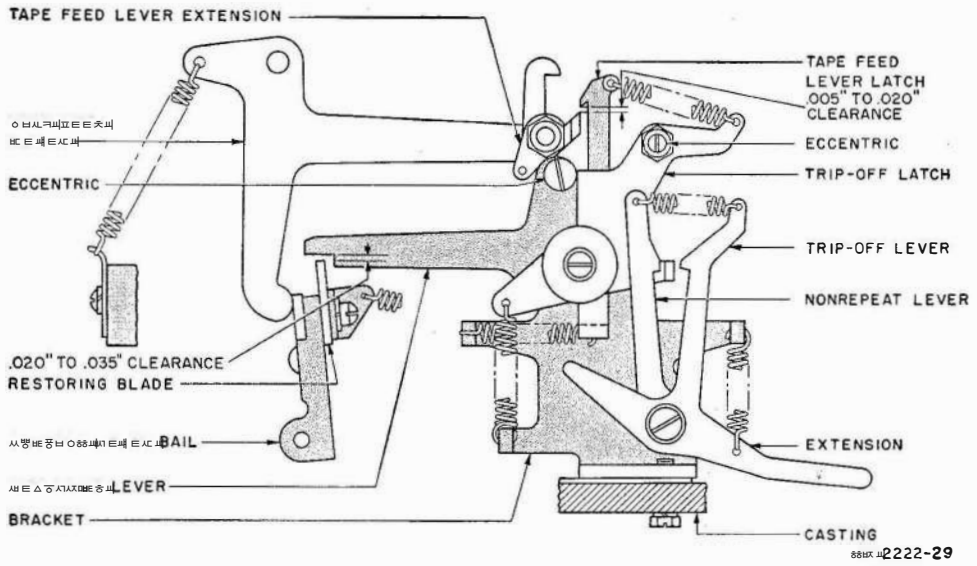


Figure 82. Tape-feed lever latch and restoring lever eccentric adjustments.

(1) *Requirement.* With the operating lever roller on the peak of its cam and the trip-off latch released, there should be a 0.020- to 0.035-inch clearance between the lower edge of the step on the end of the restoring lever and the upper edge of the restoring blade.

(2) *Adjustment.* Position the restoring lever eccentric screw. When resetting, hold the operating lever against the operating cam and check that the trip-off latch extension is carried at least 0.010 inch below the latching tooth on the nonrepeat lever. If necessary, refine the original adjustment to meet this requirement. If the adjustment cannot be made fully by using the restoring lever eccentric screw, position the restoring blade up or down by using its mounting holes.

d. TRIP-OFF LEVER SPRING TENSION (fig. 84).

(1) *Requirement.* With the trip-off latch unlocked, unhook the nonrepeat lever spring. A pull of 4 to 6 ounces is required to start the trip-off lever moving when an 8-ounce scale is hooked to the lever in line with the upper spring hole of the lever and pulled horizontally. If the spring meets the requirement, rehook it.

(2) *Adjustment.* Install a new spring.

e. NONREPEAT LEVER SPRING TENSION (fig. 85).

(1) *Requirement.* With the trip-off latch in the locked position, a pull of 1 to 2 ounces is required to start the nonrepeat lever moving when the push end of an 8-ounce scale is placed against the lever below the spring and pushed horizontally.

(2) *Adjustment.* Install a new spring.

f. TAPE-FEED LEVER LATCH SPRING TENSION (fig. 85).

(1) *Requirement.* With the trip-off latch in its locked position and the feed-lever latch against its eccentric, apply the push end of an 8-ounce scale and push horizontally against the spring post of the feed-lever latch. A push of ½ to 1½ ounces is required to start the latch moving.

(2) *Adjustment.* Install a new spring.

g. RESTORING LEVER SPRING TENSION (fig. 85).

(1) *Requirement.* With the transmitter distributor in its stopped position and the trip-off latch locked, a pull of ½ to 1½ ounces is required to start the restoring lever moving when an 8-ounce scale is hooked on the lever in line with the spring and pulled horizontally.

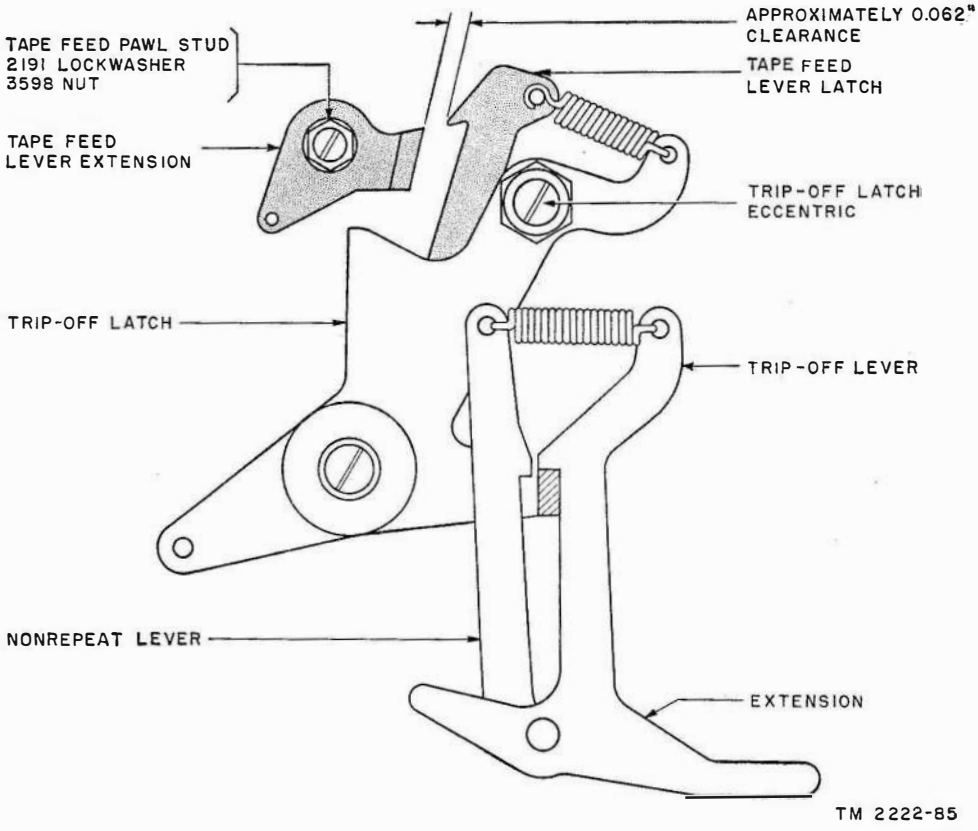


Figure 83. Trip-off latch eccentric adjustment.

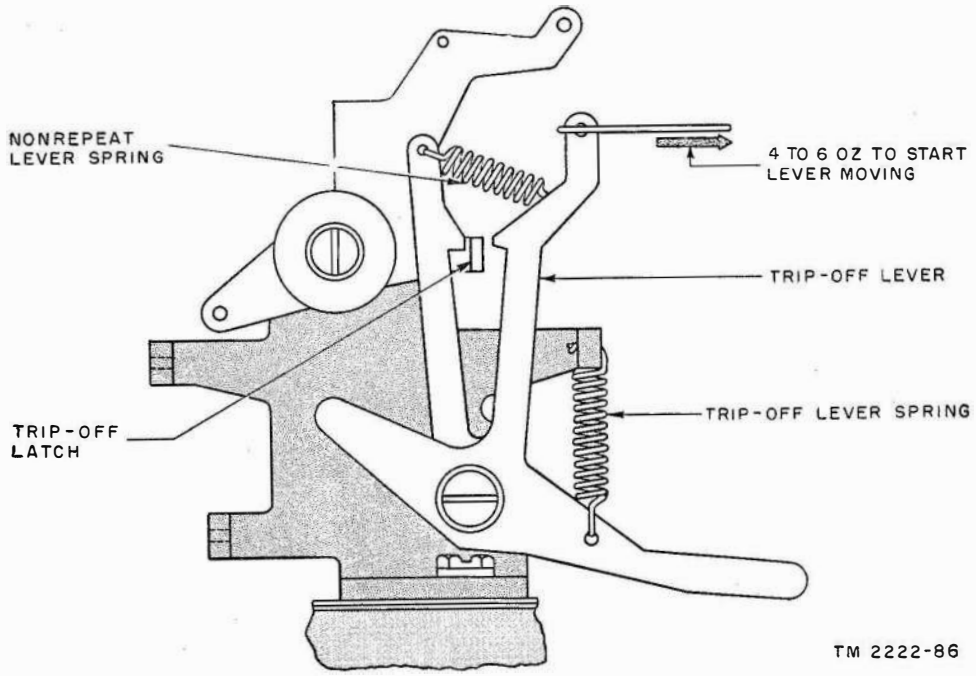


Figure 84. Trip-off lever spring tension.

(2) *Adjustment.* Install a new spring.

h. TRIP-OFF LATCH SPRING TENSION (fig. 85).

(1) *Requirement.* With the transmitter distributor on its left side and the trip-off latch locked, unhook the trip-off latch spring. With a 32-ounce scale inserted through the hole in the bottom of the base casting and hooked in the loop of the spring, a pull of 8 to 11 ounces is required to stretch the spring to position length. If the spring meets the requirement, rehook it.

(2) *Adjustment.* Install a new spring.

i. RESTORING BAIL SPRING TENSION (fig. 85).

(1) *Requirement.* With the transmitter distributor in the stopped position, unhook the restoring bail spring. With a 32-ounce scale hooked in the spring loop and pulled horizontally, a pull of 28 to 32 ounces is required to pull the spring to position length. If the spring meets the requirement, rehook it.

(2) *Adjustment.* Install a new spring.

152. Transmitter Operating Lever Adjustment for Transmitter Distributor TT-26/FG (Two-Channel) (fig. 86)

This adjustment is made at the factory when the unit is assembled and should require attention only when the shim pile-up has been disturbed or when new parts are being installed. Aline the B transmitter operating lever (front) with the A transmitter operating lever (rear). To adjust, add or remove the shims between the operating lever bearing washer and the base casting.

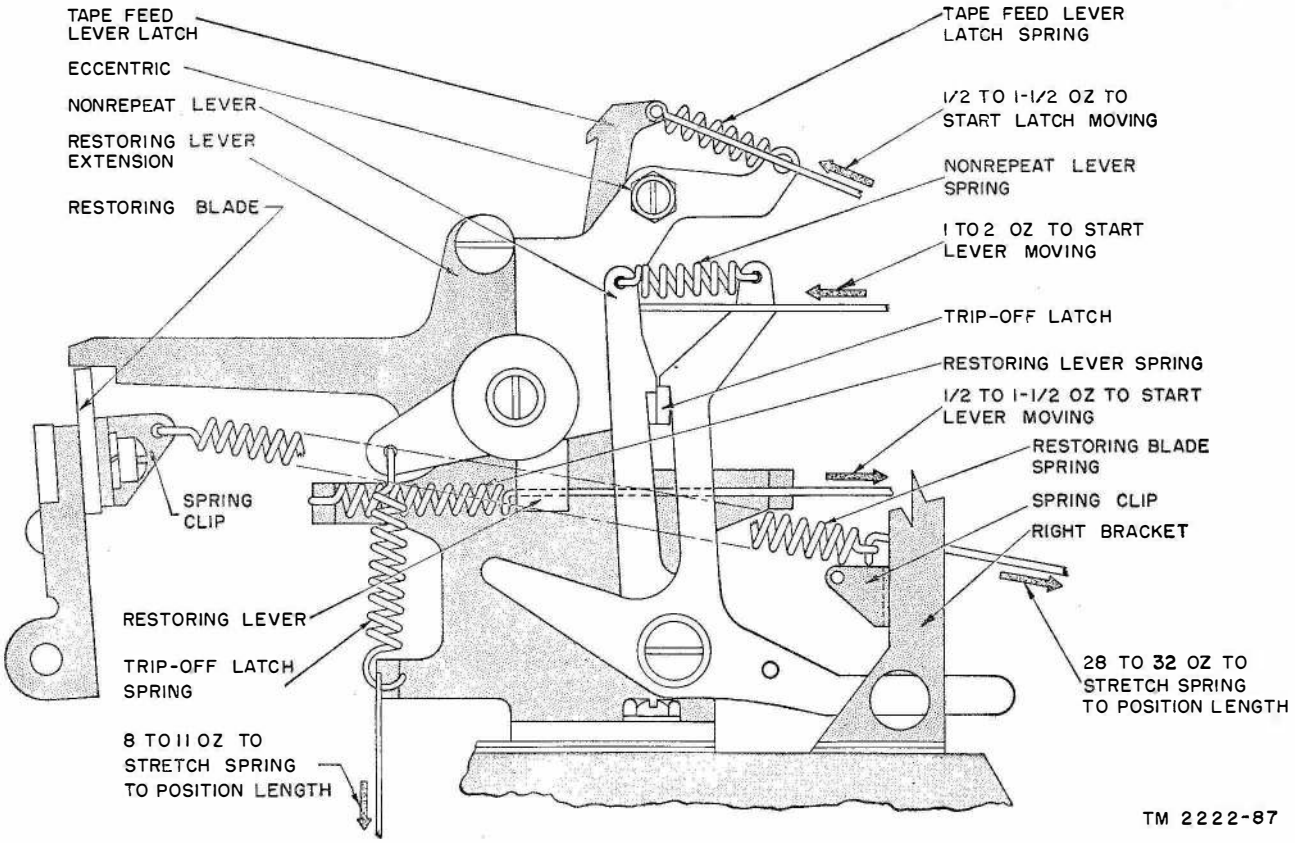


Figure 85. Nonrepeat lever, tape-feed lever latch, restoring lever, trip-off latch, and restoring bail spring tensions.

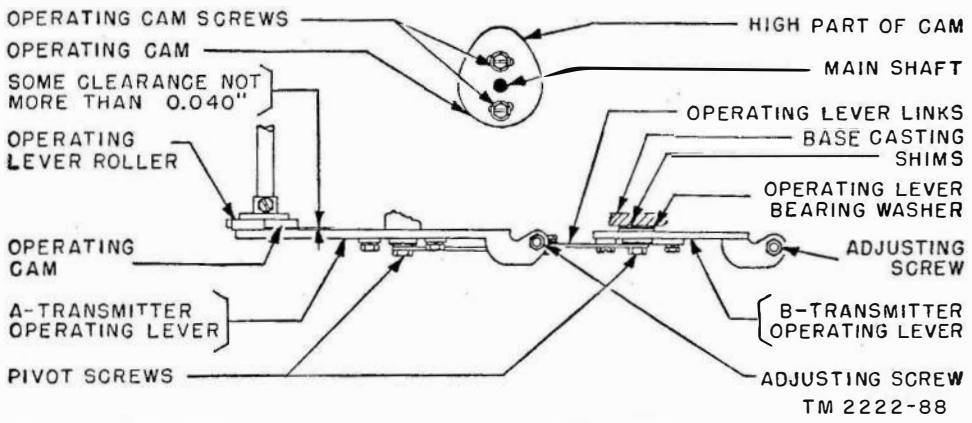


Figure 86. Transmitter operating lever adjustment (two-channel transmitter distributor).

153. Operating Lever Adjusting Screw and Link Adjustment (Two-Channel Transmitter Distributors)

When the operating lever roller is on the highest part of its cam, and the detent roller rests between two teeth on the feed wheel ratchet, there should be some clearance, not over 0.010 inch, between the face of a tooth on the ratchet wheel and the face of the feed pawl (fig. 62). To adjust, loosen the operating lever adjusting lock screw nut and position the adjusting screw. Tighten the locknut and recheck the adjustment. In meeting these requirements, set the adjusting screws of both transmitters approximately the same in their operating levers. If this adjustment does not result, loosen the operating lever link clamp screws and lengthen or shorten the link so that the B transmitter adjusting screw will be set approximately the same as the A transmitter adjusting screw when the B transmitter adjusting screw adjustment is remade. Tighten the operating lever link clamp screws and refine the B transmitter adjusting screw. Tighten the nut; recheck the adjustment. See figure 87 for location of parts.

154. Control Relay Timing Contacts and Transmitting Operating Lever Spring (Two-Channel Transmitter Distributors) (fig. 87)

To check or make these adjustments, it is necessary to position the operating lever on the high part of its cam.

a. See that the heavy contact spring is straight. Adjust by bending the spring.

b. Tension the middle or swinger contact spring against the heavy contact spring so that it requires 2½ to 3½ ounces to separate the contact points. Measure the tension with an 8-ounce scale hooked over the middle contact spring at the contact point. To adjust, bend the middle contact spring.

c. The thin short contact spring should be tensioned against its stiffener so that it requires 1 to 1½ ounces to start the spring moving away from its stiffener.

d. With the middle contact spring in contact with the heavy contact spring, there should be 0.010- to 0.015-inch clearance between the contact points of the thin contact spring and the middle contact spring. To adjust, bend the thin contact spring stiffener. Recheck the thin contact spring tension.

e. With the transmitter operating lever on the high part of its cam, there should be 0.010- to 0.015-inch clearance between the insulator on the middle contact spring and the transmitter operating lever. To adjust, position the control relay timing contact bracket by use of its mounting screws.

f. Unhook the transmitting operating lever spring from the contact bracket. With the operating lever on the high part of its cam, hook a 32-ounce scale to the spring and pull horizontally. A pull of 7 to 12 ounces is required to stretch the spring to position length (fig. 87). Rehook the spring.

g. Be sure that the contact mounting screws clear the transmitter operating lever in all positions of the lever. If no clearance is present, readjust the contact springs and bracket.

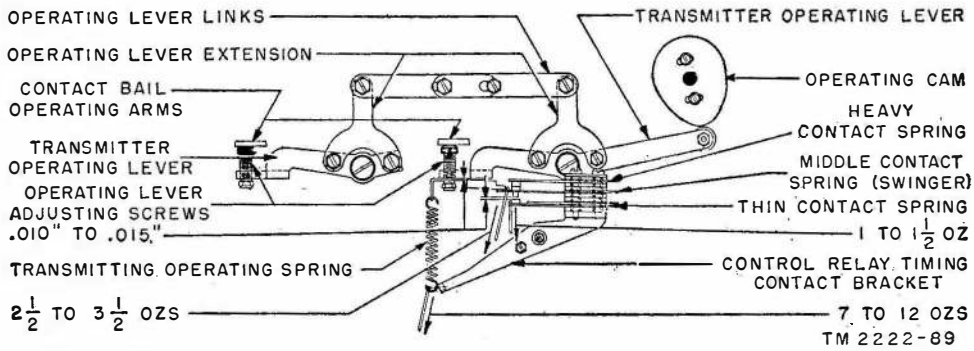


Figure 87. Control relay timing contacts (two-channel transmitter distributors).

155. Lock Pawl Adjustments (A and B Transmitters, Two-Channel)
(fig. 88)

With the operating lever on the high part of its cam, and the lock pawl in the blocking position, there should be a 0.020- to 0.025-inch clearance between the blocking surface of the lock pawl on each transmitter and the associated blocking surface of the wearing strip. To adjust, position the lock pawl by use of its mounting screw.

156. Line-shorting Contact Adjustments (Two-channel Transmitter Distributors, XD91 Type)
(fig. 89)

Remove the contact assemblies to check these adjustments.

a. The stiffener spring of each long contact spring should be straight. Adjust by bending.

b. Tension the long contact spring so that a pull of 1¼ to 1¾ ounces is required to start the spring moving away from its stiffener. Measure the tension with an 8-ounce scale hooked to the spring at the contact point. To adjust, bend the long contact spring.

c. Each prong of the short contact spring should be tensioned so that a pull of ½ to 1 ounce is required to start each prong moving away from its stiffener. Measure the tension with an 8-ounce scale hooked to the prong at the contact point. To adjust, bend each prong of the short contact spring.

d. With the long contact spring resting against its stiffener, there should be 0.020- to 0.025-inch clearance between the contact points of the short and long contact springs. To adjust, bend the short contact spring stiffener and recheck the short contact spring tension.

157. Line-shorting and Transfer Contacts Adjustment (Two-channel Transmitter Distributors, XD93 Type)
(fig. 90)

Remove the contacts assemblies to check these adjustments.

a. The stiffener of the No. 5 contact spring should be straight. To adjust, bend the stiffener.

b. Each prong of the No. 5 contact spring should be tensioned against its stiffener so that a pull of ¼ to ¾ ounce is required to start each prong moving away from the stiffener when the

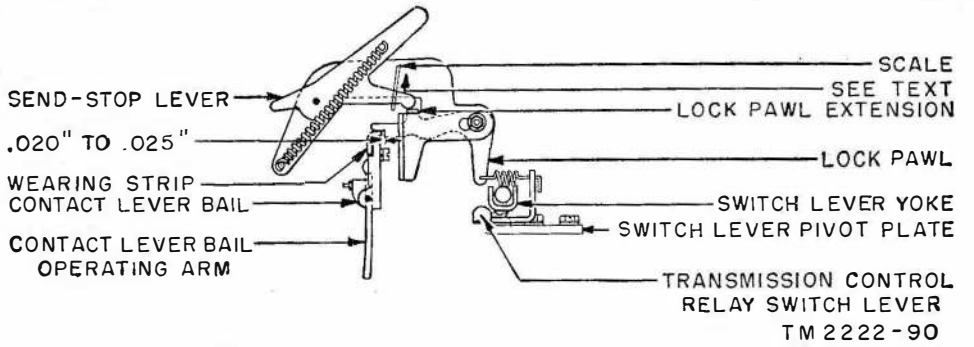


Figure 88. Two-channel type lock pawl adjustment.

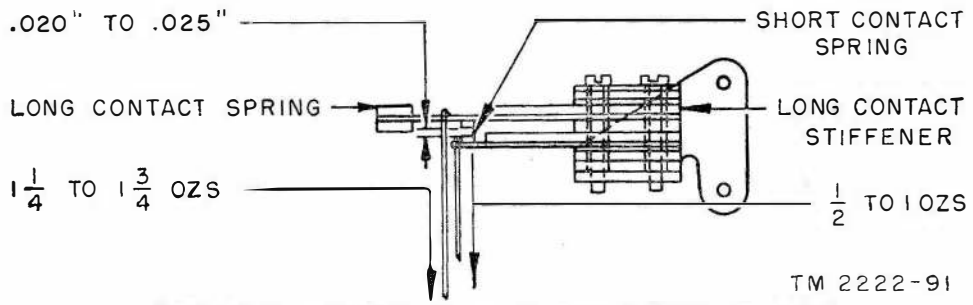


Figure 89. Line-shorting contact adjustments (XD91 type only).

No. 4 contact spring is held away and an 8-ounce scale is hooked over the spring at the contact point and pulled at right angles to the spring. To adjust, bend the No. 5 contact spring.

c. The No. 4 contact spring should be tensioned against the No. 5 contact spring so that a pull of 3 to 3½ ounces is required to separate the contact points when an 8-ounce scale is hooked over the spring at the contact points and pulled at right angles to the contact spring. To adjust, bend the No. 4 contact spring. After this adjustment has been made, check that the No. 4 contact spring holds the No. 5 contact spring away from its stiffener 0.006 to 0.015 inch.

d. With the No. 4 contact spring resting normally against the No. 5 contact spring, there should be a 0.020- to 0.025-inch clearance between Nos. 3 and 4 contact points. To adjust, bend the No. 3 contact spring stiffener.

e. Each prong of the No. 3 contact spring should be tensioned against its stiffener so that a pull of ½ to 1 ounce is required to start each prong moving away from the stiffener when an 8-ounce scale is hooked over the spring at the contact point and pulled at right angles to the contact spring. To adjust, bend the No. 3 contact spring. Recheck the adjustment described in *d* above.

f. There should be approximately 0.004-inch clearance between the insulators of the Nos. 2 and 4 contact springs. To adjust, bend the No. 2 contact spring.

g. There should be a 0.015- to 0.020-inch clearance between the Nos. 1 and 2 contact points. To adjust them, bend the No. 1 contact spring stiffener.

h. Each prong of the No. 1 contact spring should be tensioned against its stiffener so that a pull of ½ to 1 ounce is required to start each prong moving away from its stiffener when an 8-ounce scale is hooked over the spring at the contact point and pulled at right angles to the spring. To adjust, bend the No. 1 contact spring. Recheck the adjustment described in *g* above.

i. Replace the contact assemblies. With the SEND—STOP lever rotated out of the way of the lock-pawl extension, and the lock pawl resting on the long contact spring insulator, there should be a 0.015- to 0.020-inch clearance between the lower surface of the lock pawl and the upper surface of the blocking portion of the wearing strip. To adjust, position the contact assemblies by use of their mounting screws (fig. 91).

j. With the SEND—STOP lever in the STOP position and the lock pawl in the blocking position, the operated long contact spring should move its short contact spring at least 0.004 inch away from its stiffener. To adjust, bend the short contact spring stiffener (figs. 92 and 93).

158. Transmission Control Relay Switch Lever Pivot Plate Adjustment (on XD91 Type Two-channel Transmitter Distributor)

Position the pivot plate to meet the following requirements (see figures 91 for location of parts):

a. Fully engage the switch lever yoke with the switch knob so that the yoke does not bind when the switch is in either position.

b. With the switch lever moved to the right, the SEND—STOP lever in the SEND position, the line-shorting contact held away from the lock pawl, and the transmitter operating lever on the high part of its cam, hook a 32-ounce scale under the lock pawl extension and pull vertically upward. A pull of at least 8 ounces is required to start the lock pawl moving (fig. 94).

c. With the switch lever moved to the left, and the lock pawl held out of the blocking posi-

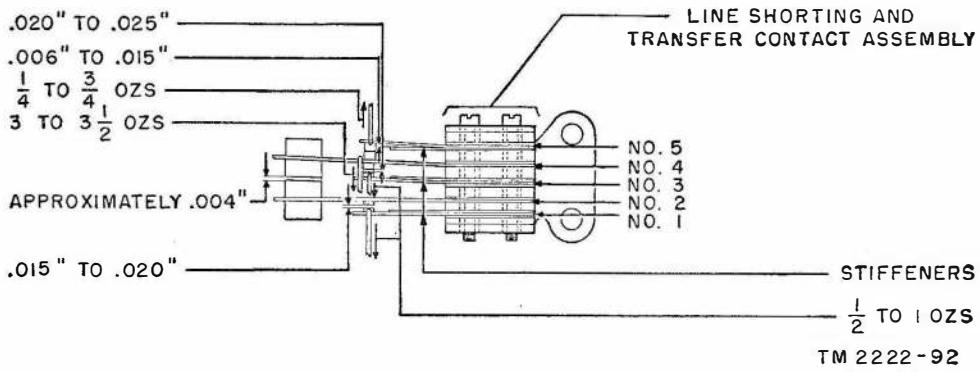


Figure 90. Line-shorting and transfer contact adjustments (XD93 only).

tion by the line shorting contact, the switch lever spring should have some end play (fig. 91). To adjust, position the pivot plate by use of its mounting screws.

159. SEND—STOP Lever Spring Tension (on XD91 Type Two-channel Transmitter Distributors) A and B Transmitters

With the lock pawl in the blocking position, the transmitter operating lever on the low part of its cam, the transmission control relay switch lever moved to the left, and the SEND—STOP lever resting on the lock pawl extension, hook a 32-ounce scale under the SEND-STOP lever adjacent to its lobe and pull vertically upward. A pull of at least 10 ounces is required to start the SEND—STOP lever moving away from the lock pawl extension (fig. 88). Replace the top plate assemblies and their right end brackets on their respective transmitters.

160. Transmission Control Relay Switch Lever Pivot Plate Adjustment (on XD93 Type Two-channel Transmitter Distributors)

Position the pivot plate to meet the following requirements:

a. Fully engage the switch lever yoke with the switch knob without binding when the switch lever is in either position.

b. With the switch lever moved to the right, the SEND—STOP lever in the SEND position, the line-shorting contact held away from the lock pawl, and the transmitter operating lever on the high part of its cam, hook a 32-ounce scale under the lock pawl extension and pull vertically upward. A pull of at least 18 ounces is required to start the lock pawl moving (fig. 94).

c. With the switch lever moved to the left, and the lock pawl held out of the blocking position by the line-shorting contact, the switch

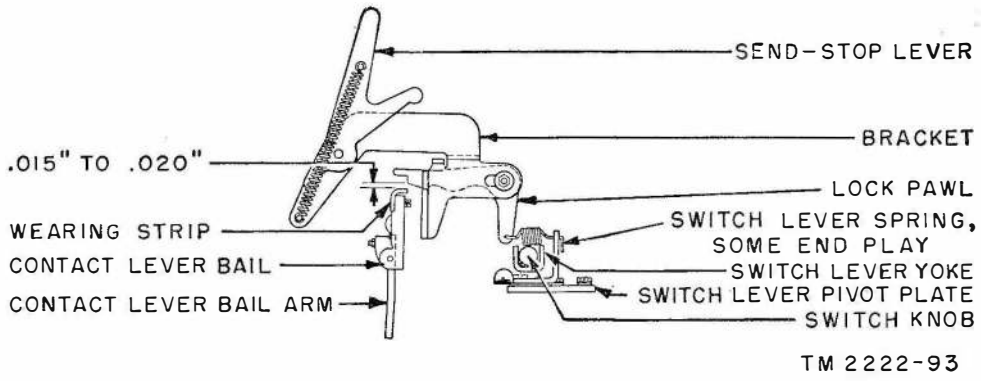


Figure 91. Transmission control relay switch lever pivot plate adjustment (XD91 only).

lever spring should have some end play (fig. 91). To adjust, position the pivot plate by use of its mounting screws.

161. SEND—STOP Lever Spring Tension (on XD93 Type Two-channel Transmitter Distributors)

(fig. 88)

With the lock pawl in the blocking position, the transmitter operating lever on the low part of its cam, the transmission control relay switch lever moved to the left, and the SEND—STOP lever resting on the lock pawl extension, hook a 32-ounce scale under the SEND—STOP lever adjacent to the lobe and pull vertically upward. A pull of at least 18 ounces is required to start the SEND—STOP lever moving away from the lock pawl extension. Replace the top plate assemblies and their right end brackets on their respective transmitters.

162. Contact Springs and Armature Hinge Positions (Two-channel Transmitter Distributors)

Position the contact springs and hinge brackets to meet the following requirements:

a. Line up all contacts within the limits indicated in A, figure 95.

b. The spring tangs should rest on the spool head so that the free end of the tang extends back of the front face of the spool head (B, fig. 95).

c. The width of each spring tang should lie entirely within the projection of the top and bottom edges of the slot in the spool head. However, the tang should not rub on the spool head when moved from its normal position of rest on the spool head in the direction of travel of the spring.

d. The hinge pins should not bind in the holes of the hinge brackets (C, fig. 95).

e. With the A spring tensions (D, fig. 95) approximately equal (if not, adjust them), both legs of the armature should bear against the hinge bracket when the relay is in the operated position and should also bear against the hinge bracket after the relay has been released. To adjust, slightly loosen the contact spring mounting screws and position the springs and the hinged brackets. Tighten the mounting screws. There should be some clearance between the armature and the adjusting stud over the entire armature travel. Bend the stud with a pair of long-nosed pliers to obtain this clearance.

f. The adjusting nut should be sufficiently tight on the stud to prevent its being readily turned with the thumb and forefinger. To adjust, back off the adjusting nut from the adjusting stud until its slotted portion is free of the stud; then force the slotted parts of the nut closer together, using long-nosed pliers.

g. There should be a .062- to .068-inch clearance between the armature stop pins and the core. To adjust, turn the adjusting nut (C, fig. 95).

163. Contact Spring Tension Adjustments (Two-channel Transmitter Distributors)

Tension the springs toward the armature. Measure all spring tensions with the armature in the unoperated position except when the armature is operated as shown in D, figure 95.

a. The A contact springs should have approximately the same tension and should hold the armature against the adjusting nut. A pressure of ⅔ to 1½ ounces is required (applied to the back of the armature at a point approximately midway between the stop pins) to start the armature moving away from the adjusting nut. Adjust by bending the A contact springs.

b. The C and H contact springs should be tensioned so that a pressure of 1 to 1⅘ ounces is required (applied to the tip just in front of the contacts) to start the tang of each spring moving away from the side of the slot in the spool head next to the armature (some are measured with the armature in the operated position) (D, fig. 95). Adjust by bending the C and H contact springs.

c. Tension the G contact spring toward the armature so that a pressure of ⅕ to ⅔ ounces is required (applied at the tip of the spring) to start its operating stud moving away from its operating spring. Adjust by bending the G spring.

d. The E contact spring should be tensioned toward the armature so that a pressure of 1 to 1⅘ ounces is required (applied to both prongs at the tip of the spring) to start its contacts moving away from its associated C break contacts. Adjust by bending the E spring.

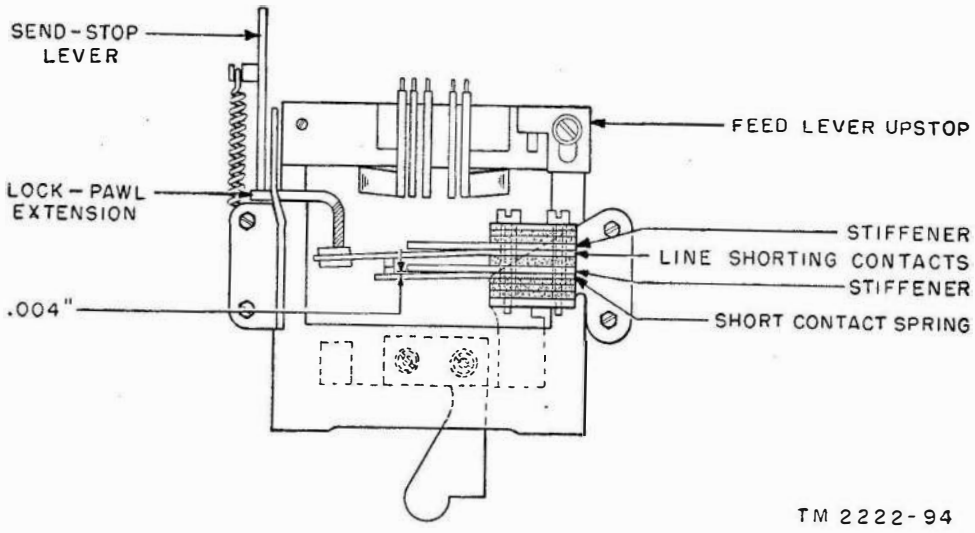


Figure 92. Location of the line-shorting contact assembly (XD91 only).

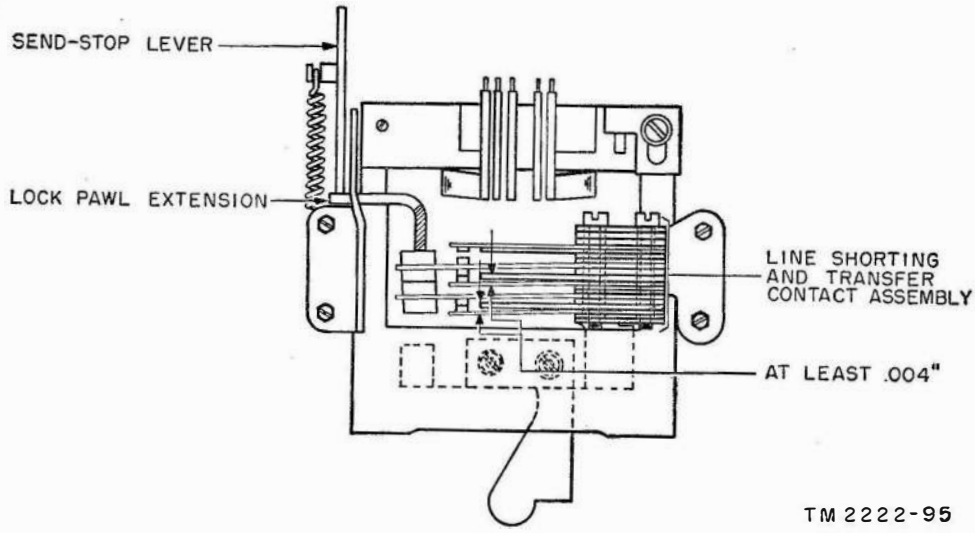


Figure 93. Location of line-shorting and transfer contact assembly (XD93 only).

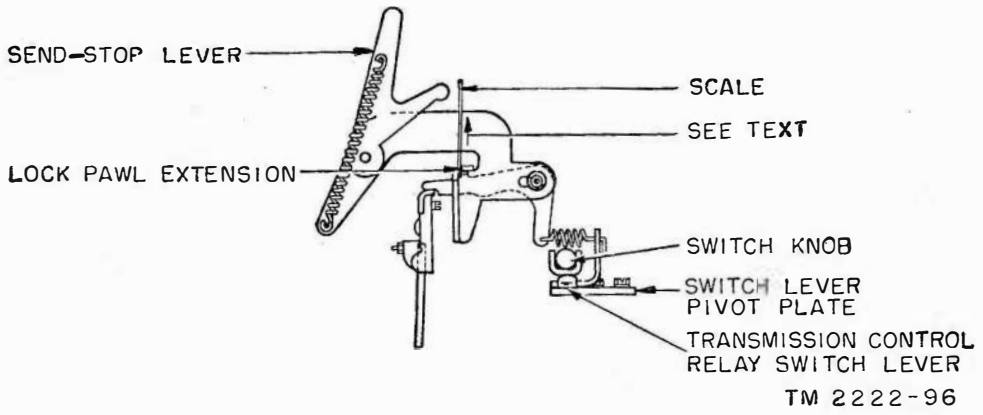


Figure 94. Lock pawl spring tension adjustment.

e. Each B and J contact spring should be tensioned toward the armature and together with the tensions of any G springs which in turn may be tensioned against it. A pressure of ⅔ to 1½ ounces is required (applied to both prongs at the tip of the spring) to start its contact away from its associated C break contacts. Adjust by bending the B and J contact springs.

f. With the armature unoperated, there should be at least 0.006-inch clearance between the end of the armature-operated stud and the B spring. To adjust, bend the associated C break contact spring tang and recheck its spring pressure. Recheck the B contact spring pressure.

g. On break-make contacts of the spring combinations, the normally closed contacts should break before the normally open contacts make. Gage by eye. Adjust by modifying the spring tensions, stud gaps, and contact adjustments as required.

164. Transmission Control Relay Contact Make Adjustments (Two-channel Transmitter Distributors)

a. Both contacts of the B bifurcated springs should make with their associated C break contact springs when the armature is in the unoperated position. They also should make contact with their associated C make contact springs when the relay is energized electrically. To adjust, bend the ends of the spring (obtain by bending only the ends of the B springs if possible). Recheck the spring pressures and the stud gap.

b. Both contacts of the A and H contact springs should make with their associated C springs when the armature is in the operated position. To adjust, bend the bifurcated spring ends and recheck the spring pressures.

c. Both contacts of the E spring should make with the C spring when the armature is in the unoperated position, and both contacts of the G spring should make with the E spring when the armature is in the operated position. To adjust, bend the ends of the springs (obtain by bending only the ends of the E springs if possible). Recheck the spring pressures.

d. The A, B, and H contact springs should meet the following requirements.

(1) With the relay electrically energized against a gage of 0.040-inch thickness, none of the make contacts should make contact with a mating contact on an associated H contact spring.

(2) With the relay electrically energized against a gage of 0.033-inch thickness, at least one of the contacts on each make contact spring should make contact with its mating contact on an associated H contact spring.

(3) With the relay electrically energized against a gage of 0.016-inch thickness, none of the make contacts should make contact with a mating contact on the associated C make contact spring.

(4) With the relay electrically energized against a gage of 0.009-inch thickness, at least one of the make contacts on each A and B contact spring should make contact with its mating contact on the associated C make contact spring.

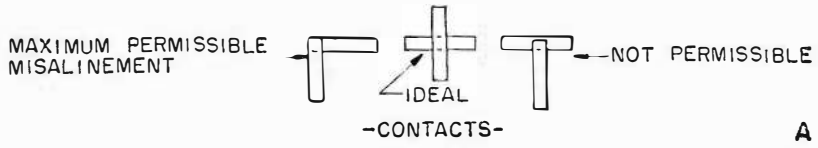
(5) With the relay electrically energized against a 0.005-inch gage inserted between the armature and the core, both break contacts on each B spring should be separated from their mating contacts. To adjust, bend the tang on the associated C contact springs and recheck their pressures.

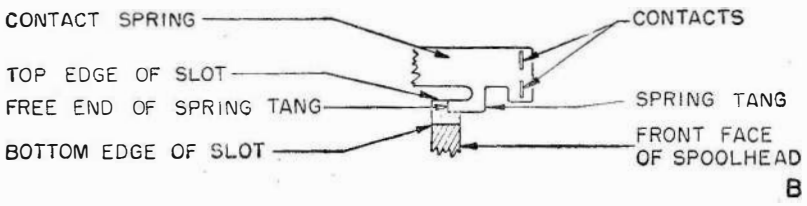
e. Contact springs G, E, J, and their associated C contact spring should meet the following requirements:

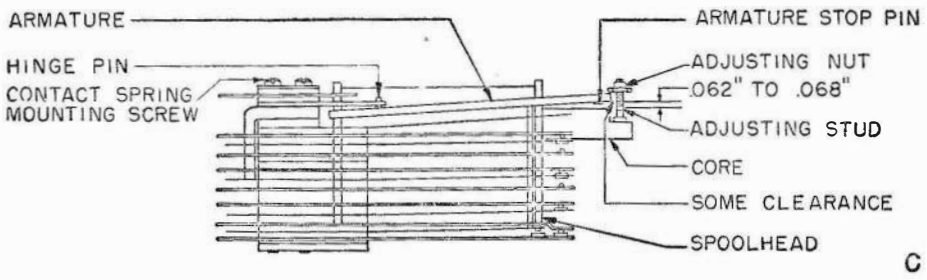
(1) With the relay unoperated, the contact separation designated U should be at least 0.010 inch, and there should be a slight clearance at the points S (D, fig. 95).

(2) With the relay electrically energized against a 0.020-inch gage, the J contact should not leave its associated C contact spring.

(3) When the relay is energized electrically against a 0.055-inch gage inserted between the armature and the core, both break contacts on the E and J contact springs should be separated from their mating contacts on the C springs. To adjust, bend the tang on the associated C break and recheck the spring pressure.







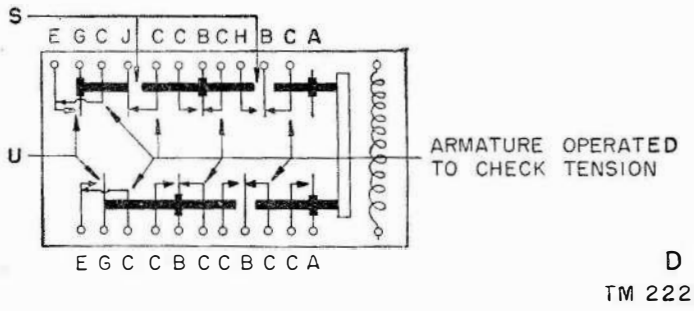


Figure 95. Transmission control relay adjustments.

165. Testing with Associated Equipment

a. After a transmitter distributor has been overhauled or a major repair has been made, it should be operated under power so that its overall operation may be observed and checks made to watch the functioning of its parts. Field repair shops where overhaul or major repairs are made usually will have available practically all the receiving equipment with which transmitter distributors are used. In most instances, such associated equipment has incorporated in it, local test circuits. Examples are model 19 teletypewriter sets, Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A, and Teletypewriter Set AN/TGC–3. When such associated equipment is available, no special testing circuits are necessary.

b. When tests are made with associated equipment, refer to technical manuals covering the particular associated equipment for equipment connections and operation performance. By referring to these technical manuals and through use of the equipment performance checklists and the trouble-analysis chart (par. 76), it can be determined quickly if the tests show that the equipment is operating satisfactorily and, in case it is not, what the trouble may be, how it can be sectionalized, localized, and corrected.

166. Test Power

a. Transmitter distributors under test with associated equipment will be powered from the associated equipment. However, in the event tests independent of associated equipment are to be made, it will be necessary to provide a power supply, and *testing personnel must be sure to check the equipment nameplate to be certain which type of power is required.*

b. Transmitter distributors which have series-governed motors require 115 volts dc or 115-volt, 25- to 60-cycles ac. Transmitter distributors having synchronous motors require a source of regulated power, usually 60-cycle ac. Make connections between the equipment and the power supply with insulated leads terminated with test clips. Strapping necessary for testing may be made with any suitable wire.

c. A ground connection is unnecessary to complete a signal circuit for testing, but it is well to attach a ground wire to the frame of the transmitter distributor to reduce danger of electric shock from worn insulation on leads, windings, etc., and bare wire making contact with the metal frame and feed-through from filter capacitors. A spring-type test clip on the ground wire will permit quick connections and disconnections.

167. Testing Procedure

a. When testing a transmitter distributor with its associated equipment, be sure that the associated equipment is in perfect operating condition. This can be determined if the associated equipment is tested with a transmitter distributor which is known to be in perfect working condition. When such a test is made, check the range on the rangefinder scale of the associated equipment. The associated equipment should give satisfactory performance between the settings of approximately 10 and 90, or a span of about 80 points.

b. After this is accomplished, exchange the transmitter distributor known to be in perfect condition for one which has been repaired and is to be tested. Operate the motor power switch to ON. Let the equipment run for 10 minutes and check the motor speed with the 87.6-vps tuning fork. Insert an RY test tape in the transmitter distributor and operate the transmitter distributor ON—OFF (SEND—STOP) switch to ON (SEND).

c. The tape should feed to the left. Again check the range on the range scale on the rangefinder of the associated equipment. There should be satisfactory performance when the range settings are for operating between settings of 10 and 90. If the performance is not satisfactory, check the adjustments associated with the transmitting mechanisms. Let the equipment operate for 10 minutes and again check the range. There should be correct transmission in the 10 to 90 range.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

168. Disassembly

Because the XD82 types of transmitter distributors used with Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A are mounted permanently to the base of the chest furnished with these reperforator transmitters, it is unnecessary to disassemble the transmitter distributor. The complete chest is packed in one box, and repacking instructions are contained in TM 11–2201.

169. Repacking

a. The XD86 type transmitter distributors used with fixed plant equipment and replacement XD82 type transmitter distributors for use with Reperforator Transmitters TG–26–A, TG–26–B, and TG–27–A, the two-channel type transmitter distributor and receiving transmitter distributors should be repacked in the original individual boxes, if available. If the original boxes are not available, place the equipment in a small cardboard box or wrap it with heavy wrapping paper. Place the box or wrapped equipment in a strong wooden box of appropriate size and cushion it with excelsior to prevent shifting of the equipment. The excelsior should be at least 3 inches thick between the sides of the box and all parts of the equipment. Nail the cover of the box securely and strap it with metal tape or strong wire.

b. Mark repacked equipment clearly on the outside of the box to show the equipment contained, condition of the equipment, and whether the equipment has been moistureproofed and fungiproofed and if so, the date.

Section II. DEMOLITION TO PREVENT ENEMY USE

170. Methods of Demolition

a. SMASH. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

b. CUT. Use axes, handaxes, machetes.

c. BURN. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. EXPLODE. Use firearms, grenades, TNT.

e. DISPOSE. Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

f. OTHER. Use anything immediately available for destruction of this equipment.

171. Destruction of Components

When ordered by your commander, destroy all equipment to prevent its being used or salvaged by the enemy.

a. Smash (par. 170*a*) the relays, capacitors, switches, nameplates, and other identifying marks.

b. Cut (par. 170*b*) all wiring, cords and cables, relays, and transformer windings.

c. Burn (par. 170*c*) technical manuals, diagrams, and circuit labels.

d. Bury or scatter (par. 170*e*) any or all of the above pieces after smashing, cutting, or breaking.

e. Destroy everything.

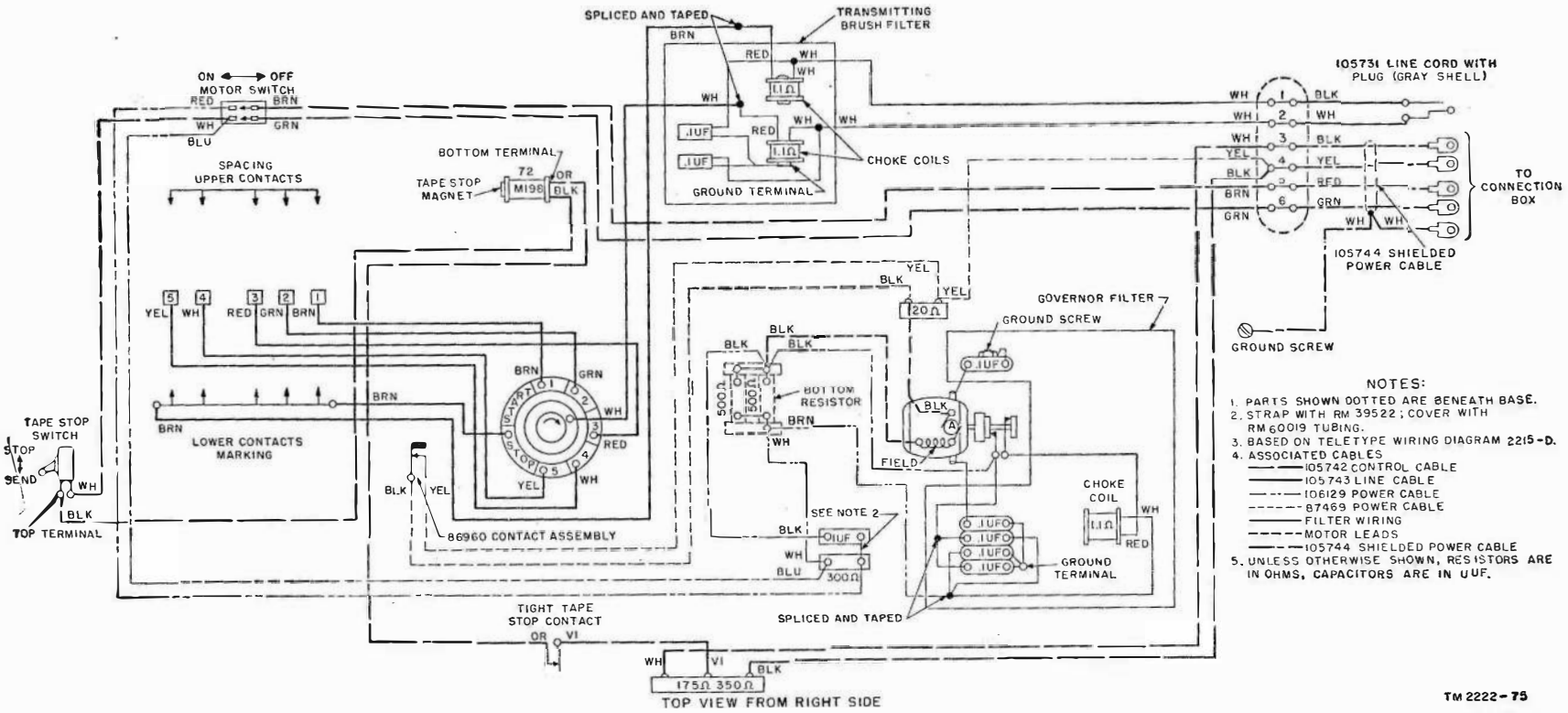


Figure 96. XD82 type transmitter distributor, used as part of Reperforator Transmitters TG-26-A and TG-27 A, wiring diagram.

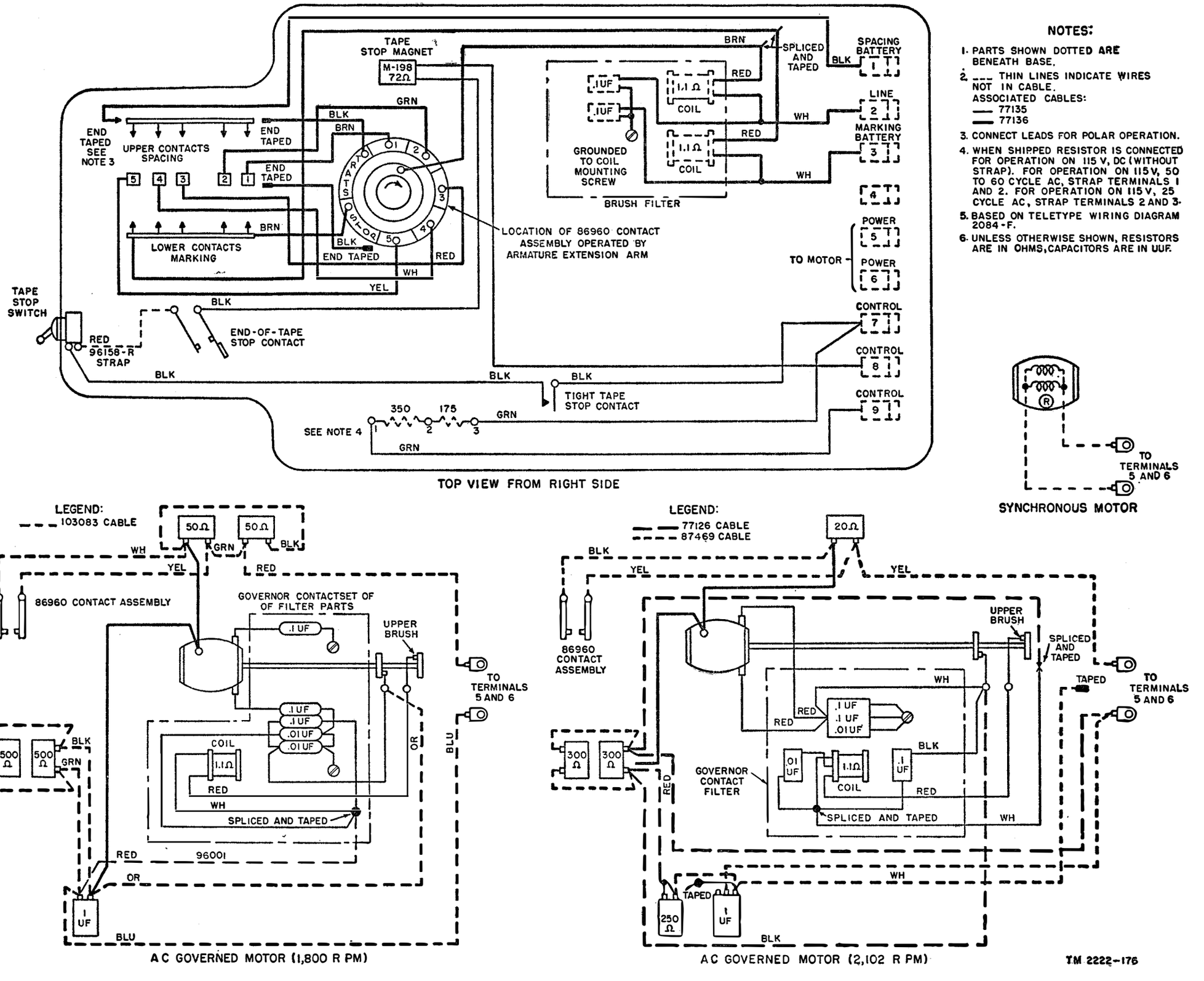


Figure 97. Transmitter Distributor TT-52/FG, used with fixed plant equipment, wiring diagram.

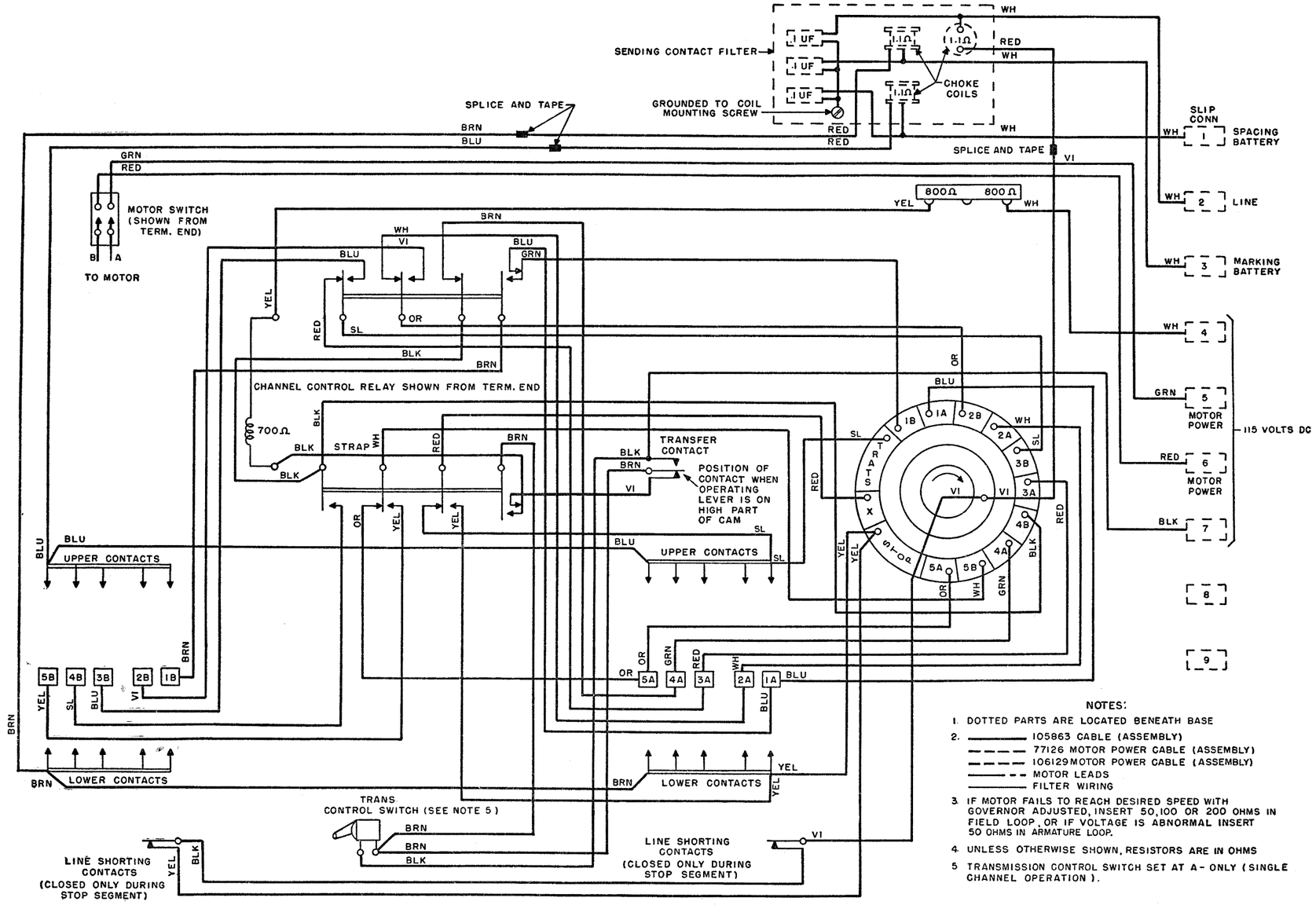
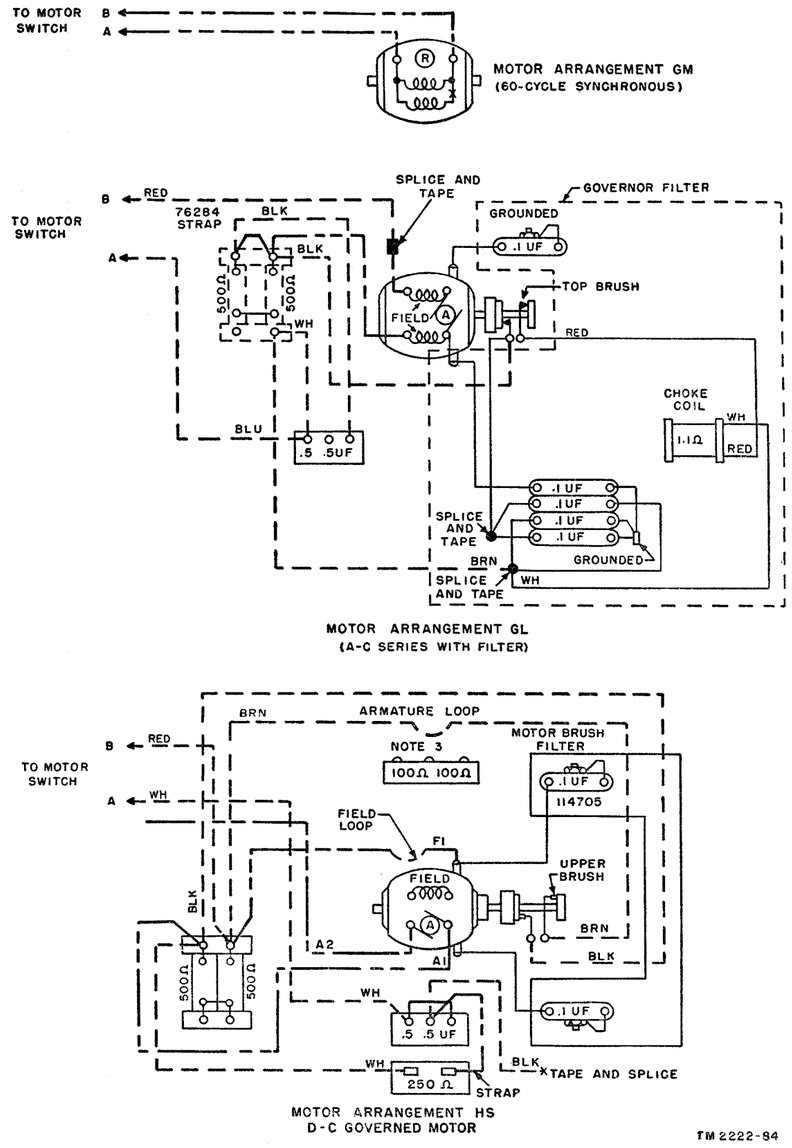


Figure 98. Transmitter Distributor TT-26/FG (two-channel), wiring diagram.



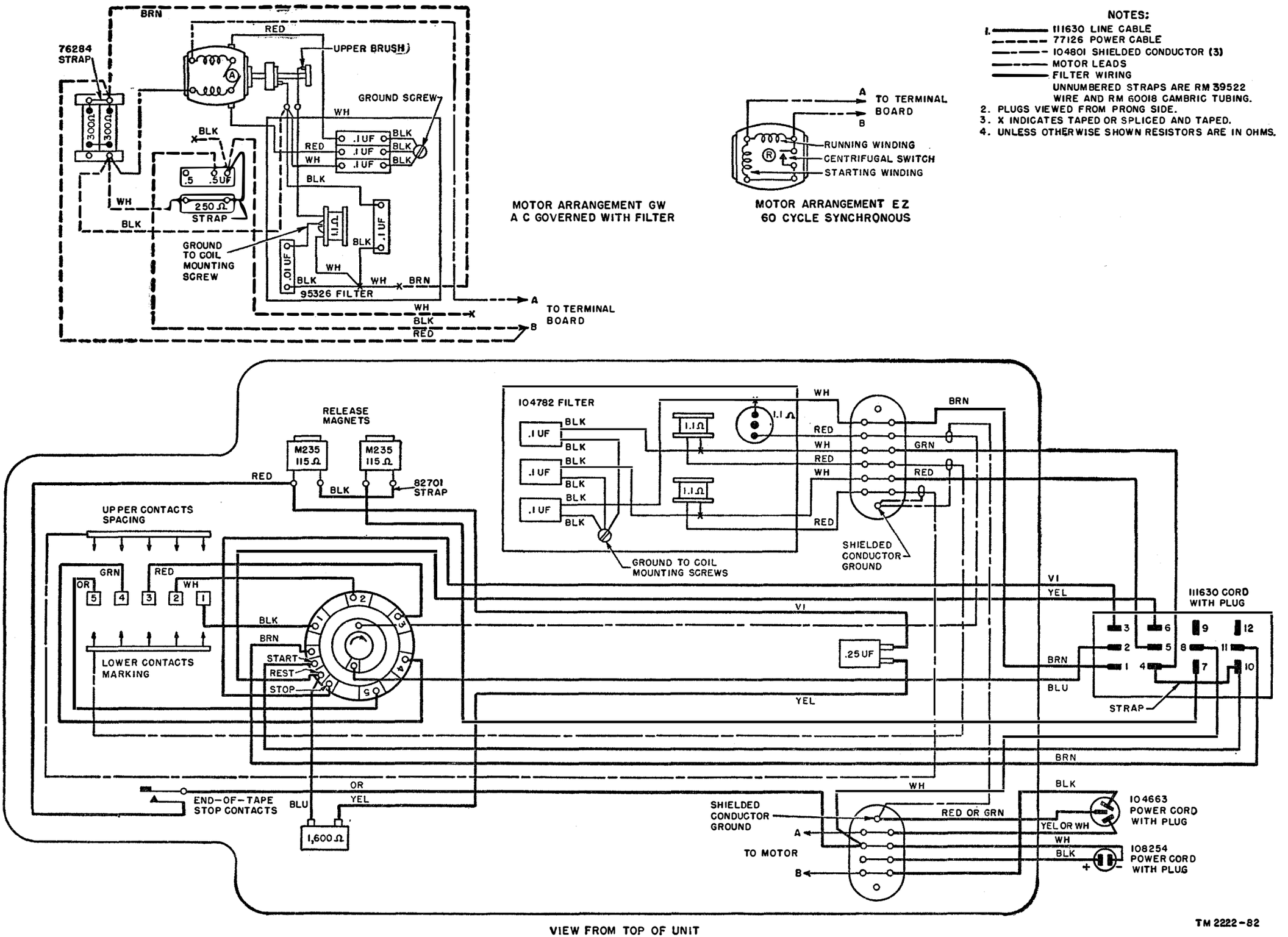
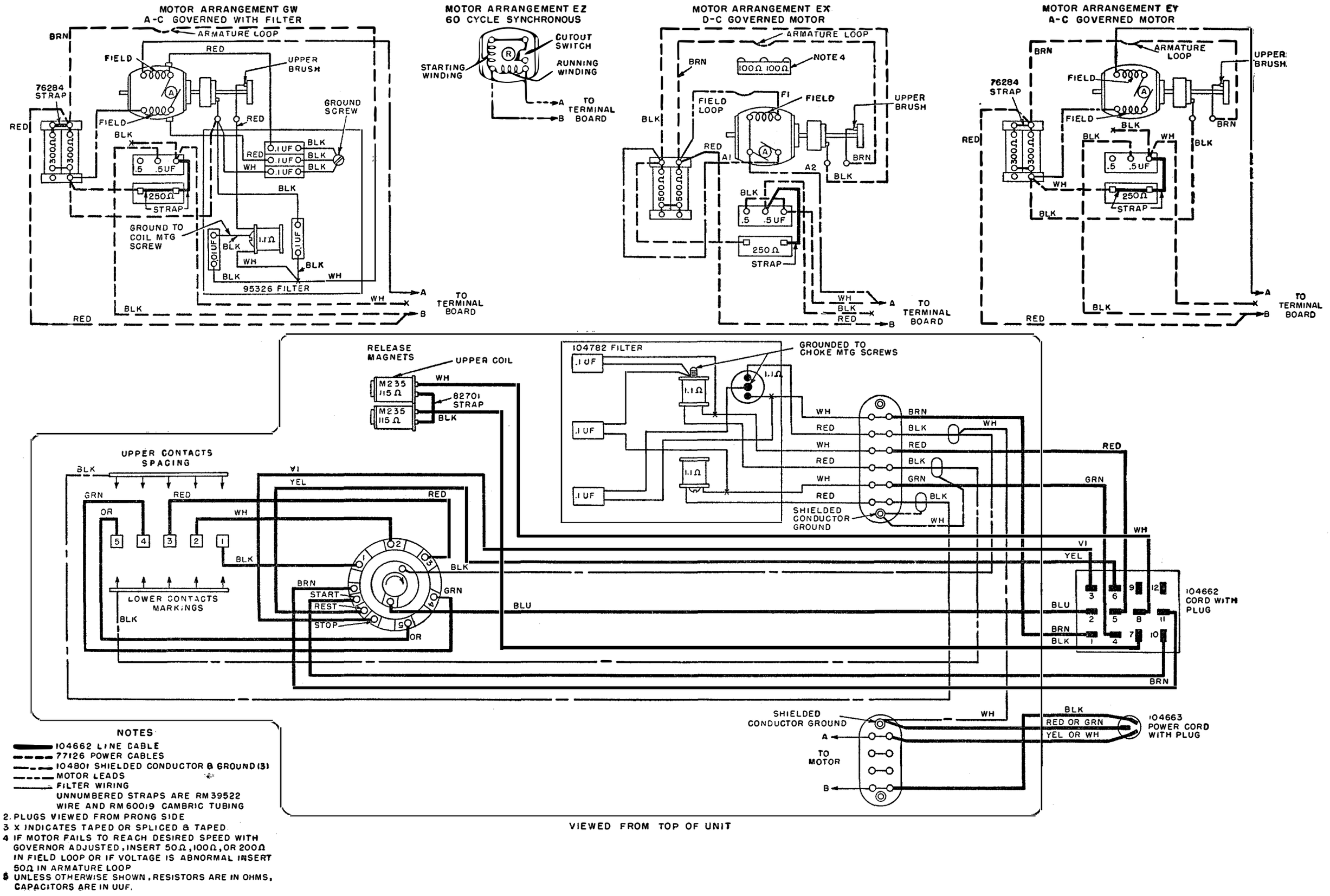


Figure 99. Transmitter Distributor TT-25/FG (receiving), wiring diagram.



NOTES

104662 LINE CABLE
77126 POWER CABLES
104801 SHIELDED CONDUCTOR & GROUND (3)
MOTOR LEADS
FILTER WIRING
UNNUMBERED STRAPS ARE RM 39522 WIRE AND RM 60019 CAMBRIC TUBING

2. PLUGS VIEWED FROM PRONG SIDE
3. X INDICATES TAPED OR SPLICED & TAPED
4. IF MOTOR FAILS TO REACH DESIRED SPEED WITH GOVERNOR ADJUSTED, INSERT 50Ω, 100Ω, OR 200Ω IN FIELD LOOP OR IF VOLTAGE IS ABNORMAL INSERT 50Ω IN ARMATURE LOOP
5. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.

Figure 100. XD79EZ, XD79EY, and XD79EX type transmitter distributors (receiving), wiring diagram.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3 for field manuals, training aids, and JANAP's. Check SR 310–20–4 for technical manuals, technical bulletins, supply bulletins, modification work orders, and Changes.

1. Technical Manuals on Associated Equipment

TM 11–356 ___ Radio Teletype Terminal Equipment AN/FGC–1 or AN/FGC–1X.
TM 11–358 ___ Telegraph Central Office Set TC–3 and Switchboard BD–100.
TM 11–486 ___ Electrical Communications Systems Engineering.
TM 11–2056 __ Test Unit I – 236 and I–236–A.
TM 11–2201 __ Reperforator Teletypewriter Sets TC–16 and TC–17.
TM 11–2203 __ } Teletypewriter Sets AN/-
AFM 102–2 __ } TGC–1 and AN/TGC–1A.
TM 11–2208 __ Test Set TS–2/TG. Teletype Manual No. 43.
TM 11–2209 __ Teletypewriter Set 131B2 (Teletypewriter Repeater Mixer AN/-FGQ–1).
TM 11–2210 __ Instruction Book, 132A2 Teletypewriter Subscriber Set and Associated Equipment.
TM 11–2211 __ 133A1 Teletypewriter Table and Associated Printer Apparatus.
TM 11–2214 __ Teletypewriter Set AN/TGC–3.
TM 11–2215 __ Teletypewriter TT–5/FG and TT–6/FG.
TM 11–2216 __ Teletypewriter TT–7/FG and TT–8/FG.
TM 11–2217 __ Distortion Test Set TS–383/GG and TS–383A/GG.
TM 11–2219 __ Typing Reperforator Sets 10.4A and 10.5A (Teletypewriter).

2. Painting, Preserving, and Lubrication

TB SIG 13 ___ Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69 ___ Lubrication of Ground Signal Equipment.

3. Packaging and Packing Information

a. JOINT ARMY-NAVY PACKAGING SPECIFICATIONS.

JAN–D–169 __ Desiccants, Activated.
JAN–P–100 __ General Specification.
JAN–P–106A _ Boxes, Wood, Nailed.
JAN–P–116 __ Preservation, Methods of.
JAN–P–131 __ Barrier-Material, Moisture-Vaporproof, Flexible.

b. U. S. ARMY SPECIFICATION.

100–2E _____ Marking Shipments by Contractors (and Signal Corps Supplement thereto).

c. SIGNAL CORPS INSTRUCTIONS.

720–7 _____ Standard Pack.
726–15 _____ Interior Marking.

4. Decontamination

TM 3–220 ____ Decontamination.

5. Demolition

FM 5–25 ____ Explosives and Demolitions.

6. Other Publications

SR 310–20–3 _ Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobiliza-

tion Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications, and Combined Communications Board Publications).

SR 310–20–4 - Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.

SR 700–45–5 - Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247).

SR 745–45–5 - Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66 (Army), SandA–70–6 (Navy), and AF–MC–U2 (Air Force).
Nav Dept Serial 85P000
AFR 71–4 ---

TB SIG 25 --- Preventive Maintenance of Power Cords.

TB SIG 66 --- Winter Maintenance of Signal Equipment.

TB SIG 72 --- Tropical Maintenance of Ground Signal Equipment.

TB SIG 75 --- Desert Maintenance of Ground Signal Equipment.

TM 1–455 ---- Electrical Fundamentals.

TM 11–462 --- Signal Corps Tactical Communication Reference Data.

TM 11–680 --- Teletypewriter Circuits and Equipment (Fundamentals).

TM 11–5500 -- Multimeter TS–297/U.

APPENDIX II

IDENTIFICATION TABLES OF PARTS

Note. The fact that a part is listed in the tables in paragraphs 2 through 6 of this appendix is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, SIG 7–8–10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalogs applicable to the equipments covered in this manual are SIG 7&8, TT–21/FG, TT–25/FG, TT–26/FG, and TT–52/FG. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

1. Identification Illustration and Index

a. Figures 101 through 153 illustrate and identify parts used in model 14 transmitter distributors. Numbers for parts shown in these illustrations are manufacturer's parts numbers. Signal Corps stock numbers for the parts illustrated appear in paragraphs 2 through 6 of this appendix. In nearly all instances, Signal Corps stock numbers are the manufacturer's parts numbers plus the prefix 4T.

b. As explained in paragraph 3, chapter 1, some XD82 type transmitter distributors are modified by the addition of a break-lock mechanism. When so modified, they are known as XD99 type transmitter distributors. An identification table of parts for this mechanism appears in paragraph 5 of this appendix. These parts are illustrated in figure 134.

c. As explained in 11*b*, the receiving type Transmitter Distributors TT–21/FG and TT–25/FG are alike with the exception that Transmitter Distributor TT–21/FG has incorporated in it a tape-feed suppression mechanism, which is illustrated in figure 123. The identification table of parts for the tape-feed suppression mechanism appears in paragraph 6 of this appendix.

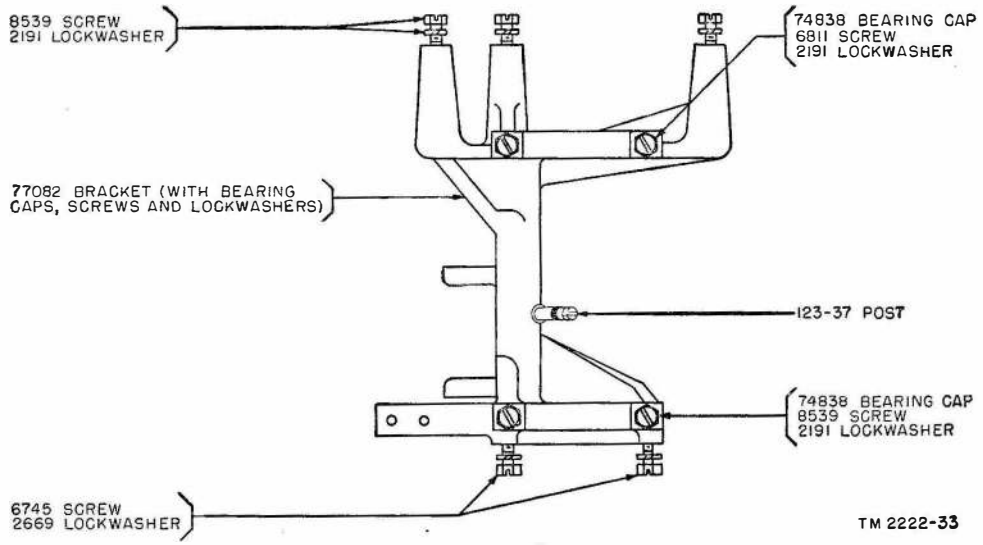


Figure 101. Main-shaft mounting bracket assembly common to all types.

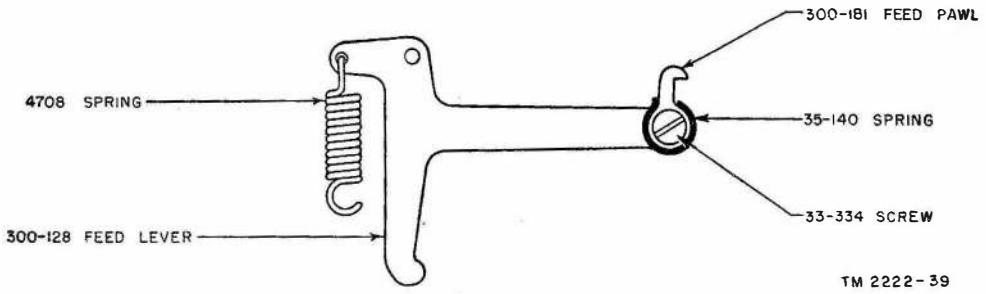


Figure 102. Tape-feed lever assembly common to all types.

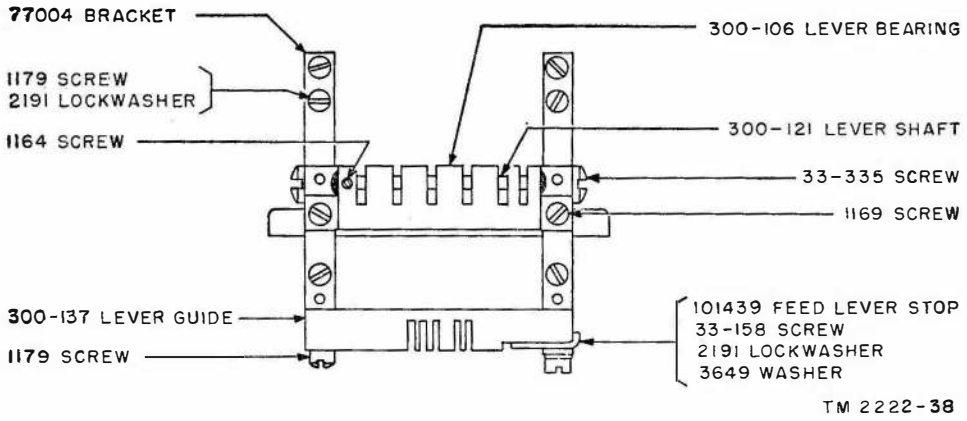


Figure 103. Contact-lever mounting bracket assembly common to all types.

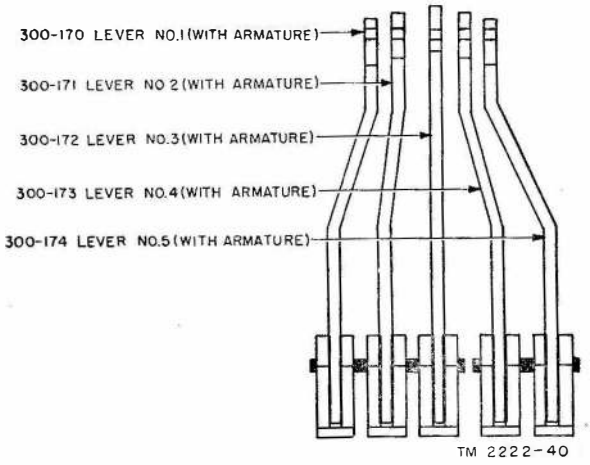
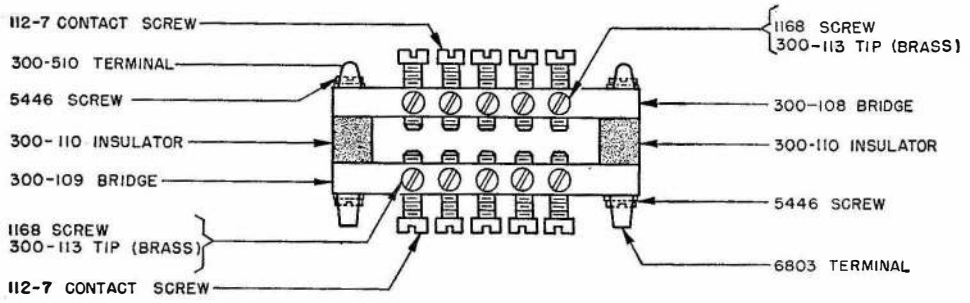


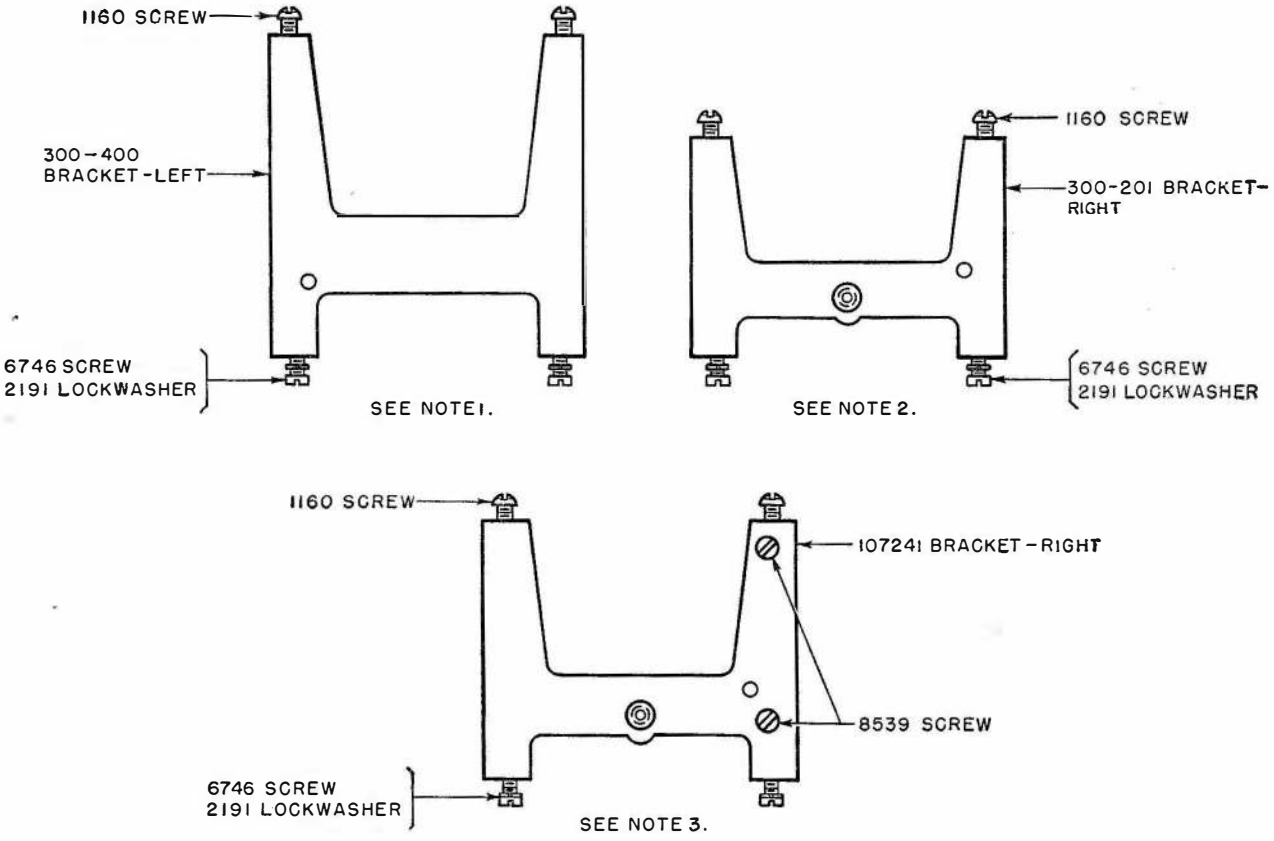
Figure 104. Contact levers with armature common to all types.



300-107 CONTACT SCREW BRIDGE ASSEMBLY

TM2222-42

Figure 105. Contact bridge assemblies common to all types.



NOTES:

1. THE LEFT MOUNTING BRACKET IS THE SAME FOR ALL MODELS.
2. THIS RIGHT MOUNTING BRACKET IS USED ON TYPES XD82, XDB6, XD79, XD95, XD100 AND ON THE TRANSMITTER UNIT B OF THE XD91 AND XD93 TYPES.
3. THIS RIGHT MOUNTING BRACKET IS USED ON TRANSMITTER UNIT A ON XD91 AND XD93 TYPES.

TM 2222-34

Figure 106. Mounting brackets.

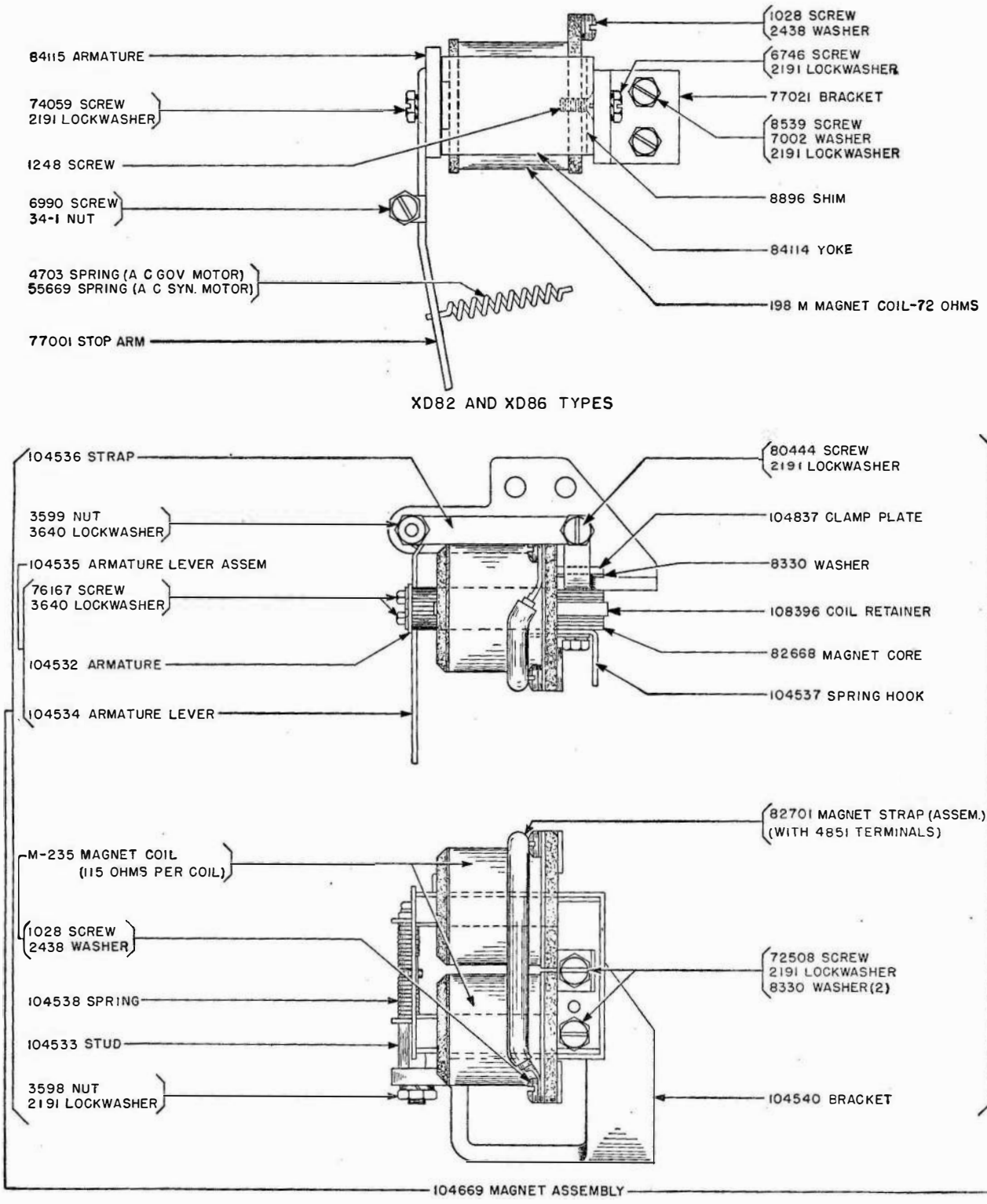
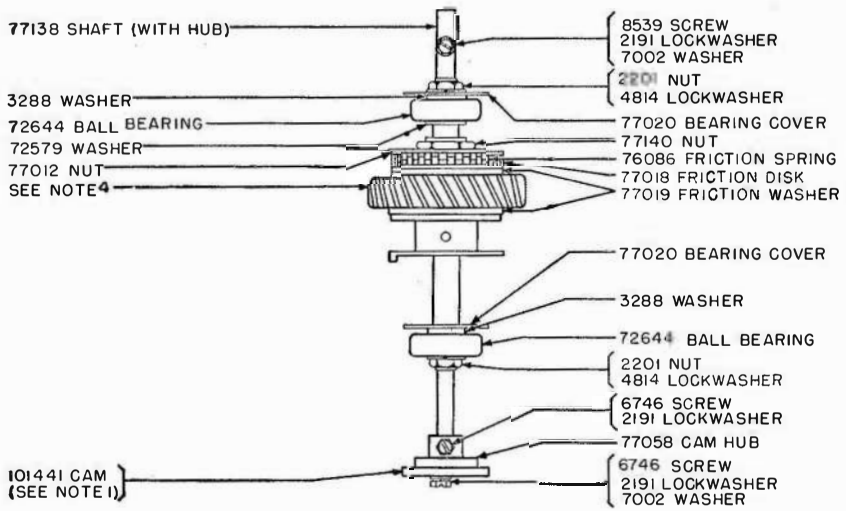
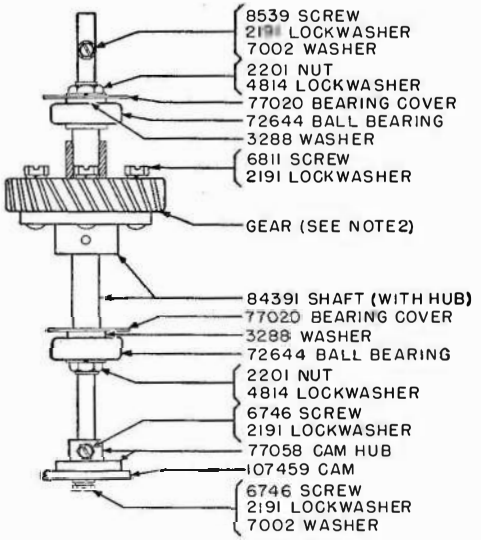


Figure 107. Magnet assemblies.



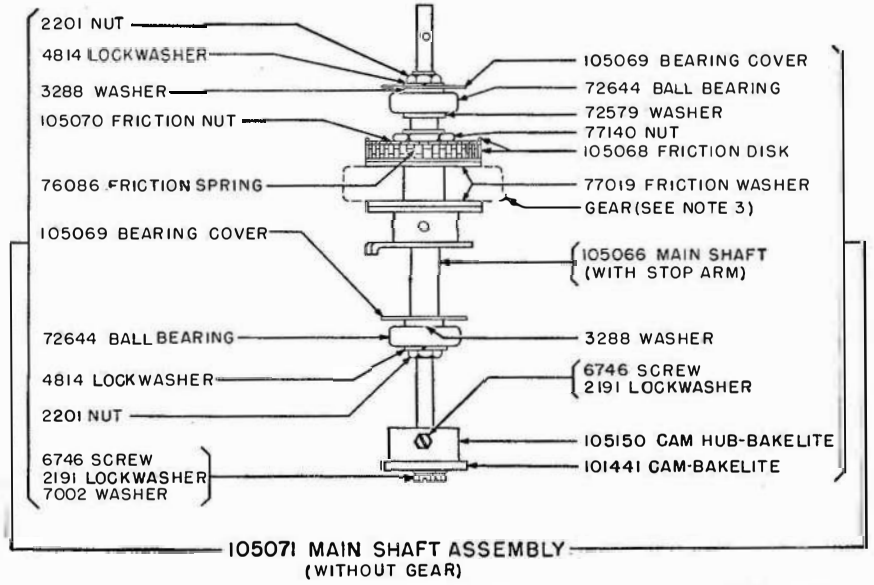
XD82 AND XD86 TYPES



MAIN SHAFT ASSEMBLY
XD91 AND XD93 TYPES

NOTES

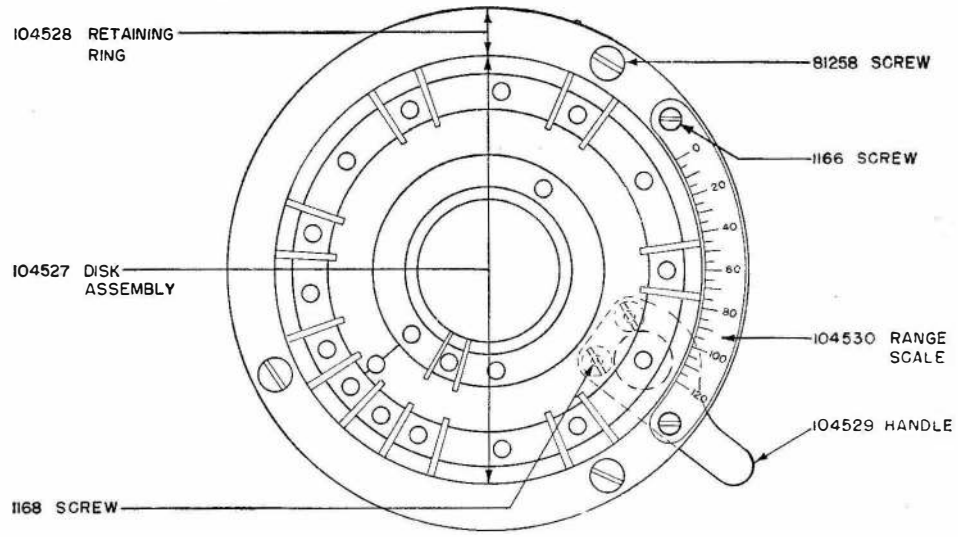
1. THE NO. 101441 CAM IS STAMPED X 101441 CAM, 101439 FEED LEVER STOP, 2191 LOCKWASHER, AND 3649 WASHER REPLACE OLD STYLE NO. 77040 CAM.
2. FOR A-C SERIES MOTORS, USE 84357 GEAR-40 TEETH, AND 77034 PINION-7 TEETH. FOR SYNCHRONOUS MOTORS, USE 87222 GEAR-44 TEETH, AND 80166 PINION-9 TEETH.
3. FOR SYNCHRONOUS MOTORS, USE 104580 GEAR-30 TEETH, AND 104579 PINION-7 TEETH. FOR D-C SHUNT MOTORS, USE 104658 GEAR-45 TEETH, AND 104659 PINION-9 TEETH. FOR A-C SERIES MOTORS, USE 104658 GEAR-45 TEETH, AND 104659 PINION-9 TEETH.
4. FOR A-C SERIES MOTORS, USE 77036 GEAR-40 TEETH, AND 77034 PINION-7 TEETH. FOR 60-CYCLE SYNCHRONOUS MOTORS, USE 80165 GEAR-44 TEETH, AND 80166 PINION-9 TEETH. FOR 50-CYCLE SYNCHRONOUS MOTORS, USE 91132 GEAR-53 TEETH, AND 91131 PINION-13 TEETH.



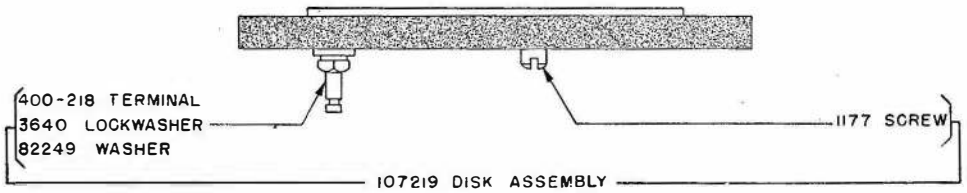
XD79, XD95, AND XD100 TYPES

TM 2222-35

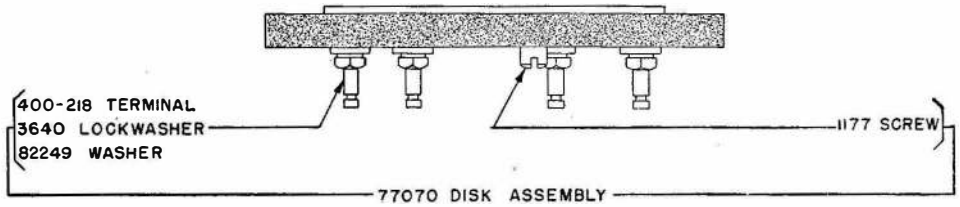
Figure 108. Main-shaft assembly.



XD79, XD95, AND XD100 TYPES



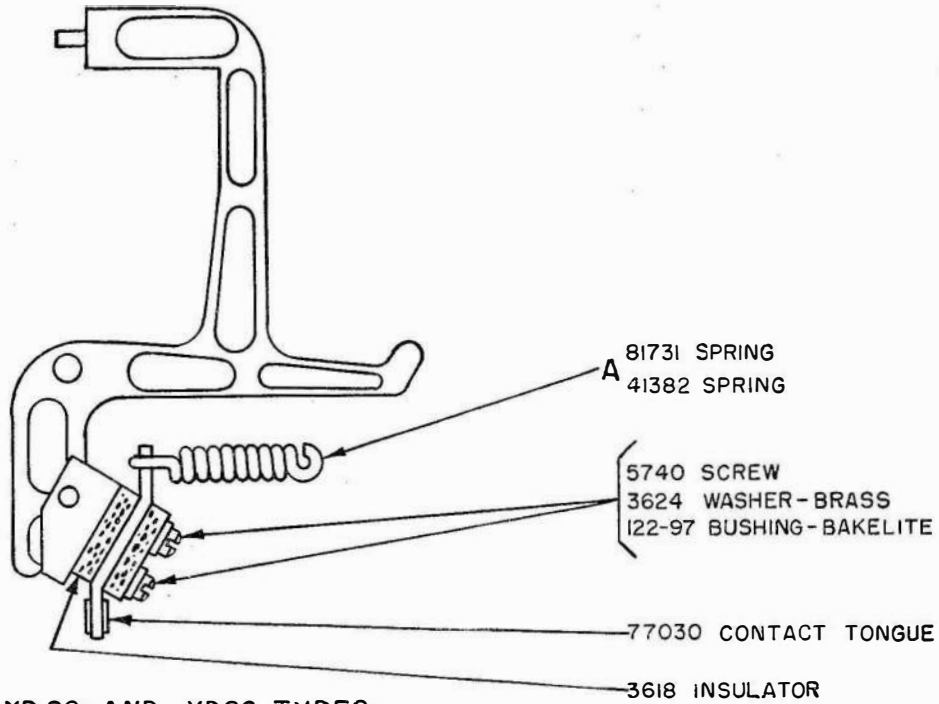
FOR TWO-CHANNEL TRANSMITTER DISTRIBUTORS



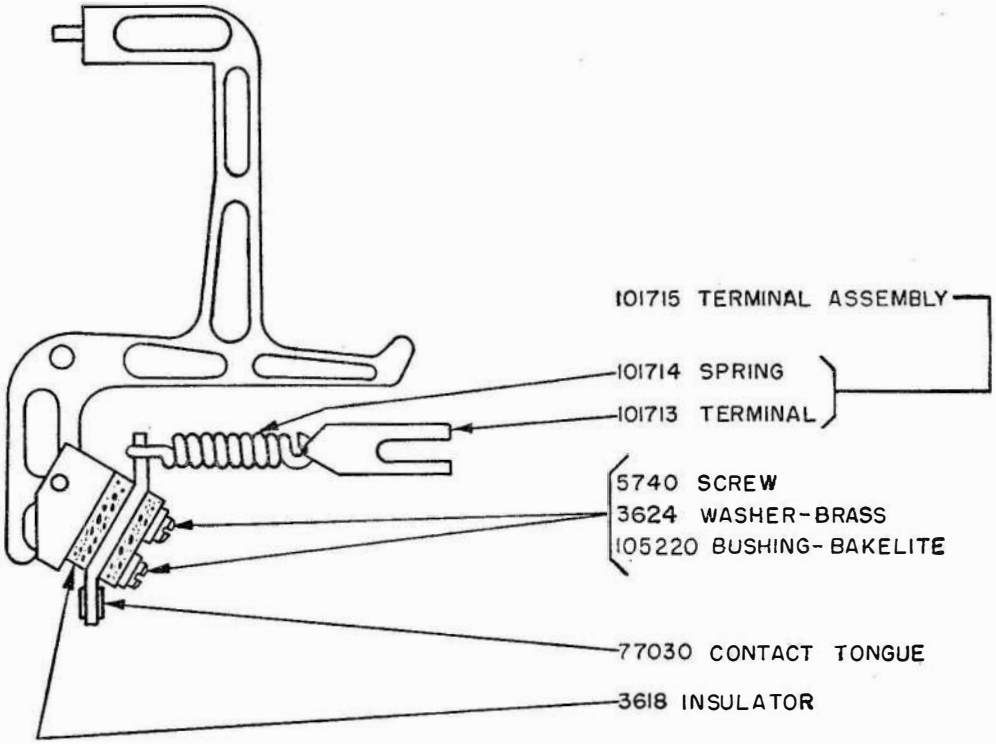
XD82 AND XD86 TYPES

TM 2222-32

Figure 109. Distributor disk assemblies.



XD 82 AND XD86 TYPES



XD79, XD91, XD93, XD95 AND XD100 TYPES

NOTE:

A NO. 81731 SPRING USED WITH REGULAR PERFORATED TAPE
NO 41382 SPRING USED WITH CHADLESS PERFORATED TAPE

TM 2222-41

Figure 110. Contact-lever assemblies.

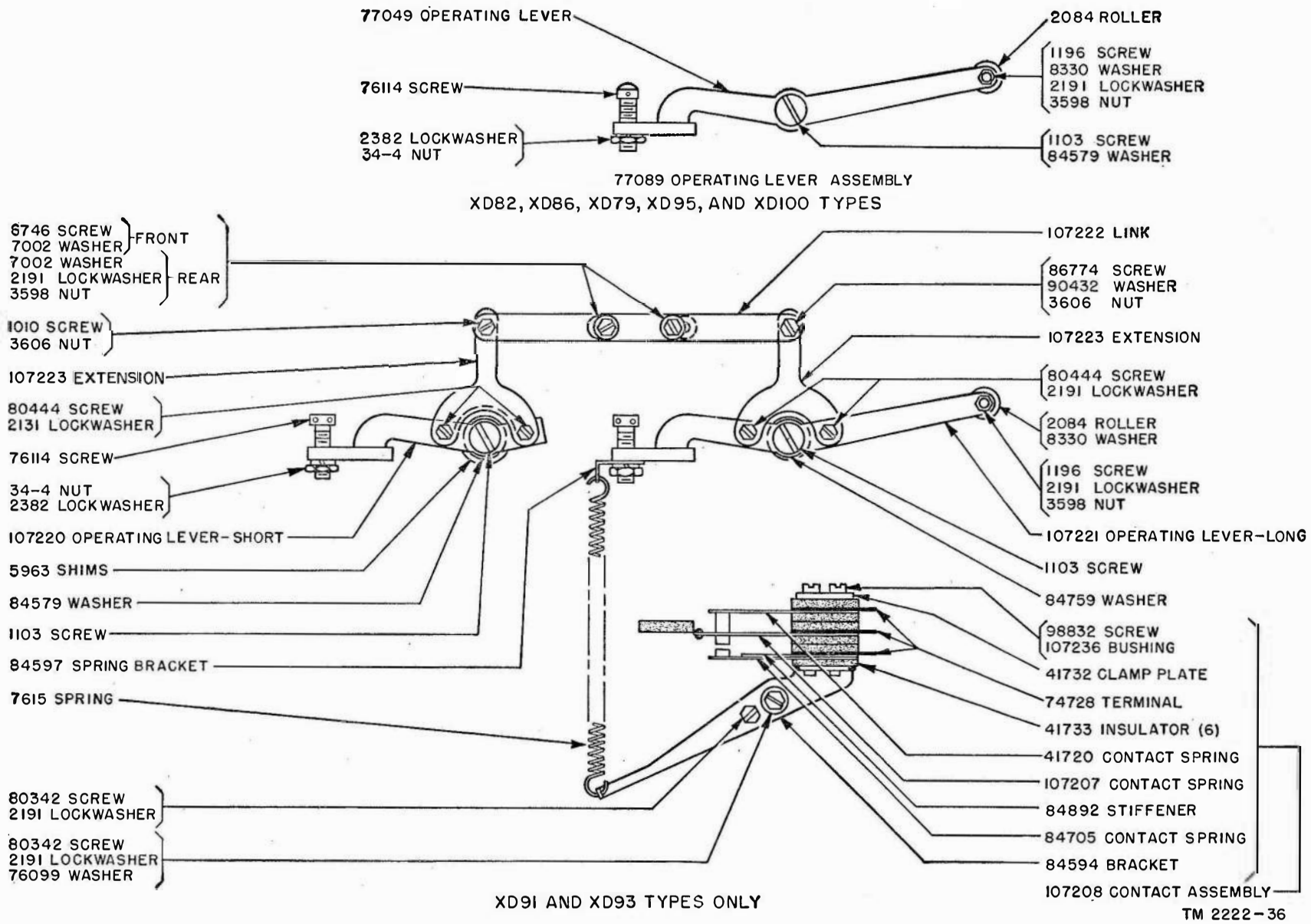
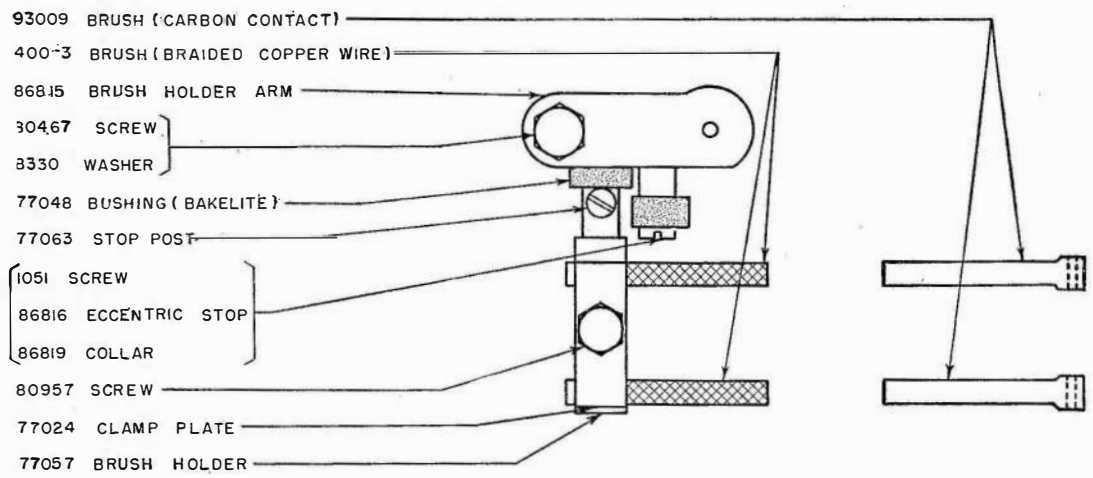
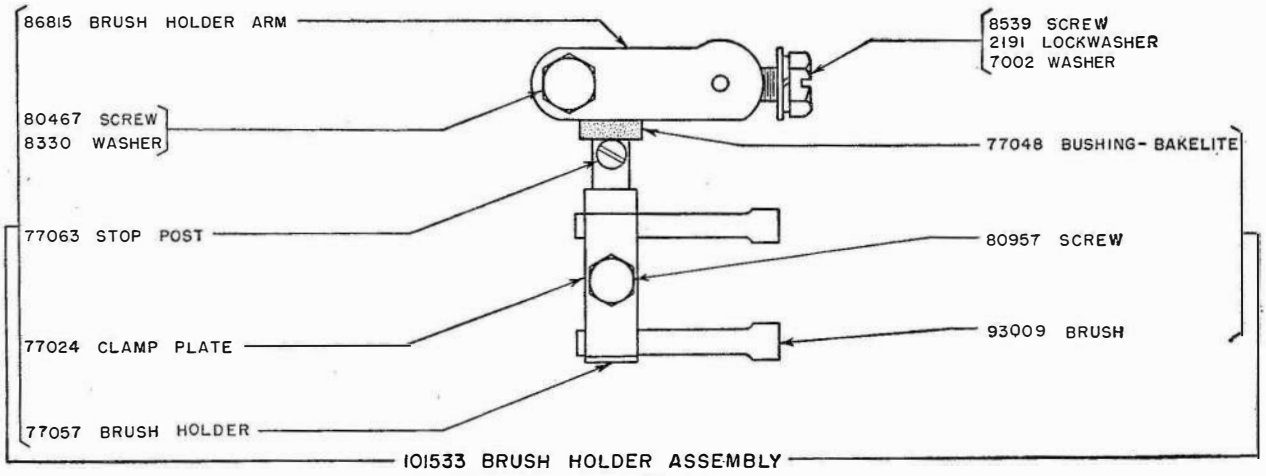


Figure 111. Operating lever assemblies.



XD82 AND XD86 TYPES



XD79, XD79, AND XD100 TYPES

NOTE:

BRUSH HOLDER ASSEMBLY FOR TWO-CHANNEL TRANSMITTER DISTRIBUTORS ARE SAME AS 101533, EXCEPTING THAT 81814 STIFFENER IS ADDED TO THE BRUSH.

TM 2222-30

Figure 112. Distributor brush-holder assemblies.

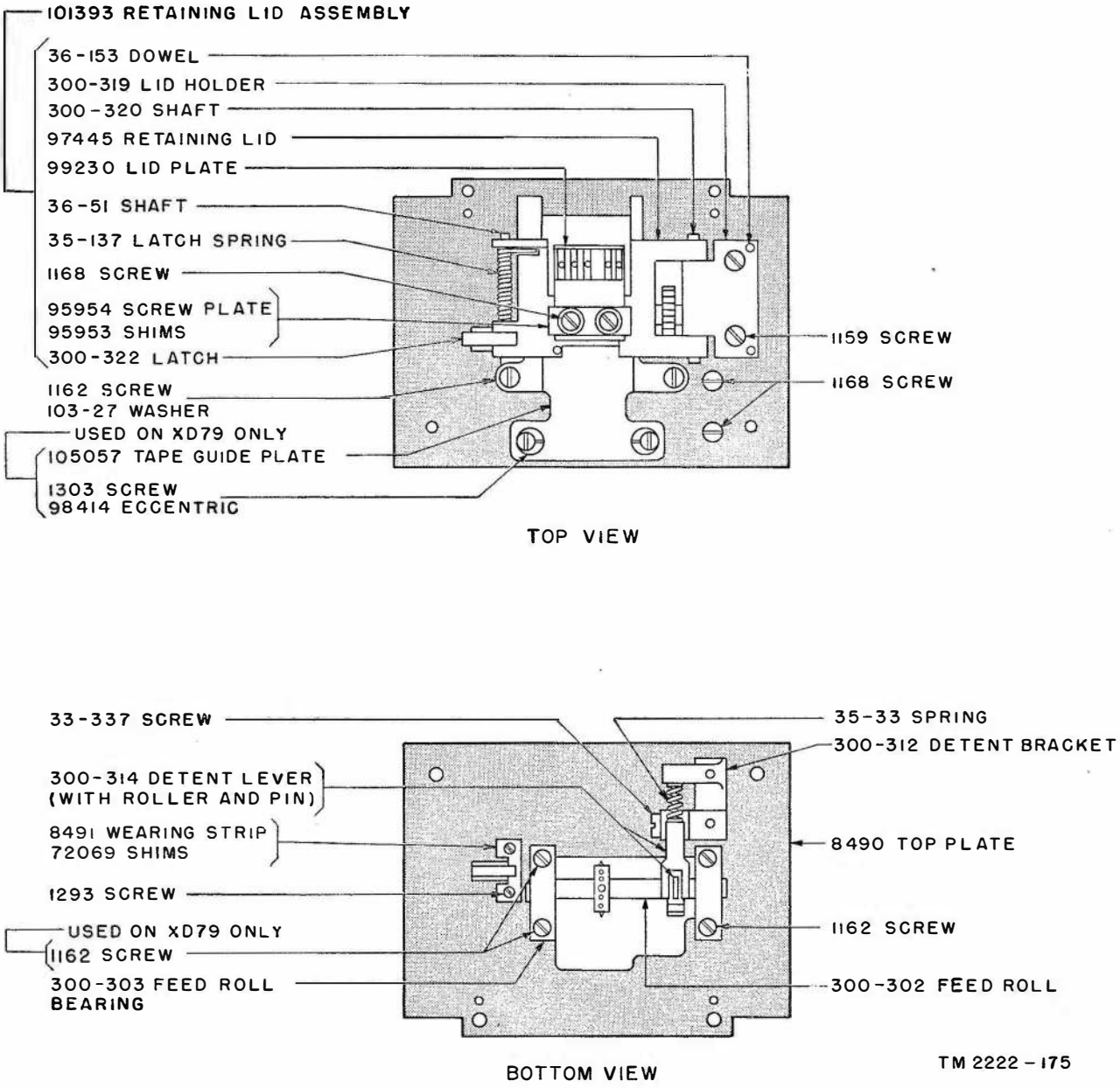
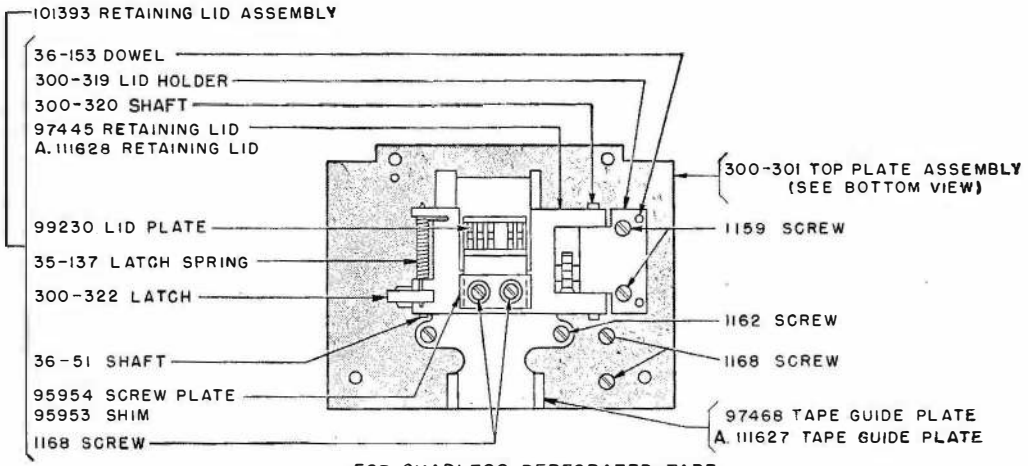
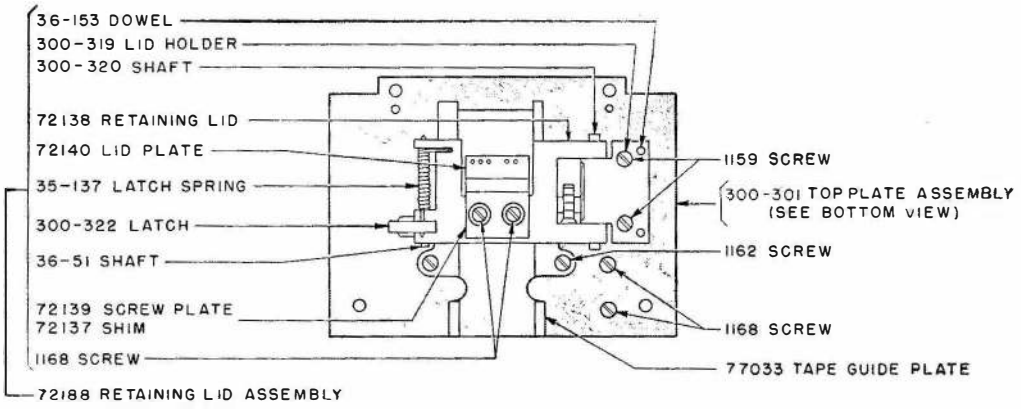


Figure 113. Transmitter top plate for receiving transmitter distributors.



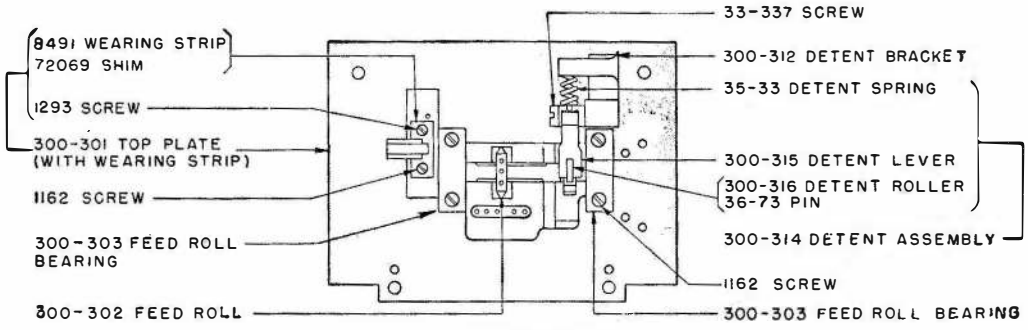
FOR CHADLESS PERFORATED TAPE

TOP VIEW



FOR REGULAR PERFORATED TAPE

TOP VIEW

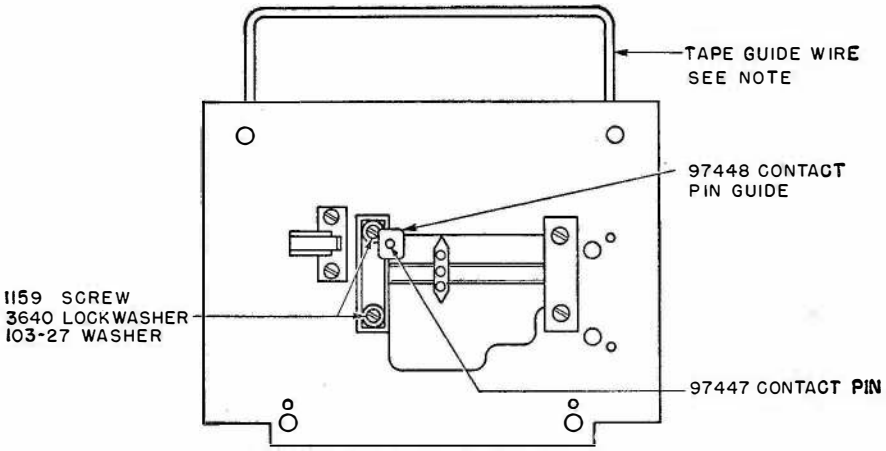


BOTTOM VIEW

A IMPROVED PARTS INTERCHANGEABLE WITH OLD PARTS AS A GROUP ONLY

TM 2222-43

Figure 114. Transmitter top plates for XD82, XD86, XD91, and XD93 types.



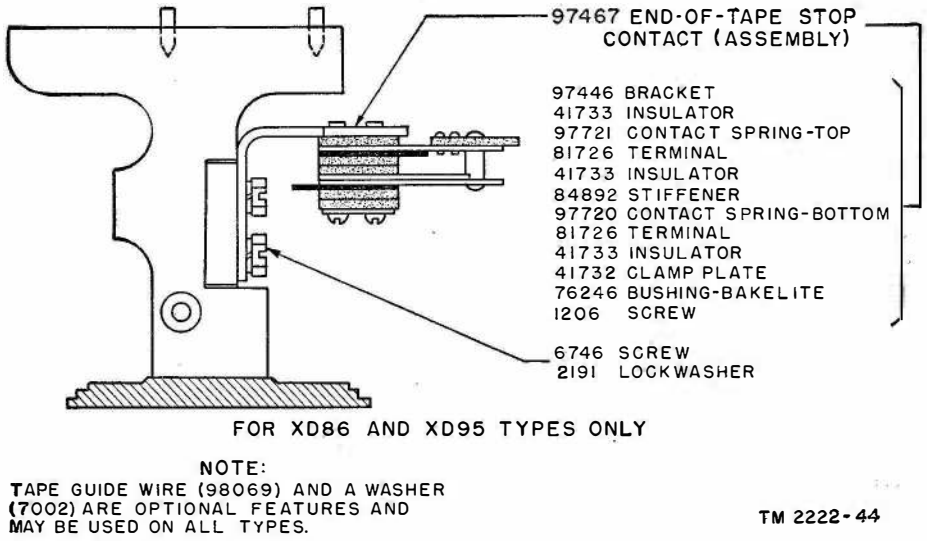
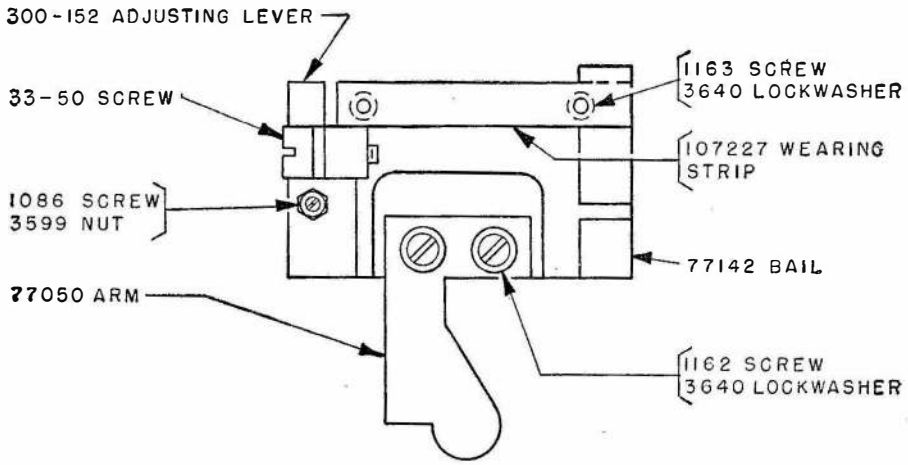
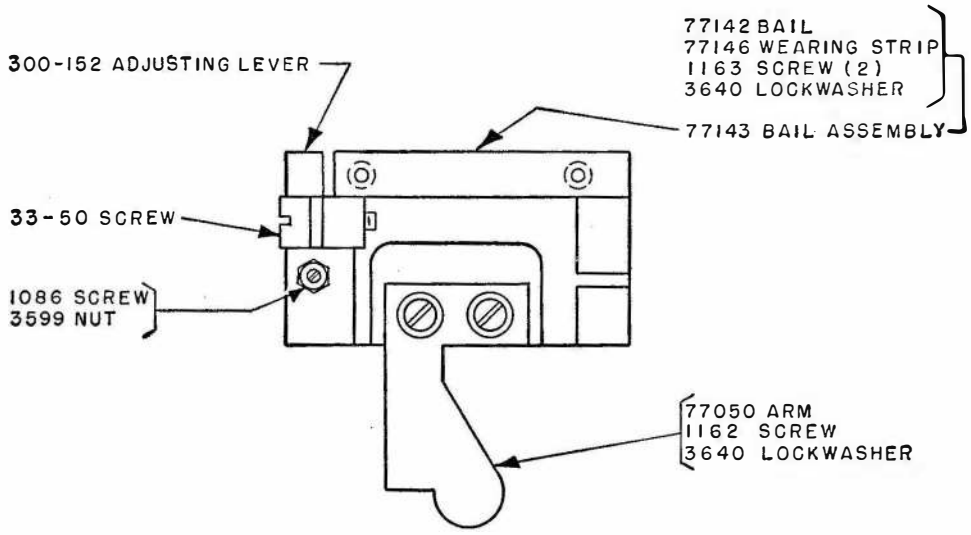


Figure 115. End-of-tape stop contact assembly.



FOR XD91 AND XD93 TYPES



XD82, XD86, XD79, XD95, AND XD100 TYPES

TM2222-37

Figure 116. Contact-lever bail assemblies.

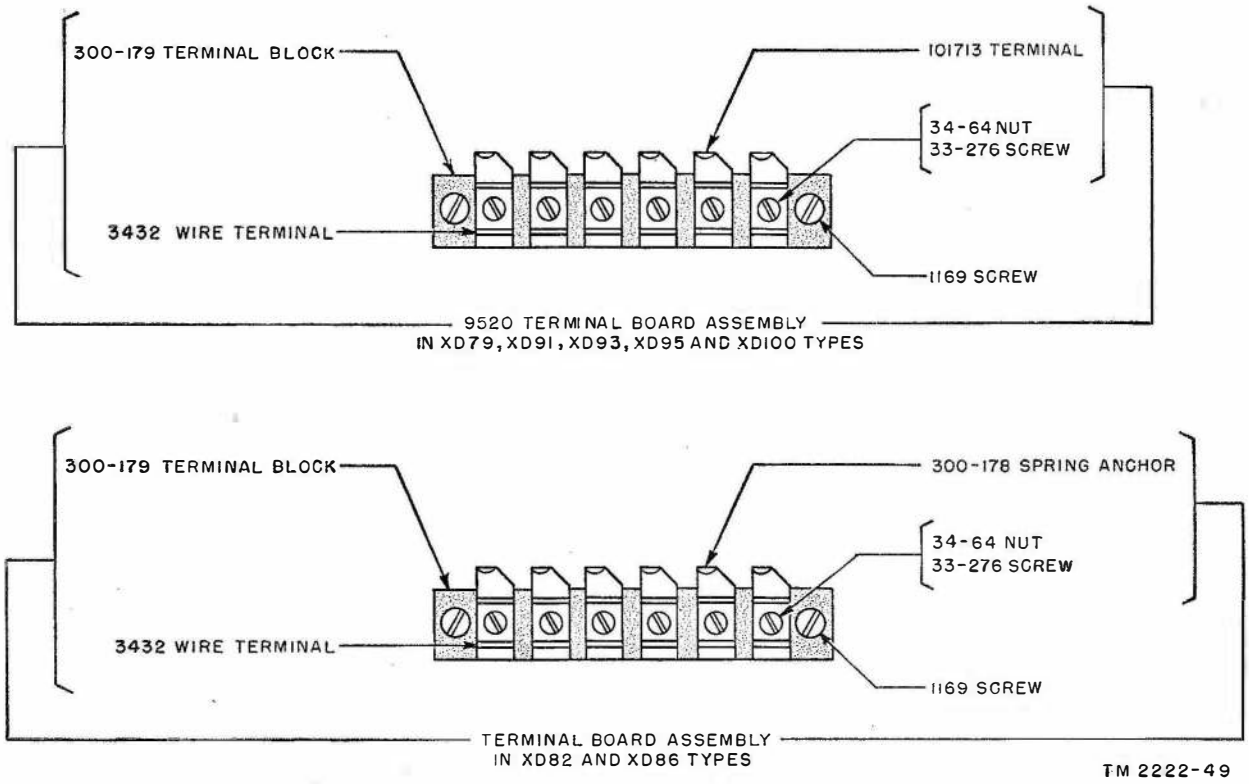


Figure 117. Terminal board assemblies.

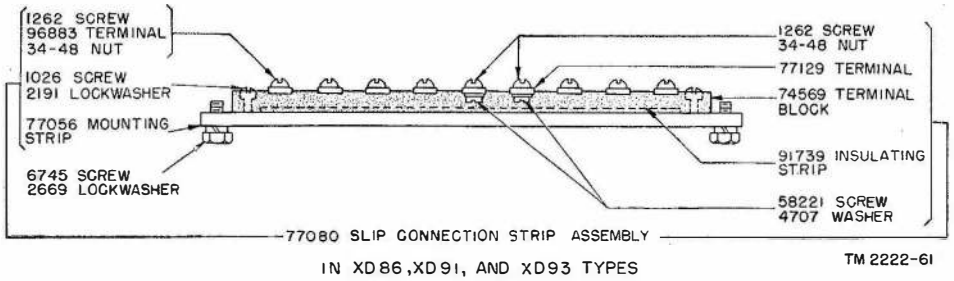


Figure 118. Slip connection strip assembly.

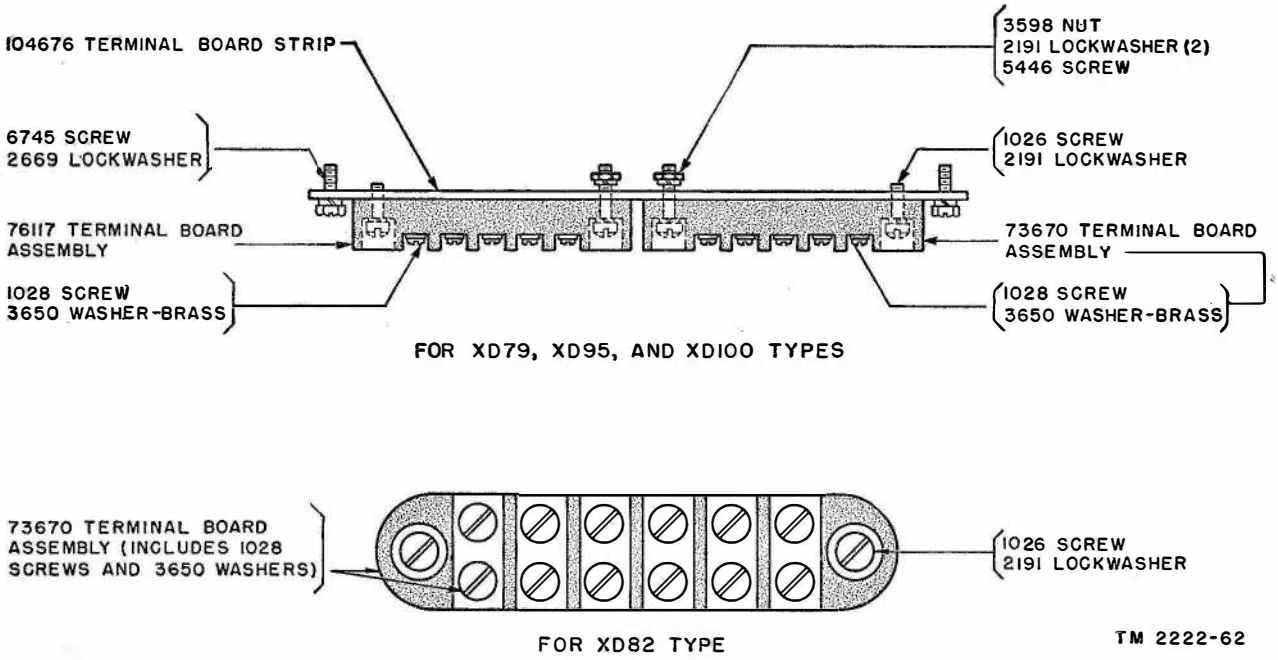


Figure 119. Terminal boards.

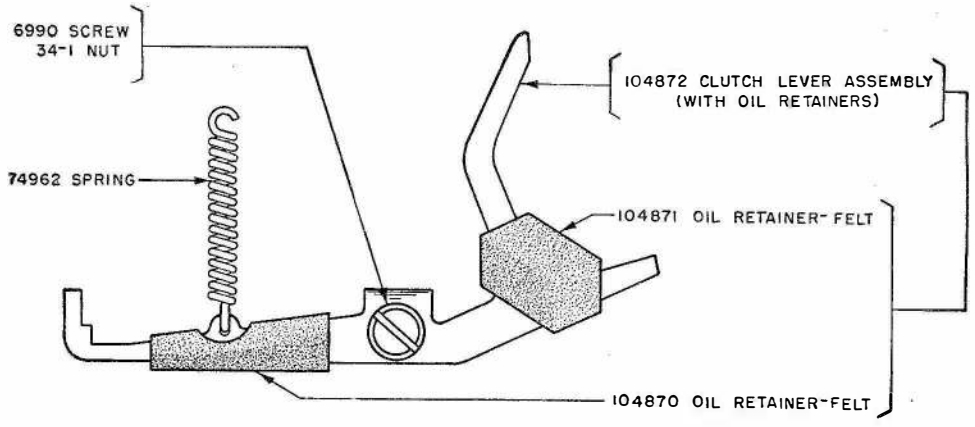


Figure 120. Clutch lever assembly.

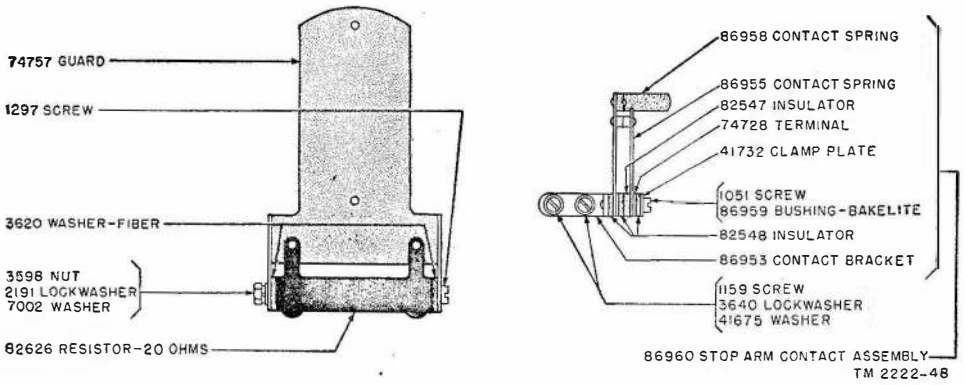


Figure 121. Load compensation resistor and contact assembly for XD82 and XD86 types.

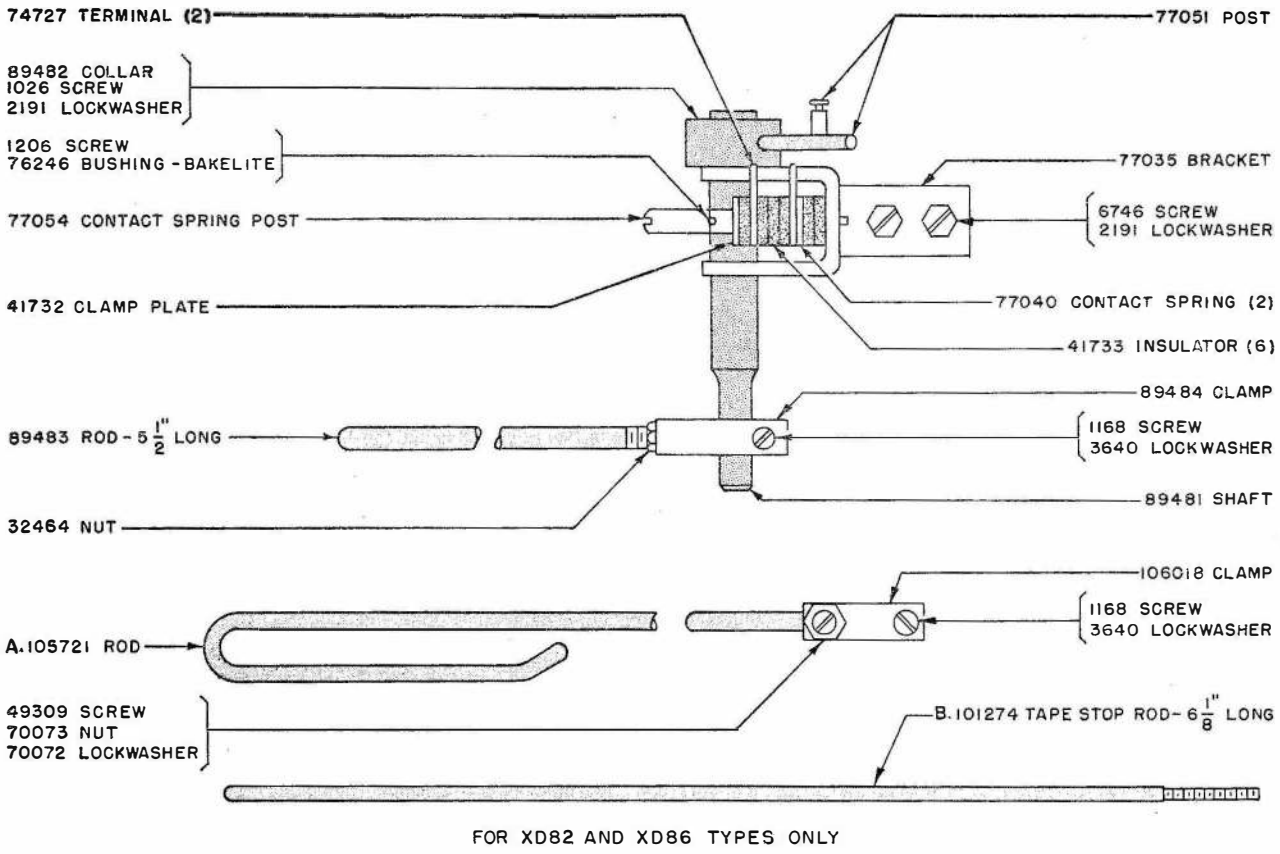


Figure 122. Tight-tape stop mechanism assembly.

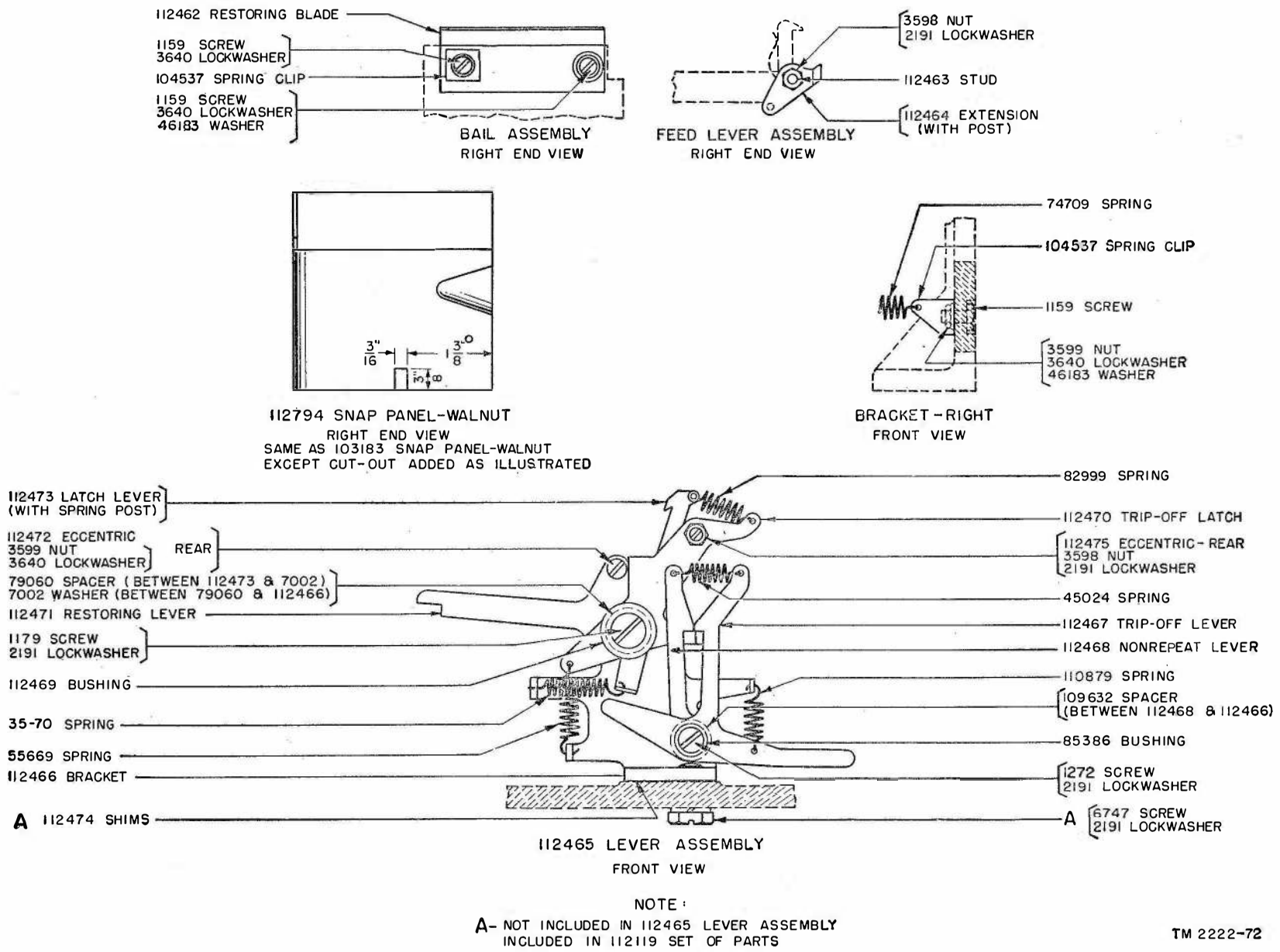


Figure 123. Tape-feed suppression mechanism (XD100).

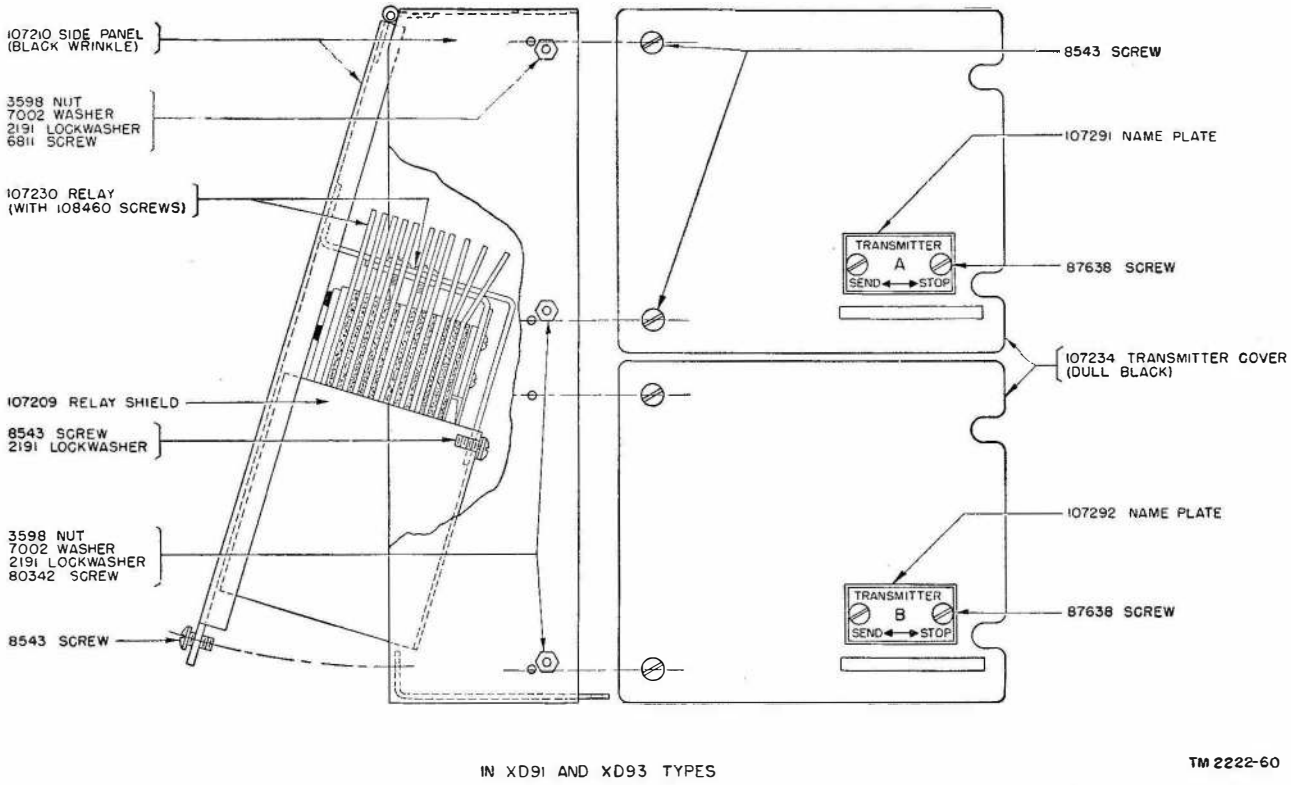
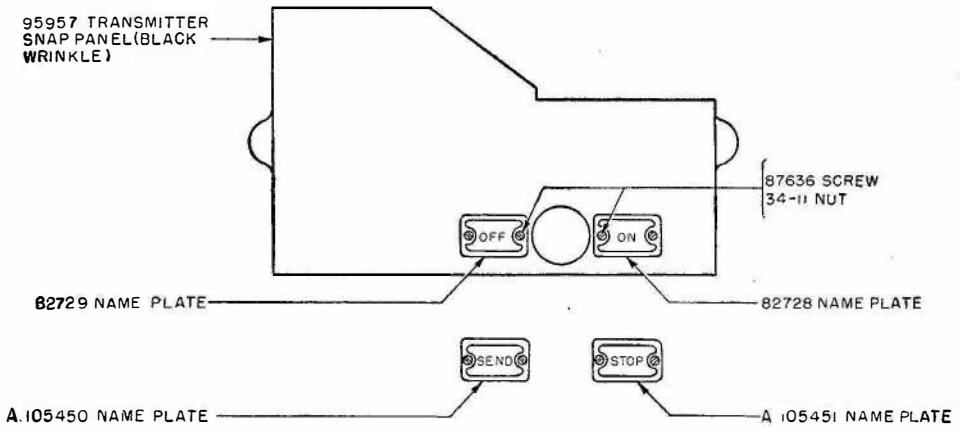
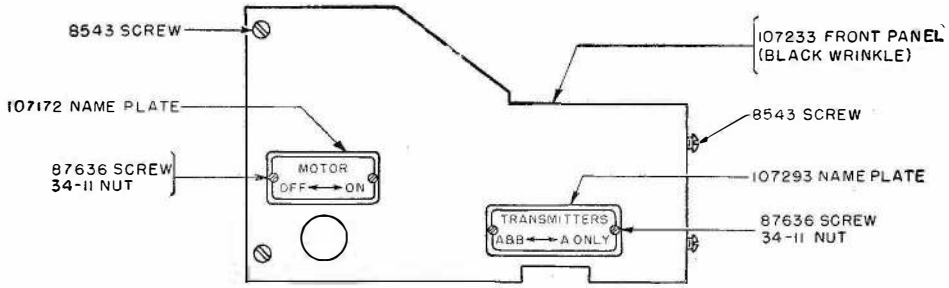


Figure 124. Transmitter covers and transmission control relay assemblies.

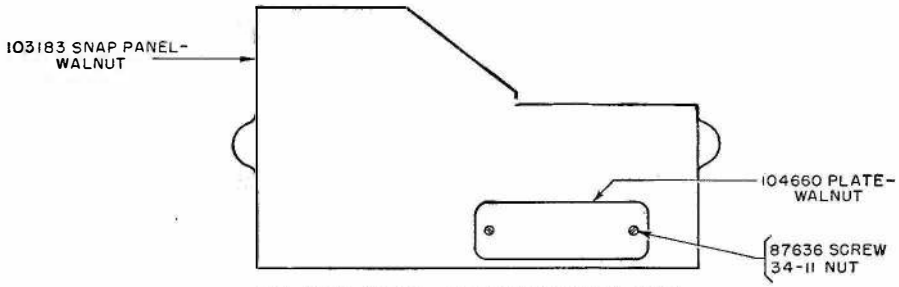


A NUMBERS 105450 AND 105451 NAME PLATES ARE USED ON REPERFORATOR TRANSMITTERS TG-26-A AND TG-27-A.

FOR XD82 AND XD86 TYPES ONLY



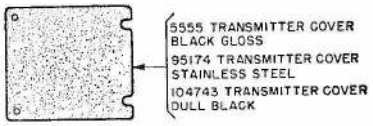
FOR XD91 AND XD93 TYPES ONLY



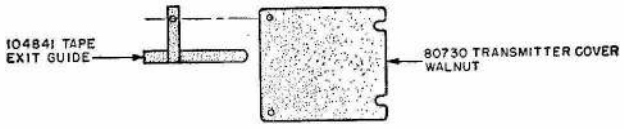
FOR XD79, XD95, AND XD100 TYPES ONLY

TM 2222-51

Figure 125. Transmitter snap panel assemblies.



FOR XD82 AND XD86 TYPES



FOR XD79, XD95, AND XD100 TYPES

TM 2222-50

Figure 126. Transmitter covers.

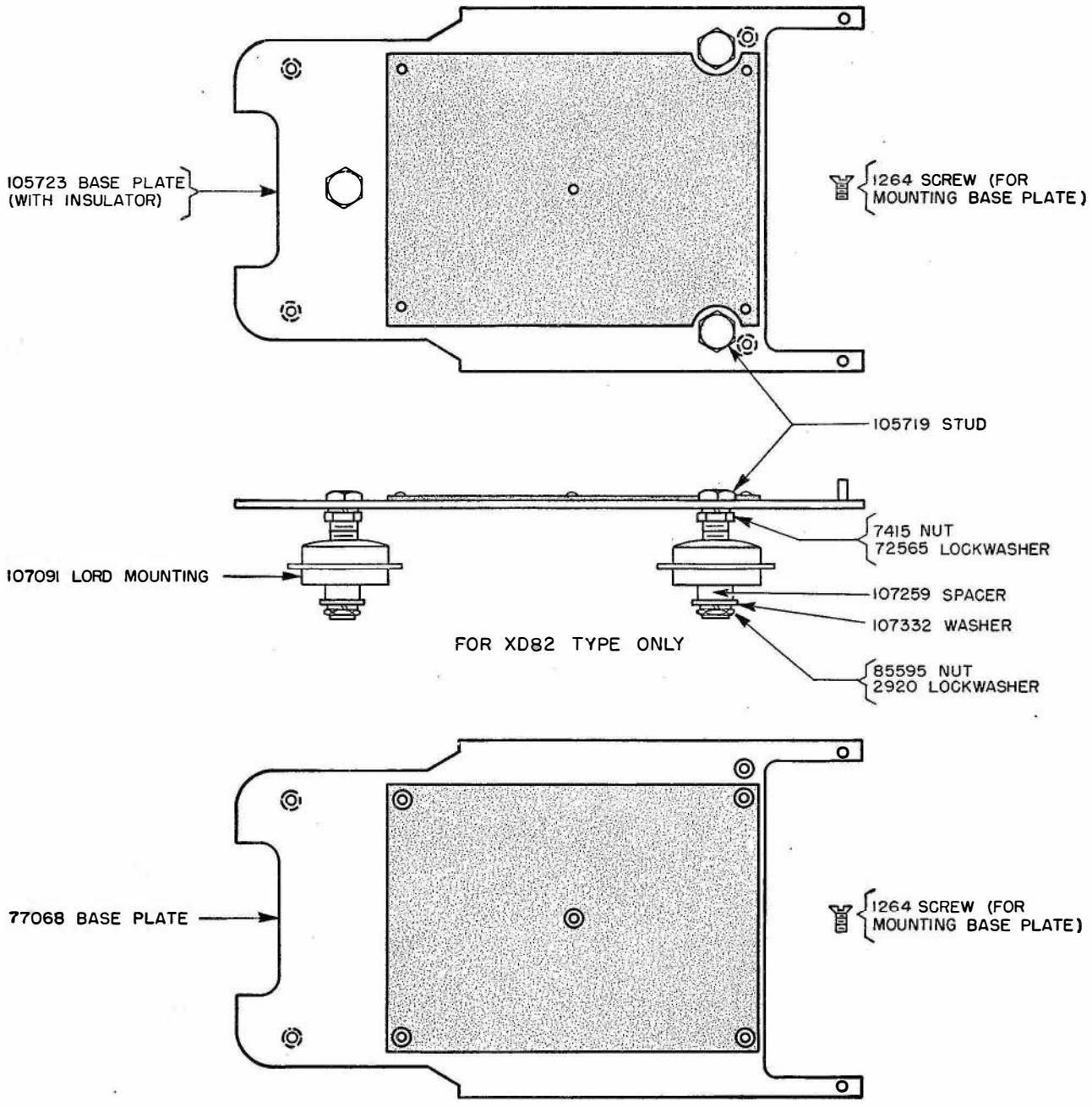


Figure 127. Base plates.

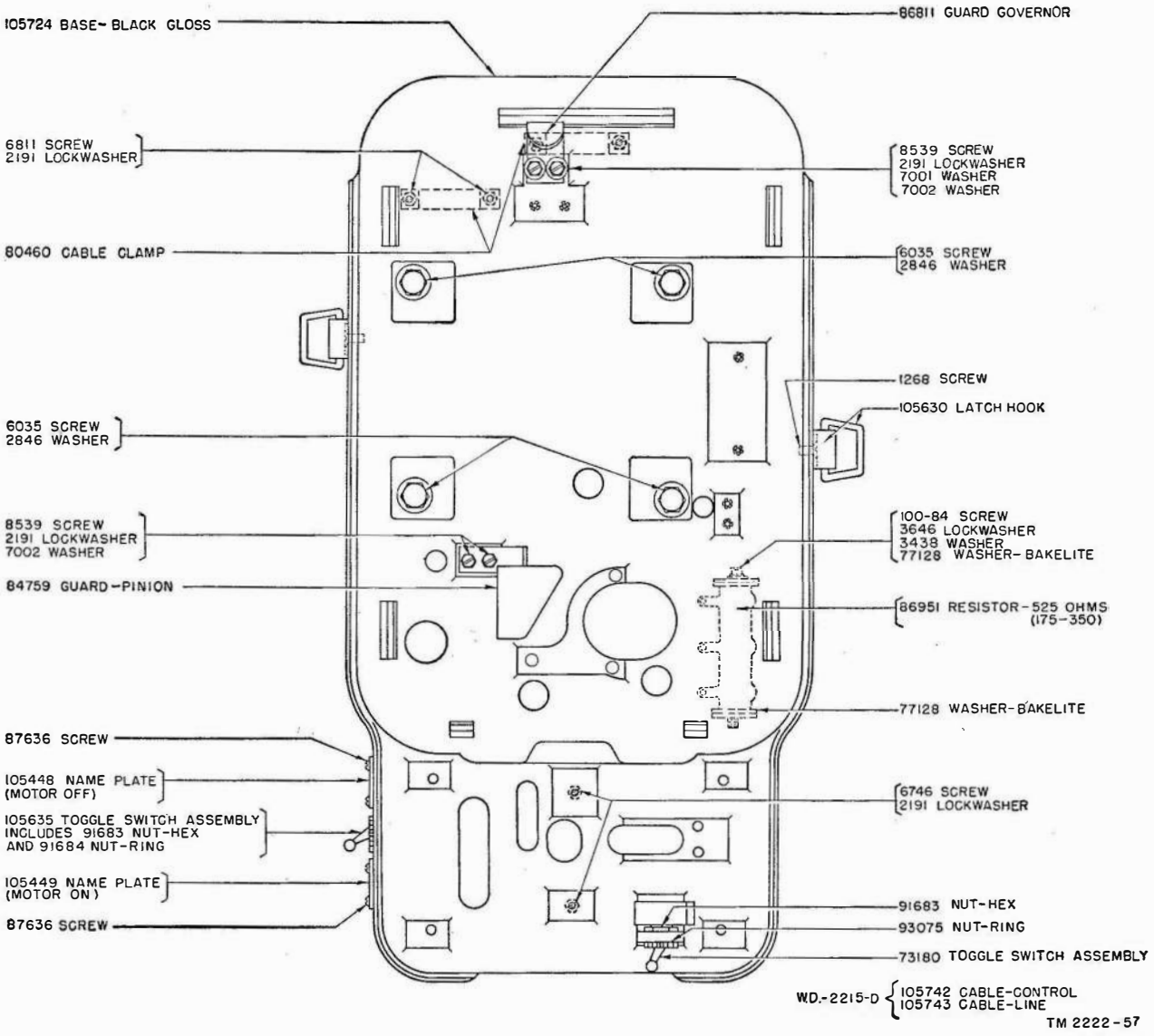
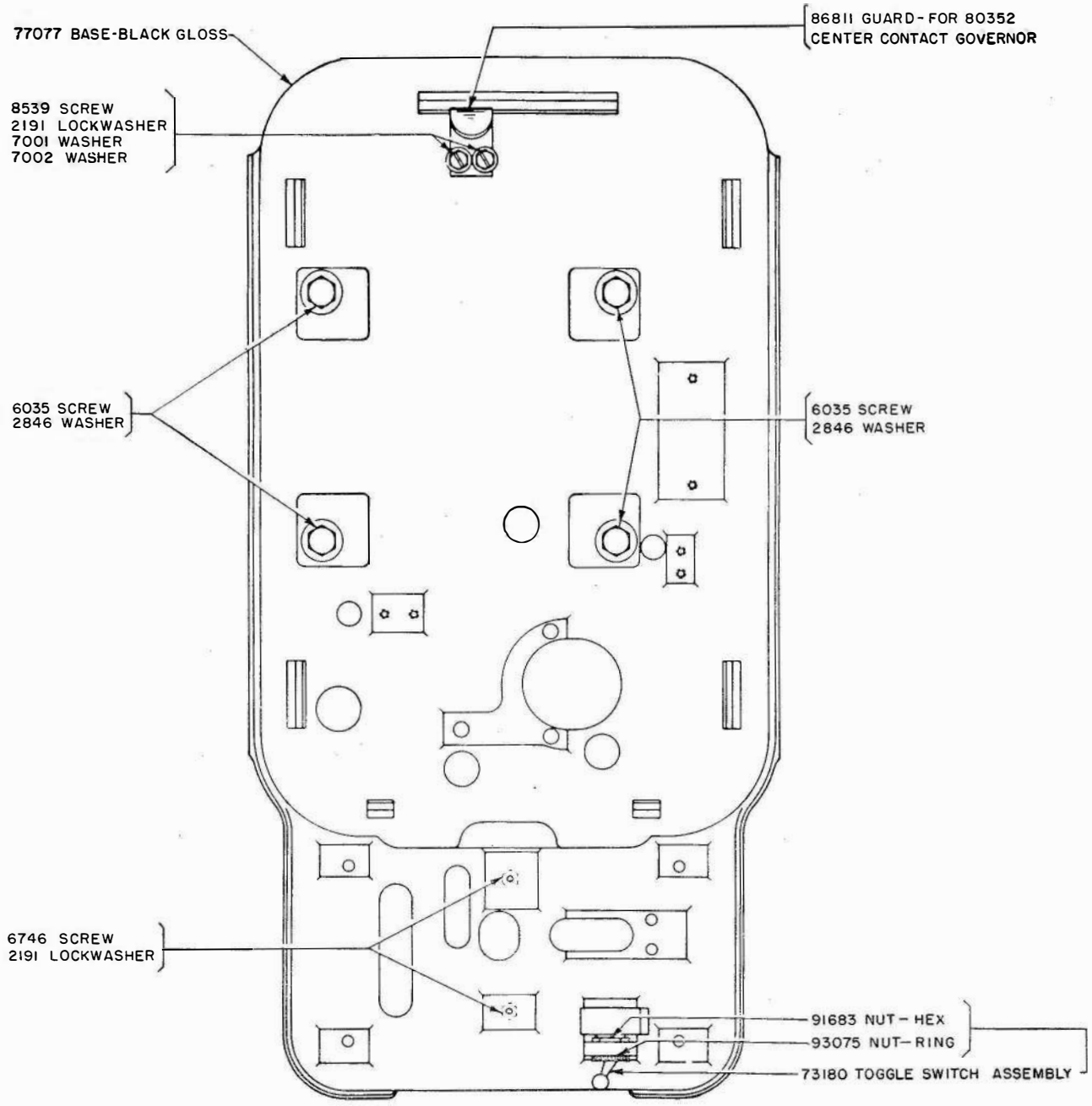


Figure 128. Base assembly (XD82).



CABLES		
PART NUMBER	DESCRIPTION	WIRING DIAGRAM NUMBER
77136	LINE	2084F
77126	POWER	
87469	STOP ARM CONTACT	
77135	CONTROL	
103083	CONTROL AND STOP ARM CONTACT	

TM 2222-58

Figure 129. Base assembly (XD86).

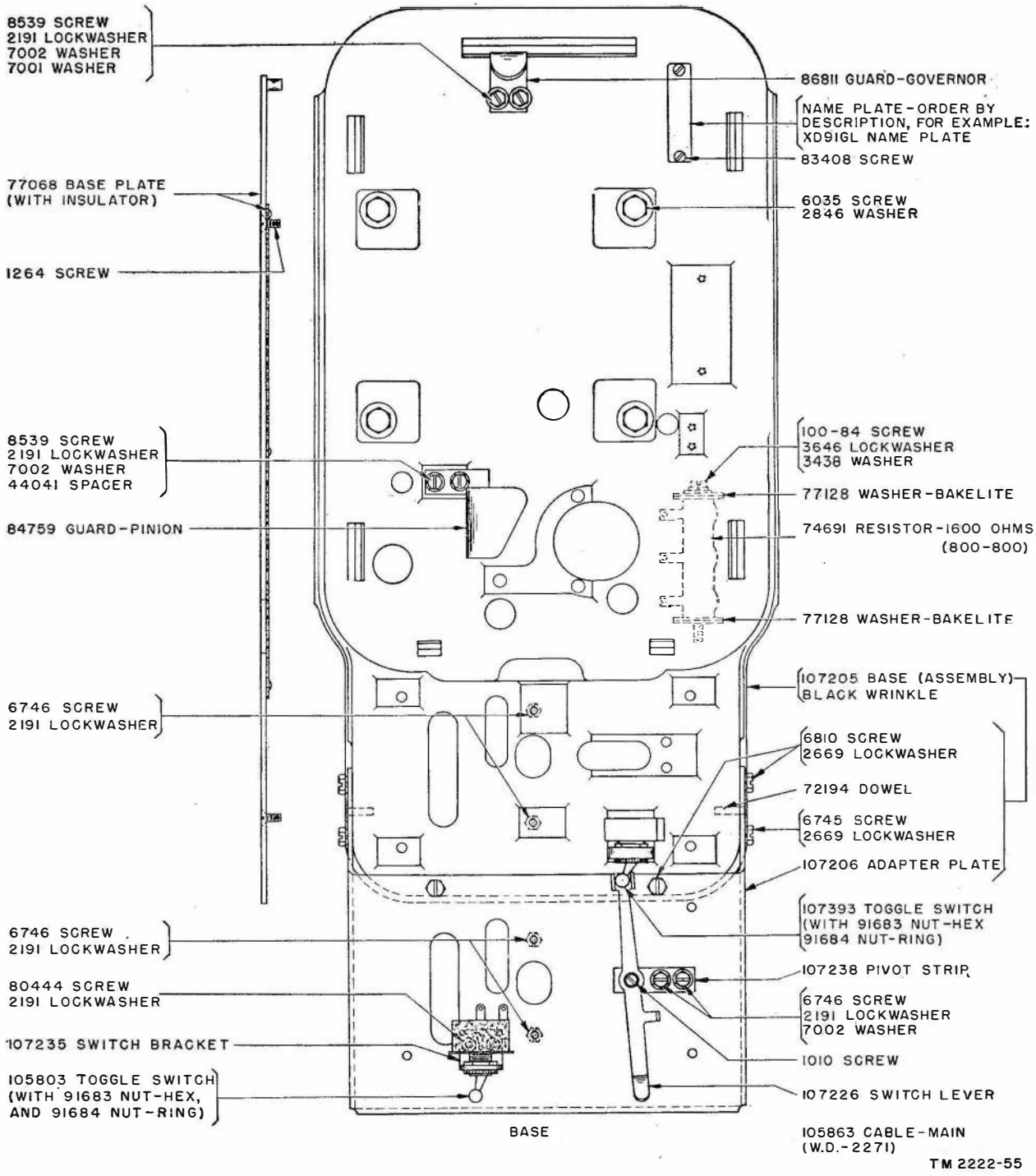


Figure 130. Base assembly (XD91 and XD93) (two-channel).

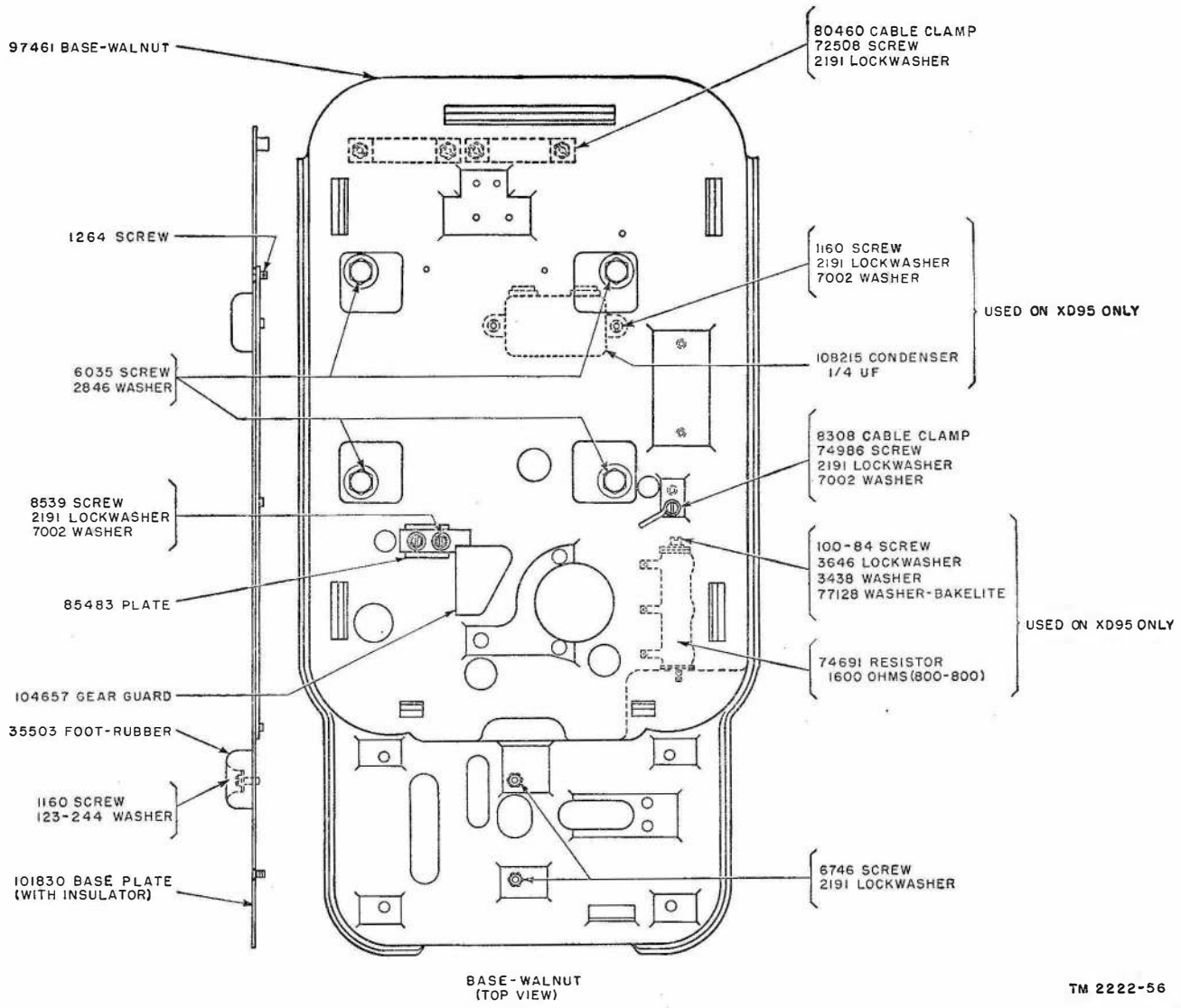
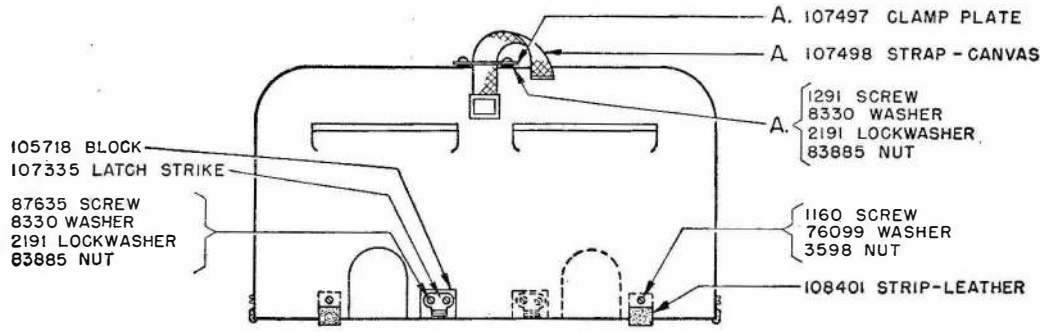
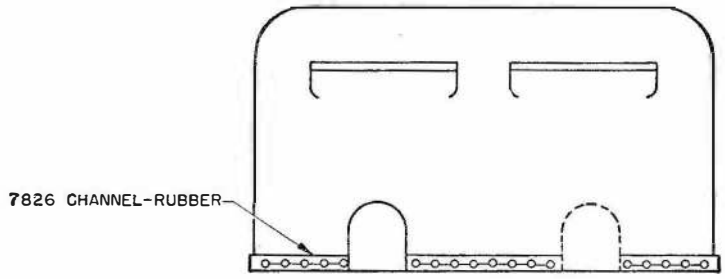


Figure 131. Base and base plate assembly (receiving type).

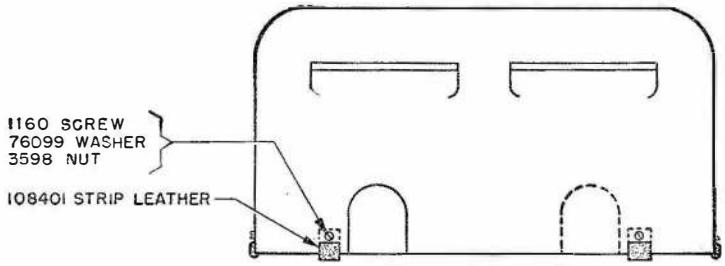


105725 DISTRIBUTOR COVER ASSEMBLY
(BLACK WRINKLE)

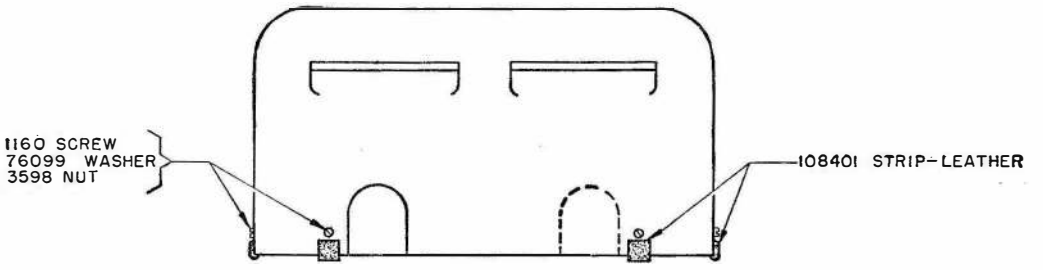
A. THESE PARTS NOT FURNISHED ON EARLY MODEL COVERS.
FOR XD82 TYPE ONLY



OLD STYLE



NEW STYLE
91224 DISTRIBUTOR COVER ASSEMBLY
(BLACK WRINKLE)
FOR XD86 AND XD91 AND XD93 TYPES



80731 DISTRIBUTOR COVER-WALNUT
FOR XD79, XD95 AND XD100 TYPES

TM 2222-52

Figure 132. Distributor cover assemblies.

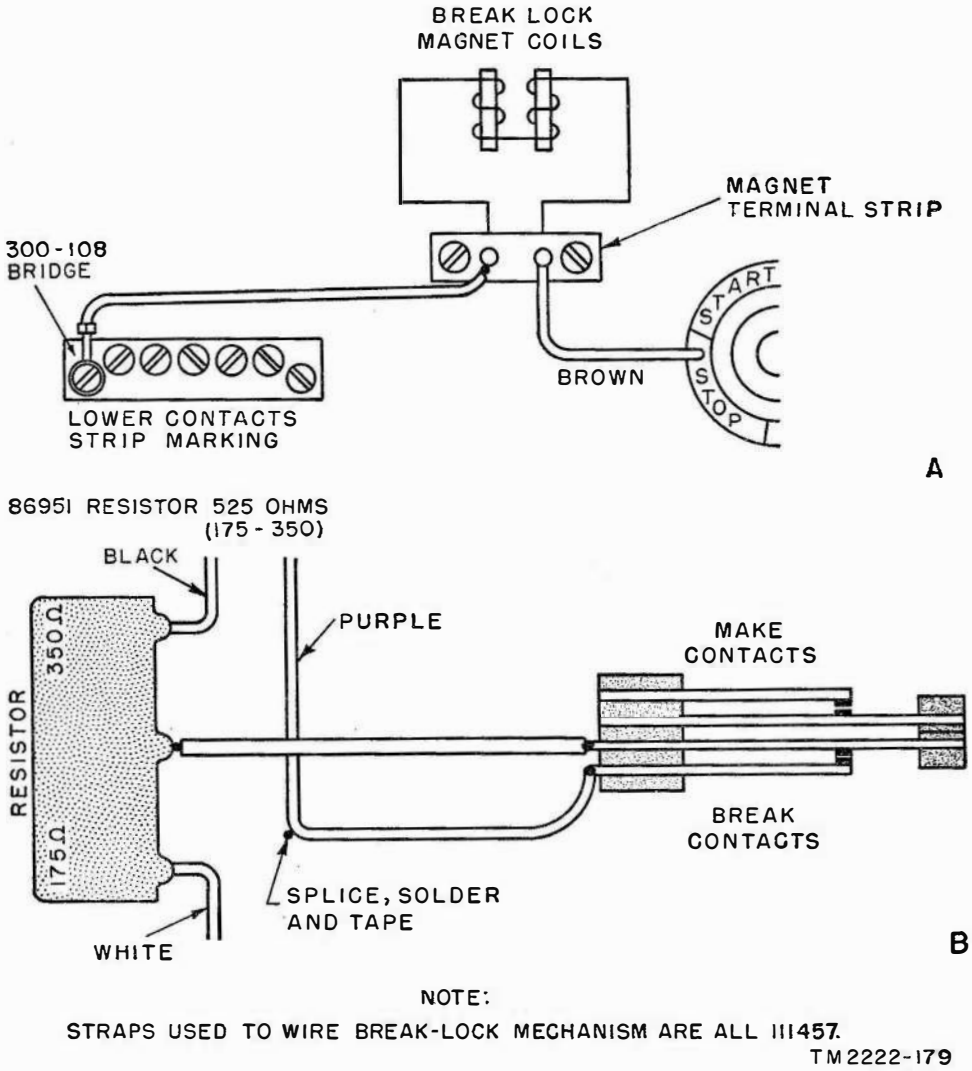


Figure 133. Parts required to connect break-lock mechanism on XD99 type transmitter distributor.

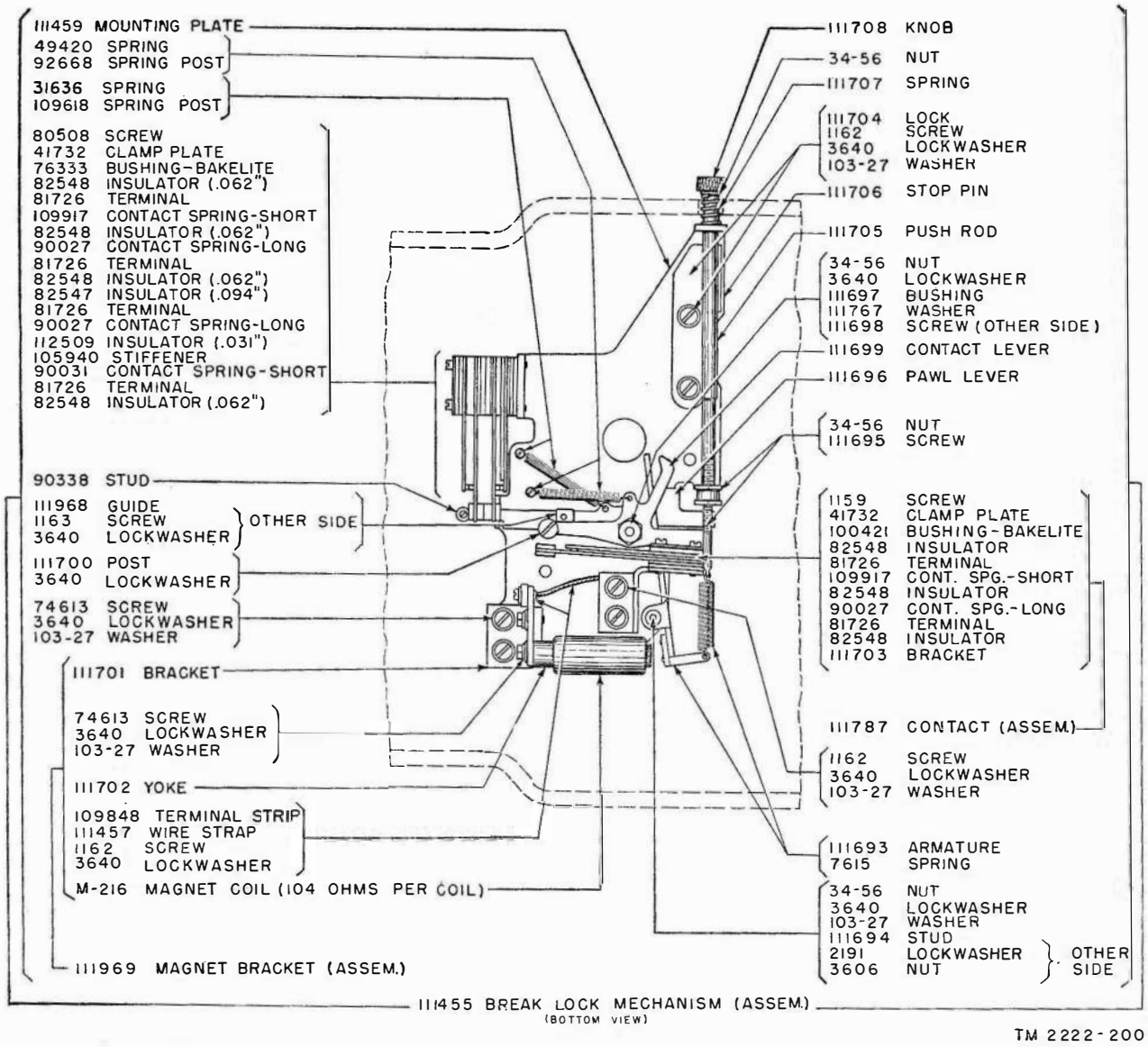


Figure 134. Parts for break-lock mechanism in XD99 type transmitter distributor.

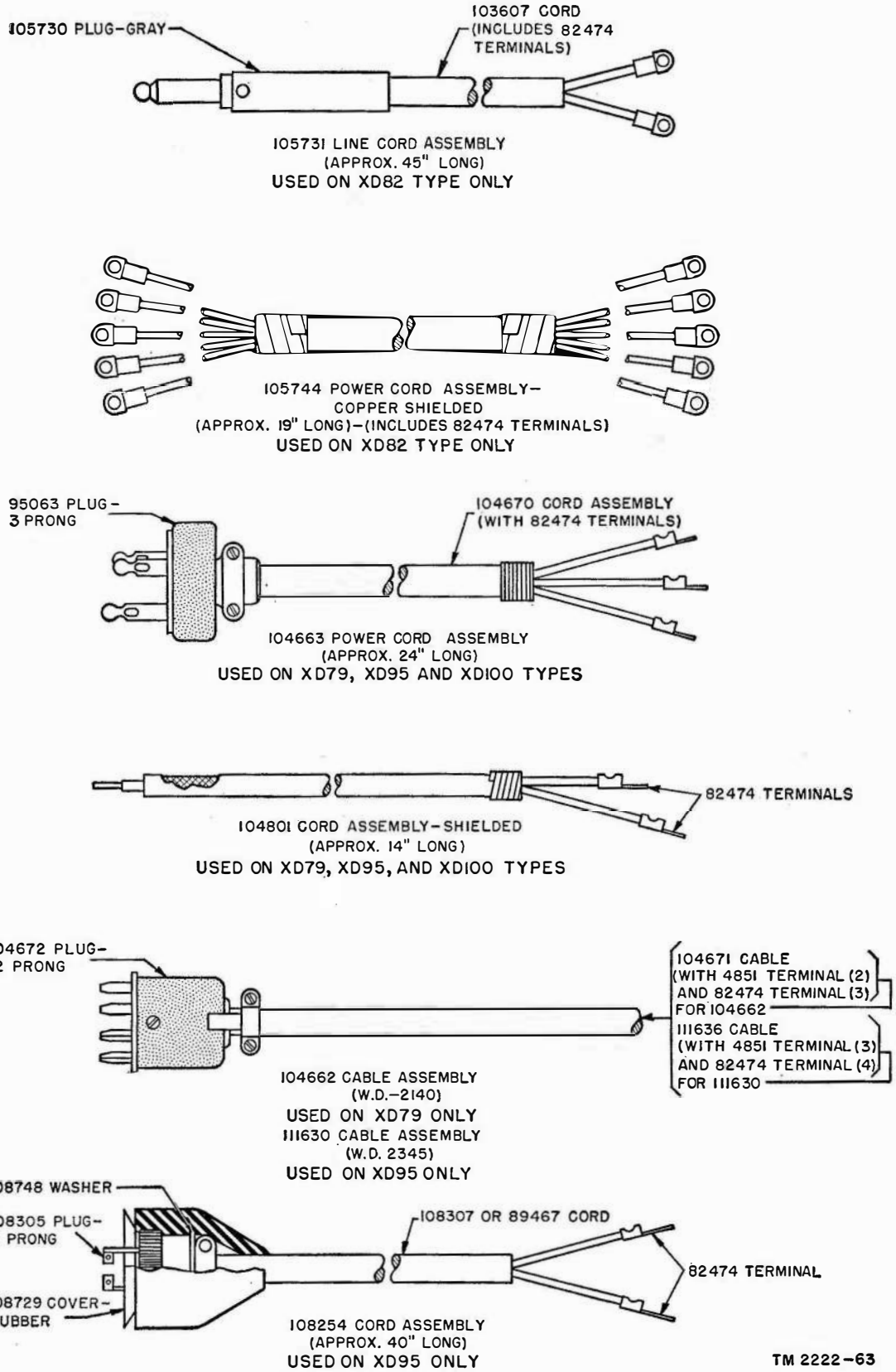


Figure 135. Power and signal cords.

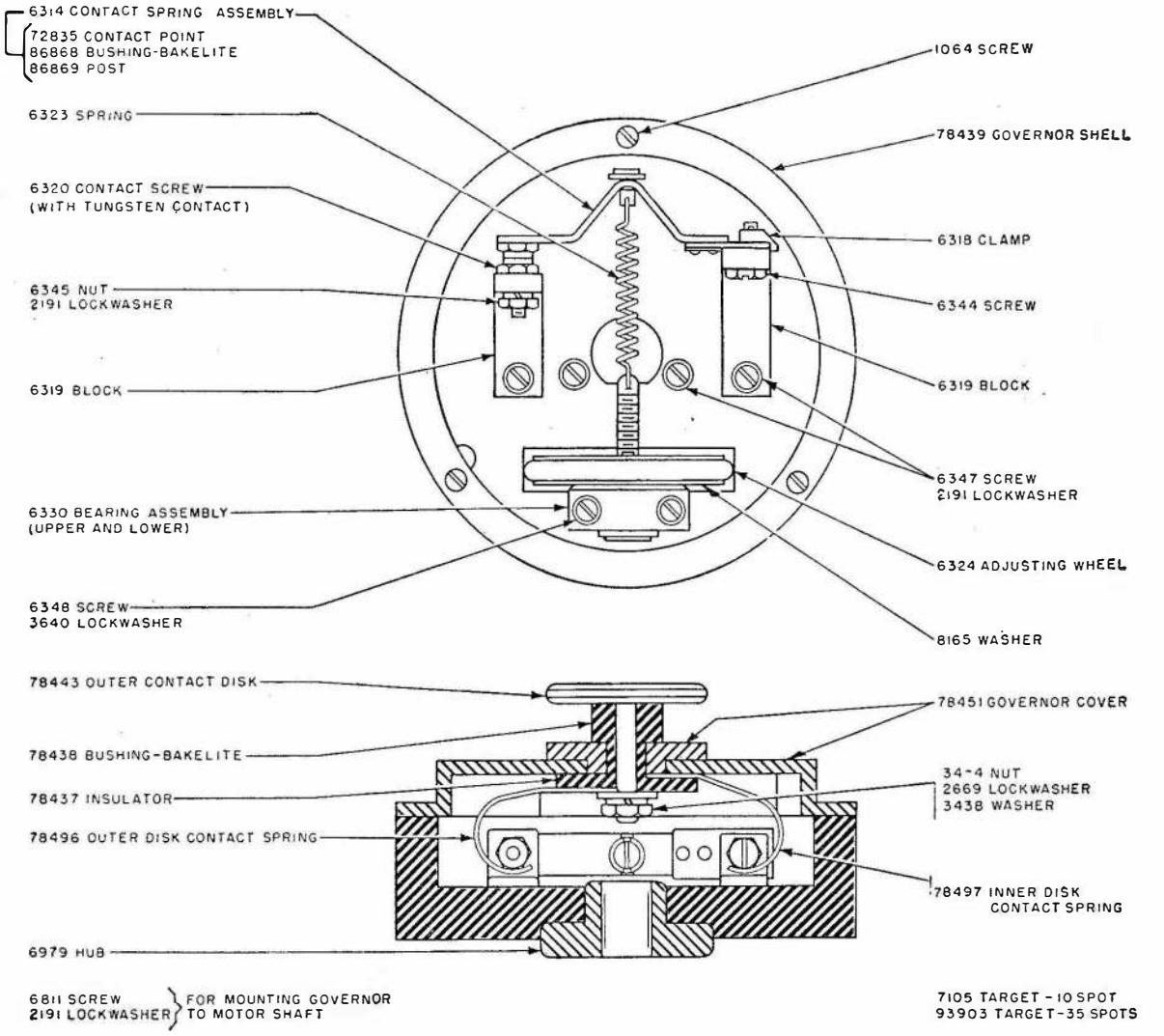


Figure 136. 80352 center contact governor assembly (for all types).

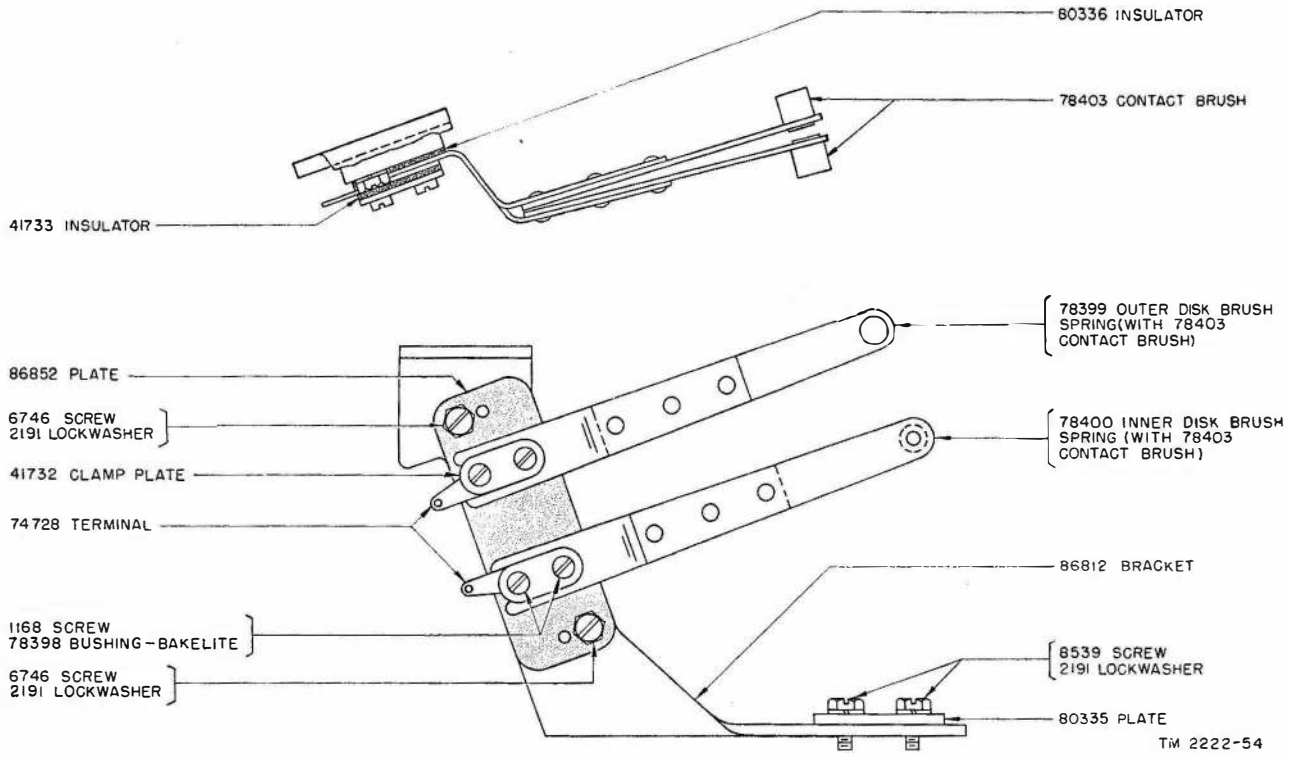


Figure 137. 86853 governor brush bracket assembly (same for all types).

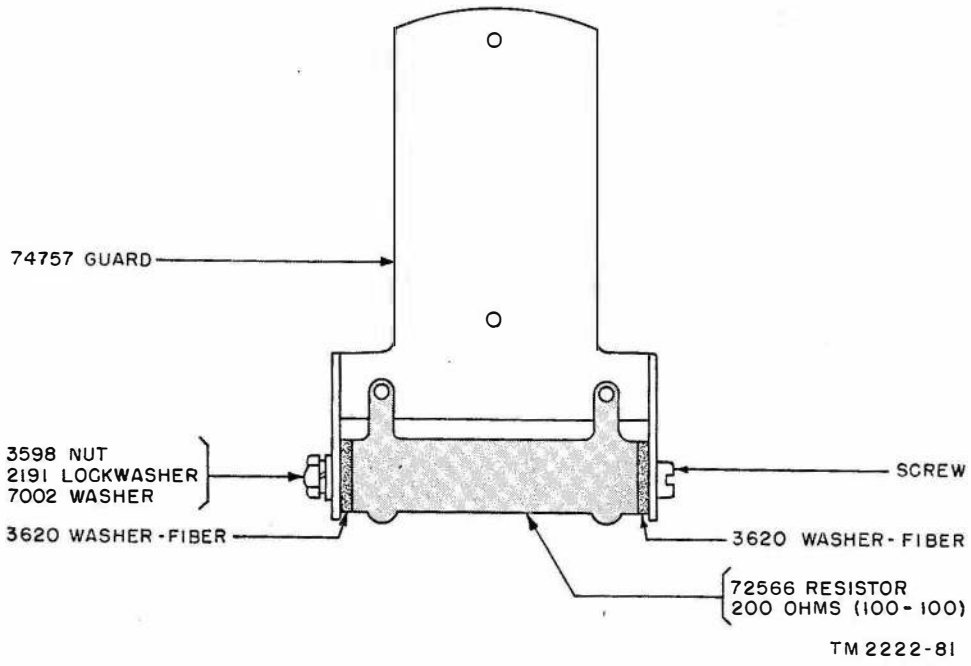


Figure 138. Resistor assembly for all types using EX motor arrangements.

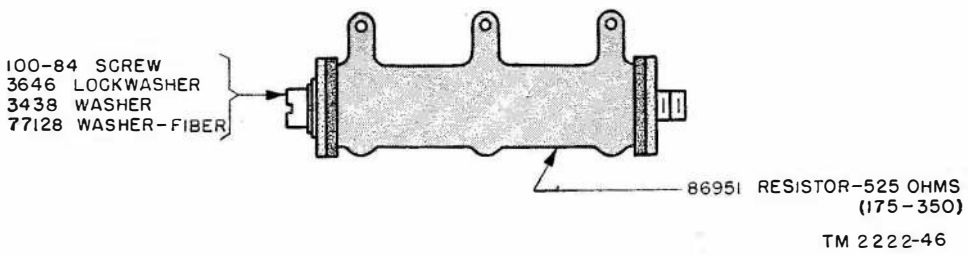
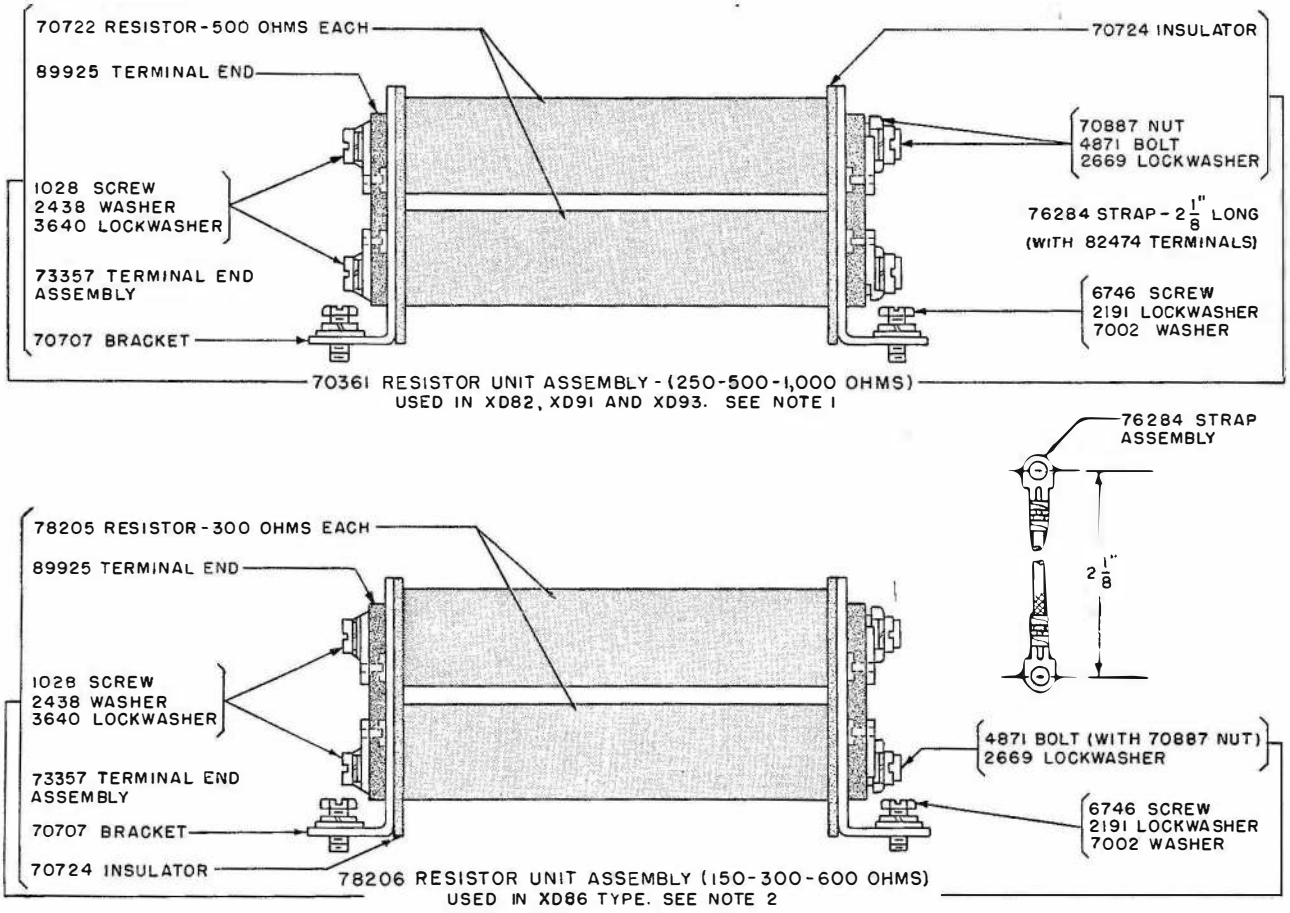


Figure 139. Resistor assembly (XD82 and XD86 types).



NOTES:

1. THE 70361 RESISTOR UNIT ASSEMBLY IS ALSO FURNISHED WITH XD79, XD95, AND XD100 TYPES WHICH HAVE EX MOTOR ARRANGEMENTS.
2. THE 78206 RESISTOR UNIT ASSEMBLY IS ALSO FURNISHED WITH XD79, XD95, AND XD100 TYPES WHICH HAVE EY AND GW MOTOR ARRANGEMENTS.

TM 2222-65

Figure 140. Resistor unit assemblies.

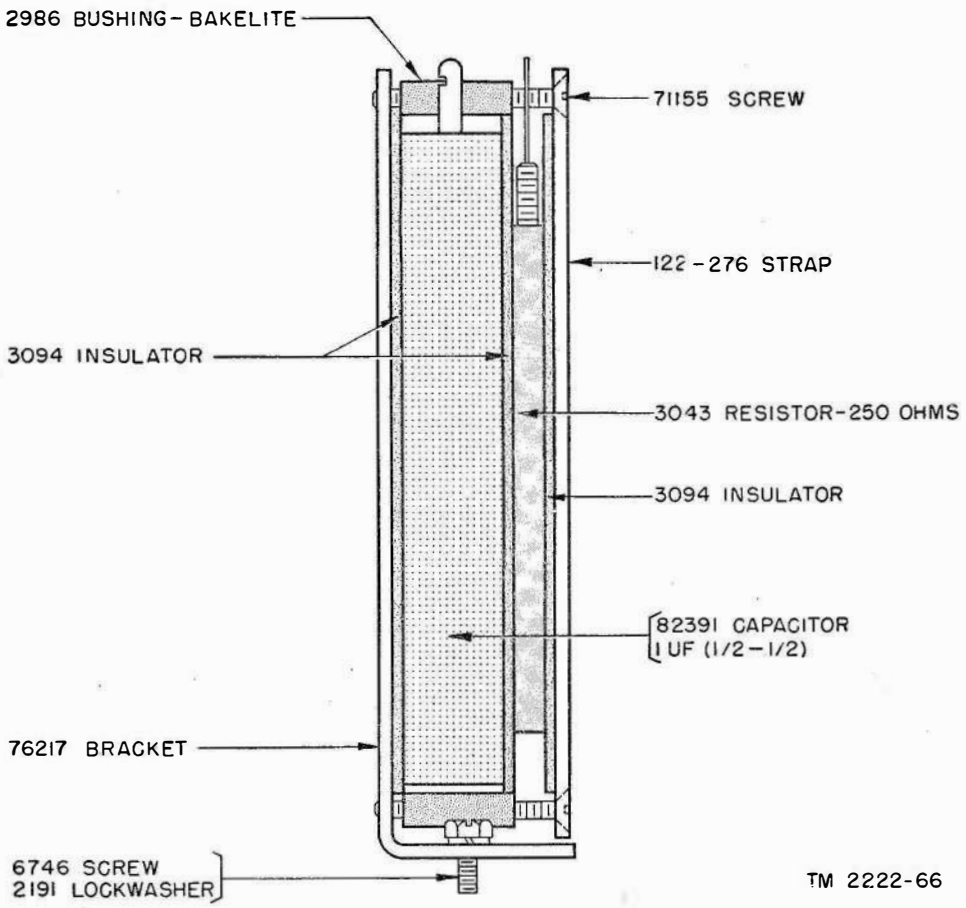


Figure 141. Resistor capacitor assembly for all types.

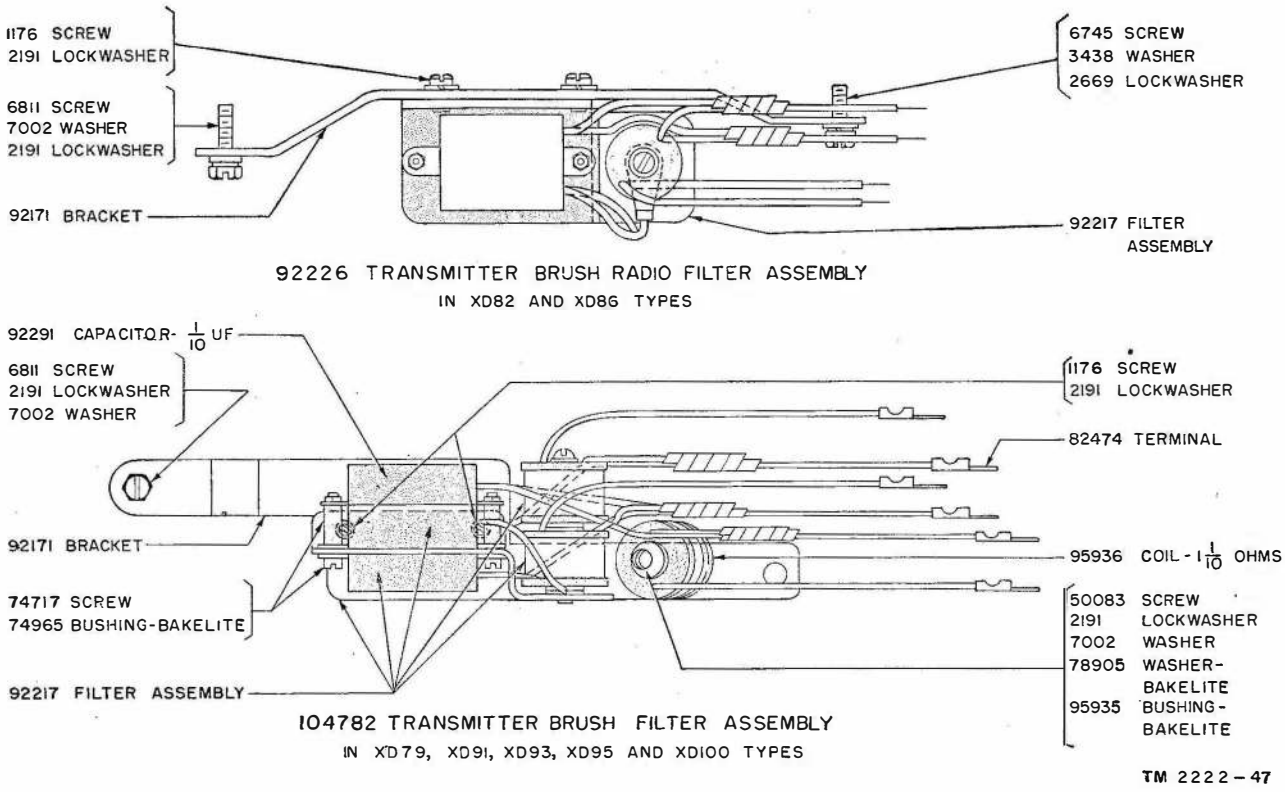
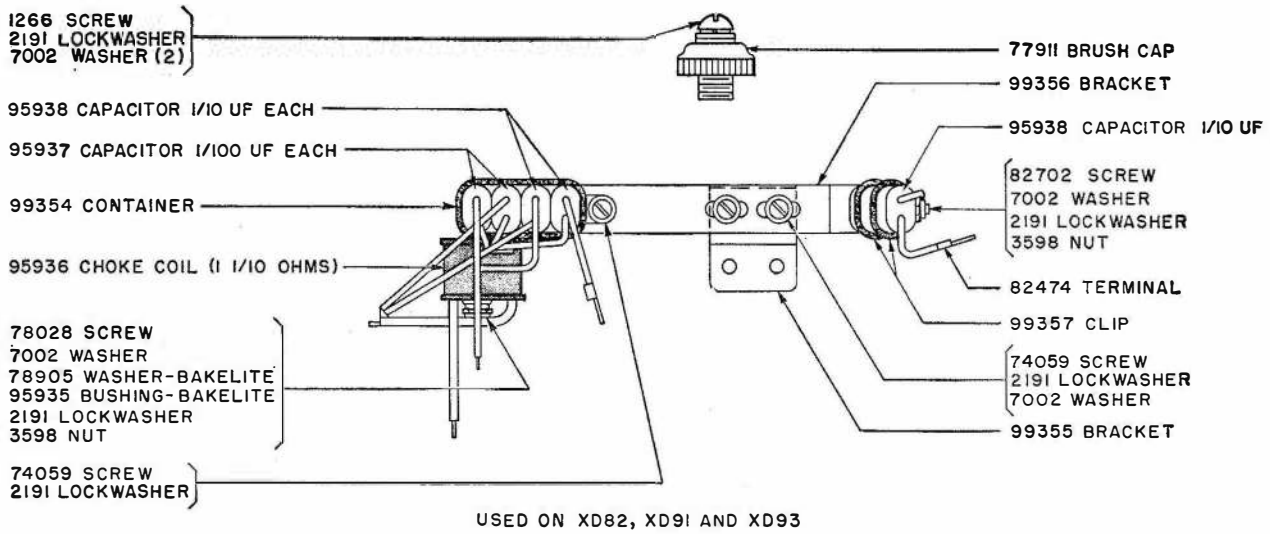
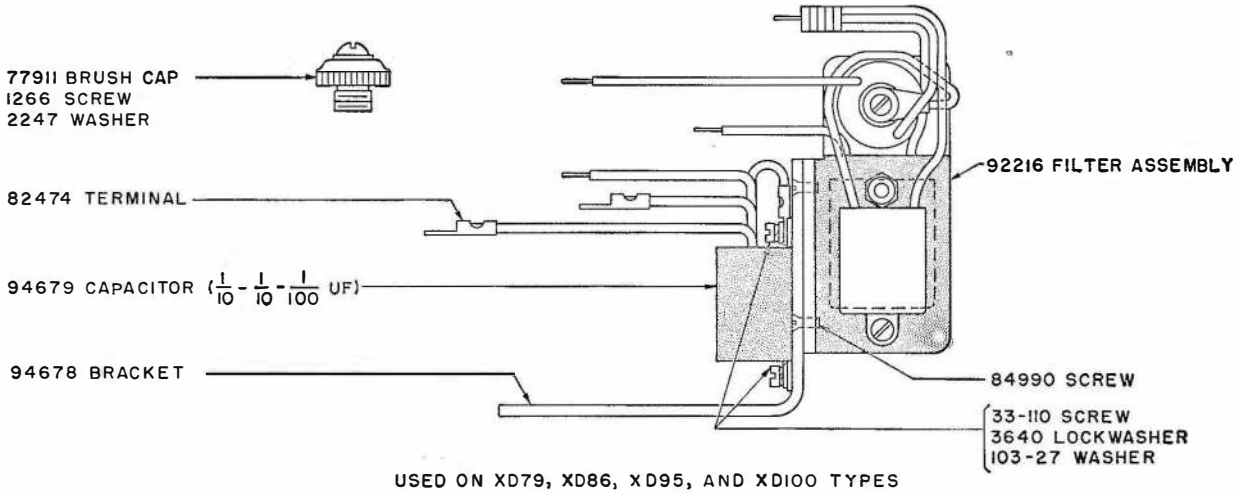


Figure 142. Transmitter brush radio filter assemblies.



USED ON XD82, XD91 AND XD93

105475 MOTOR-GOVERNOR FILTER ASSEMBLY



USED ON XD79, XD86, XD95, AND XD100 TYPES

95326 MOTOR-GOVERNOR FILTER UNIT ASSEMBLY

TM 2222-64

Figure 143. Motor governor filter assemblies.

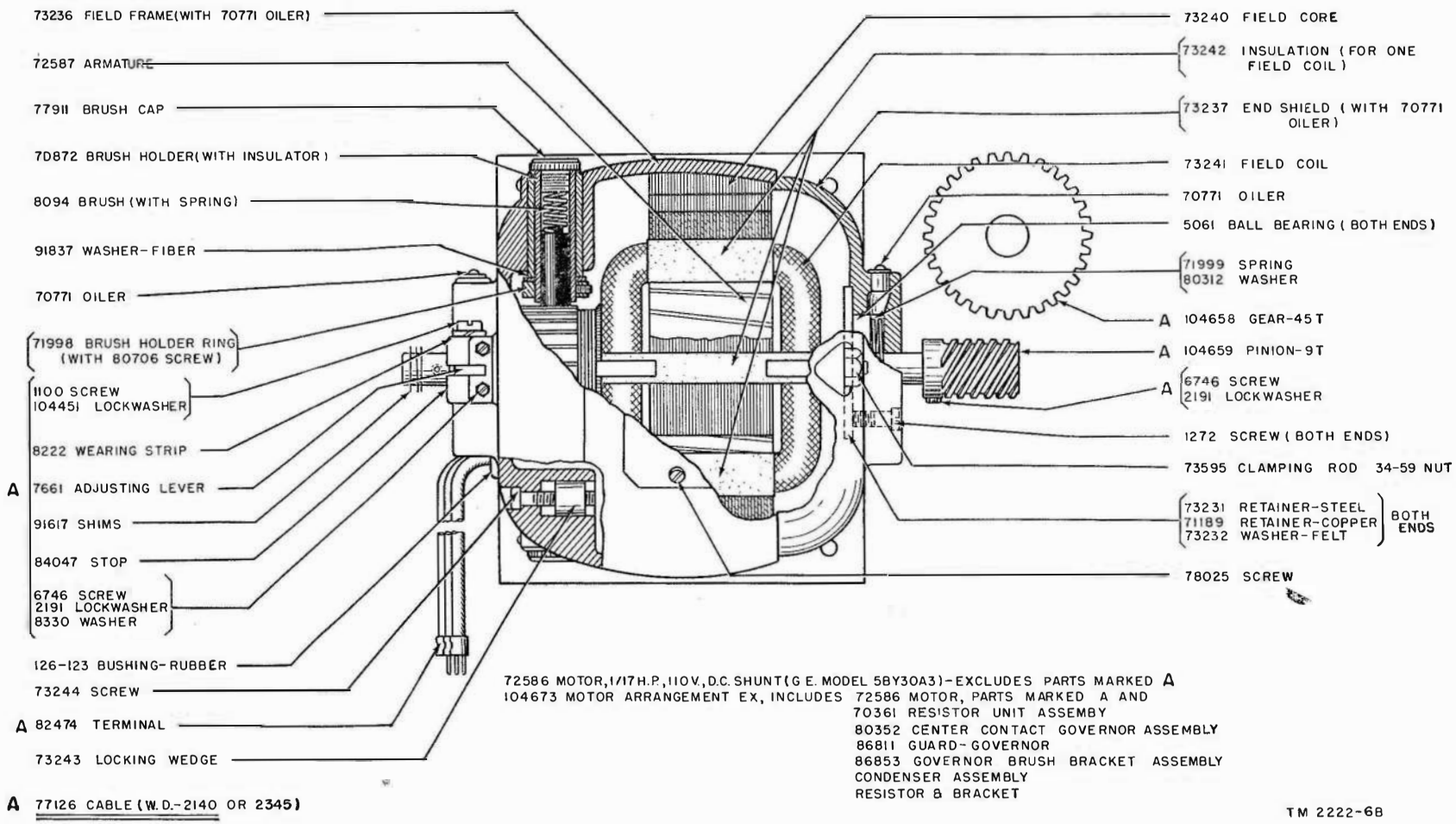
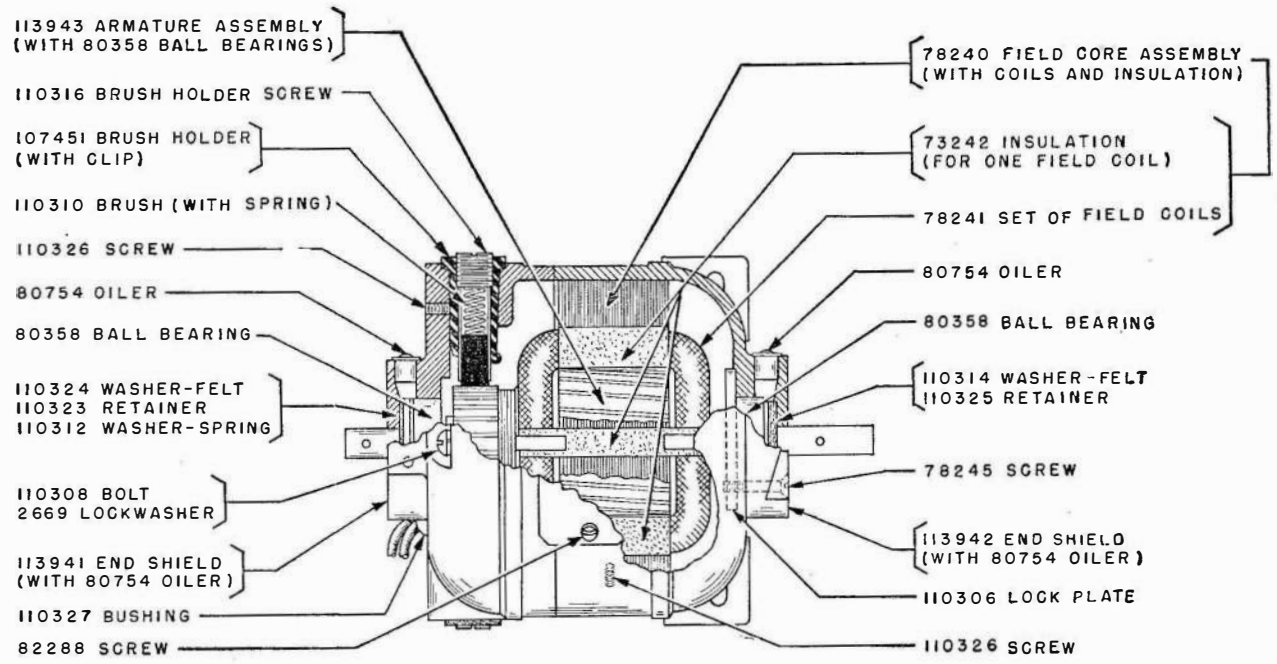


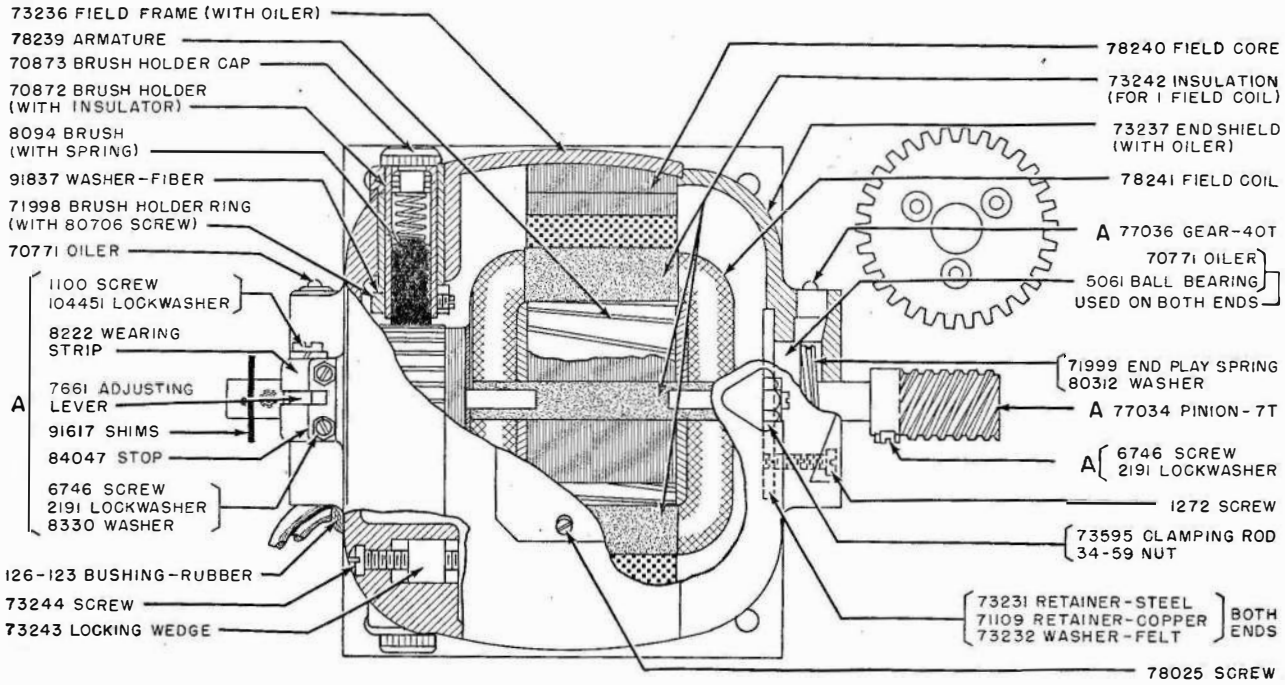
Figure 144. Governed motor; d-c shunt.



(MAY BE FURNISHED AS A SUBSTITUTE FOR 77953)

TM 2222-70

Figure 145. 106875 series motor.



1/25 HP, 110V, 60 CYCLE, AC SERIES (GE MODEL 5BA65AA29)-EXCLUDES PARTS MARKED A

TM 2222-74

Figure 146. 77953 governed motor.

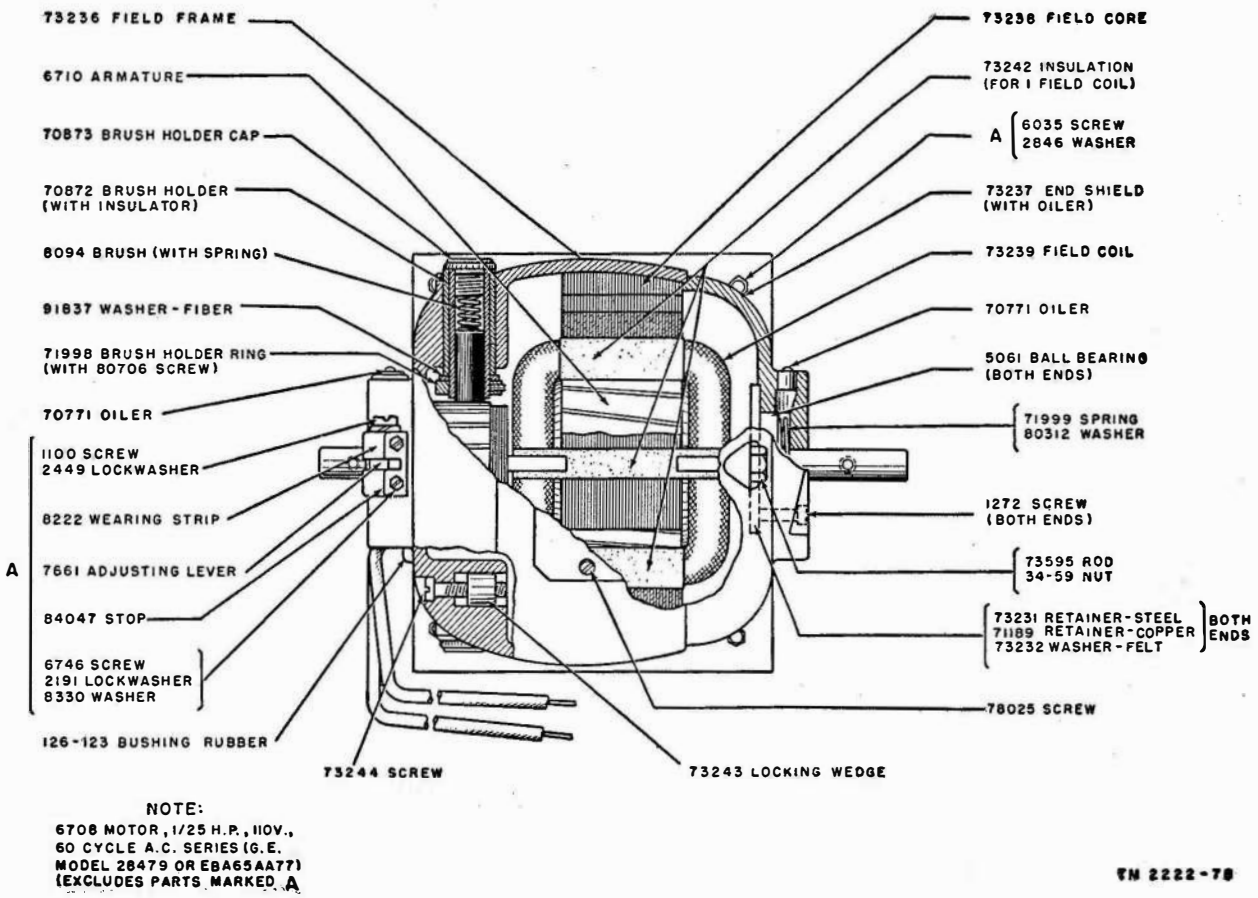


Figure 147. 6708 a-c series motor.

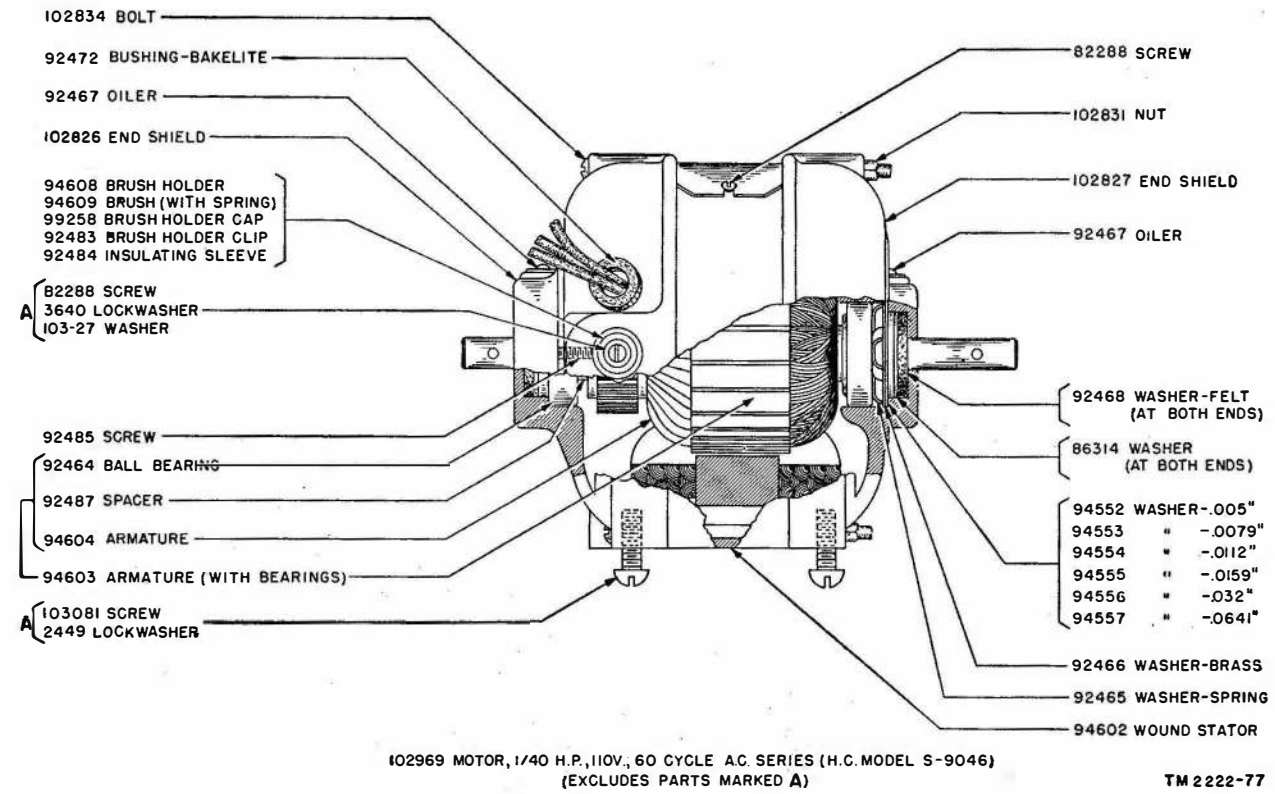


Figure 148. 102969 a-c series motor.

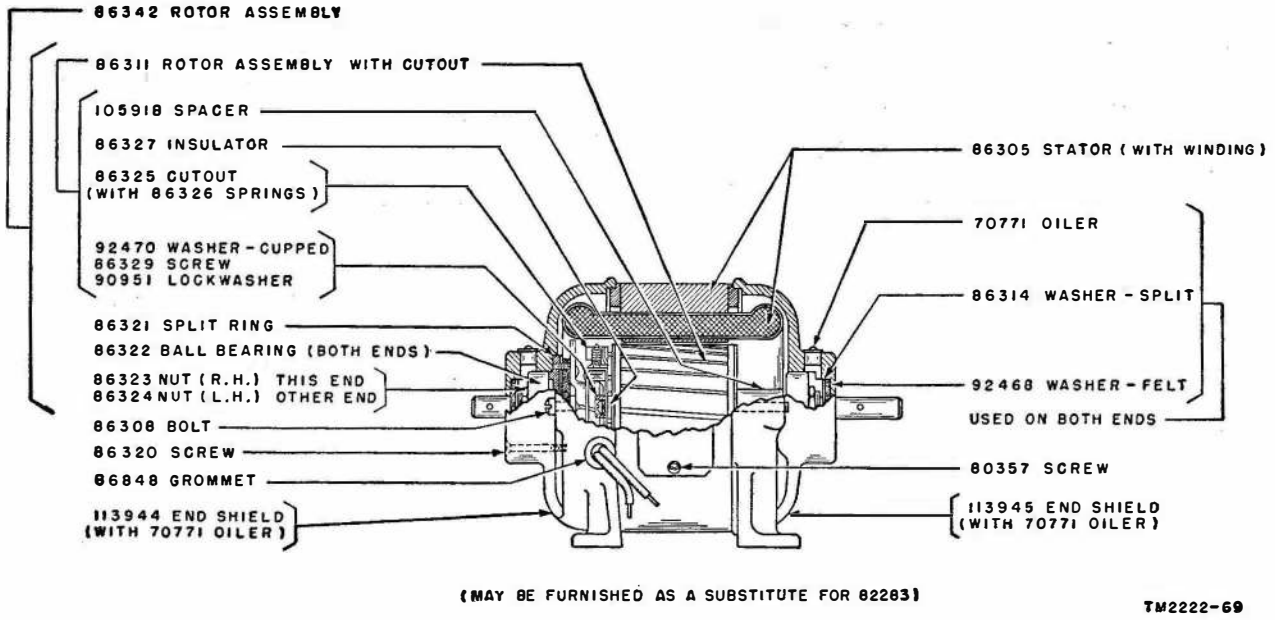
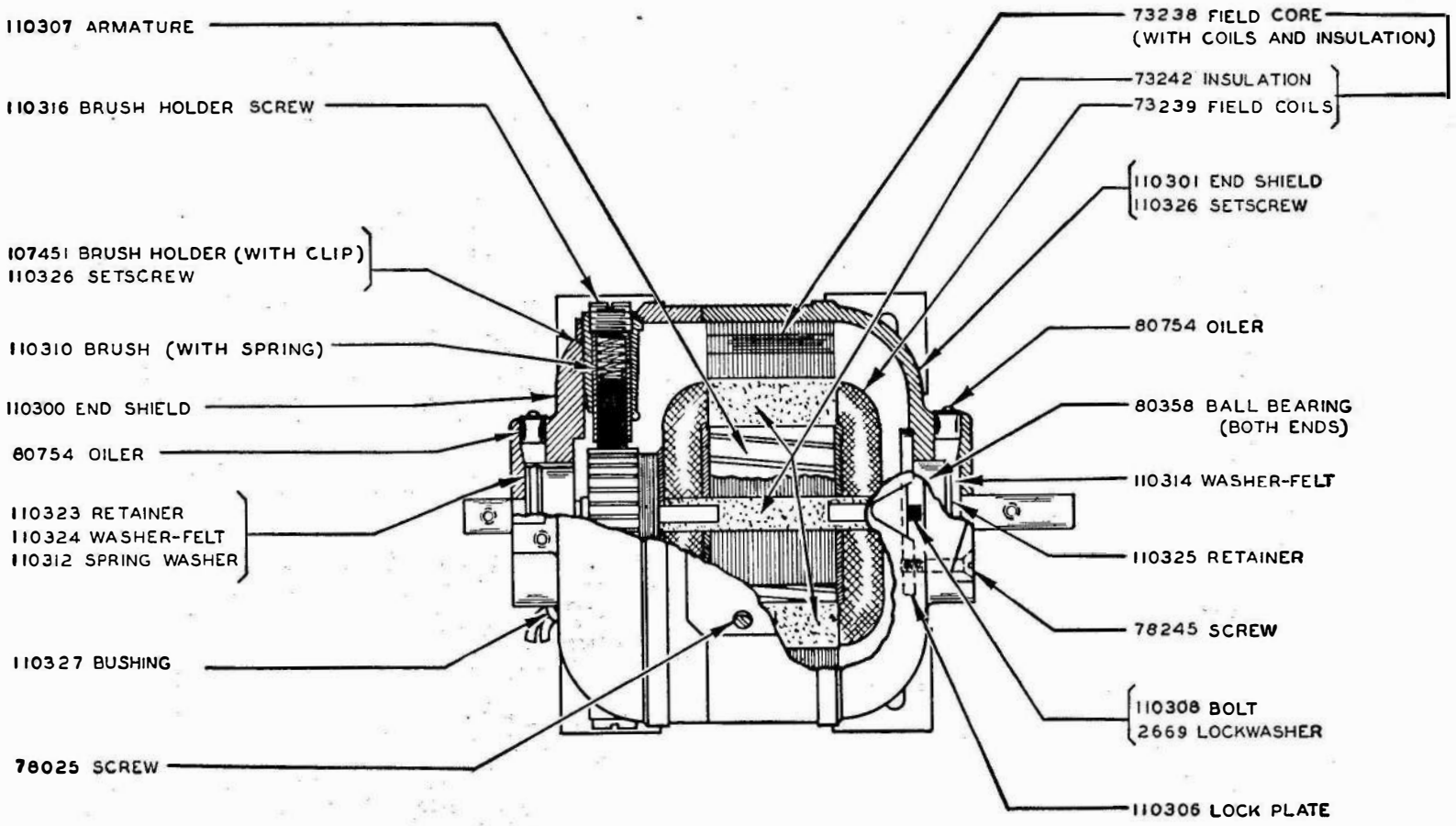


Figure 149. 83799 synchronous motor.



107151 MOTOR, 1/25 HP 115V, 50-60 CYCLE, AC SERIES(ELECTRIC SPRAYIT MODEL S-9058)
THIS MOTOR MAY BE FURNISHED AS AN ALTERNATE FOR 6708 MOTOR. TM 2222-126

Figure 150. 107151 a-c series motor.

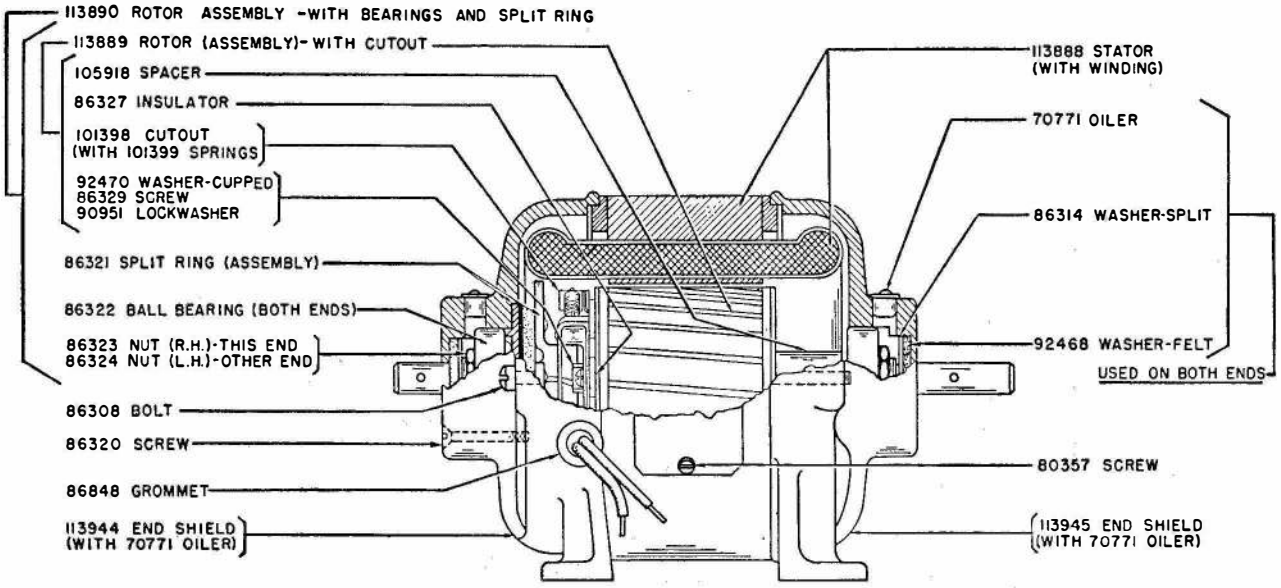


Figure 151. 104061 synchronous motor.

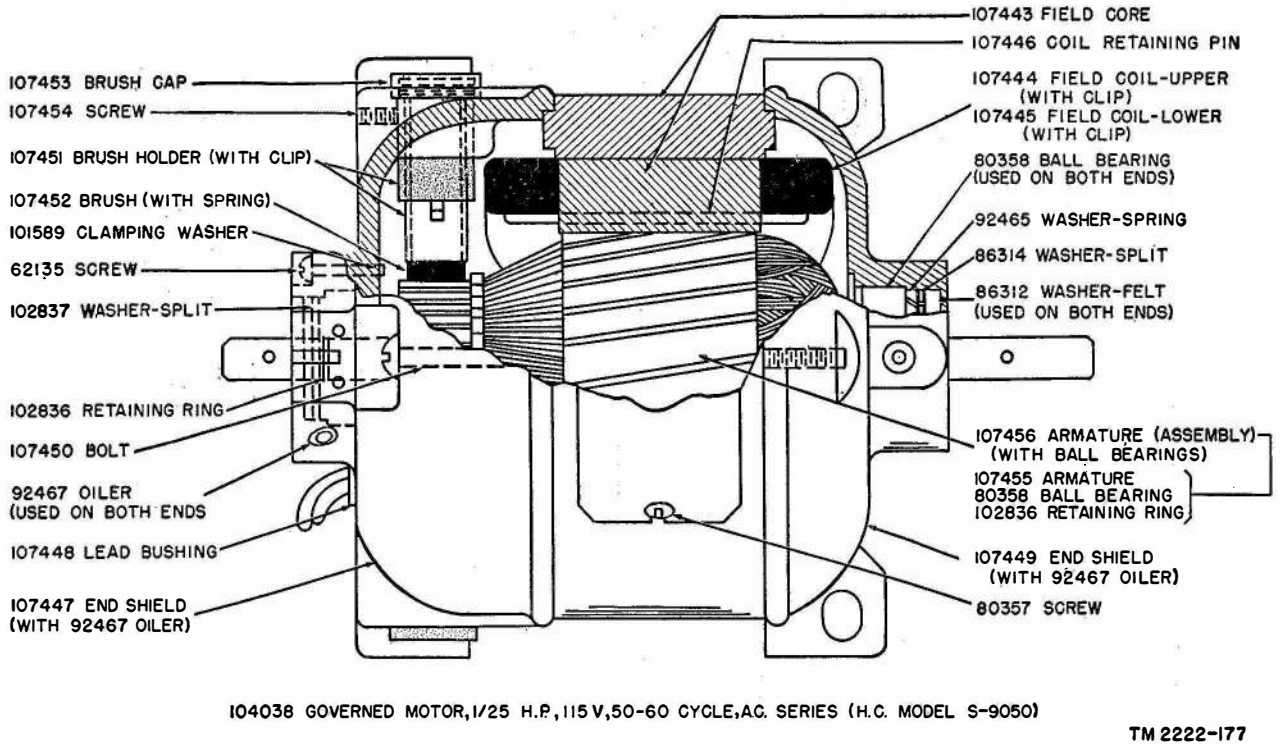


Figure 152. 104038 series-governed motor.

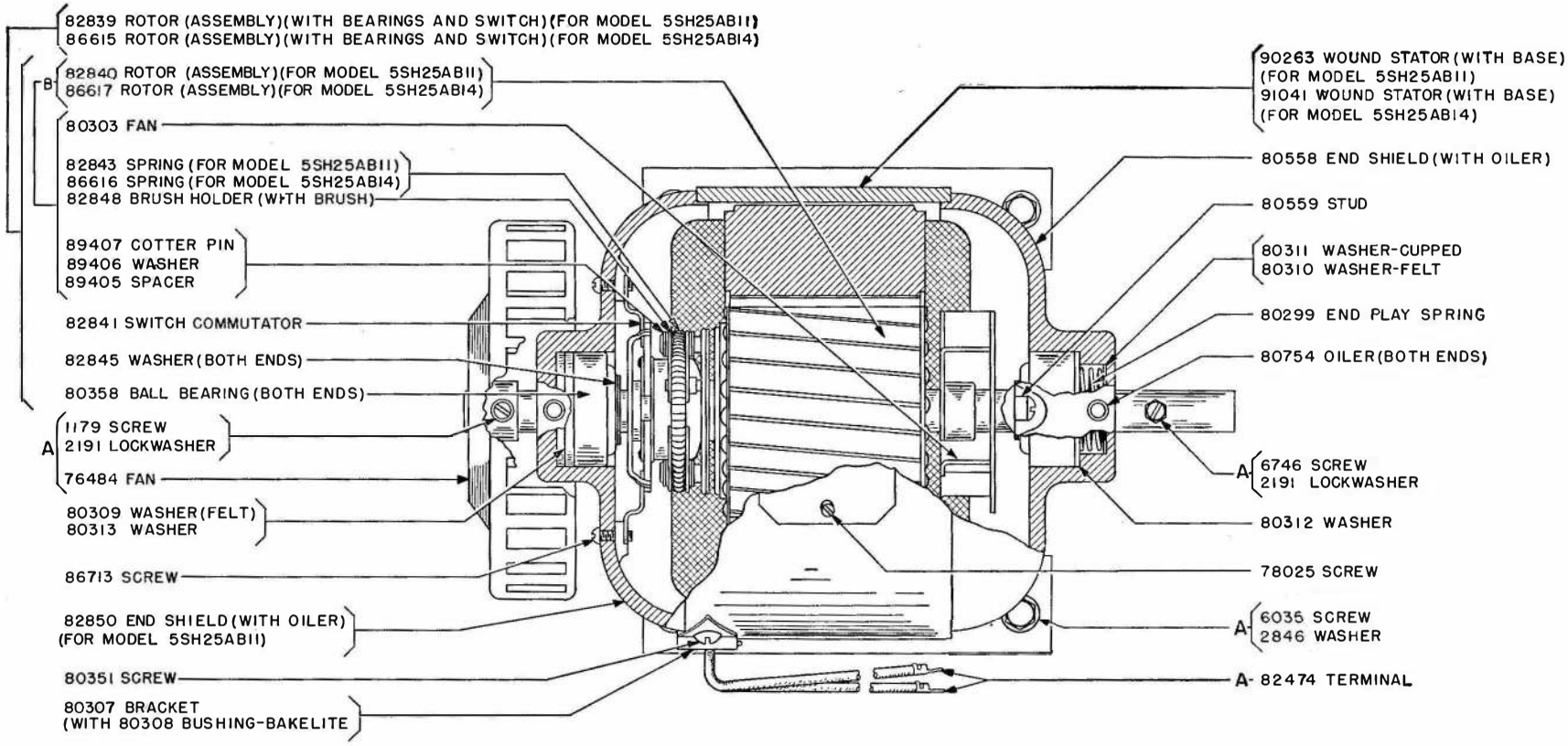


Figure 153. Synchronous motor (General Electric type).

2. Transmitter Distributor TT–52/FG and XD82 Type Transmitter Distributors

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
147	ARMATURE, for 4T6708 motor: 7⅜" lg x 2.355" dia o/a.	Motor rotor	4T6710
144, 146, 147	BRUSH, carbon: w/compression spring; 2$^{3}/_{16}$" lg ⅜" OD.	Motor commutator brush	4T8094
112	BRUSH, electrical contact; .008" nickel silver spring w/graphite contact.	Distributor disk brush	4T93009
112	BRUSH HOLDER: steel, zinc-plated	Holds distributor brushes	4T77057
108	BEARING, ball: steel, 1.0236" OD x 0.315" ID 0.199 thk o/a.	Mounts main shaft	4T72644
145, 150, 152, 153.	BEARING, ball: single row radial; felt seal, one side.	Mounts motor armature	4T80358
136	CONTACT SPRING ASSEMBLY, switch	Motor governor contact assembly.	4T6314
137	CONTACT BRUSH: carbon, copper-plated	Inner and outer disk brush contacts.	4T78403
115	CONTACT PIN: steel	End-of-tape stop contact pin	4T97447
136	CONTACT POINT, screw type: steel screw with tungsten contact.	Motor governor contact point.	4T72835
136	CONTACT SCREW: #6–32 zinc-plated steel screw w/tungsten contact welded to head.	Motor governor contact screw.	4T6320
142	FILTER, suppression: consists of 2 capacitors and 2 brass core coils.	Filters r-f interference developed by transmitting brush.	4T92226
143	FILTER (governed motor assembly): consists of 3 capacitors and 1 brass core coil.	Filters r-f interference caused by governor contacts.	4T95326
137	INNER DISK BRUSH SPRING, with brush: nickel silver or steel w/zinc chromate finish.	Closes circuit to inner disk	4T78400
111	LEVER, operating: nickel finish; 4.677" lg x ½" wd x ⅝" h o/a.	Operates contact and tape-feed levers.	4T77049
114	LID PLATE: for chadless tape	Part of tape-retaining lid	4T72140
114	LID PLATE: for chadless tape	Part of tape-retaining lid	4T99230
147	MOTOR, AC: series-governed; 110 v, $^{1}/_{25}$ hp, 1800 rpm.	Furnishes mechanical power for transmitter distributor.	4T6708
153	MOTOR: 60-cycle synchronous, 110 v	Furnishes mechanical power for transmitter distributor.	4TMU–4
137	OUTER DISK BRUSH SPRING, with brush: nickel silver or steel.	Closes circuit to outer disk	4T78399
114	PIN, straight: steel, bearing plate; $^{9}/_{32}$" lg $^{5}/_{64}$" dia.	Mounts detent roller to detent lever.	4T36–73
140	RESISTOR, 300 ohms: WW, ceramic core	Controls speed of motor	4T78205
121	RESISTOR, 20 ohms: WW, ceramic core	Aids in load compensation	4T82626
122	ROD, tape-stop: steel, nickel plated	Operates tight-tape-stop mechanism.	4T101274

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
113, 114	ROLL, feed: w/ratchet wheel; steel	Feeds tape	4T300–302
113, 114	ROLLER, detent: polished steel detent arm	Equalizes tape feeding	4T300–316
105	SCREW, contact: brass, plain finish; #6–56 thd	Connects contact tongue to line.	4T112–7
136	SPRING, extension: .033" music wire	Tensions governor contact assembly.	4T6323
102	SPRING, flat: .008" steel, approximately 5/16" dia x 9/16" thk o/a.	Tensions feed pawl	4T35–140
153	STATOR, wound: (for synchronous motor) w/base; cast steel housing, black enamel finish.	Motor stator	4T90263
153	SWITCH, commutator	Starting switch for synchronous motor.	4T82841
129	SWITCH, toggle, assembly	Transmission control switch	4T73180

3. Transmitter Distributor TT–26/FG (Two-channel Type)

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
137	ARM ASSEMBLY, contact: nickel silver or steel w/zinc plate, chromate finish.	Makes connection to outer disk.	4T78399
137	ARM ASSEMBLY, contact: nickel silver or steel w/zinc plate, chromate finish.	Makes connection to inner disk.	4T78400
153	ARM ASSEMBLY, contact: centrifugal type	Motor starting, winding brush.	4T82848
113, 314	ARM ASSEMBLY, detent: steel	Equalizes tape feeding	4T300–314
147	ARMATURE ASSEMBLY: motor	Motor rotor	4T6710
144, 146, 147	BEARING, ball: single row, self alining	Mounts motor armature	4T5061
152, 153	BEARING, ball: single row, radial; felt seal	Mounts motor armature	4T80358
113	BEARING, feed roll: steel	Mounts feed roll	4T300–303
103	BLOCK, bearing: lever, 5-unit, soft-iron, zinc plate.	Mounts contact levers	4T300–106
105	BLOCK, screw-mounting: brass, zinc plate; contact screw bridge.	Mounts spacing contact screws.	4T300–108
105	BLOCK, screw-mounting: brass, zinc plate; contact screw bridge.	Mounts marking contact screws.	4T–300–109
117	BOARD, terminal: 6 7/64" dia holes in line for terminals; black bakelite.	Provides connections from contact tongues to distributor disk.	4T300–179
117	BOARD, terminal: special; 6 double solder terminals.	Connection point for contact tongues.	4T9520
113	BRACKET, detent mounting	Mounts detent bracket	4T300–312
106	BRACKET, H-shaped: cast aluminum; right end.	Right mounting for transmitter top plate.	4T300–201
140	BRACKET, resistor mounting: L-shaped	Mounts motor control resistor.	4T70707

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
136	BRACKET, screw mounting	Mounts governor contact and contact assembly.	4T6319
137	BRUSH, electrical contact: carbon, copper plate	Contacts for inner and outer disks.	4T78403
112	BRUSH, electrical contact	Distributor brush (new style).	4T93009
144, 146, 147	BRUSH, electrical contact: carbon; w/compression spring and end cap.	Motor commutator brush	4T8094
144	CAP, contact brush: black bakelite	Holds motor commutator brush.	4T70873 (supersedes 4T77911)
136	CAP, bearing: set of 2; brass	Mounts governor adjusting wheel.	4T6330
146, 147	CAP, contact brush	Brush-holder cap	4T70873
143	CAPACITOR, fixed: paper, 100,000 $\mu\mu$f $\pm$12%; 1200 v d-c test.	In motor governor filter assembly.	4T95938
143	CAPACITOR, fixed: paper, 10,000 $\mu\mu$f +22% —0%; 1200 v d-c test.	In motor governor filter assembly.	4T95937
142	CAPACITOR, fixed: paper, dual section; 500,000 $\mu\mu$f $\pm$10%.	Reduces arcing of governor contacts.	4T82391
136	CLAMP, retainer	Holds governor contact spring assembly.	4T6318
150	COIL, field	Energizes the field core	4T73239
146, 147	COLLAR, locking: eccentric	Brush-holder ring	4T71998
153	COMMUTATOR, steel frame: bakelite insulation; brass commutator segments.	Starting switch commutator	4T82841
136	CONTACT, governor: flat spring	Connects to inner disk	4T78497
111	CONTACT, switch: .012" nickel silver; 1.687" lg x .312" wd.	Part of control relay timing contact.	4T84705
136	CONTACT ASSEMBLY, switch: tungsten contact.	Motor governor contact	4T6314
105	CONTACT ASSEMBLY, switch: screw, brass, five-unit bridge.	Marking and spacing contact bridge assembly.	4T300–107
150	CORE, field	Provides magnetic flux	4T73238
113, 114	COVER, steel	Holds tape in transmitter top plate.	4T97445
153	FAN: w/hub; vane type	Motor fan	4T76484
144, 146, 147, 149, 151.	FITTING, pressure: oiler	Lubrication point	4T70771
144	FRAME, field: w/oiler	Motor stator	4T73236
108	GEAR, helical: bakelite; linen base; 44 spiral teeth.	Main shaft gear	4T87222
108	GEAR, helical: bakelite; fine canvas base; 40 spiral teeth.	Main shaft gear	4T84357
144, 146, 147	GROMMET, rubber: made to fit 7/16" hole	Protects cable to motor	4T126–123

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
103	GUIDE, lever: steel bar; chromate finish	Guides contact levers	4T300–137
144, 146, 147	HOLDER, contact brush: w/brushes	Holds distributor brushes	4T101533
136	HUB, steel: zinc-plated	Mounts motor governor to armature.	4T6979
118	INSULATOR, block: rectangular; black bakelite.	Mounts terminals for connecting to signal and power lines.	4T74569
136	INSULATOR, bushing	Insulates inner and outer contact disks.	4T78438
136	INSULATOR, plate: flat, odd shape; molded black bakelite.	Insulates inner and outer disk contact springs.	4T78437
142	INSULATOR, bushing: headless type; tubular	In transmitter brush filter assembly.	4T95935
142	INSULATOR, bushing: tubular, brown bakelite	Part of transmitter brush filter.	4T74965
112	INSULATOR, bushing: brush holder	Insulates brush holder and brush-holder arm.	4T77048
137	INSULATOR, bushing: black phenol fiber	Insulates inner and outer disk brush springs.	4T78398
116	LATCH, lever	Tape-retaining lid plate	4T300–322
144, 146, 147	LEVER, adjusting: ⅛" steel	Used in adjusting speed of motor.	4T7661
102	LEVER, feed: 5-unit, 1/16" steel	Operates feed wheel ratchet to feed tape.	4T300–128
104	LEVERS #1, #2, #3, #4, and #5: tape contact ea w/armature.	Determine whether impulses are to be marking or spacing.	#1—4T300–170, #2—4T300–171, #3—4T300–172, #4—4T300–173, #5—4T300–174
147	MOTOR, governed: 1/25 hp, 110 v, 50/60 cyc ac; GE model 5BY65AA77.	Furnishes mechanical power to drive transmitter distributor.	4T6708
102	PAWL, feed: steel, nickel finish	Operates feed roll ratchet to feed tape.	4T300–181
114	PIN, straight: steel, bearing plate	Mounts detent roller	4T36–73
144, 146, 147	PLATE, thrust	Motor wearing strip	4T8222
114	PLATE, top: w/wearing strip; 5-unit	Transmitting top plate and tape guide.	4T300–301
116	PLATE, retainer: T-shaped	Lid holder	4T300–319
113, 114	PLATE, retainer: .050" steel	Tape lid plate	4T99230
147	PLATE, retainer: copper	Motor bearing retainer	4T71189
144	PLATE, retainer: stainless steel	Motor bearing retainer	4T73231
140	RESISTOR ASSEMBLY, fixed: two WW units, ea 250–500–1000 ohms.	Controls motor speed	4T70361
140	RESISTOR, fixed: WW; 500 ohms ±10%	Motor control	4T70722

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No
144	ROD, tie	Motor clamping rod	4T73595
116	ROLLER, guide: polished steel	Detent roller	4T300–316
111	ROLLER, guide: steel	Operating lever	4T2084
136	SCREW, adjusting: brass, polished	Outer contact disk	4T78443
114	SHAFT, steel: 1.03″ lg x .0937″ dia	Mounts tape retaining lid	4T300–320
114	SHAFT, steel: 3 spring armature	Mounts tape retaining lid latch.	4T36–51
103	SHAFT, tape contact lever	Mounts contact levers	4T300–121
144	SHIELD, end: with 70771 oiler	Motor stator	4T73237
146	SHIM, governor: steel, 3/8″ ID x 13/16″ OD x .012″ thk.	Takes up armature end play	4T91617
136	SPRING, contact: governor, flat	Connects to outer disk	4T78496
153	SPRING, extension: .012″ music wire	Governs operation of centrifugal switch.	4T82843
136	SPRING, extension	Tensions governor contact spring assembly.	4T6323
153	SPRING, compression: .073″ dia music wire	Takes up armature end play	4T80299
113, 114	SPRING, compression: detent	Tensions detent lever	4T35–33
110	SPRING, extension: .016″ music wire	Connects contact tongue to terminal.	4T101714
113, 114	SPROCKET, tape: w/ratchet wheel; steel; 12 teeth.	Feeds tape	4T300–302
141	STRAP, mounting: steel, zinc-plated	Capacitor retainer	4T122–276
142	SUPPRESSOR, electrical noise: 3 capacitors, 3 brass retardation coils.	Filter at transmitting brushes.	4T104782
130	SWITCH, toggle: DPST	Motor ON—OFF switch	4T105803
130	SWITCH, toggle: SPST; 3 amp, 250 v, 6 amp, 125 v.	Arranges transmitter distributor for single or double channel operation.	4T107393
136	TARGET, governor flywheel: 10-spot	Used in determining speed of motor.	4T7105
110	TONGUE, contact: nickel silver; 1.052″ lg .385″ wd x .250″ d o/a; special.	Makes connection to line	4T77030
136	WHEEL ASSEMBLY: governor adjusting	Controls tension on governor contact spring assembly.	4T6324
153	WASHER, flat: black felt	Grease retainer	4T80310

4. Receiving Type Transmitter Distributors

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
147	ARMATURE, motor: for 4T6708 motor	Motor rotor	4T6710
146	BEARING, ball	Mounts motor armature	4T5061
108	BEARING, ball	Mounts main shaft	4T72644
137	BRUSH, electrical contact	Inner and outer disk contacts	4T78403
144, 146, 147	BRUSH, electrical contact: carbon w/spring	Motor commutator brushes	4T8094
131	BUMPER, rubber	Cushion on base plate	4T35503
99, 135	CABLE ASSEMBLY: 12-prong plug	Power and signal cord	4T111630
99, 135	CABLE ASSEMBLY: 2-prong plug, polarized	Power cord	4T108254
99, 135	CABLE ASSEMBLY: 3-prong plug; 24" lg	Power cord	4T104663
99, 141	CAPACITOR, fixed: 1 μf (½-½)	Used with GW motor arrangement.	4T82391
109	COIL, solenoid: electromagnet; single winding, 115 ohms.	Start magnet coil	4T197M
110	CONTACT TONGUE	Determines type of signal transmitted.	4T77030
136	CONTACT SPRING	In motor governor contact assembly.	4T6314
136	CONTACT SCREW	Part of motor governor	4T6320
131	CAPACITOR, fixed: ¼ μf	Dissipates induced voltage	4T108215
108	GEAR, helical: fiber, 45 teeth	Main-shaft gear	4T104658
108	HUB, bakelite	Mounts operating cam on main shaft.	4T105150
137	INNER DISK BRUSH SPRING, with brush: nickel silver or steel w/zinc chromate finish.	Closes circuit to inner disk	4T78400
112	INSULATOR, bushing	Insulates end-of-tape stop contacts.	4T76246
112	INSULATOR, bushing: bakelite	Insulates brush holder	4T77048
137	INSULATOR, bushing	Insulates inner and outer disk brush springs.	4T78398
115, 137	INSULATOR, strip	Insulates end-of-tape stop contacts and inner and outer disk brush springs.	4T41733
102	LATCH, lever	Operates feed roll to feed tape.	4T300–181
147	MOTOR, AC: series-governed; 110 v, 50/60 cyc, 1/25 hp.	Furnishes mechanical power to drive transmitter distributor.	4T6708
137	OUTER DISK BRUSH SPRING, with brush: nickel silver or steel.	Closes circuit to outer disk	4T78399
141	RESISTOR, fixed: 250 ohms	Used in GW motor arrangement.	4T3043
131	RESISTOR, 1600 ohms: center-tapped	Dissipates induced voltage	4T74691

Fig. ref.	Name of part and description	Function of part	Signal Corps stock No.
140	RESISTOR, fixed: WW; 300 ohms	Controls motor speed	4T78205
113, 114	ROLLER, feed	Feeds tape	4T300–302
116	SCREW, adjusting: 4–40 x 3/8"	Adjusts adjusting lever	4T1086
144	SCREW, pilot: 1/4–32	In governor adjusting lever	4T1100
113, 114	SHIM: steel; .500" lg x .250" wd x .002" thk	Positions wearing strip	4T72069
113, 114	SPRING, compression	Tensions detent lever	4T35–33
113, 114	SPRING, torsion	Latch spring in retaining lid assembly.	4T35–137
102	SPRING, flat	Feed pawl spring	4T35–140
136	SPRING, extension	Tensions governor contact assembly.	4T6323
144	SPRING, compression	Takes up end play in motor armature.	4T71999
136	SPRING, flat: outer disk contact	Part of motor governor	4T78496
136	SPRING, flat: inner disk contact	Part of motor governor	4T78497
110	SPRING, extension	Tensions contact lever	4T101714
107	SPRING, torsion	Tension for armature lever	4T104538
123	SPRING, extension	In tape suppression mechanism-right bracket.	4T74709
120	SPRING, extension	Tensions clutch lever assembly.	4T74962
108	SPRING, flat: friction	Maintains pressure on friction clutch.	4T76086
102	SPRING, extension	Tensions tape-feed lever	4T4708
142	SUPPRESSOR, electrical noise	Transmitter brush filter	4T104782

5. Break-Lock Mechanism in XD99 Type Transmitter Distributor

Note. Refer to figure 134 for all parts listed in this paragraph.

	Name of part and description	Function of part	Signal Corps stock No.
	SUBASSEMBLY: break-lock mechanism; part of XD99 transmitter distributor; 6 1/4" lg x 2 1/2" wd x 2" h.	Break-lock mechanism	4T111455
	BOARD, terminal: 2 solder lug term.; 1 7/32" lg x 5/16" wd x 3/32" thk.	Provides connections to solenoid coil.	4T109848
	BRACKET: irregular L shape; 1 3/4" lg x 3/8" h x 9/16" wd.	Locking device for push rod	4T111704
	BUSHING: female; 7/16" lg x 3/8" OD x 5/32" ID; shoulder 1/4" lg x 7/32" OD; threaded portion 1/8" lg x 1/4–32 thd.	Positions contact lever	4T111697
	CAM: bakelite; 1" dia x 23/32" h; L-shaped indentation.	Operates contact lever	4T111456

Name of part and description	Function of part	Signal Corps stock No.
COIL, solenoid: d-c resistance 104 ohms; operating current .025 to .030 amp at 115 v dc; 1¼" lg x ¾" OD.	Magnet coil	4T216M
CONTACT, switch: 11/32" wd x 2 1/16" lg x 1/16" thk.	Opens and closes the circuit	4T90027
CONTACT, switch: spring leaf type; 1 9/16" lg x ⅜" wd x 1/16" thk.	Opens and closes the circuit	4T90031
CONTACT, switch: spring leaf type; 1 9/16" lg x ⅜" wd x 1/16" thk.	Opens and closes the circuit	4T109917
GUIDE, pawl: U shape; ½" lg x ¼" wd x 9/32" h.	Guides pawl lever into position.	4T111968
INSULATOR, bushing: round; bakelite; ⅝" lg; 3/32" OD x .130" ID x .037" thk.	Insulates mounting screw from contacts.	4T76333
INSULATOR, bushing: round; bakelite; 3/32" OD x .130".	Insulates mounting screw from contacts.	4T100421
INSULATOR, plate: oblong shape; 1 1/16" lg x 5/16" wd x .094" thk.	Separates switch contacts	4T82547
INSULATOR, plate: oblong shape; fiber; 1 1/16" lg x 5/16" lg x 1/16" thk.	Separates switch contacts	4T82548
INSULATOR, plate: oblong shape; fiber; 1 1/16" lg x 5/16" wd x .031".	Separates switch contacts	4T112509
KNOB: round; steel, nickel finish; .156" dia shaft; #5-40; 9/32" dia x 5/32" h; diamond knurled sides.	Part of disabling push rod	4T111708
LEVER: steel, zinc plate, chromate finish; 3" lg x 9/16" wd x ⅛" thk.	Makes and breaks switch contacts.	4T111696
LEVER: steel, zinc plate, chromate finish; 2" lg x 5/16" wd x 5/64" thk.	Makes and breaks switch contacts.	4T111699
NUT, hexagon: #6-40, NF-2; .250" across flats		4T3606
NUT, hexagon: #4-40, NC-2; ¼" across flats		4T34-56
NUT, hexagon: #2-56; 3/16" across flats		4T34-11
PIN, locking: steel, nickel finish; 8/32" lg x 3/32" OD; w/threaded base 5/32" lg.	Positions and locks disabling push rod.	4T111706
PLATE, armature: 2 9/16" lg x 1 3/16" wd	Provides motion to operate switch break contacts.	4T111693
LATE, clamp: oval shape; 1 1/16" lg x 5/16" wd x 1/16" thk.	Holds switch contact assembly.	4T41732
POST, anchor: cylindrical; ⅝" lg x 3/32" dia; w/#4-40, NC-2 thread for mounting; slotted head.	Anchor post for armature lever spring.	4T92668
POST, anchor: cylindrical; ½" lg x 3/32" OD; w/#4-40, NC-2 thread for mounting; slotted head.	Anchor post for pawl lever spring.	4T109618
ROD, plunger: 4⅛" lg x .161" OD; one end threaded #5-40, NC-2.	Operates pawl lever	4T111705

Name of part and description	Function of part	Signal Corps stock No.
SCREW, adjustment: steel, zinc plate	Adjustment screw for armature spring.	4T111695
SCREW, machine: Fil H; #4–40, NC–2; .471" lg		4T1159
SCREW, machine: Fil H; #6–40, NF–2; 7/16" lg		4T1160
SCREW, machine: FH; #4–40, NC–2; .369" lg		4T1162
SCREW, machine: Fil H; #4–40, NC–2; 1.147" lg.		4T1163
SCREW, machine: hex. head; #4–40, NC–2; .344" lg.		4T74613
SCREW, machine: flat Fil H; #4–40, NC–2; 7/8" lg.		4T80508
SCREW, machine: wrench drive; FH; #4–40, NC–2; .656" lg.		4T111698
SPRING: .200" music wire; 1" lg x 7/32" OD; approximately 29 turns; hook end term.	Relay armature spring	4T7615
SPRING: .014" music wire; .153" OD x .844" lg; 44 turns; hook end term.	Provides tension on contact lever.	4T31636
SPRING: .016" music wire; .156" OD x .719" lg; 26 turns; hook end term.	Provides tension on contact lever.	4T49420
SPRING: compression type; .021" dia; 5/32" OD x 7/8" lg; 14 turns.	Restores disabling push rod to normal position.	4T111707
STIFFENER, contact spring: 1 9/32" lg x 17/32" wd x 3/64" thk.	Gives extra tension to contact spring.	4T105940
STUD: 1 9/32" lg x 1/32" dia; threaded bottom, #4–40, NC–2, 3/16" lg; slotted head.	Makes and breaks switch contacts.	4T90338
STUD: 7/8" lg; shoulder 5/16" diam x 1/8"; one end threaded 7/16" lg x 10–32, NF–2 thread; opposite end threaded 3/16" lg x 6–40, NF–2 thread.		4T111460
STUD: 3/4" lg x 1/32" dia; bottom threaded, #4–40, NC–2.		4T111694
STUD: 9/16" lg x 1/4" OD; threaded bottom, #4–40, NC–2, 1/8" lg.		4T111700
TERMINAL, lug: double ring type; brass; wire hole 1/8" dia x 1/16" lg; lug bent 90° to base.		4T81726
WASHER, flat: steel; round, .141" ID, .313" OD.		4T7002
WASHER, flat: steel; round, 1/4" ID, 1/2" OD		4T11767
WASHER, flat: steel; round, 7/64" ID, 1/4" OD		4T103-27
WASHER, lock: steel; .120" ID x .035" thk; external teeth.		4T3640
WASHER, lock: steel; .141" ID x .032" thk; external teeth.		6L73006

6. Tape-Feed Suppression Mechanism in Transmitter Distributor TT–21/FG

Note. Refer to figure 123 for all parts listed in this paragraph.

	Name of part and description	Function of part	Signal Corps stock No.
	BLADE, restoring	Operates restoring lever	4T112462
	CLIP, spring: L shape; .035″ CHS, zinc-plated; .379″ lg x .285″ lg x 5/16″ wd.	Holds restoring spring	4T104537
	SCREW, eccentric: CHS, zinc-plated, chromate finish; .144″ ID x 1/2″ OD x 1/8″ thk.	Latch lever spacer	4T112472
	SHIM: .010″ steel; 13/16″ lg x 3/4″ wd; 2 slots; .152″ wd x 1/16″ d in lg edge, 7/16″ c to c.	Part of mounting for tape-feed suppression mechanism.	4T112474
	SPACER, washer: steel, zinc-plated, chromate finish; .144″ ID x 1/2″ OD x 1/8″ thk.	Latch lever spacer	4T79060
	SPRING, extension	Tensions trip-off lever	4T110879
	SPRING, extension: .016″ music wire; 1/2″ lg x 3/32″ dia; approx 13 turns.	Tensions nonrepeat lever	4T45024
	SPRING, extension: .016″ music wire, 11/16″ lg 3/32″ dia o/a.	Tensions trip-off latch	4T55669
	SPRING, extension: .020″ music wire; 1.219″ lg x .177″ OD o/a.	Tensions restoring blade	4T74709
	SPRING, extension: .010″ dia music wire; 5/8″ lg x .130″ dia o/a; approx 37 turns.	Tensions restoring lever	4T35–70

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