

BULLETIN 181B  
TECHNICAL MANUAL  
SIGNAL DISTORTION TEST SET  
(DXD)

SECTIONS

1. GENERAL DESCRIPTION
2. PRINCIPLES OF OPERATION
3. INSTALLATION
4. OPERATION
5. ADJUSTMENTS AND REQUIREMENTS
6. LUBRICATION



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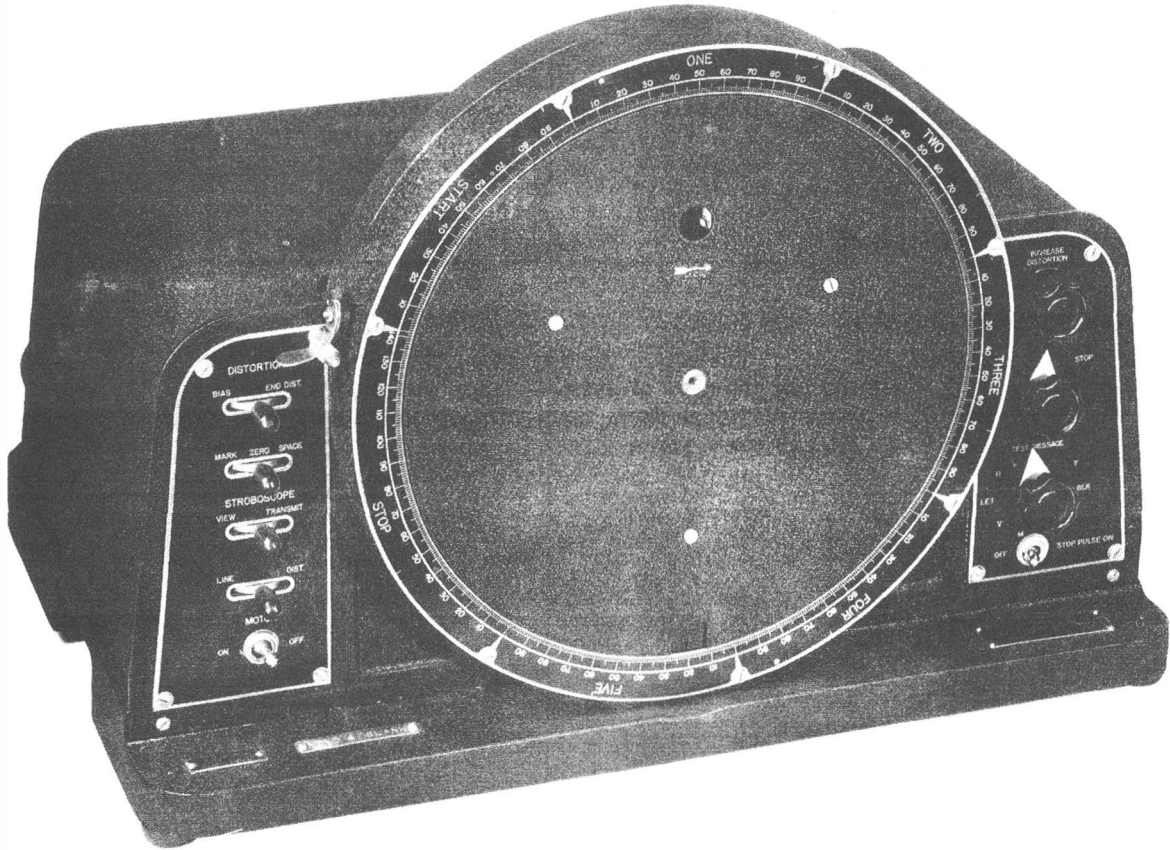


## LIST OF EFFECTIVE PAGES

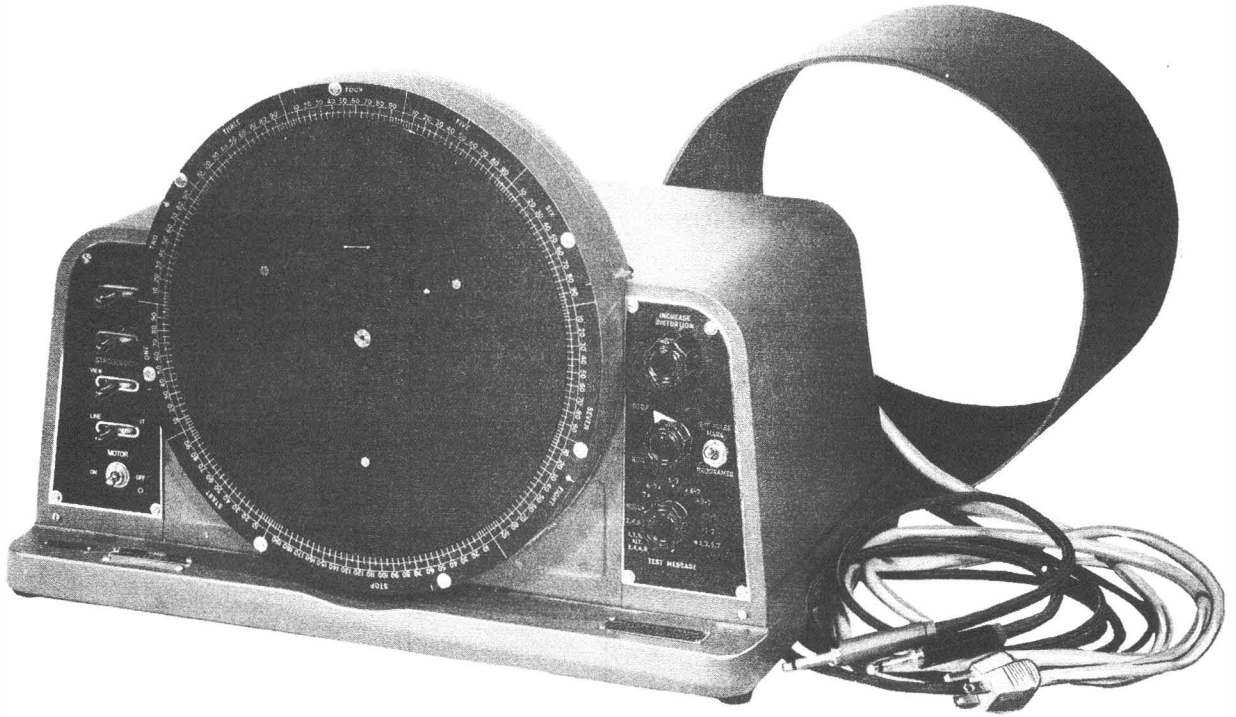
MARCH, 1963

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FIVE LEVEL SIGNAL DISTORTION TEST SET



EIGHT LEVEL SIGNAL DISTORTION TEST SET DXD800

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## SECTION 1

## GENERAL DESCRIPTION

## 1-1. GENERAL

a. The Teletype Signal Distortion Test Set (Code Disc Operated with Stroboscope, see Figure 1-1) described herein, is a motor driven unit arranged to be used for any of the following purposes:

(1) To transmit signals for testing Teletype start-stop printing telegraph circuits, and checking the efficiency of Teletype start-stop selectors. These signals are a repetition of any of the following test signals: TEST MESSAGE, R, Y, T, O, M, V, LETTERS, BLANK OR CODE LENGTH MARKING IMPULSE or special eight level signals, either undistorted or with

controlled degree of distortion up to approximately 100 per cent. On early models, only test message, R or Y test signals could be transmitted.

(2) To measure accurately, through use of the applicable test set, the impulse lengths of five level, six level or eight level code signals originating from an external transmitting unit. Synchronous motors with identical gear reductions on each unit operating on the same source of power are necessary for accuracy because the transmitting unit and the test set must be kept in exact phase relation. If one of the units is equipped with a governed motor, a slight speed variation will cause a wavering

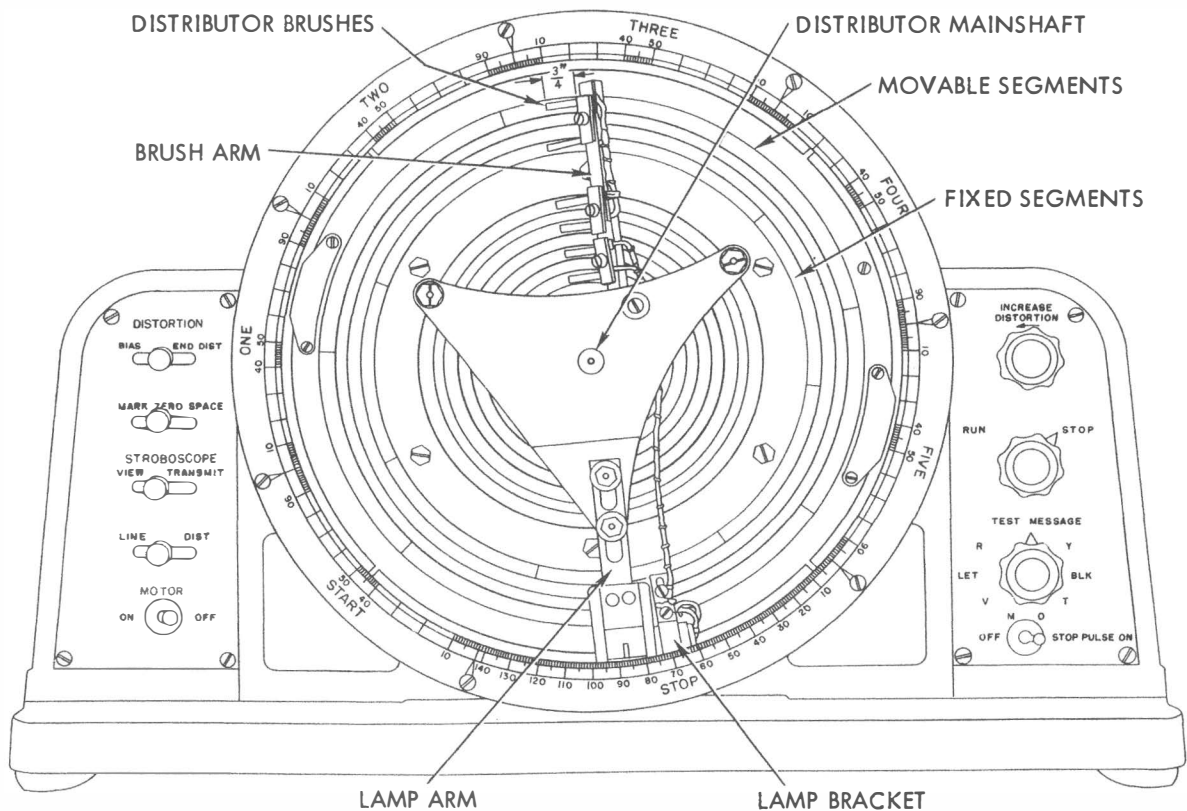


Figure 1-1. Five Level, 7.42 Unit, Signal Distortion Test Set with Cover Disc Removed

of the impulse lengths as viewed on the stroboscope, making them difficult to measure accurately.

(3) To check the operation of relays or start-stop regenerative repeaters in a local circuit. When using the test set in this manner, transmitted signals from the test set operate the relay or regenerative repeater being tested, and these signals in turn are routed to the test set stroboscope for observation.

b. Distortion produced in the transmitted signals may be any of the following types:

(1) MARKING BIAS, which advances the beginning of each marking impulse with respect to the beginning of the character cycle.

(2) SPACING BIAS, which delays the beginning of each marking impulse.

(3) MARKING END DISTORTION, which delays the end of each marking impulse.

(4) SPACING END DISTORTION, which advances the end of each marking impulse.

1-2. PHYSICAL DESCRIPTION

a. The Distortion Test Set is a self-contained unit 19-3/8 inches wide, 13 inches high, and 13-1/2 inches deep. It weighs approximately 65 pounds with aluminum casting (125 pounds with cast iron casting). The test set is mounted on a single base, on the under part of which are the terminal blocks and filters. All of the controls are available on the front panels of the test set.

b. A large, graduated, circular scale panel is mounted on the front of the test set. The circumference of this panel is scaled off in divi-

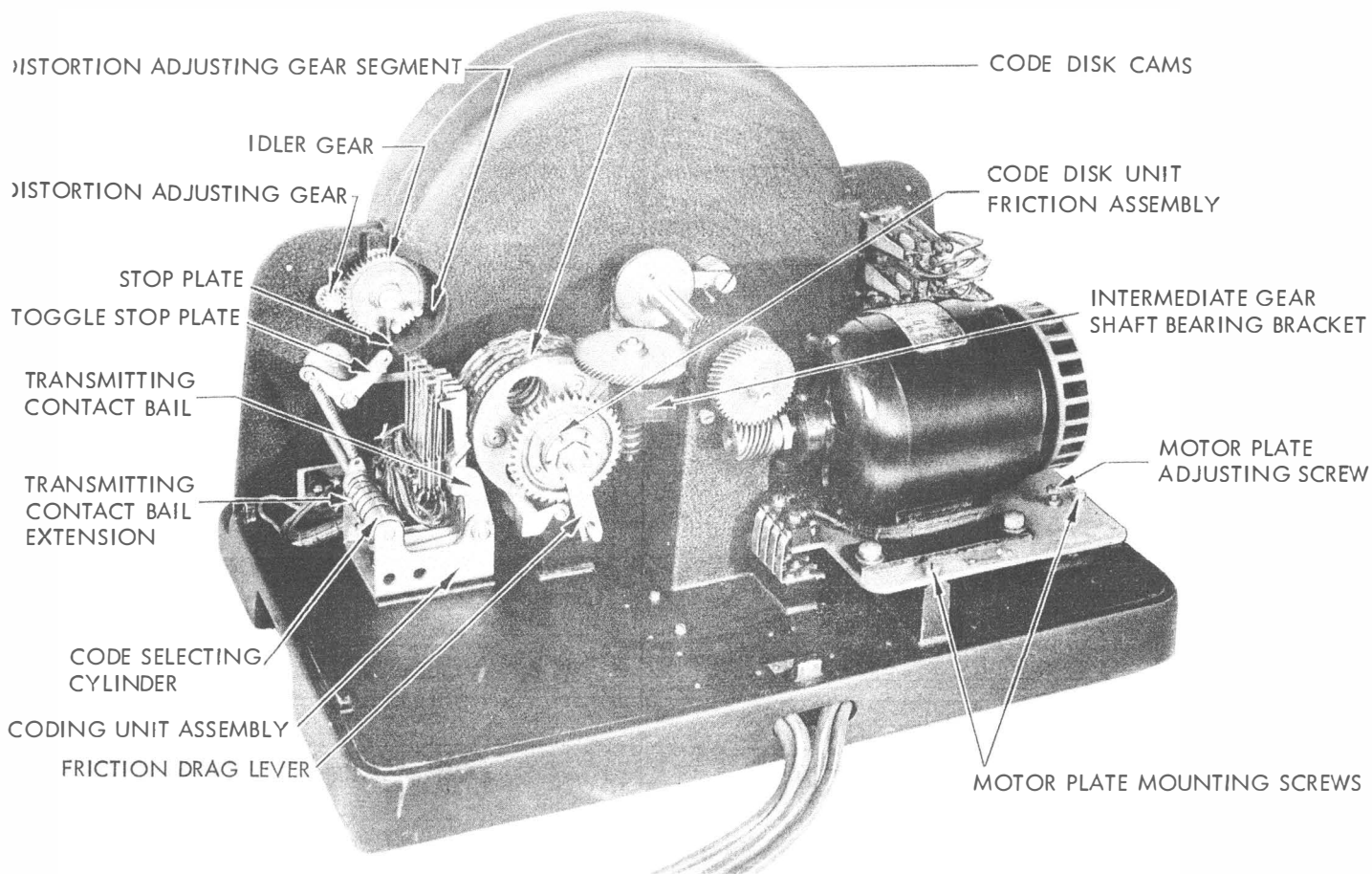


Figure 1-2. Signal Distortion Test Set, Rear View

sions equivalent to the unit code for which the test set was designed. A removable face plate covers the distributor face which is equipped with six concentric rings. The two outer rings, one movable and the other stationary, are segmented rings, and the four inner rings are solid conductor rings. A hub, which revolves with the main shaft, mounts the distributor brush arm and the lamp arm. Six brushes, one for each distributor ring, are mounted on the brush arm. A small neon lamp, which provides a visual stroboscope measurement of the various functions of the test set, is mounted on an arm opposite the brush arm.

c. A metal cover, housing the interior of the test set, is held in place by three screws. Access to the interior of the test set may be obtained by removing these screws, one in the rear of the cover and one on either side. Removing the cover exposes the motor unit, code disc transmitter, gear assemblies, and rectifier and relay if provided (as with the DXD800).

d. At the rear of the test set are five cords (three with DXD800) for making the various connections to the test set. A rubber-covered cord with a convenience plug is provided for connection to an ac power source. Two slate-colored cords with black and red plugs are provided, except on DXD800, for connection to -110 and +110 volts dc. Two green cords with black and red plugs are provided for incoming and outgoing signals.

e. A cylindrical metal hood, which slips over the circular front panel, provides a light shield to facilitate easier and more accurate reading of the stroboscope indicating light.

### 1-3. VARIATIONS IN MODELS

#### NOTE

Refer to parts bulletin and to wiring diagram shipped with equipment.

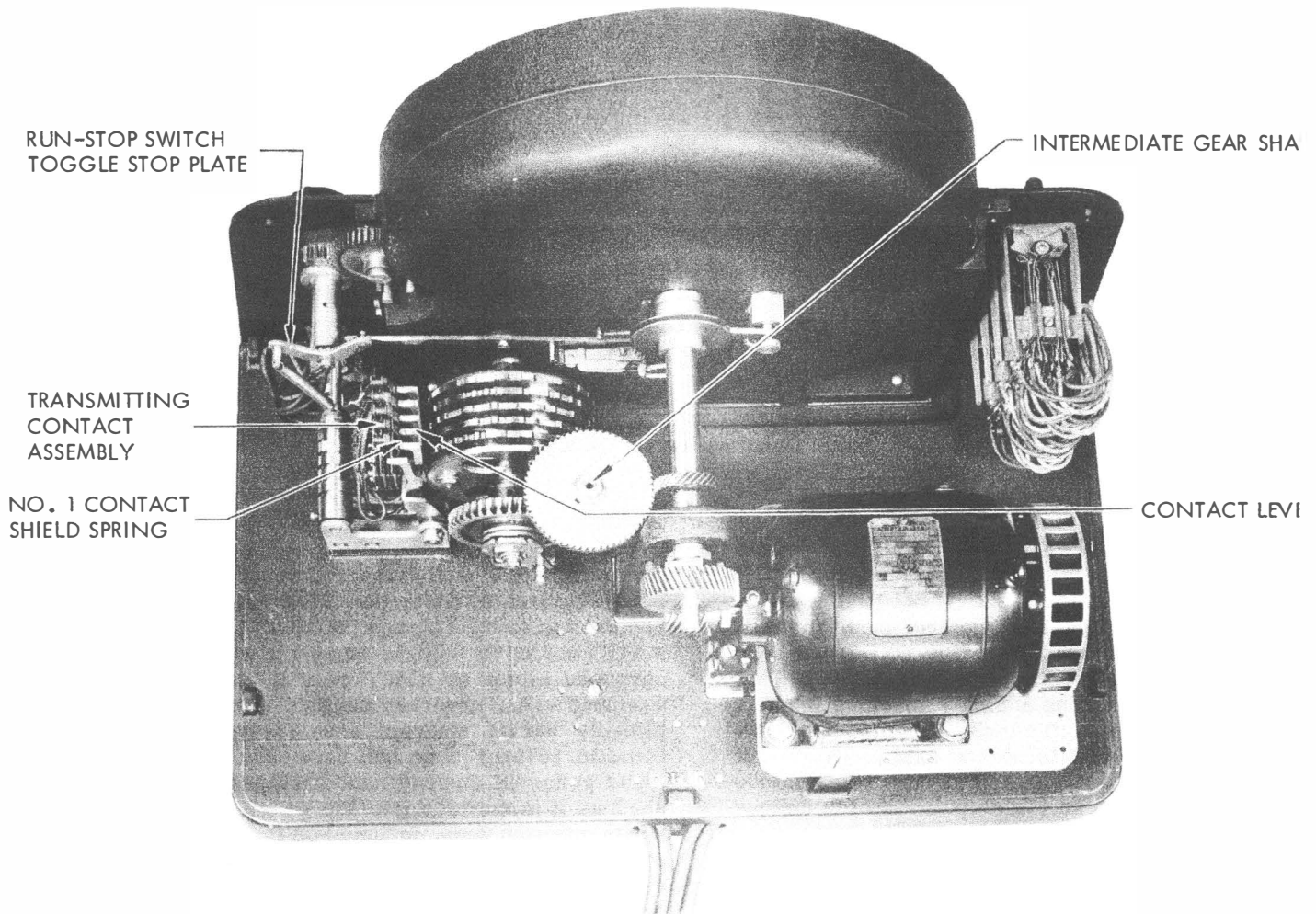


Figure 1-3. Signal Distortion Test Set, Top View

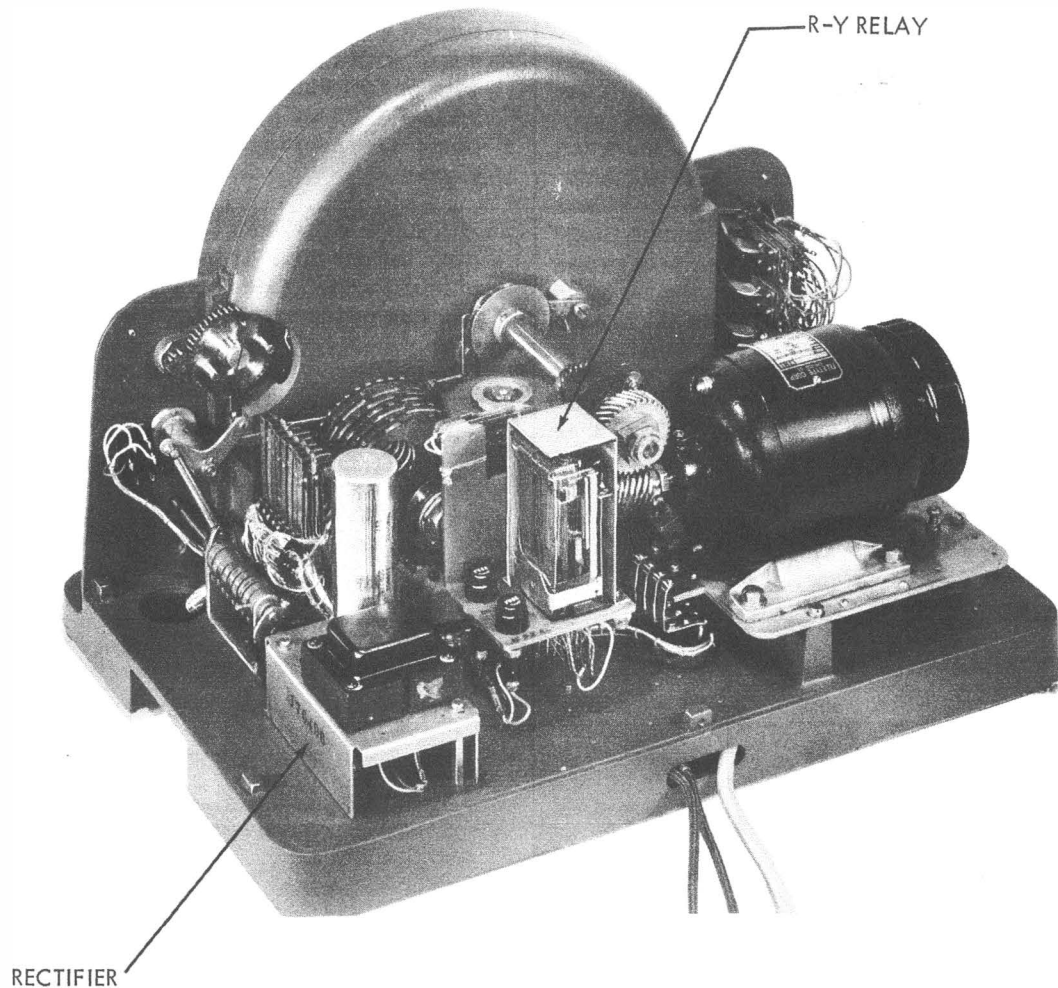


Figure 1-4. Signal Distortion Test Set DXD800, Rear View

a. **STOP PULSE TOGGLE SWITCH** - Late DXD1 Models and all DXD200 (supersedes DXD4) Models of the Distortion Test Set have a toggle switch on the right-hand control panel for disconnecting the stop pulse (the DXD4 has been discontinued and replaced by the DXD200). This permits transmitting a single marking impulse of code length with the code selecting switch set to T. Early models of the test set are not equipped with this toggle switch. The DXD800 is equipped with an eighth pulse switch instead of the STOP PULSE switch.

b. **115 VDC CORDS** - All DXD1 Models of the Distortion Test Set have one cord for providing dc power for the stroboscope (not required on DXD800). DXD200 Models are equipped with two single-conductor cords, one with a red plug for negative 115-volt dc and one with a black plug for positive 115-volt dc.

c. **MAIN SHAFT** - (1) On the main shaft, the gear used in early standard speed (60 wpm) DXD1 Models of Distortion Test Set has been replaced in late DXD1 and DXD200 Models with a 44T gear if the unit is equipped with a synchronous motor or a 40T gear if the unit is equipped with a governed motor. (Refer to applicable wiring diagram and Teletype Parts Bulletin 1079B.) The hub used with either of these gears is tapered, and tightens onto the shaft as it is screwed into the gear. (2) A reverse rotation stop, mounted on the main shaft at the rear of the frame, has been added in late models of the Distortion Test Sets. This stop prevents brush damage due to a counterclockwise rotation of the brush arm.

d. **OUTER RING BRAKE** - Late DXD1 Models of the Distortion Test Set have a brake which bears against the outer ring on its upper

left-hand corner. This brake prevents rotation of the ring after it has been set in a desired position.

e. RESISTOR - A 250,000-ohm strobe lamp resistor has been added across the contact springs of the LINE-DIST Key on late DXD1 Models and on DXD200 Models. On the DXD800 this resistor is mounted on the under side of the base near the 6,300 ohm, 7,000 ohm and 1,000 ohm resistors.

f. HOOD - A cylindrical hood is supplied with DXD5, DXD200 and DXD800 Models of the distortion test set to improve the visibility of the signals. The hood fits over the movable ring behind the distortion measuring scale.

g. Transmitted signals, except for the DXD800, are a continuous repetition of one of the following 10 choices: a standard test message, R, Y, T, O, M, V, LET (letters), BLK (blank, or code length marking impulses). An optional relay Modification Kit may be ordered to provide a continuous, alternately repeated R Y signal.

NOTE

Refer to paragraph 1-4 below for description of the DXD800.

1-4. DXD800 SIGNAL DISTORTION TEST SET

a. The DXD800 Signal Distortion Test Set is similar to the DXD200 except that it is arranged for transmitting a test message based on the Data Interchange Eight-Level Code. A NULL MESSAGE or certain combinations of marking impulses, either undistorted or with a controlled degree of distortion up to approximately 100 per cent can be transmitted.

b. The DXD800 Signal Distortion Test Set is arranged to be used for any of the following purposes:

(1) To transmit signals for testing Teletype start-stop printing telegraph circuits, and checking the efficiency of Eight-Level Teletype start-stop selectors. These signals shall be a repetition of any of the following test signals with the stop pulse marking in each case:

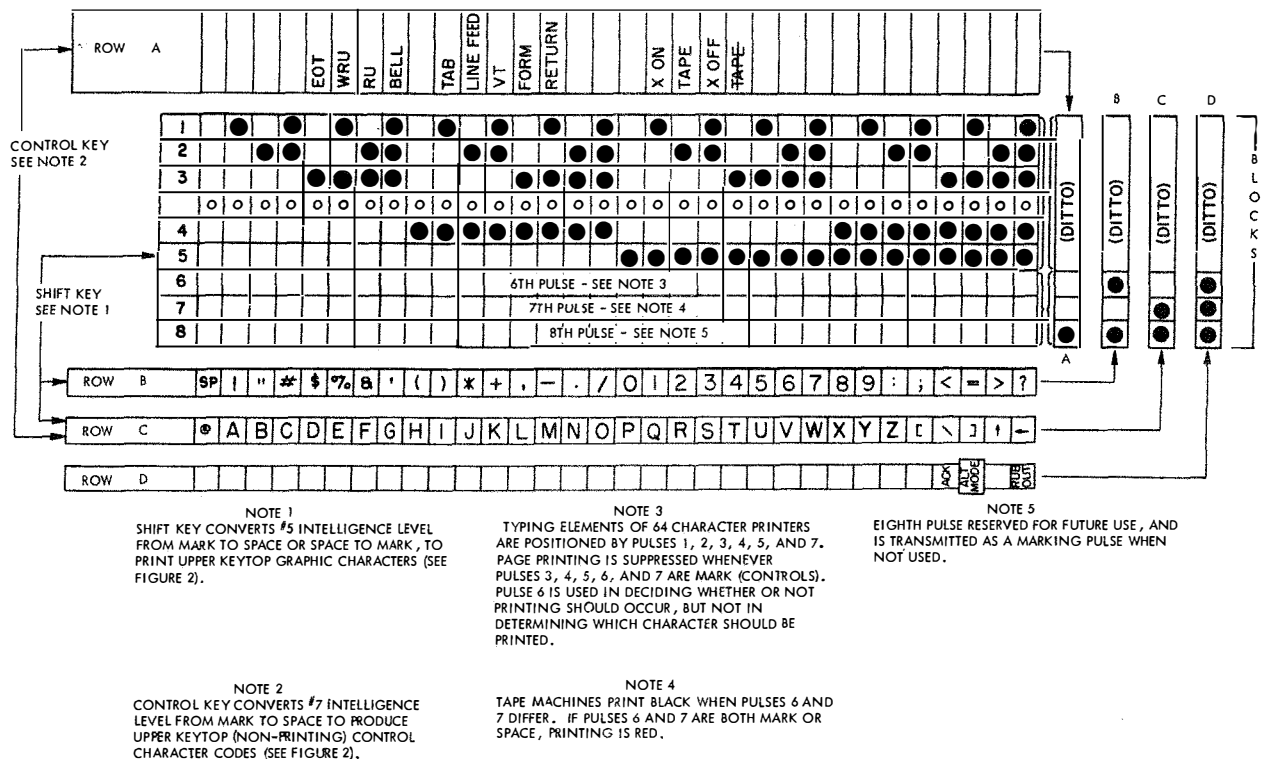


Figure 1-5. Eight Level Data Interchange Code Arrangement

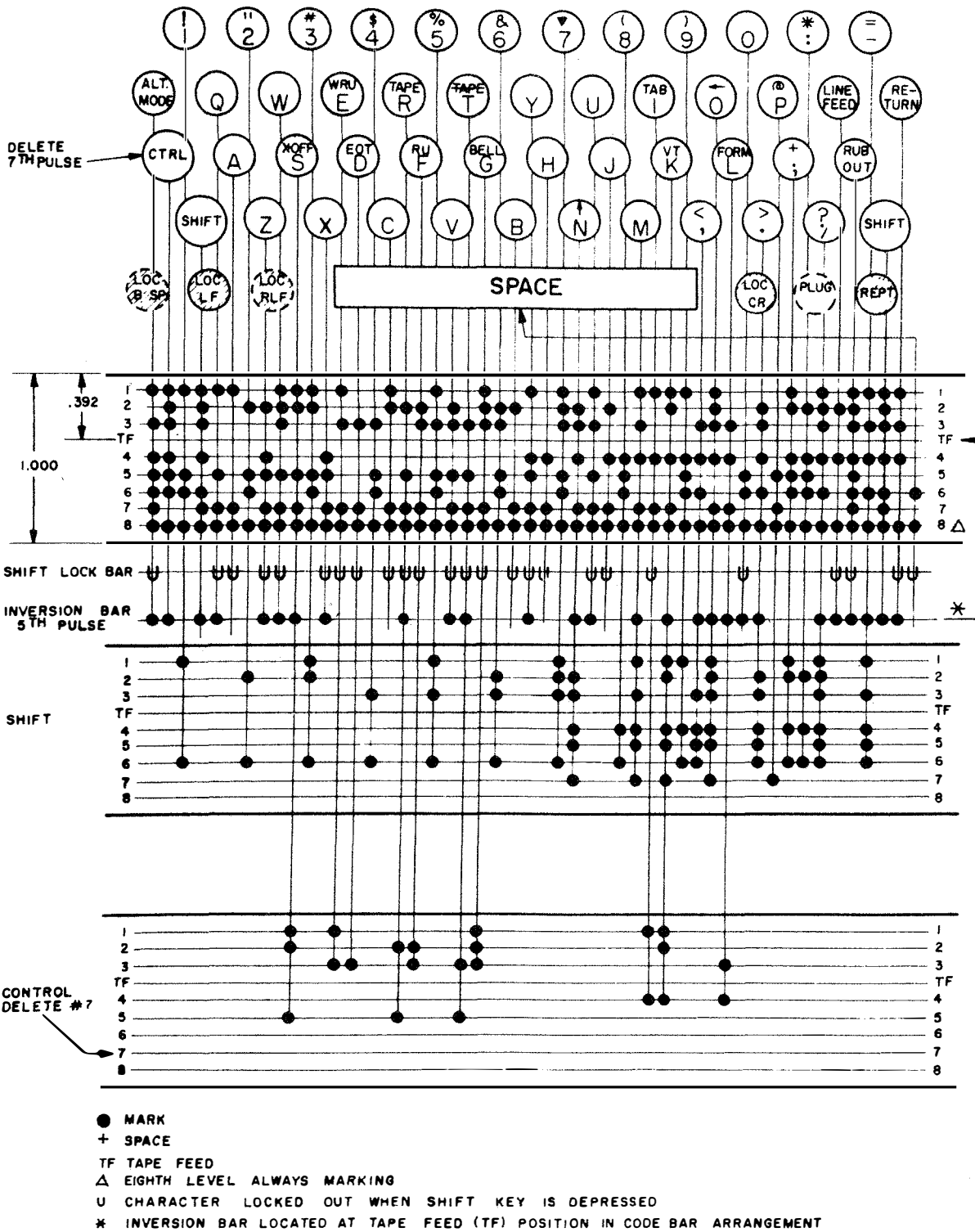


Figure 1-6. Eight-Level Data Interchange Code-Keytop Arrangement

## NULL

- 1, 3, 5, 7 Bit Marking
- 2, 4, 6 Bit Marking
- 1 through 7 Bit Marking
- 2 through 7 Bit Marking
- 3 through 7 Bit Marking
- 4 through 7 Bit Marking
- 5 through 7 Bit Marking
- 6 through 7 Bit Marking
- 7th Bit Marking
- 1, 3, 5, 7 and
- 2, 4, 6, 8 Bit Marking on alternate cycles.

Test Message (See Figure 4-4)  
Code Arrangement (See Figure 1-5)

In each case, "8th pulse mark" may be selected by a toggle switch on the control panel to give "8th Bit Marking" in addition to combination of marking pulses selected above.

(2) To measure accurately the impulse lengths of eight level, 11.0 unit code signals originating from an external transmitting unit.

(3) To check the operation of relays or start-stop regenerative repeaters in a local circuit.

c. Distortion produced in the transmitted signals may be any of the following types:

(1) MARKING BIAS, which advances the beginning of each marking impulse with respect to the beginning of the character cycle.

(2) SPACING BIAS, which delays the beginning of each marking impulse.

(3) MARKING END DISTORTION, which delays the end of each marking impulse.

(4) SPACING END DISTORTION, which advances the end of each marking impulse.

d. Provisions are made for the insertion of coded segments in the code discs (position 64, 65, and 66 as illustrated in Figure 3-6) to provide station identification in the test message.

e. Provisions are made to accommodate test message generators with eight level, 11.0 unit codes other than the one illustrated in Figure 1-5 through the substitution of code discs.

f. The DXD800 includes a relay to provide 1, 3, 5, 7 and 2, 4, 6, 8 bit marking on alternate cycles and 120 MA rectifier with fuses as standard equipment (refer to paragraph 1-3.g. above for other test sets).

## 1-5. STATION IDENTIFICATION SEGMENTS

a. The 115836 Modification Kit (included as standard equipment on later units of the DXD1, DXD5, and DXD200) contains a complete set of code discs with interchangeable code disc segments which provide a means for quickly changing the station identification on the unit without changing the code discs. An extracting tool and hub cover are also included.

b. Six sets of code disc segments having five segments in each set are provided with each modification kit to make a total of thirty segments. These sets of segments are cut with the various permutations for forming the station identification characters. Slots are provided in the code discs for insertion of segments. Spring clips are mounted on each side of the code discs for retaining the segments in position. The DXD800 includes six sets of segments having 7 segments in each set (42 segments) as standard equipment.





## SECTION 2

## PRINCIPLES OF OPERATION

## 2-1. GENERAL

The Signal Distortion Test Set consists of a code disc transmitter (with relay on DXD800), code disc cam assembly, message selector, signal distributor, neon lamp and brush arm assembly, graduated scale, control switch keys and knobs. The DXD800 also includes a 120 VDC - 120 MA rectifier with fuses.

## 2-2. DETAILS

## a. DISTRIBUTOR TEST SIGNAL TRANSMISSION

(1) Code Disc Transmitter - The transmitter, which sets up combination for transmitting the test message, consists principally of code disc cams, contact levers, and contacts. The code disc cams actuate the contact levers, which in turn operate the proper contacts. The code disc cam assembly is driven through a series of gears from the distributor shaft and is thus synchronized with the distributor brush arm. A friction assembly located at the rear of the code disc cam assembly shaft applies a drag on the shaft and prevents backlash.

(2) Message Selections - The repeated test signals are obtained by turning the message (code) selector knob to the desired setting. This knob operates the code cylinder, which positions the transmitting contacts, so that the proper electrical circuit is set up for the transmission of the signals. During transmission of TEST MESSAGE, the transmitting contacts are actuated by the code discs. For the transmission of repeated signals other than TEST MESSAGE, the transmitting contacts are cammed away from the code discs and are operated only by the code cylinder. In the 1, 3, 5, 7 ALT 2, 4, 6, 8 position of the DXD800 a relay is actuated on alternate cycles by a cammed contact. In this position, when the relay is unoperated signal transmission is through the transmitter contacts, which are set for 2, 4, 6, 8 pulse transmission. When the relay is operated on alternate cycles, the transmitter contacts are by-passed and transmission is through the relay contacts, which are set for 1, 3, 5, 7 pulse transmission. (Refer to Section 1, paragraph 1-3.g. for other than DXD800 Models.)

(3) Distributor - The distributor completes electrical connections between the transmitting contacts and the signal line in the correct sequence and at the required speed. This is accomplished by two pairs of brushes, which are drawn over four commutator rings by a distributor brush arm attached to the distributor shaft. The distributor face is equipped with six concentric rings. The two outer rings are segmented and the outer movable segmented ring may be oriented with respect to the inner (stationary) segmented ring. The position or setting of the outer segmented ring determines the amount of distortion transmitted. The next pair are solid rings and are used to complete the circuit through the segmented rings. The two inner solid rings are used to connect the neon lamp to either the transmitter-distributor circuit (LINE-DISTRIBUTOR key in DIST position) or the stroboscope circuit (LINE-DISTRIBUTOR key in LINE position). As the lamp rotates with the distributor shaft and the brush arm assembly, it shines through a narrow slit in the lamp arm each time it is lighted. This slit rotates just inside the large circular graduated scale on the front of the unit. The scale is graduated in (2-1/2 per cent and 5 per cent on DXD800) 1 per cent increments of a unit signal and may be oriented by hand to align the scale with the light trace.

(4) When the lamp is connected to the transmitter distributor circuit (LINE-DISTRIBUTOR key in DIST position) the light trace represents the marking bits of the signal being transmitted by the test set. The degree of distortion may be measured on the graduated scale by aligning the end of the stop pulse on the scale with the end of the stop pulse of the light trace. The length of a signal may, also, be measured on the scale. When the lamp is connected to the stroboscope circuit (LINE - DISTRIBUTOR key in LINE position); it is lighted by an external battery (120 VDC) and transmitter and is used in a manner similar to that described above. The sleeve of the STROBOSCOPE CONNECTOR (black) must be connected to positive battery.

## b. CONTROL KEYS, KNOBS, AND TOGGLE SWITCHES

## (1) KEYS - (Left of Distributor Face)

(a) The first key (top) is for selecting Bias or End Distortion.

(b) The second key is for selecting the type of transmission - MARKING or SPACING distortion or an undistorted signal, ZERO.

(c) The third key is for connecting the distributor rings either to the stroboscope, VIEW, or to the outgoing line, TRANSMIT.

(d) The fourth key is for connecting the neon lamp to the DISTRIBUTOR for local calibration or to an external LINE for checking incoming signals.

(2) KNOBS - (Right of Distributor Face)

(a) The first knob (top) is for adjusting the amount of distortion to be transmitted.

(b) The second knob in the STOP position shunts the outgoing line to keep the line circuit closed when calibrating the test unit. In the RUN position the line shunt is removed. Timing is provided in this knob mechanism to prevent the sending of part of a character while turning this knob.

(c) The third knob (message selector) is for selecting the signals which may be transmitted. These signals are indicated in the general description section.

(3) TOGGLE SWITCHES

(a) MOTOR ON-OFF switch - (left of distributor face on all units). On the DXD800 this switch affects both the motor and relay, but does not affect the rectifier. DC Power is always on when unit is connected to AC sources

so that the neon lamp may be lighted when the distributor shaft is turned manually.

(b) 8TH PULSE switch of DXD800 - (right of distributor face). In the MARK position, this switch adds a marking 8th pulse to the transmitted signal in addition to the message selected by the message selector knob. In the PROGRAMMED position, signal transmission is as selected by the message selector knob. On models other than the DXD800, this switch is a STOP PULSE toggle switch. Late DXD1 Models and all DXD200 Models of Distortion Test Set have a toggle switch on the right-hand control panel for disconnecting the stop pulse. This permits transmitting a single marking impulse of code length with the code selecting switch set to T. Early models of the test set are not equipped with this toggle switch.

c. MOTOR UNIT AND GEARS - The test sets have provisions for mounting a standard Model 15 Printer Synchronous Motor Unit. Motor units and gears are ordered separately and can be provided for special speed and power requirements. However, unless another arrangement is specifically requested, the Synchronous MU4 Motor Unit and 110897 Gears (600 opm) will be supplied to the customer with the DXD800. Refer to Teletype Parts Bulletin 1079B for gear sets.

d. CONNECTORS

(1) STROBOSCOPE CONNECTOR (BLACK plug) - This connector plug with cord

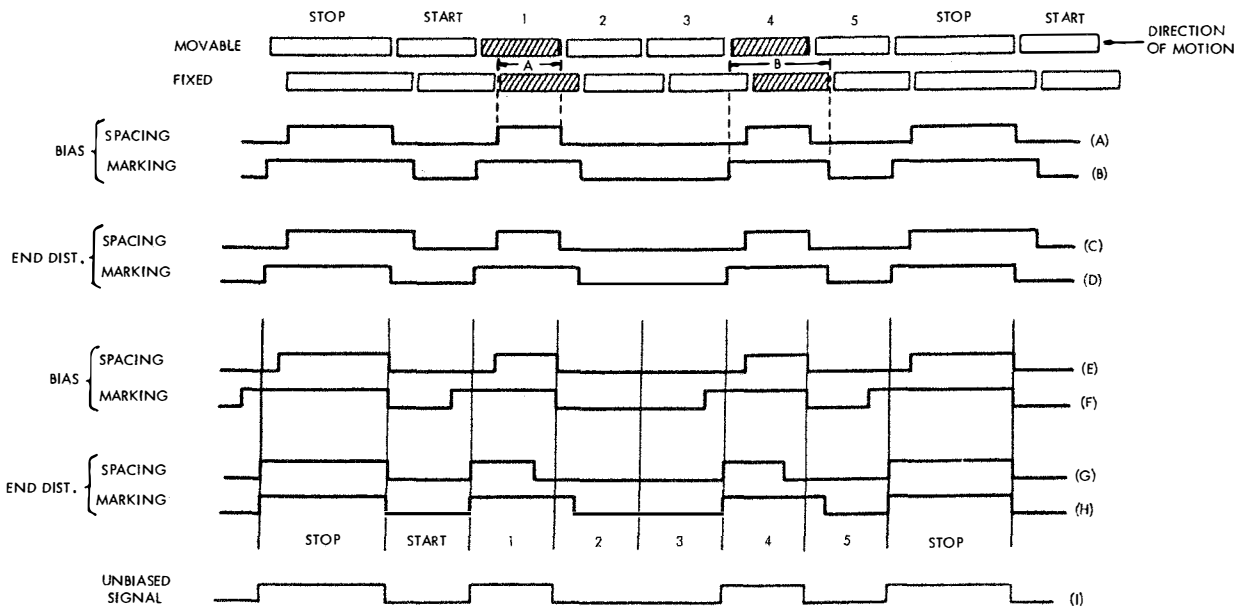


Figure 2-1. Examples of Test Set Distorted Signals

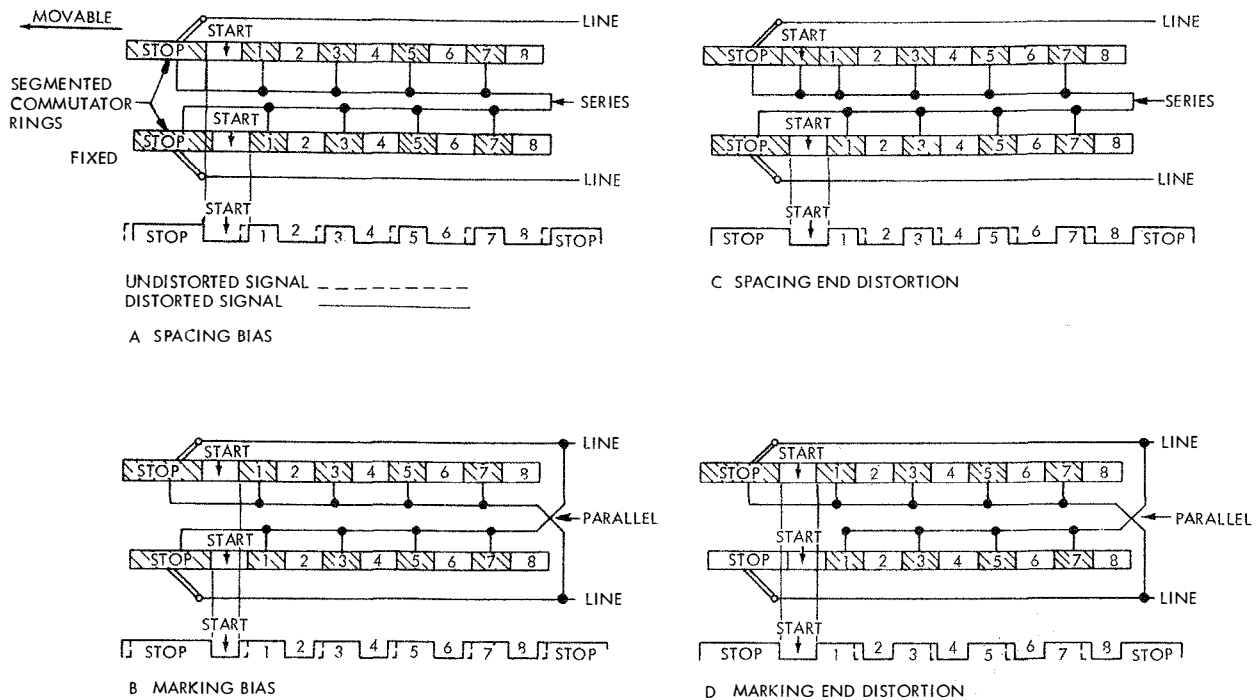


Figure 2-2. Connections for Biased and Distorted Signals

is used for viewing signals originating externally. An external battery (120 VDC) must be provided with positive battery connected to sleeve of connector.

(2) SIGNAL LINE CONNECTOR (RED plug) - This connector plug with cord is used for transmitting the signal generated.

2-3. THEORY OF OPERATION

Figure 2-1 and 2-2 are theoretical diagrams showing how the different forms of distortion described in Section 1 of this bulletin are obtained from the two segmented commutator rings. Key type switches on the left control panel connect the rings in series or parallel and connect or disconnect the stop pulse segment of the fixed commutator ring or the start pulse segment of the movable commutator ring. The phase relationship between the two commutator rings is controlled by the INCREASE DISTORTION knob on the right control panel.

a. SIGNAL COMBINATIONS OBTAINABLE - The standard models may be arranged to send a standard test message or repeated R's or repeated Y's. The lower right-hand knob is turned

to the left to obtain R's, to the right to obtain Y's and the pointer is set vertically to obtain the test message. Modifications have been incorporated in the design of the set. However, so that the following repeated signals may also be obtained on some units: "Blank", "T", "O", "M", "V", "Letters" and "Unit Marking Pulse." A unit marking pulse is a single pulse such as a "T" with the stop pulse omitted. Refer to Section 1, paragraph 1-4, for DXD800.

(1) The keys to the left of the face are used to perform the several needed switching functions. When the upper key is operated to the left the distributor sends biased signals and when it is operated to the right the distributor sends signals having end distortion. The second key determines whether the signals have zero, marking or spacing distortion. The third key, on view, connects the neon lamp to the distributor for calibrating the set or on transmit, to the signal line and the fourth key, on line, connects the neon lamp to an external circuit for special tests, or on dist. for local calibration. The bottom key is a switch to turn on the distributor motor.

(2) The means by which various amounts of distortion are obtained and examples

of signals with 25 per cent distortion will be explained by reference to Figures 2-1 and 2-2. At the top of Figure 2-1 are shown the fixed and movable segments with the movable segments shifted 25 per cent of a segment to the left.

(3) SPACING BIAS - When spacing bias is desired the segments of each ring are connected as shown in Figure 2-2A. Current will flow through the corresponding marking segments of the two rings during that distance where the marking segments overlap. (See A of Figure 2-1 associated with pulse No. 1.) The resulting current for the combination illustrated, namely a "D" signal with pulses 1 and 4 marking, is shown at trace (A) of Figure 2-1.

(4) MARKING BIAS - For this case the segments are connected as shown in Figure 2-2B so that current will flow over a distance illustrated at B of Figure 2-1. The resulting current is shown at trace (B).

(5) SPACING END DISTORTION - For this case the segments are connected as shown in Figure 2-2C. The resulting current is shown at trace (C) of Figure 2-1.

(6) MARKING END DISTORTION - For this case the segments are connected as shown in Figure 2-2D. The resulting current is shown at trace (D) of Figure 2-1.

(7) In order to show the currents as they appear to a start-stop receiver traces (A), (B), (C), and (D) are redrawn at traces (E), (F), (G), and (H) with beginnings of the start pulses lined up (Figure 2-1).

(8) Unbiased signals are obtained from the fixed segments. An unbiased signal is shown at Figure 2-1, trace (I) for comparison with examples of distorted signals.

### SECTION 3 INSTALLATION

#### 3-1. GENERAL

Observe all caution labels and instructions appearing on the boxes, cartons and enclosed wiring diagrams. Unpack all components with care and keep loose parts and bags of hardware with their associated components until ready for use in installation.

#### 3-2. UNPACKING

Be careful when unpacking and handling the equipment. When unpacking, follow as closely as possible, the steps outlined below:

- a. Place the packing case as near the operating position or work bench as possible.
- b. Cut the straps.
- c. Remove any nails with a nail puller and remove the sides and top of the packing case. Prying the sides and top off may damage the equipment.
- d. Carefully remove moistureproof covering.
- e. Lift the equipment free from the packing case or carton.

#### 3-3. PHYSICAL CHECKS

- a. Check the cords for tightness of connection and damaged insulation.

- b. Check the plugs for chips, cracks, and damaged parts.

- c. Check the control panels for chips and cracks.

- d. Check the stroboscope to insure proper operation (see Figure 4-5).

- e. Check the brush holder and the brush arm on the distributor mechanism for bent or damaged places. See that the brushes are seated properly and that they contact the rings evenly (see Section 5, Figure 5-15).

#### 3-4. MOUNTING REQUIREMENTS

- a. The test set may be mounted on any convenient horizontal surface, including a battery shelf on a relay rack where this type of mounting may be desired. The power required is 115 volt, 60 cycle regulated AC or 115 volt DC for the driving motor (determine which) and 110 to 130 volt DC for a neon lamp, used for viewing the signals. External DC for the neon lamp is not required by the DXD800.

- b. At the rear of the base on the underside are two terminal blocks. As received from the factory, a power cord is connected to the terminals labeled "Motor Power". Two cords equipped with plugs are connected to the two terminals for 110 volts DC and one cord each equipped with a plug is connected to the "Signal

CHARACTER NO.	CALL LETTERS DESIRED	DISC #1	DISC #2	DISC #3	DISC #4	DISC #5
67	A	M	M	S	S	S
68	B	M	S	S	M	M
69	C	S	M	M	M	S
USE SEGMENT NO.		126807	126810	126808	126807	126806

**NOTE:**

ADD THE FIVE SEGMENTS SELECTED IN THE SLOTS OF THE CODE DISC ASSEMBLY.

Figure 3-1. Five Level Code Segment Selection Chart Example

LETTERS	DISC #1	DISC #2	DISC #3	DISC #4	DISC #5
A	M	M	S	S	S
B	M	S	S	M	M
C	S	M	M	M	S
D	M	S	S	M	S
E	M	S	S	S	S
F	M	S	M	M	S
G	S	M	S	M	M
H	S	S	M	S	M
I	S	M	M	S	S
J	M	M	S	M	S
K	M	M	M	M	S
L	S	M	S	S	M
M	S	S	M	M	M
N	S	S	M	M	S
O	S	S	S	M	M
P	S	M	M	S	M
Q	M	M	M	S	M
R	S	M	S	M	S
S	M	S	M	S	S
T	S	S	S	S	M
U	M	M	M	S	S
V	S	M	M	M	M
W	M	M	S	S	M
X	M	S	M	M	M
Y	M	S	M	S	M
Z	M	S	S	S	M
BLANK	S	S	S	S	S
LETTERS	M	M	M	M	M
FIGURES	M	M	S	M	M
SPACE	S	S	M	S	S
C. R.	S	S	S	M	S
L. F.	S	M	S	S	S

Figure 3-2. Five Level Alphabet Code

Line" and "Stroboscope" terminals. Any DC voltage between 110 volts and 130 volts may be used for the 110 volt supply. (If at the location at which the test set is used 130 volt DC battery does not terminate in suitable jacks, it will be necessary to remove the two cords and to install a sufficient length of No. 18 Tyrex cord equipped with a plug corresponding to the type of DC receptacle provided.) The DC power supply must be polarized as shown on the wiring diagram of the test set to provide for illumination of the front electrode of the neon lamp.

c. The overall dimensions of the test set are approximately 19-3/8 inches wide, by 13-1/2 inches deep by 13 inches high. The set weighs 65 pounds, with an aluminum base casting or 125 pounds with a cast iron casting.

### 3-5. IDENTIFICATION SEGMENT INSTALLATION

a. **MODIFICATION KIT FOR OLDER UNITS** - The 115836 Modification Kit (not applicable to 8-level DXD800 or later 5-level units) contains a complete set of code discs with interchangeable code disc segments for changing the station identification on older DXD1, DXD5 and DXD200 units without changing the code discs. An extracting tool and hub cover are also included. The hub cover is used on a test message distributor and is not required on the DXD Sets.

(1) Six sets of code disc segments having five identical segments in each set are provided for five level test sets to make a total of thirty segments. These sets of segments are cut with the various permutations for forming

the station identification characters. Slots are provided in the code discs for insertion of the segments. Spring clips are mounted on each side of the code discs for retaining the segments in position.

(2) The 115836 Modification Kit consists of:

- 1 126786 Disc Assembly, Code #1
- 1 126787 Disc Assembly, Code #2
- 1 126788 Disc Assembly, Code #3
- 1 126789 Disc Assembly, Code #4
- 1 126790 Disc Assembly, Code #5
- 5 126806 Segments, Code Disc
- 5 126807 Segments, Code Disc
- 5 126808 Segments, Code Disc
- 5 126809 Segments, Code Disc
- 5 126810 Segments, Code Disc
- 5 126811 Segments, Code Disc
- 1 126812 Tool, Extracting
- 1 126814 Cover, Hub (For Test Message Distributor and not used on DXD Units)

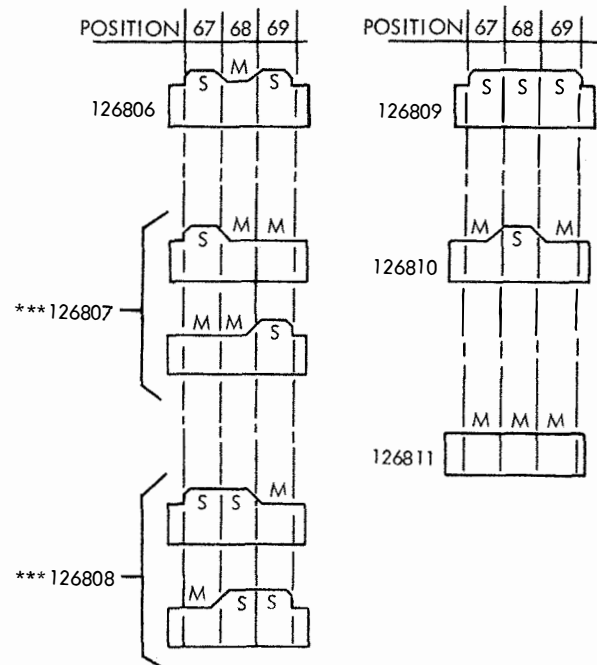
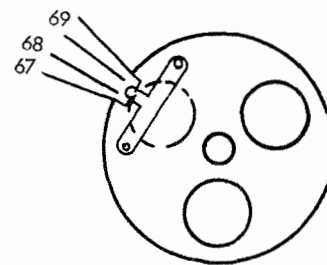
b. INSTALLATION IN FIVE LEVEL CODE SETS

NOTE

For the later units already equipped with new style code disc assemblies, disregard the following Paragraph (1).

(1) Remove and discard the five code discs from the unit and replace with the 126786, 126787, 126788, 126789 and 126790 code disc assemblies.

(2) For all units except the DXD800, select five segments (126806, 126807, 126808, 126809, 126810, 126811) having the proper code



\*\*\*THE SEGMENTS CAN BE REVERSED DEPENDING ON THE SEQUENCE DESIRED.

Figure 3-3. Five Level Code Segments

CHARACTER NO.	CALL LETTERS DESIRED	DISC #1	DISC #2	DISC #3	DISC #4	DISC #5	DISC #6	DISC #7
64	A	M	S	S	S	S	S	M
65	B	S	M	S	S	S	S	M
66	C	M	M	S	S	S	S	M
USE SEGMENT NO.		146412	146409	146411	146411	146411	146411	146413

NOTE:  
ADD THE SEVEN SEGMENTS SELECTED IN THE SLOTS OF THE CODE DISC ASSEMBLIES #1, THROUGH #7.

Figure 3-4. Eight Level Code Segment Selection Chart Example

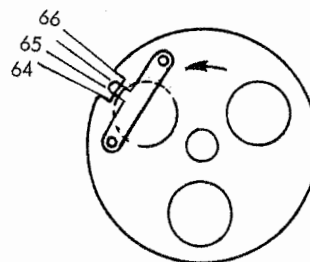
LETTERS	DISC #1	DISC #2	DISC #3	DISC #4	DISC #5	DISC #6	DISC #7	DISC #8
A	M	S	S	S	S	S	M	M
B	S	M	S	S	S	S	M	M
C	M	M	S	S	S	S	M	S
D	S	S	M	S	S	S	M	S
E	M	S	M	S	S	S	M	M
F	S	M	M	S	S	S	M	M
G	M	M	M	S	S	S	M	M
H	S	S	S	M	S	S	M	S
I	M	S	S	M	S	S	M	M
J	S	M	S	M	S	S	M	M
K	M	M	S	M	S	S	M	M
L	S	S	M	M	S	S	M	M
M	M	S	M	M	S	S	M	M
N	S	M	M	M	S	S	M	M
O	M	M	M	M	S	S	M	M
P	S	S	S	S	M	S	M	S
Q	M	S	S	S	M	S	M	M
R	S	M	S	S	M	S	M	S
S	M	M	S	S	M	S	M	S
T	S	S	M	S	M	S	M	M
U	M	S	M	S	M	S	M	S
V	S	M	M	S	M	S	M	M
W	M	M	M	S	M	S	M	S
X	S	S	S	M	M	S	M	M
Y	M	S	S	M	M	S	M	S
Z	S	M	S	M	M	S	M	M
.(PERIOD)	S	M	M	M	S	M	S	M
DELETE	M	M	M	M	M	M	M	M
SPACE	S	S	S	S	S	M	S	S
C. R.	M	S	M	M	S	S	S	S
L. F.	S	M	S	M	S	S	S	M

NOTE: SHOWN WITH 8TH PULSE SWITCH IN PROGRAMED POSITION FOR TEST PURPOSES.

Figure 3-5. Eight Level Test Message Alphabet Code



arrangement for forming the station identification desired. This may be accomplished by making a chart as shown in Figure 3-1. The alphabet code is given in Figure 3-2 and the segments are shown in Figure 3-3.



c. EIGHT LEVEL (DXD800) UNITS - The DXD800 includes a complete set of factory installed code discs with interchangeable code disc segments. An extracting tool is also included.

(1) Six sets of code disc segments having seven identical segments in each set are provided to make a total of 42 segments.

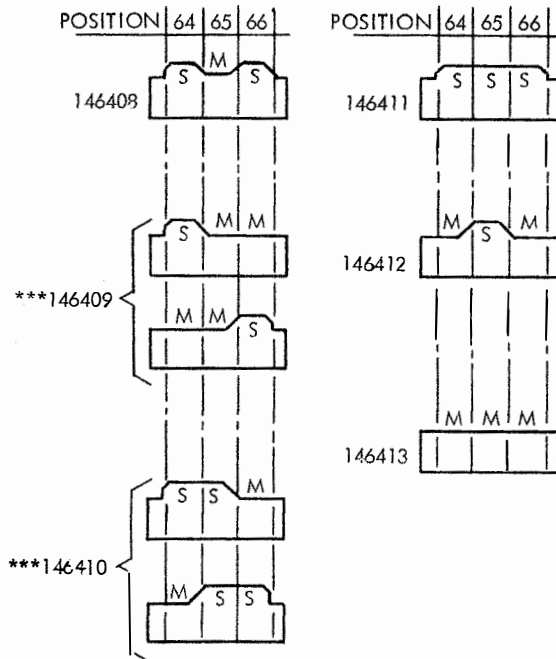
(2) DXD800 Segments

- 7 146408 Segments, Code Disc
- 7 146409 Segments, Code Disc
- 7 146410 Segments, Code Disc
- 7 146411 Segments, Code Disc
- 7 146412 Segments, Code Disc
- 7 146413 Segments, Code Disc

d. INSTALLATION (SIGNAL CHANGES) IN EIGHT LEVEL DXD800 SET

(1) Remove those segments to be changed with the 126812 Extracting Tool.

(2) Select seven segments from those listed in c.(2) above, having the proper code arrangement for forming each letter of the station identification desired. This may be accomplished by making a chart as shown in the Figure 3-4 example. The alphabet code is given in Figure 3-5 and the segments are shown in Figure 3-6.



\*\*\*THE SEGMENTS CAN BE REVERSED DEPENDING ON THE SEQUENCE DESIRED.

Figure 3-6. Eight Level Code Segments



## SECTION 4

## OPERATION

## 4-1. PREPARATION FOR USE

Before attempting to place Signal Distortion Test Set into operation, carefully read the instructions with the equipment covering its use. Be sure to comply with all caution instructions. They are given to guide the user and protect the equipment. The Signal Distortion Test Set is normally adjusted at the factory before being packed for shipment. Before any test set, new or used, is placed in service, however, certain checks should be made. (Refer to Section 3 for complete installation and station identification segment requirements.)

a. LUBRICATION - Carefully check the equipment to see whether all lubrication requirements are met. If lubrication is required, follow the detailed lubrication instructions given in Section 6.

b. MOTOR - Install the motor, pinion, and gears. Turn the motor by hand in the normal direction of operation (counterclockwise). Be sure that there is no binding and that there is a barely perceptible backlash between the motor pinion and gears, or that there is no binding in other parts of the equipment. If binding, or more than barely perceptible backlash of gears occurs, adjust according to instructions in Section 5.

## CAUTION

Do not turn the motor in the wrong direction. This will turn the distributor brushes backwards and causedamage by catching on the edges of the commutator segments.

c. CODE DISC TRANSMITTER - Check to see that all contact tongues and contact springs are undamaged.

d. KEYS, SWITCHES, AND CONTROL KNOBS - Operate all keys, switches, and control knobs to check for freedom of action and possible damage. Check the contacts for dirt, damage, and loose connections.

ORIGINAL

## 4-2. STARTING

a. Plug the ac power cord into a source of 110- to 115-volt, 50- to 60-cycle ac (50 cycle for governed or 50 cycle synchronous motors only). (Refer to wiring diagrams applicable to equipment.)

b. Turn the MOTOR switch to ON and allow the motor to run a few minutes.

c. If the test set is equipped with a governed motor, adjust motor speed as follows:

(1) Hold the vibrating shutters of the correct tuning fork above the target hub on the motor governor. (i.e. there are 87.6 vps of the fork for 968.1 opm and 96.1 vps of the fork for 404 opm).

(2) If the motor is operating at the correct speed, the target will appear stationary when viewed through the vibrating shutters. If the motor is too fast, the target will appear to be moving in the direction of rotation. If it is too slow, the target will appear to be moving in the opposite direction.

(3) If the motor speed is too fast, press the governor adjusting bracket against the governor adjusting wheel. This causes the governor adjusting wheel to be turned counterclockwise about one-quarter turn. Recheck the speed and repeat the adjustment if necessary.

(4) If the motor speed is too slow, press the adjusting lever to turn the governor adjusting wheel clockwise about one-quarter turn. Recheck the speed and repeat the adjustment if necessary.

## NOTE

When test sets are equipped with synchronous motors, no motor speed adjustment is required.

## OPERATING PROCEDURE

The following operating procedures outline the methods used in making several of the tests that can be made with the test set.

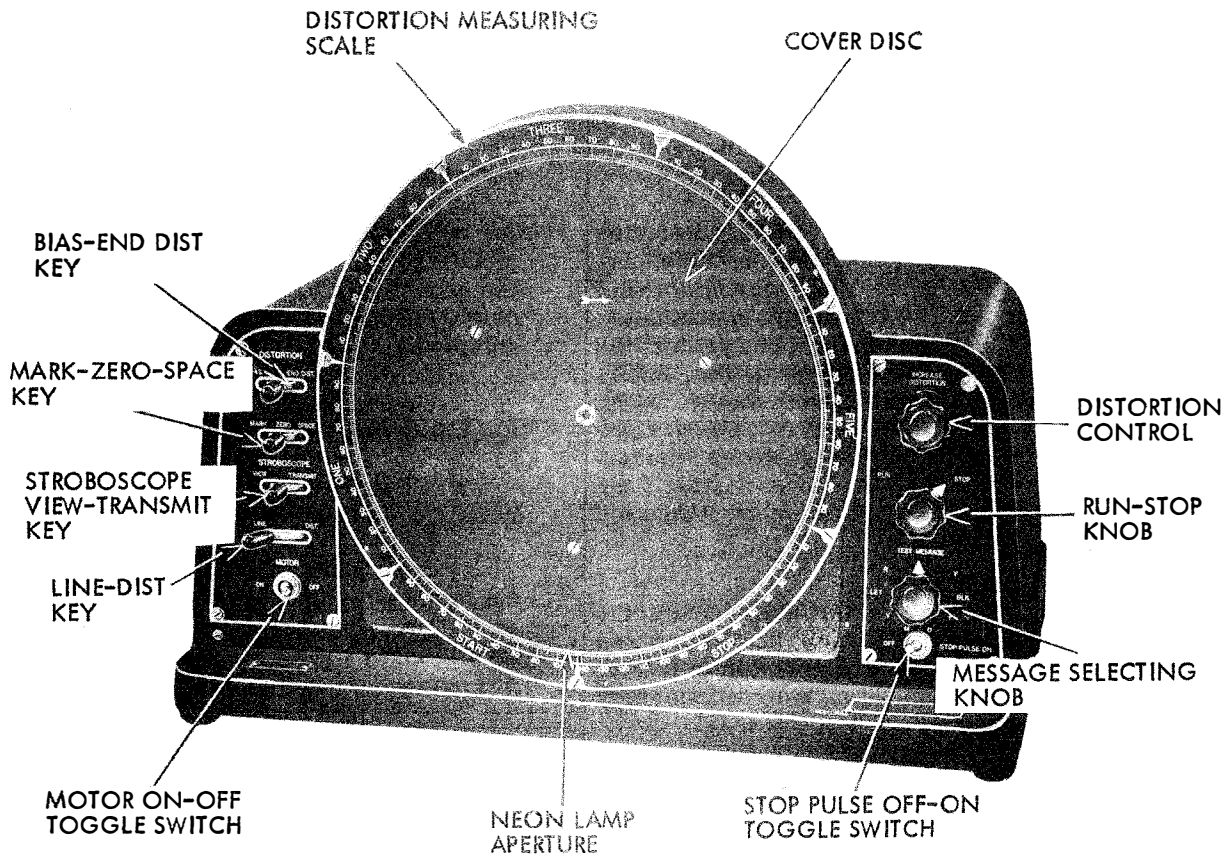


Figure 4-1. Five Level Signal Distortion Test Set Controls

4-3. LOCAL RECEIVING MARGIN

a. Connect the signal distortion test set to the proper motor power supply and to 110 volts DC for the stroboscope lamp. (See the wiring diagram furnished with the test set. External DC for stroboscope lamp is not required for the DXD800 which is equipped with a rectifier to operate the R=Y relay and neon lamp.) Turn the MOTOR switch of Distortion Test Set to ON.

NOTE

If either the test set or the receiving apparatus or both are equipped with a governed motor, adjust the motors to the same operating speed.

b. Connect the line terminals of the test set to the external signal circuit of the receiving apparatus to be tested. Line battery should be supplied externally.

c. Place the control keys and knobs as follows:

KEY OR KNOB                      POSITION

- Motor Switch . . . . . ON
- Run-Stop Knob . . . . . STOP
- Line-Dist Key . . . . . DIST
- View-Transmit Key . . . . . VIEW
- Mark-Zero-Space Key . . . . . ZERO
- Bias-End Dist Key . . . . . NEUTRAL
- \*Message Selecting Knob . . . . . R
- Message Selecting Knob on DXD800 . 2, 4, 6
- \*Stop Pulse Switch (if present) . . . . ON
- 8th Pulse Switch on DXD800 . . . . . MARK

\*Does not apply to DXD800

With the above arrangement of keys and knobs the stroboscope should indicate zero distortion of the signals, that is, the stroboscope lamp should light for 100 scale divisions of the graduated dial for each marking selecting impulse and 142 scale divisions for the stop impulse (200 scale divisions for stop pulse of the DXD800). If necessary the graduated dial should be rotated to coincide with the respective impulses.

4-4. ORIENTATION RANGE (ZERO BIAS)

The receiving apparatus connected in the external signal circuit may now be checked for orientation range with undistorted signals by rotating the Run-Stop Knob to the Run position and the Message Selecting Knob to the Test Message position and by placing the View-Transmit Key in the transmit position. See Figures 4-3 and 4-4 for Five and Eight-level test message codes. The Eight-level, as shown in Figure 4-4, is modified for test purposes and does not correspond to Eight-level Data Interchange Code due to the 8th pulse switch being placed in the programmed position instead of the Mark position. See Figures 1-5 and 3-5.

NOTE

When determining the limits of orientation, operation is generally assumed to be correct when two 72 character lines are received with only one error.

The minimum orientation requirement for new machines is 72 per cent (not established for Eight-level, Model 33 equipment, adjust for optimum setting).

4-5. MAXIMUM RECEIVING BIAS

a. Bias is a type of telegraph signal distortion which affects all impulses uniformly. It has the effect of advancing or delaying the beginning of each marking impulse with respect to the beginning of the character cycle.

b. To measure the amount of bias the selector mechanism of the receiving apparatus will withstand; place the keys and knobs in the following positions:

KEY OR KNOB	POSITION
Motor Switch	ON
Line-Dist Key	DIST
View-Transmit Key	VIEW
Bias-End Dist Key	BIAS
*Message Selecting Knob	R
Message Selecting Knob on DXD800	2, 4, 6
Run-Stop Knob	STOP
Mark-Zero-Space Key	MARK
*Stop Pulse Switch (if present)	ON
8th Pulse Switch on DXD800	MARK

\*Does not apply to DXD800

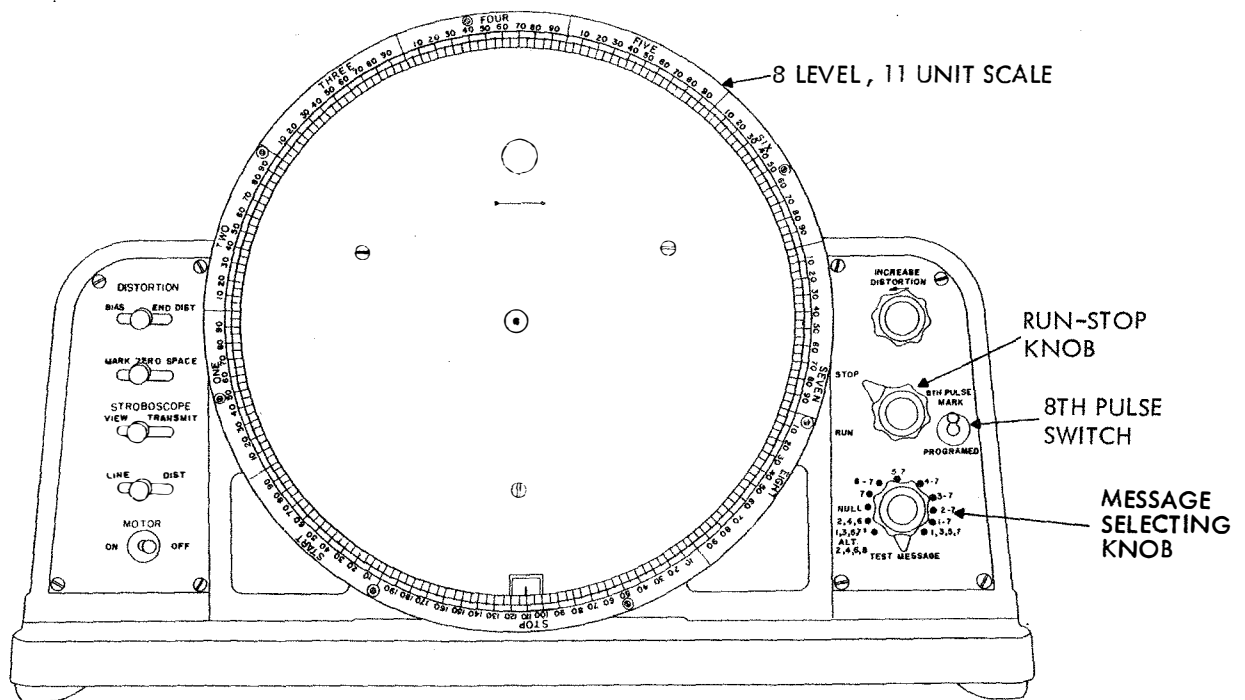


Figure 4-2. Controls Peculiar to Eight Level Signal Distortion Test Set



Adjust the Increase Distortion Knob until the stroboscope indicates that the marking selecting impulses each occupy 135 scale divisions. The signals will then be biased 35 per cent. (The Increase Distortion Knob should not be adjusted when the disc is stationary because the distributor brushes may be damaged in doing so.) Place the View-Transmit Key in the Transmit position, the Message Selecting Knob in the Test Message position, and the Run-Stop Knob in the Run position. Determine the upper limit of the range of the selector mechanism with the marking bias applied. Then place the Mark-Zero-Space Key in the Space position and determine the lower limit of the range when the spacing bias is applied. The maximum bias, in equal amounts, either marking or spacing, which the selector will withstand will be as follows:

$$\text{Maximum Bias} = 35 + \frac{\text{Upper Limit Marking Bias} - \text{Lower Limit Spacing Bias}}{2}$$

The minimum bias requirement for new machines is 40 per cent. (Refine Eight-level selector adjustments as closely as possible to 37 per cent for Model 33 and 38 per cent for Model 35 equipment at 100 wpm.)

NOTE

For maximum accuracy the distortion introduced by the test set should be equal to the maximum distortion tolerance in the selector.

4-6. OPTIMUM RANGE FINDER SETTING FOR BIASED SIGNALS

The optimum orientation setting for bias is the point at which the selector will tolerate the maximum equal amounts of either marking or spacing bias. This point may be determined from the following:

$$\text{Optimum Setting for Bias} = \frac{\text{Upper Limit Marking Bias} + \text{Lower Limit Spacing Bias}}{2}$$

4-7. MAXIMUM RECEIVING SELECTOR END DISTORTION

a. End distortion is a special type of telegraph signal distortion created for testing purposes. It affects all impulses uniformly except for the stop and start impulses. It has the effect of advancing or delaying the end of each marking selecting impulse with respect to the beginning of the character cycle.

b. To measure the amount of end distortion the selector mechanism of the receiving apparatus will withstand, place the keys and knobs in the following position:

KEY OR KNOB	POSITION
Motor Switch . . . . .	ON
Line-Dist Key . . . . .	DIST
View-Transmit Key . . . . .	VIEW
Bias-End Dist Key . . . . .	END DIST
*Message Selecting Knob . . . . .	R
Message Selecting Knob on DXD800 . . . . .	2, 4, 6
Run-Stop Knob . . . . .	STOP
Mark-Zero-Space Key . . . . .	SPACE
*Stop Pulse Switch (if present) . . . . .	ON
8th Pulse Switch on DXD800 . . . . .	MARK

\*Does not apply to DXD800

c. Adjust the Increase Distortion Knob until the stroboscope indicates that the marking selecting impulses each occupy 65 scale divisions. The signal will then have 35 per cent spacing end distortion. Place the View-Transmit Key in the Transmit position, the Message Selecting Knob in the Test Message position, and the Run-Stop Knob in the Run position. Determine the upper limit of the range with the 35 per cent end distortion applied to the signals. Place the Mark-Zero-Space Key in the Mark position and determine the lower limit of the range with 35 per cent marking end distortion applied. The maximum end distortion in equal amounts, either marking or spacing, which the selector can withstand will be as follows:

$$\text{Maximum End Distortion} = 35 + \frac{\text{Upper Limit Spacing End Marking End Distortion} - \text{Lower Limit Marking End Distortion}}{2}$$

The minimum end distortion requirements on new machines is 35 per cent. (Refine Eight-level selector adjustment as closely as possible to 37 per cent at 100 wpm for Model 33 equipment.)

4-8. OPTIMUM RANGE FINDER END DISTORTION SETTING

The optimum orientation setting for end distortion is that point at which the selector will tolerate maximum equal amounts of either marking or spacing end distortion. This point may be determined from the following:

$$\text{Optimum Setting for End Distortion} = \frac{\text{Upper Limit Spacing End Marking End Distortion} + \text{Lower Limit Marking End Distortion}}{2}$$

KEY OR KNOB	POSITION TO VIEW LOCAL SIGNALS	POSITION TO VIEW REPEATED SIGNALS
MOTOR switch	ON	ON
VIEW-TRANSMIT key	VIEW	TRANSMIT
LINE-DIST key	DIST	LINE
RUN-STOP knob	STOP	RUN
*Message Selecting knob	R or Y	R or Y
Message Selecting knob on DXD800	2,4,6 (for R) or 1,3,5,7 (for Y)	2,4,6(for R) or 1,3,5,7 (for Y)
MARK-ZERO-SPACE key	ZERO	ZERO
BIAS-END DIST key	Neutral	Neutral
*STOP PULSE switch (if present)	ON	ON
8TH PULSE switch on DXD800	MARK (for R) or PROGRAMED (for Y)	MARK (for R) or PROGRAMED (for Y)

\*DOES NOT APPLY TO DXD800

Figure 4-5. Switch Positions for Local and Repeated Signals

#### 4-9. INTERNAL BIAS

The internal bias of a receiving selector may be calculated by subtracting the Optimum Setting for Bias from the Optimum Setting for End Distortion.

#### 4-10. RELAY AND REPEATER TESTS

a. Relays or repeater sets may be checked for faulty operation by comparing the perfect signals obtained locally with signals after they have passed through the relays or repeaters. In the latter case the signals transmitted by the test set will operate the relay or repeater and the relay or repeater contacts will make and break the circuit to the stroboscope lamp. The difference between the perfect local signal and the repeated signal is the amount of distortion introduced by the repeating device.

b. To test relays or repeaters proceed as follows:

(1) Remove contact protection or filter condenser from the relay contacts.

(2) Connect the test set to the proper motor power supply and, except for DXD800, to 110 volts DC, for the stroboscope lamp. (See wiring diagram furnished with the test set.)

(3) Connect the circuit of the operating winding of the relay or repeater to the line terminals on the test set (red shell connector plug).

(4) Connect the repeated signal circuit (from the repeater or relay contacts) to the stroboscope terminals of the test set (black shell connector plug). The sleeve must be connected to positive battery, 120 VDC.

(5) Place the keys and knobs in the positions indicated on the Figure 4-5 chart.

c. The repeated signals may now be observed and the amount of distortion measured.

#### 4-11. TRANSMITTER DISTRIBUTOR (XD) SIGNALS OBSERVED ON TEST SET (DXD)

In order to eliminate the signal drift when observing (XD) transmitter distributor signals



(28 to 32 oz. friction clutch torque) on a (DXD) Signal Distortion Test set, insert a small wooden wedge tightly between the 77012 Clutch Nut and the 77018 Friction Disc on the transmitter distributor. The wedge should be small enough to clear the motor pinion during shaft rotation and should be removed for normal operation of the friction clutch. Usage of the wedge should make it unnecessary to raise the friction clutch torque of the transmitter distributor and will provide the desired signal form as observed on the signal distortion test set. When wedge is removed and a pronounced drift is observed on scope, the clutch torque should be rechecked.

each pulse is 106 divisions. Each code pulse shall begin no later than 5 divisions of the zero point and no earlier than 5 divisions of the previous pulse stop point. The zero and stop points of each pulse shall be defined as follows:

<u>Pulse</u>	<u>Zero Point</u>	<u>Stop</u>
Start	0 (Orient Disc)	# 6 Div. of One
No. 1	# 6 Div. of One	#12 Div. of Two
No. 2	#12 Div. of Two	#18 Div. of Three
No. 3	#18 Div. of Three	#24 Div. of Four
No. 4	#24 Div. of Four	#30 Div. of Five
No. 5	#30 Div. of Five	#36 Div. of Stop
Stop	#36 Div. of Stop	0 Div. of Start

4-12. SPECIAL REQUIREMENTS FOR 7.00 UNIT CODE

a. In order to use the five level, 7.42 Unit Code DXD1, DXD5 or DXD200 (TS-383/GG) to check five level, 7.00 Unit Code pulse lengths, replace the standard pinion and gear with Pinion 143333 and Gear 143334 (75 Baud) or Pinion 143330 and Gear 143331 (50 Baud) or 139269 Set of Gears (45.5 Baud).

b. The strobe disc scale can be used to indicate pulse lengths. The nominal length of

NOTE

For range and bias tests the following 7.42 Unit Code Gears sets must be installed in the receiving apparatus:

- 45.5 Baud 96473 Gear Set
- 50.0 Baud 114465 Gear Set
- 75.0 Baud 110897 Gear Set

(This is required because the DXD is still operating with a 7.42 unit code disc.)



SECTION 5  
ADJUSTMENTS AND REQUIREMENTS

5-1. GENERAL

a. The following adjustments are arranged in a sequence that would be followed if a complete readjustment of the distortion test set were undertaken. This fact should be kept in mind when a single adjustment is to be made because a change in one adjustment may affect other adjustments. Therefore, if one adjustment is changed, related adjustments should be checked.

b. The spring tension values given in this bulletin were derived from measurements made with Teletype spring scales. These scales are calibrated for use in a vertical pull position. When used in any other position, the reading is an indicated value. Therefore, in order to obtain the specified scale readings, Teletype spring scales should be used. Springs which do not meet the requirements specified and for which no adjusting procedure is given should be replaced with new springs. Ordering information for the Signal Distortion Test Set may be obtained from Teletype parts Bulletin 1079B. Refer to Bulletin 1124B for Teletype Spring Scales and Tools.

c. After an adjustment has been completed, be sure to tighten any nuts or screws that may have been loosened. The adjusting illustrations, in addition to indicating the adjusting tolerances, positions of moving parts, and spring tension, also show the angle at which the scale should be

applied when measuring spring tensions. If a part that is mounted on shims is to be removed, the number of shims used at each of its mounting screws should be noted so that the same shim pile-up can be replaced when the part is re-mounted.

NOTE

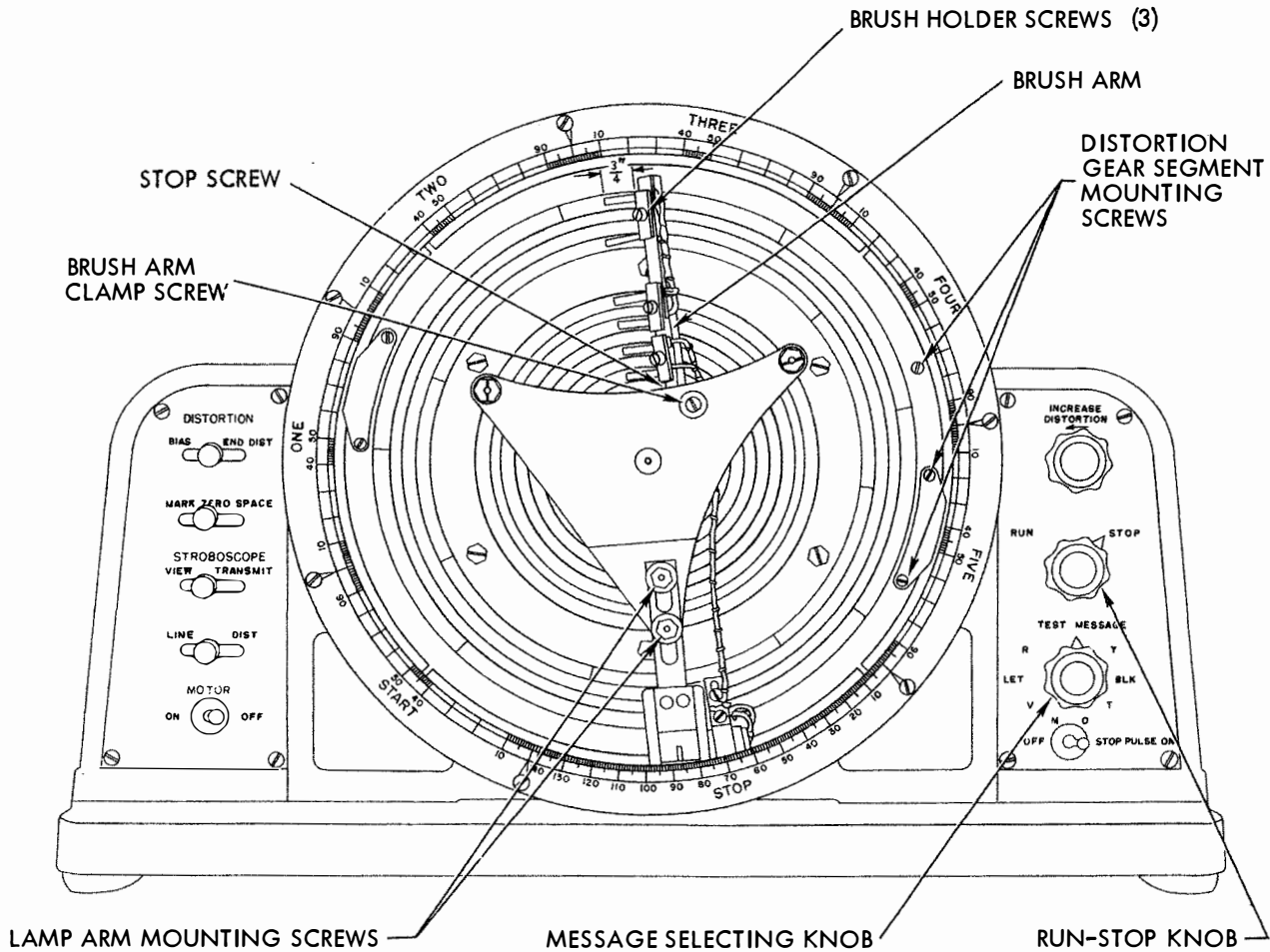
Except where otherwise indicated, DXD-800 adjustments are the same as for the standard five level units.

5-2. PRELIMINARY

Remove the large test set cover and the disc front cover. Loosen the brush arm clamp screw. Move the brushes away from the disc and tighten the clamp screw. (See Figure 5-1 for location of parts.)

5-3. LOCAL POWER REQUIREMENTS

The Signal Distortion Test Sets are usually equipped with 115 volt A.C. synchronous motors. External 115 volts direct current is required for the stroboscope lamp, except for the DXD-800 which includes a rectifier. Refer to the applicable wiring diagram shipped with the Signal Distortion Test Set.



### DISTRIBUTOR DISCS

#### REQUIREMENT

GAPS BETWEEN SEGMENTS IN THE TWO OUTER COMMUTATOR RINGS SHOULD BE CLEANED APPROXIMATELY EVERY 300 OPERATING HOURS. LOOSEN BRUSH ARM SET SCREW AND ROTATE BRUSH ARM SO THAT BRUSHES CLEAR COMMUTATOR RINGS. CLEAN ENTIRE AREA OF DISTRIBUTOR DISCS AND CHECK FOR BRUSH WEAR. REPOSITION BRUSH ARM AND TIGHTEN SET SCREW.

Figure 5-1. Front of DXD Unit with Cover Disc Removed

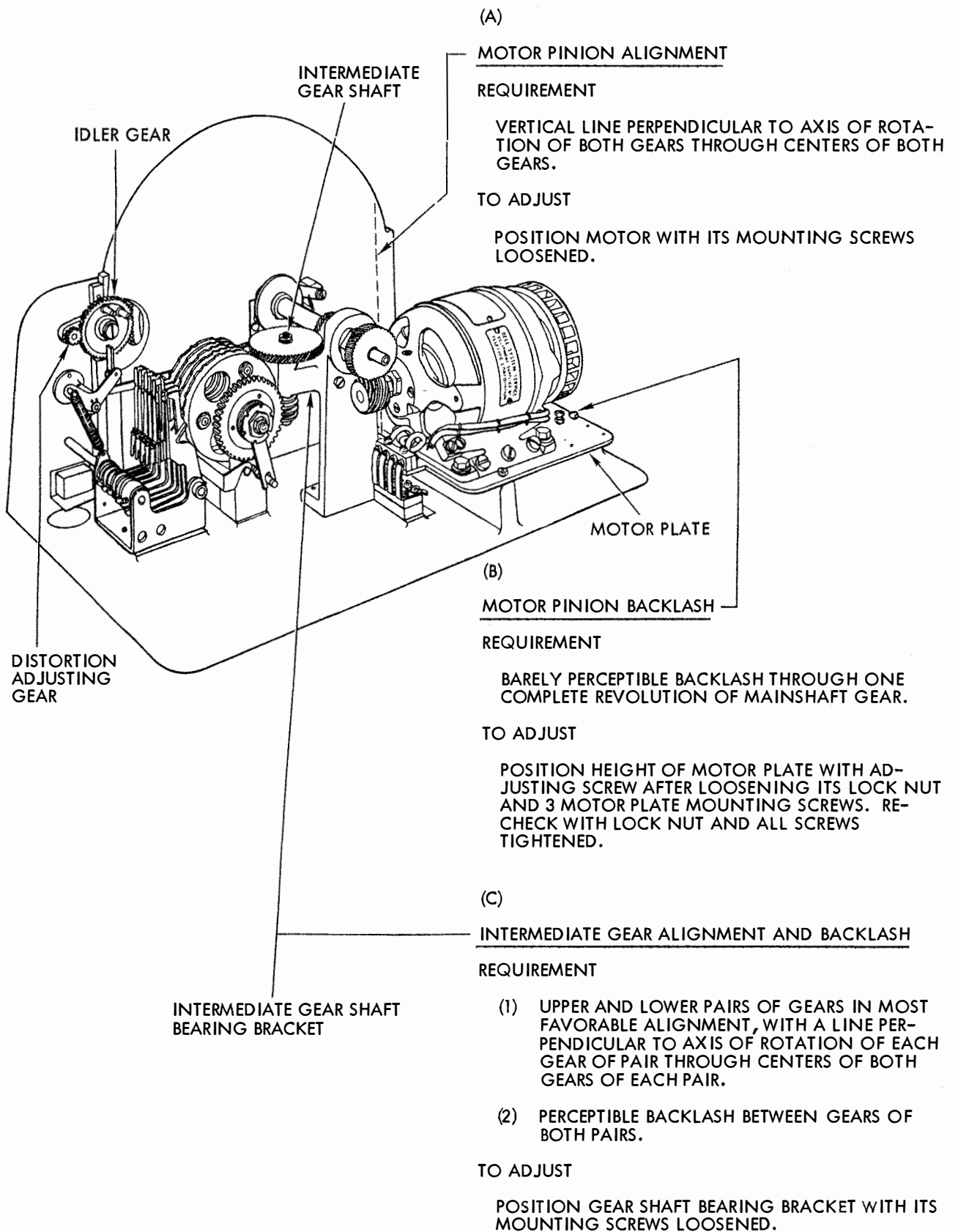
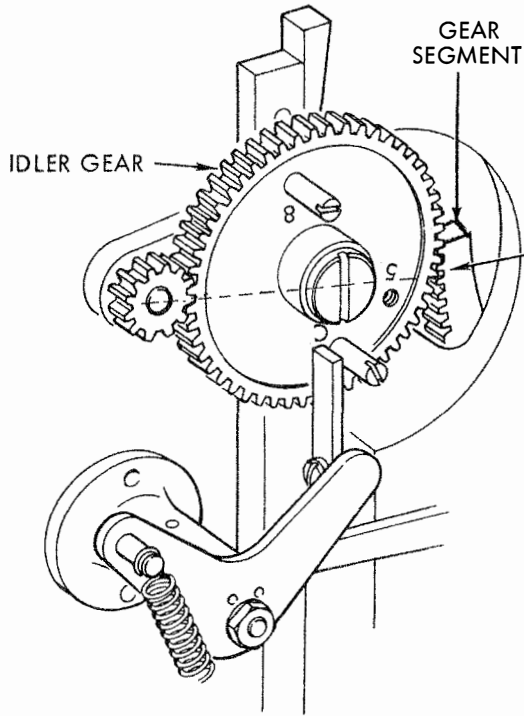


Figure 5-2. Motor and Intermediate Gear

## CAUTION

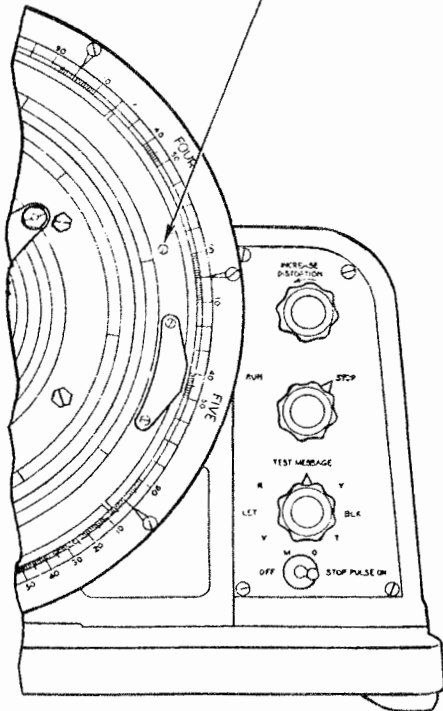
TO PROTECT BRUSHES, INCREASE DISTORTION KNOB MUST NEVER BE TURNED CLOCKWISE WHEN UNIT IS NOT OPERATING UNLESS BRUSH ARM ASSEMBLY HAS BEEN ROTATED TO LIFT BRUSHES OFF SEGMENTED COMMUTATOR RINGS.

DISTORTION ADJUSTING GEAR SEGMENT

## REQUIREMENT

- (1) WITH INCREASE DISTORTION KNOB IN MAXIMUM CLOCKWISE POSITION, GEAR SEGMENT ON MOVEABLE COMMUTATOR RING SHOULD HAVE ONE OR TWO TEETH REMAINING ABOVE HORIZONTAL CENTER LINE OF IDLER GEAR.

- (2) SLIGHT AMOUNT OF BACKLASH BETWEEN GEAR AND GEAR SEGMENT THROUGHOUT GEAR SEGMENT TRAVEL.



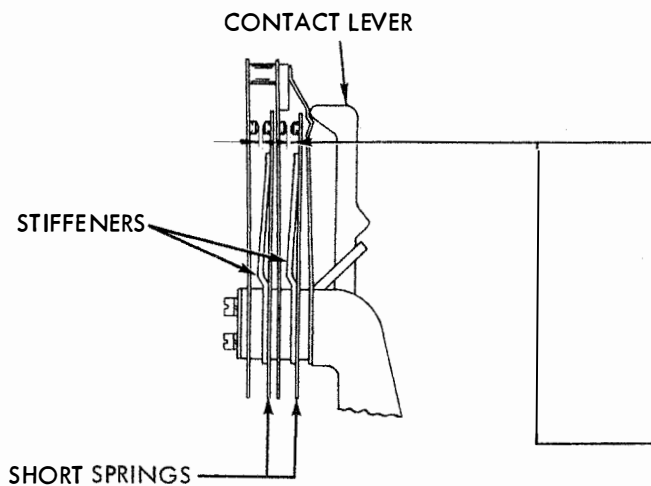
## TO ADJUST

- (1) REMOVE DISTORTION ADJUSTING IDLER GEAR (SECURED BY ONE MOUNTING SCREW) AND REPOSITION IN TEETH OF GEAR SEGMENT TO MEET REQUIREMENT (1). REINSTALL MOUNTING SCREW.
- (2) LOOSEN GEAR SEGMENT MOUNTING SCREWS (THREE SCREWS IN FRONT OF UNIT) FRICTION TIGHT. POSITION GEAR SEGMENT TO MEET REQUIREMENT (2). TIGHTEN MOUNTING SCREWS.

Figure 5-3. Distortion Adjusting Gears

TRANSMITTING CONTACTS

## NOTE



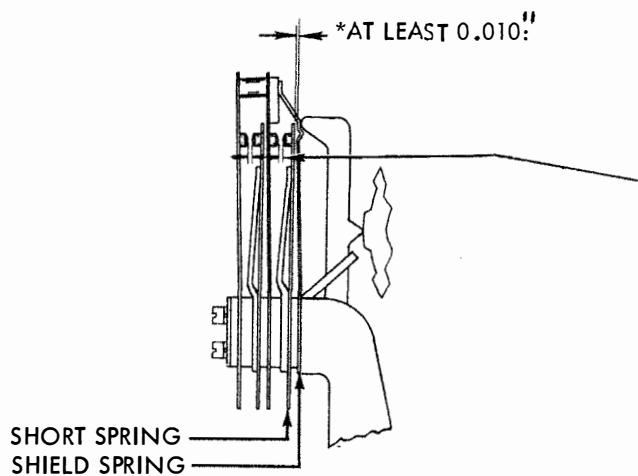
TRANSMITTING CONTACT ASSEMBLIES ARE NUMBERED FROM 1 TO 5 (1 TO 8 ON DXD800), THE NUMBER 5 (8 ON DXD800) NEAREST THE FRONT OF UNIT.

- (1) REQUIREMENT  
WITH CODE (MESSAGE) SELECTING KNOB (FIGURE 5-1) IN THE R POSITION (FIGURE 5-5 FOR DXD800), THERE SHOULD BE:  
MIN. 0.015 INCH --- MAX. 0.025 INCH  
GAP BETWEEN EACH PAIR OF CONTACT POINTS OF CONTACT ASSEMBLIES 1, 3, AND 5.

TO ADJUST  
BEND THE SHORT CONTACT SPRINGS AND THEIR STIFFENERS.

- (2) REQUIREMENT  
WITH MESSAGE SELECTING KNOB IN THE Y POSITION (SEE BELOW FOR DXD800), THERE SHOULD BE:  
MIN. 0.015 INCH --- MAX. 0.025 INCH  
GAP BETWEEN EACH PAIR OF CONTACT POINTS OF CONTACT ASSEMBLIES 2 AND 4.

TO ADJUST  
BEND THE SHORT CONTACT SPRINGS AND THEIR STIFFENERS.



- (3) REQUIREMENT  
WITH MESSAGE SELECTING KNOB IN THE TEST MESSAGE POSITION AND CONTACT LEVERS OF HIGH PART OF CAMS, THERE SHOULD BE:  
MIN. 0.015 INCH --- MAX. 0.030 INCH  
GAP BETWEEN EACH PAIR OF CONTACT POINTS:

TO ADJUST  
WITH TRANSMITTING CONTACT ASSEMBLY MOUNTING SCREWS LOOSENED, POSITION THE ASSEMBLY. TIGHTEN MOUNTING SCREWS.

- (4) REQUIREMENT  
WITH MESSAGE SELECTING KNOB IN TEST MESSAGE POSITION, CODE CAMS ROTATED UNTIL NUMBER 1 CONTACT LEVER RESTS ON LOW PART OF CAM, AND NUMBER 1 CONTACT LEVER HELD AGAINST ITS CAM, IT SHOULD REQUIRE:  
MIN. 1 OZ. --- MAX. 2 OZS.  
TO PULL SPRING AWAY FROM CONTACT LEVER CHECK EACH CONTACT SHIELD SPRING IN SIMILAR MANNER WITH EACH CONTACT LEVER ON LOW PART OF CAM.

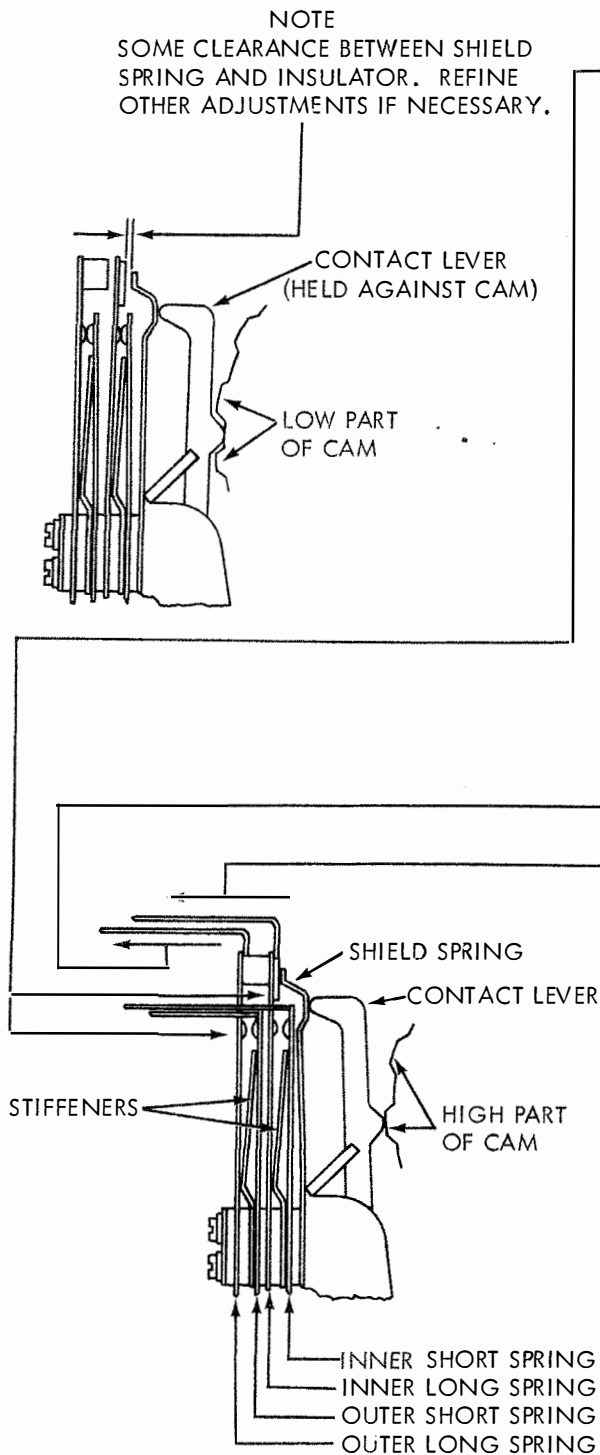
TO ADJUST  
BEND CONTACT SHIELD SPRING.

## NOTE

- \* THERE SHOULD BE A MINIMUM CLEARANCE OF 0.010 INCH BETWEEN CONTACT SHIELD SPRING AND INSIDE SHORT CONTACT SPRING. IF CONTACT SHIELD SPRING POSITIONS ARE CHANGED IN ANY MANNER, RE-CHECK CONTACT GAPS.

CONTINUED ON FIGURE 5-5

Figure 5-4. Transmitting Contacts

TRANSMITTING CONTACTS (CONTINUED)

- (5) REQUIREMENT  
WITH SCALE END APPLIED TO SHORT CONTACT  
SPRING AND PUSHED AT RIGHT ANGLES TO  
SPRING, IT SHOULD REQUIRE:  
MIN. 1 OZ.  
TO START EACH SHORT CONTACT SPRING  
MOVING AWAY FROM ITS STIFFENER.

TO ADJUST  
BEND THE SHORT CONTACT SPRING.

- (6) REQUIREMENT  
WITH SCALE HOOKED ON TOP OF OUTER LONG  
CONTACT SPRING AND PULLED AT RIGHT AN-  
GLES TO SPRING, IT SHOULD REQUIRE:  
MIN. 1 OZ. --- MAX. 2 OZS.  
TO START EACH OUTER LONG CONTACT  
SPRING MOVING AWAY FROM ITS INNER LONG  
CONTACT SPRING.

TO ADJUST  
BEND OUTER LONG CONTACT SPRING.

- (7) REQUIREMENT  
WITH OUTER LONG CONTACT SPRING HELD  
AWAY FROM INNER LONG CONTACT  
SPRING AND SCALE HOOKED OVER TOP OF  
INNER LONG CONTACT SPRING, IT SHOULD  
REQUIRE:  
MIN. 1 OZ. --- MAX. 2 OZS.  
TO START EACH INNER LONG CONTACT  
SPRING MOVING AWAY FROM ITS SHIELD  
SPRING.

TO ADJUST  
BEND INNER LONG CONTACT SPRING.

- (8) RECHECK REQUIREMENTS (3) AND (5).

TRANSMITTING CONTACTS (DXD800)

## REQUIREMENT

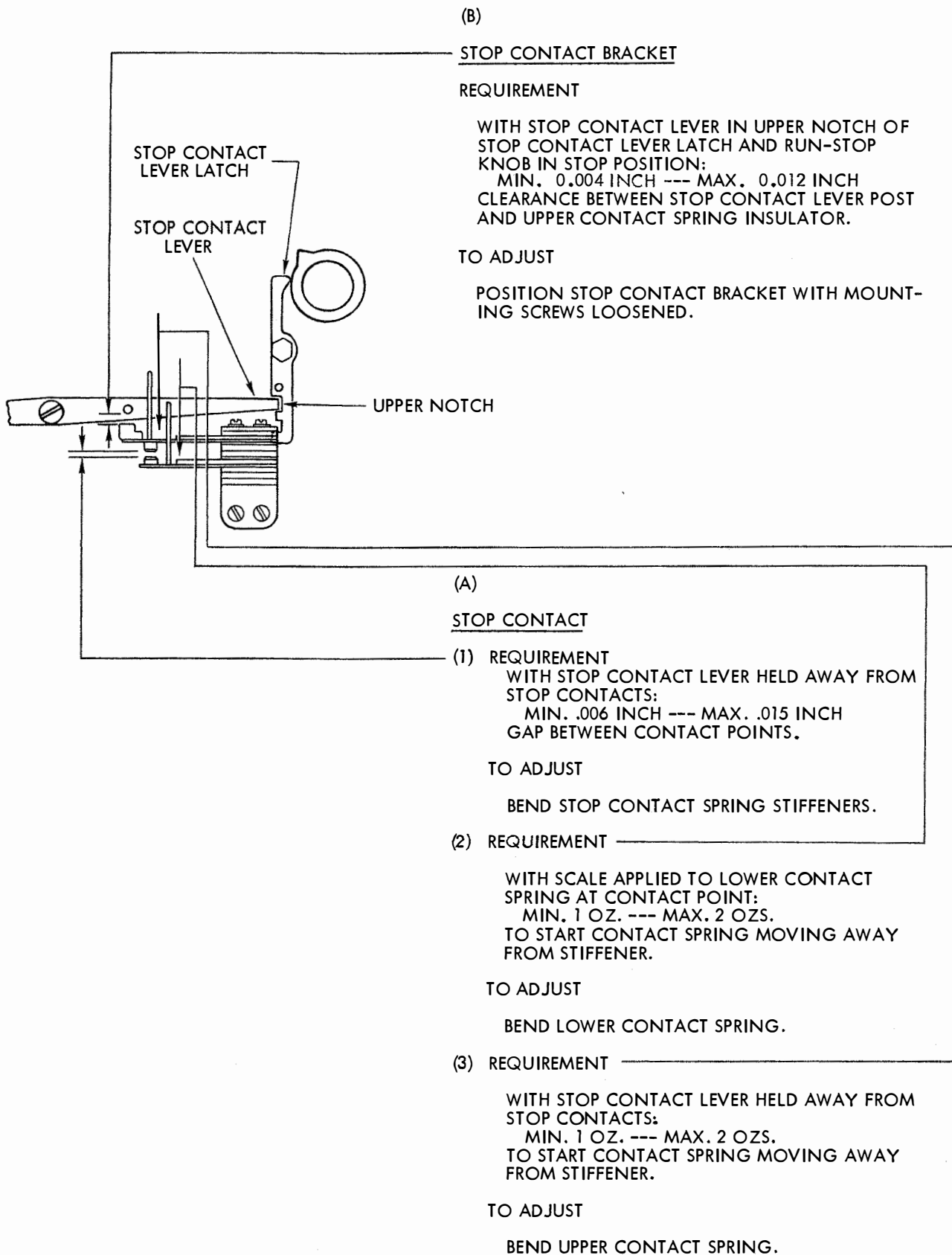
ALL REQUIREMENTS AND ADJUSTMENTS GIVEN  
ABOVE APPLY EXCEPT WHEN MESSAGE SELECTING  
KNOB POSITION Y OR R IS SPECIFIED. WHEN  
MESSAGE SELECTING KNOB POSITION Y IS SPEC-  
IFIED, USE MESSAGE SELECTOR KNOB POSI-  
TIONS 1, 3, 5, 7 AND CHECK ASSOCIATED CONTACTS.  
WHEN MESSAGE SELECTING KNOB POSITION R  
IS SPECIFIED, USE POSITIONS 1, 3, 5, 7 ALT. 2, 4,  
6, 8 AND CHECK CONTACTS 2, 4, 6, 8.

## NOTE

TRANSMITTER CONTACT ASSEMBLIES ARE NUM-  
BERED FROM 1 TO 8 WITH NUMBER 8 CONTACT  
NEAREST THE FRONT OF DXD800.

Figure 5-5. Transmitting Contacts





(B)

STOP CONTACT BRACKET

REQUIREMENT

WITH STOP CONTACT LEVER IN UPPER NOTCH OF STOP CONTACT LEVER LATCH AND RUN-STOP KNOB IN STOP POSITION:  
 MIN. 0.004 INCH --- MAX. 0.012 INCH  
 CLEARANCE BETWEEN STOP CONTACT LEVER POST AND UPPER CONTACT SPRING INSULATOR.

TO ADJUST

POSITION STOP CONTACT BRACKET WITH MOUNTING SCREWS LOOSENED.

(A)

STOP CONTACT

(1) REQUIREMENT  
 WITH STOP CONTACT LEVER HELD AWAY FROM STOP CONTACTS:  
 MIN. .006 INCH --- MAX. .015 INCH  
 GAP BETWEEN CONTACT POINTS.

TO ADJUST

BEND STOP CONTACT SPRING STIFFENERS.

(2) REQUIREMENT  
 WITH SCALE APPLIED TO LOWER CONTACT SPRING AT CONTACT POINT:  
 MIN. 1 OZ. --- MAX. 2 OZS.  
 TO START CONTACT SPRING MOVING AWAY FROM STIFFENER.

TO ADJUST

BEND LOWER CONTACT SPRING.

(3) REQUIREMENT  
 WITH STOP CONTACT LEVER HELD AWAY FROM STOP CONTACTS:  
 MIN. 1 OZ. --- MAX. 2 OZS.  
 TO START CONTACT SPRING MOVING AWAY FROM STIFFENER.

TO ADJUST

BEND UPPER CONTACT SPRING.

Figure 5-6. Stop Contact Mechanism

(C)

STOP CONTACT LEVER LATCH CAM

TO CHECK

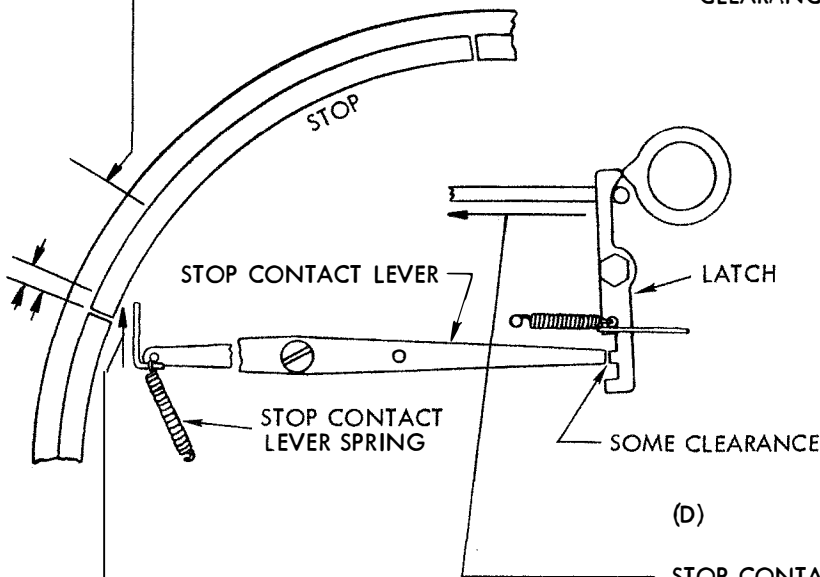
WITH CONTACT LEVER IN UPPER LATCHED POSITION AND RUN-STOP KNOB IN STOP POSITION, SLOWLY ROTATE MAIN SHAFT BY HAND UNTIL LEVER LATCH CAM JUST UNLATCHES CONTACT LEVER.

REQUIREMENT

MIN. 1/8 INCH --- MAX. 1 INCH  
CLEARANCE BETWEEN DISTRIBUTOR BRUSHES AND THE BEGINNING OF STOP SEGMENT ON FIXED DISC.

TO ADJUST

BY MEANS OF ITS SETSCREW ADJUST LEVER LATCH CAM TO MEET REQUIREMENT AND ALLOWING CLEARANCE BETWEEN CAM AND BACK CASTING.



(D)

STOP CONTACT LEVER LATCH SPRING

REQUIREMENT

WITH STOP CONTACT LEVER LATCH ON HIGH PART OF CAM AND STOP CONTACT LEVER HELD AWAY FROM SHOULDERS OF LATCH:  
MIN. 4-1/2 OZS. --- MAX. 6-1/2 OZS.  
TO START LATCH MOVING.

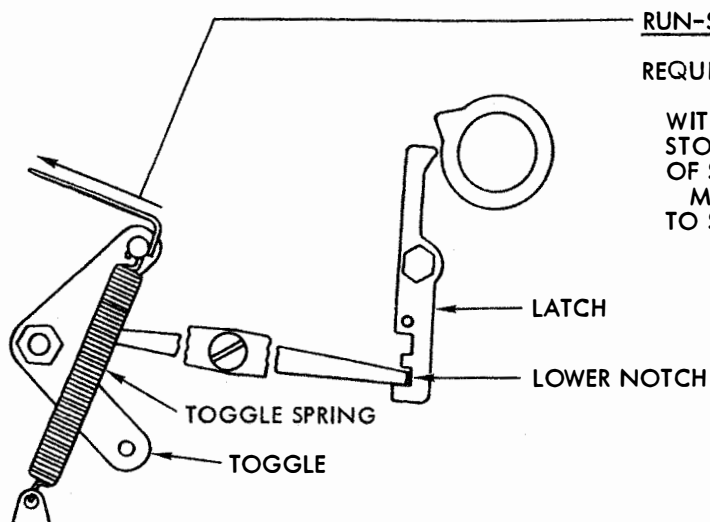
(E)

STOP CONTACT LEVER SPRING

REQUIREMENT

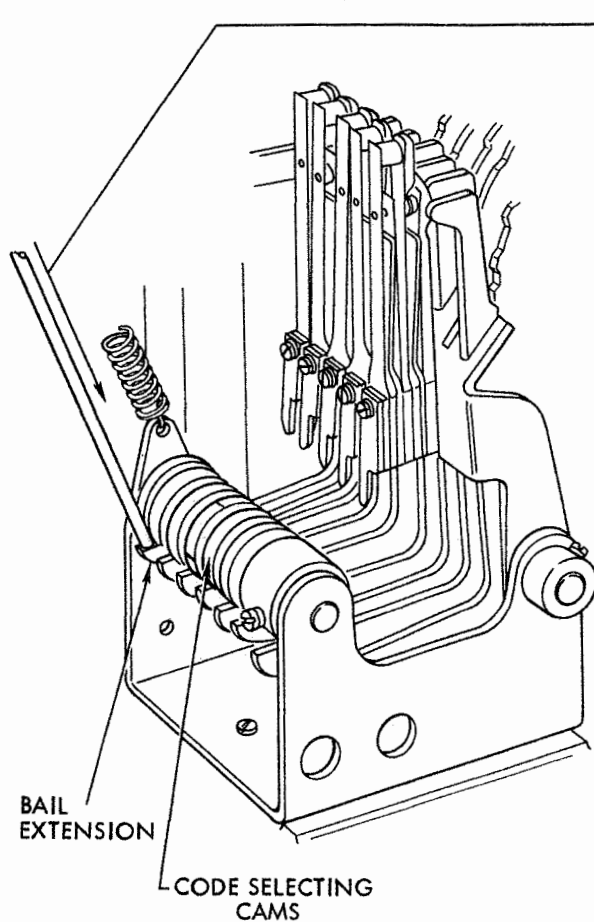
WITH STOP CONTACT LEVER LATCH ON HIGH PART OF CAM AND RUN-STOP KNOB IN RUN POSITION:  
MIN. 5 OZS. --- MAX. 8 OZS.  
TO START LEVER MOVING.

Figure 5-7. Stop Contact Mechanism

RUN-STOP SWITCH TOGGLE STOP PLATE SPRING

## REQUIREMENT

WITH RUN-STOP KNOB IN RUN POSITION AND  
STOP CONTACT LEVER LATCHED IN LOWER NOTCH  
OF STOP CONTACT LEVER LATCH:  
MIN. 4 OZS.  
TO START TOGGLE STOP PLATE MOVING.

TRANSMITTING CONTACT BAIL SPRING

## REQUIREMENT

WITH MESSAGE SELECTING KNOB IN TEST MESSAGE  
POSITION:  
MIN. 2 LBS.  
TO START BAIL EXTENSION MOVING AWAY FROM  
CODE SELECTING CYLINDER.

Figure 5-8. Run-Stop Switch Toggle Stop Plate and Transmitting Contact Bail Springs

(A)

CODE DISC SHAFT END PLAY (NOT APPLICABLE TO DXD800)

REQUIREMENT

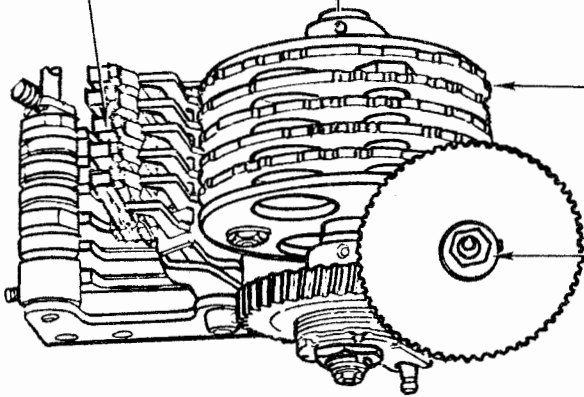
CODE DISC SHAFT SHOULD HAVE:  
MIN. SOME --- MAX. 0.005 INCH  
END PLAY.

TO ADJUST

WITH SLEEVE MOUNTING SCREW LOOSENED, POSITION  
THE SLEEVE AND SHAFT.

NO. 3 CONTACT

NO. 5 CODE DISC



(B)

CODE DISC PHASING (NOT APPLICABLE TO DXD800)

REQUIREMENT

WITH MESSAGE SELECTING KNOB IN TEST MESSAGE  
POSITION AND BRUSH SHAFT ROTATED UNTIL NUM-  
BER 3 OUTER CONTACTS CLOSE, THE FIXED DISC  
OUTER RING BRUSH SHOULD BE NOT MORE THAN  
3/4 OF A SEGMENT LENGTH IN EITHER DIRECTION  
FROM THE GAP BETWEEN STOP AND START SEGMENTS.

TO ADJUST

WITH NUT ON INTERMEDIATE GEAR SHAFT UPPER  
END LOOSENED, ROTATE CODE DISCS UNTIL NUM-  
BER 3 OUTER CONTACTS CLOSE. HOLD DISCS FROM  
MOVING. ROTATE BRUSH SHAFT UNTIL OUTER RING  
FIXED DISC BRUSH IS AT THE GAP BETWEEN STOP  
AND START SEGMENTS. TIGHTEN INTERMEDIATE GEAR  
SHAFT NUT.

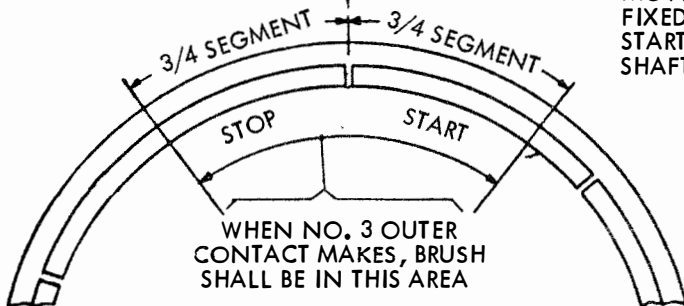


Figure 5-9. Five Level Code Disc Assembly

## CODE DISC AND RELAY PULSING CAM PHASING (DXD800)

## REQUIREMENT

- (1) WITH MESSAGE SELECTOR KNOB IN TEST MESSAGE POSITION AND BRUSH SHAFT ROTATED UNTIL NUMBER 5 OUTER TRANSMITTER CONTACTS CLOSE, FIXED DISTRIBUTOR DISC OUTER RING BRUSH SHOULD BE NOT MORE THAN  $3/4$  OF A UNIT SEGMENT LENGTH IN EITHER DIRECTION FROM GAP BETWEEN STOP AND START SEGMENTS.
- (2) WITH DISTRIBUTOR SHAFTED POSITIONED SO THAT RELAY PULSING CAM SCORE LINE IS DIRECTLY UNDER CAM FOLLOWER, FIXED DISTRIBUTOR DISC OUTER RING BRUSH SHOULD BE ON THE START PULSE SEGMENT.

## TO ADJUST

WITH NUT ON INTERMEDIATE GEAR SHAFT UPPER END LOOSENED, ROTATE CODE DISCS UNTIL NUMBER 5 OUTER TRANSMITTER CONTACTS CLOSE. HOLD DISCS FROM MOVING. POSITION BRUSH ARM BY TURNING DISTRIBUTOR SHAFT UNTIL FIXED DISC OUTER RING BRUSH IS AT THE GAP BETWEEN STOP AND START SEGMENTS. WITH BRUSHES IN THIS POSITION AND WITHOUT MOVING CODE DISCS, LOCATE RELAY PULSING CAM TO MEET REQUIREMENT (2). TIGHTEN INTERMEDIATE GEAR SHAFT NUT AND RE-CHECK REQUIREMENTS.

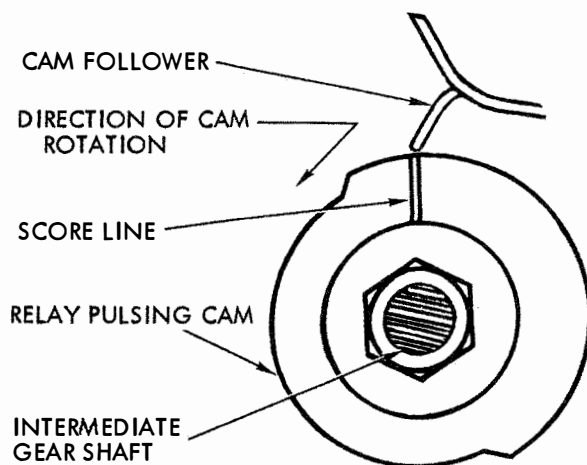
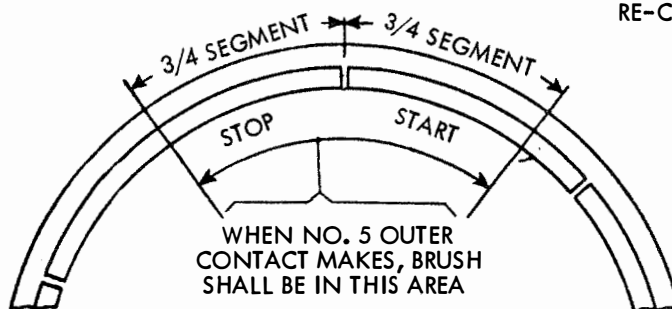
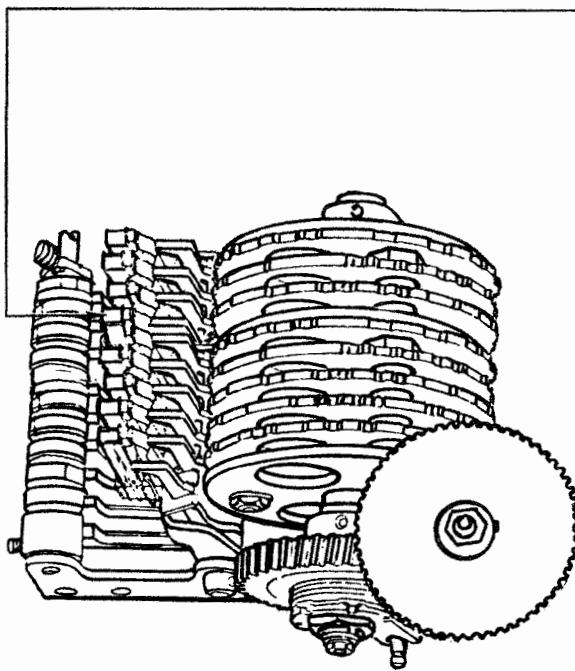
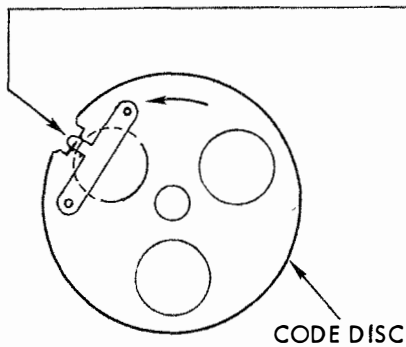


Figure 5-10. Eight Level Code Discs and Relay Pulsing Cam

CODE DISC SEGMENT RETAINING SPRING  
REQUIREMENT

SPRINGS SHALL HOLD EACH SEGMENT FIRMLY IN PLACE. CLEARANCE BETWEEN ADJACENT SPRINGS WITH ALL SEGMENTS IN PLACE IS NOT NECESSARY.

TO ADJUST  
REFINE POSITION OF SPRING ON ITS MOUNTING SCREWS AS REQUIRED.



RELAY PULSING CONTACT ASSEMBLY (DXD800)

(1) REQUIREMENT

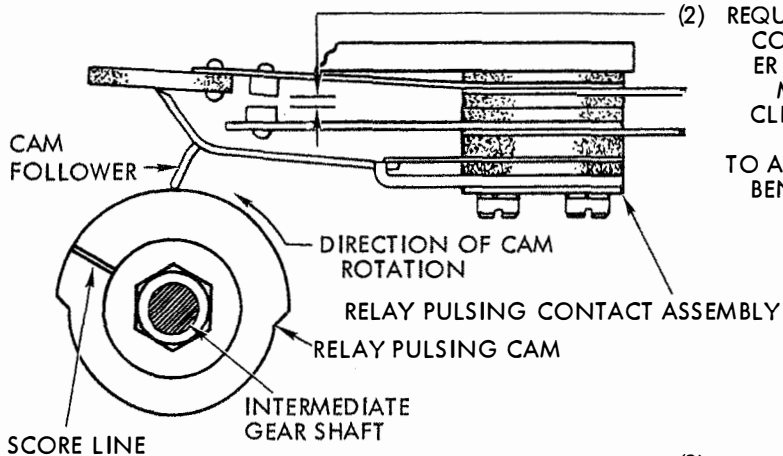
CONTACT ALIGNMENT. CAM FOLLOWER MUST RIDE CENTRALLY ON CAM AND CONTACT POINTS MUST BE IN ALIGNMENT.

TO ADJUST  
LOOSEN SCREWS AND SHIFT CONTACT ASSEMBLY.

(2) REQUIREMENT

CONTACT CLEARANCE. WITH CAM FOLLOWER ON HIGH PART OF CAM, THERE SHOULD BE:  
MIN. 0.010 INCH --- MAX. 0.020 INCH  
CLEARANCE BETWEEN CONTACTS.

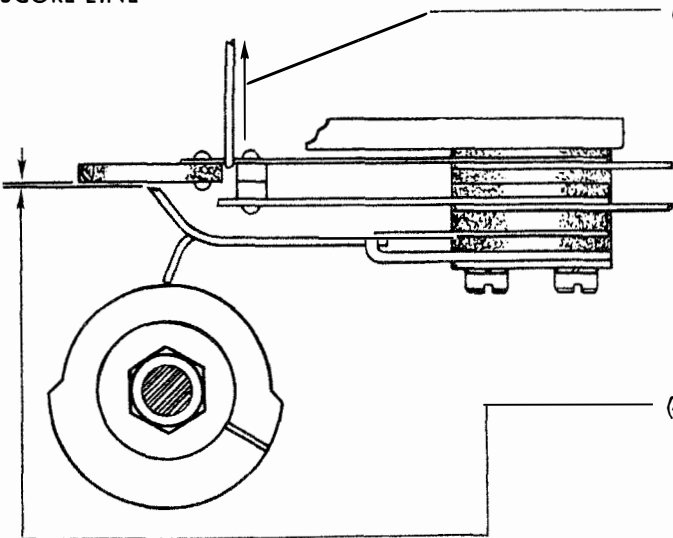
TO ADJUST  
BEND LOWER SPRING.



(3) REQUIREMENT

CONTACT TENSION. WITH CAM FOLLOWER ON LOW PART OF CAM, THERE SHOULD BE:  
MIN. 3-1/2 OZS. --- MAX. 4-1/2 OZS.  
TO JUST SEPARATE CONTACTS.

TO ADJUST  
BEND SPRINGS AND RE-CHECK CONTACT CLEARANCE REQUIREMENT (2).

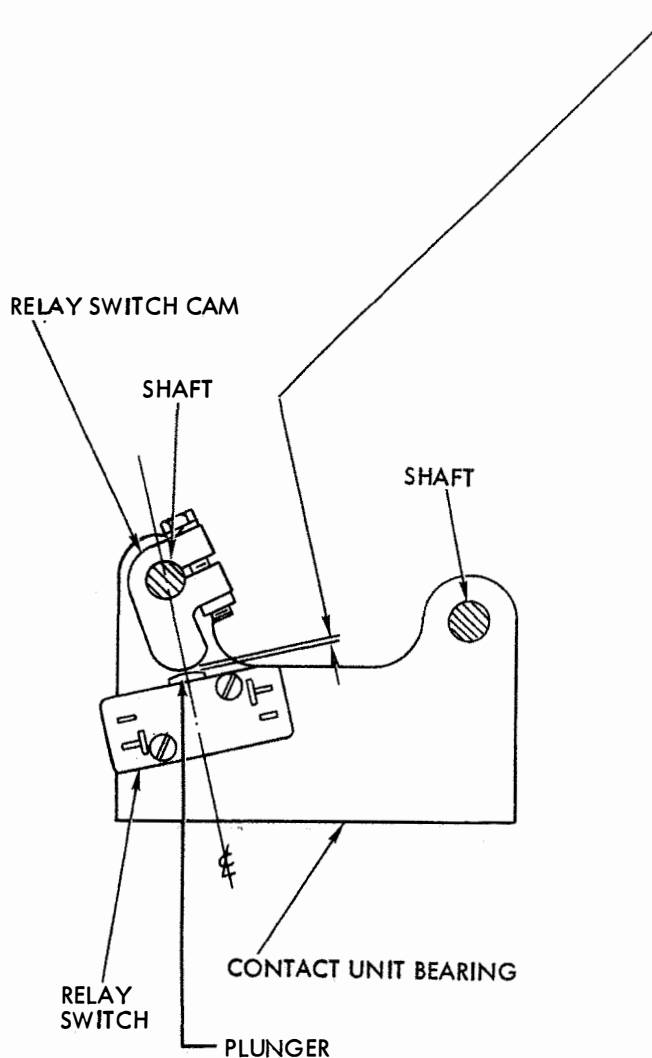


(4) REQUIREMENT

CAM FOLLOWER CLEARANCE. WITH CAM FOLLOWER IN THE CAM INDENT, THERE MUST BE SOME CLEARANCE BETWEEN CAM FOLLOWER AND CONTACT SPRING EXTENSION.

TO ADJUST  
REFINE AND RE-CHECK REQUIREMENTS (1),  
(2) AND (3).

Figure 5-11. Code Disc Segment Retaining Spring and Relay Pulsing Contact Assembly



### RELAY SWITCH AND RELAY SWITCH CAM (DXD800)

- (1) REQUIREMENT  
WITH MESSAGE SELECTOR KNOB IN THE 1, 3, 5, 7 ALT. 2, 4, 6, 8 POSITION, RELAY SWITCH CAM SHOULD BE POSITIONED ON MESSAGE SELECTING SHAFT TO GIVE MAXIMUM DEPRESSION OF RELAY SWITCH PLUNGER AND BE CENTRALLY LOCATED ON PLUNGER.

TO ADJUST  
WITH CAM MOUNTING SCREW LOOSENED, POSITION CAM ON THE SHAFT. TIGHTEN CAM MOUNTING SCREW.

- (2) REQUIREMENT  
WITH MESSAGE SELECTOR KNOB IN THE 2, 4, 6 POSITION THERE SHOULD BE SOME CLEARANCE BETWEEN RELAY SWITCH PLUNGER AND RELAY SWITCH CAM.

TO ADJUST  
REFINE REQUIREMENT (1).

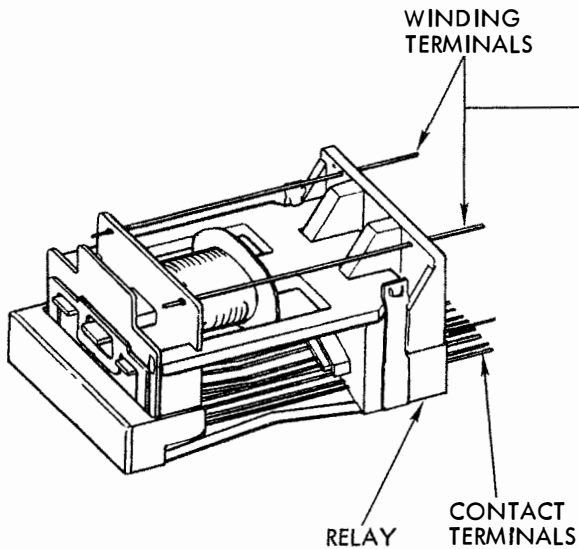
- (3) REQUIREMENT  
WITH MESSAGE SELECTOR KNOB IN THE 1, 3, 5, 7 ALT. 2, 4, 6, 8 POSITION, RELAY SWITCH CAM SHOULD OPERATE RELAY SWITCH. WHEN RELAY SWITCH PLUNGER IS HELD FULLY DEPRESSED MANUALLY, THERE SHOULD BE SOME CLEARANCE BETWEEN RELAY SWITCH PLUNGER AND RELAY SWITCH CAM.

TO ADJUST  
WITH RELAY SWITCH MOUNTING SCREWS LOOSENED, POSITION SWITCH. TIGHTEN MOUNTING SCREWS AND RE-CHECK REQUIREMENT (1).

- (4) REQUIREMENT  
RELAY SWITCH SHOULD BE ALIGNED PERPENDICULAR TO A LINE THROUGH CENTER OF SWITCH PLUNGER AND CENTER OF RELAY SWITCH CAM MOUNTING SHAFT, AS GAUGED BY EYE.

TO ADJUST  
WITH RELAY SWITCH MOUNTING SCREWS LOOSENED, POSITION SWITCH. TIGHTEN MOUNTING SCREWS AND RE-CHECK REQUIREMENTS (1) AND (3).

Figure 5-12. Relay Switch and Relay Switch Cam



RELAY TEST (DXD800)

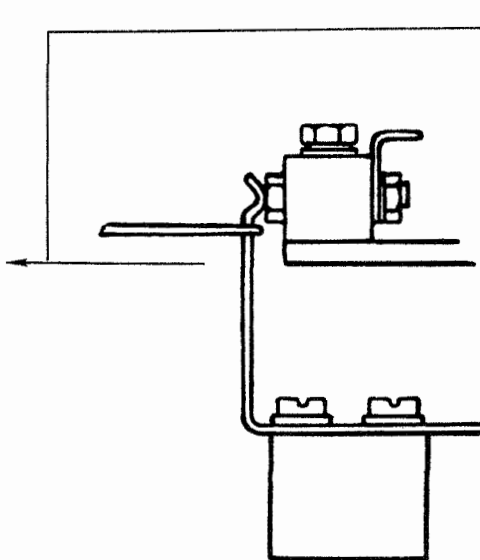
REQUIREMENT

CIRCUIT TEST REQUIREMENTS FOR 165212 RELAY (WECO RELAY AJ9 WITH SPRING COMBINATION #234) ARE:

OPERATE --- 0.040 AMPERES D.C.

NOTE

RELAY IS DESIGNED FOR MINIMUM FIELD MAINTENANCE AND IS USUALLY REPLACED RATHER THAN READJUSTED. INSPECT RELAY TO ASSURE THAT ARMATURE AND CONTACTS ARE FREE OF FOREIGN MATERIAL THAT MAY OBSTRUCT PROPER MOVEMENT. CHECK THAT CONTACT SPRING WIRES ARE IN CORRECT GUIDES.



MOTOR UNIT SLIP CONNECTION SPRING

(1) REQUIREMENT

WITH MOTOR UNIT ON BASE IT SHOULD REQUIRE:

MIN. 2-1/4 LBS. --- MAX. 3-3/4 LBS.

TO BREAK CONTACT AS MEASURED BY PULLING AT RIGHT ANGLES TO SPRING. MEASURE PRESSURE OF OPPOSITE END SLIP CONNECTION SPRING IN SAME MANNER. USE TEST LAMP TO DETERMINE WHEN CONTACT BREAKS.

TO ADJUST

REMOVE MOTOR UNIT AND BEND SLIP CONNECTION SPRINGS.

(2) REQUIREMENT

WITH MOTOR UNIT REMOVED AND A STRAIGHT EDGE PLACED ACROSS THE TWO END SLIP CONNECTION SPRINGS, THERE SHOULD BE:

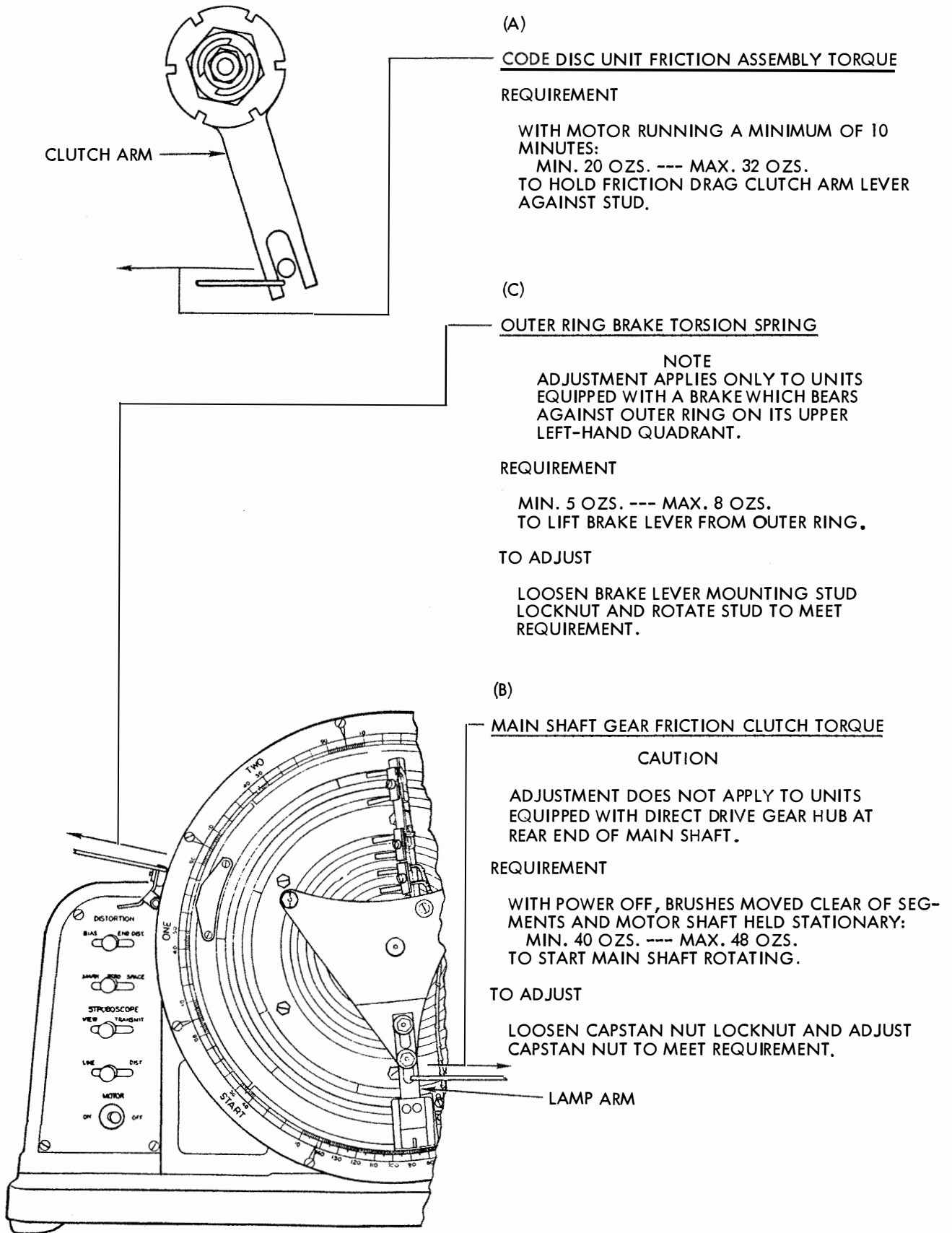
MIN. SOME --- MAX. 0.015 INCH CLEARANCE BETWEEN THE TWO INNER CONNECTION SPRINGS AND STRAIGHT EDGE.

TO ADJUST

BEND THE TWO INNER CONNECTION SPRINGS TO MEET REQUIREMENT.

Figure 5-13. Relay and Motor Unit Slip Connector





(A)  
CODE DISC UNIT FRICTION ASSEMBLY TORQUE  
 REQUIREMENT

WITH MOTOR RUNNING A MINIMUM OF 10 MINUTES:  
 MIN. 20 OZS. --- MAX. 32 OZS.  
 TO HOLD FRICTION DRAG CLUTCH ARM LEVER AGAINST STUD.

(C)  
OUTER RING BRAKE TORSION SPRING

NOTE  
 ADJUSTMENT APPLIES ONLY TO UNITS EQUIPPED WITH A BRAKE WHICH BEARS AGAINST OUTER RING ON ITS UPPER LEFT-HAND QUADRANT.

REQUIREMENT

MIN. 5 OZS. --- MAX. 8 OZS.  
 TO LIFT BRAKE LEVER FROM OUTER RING.

TO ADJUST

LOOSEN BRAKE LEVER MOUNTING STUD LOCKNUT AND ROTATE STUD TO MEET REQUIREMENT.

(B)  
MAIN SHAFT GEAR FRICTION CLUTCH TORQUE

CAUTION

ADJUSTMENT DOES NOT APPLY TO UNITS EQUIPPED WITH DIRECT DRIVE GEAR HUB AT REAR END OF MAIN SHAFT.

REQUIREMENT

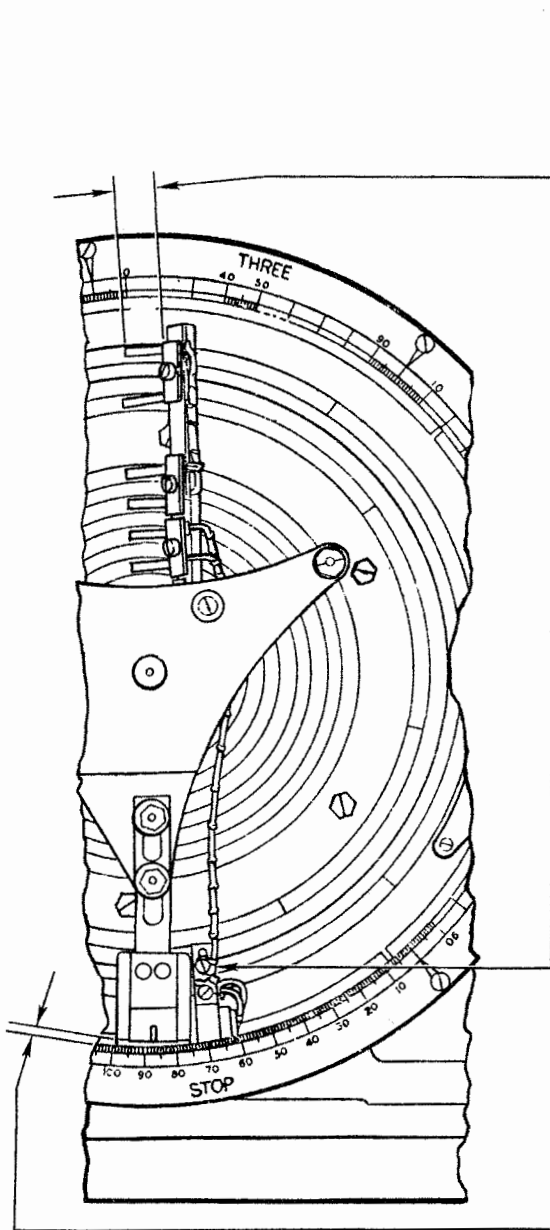
WITH POWER OFF, BRUSHES MOVED CLEAR OF SEGMENTS AND MOTOR SHAFT HELD STATIONARY:  
 MIN. 40 OZS. --- MAX. 48 OZS.  
 TO START MAIN SHAFT ROTATING.

TO ADJUST

LOOSEN CAPSTAN NUT LOCKNUT AND ADJUST CAPSTAN NUT TO MEET REQUIREMENT.

LAMP ARM

Figure 5-14. Clutches and Outer Ring Brake



(B)

DISTRIBUTOR BRUSHES

## REQUIREMENT

BRUSH ENDS SHOULD BE CUT SQUARE AND FREE FROM FRAGMENTS. BRUSHES SHOULD BE STRAIGHT AND EXTEND AT RIGHT ANGLES TO, AND 3/4 INCH FROM, BRUSH ARM.

## TO ADJUST

LOOSEN BRUSH CLAMP SCREWS AND POSITION BRUSHES. TIGHTEN BRUSH CLAMP SCREWS. LOOSEN BRUSH ARM CLAMPSCREW, MOVE BRUSHES AGAINST RESPECTIVE DISCS UNTIL BRUSH ARM POST IS AGAINST STOP POST.

(C)

INDICATING LAMP POSITION

## REQUIREMENT

INDICATING LAMP SHOULD ILLUMINATE WITH MAXIMUM BRILLIANCY, AS OBSERVED WITH FRONT COVER INSTALLED, LIGHTED SIDE OF LAMP FILAMENT TOWARD UNIT FRONT, DC ON, AND MOTOR RUNNING. (SEE FIGURE 4-5 FOR LOCAL SIGNAL CONTROL POSITIONS.)

## TO ADJUST

REMOVE FRONT COVER. WITH LAMP BRACKET MOUNTING SCREW LOOSENED, POSITION BRACKET AND LAMP WITHIN BRACKET TO MEET REQUIREMENT. TIGHTEN SCREWS AND REPLACE COVER.

(A)

INDICATING LAMP ARM

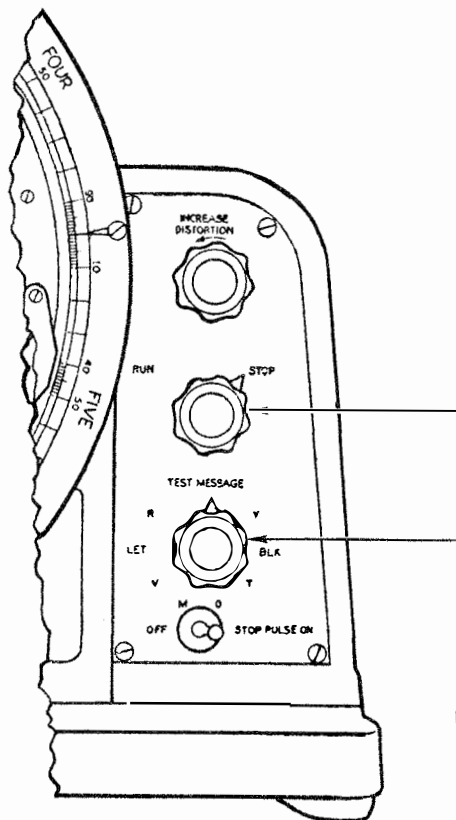
## REQUIREMENT

- (1) FACE OF SLOTTED PART OF LAMP ARM SHOULD BE APPROXIMATELY IN LINE WITH FACE OF SCALE.
- (2) AT POINT OF LEAST CLEARANCE BETWEEN END OF SLOTTED PART OF LAMP ARM AND EDGE OF SCALE PLATE THERE SHOULD BE:  
MIN. SOME --- MAX. .006 INCH CLEARANCE.

## TO ADJUST

LOOSEN LAMP ARM MOUNTING SCREWS AND POSITION LAMP ARM TO MEET REQUIREMENTS (1 AND 2).

Figure 5-15. Indicating Lamp and Distributor Brushes



(B)

RUN-STOP KNOB POSITION

## REQUIREMENT

WITH RUN-STOP KNOB IN EXTREME CLOCKWISE POSITION, KNOB POINTER SHOULD ALIGN WITH STOP POSITION LABEL ON PANEL.

## TO ADJUST

WITH SET SCREW LOOSENED, POSITION KNOB ON ITS SHAFT. TIGHTEN SET SCREW AND CHECK KNOB POINTER ALIGNMENT IN RUN POSITION (COUNTER-CLOCKWISE). REFINE ADJUSTMENT AS REQUIRED.

(A)

MESSAGE SELECTING KNOB POSITION

## REQUIREMENT

WITH CODE CYLINDER POSITIONED TO TRANSMIT TEST MESSAGE (TRANSMITTER CONTACTS POSITIONED FOR OPERATION BY CODE DISCS), MESSAGE SELECTING KNOB POINTER SHOULD POINT TOWARD TEST MESSAGE POSITION ON RIGHT PANEL PLATE AND BE POSITIONED VERTICALLY AS GAUGED BY EYE.

## TO ADJUST

WITH MESSAGE SELECTING KNOB SET SCREW LOOSENED, POSITION KNOB ON ITS SHAFT. CHECK ALIGNMENT OF POINTER IN OTHER DE-NTENT POSITIONS AND REFINE ADJUSTMENT AS REQUIRED.

Figure 5-16. Message Selector and Run-Stop Knobs



## SECTION 6

## LUBRICATION

## 6-1. GENERAL

The oil and grease specified in Paragraph 6-2 below should be used to lubricate the Teletype Signal Distortion Test Set. Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed, except where the use of grease is specified. Oil both loops of all helical springs that exert a nominal tension of less than 2-1/2 lbs. Apply grease to both loops of helical springs that exert a nominal tension of 2-1/2 lbs. or more.

## 6-2. LUBRICANTS

a. The following lubricants have been standardized for use on the apparatus. The lubricants can be ordered from the Teletype Corporation as follows:

88970	1 Qt. of KS-7470 Oil
88971	1 Gal. of KS-7470 Oil
88973	1 Lb. of KS-7471 Grease
88975	KS-8319 Grease Gun
97116	4-oz. Tube of KS-7471 Grease

b. The above grease is recommended instead of oil for lubricating motors equipped with ball bearing. The 88975 grease gun should be used for injecting grease into the bearings of the ball bearing motors. The gun may be used also for applying grease to other parts of the apparatus and no other grease container need be carried. If this grease gun is not available, the oil listed in the foregoing should be substituted for lubricating ball bearing motors.

## 6-3. LUBRICATION INSTRUCTIONS

## a. FILLING THE GREASE GUN

(1) Unscrew the lubricant tube from the cap casting of the grease gun.

(2) Insert fresh lubricant through the open end of the tube with the fingers. Apply gradually to eliminate air pockets.

(3) Tamp the lubricant down solidly in the tube by pounding the closed end solidly against the palm of the hand. Continue to add lubricant

until the tube is completely filled and the metal follower rests against the perforated tube cover.

(4) Fill the cap casting with lubricant flush to the bottom side of the tube threads.

(5) Screw the lubricant tube into the cap casting part way only. Then insert a pencil or rod through the perforated tube cover and exert pressure against the metal follower so as to expel any entrapped air past the tube threads. When lubricant begins to ooze through the threads, tighten the lubricant tube securely in the cap casting.

(6) Operate the handle back and forth for several strokes or until lubricant is pumped from the nozzle. The gun is then ready for use. If the lubricant does not flow from the nozzle in a solid stream, it is an indication that all air has not been expelled from the lubricant 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. MOTOR BALL BEARING LUBRICATION

The motor bearings are packed with grease before the motor leaves the factory and under ordinary operating conditions need no additional lubrication for approximately two months. At the regular lubricating intervals one or two strokes of the plunger of the gun should apply sufficient grease to each bearing. To lubricate, press the nozzle of the gun against the ball oiler and force the grease into the hole by pushing on the plunger of the gun. Care should be taken that the bearings are not overloaded. Overloading will result in the grease oozing out of the end castings and being forced into the motor or being thrown on other parts of the mechanism. After lubricating, the motor should be run for a few minutes and then any excess grease that has been forced out of the ends of the castings should be wiped off. Each time that the gun is used for lubricating a motor bearing, the plunger should first be depressed slightly to make sure that grease will be delivered.

c. LUBRICATION POINTS (See Figures 6-1 through 6-3)

Code disc - grease.

Code discs oil wick - saturate.

Code disc shaft - two bearings.  
 Code selecting cylinder - two bearings.  
 Code selecting cylinder camming surfaces - grease.  
 Contact levers (5,6, or 8) - bearings and at shield springs.  
 Contact lever bail shaft - two bearings.  
 Distortion adjusting gears - two bearings.  
 Intermediate gears - grease.  
 Intermediate shaft - two bearings.  
 Main shaft ball bearings - two.  
 Main shaft friction washers - saturate.  
 Main shaft gears - grease.  
 Motor bearing oilers - two oil holes.  
 Motor pinion - grease.  
 RUN-STOP Switch shaft - bearing.  
 Stop contact lever - bearing.

Stop contact lever latch - bearing.  
 Stop contact lever latch cam - grease.  
 Braking pulley - grease groove sparingly.  
 Braking wedge - bearing.

ADDITIONAL LUBRICATION FOR DXD800

Relay Pulsing Contact Assembly - Lubricate cam follower with one drop of oil at spring hinge.

Relay Pulsing Cam - Apply light film of grease over entire camming surface. Remove excess grease from cam follower after unit has run a short while.

Message selecting shaft felt washers (two) - saturate with oil.

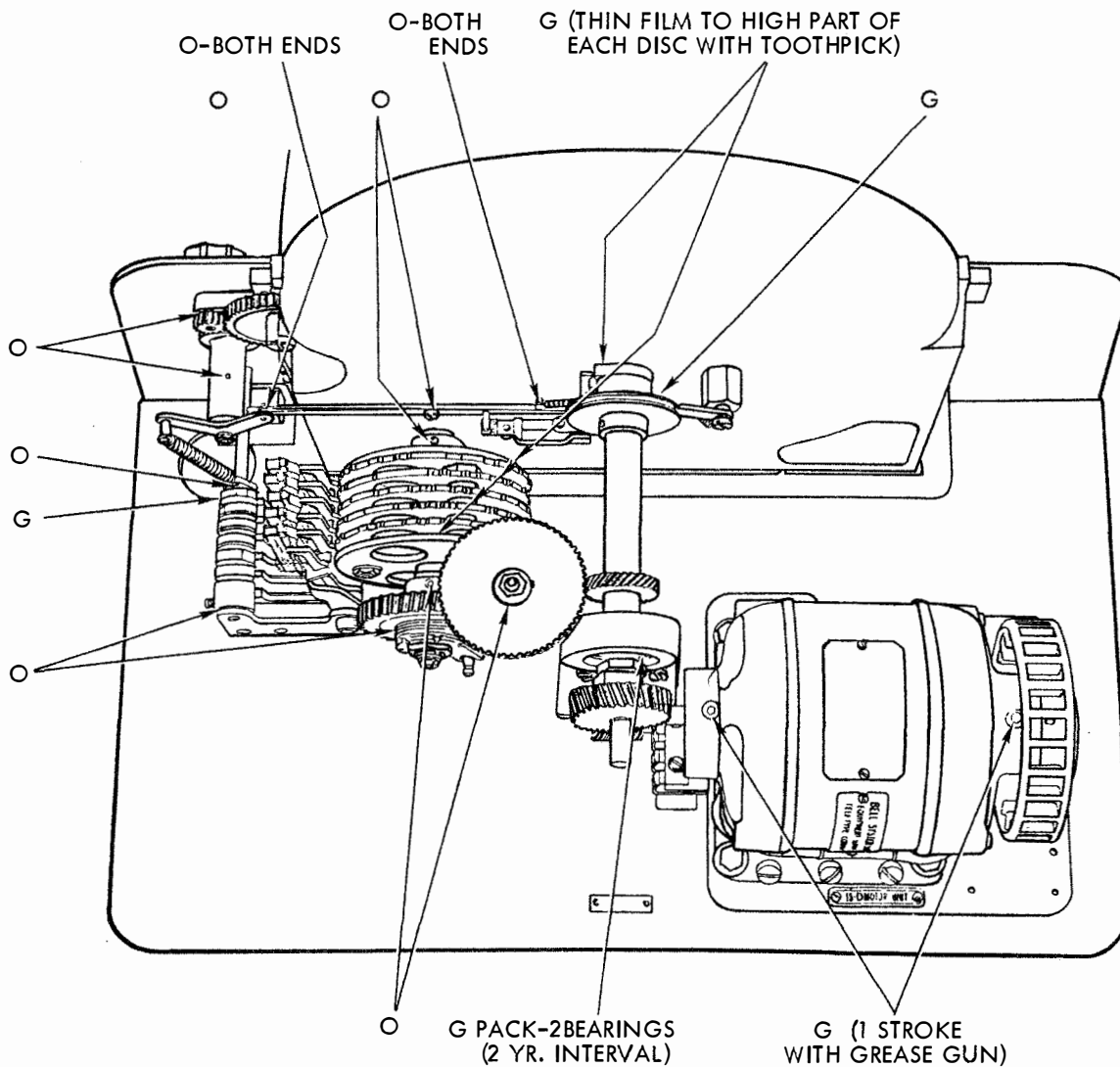


Figure 6-1. Lubrication

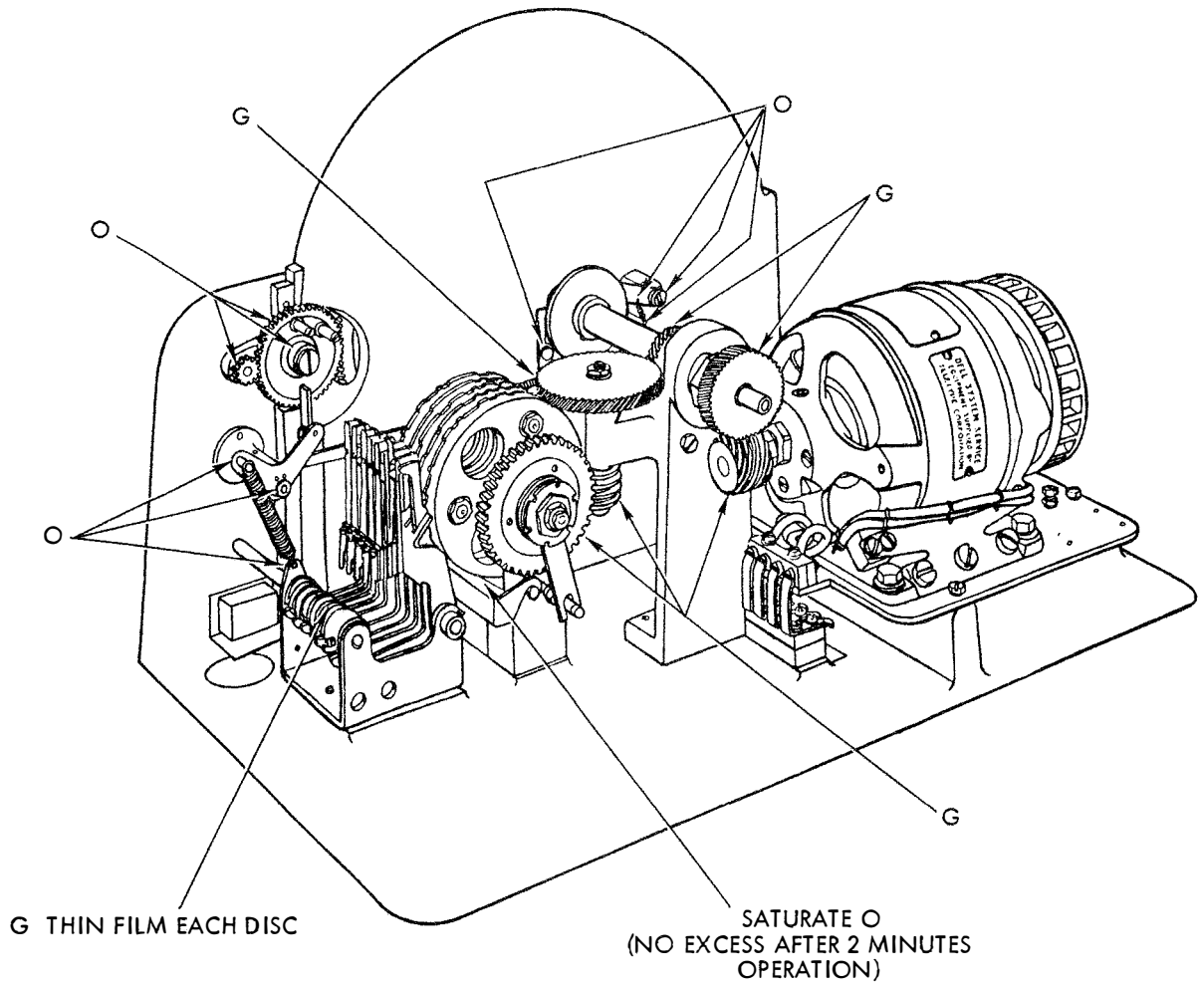


Figure 6-2. Lubrication

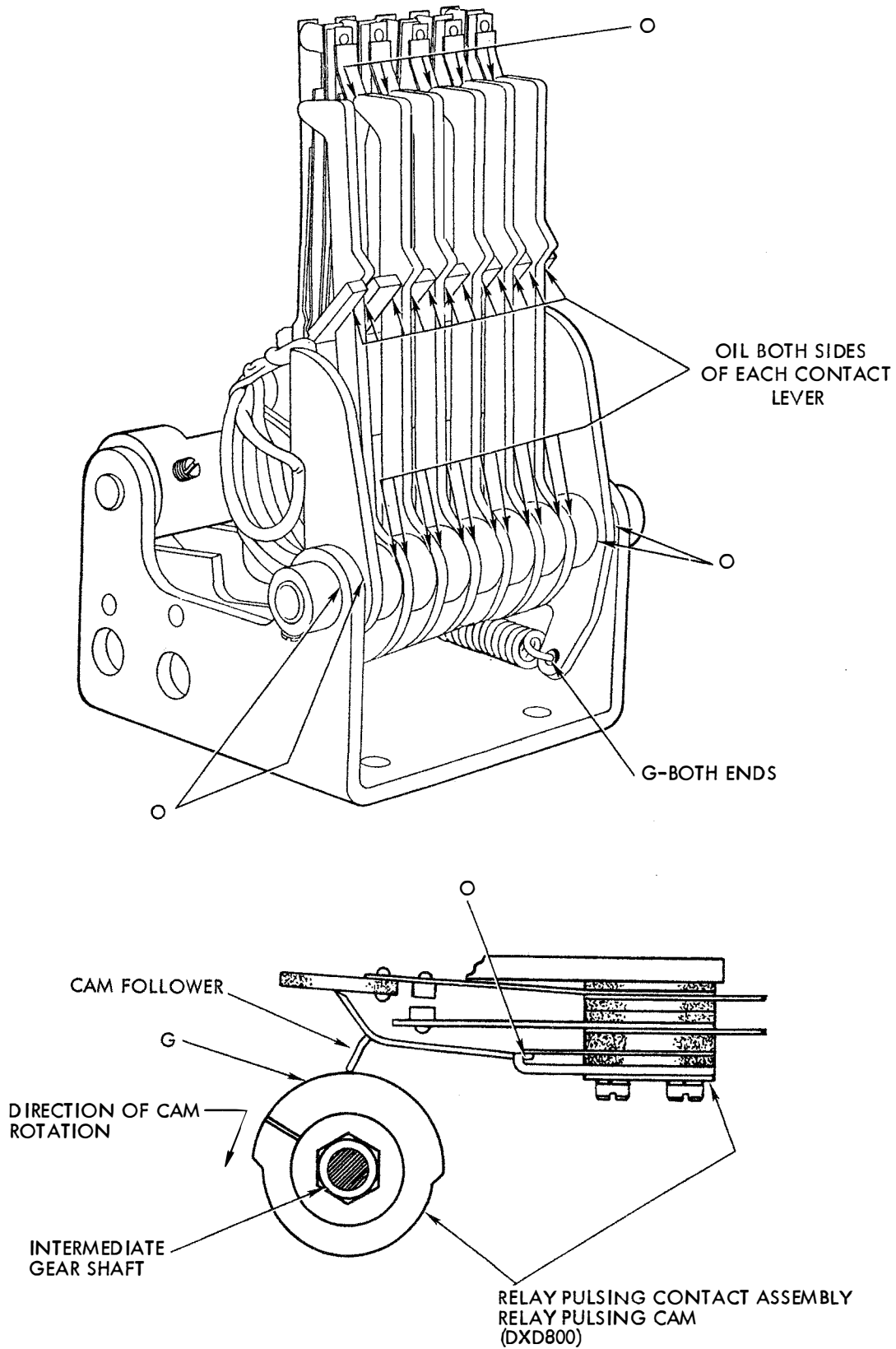


Figure 6-3. Lubrication