

**NO. 1 ELECTRONIC SWITCHING SYSTEM ADF  
HALF-DUPLEX—150 WORD PER MINUTE DATA STATION  
USING 4-ROW TELETYPEWRITERS  
MAINTENANCE**

**1. GENERAL**

**1.01** This section describes the maintenance requirements for a half-duplex, 150-word per minute 37-type teletypewriter (TTY) used with No. 1 Electronic Switching System Arranged with Data Features (No. 1 ESS ADF).

**1.02** Routine maintenance for the station is limited to the 37-type RO TTY. There is no routine maintenance required for Data Set 108A- or 109A-type, or for Data Auxiliary Set (DAS) 820B4 or 804R3.

**1.03** Routine maintenance of the 37-type RO TTY should be in accordance with 574 Division (Bell System Practices) covering the appropriate type of TTY.

**1.04** Stations thought to be having trouble should be tested as described in the section entitled No. 1 Electronic Switching System ADF—Half-Duplex—150 Word Per Minute Data Station—Using 4-Row Teletypewriters—Test Procedures (580-301-502).

**1.05** Data Set 108A- or 109A-type or DAS 820B4 not meeting test requirements should be replaced in order to restore service to the customer as quickly as possible. Data set replacement is covered in Part 6 of this section. For replacement of DAS 820B4, refer to the section entitled No. 1 Electronic Switching System ADF—Half-Duplex—150 Word Per Minute Data Station—Using 4-Row Teletypewriters—Disassembly And Reassembly (580-301-702).

**1.06** When the data set 108A- or 109A-type or DAS 820B4 is replaced, the replacement should be tested according to the section referenced in 1.04.



*To prevent damage to circuit packs, disconnect power cord plug from the customer power receptacle before connecting or disconnecting circuit packs, connectors, or options.*

**1.07** Exercise care in handling and transporting data sets and data auxiliary sets. If possible, use original cartons to store, transport, or ship them.

**1.08** If maintenance spares are stocked, verify that they are checked and ready for immediate installation.



*When DAS 820B4 is replaced and CP AR37 is also replaced, the replacement CP AR37 must be encoded as given in Part 3 of this section.*

**2. ACCESS TO DATA AUXILIARY SET 820B4**

**2.01** Access to DAS 820B4 is gained by opening the right-hand access door on the front of the TTY pedestal. The door release is located adjacent to the door inside the kneewell. To facilitate maintenance, the DAS 820B4 has a maintenance position. To position the DAS 820B4 for maintenance:

- (1) Loosen the captive locking screw which secures the sliding 93A bracket in the cabinet.
- (2) Pull the 93A bracket out through the opened door to the maintenance position (Fig. 1).

**3. CP AR37—ENCODING THE SHIFT REGISTER**

**3.01** The shift register of CP AR37 is encoded by connecting conductors to a specific terminal on CP AR37, routing the conductors through the eight tubes of the shift register (in a

specified direction), and connecting them to another specific terminal on CP AR37.



*Extreme care must be exercised when threading the conductors through the eight tubes. The conductors should be relatively taut, but not to the point that sharp bends occur in the conductors. Any excessive strain on the conductors may damage the shift register. After threading, protect the conductors by applying an insulating tape (E Vinyl or equivalent) to prevent interference with adjacent circuit packs.*

**3.02** The CP AR37 should be positioned as shown in Fig. 2. It is suggested that the encoding of the shift register be performed on a flat surface properly protected.

**3.03** *The following procedure is recommended for encoding the shift register:*

- (1) Obtain the SPC, CEC, and SIC codes from the faceplate of the CP AR37 being replaced or, for a new installation, from the service order and/or circuit layout record card.
- (2) Select proper mark and space sequence for each code by using Fig. 3.
- (3) Cut three 2-foot pieces of Formex No. 24—No. 28 American Wire Gauge (AWG), or equivalent.



*The following operations require the use of a KS-16346 L1 or L2 soldering iron (or an equivalent low-wattage rated iron). Extreme care must be exercised when soldering the conductors to the specified terminal at the completion of threading operations.*

#### SIC CODE

- (4) Connect the end of one of the conductors mentioned in (3) to the GEN terminal (Fig. 2).
- (5) Starting with tube 1 for bit one, thread the free end of this conductor through the eight tubes in the shift register as indicated in Fig. 4.

- (6) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the SIC terminal (Fig. 2).

#### SPC CODE

- (7) Connect one end of another of the conductors mentioned in (3) to the SPC terminal (Fig. 2).
- (8) Starting with tube 1 for bit one, thread the free end of this conductor through the eight tubes in the shift register as indicated in Fig. 4.
- (9) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the DET terminal (Fig. 2).

#### CEC CODE

- (10) Connect one end of the last of the three mentioned conductors to the CEC terminal (Fig. 2).
- (11) Starting with tube 1 for bit one, thread the free end of this conductor through the eight tubes in the shift register as indicated in Fig. 4.
- (12) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the DET terminal (Fig. 2).

#### 4. MAINTENANCE PHILOSOPHY

**4.01** Maintenance of the half-duplex, 150-word per minute data station, should be in accordance with the flow chart shown in Fig. 5. This flow chart is recommended for an organized trouble investigation with a minimum amount of time spent in locating the trouble.

**4.02** When a trouble report is dispatched for clearance, the report should be analyzed for obvious trouble conditions (ribbon, paper jams, appearance, etc).

**4.03** When the report is obviously TTY trouble, trouble clearing procedures and adjustments should be in accordance with the section entitled Model 37 Teletypewriters—Field Maintenance Practice (579-400-350).

**4.04** When the report is not obviously TTY trouble, inquire whether a remote loop-back test of DAS 820B4 has been performed by the serving test center (STC) or the control serving test center (CSTC). If the remote loop-back test has been performed, determine whether the results were satisfactory. If a remote loop-back test has not been performed, request the STC or CSTC to perform the test.



**A loop-back test may be performed only on a data station that is equipped with a Data Set 108A-type. Stations equipped with Data Set 109A-type are not designed to provide remote loop-back capabilities.**

**4.05** Assuming that the station is equipped with Data Set 108A-type and the results of the remote loop-back test indicate a failure, a manual loop-back test of the data set should be performed to isolate the trouble to either the data set or to DAS 820B4. If the data set fails the manual loop-back test, replace the data set with one of known workable quality and repeat the manual loop-back test. The replacement data set should, before installation, have the necessary **Preoperative Adjustments and Tests** for Data Set 108A-type in accordance with Section 580-301-202. The replacement data set should pass the test which is an indication that the replaced data set caused the trouble report. If the replacement data set fails the test, the line must be checked. Should the line fail the test requirements given in the section entitled Private Line Data Circuits—Voice Bandwidth Circuits For Miscellaneous Data—Overall Tests and Requirements (314-410-500), the line facilities should be replaced in order to restore customer service with a minimum amount of outage.

**4.06** If the data set passes the manual loop-back test, the trouble may be located in DAS 820B4.



**Replacement procedures for DAS 820B4 are covered in the section entitled No. 1 Electronic Switching System ADF—Half-Duplex—150 Word Per Minute Data Station—Using 4-Row Teletypewriters—Disassembly And Reassembly (580-301-702). To reduce the time required, it is suggested that CP AR37, of DAS 820B4 that is to be replaced, should be installed in the**

**replacing DAS 820B4. If DAS 820B4 fails again on the repeated test, CP AR37 of the replacing DAS 820B4 will have to be encoded for the station. See Part 3 of this section for the encoding procedure.**

**4.07** Should DAS 820B4 pass the repeated remote loop-back test after the replacement, the trouble was in DAS 820B4.

**4.08** If DAS 820B4 fails the repeated remote loop-back test, the next test should be the continuity check of DAS 804R3 if a replacement unit is not available for substitution check.

**4.09** If DAS 804R3 fails the continuity check, clear the trouble either by repair or replacement.

**Note:** If available, a spare DAS 804R3 may be substituted in lieu of the continuity check.

**4.10** In the event that DAS 820B4 (4.04) passes the loop-back test, further analysis of the trouble report is required to determine which mode is in trouble (message reception or control functions).

**4.11** Analysis of message reception trouble should be verified by performing a message reception test. If the results of the test indicate TTY trouble, refer to the appropriate section on field maintenance practice for clearance procedures. If results indicate DAS 820B4 or 804R3 trouble, a continuity test of DAS 804R3 should be performed (if a replacement unit is not available for substitution check). If the continuity test fails, locate the trouble and either repair or replace the defective part.

**4.12** If DAS 804R3 passes the continuity test, DAS 820B4 should be replaced. Refer to 4.06 for replacement procedures.

**4.13** Analysis of control function (4.10) trouble should be verified by performing a local test **and** message reception (4.11) tests to determine the cause of the trouble report.

**4.14** If all of the tests do not isolate the trouble to a specific component, it is recommended that additional help be requested through proper lines of organization in order to restore customer service.

## SECTION 580-301-302

### 5. DATA AUXILIARY SET 804R3

**5.01** Maintenance of DAS 804R3 is limited to replacement of lamps, keys, cord, and/or loudspeaker (Fig. 1).

**5.02** The DAS 804R3 replacement parts are:

- (1) 53A lamps
- (2) 635K2 and 635J2 keys
- (3) M24G cord
- (4) KS-16107 L2 loudspeaker

**5.03 Lamps:** To replace lamps:

- (1) Remove the faceplate by moving the latch spring to the left. Lift faceplate by left side and disengage right side of faceplate.
- (2) Remove key cap.
- (3) Using a 553A tool (lamp extractor), remove lamp.
- (4) Replace lamp.
- (5) Replace key cap.
- (6) Replace faceplate.

**5.04 Keys:** To replace keys:

- (1) Remove the faceplate by moving the latch spring to the left. Lift faceplate by left side and disengage right side of faceplate.
- (2) Using a KS-6854 screwdriver, or equivalent, remove the four 4-40 Fillister head screws which hold the key to the bracket.
- (3) Lift key (to be replaced) sufficiently to clear the bracket.
- (4) Release spring-retaining clips which hold the plug to the key, and remove plug.
- (5) Connect plug to the key to be installed and fasten spring-retaining clips.
- (6) Lower key into bracket.

(7) Replace the four 4-40 Fillister head screws.  
***Do not tighten the screws.***

(8) Align the key, then tighten the screws.

(9) Replace faceplate.

**5.05 Cord:** To replace M24G cord:

- (1) Perform 5.04 (1) through (4).
- (2) Repeat 5.04 (2) through (4) for the remaining key.
- (3) Disconnect the M24G cord plug from the connector assembly.

**Note:** Access to the connector assembly will require opening the right-hand access door of the TTY pedestal.

(4) Loosen the two screws which connect the cord to the loudspeaker. Remove spade tips from the loudspeaker.

**Note:** The conductors are Y-BL and Y-O.

(5) Remove the screw which holds the S hook assembly and the V-S conductor.

(6) Remove cord.

(7) Reverse the previous procedure for the cord to be installed.

**5.06 Loudspeaker:** To replace loudspeaker:

(1) Open the door of the TTY pedestal.

(2) Loosen the two screws on the loudspeaker that connect the Y-BL and Y-O conductors to the loudspeaker. Remove spade tips from the loudspeaker.

(3) Remove the two mounting nuts which hold DAS 804R3 to the door (Fig. 1).

(4) Remove the four screws which hold the loudspeaker to the mounting plate assembly.

(5) Remove loudspeaker.

(6) Reverse the previous procedure for the loudspeaker to be installed.

**6. DATA SET REPLACEMENT****6.01 The Replacement of the Data Set 108A- or 109A-Type is as Follows:**

- (1) Obtain access to DAS 820B4 (Part 2).
- (2) Remove lock strip (card retaining bar) by loosening the two screws which hold it to the apparatus mounting. Slide lock strip from beneath screws to remove lock strip.
- (3) Grasp handle on Data Set 108A- or 109A-type and pull straight out.

**7. ADJUSTMENT OF DATA SET 108A-TYPE**

*Verify that proper options are installed in the replacement Data Set 108A-type.*

- 7.01** Disconnect incoming data line from the T and R terminals on TS A of DAS 820B4.
- 7.02** Connect terminals + and - of portable station test set TTS-28 to TP 1 and TP 2 of the data set (Fig. 6). Set FUNCTION switch of TTS-28 to DBM 900  $\Omega$  TERM 0 position.
- 7.03** Connect TTY power cord to the customer-provided ac receptacle.

**7.04** Adjust R11 potentiometer on data set for output level specified on service order and/or circuit layout record order.

**Note:** If no output level is measured, operate carrier squelch (CS) switch on DAS 820B4 to OFF. Restore CS switch after adjustment of R11 and remove TTS-28.

**7.05** Connect the incoming data line to the T and R terminals on TS A located on DAS 820B4.

**7.06** Perform installation tests on the replacement data set in accordance with the section entitled No. 1 Electronic Switching System ADF—Half-Duplex—150 Word Per Minute Data Station—Using 4-Row Teletypewriters—Test Procedures (580-301-502).

**8. ADJUSTMENTS OF DATA SET 109A-TYPE**

- 8.01** There are no adjustments required for this Data Set.
- 8.02** Perform installation tests on the replacement data set in accordance with the section entitled No. 1 Electronic Switching System ADF—Half-Duplex—150 Word Per Minute Data Station Using 4-Row Teletypewriters—Test Procedures (580-301-502).

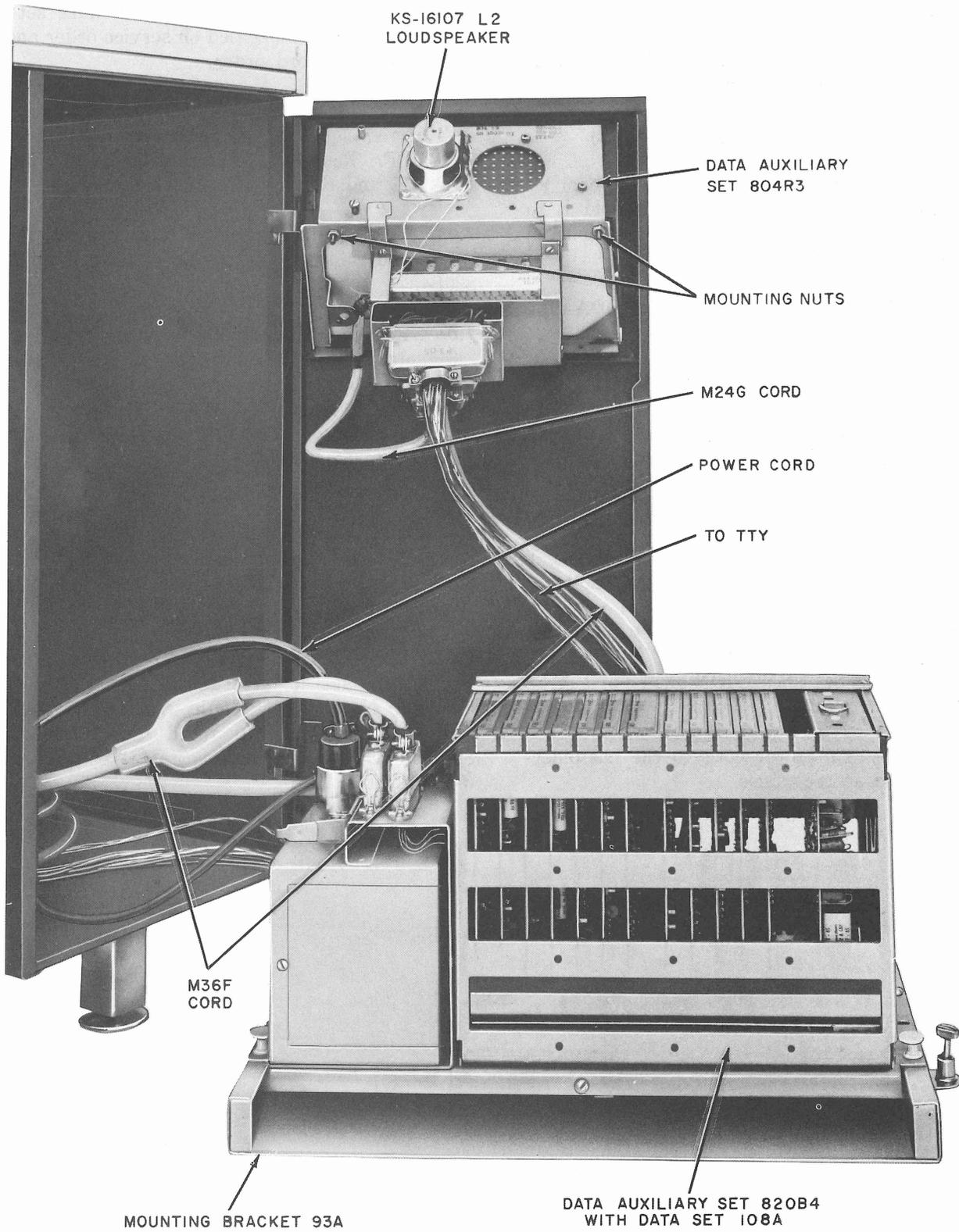


Fig. 1—37 RO TTY With Data Auxiliary Set 820B4 in the Maintenance Position

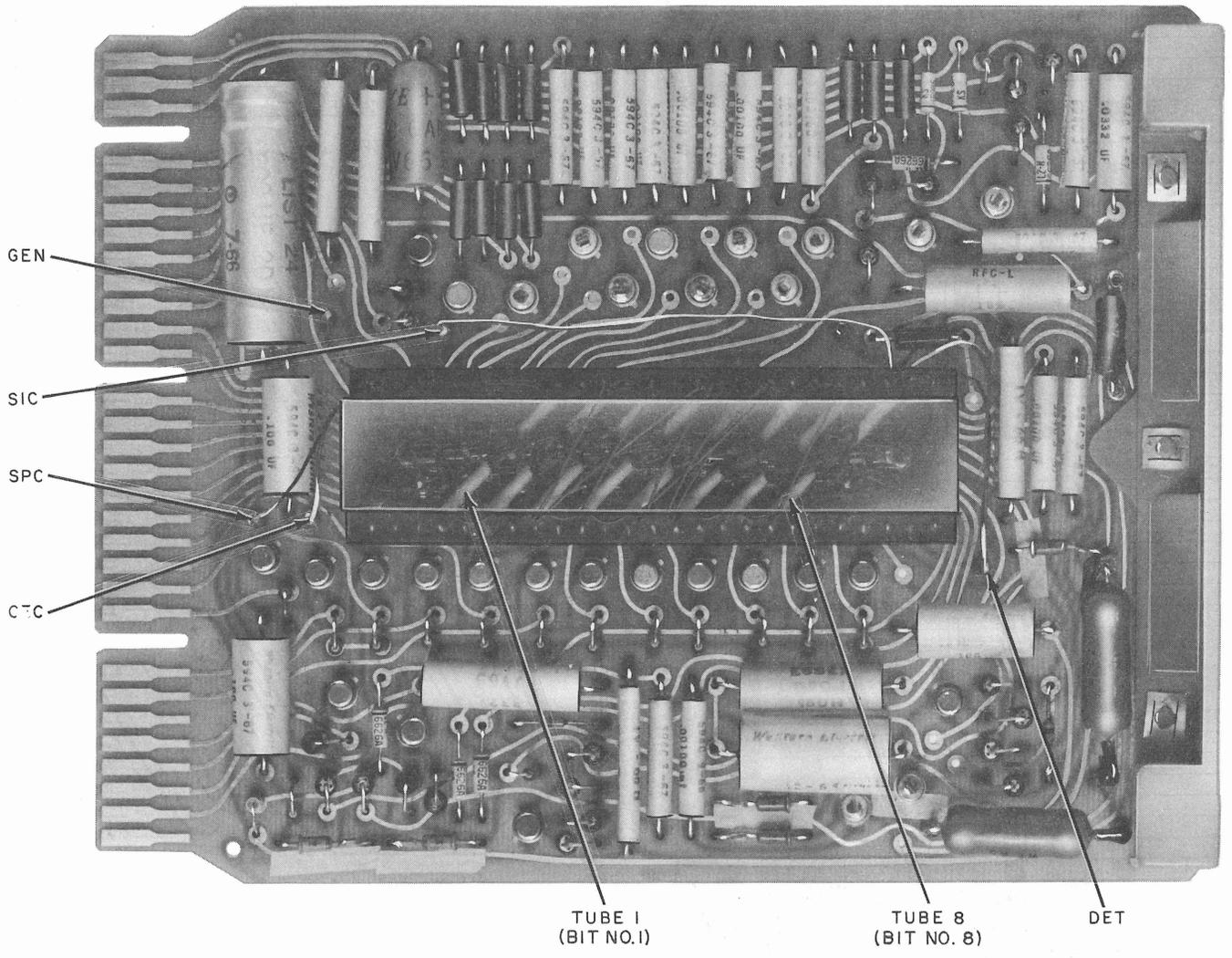


Fig. 2—Circuit Pack AR37—Location of Terminals for Wiring the Shift Register

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	BIT NUMBER									BIT NUMBER							
	8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1
NUL									ⓐ								
SOH									A								
STX									B								
ETX									C								
EOT									D								
ENQ									E								
ACK									F								
BEL									G								
BS									H								
HT									I								
LF									J								
VT									K								
FF									L								
CR									M								
SO									N								
SI									O								
DLE									P								
DC1									Q								
DC2									R								
DC3									S								
DC4									T								
NAK									U								
SYN									V								
ETB									W								
CAN									X								
EM									Y								
SUB									Z								
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LEGEND:  MARK  SPACE

Fig. 3—USA Standard Code for Information Interchange (USAS X 3.4 1967)

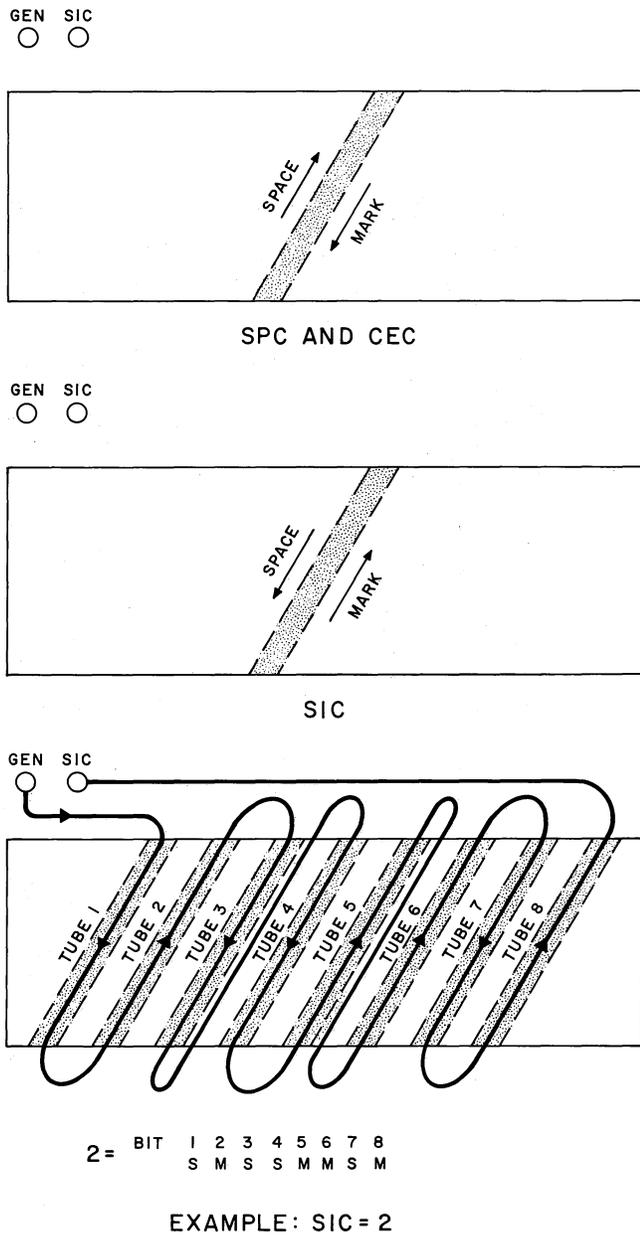


Fig. 4—Direction of Wires for Encoding the Shift Register



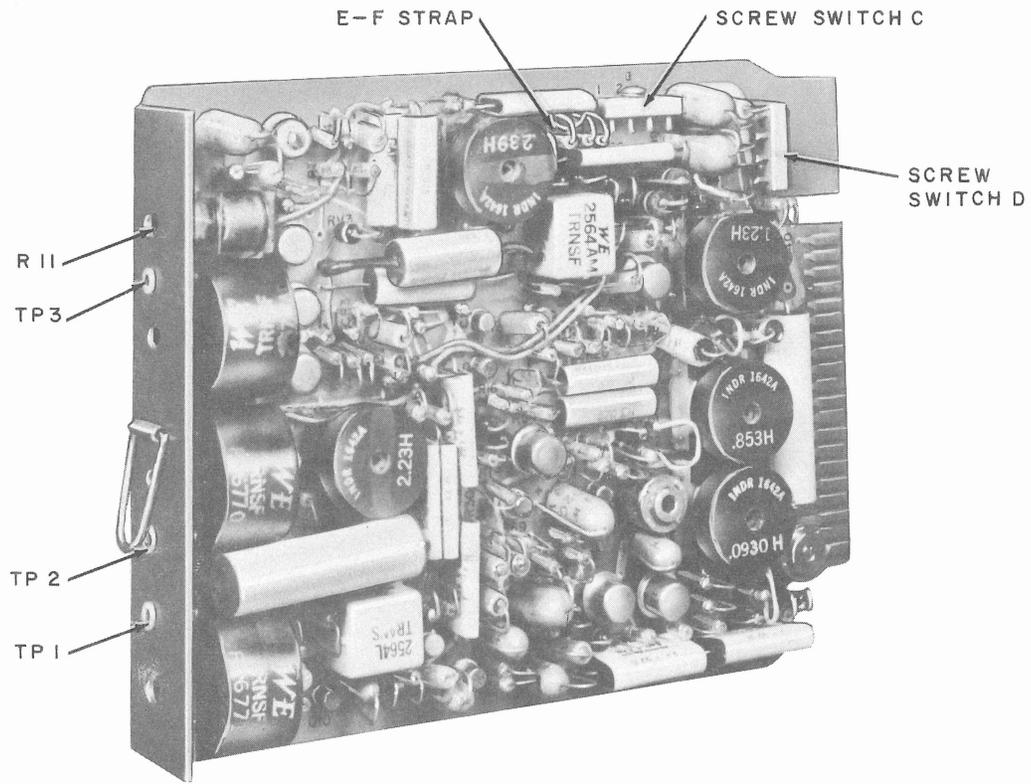


Fig. 6—Data Set 108A-Type—Location of Test Points and Screw Switches