

**86B1 DATA SELECTIVE CALLING SERVICE**  
**FULL-DUPLEX—100-WORD PER MINUTE DATA STATION**  
**MAINTENANCE**

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**1. GENERAL**

**1.01** This section provides the maintenance philosophy and procedures for an 86B1 Data Selective Calling Service Station (DSCS). The station is to be maintained by card replacement, replacement of defective units, and repair of the teletypewriter. The procedures for disassembly, reassembly, and replacement of the units that make up the station are given in this section.

**1.02** This section is reissued to include information on the data sets 108E and 109E, which are used in the DSCS. Changes are also included to make this practice compatible with the serving test center (STC) practice. Since these changes constitute a general revision, arrows normally used to indicate changes have been omitted.

**1.03** Routine maintenance of the 86B1 TTY Data Stations is limited to the 33- and 35-type TTYs which are used as the station terminal equipment. The routine maintenance of the TTYs should be performed in accordance with the appropriate 574- and 579 division Bell System Practices.

**1.04** There is no routine maintenance required for data sets 108A- or 108E-types, data set 109E-type, data auxiliary set (DAS) 820A-type (controller), or DAS 804N1, 804N2, and 804R3 (attendant set). However, when stations are suspected of being in trouble, they should be tested as described in the section entitled 86B1 Data Selective Calling Service—Full-Duplex—100-Word Per Minute Data Station—Test Procedure (581-136-502).

**1.05** When a data set does not meet test requirements, it should be replaced in order to restore service to the customer as quickly as possible. Data set replacement and adjustment are covered in this section.

**1.06** When a controller does not meet the test requirements, it should be determined which circuit pack (CP) in the controller is bad, and that CP should be replaced in order to restore the service to the customer as quickly as possible. The method of gaining access to the controller and the procedure for removing and replacing the CPs are described in Part 2 of this section.

**1.07** When the data set, controller, or any CPs in the controller are replaced, the station should be tested in accordance with the section referenced in 1.04.



*To prevent damage to CPs, disconnect power cord plug of all station TTYs from the customer power receptacle before connecting or disconnecting CPs, connectors or options.*

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



*When DAS 820A1, 820A2, or 820A6 is replaced and AR18 and AR25 CPs are also replaced, the replacing CPs must be encoded as given in Part 3 of this section.*

**1.09** The wire required for encoding the shift register on AR18 and AR25 CPs can be obtained from the Western Electric Company by ordering one of the following:

- Piece part No. 840555726 polyurethane-coated 36-gauge wire (with approximately 6 ft. of wire per envelope) *or*
- RM 638-230 polyurethane-coated 36-gauge wire (approximately 5 pounds of wire per spool).

### **2. ACCESS TO DAS 820A-TYPE AND REMOVAL/REPLACEMENT OF CIRCUIT PACKS**

#### **33-Type TTY Controller Access**

**2.01** Access to the controller is by removing the rear panel of the TTY stand. To facilitate ease in maintenance, the controller has a maintenance position. To position the controller for maintenance:

- (1) Rotate latch counterclockwise. This allows the controller to pivot on the 91A bracket.
- (2) With both hands on the controller, gently pull top of controller towards rear of station (Fig. 1).

#### **35-Type TTY Controller Access**

**2.02** Access to the controller is available by removing the lower front compartment panel. There is no maintenance position in the 35-type TTY. Maintenance of the controller is performed in the normal position (Fig. 2).

#### **35 ROTR Controller Access**

**2.03** The data set and controller are *not* mounted in the 35 ROTR stand (due to space limitation) when a 35 ROTR is used as a primary station. A

KS-20018-L1/2/3 or 4 cabinet is required. To gain access to the controller:

- (1) Apply outward pressure at the top of the KS-20018 type cabinet panel until the catches disengage.
- (2) Lift the panel up to remove it from framework. The controller is mounted inside the KS-20018 type cabinet in a position that facilitates CP removal when this panel is removed.

#### **Removal/Replacement of Circuit Packs**

**2.04** When access has been gained to the controller, the CPs can be removed as follows:

- (1) Remove the card-retaining bar by loosening the two screws that hold it to the apparatus mounting and slide it out from beneath the screws.
- (2) Place the pivots of the 748A tool assembly (card extracting tool) against the faceplate of the CP to be removed and gently push in until the pivots engage the faceplate.

*Note:* The card retaining bar on some controllers is slotted so it can be used to extract the CPs from the nest.

- (3) Grasp handle of the 748A tool and pull CP straight out.

**2.05** Replace CPs in the controller as follows:

- (1) Insert the CP into the proper slot on the controller and gently push in.
- (2) Verify that the CP is properly seated in its connector.

### **3. AR18 AND AR25 CP—ENCODING THE SHIFT REGISTER**

**3.01** The shift registers of AR18 and AR25 CPs are encoded by connecting conductors to a specific terminal on the CP, routing the conductors through the eight tubes of the shift register (in a specified direction), and connecting them to another specific terminal on the same CP.

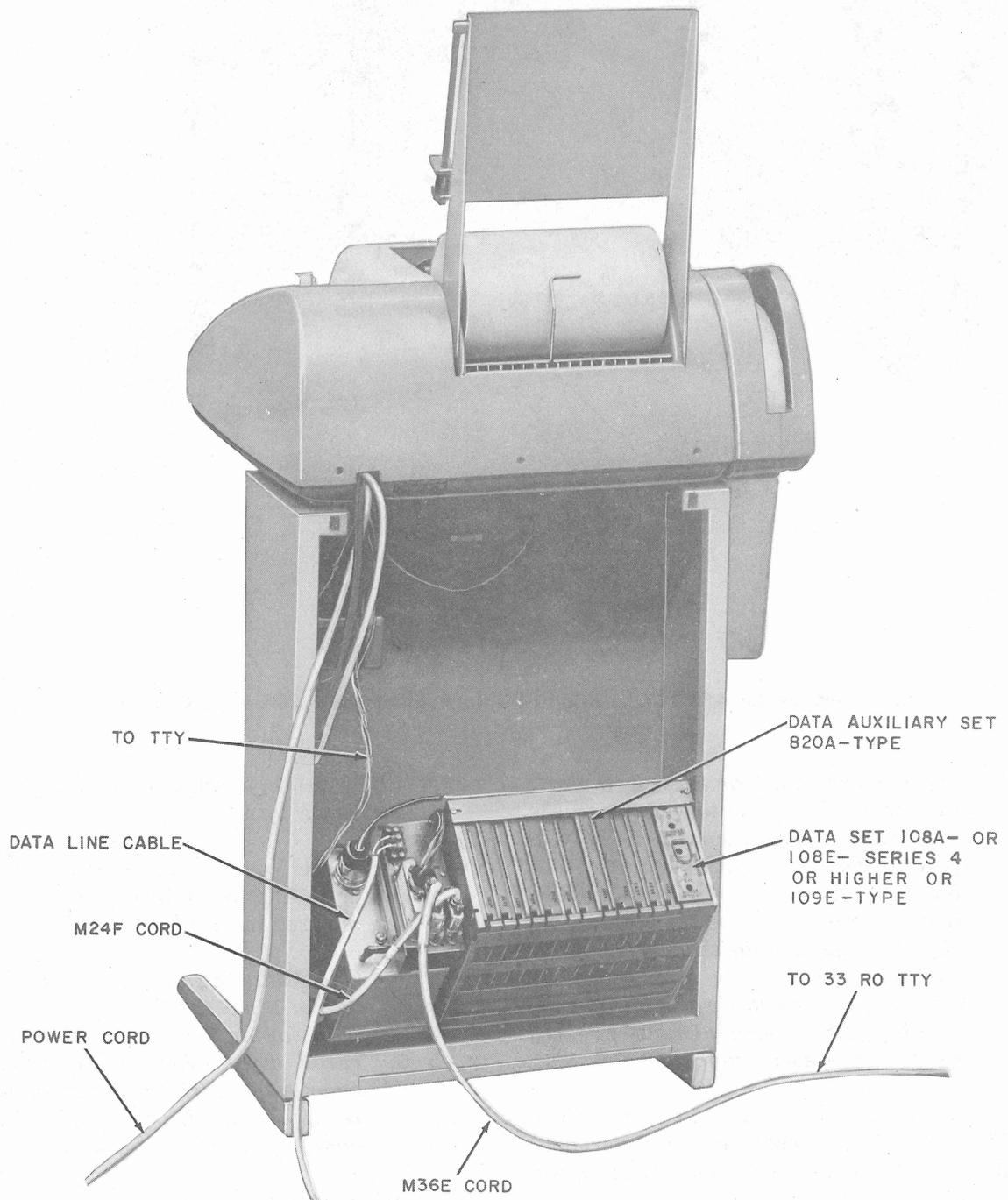


Fig. 1—Model 33 ASR TTY-Rear View With The Controller In The Maintenance Position

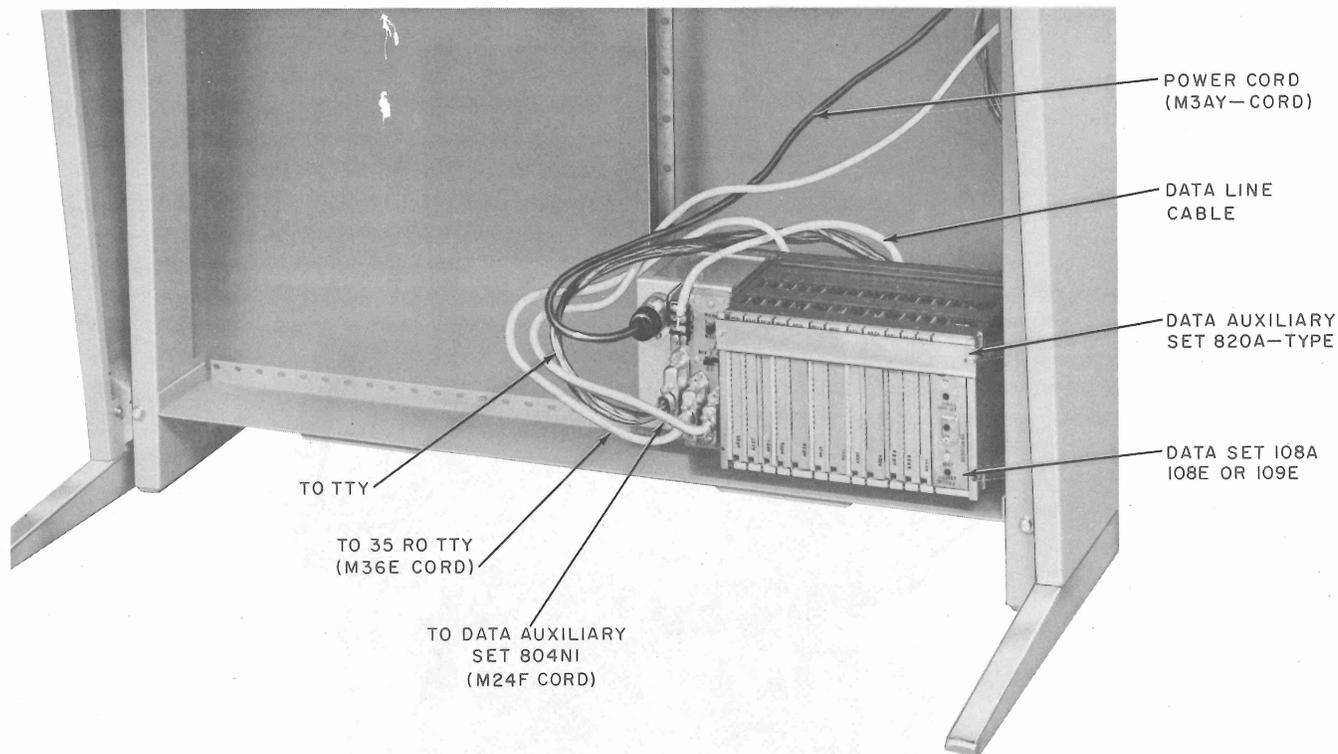


Fig. 2—Model 35 ASR TTY Location of Data Auxiliary Set 820A-Type Controller



*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 (No. 56 scotch mylar, or equivalent) to prevent interference with adjacent CPs.*

**3.02** The CPs should be positioned as shown in Fig. 3. It is suggested that the encoding of the shift register be performed on a flat properly protected surface.

**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 being replaced, or for a new installation, from the service order and/or circuit layout record card.

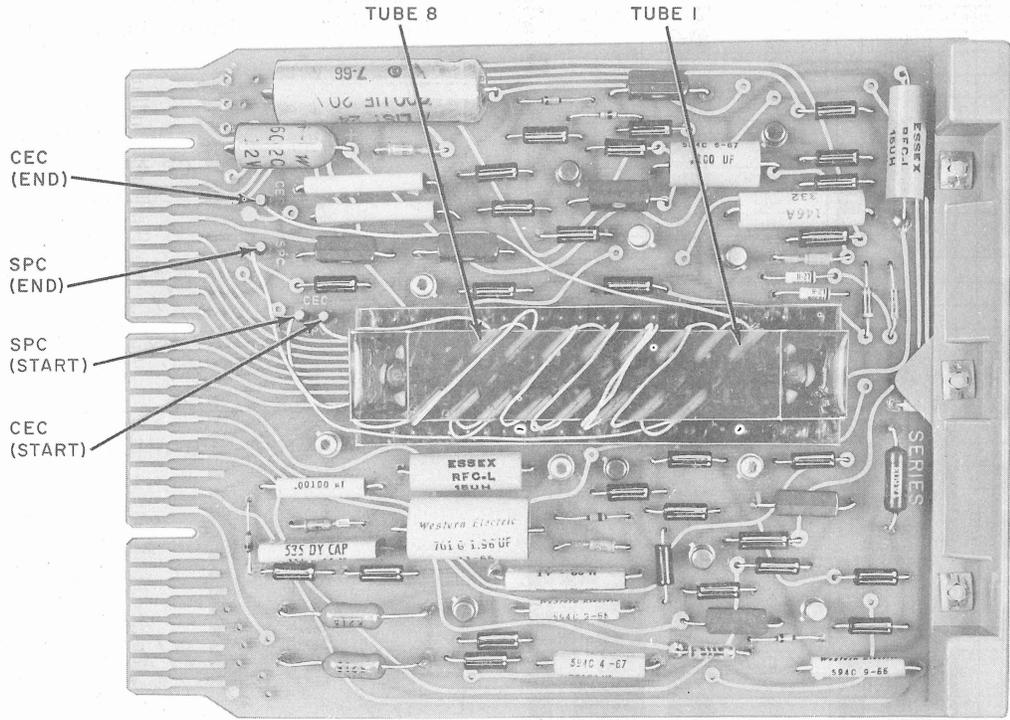
- (2) Select proper mark and space sequence for each code by using Fig. 4.
- (3) Cut three pieces of wire in two-foot lengths. Refer to 1.09 for information on the type of wire required for encoding the shift-register.



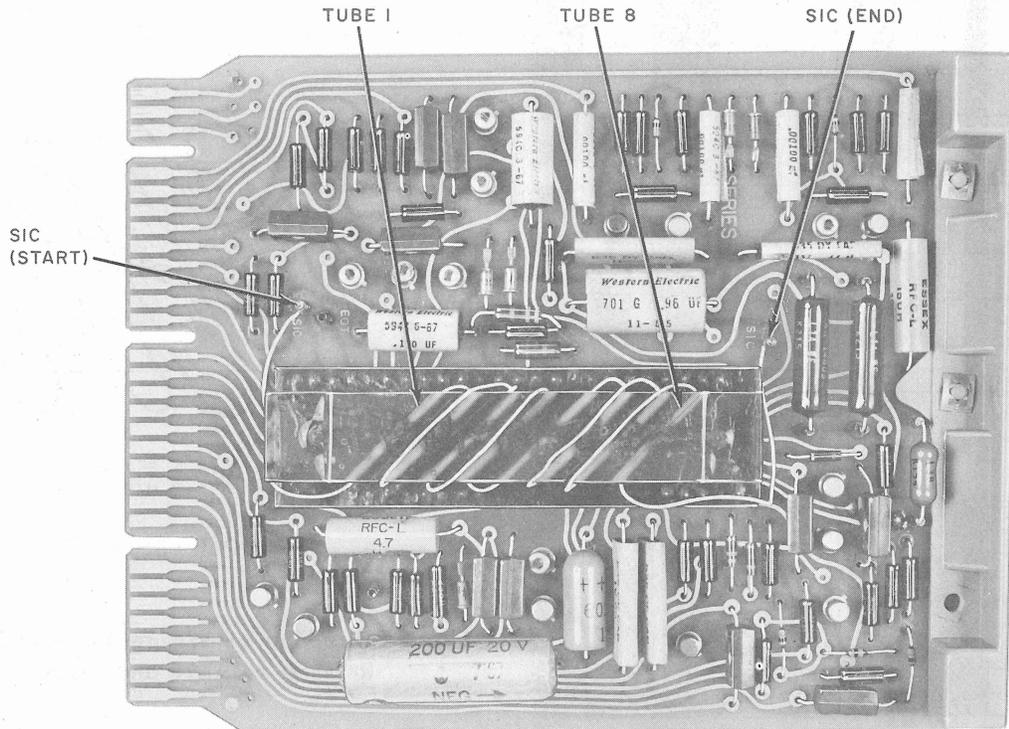
*The following operations require the use of a KS-16346-L1 or -L2 soldering iron (or an equivalent low wattage rated iron). Extreme care must be exercised when soldering the conductors to the specified terminal at the completion of threading operations.*

#### SIC Code—AR25 CP

- (4) Connect an end of one previously mentioned conductor (3) to the SIC (START) terminal (Fig. 3).
- (5) Starting with tube 1 (for bit one), thread the free end of this conductor through each of the eight tubes in the shift register in the correct direction for each bit of the selected



CP AR18



CP AR25

Fig. 3—AR18 and AR25 Circuit Packs—Location of Terminals for Wiring of the Shift Register

	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								
ESC									[								
FS									\								
GS									]								
RS									^								
US									_								
SP									`								
!									a								
"									b								
#									c								
\$									d								
%									e								
&									f								
'(APOS)									g								
(									h								
)									i								
*									j								
+									k								
,									l								
-									m								
.									n								
/									o								
0									p								
1									q								
2									r								
3									s								
4									t								
5									u								
6									v								
7									w								
8									x								
9									y								
:									z								
;									{								
<																	
=									}								
>									~								
?									DEL								

LEGEND:  MARK  SPACE

Fig. 4—American National Standard Code for Information Interchange

character. Refer to Fig. 5 for information on threading the wire to obtain a mark or a space.

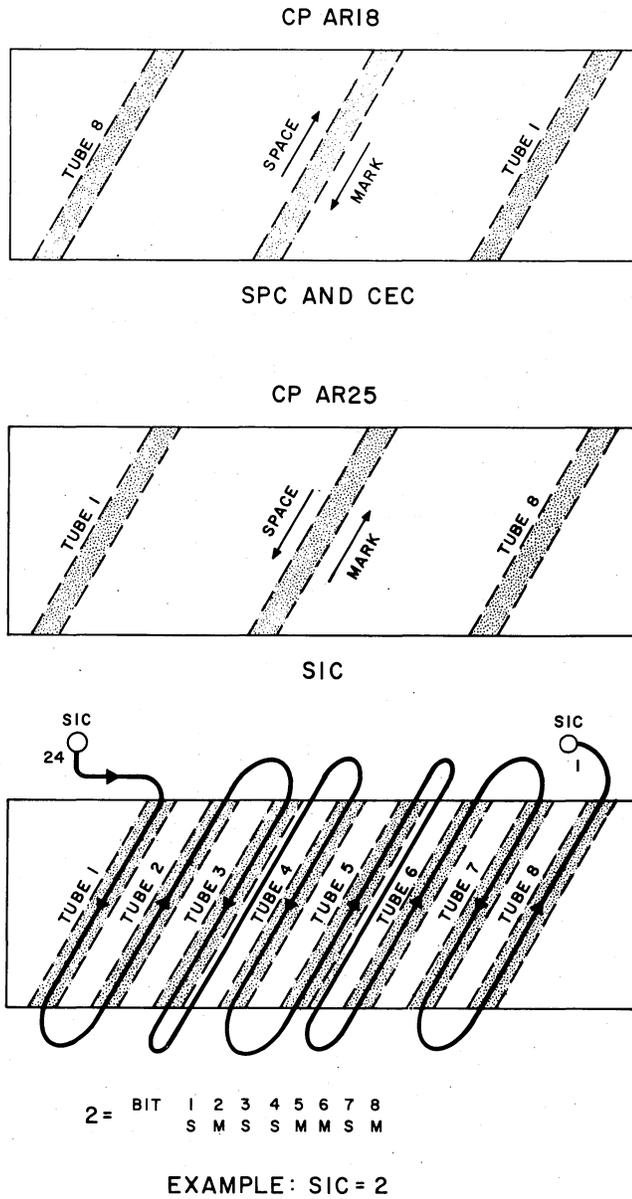


Fig. 5—Direction of Wiring for Encoding the Shift Register on AR18 and AR25 Circuit Packs

(6) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the SIC (END) terminal (Fig. 3).

**SPC Code—AR18 CP**

- (7) Connect one end of another previously mentioned conductor to the SPC START terminal (Fig. 3).
- (8) Starting with tube 8 (for bit 8), thread the free end of this conductor through each of the eight tubes in the shift register in the correct direction for each bit as indicated in Fig. 5.
- (9) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the SPC (END) terminal (Fig. 3).

**CEC Code—AR18 CP**

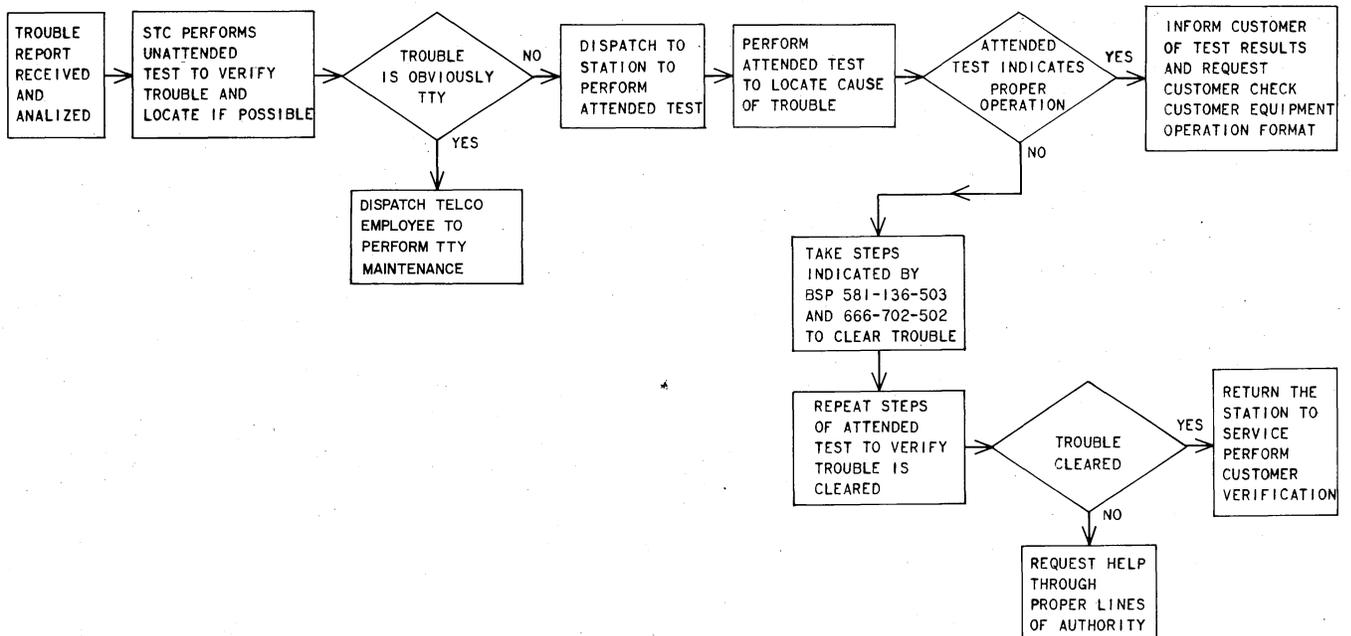
- (10) Connect one end of the last of the three mentioned conductors to the CEC (START) terminal (Fig. 3).

(11) Starting with tube 8 (for bit 8), thread the free end of this conductor through each of the eight tubes in the shift register in the correct direction for each bit as indicated in Fig. 5.

(12) At the completion of threading, remove the excess length of wire and connect the free end of this conductor to the CEC (END) terminal (Fig. 3).

**4. MAINTENANCE PHILOSOPHY**

**4.01** Maintenance of the full-duplex, 100-word per minute 86B1 data station should be in accordance with the flowchart shown in Fig. 6. This flowchart is recommended for an organized trouble investigation with a minimum amount of time spent in locating the cause of the trouble reported by the customer. The tests referred to in Fig. 6 and in the following text are given in the sections entitled 86B1 Data Selective Calling Service Full-Duplex—100-Word per Minute Data Station—Test Procedure (581-136-502) and 86B-Type



**Fig. 6—Maintenance Flowchart**

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Data Selective Calling Service Serving Test Center (STC)—Test Procedures (666-702-502).

**4.02** When a trouble report is initially received, the report should be analyzed to eliminate the 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 appropriate Field Maintenance Practice (FMP) covering the type of TTY.

**4.04** When testing indicates that the replacement of the data set or CP is necessary, the replacing unit must be conditioned with the same options or features that are used in the defective unit. Refer to the installation BSP (581-136-202) and the applicable parts of this section for information on replacing the data set and CPs.



*If the AR18 and AR25 CP is found to be faulty, the replacement will have to be encoded as described in Part 3 of this section.*

**4.05** 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 service to the customer. When the data station meets the test requirements given by the Attended Test part of Section 581-136-502, the station can be considered to be operating properly. The customer should be informed of the test results and requested to take the necessary steps to verify operation of his equipment.

### 5. DATA AUXILIARY SET 804N-TYPE

**5.01** Maintenance of DAS 804N-type is limited to the replacement of lamps, keys, cord, and/or loudspeaker.

**5.02** Table A summarizes the codes for the replacement parts.

TABLE A

DAS 804-TYPE REPLACEMENT PARTS

DAS	KEY	LAMP	CORD	SPEAKER
804N1	635J2 or 635K2	53A	M24F	KS-16908 L1
804N2			M24G	
804R3			M24J	KS-16107 L2

#### Lamps

**5.03** To replace lamps:

- (1) Remove the faceplate from the cover by removing the two mounting screws.
- (2) Remove key cap.
- (3) Using a 553A tool (lamp extractor), remove lamp.
- (4) Replace lamp.
- (5) Replace key cap.
- (6) Replace faceplate.

#### 33-Type TTY Keys, Cord, and/or Loudspeaker Replacement

**5.04** Replacement of keys, cord, and/or loudspeaker will require the removal of the TTY cover.

**5.05** To remove the cover:

- (1) Remove the faceplate from the cover by removing the two mounting screws and the MODE switch knob.
- (2) Remove nameplate by pulling it down and out. This will expose four cover mounting screws in front.
- (3) Remove these four screws and the three cover mounting screws located at the rear of the cover.

**Note:** On 33 ASR TTYs, also remove the screw from the left rear corner of the tape reader cover.

- (4) Remove platen knob.
- (5) Gently lift the cover from the subbase.

**35 ASR or RO TTY Keys, Cord, and/or Loudspeaker Replacement**

**5.06** Replacement of keys, cord, and/or loudspeaker will require opening the lower cover.

**5.07** To open the lower cover:

- (1) Open the upper cover to its partially open latched position.

**Caution:** Remove the attendant set faceplate from the cover by removing the two mounting screws before performing the next step.

- (2) Open the latch on the right-hand side of the TTY.

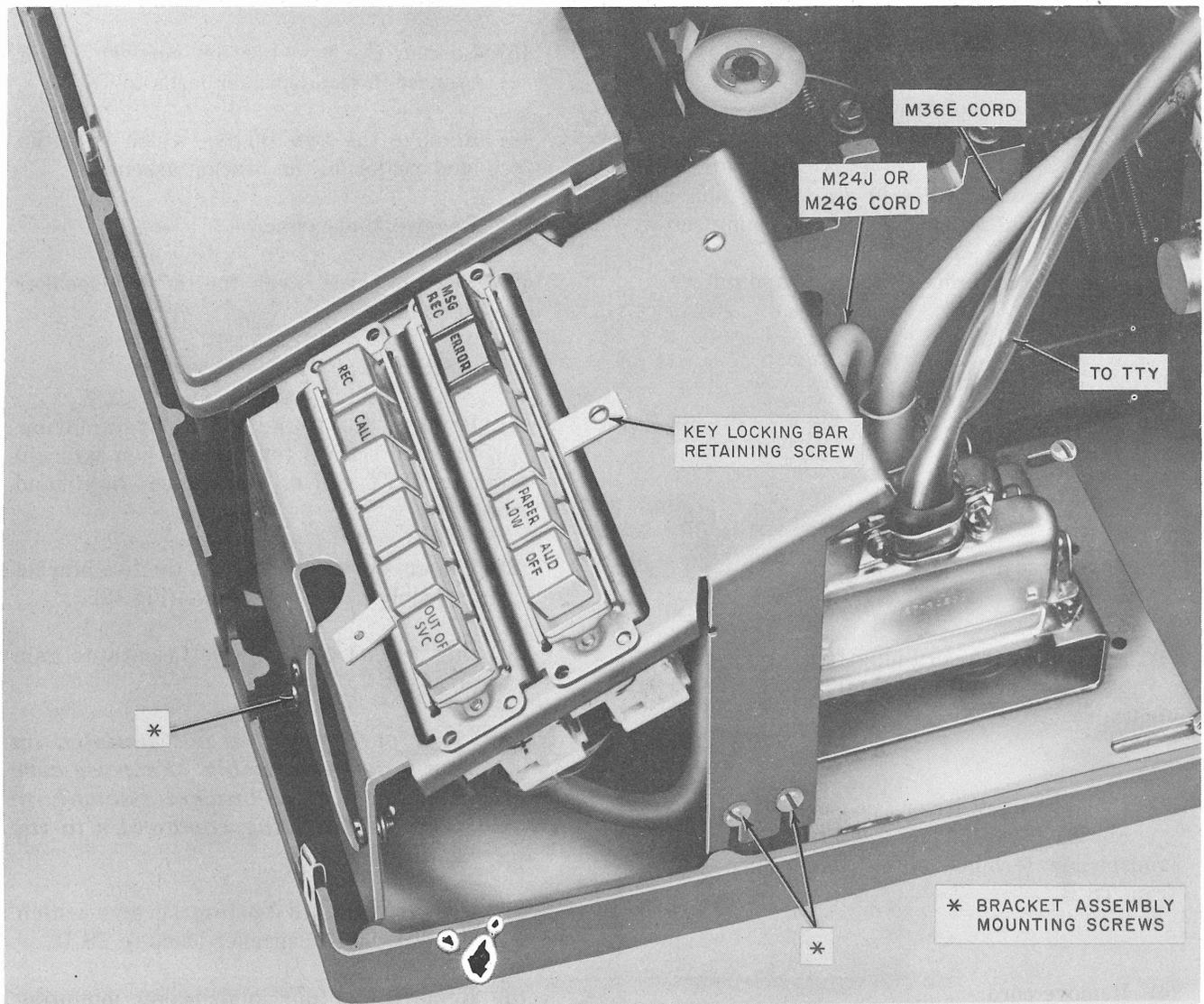
- (3) Grasp the hand grips located in the front of the lower cover and raise the cover.

- (4) Verify that the left rear stop arm is latched when cover is opened fully.

**Keys**

**5.08** After opening or removing the cover, key replacement is as follows:

- (1) Loosen the key-locking bar retaining screw (Fig. 7) on the attendant set.



**Fig. 7—Data Auxiliary Set 804N2 Mounted in 33 RO TTY**

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- (2) Remove cord-retaining screw and nut.
- (3) Lift the 635J2 key sufficiently to clear the bracket.
- (4) Release spring-retaining clips which hold the plug to the key and remove plug.
- (5) Rotate the front key-locking bar to clear the 635K2 key.
- (6) Lift the 635K2 key sufficiently to clear the bracket.
- (7) Release spring-retaining clips which hold the plug to the key and remove plug.
- (8) Connect plugs to 635K2 key and 635J2 key to be installed.
- (9) Lower keys into bracket. Slide in and seat the 635K2 key into the keying pins.
- (10) Seat the 635J2 key in the keying pins and replace the key-locking bar retaining screw.
- (11) Replace cord-retaining screw and nut.

### Cord

#### 5.09 To replace cord:

- (1) Perform 5.08(1) through (7).
- (2) Disconnect the cord plug from the controller or the connector assembly, whichever is applicable.
- (3) Using a screwdriver, loosen the two screws on TS B which connect the cord to the loudspeaker terminal strip. Remove spade tips from TS B.
- (4) Remove cord.
- (5) Reverse the procedure for installing the cord.

### Loudspeaker

#### 5.10 To replace loudspeaker:

##### (a) 33-type TTY

- (1) Remove the attendant set by removing the four screws on the mounting plate.
- (2) Loosen, but do not remove the five bracket assembly mounting screws (Fig. 7).
- (3) Lift bracket assembly sufficiently to clear mounting screws.
- (4) Turn the attendant set over to expose TS B.
- (5) Loosen the two bottom screws which connect the loudspeaker leads to TS B.
- (6) Remove the two screws which hold the loudspeaker to the bracket assembly.
- (7) Remove loudspeaker.
- (8) Reverse these steps for the loudspeaker to be installed.

##### (b) 35 ASR or RO TTY

- (1) Remove the attendant set by removing the two screws (using an Allen wrench) from the TTY pan on the bottom right-hand side.
- (2) Loosen, but do not remove, the five bracket assembly mounting screws (Fig. 8).
- (3) Lift bracket assembly sufficiently to gain access to TS B.



***The loudspeaker is not mounted on the bracket assembly. Exercise care when lifting the bracket assembly to prevent damaging conductors to the loudspeaker.***

- (4) Loosen the two bottom screws which connect the loudspeaker leads to TS B.
- (5) Remove the four loudspeaker mounting screws (using the Allen wrench) located at the right front bottom of the TTY pan.

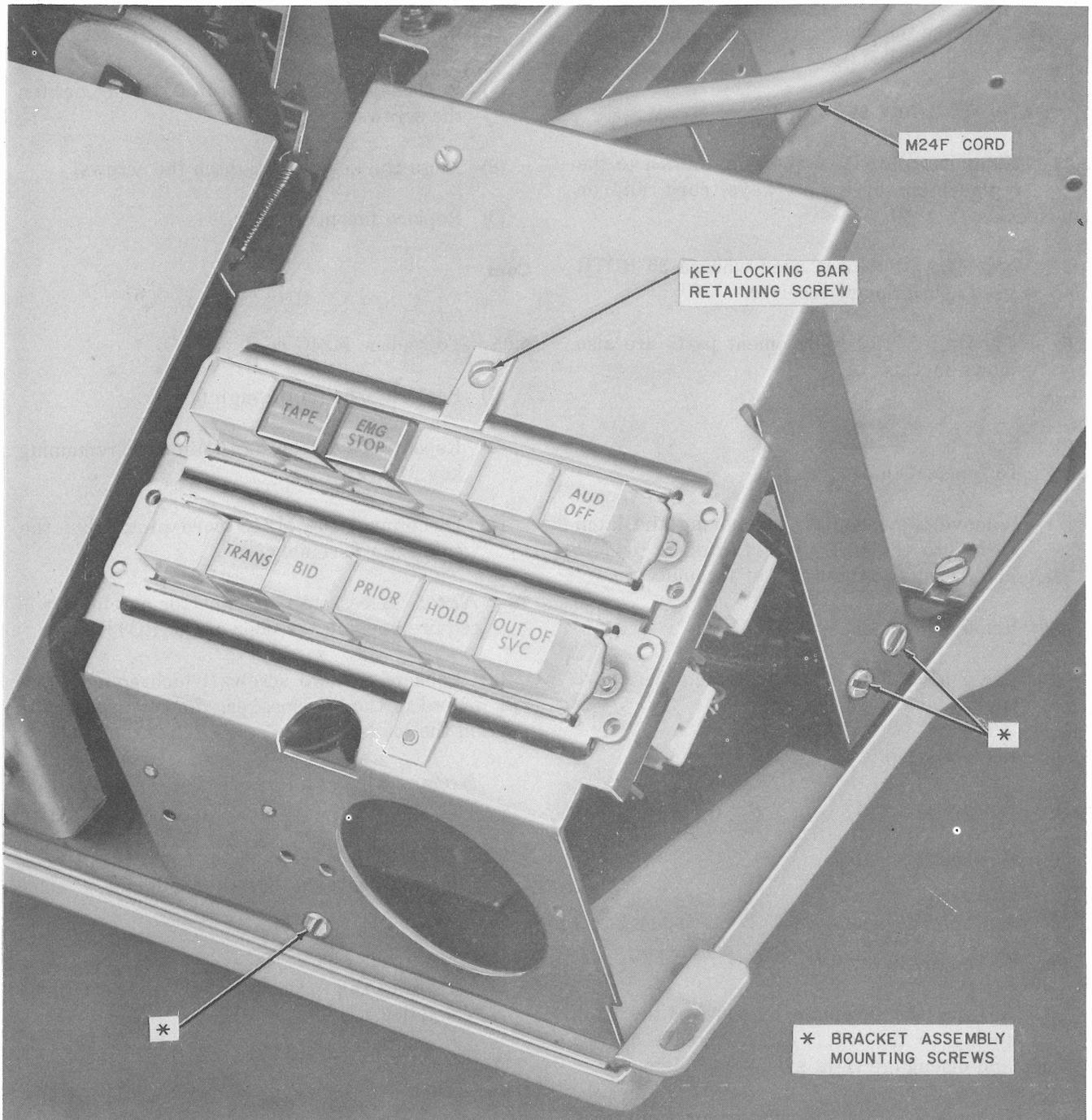


Fig. 8—Data Auxiliary Set 804N1 Mounted in 35 ASR TTY

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- (6) Remove loudspeaker.
- (7) Reverse the procedure for the loudspeaker to be installed.

### 6. DATA AUXILIARY SET 804R3

**6.01** Maintenance of DAS 804R3 is limited to the replacement of lamps, keys, cord, and/or loudspeaker (Fig. 9).

**Note:** DAS 804R3 is used when a 35 ROTR is used as a primary receiver.

**6.02** The DAS 804R3 replacement parts are also shown in Table A.

#### Lamps

**6.03** 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.

#### Keys

**6.04** 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 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.
- (6) Lower key into bracket.
- (7) Replace the four 4-40 screws. Do not tighten the screws.
- (8) Align the key, then tighten the screws.
- (9) Replace faceplate.

#### Cord

**6.05** To replace M24G cord:

- (1) Perform 6.04 (1) through (4).
- (2) Repeat 6.04 (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 door of the ROTR stand.

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

**Note:** The conductors are YEL-BL and YEL-OR.

- (5) Remove the screw which holds the S hook assembly and the VIO-SL conductor.
- (6) Remove cord.
- (7) Reverse this procedure for the cord to be installed.

#### Loudspeaker

**6.06** To replace loudspeaker:

- (1) Open the door of the ROTR stand.
- (2) Loosen the two screws on the loudspeaker which connect the YEL-BL and YEL-OR conductors to the loudspeaker. Remove spade tips from the loudspeaker.

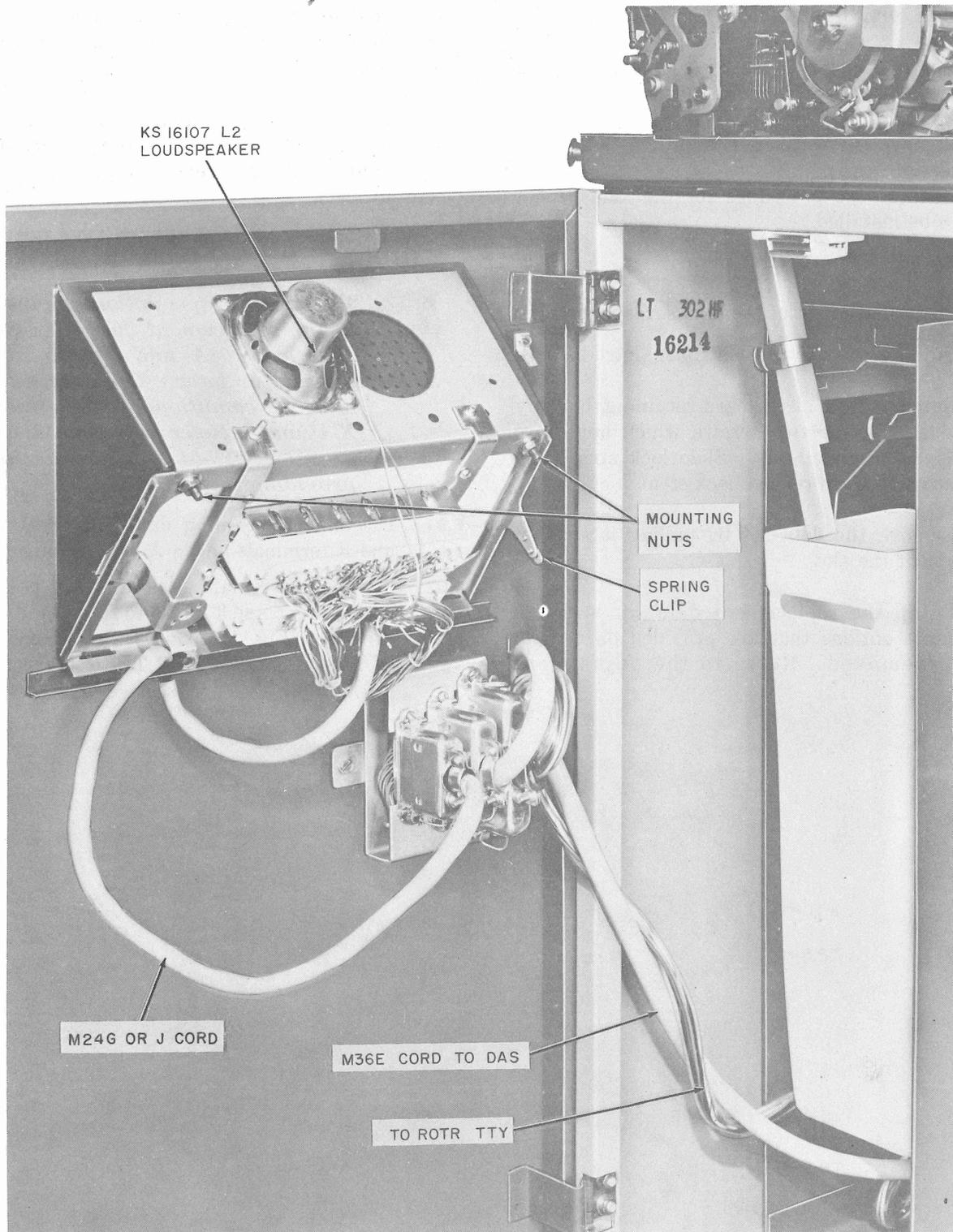


Fig. 9—Data Auxiliary Set 804R3 Mounted in the Door of 35 ROTR Pedestal

- (3) Remove the two mounting nuts which hold DAS 804R3 to the door (Fig. 9).
- (4) Remove the four screws which hold the loudspeaker to the mounting plate assembly.
- (5) Remove loudspeaker.
- (6) Reverse the procedure for the loudspeaker to be installed.

**7. DATA SET REPLACEMENT**

**7.01** The replacement of the data set is as follows:

- (1) Obtain access to the controller (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) Remove the data set by pulling it straight out of the slot.
- (4) Equip the replacement data set with the same options that are provided on the set being removed. Refer to the adjustment

procedures given in this practice for information on providing the required line padding on data set 109-types before installing the replacement data set.

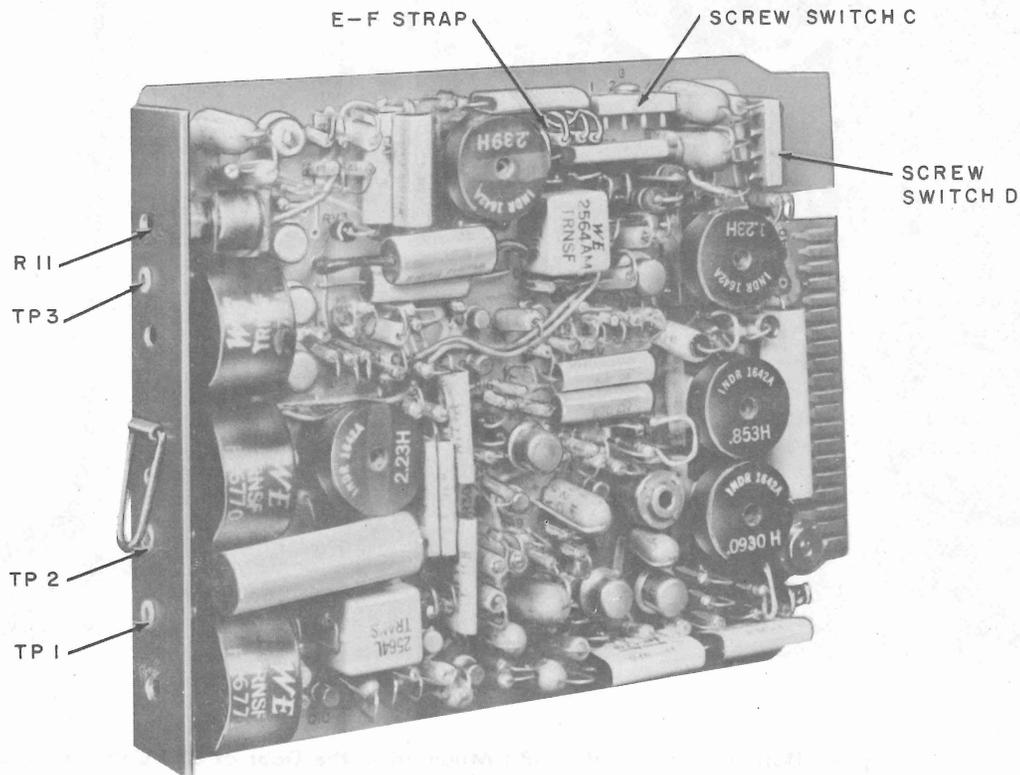
- (5) Install the replacement data set and seat firmly in the connector. Refer to adjustment procedures for data set 108-types and set the output level.

**8. ADJUSTMENT OF DATA SET 108-TYPE TRANSMIT LEVEL**

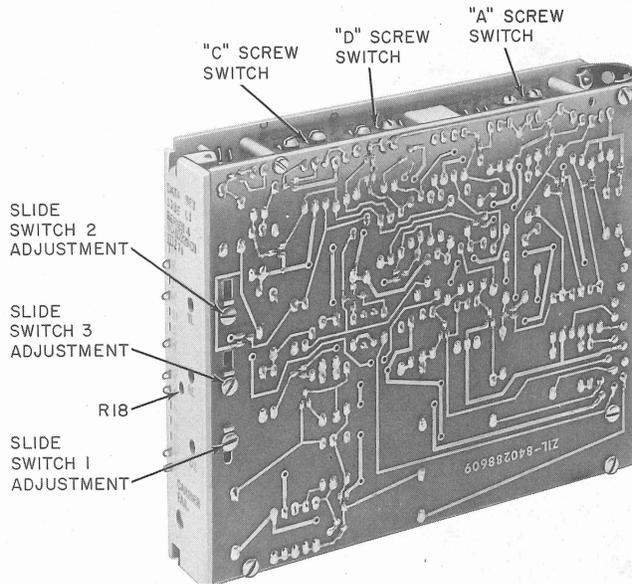


*Verify that proper options are installed in the replacement data set 108-type. Data sets 108A- and E-types must be series 4 or later. The data set 108E must be conditioned with options Y, X, U, and S. Refer to Section 591-028-100 or SD 1D229-01 for information on providing these options.*

- 8.01** Disconnect incoming data line from the T and R terminals on TS A of the controller.
- 8.02** Connect terminals + and - on portable station test set TTS-28 to TP 1 and TP 2 of the data set (Fig. 10 or 11). Set FUNCTION switch of TTS-28 to DBM 900Ω TERM O position.



**Fig. 10—Data Set 108A-Type—Location of Test Points and Screw Switches**



**Fig. 11—Data Set 108E-Type—Location of Test Points and Screw Switches**

- 8.03** Connect TTY power cord to the customer-provided ac receptacle.
- 8.04** Adjust R11 on data set 108A or R18 on data set 108E for the output level specified on service order and/or circuit layout record card.

**Note:** If no output level is measured, operate carrier squelch (CS) switch on DAS 820A1,

820A2, or 820A6 to OFF. Restore CS switch after adjustment of R11 or R18 and remove TTS-28.

- 8.05** Connect the incoming data line removed in 8.01, to the T and R terminals on TS A of the controller.
- 8.06** Perform installation tests on the replacement data set in accordance with Section 581-136-502.

## **9. ADJUSTMENT OF DATA SET 109E-TYPE (FIG. 12)**

**9.01** Three adjustable screw switches (S1, S2, and S3) are used to select options on data set 109E-type (Fig. 12). Screw switch S1 is subdivided into two sections (S1A and S1B); screw switch S3 is further subdivided into twelve sections. Two of these sections (S3-1 and S3-2) are used for options; eight of the remaining sections (S3-4 through S3-7, and S3-9 through S3-12) are used in selecting the proper line pad resistance (Table B). Sections S3-3 and S3-8 are not used and should not be equipped with screws.

**9.02** Install the required options and line padding in the replacement data set in accordance with Table B and the data set 109E-type being replaced. The no-carrier squelch option (Y) must be provided when data set 109E is used. Refer to Section 591-036-100 or SD-1D198-01 for information on providing this option.

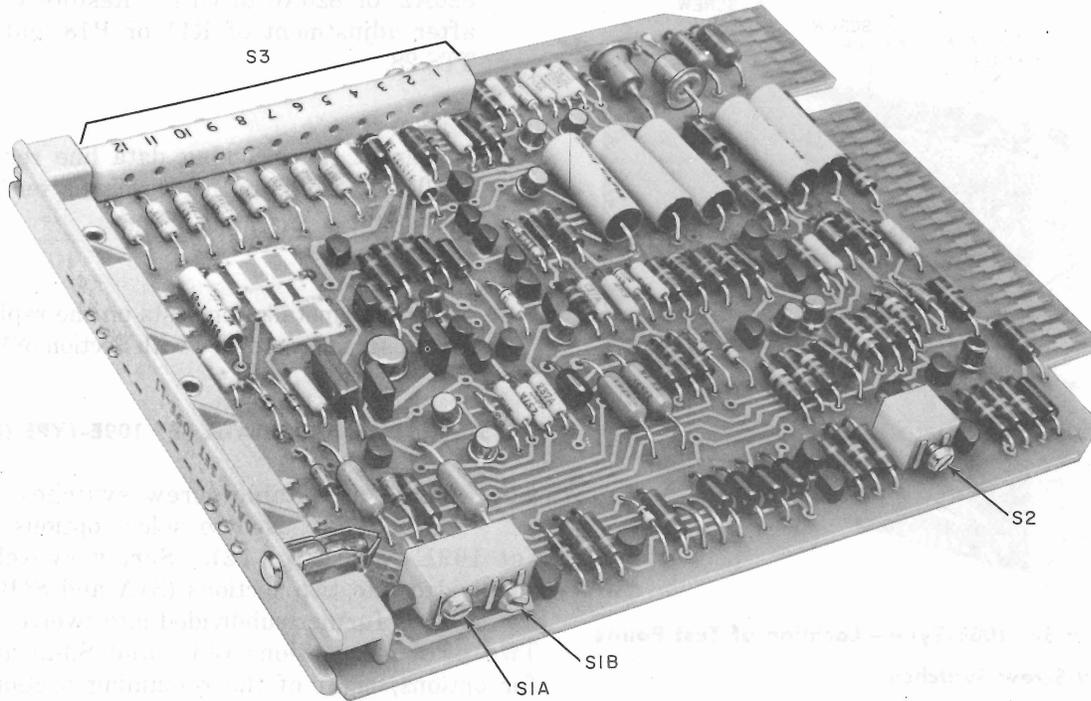


Fig. 12—Data Set 109E-Type—Location of Options and Line Pad Screw Switches

TABLE B  
DATA SET 109E—TYPE  
LINE PAD ADJUSTMENTS

LINE PAD RESISTANCE (OHMS)	SCREW SWITCH S3 SETTINGS	
	CLOSE S3-	OPEN S3-
00.0	4,5,6,7,9,10,11,12	
136.2	4,5,6,10,11,12	7,9
266.0	4,5,7,9,11,12	6,10
402.2	4,5,11,12	6,7,9,10
522.0	4,6,7,9,10,12	5,11
658.2	4,6,10,12	5,7,9,11
788.0	4,7,9,12	5,6,10,11
924.2	4,12	5,6,7,9,10,11
1022.0	5,6,7,9,10,11	4,12
1158.2	5,6,10,11	4,7,9,12
1288.0	5,7,9,11	4,6,10,12
1424.2	5,11	4,6,7,9,10,12
1544.0	6,7,9,10	4,5,11,12
1680.2	6,10	4,5,7,9,11,12
1810.0	7,9	4,5,6,10,11,12
1946.2		4,5,6,7,9,10,11,12