86A1 DATA SELECTIVE CALLING SERVICE
HALF-DUPLEX—100-WORD PER MINUTE DATA STATION
MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 This section describes the maintenance procedures along with the disassembly and reassembly procedures for the half-duplex (HDX), 100-word per minute teletypewriter (TTY) data stations used in the 86A1 Data Selective Calling Service.

1.02 This section is reissued to make reference to the 574-1 Bell System Practices (BSP) (33-TTY) and 574-2 BSPs (35 TTY), to include information for the data set 108E- and 109E-type to update the flowchart of Fig. 6, and to add 9.03, 9.04, and Table B.

1.03 Routine maintenance of the 86A1 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 ▶574-3 and 579 division BSPs.◀

1.04 There is no routine maintenance required for data set (DS) 108A-, ▶108E-, 109A-, and 109E-type;◀ data auxiliary set (DAS) 820B-type (controller); or DAS 804N4, 804N2, and 804R3 (attendant set). However, when stations are suspected of being in trouble, they should be tested as described in the section entitled 86A1 Data Selective Calling Service—Half-Duplex—100-Word Per Minute Data Station—Test Procedure (581-136-500).

1.05 When a DS 108A-, ▶108E-, 109A-, or 109E-type◀ 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 Parts 7 and 8, respectively, of this section.

1.06 When the DAS 820B-type 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 circuit packs, disconnect power cord plug of all station TTYs from the customer ac receptacle before connecting or disconnecting circuit packs, connectors, or options.

1.08 Exercise care in handling and transporting data sets, circuit packs, and data auxiliary

sets. If possible, use original cartons to store, transport, or ship them.

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

When DAS 820B1, 820B2, or 820B7 is replaced and AR272 (or AR37) CP is also replaced, the replacing CP must be encoded as given in Part 3 of this section.

1.10 The wire required for encoding the shift register on AR272 (or AR37) CP may be obtained from WE by ordering according to the following stock numbers: WE piece part number 840-555-726, polyurethane-coated 36-gauge wire (shipped in 6-foot lengths), or RM 638-230 (shipped in 5-pound lots on a spool).

2. ACCESS TO DATA AUXILIARY SET 820B-TYPE AND REMOVAL/REPLACEMENT OF CIRCUIT PACKS

33-Type TTY Controller Access

2.01 Access to the DAS 820B-type and DS 108A-, ▸108E-, 109A-, or 109E-type◂ is accomplished by removing the rear panel of the TTY stand. To facilitate ease in maintenance, the DAS 820B-type has a maintenance position. To position the DAS 820B-type for maintenance:

(1) Rotate latch counterclockwise. This allows the DAS 820B-type to pivot on the 91A bracket.

(2) With both hands, tilt the 820B-type gently towards the rear of the station (Fig. 1).

35-Type TTY Controller Access

2.02 Access to the DAS 820B-type 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 ▸DAS 820B-type and DS 108A-, 108E-, 109A-, or 109E-type◂ 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, -L2, -L3, or -L4 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 DAS 820B-type and, in the case of the 33-type TTY, the controller is in the maintenance position, the CPs can be removed as follows:

(1) Remove the ▸lock strip◂ (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 ▸or lock strip bar◂ assembly (card extracting tool) against the faceplate of the CP to be removed and gently push in until the pivot(s) engage the faceplate.

(3) Grasp the handle of the 748A tool ▸or lock strip bar◂ and pull the CP straight out.

2.05 Replace CPs in the DAS 820B-type 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. AR272 (OR AR37) CIRCUIT PACK—ENCODING THE SHIFT REGISTER

3.01 The shift register of AR272 (or AR37) CP is encoded by connecting wire to a specific terminal on the CP, routing the wire through the eight tubes of the shift register (in a specified direction), and connecting them to another specific terminal on the same CP.

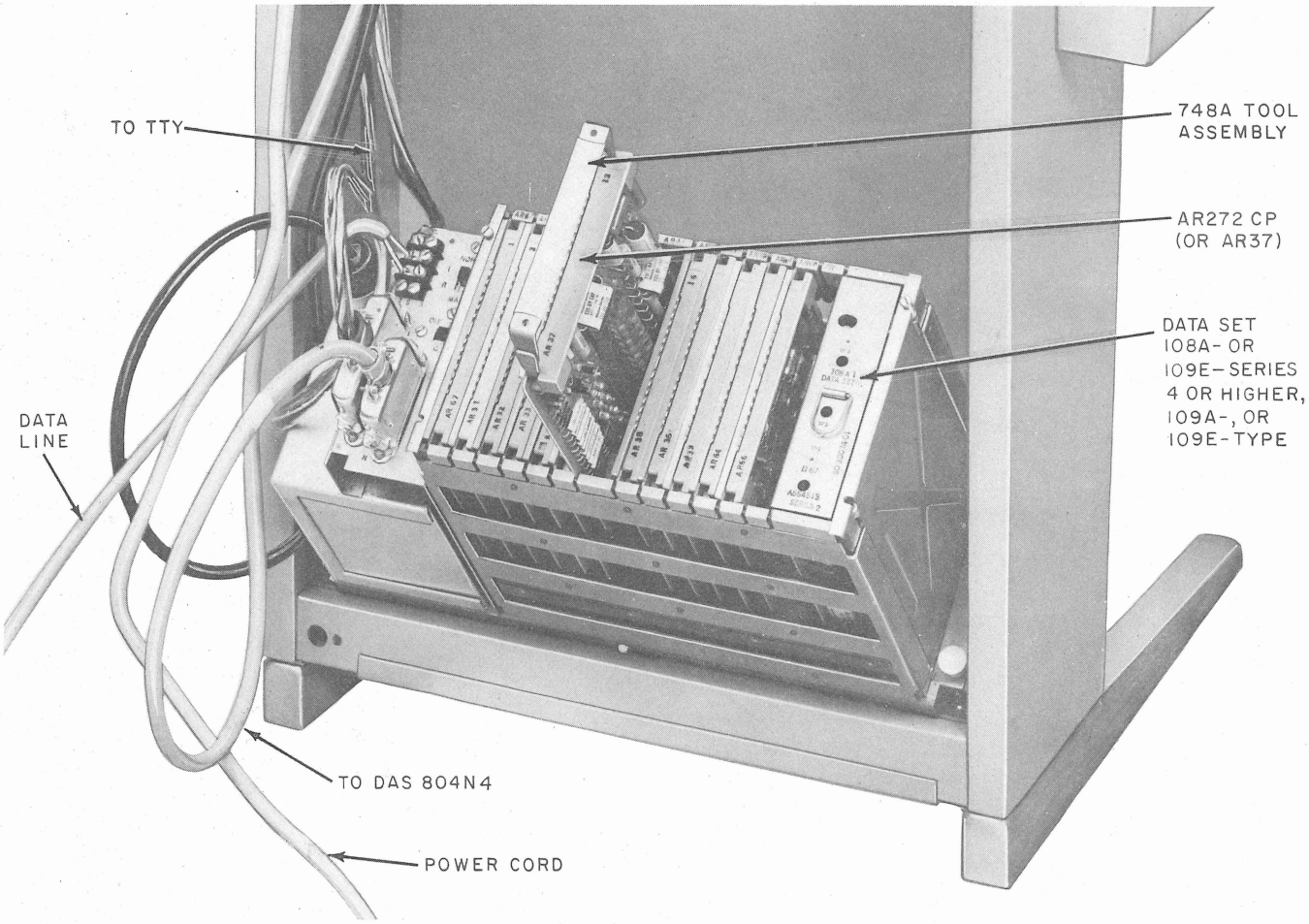


Fig. 1—DAS 820B-Type in 33-Type TTY, Maintenance Position

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

3.02 The CP should be positioned as shown in Fig. 3. It is suggested that the encoding of the shift register be performed with the CP properly protected and placed on a flat 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 AR272 (or AR37) CP being replaced or, for a new installation, from the service order and/or circuit layout record card.

(2) Select proper mark and space combination for each code by using Fig. 4.

(3) Cut three pieces of 36-gauge polyurethane-coated wire in 2-foot lengths.

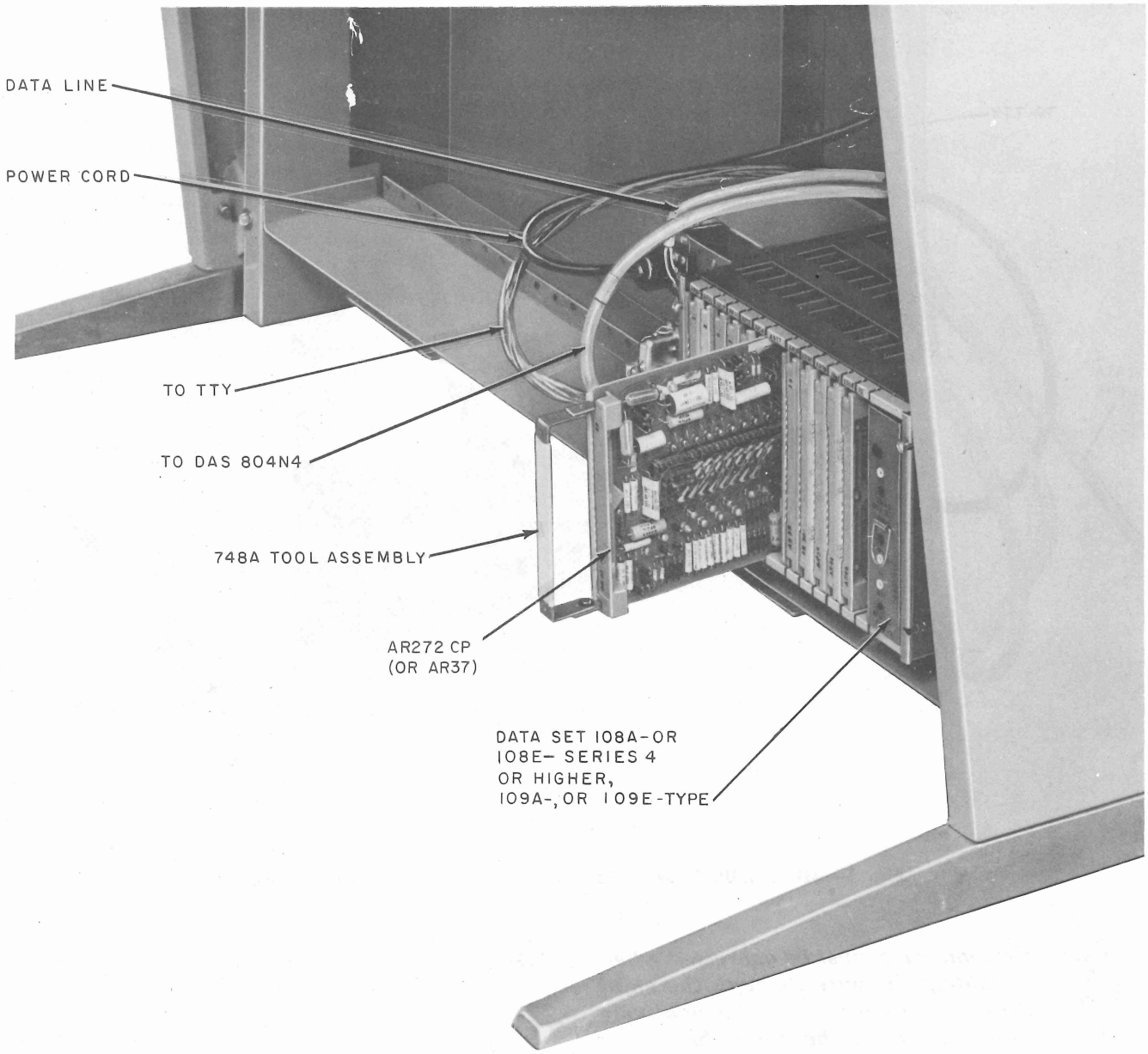


Fig. 2—DAS 820B-Type in 35-Type TTY, AR272 (or AR37) CP Extended

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 an end of one previously mentioned wire (3) to the GEN terminal (Fig. 3).

(5) Starting with tube 1 (for bit 1), thread the free end of this wire through each of the

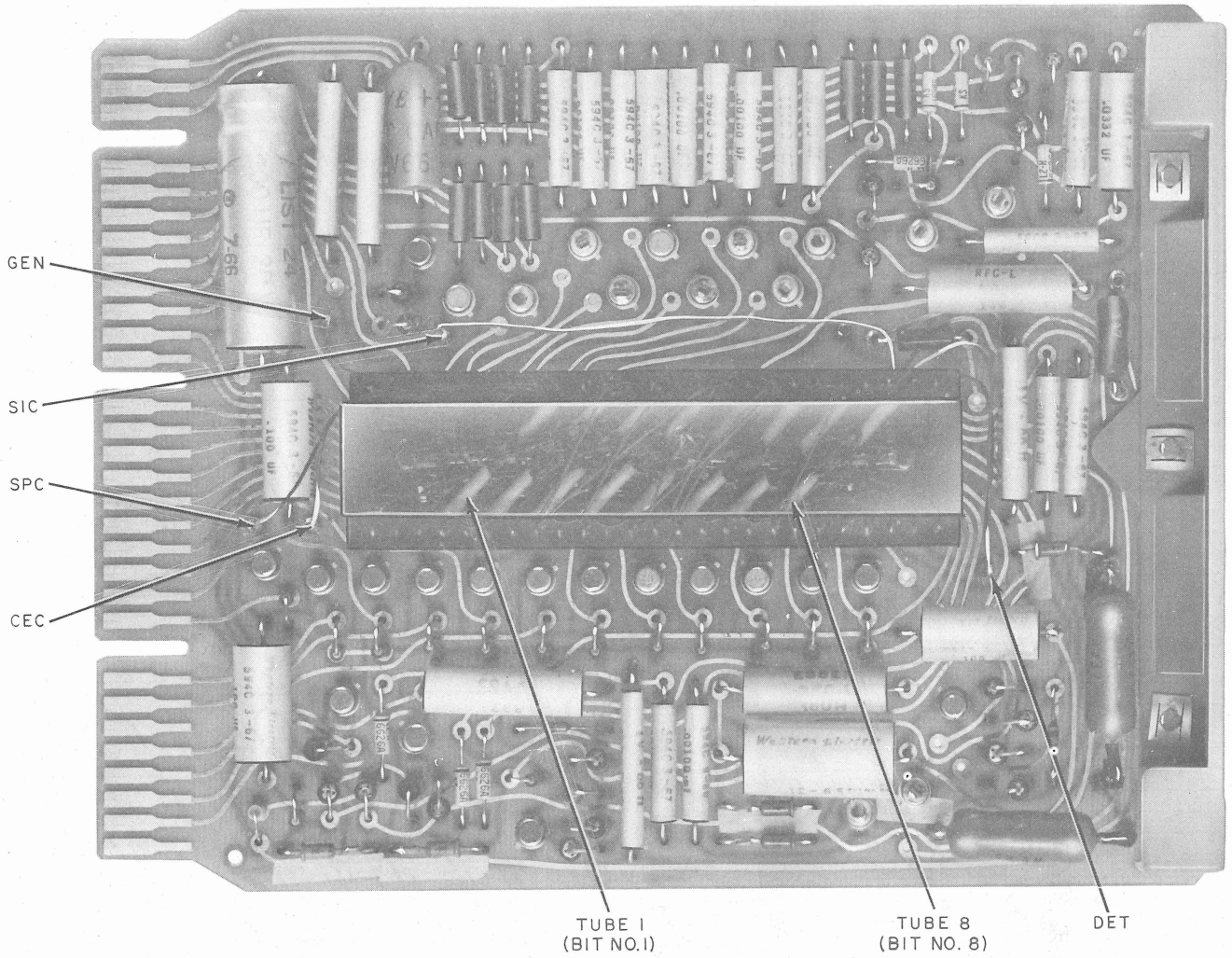


Fig. 3—AR272 (or AR37) CP, Location of Terminals for Wiring Shift Register

eight tubes in the shift register in the correct direction for each bit as indicated in Fig. 5.

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

SPC CODE

(7) Connect one end of another previously mentioned wire to the SPC terminal (Fig. 3).

(8) Starting with tube 1 (for bit 1), thread the free end of this wire 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 to the DET terminal (Fig. 3).

CEC CODE

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

(11) Starting with tube 1 (for bit 1), thread the free end of this wire through each of the eight tubes in the shift register in the correct direction for each bit as indicated in Fig. 5.

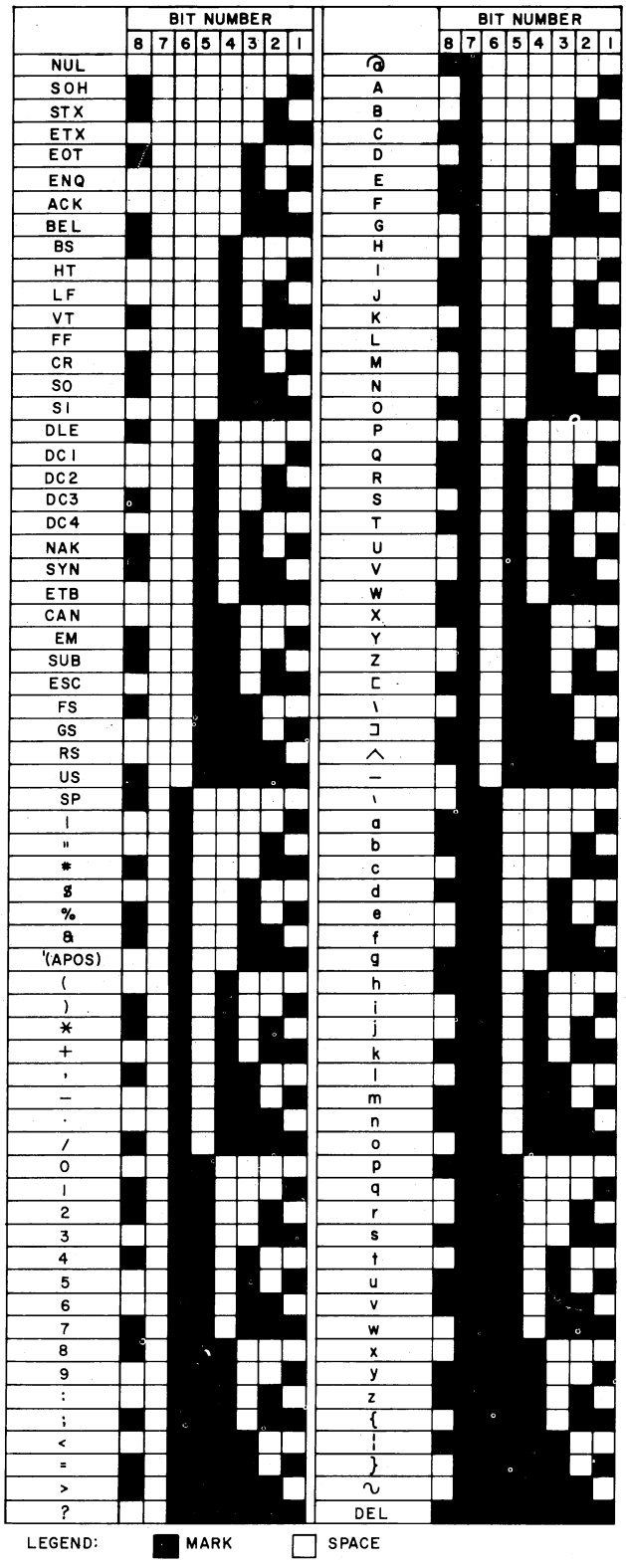


Fig. 4—American National Standard Code for Information Interchange (ASN X3.4—1968)

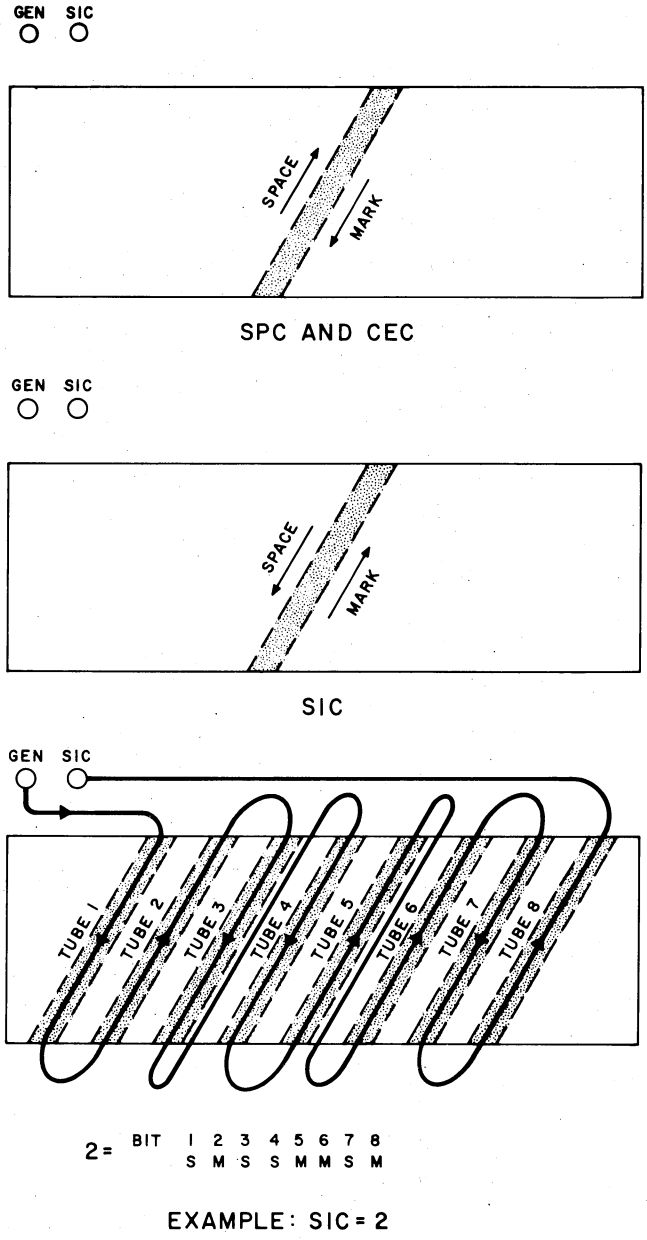


Fig. 5—Direction of Wires for Encoding Shift Registers

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

4. MAINTENANCE PHILOSOPHY

4.01 Maintenance of the half-duplex, 100-word per minute 86A1 data selective calling service 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.

4.02 When a trouble report is dispatched for clearance, 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 the report is not obviously TTY trouble, inquire whether a remote loop-back test of the DAS 820B-type 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, find out if the results were satisfactory. If a remote loop-back test has not been performed, request the STC or CSTC to perform the test.

A remote loop-back test may be performed on a data station that is equipped with a data set 108A ▸108E, or 109E.◂ Stations equipped with data set 109A are not designed to provide remote loop-back capabilities.

4.05 If the results of the remote loop-back test of the controller were not satisfactory, a loop-back test of the data set should be performed to isolate the trouble to either the data set or the controller. If the data set fails the loop-back test, replace the data set with one known to be good and repeat the loop-back test. The replacement data set should pass the test, which indicates 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 service to the customer with a minimum amount of downtime.

4.06 If the data set meets the requirements of the loop-back test, the trouble may be located in the controller. In this case, the tests described in the section entitled 86A1 Data Selective Calling Service—Half-Duplex—100-Word Per Minute Data Station—Test Procedures (581-136-500) should be performed to determine which CP is faulty. When found, the faulty CP should be replaced and the loop-back test repeated.

If AR272 (or AR37) CP is found to be the faulty CP, its replacement CP will have to be encoded for the station. The encoding procedure is described in Part 3 of this section.

4.07 Should the controller pass the remote loop-back test after replacement of the suspected CP, the trouble was in the controller.

4.08 If the controller fails the repeated test, a continuity check of the attendant set should be made.

> ***Note:*** In the event that a spare attendant set is available, substitution of the spare may reduce the time required for the repeated test of the controller. Should the controller pass the repeated test, either perform the continuity check to locate the trouble in the original attendant set and clear by repair, or replace the original attendant set with the spare.

4.09 If a spare attendant set is not available and the continuity check fails, clear the trouble by repair or replacement.

4.10 In the event that the controller passes the loop-back test, further analysis of the trouble report is required to determine which mode is in trouble (message pick-up or transmission, message reception, or control functions).

4.11 Message pick-up trouble is verified by the message transmission test. If the results of the test indicate TTY trouble, refer to the appropriate FMP or BSP for clearance procedures. If results indicate controller or attendant set trouble, a continuity test of the attendant set should be performed. If the continuity test fails, locate the trouble and either repair or replace the defective part.

4.12 If the attendant set passes the continuity test, the controller should be tested and faulty CPs replaced as described in 4.06.

4.13 Analysis of message reception trouble should be verified by performing a message reception test. Should the results of the test indicate TTY trouble, refer to the appropriate FMP or BSP for clearance procedures. If results indicate controller or attendant set trouble, a continuity test of the attendant set should be performed. If the continuity test fails, locate the trouble and either repair or replace the defective part.

4.14 If the attendant set passes the continuity test, the controller should be tested and faulty CPs replaced as described in 4.06.

4.15 Analysis of control function trouble should be verified by performing a local test and/or message transmission ***and*** message reception tests to determine the cause of the trouble report.

4.16 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.

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.

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 TTY housing cover.

5.07 To open the TTY housing cover:

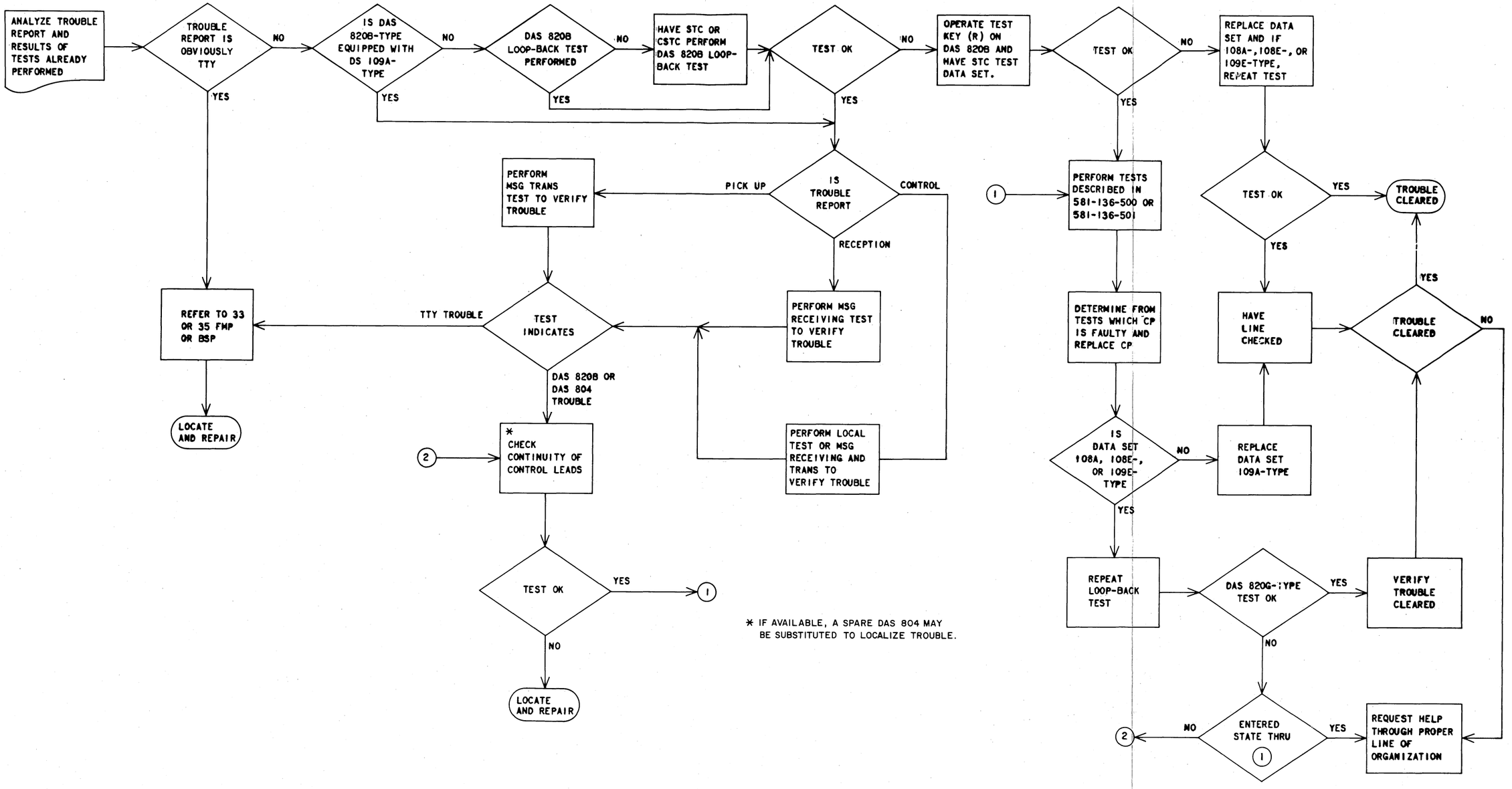
(1) Open the upper cover to its partially open latched position.

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 TTY housing and raise the cover.

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



* IF AVAILABLE, A SPARE DAS 804 MAY BE SUBSTITUTED TO LOCALIZE TROUBLE.

Fig. 6—Maintenance Test Procedure Flowchart

TABLE A

DAS 804N-TYPE REPLACEMENT PARTS

MODEL		KEY	LAMP	CORD	LOUDSPEAKER
33	RO	635J2 and 635K2	53A	M24J	KS-16908-L1
	ASR			M36C	
35	RO			M24J	
	ASR			M36C	
35	ROTR			M24J	KS-16107-L2

Keys (33 or 35 ASR or RO TTY)

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.

(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 the 635K2 key and 635J2 key to be installed and ▶fasten the spring-retaining clips.◀

(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 terminal strip (TS) B which connect the cord to the loudspeaker terminal strip. Remove the 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 DAS 804N-type 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.

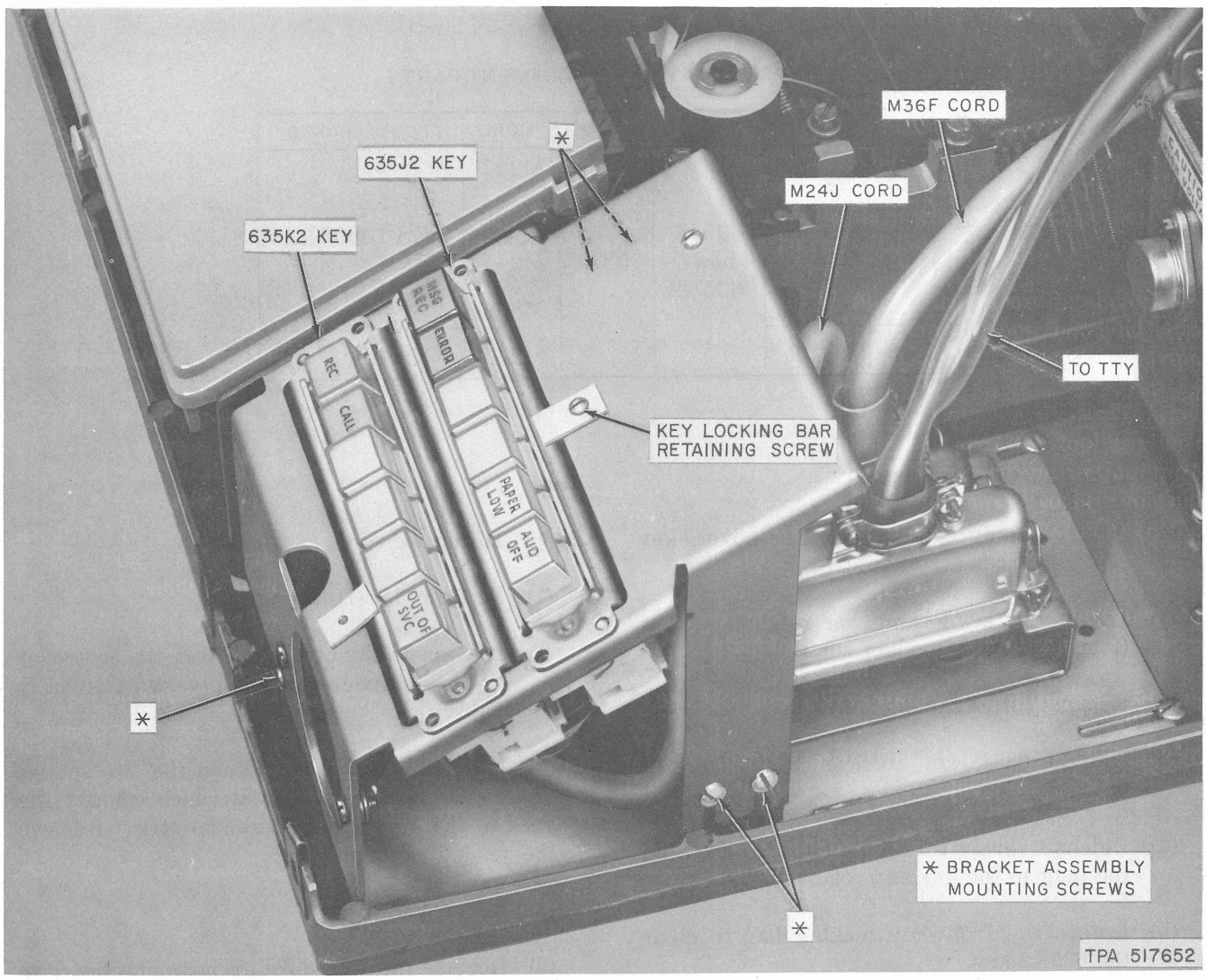


Fig. 7—DAS 804N2 Mounted in 33 RO TTY

(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.

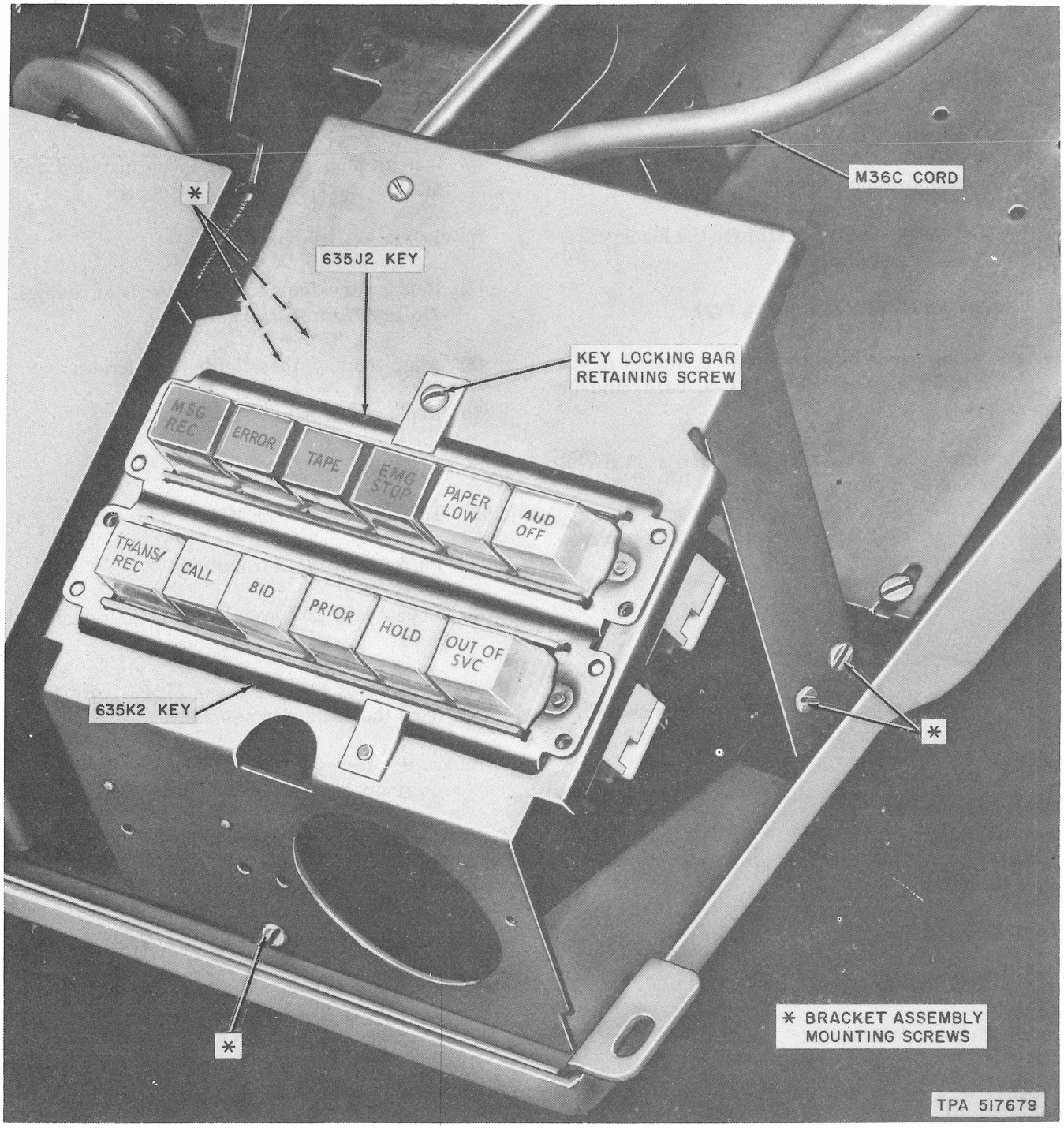


Fig. 8—DAS 804N4 Mounted in 35 ASR TTY

(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.

(6) Remove loudspeaker.

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

6. DATA AUXILIARY SET 804R3-TYPE

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 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 the spring-retaining clip.◀

(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.

Cord

6.05 To replace M24J (or M24G) cord:

(1) Perform 6.04 (1) through (4).

(2) Repeat 6.04 (2) through (4) for the remaining keys.

(3) Disconnect the M24J (or 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.

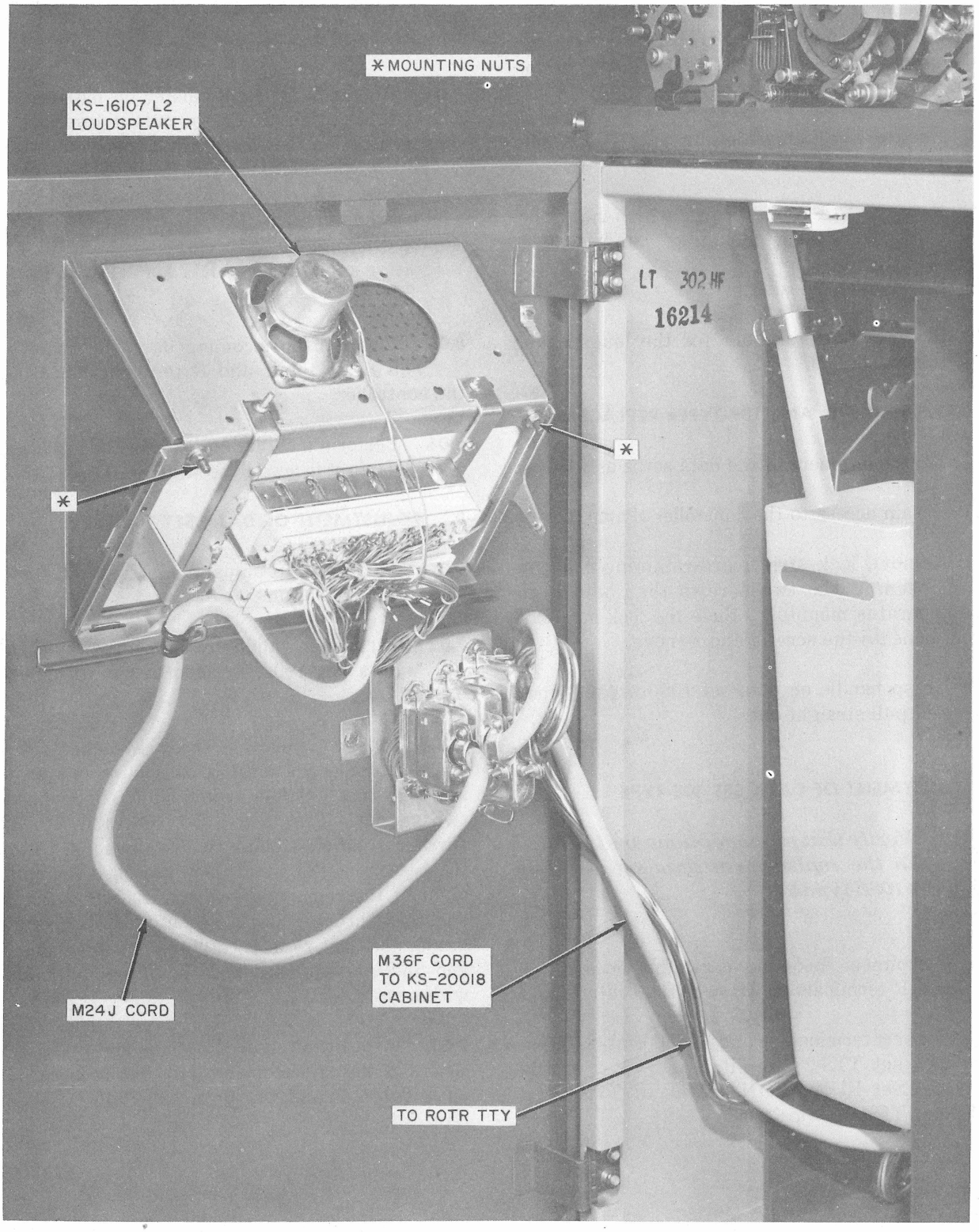


Fig. 9—DAS 804R3 Mounted in Door of 35 ROTR

(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.

(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 ▶108- AND 109-TYPE◀ 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 that hold it to the apparatus mounting. Slide the lock strip out from beneath the screws and remove.

(3) Grasp handle on data set 108- or ▶109-type◀ and pull straight out.

8. ADJUSTMENT OF DATA SET 108-TYPE

Verify that proper options are installed in the replacement data set 108A- or ▶108E-type.◀

8.01 Disconnect incoming data line from the T and R terminals on TS A of the controller.

8.02 Connect terminals + and – of portable station test set TTS-28 to TP 1 and TP 2 of the data set. Set FUNCTION switch of TTS-28 to DBM 900Ω TERM O position.

8.03 Connect TTY power cord to the customer-provided ac receptacle.

8.04 Adjust R11 potentiometer on data set 108A or ▶R18 on 108E◀ for 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 820B1, 820B2, or 820B7 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 581-136-500.

9. ADJUSTMENT OF DATA SET 109-TYPE

9.01 There are no adjustments required for data set 109A.

9.02 Perform installation tests on the replacement data set 109A in accordance with Section 580-301-500.

9.03 ▶Three adjustable screw switches (S1, S2, and S3) are used to select options on data set 109E-type. 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.

9.04 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.

◗ 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