86B2 DATA SELECTIVE CALLING SERVICE
FULL-DUPLEX—150-WORD PER MINUTE DATA STATION
MAINTENANCE

CONTENTS PAGE

1. GENERAL

1.01 This section provides the maintenance philosophy and procedures for an 86B2 Data Selective Calling Service Station. 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 pertaining to the split operation originate/terminate (ORIG/TERM) station and the use of data set 109E-type. 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 86B2 data stations is limited to the 37-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 Division Bell System Practice.

1.04 At the standard ORIG/TERM stations, it is possible to electrically substitute the printer of the automatic send and receive (ASR) TTY for the printer of the receive only (RO) TTY while the latter is being serviced. During this time, the transmitting capabilities of the station are lost; however, continuity of the ability to receive is assured. At stations where the ASR and RO TTYs are not adjacent to each other, a special cable is needed. This cable must be ordered separately from the Teletype® Corporation.

1.05 There is no routine maintenance required for data set 108A- or 109E-type, data auxiliary set (DAS) 820A5 (controller), DAS 804R2, 804R3, or 804R4 (attendant set). However, when stations are suspected of being in trouble, they should be tested as described in the section entitled 86B2 Data Selective Calling Service—Full-Duplex—150-Word Per Minute Data Station—Test Procedures (581-136-503).

1.06 When a data set 108A- 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 6, 7, and 8, respectively, of this section.

1.07 When a controller does not meet the test requirements, it should be determined which circuit pack in the controller is bad, and that circuit

pack should be replaced to quickly restore the service to the customer. The method of gaining access to the controller and the procedure for removing and replacing the circuit packs are described in Part 2 of this section.

1.08 When the data set, controller, or any circuit packs in the controller are replaced, the station should be tested in accordance with the section referenced in 1.05.

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

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

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

When DAS 820A5 is replaced and AR18 and AR25 circuit packs are also replaced, the replacing circuit packs must be encoded as given in Part 3 of this section.

1.11 The wire required for encoding the shift register on AR18 circuit pack 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 feet of wire in an envelope, or

RM 638-230 polyurethane-coated 36-gauge wire with approximately 5 pounds of wire on a spool.

2. ACCESS TO DAS 820A5 AND REMOVAL/REPLACEMENT OF CIRCUIT PACKS

37 ASR or RO TTY Controller Access

2.01 Access to the controller is available by opening the door on the right-hand side of the TTY pedestal. Maintenance of the controller is performed with the controller on the floor in front of the TTY (Fig. 1). To place the controller in the maintenance position:

(1) Loosen the mounting screw on the front of the 93A mounting bracket and slide the controller and 93A bracket forward and out of the TTY pedestal.

(2) Carefully set the controller and bracket on the floor in front of the TTY.

37 ROTR Controller Access

2.02 Due to space limitation, the data set and controller are ***not*** mounted in the 37 ROTR stand when a 37 ROTR is used as a primary TERM ONLY station. In this case, 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 circuit pack removal when this panel is removed.

Removal/Replacement of Circuit Packs

2.03 When access has been gained to the controller and the controller is in the maintenance position, the circuit packs 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.

Note: On some controllers the card retaining bar has been designed to serve as a card extractor. These card retaining bars are notched on one end so the circuit pack can be pried out using the notched end of the bar.

(2) Place the pivots of the 748A tool assembly (card extracting tool) against the faceplate of the circuit pack to be removed and gently push in until the pivots engage the faceplate.

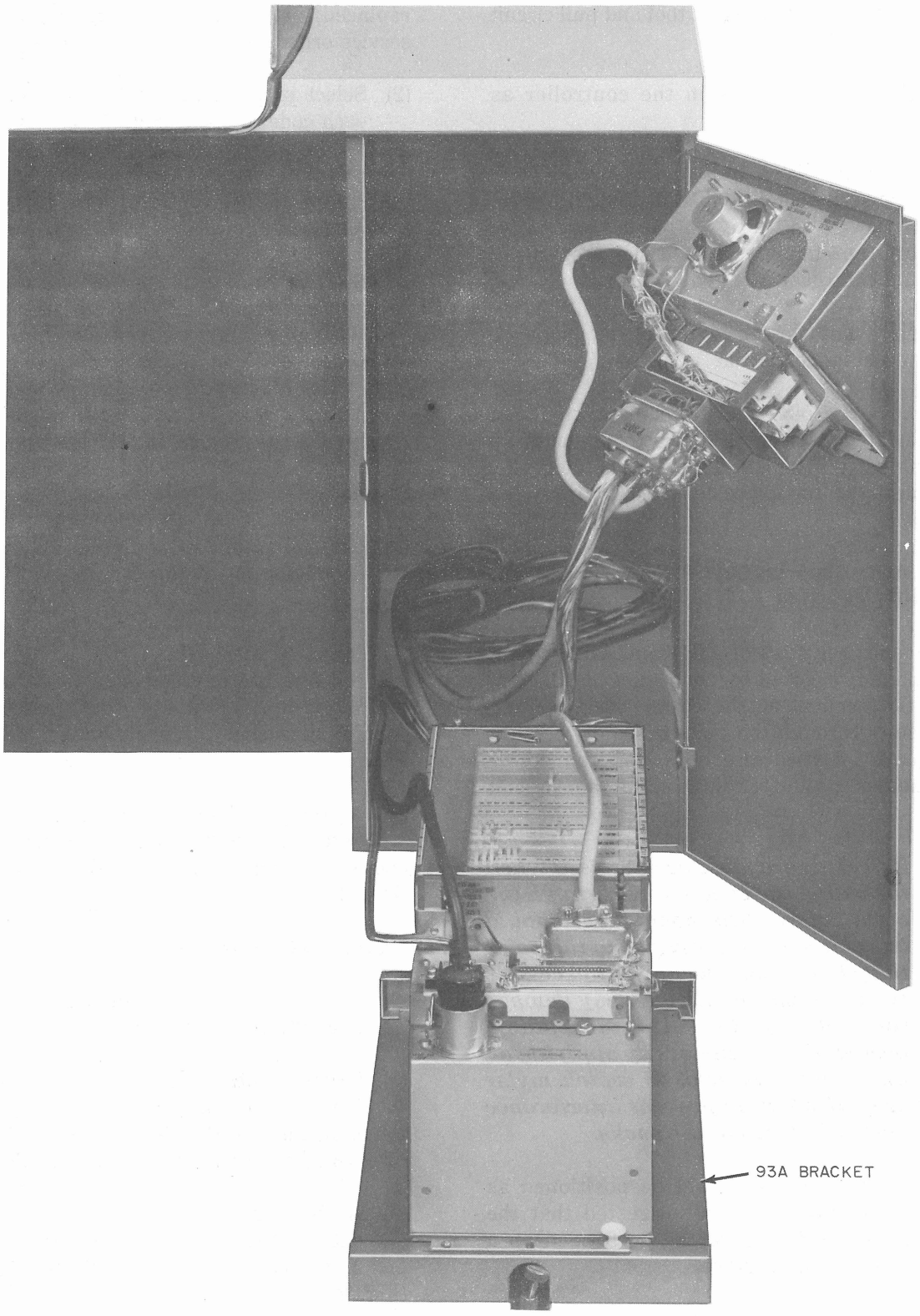

Fig. 1—DAS 820A5 Controller in Maintenance Position

(3) Grasp handle of the 748A tool and pull circuit pack straight out.

2.04 Replace circuit packs in the controller as follows:

(1) Connect the 748A tool to the circuit pack to be inserted as described in 2.03 (2).

(2) Insert the circuit pack into the proper slot on the controller and gently push in.

(3) Verify that the circuit pack is properly seated in its connector.

(4) Remove the 748A tool from the circuit pack faceplate by springing the bottom pivot down to disengage it from the circuit pack faceplate. Disengage the top pivot by lifting up on the 748A tool.

3. AR18 AND AR25 CIRCUIT PACKS—ENCODING THE SHIFT REGISTER

3.01 The shift registers of AR18 and AR25 circuit packs are encoded by connecting conductors to a specific terminal on the circuit pack, 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 circuit pack.

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. 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 circuit packs.

3.02 The circuit packs should be positioned as shown in Fig. 2. It is suggested that the encoding of the shift register be performed on a properly protected 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 circuit pack 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 pieces of wire in two-foot lengths. Refer to 1.11 for information on the type 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 Circuit Pack

(4) Connect an end of one previously mentioned conductor (3) to the SIC (START) terminal (Fig. 2).

(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 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 (END) terminal (Fig. 2).

SPC Code—AR18 Circuit Pack

(7) Connect one end of another conductor to the SPC (START) terminal (Fig. 2).

(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. 4.

(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. 2).

CEC Code—AR18 Circuit Pack

(10) Connect one end of the last conductor to the CEC (START) terminal (Fig. 2).

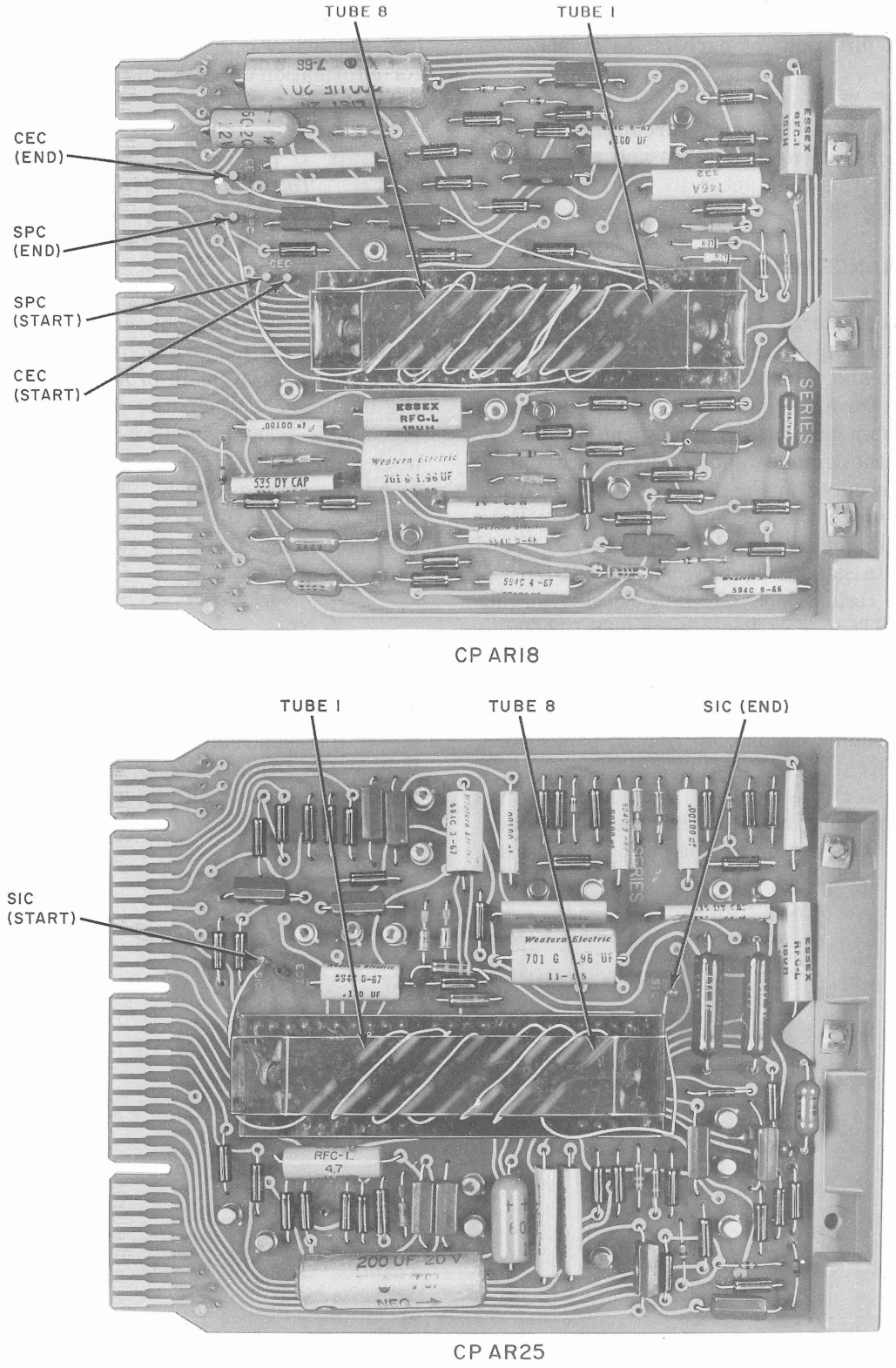

Fig. 2—AR18 and AR25 Circuit Packs—Location of Terminals for Wiring Shift Registers

(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. 4.

(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. 2).

4. MAINTENANCE PHILOSOPHY

4.01 Maintenance of the FDX, 150-wpm 86B2 data station should be in accordance with the flowchart shown in Fig. 5. 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 referenced in Fig. 5 and in the following text are shown in the section entitled 86B2 Data Selective Calling Service—Full-Duplex—150 Word Per Minute Data Station—Test Procedures (581-136-503) and 86B-Type Data Selective Calling Service Serving Test Center (STC)—Test Procedures (666-702-502).

4.02 When a trouble report is initially received at an STC, it should be analyzed to eliminate the obvious trouble conditions (ribbon, paper jams, etc).

4.03 When testing indicates that the replacement of the data set or circuit pack 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 (581-136-203) and the applicable parts of this section for information on replacing the data set and circuit packs.

If the AR18 or AR25 circuit pack is found to be faulty, the replacement will have to be encoded as described in Part 3 of this section.

4.04 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 581-136-503, 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 804R-TYPE

5.01 Maintenance of DAS 804R-type is limited to the replacement of lamps, keys, cord, and/or loudspeaker (Fig. 6, 7, 8, and 9). This requires opening the door on the right-hand side of the TTY table (for ASR or RO), or the front door (ROTR).

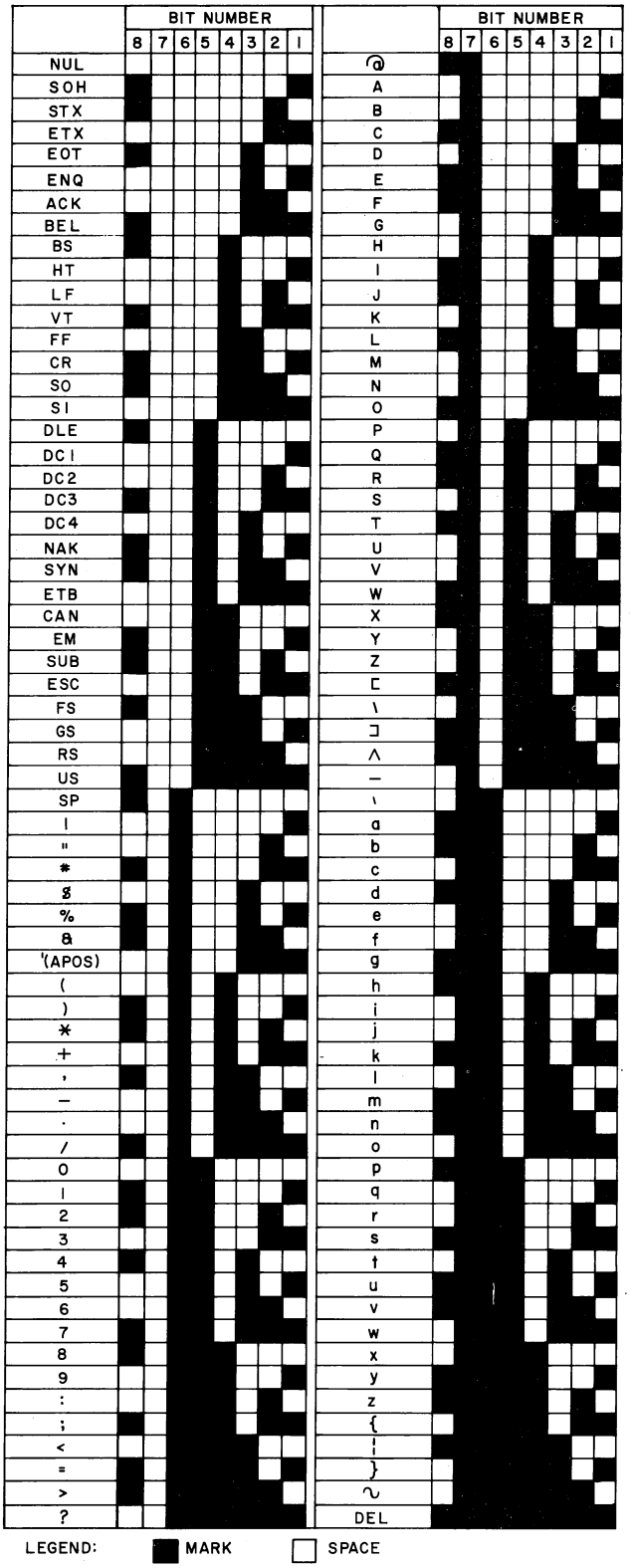

Fig. 3—USA Standard Code for Information Interchange (USAS X3.4-1968)

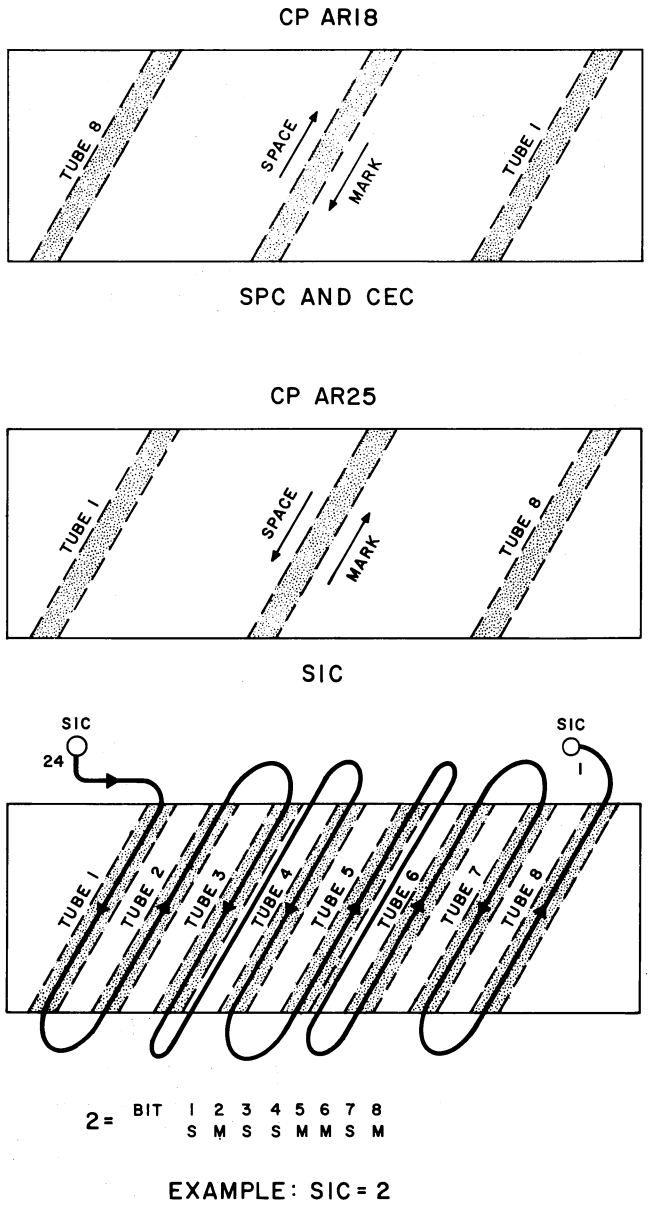

Fig. 4—Direction of Wires for Encoding Shift Registers on AR18 and AR25 Circuit Packs

5.02 The DAS 804-type replacement parts are shown in Table A.

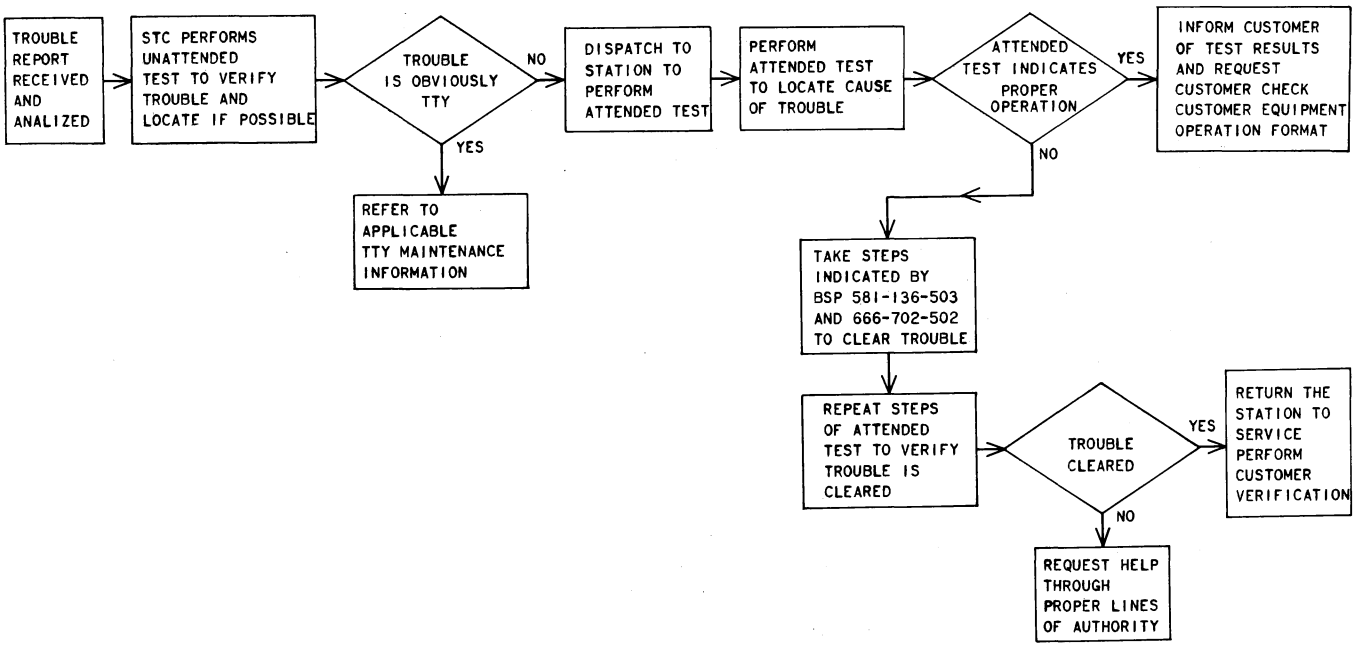

Fig. 5—Maintenance Flowchart

TABLE A

DAS 804—TYPE REPLACEMENT PARTS

DAS	KEY	LAMP	CORD	SPEAKER
804R2	635J OR	53A	M24F	KS-16908-L1
804R3 804R4	635K		M24J	KS-16107-L2

Lamps

5.03 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

5.04 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.

(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

5.05 To replace M24F (804R2) or M24J (804R3) cord:

(1) Perform 5.04 (1) through (4).

(2) Repeat 5.04 (2) through (4) for the remaining keys.

(3) Disconnect the M24F or M24J cord plug from the connector assembly.

(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

5.06 To replace loudspeaker:

(1) 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.

(2) Remove the two mounting nuts which hold DAS 804-type to the door (Fig. 6, 7, and 8).

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

(4) Remove loudspeaker.

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

6. DATA SET REPLACEMENT

6.01 The data set is replaced 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) Grasp handle on data set 108A-type or attach 748A tool to faceplate of data set 109E-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 tip, (T) and ring (R) terminals on TS A of the controller.

7.02 Connect terminals + and − of portable station test set TTS-28 to TP 1 and TP 2 of the data set (Fig. 10). Set FUNCTION switch of TTS-28 to DBM 900Ω TERM O 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 card.

Note: If no output level is measured, operate carrier squelch (CS) switch on DAS 820A5 to OFF. Restore CS switch after adjustment of R11 and remove TTS-28.

7.05 Connect the incoming data line removed in 7.01, to the T and R terminals on TS A of the controller.

7.06 Perform tests on the replacement data set in accordance with Section 581-136-503.

8. ADJUSTMENT OF DATA SET 109E-TYPE (FIG. 11)

8.01 Three adjustable screw switches (S1, S2, and S3) are used to select options on data set 109E-type (Table B). 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 C). Sections S3-3 and S3-8 are not used and should not be equipped with screws.

8.02 Install the required options and line padding in the replacement data set in accordance with Tables B and C, respectively, and the data set 109E-type being replaced.

9. DATA AUXILIARY SET 804R-TYPE (ATTENDANT SET) REMOVAL (FIG. 6, 7, 8, and 9)

9.01 To remove DAS 804R-type:

(1) Open the front access door on the TTY stand.

(2) Remove the spring clip at the right rear of the attendant set mounting bracket by removing the two mounting screws.

(3) Lift the left side of the faceplate and disengage the faceplate locking tab.

(4) Remove the faceplate.

(5) Disconnect the attendant set plug and, at 37 ROTR TTY (Fig. 8), remove connector assembly.

(6) Remove two hex nuts and lockwashers from the weld screws on the angle bracket mounting assembly.

(7) Lower the rear of the attendant set to disengage the locking tabs.

(8) Remove the attendant set by sliding it to the rear.

10. DATA AUXILIARY SET 820A5 (CONTROLLER) REMOVAL

Note: The controller mounting arrangement is the same for both the 37 ASR and 37 RO TTY.

10.01 To remove the contoller from the 37 ASR or RO TTY:

(1) Open the door on the right-hand side of the TTY pedestal.

(2) Loosen the mounting screw on the front of the 93A mounting bracket and slide the controller and 93A bracket forward and out of the TTY pedestal.

(3) Carefully set the controller and bracket on the floor in front of the TTY.

(4) Loosen the two screws on the controller terminal board (TS A) and remove the T and R spade lug wiring.

(5) Disconnect the N, P, M, and power plugs from the controller.

(6) Remove the two mounting screws from the 93A bracket.

(7) Disengage the two plungers that secure the controller to the 93A bracket and separate the controller from the bracket.

10.02 To replace the controller, reverse the procedure given in 10.01.

10.03 To remove the controller from the 37 ROTR TTY:

Note: The DAS 820A5 is mounted in a KS-20018-type cabinet when the ROTR TTY is used as a primary station.

(1) Apply outward pressure at the top front of the KS-20018 cabinet until the panel releases.

(2) Lift the panel up to remove it from framework.

(3) Loosen the two screws on the controller terminal board and remove the T and R spade lug wiring.

(4) Disconnect the N, P, and power plugs from the controller connectors.

(5) Remove two mounting screws from the 95A mounting bracket.

(6) Disengage the two plungers that secure the controller to the mounting bracket.

(7) Grasp the controller and pull out from the rear of the cabinet.

10.04 To replace the controller, reverse the procedure given in 10.03.

11. SUBSTITUTING ASR PRINTER FOR RO PRINTER (STANDARD ORIG/TERM STATION ONLY)

11.01 To substitute the ASR printer for the RO printer:

(1) Operate the OUT OF SVC keys on both the ASR TTY and RO TTY attendant sets.

(2) Operate the ASR TTY ON-LINE mode key.

(3) When both attendant set OUT OF SVC lamps are lighted, disconnect the ASR and RO TTY power cords from the ac outlets and perform 10.01 (1) through (3) on the ASR TTY.

(4) Disconnect the cable from the M connector of the controller.

(5) Open the door of the RO TTY and disconnect the cable from the X connector of the attendant set connector block assembly.

Note: If the ASR and RO TTY are not directly adjacent to each other, the procedure in (6) requires the use of a special cable which must be ordered separately from Teletype Corporation.

(6) Using the special cable, if necessary, connect the cable removed from the M connector of the controller to the X connector of the RO TTY attendant set connector block assembly.

(7) Restore the OUT OF SVC key on the RO TTY attendant set and reconnect the ASR and RO TTY power cords to the respective ac outlets.

11.02 If the station is equipped with an auxiliary receiver and the auxiliary receiver is to be used during the ASR and RO printer swap-out:

Note: This requires that the station be equipped with an optional set of AR-type circuit packs and a special cable as described in 11.01 (5).

(1) Disconnect the auxiliary receiver cable from the primary RO TTY.

(2) Connect this cable to the cable and connector supplied in the ASR TTY for this purpose.

11.03 To restore the station to normal, reverse the procedures of 11.01 and 11.02.

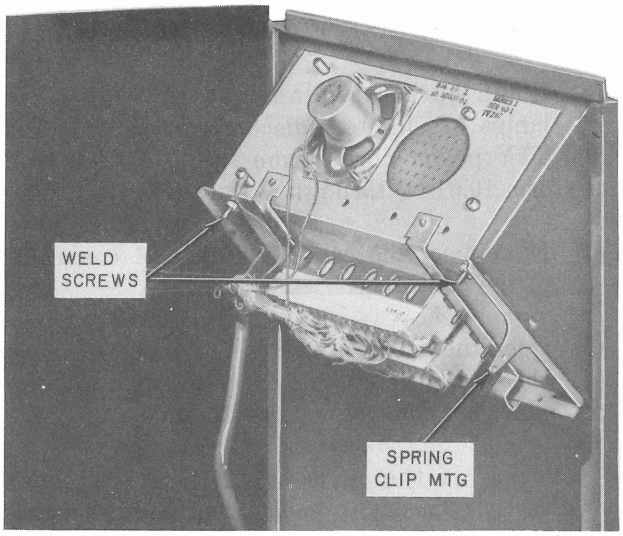

Fig. 6—DAS 804R2 in 37 ASR TTY

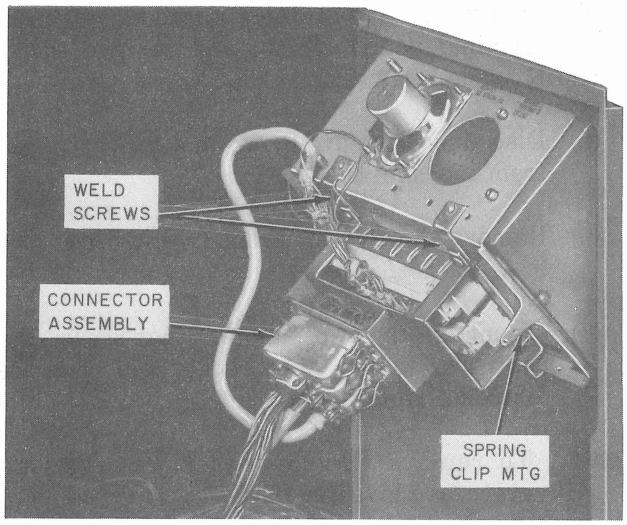

Fig. 7—DAS 804R3 in 37 RO TTY

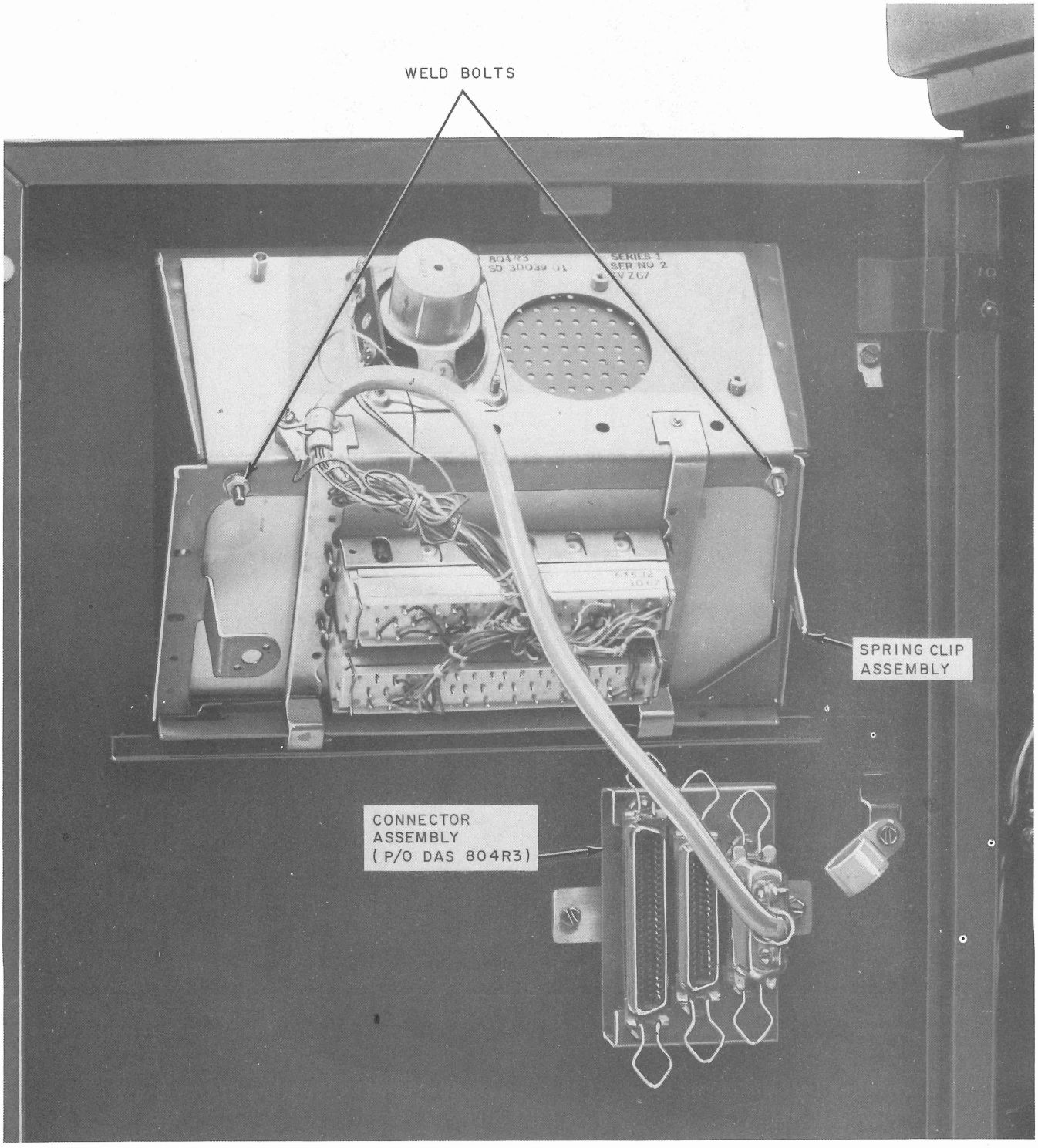

Fig. 8—DAS 804R3 in 37 ROTR

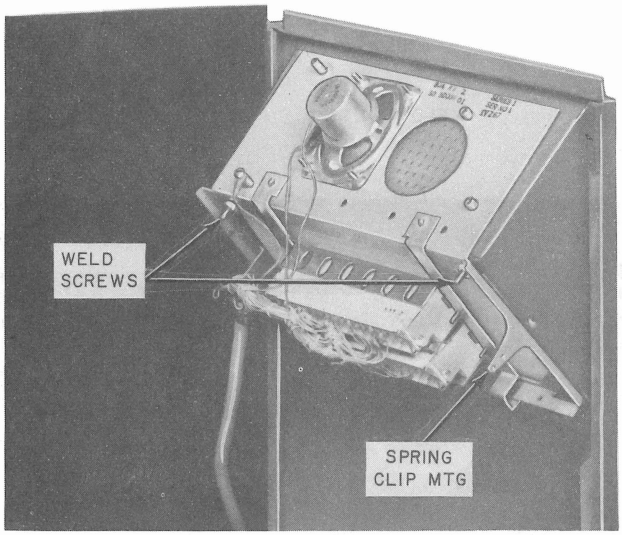

Fig. 9—DAS 804R4 in 37 ASR Split Operation TTY

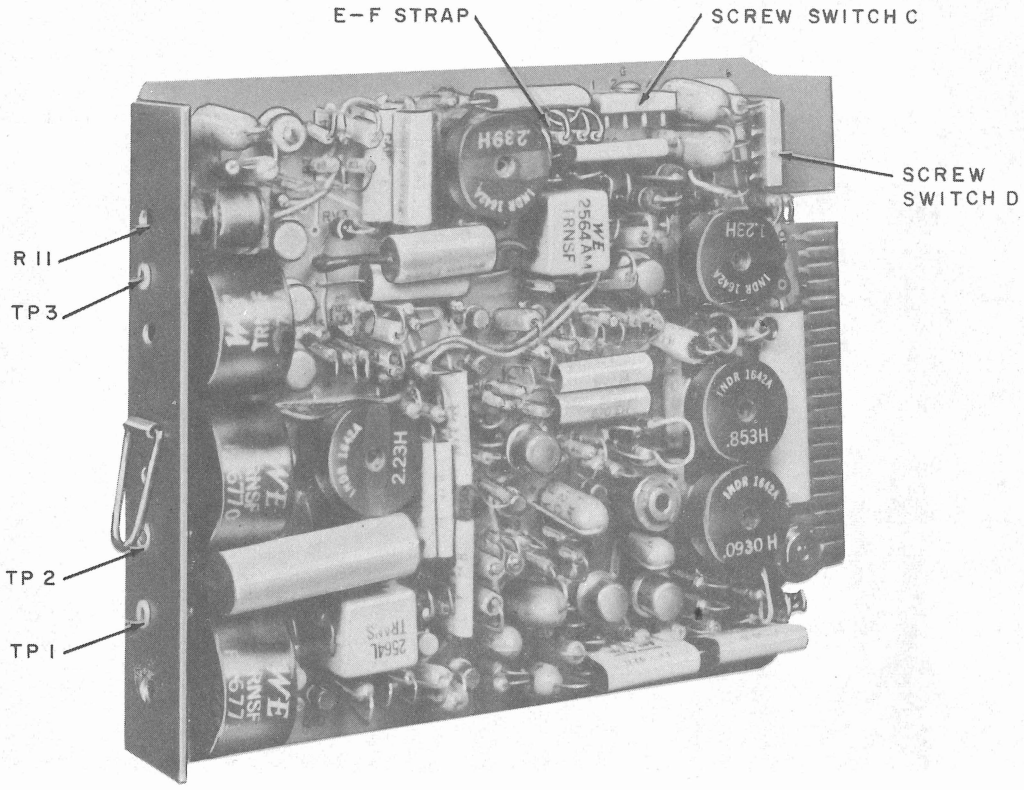

Fig. 10—Data Set 108A-Type—Location of Test Points and Screw Switches

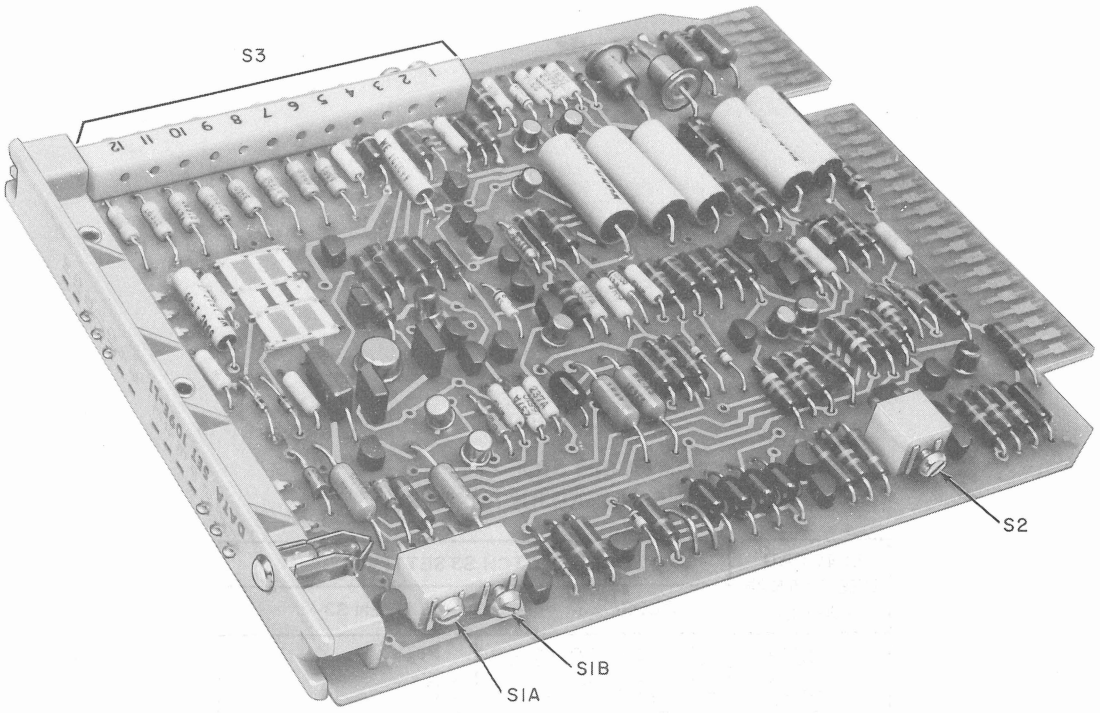

Fig. 11—Data Set 109E-Type—Location of Option and Line Pad Screw Switches

TABLE B

DATA SET 109E—TYPE SCREW SWITCH SETTINGS FOR OPTIONS

FUNCTION PROVIDED		OPTION DESIG	FACTORY EQUIPPED	SCREW SWITCH SETTING	
				CLOSE	OPEN
Current Squelch		Z	√	S2	
No Current Squelch		Y			S2
BB LEAD	SPACE HOLD	V		S1A*	S1B*
	MARK HOLD	U	√	S1B*	S1A*
CROSSOVER SHIFT	SPACE	R		S3-2	S3-1
	MARK	Q	√		S3-1 & S3-2
	NONE	P		S3-1	S3-2

*Screw switch should not be inserted in the center positions of screw switches S1A and S1B.

TABLE C

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