

## TERMINATING MARKER CONNECTOR FRAMES

### EQUIPMENT DESIGN REQUIREMENTS

### NO. 1 CROSSBAR SYSTEM

#### 1. GENERAL

##### Scope

**1.01** This specification, together with the supplementary information listed herein, covers the equipment design requirements for the framework, equipment, and circuits to be used in the engineering, manufacture, and installation of terminating marker connector frames in No. 1 crossbar offices. Equipment included in this specification may be ordered by specifying the code and list numbers covered in Part 4.

**1.02** This specification is reissued to provide equipment design requirements for Direct Inward Dialing (DID) feature code, J28850D, added in agreement with SD-25036-01, Issue 29D.

##### Capacity

**1.03** There are two terminating marker connector frames, one arranged for a maximum of six and the other for a maximum of ten terminating markers. Each frame has a capacity of four terminating marker connector circuits. Each connector is arranged for terminating or number checking senders or combinations of these as follows:

FULL SELECTOR OR A-C KEY PULSING SENDERS	"B," CENTRAL "B," DIAL PULSING, OR NUMBER CHECKING SENDERS	TOTAL SENDERS
4	0	4
3	2	5
2	3	5
1	4	5
0	5	5

For additions to existing jobs and for new installations a maximum of four terminating or number checking senders shall be assigned to a connector to facilitate future additions and

changes of the various types of senders due to traffic requirement variations. A fifth sender may be assigned to a connector as an exception when specified by the telephone company providing this will save a connector or connector frame initially, and where no near future additions or changes in terminating sender traffic requirements are anticipated. When five senders are assigned to a connector, the last sender multicontact relay in the connector shall be assigned to a sender most likely to be replaced or removed to facilitate this change. (See 1.11)

##### Description

**1.04** The terminating marker connector frame provides four marker connectors through which a maximum of twenty senders secure access to any of the terminating markers in the office. Each connector serves a maximum of five senders and can handle one call at a time, being held only as long as it is required to connect a sender to a marker. In the event of simultaneous demands for a connector by two or more senders, the senders take their successive turns in a fixed order depending on their relative positions in a chain circuit. Another chain circuit between connectors insure that only one connector at a time enters a particular marker. A connector, in releasing from a marker, is prevented from re-entering that marker until any other connectors waiting have each secured a marker. On this frame there is also mounted two "B" position finder units located here rather than on the relay rack, in order to insure their being located near the "B" position senders with which they are closely associated.

**1.05** The frame is furnished in either of two lengths depending on the number of markers to which connection is to be made. The smaller frame, a single bay 2 feet 10 inches long, will give access to six markers and the larger frame, a single bay 3 feet 10 inches long, will

give access to ten markers. Both frames mount the framework and equipment for four connectors, with multicontact relays for a maximum of five senders in each connector. All multicontact relays are mounted on supplementary frameworks mounted on the bay, and the control and alarm U-type relays on 2 inches wide mounting plates directly on the bay framework, at the bottom portion of the frame. The jack panel for the miscellaneous frame line circuits and test posts are located approximately 4 feet 6 inches from the floor and a 48-volt fuse panel and miscellaneous terminal strips are located at the upper portion of the bay.

**1.06** In any office, a minimum of two terminating marker connector frames and four terminating marker connectors are required. Where there are the minimum number of connectors they will be divided equally between two frames. The terminating senders to be served by four connectors will be divided so that approximately one quarter of the senders of each type will be located in each connector circuit. As the number of senders increase, they will continue to be distributed as equally as possible over the connectors.

**1.07** The marker connector frame is equipped with a minimum of three multicontact relays per connector for connection to a minimum of three markers per office. Additional multicontact relays for markers will be added as required in multiples of one per connector.

**1.08** The terminating marker connector relays are arranged on the frame so that the multiple wiring between these relays in each connector is in vertical local cable forms which are individual to each marker. These forms are not a part of the frame local cable and are omitted when marker relays are not equipped.

**1.09** The apparatus side of each connector is enclosed in common dust covers, individual to each relay in the case of multicontact relays, and common to each mounting plate in the case of U-type relays.

#### **Floor Plan Arrangement**

**1.10** The terminating marker connector frames shall, preferably, be located at the aisle ends of the associated terminating sender frames

with not more than two TMC frames in one row.

#### **Assignment of Senders to Connectors**

**1.11** From a traffic carrying standpoint the capacity of the connector with respect to terminating senders and number checking senders is as indicated in the table of 1.03. However, to simplify connector changes associated with the replacement of "B" senders with full selector or ac key pulsing senders and the conversion of central "B" senders to full selector operation due to changes in traffic requirements, in general, a maximum of four terminating or number checking senders shall be assigned to any one connector. This provides for the replacement of any type of terminating sender or the sender frame with any other type, or the conversion of one type to another without recabling the sender to another connector and without adding marker connectors. The connector frame shall be furnished with the fifth sender relay omitted until the engineering requirements for a new connector frame can be made available.

#### **Replacement and Removal of a Sender in a Connector**

**1.12** Where one type of sender is replaced by another on the terminating sender frame the new sender shall be assigned to the same connector multicontact relay as the replaced sender providing the capacity of the connector as outlined in the table of 1.03 is not exceeded. If the new type of sender exceeds the capacity of the connector it shall be assigned to a connector of suitable capacity. The multicontact relay for a sender to be removed from a connector shall be left in place unless it is the fifth or last sender in the connector in which case it may be removed. An intermediate relay shall be left in place to avoid extending the horizontal strapping of the armatures of the sender relays across an unequipped multicontact relay position. The sender preference relay associated with the removed sender shall be removed and wiring provided to extend the chain circuit leads from the preceding to the succeeding sender. From the connector standpoint, the most desirable sender to be removed is the last sender in the connector. In determining the choice of sender to be removed, consideration should be given to its position on the sender link frame switches. In general, the sender to be removed should be the last sender in a subgroup.

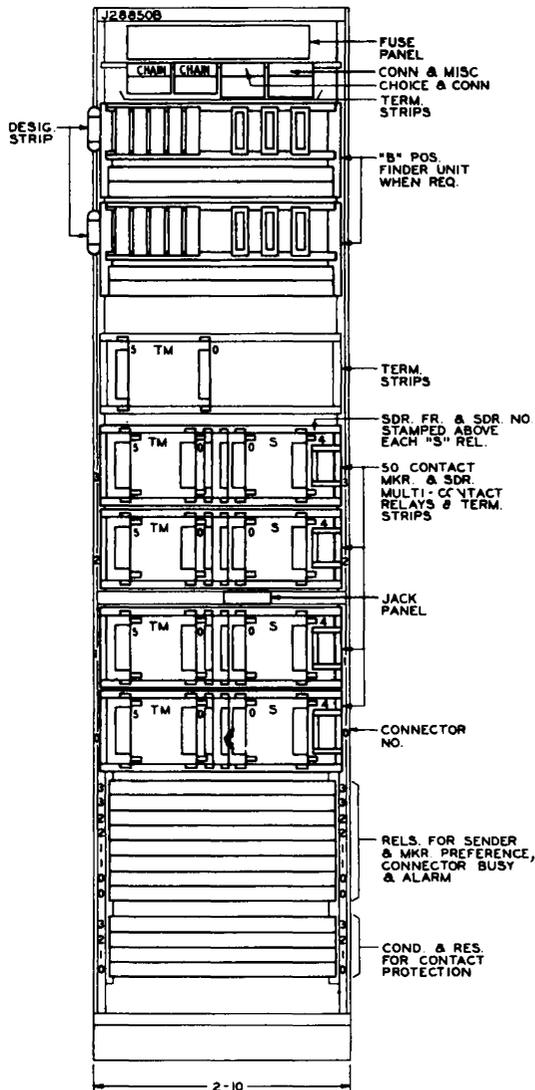


Fig. 1 — Marker Connector Frame — 6 Markers

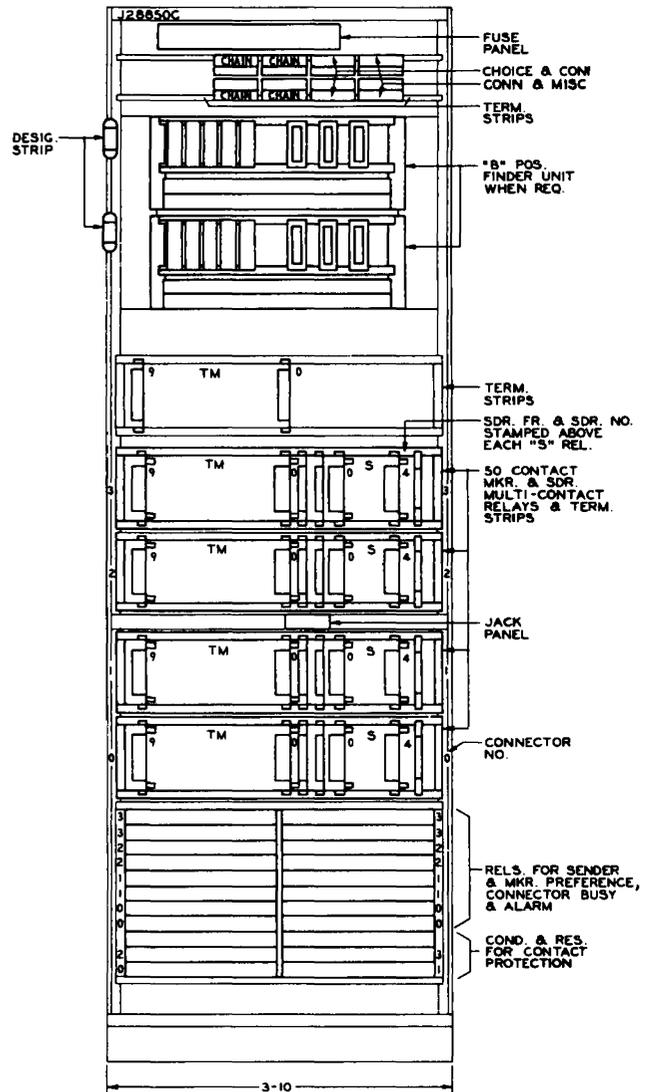


Fig. 2 — Marker Connector Frame — 10 Markers

**2. SUPPLEMENTARY INFORMATION**

- 816-000-000 — No. 1 Crossbar System Index
- BSP — Gen. Equip. Req. — Wiring and Cabling
- BSP — Gen. Equip. Req. — Numbering and Lettering Crossbar Equipment
- BSP — Gen. Equip. Req. — Auxiliary Framing
- J20150 (816-015-150) — Switchboard Power Cabling
- J25551 (816-040-150) — End Guards, Aisle Pilot Lamp Supports, DPTS Supports, Fuse Record Book and Holder and Spare Fuse Mountings

- J25552 (816-017-150) — Frame Lighting and Appliance Outlets
- Floor Plan Data — Section 9.1, Sheet 13
- Section 9.1, Sheet 20
- SD-25000-02 — Current Drain Data

**3. DRAWINGS**

WECO J drawings should be ordered by referring to the prefix and base number and requesting the current dash (—) number.

**Keysheet**

- SD-25000-01 — Keysheet — No. 1 Crossbar System

**Circuits**

- SD-25036-01 — Terminating Marker Connector Circuit
- SD-25248-01 — Miscellaneous Circuit for Terminating Marker Connector Frame

**Framework**

- ED-25020-01 — Fuse Panel, Terminal Strip, Switch Mounting Details, and Cable Brackets
- ED-25021-01 — Assembly of Jack, Key, and Lamp Panel
- ED-25023-01 — Frame Details
- ED-25025-01 — Fuse Panel Assembly
- ED-25212-01 — Designation Cards
- ED-25309-01 — Assembly of Terminating Marker Connector Frames (Arranged for 6 and 10 Terminating Markers)

**Equipment**

- J28850B-( ) — Terminating Marker Connector Frame (Arranged for Six Terminating Markers)
- J28850C-( ) — Terminating Marker Connector Frame (Arranged for Ten Terminating Markers)
- J28850D-( ) — TMA- Relay Unit, Terminating Marker Connector (Arranged to serve Ten Terminating Markers in One Connector)

**Wiring and Cabling**

- ED-25100-01 — Switchboard Cabling Plan
- ED-25130-01 — Schematic of Marker Multiple Cabling to Frame Connectors
- ED-25164-01 — Switchboard Cabling Details (Arranged for 8 Terminating Markers)
- ED-25311-01 — Frame Local Cables (Arranged for 6 or 10 Terminating Markers)
- ED-25312-01 — Switchboard Cabling Details (Arranged for 6 or 10 Terminating Markers)
- ED-25346-01 — Method of Running Power Feeders

**4. EQUIPMENT****J28850B (AT&T Co Std)—Terminating Marker Connector Frame**

Equipment — J28850B-( ) (See 5.04)

**List 1** — Framework, assembly, wiring, and common equipment arranged for four terminating marker connectors each arranged for a maximum of six terminating markers and five senders (less the multiple wiring for the terminating marker relays and the horizontal strapping on these and the sender connector relays).

	WIRE	EQUIP	SEE NOTE
Framework ED-25309-01, Item 1		1	
Fuse Panel ED-25025-01, Item 10		1	
Jack, Key, & Lamp Panel ED-25021-01, Item 10		1	
Misc. Frame Ckt. SD-25248-01:			
Fig. 2, 3, 4, 6, & 8	1	1	
Fig. 7	4	4	
Terminating Marker Connector Circuit, SD-25036-01:			5.05
Fig. 2 or 12, 3, 5, 6, 8, 10, 10C, and 10D	4	0	5.06, B
Fig. 4	12	0	
Fig. 7	16	0	5.06, 5.07

**List 2** — Framework, assembly, horizontal strapping, and equipment, required in addition to list 1, to equip one terminating marker connector for three terminating markers and one sender, also with an alarm or alarm and sequence circuit, a second trial, number check, no test and trouble detecting circuit. (See Note C, D and 5.08.)

	WIRE	EQUIP	SEE NOTE
M.C. Relay Mtg Assembly ED-25309-01, Item 2		1	5.01
Cable Support ED-25309-01, Item 3		As Spec.	A

	WIRE	EQUIP	SEE NOTE
Ter Marker Connector Ckt SD-25036-01:			
Fig. 2 or 12, 10, 10C and 10D	0	1	5.10,B
Fig. 3	1	1	5.02, 5.09
Fig. 6, 7, & 8	1	1	5.09

**List 3** — Equipment per SD-25036-01, Fig. 7, required in addition to lists 1 and 2 to equip one terminating marker connector for one additional terminating marker. (See 5.09 and 5.11.)

**List 4** — Equipment per SD-25036-01, Fig. 4 and 5 required in addition to list 1 and 2 to equip one terminating marker connector for one additional sender. (See Notes C, D and 5.09 and 5.12.)

**List 5** — Wiring and equipment required in addition to list 1 to provide multiple wiring for one terminating marker relay in all terminating marker connectors on same frame. (See 5.13.)

	WIRE	EQUIP	SEE NOTE
(TM) Terminal Strips	0	1	5.14
Ter Marker Connector Ckt SD-25036-01, Fig. 6, 7, or 8	4	0	5.14, 5.15

**Notes**

- A. When connectors No. 0 and 2 are equipped, Item 3 of ED-25309-01 shall be furnished.
- B. Provide ZP wiring when associated terminating markers are arranged to set the incoming trunk for overflow on second trial features. Provide ZJ wiring when this feature is not provided.
- C. Provide ZL wiring when number series office codes for DID are required and the connector is partially or wholly equipped with 245D or 263D relays per S or R options, respectively, of SD-25036-01.
- D. When the DID test frame is required, provide sender equipment per list 2 or 4 for the least preferred sender appearance in the connector preference control.

**J28850C (AT&TCo Std) — Terminating Marker Connector Frame**

Equipment — J28850C-( ) (See 5.04)

**List 1** — Framework, assembly, wiring, and common equipment arranged for four terminating marker connectors each arranged for a maximum of ten terminating markers and five senders (less the multiple wiring for the terminating marker relays and the horizontal strapping on these and the sender connector relays).

	WIRE	EQUIP	SEE NOTE
Framework ED-25309-01, Item 4		1	
Fuse Panel ED-25025-01, Item 10		1	
Jack, Key & Lamp Panel ED-25021-01, Item 10		1	
Misc. Frame Ckt. SD-25248-01: Figs. 2, 3, 6, 8, & 9	1	1	
Fig. 7	4	4	
Terminating Marker Connector Circuit, SD-25036-01:			5.05
Fig. 2 or 12, 3, 5, 6, 8, 10, 10C, and 10D	4	0	5.06, 5.07,B
Fig. 4	12	0	
Fig. 7	32	0	5.06, 5.07

**List 2** — Framework, assembly, horizontal strapping, and equipment, required in addition to list 1, to equip one terminating marker connector for three terminating markers and one sender, also with an alarm or alarm and sequence circuit, a second trial, number check, no test and trouble detecting circuit. (See Note C, D, and 5.08.)

	WIRE	EQUIP	SEE NOTE
M.C. Relay Mtg. Assembly ED-25309-01, Item 5		1	5.01
Cable Support ED-25309-01: Item 6		As Spec	A
Ter Marker Connector Ckt. SD-25036-01:			
Fig. 2 or 12, 10, 10C and 10D	0	1	5.10,B 5.02, 5.09
Fig. 3			
Fig. 6, 7, & 8	1	1	5.09

**List 3** — Equipment per SD-25036-01, Fig. 7, required in addition to list 1 and 2 to equip one terminating marker connector for one additional terminating marker. (See 5.09 and 5.11.)

**List 4** — Equipment per SD-25036-01, Fig. 4, required in addition to list 1 and 2 to equip one terminating marker connector for one additional sender. (See Note C, D, 5.09 and 5.12.)

**List 5** — Wiring and equipment required in addition to list 1 to provide multiple wiring for one terminating marker relay in all terminating marker connectors on same frame. (See 5.13.)

	WIRE	EQUIP	SEE NOTE
(TM) Terminal Strips	0	1	5.14
Ter Marker Connector Ckt SD-25036-01, Fig. 6, 7, or 8	4	0	5.14, 5.15

#### Notes

- When connectors No. 0 and 2 are equipped, item 6 of ED-25309-01 shall be furnished.
- Provide ZP wiring when associated terminating markers are arranged to set the incoming trunk for overflow on second trial features. Provide ZJ wiring when this feature is not provided.
- Provide wiring per SD-25036-01, ZL option when number series office codes for DID are required and the connector is partially or wholly equipped with 245D or 263D relays per S or R options, respectively, of SD-25036-01.
- When the DID test frame is required, provide sender equipment per list 2 or 4 for the least preferred sender appearance in the connector preference control.

#### **J28850D (A&M Only) — TMA Relay Unit Terminating Marker Connector**

Equipment — J28850D-( )

**List 1** — Assembly and equipment for one TMA relay unit arranged for ten terminating markers and one terminating marker connector. (See Note A, B, and C.)

**List 2** — Wiring and equipment required in addition to list 1 for each terminating marker per SD-25036-01, Fig. 13A, 13B, or 13C. (A maximum of ten List 2.)

#### Notes

- The DID test circuit is given a terminating sender appearance in one terminating marker connector. Provide wiring per SD-25036-01, ZN option when this connector is equipped for number series office codes for DID and it is partially or wholly equipped with 245D relays per S or R options, respectively, or SD-25036-01.
- The TMA relay unit is provided when number series office codes for the DID feature are required and the terminating marker connectors are partially or wholly equipped with 245D or 263D relays per S or R options, respectively, or SD-25036-01.
- The TMA relay unit is surface wired for relay rack mounting.

#### 5. GENERAL NOTES

##### Equipment

**5.01** The multicontact relay mountings are treated as an equipment item rather than as part of the frame assembly. It is considered desirable to mount the relays on the auxiliary framework and strap them as a separate assembly as required.

**5.02** The terminating marker multicontact relays in each connector shall be equipped from right to left and the sender connector multicontact relays equipped from left to right in order to provide the best arrangement for the extension of the horizontal bare strapping past the unequipped positions and facilitate changes in the multiple on additions.

**5.03** From a safety standpoint and to take care of emergencies, a minimum of four terminating marker connectors should be provided for each office regardless of its size. For the same reasons, a minimum of two terminating marker connector frames shall be furnished for each office regardless of the number of terminating marker connectors required. Where a minimum number of terminating marker connector circuits and terminating marker con-

connector frames is furnished the terminating marker connector circuits shall be divided equally on the two frames. The terminating senders to be served by four connectors shall be divided so that approximately one quarter of the senders of each type will be located in each connector circuit. Number checking senders shall be distributed as equally as possible over a minimum of two terminating marker connectors located on two marker connector frames. These two connectors shall not be served by the same interrupter frame.

**5.04** The "B" position finder unit equipment, mounted on this frame is ordered and furnished as part of the terminating and "B" sender equipment.

**5.05** The wiring to be furnished as part of this list in addition to Fig. 2 (A&M Only) or 12, 10 and 10A (A&M Only) or 10B, shall be for the SS, DS, and CB relays; the S resistance and condensers; the CB resistances and the C resistances and condensers and the wiring from this apparatus to the multicontact relays.

**5.06** Wiring and equipment per SD-25036-01, Fig. 1 and the wiring and equipment for the CB and DB jacks and the TM fuse in Fig. 9 shall be furnished as part of the terminating trouble indicator frame.

**5.07** With the exception of the DB jack and the TM fuse, wiring, and equipment per SD-25036-01, Fig. 9 shall be furnished as part of the terminating marker frame.

**5.08** One set of framework and equipment per this list shall be provided for each terminating marker connector equipped on the frame.

**5.09** The horizontal bare wire strapping for the maximum of six, eight, or ten terminating markers and five sender connector multicontact relays shall be furnished as a part of list 2. When these relays are only partially equipped, this strapping shall be continued beyond the last unequipped positions, supported at these positions and insulated as illustrated in the skinner dress specification. The frame local cable leads to these relays are provided in list 1 and the

multiple wiring for the terminating marker relays is provided in list 5.

**5.10** The C lamp of Fig. 2 (A&M Only) shall be furnished as part of the terminating trouble indicator frame. The CA1 and CA2 interrupter contacts required for the terminating marker connector, the TS and TM contacts required for the terminating senders and the TS and PB contacts for the number checking senders shall be assigned on the same interrupter frame as the interrupter contacts for the associated terminating marker connector frame. The CA interrupter contacts for the connectors shall also be distributed over four interrupter frames as equally as possible so that in the event of a motor failure on any interrupter frame, the total number of terminating marker connectors affected would be as close as 25 percent of the total as possible.

**5.11** One set of equipment per this list shall be provided initially in each terminating marker connector for each marker over three, equipped on the frame. For additions to existing equipment, one set of equipment per this list shall be provided in each terminating marker equipped on the frame for each additional terminating marker.

**5.12** One set of equipment per this list shall be provided initially in each terminating marker connector for each sender over one to be equipped. For additions to existing equipment, one set of equipment per this list shall be provided for each additional sender to be equipped in a terminating marker connector. The last sender circuit should be wired per SD-25036-01, Fig. 5.

**5.13** One set of wiring and equipment per this list shall be provided initially on a terminating marker connector frame for each terminating marker multicontact relay equipped. For additions to existing equipment, one set of wiring and equipment per this list shall be provided on each terminating marker connector frame for each terminating marker added.

**5.14** The multiple wiring per this list is in a vertical cable form which is individual to and the same for each terminating marker whether it is the first, intermediate, or last in the connector. One end of this form shall be sol-

dered to the correspondingly numbered multi-contact relay type terminal strip which is mounted directly above the terminating marker relays on framework which is furnished as part of list 1.

**5.15** On a terminating marker connector frame, equipped with less than four terminating marker connectors, the multiple leads to the unequipped marker multicontact relays, shall be looped but not cut at the positions of these relays in unequipped terminating marker connectors.

#### Wiring

**5.16** Where terminating marker and sender connector multicontact relays are partially equipped, the horizontal multiple strapping shall be prepared for the addition of multi-contact relays as shown in the cabling and wiring specification.

**5.17** No. 24 gauge DCL wire shall be used for all local cable wiring except in the case of battery and ground distributing leads which shall be 22 gauge DCL wire.

**5.18** Two types of local cables are provided on the terminating marker connector frame, (terminating marker multiple local cable and frame local cable). There is a minimum of three and a maximum of six or ten multiple local cables, each of which is individual to one terminating marker relay in each terminating marker connector. These cables are run vertically in back of the terminating marker multi-contact relays and are omitted when these relays are not equipped. The frame local cable contains all of the other wiring except the bare horizontal strapping for six or ten terminating marker relays and five sender relays; their associated contact protection and control relays; the wiring for four alarm, four second trial, four

number check, four no test, four trouble detecting circuits and the equipment common to the frame.

**5.19** The local cable wiring for the sender control relays shall be arranged so that any sender may be used as a first, intermediate, or last sender in a terminating marker connector circuit. The wiring for the terminating marker control relays shall be arranged so that relays 2 to 5 or 2 to 9 may be used as intermediate or last relays in a terminating marker connector circuit.

#### Cabling

**5.20** The code numbers of the switchboard cables ordinarily used in cabling the various circuits are shown on the switchboard cabling drawing. The circuits should, however, be checked to insure that the proper codes are specified to meet the latest circuit requirements. The cross-connecting information of the circuit shows what groups of leads are to be combined in the same cables.

**5.21** The arrangement of the switchboard cables between the terminating marker connector frames and the terminating marker frames and the terminating marker multiple between connector frames shall be in accordance with ED-25130-01.

#### List of A&M Only & Mfr Disc. Equipment

**5.22** The following equipment has been replaced as indicated:

EQUIPMENT	RATING	COVERED IN ISSUE	REPLACING EQUIPMENT
J28850A	Mfr Disc.	2	J28850B or J28850C
J28850D	A&M Only	6	—

Bell Telephone Laboratories, Inc.

Dept 5615