

CIRCUIT DESCRIPTION

CD-26382-01  
ISSUE 1  
APPENDIX 2D  
DWG ISSUE 3D

12

CROSSBAR SYSTEMS  
NO. 3  
LINE, LINE SWITCH  
AND CONNECTOR  
CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

- 2 LBC 4 and 5 - 286H Relay - Option R, Fig. 7
- 2 LBC 4 and 5 - 180A Network - Option R, Fig. 7
- 10 LGC 20-29 - 286H Relay - Option R, Fig. 7
- 10 LGC 20-29 - 180A Network - Option R, Fig. 7
- 2 LBS 4 and 5 - AF19 Relay - Option R, Fig. 8
- 2 LB 4 and 5 - AF504 Relay - Option R, Fig. 8
- 2 LB 4 and 5 - 185A Network - Option R, Fig. 8
- 10 IG 20-29 - 18GY Resistor - Option R, Fig. 9
- 5 LGC 20-29 - 19LA Resistor - Option R, Fig. 9

D. Description of Change

D.1 Option R is added to provide for the additional apparatus and wiring for the expansion of Crossbar System No. 3 from a 200-800 line application to a 200-1200 line application.

F. Changes in CD Section I

F.1 Change the third sentence of 2.02, to read:

The left bay contains line link control units, connector relay circuits, and fuse panels for the additional line blocks on line link circuits 0 and 1. (Maximum 1200 lines.)

F.2 Change 2.08 to read:

2.08 A line link consists of a minimum of one and maximum of six line blocks and their associated marker preference and connector, timing and alarm circuit, line groups, and line block connector relay circuits. Each line link provides circuits for serving 100 through 600 customer lines. Two line links are provided in the basic 200 line, line link frame.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-CBH-GWC-BT

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CIRCUIT DESCRIPTION

CD-26382-01  
ISSUE 1  
APPENDIX 1B  
DWG ISSUE 2B

CROSSBAR SYSTEMS  
NO. 3  
LINE, LINE SWITCH  
AND CONNECTOR  
CIRCUIT

CHANGES

B. Changes in Apparatus

<u>B.1</u>	<u>Removed</u>	<u>Replaced By</u>
	CO - Capacitor - 535EG Fig. 2, Option T	CO - Capacitor - 535DE Fig. 2, Option S

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25820-CBH-GWC-PN

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CROSSBAR SYSTEMS  
NO. 3  
LINE, LINE SWITCH  
AND CONNECTOR  
CIRCUIT

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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

- 1.01 The purpose of the line, line switch, and connector circuit is to provide connection between the line circuits and the junctors.
- 1.02 For calls from the lines, this circuit provides 40 outlets (links) to channel switches and 160 outlets (junctors) from the channel switches to the trunk switch circuits for each line block (100 lines). This provides each line with access to all trunk link circuits, so that connection to all originating registers, outgoing trunks, and intraoffice trunks becomes possible.
- 1.03 For calls to the lines from incoming trunks, and intraoffice trunks, it provides access via the same links.
- 1.04 Connections to the markers are made via marker connectors and connections from the markers are made via line switch connectors. However, on dial tone calls, both marker connectors and line switch connectors are closed to provide all of the leads required.

2. FRAME LAYOUT

2.01 This circuit contains the customer line relays, cutoff relays, the line and channel switches. The line and channel switches are 12-level CF- type crossbar switches. It also contains the line switch connector relay, line identification and marker start, marker preference, timing and alarm circuits.

2.02 The basic 200-line, line link frame containing two line switch units, each provides 100 line and cutoff circuits associated with customer lines. These two units are mounted in the right bay. The left bay contains line link control units, connector relay circuits and fuse panels for fusing line blocks 0-3 on line link circuits 0 and 1. (Maximum 800 lines.) Plug ended auxiliary coin line circuits may be mounted in the lower half of the left bay and cross connected at the frame terminal strip in the same bay.

2.03 The 200-line, line block frames provide for the addition of line circuits by equipping of connectorized line switch units. The unit mounted in the bottom half of the frame extends the junctor of line link 1 and the tip unit extends the junctor of line link 0.

2.04 Each line switch unit contains 100 line, cutoff relay circuits and four CF- type crossbar switches. Two of these crossbar switches are segmented by five vertical units for each functional channel switch CO-7. The other two crossbar switches are segmented into functional line switches of eight vertical units, line switch L4 is split across both switches.

2.05 Line links connect between the eight line verticals of each line switch to the eight channel switches according to the slip pattern shown in Note 304. The hold and select magnets associated with these switches are multiplied as shown in Note 305 and 306, respectively.

2.06 Lines are added by extending the junctor multiple of the channel switch and adding a line block for each 100 lines. Customer lines are connected to the 20 horizontals of the line switch via the centralized distributing module (CDM), the first 10 lines of a line group are "A" appearances and the second 10 are "B" appearances of the line group.

2.07 The line verticals, hold magnets, line and cutoff relays, and associated control circuits are subdivided as indicated in Notes 304, 305, and 306. Three subdivisions are made:

- (a) Line Link
- (b) Line Block
- (c) Line Group

2.08 A line link consists of a minimum of one and maximum of four line blocks and their associated marker preference and

connector, timing and alarm circuit, line groups and line block connector relays circuits. Each line link provides circuits for serving 100 through 400 customer lines. Two line links are provided in the basic 200-line, line link frame.

2.09 Each line block consists of line and channel switches, line group relays and resistor lamps and line, cutoff relays for five line groups serving 100 customer lines. Each plug-ended line switch unit contains one line block.

2.10 A line group consists of the 20 line and cutoff relays, line groups relay circuits, and a functional line switch consisting of eight vertical units including the hold magnets and the link to the channel switch. Each line group can serve 20 customer lines.

2.11 Twenty lines per functional line switch are provided by using a 6-wire small switch and connecting a line to each horizontal multiple for each of the ten top levels on the line switch. The line select magnet L- controls the crosspoints which connect the two horizontal tip, ring, and sleeve line multiples for each level of the two tip, ring, and sleeve vertical multiples.

2.12 The two bottom levels are the directing levels and are designated LA and LB. The directing select magnets control the crosspoints which connect the link tip, ring, and sleeve to one of the two vertical tip, ring, and sleeve multiples and are associated with appearances A and B, respectively.

### 3. GENERAL DESCRIPTION OF OPERATION

3.01 The line link frame is involved in setting up three major kinds of connections. These are:

- (a) Connection between a calling customer and an originating register.
- (b) Connection between a calling customer and an intraoffice, reverting call, or outgoing trunk.
- (c) A connection between a called customer and an intraoffice or incoming trunk.

The line link frame also has a line cutoff feature which provides overflow tone on loop start lines, and also prevents subsequent dial tone requests until customer returns handset to on-hook condition.

### CONNECTION BETWEEN CALLING CUSTOMER AND ORIGINATING REGISTER

3.02 Operation of the customer line relay marks the line location and causes the line link frame to start for a marker through the marker connector. When the marker is attached it identifies the line block and line group. On this type of call the marker also obtains access to the line link frame through the frame connector and over leads through this connector further identifies the calling line by obtaining a ground on the L lead of line relay.

3.03 The marker also has access to the line links and select and hold magnets so that it may test and set up a channel through a line link, junctor, and trunk switch to an originating register. The connection being held through the sleeve crosspoints by the register. When the connection is established the marker disconnects and the frame and connector relays are released.

### CONNECTION BETWEEN CALLING CUSTOMER AND INTRAOFFICE, REVERTING CALL, OR OUTGOING TRUNK

3.04 When the customer completes dialing into the originating register, the register connects to a marker through the marker connector and passes to it both calling line location and called number information. The marker connects to the indicated line link frame through the line switch connector and operates the line block, line group, and line relay to obtain access to the line links and switch magnets. The marker selects an idle channel between the trunk selected and the calling line, causes the register to release its connection to the line and then closes down the magnets to connect the line to the trunk. When the marker completes its function it disconnects and the connector and frame relays restore to normal.

### CONNECTION TO CALLED CUSTOMER FROM INTRAOFFICE, INCOMING TRUNK

3.05 The marker obtains the called customer number from the originating register on intraoffice calls, from the incoming register on incoming calls. The marker then connects to the marker preference and connector selecting an additional set of leads to the marker. The marker then operates the line block and line group connectors of the number corresponding to that line block selected in line identification and information derived from the translation of the

called number by the line number translator. After connection to the indicated line link through the line switch connector, the marker operates the line block, line group, and line relays to gain access to the hold magnets and the line link. The line is tested and if idle, the marker selects an idle channel between the trunk and called line and closes down the magnets to connect the trunk to the line. When the marker has completed its functions it disconnects, and the connector and frame relays restore to normal.

**OPERATION OF LINE LOCKOUT AND CONNECTION OF OVERFLOW TONE TO CUSTOMERS LINE**

3.06 This circuit is arranged to lock out a line, when the sleeve is released while the receiver is off-hook. When the channel drops with the receiver off-hook, the line loop will hold CO relay and return overflow tone over the line. The line is released to normal when the receiver is placed on-hook.

3.07 Line lockout can be used when overflow tone is required to be returned on the line. Locked out lines may be called by any special class of trunk as if they were idle. The line returns to lockout upon test release.

**SECTION II - DETAILED DESCRIPTION**

**1. CONNECTION BETWEEN ORIGINATING LINES AND ORIGINATING REGISTER (DIAL TONE CONNECTION - SC1)**

**LINE RELAY OPERATES - FS1**

1.01 The customer upon lifting the handset closes a loop through the nonoperated cutoff relay to operate the line relay, which operates a line block start (LBS-) relay associated with the line block in which the line relay appears. The LBS operates the marker start (MST) relay which initiates a connector bid and starts the connector alarm timer.

**CONNECTION TO THE MARKER THROUGH THE MARKER CONNECTOR - FS3**

1.02 The operation of the MST closes battery to the marker connector to operate its register start (RS-) relay in competition with the originating and incoming registers assigned to the same marker connector. The RS- relay will operate if no RS- relays of a higher preference are operated. The operation of the RS- relay will operate the line link connector relays which will operate a marker start relay of an idle marker, operate the marker connector relays, and cut through a large number of leads between the line link and the marker.

**MARKER IDENTIFIES THE LINE REQUESTING SERVICE - PS3**

1.03 Line link 0 is assigned to marker connector 0 and line link 1 is assigned to marker connector 1. On connector closure, the line link number is indicated to the marker by the connector requesting service. The marker tests leads LBSO-3 to determine which line blocks of the line link has lines requesting service. The marker selects one line block and places battery on the correspondingly numbered LB- lead to operate a line block (LB-) relay, the LB-relay connects a LGS- lead from each of the line groups within the selected line block to the marker.

1.04 Line groups within the selected line block which have lines requesting service may now be identified by ground on the LGS- lead. The marker selects one line group for service and places battery on the correspondingly numbered LG- lead to operate a line group (LG-) relay of the line block previously selected. The LG- connects an L- lead from each of the lines within the selected line group and line block. Lines requesting service may be identified by the marker by ground on the L- lead. The marker now selects one line for service from within the selected line block and line group. Line identification is now completed and the marker has the line location in terms of line link 0 or 1, line block 0-3, line group 0-4, and line 0-19.

**CHANNEL TEST - FS2**

1.05 Upon completion of line identification, the marker will obtain the line class of service from the line number translator, then will seize a trunk switch frame having an idle originating register. The marker will now attempt to find an idle channel between the line requesting service and the selected originating register.

1.06 After the line block identification has been made, the marker has assumed control of the line link by holding the MST relay over the HC lead. In order to cut through test leads to check for an idle channel, the marker must now operate the line link connector relays.

1.07 A channel consists of a link between the line switch, channel switch, and a junctor between the channel switch and the trunk switch. If either element is busy as evidenced by ground, the whole channel is busy.

## OPERATION OF MARKER PREFERENCE AND CONNECTOR - FS4

1.08 The marker will apply battery to the ST lead to operate its MP- relay, M- contacts, and the MA- and MB- multicontact relays, to cut through an additional set of leads to the marker. The marker next operates an LBC- relay of the number corresponding to that line block selected in line identification. The line block connector (LBC-) relay in operating closes the marker battery to the line switch select magnets, line select A (LA) will operate if the line number is 0-9, or line select B (LB) will operate if the line number is 10-19. The line select 0-9 magnets (LO-9) will operate based on the units digit of the line number. Relay LBC- also closes the path for operating the channel switch select magnets. Channel select magnet A or B (CA, CB) will be operated based on the trunk switch circuit number the marker has selected which contains the idle originating register. If trunk switch 0 has been selected, magnet CA is operated and if trunk switch 1 is selected, magnet CB is operated. The channel switch select magnets (CO-9) operation is a function of the trunk switch location of the selected originating register. The marker will extend battery through the JC- relays of the trunk switch circuit through leads CSO-9 to operate the proper CO-9 channel switch select magnet. The LBC- relay in operating also closes a path to the line group connector relays LGC-19, the marker extends battery through its operated line group relays LGO-4 through the LBC- relay to operate the LGC- relay corresponding to the line group and line block of the selected line. The LGC- in operating cuts through to the marker the eight line links, which comprise one element of the channel, for a busy test. The junctor as the other part of the channel element will be tested through the trunk switch circuit by resistance battery through the JB- resistors of the line switch circuit. An open circuit or busy ground would prevent the marker from selecting that junctor. The LGC- relay in operating connects the LT- lead to the marker. This line test lead is used by the marker to test the condition of the line. Presence of resistance battery on the LT- lead indicates an idle line, while the presence of ground indicates a busy or locked out line. On the dial tone connection the marker will monitor the LT- lead to determine that the CO- relay has operated when ground has been applied to the channel sleeve. On a calls forward connection, the marker will examine the LT- lead for a busy condition initially and will not proceed with the connection if the called line is found busy.

## CHANNEL SELECTION - FS2

1.09 The marker will test for an idle link over the LLO-7 leads, if the line switch hold magnets LO-7 are not operated indicating an idle link, the PB- relay will not operate in the marker. The winding of the PB- relay will be connected to the junctors, resistance battery will indicate an idle junctor and PB- relay will not operate. Ground on either the link or junctor, indicating a busy condition, will cause the operation of the marker PB- relay indicating that the channel is busy. After selecting an idle channel, the marker ground will be applied through the winding of JT relay and the operated HMS contact through the CH- contacts over the LL- lead of the channel selected to operate the line and channel hold magnets in parallel. At the same time, the trunk switch hold magnet is operated through an originating register F contact. The linkage is now established between the line selected for service and the originating register previously selected.

2. RELEASE OF THE LINE SWITCH AND CONNECTOR CIRCUIT

## RELEASE OF THE PREFERENCE AND CONNECTOR - FS4

2.01 After further tests of the channel, the marker will release the originating register F relay followed by the operation of marker DIS1 relay. Operation of the DIS1, removes battery to the MP-, M-, MA-, and MB- relays causing their release and opens the path to the LBC- and LGC- relays and the select magnets.

## RELEASE OF THE MARKER CONNECTOR

2.02 After the operation of DIS1 relay and check of other relays, the marker DISC relay operates placing ground on lead MRL to operate RL relay and remove the start lead to the marker connector. The release of the marker connector will release LB-, LO-, and RL relays. Upon release of the RL relay a new marker start may be initiated if other lines are awaiting service, but the operation of the connector RS- relay will be dependent on the service of a waiting originating or incoming register call.

3. CONNECTION BETWEEN CALLING LINE AND INTRAOFFICE TRUNK, OUTGOING OR REVERTIVE CALL TRUNK (CALL BACK)

## MARKER CONNECTS TO LINE LINK FRAME

3.01 The marker obtains access to this circuit by operating the MP-, M-, and

MA-, MB- connector relays as detailed in 1.08. The LBC- and LGC- relays will be operated based on information passed to the marker from the originating register.

**CHANNEL TESTS**

3.02 Prior to seizure of the line switch, the marker had selected a trunk switch and trunk, then may proceed with the channel test as described in 1.09. The link used in establishing the originating register connection is not released when the channel is set to the trunk. A second link is required to establish the call back connection.

**RELEASE OF THE LINE SWITCH CIRCUIT**

3.03 The line switch circuit is released as detailed in 1.10 and 1.11.

**4. CONNECTION BETWEEN CALLED CUSTOMER AND INFRAOFFICE OR INCOMING TRUNK (CALLS FORWARD CONNECTION)**

**MARKER CONNECTS TO LINE LINK FRAME**

4.01 The marker connects to this circuit as described in 1.08. The LBC- and LGC- relays will be operated based on information derived from the translation of the called number by the line number translator.

**CHANNEL TESTS**

4.02 Channel tests are made as described in 1.09. On an incoming call, the trunk switch location is provided by the incoming register.

**RELEASE OF THE LINE SWITCH CIRCUIT**

4.03 The line switch and connector circuit is released as detailed in 1.10 and 1.11.

**5. LINE LOCKOUT FEATURE**

**OPERATION OF THE CUTOFF RELAY AND CONNECTION OF OVERFLOW TONE TO LINE**

5.01 The application of ground to the channel sleeve lead after crosspoint closure will operate the CO- relay through the operated L- relay contact. Relay CO- will lock through its own contact to ground through L- relay operated on its secondary winding. If the L- relay is not operated as on a call forward connection, the channel sleeve ground will first operate L- relay

through diode CR- and resistor R-. Relay CO- will then operate and lock. This removes control of the L- relay from the customers loop and transfers it to control of the sleeve holding ground, so that release of the sleeve ground through a channel release will cause L- relay to release. The release of the L- relay establishes a holding path for CO- relay by ground through the primary winding to the customers loop through the released L- contacts to battery on the cutoff secondary winding to hold the CO- relay operated. This line is now in a lockout mode and is isolated from the common control circuitry. The CO- relay in operating has placed ground on the LT- lead so that the line will appear busy to the marker test. Overflow tone, 120 IPM, will be placed on the line through contact 2 of the CO- relay and CO- capacitor also the released L- relay contact to the line tip. The line will remain in this state as long as the customer loop is maintained. The line will be released from lockout when the customer switch-hook is closed.

5.02 This feature is used to return overflow tone to an originating customer. If the marker encounters a condition other than line-busy that prevents completion of the call, it will release the channel and return overflow tone through the lockout circuit. This feature requires all lines to be equipped with the line lockout feature, and there is no provision for removing this feature from any line.

**6. COIN AND DIAL SELECTED PBX LINES**

**COIN LINES ARRANGEMENT**

6.01 The line switch and connector circuit is equipped to function with either ground start or loop start coin lines. The first two lines in each line group are arranged to function with coin lines by cross connections to an Auxiliary Coin Line Circuit, SD-26409-01. If ground start coin stations are required, a more sensitive L- relay is provided in the auxiliary coin line circuit which eliminates the need to provide optional L- relays in the line switch and connector circuit.

**DIAL SELECTED PBX LINES**

6.02 The lines which may be dial selected at a PBX require the LT- lead appearance at the line number translator. Only the first five lines of each line group are arranged for this service.

**7. LINE ASSIGNMENTS AND CLASS OF SERVICE**

**LINE NUMBER TRANSLATOR AND CONNECTOR**

7.01 Although the class of service and assignment of lines is a function of the line number translator and connector circuit, a brief outline is included as an assignment guide.

**CLASS OF SERVICE**

7.02 The line number translator and connector circuit (LNT) is arranged so that each of five lines which occupy the same position in each line group must be assigned the same class of service. For example, lines 00, 20, 40, 60, and 80 of the same line block must be assigned the same class of service.

**PARTY LINE ASSIGNMENT**

7.03 Two-party lines may only be assigned in the upper half of each group of ten lines, that is those line numbers of any tens digit and a units digit of 5 through 9. Single flat rate (1FR) lines may have any line assignment. First preference should be given to assignment in the units digit 0-4, this would allow room for 2-party assignments. Multiparty lines may have any assignment.

**SECTION III - REFERENCE DATA**

**1. WORKING LIMITS**

1.01 For L- relays, see range chart in keysheet.

**2. FUNCTIONAL DESIGNATIONS**

**2.01 Relays**

<u>Designation</u>	<u>Functional Meaning</u>
CA	Connector Alarm
CO-	Cutoff
L-	Line
LB	Line Block
LBC	Line Block Connector
LBS	Line Block Sleeve
LG	Line Group
LGC	Line Group Connector
LUX	Line Link Check

<u>Designation</u>	<u>Functional Meaning</u>
M	Marker
MA	Marker Battery Supply A
MAK	Marker Connector Check
MB	Marker Battery Supply B
MP	Marker Preference
MST	Marker Start
RL	Release
TM	Timing

**2.02 Switches**

<u>Designation</u>	<u>Functional Meaning</u>
LO-4	Line Switch
CO-7	Channel Switch

**2.03 Switch Magnets**

<u>Designation</u>	<u>Functional Meaning</u>
C (Hold)	Channel Hold Magnet
C (SEL)	Channel Select Magnet
CA (SEL A)	A Appearance - Channel Select Magnet
CB (SEL B)	B Appearance - Channel Select Magnet
L (Hold)	Line Hold Magnet
L (SEL)	Line Select Magnet
LA (SEL A)	A Appearance - Line Select Magnet
LB (SEL B)	B Appearance - Line Select Magnet

**3. FUNCTIONS**

- 3.01 To operate a line relay when the customer loop is closed.
- 3.02 To provide means of operating the marker connector.
- 3.03 To provide means by which the marker can determine the line link, line block, and line group in which a calling line is located.

- 3.04 To provide means by which the marker can determine the location of the hold magnet of a calling line.
- 3.05 To provide means by which the marker can connect battery to the links.
- 3.06 To provide the marker with access to the line and channel select magnets.
- 3.07 To provide the marker with access to the line and channel hold magnets.
- 3.08 To provide means the marker can check the line switch connector.
- 3.09 To provide means to lock out a line from a new dial tone seizure if the sleeve is released while the receiver is off-hook.

4. CONNECTING CIRCUITS

- 4.01 When this circuit is listed on a key-sheet the information thereon is to be followed.
  - (a) Subscriber Line.
  - (b) Alarm Circuit - SD-26392-01.
  - (c) Alarm Sending Circuit - SD-26442-01.
  - (d) Auxiliary Coin Line Circuit - SD-26409-01.
  - (e) Interrupter Circuit - SD-26407-01.
  - (f) Line Circuits - SD-26449-01 (Typical).
  - (g) Line Number Translator and Connector Circuit - SD-26388-01.
  - (h) Line and Switch Circuit - SD-99334-01.
  - (i) Marker Circuit - SD-26384-01.
  - (j) Marker Connector Circuit - SD-26389-01.
  - (k) Subscriber Message Register Circuit - SD-26408-01.
  - (l) Test Circuit - SD-26411-01.
  - (m) Time Delay Control Circuit - SD-94820-01.

- (n) Traffic Usage Recorder Circuit - SD-96494-01.
- (o) Trunk Circuit - SD-26446-01.
- (p) Trunk Switch and Connector Circuit - SD-26383-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This line, line switch, and connector circuit shall be capable of meeting all the requirements of the Circuit Requirements Table.

6. DESCRIPTION OF ALARMS

- 6.01 If a call is not served by a marker connector in approximately 6.5 seconds, a major alarm will sound.
- 6.02 If a marker is held by a marker connector for approximately 6.5 seconds, the marker connector sounds the major alarm. Under this condition, the marker timing circuit functions, causing the marker to give a trouble release to the marker connector on a first trial basis and leaving a trouble record indicating a first trial failure. The lamps and keys associated with the time alarm circuits for the markers are located at the marker frame.
- 6.03 Momentarily operating the master alarm release (MAR) key should silence the alarm. If the alarm is not silenced and a MTCO lamp remains lighted, the trouble may be caused by a steady ground on the MRL or TRL leads.
- 6.04 All the keys and lamps associated with the time alarm circuits for the marker connectors and the make-busy jacks and lamps associated with markers, marker connectors, and registers, are located on the test frame.

Note: When an office is equipped for unattended operation, the alarm circuit will be under the control of the alarm sending circuit.

LONG TIME-OUT MARKER CONNECTOR ALARM

- 6.05 If in response to a major alarm, and MCTO lamp is lighted, it indicates that:

(a) The marker connector may have failed to connect to a marker during an interval of approximately 6.5 seconds.

(b) The marker connector may have failed to release during an interval of approximately 6.5 seconds.

Note: The BAT key on the test frame must be operated to light the line switch connector lamps. Line switch connector lamps will light during the hold period necessary to set up a call, usually a fraction of a second. With the BAT key operated the lights are continually flashing on and off depending on the office load. For this reason a steady light is associated with a trouble condition.

6.06 Momentarily operating the marker alarm release (MAR) key should silence the alarm.

6.07 If an MCTO connector lamp is lighted and the all-markers-busy (AMB) and all-markers-busy alarm (MBA) lamps are also lighted it is an indication that all markers were busy and connection was not made to a marker.

6.08 If these conditions exist momentarily operating the all-markers-busy alarm release (AMB-AR) key should extinguish the AMA and MBA lamps.

6.09 If no marker busy alarm is sounded but the marker connector fails to connect to a marker, the trouble may be due to failure of the transfer feature to function.

6.10 If a marker connector was connected to a marker, but failed to release the marker, the marker would time out and cause a trouble record to be taken. The trouble may be caused by failure of the marker to disconnect battery from the MS relay or may be due to failure of the TRL relay of the marker connector to perform its functions.

## 7. TAKING EQUIPMENT OUT OF SERVICE

### GENERAL

7.01 Any lines on which service cannot be interrupted while a circuit or piece of apparatus is out of service may be given emergency treatment in accordance with approved practices.

7.02 Relay CA - Blocking this relay nonoperated prevents sounding the major alarm when the connector times out, waiting for connection to a marker or the release of a marker.

7.03 Relays L- or CO- - To take one of these relays out of service block it nonoperated. Blocking this relay nonoperated will prevent that customer from originating a call. Where the line is associated with an emergency line circuit, arrange with the distant DSA generator to have the emergency line group, of which the line being taken out of service is a part, transferred.

7.04 Relays LB-, LBC- or LBS- - None of these relays can be removed from service without denying as many as 100 customers located in this line block. For this reason clear any trouble on these relays immediately.

7.05 Relay LQ- or LQC- - None of these relays can be removed from service without denying as many as 20 customers located in this line group. Trouble on these relays should be cleared as soon as possible.

7.06 Relays M, MA, MAK, MB, MP, or MST - Blocking any of these relays nonoperated prevents full operation of the traffic control feature and one marker connector may, therefore, be delayed unduly in seizing a marker.

7.07 Relay RL - Blocking the RL relay nonoperated prevents the release of the marker and marker connector on trouble release until the marker times out.

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7.08 Relay TM - Blocking the TM relay non-operated prevents full operation of the traffic control feature and prevents the T1 timer from seizing a timer.

LINE SWITCH

7.09 A line switch cannot be removed from service without denying service to as many as 60 customers. Each functional line

switch (L0, L1, L2, L3, or L4) services as many as 20 customers each. Therefore, any trouble which affects an entire line switch should be cleared immediately.

CHANNEL SWITCH

7.10 A channel switch cannot be removed from service without denying service to as many as 100 customers.

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