CROSSBAR SYSTEMS
NO. 3
OUTGOING SENDER LINK
AND TRUNK IDENTIFIER
CIRCUIT

CHANGES

B. Changes in Apparatus

B.1 Added

App Fig. 3

App Fig. 4

App Fig. 5

B.2

Superseded	Superseded By
App Fig. 2 (rated Mfr Disc.)	App Fig. 3 (rated Mfr Disc.)

D. Description of Changes

D.1 The FS7,8,9,10, and 11 have been added.

D.2 The FS1,2,3, and 4 have been changed to show App Fig. 2 and 3 apparatus and leads to FS7,8,9, and 10 have been added.

D.3 The FS5 and 6 have been changed to show App Fig. 2,3, and 5 apparatus.

D.4 The leads to FS11 added to FS5 plus lead GGO from FS5 to the test circuit added.

F. Changes in CD Sections

SECTION II

F.1 Add:

EXPANDED NO. 3

2.01.1 When the ST lead is grounded and App Fig. 5 is provided an S-A relay operates in parallel with its associated S- relay. The ON relay operates through 12 make-contacts in series of both operated relays, which assures an S- and an S-A is operated. The S-A relay also enables the GG- relays per 2.01 (c).

F.2 In 2.02 (d) the eighth sentence should begin, "The L_ _ diodes . . ."

SECTION III

F.3 To 2.01 Relays, add:

Designation	Meaning
GGO-7	Group 1
SO-4A	Sender Auxiliary
VGO-7A	Vertical Group
VGO-7B	Vertical Group

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DEPT 5245-GFC

WE DEPT 25820-JRF-GWC-BT

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AND TRUNK IDENTIFIER
CIRCUIT

CHANGES

D. Description of Changes

D.1 Contact 11M of CI added to FS6.

F. Changes in CD SECTIONS

SECTION II

F.1 The third sentence in 1.01 should read, "Each strap connects five consecutive crosspoints and serves a single trunk."

F.2 The next to last sentence in 2.05 should read, "In this instance the TRB will lock operated over a path from ground through 8 make ON, 3 make TRB, 11 make CI, and 8 make TM."

SECTION III

F.3 Change 3.11 to read:

3.11 When time out has occurred, to sound an audible alarm and to light the SSTI lamp at the test circuit.

F.4 Add the following to 4:01:

(g) Time Delay Control Circuit - SD-94820-01

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CROSSBAR SYSTEMS NO. 3 OUTGOING SENDER LINK AND TRUNK IDENTIFIER CIRCUIT

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

OUTGOING SENDER LINK - OSL

1.01 This circuit provides a crossbar switch link between trunks and outgoing senders.

TRUNK IDENTIFIER - TI

1.02 This circuit automatically identifies the trunk to which a sender, which has timed out, is attached.

1.03 The identification of the trunk circuit is given in terms of its outgoing sender link assignment. Reference can be made to office records for the frame and position on the frame upon which the trunk is located. The sender identification is given as a sender number and office records will disclose the frame and circuit position of the sender in question.

2. GENERAL DESCRIPTION OF OPERATION

OUTGOING SENDER LINK - OSL

2.01 The connection of outgoing senders to outgoing trunks is made through crosspoints on the two outgoing sender link switches. The senders are on the verticals and the trunks are on the horizontals of the 240-point, 6-wire switches. Each switch is organized (strapped and wired) so that it is electrically four switches. Each sender appears on four hold magnets per switch while each level serves four trunks. All senders are accessible to all of the trunks which require a sender to complete a call.

2.02 The select magnets are operated by the marker, under control of the trunk; it places battery on the lead to the select magnet for the level upon which the trunk appears. Closure of the crosspoints will occur when the hold magnet, in the group which will attach the sender chosen to the trunk, is operated by the marker under control of the trunk and select offnormal contacts. The hold magnet is then locked operated under control of the sender.

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TRUNK IDENTIFIER - TI

2.03 This circuit identifies trunks, whose attached sender has timed out. It does this by detecting the unique condition which prevails on the link SL lead at the time the sender removes ground from that lead, as it prepares to trouble release. The ground which is removed is the ground used to operate the channel hold magnets. Momentarily, while the trunk releases, a transistor detector can see the hold magnets battery and will operate. The detector which operates identifies the level on the switch upon which the trunk appears. At the same time the vertical group in which the trunk appears on the OSL switches is identified from the locking ground on the hold magnet of the link switch. The level and vertical group number information, which is stored, identify the trunk. The sender identity is known and stored as it is the sender which initiates the TI action.

2.04 At the same time that the TI is detecting and identifying the trunk it makes a bid to the test circuit for it to make a trouble record. After identification the TI which now has the sender and trunk information locked in its registers waits for the test circuit to take the record. During this time the TI ignores any other senders which trouble release and remains in this state until either a record is taken or it times out. The TI releases and returns to normal after a record is taken.

(a) Time-out waiting for a record to be taken causes the TI to sound a minor alarm and light a lamp at the test circuit. The identifier will remain in this state under control of the alarm release key at the alarm sending circuit. A craft force employee can return the circuit to normal by operating the alarm release key.

SECTION II - DETAILED DESCRIPTION

1. OUTGOING SENDER LINK - SC1

SWITCH ORGANIZATION

1.01 Each switch is strapped and wired so that it is effectively four electrical switches. The strapping of the levels which usually extends across an entire switch is cut in three places so that there are four equal length straps per level. Each strap opens five consecutive crosspoints and serves a trunk. With this arrangement each level serves four trunks and an entire 240-point OSL switch serves 48 trunks. The twelve trunks which appear on levels whose crosspoints are controlled by the same five hold magnets constitute a vertical group of trunks.

1.02 Senders appear on the verticals of the two OSL switches. Every sender appears on four verticals of each switch. They appear on one vertical in every vertical group of trunks. Those verticals being in the same position within each group. With each sender appearing once in each vertical group, all senders are available to all trunks.

CROSSPOINT CLOSURE

1.03 The marker operates the F relay in the outgoing trunk which was selected for the call being set up. The F relay operated closes a path from resistance battery in the marker, through the trunk switch and connector circuit, to the SS- lead from the trunk to the OSL circuit. The resistance battery operates the select magnet for the level on which the trunk appears; on the switch on which it appears.

1.04 When the F relay operated in the trunk, it also grounded the VG- lead from the trunk to the OSL. The grounded VG- lead is connected to the coil of the VG- vertical group relay which when operated will enable the OSL hold magnets which control the crosspoints in the vertical group in which the trunk appears. The other side of the VG- relay coils are connected to the select off-normal contacts of the switch with which it is associated. The operation of the select magnet completes a path from the VG- relays through the select off-normal contacts, through the trunk switch and connector circuit to resistance battery in the marker. The VG- relay which has been grounded by the trunk will now operate.

1.05 Each VG- relay has a set of five make-contacts which cut a vertical group of hold magnets onto the HM- leads. The five HM- leads pass through either trunk switch and connector circuit to both markers. The marker grounds the HM- lead which will operate the hold magnet of a vertical upon which appears the sender which is to be attached to the trunk. The hold magnet operates which closes the crosspoints connecting the sender and trunk. The operating ground also passes through the number 5 wire of the crosspoint to the sender HM lead and operates the sender ON relay. Later when the sender LR relay operates a lock path is established to the hold magnet by which the sender controls the connection between it and the trunk.

2. TRUNK IDENTIFIER

TRUNK IDENTIFICATION - SC2

2.01 The ground for the sleeve which controls the channel to the calling

customer is split by the outgoing trunk when a sender is attached. This ground comes from the trunk and is passed through an OSL crosspoint to the sender over the AB lead. It is then returned by the sender to trunk through another OSL crosspoint via the SL lead. This arrangement provides the sender with control of the sleeve lead. This control of the sleeve is exercised by the sender when it times out. The sender RO relay operating disconnects the ground from the SL lead which releases the calling parties channel. It also completes a path from ground to the ST lead to the trunk identifier control circuit (FS6). If this circuit is idle, an S- sender relay operates. An S- relay operating:

(a) Operates the ON relay through the 12 make-contact.

(b) Registers the number of the sender which timed out on the SRO-7 relays on a 2-out-of-5 basis.

(c) Closes a path from each one of the OSL hold magnets on which the sender appears to the GO-7 relays. Because only one of those hold magnets will be operated, 1-out-of-8 of the GO-7 relays will operate.

(d) The 9 make-contact enables the transistor level identifiers by closing ground to their emitter circuits.

LEVEL IDENTIFICATION

2.02 When an S- relay operates to enable the transistor detectors it also operates the ON relay whose 5 break-contact removes the enabling ground. The operating time of the ON relay, then, is the interval in which the detectors have to identify and register the level on which the trunk appears. When the transistor detectors are enabled their base circuits will see three different potentials. They are:

(a) No potential,

(b) Ground, or

(c) Resistive -48 volts through the channel hold magnets.

Those detectors which see no potential are attached to SL leads associated with trunks none of which at that moment are attached to senders. Those transistors which see ground are attached to SL leads associated with trunks at least one of which is attached to a sender. The ground shunts down the emitter-base circuit of those detectors and their transistor will not turn on.

(d) One detector will see resistive -48 volts. This detector, as with each of the eleven other detectors, is looking at the eight vertical group segments of a single level across both switches. Each of the segments on the same level have a common detector and are isolated from each other by the CR-- diodes. This isolation insures that the detector for the trunk to be identified will turn-on even if another trunk appearing on that same level is attached to a sender. Therefore the transistor of the detector which sees the -48 volts turns on. It operates in the saturation mode. The output (collector) of each transistor connects to three L-- diodes. The 36 L-- diodes form a matrix which decode level into 2-digit decimal number. One diode from each transistor is used to decode the tens digit on a 1-out-of-2 (0 or 1) basis to be registered on the LTO/1 relays. Two diodes from each transistor are used to decode the units digit on a 2-out-of-5 basis for storage on the LUO-7 relays.

(e) The detection, decoding and storage is done during the interval in which the ON relay is operating.

TROUBLE RECORD AND RETURN TO NORMAL

2.03 When an S- relay operates and initiates a trunk identification, its 12 make-contact closes the operate path of the ON relay. The ON relay operated:

(a) Locks to its own 8 make-contact under control of the CI and TRB relays.

(b) Removes ground from the I3 lead to the TM time delay control circuit thus starting the TM timing interval.

(c) Provides a locking ground for the register relays through its 4 make-contact.

(d) Removes ground from the level identifiers disabling those circuits and turning off the operated transistor of the level identified.

(e) Releases the operated S relay by removing battery from all of the S- relays. With the S- relays disabled the identifier ignores any other sender bids for trunk identification until it has returned to normal.

(f) Through its 6 make-contact closes resistance battery to the TRST trouble record start lead. This is a bid to the test circuit for it to make a record of the contents of the trunk identifier registers (that is, record the trunk and sender which have first been identified).

2.04 When the ON relay makes a bid for a trouble record it operates the SSP relay in the test circuit over the TRST lead. When preference is gained the CI cut-in relay stops the TM timer and at the same time the record is made. Next the test circuit operates the TRB trouble recorder busy relay. The TRB operated removes resistance battery from the TRST lead and release the ON relay. Relay ON released:

(a) Inhibits the TM timer by grounding the I3 lead to the TM time delay control circuit.

(b) Releases all of the register relays and the CI relay.

(c) Partially closes the ground to the level identifier transistor emitters.

(d) Reconnects battery to the S- relays.

The identifier is now normal and ready to identify another trunk at the request of a sender.

TIMING - SC3

2.05 The operation of the ON relay at the start of trunk identification removes ground from the I3 lead to the TM time delay control circuit. This starts a 21- to 26-second timing interval. If for any reason the TI cannot complete its functions and return to normal within the timing interval, the timer will time out and operate the TM relay. The TM relay operated:

(a) Causes an audible alarm to sound.

(b) Lights the STI lamp at the test circuit.

(c) Transfers the ON relay lock path to control of the alarm release key at the alarm circuit.

(d) Remains operated under control of the ON relay.

The TI remains in this state until the alarm release key is operated. During this interval the TI will ignore any requests by senders for trunk identification. However, had the time out occurred before the record was made, the bid for a record remains to the test circuit. In this case a record will be made when the recorder becomes available and the CI and TRB relays will operate. In this instance the TRB will lock operated over a path from ground through 8 make ON, 3 make TRB, and 8 make TM. The TI will remain in this state until the alarm release key is operated.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

Designation	Meaning
CI	Cut-In
GO-7	Group
LTO,1	Level Tens
LUO,1,2,4,7	Level Units

Designation	Meaning
ON	Off-Normal
SO-4	Sender
SRO,1,2,4,7	Sender Register
TM	Time Out
TRB	Trouble Recorder Busy
VGO-7	Vertical Group

3. FUNCTIONS

OUTGOING SENDER LINK

3.01 When a select magnet is operated, to extend the VG- lead from the trunk to the trunk switch and connector circuit.

3.02 To enable the five hold magnets on the switch which controls the crosspoints of the vertical group of trunks in which the trunk being attached to a sender appears.

3.03 To operate a hold magnet and close the crosspoints which connect the T, R, AB, D, and SL leads from the trunk to the sender.

3.04 To lock the hold magnets to the HM lead to the sender and to release the hold magnets and open the crosspoints when the sender releases.

TRUNK IDENTIFIER

3.05 To identify a sender which has timed out and to store that senders number in a register on a 2-out-of-5 basis.

3.06 To identify the level upon which the trunk attached to the sender is connected and to store that information as a 2-digit decimal number in a register. To store the tens digit on a 1-out-of-2 basis and the units digit on a 2-out-of-5 basis.

3.07 To identify the vertical group in which the trunk appears and to store that number on a 1-out-of-8 basis in a register. To convert the number as registered to a 2-out-of-5 code for the test circuit.

3.08 To make a bid to the test circuit for it to make a trouble record of the contents of the registers in the TI.

3.09 To ignore other senders requesting trunk identification until a record has been taken and it has returned to normal.

3.10 To time for 21 to 26 seconds or until a record has been taken.

3.11 When time has occurred, to sound an audible alarm, and to light the STI lamp at the test circuit.

3.12 To hold itself out of service, under control of the alarm release key, after time-out.

4. CONNECTING CIRCUITS

4.01 When this circuit is listed on a keysheet, the connecting information thereon is to be followed:

(a) Outgoing Trunk Circuit (Typical) - SD-26398-01.

(b) Outgoing Sender and Connector Circuit - SD-26387-01.

(c) Test Circuit - SD-26411-01.

(d) Alarm Circuit - SD-26393-01.

(e) Alarm Sending Circuit - SD-26442-01.

(f) Trunk Switch and Connector Circuit - SD-26383-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This circuit shall be capable of performing all of the functions listed in this Circuit Description and meeting the requirements listed in the Circuit Requirements Tables.

6. ALARM INFORMATION

6.01 If a record is not made of this circuit within 21 to 26 seconds this circuit will time out. Time out causes an audible alarm to sound and lights the STI lamp at the test circuit. The TI then remains in this mode until released by operation of the alarm release key at the alarm sending circuit.

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