STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
2 WAY TRUNK CIRCUIT
TO MANUAL OR TOLL OFFICE
COMPOSITE SIGNALING TYPE B
INCOMING TO LOCAL SWITCHTRAIN

CHANGES

D. Description of Changes

D.01 Figure 5 is rerated Mfr Disc.

D.02 Circuit Notes 102 and 103 are changed.

D.03 Connecting information for the delay dial or integrity check timing circuit is added.

D.04 Equipment Note 204 is rated Mfr Disc. and Note 205 is added.

D.05 CAD 59 is rerated Mfr Disc. and CAD 60 is changed.

D.06 Circuit Note 117 is rerated Mfr Disc.

F. Changes in CD SECTION III

F.01 Under 4. CONNECTING CIRCUITS add:

Circuit	No. 1 or 350A	No. 355A
Delay Dial or Integrity Check Timing Circuit	SD-35077-01	SD-35077-01

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 55213-DAJ

WE DEPT 45230-RWH-JTT-PG

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STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
2 WAY TRUNK CIRCUIT
TO MANUAL OR TOLL OFFICE
COMPOSITE SIGNALING TYPE B
INCOMING TO LOCAL SWITCHTRAIN

CHANGES

B. Changes in Apparatus

B.01 Added

Network R 185A
Option YG, Fig. 1

D. Description of Changes

D.01 Option YG is added to add a network across relay R.

D.02 Circuit Note 117 is added.

D.03 Circuit Note 103 is changed.

D.04 Circuit Fig. 5 is changed.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5242-DAJ

WE DEPT 45230-RWH-JTT-KAP

STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
2 WAY TRUNK CIRCUIT
TO MANUAL OR TOLL OFFICE
COMPOSITE SIGNALING TYPE B
INCOMING TO LOCAL SWITCHTRAIN

CHANGES

D. Description of Changes

D.1 The circuit is arranged to provide reverse battery supervision on standard basis, as required for direct single - digit access to toll operator from Hotel/Motel PBX stations.

D.2 For this purpose, access leads per standard Option YF are added and Option A is rerated standard.

D.3 Information on use of Option A is removed from A & M Note 108 and new information is now provided in Note 102.

D.4 Note 103 is revised and A & M rated Note 116 is added for recordkeeping purposes.

D.5 Note 301 is added to explain use of newly provided access.

D.6 Figs. 53 & 58 are changed to reflect the above.

F. Changes in Description of Operation

F.1 Change next to the last sentence in Section II, paragraph 1.02 to read:

"Relay K also reverses the tip and ring leads toward the preceding circuits which require return of reverse battery supervision upon the operator's answer."

BELL TELEPHONE LABORATORIES, INCORPORATED

Dept. 5245-GFC
WECO Dept. 8411 -JS-WEA

CIRCUIT DESCRIPTION

CD-31775-01
ISSUE 11B
APPENDIX 2B
DWG ISSUE 27B

STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
2 WAY TRUNK CIRCUIT
TO MANUAL OR TOLL OFFICE
COMPOSITE SIGNALING TYPE B
INCOMING TO LOCAL SWITCHTRAIN

CHANGES

C. Changes in Circuit Requirements other than those caused by Changes in Apparatus

C.1 Separate adjustment information is added for Relay "J" option "ZM".

BELL TELEPHONE LABORATORIES, INCORPORATED

Dept 5245 GFC
WECO Dept 5152 RWH-WEA

STEP-BY-STEP SYSTEMS
NO. 1, 350A OR 355A
2 WAY TRUNK CIRCUIT
TO MANUAL OR TOLL OFFICE
COMPOSITE SIGNALING TYPE B
INCOMING TO LOCAL SWITCH TRAIN

CHANGES

D. Description of Changes

D.1 Circuit Note 115 is added and circuit note 102 rearranged for use with precise tone.

D.2 A cost reduction on the addition of Figure 5 to an existing Figure 1 is made by:

A. Designating option YD and rating it "Mfr. Disc."
B. Adding option YE and rating it "Std."
C. Adding option YC and YB, rating both "Std" and changing circuit note 102 to reflect their usage.

D.3 CAD's 52, 59 and 60 are changed per above.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-LCB
WECO DEPT 5152-RWH-WEA

STEP BY STEP SYSTEMS NO. 1, 350A OR 355A 2 WAY TRUNK CIRCUIT TO MANUAL OR TOLL OFFICE COMPOSITE SIGNALING TYPE B INCOMING TO LOCAL SWITCH TRAIN

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit is for use at a No. 1, 350A, or 355A office to provide 2-way service to a manual or toll office. It is arranged to give class-of-service indication to the operator when desired. It is also arranged for tandem calls to other manual or toll offices over similar trunks.

SECTION II - DETAILED DESCRIPTION

1. OUTWARD CALLS

SEIZURE AND SIGNALING

1.01 When this circuit is seized, the A relay operates over the subscriber loop. Relay A operates relay G and closes part of the operating circuit for relay D. Relay G grounds the sleeve for the purpose of holding the preceding selector, places battery on the M lead to the Composite Signaling Circuit which signals the distant operator, and operates relays B and D. Relay B closes the MS lead for the purpose of starting the ringing machine, connects ground to the sleeve lead, and removes ground from the all-trunks-busy register. Relay D operates relay J, transfers the tip and ring of the selector multiple to the outside terminals of the associated transformer, and transfers the windings of relay A to the inside terminals of the transformer. Relay J operated transfers the loop over the E and F leads from the incoming selector to relay K, closes a circuit which locks relay D to the sleeve, and closes the audible ringing circuit through capacitor A to the ring side of the talking

circuit, thus providing ringing tone to the calling subscriber.

DISTANT OPERATOR ANSWERS

1.02 When the distant operator answers, the loop over the E and F leads is closed in the Composite Signaling Circuit; or when Fig. 3 or Fig. 4 is used, the E lead is grounded, operating relay PR, which operates relay K and connects ground to lead A of the Miscellaneous Alarm Circuit and to the B lead to the Intercepting Trunk Circuit and the Subscriber Line Circuit With Rotary Line Switch. When SF option is used, ground on the K lead grounds the G lead to the coin control trunk. The operation of relay K removes the audible ringing tone from the ring side of the trunk, closes a circuit for holding relay B, and removes ground from the motor start lead MS. Relay K also reverses the tip and ring leads, but this does not serve any useful function except on tandem calls. The circuit is now in a talking condition and talking battery is supplied to the calling subscriber through the A relay and the transformer.

1.03 When this circuit operates with coin station sets arranged for dial tone first operation, option SR is furnished to supply -48 volt talking battery to the calling subscriber. Otherwise, option SQ is furnished to supply -48 volt talking battery to the calling subscriber.

CLASS-OF-SERVICE TONES

1.04 This circuit is arranged to provide either one or two class-of-service tones to the office operator to indicate calls originated by coin lines or other lines entitled to special treatment. When only one class-of-service tone is desired, K wiring is provided; and on calls requiring class tone, direct ground will be found on lead A from the banks of the local selectors or Subscriber Line Circuit With Rotary Line Switch or from coin control trunk at the time of seizure of this trunk. This ground will operate relay H which in turn will ground lead MS to the Power Ringing Circuit when S wiring is used or lead IS to the Tone Interrupter Circuit when T wiring is used. When S wiring is used for a single class-of-service tone, N wiring will also be used and steady low tone on lead LT2 from the Miscellaneous Alarm Circuit will be connected through the B capacitor to the contacts of relay K. When T wiring is used for a single class-of-service tone, L wiring will also be used, and interrupted low tone on lead IT from the Miscellaneous Alarm Circuit will be connected through the B capacitor to the contacts of relay K. When the operator answers and relay K operates, the tone either steady or interrupted will be connected to the trunk and relay H will be released. Relay H, however, is slow in releasing and the operator hears the tone during its releasing time. Should the operator wish to verify the tone, she may disconnect and reconnect thus, releasing the K relay and allowing H to reoperate. When she reconnects, the K relay reoperates and H is again released, thus repeating the tone.

1.05 When two class-of-service tones are desired, relay N is provided and direct ground on lead A indicates one class of service, while ground through 3000-ohm resistance indicates the other class of service. On direct ground relay N fully operates operating, in turn, relay H which functions as above with T wiring. On resistance ground relay N closes contacts 1 and 2 but does not break its back contacts 3 and 4. Thus, relay N through its partial or full operation chooses the kind of tone to be sent to the master office. If N, N, and T wiring are used, partial operation of relay N will connect interrupted tone to the trunk and full operation of relay N will connect steady tone to the trunk. If K, L, and T wiring are used, the reverse of this will occur.

1.06 With SF option the class-of-service lead is connected to the coin control trunk through lead K and tone is applied to the line in the coin control trunk.

FLASHING SUPERVISION AND DISCONNECTION

1.07 If the calling subscriber should flash his switchhook, the A and G relays will follow flashing. When the G relay releases, it replaces battery with ground on the M lead to the Composite Signaling Circuit which signals the distant operator. The released G relay also places ground on the M lead when SF option is used. With the A and G relays released, relay B and the connection is held by relay K which is held operated over the E and F leads to the Composite Signaling Circuit or by the PR relay which is, in turn, held operated by the signaling circuit. When the calling subscriber hangs up first, relays A and G release which supplies the disconnect signal to the operator as just described. When the operator removes the plug, the loop over the E and F leads opens in the Composite Signaling Circuit, or ground is removed from the E lead, releasing relay PR, causing the release of relay K and, with SF option, the removal of ground from the G lead. The release of relay K allows relays B, D, and J to release. The circuit is then restored to normal.

DISTANT OPERATOR SENDS WINK FOR COIN CONTROL OR RERING (SF OPTION)

1.08 When the operator desires to return or collect coins or rering, the operator sends approximately a 1/10-second wink over the E lead. This wink momentarily removes ground from the E lead, causing the K relay to release and momentarily removes ground from the G lead. The wink forwarded on the G lead performs a function in the coin control

trunk. The release and reoperation of the K relay performs no useful function.

2. INWARD CALLS

SEIZURE

2.01 When this trunk is seized by an operator at the distant office, the loop over the E and F leads is closed in the Composite Signaling Circuit. This closes the loop to the A relay of the associated Incoming Selector Circuit, in series with relay N in parallel with relay P, which causes the operation of the line relay in the Incoming Selector Circuit. The operation of relay N places a ground on the S lead which is later supplemented by a ground supplied by the incoming selector and operates relay R. Relay R locks to the sleeve, prepares a circuit for the operation of relay C, opens a circuit to prevent the operation of relay B when the called party answers, and removes ground from the all-trunks-busy register.

2.02 When Fig. 3 is used, a ground is furnished on the E lead by the signaling circuit, instead of a closure of the E and F leads. This ground operates the PR relay, which provides the E and F lead closure.

2.03 When Fig. 5 is used, this circuit provides a timed off-hook signal on seizure to the incoming sender in a No. 4A or 4M toll crossbar or No. 5 crossbar (toll) distant office. This is used as an integrity check before connections are established. When this circuit is seized as described above, the operation of the N relay applies ground through diode D to terminal 3 of the circuit pack timer. The timer connects this ground through a resistor to terminal 1 for an interval of approximately 150 ms. This operates and releases the D1 relay which applies battery, then ground to the M lead, signaling the distant office.

PULSING

2.04 A relay in the associated signaling circuit which follows the dial pulses opens and closes the loop over the E and F leads. On the first open of this loop, relay C is operated from a back contact of relay N which follows the dial pulses. C remains operated during pulsing of a digit. The operation of relay C short circuits both windings of the transformer and places a 500-ohm resistor in series with the 2- and 4-uF capacitors, options ZZ and ZX, or in series with the 1-uF capacitor, options YA and ZY.

LINE OR TRUNKS BUSY AND RINGING

With Fig. C

2.05 When all trunks or the called line are busy, the operator will receive an audible busy signal supplied by the selector or connector. The operator also receives an audible ringing tone supplied by the connector when an idle line is seized.

With Fig. D

2.06 When all trunks or the called line are busy the operator will receive an audible-busy and a busy-flash signal supplied by the selector or connector. The busy-flash signal is supplied to this circuit over lead F through the break-contacts of relay C. This causes the G relay to respond and transmit the busy-flash signal to the operator by removing ground and placing battery on the M lead to the Composite Signaling Circuit. The operator also receives an audible ringing tone supplied by the connector when an idle line is seized.

CALLED SUBSCRIBER ANSWERS

2.07 When the called subscriber answers, battery is reversed over the tip and ring which causes the operation of the polarized relay P. The operation of relay P operates relay G. The operation of relay G removes the ground and places battery on the M lead to the Composite Signaling Circuit which signals the distant operator. The operation of relay G also places the polarized relay P across the E and F leads. This, however, does not perform any useful function except on tandem calls.

SUPERVISION AND DISCONNECT (ZN OPTION)

2.08 The connection is held under control of the calling operator by holding the loop over the E and F leads closed. The subscriber may flash the operator. Relays P and G follow the switchhook flashing which signals the operator by placing ground and battery alternately on the M lead to the Composite Signaling Circuit. When the operator disconnects, the loop over the E and F leads is opened, allowing the connector and relay N to release. Relay N in releasing operates relay C which connects across the inside terminals of the transformer either the 500-ohm resistor in series with the 2- and 4-uF capacitors, options ZZ and ZX, or the 500-ohm resistor in series with the 1-uF capacitor, options YA and ZY. If the called station has not disconnected, relays P and G remain operated until the incoming selector has released. With ZF option, the operated G relay removes ground from the sleeve to the incoming selector. When the incoming selector restores to normal, the battery over the loop is restored to normal and ground is removed from the S lead, allowing relays R, P, and G to release.

SUPERVISION AND DISCONNECT (ZM OPTION)

2.09 The connection is held under control of the calling operator by holding the loop over the E and F leads closed. The subscrib-

er may flash the operator as described in 2.08. When the operator disconnects, the loop over the E and F leads is opened, allowing relays N and P to release. Relay N in releasing causes the same sequence of operation as described in 2.08. Relay P releases, releasing G which removes ground from the sleeve permitting the termination connection to release.

3. TANDEM CALLS (A&M ONLY)

OUTGOING CALLS

3.01 On calls from a distant office to this trunk by way of a tandem selector, the circuit functions as described for outward calls under 1. When the called operator answers, the battery over the loop is reversed for the purpose of supervision to the calling operator and for holding the connection if the calling operator disconnects first.

INCOMING CALLS (2W OPTION)

3.02 Incoming calls which are routed to trunks to other offices proceed as described under 2.01 through 2.07. When the called operator answers, battery over loop is reversed which operates the polarized relay P. The operation of relay P operates relay G. Relay G places battery on the N lead to the Composite Signaling Circuit for the purpose of giving an answer signal to the calling operator and also places a high resistance bridge consisting of the winding of relay P and resistor G across the E and F leads for the purpose of holding relay G if the calling operator disconnects first. This high resistance bridge will allow the line relay of the outgoing trunk circuit to release and give a disconnect signal to the called operator. The connection is held by the P and G relays until the called operator disconnects. The connection is under joint control of the calling and called operators. When the called operator disconnects, the battery over the loop is restored to normal allowing relays P and G to release. The release of relay G removes ground from the sleeve allowing the connection to release.

4. TESTING

4.01 Test jack A is provided for convenience in making routine tests of the trunk circuit. When Fig. B is used, the BR lead is opened when a plug is inserted into the jack. This is to prevent spinning the rotary line or trunk switches if the circuit made busy at the A jack is the last idle one in the group.

5. EXTENSION OF ALARMS TO THE OPERATOR OFFICE

5.01 Facilities are provided for extending alarms in this office to the operator office over the T2 and R2 leads of an idle trunk.

6. FUSE FAILURE ON TRUNK

6.01 When a fuse of the trunk operates, the trunk is immediately made busy by relay MB or MBA, option ZV, in Fig. 2. Relay MB is fused by the -48 volt A or B fuse, and relay MBA is fused by the +48 volt C fuse. These relays are normally operated and the operation of one of the trunk fuses will cause the associated relay to release and ground the sleeve to make the trunk test busy to selectors and the alarm circuit. When W wiring is provided, an operated fuse will also remove ground from the BR lead to the register circuit.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

	Tandem Trunk Supv A Relay	Subscriber Supv A Relay
Maximum external loop resistance	2340 ohms	1500 ohms
Minimum insulation resistance	30,000 ohms	15,000 ohms

2. FUNCTIONAL DESIGNATIONS

None.

3. FUNCTIONS

OUTWARD CALLS

3.01 To hold the preceding circuits when this trunk is seized.

3.02 To signal the distant operator.

3.03 To start the ringing machine.

3.04 To provide an audible ringing signal to the calling subscriber.

3.05 To cut off the audible ringing signal when the operator answers.

3.06 If the call requires a class-of-service indication, to give the operator a spurt of steady or interrupted tone when she answers the call.

3.07 To provide switchhook flashing.

3.08 To hold until both ends have disconnected.

3.09 To provide for extending alarms to the master office when used as an alarm trunk.

3.10 To supply -48 volt, option ZQ, or +48 volt, option ZR, local grade (type B) talking battery to the calling subscriber.

3.11 To provide access by an intercepting trunk.

3.12 To provide access by a Subscriber Line Circuit With a Rotary Line Switch.

3.13 To function with the coin control trunk using ac signaling methods.

INWARD CALLS

3.14 To seize the associated incoming selector and to make the trunk busy to other selectors when the distant operator originates a call.

3.15 To provide a pulsing circuit.

3.16 To repeat a busy indication to the distant operator when all trunks are busy or when the called subscriber line is busy.

3.17 To signal the distant operator when the called subscriber answers.

3.18 To provide switchhook flashing.

3.19 To release when the operator disconnects on calls to local subscriber.

3.20 To hold until both operators disconnect on tandem calls.

GENERAL

3.21 To provide means for making trunk tests.

3.22 To provide means for making the trunk busy if a circuit fuse operates.

3.23 To provide means for opening the lead to the register circuit when the circuit is made busy at the test jack.

3.24 To provide a timed off-hook signal as a trunk integrity check when this trunk is associated with a No. 4A or 4M toll crossbar or No. 5 crossbar (toll) distant office.

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4. CONNECTING CIRCUITS

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

Circuit	No. 1 or 350A	No. 355A
Selector Bank Multiple Circuit	SD-32123-01	SD-32123-01
Composite Signaling Circuit	SD-95028-02*	SD-95028-02*
Composite Set and Repeating Coil Circuit	SD-95015-01*	SD-95015-01*
Miscellaneous Alarm Circuit (Alarm Sender)	SD-32193-01*	SD-32193-01*
Miscellaneous Alarm Circuit (Keys)		SD-31974-01
Miscellaneous Alarm Circuit (Registers)		SD-31976-01
Miscellaneous Tone and Tone Alarm Circuits	SD-31521-01	
Traffic Register Circuit	SD-30896-01*	
Tone Interrupter Circuit	SD-31825-01	SD-31825-01
Power Ringing Circuit	SD-80880-01* (350A only)	SD-80780-01*
Outgoing Tandem Trunk Rotary Selector		SD-31990-01
Rotary Out Trunk Switch	SD-32253-01	SD-32253-01
Intercepting Trunk Circuit	SD-31771-01	SD-31771-01

* Typical Circuits

Subscribers Line Circuit With Rotary Line Switch	SD-31259-01	SD-31259-01
Signaling Circuit	SD-56202-01	SD-56202-01
Auxiliary Trunk Circuit	SD-32025-01 (350A only)	SD-32025-01
Coin Control Trunk Circuit	SD-32288-01	SD-32288-01
4-Wire Terminating Circuits	SD-96463-01	SD-96463-01
Incoming Selector Circuit	SD-30200-01*	SD-30200-01*
Distributor Circuit	SD-32007-01	SD-32007-01
Circuit Pack Schematic	SD-99355-01	SD-99355-01
Toll Switchboard No. 1, 3C, or 3CL Trunk Circuit	SD-56525-01	SD-56525-01

* Typical Circuits

5. MANUFACTURING TESTING REQUIREMENTS

5.01 This trunk shall be capable of performing all the service functions specified in the circuit description and meeting all the requirements of the Circuit Requirements Table.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus (Components)

B.1	Superseded	Superseded By
	A/C1 - 439B Capacitor - Option ZZ	A - 441N Capacitor - Option YA
	C - 437QA Capacitor - Option ZX	C - 441QE Capacitor - Option ZY
	N - R2061 Relay - Option ZX	N - R286 Relay - Option ZY

D. Description of Changes

D.1 A change is made in Fig. 1 to improve pulsing capabilities of this circuit when pulsing into succeeding connectors on inward calls. This improvement is provided by options ZY and YA. Option ZZ, formerly part of option ZE, and option ZX are rated Mfr Disc.

D.2 The change described in D.1 effectively reduces the capacitance across the A and B leads during pulsing from 1.33 uF, which consists of capacitors C and C1 in series, options ZZ and ZX, to the 1-uF capacitor C, options YA and ZY. Previously, the 4-uF C capacitor was normally across the A and B leads at the arrival of the digit pulse train. This resulted in a distorted first pulse when the transition from 4 to 1.33 uF was made by the operation of relay C at the beginning of pulsing. This change provides for maintaining 1-uF capacitance across the A and B leads during all pulsing, including the first pulse.

D.3 As part of the above change, the code of relay N is changed to maintain transmission return loss by increasing the shunt impedance across the 1-uF C capacitor.

D.4 The designation of relay D in Fig. 5 is changed to D1 to avoid confusion with relay D in Fig. 1. This change is made on a no-record basis per agreement with Western Electric Company.

D.5 The designation of the D1 diode of timer CP D4 in Fig. 5 is changed to CR1 to agree with its designation as shown in the CP D4 control circuit, SD-99355-01.

D.6 Circuit Note 103 is changed to reflect the options added on this issue of the drawing.

D.7 Circuit Notes 113 and 114 are added.

D.8 The connecting circuit reference to SD-31851-01 as a distributor circuit for use in a No. 355A office is replaced by SD-32007-01. SD-31851-01 is not compatible with this trunk.

D.9 Fig. 60 is revised to remove the connection from terminal 39 to the G relay and to add a strap from terminal 39 to terminal 23. This brings the SD drawing into agreement with the wiring diagram.

D.10 Fig. 60 is revised to correct the connections to terminals 12 and 15 to reflect introduction of optional wiring which has changed the original connecting point.

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