

Western Electric Co., Incorporated,
Engineering Dept.,
New York.

(6 Pages) Page #1.
Issue 8 - BT-431184.
Replacing all previous issues.
April 28th, 1921.

METHOD OF OPERATION
CORD CIRCUIT

Zero and Intercepting - Arranged For Flashing Recall And For Dialing - On Line -
For Use on M.R. And C.C. Lines - Full Mechanical Switching System.

GENERAL DESCRIPTION.

1. This circuit is used at the zero and intercepting position of a special "A" board in a full mechanical office for completing two number calls, information, intercepted, and such other calls as subscribers may be unable to complete mechanically. The answering cord is used with intercepted lines, supervisor's lines, lines transferred from the repair clerk's desk, intercepting operator's final lines, three wire trunks to two number and zero operators, and special line circuits. The intercepted lines and intercepting operators' final line circuits have sleeves grounded through a maximum resistance of 42 ohms. The supervisors' lines, lines transferred from a repair clerk's desk, three wire trunks, and special line circuits have sleeves grounded through a maximum resistance of 368 ohms. The calling cord of the circuit is used with outgoing trunks, supervisor's lines and operators' district and sender selectors, whose sleeves are grounded through a maximum resistance of 368 ohms.

2. In answering a call from a toll switchboard over a toll trunk circuit, or from a cordless toll board, the supervisory lamp in the calling switchboard is extinguished when the call is answered by the zero and intercepting operator. The insertion of the plug of the answering cord in the line or trunk jack trips machine ringing in the incoming trunk and causes the answering supervisory lamp at the zero and intercepting position to flash until extinguished by the operation of the talking key. The operation of the talking key extinguishes the answering cord supervisory lamp and connects the special "A" operator's telephone circuit to the cord circuit. The operator talks with the calling party, and if the call requires a further connection, the plug of the calling cord is inserted in the jack of an outgoing trunk circuit supervisor's line or operators district and sender selector, and the operator dials or sends ringing current over the cord as may be necessary. The calling cord is arranged to prevent its being used as an answering cord in connection with incoming intercepted line or an intercepting operator's final line circuit, thereby preventing a charge on the message rate line. On zero operator's calls, or calls incoming over supervisors' lines from final, lines transferred from the repair clerk's desk, three wire trunks to zero operators, special line circuits, or incoming trunks from magneto office, it is possible to recall the zero and intercepting operators by a momentary depression of the switchhook at the calling station, or by withdrawing and immediately re-inserting the plug in the jack at the calling switchboard. The operation in either case causes the answering cord supervisory lamp to flash until the talking key is operated. On calls over intercepted lines from incoming, or intercepting operators' final line circuits it is not possible to recall the zero and intercepting operators, as depressing the switchhook at the subscriber's station or removing the plug from the jack of the calling switchboard will release the calling district and sender selector circuits. In all cases, when the receivers are replaced on the switchhooks at the calling and called stations or the plugs removed from the jacks at the calling and called switchboard, both cord supervisory lamps are lighted until the removal of the plug from the jacks.

3. The circuit is provided with the number checking feature to enable the zero operator to verify the calling party's number in making toll charges. In making

check test, the tip of the plug of the calling cord is touched to the sleeve contact of the calling line, which appears in the check test multiple before the operator. If the calling party has given the correct number, the operator will receive a checking tone upon contact of the tip of the cord with the multiplied sleeve of that number.

DETAILED DESCRIPTION.

INTERCEPTING CALLS.

4. When the plug of the answering cord is inserted in the jack of an incoming intercepting line circuit in answering a call, the MG-1 and SL-1 relays operate on ground through the sleeve of the jack. The SL-1 relay operated, lights the answering supervisory lamp. The MG-1 relay operated, closes a circuit through the winding of the SW relay which operates. The operation of the SW relay closes a 40 ohm shunt through the flashing circuit lead, intermittently around the answering cord supervisory lamp, flashing the lamp.

5. The operation of the talking key (a) connects ground to the REL lead to operate a relay in the dialing circuit, (b) connects the tip and ring of the cord to the special "A" operator's telephone circuit and (c) operates the L relay. The operation of the L relay, (a) operates the C relay which locks to battery on the armature of the SW relay, (b) connects lead L-1 of the telephone circuit, through the make contacts of the SW relay, through the repeating coil, to ground over the tip side of the cord, (c) closes a circuit from the sleeve of the answering cord, over the checking tone lead to the special "A" operator's telephone circuit, and (d) closes a circuit from battery through a winding of the S relay, make contact of the SW relay, to ground over the tip side of the incoming selector circuit, operating the S relay. The operation of the C relay disconnects the answering cord supervisory lamp from the flashing circuit. Ground connected to the L-1 lead starts the operation of the tripping relays in the operator's telephone circuit. The time required to operate the tripping relays in the operator's telephone circuit insures the tripping of machine ringing in the incoming selector circuit by battery furnished through a back contact of the third tripping relay. The S relay operated, (a) locks through the make contact of the SW relay, to ground on the tip side of the incoming selector circuit, (b) opens the circuit through the winding of the S-1 relay over the ring side of the incoming circuit, (c) closes a circuit from battery through its outer winding, to the ring side of the incoming selector circuit, and (d) extinguishes the 2-F lamp.

6. Upon insertion of the plug of the calling cord in the jack of an outgoing trunk, operator's district and sender selector, at tie line, the SL relay operates to ground on the sleeve of the jack. The MG relay, however, does not operate due to the high resistance of the jack sleeve. The operation of the SL relay disconnects the tip of the cord from the busy test lead and connects it through the dialing and ringing key to the repeating coil. The operation of the SL relay also closes a circuit from ground on its armature through its own front contact and the 18-D resistance to battery through the calling cord supervisory lamp which lights. Should the plug of the calling cord be inserted in the jack of a blank incoming intercepted line or an intercepting operator's final line circuit, the MG relay and SL relay both operate. The MG relay operated, closes a circuit through the winding of the G relay which operates, opening the tip side of the cord and preventing the intercepted line from being bridged by the repeating coil and S-2 relay, and thereby making a charge or collecting a coin at the calling station.

7. The operation of the dialing key disconnects the tip and ring of the calling cord from the repeating coil and connects it to the TD and RD leads of the dialing circuit. When the operator's district and sender selector is ready to receive dialing impulses, the dialing tone will be sent back over the tip and ring leads TD and RD, through the dialing circuit to the operator's telephone circuit.

8. When the receiver is removed from the switchhook at the called station, a reversal of current over tip and ring of the operator's district and sender selector circuit operates the S-2 polarized relay. The S-2 relay operated, extinguishes the calling cord supervisory lamp. When the receiver has been replaced on the switchhook at the calling station, the S relay releases, re-lighting the answering cord supervisory lamp. Replacing the receiver on the switchhook at the called station causes the district selector and sender circuit to function, reversing the current over tip and ring, causing the S-2 polarized relay to release, and re-light the calling cord supervisory lamp. Upon the removal of the plugs of both cords from the jacks, the SL, SL-1 and MG-1 relays are released, extinguishing both cord supervisory lamps and restoring the circuit to normal.

ZERO OPERATOR'S CALL.

9. When the plug of the answering cord is inserted in the jack of a supervisor's line, a line transferred from repair clerk's desk, a three wire trunk, or special line circuit, in answering a call, the SL-1 relay operates, but the marginal relay MG-1 does not operate due to the high resistance in the jack sleeve. The S and SW relays therefore, do not operate as in the case of the intercepted calls. Talking battery is furnished to the incoming circuit through the winding of the S-1 relay, break contact of the S relay, through the repeating coil and over the ring side of the cord. Ground is furnished through the break contact of the SW relay and repeating coil to the tip side of the cord. The S-1 relay operates through the loop of the calling station, repeating coil, to ground through the break contact of the SW relay. The S-1 relay operated, causes the answering cord supervisory lamp to flash under control of the flashing circuit described under "Intercepted Calls". The operation of the talking key functions as previously described, operating the L relay. The operation of the L relay (a) closes a circuit through the secondary winding of the C relay which operates, (b) closes a circuit through the tripping relay in the telephone circuit over the L-1 lead, break contact of the SW relay to ground on the armature of the SL-1 relay, operating the tripping relay, and (c) closes a circuit over the checking tone lead, to the answering cord sleeve. The operation of the C relay closes a circuit from battery on the armature and break contact of the SW relay, make contact of the S-1 relay, through the 18-D resistance to ground on the armature of the SL-1 relay, thereby placing a 40 ohm shunt around the answering cord supervisory lamp, extinguishing it.

10. With the plug of the answering cord inserted in the jack of a two number and zero operator trunk, the talking key operated and the tip of the calling cord plug touched to the calling station multiple sleeve contact, a circuit is closed from the checking tone lead (CTR) in the operator's telephone circuit, make contact of the L relay, sleeve of the answering cord, trunk sleeve multiple, tip of the calling cord, busy test lead, to ground through the repeating coil in the operator's telephone circuit.

11. Should the switchhook at the calling station be depressed momentarily when the talking key is in its normal position and the L relay released, the S-1 relay is released momentarily. The S-1 relay released opens a circuit through the 40 ohm winding of the C relay which releases. Upon the re-operation of the S-1 relay, a circuit is closed from ground on the armature and make contact of the SL-1 relay, 18-D resistance make contact of the S-1 relay, break contact of the C relay, over the flashing circuit lead, which causes the answering supervisory lamp to flash. In completing intercepted calls, the operation of the calling cord is the same as previously described.

12. A reverting ringing key is provided to ring on the calling cord. The operation of the key supplies ground to the tip through the 18-G resistance to hold the S relay operated.

13. The operation of the coin collect key or coin return key operates the CN relay, applying 110 volts positive or negative direct current to the tip and ring of the line to collect or return the coin. The CN relay is slow in releasing to leave a path of discharge from the coin magnet to ground to protect the apparatus against the high voltage developed by the coin magnet. The operation of the coin collect key also connects 39 volt battery to the sleeve of the line to operate the message register on a line operated on a message rate basis.

CIRCUIT REQUIREMENTS

OPERATE

NON-OPERATE

RELEASE

203-A
(S-2)

MECHANICAL REQUIREMENTS

- (a) Armature travel .015" to .020".
- (b) Armature must move freely in bearings.
- (c) There must be follow in the contact springs.
- (d) There shall be .005" air gap between the hard rubber bridge and the swinging spring.

ELECTRICAL REQUIREMENTS

When the trunk loop
does not exceed
3560 ohms resistance.
Test .004 amp.
Readj. .0024 amp.

On open circuit.

When the trunk loop is more
than 3560 ohms but does not
exceed 5000 ohms resistance.
Test .0032 amp.
Readj. .0024 amp.

On open circuit.

When the trunk loop exceeds
5000 ohms resistance.
Test .0026 amp.
Readj. .0024 amp.

On open circuit.

NOTE: TRUNK LOOP includes the resistance of the trunk conductors,
relays and repeating coils, in the district and connecting
circuits.

B76
(S-1)

After a soak of approx-
imately .3 amp.
Test .018 amp.
Readj. .015 amp.

After a soak of approx-
imately .3 amp.
Test .0047 amp.
Readj. .005 amp.

E144 (C)
Secondary
Winding
(350 ohms)

Test .055 amp.
Readj. .052 amp.

Test .010 amp.
Readj. .011 amp.

Prim. and
Ter Wdgs.
in parallel
(40 ohms)

Test .088 amp.

CIRCUIT REQUIREMENTS

	<u>OPERATE</u>	<u>NON-OPERATE</u>	<u>RELEASE</u>
E192 (CN)	Test .035 amp. Readj. .033 amp.	Test .020 amp. Readj. .022 amp.	
E456 (SW)	Test .0263 amp. Readj. .025 amp.	Test .014 amp. Readj. .015 amp.	
E464 (L)	Test .034 amp. Readj. .028 amp.		Test .003 amp. Readj. .004 amp.
Spl. E5 D-22188 coded E650 (MG & MG-1)	Through relay winding: Readj. .057 amp. Through sleeve of cord: Test .074 amp. Readj. .070 amp.	Through relay winding: Readj. .045 amp. Through sleeve of cord: Test .052 amp. Readj. .055 amp.	
Spl. E9 D-20418 (G)	Test .014 amp. Readj. .007 amp.	Test .0052 amp. Readj. .0055 amp.	
Spl. E85 D-22153 coded E649 (SL & SL-1)	Through 200 ohm winding of relay: Readj. .026 amp. Through sleeve of cord: Test .034 amp. Readj. .032 amp.	Through 200 ohm winding of relay: Readj. .017 amp. Through sleeve of cord: Test .020 amp. Readj. .021 amp.	
Spl. E164 D-22196 (S) Coded E630 Inner Wdg. 250 ohms.	Test .053 amp. Readj. .037 amp.	Test .020 amp. Readj. .022 amp.	
Outer Wdg. 250 ohms.	Test .057 amp.		

ENG.--IWB-JO.
 5/20/21.

CHK'D.--RAP-CWP.

APPROVED C. L. SLUYTER, G.M.L.