

CIRCUIT EXPLANATION

M

INTERCEPT TRUNK CIRCUIT
FOR TERMINATING INTERCEPTED
CALLS ON MECHANICAL RECORDER

H-85500-A

(Written specifically for circuit issue 11-14,
but may also apply to later issues. Refer
to H print for appropriate E issue number.)

Added
Addendum
1 to
Cover H
Issues 11
thru 14
10/74 pm
Issue 7

ISSUE 11:

No circuit change; added range chart.

ISSUE 12:

No change in circuit operation, but modified to make tone feed compatible with #1 EAX precise tone distribution facilities and to insure that #1 EAX matrix releases dry on forced disconnect.

This removed capacitors C3 & C4 and strap on relay MC1 between springs 7B & 6T, and relocated relay CO springs 1T, 2T, 4B & 5B.

ISSUE 13:

No circuit change; advanced "AH" drawing to Issue 10.

ISSUE 14:

No circuit change; provided additional information in Engineering Note 51 with the MC lead current drain per each relay MC and a resistance table for different gauges of cable.

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APPROVED

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ISSUE

7

DRAWING NO.

E-85500-A-ADDEND.1

CIRCUIT EXPLANATION

M

INCPT TRUNK CKT
FOR TERM INCPT
CALLS ON MECH
RECORDER
H-85500-A

(Written specifically for circuit issue 10,*
but may also apply to later issues. Refer
to H print for appropriate E issue number.)

*(Not Updated for NAFM FIGS)

FEATURES

FIG 1 - Local and Simplified Toll Selector Intercept (NAFM)

- a) Stopping battery and ring back tone
- b) Closes message to calling party when pick-up is received
- c) Removes message if additional dial pulses are received and restores ring back tone until recorder start signal is received
- d) Peg count and ATB registrations
- e) ALM lead and identification lamp

FIGS 2A, 3A, 6A and 7A - Selector Intercept Simplex Inter-toll

- a) Provides ring back tone to the calling party
- b) Connects recorded message to the calling party and removes the ring-back tone from the calling party at the completion of dialing
- c) Provides for removal of recorded message from the calling party if additional dial pulses are received and connects ring-back tone to the calling party until dial pulsing is completed
- d) Provides 2DB pad control (FIG 3A and 7A only)
- e) Provides ATB, PC and RBT leads
- f) Provides TEST JACKS and BUSY KEY
- g) Provides two cycle message before forced release (FIGS 6A and 7A only)

E- 85500-A

SHEET 2 TOTAL

AUTOMATIC ELECTRIC CO.
NORTH LAKE, ILLINOIS U.S.A.

SIZE

A

Changed
FEATURES,
Section 5
becomes
Section 7
Added

new
Section 5
and
Section 6

*Not
Updated
for NAFM
FIGS
4/60:cij
O'CONNELL

Issue 5

Changed
Sections
4.1, 4.2
and 4.3
Added

Section 8.
8/70:iw
O'Connell

Issue 8

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APPROVED

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ISSUE

7

DRAWING NO.

E- 85500-A

FIG 4A - Selector Intercept Toll

- a) Provides "dry trunk" supervision on seizure
- b) Provides ring-back tone to the calling party after the ring start signal is received from the Selector or Trunk circuit
- c) Connects recorded message to the calling party and removes the ring-back tone from the calling party at the completion of dialing
- d) Provides for removal of recorded message from the calling party if additional dial pulses are received and connects ring-back tone to the calling party until dial pulsing is completed
- e) Provides PC, ATB and RBT leads
- f) Provides TEST JACKS and BUSY KEY

FIG 5A - Selector Intercept Local or Simplified Toll Two Cycle Message

- a) Provides for removal of message at the end of the second cycle and releases the calling party back to the first-Selector dial tone (Local Calls).
- b) Provides for removal of message at the end of the second cycle and provides a signal to the Switchman (Incoming Toll Calls)
- c) Provides for removal of message if additional dial pulses are received and connects ring back tone to the calling party until dial pulsing is completed
- d) Connects recorded message to the calling party and removes the ring-back tone from the calling party at the completion of dialing
- e) Provides ALM, ATB, PC, and RBT leads
- f) Provides Test Jack and Busy Key

FIG 8A - Loop Intertoll Selector Intercept

- a) Stopping Battery
- b) Ring-back tone
- c) Connects message to calling party when pick-up is received

- d) Two cycle message only, then connects calling party back to 1st Selector dial tone
- e) Peg count and ATB leads
- f) 2 DB pad

CIRCUIT OPERATION

1. Local and Simplified Toll Selector Intercept (FIG 1) (NAFM)

1.1 Seizure

This circuit is marked idle by resistance (#2C0) battery on lead C. When seized, the loop is closed to BF. Relay BF operates, closes BFS, and connects lead RBT via capacitor (C3) to lead "-" giving ring back tone to the calling party. Relay BFS operates, removes ground from lead ATB for a possible all trunks busy condition, grounds lead ST to start the MECH RECORDER, closes lead MC to #2MC, and grounds lead C to mark this circuit busy.

1.2 Dialing (Operated: Relays BF and BFS)

Should the calling party continue dialing, BF follows the dial pulses of the digit and, when at normal, disconnects lead RBT via capacitor (C3) from lead "-", opens BFS, and closes C. Relay C operates and disconnects the locking path of MC. Relays BFS and C remain operated during pulsing due to their slow-to-release characteristics.

Should a momentary ground pulse be placed on lead MC, an indication of the beginning of the message portion of the next cycle from the MECH RECORDER, #2MC is closed. Relay MC operates its "X" contacts only and does not operate fully because of C being operated at this time.

After the last dial pulse, BF re-operates, connects lead RBT via capacitor (C3) to lead "-", opens C, and closes BFS. After its slow-to-release interval, C restores and connects the locking path of MC. Succeeding digits to be dialed cause the circuit to operate as previously described.

1.3 Transmitting the Recorded Message (Operated: Relays BF and BFS)

At the beginning of the message portion of the next cycle,

a momentary ground pulse is placed on lead MC by the MECH RECORDER, closing #2MC. Relay MC operates its "X" contacts only and short-circuits #1MC. When ground is removed from lead MC, the windings of MC are closed in series. Relay MC operates fully, locks, opens lead RBT via capacitor (C3) to remove ring-back tone from lead "-", extends leads "+" and "-" to leads R and T to MECH RECORDER, and connects lead MC to #1CO ("X" strap). The recorded message is now given to the calling subscriber.

1.4 Release (Operated: Relays BF, BFS and MC)

1.41 "X" Strap Used

If the message is not to be repeated, the "X" strap is used. When the ground pulse reappears on lead MC preceding the message portion of the next cycle, #1CO is closed. Relay CO operates, locks, opens both windings of MC, removes ground from lead ST, and grounds lead ALM which lights lamp L to identify the unit ("C" wiring and apparatus). Relay MC restores, removes lead MC from #1CO, and opens leads "+" and "-" from leads R and T to remove the MECH RECORDER. The circuit remains in this state until the subscriber disconnects.

When the subscriber disconnects, the loop to BF is opened. Relay BF restores, opens BFS, and closes C which operates. After its slow-to-release interval, BFS restores, opens C and CO, removes ground from leads C and ALM, which extinguishes lamp L, and grounds lead PC. Relay CO restores. After its slow-to-release interval, C restores, removes ground from lead PC, grounds lead ATB, and connects resistance (#2CO) battery to lead C to mark circuit idle. The circuit is now at normal.

If the subscriber fails to disconnect after pre-determined interval, ground on lead ALM sends alarm signal to Attendant. This circuit is held busy until the subscriber disconnects.

1.42 "X" Strap Omitted

If the message is to be repeated, the "X" strap is cut. This prevents CO from operating when the next ground pulse appears on lead MC. Relay MC remains operated and the message is repeated until the subscriber disconnects.

When the subscriber disconnects, the loop to BF is opened.

Relay BF restores, opens BFS, and closes C. Relay C operates and opens both windings of MC. After its slow-to-release interval, BFS restores, removes ground from leads C and ALM, extinguishing lamp L ("C" wiring and apparatus) opens C, and grounds lead PC. Relay MC restores and disconnects leads "+" and "-" from leads R and T to remove the MECH RECORDER. After its slow-to-release interval, C restores, removes ground from lead PC, grounds lead ATB, and connects resistance (#2C0) battery to lead C to mark circuit idle. The circuit is now at normal.

In case of failing to disconnect by the subscriber, the operation is the same as described in section 1.41.

2. Selector Intercept Simplex Intertoll (FIGS 2A and 3A)

The operation of FIGS 2A and 3A is similar to that described in Section 1, with the exceptions that when this circuit (FIGS 2A and 3A) is seized an SX leg is closed to BF, and when released the SC leg is opened.

2.1 Pad Control (FIG 3A)

Calls from local lines originated over this trunk do not require a high gain level on repeater Toll circuits. When 2 DB pad resistance is desired, FIG 3A is used and pad control is placed on leads T1 and R1 via the network of resistors R1, R2, and R3 to maintain the attenuating pad in the Outgoing Toll Trunk circuits.

3. Selector Intercept Toll (FIG 4A)

3.1 Seizure

This circuit is marked idle by resistance (#2EC) battery via lead C. When seized, leads C and EC are grounded, the latter closing #1EC; this circuit returns a "dry" trunk via leads "+" and "-" to indicate to the preceding circuit a simulated ring-start condition; and LR is closed via the line loop. Relay LR operates. Relay EC operates, locks via lead EC, and closes CH via lead C. Relay CH operates, locks via lead C, and disconnects ground from lead ATB.

When the preceding circuit returns a "ring-start" signal by the momentary removal of ground from lead EC, #1EC is opened. Relay EC restores, connects lead RBT to lead "+" via capacitor C3 to give the calling

subscriber ring-back tone, grounds lead ST to start the Mechanical Recorder, and connects lead MC to resistance (#2MC) battery. Ground returned via lead EC has no effect at this time.

3.2 Dialing (Operated: Relays CH and LR)

If the calling party continues to dial, LR follows the dial pulses and when at normal, closes DC. Relay DC operates and grounds lead PC to provide a peg count registration. Relay DC remains operated during pulsing due to its slow to release characteristic.

When a momentary ground pulse is connected to lead MC, an indication of the beginning of the message portion of the next cycle from the Mechanical Recorder, #2MC is closed. Relay MC operates to its "X" contacts only and does not operate fully because of DC being operated at this time.

When the ground pulse is disconnected from lead MC (prior to DC restoring) #2MC is opened. Relay MC restores.

After the last dial pulse, LR re-operates and opens DC. After its slow-to-release interval, DC restores. Succeeding digits to be dialed cause the circuit to operate as previously described.

At the beginning of the message portion of the next cycle, a momentary ground pulse is connected to lead MC by the Mechanical Recorder, closing #2MC. Relay MC operates to its "X" contacts only and short-circuits #1MC. When ground is removed from lead MC, the windings of MC are closed in series. Relay MC operates fully, locks, disconnects lead RBT from lead "+" via capacitor C3, connects lead MC to resistance (CO) battery. The recorded message is now returned to the calling subscriber.

3.4 Release (Operated: Relays CH, LR, and MC)

When the message is completed, a ground pulse is connected to lead MC, indicating the message portion of the next cycle, closing CO. Relay CO operates, locks, disconnects lead MC from resistance (CO) battery and disconnects leads "+" and "-" from leads T and R, respectively, removing the recorded message from the calling party. The circuit remains in this state until the calling party disconnects.

When the calling party disconnects, the loop to LR is opened. Relay LR restores and closes DC. Relay DC operates and opens CO and #1 and #2MC. Relay MC restores. Relay CO restores, connects lead MC to #2MC, and connects lead RBT to lead "+" via capacitor C3. When the preceding switch releases, ground is removed from leads C, opening CH and EC. Relay CH restores, removes lead RBT from lead "+" via capacitor C3, grounds leads PC and ATB, opens DC, removes ground from lead ST to close the operations of the Mechanical Recorder, and connects resistance (#2EC) battery and resistance (#1EC) battery to leads C and EC, respectively. After its slow-to-release interval, DC restores and removes ground from lead PC. The circuit is now at normal.

4. Selector Intercept Local or Simplified Toll Two Cycle Message (FIG 5A)

4.1 Seizure

This circuit is marked idle to preceding equipment by resistance (#2CO) battery connected to lead C. Upon seizure, a loop is closed to A via leads "+" and "-". Relay A operates, closes B, and connects leads IRR and IRT to leads "-" and "+", capacitors C5 and C4, respectively, providing the calling party with ring back tone. Relay B operates, transfers ground from lead ATB to lead ST, initiating the operations of the Mechanical Recorder, connects resistance (#2 winding of 1) battery to lead MC, and grounds lead C.

4.2 Dialing (Operated: Relays A and B)

If the calling party continues to dial, A follows the dial pulses, and when at normal, opens B, closes C, and disconnects leads IRT and IRR from leads "-" and "+", respectively. Relay C operates and disconnects resistance (#2 winding of 1) battery from lead MC. Relays B and C remain operated during pulsing due to their slow-to-release characteristics.

Should a momentary ground pulse be connected to lead MC (during the time interval between dialed digits) and indication of the beginning of the message portion of the next cycle from the Mechanical Recorder, #2 winding of 1 is closed. Two-step relay 1 operates to its "X" contacts only because C re-operates on the succeeding digit.

When C re-operates, #2 winding of 1 is opened. Two-step relay 1 restores. In this manner, this circuit prevents the calling party from receiving the recorded message until dialing is complete.

After the last dial pulse, A re-operates, closes B, opens C and connects leads IRR and IRT to leads "+" and "-" via capacitors C5 and C4, respectively. After its slow-to-release interval, C restores and connects resistance (#2 winding of 1) battery to lead MC. Succeeding digits cause the same operations as previously described.

4.3 Transmitting the Recorded Message (Operated: Relays A and B)

At the beginning of the message portion of the next cycle, a momentary ground pulse is connected to lead MC by the Mechanical Recorder, closing #2 winding of 1. Two-step relay 1 operates to its "X" contacts, closes its #1 winding in series with #2 winding, locks, operates fully, disconnects leads IRT and IRR from leads "+" and "-", respectively, connects resistance (#2 winding of 2) battery to lead MC and connects leads T and R to leads "-" and "+", respectively, returning the recorded message to the calling party.

When the next momentary ground pulse is connected to lead MC, indication of the message portion of the second cycle from the Mechanical Recorder, #2 winding of 2 is closed. Two-step relay 2 operates to its "X" contacts, closing its #1 winding in series with its #2 winding, locks, operates fully, and connects resistance (#1C0) battery to lead MC.

4.4 Release (Operated: Relays A, B, 1 and 2)

4.41 Local Calls

Before the third cycle of the recorded message, momentary ground is connected to lead MC closing #1C0. Relay C0 operates, locks, opens B and closes C. Relay C operates and opens both windings of 1 and 2. Two-step relay 1 restores, and disconnects leads T and R from leads "-" and "+", respectively. Two-step relay 2 restores. After its slow-to-release interval, B restores, disconnects ground from lead ST, grounds lead PC to provide a peg count registration, opens C, disconnects ground from lead C, returning this call to the first Selector dial tone and opening the loop via

leads "-" and "+" to A, and opens #1C0. Relay A restores. Relay C0 restores. After its slow-to-release interval, C restores, disconnects ground from lead PC, grounds lead ATB, and connects resistance (#2C0) battery to lead C. This circuit is now at normal

4.42 Incoming Toll Call

The operations are similar to Section 4.41 with the following exception. When relay B restores, #1C0 remains operated via lead C. After its slow-to-release interval, C restores, disconnects ground from lead PC, and connects resistance (lamp ALM in multiple with resistor R3) to lead ALM to provide a "delayed minor" alarm to the switchman.

When the Toll Train releases, ground is disconnected from lead C, opening #1C0 and the loop is opened to A via leads "+" and "-". Relay A restores. Relay C0 restores, disconnects resistance (resistor R3 in multiple with lamp ALM) ground from lead ALM removing the "delayed minor" alarm, grounds lead ATB and connects resistance (#2C0) battery to lead C. This circuit is now at normal.

5. Selector Intercept Simplex Intertoll (FIGS 6A and 7A)

5.1 Seizure

This circuit is marked idle by resistance (#2C0) battery on lead C. When seized, ground via the simplex leg over leads "+" and "-" closes #1BF. Relay BF operates, closes BFS, and connects lead RBT via capacitor (C3) to lead "-" giving ring-back tone to the calling party. Relay BFS operates, removes ground from lead ATB for a possible all trunks busy condition, grounds lead ST to start the MECH RECORDER, connects resistance (#2MC1) battery to lead MC and grounds lead C to mark this circuit busy.

5.2 Dialing (Operated: Relays BF and BFS)

Should the calling party continue dialing, BF follows the dial pulses of the digit and, when at normal, disconnects lead RBT via capacitor (C3) from lead "-", opens BFS, and closes C. Relay C operates and disconnects the resistance (#2MC1) battery from lead MC. Relays BFS and C remain operated during pulsing due to their slow-to-release characteristics.

After the last dial pulse, BF re-operates, connects lead

RBT via capacitor (C3) to lead "-", opens C, and closes BFS. After its slow-to-release interval, C restores and connects resistance (#2MC1) battery to lead MC. Succeeding digits to be dialed cause the circuit to operate as previously described.

5.3 Transmitting the Recorded Message (Operated: Relays BF and BFS)

At the beginning of the message portion of the next cycle, a momentary ground pulse is placed on lead MC by the MECH RECORDER, closing #2MC1. Relay MC1 operates to its "X" contacts only and short-circuits #1MC1. When ground is removed from lead MC, the windings of MC1 are closed in series. Relay MC1 operates fully, connects leads R and T to windings 3-4, and 7-8 of coil RC, respectively, to complete the transmission path, disconnects 900 Ω termination from across windings 3-4 and 7-8 of coil RC, and connects resistance (#2MC2) battery to lead MC. The ground pulse via lead MC at the beginning of the next cycle closes #2MC2. Relay MC2 operates to its "X" contacts, short-circuiting #1MC2. When the ground pulse is removed from lead MC, #1 and #2MC2 are closed in series. Relay MC2 operates fully and connects resistance (#1CO) battery to lead MC. At the start of the third message cycle, the ground pulse via lead MC closes #1CO. Relay CO operates, locks, and opens BFS, MC1, and MC2. Relay MC2 restores. Relay MC1 restores and disconnects leads R and T from coil RC. After its slow-to-release interval, relay BFS restores, removes ground from lead C, throwing this call back to the first selector dial tone and opening the loop across leads "+" and "-", opening BF, removes ground from lead ST, grounds lead ATB and opens #1CO. Relays BF and CO restore and this circuit is now at normal.

6. Loop Intertoll Selector Intercept (FIG 8A)

The operation of this section is similar to that described in Section 5, except relay BF is seized via a line loop across leads "+" and "-".

7. Testing Facilities

Since all the FIGS are tested in a similar manner, this explanation employs FIG 5A as an example. The Testman can operate the BUSY KEY or insert a shorting plug into TEST JACK springs 3 and 4, transferring lead C from resistance (#2CO) battery to ground, preventing this circuit

from being seized by preceding equipment. The desired Test equipment can be connected to TEST JACK springs 1 and 2, which are across leads "+" and "-", and the various required test can take place or this circuit can be monitored.

When the Testman has completed all the required tests or monitoring, the Test equipment is removed from TEST JACK springs 1 and 2, and the BUSY KEY or shorting plug is removed from TEST JACK springs 3 and 4, transferring lead C from ground to resistance (#2CO) battery. This circuit is now at normal.

8. Selector Intercept EAX Interface (FIG 9A)

Operation of this Section is similar to that described in Section 4. except that relays A, B, 1 and 2 are designated relays BF, BFS, MC1 and MC2, respectively, capacitors C5 and C4 become C4 and C3, respectively, terminal A receives and sends normal C lead signals over leads IT, H, S and OS via the EAX Interface Circuit (H-840227-A) and this circuit is marked idle by resistance battery, from the interface circuit, on lead IT.