

CIRCUIT EXPLANATION

M

CONNECTOR CIRCUIT WITH
FREE SERVICE - TRUNK & LEV.
HTG. WITH NIGHT LINE SERV.
TIMED RELEASE BAT. GEN.
H-580364-A

(Written specifically for circuit issue 8,
but may also apply to later issues. Refer
to H print for appropriate E issue number.)

FEATURES

- (a) Provides ring-back tone
- (b) Provides trunk and level hunting with nightline service
- (c) Provides calling or last party release (optional)
- (d) Provides timed release
- (e) Provides free service for Connector groups which may terminate on official numbers.

CIRCUIT OPERATION

1.00 Seizure (Operated: VON springs)

Resistance (#2C) battery on lead C marks this switch id.e. When seized, the loop is closed to A via leads +LINE and -LINE. Relay A operates and closes B.

Relay B operates, closes #2C via #1L or "NF" wrg, grounds wiper C via #1G and diode CR1 in series, grounds lead C to hold the preceding equipment and to mark this circuit busy. Relay C operates. If free service is used, L operates to its "X" contacts, locks via its #2 winding, operates fully and short circuits #1L.

2.00 Vertical Stepping (Operated: Relays A, B, C, and possibly L and VON springs)

Relay A follows the pulses of the first digit, and when at normal, opens B, and closes #1C and the VERT magnet in series. The VERT magnet follows the pulses from A and

Changed
Sections
1.00, 4.02
and 6.01
11/69 gv
J.W. KING
J.W. King
D.M.L. - 11/69
Issue 5/69

WRITTEN BY

G. P. Bouloukos

APPROVED

J.F.F. 9/20/67

ISSUE

5

DRAWING NO.

E- 580364-A

steps its wipers to the dialed level. On the first vertical step the VON springs restore and open #2C. Relays B and C remain operated during pulsing due to their slow-to-release characteristics.

At the completion of the digit, A re-operates, closes E, and opens #1C and the VERT magnet in series. The VERT magnet restores. After its slow-to-release interval, C restores.

3.00 Rotary Stepping (Operated: Relays A, B, and possibly L)

Relay A follows the pulses of the second digit, and when at normal, opens B and closes E and the ROT magnet in multiple. Relay E operates, locks, connects lead H to lead K ("Q" wrg) and transfers wiper C from resistance (#1G) ground to resistance (H) battery. The ROT magnet follows the pulses and steps the wipers to the dialed line, and on the first rotary step, operates its RON springs. Relay E remains operated during pulsing due to its slow-to-release characteristics.

Relay A re-operates after the last pulse, closes B, and opens E and the ROT magnet in multiple. Relay E remains operated due to its slow-to-release characteristics. The ROT magnet restores.

4.00 Testing the Called Line

4.01 Called Line Idle (Operated: Relays A, B, E, and possibly L, and RON springs)

If the called line is idle, battery is extended via wiper C, short circuiting H, preventing its operation. After its slow-to-release interval, E restores and transfers wiper C from resistance (H) battery to resistance (#1G) ground. Relay G operates to its "X" contacts, locks via its #2 winding, operates fully, grounds wiper C, short-circuits #1G, and closes S. Relay S operates, connects lead RB TONE to lead -LINE via capacitors N and M, connects lead TP to lead K ("X" WRG), connects wiper "-" to lead BAT SEN via #1F, grounds wiper "+", removes the short circuit from #1G, and connects lead C to wiper C.

4.02 Called Line Busy (Operated: Relays A, B, E, and possibly L, and RON springs)

If the called line is busy, ground is extended via wiper C, closing H. Relay H operates. After its slow-to-release interval, E restores, connects resistance (resistor E in multiple with #1 and #2N in series) battery to wiper EC, opens H, and closes #2J. Relay J operates and locks via its #2 winding. After its slow-to-release interval, H restores, connects lead BSY TONE to lead -LINE via capacitor N and resistor U in series, and disconnects resistance (resistor E in multiple with #1 and #2N in series) battery from wiper EC.

5.00 Called Party Answers (Operated: Relays A, B, G, S, and possibly L, and RON springs)

When the called party answers, ground is extended via wiper "-" closing #1F. After its slow-to-operate interval, F operates to its "X" contacts, locks via its #2 winding, operates fully, opens its #1 winding, connects leads +LINE and -LINE to wipers "+" and "-", disconnects lead RB TONE from lead -LINE, removes ground from wiper "+", closes #1 and #2D in series via wipers "+" and "-", and grounds lead SUPY 1 ("Y" wrg) or transfers relay B from ground to low resistance ground on the TD lead ("L" wiring). Relay D operates, removes ground from lead SUPY 1 ("Y" wiring) or transfers relay B from low resistance ground on the TD lead to ground ("L" wiring), and reverses battery polarity across leads +LINE and -LINE ("NF" WRG or "FS" WRG on a level where free service is not provided)

6.00 Free Service Levels (Operated: Relays A, B, F, G, S, and L)

When the switch steps to a level on which free service is provided, the LEFT NP SPGS operate and close Z (FIG FS). Relay Z operates and prevents reverse battery indication from being applied to leads +LINE and -LINE. The calling party thus receives free service.

7.00 Release

7.01 After Switch-Through (Operated: Relays A, B, F, G, S, and D, and possibly L and Z)

7.01.1 Calling Party Release Without Timed Disconnect

If the calling party release is used ("Z" WRG omitted), the loop to #1 and #2A is opened when the calling party disconnects first. Relay A restores, closes relay E and

opens B. Relay E operates and disconnects wiper C from lead C. After its slow-to-release interval, B restores, removes ground from lead C, opens S, opens E, #2G and #2F, and grounds lead SUPY 2 ("Y" WRG). Relay G restores. Relay S restores, opens #1 and #2D, disconnects wipers "+" and "-" from leads +LINE and -LINE, removes ground from wiper C, and closes the RLS magnet. Relay E restores. After its slow-to-release interval, F restores. Relay D restores, restores normal battery polarity to leads +LINE and -LINE if "NF" WRG is used or if "FS" WRG is used and the called party does not have "free service" and removes ground from lead SUPY 2 ("Y" WRG.) The RLS magnet operates and releases the switch shaft. As the Connector shaft returns to normal, the VON springs operate and connect resistance (#2C) battery to lead C to mark this circuit idle and open the RLS magnet. The RLS magnet restores. The circuit is now at normal.

If the calling party release feature is used ("Z" WRG omitted), the loop to #1 and #2D is opened when the called party disconnects. Relay D restores, grounds lead SUPY 1 ("Y" WRG), and returns normal battery polarity to leads +LINE and -LINE if "NF" WRG is used or if "FS" WRG is used and the called party does not have "free service". The circuit is held until the calling party disconnects. The remainder of the release is the same as previously described in this Section.

7.01.2 Last Party Release Without Timed Disconnect

If the last party release feature is used ("Z" WRG), relay D, when operated, holds relays F, G, and S operated via the "Z" WRG. When the called party disconnects, the loop to #1 and #2D is opened. Relay D restores and opens #2F, #2G, and S. Relays D, F, G, and S restore as previously described in this Section. Release of relays A, B, and possibly Z and L occurs in the manner previously described in this Section when the calling party disconnects.

If relays Z and L of FIG FS are operated, these relays are opened when relay D ("Z" WRG) or relay B ("Z" WRG omitted) restores. Relay Z restores and transfers leads +LI and -LI from leads N and K to leads M and J, respectively. Relay L restores, removes the short circuit from its #1 winding, and removes resistance (#2L) battery from lead C.

7.01.3 Last Party Release With Timed Release (FIG TR)

If FIG TR (TIMED RELEASE) is used, #1M is closed via a ground pulse on lead TP1. Relay M operates to its "X" contacts, connects leads C and E to leads F and H, locks via its #2 windings

to a ground pulse via lead TP2, operates fully, and disconnects leads A and L from leads B and M. Disconnecting lead A from lead B opens relay B, which restores to release the Connector as previously described in this Section.

7.01.4 Calling Party Release With Timed Disconnect by Timed Disconnection Circuit H-850698-A FIG 25A or Equiv "L" WRG)

If the calling party releases first circuit operation is the same as described in Section 7.01.1.

If the called party releases first the loop to #1 and #2D is opened. Relay D restores, returns normal polarity to leads +LINE and -LINE and transfers relay B from ground to low resistance ground on lead TD.

After a specified time delay, if the caller does not clear down, the Timed Disconnect circuit transfers lead TD from low resistance to high resistance ground, opening relay B. Circuit operation is then similar to that described in Section 7.01.1 except that leads SUPY 1 and SUPY 2 are not used, and relay E does not operate.

7.02 Release From a Busy Condition (Operated: Relays A, B, and J)

When the calling party hears busy tone and disconnects, the loop is opened to #1 and #2A. Relay A restores and opens B. After its slow-to-release interval, B restores, opens #2J, closes the RLS magnet, and removes ground from lead C to release the preceding equipment. Relay J restores and disconnects lead BSY TONE from lead -LINE. The RLS magnet operates and returns the shaft to normal. As the shaft returns to normal, the VON springs operate, connect resistance (#2C) battery to lead C to mark this switch idle, and open the RLS magnet. The RLS magnet restores. The circuit is now at normal.

8.00 Trunk Hunting (Operated: Relays A, B, and E)

This circuit is arranged to select an idle line in a group of lines. The EC bank contact of the first line in the group is strapped to the associated C bank contact. The EC bank contacts of intermediate trunks are left unconnected. The EC bank contact of the last trunk is connected via a Register to the C bank contact.

8.01 Hunting For an Idle Trunk (Operated: Relays A, B, and E)

If the first trunk in the group is idle, operation is the same as described in Section 4.01.

If the first trunk is busy, ground is encountered by wipers C and EC closing relay H. Relay H operates. After its slow-to-release interval, relay E restores, transfers wiper C from resistance (H) battery to resistance (#1G) ground via diode CR1, closes #2J and closes #1N in series with #2N via wiper EC. Relay N operates to its "X" contacts, operates fully, locks, connects resistance (resistor C) battery to wiper C and closes #1J to ground via wiper EC. Relay J operates and closes the ROT magnet. The ROT magnet operates, steps its wipers to the next bank contact, and operates its interrupter springs, opening #1G, #2J and H. Relay H remains operated due to its slow-to-release characteristics. Relay J restores and opens the ROT magnet. The ROT magnet restores, closes the interrupter springs, and when at normal, closes #1G, H and #2J. Relay J re-operates. Relay G does not operate due to resistor C and the busy grounds on the C wiper. This cycle of operation continues until an idle line is found, the last line in the group is reached or the eleventh rotary step taken.

8.02 Level Hunting (Operated: Relays A, B, H, and N)

If the wipers do not encounter an idle line on any of the bank contacts on a level in a trunk group, J re-operates and closes the ROT magnet. The ROT magnet operates, opens #2J via its interrupter springs, and steps the wipers to the eleventh rotary position. The CAMSPGS operate in the eleventh rotary position and connect the RLS magnet to the VERT wiper. Relay J restores and opens the ROT magnet. The ROT magnet restores and closes K. Relay K operates, locks, closes the RLS magnet, closes the VERT magnet via resistor A, and connects ground to the VERT wiper. The RLS magnet operates and restores the switch shaft to the rotary normal position. The VERT magnet does not step the Connector shaft vertically because resistor A limits its current, however, the VERT magnet does prevent the shaft from falling. The CAMSPGS restore, open the RLS magnet, and closes #2J. The RLS magnet restores. Relay J operates. When the VERT wiper touches the VERT BK contacts, the VERT magnet is closed via direct ground. The VERT magnet operates fully and steps the wipers to the next bank level and opens K via its interrupter springs. Relay K restores, opens the VERT magnet, removes ground from the VERT wiper, and closes the ROT magnet. The ROT magnet operates and the balance of the operation occurs as described in Section 8.01.

8.03. Idle Line Found (Operated: Relays A, B, H, N, and J)

If an idle line is found, battery is extended via wiper C closing #1G. Relay G operates to its "X" contacts, locks, short-circuits resistor C, operates fully, grounds wiper C, closes #1S, opens the ROT magnet and #2J, #1 and #2N and H. Relay J restores. After its slow-to-release interval, due to its non-inductive #2 winding in series with resistor E, N restores. After its slow-to-release interval, H restores. Relay S operates. The remainder of operation is the same as described in Sections 4.01 and 5.00.

9.00 All Trunks Busy (Operated: Relays A, B, H, N, and J)

On the last trunk of a group, the C and EC wipers are connected through a 1200 ohm resistor or 1300 ohm meter. The last line in the group is tested as previously described and if the line is busy, ground is encountered on the C wiper and resistance (1200 ohm) ground on the EC wiper. Resistance ground on wiper EC holds J operated. Relay J holds the ROT magnet and interrupter springs operated opening H.

After its slow-to-release interval, H restores, connects lead BSY TONE to lead -LINE via capacitor N and resistor V in series, transfers #1J from resistance ground on wiper EC to direct ground, and opens the ROT magnet. The ROT magnet restores.

10.00 Release (Operated: Relays A, B, N, and J)

The operation is the same as that described in Section 7.02, except that relay N is operated.

11.00 Night Service for Trunk Groups

In order to secure the trunk hunting service, it is necessary to dial the pilot number or the first number of the group. This causes relays N and J to operate if the first trunk is busy.

If a number of any other trunk in the group is dialed, no ground or a 1200 ohm ground on wiper EC will allow the circuit to operate in the same manner as when an individual line is dialed because relays N and J have not operated. This condition is used to provide "night service" when the attendant is not at the sub-station Switchboard. Any number in the group, except the first, may be listed as a night number and when dialed will establish a connection with that trunk only, without starting the trunk hunting part of the circuit.

12.00 All-Trunks-Busy Registration

Provisions may be made to register the number of times that all trunks in a group are busy by substituting a 1300 ohm meter for the 1200 ohm resistor connected between the C and EC bank contacts of the last trunk in the group. The meter will operate each time the last trunk of the group is tested and found busy.

ISSUE

5

DRAWING NO.

E-580364-A

