

7360 Loop to E & M Dial Long Line Circuit

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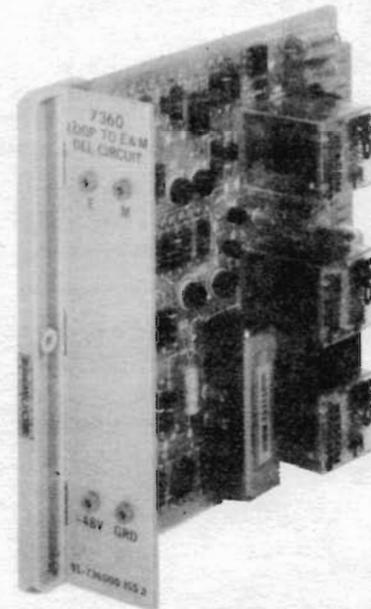


Figure 1. 7360 Loop to E and M DLL Circuit

1. GENERAL

1.01 This Section provides circuit description, installation, and basic testing information for the Wescom 7360 Loop to E & M Dial Long Line Circuit.

1.02 The 7360 Loop to E & M DLL Circuit (Figure 1), is a plug-in, printed-circuit module used to: (1) provide operation from either a loop-start or ground-start supervisory signal, (2) convert local loop- or ground-start supervision and dial pulse information into appropriate M-lead signals for transmission towards the CO, (3) provide for either open or grounded E-lead supervision during busy, (4) convert E-lead signals received from the CO into ringing signals, (5) operate premonitory busy with reverse battery towards the local station when required, and (6) terminate an associated repeater during dialing and when idle. The 7360 circuit is installed at the subscriber end or at an intermediate point on a long subscriber line or PBX off premise station. The

module is electrically positioned between the station equipment and an E & M type signaling unit. The 7360 (Issue 3 only) is functionally identical to, and directly replaces, the 7364 Loop to E & M DLL circuit with no wiring changes necessary.

1.03 The 7360 is constructed as a plug-in module designed to mount in one position of the Wescom Type 400 Mounting Assembly. Type 400 Mounting Assemblies are available in capacities of 1 to 13 modules and allow for either KTU apparatus-case or relay-rack mounting.

1.04 The 7360 makes electrical connection to the system through one of the 56-pin, wire-wrap connectors provided as part of the mounting assembly. Each connector may be mechanically keyed to prevent the module from being inserted into any position other than the proper mounting assembly position.

2. SPECIFICATIONS

2.01 Specifications describing the electrical and physical characteristics of the 7360 are as follows:

- (a) MAXIMUM LOOP LIMITS: 3000 ohms.
- (b) DIALING DISTORTION: Less than 4%.
- (c) DIALING SPEED: 8 to 14pps.
- (d) RINGING VOLTAGE: 85 to 130Vac at 16 to 66Hz, nominal.
- (e) MAXIMUM RING TRIP SENSITIVITY: 3000 ohms.
- (f) MAXIMUM INPUT LEVEL: +20dBm.
- (g) FREQUENCY RESPONSE: 200 to 10,000Hz \pm 1dB.
- (h) INSERTION LOSS: 0.0dB.
- (i) POWER REQUIREMENTS: 30mA (idle), 90mA (busy) at -48Vdc.
- (j) OPERATING ENVIRONMENT: Temperature, 35° to 120°F; Humidity, to 95% (no condensation).
- (k) WEIGHT: 1.5 lbs. (approximately).
- (l) DIMENSIONS: Height, 5-19/32 inches; 1-1/2 inches; Depth, 6 inches.
- (m) MOUNTING: One module position of Type 400 Mounting Assembly.

3. CIRCUIT DESCRIPTION

3.01 The 7360 detects loop dialing and supervisory signals from the subscriber's station equipment and converts them to M-lead signals for transmission to the CO. On an incoming call, the 7360 receives a ring indication via the E lead from

the CO and controls the application of ring generator voltage and to the subscriber's station equipment. Refer to the functional block diagram (Figure 2) while reading the following description. Since loop-start and ground-start operation of the 7360 are similar, only ground-start operation will be discussed.

Outgoing Call Sequence (Ground Start)

3.02 Ground, placed on the ring lead by the PBX, causes B-lead current to flow. The B-lead sensing circuit operates relay A and releases relay B. This prevents the operation of relay R. The operation of relay A busies the M lead. The distant end circuitry senses tip-ground from the CO and busies the E lead to the 7360. This operates the RT relay which connects ground through a 200-ohm resistor to the A lead through the associated repeat coil or hybrid, and grounds the tip lead. The PBX removes the ground and is then in the loop mode.

3.03 Dial pulses, sensed by the B-lead sensing circuit, pulse relay A and cause relay B to operate during the first break in dialing. Relay B remains operated during the pulse train. Pulsing relay A pulses the M lead. The operation of relay B places resistor R38 from the ring lead to the B lead to prevent false dial pulse transients in the term set or repeat coil.

Incoming Call Sequence

3.04 The busy condition on the E lead is sensed by the E-lead sensing circuit which operates relay R via the ringing circuit. The operation of relay R places the ringing generator on the line to the station. A set of contacts associated with relay R is available for ringing generator start. In loop-start operation, the E lead and the R lead follow the CO ring rate. In ground-start operation, relay R is controlled by the tip ground condition of the CO line circuit.

3.05 The off-hook condition during the ringing cycle is sensed by the ring trip circuit which operates relay RT. The operation of relay RT releases relay R and locks the circuit to the E-lead busy condition. The operation of relay RT places ground on the A lead to complete the loop for ground-start operation.

4. INSPECTION

4.01 Inspect the equipment thoroughly, as soon as possible after delivery. If the equipment has been damaged in transit, report the extent of damage to the transportation company immediately. If the equipment is to be stored, make an operational check to determine that the equipment is in proper working order as received from the factory. After an indication of satisfactory performance has been obtained, the equipment may be stored for future installation. If the System is to be installed at once, make an operational check after the installation is completed.

4.02 Wescom equipment is specifically identified by the model number and final-assembly number silk screened on the front panel of the plug-in module. At the start of production, the final-assembly number is assigned an issue number of 1 which becomes an integral part of the final-assembly number. After the start of production, this issue number is advanced each time a major engineering change occurs. Therefore, be sure to use the model number and final-assembly number when making inquiries about the equipment. The issue number of the instruction manual should be the same as the issue number assigned to the equipment. If a one-to-one correspondence does not exist between these items, the instruction manual required for the equipment may be obtained from Wescom upon request.

5. MOUNTING

5.01 Type 400 Mounting Assemblies are available in capacities of 1 to 13 modules and may be equipped and prewired to combine the 7360 into a system with other modules from the Wescom product line.

KTU Apparatus Case Mounting

5.02 Type 400-1 (one-module) through 400-5 (five-module) Mounting Assemblies may be installed in a 15A (equivalent to Western Electric Co. 31B) KTU apparatus case. Type 400-1 through 400-13 Mounting Assemblies may be installed in a 16C (equivalent to Western Electric Co. 16C) KTU apparatus case.

Relay-Rack Mounting

5.03 Type 400-1 through 400-9 Mounting Assemblies require the use of mounting bars when mounted on either a 19- or 23-inch relay rack. Type 400-10 and 400-11 Mounting Assemblies are provided with mounting brackets for mounting directly across 19-inch relay racks. Type 400-12 and 400-13 Mounting Assemblies are also provided with mounting brackets for 23-inch relay-rack mounting. These mounting brackets are arranged to mount on relay racks drilled to accept either 1-3/4 or 2-inch mounting plates.

5.04 Because Type 400-1 through 400-9 Mounting Assemblies must be installed on mounting bars, 7 inches of vertical space (four mounting spaces) are required for relay-rack mounting. Type 400-10 through 400-13 Mounting Assemblies, however, are provided with mounting extensions located on the sides of the mounting assemblies and require only 6 inches of vertical rack space. Install the mounting assembly in a KTU apparatus case or on a relay rack (as described above) with mounting hardware provided.

Universal Shelf Mounting

5.05 When a high degree of flexibility is required to provide for new circuit arrangements as well as circuit rearrangements, the 7360 may be mounted in a Wescom Universal Shelf. The Universal Shelf permits all intermodule wiring and installer connections to be made at the front of the mounting assembly and provides maximum accessibility to these connections when changes are required. The Type 400UA-11 and 400UB-11 Universal Shelves provide mounting positions for up to 11 modules and are designed for mounting in a 19-inch relay rack. Type 400UA-13 and 400UB-13 Universal Shelves provide mounting positions for up to 13 modules and are designed for mounting in a 23-inch relay rack.

6. INSTALLER CONNECTIONS

6.01 When installed in a Type 400 Mounting Assembly, the 7360 makes electrical connection to associated equipment through a 56-pin, wire-wrap card connector provided as part of the mounting assembly. Make all installer connections to this connector in accordance with the attached Installation Guide.

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6.02 Type 400UA-11 and 400UA-13 Universal Shelves provide terminal block locations above the mounting assembly, whereas Type 400UB-11 and 400UB-13 Universal Shelves provide terminal block locations below the mounting assembly. When the 7360 is installed in a universal shelf, make all installer connections to these terminal blocks in accordance with the attached Installation Guide.

7. OPTIONS

7.01 The 7360 is conditioned at the factory to accept loop-start operation, open-state E-lead supervisory signals during idle, and to provide nonreverse battery supervision. The 7360 may also be conditioned for ground-start operation, reverse battery supervision and loop start premonitory busy, repeater termination, and E-lead supervisory signals in the ground state during idle. If other than factory-conditioned options are required for a particular system, open the options not required and close the proper option. Refer to the option tables on the attached Installation Guide to provide the desired mode of operation.

8. TESTING

8.01 If trouble is encountered with the operation of the 7360, verify that all installer connections have been properly made in accordance with paragraph 6 and the attached Installation Guide, and that all options have been condi-

tioned as required. Make certain that the module is making good connection with the mounting assembly card connector; remove and reinsert the module. If the trouble persists, attempt to determine whether the fault is internal or external to the module, using the test procedure following paragraph 8.04. If technical assistance is required, contact the Wescom Technical Services Department by calling (312) 971-2010 or TWX 910-695-4735.

Canadian Customers: (416) 742-0236 or TWX 610-492-4367.

8.02 Field repairs involving the replacement of components within a module are not recommended. If a module is found to be defective, contact Wescom, Inc., by telephone or TWX, for instructions regarding replacement or repair. If a replacement module is required, it will be shipped the fastest way, or as specified by the customer. Upon receipt of a replacement module, return the defective module, using the shipping label provided, to Wescom, Inc., 8245 Lemont Road, Downers Grove, Illinois 60515.

Canadian Customers: Wescom Canada, Ltd., 87 Brydon Drive, Rexdale, Ontario, Canada.

Test Equipment

8.03 A Simpson 260 multimeter (or equivalent) is required for testing.

8.04 The module may be conditioned for either loop start, loop start with premonitory busy, or ground start during the following tests.

Table 1. Test Procedure

| STEP | ACTION | VERIFICATION |
|------|--|--|
| 1 | Verify that both local and distant terminals are in the on-hook condition. | |
| 2 | Set the multimeter to the 50Vdc range and connect the negative lead to the -48V test point, and the other lead to the ground test point. | The multimeter should read a minimum of 42V, indicating that power is being applied to the 7360. |
| 3 | Turn off power, remove the negative multimeter lead, and connect it to the M-lead test point. | The multimeter should read 0V. |
| 4 | Request the local station to go off-hook. | The multimeter should indicate battery potential. |
| 5 | Remove the negative lead and connect it to the E-lead test point. Request the distant end to signal the local station. | The multimeter (dependent on E-lead signaling state) should indicate battery potential or 0V. |
| 6 | Request the distant end to go on-hook. | The multimeter (dependent on E-lead signaling state) should indicate battery potential or 0V. |
| 7 | Connect a multimeter (set on the 250Vac scale) to the M and GRD test points. Request the distant end to signal the local station. | Meter should indicate ring voltage supplied to the 7360 by the local ringing generator. |
| 8 | Place the associated station in the off-hook condition. | Meter reading should indicate removal of ac voltage, verifying that ring trip has occurred. |
| 9 | Return both circuits to idle condition. | |
| 10 | Seize the local circuit (ground on R lead) to simulate outgoing call sequence. (During dialing, M-lead follows pulse train.) | Meter reading should change from ground to battery potential. |
| 11 | Connect the multimeter across the -48V test point and pin 47 (T) to monitor incoming call sequence. Request distant station to signal local station (returns E-lead ground). | Meter reading should change from ground to battery potential. |



WESCOM Installation Guide

| Lead Designation | 56-Pin Connector | | Lead Designation |
|------------------|------------------|----|-------------------|
| RING GEN | 56 | 55 | RING GEN |
| | 54 | 53 | TO STATION EQUIP* |
| | 52 | 51 | R1 (to Hyb) |
| | 50 | 49 | T1 (To Hyb) |
| | 48 | 47 | TO STATION EQUIP* |
| | 46 | 45 | |
| | 44 | 43 | E LEAD |
| | 42 | 41 | |
| GRD | 40 | 39 | GRD |
| | 38 | 37 | |
| | 36 | 35 | -48V |
| | 34 | 33 | |
| | 32 | 31 | |
| | 30 | 29 | |
| | 28 | 27 | |
| | 26 | 25 | B LEAD (To Hyb) |
| | 24 | 23 | A LEAD (To Hyb) |
| | 22 | 21 | |
| | 20 | 19 | B LEAD (To Hyb) |
| | 18 | 17 | GRD |
| | 16 | 15 | M LEAD |
| | 14 | 13 | RING GEN START |
| | 12 | 11 | |
| | 10 | 9 | R3 |
| | 8 | 7 | R2 |
| | 6 | 5 | T3 |
| | 4 | 3 | T2 |
| | 2 | 1 | |

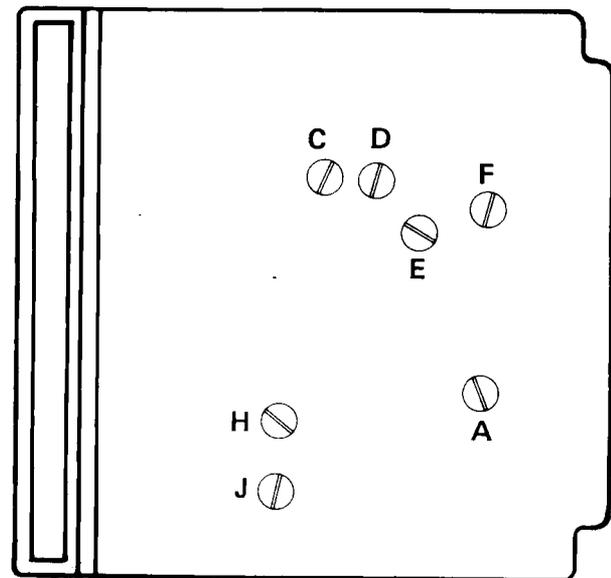
* WIRING OPTION TABLE

| TERMINAL NO | 47 | 53 |
|-------------|-----------------------|----|
| OPTION 1 | T | R |
| OPTION 2 | R | T |
| OPTION 3 | USE TERM 5 & 3, 7 & 9 | |

Installer Connections

INSTALLATION CAUTIONS:

1. Do not make any connections with power applied to the equipment or modules installed in the mounting assembly.
2. To avoid damage to voltage sensitive solid-state devices, it is recommended that the 7360 be operated from a source of well-filtered battery.
3. Removing and installing modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector for improper alignment or the presence of foreign particles.
4. The 7360 contains a mercury-wetted relay. During shipment, excess mercury may collect on the contacts of this relay causing it to be "shorted". Consequently, the 7360 should be gently tapped on a hard surface while being held in an upright position, before inserting the module in the mounting assembly.

**Option Location****OPTION CAUTIONS:**

1. When opening an option, rotate the screw counterclockwise two revolutions to ensure that the connection is broken. When closing an option, do not overtighten as damage to the plating of the printed circuit board may result.

Installer Connection Notes

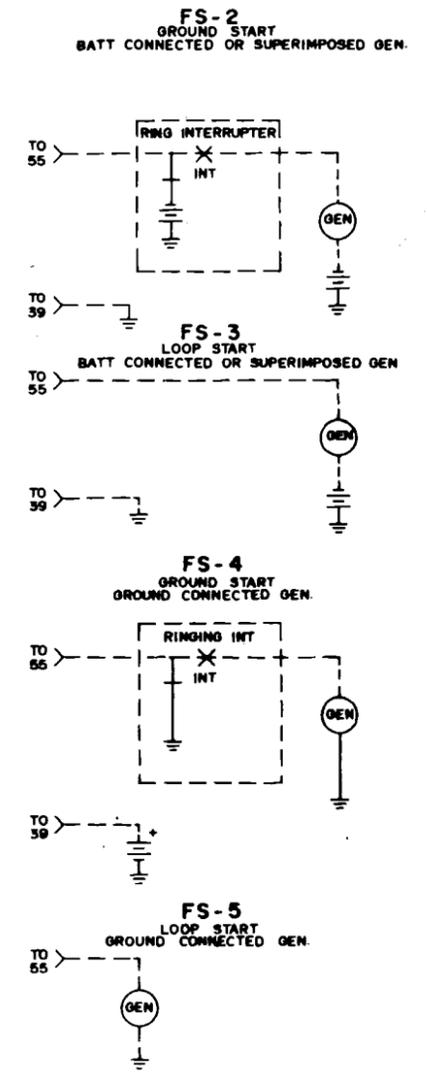
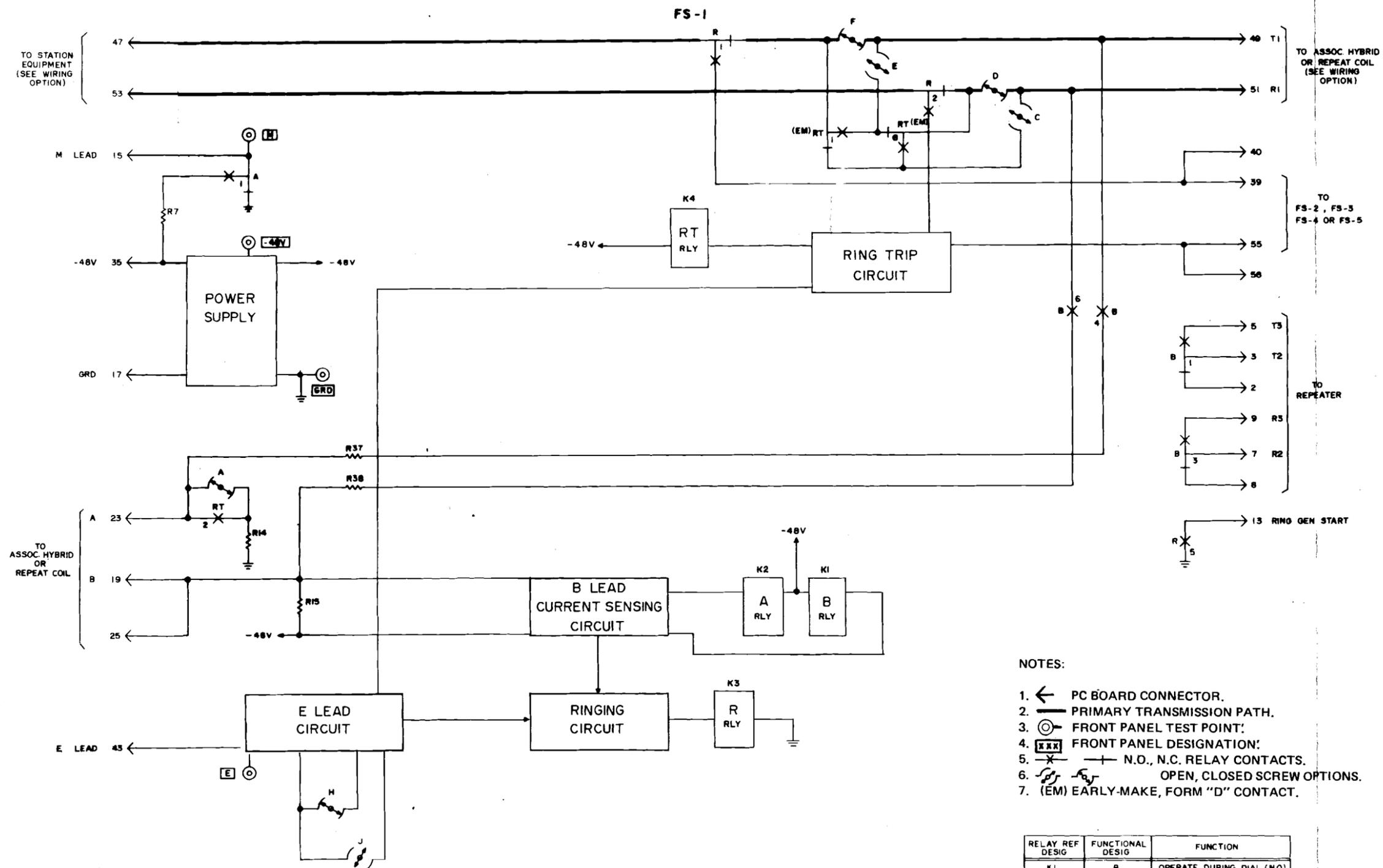
- (a) When reverse battery and premonitory busy (options A, C, & E installed) are used, connect the tip lead from the station equipment to pin 53 and the ring lead to pin 47.
- (b) Local ringing interrupt must be provided with ground start or premonitory busy modes if interrupted ring is desired.

Option Notes

Option Table

| FEATURE OPTION | MAKE | BREAK | WIRE OPTION | TYPICAL OPERATION |
|------------------------------------|---------|-------|----------------|----------------------------------|
| E LEAD OPEN IDLE | H | J | 1 OR 2 | CX, DX, SF TONE ON IDLE |
| E LEAD GRD IDLE | J | H | 1 OR 2 | SF TONE OFF IDLE |
| LOOP START | A | | 1 OR 2 | |
| GRD START | | A | 1 OR 2 | |
| NON-REV BATT | F, D | C, E | 1 | |
| REV BATT | C, E | F, D | 2 | |
| PREMONITORY BUSY | A, C, E | F, D | 2 | |
| RPTR TERM DURING DIAL & IDLE | | - | 1 OR 2 & 3 | LOCAL REPEATER TERMINATION |

A



- NOTES:
- ← PC BOARD CONNECTOR.
 - PRIMARY TRANSMISSION PATH.
 - ⊙ FRONT PANEL TEST POINT.
 - XXX FRONT PANEL DESIGNATION.
 - N.O., N.C. RELAY CONTACTS.
 - OPEN, CLOSED SCREW OPTIONS.
 - (EM) EARLY-MAKE, FORM "D" CONTACT.

| RELAY REF DESIG | FUNCTIONAL DESIG | FUNCTION |
|-----------------|------------------|---------------------------|
| K1 | B | OPERATE DURING DIAL (NO.) |
| K2 | A | LINE RELAY |
| K3 | R | RING |
| K4 | RT | RING TRIP / GS |

Figure 2. 7360 Functional Block Diagram (Issue 3)