

**CROSSES OR FALSE GROUNDS ON
SUBSCRIBER LINE LINK FRAME
LR RELAY
NO. 1 CROSSBAR OFFICES**

1. GENERAL

1.01 This section covers the methods to be followed in connection with locating troubles due to crossed or falsely grounded contacts on subscriber line link frame LR relays.

2. INDICATIONS OF TROUBLE CONDITION

2.01 Subscriber sender link alarms on various frames attended by repeated line link alarms on a particular frame.

2.02 Terminating trouble indicator displays of line link frame lockouts.

2.03 Subscriber reports of NO DIAL TONE.

3. REACTIONS DUE TO TROUBLE

3.01 Subscribers served from the line link frame in trouble may experience delays in receiving dial tone or may not receive dial tone at all.

3.02 During periods of peak traffic equipment overloads may be experienced.

4. IMMEDIATE PROCEDURE TO FOLLOW

4.01 Trouble conditions caused by crosses or false grounds on subscriber line link LR relays must be analyzed and located by observation and tests at the particular line link frame in trouble.

5. ANALYSIS OF TROUBLE

5.01 Trouble conditions caused by crosses or false grounds on the subscriber line link LR relay contacts affect the controller circuit sequence of operation in various ways depending upon the nature of the particular trouble. To aid in analyzing a particular trouble appearance this section treats trouble conditions due to crosses or false grounds on the LR relay contacts under the six following classifications illustrated in Fig. 1:

(a) A pair of contacts crossed - column 0

(b) A pair of contacts crossed - other than column 0

(c) Two contacts crossed - individual LT leads

(d) Two contacts crossed - multiple LR leads

(e) Contact grounded - individual LT lead

(f) Contact grounded - multiple LR lead

Trouble (a) - A Pair of Contacts Crossed - Column 0

5.02 No subscriber reaction should be experienced if the pair of crossed LR relay contacts are associated with column 0 and horizontal group 0. However, the preferred order of serving simultaneous calls from column 0, horizontal group 0 may be affected if the pair of contacts crossed is associated with an LR lead other than 0. As an illustration consider that the LR relay contacts serving vertical file number 5 in column 0, horizontal group 0 are crossed. Simultaneous calls are originated from vertical files 4 and 5 column 0, horizontal group 0. Under normal operation the call from vertical file 4 would be served first and then the call from vertical file 5, due to the LT relay preference chain. In this case, however, due to the trouble condition, the LT5 relay will operate following the operation of the AC relay. The LE relay will operate out of sequence, following the operation of relay VE. The LR relay normally follows the operation of relay VE to close through the LR leads to the LT relays. Due to the LE and LR relays operating simultaneously, as a result of the trouble condition, the LT4 relay may not have sufficient time to operate and lock thus permitting the call from vertical file 5 to be served first.

5.03 When a pair of contacts are crossed on an LR relay in column 0 but in a horizontal group other than 0 simultaneous calls from the vertical file involved in the trouble condition and a differently numbered vertical file in any lower numbered horizontal group in column 0 will result in blocking the line link controller. This is due to the premature operation of the LT relay, as a result of the trouble condition, and the controller preference chain for serving simultaneous calls from

different horizontal groups. In this case an attempt will be made by the controller to serve the call from the lower numbered horizontal group. The line hold magnet corresponding to the falsely operated LT relay will operate in this horizontal group. The L relay associated with the vertical file originating the call in this horizontal group will remain operated as it is not associated with the operated hold magnet. The line link controller will time out due to the RE relay remaining operated thus preventing the subscriber sender from sending a release signal to the sender link controller circuit.

5.04 Determine the horizontal group involved by observing the operated HG- relay. Observe the LT relay that is operated when the line link controller blocks. In column 0, on all horizontal groups higher in number than the one corresponding to the operated HG relay, check for an operated L relay corresponding to the operated LT relay. Release the operated L relay by insulating 1-2 contacts of the associated line hold magnet in the approved manner. The line link should now function in a normal manner.

Trouble (b) - A Pair of Contacts Crossed - Other Than Column 0

5.05 When the subscriber line relay associated with the LR relay contacts that are crossed operates, line selection is completed in the controller circuit before vertical group selection. This is due to the premature operation of the associated LT relay, followed by the operation of the RE and LS relays. The V-0 relay which operates together with all of the V relays at the start of vertical group selection will lock through the operated VS relay and the prematurely operated LS relay. The V- relay associated with the column in which the call originated will also lock. The operation of the LR and HM relays is under control of a chain circuit through contacts of the V relays. This chain circuit determines the preference, by columns, for serving simultaneous calls. With the V-0 relay locked due to the trouble condition, the HM and LR relays in column 0 associated with the horizontal group in which the call originated will operate. The hold magnet corresponding to the operated LT relay will operate in column 0 through the contacts of the HM relay. However, the subscriber line relay originating the call will remain operated as it is not associated with the operated hold magnet. The line link controller will time out due to the RE relay remaining operated thus preventing the subscriber sender from sending a release signal to the sender link controller circuit.

5.06 Determine the horizontal group involved by observing the operated HG relay. Observe the line hold magnet that operates in this horizontal group, in column 0, when the controller circuit times out, to determine the LT lead affected. In the associated columns on the horizontal group determined from the operated HG- relay, check for an operated L relay corresponding to the LT lead affected. If simultaneous calls are originated from different horizontal groups the check to determine the operated L relay corresponding to the LT lead affected should be made on all horizontal groups of higher number than the operated HG relay as well as the horizontal group corresponding to the operated HG relay. Release the operated L relay by insulating 1-2 contacts of the associated line hold magnet in the approved manner. The line link frame should now function in a normal manner.

Trouble (c) - Two Contacts Crossed - Individual LT Leads

5.07 A cross between two individual contacts on an LR relay affects the operation of the line link controller circuit when the L relay associated with the higher numbered LT lead operates. When this occurs the line link controller circuit functions in a normal manner up to and including line selection. Due to the crossed contacts on an LR relay the LT relay associated with the lower numbered LT lead will lock providing a path to operate the line hold magnet, corresponding to the locked LT relay, in the horizontal line group originating the call. The line relay originating the call is not associated with the operated line hold magnet and will remain operated keeping a ground on the LT lead. The RE relay will be held operated to the LT lead ground preventing the subscriber sender from sending a release signal to the sender link controller circuit thus causing the line link controller to time out.

5.08 Determine the column and switch associated with the trouble condition by observing the operated V and HG relays respectively. Check for an operated line relay at this location and release it by insulating 1-2 contacts of the associated line hold magnet in the approved manner. The line link controller should now function in a normal manner.

Trouble (d) - Two Contacts Crossed - Multiple LR Leads

5.09 A cross between two LR relay contacts associated with the multiple wiring (common contacts) will cause the line link controller to block when any line relay on the frame in trouble, associated with the highest

LR RELAY CONTACTS AND ASSOCIATED LT LEADS

	Bottom Contacts					Top Contacts				
Individual Contacts	1	3	5	7	9	1	3	5	7	9
Associated Common Contacts	2	4	6	8	10	2	4	6	8	10
Associated LT Lead	0	1	2	3	4	5	6	7	8	9

SKETCH OF LT AND LR LEADS

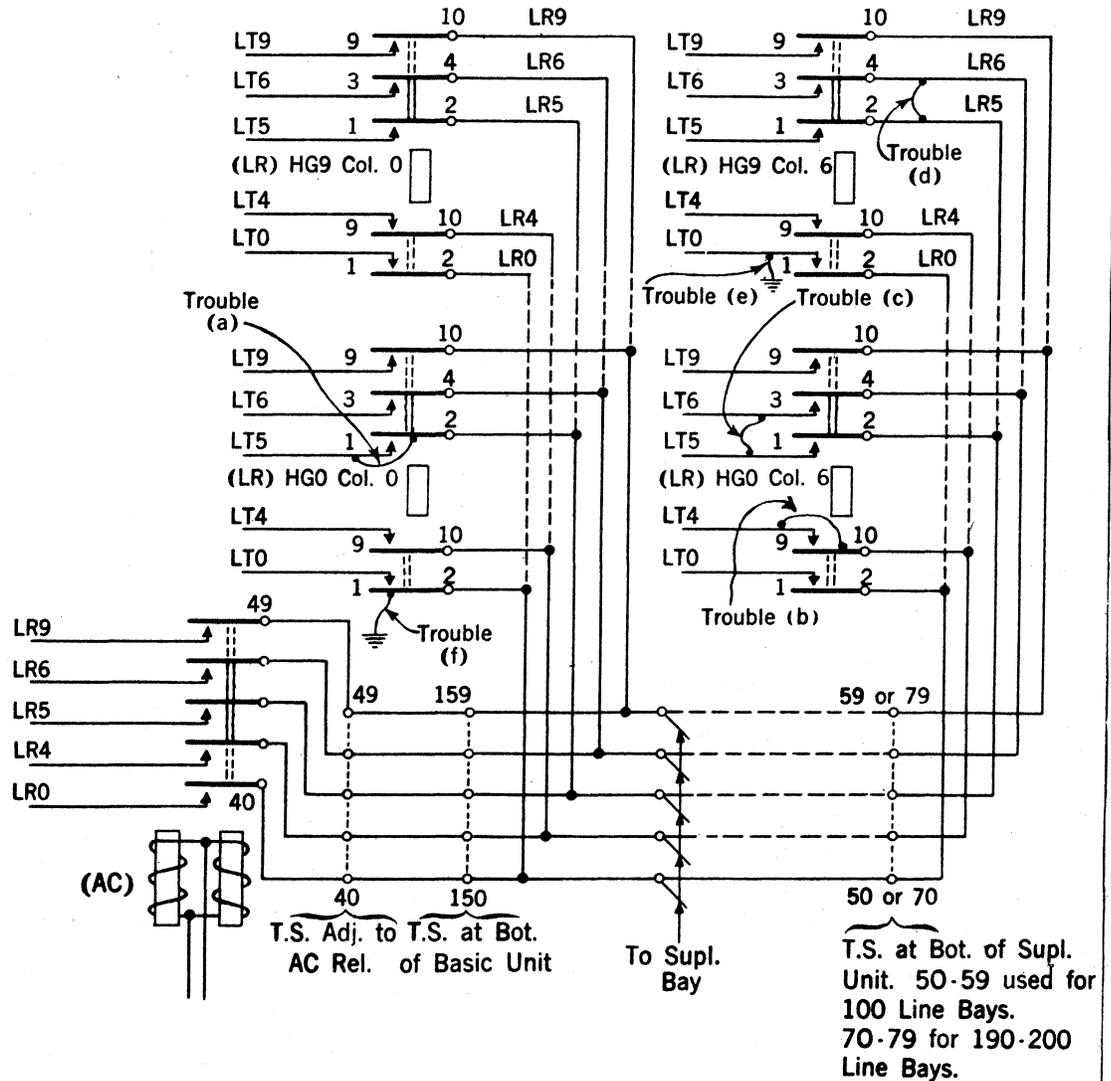


Fig. 1

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numbered LR lead involved in the cross, is operated. As an illustration consider a trouble condition caused by a wire clipping crossing the top 2 and 4 contacts of the LR relay associated with horizontal group 5, column 0. When any line relay associated with a vertical file 6 on the line link frame in trouble is operated the LT lead ground normally connected to the top 4 contact of the associated LR relay will also be connected to the top 2 contact of all LR relays on the line link frame due to the cross. The controller circuit will recognize this condition as two simultaneous calls resulting in the operation of LT5 and LT6 relays. When line selection is completed by the operation of relay LE the LT5 relay will remain operated while the LT6 relay will release due to the chain circuit through the LT relays. The HM5 lead will be grounded through contacts of the operated LT5 relay resulting in the operation of the vertical file 5 line hold magnet associated with the column and horizontal line group in which the subscriber line relay is operated. The RE relay will be held operated through the operated LT5 relay contacts and the cross from 2 top to 4 top of the operated LR relay to ground from the operated line relay. Failure of the RE relay to release will block the line link controller circuit.

5.10 Determine the number of the operated LT relay when the line link controller blocks. This will indicate one of the crossed LR leads. Normal service may be restored to all but ten per cent. of the subscribers on the line link frame in trouble by insulating the LE relay contacts in the operating path of the LT relay determined above and the 1-2 contacts of all line hold magnets corresponding to the LT relay affected, in the approved manner.

Trouble (e) - Contact Grounded - Individual LT Lead

5.11 This trouble condition affects service to a maximum of nine subscriber lines associated with a particular horizontal group and column, i.e., a false ground on the contact of any LR relay associated with the number 0 LT lead will result in denying outgoing service to subscriber lines on vertical files 1 to 9 inclusive associated with the LR relay in trouble. A false ground on the contact of any LR relay associated with the number 1 LT lead will result in denying outgoing service to subscriber lines on vertical files 2 to 9 inclusive associated with the LR relay in trouble, etc. This trouble condition will cause the line link controller circuit to operate in a manner similar to that described in 5.07.

5.12 The particular lead in trouble may be determined by observing the operated LT, V and HG relays when the line link controller

blocks. The line link controller may be restored to normal operation by insulating the particular LR relay contacts as determined from the above information.

Trouble (f) - Contact Grounded - Multiple LR Lead

5.13 This trouble condition affects calls originated in column 0 to a greater or less extent depending upon the particular lead that is grounded, the greatest number of calls being affected when the lowest numbered LR lead is grounded. Outgoing service will be denied subscribers served from columns other than 0. The line link controller will operate in a manner similar to that described in 5.03.

5.14 The LR lead associated with the grounded contacts may be identified by testing terminals 40 to 49 inclusive, on the terminal strip adjacent to the AC relay, when the line link controller is idle.

6. SUGGESTED PROCEDURE FOR LOCATING AND CLEARING TROUBLE

6.01 Trouble conditions caused by crosses or false grounds on LR relay contacts, the associated wiring or equipment, may be located by inspections or tests made in conjunction with an analysis of the particular trouble condition as outlined in this section. Analysis of a particular trouble condition may be made by making a record of certain of the line link controller relays that are operated when a time-out occurs as shown below:

<u>RELAYS OPERATED</u>			
<u>HG-</u>	<u>V-</u>	<u>LT-</u>	<u>RE</u>
3	0	5	UP
4	0	5	UP
2	0	5	UP
4	0	5	UP
3	0	5	UP

This series of readings indicates that the LR5 lead is in trouble and may be due to crossed individual and common contacts on a particular LR relay or a ground on the common LR5 lead. By blocking the LT5 relay non-operated the line link controller may be caused to function as for an AP alarm until the trouble condition is cleared. It may be necessary to disconnect the LR5 lead temporarily at the various locations of its multiple appearance (see Fig. 1) while attempting to isolate the trouble condition. If the trouble condition clears while testing or the LR5 lead is proven clear of ground the condition was probably caused by crossed contacts on an LR relay (in this case top 1 and 2 as shown on Fig. 1). Test the top 1 and 2 contacts on all LR relays to determine if a cross exists.

<u>RELAYS OPERATED</u>			
<u>HG-</u>	<u>V-</u>	<u>LT-</u>	<u>RE</u>
0	6	5	UP
0	6	5	UP
0	6	5	UP

This series of readings indicates that the LT5 lead is grounded or crossed to some higher numbered LT lead in the group of lines in column 6, horizontal group 0.

<u>RELAYS OPERATED</u>			
<u>HG-</u>	<u>V-</u>	<u>LT-</u>	<u>RE</u>
3	4	5	UP
2	1	5	UP
1	3	5	UP
0	6	5	UP

This series of readings indicates a cross between two LR leads involving LR5. Check for a cross by testing terminals 40 to 49 inclusive on the terminal strip adjacent to the AC relay.

7. TROUBLE CONDITIONS CAUSING REACTIONS MAY BE LISTED BELOW

- 7.01 Top 1 and 2 contacts on LR relay serving horizontal group 0, column 0 crossed in pile up.
- 7.02 Bottom 9 and 10 contacts on LR relay serving horizontal group 0, column 6 crossed by solder.
- 7.03 Top 1 and 3 contacts on LR relay serving horizontal group 0, column 6 crossed by wire clipping.
- 7.04 Top 2 and 4 contacts on LR relay serving horizontal group 9, column 6 crossed by metallic sliver.
- 7.05 Bottom 1 contact on LR relay serving horizontal group 9, column 6 crossed to mounting plate by excess solder.
- 7.06 Bottom 2 contact on LR relay serving horizontal group 0, column 0 grounded to mounting plate by wire clipping.
