ALARMS - METHOD OF TRACING
740E PBX

1. GENERAL

1.01 This section outlines methods which may be used in locating troubles causing alarm signals at No. 740E PBXs.

1.02 Three supervisory alarm lamps and keys are provided in the jack panel of the manual switchboard. In addition there is an audible signal (AUX) which gives an indication when any of the lamps are lighted. The audible signal may be silenced by operating the key associated with the lighted lamp (PS-AL), (FR-AL) or (PWR-AL). At installations without a manual switchboard, equivalent supervisory equipment is installed in the switch room.

1.03 The alarms provided are as follows:

Supervisory Alarm Lamp	Frame Alarm Lamp	Indication
FR-AL	FA (Red)	Fuse Alarms
	R MAG (Green)	Release Magnet Alarm
	C BLK (Red)	Call Blocked Alarm
	S (Red)	Start Lead Grounded Alarm
	C (White)	Chain Circuit Trouble Alarm
PS-AL	PS (White)	Permanent Signal Alarm
PWR-AL	ALM (White)	High-low Voltage and Fuse Alarm
	RING FAIL (White)	Ringing Failure Alarm

Note: When a 552-type PBX is used as the manual switchboard, the alarm for the switchboard fuses also appears in the jack panel.

2. APPARATUS

2.01 Test Receiver, No. 716E, connected to a W2AB Cord equipped with two No. 360A Tools (2W21A Cord) and two KS-6278 Connecting Clips, or equivalent.

2.02 No. 258C, D, or E Plugs, as required.

2.03 No. 477A (Make Busy) Tools, as required.

2.04 No. 1011G Dial Hand Test Set equipped with a 2W39A Cord Assembly consisting of a W2CL Cord, a No. 471A Jack, and a No. 240A Plug with terminals 3 and 4 strapped, or equivalent.

2.05 Lamp Socket, No. 38B, equipped with a No. 2Y (or 2T) Lamp, or equivalent (optional).

3. SWITCH FRAME FUSE ALARM

3.01 This alarm is normally caused by the operation of a fuse on a fuse panel of a line or selector frame.

Note: The operation of the fuse on the No. 15A fuse block will disable the fuse alarm but will bring in the FR alarm.

3.02 Observe whether a fuse is actually operated. If the bead end of a coil spring type fuse is displaced to either side so that it does not rest on the face of the fuse, the alarm spring may be making contact with the alarm bar. In this case reset the coil spring and retire the alarm.

3.03 If a fuse is operated, note which circuit obtains its battery through this fuse.

3.04 Attempt to replace the fuse with a fuse of the proper capacity. If the fuse does not operate, test the associated circuit equipment. If no cause for the fuse operating is found, make a record of the circuit so that any repetition of the trouble may be noted.

3.05 If the fuse operates, the associated circuit should be made busy. Make a visual inspection of the equipment to determine the cause of the trouble. If no cause for the fuse operating is apparent, test the battery feeder for ground by momentarily connecting the test receiver across the fuse posts. Do not place the receiver directly over the ear. If a ground is indicated, open the battery feeder at approximately the mid-point. Again test the circuit to see if the ground has been removed by momentarily reconnecting the test receiver across the fuse posts. If a loud click is heard, it indicates that the ground is between the fuse post and the point at which the circuit was opened. By further division of the circuit isolate the point that is grounded.

Note: The use of a No. 38B lamp socket where its cord length will permit observation of the lamp from the work location may eliminate the repeated use of the test receiver. Connecting the test lamp across the fuse posts of the circuit in trouble will light the lamp from the foreign ground. By observing the lamp during the inspection period and while manually operating relays or opening contacts on the equipment the location of the fault may be determined without opening the battery feeder. Should opening the battery feeder become necessary, the test lamp will remain lighted as long as the ground is between the lamp and the point opened on the battery feeder and will be extinguished when the location of the ground has been passed or the grounded condition cleared.

3.06 When the trouble has been cleared replace the fuse, remove the busy, and test the circuit for proper operation.

Release Magnet Alarm

3.07 This alarm is caused by the failure of a switch to release, usually because of wipers becoming snagged, interference with wiper cords, or insufficient tension in the shaft spring.

3.08 Note frame and side of frame indicated by the alarm lamp.

3.09 Remove the relay cover from the RM and/or RLS relays and note which relay is operated.

3.10 Inspect the switches associated with the operated RM or RLS relay. If the cause of the alarm is not apparent from inspection of the switch wipers and cords, remove the covers from switches which are off normal until a switch is found with the release magnet operated.

3.11 When the switch responsible for the alarm is found, restore it to normal by hand. This should retire the release alarm.

3.12 Make the switch busy and determine the reason for the switch not restoring. When the trouble is cleared restore the switch to service.

Note: The procedure in 3.09 may be omitted when the number of switches is small. The switch causing the alarm may release before it has been located, hence the procedure in 3.09 reduces the inspection to 5 or 10 switches.

Call Blocked Alarm

3.13 This alarm is caused, after a predetermined interval, by the continued operation of a G relay in the start circuit for a subgroup of line circuits.

3.14 Observe that the TST key located on the jack panel of the line frame is in the normal position. Remove the relay cover from the group, subgroup, and alarm equipment and note in which subgroup the G relay remains operated.

3.15 If the line finders are hunting and restoring, remove the cover from the L relays in the subgroup associated with the operated G relay. Then observe whether an L relay in this subgroup is electrically operated, held operated because

of a sticky armature or pole piece, or if only its 1T and 2T contacts are closed. Release and block the L relay unoperated or insulate the 1T and 2T contacts and the finders should stop hunting. Investigate the reason for the CO relay not operating, or for the L relay not releasing, as the case may be.

3.16 If the line finders are not hunting and are not all busy, observe whether the first choice finder in the subgroup is on a line. If so, insert a 258-type plug into the test jack of this line finder, and observe whether the next choice finder starts and finds the line. If the second choice line finder finds the calling line, the trouble is in the first choice line finder. Remove the cover from this finder and operate the A relay manually and observe that the switch steps properly. If the stepping circuits function properly remove the 258-type plug from the test jack and operate the G relay in the start circuit for the subgroup which should cause the line finder to operate. If the line finder does not start, temporarily block the G relay operated and observe whether the A relay of the line finder is operated. If the A relay is normal, investigate the reason for it not operating from a ground on the start lead.

3.17 If the first choice line finder in the subgroup is on a line and the D relay is operated, follow the procedure described in 3.16 on the next choice line finder which normally would hunt for the line.

3.18 If all the line finders are busy, monitor on each finder in turn, using the dial hand test set with the switch in MON position. If an off normal line finder is found where no conversation, ringing, or busy tone is heard, investigate the reason for this condition, and release the line finder.

Start Lead Ground Alarm

3.19 This alarm may be caused by the start lead becoming grounded because of circuit trouble.

3.20 If the line finders are not hunting and are not all busy, momentarily operate the AR key and observe whether the alarm is retired. If the alarm is retired the trouble may be caused by improper adjustment of the relays in the start lead circuit. Inspect the equipment, including the group alarm relays, to determine the cause and record the result of the inspection so that any repetition may be noted.

3.21 If the line finders are hunting, remove the cover from the group alarm relays and while observing the finders, manually operate the C1 relay momentarily. This will release the D relays of the idle line finders and cause the idle line finder nearest the ground to start hunting. Insert a 258-type plug into the test jack of this finder and observe whether the other finders stop hunting.

3.22 If hunting stops, the ground may be in this finder circuit. Again operate the C1 relay momentarily. If this line finder starts to hunt with the 258-type plug in the test jack, the ground is on the "in" portion of the circuit between the test jack and the A relay winding (see a Fig. 1). Inspect this portion of the start lead circuit; the trouble should be cleared immediately.

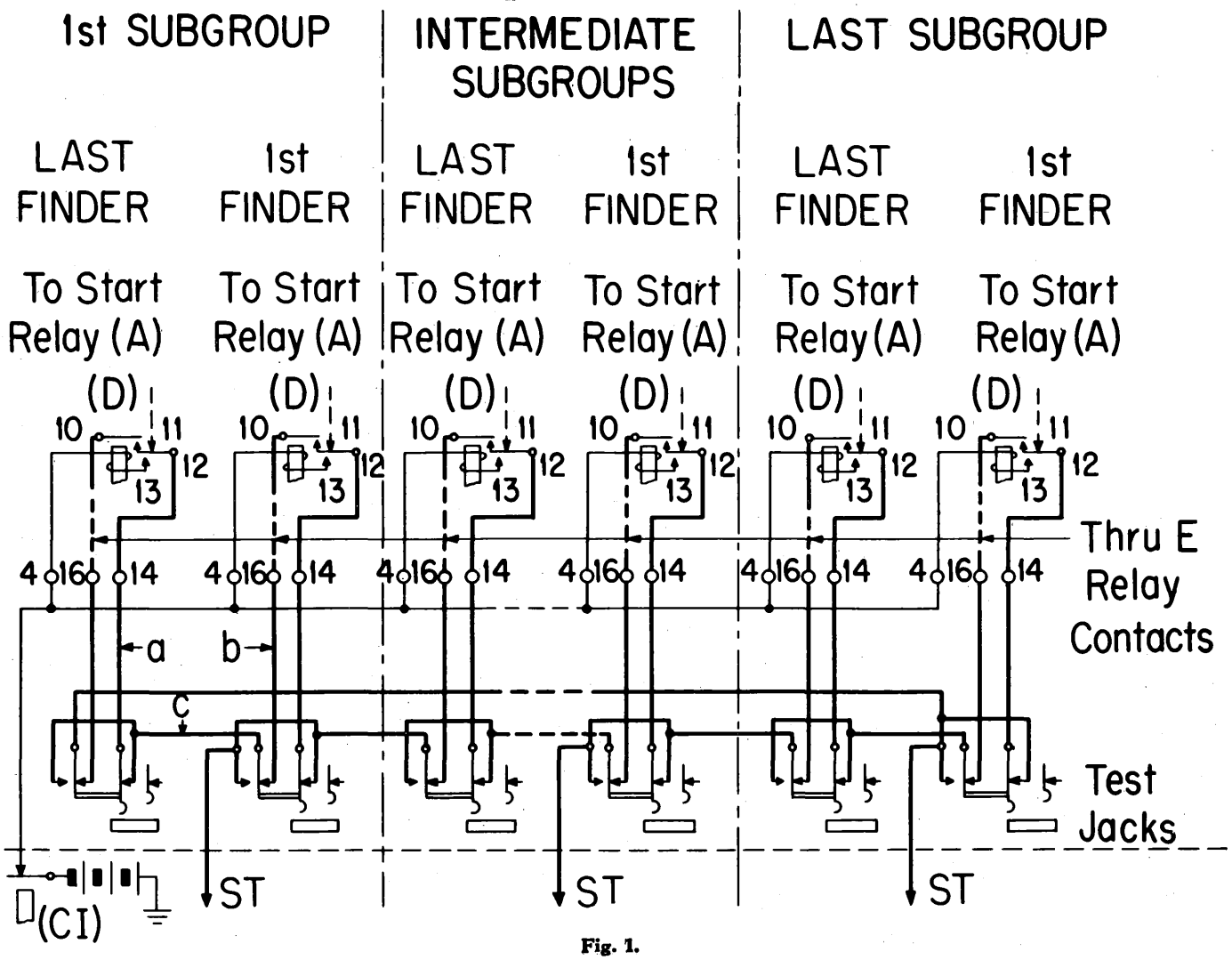

Fig. 1.

3.23 If the switches continue to hunt after inserting the 258-type plug into the test jack of the first finder to start after operating the C1 relay, remove the plug from the test jack and insert it into the test jack of the preceding line finder of the same or preceding subgroup. If the switches stop hunting the ground is on the "out" portion of the start lead circuit between the D relay and the test jacks (see b Fig. 1).

3.24 Repeat this operation of plugging and unplugging the test jacks of each preceding line finder working in a direction opposite to their normal selection until a jack is reached where the insertion of the plug causes hunting to stop.

3.25 If the switches continue to hunt after the plug is inserted into the test jack of the last finder in the group, remove the plug and proceed as in 3.21 and observe whether the same finder starts. (The ground may have been advanced through a busy switch on the original test.) Remove the cover of this switch and insulate contact 12 from 11 and 13 of the D relay. With one clip of the test receiver connected to the equipment end of a battery fuse, touch the other lead to contact 12 of the D relay. If a click is heard the ground is between the test jack of this finder and the test jack of the preceding finder of the same subgroup (see c Fig. 1). If the finder is the first finder in a subgroup, the ground may be on the ST lead of the subgroup toward the G relay or toward the test jack of the last finder of the preceding subgroup.

Note: It should be remembered that if the preceding switch is busy, or there is a plug in its test jack, the ground may be advanced from some other preceding switch or test jack.

Chain Circuit Trouble Alarm

3.26 This alarm is caused by the multiple chain circuit becoming grounded or crossed with battery.

3.27 Determine whether the S or CH relay in the group alarm circuit is released. If the S relay is released and the CH relay operated, there is a foreign ground on the multiple chain leads of the group alarm circuit. If the CH relay is released and the S operated, there is foreign battery on the multiple chain leads.

3.28 Insert 258-type plugs into all of the line finder test jacks in the group regardless of whether the switches are busy or idle and observe whether the alarm is retired. Immediately remove all of the plugs to prevent interference with service.

3.29 If the inspection in 3.27 found the CH relay released and the alarm was retired when plugs were in all of the test jacks a battery cross exists between the CH relay and the test jacks, or in the strapping between jacks. If the alarm was not retired under the aforementioned conditions, the battery cross may be on one of the individual leads between the test jack and (or in) its D relay contacts, or on the common wire strapping at the switch jacks or the lead toward the S relay.

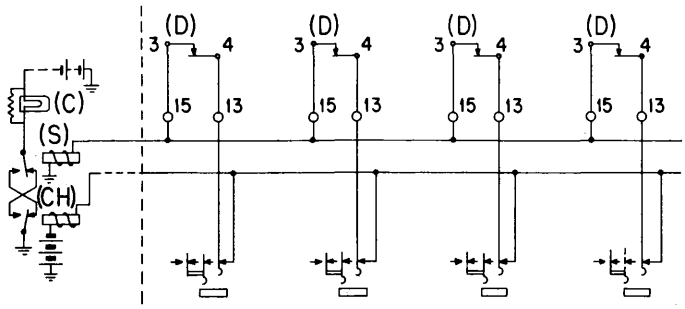

Fig. 2.

3.30 If the inspection in 3.27 found the S relay released and the alarm was retired when plugs were in all of the test jacks, a ground cross exists between the S relay and the test jacks. If the alarm was not retired under the aforementioned conditions, the ground is between the test jacks and the CH relay.

3.31 If the trouble is indicated between the test jacks and the S relay, proceed as follows to determine if the cross is in one of the switches. Insert a 258-type plug into a line finder test jack and while the plug is in the jack and the associated finder is normal, using a No. 477A tool, momentarily short-circuit the monitoring jack of the line finder under test and observe whether the alarm is retired. If the alarm is retired, the cross is indicated to be between the D relay and the test jack of the line finder under test.

Caution: Do not short-circuit the monitoring jack of a line finder which is off normal. Plugging into the test jack alone in this case, satisfies the condition of the test.

3.32 Inspect that portion of the chain circuit wiring which appears to indicate a cross and correct the condition. The alarm lamp should be extinquished when the trouble has been cleared.

Permanent Signal Alarm

3.33 This alarm occurs after a predetermined interval, when an extension user fails to dial after removing the hand set from its mounting to make a call or when an extension line becomes grounded or crossed, or when a called party fails to replace the hand set on its mounting at the conclusion of a call. It may also occur when an extension user with a wiring plan inadvertently places a hold condition on a line, or where vibration or a sudden jar may falsely operate the hold relay.

3.34 On successive selector-connectors or selectors which are normal, lift the shaft upward. On idle selectors or selector-connectors a click caused by the operation of the release magnet will be heard when the off-normal springs make contact.

3.35 When a switch is located on which no click is heard go to the associated line finder. If the permanent has not cleared in the meantime, the associated line finder will be found connected to a terminal. Connect the hand test set to the monitor jacks and challenge. If no response is received, listen for background room noises which would indicate that the hand set is off its mounting.

3.36 Record the extension number and attempt to have the hand set replaced by having the PBX attendant call a nearby extension, or by dialing a nearby extension, if known.

3.37 If no evidence of a hand set off its mounting is apparent, ask the attendant to place an idle back or right cord plug into the extension jack and then release the line finder. The alarm should be retired unless there is another permanent.

3.38 The extension line(s) causing the alarm should be investigated for a possible hand set off mounting or a cross or ground on the extension loop.

3.39 The method described in 3.34 may cause the release of a permanent caused by a holding relay of a wiring plan. Where the amount of permanents appears to be excessive it may be desirable to take remedial action at these stations, such as relocating the equipment to prevent false operation of the hold relay or reinstructing the customer in the operation of keys. As the method described in 3.34 may also release the line finder, the extension causing the permanent can not be traced. At these installations proceed as in 3.40.

3.40 Connect one clip of the No. 38B lamp socket to battery at the equipment end of a convenient fuse or to a test battery terminal and touch the other clip to spring number 3 of the test jack on each normal selector or selector-connector until one is found which lights the test lamp.

3.41 Proceed as in 3.35 to 3.38. The lighted lamp satisfies the no click condition in 3.35.

4. POWER ALARMS

4.01 This alarm is usually caused by a failure of the power supply, a rectifier tube failure, operation of a service, charge, or discharge fuse or any other fuse associated with the power circuit, failure of the ringing machine, where provided, to start or generate, or the battery voltage exceeding its high or low float limits.

4.02 If the power plant is equipped with lamp signals the lamp designation will indicate the trouble.

High-Low Voltage Alarm

4.03 This alarm (ALM) usually occurs when the battery voltage has reached the high or low limit at the power plant.

4.04 Check the battery voltage. If the voltage is low verify that the trouble was not caused by power service failure or by operated line fuses or switches. Replace operated fuse with good fuses of the proper capacity or restore switches to supply power to the rectifier. Inspect the rectifier in accordance with the Bell System Practices which cover troubles which may be experienced with these rectifiers.

Charge, Discharge or Distributing Fuse Alarms

4.05 These alarms (ALM) are usually caused by the operation of a fuse on a battery distributing panel, on the control panel, or on the fuse panel of the equipment unit.

4.06 Replace the blown fuse and then replace the associated alarm fuse (when provided) with good fuses of the proper capacity. The replacement of these fuses should retire the alarm.

4.07 If the fuse again operates, the cause of the trouble should be investigated immediately.

Ringing Failure Alarm

4.08 This alarm (RING FAIL) is usually caused when the ringing machine, when provided, fails to start or generate.

4.09 Observe whether the ringing machine is running or is idle. If a reserve ringing machine is available, place it in service in the regular manner and note if the alarm is retired.

4.10 If the procedure in 4.09 retires the alarm, or when no reserve machine is available, the machine which contributes to operation failure should be thoroughly inspected. Check the ringing brushes to see if they fit properly and that the interrupter drum is clean and not burned excessively. After the trouble has been corrected, place the ringing machine in service and note that the alarm does not reappear.

4.11 If the ringing machine appears to be functioning properly, investigate to see whether any fuses in the ringing supply circuit are operated. Also check the ringing transformer circuit.

4.12 If the ringing machine is not running, observe the operated and non-operated positions of the ringing machine start relays to determine the reason for the ringing machine not starting.

Caution: Under no circumstances should the (1A), (2A), or (2B) relays be operated by hand when the ringing machine is plugged in as such operation may result in severe arcing at contacts.