



**SECTION 543-020-310**

Power Alarm Cabinet Lamp Signal		Indication	Method Reference
Color	Designation		
White	48V H-L	High, Low and Floating Alarms..	(A)
White	BDFP	Charge, Discharge or Distributing Fuse Alarms.....	(B)
	MDF	Charge, Discharge or Distributing Fuse Alarms.....	(B)
	CHG & DISCHG	Charge, Discharge or Distributing Fuse Alarms.....	(B)
White	RP TRNS	Ring Machine Transfer Alarm	(C)
White	R1	Machine Ringing Alarm.....	(D)
White	AHM	Ampere Hour Meter Alarm.....	(E)
White	BT	Busy Tone Alarm.....	(F)
White	DT	Dial Tone Alarm.....	(F)

**TABLE 2.**

**2. APPARATUS**

- 2.01 Test Receiver (No. 528 or equivalent) equipped with Cords and Clips.
- 2.02 Dial Hand Test Set equipped with a No. 2-CB Dial and a No. 240-A Plug or a No. 240-F Plug with lamp omitted. The test plug should have terminals 3 and 4 strapped.
- 2.03 No. W1G Cord equipped with a No. 240-F Plug and a No. 2-Y (or 2-T) Lamp. One terminal of the lamp should be connected to the cord and the other to the sleeve spring of the No. 240-F Plug.
- 2.04 No. 258-A Plugs, as required.
- 2.05 Orange Sticks KS-6320, as required.
- 2.06 No. 375-A Make-busy Tools, as required.

**3. POWER ALARMS**

**(A) High, Low and Floating Alarms**

- 3.01 This alarm usually occurs when the battery voltage has reached the high, low or floating limit.
- 3.02 Operate the 48V or FLOAT GD key, where provided in the power alarm cabinet, to retire the alarm. The floating guard lamp should then light.
- 3.03 Check the actual battery voltage. If the voltage is low check that the trouble was not caused by power service failure or by blown A.C. line fuses. If fuses are blown, replace with fuses of the proper capacity. Inspect the motor or motor control apparatus or rectifiers which may contribute to operation failure to see that no trouble condition exists. See that the charging circuit is connected to the battery and is charging at the proper rate. If the voltage is high, reduce the charging rate or discontinue the charge.
- 3.04 When the trouble has been cleared and the charging current is regulated as required to maintain the voltage within the required range, the guard lamp, where provided, should be extinguished.
- 3.05 Restore the 48V or FLOAT GD key, where provided in the power alarm cabinet, to normal.

**(B) Charge or Discharge or Distributing Fuse Alarms**

- 3.06 These alarms are usually caused by the operation of a charge or discharge fuse on a battery distributing fuse panel or on the battery control panel.
- 3.07 Replace the blown fuse and then replace the associated alarm fuse (when provided) with new fuses of the proper capacity. The replacement of these fuses should retire the alarm.
- 3.08 If the fuse operates again, the cause of the trouble should be investigated immediately.

**(C) Ringing Machine Transfer Alarm**

- 3.09 This alarm usually occurs when the ringing control circuit transfers from the line driven ringing machine to the battery driven emergency ringing machine.

3.10 Operate the guard key (when provided) which should retire the alarm and light the RP GD lamp in the power alarm cabinet.

3.11 If the transfer has been caused by a power service failure, see that the transfer to the line driven ringing machine is made when the power service is restored and note that the RP GD lamp is extinguished.

3.12 If the trouble has not been caused by a power service failure, check the A.C. line fuses and if blown replace with fuses of the proper capacity. If the fuses operate again, the motor or motor control apparatus which may contribute to operation failure should be thoroughly inspected.

**(D) Machine Ringing Alarm**

3.13 This alarm is usually brought in due to a failure in the ringing current during the ringing period or by the tripping battery during the silent period.

3.14 Start the idle ringing machine in the regular manner and transfer all ringing and tone switches to the machine just started. Note whether the alarm is retired.

3.15 Should the above procedure fail to stop the alarm, check to see whether the alarm lead fuse or ringing lead fuse is operated. A further check, if necessary, of the machine and associated wiring should be made in order to locate the trouble. After the trouble has been corrected, the alarm should be retired and the regular ringing machine placed in service again.

3.16 If the procedure outlined in 3.14 retires the alarm, the ringing machine which contributes to operation failure should be thoroughly inspected. Check the ringing brushes to see whether 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 again. Note that the alarm does not reappear.

**(E) Ampere-Hour Meter Alarm**

3.17 This alarm indicates that the battery is discharged about 35 per cent. of its capacity.

3.18 Operate the AHM GD key in the power alarm cabinet, which should retire the alarm and light the AHM GD lamp.

3.19 Check that trouble was not caused by power service failure or A.C. line fuses blown and if fuses are blown replace with fuses of the proper capacity. Inspect the power apparatus to see that the charging circuit is connected to the battery and is charging at the proper rate. If necessary, increase the charging rate.

3.20 When the trouble has been cleared and the battery has been charged above the alarm range, the AHM GD lamp should be extinguished. Restore the AHM GD key to normal.

**(F) Busy or Dial Tone Alarms**

3.21 This alarm indicates when a low tone failure has occurred at the low speed interrupter on the ringing machine or its associated circuits to the distributing fuse panel at which point the alarm relay is connected.

3.22 Start the idle ringing machine in the regular manner and transfer all ringing and tone switches to the machine just started. Note whether the alarm is retired.

3.23 Should the above procedure fail to stop the alarm, check to see whether the alarm lead fuse or busy or dial tone lead fuse is operated. A further check, if necessary, of the connections and wiring of the tone repeating coil and associated wiring should be made in order to locate the trouble. After the trouble has been corrected, the alarm should be retired. The regular ringing machine should be placed in service again.

3.24 If the procedure outlined in 3.22 retires the alarm, the ringing machine which contributes to operation failure should be thoroughly inspected. Check that the busy or dial tone interrupter brushes are clean and that the tension spring is properly latched and the correct brush tension applied. After the trouble has been corrected, place the ringing machine in service again. Note that the alarm does not reappear.

**4. FUSE ALARMS****(G) Switch Frame, Relay Rack, Office Alarm Frame, Etc., Alarms**

- 4.01 These alarms are usually caused by the operation of a fuse on a fuse panel associated with a switch frame, relay rack, office alarm frame, traffic register frame, etc.
- 4.02 Observe whether a fuse is actually operated. If the bead end of a coil spring of a 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 resetting the coil spring should retire the alarm.
- 4.03 If a fuse is operated, note which circuit obtains battery from this fuse.
- 4.04 Attempt to replace the fuse with a good fuse of the proper capacity. If the fuse does not operate again, test the associated apparatus and make a record of the circuit so that any repetition of the trouble may be noted.
- 4.05 If the fuse operates again, make the associated circuit busy. Then 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 with the test receiver. If the ground is not removed open the battery feeder associated with the fuse at approximately the midpoint. Then test the circuit to see if the ground has been removed, by momentarily connecting the test receiver across the fuse posts. If a loud click is heard it is an indication that the ground is between the fuse and the point at which the circuit was opened. By further division of the circuit, isolate the point that is grounded.
- 4.06 Remove the ground, close all connections that were opened and again test for ground on the complete circuit.
- 4.07 Replace the fuse, test the apparatus and restore it to service.

**5. CIRCUIT ALARMS****(H) Call Blocked Alarm**

- 5.01 This alarm is caused, after a predetermined interval, by the continued operation of a line finder G relay.
- 5.02 Note that the TST key associated with the group of line finders is normal. Remove the relay cover on the group, subgroup and alarm relay equipment and note the subgroup in which the G relay remains operated.
- 5.03 If the line finders which are first choice to this subgroup are hunting and restoring, remove the relay cover from the line relays in the subgroup. Then check whether an L relay in the subgroup is actually operated or held up due to stickiness. If an L relay is operated, release and block it normal and the line finders should stop hunting. Check the reason for the CO relay not operating, or the L relay not releasing when the CO relay operates, as the case may be.
- 5.04 If all line finders are busy, monitor on each line finder, using the dial hand test set. If conversation, ringing induction or busy signal is heard, disconnect the dial hand test set and proceed to the next operated line finder. If an operated line finder is found where no conversation, ringing induction or busy signal is heard, check the reason for this condition and restore the line finder to service.
- 5.05 If the line finders are not hunting and are not all busy, note whether the first line finder in the subgroup is on a line. If it is not on a line, note the condition of the A relay. If the A relay is operated, check why the line finder does not step vertically. If the A relay is normal, check why it does not operate from a ground on the start lead.
- 5.06 If the first line finder in the subgroup is on a line and the D relay is operated, follow the procedure described above on the line finder which normally would hunt for the line.

**(I) Start Lead Ground Alarm**

- 5.07 This alarm may be caused by the start lead becoming grounded due to circuit trouble.
- 5.08 If the switches are not hunting and are not all busy, momentarily operate the AR key and note whether the

alarm is retired. If the alarm is retired, the trouble may be due to improper adjustments of the relays in the start lead wiring. Make an inspection of the equipment to determine the cause and record the trouble so that any repetition may be noted.

5.09 If the switches are hunting, determine whether the trouble is in one of the switches by inserting a No. 258-A plug into the test jack of a switch and noting whether the switches stop hunting. If the switches continue to hunt, remove the plug from the test jack and insert it in the test jack of another switch.

5.10 Repeat this operation until the point is reached where the insertion of the plug into the test jack of a switch causes hunting to stop.

5.11 If the switch stops hunting, inspect the start lead relay contacts and wiring of this switch for the ground. The trouble should be cleared immediately.

5.12 When the trouble has been cleared and the switch is again ready for service, remove the No. 258-A plug from the test jack and operate the FDR ST TST key and note that the switches operate and release properly through at least one cycle. Then restore the key.

5.13 If the switches continue to hunt at the time the last switch of the group is tested according to 5.09, remove the plug from the test jack and proceed as follows: Open the start lead at two switches which are widely separated from each other in the circuit, such as, switches 1 and 10 in a group of 20 switches or switches 1 and 15 in a group of 30 switches. The start lead may be opened by insulating the springs of the D relay at both switches.

5.14 Hold the vertical off-normal springs normal or insulate the contact springs of the switches mentioned in 5.13. This prevents the operation of the D relay. If the A relay remains operated, the trouble is on the start lead extending through preceding switches of the group. If the A relay is not operated, the trouble may lie in the circuit through succeeding switches.

5.15 After determining the direction in which the trouble lies remove the insulation from the springs of the D relay of the switch from which the test in 5.14 was made to close the start circuit through this switch.

5.16 Select a switch in the direction of the trouble and open the start lead by insulating the springs of its D relay.

5.17 Proceed to locate the ground as in 5.14.

5.18 Proceed as in 5.15 to 5.17 until the trouble is isolated between two switches. Examine the wiring in detail for the ground or cross which may be responsible for the trouble.

5.19 Clear the circuit of the ground and restore the D relays to normal.

5.20 Operate the AR key momentarily to retire the alarm.

5.21 Operate the FDR ST TST key and note that the switches operate and release properly through at least one cycle. Then restore the key.

**(J) Chain Circuit Trouble Alarm**

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

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

5.24 Insert No. 258-A plugs in all of the test jacks of the line finders in the group, regardless of whether they are busy or idle and note whether this retires the alarm. Immediately remove all these plugs in order to avoid interference with service.

5.25 If the alarm was retired when the plugs were in all the test jacks and the previous inspection of the S and CH relays indicated a battery cross, the trouble lies between the test jacks and the CH relay. If the alarm was not retired and a battery cross was previously indicated, the trouble lies between the test jacks and the S relay. If the alarm was retired when the plugs were in all the test jacks and the previous inspection indicated a ground cross, the trouble lies between the test jack and the S relay. If the alarm was not retired and a ground cross was previously indicated, the trouble lies between the test jack and the CH relay.

5.26 If the trouble is indicated between the test jacks and the S relay, it is desirable to determine if the trouble may be in one of the switches, as follows: Insert a No. 258-A plug into each line finder test jack in succession and while the plug is in the test jack, if the associated line finder is normal, momentarily short-circuit the monitoring jack of that line finder. If the alarm can be retired by these operations the trouble is indicated to be between the D relay and the line finder test jack.

**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.**

5.27 Inspect the portion of the chain circuit wiring indicated by the above tests as being in trouble, and correct the condition.

5.28 The alarm lamp should be extinguished when the trouble has been cleared.

#### (K) Release Alarm

5.29 This alarm is caused by the failure of a switch to release due usually to wipers becoming snagged, interference with wiper cords, or lack of tension in the shaft restoring spring.

5.30 If the cause of the alarm is not apparent from inspection of the switch wipers and cords in the group affected, remove the covers from switches which are off-normal until a selector is found with the D relay normal or the connector with the A and D relays normal or the regular line finder with the F relay normal, or the restricted service line finder with the B relay normal.

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

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

#### (L) Permanent Signal Alarm

5.33 This alarm occurs after a predetermined interval, when an extension user fails to dial after removing the receiver from the switchhook or the extension line becomes grounded or crossed, or when a calling or called party fails to hang up the receiver at the conclusion of a call.

#### Selectors

5.34 Connect the lamp and cord described in 2.03 to the 48-V battery terminal on the connecting block and insert the No. 240-F plug of the test cord into the test jack of normal selectors on the shelf in which a permanent is indicated by the lighting of the PERM lamp. When the permanent switch is located it will be indicated by the lighting of the lamp connected to the cord.

5.35 Monitor and challenge on the permanent selector and if no response is received, leave the hand set in the test jack and momentarily raise the shaft to an off-normal position. Note if the PERM lamp is extinguished.

5.36 If the associated shelf lamp is extinguished while the shaft is in an off-normal position, the indication is that there are no other permanents on the shelf. If, however, the shelf lamp again lights when the shaft is restored to normal, the indication is that there are permanents on other shelves in the supervisory group. If the shelf lamp is not extinguished by raising the shaft of the switch which is "permanent" another permanent exists on the same shelf.

5.37 When more than one permanent exists in a supervisory group, either in the same or different shelves, locate and record each permanent and attempt to extinguish the shelf lamp in the manner described in 5.35 to make certain there are no permanents on the same shelf. When all permanents in the supervisory group have been located, retire the group alarm by shorting the 3 and 4 springs of the test jack of each permanent switch with make-busy tools and then raising the associated switch shafts off-normal simultaneously. To assist in this operation it may be necessary to hold one or more shafts off-normal by placing an orange stick across the projections of the lower bank clamping plate in such a manner as to support the shaft. Each switch should be allowed to restore to normal before the make-busy tool is removed.

5.38 After locating the permanent switches go to the associated line finders. If the permanent has not cleared in the meantime, the line finder will be found in an off-normal position. Connect the hand test set to the monitor jacks of the line finder and challenge. If no response is received connect the test cord described in 2.03 to the 48-V battery terminal on the line finder frame. Apply the sleeve terminal of the No. 240-F plug to each of the sleeve wipers of the line finder at a point near the hub. If the lamp lights only when the plug is applied to the upper wiper, the indication is that the permanent line is in the upper finder bank. If the lamp lights only when the plug is applied to the lower wiper, the indication is that the permanent is in the lower bank.

5.39 Should the lamp light when contact is made on both sleeve wipers, remove the switch cover and note the position of the B and F relays for line finders not arranged for restricted service, or the E and B relays for restricted service line finders. If both are operated, the indication is that the permanent is in the upper finder bank. If the F and not the B relay is operated for line finders not arranged for restricted service or if the B and not the E relay is operated for restricted service line finders, the indication is that the permanent is in the lower bank.

5.40 Record the number of the line equipment associated with the line finder terminal to which the wipers are connected as permanent. The line finder terminal number can be determined by considering the units digits of the line finder number involved, as the tens digit of the line equipment number appearing on its first level, then counting in the regular manner to the level and line involved, as outlined in the following example.

Example: In tracing a permanent line signal, line finder, No. 8 is found to be operated to the fourth level and in to the fifth terminal. The line equipment to which the line finder is connected is determined as follows: Line finder No. 8 indicates that lines in the 80 series appear on the first level. Then counting up in the regular manner we find lines in the 90, 00 and 10 series appearing on the second, third and fourth levels respectively, and thus with the line finder connected to the fifth terminal of the fourth level, the line equipment number would be 15 in the bottom bank or 115 in the upper bank. The same numbers would obtain for line finders Nos. 18 and 28 with the same setup.

5.41 The extension line in trouble should be investigated for a possible receiver off hook or it should be put up on a test cord for testing extension lines and tested to determine the nature of the trouble. If the trouble is found to be a cross or ground on the extension loop, disconnect the loop at the frame and connect it to the test line until the trouble is cleared.

#### Connectors

5.42 When a calling or called party fails to hang up the receiver at the conclusion of a call the PERM lamp located on the connector shelf will be lighted after a predetermined interval.

5.43 Monitor on each off-normal connector on the shelf associated with the PERM lamp, using a dial hand test set. If conversation, ringing induction or busy signal is heard, disconnect the dial hand test set and proceed to the next operated connector until an operated switch is found where no conversation, ringing induction or busy signal is heard.

5.44 When this condition is found, operate the C button of the hand test set. If the PERM lamp goes out when the C button is operated, the indication is that the called line is permanent. If the PERM lamp does not go out when the C button is operated, the indication is that it is either a calling party permanent or there are other permanent switches on the shelf under inspection. In this latter event operate the C button of the hand test set at least twice. A permanent due to a called line will usually be indicated by the sound of the connector A relay operating. If the sound of the connector A relay is not heard the indication is that the switch is permanent due to the calling line.

5.45 When a called party permanent condition is detected, record the terminal number to which the switch is connected and release the connector in the following manner: Hold the shaft at its lower end with one hand so that it cannot rotate and apply an orange stick to the tip wiper with the other. Move the spring just sufficiently to open the contact and do not permit the wiper to come in contact with the bank terminal just below. After the operation of the release magnet is heard, remove the orange stick and immediately permit the shaft to restore to normal.

5.46 If a called party permanent cannot be released by opening the connector tip wiper contact, the usual indi-

cation is that the permanent is due to a selector-connector lock-up. In this event record the permanent as a selector-connector lock-up and proceed in accordance with such local instructions as may be in force regarding lock-ups. Where local instructions call for the release of the connector in the case of lock-ups, release the switch by opening both ring and tip wiper contacts simultaneously with the orange stick.

5.47 When a calling party permanent is detected, trace the connection back to the selector just preceding the connector. Monitor and challenge and if the train is still permanent, remove the switch cover and with the hand test set still connected to the test jack, step the wipers to the 11th rotary position by rapidly opening and closing the off-normal springs. This will release the connector and remove the busy condition on the called line, but the rest of the train will be held for tracing to the permanent line. The last selector being in the 11th rotary position will place a busy tone on the train which may be of assistance in tracing. Trace the connection back to the line finder terminal number and proceed in accordance with 5.38 to 5.41.

## 6. REPORTS

6.01 The required record of the alarms should be entered on the proper form.