TYPE N2 CARRIER TELEPHONE SYSTEM
TERMINAL EQUIPMENT
CHECK OF ALARM OPERATION

Relays on the bay cable terminating panel control the office alarms when the failure of fuses (−48V, +130V, and −130V), −21 volt supply, or received carrier occurs. It is the purpose of this section to check the operation of these relays as well as those associated with the alarm control circuit, by purposely causing certain failures so that the office alarms associated with the particular failure will operate.

In the check of alarm operation for fuse failure, the blown fuse simulation test is for a terminal bay containing eight terminals. The information given in this test should satisfy the requirements for partially equipped bays.

If, in the check of alarm operation for carrier failure, the K4 thermal relay should be found to require adjustment, the instructions given in SD-97116-01 should be followed.

The terminals of the carrier system under test do not have to be removed from service except for the check of alarm operation initiated by carrier failure. When this test is to be performed, both terminals (near and distant) must be removed from service.

Caution: When an alarm unit is removed from the terminal, it should be replaced as quickly as possible; since with it removed, the carrier failure indications and automatic trunk conditioning are disabled.

APPARATUS:

KS-14510, List 1 Volt-ohm-milliammeter (VOM) (20,000 ohms per volt), or equivalent
Hewlett-Packard 400D Vacuum Tube Voltmeter (VTVM)
P2DH Cord (used with VTVM)
KS-8585, List 9 H.B. Jones Plug, (wired as shown in Fig. 5)
265C Tool (contact burnisher)
266C Tool (steel music wire)

CHECK OF ALARM OPERATION FOR FUSE FAILURE

In this test the failure of fuses located on the bay cable terminating panel is simulated (see Fig. 1 and 2).

STEP	PROCEDURE
1	Place the 266C tool (steel music wire) in the 265C tool (contact burnisher) and the cap in place over the end of the 265C tool. Insert the wire through the opening of each fuse holder cap, beside the alarm indicating plunger, in such a manner as to touch the side of the opening and head of the fuse at the same time. This action simulates a blown fuse in that the local office alarms associated with the particular fuse will operate, but the operation of the equipment on the terminal bay will not be affected.

STEP	PROCEDURE
2	Apply the 265C and 266C tools to the following fuses: −48V, 1-1/3 Amp Even −48V, 1-1/3 Amp Odd −130V, 1-1/3 Amp Even −130V, 1-1/3 Amp Odd +130V, 1-1/3 Amp Even +130V, 1-1/3 Amp Odd ***Requirement 1:*** The ALM bay lamp on the bay cable terminating panel shall light. ***Requirement 2:*** All local office alarms associated with the terminal bay shall operate. If these requirements cannot be met, check relay K7 on the bay cable terminating panel.
3	Apply the 265C and 266C tools to the following fuses: −48V ALM (fuse numbers 1 through 8) −48V PWR (fuse numbers 1 through 8) −130V (fuse numbers 1 through 8) +130V (fuse numbers 1 through 8) ***Requirement 1:*** The ALM bay lamp shall light. ***Requirement 2:*** All local office alarms associated with the terminal bay shall operate. If these requirements cannot be met, check relay K8 on the bay cable terminating panel.
	CHECK OF ALARM OPERATION FOR REMOVAL OF ALARM UNIT
1	Remove the alarm unit from its terminal mounting (see Fig. 3). ***Requirement 1:*** Lamp ALM U RMV on the miscellaneous jack and alarm panel shall light (see Fig. 4). ***Requirement 2:*** The bay lamp ALM on the bay cable terminating panel shall light. ***Requirement 3:*** The associated local office alarms shall operate. If these requirements cannot be met, check relay K10 on the miscellaneous jack and alarm panel and relay K8 on the bay cable terminating panel.
2	Manually operate key ALM RLS on the miscellaneous jack and alarm panel to the vertical position. ***Requirement 1:*** Lamp ALM U RMV shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The associated office alarms shall cease to operate. If these requirements cannot be met, check relay K10 and key ALM RLS on the miscellaneous jack and alarm panel and relay K8 on the bay cable terminating panel, Fig. 1.

STEP	PROCEDURE
3	Insert the alarm unit back into the terminal mounting. ***Requirement 1:*** Lamp ALM U RMV shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall light. ***Requirement 3:*** The associated office alarms shall operate. If these requirements cannot be met, check relay K10 on the miscellaneous jack and alarm panel and relay K8 on the bay cable terminating panel, Fig. 1.
4	Return key ALM RLS on the miscellaneous jack and alarm panel to its normal position. ***Requirement 1:*** Lamp ALM U RMV shall extinguish. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The associated office alarms shall cease to operate. If these requirements cannot be met, check relay K10 on the miscellaneous jack and alarm panel and relay K8 on the bay cable terminating panel, Fig. 1.
	CHECK OF ALARM OPERATION FOR −21 VOLT FAILURE
1	Insert Jones plug into jack TST PWR on the alarm unit to simulate the loss of −21 volts (see Fig. 5, 6, and 7). ***Requirement 1:*** Lamp −21V ALM on the alarm unit shall light. ***Requirement 2:*** The bay lamp ALM on the bay cable terminating panel shall light. ***Requirement 3:*** The associated local office alarms shall operate. If these requirements cannot be met, check relay K6 on the alarm unit and relay K9 on the bay cable terminating panel, Fig. 1.
2	Manually operate key 21V ALM RLS on the alarm unit to the vertical position. ***Requirement 1:*** Lamp −21V ALM shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The associated local office alarms shall cease to operate. If these requirements cannot be met, check relay K6 and key 21V ALM RLS on the alarm unit and relay K9 on the bay cable terminating panel, Fig. 1.
3	Remove the Jones plug from the jack TST PWR on the alarm unit. ***Requirement 1:*** Lamp −21V ALM shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall light. ***Requirement 3:*** The associated local office alarms shall operate. If these requirements cannot be met, check relay K6 and key 21V ALM RLS on the alarm unit and relay K9 on the bay cable terminating panel, Fig. 1.

STEP	PROCEDURE
4	Return key 21V ALM RLS to its normal position. ***Requirement 1:*** Lamp −21V ALM shall extinguish. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The associated local office alarms shall cease to operate. If these requirements cannot be met, check relay K6 and key 21V ALM RLS on the alarm unit and relay K9 on the bay cable terminating panel, Fig. 1.

CHECK OF ALARM OPERATION FOR CARRIER FAILURE

Caution: This test must be performed with the carrier system removed from service.

When a carrier failure occurs, the trunks are seized and made busy by the carrier group alarm circuit. However, the proper operation of the carrier group alarm circuit depends upon the timing of the two ground control signals it receives from the alarm unit. The timing of these control signals is executed by the thermal relay K4 in the alarm unit. The thermal relay K4 actually contains two relays: one on top, K4T; the other on the bottom, K4B.

Note: This test requires the coordinated action of personnel at both the near and distant terminals.

In this test, the thermal relays at both terminals of the system to be checked (near and distant) will be checked for proper timing. The timing of these relays for the both terminals will be performed at the near terminal. The transmitted carrier at the near terminal will be purposely interrupted, at which time the timing process shall begin. The timing will be continuous until the thermal relays of both terminals have completed their timing cycles. The total time is approximately 33 seconds. See the time and sequence charts of Fig. 8 and 9.

At the near terminal, a VTVM is used to monitor the received carrier at the output of the group receiving unit and a VOM (dc scale) is used to monitor the −21 volts at the group transmitting unit. The behavior of the thermal relay at the distant terminal is indicated by the reading of the VTVM. For example, if the VTVM indicates approximately −13 db, the thermal relay at the distant end is nonoperated. If the VTVM reads less than −21 db, the thermal relay is operated. By the same reasoning, the thermal relay at the near terminal is nonoperated when the dc voltmeter reads −21 volts; and operated, if the meter indicates 0 volt.

STEP	PROCEDURE
	AT BOTH TERMINALS OF THE SYSTEM TO BE CHECKED (NEAR AND DISTANT)
1	Remove from service all channels of the system by operations or secondary testboard.
	AT THE NEAR TERMINAL
2	Remove a connector from either receiving jack J3 or J4 on the line terminating unit, but not both (see Fig. 10).
3	Connect a 400D VTVM into the empty jack using a P2DH cord. This will permit detection of the presence or the loss of received carrier. (Leave the VTVM connected for the remaining steps.) ***Requirement:*** −13 ±2.5 db

STEP	PROCEDURE
4	Insert the negative lead of a VOM (dc scale) into jack −21V on the group transmit unit, and the positive lead in jack MG or jack DG on any modem unit in the same terminal. This will detect the presence or the loss of −21 volts. (Leave the dc voltmeter connected for the remaining steps.) ***Requirement:*** −21 ±1 volts
5	Remove the connectors from the transmitting jacks J1 and J2 on the line terminating unit to cause a carrier failure towards the distant terminal. Note the exact time when the second connector is removed, and then observe and record the times when the following operations occur. Calculate the elapsed time (within 0.5 second) to each operation and check if the requirements have been met. The following operations occur in continuous time. (See Fig. 8 and 9.) ***Requirement 1:*** Between 2.5 and 5.5 seconds the VTVM reading shall change from −13 ±2.5 db to less than −21 db. (The thermal relay K4B at the distant terminal has operated.) If this requirement cannot be met, check relays K1, K4B, and K3 at the distant terminal. Relays K1 and K4B are on the alarm unit, Fig. 6; and relay K3 is on the line terminating unit, Fig. 10. ***Requirement 2:*** Between 5 and 11 seconds the VOM (dc scale) reading shall change from −21 volts to 0 volt. (The thermal relay K4B at the near terminal has operated.) Also, the office alarms shall operate and lamp SYS ALM on the alarm unit and the bay lamp ALM on the bay cable terminating panel shall light. If this requirement cannot be met, check relays K1, K4B, K3, and K8 at the near terminal. Relays K1 and K4B are on the alarm unit, Fig. 6; relay K3 on the line terminating unit, Fig. 10; and relay K8 on the bay cable terminating panel, Fig. 1. ***Requirement 3:*** Between 13 and 27.5 seconds the VTVM reading shall change from less than −21 db to −13 ±2.5 db. (The thermal relay K4T at the distant terminal has operated.) If this requirement cannot be met, check relays K4T and K2 on the alarm unit, Fig. 6, at the distant terminal. ***Requirement 4:*** Between 15.5 and 33 seconds the VOM (dc scale) reading shall change from 0 volt to −21 ±1 volts. (The thermal relay K4T at the near terminal has operated.) If this requirement cannot be met, check relays K4T and K2 on the alarm unit, Fig. 6, at the near terminal.
6	Manually operate key SYS ALM RLS on the alarm unit to the vertical position. ***Requirement 1:*** Lamp SYS ALM shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The office alarms shall cease to operate. If these requirements cannot be met, check relay K8 on the bay cable terminating panel, Fig. 1, at the near terminal.

STEP	PROCEDURE
	AT THE DISTANT TERMINAL
7	Between 2.5 and 5.5 seconds from the time the near terminal caused a transmission failure towards the distant terminal, the following shall occur at the distant terminal. ***Requirement 1:*** Lamp SYS ALM on the alarm unit shall light. ***Requirement 2:*** The bay lamp ALM on the bay cable terminating unit shall light. ***Requirement 3:*** The office alarms shall operate. If these requirements cannot be met, check relay K8 at the distant terminal on the bay cable terminating panel, Fig. 1.
8	Manually operate key SYS ALM RLS on the alarm unit to the vertical position. ***Requirement 1:*** Lamp SYS ALM shall remain lighted. ***Requirement 2:*** The bay lamp ALM shall extinguish. ***Requirement 3:*** The office alarms shall cease to operate. If these requirements cannot be met, check key SYS ALM RLS on the alarm unit, Fig. 6, and relay K8 on the bay cable terminating panel, Fig. 1.
	AT BOTH TERMINALS (NEAR AND DISTANT)
9	After the thermal relays of both terminals have completed their timing cycles, both terminals should be in the alarmed condition and locked up by their respective carrier group alarm circuit (see Fig. 11). Check the relays on the carrier group alarm panel associated with the system terminals being checked (visual inspection) (see Fig. 12). ***Requirement:*** Relays A1, A2, C, C1, C2, C3, C4, D, and S1 shall be operated. If this requirement cannot be met, check relays K2 and K4 on the alarm unit, Fig. 6, and relay K3 on the line terminating unit, Fig. 10.
10	Manually operate the key ALM OVRD on the alarm unit to the vertical position. ***Requirement 1:*** Lamp ALM OVRD shall light. ***Requirement 2:*** Relay C4 on the carrier group alarm unit shall release. If these requirements cannot be met, check the key ALM OVRD on the alarm unit, Fig. 6.
11	Return the key ALM OVRD to its normal horizontal position. ***Requirement 1:*** Lamp ALM OVRD shall extinguish. ***Requirement 2:*** Relay C4 shall operate. If these requirements cannot be met, check the key ALM OVRD on the alarm unit, Fig. 6.
12	At this point it may be desirable to check the busy conditioning of individual trunks provided by the carrier group alarm circuit. If so, follow Step 13. If not, go to Step 14.

STEP	PROCEDURE
13	For each trunk, and taking one trunk at a time, remove the out-of-service conditioning provided in Step 1, and observe that the trunk remains busy as a result of the carrier group alarm operation. Replace the out-of-service conditioning before proceeding to the next trunk.
	AT THE NEAR TERMINAL
14	Restore the transmitted carrier by replacing one of the two connectors to either of the transmitting jacks J1 or J2 on the line terminating unit. Some delay in restoration may occur due to the checking and timing features of the E signaling carrier group alarm circuits. Requirements are for both terminals, after restoration: ***Requirement 1:*** Lamp SYS ALM shall extinguish. ***Requirement 2:*** The bay lamp ALM shall light. ***Requirement 3:*** The office alarms shall operate. ***Requirement 4:*** All relays on the carrier group alarm circuit shall release. If these requirements cannot be met, check relay K3 on the line terminating panel, Fig. 10, and the carrier group alarm circuit, Fig. 12.
	AT BOTH TERMINALS
15	Return the key SYS ALM RLS on the alarm unit to its normal horizontal position. ***Requirement 1:*** The bay lamp ALM shall extinguish. ***Requirement 2:*** The office alarms shall cease to operate.
	AT THE NEAR TERMINAL
16	Fail the transmitted carrier again by removing the one connector from the transmitting jack on the line terminating unit to permit an additional check of alarm features.
	AT BOTH TERMINALS
17	Between 10 and 20 seconds after the office alarms operate, observe the wink-off of relay S1 on the carrier group alarm panel associated with the terminal. ***Requirement:*** Relay S1 shall operate and after a short time delay, it shall quickly release and then reoperate. If this requirement cannot be met, check relay K2 and K4 on the alarm unit, Fig. 6; relay K3 on the line terminating unit, Fig. 10; and the carrier group alarm circuit, Fig. 12. ***Note:*** Silence the office alarms by operating the key SYS ALM RLS to the vertical position. The requirements will be the same as in Step 6.
18	Remove the busy condition from all trunks provided in Step 1. Also remove the test equipment.

STEP	PROCEDURE
	AT THE NEAR TERMINAL
19	Restore the transmitted carrier by replacing the connectors in the transmitting jacks on the line terminating unit, the requirement is for both terminals. ***Requirement:*** The carrier system shall restore automatically and almost simultaneously. If this requirement cannot be met, check relay K3 on the line terminating unit, Fig. 10; relay K11 on the alarm unit, Fig. 6; and the carrier group alarm circuit, Fig. 12.
	AT BOTH TERMINALS
20	Silence the office alarms by returning key SYS ALM RLS to its normal position. The requirements will be the same as in Step 15.

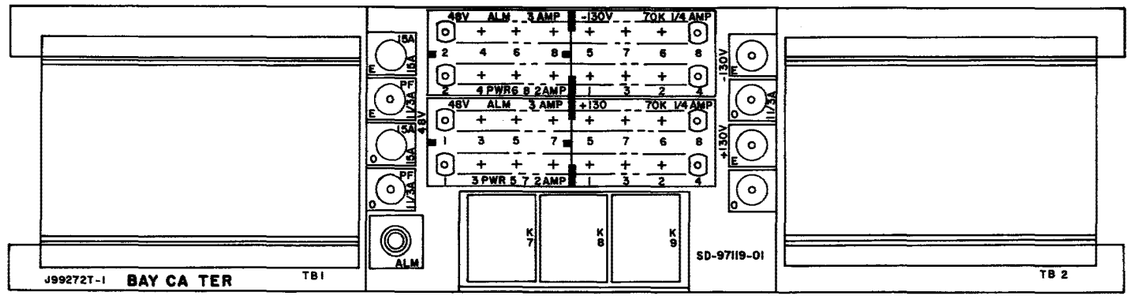


FIG. 1 — BAY CABLE TERMINAING PANEL

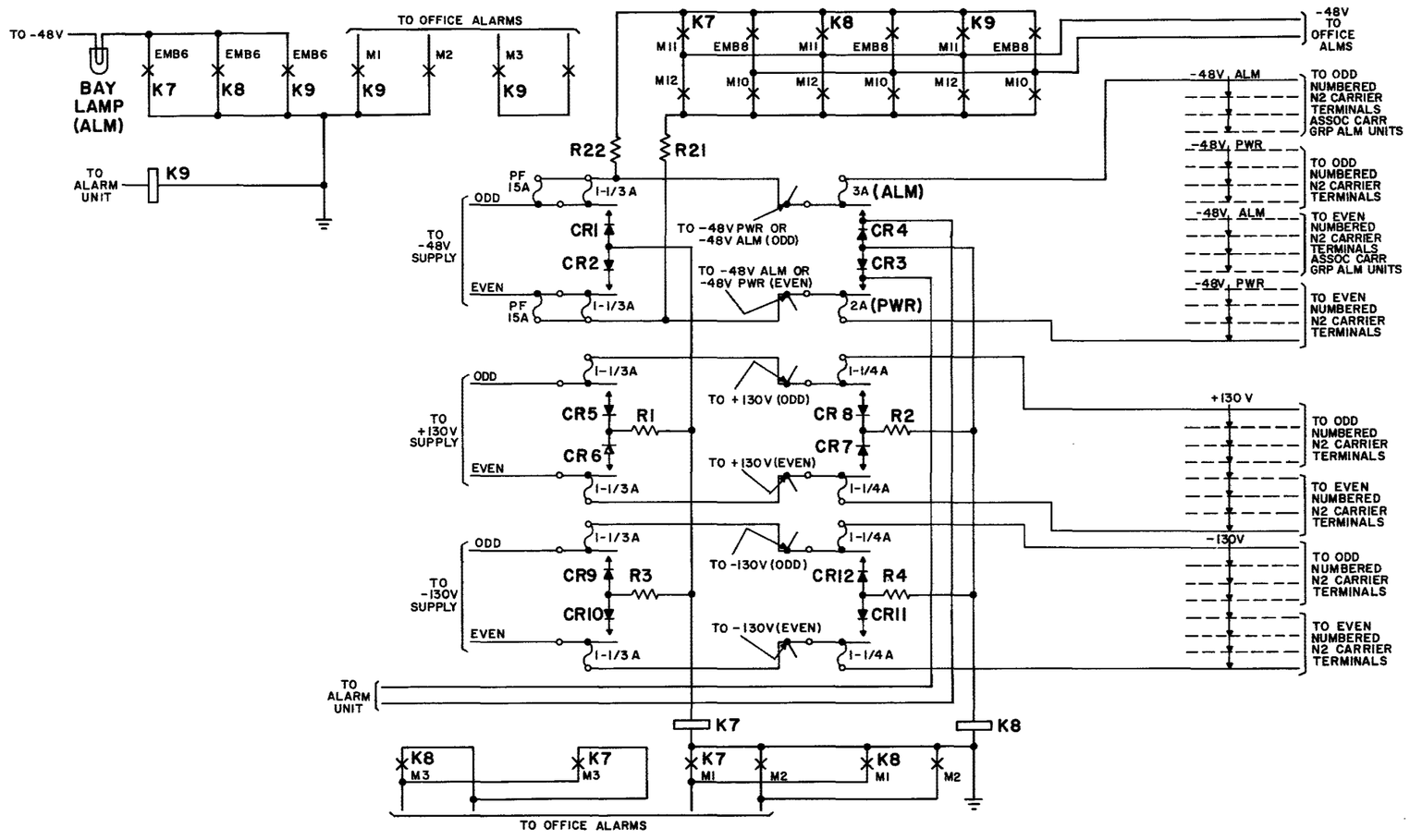


FIG. 2 — PART OF FUSE AND ALARM CIRCUIT

Fig. 1 and 2

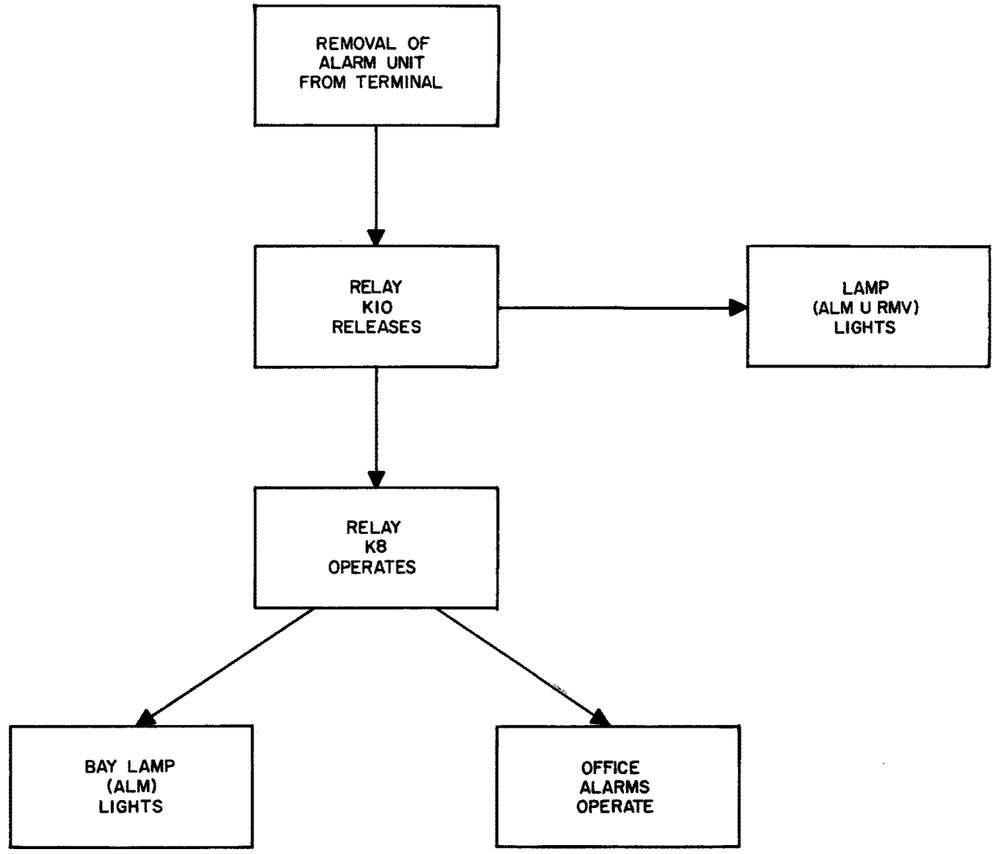


FIG. 3 - SEQUENCE CHART OF ALARM OPERATION FOR REMOVAL OF ALARM UNIT FROM TERMINAL

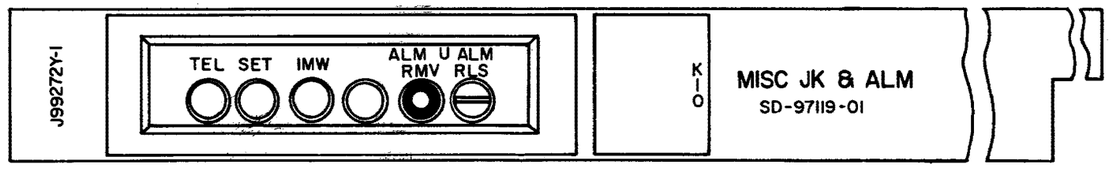
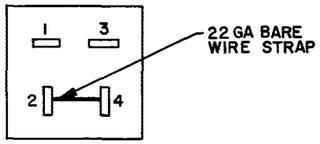


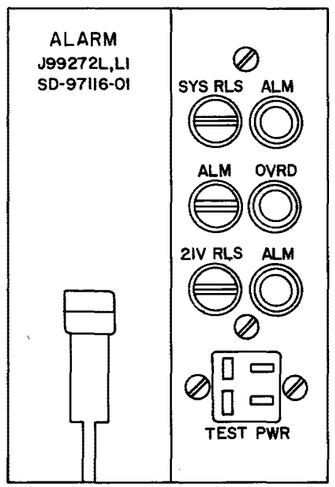
FIG. 4 - MISC JACK & ALARM PANEL

Fig. 3 and 4

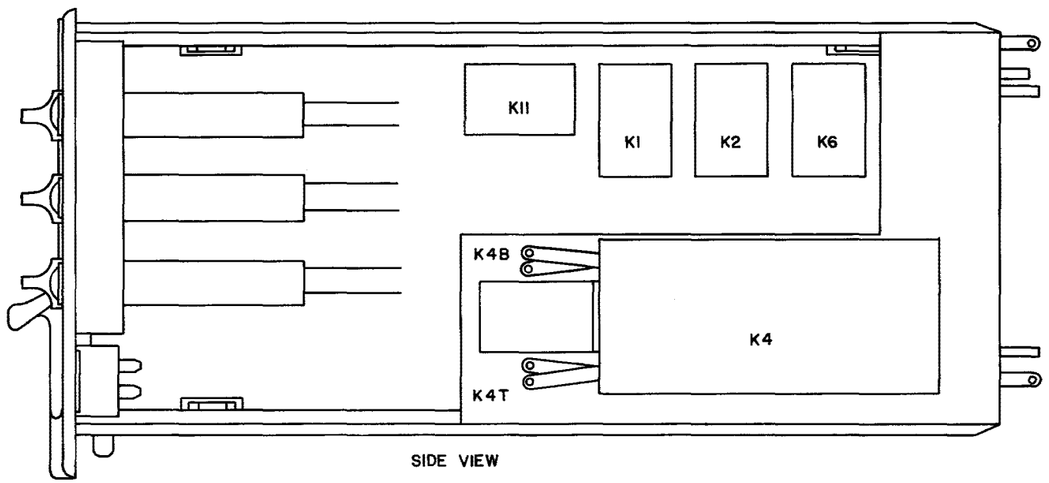


WIRING SIDE
KS-8585, L9
JONES PLUG

FIG. 5

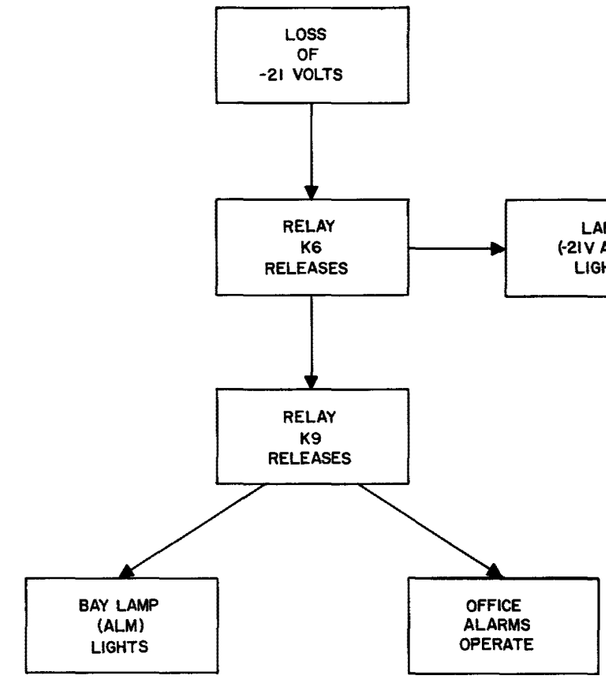


FRONT VIEW



SIDE VIEW

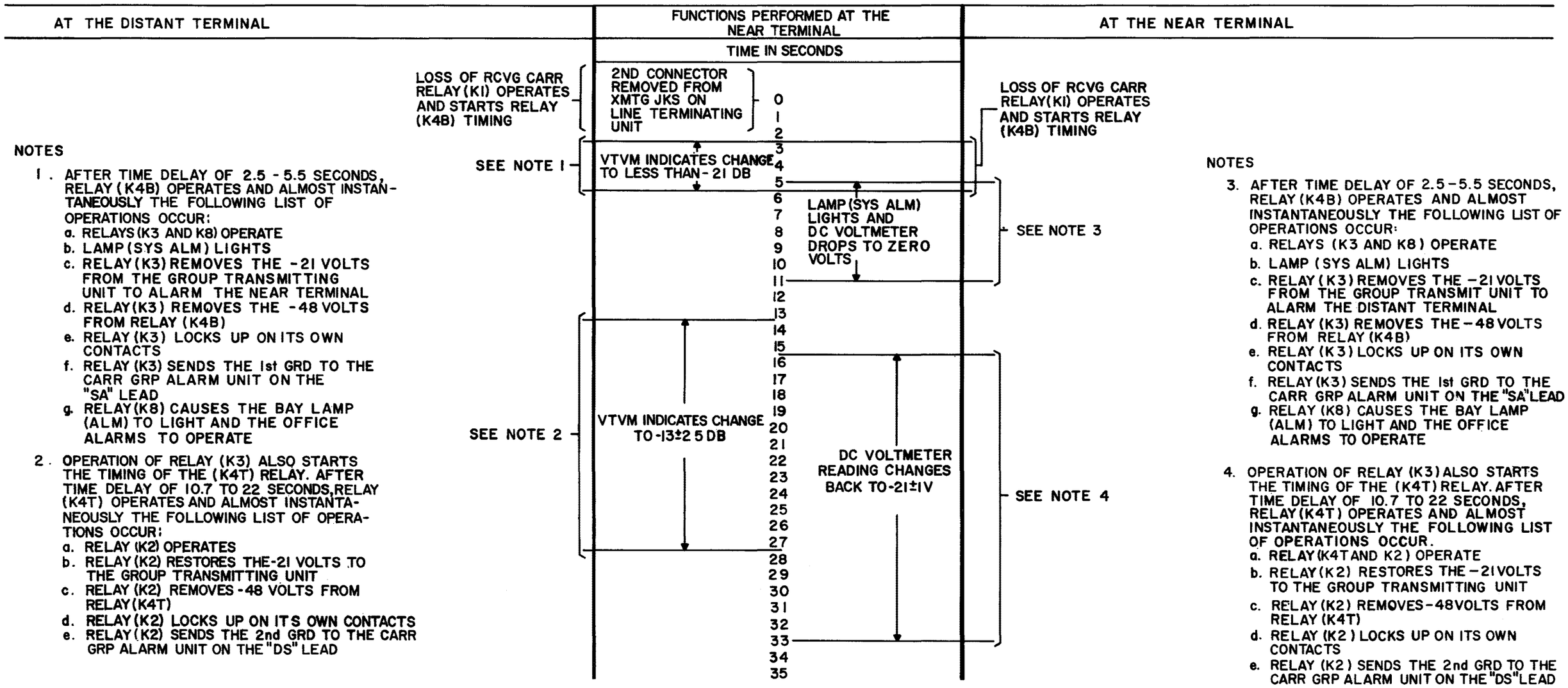
FIG. 6 - ALARM UNIT J99272L



SEQUENCE CHART FOR LOSS
OF -21 VOLTS ALARM OPERATION

FIG. 7

Fig. 5, 6, and 7



NOTES

1. AFTER TIME DELAY OF 2.5 - 5.5 SECONDS, RELAY (K4B) OPERATES AND ALMOST INSTANTANEOUSLY THE FOLLOWING LIST OF OPERATIONS OCCUR:
   a. RELAYS (K3 AND K8) OPERATE
   b. LAMP (SYS ALM) LIGHTS
   c. RELAY (K3) REMOVES THE -21 VOLTS FROM THE GROUP TRANSMITTING UNIT TO ALARM THE NEAR TERMINAL
   d. RELAY (K3) REMOVES THE -48 VOLTS FROM RELAY (K4B)
   e. RELAY (K3) LOCKS UP ON ITS OWN CONTACTS
   f. RELAY (K3) SENDS THE 1st GRD TO THE CARR GRP ALARM UNIT ON THE "SA" LEAD
   g. RELAY (K8) CAUSES THE BAY LAMP (ALM) TO LIGHT AND THE OFFICE ALARMS TO OPERATE
2. OPERATION OF RELAY (K3) ALSO STARTS THE TIMING OF THE (K4T) RELAY. AFTER TIME DELAY OF 10.7 TO 22 SECONDS, RELAY (K4T) OPERATES AND ALMOST INSTANTANEOUSLY THE FOLLOWING LIST OF OPERATIONS OCCUR:
   a. RELAY (K2) OPERATES
   b. RELAY (K2) RESTORES THE-21 VOLTS TO THE GROUP TRANSMITTING UNIT
   c. RELAY (K2) REMOVES -48 VOLTS FROM RELAY (K4T)
   d. RELAY (K2) LOCKS UP ON ITS OWN CONTACTS
   e. RELAY (K2) SENDS THE 2nd GRD TO THE CARR GRP ALARM UNIT ON THE "DS" LEAD

NOTES

3. AFTER TIME DELAY OF 2.5 - 5.5 SECONDS, RELAY (K4B) OPERATES AND ALMOST INSTANTANEOUSLY THE FOLLOWING LIST OF OPERATIONS OCCUR:
   a. RELAYS (K3 AND K8) OPERATE
   b. LAMP (SYS ALM) LIGHTS
   c. RELAY (K3) REMOVES THE -21 VOLTS FROM THE GROUP TRANSMIT UNIT TO ALARM THE DISTANT TERMINAL
   d. RELAY (K3) REMOVES THE -48 VOLTS FROM RELAY (K4B)
   e. RELAY (K3) LOCKS UP ON ITS OWN CONTACTS
   f. RELAY (K3) SENDS THE 1st GRD TO THE CARR GRP ALARM UNIT ON THE "SA" LEAD
   g. RELAY (K8) CAUSES THE BAY LAMP (ALM) TO LIGHT AND THE OFFICE ALARMS TO OPERATE
4. OPERATION OF RELAY (K3) ALSO STARTS THE TIMING OF THE (K4T) RELAY. AFTER TIME DELAY OF 10.7 TO 22 SECONDS, RELAY (K4T) OPERATES AND ALMOST INSTANTANEOUSLY THE FOLLOWING LIST OF OPERATIONS OCCUR.
   a. RELAY (K4T AND K2) OPERATE
   b. RELAY (K2) RESTORES THE -21 VOLTS TO THE GROUP TRANSMITTING UNIT
   c. RELAY (K2) REMOVES -48 VOLTS FROM RELAY (K4T)
   d. RELAY (K2) LOCKS UP ON ITS OWN CONTACTS
   e. RELAY (K2) SENDS THE 2nd GRD TO THE CARR GRP ALARM UNIT ON THE "DS" LEAD

Fig. 8 – Time Chart for Alarm Operation Due to Loss of Carrier

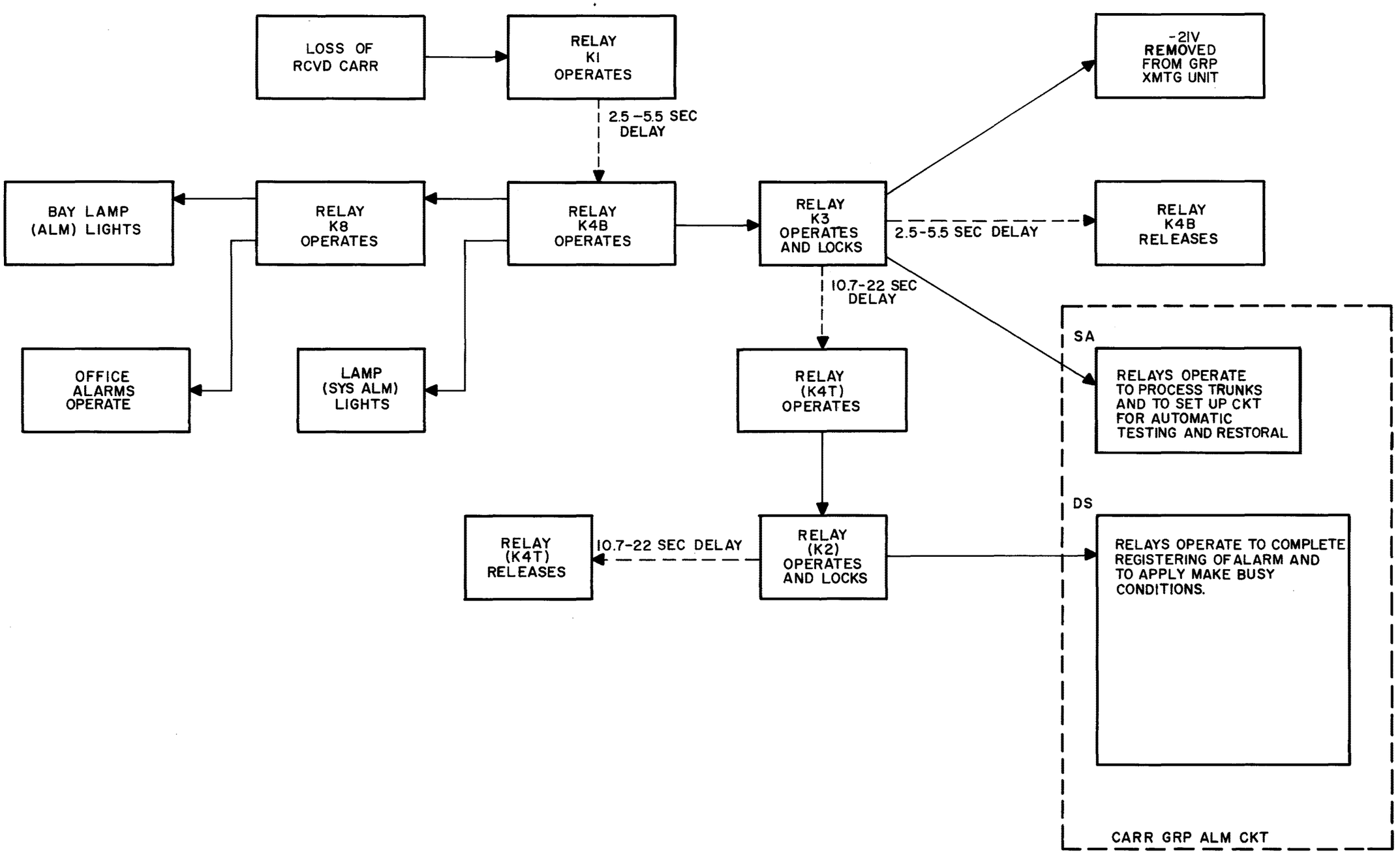


Fig. 9 – Sequence Chart for Loss of Carrier Alarm Operation

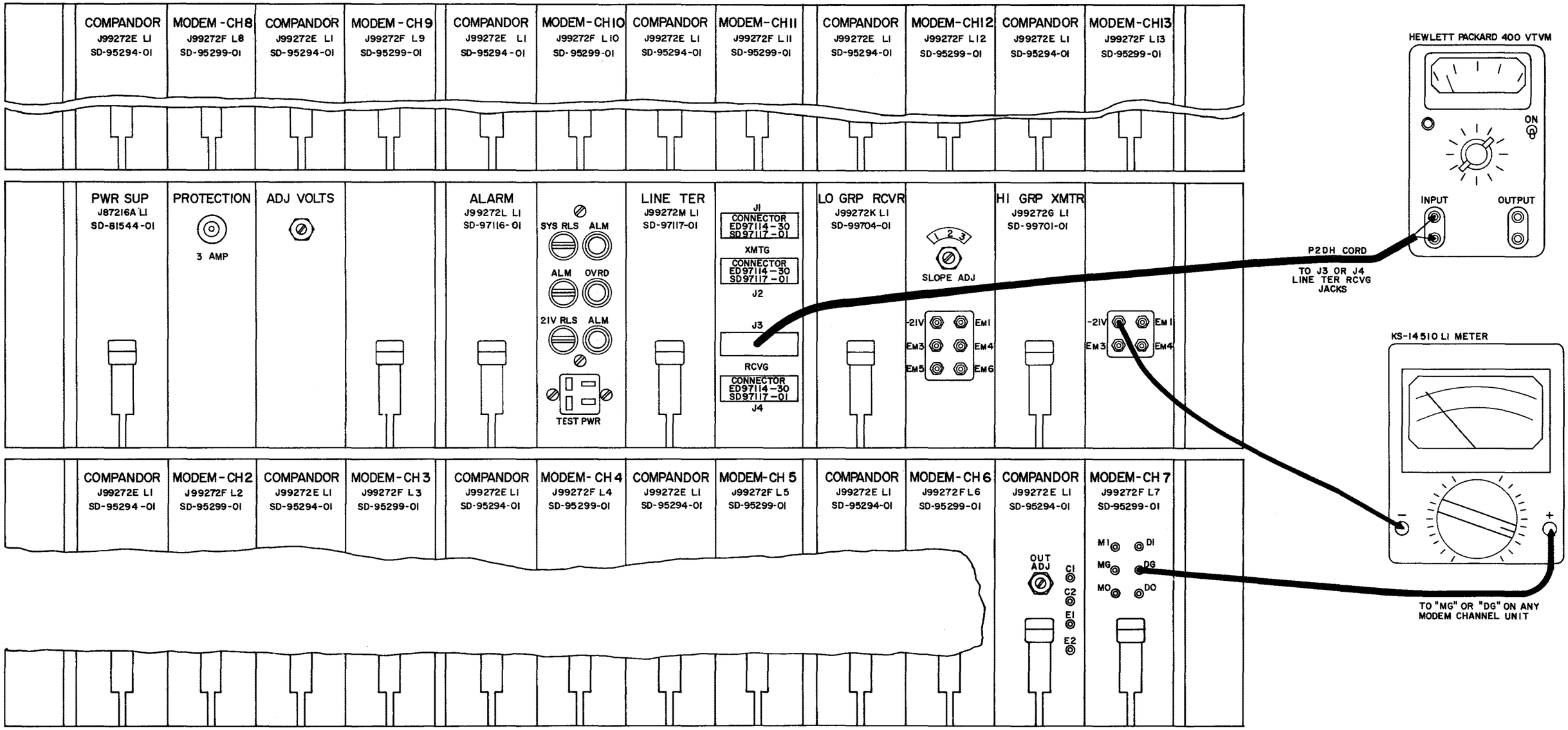


Fig. 10 – Typical Terminal Arrangement for N2 Carrier Shown with Testing Meters

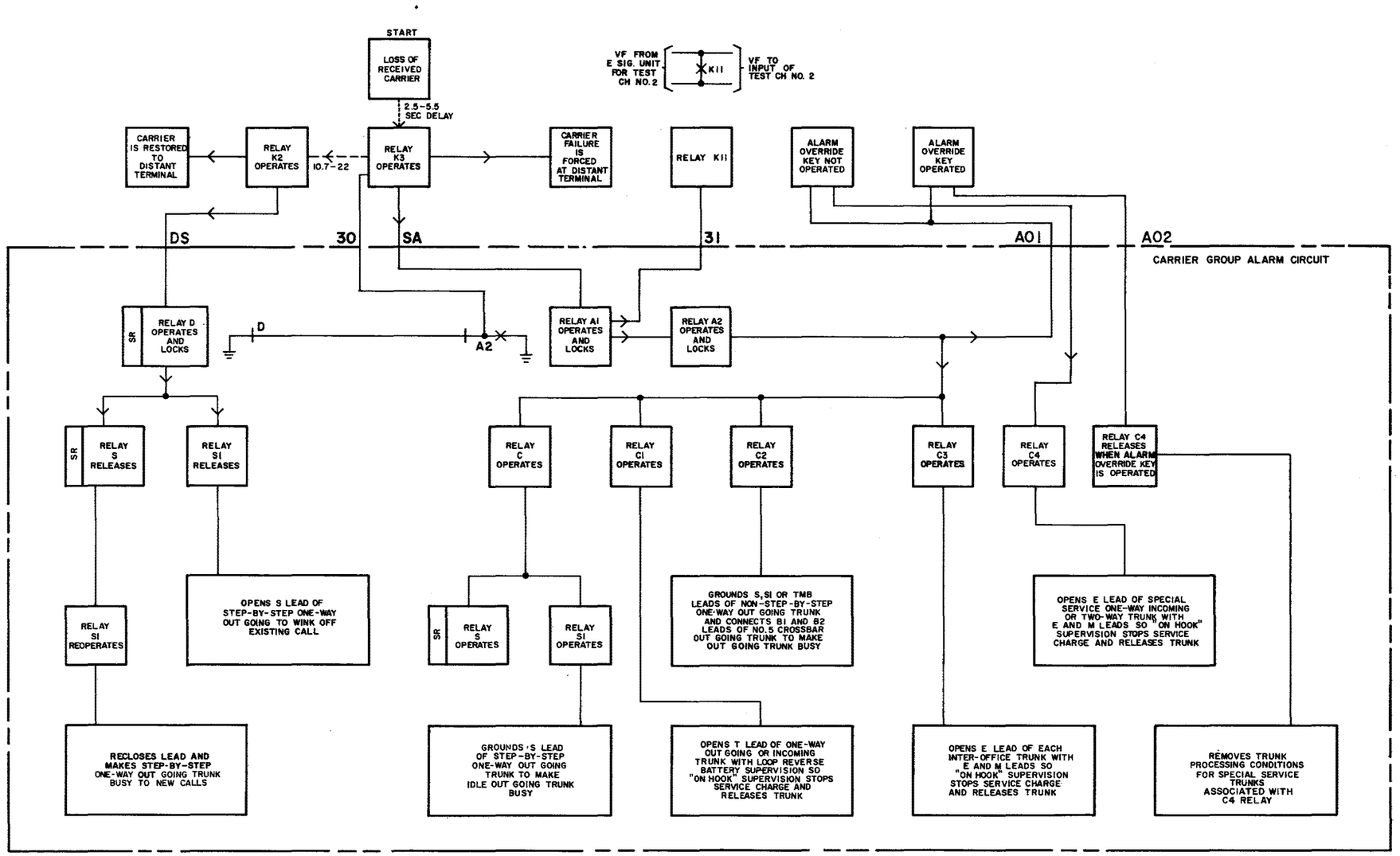


FIG. 11 - SEQUENCE CHART FOR CARRIER GROUP ALARM CIRCUIT SHOWING ALARM CONDITIONING AND TRUNK PROCESSING

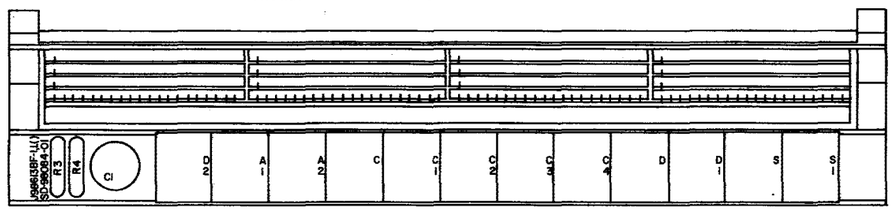


FIG. 12 TYPICAL N CARRIER TELEPHONE CARRIER GROUP ALARM PANEL

Fig. 11 and 12