TYPE N2 CARRIER SYSTEM

PACKAGED N2 TERMINAL FRAMES

DESCRIPTION

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1. GENERAL

1.01 This section describes the physical and functional characteristics of packaged N2 terminal frames. The packaged terminal frame is a shop-wired supporting framework which provides mounting facilities and electrical connections for from one to six N2 terminals and associated E-signaling units. The frame includes a carrier group alarm unit for each carrier terminal and 4-wire voice-frequency patching and monitoring jacks. It also includes common equipment such as fuses, battery filter power circuits, and signaling tone supplies. In addition, the packaged frame includes miscellaneous jacks, keys, and lamps for telephone sets, milliwatt supplies, and alarm circuits. Optional equipment such as equipment peculiar to E1F or E1S signaling units, shelves for auxiliary E-signaling units, E-signaling test oscillators, and monitor and talk panels may also be included in the packaged frames.

A. Equipment Features

1.02 The packaged terminals, when compared to nonpackaged terminals, reduce engineering and installation effort as well as cost of installation. This is caused by smaller cable requirements, fewer installer connections, fewer distributing frame appearances, less cable resistance problems, and reduced maintenance. The packaged terminals also provide the same flexibility between channel positions, E-signaling units, and trunk circuits as nonpackaged terminals, but require less distributing frame space and installer cabling. Faster and more accurate maintenance is possible due to the close proximity and uniform designation of carrier channel positions, E-signaling positions, and carrier group alarm terminal blocks.

1.03 The N2 carrier terminal equipment used in the shop-wired frames is designed to meet the transmission performance requirements of intertoll trunks handling direct distance dialing and message channel traffic. The terminals can be used with either electron tube or transistorized N1 repeaters and with the same type cables used for N1 carrier systems. N1 and N2 terminals, however, are not compatible; therefore, both ends of a particular N system must have the same type of terminals. Packaged N2 terminals can be used with nonpackaged N2 terminals at the opposite end of a system; though maximum flexibility would be obtained when packaged terminals are used at both ends of the system.

B. N2 Carrier System

1.04 The N2 carrier telephone system is a 12-channel system designed for short-haul use on toll and exchange plant cables. The system employs double sideband transmission with channels spaced every 8 kc. Arrangements are provided for 13 channels (12 active and 1 spare) which are numbered 1 through 13. Channels 2 through 13 are normally used as the active channels and occupy a frequency band of 36 to 132 kc for transmission in one direction and 172 to 268 kc for transmission in the other direction. Channel 1 is available for use in place of any other channel in the system which may be unsatisfactory as a result of radio or other interference. Channel 1 occupies a low-group frequency band of 132 to 140 kc for transmission in one direction and a high-group frequency band of 164 to 172 kc for transmission in the other direction. All carrier channels are generated in the high-group range to simplify filters and other circuit elements. The low-group frequency band is obtained by translating the high-group band to the lower frequency.

2. EQUIPMENT DESCRIPTION

A. General

2.01 The packaged terminals were designed using a new double-bay duct-type framework with cable ducts at the sides and in the middle. Five-inch deep uprights form the cable ducts with wide flanges in the front and narrow flanges in the rear. A 3-inch opening between the narrow flanges provides access for shop wiring and installer cabling. Low-level wiring is placed in the middle duct; thus, it is automatically shielded from the high-level or noisy wiring in adjacent bays, or in the outer ducts of the same frame. To increase capacity, the frame has mounting holes in the front and in the rear. These holes allow mounting of panels one behind the other without exceeding the standard 12-inch guard rail. This provides mounting space for panels that could not otherwise be accommodated.

2.02 The packaged terminal frames use the same N2 plug-in units used in nonpackaged terminals with the exception of the J99272L alarm unit and the J99272AR carrier group alarm signal receiver. A J99272AW alarm and restoral unit, which combines the functions of the J99272L and AR units, is required for each terminal in a packaged frame. Descriptions of the plug-in units may be found in Sections AA388.144 (J99272) and AA388.091 (J98613).

B. Packaged Terminal Frames

2.03 Packaged N2 terminal frames are shop-wired frameworks arranged to mount various numbers of carrier terminals on single- or double-bay duct-type framework. Six packaged frames are available: an 11-foot 6-inch high double-bay frame which will house five or six terminals, an 11-foot 6-inch high double-bay frame which will house six terminals and is arranged for centralized patching jacks, a 9-foot high double-bay frame which mounts three or four terminals, a 7-foot high single-bay frame arranged for one carrier terminal, and two 7-foot high double-bay frames each arranged for three carrier terminals with one including common equipment for both.

2.04 ***J99285A Five- or Six-Terminal Frame:*** This double-bay frame (see Fig. 1) is 11 feet 6 inches high and normally arranged for six carrier terminals. The J99285A unit, List 1 and 6, provides a complete shop-wired 72-channel frame (including voice-frequency patching and monitoring jacks) except for plug-in units. Other lists provide optional equipment such as tone supplies for E1F signaling units, E-signaling test oscillators, interbay patching and testing trunk jacks, auxiliary signal equipment, monitor and talk panel, controls for transmission and noise measuring equipment, 20-cycle supply panel, protective plastic guards for rear of N2 terminal shelves, and plastic signaling option templates for use with carrier group alarm equipment. A terminal block or distributing terminal strip may be ordered separately and field-installed above the power panel, when required. The frame may be arranged for five terminals (60 channels) with the space normally occupied by the sixth terminal reserved for transmission and noise measuring control equipment.

2.05 ***J99285B Six-Terminal Frame:*** This double-bay frame is 11 feet 6 inches high and is arranged for use with centralized voice-frequency patching and monitoring jacks. The

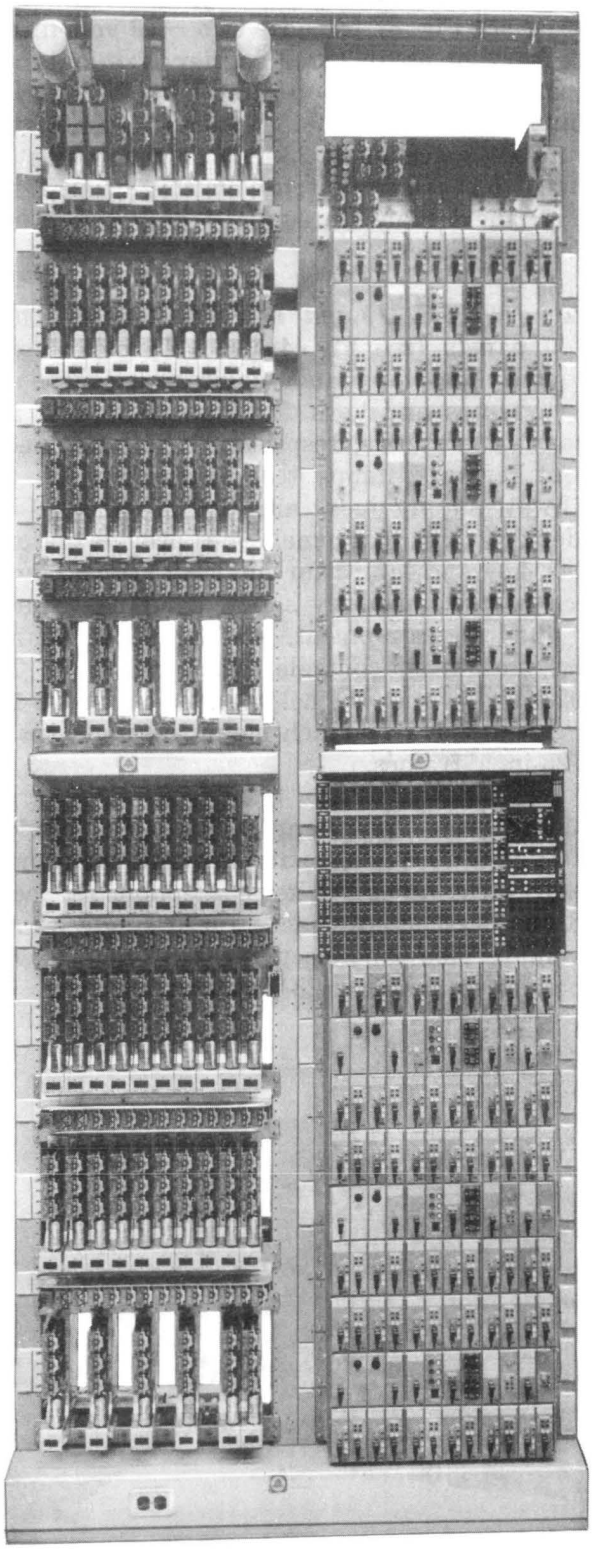

Fig. 1 — J99285A Five- or Six-Terminal Packaged N2 Terminal Frame

frame is arranged for six carrier terminals (72 channels) similar to the J99285A frame but does not include a jack field. Since the J99285B frame does not include patching and monitoring jacks, there are no provisions for interbay trunks, intraoffice communications, auxiliary signal, monitor and talk, or transmission and noise measuring equipment. The frame includes a single jack mounting for alarm lamps and keys, telephone set jacks, and milliwatt supply jacks. There is space in the frame to mount additional E-signaling shelves, when required, for auxiliary signaling units.

2.06 ***J99285C Three- or Four-Terminal Frame:*** This double-bay frame is 9 feet high. The arrangement of this frame is similar to the J99285A frame, including voice-frequency patching and monitoring jacks, except that it normally includes four carrier terminals (48 channels). It can be arranged for three terminals (36 channels) with space for transmission and noise measuring control equipment. Space is available to mount an additional E-signaling shelf, when required, for auxiliary signaling units.

2.07 ***J99285D Three-Terminal Frame:*** This frame is a 7-foot double-bay frame and includes voice-frequency patching and monitoring jacks. The frame provides three carrier terminals (36 channels) arranged similar to the J99285C frame except that transmission and noise measuring control equipment cannot be mounted in the frame. However, associated controls may be provided in the jack field. An additional E-signaling shelf may be located in the frame when required for auxiliary signaling units.

2.08 ***J99285E Single-Terminal Frame:*** This frame is a 7-foot single-bay frame. The frame does not include provisions for interbay trunks, intraoffice communications, auxiliary signal, or transmission and noise measuring equipment, but does contain voice-frequency patching and monitoring jacks. There is space for an additional E-signaling shelf, when required, for auxiliary signaling units. A monitor and talk circuit may be provided on an optional basis.

2.09 ***J99285R Auxiliary Three-Terminal Frame:*** This frame is a 7-foot double-bay frame including voice-frequency patching and

monitoring jacks and provides three carrier terminals (36 channels) arranged similar to the J99285D frame except that no power, alarm, and miscellaneous panel, talking battery filter or E-signaling tone supply equipment are provided. The J99285R frame must be used in conjunction with and located adjacent to a J99285D frame from which power and signaling tones are obtained. Each auxiliary frame includes cables for installer connection to the associated J99285D frame. There is space in the frame to mount additional E-signaling shelves for auxiliary units or to mount transmission and noise measuring control equipment for use with associated controls located in the jack field of the adjacent J99285D frame.

C. Equipment Units

2.10 ***J99285F Power, Alarm, and Miscellaneous Panel:*** This panel (see Fig. 2) provides fusing and power distribution for from three to six carrier terminals and associated carrier group alarm and E-signaling equipment as well as alarm facilities for the frame. The panel includes fuses for −48 volt power, fuses and resistors for ±130 volt power, alarm relays, and a mounting location for a restoral oscillator. This panel occupies two and one-half 2-inch mounting plate spaces on a 23-inch frame.

2.11 ***J99285G Talking Battery Filter:*** This unit (see Fig. 3) provides two −48 volt filters, each serving up to three carrier terminals and associated carrier group alarm and E-signaling equipment. This panel requires 5 inches of mounting space on a 23-inch frame but is arranged to overlap the top mounting of an E-signaling shelf thereby requiring only two 2-inch mounting plates.

2.12 ***J99285H, J, and K Jack Panels:*** These panels (see Fig. 4 and 5) provide voice-frequency patching and monitoring jacks, and alarm lamps and keys for 5 or 6, 3 or 4, and 3 carrier terminals, respectively. Miscellaneous alarm keys and lamps, telephone set jacks, and milliwatt supply jacks are also provided. Lists under the individual panel codes provide optional jacks, key and lamps for interbay trunks, intraoffice trunks, auxiliary signal equipment, monitor and talk equipment, and transmission and noise measuring controls, when required. The J99285H, J, and K jack panels occupy 8-1/2, 6-1/2, and 5-1/2 two-inch mounting plate spaces on 23-inch frames.

2.13 ***J99285L Jack Panel:*** This panel provides voice-frequency patching and monitoring jacks, alarm lamps and keys, telephone set jacks, and milliwatt supply jacks for a single carrier terminal. This panel occupies two 2-inch mounting plate spaces on a 23-inch frame.

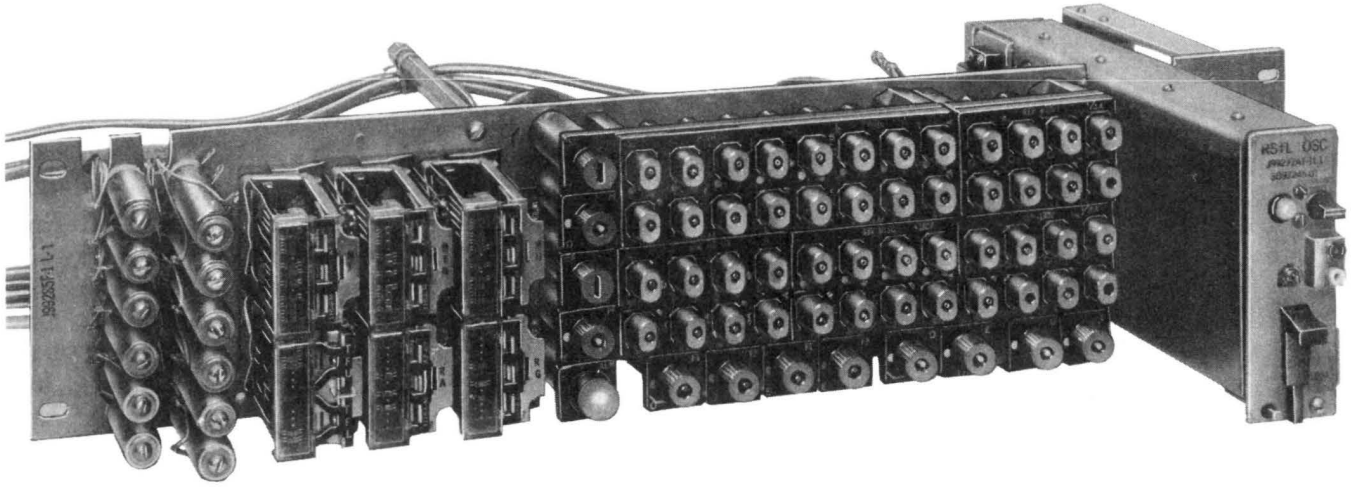

Fig. 2 — J99285F Power, Alarm, and Miscellaneous Panel

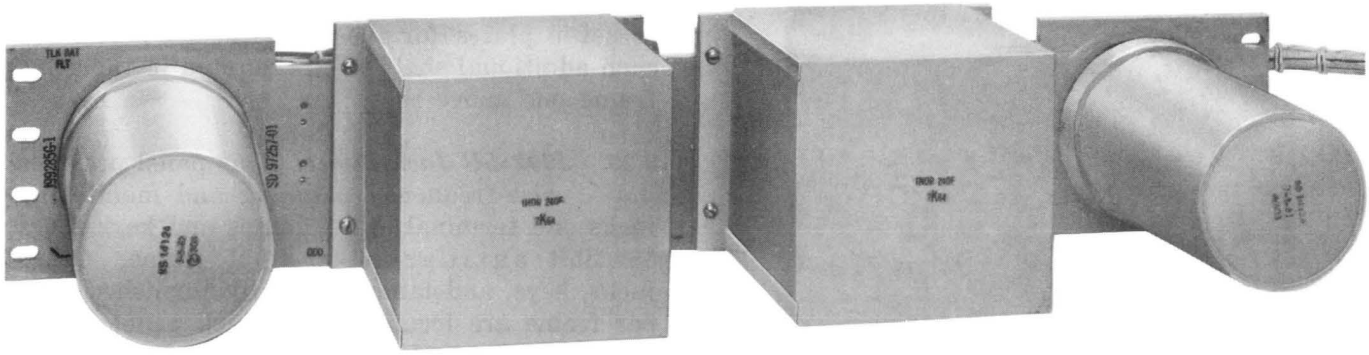

Fig. 3 — J99285G Talking Battery Filter

2.14 ***J99285M Power, Alarm, and Miscellaneous Panel:*** This panel provides fusing and power distribution for one or two carrier terminals and associated carrier group alarm and E-signaling equipment. Also provided are alarm relays, a talking battery filter, and a mounting location for a restoral oscillator. This panel occupies two and one-half 2-inch mounting plate spaces on a 23-inch frame.

2.15 ***J99285N Monitor, Talk, and Miscellaneous Panel:*** This panel (see Fig. 6) provides apparatus for a monitor and talk circuit. This circuit is used to facilitate monitoring of channel transmission, to provide patching facilities and amplifications for transmission or noise measuring on channels, and to furnish connections between a telephone set and order-wire trunks for intraoffice communications. The panel also includes relays which control buzzers associated with busy test and auxiliary signal circuits. The buzzers are mounted on a bracket attached to the framework and associated jacks, keys, and lamps appear in the frame jack fields. This panel occupies one 2-inch mounting plate space on a 23-inch frame.

2.16 ***J99285P Carrier Group Alarm and E-Signaling Connecting Panel (CGA):*** This unit (see Fig. 7) contains relays used in conditioning trunk circuits to release subscribers, give busy indications, and provide automatic system testing and restoral after a transmission failure. Also included are wiring and connectors for associated E-signaling units and a terminal strip for optional strapping required for the various signaling units and trunk circuits in a variety of offices.

2.17 The J99285P panel is designed to mount between the two E-signaling shelves on packaged N2 terminal frames only. It utilizes a 2-inch mounting strip at the front of the frame to mount 13 wire-spring relays and a message register. The rear of the panel consists of a 6-inch terminal strip. The relay strip at the front and the terminal strip in the rear are held together by brackets to form a shop-wired assembly that mounts on the rear of the packaged frame. The terminal strip is hinged to give wiring and maintenance access to the relay and register terminals and the inner surface of the terminal strip. A detailed description of the J99285P panel is contained in Section 362-345-100.

2.18 ***J99285S Carrier Group Alarm Delay Panel:*** This panel (see Fig. 8) provides delay circuits for from one to six carrier group alarm panels. Since the delay circuit is part of the over-all carrier group alarm circuit for each carrier terminal, a delay panel is provided as part of each packaged terminal frame. Lists under the J99285S code provide different numbers of delay circuits corresponding to the number of carrier terminals in a frame. This panel occupies one 2-inch mounting plate space on the rear of the frame behind the lowest E-signaling shelf.

2.19 ***J99285T Shelf and Cabling for Auxiliary E-Type Signaling Units:*** This optional shelf provides mounting positions with wiring for up to ten signaling units external to the packaged terminal frames. These positions are arranged in pairs to accommodate five E1L/E1L-A or E1S/E1S-A combinations per

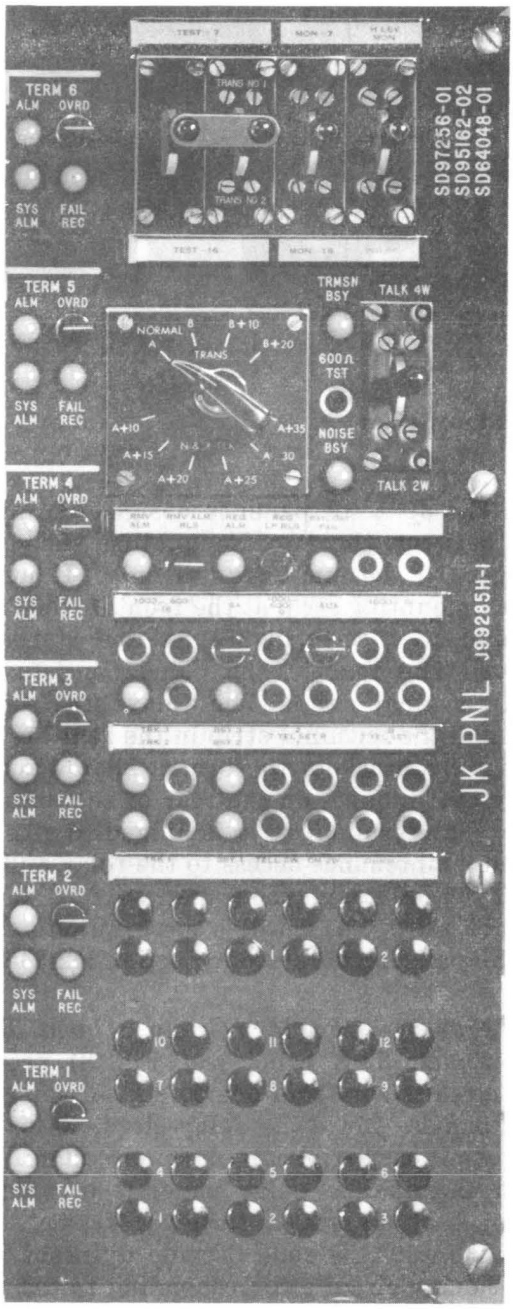

Fig. 4 — Typical Jack Panel (Alarm and Control Portion)

shelf. The second or auxiliary position of each pair is wired for auxiliary (E1L-A, E1S-A) units only. Each shelf is equipped with a stub cable which may be obtained in any length up to a maximum of 50 feet. These shelves, which mount on a miscellaneous basis, require seven 2-inch by 23-inch mounting plates when mounted singly or seven plates for the first and six plates for each additional shelf when mounted in the same frame one above the other.

2.20 ***J99285U Jack Panel:*** This panel provides voice-frequency patching and monitoring jacks and terminal alarm lamps and keys for a J99285R auxiliary 3-terminal frame. Other jacks, keys, and lamps normally furnished once per frame are located in the jack panel of the associated J99285D frame. This panel requires four and one-half 2-inch by 23-inch mounting plates.

2.21 ***J99285W 20-Cycle Fuse and Lamp Panel:*** This optional panel provides fuses and resistance lamps required when E1S E-signaling units are used. This panel also furnishes 20-cycle power for up to 90 E1S signaling units, an auxiliary signal circuit, and an E-signaling test connector. The panel requires one 2-inch by 23-inch mounting plate.

2.22 ***J98613BW 2400/2600-Cycle Oscillator and Transfer Unit:*** This unit (see Fig. 9) consists of two oscillators which are capable of operating at 2400 or 2600 cycles, and a transfer circuit which interconnects the oscillators with the distributing circuit. In the event of failure in either oscillator, the load is automatically transferred to the other oscillator and the office alarm is activated. The unit connects to office alarms and is equipped with lamps for a local alarm. A network equipped with jacks is provided for making beat-frequency comparisons between the two oscillators or between one oscillator and an outside source. This unit occupies two 2-inch mounting plate spaces on the front of the frame beneath the power, alarm, and miscellaneous panel.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 A block diagram showing typical interconnections in an N2 packaged frame arranged for message use is shown in Fig. 10. In the transmitting direction, speech currents from the trunk circuit are first applied through the distributing frame to the carrier group alarm

and E-signaling connecting unit. This unit contains trunk-make-busy and release circuits plus E-signaling connecting circuits. Under nonalarm conditions, the carrier group alarm provides direct connections between the trunk circuits and the E-signaling equipment. Under alarm conditions, these connections are broken and the trunks are made busy until the trouble is clear. The speech currents (Fig. 10) are applied from the carrier group alarm and E-signaling connecting unit to 4-wire voice-frequency channel patching and monitoring jacks. These jacks enable, for maintenance purposes, monitoring transmission in either direction or patching-out channels. From the patching and monitoring jacks the speech currents are applied to 1 of the 12 channel unit positions, designated A through M in an N2 carrier terminal. The output of the various channel units is multipled together and applied through the line terminating unit, which contains span pads and switching jacks, to the transmitting group unit. The output of this unit is then transmitted over the high-frequency carrier line.

B. E-Signaling Circuits

3.02 ***Signaling Tone Supplies:*** In the E-signaling system, supervisory signals and dial pulses are converted by the signaling units at the originating end to ac signals for transmission over a 2- or 4-wire carrier or voice facility. At the terminating end the reverse procedure takes place, with the ac signals being converted back to dc signals for the trunks and switching system. An in-band frequency of 2600 cycles is normally used to transmit the supervisory signals and dial pulses. When E1F signaling units are provided, a supplementary tone of 2000 cycles is also required.

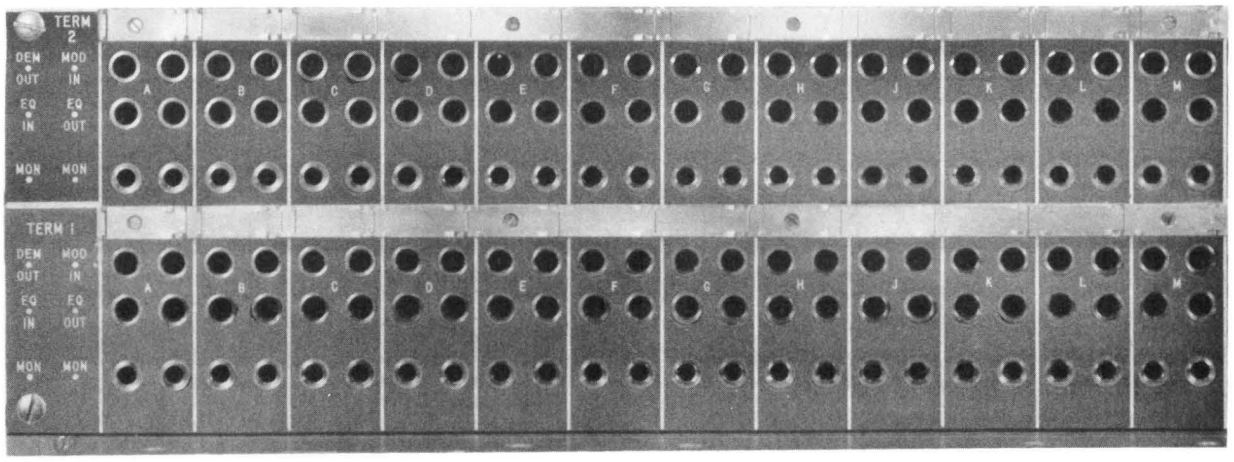

Fig. 5 — Typical Jack Panel (Patching and Monitoring Jacks)

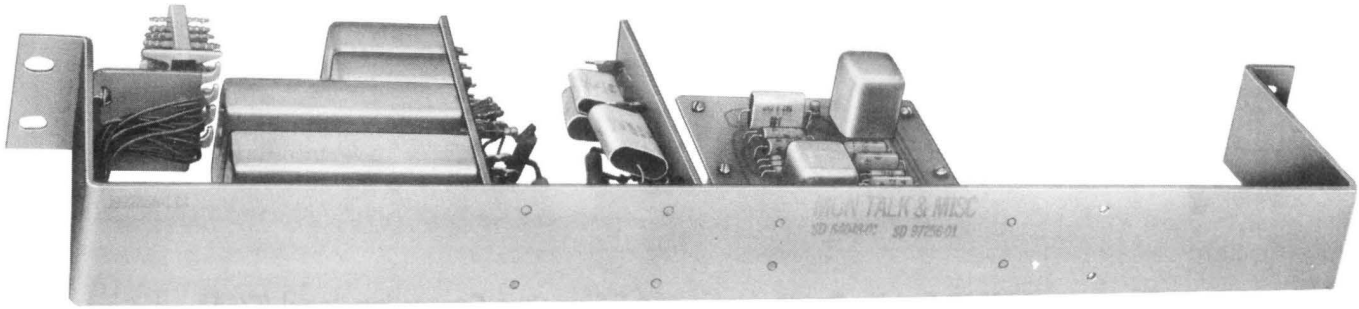

Fig. 6 — J99285N Monitor, Talk, and Miscellaneous Panel

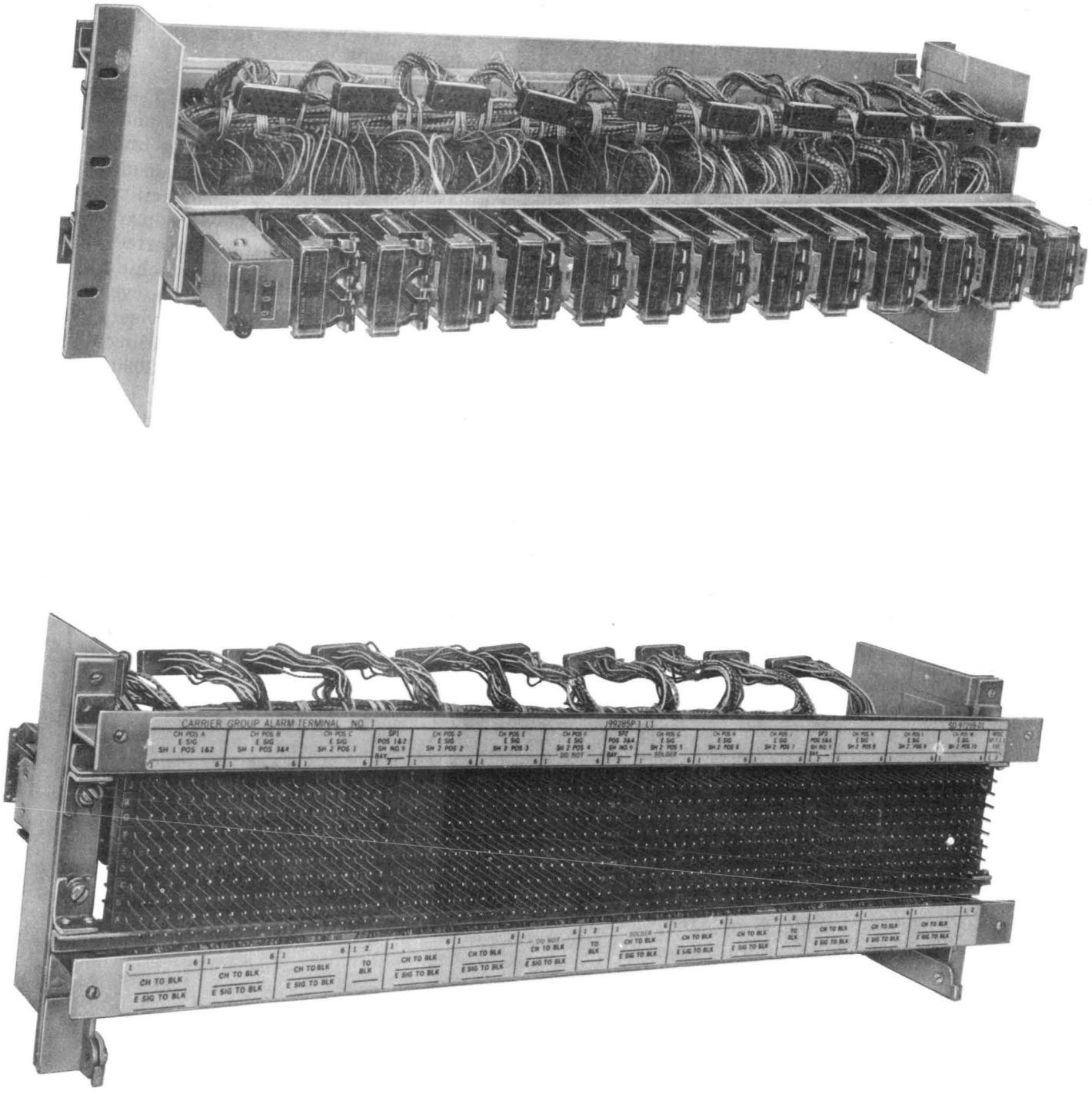

Fig. 7 — J99285P Carrier Group Alarm and E-Signaling Connecting Panel (CGA)

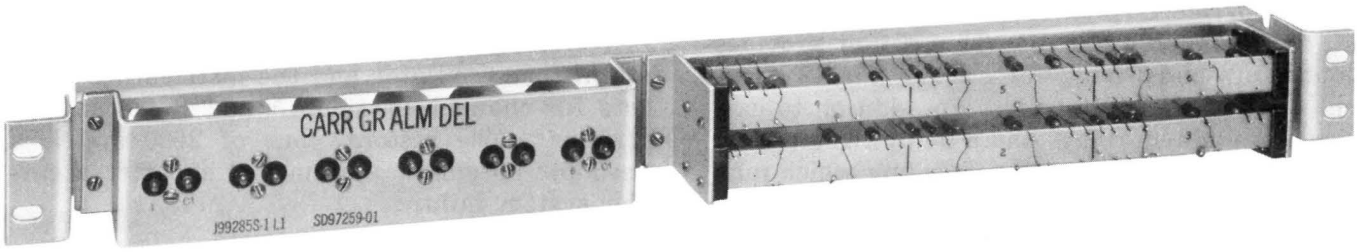

Fig. 8 — J99285S Carrier Group Alarm Delay Panel

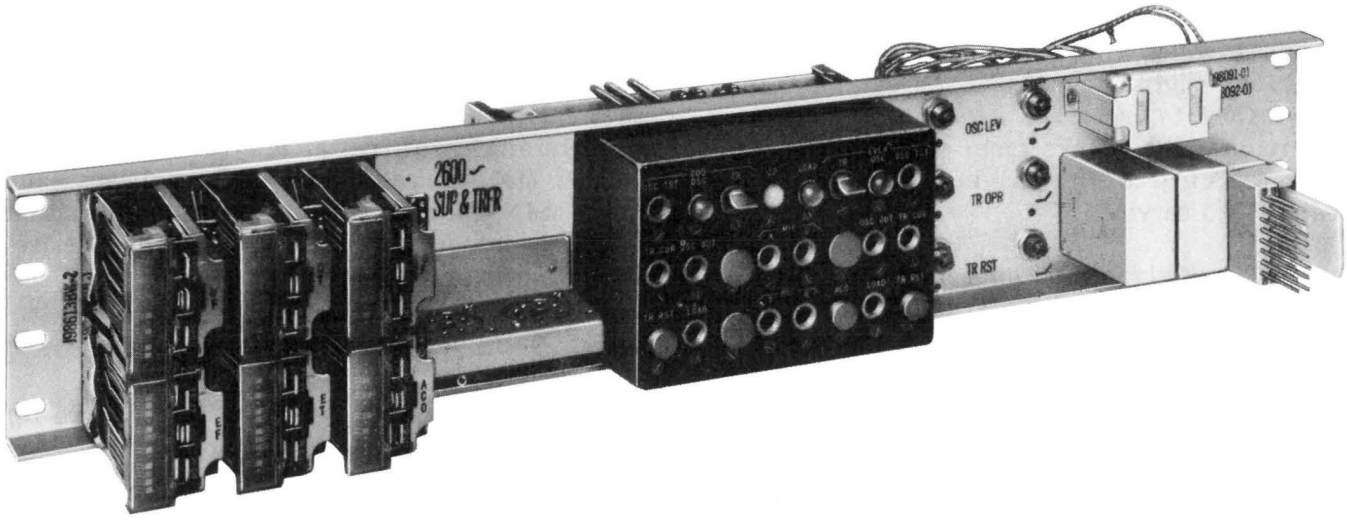

Fig. 9 — J98613BW 2400/2600-Cycle Oscillator and Transfer Unit

3.03 To generate and distribute the signaling tones for all except E1F signaling units, a tone supply and transfer circuit and a distributing circuit is used. The tone supply consists of two 2600-cycle oscillators, each oscillator supplying half the load. The transfer circuit automatically transfers the load of a defective oscillator to the operating oscillator. The distributing resistor circuit provides the proper level of 2600-cycle energy at the E-signaling units. The tone supply and transfer circuit requires −48 volts for operation and is arranged to furnish alarm ground to the power, alarm, and miscellaneous circuit in the event that one or both oscillators should fail.

3.04 In N2 packaged frames that require use of E1F signaling units, a second 2600-cycle oscillator and transfer circuit plus a 2000-cycle oscillator and transfer circuit are provided. A tone supply resistor circuit furnishes tone distribution for both frequencies. Both oscillator and transfer circuits require −48 volts for operation and are arranged for load transfer and alarm indications in case of failure.

3.05 For testing purposes, two additional oscillators can be provided in a shop-wired terminal frame. One furnishes 2000 cycles for testing E1F signaling units when E1F units are not assigned. The other furnishes 2400 cycles to test E2B or E3B signaling units. Both of these units use only one of the two oscillator assemblies on a panel. They include appropriate distributing resistors on the panel terminal strip and require −48 volts for operation. The units are not arranged for any alarm indications.

3.06 ***Carrier Group Alarm and E-Signaling Connecting Circuit:*** This circuit provides connectors and wiring for each of the 12 channel units of the N2 terminal, in addition to carrier group alarm relays and a delay circuit. This circuit also provides spare connectors which may be used in cases where auxiliary E-signaling units are required.

3.07 The carrier group alarm and E-signaling connecting circuit (CGA) is located between the trunk terminal equipment and the E-signaling equipment to provide automatic trunk protection. Under normal conditions, this circuit provides a direct connection between the trunk and signaling circuits. A carrier failure causes CGA to break the established connections and remove the trunks from service. When the trouble is cleared, the terminal is automatically restored to service.

3.08 The E-signaling connectors are wired directly to specific terminal blocks (CH POS A through CH POS M, SP1 through SP3, and MISC) on the CGA. The terminal blocks enable optional strapping between the various types of signaling units and trunk circuits found in different offices. A detailed functional description of the CGA is contained in Section 362-345-100.

C. Power Circuits

3.09 All dc power for operation of an N2 packaged terminal frame is obtained from a power, alarm, and miscellaneous circuit. This circuit shown in simplified form in Fig. 11, provides filtered −48 volt power and ground to the N2 terminal, E-signaling, and carrier group alarm equipment. In addition, −48 volts can also be supplied over the high-frequency line to power remote repeaters. The +130 and −130 volt power is used primarily for operation of remote repeaters on the carrier line. Connections to office alarm circuits are obtained through the operation of relays MJ, MJN, and MN. These relays furnish either an operating ground, a loop closure, a battery through resistance, or a dc current loop. The relays will operate in case of fuse failure, carrier failure, tone oscillator failure, excessive deviation or failure of the terminal power supply, or removal of an alarm and restoral unit or restoral oscillator.

3.10 The power, alarm, and miscellaneous circuit provides connections for a plug-in restoral tone oscillator and the distributing resistors for channel positions A and B in each N2 terminal. The restoral tone of 2600 cycles is used for automatic system testing after a carrier system failure.

D. Alarm Circuits

3.11 An N2 packaged terminal frame contains various office alarm circuits which will furnish either major or minor alarm indications depending upon the type of trouble condition. The power, alarm, and miscellaneous circuit shown in Fig. 11 contains three relays designated MJ, MJN, and MN. Relay MJ is operated when conditions require a major office alarm. Relay MN is used for minor alarms and relay MJN can be wired for operations for either major or minor alarms according to the desires of the operating company.

3.12 Major office alarms are classified as follows:

(a) Primary power feeder or fuse failure for −48, +130, and −130 volts.

(b) Failure of a signaling oscillator transfer circuit.

(c) Failure of both signaling oscillators in a transfer circuit.

3.13 Minor alarms are classified as follows:

(a) Fuse failure for E-signaling oscillator circuits, a restoral oscillator, or TFU and TFL transfer relays in the power, alarm, and miscellaneous circuit.

(b) Excessive deviation or failure of the restoral oscillator output voltage.

(c) Excessive deviation or failure of the −21 volt power supply output voltage.

(d) Removal of either an alarm and restoral unit or a restoral oscillator from an N2 terminal frame.

3.14 Relay MJN will operate under the following conditions:

(a) Fuse failure for E-signaling units, signaling oscillator transfer circuits, and a signaling test connector.

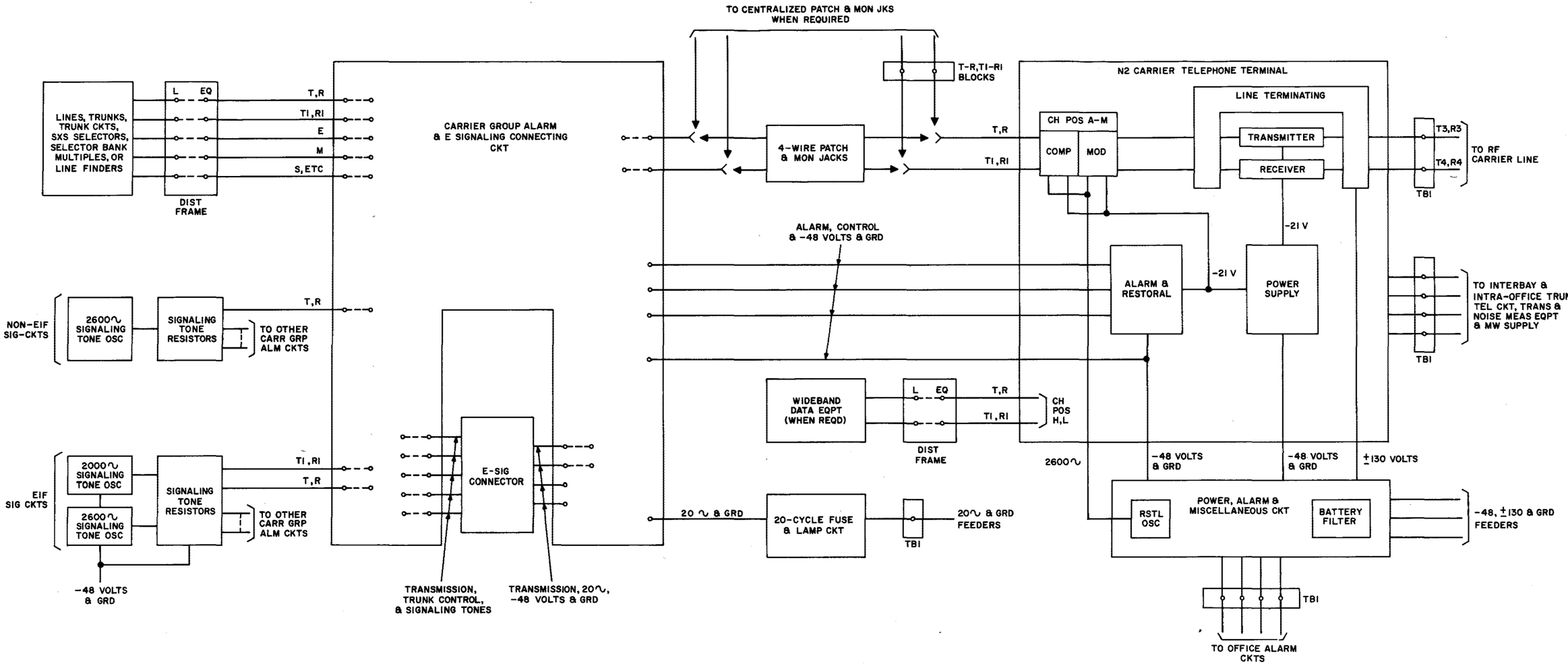

Fig. 10 — Packaged N2 Carrier Terminal, Block Diagram

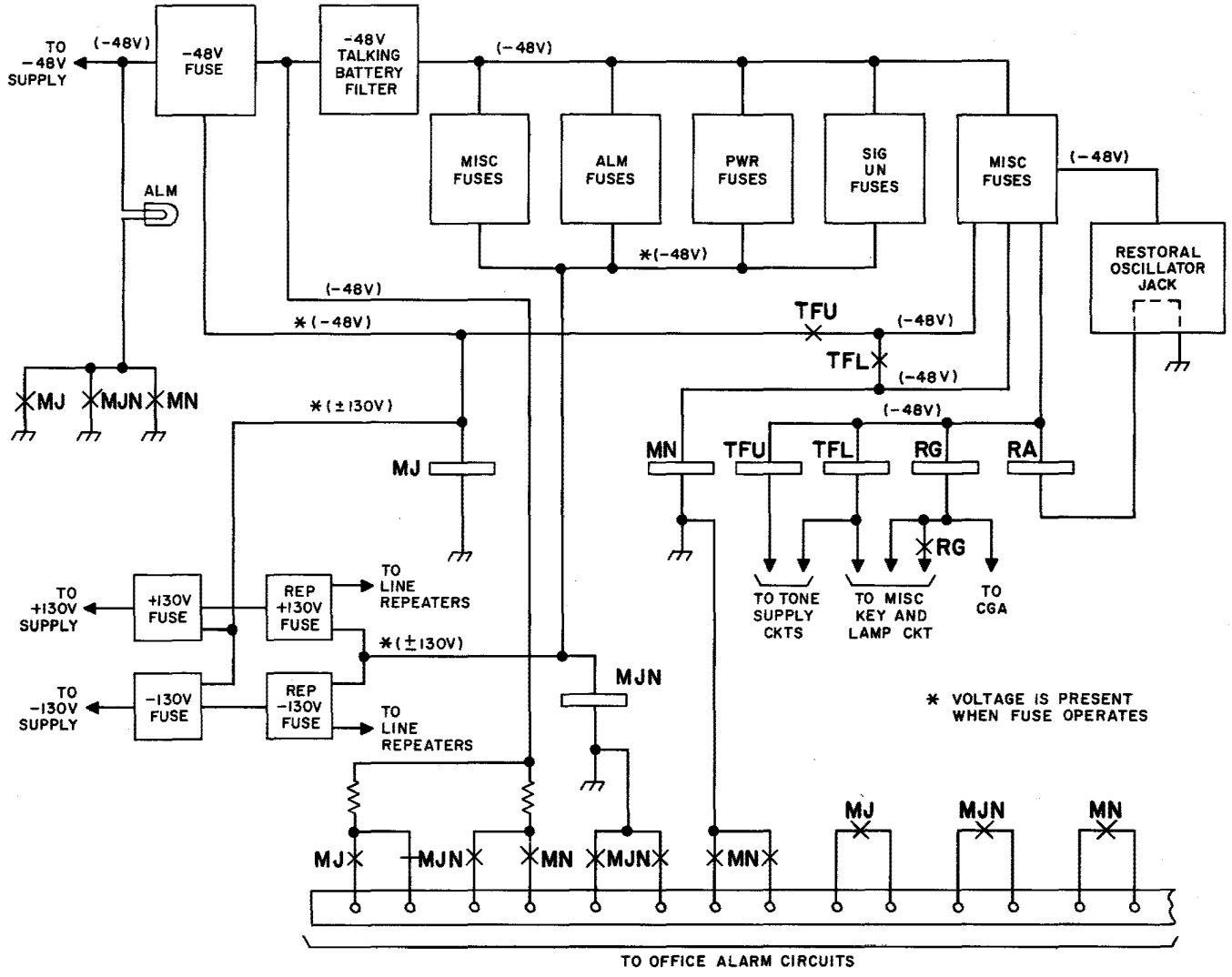

Fig. 11 — Power, Alarm, and Miscellaneous Circuit, Simplified Schematic Diagram

(b) Fuse failure for each carrier terminal and associated carrier group alarm unit.

(c) Fuse failure for battery filter capacitors, monitor and talk circuit, and various lamps in a jack field.

(d) Carrier failure of an N2 system.

3.15 In all except ESS type offices, two types of alarm signals are employed for N2 terminal frames. One alarm signal is a ground which activates either major or minor alarm indications. The other, used primarily in No. 5 crossbar offices, is −48 volts applied through an 800-ohm resistor. This signal will also activate major or minor alarm indications. The No. 1 ESS type office requires a loop closure between the N2 terminal frame and the alarm circuit to activate alarms. In addition, an ESS office requires a supplementary alarm signal to identify the equipment from which an alarm originated.

3.16 ***−21 Volt Alarm Connections:*** The −21 volt power supply unit in each N2 terminal is monitored by a circuit in an associated alarm and restoral unit. A simplified schematic diagram of this circuit is shown in Fig. 12. Variations in the −21 volt supply, that exceed

±1 volt, release normally-operated relay P. When relay P releases, −48 volts is applied to relay MN. Operation of relay MN activates minor office alarms. A detailed discussion of this circuit is provided in Section 362-803-110.

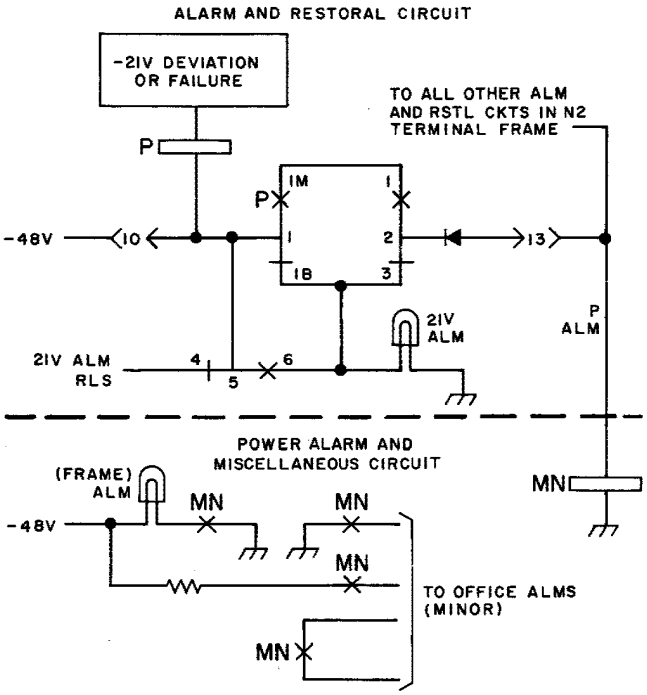

Fig. 12 — Interconnections for −21 Volt Alarm

3.17 ***Removal Alarm Connections:*** If an alarm and restoral unit in a carrier terminal or the restoral oscillator in a terminal frame is removed either inadvertently, or during maintenance routines, normally-operated relay RA (see Fig. 13) will release. When relay RA releases, ground is applied to light lamp RMV ALM. If the restoral oscillator has been removed, ground is also applied to light lamp RSTL OSC FAIL. Release of relay RA also applies ground to relay TFL. Operation of relay TFL operates minor alarm relay MN which lights lamp ALM and activates minor office alarms. Operation of key RMV ALM RLS will silence the office alarms.

3.18 Restoral of the removed unit to the terminal frame reactivates the office alarms until key RMV ALM RLS is released which causes lamp RMV ALM and, where applicable, lamp RSTL OSC FAIL to extinguish.

3.19 ***Restoral Oscillator Alarm Connections:*** The output level of 2600-cycle energy from a restoral oscillator is monitored by a circuit within the oscillator (see Fig. 14). If the level exceeds an allowable deviation or fails altogether, normally-operated relay RO is released. Release of relay RO applies −48 volts to light lamp OSC ALM and operate relay MN. Operation of relay MN activates minor office alarms and lights frame lamp ALM. Release of relay RO also lights lamp RSTL OSC FAIL. The office alarms can be silenced by operation of key ACO. When a defective oscillator is repaired or replaced, office alarms will again be activated until key ACO is released.

3.20 ***Carrier Failure Alarm Connections:*** Detection of carrier failure and the subsequent trunk conditioning and initiation of office alarms is accomplished by the carrier group alarm circuit in conjunction with an associated alarm and restoral circuit. Operation of the carrier group alarm is described in detail in Section 362-345-100. The alarm and restoral circuit is described in Section 362-803-110.

3.21 ***Miscellaneous Keys and Lamps:*** The miscellaneous key and lamp circuit is shown in Fig. 15. Lamp RSTL OSC FAIL will light if the 2600-cycle output of the restoral oscillator either fails or drops below a fixed value. If either the restoral oscillator, an alarm and restoral unit, or an alarm link unit is removed from an N2 terminal frame, lamp RMV ALM is lighted and office alarms are activated. Operation of key RMV ALM RLS will release the office alarm indications but will leave lamp RMV ALM lighted. When the removed unit has been restored to the frame, the office alarms are again activated until key RMV ALM RLS is restored to normal, thus extinguishing lamp RMV ALM.

3.22 Each carrier group alarm circuit includes a message register that is arranged to register an alarm each time transmission fails in the transmitting direction. When a register operates under these conditions, ground is furnished via lead RG1 to light lamp REG ALM. The RG relay (see Fig. 11) locks up, keeping

this lamp lighted as a reminder that the register needs to be read. After the reading has been recorded, key REG LP RLS is operated momentarily, which releases the relay and extinguishes lamp REG ALM.

E. Monitoring, Testing, and Patching Facilities

3.23 ***Patching and Testing Jacks:*** The standard N2 terminal frames normally provide a 4-wire monitoring and patching jack circuit as shown in Fig. 16. This circuit enables monitoring transmission (voice, program, or data) in either direction on a high impedance bridging basis. If an associated 4-wire monitor and talk circuit (see 3.24) is used with the patching jack circuit, it is also possible to talk in one direction at a time for maintenance or troubleshooting purposes. Using the patching jacks shown in Fig. 16 and interbay patching trunk jacks shown in Fig. 17, it is possible to patch out up to 12 channels. Alternating transmission facilities by patching channels is desirable when trouble develops in the N2 carrier system to which these channels would ordinarily be connected. In large central offices, patching and monitoring jacks may be furnished on a centralized basis. In these cases, the 4-wire channel pairs would be wired from CGA terminal blocks to the centralized jacks and then back to the N2 terminal frame, terminating at blocks provided for that purpose.

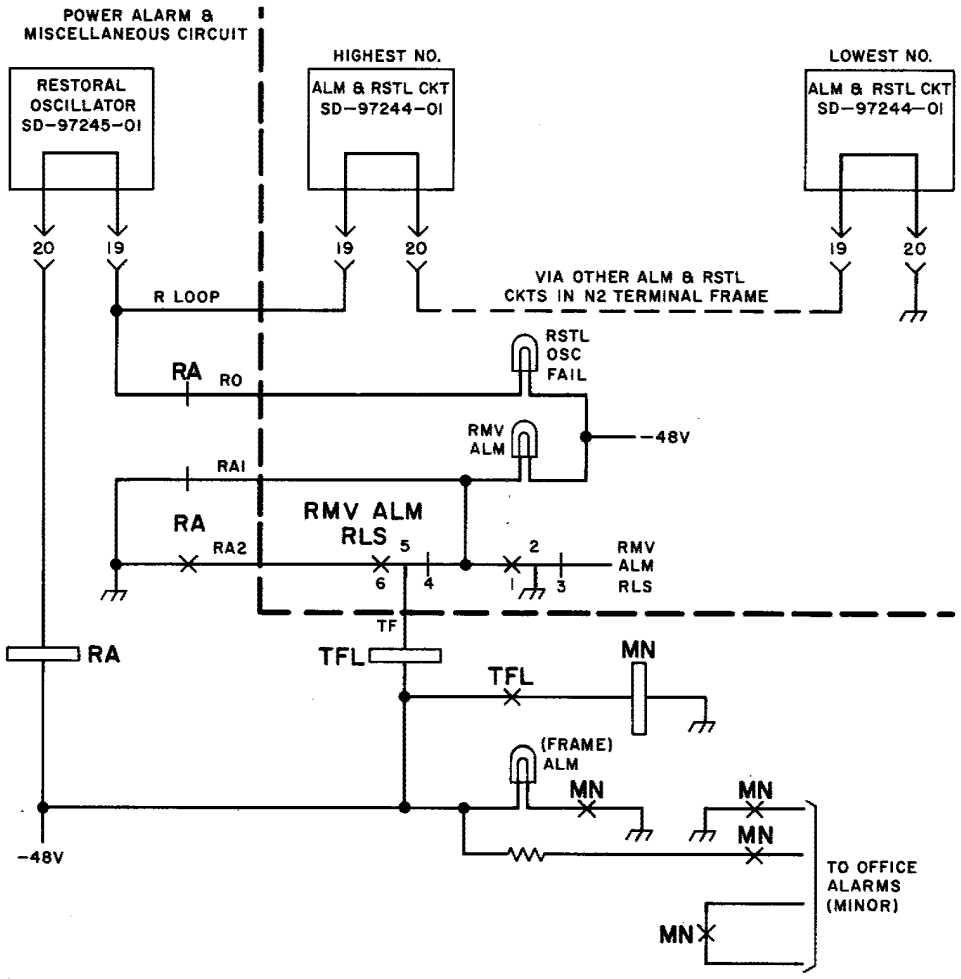

Fig. 13 — Interconnections for Removal Alarm

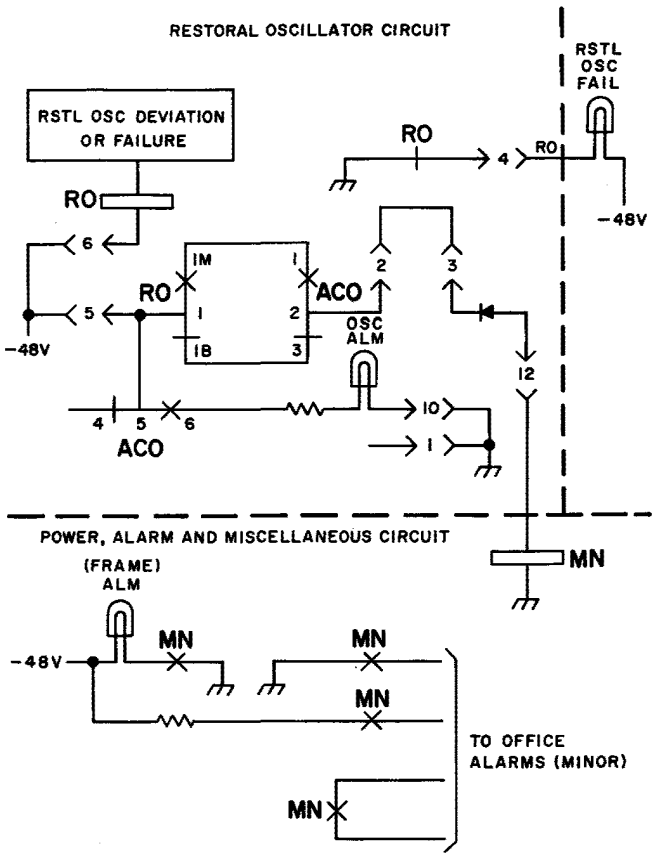

Fig. 14 — Interconnections for Restoral Oscillator Alarm

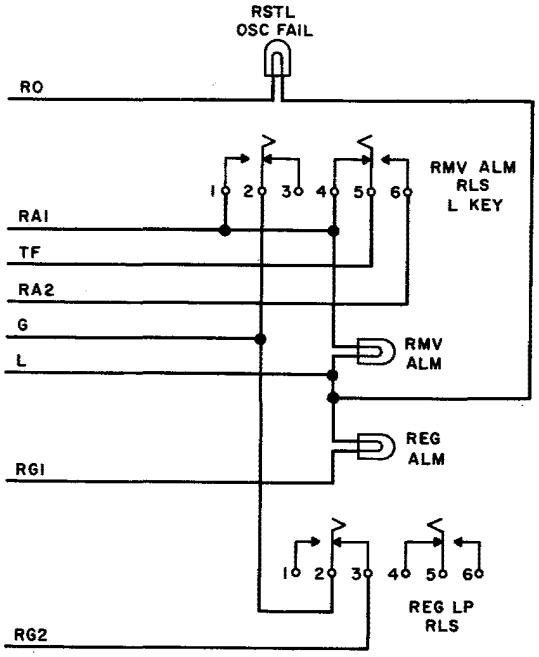

Fig. 15 — Miscellaneous Key and Lamp Circuit

3.24 ***Four-Wire Monitor and Talk Circuit:*** This circuit enables monitoring transmission on a high impedance bridging basis. The circuit may also provide patching facilities and amplification for transmission or noise measurements and can be arranged to furnish connections between a telephone set and order-wire trunks for interoffice communications.

3.25 ***Busy Test Circuit:*** If a bay line-up in a central office is arranged with multiple groups of patching jacks, it may be necessary to determine whether a particular trunk is in use. To do this, a busy test circuit, as shown in Fig. 18, is furnished in a line-up of N2 terminal frames. The test circuit consists of a relay, a buzzer, and test jacks. To check a trunk, one end of a patch cord is plugged into jack B TST of the test circuit, the other end is brought into contact with the sleeve of the trunk jacks being checked. If the trunk is busy, the sleeve will be grounded and this ground will be applied via the patch cord to the test circuit and operate relay B. Operation of relay B applies −48 volts to buzzer B causing it to operate, thus giving an audible indication that a particular trunk is busy.

3.26 ***Interoffice Communication Facilities:*** To communicate between N2 packaged frames and other locations in a central office, the circuit shown in Fig. 19 is used. For each trunk (TRK) jack, a busy (BSY) lamp is provided to indicate when a trunk is in use at the far end. An incoming call to the N2 frame will light lamp TRK by applying battery to lead L. The ground path for the lamp is through the AS lead. In cases where ground is not available on lead AS, option K is used. Option K connects one side of the TRK lamp to frame ground.

3.27 Since the interoffice trunk lamps are used in multiple at a number of N2 frames, a centralized means of signaling an incoming call may be necessary. The auxiliary signal circuit, shown in Fig. 20, is designed for this purpose.

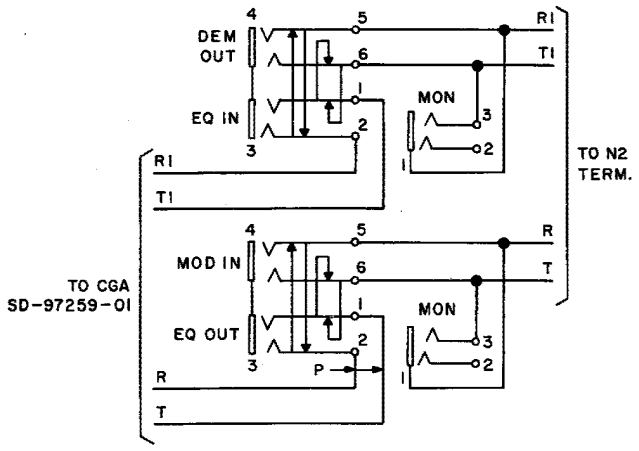

Fig. 16 — Four-Wire Monitoring and Voice-Frequency Channel Patch Jacks

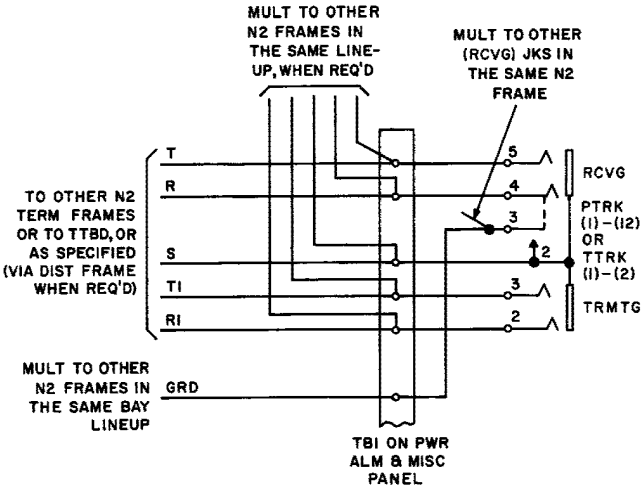

Fig. 17 — Interbay Patching and Testing Trunk Jack Circuit

The keys, relays, and buzzer in this circuit signal an incoming call in one of three ways. If keys SA and AUX are both normal, lamp TRK (see Fig. 19) will be lighted by a ground applied through the winding of relay AUX to the AS lead. If key AUX is operated, the ground on contacts A and 1 of relay AUX is applied via keys SA and AUX to the winding of relay A which operates. Operation of relay A causes buzzer AUX to operate. Operation of key SA will connect ground from the contacts of relay AUX to the distribution fuse and common aisle alarm circuit. This third method of signaling is especially suitable for use in a partially attended central office.

3.28 ***Transmission and Noise Measuring Control Circuit:*** This circuit (Fig. 21) is provided in packaged N2 frames at large offices which have centralized transmission and noise measuring equipment. The purpose of the circuit is to provide access to the centralized test equipment in order to make transmission or noise measurements. By patching to jack 600Ω TST (or via the monitor and talk circuit with key TST +7, −16 operated), it is possible to apply or receive the appropriate level of 1000-cycle tone at the monitoring and patching jacks shown in Fig. 16. The application or receipt of the 1000-cycle tone enables measuring the noise or measuring and adjusting the transmission on a particular channel. Rotary switch S1, when operated, adjusts the sensitivity of the measuring circuit to obtain an on-scale meter reading. Lamps TRMSN BSY and NOISE BSY provide a visible indication that the centralized test equipment is not available for transmission or noise measurements.

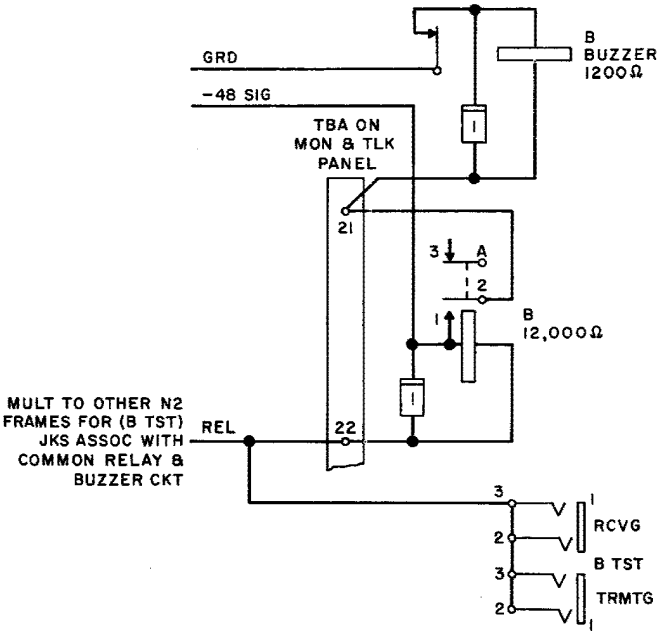

Fig. 18 — Busy Test Jack, Relay, and Buzzer Circuit

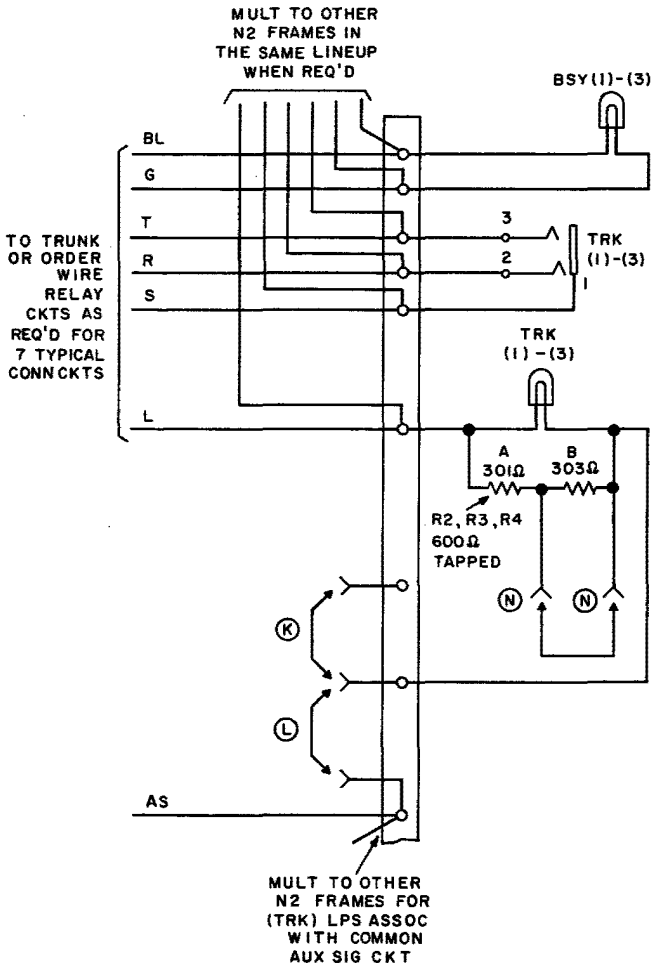

Fig. 19 — Interoffice Trunk Jack and Lamp Circuit

4. DRAWINGS

4.01 The following schematic and equipment drawings (not attached) provide detailed information.

A. SD Drawings

SD-98081-01	2000-Cycle Supply Circuit
SD-98092-01	2400-Cycle Supply Circuit
SD-98092-01	2600-Cycle Supply Circuit
SD-98091-01	Load Transfer Circuit
SD-98122-01	Tone Supply Resistor Circuit
SD-97257-01	Power, Alarm, and Miscellaneous Circuit for 3 to 6 Terminals
SD-97258-01	Power, Alarm, and Miscellaneous Circuit for 1 or 2 Terminals
SD-97245-01	Restoral Oscillator Circuit
SD-97259-01	Carrier Group Alarm and E-Signaling Connecting Circuit
SD-97244-01	Alarm and Restoral Circuit
SD-64048-01	4-Wire Monitor and Talk Circuit
SD-97190-01	20-Cycle Fuse and Lamp Circuit
SD-97256-01	Application Schematic for Packaged N2 Terminals

B. J Drawings

J99285	N2 Carrier Telephone Packaged Terminal Equipment, Common Systems
J99272	N2 Carrier Telephone N2 Terminal and Repeater Equipment, Common Systems

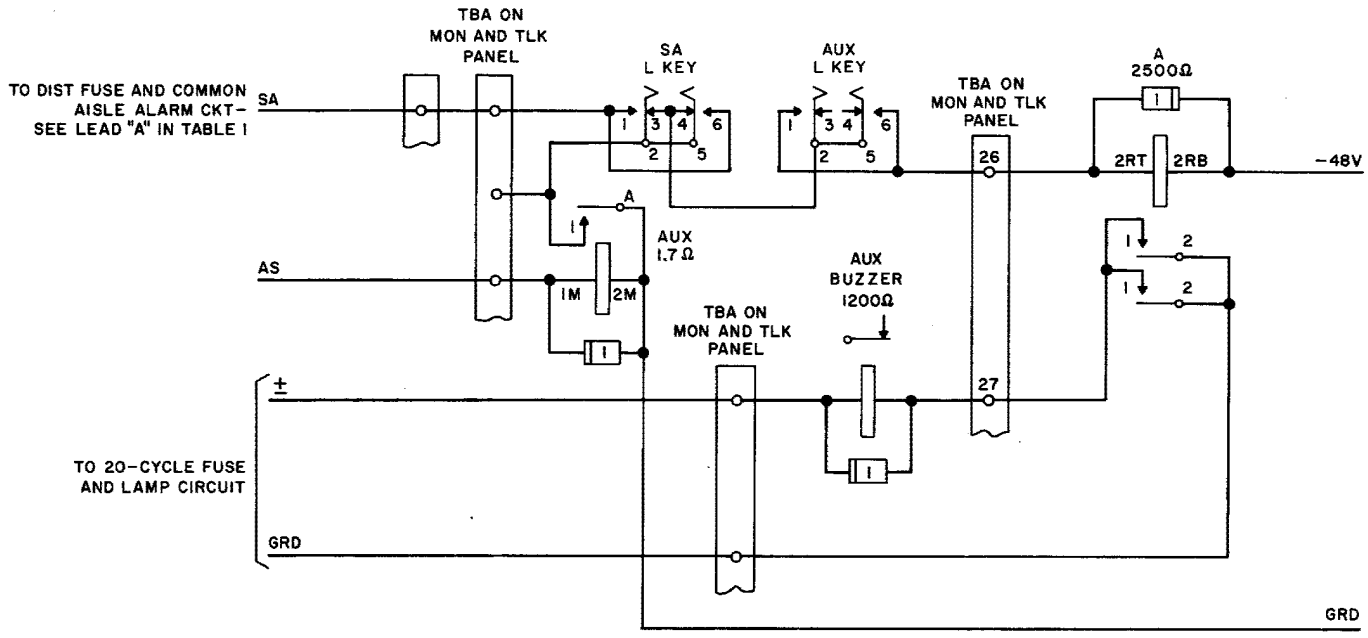

Fig. 20 — Auxiliary Signal Circuit

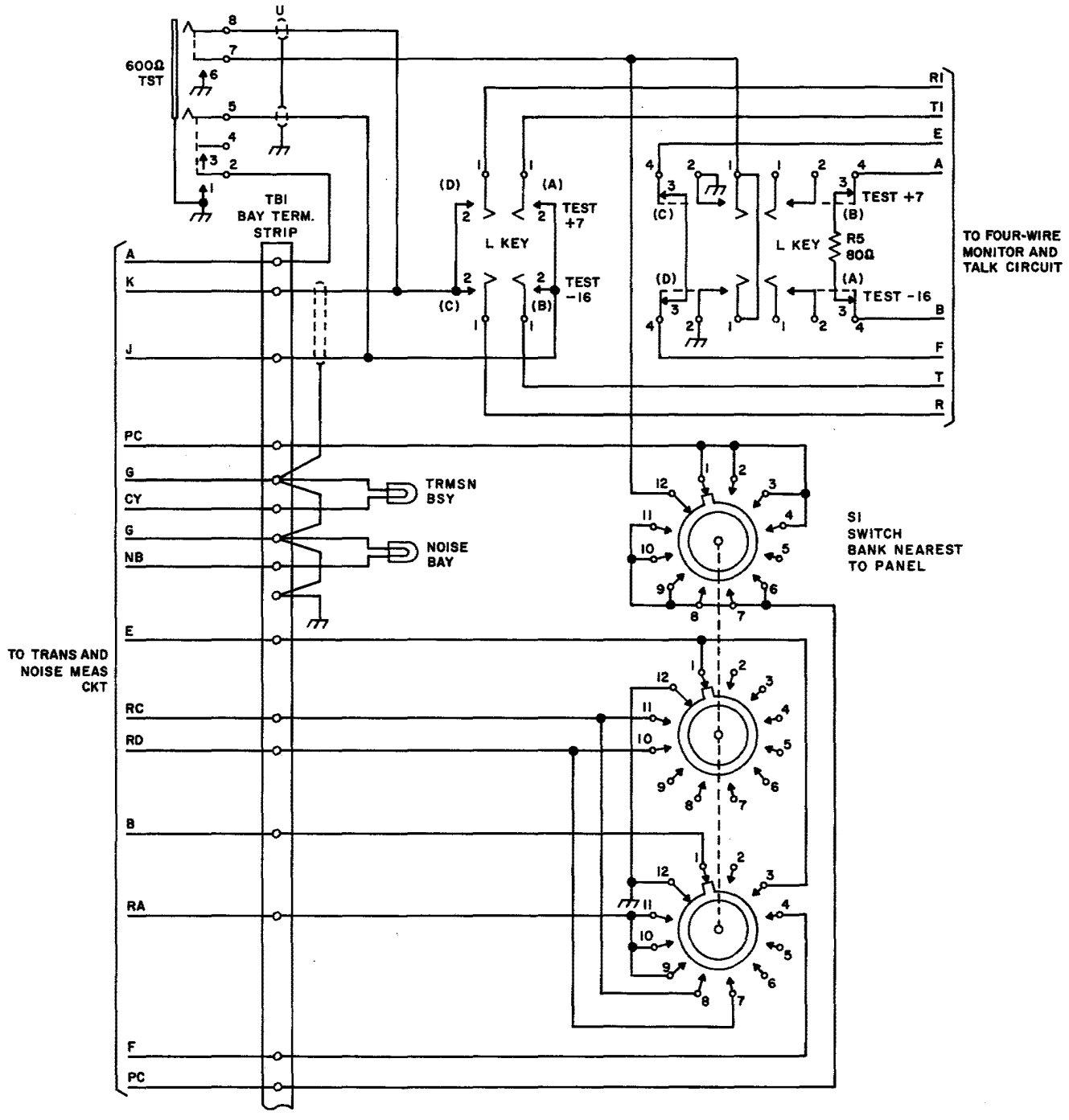

Fig. 21 — Transmission and Noise Measuring Control Circuit