

**TYPE N3 CARRIER TELEPHONE SYSTEM  
 TERMINAL EQUIPMENT DESCRIPTION**

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**1. GENERAL**

**A. Scope**

**1.01** This section provides physical and functional descriptions of the N3 carrier terminal, packaged frames equipped with E-type signaling, and carrier-only N3 carrier terminal frames associated with external F-type signaling, and the equipment associated with both types of frames. The carrier-only frames are basically rearrangements of the packaged terminal bays and are subject to the same limitations and requirements that are listed for the packaged bay. The primary carrier supply for the carrier terminals and their related secondary distribution circuits are also described. Since other sections are devoted to the description of the N3 carrier plug-in units, only a brief description is included.

**1.02** This section is reissued to include the N3 carrier-only terminal frame associated with F-type signaling, tandem powering of N1-H repeaters, and miscellaneous changes. Arrows are not used to indicate changes due to the general nature of this revision. This reissue does not affect the Equipment Test List.

**B. N3 Carrier System Features**

**1.03** The N3 Carrier Telephone System is a solid state system designed for short-haul use on toll or exchange plant cables. The N3 signal consists of 24 channels, each with a 4-kHz bandwidth and 12 high-level carriers transmitted at 8-kHz intervals within the band. At the N3 terminal, two channel groups, each containing 12 channels, are produced by two channel group modems and then combined for transmission in the N3 low- or high-group spectrum. Frequency drift correction and alarm

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and restoral functions are provided for each channel group. Upper sideband orientation is used in the first stage of modulation at all the channel modems to produce the two 12-channel intermediate groups (148 to 196 kHz). The resulting intermediate groups may be translated directly into the lower sideband of the basic 60- to 108-kHz group of the long-haul L system for extended service. Flat-gain regulation of the total signal power is provided at repeaters and at the group-receiving unit to compensate for changes in cable loss with varying temperature. In addition, double channel regulators at N3 terminals use the transmitted carriers in the N3 signal to regulate the adjacent channels.

**1.04** The N3 signal may be transmitted in the low-group spectrum (36 to 132 kHz) or in the high-group (172 to 268 kHz). The received frequency spectrum is the opposite of the transmitted, thus eliminating oscillation and reducing crosstalk. To provide partial equalization of the amplitude slope across the line frequency band, one frequency group is translated to the other and inverted at each repeater. This inverting action, called frequency frogging, distributes the loss across the band because the same channel does not always remain at the high end of the band.

**1.05** Power for terminals is derived from a standard -48 volt office power source. Power may be supplied from terminals over the cable transmission pairs to one adjacent N1 electron-tube repeater, to two N1-H type repeaters, or in some instances to as many as three N1A or four N2 transistorized repeaters. (SD-97272-01 lists repeater power requirements.)

**1.06** Both N3 and ON-2 terminals provide 24 single-sideband channels with only 12 carriers transmitted, but these terminals are not compatible. The N3 signal is composed of two 12-channel groups, whereas the ON-2 signal is composed of six 4-channel groups. The ON-2 channels are symmetrical about the carriers; but the lower and upper N3 channel frequency limits are oriented in one direction for the low-group and in the other direction for the high-group spectrum.

## 2. EQUIPMENT DESCRIPTION

### A. General

**2.01** The N3 carrier terminal, consisting of plug-in units for transmission and reception of an

N3 signal, is mounted on the shelves provided in the carrier frames. These frames accommodate the equipment panels for powering, fusing, and alarm facilities. The carrier frequencies for the N3 carrier terminal are supplied by the primary carrier frequency supply which is located external to the packaged frames.

### B. N3 Carrier Terminal

**2.02** The solid-state module units have 20-pin connectors on the rear for plug-in interconnections through the frame wiring and for connection to powering and equipment panels. The units are shown in their normal positions in Fig. 1 and are listed in Part H of this section. Resistance-combining networks for each of the two 12-channel groups are located at the rear of the terminal mounting shelves.

### C. N3-L Junctions

**2.03** N3-L junctions are used to interconnect the N3 system with the long-haul L system at group frequencies instead of using the A5 channel bank for voice-frequency (VF) connections. There are three types of N3-L junctions. The type A N3-L junction provides an interface between the N carrier repeatered line and the L multiplex facilities. Special frames are used for the type A N3-L junction, and most of the plug-in units for this junction are not common to the N3 terminal. The type B N3-L junction provides 24 N3 VF terminations at the L terminal end of a composite N3-L system. The type C N3-L junction is half type A junction and half N3 terminal; 12 channels are connected to the L facility and 12 channels are terminated. Type B and C junctions are formed in N3 frames by the replacement of certain units and the application of specific options described in Section 362-921-500.

### D. Packaged Frames

**2.04** The packaged frames are duct-type, double-bay supports for equipment panels and have shelves for carrier plug-in units and E-signaling units. These frames are shop-wired in the universal wiring scheme, which allows easy conversion to type B and C N3-L junctions. The frames are sized for the carrier terminal capacity. All the J99300 frames contain a trunk-release and make-busy panel for each group of 12 channels, shelves for plug-in units, signaling tone supply equipment, a

20-Hz ringing tone supply, a test connector for signaling test tones, and a battery supply required for portable test sets. Other major equipment and VF patching and monitoring jacks peculiar to the various frames are given below.

**2.05** The J99300A and B frames are 11 feet 6 inches high and have the capacity for two carrier terminals (48 channels). These frames have an alarm, power, and miscellaneous panel and a secondary carrier distribution circuit. The J99300A frame includes VF patching and monitoring jacks. The J99300A frame (Fig. 2) also contains a monitor and talk circuit. The J99300B frame (Fig. 3) is used with centralized 4-wire patching and monitoring jacks but does not include these jacks in the frame.

**2.06** The J99300C (Fig. 4) and F frames are 9 feet high and are used for one carrier terminal. These frames may utilize the alarm, power, and miscellaneous panel or secondary carrier distribution circuit in an adjacent frame since this equipment has the capacity to supply two carrier terminals. The J99300C frame includes VF patching and monitoring jacks, whereas the J99300F frame uses centralized jacks.

**2.07** The J99300D (Fig. 5) and G frames are 7 feet high and have the same features as the C and F frames, respectively, as well as the equipment common to all of the frames.

#### **E. Packaged Frame Equipment Panels**

##### **ED-3C172-30 Secondary Carrier Distribution Shelf or J99300E Secondary Carrier Distribution Panel**

**2.08** The ED-3C172-30 secondary distribution shelf (Fig. 6) occupies ten inches of vertical space near the top of a universally wired packaged frame. Nine distribution amplifier units mounted in this shelf distribute up to 16 carrier frequencies from the carrier frequency supply to two N3 terminals or two type B or C junctions. These amplifiers produce a high degree of isolation between the outputs. Seven of these units contain amplifiers for two frequencies, and two of the units amplify only one frequency. Provided for each amplifier in a unit are six screw switches which adjust the amplifier gain to compensate for the cabling loss from the primary carrier supply. The J99300E secondary distribution panel, consisting of die-cast aluminum sections with a printed circuit board in each section, is shop-wired in older packaged

frames. The printed boards hold an adjustable pad, a carrier regulator, an impedance-matching network, and a distribution network. No amplifiers are included in the panel. The distribution panel has the same output capacity and the same mounting requirements as the distribution shelf. The J99300E panel is described in Section 362-915-100; the new shelf and distribution amplifiers are described in Section 362-915-101.

##### **J99300T Alarm, Power, and Miscellaneous Panel**

**2.09** The panel shown in Fig. 7 serves two N3 carrier terminals. It is located in every double-terminal frame and in the first, third, and fifth single-terminal frames of each bay lineup. The panel has mounting space for the J99272AT restoral oscillator which produces a 2600-Hz tone for failed system restoral. Alarm lamps, alarm-release keys, and relays are mounted on this panel. The main -48 volt fuse, distribution fuses to carrier terminals, fuses for trunk-release and make-busy and signaling equipment, and the fuses for repeater powering are all located on this panel. The panel also contains a -48 volt decentralized battery filter and a terminal strip for miscellaneous connections with the central office equipment. The panel is 23 inches wide and 7 inches high.

##### **J99285AP or J99300BL Trunk-Release and Make-Busy Panel**

**2.10** The new AP (Fig. 8) or the BL trunk-release and make busy (TR & MB) panel contains relays used in conditioning trunk circuits to release subscribers, to give busy indications, and to provide automatic system testing and restoral in conjunction with the alarm and restoral unit. A message register on the front of the panel records loss of transmission from a terminal. The hinged rear cover of the panel supports a terminal strip with 12 channel blocks, 3 spare blocks, and a miscellaneous block. The channel blocks contain terminals for interconnections of the trunk circuits, the 12 carrier channels, and the associated E-type signaling units which are plugged into the connectors from the TR & MB panel. The TR & MB panel requires three inches of vertical mounting space in the bay between the E-type signaling shelves. The spare blocks on the TR & MB are involved when auxiliary E-type signaling units are used. A TR & MB panel is required for each 12-channel group. When an alarm and restoral unit is provided for each N3 carrier terminal in the frame, each TR & MB panel

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operates independently. This scheme is used for type B and C junctions because the groups may be terminated at different points. It is permissible to use only one alarm and restoral unit for two terminals in the frame, but this arrangement does not provide individual alarm protection for the frequency correction units or channel group modems.

### Plastic Templates

2.11 Plastic templates, which indicate optional strapping for the terminals, are available. These templates are perforated to fit over the projecting terminals of the terminal blocks on the TR & MB panel (Fig. 9). Black lines with letter identification between the holes on the templates indicate the options. These options are for a particular trunk circuit and signaling features. The templates are also very helpful for connecting a channel block to a spare block or to another channel block when auxiliary E-type signaling units are used.

### J99300BN or J99300AN Auxiliary E-Type Signaling Shelf

2.12 Where auxiliary E-type signaling units E( )L-A or E( )S-A are required, they must be located adjacent to their companion signaling unit [E( )L or E( )S]. This may require locating the signaling unit assigned a specific channel to one of the spare (49-50) or to another unassigned E-type signaling position. This arrangement requires that optional strapping be placed between the regular and the auxiliary E-type signal unit terminal blocks. All N3 carrier package bays except the J99300A and J99300G have one auxiliary signaling shelf for the installation of up to 10 signaling units. The auxiliary shelf J99300AN or J99300BN mounting serves five circuits each consisting of one regular and one auxiliary E-type plug-in signaling unit, [E( )S/E( )S-A or E( )L/E( )L-A]. The shelves are connected to the N3 carrier package bay by means of a 50-foot cable stub. The shelf is made of die-cast aluminum and is equipped with a connector for each signaling unit. For each channel used for foreign exchange, the involved channel block on the TR & MB panel and the spare block for the auxiliary signaling unit are interconnected; thus the number of pairs of signaling units that may be terminated is equal to the number of TR & MB panels times three, which is the number of spare blocks on the TR & MB panel.

### J99300W and J99300Y Patching; Monitoring; and Miscellaneous Jack, Key, and Lamp Panel

2.13 The J99300W panel (Fig. 10) is 23 inches wide and 13 inches high. It is installed in the J99300A packaged frame by the shop. The J99300Y panel is 23 inches wide and 10 inches high and is supplied with the single terminal J99300C and D frames. These panels provide the following features:

- (a) 4-wire VF patching and monitoring jacks
- (b) transmission and noise measuring jacks, keys, lamps, and switches
- (c) 1000-Hz test tone supply jacks
- (d) patching and testing trunks jacks
- (e) alarm lamps for transmission failure indication in conjunction with an alarm override key and lamp
- (f) alarm lamp and release key for power supply unit voltage alarms
- (g) jacks and keys associated with 4-wire monitor and talk circuit
- (h) telephone set jacks.

### J99285W 20-Hz Fuse and Lamp Panel

2.14 The fuse and lamp panel, shown in Fig. 11, furnishes 20-Hz power to the J99300BL or J99285AP trunk-release and make-busy panel, and to the test tone connector and auxiliary signaling circuits. This panel is always used with E1S signaling units. The panel occupies two inches of vertical space and is furnished, shop-wired on an optional basis, for all of the packaged frames.

### F. Carrier-Only Frames

2.15 The N3 carrier-only terminal frames are provided for use with external F-type signaling equipment. Three frames, designated J99300H, J, and K when used in conjunction with external F-type signaling consolidated VF equipment frames (J98624), are intended to be used instead of the J99300A, B, C, D, F, and G packaged N3 carrier terminal bays. Typical N3 carrier-only terminal frames and their associated external F-type signal

frames are listed in Table A. The N3 terminal, carrier-only frames are basically rearrangements of the existing N3 terminal packaged terminal frames; therefore, they are subject to the same limitations and requirements as the frames they replace. The alarm and restoral unit per SD-97184-02 when used with the carrier-only frames provides various alarm registration and restoral operations in case of a transmission failure. If a carrier failure occurs, this circuit extends supervision over the SA lead to operate an external trunk release and make-busy circuit which releases connected subscribers, stops service charges, and applies a simulated busy condition on the affected trunks to prevent their seizure during the failed condition. When the carrier is restored, the SA lead signals the external trunk release and make-busy circuit to restore the trunks to service. The N3 carrier-only terminal frame is a single 23-inch, duct-type bay framework. The external F-type signal frame is intended to be located adjacent to the associated carrier-only N3 terminal frame. However, it may be remotely located within the same office, similar to the N2 carrier terminal bay (J99272) and its external E-type signal bay.

**2.16** The J99300H shop wired bay (Fig. 12) provides two 24-channel N3 carrier terminals or two N3-L type B or C junctions in an unequal flange, duct-type bay framework, which is 11 feet 6 inches high. In addition to six shelves for each of the N3 terminals or junctions, this bay provides common equipment which includes an alarm, power, and miscellaneous panel; the secondary carrier distribution; and a miscellaneous jack, key, and lamp panel. Options include carrier supply output terminations for unused channels, protective covers for the rear of shelves, and a choice of two terminal blocks, one of which is used in conjunction with a high frequency cross-connect cabinet.

**2.17** The J99300J bay (Fig. 13) provides an N3 carrier terminal or N3-L type B or C junction in a 9-foot, unequal flange, duct-type bay framework. This bay provides six shelves for the N3 terminal or junction, common equipment including a frequency distribution and combining multiple panel, and a miscellaneous jack, key, and lamp panel. In addition, the first bay in the two-bay lineup provides a secondary carrier distribution shelf and an alarm, power, and miscellaneous panel. The options for this bay are the same as for the J99300H bay.

**2.18** The J99300K bay (Fig. 14) is identical to the J99300J bay described above except for the bay framework height, which is 7 feet.

#### G. Carrier-Only Frame Equipment Panels

**2.19** *ED-3C416-30 Secondary Carrier Distribution Shelf:* The ED-3C416-30 secondary carrier distribution shelf (Fig. 15) occupies 9 inches of vertical space near the top of the shop wired carrier-only N3 carrier terminal bay. One shelf is required for every two carrier terminals and is arranged to mount nine plug-in distribution amplifiers. When the shelf is fully equipped, it provides for and distributes the 16 basic carrier frequencies to the modulator and demodulator circuits of the N3 carrier terminal or N3-L junction equipment. The same distribution amplifiers are used for this shelf as for the packaged frames described in 2.08.

**2.20** *J99300BT Alarm, Power and Miscellaneous Panel:* The J99300BT panel (Fig. 16) furnishes -48V, +130V, and -130V power for transmission and alarm equipment of two terminals of an N3 terminal frame. It consists of fuses, -48 volt battery filter, relays for frame and office alarms and an alarm lamp indicator. The panel occupies three and one-half 2-inch by 23-inch mounting plate spaces near the top of the J99300H, J, and K frames. The alarm relays are capable of furnishing either an operating ground, a loop closure, or a dc loop. An alarm at this unit may be activated by any fuse failure, carrier failure, excessive deviation, or failure of the terminal power supply, or by removal of either an alarm and restoral circuit, or a restoral oscillator.

**2.21** *J99300BU Miscellaneous Jack, Key, and Lamp Panel:* The J99300BU panel (Fig. 17) provides the jack, alarm, and restoral tone panel with tone distribution resistors for two N3 terminals. A J99300AT restoral oscillator plugs into this panel to provide the 2600 Hz restoral tone for the automatic test and restoral circuitry of test channels 1 and 2. The RA (removal alarm) relay mounts in this unit with its operate path looped (in series) through micro switches of the four alarm and restoral jacks. Removal of any of these units will cause the RA relay to release, the RMV ALM lamp to light, and the minor (MN) alarm relay to operate.

**H. N3 Terminal Plug-In Units**

**2.22** The components of the plug-in units are mounted on printed circuit boards which are supported by a die-cast aluminum frame. The 20-pin connector on the rear of each unit is an extension of the printed circuit board. A latch is provided on the face of the units to lock them in place.

**2.23** Each fully equipped N3 terminal requires the following plug-in units:

24—J99300AA Plug-in Compandor Units (See Fig. 18 and Section 362-911-100)

24—J99300AB or J99300AY Plug-in Channel Modem Units (See Fig. 19) and Section 362-910-100)

12—J99300AC or J99300CA Plug-in Double Channel Regulator Units (See Fig. 20, Note 1, and Section 362-909-100)

2—J99300AD Plug-in Channel Group Modem Units (See Fig. 21 and Section 362-906-100)

2—J99300AE or J99300AS Plug-in Frequency Correction Units (See Fig. 22 and 23, Note 2, and Section 362-907-100)

1—J99300AF Plug-in High-Group Transmitter Unit (See Fig. 24 and Section 362-905-100)

1—J99300AG Plug-in Low-Group Transmitter Unit (See Fig. 25 and Section 362-905-100)

1—J99300AJ Plug-in Low-Group Receiver Unit (See Fig. 26 and Section 362-905-100)

1—J99300AH Plug-in High-Group Receiver Unit (See Fig. 27 and Section 362-905-100)

2—J99300AK Plug-in Alarm and Restoral Units (See Fig. 28 and Section 362-908-100)

1—J99300AP Plug-in Combining and Switching Unit (See Fig. 29)

1—J99300AT, List 1, 2, or 3 Plug-in Line Terminating Unit (See Fig. 30 and Section 362-904-100)

1—J87245A DC Power Converter and Regulator Unit (Fig. 31 and Section 362-903-100).

**Note 1:** The new J99300CA, List 1 and 2 double channel regulators replace List 8 and 9 units, respectively, in terminals of an N3 system and N3 terminals of an N3-L system. Table B shows the interchangeability of the two codes of regulators. The J99300CA, List 1 and 2 units must be modified to reduce noise generation in the N3 system. This modification is identified by the stamping, MOD A, on the face of the unit and on the surface of the printed circuit board.

**Note 2:** The J99300AS frequency correction unit has a greater range of correction than the older J99300AE unit, and the J99300AS unit has a single-frequency alarm pickoff to remove interference to alarm operation caused by spurious tones. The J99300AS frequency correction unit must be used for C-type N3-L junctions and at N3 terminals in an N3-L system. A J99300AS with modification A is required for the A-type N3-L junctions. The universally wired bays are equipped for use with the J99300AS unit, but the older bays must be modified. The J99300AE unit cannot be used in the new bays.

**J99300AP Combining and Switching Unit**

**2.24** The combining and switching unit has jacks on the face associated with the power supply, the group receiver, and the group transmitter for attaching the cords of the portable switching set which allows in-service replacement of the units. The single module unit contains a splitting network of resistors to distribute the group receiver output to the two channel group modems. It also combines the two channel groups in a hybrid circuit for application to the group transmitter.

**J99300AR Channel Modem Load Unit**

**2.25** This optional unit is shown in Fig. 32. It is used in place of unused channel modems in partially equipped bays in order to maintain the impedance at the 12-channel combining multiple. Removal of several modem units substantially increases the impedance and voltage at the combining multiple which hinders line amplitude equalization. One resistor in the load unit replacing the channel filter of the modem unit connects to this multiple to restore the normal condition. The other two resistors of the load unit replace the modulator and demodulator circuits of the modem units.

Removal of individual modem units for maintenance is permissible and does not require the use of the modem load unit.

#### **J99300AB VF Amplifier and J99272CA Through-Channel Connector and Pad Unit**

**2.26** These plug-in units are for optional use as described in Section 362-912-100. The VF amplifier is placed in a compandor position and the J99272CA unit is mounted in the appropriate E-type signaling unit position. The VF amplifier is used to provide noncompandored operation, whether at the terminating ends of an N3 system or at an intermediate point in an extended system formed by tandem-connected channels. The J99272CA unit provides the proper levels for channel interconnections. These units, which are located at interconnecting offices, contain loss pads for both directions of transmission to reduce the receive level of one channel to the transmit level of the connecting channel. The VF amplifier is shown in Fig. 33 and the J99272CA is shown in Fig. 34.

#### **Slope, Bulge, Cubic, and Quartic Equalization**

**2.27** The slope across the band at the output of the group transmitter, which is the power of carrier 12 with respect to the power of carrier 1, is determined by the selection of a 377-type equalizer. The slope may be adjusted from +9 dB to -9 dB in 3-dB steps. This equalizer is also used in the group receiver, and a screw-down fine adjuster on the face of the unit provides +1 dB, 0 dB, and -1 dB of slope, corresponding to setting A, B, or C respectively. In addition, bulge, cubic, and quartic equalizers are provided at repeater locations in N3 systems and N3-L systems. At N2 repeater points 391-type plug-in equalizers reduce bulge and cubic distortions, and a larger 916-type plug-in equalizer corrects for quartic distortions in the line-frequency spectrum. An adjustable deviation equalizer, which combines the four types of equalization in one unit for the high-group range, may also be provided at certain repeater points.

#### **I. Carrier Frequency Supply**

**2.28** The N3 carrier frequency supply provides all of the carrier frequencies for modulation and demodulation of 1 to 26 N3 terminals or N3-L type A, B, or C junctions. Sixteen frequencies of high purity sine waves are produced with accurately

controlled level and frequency stability. The following frequencies are produced:

12—Channel Carriers—148, 152, 156, 160, 164, 168, 172, 176, 180, 184, 188, and 192 kHz

2—Channel Group Carriers—232 and 280 kHz

1—Group Carrier—304 kHz.

1—N3-L Junction Carrier—256 kHz.

**2.29** All of the frequencies of the carrier frequency supply are derived from a single 4-kHz source which may be a 4-kHz generator unit containing a 61A oscillator or the L-multiplex primary supply, if available. The 61A oscillator has the capability of achieving a long-time frequency stability of better than seven parts per million. The output of the oscillator drives a nonlinear inductor (kick coil) to produce harmonics. Crystal filters for six odd harmonics and nine even harmonics select frequencies which are applied to separate amplifiers. The 152-kHz output of the kick coil goes to an amplifier doubler to produce 304 kHz as well as 152 kHz.

**2.30** Alternate plug-in units should be located adjacent to regular carrier supply units to assume service in case of a failure. Each regular and alternate unit pair has parallel input leads and two pairs of output leads. These output leads go to the relay transfer panel, and from there, the pair from the unit in service goes to the primary distribution circuit and the other pair is terminated in load resistors. If the service is transferred, the output leads are automatically interchanged by the relay transfer panel. A transfer relay operates unit changeover, either manually or automatically. A key on the switching and alarm panel is used to manually switch the units, and an alarm lamp for each unit indicates abnormal operation. Automatic transfer is accomplished by a sensing relay in each plug-in unit to activate the transfer relay.

**2.31** The regular plug-in units obtain their operating power from the regular power supply in the carrier supply bay and the alternate units from the alternate power supply in the carrier supply bay. Failure of the regular power supply causes the regular frequency generators to fail, which automatically switches the load to the alternate

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carrier frequency generators and the associated power supply for maintenance of service.

**2.32** The primary carrier supplies are mounted in 23-inch, duct-type packaged bays in 11-foot 6-inch, 9-foot, and 7-foot sizes. These bays have equipment panels and mounting shelves for plug-in units. The location of equipment in the frame is shown in Fig. 35. The entire carrier supply occupies 45 inches of vertical space with the remaining space used for miscellaneous mounting. Connections to the secondary distribution circuits are made on wire-wrap terminals on the primary distribution panel. All other connections, the primary power, remote office alarms, and external 4-kHz source, are made on a terminal block which is located on the front of the fuse and alarm panel.

**2.33** When service is automatically switched between regular and alternate units, a unit alarm lamp lights and the minor office alarm operates. If abnormal operation occurs in the regular or alternate power supply unit, or in both the regular and alternate units of a pair, or in a regular unit without an alternate, a unit alarm lamp for the defective units lights and a major office alarm operates. Major and minor alarm lamps provided on the switching and alarm panel are operated in conjunction with office alarms. A reset switch on the switching and alarm panel can be used to release all alarms.

### J. Carrier Frequency Supply Bay Panels

**2.34** Since Section 362-901-100 contains a detailed functional description of the equipment panels and the plug-in units, only a brief description is given here.

#### J99300P Primary Carrier Supply Distribution Panel

**2.35** This panel, which is mounted and wired in the shop, distributes 16 carrier frequencies to 1 through 13 secondary carrier distribution circuits located in N3 terminal frames and N3-L junctions. This distribution is accomplished by filtering, impedance matching, and distribution circuits on a series of printed circuit boards mounted vertically in the framework. Figure 36 shows the panel. A removable metal cover protects this assembly.

#### J99300S or J99300BP Switching and Alarm Panel

**2.36** The J99300S panel shown in Fig. 37 is a four-sided aluminum enclosure, 23 inches wide, 4 inches high, and 11-1/2 inches deep. The front piece of the panel mounts the unit alarm lamps for regular and alternate carrier supply plug-in units, manual transfer switches, a major and minor office alarm lamp, and a reset key for each. A test jack or a series of pin jacks for testing the common carrier power supply is mounted on the front piece. Printed circuit boards for major and minor alarms and for switching logic circuitry are mounted on the inside of the main framework of the panel. A power-switching relay and a terminal strip are also included in the main framework. Connections to the panel are made with bay cabling, which has sufficient slack to allow the front piece of the panel to be moved aside for maintenance.

**2.37** The J99300BP panel shown in Fig. 38 provides an alarm monitor and manual switching control position for the primary carrier supply circuits. It includes alarm lights and manual transfer switches which provide visual indication of the operating state of the carrier supply. The transfer switches, positioned directly above or below each pair of plug-in units, have white index lines on their faceplates which indicate the selection of the regular or alternate unit. Alarm lights identify any units which may have deviated from the specified safe operating limits. Major and minor office alarm indicating lamps and associated reset keys are located on this panel. The automatic switching feature functions only for primary carrier supplies which have both regular and alternate plug-in units in place. Failure of any regular or alternate unit (except for the power supply) causes its load to be automatically switched to the protecting unit unless the protecting unit is also failed. An alarm lamp identifies the faulty unit; a minor alarm lamp on the panel will light. The output of the faulty unit is simultaneously transferred to a dummy load resistor. Failure of the regular unit and the alternate unit at the same time will register a major alarm. Alarm lamps for unequipped positions do not operate. The unit is approximately 23 inches wide, 4 inches high, and 11-1/2 inches deep.

#### J99300BB or J99300BM Harmonic Generator and Carrier Filter Panel

**2.38** The aluminum framework of this panel is 23 inches wide, 4 inches high, and 8-1/4

inches deep with mounting brackets at each end. A section of the framework forms a top and bottom compartment, each of which serves to mount a subpanel. The panel supports fifteen filters and one 307A harmonic generator which consists of a kick coil and a full-wave rectifier. Figure 39 shows the newer J99300BM unit.

#### **J99300R or J99300BR Fuse and Alarm Panel**

**2.39** The fuse and alarm panel (Fig. 40) provides all the -48 volt power required by the switching and alarm panel, the relay transfer circuit, and the regular and alternate power supply units. The panel also provides a terminal strip for interconnection with the central office alarm system and, where required, with the L-multiplex 4-kHz primary supply. The panel connects to separate power feeders for regular and alternate units.

#### **ED-99753 Relay Transfer Panel**

**2.40** This panel (Fig. 41) contains relays and miscellaneous components for switching the outputs of regular and alternate 4-kHz generators and dual or doubler amplifiers to the primary distribution circuits. One relay is for the 4-kHz generators, one for the doubler amplifier, and one for each of the seven dual amplifiers.

#### **K. Carrier Frequency Supply Plug-in Units**

**2.41** The J99300BA 4-kHz generator unit (Fig. 42) is comprised of an amplifier, a circuit for monitoring the output, and a sensing relay to initiate the change to an alternate unit.

**2.42** The J99300BD dual amplifier (Fig. 43) is a single module unit comprised of two identical and independent amplifiers. Seven of these are used to amplify seven sets of frequencies produced by the harmonic generator.

**2.43** The J99300BE plug-in doubler amplifier (Fig. 44) is a single module with two independent amplifiers, one of which is preceded by a frequency doubler to produce 304 kHz from the 152-kHz input.

**2.44** The J87245A power converter and regulator unit for the primary carrier supply is the same type as used to power the N3 carrier terminal.

#### **L. Test Equipment**

##### **J99300AU N3 Group and Power Switching Set**

**2.45** This portable unit (Fig. 45) provides a means for substituting a spare group or power supply unit into the N3 carrier terminal without interrupting service on a system. This unit switches power supplies without hits. In switching group units an amplitude hit of 1 dB for a period of seven milliseconds is produced on the message channels.

**2.46** For changing group units the switching set equipped with an alternate unit is connected by a power cord and a transmission cord to the combining and switching unit in the N3 carrier terminal. Test jacks and adjusters on the switching set allow measurement and adjustment of the alternate unit output before temporarily switching service to the alternate unit. While the alternate unit is in service, the regular unit is removed from the bay and replaced with the spare unit. Before service is switched from the alternate unit to the unit in the bay, a meter is connected to the switching set to check the output of the replacing unit.

**2.47** When a power supply is switched, only the power cord is attached to the combining and switching unit. The switching set equipped with an alternate unit provides a means to parallel the output of the power supply in the bay. Test jacks and adjusters allow service to be gradually transferred to the alternate unit so that the spare can be substituted for the regular. Then the switching set is used to gradually transfer service from the alternate unit to the spare.

##### **J99300AW Terminal Test Stand**

**2.48** The terminal test stand (Fig. 46) is a portable test set which is used to test terminal equipment. The unit provides means for mounting a compandor and a modem unit together or separately, or for mounting an alarm and restoral unit outside the terminal bay for test purposes. Complete connection between the units and the terminal is obtained by flexible cords and plugs inserted in place of the plug-in units under test. Test jacks are provided for monitoring transmission or voltage on each of the connections to the unit under test. The circuit is arranged to allow opening of the terminal wiring at the input to the compressor and output of the expander for the purpose of

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injecting a test signal or measuring signal levels on a terminated basis. A looping amplifier is provided to permit testing a compandor and modem of one channel from one terminal at the other end of the system. In connection with alarm and restoral unit tests, complete loss of carrier power for the system can be simulated to actuate the alarm unit. A jack-terminated pad permits reducing the level of a 1-milliwatt test tone power to -16 dBm.

**3. DRAWINGS**

**3.01** The following schematic and equipment drawings (not attached) provide detailed information:

<b>DRAWING</b>	<b>TITLE</b>
SD-97174-02	Compandor Circuit
SD-97175-02	Channel Modem Circuit
SD-97176-02	Double-Channel Regulator Circuit
SD-97177-01	Channel-Group Modem Circuit
SD-97178-01	Frequency Correction Circuit J99300AE
SD-97178-02	Frequency Correction Unit J99300AS
SD-97179-01	Low-Group Transmitter Circuit
SD-97180-01	Low-Group Receiver Circuit
SD-97181-01	High-Group Transmitter Circuit
SD-97182-01	High-Group Receiving Circuit
SD-97183-02	Line-Terminating Circuit
SD-97184-02	Alarm and Restoral Circuit
SD-97185-01	N3 Shop-Wired Terminal Circuit
SD-97185-02	N3 Terminal Circuit for Use With F-Type Signaling
SD-97186-02	Trunk-Release and Make-Busy Circuits

<b>DRAWING</b>	<b>TITLE</b>
SD-97187-01	Alarm, Power, and Miscellaneous Circuits
SD-97187-02	Alarm, Power, and Miscellaneous Circuits—N3 Used With F-Type Signaling
SD-97188-01	Packaged Frame for N3 Terminals, Type B and C N3-L Junctions, Application Schematic
SD-97188-02	N3 Carrier Only Terminal Frames for Use With F-Type Signaling
SD-97191-01	Voice-Frequency Amplifier Circuit
SD-97192-02	Modem Load Unit
SD-97245-01	Restoral Oscillator Circuit
SD-97271-01	Switching Test Set Circuit
SD-97279-01	Terminal Test Stand Circuits
SD-97401-01	Through-Channel Connector and Pad Unit
SD-99730-01	4-KC Oscillator and Amplifier Unit
SD-99732-01	Carrier Supply Switching and Alarm Circuits
SD-99733-01	Dual Amplifier Circuit
SD-99734-01	Doubler-Amplifier Circuit
SD-99735-01	Harmonic Generator and Carrier Filter Panel
SD-99736-01	Frequency Distribution Circuit
SD-81638-01	Power Supply Circuit
SD-1C284-01	Carrier Group Alarm Control Circuit for Use With F-Type Signaling (J99335YG, YH)

DRAWING	TITLE	DRAWING	TITLE
SD-3C029-01	N3 Secondary Carrier Distribution Amplifiers for 232 and 152 kHz or 280 and 168 kHz	SD-3C033-01	N3 Secondary Carrier Distribution Amplifier for 256 kHz
SD-3C030-01	N3 Secondary Carrier Distribution Amplifier for 304 kHz	J99300	N3 Equipment
SD-3C031-01	N3 Secondary Carrier Distribution Amplifiers for 148 and 156 kHz	J87245	Power Supply
SD-3C032-01	N3 Secondary Carrier Distribution Amplifiers for 188 and 160 kHz, 164 and 176 kHz, 172 and 184 kHz, or 180 and 192 kHz	J98613	E-Type Signaling
		J98624	F-Type Signaling
		J70144	Miscellaneous Dial Teletypewriter Exchange Service Equipment—Telegraph and Data Systems
		ED-97262-30	Templates

TABLE A

**COMPATIBLE N3 CARRIER TERMINAL BAYS AND  
F-TYPE SIGNALING BAYS**

N3 BAY*	SECONDARY CARRIER SUPPLY	COMMON LANGUAGE CODE†	BAY HEIGHT	CKTS/ BAY	VF PATCH	F-TYPE SIGNALING BAY‡	CKTS/ BAY	VF PATCH
J99300H	In same bay	N3BSLOA	11' 6"	48	No	J98624E	48	Yes
J99300J	In same bay	N3BSMOA	9' 0"	24	No	J98624F	48	Yes
J99300J	In adjacent N3 bay	N3BSNOA	9' 0"	24	No	J98624F	48	Yes
J99300K	In same bay	N3BSPOA	7' 0"	24	No	J98624G	24	Yes
J99300K	In adjacent N3 bay	N3BSROA	7' 0"	24	No	J98624G	24	Yes

\* The J99300H N3 carrier bay can be mated with the J98624A (FWA) and the J98624B (FUA + auxiliary) consolidated VF equipment bays. However, these arrangements do not include provision for high impedance monitoring of circuits under test. The J98624A and J98624B bays have been replaced by J98624J and J98624K, respectively. The newer bays contain manual access and communication panels which will provide the full range of test, monitor, and talk capabilities.

Consolidated or unitized bays including a plug-in optional SMAS maintenance connector or a plug-in VF patch field consisting of multipin access connectors (MAC jacks) will be provided in 9-foot and 7-foot bays.

† These codes are for information only and not for ordering.

‡ The J98624E, F, and G consolidated VF equipment bays are equipped with the necessary equipment for utilizing the KS-20805 transmission measuring system.

TABLE B

## N3 CARRIER DOUBLE CHANNEL REGULATOR

REGULATOR POSITION	FILTER CODE	SELECTED CARRIER FREQUENCY (kHz)	12 CHANNEL GROUP REQUIREMENTS (SEE NOTE)					
			N3 TERMINALS CONNECTED THROUGH N-LINES TO N3-L TYPE A JUNCTIONS		N3-L TYPE C JUNCTION		N3 TERMINAL NOT CONNECTED THROUGH N-LINES TO N3-L JUNCTIONS	
			J99300AC-1 LISTS	J99300CA-1 LISTS	J99300AC-1 LISTS	J99300CA-1 LISTS	J99300AC-1 LISTS	J99300CA-1 LISTS
1	659A	152	9 and 2	2 and 3 or 10 and 3	8 and 2	1 and 3 or 9 and 3	8 and 2 or 1 and 2	1 and 3
2	659B	160	9 and 3	2 and 4 or 10 and 4	8 and 3	1 and 4 or 9 and 4	8 and 3 or 1 and 3	1 and 4
3	659C	168	9 and 4	2 and 5 or 10 and 5	8 and 4	1 and 5 or 9 and 5	8 and 4 or 1 and 4	1 and 5
4	659D	176	8 and 5	1 and 6 or 9 and 6	8 and 5	1 and 6 or 9 and 6	8 and 5 or 1 and 5	1 and 6
5	659E	184	8 and 6	1 and 7 or 9 and 7	8 and 6	1 and 7 or 9 and 7	8 and 6 or 1 and 6	1 and 7
6	659F	192	8 and 7	1 and 8 or 9 and 8	8 and 7	1 and 8 or 9 and 8	8 and 7 or 1 and 7	1 and 8

*Note:* Filters J99300AC-1 Lists 2 through 7 may be used in place of J99300CA-1 Lists 3 through 8, respectively. These filters use the same apparatus code.

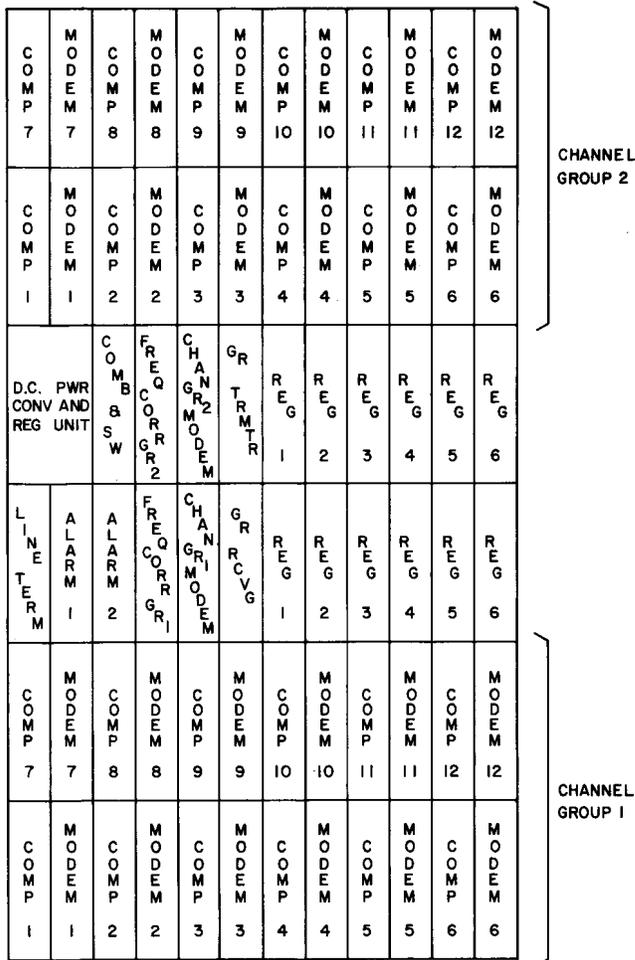


Fig. 1—N3 Carrier Terminal—Location of Plug-in Units

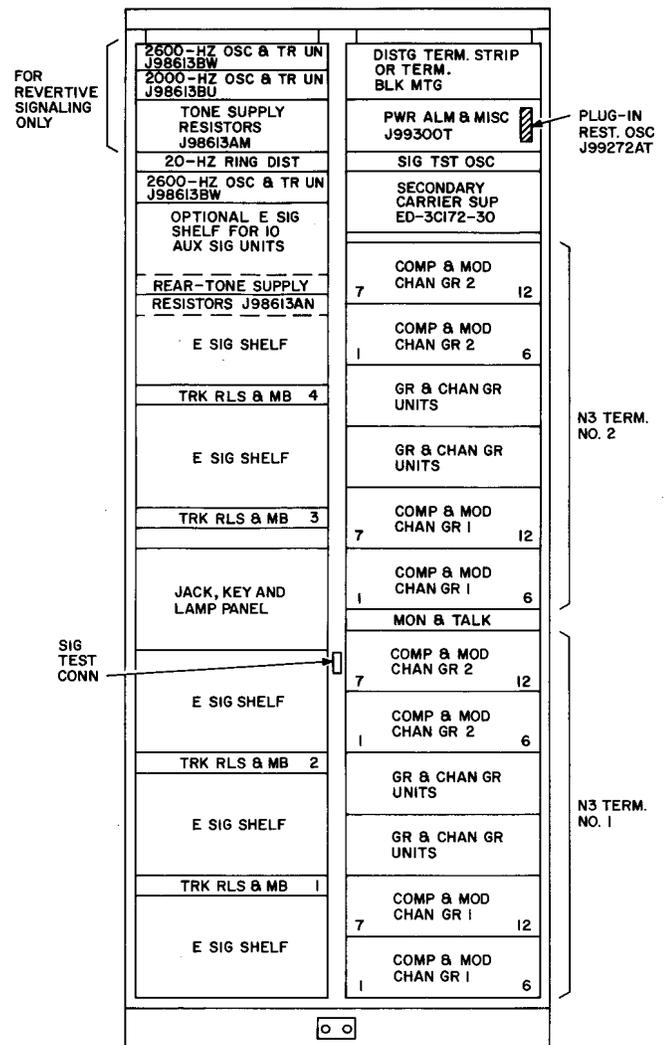


Fig. 2—J99300A N3 Carrier 48-Channel Packaged Terminal Frame

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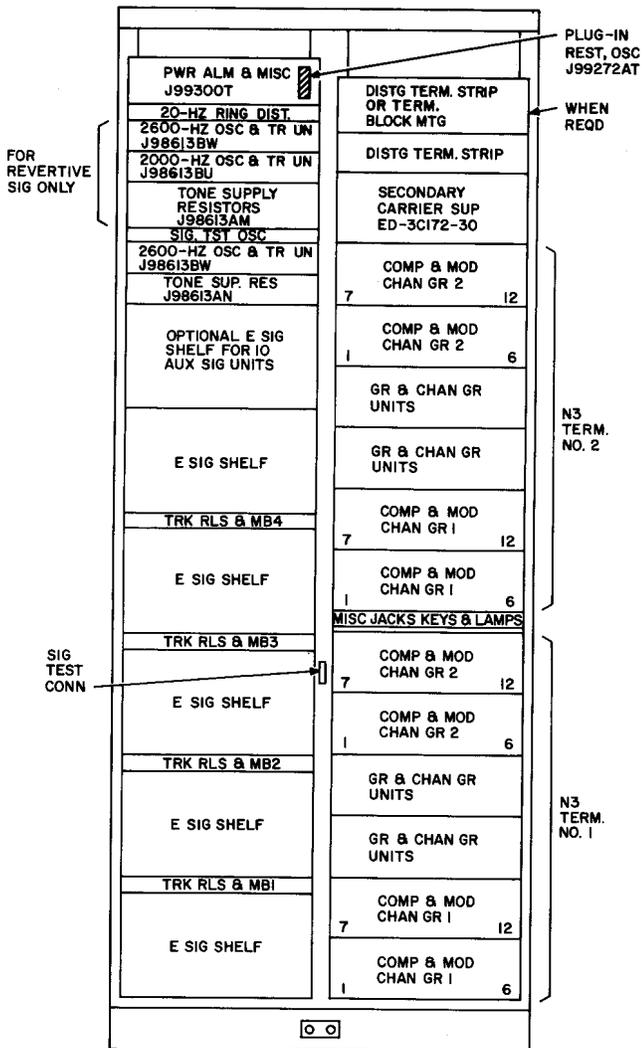


Fig. 3—J99300B N3 Carrier 48-Channel Packaged Terminal Frame

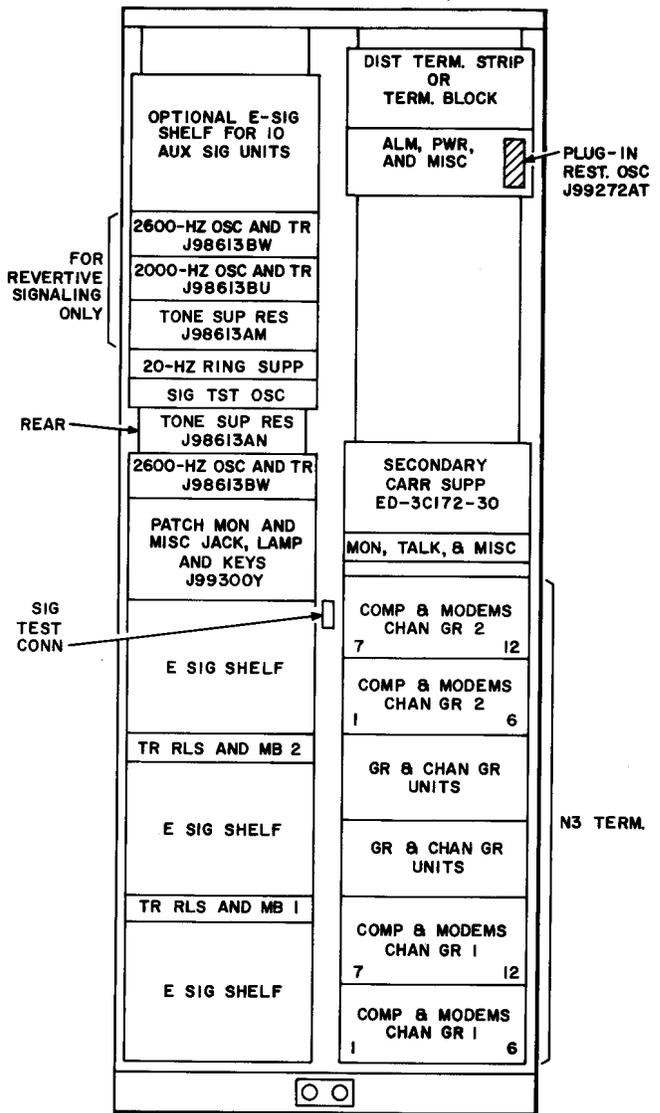


Fig. 4—J99300C N3 Carrier 24-Channel Packaged Terminal Frame

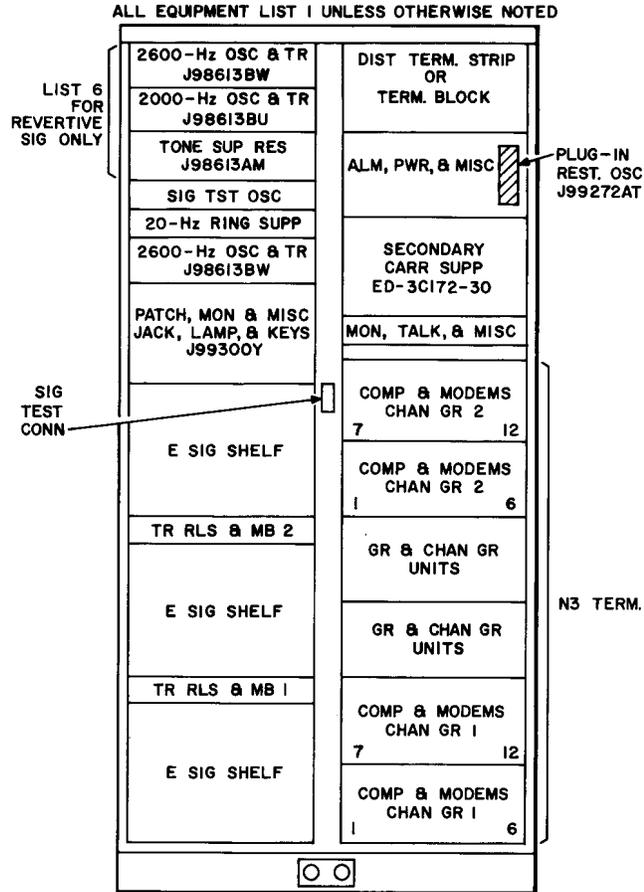


Fig. 5—J99300D N3 Carrier 24-Channel Packaged Terminal Frame

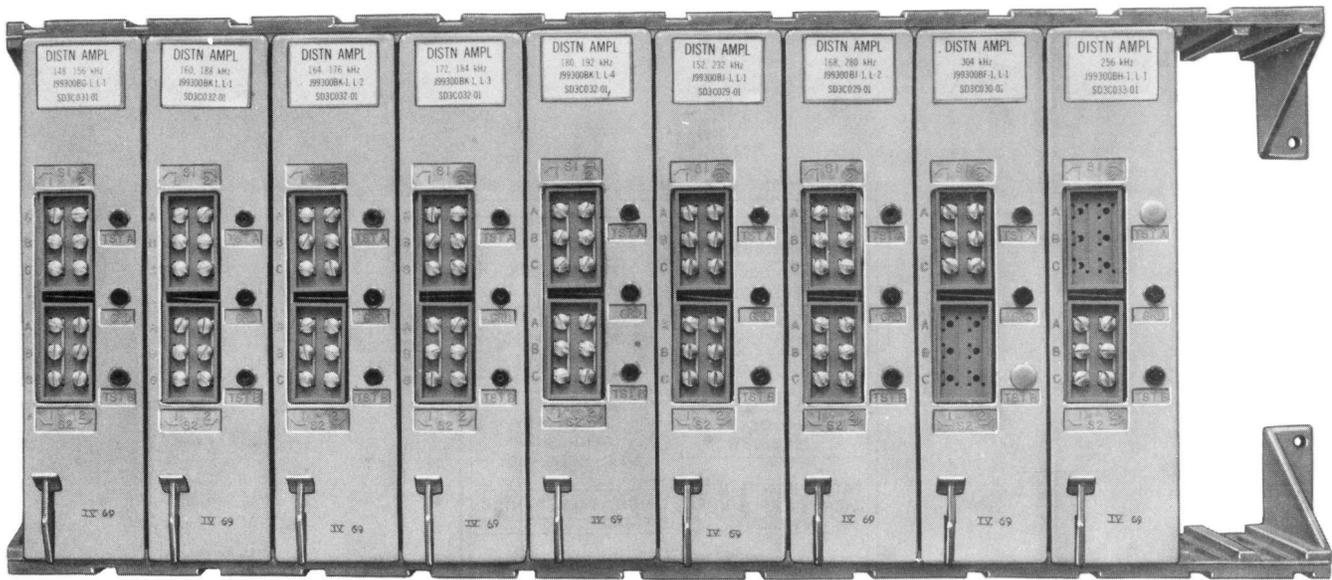


Fig. 6—ED-3C172-30 Secondary Distribution Shelf with Plug-in Amplifier Units

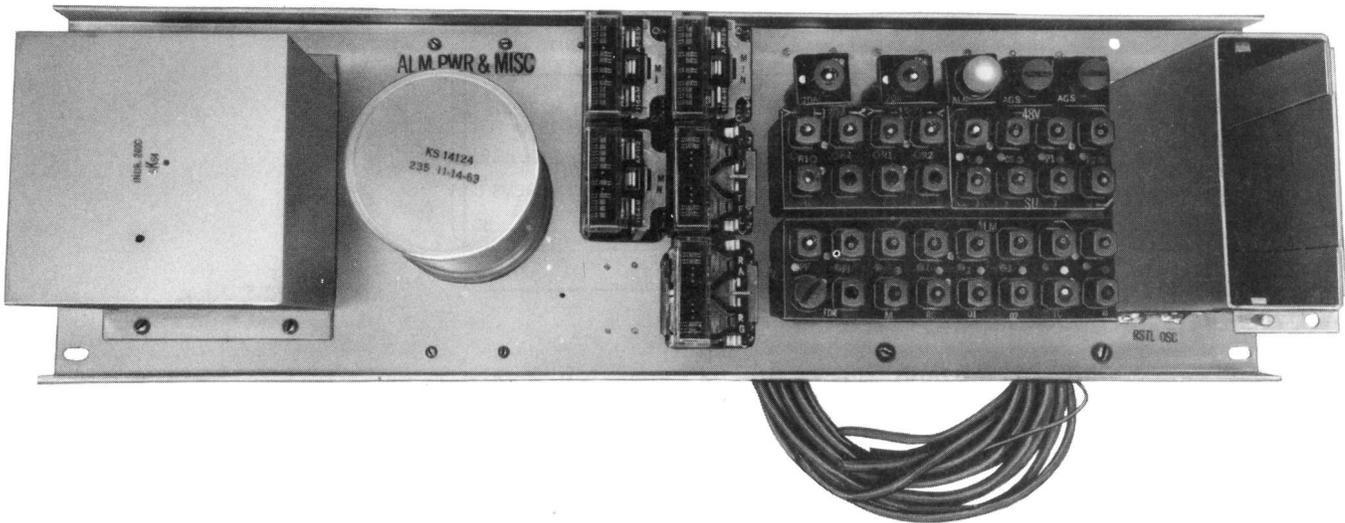


Fig. 7—J99300T Alarm, Power, and Miscellaneous Panel

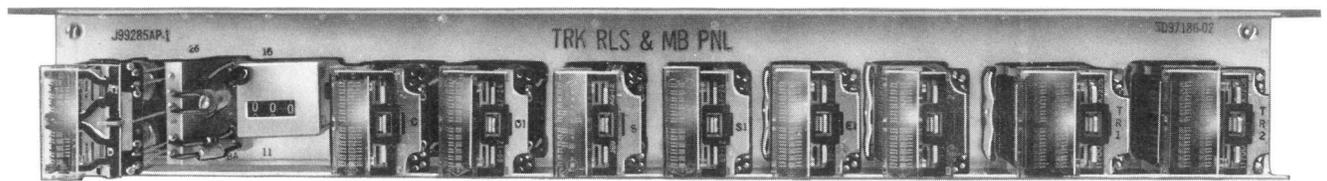


Fig. 8—J99285AP Trunk-Release and Make-Busy Panel

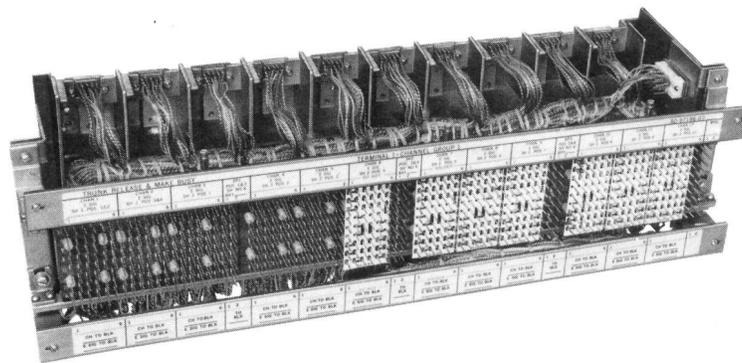


Fig. 9—Rear View of Trunk-Release and Make-Busy Panel Showing Templates

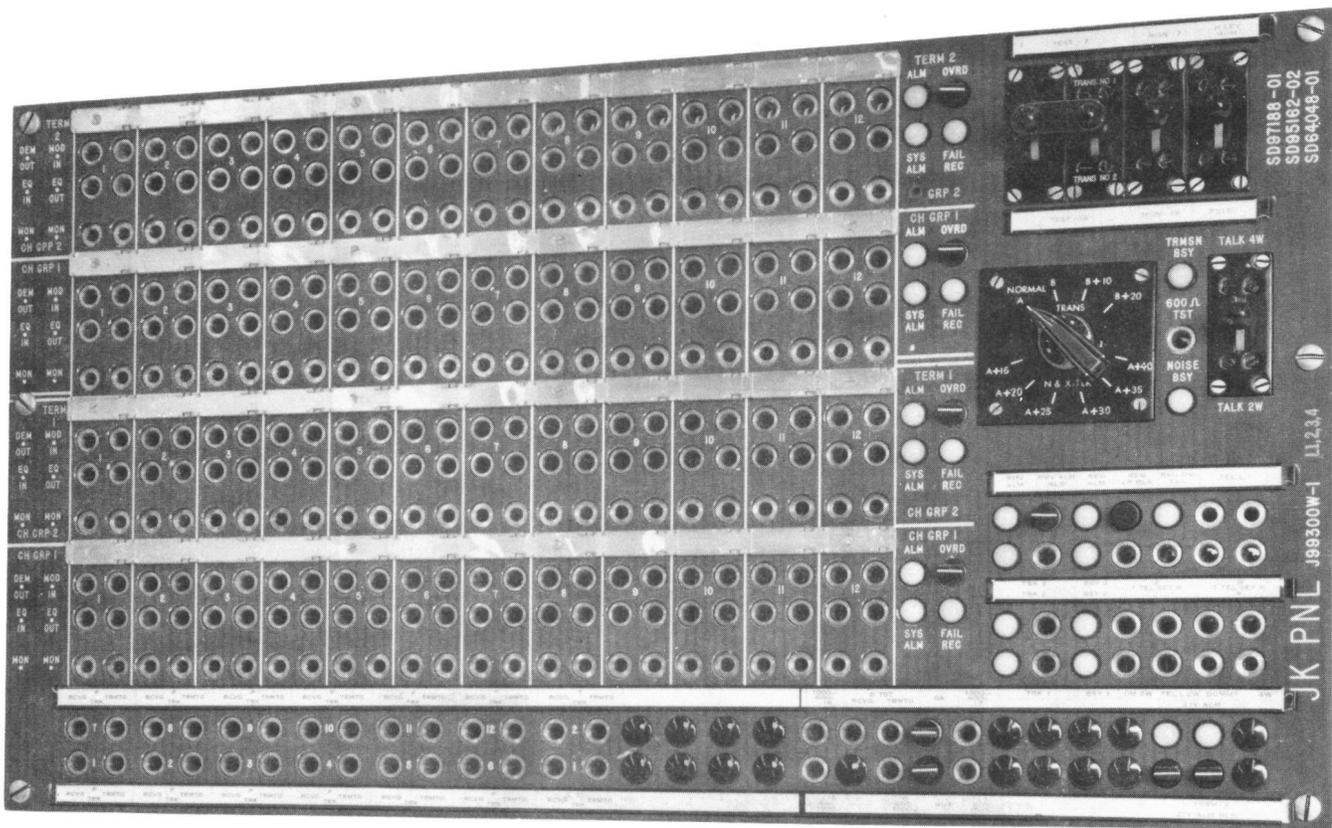


Fig. 10—J99300W Patching, Monitoring, and Miscellaneous Jack, Key, and Lamp Panel

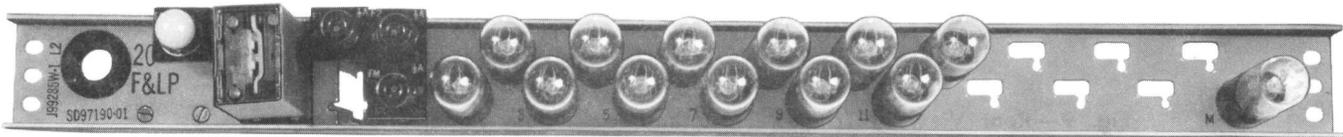


Fig. 11—J99285W 20-Hz Fuse and Lamp Panel

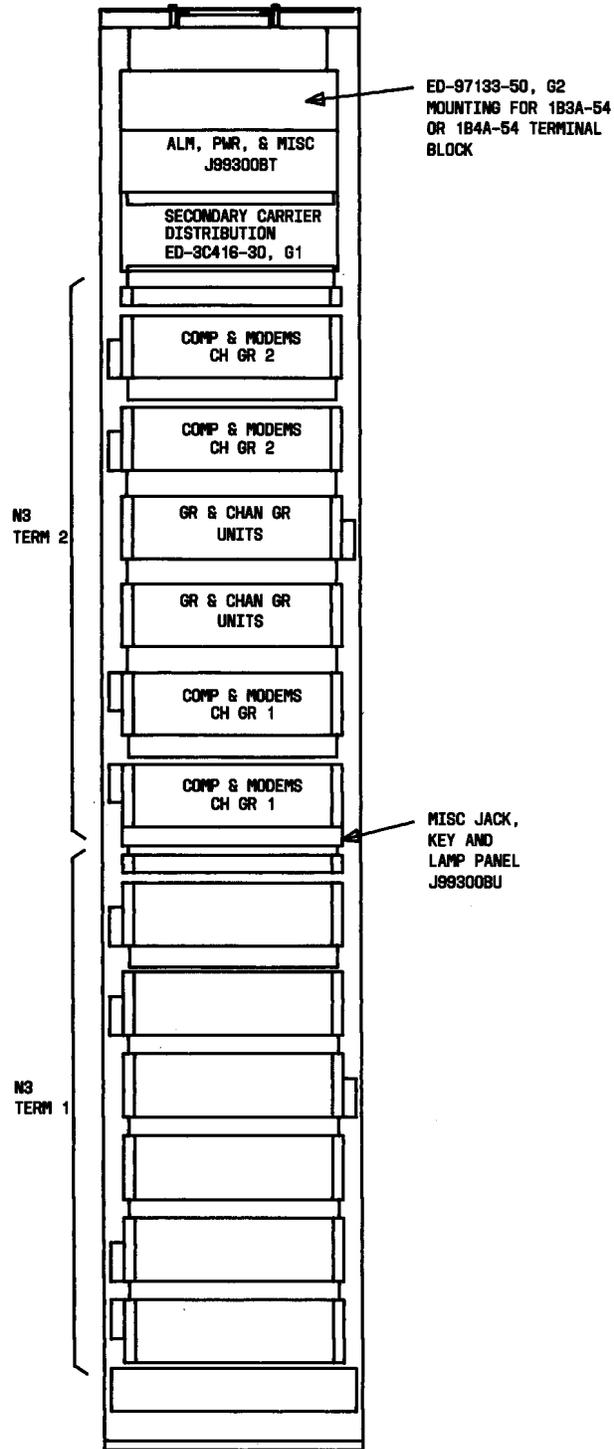


Fig. 12—J99300H, N3 Carrier Terminal Frame 48-Channel, for Use With External F-Type Signaling (11 Feet 6 Inches High)

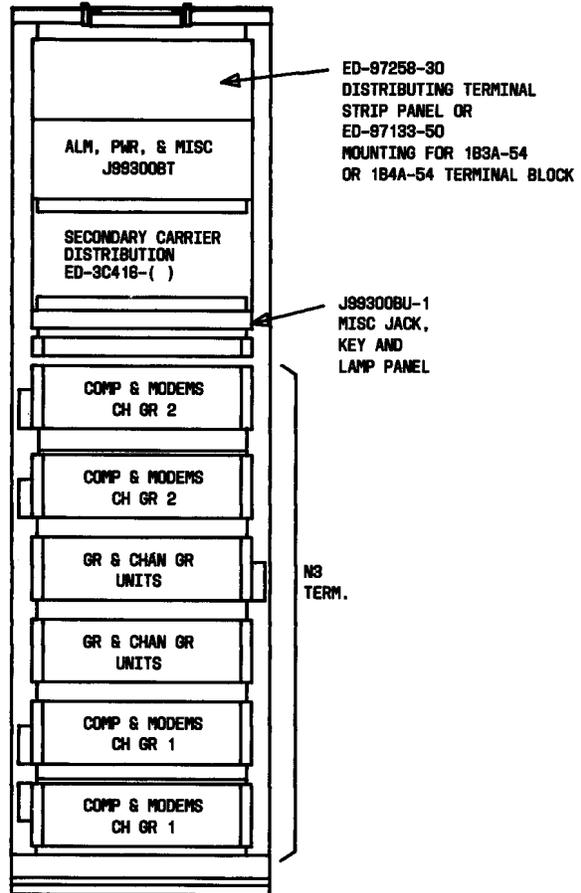
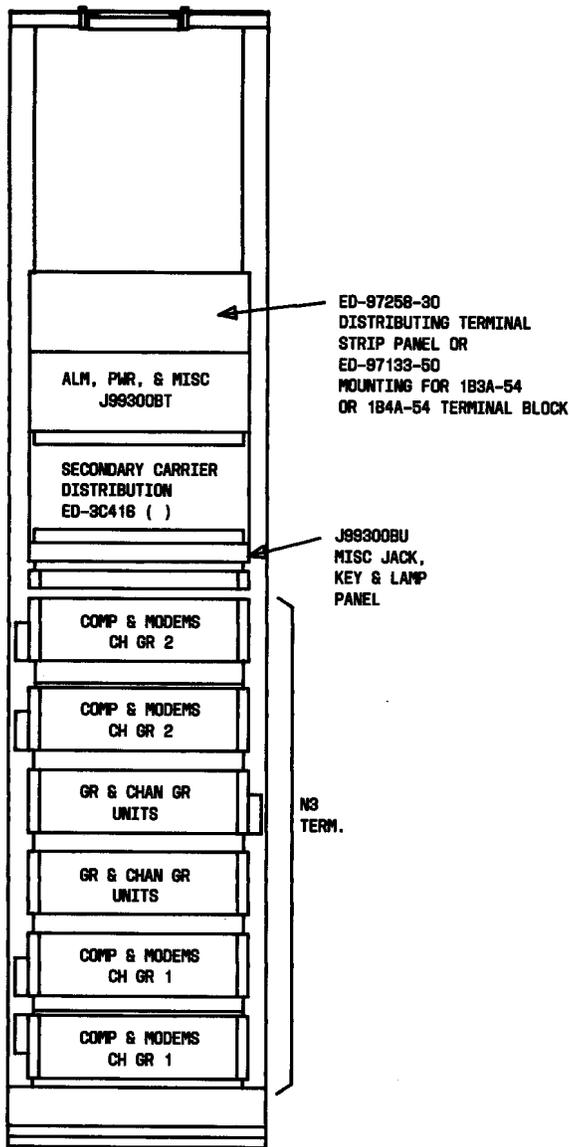


Fig. 13—J99300J, N3 Carrier Terminal Frame 24-Channel, for Use With External F-Type Signaling (9 Feet High)

Fig. 14—J99300K, N3 Carrier Terminal Frame 24-Channel, for Use With External F-Type Signaling (7 Feet High)

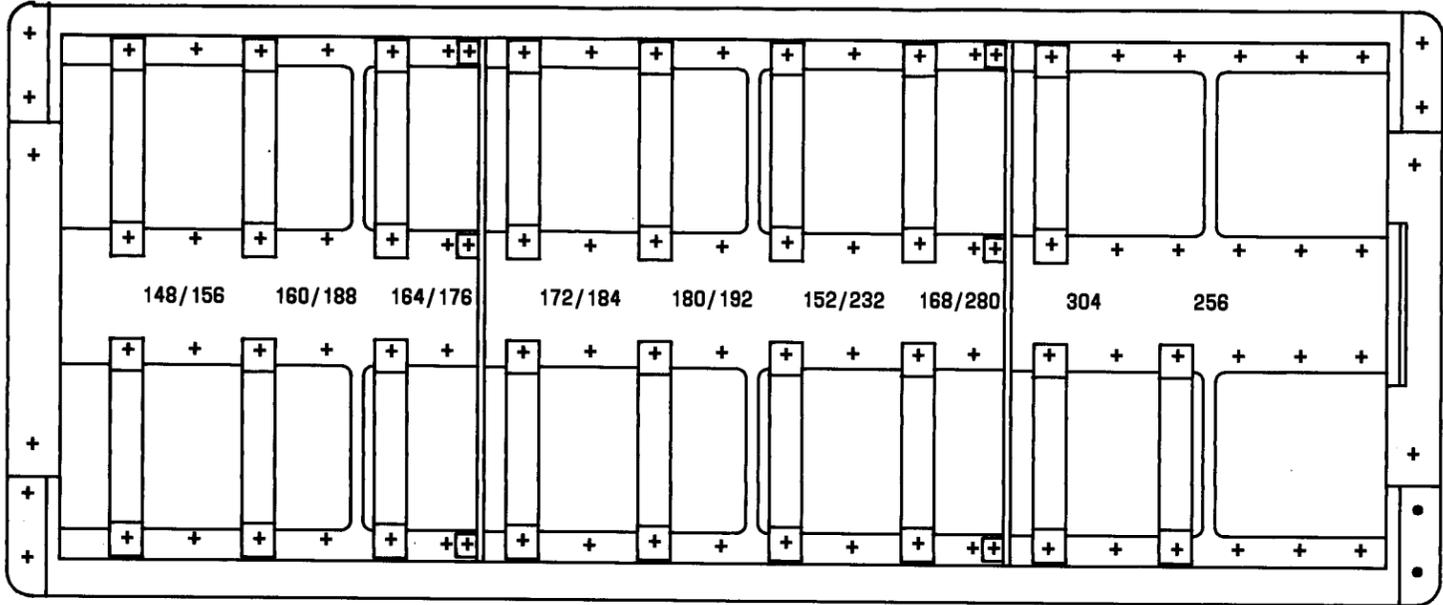


Fig. 15—ED-3C416-30 Secondary Carrier Distribution Shelf for N3 Carrier-Only Terminal Frame

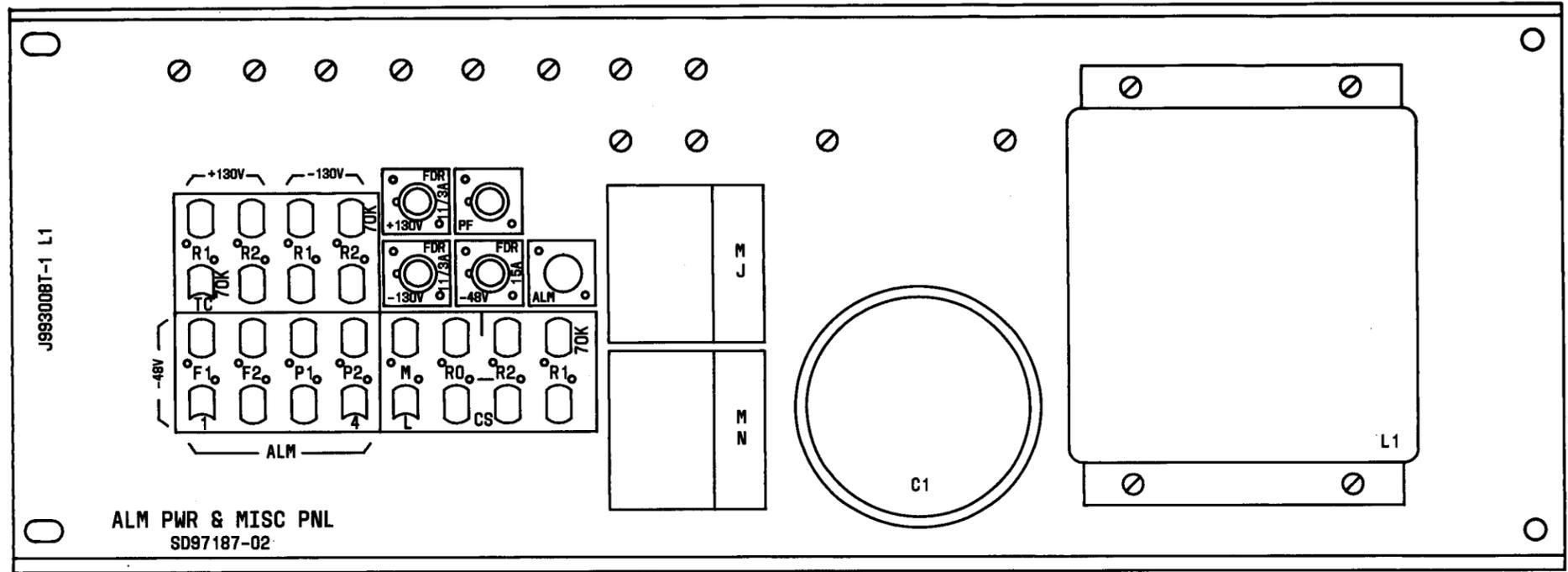


Fig. 16—J99300BT Alarm, Power, and Miscellaneous Panel—N3 Carrier-Only Frames With External F-Type Signaling

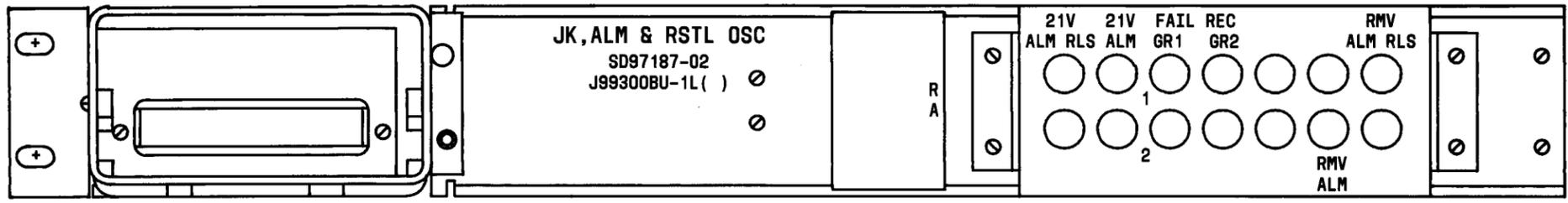


Fig. 17—J99300BU Jack, Alarm, and Restoral Oscillator for Use in N3 Carrier-Only Frames Associated With External F-Type Signaling

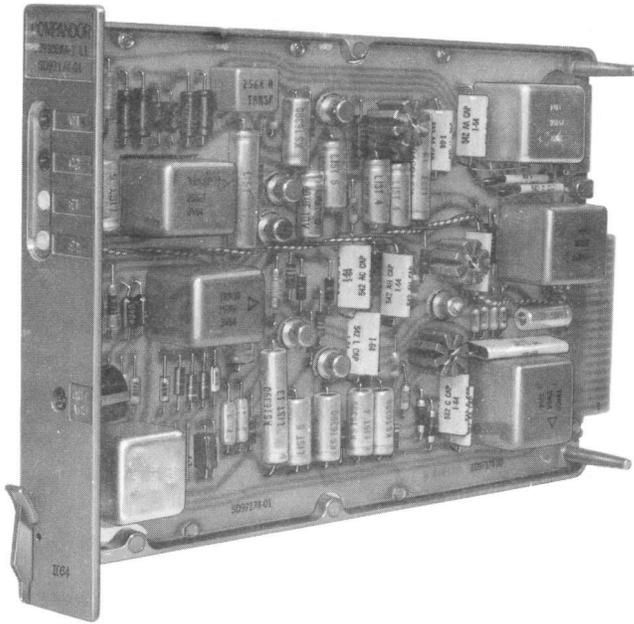


Fig. 18—J99300AA Plug-in Compandor Unit

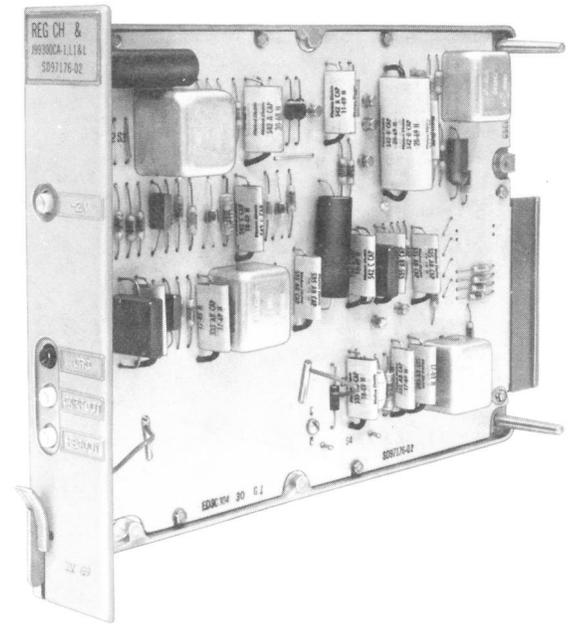


Fig. 20—J99300CA Plug-in Double Channel Regulator Unit

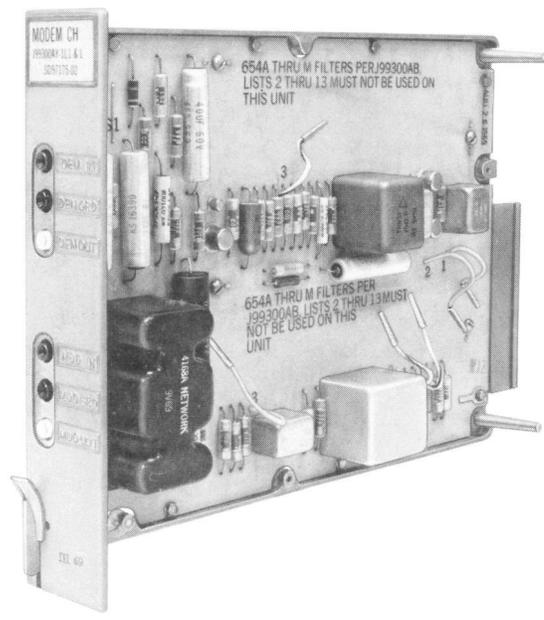


Fig. 19—J99300AY Plug-in Channel Modem Unit

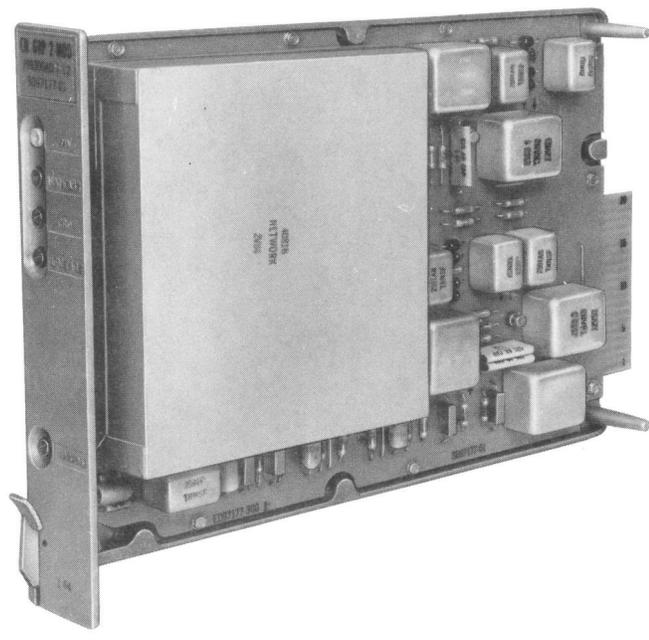


Fig. 21—J99300AD Plug-in Channel Group Modem Unit

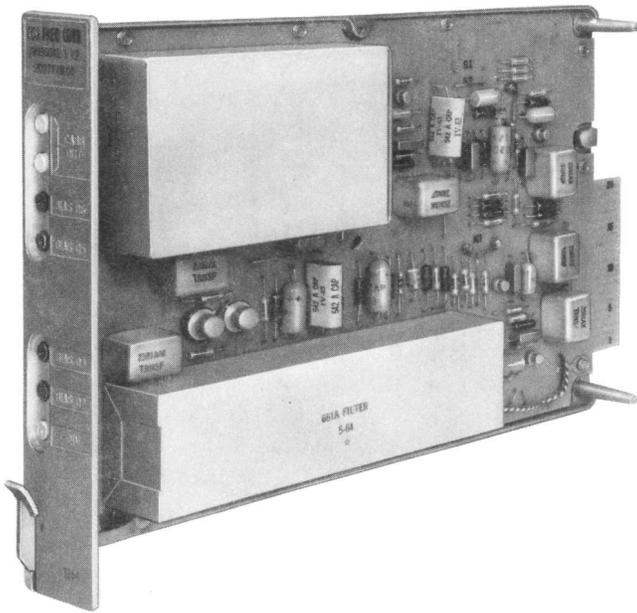


Fig. 22—J99300AE Plug-in Frequency Correction Unit

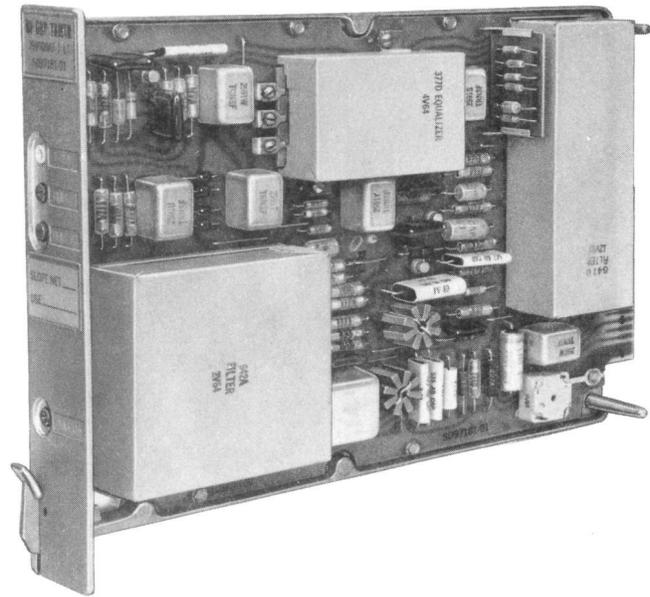


Fig. 24—J99300AF Plug-in High-Group Transmitter Unit

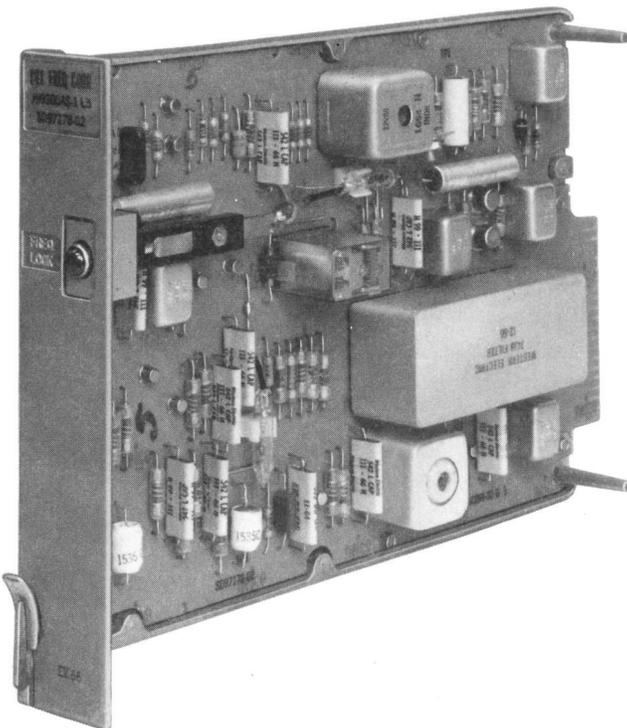


Fig. 23—J99300AS Plug-in Frequency Correction Unit

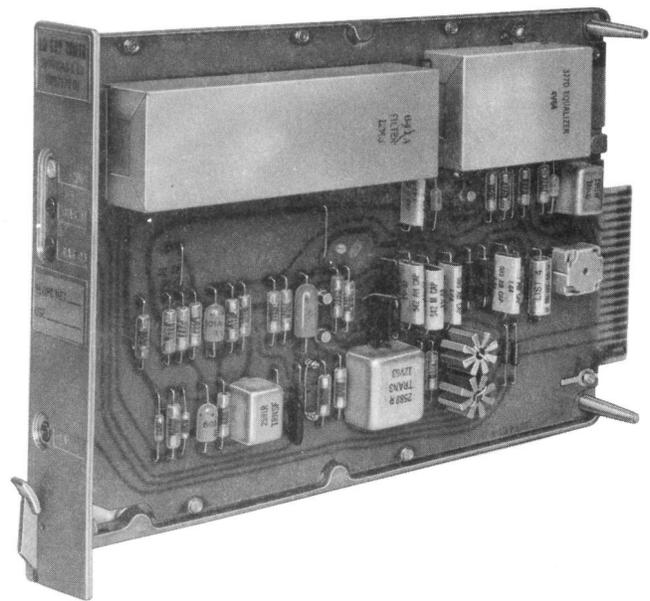


Fig. 25—J99300AG Plug-in Low-Group Transmitter Unit

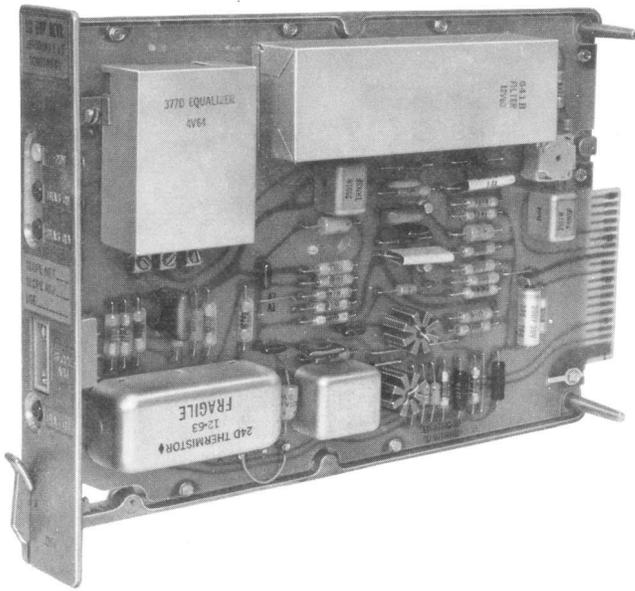


Fig. 26—J99300AJ Plug-in Low-Group Receiver Unit

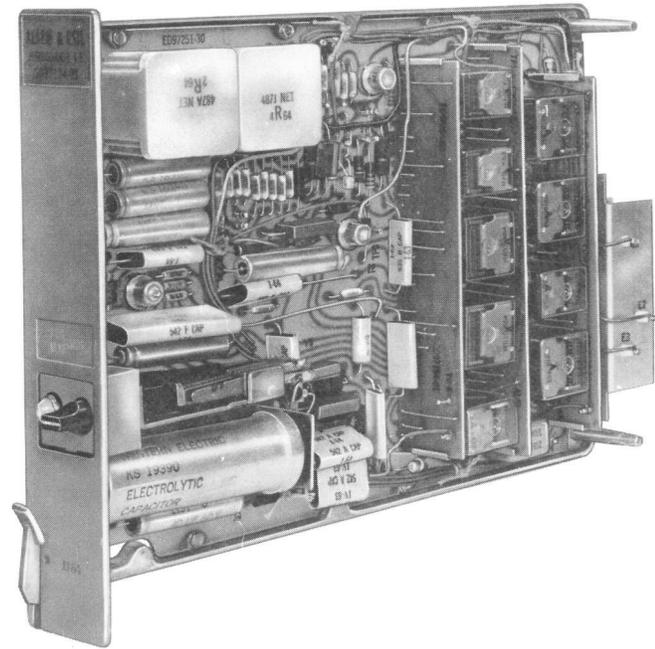


Fig. 28—J99300AK Plug-in Alarm and Restoral Unit

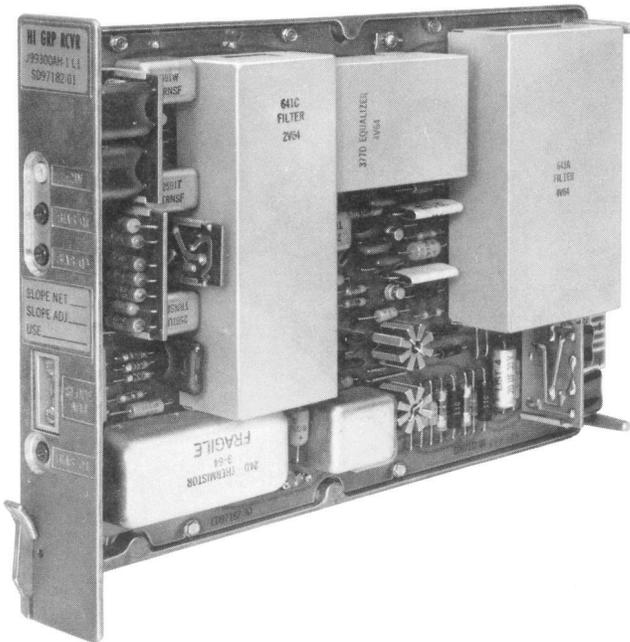


Fig. 27—J99300AH Plug-in High-Group Receiver Unit

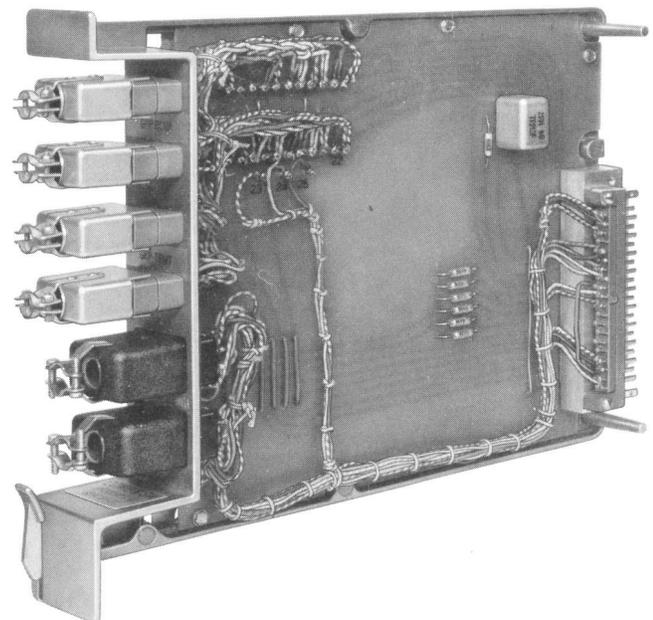
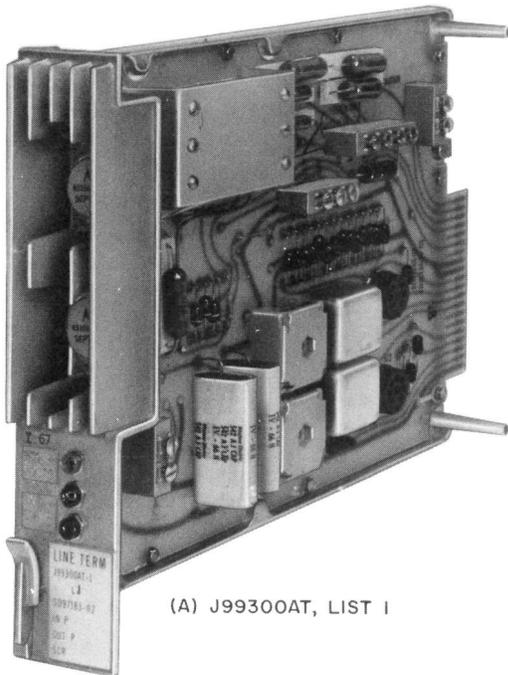
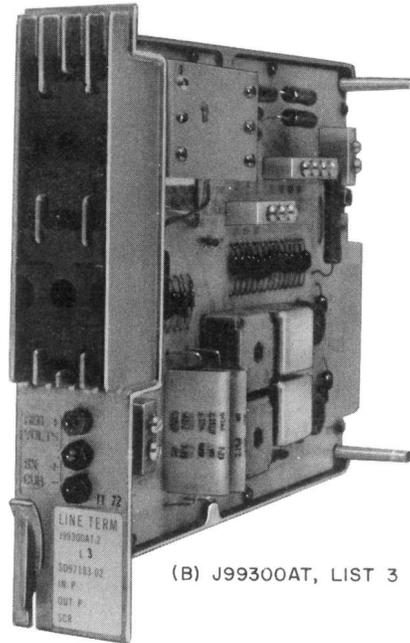


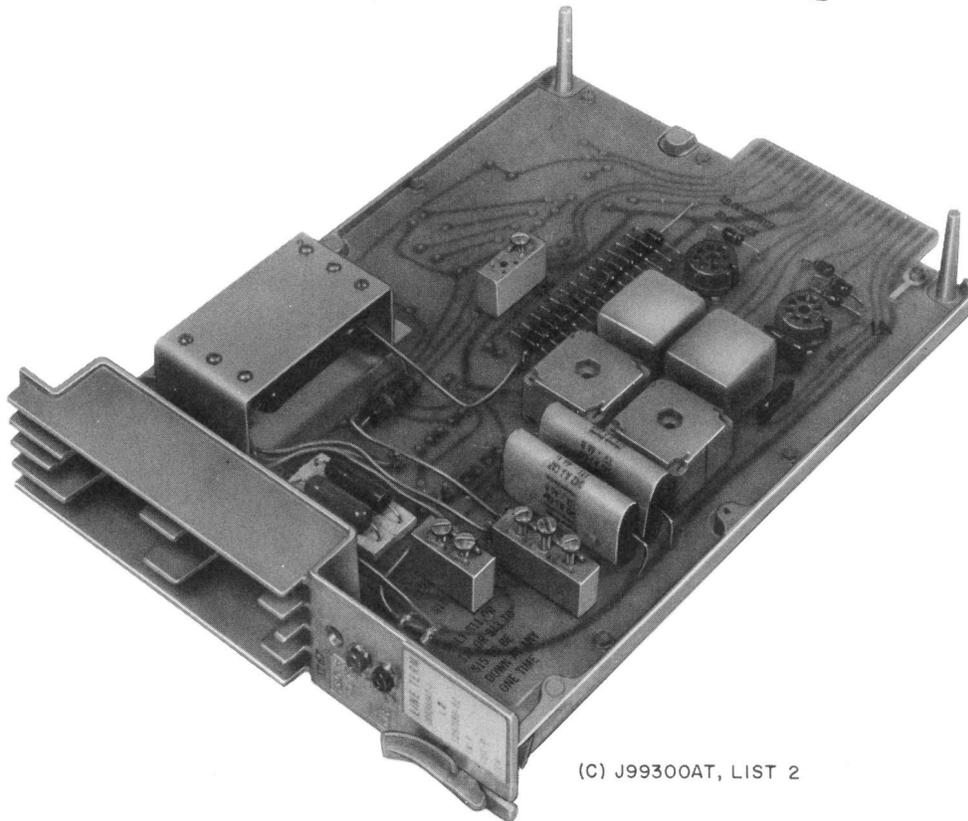
Fig. 29—J99300AP Plug-in Combining and Switching Unit



(A) J99300AT, LIST 1



(B) J99300AT, LIST 3



(C) J99300AT, LIST 2

Fig. 30—J99300AT Plug-in Line Terminating Unit



Fig. 31—J87245A DC Power Converter and Regulator Unit

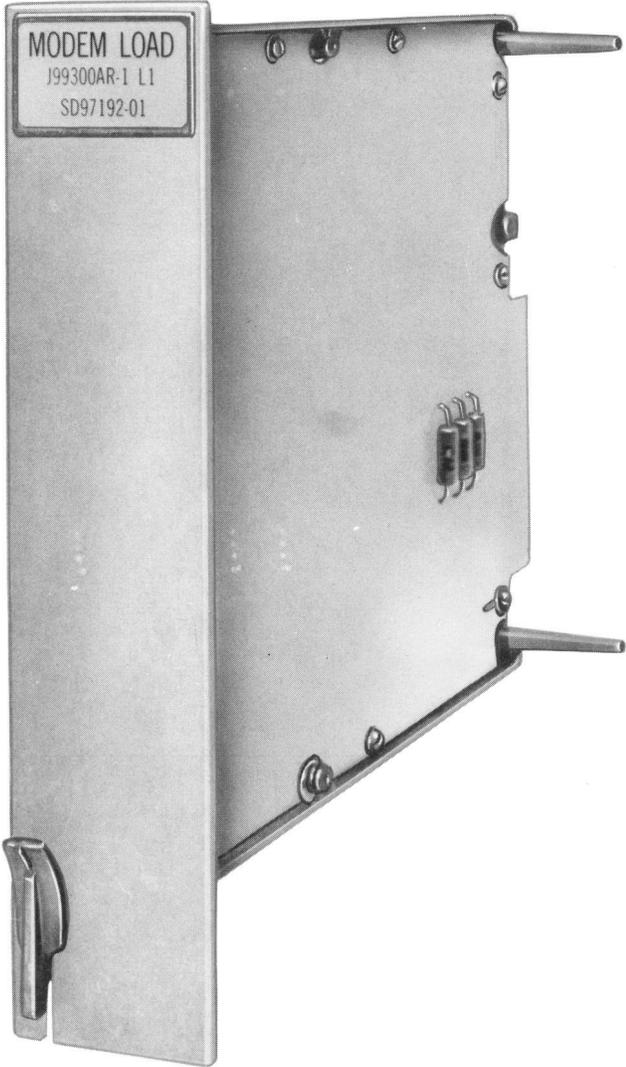


Fig. 32—J99300AR Modem Load Unit

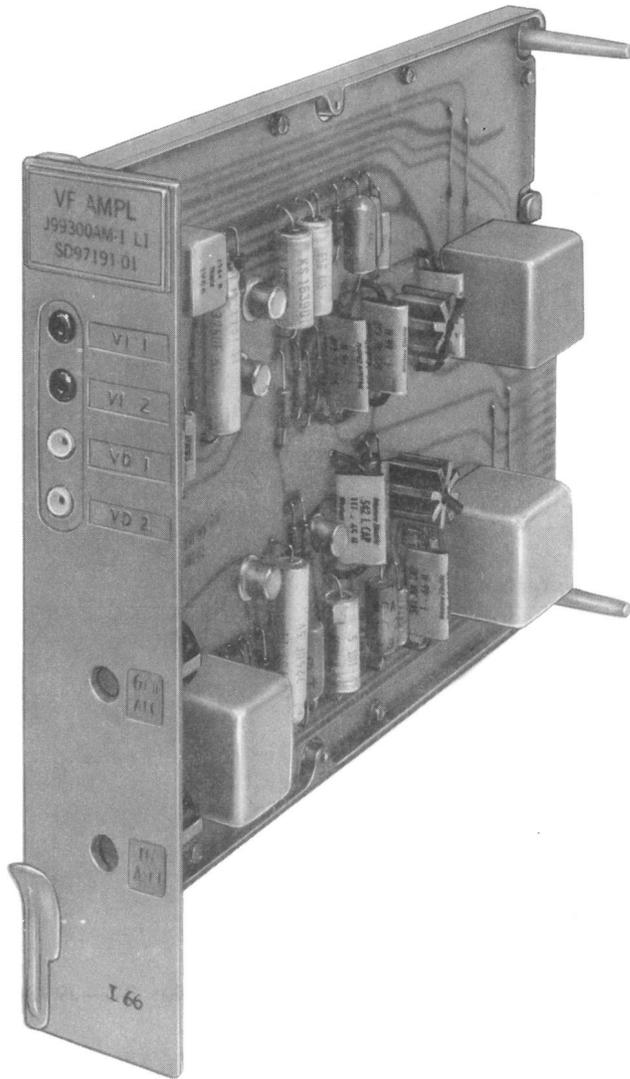


Fig. 33—J99300AB VF Amplifier Unit

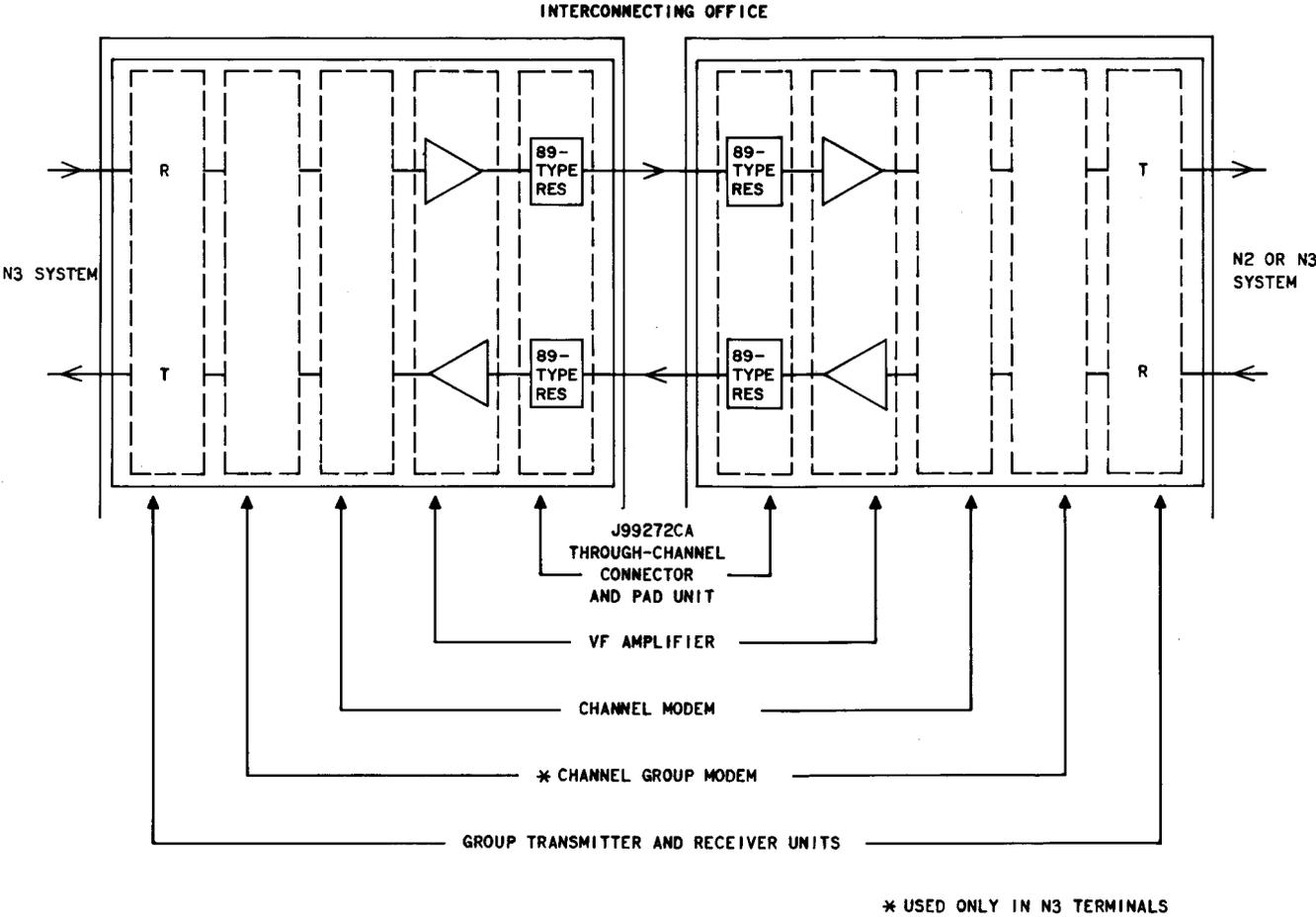


Fig. 34—J99272CA Through-Channel Connector and Pad Unit

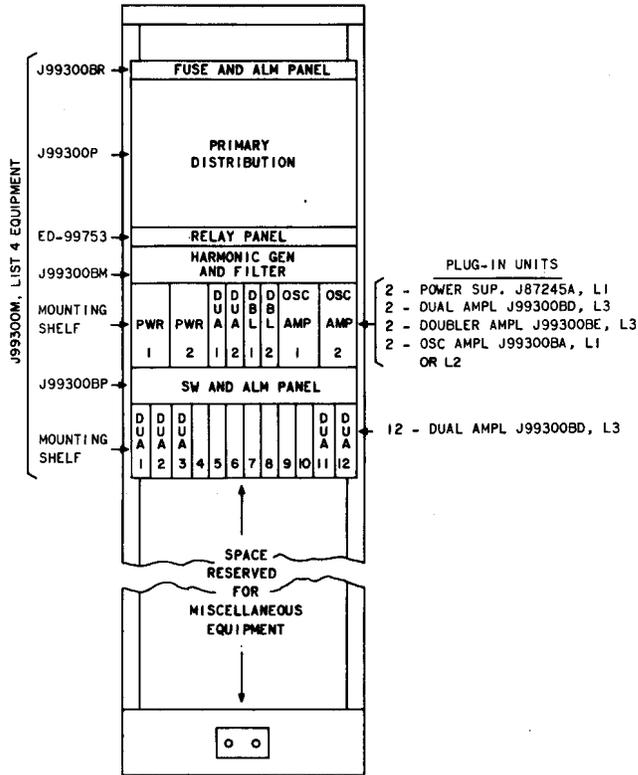


Fig. 35—J99300M Common Carrier Supply

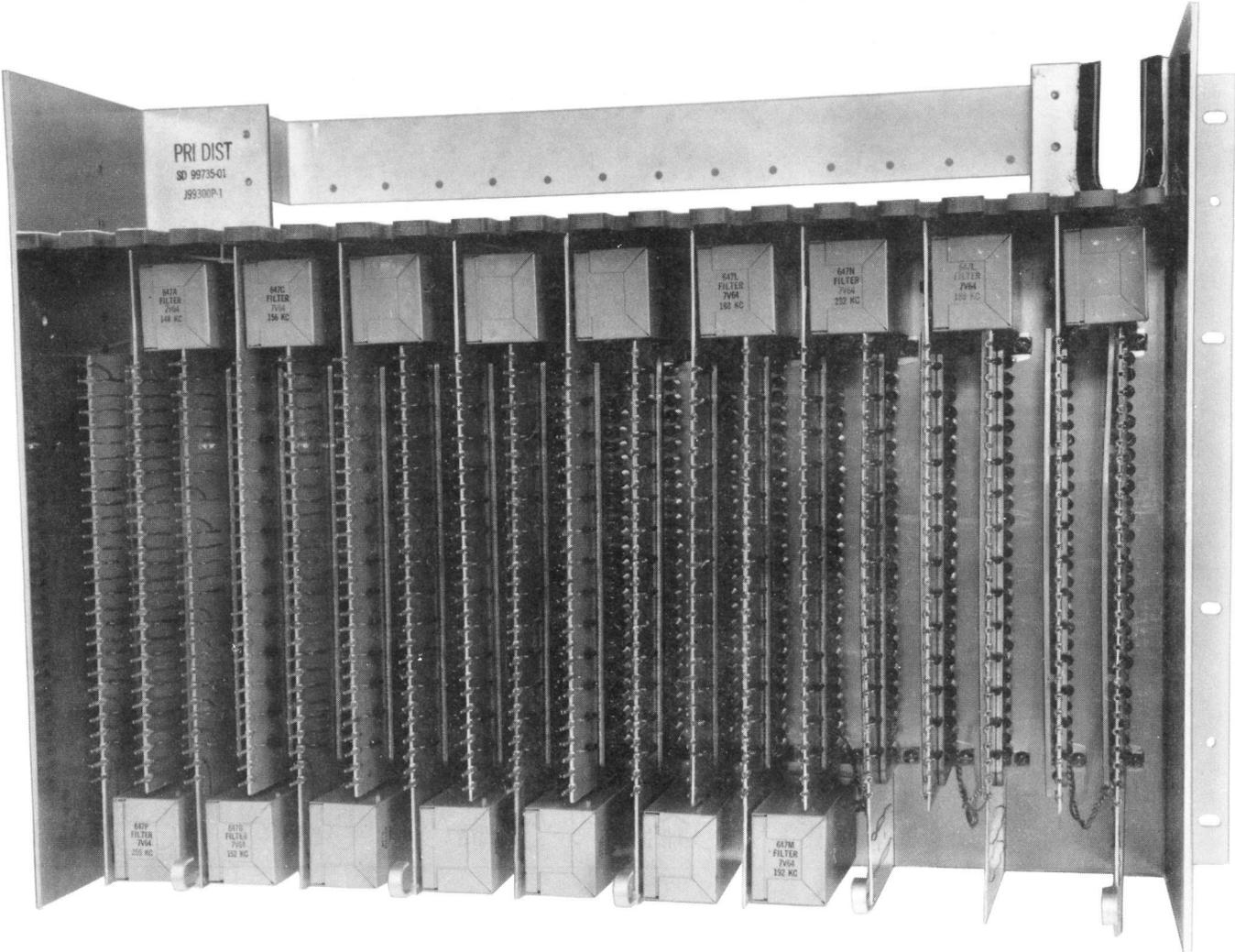


Fig. 36—J99300P Primary Carrier Supply Distribution Panel

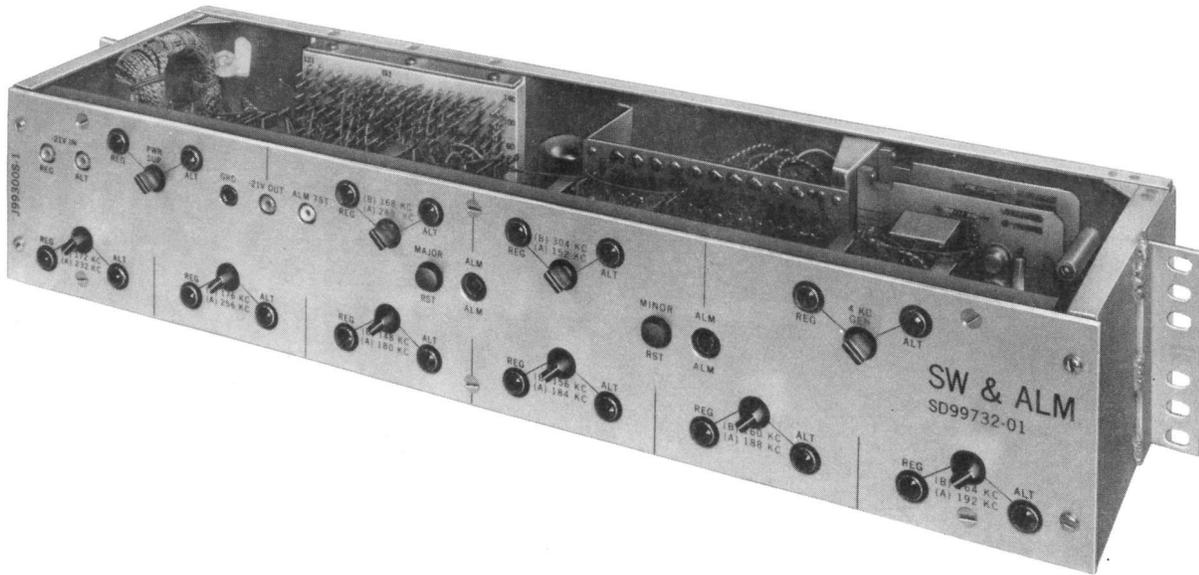
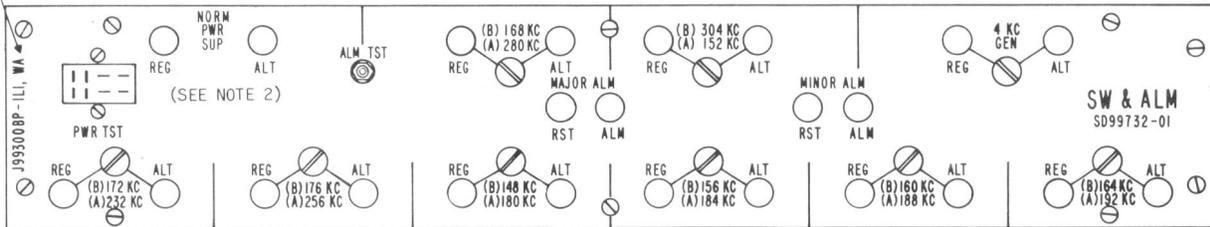


Fig. 37—J99300S Switching and Alarm Panel

SEE NOTE 1



NOTES:

1. LIST WA STAMPING DENOTES PANELS FIELD MODIFIED TO INHIBIT COMBINING THE -21 VOLT DISTRIBUTION CIRCUITS.
2. EARLIER VINTAGE UNITS WERE EQUIPPED WITH A POWER SUPPLY SWITCHING KEY.

Fig. 38—J99300BP Switching and Alarm Panel

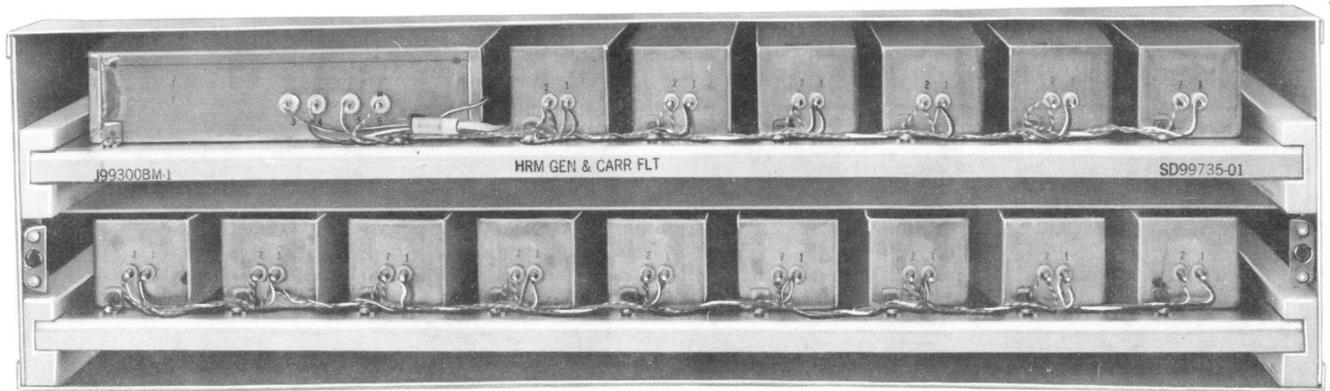


Fig. 39—J99300BM Harmonic Generator and Carrier Filter Panel (Cover Removed)

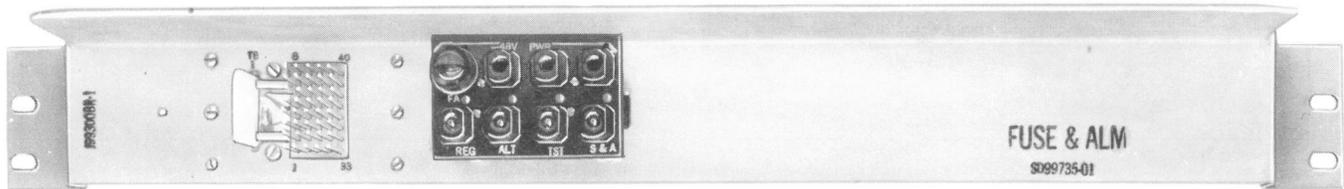


Fig. 40—J99300BR Fuse and Alarm Panel

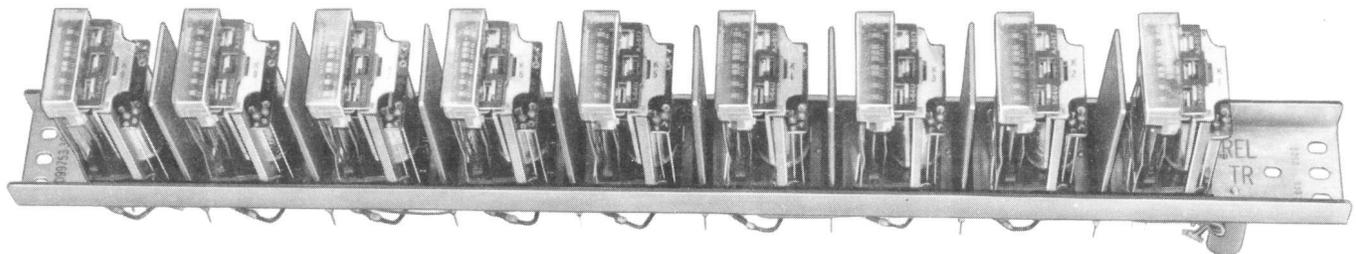


Fig. 41—ED-99753 Relay Transfer Panel

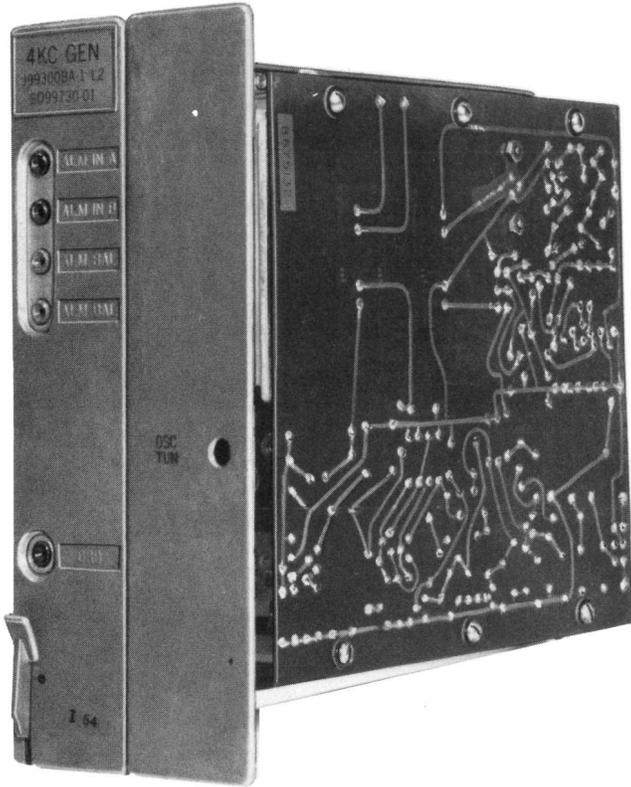


Fig. 42—J99300BA 4-kHz Generator Unit

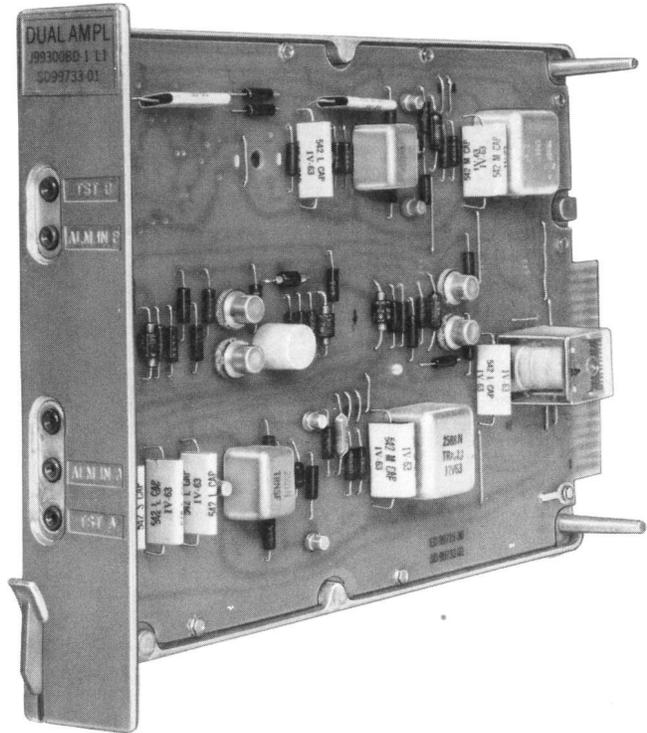


Fig. 43—J99300BD Plug-in Dual Amplifier Unit

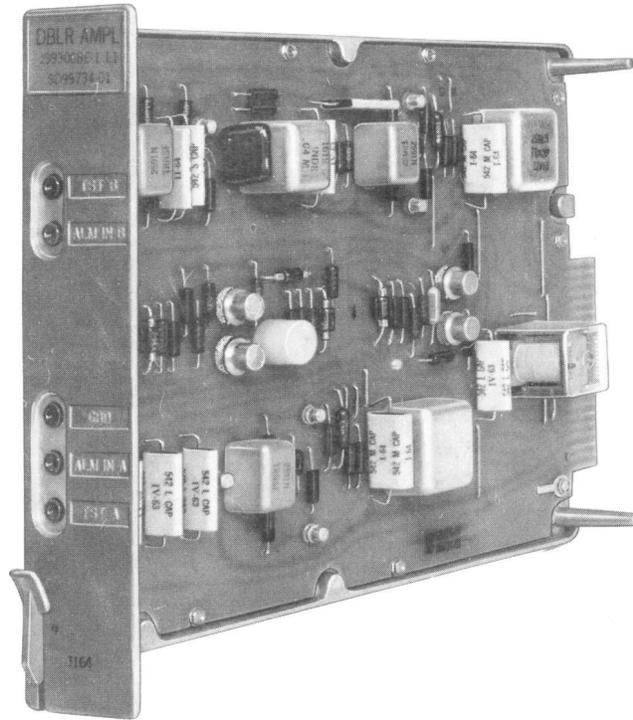


Fig. 44—J99300BE Plug-in Doubler-Amplifier Unit



Fig. 45—J99300AU Switching Test Set for Switching Group, Wideband Mode, and Power Terminal Unit

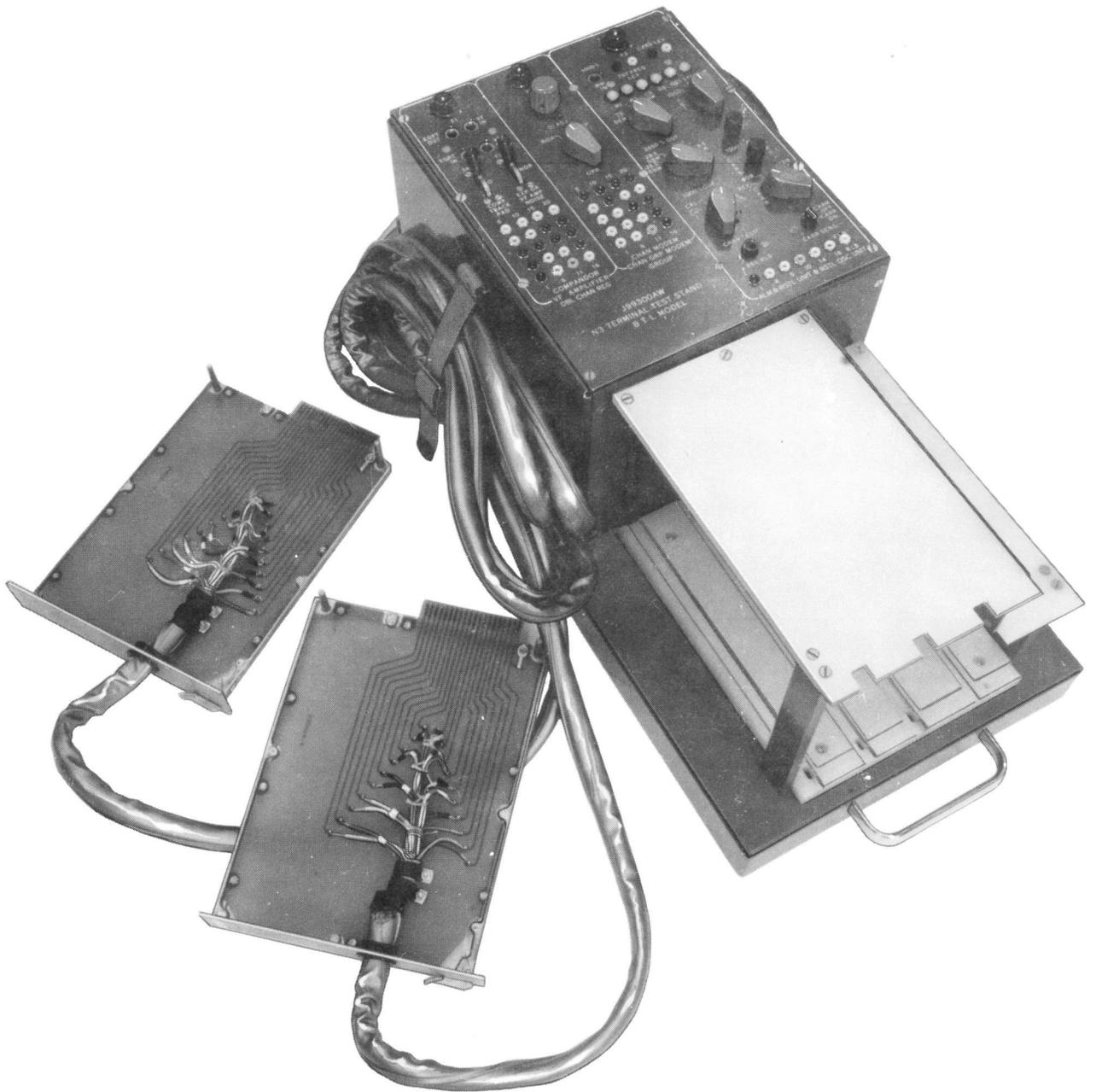


Fig. 46—J99300AW Terminal Test Stand