TYPE-3 LOW-VOLTAGE HUB
DESCRIPTION AND OPERATION

1. GENERAL

1.01 This practice provides information on the Type-3 Low-Voltage Hub arrangement. Information is included on the 27-type Data Mountings, circuit packs, and associated equipment that make up a Type-3 Low-Voltage Hub arrangement, hereafter referred to in this practice as an LV Hub or hub.

1.02 The hub arrangement provides a means of connecting, maintaining, and testing multipoint data circuits operating at speeds up to 150 baud. Any combination of Data Sets 108D-L1, 109G-L1, and 43B1 channel terminals can be interconnected to provide for an exchange of low-voltage data signals.

1.03 The Type-3 Low-Voltage Hub can be arranged to provide half-duplex (HDX), or full-duplex (FDX) modes of service. The equipment can also be arranged to interconnect data services in a back-to-back configuration. For information on making the connections required to provide the desired type of service, refer to the section entitled Type-3 Low-Voltage Hub—Installation and Connections (312-807-200).

1.04 A test capability in the form of test jacks and a test circuit is provided as an integral part of the hub. This provides for testing through the hub or with the legs of the hub. In addition to the test circuits, alarm circuits are provided to indicate a trouble condition.

2. PHYSICAL DESCRIPTION

2.01 The Type-3 Low-Voltage Hub is made from a selection of three different data mountings—27A1, 27B1, and 27C1 (see Fig. 1 through 3). The data mountings are multiposition, double-deck units that are designed for rack-mounting in either 23-inch or 25-inch racks.

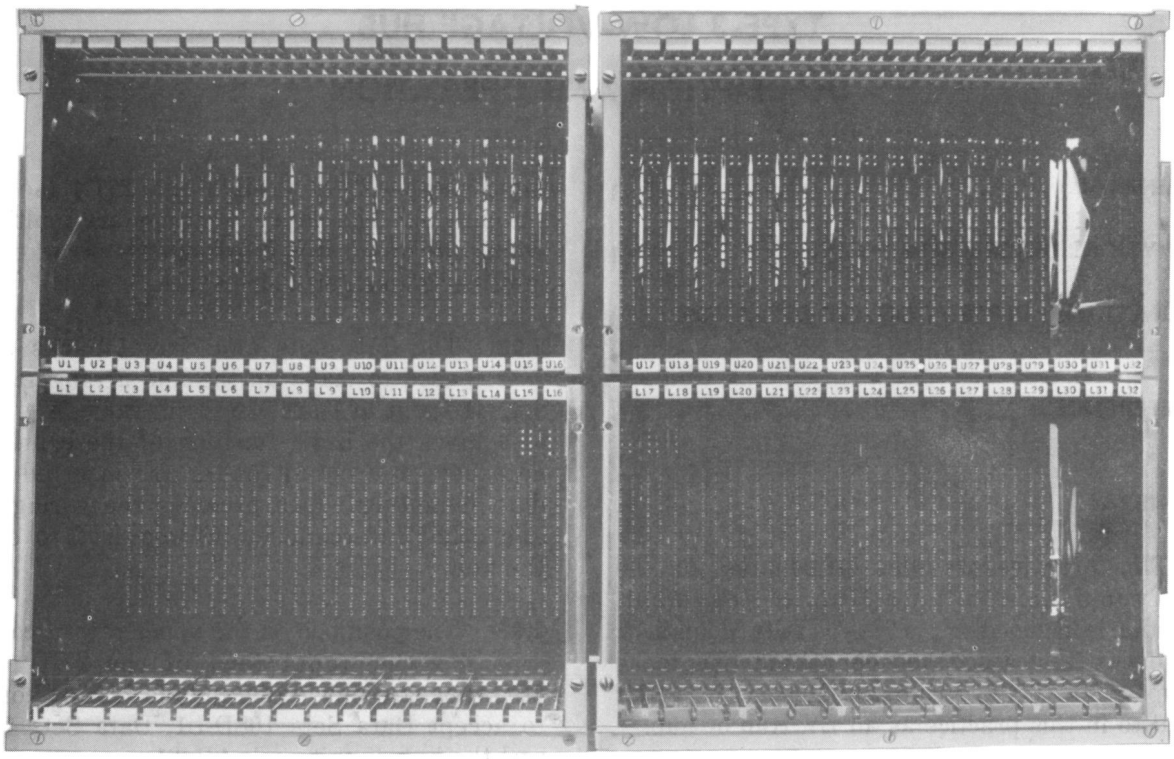
2.02 The data sets and circuit packs that are used to make up the hub arrangement (Fig. 4A, 4B, and 4C) are listed in Table A. Table A also gives the basic function of these units. The data sets and circuit packs are inserted into the data mounting which provides the wiring, power, and other interconnections required to establish the hub.

2.03 The positions on the upper row of connectors or the upper nest of the 27-type Data Mounting are physically and electrically compatible to accept Data Sets 108D-L1, Data Sets 109G-L1, and the hub circuit pack AR431.

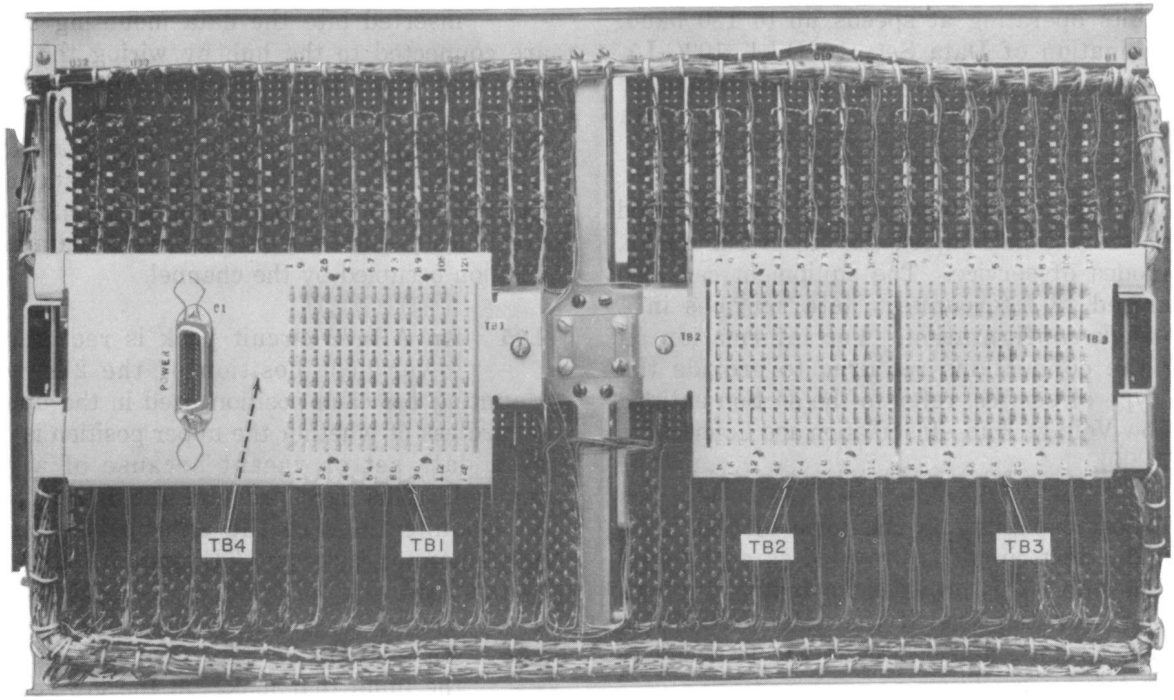
2.04 The 43B1 channel terminals are not physically inserted into the data mounting since they are connected to the hub by wiring the baseband interface leads from the 43B1 equipment to the J70173AB terminal strip unit. The circuits are then cross-connected to the 27-type Data Mounting. Although the physical space in the data mounting has not been used, connection of the 43B1 channel precludes the use of a data set in that data mounting position occupied by the channel.

2.05 An AR432 circuit pack is required in the lower nest position of the 27-type Data Mounting for each position used in the upper nest, regardless of whether the upper position is occupied by a data set or vacant because of a wired-in channel. This card provides the RL, SL, and TL lead connections to the appropriate bus. The patch-monitor jacks and TL lamp are also provided by this card.

2.06 An example of the physical placement of the units that make up the low-voltage hub is shown by Fig. 5. This figure indicates the positioning of the units required to provide the modes of service indicated by Fig. 4. For additional information on the positioning of the data sets and circuit packs in the data mounting, refer to



FRONT VIEW



REAR VIEW

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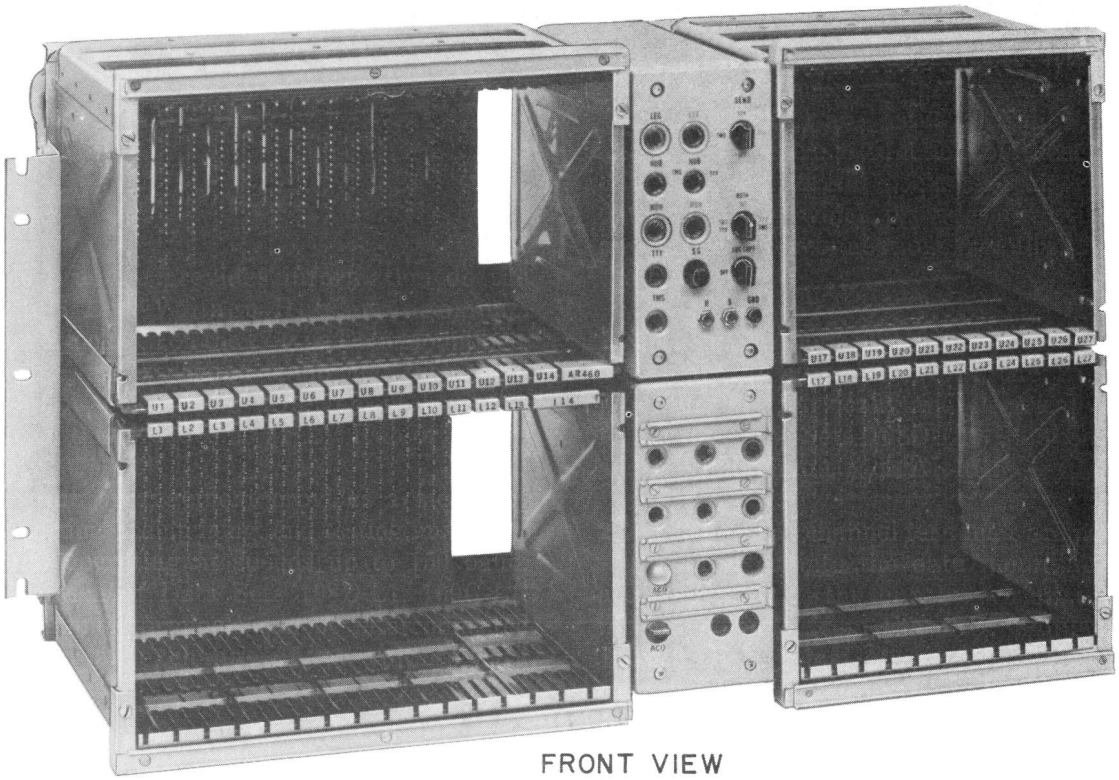
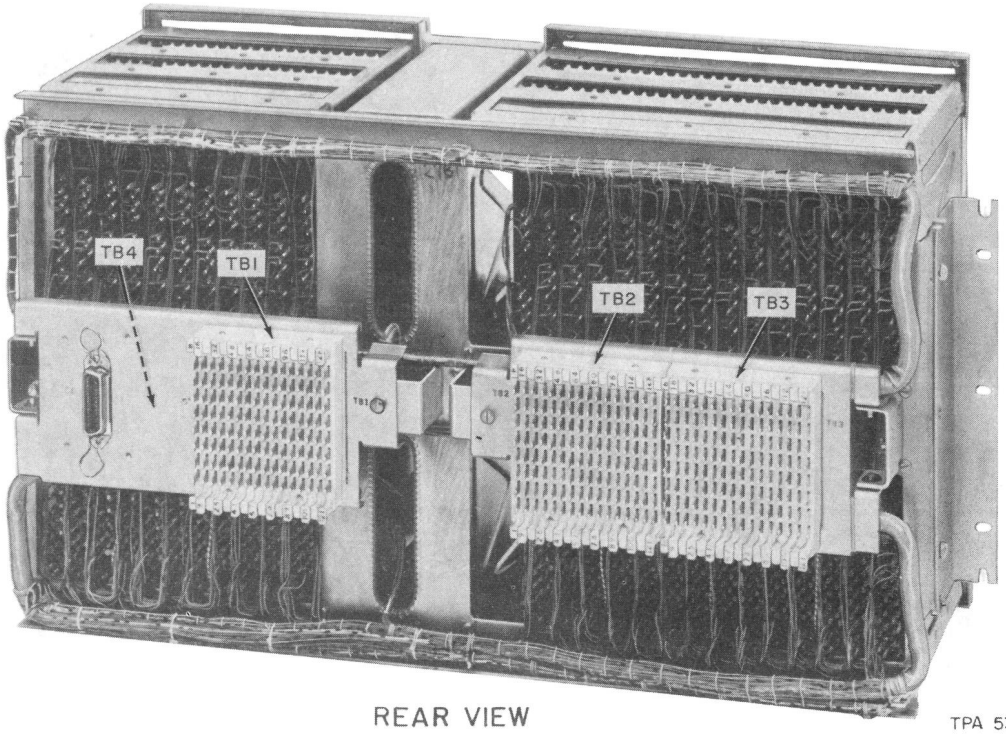
Fig. 1—27A1 Data Mounting



FRONT VIEW



REAR VIEW

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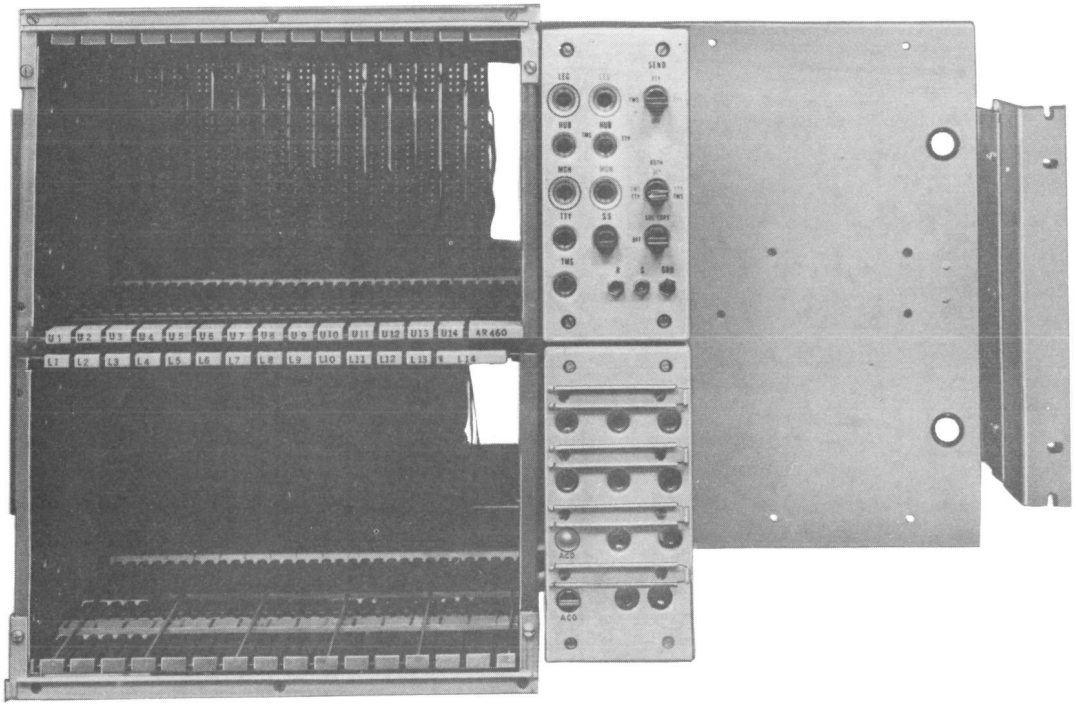
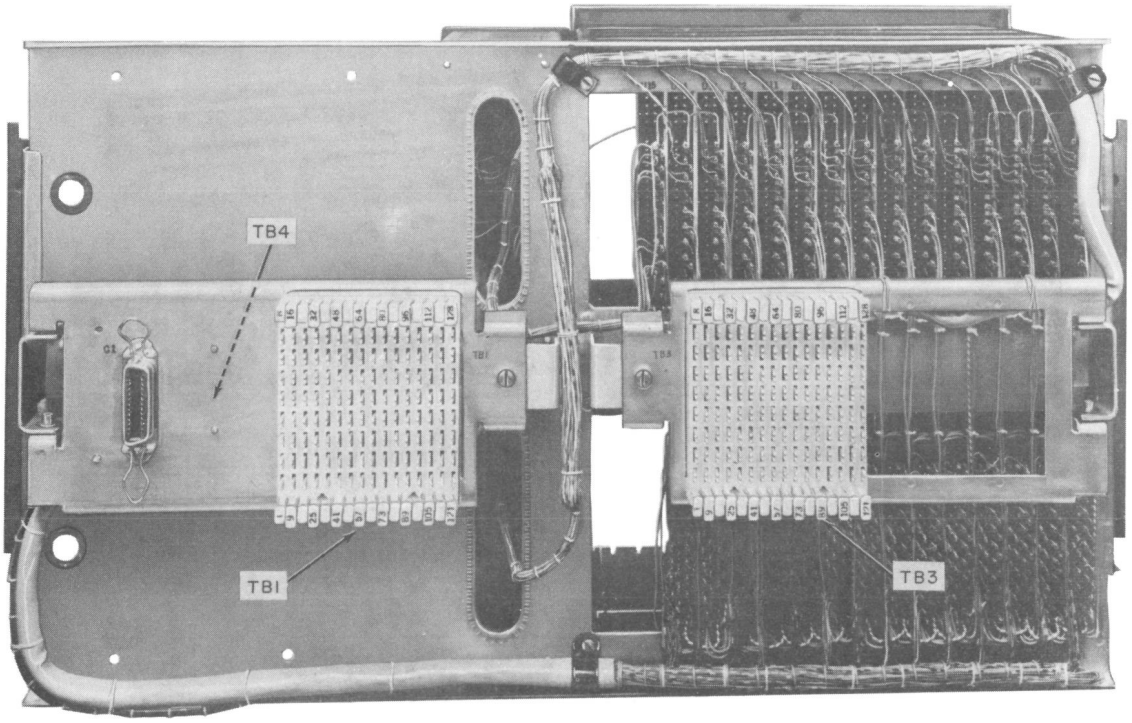
Fig. 2—27B1 Data Mounting



FRONT VIEW



REAR VIEW

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Fig. 3—27C1 Data Mounting

TABLE A

CIRCUIT PACK OR DATA SET	DESCRIPTION OR FUNCTION
Data Set 108D-L1	This data set is used for low-speed serial data where a frequency-shift-keyed modulation mode of transmission scheme is required or desirable. Refer to Section 591-028-100 for additional information.
Data Set 109G-L1	This data set is used for low-speed serial data transmission and provides a 3-ma polar dc transmission scheme. A metallic pair is required and must be limited to 2000 ohms for FDX operation and 2,500 ohms for HDX operation. Refer to Section 312-808-100 for additional information.
AR431 Circuit Pack	Hub circuit card — This card contains the amplifier circuit that transfers the mark and space signals to the other legs of the hub. The card also provides a double space detection circuit.
AR432 Circuit Pack	Bus circuit card — This card provides the necessary switches and connections to interconnect the RL, SL, and TL leads. Jacks are provided by this card to allow for monitoring and patching of the data sets and legs.
AR433 Circuit Pack	Strap circuit card — This card provides the continuity for the baseband leads when the physical size of the data set (example 108D-L1) prevents adjacent slot mounting of the sets in back-to-back operation.
AR460 Circuit Pack	Test circuit card — This card is used to provide the interface between the hub-leg circuits and the test equipment for monitoring and testing. This card is used with the 27B1 and 27C1 Data Mountings. Refer to Section 590-102-123 for additional information on the data mountings and the AR460 circuit pack.

the section entitled Type-3 Low-Voltage Hub—Installation and Connections (312-807-200).

2.07 The data sets and hub circuits require a plus and minus 24 volts power source for operation. The power requirements may be met by using any of the following for each data mounting.

- A J70169AD battery filter is used with a ±24 volt central office battery to provide the +24 volts and −24 volts.
- A J87308A-L3 and L4 power supply can be used in conjunction with the −48 volt central office battery to provide the required voltages.
- A J87308A-L5 and L6 power supply can be used in conjunction with the −24 volt central office battery to provide the required voltages.
- A KS-20575 rectifier is used to supply the required voltage from a 117v ac 60-Hz power source.

2.08 The circuits of the hub are fused so that a separate fuse circuit is provided for every four positions in the data mounting nests. This prevents trouble in one data set or hub from causing a power failure that would affect all the circuits in the data mounting. A blown fuse will cause the FA lamp to light indicating this condition.

2.09 In most cases the fuse and alarm circuits are located above the terminal strip units or cabinets. A plug-ended cable is attached to each group of 16 fuses (eight for +24 volts, eight for −24 volts). This provides a simple means of connecting the power to the data mounting.

2.10 A channel alarm (CA) relay, an alarm cutoff (ACO) relay, and a fuse alarm (FA) relay are provided for the low-voltage hub by the use of a J70173 fuse and alarm unit. The normally operated CA relay releases when an alarm condition, such as a loss of carrier in the data sets, occurs. The 43B1 channels used with a low-voltage hub may be equipped with their own system of channel alarms. When this is the case, the CF1 leads of the 43B1 are not wired in and a loss of carrier in the 43B1 link will not cause the hub channel alarm to operate. The normally released FA relay operates when any +24 or −24 volt fuse blows. An EN1 circuit pack (relay driver circuit) is used to drive both the CA and FA relays. This relay driver circuit is plugged into the fuse and alarm unit and can be arranged to operate from either a −24 or −48 volt office battery.

2.11 A block diagram (Fig. 4) showing the half-duplex (Fig. 4A), full-duplex (Fig. 4B), and back-to-back (Fig. 4C) arrangements indicates the interconnections of the equipment that make up the hub. For additional information on the data mountings and connection of this equipment, refer to the section entitled 27-Type Data Mountings—Identification (590-102-123) and Type-3 Low-Voltage Hub—Installation and Connections (312-807-200).

3. FUNCTIONAL DESCRIPTION AND OPERATION

AR431 Circuit Pack

3.01 The hub circuit receives mark and space signals from a leg of the hub and retransmits these signals to all the other legs of the hub. This is accomplished by the amplifier circuits that are located on the hub circuit pack (AR431 circuit pack).

3.02 The hub circuit card also provides for recognition of two spaces that are sent simultaneously by two or more legs of the hub. The AR431 circuit pack provides a double-space detection circuit which recognizes this condition and provides a double-space output signal.

3.03 The data signal on the RL lead is either zero milliamperes (for a mark signal), 10 milliamperes (for a space signal), or 20 milliamperes or more (for a double-space signal). These signals are applied to an input amplifier circuit and the double-space detector circuit.

3.04 When a zero-millampere signal is applied to the input circuit, a negative voltage (approximately −10 volts) signal is generated by this circuit. A 10-milliampere signal will result in a positive potential (approximately +12 volts) being produced. These voltages conform to EIA Standard RS-232B.

3.05 These EIA voltages appear on test point TP6 (−10 volts mark and +12 volts space) and

are fed directly to an emitter-follower output circuit through switch S1 N position (see Fig. 6). Switch S1 has been provided to permit the use of a regenerative repeater in the hub, when a suitable regenerator is developed. The output hub voltage on the SL lead is approximately −10v for a mark and +10v for a space.

3.06 When a 20-milliampere signal is presented on the RL lead, it is recognized as a double space by the double-space detector circuit. This results in a double-space signal being placed on the SL and TL leads whenever the double-space input signal exceeds 0.5 ms in duration.

3.07 A double-space break timer circuit is provided as an option and can be switched into the circuit by operation of switch S3 (refer to Fig. 6). When S3 is placed in the A position, a double-space input signal will cause the break timer circuit to operate if the double space is of sufficient duration. Operation of the timer circuit places a double-space output signal on the SL and TL lead for a 500-millisecond duration.

3.08 When switch S3 is in the B position, a double-space signal output is sent for only as long as two space signals are simultaneously detected on the RL lead.

3.09 In order to provide full-duplex (FDX) operation, transmission between the hub legs must be possible in both directions at the same time. Therefore, for FDX operation, the directional control circuits in the hub legs must be disabled. This can be accomplished by strapping the data sets for FDX operation or by using two hubs (one for each direction) to send from the hubs to the legs. For additional information on the hub connections, refer to the section entitled Type-3 Low-Voltage Hub—Installation and Connections (312-807-200).

3.10 Operation of switch S2 to the F position results in a +22 volt output to the hub SL lead each time a space is present on the RL lead. This output is capable of overriding the directional control circuit in the leg, thereby enabling FDX operation.

3.11 The AR431 circuit pack provides three test points TP6, TP7, and TP8. The test points can be used as follows.

- TP6—This test point can be used as either a monitoring point, a point for connecting a distortion measuring test set, or for inserting voltage signals to drive the hub for test purposes.
- TP7—This test point can be used to insert EIA voltage signals to drive the hub for test purposes.
- TP8—This test point is used to check the output of this hub circuit card.

AR432 Circuit Pack

3.12 The receive lead (RL), send lead (SL), and hit indicator lead (TL) of all data sets or 43B1 channel units are connected to the other circuits associated with a particular hub via the bus card AR432 circuit pack. The S switch (Fig. 7) provides a means of connecting the SL and RL leads from a data set or a hub to any pair of nine send and receive multiple buses of a data mounting. Back-to-back connection (Fig. 4C) is obtained by cross-connecting receive and send leads. When this is done, the TL lead is used as a receive lead because EIA signal voltages are required to key the SL leads. For information on setting the S switch to make the required connections, refer to the section entitled Type-3 Low-Voltage Hub—Installation and Connections (312-807-200).

3.13 Transmission of data is indicated by the flashing of a TL lamp. This indication is provided by a lamp driver circuit that is connected to the TL lead causing a neon lamp to light anytime a space signal (positive voltage) is present.

3.14 The AR432 circuit pack provides an M jack for monitoring and a P jack for patching of leg hub circuits. For additional information on using these jacks to maintain and test the hub, refer to the section entitled Type-3 Low-Voltage Hub—Test Procedures (312-807-500).

AR433 Circuit Pack

3.15 The strap circuit card (AR433 circuit pack) is inserted in the lower nest of the data mounting to provide continuity for the baseband leads. This is necessary only when the physical size of a data set prevents the mounting of the data sets in adjacent slots for back-to-back operation

[example, Data Set 108D-L1 located on the left of a back-to-back pair (Fig. 5)]. The AR433 circuit pack provides the required connections between the AR432 circuit packs which are used to make the bus connections.

AR460 Circuit Pack

3.16 The test and cord circuits provided by the AR460 circuit pack are designed to be used as an interface between the hub or leg circuits and the test equipment. Jacks and keys are provided to allow patching the transmission circuits to the test equipment circuits (see Fig. 8).

3.17 A test set generator such as a 911A can be connected to the TMS jack or jacks R, S, GRD and used to test the operation of the hub and associated legs. The voltage signals from the test set are converted into current signals to drive the hub by one of the circuits on the AR460 circuit pack (see Fig. 8). EIA voltage signals are supplied by another circuit of the AR460 circuit pack to drive the send inputs of the legs.

3.18 Teletypewriter interface circuits are also provided by the AR460 circuit pack. When a teletypewriter is connected to the TTY jack, the circuits provided by the circuit pack convert the signals from the keyboard or tape reader of the TTY into the proper current signals required to drive the hub. Conversion of the keyboard signals into mark and space voltages for driving the send modulator (Fig. 8), and conversion of hub or leg voltage signals into current signals to drive a TTY are also provided by the AR460 circuit pack.

3.19 For information on actual test procedures for testing the hub or legs using a transmission measuring set, test signal generator, or teletypewriter, refer to the section entitled Type-3 Low-Voltage Hub—Test Procedures (312-807-500).

4. REFERENCES

4.01 For additional information on the Type-3 Low-Voltage Hub and associated equipment refer to:

(a) Type-3 Low-Voltage Hub Circuit Description—CD 73059-01

(b) Type-3 Low-Voltage Hub Schematic Diagram—SD-73059-01

(c) 27-Type Data Mounting—Identification (590-102-123)

(d) Type-3 Low-Voltage Hub Equipment Design Requirements (807-401-153)

(e) BSPs on Data Set 108D-L1, Data Set 109G-L1, and 43B1 Channels.

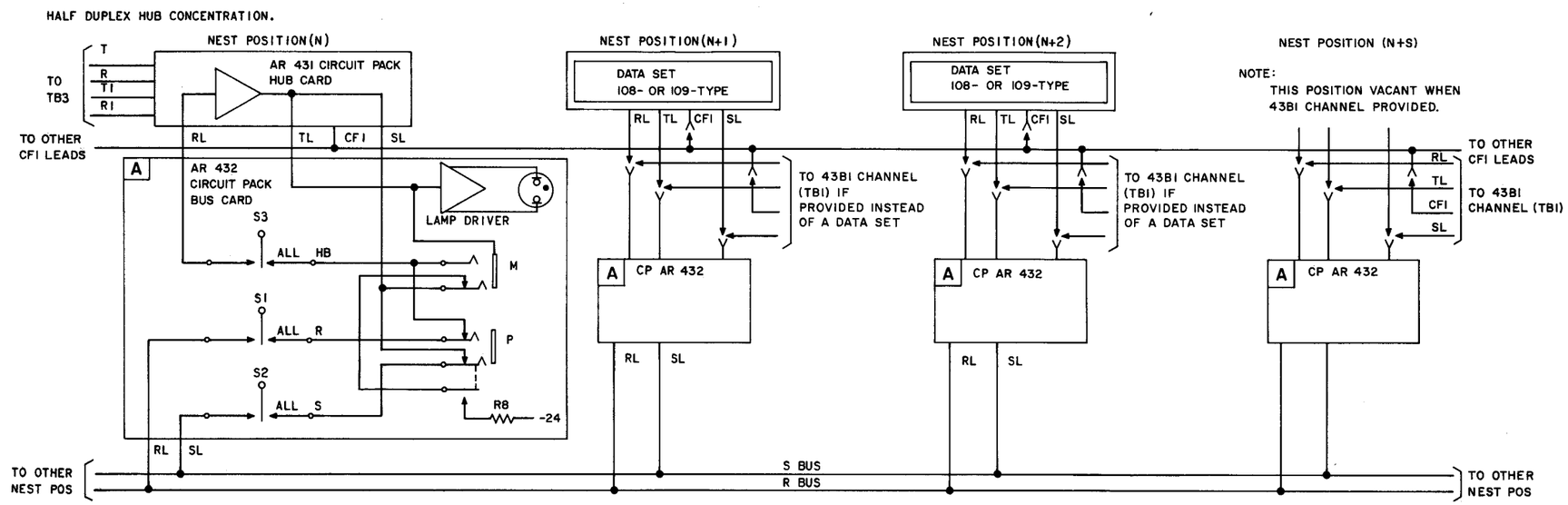


Fig. 4A—Block Diagram of Type-3 Low-Voltage Hub Showing the Half-Duplex Arrangement

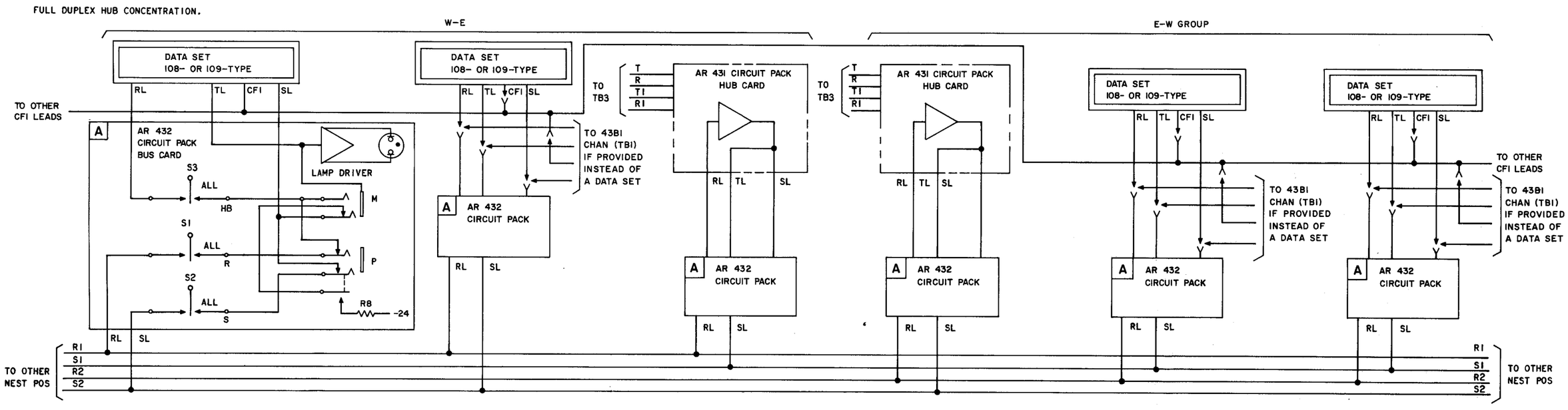


Fig. 4B—Block Diagram of Type-3 Low-Voltage Hub Showing the Full-Duplex Arrangement

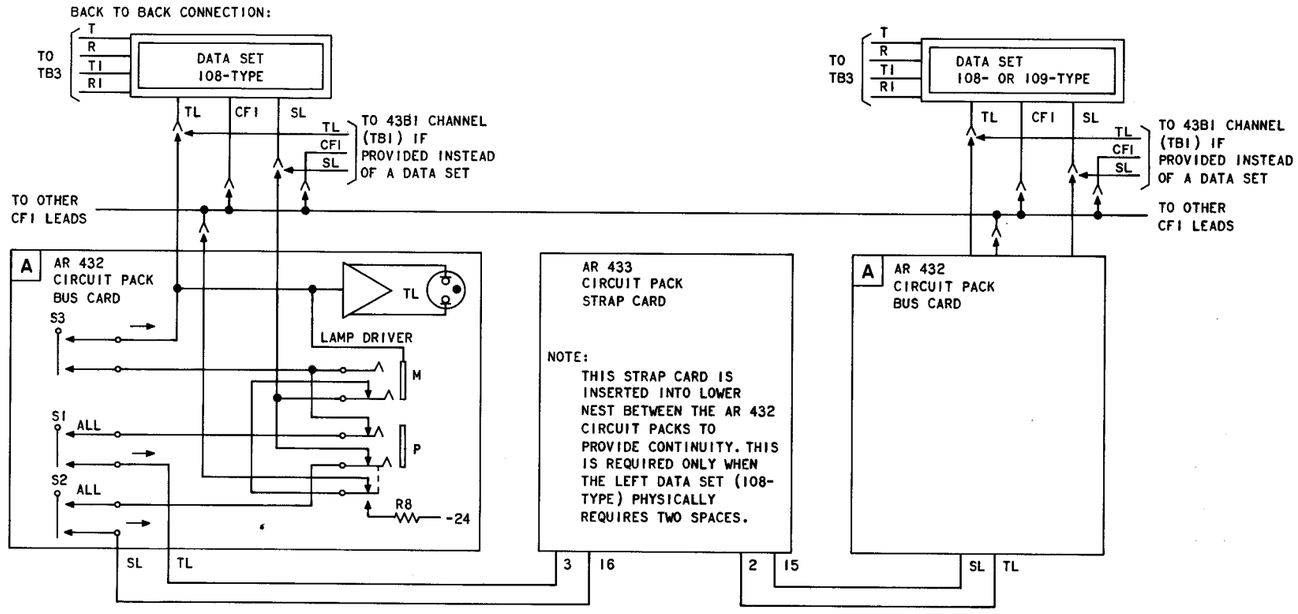
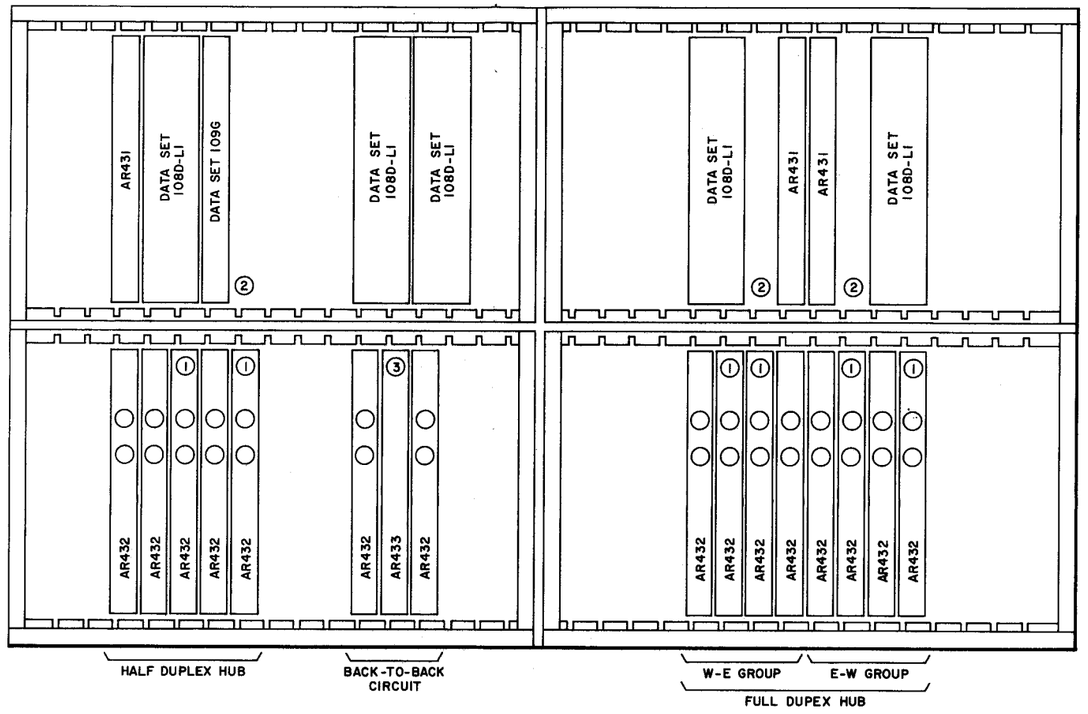


Fig. 4C—Block Diagram of Type-3 Low-Voltage Hub Showing the Back-to-Back Arrangement



① 43BI CHANNEL TERMINAL (LOCATED EXTERNALLY) WIRED TO THESE POSITIONS.

② THIS POSITION CANNOT BE EQUIPPED WHEN 43BI CHANNEL IS WIRED TO POSITION DIRECTLY BELOW IT.

③ THIS CIRCUIT PACK IS REQUIRED ONLY WHEN A DOUBLE WIDTH DATA SET, ON THE LEFT SIDE OF A PAIR USED IN BACK-TO-BACK SERVICE, CAUSES A VACANT SPACE IN THE LOWER NEST. THE AR 433 CARD PROVIDES LOWER NEST CONTINUITY.

Fig. 5—27A1 Data Mounting Showing the Physical Mounting and Arrangement of Data Sets and Circuit Packs

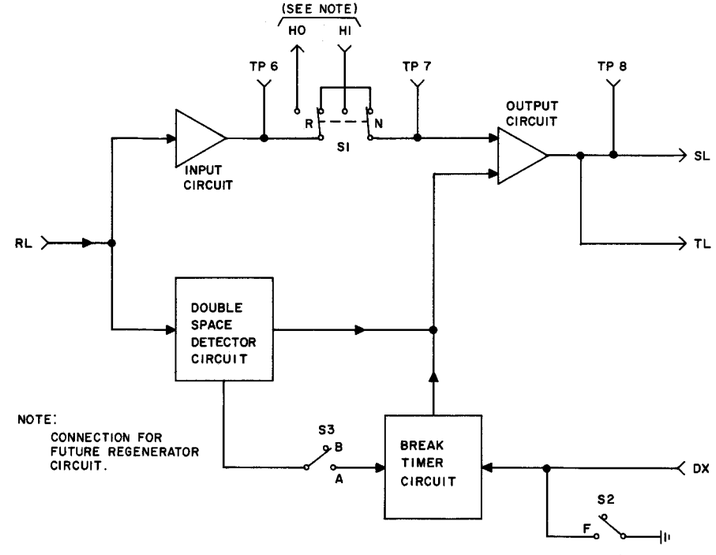


Fig. 6—AR431 Circuit Pack—Block Diagram

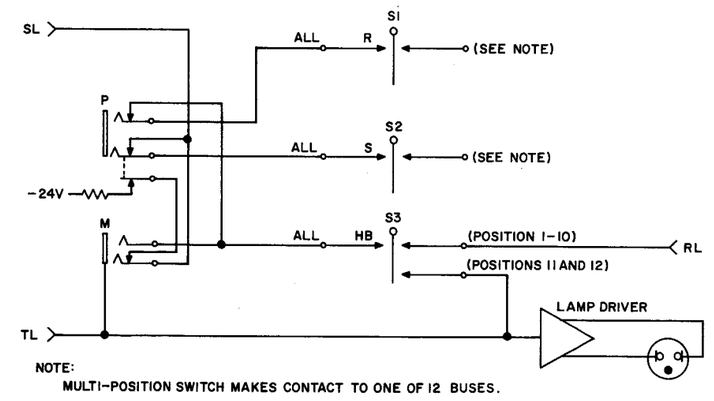


Fig. 7—AR432 Circuit Pack—Block Diagram

Fig. 6 and 7

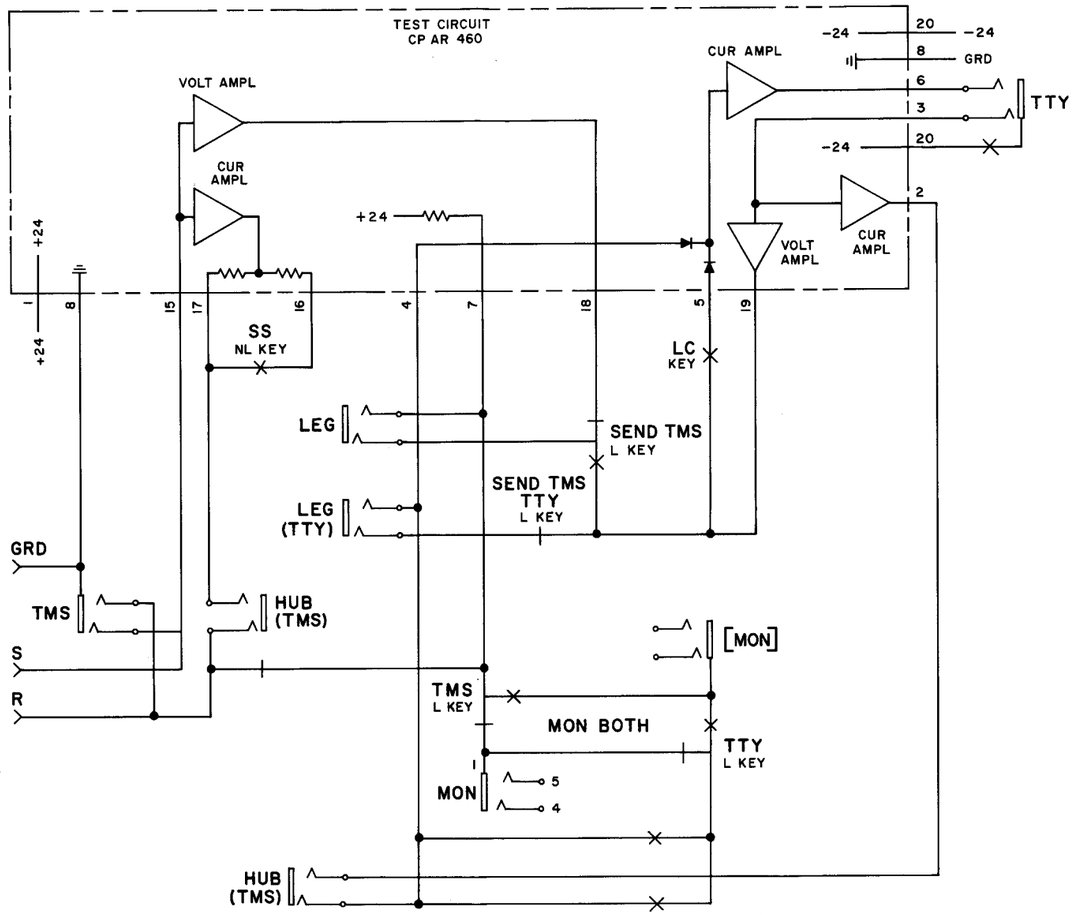


Fig. 8—AR460 Circuit Pack Test Circuits—Block Diagram