1A DATA STATION
MULTICHANNEL ARRANGEMENTS
DESCRIPTION AND OPERATION

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1. GENERAL

A. Scope

1.01 This section covers the general description, operating principles, and equipment features of the 1A Data Station Multichannel Arrangements (MCA), hereafter referred to as the 1A Data Station.

1.02 The description of the circuit details of the 1A Data Station are necessarily brief. If more detail is required, it can be found in the reference material listed in Part 6 of this section. This section has been reissued to add:

(a) Data Auxiliary Set (DAS) 811J-L1

(b) Station Balanced Interface (DP63 circuit pack) (±3 mA, 2-wire, HDX or FDX)

(c) Station Current Interface (DP68 circuit pack) (62.5- or 20-mA, 2-wire, HDX, binary only)

(d) Station EIA Interface (DP65 circuit pack) (EIA voltage, 3-wire, FDX or HDX, ternary or binary). DP65 circuit pack replaces DP55 circuit pack, now rated Manufacture Discontinued (MD).

Since this reissue constitutes a general revision, arrows ordinarily used to indicate changes have been omitted.

B. Purpose

1.03 The purpose of the 1A Data Station is to provide a terminal with the capability of multiplexing 75 and 150 baud data channels on VF facilities. The primary application of the 1A Data Station is for use on the customer premises; however, it can be used in the central office on a locally engineered basis.

1.04 The 1A Data Station is similar to and uses the same general system organization as the 43B1 Voice Frequency Carrier Data (VFCD) System described in Section 312-710-100. However, the 1A Data Station also provides the following additional features:

(a) Option of four types of baseband interface to connect channel terminals to various types of data terminal equipment

(b) Option of two forms of transmission; that is, binary (two information levels), or ternary (binary plus supervision)

(c) New maintenance aids

(d) Mounting arrangements which are designed for installation on customer premises.

1.05 The 1A Data Station may be used to terminate one end of a private line telegraph channel which, for example, may have originated in a 43A1 Voice Frequency Carrier Telegraph (VFCT) System, or a 43B1 VFCD System (binary transmission mode only).

1.06 The 1A Data Station may also be used in conjunction with a private line voice circuit where several point-to-point low-speed data channels are desired. In this case both ends of the private line voice circuit will be terminated in a 1A Data Station and may use either the binary or ternary transmission mode.

C. Design Features

1.07 The 1A Data Station provides means for multiplexing up to 17 single-width (SW) 75-baud channels or 8 double-width (DW) 150-baud channels, plus one SW channel on a 4-wire facility. (Note that the 1A Data Station provides two more DW channels than the 43A1 VFCT System, and that all channels are designed to operate at the rated baud rate.) On a 2-wire facility, up to eight SW or four DW channels may be multiplexed. The bandwidth restriction of certain facilities may preclude the use of some of the higher frequency channels. (Refer to Section AB83.048.1.) In either the 2-wire or 4-wire type of operation, each DW channel may be replaced by two SW channels assigned to the same portion of the VF spectrum.

1.08 The simplified block diagram in Fig. 1 shows one channel of a 1A Data Station. A channel is comprised of common equipment (common to all channels within a single system), channel terminal equipment, and a customer interface.

1.09 Each channel terminal consists of four circuit packs (CPs): a transmitter, a demodulator, a receive interface, and a station interface.

1.10 The channels of the 1A Data Station can be arranged to work in either of two transmission modes:

- Binary—Two information levels
- Ternary—Binary plus supervision, ie, provides for transmission of data-off supervision or data-on supervision plus binary data.

1.11 The station interface may be one of four types, depending upon the desired baseband interface:

- Voltage—per EIA Standard RS-232-B
- 20-mA neutral current 3-wire (binary mode only).
- ±3 mA balanced 2-wire polar loop current (ternary or binary mode)
- 62.5-mA (20-mA optional) 2-wire loop current (binary, HDX only)

D. Power Requirements

1.12 Each channel terminal may require as much as 3 watts each of +24 and −24 volt power, ±10 percent of nominal voltage. This is normally supplied from a KS-20575 rectifier, an ac-operated supply providing +24 and −24 volts. The sum of the currents of the +24 and −24 volt outputs of this supply should not exceed 4 amperes. Since the current drain for a channel terminal depends upon its baseband interface (EIA or current) and transmission mode (binary or ternary), a safe rule of thumb is to limit the load on a single KS-20575 rectifier to ten channel terminals plus common equipment. However, the number of terminals supplied by any one KS-20575 rectifier may be extended if desired, providing the configuration (EIA, current, etc) will permit it. This can be determined from the current drain information in Table A. The load should be divided so that the power supply in a 29A1 data mounting supplies ten channels, and the second power supply in a 29B1 data mounting supplies the remaining channels. Since the KS-20575 rectifier is a nonredundant supply, it is not recommended that it be used to power more than one system.

1.13 When the 1A Data Station is mounted in a central office environment, power may be supplied from the KS-20575 rectifiers, or from a well-filtered +24 volt central office battery using the J70169AD battery filter, or from the J87308A power supply.

> ***Note:*** There are no standard CO wiring plans; locally engineered arrangements only.

2. PHYSICAL DESCRIPTION

A. General

2.01 This part describes the physical appearance of the components of the 1A Data Station. Basically, the units of the station consist of the following:

- Cabinet
- Data mountings
- Adapters
- 599A panel
- Plug-in circuit packs
- Data auxiliary sets
- Power supply
- Indicator and cord

B. Cabinets

2.02 The KS-20018-L7 cabinet is 30 inches high, 24 inches wide and 17 inches deep. It has an inside vertical mounting space of 26 inches and will accept equipment designed to mount on standard 23-inch central office frames. Front and rear access is provided by two removable panels, held in a closed position by two spring-loaded catches. Four levelers are provided which can be removed if the cabinet is to be fastened to the floor. The KS-20018-L7 cabinet weighs 33 pounds, unequipped.

2.03 The KS-20093-L1 cabinet is 72-3/16 inches high, 34 inches wide, and 30-1/2 inches deep. Access to the cabinet is through three front doors and two rear doors. The left front door provides access to a separate compartment 5 inches wide for the full height of the cabinet. The other four doors provide access to two 25-inch rack structures mounted back-to-back, spaced 6-5/16 inches apart, and forming an integral part of the cabinet. The available vertical space is 68 inches on each rack, with tapped mounting holes spaced on 1-inch centers. The cabinet is designed to be free-standing on four adjustable levelers. The KS-20093 cabinet weighs 300 pounds, unequipped.

C. Data Mountings

2.04 Two different mounting units are provided to house the circuit packs and power supply. Both units are 8 inches high, 10-11/16 inches deep and are arranged to mount in either a 23-inch or 25-inch frame.

29A1 Data Mounting (Fig. 2)

2.05 The 29A1 data mounting contains 12 connectors to accept 2 complete channel terminals, plus the circuit packs common to the system; 2 connectors for strapping between mountings; 1 connector to interface with DAS 811G-L1 or 811J-L1; 4 screw terminal strips for connecting to a power supply, alarm indicator lamps, line connections, and an external line balancing network; and 1 wire-wrap terminal strip for connecting to alarm contacts.

29B1 Data Mounting (Fig. 3)

2.06 The 29B1 data mounting contains 16 connectors to accept 4 complete channel terminals (the channel terminal in position D may be replaced with a KS-20575 rectifier), 2 connectors for strapping between data mountings, 1 connector to interface with DAS 811H-L1 or 811J-L1, and 4 screw terminals for connecting to the power supply, when equipped.

TABLE A

MAXIMUM CURRENT DRAIN IN MILLIAMPERES

CONFIGURATION	EQUIPMENT	CARRIER FAIL CONDITION					
		SEND AND RECEIVE		SEND ONLY		RECEIVE ONLY	
		+24V	-24V	+24V	-24V	+24V	-24V
PER CHANNEL	Channel Terminal	*	*	†	†	‡	‡
	Binary Equipped With DP65 Circuit Pack (EIA)	95	90	36	15	78	76
	DP56 Circuit Pack (3-wire, 20-mA Current)	80	135	18	61	73	123
	DP63 Circuit Pack (±3 mA Current)	125	135	—	—	—	—
	DP68 Circuit Pack (2-Wire, 62.5/ 20-mA Current)	110§	115§	—	—	—	—
	Ternary Equipped With DP65 Circuit Pack (EIA)	110	100	36	15	99	84
	DP63 Circuit Pack (±3 mA Current)	140	145	—	—	—	—
PER SYSTEM	Line Circuit (DP52 Circuit Pack)	17	11	17	11	17	11
	Channel Check (DP58 Circuit Pack)	33	33	33	33	33	33
	Alarm Indicator (DP59 Circuit Pack) VB Loop Switch Normal	8.5	25	8.5	25	8.5	25
	VB Loop Switch Operated	30	25	30	25	30	25
	System Alarm (DP62 Circuit Pack)	24	28	—	—	24	58
PER CABINET	18B-49 Indicator	120	—	120	—	120	—
PER 29A1 DATA MOUNTING	Data Auxiliary Set 811G-L1	60	—	—	—	60	—
PER 29B1 DATA MOUNTING	Data Auxiliary Set 81H-L1	120	—	—	—	120	—
PER SYSTEM ¶	Data Auxiliary Set 811J-L1	60	—	—	—	60	—

* 4 circuit pack total
† 2 circuit pack total
‡ 3 circuit pack total
§ Maximum current drain on the DP68 circuit pack occurs in test mode: +24V @ 140 mA, -24V @ 125 mA
¶ May be used with up to two 29A1 Data Mountings and associated 29B1 Data Mountings.

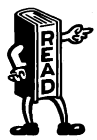
D. Adapters (Fig. 4)

2.07 The 202-type adapter is an apparatus-coded, U-shaped, 3-1/8 inch wide, 1-1/8 inch high, and 13/16-inch deep, epoxy-clad printed wiring strap card. It plugs into two 20-pin printed wire board 906E connectors simultaneously, one in each of two adjacent data mountings. The connectors are mounted on the front of the data mountings. Three adapters are provided and are color-coded for specific connections, depending upon configuration of channels and systems as described in Part 4C.

E. 599A Panel (Fig. 5)

2.08 The 599A panel consists of a 2-inch high by 23-inch wide mounting plate equipped with connectors, 2 terminal strips, and one 4066G network, with provisions for mounting an additional three 4066G networks. The electrical connection to the unit is via screw terminals.

F. Plug-In Circuit Packs



Care should be exercised in handling the circuit packs, particularly the transmitter and/or demodulator circuit packs, to avoid dropping them. It is a property of the ferrite core inductors used on these cards that a shock can alter the inductance sufficiently to change the BIAS by a few percent and change the frequency of the transmitter oscillator. A severe shock can crack the ferrite structure.

2.09 The plug-in circuit packs and figure numbers are listed in Table B.

2.10 All plug-in circuit packs associated with both the system common equipment and the channel terminal units are nominally 5-3/4 inches high and 10 inches long. The receive interface (binary), ternary receive interface, system alarm, and the carrier system alarm CPs are nominally 1 inch wide. The transmitter, demodulator, line circuit, and alarm indicator CPs are nominally 1-1/4 inches wide. The channel check, station EIA interface and the station current interface CPs are nominally 1-1/2 inches wide.

2.11 The components of each plug-in CP are mounted on a printed wire board which is fastened to a faceplate. Each faceplate has a lever mounted in its center which serves as a lock and pull handle for ease in removing and installing the plug-in CP.

G. Data Auxiliary Sets

2.12 Three data auxiliary sets, DAS 811G-L1, 811H-L1, and 811J-L1, serve as interface devices between the 1A Data Stations and the customer equipment.

Data Auxiliary Set 811G-L1 (Fig. 18)

2.13 DAS 811G-L1 provides the channel test alarm indicators and interface unit for the 1A Data Station. It is arranged to mount on the rear of the 29A1 data mounting or in the customer interface area of the KS-20093-L1 cabinet.

2.14 The overall dimensions are 8 inches high, 5 inches wide and 3-1/8 inches deep.

2.15 DAS 811G-L1 contains two 25-pin female connectors for customer connections, a 4-foot cable terminated in a 50-pin male plug to connect to the 29A1 data mounting, three lamps, one meter, three 2-position slide switches, one 3-position lever switch, two 3-position toggle switches, and a terminal strip.

Data Auxiliary Set 811H-L1 (Fig. 19)

2.16 DAS 811H-L1 provides a channel test, alarm indicators, and the interface unit for the 1A Data Station. It is arranged to mount on the rear of the 29B1 data mounting or in the customer interface area of the KS-20093-L1 cabinet.

2.17 The overall dimensions are 5 inches wide, 5 inches high, and 2-1/2 inches deep.

2.18 DAS 811H-L1 contains four 25-pin female connectors for customer connections, a 4-foot cable terminated in a 50-pin male plug to connect to the 29B1 data mounting, four lamps, and four 3-position toggle switches.

Data Auxiliary Set 811J-L1 (Fig. 20)

2.19 DAS 811J-L1 provides a channel test, alarm indicators, and interface unit for the 1A Data Station. It is arranged to mount on either 23- or 25-inch centers. If the cabinet depth is

TABLE B

PLUG-IN CIRCUIT PACKS FOR 1A DATA STATION

MULTICHANNEL ARRANGEMENTS

CIRCUIT PACK	TITLE	FIG. NO.
DP1-DP25	Transmitter	6
DP26-DP50	Demodulator	7
DP51	Receive Interface (Binary)	8
DP52	Line Circuit	9
DP56	Station Current Interface	10
DP57	Ternary Receive Interface	11
DP58	Channel Check	12
DP59	Alarm Indicator	13
DP62	System Alarm	14
DP63	Station Balanced Interface	15
DP65	Station EIA Interface	16
DP68	Station Current Interface	17

* Station EIA Interface (DP55 Circuit Pack) is rated MD. DP65 Circuit Pack is Standard.

available, it may be mounted on the rear of a 29A1 or 29B1 data mounting.

2.20 The dimensions are 6 inches high and 4-1/4 inches deep. The length may be either 23 or 25 inches, depending on how the mounting brackets are applied.

2.21 DAS 811J-L1 contains seven 50-pin connectors, two major alarm lamps, two terminal strips for alarm connections, two 2-position switches, four 3-position switches, one 2-position rotary switch, one 16-position rotary switch and a designation strip. One of the connectors (J6) is used to connect circuits to the VF cable pairs or 10-type data line concentrator. The other six connectors connect to the 29-type data mountings. Only five can be used at a time; a mechanical interlock arrangement prevents the sixth connector from being used. The channel location designation strip may be used to identify a connection to a physical location in a particular 29-type data mounting in the cabinet.

The designation strip may also be used to identify a channel and customer by name or circuit number if so desired.

H. KS-20575 Rectifier

2.22 The KS-20575 rectifier is a 5-5/16 inch high, 5-inch wide, and 6-5/8 inch deep ac-operated power supply which mounts in either the 29A1 or the 29B1 data mounting.

I. 18B-49 Indicator

2.23 The 18B-49 indicator is equipped with three beehive lenses colored white, green, and ruby. The housing is insulated material and has a light olive gray finish. It is arranged for fixed mounting by means of screws. The overall dimensions are 2-1/3 inches high, 2-1/8 inches wide, and 5-3/8 inches deep. The bulbs for the 18B-49 indicator must be ordered separately.

J. D4BD-49 Cord

2.24 The D4BD-49 cord is a 4-conductor cord having tinsel conductors with vinyl insulation color-coded green, red, yellow, and black. The cord spade tips are arranged for No. 4, 5, or 6 screws. The standard length is 5-1/2 feet, but is is also available in 9-, 13-, and 25-foot lengths.

K. A25D Connector Cable

2.25 The A25D connector cable (not supplied; must be ordered separately) consists of 25 pairs of conductors jacketed with a light olive gray vinyl. Double-ended cables, used for interconnecting DAS 811J-L1 and 29-type data mountings, are equipped with KS-16689-L3 plugs at each end and are available in lengths of 3, 6, and 9 feet. The single-ended cable, used for connecting DAS 811J-L1 to 10-type data line concentrators or customer connections, is equipped with a KS-16689-L3 plug at one end, and is available in lengths of 13, 20, 22, 24, and 26 feet.

L. Table of Weights

2.26 The weights of the various pieces of apparatus are given in Table C.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 This part describes the functions of the various components of the 1A Data Station and the function of the 1A Data Station as part of a system.

3.02 The 1A Data Station is identical to the 43B1 VFCD System with regard to the number of channels, channel bandwidth, channel spacing and line frequency assignments, modulation rates, send and receive levels, channel and system alarm detecting methods, and the method of multiplexing. The 1A Data Station can be configured to operate in two different transmission modes, binary and ternary. When operating in the binary mode it is compatible with the 43A1 VFCT or 43B1 VFCD System or another 1A Data Station. However, when operating in the ternary mode (three transmission states—mark, center, and space frequencies) it is only compatible with another 1A Data Station.

3.03 Figure 21 is a block diagram showing various 1A Data Station channel configurations and combinations of circuit packs. It is presented as a reference for the functional descriptions which follow.

Binary Transmission Mode

3.04 All channels provide either half-duplex or full-duplex low-speed serial data transmission by means of frequency-shift-keying (FSK). Two information levels are transmitted over a channel. One is associated with the space frequency; the other is associated with the mark frequency. The SW channels employ a frequency shift from the nominal center frequency of +35 Hz for mark and −35 Hz for space. The DW channels employ a frequency shift of +70 Hz for mark and −70 Hz for space. The binary mode of transmission is applicable with any of the four station interfaces listed in 1.11.

Ternary Transmission Mode

3.05 This mode provides a means for the transmission and detection of supervisory signals (data-off and data-on) as well as the normal binary data (3.04). Any one of three frequencies is transmitted and received by the channel terminal

TABLE C

WEIGHTS OF APPARATUS

APPARATUS	CODE	WEIGHT IN POUNDS
Cabinet	KS-20093-L1	300.00
Cabinet	KS-20018-L1	33.00
Data Mounting Unit	29A1	17.00
Data Mounting Unit	29B1	17.00
Rectifier	KS-20575	13.00
Data Auxiliary Set	811G-L1	2.30
Data Auxiliary Set	811H-L1	1.90
Data Auxiliary Set	811J-L1	8.00
Panel (less network)	599A	3.00
Lamp Indicator	18B-49	0.38
Adapter	202-type	0.50
Balancing Network	4066G	0.50
Circuit Pack		
Transmitter	DP1-DP25	1.06
Demodulator	DP26-DP50	1.06
Receive Interface	DP51	0.60
Line Circuit	DP52	0.81
Station Current Interface	DP56	0.56
Ternary Receive Interface	DP57	0.69
Channel Check	DP58	1.00
Alarm Indicator	DP59	0.75
System Alarm	DP62	0.50
Station Balanced Interface	DP63	0.69
Station EIA Interface	DP65	0.56
Station Current Interface	DP68	0.56

(center, mark, or space). The center frequency is transmitted when the system is idle and no data is transmitted (data-off). When the terminal has data to transmit, the center frequency is turned off and mark or space frequencies transmitted (data-on). This mode of operation is applicable only to channel terminals equipped with station EIA or balanced interface circuit packs.

3.06 When operating in the ternary mode, a second input signal (transmit supervision) is required in addition to the data input signal to establish the state of the modulator. When the transmit supervision is in the data-off state, the modulator is held in a condition which causes the center frequency to be transmitted to the line, regardless of the signal condition on the data input lead. When the transmit supervision lead is in the data-on state, the output of the modulator (after an initial delay of 30 ms, during which time the mark frequency is transmitted) is determined by the signal condition on the data input lead (mark or space).

3.07 Similarly, two leads are provided at the output of the receiver. Whenever center frequency is detected, the receive supervision lead of the channel terminal is held in the data-off state and the data output lead is held marking. When the receive supervision lead is in the data-on state, the state of the data output lead is determined by the received frequency (mark or space). Timing circuits which delay the data-on and data-off responses are employed to safeguard the receive supervision circuit from false operation due to noise.

B. Channel Frequency Assignments

3.08 Table D lists the CENTER frequencies as well as the MARK and SPACE frequencies for each of the 25 channels.

3.09 The chart in Fig. 22 shows the relative position of DW channels to SW channels in the voice frequency spectrum for the 1A Data Station. As can be seen from the chart, each DW channel replaces two SW channels. The frequency shifts and channel assignments are identical to those employed in the 43B1 VFCD and the 43A1 VFCT Systems. Thus, the 43A1 VFCT, the 43B1 VFCD Systems, and the 1A Data Station are electrically compatible for end-to-end operation.

> ***Note 1:*** The two lower DW channels of the 1A Data Station and the 43B1 VFCD System do not have corresponding channels in the 43A1 VFCT System.
>
> ***Note 2:*** The ternary transmission mode is not compatible with the 43A1 or the 43B1 System.

3.10 The same frequencies may be used in both directions when operating on a 4-wire facility. However, when operating on a 2-wire facility, different frequencies must be used in the transmit and the receive paths. The lower half of the frequencies are used for transmission in one direction and the upper half for transmission in the other direction in order to generate adequate return loss at the driving point. For reason of standardization, it is recommended that the lower frequencies be used in transmission from an STC to a station and the higher frequencies be used for the other direction.

3.11 The bandpass filters on both the transmitter (DP1-DP25 circuit packs) and the demodulator (DP26-DP50 circuit packs) are permanently associated with their respective modulators and discriminators. Changing a channel terminal transmitting frequency assignment, therefore, involves replacing the transmitter circuit pack. Similarly, to change the receiving frequency assignment, it is necessary to replace the demodulator circuit pack.

Modulation Rates

3.12 Each of the 17 SW channels in either the binary or ternary transmission mode is designed to accept and deliver serial data at speeds up to 75 baud. Each of the eight DW channels is designed to accept and deliver serial data at speeds up to 150 baud.

C. Line Circuit (Fig. 23)

3.13 Multiplexing of the various permissible combinations of SW and/or DW channels onto a voiceband facility is accomplished by means of a line circuit (DP52 circuit pack). The line circuit contains a common transmitting amplifier and a common receiving amplifier.

3.14 The outputs of the channel transmitters are multipled (connected in parallel) and connected to the input of the transmitting amplifier. The low input impedance of the transmitting amplifier allows the signals from various channels to be summed with negligible interaction between channels. The output of the amplifier is balanced and can be arranged for either 600- or 900-ohm line terminations. The gain of the transmitter is adjustable, by means of straps, over a 34.5-dB range in 1.5-dB steps.

3.15 The input to the common receiving amplifier is balanced and can be arranged to terminate either a 600- or 900-ohm line. The output of this amplifier is a low impedance driver capable of handling a load equivalent to 17 receiving channels connected in parallel. The receiving amplifier gain is adjustable by means of a potentiometer and can provide up to approximately 23 dB voltage gain at its output referred to its input (the voice facility

TABLE D

CHANNEL FREQUENCY ASSIGNMENTS

CHANNEL NUMBER	SPACE FREQUENCY	CENTER FREQUENCY	MARK FREQUENCY
SINGLE BANDWIDTH			
1	390	425	460
2	560	595	630
3	730	765	800
4	900	935	970
5	1070	1105	1140
6	1240	1275	1310
7	1410	1445	1480
8	1580	1615	1650
9	1750	1785	1820
10	1920	1955	1990
11	2090	2125	2160
12	2260	2295	2330
13	2430	2465	2500
14	2600	2635	2670
15	2770	2805	2840
16	2940	2975	3010
17	3110	3145	3180
DOUBLE BANDWIDTH			
21 (57)	610	680	750
22 (58)	950	1020	1090
23 (51)	1290	1360	1430
24 (52)	1630	1700	1770
25 (53)	1970	2040	2110
26 (54)	2310	2380	2450
27 (55)	2650	2720	2790
28 (56)	2990	3060	3130

( ) These designations appear on the Stelma KS-19935 Telegraph Carrier Test Set.

Designations (51) through (56) correspond to double-width channels of the 43A1 VFCD System.

side of the receiving amplifier). This gain offsets the loss between the output of the receiving amplifier and the input to each channel amplifier-limiter.

3.16 The line circuit also contains strapping options to permit connection to 2- or 4-wire facilities, and strapping options to permit either 600 or 900 ohms, balanced to ground.

3.17 A compromise hybrid balancing network provided on the line circuit will permit satisfactory 2-wire operation on nonloaded cable when the difference between the transmitted and received signals on the voice facility side of the line circuit is 20 dB or less at frequencies near the center of the voiceband (more precisely, at the frequency at which the RCV GAIN of the line circuit CP is adjusted). Two-wire operation over loaded cable is possible with the compromise network provided on the line circuit with differences as large as 30 dB between the transmitted and received signals measured on the voice facility side of the line circuit. For a detailed description concerning 2- and 4-wire connections, including the compromise network, refer to Section 591-813-200.

3.18 With an external (with respect to the line circuit) hybrid balancing network (4066G) connected to the line circuit, operation with nonloaded facilities and with a difference in send and receive levels greater than 20 dB but less than 30 dB (at the frequency at which the RCV GAIN of the line circuit CP is adjusted) is permissible. It is intended that this network plug into the 599A panel mounted in the cabinet and be wired, when required, to the desired line circuit. Screw terminals are provided to facilitate the wire connections.

D. Binary Channel Terminal (Fig. 24 and 26)

3.19 The binary channel terminal, either SW or DW, consists of four plug-in circuit packs: a transmitter (DP1-DP25), a demodulator (DP26-DP50), a binary receive interface (DP51), and any of four station interface circuit packs:

(a) Station EIA interface (DP65)

(b) Station current interface (DP56) (20-mA neutral current)

(c) Station current interface (DP68) (62.5- or 20-mA loop current)

(d) Station balanced interface (DP63) ($\pm$3 mA loop current).

3.20 The transmitter circuit pack contains a buffer amplifier, a keyer, an oscillator, a transmitting bandpass filter (TRMT BPF), a carrier squelch circuit, and some of the baseband interface circuitry.

3.21 The demodulator circuit pack contains an FM discriminator and the receiving bandpass filter (RCV BPF).

3.22 The binary receive interface circuit pack contains an amplifier-limiter, a carrier detector, a low-pass filter (LPF), a data slicer, a carrier indicator lamp, and an EIA output amplifier.

3.23 The station interfaces are covered in Part 3F.

E. Ternary Channel Terminal (Fig. 25 and 26)

3.24 The ternary channel terminal, either SW or DW, consists of four plug-in circuit packs: a transmitter (DP1-DP25), a demodulator (DP26-DP50), a ternary receive interface (DP57), and either a station EIA interface (DP65) or a station balanced interface (DP63).

3.25 The transmitter (DP1-DP25 circuit packs) and demodulator (DP26-DP50 circuit packs) are identical to those used in the binary channel terminal and are described in 3.20 and 3.21. The station EIA interface and station balanced interface are described in Part 3F.

3.26 The ternary receive interface circuit pack contains an amplifier-limiter circuit, a carrier detector, a dc baseband amplifier, a data slicer, a data delay circuit, a data output circuit, a center frequency detector, an off- and on-state timer, a carrier fail indicator lamp, and an EIA output circuit.

F. Station (Baseband) Interface

3.27 The station interface of a channel terminal is designed to drive one of four different types of data terminations. These are as follows:

(a) Voltage per EIA Standard RS-232-B

(b) 20-mA neutral current (3-wire)

(c) 62.5- or 20-mA loop current (2-wire)

(d) $\pm$3 mA loop current (2-wire).

3.28 The station interface circuit pack may be intermixed within the same system (ie, all four used with four different channels in the same system). Connections between all four station interfaces and the data terminal can be made through a 25-pin access connector on DAS 811G-L1 or DAS 811H-L1 (see Table E for DAS 811G-L1 and 811H-L1 pin assignments). In addition, the station current interface (DP68 circuit pack) and the station balanced interface (DP63 circuit pack), may be used with DAS 811J-L1. When so arranged, several 2-wire loops are connected to the interface circuit pack by a 50-pin connector on the DAS 811J-L1. (See Table F for 811J-L1 pin assignments.)

TABLE E

PIN ASSIGNMENTS FOR THE 25-PIN CONNECTOR ON THE DATA AUXILIARY SETS 811G-L1 AND 811H-L1

PIN NO.	CKT	DESCRIPTION	STA INT	
			CUR	EIA
1	AA	Protective Ground	X	X
2	BA	Transmitted Data (From Cust. Equip.)	X	X
3	BB	Received Data (To Cust. Equip.)	X	X
4	CA	Request to Send	—	X
5	CB	Clear to Send	—	X
6	CC	Data Set Ready*	—	X
7	AB	Signal Ground	X	X
8	CF	Data Carrier Detector	X	X
9	—	Data Set Test (+24V)	X	X
10	—	Data Set Test (-24V)	X	X
11-19	—	Not Used	—	—
20	CD	Data Term Ready	—	X
21-25	—	Not Used	—	—

* Fail Safe Lead
— Pin Not Used
X Pin is Used

Voltage per EIA Standard RS-232-B

3.29 The station EIA interface (DP65 circuit pack) is intended for use with a channel terminal operating in either the binary or ternary transmission mode. In the ternary mode, the CD lead transmits supervisory information from the data terminal equipment to the channel terminal, while the CC lead transmits supervisory information from the channel terminal to the data terminal equipment. When the channel operates in the binary mode, as it would for private line telegraph service, the CC lead is held on during normal operation. The CD lead should not be connected externally. If CD lead is connected externally, it will not have any effect on the operation of the channel.

3.30 The station EIA interface circuit pack contains a lamp driver, an RD (receive data) driver, a TD (transmit data) driver, a CC (receive supervision) driver with a fail-safe circuit, and a CF (carrier fail) driver. In addition, the circuit pack has a relay whose operation places the channel in the test mode. The station EIA interface is meant to interface data terminal equipment conforming to EIA Standard RS-232-B.

3.31 Options on the station EIA interface (DP65 circuit pack) provide for the following:

- Monitoring the line on the BB lead while in the test mode

TABLE F

PIN ASSIGNMENTS FOR J6 (LOOP CIRCUITS) 50-PIN CONNECTOR ON DATA AUXILIARY SET 811J-L1

DAS 811J-L1 J6 CONNECTOR	
PIN	CIRCUIT
1 26	BB1 BA1
2 27	BB2 BA2
3 28	BB3 BA3
↑ THROUGH ↓	↑ THROUGH ↓
16 41	BB16 BA16
(SEE NOTE)	

Note: Pins 17 through 25 and 42 through 50 are not used

- Holding BB lead marking while in the test mode
- Local copy, eg, half-duplex
- CB Lead (clear-to-send) to follow CA lead (request-to-send)
- CB Lead (clear-to-send) to follow CC lead (data set ready)
- CC Lead (data set ready) being off when CF lead (data carrier detector) is off
- Receive only, or ternary operation when CD lead is not terminated by the customer, or binary operation
- Forcing transmission data-on supervision in the test mode
- Independent ternary transmit and receive.

20-mA Neutral Current (3-Wire)

3.32 The 3-wire station current interface (DP56 circuit pack) is intended for use with a teletypewriter or an equivalent data terminal requiring 20-mA neutral signals. Separate 20-mA looops are provided for both the send and receive circuits. These loops are not suitable for connection to outside cable plants. The maximum send and receive loop resistances are each 500 ohms plus 1/2-henry inductance. This will permit a receiver to be placed in series with the send loop for monitoring purposes, provided the combined resistance of the loop and receiver does not exceed 500 ohms and 1/2-henry inductance for 20-mA operation. The 1A Data Station provides the power for the send and receive loops. No loop current adjustments are required. The station current interface CP is ***not*** suitable for use with a channel operating in the ternary mode.

3.33 The 3-wire 20-mA station current interface (DP56 circuit pack) contains a lamp driver, a send loop detector, a receive loop driver, and a CF (carrier fail) driver. In addition, the circuit has a relay whose operation places the channel in the test mode.

3.34 Options on the 3-wire 20-mA station current interface (DP56 circuit pack) provide for the following:

- Half duplex (local copy), or full duplex.
- Holding BB lead (received data) marking during the test mode
- Monitoring the line while in the test mode
- Receive only operation
- Send only operation.

62.5- (or 20-) mA Loop Current (2-Wire)

3.35 The 2-wire station current interface (DP68 circuit pack) is intended for use in telegraph and point-to-point HDX binary services with terminal equipment requiring a 2-wire, 62.5- or 20-mA neutral current. The 20-mA current operation is obtained by cutting a strap on the circuit board. The maximum allowable send and receive loop resistances are 300 ohms plus 1/2-henry inductance for 62.5-mA operation. For 20-mA operation, the maximum allowable send and receive loop resistances are 500 ohms plus 1/2-henry inductance. This will permit a receiver to be placed in series with the loop for monitoring purposes, provided the combined resistance and inductance does not exceed the values stated above. No loop current adjustments are required. The 2-wire station current interface CP is ***not*** suitable for use with a channel operating in the ternary mode, nor is it suitable for connections to exposed outside cable plant.

3.36 The 2-wire station current interface contains a lamp driver, a transmit driver, a receive driver, a loop detector, and a CF (carrier fail) driver. In addition, the circuit has a relay, which when operated, places the channel in the test mode.

3.37 Options provided on the 2-wire station current interface are the same as for the 3-wire station current interface in 3.34. In addition, the circuit pack may be optionally strapped for either 62.5- or 20-mA neutral current operation.

±3 mA Balanced Polar Loop Current (2-Wire)

3.38 The station balanced interface (DP63 circuit pack) is used to interface Data Sets 109-type or the 10-type data line concentrator with a 1A Data Station via the DAS 811J-L1. The DP63 circuit pack output is a 3-mA balanced polar signal over a 2-wire, 2000-ohm loop and operates in the FDX mode. Loops of less than 2000 ohms are built out to 2000 ohms using a line pad on the DP63 circuit pack. The DP63 circuit pack can operate in HDX mode with an exended range to 2500 ohms resistances and less than 1 μF capacitance.

3.39 The station balanced interface contains a tandem trunk timer, loop transmitter, bridge, line pads, monitor, data slicer, threshold shifter, squelch detector, receiver, squelch driver, lamp driver, RC timer, current detector, and test relay.

3.40 The following features are provided on the station balanced interface:

- Allows the 1A Date Staton to interface either its line or trunk side of a 10-type concentrator.
- Means for padding out the loop resistance to 2000 ohms.
- A mark output is applied to the noise facility when a zero loop current is received for more than 15 ms.
- A supervisory signal is looped back to the sending station in the test mode.
- Means for reducing distortion when an extremely short metallic loop is used.

3.41 Options on the station balanced interface (DP63 circuit pack) provide for the following:

- A mark, space, or no-crossover shift
- Reception of camp-on signal on the line side of a 10-type data line concentrator
- Zero voltage to be applied to the dc loop upon loss of the VF carrier

G. Transmission Through a Binary Channel (Fig. 24 and 26)

Station EIA Interface (DP65 Circuit Pack)—Transmit Direction

3.42 EIA signals received from the customer equipment on the transmitted data lead (BA) of the station EIA interface are applied to the input of the TD driver, which is designed to properly terminate an EIA circuit. Signals at the output of the TD driver are applied to the input of the modulator through a buffer circuit via the TD lead to the transmitter.

3.43 A mark signal on the BA lead will cause the modulator to key the oscillator at a mark frequency, while a space signal will cause the modulator to key the oscillator at a space frequency. The output of the oscillator passes through the buffer amplifier and into the transmitting bandpass filter. This filter reduces the magnitude of the frequency components generated by the modulation process which fall in the band of the adjacent channels so that interchannel interference is virtually eliminated. The output signal from the filter appears on the B LIN lead, and is summed with all other channel signals at the transmitting amplifier input on the line circuit. The resulting composite signal is then amplified by the transmitting amplifier for transmission of the voice facility.

3.44 If strapping terminals E3 and E4 of the transmitter are connected together, a negative signal voltage on the CF lead will result in no signal being transmitted (carrier squelch). This signal will occur whenever the receiving part of the channel terminal detects a no-carrier condition, or in the event of a system alarm.

Station EIA Interface (DP65 Circuit Pack)—Receive Direction

3.45 At the receiving end of the voice circuit, the composite signal is coupled into the line circuit receiving amplifier by means of an input transformer. After amplification, the composite signal is fed from the low impedance output of the receiving amplifier (A LIN lead) to the receiving portion of each of the channels. Each channel selects its own part of the signal spectrum with its receiving bandpass filter on the demodulator. After passing through the receiving bandpass filter, the signal is amplified and limited on the receive interface. The limited signal drives the discriminator on the demodulator. The output of the discriminator has a low-frequency component, which is the desired baseband signal, plus some higher frequency components. A low-pass filter, following the discriminator, eliminates the higher frequency components. The output of the low-pass filter is then sliced and amplified on the receive interface to produce a replica of the signal used to drive the channel modulator and appears on the A lead.

3.46 The signal on the A lead is applied to the station EIA interface. The signal passes through a gating circuit (RD driver) and is then looped back on B lead to the receive interface. Here it is amplified and appears as a bipolar signal (plus for space and minus for mark) on the RD lead from the receive interface. It then passes back through the station EIA interface and DAS 811G-L1 or DAS 811H-L1, and appears on the BB lead at the DAS terminal.

Station Balanced Interface (DP63 Circuit Pack—Transmit Direction

3.47 When operating in the FDX mode, both the near and far station balanced interface may be sending and receiving data simultaneously, resulting in currents in the loop as shown in Table G.

3.48 When data appears on the loop, the bridge and monitor sense the magnitude and direction of the current and provide a voltage to the data slicer which is proportional to the loop current.

3.49 The sensing level of the data slicer (level at which the mark-to-space and space-to-mark transitions are detected) is shifted from 0 to −6 mA by the threshold level shifter upon receipt of a space from the receive interface. The shift and manner of detection are shown in Fig. 27. Thus, the data slicer in conjunction with the threshold level shifter enables the station balanced interface to recover the incoming data when both transmitted and received data are present in the bridge.

3.50 The transmitting direction is defined as being from the loop to the voice facility.

TABLE G

LOOP CURRENTS IN THE LOOP RESULTING FROM BOTH NEAR AND FAR INTERFACES TRANSMITTING DATA TO ONE ANOTHER SIMULTANEOUSLY

DATA TRANSMITTED		CURRENT IN LOOP (MILLIAMPERES)
NEAR DP63	FAR INTERFACE*	
MARK (4V)	MARK (4V) SPACE (-12V)	+3 -3
SPACE (-12V)	MARK (4V) SPACE (-12V)	-3 -9

* The tip and ring connections are reversed so that when both DP63 circuit packs transmit marks, the voltages applied to the loop will be series-aiding.

3.51 When data appears on the loop and passes through the bridge and monitor and is detected in the data slicer (described in 3.48 and 3.49), the data is further processed and shaped in the receiver before being applied, through a transistor switch, to the TD lead.

3.52 The current detector is activated when the loop current falls below a predetermined value (near zero) to indicate to the RC timer that there is a loss of loop current condition. After a nominal 15-ms delay, the state of the E lead is changed to a positive potential in order to clamp the TD lead marking (data-off) via the transistor switch. The 15-ms delay period is longer than necessary for the mark-to-space and space-to-mark transition and thus does not allow the squelch detector to send a false loss-of-loop current signal while receiving normal data signals. Upon restoration of normal loop current, the RC timer will provide a nominal 15-ms delay before the E and TD leads are restored to normal operation.

3.53 Data signals at the output of the transistor switch are applied to one input of the modulator on the transmitter via the TD lead. Provided that the voltage on the E lead is kept negative with respect to signal ground, a received mark signal from the loop will cause the modulator to produce its mark frequency, while a received space signal from the loop will cause the modulator to produce its space frequency. The output of the oscillator is then treated in the same fashion as for binary operation as described in 3.43.

3.54 Upon receipt of a no-current condition on the loop, the E lead, after a 15-ms delay, changes to a positive potential causing the modulator to key the oscillator steady mark (data-off signal).

3.55 When data appears on the loop, the E lead changes to negative or near ground potential to allow the modulator to be keyed by the incoming signals (data-on signals). Data signals on the TD lead will now cause the modulator to switch between mark and space frequency at the data rate, and the operation of the binary channel is the same as described in 3.43 and 3.44.

Station Balanced Interface (DP63 Circuit Pack)—Receive Direction

3.56 Until the signal arrives on the A lead from the receive interface, operation of a binary channel with a station balanced interface is the same as in 3.45. The A lead from the receive interface is looped through the station balanced interface and back over B lead to the receive interface. The signal is amplified and converted to a bipolar signal (plus for space and minus for mark) and applied to RD lead.

3.57 Data on the RD lead is applied to the loop transmitter on the station balanced interface. In normal operation, the loop transmitter is enabled by signals from the carrier squelch driver and the OS1 lead. The carrier squelch driver indicates that there is no loss of voice frequency carrier. The OS1 lead indicats that no tests have been implemented on the channel.

3.58 With the loop transmitter enabled, +4 volts will be applied to the loop, via the bridge, when a mark is received on the RD lead and −12 volts will be applied to the loop, via the bridge, when a space is received on the RD lead.

3.59 When a data-off signal is received on the RS lead, the loop transmitter causes a no-voltage state to be applied to the loop. The no-voltage state on the loop is recognized at the far end of the loop as a data-off signal.

Station Current Interface (DP68 Circuit Pack)—Transmit Direction

3.60 A current of 62.5 mA (20 mA is optional) in the loop is recognized by the send/receive loop circuit as a mark and translated to a negative voltage by the TD circuit (transmit data). No current in the loop is recognized by the send/receive loop circuit as a space and translated to a positive voltage by the TD circuit. The signals at the output of the TD circuit are applied to the input of the modulator (on the transmitter ciruit pack) via the TD lead.

3.61 After the transmit signal arrives on the TD lead at the transmitter, the operation of the binary channel is the same as described in 3.43 and 3.44.

Station Current Interface (DP68 Circuit Pack)—Receive Direction

3.62 Until the signal arrives on the A lead from the receive interface, operation of a binary channel with a station current interface is the same as in 3.45. The A lead from the receive interface is looped through a diode on the station current interface and back over B lead to the receive interface where it is amplified and converted to a bipolar signal (plus for space and minus for mark). This signal is then applied through RD (receive data) on the station current interface to the send/receive loop circuit where the output is 62.5-mA (optional 20 mA) for mark and 0 mA for space. The receive loop (here, also the send loop) consists of the path from the BB lead at the DP68 circuit pack, through the data terminal, back to the BA lead at the circuit pack.

3.63 The loop detector monitors both the loop data signals and the data signals from the receive interface. When the loop detector recognizes data received from the receive interface, the transmitter is inhibited from operation via the SL lead, the directional control on the receive interface, the DC lead, and the E lead.

3.64 The loop detector on the station current interface and the directional control on the receive interface also provide for transmitting a break signal from the terminal while it is receiving data. This is possible with the HDX DP68 circuit pack because the transmission on the VF facility is FDX. The directional control interprets the break signal as a double space condition and causes the modulator of the transmitter to transmit a space while a data space is being received on the RD lead. The output of the send/receive loop circuit is 62.5 mA (20 mA by option) for mark and 0 mA for space.

Station Current Interface (DP56 Circuit Pack)—Transmit Direction

3.65 If the send BA lead is connected to the −P lead through the customer data terminal equipment (an impedance of 500 ohms and 1/2-henry inductance or less), a current of 20 mA will flow into the send loop detector on the station current interface. This current in the BA lead is translated by the send loop detector into a negative voltage as a mark, which appears on the TD lead to the transmitter. No current in the loop is recognized as a space.

3.66 After the transmit signal arrives on the TD lead at the transmitter, the operation of the binary channel is the same as described in 3.43 and 3.44.

Station Current Interface (DP56 Circuit Pack)—Receive Direction

3.67 Until the signal reaches the A lead from the receive interface, operation of a binary channel with a station current interface is the same as in 3.45. The A lead from the receive interface is looped through a diode on the station current interface and back over the B lead to the receive interface, where it is amplified and converted to a bipolar signal (plus for space and minus for mark). This signal is then coupled to the receive loop driver on the station current interface via the RD lead. The output of the receive loop driver is 20 mA for mark and 0 mA for space, provided the receive lead (BB) is connected to the −P lead through the data terminal. The receive loop circuit consists of the path from the BB lead at the DP56 circuit pack, through the data terminal, back to the −P lead of the circuit pack (an impedance of 500 ohms and 1/2 henry inductance or less).

H. Transmission Through a Ternary Channel (Fig. 25 and 26)

Station EIA Interface (DP65 Circuit Pack)—Transmit Direction

3.68 Bipolar data signals arriving from the customer on the transmitted data lead (BA) at the station EIA interface are applied to the TD driver which is designed to properly terminate an EIA circuit.

3.69 Signals at the output of the TD driver are applied via the TD lead to the input of the modulator through a buffer circuit on the transmitter.

3.70 Provided the modulator has not been inhibitied by a positive signal on the TS lead (see 3.71), a mark signal (−5 to −25 volts) on the BA lead will key the modulator to cause the oscillator to produce its mark frequency, while a space signal (+5 to +25 volts) will key the modulator to cause the oscillator to produce its space frequency. The output of the oscillator is then treated in the same fashion as for the binary operation described in 3.43 and 3.44.

3.71 As noted in 3.70, a negative voltage (enabling signal) must be on the TS lead, applied to the modulator in order for the oscillator to be keyed from mark to space or from space to mark. If an inhibiting signal (+5 to +25 volts) is applied to the TS lead, the output frequency of the modulator will shift downward 35 Hz for SW channels and 70 Hz for DW channels. In order to generate center frequency, it is necessary to maintain a mark signal on the TD lead and a positive signal voltage on the TS lead. The source of signals on the TS lead is the TS driver circuit on the station EIA interface. An inhibiting signal on the TS lead, which will hold the transmitter in the data-off state (center frequency), is caused by any one of the following: a carrier fail on the receive path, the data terminal is not ready to transmit data, or the CHANNEL MODE switch on the DAS has been operated to the OFF position.

Station EIA Interface (DP65 Circuit Pack)—Receive Direction

3.72 At the receiving end of the voice circuit, the composite signal is coupled into the line circuit receiving amplifier by means of an input transformer. After amplification, the composite signal is fed from the low impedance output of the receiving amplifier to the receiving portion of each of the channels. Each channel selects its own part of the signal spectrum with its receiving bandpass filter on the demodulator. After passing through the receiving bandpass filter, the signal is amplified and limited on the ternary receive interface. The limited signal drives the discriminator on the demodulator circuit packs. The output of the discriminator has a low frequency component, which is the desired baseband signal, plus some higher frequency components. A low-pass filter, following the discriminator, eliminates the higher frequency components. The output of the low-pass filter is then amplified and applied to the inputs of both the data slicer and a center frequency detector. The output of the center frequency detector indicates when the received signal is in the center frequency region, ie, ± 22 Hz of center frequency for DW channels and ± 11 Hz of center frequency for SW channels.

3.73 Assume the receiver is initially in a data-on state (data, or steady mark or space is being received) and the received signal goes to center frequency. The center frequency detector detects that a signal exists in the center region. After a 30-ms delay, the data-off state timer times out, indicating (via the RS lead and the CC driver on the station EIA interface) to the customer equipment that a data-off condition exists.

3.74 Assume the receiver is initially in a data-off state, ie, receiving center frequency, and the received signal changes from center frequency to mark frequency. The center frequency detector detects the signal is out of the center region. After a 15-ms delay the data-on timer times out, indicating to the customer equipment via the RS lead that a data-on condition exists. The data-on delay is provided to protect the RS lead from false data-on indications due to incoming noise while the center frequency is being received.

3.75 When the received line signal frequency changes from mark to space, such as upon receipt of data, the center frequency is momentarily detected during the transition from mark to space (a mark-to-center frequency transition normally indicates a data-off condition). When the mark-to-space transition occurs, the data-off timer starts its timing interval of 30 ms. The time required for the data signal to sweep through the center frequency detection region is much less than the data-off timer interval. Therefore, the data-off timer will not time out but will recycle as soon as the signal passes out of the center frequency detection area of the center frequency detector.

3.76 A similar transition from mark to center frequency may be caused by noise. However, if the noise is incapable of causing the baseband signal to remain in an area where it can be detected by the center frequency detector for a period equal to or greater than the data-off timing interval (30 ms), no data-off indication will be given.

3.77 When the received signal goes to center frequency, noise might cause the received signal to fluctuate about the data threshold during the 30-ms data-off timing, causing received errors. This is prevented by delaying the data threshold crossing by 3.8 ms for DW channels and 8.0 ms for SW channels. Thus, in normal data transmission, the received signals will have passed out of the center region before the corresponding data transition reaches the channel output. Data transitions are blocked from appearing at the channel output while the received signal is in the center region, with the exception that a single space or mark transition is allowed for each entry into the center region. When the data-off signal is detected, the data output is clamped to mark.

3.78 As the baseband changes from mark to center frequency, two functions are initiated.

One is the start of the data-off timer, and the other is the preparation to clamp the data output RD lead marking. The circuit is arranged so that the RD lead is clamped marking at the time the center frequency is detected if the RD lead was marking. If the RD lead is spacing at this time, the clamping action is delayed until the space-to-mark transition occurs on the RD lead or until the data-off timer times out. The clamping action is needed to protect the data output (RD lead) for the duration of the data-off timing interval, as noted in 3.76. After 30 ms the data-off timer times out, and the RS lead turns off (becomes negative) and indicates to the customer equipment that a data-off condition exists.

3.79 The operation of the data output clamping circuit described in 3.78 assumes that the data lead (RD) is marking when the data-off signal is detected. It is possible, however, that the data lead might be spacing when the data-off signal is detected. It is also possible that during the entire data-off interval the baseband output voltage never exceeds the data slicer threshold for the detection of a mark. This latter condition may exist from adjustment of the BIAS potentiometer or from the received center frequency being in error by a few Hertz in the spacing direction. Under these conditions the data lead remains spacing and is clamped to mark (in the data output circuit) at the moment the data-off timer (30 ms) times out. This clamp occurs at the same time that the RS lead becomes negative (data-off).

3.80 The clamp-to-mark circuit portion of the data output is arranged to be disabled by means of two paths. One of these is opened when the baseband signal enters the center frequency region. If the data lead (RD) is still spacing, the second path remains operative. The removal of the second holding path enables the clamp-to-mark circuit. This will occur only if the data lead RD is marking. Once enabled, the clamp-to-mark condition can only be removed by the receipt of a data-on signal (mark frequency) of sufficient duration to cause the receiver to detect the data-on condition.

3.81 As previously mentioned in 3.72, the output of the dc amplifier also feeds the data slicer. The slicing voltage is set by means of the BIAS potentiometer. This adjustment is necessary to accommodate the data distortion produced by the channel shaping of the send and receive filters, and is essentially the same as for a binary channel. The output of the slicer connects to the data delay circuit, which delays all data transitions an equal amount, as noted in 3.77. This delay is necessary because the data-off timer is started as a result of the baseband signal passing through the center frequency detection area. This results in the data output lead clamped mark, as discussed in 3.78. As the baseband signal crosses the data slicing level, a mark-to-space transition occurs at the output of the data slicer. If the data delay were not present, the mark-to-space transition could not occur, because when the center frequency area is entered, the clamp-to-mark circuit will be activated. By delaying the output response of the data slicer circuit so that each signal transition is presented to the clamping circuit ***after*** the baseband signal has left the center region, the clamp to mark has no effect and causes no distortion to the data transitions. To ensure satisfactory operation, the delay is greater than the maximum time required for the baseband signal to cross through the detectable center frequency region from the mark frequency to to the space frequency. An option is provided on the ternary receive interface to set the delay for either SW or DW channels.

3.82 The data signals on the RD lead pass through the station EIA interface and are sent to the customer via the BB lead.

Station Balanced Interface (DP63 Circuit Pack)—Transmit Direction

3.83 The transmission of a signal through a channel operating in the ternary mode using a station balanced interface is the same as for the binary mode described in 3.47 through 3.53 with the following addition.

3.84 Upon receipt of a no-current condition of the loop, the TS and E leads, after a 15-ms delay, change to a positive potential causing the modulator to key the oscillator for the center frequency (data-off signal).

3.85 When data appears on the loop, the TS and E leads change to negative or near ground potential, causing the modulator to cease keying center frequency (data-on signal). Data signals on the TS lead will now cause the modulator to switch between mark and space frequency at the data rate. After this point the operation of the ternary channel is the same as described in 3.43 and 3.44.

Station Balanced Interface (DP63 Circuit Pack)—Receive Direction

3.86 Until the signal arrives at the output of the ternary receive interface, operation of a ternary channel in the receive direction with a station balanced interface is the same as described in 3.72 through 3.81.

3.87 Data is applied on the RD lead at the station balanced interface to the loop transmitter. In normal operation the loop transmitter is enabled by signals from the RS lead, the carrier squelch driver, and the OS1 lead. The RS lead provides the data-on signal. The carrier squelch driver indicates that there is no loss of voice frequency carrier. The OS1 lead indicates that no tests have been implemented on the channel.

3.88 With the loop transmitter enabled, +4 volts will be applied to the loop via the bridge when a mark is received on the RD lead, and −12 volts will be applied to the loop via the bridge when a space is received on the RD lead.

3.89 When a data-off signal is received on the RS lead, the loop transmitter causes a no-voltage state to be applied to the loop. The no-voltage state on the loop is recognized at the far end of the loop as a data-off signal.

I. 1A Data Station, MCA, Application in a 10-Type Data Line Concentrator System

General

3.90 The following description assumes that the reader has a general knowledge of the 10-type data line concentrator. If not, this information may be found in Section 591-810-100.

3.91 A DAS 811J-L1 will always be used with a 10-type data line concentrator. A connecting block is installed at a convenient location between the DAS 811G-L1 and the concentrator in both the line and trunk sides. The cabling between the DAS 811J-L1 and the concentrator is connected via the connecting block. This feature is especially important on the trunk side of the concentrator. The connector pin numbers on the concentrator and those on the DAS 811J-L1 do not match for each respective loop circuit. The connecting block is the point at which the power connection is made.

Tandem Concentration Arrangement (Fig. 28)

3.92 In a tandem concentration arrangement with 10-type concentrators, an additional function must be provided to that described in 3.87 through 3.89. The tandem trunk timer on the station balanced interface in the 1A Data Station on the trunk side of the tandem concentrator must be strapped to provide a 265-ms interval of the data-off signal to the loop.

3.93 If the computer port provides a data-off signal, the 1A Data Station on the line side of the primary concentrator will send center frequency (data-off signal) towards the tandem concentrator. The 1A Data Station on the trunk side of the tandem concentrator, upon detecting the center frequency, causes its RS lead to indicate a data-off signal after a 30-ms timing delay. With proper strapping on the tandem trunk timer, the data-off signal is applied to the loop for 265 ms. After this time the tandem trunk timer will force the transmitter circuit to apply an output of +4 volts (steady mark), a data-on indication, regardless of the data-off signal on the RS lead. Thus, the trunk-side 1A Data Station is able to connect to a station requesting service at the line side of the tandem concentrator.

If strapping is not implemented to provide for the 265-ms interval of the data-off signal, the tandem concentrator will, after a 75 ms delay, break its connection between the line and trunk side of the tandem 1A Data Stations. In addition, 15 ms after a data-off signal has been received by the tandem trunk-side 1A Data Station, a data-off signal is sent back to the primary line-side 1A Data Station resulting in a no-voltage state at its output terminals toward the line side of the tandem concentrator. This will result in the inter-concentrator trunk being in a "no service request" condition, thus locking out the channel forever.

Camp-On Signal

3.94 The 1A Data Station causes a mark current to flow in the line-side loop when it initiates a service request. If an all-trunk-busy condition exists, the concentrator will open the loop (causing the current to drop to 0 mA) for 6 to 7 ms at approximately 3-second intervals, thereby generating the camp-on signal.

3.95 In order for the data terminal initiating the service request to receive the camp-on signal, the station balanced interface (DP63 circuit pack) in the the line-side 1A Data Station must be strapped for space crossover shift. This assures that the line-side 1A Data Station will ***immediately*** upon loss of loop current transmit a spacing signal toward the station. This spacing signal will be sent for the duration of the camp-on signal (6 to 7 ms). Since the camp-on signal duraton does not exceed the RC timer delay (15 ms), no carrier fail will be initiated. The camp-on signal will be recognized by the station initiating the original service request as an all-marking character. This will cause the receive mechanism of a teletypewriter to cycle and/or camp-on lamp (if provided) to flash. The camp-on signal sequence will be repeated until the line is either connected to a trunk or the service request is removed.

Crossover Shift

3.96 A 1A Data Station installed on the trunk side of a 10-type concentrator must be strapped for mark crossover shift in order that it not detect a no current condition in the trunk-side loop (idle trunk) as a trouble condition. An idle trunk presents +4 volts to the concentrator. After the concentrator connects a trunk to a line, current will flow as indicated in 3.94.

J. Back-to-Back Operation (Fig. 29)

3.97 Back-to-back operation of two channel terminals is possible if both are equipped with a station EIA interface. For this arrangement the BB lead of one channel terminal is strapped to the BA lead of the other, and vice-versa. If the ternary transmission mode is used, the CD lead of one channel terminal is strapped to the CC lead of the other, and vice versa. A common signal ground (AB) should also be provided. The CA, CB1 and CF leads should not be interconnected nor should CC and CD leads be connected for binary channels.

Channel Send Level

3.98 No individual channel and level adjustment is provided. The send transmission level for each SW and DW channel center frequency is factory set at −15 dBm and −12 dBm, respectively, as measured at the TRMT OUT test point on the transmitter (DP1-DP25 circuit packs). The mark and space frequency levels are down approximaely 1 dB from the center frequency level, ie, —16 dBm and −13 dBm, respectively, for SW and DW channels. This measurement must be made with a high impedance voltmeter.

3.99 The system send level is adjustable over a 34.5-dB range in 1.5-dB steps, by means of straps located in the transmit amplifier on the line circuit. For more detailed information see Section 591-813-200.

Gain Adjustments in the Receiver

3.100 The channels, whether they are SW or DW and whether they operate in the binary or ternary mode, are designed to operate with per-channel receive levels in the range from −11 to −50 dBm for a 600-ohm termination and from −9 to −48 dBm for a 900-ohm termination. The required amplification is provided by the receiving amplifier on the line circuit, common to all channels and the per-channel amplifer-limiters on the receive interfaces. The gain of the receiving amplifier on the line circuit is adjusted with the RCV GAIN potentiometer on the line circuit to provide a nominal level of −32 dBm at the LIM IN test point for one of the channels in the system (preferably one of the channels near the center of the voiceband). However, a level of −32 dBm of the LIM IN test point may not be possible with a reduced level at the line circuit of −40 dBm and −42 dBm for ternary and binary channels terminals, respectively.

Carrier Fail

3.101 Each channel continuously measures the power in its frequency band with a carrier detection circuit on the receive interface. When the received level drops 12 dB from the initial lineup level, a carrier fail indication is given via the G lead to the CF driver circuit on the station interface CP. The output of the CF driver is the CF lead which appears on the 25-pin connector.

3.102 When activated, the carrier fail circuit initiates several actions within the channel terminal.

(a) It lights the carrier fail (CF) lamp on the receive interface.

(b) It clamps the output of the demodulator marking or spacing, depending upon the position of the HOLD switch.

(c) It causes the signal on the CF lead to change from positive to negative voltage.

(d) With proper strapping on the station EIA interface, it sends a data-off indication to the customer equipment (in ternary mode, only).

(e) With the proper strapping on the transmitter, it provides means to squelch the output of the channel oscillator.

(f) It causes center frequency to be transmitted when the channel operates in the ternary mode.

(g) It sends a signal to the system alarm circuit via the CF1 and CF2 leads.

(h) It monitors for the presence of incoming carrier.

K. Alarm Features (Fig. 30)

3.103 The system alarm circuit (DP62 circuit pack) is required for channelizing service but is optional under private line telegraph. Without the DP62 circuit pack, the alarm indicator circuit pack (DP59) is strapped to provide CF alarm only.

3.104 In order to provide an indication of the data transmission capability of the voiceband facility, a system alarm is incorporated into the 1A Data Station. It functions by simultaneously monitoring two channels, either SW or DW or one of each, within the 1A Data Station.

3.105 The system alarm looks for both excessive changes in signal level and poor signal-to-noise ratios. A drop of 12 dB or an increase of 10 dB from the initial lineup level in either monitoring channel will be detected. In addition, a signal-to-noise ratio of approximately -2 dB or less for an SW channel, or approximately $+3$ dB or less for a DW channel, will be detected.

3.106 The two monitoring channels associated with the system alarm circuit pack are located in the 29A1 data mounting, as is the system alarm. The outputs of the system alarm circuit pack are as follows.

(a) A system alarm is provided on the SA and SAS leads when a fault due to high power, low power, or excessive noise is detected in both monitoring channels. The activation of the SA lead will cause the alarm indicator to indicate a major alarm by causing the normally operated K2 relay to release. This, in turn, lights the MAJ ALM lamp on DAS 811G-L1 (or 811J-L1) via the SAL lead, as well as the externally mounted ruby ALARM lamp via the AL lead. Note that the K2 relay generally follows the operation of the SA lead of DP62 circuit packs, except that K2 relay does release due to a power failure, and the release of the K2 relay is inhibited when the VB LOOP switch is activated.

(b) The channel disable (CD) lead is activated when the signals in both monitoring channels are excessively high in power or are noisy.

Note: The channel disable lead need not be activated due to low-signal power in the channels since the proper functions are provided internally for individual channels. An alarm condition on the CD lead will cause the following action to be taken in each channel in the system (including the two monitoring channels):

(1) The data output lead (BB) of the channel is clamped to a marking or a data condition, depending upon the position of the HOLD switch.

(2) The signal on the CF lead will change from a positive to a negative voltage.

(c) A channel alarm (on lead CA1) is provided when any type of fault is detected in any channel in the system, unless the fault is such as to cause a system alarm. The faults that can activate the channel alarm are high power, low power, or high noise in either monitoring channel, or a carrier fail in any of the remaining channels in the system. In addition, to reduce the possibility of accidental removal of any circuit pack associated with the system alarm function, all eight of the circuit packs are electrically interlocked via their CN1 and CN2 leads. The removal of any of these packs will activate the channel alarm. Removal of the system alarm circuit pack will also activate the channel alarm. The CA1 lead is connected to the alarm indicator (DP59 circuit pack) so that the activation of any channel alarm in the system will operate the normally released K1 relay, provided the ALARM switch is in the ON position. This, in turn, lights the externally mounted ruby ALARM lamp via the AL lead. In addition, if the system alarm circuit pack is not provided, an option is available which will cause the K1 relay to operate if a carrier fail occurs in any channel in the system, if the ALARM switch is in the ON position.

> ***Note:*** The removal of a receive interface CP from a channel other than a monitoring channel is interpreted as taking the receive portion of that channel out of service so that no alarms are given in this instance.

(d) A lamp on the system alarm (DP62 circuit pack) will light when any alarm output on the circuit pack is activated.

3.107 When the system alarm is not installed, E1 is strapped to E3 on the alarm indicator circuit pack. With this connection, a carrier fail in any channel in the associated system will operate the K1 relay, indicating a minor alarm.

ALARM Switch

3.108 The ALARM switch on the alarm indicator (DP59 circuit pack) provides for alarm signals from either the system alarm CP, if equipped, or from the carrier fail outputs from the channels to be applied to remote visual and/or audible alarm circuits. The alarm system is operational with the associated ALARM switch in the ON position. With the ALARM switch in the OFF position, only the CF alarms are operational. Regardless of the position of the ALARM switch, a power failure will bring in the major alarm by releasing the K2 relay on the alarm indicator CP.

Interpretation and Use of Alarm

3.109 A channel alarm, which indicates a fault in one or more channels in the system but not a fault in all channels, is intended as a minor alarm to the customer or to central office personnel.

3.110 A system alarm, which indicates all channels are probably inoperative, is intended as a major alarm to the customer or to central office personnel. The system alarm also presents a lead, SAS (located on a terminal strip on the 29A1 data mounting), which can be monitored remotely to determine when, and in which system, a system alarm has occurred.

3.111 By operating audible and visual alarms from the output of the alarm indicator, the trouble can be localized to a cabinet or frame. At the cabinet or frame, the alarm lamp on each system alarm circuit pack and the carrier fail lamps for each channel will localize faults to a system or channel. The lamps mentioned above are located on the faceplates of the circuit packs and also on the data auxiliary sets. An alarm condition within a cabinet is indicated by means of the 18B-49 indicator (see 3.115). Indicator lamps to isolate a fault to a system or a channel are located on DAS 811G-L1, 811H-L1 and 811J-L1. These are intended for use by non-Bell System personnel.

3.112 Each channel terminal presents a CF lead on the customer 25-pin connector. The CF lead when activated indicates an alarm condition in a specific channel terminal. It is activated if the power is low in the individual channel or if the system alarm detects a system fault.

3.113 In the event that either the +24 volt power or −24 volt power should fail, a major alarm indication is given via relay contacts, and the white light on the 18B-49 indicator is extinguished.

3.114 For both the major alarm and minor alarm, two sets of relay transfer contacts are made available from the alarm indicator circuit pack. These may be used to activate audible and/or visual alarms. One set of contacts for each type of alarm is made accessible to the customer on TS(A) of DAS 811G-L1 and on TS(A) and TS(B) of DAS 811J-L1. The other set of wire-wrap terminals TS(E) on the 29A1 data mounting can be used to give a remote indication of the alarm to a nearby central office over a separate path, if desired.

3.115 In addition to the alarm contacts described in 3.114, three lamps (ALARM, TEST, and PILOT) are provided (18B-49 indicator). These lamps are intended to monitor the state of all the equipment located within a cabinet, regardless of the number of systems involved. The lamps provide the following indications:

(a) The ALARM lamp (ruby) will light if any channel or system should fail.

(b) The TEST lamp (green) will light when any test key capable of interrupting system operation is operated to an off-normal position. This lamp is intended to be a reminder to restore all keys before attempting to put a system or channel into service.

(c) The PILOT lamp (white) monitors power within the cabinet, and is usually on. Should any power fail, the PILOT lamp will be extinguished.

4. MOUNTING ARRANGEMENTS

A. General

4.01 Mounting arrangements for the 1A Data Station are designed primarily to facilitate installation on customer premises. Therefore, all connections are made by means of plug and socket arrangements or screw terminals.

B. Channel Housings

4.02 Two different apparatus-coded data mounting units are provided to house the equipment. One unit, designated the 29A1 data mounting, is arranged to accommodate all the common equipment associated with a system (line circuit, system alarm, alarm indicator, and channel check test set), as well as two channel terminals and a KS-20575 rectifier. The other housing, designated the 29B1 data mounting, is arranged to accommodate either four channel terminals or three channel terminals and a KS-20575 rectifier.

C. Interconnections

4.03 Interconnection of the 29-type data mountings is accomplished by means of an apparatus-coded U-shaped epoxy-clad printed wiring strap card. The strap card is designated a 202-type adapter. It plugs into two 20-pin printed wire board 906E connectors simultaneously, one in each of two adjacent data mountings. The connectors are mounted on the front of the data mountings.

4.04 The ***202A adapter,*** color-coded ***gray,*** is used to interconnect 29A1 and 29B1 data mountings associated with a single system. In particular the 202A adapter will accomplish the following:

- Interconnect a 29A1 data mounting with a 29B1 data mounting when the latter contains only chanel terminals

- Interconnect two 29B1 data mountings, both of which contain only channel terminals.

4.05 The ***202B adapter,*** color-coded ***orange,*** is used to interconnect two 29B1 data mountings, the lower one of which contains a maximum of three channel terminals plus a KS-20575 rectifier, while the one above contains only channel terminals.

4.06 The ***202C adapter,*** color-coded ***yellow,*** is used to interconnect two data mountings where it is desired to share channel positions in one 29B1 data mounting between two systems. In particular the 202C adapter will accomplish the following:

- Interconnect the two leftmost channel positions of a 29B1 data mounting to another 29B1 data mounting or a 29A1 data mounting immediately above it.

- Interconnect the two rightmost channel positions of a 29B1 data mounting to a 29A1 data mounting immediately below it.

- Interconnect the three leads between separate systems (within a cabinet or a frame) necessary to activate the ALARM, TEST, and PILOT lamps of a single indicator shared between two or more systems. In this situation the interconnection is between a 29A1 data mounting below and a 29A1 or 29B1 data mounting above.

D. Data Auxiliary Sets

4.07 In order to provide for an interface between Bell System equipment and customer equipment, and control of test facilities, three data auxiliary sets (DASs) are available.

4.08 DAS 811G-L1 is associated with the 29A1 data mounting. DAS 811H-L1 is associated with the 29B1 data mounting. Both DASs are equipped with a cable terminated in a 50-pin connector. This plugs into a connector mounted on the front of their respective data mountings.

The DASs themselves are designed to mount at the rear of their respective data mountings, provided the depth of the overall mounting space is at least 17 inches and rear access is posssible. Alternatively, they may be located in the customer access section of the KS-20093-L1 cabinet.

4.09 DAS 811J-L1 is associated with either the 29A1 or 29B1 data mounting. Its intended use is with a 10-type concentrator. The DAS 811J-L1 consists of a panel which is capable of being mounted on either 23- or 25-inch centers. If cabinet depth is available, it may be mounted on the rear of a 29A1 or 29B1 data mounting. This may be accomplished by removing and discarding the rear cover of the DAS and using the data mounting cover screws to secure the DAS and data mounting cover to the data mounting. Up to 5 data mountings may be used with the DAS 811J-L1. A maximum of 16 channel terminals may be used with the DAS 811J-L1.

4.10 DAS 811H-L1 contains four 25-pin connectors, four CHANNEL MODE keys, and four CARRIER FAIL lamps. Each of the four channel positions (A through D) of the 29B1 data mounting is associated with one connector, key, and lamp group on its associated DAS 811H-L1. The lamp will permit the user to determine which channel of a system has lost carrier. The key will permit the user to assist central office personnel in testing a channel terminal.

4.11 DAS 811G-L1 contains two 25-pin connectors, two CHANNEL MODE keys, and two CARRIER FAIL lamps. These are associated with the two channel positions (B and C) contained in a 29A1 data mounting. DAS 811G-L1 also contains three keys associated with the channel check test set, as well as a meter which displays the peak distortion measurement of the test set. This meter is in addition to the one contained in the channel check circuit (DP58 circuit pack). Both meters are driven from the same source. The user of the equipment is given access to the test set in order that he may assist in localizing trouble when terminals of a 1A Data Station are located outside the central office environment. In addition, DAS 811G-L1 contains a MAJ ALARM lamp, the VB LOOP switch, and screw terminals for access to the major and minor alarm contacts.

4.12 DAS 811J-L1 contains seven 50-pin connectors, three keys associated with the channel check circuit (DP58 circuit pack), one rotary switch for selecting the channel check circuit pack of either of two systems, one rotary switch for selecting any one channel in either System I or II, one CHANNEL MODE key, a VBLA switch, two major alarm lamps (one for each system), two sets of screw terminals for access to major and minor alarm circuits, and a designation strip (described in 2.21). The function of the switches listed above is described in Part 5.

4.13 Six of the seven 50-pin connectors (4.12) are available for data mounting connections. Of these six, only five can be used at any time. A mechanical interlock prevents the sixth connector from being used. Therefore, a maximum of five data mountings can be used for any one configuration. The seventh connector is used for connections to the voice frequency cable pairs (loop).

4.14 DAS 811J-L1 is intended to be used instead of DAS 811G-L1 and 811H-L1 when all or most channel terminals are equipped with the station balanced interface (DP63 circuit pack) or the 2-wire station current interface (DP68 circuit pack). One A25D connector cable is required for each data mounting. Connection to voice frequency pairs or to the 10-type concentrator is also made by means of an A25D double-ended connector cable.

E. System Configurations Associated With the Data Auxiliary Sets

DAS 811G-L1 and 811H-L1

4.15 Figure 31 shows the possible channel arrangements for an installation having one system per cabinet when using the DAS 811G-L1 and 811H-L1. Figure 32 shows the possible channel arrangements for installations having more than one system per cabinet when using the DAS 811G-L1 and 811H-L1. Note that the 202C adapter ***only*** may be oriented in two ways, depending upon the application.

DAS 811J-L1

4.16 Figure 33 shows three possible channel arrangements when using DAS 811J-L1.

4.17 Figure 33A shows the DAS 811J-L1 in use with a single-system 1A Data Station with 16 channel terminals. The 29A1 data mounting, containing the common equipment, power supply, and two channel terminals, is coupled to the DAS 811J-L1 through the appropriate A25D connector cable. The additional 29B1 data mountings are also coupled to the DAS 811J-L1 with their associated A25D connector cables.

4.18 Figure 33B shows the DAS 811J-L1 in use with two separate and destinct systems. Both systems share various test functions of the single DAS 811J-L1. Individual system alarm outputs are provided for each system. Only one system can be tested at a given time, since the test circuitry is shared among all the channels of a system. A single channel check circuit is used and may be located at either system location.

4.19 In the above configurations (4.17 and 4.18), each channel terminal must contain a station balanced interface (DP63 circuit pack) or a 2-wire station current interface (DP68 circuit pack). The 2-wire data output of the station balanced interface and the station current interface is suitable for use with DAS 811J-L1. However, this does not exclude the use of station interface circuit packs with three or more additional terminal outputs (see 4.20).

4.20 Figure 33C shows a configuration in which a combination of station balanced interface (DP63 circuit pack), 2-wire station current interface (DP68 circuit pack), 3-wire station current interface (DP56 circuit pack), and station EIA interface (DP65 circuit pack) are utilized in a single system. The only mounting requirement is that an individual data mounting may not combine a station balanced interface or 2-wire station current interface with either a station EIA interface or a 3-wire station current interface. Those data mountings containing the station balanced interfaces and 2-wire station current interfaces are interconnected to the DAS 811J-L1 using the appropriate A25D connector cable; those data mountings containing the 3-wire station current interfaces and station EIA interfaces are interconnected to their respective DAS 811H-L1. In Fig. 33C, channel terminals 11 through 16 (housed in the two lower data mountings) are tested through a combination of DAS 811H-L1 and DAS 811J-L1, while the remaining channel terminals are tested with DAS 811J-L1.

4.21 DAS 811J-L1 is intended for use by Telco employees. Because of this, no individual carrier fail lamps or channel check meter is provided in DAS 811J-L1. Instead, the carrier fail lamps and channel check meter mounted at the respective circuit pack faceplates are utilized.

5. INSTALLATION AND MAINTENANCE (Fig. 34, 35, and 36)

A. General

5.01 The 1A Data Station has features incorporated in it which allow it to be aligned and tested with a minimum of external testing equipment. An ac voltmeter and a dc voltmeter are the only pieces of testing equipment required for any alignment procedures. Two employees are required for alignment and test procedures; one at each end.

5.02 Built-in testing features will allow customers on 2-point channelizing service to test data signals from end-to-end or looped back, in order to help isolate trouble. These testing features allow a Telco maintenance employee to further isolate trouble. Certain basic trouble isolation procedures can be accomplished with a Telco employee at only one end. In this case it will be necessary for the customer to operate switches at the other end which loop back the received signals.

5.03 When the DAS 811J-L1 is required, the channel location designation strip may be used to assist during maintenance by reference to the information written on it at the time of installation. This information could be used to identify a connection to a physical location in a particular 29-type data mounting in the cabinet, to identify a channel and customer by name or circuit number, or to correlate loop circuits and connector pin numbers, etc.

B. Test Switch Function

5.04 Table H lists the control switches and lamps on the panel of each DAS 811-type used with the 1A Data Station. Figure 36 shows the function of the test switches on DAS 811G-L1 and DAS 811J-L1. The arrangement of the switches in the diagram indicates the sequential electrical path of the test circuits and not necesarily the order of operation. For example, the CHAN MODE switch should be operated ***last*** after the test procedure has been programmed by the other switches, so as not to cause hits to be applied to the channel.

TABLE H

PANEL MARKINGS ON DATA AUXILIARY SETS

811J-L1	811G-L1	811H-L1
CHAN CHK SYS { I, II }	—	—
RLS—TEST (See note)	—	—
CHANNEL SELECT (See note) { 1 ⋮ 16 }	—	—
TEST MODE { CHAN CHK, DA LP }	TEST MODE { CHAN CHK, DA LP }	—
BAUD { 75, 150 }	BAUD { 75, 150 }	—
VBLA { SYS I, NORM, SYS II }	VOICE BAND LOOP AROUND { TEST, NORM }	—
FUNCTION { REM, LOC, SIG }	FUNCTION { REM, LOC, SIG }	—
CHAN MODE { TEST, NORM, OFF }	CHANNEL MODE { TEST, NORM, OFF }	CHANNEL MODE { TEST, NORM, OFF }
—	CARRIER FAIL (lamp)	CARRIER FAIL (lamp)
MAJOR ALARM (lamps) { SYS I, SYS II }	—	—

Note: CHANNEL SELECT switch may be switched *only* when mechanically released by operating RLS—TEST switch to RLS position. Tests may be performed *only* when RLS—TEST switch is in TEST position.

5.05 ***CHAN CHK—SYS I or II:*** The CHAN CHK switch provides access to the channel check (DP58 circuit pack) in either System I or II. Since DAS 811G-L1 is associated with a single system and therefore with only one channel check circuit pack, there is no need for a selector switch.

5.06 ***CHANNEL SELECT AND RLS—TEST:*** The CHANNEL SELECT switch selects the individual channel within a system selected for testing. However, the CHANNEL SELECT switch may be moved ***only*** when mechanically released by operating the RLS—TEST switch to the RLS (release) position. This prevents interrupting other channels of a system when selecting the test channel position. Tests may be performed ***only*** when the RLS—TEST switch is in the TEST position. The CHANNEL SELECT and RLS—TEST switches are not installed on DAS 811G-L1 and DAS 811H-L1 because each channel has an individual channel mode switch.

5.07 ***TEST MODE:*** The TEST MODE switch provides for the selection of either looping back the signal at the baseband level (DA LP position) or for using the channel check (DP58 circuit pack) (CHAN CHK position) for sending and/or receiving test signals at the baseband level. The TEST MODE switch appears on the DAS 811J-L1 and DAS 811G-L1. It does not appear on the 811H-L1 because only one TEST MODE switch is needed per system and there will always be a DAS 811G-L1 employed before a DAS 811H-L1 is needed.

5.08 ***BAUD:*** The BAUD switch is used to condition the channel check (DP58 circuit pack) for either 75- or 150-baud operation. It does not appear on DAS 811H-L1 for the same reason given for the TEST MODE switch in 5.07.

5.09 ***FUNCTION:*** The FUNCTION switch selects the type of signal to be transmitted and conditions the near end for sending or looping back the test signal. The LOC position conditions the channel check (DP58 circuit pack) to send either a steady mark or a steady space signal, depending upon the selection made at the LOC CONT switch (M or S) on the channel check circuit pack. The REM position loops back a 22-percent marking bias or spacing bias depending upon whether a steady mark or steady space is received from the other end. The SIG position conditions the channel check to send an undistorted dotting signal (square wave) to the far end. This signal may be read at the far end or looped back at the far end and read at the near end.

5.10 ***CHAN MODE:*** The CHAN MODE on the DAS 811J-L1 (CHANNEL MODE for DAS 811G-L1) selects the mode of channel operation. The NORM* position conditions the channel for normal operation. The TEST position removes the channel from the customer and prepares it for testing. The OFF* position removes the channel from the customer and conditions the transmitter (DP1-DP25 circuit packs) to send a data-off (center frequency) signal to indicate to the far end that the channel is out of service.

*Early models have designations NOR for NORM and OS for OFF.

READ: ***Operation of the CHAN MODE switch from NORM position removes the channel from service (the customer will be cut out of the circuit).***

5.11 ***VBLA:*** The VBLA switch on the DAS 811J-L1 (VOICE BAND LOOP AROUND for DAS 811G-L1) loops the signal on the voice frequency circuit back to the far end. Positions are available to select either SYS I or SYS II to be looped back. The NORM position conditions the circuit for normal operation.

READ: ***Operation of the VBLA on the DAS 811J-L1 (VOICE BAND LOOP AROUND for DAS 811G-L1) from NORM position removes all channels in a system from service.***

C. Voiceband Loop-Around

5.12 If the 1A Data Station is arranged for 4-wire operation, the send pair is connected to the receive pair when the VOICE BAND LOOP AROUND switch is operated. This will permit a check of the integrity of the 4-wire facility from the central office. If the 1A Data Station is arranged for 2-wire operation, the transmission pair is terminated in an open circuit. Under these circumstances, tip and ring appear on screw terminals on TS(A) of the 29A1 data mounting. If desired, a known impedance (a resistor or capacitor) may be used to terminate the pair to permit testing from the central office. Note that this impedance is not supplied with the equipment and must be locally engineered. In both the 2-wire and 4-wire situations, operation of the VOICE BAND LOOP AROUND switch removes the line circuit (DP52 circuit pack) from the voiceband facility. This is accomplished through the operation of the K3 relay on the alarm indicator (DP59 circuit pack) via the the VB lead.

D. Baseband Loop-Around

5.13 In the following discussion of self-testing features, either the binary or ternary mode may be used. However, when operating in the ternary mode, the station EIA interface at the previously designated primary end (the end from which trouble isolation is to be performed) must be strapped to force a data-on supervision signal to be sent from the primary end. At the far end, the received supervisory signal is looped back via the K1 relay contacts on the station EIA interface. The far-end station EIA interface loops the supervisory signal back via the K1 relay, provided a strap option has been implemented.

5.14 Operation of CHANNEL MODE switch located on both DAS 811G-L1 and DAS 811H-L1 (CHAN MODE for DAS 811J-L1) from the NORM position to the TEST position causes the K1 relay on the station interface to operate via the TM lead which causes the following to occur:

(a) In a ternary channel, data-on supervision is forced from the primary end, while the supervision is looped back at the far end. Data-off supervision may be sent from the primary end by grounding the TS test point on the station interface CP.

(b) In either the binary or ternary mode, the transmit and receive data (baseband) leads of the channel are disconnected from customer control and switched to the associated DAS. On the DAS the baseband leads may be looped around by operating the TEST MODE switch to DA LP, or they may be connected to channel check CP by operating the TEST MODE switch to CHAN CHK. In this position several signals may be sent and received under control of the FUNCTION switch as described in 5.09. The third position of the CHANNEL MODE key is designated OFF. Its primary function is to cause a data-on signal to be transmitted to the far end of a channel operating in the ternary transmission mode. It is functionally nonoperative for the binary transmission mode.

E. Channel Check Circuit (DP58 Circuit Pack) (Fig. 34, 35, and 36)

5.15 The channel check circuit is required for channelizing service, but is optional under private line telegraph. The channel check circuit consists basically of a signal generator and a signal detector. The signal generator, by the use of bipolar signals, is capable of keying the channel modulator in a number of ways, which may be selected by the FUNCTION switch located on DAS 811G-L1 and 811J-L1. The signal detector is capable of driving a meter to indicate the transmission quality of the data channel. The signal detector can be interconnected with the channel check signal generator by means of the FUNCTION switch to give the distant terminal control of the transmitter, as described in 5.24.

5.16 The channel check signal generator consists of an output amplifier, a square wave generator, a distorting circuit, a LOC CONT (local control) switch, and a relay for switching from 75-baud to 150-baud operation. The distorted signals are meant for initial lineup procedures by Telco personnel only.

5.17 The channel check signal detector circuit consists of an input amplifier, a long pulse detector, and an output meter. When a test signal is received, the measurement is displayed on two meters—one on DAS 811G-L1 and the other on the channel check circuit. When a DAS 811J-L1 (not equipped with an output meter) is installed, the measurement is displayed on the channel check circuit pack only. Accuracy of the measurement is within ± 3 percent. The BIAS ADJ potentiometer on the RCV INTF of the channel under test (at the near end) is properly adjusted when the same deflection on the meter is observed for marking bias as for spacing bias.

5.18 The channel check circuit is not suitable for measuring distortion on data signals generated by the data terminal equipment, since it incorporates a long pulse measurement technique. The circuitry for the channel check test set consists of one plug-in circuit pack. Each system in a 1A Data Station is arranged to accept a channel check circuit; however, its requirement is optional. One channel check circuit may be shared among several systems by plugging it into the system to be tested.

5.19 The type of signal connected to the output amplifier is selected by means of the FUNCTION switch located on the DAS. The data signal rate for the SW (75-baud) or DW (150-baud) channel is selected by the BAUD switch, which is also located on DAS 811G-L1 and DAS 811J-L1. The operation of the BAUD switch conditions the data receiving circuit, as well as the transmitting circuit for the corresponding baud rate.

5.20 When the FUNCTION switch on the DAS is operated to the SIG position, an undistorted dotting signal is transmitted at the baud rate corresponding to the position of the BAUD switch. If the channel is in good alignment, the received signal should also be a dotting signal with approximately equal marking and spacing intervals. Under this condition, the long pulse detector output should be small, and the meter readings should be small. If, however, the signal being received is distorted, one of the received pulses—either mark or space—will be lengthened with respect to the other and the meter will deflect upscale.

5.21 For 1A-to-1A operation, adjustment of the bias in the channels is made as follows. At the far end, operate CHANNEL MODE to TEST of channel to be aligned, TEST MODE to CHAN

CHK, FUNCTION switch to REM, and BAUD switch to corresponding channel type. At the primary end, operate CHANNEL MODE to TEST, TEST MODE to CHAN CHK, FUNCTION to LOC, and BAUD switch to the corresponding channel type. For each position (M for mark and S for space) of the LOC CONT switch on the channel check circuit pack at the near end, the reading on the CHANNEL CHECK meter is noted.

5.22 For 1A-to-43B1 operation, the test mode at the 1A Data Station operates as described in 5.20. The BIAS ADJ potentiometer may be used along with the channel check test circuit at the 1A Data Station to assist in aligning the channel. Due to the manner in which the channel check circuit functions, all signals from the hub must be dotting signals, 75 or 150 baud. If the 1A Data Station is placed in the baseband loop-around condition, then the signal from the hub is not limited to a dotting signal. For further details see Section 591-813-500.

5.23 When the LOC CONT switch mounted on the faceplate of the channel check circuit pack at the primary end is operated to the M position, the LOC position of the FUNCTION switch causes the primary end 1A Data Station signal generator to send a ***steady*** marking frequency signal. The operation of the LOC CONT switch to the S position causes the primary end 1A Data Station signal generator to send a ***steady*** spacing frequency signal.

5.24 The signal distorter operates only when the far-end FUNCTION switch is in the REM position. In this position the signal distorter is arranged such that the signal generated by the channel check circuit is distorted with either 22 percent marking or 22 percent spacing bias, depending upon the ***incoming signal*** from the primary end (Fig. 37A). If the incoming signal is a steady mark, then a dotting signal containing 22 percent marking bias is transmitted; if the received signal is steady space, then a dotting signal containing 22 percent spacing bias is transmitted. Distorted signals cannot be transmitted if a baseband loop-around or a voiceband loop-around condition exists at either end of the system.

5.25 Figure 37 (A, B, and C) shows the various test modes that may be used during maintenance procedures. Figure 37A is to be used only by a Telco maintenance employee during part of the alignment. Figure 37B shows the configuration for a one-way check of a channel and is to be used only by a Telco maintenance employee during part of the alignment. Figure 37C may be used by Telco or customer maintenance personnel.

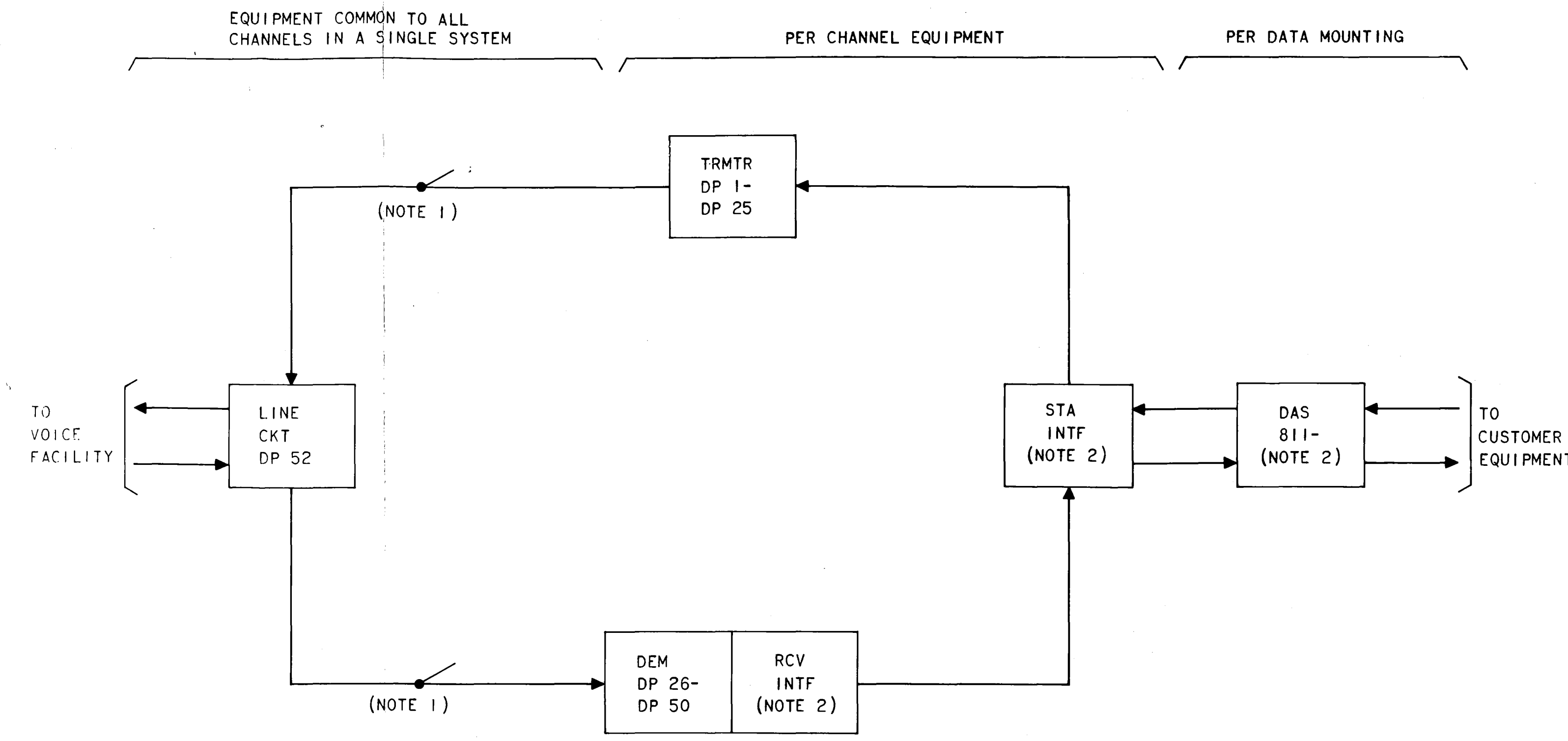
5.26 The measurement available by this built-in test set on the channel check circuit pack, while accurate (within ± 3 percent of the meter reading), should not be construed as a true measure of the channel performance. The use of a dotting signal permits only a measure of the bias in a channel. Typically, the characteristic distortion may raise this reading as much as 5 to 10 percent. Hence the use of this test set should be primarily to see if undistorted data can be transmitted and received without the meter entering the red area. The distorted signals are meant for initial lineup procedures only.

6. REFERENCES

6.01 For additional information relating to this section, refer to the following list:

SECTION	TITLE
SD-1D148-01	1A Data Station—Multichannel Arrangements
CD-1D148-01	1A Data Station—Multichannel Arrangements
591-810-100	10-Type Data Line Concentrator System (DLCS) —Description
591-813-200	1A Data Station—Multichannel Arrangements—Installation
591-813-300	1A Data Station—Multichannel Arrangements—Maintenance
591-813-500	1A Data Station—Multichannel Arrangements—Tests
SD-81978	KS-20575 Rectifer
CD-81978	KS-20575 Rectifer
SD-70958-01	43B1 Voice Frequency Carrier Data System
CD-70958-01	43B1 Voice Frequency Carrier Data System

SECTION	TITLE
591-813-180	Data System, 1A Data Station—Multichannel Arrangements—Summarizing Specification
312-710-100	43B1 Voice Frequency Carrier Data System—General Description
312-710-200	43B1 Voice Frequency Carrier Data System—Installation and Out-of-Service Tests
312-710-201	43B1 Voice Frequency Carrier Data System—2- and 4-Wire Connections—Description and Installation
312-710-500	43B1 Voice Frequency Carrier Data System—Trouble Locating Tests
332-852-107	4066G Network—Description
AB83.048.01	43B1 Voice Frequency Carrier Data System—General Engineering Considerations
598-073-100	Data Auxiliary Set 811G—Identification
598-074-100	Data Auxiliary Set 811H—Identification
590-102-125	29-Type Data Mounting—Identification



NOTES:
1. TO OTHER CHANNELS.
2. TABULATION OF VARIOUS CONFIGURATIONS:

RCV	STA INTF	DAS 811- G OR H	DAS 811- J
DP 51	DP 56	✓	—
	DP 63	✓	✓
	DP 65 (NOTE 4)	✓	—
	DP 68	✓	✓
DP 57	DP 63	✓	✓
	DP 65	✓	—

3. EARLY UNITS MAY HAVE DP 55(MD) INSTALLED - DP 65 IS STD.
4. ALARM INDICATOR, SYSTEM ALARM AND CHANNEL CHECK CIRCUIT PACKS AND POWER SUPPLY NOT SHOWN. THEY ARE PART OF SUPPORT EQUIPMENT AND ARE NOT IN DATA PATH.

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Fig. 1—One Channel of a 1A Data Station, MCA—Block Diagram

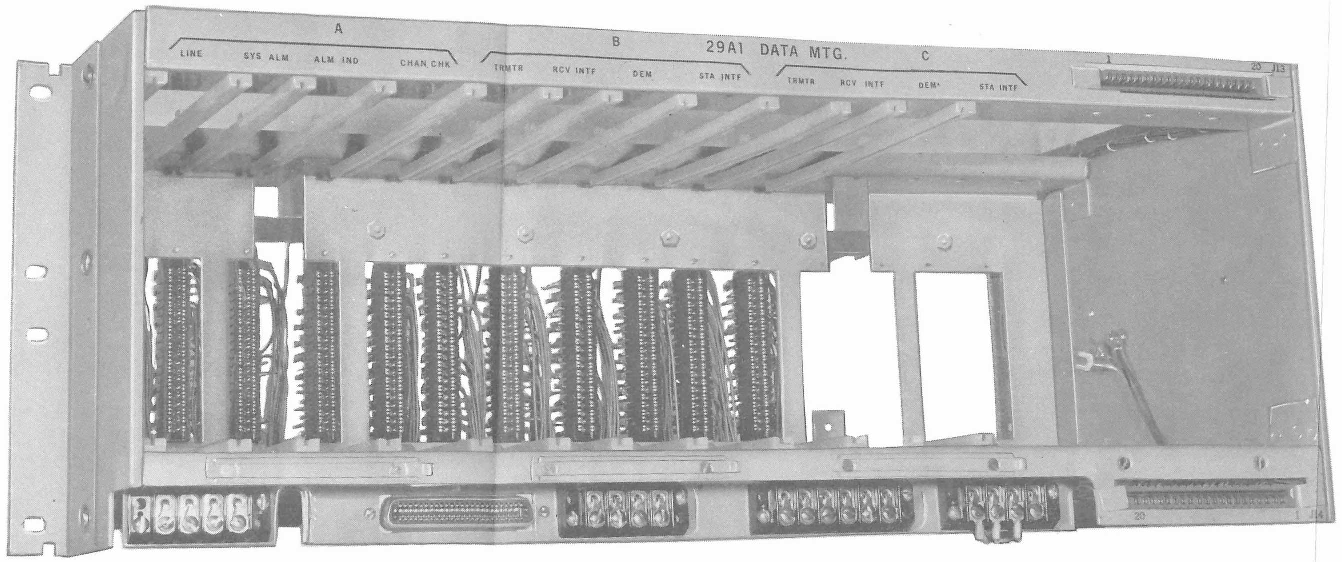


Fig. 2—29A1 Data Mounting

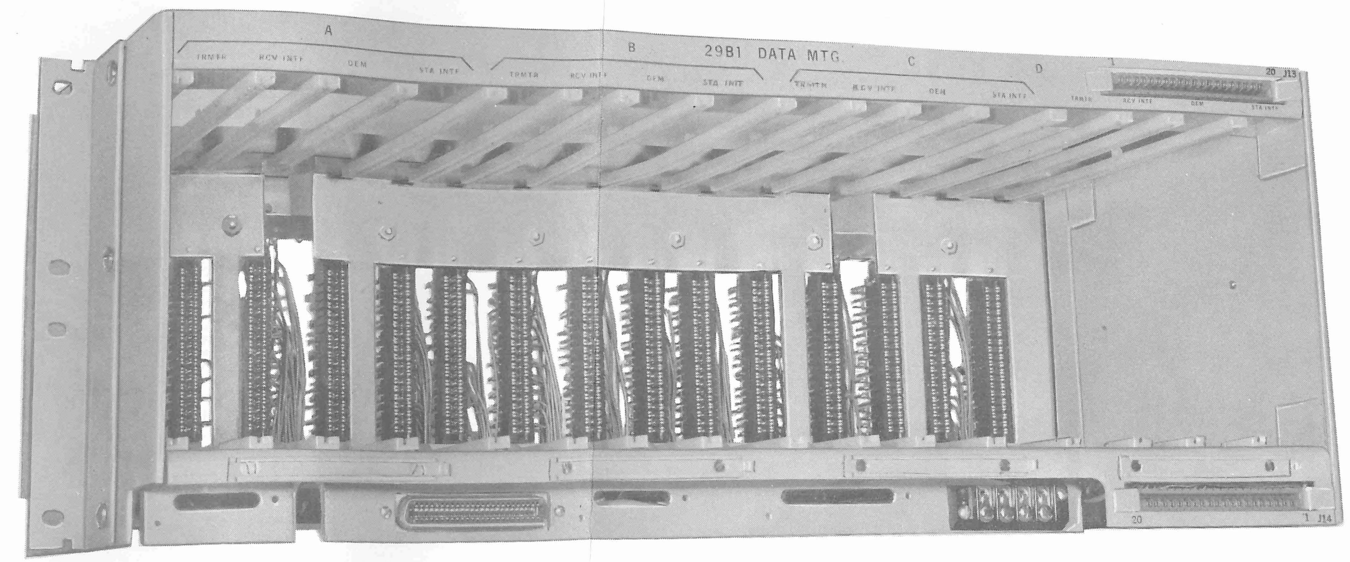


Fig. 3—29B1 Data Mounting

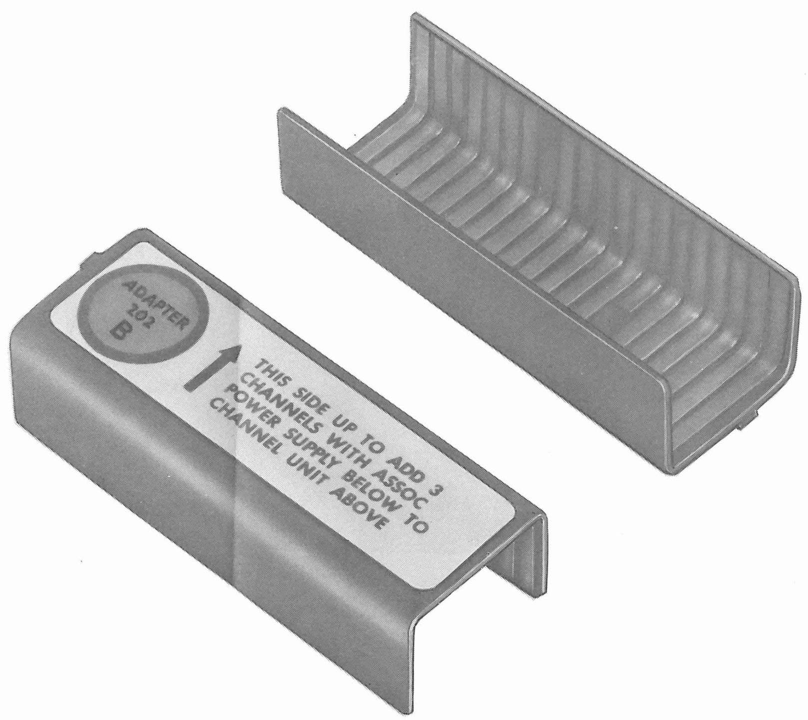


Fig. 4—202-Type Adapter—1A Data Station, MCA

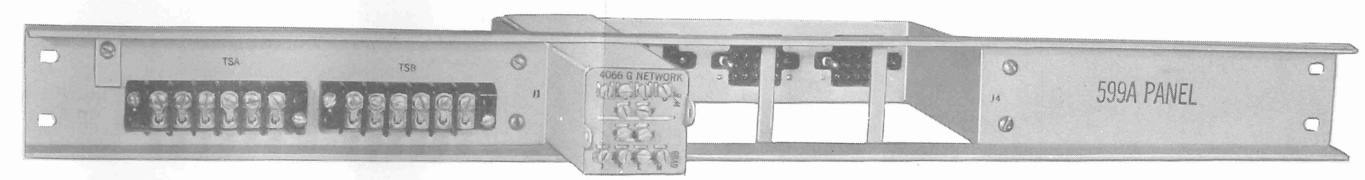


Fig. 5—599A Panel

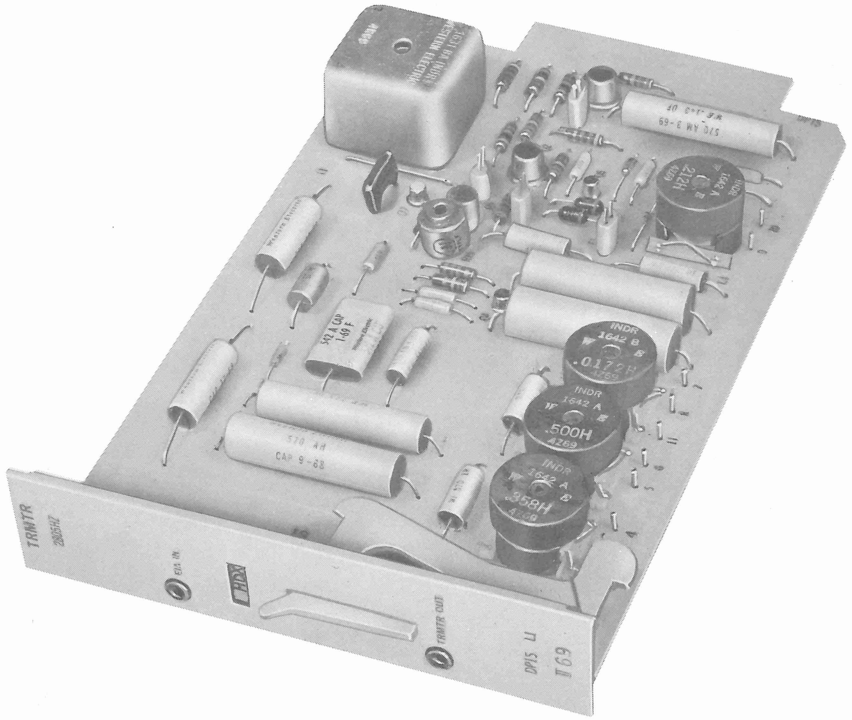


Fig. 6—Transmitter (DP1-DP25 Circuit Packs)

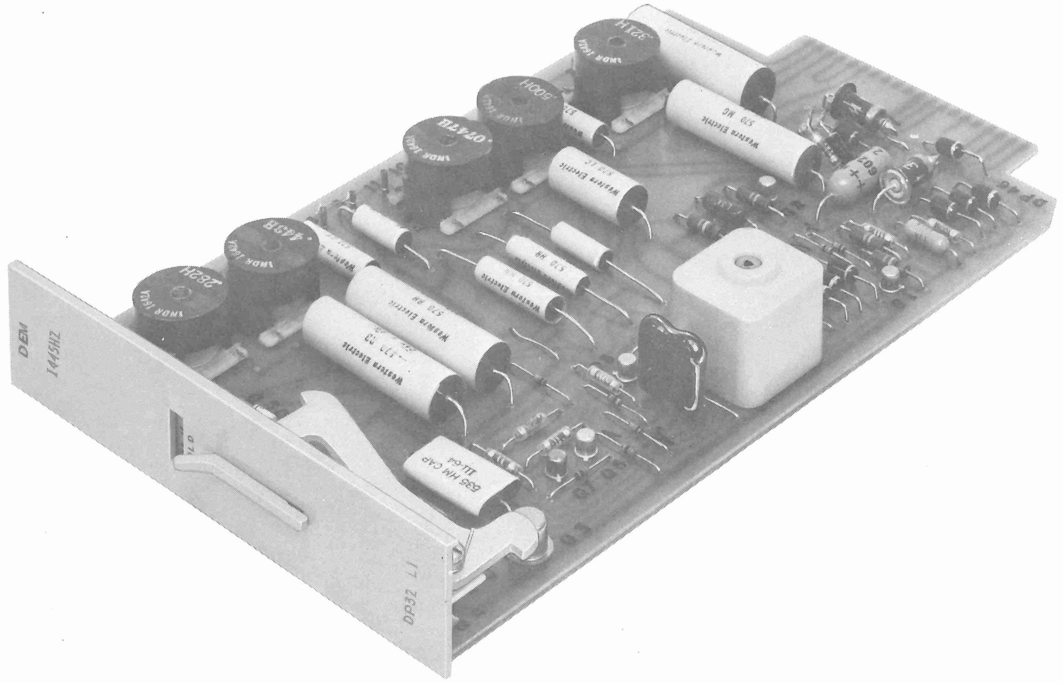


Fig. 7—Demodulator (DP26-DP50 Circuit Packs)

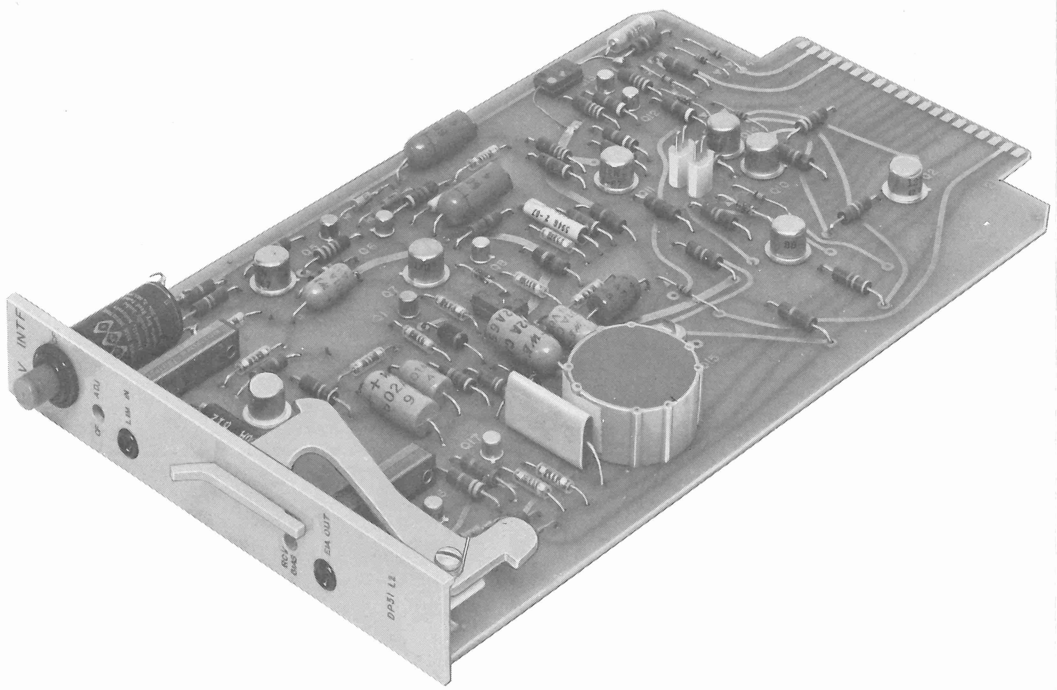


Fig. 8—Binary Receive Interface (DP51 Circuit Pack)

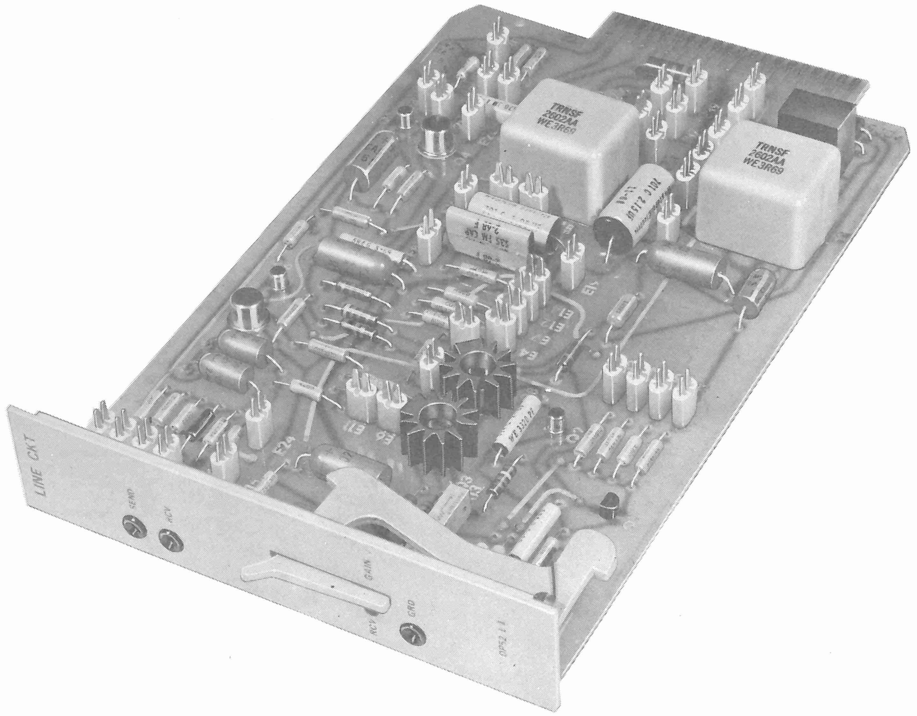


Fig. 9—Line Circuit (DP52 Circuit Pack)

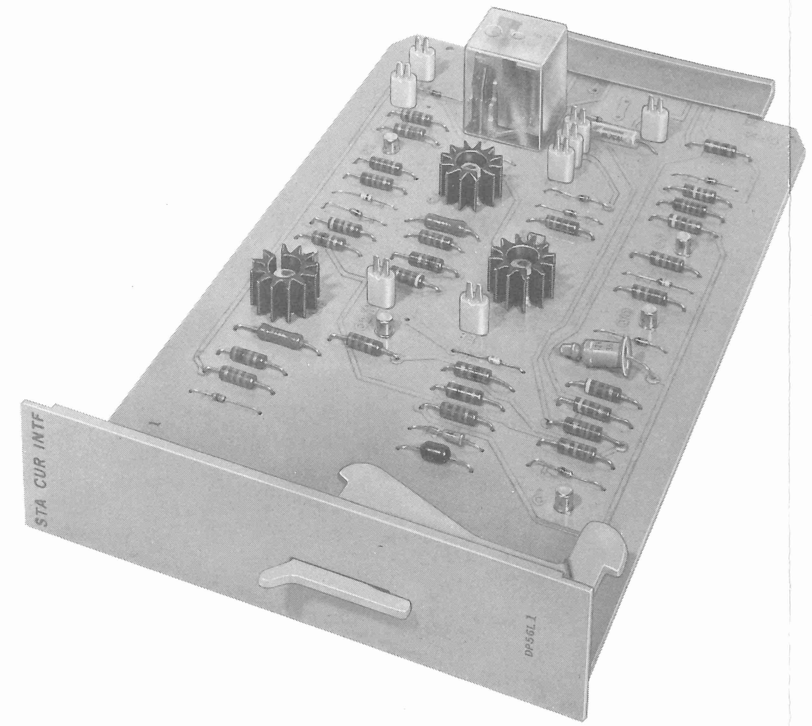


Fig. 10—Station Current Interface (DP56 Circuit Pack)

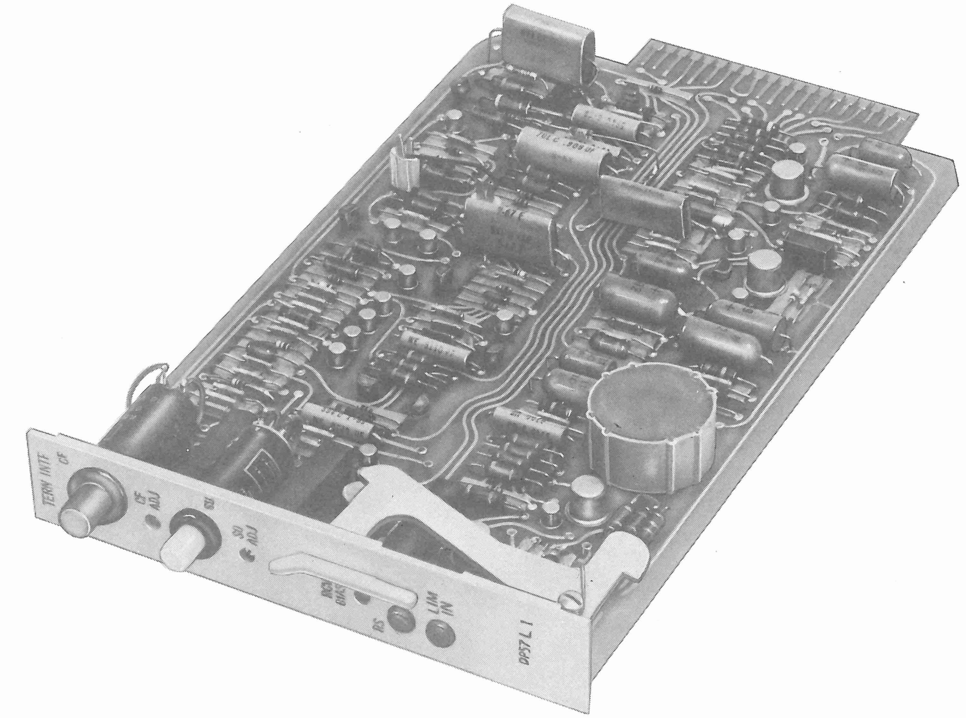


Fig. 11—Ternary Receive Interface (DP57 Circuit Pack)

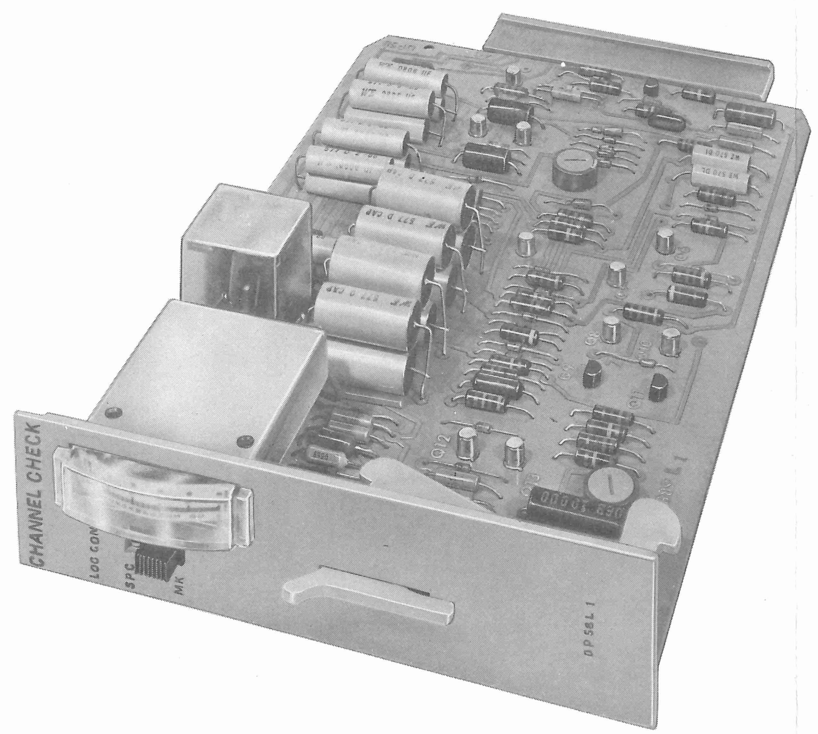


Fig. 12—Channel Check (DP58 Circuit Pack)

Fig. 13—Alarm Indicator (DP59 Circuit Pack)

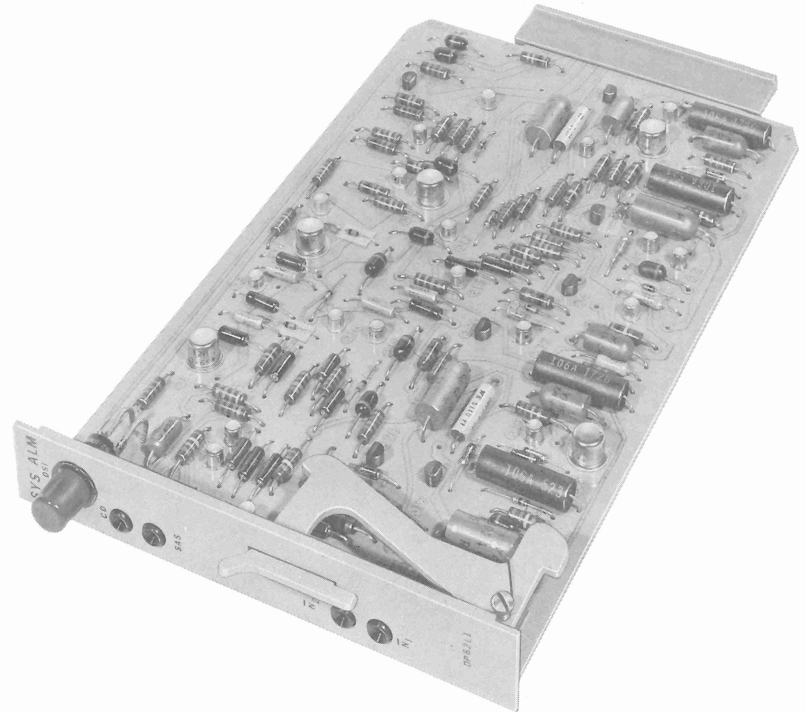


Fig. 14—System Alarm (DP62 Circuit Pack)

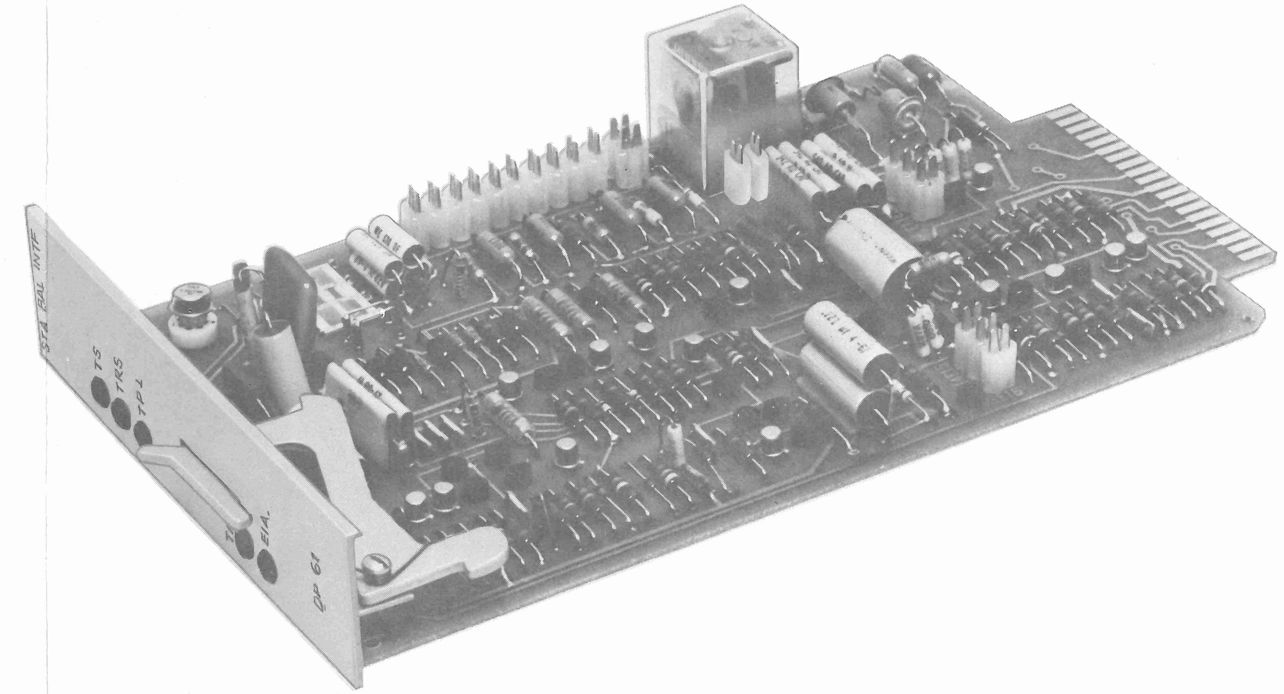


Fig. 15—Station Balanced Interface (DP63 Circuit Pack)

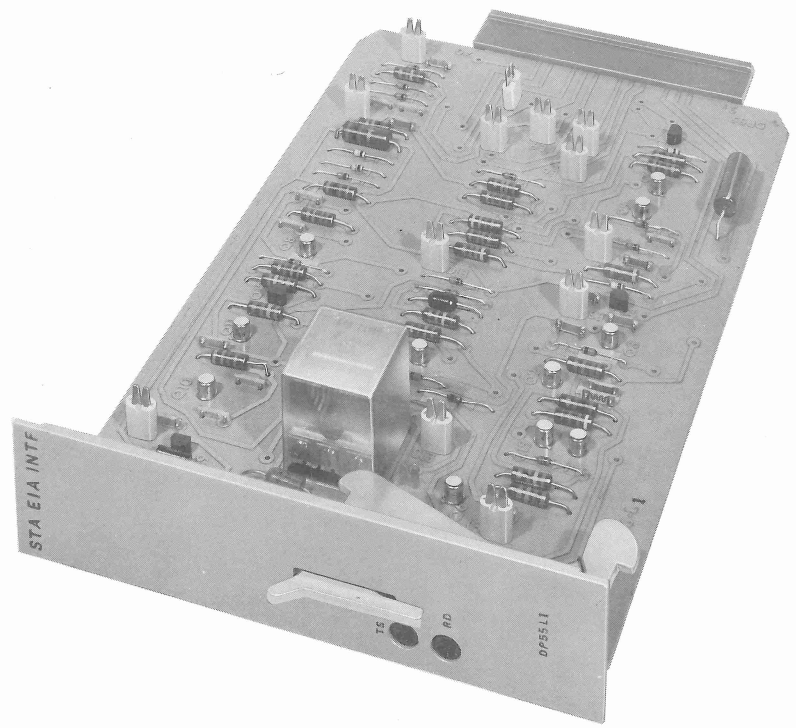


Fig. 16—Station EIA Interface (DP65 Circuit Pack)

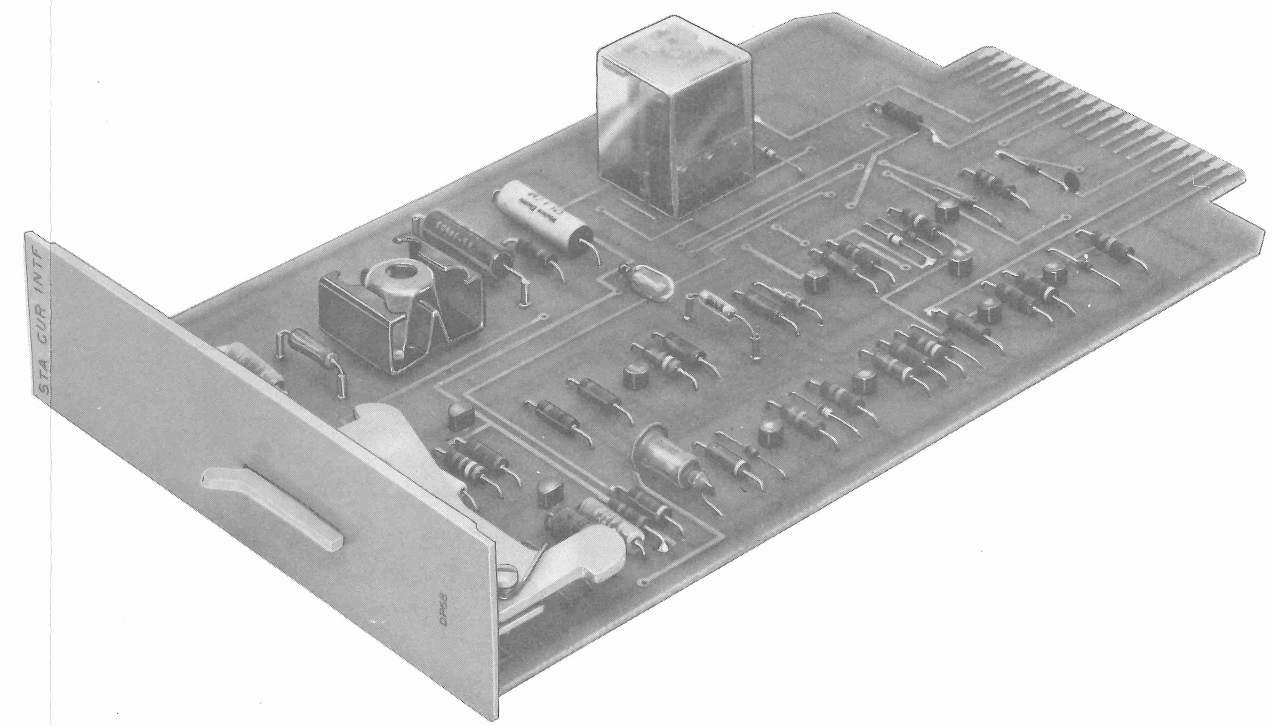


Fig. 17—Station Current Interface (DP68 Circuit Pack)

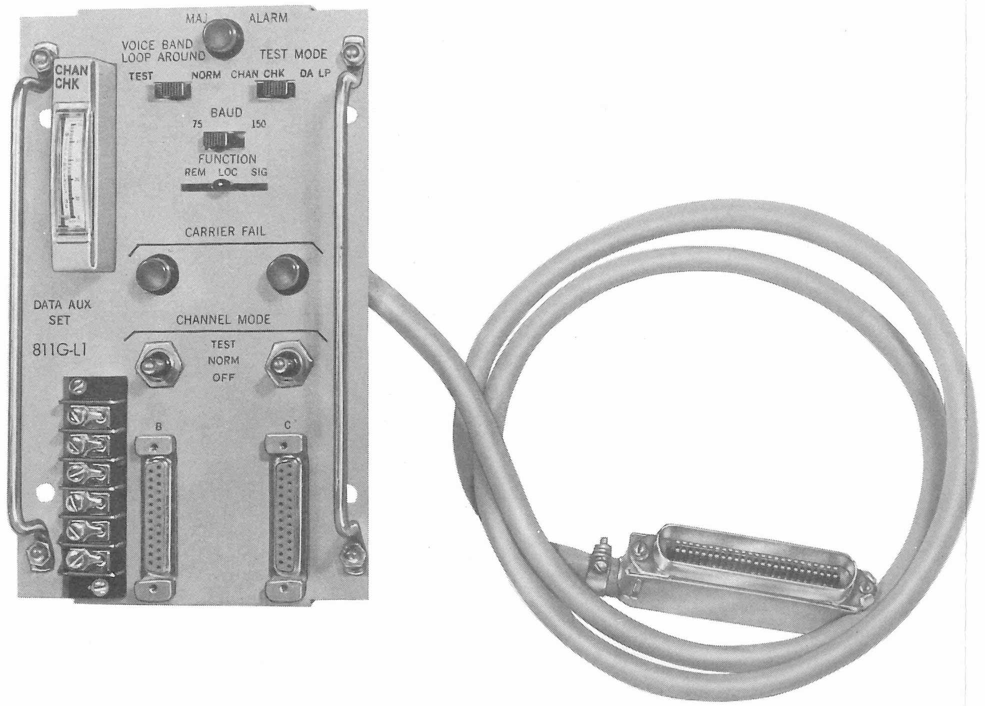


Fig. 18—Data Auxiliary Set 811G-L1

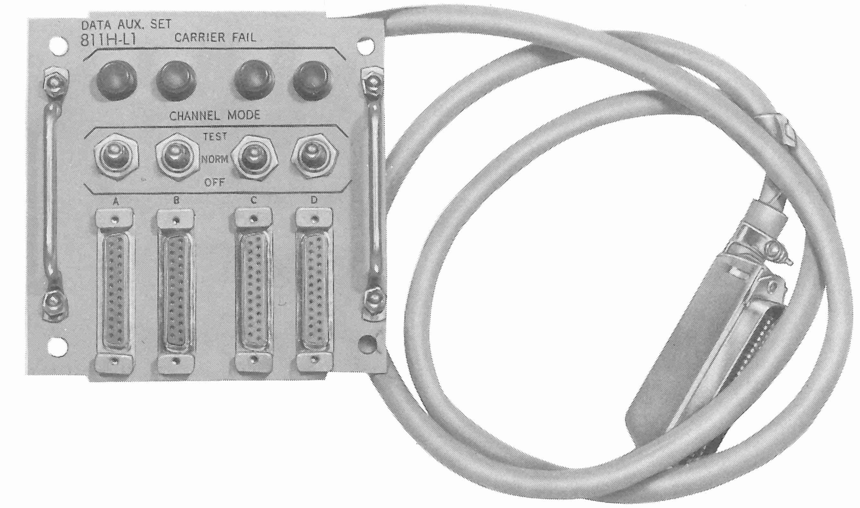


Fig. 19—Data Auxiliary Set 811H-L1

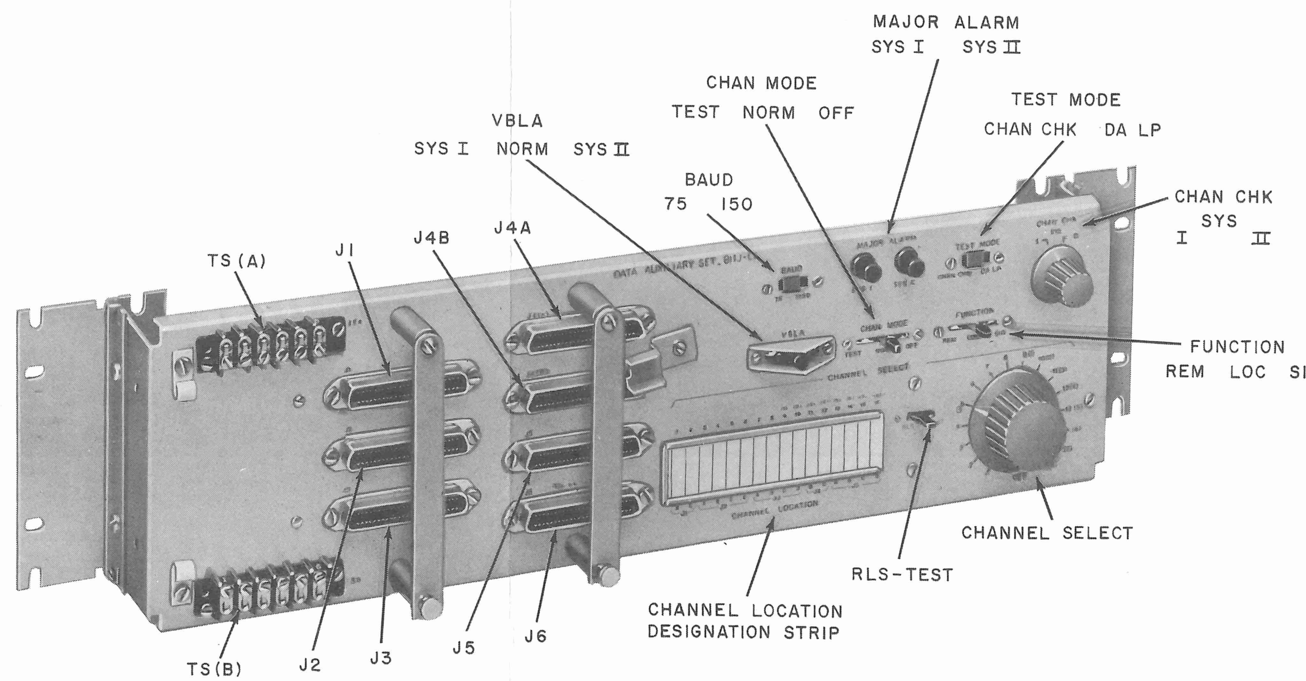


Fig. 20—Data Auxiliary Set 811J-L1

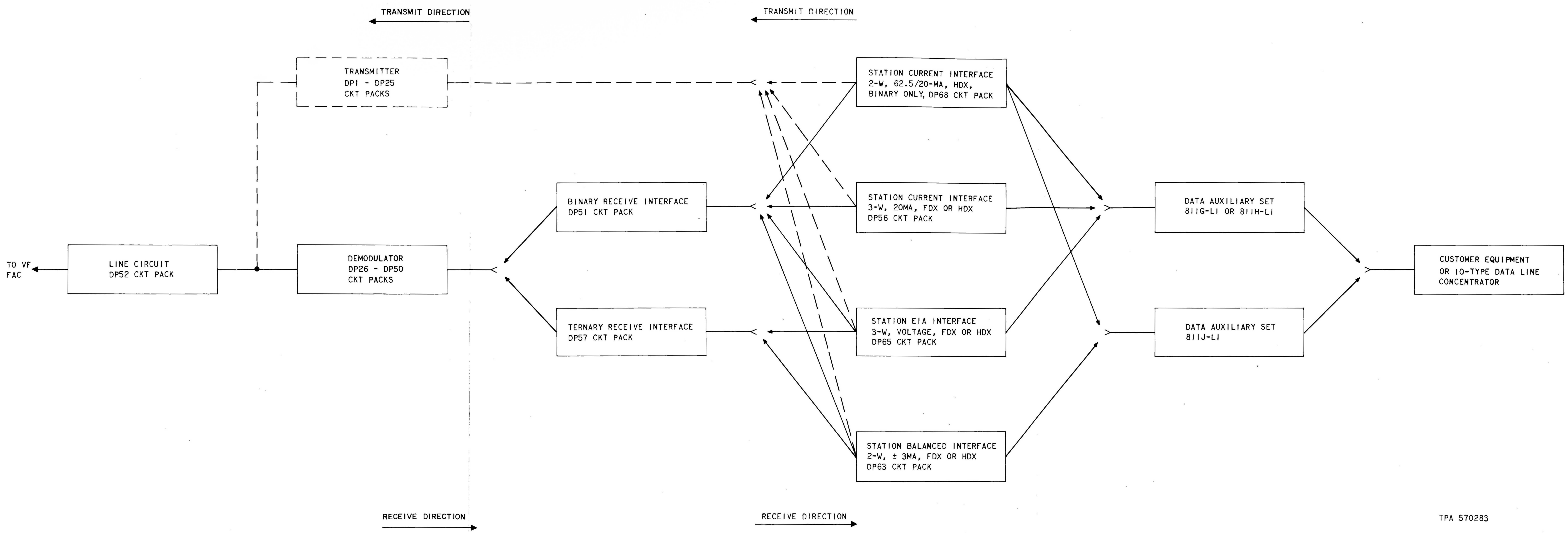


Fig. 21—Various Channel Configurations and Combinations of Circuit Packs—1A Data Station, MCA—Block Diagram

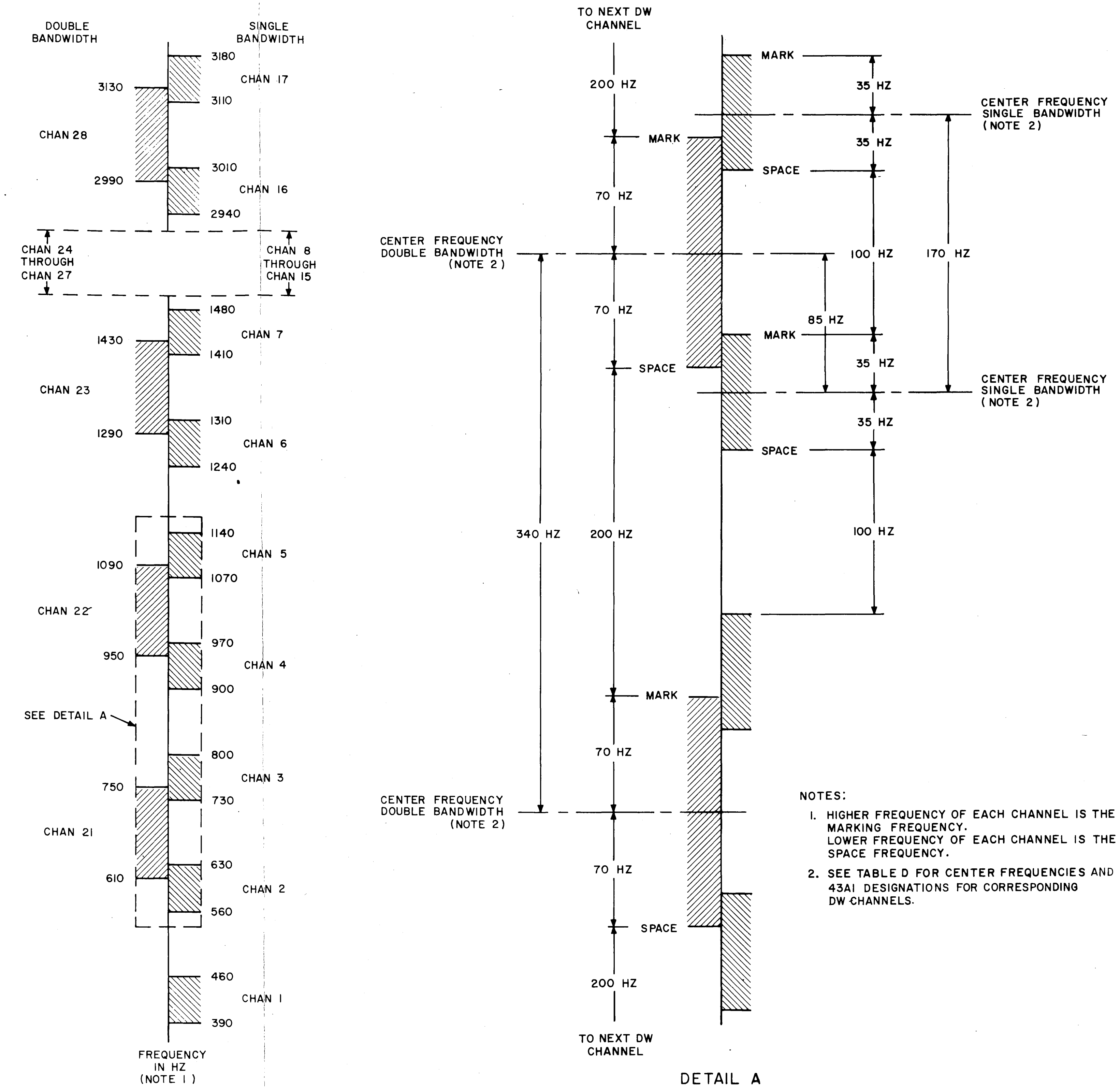
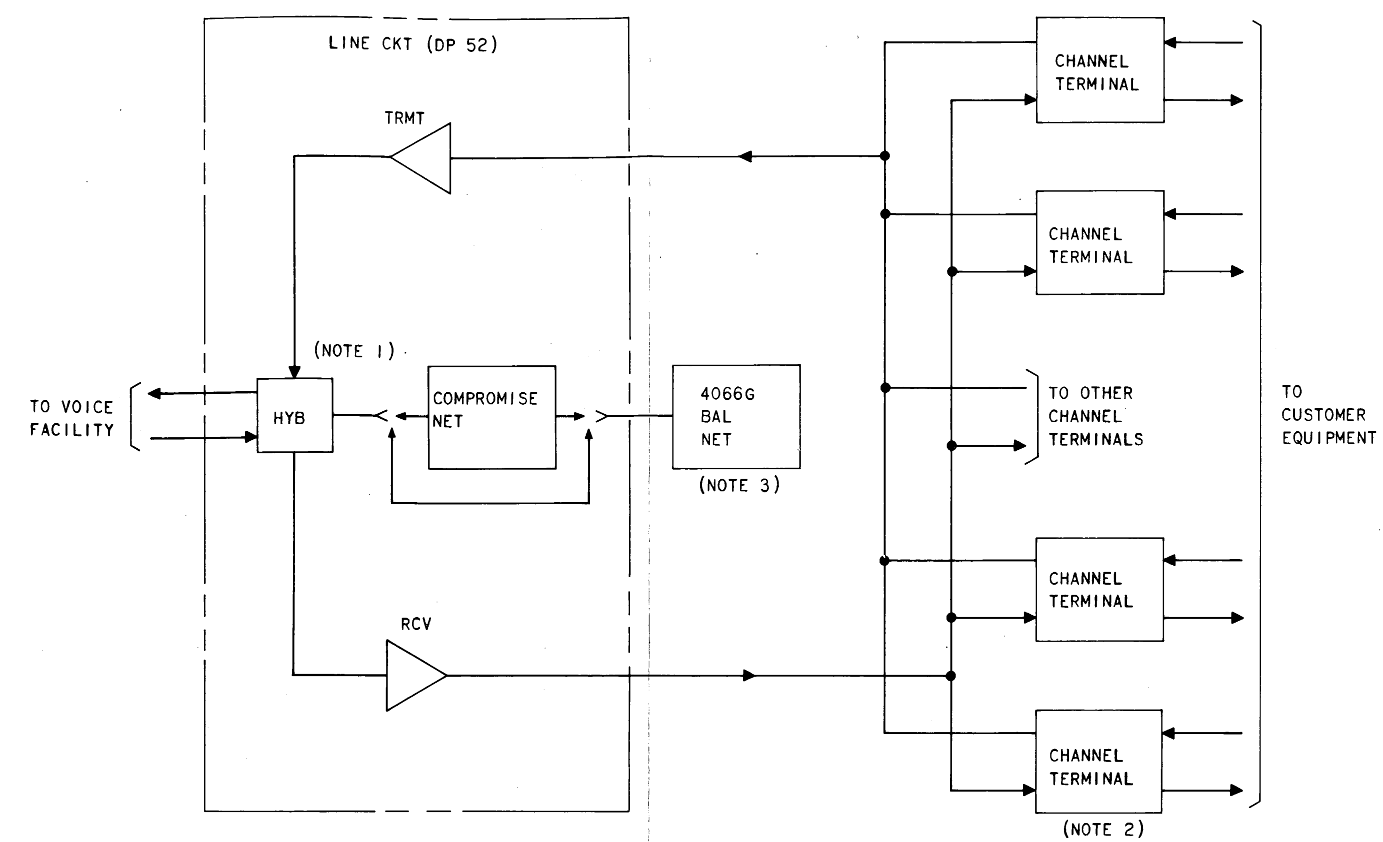


Fig. 22—Chart—Relative Position of DW Channel With Respect to SW Channel



NOTES:
1. TRANSFORMER HAS CAPABILITIES OF BEING STRAPPED FOR EITHER 600- OR 900-Ω, 2- OR 4-WIRE CONN.
2. CHANNEL TERMINAL INCLUDES TRMTR,DEM,RCVR INT (BINARY OR TERNARY), AND STA INT (EIA OR CUR) CIRCUIT PACKS.
3. 4066G USED PROVIDES ADDITIONAL BALANCING OVER THAT ATTAINABLE WITH COMPROMISE BAL NET ON LINE CKT.

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Fig. 23—Line Circuit—Block Diagram

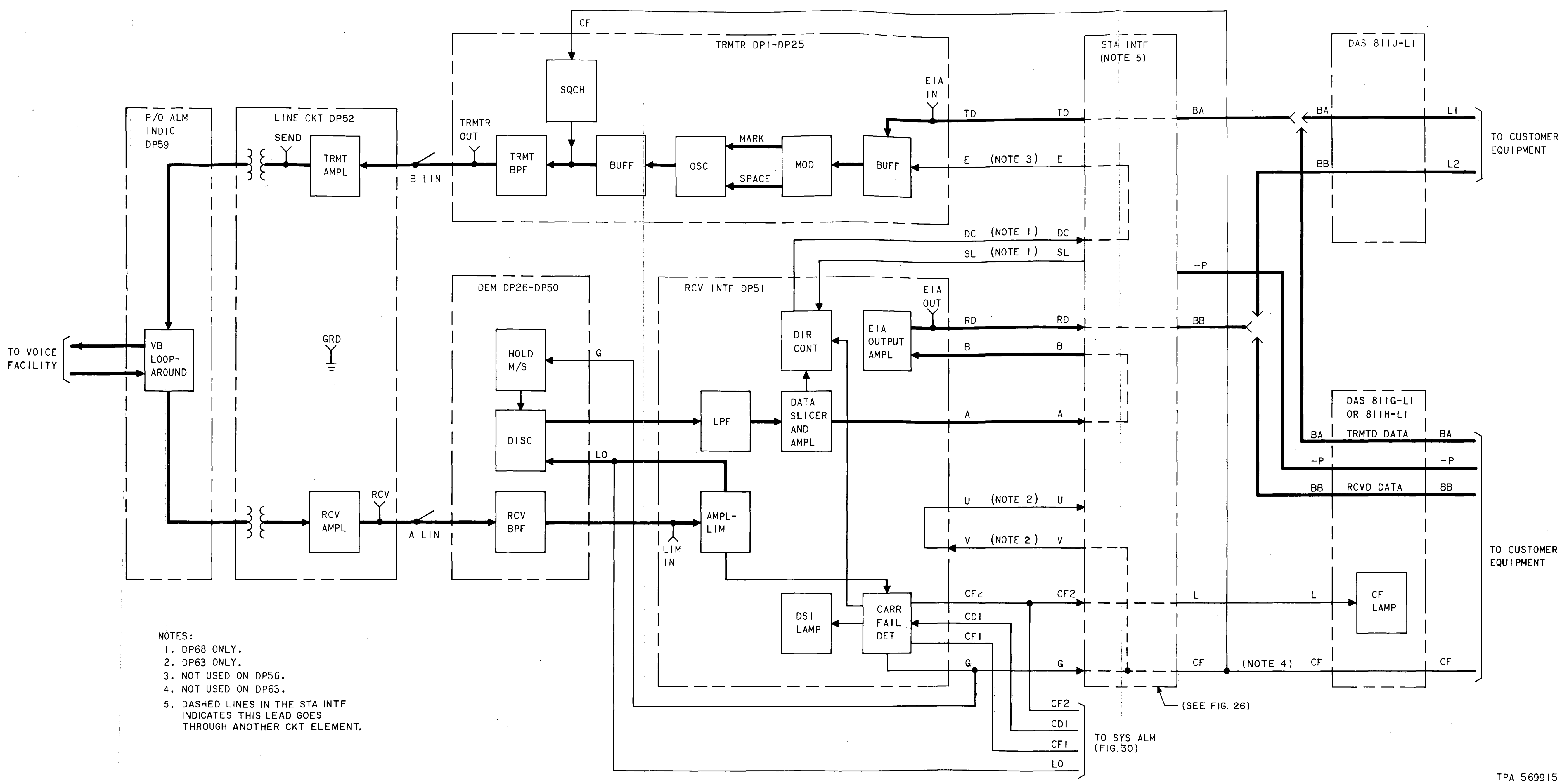
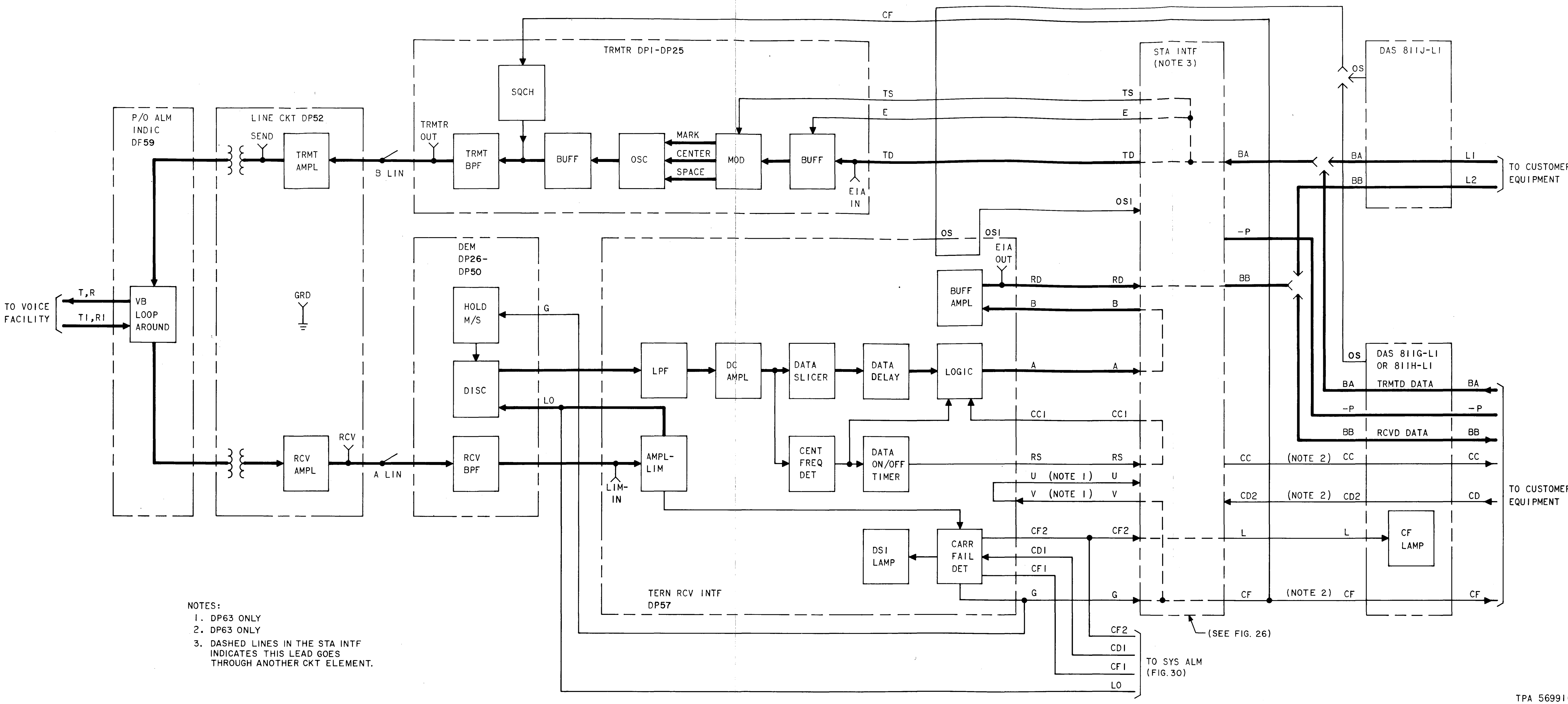


Fig. 24—Transmit and Receive Signal Paths—Binary Data Channel—1A Data Station, MCA—Block Diagram



NOTES:
1. DP63 ONLY
2. DP63 ONLY
3. DASHED LINES IN THE STA INTF INDICATES THIS LEAD GOES THROUGH ANOTHER CKT ELEMENT.

Fig. 25—Transmit and Receive Signal Paths—Ternary Data Channel—1A Data Station, MCA—Block Diagram

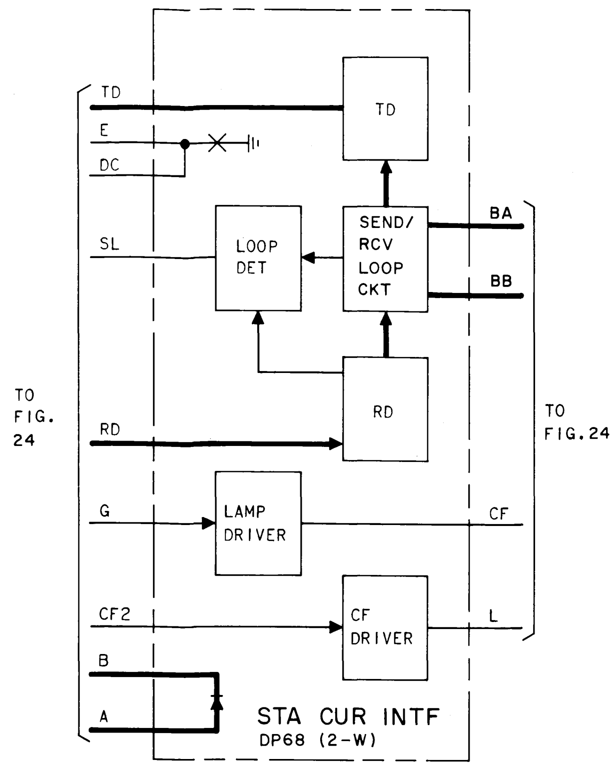


FIG. 3A
(NOTE 4)

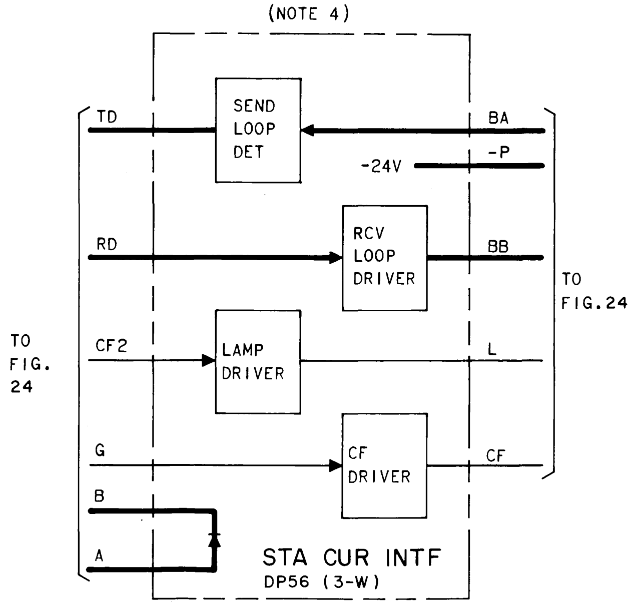


FIG. 3B
(NOTE 4)

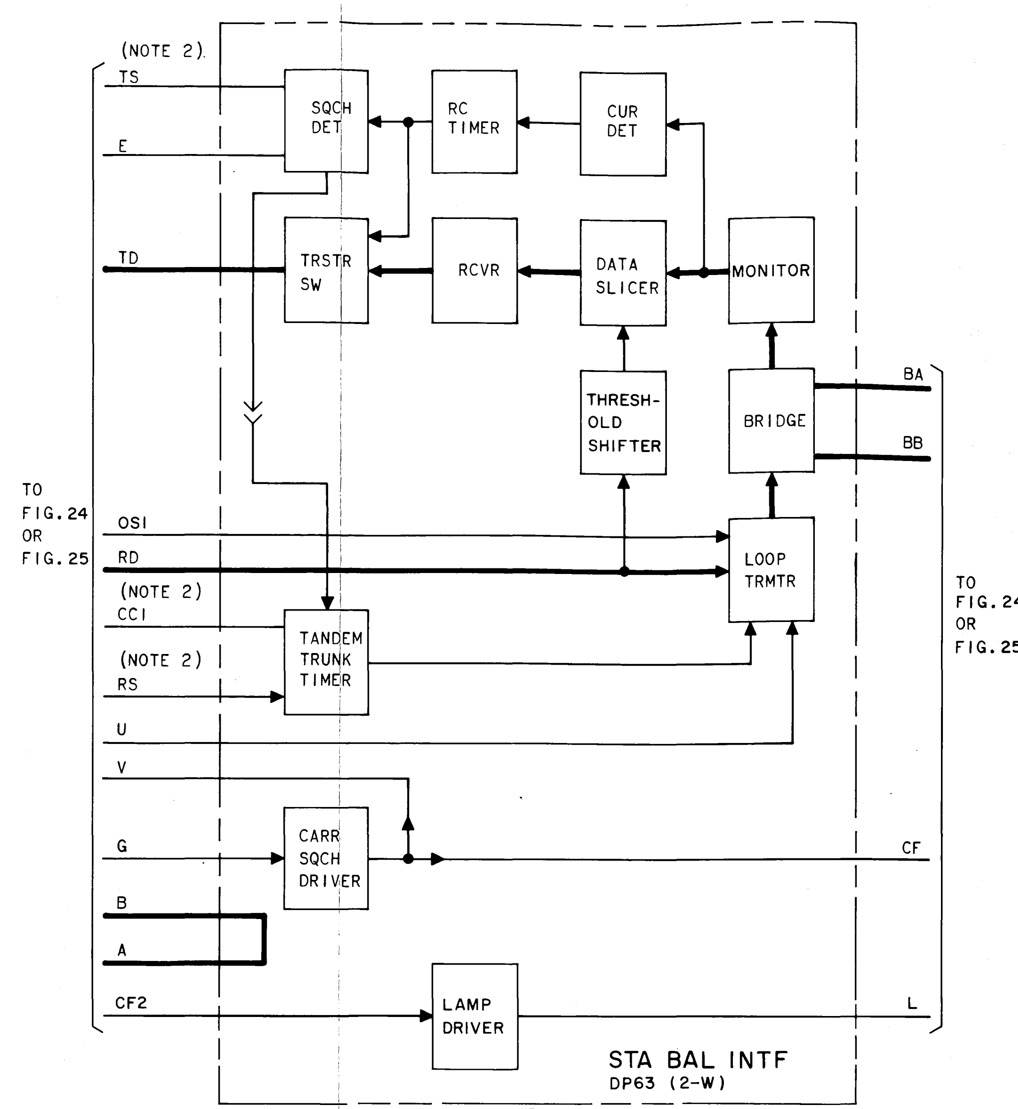


FIG.3C
(NOTE 3)

NOTES:

1. CIRCUITS SHOWN IN SOLID LINES ARE USED IN BINARY OPERATION. BOTH SOLID AND DOTTED CIRCUITS ARE USED IN TERNARY OPERATION.
2. USED IN TERNARY MODE ONLY.
3. PART OF FIG. 24 AND 25 WHEN APPLICABLE.
4. PART OF FIG. 24.

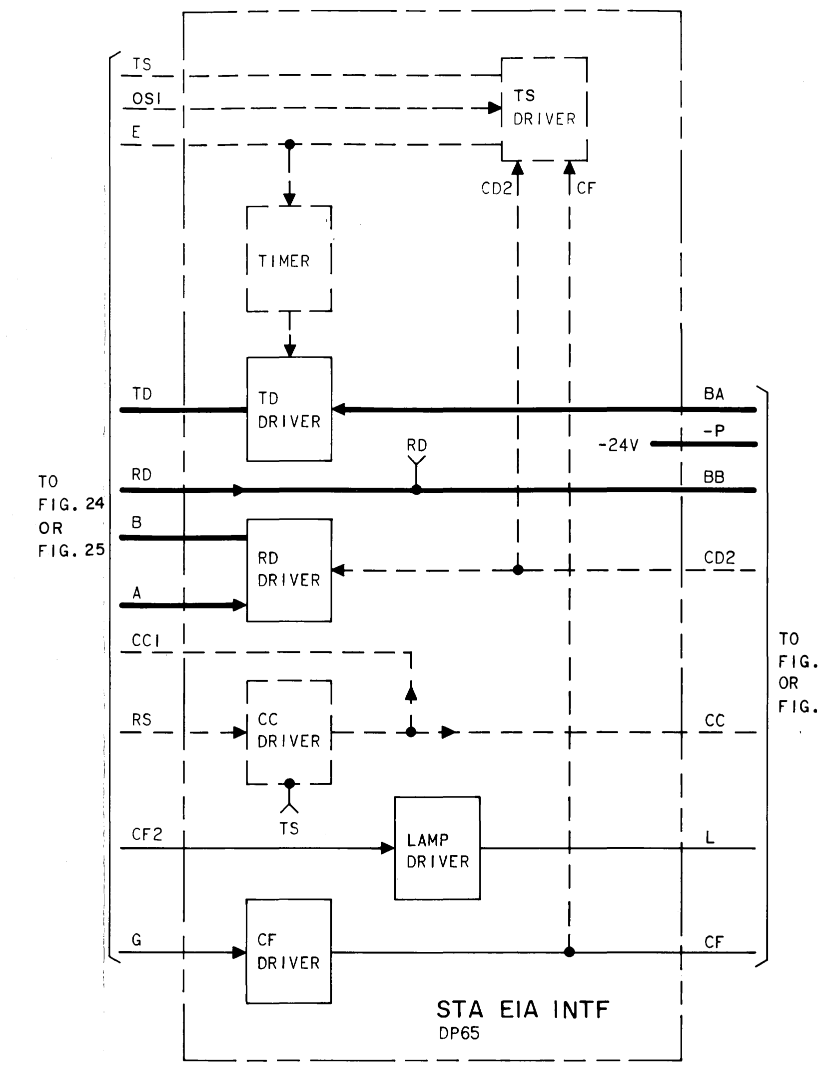


FIG. 3D
(NOTE 1)
(NOTE 3)

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Fig. 26—Station Interface Circuit Packs—Signal and Signal Control Circuits—1A Data Station, MCA

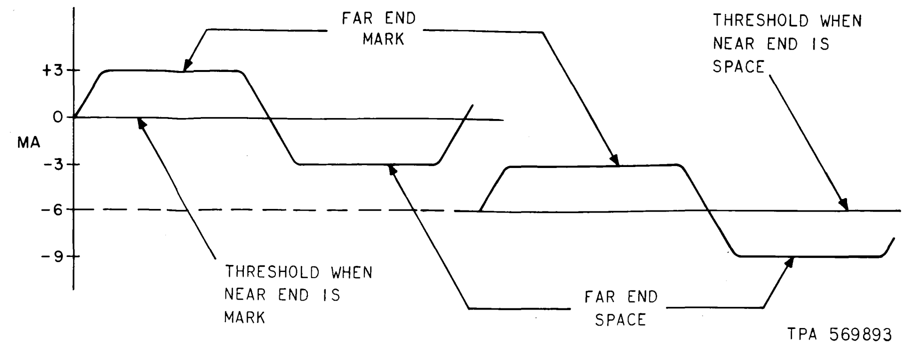


Fig. 27—Manner of Detection of Received Data From the Loop When Near End is Transmitting Data (DP63 Circuit Pack)

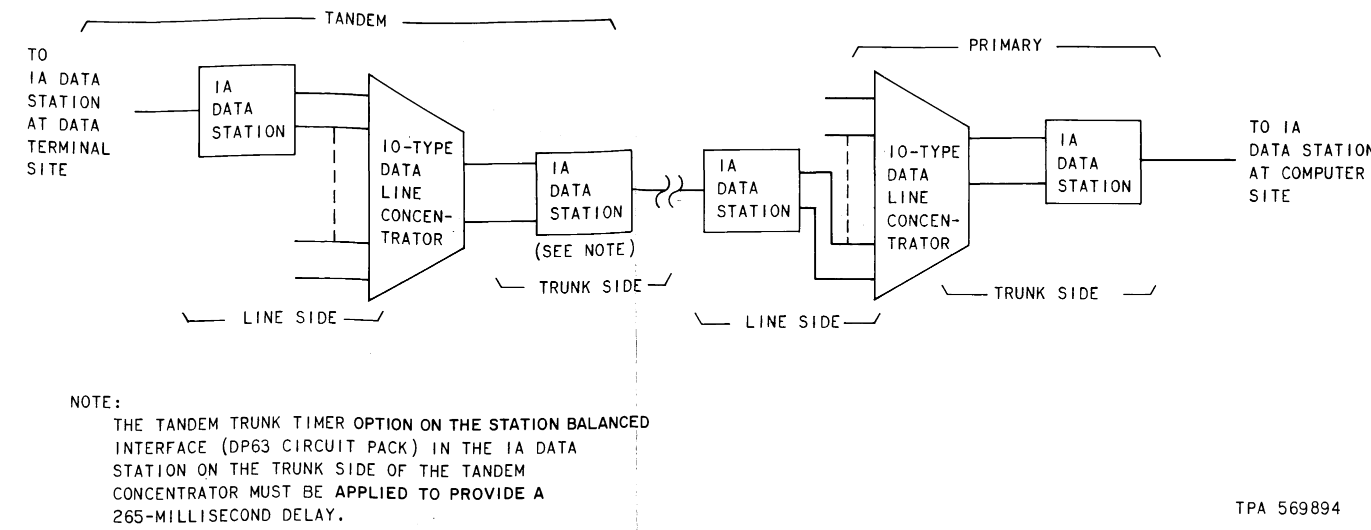


Fig. 28—1A Data Station, MCA, With Tandem Concentration

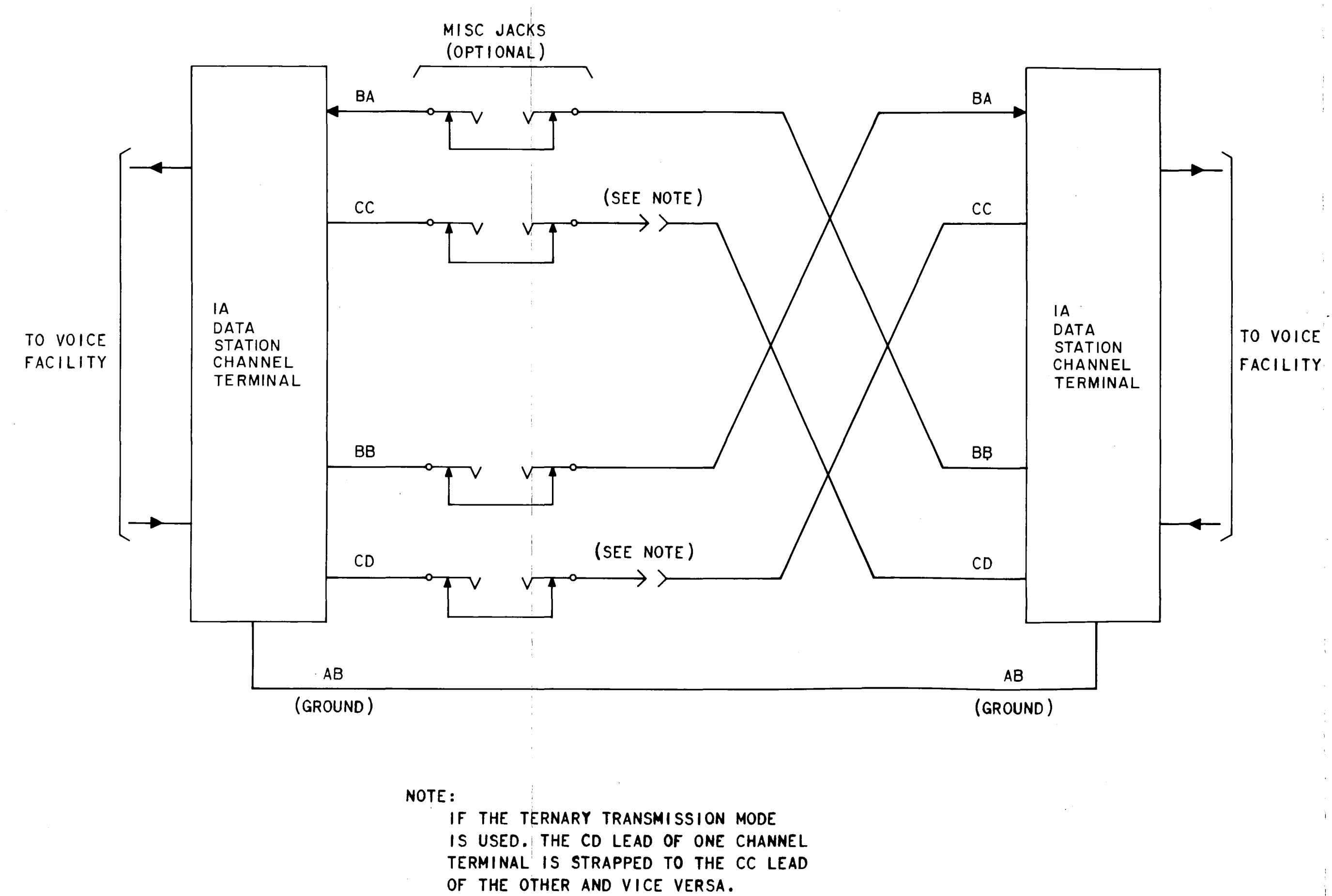
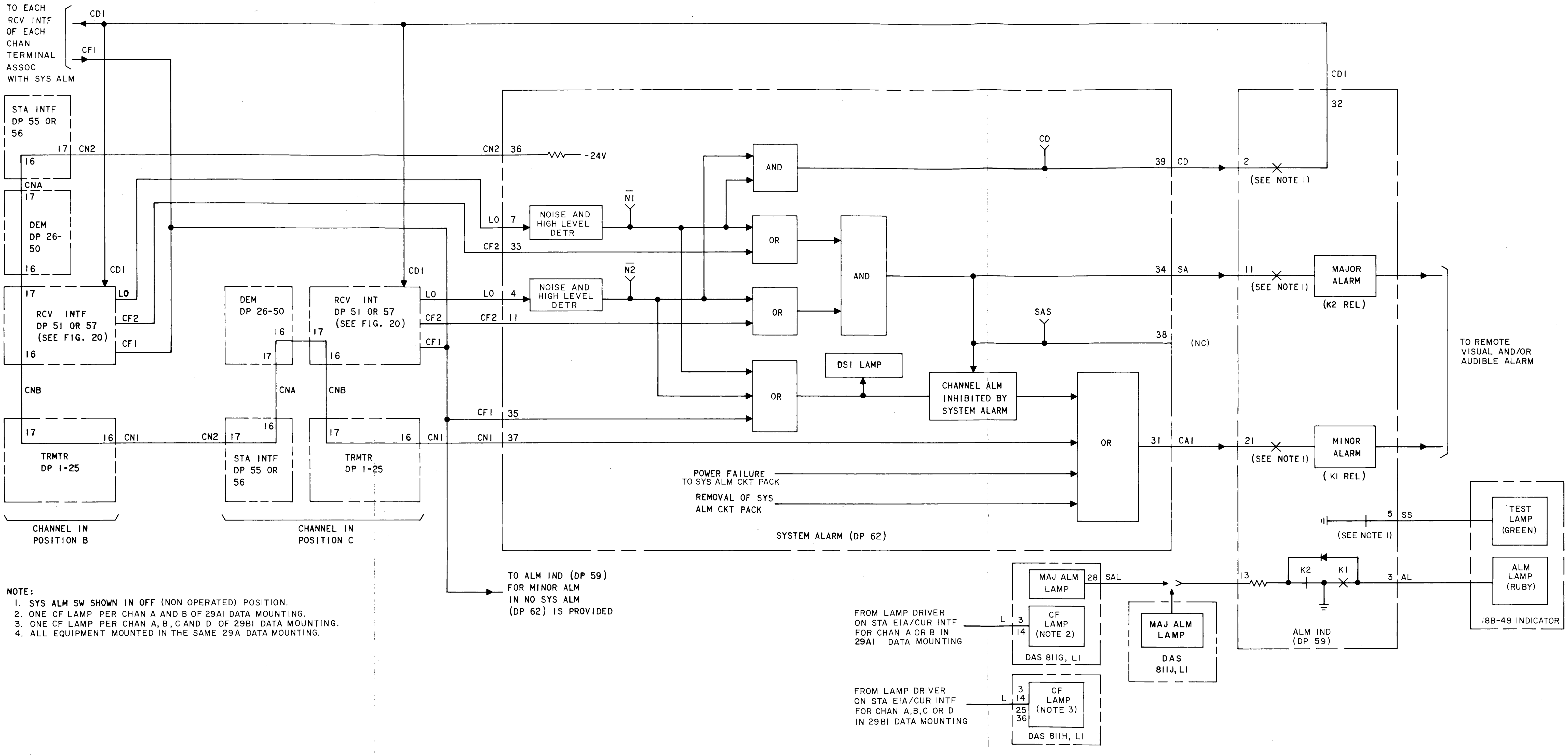
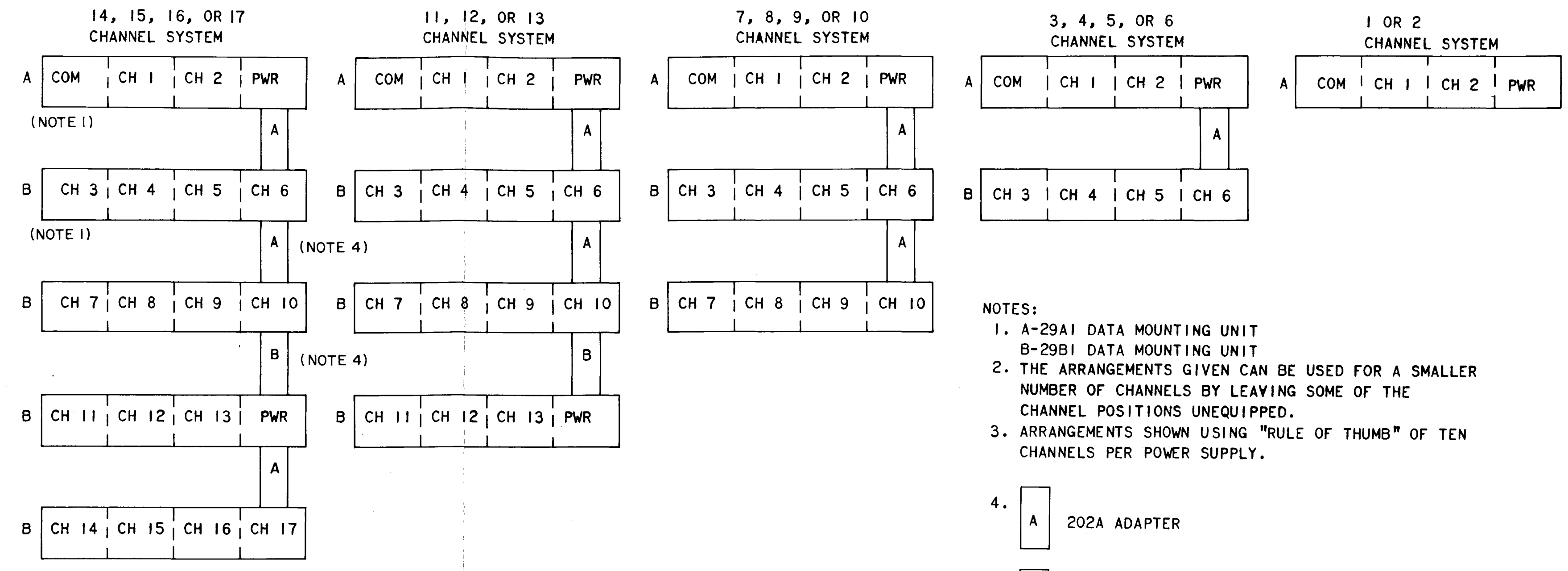


Fig. 29—Back-to-Back Operation



NOTE:
1. SYS ALM SW SHOWN IN OFF (NON OPERATED) POSITION.
2. ONE CF LAMP PER CHAN A AND B OF 29A1 DATA MOUNTING.
3. ONE CF LAMP PER CHAN A, B, C AND D OF 29B1 DATA MOUNTING.
4. ALL EQUIPMENT MOUNTED IN THE SAME 29A DATA MOUNTING.

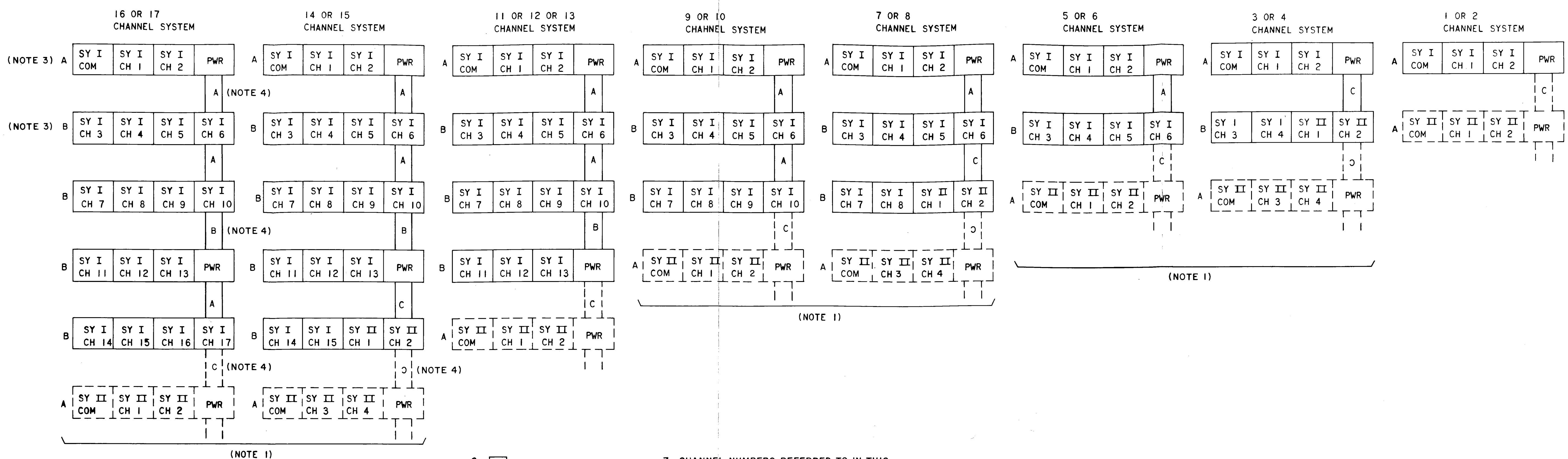
Fig. 30—System Alarm—1A Data Station, MCA—Block Diagram



NOTES:

1. A-29A1 DATA MOUNTING UNIT
   B-29B1 DATA MOUNTING UNIT
2. THE ARRANGEMENTS GIVEN CAN BE USED FOR A SMALLER NUMBER OF CHANNELS BY LEAVING SOME OF THE CHANNEL POSITIONS UNEQUIPPED.
3. ARRANGEMENTS SHOWN USING "RULE OF THUMB" OF TEN CHANNELS PER POWER SUPPLY.
4. [A] 202A ADAPTER
   [B] 202B ADAPTER
5. CHANNEL NUMBERS REFERRED TO IN THIS CHART DESIGNATE QUANTITY. THEY HAVE NO REFERENCE TO ANY SPECIFIC CHANNEL FREQUENCY OR BANDWIDTH.

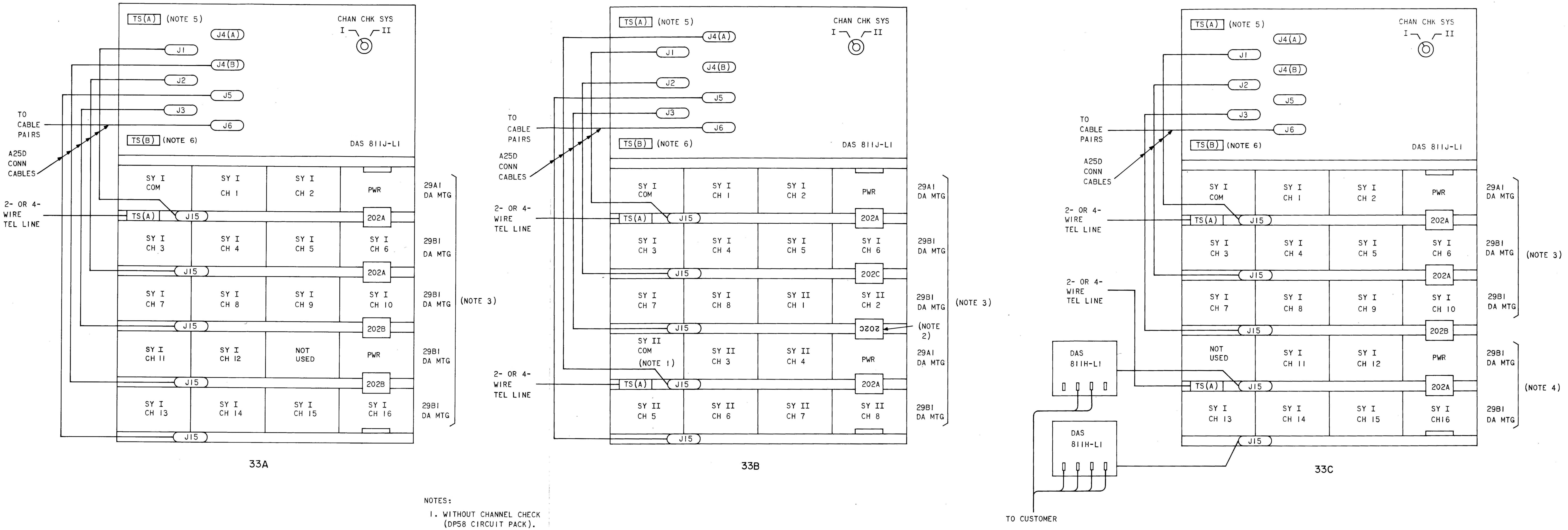
Fig. 31—Possible Channel Arrangements for One System Per Cabinet



NOTES:

1. LAST TWO CHANNEL POSITIONS IN BOTTOM "B" NEST CAN BE ASSIGNED TO EITHER SYSTEM I OR SYSTEM II BY CHANGING THE PLUG-IN STRAP ADAPTORS BETWEEN NESTS.
2. THE ARRANGEMENTS GIVEN CAN BE USED FOR A SMALLER NUMBER OF CHANNELS BY LEAVING SOME OF THE CHANNEL POSITIONS UNEQUIPPED.
3. A—29A1 DATA MOUNTING UNIT
   B—29B1 DATA MOUNTING UNIT
4. DOTTED LINES INDICATE HOW THE NEXT SYSTEM IS TO BE STARTED.
5. ARRANGEMENTS SHOWN USING "RULE-OF-THUMB" OF TEN CHANNELS PER POWER SUPPLY.
6.
   - [A] 202A ADAPTER
   - [B] 202B ADAPTER
   - [C] 202C ADAPTER
   - [Ɔ] 202C ADAPTER, INVERTED
7. CHANNEL NUMBERS REFERRED TO IN THIS CHART DESIGNATE QUANTITY. THEY HAVE NO REFERENCE TO ANY SPECIFIC CHANNEL FREQUENCY OR BANDWIDTH.

Fig. 32—Possible Channel Arrangements for More Than One System Per Cabinet



NOTES:

1. WITHOUT CHANNEL CHECK (DP58 CIRCUIT PACK).
2. 202C ADAPTER IS INVERTED.
3. ONE STATION BALANCED INTERFACE (DP63 CIRCUIT PACK) OR STATION CURRENT INTERFACE (DP68 CIRCUIT PACK) PER CHANNEL TERMINAL.
4. INCLUDES A COMBINATION OF UP TO SIX STATION EIA INTERFACES (DP65 CIRCUIT PACK) AND STATION CURRENT INTERFACES (DP56 CIRCUIT PACK) - ONE INTERFACE PER CHANNEL TERMINAL.
5. TS(A): SYSTEM I ALARM OUTPUTS
6. TS(B): SYSTEM II ALARM OUTPUTS

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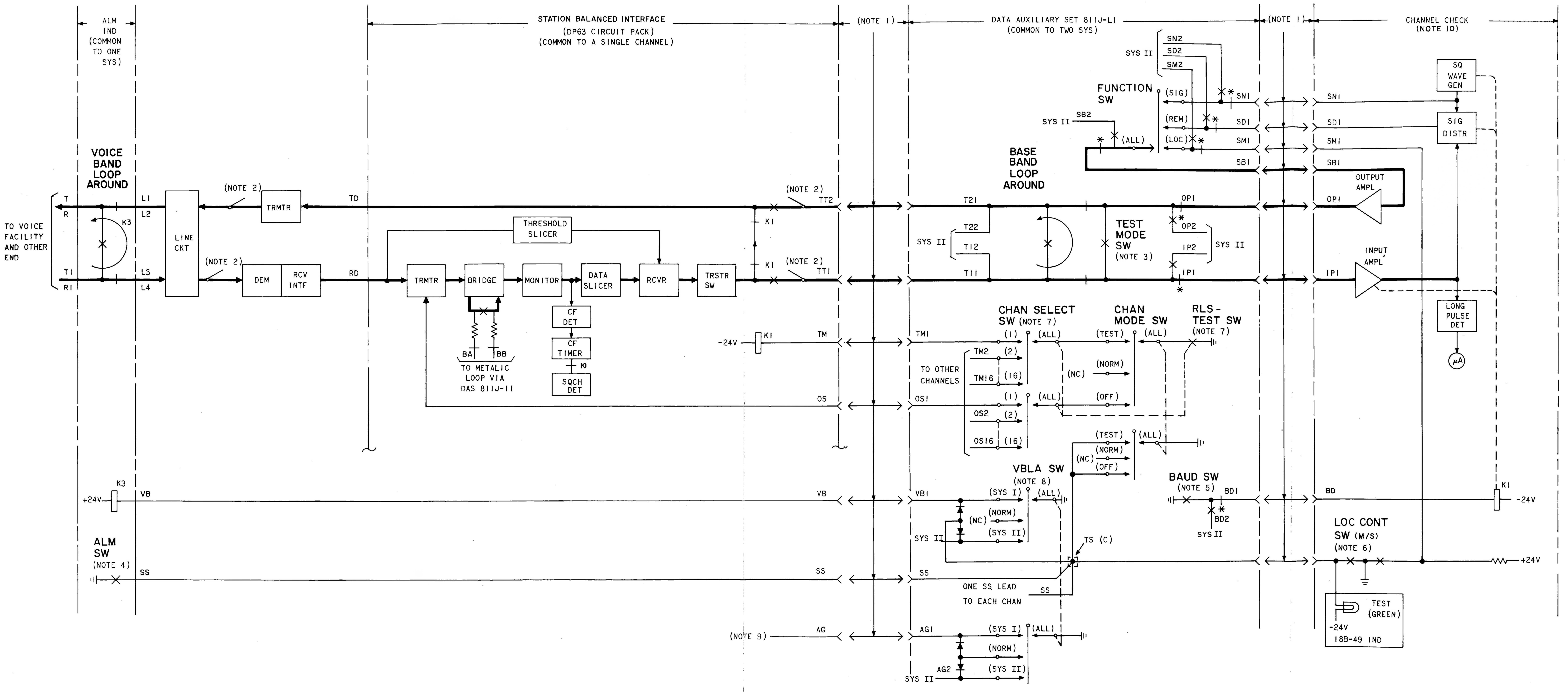
Fig. 33—Possible Channel Arrangements for a 1A Data Station, MCA, Using DAS 811J-L1



NOTES:

1. PART OF DOUBLE-ENDED A25D CORD CONNECTING DAS 811J-L1 AND 29A1 OR 29B1 DATA MOUNTING (MUST BE ORDERED SEPARATELY).
2. MULTIPLE TO ALL OTHER CHANNELS IN SAME SYSTEM.
3. DPDT SWITCH - SHOWN OPERATED TO CHAN CHK POSITION (DA LP IS OFF).
4. ALM SWITCH SHOWN IN ON POSITION.
5. NON-OPERATED: 150 BAUD (DW) OPERATED: 75 BAUD (SW).
6. LOC CONT SW SHOWN IN MARK POSITION - NOT OPERATED (NOT FOR CUSTOMER USE).
7. CHAN SELECT SW IS MECHANICALLY INTERLOCKED WITH RLS-TEST SW. THE RLS-TEST SW MUST BE IN RLS POSITION (SHOWN) BEFORE CHAN SELECT SW CAN BE ROTATED. THE RLS-TEST SW MUST BE IN THE TEST POSITION FOR THE TEST CIRCUITRY TO FUNCTION.
8. VBLA SW IS PROTECTED FROM INADVERTENT OPERATION BY A MECHANICAL GUARD.
9. LEAD AG INHIBITS ALM WHEN VBLA SW IS OPERATED FROM NORM POSITION. (TO ALM IND CKT).
10. CHANNEL CHECK MAY BE SHARED BETWEEN TWO SYSTEMS.

* CHAN CHK SW

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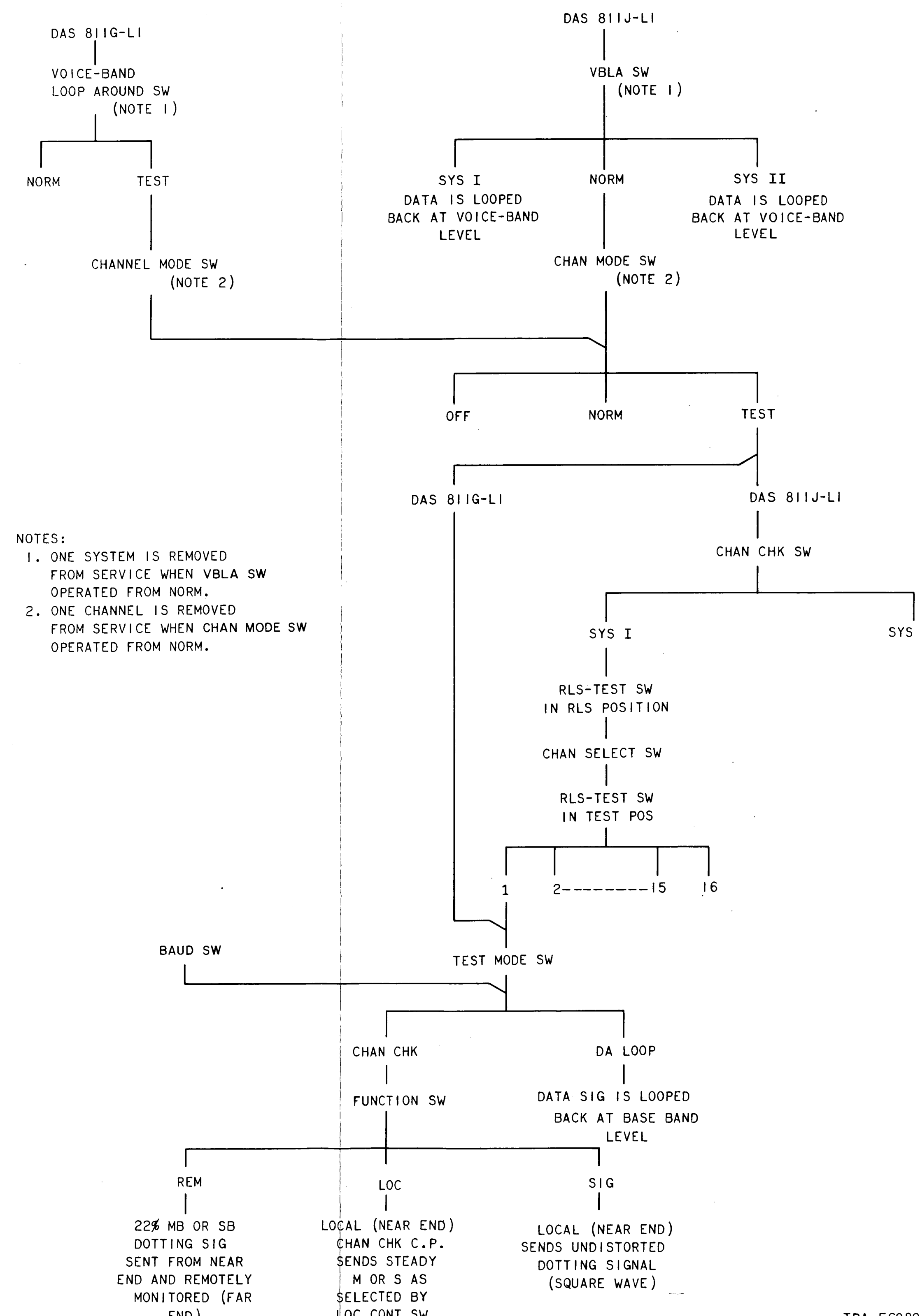
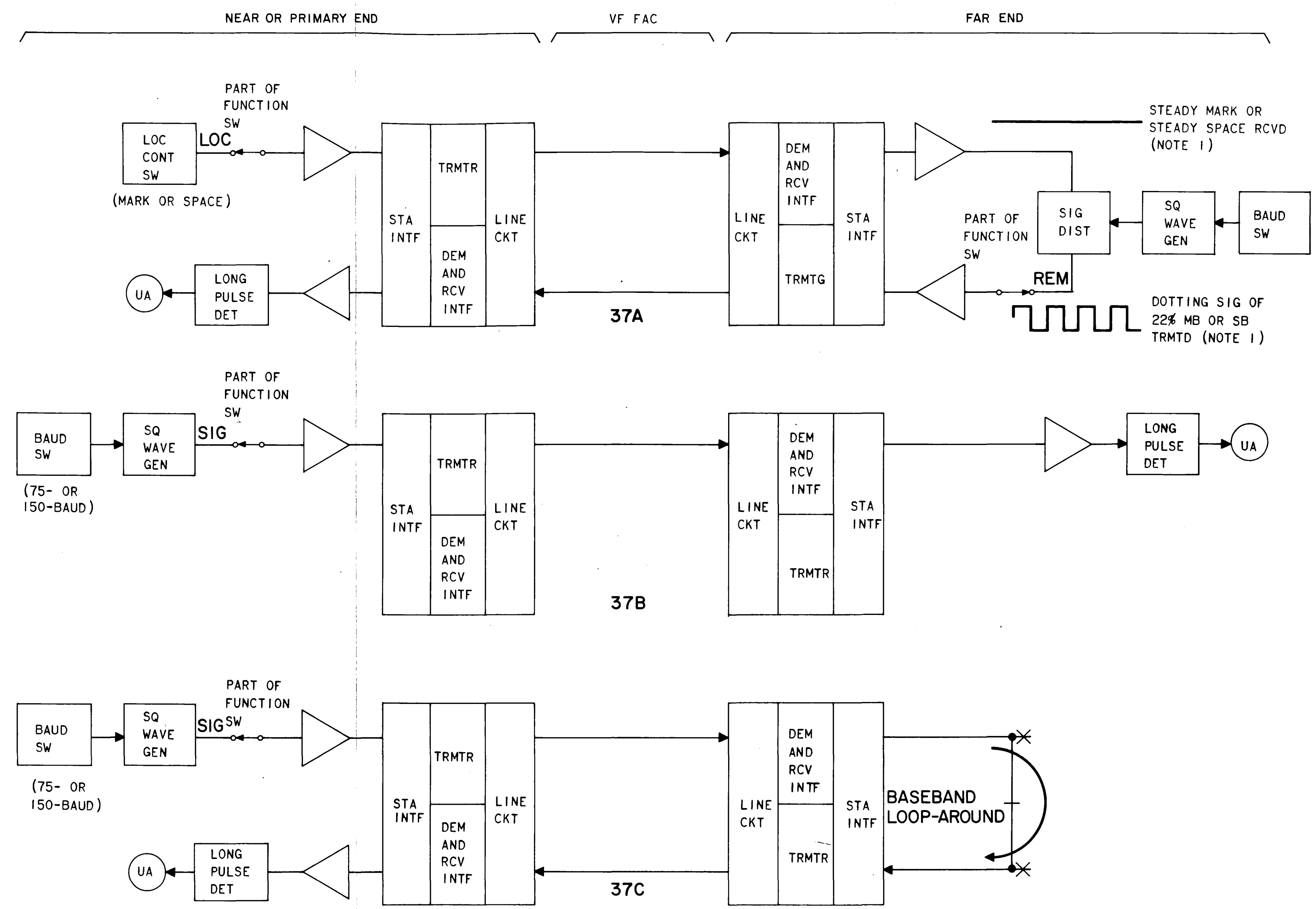
Fig. 35—Test Circuitry Associated With DAS 811J-L1 and Station Balanced Interface (DP63 Circuit Pack)—1A Data Station, MCA—Functional Diagram



NOTES:
1. ONE SYSTEM IS REMOVED FROM SERVICE WHEN VBLA SW OPERATED FROM NORM.
2. ONE CHANNEL IS REMOVED FROM SERVICE WHEN CHAN MODE SW OPERATED FROM NORM.

Fig. 36—Function of Test Switches on DAS 811G-L1 and 811J-L1—1A Data Station, MCA—Sequence Diagram



NOTES:
1. DEPENDS UPON SETTING OF LOC CONT SW AT PRIMARY END.
2. CKTS HAVE BEEN ARRANGED SUCH THAT CUSTOMER'S TERMINAL EQUIPMENT HAS BEEN SWITCHED OUT AND THE 1A DATA STATION'S CHAN CHECK CKT HAS BEEN SWITCHED IN.

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Fig. 37—System Test Modes—1A Data Station, MCA—Block Diagram