

**WIDEBAND DATA STATION USING DATA SET 306
POINT-TO-POINT, LIMITED DISTANCE
DESCRIPTION AND OPERATION**

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1. GENERAL

1.01 This section contains information concerning the description and operation of the wideband data station using Data Set (DS) 306A-type (Fig. 1). The information in this section includes a description of the possible arrangements that can be made with the various data units and data auxiliary set.

1.02 The DS 306A-type provides for full-duplex high-speed synchronous data transmission over 4-wire T1 carrier facilities. Figure 2 is a block diagram of a Wideband Data System using DS 306A-L1/2. The data set accepts serial digital data signals from the customer business machine at a 1.344 megabit per second (Mb/s) data rate and processes these signals into the T1 line signal format for transmission at the T1 line rate of 1.544 Mb/s.

1.03 The line signal received by the data set is processed and delivered to the customer as a serial digital signal at a 1.344 Mb/s rate.

1.04 The interface signals between the customer business machine and the data set are of two types: high-speed clock and data signals and control signals. The high-speed signals are dc-coupled balanced signals that meet the international balanced interface standard CCITT Recommendation V35 Appendix 4. The control signals are the EIA type and meet the requirements of EIA Standard RS-232-C.

1.05 The DS 306A-L1/2 can be used in the following station arrangements:

- (a) Wideband data station using DS 306A-L1/2 with wideband data transmission independent of the status of the associated voice circuit. If voice communication is desired, the station may be equipped with either a telephone set or Data Auxiliary Set (DAS) 804A-type.
- (b) Wideband data station using DS 306A-L1/2 with wideband data transmission dependent

upon the placing of a call on the voice coordination channel. Provides simultaneous wideband data transmission and voice coordination. This station arrangement uses DAS 804A-type.

(c) Wideband data station using DS 306A-L1/2 with DAS 804A-type control providing DATA-PHONE features. The DAS 804A-type must be in the data mode for wideband data transmission. Simultaneous wideband data transmission and voice coordination are not possible in this station arrangement.

1.06 The wideband data station arrangements are provided with a voice coordination circuit, which may be provided using a separate voice telephone circuit, in order to provide a path for transmission of the remote test control signal. The remote test is performed to check the wideband data facility and is controlled by the wideband test bay transmitting a 2800-Hz tone over the voice coordination line.

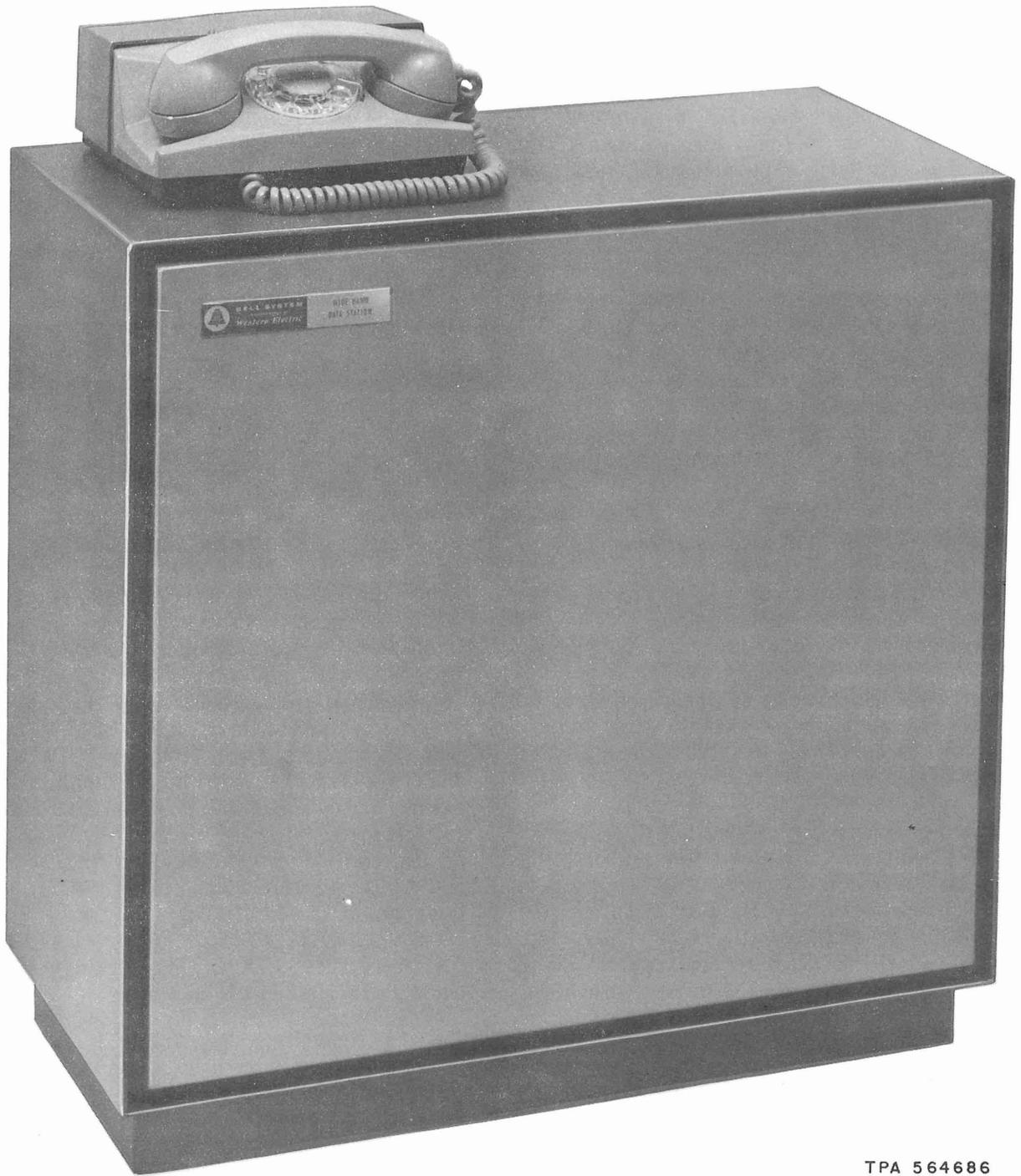
1.07 A telephone set can be supplied with the voice line, if desired, to provide communication functions between stations. DAS 804A-type can be used in place of a telephone set to provide additional features that will be discussed later. The voice line is connected to DAS 804A-type through the data set.

1.08 On T1 line installations, a T1 line terminating unit (LTU) and power supply (KS-15620-L14) are required with DS 306A. These units are part of the T1 line installation and provide proper line terminations, maintenance functions, and power arrangements. The LTU and associated power supply may be separated from the data set by up to 750 feet, or they may be placed in the data set cabinet.

2. PHYSICAL DESCRIPTION

DATA SET 306A-TYPE

2.01 Data Set 306A-L1 consists of a 33A1 Data Unit (DU), 41A2 power unit, 840129985 cord assembly, and a P3BG cord. The 33A1 DU includes nine plug-in circuit packs that are listed in Table A. The DS 306A-L1/2 consists of a 32A1 DU (series 2 or higher), 33A1 DU, 41A2 power unit, 840129985 cord assembly, 840129977 cable assembly, and a P3BG cord. The 32A1 DU includes two plug-in circuit packs (CS4 and AR122) and a plug-in 10A3



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Fig. 1—Wideband Data Station Using Data Set 306A-Type in a KS-20018-Type Cabinet

DU. The circuit packs have test points brought out to numbered pins on the faceplate.

2.02 The monitoring and terminating jacks on the front of the 10A3 DU in DS 306A-L1/2 provide test access to the 4-wire wideband and voiceband line facilities. The monitoring jacks may also be used as equipment-terminating jacks by inserting a dummy plug in the corresponding line-terminating jack.

2.03 The DS 306A-type can be installed in a 23-inch relay rack of No. 5 crossbar-type or bulb angle-type or in a KS-20018-type Bell System cabinet. The DS 306A-L1/2 alone is mounted in a KS-20018-L1 cabinet (Fig. 3). When the LTU and associated power supply are to be mounted in the data station cabinet, the KS-20018-L3 cabinet is used (Fig. 4).

2.04 The DS 306A-L1/2 weighs approximately 30 pounds and has external dimensions of 23-1/4 inches wide, 6 inches high, and 10 inches deep. The data set consumes approximately 40 watts of ac power (45 watts under test conditions), and when used with DAS 804A-type, the power consumption is increased by approximately 3 watts. The data set will operate satisfactorily over a temperature range of +40 to +120°F and a relative humidity of up to 95 percent.

2.05 A 3-conductor cord, coded P3BG, is used to feed power from a customer-provided outlet supplying a nominal 117 volts at 50 to 60 Hz to the 41A2 power unit. When the LTU and associated power supply is installed in the same cabinet with the data set, the P3BG cord may supply power from the customer-provided outlet to a 590B distribution panel, which is provided optionally, in the bottom of the cabinet. From the distribution panel, a P3BG cord supplies power to the 41A2 power unit. The 33A1 DU obtains its power from the 41A2 power unit, and the 32A1 DU obtains its power from the 33A1 DU.

2.06 Figure 5 is a rear view of DS 306A-L1/2 showing terminal boards and connectors. The rear of the 32A1 DU contains a terminal board, TB1, and two connectors. Of the two connectors, only the TEL SET connector J5, which is a 50-pin KS-16672-L3 connector, is used in DS 306A-L1/2. The rear of the 33A1 DU contains two terminal boards (TB1 and TB2), a 944A equalizer, and the customer interface connector. The customer must

furnish an interface cable that will mate with the customer connector, a 34-pin Winchester MRA-34-S-SFC-J connector. The signals from the interface leads are brought out to test points on TB2. The 944A equalizer compensates for the cable length between the 33A1 DU and the LTU. Sections of the equalizer are cut in or out depending upon which screw-down terminals are screwed down or left in the up position. The rear of the 41A2 power unit contains an ac input connector, P2, and dc output connector.

DATA AUXILIARY SET 804A-TYPE

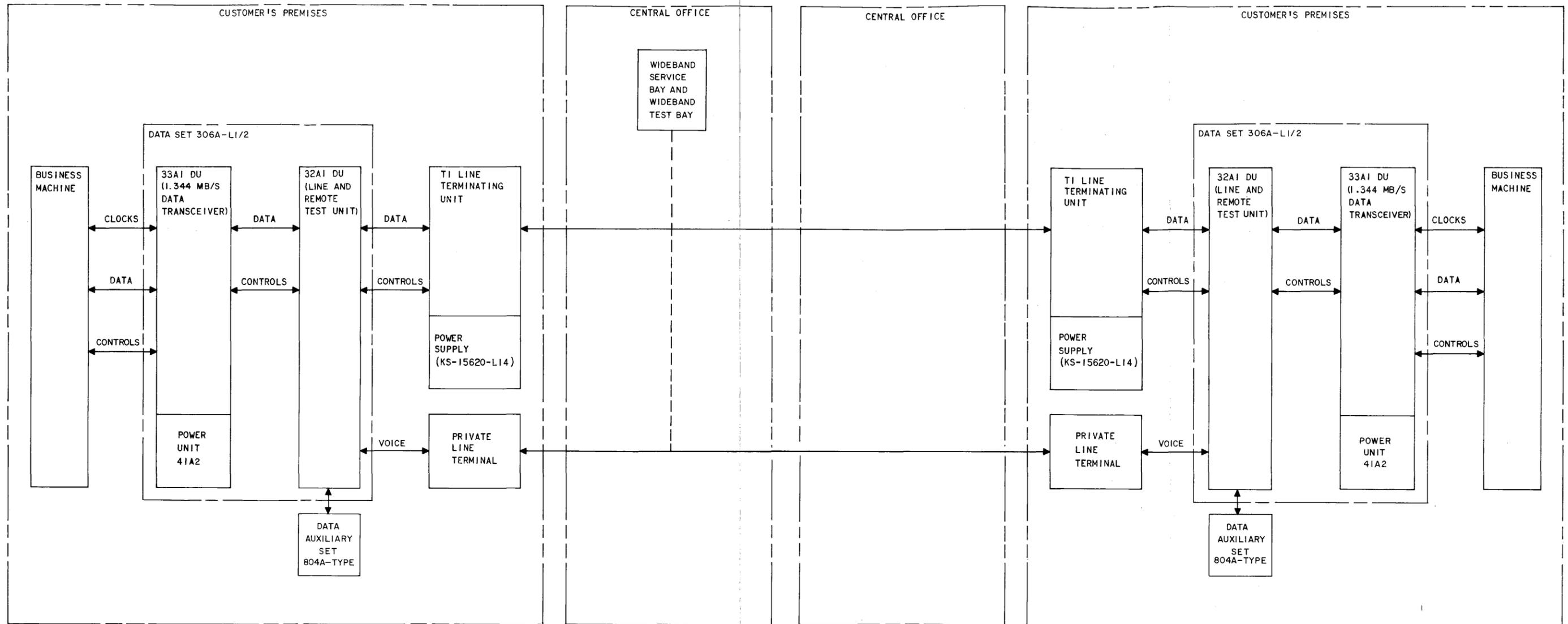
2.07 The DASs 804A1 and A3, which are rated MD, are replaced by DASs 804A5 and A7, respectively. Any one of the above data auxiliary sets may be used with the station arrangement, but if the DAS 804A1 or A3 is to be used, a 185A protection network must be connected between terminals 44 and 46 on the 3A1 Data Unit.

2.08 The DAS 804A-type is an auxiliary apparatus, the use of which is optional with DS 306A-L1/2. It obtains its power from the 32A1 DU. The DAS 804A-type is arranged for either 2-wire or 4-wire service as required for point-to-point service when it is used with DS 306A-L1/2. The DAS 804A-type is equipped with a rotary or TOUCH-TONE® dial, a telephone handset, and six illuminating keys. Figure 6 shows how the keys on DAS 804A-type are designated. The key marked WB CHAN should be blocked by inserting a blocking ring. The TEST and AUTO keys should be made locking and the lamp under the DATA key should be removed except when DAS 804A-type is providing DATA-PHONE features. The DATA key (nonlocking) is used to place the data set in the data mode.

2.09 A D50R-61 mounting cord, 5-1/2 feet long, is part of DAS 804A-type. It is equipped with a KS-16699-L1 plug which plugs into connector J5 on the rear of the 32A1 DU.

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2.10 This station arrangement consists of DS 306A-L1/2 and a voice coordination line. A telephone set or DAS 804A-type may be used with the voice line as required. The LTU, which terminates the T1 line, may be mounted in the data station cabinet along with its associated power supply, KS-15620-L14.



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Fig. 2—Block Diagram of a Typical Wideband Data System Using Data Set 306A-L1/2

TABLE A
33A1 DATA UNIT CIRCUIT PACKS

CIRCUIT PACK NO.	FUNCTION
AR511	Transmitting 1.544-MB Bipolar Line Interface
AR510	Transmit Bit Rate Converter
AR509	Customer High-Speed Data Interface
AR508	Scrambler/Descrambler (2 Required)
AR507	Receiving Bit Rate Converter
AR506	Framing Detector
AR505	Receiving 1.544-MB Bipolar Line Interface
AR504	Customer Controls Interface

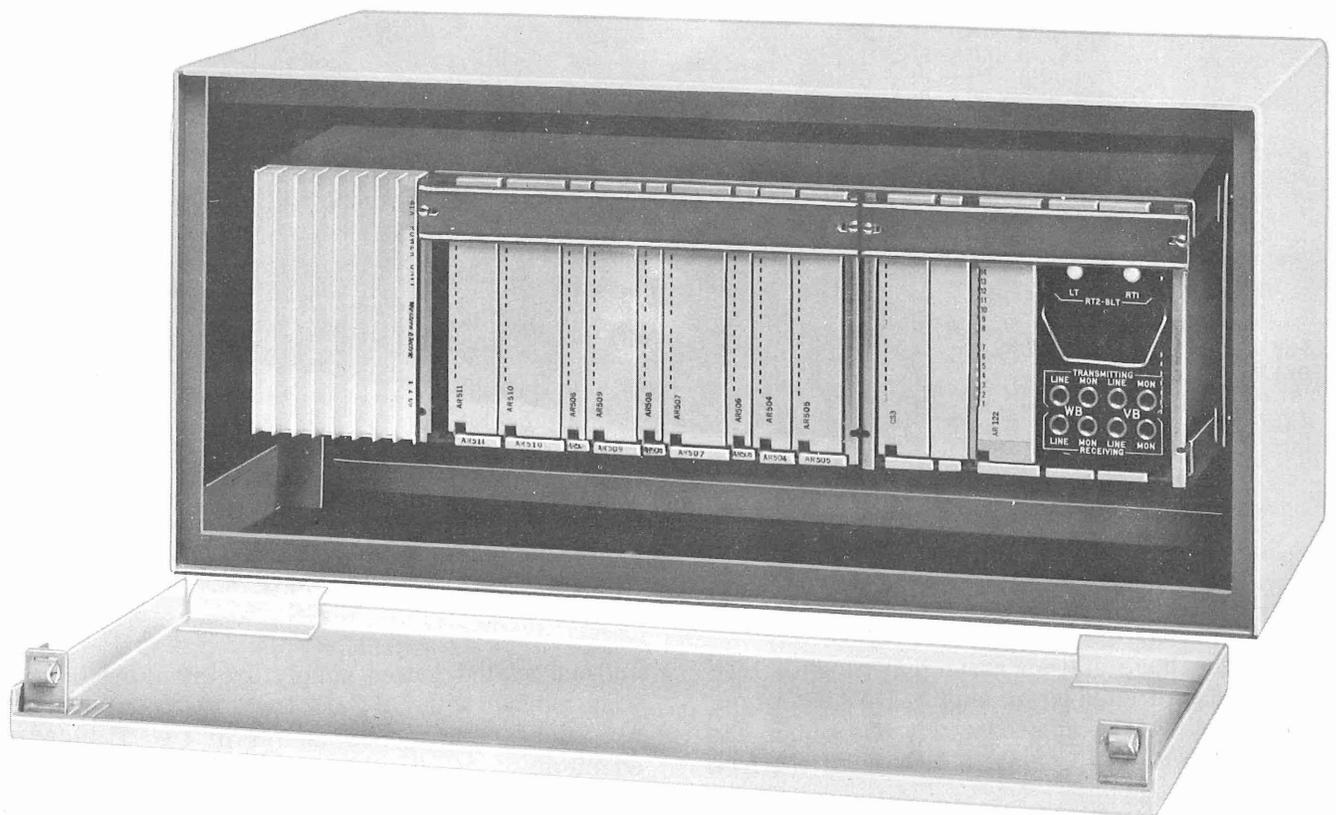
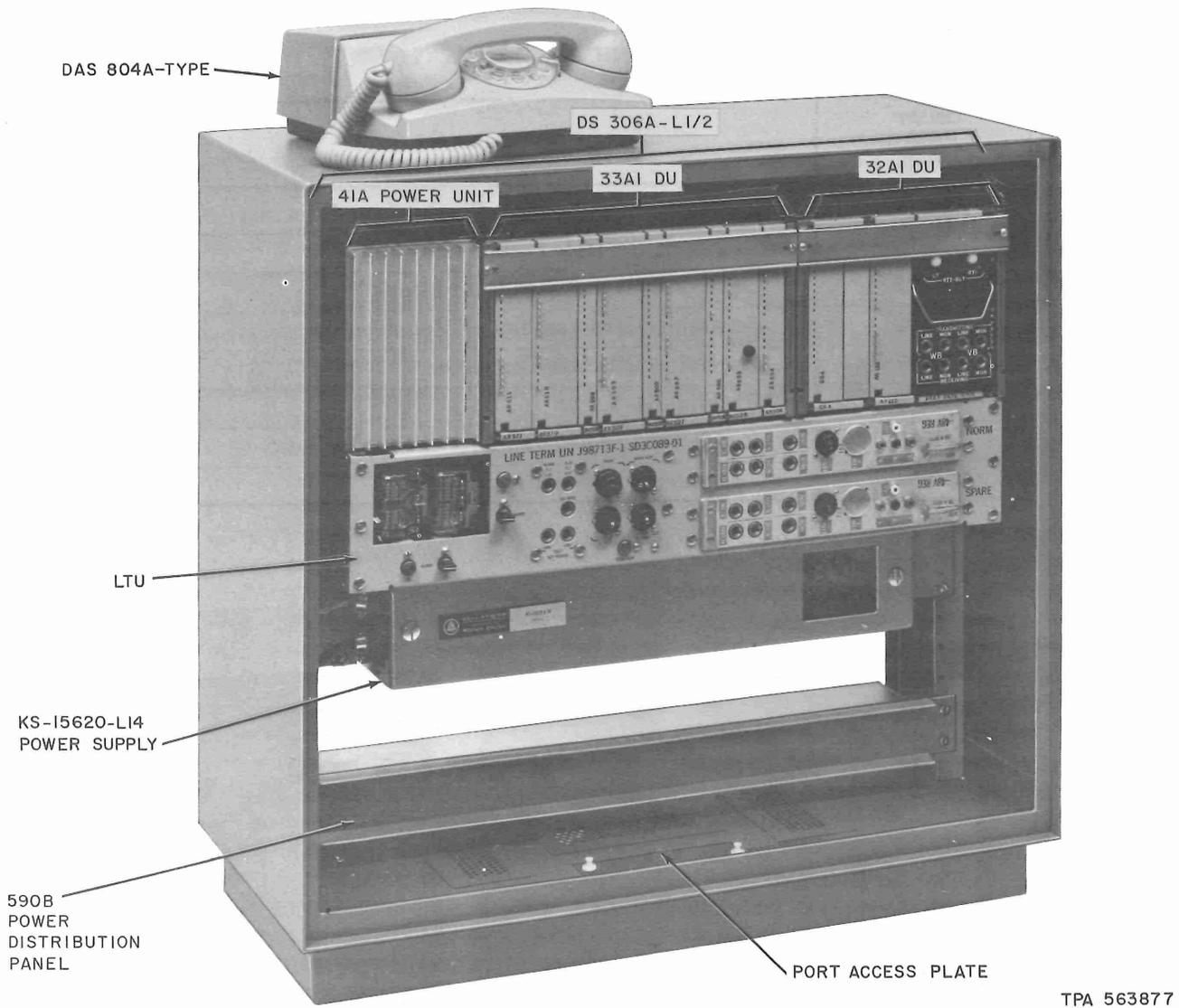


Fig. 3—Data Set 306A-L1/2 in a KS-20018-L1 Cabinet

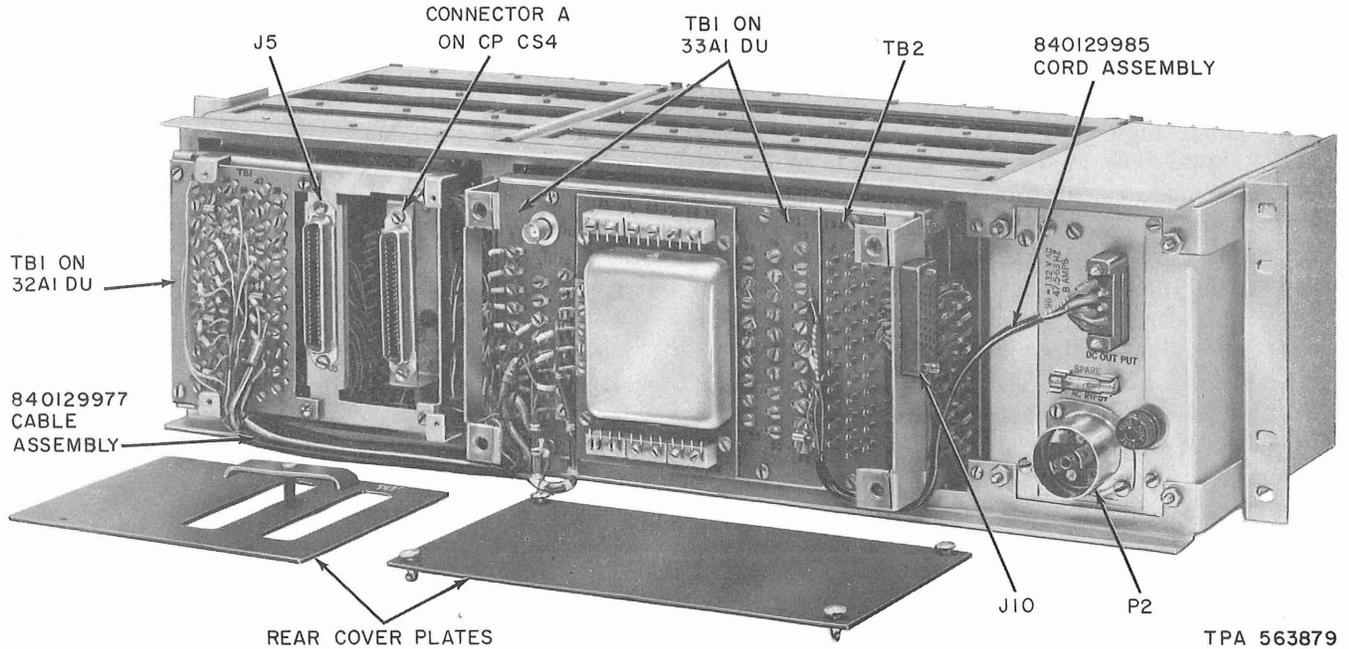


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Fig. 4—Data Set 306A-L1/2 With LTU and KS-15620-L14 Power Supply

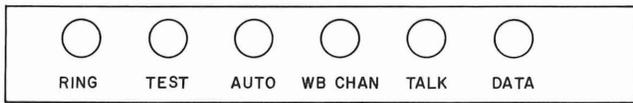
2.11 The above station arrangement with LTU and associated power supply, DAS 804A-type, and cabinet weighs approximately 93 pounds and occupies a vertical space of 16 inches. If the LTU

and associated power supply are mounted in the same cabinet with DS 306A-L1/2, the power supply has to be mounted by means of two P-426535 adapters.



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Fig. 5—Terminal Board and Connector Identification on the Rear of Data Set 306A-L1/2



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Fig. 6—Data Auxiliary Set 804A5 Key Designations When Used With Data Set 306A-L1/2

2.12 For rack-mounting purposes, the height of each component in the station is given below:

COMPONENT	HEIGHT (INCHES)
Data Set 306A	6
T1 Line Terminating Unit	4
KS-15620-L14 Power Supply	3-1/2
590B Panel	1-3/4

3. FUNCTIONAL DESCRIPTION

DATA SET 306A-L1

3.01 The intended application for DS 306A-L1 is for use in the wideband data test bay. Information concerning the use of DS 306A-L1 in the test bay is covered in Engineering Letter (EL) 1232.

DATA SET 306A-L1/2

3.02 The DS 306A-L1/2 is normally located on the customer's premises and provides the interface between his business machine equipment and the wideband data transmission system. The transmission system provides a full-duplex wideband data channel for the transmission of synchronous data at 1.344 Mb/s. In addition to the wideband channel, a voice frequency coordination circuit is optionally provided. This circuit is used for transmission of the remote test tone and for voice communication if desired. The voice-frequency circuit may be provided with a telephone set or DAS 804A-type. The DAS 804A-type can be used as a typical telephone set or it can be used to provide partial control or to provide DATA-PHONE

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features. Figure 7 is a block diagram of a wideband data station using DS 306A-L1/2 which will be described in the following paragraphs.

3.03 Since logic diagrams are used to describe signal flow in the data set, refer to Fig. 8, when necessary, for the meanings of the logic symbols that will be used in the description.

3.04 The 1.344-Mb/s data transceiver (33A1 DU) at the originating station accepts the customer's 1.344-Mb/s data and converts it to a 1.544 Mb/s bipolar pulse stream. The 200 kilobit per second (kb/s) difference between the customer and line bit rates is due to the data being organized in frames (Fig. 9) such that every 193rd line bit is a framing bit that alternates between a 1 and a 0. Within the frame, every 8th bit is a stuffing bit, which is a 1. The stuffing bits are necessary to keep the T1 repeaters in synchronization.

3.05 On the receiving end, the framing and stuffing bits are removed and the 1.344-Mb/s data stream is regenerated and transmitted to the business machine.

3.06 The transmitting portion of the data transceiver derives its timing from a 1.544-MHz master clock. The clock is applied to the transmit bit rate converter where the framing generator removes clock pulses corresponding to the framing and stuffing bit time slots. The resulting output is a staggered 1.344-MHz clock (1.544-MHz clock minus framing and stuffing bits) that is smoothed by the 1.344-MHz clock recovery to produce the 1.344-MHz clock, serial clock transmit (SCT), supplied to the business machine. The SCT signal must be returned to the data set on the SCTE leads to insure that, no matter what the length of the line between the customer and the data set is, the clock (SCTE) and data (SD) are always in phase at the data set. The business machine clocks the data onto the SD leads in proper phase with the SCTE signal.

3.07 The SD and SCTE signals from the customer are passed to the customer high-speed data interface via the cable terminators. From the terminators, the signals go to a regenerator and the output is "ANDed" with an inverted transmit gate 1 (XG1) signal. For information on the derivation of XG1, refer to the data station configuration desired. If the XG1 signal is a 0, then the SD signal is allowed to be applied to the scrambler where a quasi-random sequence is added

to the send data. The SD output from the scrambler is written into the elastic store in the transmit bit rate converter on negative-going transitions of SCTE. The data is read out of the elastic store at a 1.544-Mb/s rate with the staggered 1.344-MHz clock. Framing and stuffing bits are added to the resulting data stream producing the 1.544-Mb/s data.

3.08 The 1.544-Mb/s data from the transmitting bit rate converter enters the binary-to-bipolar converter in the transmit line circuit where it is converted to a bipolar pulse stream. The data is then passed through the equalizer and transmitted through the 32A1 DU to the T1 line terminating unit and on to the T1 line.

3.09 On the receive end, after passing through the T1 LTU and the 32A1 DU, the T1 bipolar line signal is applied to the bipolar-to-binary converter, in the receive line circuit, where it is converted to a binary signal and 1.544-MHz clock is recovered. A bipolar violation detector is included on the receiving 1.544-Mb/s bipolar line interface board (AR505) to flash a light, located on the faceplate of CP AR505, every time there is a bipolar violation in the input line signal. A bipolar violation occurs whenever two plus pulses have been received without an intermediate minus pulse or vice versa.

3.10 The framing detector monitors the 1.544-Mb/s data with framing pulses from the framing generator and provides control information to the framing generator to establish frame synchronization. The clock pulses corresponding to the framing and stuffing bit time slots are removed from the 1.544-MHz clock producing the staggered 1.344-MHz clock. This clock is used to read the receive data into the elastic store. The data is then descrambled and passed to the high-speed data interface over the RD leads, along with the 1.344-MHz received clock on the SCR leads. The RD and SCR signals go to a regenerator and the output is ANDed with an inverted RG signal. For information on the derivation of RG, refer to the data station configurations. The output from the AND gate is sent to the business machine over the RD leads along with the signal on the SCR leads.

3.11 Customer interface signals and detection of frame sync are used to control the flow of signals through the data set. For more detailed

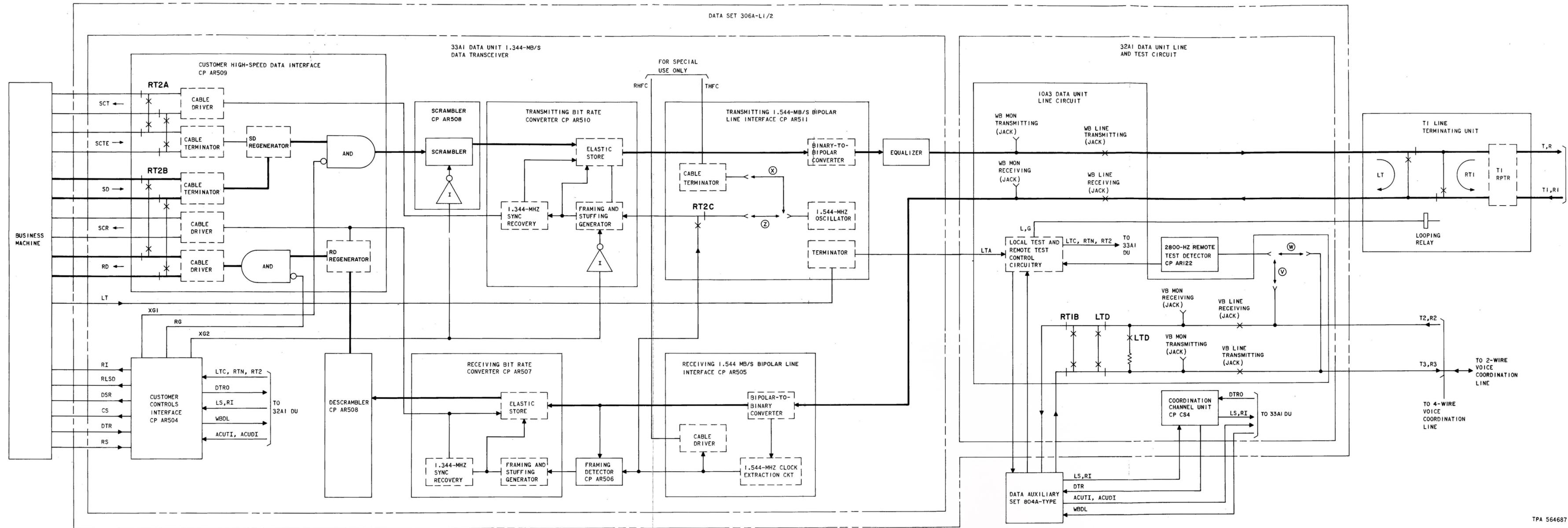
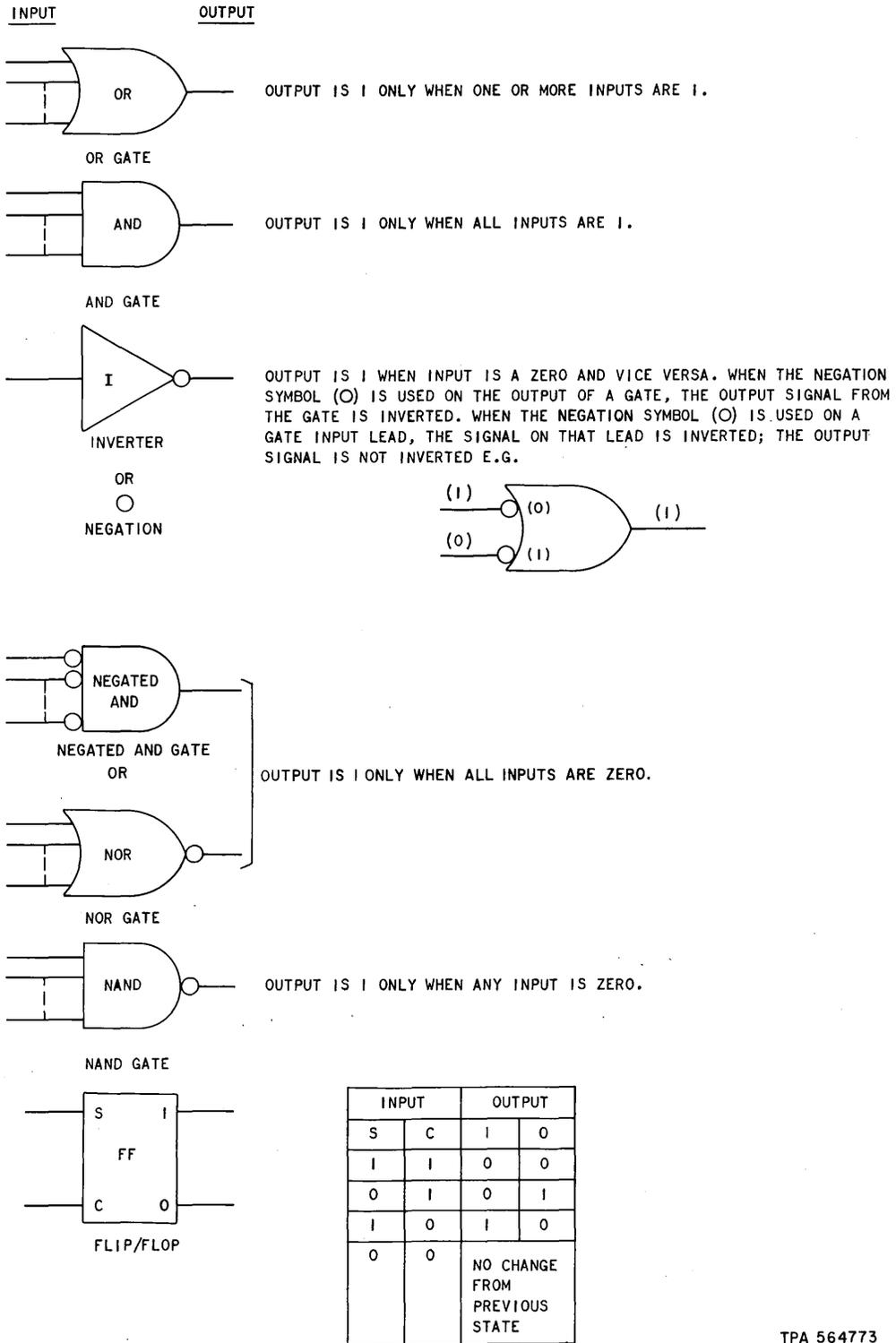


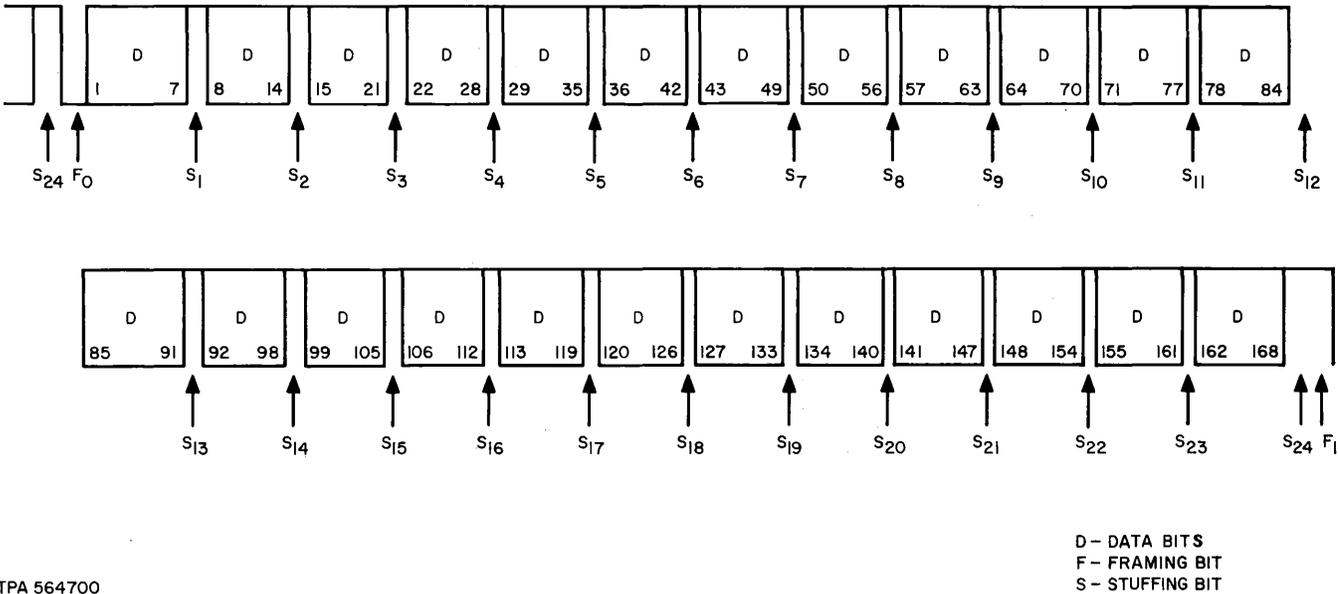
Fig. 7—Block Diagram of a Wideband Data Station Using Data Set 306A-L1/2

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Fig. 8—Logic Symbol Description



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Fig. 9—Arrangement of Data, Stuffing, and Framing Bits

information concerning these control features, refer to the data station configuration desired.

LOCAL AND REMOTE TESTS

3.12 The wideband data station using DS 306A-L1/2 provides two test features: local test (LT) and remote test (RT). The 32A1 DU in DS 306A-L1/2 provides these two test features. The voice coordination circuit must be supplied with the data station in order for the remote test to be performed. The two test features are described as follows:

(a) **Local Test (LT)**—The local test condition disconnects the station from the T1 line at the LTU and establishes a loopback, allowing the customer's data to be transmitted through the complete data set and to be checked by the customer. When the data set is placed in the LT mode, relays operate to connect the transmit line circuits to the receive line circuits in the LTU. The data set can be placed in the local test mode in one of the following ways:

- (1) Operating the LT key on the 10A3 DU
- (2) Depressing the TEST button on DAS 804A-type, when provided

- (3) Having the customer establish an ON signal on the LT lead of the customer interface.

The local test condition also loops the T1 line back to the telephone central office to allow a signal to be maintained on the T1 lines. The local test circuitry consists of relays LTA, LTB, LTC, and LTD in the 32A1 DU, the looping relay in the LTU, and the LT cable terminator on CP AR511. The indicating lamps and control keys for LT include the locking key LT and lamp LT on the 32A1 DU and the TEST key and TEST lamp on DAS 804A-type.

(b) **Remote Test (RT)**—The remote test consists of two loop-back conditions: remote test 1 (RT1) which loops the wideband facility in the LTU and remote test 2 (RT2) which loops wideband lines at the customer interface. Remote control of the two loop-back conditions is effected from a remote control signal detector found in CP AR122. The signal detector is bridged across the receive pair of a 4-wire voice coordination line, option V, or across the line when the voice coordination line is 2-wire, option W. A remote test signal of 2780 to 2820 Hz and between -8 and -25 dBm in power must be present at the detector circuit for a period of at least 6.5 seconds to guarantee proper activation of the

looping circuits. When a remote test signal of proper frequency is applied to the remote control signal detector, circuitry is activated that causes +18 volts to operate relays in the sequential relay circuit located in the 10A3 DU. The relays in the sequential relay circuit control the looping circuits for the remote test. The first application and release of the remote test signal (2800 Hz) activates RT1. Remote test 1 is indicated by the lighting of lamp RT1 on the 10A3 DU. The data unit remains locked in this state until the 2800-Hz signal is applied a second time to activate RT2. Remote test 2 is indicated by the combination of lighted lamps RT1 and LT on the 10A3 DU. A third application and removal of the 2800-Hz signal restores the normal operating state. The station can also be put in remote test by depressing the LRT key on the 10A3 DU instead of having a 2800-Hz tone applied at a wideband test bay.

3.13 The RT1 condition allows remote testing of the T1 line facility on a loop-back basis with the wideband data station disconnected. The data set can be placed in the RT1 mode under the control of a wideband data test bay at a telephone central office or by depressing the LRT button on the 10A3 DU for approximately 7 seconds. Looping of the wideband line is performed by the looping relay in the T1 LTU. The 32A1 DU provides the control for the looping action and all related supervisory information. Loop-back circuitry in the wideband path of the 32A1 DU is bypassed by means of option A. The same looping relay in the LTU is operated when LT or RT1 is activated (Fig. 7). The RT1 circuitry consists of the looping relay in the LTU and the 2800-Hz detector and the sequential relay circuitry in the 32A1 DU. The indicating lamps and control key for RT1 include indicating lamp RT1 and the LRT key on the 32A1 DU, and the TEST lamp on DAS 804A-type.

3.14 The RT2 condition allows testing of the complete data set from a wideband data test bay. The wideband data lines are looped at the business machine interface with the business machine disconnected. The data set is placed in the RT2 mode under the control of a wideband data test bay at a telephone central office or by depressing the LRT key on the 10A3 for approximately 7 seconds after completing RT1. The RT2 circuitry consists of relays RT2A, RT2B and RT2C, the 2800-Hz detector, and the sequential relay circuit in the 32A1 DU. The indicating lamps and control

key consist of lamps RT1, LT, and the LRT key on the 32A1 DU, and the TEST lamp on DAS 804A-type.

3.15 Figure 7 shows the location of relays and contacts in LT, RT1, and RT2. When DS 306A-L1/2 is placed in the local test, relay action in the 10A3 DU operates the looping relay in the LTU via the L and G leads.

3.16 A lighted LT lamp on the 10A3 DU indicates that the data set is in the LT mode. When the data set is not in the LT mode, the 10A3 DU delivers a ground to the 33A1 DU over the LTC lead. This ground is removed when the data set is in the LT mode.

3.17 When DAS 804A-type is used with the data set, the line-looping for RT1 is preceded by the transmission of a 2025-Hz answer-back tone from DAS 804A-type as a verification that the remote test control signal has been detected and acted upon. If the 117-volt ac power is interrupted during the remote test sequence, the sequence will be interrupted and the station will be placed in the normal nontest state.

WIDEBAND DATA STATION USING DATA SET 306A-L1/2

3.18 In this arrangement, a voice telephone line is provided for the transmission of the remote test control signal and also for voice communication if desired. A typical telephone set may be provided with the voice line for communication. The DS 306A-L1/2 must connect to the telephone line in order to provide a transmission path for the 2800-Hz remote test control tone. The data set is continuously on line and data may be processed as long as a good framing signal is received. The condition of the voice line has no effect on the capability of the wideband service to process data.

A. Interface Leads

3.19 The two types of customer interface signals, high-speed and control, are transmitted over twisted pair conductors. The customer high-speed interface signals use balanced dc circuits and the customer control interface signals use unbalanced voltage circuits. Refer to Part 5 for a detailed explanation of the interface leads.

3.20 A mark or binary one on the high-speed data leads, SD and RD, is defined as the

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A lead being more negative than the B lead. A signal more negative than -3 volts appearing on the control leads results in an OFF condition and a signal more positive than +3 volts results in an ON condition.

3.21 Pin assignments for the interface signal test points on TB2 on the rear of the 33A1 DU are given in Table B. Recommendations regarding assignment of pairs in the customer-provided cable, in order to reduce the possibility of crosstalk between the various leads and assure proper operation, are given in the Bell System Data Communications Technical Reference entitled Wideband Data Set 306-Type Interface Specification.

3.22 The state of the control signals can be derived using the logic diagram in Fig. 10. The data set can transmit and receive data when leads XG1, XG2, and RG are 0 and DSR, CS, and RLSD are 1. The RDF input is a 1 when the data set is receiving framing information from the other end and a 0 at all other times. The LTC and RTN inputs are 1 when the data set is in a no-test condition and are 0 during testing. The RS and DTR inputs are 1 when the customer supplies positive voltages on these leads and are 0 when the customer supplies negative voltages. All of the inputs that are options are 1 when the option is strapped in.

B. Options

3.23 Certain options are available for use in the 32A1 DU and the 33A1 DU when they are part of the station using DS 306A-L1/2. Table C lists the options available in this type of station arrangement. A description of each option is given in Part 4.

C. Operational Sequence

3.24 The flow of signals over the customer control interface leads is sequential once operation of the data set has started. Figure 11 shows the sequence of signal flow over the interface leads before data is transmitted or received.

3.25 In this station configuration, the framing signal is continuously monitored. The permanent answer option (W) and permanent line status option (S) are strapped in at both stations. When DTR is on at the data station, the data set ready (DSR) lead becomes a 1 and the XG2 lead

becomes a 0. The station transmits framing pulses when XG2 lead becomes 0.

3.26 When framing is received and frame sync is established at a data station, the RDF lead goes to a 1, then the RG lead goes to 0 along with the RLSD lead going to 1. The 0 on the RG lead allows the received data to be transmitted to the business machine. If the RS lead is ON, the CS lead goes to a 1 and the XG1 lead goes to 0 allowing the customer's send data (SD) to be transmitted.

D. Attendant Operation

3.27 Since the data stations are in frame sync whenever DTR is ON, the customer must only turn his business machine on in order to send or receive data. The telephone set can be used while data is being transmitted and/or received without affecting data transmission.

3.28 The customer can place the data station in the local test mode, if necessary, by operating the LT key on the 10A3 DU. The normal procedure for placing the data set in remote test is a 2800-Hz tone from the central office. The customer can also place the data station in remote test 1, if necessary, by depressing the LRT key on the 10A3 DU for approximately 7 seconds. The customer can place the data station in remote test 2, if necessary, by depressing the LRT key on the 10A3 DU for approximately 7 seconds after completion of RT1.

WIDEBAND DATA STATION USING DATA SET 306A-L1/2 WITH DATA AUXILIARY SET 804A-TYPE

3.29 In this station configuration, there are three arrangements with DAS 804A-type functioning as a typical telephone set, providing limited control, or providing DATA-PHONE features. The following paragraphs describe the three different arrangements.

A. Wideband Data Station Using Data Set 306A-L1/2 With Data Auxiliary Set 804A-Type Functioning as a Typical Telephone Set

3.30 This type of station arrangement functions basically the same as 3.18 through 3.28. Wideband data transmission is independent of the status of the voice circuit. Options are as listed in Table C. The DAS 804A-type is connected to the telephone line via the 32A1 DU. The DAS

TABLE B
PIN ASSIGNMENT OF CUSTOMER INTERFACE LEADS

PIN	ASSIGNMENT*	EIA (RS-232-C) DESIGNATION
A	Protective Ground	AA
B	Signal Ground	AB
C	Request-to-Send	CA
D	Clear-to-Send	CB
E	Data Set Ready	CC
F	Received Line Signal Detector	CF
H	Data Terminal Ready	CD
J	Ring Indicator	CE
K	Local Test	
L	Ground	
M	Ground	
N	Ground	
P	Send Data (A)	
R	Received Data (A)	
S	Send Data (B)	
T	Received Data (B)	
U	Serial Clock Transmit External (A)	
V	Serial Clock Receive (A)	
W	Serial Clock Transmit External (B)	
X	Serial Clock Receive (B)	
Y	Serial Clock Transmit (A)	
a	Serial Clock Transmit (B)	
d	Ground	
g	Ground	
m	Test Set Power†	

*Pin B is circuit ground. The leads labeled Ground are used to isolate the EIA leads and are connected to pin B (signal ground) within the data set.
†This lead is reserved for future use as a source of test power (+18V) to be applied by means of the F option in 33A1 DU.

804A-type provides for voice communication as well as the following additional features:

- (a) Ring indication (RI) to the customer
- (b) LT control (TEST key)
- (c) An indication that data can be received (WB CHAN lamp)

TABLE C

**OPTIONS IN WIDEBAND DATA STATION USING DATA SET 306A-L1/2
WITH TELEPHONE SET AND DATA AUXILIARY SET 804A-TYPE
FUNCTIONING AS TYPICAL TELEPHONE SET**

32A1 DATA UNIT	33A1 DATA UNIT		DATA AUXILIARY SET 804A-TYPE
REQUIRED*	REQUIRED	PERMISSIBLE	REQUIRED*
A	G‡	N	F
S	S	Q	H
V or W†	W	R	J or M¶
X	Y		N
ZG	X or Z§		V
			ZA
			ZB or ZD**

* There are no permissible options in the 32A1 DU and DAS 804A-type.

† The V option is required when the voice line is 4-wire and the W option is required when the voice line is 2-wire.

‡ Can be removed to reduce ground noise problems.

§ The X option is required when the transmitting clock is external and the Z option is required when the transmitting clock is internal.

¶ The J option is required when the voice line is 2-wire and the M option is required when the voice line is 4-wire.

** The ZB option (rotary dial) is required on DASs 804A1 and A5 and the ZD option (TOUCH-TONE pad) is required on DASs 804A3 and A7.

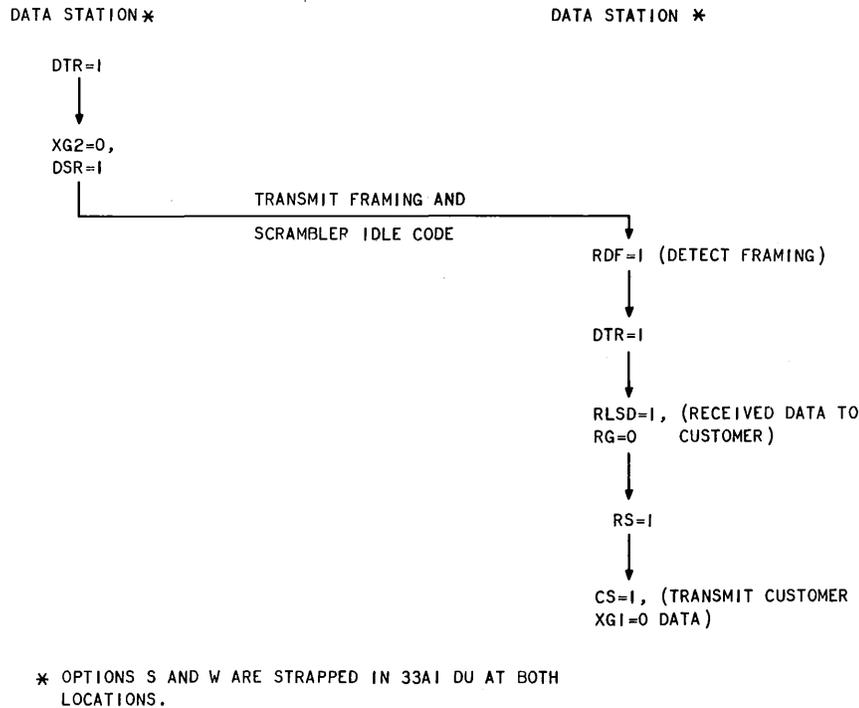
part of this type of station arrangement, are listed in Table D. The options are described in Part 4.

Operational Sequence

3.35 The signal flow over the customer control interface leads follows a sequential pattern of operation as shown in Fig. 13. The sequence of operation for this data station configuration is similar to the operation in the previous configuration as described in 3.25; also, whenever the RLSD lead is activated, the wideband data lamp lead goes to 1 and the WB CHAN lamp on DAS 804A-type illuminates. The DAS 804A-type can be used for communication between stations without affecting the transmission of data.

Attendant Operation

3.36 Data terminal ready (DTR) must be on at the business machine and DAS 804A-type must be off-hook, or on-hook in the data mode, at both stations in order to send or receive data. To place a call to the far end using DAS 804A-type, remove the handset, depress the TALK key, and then depress the RING key. To answer a call using DAS 804A-type, the TALK key should be depressed and, after ringing is detected, remove the handset and answer the call. The WB CHAN lamp on DAS 804A-type will be illuminated when data is capable of being received. The DATA key on DAS 804A-type must be depressed before placing the handset on-hook to prevent loss of data transmission.



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Fig. 11—Operational Sequence of Data Set 306A-L1/2 With Telephone Set or Data Auxiliary Set 804A-Type Functioning as a Typical Telephone Set

3.37 The data station can be placed in the LT, RT1, and RT2 modes by following the procedures in 3.28. The TEST lamp should light when the TEST key is depressed on DAS 804A-type.

C. Wideband Data Station Using Data Set 306A-L1/2 With Data Auxiliary Set 804A-Type Control Providing DATA-PHONE Features

3.38 In this arrangement, wideband data transmission is under the control of DAS 804A-type and is similar to DATA-PHONE operation. The DAS 804A-type must be in the data mode for data transmission. Simultaneous data transmission and talking is not possible. If the data station is in the data mode when the TALK key on DAS 804A-type is depressed, data transmission will be interrupted. The DAS 804A-type, in addition to providing voice communication between stations, provides the following features:

- (a) Ring indication (RI) to the customer
- (b) LT control (TEST key)

(c) An indication that data can be received (WB CHAN lamp)

(d) An indication of test conditions (TEST lamp).

Interface Leads

3.39 For a description of the customer control interface leads and the customer high-speed interface leads, refer to 3.19 through 3.21. The control interface signals can be derived using the logic diagram in Fig. 14. Refer to 3.22 for an explanation of the logical states of most of the inputs to the logic gates. Line status (LS) becomes a one 2 to 5 seconds after the DATA key on DAS 804A-type is depressed and remains a 1 as long as DAS 804A-type is in the data mode. The ACUTI input is a 1 whenever the TALK key on DAS 804A-type is depressed and off-hook. The ACUDI input is a 1 whenever DAS 804A-type is placed in the data mode.

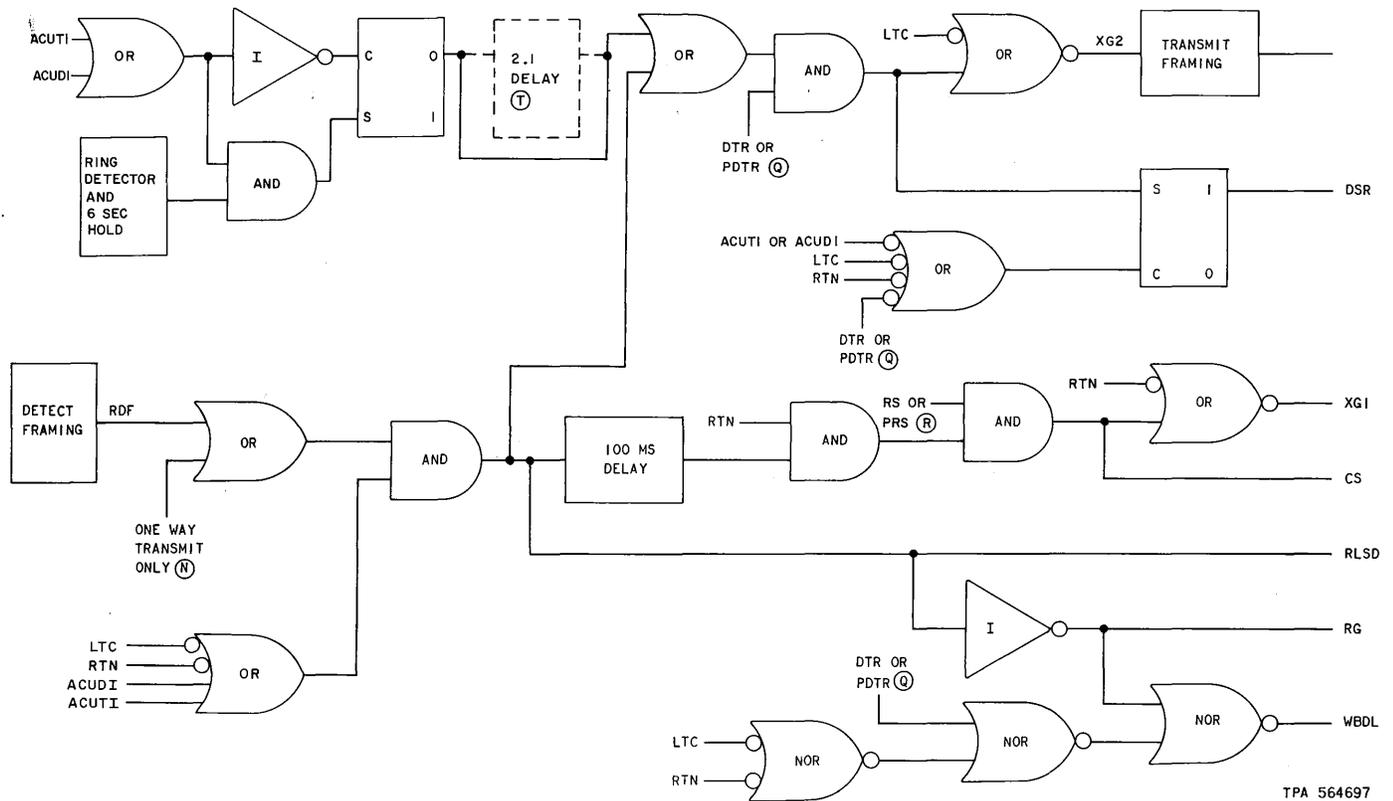


Fig. 12—Logic Diagram of Data Set 306A-L1/2 With Data Auxiliary Set 804A5 Providing Limited Control

Options

3.40 The options available for use in the 32A1 DU, 33A1 DU, and DAS 804A-type, when they are part of this type of station arrangement, are listed in Table E. The options in the table are described in Part 4.

Operational Sequence

3.41 The signal flow over the customer control interface leads in DS 306A-L1/2 with DAS 804A-type in control of line status follows a sequential pattern of operation as shown in Fig. 15. At both data stations, DTR must be on at the business machine and DAS 804A-type must be on-hook in the data mode. Framing pulses and scrambler idle code are transmitted and received at each station. No data transmission is possible from either of the stations until after the DAS 804A-type has been put in the data mode at the particular station. Customer data cannot be transmitted until the LS control becomes a 1 and the XG1 control becomes a 0. The change in the LS control occurs 2 to 5

seconds after the DATA key is depressed when transferring from the talk to the data mode. The LS lead remains at a 1 as long as the DAS 804A-type remains in the data mode.

Attendant Operation

Placing a Data Call Manually

3.42 To place a data call using DAS 804A-type, DTR should be ON at the originating and the answering data stations. Lift the handset, with the TALK key depressed, and depress the RING key. At the answering station, the RING lamp on DAS 804A-type will light when ringing is being received.

Answering Data Call Manually

3.43 To answer a data call using DAS 804A-type, lift the handset, with the TALK key depressed, after ringing is heard. Now the attendants at both stations can converse with each other. The WB CHAN lamp on DAS 804A-type

TABLE D

**OPTIONS IN WIDEBAND DATA STATION USING DATA SET 306A-L1/2
WITH DATA AUXILIARY SET 804A-TYPE PROVIDING LIMITED CONTROL**

32A1 DATA UNIT	33A1 DATA UNIT		DATA AUXILIARY SET 804A-TYPE	
	REQUIRED*	REQUIRED	PERMISSIBLE	PERMISSIBLE
A	G§	N	F	B
J	S	Q	H	G
S	X or Z¶	R	J or M**	
ZB			N	
ZE			V	
ZF†			X, Y, or Z††	
ZG			ZA	
V or W‡			ZB or ZD‡‡	
X			ZM	

* There are no permissible options in the 32A1 DU.

† Required when voice line is 4-wire; otherwise omit.

‡ The V option is required when the voice line is 2-wire and the W option is required when the voice line is 4-wire.

§ Can be removed to reduce ground noise problems.

¶ The X option is required when the transmitting clock is external and the Z option is required when the transmitting clock is internal.

** The J option is required when the voice line is 2-wire and the M option is required when the voice line is 4-wire.

†† Use one of the three options that supplies closest to -12 dBm answer tone to the serving central office.

‡‡ The ZB option (rotary dial) is required on DASs 804A1 and A5 and the ZD option (TOUCH-TONE pad) is required on DASs 804A3 and A7.

will be illuminated when the data station is capable of receiving data.

Entering the Data Mode

3.44 Data cannot be transmitted until the stations are placed in the data mode from DAS 804A-type. After the attendants at both stations agree to enter the data mode, proceed as follows:

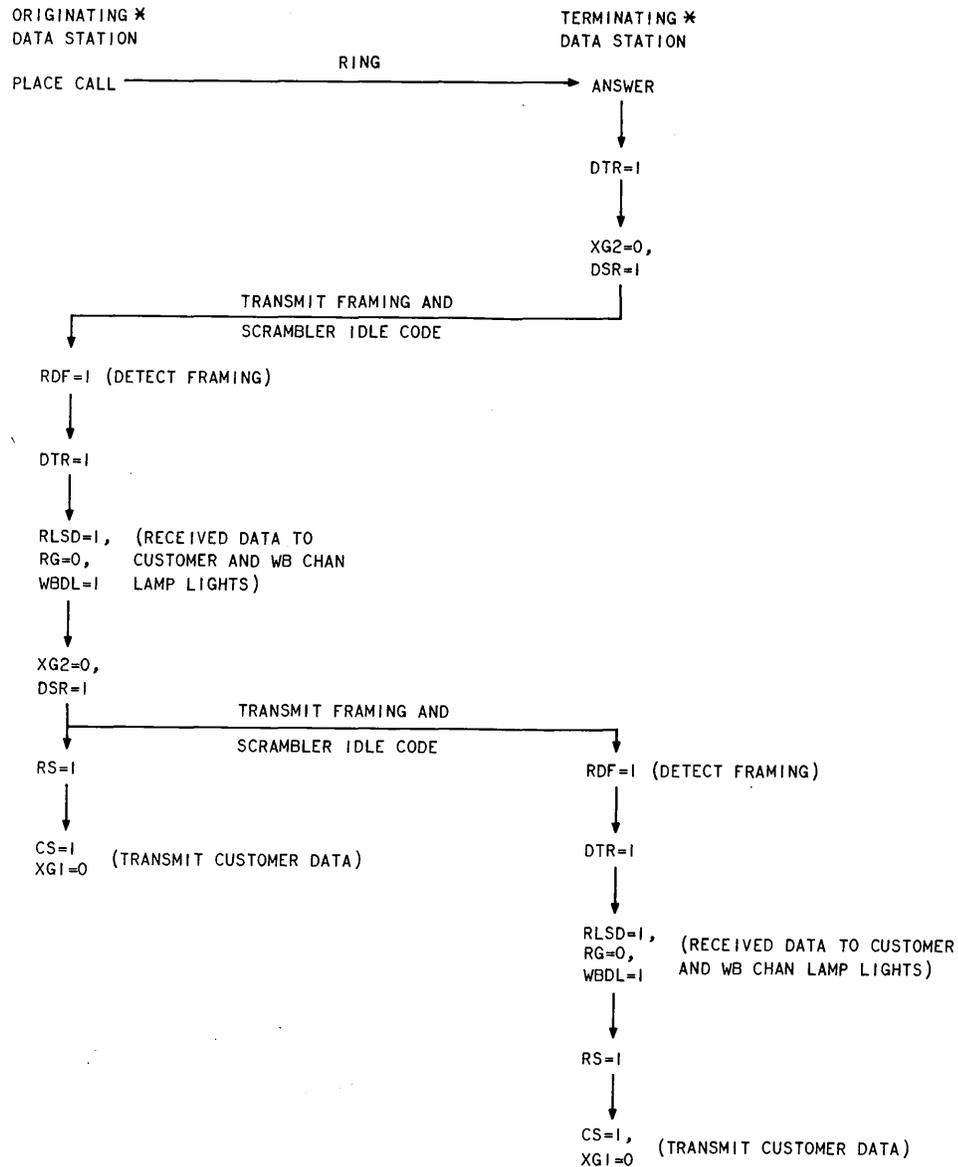
- (1) The attendant at the receiving station should depress the DATA key on DAS 804A-type and place the handset on-hook.

- (2) The attendant at the originating station should listen for a 2025-Hz tone and, when the tone ceases, depress the DATA key on DAS 804A-type and place the handset on-hook.

Returning to the TALK Mode

3.45 To go from the data mode to the talk mode, lift the handset and depress the TALK key on DAS 804A-type.

Placing the Data Station in the Automatic Answer Mode



* OPTION S IS STRAPPED IN 33A1 DU AT BOTH STATIONS.

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Fig. 13—Operational Sequence of Data Set 306A-L1/2 With Data Auxiliary Set 804A5 Providing Limited Control

3.46 To have a data call answered automatically, depress the AUTO key on DAS 804A-type and leave the handset on-hook.

Placing a Call to an Automatically Answered Station

3.47 When an originating station places a call to a station that is in the automatic answer

mode, the attendant at the originating station will hear a 2025-Hz tone when the receiving station detects ringing. When the tone ceases, depress the DATA key on DAS 804A-type and place the handset on-hook.

3.48 The data station can be placed in the LT, RT1, and RT2 modes by following the procedure given in 3.28. The TEST lamp will light

when the TEST key on DAS 804A-type is depressed and when the station is in one of the three test modes.

4. OPTIONS

4.01 Option strapping is available in the 32A1 DU, 33A1 DU, and DAS 804A-type and the options used in the data station using DS 306A-L1/2 will depend on the station configuration. The options in the 32A1 DU, 33A1 DU, and DAS 804A-type are given in the following paragraphs.

32A1 DATA UNIT OPTIONS

4.02 Options in the 32A1 Data Unit that pertain to the wideband data station using DS 306 are described as follows:

- **A Option**—Provides a wideband transmission path through the 32A1 DU in which the remote test and local test looping configuration is bypassed. This permits the local test and remote test loop-back functions to be performed in the LTU. Not factory furnished.
- **J Option**—Completes the answer-back tone and transmitting voice-frequency data path of an associated DAS 804A-type. The option completes these paths by shorting the DAS 804A-type mounting cord leads Q to D1, D2 to ACU DATA MODE, and D1 to L2. Factory furnished.
- **S Option**—Must be provided to make DTR control dependent upon DTR option selected in the 33A1 DU.
- **V Option**—Used when the voice-frequency circuit is 4-wire to provide a path for the remote test signal to reach the remote test detector circuit and to provide operation of relay RT1B during RT1 and relay LTD during LT. Factory furnished.
- **W Option**—Used when the voice-frequency circuit is 2-wire to provide a path for the remote test signal to reach the remote test detector circuit. Not factory furnished.
- **X Option**—Provides a control path for LT so that the LT looping can be done in the LTU. Factory furnished.

- **ZB Option**—Provides the path for the ACU TALK IND function when DAS 804A-type is used. Options ZB and ZH are mutually exclusive. (The ACU TALK IND function from DAS 804-type appears on J5-4 when the DAS is 804A-type and on J5-43 when the DAS is 804M-type. Not factory furnished.

- **ZE Option**—Terminates an associated DAS 804-type operated to the data mode when a voiceband data set is not provided. Not factory furnished.

- **ZE Option**—Connects the operating path to the RVD relay to provide switching of the receive pair of a 4-wire full-period point-to-point voice coordination line to the telephone receiver of an associated DAS 804A-type operated to the talk mode.

- **ZG Option**—Provides a contact closure to operate an external looping relay in the LTU when the data unit is placed in the local test mode. Option ZG is used with option A. Not factory furnished.

33A1 DATA UNIT OPTIONS

4.03 Options in the 33A1 Data Unit that pertain to the wideband data station using DS 306 are described as follows:

- **G Option**—Connects circuit ground to frame ground. This option is normally used unless ground noise problems force a floating ground for satisfactory operation. Factory furnished.
- **N Option**—One-way transmit only. Used to permit transmit-only operation without requiring reception of framing signal. Not factory furnished.
- **Q Option**—Provides permanent data terminal ready. Not factory furnished.
- **R Option**—Provides permanent request to send. Not factory furnished.
- **S Option**—Provides permanent line status. Permits transmission of wideband data while talking over the voice lines. Factory furnished.

TABLE E

**OPTIONS IN WIDEBAND DATA STATION USING DATA SET 306A-L1/2
WITH DATA AUXILIARY SET 804A-TYPE CONTROL
PROVIDING DATA-PHONE FEATURES**

32A1 DATA UNIT	33A1 DATA UNIT		DATA AUXILIARY SET 804A-TYPE	
	REQUIRED*	REQUIRED	PERMISSIBLE	PERMISSIBLE
A	G§	N	F	B
J	X or Z¶	Q	H	G
S		R	J or M**	
ZB			N	
ZE			V	
ZF†			X, Y, or Z††	
ZG			ZA	
V or W‡			ZB or ZD‡‡	
X			ZM	

* There are no permissible options in the 32A1 DU.

† Required when voice line is 4-wire; otherwise omit.

‡ The V option is required when the voice line is 2-wire and the W option is required when the voice line is 4-wire.

§ Can be removed to reduce ground noise problems.

¶ The X option is required when the transmitting clock is external and the Z option is required when the transmitting clock is internal.

** The J option is required when the voice line is 2-wire and the M option is required when the voice line is 4-wire.

†† Use one of the three options that supplies closest to -12 dBm answer tone to the serving central office.

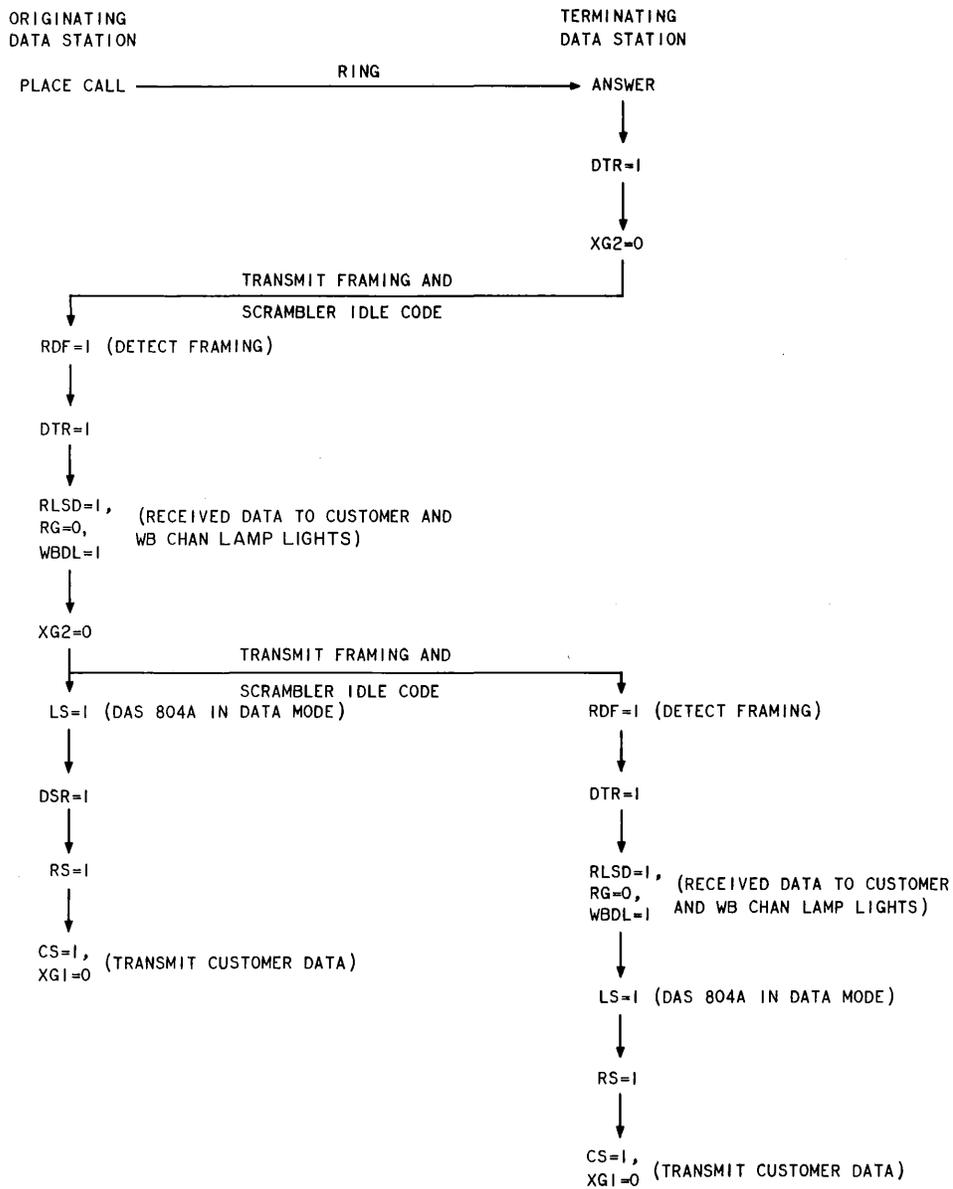
‡‡ The ZB option (rotary dial) is required on DASs 804A1 and A5 and the ZD option (TOUCH-TONE pad) is required on DASs 804A3 and A7.

● **T Option**—Provides 2-second billing delay to prevent transmission or reception of data until after billing has been initiated. Not factory furnished.

● **W Option**—Provides simulated answer when there is no DAS 804A-type control. Not factory furnished.

● **X Option**—Allows an external clock for the transmitting 1.544-Mb/s bipolar line interface. Not factory furnished.

● **Y Option**—Provides permanent off-hook by grounding the ACUDI lead when DAS 804A-type is not provided. Not factory furnished.



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Fig. 15—Operational Sequence of Data Set 306A-L1/2 With Data Auxiliary Set 804A5 Control Providing DATA-PHONE Features

- **Z Option**—Provides internal clock connection for the transmitting 1.544-Mb/s bipolar line interface. Factory furnished.

DATA AUXILIARY SET 804A-TYPE OPTIONS

4.04 Options in Data Auxiliary Set 804A-type that pertain to the wideband data station using DS 306 are described as follows:

- **B Option**—Provides a portion of the automatic answer mode. May be left installed in all cases without affecting data transmission. Factory furnished.
- **F Option**—Provides lighting of the TALK lamp through the T (TALK) relay contacts when the TALK key is depressed. Not factory furnished.
- **G Option**—Provides the remainder of the operate path for automatic answer mode. Provides the locking AUTO key. Not factory furnished.
- **H Option**—Provides a balanced pair on DST and DSR instead of single signal lead with a common ground. Not factory furnished.
- **J Option**—Provides the proper network configuration for fixed 2-wire service. Factory furnished.
- **M Option**—Provides the proper network configuration for fixed 4-wire service. Not factory furnished.
- **N Option**—Connects the ringer circuit to the ringing receive pair, RING R and RING T. Not factory furnished.
- **V Option**—Provides a 600-ohm impedance on the line across leads D1 and D2. Not factory furnished.
- **X, Y, or Z Option**—Provides -12, -7, or -3 dBm answer-tone power, respectively. Use the option which furnishes nearest to -12 dBm to the serving central office. The X option is factory furnished.
- **ZA Option**—+18 volt data set power. Factory furnished.

- **ZB Option**—Provides the data auxiliary set with a rotary dial (11C apparatus unit). Factory furnished with DASs 804A1 and A5.
- **ZD Option**—Provides the data auxiliary set with a TOUCH-TONE pad (11G apparatus unit). Factory furnished with DASs 804A3 and A7.
- **ZM Option**—Removes the data auxiliary set compatibility with DS 203. Required to complete answer-back tone path. Factory furnished.

5. INTERFACE LEADS

HIGH-SPEED SIGNALS

5.01 The customer high-speed interface signals are described in the following paragraphs. Waveforms for each signal, as displayed on an oscilloscope, are discussed in 5.17.

5.02 **Serial Clock Transmit (SCT—Originates in Data Set):** The SCT is a 1.344-MHz balanced clock transmitted to the business machine over the SCT (A) and SCT (B) leads. The frequency accuracy of the clock is ± 0.003 percent. The SCT is used by the business machine to synchronize the clocking of data to the data set and to generate the SCTE signal. The symmetry of the signal is such that the difference between the width of the positive portion and the width of the negative portion of the cycle is within 0.10 of the period of the cycle.

5.03 **Serial Clock Transmit External (SCTE—Originates in Business Machine):**

The SCTE is the balanced transmit clock transmitted to the data set over the SCTE (A) and SCTE (B) leads. The SCTE signal is generated in the business machine from the SCT signal supplied from the data set. The SCT must be returned to the data set over the SCTE leads, and the send data signal must be properly aligned with the SCTE for proper transmission of data. The symmetry of the SCTE signal is measured at the data set connector with the leads terminated in the data set or in an external 100-ohm resistor. The symmetry of the signal is such that the difference between the width of the positive portion and the width of the negative portion of the cycle is within 0.20 of the period of the cycle. Since the cable between the business machine and the data set is not expected to adversely

affect the clock symmetry, the above requirements should be substantially the same at the business machine connector.

5.04 *Send Data (SD—Originates in Business Machine):* The SD is a balanced signal transmitted to the data set over the SD (A) and SD (B) leads. The SD circuitry is designed to accept serial binary data from the business machine. The SD (A) lead should be negative with respect to the SD (B) lead for a mark or binary ONE condition. The SD signal must be properly aligned with the SCTE signal so that the SD signal changes state within 0.10 of a clock cycle of the positive-going transition of the SCTE (A) minus SCTE (B) signal as measured at the data set customer connector.

5.05 *Receive Data (RD—Originates in Data Set):* Receive data is a balanced signal delivered to the business machine on the RD (A) and RD (B) leads. The RD signal is regenerated and in phase with the Serial Clock Receive (SCR) signal. The signal changes state within 0.10 of a clock cycle of the positive-going transition of the SCR (A) minus SCR (B) signal. The RD circuit will be held in the mark-hold condition whenever the data set is not in frame sync. During the mark-hold condition, the RD (A) lead is negative with respect to the RD (B) lead and is equivalent to receiving a binary ONE. The mark-hold condition also occurs whenever the data set control signals are not in the proper condition for receiving data.

5.06 *Serial Clock Receive (SCR—Originates in Data Set):* The SCR is a balanced signal transmitted to the business machine on the SCR (A) and SCR (B) leads. The data set receiver derives the SCR bit synchronization signal from the received line signal. The symmetry of the SCR signal should be such that the difference between the width of the positive portion and the width of the negative portion of the cycle should be within 0.10 of the period of the cycle.

CONTROL SIGNALS

5.07 The following paragraphs describe the control interface signals that flow over the customer control interface leads between the business machine and the data set. A signal more negative than -3 volts appearing on the control leads results in an OFF condition and a signal more positive than +3 volts results in an ON condition.

5.08 *Data Set Ready (DSR—Originates in Data Set):* An ON condition on the DSR lead indicates to the business machine that the data set is capable of operating (not in a test mode). The data set can receive wideband data provided Receive Line Signal Detector (RLSD) signal is ON and can transmit wideband data provided Clear-to-Send (CS) signal is ON. The conditions for DSR depend upon options wired into the data set. In all cases, a DSR OFF condition indicates one of the following:

- (a) A local test, remote test, or power off condition
- (b) Data Terminal Ready (DTR) OFF
- (c) DAS 804A-type, when used for control, is on-hook and not in the data mode.

Requirements for DSR ON condition depend on the method of operation. The following modes of operation are available:

- (a) The station may be operated with the wideband data transmission dependent upon the placing of a call on the voice coordination channel.
- (b) An option may be used that disassociates the wideband data set control from the voice coordination channel and DAS 804A-type.

5.09 When operation is with wideband data transmission dependent upon placing a call on the voice coordination channel, DSR ON at the answering data set requires the following:

- (1) Data set power is ON.
- (2) Data set is not in the local test or remote test mode.
- (3) Data Terminal Ready is ON.
- (4) All delays inherent in setting up the call have elapsed.

At the originating data set, DSR ON requires all of the above and RLSD ON. Interruption of RLSD once DSR has been ON will not turn DSR OFF. DSR is turned off when the call is terminated.

5.10 When the wideband data set control is disassociated from the voice coordination

channel and DAS 804A-type, DSR requires the following.

- (a) Data set power is ON.
- (b) Data set is not in the local or remote test mode.
- (c) DTR is ON.

5.11 Data Terminal Ready (DTR—Originates in Business Machine): Signals on this circuit are generated within the business machine to control the holding and dropping of a wideband call and are required for the transmission of the framing signal. When automatic answer and/or call termination by the business machine are not required, the Q option (permanent DTR) may be installed in the 33A1 DU if desired by the customer.

5.12 Receive Line Signal Detector (RLSD—Originates in Data Set): The ON condition is an indication that the data set is in frame sync and is receiving good framing information over the T1 line from the distant data set and DTR is on at the distant end. An ON signal on this lead is one indication that signals on the RD lead are reliable. The RLSD ON signal is not produced unless DTR is ON. If DAS 804A-type is used, either the DAS 804A-type must be off-hook or it can be on-hook in the data mode, or the option that disassociates the control circuitry from DAS 804A-type for point-to-point operation must be wired in. The RLSD ON condition is also passed to the business machine when the data set is in a test mode.

5.13 Request-to-Send (RS—Originates in Business Machine): The RS signal must be in the ON condition to send wideband data. It can be wired permanently ON (option R) in the business machine or it can be wired permanently ON in the data set by the telephone company. The data set is capable of transmitting framing pulses and scrambler idle code so that bit synchronization may be maintained at the far-end data set independent of the RS signal.

5.14 Clear-to-Send (CS—Originates in Data Set): An ON condition on this lead indicates that the wideband data set is in a condition to permit the transmission of test signals in the local test condition or data signals. An ON condition on the CS lead requires that RLSD, LS, and RS

be ON. There is a time delay of approximately 0.1 millisecond built into the logic for the CS circuit that is measured from the time RLSD goes ON. The delay insures that the wideband data sets at both ends are in bit synchronization before CS is turned ON.

5.15 Ring Indicator (RI—Originates in Data Auxiliary Set 804A-Type): Signals on this lead are generated in DAS 804A-type and passed through the data set to the business machine to indicate to the business machine that a ringing signal is being received. The RI signal follows the ringing signal on the voice-frequency coordination line and is ON when ringing is present.

5.16 Local Test (LT—Originates in Business Machine): When the LT lead is ON, the data set is in the local test mode. The telephone lines are looped back to the telephone central office at the LTU, and the data set output is looped back to the data set. This permits the business machine to send to itself through the data set for local testing. When DAS 804A-type is used with the data set, a lamp lights under the TEST button on DAS 804A-type any time the local test circuit is operated or the data set is put in the remote test mode by the telephone company.

OSCILLOSCOPE PATTERNS

5.17 The oscilloscope patterns of the customer high-speed interface signals discussed in 5.01 were obtained by using a TEKTRONIX 422 oscilloscope with two times ten (X10) attenuation probes (one for each channel). Any approved oscilloscope may be used to obtain interface signal patterns, but the following paragraphs describe the setup of the 422 scope when obtaining the patterns. Before checking the interface signal patterns, carefully adjust the gain of both channels and compensation of both probes for identical response. Check the compensation and gain by connecting both probes to the same signal and setting both VOLTS/DIV switches on the scope to .01. Add the two signals algebraically with channel 2 inverted. Adjust the gain and compensation of one channel as required to approach a straight line trace. Perform the following steps to obtain the interface signal patterns:

- (a) Set the controls on the scope as follows:
 - (1) Mode switch to ALG ADD.

- (2) Pull the INVERT switch.
 - (3) VOLTS/DIV switches to .02.
 - (4) TRIGGERING source switch to EXT.
 - (5) TRIGGERING coupling switch to AC.
 - (6) TRIGGERING LEVEL switch to AUTO.
 - (7) TIME/DIV switch to 1 μ SEC.
 - (8) Pull the X10 MAG switch.
- (b) Connect both probes to the same signal and adjust the GAIN controls to get a straight line.

Note: Whenever the scope probes are connected to a signal, connect the probe ground leads to a common ground, such as the metal chassis.

- (c) Place both AC-GND-DC switches to GND and set trace on scope on the center line.
- (d) Place both AC-GND-DC switches to DC and connect a lead between the TRIG IN jack on the scope to TP9 on CP AR510 in the data set.
- (e) To obtain the **SCT signal** (Fig. 16), connect INPUT 1 probe to test point Y on TB2 (located on the rear of the 33A1 DU) and connect INPUT 2 probe to test point **a** on TB2.
- (f) Adjust the VARIABLE control on the TIME/DIV switch to get one cycle of the SCT signal in five vertical divisions (graticule lines).
- (g) Adjust the horizontal POSITION control until the positive-going transition of the SCT signal passes through zero, where the center vertical graticule line intersects the center horizontal graticule line. The amplitude of the signal should be within the limits shown in Fig. 16, and the zero crossing (where the signal crosses the center horizontal graticule line) of the negative-going transition of the signal should be within the limits given.
- (h) To obtain the **SCTE signal**, set up the scope according to steps (a) through (d),

connect INPUT 1 probe to test point U on TB2, and connect INPUT 2 probe to test point W on TB2.

- (i) Adjust the VARIABLE control on the TIME/DIV switch to get one cycle of the signal in five vertical graticule lines.
- (j) Adjust the horizontal POSITION control until the positive-going transition of the signal passes through zero, where the center vertical graticule line intersects the center horizontal graticule line (Fig. 17). The amplitude of the signal should be within the limits given and the zero crossing of the negative-going transition of the signal should be within limits as shown.
- (k) To obtain the **SD signal**, set up the scope to display the SCTE signal according to steps (h) through (j). Then connect INPUT 1 probe to test point P and connect INPUT 2 probe to test point S on TB2.



Do not adjust the VARIABLE control on the TIME/DIV switch or the horizontal POSITION control.

- (l) The waveform should look like Fig. 18 with the signal amplitude and zero crossings within the indicated limits.
- (m) To obtain the **SCR signal**, set up the scope according to steps (a) through (c) and place both AC-GND-DC switches to DC. Connect a lead from the TRIG IN jack on the scope to TP13 on CP AR509 in the data set.
- (n) Connect the INPUT 1 probe to test point V on TB2 and connect the INPUT 2 probe to test point X on TB2.
- (o) Adjust the VARIABLE control on the TIME/DIV switch to get one cycle of the signal in five vertical graticule lines.
- (p) Adjust the horizontal POSITION control until the positive-going transition of the signal passes through zero, where the center vertical graticule line intersects the center horizontal graticule line.
- (q) The SCR signal should be the same as the SCT signal in Fig. 16. The amplitude and

the zero crossing of the negative-going transition of the SCR signal should also be within the limits given in Fig. 16.

(r) To obtain the *RD signal*, set up the scope for the SCR signal according to steps (m) through (p).

(s) Connect the INPUT 1 probe to test point R on TB2 and connect the INPUT 2 probe to test point T on TB2.



Do not adjust the VARIABLE control on the TIME/DIV switch or the horizontal POSITION control.

(t) The waveform should look like Fig. 19 with the signal amplitude and zero crossings within the indicated limits.

6. REFERENCES

6.01 The CDs and SDs for the apparatus included in the wideband data station using DS 306A-type are listed as follows:

SD-1D187-01 and CD-1D187-01—Data Set 306A-type

SD-1D218-01 and CD-1D218-01—Data Unit 32A-type

SD-1D196-01 and CD-1D196-01—Data Unit 33-type

SD-1D041-01 and CD-1D041-01—Data Auxiliary Set 804A-type

SD-3C089 and CD-3C089—T1 Carrier Line Terminating Unit

SD-1D237-01 and CD-1D237-01—Wideband Data Station Using Data Set 306-Type—Application Schematic.

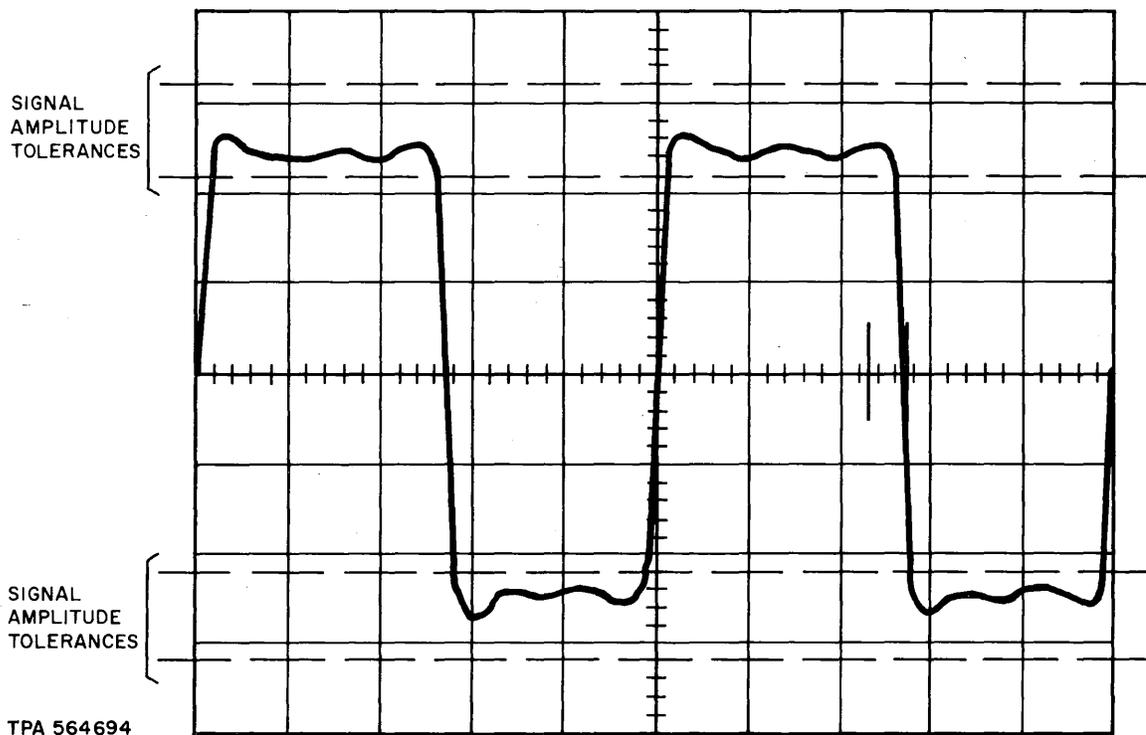


Fig. 16—Serial Clock Transmit Signal [SCT(A)—SCT(B)]

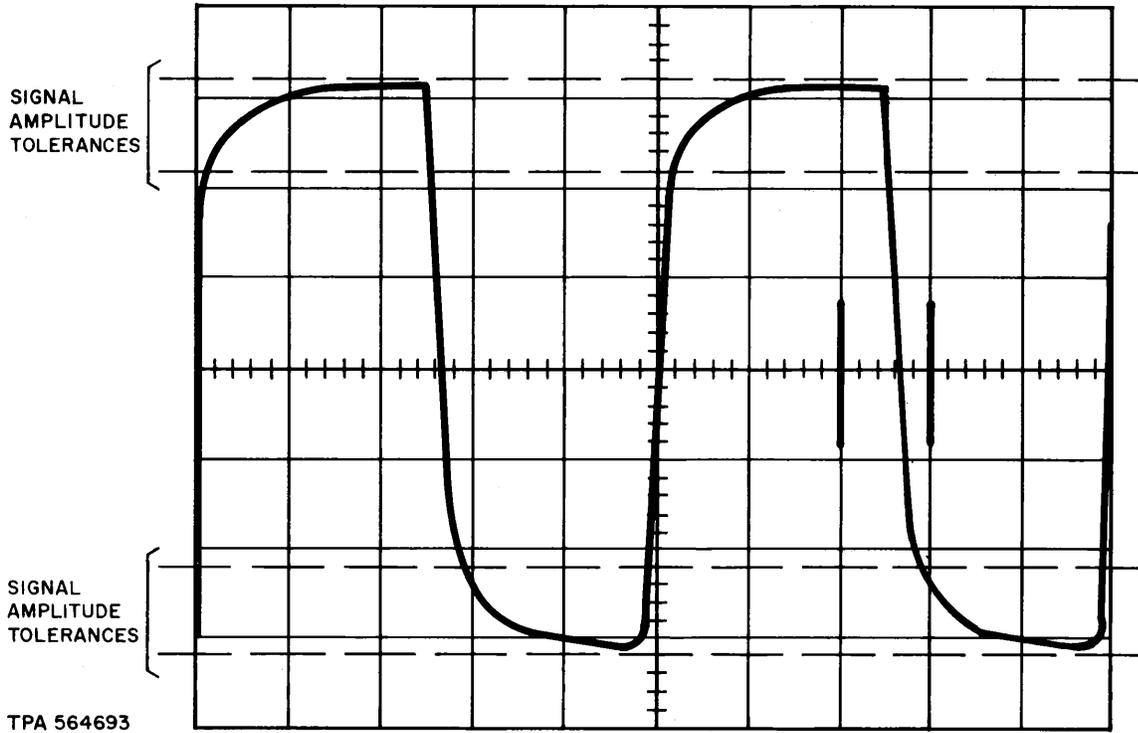


Fig. 17—Serial Clock Transmit External Signal [SCTE(A)—SCTE(B)]

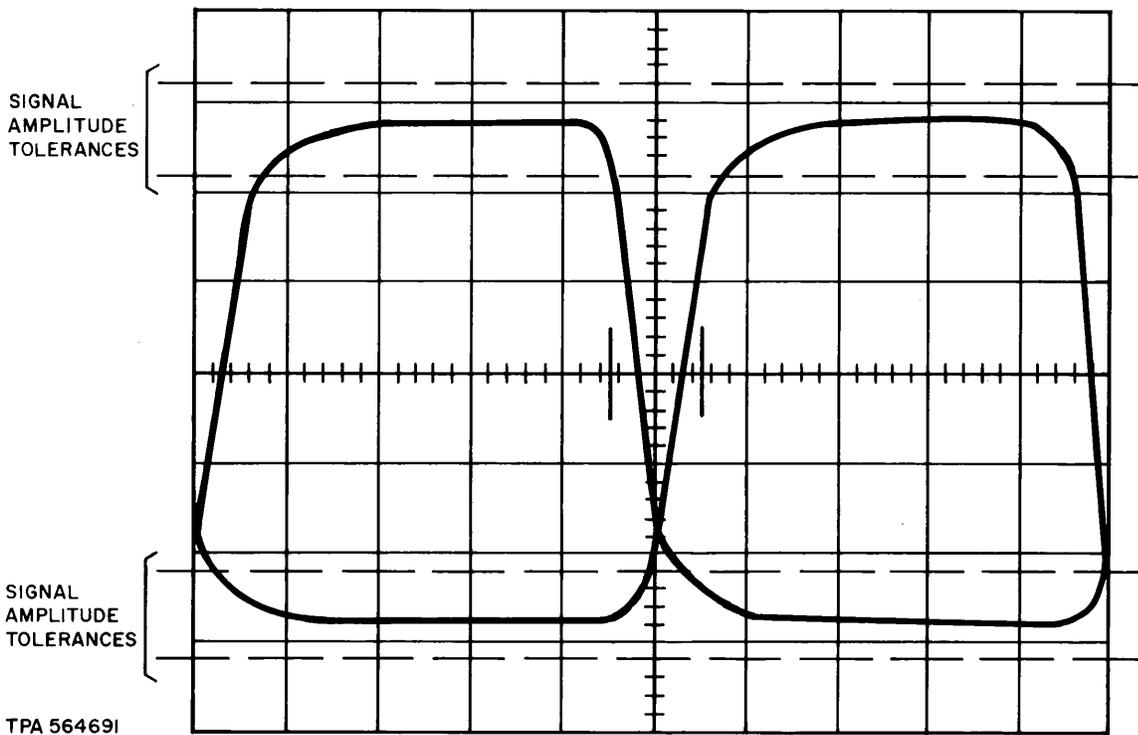


Fig. 18—Send Data Signal [SD(A)—SD(B)]

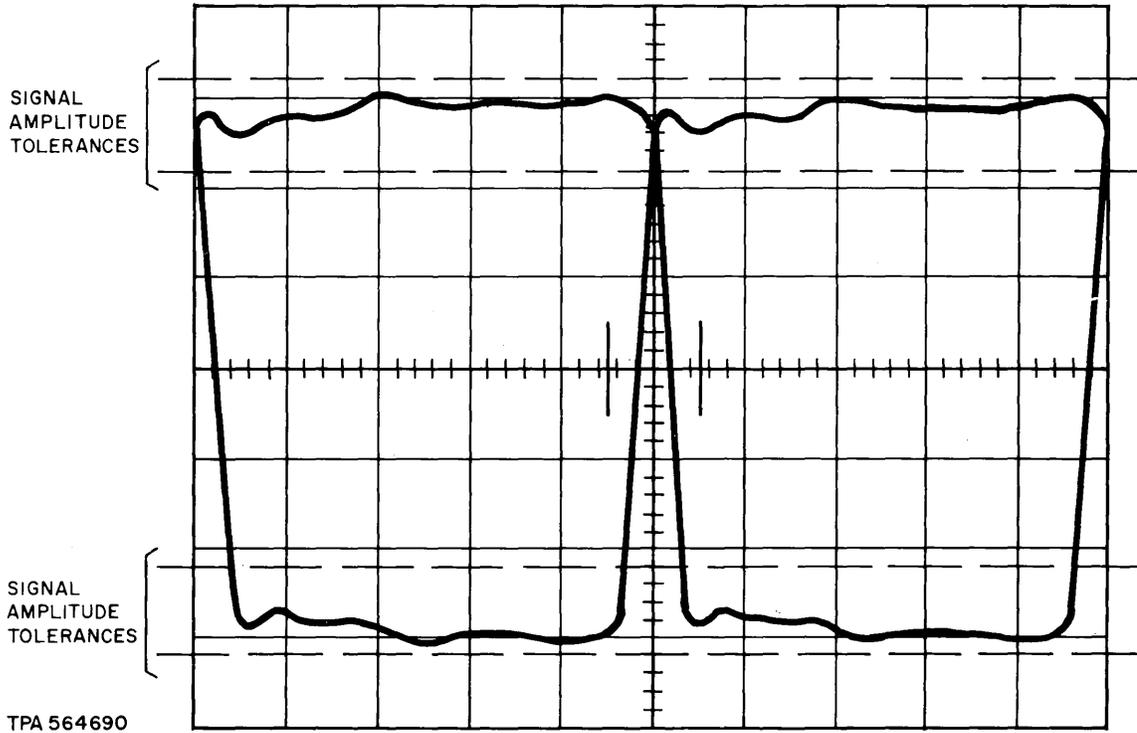


Fig. 19—Receive Data Signal [RD(A)—RD(B)]

6.02 Bell System Practices covering the various equipment in the station using DS 306A-type are listed below:

593-801-200

Wideband Data Station Using Data Set 306, Point-to-Point, Limited Distance, Installation and Connections

SECTION

TITLE

365-200-103

T1 Carrier, J98713F Line Terminating Unit, Description

593-801-500

Wideband Data Station Using Data Set 306, Point-to-Point, Limited Distance, Test Procedures

590-100-122

32A-Type Data Unit, Description and Operation

598-030-100

Data Auxiliary Set 804A-Type, Description and Operation.

590-100-123

33A-Type Data Unit, Description