

**WIDEBAND DATA STATION USING DATA SET 303  
FOUR-WIRE POINT-TO-POINT PRIVATE LINE  
(COMMERCIAL SERVICE)  
DESCRIPTION AND OPERATION**

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**1. GENERAL**

**1.01** This section describes the wideband data station using Data Set (DS) 303-type. The information will include a description of possible arrangements that can be made with the various data sets and data auxiliary sets for point-to-point private line commercial service.

**1.02** This section is reissued to:

- Show Data Auxiliary Set (DAS) 804A1 and 804A3 Manufacture Discontinued (MD) and replace with DASs 804A5 and 804A7, respectively
- Show 590A and 591A panels MD and replace with 590B and 591B panels, respectively
- Remove detailed information describing the KS-20018-type cabinets

- Show DASs 806B1, B2, B6, and B7 MD. A recommended replacement is DAS 806D1.

**1.03** This section is to supplement the descriptive practices covering the components of the wideband data station. It is not issued as a replacement of those practices.

**1.04** Wideband data stations are designed to provide high-speed wideband data service with a voice coordination circuit that may be used for speech or for transmission of low-speed data.

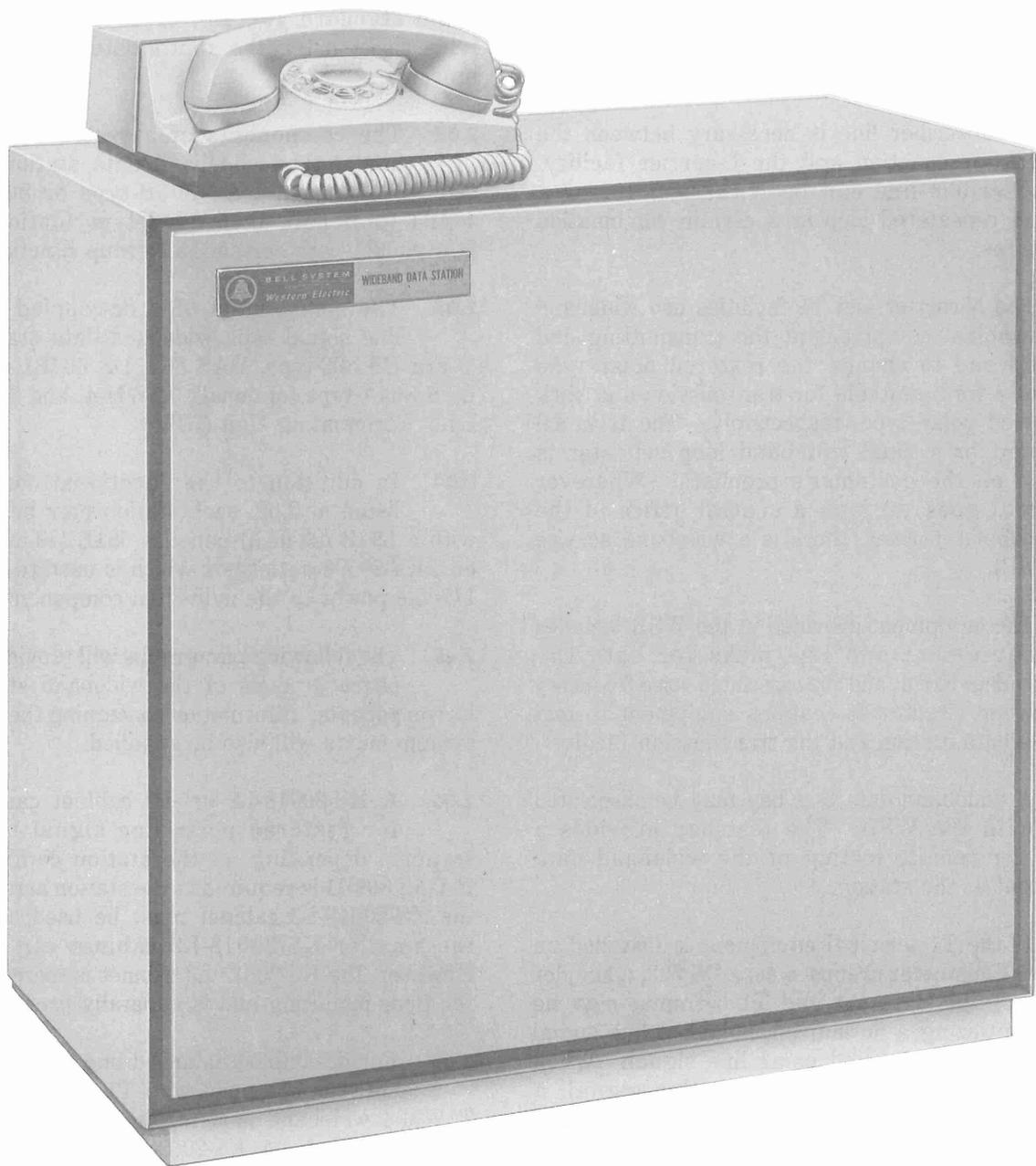
**1.05** The data station (Fig. 1) serves as part of a wideband data system for use in the transmission of serial binary synchronous or nonsynchronous data over half-group, group, supergroup, or T facilities or any other facility with sufficient bandwidth for the particular data rate.

**1.06** Figures 2 and 3 are block diagrams of complete wideband data systems. Although this section is written to describe only the station, the complete system is shown for continuity. This section will describe the most simple station arrangement first and progress to the most complex. Unless otherwise stated, the information is applicable to both restored polar and dc-coupled balanced line signal type sets.

**1.07** Wideband data stations are designed to transmit synchronous data at speeds of 19.2, 40.8, 50.0, 230.4, and 460.8 kilobits per second (kbps). Speeds of 18.75 and 200 kbps are available for special applications. The 18.75 kbps data sets are available only with balanced customer interface. Minimum signal element duration for nonsynchronous transmission over half-group, group, and supergroup facilities are 52, 20, and 4.3  $\mu$ sec, respectively; for nonsynchronous transmission using dc-coupled balanced line signals over digital facilities, minimum durations are 2.0  $\mu$ sec.

**1.08** The wideband data station (Fig. 2) accepts serial high-speed, or serial high-speed and parallel low-speed, data signals from a business machine and transmits them to the receiving station over the transmission facilities.

**1.09** The high-speed signals are fed from the business machine to DS 303-type over coaxial cables via the customer interface. DS 303-type shapes the signals for transmission over the wideband facility.



**Fig. 1—Wideband Data Station Using Data Set 303-Type**

**1.10** The signals are next sent to DAS 809B1, in certain half-group applications, and then through DAS 806 to the wideband line. The DAS 809B1 is a vestigial sideband modem used to put data signals into the 28—44 kHz band.

**1.11** The low-speed data from the business machine is modulated into a 2-out-of-10 multifrequency

format by DS 404B1 for transmission on the voiceband line. DAS 804A-type provides means for voice transmission and certain control functions of the station.

**1.12** The transmission facilities between DS 303-type stations consist of a 4-wire circuit, usually L-carrier facilities, conditioned for data

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transmission and a 2- or 4-wire voiceband circuit. Wideband modems are used to put the restored polar type signal, along with the voice signal, into the appropriate band of the carrier system.

**1.13** A subscriber line is necessary between the station location and the L-carrier facility. The subscriber line can be N-carrier, T1, or a wideband repeatered loop or a certain combination of the three.

**1.14** The N-carrier and T1 facilities use wideband terminal equipment at the transmitting and receiving end to change the restored polar type signal to a form suitable for transmission and back to restored polar type, respectively. The terminal equipment or a final wideband loop repeater is installed on the customer's premises. Wherever the signal goes through a central office in the restored polar format, there is a wideband service bay (WSB).

**1.15** The equipment provided in the WSB includes equipment and line jacks for both the wideband data circuit and the associated voice-frequency coordination circuit. It contains equipment to test both the data station and the transmission facility.

**1.16** A wideband data test bay may be associated with the WSB. The test bay provides a means for remote testing of the wideband data equipment at the station.

**1.17** If the T1 terminal equipment is installed on the customer premises near DS 303, a simpler version of the data set and T1 terminal may be used by utilizing a dc-coupled, balanced line signal in place of the restored polar line signal. When utilizing a dc-coupled, balanced line signal, a T1WM-4 terminal and a T1 line terminating unit (LTU) are included in the data station.

**1.18** A 912A Wideband Data Test Set is used for testing the wideband data station. This test set is available for mounting in the wideband test bay or as a portable unit for testing at the station site. The test set is described in the section entitled 912A Wideband Data Test Set, Description and Operation (107-400-100).

## 2. PHYSICAL DESCRIPTION

**2.01** The components which are combined to make up a wideband data station can be mounted

in a Bell System-provided KS-20018-type cabinet or on standard 19-, 23-, or 25-inch Bell System relay racks using the appropriate code of 87-type brackets.

**2.02** The components of a restored polar line signal type wideband data station (Fig. 4) are DS 303-type, DAS 806B-type or 806D1, DS 404B1 (optional), DAS 804A-type (optional), and DAS 809B1 with certain half-group functions.

**2.03** The components of a dc-coupled balanced line signal type wideband data station (Fig. 5) are DS 303-type, DAS 806, DS 404B1 (optional), DAS 804A-type (optional), T1WM-4, and T1 Carrier Line Terminating Unit (LTU).

**2.04** In addition to the functional components listed in 2.02, each station may be equipped with a 590B (23-inch) panel, a 591B (19-inch) panel, or a KS-20598 outlet box which is used to distribute 117-vac power to the individual components.

**2.05** The following paragraphs will provide physical characteristics of the wideband station and its components. Information concerning the mounting arrangements will also be supplied.

**2.06** A KS-20018-L2 or -L3 cabinet can be used for restored polar line signal type data stations, depending on the station configuration. If DAS 809B1 is required in the station arrangement, the KS-20018-L3 cabinet must be used; otherwise, the smaller KS-20018-L2 cabinet can be used. However, the KS-20018-L3 cabinet is more attractive for floor mounting and is generally preferred.

**2.07** For dc-coupled balanced line signal type data stations equipped with T1 carrier LTUs and T1WM-4 wideband modem, the larger KS-20018-L7 cabinet is used. A KS-20598 outlet box is used in place of a 590B panel to distribute power to the individual components. The outlet box mounts in the cabinet with an 87T bracket.

**2.08** Options wired into DS 303-type and associated apparatus should be recorded on the label placed in the data station cabinet. If circuit packs are changed, this should be noted on the label. This will aid in identifying options and changes on subsequent repair visits.

**2.09** Interface cabling access is made through two rectangular ports in the front and rear

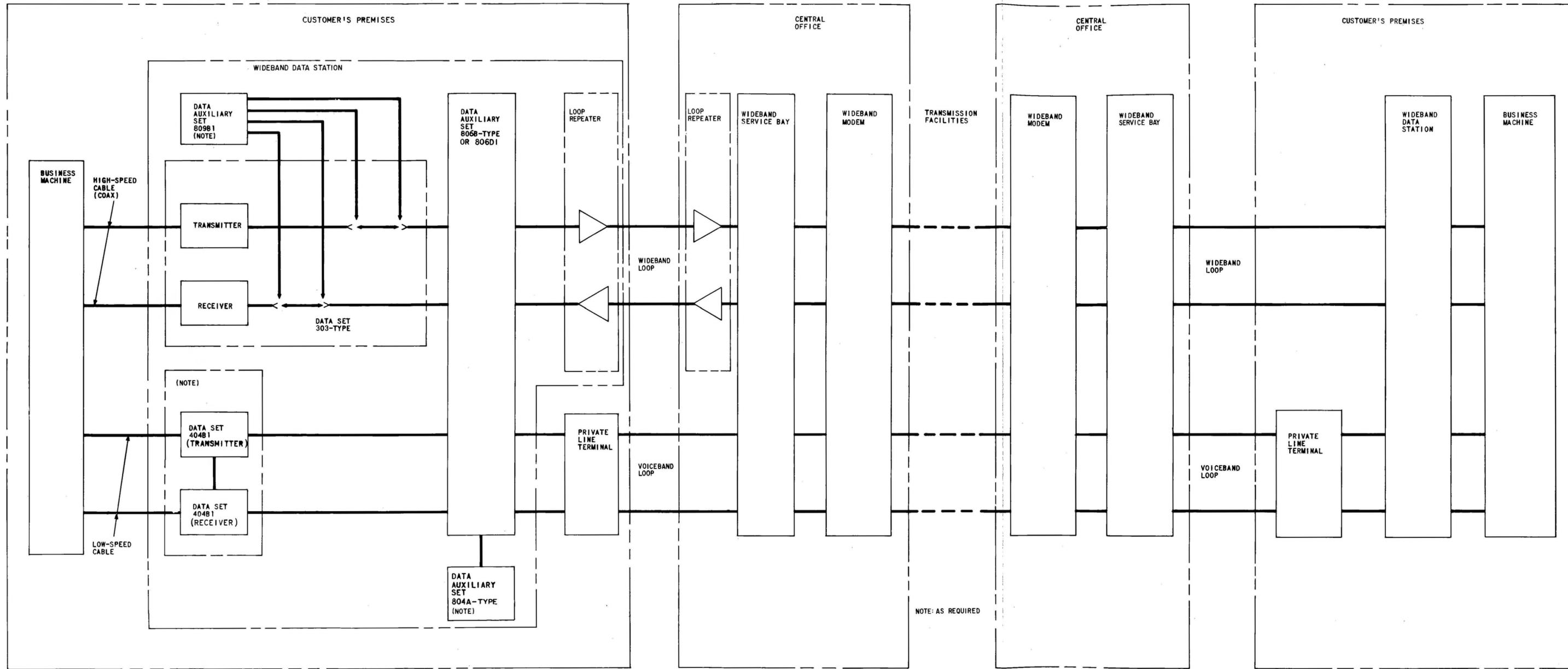


Fig. 2—Restored Polar Wideband Data System—Block Diagram

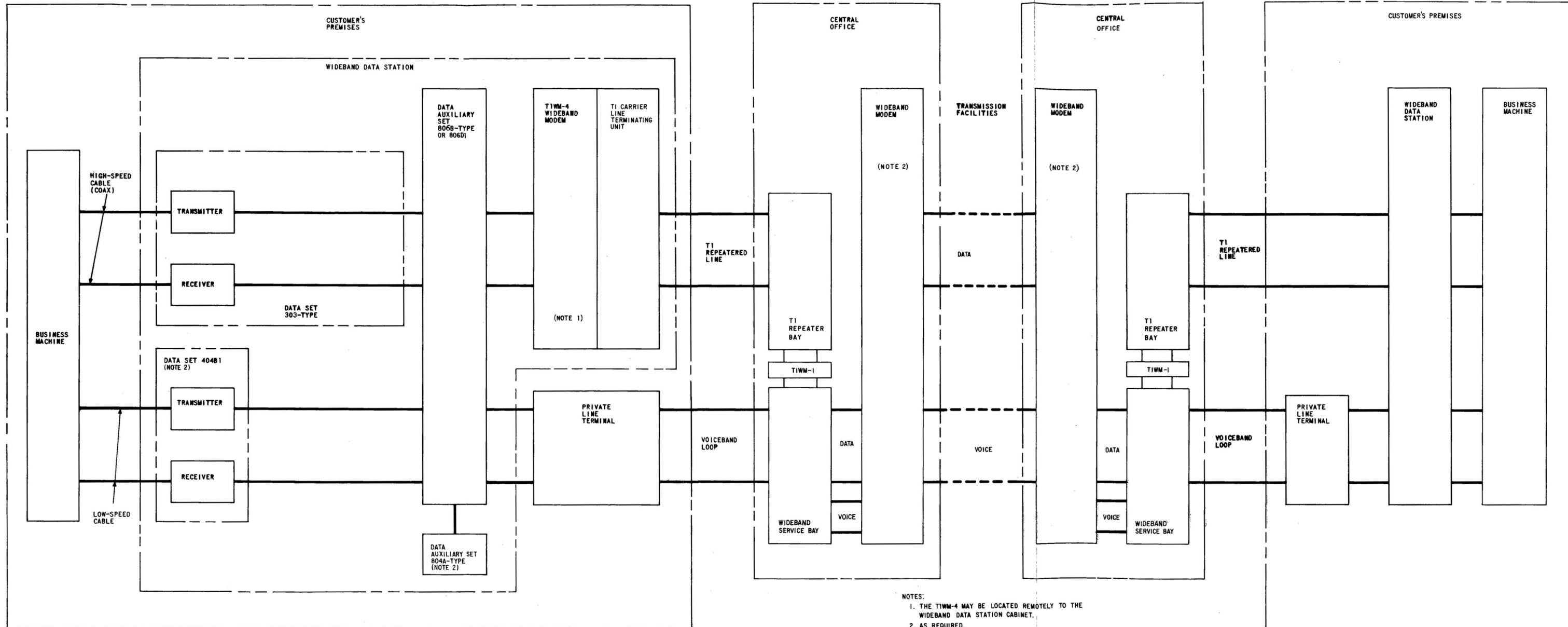
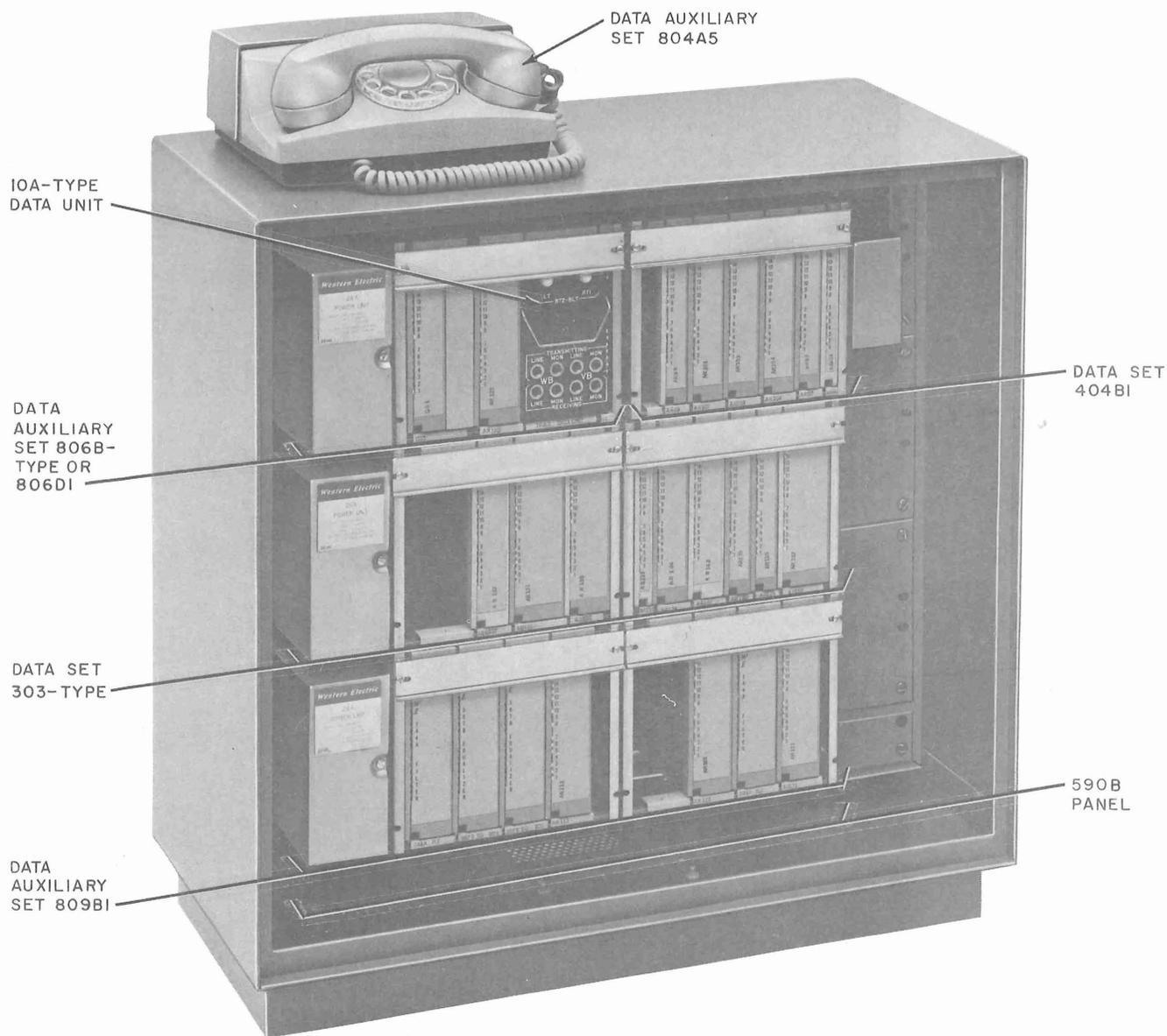


Fig. 3—TIWM-4 Wideband Data System—Block Diagram



**Fig. 4—Restored Polar Wideband Data Station Components—Front View**

center of the cabinet bottom plate. These ports are normally covered with a plate held in place by two quick-release fasteners.

**2.10** Vertical mounting strips (part of the two side walls of the cabinet) provide means for mounting the data sets and data auxiliary sets. These strips provide mounting arrangements identical to 23-inch Bell System relay racks. The locations of the data sets and data auxiliary sets are shown in Fig. 4, 5, 6, and 7.

**2.11** The data sets and data auxiliary sets are mounted onto the mounting strips by means of 87-type brackets.

### **3. FUNCTIONAL DESCRIPTION**

#### **GENERAL**

**3.01** The wideband data station is located at the customer's premises and provides the interface between business machine equipment and the

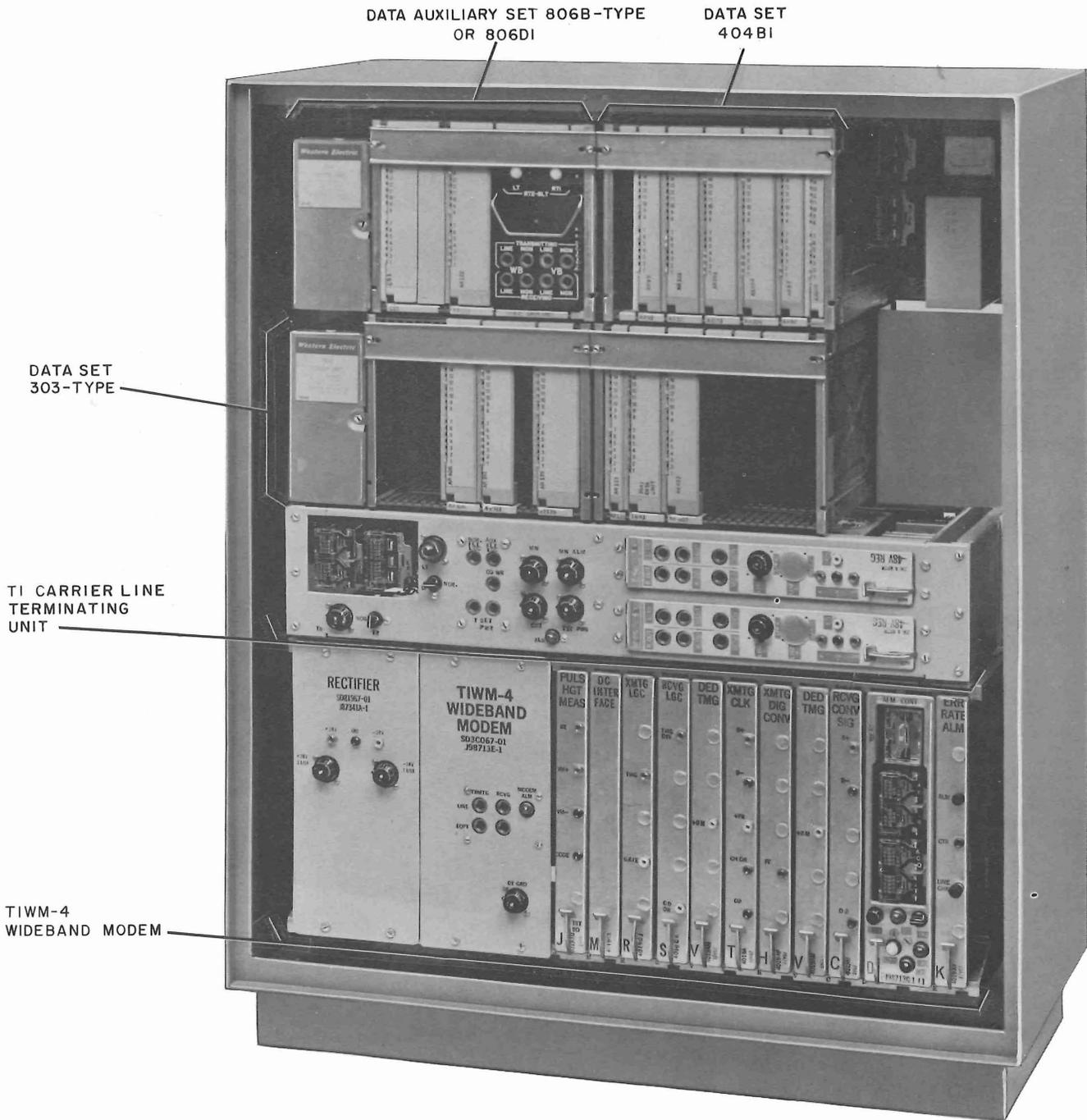
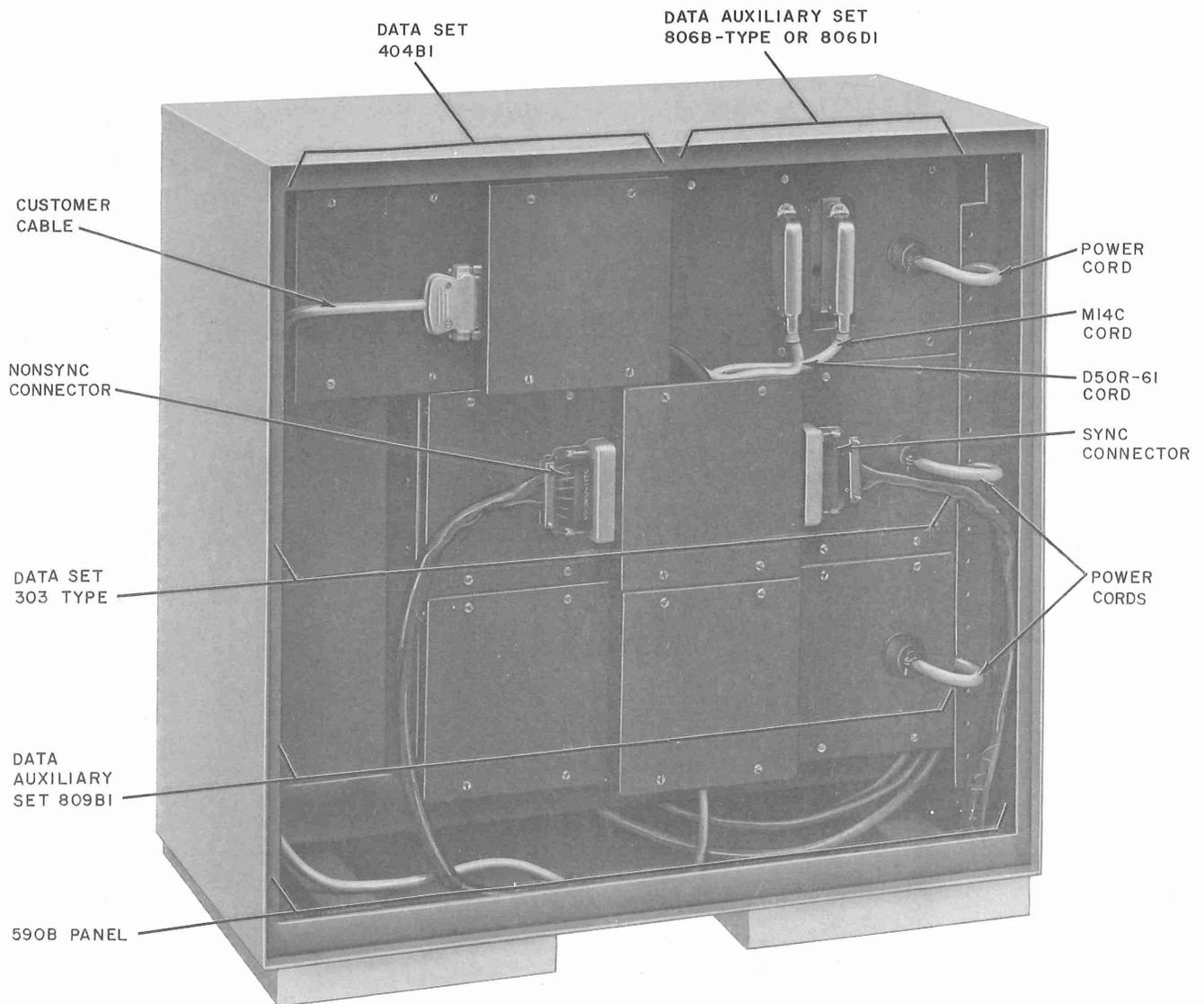


Fig. 5—DC-Coupled Balanced Line Signal Wideband Data Station Components—Front View



**Fig. 6—Restored Polar Wideband Data Station—Rear View**

wideband data transmission system. Depending on the service furnished, DS 303 can be used with DAS 804A-type, 806B-type or 806D1, 809B1, T1WM-4, and voiceband DS 404B1.

**3.02** Data Set 303-type uses either restored polar or dc-coupled balanced line signals. The restored polar type DS 303 accepts high-speed ON-OFF baseband signals from the customer's business machine and conditions these signals for optimum transmission performance over analog facilities by removing the dc component from the

signal and attenuating the low frequencies. The dc and low frequency components are reinserted by the receiving data station into a form suitable to the customer's data terminal equipment. This process is known as restored polar transmission. The restored polar type of line signal is not required for applications using less than 1000 feet of transmission line at the data set output or when the data set is used with a T1WM-4 wideband modem for transmission over T1 facilities. A simpler version of the data set is utilized where the restored polar circuitry is not used and the dc

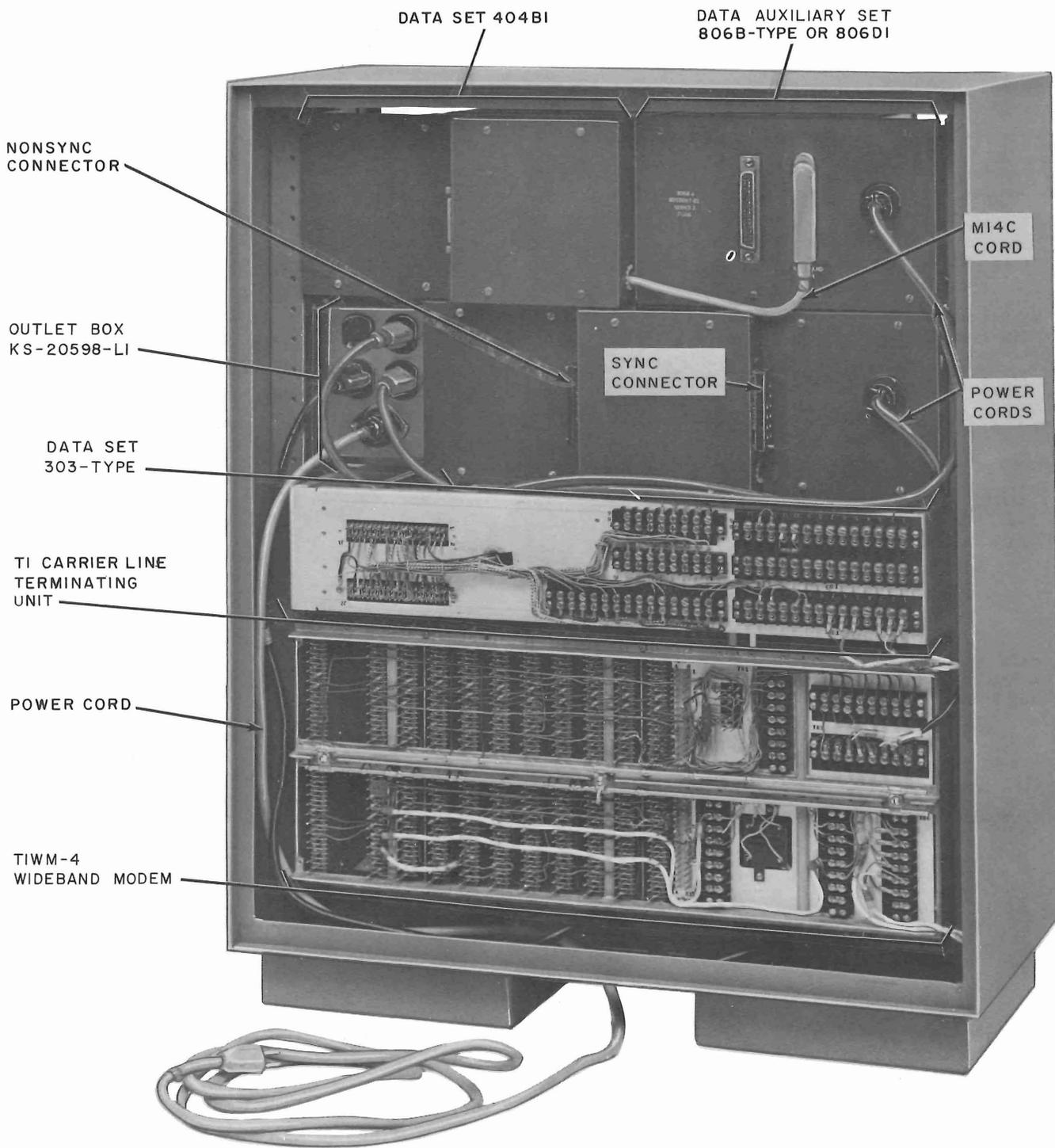


Fig. 7—DC-Coupled Balanced Line Signal Wideband Data Station Components—Rear View

component is transmitted. The line signal is referred to as a dc-coupled balanced line signal and is used in conjunction with T1 carrier systems.

**3.03** The following is a brief summary of the characteristics of signals existing on leads between the wideband data station and the customer's equipment.

**3.04** Operation of the wideband part of the station is controlled by signals between DS 303-type and the associated customer equipment. Characteristics of these signals are:

(a) Current Interface

- (1) A control "off", binary "1", or a "marking" signal is represented by a current of less than 5 mA into 100 ohms.
- (2) A control "on", binary "0", or a "spacing" signal is represented by a current greater than 23 mA.

(b) Voltage Interface (EIA)

- (1) An ON voltage signal—voltage greater than +3 volts
- (2) An OFF voltage signal—voltage more negative than -3 volts.

**3.05** The voiceband part of the station is controlled by the same control signals as wideband, except that data signals are passed between DS 404B1 and the business machine. DS 404B1 is a transmitter-receiver which converts voltage interface signals with electrical characteristics conforming to EIA Standard RS-232-C into tones for transmission, and at the receiving end, converts the tones back into voltage signals.

**DATA SET 303 ONLY**

**A. General**

**3.06** Data Set 303 and DAS 806 are considered minimum equipment for a standard 303-type wideband data station; however, special installations may consist of DS 303 only. This type of installation is implemented only after engineering consideration has been given to the limitations of the wideband data station resulting from lack of local and remote test capability.

**3.07** The operation of DS 303 is similar regardless of the station arrangement. All connections between DS 303 and the business machine are made via either the high-speed SYNC or NONSYNC connector on the rear of the data set.

**3.08** The high-speed customer interface is provided on a current-switching basis with the exception of two functions, ie, Data Terminal Ready (DTR) and Ring Indicator (RI). DTR and RI are not applicable unless DAS 804A-type is provided in the station.

**B. Control Functions**

**Nonsynchronous Data Set**

**3.09** There are gates in DS 303-type which block transmitted and received data unless the proper conditions exist. The procedure in 3.10 through 3.16 outlines the control functions in the transmitting and receiving of data for a nonsynchronous data set.

**3.10** Signals between DS 303-type and the customer's business machine are as follows:

- **SD**—Send Data—Current interface transmit data lead. (Originates in business machine.)
- **RD**—Receive Data—Current interface receive data lead. (Originates in data set.)
- **AGCL**—Automatic Gain Control Lock—An ON current signal sent to the business machine when the received data is of adequate amplitude, or, with DAS 809B1, when the received carrier pilot is of adequate amplitude. (Originates in data set.)
- **LT**—Local Test—An ON current signal sent by the business machine to place the station in the local test mode. (Originates in business machine.)
- **RS**—Request-to-Send—An ON current signal from the business machine which signals the data set when transmission is desired. (Originates in business machine.)
- **DSR**—Data Set Ready—An ON current signal sent to the customer when the data set is capable of operating and can receive wideband data and can receive and transmit

voiceband data if so equipped. The station should be in the data mode. A local or remote test should not be in progress. (Originates in data set.)

- **CS**—Clear-to-Send—An ON current signal sent to the customer when DSR is ON and the customer has turned ON RS, or when the station is in the local test mode and RS is ON. (Originates in data set.)
- **ALT**—Alternate Use—An ON current signal from the customer which conditions a set for transmission of nonsynchronous data through the nonsynchronous connector. This lead is connected to the nonsynchronous connector only. (Originates in business machine.)
- **SCT**—Serial Clock Transmit—A current interface lead which supplies transmit clock to the customer. DS 303 requires option Z. (Originates in data set.)
- **SCTE**—Serial Clock Transmit External—A current interface lead on which the customer provides clock to the data set. DS 303 requires option E. (Originates in business machine.)
- **SCR**—Serial Clock Receive—A current interface lead which passes the receive clock derived by the data set to the customer. (Originates in data set.)
- **DTR**—Data Terminal Ready—An ON voltage signal supplied by the customer to indicate when the terminal equipment is ready to transmit and receive data. This signal must be present to place the station in the data mode when DAS 804A-type is used and to automatically answer an incoming call. The signal must be OFF for at least 50 milliseconds to guarantee termination of a call. (Originates in business machine.)
- **RI**—Ring Indicator—An ON voltage signal supplied to the customer when ringing current is present on the incoming voice-frequency coordination circuit. An OFF voltage signal is supplied to the customer when ringing current is not present. (Originates in the business machine.)

**3.11** The alternate use (ALT) function is provided so that a synchronous data set can be operated nonsynchronously but at standard data rates. For a synchronous DS 303 to operate nonsynchronously, the customer must supply an ON signal on the ALT lead or strap in the A option.

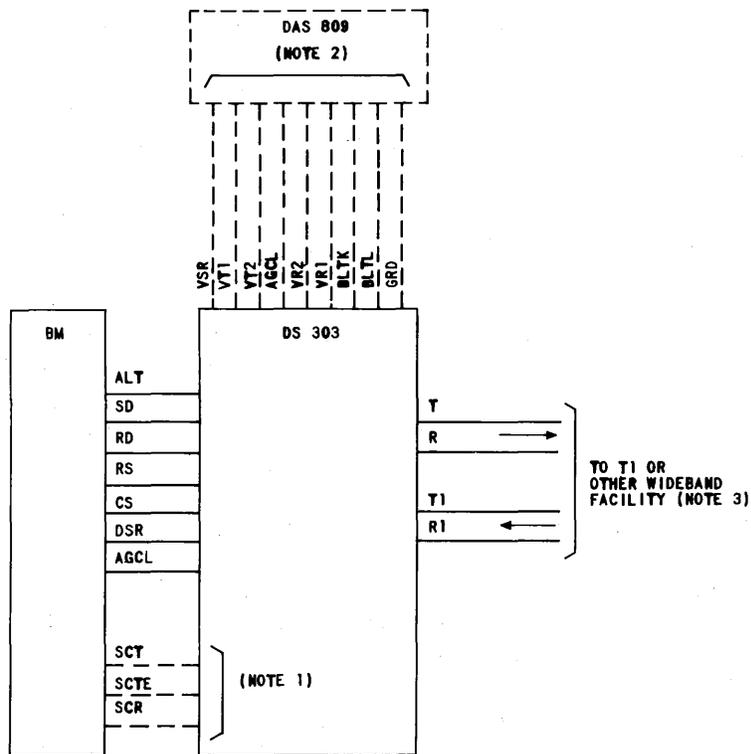
**3.12** Data is sent from the business machine (Fig. 8) to the transmitter circuits in DS 303-type on the Send Data (SD) lead. The customer's SD signal is terminated by a cable terminator. This cable terminator blocks data unless the Clear-to-Send (CS) signal is ON.

**3.13** To initiate the transmission of data, the Request-to-Send (RS) signal is originated by the business machine. (RS can be permanently strapped in the data set in the ON condition.) The RS signal is a current interface signal which provides one of the inputs required for CS. The other input to CS is the Data Set Ready (DSR) signal. For this application (DS 303 only), DSR is obtained by providing options W and K. The DSR signal indicates that all the required data set conditions are fulfilled. The CS circuit provides an ON signal to the business machine and enables the SD cable terminator. In this application (DS 303 only), the CS signal means that the data station has the RS signal ON and that the proper options are installed.

**3.14** When the RS signal is sent from the business machine to the data set and the CS signal is returned to the business machine, the system is conditioned to transmit data. The signals on the SD lead are sent to the transmitter circuit and then to the facilities.

**3.15** To receive data, the DSR control signal must be ON. When DSR is ON, the RD gate is opened. When the gate is open, the data set is conditioned to pass the receiver output through the RD cable driver to the business machine.

**3.16** The Automatic Gain Control Lock (AGCL) is an ON current signal which is sent to the business machine when the received data is of adequate amplitude. The DTR, RI, and Local Test (LT) control functions do not affect this signal.



## NOTES:

1. REQUIRED FOR SYNCHRONOUS SETS ONLY.
2. DAS 809 MAY BE REQUIRED FOR RESTORED POLAR HALF-GROUP OPERATION.
3. REFER TO FIG. 12 FOR CONNECTION TO TIWM-4 WIDEBAND MODEM.

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Fig. 8—Special Arrangement Consisting of Data Set 303 Only—Connections

**Synchronous Data Set**

**3.17** The procedure in 3.18 through 3.20 outlines the control functions in the transmitting and receiving of data for a synchronous data set.

**3.18** In synchronous sets, all the nonsynchronous circuits described in 3.10 through 3.16 are used in addition to the synchronous circuits which are added. The signal control circuit pack blocks the nonsynchronous data from reaching the transmitter and blocks the receiver output from reaching the RD cable driver. Synchronous operation requires two clock signals, ie, clocks for the transmitter and receiver.

**3.19** During transmission, the output of the SD cable terminator is sampled on the signal control circuit pack. The clock is obtained from either the customer [Serial Clock Transmit External (SCTE)] or a clock in the data set [Serial Clock Transmit (SCT)]. When the scrambler/descrambler card is plugged in, the sampled SD signal is scrambled and returned to the signal control circuit pack. The purpose of the scrambler is to randomize

the data pattern and reduce strong single-frequency signal components on the line if a short repetitive pattern is sent by the customer.

**3.20** The receiver output is applied to the sync recovery and signal regenerator circuit pack. This circuit pack contains circuitry for deriving a clock signal from the received data. The sync recovery and signal regenerator output is connected to the scrambler/descrambler signal control boards where descrambling automatically takes place. The clock signal is delivered to the customer via the Serial Clock Receive (SCR) lead.

**C. Options**

**3.21** Certain options must be used when a DS 303-type is used without a data auxiliary set. Other options and features are determined by the customer's preference. Table A lists the options which must be provided and those that may be used.

**3.22** The following is a description of the options available in DS 303.

TABLE A  
OPTIONS – DS 303 ONLY

REQUIRED	PERMISSIBLE*
K; W	A; V; R; T; X;
M or Q,	Y or J
E† or Z†	

\* The following pairs of options are mutually exclusive and only one of each pair should be provided in DS 303: E or Z, Y or J, M or Q.

† Synchronous sets

- **A Option**—Permanent Nonsync—Required of all nonsynchronous data sets equipped with a balanced customer interface and factory-furnished in balanced interface sets. It may be used in nonsynchronous data sets equipped with an unbalanced customer interface rather than requiring the customer to supply an ON signal on the ALT lead.
- **E Option**—External Transmit Clock—It must be supplied in synchronous unbalanced interface data sets when the customer supplies the transmitting clock. Do not use Z option when E option is provided.
- **J Option**—Sync Logic Normal—Factory-furnished in all synchronous sets and should be installed in all synchronous sets not equipped with Y option.

**Note:** J option must be removed if Y option is installed.

- **K Option**—This option, which is not factory-furnished, provides permanent Line Status (LS) indication. It must be used when DAS 804A-type is not used. This provides a permanent enabling signal to DS 303-type in absence of DAS 804A-type.
- **M Option**—When this option is furnished, the scrambler idle code is not transmitted until RS is ON. It is factory-furnished with unbalanced interface data sets if a scrambler is supplied. Either the M or Q option must be supplied in all synchronous sets even if the scrambler is not used.

- **Q Option**—When this option is installed, the scrambler idle code is transmitted whenever it is receiving a transmit clock. Either the Q or M option must be furnished in all synchronous data sets. It is factory-furnished in all synchronous data sets with an unbalanced interface and no scrambler, which are rated MD.

- **R Option**—This option, necessary on multipoint nonswitched networks, is not factory-furnished and applies only to half-group data sets used with DAS 809B1. When it is installed, the vestigial sideband (VSB) carrier from the DAS 809B1 is turned OFF when RS is OFF.

- **T Option**—When this option is supplied, a permanent RS indication is given to DS 303-type. The option, which is not factory-furnished, can be used rather than customer-supplied RS.

- **V Option**—Used to bypass DAS 809B1. It is factory-furnished in all group and supergroup data sets. It is needed with half-group sets if a VSB DAS 809B1 unit is not used.

- **W Option**—This option, not factory-furnished, is necessary when DAS 806 is not used. It provides a “no remote test” and “no local test” indication to DS 303-type to open the transmit and receive gates in DS 303-type when DAS 806 is not used.

- **X Option**—This option, not factory-furnished, provides for scrambling with no descrambling.

- **Y Option**—This option, not factory-furnished, provides for descrambling with no scrambling.

**Note:** X and Y options are to be used only when one-way scrambling is necessary.

- **Z Option**—This option must be supplied when the transmitting clock is internal to DS 303-type. The E option must not be supplied when Z option is installed. Z option is factory-furnished where it is required.

#### D. Operation

**3.23** In this application, there are no attendant operations associated with the station. DS 303 is always operational, provided the customer

has an ON signal to the RS lead, or RS is permanently strapped ON.

**DATA SET 303 PLUS DATA AUXILIARY SET 806**

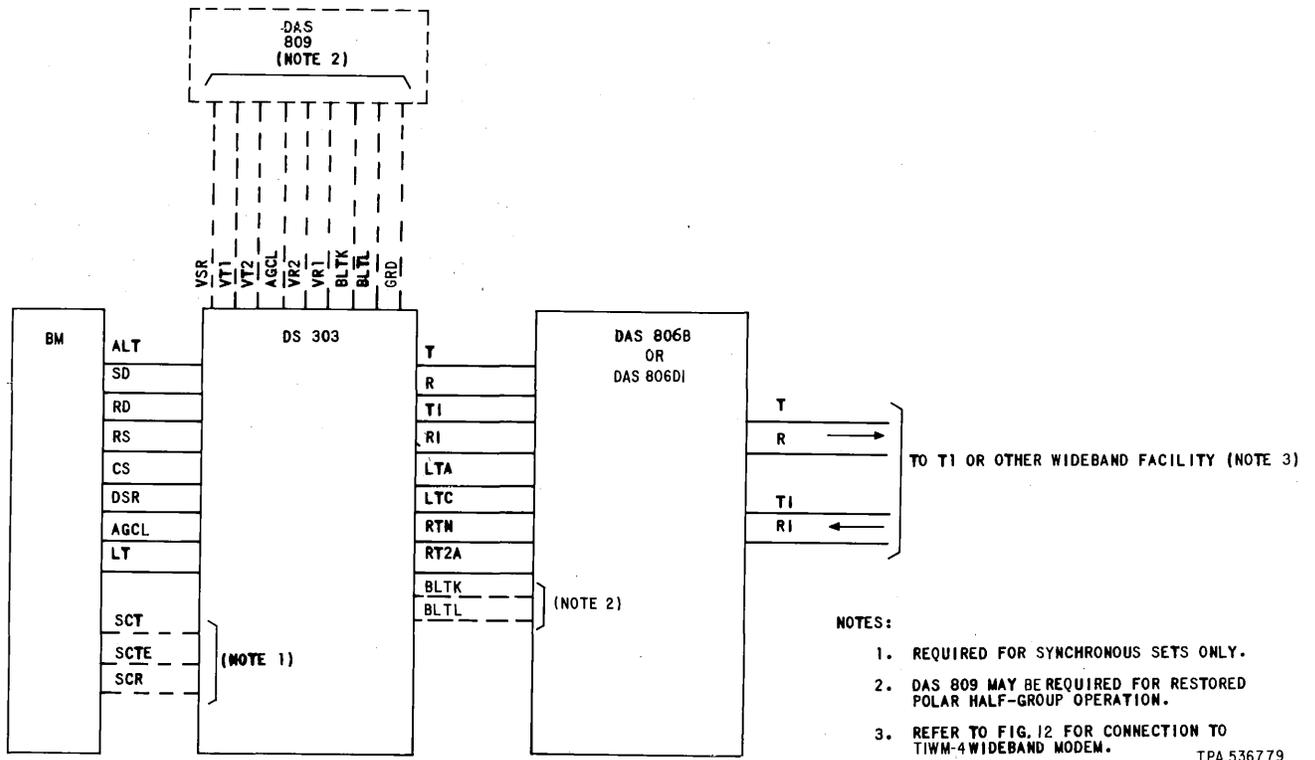
**A. General**

**3.24** Data Set 303 plus DAS 806 is the minimum station arrangement which provides remote test capabilities (Fig. 9). DAS 806B1, B2, B6, and B7, which are all MD, can be used in this station arrangement or DAS 806D1 can be used. DAS 806D1 is a recommended substitute for any of the above DAS 806Bs. For the DS 303 plus DAS 806-type of station arrangement, the operation and control functions between DS 303 and the business machine are the same as for DS 303 only unless otherwise specified.

**3.25** The use of DAS 806D1 provides for all of the features provided by DAS 806B-type, as well as certain new features. Certain differences

in the implementation of the features common to both are described as follows:

- (a) The wideband and voiceband line connections to DAS 806D1 are different from those to DAS 806B-type. All other connections to the terminal block of DAS 806D1 from other station apparatus are the same as for DAS 806B-type.
- (b) The use of DAS 806D1 involves two additional functions: ACU Talk Indicator and ACU Data Indicator, from DAS 804A-type to DAS 806D1. The associated leads are discussed in 3.53.
- (c) The capability of simultaneous transmission of wideband data and talking is provided differently in the station arrangement using DAS 806B-type than in the station arrangement using DAS 806D1. When DAS 806B-type is used, this feature is provided by the N and S options in DS 303-type. When DAS 806D1 is used, this feature is provided by option ZC in DAS 806D1 when the feature is always required. When the feature is to be switched in or out under



**Fig. 9—Station Arrangement Consisting of Data Set 303, Data Auxiliary Set 806—Interconnections**

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the control of the alternate use (ALT) signal, a combination of option ZD in DAS 806D1 and option N or S in DS 303 is required. Table B summarizes the application of these options.

(d) There is a difference in operating procedure between DS 303-type stations using DAS 806B-type and DS 303-type stations using DAS 806D1. Because of this difference, it is desirable to provide the same code of DAS 806-type at both ends of the point-to-point circuit. When it is unavoidable to have the same code at both ends, the DAS 806D1 can be modified so that the station in which it is used will have an operating procedure similar to the station using DAS 806B-type.

### B. Monitoring and Terminating Jacks

**3.26** On DAS 806B-type or 806D1, monitoring or bridging jacks are provided on both the transmit and the receive pairs of the wideband transmission paths and provide access to the associated wideband line facilities. These jacks may also be used as equipment-terminating jacks by inserting a dummy plug in the corresponding line-terminating jack.

**3.27** Both the transmit and receive pairs of the wideband lines are connected to the data auxiliary set through line jacks which permit the lines to be terminated for test purposes. When a line is terminated, it is disconnected from all circuitry internal to the data auxiliary set.

### C. Local Test

**3.28** The local test feature provides a means for looping the data station transmit line circuit to the receive circuit to permit a check of performance through the data station from the business machine on a local loop-back basis.

**3.29** The local test condition (in this application) can be initiated in either of two ways: (1) by operating the LT key on the 10A-type Data Unit (DU) or (2) by placing an ON signal on the Local Test (LT) lead from the business machine.

**3.30** Regardless of how the local test condition is established, it is functionally the same. Relays operate in DAS 806 to connect the transmit line circuits to the receive line circuits, and to

terminate the transmit and receive lines of the facilities.

**3.31** When the station is placed in the local test mode, the LT lamp on the 10A-type DU lights.

### D. Remote Test

**3.32** The remote test feature (in DAS 806D1 and in certain codes of DAS 806B) enables a test center to loop the facilities at the data station line interface so that transmission tests can be made over the facilities, or to loop the send data circuit to the receive data circuit inside the data set at the customer's interface so that overall transmission tests can be made.

**3.33** There are two remote tests: remote test 1 (RT1) and remote test 2 (RT2). RT1 provides a turnaround connection at the line interface. RT2 provides a turnaround connection at the business machine interface. The combination of the tests provides the serving central office or data test center with a means of testing the transmission facilities as well as the data station.

**3.34** Remote tests can be performed with DASs 806B2 and 806B7, which are rated MD, and DAS 806D1. A 2800-Hz tone transmitted for at least 7 seconds from a test center is used to initiate each of the two test conditions in sequence. The 2800-Hz tone is normally applied and detected on the receiving voice pair. The tone is detected in the data auxiliary set and is used to initiate a sequential relay chain. The relay chain, in turn, controls the relays which loop the lines. Wideband and voiceband lines are looped by relay RT1A.

**3.35** When the lines are looped, the data set is disconnected from the lines. The looping path includes the jack normals and normal contacts on the wideband line looping relays in the transmission path.

**3.36** The data set is looped by relays that are included as part of the data set. Control of these relays is over the RT2A lead for the wideband set.

**3.37** The line facilities will be looped when the 2800-Hz tone is applied for at least 7 seconds for the first time and then removed. The second application and removal of the tone produces a

**TABLE B**  
**OPTIONS REQUIRED TO PROVIDE COMBINATIONS OF**  
**WIDEBAND DATA AND TALKING CAPABILITY**

STATION OPERATING FEATURE	DATA SET 303-TYPE USING DATA AUXILIARY SET 806B-TYPE		DATA SET 303-TYPE USING DATA AUXILIARY SET 806D1			
	DATA SET 303-TYPE OPTIONS		DATA SET 303-TYPE OPTIONS		DATA AUXILIARY SET 806D1 OPTIONS	
	N	S	N	S	ZC	ZD
DAS 804A-type must be in the data mode for wideband data to be transmitted.	O	O	O	O	O	O
Simultaneous wideband data and talk.*	I	I	O	O	I	O
Simultaneous synchronous wideband data and talk when ALT is OFF and nonsynchronous wideband data or talk when ALT is ON.	I	O	I	O	O	I
Simultaneous non-synchronous wideband data and talk when ALT is ON and synchronous wideband data or talk when ALT is OFF.	O	I	O	I	O	I

\* When DAS 806B-type is used and this feature is installed, the station is capable of handling wideband data independently of whether DAS 804A-type is in the talk or data mode. When DAS 806D1 is used and this feature is installed, the station is capable of handling wideband data independently of whether DAS 806A-type is in the talk or data mode after the initial operation of DAS 804A-type to the data mode.

O — Omit option

I — Install option

loop-back at the customer interface. The third application and removal restores the data auxiliary set to its normal transmission mode. The associated data sets are then restored to service. The sequence must be completed once it is initiated. If the

state of the remote test sequence is not known, the data auxiliary set can be restored to normal by breaking and reapplying the ac power. The test conditions controlled by the 2800-Hz tone can also be set up by operating the LRT key on DAS

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806 in the same sequence and time duration as the 2800-Hz tone.

**E. Control Functions**

**3.38** The addition of DAS 806 causes certain changes in the operation between DS 303 and the business machine (Fig. 8). These changes are described in 3.39.

**3.39** There are, after adding DAS 806, two ways to establish the local test mode in this application. If the local test condition is established by the business machine, there will be an ON signal on the LT lead. The local test condition can also be established by operating the LT key on DAS 806. In either case, the transmitting and receiving gates are opened and the CS signal is presented to the business machine when the RS signal is presented by the business machine. This permits the business machine to loop back data through DS 303 and DAS 806.

**3.40** In this application, the signal and control leads between DS 303 and DAS 806 are as follows:

- **T and R**—Form the wideband tip and ring transmit pair.
- **T1 and R1**—Form the wideband tip and ring receive pair.
- **LTA**—Local Test—The local test mode can be established from the customer's data terminal equipment by application of an ON signal to the LT lead in the high-speed cable to DS 303-type. The signal is converted to a ground closure in DS 303-type and passes to DAS 806 over the LTA lead. This ground

initiates the local test mode by operating the LTA relay.

- **LTC**—The connecting DS 303 requires an indication of the local test status from DAS 806. This indication is provided over the LTC lead which delivers a ground when the data auxiliary set is not in the local test mode. The ground is removed when the local test mode is established. This function is provided by the W option when DAS 806 is not used.
- **RTN**—Remote Test Normal—A ground is passed over the RTN lead to the connecting DS 303-type when the DAS 806 is not in the remote test mode. When DAS 806 is not used, this function is provided by the W option.
- **RT2A**—Remote Test—During the RT2 mode, DAS 806 applies positive battery to the RT2A lead. Positive battery on the RT2A lead operates the RT2A relay in DS 303 which connects the RD lead to the SD lead for the loopback. When the station is operating synchronously, relay RT2A also loops the SCR lead back on the SCTE lead.

**F. Options**

**3.41** Certain options are required for a DAS 806 and DS 303 type of station arrangement. Customer preference determines other available options and features. Table C lists the options which must be provided and those available by customer choice.

**3.42** Data Set 303 options for a DS 303 plus DAS 806 type of installation are the same

**TABLE C**  
**OPTIONS – DS 303 AND DAS 806**

DATA SET 303		DATA AUXILIARY SET 806B-TYPE		DATA AUXILIARY SET 806D1	
REQUIRED*	PERMISSIBLE*	REQUIRED	PERMISSIBLE	REQUIRED	PERMISSIBLE
K; M or Q; E† or Z†	A; V; R; T; X; Y or J	X; R; Z; V or W	—	X; R; Z; B; V or W	—

\* The following pairs of options are mutually exclusive and only one of each pair should be provided in DS 303: E or Z; Y or J; M or Q.

† Synchronous sets

as for installation of DS 303 only, except that option W is not needed.

**3.43** The following DAS 806 options are required for a DS 303 plus DAS 806 type of installation:

- **B Option**—This option, provided in DAS 806D1 only, is factory-furnished and provides the wideband transmission path which includes the remote test and local test looping configurations.
- **R Option**—Provides terminations for the voiceband line when the line is not used for voice communication or transmission of low-speed data.
- **V Option**—Factory-furnished option to be used when the voice-frequency circuit is 4-wire. The 2800-Hz test detector is connected to the receiving side of the 4-wire line.
- **W Option**—This option (not factory-furnished) is available in special applications where remote and local test features are desired for use with a 2-wire talk only circuit for the coordination channel. It connects the 2800-Hz test detector to the voice pair in DAS 806 and disables the local and remote test relays in the voice line.
- **X Option**—Factory-furnished option which provides a 0-dB pad in the wideband transmitting line. It is required when DAS 806 is used with DS 303-type.
- **Z Option**—Necessary for remote test capability in absence of DAS 804A-type.

#### G. Operation

**3.44** Attendant operation in this application is confined to the controls on the business machine. There are controls located on the 10A-type DU associated with testing.

- (a) To enable DS 303-type to receive data, DS 303-type must be in the operating condition and not in the test mode. An *on* indication is returned to the customer on the DSR lead.

(b) To enable DS 303-type to send data, the same conditions must exist as for receiving data. In addition:

- (1) The customer also supplies an *on* indication to DS 303-type on the RS lead or permanent RS (option T) is installed.
  - (2) If DS 303-type supplies an *on* indication to the DSR lead, an *on* indication is supplied to the CS lead when RS is ON.
- (c) To place the station in the local test mode, either turn the LT key on the 10A-type DU to the vertical position, or the customer may place an ON signal on the LT lead.

#### DATA SET 303, DATA AUXILIARY SET 806, PLUS DATA AUXILIARY SET 804A-TYPE

##### A. General

**3.45** This station arrangement works in conjunction with a private line terminal. DAS 804A-type includes a telephone which provides voice communication over the voice-frequency coordination channel. In addition, it provides control for the switching functions required by the data set. Either DAS 804A1 (MD), 804A5 (both with rotary dial), 804A3 (MD) or 804A7 (both with TOUCH-TONE® dial) can be used in this station configuration.

**3.46** Data Auxiliary Set 804A-type is mounted outside the data station cabinet. It can be located up to 75 feet from the cabinet by using the appropriate length of B25A cable. The DAS 804A-type is connected to the data station and telephone lines through a mounting cord which plugs into DAS 806.

**3.47** Data Auxiliary Set 804A-type is equipped with six buttons—RING, TEST, AUTO, WB DATA, TALK, and VB DATA. The functions of these buttons are described briefly as follows:

- **RING**—A nonlocking button which, when depressed, initiates ringing to the far-end station. At the called station, the associated lamp lights to indicate that the station is being signaled, and ringing is heard.
- **TEST**—A locking button which, when depressed, places the station in the local test mode. When any other button, except

RING, on DAS 804A-type is depressed, this button releases. The associated lamp lights when the TEST button is depressed, when the local test mode is established by either DAS 806 or the customer, or when the station is in the remote test mode.

- **AUTO**—A locking button which, when depressed, enables the automatic answer feature. The associated lamp lights when the automatic answer feature is enabled.
- **WB DATA**—This button is blocked. The associated lamp lights when the station is conditioned to process wideband data.
- **TALK**—A locking button which, when depressed, places the data station in the talk mode. This button is released when any other button, except RING, is depressed. When the station is placed in the talk mode, transmission of wideband data is prevented unless a simultaneous talk and data option is installed in DS 303.
- **VB DATA**—A nonlocking button which, when depressed, places the wideband data station in the data mode. To ensure that the station is in the data mode, the VB DATA button should be held depressed until the associated lamp lights. If the simultaneous talk and data option is installed, this button need not be depressed.

## B. Testing Functions

**3.48** Functionally, the local test is the same as that described for DS 303 plus DAS 806 installation (3.28 - 3.31); however, the addition of DAS 804A-type provides another means of placing the station in the local test mode. The station is placed in the local test mode when the TEST button on DAS 804A-type is depressed.

**3.49** The remote tests are functionally the same as those described for the DS 303 plus DAS 806 installation. Refer to 3.32 - 3.37.

## C. Control Functions

**3.50** The addition of DAS 804A-type does not change the previously described control functions between DS 303 and the business machine

or between DS 303 and DAS 806 unless otherwise specified.

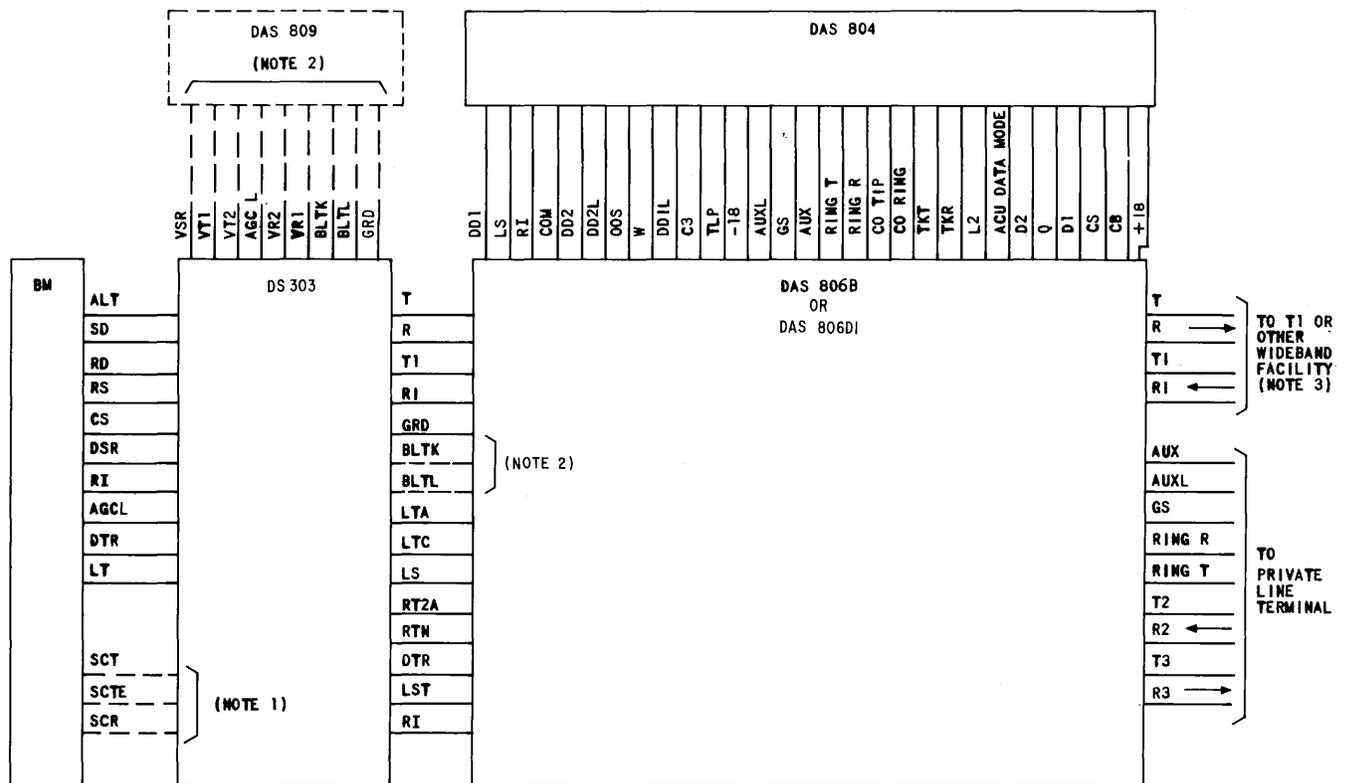
**3.51** The addition of DAS 804A-type causes the following change in the control functions between DS 303 and the business machine—DTR and RI are added (Fig. 10).

- **DTR**—Data Terminal Ready—An ON voltage signal supplied from the customer's terminal equipment to indicate that it is ready to transmit and receive data. This signal must be present to place the station in the data mode and to automatically answer an incoming call. The signal must be OFF for at least 50 milliseconds to guarantee termination of a call.
- **RI**—Ring Indicator—An ON signal on this lead indicates to the business machine equipment that a ringing signal is being received from a remote station. This circuit is independent of the condition on the DTR lead.

**3.52** The addition of DAS 804A-type causes the following change to the control leads between DS 303 and DAS 806—LS lead is added. The line status function replaces the function provided by the K option in DS 303. This is a positive voltage signal to the DSR gate in DS 303 which indicates that DAS 804A-type is in the data mode. The LST lead is functional only in conjunction with either the N or S option in DS 303. When DAS 806B-type is used, the LST lead supplies an artificial line status signal by providing +18 volts from DAS 806B-type to TB2-15 of DS 303 as long as the station is not in the automatic answer mode. When DAS 806D1 is used, the LST lead, in conjunction with the N or S option of DS 303, provides the operate path for switching the simultaneous wideband data and talking feature in or out as a function of the ALT signal from the customer.

**3.53** The leads between DAS 806 and DAS 804A-type are as follows:

- **OOS**—Ground is applied to this lead by DAS 806-type when the station is in a test mode.
- **DDI**—Ground is applied to this lead by DAS 804A-type to place DAS 806 in the local test mode.



## NOTES:

1. REQUIRED FOR SYNCHRONOUS SETS ONLY.
2. DAS 809 MAY BE REQUIRED FOR RESTORED POLAR HALF-GROUP OPERATION.
3. REFER TO FIG. 12 FOR CONNECTION TO TIWM-4 WIDEBAND MODEM.

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**Fig. 10—Station Arrangement Consisting of Data Set 303, Data Auxiliary Set 806, Data Auxiliary Set 804—Interconnections**

- **LS**—When DAS 806B-type is used, positive 18 volts is applied to this lead when DAS 804A-type is in the data mode. When DAS 806D1 is used, ground is applied to this lead when DAS 804A-type is in the data mode.
- **DDIL**—Negative 18 volts is applied to the TEST lamp in DAS 804A-type when DAS 806 is in the test mode.
- **C3**—Provides a delayed application of +18 volts to bring up remote test line looping relays in DAS 806 to ensure that the lines are not looped until after the answerback tone has been transmitted.
- **TLP**—Provides +18 volts for the WB DATA lamp in DAS 804A-type.
- **-18 and +18**—Power for DAS 804A-type.
- **GRD**—Ground
- **AUXL**—Receives -24 volts through DAS 806 from the private line terminal to light the RING lamp.

- **GS**—Ground is applied to this lead by the RING key in DAS 804A-type to start ringing from the private line terminal.
- **RING T and RING R**—Ringing signal is sent from the private line terminal to DAS 804A-type over these leads.
- **CO TIP and CO RING**—Transmit pair from DAS 804A-type.
- **D1, Q, D2, and ACU Data Mode**—These leads are strapped in DAS 806 to complete the voiceband data path in DAS 804A-type.
- **L2**—Introduces protection in DAS 804A-type.
- **RI**—Passes the ring indication from the ring detector of DAS 804A-type to the ring cable driver in DAS 806-type.
- **COM**—Common ground (DAS 806D1) or battery (DAS 806B-type) is supplied over this lead for RI and LS functions.
- **DD2**—Ground is applied to this lead when DAS 804A-type is in the automatic answer mode.
- **DD2L**—Positive 18 volts is applied to this lead when DAS 804A-type is in the automatic answer mode.
- **W**—DTR path to the C relay driver in DAS 804A-type.
- **AUX**—Ground return lead to the private line terminal, via DAS 806-type, for the RING key.
- **TKT and TKR**—Receiver pair from DAS 804A-type.
- **CS**—Supplies ground from DAS 806-type for application to the CB lead when DAS 804A-type is in the talk mode.
- **CB**—Controls RVD relay in DAS 806-type.
- **DST and DSR**—Voiceband transmit pair.
- **ACU TALK IND**—Provides a ground from DAS 804A-type when it is off-hook in the talk mode (used by DAS 806D1 only).

- **ACU DATA IND**—Provides ground from DAS 804A-type when it is off- or on-hook in the data mode (used by DAS 806D1 only).

**3.54** The control leads between DAS 804A-type and DAS 806 can be combined in three groups: ringing indication, voice communication, and control functions.

**3.55** In this application (DS 303, DAS 806, plus DAS 804), the following leads are used in voice communication: CO TIP, CO RING, TKT, and TKR. The OOS and W leads are used for control of the C relay, and the CS and CB leads are used for control of the RVD relay. The AUX, AUXL, GS, RING R, and RING T leads are used in the ringing function.

**3.56** The C relay provides a data interlock for DAS 804A-type. The C relay must be operated in the data mode, and unless it is released, the station will neither transmit nor receive voice. The C relay is operated in any of the following three ways:

- (a) By placing a ground on the OOS lead. This ground is provided by relay action in DAS 806 when the station is in either the remote or local test mode.
- (b) By depressing the VB DATA key on DAS 804A-type, provided the customer has an ON signal on the DTR lead and the H relay is operated. This implies that battery is on the line.
- (c) When ringing is detected, provided that the station is conditioned for automatic answering and the customer has an ON signal on the DTR lead.

**3.57** The received voiceband signals are applied to T2 and R2 of DAS 806 from the private line terminal. Unless the RVD relay is operated, these signals pass straight through DAS 806 and out on leads DR1 and DT1. To operate the RVD relay, the C relay must be released. The ground on the CS lead is then connected through the closed contacts of the C relay over the CB lead to the RVD relay in DAS 806. When operated, relay RVD opens data leads DT1 and DT2, transfers the signals on T2 and R2 to the handset receiver of DAS 804A-type via TKT and TKR leads, and

completes the sidetone path. The receiving path is now complete.

**3.58** Voice signals and the 2025-Hz answer-back tone are transmitted from DAS 804A-type via CO TIP and CO RING leads to DAS 806 and through DAS 806 to the private line terminal via T3 and R3. To enable the system to transmit voice signals, the C relay and the VB DATA key must be released, the TALK key must be depressed, and the handset must be off-hook. The following leads are strapped together: Q to L2 and D1, and ACU DATA MODE to D2. These leads are strapped in DAS 806 by options V and J. This provides transmit line protection, and a path for the 2025-Hz answer-back tone.

**3.59** To enable the 2025-Hz answer-back circuit in the automatic answer mode, DTR signal must be ON, and the AUTO key must be depressed. When ringing is detected, relay action triggers the 2025-Hz oscillator. At the end of the 2025-Hz tone, the LS relay operates. The output of the 2025-Hz oscillator is coupled to CO TIP and CO RING through a transformer and strapped leads Q, D1, L2, ACU DATA MODE, and D2. The 2025-Hz answer-back tone passes through DAS 806 to the private line terminal via T3 and R3. The 2025-Hz tone is also transmitted when DAS 804A-type is placed in the data mode manually.

**3.60** A private line terminal or equivalent must be used in conjunction with DAS 804A-type to provide the ringing control function. The ringing function uses control leads AUX, AUXL, GS, RING T and RING R. The private line terminal leads connect to the terminal board in DAS 806 for convenience only. Functionally, these leads pass through DAS 806 to the private line terminal. A typical private line terminal is shown on SD-1D099-01. The RING key is in series with the AUX and GS leads. When the RING key is depressed, ground is applied to the GS lead to initiate ringing. A negative voltage is applied to the AUXL lead to light the RING lamp at the called station. The ringing signal from the private line terminal is sent to DAS 804A-type over RING T and RING R leads.

**3.61** When the AUTO button on DAS 804A-type is depressed, the AA relay in DAS 806 is held operated by ground applied over the DD2 lead. The operated AA relay applies +18 volts to the DD2L lead to light the lamp associated with

the AUTO button. When DAS 806B-type is used, the AA relay also opens the LST lead from DAS 806B-type to DS 303 to disable wiring options N and S in DS 303. This forces the LS indication to be generated by DAS 804A-type going into the data mode when the call is answered automatically. The N and S options, which permit talking while sending wideband data, are reinstated with the first operation of the TALK button on DAS 804A-type. Operation of the TALK button releases the AUTO button, thereby dropping the AA relay and restoring the LST lead.

**3.62** The RI signal is developed differently, depending upon whether DAS 806B-type or 806D1 is used. The following description applies when DAS 806B-type is used. The COM lead supplies +18 volts from DAS 806 to a set of contacts on the R relay in DAS 804A-type. The signal provided from DAS 804A-type on the RI lead to DAS 806 is +18 volts when ringing is present and open at all other times. A resistor-diode network is provided in DAS 806 to modify the +18 volts on lead RI. The signal delivered from DAS 806 to DS 303 on the RI lead will vary about ground. This signal will be positive when the RI lead from DAS 804A-type is at +18 volts, and negative when RI is open. The magnitude of the voltage is determined by the lead termination. When DAS 806D1 is used, the following description applies. The COM lead supplies ground from DAS 806D1 to a set of contacts on the R relay in DAS 804A-type. The signal provided on the RI lead from DAS 804A-type to DAS 806D1 is ground when ringing is present and open at all other times. This signal is converted to a voltage signal in DAS 806D1 and the signal will be positive when the RI lead from DAS 804A-type is at ground and negative when RI is open.

**3.63** The LS signal is developed differently, depending upon whether DAS 806B-type or 806D1 is used. The following description applies when DAS 806B-type is used. The LS signal originates in DAS 804A-type. The +18 volts on the COM lead is applied to a set of contacts on the LS relay. When operated, the LS relay applies +18 volts to DAS 806. The signal path is divided into two parts in DAS 806. One branch goes to DS 303 and the other branch goes back to DAS 804A-type. The +18 volts indicates to DS 303 that the station is in the data mode. The +18 volts is also returned to DAS 804A-type over the TLP lead to light the WB DATA lamp. The +18

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volts is removed from the TLP lead when the station is in either the remote test mode (relay RTNS released) or in the local test mode (relay LTC operated). When DAS 806D1 is used, the following description applies. The LS signals originate in DAS 804A-type. Ground on the COM lead is applied to a set of contacts on the LS relay and when the LS relay is operated, it applies ground to operate the LSS relay in DAS 806D1. Operation of relay LSS translates the LS ground from DAS 804A-type to a +18 volt signal. When the appropriate option is used, relay LSS can be provided with a locking path which maintains relay LSS operated to provide a continuous LS signal to permit simultaneous wideband data transmission and talking for certain modes of station operation. The LS signal path is divided into two parts in DAS 806D1. One branch goes to DS 303 and the other branch goes to DAS 804A-type. The +18 volts to DS 303 indicates that the station is in the data mode. The +18 volts to DAS 804A-type over the TLP lead lights the WB DATA lamp. The +18 volts is removed from the TLP lead when the station is in either the remote or local test mode.

**3.64** The C3 lead provides battery from DAS 804A-type for line-looping relays RT1A and RT1B in DAS 806. Released contacts of the T relay enable this circuit. Application of the battery is delayed by contacts of the LS relay. This delay is necessary to permit transmission of the answer-back tone before the lines are looped ahead of the data station.

**3.65** The local test mode can be controlled from a connecting DAS 804A-type by depressing the TEST key. Depression of the TEST key places ground on the DD1 lead. This operates the LTA relay in the same manner as when ground is applied from the LT key of DAS 806.

**3.66** The local test mode is indicated by a lighted TEST lamp on DAS 804A-type. The TEST lamp is lighted when -18 volts is applied to the DD1L lead through a make contact on relay LTC.

**3.67** In this application, leads from DAS 806 to the private line terminal perform the same functions as their corresponding leads between DAS 804A-type and DAS 806.

### D. Options

**3.68** Certain options are required in this application (DS 303, DAS 806, and DAS 804). Other options and features are determined by the customer's preference. Table D lists the required options and those available by customer choice. The following describes the options available for a DS 303, DAS 806, plus DAS 804 station arrangement.

**3.69** Data Set 303 options for this type of installation are the same as for an installation of DS 303 only except that the K and W options are not to be used and options N and S may be used. When the station arrangement includes DAS 806B-type, the N and S options in DS 303 are used to provide the simultaneous wideband data and talking feature as follows:

- **N Option**—When this option is installed, DS 303-type is in the data mode whenever ALT is OFF. This permits simultaneous voice communication and synchronous wideband data. When ALT is ON, DAS 804A-type must be in the data mode to transmit wideband data.
- **S Option**—The inverse of N option and permits simultaneous talk and nonsynchronous wideband data when ALT is ON. When ALT is OFF, DAS 804A-type must be in the data mode to transmit wideband data.
- **S and N Options**—When both S and N options are installed, DS 303-type can transmit either synchronous or nonsynchronous data independent of whether DAS 804A-type is in the talk or data mode. When neither the S nor N option is supplied, DAS 804A-type must be in the data mode to transmit wideband data. Note that when DAS 804A-type is not used, the K option must be supplied. Neither the N nor S option is factory-furnished in DS 303-type.

When the station arrangement includes DAS 806D1, options N and S are not required to provide the simultaneous wideband data and talking feature unless this feature is to be switched in and out under control of the ALT lead. Option ZC in DAS 806D1 provides the simultaneous wideband data and talking feature on a nonswitched basis. When the feature is to be switched under the ALT control by the customer, then either option

TABLE D  
 OPTIONS – DS 303, DAS 806, AND DAS 804

DATA SET 303		DATA AUXILIARY SET 806B-TYPE		DATA AUXILIARY SET 806D1		DATA AUXILIARY SET 804	
REQUIRED*	PERMISSIBLE*	REQUIRED*	PERMISSIBLE	REQUIRED*	PERMISSIBLE*	REQUIRED	PERMISSIBLE
M or Q; E† or Z†	A; N; S; T; V; R; X; Y or J	X; V; J; S or T	—	B; J; X; V; S or T; ZA; ZB; ZE; ZF	ZC or ZD	F; H; N; M; V; ZA; X, Y, or Z‡; ZM§	B; G

\* The following pairs of options are mutually exclusive and only one of each pair should be provided in DS 303: E or Z, Y or J; M or Q; in DAS 806D1: S or T, ZC and ZD.

† Synchronous sets.

‡ Use one of the three options (X, Y, or Z) that will allow the answer tone to arrive at the serving central office closest to -12 dBm.

§ Provided in codes 804A5 and later.

N or S in DS 303 is used in conjunction with option ZD in DAS 806D1 to provide the desired mode of operation as defined by the N or S option. The use of these options associated with the simultaneous wideband data and talking feature is shown in Table D.

**3.70** The DAS 806-type options for this type of installation depend upon the code of DAS 806 used. When DAS 806B-type is used, the required options are V; X; J; and S or T. When DAS 806D1 is used, the required options are V; X; J; S or T; B; ZA; ZB; ZE; and ZF. Options ZC or ZD may be used with DAS 806D1.

**3.71** The additional applicable options for DAS 806B-type and DAS 806D1 will be described briefly.

- **J Option**—Factory-furnished option which completes the answer-back tone and voice-frequency data paths in DAS 804A-type.
- **S Option**—Factory-furnished option which is used when the DTR signal is to be provided from the customer's data terminal. It must be used if the station has an automatic answer feature.
- **T Option**—This option provides a permanent data terminal ready signal. It is not factory furnished.
- **ZA Option**—Provides the operating path for the WB DATA lamp in an associated DAS 804A-type. This option applies to DAS 806D1 only and is not factory-furnished.
- **ZB Option**—This option is used when DAS 804A-type is provided. Furnishes the path for ACU TALK IND function which provides the off-hook indication when DAS 804A-type is in the talk mode. This option applies to DAS 806D1 only and is not factory-furnished.
- **ZC Option**—Provides simultaneous wideband data and talk feature on a nonswitched basis. This option applies to DAS 806D1 only and is not factory-furnished.
- **ZD Option**—When this option is used in conjunction with the N or S option in DS 303-type, it provides the simultaneous data and talk feature on a switched basis under

control of the ALT signal from the customer to DS 303-type. This option applies to DAS 806D1 only and is not factory-furnished.

- **ZE Option**—Terminates an associated DAS 804A-type operated to the data mode when a voiceband data set is not provided. This option applies to DAS 806D1 only and is not factory-furnished.
- **ZF Option**—Applies the control path to the RVD relay, in DAS 806D1, to provide switching of the receive pair of a 4-wire full-period point-to-point voice coordination line between the telephone receiver of an associated DS 404B1 under control of the operating mode of DAS 804A-type. This option applies to DAS 806D1 only and is not factory-furnished.

**3.72** The following DAS 804A-type options are available for use in this type of installation:

- **B Option**—Connects R relay make contact to AUTO key to provide part of the operate path for the C relay in the automatic answer mode.
- **F Option**—Used to connect the TALK lamp to the T relay. When the station is in the talk mode, the lamp associated with the TALK key lights.
- **G Option**—In series with the AUTO key and provides remainder of operate path for C relay in automatic answer mode. Used with the B option, it provides the automatic answer function for the data station.
- **H Option**—Provides a balanced pair on DT and DR instead of a single signal lead with a ground common.
- **M Option**—Used when DAS 804A-type is operating on a 4-wire service.
- **N Option**—Ties the ring detecting circuit to cord leads Ring R and Ring T.
- **V Option**—Provides a 600-ohm line impedance.
- **X, Y, or Z Option**—Controls answertone power. Use the option that supplies closest

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to -12 dBm answertone power to the serving control office.

- **ZA Option**—An installer option to allow use of the  $\pm 18$  volt power supply in the data set.
- **ZM Option**—Use this option when DAS 804A-type is not used with DS 303-type. This option is provided in codes DAS 804A5 and later.

### E. Operation

#### Placing a Telephone Call

**3.73** To initiate a telephone call:

- (a) Lift handset.
- (b) Depress TALK key. (TALK lamp lights.) Station is in the talk mode.
- (c) Depress RING key.
- (d) At the called end, DAS 804A-type rings, RING lamp flashes, and station answers in the talk or auto mode.

#### Answering a Call in the Talk Mode

**3.74** To answer a call in the talk mode, depress TALK key (TALK lamp lights) and lift handset.

#### Answering a Call in the Auto Mode

**3.75** To answer a call in the auto mode:

- (a) AUTO key must be depressed (AUTO lamp lighted) and DTR lead must be *on*.
- (b) When called, the station answers automatically. (VB DATA lamp lights.)
- (c) Approximately 3 seconds of 2025-Hz answer-back tone is sent to the calling station. The originating station may go into the data mode after the tone ceases.
- (d) At the end of the answer-back tone, WB DATA lamp lights. The station supplies a DSR ON signal to the customer which indicates that it is ready to receive data. When RS lead

is *on*, the station supplies a CS ON signal to the customer which indicates that it is ready to send data.

#### Entering the Data Mode

**3.76** To go into the data mode:

- (a) The data set must be in the talk mode and DTR lead must be *on*. If the call was answered automatically and the terminating station is still on line, see step (f).
- (b) Depress VB DATA key. (VB DATA lamp lights.)
- (c) Place handset on-hook.
- (d) Approximately 3 seconds of 2025-Hz answer-back tone is sent to the terminating station. The terminating station may now go into the data mode by depressing the VB DATA key.
- (e) At the end of the answer-back tone, the WB DATA lamp lights. The station supplies a DSR ON signal to the customer which indicates that it is ready to receive data. When RS lead is *on*, the station supplies a CS ON signal to the customer which indicates that it is ready to transmit data.
- (f) If a call has been answered automatically and the terminating station is still on line, the station can be put directly into the data mode by depressing the VB DATA key.

#### Entering the Talk Mode

**3.77** To go into the talk mode:

- (a) Depress TALK key.
- (b) Lift handset. (TALK lamp lights.)

**3.78** To go into the auto mode:

- (a) Depress AUTO key. (AUTO lamp lights.)
- (b) If presently in the data mode, station will remain in the data mode until call is terminated. There will be no interruption of data being transmitted.

**3.79** To go into the local test mode under control of DAS 804A-type:

- (a) Depress TEST key. (VB DATA and TEST lamps light.)
- (b) The wideband data path is looped immediately. (An OFF signal on DSR lead is supplied to the customer.)
- (c) The voiceband data path is looped after approximately 5 seconds.

**3.80** The station may also be put in the local test from DAS 806 by turning the LT key to the vertical position, or from the business machine by placing an ON signal over the LT lead in the customer's wideband data cable.

**3.81** To terminate a call manually:

- (a) Go into talk mode (3.77).
- (b) Place handset on-hook.

**3.82** To guarantee termination of a call by control of the DTR lead, assuming the station is in the data or auto mode, an OFF signal for at least 50 milliseconds on the DTR lead is required.

**3.83** For simultaneous talk and wideband data operation when DAS 806B-type is used:

- (a) The N option in DS 303-type permits wideband synchronous data transmission regardless of the mode of DAS 804A-type. (WB DATA lamp is lighted if DS 303-type is in the synchronous mode.)
- (b) The S option in DS 303-type permits wideband nonsynchronous data transmission regardless of the mode of DAS 804A-type. (WB DATA lamp is lighted if DS 303-type is in the nonsynchronous mode.)
- (c) The simultaneous talk and wideband data features are disabled when the station is in the auto mode.

**3.84** For simultaneous talk and wideband data when DAS 806D1 is used:

- (a) The ZC option in DAS 806D1 permits wideband data transmission regardless of the mode of

DAS 804A-type, after DAS 804A-type has been operated initially to the data mode. This applies for synchronous, nonsynchronous or alternate use (ALT) operation when a voiceband data set is not provided. The N and S options in DS 303-type are not required for this type operation. The WB DATA lamp on DAS 804A-type is lighted when the data station is in the data mode.

- (b) The ZD option in DAS 806D1, when used in combination with option N or S in DS 303-type, permits wideband data transmission regardless of the mode of DAS 804A-type for either synchronous or nonsynchronous data as a function of the alternate use (ALT) signal. The DAS 804A-type must be operated to the data mode initially for this type of operation. The N option in DS 303-type, when used with the ZD option in DAS 806D1, permits wideband data transmission regardless of the mode of DAS 804A-type when the ALT signal is OFF. The S option in DS 303-type, when used with the ZD option in DAS 806D1, permits wideband nonsynchronous data transmission regardless of the mode of DAS 804A-type when the ALT signal is ON.

#### **DATA SET 303, DATA AUXILIARY SET 806, DATA AUXILIARY SET 804, PLUS DATA SET 404B1**

##### **A. General**

**3.85** Some wideband facsimile stations require low-speed control functions in each direction in addition to the wideband channel. This capability is provided by the use of DS 404B1 on the voice-frequency coordination channel. Refer to Fig. 11.

**3.86** Data Set 404B1 is a nonintegrated, 4-wire voiceband data transceiver capable of transmitting and receiving a 2-out-of-10 multifrequency format. The transmitter accepts voltage signals, having electrical characteristics of EIA Standard RS-232-C, from the connecting business machine and converts these to voice-frequency signals for transmission over the telephone line. The receiver converts these frequencies into voltage signals which are passed to the connecting business machine. DS 404B1 is capable of operating at a rate of up to 20 characters per second. One end of an M14C cord is wired to TB1 of DS 404B1 and the other end connects to DAS 806 to provide connection. The lead designations are shown in Table E. The

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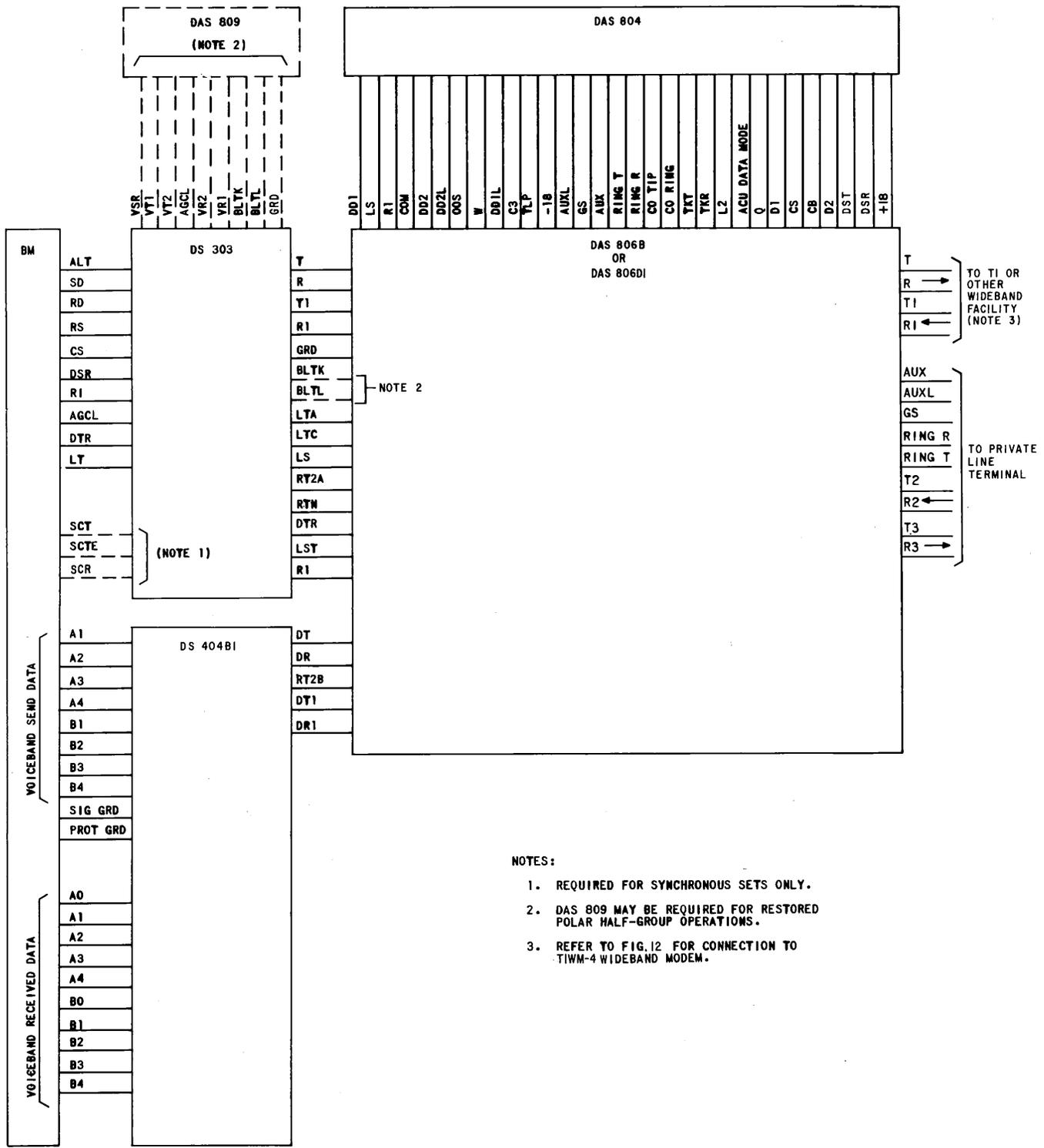


Fig. 11—Data Set 303, Data Auxiliary Set 806, Data Auxiliary Set 804, Data Set 404—Interconnections

interface connections between DS 404 and the business machine are given in Table F.

TABLE E  
LEADS BETWEEN DS 404 AND DAS 806

TERMINAL ON TB1 OF DS 404	DESIGNATION	FUNCTION
1	DT	Data Tip *
2	DR	Data Ring *
3	DT1	Data Tip †
4	DR1	Data Ring †
5	RT2B	Remote Test

\* Transmitting

† Receiving

TABLE F  
LEADS BETWEEN DS 404 AND BUSINESS MACHINE

PIN NO.	DESIGNATION	FUNCTION
1	FR GRD	Frame Ground
2	A1	Data Channel A1*
3	A2	Data Channel A2*
4	A3	Data Channel A3*
5	A4	Data Channel A4*
7	SIG GRD	Signal Ground
8	B1	Data Channel B1*
9	+TST	Power for 901B Data Test Set†
10	-TST	Power for 901B Data Test Set†
11	B2	Data Channel B2*
12	B3	Data Channel B3*
13	B4	Data Channel B4*
14	A0	Data Channel A0‡
15	A1	Data Channel A1‡
16	A2	Data Channel A2‡
17	A3	Data Channel A3‡
18	A4	Data Channel A4‡
19	B0	Data Channel B0‡
21	B1	Data Channel B1‡
23	B2	Data Channel B2‡
24	B3	Data Channel B3‡
25	B4	Data Channel B4‡

\* Transmit Channel

† Test Purposes Only

‡ Receive Channel

### B. Local Test

**3.87** Functionally, the local test is the same as described for DS 303, DAS 806, plus DAS 804 installation (3.48). Relays operate in DAS 806 to connect the transmit voiceband line circuits to the receive voiceband line circuits and to terminate the transmit and receive lines of the facilities.

### C. Remote Test

**3.88** When DS 404B1 is placed in the remote test mode, the customer's circuits are disconnected from the interface circuits of the data set. The output of each receiving circuit is connected to the input of the corresponding transmitting circuit. Thus, the data set response to the A1, A2, A3, A4, B1, B2, B3, and B4 frequencies can be tested by sending each frequency in turn to the receivers and observing that the same frequency is returned from the transmitter. Operation of the idle state (rest tone) detectors (A0 and B0) is verified by sending A0 and B0 and observing that B4 is returned only when in the test condition. (The outputs of A0 and B0 are sent to an AND gate which keys the B oscillator to send B4 frequency.)

### D. Control Functions

**3.89** When DAS 804 is placed in the data mode, the voiceband data transmit signals from DS 404B1 are sent to DAS 806 over leads DT and DR. From DAS 806, the signals are sent to DAS 804 over leads DST and DSR. The transmit signals are sent from DAS 804 back to DAS 806 over the CO TIP and CO RING leads and then to the connecting private line terminal over the T3 and R3 leads.

**3.90** The receive data signals, from the associated private line terminal, are sent over the T2 and R2 leads to DAS 806. From DAS 806, the signals are then sent to DS 404 over the DT1 and DR1 leads.

### E. Options

**3.91** Certain options must be used due to the type of service and station arrangement. Other options and features are determined by the customer's preference. When DS 404B1 is added, options for DS 303, DAS 806, plus DAS 804 are not affected.

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**3.92** The W and Y options are factory-provided in DS 404. Option Y will always be used in private line applications; option W will be used in most cases. When W option is not used, the X option is used. These options are described as follows:

- **W Option**—Provides full gain of the receiver.
- **X Option**—Reduces the gain of the receiver by one-half by inserting a 6-dB pad.
- **Y Option**—The receiver can be arranged to terminate either a 600- or 900-ohm line. The Y option provides 600-ohm operation.

**F. Operation**

**3.93** Attendant operation is not affected by the addition of DS 404B1. Refer to the operating procedures for the same station configuration without DS 404B1.

**DATA AUXILIARY SET 809**

**A. General**

**3.94** Data Auxiliary Set 809B1, when used in conjunction with a 19.2-kbps (or 18.75-kbps in special applications) DS 303, will provide service over half-group wideband transmission facilities. When dc-coupled balanced line interface DS 303-type is used, DAS 809B1 is not required at the data station.

**3.95** Data Auxiliary Set 809 is a transmitter-receiver which converts a baseband data signal from

DS 303-type into a vestigial sideband (VSB) form which can be transmitted over a half-group wideband facility.

**3.96** Connection to DS 303B-type is made by a cable which is furnished as part of DAS 809B1. The wires in the cable, which are spade-tipped and attached to a fanout strip, are connected to TB1 of DAS 809B1. The interface connections between DS 303 and DAS 809 are given in Table G.

**B. Local Test**

**3.97** Functionally, the local test is the same as that described for the DS 303, DAS 806, plus DAS 804A-type installation (3.48). In addition, the Baseband Local Test (BLT) circuits are added.

**3.98** A BLT circuit is included in DAS 809B1 to switch the 809B1 transmit and receive circuits out of the data paths during a local test of the station. The BLT circuit can be used to determine if a trouble condition is caused by a malfunction in DAS 809B1 or in DS 303B-type.

**3.99** The BLT circuit is engaged by placing the wideband station in the local test mode (by any method) and then momentarily depressing the BLT pushbutton. The LT key and the BLT pushbuttons are located on the front panel of DAS 806. The BLT circuit is released when the wideband station is removed from the local test mode. Lamps on DAS 806 indicate when the wideband station is in the local test or baseband local test mode. The Baseband Local Test key (BLTK) and Baseband Local Test Lock (BLTL) leads provide operate and

**TABLE G  
LEADS BETWEEN DS 303 AND DAS 809**

SCREW TERMINAL ON TB1	DESIGNATION	FUNCTION	COLOR
23	BLTL	Baseband Local Test Lock	W-BL
24	VSR	VSB Send Request	W-BR
25	VT1	VSB Transmitter In	O
26	VT2	VSB Transmitter Out	BL
27	CKT GRD	CKT Ground	W-BK
28	VR1	VSB Receiver In	BR
29	VR2	VSB Receiver Out	G
30	BLTK	Baseband Local Test Key	W-O
31	AGCL	Automatic Gain Control Lock	W-G

holding current paths for the BLT relay located in DAS 809B1.

### C. Remote Test

**3.100** Functionally, the remote tests are the same as those described for DS 303 plus DAS 806. In the RT1 mode, the transmit lines are looped back on their respective receive lines at the line side of the data station. In the RT2 mode, the lines are looped at the customer's interface. DAS 809 is included in the transmission of data in the RT2 mode. Refer to 3.32 - 3.37 for a complete description of the remote test feature.

### D. Control Functions

**3.101** The leads between DAS 806 and DS 303 and between DS 303 and DAS 809 are the only control functions affected by the addition of DAS 809. The BLTK and BLTL leads are added between DS 303 and DAS 806. (These leads pass through DS 303 to DAS 809.) When the BLT key on DAS 806 is depressed, the BLT relay in DAS 809 operates. The operating voltage for the BLT relay is applied from DAS 806 through DS 303 to DAS 809 via the BLTK lead. The BLTL lead provides a lock-up path for the BLT relay.

**3.102** The signal functions between DS 303 and DAS 809 are described in 3.103 and 3.104.

**3.103** The function of the transmitting circuit is to accept the baseband signal from the transmitter in DS 303B-type and to amplitude modulate and vestigial sideband (VSB) shape it to a 28- to 44-kHz frequency spectrum which is suitable for transmission over half-group facilities.

**3.104** The receiver circuits in DAS 809B1 accept the VSB signal and demodulate it to the original baseband spectrum. This signal is then amplified by a buffer amplifier and fed out on interface cable lead VR2 to the receiver circuits in DS 303B-type.

### E. Options

**3.105** There are no options for DAS 809. When DAS 809B1 is used in a station arrangement, the options in DAS 806, DAS 804A-type, and DS 404 are not affected; however, the R option may be installed in and the V option must be removed from DS 303-type.

### F. Operation

**3.106** Attendant operation is affected by the addition of DAS 809. The BLT key on DAS 806 isolates DAS 809 during the local test mode. Refer to 3.97 and 3.98 for a description of the BLT function.

### T1WM-4 WIDEBAND MODEM

#### A. General

**3.107** The T1WM-4 wideband modem (Fig. 12) can be used in conjunction with any of the wideband data station arrangements shown in Figures 8 through 11. DS 303 must be coded for dc-coupled balanced line signal type operation. When dc-coupled balanced line signal type DS 303 is used, DAS 809B1 cannot be used.

**3.108** The T1WM-4 accepts serial binary signals from DS 303 and converts them into a form suitable for transmission over T1 carrier facilities. The receiver portion of the T1WM-4 wideband modem performs the inverse by converting the T1 type signals into a form suitable to DS 303. Refer to the sections entitled T1 Carrier System Terminal, T1WM-4 Wideband Modem, Description (365-121-100) and Digital Transmission Systems, T1 Carrier J98713F Line Terminating Unit, Description (365-200-103) for a description of T1WM-4 and the associated T1 Carrier Line Terminating Unit.

#### B. Local Test

**3.109** Functionally, the local test is the same as for the corresponding restored polar type of station arrangement. The local test loops the transmit pair back to the receiver pair in DAS 806; therefore, T1WM-4 is not included in the local test loop. However, it is possible to include the T1WM-4 wideband modem in a local test procedure by using a manual control on the T1WM-4 modem. Procedures for establishing local test from the T1WM-4 wideband modem are detailed in Section 365-121-100.

#### C. Remote Test

**3.110** RT1 provides a turnaround connection at the line side of DAS 806. This provides a means of testing the T1 line and T1WM-4 from the serving central office or data test center. RT2 provides a turnaround connection at the business

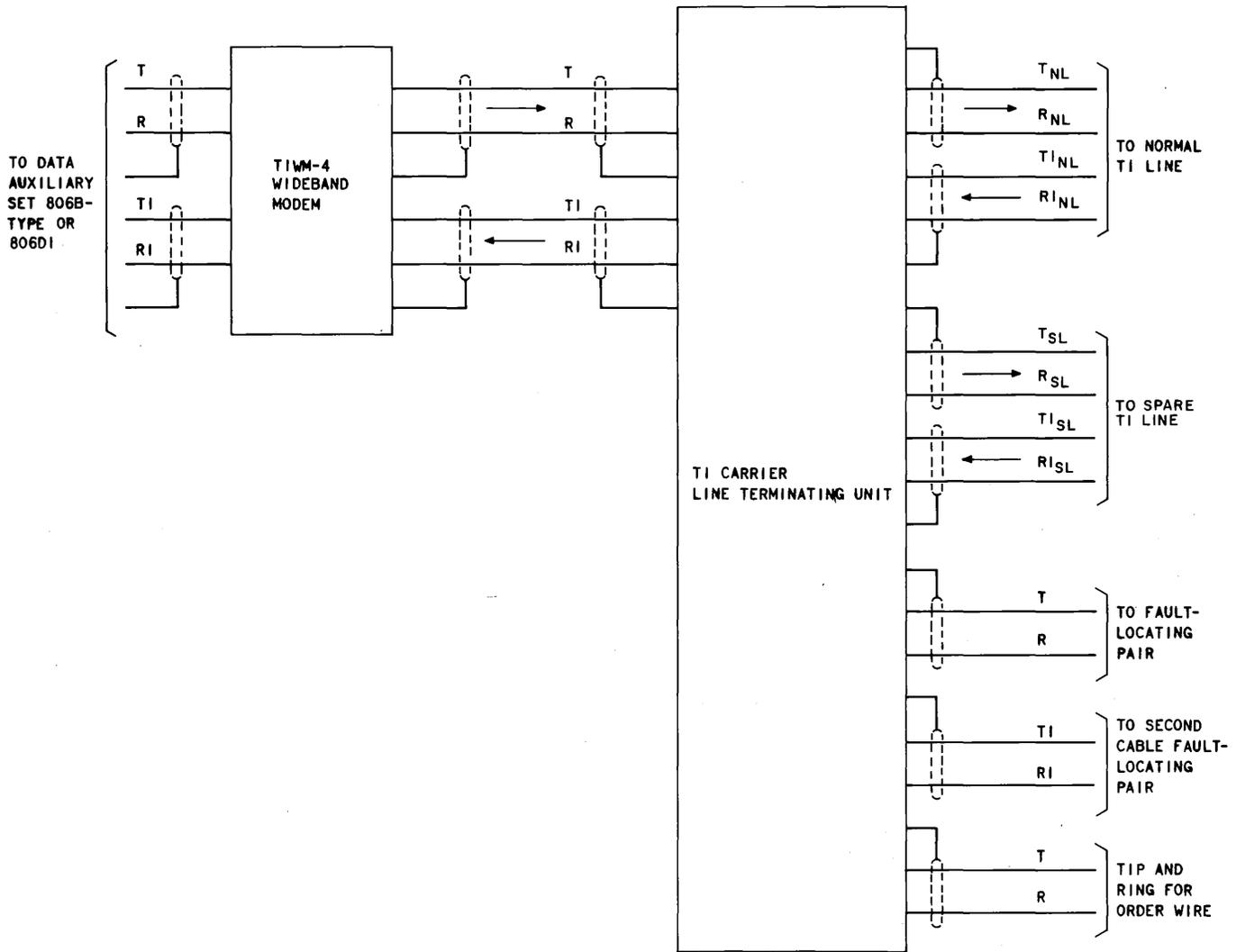


Fig. 12—TIWM-4 Wideband Modem and Line Terminating Unit—Interconnections

machine side of DS 303. This provides a means of testing the T1 line and the complete data station.

**D. Control Functions**

3.111 The control functions are the same as for the corresponding restored polar type data station.

**E. Options**

3.112 The options are the same as for the corresponding restored polar type data station except for the V option which, in DS 303, is not applicable to a dc-coupled balanced line signal type of data set. DAS 809 is never used with this type data set.

**F. Operation**

**3.113** The previously described operation is not affected by the T1WM-4 wideband modem. For a description of the controls associated with the T1WM-4 wideband modem and the T1 Carrier Line Terminating Unit, refer to Section 365-121-100 and 365-200-103, respectively.

**4. REFERENCES**

**4.01** The CDs and SDs for the apparatus included in the wideband data station using Data Set 303-type are as follows:

SD-1D100-01 and CD-1D100-01 Data Set 303-Type

SD-1D067-01 and CD-1D067-01 Data Auxiliary Set 809B1

SD-1D069-01 and CD-1D069-01 Data Set 404B1

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

SD-1D097-01 and CD-1D097-01 Data Auxiliary Set 806B-Type

SD-1D217-01 and CD-1D217-01 Data Auxiliary Set 806D1

SD-1D218-01 and CD-1D218-01 Data Unit 32A-Type

SD-1D061-01 and CD-1D061-01 Typical Data Set Applications

SD-1D099-01 and CD-1D099-01 Data Station for Wideband Service Using 303-Type Data Set, Application Schematic.

**4.02** Bell System Practices covering the various equipment in the station are given below:

Data Set 303-Type, Description (593-012-100)

Data Auxiliary Set 809B1, Description and Operation (598-034-100)

Data Set 404B1, Description (594-024-100)

Data Auxiliary Set 804A-Type, Description and Operation (598-030-100)

Data Auxiliary Set 806B-Type, Description and Operation (598-042-100)

Data Auxiliary Set 806D-Type, Identification (598-077-100)

10A-Type Data Unit, Identification (590-100-106)

32A-Type Data Unit, Description and Operation (590-100-122)

16A1 Data Unit, Identification (590-100-113)

Digital Transmission Systems, T1 Carrier, J98713F Line Terminating Unit, Description (365-200-103)

T1 Carrier System Terminal, T1WM-4 Wideband Modem, Description (365-121-100).