WIDEBAND DATA STATION USING DATA SET 303-TYPE 50-KBPS GOVERNMENT SECURE SPEECH SERVICE DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the Wideband Data Station using Data Set (DS) 303-type, Data Auxiliary Set (DAS) 806B7 or DAS 806D1, and DAS 824A1. The information will include a description of possible arrangements that can be made with the various data sets and data auxiliary sets for 4-wire point-to-point government secure speech service. 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.

1.02 This section is reissued for the following reasons:

- Change title to agree with Sections 593-800-201 and 593-800-501.
- Data Auxiliary Set (DAS) 806B7 is rated Manufacture Discontinued (MD) and the recommended substitute is DAS 806D1.

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

1.03 Wideband Data Stations (Fig. 1) are designed to provide high-speed wideband data service with a voice coordination circuit. In the 50 kilobit per second (kbps) government secure speech network application, the wideband station normally provides 4-wire to 8-wire conversion. The 8-wire circuit provides separate 4-wire wideband and 4-wire voiceband facilities. This conversion allows the connection of 4-wire government-owned facilities to the 8-wire Bell System facilities. Provision is made for 8-wire to 8-wire conversion in special cases.

Fig. 1—Typical Secure Speech Type Wideband Data Station

1.04 The data station serves as part of a Wideband Data System for use in the transmission of serial binary synchronous or nonsynchronous data over group facilities, T facilities, or any other facility with sufficient bandwidth for the particular data rate. The station is designed to transmit synchronous data at speeds of 50 kbps. Nonsynchronous transmission can occur at 50 kbps or less (the minimum signal element duration is 20 μsec).

1.05 Figure 2 is a block diagram of a typical Wideband Data System. 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. To select the proper DS 303-type code, refer to Section 593-012-100.

1.06 In the typical 4-wire to 8-wire conversion, input to the data station is over a 4-wire line from the customer-owned and maintained (COAM) terminal. The received signal consists of either clear-voice and voice-frequency signaling or 50-kbps data signaling. The DAS 824A1 determines which type of signal is present and switches the 4-wire line to the appropriate 4-wire facility (voice or wideband data) for transmission to the distant station. The received signal from the 8-wire facility is monitored and then directed through the appropriate circuit in the data station for transmission to the near-end COAM terminal.

(a) Customer signals are fed from the COAM terminal to a data recognizer (DAS 824A-type). Two versions of DAS 824A-type are available: DAS 824A1, which is not self-powered; and DAS 824A2, which includes a 26A power unit. When the arrangement involves DAS 806B7 or DAS 806D1 and DS 303-type, the DAS 824A1 is typically used and powered from the DAS 806B7 or DAS 806D1. The purposes of DAS 824A-type are as follows:

- To determine when 50-kbps data is being transmitted from the near-end COAM facilities and when 50-kbps data is being received from the far-end COAM facilities

- To switch 4-wire balanced customer or plant lines (carrying voice, voice-frequency signaling tones, or 50-kbps baseband serial binary

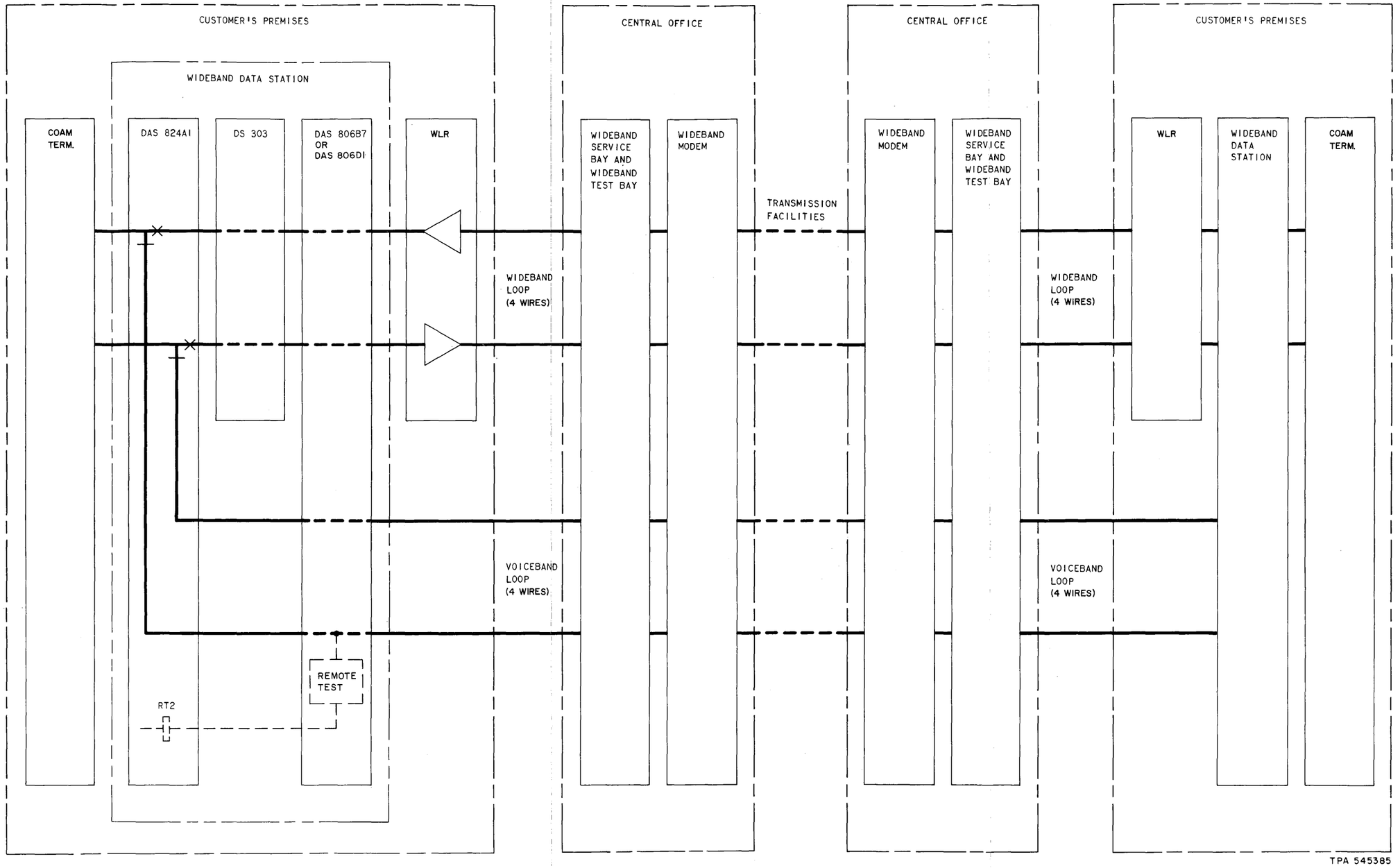

Fig. 2—Typical Secure Speech Wideband Data System—Block Diagram

signals) to either a 4-wire voice-frequency channel or to a 4-wire 50-kbps data transmission channel

- To provide a simulated data signal under certain conditions

- To bypass a COAM translator when voice-frequency signals are being transmitted

- To provide the customer with a set of contact closures when 50-kbps digital signals are being transmitted or received and the station is used for 8-wire to 8-wire switching.

(b) The wideband signals are fed from DAS 824A1 to DS 303-type before being applied to DAS 806B7 or DAS 806D1. Data Set 303-type shapes the signals so that they can be sent over the wideband facilities. The voiceband signals are applied from DAS 824A1 to DAS 806B7 or DAS 806D1.

(c) Both the wideband and voiceband signals are passed through DAS 806B7 or DAS 806D1 to their corresponding facility.

1.07 The transmission facilities between the station and the serving central office consist of a 4-wire wideband circuit conditioned for data transmission and a 4-wire voiceband circuit. Both circuits normally terminate in the wideband service bay at the serving central office.

1.08 The wideband service bay includes equipment and line jacks for both the wideband data circuit and the associated voice-frequency coordination circuit. It usually contains transmission testing equipment.

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

1.10 For restored polar operation, both the wideband and voiceband signals are fed from the wideband service bay to the wideband modem (if applicable) where they are modulated for transmission over carrier facilities. At the receiving end, these signals are demodulated to baseband frequencies.

1.11 For dc-coupled balanced line signals, the data set converts the serial binary data into a form that is compatible with the T1WM-4 wideband modem. The T1WM-4 wideband modem encodes the transition of the data stream into a suitable format for transmission over a T1 line.

1.12 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 restored polar type wideband data station can be mounted in a Bell System-provided cabinet (Fig. 3) or on standard 19-inch, 23-inch, or 25-inch Bell System relay racks using the appropriate code of 87-type brackets. When the Wideband Data Station is a dc-coupled balanced line type, the components must be in a Bell System-provided cabinet or in a 23-inch relay rack.

2.02 The components of a restored polar line signal type Wideband Data Station (Fig. 4 and 5) are DS 303-type, DAS 806B7 or DAS 806D1, and DAS 824A1.

2.03 The components of a dc-coupled balanced line signal type Wideband Data Station (Fig. 6 and 7) are DS 303-type, DAS 806B7 or DAS 806D1, DAS 824A1, T1WM-4, and T1-carrier line terminating unit (LTU).

2.04 The restored polar type station is equipped with a 590B (23-inch) or a 591B (19-inch) panel which is used to distribute 117-vac power to the individual components. In the case of the fully equipped dc-coupled balanced line signal type Wideband Data Station, the 590B power distribution panel is not used. The 590B power distribution panel is replaced by a KS-20598 outlet box which mounts on an 87T bracket. This is necessary because of the space limitations within the cabinet. The 87T bracket then mounts DS 303 inside the cabinet. In other words, the 590B power distribution panel may be used in all 303-type Wideband Data Stations that are not cabinet-mounted and in all cabinet-mounted stations that do not include the T1WM-4 and LTU. The KS-20598 outlet box must

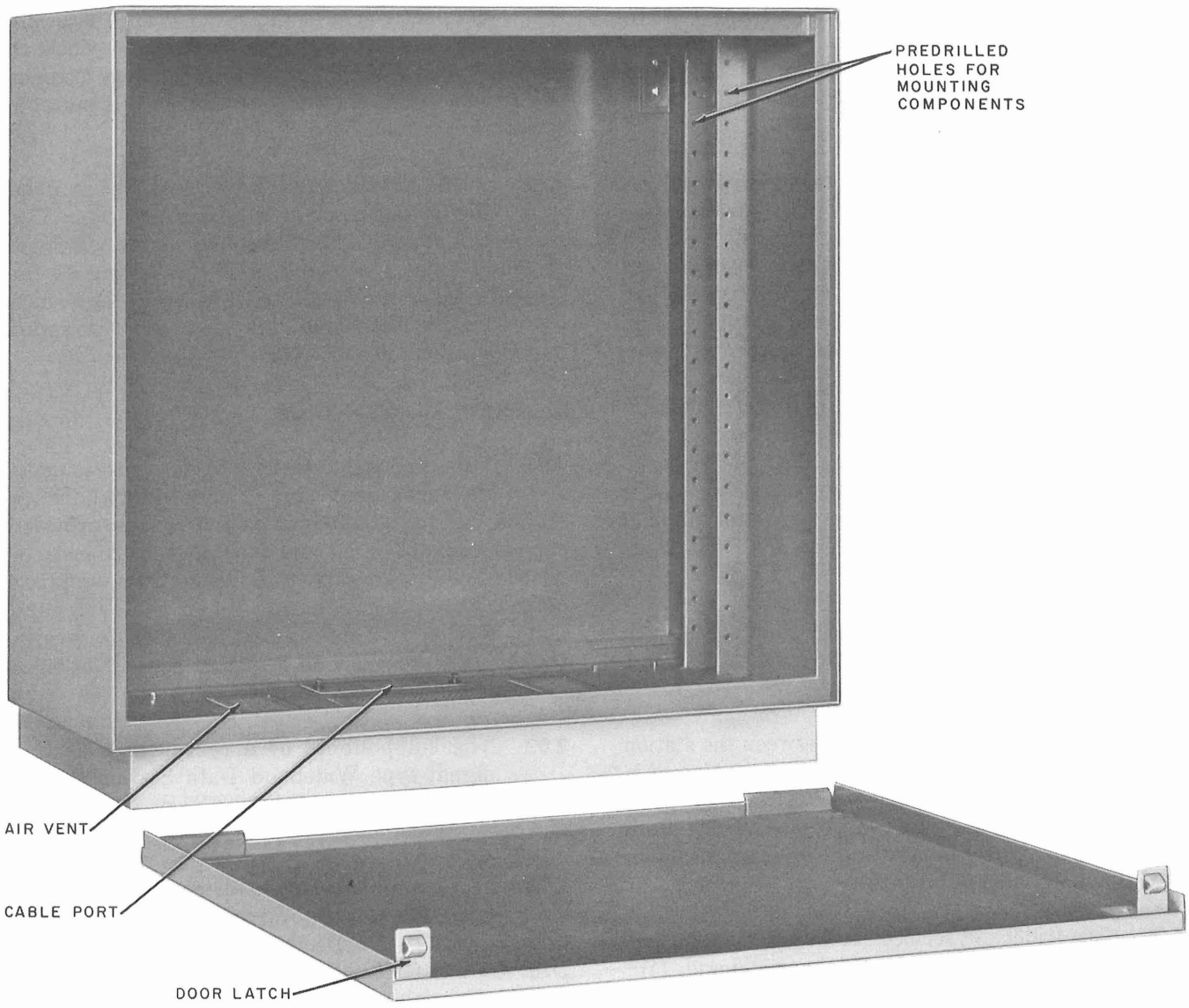

Fig. 3—Cabinet KS-20018

be used in stations containing a T1WM-4 and LTU and may be used in other station arrangements. When the KS-20598 outlet box is used, DS 303-type must be mounted with the 87T-type bracket.

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 The cabinet which is used to house the wideband station is coded KS-20018. One of the two cabinets, L2 or L3, can be used for restored polar line signal type data stations, depending on the station configuration.

2.07 If the data station is to operate over restored polar facilities, then the smaller KS-20018-L2 cabinet may be used. However, the L3 cabinet is more attractive for floor mounting and is generally preferred. For dc-coupled balanced line signal type data stations equipped with T1-carrier line terminating units and T1WM-4 wideband modem, the KS-20018-L7 cabinet is used. The weight and dimensions of the cabinets are given in Table A.

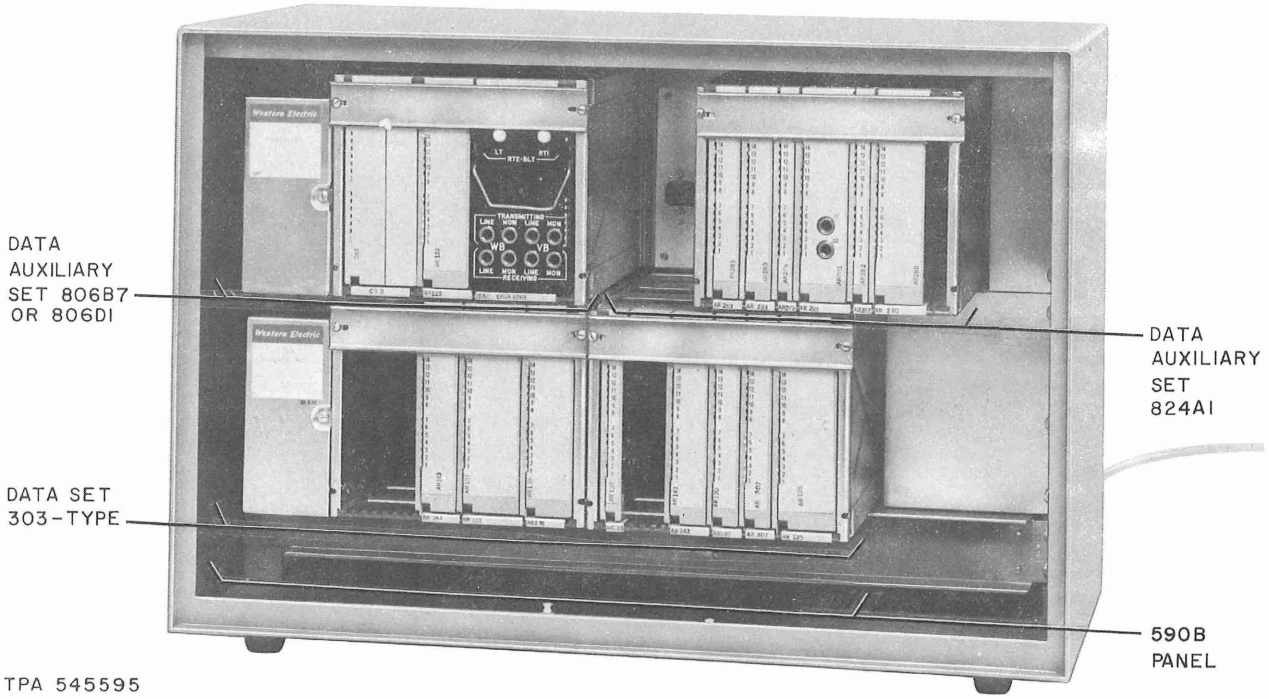

Fig. 4—Restored Polar, Secure Speech, Wideband Data Station—Front View

2.08 The cabinets are constructed of aluminum sheet and extrusions and are available in 2-tone gray with textured vinyl finish. These cabinets consist of dark gray framework housings with light olive gray front and rear panels.

2.09 Options wired into DAS 824A1, 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.

2.10 Interface cabling access is made through two rectangular ports in the front and rear center of the cabinet bottom plate. These ports are normally covered with a plate held in place by two quick-release fasteners.

2.11 Ventilation of the cabinets is provided by three large screened holes in the bottom plate and two half-inch wide slots which run the full width of the cabinet at the top of the front and rear panels.

2.12 The L3 and L7 cabinets have a skirt forming the base with a 6-inch port at the rear for cable ingress. The L2 cabinets have four rubber feet, one in each of the four corners.

2.13 Four levelers are provided with the L3 and L7 cabinets and may be removed when the cabinet is to be secured to the floor. Bolts or screws may be used for fastening the cabinet to the floor.

2.14 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.

3. FUNCTIONAL DESCRIPTION

GENERAL

3.01 The Wideband Data Station provides the interface between the COAM equipment and the Wideband Data Transmission System. A voice-frequency coordination channel may be employed. In such cases, both the wideband and the voiceband

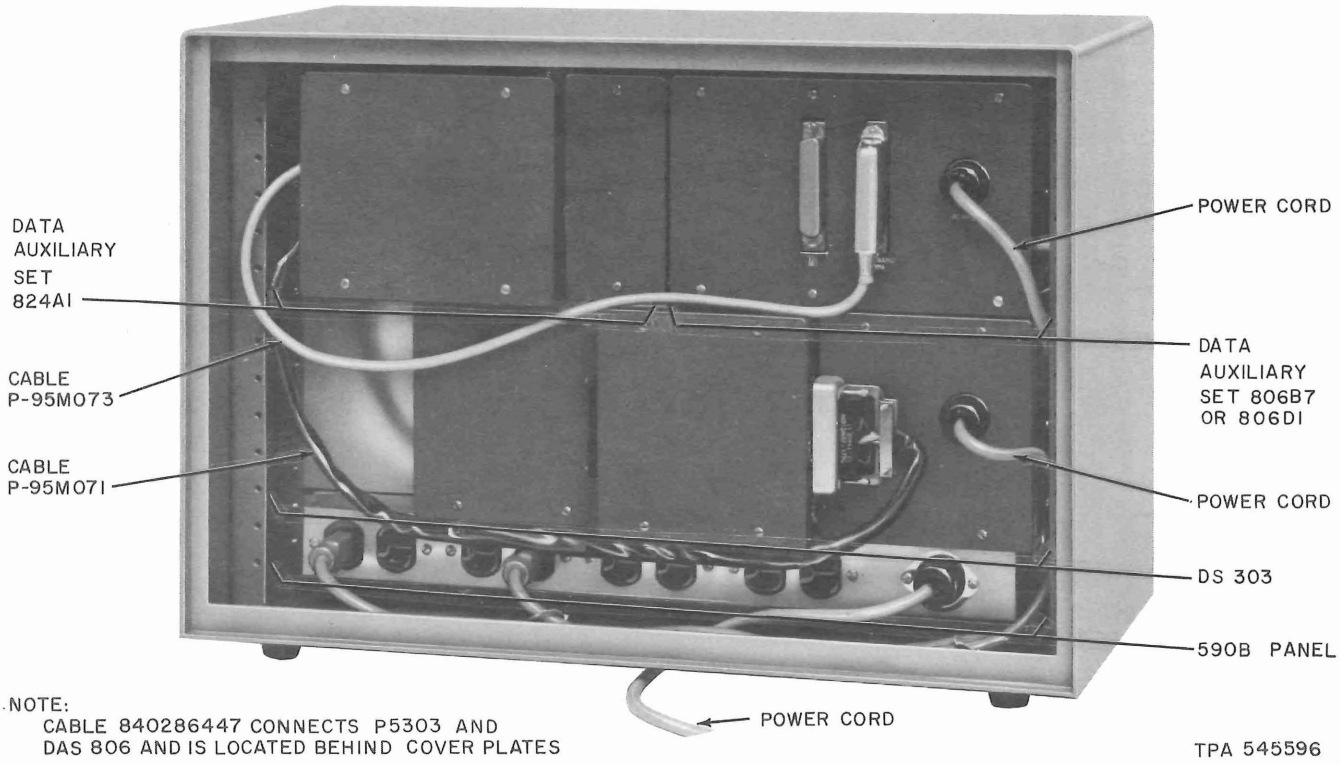

Fig. 5—Restored Polar, Secure Speech, Wideband Data Station—Rear View

sections of the station normally operate in the full-duplex mode. The usual secure speech type of data station consists of DAS 824A1, DS 303-type, and DAS 806B7 or DAS 806D1.

3.02 The secure speech type of Wideband Data System provides a means for detecting 50-kbps serial binary baseband signals. When 50-kbps data is detected, the balanced 4-wire connection is switched from the voice transmission facilities to the wideband circuits. Installer options are available to convert DAS 824A1 for use in any of five different configurations of customer connections and transmission facilities. However, only four station configurations are used over the Bell System facilities.

3.03 Data Auxiliary Set 824A1 provides the interface between the customer and the Bell System facilities. Two terminal boards are located under the rear cover of DAS 824A1 to provide a means for making these connections. Two jacks are provided on the front of DAS 824A1 to facilitate testing. For more information, refer to Section 598-060-100.

3.04 The DAS 824A1 determines whether a 50-kbps data signal or a voiceband signal is present and then switches the signal to the appropriate connections. The presence of 50-kbps data is detected in a data recognizer circuit. The DAS 824A1 includes two data recognizer circuits. One data recognizer circuit, called "A", monitors the transmitting pair of the COAM terminal. When data is detected on this line, a relay under control of the data recognizer circuit switches the transmitting pair from the voiceband loop to the wideband data loop. The second data recognizer, called "B", monitors the receive pair of the wideband data loop. In the absence of received data, the receive pair of the customer's 4-wire circuit is connected through to the voiceband facility. When received data is detected, a relay under control of data recognizer B switches the customer's receive pair to the receive pair of the wideband data loop.

3.05 Certain COAM equipment requires a third feature in addition to the detecting data feature and the line switching feature. This feature, called a "fooler," simulates a 50-kbps dotting signal on the receive pair. The fooler is necessary to

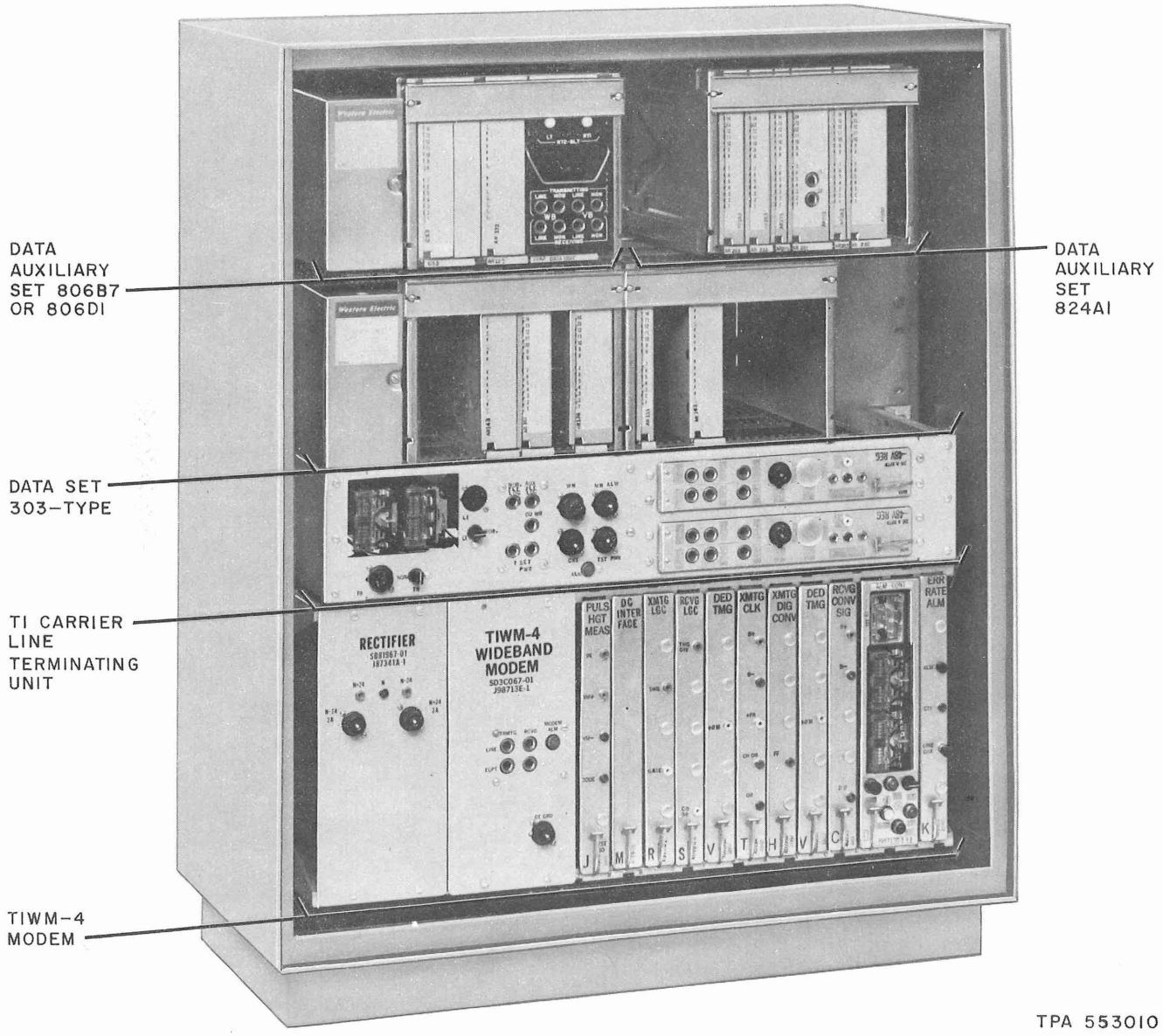

Fig. 6—DC-Coupled Balanced Line Signals, Secure Speech, Wideband Data Station—Front View

prevent the COAM equipment from timing-out before data is received. The logic sequence of the fooler is arranged such that the simulated data signal is applied to the receiving line of the COAM terminal only when data recognizer A operates before data recognizer B. This signal is maintained on the line until recognizer B operates. Once the logic sequence (A before B) has occurred, the fooler cannot be utilized again until data disappears from both the transmit and receive pairs.

3.06 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 COAM terminal 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 COAM equipment.

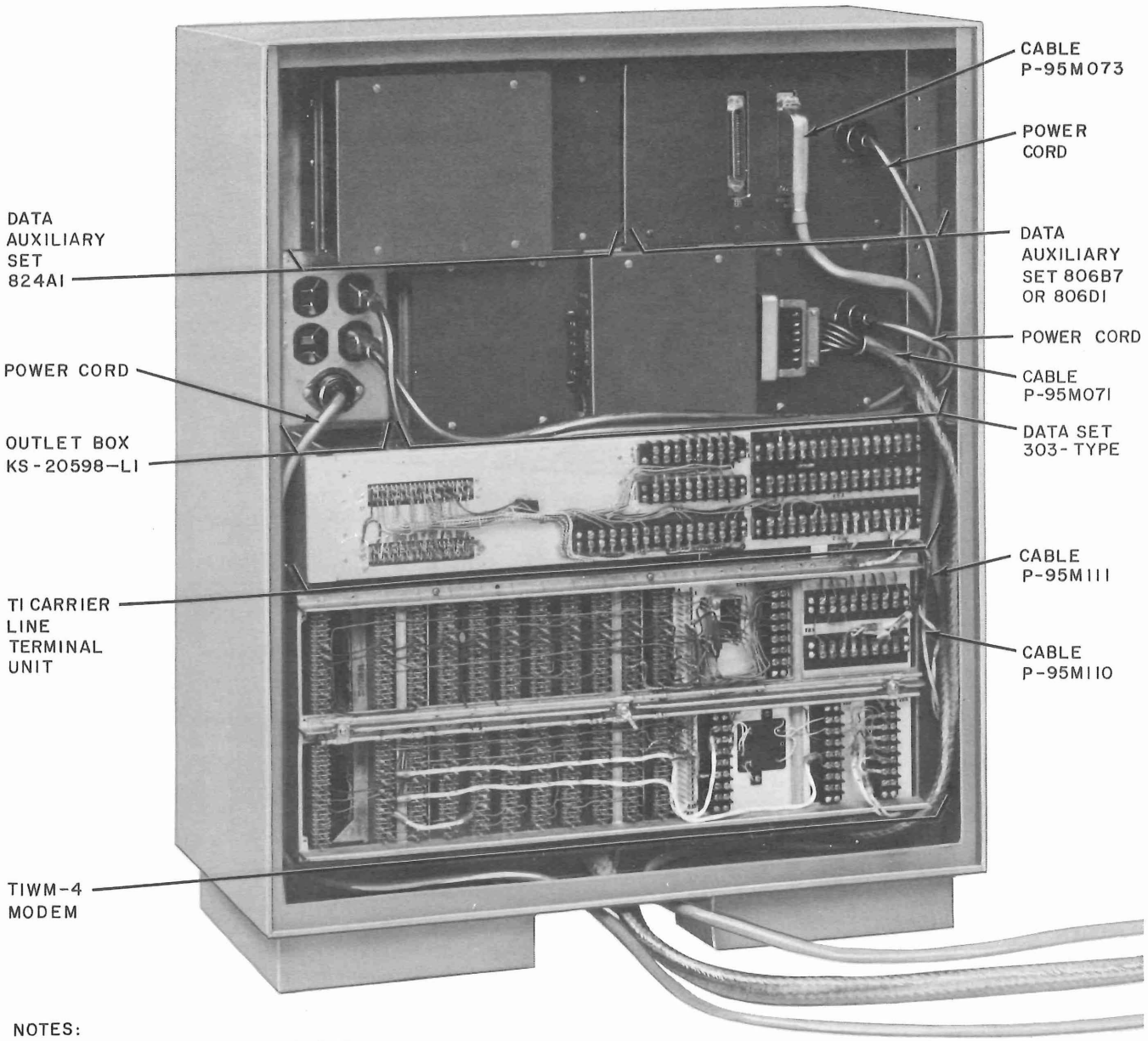

Fig. 7—DC-Coupled Balanced Line Signals, Secure Speech, Wideband Data Station—Rear View

This process is known as restored polar transmission. The restored polar type of line signal is not required for applications using the T1WM-4 wideband modem for transmission of data over T1 facilities. A simpler version of the data set is utilized where the restored polar circuitry is not used. This line signal is referred to as a dc-coupled balanced line signal and is used in conjunction with digital T-type telephone facilities.

3.07 Data Auxiliary Set 806B7 or DAS 806D1 provides line interfacing. In addition to line interfacing, DAS 806B7 or DAS 806D1 provides facilities for the following:

(a) ***Local Test:*** This provides a means for looping the data station transmit line circuit to the receive circuit to permit a check of

TABLE A

CABINET DIMENSIONS

CODE	LIST NO.	DEPTH (INCHES)	WIDTH (INCHES)	HEIGHT (INCHES)	WEIGHT (POUNDS)
KS-20018	L2	12	24	17	18
KS-20018	L3	12	24	24	24
KS-20018	L7	17	24	30	33

performance through the data station from the customer equipment on a local loop-back basis.

(b) ***Remote Test:*** The remote test feature enables a test center to loop the 4-wire wideband and 4-wire voice facilities at the remote data station line interface so that transmission tests can be made over the facilities and to loop the send data circuit to the receive data circuit in the DAS 824A1 at the customer's interface so that overall transmission tests can be made through the entire station.

(c) ***Monitoring and Terminating Jacks:*** These jacks provide access to the associated wideband line facilities.

STATION ARRANGEMENTS

3.08 DAS 824A1 provides data recognition and switching on a 4-wire wideband balanced customer connection which carries either voiceband or wideband signals. When 50-kbps serial binary baseband signals are detected, the balanced 4-wire connection is switched from 4-wire voice transmission facilities to 4-wire wideband facilities. Installer options are available to convert these data auxiliary sets for use in any of five different configurations of customer connections and transmission facilities.

3.09 The optional configurations of DAS 824A1 are installed by strapping together certain designated terminals on the option card (CP AR282). Refer to Section 593-800-201 for the strapping procedure. Each option is assigned a letter designation for reference purposes. The following is a functional description of these options.

A. Four-Wire Voice Frequency—Wideband Circuit to Eight-Wire Line (Option Z)

3.10 The Z option type of station arrangement provides an interface between the customer's 4-wire facility and the Bell System 8-wire facility (Fig. 8).

3.11 Data recognizer A bridges the transmitting circuit. When 50-kbps signals are being transmitted from the 4-wire voice frequency—wideband circuit A, data recognizer A circuit operates the A relay. The make contacts of the A relay transfer the signal to DS 303 via the wideband leads. The remainder of the wideband transmitting operation is the same as for a typical Wideband Data Station. The break contacts of the A relay open the voiceband path. An additional set of make contacts on the A relay provides a 135-ohm termination for the voiceband circuit. Any time 50-kbps signals are not being transmitted, the A relay is not operated and the voiceband signal transmitting path is complete.

3.12 Data recognizer B bridges the receive output of the wideband data set. Any time 50-kbps data is not being received, the B relay is not operated and the voiceband signal path is complete. When the 50-kbps signal is present, data recognizer B operates. This completes the 50-kbps receive path and terminates the voice-frequency signal path. An additional set of make contacts on the B relay provides 135-ohm termination for the voiceband circuit.

3.13 Remote test 2 (RT2) provides a turnaround connection at the COAM terminal interface. When DAS 806B7 or DAS 806D1 establishes the RT2 mode, the RT2 relay in DAS 824A1 operates.

This opens the connection to the customer and connects the receive pair to the transmit pair.

B. Four-Wire Voice Frequency—Wideband Circuit to Eight-Wire Line With 50-KBPS Oscillator (Option Y)

3.14 The Y option provides an interface between the customer's 4-wire facility and the Bell System 8-wire facility while simulating a digital response necessary to keep certain customer equipment from timing-out before the far-end equipment begins transmitting (Fig. 9). The circuit that simulates the data response is called a "fooler."

3.15 This station arrangement is the same as the Z option except for the "fooler." The customer's equipment must be receiving a signal to operate or it will time-out. The "fooler" provides a 50-kbps dotting signal back to the customer until 50-kbps data is received. The operational logic sequence for the "fooler" is controlled by data recognizers A and B. If data recognizer A operates before B, then the "fooler" comes ON and remains ON until data is received which causes data recognizer B to operate. If B operates before A, the "fooler" does not operate. Once the "fooler" is off, the logic sequencing cannot be repeated until data has ceased in both directions. Refer to Table B for the complete "fooler" sequence during initial application of signals.

C. Four-Wire Voice Frequency—Wideband Circuit to Four-Wire Voice Frequency—Wideband Circuit With Translator (Option X)

3.16 The X option is for connection of COAM equipment to COAM equipment (4-wire to 4-wire) either directly or over Bell System facilities. Since the X option does not involve Bell System equipment other than DAS 824A2 (same as DAS 824A1 but with a 26A power unit), the X option is not described in this practice. Refer to Section 598-060-100.

D. Four-Wire Voice Frequency—Wideband Circuit to Eight-Wire Line With Translator (Option W)

3.17 The W option provides the basic 4-wire to 8-wire interface conversion with the addition of a translator in the wideband path (Fig. 10). Voice-frequency signals are switched to the Bell System voice channel, and digital signals are diverted through the COAM translator. A simulated digital response is provided by the "fooler."

3.18 This station arrangement is the same as for the Y option except that a COAM translator is interposed in the wideband part of the circuit. The wideband signal is looped through the translator back to DAS 824A1 and from DAS 824A1 to DS 303 for transmission. The added A relay contacts isolate the translator's idle code from DS 303 input. This prevents false signals from being transmitted over the wideband lines when data is not being transmitted. The process of receiving data is the inverse of transmitting data. The added B relay contacts isolate DS 303 from the translator when wideband data is not being received.

E. Eight-Wire Voice Frequency—Wideband Circuit to Eight-Wire Line (Option V)

3.19 The V option provides an interface between the customer's 8-wire and the Bell System 8-wire facility. The V option also provides the customer with a contact closure when digital signals are being transmitted and with another contact closure when digital signals are being received. This contact closure is necessary to activate switching on the customer's side of the interface when a signal format conversion is made (diphase to restored polar). The "fooler" is not used in this application (Fig. 11).

3.20 The V option is similar to the Z option except that the customer provides an 8-wire interface instead of the customary 4-wire interface. During the normal mode, voice communication is used and speech is carried through relays A and B break contacts to a 135- to 600-ohm impedance-matching transformer for transmission over normal 600-ohm voice-frequency lines. The voice-frequency signal goes through DAS 806B7 or DAS 806D1 without alteration. When data is recognized, the voice-frequency line is terminated toward the Bell System facilities.

3.21 Both the A and B data recognizers operate independently upon the recognition of 50-kbps data and provide their respective relay contact closure to the customer.

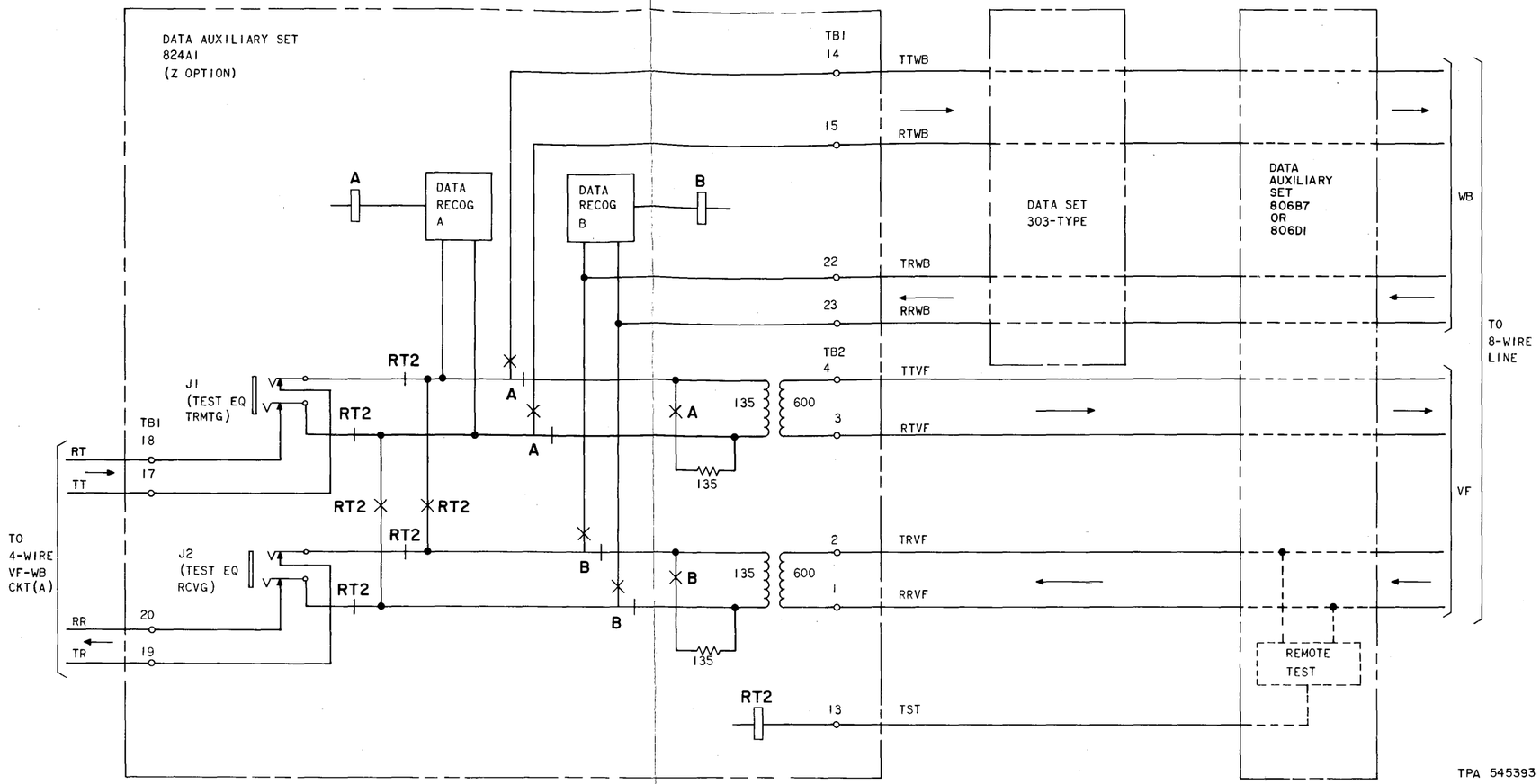

Fig. 8—Option Z Station Arrangement

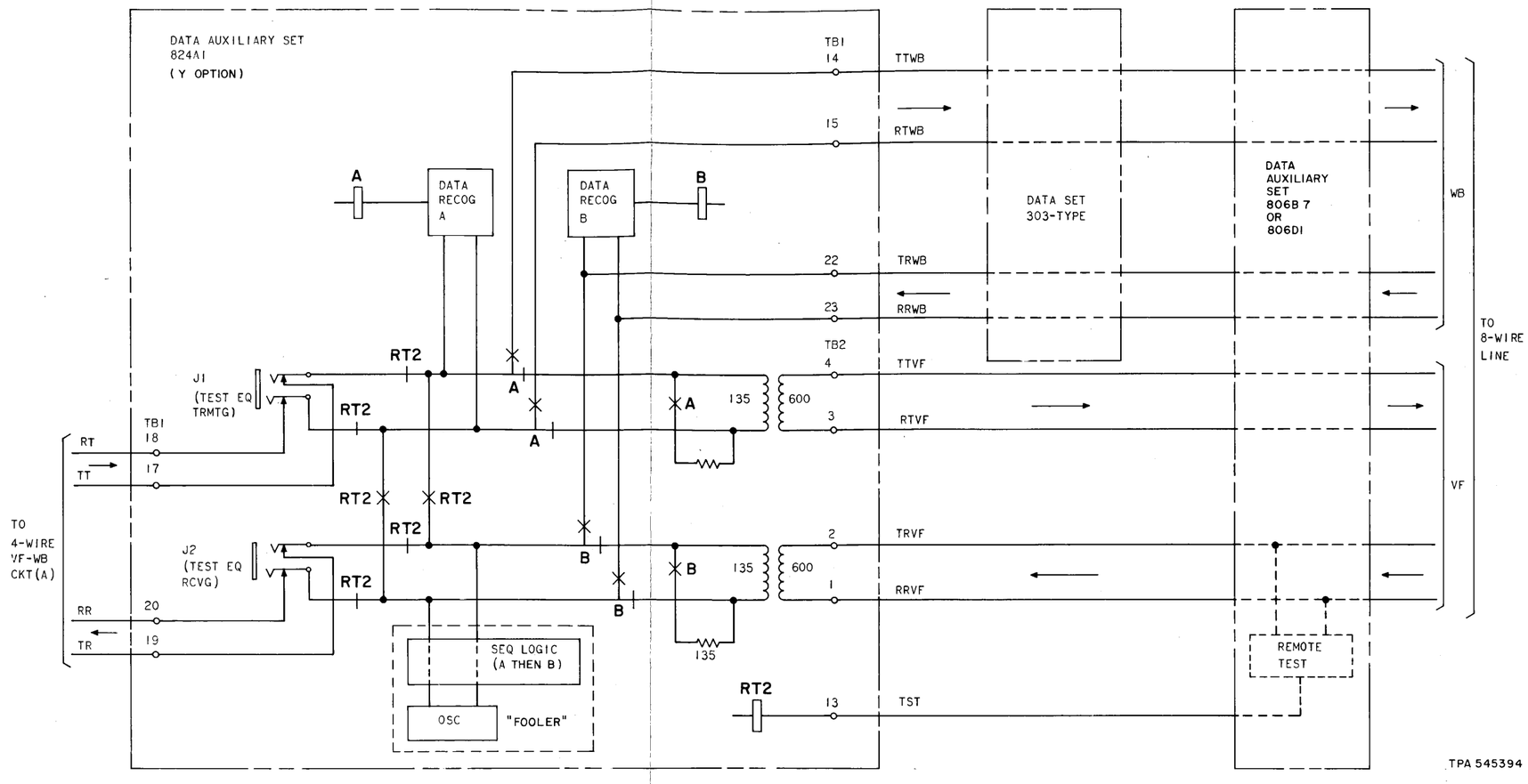

Fig. 9—Option Y Station Arrangement

TABLE B

FOOLER SEQUENCE

DATA RECOGNIZER A	DATA RECOGNIZER B	FOOLER	STATION OPERATING MODE
OFF	OFF	OFF	Voiceband operation
ON	OFF	ON	Transmitting but not receiving wideband data
OFF	ON	OFF	Receiving but not transmitting wideband data
ON	ON	OFF	Transmitting and receiving wideband data

Note: This table is valid only upon the initial application of signals. After the initial sequence, the fooler cannot be reapplied until data signals cease on both lines.

4. CONTROL FUNCTIONS

4.01 In this application, DS 303 uses the balanced customer interface. The balanced customer interface is provided in DS 303 for special cases where the data signals between the customer and the data set are over balanced lines. The balanced customer interface provides the cable terminators and drivers necessary for the reception and transmission of data. There are no control functions, and the data set is always operational.

4.02 The only control lead between DAS 806B7 or DAS 806D1 and DAS 824A1 is the TST lead. This lead provides a means for operating the remote test relay in DAS 824A1.

4.03 The remaining leads are signal leads except the leads to provide the customer with relay contact closures when the V option is installed in the DAS 824A1.

5. OPTIONS

5.01 Certain options are required by DS 303 and DAS 806B7 or DAS 806D1 in this application. The installer option used in DAS 824A1 determines the station configuration.

5.02 The station can be arranged in any one of four different applications, dependent upon which option is installed in DAS 824A1. The following is a brief description of these options:

- ***Option Z*** provides an interface between the customer's 4-wire facility and the Bell System 8-wire facility.

- ***Option Y*** provides an interface between the customer's 4-wire facility and the Bell System 8-wire facility while simulating a digital response necessary to keep certain customer equipment on the line until the far-end equipment begins transmission. The circuit that simulates the data response is called a "fooler."

- ***Option W*** provides the basic 4-wire to 8-wire interface conversion with the addition of a COAM translator in the wideband path. Voice-frequency signals are switched to the Bell System voice channel, and digital signals are diverted to the COAM translator. A simulated digital response is usually provided. The circuit that simulates the digital response is called a "fooler." The "fooler" may be used or it may be omitted, dependent on the requirements of each installation.

- ***Option V*** provides the customer with a contact closure when digital signals are being received and with another contact closure when digital signals are being transmitted.

This contact closure is necessary to activate switching on the customer's side of the interface when signal format conversion is used.

5.03 The following options are required in DS 303-type:

- ***J Option***—Sync Logic Normal—Factory-furnished in all synchronous sets and should be installed in all synchronous sets not equipped with Y option. The J option must be removed if the Y option is installed.

- ***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 synchronous data sets with an unbalanced interface and no scrambler and in all synchronous data sets with a balanced interface regardless of whether a scrambler-descrambler is provided.

- ***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 vestigial sideband (VSB) unit is not used.

- ***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.

5.04 The following options are required in DAS 806B7 or DAS 806D1:

- ***G Option***—Connects voice transmitting pair of 4-wire voice circuit to voiceband data connector.

- ***V Option***—Factory-furnished option to be used when the voice-frequency circuit is 4-wire. Option V must be removed when option W (2-wire voice) is installed.

- ***X Option***—Factory-furnished option which provides a 0-dB pad in the wideband transmitting line. It must be used when DAS 806B7 or DAS 806D1 is used with DS 303-type.

- ***Z Option***—Necessary for remote test capability in absence of DAS 804A-type. It is not factoy-furnished in DAS 806B7 or DAS 806D1.

5.05 The following option is provided only in the DAS 806D1:

- ***B Option***—Factory-furnished option which provides a wideband transmission path through the 32A1 Data Unit which includes the remote test and local test looping configurations.

6. OPERATION

6.01 Attendant operation in this application is confined to the controls on the COAM terminal. There are controls located on DAS 806B7 or DAS 806D1 and DAS 824A1 associated with testing. These controls are described in Section 593-800-501.

7. REFERENCES

7.01 The circuit descriptions (CDs) and schematic drawings (SDs) for the apparatus included in the 4-wire point-to-point (Government Secure Speech Service) type data station are as follows:

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

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

- CD- and SD-1D134-01 Data Auxiliary Set 824-Type

- CD- and SD-1D217-01 Data Auxiliary Set 806D-Type

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

- CD- and SD-1D219-01 10A3 Data Unit.

7.02 Bell System Practices covering the various apparatus in the station are as follows:

SECTION	TITLE
590-100-122	32A-Type Data Unit, Description and Operation

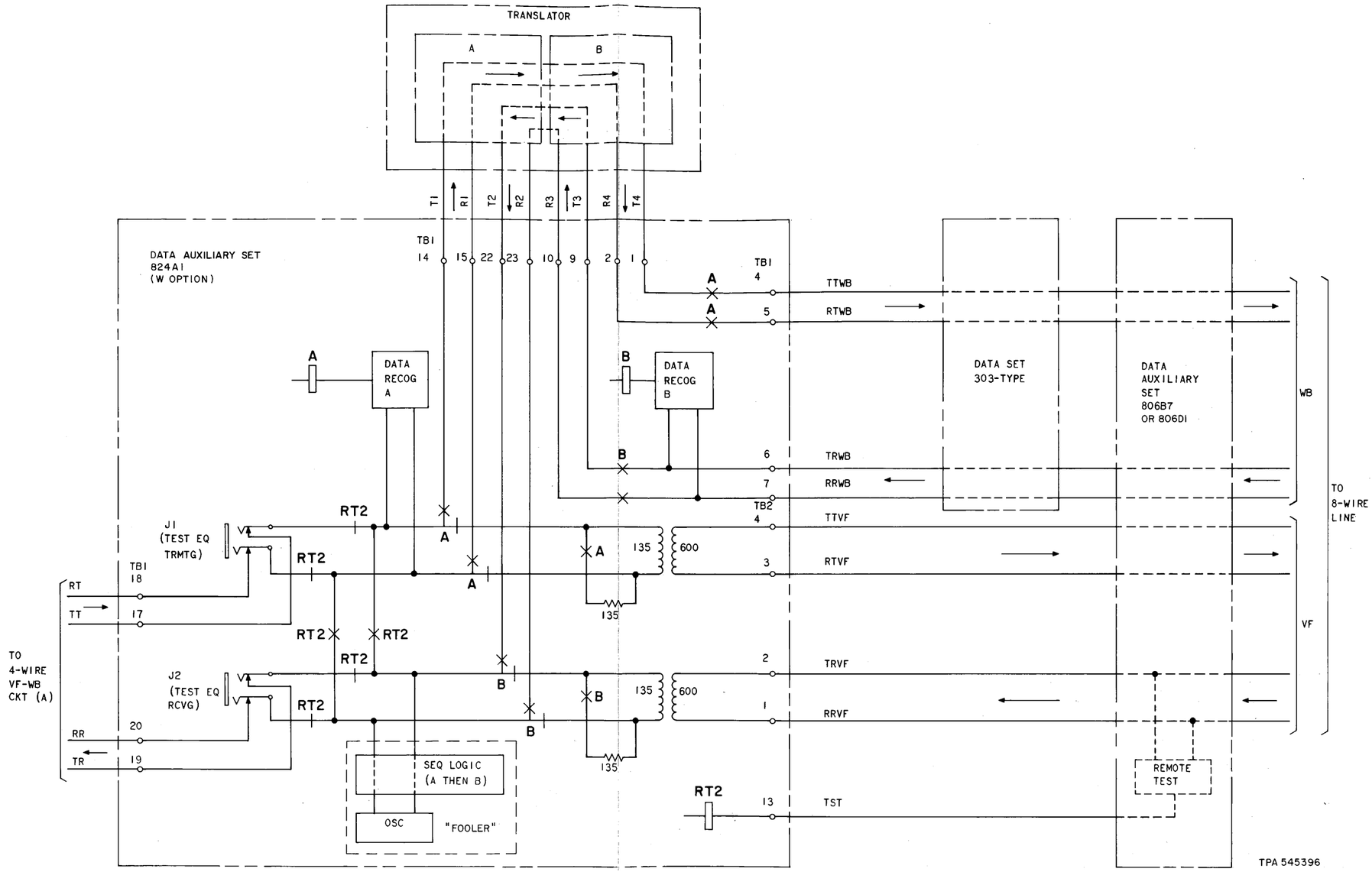

Fig. 10—Option W Station Arrangement

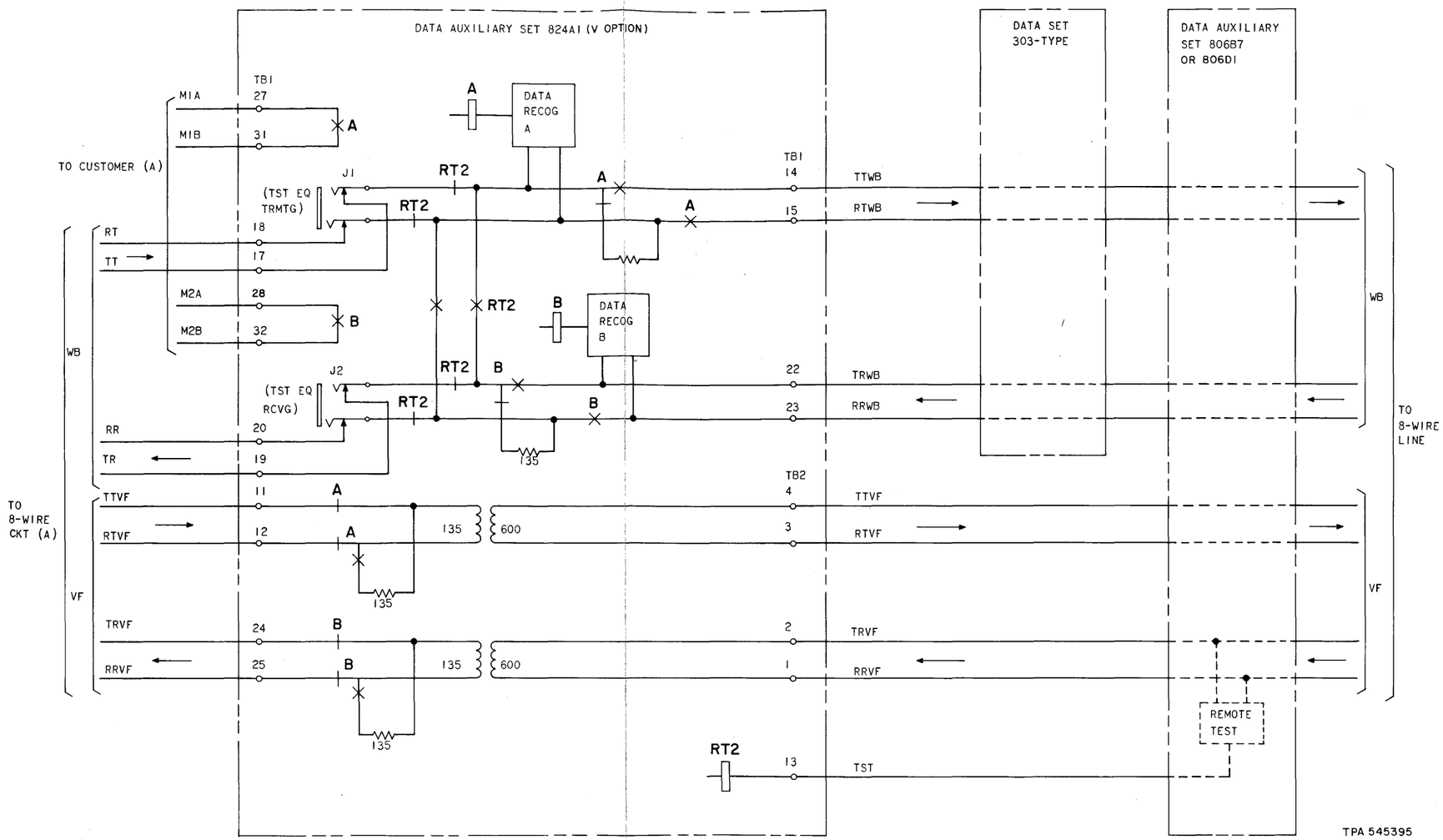

Fig. 11—Option V Station Arrangement

SECTION	TITLE
593-012-100	Data Set 303-Type, Description
598-042-100	Data Auxiliary Set 806B-Type, Description and Operation
598-060-100	Data Auxiliary Set 824A-Type 50 Kilobit Data Recognizer, Description
590-100-106	10A-Type Data Unit, Identification and Operation
365-122-100	T1 Carrier System Terminal, J98713F Line Terminating Unit, Description
365-121-100	T1 Carrier System Terminal, T1WM-4 Wideband Modem, Description
598-077-100	Data Auxiliary Set 806D-Type, Identification.