

**DATA SET 301B-TYPE**  
**TRANSMITTER-RECEIVER**  
**IDENTIFICATION AND OPERATION**

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**1. GENERAL**

**1.01** This section covers the identification and operation of Data Set (DS) 301B-type. It does not include information concerning business machines used with the data set.

**1.02** This section is reissued because of the following:

- DS 301B1 is rated Manufacture Discontinued (MD).
- DS 301B2 is rated Addition and Maintenance (A&M).
- Data Auxiliary Set (DAS) 806B5 is rerated A&M.
- 14A2 Data Unit, which is part of DAS 806B5, is rated A&M.
- 10A2 Data Unit, which is part of DAS 806B5, is rated MD and replaced by 10A3 Data Unit with the B option installed.
- DAS 803A1 is rated MD.
- DAS 803A2 is rated A&M.

**1.03** The DS 301B-type transmitter-receiver was first manufactured as a J1D301B List 1 unit. This set was modified to provide regeneration and was coded as J1D301B List 2. When the coding

was changed from equipment to apparatus coding, the List 2 set became the 301B1. In order to insure the proper transmission of the 10-00 idle code, the 301B1 was modified further. The resulting set was coded 301B2. Transmission of the proper idle code is necessary to prevent single-frequency interference on analog carrier systems. Although the 301B1 has been used as a regenerator in some installations, only the 301B2 is recommended for use as a regenerator.

**1.04** The DS 301B-type (Fig. 1) is designed for use on 4-wire facilities only.

**1.05** No provision is made in the data set for alternate voice communication.

**1.06** The data set accepts synchronized serial dc binary data at 40,800 bits per second. The data is encoded two bits (a "dibit") at a time to a phase-modulated carrier signal in the 10.2- to 51-kHz frequency spectrum for transmission over wideband facilities. (Special terminal units will be required to terminate wideband transmission facilities.) At the receiving end of the data transmission system, the line signal is demodulated and the serialized data is delivered with a recovered synchronized timing signal to a connecting data processing or storage device.

**1.07** The data set can transmit and receive data simultaneously (full-duplex operation).

**1.08** A DAS 803A line and test circuit, or equivalent substitute such as the 806B5, must be provided.

(a) When an 803A-type set is used, operation of the key on this set to the TEST position provides two functions:

- It loops the transmit and receive lines toward the central office for testing. This applies the incoming 10-00 idle code from the far-end DS 301B to the transmit pair. The signal



Fig. 1—Data Set 301B-Type

power is thus maintained and allows the wideband loop repeaters to regulate properly. (WLR-1 and WLR-2 repeaters regulate on total power.)

- It connects data set transmit and receive leads together for local test of the business machine through the data set.
- (b) When a DAS 806B5 is used, three test conditions are provided:
- **Local Test:** By operation of the LT key located on the front of the 10A3 Data Unit, or by applying an "on" signal to the LT customer interface lead, the data set transmit (DT1, DR1) and receive (DT, DR) leads are connected together for a local test of the data set by a business machine or data test set. In addition to providing this loop-back feature, the facility is isolated from the station equipment and the transmit and receive lines are terminated in 135 ohms. Since operation of the LT key terminates

the transmit and receive lines in 135 ohms, no signal will be present on the transmit line and the gain of the line-transmitting amplifiers as well as the far-end receiving amplifiers will rise to maximum gain. If the resulting increase is sufficient to overcome the critical near-end crosstalk coupling loss paths, the system will break into oscillation and the repeaters will regulate on the power of the oscillation. For this reason, the serving test center should be notified so that appropriate steps can be taken to minimize oscillation. The customer should also be cautioned to wait at least 20 seconds following the restoration of the service to insure that the repeater gains are stabilized and regulated properly at normal transmitting line levels.

- **Remote Test One (RT1) Mode:** The first 10-second application of a 2800-Hz signal transmitted from the test center over the voice coordination channel loops the receive pair to the transmit pair of the wideband

transmission circuit in the DAS 806B5 at the customer's location.◀

- **Remote Test Two (RT2) Mode:** ▶ The second 10-second application of the 2800-Hz signal reconnects the receive and transmit pairs of the local loop to the data set and loops the wideband circuit at the customer's interface of the 301B.◀ This isolates the customer's interface from the data set and provides a means for the test center to make an overall data transmission test.

**Note:** When the 806B5 is in the RT2 mode, DS 301B is required to act as a regenerator. Since the J1D301B List 1 unit is not arranged to operate as a regenerator, RT2 should not be attempted in such installations.

**1.09** The remote test features can be controlled locally by the LRT key located on the front of the DAS 806B5. Refer to the section entitled Data Auxiliary Set 806B-Type, Identification (598-042-100) for a description of DAS 806B5.

**1.10** In addition to the test features, DAS 806B5 provides a customer interface for DS 301B which is updated to include changes incorporated in the customer interface of the DS 303-type wideband data station. New functions provided are Local Test (LT), Data Set Ready (DSR), Ring Indicator (RI), and Data Terminal Ready (DTR). Functions that were deleted from the customer's interface are IT, DCR, and DCTE.

**1.11** A voice-frequency coordination channel is provided with each DS 301B-type installation. When this channel is equipped with a DAS 806B5, it is used to establish remote test of the wideband channel and data set from a serving test center.

**1.12** A DAS 804M is used with DAS 806B5 in 4-wire switched voice circuits.

## 2. IDENTIFICATION

**2.01** The data set is composed of electronic circuits arranged on printed board assemblies mounted in a cabinet (Fig. 2). Printed board assemblies are plug-in types.

**2.02** The interface connector, designated CUST EQUIP, is a Burndy KS-19401-L1 12-conductor coaxial connector. A KS-19087-L2 connector

designated TST provides a multiple appearance of the interface leads. This permits connection to a data test set, such as the 901B Data Test Set ▶ or the 912A Wideband Data Test Set.◀ The business machine cord equipped with a Burndy ▶MD12MXP-17TC◀ plug must be supplied by the customer.

**2.03** The DAS 806B5 is equipped with a KS-19402-L1 connector on the end of a pendant cord which is plugged into the CUST EQUIP connector on the data set. The business machine cord plugs into a KS-19401-L1 connector on the rear of the 14A2 Data Unit. The 14A2 Data Unit is an integral part of DAS 806B5.

**2.04** A KS-19087-L1 connector designated LINE is provided for connection of transmit and receive pairs from the data auxiliary set to the data set.

**2.05** A 10-foot W9A cord is furnished as part of the data set for connection to the data auxiliary set. The cord is composed of a gray nylon braid jacket enclosing four individually shielded pairs of conductors. It is equipped with a KS-19088-L1 connector on one end for connection to the data set. At the other end, the conductors are spade-tipped and all shields are connected to a common lead also equipped with a spade tip.

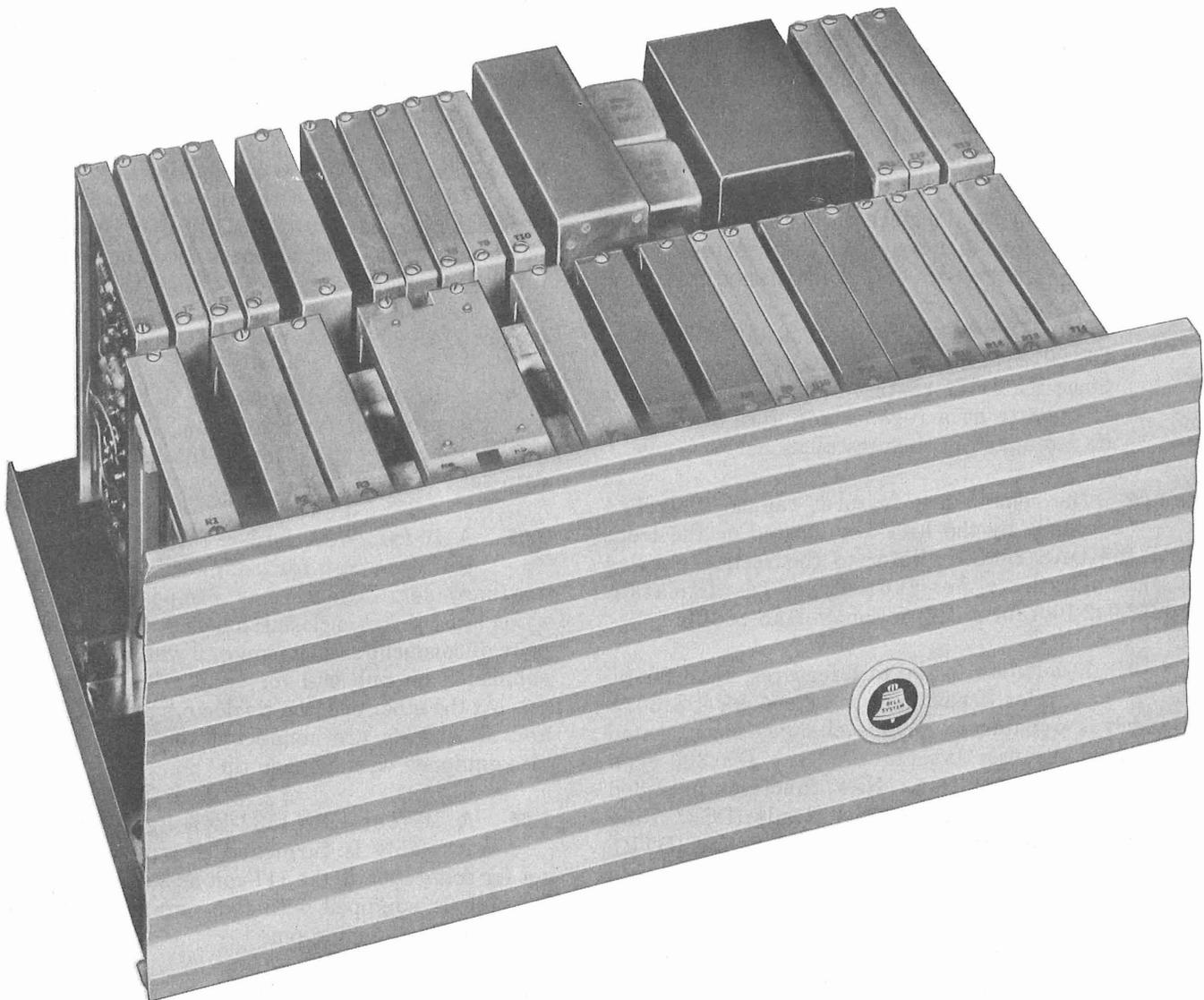
**2.06** A 10-foot KS-14532-L15 light gray cord assembly is furnished as part of the data set for connection to the 117-volt ac 3-wire receptacle. Its plug is equipped with two parallel blades and a U-shaped grounding pin.

**2.07** Figure 3 shows the locations of the various connectors on the rear of the data set.

**2.08** The options shown in Table A can be provided as required for a specific installation of DS 301B-type.

**2.09** Refer to the section entitled Data Set 301B-Type, Transmitter-Receiver, Maintenance (593-011-300) for the options that can be provided as part of the 803A line and test circuit and DAS 806B5.

**2.10** The transmitting level is set at +10 dBm  $\pm 1$  dB. No provision is made for adjustment of this level.



**Fig. 2—Data Set 301B-Type, Interior View**

**2.11** Timing synchronization may be derived from an internal oscillator or from the business machine. The timing signal must be a square wave with a frequency of 40.8 kHz  $\pm 0.01$  percent with a duty cycle of 50  $\pm 10$  percent.

**2.12** The DS 301B-type consists of a cabinet, all printed board assemblies, and necessary cords. (The above code does not include the data auxiliary set.) Individual cards and apparatus are coded as shown in Table B.

### **3. OPERATION**

**3.01** No manual operation of the data set by an attendant is required. All functions of the data set are under control of the business machine.

**3.02** For a detailed description of the data set operation, refer to CD- and SD-1D033-01. Fig. 4 and 5 show simplified block diagrams of the data set.

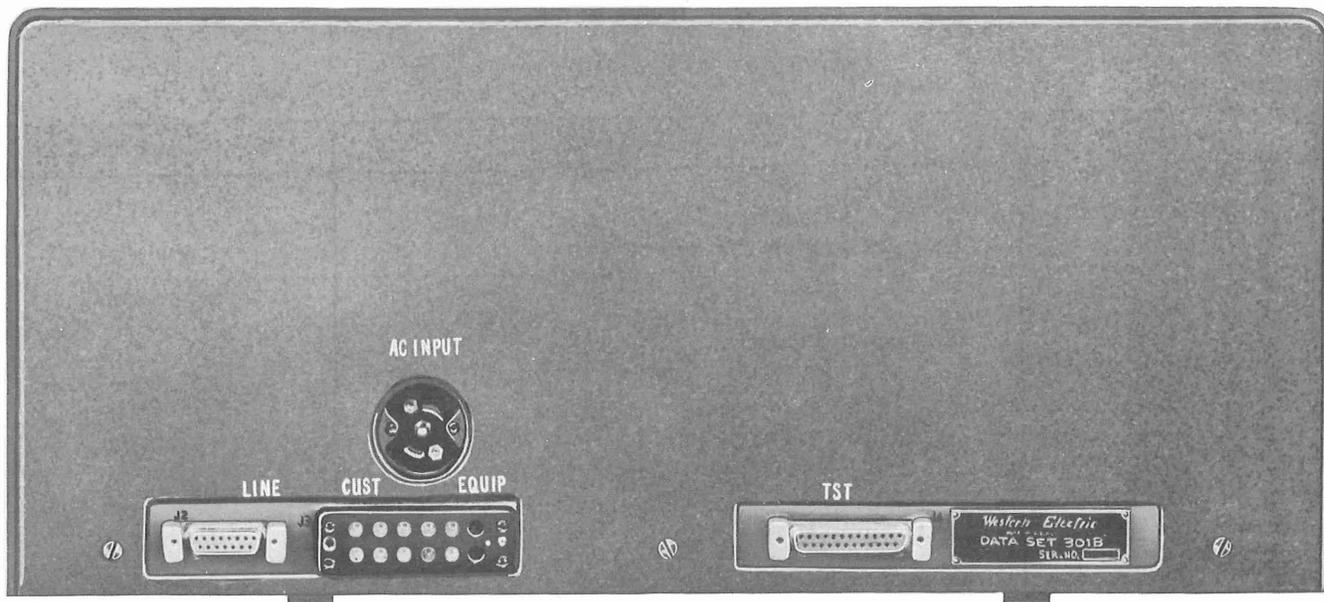


Fig. 3—Data Set 301B-Type, Rear View

TABLE A  
OPTIONS FOR DATA SET 301B-TYPE

FEATURE	OPTION	STRAP CONNECTION	PRINTED BOARD ASSEMBLY	QUANTITY
External Transmitter Timing (Clock in Business Machine)	Y	A to E B to D	Serial Clock Interface T1 (CP AN18)	1 Per Set
Internal Transmitter Timing (Clock in Data Set)	Z	A to B C to E		
Receive Level	X (+10 to -20 dBm)	1 to 4	AGC, Amplifier, and Carrier Detector No. 1 R1 (CP AN29)	1 Per Set
	W (-5 to -35 dBm)	1 to 3		
	V (-20 to -50 dBm)	1 to 2		

**Note:** When DAS 806B5 is used, the external transmitter timing option (Y) must be used.

**TABLE B**  
**INDIVIDUAL CARDS AND APPARATUS**

DESIGNATION	CARDS AND APPARATUS	PRINTED BOARD ASSEMBLY
T1	Serial Clock Interface	CP AN18
T2	Internal Timing Oscillator	CP AN19
T3	Transmitter Interface	CP AN20
T4	Transmitter Control	CP AN21
T5	Filter	618C
T6	Zero Crossing Detector	CP AN22
T7	Dibit and Envelope Binaries	CP AN14
T8	Data Sample	CP AN15
T9	Phase Logic 1	CP AN23
T10	Phase Logic 2	CP AN24
T11	Channel A	CP AN25
T12	Channel B	CP AN25
T13	Envelope Generator and Modulator	CP AN27
T14	Output Amplifier	CP AN28
R1	AGC, Amplifier, and Carrier Detector No. 1	CP AN29
R2	Bandpass Filter	618B
R3	AGC, Amplifier, and Carrier Detector No. 2	CP AN30
R4	Network	844C
R5	Network	844C
R6	Filter	618A
R7	Sync Circuit Modulator	CP AN31
R8	Sync Circuit Final Selector	CP AN32
R9	Sync Circuit Amplifier	CP AN16
R10	Receiver Timing Logic	CP AN17
R11	Demodulator	CP AN33
R12	Demodulator	CP AN34
R13	A Register	CP AN35
R14	B Register	CP AN35
R15	Carrier On-Off and Receiver Interface	CP AN37

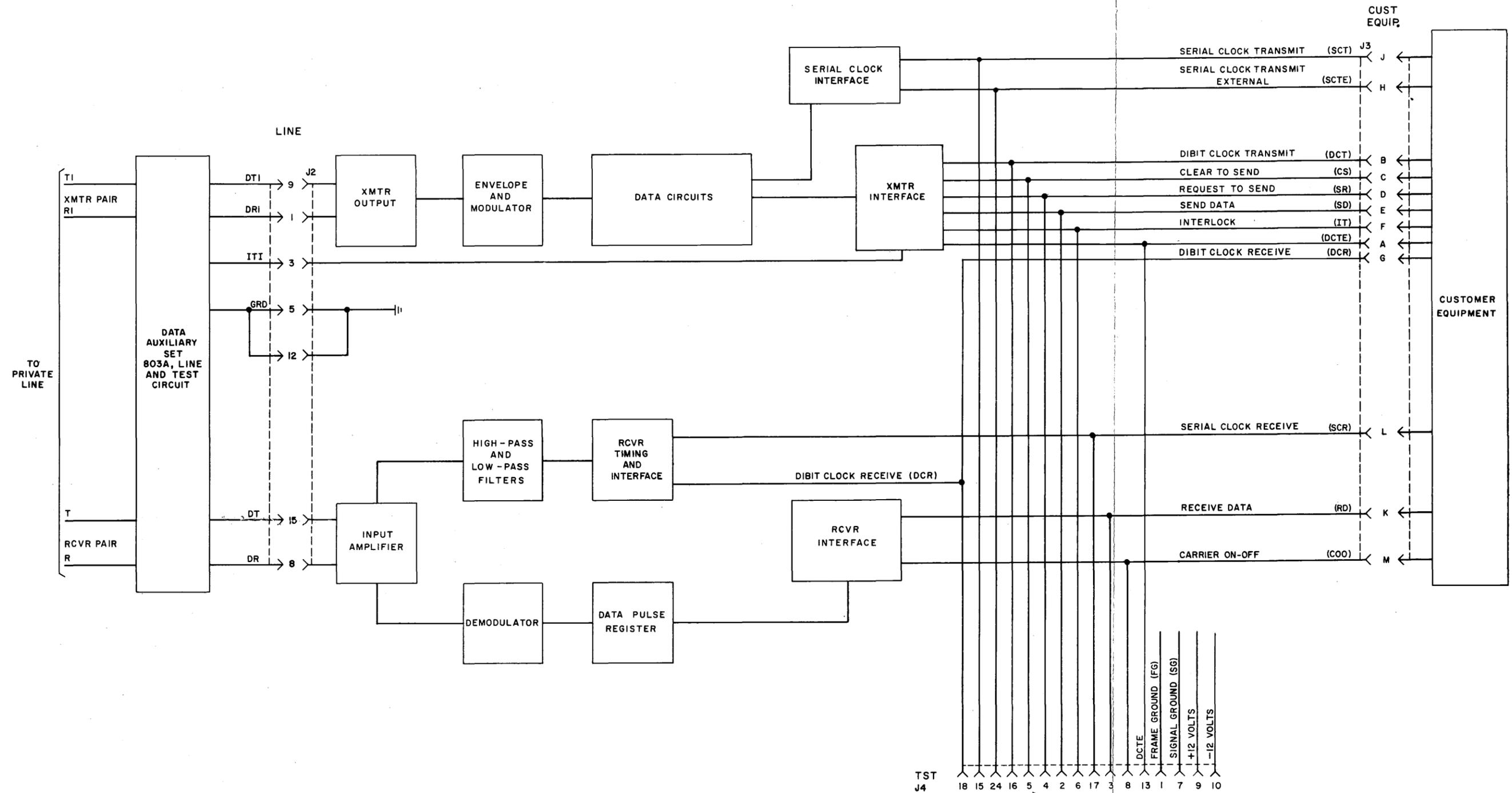


Fig. 4—Data Set 301B-Type and Data Auxiliary Set 803A, Block Diagram

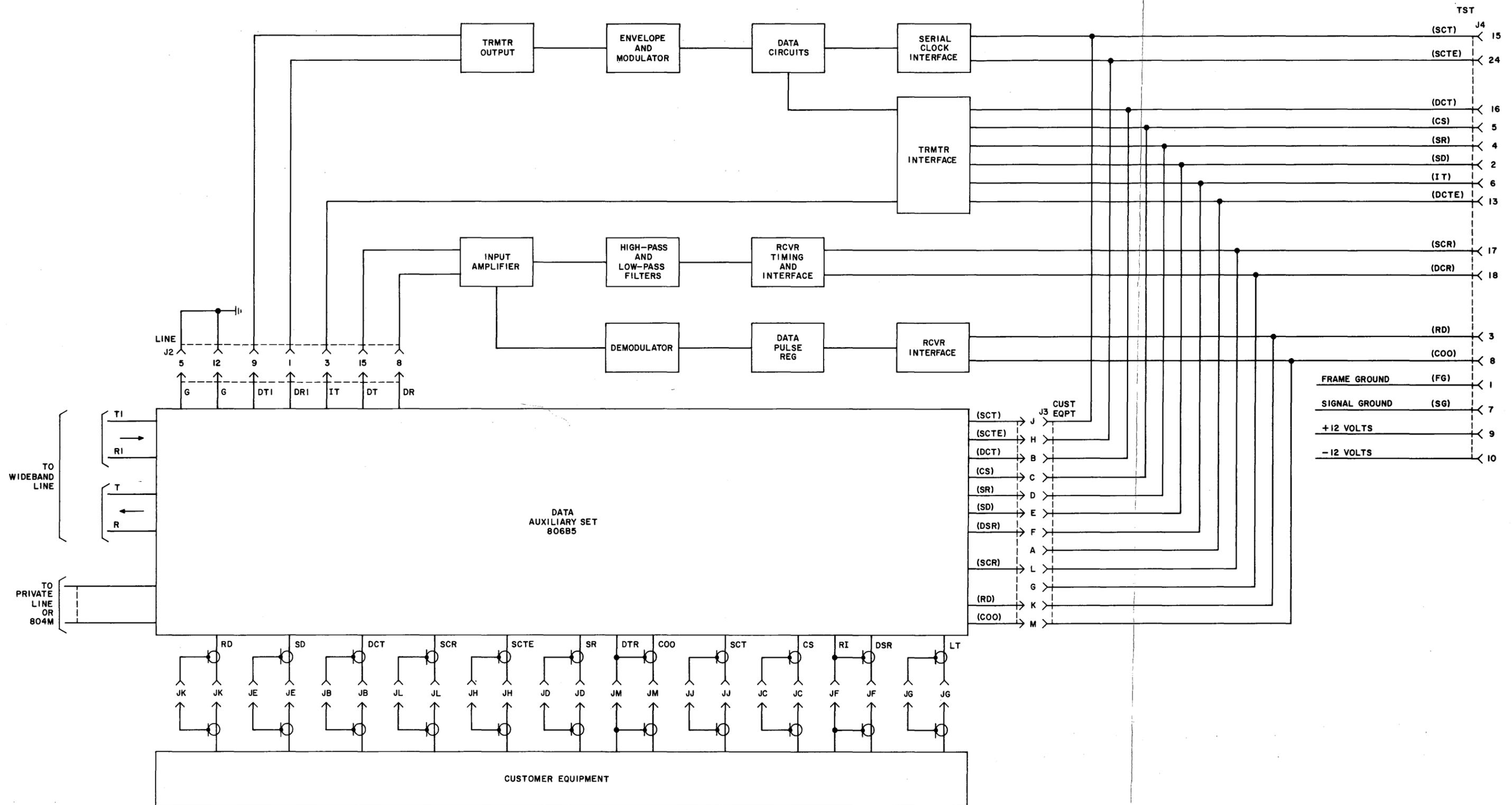


Fig. 5—Data Set 301B-Type and Data Auxiliary Set 806B5, Block Diagram

**3.03** Additional information on the DAS 803A and 806B5 is contained in the section entitled Data Set 301B-Type Transmitter-Receiver, Installation and Connections (593-011-200). Also see the applicable sections on DAS 803A (Section 598-025-100) and 806B5 (Section 598-042-100).

**3.04** When the business machine request-to-send (SR) lead is in the off condition, the send data circuits are disabled and a repeated code of 10-00 (idle code) is transmitted over the line.

**3.05** After the business machine turns on the SR lead, a clear-to-send (CS) signal is returned to the business machine. The business machine then sends data over the send data (SD) lead to the data set. Transitions on the SD lead from the business machine must coincide with the positive transitions of the serial clock transmit (SCT) lead.

**3.06** Data and other interface signals from the business machine consist of dc signals. Requirements for reliable recognition of these signals in a 100-ohm termination are:

- Mark (1) or OFF—Less than 5.0 milliamperes
- Space (0) or ON—Greater than 23.0 milliamperes.

**3.07** The data set converts these dc signals into a line signal by using a phase-modulation technique.

**3.08** When a line signal is received, the carrier on-off (COO) lead to the receive business machine is switched to ON.

**3.09** Receiver circuits convert incoming line signals into dc signals and send them over the receive data (RD) lead to the business machine where they are read on the negative transition of the serial clock receive (SCR) lead.

**4. REFERENCES**

**4.01** The circuit description and schematic drawing for the data set are CD- and SD-1D033-01.

**4.02** Bell System Practices covering the various equipment associated with the data set are as follows:

SECTION	TITLE
598-025-100	Data Auxiliary Set 803A1 and 803A2 Line and Test Circuit, Identification and Operation
598-042-100	Data Auxiliary Set 806B-Type, Description and Operation