

DATA SET 205B-TYPE TRANSMITTER-RECEIVER IDENTIFICATION AND OPERATION

1. GENERAL

- 1.01** This section contains descriptive and operational information for the Data Set 205B. This section does not include information regarding the business machine used with the data set.
- 1.02** This section is reissued to incorporate features available with Data Set 205B2.
- 1.03** For the purpose of this practice, reference to a business machine should be interpreted to mean any customer equipment whose input and output signals are in accordance with EIA Standard RS-232-A or Military Standard 188B.
- 1.04** Data Set 205B is a 4-phase modem designed to be used primarily as a terminal station for full period service on 4-wire private lines. No telephone set is associated with the data set. The Data Set 205B2, when associated with Data Auxiliary Set 804M-type or a 5A-type Data Mounting, provides unattended answer operation over a 4-wire switched network.
- 1.05** The data set provides synchronous serial binary data transmission and reception capability at 2400 bps over telephone facilities available under Type 4B (type 3004 channel) tariffs.
- 1.06** Operation over long haul facilities with significantly poorer end-to-end transmission characteristics than those defined as Type 4B is possible if two data sets are connected as a regenerative repeater and inserted into the facility at some intermediate point.
- 1.07** The Data Set 205B-type has a long term error rate objective of better than one error in 10 bits, when transmitting random data at 2400 bps on facilities which meet Type 3004 (Type 4B) requirements.
- 1.08** Transmitter and receiver timing signals accurate to ± 5 ppm are generated within the data set. This stability of the clock signal ensures an outage holdover capability for a minimum of 6 seconds. Oscillator adjustment at 3-year intervals is necessary if the 6-second holdover requirement is to be maintained.
- 1.09** Customer requirements for optional serial binary data transmission capability at both 1200 and 600 bps rates are provided by Data Set 205B. Transmit and receive clock signals at the selected rate are provided. The transmission rate, including the regenerative repeater mode of operation, is selected by proper control signals applied to four customer interface connections. The 2400, 1200, or 600 bps transmission rate may be selected independently in each direction of transmission.
- 1.10** The data set transmitter timing may be controlled by the data set internal oscillator or by an external timing source.

2. DESCRIPTION

- 2.01** A business machine is connected to the data set through a 25-terminal CUSTOMER connector. Terminal assignments as defined by the EIA Interface Specification RS-232-A are used where applicable.
- 2.02** All interface circuits, except four, meet EIA electrical specifications. Circuits for Send Data (SD), Receive Data (RD), Serial Clock Transmit (SCT), and Serial Clock Receive (SCR) meet the intent of Military Standard 188B. These four circuits are designed to generate (or accept, in the case of Send Data) waveforms with longer rise and fall times than permitted using EIA specifications. This has reduced crosstalk between signalling leads by a significant amount.

2.03 The Dibit Clock Transmit (DTI) interface lead is used during data set testing. This circuit is an EIA driver with very fast rise and fall times. If crosstalk within the cord connecting the data set to the business machine is a problem because of DTI, the DTI lead may be shielded.

A. Physical Description

2.04 The Data Set 205B is a 23-inch rack mounted set that requires 12 inches of vertical rack

mounting space. The set is 8 inches deep. Figures 1 and 2 are front views of the data sets with one circuit pack retaining cover removed.

2.05 The data set contains 36 circuit packs consisting of 11 types of specialized circuits and an oscillator required to provide the electronic functions of the data set. The circuit pack number and reference location number on the data set are shown in Table A. The equipment location numbers and the last three digits of the printed wiring board

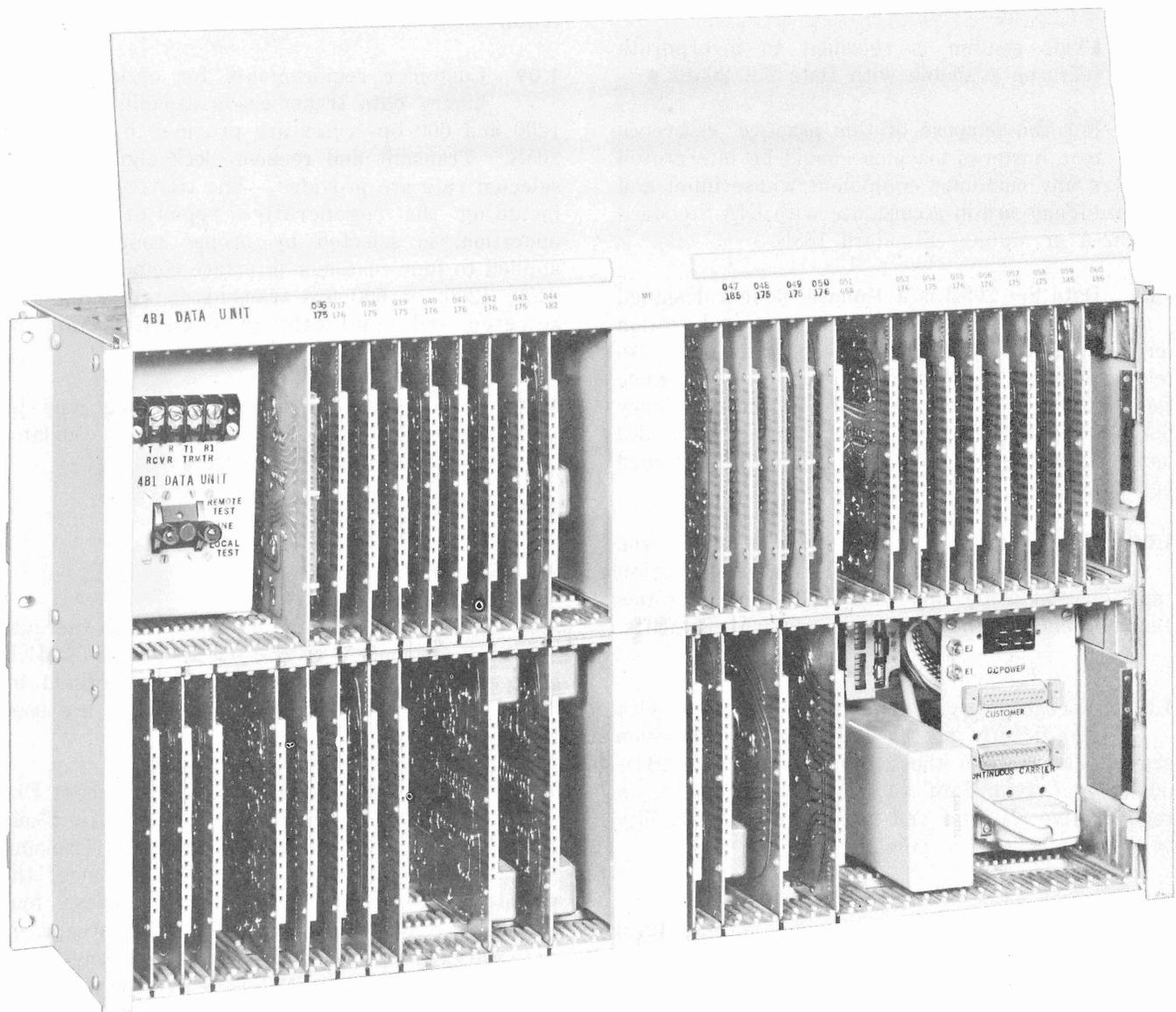


Fig. 1—Data Set 205B1, Front View

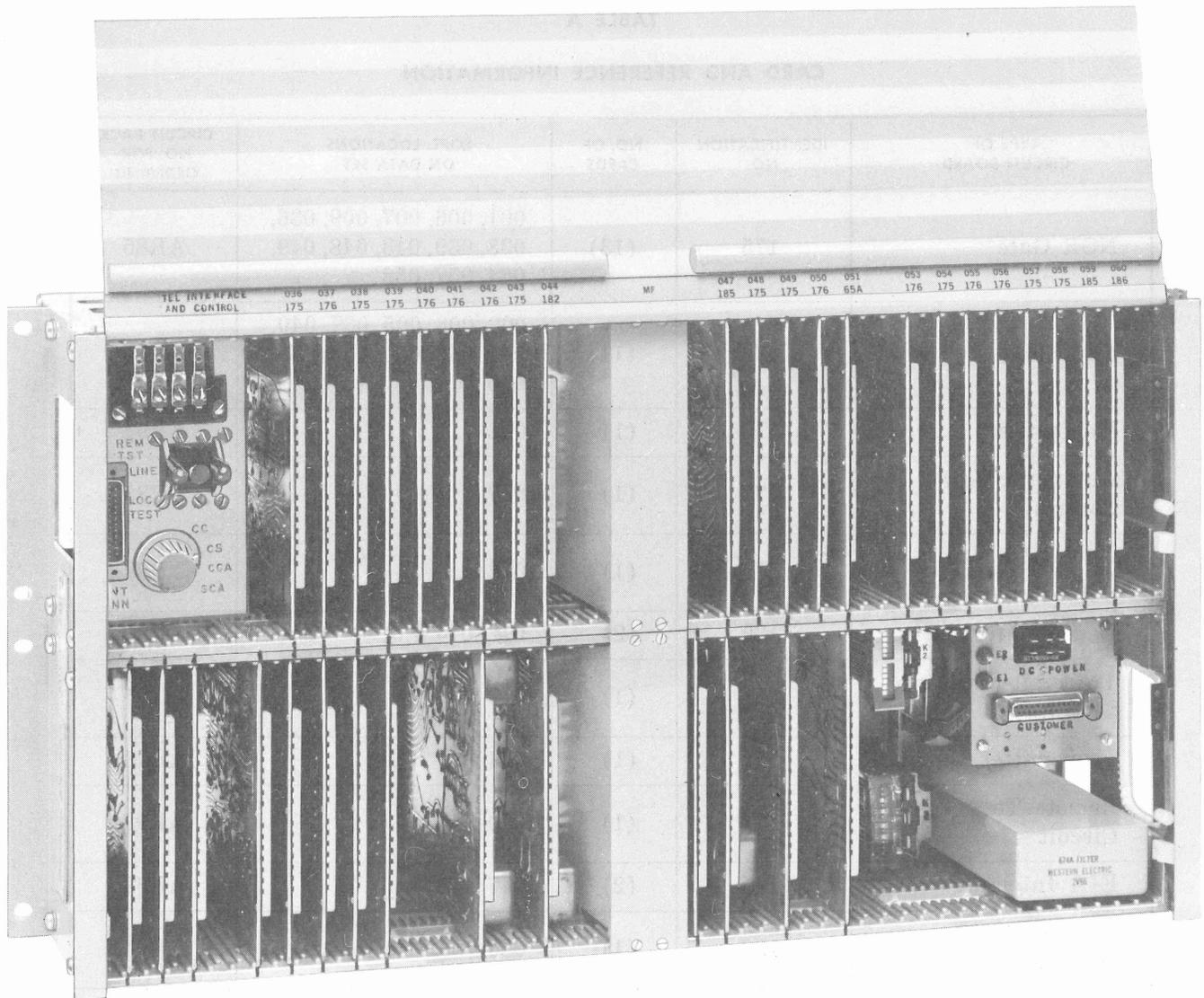


Fig. 2—Data Set 205B2, Front View

numbers are stamped on the circuit pack retaining covers.

2.06 Figures 3 and 4 are rear views of the data sets showing board reference location numbers and reference points shown on the schematic drawings.

2.07 The Data Set 205B weighs 31 pounds.

2.08 The Data Set 205B contains the following ten major circuit categories:

(1) Line Connector and Transmit-Receive Switch

(2) Interface Connectors and Remote Test

(3) Clock Select

(4) Control Timing

(5) Oscillator and Common Countdown

(6) Transmitter Timing

(7) Data Transmitter

(8) Analog Receiver

TABLE A
CARD AND REFERENCE INFORMATION

TYPE OF CIRCUIT BOARD	IDENTIFICATION NO.	NO. OF CARDS	EQPT. LOCATIONS ON DATA SET	CIRCUIT PACK NO. FOR ORDERING
NOR Gate	175	(13)	001, 006, 007, 009, 036, 038, 039, 043, 048, 049, 054, 057, 058	AR85
Flip-Flop	176	(11)	002, 003, 005, 037, 040, 041, 042, 050, 053, 055, 056	AR86
Monopulser	177	(1)	008	AR91
Automatic Gain Control 1	178	(1)	017	AR88
Automatic Gain Control 2	179	(1)	016	AR89
Demodulator	180	(2)	012, 014	AR96
Transmit-Receive Switch	181	(1)	019	AR95
Transmitter Output	182	(1)	044	AR90
Remote Test Circuit	184	(1)	020	AR93
EIA Interface	185	(2)	047, 059	AR92
MIL STD 188 Interface	186	(1)	060	AR94
Oscillator	65A	(1)	051	

(9) Digital Data Receiver

(10) Receiver Timing

2.09 A block diagram illustrating the interconnections between data set functions is shown in Fig. 5. A brief description of each block in numerical sequence is presented in the following paragraphs.

2.10 (1) *Line Connector and Transmit-Receive Switch:* These circuits provide a terminal strip for connection of the telephone line pairs T, R, and T1, R1. The Data Set 205B2, in addition, provides for the telephone line pairs to be connected

to the data set through a CONTROL connector. This connector is used for control leads from either a Data Auxiliary Set 804M-type (or equivalent) or a console. The operational mode of the data set may be selected as illustrated in Table B. The Transmit-Receive Switch on circuit pack 181-019 controls the application of the transmitter line signal to the telephone line.

2.11 (2) *Interface Connectors and Remote Test:* These circuits contain the CUSTOMER jack (J61), the remote test (RMT) circuit pack, and relay K2. The remote test circuits permit remote testing of Data Set 205B1 from a 904E-Type Data Test Center. The data set may be placed in the

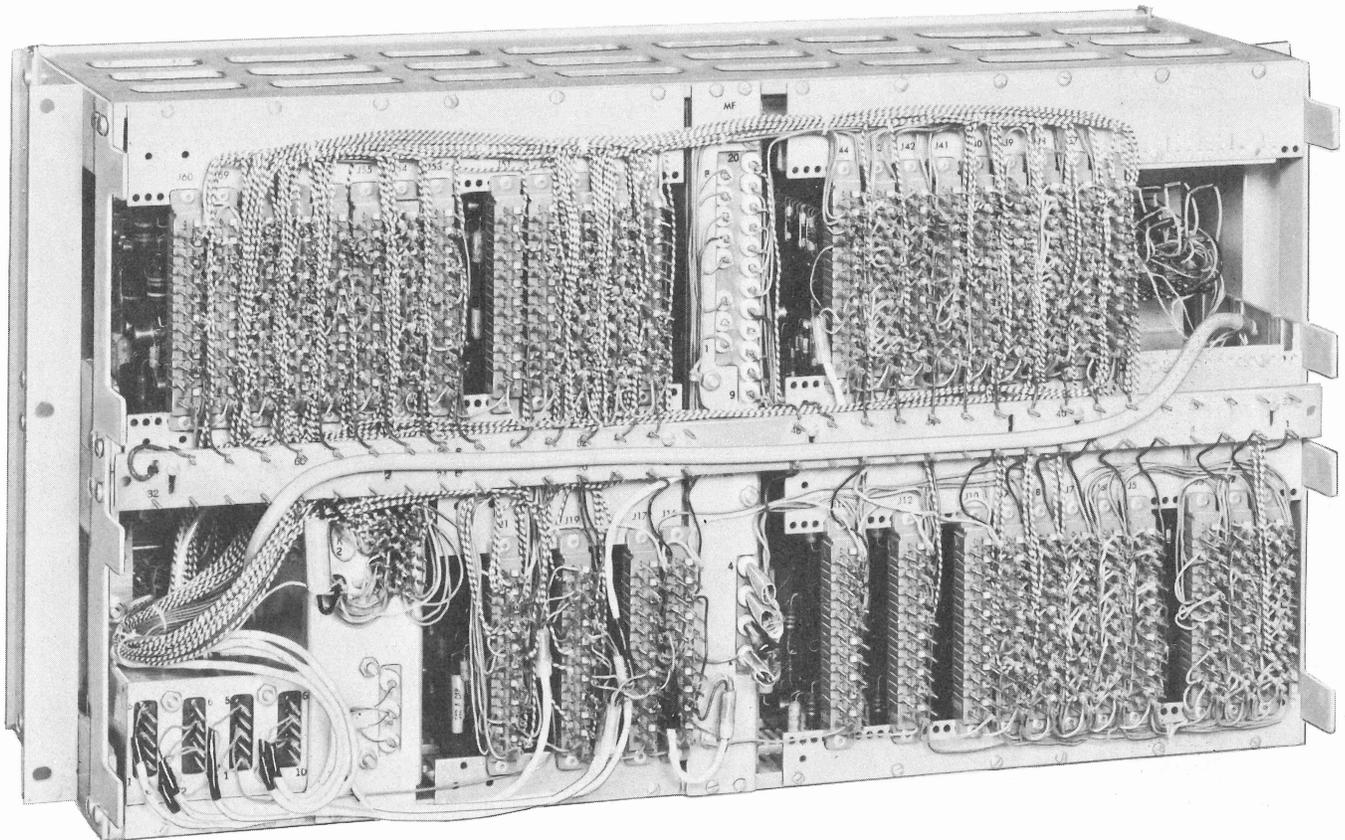


Fig. 3—Data Set 205B1, Rear View

remote test mode by (1) a test key on the data set; (2) remotely by a signal on the RMT lead through the CUSTOMER connector, or (3) when operating a 205B2, applying a signal through the CONTROL connector.♦

2.12 (3) ♦Clock♦ Select: The ♦clock♦ select circuit provides control signals necessary for the selection of appropriate circuit configurations for each of eight modes of transmitter and receiver operation. Also, the ♦clock♦ select circuit delivers the appropriate selected clock waveform for each mode of operation to the customer or for regenerative repeater operation.

2.13 (4) Control Timing: Timing functions and modes of operation are controlled by the Request-to-Send (RS) interface signal. A Clear-to-Send (CS) signal is generated by the control timing circuits and indicates to the connected business machine that the Send Data (SD) will be processed correctly. CS signal transitions are coincident with

positive transitions of the Serial Clock Transmit (SCT) signals. A serial binary digit initiated in coincidence with the rise of the CS signal will be processed by the data set.

2.14 (5) Oscillator and Common Countdown:

The oscillator and common countdown circuits generate square-wave signals at 230.4 kHz, 115.2 kHz, and 57.6 kHz. These signals are required to operate both the transmitter and receiver timing circuits. When the data set receiver operates at 600 bps, the square-wave signal used for receiver timing is divided by two. The input square-wave frequency for the receiver clock is 28.8 kHz for the 600 bps mode of operation.

2.15 (6) Transmitter Timing: The transmitter timing circuits generate the timing waveforms used in the (7) data transmitter circuits. The timing circuits are provided with options for internal or external timing. The basic transmitter timing circuit functions are to:

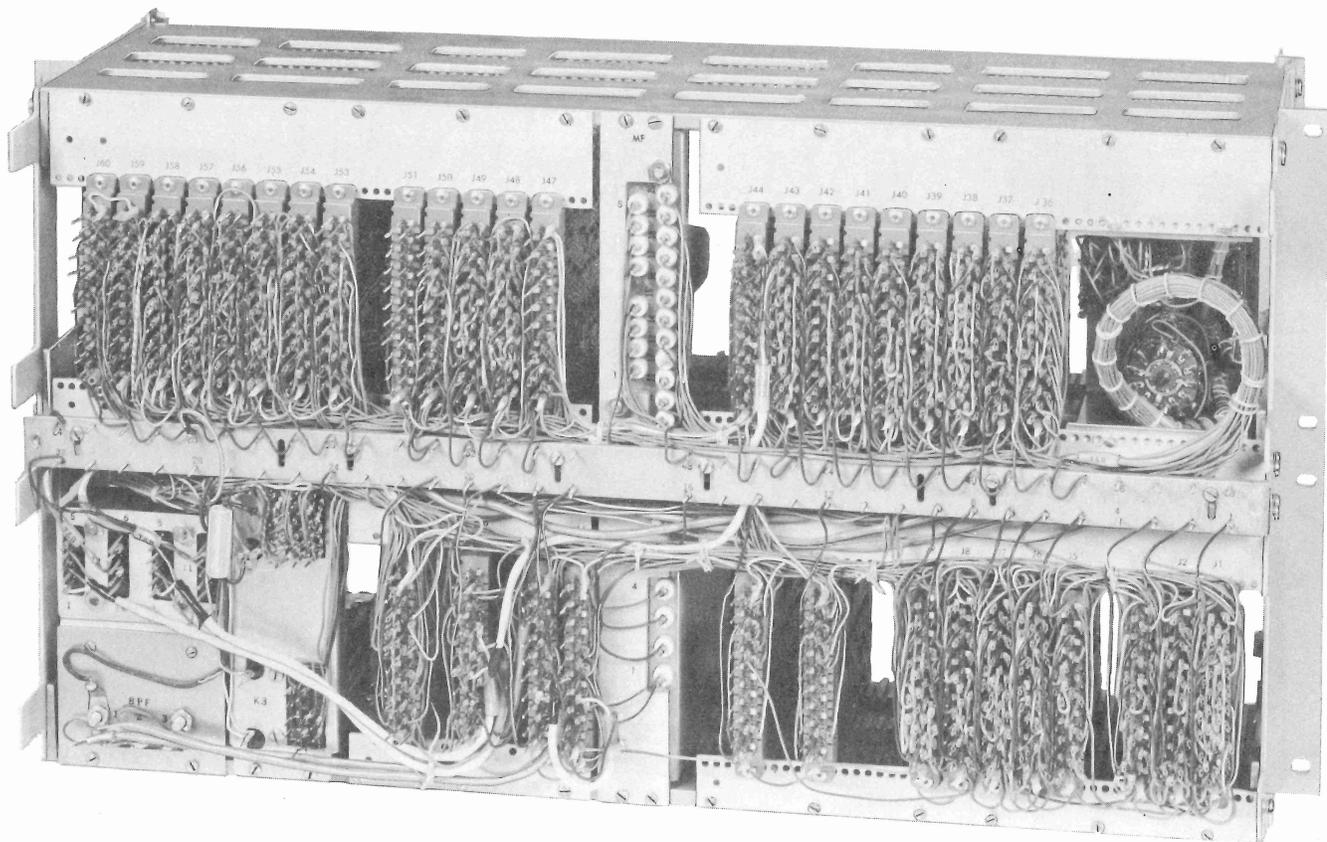


Fig. 4—Data Set 205B2, Rear View

TABLE B

DATA SET OPERATIONAL MODES

MODE	205B1	205B2
Switched Carrier	Plug the 4B1 Data Unit cord into SWITCHED CARRIER connector	Operate switch to SC or SCA position. (SCA for Auto Answer operation).
Continuous Carrier	Plug the 4B1 Data Unit cord into CONTINUOUS CARRIER connector	Operate switch to CC or CCA position. (CCA for Auto Answer operation).

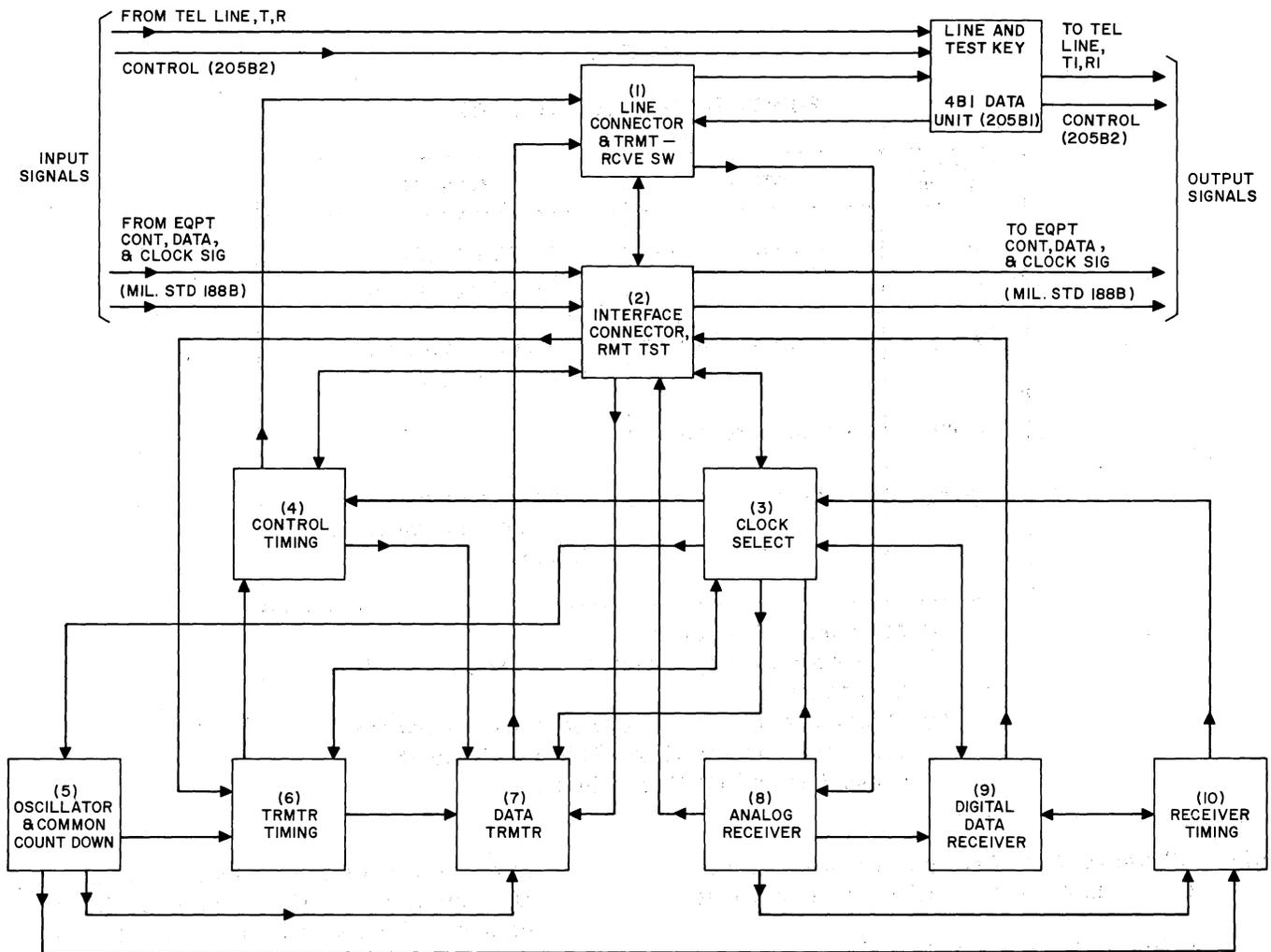


Fig. 5—Data 205B-Type, Block Diagram

- (a) Generate square-wave input signals to the phase modulated channel counters
- (b) Generate square-wave input signals for the interface driver circuits
- (c) Generate a pulse train used to sample SD
- (d) Generate accurate square-wave signals for encoding purposes
- (e) Generate square-wave input signals to operate the pulse modulators
- (f) Generate six pulse trains to operate the phase logic channel counter transfer gates and perform other 'set' or 'clear' functions.

- (g) Generate a pulse train to operate the control timing circuits

2.16 (7) Data Transmitter: The data transmitter circuits encode serial binary data as a band-limited signal suitable for transmission over telephone lines. The transmitter circuits also generate the repeated 1000 code used for initial synchronization of data sets.

2.17 (8) Analog Receiver: The analog receiver circuits amplify the received band-limited line signal to a fixed level, and convert the received line signal into two parallel signals which constitute demodulated data.

TABLE C
POWER SUPPLY REQUIREMENTS

DC POWER CORD WIRE	FUNCTION	REQUIREMENTS
Red	Positive Voltage	+18.75 (± 0.5) vdc; 1.8 amp ① ② ③
Orange	Negative Voltage	-18.75 (± 0.5) vdc; 0.4 amp ① ② ③
Green	Frame Ground	
Black	Common	This is the power supply common and must be floating.

- ① Measured to common
- ② Peak-to-peak ripple must be less than 0.5 volt maximum
- ③ Power supply output voltage must not exceed 20.75 volts at any time. This requirement includes ON and OFF transients.

2.18 (9) Digital Data Receiver: The basic functions of the digital data receiver circuits are to:

- (a) Convert the demodulated data waveform to standard logic signals
- (b) Generate axis-crossing pulses for the timing recovery circuit operation and
- (c) Generate a serial binary data waveform for customer use from the demodulated data.

2.19 (10) Receiver Timing: The receiver timing circuits are used to recover synchronization timing signals for sampling, regeneration and parallel-to-serial conversion of the received data.

2.20 The Data Set 205B provides the following two grounds: Frame Ground (FG) is common to both chassis ground and the ac power third-wire ground, and Signal Ground (SG) is used as a reference for all data, timing, and control signals. Signal ground is connected to chassis ground when terminal E1 is strapped to terminal E2 in the data set, or when the customer connects signal ground to frame ground through the CUSTOMER connector.

(a) **◆Data Set 205B1:** The data set contains a 4B1 Data Auxiliary Unit to interface between the data set circuits and the 4-wire telephone line. The telephone line pairs T, R, and T1, R1 are connected to a terminal strip on the 4B1 Data Unit. A 3-position line and test key (in LINE position) provides continuity between the terminal strip and the 4B1 connecting cord jack. The jack mates with either SWITCHED CARRIER plug (P1), or CONTINUOUS CARRIER plug (P2) to select the data set operational mode. The remaining line and test key positions are REMOTE TEST which provides manual conditioning of the data set to be tested by a 904E-Type Data Test Center, and LOCAL TEST, which terminates the telephone line pairs into 600 ohms and provides a loop-back feature between transmitter and receiver sections of the data set.

(b) **◆Data Set 205B2:** The telephone line pairs T, R, and T1, R1 are either connected to a terminal strip or brought in through the CONTROL connector. A 3-position line and test key (in LINE position) provides continuity between the telephone line and the data set

circuits. The remaining line and test key positions are REMOTE TEST which provides manual conditioning of the data set to be tested by a 904E-type Data Test Center, and LOCAL TEST, which terminates the telephone line pair into 600 ohms and provides a loop-back feature between transmitter and receiver sections of the data set. A rotary switch is used to select either the Switched Carrier (SC); Switched Carrier—Autoanswer (SCA); Continuous Carrier (CC); or Continuous Carrier—Autoanswer (CCA) modes.◆

2.21 Two interface signals which the business machine may not have provisions for terminating are the External Clock signal input (SCTE), and Remote Test (RMT). These leads may be optionally strapped to ground by using the appropriate terminals on the Transmit-Receive Switch circuit pack (181/019) board.

2.22 The Data Set 205B requires operating voltages (if supplied by the customer) as listed in Table C. A dc power cord is supplied with the data set to connect between the data set and the customer power supply. One end of the dc power cord mates to the data set DC POWER connector. The opposite end is supplied with spade-tipped lugs. Table C identifies each color coded wire and function. Data Set 205B is provided with protective diodes to prevent data set damage if the dc power cord to customer power supply is improperly connected. If Data Set 205B obtains operating voltages from Data Auxiliary Set 819A, the spade-tipped dc power cord must not be used. The Data Auxiliary Set 819A is provided with the required dc power cord. For more information, see Data Auxiliary Set 819A; Identification and Operation (Section 598-040-100).

3. OPERATION

3.01 Operating power for the data set is supplied through the 6-pin DC POWER connector from either a customer provided power supply or a Data Auxiliary Set 819A-type power supply. If a DAS 819A-type unit is required, it must be ordered separately. A P10H094 power cord is supplied with the data set for connecting to customer provided dc power. A DAS 819A-type unit is equipped with an integral power cord.

(a) ◆**Data Set 205B1:**◆ The 4-wire telephone line is connected to the data set circuits through either SWITCHED CARRIER plug (P1) or

CONTINUOUS CARRIER plug (P2). Selection of the connecting plug determines the data set mode of operation.

(b) ◆**Data Set 205B2:** The data set mode of operation is determined by a 4-position rotary switch. The switch positions are:

- (1) Switched Carrier (SC)
- (2) Switched Carrier—Autoanswer (SCA)
- (3) Continuous Carrier (CC)
- (4) Continuous Carrier—Autoanswer (CCA).

3.02 In the continuous carrier mode◆ the data set transmitter is conditioned to remain on line continuously. The Request-to-Send (RS) control signal from the business machine in the OFF condition causes the data set to generate and transmit an idle code suitable for maintaining the clock synchronization of the distant receiver. If RS is ON, transmission on the Send Data (SD) interface lead begins as soon as the transmitter can process Send Data signals from the business machine correctly. The control signal, Clear-to-Send (CS), from the data set provides the proper indication to the business machine that data signals will be processed.

3.03 ◆In the switched carrier mode◆ the data set transmitter is conditioned to remain OFF while RS is OFF. When RS is turned ON, the data set transmitter also is turned ON and generates a synchronizing code for a period of time adequate to bring the distant data set receiver into clock synchronization. At the end of this time period, the CS is turned ON and SD signals are processed correctly.

3.04 The transmitter output level may be set at 0; -3; -6; or -9 dbm by selecting the proper strap conditions on the Transmitter Output circuit pack (182/044).

3.05 ◆The data set receiver is always on line in either continuous carrier or switched carrier mode of operation.◆

3.06 The receiver circuits contain an AGC circuit with a 30-db dynamic range and a maximum input sensitivity of -39 (±1.0) dbm. Attenuation

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pads at the receiver input may be strapped to reduce the sensitivity.

3.07 The data carrier detector (COO) circuit is also affected by the receiver attenuation pads. The COO circuit provides an ON signal to the business machine when received line power is above a minimum threshold level. The maximum input sensitivity of the COO circuit is $-39 (\pm 1.0)$ dbm. Excessive line noise, speech, and other signals, as well as carrier, can operate this circuit. Therefore, the attenuation pads at the receiver input reduce the input sensitivity of the COO circuit by the amount of attenuation inserted.

3.08 The receiver input level may be set at 15; 10; 5; and 0 db loss by selecting the proper strap conditions on the Automatic Gain Control 1 circuit pack (178/017).

3.09 When two Data Sets 205B are interconnected to make a 4-wire regenerative repeater, each data set transmitter derives external timing from the receiver of the other data set. Receive Data (RD) signals from each receiver are applied to the Send Data (SD) input of the other transmitter.

3.10 The data set may be remotely tested over 4-wire facilities with a 904E-Type Data Test Center. The customer or operator must either apply an ON signal to the Remote Test (RMT) interface lead or manually operate the line and test key to REMOTE TEST position to place the data set in the remote testing mode. To return the data set to normal operation, the customer must change the RMT signal to OFF or manually

return the line and test key to LINE position. ♦The Data Set 205B2 may also be placed in the REMOTE TEST mode with a signal through the CONTROL connector.♦

3.11 The Data Set Ready (DSR) circuit in the data set will provide an ON indication to the customers business machine when power is applied and the data set is not in a test mode.

3.12 ♦A Data Set 205B2 connected to a Data Auxiliary Set 804M-type provides the 4-wire switched network autoanswer capability. Calls may be initiated or answered automatically under the control of properly equipped data terminal equipment. The appropriate Data Auxiliary Set 804M-type options for operation with Data Set 205B2 are "K", "N", "R", "Y", and "W" which will be specified on the service order.

3.13 Calls from a distant station to a computer site will normally be originated by the distant station attendant and automatically answered by the first nonbusy station associated with the Data Set 205B2 group. During this condition, the distant station attendant must switch to the DATA mode at the end of the 2025 Hz answer tone and before the 2.56 second burst of 1000 code ends.

3.14 Calls from a computer site will normally be automatically answered at the distant station. Completely manual operation is a back-up procedure. For this condition, attendants at both ends will verbally agree to initiate the DATA mode simultaneously.♦