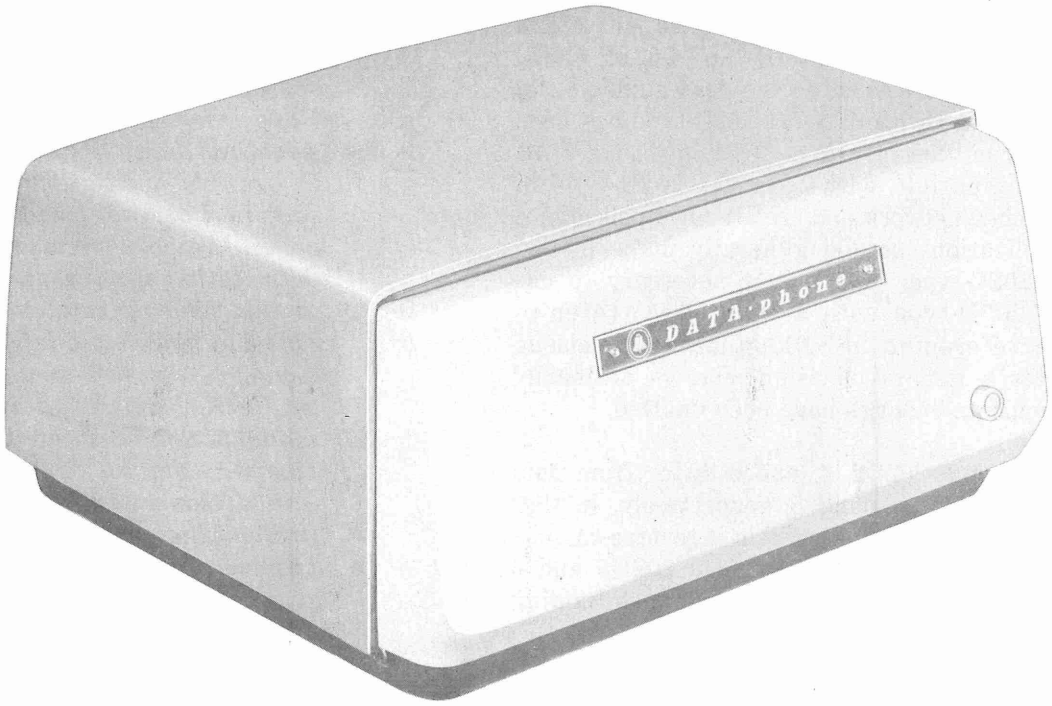
DATA SET 202D-TYPE

REFERENCE GUIDE



Data Set 202D-Type

CONTENTS

1. GENERAL

1.01 Data set 202D-type is a medium speed, nonsynchronous, frequency shift, serial voiceband transmitter-receiver designed primarily for operation in private line service. On 3002 private lines with no conditioning, the maximum bit rate is 1200 bps; with C1 conditioning, it is 1400 bps; and with C2 conditioning, 1800 bps. Data set 202D-type operates 2-wire half-duplex or 4-wire full-duplex. Interface signals have the electrical

characteristics of Electronic Industries Association (EIA) standard RS-232, with optional contact closure on certain control leads.

1.02 This section is reissued to provide coverage on data sets 202D5 and 202D6 as the replacing data sets for data sets 202D3 (MD) and 202D4 (MD), respectively. Data sets 202D5 and 202D6 have all the features of data sets 202D3 and 202D4 and also data sets 202D1 (MD) and 202D2 (MD), respectively. Information on the data auxiliary set (DAS) 804A used with data set 202D-type has been removed from this section. Although the DAS 804A is compatible with data set 202D-type in many switched network and private line applications, these applications should generally make use of data set 202C-type. When it is necessary to use data set 202D-type with a DAS 804A, refer to practices referenced in 8.01. Since this reissue constitutes a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Data sets 202D2, 4, and 6 differ from data sets 202D1, 3, and 5, respectively, in that data sets 202D2, 4, and 6 contain a reverse-channel transceiver. In addition, data sets 202D5 and 6 contain timing options which are used in polling systems.

2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

2.01 Data set 202D-type is a nonintegrated unit combining a data transmitter and a data receiver in a two-tone gray plastic housing which measures 10-1/2 inches wide, 8-3/4 inches deep, and 5-1/2 inches high. Data set 202D-type weighs about 14 pounds.

2.02 Data set 202D-type requires 15 watts of 117-volt $\pm$10%, 60 $\pm$3 Hz power supplied by the customer through a 3-wire receptacle.

2.03 Data set 202D-type will operate in a temperature of +40 to +120°F and in a relative humidity of 20 to 95 percent.

3. SERVICE ORDER INFORMATION

3.01 Data service orders should describe the desired service by USOC and should not specify particular data set codes. The ***encoding procedure*** to determine the appropriate USOC is described in Section 590-000-100. Customer option decisions which must be made to determine the USOC suffix are listed in 3.03. An explanation of features and options common to most data sets is given in Section 590-000-101. A rapid cross-reference between USOC, data sets, and reference guides is presented in Section 590-000-102. Intercity Service Manual (ISM) Section 87 gives customer billing nomenclature, shows tariff listings for data services, and provides general reference information.

Service orders should not specify data set codes. Engineering or Plant Department personnel responsible for selecting data sets are not compelled to use any particular data set codes specified or suggested on the service order. To achieve maximum reuse of data station apparatus, the first choice in selecting apparatus should be the oldest available model that will satisfy the service requirements as identified by USOC. When the desired data set model is not available from telephone company stocks (field or class C), the use of an available substitute is preferred over the purchase of a new current model. USOC decoding procedures are described in Section 590-000-100.

3.02 Service offerings and substitute data sets are given in Table A. Customer options and option designations are given in Table B. Telephone company engineering options are listed in Table C.

CUSTOMER OPTIONS

3.03 The following paragraphs provide detailed information on customer options for ***USOC suffix determination.*** To provide the features requested by the customer, one of the two options under each decision must be selected.

(a) ***DECISION A—EIA Voltage or Contact Closure Interface:***

This option applies only to data set ready (CC or interlock), data terminal ready (CD or remote control), and ring indicator (CE) interface leads. All other interface leads are EIA voltage, regardless of which option is used.

TABLE A

SERVICE OFFERINGS

USOC (Note 1)	FEATURE	USABLE SETS	REMARKS
DRE++	Without Telephone Set; Without Reverse Channel	202D1 202D2 202D3 202D4 202D5 202D6	Note 2, 4 Note 2, 3, 4 Note 4 Note 3, 4 Latest Model Note 3
DRM++	Without Telephone Set; With Reverse Channel	202D2 202D4 202D6	Note 2, 4 Note 4 Latest Model

Note 1: Determine USOC suffix from customer option table and Section 590-000-100.
Note 2: Soft carrier turnoff is permanently installed.
Note 3: Reverse-channel feature is not used.
Note 4: Does not have fast turnaround capability.

TABLE B

CUSTOMER OPTIONS

DECISION	OPTION	DESIGNATION
A	1. EIA Interface — All Leads 2. Contact Closure on Certain Control Leads	N M
B	3. Carrier Soft Turnoff In (Note 1) 4. Carrier Soft Turnoff Out	ZY ZZ
C	5. Received Data Clamped OFF by Carrier Detector OFF (Note 2) 6. No Clamp of Received Data	V U
D (Note 3)	7. Slow Turnaround In 8. Fast Turnaround In	YP YR or YS
E	9. 60-Millisecond Clear-to-Send Interval 10. 30-Millisecond Clear-to-Send Interval	YR YS

Note 1: Carrier Soft Turnoff In is generally left In.
Note 2: For 2-wire operation, option V must be chosen.
Note 3: If decision D7 is made, decision E is unnecessary.

*1. **EIA Voltage:*** Signals between business machine and data set are EIA voltage. Normally, this customer option will be provided.

*2. **Contact Closure:*** The contact interface is used in those data sets working with business machines requiring an open condition on a specific lead to signify an ***on*** condition and a ground condition on a specific lead to signify an ***off*** condition.

(b) ***DECISION B—Carrier Soft Turnoff—IN or OUT:*** When the request-to-send lead is turned off, the data carrier shifts from 1200 Hz to 900 Hz; the 900-Hz carrier then slowly decays. This prevents an end-of-transmission transient

TABLE C

TELCO ENGINEERING OPTIONS

OPTION (Note 1)	DESIGNATION
2-Wire Half-Duplex 4-Wire Full-Duplex	Z Y
Terminal Impedance of 600 ohms 900 ohms	X W
Squelch IN OUT (Note 2)	R ZL
Amplitude Equalizer IN OUT	F E
Delay Equalizer IN OUT	B A
Transmit Level 0 to −13 dB on all data sets 202D3 and 202D4, series 4 and later, and 202D5 and 202D6 0 dBm −3 dBm −6 dBm −9 dBm	— K J H G
Reverse Channel Transmit Level 0 to −13 dB on all data sets 202D4, series 4 and later, and 202D6 −3 dBm −6 dBm −9 dBm	— ZK ZM ZN
Test Key Enabled Disabled (Test from DAS 804A)	ZE ZF
2-Wire Operation Without 4-Wire Backup 4-Wire Operation Without 2-Wire Backup	ZG ZH
Install When Not Using DAS 804A or 6017AP Key	ZJ
Automatic Answer Used Not Used	Q Q Removed
40-msec Acquisition of Carrier 20-msec Acquisition of Carrier	YM YN

Note 1: Designation ZB (previously considered an option for data sets receiving greater than 900 bps) must be installed.

Note 2: For 2-wire operation, Squelch IN must be used. For 4-wire operation, Squelch OUT must be used.

from causing a false spacing output at the receiving station.

3. Carrier Soft Turnoff IN: This option is provided normally.

4. Carrier Soft Turnoff OUT: Disabling the soft turnoff feature normally is required in multiparty private line systems utilizing polling by a master station and when associated business machines are immune to false space pulses at the receiving station.

(c) ***DECISION C—Clamp of Received Data Lead:***

5. Received Data Clamped OFF by Carrier Detector OFF: The carrier detector clamp holds the received data circuit in the mark condition whenever the received line signal detector (carrier detector) is ***off.***

6. No Clamp of Received Data: If desired by the customer, the no-clamp option may be used. With this option, noise may cause spurious space indications on the received data circuit, even if the received line signal detector is ***off.***

(d) ***DECISION D—Slow or Fast Turnaround:***

7. Slow Turnaround: In systems where turnaround time is not critical, the slow turnaround option should be used. This option provides a 200-millisecond interval between request-to-send ***on*** and clear-to-send ***on*** and provides a 40-millisecond carrier acquisition timer. It also provides for the demodulator to be squelched for 110 milliseconds after request-to-send is turned ***off.*** Also provided is a soft carrier turnoff which causes the data set transmitter to emit a 900-Hz tone for 20 milliseconds after the request-to-send lead is turned ***off.*** This reduces the possibility of transients occurring when the data transmitter turns off abruptly.

8. Fast Turnaround: There are combinations of installer options available with data set 202D-type which provide shorter turnaround intervals. In order to be effective, the local and remote data set must be equipped with the fast turnaround option. (When decision C6 is made, decision D7 or D8 must be made.)

(e) ***DECISION E—60- or 30-Millisecond Clear-to-Send Interval:***

9. 60-Millisecond Clear-to-Send Interval: Two fast turnaround features are available. This option provides a 60-millisecond interval between request-to-send ***on*** and clear-to-send ***on*** and provides a 40-millisecond carrier acquisition time. The 110-millisecond receiver squelch is disabled and the soft carrier turnoff feature is removed. With this option, the modulator is turned off within 2 milliseconds after the request-to-send lead is turned off.

10. 30-Millisecond Clear-to-Send Interval: This option provides a 30-millisecond interval between request-to-send ***on*** and clear-to-send ***on*** and provides a 20-millisecond carrier acquisition timer. The 110-millisecond receiver squelch is disabled and the soft carrier turnoff feature is removed. With this option, the modulator is turned off within 2 milliseconds after the request-to-send lead is turned ***off.***

4. SERIES INFORMATION

4.01 Table D lists the data sets by code and the significant modification which resulted in changes in a series number.

5. CONVERSION INFORMATION

5.01 For information on conversion of data sets 202D-type, refer to Table E.

6. MAINTENANCE SPARE GUIDELINES

6.01 To reduce the types of data sets in field stock, a universal spare may be used for a group of in-service data sets containing various features. For a recommendation of the substitute data sets which should be stocked for maintenance spares, refer to Table F.

7. POLLING APPLICATIONS

7.01 The following examples present two possible applications using data set 202D-type. There are other possible applications; however, these two are expected to be the most widely used. This information is useful when selecting data set options during the design of data systems.

TABLE D

SERIES INFORMATION

DATA SET	BASE PAN SERIES	PURPOSE OF MODIFICATION
202D1, 2	1	Initial manufacture.
	2	To guard against the reception of false space transition upon transmitter turnoff.
	3	To protect the data set against excessive ambient electrical noise.
	4	To provide a continuously adjustable transmitter output level to comply with F.C.C. Tariff 263.
	5	To reduce distortion in the receiver.
	6	To reduce the susceptibility of the data set to power line transients.
202D3, 4	1	Initial manufacture to provide carrier soft turnoff as an option.
202D1, 2	7	To guard against dropping the telephone line during the remote test.
202D3, 4	2	
202D1, 2	8	To replace 17A power unit with 48A power unit for additional power line noise protection and to lengthen holdover timing.
202D3, 4	3	
202D1, 2	9	To comply with the signal level restraints in F.C.C. Tariff 263.
202D3, 4	4	
202D1, 2	10	To prevent the transmitter from cross-talking into the receiver when the data set is connected for 4-wire operation and the send level is above −6 dBm.
202D3, 4	5	
202D1, 2	11	To prevent improper operation of the carrier detector circuit under certain combinations of acceptable telephone line characteristics and customer signaling patterns.
202D3, 4	6	
202D1, 2	12	To modify voltage suppression associated with the CC lead.
202D3, 4	7	
202D5, 6	1	Initial manufacture to provide additional clear-to-send and carrier detector timing options.

7.02 The first example is that of data sets used in a 4-wire polling system with fast turnaround. Figure 2 shows the equipment arrangement. Table G provides option information to be used at the polling terminal (computer port) and the polled terminals.

7.03 The second example is that of data sets used in a 4-wire polling system with a medium speed turnaround. This arrangement provides greater reliability than the arrangement described in the first example and might be used when longer messages are being transmitted. In

TABLE E

CONVERSION INFORMATION

DATA SET	LATEST SERIES	MFG. STATUS	REPLACED BY	CONVERTIBLE TO	UPDATE & REPAIR RECOMMENDATION*
202D1	12	MD	202D3	202D2	Series 5, 7, 10, and 11
202D2	12	MD	202D4	202D1	Series 5, 7, 10, and 11
202D3	7	MD	202D5	202D4	Series 2, 5, and 6
202D4	7	MD	202D6	202D3	Series 2, 5, and 6
202D5	1	Current	—	202D6	Update & Repair
202D6	1	Current	—	202D5	Update & Repair

* This column indicates the series changes which are recommended for incorporation into the data sets listed under the DATA SET column.

TABLE F

MAINTENANCE SPARE GUIDELINES

SETS IN SERVICE	MAINTENANCE SPARE	NOTES
202D1	202D1	—
202D1 202D2	202D2	1
202D1 202D2 202D3 202D4 202D6	202D4	1, 2
202D1 202D3 202D5	202D5	—

Note 1: Disable reverse channel when appropriate to provide proper service.

Note 2: Data set 202D4 is recommended as the maintenance spare rather than the latest model 202D6 due to availability. The only extra capability of the 202D6 in comparison to the 202D4 is the fast turn-around Feature, which is generally not required in combination with reverse channel.

such a situation, this slower turnaround would not constitute a significant reduction in through-put. The equipment arrangement is shown in Fig. 2 and the option information for the polling terminal and polled terminal is shown in Table H.

8. REFERENCES

8.01 The following Bell System Practices provide additional information on data set 202D-type.

SECTION	TITLE
592-016-100	Data Set 202D-Type—Transmitter-Receiver—Description and Operation
592-016-150	Data Set 202D-Type—Transmitter-Receiver—Theory of Operation and Supplementary Information
592-016-200	Data Set 202D-Type—Transmitter-Receiver—Installations and Connections
592-016-300	Data Set 202D-Type—Transmitter-Receiver—Maintenance
592-016-500	Data Set 202D-Type—Transmitter-Receiver—Test Procedures

8.02 The following schematic drawings (SDs), circuit descriptions (CDs), Engineering Letters

TABLE G

TERMINAL OPTIONS FOR 4-WIRE POLLING SYSTEM WITH FAST TURNAROUND

TERMINAL OPTIONS		DESCRIPTION	REASON FOR USE
POLLING STATION	POLLED STATION		
Y	Y	4-Wire operation	Design assumption.
—	ZZ	Fast turnoff of carrier	At polling station, setting is arbitrary. At polled station, fast turnoff of carrier is a design assumption.
—	ZL	No squelch of carrier detector	From polling end, carrier is continuous and setting is arbitrary. At polled station, squelch is OUT since 4-wire operation is a design assumption.
YN	—	20-msec acquisition of carrier	Fast startup of receiver upon reply to polling operation.
YM	YM	40-msec acquisition of carrier	Greatest protection of system.
V	V	*Carrier detector clamps RD lead	Prevents received data lead from responding to noise in absence of carrier.
—	YS	30-msec clear-to-send timer	From polling end, carrier is continuous and setting is arbitrary. At polled station, 30 msec is a design assumption for fast turnaround.

* Clamp of RD lead can be removed if customer builds appropriate safeguards into the terminal by some method, such as start of message (SOM) code.

(ELs), Engineering Memorandums (EMs), Plant Engineering Letters (PELs), and Plant Engineering Memorandums (PEMs) contain pertinent information on data set 202D-type.

NUMBER	TITLE
SD-&CD-1D049-01	Data Set 202D Type—Transmitter-Receiver Circuit
EL 486	Class A Change—Data Sets 202C and D
EL 1161	Class A1C Change on Data Sets 202C and 202D
EL 1890	Class B1 Changes on Data Sets 202C and 202D
EM 28	Data Sets 202C and 202D
EM 646	Data Set 202D—Private Line Applications
EM 650	Data Sets 202C and 202D
EM 1216	Data Sets 202C and D
PEL 7287	Data Sets 202C and 202D
PEM 8950	Data Service Class A1G Change in Data Set 202C and 202D
PEM 9309	Class A1G Change—Data Sets 202C and 202D

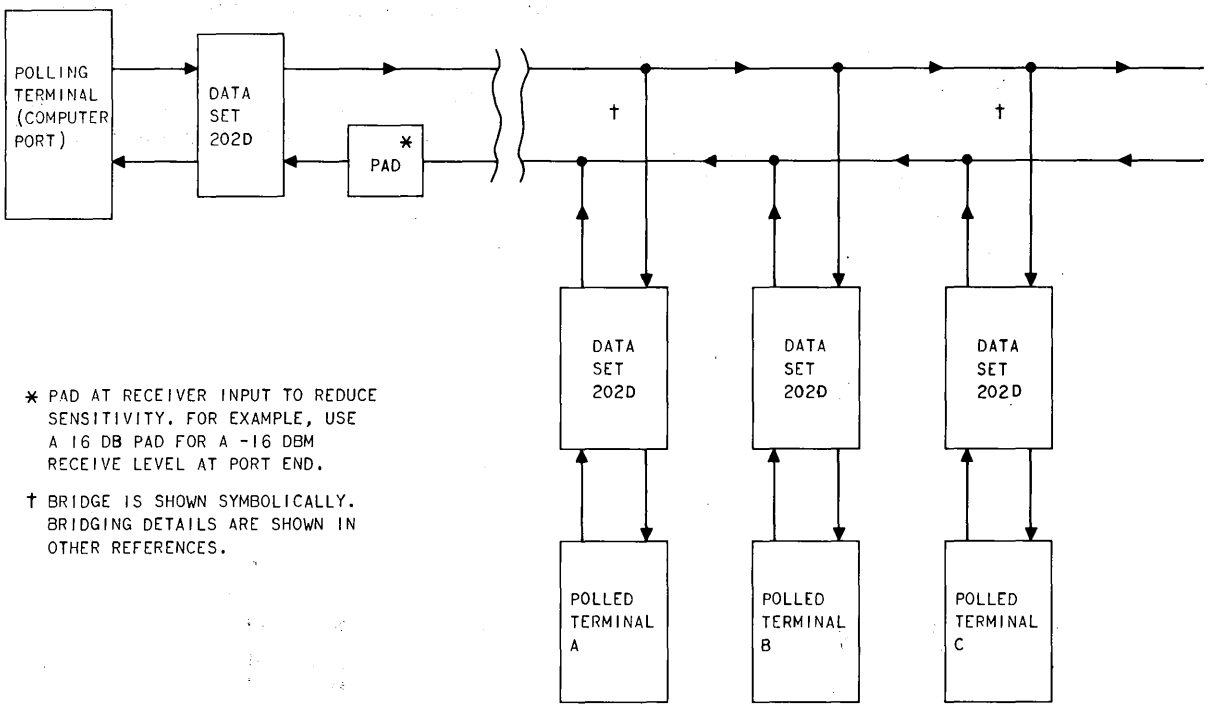


Fig. 2—4-Wire Polling System

TABLE H

TERMINAL OPTIONS FOR 4-WIRE POLLING SYSTEM WITH MEDIUM SPEED TURNAROUND

TERMINAL OPTIONS		DESCRIPTION	REASON FOR USE
POLLING STATION	POLLED STATION		
Y	Y	4-wire operation	Design assumption.
—	ZY	Soft turnoff of carrier	At polling station, setting is arbitrary. At polled station, soft turnoff increases reliability of system.
—	ZL	No squelch of carrier detector	From polling end, carrier is continuous and setting is arbitrary. At polled station, squelch is OUT since 4-wire operation is a design assumption.
YM	YM	40-msec acquisition of carrier	Greatest protection of system.
V	V	Carrier detector clamps RD lead	Prevents received data lead from responding to noise in absence of carrier.
—	YR	60-msec clear-to-send timer	From polling end, carrier is continuous and setting is arbitrary. At polled station, 60 msec is the only period suitable for medium speed turnaround.

NUMBER	TITLE
PEM 9609	Class A Change—Data Sets 202C and 202D
PEM 9978	Special Services—Data Set 202C and D Circuit

8.03 Interface information is given in the following:

Technical Reference—Data Sets 202C and 202D Interface Specification, PUB 41202