

DATA SET 202R REFERENCE GUIDE



Fig. 1—Data Set 202R-L1/2—Front View

1. GENERAL

1.01 Data set 202R is a transmitter-receiver for medium-speed, binary serial data. The data set is primarily intended for operation in private line service on 2-wire or 4-wire facilities. It employs frequency shift modulation for one-way, two-way nonsimultaneous, or two-way simultaneous (on 4-wire lines only) transmission for point-to-point or multipoint application.

1.02 This section is reissued to add information to aid in selecting options for data set 202R.

1.03 On 3002 private lines, the recommended maximum bit rate is 1200 bits per second (bps). With C1 conditioning, the recommended maximum bit rate is 1400 bps and with C2

conditioning the recommended maximum bit rate is 1800 bps.

1.04 With the addition of a telephone set, data set 202R is suitable for DATA-PHONE[®] service at speeds up to 1200 bps. However, manual operation must be used, that is, manual answer of incoming ringing, no automatic calling unit compatibility, and manual termination of a call.

1.05 In private line applications, data set 202R is compatible for use with another data set 202R or data set 202D. With the DATA-PHONE option, data set 202R is compatible for use with 202C, 202D, or 202R (equipped with alternate voice capability). In addition, the receiver portion of data set 202R can be used in receive-only configuration with a data set 202E as the distant transmitter.

Note: Data set 202R does not provide a reverse-channel feature as do certain models of data set 202C, 202D, or 202E.

1.06 For DATA-PHONE service, the following telephone sets are recommended:

511F—Desk Telephone—rotary dial

558F—Wall Telephone—rotary dial

2511F—Desk Telephone—TOUCH-TONE® dial

2558D—Wall Telephone—TOUCH-TONE dial.

Any of these telephones may also be used for half-duplex private line service (on 2-wire facilities only) with DDD backup. Such an arrangement does not permit voice communication over the private line facilities. However, the telephone set can be used for voice communication on the DDD network even while the data set is in use on the private line facilities.

2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

2.01 Data set 202R-L1 consists of a transmitter, receiver, and control circuits mounted on three plug-in type circuit boards located in an apparatus mounting. A terminal board with screw connections is attached to the rear of the mounting for connecting the telephone lines and low-voltage ac power source. The overall dimensions of data set 202R-L1 are approximately 9 inches long, 6 inches wide, and 4 inches high. The weight is approximately 6 pounds. Data set 202R-L1 can be mounted on 19-, 23-, or 25-inch racks for multiple installation.

2.02 Data set 202R-L1/2 consists of a data set 202R-L1 in a 2-tone gray plastic housing. In addition, an external power transformer and D10P cord are provided with the data set 202R-L1/2. The overall dimensions of data set 202R-L1/2 are 11 inches wide, 5-1/2 inches high, and 10-1/4 inches deep. The weight is approximately 8 pounds.

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

2.04 All interface leads for data set 202R are terminated in a 25-pin receptacle mounted on the AR593 circuit board. The customer data

equipment must be equipped with a cable terminated in a Cinch or Cannon DB-19604-432 plug with a Cinch DB-51226-1 hood assembly (or equivalent).

3. OPERATION

3.01 In private line applications (without a telephone set), the data set is normally in the data mode unless it is transferred to the test mode by using the test switch provided on the faceplate of the AR593 circuit board. This permits the telephone company to evaluate the condition of the data set from a data test center.

3.02 If the data set is to be used on DATA-PHONE service, it must be used with a telephone set equipped with an exclusion key. Calls must be originated, answered, and terminated manually. To enter the data mode, the data station attendant must raise the exclusion key and leave the handset off the switch hook during data transmission. The test mode for DATA-PHONE service is the same as that explained in 3.01.

4. SERVICE ORDER INFORMATION

4.01 Service orders for data services should describe the desired service by USOC (Uniform Service Order Code). Service orders **should not** specify 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 suffixes are listed in 4.03. 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.

4.02 The USOC **decoding** procedures are described in Section 590-000-100. 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 set apparatus, the oldest apparatus that will perform the service as described by USOC should be utilized first. Refer to Table A for a list of data sets which can be substituted for data set 202R.

TABLE A
SERVICE OFFERINGS

USOC	FEATURE		USABLE SETS
GHA	Private Line — Single Installation		202R-L1/2 202D*
GHB	Private Line — Multiple Installation		202R-L1
GHC	Rotary Dial	DATA-PHONE® Service — Single Installation	202R-L1/2 202C* 202D with 804A*
GHE	TOUCH-TONE®		
GHF	Rotary Dial	DATA-PHONE Service — Multiple Installation	202R-L1
GHG	TOUCH-TONE		

*Manual operation and no reverse channel.

4.03 Refer to Table B for the options which require a customer decision. The following subparagraphs provide detailed information on customer options. To provide the features desired by the customer, one of the two options under each of the following decisions must be selected:

(a) **Decision A—Clamp of Received Data Lead:**

(1) **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**.

(2) **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**.

(b) **Decision B—Data Set Carrier Control:**

(3) **Data Set Carrier Controlled by Request to Send:** With the data set carrier controlled by request to send, the data set can transmit when request to send is **on** and the data set is conditioned to receive when request to send is **off**.

(4) **Continuous Carrier:** With this option, the request-to-send lead is bypassed and is held **on** by circuitry within the data set. The continuous carrier option is used on 2-wire systems arranged to transmit only and on 4-wire systems. For receive-only service, a "no carrier" option inhibits the transmitter from sending carrier.

(c) **Decision C—Slow or Fast Turnaround:**

(5) **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.

(6) **Fast Turnaround:** There are combinations of installer options available with data set 202R 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.)

(d) **Decision D—60- or 30-Millisecond Clear-to-Send Interval:**

(7) **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 timer. The 110-millisecond receiver squelch explained in 4.03(c) 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.

(8) **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 explained in 4.03(c) is disabled and the soft carrier turn-off feature is removed. With this option, the modulator is turned off within 2 milliseconds after the request-to-send lead is turned *off*.

4.04 Additional Customer Information: Data set 202R may be installed in one of three different arrangements:

- (a) Private line half-duplex data only (2-wire facilities)
- (b) Private line full-duplex data only (4-wire facilities)
- (c) DATA-PHONE service (with alternate voice).

To properly select the Telco engineering options (two-wire or four-wire), it is necessary that sufficient information about the arrangements be included in the System Service Order (SSO). For private line use, it should be specified if the data set is to be used for half-duplex or full-duplex service, and if alternate voice is used, the type telephone set should be designated.

OPTION SELECTION

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

4.06 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 C provides option information to be used at the polling terminal (computer port). Table D provides option information for the polled terminals.

4.07 The second example is that of data sets used in a 4-wire polling system with a medium speed turnaround. This arrangement provides a greater reliability than the arrangement described in the first example and might be used when longer messages are being transmitted. In 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 is shown in Table E. Table F provides the option information for the polled terminal. The third example is that of a 2-wire point-to-point (or DDD) arrangement for a maximum length connection. In this situation, the options selected are the same for both terminals and are shown in Table G. The equipment arrangement is shown in Fig. 3.

5. REFERENCES

5.01 The following Bell System Practices contain additional information concerning data set 202R:

SECTION	TITLE
592-025-100	Data Set 202R, Transmitter-Receiver, Description and Operation
592-025-180	Data Set 202R, Transmitter-Receiver, Summarizing Specification
592-025-200	Data Set 202R, Transmitter-Receiver, Installation and Connections
592-025-300	Data Set 202R, Transmitter-Receiver Maintenance

592-025-500 Data Set 202R, Transmitter-Receiver Test Procedures.

(b) Technical Reference, Data Set 202R

5.02 The following documents contain additional information concerning data set 202R:

(a) SD- and CD-1D224-01

TABLE B
CUSTOMER OPTION TABLE

DECISION	OPTION	WIRING DESIGNATION
A	1. Received Data Clamped OFF by Carrier Detector OFF	K
	2. No Clamp of Received Data	J
B*	3. Data Set Carrier Controlled by Request to Send	X
	4. Continuous Carrier (For No Carrier, see note.)	W
C**	5. Slow Turnaround In	G,M,R,S
	6. Fast Turnaround In	F or E
D	7. 60-Millisecond Clear-to-Send Interval	F,M,Q,T
	8. 30-Millisecond Clear-to-Send Interval	E,N,Q,T

Note:

For receive-only service, the wiring options are No Carrier (V option) instead of Continuous Carrier (W option). Since V option would not be included in the USOC suffix, this information must be included in the remarks column of the service order.

* If decision B4 is made, decisions C and D are unnecessary.

** If decision C5 is made, decision D is unnecessary.

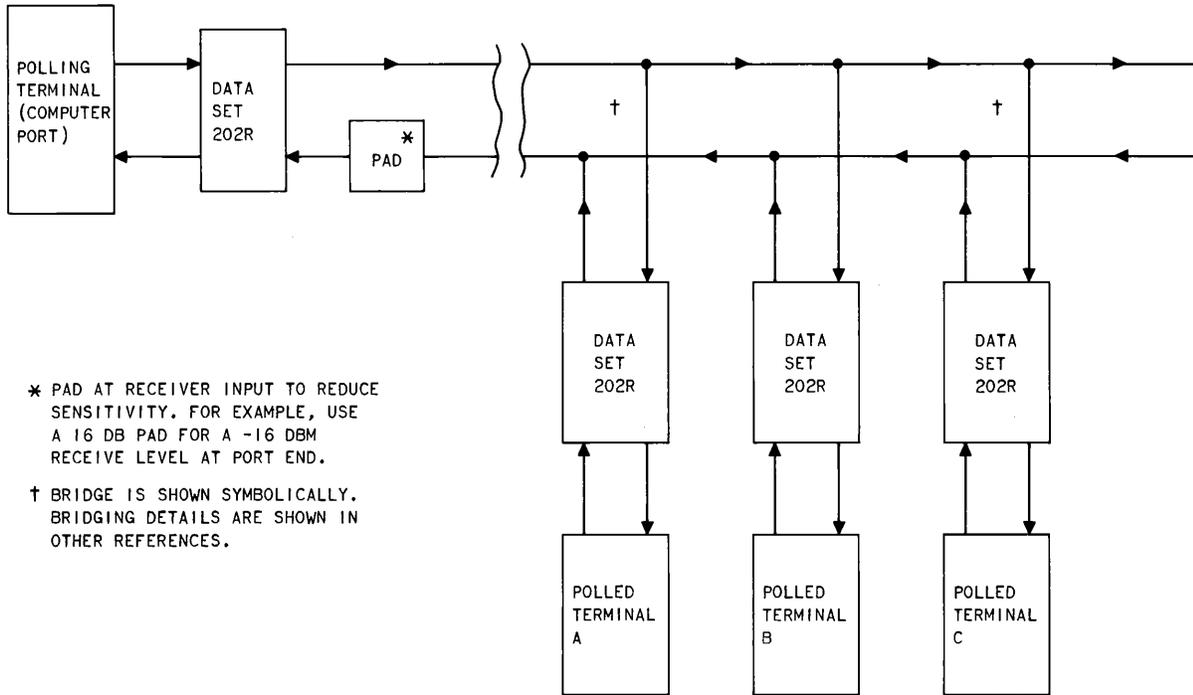


Fig. 2—Four-Wire Polling System

TABLE C

◆ POLLING TERMINAL OPTIONS FOR FOUR-WIRE POLLING
SYSTEM WITH FAST TURNAROUND ◆

OPTION	DESCRIPTION	REASON FOR USE
Y	4-Wire operation	Design assumption
W	Continuous carrier	Design assumption. Does not require initial start-up time for each poll
T	Fast turnoff of carrier	Unused feature; setting is arbitrary
Q	No squelch of carrier detector	Unused feature; setting is arbitrary since carrier is continuous from polling end
N	20-msec acquisition of carrier	Fast start-up of receiver upon reply to polling operation
K	*Carrier detector clamps RD lead	Prevents received data lead from responding to noise in absence of carrier from polled data sets
E	30-msec clear-to-send timer	Unused feature; setting is arbitrary since carrier is continuous from polling end

* 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.

TABLE D

◆POLLED TERMINAL OPTIONS FOR FOUR-WIRE
POLLING SYSTEM WITH FAST TURNAROUND◆

OPTION	DESCRIPTION	REASON FOR USE
Y	4-Wire operation	Design assumption
X	Data set under control of request-to-send lead	Design assumption requiring polled stations to be quiet until responding to poll
T	Fast turnoff of carrier	Design assumption for fast turnaround
Q	No squelch of carrier detector	Not used in 4-wire operation; otherwise, this feature could interfere with full duplex operation
M	40-msec acquisition of carrier	Greatest protection of system in face of system failure
K	Carrier detector clamps RD lead	To prevent received data lead from responding to noise in absence of carrier from polling data set 202R
E	30-msec clear-to-send timer	Design assumption for fast turnaround

TABLE E

◆ POLLING TERMINAL OPTIONS FOR FOUR-WIRE
 POLLING SYSTEM WITH MEDIUM SPEED
 TURNAROUND ◆

OPTIONS	DESCRIPTION	REASON FOR USE
Y	4-Wire operation	Design assumption
W	Continuous carrier	Design assumption does not require initial start-up time for each poll
S	“Soft” turnoff of carrier	Unused feature, setting arbitrary
Q	No squelch of carrier detector	Unused feature, setting arbitrary since carrier is continuous from polling end
M	40-msec acquisition of carrier	Longer time used to avoid possible false detection of carrier
K	Carrier detector clamps receive data	Prevents receive data lead from responding to noise in absence of carrier from polled data sets 202R
F	60-msec clear-to-send timer	Unused feature, setting arbitrary since carrier is continuous from polling end

TABLE F

◆POLLED TERMINAL FOUR-WIRE POLLING
SYSTEM WITH MEDIUM SPEED TURNAROUND◆

OPTION	DESCRIPTION	REASON FOR USE
Y	4-Wire operation	Design assumption
X	Data set under control of request-to-send lead	Design assumption requiring remote station to be quiet until responding to poll
S	"Soft" turnoff of carrier	Design assumption for most reliable end of each transmission from polled data sets 202R.
Q	No squelch of carrier detector	Not used in 4-wire continuous carrier operations; otherwise, this feature could interfere with full-duplex operation
M	40-msec acquisition of carrier	Greatest protection of system in face of system failure
K	Carrier detector clamps received data lead	To prevent receive data lead from responding to noise in absence of carrier from polling 202R (Failure Protection)
F	60-msec clear-to-send timer	Minimum period suitable for 40-msec carrier detector

TABLE G

◆OPTIONS FOR TWO-WIRE POINT-TO-POINT
(DDD CONNECTION) MAXIMUM LENGTH
CONNECTION◆

OPTION	DESCRIPTION	REASON FOR USE
Z	2-Wire operation	Design assumption
X	Data set under request-to-send lead	Direction of transmission under control of data terminal
S	"Soft" turnoff of carrier	Most positive method of terminating transmission without false operation due to transients
R	110-msec squelch of carrier detector	To prevent local carrier detector from responding to echo of final local transmission
M	40-msec acquisition of carrier	Most reliable carrier detection time
K	Carrier detector clamps receiver	To prevent receiver output when carrier is off and only noise is present
G	200-msec clear-to-send timer interval	To prevent transmission until other data set squelch and carrier detector time has lapsed

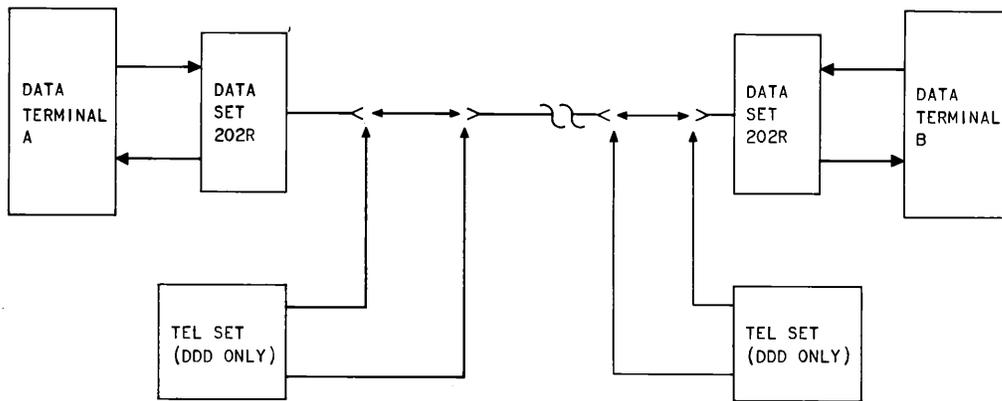


Fig. 3—Two-Wire Point-to-Point