DATA SET 103JR-L1/2
TRANSMITTER-RECEIVER
SINGLE SET
DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section describes the physical and functional characteristics of data set (DS) 103JR-L1/2 (Fig. 1). General operating information is included for single set installations. Other than

a description of interface signals, information pertaining to customer-provided equipment (CPE) is not provided. Section 590-011-202 provides registered station arrangements that include multiset installations in 40A3 data mountings and Bell System provided cabinets.

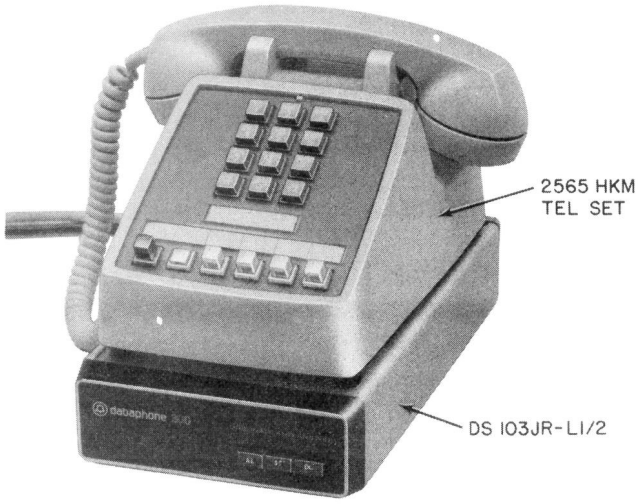

Fig. 1—DS 103JR-L1/2 With 2565HKM Telephone Set

1.02 Whenever this section is reissued, the reason for reissue will be contained in this paragraph.

1.03 DS 103J-L1 has been replaced by DS 103JR-L1 which is the registered version of the data set. DS 103JR-L1 meets the requirements of the FCC registration program. The registration number for DS 103JR-L1 is AS593M-70104-DM-E.

1.04 General information concerning registered data sets and arrangements follows:

- Registered versions of data sets are coded with an "R" in the data set code.
- All Bell System switched network data sets not coded with an "R" in the data set code are grandfathered.
- Grandfathered DS 103J may be connected in registered arrangements provided the interface with the network is made with the appropriate jack and cord as shown in Section 591-044-200.
- DS 103JR may be connected in grandfathered arrangements provided the interface with the network is made using the appropriate cords as shown in Section 591-044-200.
- Connections to the telephone lines must be made via the proper cords to the voice or data jack as shown in Section 591-044-200.
- In the one-to-five data set arrangements a mixture of new-family data sets (103JR, 113CR, 113DR, 201CR, 202SR, 208BR, and 212AR) may be used as shown in Section 591-044-200.

1.05 DS 103JR-L1/2 is intended for use on 2-wire switched network circuits at speeds up to 300 baud.

1.06 The following is a specification summary for DS 103JR.

Operation: Nonsynchronous, binary, serial, full-duplex on 2-wire switched network.

Modulation: Frequency shift keying.

Rate: Up to 300 baud.

Modes: Originate, answer.

Customer Interface Connection: Electronic Industries Association (EIA) Standard RS-232-C. Customer-provided equipment (CPE) must connect via a 25-pin Cinch or Cannon DB-19604-432 (male) connector plug with Cinch DB-51226-1 hood (or equivalents). Interface cable should be less than 50 feet long per EIA Standard RS-232-C recommendations.

Power: 105 to 129 Vac at 57 to 63 Hz, approximately 10 watts.

Environment: Ambient temperature = 40 to 120°F, relative humidity = 20 to 95 percent.

Note: These environmental operational limits are valid only under the condition that no condensation occurs.

Dimensions and Weights: DS 103JR-L1 overall dimensions are 5.6 inches wide, 10.4 inches long, and 1.5 inches high. The assembly weighs approximately 2 pounds. DS 103JR-L1/2 dimensions

are 5.8 inches wide, 10.9 inches long, and 2.2 inches high. The weight is approximately 5 pounds.

Compatibility: DS 103JR-L1 is compatible with originate-answer data sets such as 103-type or 212A-type. It can also originate calls to answer-only sets such as 113B- or 113D-type and answer calls from originate only sets such as 113A- or 113C-type.

Installation Configurations: Single set or multiple, manual and/or automatic calling, or manual or automatic answer.

Testing: Local self test, analog loopback, digital loopback and end-to-end self test.

2. PHYSICAL DESCRIPTION

2.01 List code designations have been assigned to DS 103JR as follows:

- ***DS 103JR-L1:*** Printed circuit pack assembly shown in Fig. 2.
- ***DS 103JR-L1/2:*** Printed circuit pack assembly DS 103JR-L1, 47C1 data mounting, and M4AS cord. The 47C1 data mounting consists of a housing assembly, power cord, transformer, and M13F cord.

A. DS 103JR-L1

2.02 This list code specifies the basic data set. DS 103JR-L1 consists of two printed circuit boards interconnected by three flexible cables. The overall dimensions are 1.5 inches high, 5.6 inches wide, 10.4 inches long, and the weight is 2 pounds. A faceplate is provided which contains the status indicators and the three test switches. All interconnections to the circuit packs are made via an edge connector at the rear of the board.

2.03 The test switches perform the same function in DS 103JR-L1 as in DS 103JR-L1/2. The status indicators perform the same function; however, in DS 103JR-L1 the light emitting diodes (LEDs) are viewed directly, while in DS 103JR-L1/2 the LEDs illuminate dropout graphics. The options are the same for both codes except that the common ground options are made on their respective data mountings.

2.04 The status indicators are described as follows:

- MB (Made Busy): Lighted when the CN lead is turned ***ON*** by the CPE, if the ST and DL buttons are released; or when the AL test button is operated.
- TR (Terminal Ready): Lighted when the data terminal ready (CD) lead is ***on.***
- MR (Modem Ready): Lighted when the data set ready (CC) lead is ***on.***
- SD (Send Data): Lighted when the transmitted data (BA) lead is spacing.
- RD (Receive Data): Lighted when the received data (BB) lead is spacing.
- MC (Modem Check): Lighted in any of the following situations:

  (1) In idle mode if power is present

  (2) In data mode if carrier is not being detected

  (3) In self test if test fails.

  Note: May be lighted for first few seconds while handshaking.

- TM (Test Mode): Lighted when one or more of the AL, ST, or DL switches is depressed.

2.05 The data set is equipped with three locking pushbutton switches on the faceplate, which are used to test the data set. These switches are the depress-to-operate and depress-to-release type, and are designated AL (analog loopback), ST (self test) and DL (digital loopback). The functions of these switches are described in Part 4.

B. DS 103JR-L1/2

2.06 This list code specifies the "stand alone" configuration. It consists of the data set previously described, enclosed in a 47C1 data mounting, and an M4AS cord.

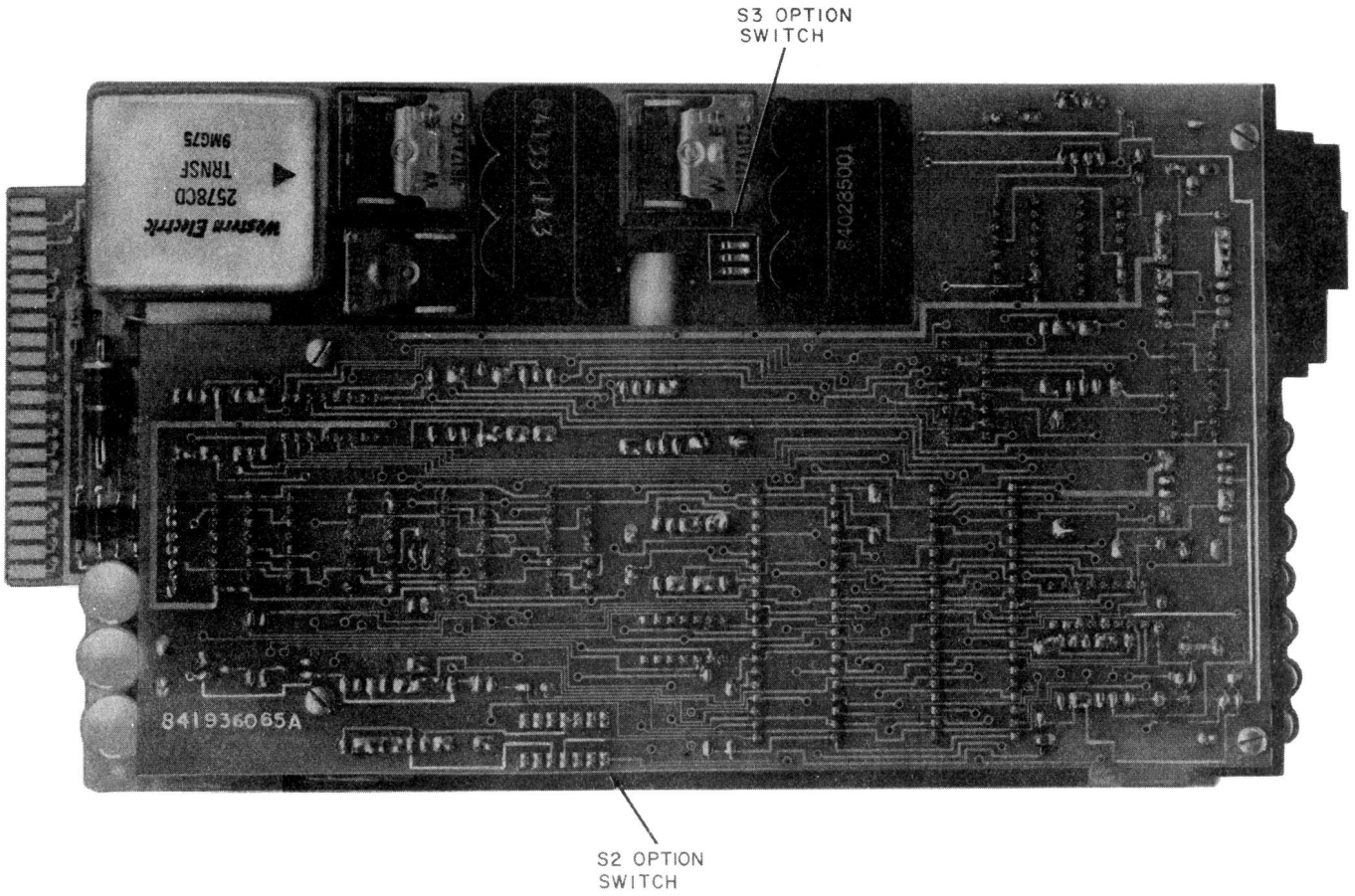

Fig. 2—103JR-L1

2.07 the data mounting is an extruded aluminum shell measuring 2.2 inches high, 5.8 inches wide, 10.9 inches long, and weighing 2.3 pounds (3.2 with KS-21239 transformer). The data mounting and data set plus transformer weigh approximately 5 pounds. The front cover is molded black plastic with seven translucent designations and a cutout for the test switches. The rear cover is also molded black plastic with a cutout for the two interface connectors and the power cord.

2.08 A KS-21239-L5 transformer, which is attached to the mounting by a power cord, a transformer mounting screw, and an M13F cord, are included with the mounting. The transformer plugs into a standard nonswitches 117-volt 60-Hz, 3-wire grounded outlet.

2.09 When DS 103JR-L1 is placed in the mounting with the covers installed, the LEDs illuminate "dropout" graphics on the front cover. "Dropout" graphics provide for the appearance of the 2-letter abbreviation when the indicator is lighted and a continuous black opaque surface when the indicator is off.

2.10 Installer options are accomplished by setting the position of individual switches on multiple section rocker assemblies, S2 and S3 on the circuit pack, and screw switch S1 on the data mounting. Refer to Section 591-044-200 for installation of options.

3. FUNCTIONAL DESCRIPTION

3.01 This part contains a brief functional description of DS 103JR.

A. Customer Interface

3.02 The customer interface conforms to E1A Standard RS-232-C. The 25-pin female connector is not part of the data set cord but is provided on the mounting (Fig. 3). The connector pin designations and functions are listed in Table A.

3.03 All other interface connector pins on the mounting are unused. As specified in EIA Standard RS-232, connector pins 9 and 10 are not to be used by the CPE. An additional interface circuit, CN on pin 25, is provided. Its function is to activate the make-busy and analog loop features via the interface.

B. Telephone Interface

3.04 A 25-pin plug is provided on the mounting for all telephone set and ACU connections (Fig. 3). The plug pin designations and functions are listed in Table B.

C. Options

3.05 Table C provides a listing of DS 103JR-L1/2 options.

D. General Operation

3.06 DS 103JR-L1/2 is a dual mode data set, suitable for originate-answer service. The frequencies used depend on the mode and are listed in Table D.

E. Originating a Call

3.07 Either of the following methods may be used to originate a data call:

(a) The associated telephone set is used in the normal way to establish a telephone connection to a DS 212A-type or any switched network DS 100-type except 113A or 113C. If the call is answered in the telephone mode, the caller requests a transfer to the data mode; if the called station is arranged for automatic answer, it answers in the data mode. In either case,

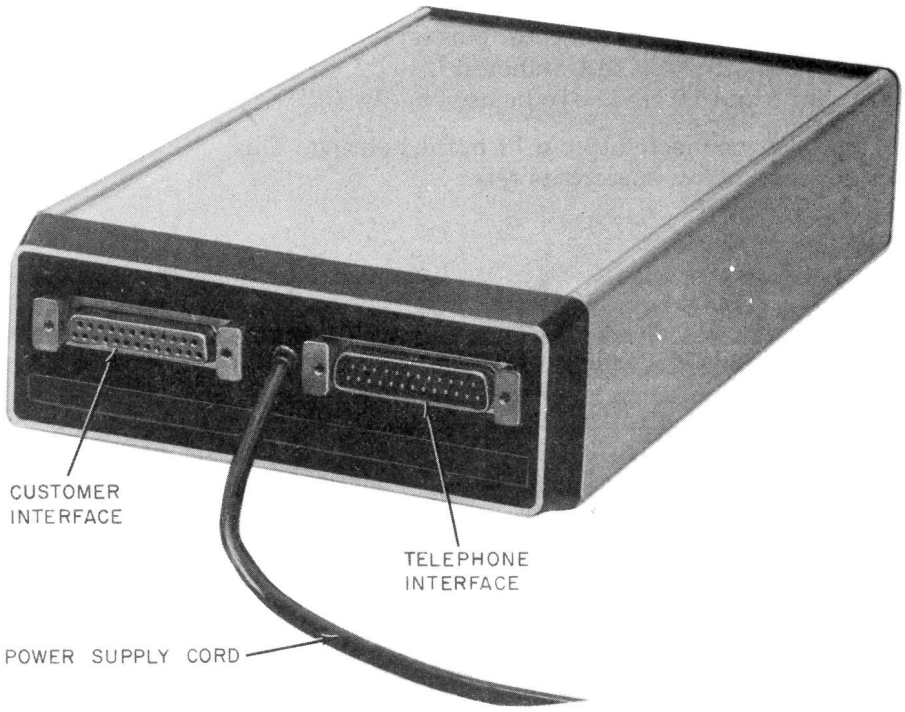

Fig. 3—DS 103JR-L1/2—Rear View

TABLE A

CUSTOMER INTERFACE

EIA DESIG-NATION	CIRCUIT	CIRCUIT PACK CONNECTOR PIN ASSIGNMENT	CUSTOMER INTERFACE CONNECTOR PIN ASSIGNMENT
AA	Protective Ground	—	Note 1
BA	Transmitted Data	2	2
BB	Received Data	3	3
CB	Clear to Send	5	5
CC	Data Set Ready	6	6
AB	Signal Ground	7	7
CF	Data Carrier Detector	8	8
+P	Data Set Test (+12V)	27	9 ⎫ Note 2
—P	Data Set Test (—12V)	26	10 ⎭
—	Not Used	—	11 ⎫ Note 3
—	Not Used	—	19 ⎭
CD	Data Terminal Ready	22	20
CE	Ring Indicator	23	22
CN	Terminal Busy	25	25

Note 1: Not wired in connector but available in data mounting.

Note 2: All other interface connector pins on the mounting are unused. As specified in EIA Standard RS-232, connector pins 9 and 10 are not to be used by the CPE.

Note 3: Pin 19 is connected to pin 11 in the housing. This circuit is not used in low-speed data sets.

an f2 mark tone is heard by the caller, who then depresses the data key on the telephone.

(b) An alternate way to originate a call is via an optional automatic calling unit (ACU). In this case, the dialing of the call and the subsequent monitoring for f2 mark tone is accomplished by the ACU, which then puts DS 103JR in the data mode. For either method, the originating data set when going into the data mode does the following:

(1) Turns ***on*** the CC lead when going off-hook, provided option ZD (CC indication early) is installed, and monitors the line for an f2 mark tone.

(2) When a continuous f2 mark is detected, the data set does the following within a short time interval:

- Turns ***on*** the CF lead.
- Turns ***on*** the CC lead, provided option ZC (CC indication delayed) is installed.
- Removes the marking clamp on the BB lead.

TABLE B

TELEPHONE AND ACU INTERFACE

DESIG-NATION	DESCRIPTION	CIRCUIT PACK CONNECTOR PIN ASSIGNMENT	25-PIN PLUG PIN ASSIGNMENT
L	Tel set line lamp control from data set	18	1
LG	Tel set line lamp ground from data set	35	4
TD	Talk/data control from tel set	14	5
T	Tel line tip lead	20	7
R	Tel line ring lead	19	8
RD	Common ringer control contact to ground	39	12
C	Contact closure to ground from data set to ACU to indicate data mode	15	14
D1	Contact closure to ground from ACU to data set to place set off-hook	16	16
T1	Tel set tip lead	34	21
R1	Tel set ring lead	33	22
A	"A" lead control: used to provide an indication to	37	23
A1	ACU or KTU when the line is in use	38	24
TDG	Ground lead	36	25
RT	Remote test (Note 1)	17	—
MB	Make busy (Note 1)	40	—

Note 1: Not used in registered arrangements.

- Applies an f1 mark to the line.
- Turns ***on*** the CB lead. As soon as the CB lead is ***on***, the CPE can send data.

(3) If f2 mark is not received within 14 ±4 seconds, an abort timer automatically disconnects the set.

F. Answering a Call

3.08 In response to a ringing voltage, the CE lead is turned ***on*** by the data set while ringing voltage is present.

3.09 If option ZG (automatic answer NO) was selected at installation, incoming calls are not answered automatically. Manual answer is accomplished by depressing the associated locking line key located on the telephone set and lifting the telephone receiver. Connection of the data set to the line is effected by momentarily depressing the data key, provided that the CD lead is ***ON.***

3.10 If option ZH (automatic answer YES) was selected, the data set is connected to the line after the end of a ringing interval, provided the CD lead is ***on.***

3.11 When the data set is connected by either method, the CC lead is turned ***on*** and the transmitter is kept disabled for a period of 2 seconds, after which time the f2 mark frequency is transmitted. After receipt of this tone for some time, the originating station transmits the f1 mark tone. If no such signal is received for 14 ±4

TABLE C

DS 103JR-L1/2 OPTIONS

FEATURE		OPTION
Receive Space Disconnect	YES NO	V* Y
Send Space Disconnect	YES NO	T* U
Loss of Carrier Disconnect	YES NO	S* R
CC Indication	EARLY DELAYED	ZD* ZC
CB and CF Indications	COMMON SEPARATE	A* B
CC Indication for Analog Loop	ON OFF	ZF* ZE
Fail-Safe State of CN Circuit	ON OFF	K J*
Automatic Answer	YES NO	ZH* ZG
Common Ringer	YES NO	ZB ZA*
Tip-Ring Make Busy	YES NO	F E*
Contact to Ground Make Busy Floating Contact Make Busy	For use with 40A-type data mounting in grandfathered arrangements	
Common Grounds	YES NO	Q* P

* Factory-Furnished Option

seconds after connecting, an abort timer automatically disconnects the set. If a continuous f1 mark is detected, the CB and CF leads are turned ***on,*** a mark hold is removed from the BB lead, and the CPE can send and receive data.

G. Mode Selection

3.12 The mode of DS 103JR is automatically selected, depending on whether the call was originated or answered. Whenever ringing voltage has been received, the data set is readied to go off-hook in the answer mode, using the answer mode frequencies listed in Table D. Ring memory persists for a little over 4 seconds if the call is not answered, and for the duration of the call if answered either by the telephone or by an off-hook condition of the data set. It also persists on transfers between the data and talk modes. If no ringing voltage has been received, the call is

TABLE D

TRANSMIT AND RECEIVE FREQUENCIES

	ORIGINATE MODE	ANSWER MODE
Transmit	f1 mark—1270 Hz f1 space—1070 Hz	f2 mark—2225 Hz f2 space—2025 Hz
Receive	f2 mark—2225 Hz f2 space—2025 Hz	f1 mark—1270 Hz f1 space—1070 Hz

assumed to be an originating call, and the originate mode frequencies listed in Table D are used. In this way, compatibility between all DS 103-type is assured. In addition, originate-only data sets can originate calls to DS 103JR, and DS 103JR can call answer-only sets.

3.13 Three hazards exist which can cause the data set to be in the wrong mode (glare).

(1) If a call is originated from DS 103JR just after a switching office has connected an incoming call, but during a silent interval before the ringing voltage was applied, the incoming call will be inadvertently answered, but in the originating mode. This silent interval may be as long as 4 seconds.

(2) If a call is answered manually after a very short ring, the DS 103JR may remain in the originate mode.

(3) If a call is originated within a few seconds after ringing voltage has been applied, but after the caller has abandoned his calling attempt, dial tone is received and a call can be originated, but the data set assumes the answer mode.

3.14 There are provisions for switching the mode at a 103JR station for test purposes. This is explained in Part 4.

H. Carrier in Data Mode

3.15 In the data mode, any signal of sufficient amplitude in the appropriate band (f2 for originate mode, f1 for answer mode) will keep the carrier detector ***on.*** A loss for approximately 10 ms results in CF being turned ***off*** and BB clamped to mark. CB either goes ***off*** or stays ***on*** during periods of carrier fail, depending on the option selected. Any in-band signal of sufficient amplitude and duration is capable of restoring the carrier detector to the ***on*** state.

I. Terminating a Data Call

3.16 There are four ways by which DS 103JR can be disconnected.

(1) The data set can be disconnected by momentarily turning the CD lead ***off.*** Provided option T is installed, the data set then transmits 3 ±1 seconds of spacing signal prior to disconnecting.

(2) Provided option V is installed, the data set disconnects upon receipt of a continuous space signal of at least 2.2 seconds.

(3) If option S is installed, the data set disconnects when incoming carrier is lost for approximately 250 ms.

(4) The data set may also be manually disconnected by using the associated telephone.

J. Telephone Sets

3.17 The 565HKM or 2565HKM telephone set can be used with DS 103JR-L1/2. The 2662A1M telephone set may be substituted for the 2565HKM telephone set if a card reader is required.

3.18 The operation of all telephone sets is similar. One locking line key is associated with a particular data set and its telephone line. Depressing the line key and lifting the handset makes the telephone set available for dialing or answering calls and for talking. The lamp under the key does not light in the talk mode.

3.19 To transfer a call from the talk mode to the data mode, momentarily depress the red, nonlocking data key. This key is used for all data sets sharing the telephone set. The lamp under the line key lights whenever the associated data set is off-hook. The handset may be replaced during the data call.

3.20 To transfer a call from the data mode to the talk mode, depress the associated line key and pick up the handset.

3.21 A data call may be manually disconnected by entering the talk mode and then replacing the handset.

3.22 During ringing on any line, the lamp under the associated line key flashes at the ringing rate.

3.23 For installations where only ACU dialing and/or automatic answering is used and the talk mode is not required, the telephone set can be omitted. Nevertheless, its use is recommended for ease of maintenance.

K. Make-Busy Feature

3.24 A make-busy feature is available for DS 103JR. This feature is important in line-hunting arrangements. It should not be used for nonline-hunting installations, for which the "don't answer" condition is proper to indicate that a port is out of service.

L. Other Features

3.25 The telephone set used with DS 103JR is not provided with keys to select automatic or manual answer. An installer option determines whether the automatic answer feature is functional. To override the automatic answer feature, if installed, CD lead should be turned ***off*** in the CPE. An alternate method consists of operating the AL button, if the make-busy option is not installed. Before manually transferring to the data mode, this button must be released.

3.26 A common ringer option (ZB) is available when one telephone set is shared by five "new family" data sets. When any of the five sets receives a ringing signal, a buzzer sounds, while the flashing light under one of the line keys identifies the line which is rung. A similar option exists for the 40A-type data mounting, but can only be used if the sleeve-lead or second pair make-busy feature is not installed.

3.27 For installations in key telephone systems, the data set provides "A" lead control when required.

M. Performance

3.28 The performance of DS 103JR over the switched telephone network is as good as or better than the performance of the older 103-type sets. The transmit level is fixed at a nominal -9.75 dBm into a 600-ohm line, and will not exceed -9 dBm. It can receive at any level between 0 and -50 dBm, and detects loss of carrier when the signal falls below this level, typically at -53 dBm.

N. Status Lamps

3.29 DS 103JR-L1 is equipped with seven status lamps. These are useful for checking the status of the data set, for observing the progress of a call and the exchange of data, and for checking the results of tests. The lamps are designated as follows:

MB—Made Busy

TR—Terminal Ready

MR—Modem Ready

SD—Send Data

RD—Receive Data

MC—Modem Check

TM—Test Mode.

3.30 These lamps and the associated line keys light as follows.

Data Set in Idle Mode (On Hook, All Test Buttons Released), or Talk Mode

- MC is lighted.
- TR is lighted if CD lead (data terminal ready) is ***on.***
- SD is lighted if BA lead (send data) is spacing.

Note: The MC lamp in idle mode serves as a "power on" indication. No ON lamp is provided.

Ringing

- The line key lamp flashes on and off at the ringing rate.
- MC is lighted.

- TR is lighted if CD lead is ***on.***
- SD is lighted if BA lead is spacing.

Entering the Data Mode

- MC is lighted.
- SD is lighted if BA lead is spacing.
- TR is lighted (CD lead must be ***on,*** otherwise the set cannot enter the data mode).
- The line key lamp lights and MR lights when the data set goes off-hook.
- MC goes off when the CF lead is turned ***on.***

Data Mode

- TR and MR are lighted.
- SD lights whenever the CPE applies a space on the BA (send data) lead.
- RD lights whenever the data set receives a space and the BB (receive data) lead is spacing.

Note: A steady mark on BA or BB can be recognized by a nonlighted SD or RD lamp. Data transmission can be detected by a flickering lamp. Reversals at rates above 60 baud may look like a steadily lighted lamp.

Test Modes

- TM lights if any of the test keys of the data set are depressed and serves as an indication to the attendant that a manual operation is required to restore the set to normal. On a test initiated by turning ***on*** of the CN lead (terminal busy) by the CPE, TM does not light. Refer to Part 4 for lamp status during test modes.

Made Busy

- MB lights if any of the three following events occur:

  (1) CPE turns ***on*** the CN lead, provided the ST and DL buttons are released.

  (2) If option K is installed and there is zero volt or an open circuit on the CN lead, provided the ST and DL buttons are released.

  (3) Operation of the AL test button.

Note: The MB light does not light if the line is made busy by the 40A-type data mounting circuits.

O. Installation and Maintenance

3.31 No special tools are required at installation.

3.32 DS 103JR does not require routine maintenance or adjustments. Troubles isolated to the set should be cleared by data set replacement.

4. TEST FEATURES

A. Test Buttons

4.01 The data set is equipped with three push-to-operate, push-to-release buttons which are accessible at the front panel. The buttons are designated as follows:

AN—Analog Loopback

ST—Self Test

DL—Digital Loopback

B. Analog Loopback Test

4.02 This test can be initiated by either of two methods:

- The AL button is operated.
- CPE applies an ***on*** condition to the CN lead.

4.03 In the analog loopback test mode, the data set is isolated from the telephone line, with the exception of the ring detector circuit. During this test, the data set circuits are modified to keep both the transmitter and the receiver in the f1 mode. The output of the transmitter is looped via an attenuating circuit to the receiver.

4.04 If a make-busy option is installed, the telephone line is made busy. If not, the

data set ring detector turns ***on*** the CE lead and lights the associated line key lamp for incoming calls. Automatic answer is inhibited during this test; the telephone set and telephone ringer remain functional.

4.05 The test is performed in the following manner.

(a) The AL button is depressed or the CN lead is turned ***on*** by the CPE. If at this time the CD lead is ***off,*** the MC and MB lamps are lighted, indicating that an idle data set is in the AL test mode. The TM lamp is also lighted if AL is depressed, and the SD lamp is off only if the BA lead is marking.

(b) If the CD lead is ***on,*** the data set goes through the "handshaking" sequence. TR and MR are lighted and after a slight delay, MC goes off and the CB and CF leads are turned ***on.***

Note: If option ZE is installed, the CC lead remains ***off*** per RS-232-C for the duration of the test. If option ZF is installed, the CC lead is turned ***on*** for the duration of the test. Some terminals require the CC ***on*** indication to be able to proceed with this test.

(c) The CPE can now send data signals which will be modulated by the transmitter, looped back to the receiver, demodulated, and presented to the CPE via the BB lead. In this way the CPE, in a duplex mode, can test the complete operation of the data set, and its own capability to generate and read data signals. The data signals may be observed at the SD and RD lamps.

(d) Release of the AL button and/or turning ***off*** of the CN lead restores the station and lamps to normal.

C. End-to-End Self Test

4.06 Operation of the ST button turns ***off*** the CC, CB, aod CF leads, opens the BA and BB leads, and arranges the data set circuits to ignore the CN and CD leads from the CPE. It simulates internally the ***on*** condition of the CD circuit, and connects a square-wave (reversals) signal generator of about 300 baud to the transmitting circuits and a bias detector to the output of the receiver.

4.07 To perform an end-to-end self test, a call is set up to another DS 100-type equipped with a self-test button. The ST buttons are operated at both ends, and the data mode is entered in the normal way. The test can be performed with or without a terminal connected to the data set. The TR lamp continues to monitor the terminal and can be ignored. TM, SD, and MC are lighted. When entering the data mode, MR and RD light, and MC goes off only if the signal from the far end is received with less than 35 percent distortion. Similarly, the MC lamp at the far end indicates the proper reception of the square wave generated at the near-end data set. On noisy connections, MC may go off but flash on occasionally, indicating a "hit" or error.

4.08 A similar test may be conducted when the set is connected to a testboard, with the testboard using a square-wave (reversals) generator and a bias indicator. It should be noted that some TMS bias indicators will give excessive readings if the speed setting of the indicator differs from the actual speed of the generator. At DS 103JR, the speed is held to 300 ±15 baud. The built-in bias detector of DS 103JR is speed-insensitive.

4.09 If the far-end data set does not have a self-test button but is provided with a digital loopback feature, it is still possible to make an end-to-end test, but the results may be ambiguous. Have the far-end data set placed in the digital loopback mode and depress the ST button on the near-end DS 103JR. The square-wave signal makes one complete round trip, and the signal detector of DS 103JR checks if the round-trip distortion exceeds 35 percent. If the MC lamp goes off now, there is a very strong indication that both data sets and the line facilities are satisfactory.

Note: There is a slight possibility that the bias may be excessive in at least one direction, but that this bias is compensated for by bias of the opposite polarity in the other direction.

A successful test indicates that all circuits of both data sets seem to be working. If the MC lamp does not go off, the only conclusion that can be drawn is that the round-trip distortion exceeds 35 percent. As the bias distortion in the two directions of transmission may be additive, no conclusion about

the proper operability of the sets and the line facilities can be drawn.

D. Local Self Test

4.10 By operating the ST and then the AL button, a local self test can be performed. The effect on the telephone line, the telephone set, and make-busy circuits is outlined in paragraphs 4.03 and 4.04, and the effect on the CPE is outlined in paragraph 4.06.

4.11 In the local self test, an internal CD ***on*** condition is applied; the data set goes through the "hand-shaking" sequence; and a data signal is applied to the transmitter, looped back to the receiver (both in the f1 mode), and the demodulated signal is checked by the bias detector. In this way, most of the circuits of the data set are checked. The MC lamp goes out after a short delay if the bias of the received signal is under 20 percent, indicating proper operation of the set.

E. Digital Loopback Test

4.12 A digital loopback test is normally set up at the request of the test center. Operation of the DL button turns ***off*** the CC, CB, and CF leads, clamps the BB lead marking, and arranges the data set circuits to ignore the BA and CD leads from the CPE. It simulates internally the ***on*** condition of the CD circuit, and internally loops BB to BA. When a data call is established between the test center and the data set, the test center can measure the round trip data distortion.

4.13 The digital loopback test can also be set up between two data sets, as described in paragraph 4.09. During the test, TR monitors the CD lead and SD monitors the BA lead; MB, RD, and MC are off; and MR and TM are lighted.

4.14 No mode switching takes place, and the set must be manually restored to normal by releasing the DL button.

F. Mode Switching

4.15 At times it may be advantageous to switch the mode of the data set manually for test purposes. For instance, after a test center has called a data set for testing in the answer mode, switching manually to the originate mode permits further testing without having to call from the station.

4.16 To switch from the answer to the originate mode, enter the talk mode by depressing the associated line key and lifting the telephone receiver. Momentarily depressing the switchhook now changes the mode memory to the originate mode. Reenter the data mode by depressing the data key.

4.17 To switch from the originate mode to the answer mode while a call is in progress, depress both the DL and ST buttons and then release.

4.18 For an answered call, it is safe to switch back and forth between the two modes without losing the central office connection. For an originated call which was manually switched to the answer mode, take care to flash the switchhook only very briefly (to return to the originate mode) and thus avoid a release of the central office connection. On some PBX or Centrex arrangements, conditions are set up for call transfer when the switchhook is flashed; for instance, the operator may be recalled. Appropriate action such as telling the operator to ignore the signal will normalize the call.

5. OPERATION

A. Manually Originting a Call

5.01 To originate a call manually, perform the following:

- Depress the appropriate line button and lift handset.
- Listen for dial tone.
- Dial the call in the usual way.
- If the call is answered in the talk mode, request a transfer to the data mode. If the called station is arranged for automatic answer, it will answer in the data mode. In either case, an f2 (2225 Hz) mark tone should be heard by the caller.
- If the TR lamp is lighted, depress the red data key on the telephone set. The line key lights and remains lighted.

Note: If the data key is depressed when TR is not lighted, the call will be lost.

- On the data set, the MR lamp lights and the MC lamp goes off.
- Data transmission can begin.
- The handset may be placed in the on-hook position.

B. ACU-Originated Call

5.02 The ACU accomplishes the dialing of the call and the subsequent monitoring for f2 mark tone. When the f2 mark tone is detected, the ACU automatically places the data set in the data mode.

C. Manually Answering a Call

5.03 To answer a call manually, perform the following procedure:

- Depress the flashing line key on the telephone set and lift handset.
- If the TR lamp on the near-end DS 103JR is lighted, depres the red data key on the telephone set. The line key lights and remains lighted.

Note: If the data key is depressed when TR is not lighted, the call will be lost.

- On the data set, the MR lamp lights and the MC lamp goes off.
- Data transmission can begin.
- The handset may be placed in the on-hook position.

D. Answering an Incoming Call Automatically

5.04 Stations arranged for automatic answer require no intervention by the attendant provided the TR lamp is lighted (CPE ready).

5.05 To override the automatic answer feature, depress the AL key. With the AL key depressed, the telephone can be used in the talk mode. Be sure to release the AL key before going into the data mode, or call will be lost.

Note: If the tip-ring make-busy option is installed, paragraph 5.05 does not apply.

E. Terminating a Data Call

5.06 A data call can be terminated in any of four ways.

(1) The call is terminated by going into the talk mode and hanging up.

- Depress the associated line key.
- Lift the handset. Line key goes off.
- Hang up the handset.

(2) The CPE can terminate the call by momentarily turning ***off*** the CD lead (data terminal ready):

(3) With option V (receive space disconnect) installed, the data set disconnects on reception of a long spacing signal.

(4) With option S (loss of carrier disconnect) installed, the data set disconnects upon loss of carrier.

6. REFERENCES

6.01 The following BSPs provide additional information:

SECTION	TITLE
590-011-202	Registered Data Sets—Station Arrangements for Registered Data Sets in 40A3 Data Mountings
591-044-200	Data Set 103JR-L1/2—Transmitter-Receiver—Single Set—Installation and Connections
591-044-500	Data Set 103JR-L1/2—Transmitter-Receiver—Single Set—Test Procedures