

## DATA SET 402A-TYPE AND DATA SET 402C-TYPE REFERENCE GUIDE



Fig. 1—Data Set 402C-Type

### 1. GENERAL

1.01 Data Set 402A-type and Data Set 402C-type may be used in DATA-PHONE® data service or on private lines.

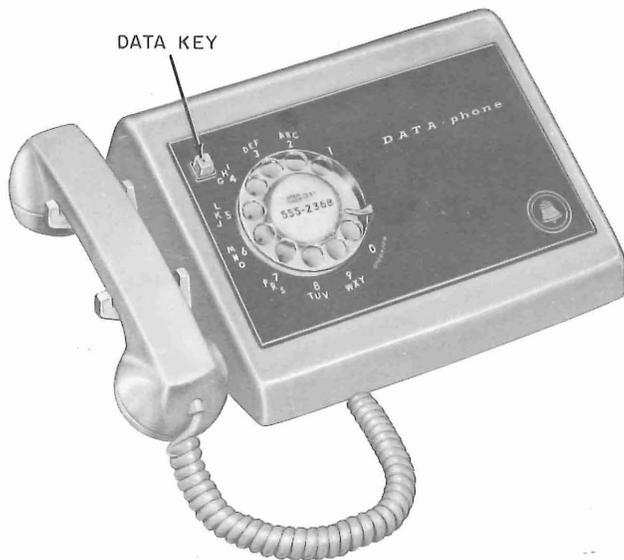
1.02 This section is reissued:

- (a) To add new coding information
- (b) To revise Table A by including in it the information formerly in Table D
- (c) To revise Table C
- (d) To add conversion/disposition information in Table D

(e) To add preferred maintenance spare guidelines in Table E.

1.03 Data Set 402A-type is an early transmitter component of a medium-speed parallel data transmission system capable of transmitting eight data levels at any speed up to 75 characters per second, which is the equivalent of 600 bits per second if all eight channels are used. The system was designed for one-way transmission of data over a voice channel on a half-duplex basis, with provision for answer-back transmission.

1.04 The data transmitter consists of a timing channel and eight data channels. Each channel is composed of an oscillator circuit which generates both the MARK and SPACE frequencies



**Fig. 2—Data Set 402A-Type Transmitter**

of the channel, dependent on the condition of the data lead with respect to the data common lead (open or closed). A fixed capacitor in each channel is connected in parallel with the oscillator capacitance over interface leads under control of the customer equipment. Business machine action closes the data lead to the data common lead, which shifts the frequency from SPACE to MARK. Therefore, on each channel, a closure from the business machine indicates MARK and an open indicates SPACE. These frequencies are 70 Hz apart. There is a 100-Hz guard band between channels.

**1.05** The timing channel input is also under the control of a set of contacts in the business machine, which will alternately open and close. The condition of the timing contacts will change at the beginning of a character and remain constant for the duration of the character. Therefore, if the timing channel is in the MARK condition for one character, it will be in the SPACE condition for the next one, and will so alternate during transmission.

**1.06** During data transmission, there are always nine frequencies on the line simultaneously.

**1.07** Data Set 402C-type is a medium-speed, binary, parallel data transmitter for use on DDD or 2-wire private line. Data Set 402C-type will transmit eight data levels at any speed up to 75 bits per second per channel. A nonsimultaneous answer-back

feature is provided at a maximum speed of twenty 2-bit characters per second. All signals, both data and control, interchanged between the business machine and the data set are in the form of contact closures. Data Set 402C1 (rotary dial) and Data Set 402C3 (TOUCH-TONE® dial) are not equipped with 1B-type data units (reverse channel). Data Sets 402C2 (rotary dial) and 402C4 (TOUCH-TONE dial) are equipped with reverse-channel units.

**1.08** Data Sets 402C5, 402C6, 402C7, and 402C8 have been coded as replacements for Data Sets 402C1, 402C2, 402C3, and 402C4, which are rated manufacture discontinued. The new replacement data sets have 3A2 data units instead of 3A1 data units. The 3A2 data unit is used for line control and is similar to the 3A1 data unit, but it provides compatibility for the data sets with ESS offices and Unigauge lines.

**1.09** Later models of Data Set 402C-type are equipped with 48A power units replacing the 17A power units to reduce cost and power input frequency sensitivity. When this change is made, the series number for the 402C1 is raised from 6 to 7. The series number for the 402C2 is raised from 8 to 9. The series number for the 402C3 and 402C4 is raised from 3 to 4. The series number for the 402C5, 402C6, 402C7, and 402C8 is raised from 2 to 3.

**1.10** Data Set 402C-type has the following additional capabilities:

- (a) It can receive one of three answer-back signals transmitted from the receiving data set at the rate of 20 characters per second. When the data set is in this mode, transmission has been interrupted.
- (b) it can operate as a telephone set for voice communication.
- (c) It can answer incoming calls automatically (optional) and transmit an answer tone.
- (d) It can receive a reverse channel signal from the receiving data set during data transmission (optional).
- (e) It can operate with an automatic calling unit (optional).

- (f) It can communicate with a data test center for comprehensive testing of the data set.
- (g) It is capable of providing "A" lead control in conjunction with a key telephone unit.

**1.11** The feature of "A" lead control is provided by changing the switchhook wiring arrangement. The series numbers of data sets modified for this feature are as follows:

1. 402C1 Series 5 and above
2. 402C2 Series 7 and above
3. 402C3 and 402C4 Series 2

All Data Sets 402C5, 402C6, 402C7 and 402C8 are equipped with this feature.¶

## 2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

**2.01** Data Set 402A-type (MD) consists of a 9-channel transmitter, an answer-back receiver, and a telephone set, enclosed in a gray integrated housing.

**2.02** A 117-volt ac receptacle is required for the 2012B transformer to supply power to the data set. The receptacle should be on a circuit not controlled by a switch. The length of the wire between the transformer and the data set connecting block must not exceed 150 feet.

**2.03** Data Set 402C-type consists of a telephone set (either rotary or TOUCH-TONE dialing), a key unit, and electronic and relay circuits for transmission of data signals. A M1A ringer provides an audible signal from the data set. These components are enclosed in an integrated gray housing and weigh approximately 20 pounds.

**2.04** Two cords are supplied with the data set.

- (a) A D6AA-61 (5-1/2 foot) cord connects the data set to the telephone line. If the Data Set 402C-type is connected to a Data Set 402D-type at a transmit-receive terminal, the cord must be replaced with a D50C-61 (5-1/2 foot) cord which is not supplied with the data set.
- (b) A KS-14532, List 16 (10-foot) 3-conductor power cord.

**2.05** The cord connecting the customer's business machine to the data set is furnished by the customer. This cord is equipped with a Cinch DB-19604-432 plug or equivalent. A KS-19087, List 6 receptacle for this connection is located at the rear of the data set.

**2.06** Data Set 402C-type operates on 105 to 125 volts  $60 \pm 1$  Hz ac supply. It is designed to operate within the temperature range of 40° to 120° F.

## 3. OPERATION

### *Data Set 402A-Type*

**3.01** To prepare the circuit for data transmission, it is first necessary to establish voice communication with the receiving station in the normal manner. When the attendant at the receiving station signifies that he is ready to receive data, the data key of the 402A must be pulled up. The telephone handset must remain off-hook.



*The data set at the receiving station must be in the data mode.*

**3.02** Upon completion of data transmission, voice communication can be re-established by depressing the data key to its normal position. If voice communication is not desired, the circuit is restored to normal by placing the handset on the switchhook. Mechanical linkage between the switchhook and the data key will restore the data key to normal.

### *Data Set 402C-Type*

**3.03** To use the data set for voice communication, depress the TALK key (TALK lamp lights) and proceed in a normal telephone manner.

**3.04** To originate a data call:

- (a) Depress the TALK key (TALK lamp lights) and establish connection with the distant terminal in a normal telephone manner.

## SECTION 590-004-104

- (b) After distant terminal has answered:
- (1) **Manually:** After verbal agreement is reached to transmit data, both ends depress their DATA key until DATA lamp lights.

- (2) **Automatically:** A 2025-Hz tone should be heard for a few seconds, indicating distant set is ready to receive data. Immediately depress the DATA key until DATA lamp lights.

- (c) Releasing the DATA key restores the TALK key to normal and extinguishes the TALK lamp. The set is now in the data mode and transmission can begin. The handset can be placed on its cradle. When the data set is in the data mode and the handset is on its cradle, accidental or intentional operation of any key will not affect data transmission.

- 3.05** To terminate a call, lift the handset, depress the TALK key, then hang up.

- 3.06** The data set may be conditioned to answer incoming calls either manually or automatically.

- (a) **Automatically (Option N):** Data sets conditioned for automatic-answer require no operation by the attendant.

- (b) **Manually (Option ZC):** Call is answered in normal manner. When verbal agreement is reached on when to begin data transmission, depress DATA key until the DATA lamp lights. The set is now in the data mode and transmission can begin. The handset can be placed on its cradle.

- 3.07** Test mode:

- (a) To put data set into test mode:
- (1) Remove handset from cradle and operate TALK key. TALK lamp lights.
  - (2) Depress TEST key. Data set is now in test mode. TEST lamp should light. The handset can be placed on its cradle.

- (b) Manual release of test mode:

- (1) Remove handset from cradle.

- (2) Operate and release DATA key.

- (3) Operate TALK key.

The test mode is also released by power interruptions.

## 4. SERVICE ORDER INFORMATION

**4.01** Service orders for data services 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 are listed in 4.04. 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** Service orders **should not** specify data set codes. USOC decoding procedures are described in Section 590-000-100. Engineering or Plant Design 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 re-use of data station apparatus, the first choice in selecting apparatus should be the oldest unit that will satisfy the service requirements as identified by USOC. When the current 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.

**4.03** Service offerings and substitute data sets are outlined in Table A. Customer options are given in Table B. Data Set 402C-type may be installed with Data Set 402D-type (receiver) at a transmit-receive terminal. When this service is desired, specify DHA (combined send-receive with rotary dial) or DHM (combined send-receive with TOUCH-TONE dial).

**4.04** The following paragraphs provide detailed information on customer options for USOC suffix determination.

**Note:** There are no customer options with Data Set 402A-type.

→TABLE A←

SERVICE OFFERINGS — CURRENT AND SUBSTITUTE MODELS

USOC	FEATURE	USABLE SETS	ITEM*	REMARKS
DWU 00	Attended Operation Only	402A1 402A2 402C1 402C2 402C5 402C6		Note 2  Notes 5 and 7 Notes 6 and 7 Note 5 Note 6
DUA++	Rotary Dial w/o Reverse Channel	402C5 402C1 402C2 402C6	A3	Latest Model Note 7 Notes 3 and 7 Note 3
DYC++ Note 1	Rotary Dial w/ Reverse Channel	402C6 402C1 402C2	A3	Latest Model Notes 4 and 7 Note 7
DUC++	TOUCH-TONE Dial w/o Reverse Channel	402C7 402C3 402C4 402C8	A3	Latest Model Notes 4 and 7 Notes 3 and 7 Note 3
DYL++ Note 1	TOUCH-TONE Dial w/ Reverse Channel	402C8 402C3 402C4	A3	Latest Model Notes 4 and 7 Note 7

\*ITEM — Refers to descriptive information contained in Section 590-000-101.

**Note 1:** In those companies where the unattended feature is an additional charge, DYC becomes DWB and DYL becomes DWS when unattended.

**Note 2:** Also J1D402A-L1.

**Note 3:** Reverse-channel feature not used.

**Note 4:** Convert by adding reverse-channel unit.

**Note 5:** Unattended feature not used.

**Note 6:** Unattended and reverse-channel features not used.

**Note 7:** Not compatible with ESS offices and Unigauge lines.

++ Determine USOC suffix from the following customer option decision matrix or refer to Section 590-000-100.

CUSTOMER OPTION DECISION	A1	A2	} USOC } Suffix
	B3	01 02	
B4	03 04		

→TABLE B←

CUSTOMER OPTION DECISION TABLE (402C-TYPE ONLY)

DECISION	OPTION	DESIGNATION	ITEM*
A	1. Attended operation 2. Unattended operation	ZC† N	B6
B	3. With 801 ACU 4. Without 801 ACU	T	B1

\* ITEM — Refers to description contained in Section 590-000-101.

† Factory supplied.

(a) **DECISION A—Attended or Unattended Operation:**

(1) **1. Attended Answering—Option ZC:**

The connection from the data set to interface lead remote operate is opened and the strap is stored by option ZC. Incoming calls must be answered by an attendant.

(2) **2. Unattended Answering—Option N:**

When interface leads remote operate and remote release are connected to data ground by the business machine and option N has connected remote operate through to the data set, incoming calls are answered automatically, 2025-Hz answer tone is returned, and the set is placed in the data mode regardless of the position of the control keys.

(b) **DECISION B—With or Without Automatic Calling Unit:**

(1) **3. With Automatic Calling Unit—Option T:**

This option provides strapping to activate a nonlocking dial tone key when used with an automatic calling unit. In case of power failure or disability of the ACU, this key is used to apply ground on the ring side of the line to signal the central office for dial tone.

(2) **4. Without Automatic Calling Unit—Remove T Option:** The dial tone key is disabled when an ACU is not used.

**4.05 Telco Options:** Telephone Company options for Data Set 402C-type are listed in Table C. There are no Telco options for Data Set 402A-type.

**5. SUBSTITUTION, CONVERSION, AND DISPOSITION INFORMATION**

**5.01** Data sets that may be substituted to supply the services previously described in this section are listed in Table A.

**5.02** For information on conversion and disposition of Data Sets 402C-type, refer to Table D.

**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. Table E provides information on suggested field maintenance spares.

**7. REFERENCES**

**7.01** The following drawings, specifications, and sections provide additional information on Data Sets 402A-type:

- (a) Schematic Diagram—SD-1D005-01
- (b) Circuit Description—CD-1D005-01
- (c) Interface Specification dated 7/63
- (d) BSPs 594-016-Series

## →TABLE C←

## TELCO OPTIONS

OPTION	DESIGNATION	ITEM*	
Data Transmitter Level†	-1 dBm -2 dBm -3 dBm -4 dBm -5 dBm -6 dBm -7 dBm -8 dBm -9 dBm -10 dBm -11 dBm -12 dBm	ZL ZM ZN ZO ZP ZQ ZR ZS‡ ZT ZU ZV ZW	C2
Answer Tone Level†	-12 dBm -8 dBm -4 dBm	X Y‡ Z	C4
Output Level§	-3 dBm -6 dBm -9 dBm	Z Y X‡	C2
Terminal Impedance	900 ohms 600 ohms	W‡ V	C1
-18 volts on interface (test only) ¶ Without -18 volts on interface**	M		

\* ITEM — Refers to description contained in Section 590-000-101.

† Modified transmitter level and answer-tone level available in the following type data sets:

- (1) 402C1 Series 6 and above
- (2) 402C2 Series 8 and above
- (3) 402C3 and 402C4 Series 3 and above
- (4) 402C5 through 402C8 Series 2 and above.

‡ Factory-supplied options.

§ Values of output level apply to earlier series of Data Set 402C-type.

¶ **-18V on Interface — Option M:** This option connects -18V to pin 25 on the interface. This voltage is required when the installer is making tests covered in Section 594-019-500, using a 901B Data Test Set. Power is supplied to an audio amplifier in the 901B so that test tones may be heard over a 1011B test set connected to the 901B. This option should not be specified on the circuit layout card, but should be connected by the installer only when directed by test procedures in Section 594-019-500.

\*\* **Without -18V on Interface — Remove Option M:** Always specify this option on the circuit layout card. The strap connecting -18V to pin 25 on the interface is stored.

→TABLE D←

## DISPOSITION AND CONVERSION INFORMATION

DATA SET	LATEST SERIES	MANUFACTURING STATUS	REPLACED BY	CONVERTIBLE TO	DISPOSITION RECOMMENDATIONS
J1D402A1L1	—	Never Mfg.	—	—	—
J1D402A2L2	—	MD	J1D402A2L2B	—	*Scrap
402A2	—	MD	—	—	*Scrap
402C1	7	MD	402C5	402C2	Update & Repair
402C1A	—	Never Mfg.	—	—	—
402C2	9	MD	402C6	402C1	Update & Repair
402C2A	—	Never Mfg.	—	—	—
402C3	4	MD	402C7	402C4	Update & Repair
402C4	4	MD	402C8	402C3	Update & Repair
402C5	3	Standard	—	402C6	Update & Repair
402C6	3	Standard	—	402C5	Update & Repair
402C7	3	Standard	—	402C8	Update & Repair
402C8	3	Standard	—	402C7	Update & Repair

\* Scrap — Return units to Western Electric Service Centers for best allowance.

**7.02** The following drawings, specifications, and sections provide additional information on Data Sets 402C-type:

- (a) Schematic Diagram—SD-1D039-01
- (b) Circuit Description—CD-1D039-01
- (c) PEL 7288

- (d) PEM 9192
- (e) EM 651 dated 2/68
- (f) Interface Specification dated 11/64
- (g) BSPs 594-019-Series

→TABLE E←

## MAINTENANCE SPARE GUIDELINES

SETS IN SERVICE	MAINTENANCE SPARE	SPARE UNIT APPLICATION NOTES
J1D402A1L1	402C6*	
J1D402A2L2	402C6*	
402A2	402C6*	
402C1	402C6*	1
402C2	402C6*	
402C3	402C6*	1,2
402C4	402C6*	2
402C5	402C6*	1
402C6	402C6*	
402C7	402C6*	1,2
402C8	402C6*	2
402C3	402C8†	1
402C4	402C8†	
402C7	402C8†	1
402C8	402C8†	

\* Rotary dial.

† TOUCH-TONE dial.

**Note 1:** Disable reverse channel.

**Note 2:** Only for temporary use to restore service. Replace with TOUCH-TONE unit when available.