DATA SERVICES
PARALLEL DATA TRANSMISSION UP TO 20 CHARACTERS PER SECOND PROVIDED BY DATA SETS 401-TYPE
REFERENCE GUIDE

Data Set 401M-Type—Typical

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1. GENERAL

1.01 Parallel data transmission up to 20 characters per second is provided by data sets (DS) 401-type. Service is provided by 2-wire operation over the switched network.

1.02 This section contains information formerly contained in the following sections:

SECTION	TITLE
590-004-100	401A Reference Guide
590-004-101	401E Reference Guide
590-004-102	401H Reference Guide
590-004-103	401J Reference Guide
590-004-108	401M Reference Guide

Due to extensive changes, arrows ordinarily used to indicate changes have been omitted.

1.03 All of the sets except the DS 401H-type are integrated sets containing a data transmitter or receiver and a telephone set in one housing. The DS 401H-type does not contain a telephone set.

2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

2.01 All of the DS 401-type sets operate by means of contact closures. Four of the sets are transmitters; one set is a receiver. The basic similarities and differences in the DS 401-type sets are shown in Table A. The full potential of the DS 401H-type cannot be realized in a DS 401-type system because of the limitations imposed by the DS 401J-type receiver. All of the transmitters generate either two or three tones for a given character simultaneously, thus ***parallel*** operation.

2.02 The transmitting data sets accept data in the form of contact closures from the customer business machine and generate corresponding audio tones, which are sent over the data (telephone) line. The DS 401J-type receiver converts these tones to contact closures and passes this information to the customer business machine at the receiving end.

TRANSMITTERS

2.03 ***The DS 401A-type transmitter*** contains two oscillators, each of which can produce any one of four frequencies. This provides the 2-out-of-8 format, and permits 16 possible combinations of two tones, thus limiting the number of characters to 16. These characters can be generated up to 20 per second.

2.04 ***The DS 401E-type transmitter*** contains three oscillators, two of which can produce any one of five frequencies; the third oscillator can produce any one of four frequencies. This provides the 3-out-of-14 format, and permits 100 possible combinations of three tones, thus limiting the number of characters to 100. These characters can be generated up to 20 per second.

2.05 ***The DS 401H-type transmitter*** contains three oscillators, each of which can produce any one of five frequencies. This provides the 3-out-of-15 format, and permits 125 possible combinations of three tones, thus limiting the number of characters to 125. These characters can be generated up to 20 per second. However, the DS 401J-type receiver is limited to 100 possible tone combinations. Therefore, the DS 401H-type transmitter must be limited to combinations of 14 oscillator frequencies in order to be compatible with the DS 401J-type receiver.

2.06 ***The DS 401M-type transmitter*** contains two or three oscillators, depending on the list number. This provides a 2-out-of-10 format, or a 3-out-of-14 format, and permits either 25 or 100 possible combinations of tones, thus limiting the number of characters to either 25 or 100. These characters can be generated at a rate up to 20 per second.

RECEIVER

2.07 ***The DS 401J-type receiver*** contains three detectors which convert the 2/8 or 3/14 signals from the transmitter into contact closures for applying to the customer business machine. The receiver will operate on alphanumeric data from any of the DS 401-type transmitters already described, up to a maximum rate of 20 characters per second. The DS 401-type transmitters can also be used with DS 403- and DS 407-type receivers.

TABLE A

BASIC ELECTRICAL CHARACTERISTICS OF DS 401-TYPE

FEATURE	DS 401A	DS 401E	DS 401H	DS 401J	DS 401M
Transmitter/ receiver	TRMTR	TRMTR	TRMTR	RCVR	TRMTR
Format	2/10 [1]	3/14	3/15 [2]	3/14	2/10 or 3/14 [3]
Type characters	Numeric	Alpha/ numeric	Alpha/ numeric	Alpha/ numeric	Alpha/ numeric
No. characters	25 [1]	100	125 [2]	100	25/100 [3]
Characters/sec	20	20	20	20	20
Answer-back	Tone	Tone or voice	Tone	Tone or voice	Tone or voice
Dial	Rotary	Rotary/ Touch-Tone®	None	Rotary/ Touch-Tone	Rotary/ Touch-Tone
Remote test	No	Yes	No	Yes	Yes
Attended/ unattended	Attended	Attended	Unattended	Attended/ unattended	Attended
Telephone set	Yes	Yes	No	Yes	Yes
Interface	Contact closure	Contact closure	Contact closure	Contact closure	Contact closure

Notes:
1. Includes rest tones, which are not used to transmit data.
2. Exceeds limits of DS 401J-type receiver.
3. Chosen by List Number of DS 401M-type.

POWER FOR DATA SETS

2.08 Power to operate DS 401-A, E, and M types is supplied by the telephone line. Power for the DS 401H-type is supplied by the telephone line, except for the electrical answer-back (EAB) circuits in DS 401H5. Power for the EAB circuits is supplied by 117 Vac 60 Hz. All power for the DS 401J-type is supplied by 117 Vac 60 Hz.

PHYSICAL CHARACTERISTICS

2.09 Dimensions, weights, and temperature and humidity ranges of the DS 401-type are given in Table B.

CORDS AND INTERFACE CONNECTORS

2.10 Cords are used for connecting the data set to the data (telephone) line, for connecting

TABLE B

BASIC PHYSICAL CHARACTERISTICS OF DS 401-TYPE

DATA SET	DIMENSIONS, INCHES W	D	H	WEIGHT, POUNDS	TEMPERATURE RANGE, °F	HUMIDITY RANGE, %	COLOR
401A1	8-3/4	9	4-1/2	6	+40 to +120	20 to 95	
401E	8-3/4	9	4-1/2	6	+40 to +120	20 to 95	2-tone gray
401H1	6	8	3-3/16	4-1/2	+20 to +140	20 to 95	gray metal
401H2, H3	6	8	3-3/16	4-1/2	—20 to +140	20 to 95	gray metal
401H4, H5	9	7-1/4	4	4-1/2	—20 to +150	20 to 95	gray metal
401J	10-3/4	14-1/2	5-1/2	22	+40 to +120	20 to 95	2-tone gray
401M	8-3/4	9	3-1/2	6	+40 to +120	20 to 95	2-tone gray

external telephones or speakers, and for supplying power to the data set. The interface connector is used to connect the data set to the customer business machine. Cords and connectors for the DS 401-type sets are summarized in Table C. For further details on the cords and connectors, refer to the appropriate -100 and -200 sections listed in the references.

2.11 The customer must supply an interface cord with a connector to mate with the 25-pin connector on the data set. This cord should not exceed 50 feet in length.

3. SERVICE ORDER INFORMATION

3.01 Data service orders should describe the desired service by universal service order code (USOC). 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. Customer option decisions which must be made to determine the USOC suffix are listed in 3.03.

Note: The ***encoding and decoding procedure*** to determine the appropriate USOC suffix is contained in Section 590-000-100. 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.

3.02 Transmitter and receiver service offerings are presented in Tables D and E, respectively.

CUSTOMER OPTIONS

3.03 There are no customer options for any of the DS 401-type transmitters. Customer options for the DS 401-type receiver are shown in Table F.

TELCO OPTIONS

3.04 There are no telephone company (telco) options for the DS 401A-type transmitter. Telco options for DS 401E-, 401H-, and 401M-type transmitters, and for the DS 401J-type receiver are shown in Table G.

4. CONVERSION INFORMATION

4.01 For information on conversion of data sets 401-type, refer to Table H.

TABLE C

DS 401-TYPE CORDS AND CONNECTORS

DATA SET	CORD FOR TEL LINE	INTERFACE CONNECTOR	NOTES
401A1	D10M-61	KS-19087-L2 on rear of set (25-pin)	1
401A1, L1	D6AB-61	D14J-61 cord w/Cinch K03-19-20 SN plug (round) or M14B-61 cord w/KS-19087-L2 (rectangular)	2
401E1	D4BJ-61	KS-19087-L2 on rear of set (25-pin)	
401E2, E3, E4, E5	D6AA-61	KS-19087-L2 on rear of set (25-pin)	
401H1, H2, H3, H4, H5	---	KS-19087-L2 on rear of set (25-pin)	3, 4
401J1	D6AA-61	KS-19087-L2 on rear of set (25-pin)	5
401J2, J3, J4, J5, J6, J7, J8, J9	D10P-61	KS-19087-L2 on rear of set (25-pin)	5
401M-type	D4BJ-61	KS-19087-L2 or L6 (25-pin)	

Notes:

1. D10M-61 cord also provides for external telephone and speakerphone connections.
2. Requires D10H-61 cord if speakerphone is used.
3. Data (telephone) line connects directly to terminal strip on DS 401H-type.
4. DS 401H5 also requires D4BJ-61 cord for 117 Vac connection to supply electrical answer-back.
5. All DS 401J-type also require KS-14532-L16 power cord for supplying 117 Vac 60-Hz power.

TABLE D

TRANSMITTER SERVICE OFFERINGS

SERVICE FEATURES	USOC	USABLE DATA SETS	NOTES
Numeric, rotary dial, tone answer-back	DSU00	401A1 401E1 401E2 401M-L1/4	1, 2 2, 3 2, 3, 4
Alphanumeric, rotary dial, tone answer-back	DAC00	401E1 401E2 401M-L1/2/4	2 2, 5
Alphanumeric, Touch-Tone dial, tone answer-back	DAS00	401E4 401M-L1A/2/4	2, 6
Alphanumeric, rotary dial, voice answer-back	DBF00	401E3 401M-L1/2/3	2
Alphanumeric, Touch-Tone dial, voice answer-back	DBM00	401E5 401M-L1A/2/3	2
Alphanumeric, unattended, automatic answer	DDR00	401H4 401H1 401H2 401H3	7 8 8 8
Alphanumeric, unattended, automatic answer, electrical (tone) answer-back	DDV00	401H5 401H4	7 9

Notes:

1. Use series 3.
2. May require external padding to meet signal requirement of −12 dBm at central office.
3. Use with DS 401J-type receiver.
4. Option M required when used with DS 403D- or DS 403E-type receiver.
5. Can be converted to DS 401E3 (shop change).
6. Can be converted to DS 401E5 (shop change).
7. Provides selective ringing.
8. Reusable when loop length and lightning protection considerations are met. DS 401H2 should be converted to DS 401H3. These sets do not provide selective ringing.
9. Provides same features as DS 401H5 except electrical answer-back.

TABLE E

RECEIVER SERVICE OFFERINGS

SERVICE FEATURES	USOC	USABLE DATA SETS	NOTES
Alphanumeric, rotary dial, tone answer-back	DPC++	401J6	
		401J1	1
		401J2, series 1	1, 3
		401J2, series 2 & up	3
		401J3, series 1	1, 2, 3
		401J3, series 2 & up	2, 3
		401J7	2
Alphanumeric, Touch-Tone dial, tone answer-back	DPK++	401J8	
		401J4, series 1	1, 3
		401J5, series 1	1, 2, 3
		401J5, series 2 & up	2, 3
		401J9	2
Alphanumeric, rotary dial, tone and voice answer-back	DMC++	401J7	
		401J3, series 1	1, 3
		401J3, series 2 & up	3
Alphanumeric, Touch-Tone dial, tone and voice answer-back	DME++	401J9	
		401J5, series 1	1, 3
		401J5, series 2 & up	1, 3
Receive only, numeric	DSV00	401B (MD)	4
		401F (MD)	

Notes:

1. Directly reusable except where "A" lead control is required. ZC wiring required (field wiring change; see SD-10064).
2. Voice answer-back not used.
3. Directly reusable except where ESS offices and Unigauge lines are used.
4. Recommend using DS 401J-type.

TABLE F

CUSTOMER OPTONS FOR DATA SET 401J-TYPE RECEIVER

DECISION	OPTION	
	DESCRIPTION	DESIGNATION
A	1. Attended operation	H
	2. Unattended operation	G
B	3. Used with ACU	F
	4. Used without ACU	F removed
C	5. Ring indication to customer	W
	6. Out-of-service controlled by customer	X

TABLE G

TELCO ENGINEERING OPTIONS

DATA SET	OPTION				NOTES
	DESCRIPTION			DESIGNATION	
401E2 & 4	Data set compatibility			M	1
401E-type	External padding			---	2
401H1, 2, 3	Loop resistance strapping			X, Y, Z	2, 3
401H4, 5	Loop resistance strapping			(A thru H screws)	3
401M-type	Loop resistance strapping			(A thru H screws)	4
401J-type	Answer-back tone level	−3 dBm	0 dBm	J	5
		−6 dBm	−3 dBm	K	5
		−9 dBm	−6 dBm	T	5, 6
		−12 dBm	−9 dBm	M	5
	Terminal impedance		600 ohms	N	
			900 ohms	O	
	6-dB pad		IN	R	
			OUT	S	

Notes:

1. Option M is required when using DS 401E2 or 401E4 as a replacement for DS 401A-type when working with DS 403D- or 403E-type receivers.
2. External padding may be required to reduce signal level to −12 dBm at serving central office.
3. For values of various loop resistance options, see Section 594-022-200.
4. For values of various loop resistance options, see Section 594-028-200.
5. Values of −3 through −12 dBm apply to data sets 401J6, J7, J8, and J9; also to 401J2, J3, J4, and J5, series 3 and above. Values of 0 through −9 dBm apply to data sets 401J2, J3, J4, and J5, series 1 and 2.
6. This option is designated "L" on DS 401J1 only.

TABLE H

CONVERSION AND DISPOSITION INFORMATION

DATA SET	LATEST SERIES	MFG STATUS	REPLACED BY	CONVERTIBLE TO	REMARKS
J1D401A-L1	--	MD	J1D401A-L2	--	Scrap (Note)
J1D401A-L2	--	MD	401A	--	Scrap (Note)
401A	--	MD	401A1	--	Scrap (Note)
401A1	3	MD	401E-type	Update to series 3	
J1D401E-L1		MD	401E1	--	Scrap (Note)
401E1		MD	401E2	--	Scrap (Note)
401E2		MD	401M-type	401E3	Repair
401E3		MD	401M-type	401E2	Repair
401E4		MD	401M-type	401E5	Repair
401E5		MD	401M-type	401E4	Repair
401H1		MD	401H2	--	Return for full credit
401H2		MD	401H3	401H3	Convert and repair
401H3		MD	401H4	--	Repair
401H4		Standard		--	
401H5		Standard		--	
J1D401J1-L1	--	MD	401J1		Scrap (Note)
401J1	--	MD	401J2		Scrap (Note)
401J2		MD	401J6		Repair
401J3		MD	401J7		Repair
401J4		MD	401J8		Repair
401J5		MD	401J9		Repair
401J6		Standard			
401J7		Standard			
401J8		Standard			
401J9		Standard			

Note: Return to Western Electric for best allowance.

5. MAINTENANCE SPARE GUIDELINES

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

6. REFERENCES

6.01 For more detailed information on data sets 401-type, refer to the following sections (-100, -200, -300, -500).

SECTION	TITLE
594-010-XXX	DS 401A-Type—Transmitter
594-014-XXX	DS 401E-Type—Transmitter
594-018-XXX	DS 401J-Type—Receiver
594-022-XXX	DS 401H-Type—Transmitter
594-028-XXX	DS 401M-Type—Transmitter

TABLE I

MAINTENANCE SPARE GUIDELINES

SETS IN SERVICE	COMMON MAINTENANCE SPARE	NOTES
J1D401A-L1 J1D401A-L2 401A 401A1 401E-type	401A1	1
J1D401A-L1 J1D401A-L2 401A 401A1 401E-type 401M-L1/4	401M-L1/4	1
J1D401E-L1 401E1 401E2	401E2	
J1D401E-L1 401E1 401E2 401M-L1/2/4	401M-L1/2/4	
401E3	401E3	
401E3 401M-L1/2/3	401M-L1/2/3	
401E4	401E4	
401E4 401M-L1A/2/4	401M-L1A/2/4	
401E5	401E5	
401E5 401M-L1A/2/3	401M-L1A/2/3	
401H1 401H2 401H3 401H4	401H4	
401H5	401H5	
J1D401J1-L1 401J1 401J2 401J6	401J6	
J1D401J1-L1 401J1 401J2 401J3 401J6 401J7	401J7	2
401J4 401J8	401J8	
401J4 401J5 401J8 401J9	401J9	2

Notes:

1. DS 401A1 may be used as a spare when DS 401E-type is being used to provide service described by DSU00.
2. Voice answer-back not used in replacing even-coded sets.