57A1 AND 57B1 DATA UNITS
DESCRIPTION, OPERATION, INSTALLATION, AND TESTING

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1. GENERAL

1.01 This section contains information on the description, operation, installation, and testing of the 57A1 and 57B1 data units (Fig. 1).

1.02 This section is reissued to include the design changes affecting 57B1 data unit. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

1.03 In all prior arrangements, the data set and the automatic calling unit (ACU) were paired on a single direct distance dialing (DDD) line. Thus, at least one of the two sets was idle at all times. If the messages are long compared to the call setup time, the efficiency of the data set usage is high, and of the ACU low.

1.04 To improve the overall efficiency, the ACU sharing circuit, coded 57A1 and 57B1 data units, has been developed.

1.05 In a sharing arrangement, the ACU is associated with a group of data sets, rather than a

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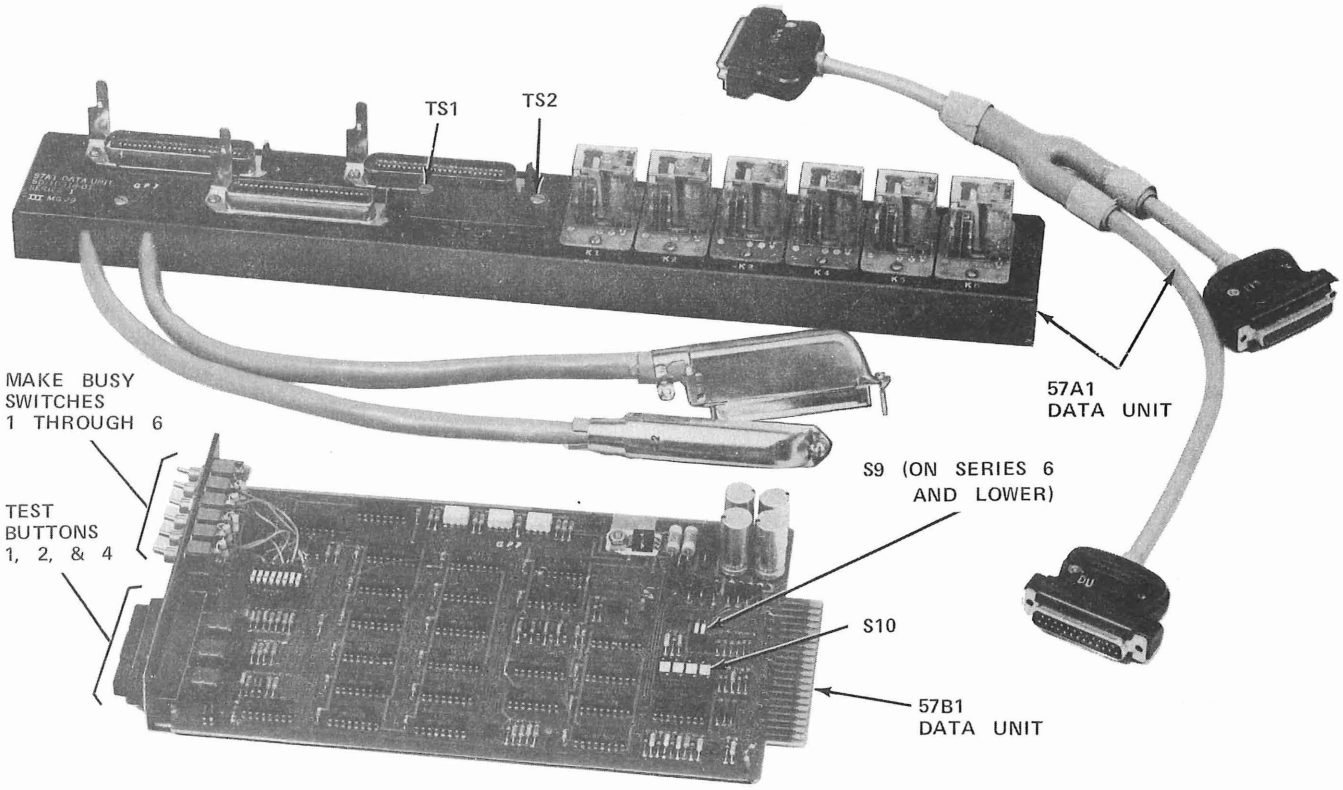


Fig. 1—57A1 and 57B1 Data Units

single data set. The DDD lines are associated with the data sets only, and the ACU accesses the line of the data set in the group on demand (in turn).

1.06 The number of data sets a single ACU can serve depends on the message length and the time required for call setup.

1.07 For many traffic patterns, six or more data sets can be served with little effect on the throughput. If end-of-number (EON) operation of the ACU can be used, the holding time of the ACU becomes very much shorter, permitting it to serve many data sets even if the messages are of short duration.

1.08 If a particular traffic pattern permits a single ACU to serve a very large number of data sets, few systems want to risk complete failure of all these sets by relying on a single ACU. If the ACU fails, all associated data sets are unable to originate calls. For this reason, the 57A1 and 57B1 data units are designated to serve a maximum of twelve data sets.

1.09 The reduced number of ACUs in shared arrangeents can result in considerable cost and space savings compared with paired arrangements. Even larger savings are produced by the reduction in the number of ACU ports.

1.10 The 40A-type data mounting provides the low voltage ac required to power the system.

1.11 The 57A1 and 57B1 data units operate in conjunction with a 40A3 or 40A4 data mounting, a data auxiliary set (DAS) 801C-type ACU, and suitable data sets inserted into the data mounting. Both the 57A1 and the 57B1 data units are required for the installation.

1.12 The 57A1 and 57B1 data units operate in an ambient temperature range of 40 to 120°F and a relative humidity range of 20 to 95 percent noncondensing.

2. PHYSICAL DESCRIPTION

A. 57A1 Data Unit

2.01 The 57A1 data unit consists of a relay panel and a cord. The relay panel is 17 inches long, 2.3 inches wide, 2.25 inches high and weighs approximately 3 pounds. The cord is 19 inches long and weighs 0.5 pound, and has three (3) arms. Each arm terminates in a 25-pin connector.

B. 57B1 Data Unit

2.02 The 57B1 data unit is 5.5 inches wide, 10.4 inches long, 1.5 inches high and weighs 0.5 pound. It consists of a single printed circuit pack. The faceplate is equipped with three (3) pushbuttons for tests, six toggle switches for making lines busy, and seven light-emitting diodes (LEDs) for supervision. There are also rocker switches installed on the circuit pack for setting installer options (see Table A).

3. OPERATION

3.01 A single ACU can be shared by up to twelve data sets. Each data set is connected to a DDD line and communicates with the port via an interface plug in accordance with RS-232-C. A single ACU is connected to the port via an interface plug corresponding to RS-366.

3.02 The port requests a call by turning ON the call request (CRQ) lead. Next, the port has to request the selection of a particular data set. It does so by prefixing the data set position number to the telephone number. The ACU, in response to the first digit, seizes the line of the data set with the corresponding position number.

3.03 When the line requested by the port is not available, a data line occupied (DLO) indication is returned by the ACU. The port may do its own line hunting by presenting data set position numbers until no DLO indication is returned. When it is available, the next digit is requested by the ACU. The remaining digits presented by the port are interpreted as the telephone number to be called.

3.04 When the ACU detects the answer tone from the distant data set, it places the data set associated with the dial line off hook and disassociates itself from the data set. The ACU is now ready to honor the next call request from the same ACU port of the computer. Whenever the ACU receives the EON code from the port, it will act as if answer tone has been detected.

3.05 Data sets can be in an outgoing hunt group as above, and at the same time in an incoming hunt group controlled by the serving central office.

A. Without End-of-Number (EON)

3.06 Data sets for operation without EON and sharing the ACU must either be all data set (DS) 202S-type, or any mixture of DSs 103J-type,

TABLE A

INSTALLER OPTIONS (NOTE 1)

	SWITCH						
	S9 (NOTE 2)		S10				
	1	2	1	2	3	4	OPTION
First or only 57B1	—	0	0	0	0	0	F
Second 57B1	—	X	X	X	X	X	E

Note 1: X indicates operated switch, 0 indicates nonoperated switch.

Note 2: 57B1 data unit with series 7 or higher number, options are selected with S10 only. S9 is omitted.

113C-type, and 212A-type. Any of these sets and DS 113D-type may be used in the same mounting for answering and for manual origination.

3.07 A typical sequence is given below:

The DLO is OFF, indicating at least one available data set. The CRQ is turned ON by the port. The sharing circuit immediately returns present next digit (PND), as an indication to the port to dial the number of the data set it wants to use. Valid numbers are: 1 through 6 for the six data sets in the first mounting, and 9 through 14 for the next six data sets in the second mounting, if used.

3.08 The sharing circuit will return a DLO indication in the following cases:

(1) The data set requested by the port is in the data, test, or talk mode.

(2) The make busy switch on the 57B1 data unit of the desired data set is in the busy position.

(3) The number requested by the port is invalid.

(4) The number requested is 9 through 14, but no second mounting is provided in the arrangement.

If none of the four conditions above apply, the sharing circuit will seize the line requested.

3.09 The sharing circuit will give the next PND indication to the port only after detection of dial tone as an indication to start dialing the telephone number. After completing the dialing, the ACU waits for the distant station to answer the call and to return answer tone. On detection of the answer tone, the ACU takes the data set associated with the outgoing line off-hook and returns call origination status (COS) to the port. The ACU then disassociates itself from the data set. As soon as CRQ is turned OFF by the port, the loudspeaker (if any) will be muted and the ACU will be available again for the next call.

3.10 If no answer tone is detected within the interval set in the abandon call and retry (ACR) timer of the ACU, an ACR indication is returned to the port.

3.11 Whenever all data lines are unavailable, DLO is turned ON, and PND will remain OFF even if CRQ is turned ON by the port.

3.12 When several data sets are of the same type and are connected to similar lines, a line-hunting operation may be useful. If the port does not know which lines are available at a particular moment, line hunting may be required. This can be accomplished by sequentially presenting position numbers until the ACU confirms the availability of that line.

3.13 As an example, let us assume that four DSs 212A are in positions 1 through 4 of the mounting, each connected to a WATS line, and that set 1 is in the data mode, while set 2 is in a test mode. The port, after requesting a call, presents digit 1 on the digit signal circuits. The ACU responds by turning ON DLO. Next, the port presents digit 2, with the same result. Finally, when digit 3 is presented, the ACU responds by turning OFF PND rather than turning ON DLO. The port now knows that the call will be made on the line of data set 3 and presents the telephone number to be called.

B. End-of-Number

3.14 The same restrictions apply to EON operation in shared arrangements as in paired arrangements. But while there are no substantial benefits in paired arrangements, EON operation in shared arrangements enable the ACU to serve many more data sets, as explained in detail in paragraph 10.

3.15 Data sets capable of EON operation are: 113CR-L1A (series 4 or higher), 113DR-L1/3, and 212A-type. All of these sets may share the same ACU. While DS 202S-type may also be used for EON operation, this is not recommended because of additional restrictions. Any of these sets and DSs 103J-type, 113C-type, and 113D-type may be used in the same mounting for answering and for manual origination.

3.16 The typical sequence of operation that is given in paragraph A, without End-of-Number, also applies to the EON operation, up to the point where the port transmits the last digit of the telephone number to the ACU.

3.17 For EON operation, the port now transmits the EON code (digit 12) on the number leads to the ACU. The ACU responds by transferring the call (immediately) to the data set, greatly reducing its holding time. The data set will then monitor the line for answer tone and go into the data mode upon its detection.

3.18 As the ACU is no longer involved in this call, its ACR timer cannot monitor the interval between the last digit and the answer tone for the operation of the ACR circuit, if required. Therefore, the data set port has to monitor the successful completion of the call and disconnect the data set if the time going off-hook (CC ON) to entering the data mode (CF ON) is excessive. Alternatively, if the CC is not used, and the CD of the data set port is turned ON in response to the data set selection by the ACU port, the interval between the CD turning ON (port opening) and carrier detection (CF ON) can be timed.

3.19 Data sets with and without EON operation can be mixed in the same mounting. For instance, it is possible to provide DSs 202S-type operating without EON in the same mounting with DSs 100-type with EON operation.

4. INSTALLATION

4.01 The 57A1 and 57B1 data units accept signals at the terminal interface in accordance with specifications of Electronics Industries Association (EIA) RS-366. The connection to this interface, which should meet EIA RS-366 specificatioin, is provided by the customer.

4.02 The 57B1 data unit consists of a circuit pack which plugs into slot 8 of a 40A3 or 40A4 data mounting. Slot 7 of the data mounting is used for DAS 801C-type (ACU). The remaining slots are used for data sets that share the ACU, and those without ACU operation.

4.03 The relay panel can be mounted either at the bottom (Fig. 2) or at the rear of the 40A3 or 40A4 data mounting. If mounted on the rear, two mountings cannot be used back-to-back. If mounted on the bottom, the vertical mounting space requirement is increased from 7 to 9 inches.

4.04 The choice of the mounting position corresponds to the choice for the EIA connector panel, which is part of the 40A3 data mounting.

4.05 If both panels are mounted at the bottom, or both at the rear of the data mounting, the installation takes no additional mounting space in the cabinet.

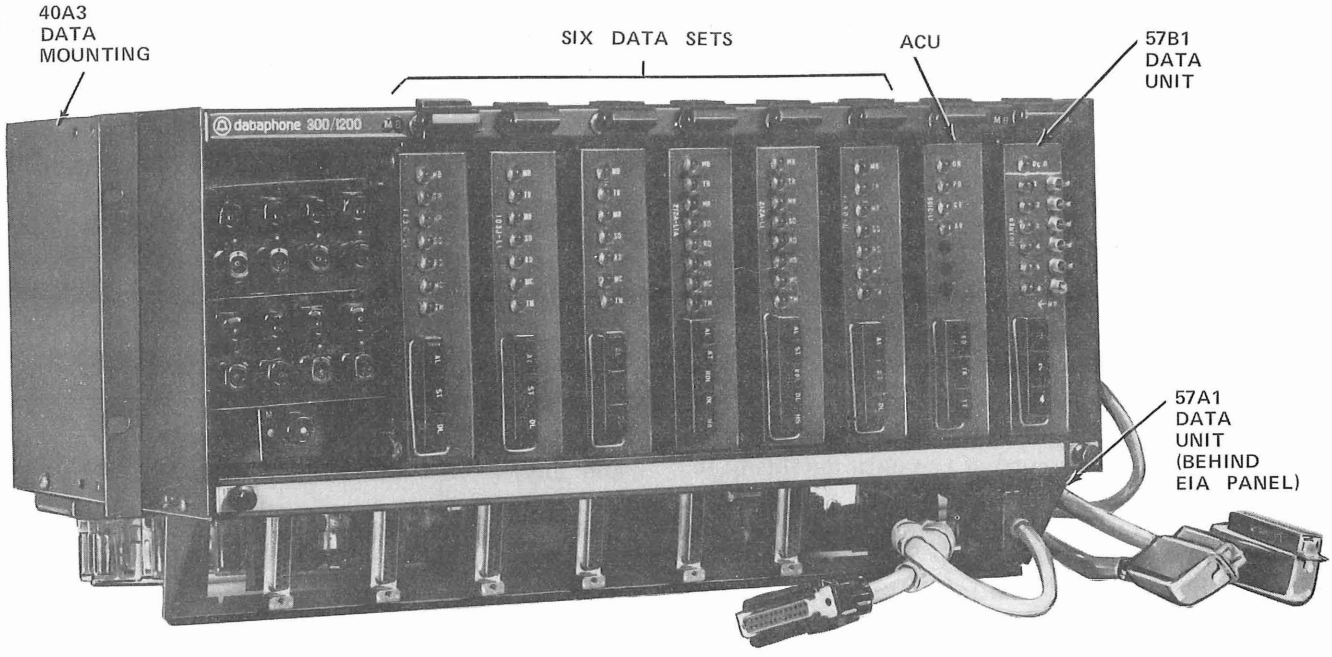


Fig. 2—40A3 Data Mounting With Six Data Sets, ACU, and 57A1 and 57B1 Data Units

4.06 Six additional data sets can be shared by a single ACU by adding a second 40A3 or 40A4 data mounting, and a second pair of 57A1 and 57B1 data units. Connect the two data mountings via a D4BD cord (or equivalent).

4.07 An optional 107B loudspeaker (Fig. 3) may be connected to screw terminals on the 57A1 data unit to monitor call progress tones on all lines. The speaker operates only while the ACU is dialing a call. The loudspeaker is powered by a 2012D transformer, which requires a D4BD cord (or equivalent) for its connection.

4.08 An M16L cord is required to connect 100-type data sets to a multiple-line voice jack (USOC RJ21X). An M16E or M16N cord is required to connect 200-type data sets (or a mixture of 100- and 200-type data sets) to a multiple-line universal jack (USOC RJ26X). A 330B adapter is required to connect 200-type data sets (or a mixture of 100- and 200-type data sets) to a multiple-line voice jack behind a PBX or Key System. Refer to Fig. 3, 4, and 5.

4.09 The M23C, M100G, and M14G cords normally used in multiple ACU installations, are not needed in shared installations.

A. Up to Six Data Sets Shared by Automatic Calling Unit (ACU)

4.10 Mount the relay panel of the 57A1 data unit on the rear or bottom of the 40A-type data mounting, using screws provided with the data unit.

4.11 Connect the J1 and J2 cords of the data mounting to the P1 and P2 plugs of the data unit. Refer to Fig. 3, 4, and 5. On the 40A4 data mounting only, these cords are held with screws to the flange of the data mounting. Remove these screws to free the cords.

4.12 Connect the P1 cord of the data mounting to the J1 connector of the data unit. Connect the P3 cord of the data unit to a multiple-line voice jack (USOC RJ21X) via an M16L cord or 330B adapter, or to a multiple-line universal jack (USOC RJ26X) via an M16E or M16N cord.

4.13 Insert a 57B1 data unit, with option F installed (refer to Table A for switch position and Fig. 1 for switch location) into slot 8 of the data mounting. Insert a DAS 801CR-L1 or 801C-L1 into slot 7. Insert data sets which are to share the ACU into adjacent slots, starting with slot 1. Follow with data sets which are not to be used with the ACU.

4.14 Using the three-headed cord of the 57A1 data unit, connect the end marked ***DU*** to the EIA connector of slot 8, and the end marked ***ACU*** to the connector of slot 7. The third end, marked ***EIA,*** connects to the RS-366 ACU port. The J2 cord of the 57A1 data unit connects to an 2830CM telephone set, if provided.

4.15 If an 107B loudspeaker set is required (Fig. 3), connect the BL and W wires of the loudspeaker cord to the SP1 and SP2 screw terminals, respectively, of TS1 (Fig. 1). Remove TS2 (Fig. 1) temporarily to gain access to the screws of TS1. Replace TS2 and connect the BK, Y, R, and G wires of the loudspeaker cord to the four terminals of TS2. Extend the BK and Y leads via an D4BD cord (or equivalent) to the output of a 2012D transformer.

B. Up to Twelve Data Sets Shared by ACU

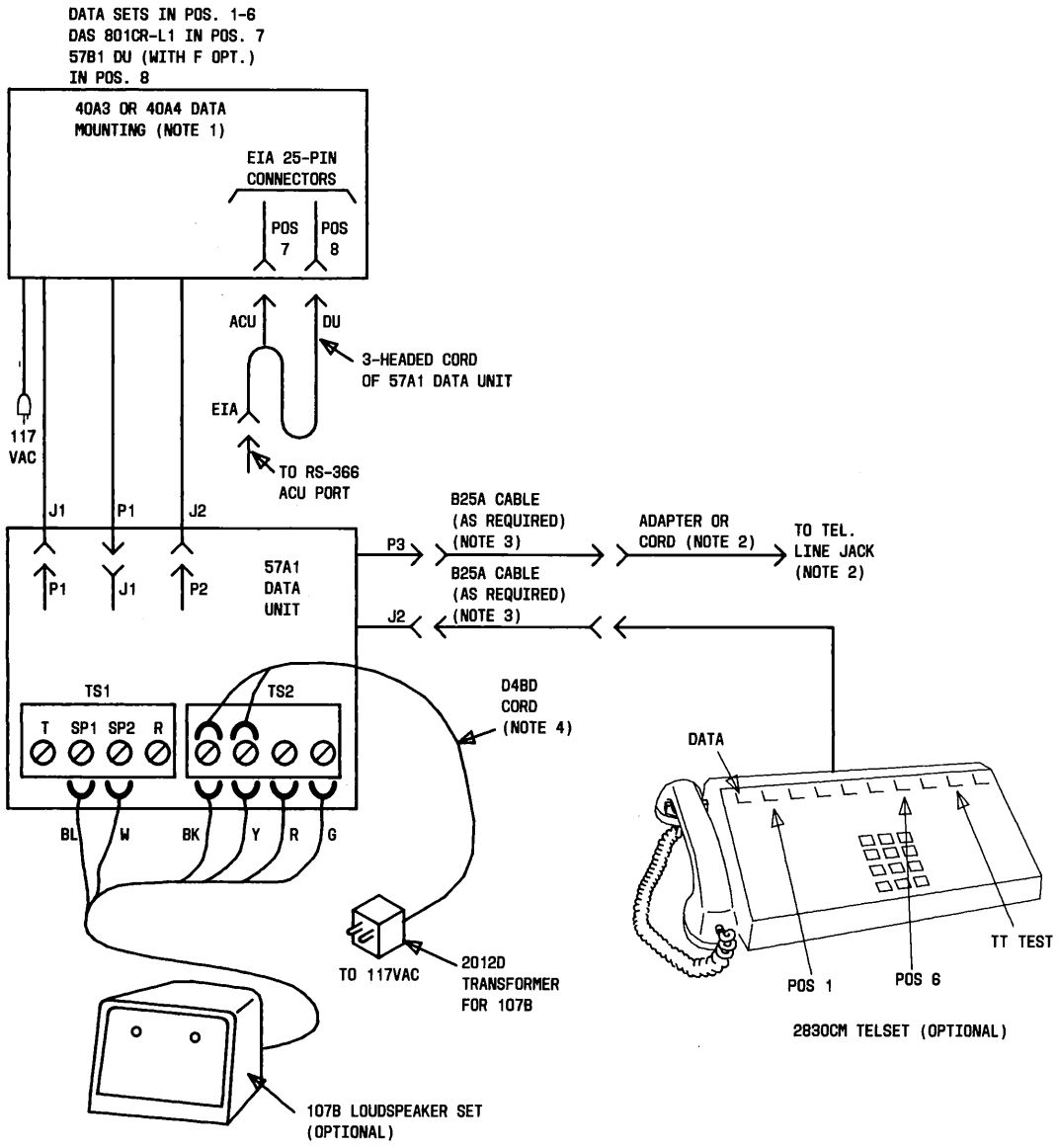
4.16 Using two 40A3 or 40A4 data mountings, connect to the 57A1 data units as above. Use two 57B1 data units but only one ACU. Note interconnection of T and R terminals of TS1 of the two data mountings. Using two 3-headed cords, interconnect as shown on Fig. 6. Refer to Fig. 7 for make-busy option and to Fig. 8 for service line and make-busy options.

4.17 The 57B1 data unit in the first data mounting requires option F, while the 57B1 data unit in the second data mounting requires option E (Table A).

5. OPTIONS

5.01 Installer options (Table A) are accomplished by setting individual rocker switches S9 and S10 (for series 6 and lower) or S10 only (for series 7 and higher) in the 57B1 data unit (Fig. 1) to the proper position.

5.02 If the 57B1 data unit is the only sharing circuit in an arrangement, or the first one in an arrangement using two data mountings to provide sharing of up to twelve data sets, all switch positions must be open (option F). If the 57B1 is the second sharing circuit in this arrangement using two data mountings, all switch positions must be closed (option E).



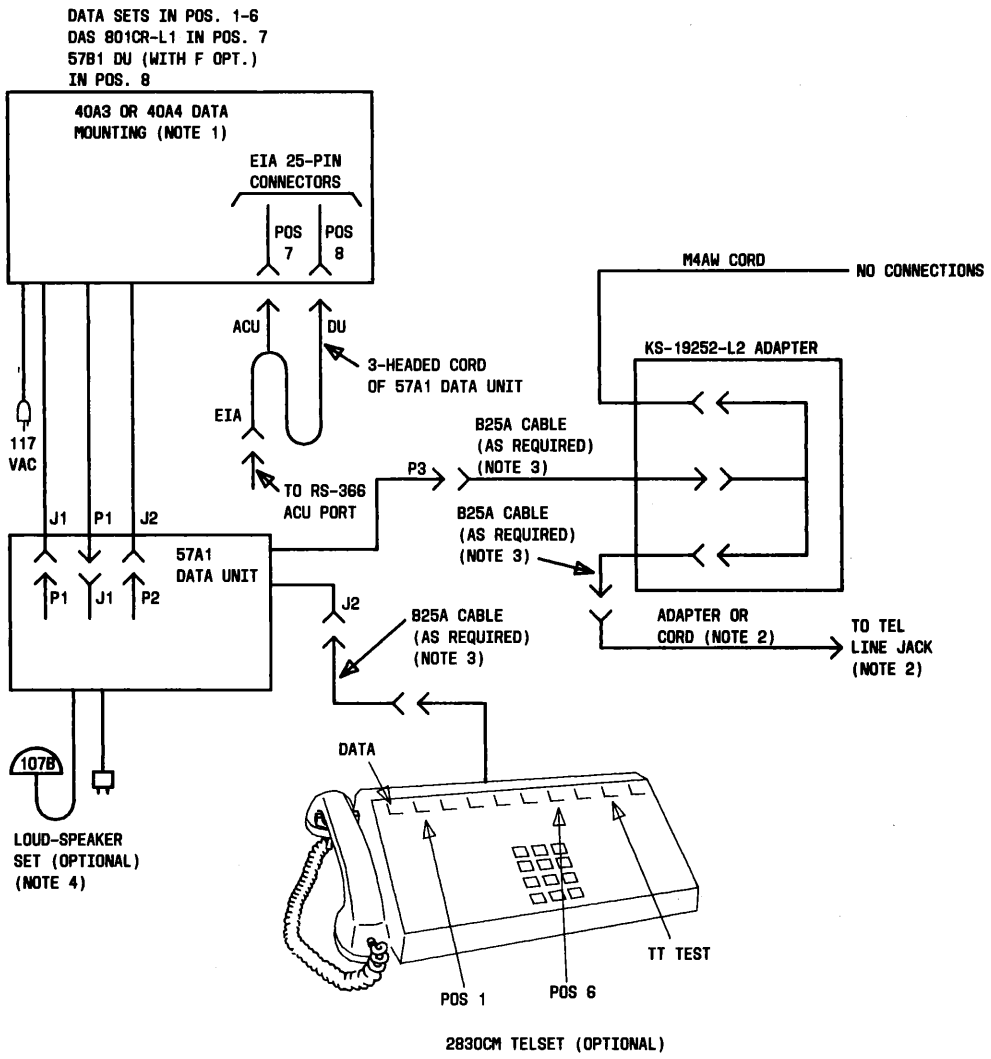
NOTES:

1. THIS DATA MOUNTING MAY BE EQUIPPED WITH UP TO SIX DATA SETS OF THE FOLLOWING CODES: 113CR, 113DR, 103JR, 202SR, OR 212AR. A 40A2 MAY BE USED WITH ALL SECTIONS OF SWITCHES SA7 AND SA8 OPEN, AND WITH J1, J2, AND P1 OF THE MOUNTING EXTENDED WITH B25A.
2. SEE TABLE FOR PROPER ADAPTER OR CORD:

DATA SET	TELEPHONE LINE	
	VOICE JACK (USOC-RJ21X)	DATA JACK (USOC-RJ26X)
100 SERIES	M16L	M16F
200 SERIES	330B ADAPTER	M16E OR M16N
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N

3. MAXIMUM LENGTH 60 FEET.
4. TAPE AND STORE UNUSED LEAD.

Fig. 3—40A-Type Data Mounting Equipped With Shared ACU and up to Six Data Sets



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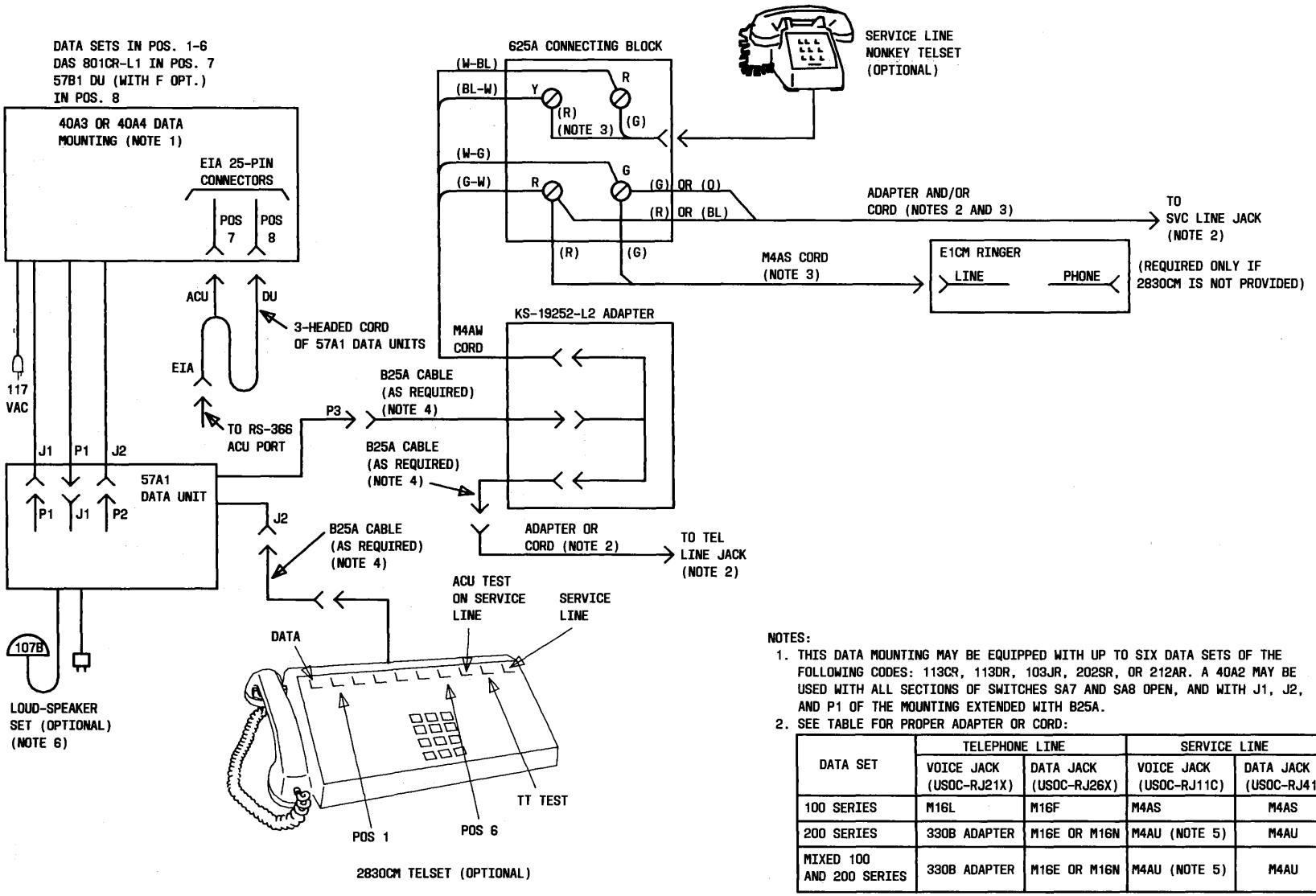
100 SERIES	M16L	M16F
200 SERIES	330B ADAPTER	M16E OR M16N
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N

3. MAXIMUM LENGTH 60 FEET.
4. FOR CONNECTIONS OF OPTIONAL LOUD-SPEAKER, SEE FIG. 3.

Fig. 4—40A-Type Data Mounting Equipped With Shared ACU and up to Six Data Sets (With Make-Busy Option)



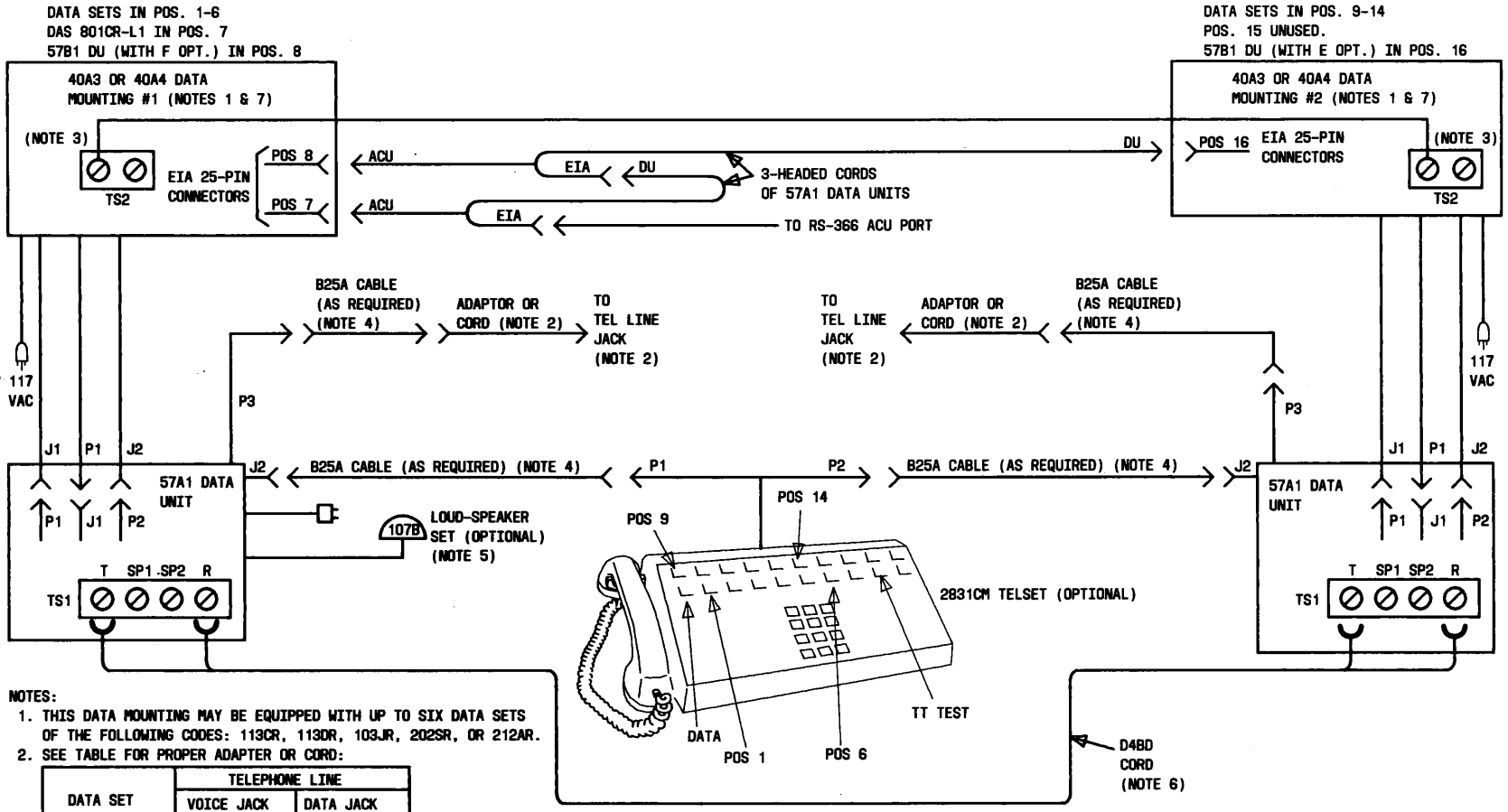
NOTES:

1. THIS DATA MOUNTING MAY BE EQUIPPED WITH UP TO SIX DATA SETS OF THE FOLLOWING CODES: 113CR, 113DR, 103JR, 202SR, OR 212AR. A 40A2 MAY BE USED WITH ALL SECTIONS OF SWITCHES SA7 AND SA8 OPEN, AND WITH J1, J2, AND P1 OF THE MOUNTING EXTENDED WITH B25A.
2. SEE TABLE FOR PROPER ADAPTER OR CORD:

DATA SET	TELEPHONE LINE		SERVICE LINE	
	VOICE JACK (USOC-RJ21X)	DATA JACK (USOC-RJ26X)	VOICE JACK (USOC-RJ11C)	DATA JACK (USOC-RJ41S)
100 SERIES	M16L	M16F	M4AS	M4AS
200 SERIES	330B ADAPTER	M16E OR M16N	M4AU (NOTE 5)	M4AU
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N	M4AU (NOTE 5)	M4AU

3. THE UNUSED CONDUCTORS IN THIS CORD SHOULD BE INSULATED AND STORED.
4. MAXIMUM LENGTH 60 FEET.
5. CONNECT A 330A ADAPTER BETWEEN THE M4AU CORD AND THE VOICE JACK.
6. FOR CONNECTIONS OF OPTIONAL LOUD-SPEAKER, SEE FIG. 3.

Fig. 5—40A-Type Data Mounting Equipped With Shared ACU and up to Six Data Sets (With Service Line and Make-Busy Option)



NOTES:

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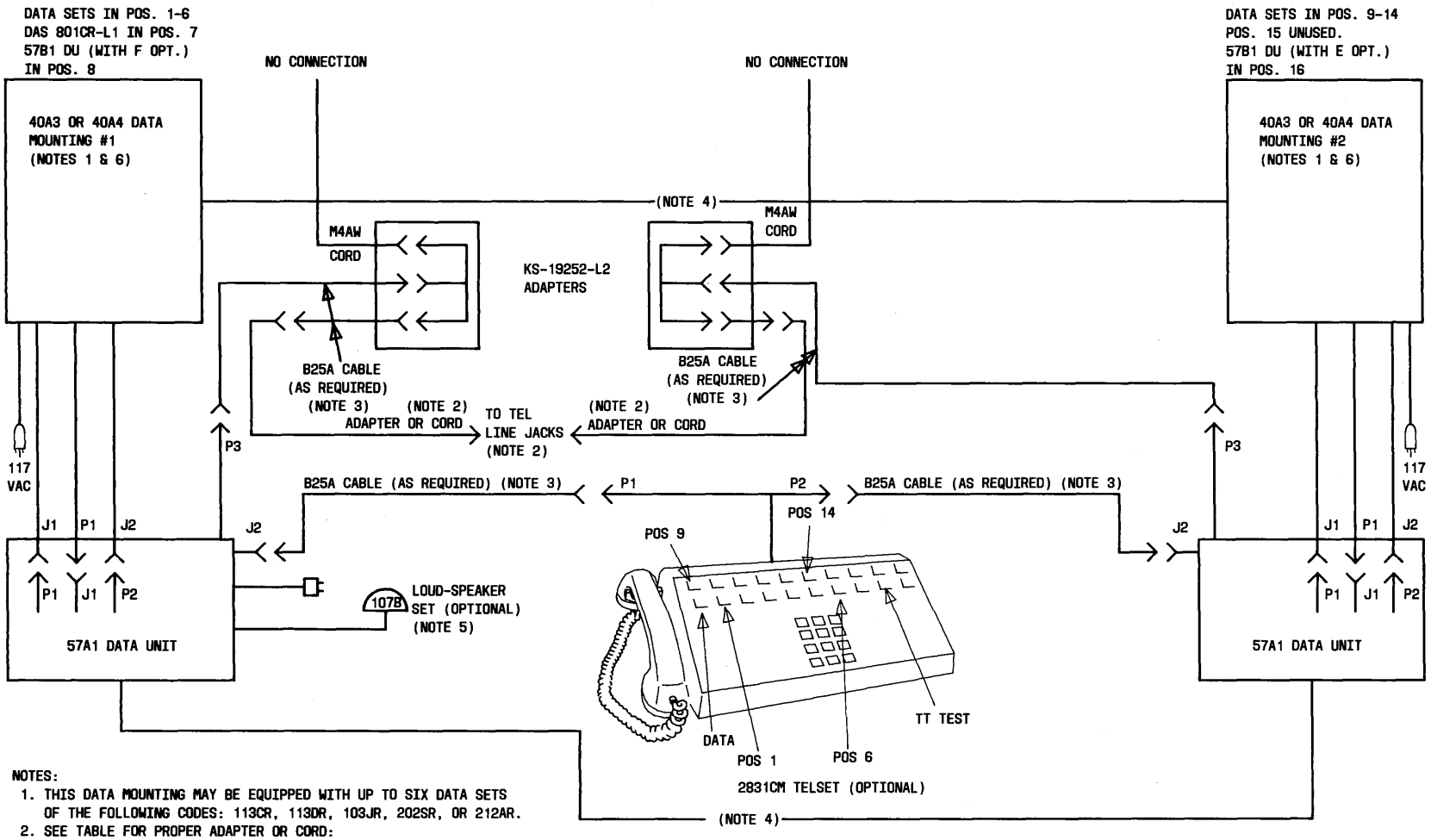
2. SEE TABLE FOR PROPER ADAPTER OR CORD:

DATA SET	TELEPHONE LINE	
	VOICE JACK (USOC-RJ21X)	DATA JACK (USOC-RJ26X)
100 SERIES	M16L	M16F
200 SERIES	330B ADAPTER	M16E OR M16N
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N

3. IF SIGNAL GROUND IS DISCONNECTED FROM FRAME GROUND (OPTION ZJ) THIS SIGNAL GROUND CONNECTION MUST BE MADE FROM MOUNTING TO MOUNTING (ON 40A3 OR 40A4 ONLY). (SIGNAL GROUND IS THE SCREW TERMINAL CLOSEST TO THE CENTER OF THE MOUNTING.)
4. MAXIMUM LENGTH 60 FEET.
5. FOR CONNECTIONS OF OPTIONAL LOUD-SPEAKER. SEE FIG. 3.
6. TAPE AND STORE UNUSED LEAD
7. IF INSTALLATION CONTAINS A 57B1 (SERIES 6 OR LOWER) AND A 57B1 (SERIES 7 OR HIGHER) DATA UNIT, THE 57B1 (SERIES 6 OR LOWER) DATA UNIT MUST BE USED IN MOUNTING #1

Fig. 6—40A-Type Data Mountings Equipped With Shared ACU and 7 to 12 Data Sets

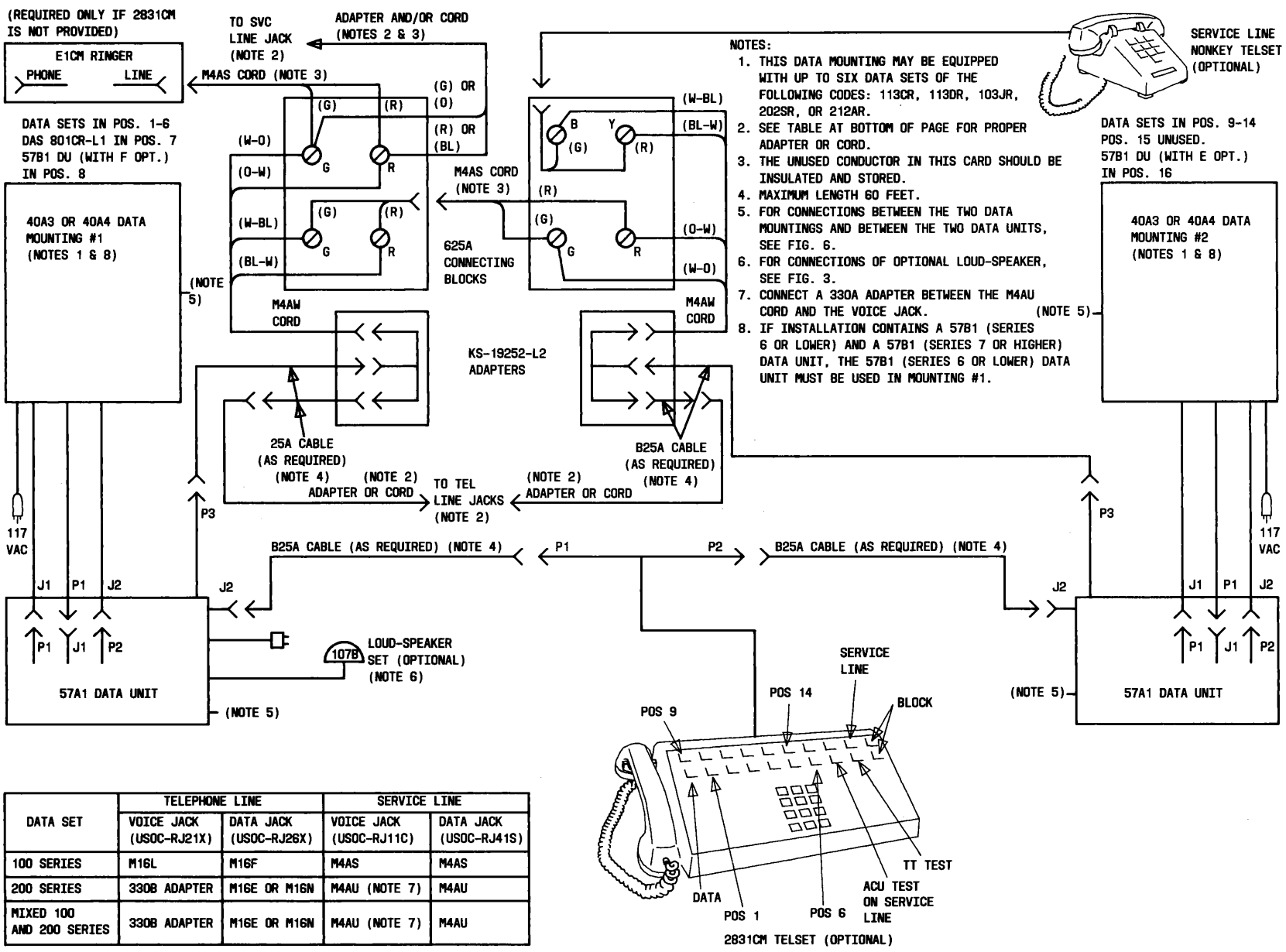


NOTES:
1. THIS DATA MOUNTING MAY BE EQUIPPED WITH UP TO SIX DATA SETS OF THE FOLLOWING CODES: 113CR, 113DR, 103JR, 202SR, OR 212AR.
2. SEE TABLE FOR PROPER ADAPTER OR CORD:

DATA SET	TELEPHONE LINE	
	VOICE JACK (USOC-RJ21X)	DATA JACK (USOC-RJ26X)
100 SERIES	M16L	M16F
200 SERIES	330B ADAPTER	M16E OR M16N
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N

3. MAXIMUM LENGTH 60 FEET.
4. FOR CONNECTIONS BETWEEN THE TWO DATA MOUNTINGS AND BETWEEN THE TWO DATA UNITS. SEE FIG. 6.
5. FOR CONNECTIONS OF OPTIONAL LOUD-SPEAKER. SEE FIG. 3.
6. IF INSTALLATION CONTAINS A 57B1 (SERIES 6 OR LOWER) AND A 57B1 (SERIES 7 OR HIGHER) DATA UNIT, THE 57B1 (SERIES 6 OR LOWER) DATA UNIT MUST BE USED IN MOUNTING #1.

Fig. 7—40A-Type Data Mountings Equipped With Shared ACU and 7 to 12 Data Sets (With Make-Busy Option)



DATA SET	TELEPHONE LINE		SERVICE LINE	
	VOICE JACK (USOC-RJ21X)	DATA JACK (USOC-RJ26X)	VOICE JACK (USOC-RJ11C)	DATA JACK (USOC-RJ41S)
100 SERIES	M16L	M16F	M4AS	M4AS
200 SERIES	330B ADAPTER	M16E OR M16N	M4AU (NOTE 7)	M4AU
MIXED 100 AND 200 SERIES	330B ADAPTER	M16E OR M16N	M4AU (NOTE 7)	M4AU

Fig. 8—40A-Type Data Mountings Equipped With Shared ACU and 7 to 12 Data Sets (With Service Line and Make-Busy Option)

5.03 If both 57B1 (series 6 or lower) and 57B1 (series 7 or higher) data units are combined in an arrangement to provide sharing of up to twelve data sets, the 57B1 (series 6 or lower) data unit must be installed in mounting 1. Refer to Fig. 6, 7, and 8.

5.04 There are no customer-selected options. The various modes of operation are selected by the use of the appropriate software in the computer port.

6. MAINTENANCE

6.01 No special tools are required.

6.02 The 57A1 and 57B1 data units do not require routine maintenance or adjustments. Trouble isolated to one of the units should be cleared by replacement.

7. INTERCHANGE CIRCUITS

7.01 The interchange circuits to the customer-provided terminal (ACU port) conform to EIA RS-366. The circuits provided are identical to those of the ACU (see Table B). The operation of all interchange circuits corresponds to the definitions in EIA RS-366, with the exception of circuit DLO.

TABLE B

INTERCHANGE CIRCUIT CONNECTIONS

CIRCUIT	PIN	NAME
AA	—	Protective Ground
DPR	2	Digit Present
ACR	3	Abandon Call and Retry
CRQ	4	Call Request
PND	5	Present Next Digit
PWI	6	Power Indication
AB	7	Signal Ground
(Test)	9	Telephone Co. Use Only
(Test)	10	Telephone Co. Use Only
COS	13	Call Origination Status
NB1	14	Digit Signal Circuit
NB2	15	Digit Signal Circuit
NB4	16	Digit Signal Circuit
NB8	17	Digit Signal Circuit
DLO	22	Data Line Occupied

7.02 The operation of all interchange circuits corresponds to the definitions in EIA RS-366, with the exception of circuit DLO, which states:

> Signals on this circuit are used to indicate when the communication channel is in use for automatic calling, data communication, voice communication or for testing of the automatic calling or data communication equipment.

7.03 In the sharing arrangement, a new definition is used which takes account of the multiple channels associated with the ACU which states:

> Signals on this circuit are used to indicate when the communication channel or a group of communication channels are in use (eg, for data communication, voice communication or testing of the ACU or data set).

7.04 The ON condition indicates that the communication channel is in use. The channel is considered to be in use when it is controlled by any equipment other than the ACU originating the call.

7.05 The DLO ON indicates that all channels are in use, while DLO OFF indicates that at least one channel is not in use. The operation of DLO corresponds to the definition in the new standard, EIA RS-366-A.

8. STATUS LAMPS (Light-Emitting Diodes [LEDs]) AND MAKE-BUSY SWITCHES

8.01 The faceplate of the 57B1 data unit is equipped with seven LEDs. The top LED is designated DLO and is lighted whenever interchange circuit DLO is ON. The remaining LEDs are designated 1 through 6. A lighted LED indicates that the sharing circuit has seized the line of the corresponding number.

8.02 The make-busy switches (Fig. 1) are also designated 1 through 6, with an arrow labeled MB indicating the direction of operation to make any line busy to outgoing traffic originated by the ACU. Call answering, manual call origination, calls in progress, and ACU dialing in progress are not affected.

8.03 When two 57B1 data units are used in two data mountings, both DLO LEDs will light at the same time when interchange circuit DLO is ON. The DLO LED of the first data unit will also light (with-

out turning ON DLO) when all the data lines of its mounting are busy. The DLO LED of the second data unit will light only if all data lines of both mountings are busy.

9. TESTS

9.01 Three push-to-operate, push-to-release buttons are provided on the faceplate of the 57B1 data unit, labeled 1, 2, and 4, (Fig. 1) respectively. They are used to test major portions of the sharing circuit, as well as the ability of the lines to provide dial tone.

A. Dial Tone Test

9.02 Depressing line pick-up key (button) No. 1 will light the DLO and CR LEDs. If line 1 is idle, the sharer will seize line 1, connect it to the ACU, and light LED No. 1. The ACU, going off-hook, causes the central office to connect dial tone to the line, which can be heard by means of the 107B loudspeaker (if available). The proper detection of this tone by the ACU can be checked by observing that the PD LED on the ACU lights.

9.03 Lead DLO to the port is turned ON whenever a test button is pushed, as an indication that the ACU is not available to the port.

9.04 Pushing the button a second time releases the test circuit.

9.05 Other lines are checked by pushing one or two buttons simultaneously or in quick succession. The number of the line accessed is equal to the sum of the designations on the buttons.

9.06 This test checks the ability of the sharing circuit to select lines, to cause the ACU to go off-hook, checks the ability of the line to provide dial tone, and its detection by the ACU.

B. Use of Test Buttons on the ACU

9.07 The type of tests available at any installation depends on the provision of a telephone set (2830CM or 2831CM), a loudspeaker (107B), and/or a service line (S/L). Instead of the loudspeaker, a monitor hand telephone set connected to screw terminals SP1 and SP2 on TS1 of the 57A1 data unit can be used. The TT button is used to test the TOUCH-TONE® service frequencies and timing circuit of the ACU. In an ACU installation without sharing, the TR button is used to test dial tone and answer tone detections. In sharing arrangements, the TR button is used only to test answer tone detection. Dial tone detection is tested with buttons of the 57B1 data unit and is described in paragraph A. Dial Tone Test. The SD button is used to slow down the tone generating rate.

Test Without 2830CM, 107B, or S/L

9.08 Check that the CR LED on the ACU is not lighted. If it is, the ACU port has lead CRQ turned ON. In that case, disconnect the EIA RS-366 ACU connector to extinguish the LED.

9.09 Push and hold depressed the TT button on the ACU and switch MB7 on the data mounting down. The PD LED should blink ten times. Depressing SD on the ACU slows down the rate at which the tones are generated, and thereby slows down the blinking of the LED to facilitate counting. Release the test buttons and restore MB7 to the UP position. This test checks the tone generating timing circuits of the ACU.

Test with 107B (or Hand Telephone Set), Without 2830CM or S/L

9.10 Conduct the test as described in paragraph 9.08 and 9.09, except flick MB7 down for as short a time as possible, and immediately back again to the UP position. The LED will blink as described above. In addition, TOUCH-TONE service frequencies will be heard in the loudspeaker or hand telephone set. Of the ten tones, at least one and possibly more will be missing at the beginning of the sequence 1, 2, 3 ...9, 0,depending on how long switch MB7 remained in the DOWN position. This test checks the tone-generating ability of the ACU in addition to the timing circuits.

Test With 2830CM or 2831CM and 107B (or Hand Telephone Set)

9.11 Conduct the test as described in paragraph 9.10 above, except do not operate switch MB7. Instead, depress pickup button 8 of the telephone set and pick up the handset. Results are as shown in paragraph 9.10 above, except that all ten tones are heard on the loudspeaker or hand telephone set.

Test With 2830CM or 2831CM and S/L

9.12 Check that CR LED on the ACU is not lighted. If it is, the ACU port has lead CRQ turned ON.

In that case, disconnect the EIA RS-366 ACU connector to extinguish the LED.

9.13 Operate switches MB7 and SL7 on the mounting to the DOWN position. Depress line button 7 on the telephone set and dial the telephone number of a near-by telephone set. When the call is answered, depress the TT button on the ACU. The ten TOUCH-TONE service frequency combinations can then be heard in the receiver of the called telephone set.

9.14 The PD LED blinks ten times. Depressing SD on the ACU slows down the rate at which the tones are generated, and thereby slows down the blinking of the LED to facilitate counting.

9.15 When a call is made as above to a test center, the tests specified in Section 598-088-500 for the TT and TR buttons can be performed with the test center.

9.16 The same tests can also be performed for received telephone calls. The caller should dial the telephone number of the service line. The 2830CM or 2831CM telephone set will ring. Answer the call by switching MB7 and SL7 to the DOWN position, depressing line button 7, and lifting the handset.

9.17 With the 2830CM telephone set, the service line can be used without interfering with any data set by using line button 9 if none of the SL switches are in the down position.

9.18 With the 2831CM telephone set, the service line can be accessed with the second line button from the right in the top row. The right buttons of both rows of the 2831CM telephone set should be blocked.

10. SIZE OF DATA SET GROUP IN ACU SHARING

10.01 To estimate the number of data sets that can be served by a single ACU, assume that all originated calls take an equal time to be answered, and that all messages are of equal length.

10.02 The number of data sets that can be served by a single ACU would then be:

$$N \leq T(\text{data set}) / T(\text{ACU})$$

where N is the number of data sets

T(data set) is the holding time of the data set
T(ACU) is the holding time of the ACU

10.03 For practical systems with varying setup times and message lengths, N is harder to evaluate, but the formulas given are useful in estimating the maximum number of data sets that can be served by a single ACU.

A. Without End-of-Number

10.04 To estimate the number of data sets that can be served by a single ACU without EON,

$$N \leq (Tm + Tq)/(Td+Ts+Ta+ti)$$

where N is the number of data sets.

Tm is the message duration, including handshake (depends entirely on the system application).

Tq is the interval between messages presented by the port (depends on traffic density and computer capability).

Td is the duration of dialing (0.1 second per digit plus dial tone delay).

Ts is the switching time of the central office involved (depends on the location of the called station with respect to the calling station, and may vary from a few seconds to 60 seconds.)

Ta is the time between completion of switching to detection of answer tone. (Depends on the part of the ringing cycle during which the switching is completed, and the type of data set at the answering end. Approximate time intervals are 5 to 12 seconds for DS 202S and 3 to 10 seconds for other data sets.)

Ti is the intercall interval of the ACU fixed at 2 seconds for present ACUs.

10.05 As an example, if the message length Tm is 5 minutes, the interval between messages Tq is zero, the duration of dialing Td is 1 second, switching time Ts is 20 seconds, and the average tone detection time, Ta is 7 seconds, then the number of data sets that can be served is 10. Of course, there might be a delay in establishing calls in such a system, up to 4 1/2 minutes for the tenth data set in the above example, if ten calls are to be established at once after all data sets were idle.

B. End-of-Number

10.06 With the EON operation, the holding time of the ACU becomes very much shorter, permit-

ting it to serve many more data sets, even for short messages.

10.07 The number of data sets that can be served by a single ACU with EON operation,

$$N \leq (Tm+Tq+Ts+Ta) / (Td+Ti)$$

with N and the various Ts defined as above.

10.08 As an example, if the message length Tm is only 2 seconds and all other times as in the previous example, nine data sets can be served. With a message length of 9 seconds, twelve data sets can be served by a single ACU.

11. REFERENCES

11.01 The following Bell System Practices provide additional information.

SECTION	TITLE
590-010-202	Data Set—Station Arrangements for Mixed Data Set Types in 40A-Type Data Mounting
590-011-202	Data Sets—Registered Arrangements for Data Sets in 40A3 Data Mountings
591-044-200	Data Set 103JR-L1/2—Transmitter-Receiver—Single Set—Installation and Connections
591-046-200	Data Set 113CR-L1A/2—Transmitter-Receiver—Single Set—Installation and Connections
591-047-200	Data Set 113DR-L1A/2—Transmitter-Receiver—Single Set—Installation and Connections
592-037-200	Data Set 202SR—Transmitter-Receiver—Single Set—Installation and Connections
592-039-200	Data Set 212AR-L1A/2A—Transmitter-Receiver—Installation and Connections
598-088-100	Data Auxiliary Set 801CR-L1/2—Description and Operation
598-088-200	Data Auxiliary Set 801CR-L1/2—Installation and Connections
598-088-500	Data Auxiliary Set 801CR-L1/2—Test Procedures

11.02 Detailed information concerning the 57A1 and 57B1 data units is contained in CD and SD 1D318-01.