

**DATA SERVICE UNIT AND CHANNEL SERVICE UNIT
FOR DATAPHONE® DIGITAL SERVICE
PRIVATE LINE
REFERENCE GUIDE**



Fig. 1—500A-Type Data Service Unit

CONTENTS	PAGE	3. SERVICE ORDER INFORMATION	4
1. GENERAL	1	Customer Options	5
A. DSU (Fig. 1)	2	Telco Options	7
B. CSU (Fig. 2)	3	4. REFERENCES	8
2. PHYSICAL AND ELECTRICAL CHARACTERISTICS	3	1. GENERAL	
A. DSU	3	1.01 This section covers the 500A-type data service unit (DSU) and 550A-type channel service unit (CSU) when used in the private line (PL) digital data system (DDS).	
B. CSU	4		

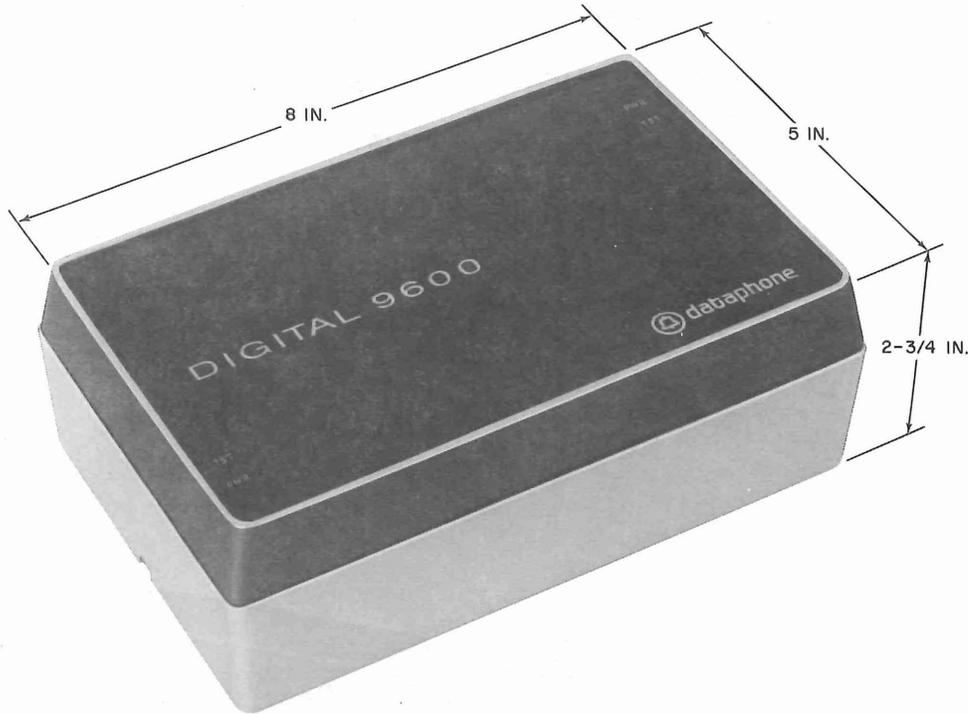


Fig. 2—550A-Type Channel Service Unit

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

1.03 The DSU and CSU are used to interface the customer-provided equipment (CPE) at a DDS station to the DDS network on a 4-wire full-duplex (FDX) basis. Both the DSU and CSU are apparatus coded according to the customer service rate (data speed) at which they operate. Table A lists the four DSUs and four CSUs by code and gives the speed for each. In the following text, the term "*subrate*" refers to the 2.4, 4.8, and 9.6 kb/s service rate.

TABLE A

DSU AND CSU APPARATUS CODES

CODE		OPERATING SPEED
DSU	CSU	
500A-L1/2	550A-L1/2	2.4 kb/s
500A-L1/3	550A-L1/3	4.8 kb/s
500A-L1/4	550A-L1/4	9.6 kb/s
500A-L1/5	550A-L1/5	56.0 kb/s

DSU (Fig. 1)

1.04 The DSU converts the serial, unipolar data signals received from the CPE on the customer interface leads to the balanced, bipolar (return-to-zero) signals used by the DDS and transmits them to the DDS network via the 4-wire PL facility. Conversely, the DSU converts the balanced, bipolar signals received from the DDS network on the 4-wire PL facility to the serial, unipolar signals used by the CPE and transmits them toward the CPE on the customer interface leads. It also provides automatic equalization and loop loss adjustment for the receive pair of the 4-wire PL facility.

1.05 The DSU provides all of the control, timing, and data interface leads required by the CPE. In the case of the subrate DSUs, all of the interface leads provide signals which conform to the Electrical Industries Association (EIA) Standard RS-232-C and RS-334. However, because of the speed limitation of the EIA standards, only the control interface leads of the 56 kb/s DSU conform to this Standard. The 56 kb/s DSU timing and

data interface leads are designed to meet the requirements of the CCITT Recommendation V.35.

1.06 In addition, the DSU may be locally or remotely looped back at either the 4-wire local facility side or customer interface side. This allows a remotely located serving test center (STC) to make remote tests of the 4-wire local facility (channel loop-back) or 4-wire local facility and DSU (DSU loop-back).

CSU (Fig. 2)

1.07 The CSU accepts serial, balanced bipolar signals from the CPE, adjusts the levels, filters them, and transmits them toward the DDS network over the 4-wire PL facility. Conversely, it accepts the balanced bipolar signals from the DDS network and transmits them towards the CPE on the customer interface leads. Like the DSU, it also provides automatic equalization and loop loss adjustment for the receive pair of the 4-wire PL facility.

1.08 Unlike the DSU, the CSU only provides the CPE with the minimum number of interface leads required to match the CPE to the 4-wire PL facility (two control leads and four data leads). These are the status indicator (SI) and ground (GRD) control leads, the data transmit (DT1 and DR1) leads, and the data receive (DT and DR) leads. The signals on the SI lead conform to the EIA Standard RS-232-C and the GRD lead provides ground return for the SI lead. The four data leads (DT1, DR1, DT, and DR) provide a balanced, 135-ohm interface for the CPE. The signals on these leads conform to the balanced bipolar (return-to-zero) format used by the DDS rather than either the EIA Standard or the CCITT Recommendation.

1.09 When used with a CSU, the CPE must be capable of generating the balanced bipolar data signals used by the DDS at the correct service rate. In addition, the CPE must provide its own clock recovery.

1.10 The CSU provides only the channel loop-back feature for remote testing by the STC.

2. PHYSICAL AND ELECTRICAL CHARACTERISTICS

A. DSU

2.01 The 500A-type DSU (Fig. 1) consists of a transmitter, receiver, control logic, automatic line build-out (ALBO), fixed line build-out (FLBO), and customer interface circuits mounted on two circuit packs (CPs) which are interconnected by a flexible cable harness. The two circuit packs and an 82A power unit are contained in a housing with a natural aluminum cover and two black plastic faceplates. The DSU is approximately 11.5 inches wide, 11 inches deep, 4 inches high, and weighs approximately 10.5 pounds.

2.02 The dc voltages required by the two DSU CPs are provided by the 82A power unit. The 82A power unit requires a nonswitched 57 to 63 Hz ac power source of 105 to 129 volts. It will dissipate approximately 17 watts. The ac power cord (supplied with the DSU) is a 3-conductor cord (KS-14532-L20) that requires an ac outlet that accepts a plug with two parallel blades and a round ground pin. A 9-foot long, 4-conductor (D4BD-49) cord is also supplied with the DSU for connection to the 4-wire local facility.

2.03 The DSU will operate in an environment of +40 to +120°F with a relative humidity of less than 95 percent. The surface temperature of the aluminum cover will be approximately 16°F above the ambient room temperature.

2.04 A slide switch and light-emitting diode (LED) assembly comes factory installed on the front faceplate. However, it may be moved to the rear faceplate according to local option. The assembly contains a three position slide switch and four LEDs which are designated on the faceplates as PWR (power), NS (no signal), LL (local line loop-back), and RT (remote terminal loop-back). A spring clip which is supplied with the DSU may be installed over the slide switch of a DSU used on a multipoint circuit. This prevents the possibility of the DSU being accidentally placed in the LL mode, thereby disrupting service on the multipoint circuit.

2.05 The HP1 CP of the DSU performs the logic functions and is common to all four of the DSUs. The other CP (HN1, HN2, HN3, or HN4) is a speed sensitive analog board and is determined by the customer service rate for which the DSU

is intended. Table B lists the DSUs by code and customer service rate and gives the HN-type CP used in each.



Remember the logic CP (HP1) is common to all four DSUs.

TABLE B
DSU HN-TYPE CP USE

DSU CODE	CUSTOMER SERVICE RATE	TYPE CP
500A-L1/2	2.4 kb/s	HN1
500A-L1/3	4.8 kb/s	HN2
500A-L1/4	9.6 kb/s	HN3
500A-L1/5	56.0 kb/s	HN4

2.06 The customer interface leads of the subrate DSUs are terminated in a 25-pin connector that requires the interface cord of subrate CPEs to be equipped with a Cinch (or Cannon) DB-19604-432 plug and DB-51226-1 hood, or equivalent. The 56 kb/s DSU customer interface leads are terminated in a 34-pin connector that requires the interface cord of 56 kb/s CPEs to be equipped with a Winchester MRA-34 P-JTC6-H plug, or equivalent.

2.07 All DSU options are switch selectable. With the exception of the ground option, customer options are selected with a roller-type switch located on the HP1 CP. The ground customer option is selected by use of a screw switch on the HN-type CP. The telco option (fixed line build-out network) is selected by means of a second roller-type switch located on the HN-type CP.

B. CSU

2.08 The 550A-type CSU (Fig. 2) consists of the transmit filter, transmit line lightning protection, fixed line build-out (FLBO), automatic line build-out (ALBO), and customer interface circuits mounted on two CPs which are interconnected by a flexible cable harness. The two CPs and a 96A power unit are contained in a housing with a black plastic snap-on cover.

2.09 The CSU is approximately 8 inches wide, 5 inches deep, 2.75 inches high, and weighs approximately 3.5 pounds.

2.10 The dc voltages required by the two CSU CPs are provided by the 96A power unit. The 96A power unit requires a nonswitched 57 to 63 Hz ac power source of 105 to 129 volts. The 3-conductor power cord is a part of the 96A power unit and requires an ac outlet that accepts a plug with two parallel blades and a round ground pin. The cord for connection to the 4-wire facility is not supplied with the CSU.

2.11 The CSU will operate in an environment of +40 to +120°F with a relative humidity of less than 95 percent.

2.12 Two light-emitting diodes (LEDs) are visible through the CSU cover. They are designated as PWR (power) and TST (test). For locations where access to the customer interface connector is restricted, the CSU may be mounted with the power cord and interface connector on either the right or left side. After mounting the CSU, the cover is replaced with the lettering right side up.

2.13 Each code CSU contains one HR-type transmitter CP and one HR-type receiver CP both of which have speed sensitive circuitry. Table C lists the CSUs by code and speed along with the HR-type CP required for the transmitter and receiver of each.

2.14 The customer interface leads of all four CSUs are terminated in a 15-pin connector that requires the interface cord of the CPE to be equipped with a Cinch DAMA-15-P plug, or equivalent.

2.15 The FLBO network is associated with the receive line and may be switched in or out by a roller-type switch (S1) located on the receiver CP. The ground option is selectable by means of a screw switch (S2) located on the receiver CP.

3. SERVICE ORDER INFORMATION

3.01 Service orders for Dataphone Digital Service must describe the desired service by USOC and not by DSU or CSU apparatus codes. The encoding procedures for determining the appropriate USOC are described in Section 590-000-100. An explanation of features and options common to most data services is given in Section 590-000-101. A

TABLE C
CSU HR-TYPE CP USE

CSU CODE	CUSTOMER SERVICE RATE	TRANSMIT CP	RECEIVE CP
550A-L1/2	2.4 kb/s	HR1	HR5
550A-L1/3	4.8 kb/s	HR2	HR6
550A-L1/4	9.6 kb/s	HR3	HR7
550A-L1/5	56.0 kb/s	HR4	HR8

rapid cross-reference between USOC, data sets, and reference guides is presented in Section 590-000-102. For customer billing nomenclature, data service tariff listings, and general reference information, refer to Section 87 of the Intercity Service Manual (ISM). Customer option decisions which must be made to determine the USOC suffix are listed in 3.04. Telco option decisions are listed in 3.05.

3.02 The CSU is an inherent part of the digital access line (DAL) and therefore has no USOC. When a DSU is not specifically requested, a CSU will be provided. The CSU customer option YK (signal ground connected to frame ground) is normally provided. If the CSU customer option YL (signal ground disconnected from frame ground) is specifically requested by the customer, it should be indicated on the USSO as a remark (RMK) entry for the circuit location (CKL).



When a DSU is to be provided, the DSU apparatus code is not to be specified on the service order. Engineering or Plant Department personnel responsible for selecting the DSU shall select the DSU that will satisfy the service requirements as identified by the USOC. The procedure for decoding the USOC is given in Section 590-001-100.

3.03 The following service order information is provided in tabular form:

- Service Offerings—Current Standard Models—Table D.
- Customer Options for the DSU (USOC DDQ, DDW, DDX, and DDY) and CSU—Table E.

TABLE D
SERVICE OFFERINGS
CURRENT STANDARD MODELS

USOC	FEATURE	MODEL
DDQ++	2.4 kb/s DSU	500A-L1/2
DDW++	4.8 kb/s DSU	500A-L1/3
DDX++	9.6 kb/s DSU	500A-L1/4
DDY++	56 kb/s DSU	500A-L1/5
*	2.4 kb/s CSU	550A-L1/2
	4.8 kb/s CSU	550A-L1/3
	9.6 kb/s CSU	550A-L1/4
	56.0 kb/s CSU	550A-L1/5

* See 3.02

- Telco Options for the DSU (USOC DDQ, DDW, DDX, and DDY) and CSU—Table F.

Customer Options

3.04 The following paragraphs provide detailed information on customer options listed in Table E. To provide the features requested by the customer, one of the two options under each decision must be selected.

(a) **DECISION A—Continuous Request to Send OR Switched Request to Send.**

1. **Continuous Request to Send (YS):** This option must be selected when the CPE does not provide a request to send (CA lead ON)

TABLE E
CUSTOMER OPTIONS FOR THE
DSU (USOC DDQ, DDW, DDX, AND DDY) AND CSU

DECISION	OPTION	DESIGNATION	
		DSU	CSU
A	1. Continuous request to send.	YS	NA*
	2. Switched request to send.	YT	NA*
B	3. Signal ground to frame ground.	YK	YK
	4. Signal ground disconnected from frame ground.	YL	YL
C (Note)	5. Loop-back switch and indicator lamps on front.	XN	NA*
	6. Loop-back switch and indicator lamps on rear.	XM	NA*

* Not applicable.

Note: For single station or stacked multiple station installations, either decision C5 or C6 may be chosen. For multiple station installations using the 48A data mounting, decision C6 must *always* be provided.

indication to the DSU. When installed, this option causes the DSU to ignore the status of the CA interface lead and operate as if the CA lead were constantly ON.

2. **Switched Request to Send (YT):** This option must be selected when the CPE is designed to turn on the CA lead when a request to send is initiated. When installed, this option causes the DSU to operate in accordance with the status of the CA interface lead.
- (b) **DECISION B—Signal Ground to Frame Ground OR Signal Ground Disconnected From Frame Ground.**
3. **Signal Ground to Frame Ground (YK):** This option is normally provided unless specifically requested differently by the customer. When installed, this option physically interconnects the signal ground and frame ground circuits within the DSU or CSU.

4. **Signal Ground Disconnected From Frame Ground (YL):** The use of this option is dependent on local noise conditions, ground potentials, and safety regulations and it should only be selected at the specific request of the customer. When installed, this option isolates the signal ground circuit from the frame ground circuit within the DSU or CSU.

(c) **DECISION C—Loop-Back Switch and Indicator Lamps on Front Panel OR Loop-Back Switch and Indicator Lamps on Rear Panel.**

5. **Loop-Back Switch and Indicator Lamps on Front Panel (XN):** This option physically locates the loop-back switch and indicator lamp assembly on the DSU front panel. It may or may not be selected for single station or stacked multiple station installations. It does not apply to multiple station installations which use the 48A data mounting.

TABLE F
TELCO OPTIONS FOR THE
DSU (USOC DDQ, DDW, DDX, and DDY) and CSU

OPTION	DESIGNATION	
	DSU	CSU
FLBO network installed.	WV	WV
FLBO network removed.	WW	WW
Circuit assurance indication from DSU.	YQ†	NA*
No circuit assurance indication from DSU.	YR‡	NA*
System status interface indication.	XK†	NA*
No system status interface indication.	XL‡	NA*
LL spring clip installed.	XO§	NA*
LL spring clip not installed.	XP	NA*

* Not applicable.

† This option reserved for future service offering.

‡ Until further notice, this option must be selected.

§ This option must always be selected when station terminates multipoint service.

6. **Loop-Back Switch and Indicator Lamps on Rear Panel (XM):** This option physically locates the loop-back switch and indicator lamp assembly on the DSU rear panel. It may or may not be selected for single station and stacked multiple station installation. It **must** always be selected for multiple station installations which use the 48A data mounting.

Telco Options

3.05 The following paragraphs provide detailed information on telco options listed in Table F.

- (a) **FLBO Network Installed (WV):** This option must be provided when the calculated insertion loss for the local cable pairs is less than 10 db. When installed, this option extends the range of the ALBO so that the proper signal levels are delivered to the DSU or CSU receiver when short local cable pairs are used.
- (b) **FLBO Network Removed (WW):** This option must be provided when the calculated

insertion loss for the local cable pairs is 10 dB or more. When installed, this option reduces the range of the ALBO so that the proper signal levels are delivered to the DSU or CSU receiver when long local cable pairs are used.

- (c) **Circuit Assurance Indication From DSU (YQ):** This option is reserved for a future service offering. Until further notice, this option is not to be provided and option YR is to be used. When installed, this option causes the DSU to hold the clear to send (CB) interface lead OFF until the CA lead is ON, the received line signal detector (CF) lead is ON, and the CB timing delay circuit has timed out.

Warning: The YQ option must never be provided.

- (d) **No Circuit Assurance Indication From DSU (YR):** Until further notice, this option will **always** be provided. When installed, this option causes the DSU to operate normally.

(e) System Status Interface Indication (XK):	SECTION	TITLE
At present, this option is only installed as required by the 831A-type DAS installation BSP (Section 314-919-200). When installed, this option causes the data set ready (CC) interface lead to turn off when an out-of-service indication is detected by the DSU. Use of this option defines the idle mode as CC lead ON; CF lead OFF.	314-900-300	Digital Data System—Private Line Service—Overall Maintenance
(f) No System Status Interface Indication (XL): When installed, this option causes the DSU to hold the CC lead ON except when the DSU is in a loop-back test mode.	314-901-300	Digital Data System—Serving Test Center—Private Line Circuit—Maintenance Procedures
(g) LL Spring Clip Installed (XO): This option must always be provided when the DSU terminates a local loop on a DDS multipoint circuit. When installed, this option provides a spring clip which prevents the operation of the loop-back switch to the local loop-back (LL) position.	595-100-100	Digital Data System—550A-Type Channel Service Unit—Description
(h) LL Spring Clip Not Installed (XP): This option may or may not be provided when the DSU terminates a local loop not on a DDS multipoint circuit. The implementation of this option consists of the removal of or lack of installation of the spring clip that prevents operation of the loop-back switch to the LL position. This allows the customer to perform local tests of the CPE.	595-100-150	Digital Data System—550A-Type Channel Service Unit—Test Access Arrangement
4. REFERENCES	595-100-180	Digital Data System—550A-Type Channel Service Unit (CSU)—Summarizing Specification
4.01 The following Bell System Practices (BSPs), Circuit Descriptions (CDs), and Schematic Diagrams (SDs) provide additional information on the 500A-type DSU and 550A-type CSU.	595-100-200	Digital Data System—550A-Type Channel Service Unit—Installation and Connections
SECTION	595-100-300	Digital Data System—550A-Type Channel Service Unit—Maintenance
TITLE	595-100-500	Digital Data System—550A-Type Channel Service Unit—Test Procedures
CD- & SD-1D235-01 500A Type Data Service Unit	595-200-100	Digital Data System—Data Service Unit—Description
CD- & SD-1D234-01 550A Type Data Service Unit	595-200-180	Digital Data System—500A-Type Data Service Unit (DSU)—Summarizing Specification
314-410-310	595-200-200	Digital Data System—500A-Type Data Service Unit—Installation and Connections
Digital Data System—Private Line Local Channel—Trouble Analysis	595-200-300	Digital Data System—500A-Type Data Service Unit—Maintenance
314-410-510	595-200-500	Digital Data System—500A-Type Data Service Unit—Test Procedures
Digital Data System—Private Line Local Channel—Test and Requirements	880-601-115	Digital Data System—Local Loop—Engineering Guidelines
314-900-100		
Digital Data System—Private Line Service—Overall Description		