



USER'S MANUAL

DSU II, DSU II TST DATA SERVICE UNIT

ALL-RATE , INCLUDING 19.2 KB/S
WITH SECONDARY CHANNEL

SINGLE, STAND-ALONE UNIT
DESK OR RACK MOUNTED

SECTION 61200007-1A, ISSUE 2 MARCH, 1990



PART # 1200007A - DSU II
CLEI CODE #DDDSBDTNA A

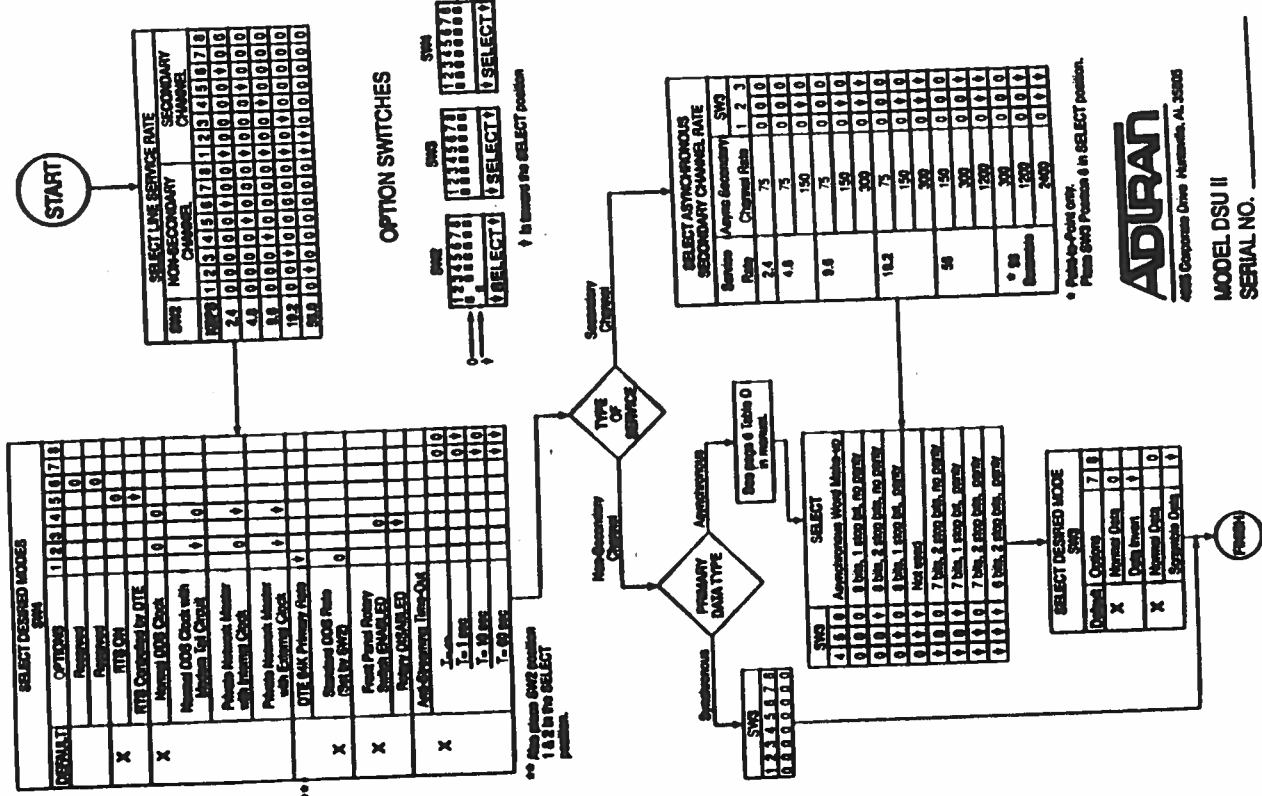
PART # 1200009A - DSU II W/FLIP TOP
CLEI CODE #DDDSBDVNA A

PART # 1200009L1- DSU II TST W/34 LED
CLEI CODE #DDSUAD22AA

Complies with Part 68 FCC Rules.
 USOC Jack Type RJ48S, Ringer
 Equivalence N/A, FCC Registration
 No. **HDC3BK-10933-DD-N**.

This equipment complies with the requirements in Part 15
 of FCC Rules for a Class A Computing device. Operation of
 this equipment in a residential area may cause unacceptable
 interference to radio and TV reception requiring the operator
 to take whatever steps are necessary to correct the interference.

SET UP PROCEDURE



LISTED



7357

DATA PROCESSING
 EQUIPMENT



LR 65756

INFORMATION PROCESSING
 EQUIPMENT

NOTICE

This equipment complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential neighborhood may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct this interference

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

Shielded V.35 cables should be used with this unit to insure compliance with the Class A limits.

CANADIAN EMISSION REQUIREMENTS

"This digital apparatus does not exceed the (Class A/Class B)* limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications."

*Indicate only the class of digital apparatus which is appropriate for the specific application.

"Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A/de la class B)* prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada."

*Indiquer seulement la classe d'appareils numériques correspondant à l'application visée.

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1 INTRODUCTION

1.1 General Description

The all rate DSU-II and DSU-II TST are advanced technology digital service units which provide an interface between the Digital Data System (DDS[®]) and the customer's data terminal unit.

The DSU-II and DSU-II TST provide any of the standard DDS rates of 2.4, 4.8, 9.6 and 56 kb/s, plus 19.2 and 64 kb/s. Secondary channel is also supported for all rates except 64 kb/s. It can accommodate either synchronous or asynchronous primary data rates and has an advanced design equalizer to allow DDS-like services to be extended to many customers not previously accommodated. The receiver range is 0 to 45 dB at 56 kb/s therefore permitting operation over long loops (18,000 ft.) when the Telephone Company utilizes an ADTRAN OCU DP or OCU which also provides a 45 dB receiver range.[®]

The DSU-II and DSU-II TST are compatible with WECO[®] model 500 and WECO 2500 series. Digital Data Service (DDS) is a nationwide service of AT&T that allows interconnection and transport of data for the Regional Bell Operating Companies (RBOCs). The Telephone Company provides a DDS-compatible service within their region and provides the local loop service to DDS customers.

DDS (Digital Dataphone Service) is a 4-wire, full-duplex system. The service may be point-to-point or multi-point. Once installed, the equipment is dedicated to the DDS customer.

The DSU-II includes all DDS rates along with 19.2 and 64 kb/s, and asynchronous secondary channel rates of 75, 150, 300, 1200, and 2400 bps. CSU or channel loopback is supported along with DSU loopback except 64 kb/s which employs latching DSU loopback.

[®]DDS is a registered service mark of AT&T Communications
[®]ADTRAN Pat. No. 4,759,035
[®]WECO is a registered trademark of AT&T Technologies, Inc.

1.2 Physical Description

The DSU-II is a single stand-alone unit which may be desk mounted or rack mounted. The front panel is labeled so that the controls and indicators may be read directly from either a horizontal (desk mount) or vertical (rack mount) direction. For a description of the DSU Rack, see Appendix 1.

The DSU-II measures two (2) inches high by 6.34 inches wide by 9.5 inches deep. The unit weighs three (3) pounds.

The front panel is shown in Figure 1.1. It contains a rotary mode selection switch and 11 LED indicators. The mode select switch is used to select either the normal data mode or test modes.

The rear panel is shown in Figure 1.2. The rear panel contains 3 data converters which provide either V.35 (synchronous), RS232 synchronous or asynchronous, and RS232 asynchronous secondary channel inputs. A power cord and fuse is also shown on the rear panel.

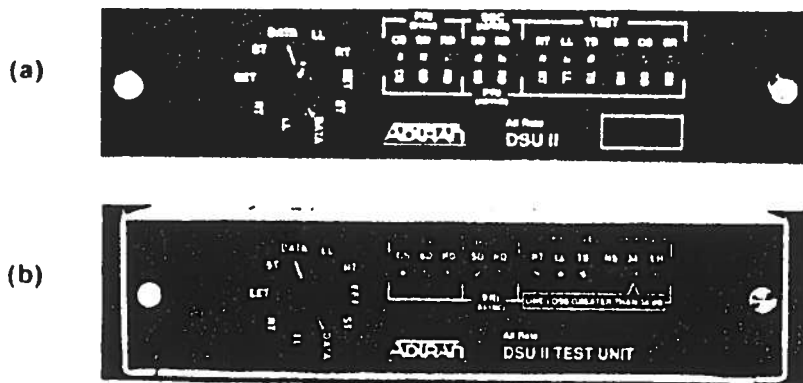


FIGURE 1.1 (a) and (b)—FRONT PANELS

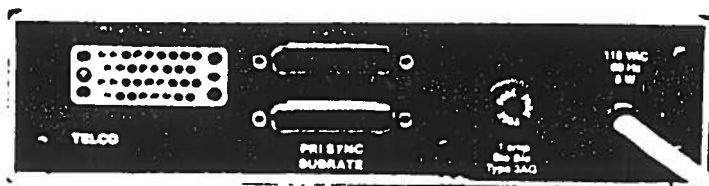


FIGURE 1.2—REAR PANEL

2. INSTALLATION

2.1 UNPACKING

All DSU-II stand-alone models are shipped in corrugated cardboard cartons. Suitable packing material is included with each unit to prevent movement of the equipment in transit. Unpacking consists of opening the carton and removing the equipment. Cartons and packing material should be retained to provide a suitable storage medium for the equipment until it is ready for installation. After unpacking, all equipment should be inspected for obvious damage or deficiencies. Report any such damage or discrepancies to ADTRAN in accordance with the distributor's established procedures.

2.2 INSPECTION AND LOCATION

Inspection

When initial inspection has been completed, the equipment should be identified and verified against the accompanying order and shipping documents. Each item should be checked for the correct model and serial number as indicated on the shipping list; any discrepancies should be reported immediately to the vendor. The underside of the DSU-II stand-alone unit bears labels on which the unit's model, serial number, and technical data are printed.

Location Requirements

Be sure to use a grounded 115V AC 60 Hz receptacle. A captive six-foot (1.8m) power cord is provided with each DSU-II. The power cord is terminated by a three-prong plug which connects to the grounded power receptacle. Ensure also that the DTE cable is long enough to reach the DSU-II.

CAUTION: To prevent possible radio frequency interference emissions, a shielded V.35 cable is required.

2.3 SETUP AND OPTION SWITCHES

The locations of switch selectable options are illustrated in Figure 2.1A. Figure 2.1B illustrates the switch locations on the DSU/TST or 'flip top' test unit.

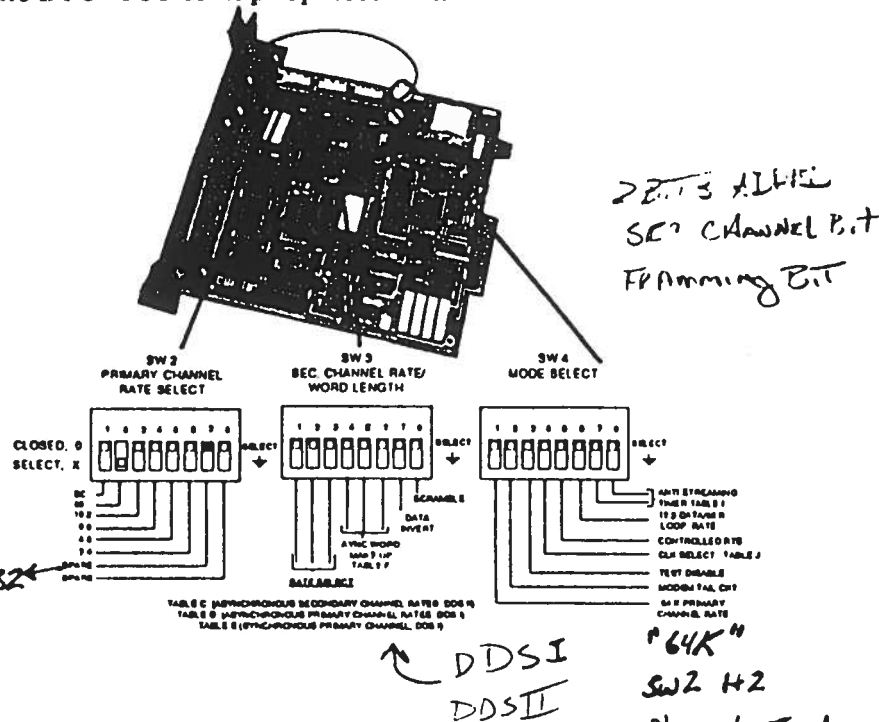


FIGURE 2.1A—Option Switches

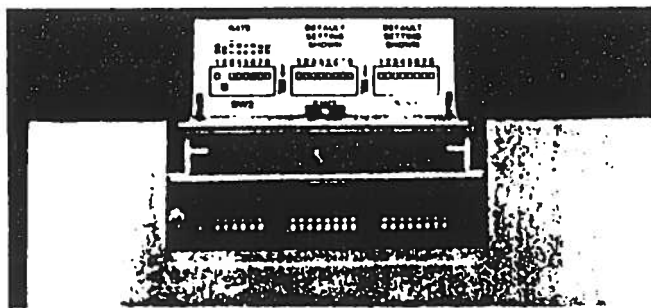


FIGURE 2.1B—Option Switch locations on DSU-II TST

2.31 DDS LINE SERVICE RATE OPTIONS

SW2 is an 8-position switch allowing selection of digital service rates with positions 2 through 6 according to the following Tables A and B, where "X" is toward the SELECT position and "0" is away from SELECT. Position 1 allows for secondary channel operation when placed in the SELECT position (Positions 7 and 8 are not used.)

SW2	SELECT LINE SERVICE RATE								
	KBPS	1	2	3	4	5	6	7	8
2.4	0	0	0	0	0	X	0	0	0
4.8	0	0	0	0	X	0	0	0	0
9.6	0	0	0	X	0	0	0	0	0
19.2	0	0	X	0	0	0	0	0	0
56.0	0	X	0	0	0	0	0	0	0

SW2	SELECT LINE SERVICE RATE								
	KBPS	1	2	3	4	5	6	7	8
2.4	X	0	0	0	0	X	0	0	0
4.8	X	0	0	0	X	0	0	0	0
9.6	X	0	0	X	0	0	0	0	0
19.2	X	0	X	0	0	0	0	0	0
56.0	X	X	0	0	0	0	0	0	0

TABLE A
Primary Channel Rate Select
W/O Secondary Channel

TABLE B
Primary Channel Rate Select
With Secondary Channel

2.3.2 ASYNCHRONOUS CHANNEL OPTIONS (RATE, WORD MAKE-UP)

SW3 is an 8-position switch allowing selection of asynchronous DTE rates with positions 1, 2, and 3 according to the following Tables C and D, where "X" is toward the SELECT position and "0" is away from SELECT. Two asynchronous data applications can be selected. These are (1) an asynchronous secondary channel combined with a synchronous primary channel or (2) an asynchronous primary channel only. When an asynchronous primary channel is selected, the secondary option is not available. For each DDS service rate, the desired asynchronous DTE rate must also be selected.

Service Rate	Asynchronous Secondary Rate	SW1		
		Position		
kb/s	kb/s	1	2	3
2.4	150	0	0	0
4.8	150	0	0	0
	150	0	X	0
4.8	150	0	0	0
	150	0	X	0
	300	0	X	X
19.2	150	0	0	0
	150	0	X	0
	300	0	X	X
56	150	0	0	0
	300	0	0	X
	300	0	X	X
56	1,200	0	0	0
56	1,200	0	0	X

Table 3. SW1 Position 8 in SELECT position
Data Invert Only

TABLE C
Asynchronous Secondary Channel Rate Settings

Service Rate	Asynchronous Primary Rate	SW1		
		Position		
kb/s	kb/s	1	2	3
2.4	300	X	0	0
	1200	X	0	X
	2400	X	X	X
4.8	1200	X	0	0
	2400	X	X	0
	4800	X	X	X
9.6	2400	X	0	X
	4800	X	X	0
	9600	X	X	X
19.2	2400	X	0	0
	4800	X	0	X
	9600	X	X	0
	19200	X	X	X
56	2400	X	0	0
	4800	X	0	X
	9600	X	X	0
	19200	X	X	X

TABLE D
Asynchronous Primary Channel Rate Settings

When synchronous primary channel alone is to be operated, SW3 positions 1-6 must be set as shown in Table 3, where "0" is away from SELECT:

SW3					
1	2	3	4	5	6
0	0	0	0	0	0

TABLE E
Synchronous Primary Channel Rate Settings Without Secondary Channel

Positions 4-6 of SW3 allow selection of asynchronous word make-up according to the following Table F, where "X" is toward SELECT and "0" is away from SELECT:

SW3			Asynchronous Word Make-up
Position			
4	5	6	
0	0	0	8 bits, 1 stop bit, no parity
0	0	X	8 bits, 2 stop bits, no parity
0	X	0	8 bits, 1 stop bit, parity
0	X	X	Not Used
X	0	0	7 bits, 2 stop bits, no parity
X	0	X	7 bits, 1 stop bit, parity
X	X	0	7 bits, 2 stop bits, parity
X	X	X	6 bits, 2 stop bits, parity

TABLE F — Asynchronous Word Make-Up

In DDS secondary channel point-to-point operation at 56 kb/s, there is a constraint upon user data such that primary channel and secondary channel data may not simultaneously be zero. A system using HDLC protocol may conform to this constraint by operating with SW3, Position 7, in the SELECT position.

In DDS secondary channel point-to-point operation at 56 kb/s, all primary and secondary channel data constraints may be removed by scrambling the data: SW3, position 8 set to SELECT position. This feature may not be used for multipoint operation. With the scrambler selected, a 2400 bps asynchronous channel rate may be used (see Table C).

SW3	7	8
Normal Data	0	
Data Invert	X	
Normal Data	0	
Scramble Data		X

TABLE G
Data Sense and Scramble Options for Secondary Channel

2.3.3 OPERATING MODE OPTIONS

SW4 is an 8-position DIP switch which allows selection of operating mode options, as summarized in Table H. Table I shows the options available for setting the anti-streaming timer.

Function	SW4		Effect
	Position	Setting	
64K	1	0	DTE primary rate set by SW2
		X	DTE primary rate set to 64 kb/s
Test Disable	3	0	Enables front panel rotary SW1
		X	Disables front panel rotary SW1
RTS	5	0	RTS permanently ON
		X	RTS follows DTE control signal
19.2 Data/ 56K Loop Rate	6	0	Normal 56K operation
		X	19.2 Sync DTE Data at 56K Loop Rate

TABLE H - Operating Mode Options

When SW4, Position 1, is in the SELECT position for 64 kb/s primary rate (clear channel), SW2 Positions 1 and 2 must also be in the SELECT position.

When SW4, Position 5, is in the SELECT position for controlled RTS operation (as it would be for tributaries in a multipoint system), an antistreaming timer is activated.

SW4, Positions 7 and 8, may be optioned to select the time-out value of the anti-streaming timer as shown in Table 2-9.

SW4 Position 6, is set to OFF for normal 56K operation. The SELECT position enables 19.2K synchronous data to be transmitted over a 56k loop to another DSU with this same feature enabled. NOTE: When this option is SELECTED, the Secondary Channel Option and the remote test feature are disabled.

Function: Anti-Streaming Time Out In Controlled RTS Operation		
SW4		Effect
Pos. 7	Pos. 8	
0	0	T = ∞ (anti-streaming disabled)
0	X	T = 1 Sec.
X	0	T = 10 Sec.
X	X	T = 60 Sec.

TABLE I - Anti-Streaming Timer Options

For SW4, positions 2 and 4, select the clocking/timing source for the DSU as shown in Table J. For normal DDS operation, positions 2 and 4 should be away from the SELECT position.

In a DDS application where the DSU is connected to a modem through a tail circuit configuration, position 2 must be toward SELECT and position 4 away from SELECT. In private point-to-point applications, one end of the link must serve as a master which will provide the clock.

Therefore, the DSU selected as the master must have position 2 away from SELECT and position 4 must be toward SELECT. If the master DSU is to be provided with an external clock from the RS-232-C or V.35 interface, positions 2 and 4 must be in the SELECT position.

Function:		Clocking/Timing
SW4		OPTIONS
Position 4 (MC)	Position 2 (Tail)	
Master Clock	Tail Ckt.	
0	0	Normal DDS (or Private Network Tributary)
X	0	Private Network Master
0	X	Normal DDS with Modem Tail Circuit
X	X	Private Network Master with External Clock

TABLE J - Clocking/Timing Options

2.4 DTE CONNECTIONS

Tables K, L, and M define the DTE connector pin assignments. The DSU II should be located so that the customer provided interface cable to the data terminal does not exceed 50 feet for EIA RS232-C or 100 feet for CCITT V.35.

NOTE

The async RS-232-C connector defined in Table M is also used when asynchronous operation is desired in the primary channel with non-secondary channel service. See section 2.3.2, Table D, with option SW 3, position 1, in the "X" ("SELECT") position.

Pin	CCITT Designation	Description
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request-To-Send (RTS)
D	106	Clear-To-Send (CTS)
E	107	Data Set Ready (DSR)
F	109	Received Line Signal Detector (CO)
R	104	Received Data (RD-A)
T	104	Received Data (RD-B)
V	115	Receiver Signal Element Timing (SCR-A)
X	115	Receiver Signal Element Timing (SCR-B)
P	103	Transmitted Data (SD-A)
S	103	Transmitted Data (SD-B)
Y	114	Transmitter Signal Element Timing (SCT-A)
AA	114	Transmitter Signal Element Timing (SCT-B)
J	—	Local Loopback Command
U	113	External TX Signal Element (SCX-A)
W	113	External TX Signal Element (SCX-B)
H, K, L M, N, Z BB, FF HH	—	Not Used

**TABLE K—Primary-Sync (V.35)
Connector Pin Assignments for 56 KB/S**

Pin	EIA Designation	Description
1	AA	Protective Ground (PC)
2	BA	Send Data (SD)
3	BB	Receive Data (RD)
4	CA	Request-To-Send (RTS)
5	CB	Clear-To-Send (CTS)
6	CC	Data Set Ready (DSR)
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (RLSD)
9	.	Reserved for Testing
10	.	Reserved for Testing
11-14	—	Not Used
15	DB	Transmit Clock (SCT)
16	—	Not Used
17	DD	Receive Clock (SCR)
18	—	Local Loopback Command
24	DA	External TX Clock (SCX)
19-23,25	—	Not Used

***Pins 9 and 10 are +12V and -12V outputs respectively. They are current limited by 680 Ohm resistors.**

**TABLE L—Primary-Sync (RS-232-C)
Connector Pin Assignments for Subrates**

Pin	EIA Designation	Description
1	AA	Protective Ground
2	BA	Secondary Transmitted Data
3	BB	Secondary Received Data
4	CA	Secondary Request-To-Send
5	CB	Secondary Clear-To-Send
6	CC	Secondary Data Set Ready
7	AB	Signal Ground (Common Return)
8	CF	Secondary Received Line Signal Detector
9-25	—	Not Used

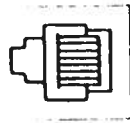
**TABLE M—Secondary-Async (RS-232-C)
Connector Pin Assignments (also used for Primary-Async)**

2.5 PHYSICAL NETWORK INTERFACE

The interface consists of four leads which are paired to provide the receive data pair and transmit data pair. The four leads are provided on an 8-position modular jack located on the rear panel (Figure 4.2).

The following are the pin assignments for the modular (Telco) jack on the rear of the DSU II.

<u>Pin Number</u>	<u>Function</u>	<u>Signal Direction</u>
1	Transmit Data (R1)	From Customer To Network Interface
2	Transmit Data (T1)	From Customer To Network Interface
7	Receive Data (T)	From Network Interface To Customer
8	Receive Data (R)	From Network Interface To Customer



The other four pins (3-6) are not connected.

3. DETAILED DESCRIPTION

The DSU-II provides the interface between a customer's Data Terminal Equipment (DTE) and the Digital Data System with a Secondary Channel option (DDS/SC). The DSU-II provides all functions required for this application, including loopback at both the DTE and 4-wire interface, plus self-test and end-to-end test. The stand-alone DSU-II operates at specific data and line rates, and with specific DTE interfaces shown in Table N.

Service Rate/SC	Primary Channel (Sync)		Secondary Channel (Async)	
	KB/S	DTE IFC	BPS	DTE IFC
2.4	2.4	EIA RS232-C	75	EIA RS232-C
4.8	4.8		75/150	
9.6	9.6		75/150/300	
19.2	19.2		75/150/300	
56	56	CCITT V.35	150/300/1200/2400*	EIA RS232-C
56	64	CCITT V.35	-----	-----

*2400 only available point-to-point with scrambler enabled

TABLE N—DSU-II Interfaces and Data Rates

In addition, the DSU-II provides either synchronous or asynchronous interface between a customer's DTE and DDS without Secondary Channel as illustrated in Tables O and P.

Service Rate/SC	Primary Channel (Sync)	
KB/S	KB/S	DTE IFC
2.4	2.4	EIA RS232-C
4.8	4.8	
9.6	9.6	
19.2	19.2	
56	56	CCITT V.35
64	64	

TABLE O—DSU-II Synchronous Interfaces and Data Rates (without Secondary Channel)

Service Rate	Primary Channel (Async)	
KB/S	KB/S	DTE IFC
2.4	.3/1.2/2.4	EIA RS232-C
4.8	1.2/2.4/4.8	
9.6	2.4/4.8/9.6	
19.2	2.4/4.8/9.6	
56	2.4/4.8/9.6/19.2	

TABLE P—DSU-II Asynchronous Interfaces and Data Rates (without Secondary Channel)

SPECIFICATION SUMMARY:

Operating Mode:	Full or half-duplex
Data Rates:	2.4, 4.8, 9.6 and 19.2 are synchronous or asynchronous, 56 and 64 kb/s synchronous. Secondary Channel capability.
Receiver Sensitivity:	-45 dbm at 56 kbs.
Line Interface:	4-wire, full-duplex.
DTE Interface:	V.35 synchronous, RS232 Synchronous or Asynchronous, RS232 Asynchronous Secondary Channel.
Line Requirements:	Loop transmission system compatible as defined in AT&T Pub. 62310.
Data Buffering:	12 Byte Slack Buffer.
Clocking:	1) Normal DDS (or private network tributary). 2) Private network master. 3) Normal DDS with modem tail circuit. 4) Private network master slaved to DTE external clock.
Diagnostics:	
Test Center Activated-	D.C. current reversal for local line (LL) loop. Remote terminal test code for terminal (RT) loop.
Operator Activated-	Local line (LL) or remote terminal (RT) loop, self-test (ST), end-to-end (EET) by 5-position rotary switch on front panel.
Environment:	
Operating-	0° to 50° C (32° to 122° F).
Storage-	-20° to 70° C (-4° to 158° F).
Relative Humidity-	up to 95% non-condensing.
FCC Approval:	FCC part 15, Class A; FCC part 68: UL.
Packaging:	Stand-Alone or Rack Mount.
Physical:	Stand-Alone or Rack Mount. 2¼" H.; 8¾" W.; 10¼" D.; 3 lbs.
Power:	115V AC, 60 Hz, 5 Watts.

4. FEATURES

The locations of all controls and indicators are shown in Figure 4.1. Figure 4.2 is a view of the rear panel connections for the Data Terminal Equipment (DTE) and the four-wire digital data service.

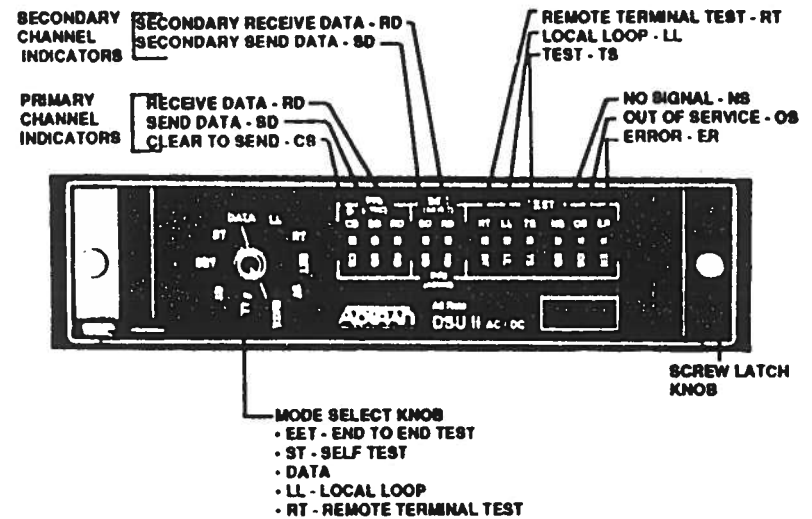


FIGURE 4.1—FRONT PANEL

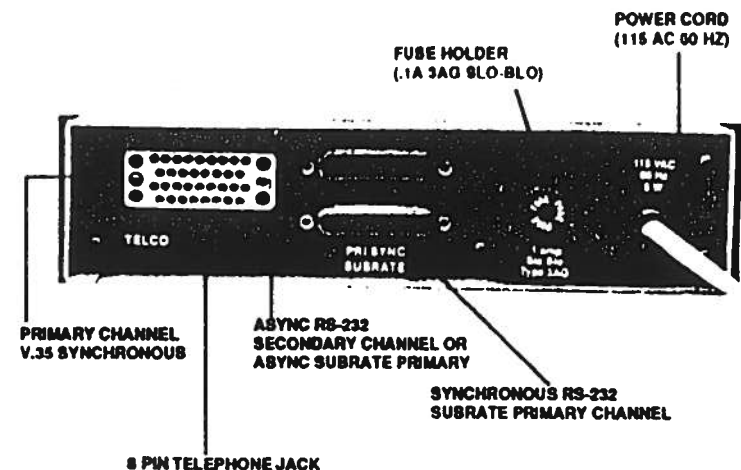


FIGURE 4.2—REAR PANEL

4.1 INDICATORS

The unit's status along with primary and secondary channel activity is displayed via front panel LED indicators as shown in Table Q.

INDICATORS	FUNCTION
PRI CS	Illuminates when primary DSU is clear-to-send.
PRI SD	Illuminates when primary data is being transmitted.
PRI RD	Illuminates when primary data is being received.
SEC SD	Illuminates when secondary data is being transmitted.
SEC RD	Illuminates when secondary data is being received.
RT	Illuminates when the unit is in RT and EET test, - Flashes when the other end is performing EET.
LL	Illuminates when the unit is in Local Line test or Self Test.
TS	Illuminates in all test modes except network activated channel loopback (sealing current reversal)
NS	In Non-Secondary Channel Mode of Operation: Illuminates when loss of line signal is detected, - Flashes when abnormal station code is detected
OS	In Secondary Channel Mode of Operation: - Flashes when loss of line synchronization is detected.
ER	Illuminates anytime a receive path error is detected.

TABLE Q—Indicators and Function

Initial indicator activity with DTEs connected and power applied to both local and remote equipment:

- SD indicators OFF — No data for the local DTEs.
- RD indicators OFF — No data from the remote DTEs.
- NS, OS indicators OFF — Synchronized signal present on the DDS line.

When local DTE RTS is on or RTS is selected PERMANENT by SW4, CTS on the local DSU-II will also be illuminated.

4.2 LOOPBACK TESTING

The front panel 5-position rotary switch (SW1) allows the user to perform manual loopback testing. The DDS/SC network test center can also perform loopback testing with the DSU-II rotary switch in the "Data" position.

If the option switch SW4, position 3, is selected, the front panel rotary switch is disabled and none of the following tests can be manually initiated from the DSU-II.

4.2.1 LOCAL LINE (LL) TEST

The configuration in Figure 4.3 is implemented when the rotary switch is placed in the "LL" position. This loopback can also be initiated by the DDS/SC test center (CSU or Channel Loopback), provided that the rotary switch is in the Data position.

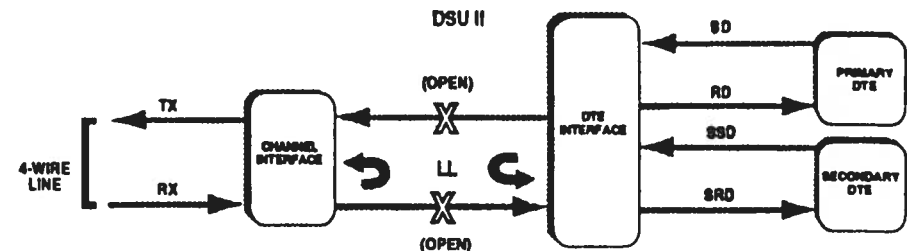


FIGURE 4.3—LOCAL LINE (LL) LOOPBACK

A DC sealing current in the range of 4 to 20 ma. is accepted by the DSU-II. Reversal of the sealing current is used by the DDS/SC test center to remotely activate the LL test. When the test is activated, the "LL" indicator should be ON.

4.2.2 REMOTE TERMINAL (RT) TEST

The configuration in Figure 4.4 is implemented when the rotary switch is placed in the "RT" position. This loopback can also be initiated by the DDS/SC network test center,

(DSU Loopback), provided that the rotary switch is in the data position. Normal loopback codes activate DSU loopback at all rates except 64 kb/s, which is activated by latching loopback code. When the test is activated, the "RT" indicator should be ON.

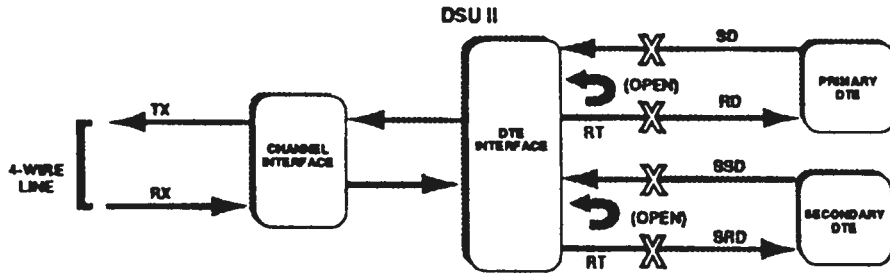


FIGURE 4.4—REMOTE TERMINAL (RT) LOOPBACK

4.2.3 SELF-TEST (ST)

The configuration in Figure 4.5 is implemented when the rotary switch is placed in the "ST" position. This test can be conducted with the DSU-II disconnected from the line and the DTEs.

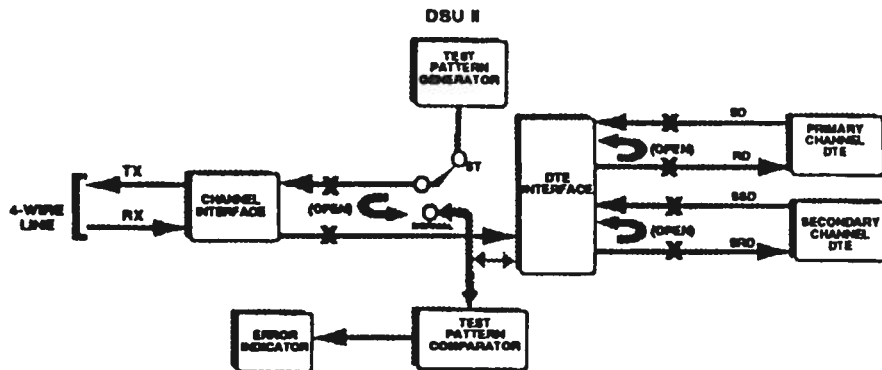


FIGURE 4.5—SELF-TEST

The "TS," "ER," and "LL" indicators signal the progress of the test as follows:

- "TS" and "LL" ON — Test in progress
 - "ER" ON or flashing — Test fails*
 - "ER" Extinguished — Test passes
- * Upon entering the test, the "ER" indicator will flash once.

4.2.4 END-TO-END TEST

This test is only applicable in point-to-point configurations and is activated only by placing the rotary switch in position "EET." The far-end must be set in the "Data" position. Figure 4.6 illustrates the configuration implemented.

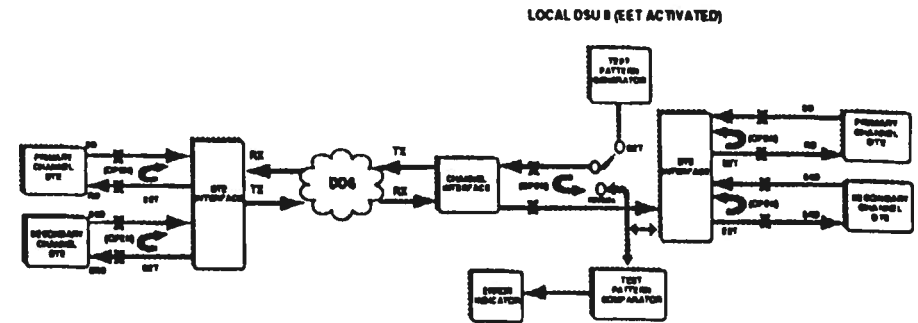


FIGURE 4.6—END-TO-END TEST

The DTEs at both local and remote ends are interrupted. The "TS" indicator on the local and remote DSU-II is illuminated ("RT" flashing at the remote). Progress of the test is indicated at the local DSU-II as follows:

- "ER" ON or flashing — Test fails
- "ER" Extinguished — Test passes

5. TROUBLESHOOTING

5.1 TROUBLESHOOTING PROCEDURES

Table R correlates symptoms, causes and recommended operator actions for various types of malfunctions. The table aids in determining whether a problem exists with the DSU-II, the DTE, or four-wire facility.

TABLE R — DSU II TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	OPERATIONS
When the DSU II is plugged into an appropriate source of power all LED's are off	Ac Power Source	Check source of power.
	Blown Fuse	Check fuse on rear of unit. Replace if necessary with a .1A Type 3AG Slo-Blo fuse
Red RT LED indicator is ON	FP Rotary switch is set to RT	Set switch to "DATA" position.
	DDS/SC office is performing RT	Check with DDS/SC office.
Red LL LED indicator is ON	FP Rotary switch is set to LL	Set switch to "DATA" position
	DDS/SC Office is performing loop tests	Check with DDS/SC Office.
	Tx pair interchanged with Rx pair at customer premises.	Correct connection at DDS/SC Office input to customer premises
Red NS LED illuminated on power-up or a failure	4-wire loop disconnected.	Check 4-wire loop
Red OS LED illuminates in secondary channel operations	DSU clock option incorrectly set.	Check clock options Table J.
	Defective line	Check with DDS/SC Office.
Yellow TST LED indicator is ON	FP Rotary Switch is set to ST or EET	Set switch to "DATA" position
Red ER LED indicator is "ON" (Data errors in operations)	Local or Remote DSU II defective.	Self-Test (ST).
	Defective line	End-To-end Test (EET). Check with DDS/SC Office.
TS and ER LED's flashing "ON" and "OFF"	Disallowed option setting.	Re-check option settings.

5.2 PROCEDURE FOR ASSISTANCE

If a malfunction has occurred in the DSU II, follow the Repair and Return Policy/Procedure provided in Appendix 3, Page A-7.

APPENDIX 1: DSU RACK DESCRIPTION

The ADTRAN DSU Rack is ideal for applications requiring several DSU II's centrally located. The DSU Rack houses up to eight ADTRAN DSU II circuit packs and can be mounted into either a 19 inch or 23 inch bay. Figure A1.1 shows a frontal view of the ADTRAN DSU Rack fully loaded with eight DSU II circuit packs.

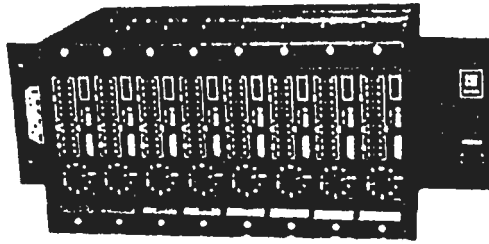


FIGURE A1.1—
ADTRAN DSU Rack containing DSU II circuit packs

The product is available as a 115V AC powered rack (Part No. 1150008AC) as shown from the rear in Figure A1.2; or a -48 V DC powered rack (Part No. 1150008DC), as shown from the rear in Figure A1.3.

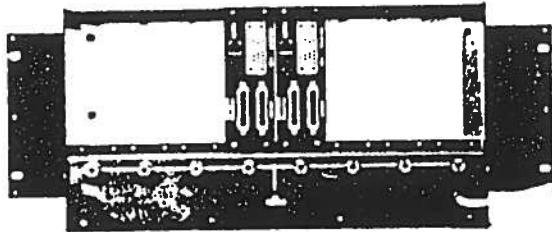


FIGURE A1.2—Rear view of ADTRAN AC Powered DSU Rack

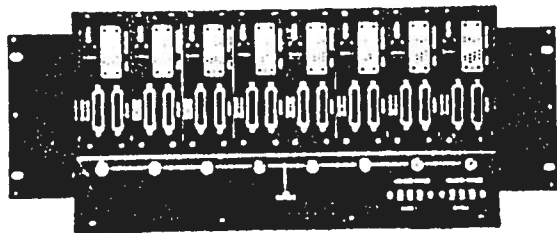


FIGURE A1.3—Rear view of ADTRAN DC Powered DSU Rack

Each rack mounted DSU II card is equipped with a small piggyback mounted Power Option Card. This card contains two sets of jumper options; the right hand (from the front) set of options configures the DSU card for incoming DC power. The left hand set of jumpers configure the DSU card for incoming AC power. The factory set default for all rack mounted DSU II cards is with the jumpers set in the DC (right side) power position. Figure A1.4 shows the position of the Power Option Card configured in the Default position.

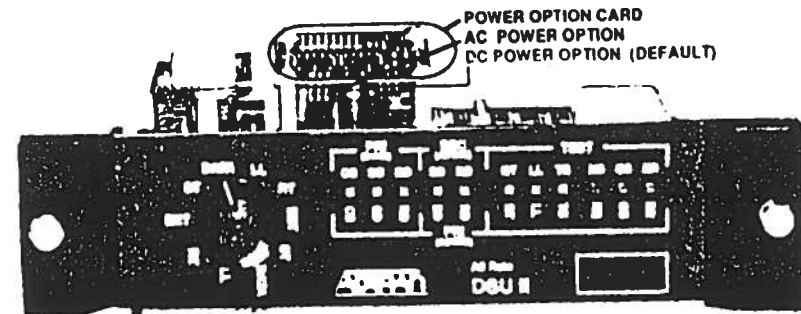


FIGURE A1.4—DSU II Card with Power Option Card mounted in Default setting.

NOTES:

1. Plugging an AC configured DSU II card into a DC rack or vice versa, will not adversely affect the circuit card but the card will not function. The Power Option Card must be configured for the correct power type (AC/DC) for the circuit to function properly.
2. A rack mounted DSU II card, with the Power Option Card configured for AC operation, may be removed from the rack and placed in a stand-alone housing for use at remote locations.

APPENDIX 2: NOTICE TO USERS ON PUBLIC DOMAIN DATAPHONE SERVICE

The following instructions are provided to ensure that you Comply with the Federal Communications Commission (FCC) Rules, Part 68.

1. All direct connections to the DDS lines must be made through standard plugs and jacks furnished by the Telephone Company. No connections can be made to party lines or coin lines. Before connecting your unit, you must do the following:
 - * Tell the Telephone Company that you have an FCC registered device that you wish to connect to the company's phone lines. Provide the 14-digit FCC registration number listed on the label. The Telephone Company will also need to know the facility interface code and service code in order to connect the necessary service. For this unit, the facility interface code will be 04DU524, 04DU5-48, 04DU5-96, and 04DU5-56, for 2.4, 4.8, 9.6 and 56 kb/s service, respectively. The service code is 6.0Y.
 - * Inform The Telephone Company of the jack arrangement you want to use, which will be RJ48S or RJ48T.
 - * After The Telephone Company has installed the requested jack, you can connect the CSU-DSU with the appropriate cable.
2. If the unit appears to be malfunctioning, it should be disconnected from the telephone line until you learn if your equipment or the telephone line is the source of the trouble. If your equipment needs repair, it should not be reconnected until it is repaired.
3. The CSU/DSU has been designed to prevent harm to the DDS network. If the Telephone Company finds that the equipment is exceeding tolerance parameters, the Telephone Company can temporarily disconnect service, although they will attempt to give you advance notice if possible.
4. Under the FCC Rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.
5. If the Telephone Company alters their equipment or operations in a manner that will affect the use of this device, they must give you advance warning so as to give you the opportunity for uninterrupted service.

6. In the event of equipment malfunction, all repairs should be performed by ADTRAN or authorized agent. It is the responsibility of the users requiring service to report the need for service to ADTRAN or to one of our authorized agents. Service can be obtained at:

ADTRAN
4955 Corporate Drive
Huntsville, AL 35805

Phone: (205) 837-7800
(800) 726-8663

agents or customers harmless from liability as finally determined by a court of competent jurisdiction, for such infringement, provided that Buyer gives ADTRAN notice promptly of such claim, suit or action, and shall have given ADTRAN full and exclusive control of the defense thereof, and that ADTRAN shall have given sole right to settle or compromise such claim, suit or action.

In the event of a claim, suit or action against ADTRAN alleging infringement by the use of any such equipment or documentation, furnished under this Agreement, in combination with other articles or in carrying out any process covered by a patent owned or controlled by any other person, in which independent use of the equipment under this Agreement would not be an infringement. Buyer shall save ADTRAN harmless from liability, as finally determined by a court of competent jurisdiction, for such infringement, provided that ADTRAN shall have given Buyer full and exclusive control of the defense thereof, and that Buyer shall have the sole right to settle claim, suit or action.

Except as herein provided in this indemnity paragraph, neither Buyer nor ADTRAN makes any warranty to the other with respect to any claim, suit or action of any third party by way of infringement and neither party shall be responsible to the other for any loss, cost or damages consequential or otherwise, that may be suffered by the other as a result of any such claim, suit or action.

REPAIR AND RETURN POLICY AND PROCEDURE

GENERAL: Repair of all defective or malfunctioning equipment by ADTRAN will be made at ADTRAN, Huntsville, Alabama. All inquiries, correspondence and returned equipment shall be addressed to:

ADTRAN
4955 Corporate Drive
Huntsville, AL 35805

Telephone inquiries shall be made to:

ADTRAN Customer Service
(205) 837-7800
1-(800)-726-8663

POLICY: All returned equipment, both in-warranty and out-of-warranty, shall be forwarded freight prepaid. ADTRAN will return equipment at its expense utilizing surface shipping carriers. Other means of express shipment will be made at Buyer's request. The cost of shipping shall be paid by Buyer if express shipment is requested.

Repair work made on equipment is guaranteed for one (1) year from date of shipment is requested.

Equipment received for repair will normally be shipped back to Buyer within ten (10) working days.

REPAIR CHARGES: In-warranty repairs will be made at no charge to the Buyer provided that failure is not due to misuse or mishandling. Repair charges for damaged equipment will be quoted to the Buyer and Buyer's acceptance of these charges is necessary before repairs will be made. In-warranty equipment returned for repair but found not to be defective or malfunctioning shall be subject to a handling and testing charge of \$25.

Out-of-warranty repairs will be made at a cost of \$25 plus 10% of the original sell price provided that failure is not due to misuse or mishandling. Repair charges for damaged equipment will be quoted to the Buyer and Buyer's acceptance of these charges is necessary before repairs will be made.

RETURNED MATERIALS PROCEDURE:

1. Request a RETURN MATERIAL AUTHORIZATION NUMBER (RMA) by contacting the ADTRAN Customer Service Department. Provide total quantity of each model to be returned.
2. Return equipment to ADTRAN showing RMA number on the outer shipping label.
3. Provide return shipping address, list of items returned by model number and serial number, and RMA number on repair debit memo or purchase order.