

WESCOM DUALINE PLUS
DIGITAL SINGLE SUBSCRIBER CARRIER SYSTEM
DDL 391 DUALINE PLUS LINE UNIT

1 GENERAL

1.01 This section is a cover sheet for the Wescom Dualine Plus DDL 391 Line Unit for use in the AML-II or AML-III central office terminal shelf. This section is copyrighted and reproduced with the permission of Charles Industries.

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

1.03 The Wescom Dualine Plus System is a general purpose digital single subscriber carrier (DSSC) system that provides pair gain capability over a non-loaded, two wire, copper facility.

The Dualine Plus requires installation of a central office terminal and a field module, located at or near the subscriber premise.

1.04 Associated practices for installation and maintenance of the system are:

<u>Section</u>	<u>Title</u>
363-400-800SW	System Overview
502-204-800SW	DDL 102 Dualine Plus Remote Terminal
502-204-801SW	DDL 104 Dualine Plus Remote Terminal
502-204-802SW	DDL 112 Dualine Plus Remote Terminal
363-400-801SW	DDL 201 Dualine Plus Central Office Terminal Shelf (23 inches)
363-400-802SW	DDL 210 Dualine Plus Central Office Terminal (COT) Power Unit
363-400-803SW	DDL 221 Dualine Plus Central Office Terminal (COT) Common Unit
363-400-804SW	DDL 230 Dualine Plus Central Office Terminal (COT) Line Unit
502-204-803SW	DDL 190 Dualine Plus Remote Terminal Simulator
502-204-804SW	Digital Signal Trak-A-Tone Model 92-5

1.05 If corrections are required in the attached document, use Form-3973 as described in Section 000-010-015.

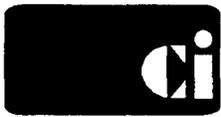
1.06 If manufacturing and/or design problems are encountered, refer to Section SW 010-522-906 for procedures on filing an Engineering Complaint.

2 ORDERING PROCEDURES

2.01 Components of the Dualine Plus System may be ordered via the Southwestern Inventory Management System (SWIMS).

2.02 To order additional copies of this practice, use WSCM 363-400-805SW.

PROPRIETARY
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Wescom® DDL391 DualLine Plus™ Line Unit

CLEI™ Code: Pending

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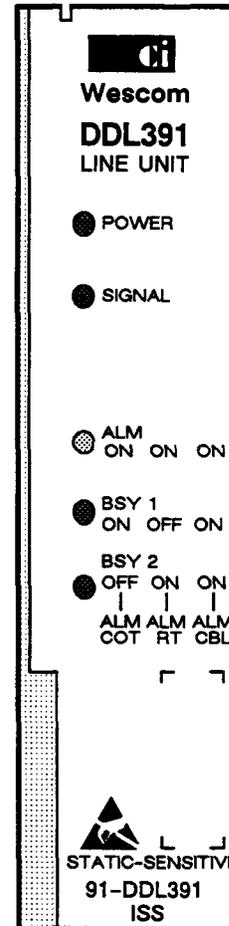


Figure 1. DDL391 Line Unit

1. GENERAL

1.01 This practice provides a general description of the Wescom® DDL391 DualLine Plus Line Unit. The DDL391 Line Unit, depicted in Figure 1, occupies one position of an AML-II® or AML-III® shelf.

1.02 Whenever this practice is reissued or reprinted, the reason will be stated in this paragraph.

1.03 The DDL391 Line Unit, an addition to the DualLine Plus family, provides an interface between 2 CO POTS lines and a 2-wire Digital Subscriber Line (DSL). Refer to Section DDL-001-100 for the general description and features of the DualLine Plus System.

2. APPLICATION GUIDELINES

2.01 The Wescom DDL391 DualLine Plus Line Unit connects 2 CO POTS lines to a Digital Subscriber Line (DSL). A DualLine Plus Remote Terminal (RT),

located near a subscriber's location, converts the DSL into 2 POTS lines for a subscriber's telephones (see Figure 2). Refer to Section 11 for information regarding the 2-wire range, DC supervisory range, Digital Subscriber Line impedance, etc.

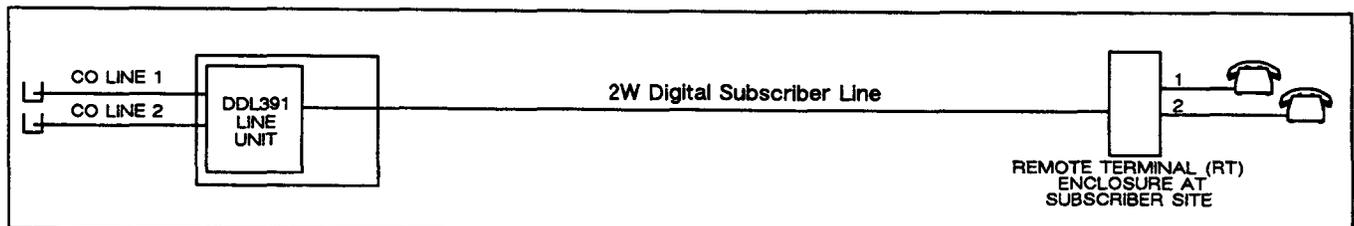


Figure 2. DualLine Plus System Configuration

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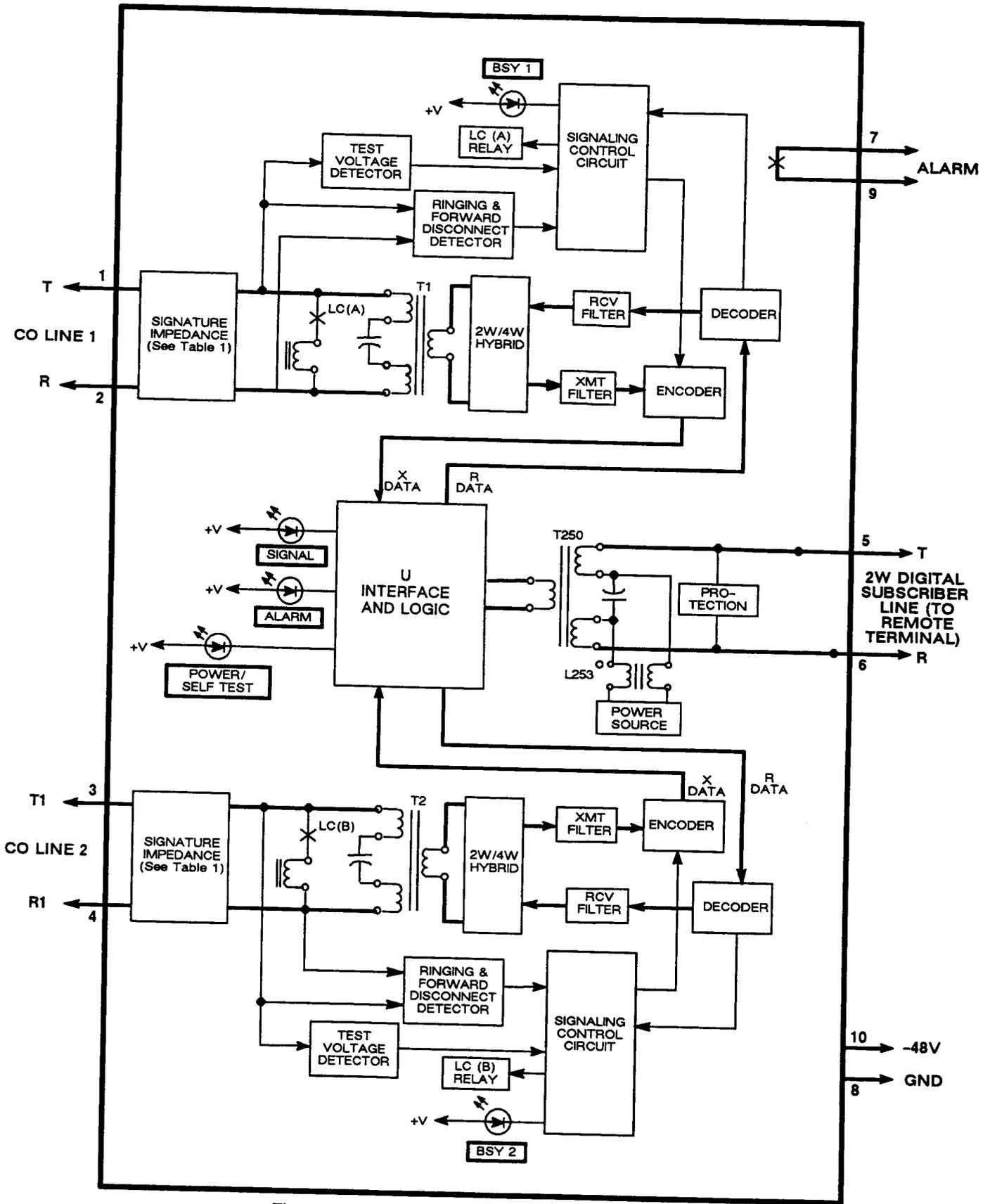


Figure 3. The DDL391 Line Unit Block Diagram

SYSTEM STATUS	IMPEDANCE SIGNATURE		
	TIP-RING	TIP-GRD	RING-GRD
SYSTEM OK	200K	188K	388K
RT FAILURE	171K	162K	280K
COT FAILURE	155K	148K	218K
DSL CABLE FAILURE	144K	139K	179K

Table 1. DDL391 Line Unit Impedance Signatures

3. CIRCUIT DESCRIPTION

3.01 The Wescom DDL391 Line Unit contains circuitry to interface two POTS CO lines to the Digital Subscriber Line. Refer to Figure 3 for the Block Diagram of the DDL391 Line Unit.

3.02 The DDL391 Line Unit provides power to the Remote Terminal over the Digital Subscriber Line. Line power is reduced during periods of low power consumption (idle intervals) and is increased as required during busy and ringing conditions. The Line Unit also provides Signature Impedances for system testing (See Table 1).

3.03 The Wescom DDL391 Line Unit provides front panel LEDs for the following functions:

POWER LED (Green)

(a) The POWER LED lights when -48Vdc is applied to the DDL391 and all internal self-tests were completed successfully. The POWER LED will flash on and off when any of the self-tests fails.

SIGNAL LED (Green)

(b) The SIGNAL LED lights when there is synchronization between the DDL391 and a DualLine Plus Remote Terminal.

ALM LED (Yellow)

(c) The ALM (Alarm) LED lights when there is an open, short or loss of signal on the Digital Subscriber Line. The ALM LED, in conjunction with the BSY 1 and BSY 2 LEDs, provide the alarm indications noted in Table 2. These indications are also present on the POTS Line interface as Impedance Signatures (refer to Table 1). During any alarm condition, the alarm relay is closed. Refer to Paragraph 3.05.

BSY (Busy) 1 and BSY (Busy) 2 LEDs (Green)

(d) The BSY 1 and BSY 2 LEDs will light to indicate an off-hook condition on the corresponding line and will flash during the ringing period of the ring cycle.

LEDs			TROUBLE INDICATION
ALM	BSY 1	BSY 2	
ON	ON	OFF	COT (CENTRAL OFFICE TERMINAL) ALARM
ON	OFF	ON	RT (REMOTE TERMINAL) ALARM
ON	ON	ON	CBL (Digital Subscriber Line) ALARM

Table 2. COT Line Unit Front-Panel Alarm Indications

3.04 The DDL391 Line Unit will detect and repeat ringing frequencies and cadences from the Central Office switch. The ringing frequency and cadence information is transmitted to the Remote Terminal (RT). All DualLine Plus RTs can duplicate the ringing cadence. Certain RTs can duplicate the ringing frequency as well as the ringing cadence. Refer to Section 11 for information regarding ringing frequency detection ranges.

CAUTION

Hazardous voltages exist on the Digital Subscriber Line (DSL). Always exercise caution when performing maintenance or testing a live circuit.

Alarm Contacts

3.05 The Wescom DualLine Plus contains an alarm relay. This relay provides a contact closure between pins 7 and 9 during any failure state. This contact can be connected to external alarm indicators.

4. INSPECTION

4.01 Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

4.02 Wescom equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by one number on any subsequent models that are manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

4.03 Each module is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved

static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling modules outside of their protective packaging. A module intended for future use should be tested as soon as possible and returned to its original protective packaging for storage.

CAUTION

This equipment contains sensitive electronic devices. Do not ship or store modules near strong electrostatic, electromagnetic or magnetic fields. Also, make sure to use the original static-protective packaging for shipping or storage.

5. MOUNTING

5.01 Wescom DDL391 Line Unit mounts in one position of the an AML II or AML III shelf. See Figure 4.

CAUTION

Installation and removal of channel units should be done with care. Use static-preventive measures when handling. Do not force a unit into place. If excessive resistance is encountered during installation, remove the unit and check the card guides and connector to verify proper alignment and the absence of foreign material.

6. INSTALLER CONNECTIONS

6.01 No installer connections are required for the DDL391 Line Unit. All connections are provided via the card-edge connector on the shelf. See Table 3.

6.02 The shelf must provide 48Vdc at 0.25 amps for each DDL391 installed. A fully equipped 19-inch or 23-inch shelf should be fused at 5.0 amps.

PIN NUMBER	SIGNAL
1	CO Line 1 Tip
2	CO Line 1 Ring
3	CO Line 2 Tip
4	CO Line 2 Ring
5	DSL Tip
6	DSL Ring
7	Alarm Contact
8	Ground
9	Alarm Contact
10	-48V

Table 3. DDL391 Line Unit Pin Numbers

7. OPTIONS

7.01 The DDL391 is equipped with a 3-section DIP switch, to condition the module for proper operation and application. Refer to Figure 5 for the location of these options while reading the following optioning instructions.

Slide Switch S1-1, Negative Power To DSL During Idle Condition

7.02 Place S1-1 in the ON position to apply negative voltages only (-130V & GND maximum) to the DSL during low power (idle) periods. Place S1-1 in the OFF position to apply negative and positive voltages (+50 & -80V maximum) to the DSL during low power (idle) periods.

Slide Switch S1-2 and S1-3

7.03 No current function. Reserved for future use.

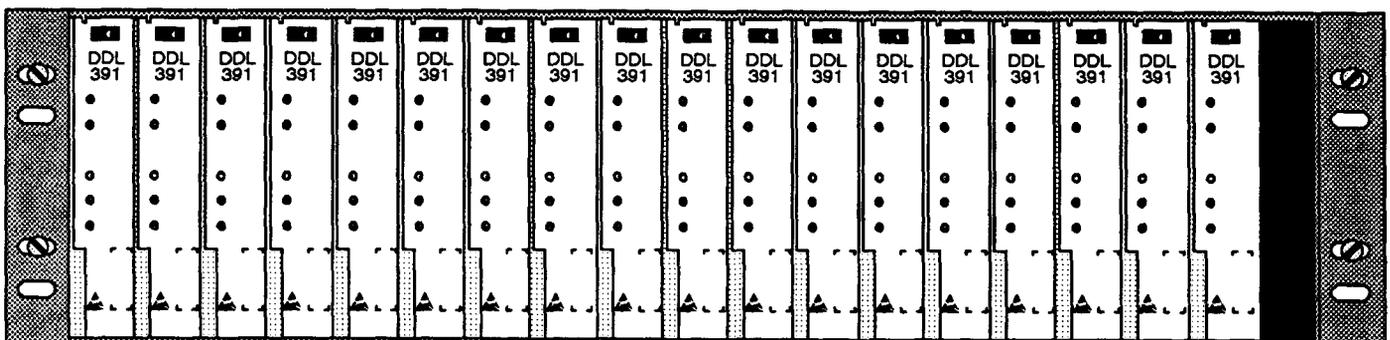


Figure 4. Shelf Showing DDL391 Line Unit Mounting

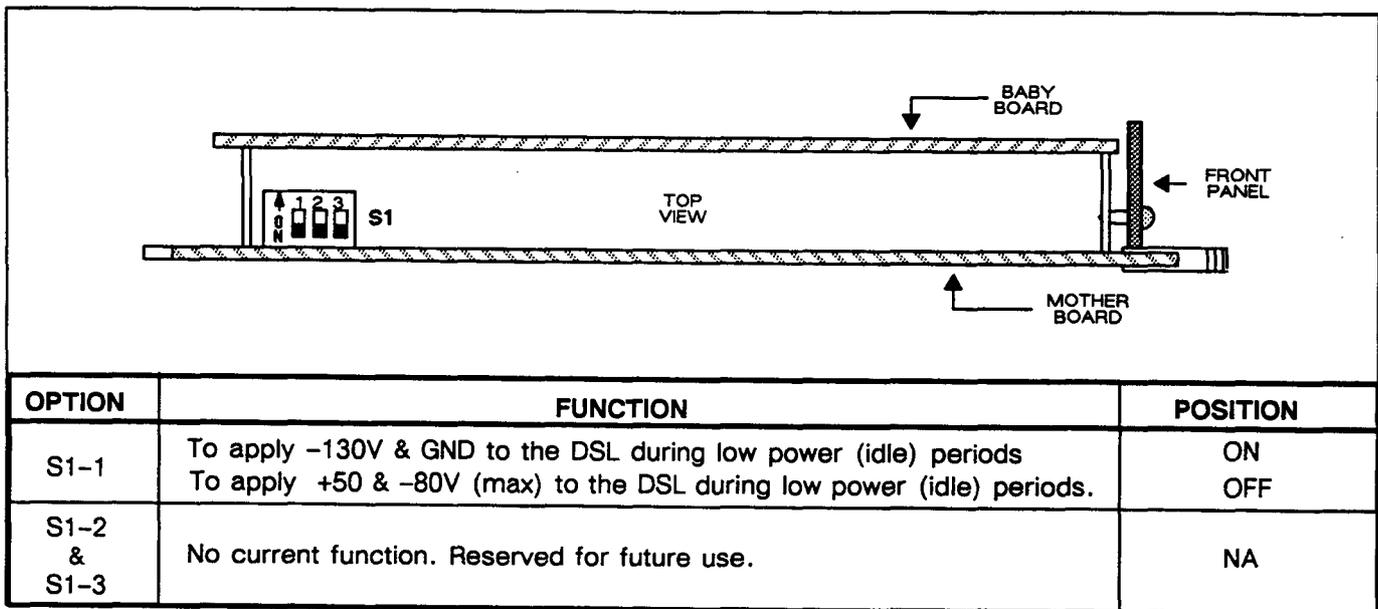


Figure 5. DDL391 Option Locations And Summary

8. INSTALLATION/TEST

8.01 Insert and seat the DDL391 Line Unit (LU) into the shelf per the facility plan. All the front panel LEDs should light. After 1 second, all LEDs will extinguish. The *POWER* LED will immediately relight. The DDL 390 then performs a self-test. If the self-test fails, the *POWER* LED will flash. If the *POWER* LED flashes or does not light at all, replace the DDL391. After 30 seconds, the *SIGNAL* LED will light if the DDL391 LU has synchronized with a DualLine Plus Remote Terminal.

9. TECHNICAL ASSISTANCE

9.01 If technical assistance is required, contact Charles Industries, Ltd. Technical Services Department at:

Charles Industries - Wescom
5600 Apollo Drive
Rolling Meadows, Illinois 60008
Telephone: (708) 806-6300 (Main)
(708) 806-8500 (Tech Service)
(708) 806-6231 (FAX)

9.02 Canadian customers call (416) 821-7673 for technical assistance. After October 1993, use area code 905 in place of area code 416.

10. WARRANTY AND CUSTOMER SERVICE

10.01 Wescom offers an industry-leading, 5-year warranty on products manufactured by Wescom. Contact your local Sales Engineer for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

10.02 Field repairs involving the replacement of components within a unit are not recommended. If a unit is in need of repair, contact Wescom by telephone, letter, or FAX for instructions regarding replacement or repair.

10.03 If a replacement is required, it will be shipped in the fastest manner consistent with the urgency of the situation. Upon receipt of the replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided.

Repair or Exchange Services

10.04 Wescom offers a repair or exchange service for those units out of warranty. Under this arrangement, out-of-service units may be shipped to Wescom and either completely repaired and quality-tested or exchanged for a replacement unit. To obtain details of this service and a schedule of prices, contact your local Sales Engineer.

11. SPECIFICATIONS

11.01 The electrical and physical characteristics of the DDL391 Line Unit are as follows:

Electrical

- (a) SYSTEM LOSS IN EACH DIRECTION OF TRANSMISSION: 3.5 ±0.5dB nominal.
- (b) FREQUENCY RESPONSE: The loss relative to 1004Hz with 0dBmO input signal:

FREQUENCY	MINIMUM LOSS	MAXIMUM LOSS
300 Hz	0.0 dB	+3.0 dB
400 Hz to 3000 Hz	-0.5 dB	+1.0 dB
3200 Hz	-0.5 dB	+1.5 dB
3400 Hz	0.0 dB	+3.0 dB

- (c) IDLE CHANNEL NOISE AT THE OUTPUT OF THE LINE UNIT: 20dBmC maximum.
- (d) CHANNEL CROSSTALK: With 0dBmO single frequency input signals between 200 and 3400Hz applied to any line, the C-message weighted total output of any line at the Line Unit in the 200 and 3400Hz frequency band is less than -65dBmO.
- (e) RANGE OF THE DIGITAL SUBSCRIBER LINE: Line length equal to or less than 1300 ohms or 42dB loss at 40kHz with no load coils.

- (f) DIGITAL SUBSCRIBER LINE IMPEDANCE: 135 ohms.
- (g) VOLTAGE AND CURRENT LIMITATIONS: Idle condition, A2 limitations (±80V Tip to Ground/Ring to Ground); Busy condition, A3 limitations (±140V Tip to Ground/Ring to Ground).
- (h) RINGING DETECTOR SENSITIVITY AT 16 2/3Hz TO 66 2/3Hz (sinewave): 60Vrms minimum.
- (i) OFFICE SIDE LOOP CLOSURE RESISTANCE: 1000 ohms typically at 23mA. 1400 ohms maximum at 15mA.
- (j) RETURN LOSS (Ref: 900 ohms + 2.16 µF): ERL> 18dB; SRL> 10dB.
- (k) POWER REQUIREMENT: 0.25 amps maximum at 48Vdc.

Physical

- (l) OPERATING ENVIRONMENT: Temperature, 32° to 122°F (0° to 50°C).
- (m) WEIGHT: 18 oz. (509 g), nominal.
- (n) DIMENSIONS: Height, 4.75 in (12 cm); width, 1.02 in (2.6 cm); depth, 9.45 in (24.0 cm).
- (o) MOUNTING: Mounts in one position of a AML-II or AML-III shelf.