

# Westell INTELIPORT + Dual Powered 2W/4W Data Station Termination Model SDS5496LN (Issue 4)

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CONTENTS	PAGE #
1. GENERAL .....	1
2. APPLICATIONS .....	2
3. CIRCUIT/FUNCTIONAL DESCRIPTION .....	3
4. SWITCH OPTIONS .....	6
5. INSTALLATION .....	8
6. ALIGNMENT .....	9
7. MAINTENANCE TESTING .....	11
8. TESTING & TROUBLESHOOTING .....	19
9. CUSTOMER & TECHNICAL SERVICES .....	20
10. WARRANTY & REPAIRS .....	20
11. SPECIFICATIONS .....	20

## 1. GENERAL

### 1.1 Document Purpose

This document describes Westell's INTELIPORT+ Dual Powered 2W/4W Data Station Termination Model SDS5496LN Issue 4, shown in Figure 1.

- NOTE -

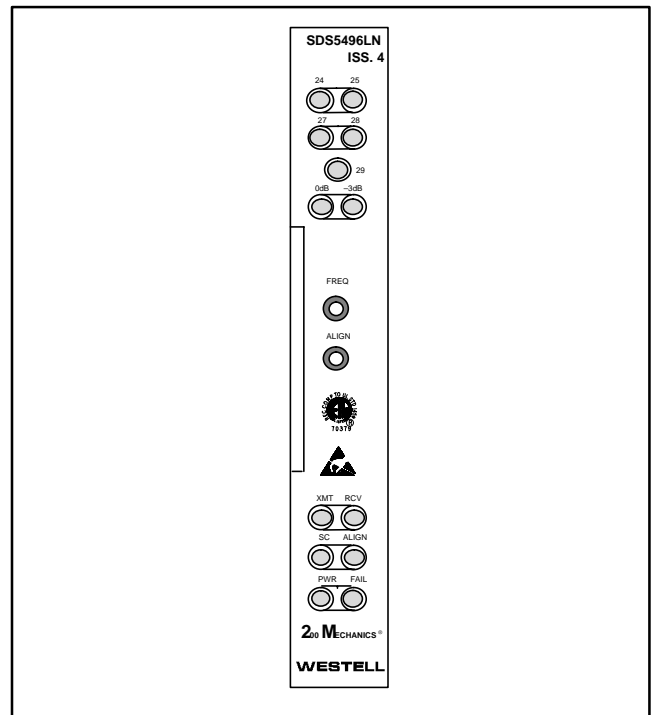
*Hereafter, the INTELIPORT + Dual Powered 2W/4W Data Station Termination Model SDS5496LN Issue 4 will be referred to as the "SDS5496LN" or as the "INTELIPORT."*

### 1.2 Document Status

Issue 4 of this product enhances product alignment. Issue 3 version of the SDS5496LN replaces Issue 2 and changes the unit to 200 Mechanics®. Revision A of this practice replaces the 057-021100 with 030-101466 and updates the company contact information. Whenever this practice is updated, the reason will be stated in this paragraph.

### 1.3 Product Purpose and Description

Westell's Dual Powered 2W/4W Data Station Termination module, Model SDS5496LN, provides an interface between a 4-wire facility and a 600-ohm, 2W or 4W data modem. The SDS5496LN provides all the functions of a standard DST but with additional features. One of the unique features of Westell's



**Figure 1. Front View of SDS5496LN**

SDS5496LN is its ability to be used in standard DST applications, FAA applications and/or Power Company (or other utility-type) applications. The SDS5496LN can be either line powered via the simplex leads or locally powered from an external power source. The SDS5496LN contains an on-board microprocessor and precision oscillator circuit. These circuits allow comprehensive alignment and testing of INTELIPORT when activated from a Serving Test Center (STC).

### 1.4 Product Features

- 200 Mechanics® high density design
- Operates in 2W or 4W applications
- Terminating impedance option of 150, 600, or 1200 Ohms (switch-selectable)
- Sealing Current optioning for TERM and SUPPLY -(LOCAL POWERED ONLY)

- Unit ID tone (alternating 2814 Hz/1814 Hz)
- Command Mode/Loopback activation:
  - 2713 Hz is the default
  - 2413 Hz, 2513 Hz, 2813 Hz 2913 Hz selectable via the front-panel push button or remotely with tones
- Customer Demarc level selection of 0.0 RCV/0.0 XMT (TLP) or -3 RCV/+13 XMT (TLP)
- Remote Alignment capability
- Automatic Alignment capability; Activated via the front-panel TEST switch only
- Capable of aligning the circuit with respect to TLP (Transmission Level Point) or DLP (Data Level Point).
- Automatically adjusts amplitude response characteristics (up to 15.3 dB, referenced at 1004 Hz) to meet C5 conditioning requirements
- Adjustable XMT OUT Level in 0.5 dB (gain/loss) increments
- Full-Range Transponder with quiet termination
- Non-volatile memory retains programmed information in the event of power loss
- Mounts in one position of a Westell Type 550 mounting (Type-400 equivalent mounting)
- Operates via simplex current (line powered) or from an external power source of -22 to -56 Vdc or 20 to 28 Vac
- 7-year warranty

## 2. APPLICATIONS

The SDS5496LN provides an interface between a 4-wire facility and a 600-ohm 2W or 4W data modem. The SDS5496LN is normally located on the same premises as the modem. The integral microprocessor circuit controls all functions of the unit. The precision oscillator circuit generates test tones during testing and alignment.

The SDS5496LN can be configured to meet the frequency and level requirements of a DST used in FAA applications, as a standard DST used in normal data circuit designs, or Power

Company (or other utility-type) applications. The operating mode of the DST is changed from the front panel FREQ/LVL selection recessed push button or remotely from the command mode via tone commands.

### 2.1 Command Mode

The command mode is the operational state in which INTELI-PORT monitors its transmission paths for incoming frequencies and interprets these frequencies as commands to carry out specific functions. The command mode is factory-conditioned to activate upon receiving 2713 Hz for greater than 30 seconds. INTELI-PORT, upon receiving 2713 Hz for greater than 1.5 seconds returns a 1-second Unit ID tone of alternating 2814 Hz/1814 Hz. From this point, if the 2713 Hz tone is received for greater than 30 seconds, INTELI-PORT returns a steady 1014 Hz tone indicating command mode initiation. If the tone is removed in less than 30 seconds, INTELI-PORT enters loopback.

- NOTE -

*The tone used to activate the command mode is the same tone used to activate the loopback circuit. The only difference is the time frame in which the tone is sent; tone applied for greater than 30 seconds activates command mode. Tone applied for less than 30 seconds activates loopback.*

Once the command mode is activated, the test person can change the operating mode of the SDS 5496LN to other loopback/activation frequencies for different types of applications, such as:

- 2713 Hz for Standard DST Applications;
- 2413 Hz for FAA Applications; or
- 2513, 2813, 2913 Hz for Power Co. or Other Utility-Type Application

The release to idle tone is the programmed XX13 Hz. The release tone must be detected for greater than 0.9 seconds.

### 2.2 Operating Levels

Once the command mode is activated, the test person can change the equipment side levels of the unit to meet the customer interface levels independent of the loopback/activation frequency selected. The default level is -3.0 RCV/+13.0 XMT (TLP). The unit can be optioned for 0.0 RCV/0.0 XMT (TLP) interface levels from the front panel switch or remotely via tone commands.

The operating levels for the different operating modes the SDS5496LN are listed in Table 1.

PORT	LEVELS (IN DBM)			
	-3.0/+13.0 TLP Standard Operating Levels		0.0/0.0 TLP FAA, Other Operating Levels	
PORT	TLP	DLP	TLP	DLP
RCV IN	+5 to -10 (TLP) or -8 to -23 (DLP) For all operating modes			
RCV OUT	-3	-16	0	-13
XMT IN	+13	0	0	0
XMT OUT	+5	-8	+5	-8

\*The XMT OUT level can be remotely adjusted for any level from +7 to -16 dBm (TLP) or -6 to -29 dBm (DLP).

**Table 1. Operating Levels**

### 2.3 XMT OUT Level Adjust

The level at the Transmit Out port can be remotely adjusted to accommodate any level from +7 to -16 dBm. The XMT OUT level is adjusted by adding either gain or loss in 0.5dB increments or can be set to achieve a -16 dBm level. See paragraph 6.9 for more details on XMT OUT Level Adjust.

### 2.4 Dual Powering

The dual powering feature of Westell's SDS5496LN allows the unit to operate from either the Serving Office sealing current source or from a local external power source. This feature is especially useful when local power is either missing or has been interrupted for whatever reason. The SDS5496LN automatically switches over to operate via the Line Powering option if local power ever becomes absent. The unit maintains full functionality during maintenance testing, regardless of the powering option used. When both local and line power is present, the SDS5496LN will always operate from local power as its first choice. In this case, the internal sealing current circuit provides a termination for sealing current when supplied from the distant end.

### 2.5 Alignment

The SDS5496LN features both remote and automatic alignment capability. A test person located at the test center can align the circuit to either three tones or four tones.

- NOTE -

*The 4-tone alignment allows for a more accurate alignment when interfacing long sections of loaded cable or a mixture of loaded and non-loaded cable facilities). Refer to paragraph 6 for details on circuit alignment.*

## 3. CIRCUIT/FUNCTIONAL DESCRIPTION

Refer to Figure 2, SDS5496LN (Issue 4) Block Diagram, as needed, while reading this section.

### 3.1 Front-Panel LED Status Indicators

The INTELIPORT front panel contains LEDs that provide a quick visual indication of the unit's status and operating mode. Table 2 describes each LED and gives a summary of the LED function.

- 24, 25, 27, 28, 29, 30, 0dB, and -3dB  
Indicate operating frequency and interface levels
- XMT-Transmit Data
- RCV-Receive Data
- SC-Simplex Current Power
- ALIGN-Align Loopback
- PWR-Local Power
- FAIL-Fail Test

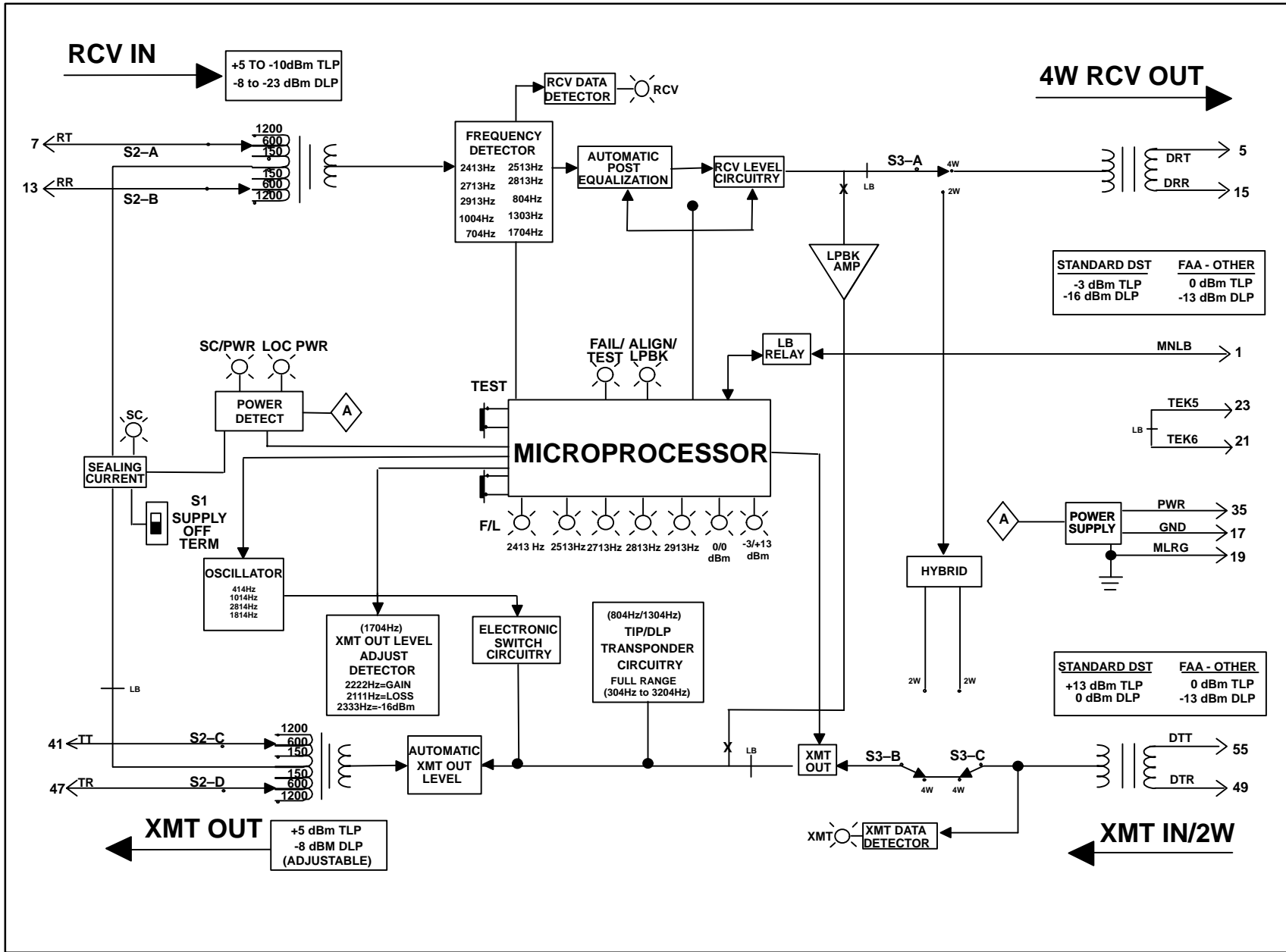


Figure 2. SDS5496LN (Issue 4) Block Diagram

### 3.2 Command Mode Operation

INTELIPOINT is factory-conditioned to respond to 2713 Hz. The unit can be changed to respond to 2413, 2513, 2813, or 2913 Hz Loopback/Activation, if required. The following paragraphs describe the procedures to accomplish this task.

### 3.3 Command Mode Activation

The command mode is initially activated by sending 2713 Hz via the RCV IN port (RT and RR, pins 7 and 13). INTELIPOINT must receive this 2713 Hz for more than 30 seconds. However, upon detecting 2713 Hz for more than two seconds, INTELIPOINT outputs a 1-second alternating 2814 Hz/1814 Hz tone. Unit Identification tone identifying the circuit accessed as Westell's INTELIPOINT, Model SDS5496LN. At this point, upon receiving 2713 Hz for more than 30 seconds INTELIPOINT enters the command mode and returns a steady 1014 Hz tone at +5 dBm (TLP) via the XMT OUT port (TT and TR, pins 41 and 47). When command mode tone is received from INTELIPOINT, the test person removes the 2713 Hz tone.

- NOTE -  
*If the tone is removed in less 30 seconds, INTELIPOINT enters the Loopback mode of operation.*

### 3.4 Unit Identification Tone

Each time INTELIPOINT is being accessed from an idle state by receiving the appropriate activation tone for more than two seconds, INTELIPOINT outputs a 1-second alternating 1014 Hz/1814 Hz Unit I.D. tone. At this point, if the activation tone is removed in less than 30 seconds INTELIPOINT enters loopback. If the tone is present for more than 30 seconds, INTELIPOINT enters command mode.

### 3.5 Command Mode Features

While in command mode, the test person can activate INTELIPOINT's intelligent functions. The intelligent functions include: XMT OUT Level Adjust mode, Customer Demarc Interface Levels, Loopback/Activation frequency, Remote Alignment mode, TLP or DLP Quiet Term/Transponder mode. If desired, the test person can exit the command mode and return to idle by sending the appropriate release to idle tone for greater than 0.9 seconds.

- NOTE -  
*The command mode is equipped with a 5-minute timer circuit. If no tone is sent to INTELIPOINT during the five minute time frame, INTELIPOINT sends an error tone (ramp-down tone from 3014Hz to 314Hz; holding 314Hz for 10 seconds) then returns to idle. The ramp-down tone, in this case, indicates the command mode has timed out via the 5-minute timeout feature.*

### 3.6 Loopback/Activation Frequency

Once the command mode is activated the test person can change the operating frequency of the SDS5496LN. To change the loopback/activation frequency of the SDS5496LN, the test person sends a 704Hz tone. INTELIPOINT, upon detecting 704Hz for greater than five seconds, returns one of the following acknowledgements:

- alternating 1014 Hz/2450 Hz holding at 2450 Hz if configured for 2413 Hz applications;
- alternating 1014 Hz/2550 Hz holding at 2550 Hz if configured for 2513 Hz applications; or
- alternating 1014 Hz/2750 Hz holding at 2750 Hz if configured for 2713 Hz applications (Default); or
- alternating 1014 Hz/2850 Hz holding at 2850 Hz if configured for 2813 Hz applications; or
- alternating 1014 Hz/2950 Hz holding at 2950 Hz if configured for 2913 Hz applications.

Upon receiving one of the above acknowledgements, the test person can change the operating mode by sending one of the following commands:

- **Standard DST Applications**—2713 Hz. INTELIPOINT returns alternating 1014 Hz/2750 Hz holding at 2750 Hz for 5 seconds then returns to command mode; or
- **FAA Applications**—2413 Hz. INTELIPOINT returns alternating 1014 Hz/2450 Hz holding at 2450 Hz for 5 seconds then returns to command mode; or
- **Power Co. or Other Utility-Type Application**—2513, 2813, or 2913 Hz. INTELIPOINT returns alternating 1014 Hz/XX50 Hz holding at XX50 Hz for 5 seconds then returns to command mode

To return to the command mode without changing the current frequency, send the current frequency, INTELIPOINT returns alternating 1014 Hz/XX50 Hz holding at XX50 Hz for 5 seconds then returns to the command mode.

The front panel frequency LED will be changed to display the new loopback/activation frequency selected.

- NOTE -  
*The release to idle tone is the programmed XX13Hz (i.e. current activation tone is 2813 Hz, release tone is 2813 Hz). The release tone must be detected for greater than 0.9 seconds.*

### 3.7 Customer Demarc Interface Levels

To change the present configuration, the test person enters command mode and sends 1404Hz tone. INTELIPOINT, upon detecting 1404Hz, returns one of the following acknowledgements:

- Alternating 1014Hz/414Hz holding at 414Hz if configured for 0.0 RCV/0.0 XMT (TLP) levels; or
- Alternating 1014Hz/2814Hz holding at 2814Hz if configured for -3.0 RCV/+13.0 XMT (TLP) levels.

Upon receiving one of the above acknowledgements, the test person can change the customer interface levels by sending one of the following commands:

- **0.0 RCV/ 0.0 XMT (TLP) Levels**  
**-13.0 RCV/-13.0 XMT (DLP) Levels**—Send 414Hz. INTELIPORT returns alternating 1014Hz/414Hz holding at 414Hz for 5 seconds then returns to command mode; or
- **-3.0 RCV/ +13.0 XMT (TLP) Levels**  
**-16.0 RCV/ 0.0 XMT (DLP) Levels**—Send 2814 Hz. INTELIPORT returns alternating 1014 Hz/2814 Hz holding at for 5 seconds then returns to command mode.

To return to the command mode without changing the current interface levels, send the received frequency, INTELIPORT returns alternating 1014 Hz/XX14 Hz holding at XX04 Hz for 5 seconds then returns to the command mode.

The front panel level LED will be changed to display the new interface level selected.

The Loopback/Activation frequency and demarc levels can be changed by the field technician also (see section 4.4).

## 4. SWITCH OPTIONS

Westell's SDS5496LN provides three option switches, S1, S2, S3. These switches are used to configure INTELIPORT for proper operation for a given application. A brief description of each option is given below. This description, as well as the location of each option, is also shown in Table 2.

### 4.1 Option Switch S1

Option switch S1 (Sealing Current) provides selection of SUPPLY or TERM operation of the sealing current circuitry. When S1 is placed in the TERM position, the unit provides a simplex load (loop) and the unit will operate with LOCAL/LINE power. When S1 is set to SUPPLY the unit will supply 20 mA regulated sealing current to the simplex leads.

- NOTE -

*When the INTELIPORT is optioned for SUPPLY, the line powering capability is disable, as the unit become a locally powered only module.*

### 4.2 Options Switch S2

Option switch S2 (Facility Impedance) is used to select the impedance of the unit (150/600/1200 Ohms) that will match the impedance of the 4-wire facility.

### 4.3 Options Switch S3

Option switch S3 (2W/4W) is used to set INTELIPORT's internal circuitry to properly interface the 600-ohm, 2-wire or 4-wire data modem equipment.

### 4.4 Front-Panel FREQ (Level) Push Button

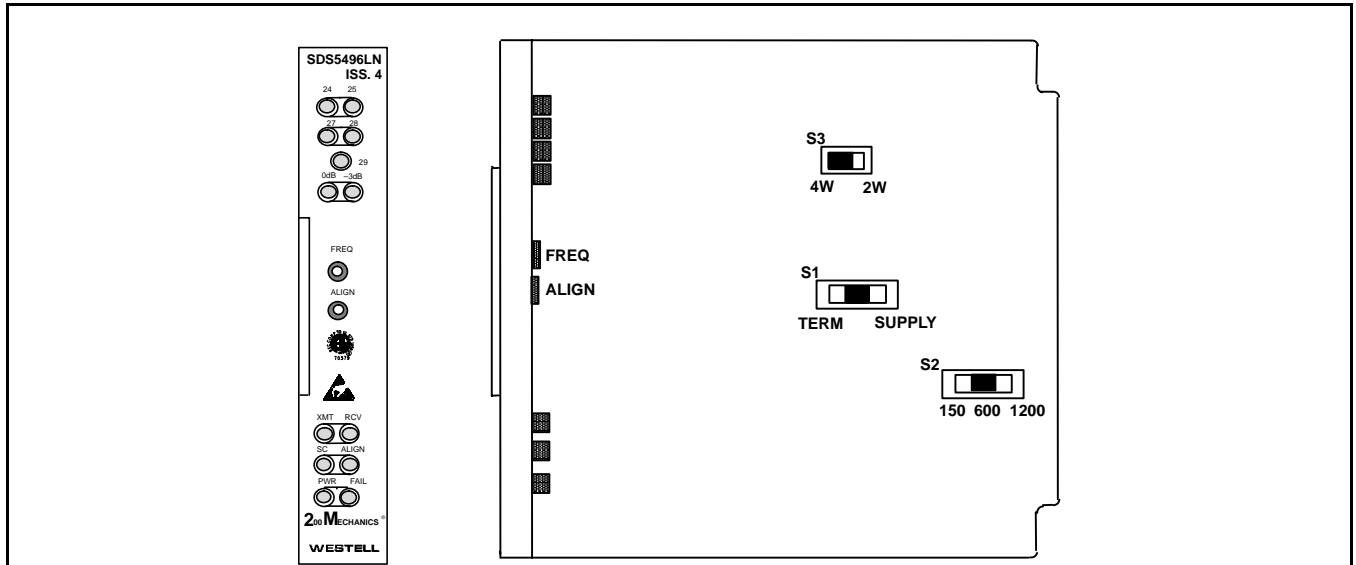
The front panel FREQUENCY/LEVEL (FREQ/LVL) recessed push button switch allows for local selection of the various loopback/activation frequencies and customer interface levels. The FREQ/LVL switch is active for the first five minutes of power-up, and then it is disabled.

Once the wiring has been verified, the tester can program the SDS5496LN for other operating frequencies and customer interface levels by depressing the FREQ/LVL front panel switch within the first five minutes on power up. The factory default is 2713 Hz with -3.0 RCV/+13.0 XMT interface levels. The front panel 2713Hz and -3/+13 dBm LED indicators should be illuminated.

To change the frequency and/or interface levels, depress the front panel FREQ/LVL button once and the unit will step to the next frequency setting. Depressing the button again steps the unit to the next level setting (i.e. depressing the frequency level button once illuminates the 2813 Hz LED. Depressing the button again, changes the demarc level to -3/+13 dBm). After the correct frequency and/or level is selected, the unit after five seconds, will store the new settings in non-volatile memory and reset the unit to the new parameters.

- NOTE -

*The operating frequency and demarc level can be changed remotely also. See paragraphs in section 3 for more details.*



**SDS5496LN Switch Option Layout**

OPTION	POSITION	FUNCTION
S1	SUPPLY	Select to have unit supply 20MA of sealing current to simplex leads
	OFF	Select to disable internal sealing current circuit
	TERM	Select to have unit provide termination for sealing current supplied from distant end
S2	1200	Select when interfacing loaded cable facility
	600	Select when interfacing short non-loaded cable facility
	150	Select when interfacing long non-loaded cable facility
S3	2W	Select when interfacing 2W data modem equipment
	4W	Select when interfacing 4W data modem equipment
ALIGN (TEST) push button	PRESS (LESS THAN 5 SEC.)	Press for less than 5 seconds to activate INTELIPORT's Wire Test Mode. Press for a second time to end the Wire Test Mode. Note: The Wire Test Mode automatically times out one hour after initial activation if the TEST switch is not pressed a second time.
	PRESS (MORE THAN 5 SEC.)	Press for more than 5 seconds to activate INTELIPORT AUTO-ALIGN sequence from on-site. (NOTE: This feature is activated only during the first five minutes of initial power-up of the unit.)
FREQ (LEVEL) push button	PRESS AND RELEASE	Steps front panel LED indicators through each Loopback/Activation frequency and Customer Demarc Interface level options for selection.  Press >10 seconds for default settings of 2713 Hz Loopback/Activation Frequency and -3/+13 dBm Customer Demarc Interface Levels. (NOTE: This feature is activated only during the first five minutes if initial power-up of unit).

**LED Descriptions**

PWR	When lit steady, it indicates power is present. When off, it indicates power is not present.
SC	When lit steady, it indicates sealing current is present. When off, it indicates sealing current is not present.
ALIGN (LPBK)	When lit steady, it indicates the unit is either in the command, alignment or transponder mode. When off, it indicates the unit is in the idle state. When flashing, it indicates the unit is in Loopback.
FAIL (TEST)	When lit steady, it indicates a unit failure. Replace unit. When off, it indicates the unit is in the idle state. When flashing, it indicates the Wire Test mode is activated.
XMT	When lit (steady or flashing), it indicates unit is sending data to customer's equipment. When off, it indicates the unit is in the idle state.

RCV	When lit (steady or flashing), it indicates unit is sending data to customer's equipment. When off, it indicates the unit is in the idle state.
FREQ and Levels	The LEDs labeled 24, 25, 27, 28, and 29 and the LEDs labeled 0 dB and -3 dB illuminate during the first 5 minutes of operation to indicate the operating frequencies and return interface levels for which the unit is set. See section 4.4 for details.

**Table 2. SDS5496LN Switch Options and LED Descriptions**

To default the unit back to factory parameters (i.e., 2713 Hz loopback/activation, -3/+13 dBm levels, flat equalization, fixed gain) depress and hold the FREQ/LVL button for greater than 10 seconds. The unit will flash the front panel LED's and resets to factory default settings.

**4.5 Front-Panel ALIGN (Test) Push Button**

In addition to the three option switches, INTELIPORT also provides a front-panel ALIGN switch. The ALIGN switch serves two functions. The ALIGN switch is used to activate INTELIPORT's Wire Test mode and INTELIPORT's automatic alignment sequence. Both features are activated from on-site. The ALIGN switch is active only during the first five minutes of initial power-up of the unit. If the ALIGN switch is not pressed within the first five minutes of initial power-up, the ALIGN switch, and the functions it controls become inactive. The installer can, if required, unplug the unit from the mounting assembly and re-insert the module to reset the 5-minute timer circuit and reactivate the ALIGN switch.



**5. INSTALLATION**

This section covers the physical installation of the SDS5496LN.

Installation consists of inspecting the equipment for damages, following proper safety precautions, mounting the units in the proper slot of the mounting assembly, or in a rack/on a wall), verifying the presence of power and signalling as indicated by the status LEDs.

*- INSPECTION NOTE -*

*If not previously inspected at the time of delivery, visually inspect the unit for damages prior to installation. If the equipment has been damaged in transit, immediately report the extent of the damage to the transportation company and to Westell (see Part 6 for telephone number).*

 **CAUTION - STATIC-SENSITIVE** 

**This product contains static-sensitive components! Proper electrostatic discharge procedures must be followed to maintain personal and equipment safety. Do not store units near magnetic, electromagnetic or electrostatic fields. Always store or ship units in the original static-protective packaging from Westell. Use anti-static mats when working on units.**

**- PRECAUTIONARY STATEMENT -**

**Never install telephone wiring during a lightning storm.**

**Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.**

**Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**

**Use caution when installing or modifying telephone lines.**

**5.1 Installer Connections**

When installing the unit in Westell's pre-wired USA Type-550 mounting (Type-400 equivalent mounting), connections are made via 25-pair cables mating to the appropriate 25-pair cable connectors located on the rear of the shelf assembly. Pinouts are listed in Table 3.

DESCRIPTION		PIN
RT-RCV IN Tip	Facility	7
RR - RCV IN Ring		13
TT - XMT OUT Tip		41
TR - XMT OUT Ring		47
DRT - Data RCV OUT Tip	Equipment	5
DRR - Data RCV OUT Ring		15
DTT - Data XMT IN/2W Tip		55
DTR - Data XMT IN/2W Ring		49
TEK5-Data Modem		23
TEK6-Disable Leads		21
MNLB-Manual LPBK	Miscellaneous	1
MLBG-Manual LPBK GND		19
PWR-Power		35
GND-Ground		17

**Table 3. Installer Connections**

**5.2 Power Requirements**

Power to the SDS5496LN can be supplied via the simplex leads (line powered) or from a local external power source. When powered locally, the SDS5496LN will operate from a power source of 20 to 28 Vac (24 Vac, nominal) at 40 mA, maximum or



from -22 to -56 Vdc (-48Vdc, nominal) at 22 mA, or 42 mA when supplying sealing current to a distant device.

### 5.3 Dual Powering Feature

The Power Detect circuit monitors both the local power input leads (pins 35 and 17) and the simplex leads. If INTELIPORT is being powered from a local external power source (20 to 28 Vac or -22 to -56 Vdc), the internal Sealing Current circuit provides a termination for sealing current. If a local power source is not available, INTELIPORT will operate off the simplex current. If both local power and simplex powering is present, INTELIPORT will always operate off the local power source as its first choice. This way, if local power is ever interrupted, for whatever reason, the Power Detect circuit automatically switches the internal circuitry so INTELIPORT can operate off the line power source. Subsequently, when local power is restored, the internal circuitry automatically switches back to operate off the local power.

- NOTE -

*When local power and sealing current is present, both the PWR LED and the SC/PWR LED will light. When local power is not present but sealing current is present, the PWR LED will be off but the SC/PWR LED will be lit (on steady) indicating INTELIPORT is being powered via simplex current.*

When the SDS5496LN is locally powered and optioned to supply sealing current, switch (S1) in SUPPLY, the unit is configured for local powering only and does not seek line power if local power fails.

### 5.4 Wire Test Mode

INTELIPORT's Wire Test mode is used to verify installation and station wiring after the option switches have been set and the unit is installed. The Wire Test mode is activated by momentarily pressing the front-panel TEST switch for less than five seconds. The front-panel FAIL/TEST LED will flash indicating the Wire Test mode is activated.

- NOTE -

*If the TEST switch is pressed for more than five seconds, INTELIPORT interprets this as a command to activate the automatic alignment feature. The front-panel ALIGN/LPBK LED will be on steady if the alignment mode is activated.*

When the TEST switch is pressed and released in less than five seconds, INTELIPORT applies a 1014 Hz tone over the RCV and XMT transmission pairs. Station wiring is then verified by connecting a Transmission Test Set, with a built-in speaker, or other suitable listening device, to the RCV and XMT channel pairs at the cable connection and demarcation points and listening for the appropriate tones (see Table 3). Once the tones are verified, the installer may press the TEST switch again to end the Wire Test mode.

- NOTE -

*If the TEST switch is not pressed a second time, the Wire Test mode automatically times out one hour after initial activation.*

PORT		4W APPLICATIONS	2W APPLICATIONS
RT - RCV	verify	continuous 1014 Hz	continuous 1014 Hz
RR - RCV		continuous 1014 Hz	
TT - XMT		interrupted 1014 Hz	interrupted 1014 Hz
TR - XMT		interrupted 1014 Hz	interrupted 1014 Hz

\*In 2W applications, the RCV OUT and XMT IN ports utilize the same transmission pairs (XMT, IN, T and R pins 55 and 49).

**Table 4. Wire Test Mode Tones**

After verifying installation and station wiring, the installer can turn the circuit over to a test person and leave.

## 6. ALIGNMENT

INTELIPORT features both remote and automatic alignment capability. Remote alignment is used to align only the SDS5496LN. Auto-Align is used to automatically align the SDS5496LN with another Intelligent ETO at the near end. (ISQ4389LNI2 or AUA441LN). Both the Remote and Auto-Align sequence is done at TLP and with respect to either three tones or four tones.

### 6.1 Auto-Align Mode

Auto-Align is initiated only by pressing the front-panel TEST switch for more than five seconds and only during the first five minutes of initial power-up. or by sending 1804 Hz when in command mode. If the circuit has been powered up for more than five minutes, the TEST switch becomes disabled.

- NOTE -

*The Auto-Align sequence, once started, takes approximately two to three minutes to complete.*

When command mode tone is received from the distant end, INTELIPORT continues the Auto-Align sequence by sending 1014Hz. Upon receiving 1014Hz, the distant end returns 2814Hz. Upon receiving 2814Hz from the distant end, INTELIPORT sends 2814Hz. Upon receiving 2814Hz, the distant end returns 414Hz. Upon receiving 414Hz from the distant end, INTELIPORT sends 414Hz, distant end returns 1814 Hz. Upon receiving 1814 Hz from the distant end, INTELIPORT sends 1814 Hz. Upon receiving 1814 Hz from INTELIPORT, both ends align to the four tones.

After alignment, INTELIPORT returns to idle. The distant end also returns to idle.

## 6.2 Remote (Manual) Alignment

The command mode is activated by sending the appropriate Loopback/Activation frequency for greater than 30 seconds. At this point the unit enters the command mode and returns 1014 Hz. While in command mode (1014 Hz present), the test person should verify/record the level received. The test person then initiates the Remote (manual) Alignment sequence by sending 1004 Hz to INTELIPORT.

- NOTE -

*During Remote Alignment, INTELIPORT provides a built-in, 5-minute waiting period for each tone (1004, 2804 and 404 Hz) to be returned by the test person in response to INTELIPORT's 1014 Hz, 2814 Hz and 414 Hz, respectively. If the correct tone is not received by INTELIPORT during the 5-minute period, INTELIPORT, after the five minute time frame, returns an error tone of 3014 Hz to 314 Hz (holding the 314 Hz tone for 10 seconds). After this 10-second time frame, INTELIPORT drops out of the Remote Alignment mode and returns to idle. The ramp-down tone, in this case, indicates the 5-minute timeout feature timed out. If this occurs without completing the alignment, the non-volatile memory circuit will not be updated.*

INTELIPORT, upon receiving 1004 Hz, returns 2814 Hz. The test person should verify/record the level received at 2814 Hz, then send 2804 Hz to INTELIPORT. Upon receiving 2804 Hz, INTELIPORT returns 414 Hz. The test person should verify/record the level received at 414 Hz, then send 404 Hz to INTELIPORT.

Upon receiving 404 Hz, INTELIPORT returns 1814 Hz for 120 seconds. The test person should verify/record the level received at 1814 Hz, then has the option of aligning the circuit to 3 tones or 4 tones.

## 6.3 3-Tone Alignment

If the test person chooses to ignore the 1814 Hz tone from INTELIPORT, the 1814 Hz tone, after 60 seconds, times out. At this point, INTELIPORT sets the alignment levels based on three tones, returns either a ramp-up or ramp-down tone, applies quiet termination for one second, then enters loopback.

If the test person chooses to send 1004 Hz to INTELIPORT during the 120-second time frame that 1814 Hz is present, INTELIPORT's 60-second timer circuit is bypassed. At this point, INTELIPORT sets the alignment levels based on three tones, returns either a ramp-up or ramp-down tone, applies quiet termination for one second, then enters loopback.

Upon completing the alignment, INTELIPORT automatically outputs a level of +5 dBm (TLP) immediately following the alignment process. If a level other than +5 dBm (TLP) is required, see section 6.9 for details on setting the XMT OUT level.

## 6.4 4-Tone Alignment

If a 4-tone alignment is required, the test person sends 1804 Hz within the 120-second time frame. Upon receiving 1804 Hz, INTELIPORT aligns to four tones. Upon completion, INTELIPORT returns either a ramp-up or a ramp-down tone sequence. The ramp-up tone indicates both ends have aligned correctly. The ramp-down tone indicates correct alignment could not be achieved. The unit then applies quiet termination for one second, then enters loopback.

## 6.5 Ramp-Up Tone Sequence

A ramp-up tone, consisting of a series of tones ranging from 314 Hz to 3014 Hz in ascending order, indicates alignment is within the criteria for meeting C5 conditioning requirements. The ramp-up tone also occurs whenever a 20-minute timer circuit times out due to inactivity (that is, no tone sent to INTELIPORT during a test function equipped with the 20-minute timeout feature).

## 6.6 Ramp-Down Tone Sequence

A ramp-down tone, consisting of a series of tones ranging from 3014 Hz to 314 Hz in descending order, indicates alignment is not within the parameters of C5 conditioning. The ramp-down tone also occurs whenever a 5-minute timer circuit times out due to inactivity (that is, no tone sent to INTELIPORT during a test function equipped with the 5-Minute timeout feature).

The ramp-up or ramp-down tone sequence is applied for approximately three seconds with the last tone (3014 Hz in the ramp-up sequence or 314 Hz in the ramp-down sequence) being applied for approximately 10 seconds.

## 6.7 Loopback After Remote Alignment

Immediately following the Remote Alignment sequence INTELIPORT enters Loopback to permit verification of alignment settings. While in loopback, the test person sends tones (404, 1004, 1804 and 2804 Hz), one at a time, to INTELIPORT. The test person should verify/record the level of each tone as it is looped back by INTELIPORT. The loopback circuit automatically inserts 16dB gain when demarc levels are set to -3/+13 dBm or 0 dB when demarc levels are set to 0/0 dBm, to provide an equal-level loopback condition for verifying alignment settings.

## 6.8 Loopback Release

Loopback automatically releases 20 minutes after initial activation. If release is desired before the 20-minute time frame expires, send the programmed loopback/activation frequency for 0.9 seconds, minimum. INTELIPORT returns to command mode. At this point, if the test person removes and resends the loopback/activation frequency a second time, INTELIPORT returns to idle.

## 6.9 XMT OUT Level Adjust Mode

The XMT OUT level can be adjusted for any level from +7 dBm to -16 dBm TLP (-6 dBm to -29 dBm DLP). The XMT OUT level is adjusted by adding either gain or loss to the +5.0 dBm level to obtain the desired XMT OUT level. Gain or loss can be added in 0.5 dB increments. If desired the XMT OUT level can be set to -16 dBm by sending one simple command.

To access the XMT OUT Level Adjust mode, the test person sends 1704 Hz while INTELIPORT is in the command mode. The test person can monitor the XMT OUT port to verify the change in levels.

*- NOTE -*

*The XMT OUT Level Adjust mode provides a built-in five minute waiting period for each tone to be sent by the test person. If no tone is sent during the five minute time frame, INTELIPORT returns an error tone (ramp-down tone of 3014 Hz to 314 Hz; holding the 314 Hz tone for 10 seconds) and returns to idle. The ramp-down tone, in this case, indicates the XMT OUT Level Adjust mode has timed out via the 5-minute timeout feature.*

## 6.10 Adding +0.5 dB Gain

The test person adds gain to the XMT OUT level by sending and removing a tone of 2222 Hz. Upon receiving 2222 Hz, INTELIPORT re-adjusts the output level by adding 0.5 dB of gain. If more gain is required, the test person repeats the process of sending and removing 2222 Hz. INTELIPORT re-adjusts the output level by 0.5 dB each time 2222 Hz is sent and removed. After obtaining the required XMT OUT level, the test person must send the Loopback/Activation Frequency for 5 seconds to return to command mode.

## 6.11 Adding -0.5 dB Loss

The test person adds loss to the XMT OUT level by sending and removing a tone of 2111 Hz. Upon receiving 2111 Hz, INTELIPORT re-adjusts the output level by adding 0.5dB of loss. If more loss is required, the test person repeats the process of sending and removing 2111 Hz. INTELIPORT re-adjusts the output level by 0.5 dB each time 2111 Hz is sent and removed. After obtaining the required XMT OUT level, the test person must send the Loopback/Activation frequency for 5 seconds to return to command mode.

## 6.12 Setting -16dBm Level

To set the XMT OUT level for -16dBm, the test person sends and removes a one-time tone of 2333Hz. Upon receiving 2333Hz, INTELIPORT sets the output level to -16.0dBm. The test person can add gain to the -16dBm level to obtain the desired XMT OUT level (see paragraph 6.10). After obtaining the required XMT OUT level, the test person must send the Loopback/Activation frequency for 5 seconds to return to command mode.

## 7. MAINTENANCE TESTING

Testing and maintenance features include Loopback and a Quiet Term/Transponder operation. Loopback allows the test person to verify alignment setting established during alignment. The Quiet Term/Transponder allows the test person to perform noise and tone level measurements.

### 7.1 Loopback - From Idle State

Loopback can be initiated any time the unit is idle by applying a ground to the MNLB (manual loopback) lead, pin 1 or by sending the Loopback/Activation frequency to INTELIPORT's RCV IN port for more than two seconds but less than 30 seconds.

When loopback is activated via tone command, after receiving the Loopback/Activation tone for more than two seconds, INTELIPORT returns a 1-second alternating 2814 Hz/1814 Hz Unit I.D. tone.

*- NOTE -*

*If the Loopback/Activation tone is present for more than 30 seconds, INTELIPORT enters the command mode.*

While in loopback, the test person sends tones (404, 1004, 1804 and 2804 Hz), one at a time, to INTELIPORT. The test person should verify/record the level of each tone as it is looped back by INTELIPORT. The loopback circuit automatically inserts 0 dB or 16dB gain to provide an equal-level loopback condition for verifying alignment settings.

### 7.2 Loopback Release

Tone-activated loopback automatically releases 20 minutes after initial activation. If release is desired before the 20-minute time frame, send the selected Loopback/Activation tone for 0.9 seconds, minimum. INTELIPORT returns to idle upon detecting the appropriate release tone.

*- NOTE -*

*When loopback is manually activated, neither automatic timeout nor detection of the loopback/activation tone will effect loopback release. Release of a manually-activated loopback condition can occur only by removing the ground.*

### 7.3 Quiet Term/Transponder Operation

INTELIPORT's Quiet Term/Transponder operation allows the test person to remotely conduct noise and tone level measurements. The Quiet Term/Transponder test can be conducted with levels referenced at either TLP or DLP (data level). In the TLP mode, INTELIPORT outputs its respective tones at +5 dBm (TLP) or at the current XMT OUT level established via the XMT OUT Level Adjust mode. In the DLP mode, INTELIPORT outputs its respective tones at -8 dBm (DLP) or at the current XMT OUT level established via the XMT OUT Level Adjust mode.

To activate the TLP Quiet Term/Transponder, the test person sends 804 Hz while in command mode. To activate the DLP

Quiet Term/Transponder, the test person sends 1304Hz while in command mode.

Upon detecting 804 Hz or 1304 Hz, INTELIPORT applies a quiet termination over the XMT IN port and sets a 20-minute timer circuit. During quiet termination, the test person performs noise measurements at the RCV OUT port.

- NOTE -

*Quiet termination remains in effect for 20 minutes or until another tone (to enter the Full-Range Transponder mode of operation or return to command mode) is sent to INTELIPORT. If no tone is sent within the 20 minute time frame, INTELIPORT, after 20 minutes, returns a ramp-up tone of 314 Hz to 3014 Hz (holding 3014 Hz for 10 seconds), then returns to idle. The ramp-up tone indicates the Quiet Term/Transponder mode has timed out via the 20-minute timeout feature.*

## 7.4 Full-Range Transponder Mode

The Full-Range Transponder allows the test person to perform a detailed level verification test over a range of frequencies from

304 Hz to 3204 Hz. The Full-Range Transponder is accessed from the quiet termination mode only by sending any tone from 304Hz to 3204Hz (except 2413 Hz, 2513 Hz, 2713 Hz, 2813 Hz, or 2913Hz depending on the Loopback/Activation frequency selected) to INTELIPORT.

While in the Full-Range Transponder test mode, tones sent to INTELIPORT should be in 100 Hz increments. Upon detecting tone from the STC, INTELIPORT returns a similar tone (but at a 10 Hz off-set). Tones returned by INTELIPORT are applied for the same duration tone is received from the STC. The test person should verify/record the level of each tone as it is returned by INTELIPORT. Each time a new tone is sent, INTELIPORT responds to that tone. If, after removing a tone, no tone is sent to INTELIPORT, INTELIPORT re-applies a quiet termination and re-sets the 20-minute timeout circuit.

Upon completion and if no tone is sent during the 20-minute time frame, INTELIPORT, after 20 minutes, returns a ramp-up tone, drops out of the Quiet Term/Transponder mode and returns to idle. If release is desired before the 20-minute time frame, send the Loopback/Activation frequency for 5 seconds to return to command mode.

INSTALLATION PROCEDURES																
STEP	ACTION															
1.	<p><b>INSTALLER'S PROCEDURES</b></p> <p>Set option switches as required per Circuit Layout Record (CLR) card. Install the unit and apply power.</p> <p>Verify                    LOC PWR LED ON if unit is locally powered or                                             SC PWR LED ON if unit is line powered.</p> <p>Also verify ALIGN/LPBK, FAIL/TEST, RCV and XMT LEDs are OFF:</p> <p style="text-align: right;"><b>NOTE:</b> If FAIL/TEST LED is flashing, press front-panel TEST switch. If FAIL/TEST LED is ON steady, replace unit and repeat procedures.</p>															
2.	<p><b>Wire Test Mode</b></p> <p>CAUTION-INTELIPOINT places 1014Hz tone on the transmission pairs when TEST mode is activated. Be sure INTELIPOINT is not connected to an in-service circuit where this tone may cause interference.</p> <p>Momentarily press the front-panel TEST switch (less than five seconds) and release. Verify FAIL/TEST LED is flashing. Connect TMS with built-in speaker, or other suitable listening device, to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">PORT</th> <th style="text-align: left;">4W APPLICATIONS</th> <th style="text-align: left;">2W APPLICATIONS</th> </tr> </thead> <tbody> <tr> <td>RCV IN            verify</td> <td>Continuous 1014 Hz</td> <td>Continuous 1014 Hz</td> </tr> <tr> <td>RCV OUT        verify</td> <td>Continuous 1014 Hz</td> <td></td> </tr> <tr> <td>XMT IN            verify</td> <td>Interrupted 1014 Hz</td> <td>Interrupted 1014 Hz</td> </tr> <tr> <td>XMT OUT        verify</td> <td>Interrupted 1014 Hz</td> <td>Interrupted 1014 Hz</td> </tr> </tbody> </table> <p>When tones are verified, press TEST switch to end test mode. Test mode automatically times out one hour after initial activation if switch is not pressed a second time.            Note: In 2W applications RCV OUT and XMT IN port utilize same transmission pairs (XMT IN).</p>	PORT	4W APPLICATIONS	2W APPLICATIONS	RCV IN            verify	Continuous 1014 Hz	Continuous 1014 Hz	RCV OUT        verify	Continuous 1014 Hz		XMT IN            verify	Interrupted 1014 Hz	Interrupted 1014 Hz	XMT OUT        verify	Interrupted 1014 Hz	Interrupted 1014 Hz
PORT	4W APPLICATIONS	2W APPLICATIONS														
RCV IN            verify	Continuous 1014 Hz	Continuous 1014 Hz														
RCV OUT        verify	Continuous 1014 Hz															
XMT IN            verify	Interrupted 1014 Hz	Interrupted 1014 Hz														
XMT OUT        verify	Interrupted 1014 Hz	Interrupted 1014 Hz														

<b>TESTING AND ALIGNMENT PROCEDURES</b>	
3.	<p><b>Serving Test Center's Procedures</b></p> <p>Send 2713 Hz (&gt;30 sec.*) at TLP to INTELIPORT's RCV IN port. Verify steady 1014 Hz at +5dBm (TLP) from INTELIPORT. remove 2713 Hz. Command mode initiated.                      Note: if 2713 Hz is present for two sec. but removed in less than 30 seconds, INTELIPORT sends a 1-second alternating tone of 1014 Hz/414 Hz and enters loopback.</p>
4.	<p><b>Remote (Manual) Alignment Mode</b></p> <p>From command mode, verify/record level received at 1014 Hz, then send 1004 Hz to INTELIPORT.                      Upon detecting 1004 Hz, INTELIPORT returns 2814 Hz.                      Verify/record level received at 2814 Hz, then send 2804 Hz to INTELIPORT                      Upon detecting 2804 Hz, INTELIPORT returns 414 Hz.                      Verify/record level received at 414 Hz, then send 404 Hz to INTELIPORT.                      Upon detecting 404 Hz, INTELIPORT returns 1814 Hz for 120 seconds.                      Verify/record level received at 1814 Hz. At this point, STC has option of aligning to 3 tones or 4 tones.</p> <p>3-tone alignment: Ignore 1814 Hz tone. After 120 seconds, 11814 Hz tone from INTELIPORT times out. INTELIPORT aligns to 3 tones, returns a ramp-up or ramp-down tone*, applies quiet termination for one second, then enters loopback. NOTE: 120-second timer can be bypassed by sending 1004 Hz during the 120-second time frame.</p> <p>4-tone alignment: Send 1804 Hz in response to INTELIPORT'S 1814 Hz in response to INTELIPORT's 1814 Hz within the 120 time frame. INTELIPORT aligns to 4 tones, returns a ramp-up or ramp-down*, applies quiet termination for one second, then enters loopback.</p> <p>NOTE: Upon completion, if a level other than +5dBm (TLP) is required at the XMT OUT port the STC should access the XMT OUT Level Adjust mode to set the desired output level.                      Note: Ramp-up tone (314 Hz to 3014 Hz) indicates alignment is within C5 conditioning. Ramp-down tone (3014 Hz to 314 Hz) indicates alignment is not within C5 conditioning.</p> <p><b>Auto-Align Mode</b></p> <p>Note: Auto-align is initiated by pressing the front-panel TEST switch (more than five seconds) during the first five minutes of initial power-up, or via command mode by sending 1804 Hz to INTELIPORT.</p> <p>When activated, INTELIPORT sends 2913 Hz out of the RCV IN port to near end to put near end into command mode. Near end, upon entering command mode, returns command mode tone to INTELIPORT. With both Stations set, tones are automatically sent and received between both ends. Upon completion (approximately two to three minutes), INTELIPORT returns to idle. Near end also returns to idle.</p>

**Table 5. Testing and Alignment Procedures**

5.	<p><b>Loopback (After Alignment)</b> Upon entering loopback after alignment, STC sends tones, one at a time, to INTELIPORT. Record level of each tone as it is looped back by INTELIPORT.</p> <p>Loopback is equipped with an automatic time-out feature that releases loopback 20 minutes after activation. INTELIPORT returns to idle. If release is desired before the 20-minute time frame, send 2713 Hz (0.9 sec, min.). INTELIPORT returns to command mode. Remove and re-send 2713 Hz tone (0.9 sec, min.) to return to idle.</p> <p><b>Loopback (From Idle State)</b> Send 2713 Hz for ore than two sec. but less than 30 sec. Upon entering loopback, INTELIPORT returns a one second alternating tone of 1014 Hz/414 Hz, identifying the unit accessed as Westell's SDS5496LN, Issue 3. NOTE: At this point, if 2713 Hz is removed in less than 30 seconds, INTELIPORT enters loopback. If 2713 Hz is applied for more than 30 seconds, INTELIPORT enters command mode.</p>
6.	<p><b>XMT OUT Level Adjust Mode</b> Upon completing alignment, the STC can adjust the XMT OUT level for any level from +7dBm to -16dBm (TLP), 0.5 dB increments. STC can monitor the XMT OUT port to verify the change in the output level. While in command mode, send 1704 Hz to enter XMT OUT Level Adjust mode. Once activated,</p> <p><b>To add Gain:</b> send and remove 2222 Hz. INTELIPORT re-adjusts output level by adding 0.5 dB of gains. If more gain is required, repeat the process of sending and removing 2222 Hz until desired output level is obtained. INTELIPORT re-adjusts the output level by 0.5 dB each time 2222 Hz is detected and removed.</p> <p><b>To add Loss:</b> Send and remove 2111 Hz. INTELIPORT re-adjusts output level by adding 0.5 dB of loss. If more loss is required, repeat the process of sending and removing 2111 Hz until desired output level is obtained. INTELIPORT re-adjusts the output level by 0.5 dB each time 2111 Hz is detected and removed.</p> <p><b>To Set Level For -16 dBm:</b> send and remove 2333 Hz. INTELIPORT re-adjusts output level to -16 dBm. Upon completion, STC must send 2713 Hz (0.9 sec, min.) to return to command mode. A second 2713 Hz tone causes INTELIPORT to return to idle.</p> <p><b>NOTE:</b> XMT OUT Level Adjust mode is equipped with a 5-minute automatic time-out feature that releases if no tone is sent within 5 minute time frame. INTELIPORT returns to idle.</p>
7.	<p><b>Transponder Mode (TLP/DLP)</b> From command mode, send 804Hz to access TLP Transponder or 1304 Hz, INTELIPORT applies quiet termination over the XMT IN port and sets a 20-minute timer. During quiet termination, STC performs noise measurements at the RCV OUT port.</p> <p>While in quiet termination, the STC initiates the transponder mode by sending any tone from 300 Hz to 3200 Hz (except 2700 Hz), in 100 Hz increments. INTELIPORT returns similar tone (TLP or DLP) at a 10 Hz off-set for same duration tone is received.</p> <p>Upon completion and if no other tone is sent, INTELIPORT re-applies quiet termination and resets the timer circuit. If no tone is sent within the 20-minute time frame, INTELIPORT, after 20 minutes, drops out of the transponder mode and returns to idle. If release is desired before the 20-minute time frame, send 2713 Hz for 0.9 seconds, minimum. INTELIPORT RETURNS TO COMMAND MODE. A second 2713 Hz tone causes INTELIPORT to return to idle.</p>

**Table 5. Testing and Alignment Procedures (Continued)**

A	B	C	D*	E**
FREQUENCY	ALIGNMENT LEVELS	LOOPBACK LEVELS	COLUMN C MINUS COLUMN B	COLUMN D PLUS -16
1014 HZ				
2814 Hz				
414 Hz				
1814 Hz				
*Column D equals deviation from 0dBm (TLP) **Column E equals Customer's RCV OUT level				
Note: During this procedure, all tones from STC are sent at TLP.				
1) Send 2713 Hz for more than 30 seconds. After detecting 2713 Hz for more than two seconds, INTELIPORT returns a 1-second, alternating tone of 1014 Hz/414 Hz (Unit I.D. tone) indicating the unit being accessed as Westell's INTELIPORT 1, Model SDS5496LN. 2) After detecting 2713 Hz for more than 30 seconds, INTELIPORT sends 1014 Hz at +5 dBm (TLP). Record level received in Column B. Remove 2713 Hz. Command mode initiated. (NOTE: if XMT OUT level requires adjustment it is accomplished after completing Steps 3 through 12. Procedures for adjusting XMT OUT level is given on page 15, under Optional Tests).				
<b>Remote Alignment Mode</b>				
3) While in command mode, send 1004 Hz.				
4) INTELIPORT returns 2814 Hz				
5) Record level at 2814 Hz in Column B, then send 2804 Hz				
6) INTELIPORT returns 414 Hz.				
7) Record level at 414 Hz in Column B, then send 404 Hz				
8) INTELIPORT returns 1814 Hz for 120-seconds.				
9) Record level at 1814 Hz in Column B. STC has option of aligning the circuit to either 3 tones or 4 tones:				
3-Tone Alignment	Ignore 1814 Hz tone from INTELIPORT After 120 seconds*, 1814 Hz tone times out. INTELIPORT aligns to 3 tones, sends ramp-up or ramp-down tone, then enters loopback. *NOTE: Send 1004 Hz within 120-sec. time frame to bypass timer circuit..			
4-Tone Alignment	Send 1804 within 120-second time frame. INTELIPORT aligns to 4 tones, sends -up or ramp-down tone, then enters loopback.			
<b>Loopback</b>				
10) Send 404 Hz. Record level received from INTELIPORT in Column C.				
11) Send 1004 Hz. Record level received from INTELIPORT in Column C.				
12) Send 2804 Hz. Record level received from INTELIPORT in Column C.				
13) (OPTIONAL) Send 1804 Hz. Record level received from INTELIPORT in Column C.				
14) Send 2713 Hz for 0.9 seconds. INTELIPORT returns to command mode. Remove 2713 Hz.				
15) Re-send 2713 Hz 0.9 seconds. INTELIPORT returns to idle. Remove 2713 Hz.				
16) Perform calculations for Columns D and E as required.				

Table 6. SDS5496LN (INTELIPORT) ISSUE 4 ALIGNMENT

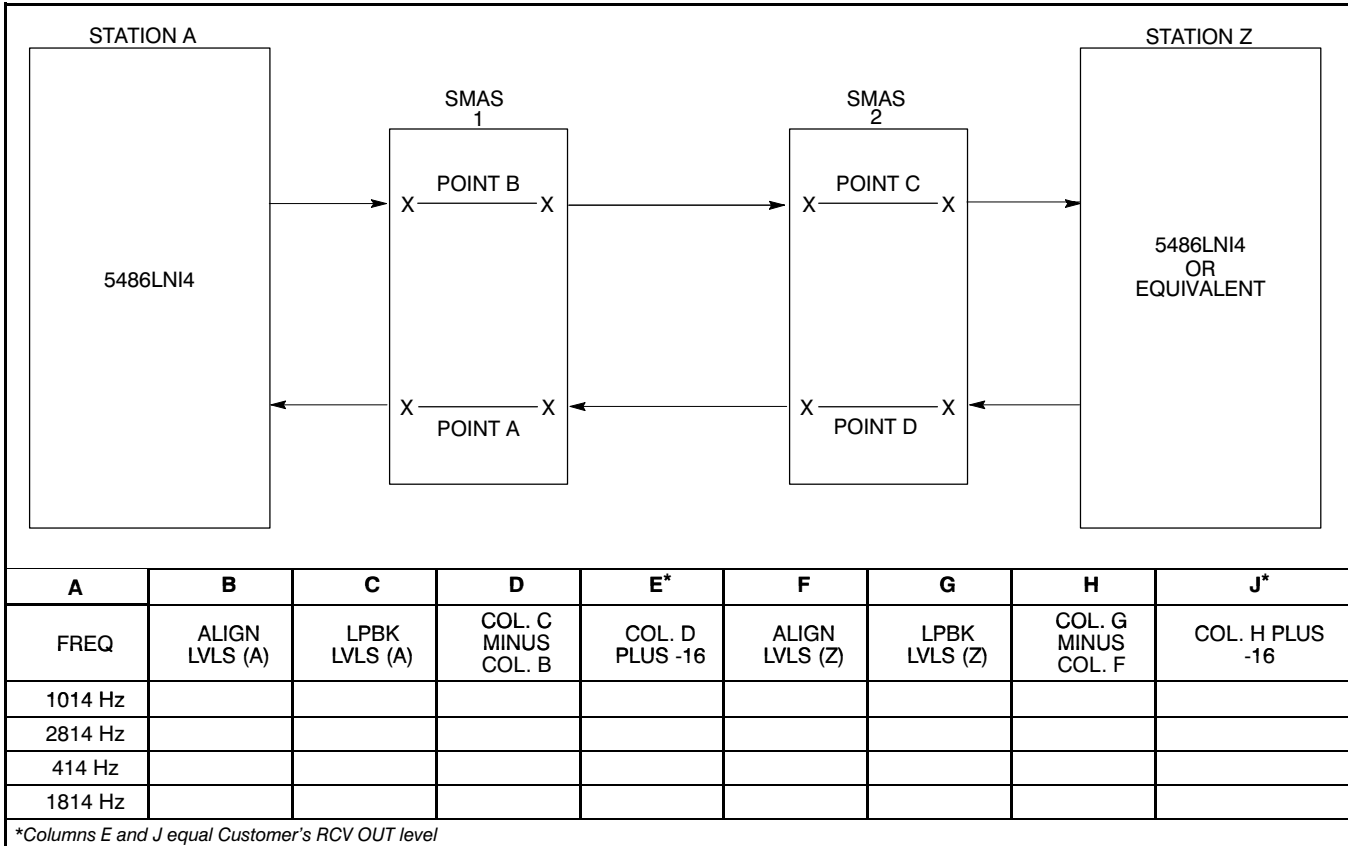


SDS5496LN OPTIONAL TESTS		
XMT OUT LEVEL ADJUSTMENT		
TO ADD GAIN	TO ADD LOSS	TO OBTAIN -16 dBm
1. From command mode, send 1704Hz	1. From command mode, send 1704Hz	1. From command mode, send 1704Hz
2. INTELIPORT sends 1014 Hz at +5 dBm (TLP)	2. INTELIPORT sends 1014 Hz at +5 dBm (TLP)	2. INTELIPORT sends 1014 Hz at +5 dBm (TLP)
3. STC sends and removes 2222 Hz	3. STC sends and removes 2111 Hz	3. STC sends and removes 2333 Hz
4. INTELIPORT adds 0.5 dB of gain to output level.	4. INTELIPORT adds 0.5 dB of gain to output level.	4. INTELIPORT re-adjusts output level to -16 dBm (TLP).
5. Repeat Steps 3 and 4 until desired output level is obtained.	5. Repeat Steps 3 and 4 until desired output level is obtained.	5. Send 2713 Hz for 0.9 seconds.
6. Send 2713 Hz for 0.9 seconds	6. Send 2713 Hz for 0.9 seconds	6. INTELIPORT returns to command mode
7. INTELIPORT returns to command mode	7. INTELIPORT returns to command mode	7. Send 2713 Hz for 0.9 seconds.
8. Send 2713 Hz for 0.9 seconds.	8. Send 2713 Hz for 0.9 seconds	8. INTELIPORT returns to idle.
9. INTELIPORT returns to idle.	9. INTELIPORT returns to idle	
<i>NOTE: Maximum output level is +7 dBm (TLP)</i>	<i>NOTE: Minimum output level is -16 dBm (TLP)</i>	
<p><i>NOTE: Optional tests are initiated from command mode. All tones sent from STC are TLP unless stated otherwise.</i></p> <p><b>TLP Transponder Mode (804 Hz Activated)</b></p> <ol style="list-style-type: none"> <li>1) While in command mode, send 804 Hz.</li> <li>2) INTELIPORT applies quiet termination over the XMT IN port.</li> <li>3) STC performs noise measurements at the RCV OUT port.</li> <li>4) STC sends any tone from 300 Hz to 3200 Hz (except 2700 Hz), in 100 Hz increments, at TLP.</li> <li>5) INTELIPORT returns similar tone (at a slight off-set) for same duration tone is received, at +5 dBm (TLP or at the current XMT OUT level established.</li> <li>6) Repeat Steps 4 and 5 as required.</li> <li>7) Upon completion and no other tone is sent by STC, INTELIPORT reapplies quiet termination and re-sets 20-min. timer.</li> <li>8) Send 2713 Hz for 0.9 seconds. INTELIPORT returns to command mode. Remove 2713 Hz.</li> <li>9) Re-send 2713 Hz for 0.9 seconds. INTELIPORT returns to idle.</li> </ol> <p><b>DLP Transponder Mode (1304 Hz Activated)</b></p> <ol style="list-style-type: none"> <li>1) While in command mode, send 1304 Hz.</li> <li>2) INTELIPORT applies quiet termination at the XMT IN port.</li> <li>3) STC performs noise measurements at the XMT OUT port.</li> <li>4) STC sends any tone from 300 Hz to 3200 Hz (except 2700 Hz), in 100 Hz increments, at DLP.</li> <li>5) INTELIPORT returns similar tone for same duration tone is received, at -8 dBm (DLP) or at the current XMT OUT Level established.</li> <li>6) Repeat Steps 4 and 5 as required.</li> <li>7) Upon completion and no other tone is sent, INTELIPORT reapplies quiet termination and re-sets 20-Min. timer.</li> <li>8) Send 2713 Hz for 0.9 seconds. INTELIPORT returns to command mode. Remove 2713 Hz.</li> <li>9) Re-send 2713 Hz for 0.9 seconds. INTELIPORT returns to idle.</li> </ol>		

Table 7. SDS5496LN Optional Tests

### 7.5 Point-to-Point Remote Alignment Procedure

This procedure involves aligning an SDS5496LN at Station A then aligning SDS5496LN (or equivalent unit) at Station Z. An alignment chart is provided for recording measurements during alignment and for making the necessary calculations to determine the Drop-side signal level at the RCV demarcation point of Station A and Station Z.



**Table 8. SDS8486LN Point-Point Remote Alignment**

1)	Open SMAS access at Point D to A to C.
2)	From SMAS Point A, send 2713 Hz at TLP for more than 30 seconds. Station A sends 1014 Hz to SMAS Point B.
3)	From SMAS Point C, send 2713 Hz at TLP for more than 30 seconds. Station Z sends 1014 Hz to SMAS Point D.
4)	From SMAS Point C, send 804 Hz at TLP. When SMAS Point D goes quiet, remove 804 Hz.
5)	Close SMAS access Point D to A.
6)	From SMAS Point B, measure level at 1014 Hz and record in Column B.
7)	From SMAS Point C, send 1004 Hz at TLP.
8)	SMAS Point B will change to 2814 Hz. Measure level and record in Column B.
9)	From SMAS Point C, send 2804 Hz at TLP.
10)	SMAS Point B will change to 414 Hz. Measure level and record in Column B.
11)	From SMAS Point C, send 404 Hz at TLP.
12)	SMAS Point B will change to 1814 Hz for 120 seconds. Measure level and record in Column B. STC now has option:
	Perform 3-Tone Alignment - Ignore 1814 Hz tone from INTELIPORT. After 120 seconds, 1814 tone times out. INTELIPORT (Station A) aligns to 3 tones, sends ramp-up or ramp-down tone, and enters loopback.
	Perform 4-Tone Alignment - From SMAS Point C, send 1804 Hz within 120 seconds. INTELIPORT (Station A) aligns to 4 tones, sends ramp-up or ramp-down tone, then enters loopback.
13)	From SMAS Point C, send 404 Hz, 2804 Hz, 1004 Hz and, if required, 1804 Hz, one at a time. Measure level of each tone looped back by INTELIPORT at Point B and record levels in appropriate spaces of Column C.
14)	From SMAS Point C, send 2713 Hz at TLP for 0.9 seconds minimum. Station Z returns to command mode.
15)	From SMAS Point A, send 2713 Hz at TLP for 0.9 seconds minimum. Station A returns to command mode.
16)	From SMAS Point A, send 804 Hz at TLP. When SMAS Point B goes quiet, remove 804 Hz.
17)	Close SMAS access Point B to C.
18)	From SMAS Point D, measure level at 1014 Hz and record in Column F.
19)	From SMAS Point A, send 1004 Hz at TLP.
20)	SMAS Point D will change to 2814 Hz. Measure and record level in Column F.
21)	From SMAS Point A, send 2804 Hz at TLP.
22)	SMAS Point D will change to 414 Hz. Measure and record level in Column F.
23)	From SMAS Point A, send 404 Hz at TLP.
24)	SMAS Point D will change to 1814 Hz for 120 seconds. Measure and record level in column F. STC now has option:
	Perform 3-Tone Alignment - Ignore 1814 Hz tone from INTELIPORT. After 120 seconds, 1814 tone times out. INTELIPORT or equivalent unit (Station Z) aligns to 3 tones, sends ramp-up or ramp-down tone, and enters loopback.
	Perform 4-Tone Alignment - From SMAS Point A, send 1804 Hz within 120 seconds. INTELIPORT or equivalent unit (Station Z) aligns to 4 tones, sends ramp-up or ramp-down tone, and enters loopback.
25)	From SMAS Point A, send 404 Hz, 2804 Hz, 1004 Hz and, if required, 1804 Hz, one at a time. Measure level of each tone looped back by INTELIPORT at Point D and record levels in appropriate spaces of Column G.
26)	From SMAS Point A, send 2713 Hz at TLP for 0.9 seconds minimum. Station A returns to command mode.
27)	From SMAS Point A, send 2713 Hz at TLP for 0.9 seconds minimum. Station A released.
28)	From SMAS Point C, send 2713 Hz at TLP for 0.9 seconds minimum. Station Z returns to command mode.
29)	From SMAS Point C, send 2713 Hz at TLP for 0.9 seconds minimum. Station Z released.
30)	Close SMAS access Point D to A and B to C.
31)	Perform calculations in Columns D, E, H, and J.
32)	Alignment complete.

**Table 8. SDS8486LN Point-Point Remote Alignment (Continued)**

## 8. TESTING & TROUBLESHOOTING

## 8.2 Troubleshooting

### 8.1 Testing

The procedures outlined in this document and in Table 5 are intended only to ascertain proper operation of the unit and, if problems should occur, to isolate those problems to the most probable area. These procedures are not designed to effect repairs or modifications. Tests beyond those outlined, or repairs made beyond replacing a faulty unit, are not recommended and may void the warranty.

If trouble is encountered, verify all installer connections to the assembly and check that the CO power fuse is not blown. Also verify all module connections and option switch settings, and verify the modules are making a positive connection with the shelf connector. If trouble persists, replace the suspect unit and repeat procedures outlined. These procedures are not designed to effect repairs or modifications. Any tests beyond those outlined herein, or repairs made beyond replacing a faulty unit, are not recommended and may void the warranty.

## 9. CUSTOMER & TECHNICAL SERVICES

### 9.1 Customer Service & Technical Assistance

If technical or customer assistance is required, contact Westell by calling or using one of the following options:

Voice: (630) 898-2500  
 Voice: (800) 323-6883  
 email: [global\\_support@westell.com](mailto:global_support@westell.com)

Visit the Westell World Wide Web site at <http://www.westell.com> for additional information about Westell.

### 9.2 Part Numbers

This Westell equipment is identified by a model number and an issue level. Each time a change is made to the product which changes the form, fit, or function of the product, the issue level/letter is incremented or advanced by one. Be sure to indicate the issue level as well as the model number when making inquiries about the product.

## 10. WARRANTY & REPAIRS

### 10.1 Warranty

Westell warrants this product to be free of defects at the time of shipment. Westell also warrants this product to be fully functional for the time period specified by the terms and conditions governing the sale of the product. Any attempt to repair or modify the equipment by anyone other than an authorized Westell representative will void the warranty.

### 10.2 Repair and Return

Westell will repair or replace any defective Westell equipment without cost during the warranty period if the unit is defective for any reason other than abuse, improper use, or improper installation. Before returning the defective equipment, first request a Return Material Authorization (RMA) number from Westell. Once an RMA number is obtained, return the defective unit, freight prepaid, along with a brief description of the problem, to:

Westell, Inc.  
 ATTN: R.G.M. Department  
 750 N. Commons Drive  
 Aurora, IL 60504-7940

Replacements will be shipped in the fastest manner consistent with the urgency of the situation. Westell will continue to repair or replace faulty equipment beyond the warranty period for a nominal charge. Contact Westell for details.

## 11. SPECIFICATIONS

### 11.1 Ordering Specifications

To order units, call the telephone numbers shown in Paragraph 9.1, and please specify a specific model number shown in Table 9.

Description & Comments	Description & CommentsPart/Model #
5496LNi4 Dual Powered DST (INTELIPOINT "+")	SDS5496LN CLEI Code: DST1A1M1AA
Technical Publication	030-101466

\*CLEI is a trademark of Telcordia Technologies.

**Table 9. Ordering and Option Information**

### 11.2 Electrical and Physical Specifications

The electrical and signaling specifications are listed below, and the physical specifications for the SDS5496LN are shown in Table 10.

- A. Impedance: Facility-side, selectable for 150, 600, 1200 Ohms; Equipment-side (2W/4W), 600 Ohms, fixed. See Table 1, Operating Levels.
- B. Wire Test Mode: Activated via TEST switch being pressed <5 sec. and only during first five minutes of initial power-up; Deactivated via TEST switch or automatic release after one hour. Note: the TEST switch also used to activate AUTO-ALIGN feature (switch pressed for >5 sec.) but only during first five minutes of initial power-up.
- C. Command Mode: Send Loopback/Activation frequency (>30 sec). INTELIPOINT returns steady 1014 Hz at +5 dBm (TLP) indicating command mode initiation. See paragraph 6.01 through 6.08 for changing activation tone and customer demarc levels of unit. Note: If Loopback/Activation frequency is removed in <30 seconds, INTELIPOINT enters loopback.
- D. Unit I.D. Tone: One sec. alternating 2814 Hz/1814 Hz tone upon detecting activation tone for >2 sec.
- E. Remote Alignment: Activated from command mode by sending 1004 Hz in response to INTELIPOINT's 1014 Hz; Alignment continues by sending appropriate tones in response to tones received from INTELIPOINT.
- F. Loopback After Alignment: Automatically entered after remote alignment; **Release**, 20-minute automatic timeout (unit returns to idle) or by sending the Loopback/Activation tone for >0.9 sec. (return to command mode).
- G. Auto-Align: Activated only by pressing TEST switch (>5 sec) and only during the first five minutes of initial power-up; Release: Automatic.
- H. Equalization: Automatically provides RCV channel amplitude equalization (up to 15.3dB, re: 1004 Hz) to meet C5 conditioning.

- I. Tone-Activated Loopback: From idle state by sending the selected Loopback/Activation frequency ( $\pm 7$  Hz) for  $> 2$  but  $< 30$  sec.; **Release**, 20-minute automatic timeout or the Loopback/Activation frequency for  $> 0.9$  sec.; Manual Loopback: Activated by grounding MNLB lead, pin 1; **Release**, removal of ground only.
- J. Loopback Detector Threshold Level: -24 dBm (typically -30 to +5 dBm)
- K. Loopback Gain: Automatically inserts 0 dB or 16 dB gain to provide equal-level loopback condition.
- L. Quiet Term Operation: TLP Transponder, activated from command mode via 804 Hz; DLP Transponder, activated from command mode via 1304 Hz. When activated, INTELIPORT applies quiet termination and sets 20 minute timer circuit; **Release**, 20-minute automatic timeout (unit returns to idle), Loopback/Activation frequency for 0.9 seconds (return to command mode), second application of Loopback/Activation frequency for  $> 0.9$  sec. (return to idle).
- M. Transponder Mode: Activated from quiet termination mode only by sending any tone from 304 Hz to 3204 Hz (except the selected Loopback/Activation frequency). Tones sent to INTELIPORT should be in 100 Hz increments. INTELIPORT returns similar tone (at 10 Hz off-set) for same duration tone is received. Upon completion and if no other tone sent, INTELIPORT reapplies quiet term and resets 20 minute timer; **Release**, 20-minute automatic timeout (unit returns to idle), Loopback/Activation frequency  $> 0.9$  sec (return to command mode), second application of Loopback/Activation frequency for  $> 0.9$  sec (return to idle).
- N. Idle Noise:  $< 17$  dBmC0
- O. Trans-hybrid Loss:  $> 30$  dB minimum; 45 dB typical
- P. Frequency Response: Receive Path, meets C5 requirements; Transmit Path,  $\pm 0.5$  dB from 300 to 3000 Hz
- Q. Sealing Current: Option switch S1 provides selection of SUPPLY to supply 20 mA of regulated sealing current to the distant end, or TERM for LINE/LOCAL powering applications.
- R. Power: Line Powered via simplex leads @ 8 mA. Locally Powered -22 to -56 Vdc (-48V typical) @ 22 mA (42 mA when optioned for SUPPLY) or 20 to 28 VAC (24V typical) @ 40 mA.
- S. Meets UL1459 requirements.

Physical Feature	U.S.	Metric
Height	5.58 in.	14.2 cm
Width	1.4 in.	3.6 cm
Depth	5.9	15 cm
Weight (approx.)	1 lbs	0.48 kgs
Operating Environment	32°F to +122°F	0°C to +50°C
Operating Humidity	0 to 95% (non-condensing)	

Table 10. SDS5496LN Physical Specifications

