

Model SDS5496LGI2 ULTRAPORT® Dual Powered 2W/4W Data Station Termination

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1. GENERAL

1.1 Document Purpose

This document describes the Engenuity SDS5496LGI2 ULTRA PORT Dual Powered 2W/4W Data Station (see Figure 1.)

- NOTE -

Hereafter, the SDS5496LGI2 ULTRAPORT Dual Powered 2W/4W Data Station Termination will be referred to as the "SDS5496LGI2" or "ULTRAPORT."

1.2 Document Status

Whenever this practice is updated (to reflect a new issue or revision), the reason will be stated in this paragraph. Issue 2 of this product adds pins 9 and 43 to the Block Diagram, Figure 2.

1.3 Product Description

Engenuity line powered 2W/4W Data Station Termination Model SDS5496LGI2, provides an interface between a 4-wire facility and a 2W or 4W data modem. As a member Engenuity's family of ULTRAPORT Intelligent Network Channel Termination Equipment (INCTE), the SDS5496 LGI2 provides all the functions of a standard data station termination (DST) but with additional features.

One unique feature of Engenuity's SDS5496LGI2 is its selectable frequencies and operating levels of standard +13 dBm or 0 dBm XMT IN and -3 dBm or 0 dBm RCV OUT, which allows this unit to operate in normal DATA and FAA applications.

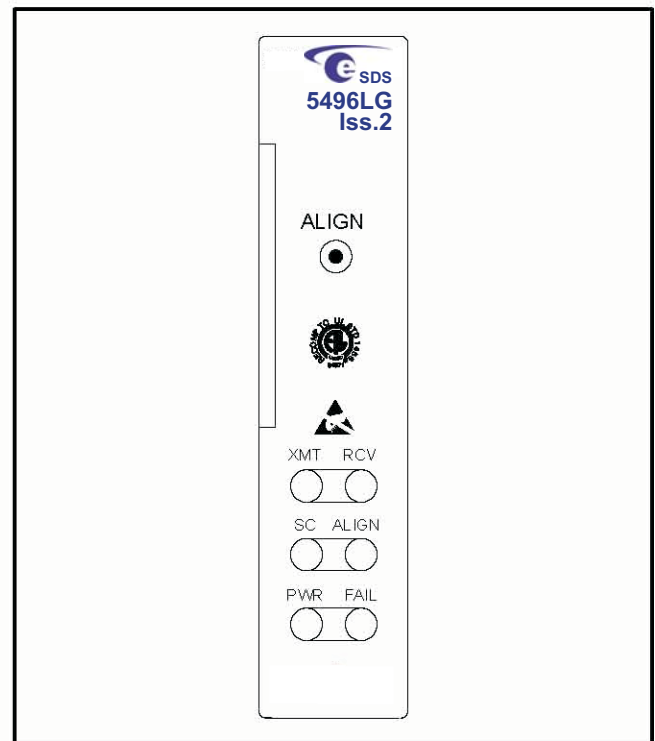


Figure 1. Front View of SDS5496LGI2

Another unique feature is the SDS5496LGI2's ability to be locally powered or line powered. The SDS5496LGI2 contains an integral microprocessor and precision oscillator circuit that allow comprehensive remote testing and alignment when the circuit is activated from the Serving Test Center (STC).

1.4 Product Features

The SDS5496LGI2 offers the following features:

- Facility-side terminating impedance option (150/600/1200 Ohms) to match the impedance of the 4-wire facility; Equipment-side impedance is 600 Ohms, fixed
- Operates in either 2W or 4W data modem applications
- Internal sealing current circuit provides a TERM for LINE POWERED applications or SUPPLY when supplying sealing current to the distant end or OFF
- Soft Switch selection of 1713 Hz, 1913 Hz, 2413 Hz, 2913 Hz, or 2713 Hz, (Factory Default 2713 Hz), loopback/ command mode activation

- Acknowledgement tone (alternating 1814 Hz/2814 Hz) identifies the unit as ULTRAPORT® module
- Remote or automatic 3- or 4-tone alignment capability
- Automatically adjusts RCV channel gain and amplitude response characteristics (up to 15.3 dB)
- RCV OUT Level of -3 dBm or 0 dBm;
- XMT IN level of +13 dBm or 0 dBm (Factory Default -3 dBm RCV, +13 dBm XMT)
- Full range transponder (300 Hz to 3200 Hz) with a quiet termination and 4-tone auto sweep permits remote testing of noise and tone level measurements
- Front-panel ALIGN switch used to manually activate ULTRAPORT's automatic alignment feature for distant DSTs and to activate wire test to verify station wiring
- Front-panel LEDs for operational mode of the unit
- Non-volatile memory circuit retains programmed information in the event of a power loss
- High density 200 Mechanics® mounts in one position of 400 mechanics shelf or 200 Mechanics® shelf
- Local Power: Operates from -22 to -56 Vdc at 20mA maximum or 20 to 28 Vac at 40 mA maximum; Line Power: can operate from power supplied by the serving office at 8 mA
- Meets UL 1459 requirements
- 7-year warranty

2. APPLICATIONS

The SDS5496LGI2 provides an interface between a 4-wire facility and a 600 ohm 2W or 4W data modem. The SDS5496LGI2 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 SDS5496LGI2 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 remotely from the command mode via tone commands.

2.1 Command Mode

The command mode is the operational state in which ULTRAPORT 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. If the 2713 Hz tone is received for greater than 30 seconds, ULTRAPORT returns a steady 1014 Hz tone indicating command

mode initiation. If the tone is removed in less than 30 seconds, ULTRAPORT enters loopback.

- NOTE -

The tone used to activate 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 SDS5496LGI2 to other loopback/activation frequencies for different types of applications, such as:

- 2713 Hz for Standard DST Applications
- 2413 Hz for FAA Applications; or
- 1713, 1913, 2913 Hz for Power Co. or other Utility-Type Application

The release to idle tone is the programmed XX13Hz. 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 dBm RCV/+13.0 dBm 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 of the SDS5496LGI2 are listed in Table 1.

PORT	LEVELS (IN DBM)			
	-3.0/+13.0 TLP STANDARD DST OPERATING LEVELS		-3.0/+13.0 TLP STANDARD DST OPERATING LEVELS 0.0/0.0 TLP FAA, OTHER OPERATING LEVELS	
	TLP	DLP	TLP	DLP
RCV IN	+5 TO -10 (TLP)	-8 to -23 (DLP)	+5 TO -10 (TLP)	-8 to -23 (DLP)
RCV OUT	-3	-16	0	-13
XMT IN	+13	0	0	-13
XMT OUT	+5	-8	+5	-8

Table 1. Operating Levels

2.3 Dual Powering Feature

The dual powering feature of the SDS5496LGI2 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 the local power is either missing or has been interrupted. The SDS5496LGI2 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 are present, the SDS5496LGI2 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.

2.4 Alignment (Remote and Auto)

The SDS5496LGI2 features both remote and automatic alignment capabilities. A tester center can align the circuit to either three tones or four tones.

- NOTE -

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 paragraphs 3.6 through 3.13 for details on circuit alignment.

3. CIRCUIT/FUNCTIONAL OPERATION

Refer to Figure 2, the SDS5496LGI2 Block Diagram, as needed, while reading this section.

3.1 LED Status Indicators

The SDS5496LGI2 has six front-panel LEDs (XMT, RCV, SC, ALIGN, PWR, FAIL) that provide visual indication of the unit's status and mode. Table 2 provides a brief summary of the LED functions.

LED	ON	OFF	FLASHING
XMT	Receiving data from Equip.	Idle	NA
RCV	Transmitting data to Equip.	Idle	NA
SC	Sealing Current Applied	Sealing Current Not Applied	NA
ALIGN/LPBK	Command Mode, Alignment Mode or Transponder Mode	Idle	Loopback Mode
PWR	Power Applied	Power Not Applied	NA
FAIL	Logic Failure	Idle	Test Mode

Table 2. LED Status Indicators

3.2 Command Mode Operation

ULTRAPORT is factory-conditioned to respond to 2713 Hz. The unit can be changed to respond to 2413, 1713, 1913, or

2913Hz 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). ULTRAPORT must receive this 2713 Hz for more than 30 seconds, ULTRAPORT 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 ULTRAPORT, the test person removes the 2713 Hz tone.

- NOTE -

If the tone is removed in less than 30 seconds, ULTRAPORT enters the Loopback mode of operation.

3.4 Command Mode Features

While in command mode, the test person can activate ULTRAPORT's intelligent functions. The intelligent functions include: Customer Demarc Interface Levels, Loopback/Activation frequency, Remote Alignment mode, TLP or DLP Quiet Term/Transponder mode, factory default, and Auto Align. 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 ULTRAPORT during the 5 minute time frame, ULTRAPORT returns to idle.

Changing Loopback/Command Mode Activation Frequency (1713, 1912, 2413, 2713, 2913 Hz).ULTRAPORT can be programmed to respond to a loopback/command mode activation tone of either 1713 Hz, 1913 Hz, 2413 Hz, 2713 Hz (Standard), or 2913 Hz. To activate the Level/Frequency Selection Mode, The STC must first enter the command mode. While in command mode, the test person sends 1604 Hz. Upon detecting 1604Hz, ULTRAPORT sends a two-second interrupted 1014 Hz /XX13 Hz tone, holding on the XX50 Hz tone for up to five minutes. The XX13 Hz tone is the current loopback/activation frequency.

To change to loopback/activation frequency, the tester sends 1713 Hz, 1913 Hz, 2413 Hz, 2713 Hz, or 2913 Hz for 1713 Hz, 1913 Hz, 2413 Hz, 2713 Hz, or 2913 Hz respectively for operation. Upon receiving 1713 Hz, 1913 Hz, 2413 Hz, 2713 Hz, or 2913 Hz, the ULTRAPORT returns interrupted 1014/XX13 Hz, holds the XX13 Hz tone for ten seconds, and then returns to command mode.

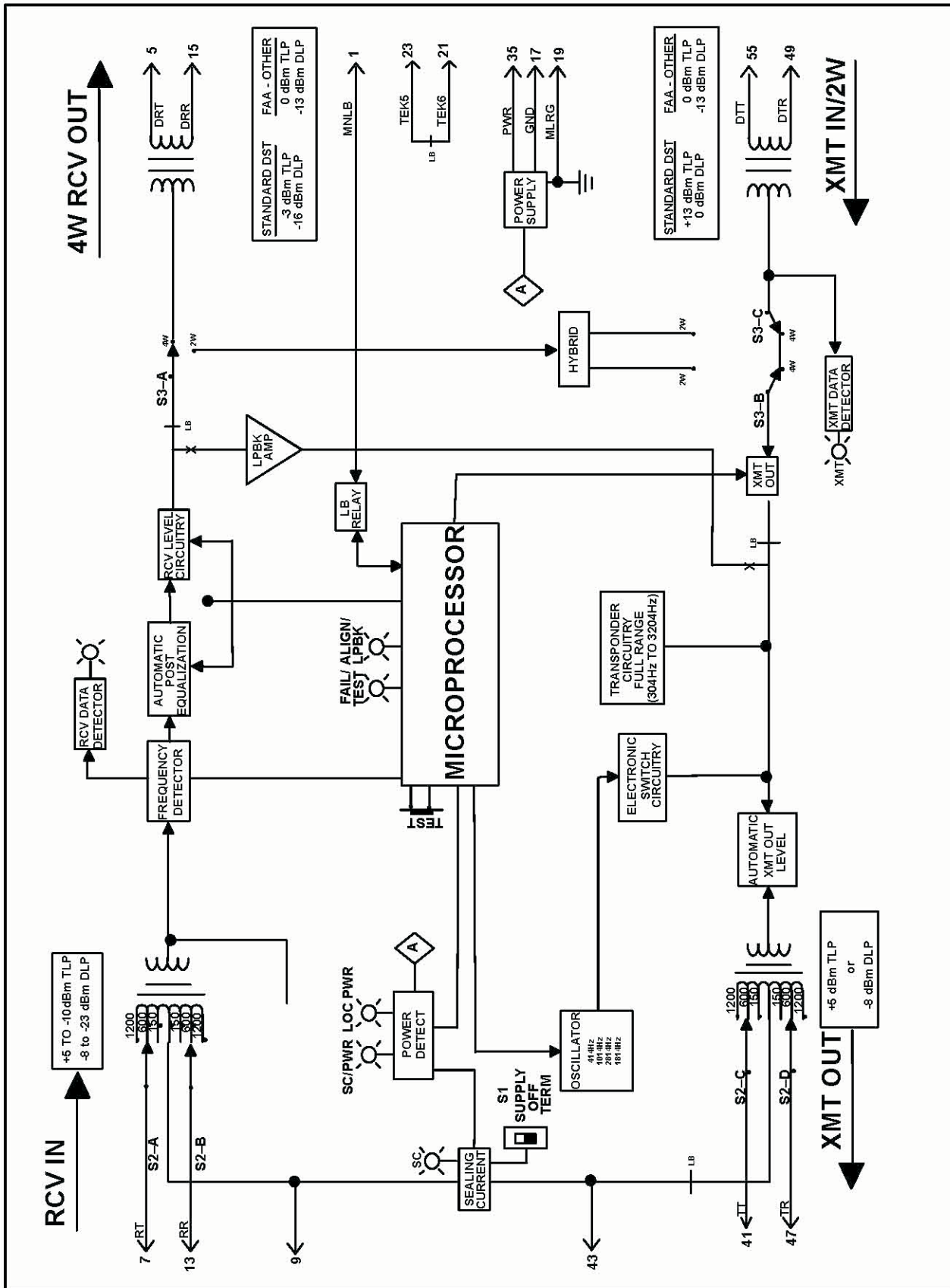


Figure 2. SDS5496LG12 ULTRAPORT Block Diagram

- NOTE -

To leave the ULTRAPORT frequency setting menu without changing the current frequency, send the appropriate command (i.e. 1713, 1913, 2413, 2713, or 2913 Hz) for the current frequency to return to the command mode.

Changing Customer Levels (+13/-3 or 0/0) (Factory Default -3 dBm RCV/ +13 dBm XMT). ULTRAPORT can be programmed for standard customer interface levels of +13 dBm (TLP) XMT IN and -3 dBm (TLP) RCV OUT or 0 dBm XMT IN and 0 dBm RCV OUT. To activate the Level/Frequency Selection Mode, the STC must first enter the command mode. While in command mode, the test person sends 1604 Hz. Upon detecting 1604 Hz, ULTRAPORT returns a ramp-up sequence the SDS5496LGI2 sends a two-second interrupted 1014/XX13 Hz tone, holding on the XX13 tone for up to five minutes.

To change the customer level interface, the tester sends 2600 Hz to toggle the current level. Upon sending 2600 Hz to the SDS5496LGI2, the ULTRAPORT returns a Ramp-UP sequence indicating the SDS5496LGI2 is set for +13/-3 levels or a Ramp-Down sequence indicating the SDS5496LGI2 is set for 0/0 levels, and then returns to the command mode.

- NOTE -

To leave the ULTRAPORT Level/Frequency setting menu without changing the current levels or frequency, send the appropriate command (i.e. 1713, 1913, 2413, 2713, or 2913 Hz) for the current frequency to return to the command mode.

3.5 Alignment

ULTRAPORT features both remote and automatic alignment capability. Remote alignment is used to align only the SDS5496LGI2. Auto-align is used to automatically align the SDS5496LGI2 with another Intelligent DST at the distant end. Both the Remote and Auto-align is done at TLP and with respect to either three tones or four tones.

3.6 Auto-Align Mode

Auto-Align is initiated from command mode, or by pressing the front-panel ALIGN switch for more than five seconds during the first five minutes of initial power-up. If the circuit has been powered up for more than five minutes, the ALIGN switch becomes disabled.

- NOTE -

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

Upon sensing the Align switch being pressed for more than five seconds, ULTRAPORT sends the selected loopback/activation frequency to the distant end to put the distant end into command mode. The distant end, upon receiving the appropriate activation tone, enters command mode and returns 1014 Hz command mode tone back to ULTRAPORT.

When command mode tone is received from the distant end, ULTRAPORT continues the Auto-Align sequence sequence by sending 1014 Hz. Upon receiving 1014 Hz, the distant end returns 2814 Hz. Upon receiving 2814 Hz from the distant end returns 414 Hz. Upon receiving 414 Hz from the distant end, ULTRAPORT SENDS 414 Hz.

At this point, if the distant end has the capability of aligning to four tones, the distant end returns 1814 Hz. Upon receiving 1814Hz from the distant end, ULTRAPORT sends 1814 Hz. Upon receiving 1814 Hz from ULTRAPORT, both ends align to the four tones.

- NOTE -

If the distant end does not have the capability of aligning to four tones, both ends align to three tones.

After alignment, ULTRAPORT sends the selected loopback/activation frequency to the distant end and returns to idle. The distant end, upon detecting the frequency also returns to idle.

3.7 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 1014Hz. 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 ULTRAPORT.

- NOTE -

During Remote Alignment, ULTRAPORT provides a built-in five-minute waiting period for each tone (1004, 2804, and 404Hz) to be returned by the test person in response to ULTRAPORT's 1014, 2814, and 414 Hz respectively. If the correct tone is not received by ULTRAPORT during the five-minute period, ULTRAPORT, 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 ten seconds, ULTRAPORT drops out of the Remote Alignment mode and returns to idle. The ramp-down tone, in this case indicates the ULTRAPORT has reached the 5-minute timeout. If this occurs without completing the alignment, the non-volatile memory circuit will not be updated.

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

Upon receiving 404 Hz, ULTRAPORT returns 1814 Hz for 120 seconds. The test person should verify/record the level received at 1814 Hz, and then align the circuit to either 3- or 4-tones.

3.8 3-Tone Alignment

If the test person chooses to ignore the 1814 Hz tone from ULTRAPORT, the 1814 Hz tone time out after 120 seconds. At this

point, ULTRAPORT sets the alignment levels based on three tones, returns either a ramp-up or ramp-down tone, applies quiet termination for one second, and then enters loopback.

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

Upon completing the alignment, ULTRAPORT automatically outputs a level of +5 dBm (TLP) immediately following the alignment process.

3.9 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, ULTRAPORT aligns to four tones. Upon completion, ULTRAPORT 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, and enters loopback.

3.10 Ramp-Up Tone Sequence

A ramp-up tone, consisting of a series of tones ranging from 314Hz 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 ULTRAPORT during a test function equipped with the 20-minute time-out feature).

3.11 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 ULTRAPORT during a test function equipped with the 5-minute time-out 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.

3.12 Loopback After Remote Alignment

Immediately following the Remote Alignment sequence, ULTRAPORT 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 ULTRAPORT. The test person should verify/record the level of each tone as it is looped back by ULTRAPORT. The loopback circuit automati-

cally inserts 16 dB gain when demarc levels are set to +13/ -3 dBm, or 0 dB when demarc levels are set to 0/0 dBm to provide an equal-level loopback condition for verifying alignment settings.

3.13 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. ULTRAPORT returns to command mode. At this point, if the test person removes and resends the loopback/activation frequency a second time, ULTRAPORT returns to idle.

3.14 Tone-Activated 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. ULTRAPORT returns to idle upon detecting the appropriate release tone.

- NOTE -

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

3.15 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.

3.16 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 ULTRAPORT'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, ULTRAPORT returns a one-second alternating 2814 Hz/1814 Hz Unit I.D. tone.

- NOTE -

If the loopback/activation tone is present for more than 30 seconds, ULTRAPORT enters the command mode.

3.17 Quiet Term/Transponder

ULTRAPORT's Quiet Term/Transponder mode allows the test persons to conduct noise and tone level measurements remotely over the XMT OUT port. From the command mode, the Quiet

Term/Transponder mode is activated by sending 404 Hz to ULTRAPORT via the RCV IN port. Upon detecting 404 Hz, ULTRAPORT applies a quiet termination at the XMT IN port and isolates signals from the data modem.

During quiet termination, the test person performs noise measurements at the XMT OUT port. Quiet termination remains in effect for 20 minutes or until another tone is sent (i.e., to enter the transponder mode of operation, return to command mode or return to idle). If no tone is sent, after 20 minutes of no activity, ULTRAPORT times out and automatically returns to idle. If desired, the test person can send activation frequency for more than five seconds to return ULTRAPORT back to command mode.

3.18 Transponder Mode of Operation

From the Quiet Termination Mode, ULTRAPORT features a 4-Tone Automatic Sweep Transponder mode of operation and a Full-Range Transponder mode of operation. The 4-Tone Auto-Sweep Transponder allows for a quick tone level verification test over the XMT OUT port as ULTRAPORT sweeps four tones. The Full-Range Transponder mode allows for a more detailed tone level verification test over a range of frequencies from 314Hz to 3214Hz. Both transponder modes are activated from the quiet termination mode only.

3.19 4-Tone Auto-Sweep

To activate the 4-tone Auto-Sweep tone during the quiet termination portion of the Quiet Term/Transponder mode. Upon detecting this 404 Hz, ULTRAPORT sweeps the tones of 414Hz, 1014 Hz, 1814 Hz, and 2814 Hz, each for 15 seconds. The level of each tone is applied over the XMT OUT port. After sending the last tone, ULTRAPORT reapplies quiet termination and resets the 20-minute timer circuit. The 4-Tone Auto-Sweep Transponder test can be restarted by resending 404 Hz as the first tone while in quiet termination.

3.20 Full-Range Transponder

To activate the Full-Range Transponder, the test person sends any tone from 304 Hz to 3204 Hz (except 404 Hz as the first tone, or the loopback/activation Tone) while in quiet termination. If 404 Hz is detected as the first tone, ULTRAPORT begins the 4-Tone Auto-Sweep. However, 404 Hz can be sent any time after the transponder test has begun. If the loopback/activation frequency is received at any time, ULTRAPORT returns to command mode.

During the Full-Range Transponder test, each tone sent to ULTRAPORT should be increments of 100 Hz. As tone is received, ULTRAPORT responds to the tone being sent by returning a similar tone (but at a slight offset) for the same duration tone is received or for 15 seconds (whichever is longer). After removing a tone and if no other tone is sent by the test person, ULTRAPORT reapplies quiet termination and resets the 20-minute

timer circuit. If no tone is sent to ULTRAPORT within the 20-minute time frame, ULTRAPORT, after 20 minutes, times out and returns to idle. If release is desired before the 20-minute time frame, send activation frequency for five seconds to return to command mode.

4. OPTIONS & FEATURES

4.1 Option Switches

Westell's SDS5496LGI2 provides three option switches S1, S2, and S3. These three switches are used to configure the SDS5496LGI2 for proper operation in a given application. A brief description of each option is given below. This description, as well as the location of each option, is shown in Table 3.

4.1.1 Option Switch (S1)

Option switch S1 (Sealing Current) provides a 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 ULTRAPORT is optioned for SUPPLY, the line powering capability is disabled, as the unit becomes a locally-powered-only module.

4.1.2 Option 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.

4.1.3 Option Switch (S3)

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

4.2 Front-panel ALIGN Switch

In addition to the three option switches, the ULTRAPORT also provides a front-panel ALIGN switch, that serves two functions. The ALIGN switch is used to activate ULTRAPORT's wire test mode and ULTRAPORT'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 reinsert the module to reset the 5-minute timer circuit and reactivate the ALIGN SWITCH.

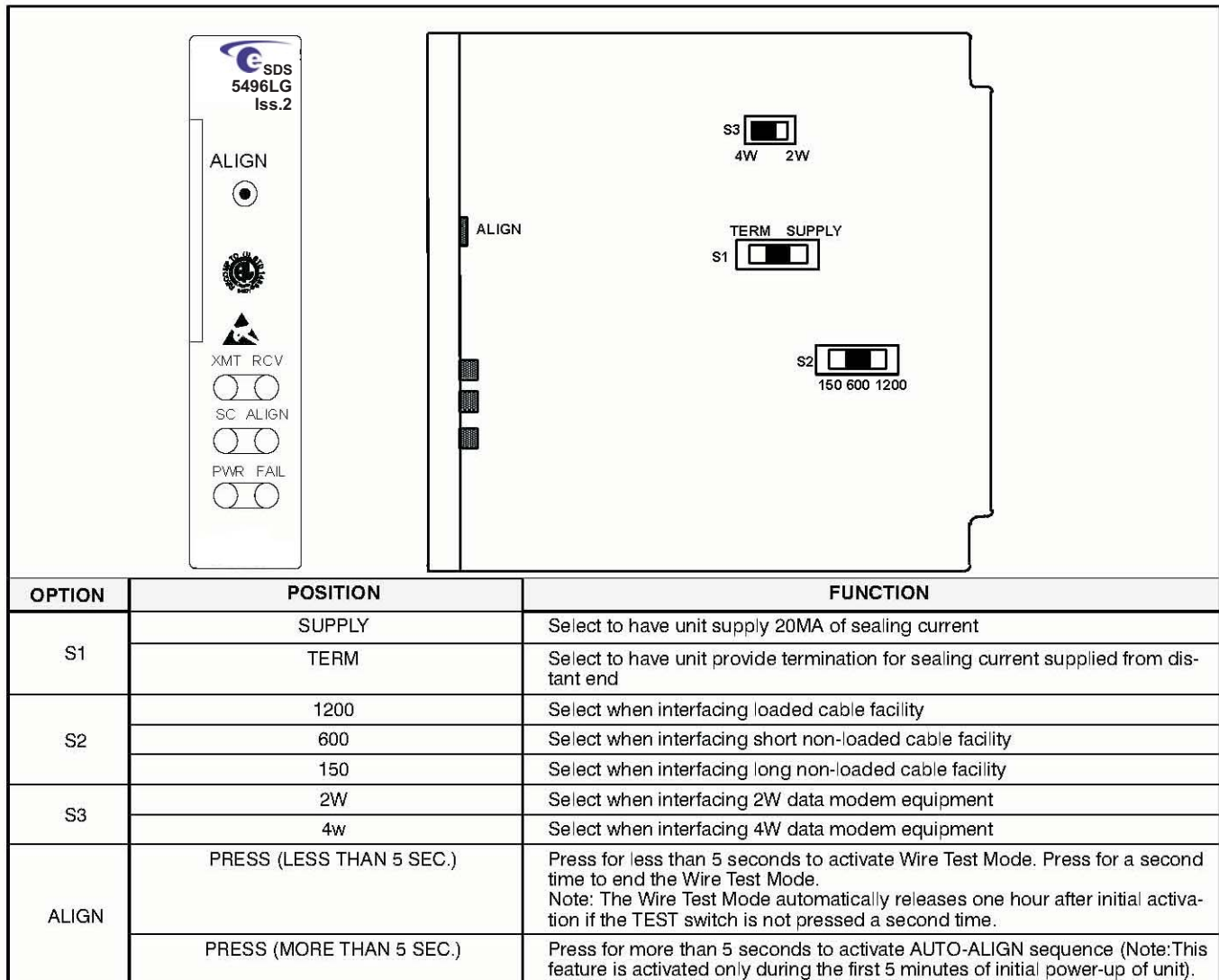


Table 3. SDS5496LGI2 Front-panel and Switch Option Location Diagram

5. INSTALLATION

Installation consists of physically mounting the assembly, making the necessary electrical connections, and installing the modules in the assembly. Before installing the unit, please observe the following safety notes:

- 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 7.1 for telephone number).



- CAUTION -



Risk of electric shock. Voltages up to 140 VDC (with reference to ground) may be present on telecommunications circuits.



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.

- CAUTION -

Use care when installing and removing modules - *do not force a module into place*. If a module resists insertion, remove it and check for debris in or near the module's or shelf's connectors and mounting slots. The module may then be gently re-inserted.

5.1 Installer Connections

When installing the unit in Westell's prewired USA Type-550 mounting (Type-400 equivalent), connections are made via 25-pair cable connectors located on the rear of the shelf assembly. Pin-outs are listed in Table 4.

DESCRIPTION		PIN
RT-RCV IN Tip	Facility	7
RR - RCV IN Ring		13
TT - XMT OUT Tip		41
TR - XMT OUT Ring		47
SXR - Simplex RCV		9
SXT - Simplex XMT		43
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
E/TEK5 - Data Modem		23
M/TEK6 - Disable Leads		21
MNLB - Manual Loopback	Miscellaneous	1
MLBG - Manual LPBK Ground		19
PWR - Power		35
GND - Ground		17

Table 4. Installer Connections

5.2 Power Requirements

Power to SDS5496LGI2 can be supplied via the serving office (line powered) or from a local external power source. When powered locally, the SDS5496LGI2 will operate from a power source of 20 to 28 Vac (24 Vac, nominal) at 22mA, 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 derived power. If ULTRAPORT is being powered from a local external power source (20 to 28 Vac or 22 to -56 Vdc), internal Sealing Current circuit provides a termination for sealing current. If a local power source is not available, ULTRAPORT will operate off the simplex current. If both local power and simplex powering are present, ULTRAPORT will always operate off the local power source as its first choice. If local power is ever interrupted, the Power Detect circuit automatically switches the internal circuitry so ULTRAPORT 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. When the SDS5496LGI2 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.

- NOTE -

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

5.4 Wire Test Mode

ULTRAPORT'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 ALIGN switch for less than five seconds. The front-panel FAIL/TEST LED will flash indicating the Wire Test mode is activated (see Table 5 for Wire Test Mode Tones).

- NOTE -

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

When the ALIGN switch is pressed and released in less than five seconds, ULTRAPORT 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 5). Once the tones are verified, the installer may press the ALIGN switch again to end the Wire Test mode. The ALIGN switch is also used to activate the AUTO-ALIGN feature. The ALIGN switch may be pressed for less than 5 seconds, but only during the first five minutes of the initial power-up.

- NOTE -

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

PORT	4W APPLICATIONS	2W APPLICATIONS
RCV IN	Continuous 1014 Hz	Continuous 1014 Hz
XMT OUT	Continuous 1014 Hz	Interrupted 1014 Hz
RCV OUT	Interrupted 1014 Hz	—
XMT IN/2W	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 5. Wire Test Mode Tones

STEP	ACTION															
1.	<p>Installer's Procedures - Set option switches as required per Circuit Layout Record (CLR) card. Install unit and apply power. Verify LOC PWR LED ON if unit is locally powered or SC PWR LED on if unit is line powered. Also verify ALIGN/LPBK, FAIL/TEST, RCV and XMT LEDs are OFF. Note: 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>Wire Test Mode Note: Pressing the ALIGN Button Activates the Wire Test Mode only in the first five minutes of power-up.</p> <p>CAUTION: ULTRAPORT places 1014Hz tone on the transmission pairs when Wire Test mode is activated. Be sure ULTRAPORT is not connected to an in-service circuit where this tone may cause interference.</p> <p>Momentarily press the front-panel ALIGN 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"> <thead> <tr> <th>PORT</th> <th>4W APPLICATIONS</th> <th>2W APPLICATIONS</th> </tr> </thead> <tbody> <tr> <td>RCV IN</td> <td>verify Continuous 1014 Hz</td> <td>Continuous 1014 Hz</td> </tr> <tr> <td>XMT OUT</td> <td>verify Interrupted 1014 Hz</td> <td>Interrupted 1014 Hz</td> </tr> <tr> <td>RCV OUT</td> <td>verify Continuous 1014 Hz</td> <td></td> </tr> <tr> <td>XMT IN /2W</td> <td>verify Interrupted 1014 Hz</td> <td>Interrupted 1014 Hz</td> </tr> </tbody> </table> <p>When tones are verified, press ALIGN switch to end Wire Test mode. Wire 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	XMT OUT	verify Interrupted 1014 Hz	Interrupted 1014 Hz	RCV OUT	verify Continuous 1014 Hz		XMT IN /2W	verify Interrupted 1014 Hz	Interrupted 1014 Hz
PORT	4W APPLICATIONS	2W APPLICATIONS														
RCV IN	verify Continuous 1014 Hz	Continuous 1014 Hz														
XMT OUT	verify Interrupted 1014 Hz	Interrupted 1014 Hz														
RCV OUT	verify Continuous 1014 Hz															
XMT IN /2W	verify Interrupted 1014 Hz	Interrupted 1014 Hz														
FRONT PANEL LED INDICATORS																
PWR	If this LED is ON steady, it indicates the unit is being powered via a local, external power source.															
	If this LED is Off, it indicates local power is not present. Check status of the SC LED.															
SC	If this LED is ON steady, it indicates unit is being powered via simplex current (line powered).															
	If this LED is OFF, it indicates simplex current is not present. Check status of the PWR LED. Note: If both the PWR and SC LEDs are lit it indicates the unit is locally powered and the internal sealing current circuit is providing a termination for sealing current.															
ALIGN	When this LED is ON steady, it indicates the unit is in the command, alignment, or transponder mode.															
	When this LED is OFF, it indicates the unit is idle.															
	When this LED is flashing, it indicates the unit is in the looback mode.															
FAIL	When this LED is ON steady, it indicates a unit failure condition. Replace the unit.															
	When this LED is Off, it indicates the unit is idle.															
	When this LED is flashing, it indicates the unit is in the Wire Test mode.															
XMT	When this LED is ON Steady or flashing, it indicates the unit is receiving data from Equipment.															
	When this LED is OFF, it indicates the unit is idle.															
RCV	When this LED is ON steady or flashing, it indicates the unit is sending data to Equipment.															
	When this LED is OFF, it indicates the unit is idle.															

Table 6. Installation Procedures

STEP	ACTION
1.	<p>Serving Test Center's Procedures Send loopback/activation frequency to ULTRAPORT.</p> <p>Upon receiving appropriate tone for >30 seconds, ULTRAPORT returns to a steady 1014 Hz at +5 dBm. Command mode initiated. Remove activation tone to change the loopback/activation frequency, the tester should query the unit by sending 1604 Hz.</p> <p>ULTRAPORT returns one of the following acknowledgements: Alternating 1014 Hz/2413 Hz (holding at 2413 Hz) if configured for FAA applications: Alternating 1014 Hz/2713 Hz (holding at 2713 Hz) if configured for DST applications: or Alternating 1014 Hz/XX13 Hz (holding at XX13 Hz) if configured for Power Company, or other utility-type applications.</p> <p>Upon receiving one of the above acknowledgements, test person can change the loopback/activation frequency by sending: 2713 Hz to configure ULTRAPORT for use in Standard DST Application: 2413 Hz to configure ULTRAPORT for use in FAA Applications: or 1713, 1913, or 2913 Hz to configure ULTRAPORT for use in Power Co., or Other Utility-type Applications ULTRAPORT returns alternating 1014 Hz/XX13 Hz and holds XX13 Hz for 5 seconds, then returns to the command mode.</p>
2.	<p>Remote (Manual) Alignment Mode From command mode, verify/record level received at 1014 Hz, and then send 1004 Hz to ULTRAPORT. ULTRAPORT returns 2814 Hz. Verify/record level received at 2814 Hz, and then send 2804 Hz to ULTRAPORT. ULTRAPORT returns 414 Hz. Verify/record level received at 414 Hz, and then send 404 Hz to ULTRAPORT. ULTRAPORT returns 1814 Hz for 120 seconds. Verify/record level received at 1814 Hz.</p> <p>At this point, the test person has option: 3-Tone Alignment: Ignore 1814 Hz. After 120 seconds, 1814 Hz tone from ULTRAPORT times out. ULTRAPORT aligns to 3 tones, returns ramp-up or ramp-down tone*, and 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 ULTRAPORT's 1814 Hz within the 120-second time frame. ULTRAPORT aligns to 4 tones, returns ramp-up or ramp-down tone, and then enters Loopback. 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>
3.	<p>Loopback (After Remote Alignment) While in Loopback, test person sends tones, one at a time, to ULTRAPORT. Record level of each tone as it is looped back by ULTRAPORT.</p> <p>Loopback automatically releases loopback 20 minutes after activation. ULTRAPORT returns to idle. Send loopback/activation tone for >0.9 seconds to return to idle.</p> <p>Loopback (From Idle State) Send the loopback/activation tone for >1.5 seconds but <30 seconds ULTRAPORT returns a one-second alternating tone of 1814 Hz/2814 Hz (Unit ID Tone) and then enters Loopback. NOTE: If loopback/activation tone is applied for >30 seconds, ULTRAPORT enters command mode.</p>
4.	<p>Auto-Align Mode Initiated by pressing front-panel ALIGN switch (>5 seconds), but ONLY during the first five minutes of initial power-up</p> <p>When activated, ULTRAPORT sends 2713 Hz to put distant end into command mode. Distant end returns command mode tone. With both stations set, tones are automatically sent and received between both ends. Upon completion (approximately two to three minutes) ULTRAPORT returns 2713 Hz to distant end and returns to idle.</p>

Table 7. Testing and Alignment Procedures

STEP	ACTION
5.	<p>Quiet Term/Transponder Operation From command mode, send 404 Hz. ULTRAPORT applies quiet termination at the XMT IN port and sets 20-minute timer. STC performs noise measurements over the XMT OUT port.</p> <p>NOTE: Quiet termination remains in effect for 20 minutes or until another tone is sent (i.e. enter 4-Tone Auto-Sweep or Full-Range Transponder, or exit quiet termination and return to command mode or return to idle.) If no tone is set within the 20-minute time frame, ULTRAPORT, after 20 minutes, times out and automatically returns to idle.</p> <p>During quiet termination, test person has option:</p> <p>4-Tone Auto-Sweep Transponder. Send 404 Hz as first tone while in quiet termination. Upon detecting 404 Hz, ULTRAPORT sweeps 414, 1014, 1814, and 2814 Hz, each for 15 seconds, over the XMT OUT port. Test person should verify/record level returned by ULTRAPORT. After sending the last 15-second tone, ULTRAPORT reapplies quiet termination.</p> <p>Full-Range Transponder. Send any tone from 304 Hz to 3204 Hz (except 404 Hz as the first tone, or the loopback/activation tone).</p> <p>NOTE: 404 Hz can be sent at any time after the transponder mode is initiated. Detection of the loopback/activation tone at any time, causes unit to return to command mode.</p> <p>Upon receiving tone, ULTRAPORT returns similar tone (at XX14Hz) for same duration tone is received or 15 seconds (whichever is longer). Test person should verify/record level returned by ULTRAPORT.</p> <p>Tones from the STC should be sent in 100Hz increments. Upon completion, and if no other tone is sent from the STC, ULTRAPORT reapplies quiet termination and resets the 20-minute timer.</p> <p>Release. Release and return to command mode is accomplished by sending loopback/activation tone for >5 seconds. Release and return to idle is accomplished via 20-minute automatic time-out feature.</p>
6.	Testing and maintenance tests are complete.

Table 7. 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.

- Send loopback/activation frequency to ULTRAPORT.
- Upon receiving appropriate tone for >30 seconds, ULTRAPORT returns steady 1014 Hz at +5 dBm. Command mode initiated. Remove activation tone. To change the loopback/activation frequency, the tester should query the unit by sending 1604 Hz. ULTRAPORT returns one of the following acknowledgements:
 Alternating 1014 Hz/2413 Hz (holding at 2413 Hz) if configured for FAA applications
 Alternating 1014 Hz/2713 Hz (holding at 2713 Hz) if configured for DST applications; or
 Alternating 1014 Hz/XX13 Hz (holding at XX13 Hz) if configured for Power Company, or other utility-type,

 Upon receiving one of the above acknowledgements, test person can change the loopback/activation frequency by sending:
 2713 Hz to configure ULTRAPORT for use in Standard DST Applications;
 2413 Hz to configure ULTRAPORT for use in FAA Applications; or
 1713, 1913, or 2913 Hz to configure ULTRAPORT for use in Power Co. or Other Utility-type applications
 ULTRAPORT returns alternating 1014/XX13 Hz and holds XX13 Hz for 5 seconds, then returns to the command mode.
 Record level of 1014 Hz received in Column B.

Remote Alignment Mode

- From command mode, send 1004 Hz. ULTRAPORT returns 2814 Hz.
- Record level at 2814 Hz in Column B, then send 2804 Hz. ULTRAPORT returns 414 Hz
- Record level at 414 Hz in Column B, in Column B, then send 404 Hz. ULTRAPORT returns 1814 Hz for 60-seconds.
- Record level at 1814 Hz in Column B, Test person has option:

3-Tone Alignment: Ignore 1814 Hz tone from ULTRAPORT. After 120 seconds*, 1814 Hz tone times out. ULTRAPORT aligns to 3 tones, sends ramp-up or ramp-down tone, then enters loopback
NOTE: Send 1004 Hz within the 120-second time frame to bypass timer circuit.

4-Tone Alignment: Send 1804 Hz within 120-second time frame. ULTRAPORT aligns to 4 tones, sends ramp-up or ramp-down tone, then enters loopback.

Loopback

- Send 404 Hz. Record level received from ULTRAPORT in Column C.
- Send 1004 Hz. Record level received from ULTRAPORT in Column C.
- Send 2804 Hz. Record level received from ULTRAPORT in Column C.
- (OPTIONAL) Send 1804 Hz. Record level received from ULTRAPORT in Column C.
- Re-send the loopback/activation tone for 0.9 seconds. ULTRAPORT returns to idle.
- Perform calculations for Columns D and E as required.

Table 8. SDS5496LGI2 Alignment

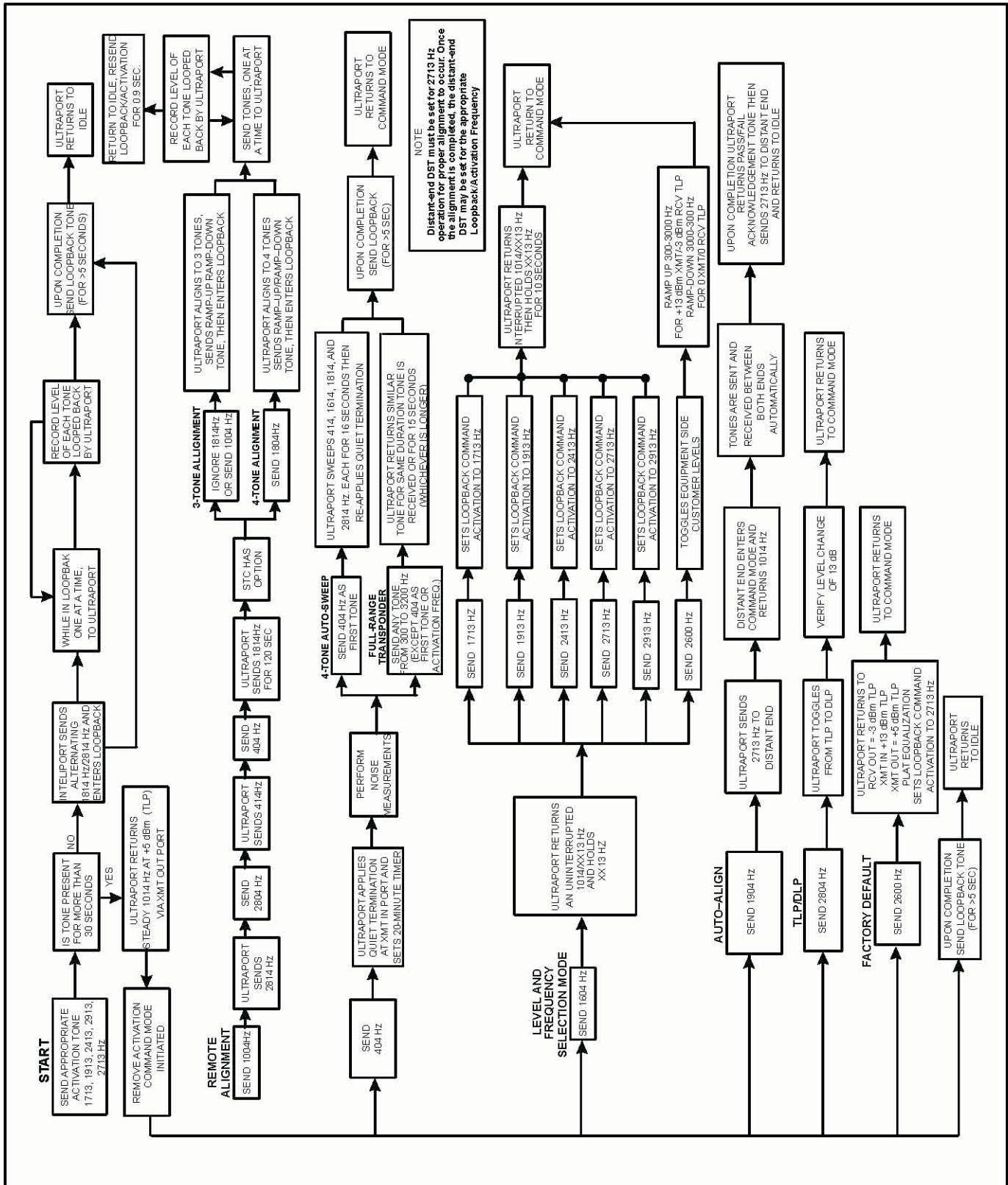


Figure 3. SDS5496LG12 FLOW DIAGRAM

6. TESTING & TROUBLESHOOTING

6.1 Testing

This equipment should not be field repaired. If the equipment is suspected of being faulty, replace it with another unit. If the replacement unit appears to operate correctly, the original unit may be faulty and should be returned to Westell for replacement. See Section 8.2.

6.2 Troubleshooting

If trouble is encountered, verify all installer connections to the assembly. 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.

7. CUSTOMER & TECHNICAL SERVICES

7.1 Customer Service & Technical Assistance

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

Voice: (800) 980-3266
email: rgm@engenuitycommunications.com

7.2 Part Numbers

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

8. WARRANTY & REPAIRS

8.1 Warranty

Engenuity warrants this product to be free of defects at the time of shipment. Engenuity 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 Engenuity representative or Engenuity staff will void the warranty.

8.2 Repair and Return

Engenuity will repair or replace any defective Engenuity 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 Engenuity. Once an RMA number is obtained, return the defective unit, freight prepaid, along with a brief description of the problem, to:

Engenuity Communications
Attention: RGM Department
1251 Nagel Blvd.
Batavia, IL 60510

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

9. SPECIFICATIONS

9.1 Ordering Specifications

To order units, call the telephone numbers shown in Paragraph 7.1 and please specify a specific model number shown in Table 9.

Part or Model #	Description
SDS5496LGI2	Model SDS5496LGI2 ULTRAPORT® Dual Powered 2W/4W Data Station Termination <small>CLEI® Code: NCD3/JMHDAA CPR Code: J73649</small>
Technical Publications	001-01-000014 Rev. 000

*CLEI is a trademark of Telcordia Technologies.

Table 9. Ordering and Option Information

9.2 Electrical and Physical Specifications

The electrical and signaling specifications are listed below, and the physical specifications for the SDS5496LGI2 are shown in Table 10.

- A. **Wire Test Mode:** Activated via ALIGN switch being pressed <5 seconds and only during the first five minutes of initial power-up; Deactivated via ALIGN switch or automatic release after one hour.

- NOTE -

ALIGN switch is also used to activate AUTO-ALIGN feature (switch pressed for >5 seconds), but only during five minutes of initial power-up.

- A. **Command Mode:** Send loopback/activation frequency (>30 seconds); ULTRAPORT returns steady 1014 Hz at +5 dBm (TLP) indicating command mode initiation. See

section 3.4 for information on changing activation tone and customer demarc levels of the SDS5496LG12.

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

- A. **Remote Alignment:** Activated from command mode by sending 1004 Hz in response to ULTRAPORT's 1014 Hz; Alignment continues by sending appropriate tones in response to tones received from ULTRAPORT.
- B. **Loopback After Alignment:** Automatically entered after remote alignment. Release: 20-minute automatic time-out (unit returns to idle) or send the loopback/activation tone for >0.9 seconds (return to command mode).
- C. **Auto-Align:** Activated only by pressing ALIGN switch (>5 seconds) and only during the first five minutes of initial power-up. Release: Automatic
- D. **Equalization:** Automatically provides RCV channel amplitude equalization (up to 15.3 dB, re: 1004 Hz) to meet C5 conditioning.
- E. **Tone-Activated Loopback:** From idle state by sending the selected loopback/activation frequency (± 7 Hz) for >2 but <30 seconds. Release: 20-minute automatic time-out or the loopback/activation frequency for >0.9 seconds. Manual Loopback: Activated by grounding MNLB lead, pin 1. Release: removal of ground only.
- F. **Loopback Detector Threshold Level:** -24 dBm (typically -30) to +5 dBm
- G. **Loopback Gain:** Automatically inserts 0 dB or 16 dB gain to provide equal-level loopback condition.
- H. **Quiet Termination Mode:** From command mode via 404Hz. ULTRAPORT applies quiet term over XMT IN port and sets 20-Min. timer; Release: loopback/activation tone (>5 seconds) return to command mode. Automatic time-out (20 minutes) if no tone sent. Unit returns to Idle.
- I. **4-Tone Auto-Sweep Transponder Operation:** From quiet termination mode only via 404 Hz as first tone, ULTRA-

PORT sweeps four tones, each for 15 seconds, then reapplies quiet termination and resets 20-minute timer. Release: loopback/activation tone (>5 seconds) to return to command mode. Automatic time-out (20 minutes) if tone sent. Unit returns to idle.

- J. **Full-Range Transponder Operation:** From quiet termination mode only via any tone from 304 Hz to 3204 Hz (except 404 Hz as the as the first tone, or loopback/activation Tone). ULTRAPORT returns similar tone (but a slight offset) for same duration tone is received or 15 seconds (whichever is longer). Upon completion, ULTRAPORT reapplies quiet termination and resets 20-minute timer. Release: loopback/activation tone (>5 seconds) to return to command mode. Automatic time-out (20 minutes) if no tone is sent. Unit returns to idle.
- K. **Idle Noise:** >17 dBmCo
- L. **Trans-hybrid Loss:** >30dB minimum; 45 dB typical
- M. **Frequency Response:** Receive Path, meets C5 requirements; Transmit Path, ± 0.5 dB from 300 to 3000 Hz.
- N. **Sealing Current:** Option switch S1 provides selection of SUPPLY to supply 20 mA of regulated sealing current to the distant end, or Term of LINE/LOCAL powering applications
- O. **Power:** Line Powered via simplex current @ 8 mA. Locally powered -22 to -56 Vdc (-48 typical) @ 22mA (42mA when optioned for SUPPLY) or 20 to 28 Vac (24 V typical) @ 40 mA

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.)	1.0 lbs	0.48 kg
Operating Environment	32°F to +122°F	0°C to +50°C
Operating Humidity	0 to 95% (non-condensing)	

Table 10. SDS5496LG12 Specifications