ENGINUITY INTELIPORT I
2W/4W Data Station Termination Interface
Model SDS5486AI2

CLEI* Code: DST1FGL1AA

CONTENTS PAGE #

1. GENERAL

1.1 Document Purpose

This document describes the Enginuity's INTELIPORT 2W/4W Data Station Termination Interface Model SDS5486A Issue 2, shown in Figure 1.

- NOTE -
Hereafter, Enginuity's INTELIPORT 2W/4W Data Station Termination Interface Model SDS5496A Issue 2, will be referred to as the "INTELIPORT" or the "SDS5486AI2."

1.2 Document Status

Whenever this practice is updated, the reason will be stated in this paragraph. Revision 001 of this practice updates contact information. Paragraph 7.1, 8.2, and 9.1 were updated to reflect new company address an contact information.

1.3 Product Purpose and Description

Enginuity's INTELIPORT I Model SDS5486AI2, provides an interface between a 4-wire facility and a 600-ohm, 2W or 4W data modem. As a member of Enginuity family of Intelligent Network Channel Terminating Equipment (INCTE), the SDS5486AI2 provides all the functions of a standard DST plus remote and automatic alignment capability. The integral microprocessor of INTELIPORT controls the intelligent functions of the unit, while the oscillator circuit generates test tones. Both circuits allow comprehensive remote alignment and testing of the circuit when activated from the Serving Test Center (STC).

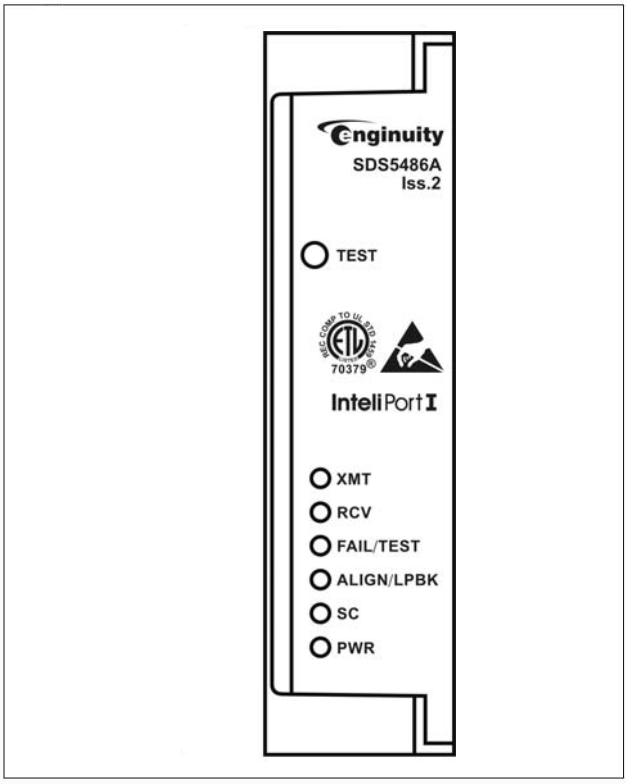


Figure 1. Front View of SDS5486AI2

1.4 Product Features

Features of Enginuity's SDS5486AI2 are as follows:

- Terminate and Leave capability
- Operates in either 2W or 4W data modem applications
- Microprocessor controlled
- Facility-side terminating impedance option (150, 600, 1200 Ohms); Equipment-side impedance is 600 Ohms, fixed
- Remote and/or automatic 3-tone or 4-tone alignment capability

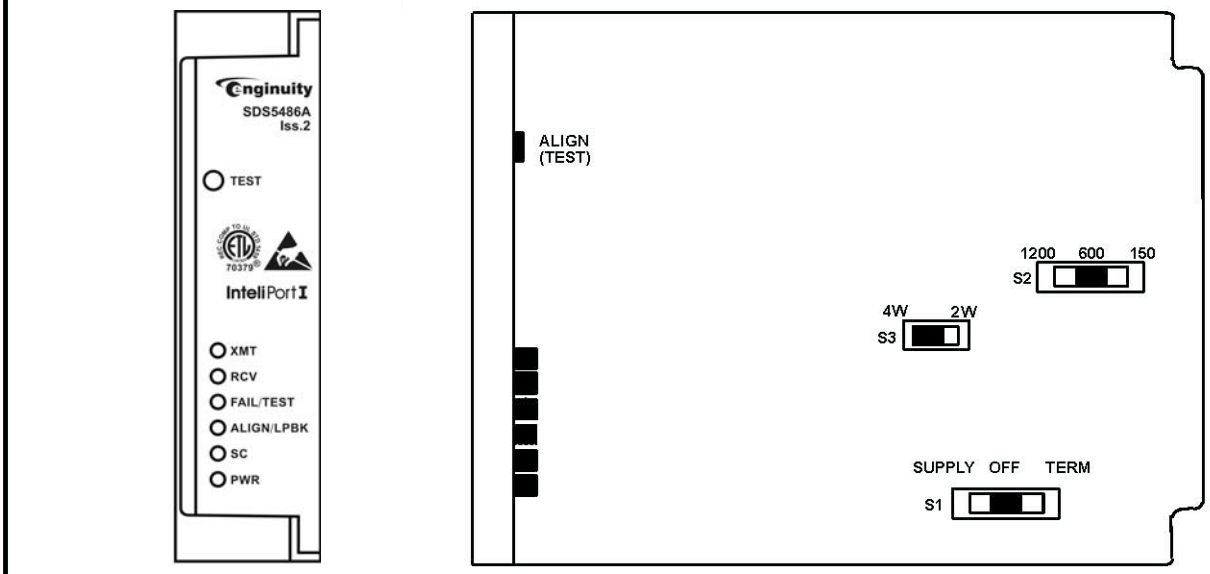
- Automatically adjusts amplitude response characteristics (up to 15.3 dB) with respect to 3-tone or 4-tone alignment to meet C5 conditioning; Also provides equalizer query mode to determine equalizer's performance
- Automatically adjusts receive path for proper level coordination between facility and data modem with respect to TLP (Transmission Level Point) or DLP (Data Level Point)
- Four tone auto-sweep or full-range transponder operation with quiet termination mode permits remote testing of noise and tone level measurements; Also provides 4-tone auto transponder over RCV IN port
- Front-panel TEST switch used to manually activate INTELIPORT's test mode for verifying station wiring or to manually activate INTELIPORT's Auto-Align feature
- Sealing current SUPPLY/OFF/TERM operation
- Manual or tone-activated loopback
- Acknowledgement tone (alternating 1008/2808 Hz) identifies unit as INTELIPORT when circuit is accessed for maintenance testing
- Escape to command mode via 2604 Hz; Escape to idle via 2713 Hz
- Front-panel LEDs provide a quick visual indication to the status and operational mode of the unit
- Non-volatile memory circuit retains programmed information in the event of power loss
- Mounts in one position of a Type-550 mounting assembly (Type-400 equivalent) mounting
- Operates from -22 to -56 Vdc at 70 mA, typical or from 20 to 28 Vac at 100 mA, typical; Also provides power query mode to determine power supply performance
- 7-year warranty

2. APPLICATIONS

INTELIPORT I is used to interface a 4W facility with a 600-ohm, 2W or 4W data modem and is normally located on the same premises as the modem. INTELIPORT is an intelligent DST that incorporates a microprocessor and oscillator circuit which allows comprehensive remote testing of the circuit when activated from a manual or automated Serving Test Center (STC).

INTELIPORT incorporates a command mode in which all functions, except manual and tone-activated loopback, are accessed. The command mode is the operational state in which INTELIPORT monitors its transmission ports of incoming frequencies and interprets these frequencies as commands to carry out a specific function. The command mode is remotely activated from the STC by sending 2713 Hz to INTELIPORT's RCV IN port for more than 30 seconds. After meeting this requirement, INTELIPORT sends a steady 1008Hz tone at +5dBm (TLP) indicating command mode initiation. The STC, at this point, can remove the 2713Hz tone.

While in the command mode, the STC can access any one of INTELIPORT's intelligent functions which include: a terminate and leave feature, toggling from TLP reference to DLP reference, activate the remote 3- or 4-tone alignment mode, initiate the automatic alignment sequence, activate a 4-tone auto-sweep transponder over the RCV IN port, activate the quiet term/transponder mode of operation, ability to query the equalizer and/or power supply status, or exit the command mode and return to idle. Details of each operating mode are discussed in Section 3 of this document. To exit the command mode, the STC sends a second 2713 Hz tone for five seconds or longer, subsequently removing the tone.



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 30 mA current-limiting load to simplex leads 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)	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's AUTO-ALIGN sequence from on-site to align two SDS5486AI2 units in a point-to-point application. NOTE: This feature is activated only during the first five minutes of initial power-up of the unit.
LEDs		
PWR	ON-indicates Local Power is present OFF-indicates Local Power is not present. NOTE: Unit may be line powered. Verify status of SC LED.	
SC	If the SC LED and the PWR LED is ON, it indicates sealing current is present and the unit is being locally powered. If the SC LED is OFF, it indicates that sealing current is not present. If the SC LED is ON and the PWR LED is OFF, it indicates the unit is being powered via the simplex leads (line powered).	
ALIGN (LPBK)	ON-indicates unit is either in the Command Mode, the Alignment Mode or in the Transponder Mode of operation OFF-indicates the unit is in the idle state FLASHING-indicates the unit is in the Loopback mode of operation	
FAIL (TEST)	ON-indicates a unit failure. Replace unit OFF-indicates unit is in Idle state FLASHING-indicates unit is in the Wire Test mode	
XMT	ON-indicates unit is receiving data from customer's equipment OFF-indicates unit is in the Idle state	
RCV	ON-indicates unit is sending data to the customer's equipment OFF-indicates unit is in the Idle state	

Table 1. SDS5486AI2 Switch Options

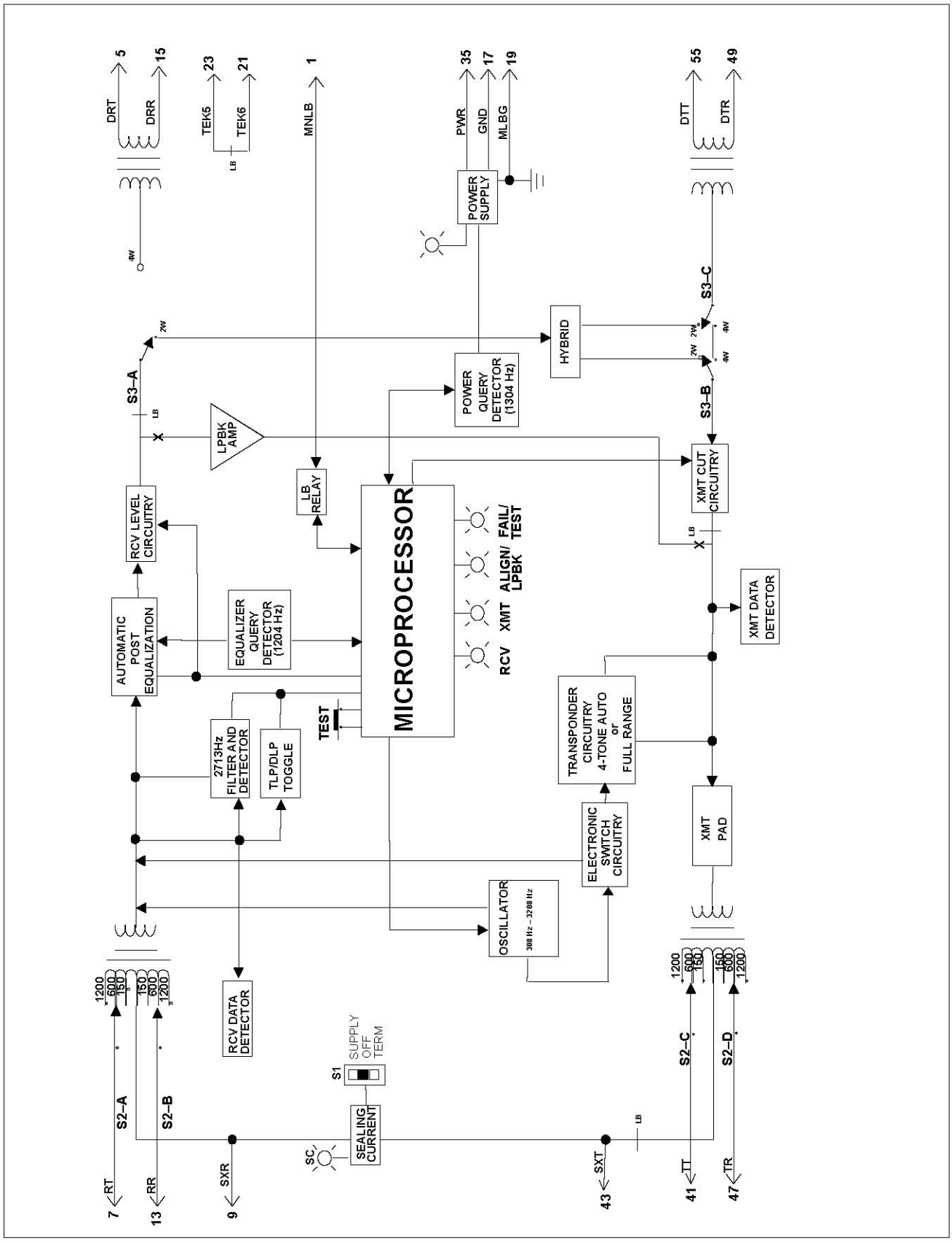


Figure 2. SDS5486AI2 Block Diagram

3. CIRCUIT/FUNCTIONAL DESCRIPTION

Refer to Figure 2, the SDS5486AI2 Block Diagram, as needed, while reading the following functional description.

3.1 LED Status Indicators

INTELIPORT is equipped with six front-panel LEDs that provide a quick visual indication to the status and particular mode the unit is in. Table 1 provides a summary of the LED function.

3.2 Wiring Test Mode

Once the installer connections are complete and unit is installed (see Sections 4 and 5), it is recommended that the installer manually activate INTELIPORT's test mode to verify installation and station wiring. Pressing the recessed push-button TEST switch, located on INTELIPORT's front panel, for less than five seconds (see following NOTE) causes 1008 Hz to be applied to the RCV channel ports and to the XMT channel ports. Station wiring is verified by connecting a Transmission Test Set, with a built-in speaker, or other suitable listening device, to the receive and transmit channel pairs at the cable connection and demarcation points and listening for the appropriate tones. Refer to Table 2 for a summary of the tones INTELIPORT will output when operating in 2W or 4W applications.

- NOTE -
If the TEST switch is pressed and held for longer than five seconds, INTELIPORT recognizes this as a command to enter the AUTO-ALIGN sequence.

After verifying the tones, press the TEST switch a second time to end the test mode. If the TEST switch is not pressed a second time, the test mode automatically times out one hour after initial activation or the STC can release the test mode remotely by sending 2713 Hz, 10 to 60 minutes after initial activation.

PORT	4W APPLICATIONS	2W APPLICATIONS
RCV IN PORT (Facility-Side)	Continuous 1008 Hz	Continuous 1008 Hz
RCV OUT PORT (Demarcation Side)	Continuous 1008 Hz	Continuous 1008 Hz
XMT IN PORT (Demarcation Side)	Interrupted 1008 Hz	Continuous 1008 Hz
XMT OUT PORT (Facility-Side)	Interrupted 1008 Hz	Interrupted 1008 Hz

**Note: 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 2. Wire Test Mode Tones

3.3 Command Mode

The command mode is remotely activated from the STC by sending 2713 Hz to the RCV IN port (pins 7 and 13, RT & RR) for more than 30 seconds. At this time, INTELIPORT sends steady 1008 Hz at the XMT OUT port (pins 41 and 47, TT and TR) indicating command mode initiation.

- NOTE -
If 2713 Hz is removed in less than 30 seconds, INTELIPORT enters loopback.

3.4 Terminate And Leave

INTELIPORT features a terminate and leave function that allows for pre-service conditioning. Pre-service conditioning allows for a unit to be installed now but is not ready for service cut-over until a later date. In addition, the terminate and leave feature can also be used as a maintenance function, in case of trouble, by disabling the circuit until a technician can be dispatched for troubleshooting.

3.5 Terminate And Leave Enable

To activate Terminate And Leave, test personnel must send 2004 Hz for 20 seconds minimum to INTELIPORT while in the command mode. Upon detecting 2004 Hz, INTELIPORT's command mode tone of 1008 Hz at +5 dBm (TLP) changes to 2008 Hz at +5 dBm (TLP) and returns to idle. When activated, the front panel ALIGN/LPBK LED flashes at an approximate rate of one second off, 1/4 second on.

3.6 Terminate And Leave Disable

To disable Terminate And Leave, test personnel must reactivate the command mode, see paragraph 3.3. The command mode tone, at this point, is 2008 Hz at +5 dBm (TLP). Test personnel must then send 2004 Hz for more than 20 seconds. Upon detecting 2004 Hz, the 2008 Hz command mode tone changes back to 1008 Hz and awaits further instructions.

3.7 TLP/DLP Toggle

INTELIPORT is initially programmed to align and transpond at TLP. This feature can, however, be programmed to have the unit align and transpond at DLP (data level point). Toggling from TLP to DLP is accomplished while in the command mode and the STC sends 2804 Hz. Upon detecting 2804 Hz, INTELIPORT toggles to the DLP mode, corrects the internal circuitry to accommodate the change in levels, then returns to the command mode. Toggling is verified by monitoring the level for a change of 13 dB. To return to TLP, the STC sends another 2804Hz.

- NOTE -

Each time INTELIPORT returns to idle, the TLP/DLP feature automatically returns to the TLP mode. Therefore, whenever the command mode is reaccessed from an idle state and testing or alignment is to be done at data level, the STC must send 2804 Hz to toggle to the DLP mode.

3.8 Alignment

The SDS5486AI2 features both remote (manual) and automatic alignment capability. The remote alignment feature is used to align one SDS5486AI2 unit and is remotely activated from the STC, while in the command mode, by sending 1004Hz. The automatic alignment feature is used to align INTELIPORT with the distant end in a point-to-point application and is remotely activated from the STC, while in the command mode, by sending 1804 Hz. In either the remote (manual) alignment or automatic alignment mode, INTELIPORT automatically adjusts the gain and equalization settings for proper level coordination between the facility and data modem equipment.

- NOTE -

The automatic alignment feature can also be activated from an on-site location by pressing the recessed, front-panel push-button TEST switch for longer than five seconds.

INTELIPORT is initially programmed to align at TLP, but can be programmed to align at data level (DLP) (see paragraph 3.7 for details). When programmed to align at TLP, INTELIPORT outputs its respective tones at +5dBm. When set to align at DLP, INTELIPORT outputs its respective tones at -8dBm. The operating levels for the SDS5486AI2 are given in Table 3.

PORT	-3RCV/+13 XMT		0 RCV/ 0 XMT	
	TLP	DLP	TLP	DLP
RCV IN	+5 to–10	-8 to –23	+5 to –10	–8 to –23
RCV OUT	–3	– 16	0	– 13
XMT IN	+13	0	0	–13
XMT OUT	+ 5	– 8	+ 5	– 8

Table 3. Operating Levels

3.9 Remote (Manual) Alignment

While INTELIPORT is in the command mode (1008 Hz present), the STC should record the level received at 1008 Hz, then initiate the remote alignment mode by sending 1004 Hz to INTELIPORT. INTELIPORT, upon detecting 1004 Hz, sends 2808 Hz. The STC should record the level received at 2808 Hz, then send 2804 Hz to INTELIPORT. Upon detecting 2804 Hz, INTELIPORT sends 408 Hz. The STC should record the level received at 408 Hz, then send 404 Hz to INTELIPORT. Upon detecting 404 Hz, INTELIPORT sends 1808 Hz to the STC for 60 seconds. The STC should record the level received at 1808Hz then has the option of sending 1804 Hz to INTELIPORT before 60 seconds times out or ignoring the tone. The fourth tone (1808 Hz) provides for a more accurate equalization response when interfacing long section of loaded cable or a mixture of loaded and non-loaded cable.

If the STC sends 1804 Hz within the 60-second time frame, INTELIPORT aligns to the four tones. If the STC chooses to ignore the 1804 Hz request (i.e., prefers a 3-tone alignment), the 1808 Hz tone from INTELIPORT times out after 60 seconds and alignment is complete to three tones. Please note that during 3-tone alignment, the 60-second timeout feature can be bypassed by sending 1004 Hz within the 60-second time frame.

Once the levels are established, INTELIPORT sends a tone sequence indicating whether or not the cable, on the facility-side, was equalized (see also equalizer query mode of operation in Paragraph 3.19). A ramp-up sequence, consisting of a series of tones ranging from 308 Hz to 3008 Hz in ascending order, indicates alignment and equalization is within the specified requirements. A ramp-down sequence, consisting of a series of tones ranging from 3008 Hz to 308 Hz in descending order, indicates equalization is not within the specified requirements. The ramp-up or ramp-down sequence is applied for approximately 1.5 seconds with the last tone (3008 Hz in the ramp-up sequence; 308 Hz in the ramp-down sequence) being applied for approximately 15 seconds. After 15 seconds, INTELIPORT enters loopback to permit verification of alignment settings. Please note that the 15-second timeout feature can be bypassed by sending 1004 Hz.

3.10 Loopback

While in loopback, the receive path is interconnected to the transmit path via a loopback amplifier and allows the STC to verify alignment settings and facility frequency response. The loopback circuit automatically inserts 16dB of gain to provide an equal-level loopback condition. During loopback, the STC sends tones (404, 1004, 1804, and 2804 Hz), one at a time, to INTELIPORT. The STC should verify/record the level of each tone as it is looped back by INTELIPORT.

3.11 Loopback Release

Loopback is equipped with an automatic timeout release feature that releases the loopback condition 20 minutes after initial activation. If release from loopback is desired before the 20-minute time frame, it can be accomplished by sending 2713Hz for 0.9 seconds, or longer then removing the tone. Loopback releases when 2713 Hz is detected. The automatic timeout release feature ensures restoration of the transmission paths in the event the 2713 Hz tone is not sent.

Loopback can be initiated any time the unit is idle by applying 2713 Hz for a period greater than 2.5 seconds but less than 30 seconds. INTELIPORT returns an alternating 1008/2808 Hz indicating the circuit accessed for testing is an intelligent unit.

- NOTE -

If 2713 Hz is present for more than 30 seconds, INTELIPORT enters the command mode.

3.12 Manual Loopback Activation

Manual loopback activation can also be accomplished by placing a ground on the MNLB lead, pin 1. When manually activated, neither automatic timeout nor detection of 2713 Hz will effect loopback release. Release of a manually activated loopback condition can only occur by removing the ground.

3.13 4-Tone Auto-Sweep (RCV IN Port)

INTELIPORT features a 4-tone automatic sweep transponder mode that allows for a quick level verification test over the receive in port. To activate this 4-tone auto sweep, the STC sends 504 Hz while in command mode. Upon detecting 504 Hz, INTELIPORT sends 1008 Hz for 60 seconds, followed by 60 seconds of quiet termination, then begins a sweep of 408 Hz, 1808 Hz, and 2808 Hz at 0 dBm, each for 30 seconds, then returns to command mode.

- NOTE -

If the STC wishes to bypass the 60-second quiet termination portion and quickly enter the auto-sweep portion of the test, the STC sends 1004 Hz for five seconds, subsequently removing the tone. If the STC wishes to abort this test and return to command mode, it can be accomplished by sending 2713 Hz (during quiet termination only) for longer than five seconds, subsequently removing the tone.

3.14 Quiet Term/Transponder

INTELIPORT incorporates a quiet term/transponder mode of operation that allows the STC to remotely conduct noise and tone level measurements. While in the command mode, the STC activates the quiet term/transponder by sending 404Hz. Upon detecting 404 Hz, INTELIPORT applies a quiet termination to the XMT IN port and isolates signals from the data modem. During quiet termination, the STC performs noise measurements. Quiet termination remains in affect for 20 minutes or until another tone (to enter the transponder operation or return to command mode) is sent. Please note that if no tone is sent with the 20-minute time frame, INTELIPORT times out and returns to idle. Escape to command mode can also be done by sending 2604 Hz for more than five seconds, subsequently removing the tone. Escape to idle can also be done by sending 2713 Hz for more than five seconds, subsequently removing the tone.

3.15 Transponder Operation

INTELIPORT features a 4-tone automatic sweep transponder mode and a full range transponder mode of operation. The 4-tone auto-sweep transponder allows for a quick level verification test over the transmit port. The full-range transponder allows for a more detailed level verification test over a range of frequencies from 308 Hz to 3208 Hz over the transmit port. Both transponder modes are activated from the quiet termination mode only.

3.16 4-Tone Auto-Sweep

To activate the 4-tone auto-sweep transponder, the STC sends 404 Hz as the first tone while in quiet termination. Upon detecting this 404 Hz, INTELIPORT begins a sweep sequence at tones of 408 Hz, 1008 Hz, 1808 Hz, and 2808 Hz, each for 30 seconds, then returns to quiet termination and resets the 20-minute timer circuit.

3.17 Full-Range Transponder

To activate the full-range transponder, the STC sends any tone from 304 Hz to 3204 Hz (except 400 Hz and 2700 Hz). As tone is received, INTELIPORT responds by sending the similar tone (but at an offset) for the same duration tone is received from the STC or for 15 seconds (whichever is longer). Each tone transmitted by the STC is sent in increments of 100 Hz. Upon completion and no other tone is sent by the STC, INTELIPORT reapplies quiet termination and resets the 20 minute timer circuit. If no tone is sent within the 20-minute time frame, INTELIPORT times out and returns to idle. If release to command mode is desired before the 20-minute time out, it can be accomplished by sending 2604 Hz for five seconds, or longer. If release to idle is desired before the 20-minute time out, it can be accomplished by sending 2713 Hz for five seconds or longer.

3.18 Auto-Align

Auto-Align is used to align INTELIPORT with the distant end in a point-to-point application and can be initiated remotely from the STC while in command mode or from an on-site location by pressing and holding the TEST switch, located on the front panel, for more than five seconds. When auto-align is initiated via the TEST switch, alignment at TLP and C5 conditioning takes place. For purposes of discussion, the unit accessed via the STC/Installer is referred to as Station A while the unit at the distant end is referred to as Station Z.

To activate INTELIPORT at Station A, the STC must first send 2713 Hz for longer than 30 seconds. Upon detecting 2713Hz for longer than 30 seconds, INTELIPORT enters the command mode and returns a 1008 Hz tone at +5dBm (TLP) to the STC. Upon detecting 1008 Hz from INTELIPORT, the STC removes 2713 Hz. The 1008 Hz tone indicates INTELIPORT is in command mode. Before auto-align is initiated, the STC must also decide if alignment is to be done at TLP or DLP.

- NOTE -

INTELIPORT is initially programmed to align at TLP.

While in command mode, auto-align is then initiated by sending 1804 Hz to Station A. Station A, upon detecting 1804 Hz, sends 2913 Hz to Station Z for 60 seconds. After 60 seconds, 2913 Hz is removed. At this point, if a command mode tone from the distant end is detected (i.e., 1004 Hz, $\pm$1%), Station A assumes the unit at the distant end (Station Z) is an intelligent 4W ETO and the automatic alignment sequence contin-

ues. If a command mode tone is not detected after sending 2913 Hz, Station A then sends 2713 Hz. If a command mode tone from the distant end is detected at this point, then the automatic alignment sequence continues.

- NOTE -

If no response from either 2913 Hz or 2713 Hz is detected, Station A re-sends 2713 Hz to the distant end for greater than five seconds and returns to idle.

Upon receiving command mode tone from Station Z and if Station A is programmed to align at DLP, Station A sends 2808 Hz to Station Z to toggle Station Z's circuitry to the DLP mode.

With both stations set and from the command mode, tones are automatically sent and received between both ends. Upon completion of the last tone and detection of the ramp-up or ramp-down tone sequence (approximately two to three minutes), Station A re-sends 2713 Hz to Station Z and returns to idle. Station Z, upon detecting 2713 Hz, also returns to idle. Gain and equalization is automatically set and alignment is complete.

3.19 Equalizer Query Mode

The equalizer query mode permits the STC to verify whether INTELIPORT returned the ramp-up tone sequence (indicating a good alignment) or the ramp-down tone sequence (indicating correct alignment could not be achieved). The equalizer query mode is activated from the command mode by sending 1204 Hz. Upon detecting 1204 Hz, INTELIPORT returns the ramp-up or ramp-down tone, then returns to command mode.

3.20 Sealing Current

Sealing current is recommended on all metallic facilities to help prevent transmission path noise. Sealing current is a low-value dc current (approx. 20 mA) applied to the 4-wire dry cable pairs, on a simplex basis, to break down resistance which may build up at non-soldered cable splices. Continuous application of sealing current helps prevent degradation of transmission performance.

The internal sealing current circuit is controlled by option switch S1 and can be optioned to have the unit supply 20 mA of current to the simplex leads (SUPPLY position), provide a current-limiting load to the simplex leads when sealing current is supplied from the distant end (TERM position), or can be disabled when sealing current is not being used (OFF position).When sealing current is being supplied from the unit, the simplex leads at the distant end must be connected together to complete the path.

- NOTE -

When INTELIPORT is supplying sealing current, a 24 Vac or -24 Vdc power source is adequate for a metallic facility loop of less than 1000 Ohms. For loops in excess of 1000 Ohms, a -48 Vdc power source is recommended. In addition, when sealing current is present, the SC LED will light. The SC LED will also detect sealing current as low as 8 mA.

3.21 Power Query Mode

INTELIPORT provides a power supply query mode that permits the STC to verify the status of the power supply to determine if power was interrupted for whatever reason. The power query mode is activated from the command mode by sending 1304 Hz. Upon detecting 1304 Hz, INTELIPORT returns the ramp-up tone (indicating power has not been interrupted since last alignment or query) or the ramp-down tone (indicating that an interruption in power occurred), then returns to command mode.

4. SWITCH OPTIONS

Westell's SDS5486AI2 contains three option switches that are used to condition the unit for proper application and operation. In addition, a front-panel TEST switch is provided and is used to manually activate INTELIPORT's test mode (when pressed for less than five seconds) for verifying station wiring after the unit is installed or can be used to manually activate INTELIPORT's automatic alignment feature (when pressed for more than five seconds). Refer to Table 1 for the location and description of each option.

5. INSTALLATION

Upon receipt of the equipment, visually inspect it for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to Westell.

- 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.

- 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 obstructions in or near the module's or shelf's connectors and mounting slots. The module may then be carefully aligned and gently re-inserted.

5.1 Installer Connections

When installing the unit in an NCTE type mounting (pre-wired Type 550 shelf), connections are accomplished via 25-pair cables mating to the appropriate 25-pair cable connectors located on the rear of the mounting assembly. When installing the unit in an NCTE un-wired Type 550 mounting (Type-400 equivalent), connections are made by wire-wrapping the appropriate leads from the facility and data modem to the proper pins of the appropriate 56-pin connector in which the module is to be installed. Pin identifications for proper wiring are listed in Table 4. Power requirement for proper operation is -22 to -56 Vdc (-48 Vdc, nominal) at 70 mA during normal operation; 90 mA, maximum, during testing and alignment or 20 to 28 Vac (24 Vac, nominal) at 100 mA during normal operation; 110 mA, maximum, during testing and alignment. INTELIPORT provides a power query mode of operation that permits the STC to verify the status of the power supply.

6. TESTING & TROUBLESHOOTING

6.1 Testing

The testing and alignment procedures, shown in Table 7, may be performed after the unit is installed and power applied. The procedures outlined in this practice 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. This equipment should not be field repaired. If the equipment is suspected of being faulty, replace it with another unit, optioned identically, and retest. If the replacement unit appears to operate correctly, the original unit may be faulty and should be returned to Enginuity Communications for repair or replacement (See Paragraph 8.2).

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 - 4W RCV OUT (Tip)	Modem	5
DRR - 4W RCV OUT (Ring)		15
DTT - XMT IN/2W (Tip)		55
DTR - XMT IN/2W (Ring)		49
TEK5-Data Set Disable		23
TEK6-Data Set Disable		21
MNLB-Manual Loopback	Misc.	1
MLBG-Manual Loopback Ground		19
PWR - Power		35
GND - Ground		17

Table 4. Installer Connections

6.2 Troubleshooting

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.

7. CUSTOMER & TECHNICAL SERVICES

7.1 Customer Service & Technical Assistance

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

Voice: 630-761-1892
Voice: 1-800-980-3266

Visit the Enginuity Communication Web site at www.enginuitycommunications.com for additional information

7.2 Part Numbers

Enginuity's 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.

8. WARRANTY and REPAIRS

8.1 Warranty

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

8.2 Repair and Return

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

Enginuity 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. Enginuity will continue to repair or replace faulty equipment beyond the warranty period for a nominal charge. Contact Enginuity 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 5.

Model/Part #	Description
5486AI2	SDS5486AI2 INTELIPORT I *CLEI* Code: DST1FGL1AA. Barcode: 226206.*
~~001-01-000008 Rev. 001~~	Technical Publication

**CLEI is a trademark of Telcordia Technologies.*

Table 5. Ordering and Option Information

9.2 Electrical and Physical Specifications

The electrical and signalling specifications are listed below, and the physical specifications are shown in Table 6.

A. Impedance: Facility-side, selectable for 150, 600, 1200 Ohms via option switch S2; Equipment-side (2W/4W), 600 Ohms, fixed.

B. Impedance: Facility-side, selectable for 150, 600 or 1200 Ohms; Equipment-side, (2W or 4W) 600 Ohms, fixed

C. RCV Level Range: Input, -10 to +5 dBm (TLP), -23 to -8dBm (DLP); Output, -3dBm (TLP), -16dBm (DLP), $\pm$0.5dB

D. XMT Level Range: Input, +13 dBm (TLP), 0 dBm (DLP); Output, +5 dBm (TLP), -8 dBm (DLP), $\pm$0.5dB

E. Test Mode: Activated via TEST switch (pressed for less than 5 sec.) Causes continuous 1008 Hz to be applied to RCV pairs, interrupted 1008 Hz XMT pairs; Release, TEST switch pressed second time , releases automatically 1-hour after initial activation, or can be released from STC, 10 to 60 minutes after activation. (NOTE: If switch is pressed for more than 5 sec., INTELIPORT enters AUTO-ALIGN)

F. Command Mode: Activated from STC via 2713 Hz for more than 30 sec. INTELIPORT sends steady 1008 Hz indicating command mode initiation; Release, second 2713 Hz for more than five sec., or via 5-minute timeout if no tone sent (NOTE: If 2713 Hz is removed is less than 30 sec., INTELIPORT enters loopback)

G. Terminate And Leave: Activated while in command mode by sending 2004 Hz for more than 20 sec. 1008Hz command mode tone changes to 2008 Hz and returns to idle; Deactivated by reaccessing command mode and sending 2004 Hz for more than 20 sec. 2008Hz command mode tone changes back to 1008 Hz at +5 dBm (TLP)

H. TLP/DLP: Unit is factory programmed to align at TLP but can be programmed to align at data level (DLP). To toggle send 2804 Hz while in command mode. Verify level change of 13 dB. Unit returns to command mode after toggling (NOTE: Unit automatically returns to TLP whenever unit returns to idle and command mode is reaccessed from idle state)

I. Remote (Manual) Alignment: Activated from command mode via 1004Hz in response to INTELIPORT's 1008 Hz and repeated with frequencies of 2804, 404 and 1804 Hz in response to INTELIPORT's 2808, 404 and 1808 Hz, respectively. INTELIPORT sends ramp-up tone or ramp-down tone upon completion, then enters loopback; Escape to command mode feature via 2604 Hz for more than five sec., escape to idle feature via 2713 Hz for more than five sec.

J. Auto-Alignment: Activated from command mode via 1804 Hz (can also be activated via TEST switch being pressed and held for more than 5 sec.). When activated from command mode, alignment at TLP or DLP takes place. When activated via TEST switch, alignment at TLP takes place; Release, automatically returns to idle upon completion (approx. 2 to 3 minutes)

K. Equalization: Provides receive channel amplitude equalization (up to 15.3 dB, re: 1004 Hz) for 3- or 4-tone alignment to meet C5 conditioning; Also pro-

vides equalizer query mode (activated from command mode via 1204 Hz) to determine equalizer's performance

L. Loopback Activation: Tone-activated via 2713 Hz (±7Hz) for 2.5 sec., min., but less than 30 sec. followed by removal of tone must detect to operate; ±37 Hz must not operate. If tone applied for more than 30 sec., INTELIPORT enters command mode; Manual Loopback, activated via grounding pin 1 (MNLB lead).

M. Transmission Level: Automatically inserts up to 16dB of gain to provide equal-level (±1dB) loopback condition

N. Loopback Level: -24 dBm (typically -30) to -3 dBm

O. Loopback Release: For tone-activated loopback, 2713Hz for 0.9 sec. min., or via a 20-minute automatic timeout release feature; For manually activated loopback, removal of ground only

P. Quiet Termination Mode: Activated from command mode via 404 Hz. INTELIPORT applies quiet termination to XMT IN port and sets 20 minute timer. STC performs noise measurements; Release, 2604 Hz for more than five sec. (unit returns to command mode), 2713 Hz for more than five sec. returns unit to idle, or via 20-minute automatic timeout (unit returns to idle) if no tone sent

Q. 4-Tone Auto-Sweep Transponder (RCV IN):

R. Activated from command mode via 504 Hz. INTELIPORT sends 60 sec. of 1008 Hz, 60 sec. of quiet term, then sweeps tones of 408, 1808, and 2808Hz (±1%) at 0dBm (@ 600 Ohms), each for 30 sec., then returns to command mode; Escape to command mode, 2713 Hz for five sec. during quiet termination cycle

S. 4-Tone Auto-Sweep Transponder Operation: Activated from quiet termination mode only via 404 Hz as first tone. INTELIPORT sweeps tones of 408, 1008, 1808, and 2808 Hz (±1%), each for 30 sec., then reapplies quiet termination and resets 20-minute timer; Release, 2604 Hz for more than five sec. (unit returns to command mode), 2713 Hz for more than five sec. returns unit to idle, or via 20-minute automatic timeout (unit returns to idle) if no tone sent

T. Full-Range Transponder Operation: Activated from quiet termination mode only via any tone from 304 Hz to 3204 Hz (except 400 Hz and 2700 Hz). INTELIPORT responds by sending a similar tone (but at an offset) for same duration tone is received or for 15 sec. (whichever is longer). Tones sent from the STC must be in increments of 100 Hz. Upon completion and no other tone is sent from the STC, INTELIPORT reapplies quiet termination and resets the 20-minute timer; Release, 2604 Hz for more than five sec. (unit returns to command mode), 2713 Hz for more than five sec. returns unit to idle, or via 20-minute automatic timeout (unit returns to idle) if no tone sent

U. Idle Noise: 17 dBrnC0, max.

V. Transhybrid Loss: > 30 dB, minimum; 45 dB typical

W. Frequency Response: Receive path, meets C5 conditioning

X. Longitudinal Balance: > 58 dB at 200 to 3000 Hz

Y. Harmonic Distortion: <-60 dB at 200 to 3000 Hz

Z. Sealing Current: Can be selected to supply 20 mA of sealing current to simplex leads (SUPPLY), provide 20 mA current-limiting load to simplex leads when sealing current is supplied from distant end (TERM), or can be disabled (OFF)

AA. Power: -22 to -56 Vdc (-48 Vdc, nominal) at 70 mA, typical; or 20 to 28 Vac (24 Vac, nominal) at 100 mA, typical; Also provides power query mode (activated from command mode via 1304 Hz) to determine power supply's performance

Physical Feature	U.S.	Metric
Height	5.58 in.	14.17 cm
Width	1.42 in.	3.6 cm
Depth	5.9	15 cm
Weight (approx.)	1.4 lbs	0.63 kgs
Operating Environment	32°F to +122°F	0°C to +50°C
Operating Humidity	0 to 95% (non-condensing)	
Mounting	NCTE Type 400 or Westell Type 550 mounting	

Table 6. SDS5486AI2 Physical Specifications

Table 7. 5486AI2 TESTING AND ALIGNMENT PROCEDURES

INSTALLER'S PROCEDURES

1. Set all option switches as required per Circuit Layout Record (CLR) card. Install unit and apply power. Verify PWR LED on, SC LED on (if applicable), and ALIGN/LPBK and FAIL/TEST LEDs off.
NOTE: If FAIL/TEST LED is on steady, replace unit and repeat Step 1. If FAIL/TEST LED continues to flash, momentarily press the recessed front-panel TEST switch.

Test Mode -

NOTE: INTELIPORT places 1008 Hz on the transmission pairs when test mode is activated. Be sure INTELIPORT is not connected to an in-service circuit where this tone may cause interference.

2. Momentarily press the front-panel TEST switch (less than five seconds). Verify FAIL/TEST LED flashing. Connect TMS with built-in speaker, or other suitable listening device, to:

PORT		4W APPLICATIONS	2W APPLICATIONS
RCV IN pair at the cable entry	Verify	Continuous 1008 Hz	Continuous 1008 Hz
RCV OUT pair at demarcation	Verify	Continuous 1008 Hz	Continuous 1008 Hz
XMT IN pair at demarcation	Verify	Interrupted 1008 Hz	Continuous 1008 Hz
XMT OUT pair at cable entry	Verify	Interrupted 1008 Hz	Interrupted 1008 Hz

When tones are verified, press TEST switch again to end test mode. Verify FAIL/TEST LED off.

NOTE: Test mode will automatically release itself one hour after initial activation if the TEST switch is not pressed a second time. If desired, STC can release the test mode by sending 2713 Hz, 10 to 60 minutes after initial activation.

NOTE: If the TEST switch is pressed for longer than five seconds, INTELIPORT enters the AUTO-ALIGN mode.

TEST CENTER'S PROCEDURES

Command Mode
3. Send 2713 Hz (more than 30 seconds). INTELIPORT returns 1008 Hz. STC removes 2713 Hz. Command mode initiated
NOTE: If 2713 Hz is removed in less than 30 seconds, INTELIPORT enters loopback.

Terminate and Leave (Enable/Disable) - To be performed only if circuit is not ready to be cut-over at this time.
4. To activate, send 2004 Hz for 20 seconds minimum to INTELIPORT while in the command mode. Upon detecting 2004 Hz, INTELIPORT's command mode tone of 1008 Hz at +5 dBm (TLP) changes to 2008 Hz at +5 dBm (TLP). When activated and when INTELIPORT returns to idle, the front panel ALIGN/LPBK LED flashes at an approximate rate of one second off, 1/4 second on also indicating the Terminate and Leave feature is activated.

To disable, test personnel must reactivate command mode. The command mode tone, at this point, is 2008 Hz at +5 dBm (TLP). Test personnel must then send 2004 Hz for more than 20 seconds. Upon detecting 2004 Hz, the 2008 Hz command mode tone changes back to 1008 Hz and awaits further instructions.

TLP/DLP (Perform this step only if aligning at DLP)- INTELIPORT is initially set to align at TLP

5. From command mode, send 2804 Hz. INTELIPORT toggles to DLP mode, then returns to command mode. Toggling is verified by monitoring level for a change of 13 dB. To toggle back to TLP, send another 2804 Hz.
NOTE: INTELIPORT automatically returns to TLP mode whenever unit returns to idle and the command mode is reaccessed from an idle state. Therefore, when aligning at DLP, unit must be reset to DLP mode.

Remote (Manual) Alignment

6. From command mode (1008 Hz present), record level received, then send 1004 Hz to INTELIPORT.

INTELIPORT sends 2808 Hz. Record level received, then send 2804 Hz to INTELIPORT.
INTELIPORT sends 408 Hz. Record level received, then send 404 Hz to INTELIPORT.
INTELIPORT sends 1808 Hz for 60 seconds. Record level received. STC now has option:
Send 1804 Hz within 60 seconds. INTELIPORT aligns to 4 tones, sends ramp-up/ramp-down tone, then enters loopback.
Ignore 1804 Hz request. INTELIPORT's 1808 Hz tone times out after 60 seconds. INTELIPORT then aligns to 3 tones, sends ramp-up/ramp-down tone, then enters loopback. Please note that when aligning to 3 tones is preferred, the 60-second timer circuit can be bypassed by sending 1004 Hz.

Table 7. 5486AI2 TESTING AND ALIGNMENT PROCEDURES (Cont.)

Loopback

7. While in loopback, STC sends tones (404, 1004, 1804 and 2804 Hz), one at a time, to INTELIPORT. The STC should record the level of each tone as it is looped back by INTELIPORT.

Release from loopback. Loopback is equipped with an automatic timeout release feature that releases the loopback condition after 20 minutes. INTELIPORT returns to idle. If release is desired before the 20-minute time frame, STC can send 2713 Hz for 0.9 seconds, or longer. INTELIPORT returns to idle upon detecting 2713 Hz.

4-Tone Auto-Sweep (RCV IN Port)

8. From command mode, STC sends 504 Hz. INTELIPORT sends 1008Hz for 60 seconds followed by 60 seconds of quiet termination, then begins a sweep of 408 Hz, 1808 Hz, and 2808 Hz at 0 dBm, each for 30 seconds, then returns to command mode. NOTE: If the STC wishes to bypass the 60-second quiet termination portion and quickly enter the auto-sweep portion of the test, the STC sends 1004Hz for five seconds, subsequently removing the tone. If the STC wishes to escape this test and return to command mode, it can be accomplished by sending 2713 Hz (during quiet termination only) for longer than five seconds, subsequently removing the tone.

Quiet Term/Transponder Operation

9. From command mode, STC sends 404 Hz. INTELIPORT applies quiet termination to the XMT IN port and sets 20-minute timer. STC performs noise measurements. Quiet termination remains in affect for 20 minutes or until another tone is sent (i.e., enter 4-tone auto or full-range transponder, or to exit quiet termination and return to command mode). If no tone is sent within the 20-minute time frame, INTELIPORT times out and returns to idle.

Auto-Align

10. From command mode, perform Step 5 (if required), then send 1804 Hz to Station A.

Station A first sends 2913 Hz to Station Z for 60 seconds. After 60 seconds, 2913 Hz is removed. If a command mode tone is received upon removal of 2913 Hz, INTELIPORT assumes distant end (Station Z)is an intelligent 4W ETO and alignment continues. If no response to 2913 Hz is detected (i.e., command mode tone), INTELIPORT then sends 2713 Hz to Station Z. If a command mode tone is received from Station Z at this point, the automatic alignment sequence continues. If no response from either 2913 Hz or 2713 Hz is detected, Station A re-sends 2713 Hz to Station Z for greater than five seconds and returns to idle.

NOTE: After receiving command mode tone from Station Z and if Station A is programmed to align at DLP, Station A sends 2808 Hz to Station Z to make Station Z compatible.
Upon receiving command mode tone from Station Z, tones are automatically sent and received between both ends. Upon completion (approximately two to three minutes), and through sending and receiving the appropriate tones, both stations return to idle. Gain and equalization is automatically set. Auto-Align can also be initiated from an on-site location via the front-panel TEST switch when pressed for longer than five seconds. When activated in this manner, automatic alignment is done at TLP only.

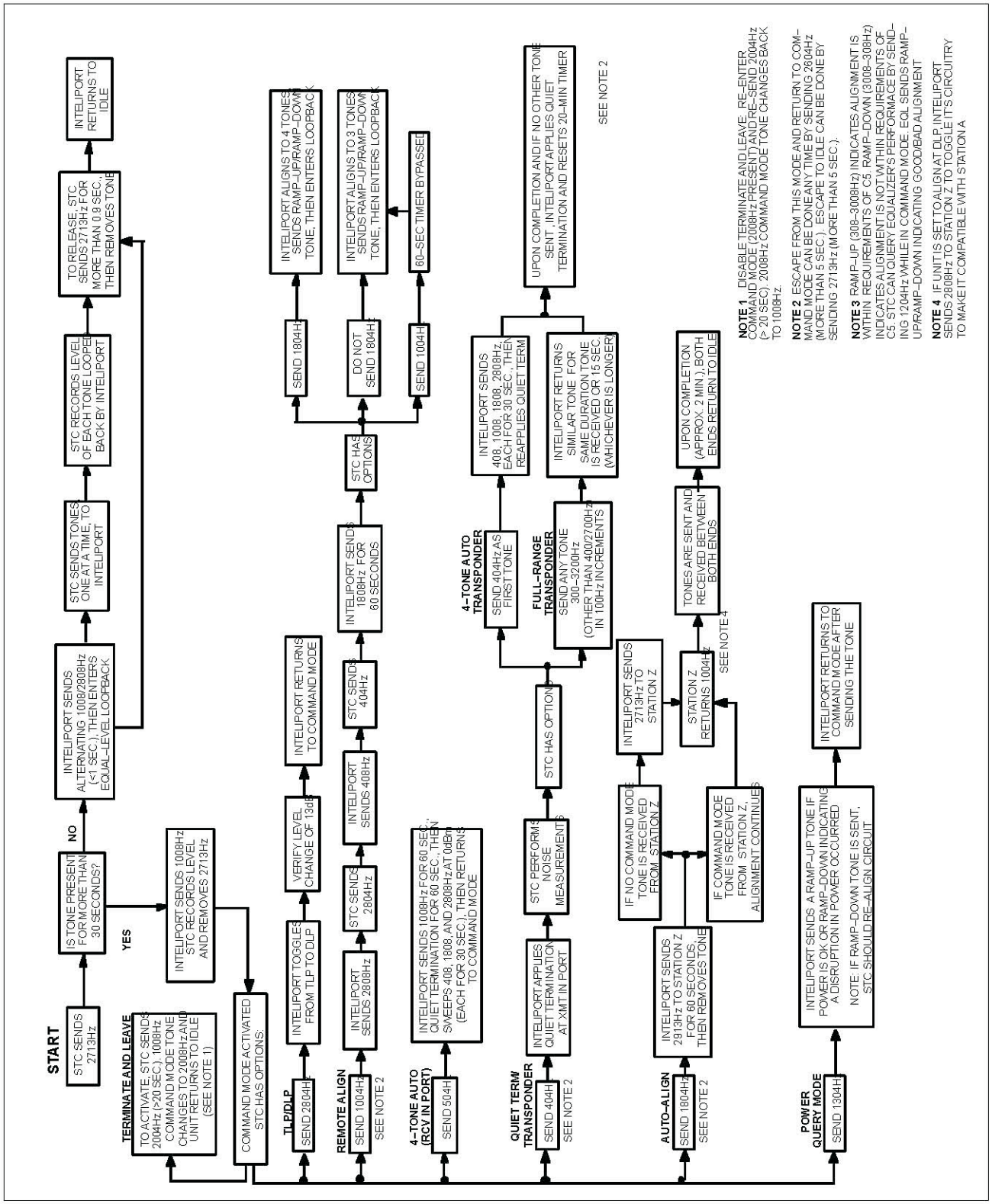


Figure 3. SDS5486AI2 FLOWCHART