INTELIPORT®I - SDS5497FA Issue 2
Line Powered 2W/4W Data Station Termination

CLEI* Code: NCC1HJJ2AA

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1. GENERAL

1.1 Document Purpose

This document describes Enginuity's *INTELIPORT®I* SDS5497FA Issue 2 Line Powered 2-Wire/4-Wire (2W/4W) Data Station Termination, shown in Figure 1.

> - NOTE -
> *Hereafter, the SDS5497FA Issue 2 will be referred to as the "5497" or the "module."*

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 9.2 were updated to reflect new company address an contact information.

1.3 Product Purpose and Description

The 5497 is designed to provide an interface between a 4W facility and a 600-ohm, 2W or 4W data modem. The 5497 is designed for Standard and FAA Data applications with selectable RCV OUT levels of -3 dBm TLP (Standard) or 0dBm TLP (FAA) and XMT IN levels of +13 dBm TLP (Standard) or 0dBm TLP (FAA). As a member of Teltrend's family of Intelligent Network Channel Terminating Equipment (INCTE), the 5497 provides all the functions of a standard DST but with enhanced features. Enhanced features include remote and automatic alignment capability, choice of local or line power operation, and more. The 5497 is a microprocessor controlled unit. The integral micropro-

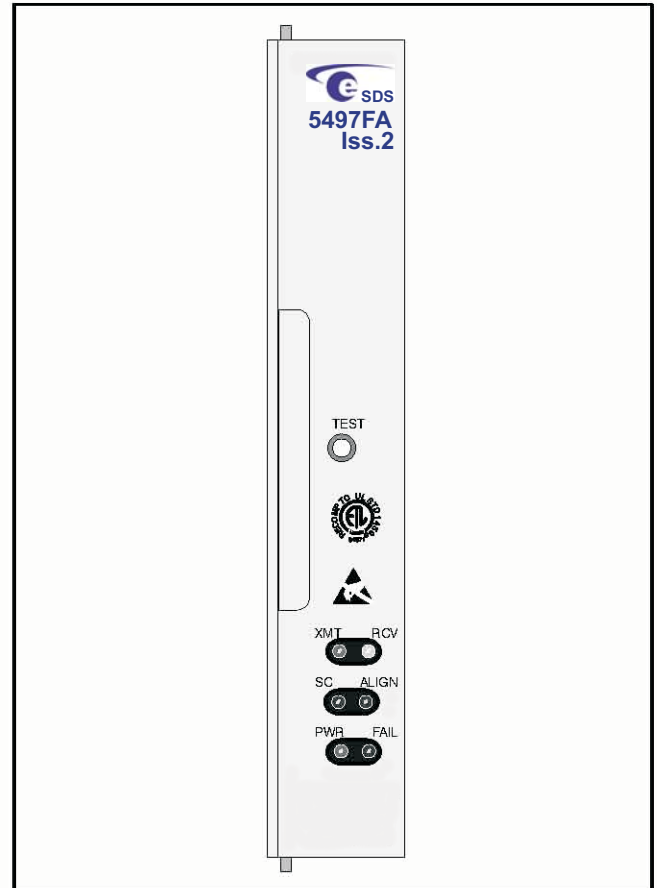**Figure 1.** Front View of SDS5497FA Issue 2

cessor 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 a remote Serving Test Center (STC).

1.4 Product Mounting

The 5497 is a 200 MECHANICS®-type module and is typically mounted in either 400-type (or 550-type) or 200 MECHANICS®-type module mounting assemblies.

1.5 Product Features

The 5497 offers the following features.

• Operates in either 2W or 4W data modem applications

- Microprocessor controlled

- 200 MECHANICS® high-density unit mounts in one position of a 200 mechanics or 400 mechanics shelf

- Facility-side terminating impedance option (150, 600, 1200 Ohms); Equipment-side impedance is 600 Ohms, fixed

- Remote (manual) 3- or 4-tone alignment capability

- Automatic 3- or 4-tone alignment capability

- Capable of aligning the circuit with respect to TLP (Transmission Level Point) or DLP (Data Level Point)

- Automatically adjusts amplitude response characteristics (Up to 15.3dB) to meet C5 conditioning; Also provides equalizer query mode to determine equalizer's performance

- Selectable Customer Interface Level of -3/+13 dBm (Standard) or 0/0 dBm (FAA). (Factory Default levels -3/+13 dBm)

- Selectable Loopback/Activation frequencies of 1713Hz, 1913Hz, 2413Hz and 2713Hz. (Factory Default frequency 2713Hz)

- Automatically adjusts receive path for proper level coordination between facility and data modem

- Four tone auto-sweep or full-range transponder operation with quiet termination mode permits remote testing of noise and tone level measurements

- Front-panel TEST switch used to activate INTELIPORT's Wire Test mode for verifying station wiring or to activate INTELIPORT's Auto-Align feature (DST-ETO; DST-DST) from on-site

- Internal Sealing current TERM/SUPPLY circuit provides a termination for sealing current if sealing current is being supplied from the distant end or SUPPLY if the unit is being powered from a local power source to provide sealing current.

- Acknowledgement tone (alternating 408/1008Hz) identifies unit as INTELIPORT when circuit is accessed for maintenance testing

- Local power operation: Operates from a local power source of -22 to -56Vdc at 20mA maximum, or from 20 to 28Vac at 40mA maximum

- Line power operation: Can be line powered from the simplex leads when local power is not available

- 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

- Meets UL1459 requirements

- 7-year warranty

2.   APPLICATIONS

2.0.1   The 5497 is designed to operate in Standard or FAA applications requiring a RCV OUT and XMT IN levels of -3/+13 dBm TLP (Standard) or 0/0 dBm TLP (FAA). The 5497 interfaces a 4W facility to a 600-ohm, 2W or 4W data modem. The 5497 is normally located on the same premises as the modem. INTELIPORT is an Intelligent Data Station Termination that allows comprehensive remote testing of the circuit when activated from a manual or automated Serving Test Center (STC).

2.0.2   INTELIPORT incorporates a command mode from which all functions, except manual and tone-activated loopback and manual activation of the Auto-Align feature, are accessed. The command mode is the operational state in which INTELIPORT monitors its transmission ports for incoming frequencies and interprets these frequencies as commands to carry out specific functions. The command mode is remotely activated from the STC by sending the appropriate Loopback/Activation tone of 1713, 1913, 2413 or 2713Hz to INTELIPORT's RCV IN port for more than 30 seconds. After meeting this requirement, INTELIPORT responds with a steady 1008Hz tone at +5dBm (TLP) indicating command mode initiation.

2.0.3   While in command mode, the STC can access any one of INTELIPORT's intelligent functions which include: toggling from TLP reference to DLP reference, activating a 3- or 4-tone remote alignment mode, initiating the automatic alignment sequence, or activating the quiet term/transponder mode of operation. Details of each operating mode are discussed in Sections 5 and 6 of this document.

Dual Powering Feature

2.0.4   The dual powering feature of Teltrend's 5497 allows the unit to operate from either the Serving Office sealing current source or from a local power source. This feature is especially useful when local power is either missing or has been interrupted for whatever reason. When powered from a local source and if local power ever becomes absent, the 5497 automatically switches over to operate via the Line Powering option. The unit maintains full functionality during maintenance testing, regardless of the powering option used. When both local and line power is present, the 5497 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.

3.   CIRCUIT/FUNCTIONAL DESCRIPTION

Refer to Figure 2, the 5497 Functional/Block Diagram, as needed, while reading the following functional description.
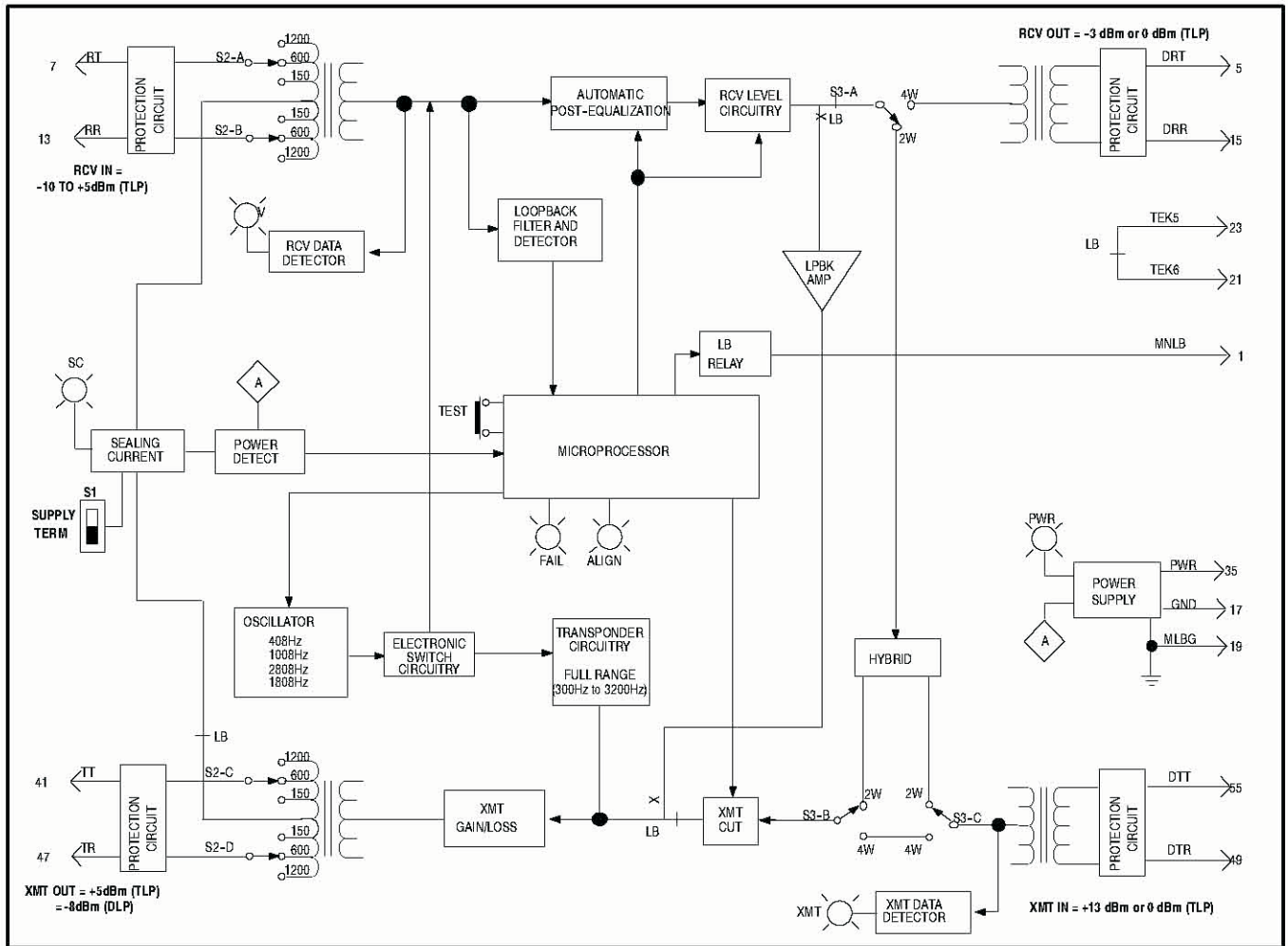
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Figure 2.   Functional Block Diagram

3.1   Command Mode

3.1.1   INTELIPORT incorporates a command mode from which all functions, except manual and tone-activated loopback and manual activation of the Auto-Align feature, are accessed. The command mode is the operational state in which INTELIPORT monitors its transmission ports for incoming frequencies and interprets these frequencies as commands to carry out specific functions.

3.1.2   INTELIPORT's command mode is activated from the STC by sending the appropriate activation tone (1713, 1913, 2413 or 2713Hz) to INTELIPORT's RCV IN port (pins 7 and 13) for more than 30 seconds. If the activation tone is removed in less than 30 seconds, INTELIPORT enters loopback (see Paragraph 6.2).

3.1.3   Upon detecting the activation tone for more than 30 seconds, INTELIPORT returns a steady 1008Hz tone at the XMT OUT Level setting via the XMT OUT port (pins 41 and 47). The STC, Upon receiving steady 1008Hz, removes the ac-

tivation tone. Command mode is activated. Please note that the command mode is equipped with a 5-minute timeout circuit. If no tone is sent to INTELIPORT within a five minute time frame, INTELIPORT drops out of the command mode and returns to idle.

3.1.4   While in command mode, the STC can access any one of INTELIPORT's intelligent functions which include: toggling from TLP to DLP, activating the 3- or 4-tone remote alignment mode, or initiating the automatic alignment sequence. Maintenance functions (see Part 6) include an Alignment Query mode, a Loopback mode a Quiet Term/Transponder mode of operation and a RCV IN port 4-Tone Auto-Sweep Transponder mode of operation for verifying noise and tone level measurements. *NOTE: INTELIPORT also provides an escape feature that allows the test person to escape from any mode for whatever reason. Escape and return to command mode from any mode, except loopback when activated from the idle state, is accomplished by sending 2604Hz. Escape and return to idle from any mode is accomplished by sending the Loopback/Activation tone >5 seconds.*

3.2   LED Status Indicators

INTELIPORT is equipped with six front-panel LEDs that provide a quick visual indication of the units operatio nal status and mode. See Table 2 for a description of the LED function.

3.3   Changing Loopback/Command Mode Activation Frequency (1713, 1913, 2413, 2713 Hz)

3.3.1   INTELIPORT can be programmed to respond to a loopback/command mode activation tone of either 1713Hz, 1913Hz, 2413Hz or 2713Hz (Standard). To activate the Level/ Frequency Selection Mode, the STC must first enter the command mode. While in command mode, the test person sends 1604Hz. Upon detecting 1604Hz INTELIPORT returns a Ramp-Up sequence indicating the 5497FA is set for +13/-3 (TLP) customer levels or a Ramp-Down sequence indicating the 5497FA is set for 0/0 (TLP) levels then sends a two second interrupted 1008Hz/XX50Hz tone holding on the XX50Hz tone for Up to five minutes. The XX50Hz tone represents the current loopback/activation frequency (i.e. 1750Hz =1713Hz, 2450Hz = 2413Hz).

3.3.2   To change the loopback/activation frequency, the tester sends 404Hz for 1713Hz, 1004Hz for 1913Hz, 2804Hz for 2413Hz or 2713Hz for 2713Hz operation. Upon receiving 404, 1004, 2804 or 2713Hz, the INTELIPORT returns interrupted 1008/XX50Hz and holds the XX50Hz tone for ten seconds then returns to command mode.

- NOTE -
To leave the INTELIPORT frequency setting menu without changing the current frequency, send the appropriate command (i.e. 404, 1004, 2804 or 2713Hz) for the current frequency to return to the command mode.

3.4   Changing Customer Levels (⁺13/-3 or 0/0) (FACTORY DEFAULT -3 dBm RCV/⁺13 dBm XMT)

3.4.1   INTELIPORT 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 1604Hz. Upon detecting 1604Hz INTELIPORT returns a Ramp-Up sequence indicating the 5496FA is set for +13/-3 (TLP) customer levels or a Ramp-Down sequence indicating the 5497FA is set for 0/0 (TLP) levels then sends a two second interrupted 1008Hz/XX50Hz tone holding on the XX50Hz tone for up to five minutes.

3.4.2   To change the customer level interface, the tester sends 2600Hz to toggle the current level. Upon sending 2600Hz to the 5497FA, the INTELIPORT returns a Ramp-Up sequence indicating the 5497FA is set for +13/-3 levels or a Ramp-Down sequence indicating the 5497FA is set for 0/0 levels then returns to the command mode.

- NOTE -
To leave the INTELIPORT Level/Frequency setting menu without changing the current levels or frequency, send the appropriate command (i.e. 404, 1004, 2804 or 2713Hz) for the current frequency to return to the command mode.

3.5   TLP/DLP Toggle

INTELIPORT is initially programmed to align and transpond with levels referenced at TLP (Transmission Level Point). This feature can, however, be changed to have the unit align and transpond with levels referenced at data level (DLP). Toggling from TLP to DLP is accomplished while in the command mode by sending 2804Hz. Upon detecting 2804Hz, INTELIPORT toggles to the DLP mode, corrects the internal circuitry to accommodate the change in reference levels, then returns to command mode. The toggling function can be verified by monitoring the 1008Hz output level for a change of 13dB. To return the circuit back to the TLP mode, the test person sends another 2804Hz while in command mode.

- NOTE -
Each time INTELIPORT returns to idle, the TLP/DLP circuit automatically returns to the TLP mode. Therefore, whenever the command mode is re-accessed from an idle state and testing or alignment is to be done at data level, the test person must send 2804Hz to toggle the circuit to the DLP mode.

3.6   Alignment

3.6.1   The 5497 features both remote and automatic alignment capability. Remote alignment is used to align only the 5497. Remote alignment is activated while in the command mode by sending 1004Hz. Automatic alignment is used to automatically align INTELIPORT with another intelligent unit at the distant end. Auto align can be activated from the command mode by sending 1804Hz or can be activated by pressing the front-panel TEST switch. In either the remote or automatic alignment mode, INTELIPORT's internal circuitry automatically adjusts the gain and equalization for proper level coordination between the facility and data modem equipment.

3.6.2   From command mode and before either Remote or Auto Align is activated, the test person must decide if alignment is to be done at TLP or DLP. When set 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 5497 are given in Table 1. NOTE: Auto-align, when activated via the TEST switch, takes place at TLP only.

- NOTE -
When performing automatic alignments to another SDS 5497FA or from an intelligent D4 or SLC-5 ETO, the SDS 5497FA must be set for 2713Hz loopback/activation mode prior to the automatic alignment taken place. Once the alignment is complete, then change the loopback/activation frequency of the SDS 5497FA as specified.

Port	Standard		FAA	
	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 1. 5497 Operating Levels

3.7   Auto-Align

PORT	4W	2W
RCV IN PORT (Cable Entry Point)	Verify Continuous, 1008Hz	Verify Continuous, 1008Hz
XMT OUT PORT (Cable Entry Point)	Verify Interrupted, 1008Hz	Verify Interrupted, 1008Hz
RCV OUT PORT (Demarcation Point)	Verify Continuous, 1008Hz	
XMT IN PORT (Demarcation Point)	Verify Interrupted, 1008Hz	Verify Interrupted, 1008Hz

As mentioned, Auto-align is used to automatically align INTE-LIPORT with another intelligent unit at the near-end. Auto-align can be initiated by one of two ways: Auto-align from command mode or Auto-align via the TEST switch. When auto-align is initiated via the TEST switch, the TEST switch can be pressed for more than five seconds but less than 10 seconds to initiate a DST to ETO alignment or can be pressed for more than 10 seconds to initiate a DST to DST alignment.

> **- NOTE -**
> *The TEST switch should be pressed only when instructed. Otherwise, pressing this switch at an inappropriate time may cause circuit interference. Please also note that pressing the TEST switch for less than five seconds activates the Wire Test mode. Remember, when auto-align is initiated via the TEST switch alignment takes place at TLP only.*

3.8   DST-ETO Alignment Via TEST Switch

In this application, INTELIPORT must be interfacing an intelligent ETO. When the TEST switch is pressed for more than five seconds but less than 10 seconds INTELIPORT recognizes this as a command to perform a DST to ETO alignment. When activated, INTELIPORT outputs 2913Hz on the RCV IN port (that is, in the reverse direction) toward the ETO. Continue with Paragraph 3.10.3. *(NOTE: When Auto-Align is activated in this manner, the front-panel FAIL and ALIGN LEDs will light steady.)*

3.9   DST-DST Alignment Via TEST Switch

In this application, INTELIPORT must be interfacing an intelligent DST. When the TEST switch is pressed for more than 10 seconds, INTELIPORT recognizes this as a command to perform a DST to DST alignment. Continue with Paragraph 3.10.3. *(NOTE: When Auto-Align is activated in this manner, the front-panel FAIL and ALIGN LEDs will flash and INTELIPORT sends 2713Hz for 60 seconds from the XMT OUT port.)*

3.10   Auto-Align Via The Command Mode

3.10.1   While in the command mode (1008Hz present), the test person initiates the Auto Align sequence by sending 1804Hz. When Auto Align is activated in this manner, the intelligent unit at the other end can be either an ETO or another DST.

3.10.2   In either case, upon detecting the command to enter the Auto Align mode (1804Hz or via the TEST switch being pressed), INTELIPORT first sends 2913Hz to the distant end for 60 seconds or until command mode tone is received from the distant end.

At this point:

- If a command mode tone is received from the distant end after sending 2913Hz, INTELIPORT assumes the unit at the distant end is an intelligent 4W ETO. INTELIPORT then removes its 2913Hz and automatic alignment continues.

- If a command mode tone is not detected after sending 2913Hz, INTELIPORT drops the 2913Hz tone and sends 2713Hz. If a command mode tone is detected from the distant end at this point, INTELIPORT assumes an intelligent DST is at the other end and automatic alignment continues.

- If no response is detected from the distant end after sending either 2913Hz or 2713Hz, INTELIPORT assumes the equipment at the other end is either a non-intelligent unit or the equipment is missing. In this case, INTELIPORT re-sends 2713Hz to the distant end and returns to idle. If no response is the result, the test person may perform a remote alignment of the 5497 (see Paragraph 3.6).

3.10.3   When both ends are set to align, tones of 1008Hz, 408Hz, 2808Hz, and 1808Hz are automatically sent and received between both ends. If the distant end is capable of aligning to four tones, the fourth tone (1808Hz) is sent and both ends align to the four tones. If the distant end is not capable of aligning to four tones, the 1808Hz tone drops and both ends automatically align to three tones. Gain and equalization is automatically set and alignment is complete. The automatic alignment sequence takes place in about three to five minutes.

Upon completing the 3- or 4-tone alignment sequence,

- If aligning the 5497 with an intelligent 4ETO (such as Teltrend's ISQ4389C), the ISQ returns either a Ramp-Up tone or a Ramp-Down tone after alignment. After receiving the Ramping tone, INTELIPORT re-sends 2913Hz to the ISQ. At this point, the ISQ returns to idle. After five seconds, INTELIPORT returns to idle.

- If aligning the 5497 with another intelligent DST, the distant end returns either a Ramp-Up or Ramp-Down tone after alignment. After receiving the Ramping tone, INTELIPORT returns either a Ramp-Up tone or a Ramp-Down tone toward the tester then INTELIPORT sends 2713Hz to the distant end and returns to idle. The distant end receiving 2713Hz from INTELIPORT, also returns to idle.

3.11   Ramp-Up/Ramp-Down Tone Sequence

The Ramping tone after alignment is complete indicates whether or not the cable pair, on the facility-side, was equalized. A Ramp-Up tone, consisting of a series of tones ranging from 308Hz to 3008Hz in ascending order, indicates alignment is within the specified requirements to meet C5 conditioning. A Ramp-Down tone, consisting of a series of tones ranging from 3008Hz to 308Hz in descending order, indicates alignment is not within the specified requirements to meet C5 conditioning. The Ramp-Up or Ramp-Down tone sequence is applied for approximately one second with the last tone (3008Hz in the Ramp-Up tone sequence; 308Hz in the Ramp-Down tone sequence) being applied for approximately 5 seconds.

- NOTE -
If INTELIPORT determines that the loop cannot be aligned to C5 conditioning, the FAIL and ALIGN LEDs will flash (alternately) for five minutes. This indication lets the installer know to check the equalization to verify that the circuit meets specification.

3.12   Remote (Manual) Alignment

3.12.1   Remote alignment is used to align only the 5497. While in command mode (1008Hz present), the test person should record the level received at 1008Hz first. The test person then initiates remote alignment by sending 1004Hz to INTELIPORT.

3.12.2   Upon detecting 1004Hz, INTELIPORT returns 2808Hz. The test person should record the level received at 2808Hz, then sends 2804Hz to INTELIPORT. Upon detecting 2804Hz, INTELIPORT returns 408Hz. The test person should record the level received at 408Hz, then sends 404Hz to INTELIPORT. Upon detecting 404Hz, INTELIPORT returns 1808Hz for 60 seconds. The test person should record the level received at 1808Hz then has the option of aligning the circuit to 3 tones or to 4 tones. *NOTE: The fourth tone in the alignment sequence (1808Hz) provides for a more accurate equalization when interfacing long section of loaded cable or a mixture of loaded and non-loaded cable.*

3.12.3   3-Tone Alignment

If a 3-tone alignment is required, the test person can either ignore the 1808Hz tone from INTELIPORT or can send 1004Hz to INTELIPORT during the 60-second time frame. If the 1808Hz tone is ignored, INTELIPORT, after the 60-second time frame, drops the 1808Hz tone and aligns the circuit to the three tones. By sending 1004Hz in response to INTELIPORT's 1808Hz tone, within the 60-second time frame, the 60-second timer circuit is bypassed, the 1808Hz tone drops and INTELIPORT aligns the circuit to three tones. Upon completion, INTELIPORT returns either a Ramp-Up tone or a Ramp-

Down tone (see Paragraph 3.11) then enters loopback to permit verification of alignment levels (see Paragraph 3.10.3).

3.12.4   4-Tone Alignment

If a 4-tone alignment is required, the test person sends 1804Hz, in response to INTELIPORT's 1808Hz tone, within the 60-second time frame, Upon detecting 1804Hz, INTELIPORT aligns to the four tones. Upon completion, INTELIPORT returns either a Ramp-Up tone or a Ramp-Down tone (see Paragraph 3.11) then enters loopback to permit verification of alignment levels (see Paragraph 3.10.3).

3.13   Loopback After Remote Alignment

While in loopback, the receive path is interconnected to the transmit path via a loopback amplifier. Loopback allows the test person to verify alignment settings and facility frequency response. The loopback circuit, when activated, automatically inserts 16dB (Standard Levels) or 0 dBm (FAA) of gain to provide an equal-level loopback condition. During loopback, the test person sends tones (404, 1004, 1804, and 2804Hz), one at a time, to INTELIPORT. The test person should verify/record the level of each tone as it is looped back by INTELIPORT.

3.14   Loopback Release

Loopback automatically releases 20 minutes after initial activation. If release from loopback is desired before the 20-minute time frame, the test person can send the appropriate Loopback/Activation tone for 0.9 seconds, minimum. Loopback releases upon detecting the tone. The automatic timeout release feature ensures the transmission paths restore to normal operation if the Loopback/Activation tone is not sent.

4.   OPTIONS & FEATURES

The 5497 contains features and switch options located on the front and side (PCB) panels, as shown in Figure 3. Two option switches are used to condition the unit for proper operation in a given application. In addition, the 5497 is equipped with a front-panel TEST switch. The TEST switch is used by the Installer to activate INTELIPORT's Wire Test mode for verifying station wiring after the unit is installed. The TEST switch can also be used to activate INTELIPORT's automatic alignment feature. See Paragraphs 3.6 through 3.13 for details on the automatic alignment features provided by Teltrend's 5497.

- NOTE -
The TEST switch, when used to activate INTELIPORT's automatic alignment feature, should be pressed only when instructed. Otherwise, pressing this switch at an inappropriate time may cause circuit disruption.
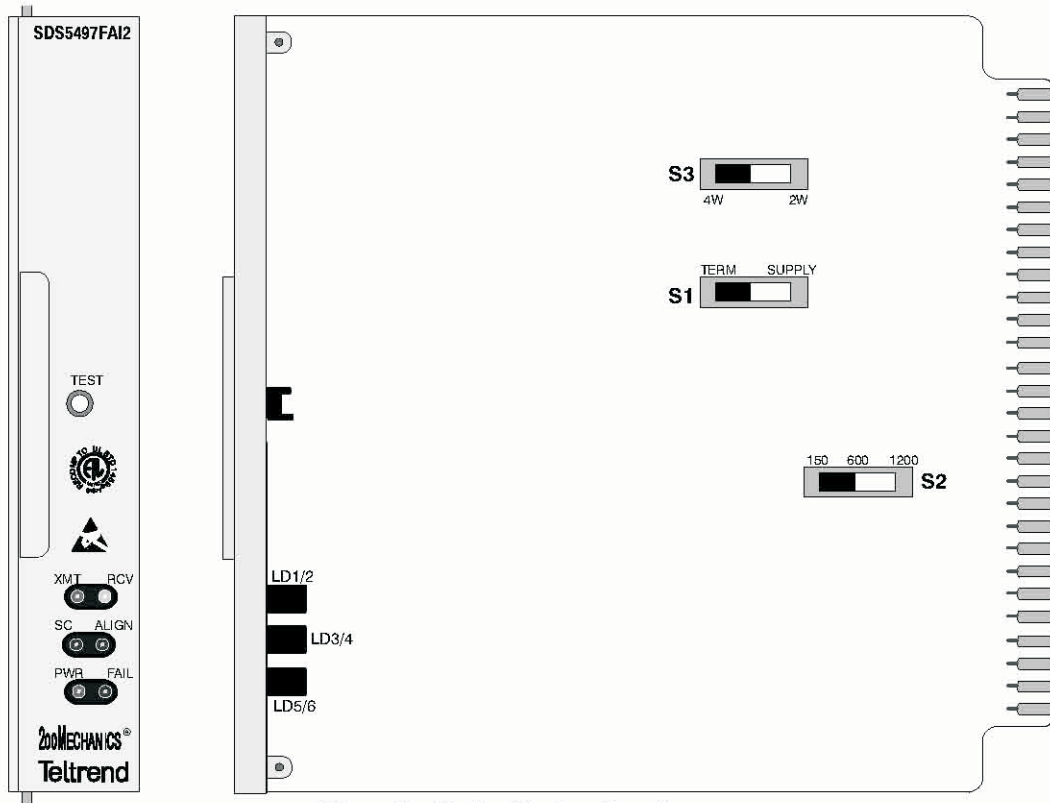

Figure 3.   Option/Feature Locations

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PCB Side Panel Options		
Option	Switch Positions	Description
S1	Supply	Select to supply Sealing Current to distant end (Note: Available with local power only).
	Term	Select when providing a termination for distant Sealing Current source.
S2	1200	Select when interfacing loaded cable.
	600	Select when interfacing short nonloaded cable.
	150	Select when interfacing long nonloaded cable.
S3	2W	Select when interfacing 2W data modem equipment.
	4W	Select when interfacing 4W data modem equipment.

Front Panel Features			
Item	Label	Status	Description
LEDs	XMT	On / Flashing	Indicates the unit is receiving data from Equipment.
		Off	Indicates the unit is idle.
	RCV	On / Flashing	Indicates the unit is sending data to Equipment.
		Off	Indicates the unit is idle.
	SC	On	Indicates unit is being powered via simplex current (line powered).
		Off	Indicates simplex current is not present. Check status of LOC PWR LED.
	ALIGN	On	Indicates the unit is in the command, alignment, or transponder mode.
		Flashing	Indicates the unit is in the Loopback mode.
		Off	Indicates the unit is idle.
	PWR	On	Indicates unit is being powered via a local, external power source.
		Off	Indicates local current is not present. Check status of SC LED.
	FAIL	On	Indicates a unit failure condition. Replace the unit.
		Flashing	Indicates the unit is in the Wire Test mode.
		Off	Indicates the unit is idle.
Push Button	TEST	Press < 5 sec.	Press for <5 seconds to activate INTELIPORT's Wire Test mode.
		Press >15 sec and < 10 sec.	Press for >15 seconds but < 10 seconds to activate INTELIPORT's Auto-Align mode to align the 5497 with an intelligent ETO known to be at the other end.
		> 10 sec.	Press for >10 seconds to activate INTELIPORT's Auto-Align mode to align the 5497 with another intelligent DST known to be at the other end.

Table 2. Options and Features

5. INSTALLATION

- INSPECTION NOTE -

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

CAUTION - STATIC-SENSITIVE

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

- PRECAUTIONARY STATEMENT -

Never install telephone wiring during a lightning storm.

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

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

Use caution when installing or modifying telephone lines.

5.1 Mounting the Module

Before installing the module, set any option switch(es) to the desired position(s). Align the module with the mounting or assembly card guides above and below the unit and insert as far as it will go into the slot connector.

The 5497 is a 200 MECHANICS®-type plug-in module that mounts in a 200-, 400-, or 550-type mounting assembly (or equivalent mounting which matches the pin-out plan of the module).

- 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.

5.2 Installer Connections

When installing the unit in Teltrend's USA pre-wired Type 550 shelf (Type-400 equivalent), connections are made 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 Teltrend's 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. Pin identifications for proper wiring are listed in Table 3.

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Pin #	Lead Designation		Type
7	RT -	Receive In (Tip)	Facility
13	RR -	Receive In (Ring)	
41	TT -	Transmit Out (Tip)	
47	TR -	Transmit Out (Ring)	
5	DRT -	4W Receive Out (Tip)	Modem
15	DRR -	4W Receive Out (Ring)	
55	DTT -	Transmit In/2W (Tip)	
49	DTR -	Transmit In/2W (Ring)	
23	TEK5 -	Data Set Disable	
21	TEK6 -	Data Set Disable	
1	MNLB -	Manual Loopback	Misc.
19	MLBG -	Manual Loopback Ground	
35	PWR -	Power	
17	GND -	Ground	

Table 3. Pin/Lead Designations

5.3   Powering Requirements

Power for proper operation can be supplied from a local power source of -22 to -56Vdc (-48Vdc, nominal) at 20mA, maximum or from a 20 to 28Vac (24Vac, nominal) at 40mA, maximum. If local power is not available, the 5497 can be powered from the simplex leads (Line power). The unit maintains full functionality during maintenance testing when the unit is line powered.

5.3.1   Dual Powering Feature

The Power Detect circuit monitors both the local power source (pins 35 and 17) and the simplex leads . If the unit is being powered from a local power source, the internal Sealing Current circuit provides a termination for sealing current when sealing current is being supplied from the distant end. If a local power source is not available, INTELIPORT will operate off the simplex current. If both local power and simplex powering is present, INTELIPORT will always operate off the local power source as its first choice. This way, if local power is ever interrupted the Power Detect circuit automatically switches the internal circuitry so INTELIPORT can operate off the line power source. Subsequently, when local power is restored, the internal circuitry automatically switches back to operate off the local power source.

5.3.2   Sealing Current/Simplex Powering

5.3.2.1   Sealing current is recommended on all metallic facilities to help prevent transmission path noise. Sealing current is a low-value dc current (approx. 20mA) 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.

5.3.2.2   The internal sealing current TERM circuit provides a termination for sealing current when sealing current is supplied from the distant end. When local power and sealing current is 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 INTELIPORT is being powered via the simplex current. The SUPPLY option is used to provide sealing current from the 5497FA to the distant end, and functions only when the INTELIPORT is locally powered.

5.3.3   Wire Test Mode

5.3.3.1   Once the installer connections are complete and the option switches have been set to the required position, the unit can be installed (see Installer's Procedures in Table 7 also). After installing the unit, the installer should activate INTELIPORT's Wire Test mode to verify installation and station wiring. Pressing the recessed, front-panel pushbutton TEST switch, for less than five seconds (see NOTE) causes 1008Hz to be applied to the RCV and 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 4 for a summary of tones output by INTELIPORT when operating in 2W or 4W applications.

PORT	4W	2W
RCV IN PORT (Cable Entry Point)	Verify Continuous, 1008Hz	Verify Continuous, 1008Hz
XMT OUT PORT (Cable Entry Point)	Verify Interrupted, 1008Hz	Verify Interrupted, 1008Hz
RCV OUT PORT (Demarcation Point)	Verify Continuous, 1008Hz	
XMT IN PORT (Demarcation Point)	Verify Interrupted, 1008Hz	Verify Interrupted, 1008Hz
Note: In 2W applications, the RCV OUT port and XMT IN port utilize the same transmission pairs (T & R, pins 55 and 49).		

Table 4. Wire Test Mode Tones

5.3.3.2   After verifying the tones, press the TEST switch again (for less than five seconds) to end the Wire Test mode. If the TEST switch is not pressed a second time, the Wire Test mode automatically times out one hour after initial activation. If desired, the test person can release the Wire Test mode remotely by sending the appropriate activation tone (1713, 1913, 2413 or 2713Hz), 10 to 60 minutes after initial activation. The 5497 returns to idle Upon detecting the Loopback/Activation tone.

6.   TESTING & MAINTENANCE

The 5497's testing and maintenance features include Alignment Query, Loopback, a Quiet Term/Transponder and a RCV IN port 4-Tone Auto-sweep Transponder mode of operation. The following paragraphs in this section describe the operation of the testing and maintenance features.

6.1   Alignment Query

The Alignment Query mode of operation allows the test person to periodically check INTELIPORT's equalization/alignment status to verify if alignment is in or out of C5 conditioning requirements. Alignment Query is activated while in the command mode by sending 1204Hz. Upon detecting 1204Hz, INTELIPORT returns either a Ramp-Up tone sequence (308Hz to 3008Hz in ascending order) or a Ramp-Down tone sequence (3008Hz to 308Hz in descending order). The Ramp-Up tone indicates alignment is within the parameters of C5 conditioning requirements. The Ramp-Down tone indicates correct alignment could not be achieved. Following the end of the Ramping tone, INTELIPORT automatically returns to command mode.

6.2   Loopback - From Idle State

6.2.1   Loopback can be initiated any time the unit is idle by sending the Loopback/Activation tone (1713, 1913, 2413 or 2713Hz) to INTELIPORT's RCV IN port for more than 2.5 seconds but less than 30 seconds. If the tone is present for more than 30 seconds, INTELIPORT enters the command mode.

6.2.2   Upon detecting the Loopback/Activation tone for more than 2.5 seconds, INTELIPORT returns an alternating 408/1008Hz identification tone indicating the circuit being accessed for maintenance testing as INTELIPORT, Teltrend's 5497 intelligent 2W/4W Data Station Termination unit.

6.2.3   While in loopback, the test person sends tones (404, 1004, 1804, and 2804Hz), one at a time, to INTELIPORT. The test person should verify/record the level of each tone as it is looped back by INTELIPORT. Loopback automatically releases 20 minutes after initial activation. If release is desired before the 20-minute time frame, send the loopback/activation tone for 0.9 seconds.

6.3   Manual Loopback Activation

In addition to tone-activated loopback, the 5497 can be looped-back manually by placing a ground on the MNLB lead, pin 1. When loopback is activated manually, 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 from pin 1.

6.4   Quiet Term/Transponder

6.4.1   INTELIPORT's Quiet Term/Transponder mode allows the test person to remotely conduct noise and tone level measurements over the XMT OUT port. From the command mode, the Quiet Term/Transponder mode is activated by sending 404Hz to INTELIPORT via the RCV IN port. Upon detecting 404Hz, INTELIPORT applies a quiet termination at the XMT IN port and isolates signals from the data modem.

6.4.2   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 (i.e., to en-

ter the transponder mode of operation, return to command mode or return to idle) is sent. If no tone is sent to INTELIPORT with the 20-minute time frame, INTELIPORT, after 20 minutes of no activity, times out and automatically returns to idle. If desired, the test person can send 2604Hz for more than five seconds to return INTELIPORT back to command mode. To return to idle, at any time, the test person sends the Loopback/Activation tone for more than five seconds.

6.5   Transponder Mode Of Operation

From the Quiet Termination mode, INTELIPORT 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 INTELIPORT sweeps four tones. The Full-Range Transponder mode allows for a more detailed tone level verification test over a range of frequencies from 304Hz to 3604Hz. Both transponder modes are activated from the quiet termination mode only.

6.5.1   4-Tone Auto-Sweep

To activate the 4-tone Auto-Sweep Transponder, the test person sends 404Hz as the first tone during the quiet termination portion of the Quiet Term/Transponder mode. Upon detecting this 404Hz, INTELIPORT sweeps the tones of 408Hz, 1008Hz, 1808Hz, and 2808Hz, each for 15 seconds. The level of each tones is applied over the XMT OUT port. After sending the last tone, INTELIPORT reapplies quiet termination and resets the 20-minute timer circuit. The 4-Tone Auto-sweep Transponder test can be re-started by re-sending 404Hz as the first tone while in quiet termination.

6.5.2   Full-Range Transponder

6.5.2.1   To activate the Full-Range Transponder, the test person sends any tone from 304Hz to 3604Hz (except 404Hz as the first tone, or 2604Hz and the Loopback/Activation Tone) while in quiet termination. If 404Hz is detected as the first tone, INTELIPORT begins the 4-Tone Auto-Sweep. However, 404Hz can be sent any time after the transponder test has begun. If 2604Hz is detected, at any time, INTELIPORT interprets this as a command to return to command mode. If the loopback/activation frequency is received at any time, INTELIPORT to returns to idle.

6.5.2.2   During the Full-Range Transponder test, each tone sent to INTELIPORT should be in increments of 100Hz. As tone is received, INTELIPORT 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, INTELIPORT reapplies quiet termination and resets the 20 minute timer circuit. If no tone is sent to INTELIPORT within the 20-minute time frame, INTELIPORT, after 20 minutes, times out and returns to idle. If release is desired before the 20-minute time frame, send 2604Hz for five seconds to return to

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command mode or the Loopback/Activation tone for five seconds to return to idle.

6.6   4-Tone Auto-Sweep (RCV IN Port)

6.6.1   In addition to the normal Quiet Term/ Transponder mode of operation, INTELIPORT features a 4-Tone Auto-Sweep test over the RCV IN port. This test also allows the test person to perform a quick level verification test of tones output by INTELIPORT over the RCV IN port. The 4-Tone Auto-Sweep RCV IN port test mode is activated while in command mode by sending 604Hz.

6.6.2   Upon receiving 604Hz, INTELIPORT begins by sending 1008Hz over the RCV IN port for 60 seconds followed by 15 seconds of quiet termination. The test person should verify/record the level received at 1008Hz as well as perform noise measurements. From this point, after 15 seconds of quiet termination, INTELIPORT then sweeps the tones of 408Hz, 1808Hz and 2808Hz at 0dBm. Each tone is applied over the RCV IN port for 15 seconds. The test person should verify the level of each tone output by INTELIPORT. After sending the last tone for 15 seconds, INTELIPORT automatically returns to command mode. The RCV IN port 4-Tone Auto-sweep Transponder test can be re-started by re-sending 604Hz while in the command mode.

6.7   Testing Procedures

6.7.1   In addition to the text, this document provides a Testing and Alignment procedure, see Table 7. This document is also accompanied with a Flowchart which can be used as a quick reference for testing. Tests beyond those outlined, or repairs made beyond replacing a faulty unit, are not recommended and may void the warranty.

6.7.2   If trouble is encountered with this module, be sure all installer connections have been made correctly and that the unit is properly seated in mounting assembly. Please also check that the option switches are set to the correct position. After verifying all the above conditions, retest the module.

7.   CUSTOMER & TECHNICAL SERVICES

7.1   Customer Service & Technical Assistance

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

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

7.2   Part Numbers

This equipment is identified by a product 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 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 equipment.

8.   WARRANTY & 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   Regulatory/Agency Specifications

The module is designed to meet the following regulatory, safety, or environmental specifications or requirements:

•   Meets UL1459 requirements

9.2   Ordering Specifications

To order units, call the telephone number shown in Paragraph 7.1 and please specify a specific model number shown in Table 5.