

# Satellite Link Emulator

## ASLE-L-36D



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## Preface

This user manual contains operation instructions and test procedures for the ASLE-L-36D. The ASLE-L-36D is an instrument that reproduces propagation time delay, path loss, and doppler shift that occur in real-world satellite links.

This user manual is divided into the following sections:

### **Precautions**

#### **Chapter 1**

Describes overview, features, and applications.

#### **Chapter 2**

Describes the configuration on the front panel and the connectors on the rear panel.

#### **Chapter 3**

Describes installation details.

#### **Chapter 4**

Describes how to operate the instrument.

#### **Chapter 5**

Specifications.

#### **Appendix**

Describes warranty information.

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## Precautions

Be sure to read these precautions before using this instrument.

**Warning:**

Information to prevent personal injury.

**Caution:**

Information to prevent damage to the instrument.

**WARNING**

### Electrical hazards (AC supply voltage)

- There is a danger of electric shock if you touch the power cord with wet hands.
- Do not remove this instrument covers as this may result in personal injury.
- If there is no grounded AC power outlet, the grounding terminal on the rear panel must be grounded.
- Pulling out the power cord may cause personal injury and electric shock.
- There is a danger of electric shock if the fuse is replaced while the power is supplied. Before replacing the fuse, turn off the power switch and disconnect the power cord from the power socket.

### Fire hazard

- Make sure that only fuses of the correct rating and type are used for replacement.

### Tilt facility

- When the instrument is in the tilt position, it is advisable, for stability reasons, not to stack other instrument on top of it.

**CAUTION****Static sensitive components**

- This instrument contains static sensitive components which may be damaged by handling.

**Storage and transportation**

- Do not store it in a place exposed to high temperatures over 50°C or high humidity over 90%.
- Do not store in a place exposed to direct sunlight or dust.
- Do not store in a place exposed to active gas such as thinner and benzene.
- Avoid any shock or vibration during transportation.
- This instrument has a fan on the rear panel to maintain a steady internal temperature. Leave a gap of at least 10 cm between the rear panel and wall, nearby equipment or any obstructions so that fan ventilation is not blocked.
- Keep cooling fan free of dust.

# Chapter 1

## Introduction

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## Introduction

### Overview

ASLE-L-36D reproduces link effects that occur as signals propagate through the atmosphere and space. These link effects include propagation delay, carrier Doppler shift, and path loss. The ASLE-L-36D reproduces those effects by generating time delay, magnitude attenuation, and DDS frequency shift.

### Features

- Frequency Range / Step (MHz): 950 to 1,450 / 0.1
- Operating Bandwidth (MHz): 36
- Time Delay Range / Resolution (us): 0 (Bypass), 10 to 530,000 / 1
- Attenuation Range / Step (dB): 0 to 40 / 0.5
- Doppler Shift Range / Resolution (Hz): -3,000,000 to +3,000,000 / 1
- 14bit ADC: Excellent SNR

### Applications

- Satellite Modem testing
- VSAT testing:
- Satellite payload testing
- UAV testing
- Earth terminal testing
- Satellite system integration test beds
- Mobile transceiver testing

## Chapter 2

### Front and Rear Panels

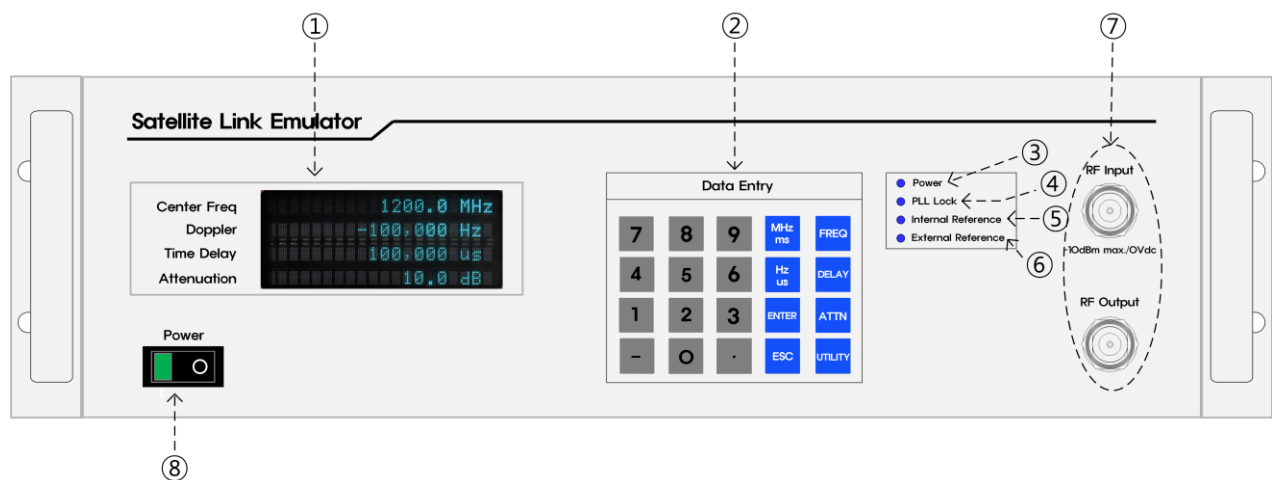
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## Front and rear panels

This chapter describes the configuration on the front panel and the connectors on the rear panel.

### Front panel



[Figure 2-1]

#### ① VFD (Vacuum Fluorescent Display)

The VFD displays the current setting values for the control parameters as follows.

- Center Freq: operating frequency
- Doppler: carrier Doppler shift
- Delay: propagation time delay
- Attenuation: path loss

#### ② Data Entry

Hard keys to set and edit parameters

#### ③ Power

Blue LED is on when primary power is applied.

#### ④ PLL Lock:

Blue LED is on when phase is locked and red LED is on when phase is unlocked.

#### ⑤ Internal Reference:

Blue LED is on if no external reference is present.

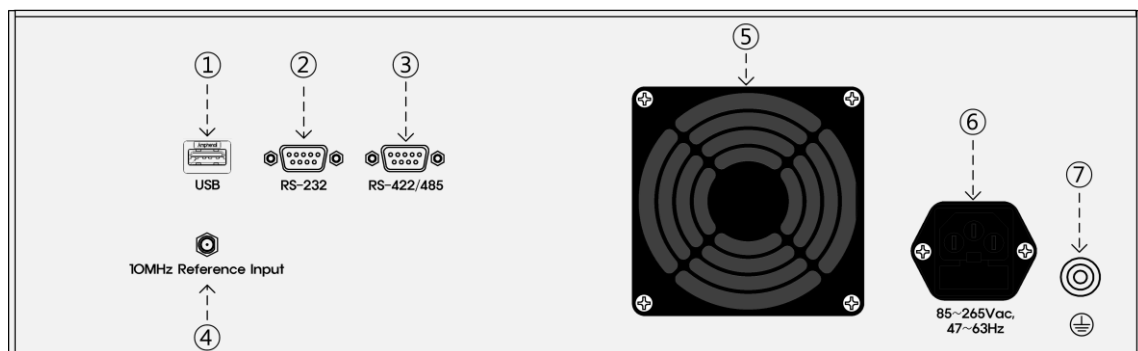
#### ⑥ External Reference:

Blue LED is on if external reference is present.

The ASLE-L-36D will automatically switch to its internal reference if no external reference is present. At this time, switching is completed after 5 seconds have elapsed for system resynchronization.

- ⑦ RF Input / RF Output
  - RF Input: N type Jack connector, 50Ω
  - RF Output: N type Jack connector, 50Ω
- ⑧ Power Switch
  - Primary power on/off switch

## Rear panel



[Figure 2-2]

- ① USB type-A receptacle connector for external USB interface
- ② D-Sub 9pin plug connector for external RS-232 interface
- ③ D-Sub 9pin plug connector for external RS-422/485 interface
- ④ SMA Jack connector for external 10MHz reference input
- ⑤ FAN to ventilate internally-generated heat
- ⑥ Fused AC power inlet: 90Vac ~ 240Vac, 47Hz ~ 63Hz
- ⑦ Grounding terminal

# Chapter 3

## Installation

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## Installation

### Unpacking

Unpack the shipping container and take out the contents as shown in [Table 1].

[Table 1]

Quantity	Description	Remarks
1	ASLE-L-36D	Satellite Link Emulator
1	AC Power Cord	
1	User Manual	

### Initial Inspection

Inspect the ASLE-L-36D for any possible wear or damage. If the ASLE-L-36D appears damaged when you first unpacked the container, please do not install the instrument. Contact **Polaris** immediately.

- Address: #1913, Anam tower, 311 Teheran-ro, Gangnam-gu, Seoul, Republic of Korea
- Tel: +82-2-2009-2120
- Email: info@polariswave.com

### Applying Power

- Place the ASLE-L-36D on the intended workbench and plug the power cord into the AC power inlet on the rear panel.
- Press the power button located on the front panel.

### Booting

When the power switch is turned on, letter strings as shown in [Figure 3-1 to 3-3]

appear on the VFD and system booting is completed.



[Figure 3-1]



[Figure 3-2]



[Figure 3-3]

# Chapter 4

## How to Operate the Instrument

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## How to operate the instrument

This instrument is controllable through [Data Entry](#) on the front panel or remote interface.

### Frequency

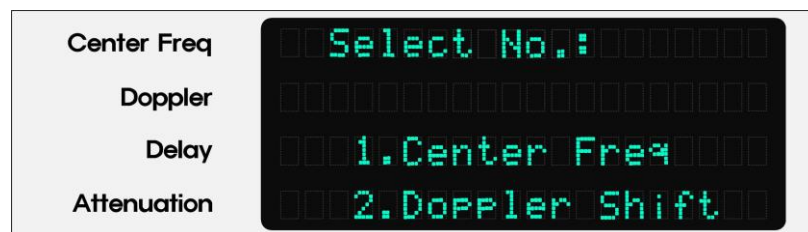
- Range / Resolution

Center frequency: 950MHz to 1,450MHz / 0.1MHz

Doppler shift: -3MHz to +3MHz / 1Hz

- Setup procedures

- ① Press [FREQ] key to setup center frequency and doppler shift. The menu appear as shown in [Figure 4-1].

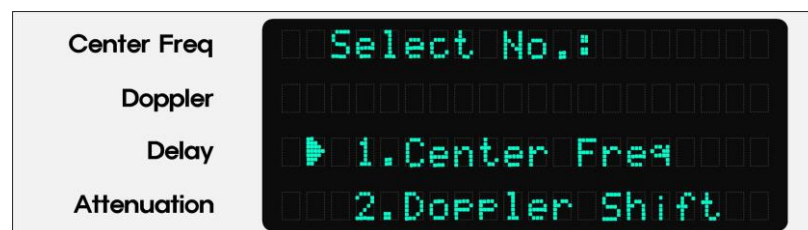


[Figure 4-1]

- ② **Center Freq**

- Press [1] key to set the center frequency.

☞ The pointer [▶] appears as shown in [Figure 4-2].

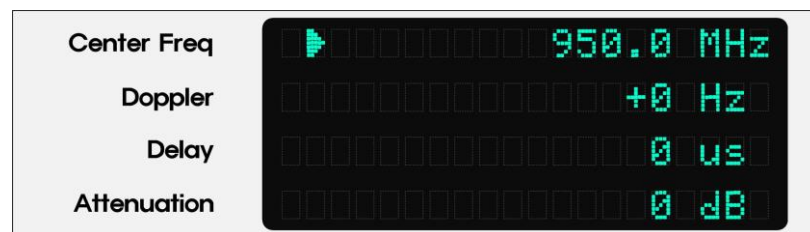


[Figure 4-2]

- Press [ENTER] key.

- Press numeric values of frequency (valid range: 950MHz to 1,450MHz, 0.1MHz steps). If frequency step is greater than 0.1MHz, it is not necessary to press the [.] key. The frequency is also set by pressing the [ENTER] key without pressing the [MHz/ms] key.

☞ [Figure 4-3] is an example for 950.0MHz.



[Figure 4-3]

- Press [ESC] key to edit numeric values of frequency.
- ☞ The **Center Freq** field changes to blank as shown in [Figure 4-4].



[Figure 4-4]

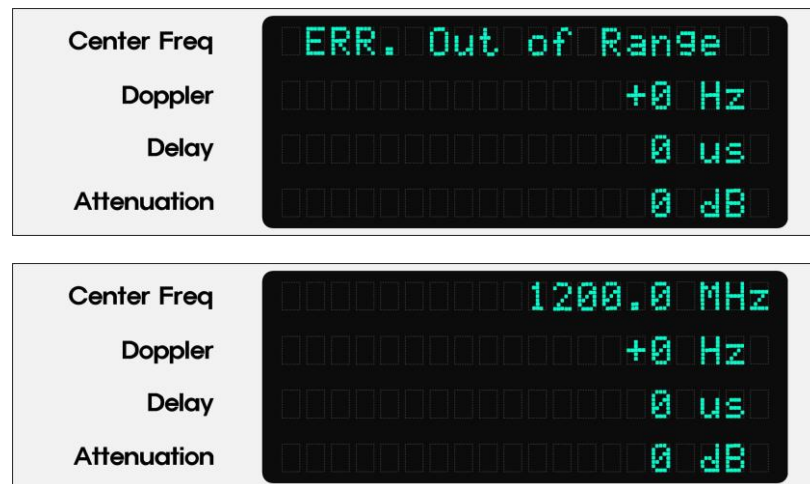
- Press numeric values of frequency again
- ☞ [Figure 4-5] is an example changed to 1200.0MHz.



[Figure 4-5]

- Press [ENTER] key.
- ☞ Success !! is displayed at the **Center Freq** field, and numeric values are saved.


- When numeric values of frequency are out of the valid range (950MHz to 1,450MHz), "ERR. Out of Range" appears for 1 second as shown in [Figure 4-6], and it returns to the previous value.

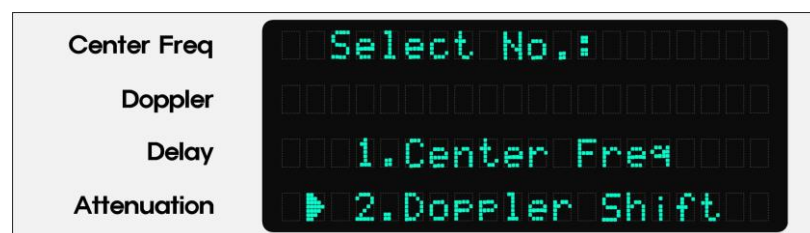


[Figure 4-6]

- Press the [ESC] key to return to the previous menu.

### ③ Doppler Shift

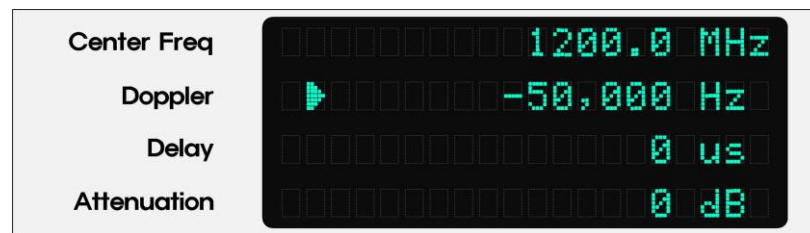
- Press [2] key to set the Doppler shift.  
 The pointer [▶] appears as shown in [Figure 4-7].



[Figure 4-7]

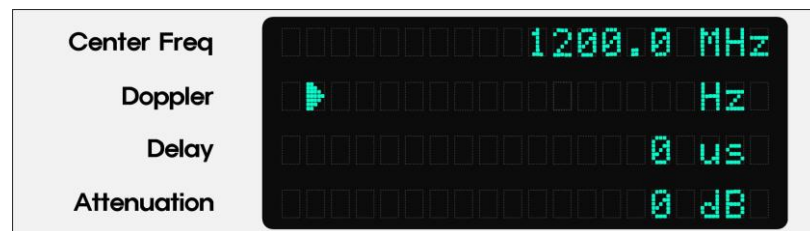
- Press [ENTER] key.
- Press numeric values of Doppler shift (valid range: -3MHz to +3MHz, 1Hz steps). To set in Hz steps, press numeric values and then press the [ENTER] key. To set in MHz steps, To set in MHz steps, press any desired number from [1] to [3], press the [MHz/ms] key and then press the [ENTER] key. Press the [-] key to change the + and - signs.

☞ [Figure 4-8] is an example for -50,000Hz.



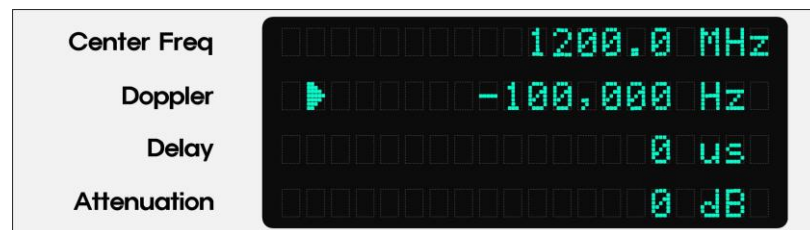
[Figure 4-8]

- Press [ESC] key to edit numeric values of Doppler shift.
- ☞ The **Doppler** field changes to blank as shown in [Figure 4-9].



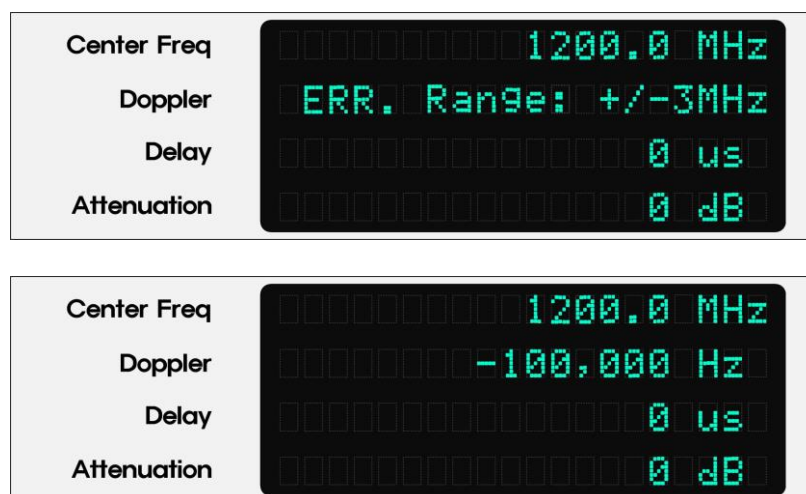
[Figure 4-9]

- Press numeric values of Doppler shift again.
- ☞ [Figure 4-10] is an example for -100,000Hz.



[Figure 4-10]

- Press [ENTER] key.
- ☞ Success !! is displayed at the **Doppler** field, and numeric values are saved.
- When numeric values of Doppler shift are out of the valid range (-3MHz to +3MHz), "ERR. Range: +/-3MHz" appears for 1 second as shown in [Figure 4-11], and it returns to the previous value.



[Figure 4-11]

- Press the [ESC] key to return to the previous menu.

## Delay

- Range / Resolution

0 (Bypass), 10 to 530,000us / 1us

- Setup Procedures

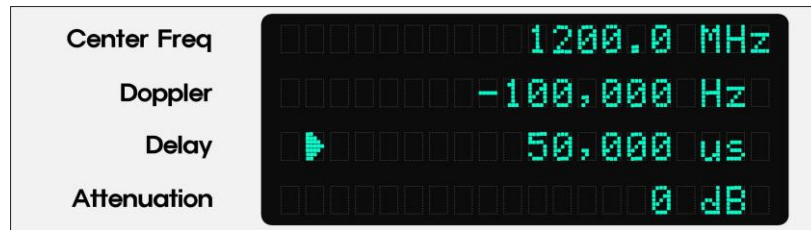
- ① Press [Delay] key to set the time delay. The pointer [▶] appears as shown in [Figure 4-12].



[Figure 4-12]

- ② Press numeric values of delay (valid range: 0 (Bypass), 10 to 530,000us, 1us steps). To set in us steps, press numeric values and then press the [ENTER] key. To set in ms steps, press any desired numbers less than or equal to 530, press the [MHz/ms] key and then press the [ENTER] key.

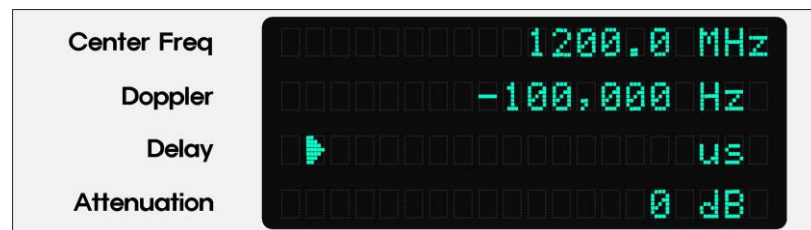
☞ [Figure 4-13] is an example for 50ms.



[Figure 4-13]

- Press the [ESC] key to edit numeric values of delay.

☞ The **Delay** field changes to blank as shown in [Figure 4-14].



[Figure 4-14]

- Press numeric values of delay again

☞ [Figure 4-15] is an example for 500ms.

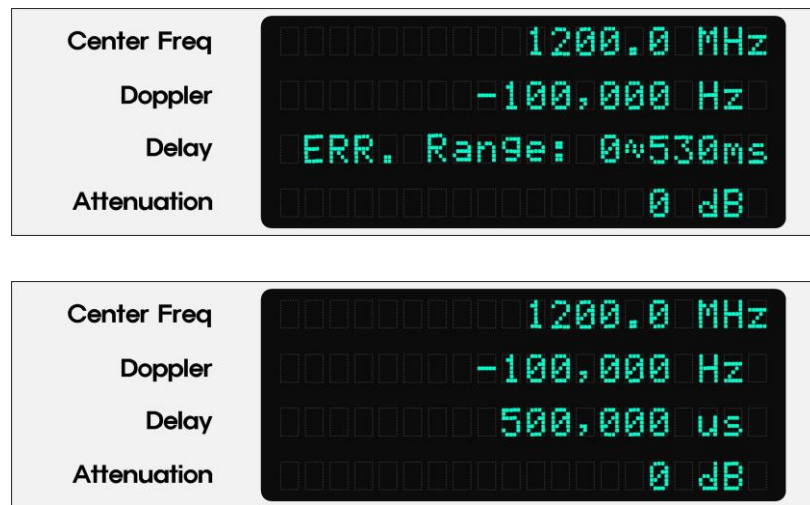


[Figure 4-15]

- Press [ENTER] key.

☞ Success !! is displayed at the **Delay** field, and numeric values are saved.

- When numeric values of delay are out of the valid range (10 to 530,000us), "ERR. Range: 0~530ms" appears for 1 second as shown in [Figure 4-16], and it returns to the previous value.



[Figure 4-16]

- Press the [ESC] key to return to the previous menu.

## Attenuation

- Range / Resolution  
0 to 40dB / 0.5dB
- Setup Procedures
  - ① Press [Atten] key to setup attenuation. The pointer [▶] appears as shown in [Figure 4-17].

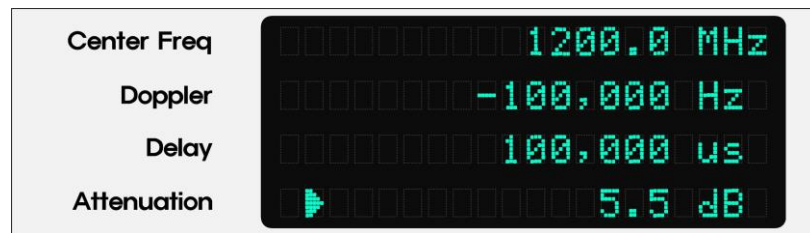


[Figure 4-17]

- ② Press numeric values of attenuation (valid range: 0 to 40dB, 0.5dB steps). If attenuation step is greater than 0.5dB, it is not necessary to press the [.] key.

☞ [Figure 4-18] is an example for 5.5dB.





[Figure 4-18]

- Press the [ESC] key to edit numeric values of attenuation.
- ☞ The **Attenuation** field changes to blank as shown in [Figure 4-19].



[Figure 4-19]

- Press numeric values of attenuation again
- Press [ENTER] key.
- ☞ Success !! appears at the **Attenuation** field, and numeric values are saved.



[Figure 4-20]

- When numeric values of attenuation are out of the valid range (0 to 40dB), "ERR. Range: 0~40dB" appears for 1 second as shown in [Figure 4-21], and it returns to the previous value.





[Figure 4-21]

- If numeric values of the attenuation are not multiples of 0.5 (e.g. 10.3), "Step must be 0.5dB" appears for 1 second as shown in [Figure 4-22], and it returns to the previous value.



[Figure 4-22]

- Press the [ESC] key to return to the previous menu.

## Utility

### • SAVE/LOAD, EXT Interface

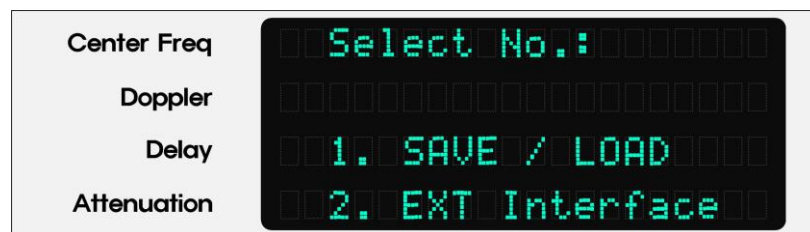
- SAVE/LOAD: This utility saves and loads current settings of the ASLE-L-36D up

to 5.

- EXT Interface: This Utility is used to select one of USB, RS-232, and RS-422/485 for the external interface.

#### • Setup Procedures

- ① Press [Utility] key to setup SAVE/LOAD and EXT Interface. The sub-menu appear as shown in [Figure 4-23].



[Figure 4-23]

#### ② **SAVE / LOAD - SAVE**

- Press [1] key to set the SAVE/LOAD.
  - ☞ The pointer [▶] appears as shown in [Figure 4-24].



[Figure 4-24]

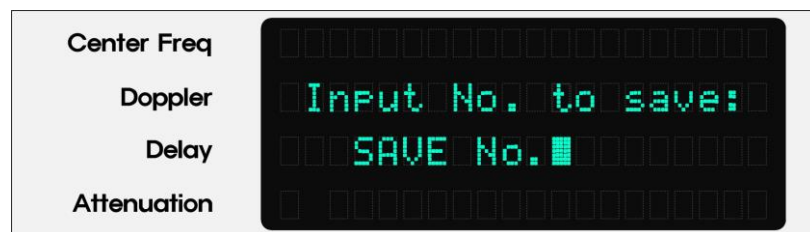
- Press [1] key to select SAVE.
  - ☞ The pointer [▶] appears as shown in [Figure 4-25].



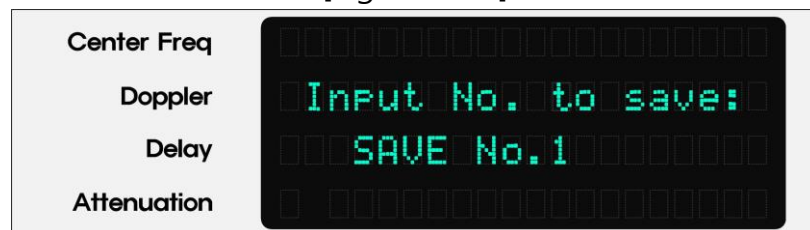
[Figure 4-25]

- Press [ENTER] key.

- Press any number from 1 to 5 to save the current settings.  
 ➡ [Figure 4-27] is an example for [SAVE No. 1].
- Press [ENTER] key.  
 ➡ Current settings are saved as shown in [Figure 4-28].  
 ➡ After saving is completed, current settings are displayed as shown in [Figure 4-29] again.



[Figure 4-26]



[Figure 4-27]



[Figure 4-28]



[Figure 4-29]

- Press [ESC] key to cancel [SAVE].
- Press the [ESC] key to return to the previous menu.

③ **SAVE / LOAD – LOAD**

- Press [2] key to select LOAD.

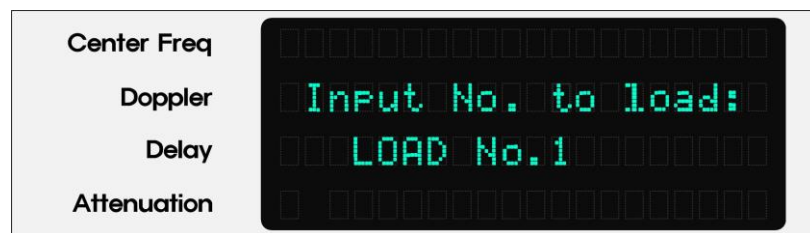
☞ The pointer [▶] appears as shown in [Figure 4-30].



[Figure 4-30]

- Press [ENTER] key.
- Press any number from 1 to 5 to restore the saved settings.

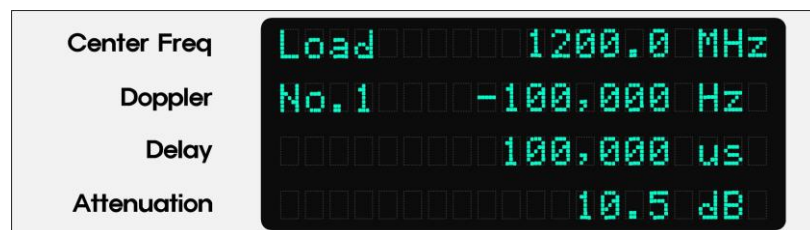
☞ [Figure 4-31] is an example for [LOAD No. 1].



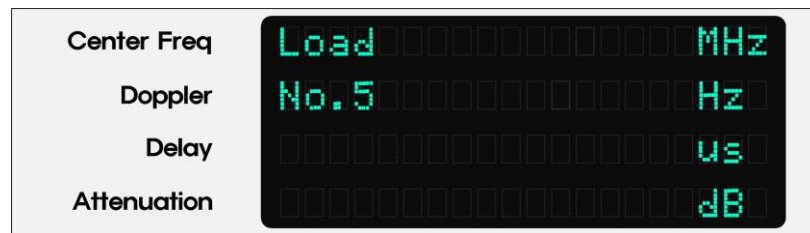
[Figure 4-31]

- Press [ENTER] key.

☞ If there are saved settings in the designated [LOAD No], they appear as shown in [Figure 4-32], and if there are no saved settings, they appear blank as shown in [Fig. 4-33].



[Figure 4-32]



[Figure 4-33]

- Press [ENTER] key.
- ☞ The saved settings are restore as shown in [Figure 4-34] and [Figure 4-35].



[Figure 4-34]

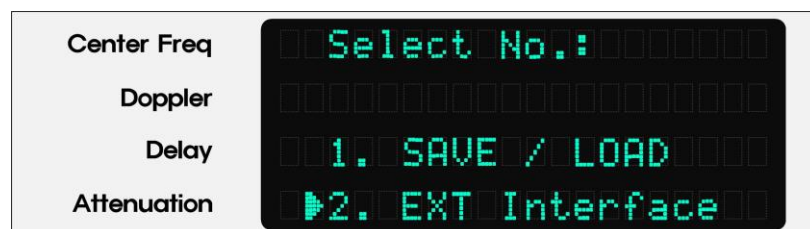


[Figure 4-35]

- Press [ESC] key to cancel [LOAD].
- Press the [ESC] key to return to the previous menu.

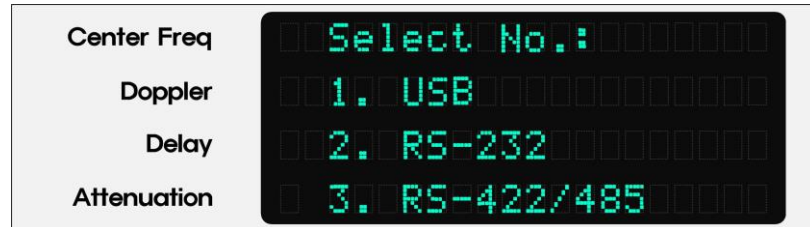
### ③ EXT Interface

- Press [2] key to set the EXT Interface.
- ☞ The pointer [▶] appears as shown in [Figure 4-36].



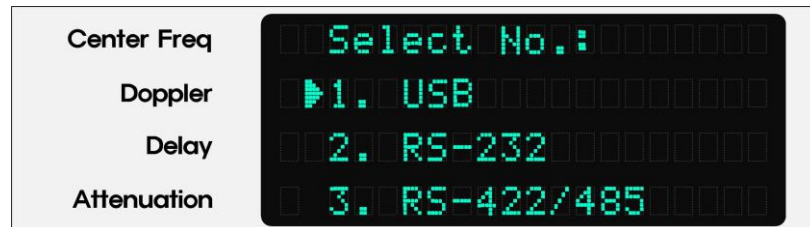
[Figure 4-36]

- Press [ENTER] key.
- The sub-menu appear as shown in [Figure 4-37].



[Figure 4-37]

- Press any number from 1 to 3 to connect the remote interface.  
☞ [Figure 4-38] is an example for [USB].



[Figure 4-38]


- Press [ENTER] key.
- Press the [ESC] key to return to the previous menu.

## **Remote Operation**


The ASLE-L-36D can be controlled remotely using a USB, RS-232, or RS422/RS485 interface.

### • Setup Procedures

- Press the [Utility] key on the front panel and select one of USB, RS-232, or RS422/RS485.
- Connect the ASLE-L-36D to a PC or Server using a communication cable..

 Pin-out for RS-232 connector on the rear panel.

Pin number	Signal	Connector type
2	TXD	D-Sub 9 pin plug connector
3	RXD	
5	GND	

 Pin-out for RS-422/485 connector on the rear panel.

Pin number	Signal	Connector type
3	TXD+	D-Sub 9 pin plug connector
8	TXD-	
2	RXD+	
7	RXD-	
5	GND	

- Set communication protocol of the PC or Server as follows.
  - Baud rate : 115200
  - Data : 8bit
  - Parity : none
  - Stop : 1bit
  - Flow control : none
- Type "help" to see the control commands of the ASLE-L-36D as shown in [Figure 4-39].

```
>> help

* How to Set *
Center Frequency/Step (MHz) (950.0~1450.0/0.1)      > F xxxx.x
Time Delay/Step (us) (0~530,000/1)                  > T xxxxxx
Doppler Shift/Step (Hz) (-3,000,000~+3,000,000/1)    > D yxxxxxxxx (y: + or -)
Attenuation/Step (dB) (0~40.0/0.5)                  > A xx.x
Show the operating status                           > RECALL
Show this help messages                             > HELP
```

[Figure 4-39]

- Type "recall" to see the current settings of the ASLE-L-36D as shown in [Figure 4-40].

```
>> recall

* Operating Status *
Center Frequency (MHz):      1200.0
Doppler Shift (Hz):         -100
Time Delay (us):            200,000
Attenuation (dB):           10.0
```

[Figure 4-40]



# Chapter 5

## Specifications

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## Specifications

Parameter		Specification	Remarks
Frequency	Range	950 to 1,450MHz	
	Resolution	0.1MHz	
Operating bandwidth		36MHz min.	
RF input power		-10dBm max.	
Maximum gain		0±1dB at 0 dB Atten. & 1200 MHz	
Amplitude flatness		2dBp-p max.	
Attenuation	Range	0 to 40dB	
	Resolution	0.5dB	
	Accuracy	±0.5dB max.	
Spurious at in-band		-50dBc max. (-55dBc typ.)	
VSWR		1.5:1 max. into 50Ω	
Doppler	Range	-3MHz to +3MHz	
	Resolution	1Hz	
	Absolute accuracy	Based on 10MHz reference	
Delay	Range	0 (Bypass), 10 to 530,000us	
	Resolution	1us	
	Accuracy	±0.1us max.	
External reference switching		Automatic (switching time: 5 sec)	
User interfaces	Local interface	Front Panel (VFD/Keypad)	
	Remote interface	USB, RS-232, or RS-422/RS-485	
Primary power	Voltage	90 to 240VAC	
	Frequency	47 to 63Hz	
Operating ambient temperature		+10°C to +40°C	
Connectors	RF Input	N type receptacle, 50 Ω	
	RF Output	N type receptacle, 50 Ω	
	USB	USB type-A receptacle	
	RS-232	D-sub 9 pin plug	
	RS-422/485	D-sub 9 pin plug	
	10MHz Reference Input	SMA type receptacle, 50Ω	
	Grounding terminal	5A, Φ2 Hole	
Size (Width x Height x Depth)		19" x 5.25" x 21"	

# Appendix

## Warranty

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## Warranty

### SHIPPING METHODS

Air freight will be used as the primary international means of shipment. Please indicate at time of purchase what method of shipment you require. **Polaris** is not responsible for products damaged or lost in transit. Unless otherwise specified, shipping insurance may be billed to customer.

### DRAWINGS AND SPECIFICATIONS

Please see our website for up to date information. Mechanical and electrical requirements are subject to change without notice. Please contact the factory to verify information or to enquire about products not listed on our website.

### PRODUCT RETURNS

All products being returned to **Polaris** for repair must be shipped to **Polaris** with the shipping charges prepaid. Products subject to in-warranty repairs will be returned prepaid to the customer at no charge. The customer will be responsible for return shipping charges for products that are out-of warranty or that have been mishandled.

### REPAIR COSTS

Warranty repairs will be made at no charge to the customer. Products out of warranty, or those which have been mishandled, will require approval by the customer for the charges involved before the repairs can be accomplished. We will provide an estimate for the cost of the repair, which can be applied to the repair, if approval is granted. For those products that are deemed beyond repair, or where the customer may decide not to repair the product, an evaluation fee and handling charge will be applicable.

### WARRANTY POLICY

**Polaris** standard warranty is applicable to all products manufactured by **Polaris**. **Polaris** warranty policy is one (1) year from the date of shipment for new products. Our obligation is limited to repairing products that prove to be defective during the warranty period. Warranties do not apply to any product that has been modified, damaged, statically damaged, mishandled, or subjected to conditions exceeding the operation limits of the specifications. Warranties do not apply to products with tampered warranty labels.