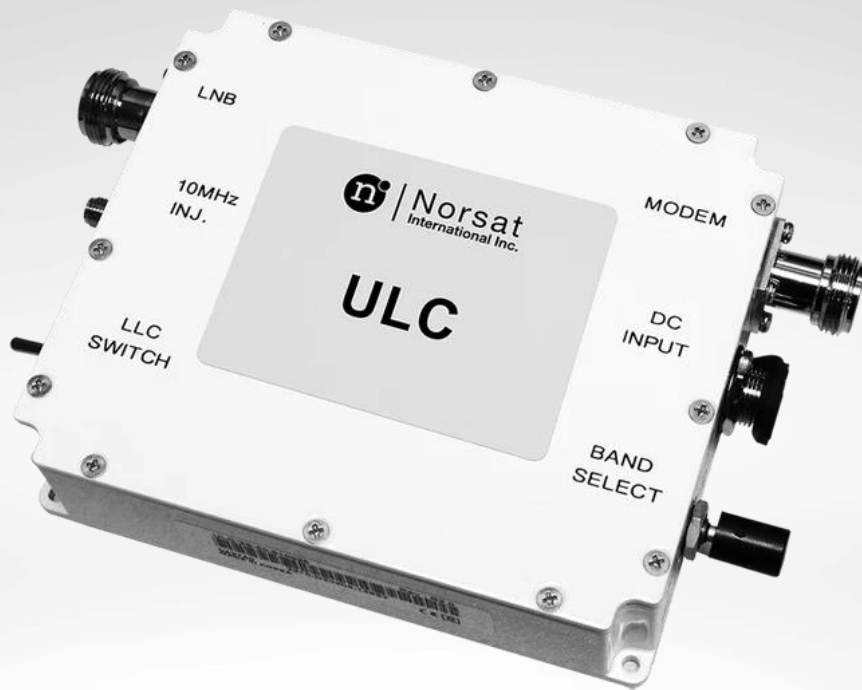


# USER MANUAL

## 6 Band Universal LNB Controller (ULC)



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# Acronyms

CI	Control Interface
IFL	Interfacility Link
LLC	Line Length Compensation
LNB	Low-noise Block Downconverter
OCXO	Oven controlled crystal oscillator
PLC	Programmable Logic Controller
RF	Radio Frequency
ULC	Universal LNB Controller

## Safety

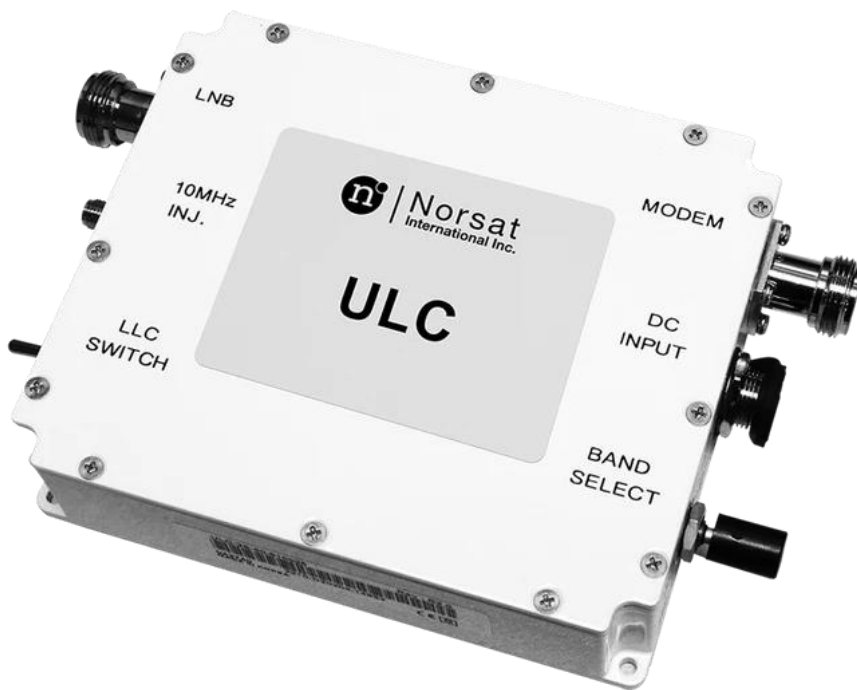
<p>Warning</p> 	<p><b>Changes or Modifications to Equipment</b></p> <p>Changes or modifications to this equipment, not explicitly approved by the manufacturer, could void the user's authority to operate the equipment.</p>
<p>Warning</p> 	<p><b>Accessories and Devices</b></p> <p>Use of non-approved accessories or devices may lead to a degradation in performance, damage to equipment, or potential hazards.</p>

# 1. Overview

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The Norsat Universal LNB Controller (ULC) is a standalone control unit for a single multi-band LNB. This system allows a user to select LNB frequency bands without any additional control hardware. The ULC can be configured to fit most applications and has options for:

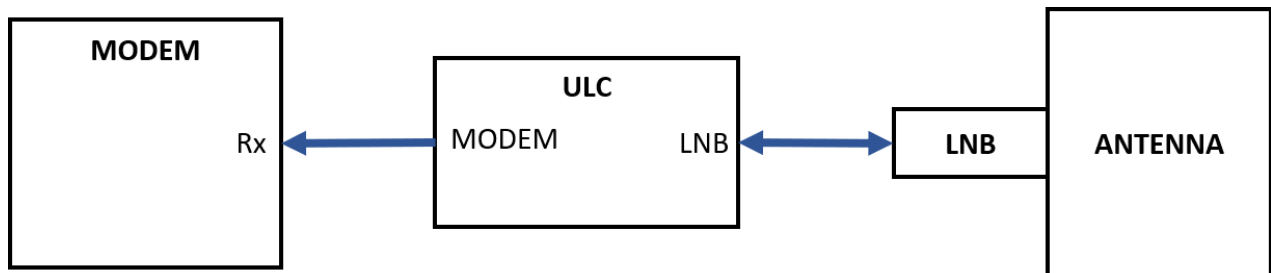
- RF Connector customization
- 10MHz reference configurations
- Line Length Compensation (LLC) to compensate for voltage drop between the ULC and LNB
- Control Interface customization



# 2. System Overview

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The ULC system consists of a ULC, universal power supply, and mounting plate. When powered on, the unit supplies a variable voltage and tone control signal to a multiband LNB, supporting up to 6-band applications. The ULC is installed between the Modem and LNB as shown in the diagram below.



## 3. Hardware

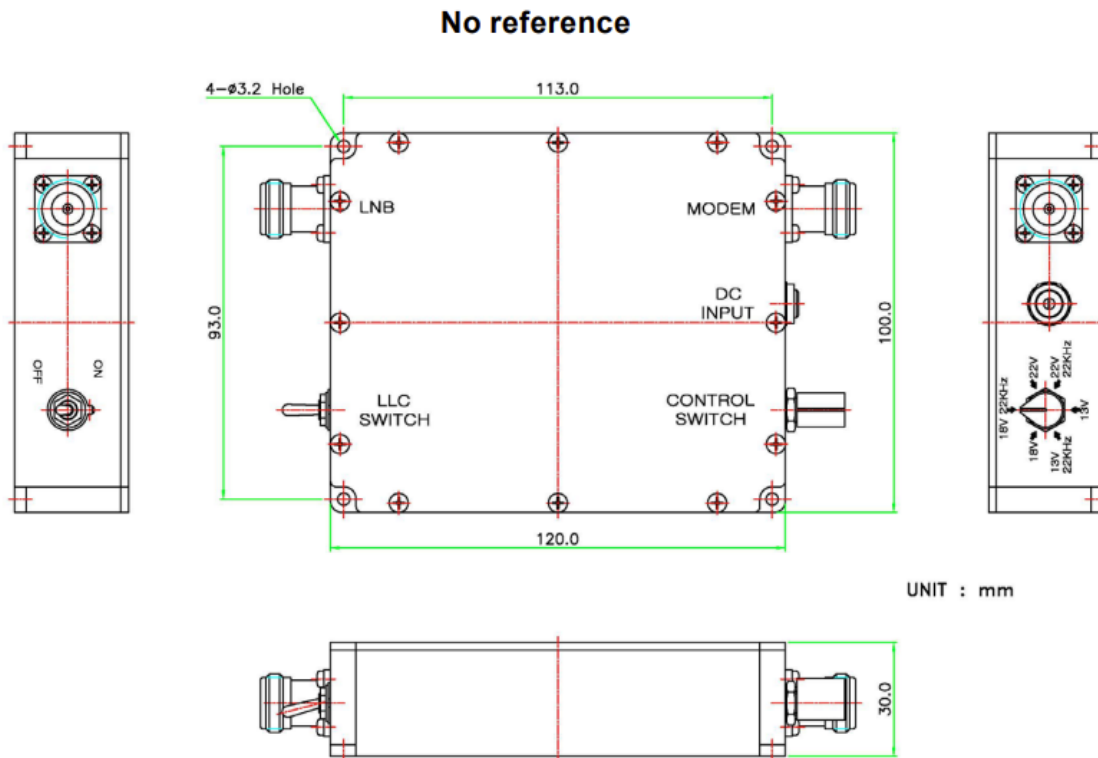
### 3.1 System

The ULC system supports a single multi-band LNB. This system is designed in accordance with the DiSEqC 1.x standard, supporting up to 6-band LNBS.

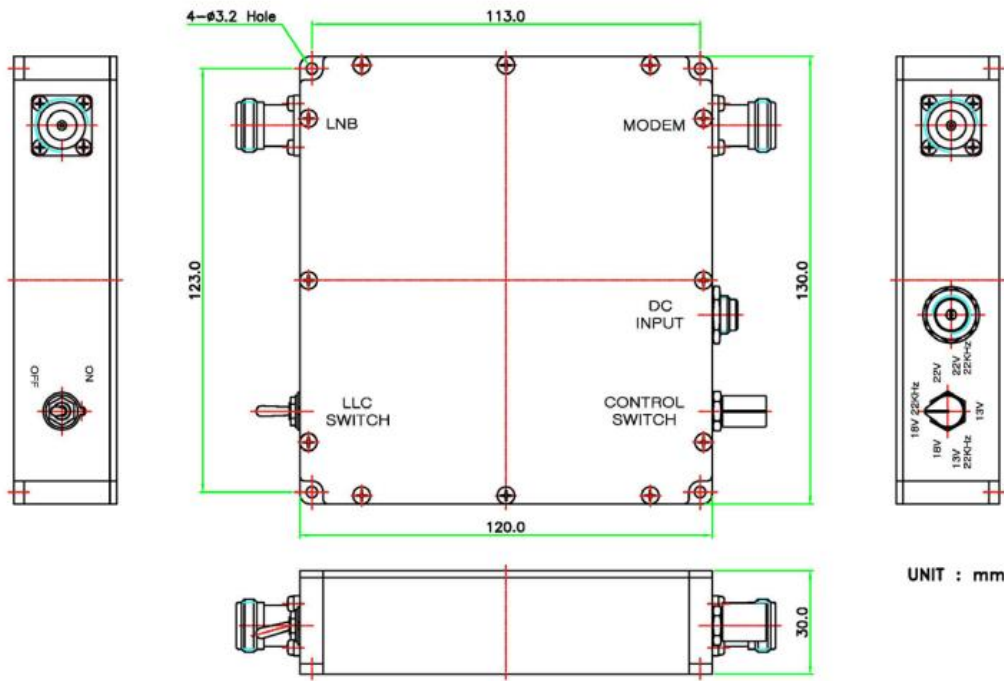
SPECIFICATION	DESCRIPTION
Number of LNBS supported	1
Maximum LNB supply current	500mA
LNB Control Specification	DiSEqC 1.x
# of Bands supported	Up to 6
Certifications	CE, RoHS, WEEE

### 3.2 Mechanical

The ULC has a compact mechanical design allowing it to be easily integrated into existing satellite systems. The included baseplate also allows for easy mounting and flexibility. The ULC mechanical layout offers multiple connector configurations depending on the options selected. The diagram below gives an overview of the connector locations and mechanical dimensions. The following table also outlines the options for each connector.

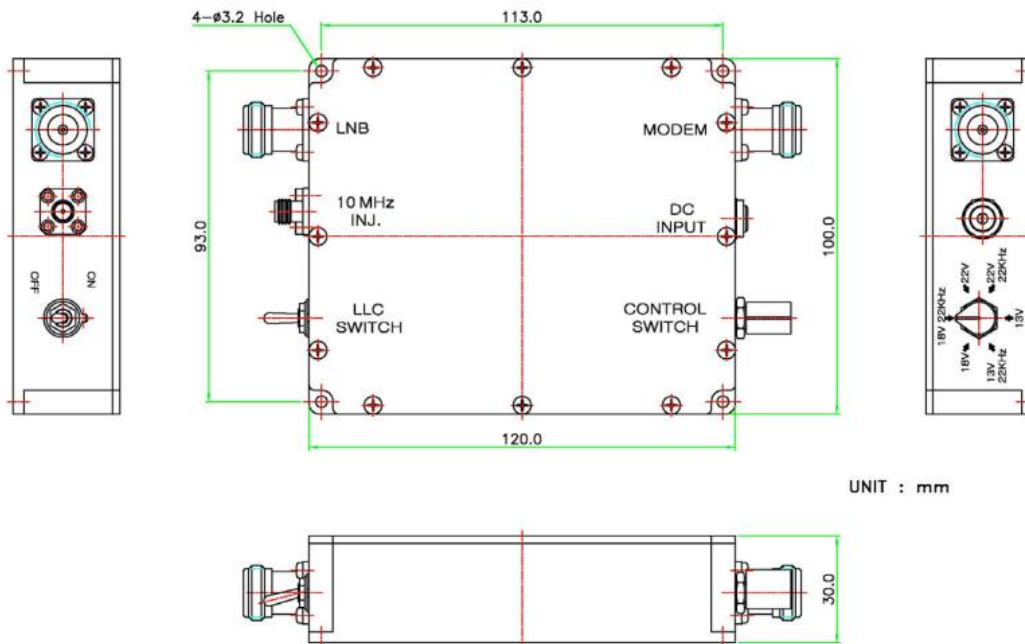


### 10 MHz reference



UNIT : mm

### 10 MHz injection port, SMA connector



UNIT : mm

CONNECTOR	DESCRIPTION
<b>Modem &amp; LNB RF Connectors</b>	Options for: <ul style="list-style-type: none"> <li>• 75 Ohm F connectors</li> <li>• 50 Ohm N Connectors</li> <li>• 50 Ohm SMA Connectors</li> </ul>
<b>DC Input</b>	Threaded Barrel Connector
<b>Control Interface</b>	Options for: <ul style="list-style-type: none"> <li>• Control Switch</li> <li>• Control Interface</li> </ul>
<b>10MHz Injection (Optional)</b>	Options for: <ul style="list-style-type: none"> <li>• 75 Ohm F connector</li> <li>• 50 Ohm N Connector</li> <li>• 50 Ohm SMA Connector</li> </ul>

### 3.3 Interfaces

#### 3.3.1 RF Connectors (LNB to Modem)

SPECIFICATION	MIN	TYP.	MAX	UNITS
<b>RF Frequency Range</b>	950	-	1950	MHz
<b>LNB supply current</b>	-	-	400	mA
<b>22kHz Tone Frequency</b>	20	22	24	kHz
<b>22kHz Tone Amplitude</b>	550	650	900	mV
<b>LNB Voltage (13 VDC)</b>	12.5	13	13.5	V
<b>LNB Voltage (18 VDC)</b>	17.5	18	18.5	V
<b>LNB Voltage (22 VDC)</b>	21.3	22	22.7	V
<b>LNB Voltage with LLC (13 VDC)</b>	13.5	14	14.5	V
<b>LNB Voltage with LLC (18 VDC)</b>	18.3	19	19.7	V
<b>LNB Voltage with LLC (22 VDC)</b>	22.3	23	23.7	V
<b>RF Path Loss</b>	-	-	3	dB

#### 3.3.2 DC Input Connector

SPECIFICATION	MIN	TYP.	MAX	UNITS
<b>Input Voltage Range</b>	23	24	25	V
<b>Power Consumption (No 10MHz)</b>			500	mA
<b>Power Consumption (Internal 10MHz)</b>			1100	mA



### 3.4 10MHz Reference Options

The ULC has the following 10MHz configurations:

- **No Reference**
- **Internal 10MHz Reference**
- **10MHz Injection port with SMA Female Connector**

#### 3.4.1 No Reference

With the *No Reference* option selected, the ULC will pass through a 10MHz signal from the modem port to the LNB. The specifications for this option are listed below.

SPECIFICATION	DESCRIPTION
<b>10MHz Path Loss</b>	< 2dB
<b>10MHz Filtering from Modem to LNB</b>	Passthrough

#### 3.4.2 Internal 10MHz Reference

With the *Internal 10MHz Reference* option, the ULC is configured with a high stability, low phase noise OCXO 10MHz reference which is passed through to the LNB port. The specifications for this option are listed below.

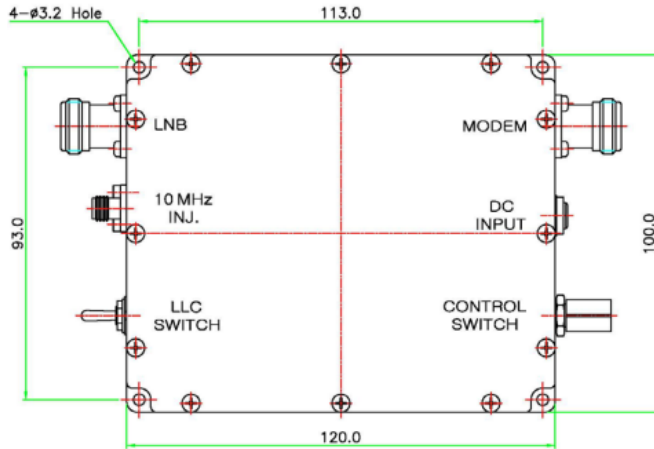
SPECIFICATION	DESCRIPTION
<b>Reference Type</b>	OCXO
<b>Frequency</b>	10MHz +/- 0.2Hz
<b>Thermal Stability</b>	5.00E-7
<b>Frequency Tolerance</b>	±1.0E-07 @ +25°C
<b>10MHz Power Level</b>	0+2dBm
<b>10MHz Filtering from Modem</b>	10MHz Blocked (> 55dB attenuation)

SPECIFICATION	10Hz	100Hz	1kHz	10kHz
<b>10MHz Phase Noise</b>	-120dBc/Hz	-135dBc/Hz	-150dBc/Hz	-155dBc/Hz

### 3.4.3 10MHz Injection

With the *10MHz injection* option, the ULC is configured with an external 10MHz injection port. The specifications for this option are listed below.

#### 10 MHz injection port, SMA connector



SPECIFICATION	DESCRIPTION
<b>10MHz Injection Path Loss</b>	< 2.0 dB
<b>10MHz Filtering from Modem</b>	10MHz Blocked (> 55dB attenuation)
<b>10MHz Injection Port</b>	Options for: <ul style="list-style-type: none"> <li>• 75 Ohm F connector</li> <li>• 50 Ohm N Connector</li> <li>• 50 Ohm SMA Connector</li> </ul>

### 3.5 Control Interface

The ULC has the following control interface options:

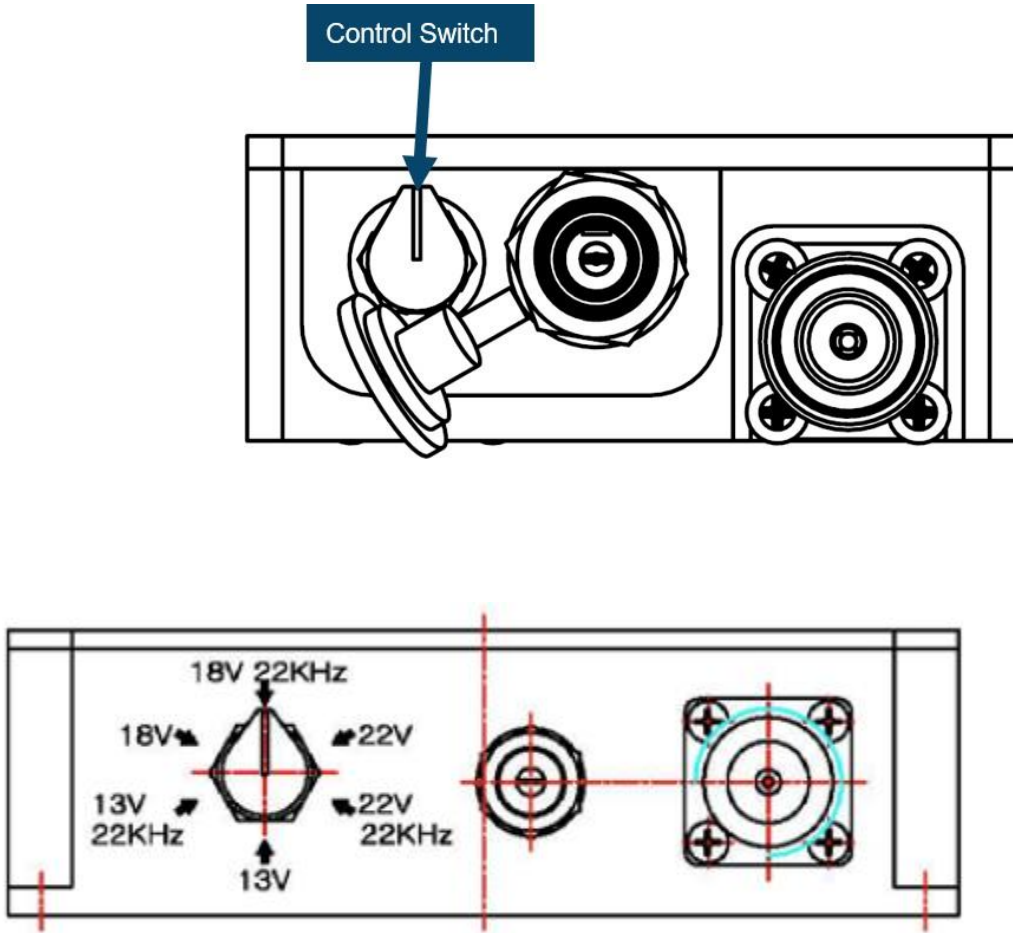
- **Switch Control & Line Length Compensation with Switch**
- **Control Interface Cable & Line Length Compensation with Switch**

The control interface controls the following parameters:

SETTING	DESCRIPTION
<b>22kHz Tone</b>	When active, sends a 22kHz signal to the LNB
<b>Voltage</b>	Selects either +13V or +18V or +22V output
<b>Line Length Compensation (LLC)</b>	When active, increases the LNB output voltage to +14V or +19V or +23V to compensate for DC voltage drop between the ULC and LNB

### 3.5.1 Switch Control & Line Length Compensation with Switch

For the *Switch Control Only* option, the tone and voltage output is controlled by turning the control switch. A summary of the switch position and corresponding outputs is shown below:



SWITCH POSITION (LEFT TO RIGHT)	OUTPUT
1	13V
2	18V
3	13V + Tone
4	18V + Tone
5	22V
6	22V + Tone

## Line Length Compensation with Switch

The *Line Length Compensation with Switch* option provides an external LLC switch and a control switch. A summary of the switch positions and control outputs is shown below:

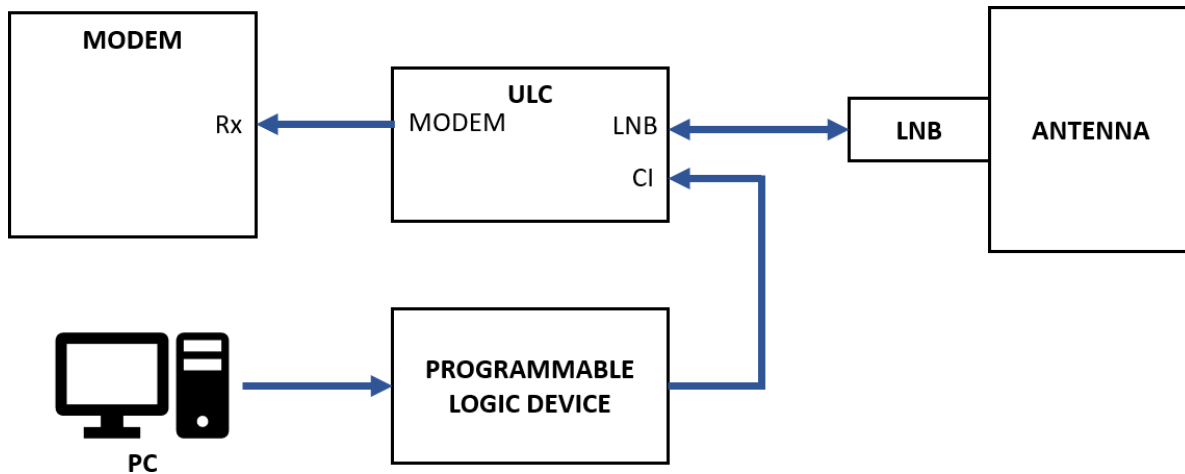


CONTROL SWITCH POSITION (LEFT TO RIGHT)	LCC SWITCH POSITION	OUTPUT
13 V	OFF	13V
13 V	ON	14V
18 V	OFF	18V
18 V	ON	19V
22 V	OFF	22V
22 V	ON	23V

### 3.5.2 Control Interface Cable

For the *Control Interface Cable* option, the control switch is replaced with a 4-pin connector (see image below). With this option, the ULC can be controlled by applying a voltage to the control pins (see tables below). A mechanical diagram of the control pinout is shown below.

**Note: It is the user's responsibility to determine how to drive the control pins on the ULC. With the provided 2m long cable, the ULC can be connected to control hardware such as a PLC, Microcontroller, Ethernet I/O module, or other programmable logic device.**



SIGNAL LEVEL	RANGE
Low (L)	0 - 0.8V
High (H)	2.5 - 6V
Input Current	20mA Max

BAND	Pin 1 (Voltage Select)	Pin 2 (22 KHz Tone)	Pin 4 (22V select)	Output
Band 1	L	L	L	13 VDC
Band 2	L	H	L	13 VDC & Tone
Band 3	H	L	L	18 VDC
Band 4	H	H	L	18 VDC & Tone
Band 5	L	L	H	22 VDC
Band 6	L	H	H	22 VDC & Tone

### 3.6 Universal Power Supply



The ULC system includes a universal AC/DC power supply. The power supply includes multiple AC connector adaptors to support a variety of international plug types. The AC/DC power supply specifications are shown in the table below:

SPECIFICATION	DESCRIPTION
<b>Supported Plug Types</b>	North America (Type A), Europe (Type F), United Kingdom (Type G), Australia (Type I), and China (Type A) blades included
<b>Input Voltage Range</b>	90VAC to 264VAC
<b>DC Plug type</b>	Barrel connector, center positive
<b>Cable Length</b>	2 meters
<b>Environmental Rating</b>	Indoors
<b>Operating Temperature</b>	0°C to +40°C
<b>Safety Approvals</b>	UL/cUL, RCM, CCC, PSE

## 4. Operation

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1. Connect all external cables to the ULC. Ensure that all connectors are properly threaded and secure.
2. Plug in the universal power supply.
3. Select the desired LNB control signals (See Section 3.5)



## 5. System Troubleshooting

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PROBLEM	TROUBLESHOOTING STEPS
<b>No power to the LNB</b>	<ol style="list-style-type: none"><li>1. Verify that the ULC power supply is connected to AC power.</li><li>2. Verify that the LNB is connected to the “LNB” RF connector and not the “Modem” RF connector.</li><li>3. Verify that the LNB RF cable is threaded properly on the ULC.</li><li>4. Swap LNBs to determine if the LNB is malfunctioning.</li><li>5. If the problem is not corrected in the above steps, contact the manufacturer.</li></ol>
<b>LNB not switching frequency bands</b>	<ol style="list-style-type: none"><li>1. Verify that the control interface is set properly (See Section 3.5)</li><li>2. Verify that the LNB is connected to the “LNB” RF connector and not the “Modem” RF connector.</li><li>3. Verify that the multiband LNB is compatible with the voltage and tone control provided by the ULC.</li><li>4. Power cycle the ULC</li><li>5. If the problem is not corrected in the above steps, contact the manufacturer.</li></ol>

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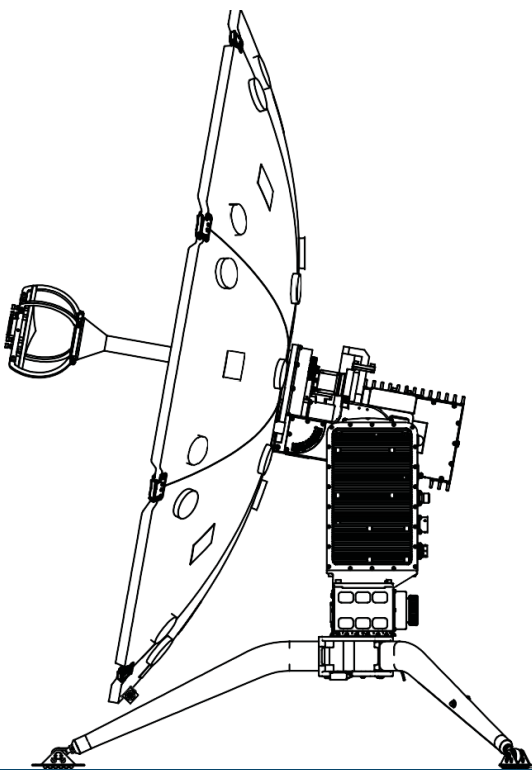
## 6. System Maintenance

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NO.	DESCRIPTION	FREQUENCY
1	Inspect and tighten all connectors on the ULC	Once per month
2	Inspect all cables for damage	Once per month



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## ABOUT NORSAT

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