StreamCaster MIMO Radio User Manual

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Notice

Silvus Technologies reserves the right to make changes to its products or discontinue any of its products or offerings without notice.

Silvus Technologies warrants the performance of its products to the specifications applicable at the time of sale in accordance with Silvus Technologies' standard warranty.

Revision History

Version	Date	Changes
1.0	September, 2012	Original
1.1	October 9, 2012	Minor Fixes
2.0	January 9, 2012	Updated for StreamScape 2.0
2.1	March 15, 2012	Updated Sensitivity Values. Added cable pinouts
2.2	May 23, 2013	Updated cable pinouts section
2.3	June 5, 2013	Added Tri-Color LED info
3.0	July 1, 2013	Updated for StreamScape 3.0
3.1	July 23, 2013	Minor Fixes
3.2	September 3, 2013	Added Link Characteristics
3.3	January 17, 2014	Updated Throughput in Tables 6 and 7
3.4	February 24, 2014	Updated through release SS3vb9.17
3.5	April 1, 2014	Updated to include SC3822
3.6	August 18, 2014	Updated for SS3.11.2.5
3.7	August 20, 2014	Added Safety Disclaimer
3.7.1	September 13, 2014	Updated FCC Clause
3.8	October 23, 2014	Added 10MHz data, added 3822 mechanicals, etc.
3.8.1	October 28, 2014	Added EXT PA related information
3.8.2	November 24, 2014	Added EXT PA Connector Diagram
3.9	March 17, 2015	Updated for SS3.11.3.13
3.10	March 23, 2015	Added SC3822 USB/GPIO Connector Diagram
3.11	May 11, 2015	Updated 5V GPS Voltage for Newer Revs
3.11.1	June 2, 2015	Updated FCC clause to include SC3822
3.12	September 10, 2015	Updated for SS3.12 – Added VLAN, USB, and Spectrum Scan support
3.12.1	February 17, 2016	Corrected 3822 Voltage Range in Table 5
3.12.2	April 28, 2016	Added SC4200
3.12.3	August 18, 2016	Added SC4210 to Section 11 FCC Notes
3.12.4	September 15, 2016	Added Custom Frequency Plan instructions
3.12.5	October 7, 2016	Updated Section 12 FCC Notice

3.12.6	December 1, 2016	Updated 3822/4200 Pinout
3.12.6.4	May 22, 2017	Updated for release 3.12.6.4; Added SC4400
3.12.6.5	May 24, 2017	Added Encryption Profile Descriptions
3.12.6.10	August 1, 2017	Added CE info; Added Network Wide Upgrade; Added iPerf description
3.12.6.11	August 24, 2017	Additional CE Updates on Last 2 pages
3.12.6.12	August 30, 2017	More CE Updates
3.12.6.13	October 19, 2017	Final CE Update; Updated SC4200 Mechanical Drawing
3.12.6.14	December 11, 2017	Added disclaimer to Section 5.1.2 Advanced Configuration
3.13.0	March 28, 2018	Updated SC4200 Photo for ODU PTT
3.13.1	May 14, 2018	Added FCC Info for SC4410-235 and SC4480-235
3.15.0.0	May 15, 2018	Added FIPS features
3.15.0.1	July 2, 2018	Added QoS Scheduler feature
3.15.0.2	July 24, 2018	Reformatted FCC Notice section
3.15.0.3	August 15, 2018	Revised Advanced Configurations to match new firmware version
3.15.0.4	October 23, 2018	Added section 13.5 and 13.6
3.16.1.3	November 11, 2018	Add new LED definitions, and updated screenshots of GUI, revised section 13.4 FCC Identifier N2S-SC44-245, added section 13.5 and 13.6, revised GPS configuration in section 5.1.6, revised Max Power in section 13.6
3.17.0.4	April 2, 2019	Added Virtual IP VLAN to section 5.1.3. Added MAC address and variable GI mode and remove number of retransmissions to section 5.2.1. Updated figure 32 in section 5.1.10. Updated description for network ID in section 5.1.11. Updated figure 26 in section 5.1.4. Added the 4200E/4400E specs.
3.17.0.5	April 24, 2019	Changed section 13.7 to 13.8 and added new section 13.7 Added section 15
3.17.0.6	July 22, 2019	Added various updates to section 15
3.17.0.7	October 7, 2019	Updated Section 13 and 14

Contents

List of Figures

List of Tables

1. General Safety Information

The information that follows, together with local site regulations, should be studied by personnel concerned with the operation or maintenance of the equipment, to ensure awareness of potential hazards.

Switch off supplies before removing covers or disconnecting any RF cables, and before inspecting damaged cables or antennas.

Avoid standing in front of high gain antennas (such as a dish) and never look into the open end of a waveguide or cable where strong RF power may be present.

Users are strongly recommended to return any equipment that requires RF servicing to Silvus Technologies.

CAUTION: This system contains MOS devices. Electro-Static Discharge (ESD) precautions should be employed to prevent accidental damage.

1.1 Health & Safety

Exposure to Non-Ionizing (RF) Radiation/Safe Working Distances

The safe working distance from a transmitting antenna may be calculated from the relationship:

$$D = \sqrt{\frac{P_T \cdot G_R}{4\pi \cdot w}}$$

In which D = safe working distance (meters)

PT = transmitter or combiner power output (watts)

GR = antenna gain ratio = anti log (gain dBi ÷10)

w = power density (watts/square meter)

The RF power density value is determined by reference to safety guidelines for exposure of the human body to non-ionizing radiation. It is important to note that the guidelines adopted differ throughout the world and are from time-to-time re-issued with revised guidelines. For Silvus use, a maximum power density limit of 1w/m² is to be applied when calculating minimum safe working distances.

Important Note: It must be remembered that any transmitting equipment radiating power at frequencies of 100kHz and higher, has the potential to produce thermal and a-thermal effects upon the human body.

To be safe:

a) Operators should not stand or walk in front of any high gain antenna such as dish antennas, nor should they allow anyone else to do so.

b) Operators should not operate any RF transmitter or power amplifier with any of its covers removed, nor should they allow anyone else to do so.

Antenna			Transmitter Power				
Type	**Gain (dBi)**	**Gain Ratio (GR)**	**1W**	**2W**	**4W**	**10W**	**30W**
Omni	3	2	0.4	0.6	0.8	1.3	2.2
Sector	20	100	2.9	4	5.6	9	15.5
Parabolic Dish	35	3162	16	22.5	32	50	87
			Minimum Safe Distance (Meters)				

Table 1 Safe Working Distances

General Safety Notes

- A flashing/steady Red LED status indication is a normal condition, and is not meant to convey a fault condition.
- The Power Disconnect Device for the product is the connector for the external AC/DC Adapter or other DC power source.
- Although the Low Voltage DC powered units are approved for Outdoor use (Dust/Temporary Immersion), the optional AC power option with AC/DC power supply is only certified for indoor use.
- The unit housing serves as a heatsink, and must be mounted on a non-combustible surface.
- The units are not User Serviceable. Contact the manufacturer for further instructions on servicing or repair.
- All symbols, markings and warning statements marked on the equipment are shown below for reference.

Product Symbols

This table describes the symbols marked on the device.

Symbol		Description
	Caution Read User Manual	Please follow all instructions in this User Manual including all warnings, cautions, and precautions before using the Organelle. Unit is not user serviceable. Contact the manufacturer if defective or damaged.
	RoHS Compliant	The product is compliant with the RoHS 2 Directive 2011/65/EU (RoHS 2). (Note: This Symbol may not be marked on device)
	CE	Product complies with the European Union Low Voltage Directive (LVD), RoHS 2 and EMC Directives.
	HOT SURFACE SYMBOL	Please avoid bodily contact with the product housing and do not mount the product on a combustible surface.
	Disposal	Per the European WEEE Directive, please dispose the product in accordance with local regulations

Figure 1 Product Symbols with Definition

- Product cleaning should only be done with a soft cloth and mild detergent, do not use any solvents that might remove case markings or labels.
- The unit, at the end of its useful life is to be disposed in accordance with local regulations, or may be returned to the manufacturer.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment and/or equipment performance may be impaired.

1.2 Maximum RF Power Density Limits

The RF Radiation Power Density limit figure recommended by Silvus is based upon guideline levels published in:

a. IEEE standard C95.1 1999 - IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

b. Guidelines for Limiting Exposure to Time-varying Electric, Magnetic & Electromagnetic Fields (up to 300 GHz) published in 1998 by the Secretariat of the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

Both documents define guideline RF power density limits for "Controlled" and "Uncontrolled" environments. An uncontrolled environment is defined as one in which the person subjected to the RF radiation may be unaware of and has no control over the radiation energy received. The uncontrolled environment conditions can arise, even in the best regulated operations and for this reason the limits defined for the uncontrolled environment have been assumed for the RF Central recommended limit.

Documents a) and b) also show the RF power density guidelines to be frequency dependent. Different power density / frequency characteristics are presented in the two documents. To avoid complexity and to avoid areas of uncertainty, Silvus recommends the use of a single power density limit across the frequency range 100 kHz to 300 GHz. The 1w/m² power density limit we recommend satisfies the most stringent of the guidelines published to date.

Footnote: The IICNIRP document may be freely downloaded from the internet at www.icnirp.de/documents/emfgdl.pdf (PDF file).

2. Introduction

The StreamCaster family of MIMO radios was designed with operator ease of use in mind. Each radio is capable of operating in a multitude of configurations that are accessed via simple web pages within the radio. Settings such as transmit power, frequency, channel bandwidth, link adaptation and range control can be accessed by simply using a web browser to log into any radio within the network. This quick start user guide contains all essential information for the user to configure the StreamCaster radio as well as how to run an iperf network test.

3. StreamCaster Network

Each StreamCaster MIMO radio has a fixed static IP address in the 172.20.xx.yy network. The radio operates as a network switch; the user equipment does not need to be on the same subnet as the radio during operation. It is possible to setup a secondary IP address on the radio if the user finds this feature convenient. Setting up a secondary IP address is useful if the user wishes to access the radio's web interface in their network.

4. StreamCaster Hardware Overview

4.1 Hardware Interfaces

SC4400E

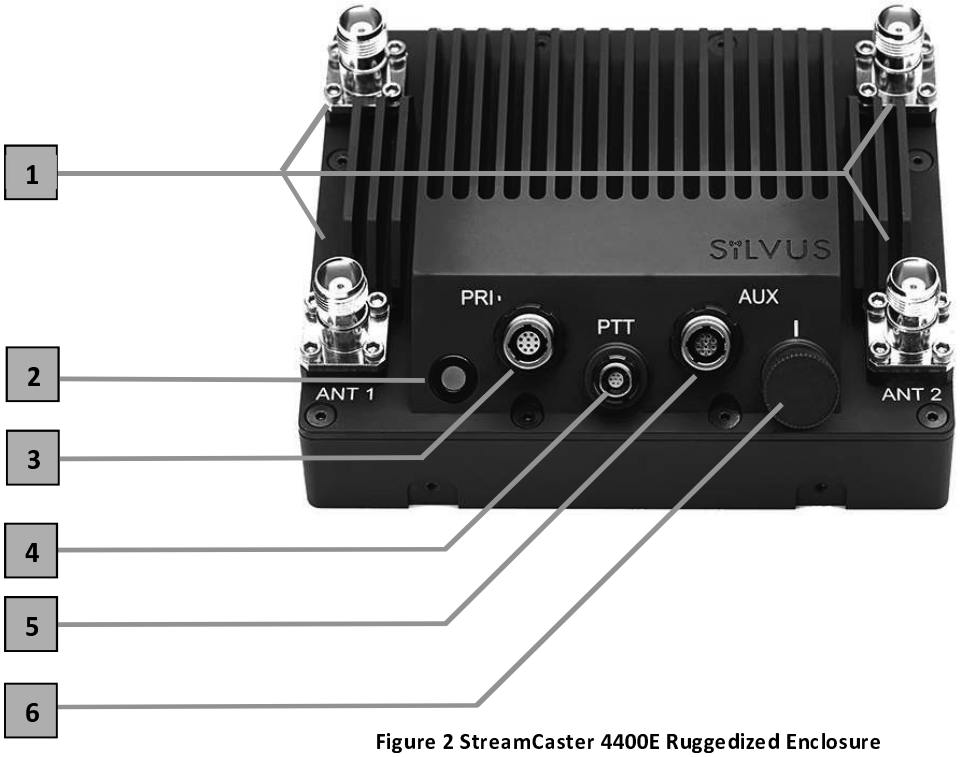


Figure 2 StreamCaster 4400E Ruggedized Enclosure

1 RF Channels 1-4 Connectors [TNC Female]

2 Bi-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Flashing Green – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Spectrum Scan in Progress
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings.

- Rapid Flashing Red for 1 second – The battery is less than or equal to 20%. LED will blink red rapidly for 1 second then go back to normal. This will repeat every 5 seconds.
- Rapid Flashing Green – When the multi position switch is rotate to a new position, LED will rapidly flash green while new settings are being applied. LED will resume normal indication after settings have been applied.

3 Power (9-20V), Ethernet, and Serial Port Connector [ODU GK0YAR-P10UC00-000L]

4 Push-to-Talk (PTT) Connector [ODU GKCWAM-P07UB00-000L]

5 AUX Connector [ODU GK0YCR-P10UC00-000L]

6 Power Switch [15-Position Rotating]

SC4200E

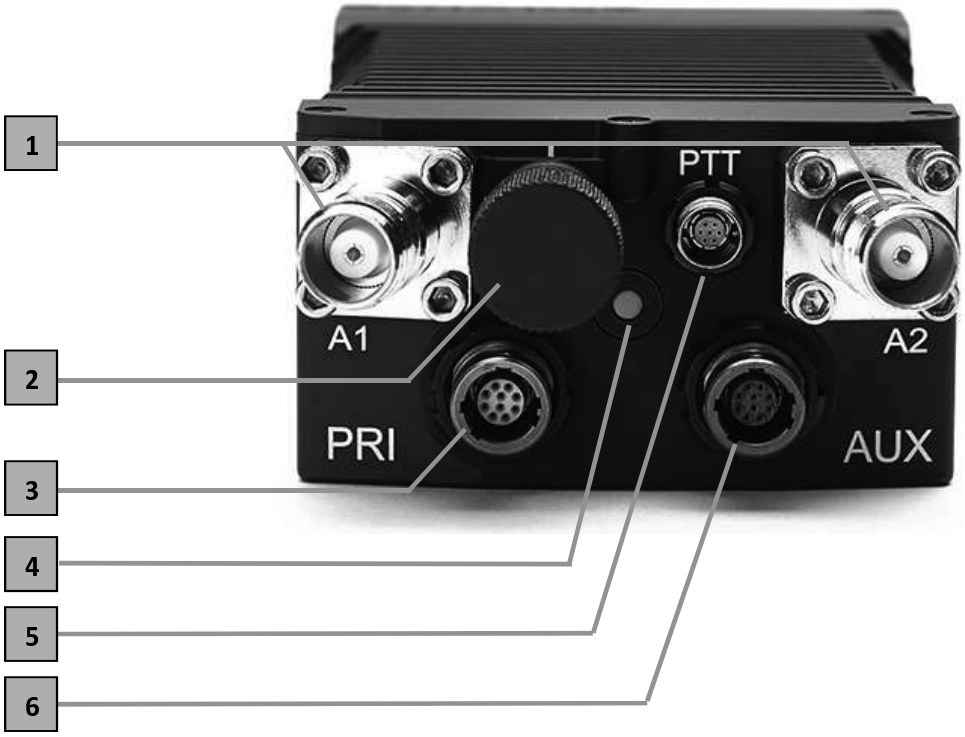


Figure 3 StreamCaster 4200E Ruggedized Enclosure

1 RF Channels 1-2 Connectors [TNC Female]

2 Power Switch [15-Position Rotating]

3 Power (EB Version Only, 9-20V), Ethernet, and Serial Port Connector [ODU GK0YAR-P10UC00-000L]

4 Bi-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Flashing Green – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Spectrum Scan in Progress
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings.

- Rapid Flashing Red for 1 second – The battery is less than or equal to 20%. LED will blink red rapidly for 1 second then go back to normal. This will repeat every 5 seconds.
- Rapid Flashing Green – When the multi position switch is rotate to a new position, LED will rapidly flash green while new settings are being applied. LED will resume normal indication after settings have been applied.

5 Push-to-Talk (PTT) Connector [ODU GKCWAM-P07UB00-000L]

6 AUX Connector [ODU GK0YCR-P10UC00-000L]

SC4400:

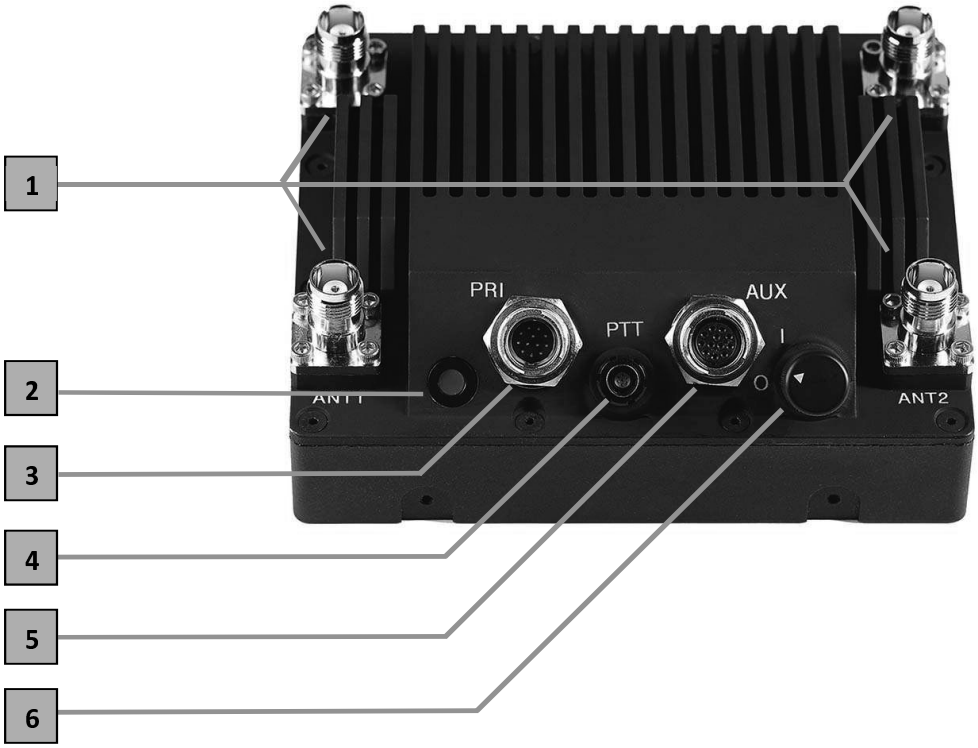


Figure 4 StreamCaster 4400 Ruggedized Enclosure

1 RF Channels 1-4 Connectors [TNC Female]

2 Bi-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Flashing Green – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Spectrum Scan in Progress
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings.
- Rapid Flashing Red for 1 second – The battery is less than or equal to 20%. LED will blink red rapidly for 1 second then go back to normal. This will repeat every 5 seconds.

- Rapid Flashing Green – When the multi position switch is rotate to a new position, LED will rapidly flash green while new settings are being applied. LED will resume normal indication after settings have been applied.

3 Power (9-20V), Ethernet, and Serial Port Connector [Hirose LF10WBRB-12PD]

4 Push-to-Talk (PTT) Connector [ODU GKCWAM-P07UB00-000L]

5 AUX Connector [Hirose LF10WBRB-12SD]

6 Power Switch [2-Position Rotating]

SC4200:

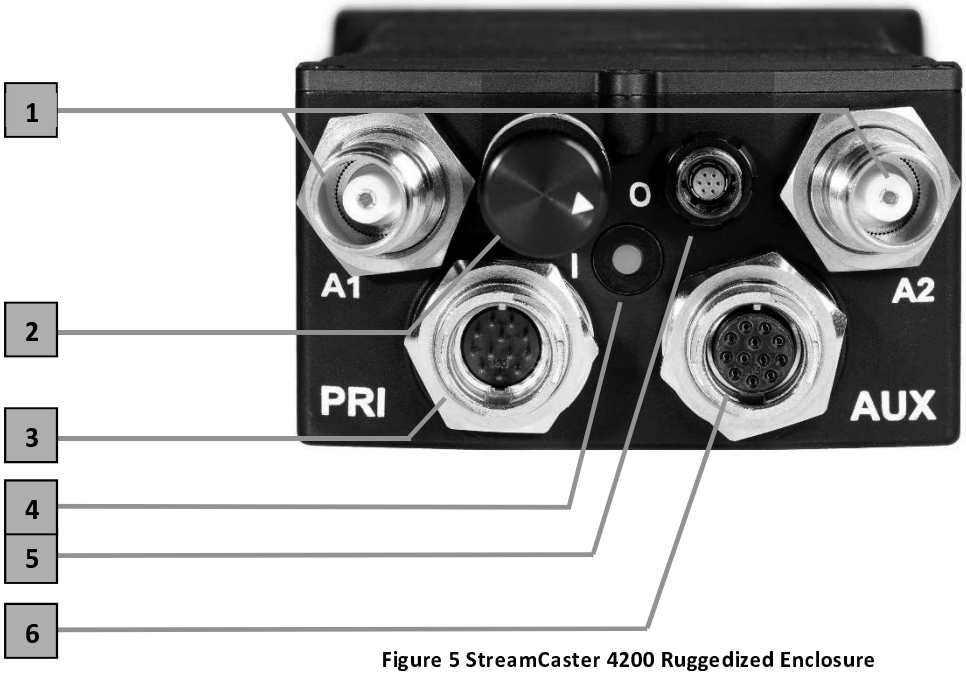


Figure 5 StreamCaster 4200 Ruggedized Enclosure

1 RF Channels 1-2 Connectors [TNC Female]

2 Power Switch [2-Position Rotating]

3 Power (EB Version Only, 9-20V), Ethernet, and Serial Port Connector [Hirose LF10WBRB-12PD]

4 Bi-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Flashing Green – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Spectrum Scan in Progress
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings.
- Rapid Flashing Red for 1 second – The battery is less than or equal to 20%. LED will blink red rapidly for 1 second then go back to normal. This will repeat every 5 seconds.

- Rapid Flashing Green – When the multi position switch is rotate to a new position, LED will rapidly flash green while new settings are being applied. LED will resume normal indication after settings have been applied.

5 Push-to-Talk (PTT) Connector [ODU GKCWAM-P07UB00-000L]

6 AUX Connector [Hirose LF10WBRB-12SD]

SC3822:

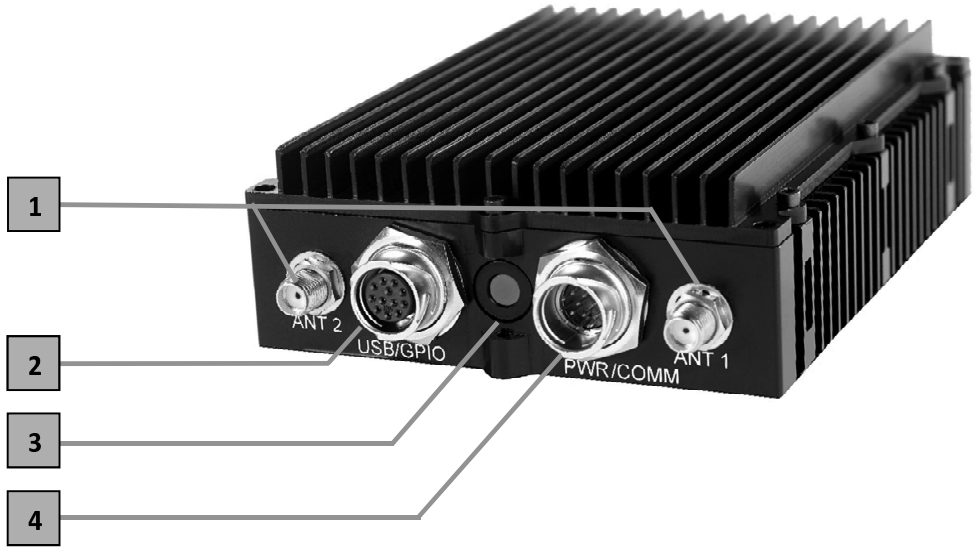


Figure 6 StreamCaster 3822 Ruggedized Enclosure

1 RF channels 1-2 Connectors [SMA Female]

2 USB/GPIO Connector [Hirose LF10WBRB-12SD]

3 Tri-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Orange – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings.

4 Power (9-32 VDC), Ethernet, and Serial Port connector [Hirose LF10WBRB-12PD]

SC3500/SC3800:

Figure 4 StreamCaster 3500/3800 Ruggedized Enclosure

1 RF channels 1-4 connectors [TNC Female]

2 Ethernet connector [Mighty-Mouse 801-010-07NF7-10SA]

3 Power (9-20 VDC) and Serial Port connector [Mighty-Mouse 801-010-07NF7-10PA]

4 Tri-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Orange – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings

5 Power Switch

SC3500/SC3800 with EXT Connector (PA Faceplate Option):

Figure 5 StreamCaster 3500/3800 Ruggedized Enclosure

1 RF channels 1-4 connectors [TNC Female]

2 EXT PA Connector [Mighty-Mouse 801-010-07NF7-25SA]

3 Ethernet connector [Mighty-Mouse 801-010-07NF7-10SA]

4 Power (9-20 VDC) and Serial Port connector [Mighty-Mouse 801-010-07NF7-10PA]

5 Power Switch

6 Tri-Color Status LED (See Section 12.1 for Troubleshooting Information)

- Red – Radio is in the process of booting up
- Orange – Radio is fully booted but not wirelessly connected to any other radio
- Green – Radio is wirelessly connected to at least one other radio
- Flashing Red – Radio has recovered from a bad state and has reverted to factory default settings

4.2 Connector Pinouts

4.2.1 SC4400E Pinouts

SC4400E Power/Ethernet/Serial Connector Pinout		
Enclosure PWR/COMM (GK0YAR-P10UC00-000L)	Signal	Switchcraft Pinout (EN3C2F16X)
1	5V OUT (For External GPS Puck)	NC
2	GND IN	2
3	VCC IN	1
4	ETH0_MX2N	1
5	ETH0_MX2P	1
6	ETH0_MX1P	NC
7	RS232_RXD	NC
8	RS232_TXD	NC
9	GND	NC
10	ETH0_MX1N	NC

Table 2 SC4400E Power/Ethernet/Serial Connector Pinout

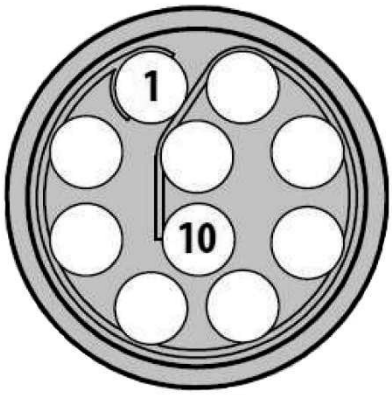


Figure 6 SC4400E Power (Optional)/Serial/Ethernet Pinout Diagram (Cable Side)

SC4400E RS-232 Pinout		
RS-232 (DB9)	**Signal**	**Switchcraft Pinout**
3	TxD	2
2	RxD	1
NC	NC	4
NC	5V OUT	6
NC	NC	5
5	Ground	3

Table 3 SC4400E Serial and GPS Pinout

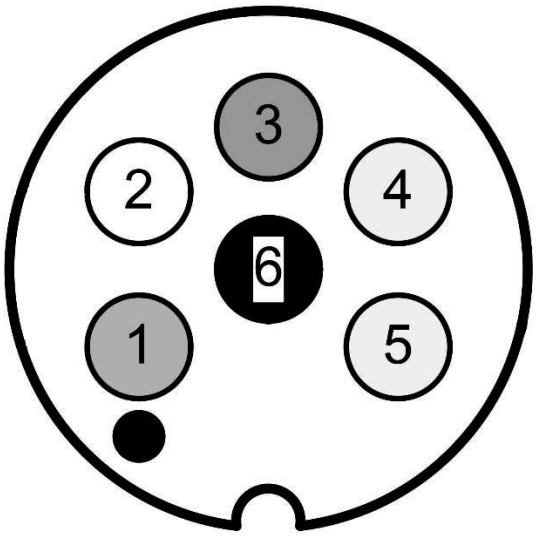


Figure 8 Switchcraft connector on Primary/Power cable

SC4400E AUX Connector Pinout	
Enclosure AUX (LF10WBRB-12SD)	**Signal**
1	USB GND
2	USB1_D-
3	USB1_VBUS
4	USB0_VBUS
5	GPIO1 (BDA control)
6	USB0_D+
7	USB0_D-
8	GND
9	USB1_ID
10	USB1_D+

Table 4 SC4400E USB/GPIO Connector Pinout (USB1 is USB 2.0 OTG, USB2 is USB 2.0 Host Mode Only)

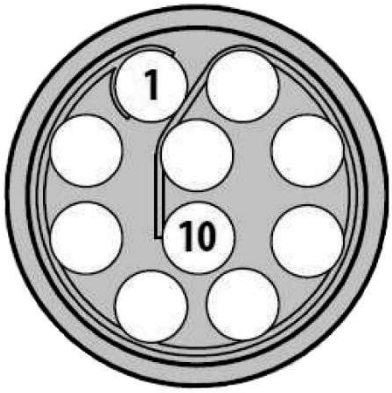


Figure 9 SC4400E AUX Pinout Diagram (Cable Side)

SC4400E PTT Connector	
Enclosure PTT Connector (ODU GKCWAM-P07UB00-000L)	**Signal**
1	RESERVED (Do Not Connect)
2	RESERVED (Do Not Connect)
3	AUDIO_GND
4	PTT
5	SPEAKER_OUT
6	MIC_IN
7	RESERVED (Do Not Connect)

Table 5 SC4400E PTT Connector Pinout

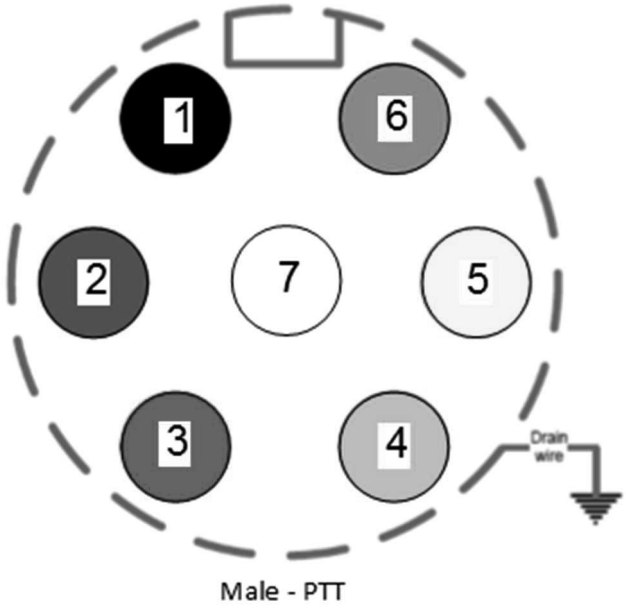


Figure 7 SC4400E PTT Pinout Diagram (Cable Side)

4.2.2 SC4200E Pinouts

SC4200E Power/Ethernet/Serial Connector Pinout		
Enclosure PWR/COMM (GK0YAR-P10UC00-000L)	**Signal**	**Switchcraft Pinout (EN3C2F16X)**
1	5V OUT (For External GPS Puck)	NC
2	GND IN	2
3	VCC IN	1
4	ETH0_MX2N	1
5	ETH0_MX2P	1
6	ETH0_MX1P	NC
7	RS232_RXD	NC
8	RS232_TXD	NC
9	GND	NC
10	ETH0_MX1N	NC

Table 6 SC4200E Power/Ethernet/Serial Connector Pinout

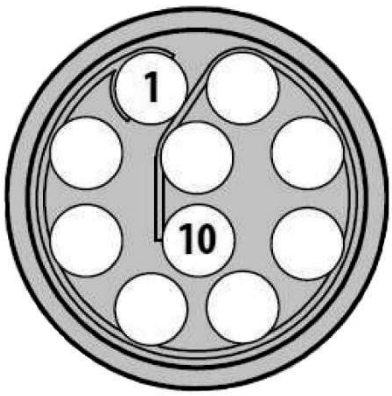


Figure 8 SC4200E Power (Optional)/Serial/Ethernet Pinout Diagram (Cable Side)

SC4200E RS-232 Pinout		
RS-232 (DB9)	**Signal**	**Switchcraft Pinout**
3	TxD	2
2	RxD	1
NC	NC	4
NC	5V OUT	6
NC	NC	5
5	Ground	3

Table 7 SC4200E Serial and GPS Pinout

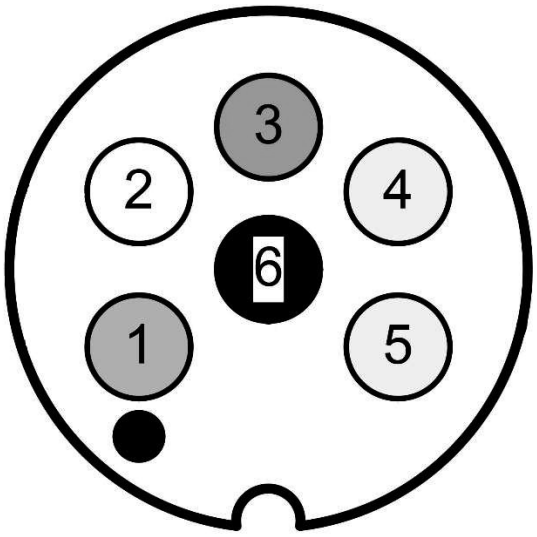


Figure 8 Switchcraft connector on Primary/Power cable

SC4200E AUX Connector Pinout	
Enclosure AUX (LF10WBRB-12SD)	**Signal**
1	USB GND
2	USB1_D-
3	USB1_VBUS
4	USB0_VBUS
5	GPIO1 (BDA control)
6	USB0_D+
7	USB0_D-
8	GND
9	USB1_ID
10	USB1_D+

Table 8 SC4200E USB/GPIO Connector Pinout (USB1 is USB 2.0 OTG, USB2 is USB 2.0 Host Mode Only)

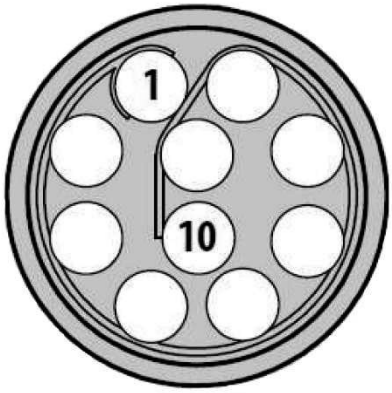


Figure 9 SC4200E AUX Pinout Diagram (Cable Side)

SC4200E PTT Connector	
Enclosure PTT Connector (ODU GKCWAM-P07UB00-000L)	**Signal**
1	RESERVED (Do Not Connect)
2	RESERVED (Do Not Connect)
3	AUDIO_GND
4	PTT
5	SPEAKER_OUT
6	MIC_IN
7	RESERVED (Do Not Connect)

Table 9 SC4200E PTT Connector Pinout

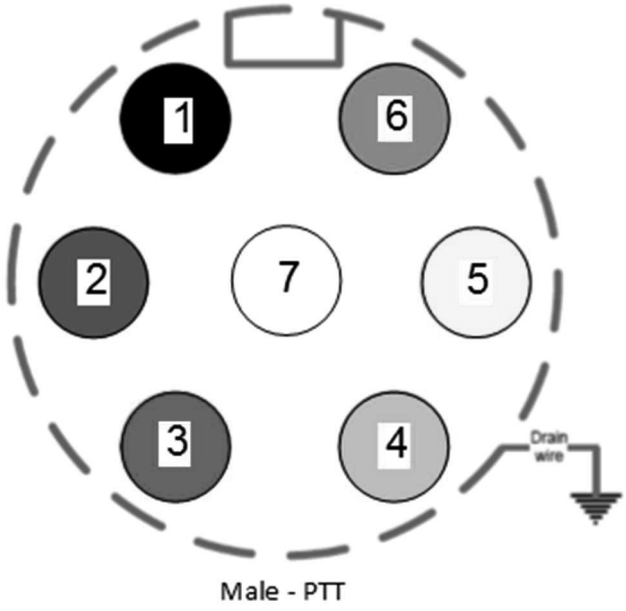


Figure 9 SC4200E PTT Pinout Diagram (Cable Side)

4.2.3 SC4400 Pinouts

SC4400 Power/Ethernet/Serial Connector Pinout		
Enclosure PWR/COMM (LF10WBRB-12PD)	Signal	Switchcraft Pinout (EN3C2F16X)
1	5V OUT (For External GPS Puck)	NC
2	GND IN	2
3	GND IN	2
4	VCC IN	1
5	VCC IN	1
6	100-Base T ETH0 M2N	NC
7	100-Base T ETH0 M2P	NC
8	100-Base T ETH0 M1P	NC
9	RS232_RXD	NC
10	RS232_TXD	NC
11	RS232_GND	NC
12	100-Base T ETH0 M1N	NC

Table 10 SC4400 Power/Ethernet/Serial Connector Pinout

SC4400 RS-232 and PS/2 (GPS) Pinout			
RS-232	PS/2 (GPS)	Signal	Switchcraft Pinout
3	4	TxD	2
2	5	RxD	1
NC	NC	NC	4
NC	2	5V OUT	6
NC	NC	NC	5
5	1	Ground	3

Table 11 SC4400 Serial and GPS Pinout

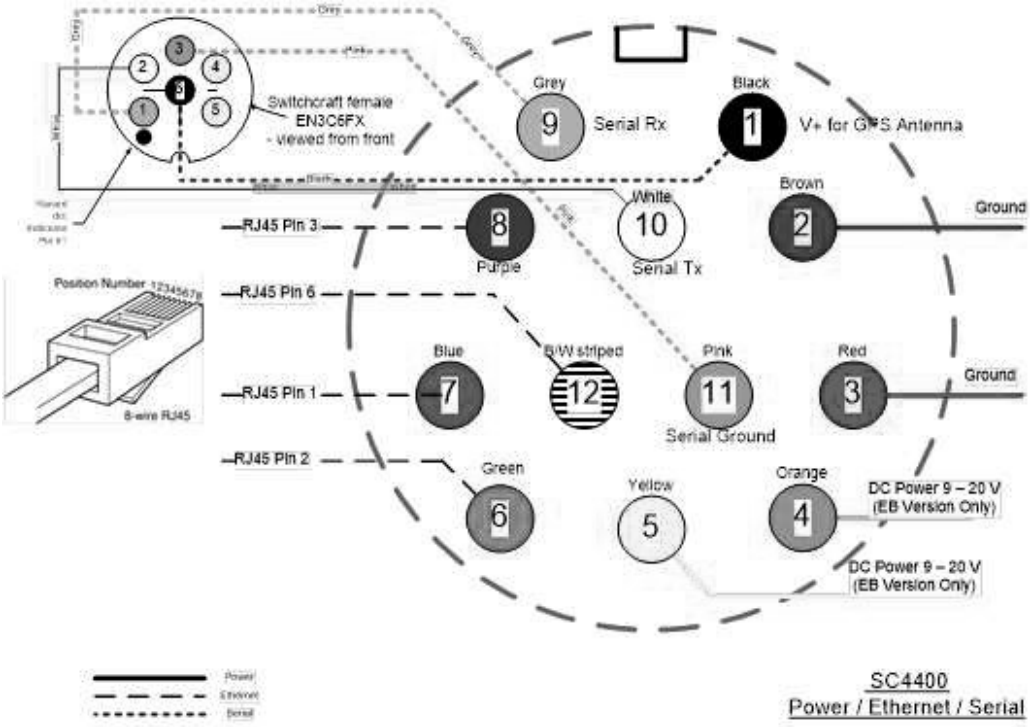


Figure 10 SC4400 Power (Optional)/Serial/Ethernet Pinout Diagram (Cable Side)

SC4400 AUX Connector Pinout	
Enclosure AUX (LF10WBRB-12SD)	**Signal**
1	USB1_GND
2	USB1_D-
3	USB1_VBUS
4	USB2_VBUS
5	GPIO1 (PA Enable 3.3V)
6	USB2_D+
7	USB2_D-
8	RESERVED (Do Not Connect)
9	GND
10	USB1_Sense
11	USB1_D+
12	USB2_GND

Table 12 SC4400 USB/GPIO Connector Pinout (USB1 is USB 2.0 OTG, USB2 is USB 2.0 Host Mode Only)

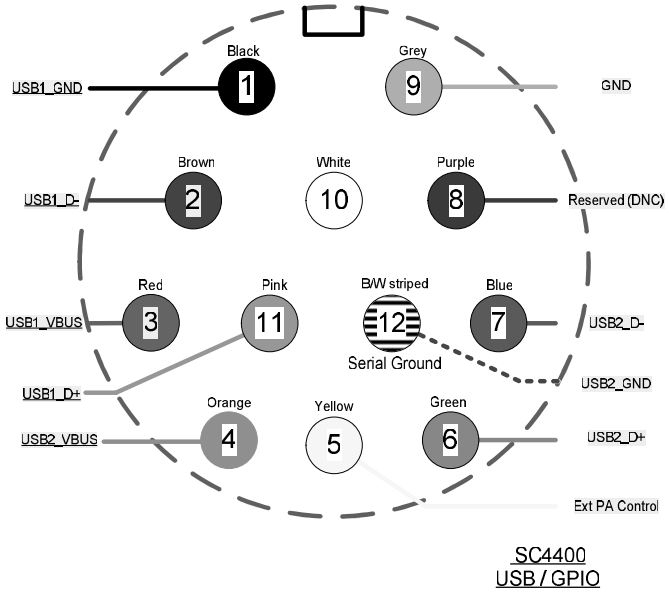


Figure 11 SC4400 AUX Pinout Diagram (Cable Side)

SC4400 PTT Connector	
Enclosure PTT Connector (ODU GKCWAM-P07UB00-000L)	**Signal**
1	RESERVED (Do Not Connect)
2	RESERVED (Do Not Connect)
3	AUDIO_GND
4	PTT
5	SPEAKER_OUT
6	MIC_IN
7	RESERVED (Do Not Connect)

Table 13 SC4400 PTT Connector Pinout

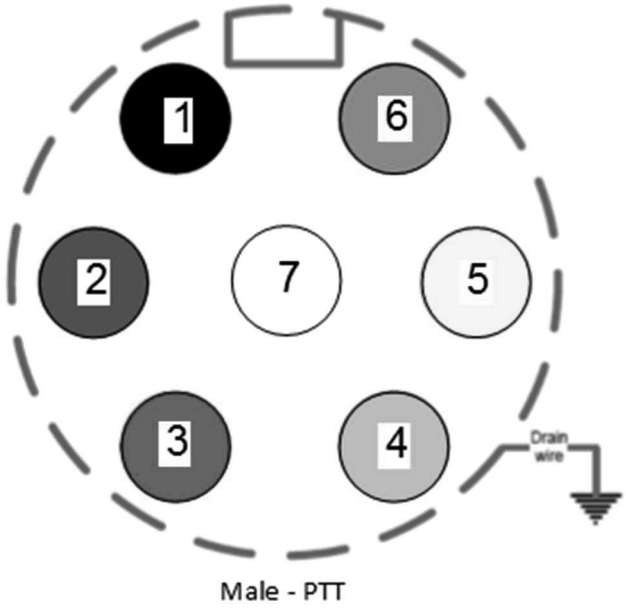


Figure 12 SC4400 PTT Pinout Diagram (Cable Side)

4.2.4 SC4200 Pinouts

SC4200 Power/Ethernet/Serial Connector Pinout		
Enclosure PWR/COMM (LF10WBRB-12PD)	**Signal**	**Switchcraft Pinout (EN3C2F16X)**
1	5V OUT (For External GPS Puck)	NC
2	GND IN (External Power Option Only)	2
3	GND IN (External Power Option Only)	2
4	VCC IN (External Power Option Only)	1
5	VCC IN (External Power Option Only)	1
6	100-Base T ETH0 M2N	NC
7	100-Base T ETH0 M2P	NC
8	100-Base T ETH0 M1P	NC
9	RS232_RXD	NC
10	RS232_TXD	NC
11	RS232_GND	NC
12	100-Base T ETH0 M1N	NC

Table 14 SC4200 Power/Ethernet/Serial Connector Pinout

SC4200 RS-232 and PS/2 (GPS) Pinout			
RS-232	**PS/2 (GPS)**	**Signal**	**Switchcraft Pinout**
3	4	TxD	2
2	5	RxD	1
NC	NC	NC	4
NC	2	5V OUT	6
NC	NC	NC	5
5	1	Ground	3

Table 15 SC4200 Serial and GPS Pinout

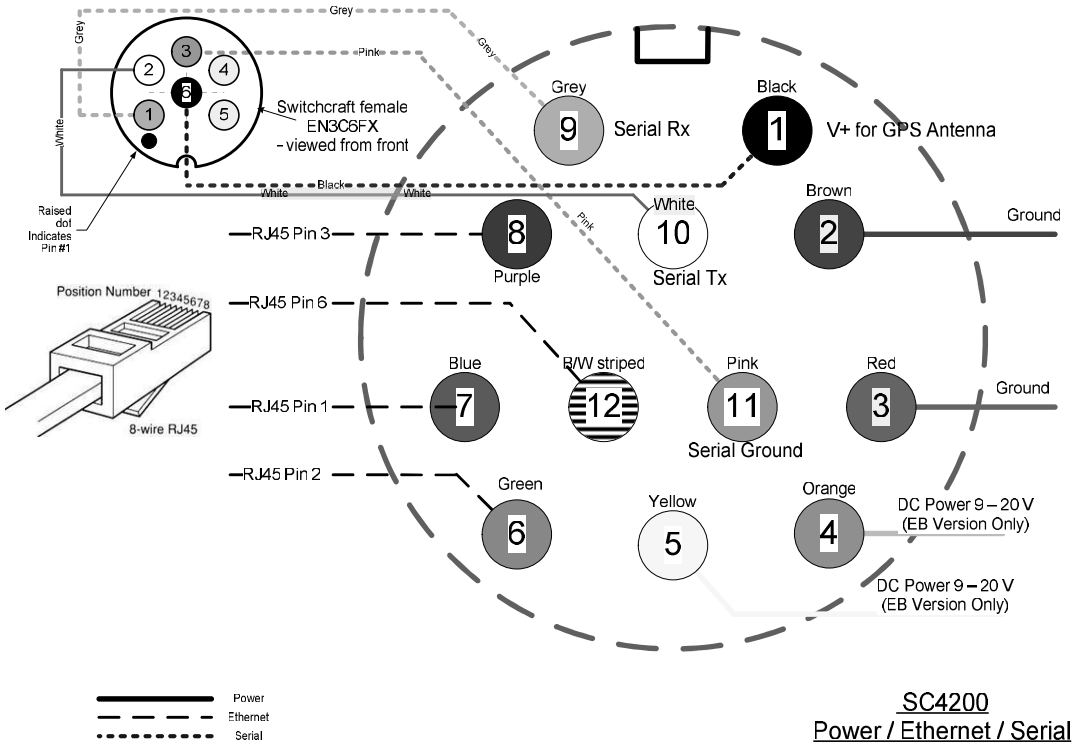


Figure 13 SC4200 Power (Optional)/Serial/Ethernet Pinout Diagram (Cable Side)

SC4200 AUX Connector Pinout	
Enclosure AUX (LF10WBRB-12SD)	**Signal**
1	USB1_GND
2	USB1_D-
3	USB1_VBUS
4	USB2_VBUS
5	GPIO1 (PA Enable 3.3V)
6	USB2_D+
7	USB2_D-
8	RESERVED (Do Not Connect)
9	GND
10	USB1_Sense
11	USB1_D+
12	USB2_GND

Table 16 SC4200 USB/GPIO Connector Pinout (USB1 is USB 2.0 OTG, USB2 is USB 2.0 Host Mode Only)

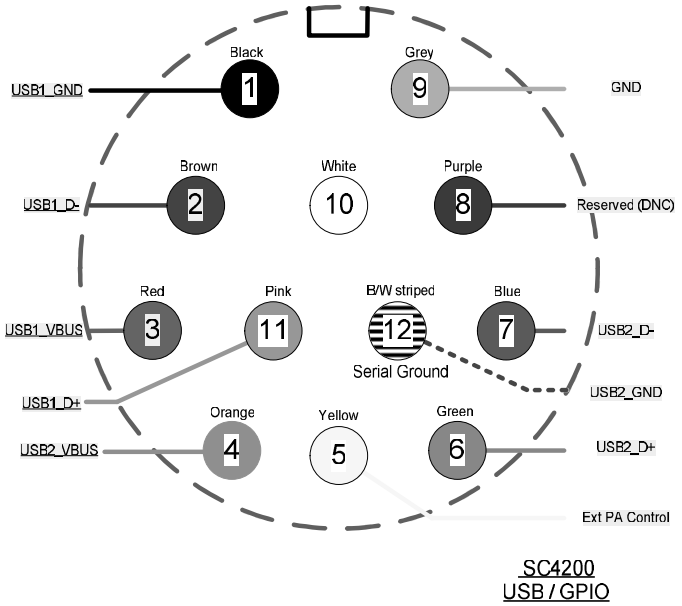


Figure 14 SC4200 AUX Pinout Diagram (Cable Side)

SC4200 PTT Connector	
Enclosure PTT Connector (ODU GKCWAM-P07UB00-000L)	**Signal**
1	RESERVED (Do Not Connect)
2	RESERVED (Do Not Connect)
3	AUDIO_GND
4	PTT
5	SPEAKER_OUT
6	MIC_IN
7	RESERVED (Do Not Connect)

Table 17 SC4200 PTT Connector Pinout

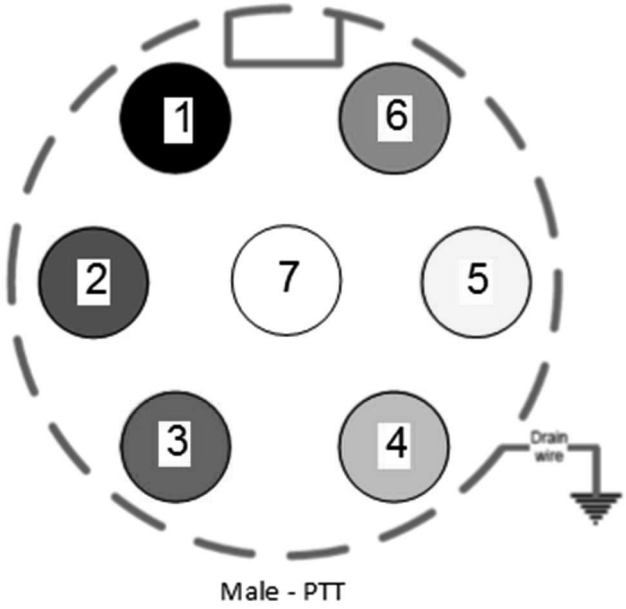


Figure 15 SC4200 PTT Pinout Diagram (Cable Side)

4.2.5 SC3822 Pinouts

SC3822 Power/Ethernet/Serial Connector Pinout		
Enclosure PWR/COMM (LF10WBRB-12PD)	Signal	Switchcraft Pinout (EN3C2F16X)
1	3.3V (5V on Rev. D Digital and Newer)	NC
2	GND IN	2
3	GND IN	2
4	VCC IN	1
5	VCC IN	1
6	100-Base T ETH0 M2N	NC
7	100-Base T ETH0 M2P	NC
8	100-Base T ETH0 M1P	NC
9	RS232_RXD	NC
10	RS232_TXD	NC
11	RS232_GND	NC
12	100-Base T ETH0 M1N	NC

Table 18 SC3822 Power/Ethernet/Serial Connector Pinout

SC3822 RS-232 and PS/2 (GPS) Pinout			
RS-232	PS/2 (GPS)	Signal	Switchcraft Pinout
3	4	TxD	2
2	5	RxD	1
NC	NC	NC	4
NC	2	3.3V (5V on Rev. D Digital and Newer)	6
NC	NC	NC	5
5	1	Ground	3

Table 19 SC3822 Serial and GPS Pinout

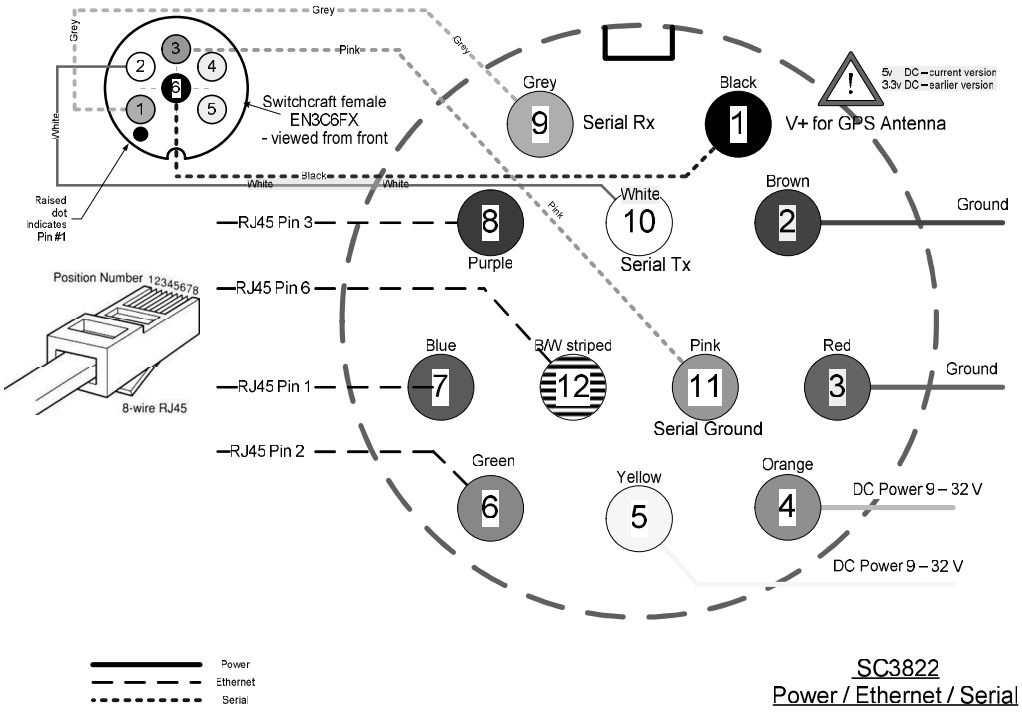


Figure 16 SC3822 Power/Serial/Ethernet Pinout Diagram (Cable Side)

SC3822 USB/GPIO Connector Pinout	
Enclosure USB/GPIO (LF10WBRB-12SD)	**Signal**
1	USB_GND
2	USB_D-
3	USB_5V
4	NC
5	GPIO1 (PA Enable 3.3V)
6	GPIO2
7	GPIO3
8	3.3V
9	GND
10	USB_Sense
11	USB_D+
12	GPIO4

Table 20 SC3822 USB/GPIO Connector Pinout

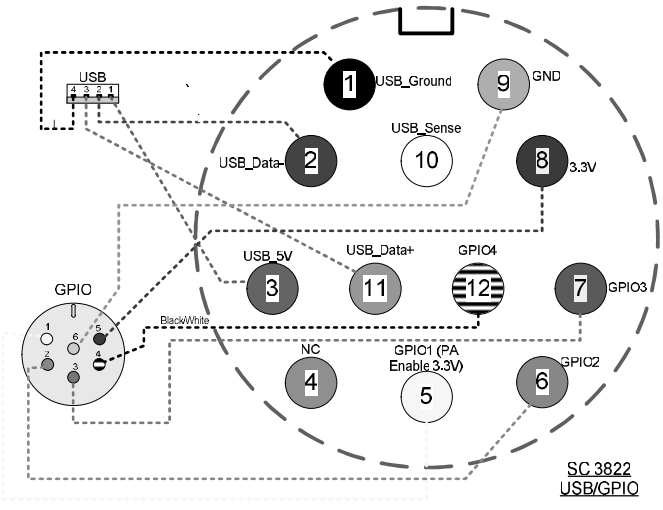


Figure 17 SC3822 USB/GPIO Pinout Diagram (Cable Side)

SC3822 Extension Port Pinout		
Pin #	**Signal**	**Notes**
1-6	VCC_IN	9V - 32V. These pins are directly wired to the VCC_IN on FPC 1.
7-10	GPIO1 – GPIO4	These GPIOs are directly wired to the GPIOs on FPC connector 2.
11-19	Reserved for Testing	Do Not Connect
20	CPU Reset (3.3V)	Wired to PS_SRST_EXT signal on FPC 1
21-54	Reserved for Testing	Do Not Connect
55	GND	
56	ETH1_MX4N	Second Gigabit Ethernet Interface
57	ETH1_MX4P	
58	ETH1_MX3N	
59	ETH1_MX3P	
60	ETH1_MX2N	
61	ETH1_MX2P	
62	ETH1_MX1N	
63	ETH1_MX1P	
64	GND	
65-68	Reserved for Testing	Do Not Connect

Table 21 SC3822 Extension Port Pinout

4.2.6 SC3500/SC3800 Pinouts

SC3500/3800 Power Connector Pinout		
Enclosure Pinout (801-010-07NF7-10PA)	Signal	Switchcraft Pinout (EN3C2F16X)
1	12V Power Return	2
2	12V Power Return	2
3	12V Power	1
4	12V Power	1
5	TxD	For Serial Comm.
6	RxD	For Serial Comm.
7	RTS	For Serial Comm.
8	CTS	For Serial Comm.
9	Ground	For Serial Comm.
10	3.3V (5V on Rev. E Digital and Newer)	3.3VDC for GPS

Table 22 SC3500/SC3800 Power Connector Pinout

SC3500/3800 RS-232 and PS/2 (GPS) Pinout			
RS-232	PS/2 (GPS)	Signal	Switchcraft Pinout
3	4	TxD	2
2	5	RxD	1
7	NC	RTS	4
NC	2	3.3V (5V on Rev. E Digital and Newer)	6
8	NC	CTS	5
5	1	Ground	3
NA	NA	LED Ground	NA
NA	NA	Green	NA
NA	NA	Red	NA

Table 23 SC3500/SC3800 Serial and GPS Pinout

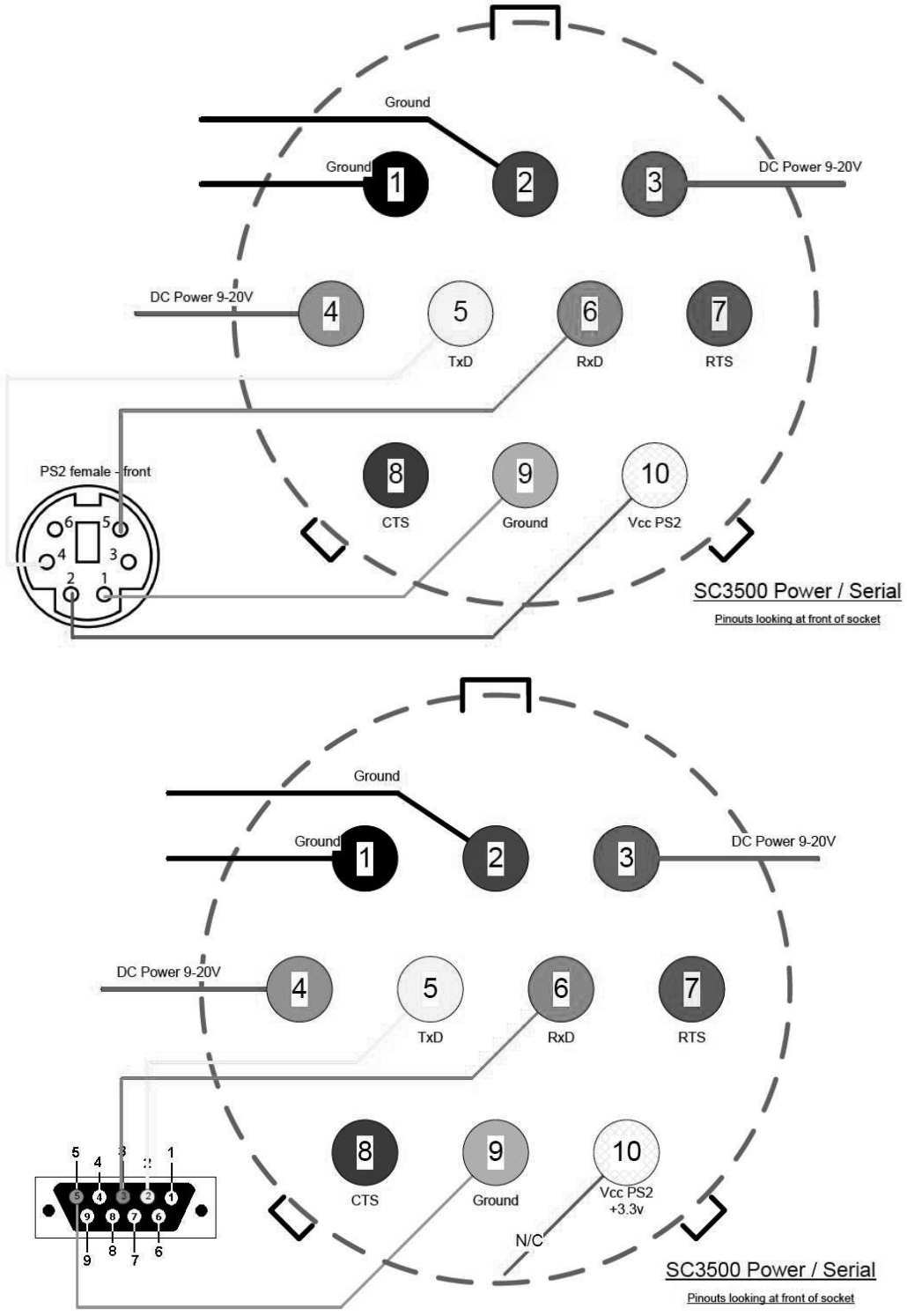


Figure 18 SC3500/SC3800 Power/Serial Pinout Diagram (Cable Side) for GPS (Top) and RS-232 (Bottom)

SC3500/3800 Ethernet Connector Pinout		
Enclosure Pinout (801-010-07NF7-10SA)	Signal	RJ45 Pinout
1	WHT/BLU	5
2	WHT/BRN	7
3	BRN	8
4	ORG	2
5	WHT/GRN	3
6	WHT/ORG	1
7	BLU	4
8	GRN	6
9	NC	NC
10	NC	NC

Table 24 SC3500/SC3800 Ethernet Connector Pinout

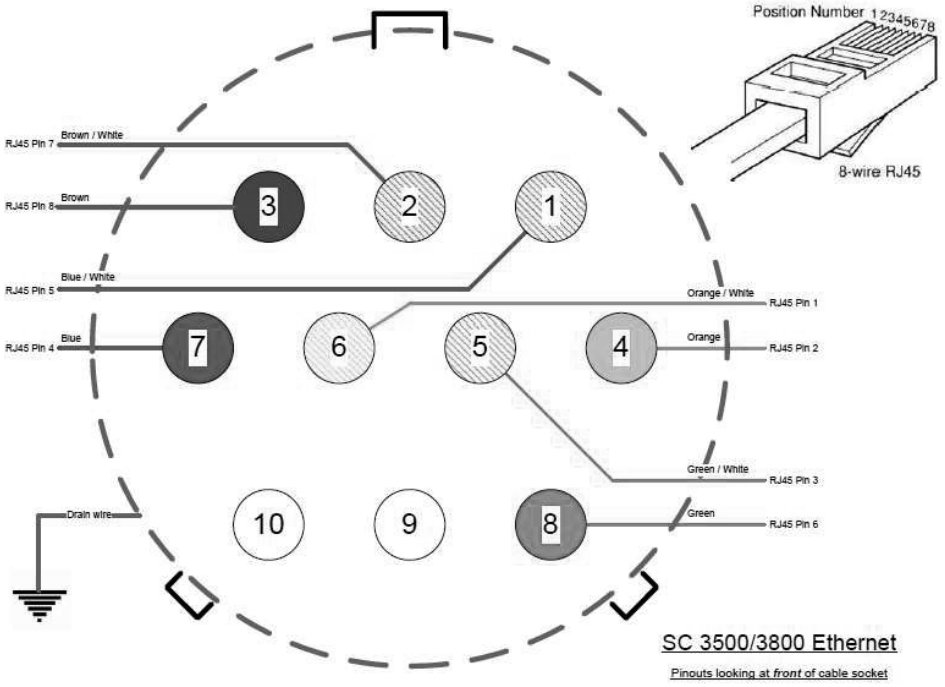


Figure 19 SC3500/SC3800 Ethernet Pinout Diagram (Cable Side)

SC3500/3800 EXT Connector Pinout (PA Faceplate Option Only)	
Enclosure Pinout (801-010-07NF7-25SA)	**Signal**
1	PA On (+3.3V)
2	Ground
3	NC
4	NC
5	NC

Table 25 SC3500/SC3800 EXT Connector Pinout

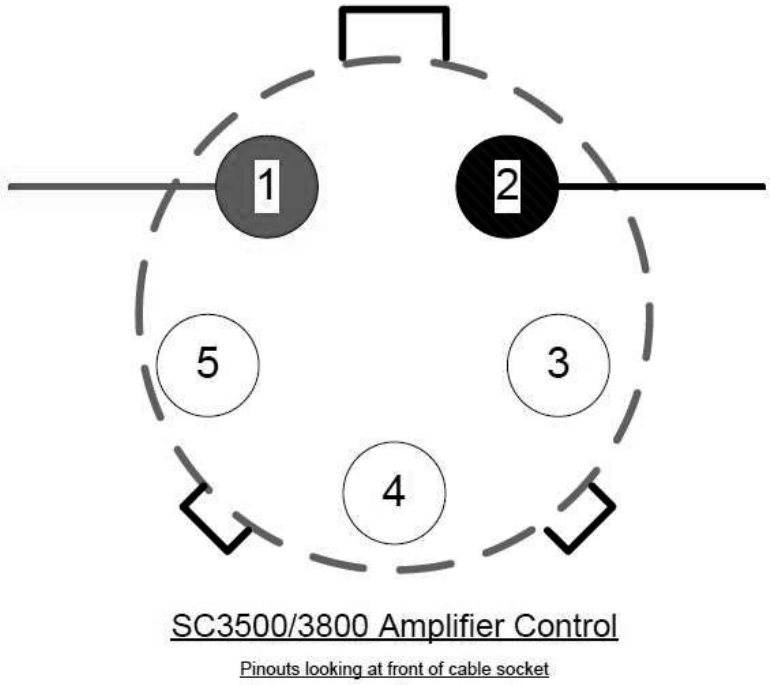


Figure 20 SC3500/SC3800 EXT Pinout Diagram (Cable Side)

4.3 Mechanical and Operating Specifications

SC4400E:

Mechanical

• **Ambient Temp.**	-40° to +65° C
• **IP Rating**	IP-68 (Dust / Submersible in Water to 20m)**
• **Dimensions**	5.25” x 4.5” x 1.8” (Excluding Connectors)
• **Weight**	2.5 lbs. (40 oz./1.13 kg.)
• **Color**	Black Anodized
• **Mounting**	4-Hole Mounting Pattern

Power

• **Voltage/Current**	9 – 20 VDC (± 5%), 5A
• **Power Consumption**	8 W – 43 W @ 8 W TX Power 8 W – 24 W @ 1 W TX Power
• **Optional External Power Supply (for indoor only)**	12VDC, 5A

Interfaces

• **RF**	4 x TNC(f) [N(f) Optional]
• **Primary**	Ruggedized Push/Pull Connector [1 x Ethernet, 1 x RS232, DC Input]
• **Auxiliary**	Ruggedized Push/Pull Connector [1 x USB 2.0 Host, 1 x USB 2.0 OTG]
• **PTT (Push-to-Talk)**	Ruggedized Break away Connector (Front Panel)
• **Status Indicator**	Tri-Color LED
• **Control Interface**	Multi-Position Switch
	13 presets plus zeroize crypto
	Web-Based StreamScape™ Network Manager

Mechanical – OEM

• **Dimensions**	4.29” x 3.3” x 0.82”
• **Weight**	9.1 oz (w/ Outer Shields)
• **RF Connectors**	SMP (m)

(**) Must have all connectors mated with IP68+ cables/antennas

SC4200E:

Mechanical

• **Ambient Temp.**	-40° to +65° C
• **IP Rating**	IP-68 (Dust / Submersible in Water up to 20m)**
• **Dimensions**	4.00" x 2.63" x 1.51" (Excluding Connectors)
• **Weight**	0.94 lbs. (15 oz./0.43 kg.)
• **Color**	Black Anodized
• **Mounting**	4-Hole Mounting Pattern (Through-Hole)

Power

• **Voltage/Current**	9 – 20 VDC (± 5%), 5A
• **Power Consumption**	4.8 W – 24 W @ 4W TX Power
	4.8 W – 16 W @ 1W TX Power
• **Battery Life**	Up to 12 Hours (6.8Ah MBITR Battery)
• **Power Options**	Twist-Lock Battery or Front Panel
• **Optional External Power Supply (for indoor only)**	12VDC, 5A

Interfaces

• **RF**	TNC(f) (2 Each)
• **Primary**	Ruggedized Push/Pull Connector (Front Panel)
	1 x Ethernet, 1x RS232, DC Input (Optional)
• **Auxiliary**	Ruggedized Push/Pull Connector (Front Panel)
	1 x USB 2.0 Host, 1 x USB 2.0 OTG
• **PTT (Push-to-Talk)**	Ruggedized Breakaway Connector (Front Panel)
• **Status Indicator**	Tri-Color LED
• **Management Interface**	Multi-Position Switch
	13 presets plus zeroize crypto
	Web-Based StreamScape™ Network Manager

Mechanical – OEM

• **Dimensions**	3.61" x 2.15" x 0.71"
• **Weight**	4.1 oz (w/ Outer Shields)
• **RF Connectors**	SMP (m)

(**) Must have all connectors mated with IP68+ cables/antennas

SC4400:

Mechanical

- **Ambient Temp.** -40° to +65° C
- **IP Rating** IP-67 (Dust / Immersion in Water up to 1m)**
- **Dimensions** 5.25" x 4.5" x 1.8" (Excluding Connectors)
- **Weight** 2.5 lbs. (40 oz./1.13 kg.)
- **Color** Black Anodized
- **Mounting** 4-Hole Mounting Pattern

Power

- **Voltage/Current** 9 – 20 VDC (± 5%), 5A
- **Power Consumption** 8 W – 43 W @ 8 W TX Power
  8 W – 24 W @ 1 W TX Power
- **Optional External Power Supply (for indoor only)** 12VDC, 5A

Interfaces

- **RF** 4 x TNC(f)
  [N(f) Optional]
- **Primary** Ruggedized Circular Connector
  [1 x Ethernet, 1 x RS232, DC Input]
- **Auxiliary** Ruggedized Circular Connector
  [1 x USB 2.0 Host, 1 x USB 2.0 OTG]
- **PTT (Push-to-Talk)** Ruggedized Break away Connector (Front Panel)
- **Status Indicator** Tri-Color LED
- **Management Interface** Web-Based StreamScape™ Network Manager

Mechanical – OEM

- **Dimensions** 4.29" x 3.3" x 0.82"
- **Weight** 9.1 oz (w/ Outer Shields)
- **RF Connectors** SMP (m)

(**) Must have all connectors mated with IP67+ cables/antennas

SC4200:

Mechanical

- **Ambient Temp.** -40° to +65° C
- **IP Rating** IP-67 (Dust / Immersion in Water up to 1m)**
- **Dimensions** 4.00" x 2.63" x 1.51" (Excluding Connectors)
- **Weight** 0.94 lbs. (15 oz./0.43 kg.)
- **Color** Black Anodized
- **Mounting** 4-Hole Mounting Pattern (Through-Hole)

Power

- **Voltage/Current** 9 – 20 VDC (± 5%), 5A
- **Power Consumption** 4.8 W – 24 W @ 4W TX Power
  4.8 W – 16 W @ 1W TX Power
- **Battery Life** Up to 12 Hours (6.8Ah MBITR Battery)
- **Power Options** Twist-Lock Battery or Front Panel
- **Optional External Power Supply (for indoor only)** 12VDC, 5A

Interfaces

- **RF** TNC(f) (2 Each)
- **Primary** Ruggedized Circular Connector (Front Panel)
  1 x Ethernet, 1x RS232, DC Input (Optional)
- **Auxiliary** Ruggedized Circular Connector (Front Panel)
  1 x USB 2.0 Host, 1 x USB 2.0 OTG
- **PTT (Push-to-Talk)** Ruggedized Break away Connector (Front Panel)
- **Status Indicator** Tri-Color LED
- **Management Interface** Web-Based StreamScape™ Network Manager

Mechanical – OEM

- **Dimensions** 3.61" x 2.15" x 0.71"
- **Weight** 4.1 oz (w/ Outer Shields)
- **RF Connectors** SMP (m)

(**) Must have all connectors mated with IP67+ cables/antennas

SC3822:

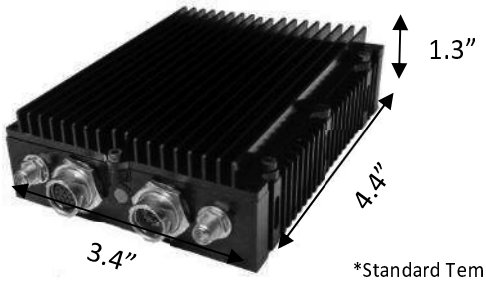
Environmental

	Standard Temperature	Extended Temperature
• **Operating Temp.**	-40° - +55° C	-40° - +65° C
• **IP Rating (Ingress Protection)**	IP-67 (Dust / Immersion in water up to 1m)*	

*Must have all connectors mated and use IP67 or better cables/antennas

Mechanical – Chassis

	Standard	Extended Temperature
• **Dimensions**	4.4" x 3.4" x 1.3"	4.4" x 3.4" x 2.0"
• **Weight**	1.0 lbs. (0.45 kg/16 oz)	1.2 lbs. (0.54 kg/19.2 oz)
• **Color**	a. Black anodized b. FED-STD-595B-34094 (green 383)	
• **Mounting**	4-hole mounting patterns (Through-hole)	



*Standard Temperature enclosure shown.
Extended Temp has height of 2".

Connectors

- **RF** SMA (f) (2 each)
- **Data / Control** Ethernet (Gigabit for OEM, 100 Base-T for Enclosed), RS232, USB
- **Power** Hirose LF Series Circular Connector (Front Panel)

  Samtec QSH (Expansion)

Controls and Indicators

- **Status Indicator** Tri-Color LED

Power Requirements

- **Voltage** 9 – 32 VDC
- **Consumption** 6W – 16W (Duty Cycle and Frequency Dependent)

Mechanical – OEM Board Stack

- **Dimensions** 3.3" x 2.9" x 0.5" L x W x H
- **Weight** 3 oz
- **RF Connector** SMP (m)

SC3500/SC3800:

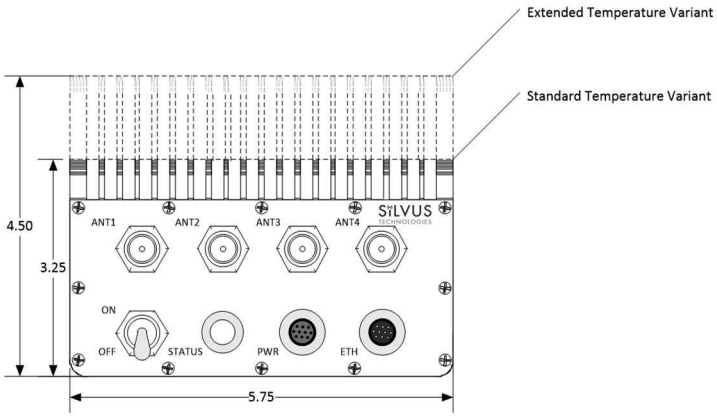
Environmental

	Standard	Extended Temperature
• **Operating Temp.**	-40° - +55° C	-40° - +65° C
• **IP Rating (Ingress Protection)**	IP-67 (Dust / Immersion in water up to 1m)*	

*Must have all connectors mated and use IP67 or better cables/antennas

Mechanical – Chassis

	Standard	Extended Temperature
• **Dimensions**	3.25" x 5.75" x 4"	4.5" x 5.75" x 4"
• **Weight**	3.7 lbs. (1.68 kg/59.2 oz)	4 lbs. (1.81 kg/64 oz)
• **Color**	c. FED-STD-595B-34094 (green 383) d. Black anodized	
• **Mounting**	4-hole mounting patterns (non-penetrating) located on both rear and bottom sides	



Connectors

- **RF** TNC (f) (4 each)
- **Data / Control** Ethernet cable, Mighty-Mouse 801 Heavy-Duty, Double-Start 10
- **Power** Mighty-Mouse 801 Heavy-Duty, Double-Start 10 conductor (m)

Controls and Indicators

- **Power** On / Off Toggle with detent
- **Status Indicator** Tri-Color LED

Power Requirements

- **Voltage** 9 – 20 VDC
- **Consumption** 12W – 22.5W (Duty Cycle and Frequency Dependent)

Mechanical – OEM Board Stack

- **Dimensions** 1.9" x 5.25" x 2.9" H x L x W

- **Weight** 8 oz
- **RF Connector** SMP (m)
- **Data Connector** Harwin M80 8-pin (m), (RS232/GPS optional)
- **Power Connector** Harwin M80 8-pin

4.3.1 SC4400E Enclosure Mechanical Drawing

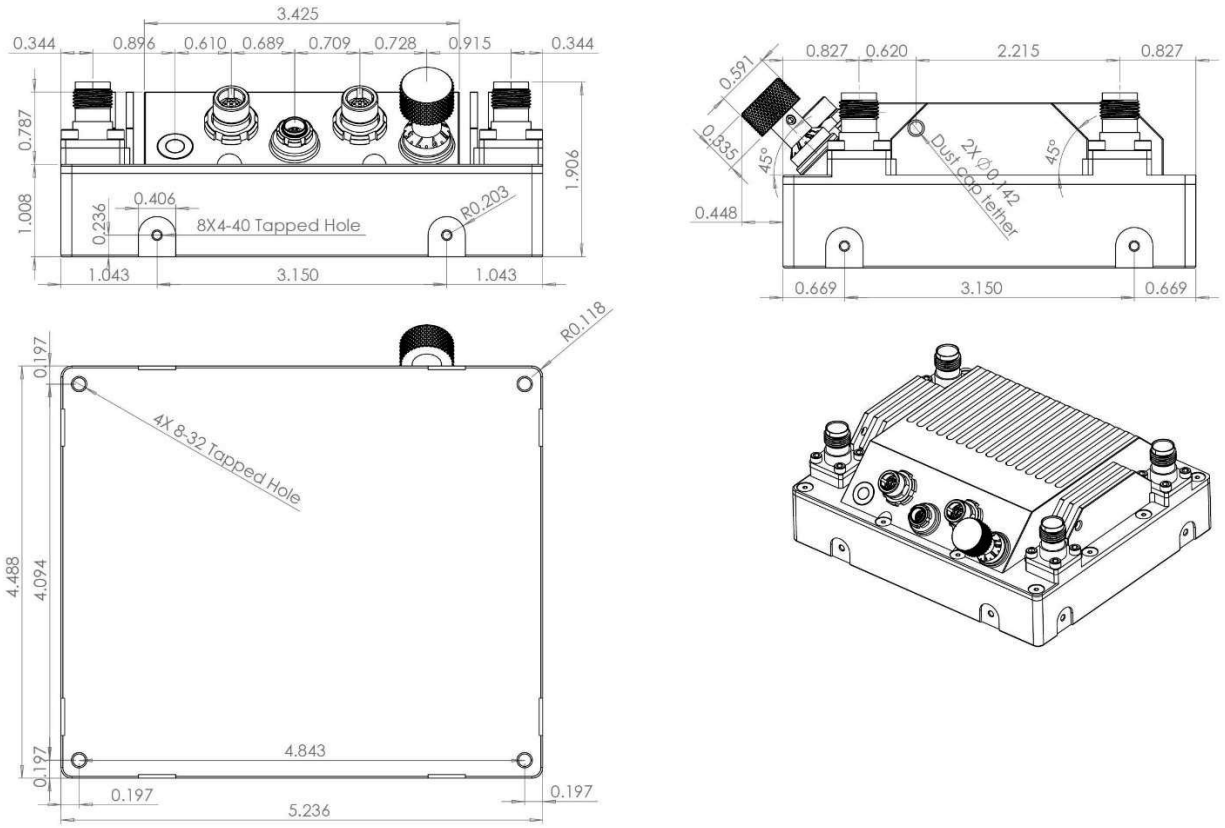


Figure 21 SC4400E Mechanical Drawing (top) and Mounting Pattern (bottom)

4.3.2 SC4200E Enclosure Mechanical Drawing

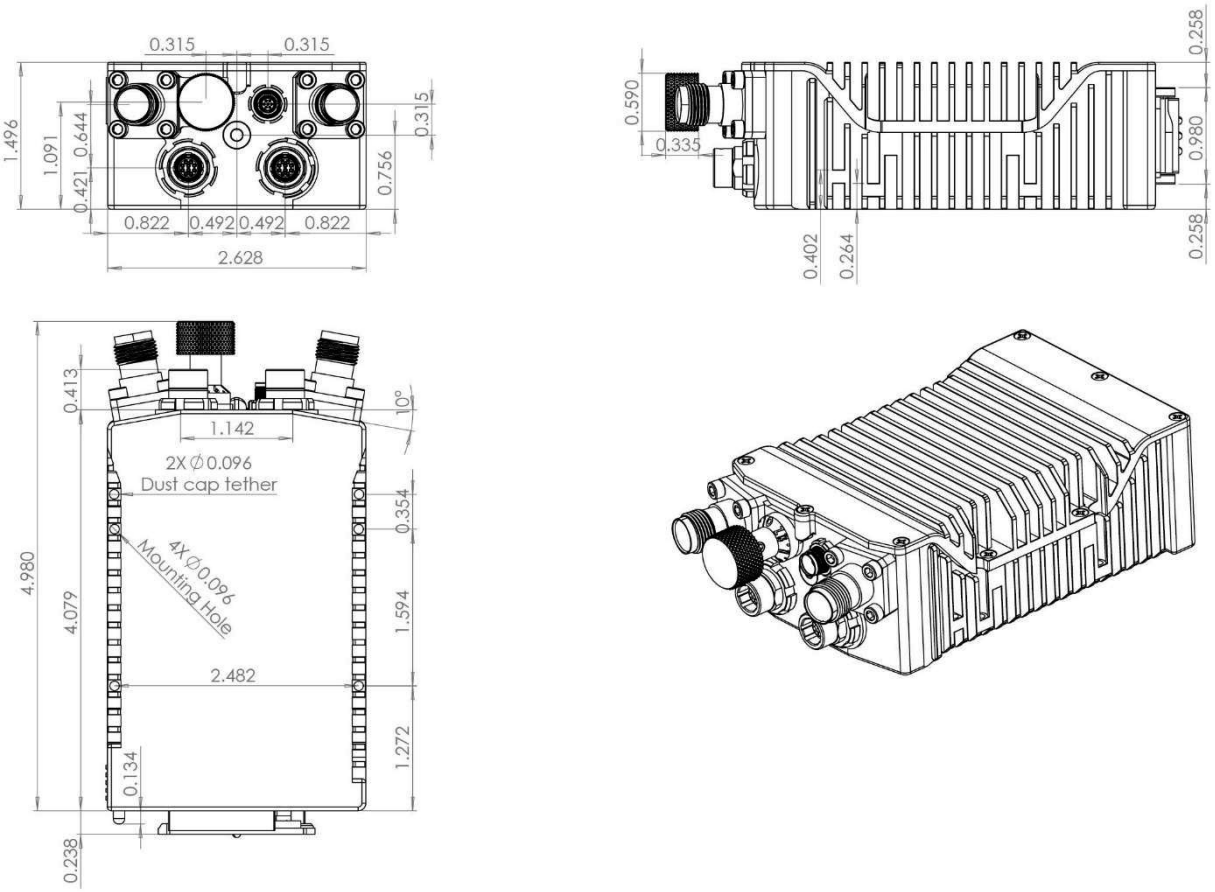


Figure 22 SC4200E Mechanical Drawing (top) and Mounting Pattern (bottom)

4.3.3 SC4400 Enclosure Mechanical Drawing

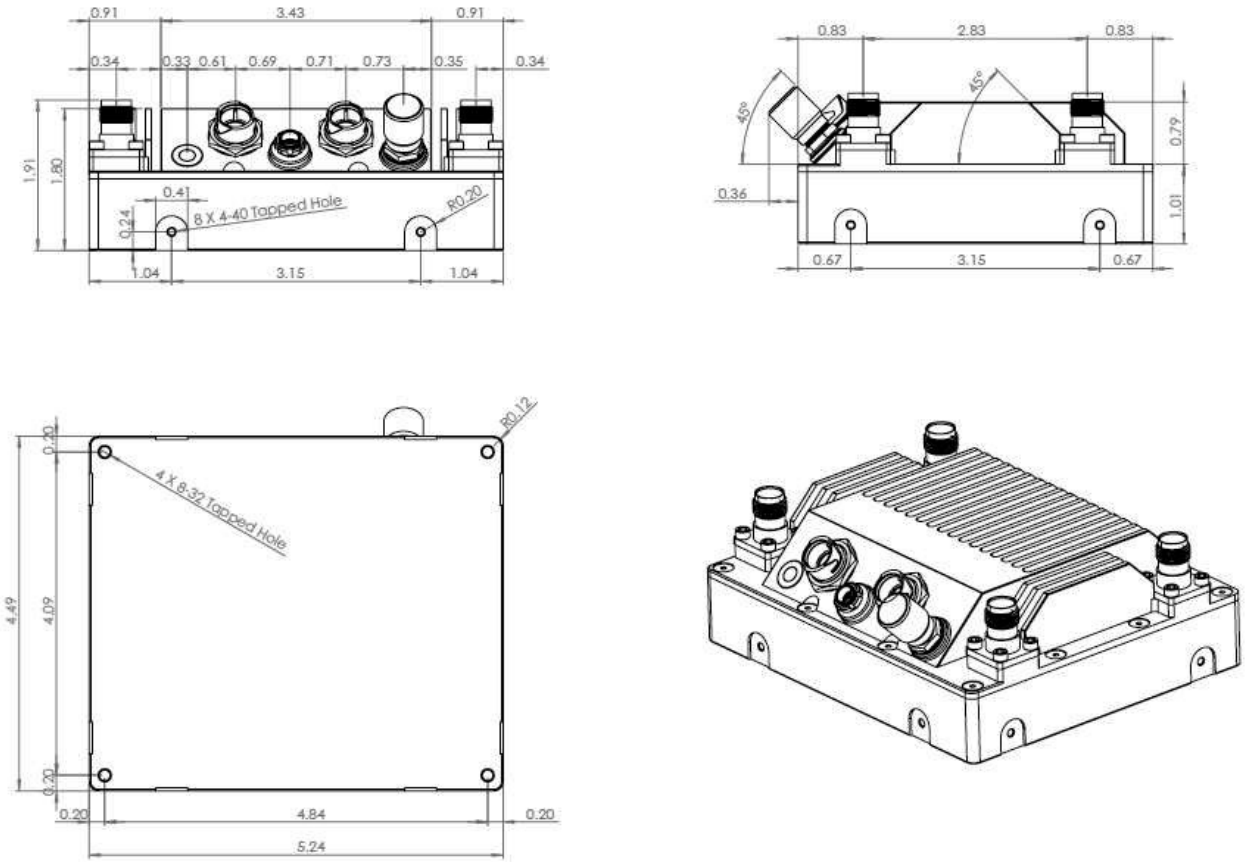


Figure 23 SC4400 Mechanical Drawing (top) and Mounting Pattern (bottom)

4.3.4 SC4200 Enclosure Mechanical Drawing

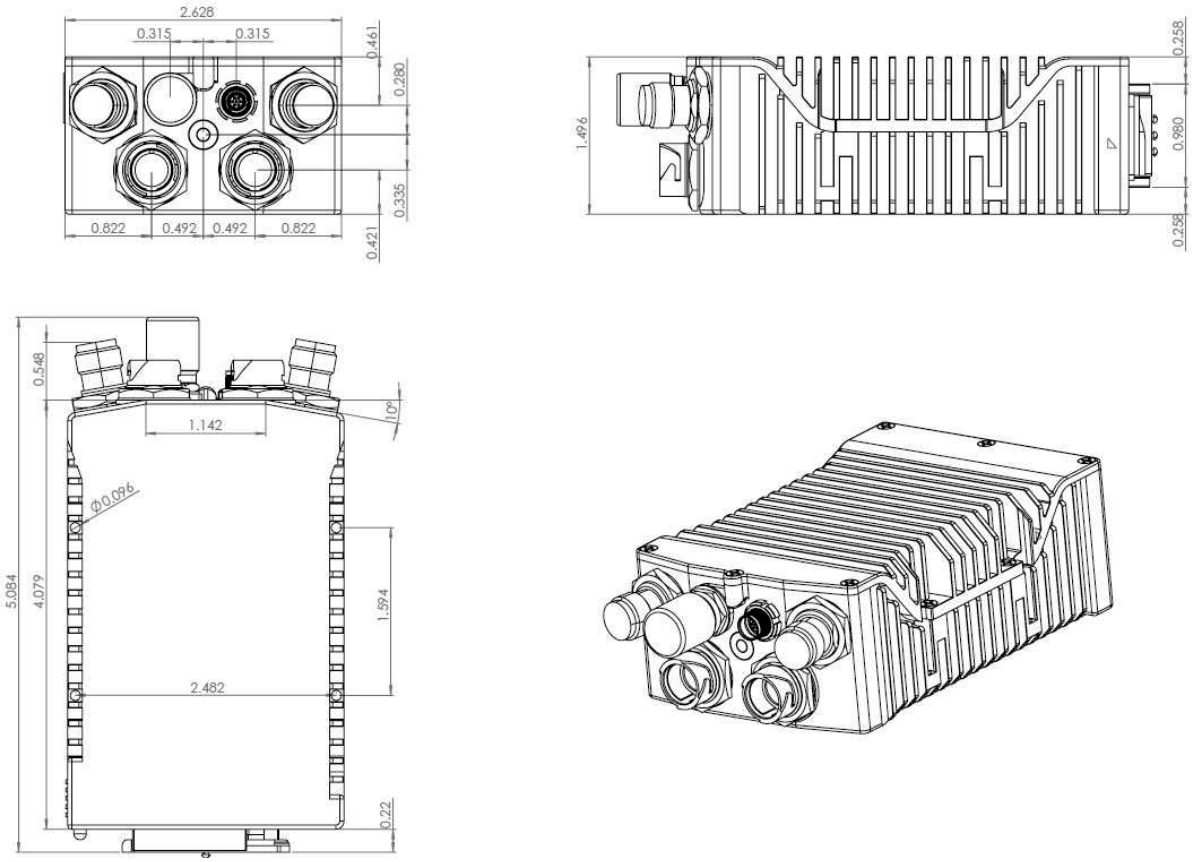


Figure 24 SC4200 Mechanical Drawing (top) and Mounting Pattern (bottom)

4.3.5 SC3822 Enclosure Mechanical Drawing

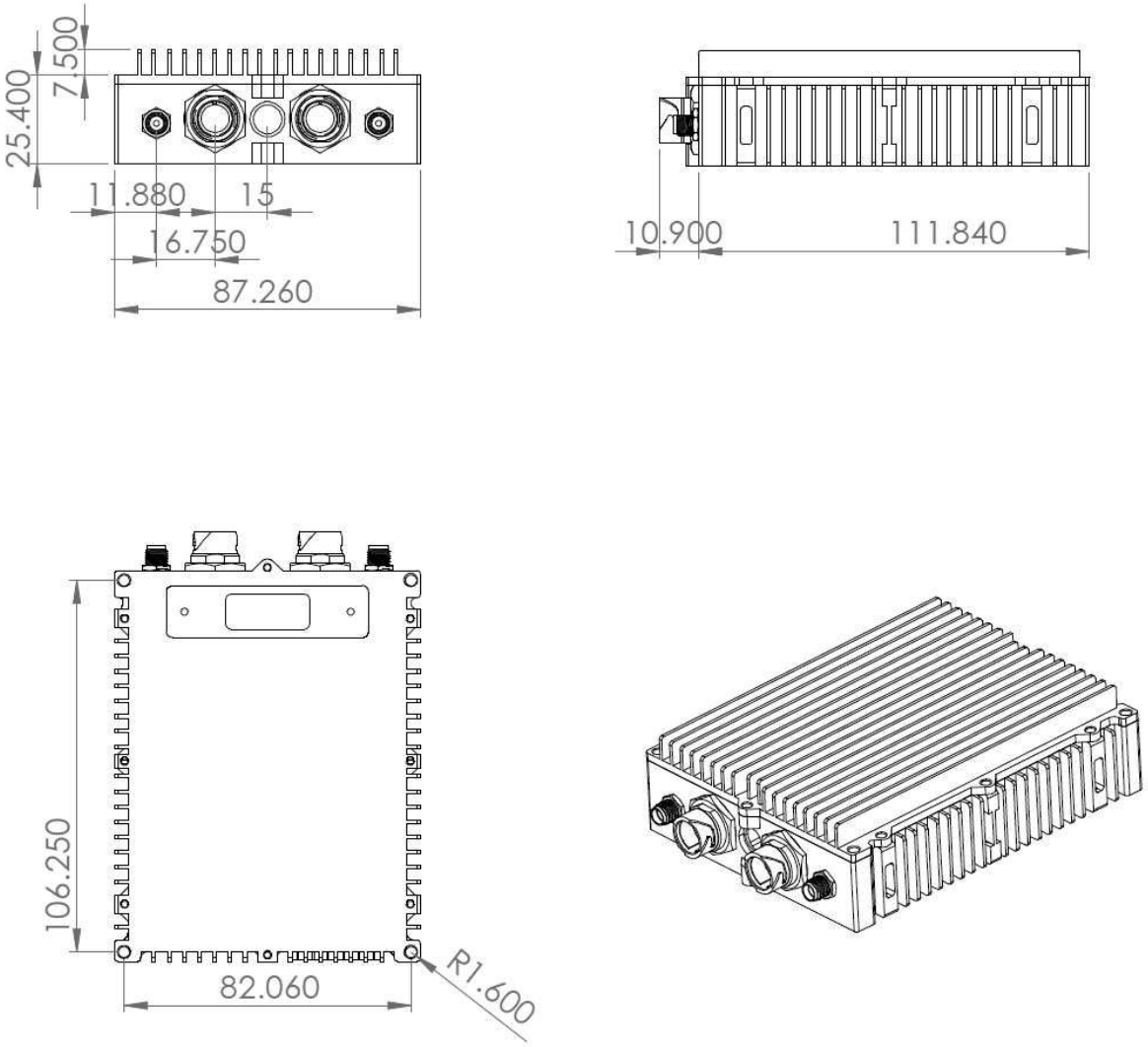


Figure 25 SC3822 Mechanical Drawing (top) and Mounting Pattern (bottom)

4.3.6 SC3500/SC3800 Phase II Enclosure Mounting Pattern

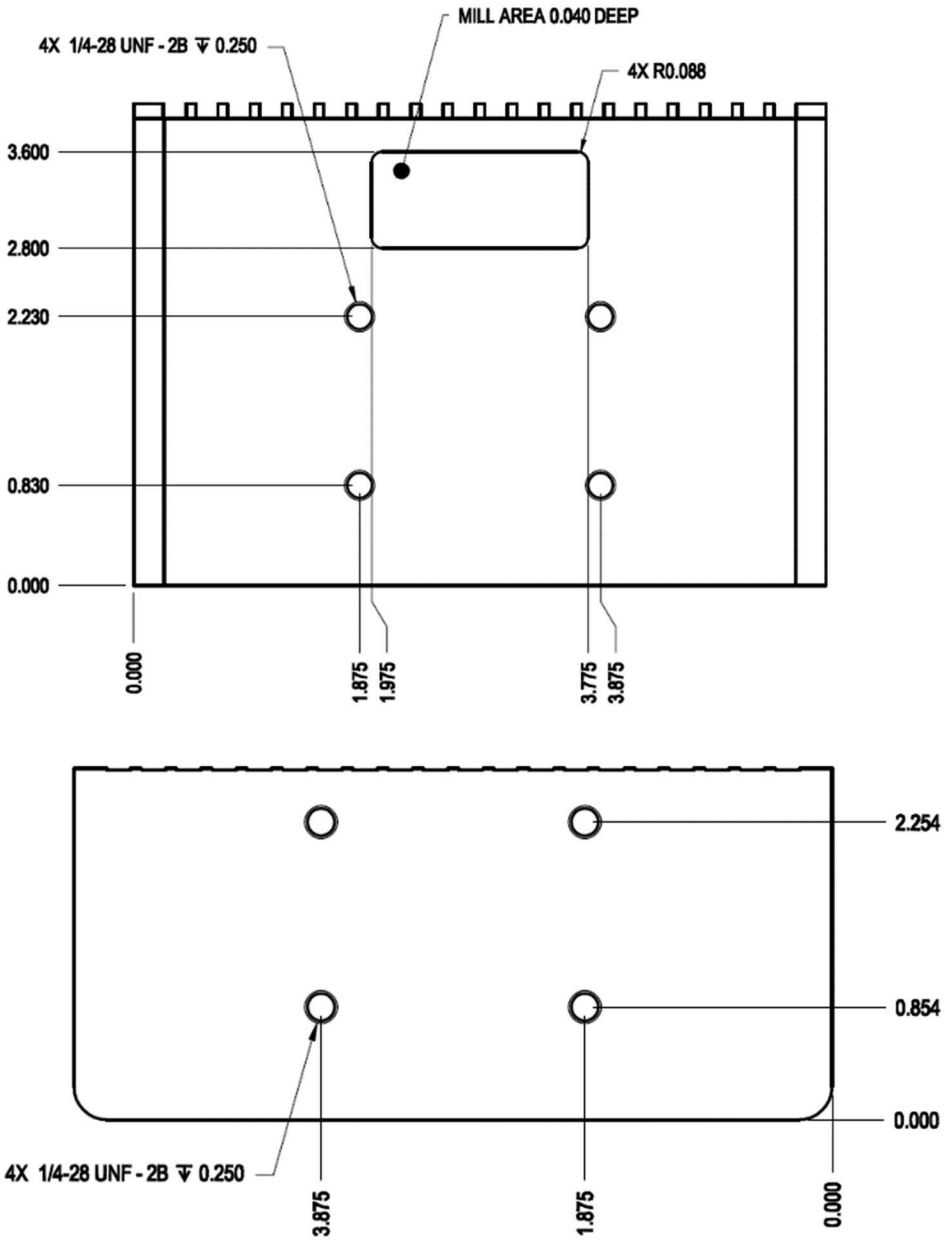


Figure 26 SC3500/SC3800 Phase II Enclosure Mounting Pattern for Back of Enclosure (top) and Bottom of Enclosure (bottom)

4.3.7 SC3500/ SC3800 Phase III Enclosure Mounting Pattern

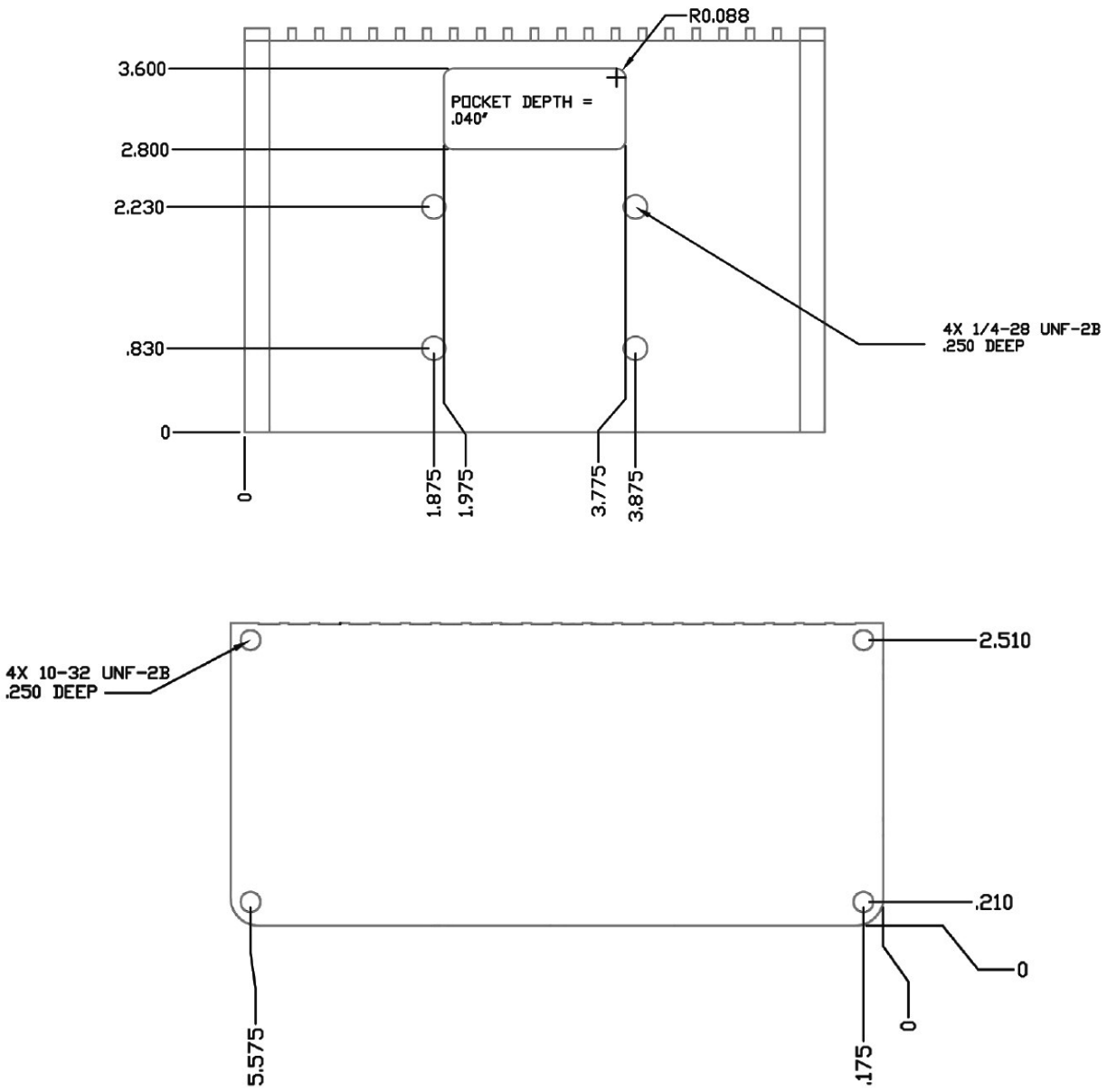


Figure 27 SC3500/SC3800 Phase III Enclosure Mounting Pattern for Back of Enclosure (top) and Bottom of Enclosure (bottom)

4.4 SC4400E Specifications

General

- **Waveform** — Mobile Networked MIMO (MN-MIMO™)
- **Modulation** — BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** — 5, 10 & 20 MHz (1.25*, 2.5*)
- **Encryption** — DES Standard, AES/GCM 128/256 Optional (FIPS 140-2), Suite B
- **Tuning Step Size** — 1kHz
- **Data Rates** — Up to 100 Mbps (Adaptive)
- **Error Correction** — 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** — Spatial Multiplexing, Space-Time Coding, TX Eigen Beamforming, RX Eigen Beam Forming
- **No. of Spatial Streams** — 1-2
- **No. of Antennas** — 4

Performance

- **Latency** — 7ms Average (20MHz BW)
- **Sensitivity** — -102 dBm @ 5MHz BW
- **Frequency Bands** — Bands from 400MHz to 6GHz Available Dual Band Optional
- **Onboard Storage** — 64 GB*

Frequency Band Options

Band (Freq. Code)	Frequency Range	Band (Freq. Code)	Frequency Range
UHF (042)	400-450	**Low C Band (455)**	4400-4700
ISM 900 (091)	902-928	**Federal C-1 (467)**	4400-4940
L Band (137)	1350-1390	**High C Band (485)**	4700-5000
Upper L (181)	1780-1850	**5.2GHz ISM (520)**	5150-5250
Broadcast B (206)	2025-2110	**5.8GHz ISM (580)**	5725-5875
Federal S (225)	2200-2300		
S Band (235)	2200-2500		
2.4GHz ISM (245)	2400-2500		

(All bands listed in MHz)

Note: If band of interest is not listed, please contact a sales representative

Footnote: (*) in development

4.5 SC4200E Specifications

General

- **Waveform** — Mobile Networked MIMO (MN-MIMO™)
- **Modulation** — BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** — 5, 10 & 20 MHz (1.25*, 2.5*)
- **Encryption** — DES Standard, AES/GCM 128/256 Optional (FIPS 140-2), Suite B
- **Tuning Step Size** — 1kHz
- **Data Rates** — Up to 100 Mbps (Adaptive)
- **Error Correction** — 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** — Spatial Multiplexing, Space-Time Coding, TX Eigen Beamforming, RX Eigen Beam Forming
- **No. of Spatial Streams** — 1-2
- **No. of Antennas** — 2

Performance

- **Latency** — 7ms Average
- **Sensitivity** — -99 dBm @ 5MHz BW
- **Frequency Bands** — Bands from 400MHz to 6GHz Available Dual Band Optional
- **Onboard Storage** — 64 GB*

Frequency Band Options

Band (Freq. Code)	Frequency Range	Band (Freq. Code)	Frequency Range
UHF (042)	400-450	**Low C Band (455)**	4400-4700
ISM 900 (091)	902-928	**Federal C-1 (467)**	4400-4940
L Band (137)	1350-1390	**High C Band (485)**	4700-5000
Upper L (181)	1780-1850	**5.2GHz ISM (520)**	5150-5250
Broadcast B (206)	2025-2110	**5.8GHz ISM (580)**	5725-5875
Federal S (225)	2200-2300		
S Band (235)	2200-2500		
2.4GHz ISM (245)	2400-2500		

(All bands listed in MHz)

Note: If band of interest is not listed, please contact a sales representative

Footnote: (*) in development

SC4400E/SC4200 PTT

Supported Mic Type	Moving Coil or Condenser (Software Configurable)
• **Max Avg. Speaker Output Power**	2.65W with 4 Ohm Speaker Impedance
• **MIC Bias**	2.15V or 3V (Software Configurable); Applied via a 2K Ohm Resistor
• **Recommended Speaker Impedance (Handset)**	4 Ohm to 16 Ohm
• **Recommended Speaker Impedance (Headset)**	75 Ohm to 300 Ohm
• **Recommended MIC impedance**	<= 1K Ohm
• **Peak Speaker Output Voltage**	5.5V
• **Absolute MIC Input Voltage**	3.3V

4.6 SC4400 Specifications

General

- **Waveform** — Mobile Networked MIMO (MN-MIMO™)
- **Modulation** — BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** — 5, 10 & 20 MHz (1.25*, 2.5*)
- **Encryption** — DES Standard, AES/GCM 128/256 Optional (FIPS 140-2), Suite B
- **Tuning Step Size** — 1kHz
- **Data Rates** — Up to 100 Mbps (Adaptive)
- **Error Correction** — 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** — Spatial Multiplexing, Space-Time Coding, TX Eigen Beamforming, RX Eigen Beam Forming
- **No. of Spatial Streams** — 1-2
- **No. of Antennas** — 4

Performance

- **Latency** — 7ms Average (20MHz BW)
- **Sensitivity** — -102 dBm @ 5MHz BW
- **Frequency Bands** — Bands from 400MHz to 6GHz Available Dual Band Optional
- **Onboard Storage** — 64 GB*

Frequency Band Options

Band (Freq. Code)	Frequency Range	Band (Freq. Code)	Frequency Range
UHF (042)	400-450	**Low C Band (455)**	4400-4700
ISM 900 (091)	902-928	**Federal C-1 (467)**	4400-4940
L Band (137)	1350-1390	**Federal C-2 (469)***	4400-4990
Upper L (181)	1780-1850	**High C Band (485)**	4700-5000
Broadcast B (206)	2025-2110	**5.2GHz ISM (520)**	5150-5250
Federal S (225)	2200-2300	**5.8GHz ISM (580)**	5725-5875
S Band (235)	2200-2500		
2.4GHz ISM (245)	2400-2500		

(All bands listed in MHz)

Note: If band of interest is not listed, please contact a sales representative

Footnote: (*) in development

4.7 SC4200 Specifications

General

- **Waveform** — Mobile Networked MIMO (MN-MIMO™)
- **Modulation** — BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** — 5, 10 & 20 MHz (1.25*, 2.5*)
- **Encryption** — DES Standard, AES/GCM 128/256 Optional (FIPS 140-2), Suite B
- **Tuning Step Size** — 1KHz
- **Data Rates** — Up to 100 Mbps (Adaptive)
- **Error Correction** — 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** — Spatial Multiplexing, Space-Time Coding, TX Eigen Beamforming, RX Eigen Beam Forming
- **No. of Spatial Streams** — 1-2
- **No. of Antennas** — 2

Performance

- **Latency** — 7ms Average
- **Sensitivity** — -99 dBm @ 5MHz BW
- **Frequency Bands** — Bands from 400MHz to 6GHz Available Dual Band Optional
- **Onboard Storage** — 64 GB*

Frequency Band Options

Band (Freq. Code)	Frequency Range	Band (Freq. Code)	Frequency Range
UHF (042)	400-450	**Low C Band (455)**	4400-4700
ISM 900 (091)	902-928	**Federal C-1 (467)**	4400-4940
L Band (137)	1350-1390	**Federal C-2 (469)***	4400-4990
Upper L (181)	1780-1850	**High C Band (485)**	4700-5000
Broadcast B (206)	2025-2110	**5.2GHz ISM (520)**	5150-5250
Federal S (225)	2200-2300	**5.8GHz ISM (580)**	5725-5875
S Band (235)	2200-2500		
2.4GHz ISM (245)	2400-2500		

(All bands listed in MHz)

Note: If band of interest is not listed, please contact a sales representative

Footnote: (*) in development

SC4400/SC4200 PTT

Supported Mic Type

Moving Coil or Condenser (Software Configurable)

- **Max Avg. Speaker Output Power** — 2.65W with 4 Ohm Speaker Impedance
- **MIC Bias** — 2.15V or 3V (Software Configurable); Applied via a 2K Ohm Resistor
- **Recommended Speaker Impedance (Handset)** — 4 Ohm to 16 Ohm
- **Recommended Speaker Impedance (Headset)** — 75 Ohm to 300 Ohm
- **Recommended MIC impedance** — <= 1K Ohm
- **Peak Speaker Output Voltage** — 5.5V
- **Absolute MIC Input Voltage** — 3.3V

4.8 SC3822 Specifications

General

• **Waveform**	Mobile Networked MIMO (MN-MIMO™)
• **Modulation**	BPSK, QPSK, 16-QAM, 64-QAM
• **Channel Bandwidth**	5, 10 & 20 MHz (1.25*, 2.5*)
• **Encryption**	DES Standard, AES 128/256 Optional (FIPS 140-2)
• **Frequency Stability**	1 PPM over temp -40° - +85° C
• **Tuning Step Size**	1KHz
• **Data Rates**	85 Mbps UDP & 70 Mbps TCP
• **Error Correction**	1/2, 2/3, 3/4, 5/6
• **Antenna Processing**	Spatial Multiplexing, Space-Time Coding, RX Eigen Beam Forming
• **No. of Spatial Streams**	1-2
• **No. of Antennas**	2
• **Total Power Output**	10mW – 500mW (variable)

Performance

• **Latency**	7ms average
• **Sensitivity**	Varies with MCS index Maximum = -99 dBm (5MHz BW, MCS0) (5 MHz BW, MCS 0)

Frequency Band Specifics

Please note, this table reflects standard frequency bands available, additional bands are frequently added as demands dictate. If your band of interest is not listed, please contact your sales person. (All bands listed in MHz)

Low Band		High Band	
UHF	400-450	**Low C Band**	4400-4700
ISM 900	902-928	**High C Band**	4700-5000
L Band	1350-1390	**5.2GHz ISM**	5150-5250
Broadcast A	1980-2200	**5.8GHz ISM**	5727-5852
Broadcast B	2025-2110		
Federal 'S'	2200-2300		
Federal 'S' + 2.4GHZ ISM	2200-2500		

Footnote: (*) in development

4.9 SC3500 Specifications

General

- **Radio Type** MIMO Coded-OFDM
- **Subcarrier Modulation** BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** 5, 10 & 20 MHz
- **Encryption** DES Standard, AES 128/256 Optional
- **Frequency Stability** 1 PPM over temp -40° - +85° C
- **Tuning Step Size** 1KHz
- **Data Rates** 85 Mbps UDP & 70 Mbps TCP
- **Error Correction** 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** Spatial Multiplexing, Space-Time Coding, Eigen Beam Forming
- **No. of Spatial Streams** 1-4
- **No. of Antennas** 4
- **Total Power Output** 10mW – 1W (variable)

Performance

- **Latency** 7ms average
- **Sensitivity** Varies with MCS index

  Maximum = -102 dBm (5 MHz BW, MCS 0)

Frequency Band Specifics

	S Band	C Band
• **Frequency Code '245540'**	2.400 – 2.500 GHz	4.940 – 5.875 GHz
• **Frequency Code '245551'**	2.400 – 2.500 GHz	5.150 – 5.875 GHz
• **Frequency Code '243578'**	2.417 – 2.457 GHz	5.735 – 5.840 GHz

4.10 SC3800 Specifications

General

- **Radio Type** — MIMO Coded-OFDM
- **Subcarrier Modulation** — BPSK, QPSK, 16-QAM, 64-QAM
- **Channel Bandwidth** — 5, 10 & 20 MHz (1.25*, 2.5*)
- **Encryption** — DES Standard, AES 128/256 Optional
- **Frequency Stability** — 1 PPM over temp -40° - +85° C
- **Tuning Step Size** — 1KHz
- **Data Rates** — 85 Mbps UDP & 70 Mbps TCP
- **Error Correction** — 1/2, 2/3, 3/4, 5/6
- **Antenna Processing** — Spatial Multiplexing, Space-Time Coding, RX Eigen Beam Forming
- **No. of Spatial Streams** — 1-4
- **No. of Antennas** — 4
- **Total Power Output** — 10mW – 1 W (variable)

Performance

- **Latency** — 7ms average
- **Sensitivity** — Varies with MCS index

Maximum = -102 dBm (5MHz BW, MCS 0)

Frequency Band Specifics

Please note, this table reflects standard frequency bands available, additional bands are frequently added as demands dictate. If your band of interest is not listed, please contact your sales person. (All bands listed in MHz)

Low Band		High Band	
UHF	400-450	**Low C Band**	4400-4700
ISM 900	902-928	**High C Band**	4700-5000
L Band	1350-1390	**5.2GHz ISM**	5150-5250
Broadcast A	1980-2200	**5.8GHz ISM**	5727-5852
Broadcast B	2025-2110		
Federal 'S'	2200-2300		
ISM2400	2400-2483		
Federal 'S' + 2.4GHZ ISM	2200-2500		

Footnote: (*) in development

5. Web Interface

5.1 Getting Started

Connect a laptop to the StreamCaster radio using the supplied Ethernet cable and turn on the radio. Users can type "ping <IPaddress>" in order to determine whether the radio is fully booted. A web configuration will then be available by typing the radio IP address in a web browser. Please ensure that your laptop is on the same subnet as the radio (172.20.xx.xx by default). Users will be directed to the Basic Configuration page. (See **Figure 28**)

5.1.1 Basic Configuration

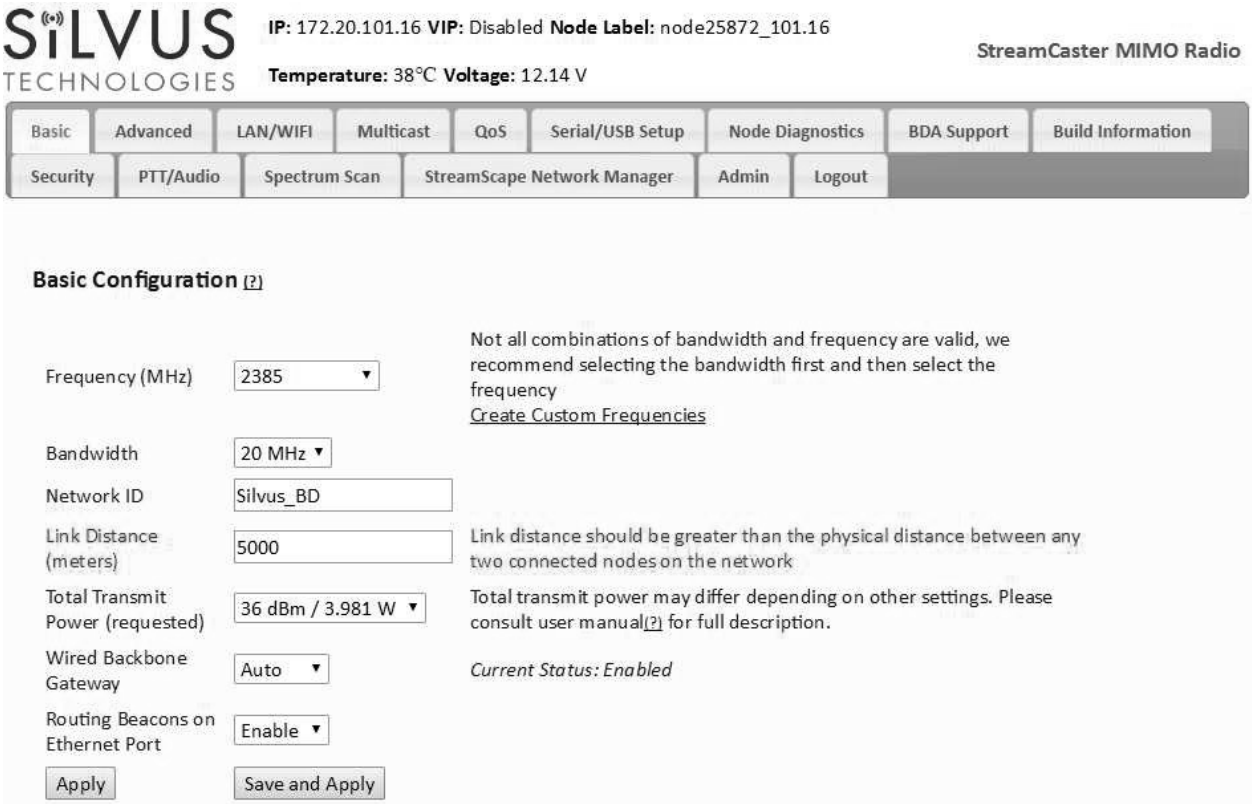


Figure 28 Basic Configuration Page

This page is used to set basic configurations. A brief description of each parameter is given below.

- **Frequency**: This defines the frequency of the signal. There is a drop-down menu for frequency selection. The frequency choices will vary depending on the StreamCaster

model(s) you are using. Please see Section 8 for "Custom Frequency Plan" access and installation instructions.

- **Bandwidth**: This defines the RF bandwidth of the signal.

- **Network ID**: Network ID allows for clusters of radios to operate in the same channel, but remain independent. A radio with a given Network ID will only communicate with other radios with the same Network ID. The Network ID is limited to alphanumeric characters, spaces, and the special character '-'. Character limit is 32 characters.

- **Link Distance**: Set to an approximate maximum distance between any two nodes in meters, e.g., 5000 for 5km (default). It is important to set the link distance to allow enough time for packets to propagate over the air. Failing to set the link distance to an approximate maximum distance can result in over the air collisions and a degradation of performance. It is recommended to set the link distance 10-15% greater than the actual maximum distance.

- **Total Transmit Power**: This defines the total power of the signal (power is divided equally between the radio antenna ports). There is also an option to 'Enable Max Power' which will allow the radio to push to the highest TX power it can support. This will be slightly different on each radio.

- **Wired Backbone Gateway**: This setting pertains to wired backbone functionality (See Section 7: Wired Backbone). For normal operation, set Wired Backbone Gateway to 'Auto'. If multiple radios will be connected to a wired backbone, all radios on the backbone should be set to 'Auto'.

- **Routing Beacons on Ethernet Port**: For radios to be able to communicate and transfer data over a wired link, routing information needs to be sent over the wireline. These packets are broadcast packets that are sent even if there is only one radio on the network. If wired backbone is not being utilized, the user can disable these routing beacons to prevent loading their local network with these routing packets.

- **Apply**: Apply the new values. Values will change back to the default setting after reboot.

- **Save and Apply**: Apply the new values and set the new values as the default.

5.1.2 Advanced Configuration

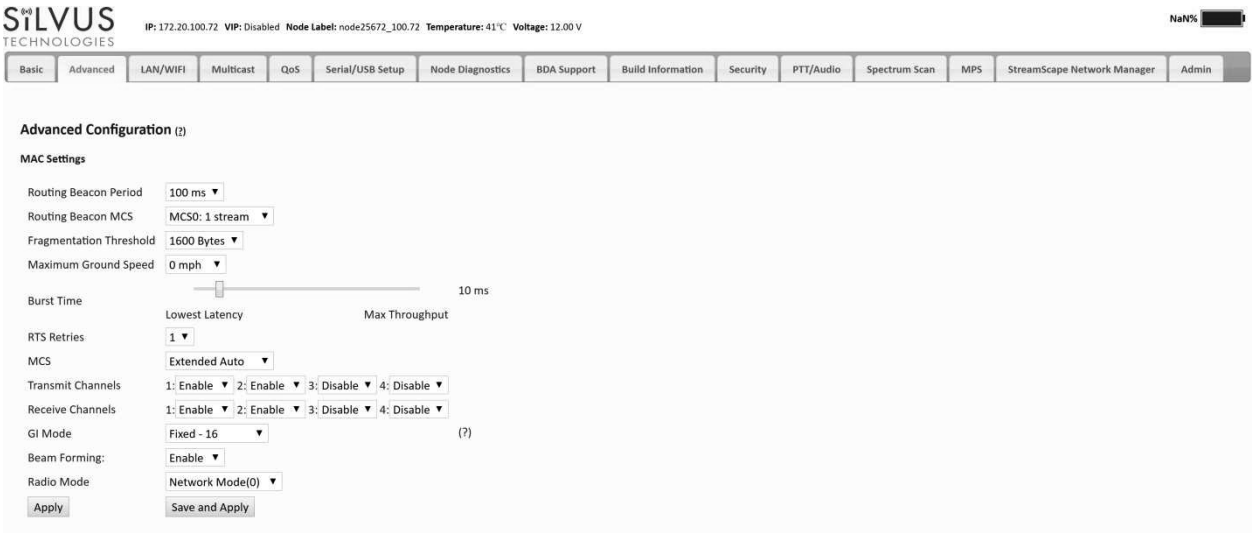


Figure 29 Advanced Configuration Page

This page is used to set the advanced settings. A brief description of each parameter is given below.

MAC Settings:

- **Routing Beacon Period**: Controls how often routing beacons are sent to other radios. A lower Routing Beacon Period results in faster reaction to topology changes. A lower Routing Beacon Period also adds more overhead to the network which scales with the number of nodes in the network. For larger networks, a larger Routing Beacon Period is recommended. Default value is 100ms.

- **Routing Beacon MCS**: Select the MCS that routing beacons are sent at. Higher MCS values require less network overhead and may be beneficial for larger networks. The drawback is that the link will break when the Routing Beacon MCS can no longer be supported.

- **Fragmentation Threshold**: Allows user to determine the minimum over-the-air packet size in bytes. Smaller packet size can improve performance in high mobility while a larger packet size will allow for more throughput. (1600 bytes default).

- **Maximum Ground Speed**: This setting improves performance in high mobility scenarios where the wireless channel may change rapidly. Setting this value to an unnecessarily high value may have an impact as high as 25 percent on overall achievable throughput.

- **Burst Time**: The burst time determines the maximum amount of time each node is allowed to transmit at once. A larger burst time will provide higher throughput at the cost of higher latency. On the other hand, a smaller burst time will provide less latency at the cost of less throughput.

- **RTS Retries:** A node wishing to send data initiates the process by sending a request to send message (RTS). The destination node replies with a clear to send (CTS) message. Any other node that receives the RTS or CTS message will refrain from sending data for a given time. In larger networks, there is a higher probability of collisions occurring when an RTS is sent out. This field defines the number of retries before a packet is dropped. A lower value will result in faster handoffs in mobile situations.

- **MCS**: Choose the modulation and coding scheme (MCS). If this is set as AUTO, the radio will dynamically cycle between a subset of the modes depending on the quality of the link. This is the recommended setting for most users and will provide the maximum data rate that the link can support. The EXTENDED AUTO mode includes 64QAM rate modes on top of those included in the AUTO mode. **Table 26** -
  Table 28 below show the estimated UDP data rate and sensitivity for each MCS. This table assumes a 20MHz bandwidth, 5000 meter link distance and 1600 byte fragmentation threshold.

- **Transmit Channels:** Allows user to Enable or Disable each channel on the radio for TX.

- **Receive Channels:** Allows user to Enable or Disable each channel on the radio for RX.

- **GI Mode:** This feature can be used to improve performance in environments where long delay spread is present and causing intersymbol interference (https://en.wikipedia.org/wiki/Intersymbol_interference). This setting allows the radio to vary its Guard Interval (https://en.wikipedia.org/wiki/Guard_interval) to allow for longer delay spread. When set to 'Extended Auto – GI', the radio will choose between the regular GI, and the user specified longer GI (Cyclic Prefix Length in the next setting) depending on channel conditions.
- **Beamforming (SC4200/SC4400 Only):** Enable or disable TX Beamforming (Up to 2X increase in range when enabled)

- **Radio Mode**: Switch between Network mode and PHY Diagnostics. If the value equals 0, it is in Network mode; if the value equals 1, it is in PHY Diagnostics. PHY Diagnostics mode is only relevant for users who wish to run diagnostic tests on the radio.
- **Apply**: Applies the new values but does not save them to flash.
- **Save and Apply**: Save the new values to flash and apply.

Modulation Modes and Receiver Sensitivity

- Note that listed sensitivity values were measured using a controlled and cabled setup. Actual results may vary by +/- 2dB. Table assumes link distance of 5000m. 10ms, 20ms, and 40ms burst time for 20, 10, and 5MHz bandwidth respectively. 1600 byte Fragmentation Threshold.
- * Modes supported under the AUTO MCS option.
- * Modes supported under the EXTENDED AUTO MCS option in addition to AUTO MCS modes.
- *Modes currently not supported

NSS	MCS	Coding Rate	PHY Throughput (Mbps)	UDP User Throughput (Mbps)	SC4400/3500/3800 Sensitivity	SC4200/3822 Sensitivity
1	0	BPSK 1/2	1.625	1.03	-102	-99
1	1	QPSK 1/2	3.25	2.06	-100	-97
1	2	QPSK 3/4	4.875	3.09	-97	-94
1	3	16-QAM 1/2	6.5	4.12	-95	-92
1	4	16-QAM 3/4	9.75	6.18	-92	-89
1	5	64 QAM 2/3	13	8.25	-87	-84
1	6	64 QAM 3/4	14.625	9.28	-85	-82
1	7	64 QAM 5/6	16.25	10.30	-80	-77
2	8	BPSK 1/2	3.25	2.06	-100	-97
2	9	QPSK 1/2	6.5	4.12	-97	-94
2	10	QPSK 3/4	9.75	6.18	-94	-91
2	11	16-QAM 1/2	13	8.25	-91	-89
2	12	16-QAM 3/4	19.5	12.38	-88	-85
2	13	64 QAM 2/3	26	16.21	-84	-81
2	14	64 QAM 3/4	29.25	17.62	-82	-79
2	15	64 QAM 5/6	32.5	18.94	-77	-74

Table 26 MCS vs. Sensitivity Chart (5MHz Bandwidth)*

NSS	MCS	Coding Rate	PHY Throughput (Mbps)	UDP User Throughput (Mbps)	SC4400/3500/3800 Sensitivity	SC4200/3822 Sensitivity
1	0	BPSK 1/2	3.25	2.48	-99	-96
1	1	QPSK 1/2	6.5	4.96	-97	-94
1	2	QPSK 3/4	9.75	7.40	-94	-91
1	3	16-QAM 1/2	13	9.90	-92	-89
1	4	16-QAM 3/4	19.5	14.80	-89	-86
1	5	64 QAM 2/3	26	19.90	-84	-82
1	6	64 QAM 3/4	29.25	22.40	-82	-80
1	7	64 QAM 5/6	32.5	24.0	-77	-78
2	8	BPSK 1/2	6.5	4.96	-97	-94
2	9	QPSK 1/2	13	9.90	-94	-91
2	10	QPSK 3/4	19.5	14.80	-91	-88
2	11	16-QAM 1/2	26	19.90	-89	-86
2	12	16-QAM 3/4	39	29.90	-85	-82
2	13	64 QAM 2/3	52	39.70	-81	-79
2	14	64 QAM 3/4	58.5	43.50	-79	-77
2	15	64 QAM 5/6	65	48.1	-74	-75

Table 27 MCS vs. Sensitivity Chart (10MHz Bandwidth)*

NSS	MCS	Coding Rate	PHY Throughput (Mbps)	UDP User Throughput (Mbps)	SC4400/3500/3800 Sensitivity	SC4200/3822 Sensitivity
1	0	BPSK 1/2	6.5	4.92	-96	-93
1	1	QPSK 1/2	13	9.82	-94	-91
1	2	QPSK 3/4	19.5	14.73	-91	-88
1	3	16-QAM 1/2	26	19.65	-89	-86
1	4	16-QAM 3/4	39	29.47	-86	-83
1	5	64 QAM 2/3	52	39.29	-82	-79
1	6	64 QAM 3/4	58.5	44.20	-80	-77
1	7	64 QAM 5/6	65	47.45	-78	-75
2	8	BPSK 1/2	13	9.82	-94	-91
2	9	QPSK 1/2	26	19.65	-91	-88
2	10	QPSK 3/4	39	29.47	-88	-85
2	11	16-QAM 1/2	52	39.29	-86	-83
2	12	16-QAM 3/4	78	57.04	-82	-79
2	13	64 QAM 2/3	104	75.00	-79	-76
2	14	64 QAM 3/4	117	85.00	-77	-74
2	15	64 QAM 5/6	130	94.00	-75	-72

Table 28 MCS vs. Sensitivity Chart (20MHz Bandwidth)*

****Sensitivity numbers reflect "typical" values. Actual sensitivity will vary by band.***

5.1.3 LAN/WIFI Configuration

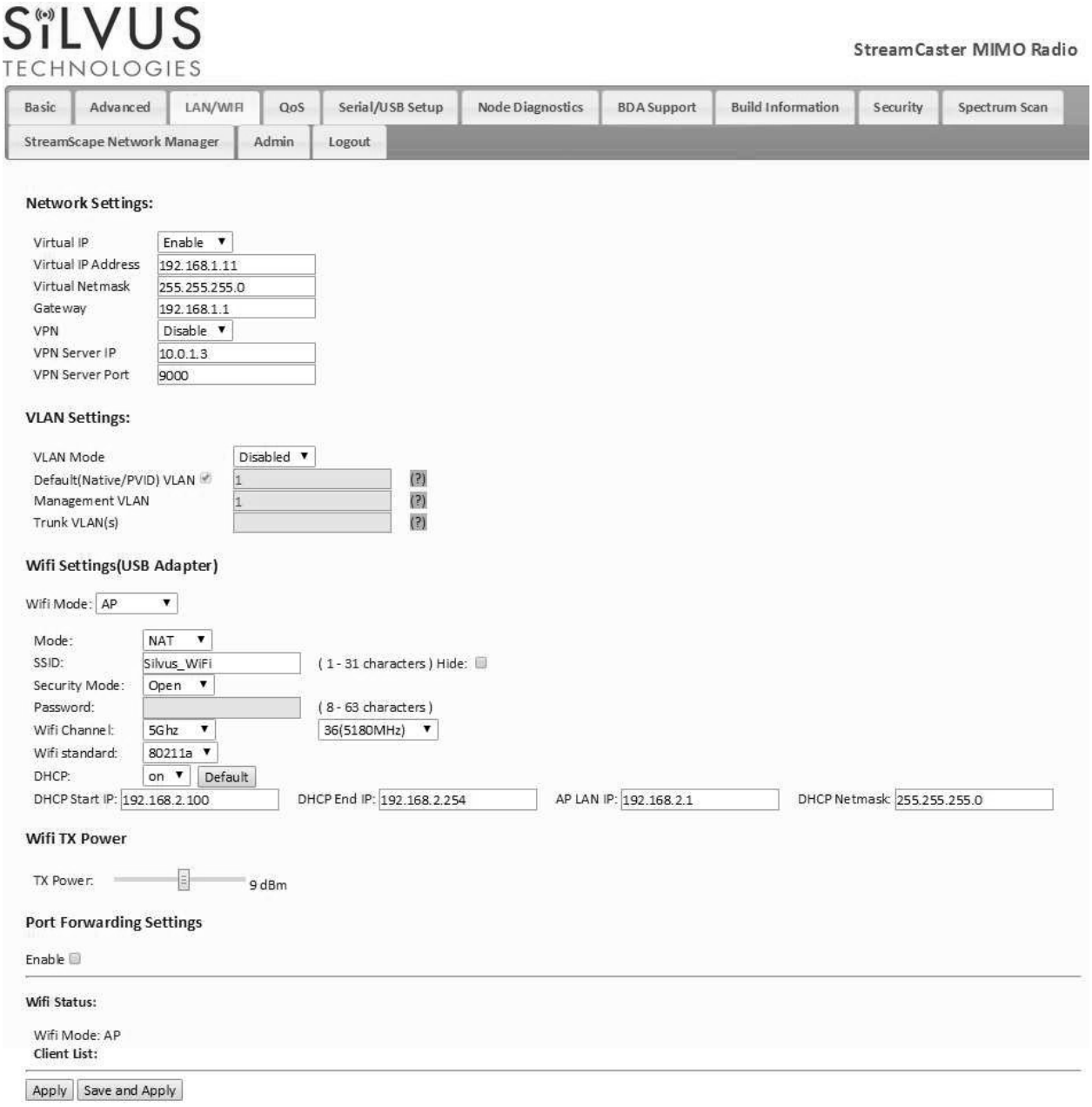


Figure 30 LAN/WIFI Configuration Page

Network Settings:

- **Virtual IP**: Enable or Disable the Secondary IP address for the radio.

- **Virtual IP Address**: Set the secondary IP address for the radio. The user may set this to be on the user's IP network, e.g., 192.168.2.10. Once this secondary IP address is set, the user may access the radio web page using either the native IP address or the secondary IP address. Please note that the secondary IP address should NOT be on the 172.20.xx.xx subnet.

- **Virtual Netmask**: Netmask for the Secondary IP address, e.g. 255.255.255.0.

- **Gateway:** Gateway for local network to allow radio to connect to the internet

- **VPN:** For WAN wired backbone scenarios where radios from two different sites are connected via the internet, a public N2N server is needed to route the data. Here is an example of how to setup an N2N server on a server hosted by Amazon AWS running Ubuntu 12.04:

  Compile:

  git clone https://github.com/lukablurr/n2n_v2_fork ### downloads the code

  cd n2n_v2_fork

  export N2N_OPTION_AES=no

  make clean

  make

  Execute:

  ./supernode -l 9000 -v

  Server will be running on port 9000.

- **VPN Server IP**: IP Address of N2N VPN Server

- **VPN Server Port**: Port that the N2N VPN server is configured to listen on.

VLAN Settings:

VLANs allow users to segregate the Ethernet layer by assigning one or more VLAN IDs to the ports of a VLAN switch. Ethernet packets are only allowed to travel between ports that belong to the same VLAN. To allow concatenating multiple VLAN switches and/or a single physical interface residing on multiple VLANs, a VLAN ID can be inserted to the Ethernet packet header to indicate which VLAN the packet belongs to. This is called VLAN Tagging. A packet that contains a VLAN ID is called a tagged packet. A port on a VLAN switch typically operates in either access mode or trunk mode.

- **VLAN Mode:** Specify 'Access' or 'Trunk' mode for the radio per the 802.1Q standard.
- **Default (Native/PVID) VLAN:** This is the VLAN associated with untagged packets entering the radio. The virtual IP of the radio is available on this VLAN. This is for Access mode only.
- **Virtual IP VLAN:** Virtual IP of the radio will be available on this VLAN. This is for Trunk mode only.
- **Management VLAN:** This is the VLAN used for radio management (e.g. routing and network management). All radios on the network should have the same management VLAN. The 172.20.xx.yy IP of the radio is available only on this VLAN.
- **Trunk VLAN(s):** This setting enables the trunking of VLANs when the radio is connected to an 802.1Q switch. If left empty, only the native and management VLAN traffic will be allowed. User may enter a comma separated list of VLANS, e.g. 4,5,6 or an arry of VLANs in the format of a:b:c where a and c are start and end, and b is step size, e.g. 4:1:7 translates to 4,5,6,7. Any combination of the above is allowed.

WiFi Settings:

Note: Use of this feature requires a Silvus USB-WiFi adapter. The WiFi settings will only display if the WiFi dongle is attached to the radio's USB port before it is powered on.

- **Wifi Mode**: Choose between AP, Client or Disabled. AP mode turns the WiFi dongle into a wireless AP. This mode is useful for connecting phones, tablets, laptops, etc. to the radio in order to pull up the web interface and access other devices in the mesh network. Client mode allows the radio to connect to another wireless AP. This mode is useful for connecting to wireless cameras and other devices which generate their own 'hotspot'. Once set to client mode, a list of detected wireless networks will be displayed with an option to connect.

- **Mode**: When set to AP, the wireless can be configured to be in Bridge Mode or NAT mode. In Bridge mode, the wireless interface is bridged with the Ethernet interface and the rest of the mesh. This is the simplest mode as all data is transparent and at layer 2. NAT mode puts the WiFi wireless traffic on a LAN, and the rest of the Silvus mesh network on a WAN. In effect, this means that a device connected wirelessly via the NAT AP will be able to find any device in the larger mesh network, but not vice versa. NAT mode is recommended for more advanced users who wish to be able to segregate data.

- **SSID**: Define the SSID for the wireless network. Must be between 1-31 characters. User also has the option to prevent the AP from broadcasting it's SSID by checking the 'Hide' box.

- **Security Mode**: Determines whether the AP requires a password to connect.

- **Password**: If 'Security Mode' is set to 'Secure', a password between 8 and 63 characters must be set.

- **Wifi Channel**: The Silvus USB-Wifi adapter supports 20 different Wifi channels in both the 2.4GHz and 5GHz frequency ranges. It is recommended to set the Wifi channel to a frequency that has maximum separation from the mesh network frequency. (i.e. if mesh network is operating at 2.4GHz, it is recommended to set the Wifi frequency somewhere in the 5GHz range). Note that not all user devices support 5GHz Wifi.

- **Wifi Standard**: Specify 802.11b or g wifi standard. Some legacy devices may not be able to connect to an 802.11g network.

- **DHCP**: When enabled, the USB-Wifi adapter will assign IP addresses to connected devices. Note that when the AP is set to 'Bridge' mode, the DHCP will be delivered to the entire mesh. Users should be careful to make sure there is only one DHCP server connected into the mesh network to avoid any conflicts. When DHCP is enabled, the DHCP parameters must be set.

- **Wifi TX Power**: This slider can be used to control the Wifi TX power from 0dBm (1mW) up to 17dBm (50mW).

- **Wifi Status**: Provides status information of the wifi adapter. A list of connected clients will also be shown here.

- **Port Forwarding (NAT Mode Only)**: When in NAT mode, devices on the larger mesh will not be able to locate devices connected to the wireless adapter. This can be overcome by mapping port forwarding for specific data streams.

- **Apply**: Applies the new values but does not save them to flash.

- **Save and Apply**: Save the new values to flash and apply.

5.1.4 Multicast

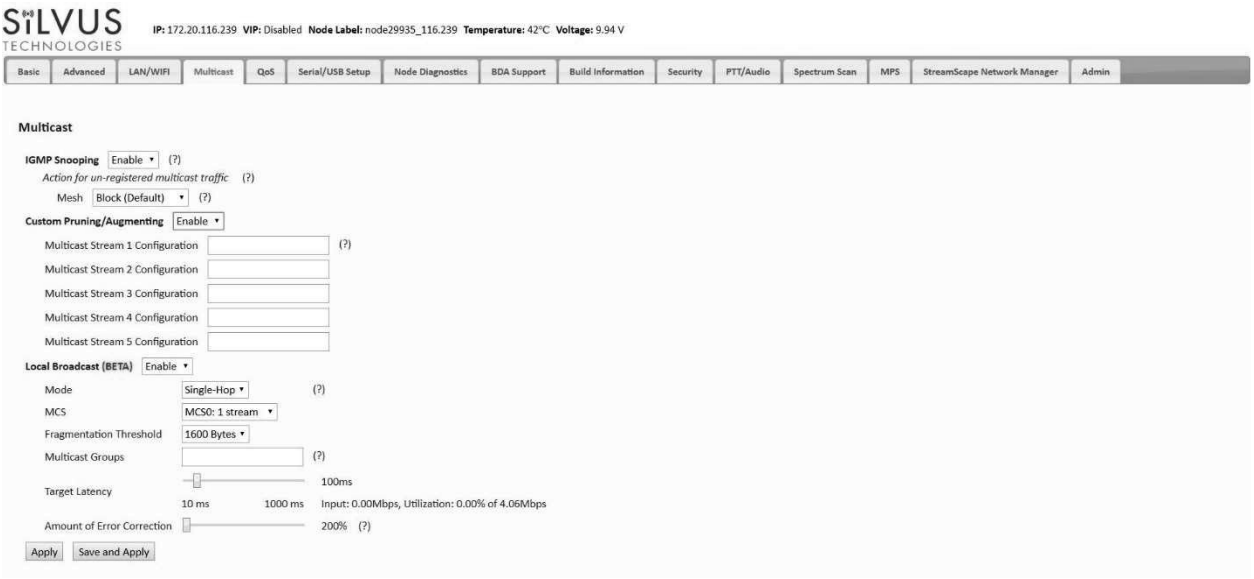


Figure 31 Multicast Configuration Page

- **IGMP Snooping**: Enable or Disable IGMP Snooping for Multicast traffic
- **Mesh**: This option controls default behavior for local and mesh multicast traffic that has no IGMP snooping entries. If set to 'Block', all unregistered multicast traffic will be block. If set to 'Send to All', all unregistered multicast traffic will be sent to all radios.
- **Custom Pruning/Augmenting**: Enable or Disable the Multicast group. The format for the field is Multicast_ip_address, receiver_id1, … receiver_idn If IGMP snooping is disabled, multicast traffic will only be forwarded to the radios in this list. If enabled, multicast traffic will only be forwarded to radios in this list that have client devices requesting this traffic. Traffic may be forced to go to a radio by adding the node with postfix "+". Traffic may be prevented from reaching a radio by adding postfix "-". (e.g. 224.50.50.50 1234, 1235-, 1236+) If receiver_id is -1, it will stop multicast traffic for this group.

Multicast Pruning Examples:

Data for multicast group 224.50.50.51 will be received only by radios with node-ids 1131 and 1261:

224.50.50.51, 1131, 1261

Data for multicast group 224.50.50.51 will be discarded at the transmitter and not put on the air:

224.50.50.51, -1

- **Local Broadcast**: Enable or Disable the Local Broadcast feature. The local broadcast mode can be either single-hop or multi-hop. In single-hop mode, multicast traffic will be transmitted to all radios reachable in a single hop. Traffic will terminate at these nodes. In multi-hop mode, multicast traffic will reach all radios in the mesh, subject to IGMP/custom pruning if applicable. MCS, and fragmentation threshold must be designated for these transmissions. Multicast Groups is a list of multicast IPv4 addresses separated by comma (,), e.g. 224.50.50.50, 224.50.50.51. Traffic for these multicast groups will be sent using Local Broadcast. Target latency will make the node wait for the time set in parameter and collect all data and construct forward error correction packets to send out. Higher latencies are better since the low density parity check code can generate more robust codes resulting in better error correction on the receiver. Amount of Error Correction is the amount of additional error correction packets sent along with the data packets.

5.1.5 Quality of Service (QoS)

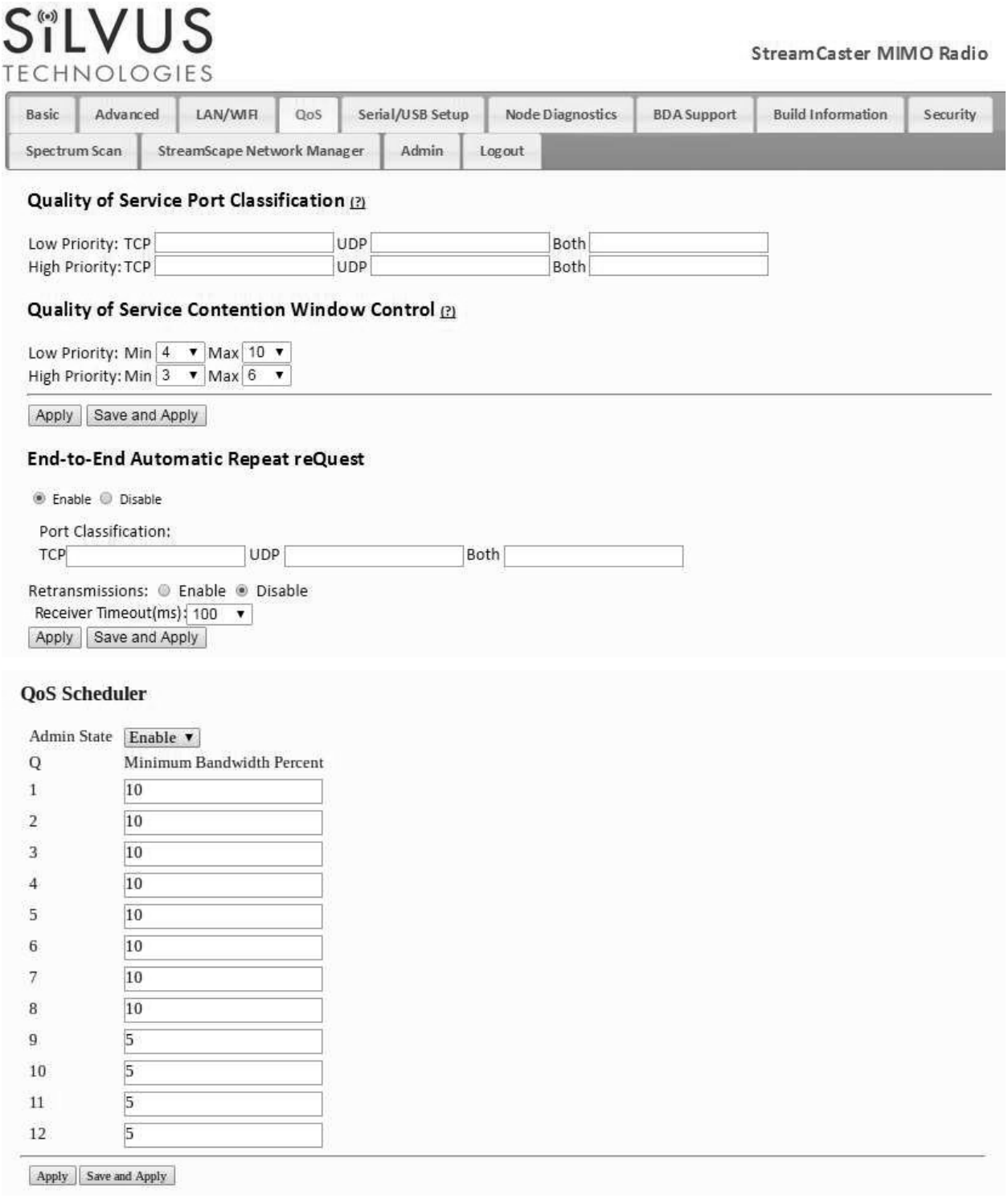


Figure 32 Quality of Service (QoS) Configuration Page

Quality of Service Port Classification:

The Quality of Service configuration page allows the user to make a distinction between low and high priority traffic transmitted through each radio. High priority traffic will always jump to the front of the queue and bypass any awaiting low priority traffic. In instances where the link cannot support the amount of data trying to be transmitted, low priority traffic may be completely shelved in order to ensure that the high priority traffic gets through.

To specify Low/High priority traffic, the user needs to simply input the port number that the traffic will be arriving on. Multiple ports of the same priority can be separated by a comma (i.e. 5001, 6001, 6002). Alternatively, the user can specify a range of ports using a dash (i.e. 5001-5006). Any combination of commas and dashes will work as well (i.e. 5001, 6001-6007, 8000). Any field can be cleared by removing the text and clicking 'Apply' or 'Save and Apply'. If unspecified, traffic is treated as Low Priority.

Quality of Service Contention Window Control:

The Quality of Service Contention Window Control tunes the aggressiveness of CSMA backoffs when collisions occur. The MAC takes random backoffs in the range [0, 2^cw_min]. Every time there is a collision/noise it will increase this cw_min by 1, until it is capped by cw_max.

E.g. 4,10 translates to random backoffs in the range [0,16] in the beginning for a packet. If the first try results in a collision, it will pick another backoff in the range [0,32], then [0,64], until [0,1024]. After successful transmission, backoff is reset to [0,16]. The default is 4,10 for low priority, and 3,6 for high priority. For larger networks, it is recommended to increase the Low Priority minimum to reduce the chance of collisions occurring.

End-to-End Automatic Repeat request (Beta Feature – License Enabled)

The End-to-End ARQ feature provides packet re-ordering capability to the radio. This feature is useful in applications that are sensitive to out of order packets (i.e. video applications where the decoder does not have the ability to re-order packets).

To enable packet reordering, specify the port number of the subject data in the same format as the QoS ports on the source and destination radio. The settings should match on both radios and do not need to be set on any relays.

Retransmissions Disabled – Only packet re-ordering with no end-to-end retransmissions if packets are lost. The receiver timeout is the length of time the receiver waits for out-of-order packets before giving up and delivering the data it has in its buffer. This is similar in concept to

the jitter buffer in common video decoders (e.g. VLC). The worst-case end-to-end delay will be incremented by the receiver timeout value.

Retransmissions Enabled – Packet re-ordering and end-to-end retransmissions enabled in case of packet loss. The retransmission timeout is the time the transmitter will wait before re-sending a lost packet. The worst-case end-to-end delay will be incremented by the retransmission timeout value.

Determining Timeout Value – Both receiver timeout and retransmission timeout should be set to roughly 3 times the end-to-end latency. The end-to-end latency can be found by disabling e2e and doing a ping between the transmitter and receiver.

QoS Scheduler (Beta Feature – License Enabled)

The Quality of Service (QoS) Scheduler feature provides a Hierarchical Token Bucket (HTB) scheduler. The scheduler prioritizes traffic based on the packets DSCP value. There are 12 queues in the scheduler; each with an assignable minimum bandwidth guarantee. First, the minimum guarantees are fulfilled for all queues waiting to transmit traffic out. If there is bandwidth remaining, it becomes available to highest priority traffic (lower number means higher priority) and it will take as much bandwidth as it needs to transmit out its data. Next, the remaining bandwidth will become available to the next lowest priority queue and so on. Traffic flows which map to the same priority will fairly share the available bandwidth using the Fair Queuing with Control Delay (FQ_CoDeL) scheduling algorithm. The feature is applicable to IPv4 and IPv6 untagged and tagged packets. Fragmented packets are not supported. Detailed below is the DSCP to queue/priority mapping.

Queue	Priority	DSCP	TOS	DSCP Name
1	0	0x30	0xC0	CS6
2	1	0x2E	0xB8	EF
3	2	0x28	0xA0	CS5
4	3	0x26	0x98	AF43
		0x24	0x90	AF42
		0x22	0x88	AF41
5	3	0x20	0x80	CS4
6	4	0x1E	0x78	AF33
		0x1C	0x70	AF32
		0x1A	0x68	AF31
7	4	0x18	0x60	CS3
8	5	0x16	0x58	AF23
		0x14	0x50	AF23
		0x12	0x48	AF23
9	5	0x10	0x40	CS2
10	6	0x0E	0x38	AF13
		0x0C	0x30	AF12
		0x0A	0x28	AF11
11	6	0x00	0x00	BE
12	7	0x08	0x20	CS1

Admin State – Enables and disables the scheduler.

Minimum Bandwidth Percent – Sets the minimum bandwidth guarantee for the queues as a percentage of the link rate. The sum of the minimum bandwidth guarantees cannot exceed 100% of the link rate.

5.1.6 Serial/USB Setup

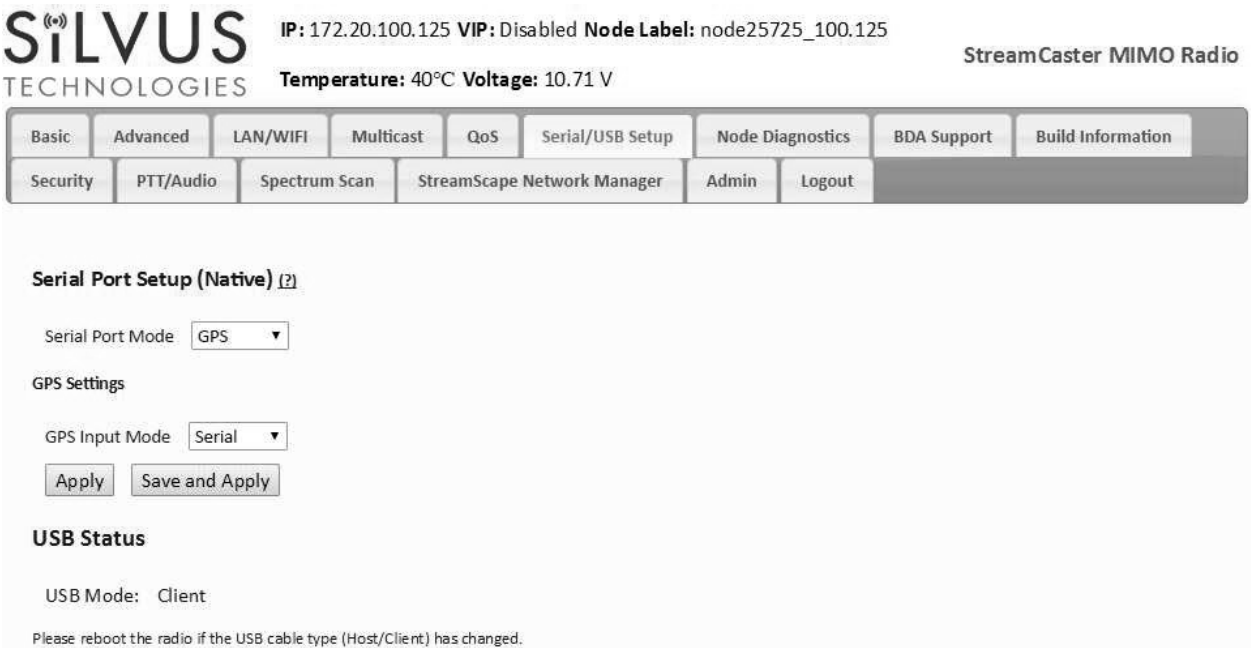


Figure 33 Serial/USB Setup Configuration Page

Serial Port Setup:

Each StreamCaster is equipped with one user configurable serial port. A special power cable and null modem cable are required for access to the radio's serial port. A brief description of each parameter is given below.

- **Serial Port Mode**: The user can select one of four available modes for the serial port: *GPS, RS232, Debug,* and *Disabled*.

    - ***GPS***: In GPS mode, an external serial GPS module can be connected to and powered from the serial port of the radio. A gpsd service daemon running on the node will make the GPS information available to any user on the network from TCP/IP port 2947. For more information on gpsd please see: http://catb.org/gpsd/

      In addition, GPS information can be pushed to the radio via the Ethernet or pulled by the radio from a remote device. If using a remote device to obtain GPS, set the GPS mode to remote, the GPS Server IP to the IP address of the remote device, and the Port. The radio will try to connect via TCP to server on local subnet. It will expect data in GPSd format. If GPS information is pushed to the radio via Ethernet, the radio will listen on specified port and expect GPS data as NMEA Formatted UDP packets.

- ***RS-232***: The RS-232 mode provides a wireless serial connection between any two serial devices connected to StreamCaster radios on the network. In this mode, the user must configure the RS-232 protocol parameters shown in **Figure 33** above. The transport protocol for the serial data can be set as either TCP or UDP. For data that is sensitive to latency such as command and control data, UDP is recommended. For data that cannot tolerate any data loss, such as telemetry data, TCP is recommended.

    - The Peer IP should be the IP address of the radio on the other end of the RS-232 communication.
    - The Peer IP can be the native or virtual IP address, but must be consistent at both ends.
    - Baud rate must match the baud rate of data being sent from the device.
    - Note – An additional 'null modem' cable may be needed at either end, depending upon whether connected device is acting as a terminal or as a control (DTE or DCE)

- ***Debug***: The debug mode is used to gain terminal access to the StreamCaster radio and is available for debug or interface purposes (API commands). The user's terminal client should be set to a baud rate of 115200 for console access to the radio.

- ***Disabled:*** This mode completely disables the serial terminal of the radio.

- **Apply**: Apply the new values but does not save them to flash.
- **Save and Apply**: Save the new values to flash and apply.

USB Status (3822/4200/4400):

The USB port on the 3822/4200/4400 can auto-detect whether the connected device is a USB host or client device. The USB cable should not be unplugged while the radio is running.

5.1.7 Node Diagnostics

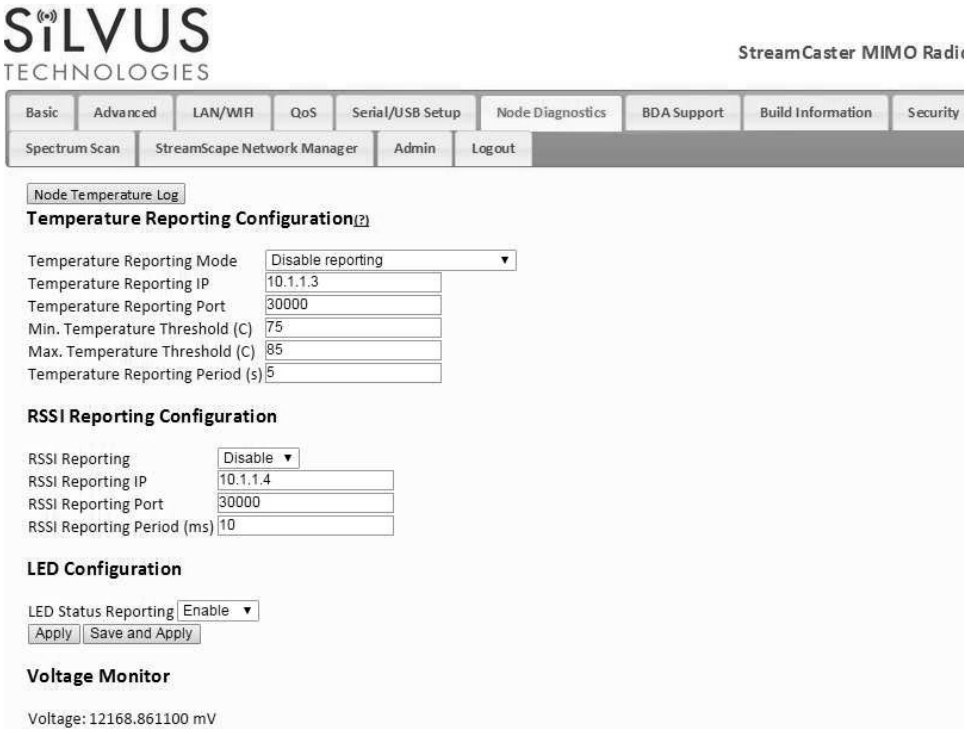


Figure 34 Node Diagnostics Configuration Page

The Node Diagnostics page allows the user to specify an IP and Port number for Temperature and RSSI (Receiver Signal Strength Indication) reports to be delivered to. This is useful for users that intend to feed this information into some other platform for analysis and recording. Section 8 gives more information on the format of streaming reports.

Temperature Thresholds:

In addition to receiving temperature reports, this page can be used to set minimum and maximum temperature thresholds for the radio. The StreamCaster™ family of radios is equipped with on board temperature sensors which are monitored to prevent overheating. Once a radio reaches the maximum temperature threshold, the radio will begin to reduce its transmission time until the temperature falls below the minimum temperature threshold. By default, the min and max values are 75C and 85C respectively.

RSSI Reporting Configuration

This setting allows the users to report the RSSI values every few milliseconds base on users setting.

LED Configuration:

This setting allows the user to disable or enable the LED on the faceplate of the radio.

Voltage Monitor:

Radios built on or after Jan 1, 2015 have the ability to monitor the input voltage, displayed here.

5.1.8 BDA Support

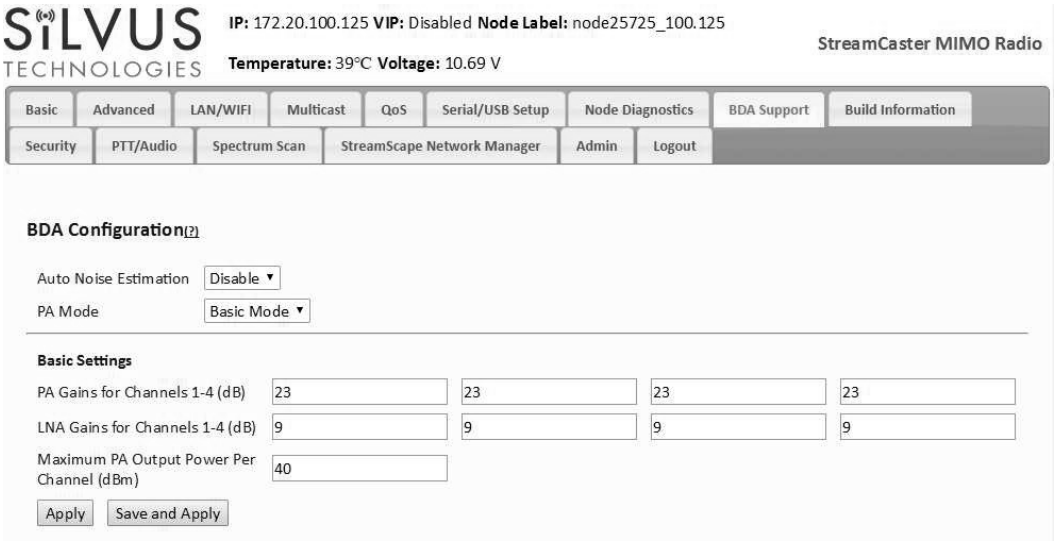


Figure 35 BDA (Bi-Directional Amplifier) Support Configuration Page

The BDA Support page is used to configure the radio to work with an external bi-directional amplifier. These settings should be configured before connecting the amplifier to the radio.

- **Auto Noise Estimation:** When enabled, the radio can automatically estimate the noise in the channel, including any amplification due to the external amplifier. It is preferred that this remain disabled and the LNA gain values be manually input further below, but if the LNA gain values are not known, this can be used instead.

- **PA Mode**: Either set to "No PA" when there is no amplifier present or "Basic Mode" when using an external amplifier.

Basic Settings:

- **PA Gains for Channels 1-4**: Enter the gain (dB) for the power amplifier connected to each channel of the radio.

- **LNA Gains for Channels 1-4**: Enter the gain (dB) for the LNA connected to each channel of the radio.

- **Maximum PA Output Power Per Channel (dBm)**: Enter the maximum output power for each PA.

- **Apply**: Apply the new values but does not save them to flash.

- **Save and Apply**: Save the new values to flash and apply.