WARRIERTECH

Limitless GNSS Data Sheet

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DOCUMENT HISTORY

Version	Description	Author	Date
A	Initial Release	Arjun Warrier	26 Aug, 2022
B	Added PuTTY screens	Arjun Warrier	30 Sep, 2022

1 OVERVIEW

The LIMITLESS GNSS is a satellite modem solution consisting of the 9523N L-Band Transceiver (LBT) from Iridium® paired with a high accuracy Global Navigation Satellite System (GNSS) receiver. The key features of the LIMITLESS GNSS are,

- One DB15 connector for power, data, and control
- RS232 communication interface
- Single pin mode control for Iridium or GNSS
- Wide supply voltage range (7– 24 VDC)
- Transient and reverse voltage protection
- Integrated SIM card holder
- Screw mountable aluminum enclosure
- Small solution size (4.8L x 2.6W x 1.3H inch)
- SMA antenna connectors

When configured as an Iridium device, in addition to Short Burst Data (SBD) capabilities, the modem offers large data transfer capabilities including Circuit Switched Data (CSD) and Router-Based Unrestricted Digital Internetworking Connectivity Solutions (RUDICS). In GNSS mode, the modem streams navigation data from the receiver over the serial port according to the National Marine Electronics Association (NMEA) protocol.

Figure 1: Limitless GNSS

2 SPECIFICATIONS

Key operational specifications* of the LIMITLESS GNSS is provided in Table 1.

Table 1: Limitless GNSS Specifications

Parameter	Min	Typ	Max	Unit
Input Voltage (V_{in})	7	-	24	VDC
Average Current @ V_{in} = 12 VDC (Iridium mode)**		70		mA
Average Current @ V_{in} = 12 VDC (GNSS mode)		18		mA
Peak Transmit Current @ 12VDC		2	3	A
GNSS Active Antenna Voltage		3.3		VDC
GNSS Active Antenna Current Limit		50		mA
Operating Temperature	-30	-	70	°C
Operating Humidity	0	-	75	%RH

* Unless otherwise noted, specifications of the Iridium 9523N apply to this device.

** Not inclusive of peak transmit pulses of 8.3 ms every 90 ms.

2.1 Modem Pinout

The LIMITLESS GNSS features a DB15 male connector that enables all power, communications, and control signals to be on the same physical interface. The pinout of the connector is described in Table 2.

Table 2: Limitless GNSS Pinout

DB15 Pin#	Name	Function	Description	I/O Direction
1	VIN	Power Supply Input	7-24 VDC	
2	VIN	Power Supply Input	7-24 VDC	
3	GND	Power Supply Return		
4	IRD_CTRL	Iridium Transceiver Select	Pull Down or Input Control	Input
5	GND	Power Supply Return		
6	UART_DIN	UART Data Input	Data Into Modem	Input
7	UART_DOUT	UART Data Output	Data From Modem	Output
8	GND	UART Signal Return		
9	ANT_DET_PWR	Antenna Detect Power	Wired to 9523N Pin 29	Output
10	FULL_PWR_EN	Enable Full RF Power	Wired to 9523N Pin 28	Input
11	PA_BOOST_EN	Enable Boost Convertor	Wired to 9523N Pin 33	Output
12	RI_EXT	UART Ring Indicator	Wired to 9523N Pin 20	Output
13	UART_RTS	UART Request To Send	Wired to 9523N Pin 21	Input

14	UART_DTR	UART Data Terminal Ready	Wired to 9523N Pin 22	Input
15	TX_ACTIVE	Iridium Transmit Active	Wired to 9523N Pin 31	Output

* The pin designation is defined as looking into the DB15 connector towards the LIMITLESS GNSS as a Data Communication Equipment (DCE).

2.2 Device Connections

The minimum configuration of the LIMITLESS GNSS uses 3-wire RS-232 communications. The minimum required wiring comprises of the power supply to the modem, serial communications and mode control line as shown in Figure 2.

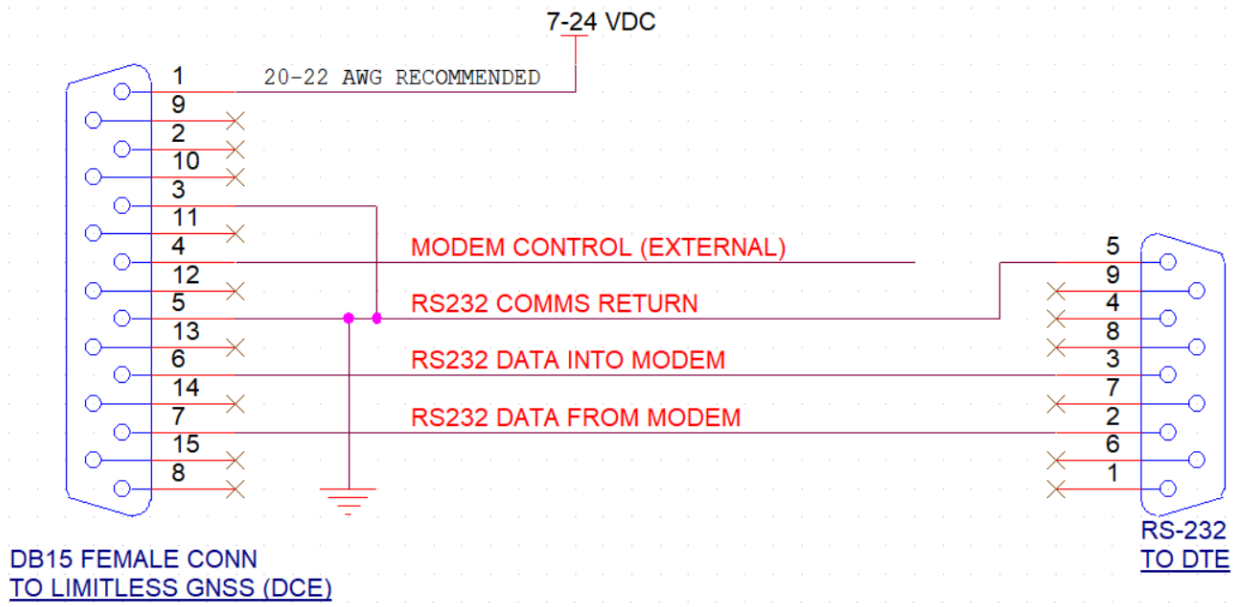

Figure 2: Minimum Wiring

2.3 Mode Selection

The LIMITLESS GNSS can be configured in two modes, either as an Iridium transceiver or a GNSS receiver. The mode selection is controlled externally via pin 4 of the DB15 connector and can be configured for pull-down control using an external relay or set for voltage input control. Internal on-board connector J11, shown in Figure 3 is used to select the control mode type. Shorting pins

1 and 2 will enable the pull-down control mode, while shorting pins 2 and 3 will enable the voltage control mode. The modem is set for pull-down control by default.

Pin 1 is identified by the inverted triangle shown in Figure 3. Once the mode control type is configured, pin 4 of the DB15 connector allows selection of either mode as described below.

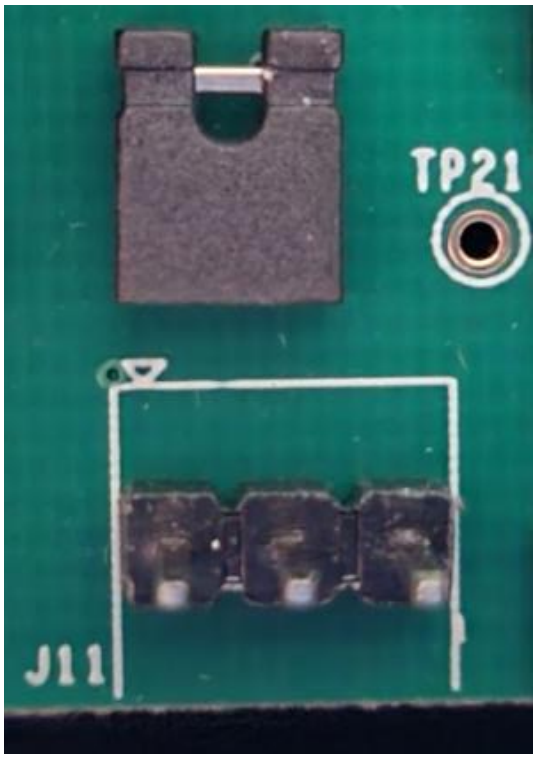

Figure 3: Mode Selection Type Jumper

2.3.1 Pull Down Control

In this control type setting, shorting pin 4 of the DB15 connector to ground reference of the LIMITLESS GNSS will set the modem as an Iridium transceiver. Floating pin 4 of the DB15 connector will set the modem as a GNSS receiver. This mode control type is intended for driving the modem control with small signal external relays. Contact rating of 3 VDC, 1 mA or higher is required for the relay.

Table 3: Pull-Down Control Mode Settings

Pin 4 Setting	Mode	Baud Rate (bps)
Short to Ground Reference	Iridium Transceiver	Auto-baud
Float	GNSS Receiver	115200

2.3.2 Voltage Control

In this control type setting, driving pin 4 of the DB15 connector with a voltage as described in Table 4 will set the modem as an Iridium transceiver. Driving pin 4 of the DB15 connector low will set the modem as a GNSS receiver. The drive must be able to source a minimum of 100 µA in this mode. This mode is intended for driving the modem control with external microcontroller I/O pins or similar.

Table 4: Voltage Control Mode Settings

Pin 4 Setting	Mode	Baud Rate (bps)
2 ≤ V ≤ 24 VDC	Iridium Transceiver	Auto-baud
0 VDC	GNSS Receiver	115200

2.4 Serial Data Interface

In Iridium mode, the RS-232 interface is switched to the 9523N transceiver which supports autobaud functionality. 115200 bps, 8 bit, No Parity, No Flow Control settings are recommended in this mode.

In GNSS mode, the RS-232 interface is switched to the GNSS receiver which operates only at 115200 baud. 8 bit, No Parity, No Flow Control settings are recommended in this mode.

2.4.1 PuTTY Screens

A terminal emulator tool such as PuTTY may be used to communicate with the modem using a PC. A USB to UART serial cable or similar that supports RS-232 voltage levels is required.

Sample screenshots of the modem in Iridium and GNSS modes are shown below. In these examples the baud rate is set to 115200 at the PC which is the Data Terminal Equipment (DTE). The modem which is the Data Communication Equipment (DCE) does not require any explicit communication configuration setting. The 9523N supports autobaud and the GNSS receiver outputs NMEA-0183 formatted messages at a rate of 115200 bps.

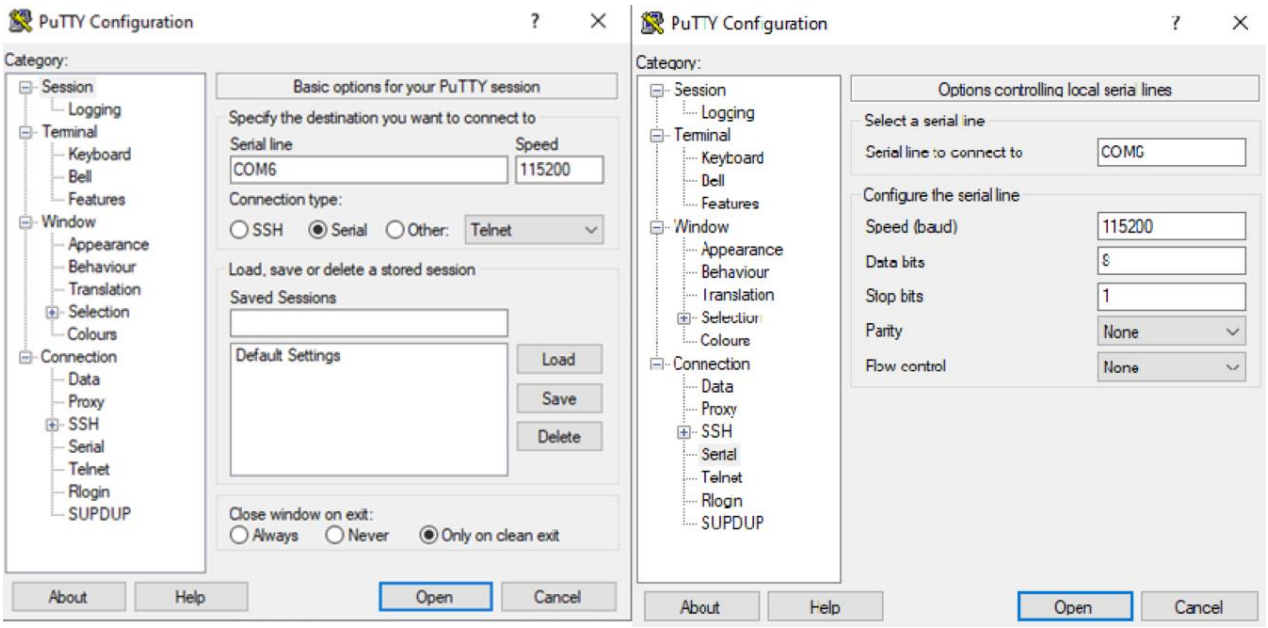

Figure 4: Serial Port Settings

2.4.1.1 Iridium Mode

In Iridium mode. the user can enter supported AT commands, as shown in Figure 5. Example below shows the 9523N's unique International Mobile Equipment Identity (IMEI) and SIM card Integrated Circuit Card ID (ICCID). They are typically 15 and 19 digit numbers.

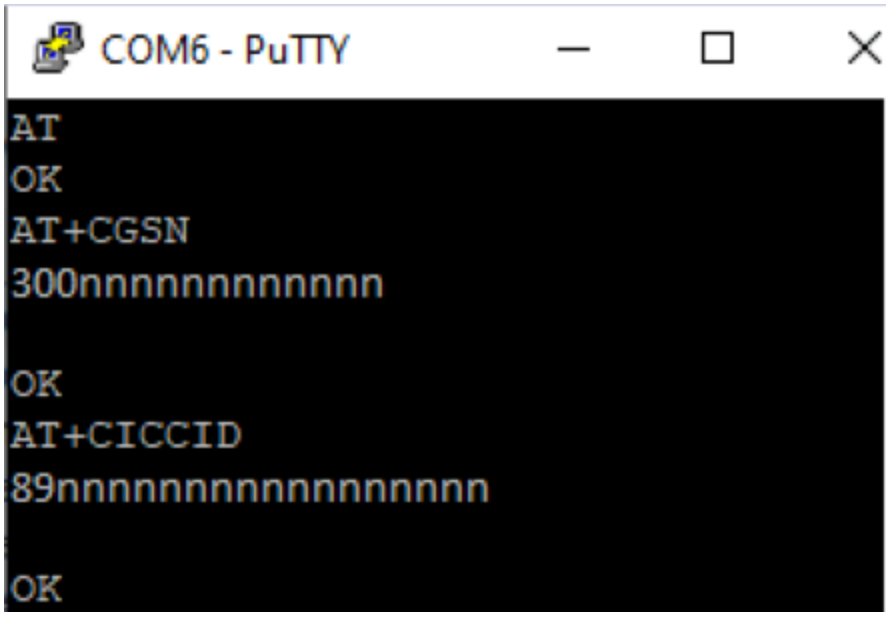

Figure 5: Iridium Mode Example

2.4.1.2 GNSS Mode

In GNSS mode. the user can view the GNSS NMEA-0183 formatted messages, as shown in Figure 6. The start of GNSS message streaming is indicated by the characters ST as shown in Figure 6.

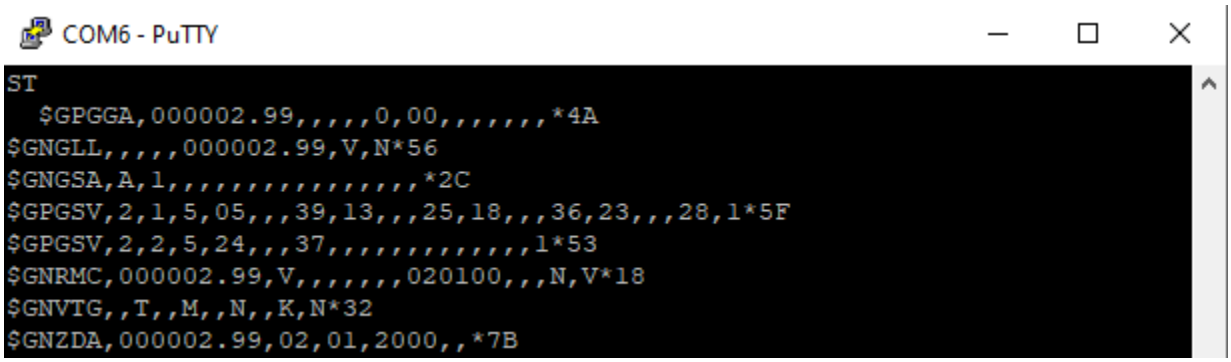

Figure 6: GNSS Mode Example

Once valid fix data is achieved as shown highlighted in Figure 7 and Table 5, the GNRMC message can be decoded to obtain time, date, position, course, and speed data.

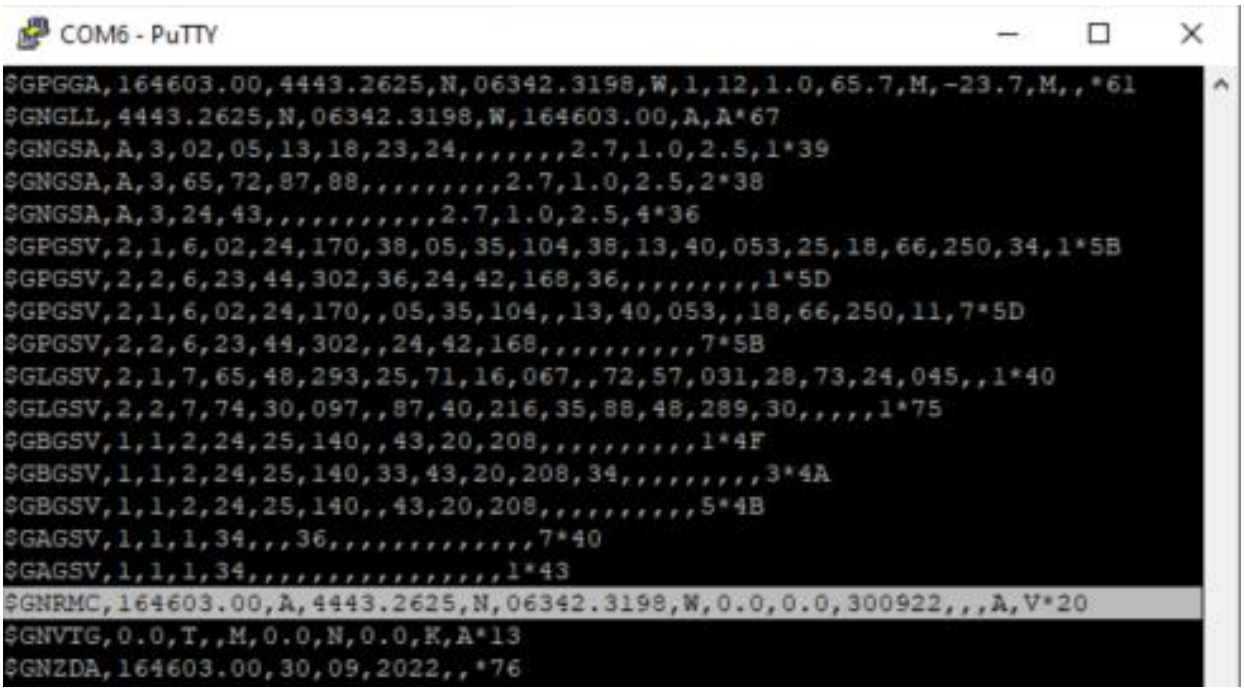

Figure 7: Mode Selection Type Jumper

Table 5: RMC Message Formatting

Field	Example	Comments
Preamble	$	Start of sentence
Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU (COMPASS) GA = Galileo GN = Global Navigation / Multi-constellation
Sentence ID	RMC	Recommended Minimum Specific GNSS Data
UTCTime	082653.100	hhmmss.sss (hours, minutes, seconds)
DataValidStatus	A	A = Data valid V = Navigation receiver warning (data invalid)
Latitude	2446.4768	ddmm.mmmm (degrees and minutes)
N/AIndicator	N	N = North, S = South
Longitude	12100.0344	dddmm.mmmm (degrees and minutes)
E/WIndicator	E	E = East, W = West
SpeedOverGround	0.00	Knots
CourseOverGround	128.42	Degrees true
UTCDate	270705	ddmmyy (day, month, year)
MagneticVariation		Degrees magnetic
MagneticVariation		E = East, W = West
ModeIndicator	A	A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid
NavStatus	S	(Support from NMEA version 4.10) S = Safe C = Caution U = Unsafe V = Invalid
End of Data Fields	*	Asterisk delimiter
Checksum	67	Two character hexadecimal value
Terminator	<CR><LF>	End of sentence sequence

2.5 Antenna Connectors

SMA type RF connectors are provided for both Iridium and GNSS antenna interfaces. The connector placement is as shown in Figure 8. Only one of the antenna interfaces is active in either mode of the device.

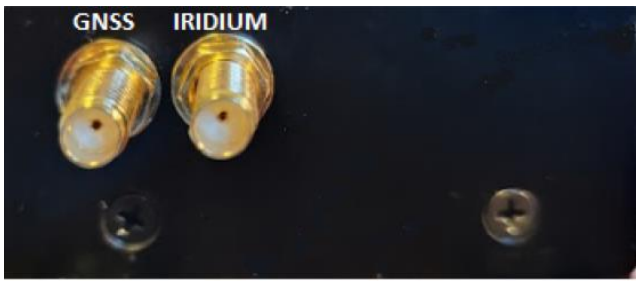

Figure 8: RF Connector Assignment

2.5.1 Iridium Antenna

Only passive Iridium antennas are supported. The antenna connector is directly wired to the RF port of the 9523N transceiver. Any lightning or transient protection devices must be installed outside the LIMITLESS GNSS modem.

2.5.2 GNSS Antenna

The GNSS antenna supports active antenna and provides 3.3 VDC at the connector. Care must be taken to limit current draw through the GNSS antenna port to less than 50 mA.

2.6 Mechanical Footprint

The mechanical footprint* of the LIMITLESS GNSS modem is shown in Figure 9. #6 mounting screws can be used for securing the modem using the mounting feet.

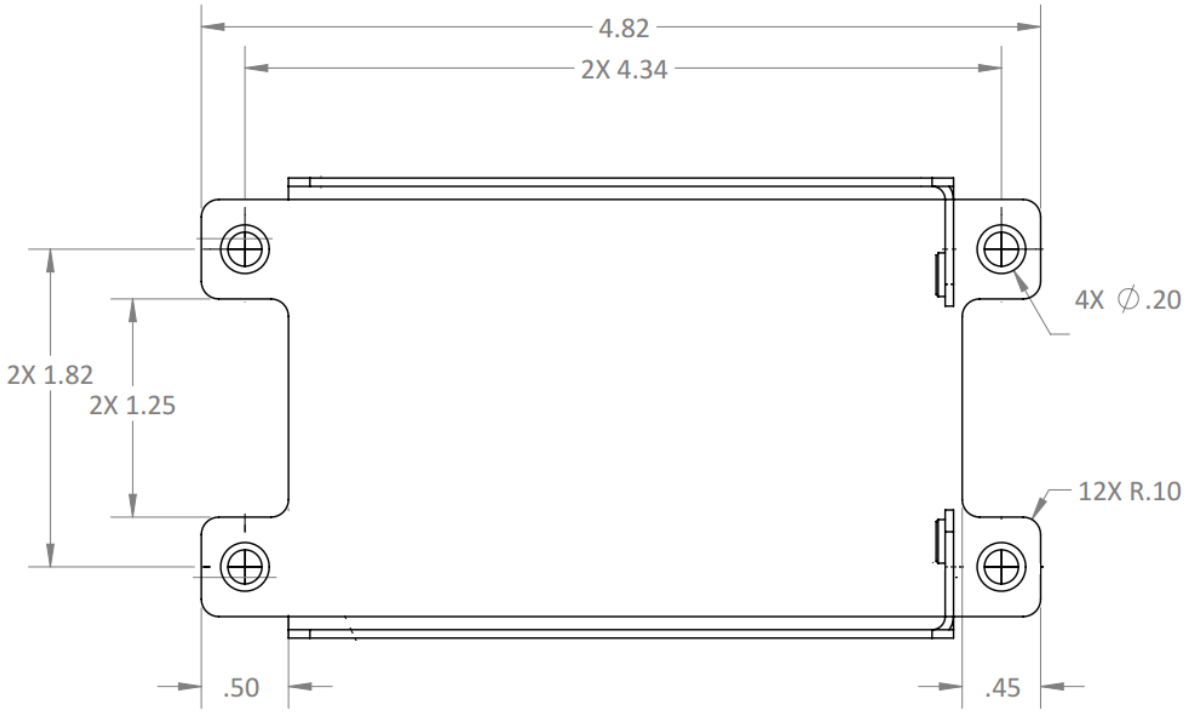

Figure 9: Limitless GNSS Mechanical Footprint

* Dimensions are in inches.