SL876Q5-A
EVK User Guide

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PRODUCT APPLICABILITY TABLE

PRODUCT
SL876Q5-A EVK

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1 INTRODUCTION

1.1 Purpose

The scope of this manual is provide product information for the SL876Q5-A Evaluation Kit (EVK).

1.2 Contact and Support Information

For general contact, technical support services, technical questions, and to report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com

Alternatively, use:
http://www.telit.com/support

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:
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Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.3 Text Conventions

Dates are in ISO 8601 format, i.e. YYYY-MM-DD.

Symbol	Description
	Danger – This information MUST be followed or catastrophic equipment failure and/or bodily injury may occur.
	Caution or Warning – This is an important point about integrating the product into a system. If this information is disregarded, the product or system may malfunction or fail.
	Tip – This is advice or suggestion that may be useful when integrating the product.

1.4 Related Documents

- SL876Q5-A Product User Guide

1.4.1 Related Documents Requiring a Non-Disclosure Agreement

- None

2 Evaluation Kit Requirements

To use the SL876Q5-A Evaluation Kit (EVK), you will need:

- USB Drivers (on the included flash drive)
- SiRFLive 2.07P4 or later (on the included flash drive)
- A PC with a USB port that fulfills the minimum software requirements:
  - Windows XP or later
  - NET Framework 2.0 (automatically installed by the SiRFLive package if necessary - internet connection is required).

3 Evaluation Kit (EVK) Description

3.1 EVK Contents

Figure 3-1 EVK photo

EVK Contents
Plastic case
USB cable
USB drive with software and documentation
Evaluation Board

Table 3-1 EVK Contents

3.2 SL876Q5-A Evaluation Board

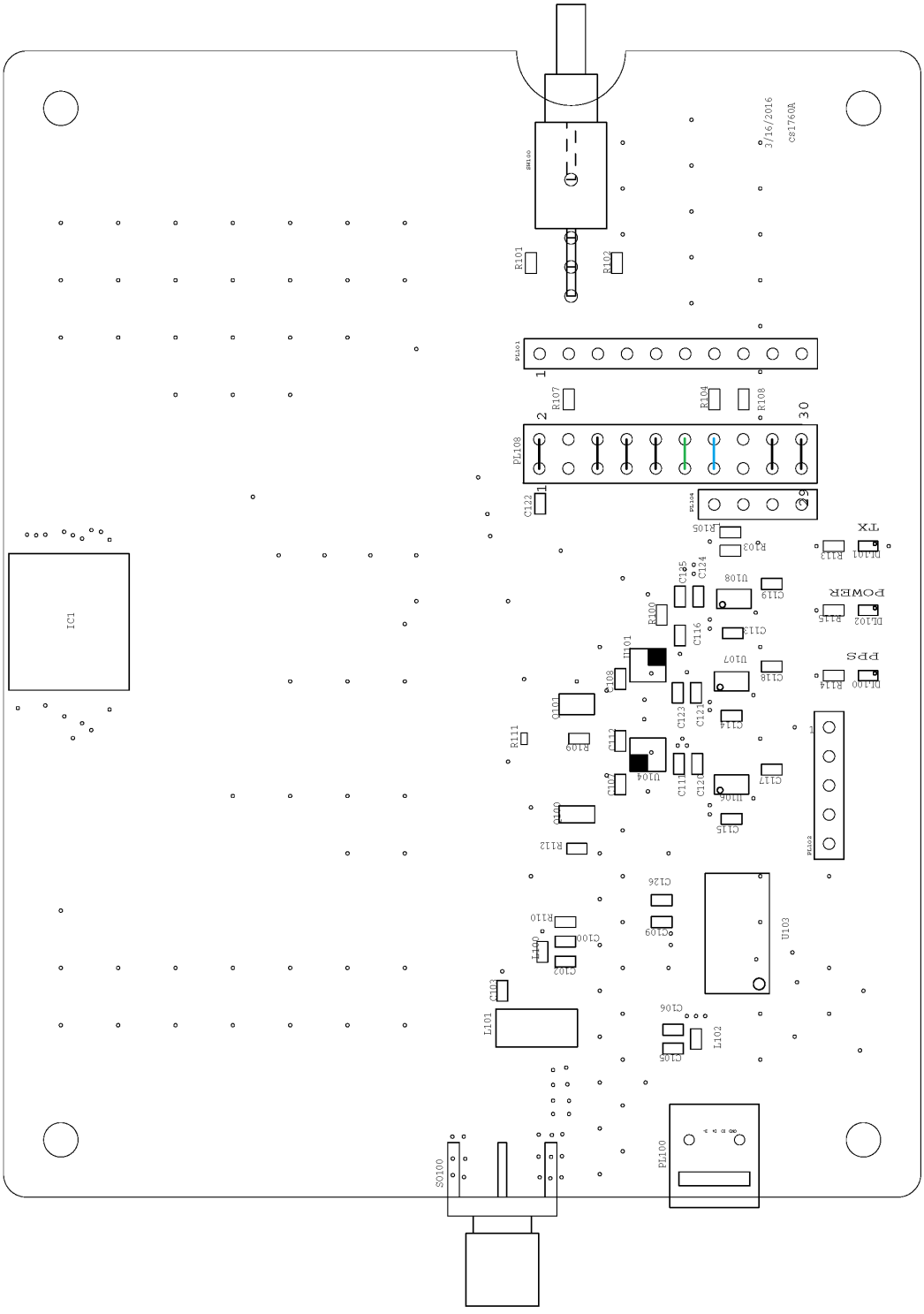
With default jumpers

Figure 3-2 SL876Q5-A Evaluation Board

3.3 SL876Q5-A Module

Figure 3-3 SL876Q5-A Module

3.4 Evaluation Board Layout



See **Table 3-5 PL-108 Pin Description** for jumper color code.

Figure 3-4 SL876Q5-A Evaluation Board Layout

3.5 Evaluation Board Component and Pin Identification

ID	Description
IC 1	SL876Q5-A Module (including chip antenna)
SO 100	SMA connector - External Antenna
SW 100	On-Off Toggle Switch Applies 1V8 to the Module On-Off pin
DL 100	LED – 1PPS output
DL 101	LED - TX data output
DL 102	LED – System ON output
PL 100	Mini USB connector – Power, ground, Tx, and Rx
PL 102	1 x 5 Header Pins
PL 104	1 x 4 Header Pins
PL 108	2 x 10 Header Pins
PL 101	1 x 10 Header Pins
See tables below for Header Pin descriptions	

Table 3-2 Evaluation Board Components

Pin	PL-102 Description
1	Ground
2	PL104-4 & 10 KΩ to 1V8 pullup
3	PL104-3 & 10 KΩ to 1V8 pullup
4	PL104-2
5	PL104-1

Table 3-3 PL-102 Pin Description

Pin	PL-104 Description
1	PL 102-5
2	PL 102-4
3	PL 102-3 & 10 KΩ to 1V8 pullup
4	PL 102-2 & 10 KΩ to 1V8 pullup

Table 3-4 PL-104 Pin Description

Pin	PL-108 Description	Pin	Description	For normal operation
1	V_{GPS}	2	module V_{CC} (module supply current)	Yes
3	module BOOT	4	10 KΩ pullup to 1V8	No
	Jumper these pins only if a “hardware” boot is required (e.g. if using SiRFflash). For SiRFlive re-flashing, do not jumper these pins.			
5	Enable 1V8	6	V_{USB}	Yes
7	Enable $3V_{ALT}$	8	V_{USB}	Yes
9	Enable V_{GPS}	10	V_{USB}	Yes
11	V_{ANT} (Antenna Voltage Supply)	12	$3V_{ALT}$ controlled by LNA Enable	Option
13	module GPIO6	14	10 KΩ pullup to 1V8	UART - Yes
15	module GPIO7	16	10 KΩ pulldown to Ground	UART - No
17	USB RXD	18	module TX	Yes
19	module RX	20	USB TXD	Yes

Table 3-5 PL-108 Pin Description

Pin	PL-101 Description
1	1V8
2	module 1PPS pulse output (level translated)
3	module SDA (GPIOB)
4	module SCL (GPIOC)
5	module nExternal Ant Enable (input) Connect to ground (e.g. pin 9) to enable an external antenna.
6	N C
7	module GPIOA
8	module nRESET
9	Ground
10	N C

Table 3-6 PL-101 Pin Description

3.6 Evaluation Board Schematic Diagram

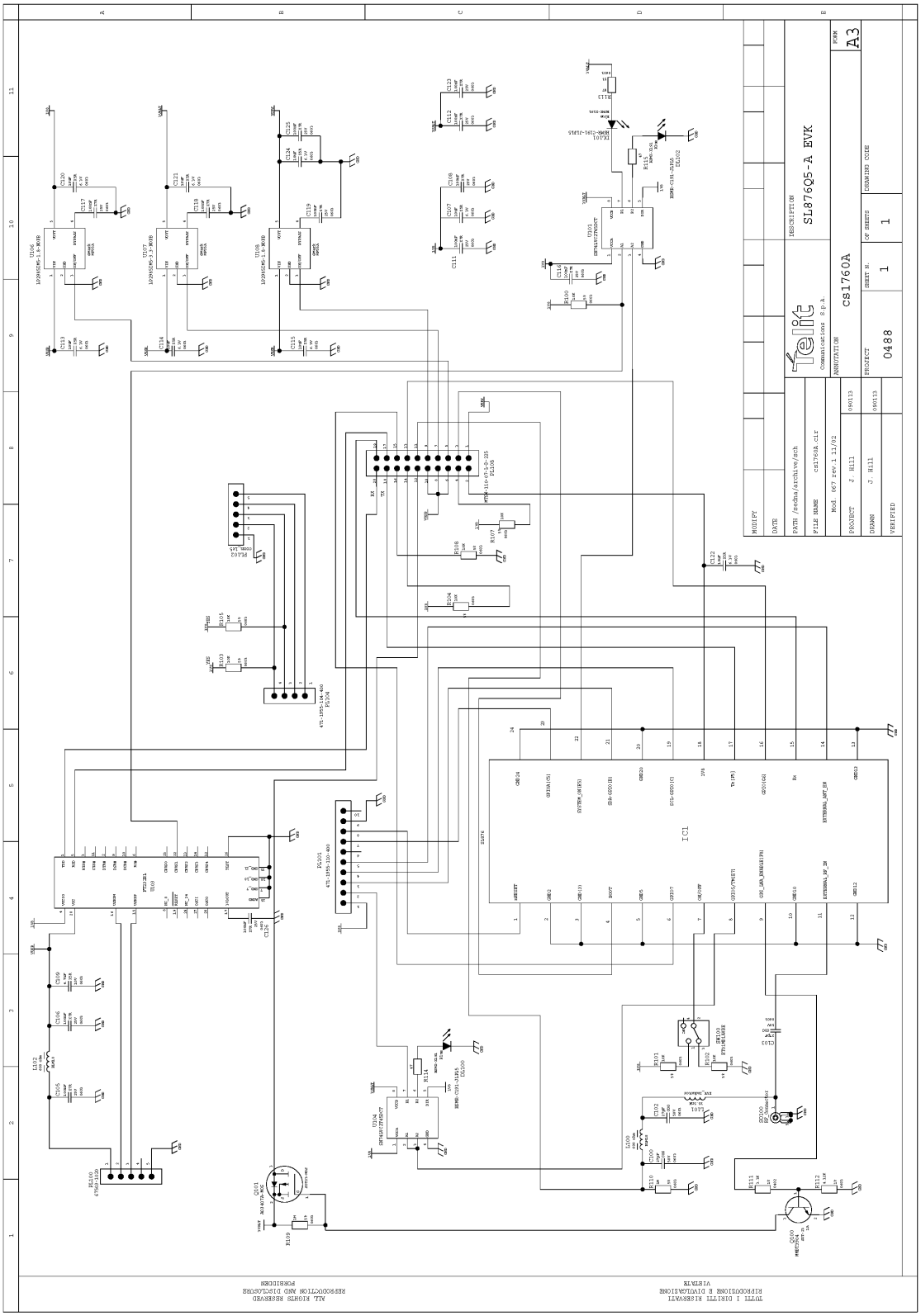


Figure 3-5 SL876Q5-A Evaluation Board Schematic Diagram

4 Evaluation Kit Setup

4.1 Installing the USB Drivers

Before connecting the SL876Q5-A Evaluation Kit, install the necessary USB drivers.

- Double-click the USB driver executable CDM v2.12.00 WHQL Certified.exe, and follow the directions to install the USB drivers.

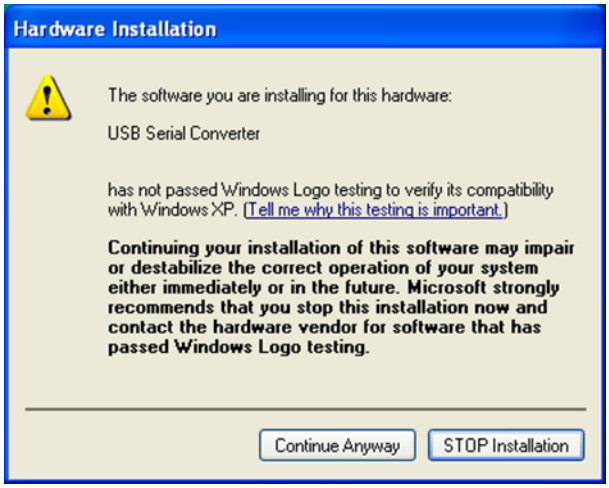


Figure 4-1 USB Driver Installation

- Click “Continue Anyway” to install the USB COM port driver
- When the EVK board is connected to a personal computer USB port, the driver will create a COM port.
- Use the Windows “Device Manager” to check the identification of the new COM port. This port identification is necessary for EVK tools to connect to the evaluation kit.

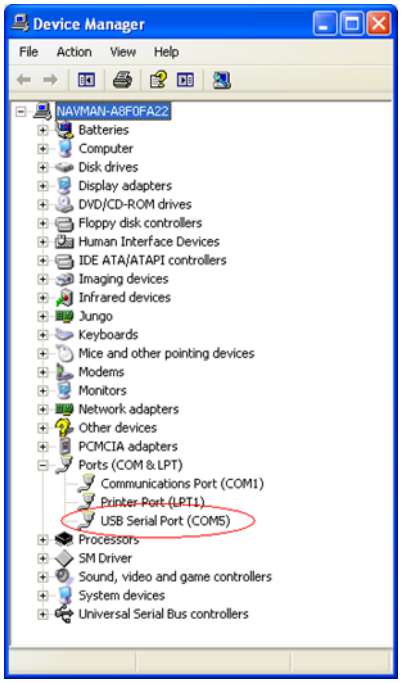


Figure 4-2 Identify new COM port

- In this example, the COM port is assigned as COM5

4.2 Installing SiRFLive

Minimum PC requirements:

- Pentium CPU 2 GHz
- 1 GB of RAM
- 100 MB hard drive

Recommended:

- 2 GB of RAM
- 1280 x 1024 screen resolution

Double-click the SiRFLiveInstaller_MKTG_Lite.msi file to install the SiRFLive program, then follow the installer directions until finished.

It is recommended that SiRFLive be installed to the default location – C:\CSR\SiRFLive.

5 Evaluation Board Operation

1. Verify that the correct jumpers are installed. See Sections **3.4 Evaluation Board Layout** and **3.5 Evaluation Board Component Identification.**

2. Power will be applied to the SL876Q5-A module when the USB interface is connected to a USB port on a personal computer. When the EVB On-Off switch is turned ON, the module ON_OFF pin will be powered up and the module will begin operation.

3. Place the board face up in a location with a clear view of open sky.

4. Use SiRFLive or TelitView to send commands to and display output from the module.

6 Using SiRFLive

6.1 Starting SiRFLive

1. Connect the EVK to a USB port on the PC.

2. Turn on (up) the EVK Power switch.

3. Launch the SiRFLive application. nd

4. Connection Settings window: Use the **Receiver** drop-down box to select the receiver. This is where you select the COM port that was previously created by the USB driver in **Section 4.1 Installing the USB Drivers.**

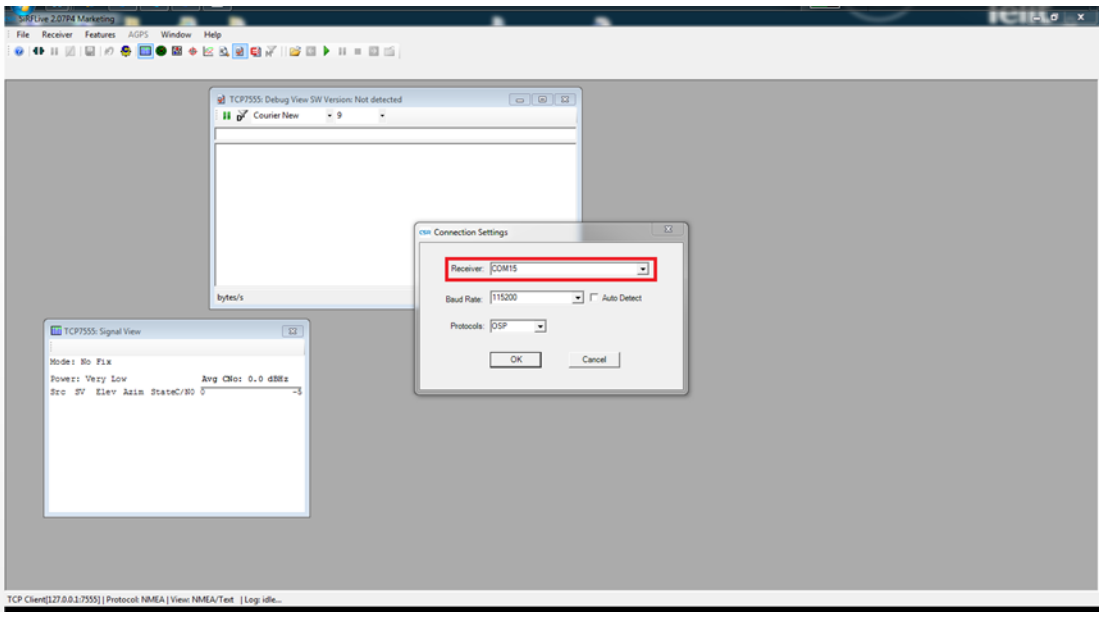


Figure 6-1 Connection settings window

5. If the default **Baud Rate** is 115200 and **Protocol** is OSP on your EVK, leave those boxes with their values as presented.

If the default **Baud Rate** is 9600 and **Protocol** is NMEA on your EVK, change those boxes to match.
If you have changed the receiver's defaults, select them using the **Baud Rate** and **Protocol** drop-down boxes.

6. Click **OK**. The remainder of these screen captures will show NMEA protocol. OSP will present somewhat different data.

7. If necessary, click **Receiver**, then **Connect** on the menu bar.

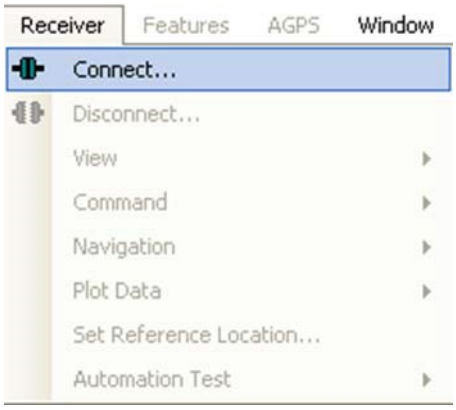


Figure 6-2 Click Receiver, then Connect on the menu bar

8. The SL876Q5-A defaults to a power-saving mode called SmartGNSS2, so you may see the GLONASS satellites disappear from the Radar View. This is normal. If you wish to command the full-time use of GLONASS as well as GPS, use the following procedure:

    a. Click **Receiver**, **Command**, then **Switch Comm Settings**.

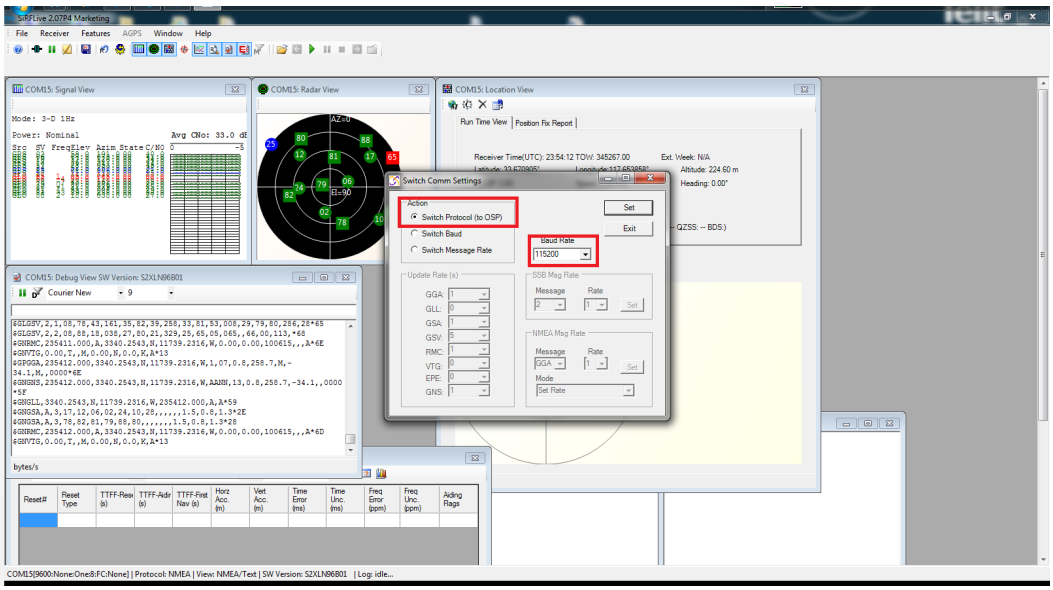


Figure 6-3 Switch Comm Settings window

    b. Verify that **Switch Protocol (to OSP)** and **Baud Rate** of **115200** are selected as shown above.

c. Click **Set**. The receiver and display will both switch to OSP protocol at 115,200 bps.

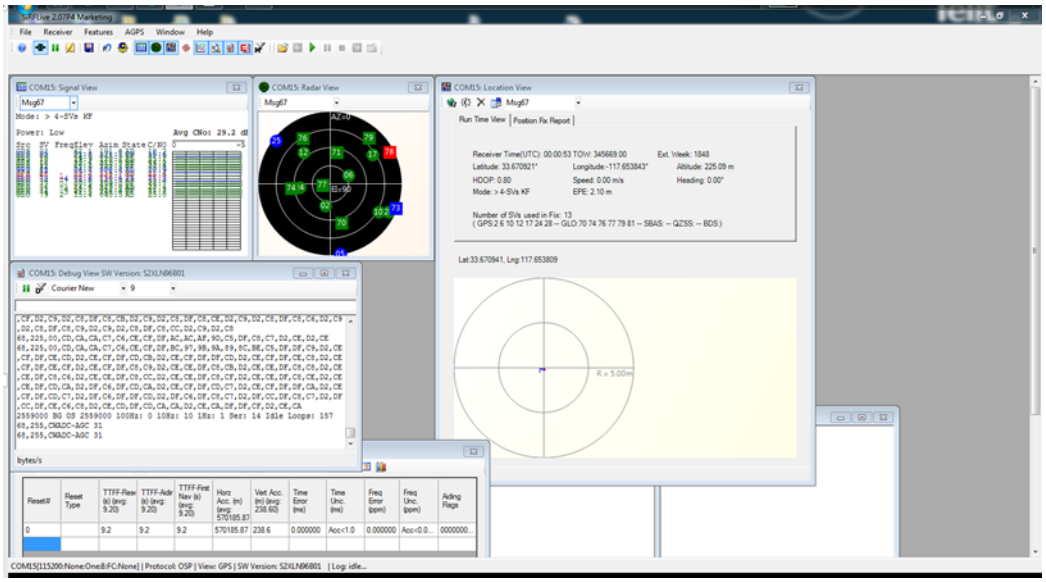


Figure 6-4 The OSP protocol window

d. Click **Features**, **Power Mode**, then **Advanced**.

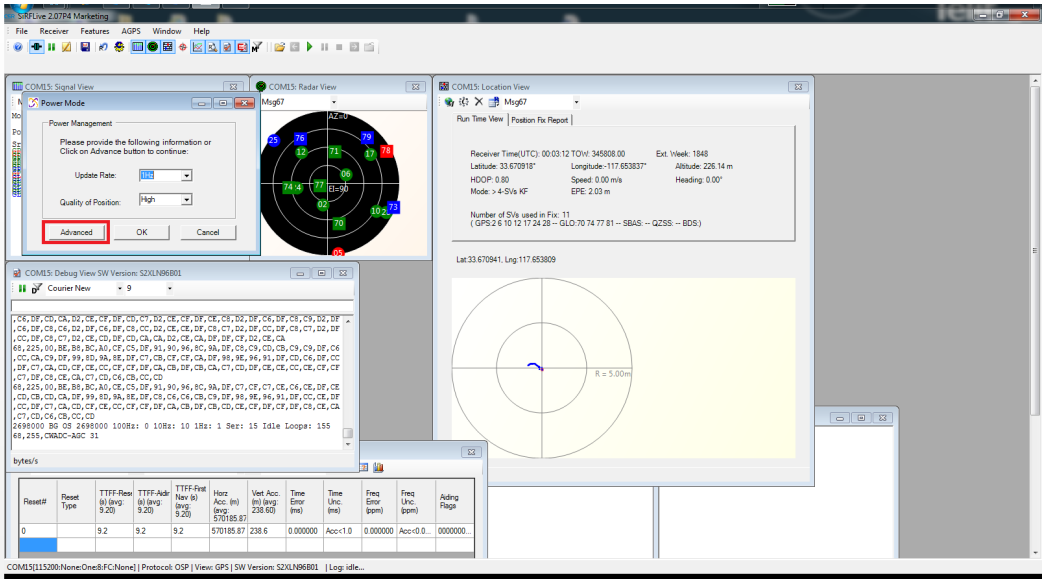


Figure 6-5 Features, Power Mode window

e. Verify that **Full Power** is selected, and click **OK**.

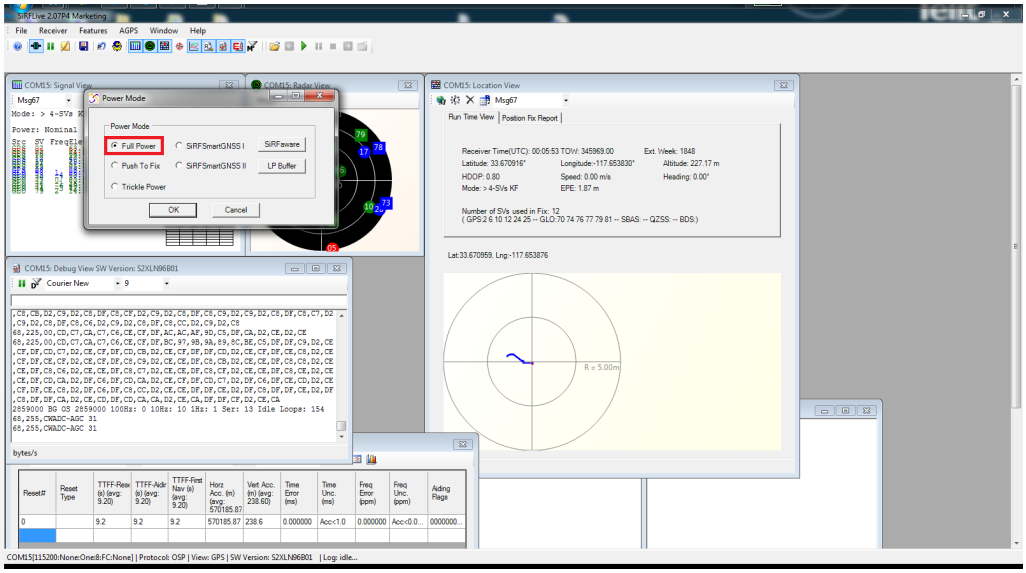


Figure 6-6 Full Power Mode window

f. To return to the NMEA display, click **Receiver**, **Command**, **Switch Comm** Settings

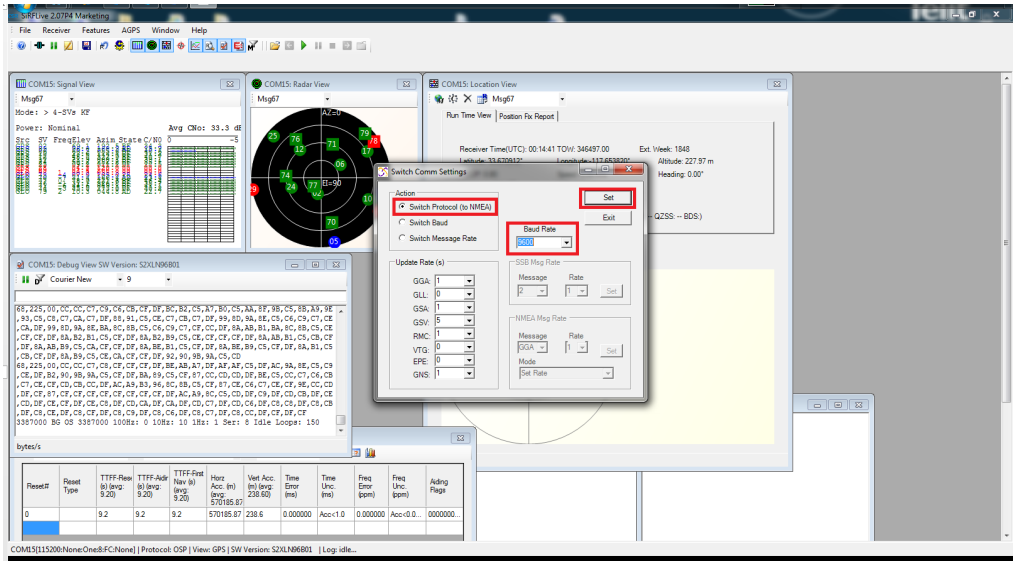


Figure 6-7 Verify NMEA window

g. Verify **NMEA** at **9600** bps (or your desired rate), and click **Set**.

9. There are many additional functions available in SiRFLive. Please refer to the built-in User Manual for further details. Click **Help** in the Menu Bar, **then User Manual.**

6.2 SiRFLive Windows

After a successful connection with the receiver is established, the default SiRFLive windows should be arranged and become filled with data.

If not all the default windows are arranged or opened, under the Main Menu Bar,

Click **Window**, **Restore Layout**, and **Default**.

6.2.1 Signal View

(Tool Bar icon)

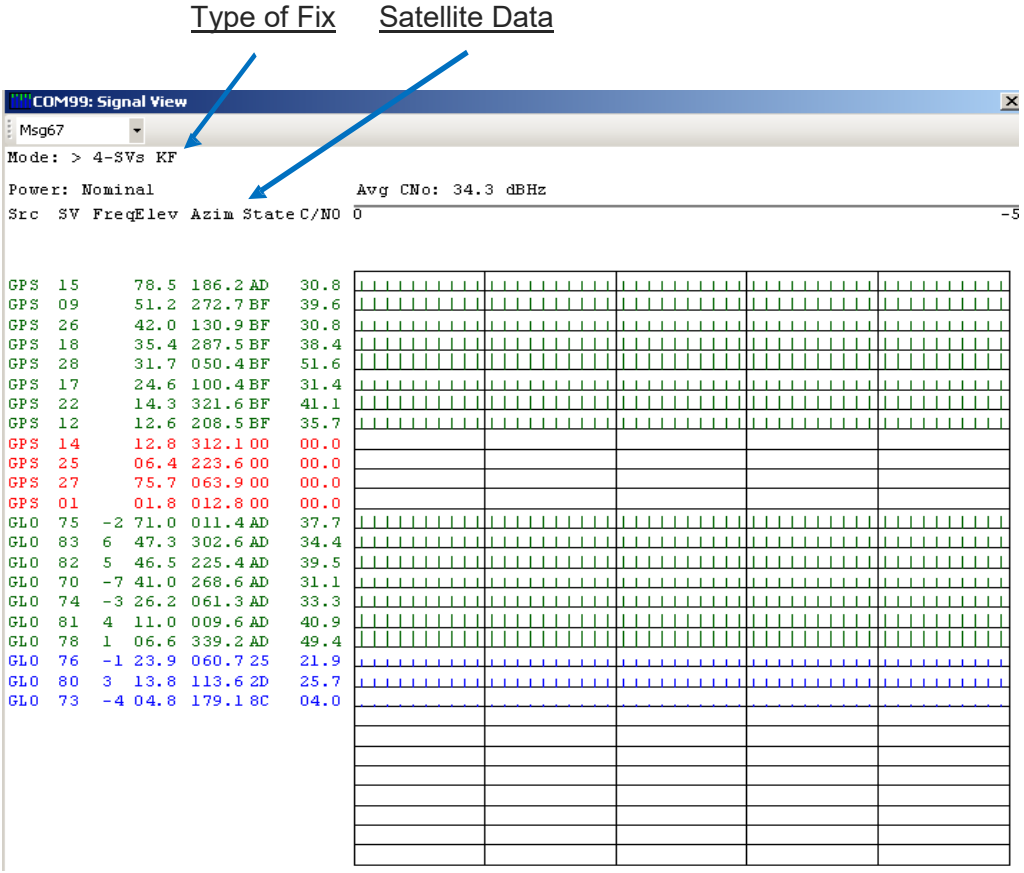
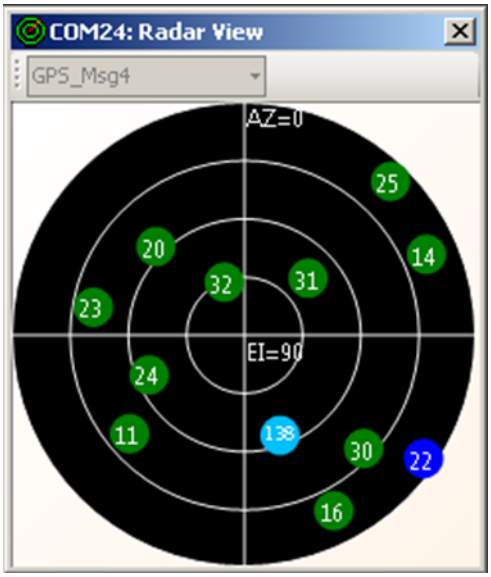


Figure 6-8 Satellite signal levels

6.2.2 Radar View

(Tool Bar icon)



Symbol	Description
Circle	GPS
Square	GLONASS
Sky blue	SBAS
Red	$C/N_0 = 0$
Blue	$C/N_0 \neq 0$ and not used in the navigation solution
Green	$C/N_0 \neq 0$ and used in the navigation solution
Orange	ABP is being used to acquire satellites
Purple	CGEE is being used
Pink	SGEE is being used

Figure 6-9 Satellites by azimuth and elevation

6.2.3 Debug View

(Tool Bar icon)

Displays the messages incoming from the receiver

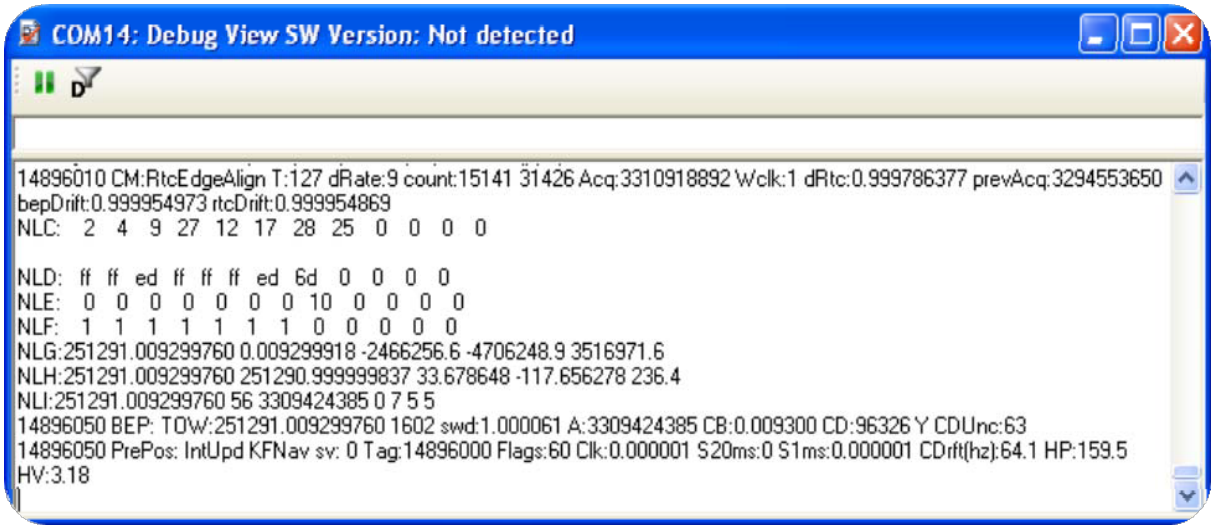


Figure 6-10 Receiver Messages (OSP)

6.2.4 Location View

(Tool Bar icon)

Map position button requires Internet access.

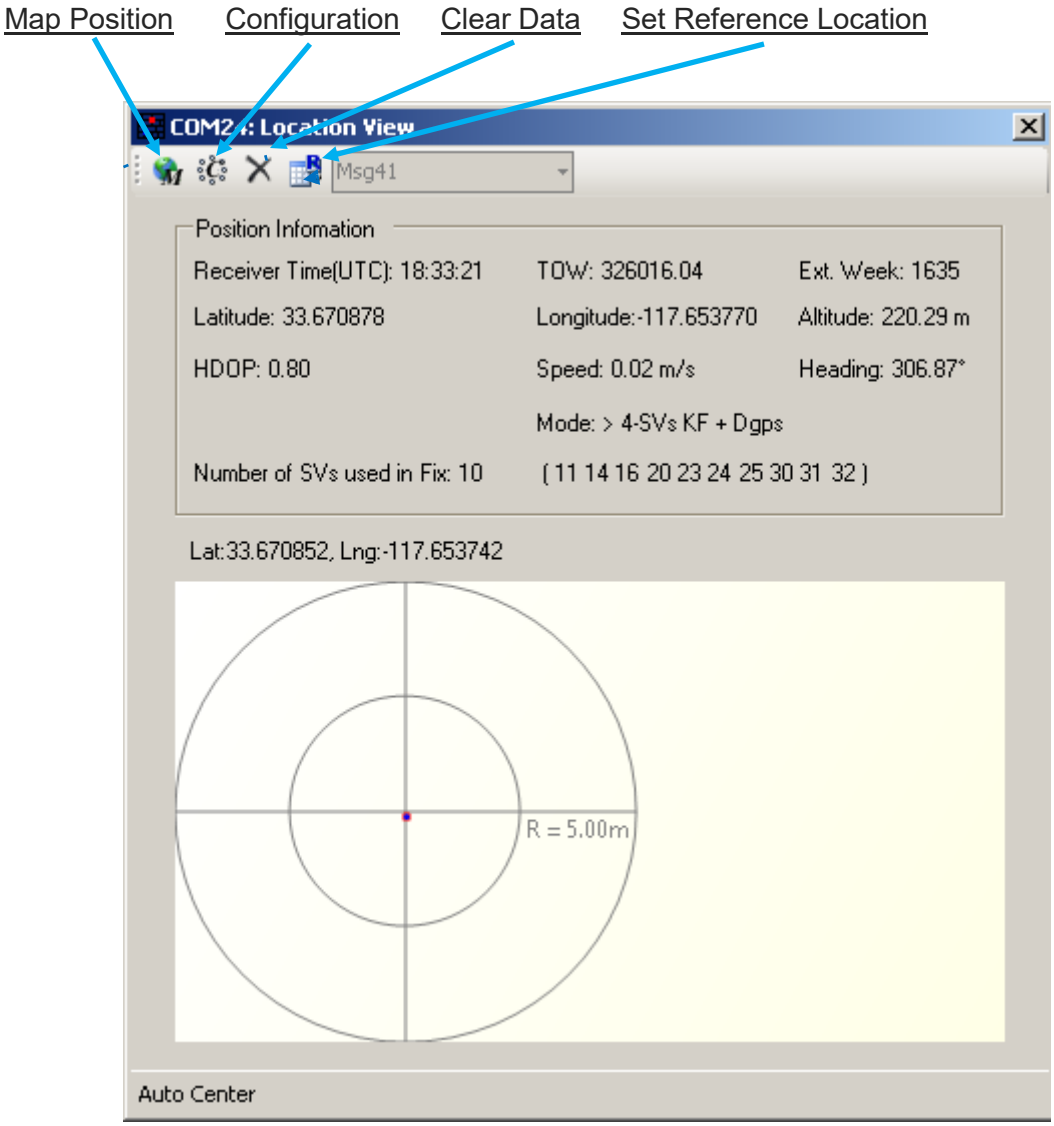


Figure 6-11 Details of the position fix

6.3 Logging Data

(Main Tool Bar icon)

SiRFLive can record the current message stream (OSP or NMEA) into a log file.

From the Menu Bar, click **File, Log File,** & **Start** or click the **Log File** icon on the Tool Bar.

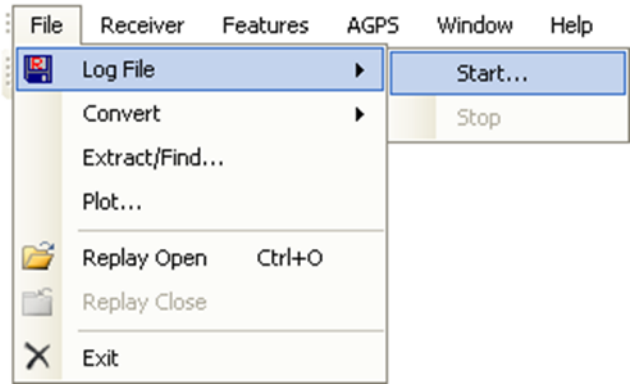


Figure 6-12 Log File command

Enter the desired log file path and filename in the **Log File Path** box, as shown below, then click **Start** to begin logging.

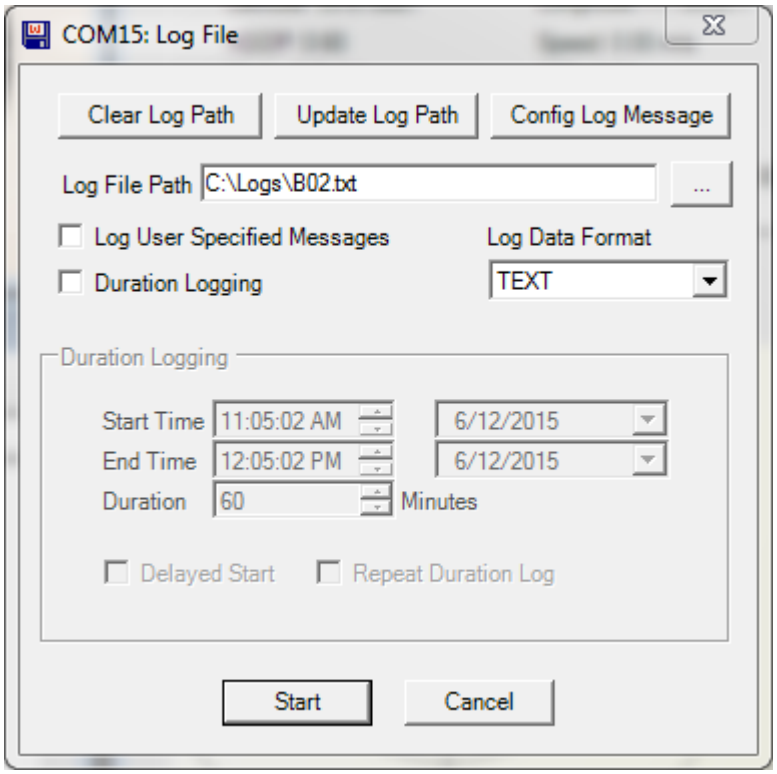


Figure 6-13 Enter the filename to specify the log file

6.4 Receiver Commands

Many of the receiver commands can be accessed through the Menu Bar under **Receiver**, **Command**. There are also equivalent shortcuts on the Tool Bar for frequently used commands

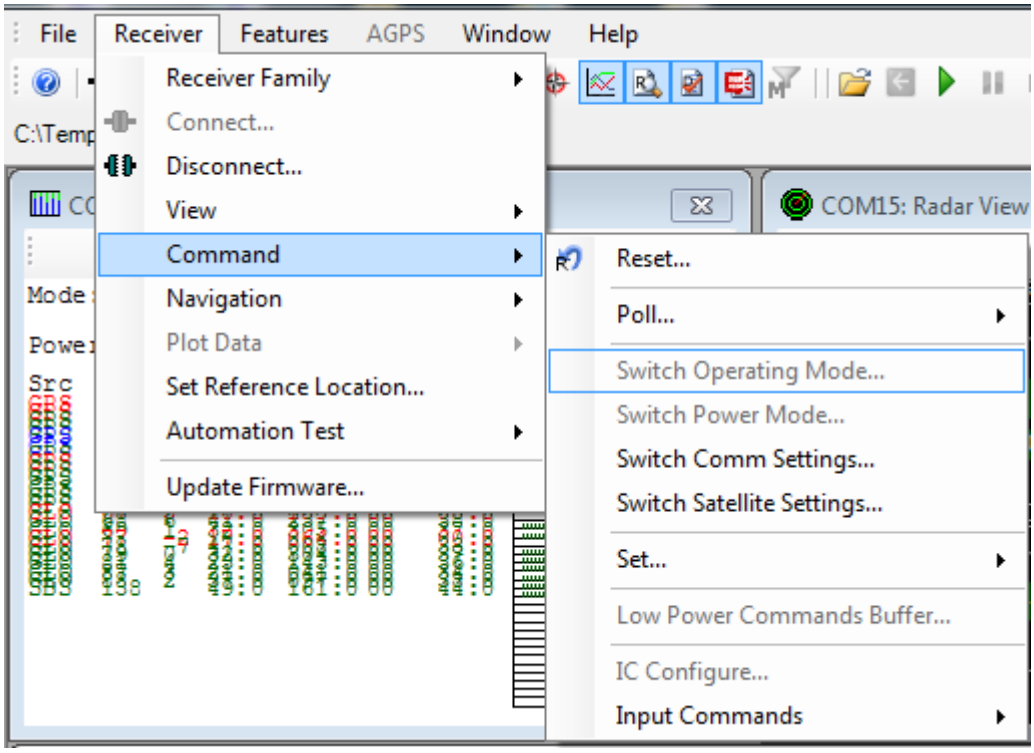


Figure 6-14 Receiver commands

Some receiver commands are available in One Socket Protocol (OSP) only.

6.4.1 Reset commands

(Tool Bar icon)

Select from the Menu Bar **Receiver**, **Command**, **Reset** or click the **Reset** icon on the Tool Bar.

Resets are used to measure the TTFF of the receiver. The TTFF/Nav Accuracy window conveniently displays the TTFF in seconds and Navigation accuracy based on the Reference Location.

Reference Location allows the user to change the position used as the reference. This helps determine position accuracy in conjunction with Time-To-First-Fix values.

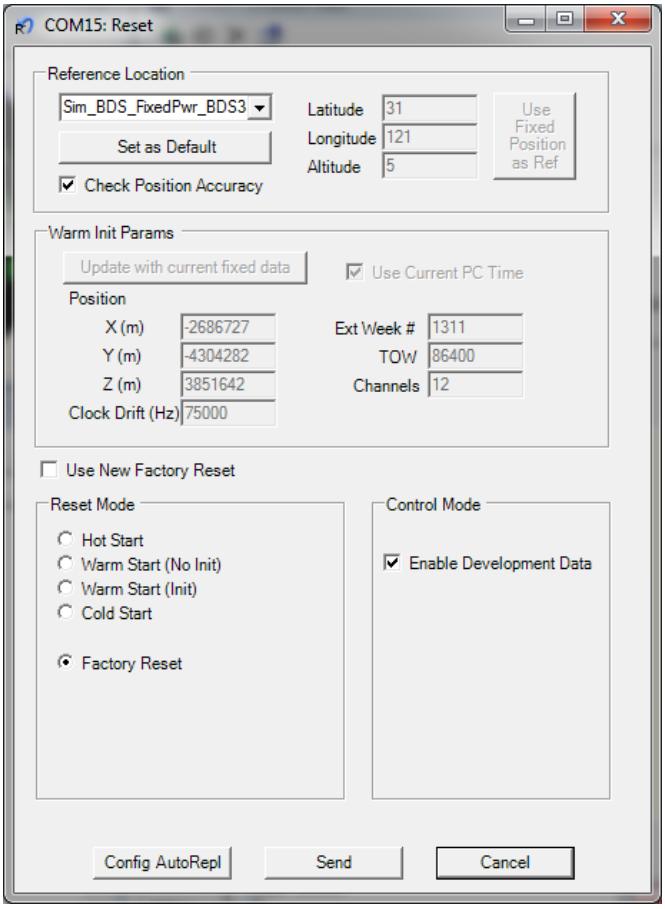


Figure 6-15 Reset Window

.

6.4.2 Switching Protocols

On the Menu Bar, select **Receiver, Command, Switch COMM Settings**.

Click **Set** to apply settings.

OSP has many commands that are not available in NMEA. Therefore, switching to OSP is recommended for testing purposes.

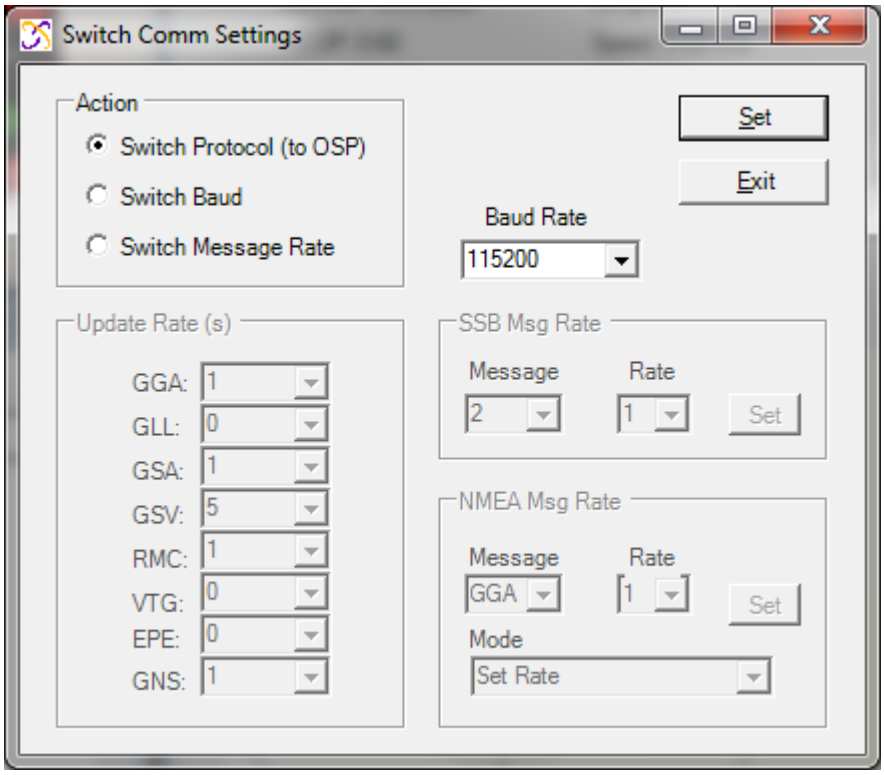


Figure 6-16 Switching to OSP protocol with its default 115200 baud rate

6.4.3 Setting the Receiver Type

SiRFLive will normally auto-detect the connected chipset, but if not, click **Receiver**, **Receiver Family**, then the desired family.

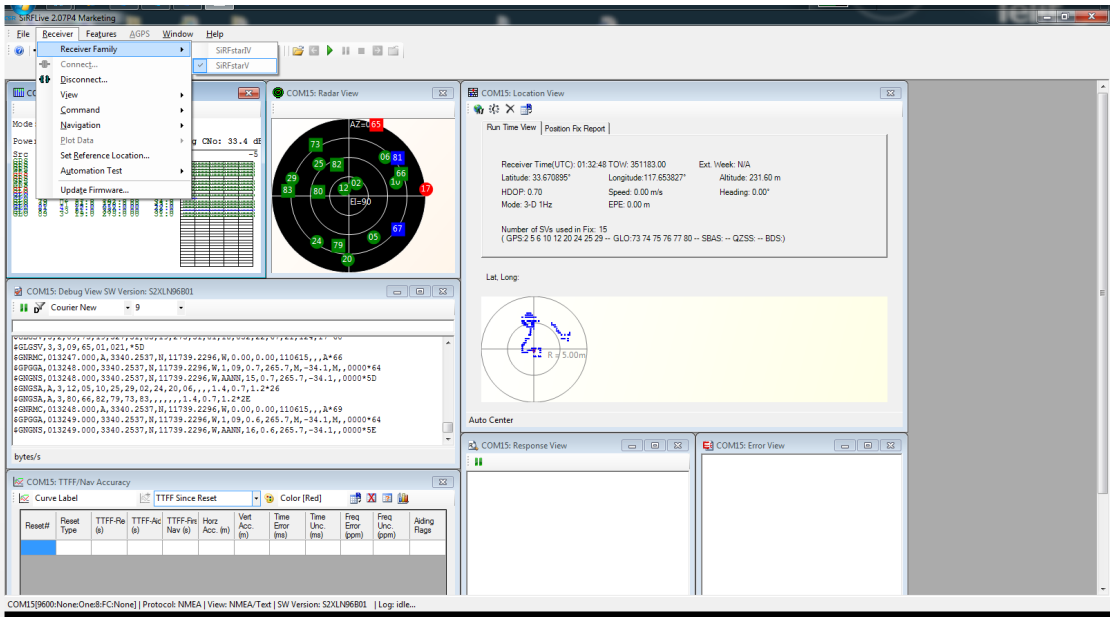


Figure 6-17 Click Receiver, Receiver Family, then the desired family

6.4.4 Enabling 5Hz Update

First, set the baud rate high enough so that characters are not dropped. The default rates (9600 for NMEA and 115.200 for OSP) may be too low depending on the configured message set.

Through the SiRFLive Menu Bar, click **Receiver, Navigation, Set 5Hz Nav** and select **Enable 5Hz Nav**.

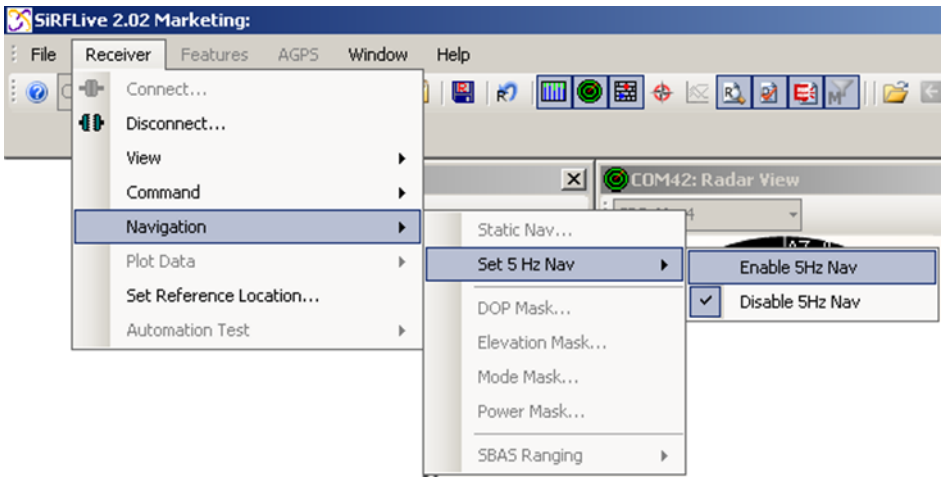


Figure 6-18 Enable 5Hz Nav command

The **Enable 5Hz Nav** command in SiRFLive sends the following OSP:

A0 A2 00 0E 88 00 00 04 04 00 00 00 00 00 00 00 0F 02 00 A1 B0 B3

The **Disable 5Hz Nav** command in SiRFLive sends the following OSP:

A0 A2 00 0E 88 00 00 04 00 00 00 00 00 00 00 00 0F 02 00 9D B0 B3

6.4.5 OSP MID 136 - Mode Control Command

Name	Bytes	Binary (Hex)		Unit	Description
		Scale	Example		
Message ID	1 U		88		Decimal 136
Reserved	2 U		0000		Reserved
Degraded Mode	1 U		01		Controls use of 2-SV and 1-SV solutions
PositionCalc Mode	1 U		01		xxxx xxx0 = ABP, OFF xxxx xxx1 = ABP, ON xxxx xx0x = Reverse EE OFF xxxx xx1x = Reverse EE ON xxxx x0xx = 5Hz nav update OFF xxxx x1xx = 5Hz nav update ON xxxx 0xxx = SBAS Ranging use OFF xxxx 1xxx = SBAS Ranging use ON
Reserved	1 U		00		Reserved
Altitude	2 S		0000	meters	User specified altitude, range - 1,000 to 10,000
Alt Hold Mode	1 U		00		Controls use of 3-SV solution
Alt Hold Source	1 U		00		0 = Use last computed altitude 1 = User user-input altitude
Reserved	1 U		00		Reserved
DegradedTime Out	1 U		05	sec	0 = disable degraded mode, 1 to 120 seconds degraded mode time limit
DR Time Out	1 U		02	sec	0 = disable dead reckoning, 1 to 120 seconds dead reckoning mode time limit
Measurement and Track Smoothing	1 U		00000011		xxxxxxx0 = disable track smoothing xxxxxxx1 = enable track smoothing xxxxxx0x = use raw measurements xxxxxx1x = use smooth measurements

Table 6-1 MID 136 - Mode Control command

7 Updating Firmware with SiRFLive

7.1 Flashing Requirements

- Personal Computer with a USB/COM port running SiRFLive Firmware file

7.2 Flashing Instructions

Note: Do NOT use the BOOT pin on the module (leave it floating).

1. Click on **Receiver**, **Update Firmware** from the Menu Bar.

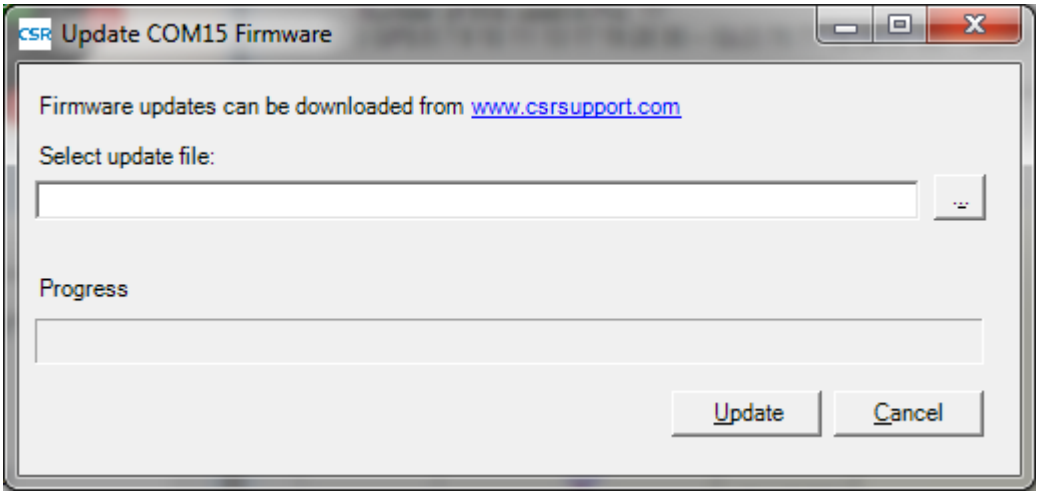


Figure 7-1 Firmware file selection

2. Enter the filename or browse to the firmware file.

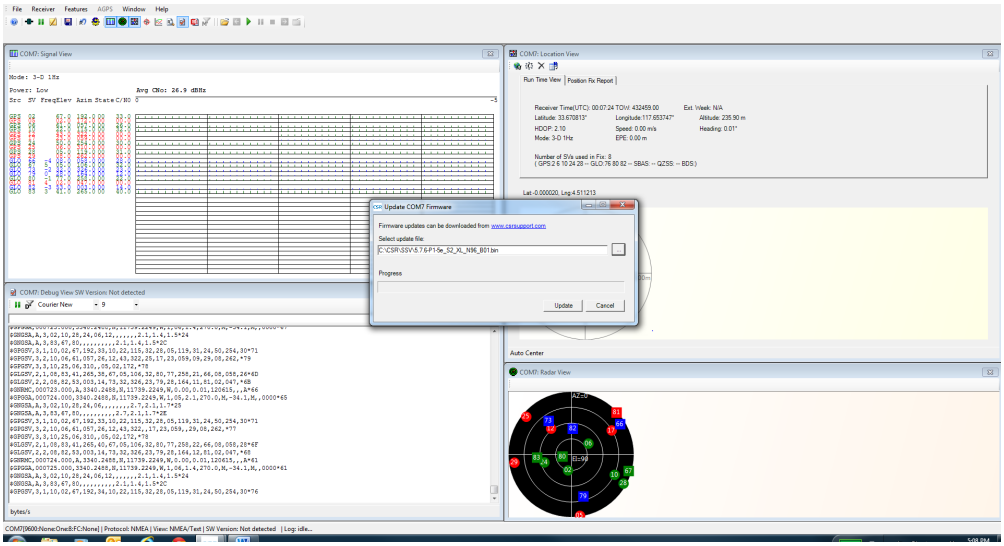


Figure 7-2 Select Firmware file

3. Click **Update**.

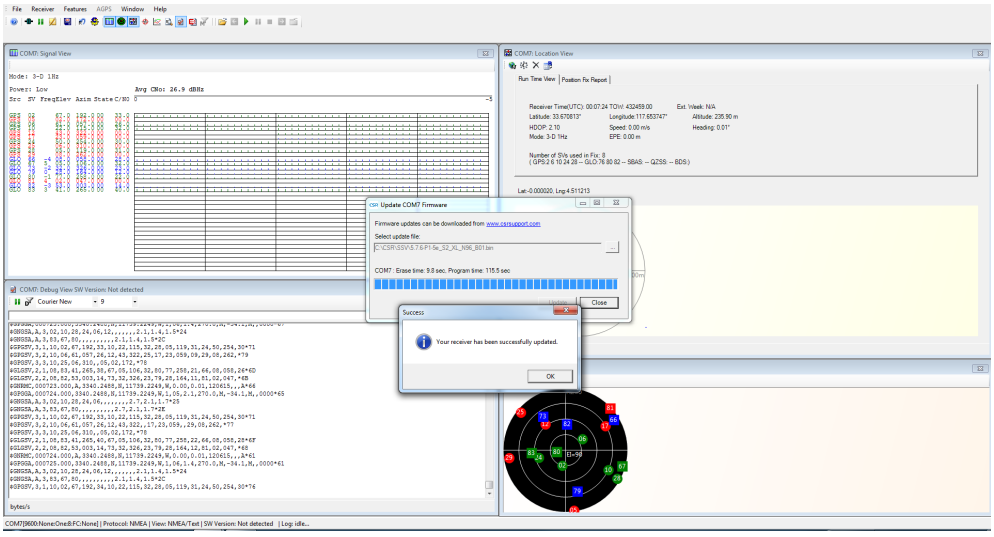


Figure 7-3 Successful firmware installation

4. The new firmware will be installed, and the receiver will begin operation.

8 Software Interface

The host serial I/O port (UART, I^2C, or SPI) supports full duplex communication between the receiver and the user.

The default UART configuration is: NMEA, 9600 bps, 8 data bits, no parity, and 1 stop bit.

Two protocols are available for data output and command input:

- NMEA-0183 V4.10
- SiRF One Socket Protocol (OSP)

More information regarding the software interface can be found in the Telit CSR Software User Guide. Access to this document requires a Non-Disclosure Agreement (NDA) with Telit.

8.1 NMEA Output Messages

Defaults:

- NMEA-0183
- 1 Hz fix rate. Maximum is 10 Hz.
- Message Set

Standard Messages

Message ID	Description	Frequency
RMC	GNSS Recommended minimum navigation data	1
GGA	GNSS position fix data	1
GSA	GNSS Dilution of Precision (DOP) and active satellites	1
GSV	GNSS satellites in view.	1 / 5
Note: Multiple GSA and GSV messages may be output per cycle.		

Table 8-1 Default NMEA Output Messages

The following messages can be enabled by command:

Message ID	Description
GLL	Geographic Position – Latitude & Longitude
GNS	GNSS Fix Data
VTG	Course Over Ground & Ground Speed

Table 8-2 Available Messages

Talker ID	Constellation
GA	Galileo
GB	BeiDou
GL	GLONASS
GP	GPS
GN	Solutions using multiple constellations

Table 8-3 NMEA Talker IDs

Proprietary Messages

The receiver can issue several proprietary NMEA output messages ($PSRF) which report additional receiver data and status information.

8.2 NMEA Input Commands

The receiver uses NMEA proprietary messages for commands and command responses. This interface provides configuration and control over selected firmware features and operational properties of the module.

The format of a command is:

$<command-ID>[,<parameters>]*<cr><lf>

Commands are NMEA proprietary format and begin with “$PSRF”.

Parameters, if present, are comma-delimited as specified in the NMEA

8.3 One Socket Protocol (OSP) Output Messages

SiRF One Socket Protocol (OSP) is supported. This is an extension of the existing SiRF Binary protocol. The following messages are output once per second:

- MID 2
- MID 3
- MID 4
- MID 7
- MID 9
- MID 41
- MID 64 SUB ID 2 (One message for each satellite being tracked).
- MID 138

9 DOCUMENT HISTORY

Revision	Date	Changes
0	2017-03-21	First Issue

SUPPORT INQUIRIES

Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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