

SE880 RDK User Manual

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APPLICABILITY TABLE

PRODUCT SE880



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1. Introduction

1.1. Scope

Scope of this document is to give an overview of the SE880 reference design kit (or SE880 RDK) of the GPS standalone 3D-SiP SE880.

1.2. Audience

This document is intended for customers who are evaluating one or more products in the applicability table.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com TS-NORTHAMERICA@telit.com TS-LATINAMERICA@telit.com TS-APAC@telit.com

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1.4. Text Conventions



<u>Danger – This information MUST be followed or catastrophic equipment failure</u> <u>or bodily injury may occur.</u>



Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.



Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

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

1.5. Related Documents

- SE880 HW User Guide
- SE880 Product Descritption
- NMEA Reference Manual (CS-129435-MA-3)
- GSD4e OSP Manual (CS-129291-DC-13)
- SiRF Live User Manual (CS-206217-UG-5)



NOTE:

- To prevent ESD and EOS damage, a properly grounded ESD wrist strap should be worn when working inside the RDK.
- Do not alter switch positions while USB power is applied.
- Do not short the RF signal to ground if the antenna voltage is installed. Damage to the RDK may result.

NOTE:

Always follow ESD safety precautions when utilizing the SE880 RDK. For additional information on the SE880, ask your sales representative for additional manuals, datasheets, support, etc.





2. Preparing for the SE880 RDK

What is Necessary

To use the SE880 RDK, you will need:

- FTDI USB Drivers
- SiRFLive2.0 and above or
- A PC with a USB port that fulfills the minimum software requirements:
 - Windows XP 0
 - .NET Framework 2.0 0
 - This will be automatically installed by the SiRFLive package if . necessary (internet connection is required).

2.1. Installing the USB Drivers

Before connecting the SE880 RDK, install the necessary USB drivers.

1 Double-click the USB driver executable and follow the directions to install the USB drivers.

2.2. Installing SiRFLive

NOTE SiRFLive does not work on 64-bit OS machine at this time! 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

0

Ensure that all previous installation versions of SiRFLive have been uninstalled before installing any newer versions!

> Install the current SiRFLive with the attached installer. Follow the installer directions until finished. Users should allow SiRFLive to install to the default location - C:\Program Files\SiRF\SiRFLive, but it can be changed if necessary.





3. SE880 Reference Design Kit

3.1. What's in the Box



Chip Antenna

12mm x 12mm Patch Antenna



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SE880 RDK Features 3.2.



Flash Select

Figure 2: SE880 RDK assembly

Item	Function
System ON LED	LED that indicates the SE880 is ready for GPS reception
1PPS LED	LED that pulses ON at $1/2$ a second and OFF at $1/2$ a second, indicating a fix with the receiver.
ON_OFF Pulse	Push button that sends a 1.8V voltage pulse to the ON_OFF input of the SE880 module toggling the module between Operating or Hibernate mode.
Flash Select Switch	Switch that selects the external 4Mbit SPI Flash connected to auxiliary port. Patch code "GSD4e_4.1.2-P1_RPATCH.03-Telit-F01" is preloaded in the Flash by using the ROM Patcher provided.



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4. SE880 RDK Reference Layout

The reference schematic and PCB layout are provided in the USB memory which comes alone with the RDK. The performance of SE880 will be optimized with the following guidelines:

- 1. Use the bottom layer (layer-2) as the big ground plane for both RF and heat transfer.
- 2. The ground plane with via holes under the SE880 (shown in Figure 3) serves two purposes:
 - a. Provide a good RF ground plane for the SE880.
 - b. The big via hole dominates heat transfer from the SE880 to the big ground on layer-2. This enhances TCXO implementation by provide the TCXO a thermally stable environment. Heat transfer of copper is 1400 times fast than FR4.
- 3. Coplanar waveguide calculator should be used to determine the appropriate transmission line structure to achive 50 Ohm input trace for the antenna at 1.575GHz..



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5. Step-by-Step: Running the SE880 RDK

5.1. Step-by-Step: First Time Connection

- 1. Before connecting the RDK, ensure that the USB drivers have been installed.
- 2. As soon as the evaluation board is connected to the PC, it will be detected and installed.



Figure 4: USB installation, select "Continue Anyway" to proceed.

3. After the evaluation board has been installed, check the "Device Manager" window for the evaluation board COM port number. This information is needed for use with the GPS tools.



Figure 5: In this case, the COM port is assigned as COM5



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5.2. Powering on the RDK

- 1. At first application of power (connecting of USB), SE880 will be in hibernate mode.
- 2. Press the **ON/OFF** pulse button to bring the unit into *Full Power Mode*.
- 3. Connect one of the provided passive antennas to the RF connector of SE880 through the RF cable.
- 4. Place the Antenna to where it has a clear view of open sky.
- 5. The evaluation board can now be manipulated with the provided GPS tools (SiRFLive).
- 6. Refer to Chapter 5: SE880 on SiRFLive for using the SE880 on SiRFLive.





6. SE880 on SiRFLive

Launch the SiRFLive application.



6.1. Main Interface

After launching SiRFLive, first notice the application's main interface.

: File Receiver Features AGPS Window Help *Figure 6:* Main Menu Bar

6.2. Connecting To the SE880

The user can utilize either the Main Menu Bar or the Main Tool Bar.

6.2.1. Main Menu Bar

Under the option "Receiver" on the *Main Menu Bar*, there is a selection "Connect. . ." This will open the Receiver settings for connection.



Figure 8: Connect to Receiver



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6.2.3. **Rx Port Settings**

Select the GSD4e Product Family, RS232/USB, and the Correct COM Port.

🕅 Rx Port Settings	
Product Family: Rx Name: GSD4e SiRF_EVK	Physical Connection RS232/USB C 12C C SPI
R5232	
Port: COM1 Baud Rate: 9600 Protocols Imea Auto Detect Protocol and Baud Rate? Advanced Settings	Advance Settings Parity: None Stop Bits: One Data Bits: 8 Flow Control: None Read Buffer: 8192
	<u>D</u> K <u>C</u> ancel

Figure 9: The Rx Port Connection Window

 \bigcirc Default Baud rate for SE880 RDK is NMEA 9600 baud at power up.





6.3. 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*, go to "Window" > "Restore Layout" > "Default."

6.3.1. Signal View

	_					
(ma		ol bar ic ype of 1		Satell	ite Da	ta
		Signal				×
Msg	1	-		/		
Mode	:>4-	SVs KF				
Powe	r: Nor	minal				Avg CNo: 32.9 dBHz
Src	SV	Elev	Azim	State	C/N0	05
GPS GPS GPS GPS GPS GPS GPS GPS GPS GPS	11 20 24 30 31 32 23 16 14 22 25	32.0 41.0 50.0 26.0 57.5 67.5 30.5 13.5 13.5 13.5 06.5 08.0	231.0 315.0 249.0 133.5 048.0 337.5 279.0 153.0 064.5 123.0 043.5	BF BF BF BF BF AD AD AD	38.4 42.7 33.6 36.8 36.3 40.9 30.9 28.8 19.2 23.1 25.6	
SBS	138	49.0	160.5	ЗF	37.9	

Figure 10 Shows the satellite signal levels.



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6.3.2. Radar View



(main tool bar icon)

Red satellites - 0 C/N0

Blue satellites – nonzero C/N0 but not being used in the navigation solution

Green satellites – nonzero C/N0 and are being used in the navigation solution

Skyblue satellites - SBAS satellites

Orange satellites - ABP is being used to acquire satellites

Magenta satellites - Extended Ephemeris is being used to acquire satellites.



Figure 11: Displays the satellites by azimuth and elevation.



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6.3.3. Debug View

100
~

(main tool bar icon) Shows the communication messages with the receiver.

COM14: Debug View SW Version: Not detected	
14896010 CM:RtcEdgeAlign T:127 dRate:9 count:15141 31426 Acq:3310918892 Wolk:1 dRtc:0.999786377 prevAcq:32945536 bepDrift:0.999954973 rtcDrift:0.999954869 NLC: 2 4 9 27 12 17 28 25 0 0 0 0	50 🗹
NLD: ff ff ed ff ff ff ed 6d 0 0 0 0 NLE: 0 0 0 0 0 0 0 0 0 0 0 0 0 NLF: 1 1 1 1 1 1 1 0 0 0 0 0 NLF: 1 1 1 1 1 1 1 0 0 0 0 0 NLF: 251291.009299760 0.009299918 -2466256.6 -4706248.9 3516971.6 NLH:251291.009299760 251290.9999993837 33.678648 -117.656278 236.4 NLI:251291.009299760 56 3309424385 0 7 5 5 14896050 BEP: TOW:251291.009299760 1602 swd:1.000061 A:3309424385 CB:0.009300 CD:96326 Y CDUnc:63 14896050 BEP: TOW:251291.009299760 1602 swd:1.000061 A:3309424385 CB:0.009300 CD:96326 Y CDUnc:63 14896050 PrePos: IntUpd KFNav sv: 0 Tag:14896000 Flags:60 Clk:0.000001 S20ms:0 S1ms:0.000001 CDrft(hz):64.1 HP:159.5 -V:3.18	
NLI: 251 231, 009239760 56 3309424385 0 7 5 5 14896050 BEP: TOW: 251 291, 009239760 1 602 swd: 1, 000061 A: 3309424385 CB: 0, 009300 CD: 96326 Y CDUnc: 63 14896050 PrePos: IntUpd KFNav sv: 0 Tag: 14896000 Flags: 60 Clk: 0, 000001 S20ms: 0 S1ms: 0, 000001 CDritt(hz]; 64, 1 HP: 159, 5 HV: 3, 18	

Figure 12: Debug view with One Socket Protocol messages.



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6.3.4. Location View

(main tool bar icon)

Displays more detailed information regarding the UTC, TOW, Latitude, Longitude, Altitude, etc.



Figure 13: Location view

Map position button requires Internet access to work.

 \bigcirc



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6.4. Receiver Commands

Most of the Receiver Commands can be accessed through the *Main Menu Bar* under "Receiver" > "Command." There are also shortcuts on the *Main Tool Bar* which will be covered in this section.

Rec	eiver		_	
-0-	Connect			
11	Disconnect			
	View	•		
	Command	•	Ŕ	Reset
	Navigation	►		Poll S/W Version
	Plot Data	►		Poll Nav Parameters
	Set Reference Location			Poll Almanac
	Automation Test	•		Poll Ephemeris
				Switch Operating Mode
				Switch Power Mode
				Switch Protocols
				Set Almanac
				Set Ephemeris
				Set CGEE
				Set Debug Levels
				Set DGPS
				Set MEMS
				Set ABP
				Low Power Commands Buffer
				IC Configure
				IC Peek/Poke
				Input Commands

Figure 14: All the commands for the receiver.

All of the Receiver Commands become available in One Socket Protocol (OSP) only.

 \bigcirc



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6.4.1. Sending Cold Start

(main tool bar icon)

1. Select "Cold Start. . ." under the *Main Menu Bar* "Receiver" > "Command" > "Reset. . ."

Or

Select the Reset icon on the Main Tool Bar.

The "Reset" window should open.

Optional 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.

	Latitude: 33.6786428 Fix P
Check Position Accuracy?	Longitude: -117.656331
Set as Default	Altitude: 240.26
Config AutoReply	
Warm Init Params	
Update with current fixed data	
Position:	Use Current PC Time
×(m): -2686727	Ext Week # 1311
Y(m): -4304282	TOW: 86400
Z(m): 3851642	Channels: 12
Clock Drift(Hz): 75000	ondimote. J
B	Messages
Reset Mode	
Reset Mode	Enable Navlib Data
 <u>H</u>ot Start <u> W</u>arm Start (No Init) 	 Enable <u>N</u>avlib Data Enable <u>D</u>evelopment Data
 <u>H</u>ot Start <u>W</u>arm Start (No Init) Warm Start [[nit] 	
● <u>Ho</u> t Start ● <u>W</u> arm Start (No Init) ● Warm Start ([nit) ● <u>C</u> old Start	
<u>H</u> ot Start <u>W</u> arm Start (No Init) Warm Start (Init) <u>Cold Start</u> <u>Factory Reset</u>	
● <u>Ho</u> t Start ● <u>W</u> arm Start (No Init) ● Warm Start ([nit) ● <u>C</u> old Start	Enable Development Data



OSP protocol should be used to open the TTFF/Nav Accuracy window which conveniently displays the TTFF in seconds and Navigation accuracy based on the Reference Location. Refer to 5.4.2.

Factory Reset will remove the patch code stored in the RDK's 4Mbit SPI Flash! Don't attempt to perform Factory Reset unless the user has familiarized with the use of the ROM Patcher comes alone with the RDK.



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6.4.2. Switch Protocol

The number of available commands in NMEA is limited compared to OSP. Switching to OSP for testing is recommended.

1. On the Main Menu Bar, select "Receiver" > "Command" > "Switch Protocols..."

🕉 Switch Protocol	
Protocols © OSP © NMEA	<u>S</u> et <u>C</u> ancel
Update Rate (s) GGA: 1 GLL: 0 GSA: 1 GSA: 1 RMC: 5 RMC: 1 VTG: 0	Baud Rate: 115200

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

2. Click "Set" to apply settings.

Switching to NMEA should be similar.

6.4.3. Logging Data



SiRFLive is capable of collecting either the OSP message stream or the NMEA message stream into a log file.

1. While the receiver is outputting messages to SiRFLive, click on the *Log File* icon on the *Main Tool Bar* or go through the *Main Menu Bar* under "Log File" then "Start. . ." shown in Fig 16.



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-	File	Receiver	Features	AGPS	i Wind	ow	Help
	R	Log File		•	Sta	art	
1		Convert		•	Sto	p	
		Extract/Find.					
		Plot					
	2	Replay Open	Ctrl+O				
	1	Replay Close					
	×	Exit					

Fig 17: Main Menu Bar access to the Log File command.

i. The *Log File* window should open, which is shown in Fig 17. Click on the ". . ." button, as indicated by the arrow in Fig 19, to open a window where the user can specify the output folder and the output file name.

OM24: Log File Clear Log Path Upc	date Log Path Config Log Message
.og File Path test.gps	
Log User Specified Mess	ages
Duration Logging	Log Format GPS
Duration Logging	
🗖 Delayed	Start
Start Time 11:43:01 AM	M 🚔 5/11/2011 💌
End Time 12:43:01 PM	M 🚍 5/11/2011 💌
Duration 60	Minutes
<u>S</u> tart	<u>C</u> ancel

Fig 18: Clicking on the "..." button will give the user the control of the output folder and output name

ii. After specifying the output folder and output name, close the "Specify log file name:" window by clicking *Open* and the "Log File Path:" bar should be filled with the file path. Select the desired Log Format, and click "<u>Start</u>" in order to start logging.



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7. Document History

Revision	Date	Changes
0	2013-01-16	First draft
1	2013-05-01	Revision 1



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