NAVMAN

Jupiter 30
20-channel GPS receiver module
Development kit Guide

(AA003029 series)

Related products
Jupiter 30 (standard) AA003025-G

Related documents
- Jupiter 30 Data sheet LA000576
- Jupiter 30 Product brief LA000575
- SiRF Binary Protocol reference manual MN000314
- NMEA reference manual MN000315
- SiRFDemo and SiRFflash user guide MN000316

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1.0 Introduction

This document provides detailed guidelines for the operation and configuration of the Jupiter 30 GPS Module Development Kit. The AA003029 series of development kits assist in the integration of the Jupiter 30 in a customer's application, offering a simple and easy to use platform for evaluation purposes.

It is recommended that the user pays particular attention to the configuration settings outlined in section 3.0 prior to applying power and operating the development unit. For example, it is important to understand and recognise the main functional switches and connector locations accessible on the development unit's front and rear panels. Following this information, simple step-by-step guidelines are presented to ensure successful setup of the development unit.

In addition to hardware, the GPS Development Kit is supplied with SiRFDemo and SiRFflash analysis software to allow communication with the Jupiter 30 GPS receiver through a serial port. The Windows based software presents the receiver's raw data in a geographical form, allowing both detailed analysis and evaluation for both NMEA and SiRF Binary formats.

2.0 Equipment

This section provides a brief overview of the equipment included in the Jupiter 30 GPS Development Kit.

2.1 Equipment supplied

This kit should contain the items illustrated in Figure 2-1.

1. Jupiter 30 GPS development unit

The Jupiter 30 GPS receiver development unit includes all of the following hardware to allow thorough evaluation:

- Dual RS232 level serial data I/O ports

- Selectable bias voltages for active GPS antennas

- Backup power source for SRAM and RTC

- Provision to insert a current measuring device to monitor both primary and backup power usage under various conditions

- Regulated DC power supply to the Jupiter 30 module

- Status indication through four LEDs on front panel

- Configurable functionality using a DIP switch accessed through the front panel
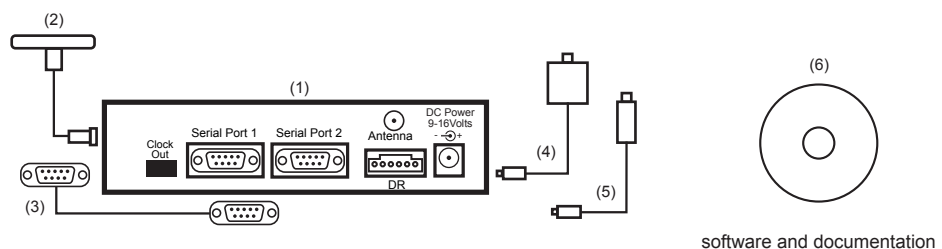
Figure 2-1 Equipment supplied in the Jupiter 30 GPS Development Kit

Note: before supplying power to the development unit, please review the configuration settings and operation described in this document for optimum performance of the Jupiter 30 GPS receiver.

2. GPS antenna with pre-amp, magnetic base and SMA connector

A magnetic-mount active antenna is supplied with the receiver development kit, along with an RF cable (RG-316) already terminated with the proper connector for the development unit. The nominal measured attenuation of the cable with connectors is approximately 5 dB. The supplied active antenna should be biased at +3 VDC, but a different active antenna with a bias of either +3, +5 or +12 VDC may be used. Refer to section 3.2 to ensure that the configuration switches on the front panel of the development unit are chosen to select the appropriate bias voltage.

Caution: ensure antenna power switches are properly set before connecting the antenna. An antenna designed for +3 VDC operation will be damaged if connected to a +12 VDC source.

3. Serial interface cable

A serial cable is provided to interface between the development unit and the customer's PC, or between the development unit and a DGPS receiver. This cable is terminated at both ends with female connectors to match the male connectors on the development unit and the PC. If the PC used only supports a USB port, an RS232/USB converter could be utilised.

4. Power adapter for 240/120 VAC operation

DC power for the development unit is provided by either an AC/DC converter or automobile adapter. The AC/DC converter operates from a nominal 120/240 VAC input and provides a 12 VDC at 500 mA out.

5. Power adapter for 12 VDC vehicle operation

For mobile operation, an automotive adapter intended for use in 12 VDC vehicles is provided.
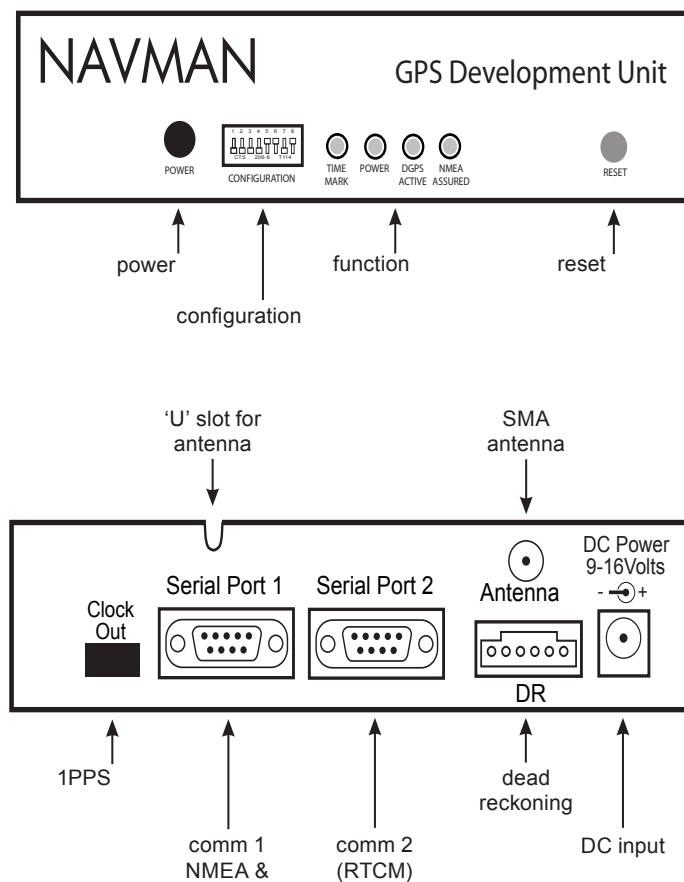
Figure 3-1 Front and back panels of the Jupiter 30 development unit

(showing functional switches and connector locations)

6. Software and documentation CD

The CD contains the Jupiter 30 GPS receiver data sheet, PC Analysis software (SiRFDemo and SiRFflash), and other information on how to use GPS receivers.

2.2 Equipment required

The following equipment is also required to evaluate the Jupiter 30 receiver.

- IBM compatible PC

- Minimum one serial port (If your PC only has USB, a USB/RS232 converter can be employed)

- Windows 95/98, WinNT4.0 or higher

- 486 100MHz or higher

- SVGA at least 800x600 resolution

- 16 Megabytes of RAM

- 6 Megabytes (min) of disk space

3.0 Technical configuration

This section provides a detailed description of all the technical aspects and configurable functionality of the Jupiter 30 GPS development unit.

3.1 Overview

Figure 3-1 illustrates the connectors, switches and LEDs available on the development unit.

3.1.1 Power switch (On/Off)

The switch on the front panel controls primary power to the Jupiter 30 receiver module inside. The power status LED (see section 3.3) indicates the state of the unit: if lit, the module has primary power supplied. If the configuration DIP switch 5 is on and Jumper JB5/6 linked, the module's secondary supply SRAM and RTC will continue to be powered when the power switch is off. Only the removal of the DC power input at the rear of the unit will stop secondary power being applied (assuming Jumper JB5/6 and switch 5 are correctly set). Having this secondary power supply applied means that the Jupiter 30 will have a 'hot start' capability when primary power is re-applied within 4 hours, and a 'warm start' thereafter, by maintaining last position, current time and satellite ephemerides.

3.1.2 Configuration DIP switch

The configuration DIP switch on the front panel provides the ability to configure the Jupiter 30 module, offering flexibility depending on the specific application. Refer to section 3.2 for a description of the functionality of each individual switch, including the typical settings when using the Jupiter 30 module.

3.1.3 Function LEDs

The four LEDs on the front panel provide an indication of the current status of basic features associated with the development unit. Refer to section 3.3 for a complete description of the function of each LED.

3.1.4 Reset switch

A reset push button is provided on the front panel to generate a receiver system hardware reset.

3.1.5 Clock out connector

The Clock out connector, located on the rear panel of the development unit, can be used to provide module generated timing signals. Refer to section 3.4 for more detailed information.

3.1.6 Serial port 1

This host serial port is used to send and receive serial data. This port is used as the default, with transmission in NMEA format at the rate of 9600 Baud. The connectors to be used with these serial ports are 9-pin D-subminiature connectors.

3.1.7 Serial port 2

This is the auxiliary serial port, and primarily used for the reception of RTCM SC-104 DGPS (Differential GPS) correction messages.

3.1.9 Antenna connector

The antenna provided with this development kit should be connected to the SMA connector located on the rear panel of the development unit.

3.1.10 DC power input

The supplied DC power adapter is to be plugged into the DC connector on the rear panel of development unit. The development unit will accept voltages from 9 to 16 VDC. The middle pin on J1 is negative polarity, while the outer shell is positive.

3.2 Configuration DIP switch

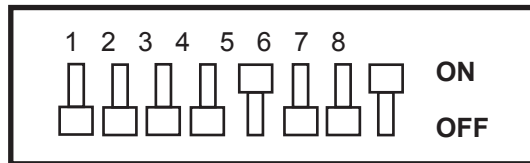A typical setting of the Configuration DIP switch is shown in Figure 3-2.

Figure 3-2 Configuration DIP switch

Table 3-1 outlines the available functionality and corresponding switch position for the Configuration DIP switch.

Switch	Description	Typical setting
1	GPIO3/GYROIN*	OFF (high)
2	GPIO15/FR*	OFF (high)
3	Serial BOOT	OFF (normal run)
4	GPIO1/W_TICKS*	OFF (high)
5	RTC BACKUP POWER	ON (enabled)
6	PREAMP power select	OFF (3 V)
7	PREAMP power select	OFF (12 V)
8	PREAMP power enable	ON (enabled)
These functions have been disabled by internal switch SW3 to allow correct operation of the antenna current sense circuits on the Jupiter 30 adapter board.		

Table 3-1 DIP switch settings

A brief description of the functionality of each switch is specified below. Refer to the Jupiter 30 Data sheet for more information about the functionality of specific pads. The receiver operating settings will not change after moving the position of a configuration switch while the development unit is operating. Pressing the reset switch, or turning the unit off and on will enable the settings to take effect in the receiver. The recommended method for reconfiguration is to switch the unit off, modify the switch positions, then re-apply the power.

3.2.1 DIP switch 1 – GPIO3 /GYROIN input

DIP switch 1 interfaces with the GPIO3 /GYROIN pad of the module. The switch is typically off, but has no effect with the standard module's software. This switch can be enabled by the internal switch SW3.1.

3.2.2 DIP switch 2 – GPIO15 /FR input

DIP switch 2 interfaces with the GPIO15 /FR pad of the module. The switch is typically off, but has no effect with the standard module's software. This switch can be enabled by the internal switch SW3.2.

3.2.3 DIP switch 3 – BOOT from serial mode

DIP switch 3 interfaces with the BOOT pad of the module and allows the user to upgrade the Flash memory. For normal operation the switch should be set to off. To boot from the serial port the switch should be set to on. This switch is enabled by the internal switch SW3.3.

3.2.4 DIP switch 4 – GPIO1/W_TICKS input

DIP switch 4 interfaces to the GPIO1/W_TICKS pad of the module. The switch is typically off, but has no effect with the standard module's software. This switch can be enabled by the internal switch SW3.4.

3.2.5 DIP switch 5 – RTC backup power enable

DIP switch 5 provides control of the RTC backup power to the module. When set to the on position, the RTC backup power is applied to the module, allowing the RTC and SRAM to continue being powered when the primary source is removed. The jumper JB5/6 must also be in place for the backup power to be supplied. This power supply will be supplied to the module even with the main power switch in the off position.

3.2.6 DIP switch 6 – Antenna preamp power select (3.3 V or 5/12 V)

Dip switch 6 provides control of the antenna preamp voltage applied to the module. The switch position determines the supply voltage (off = 3.3 V, on = 5/12 V). **Switch 6 should be left in the 3.3 V (off) position.** The positions of switches 7 and 8 also need to be considered when using the preamp function.

Note: the supplied antenna is a 3.3 V type.

3.2.7 DIP switch 7 – Antenna preamp power select (5 V or 12 V)

DIP switch 7 also controls the antenna preamp voltage applied to the module. If switch 6 is on, then switch 7 will determine the supply voltage to the active antenna (off = 12 V, on = 5 V). **Switch 7 is not operational when switch 6 is in the 3.3 V (off) position.**

3.2.8 DIP switch 8 – Antenna preamp power enable

DIP switch 8 provides the ability to enable/disable the antenna preamp voltage to the module depending on the antenna being used. Typically this switch is on, enabling 3 V to be applied to the active antenna supplied with the kit.
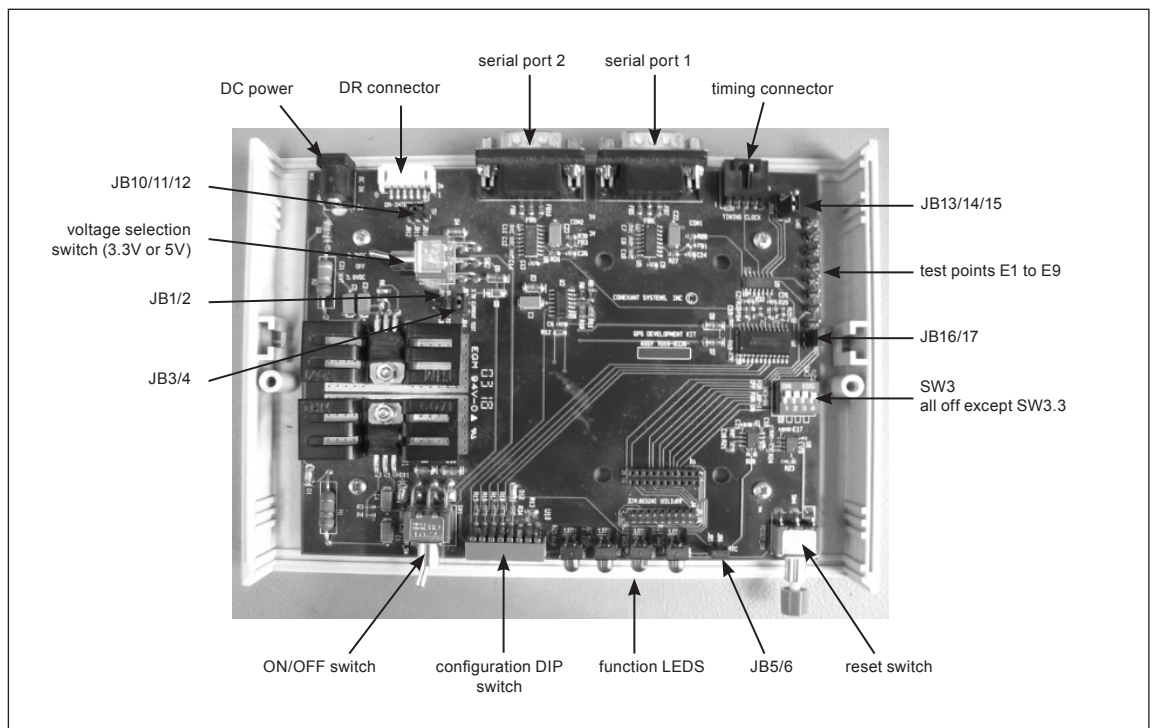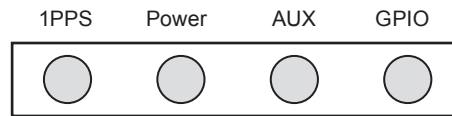

Figure 3-5 Internal layout of the development unit

3.3 Function LEDs

There are four LEDs on the front panel of the development unit, indicating the status of a selection of basic functions. The functions of the LEDs are described in the sections that follow.

Figure 3-3 Function LEDs on front panel

Note that some early versions of the evaluation unit have different LED legends.

3.3.1 1PPS

This LED will flash on with each transition of the 1 PPS (Pulse Per Second) output of the GPS receiver. The 1PPS LED will begin flashing when the receiver is tracking a satellite.

3.3.2 Power

This LED indicates presence of primary DC power to the module.

3.3.3 AUX

This LED shows activity on the auxiliary serial RS232 port (DGPS).

3.3.4 GPIO

This LED indicates the state of GPIO15 , which can be set via DIP switch 2. This LED is lit when switch 2 is set to on. (Note that switch 2 has no effect when using standard Jupiter 30 software.)

3.4 Clock out connector

The Clock out connector provides an interface for all associated timing signals with the module. It provides the user access to the Time Mark (1PPS) signal. The pinout connections are described in Table 3-2, and illustrated in Figure 3-4.

Pin number	Function
1	not used
2	inverted 1PPS signal
3	normal 1PPS signal
4	ground

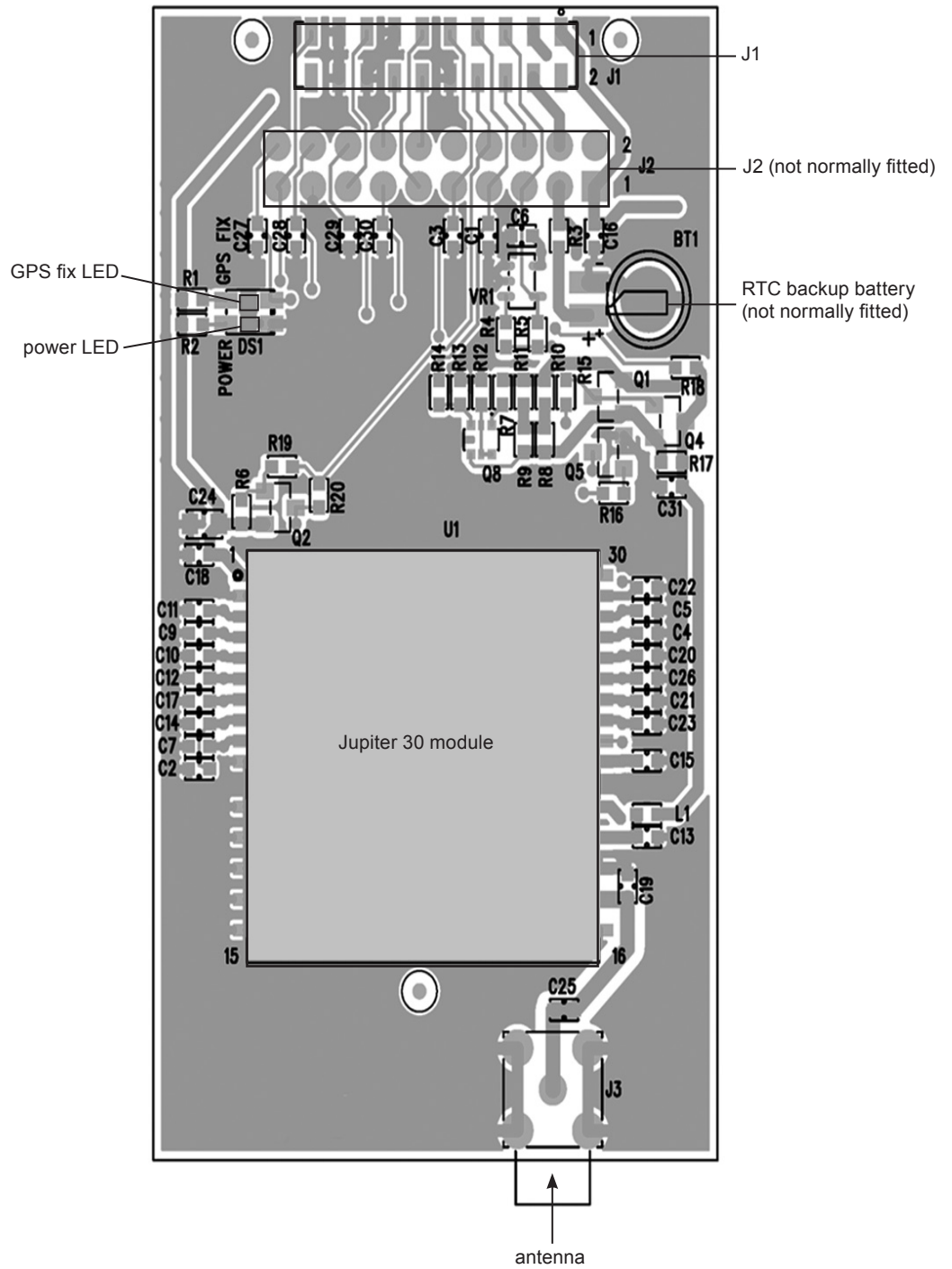**Table 3-2 Pin functions of the clock out connector**
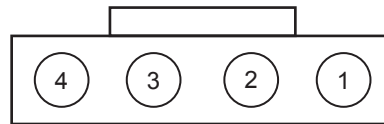
Figure 3-6 Jupiter 30 adapter board

Figure 3-4 Pin layout of the clock out connector

A mating connector for the clock out connector is supplied with the development kit. The part number is shown in Table 3-3.

Manufacturer	Part number
Molex	70400 series 'G'

Table 3-3 Mating connector part description

3.5 Internal configuration

It should not be necessary to open the development unit unless accessing the internal test pins. Most combinations of I/O can be made from the front panel configuration switch. In the event that it is necessary to open the unit, Figure 3-5 illustrates the internal layout of the development unit board.

As shown in Figure 3-5, there is a selection of links that can be configured to provide functionality depending on the application. Table 3-4 lists the functions available.

Pins	Function when linked
JB1/2	Current link for 5 V supply. Can be used to determine current on 5 V rail. Not used for the Jupiter 30 module.
JB3/4	Current link for the primary power 3.3 V supply. Can be used to determine supply current for 3.3 V rail.
JB5/6	Current link for the secondary power RTC supply. Can be used to determine supply current for RTC rail.
JB10/11	5 V supplied to Pin 1 of the DR connector
JB11/12	3.3 V supplied to Pin 1 of the DR connector
JB13/14	not used
JB14/15	not used
JB16/17	Internal interface enable (normally fitted)

Table 3-4 Pin functionality

In addition to the configurable jumpers, there is a selection of test points on the board. The signals available on the test points are shown in Table 3-5.

Test point	Function
E1	TXA
E2	RXA
E3	TXB
E4	RXB
E6	1PPS
E7	not used
E8	ground
E9	ground

Table 3-5 Signals available on the test points

There are some settings that should not be changed when using the standard Jupiter 30 module in conjunction with the development unit. These are as follows:
- SW2 must remain selected on 3.3 VDC

- Link for JB3/4 must be fitted

- Link for JB16/17 must be fitted

- SW3 DIP switch must be all off except SW3.3

3.6 Jupiter 30 module on adapter board

Figure 3-6 (on the following page) shows the adapter board with the positions of the connectors and indicators.

Table 3-6 lists the pin configurations for the J1 and J2 connectors.

Jupiter function	J2 (2.54 mm pitch header) pin no.	J1 (2 mm pitch header) pin no.
V_ANT	1	1
VCC_RF	2	
V_BATT	3	3
VDD	4	4
M_RST	5	5
GPIO3/GYRO IN	6	6
GPIO15/FR	7	7
BOOT	8	8
GPIO1/W TICKS	9	9
RFON	10	
GND		10
TXA	11	11
RXA	12	12
GPIO4	13	
GND		13
TXB	14	14
RXB	15	15
Wake-up	16	
GND	17	16
GPIO13	18	
GND		17
GND		18
1PPS	19	19
GPS_FIX/GPIO10	20	

Table 3-6 Connections J1 (2 mm pitch header) and J2 (2.54 mm pitch header)

4.0 Operating instructions

This section provides important information for the evaluation of the Jupiter 30 GPS module. Step-by-step instructions for connecting and operating the GPS development kit are included for first time setup.

4.1 Initial connection and operation

The following steps describe how to connect and operate the GPS Development Kit.

Install the supplied SiRFdemo on your PC:
1. Insert the supplied CD into the CDROM drive

2. Double click on the SiRFDemo software icon and follow the installation process.

Set up the hardware:
1. Connect the DC power adapter to the power input J1.

2. Connect the antenna cable to the SMA coaxial antenna connector on the rear panel of the Development unit.

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3. Connect the DB9 serial data cable between the PC serial communication port and the development unit's Serial Port 1.

4. Place the antenna in a site where a good view of the sky can be seen (refer to section 4.2 for more detail).

5. Run the GPS analyser software on the PC. (Refer to section 4.4 for more details.)

6. Connect the power supply to a suitable AC outlet.

7. Turn the unit on using the power switch on the front panel to provide primary power to the Jupiter 30 receiver. Once power is applied, the Power LED should be lit.

4.2 Positioning the GPS antenna

The GPS antenna should be located with a clear view of the sky for optimal reception of the satellite signals. The 1PPS LED should begin flashing at 1 Hz once the receiver is powered and has started receiving at least one satellite. This provides an indication of whether or not the receiver is running.

Note: GPS signals may be severely attenuated or totally obscured by roofs, solid walls, dense foliage, or even coated glass (found in many office structures and car windows). The development unit should be outside, or on the roof of a building to effectively evaluate receiver performance. With stationary developments, care should be taken to keep the antenna away from the side of a building as GPS signals can reflect off metal or coated glass. These reflections have a longer path than direct signals and can cause multi-path errors.

4.3 Connecting an RTCM differential source

For debugging purposes, it is suggested that users log both the GPS and RTCM data simultaneously. To allow the provision to do this, Navman can supply a software program called Labmon.
The development unit, PC and the RTCM SC-104 differential correction source are connected as shown in Figure 4.1. If RTCM SC-104 data needs to be logged at the same time it is sent to the receiver, the OEM must supply a cable with three connectors to connect the RTCM correction source to the development unit's auxiliary port and to an unused serial port on the PC. In this case, data is only logged when Labmon is invoked with file names as command line arguments (refer to the Labmon application note LA010103). Logging and subsequent review of the RTCM correction data often resolves performance or compatibility issues.

The development unit should be set up as shown in Figure 4-1 with only the RTCM correction source connected to the receiver. If the RTCM cable is not connected to the receiver's auxiliary port, DGPS operation will not be possible. When RTCM data is being received the AUX LED will be lit.

Note: the development unit may be connected to either the COM1, COM2, COM3, or COM4 serial ports and the RTCM differential correction data source connected either directly to the receiver's auxiliary I/O port, to one of the remaining serial ports of the PC, or to both using an OEM-supplied three-connector serial cable.
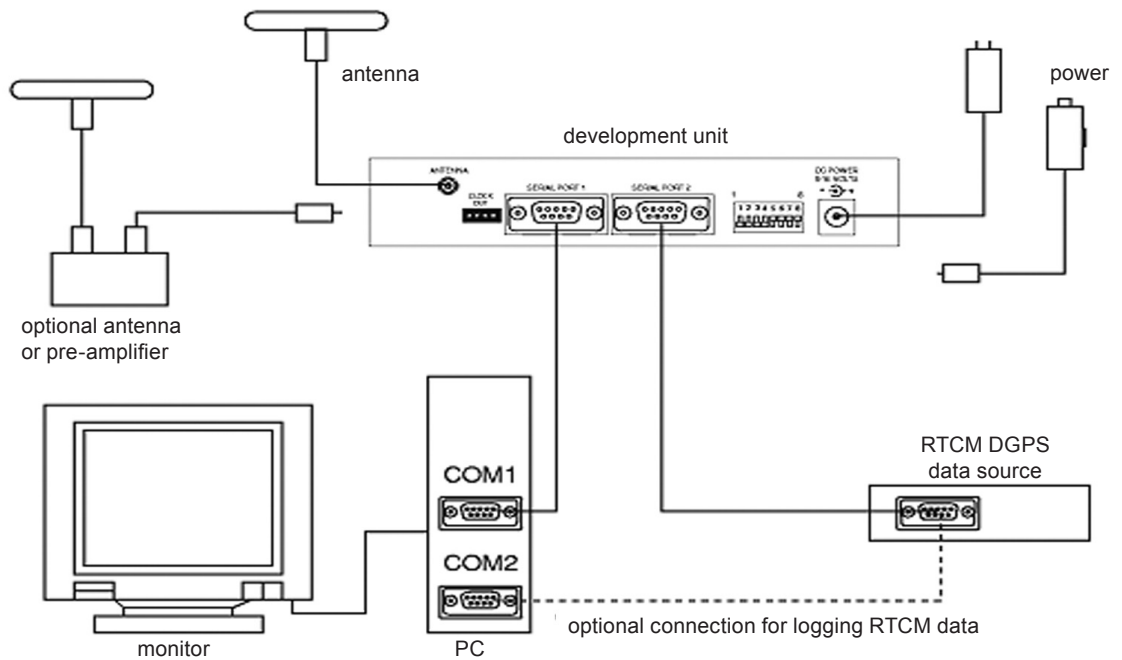
Figure 4-1 Development unit test equipment

4.4 Operating the GPS Analyser software

There are two software packages supplied with the GPS Development Kit: SiRFDemo and SiRFflash. The VisualGPS program can be obtained free of charge from the VisualGPS website (*www.visualgps.net/VisualGPS/*).

4.4.1 VisualGPS

VisualGPS graphically presents the serial data transmitted by the receiver. The receiver output must be enabled in the NMEA protocol for this software to be used.

To enable the receiver output

1. Open the VisualGPS software installed on the PC.

2. Select the Settings>Communications tab.

3. When the Communications Settings window is displayed, select the correct COM Port and set the Baud rate to 9600 Baud.

When this has been carried out, and the development unit is powered, raw NMEA data should appear in the NMEA Monitor Window. For more detailed information on any of the analysis windows, use the Help function in the top toolbar.

4.4.2 SiRFDemo

SiRFDemo software can provide analysis of receiver output in either SiRF binary or NMEA protocols. When enabled in NMEA format, the only analysis provided is raw data being transmitted by the receiver. While the module is transmitting serial data in NMEA format, it is

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suggested that VisualGPS is used for analysis, rather than SiRFDemo.

To provide graphical presentation of the data, the receiver can be set to output in SiRF binary format.

To set the receiver output to SiRF binary

1. Open the SiRFDemo software.

2. When the Data Source setup is displayed, select the appropriate COM port and 9600 Baud from the drop down menu.

3. Select the Action menu and click on Open Data Source. If the development unit is powered, and the serial port is connected to the PC, NMEA data should appear in the Debug View window.

To change to SiRF binary, select the Action menu and click on the Switch to SiRF Protocol. This should now present information in each window, similar to that of VisualGPS. Whilst enabled in SiRF binary protocol, more of the analysis software's functionality can be accessed. To switch back into NMEA mode, select the Action menu and click on Switch to NMEA Protocol. Select 9600 for the baud rate and click on the Send button.

Note: settings, including the current output protocol, are reset if all power is removed from the unit. For more information, refer to the Navman SiRFDemo and SiRFflash User Guide MN000316.

5.0 Acronyms used in this document

1PPS: One Pulse Per Second

DGPS: Differential Global Positioning System

GPIO: General Purpose Input Output

GPS: Global Positioning System

NMEA: National Marine Electronics Association

RTC: Real Time Clock

RTCM: Radio Technical Commission for Maritime services

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