Jupiter Series
Development kit

User guide

Jupiter series Development Unit

Development kit Part Numbers

- AA003253-G - Jupiter 32 Development kit RoHS
- AA003029-G - Jupiter 30 Development kit RoHS
- TU10-D057-400 Jupiter 20 Development kit RoHS
- TU10-D057-401 Jupiter 20 S Development kit RoHS
- TU10-D057-402 Jupiter 20 DR Development kit RoHS
- TU10-D057-403 Jupiter 21 Development kit RoHS
- TU10-D057-404 Jupiter 21 S Development kit RoHS
- TU10-D057-410 Jupiter 110 “R” Development kit RoHS
- TU10-D057-411 Jupiter 110 “RS” Development kit RoHS

Related documents

- GPS module documentation
- RoHS Compliant adaptor boards technical note LA000655
- Low power operating modes application note LA000513
- Navman NMEA reference manual MN000315
- SiRF Binary protocol reference manual MN000314

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1.0 Introduction

The Jupiter series GPS Development kit is designed to assist with the integration of Jupiter GPS receiver modules in custom applications and as a platform for the development of new products using the Jupiter series of modules. The Development kit provides a hardware and software platform for development and testing and includes the Development Unit, antenna, cables and interface software (See Figure 1-1).

Figure 1-1: Development kit contents

The kit provides the GPS software tools SiRFDemo and SiRFView to allow communication with the Jupiter GPS receiver. These Windows-based programs present the receiver's raw data in graphical form, allowing detailed analysis and development using both NMEA and SiRF Binary formats. The SiRFFlash utility is provided for upgrading the GPS Flash.

This user guide describes configuration and operation of the hardware items supplied with the Development kit. The latest versions of the documentation can be downloaded from the Navman website www.navman.com (Commercial GPS Solutions).

The development kit is intended to work with the following Jupiter series products:

- TU20-D410-0013 Jupiter 20 (standard)
- TU20-D410-101 Jupiter 20S (XTrac)
- TU20-D420-201 Jupiter 20D (dead reckoning)
- TU20-D100-001 Jupiter 20 (standard) adapter
- TU20-D100-101 Jupiter 20S (XTrac) adaptor
- TU20-D120-201 Jupiter 20D (DR) adaptor
- TU21-D450-021 Jupiter 21 (standard) with right angle OSX
- TU21-D450-031 Jupiter 21 (standard) with straight OSX
- TU21-D450-041 Jupiter 21 (standard) with right angle SMB
- TU21-D550-021 Jupiter 21S (XTrac) with right angle OSX
- TU21-D550-031 Jupiter 21S (XTrac) with straight OSX
- TU21-D550-041 Jupiter 21S (XTrac) with right angle SMB
- AA003025-G Jupiter 30 (standard)
- AA003027-G Jupiter 30 on adapter board
- AA003252-G Jupiter 32 (standard)
- AA003251-G Jupiter 32 on adapter board
- AA004260-G Jupiter 110 (standard)
- AA004261-G Jupiter 110S (with SiRF XTrac)
- AA004250-G Jupiter 110R (with external RF antenna support)
- AA004263-G Jupiter 110RS (with external RF antenna support and SiRF XTrac)

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1.1 Module documentation

This guide is designed to assist with the process of evaluation and development using Jupiter series products. For a general overview of the Jupiter Series products, refer to the Product Briefs. For more detailed specifications and parameters refer to the Data Sheets. For detailed reference design and integration issues, refer to the Integrator's Guides. Some products such as the Jupiter 20 and Jupiter 110 have a combined Data Sheet and Integrator's Guide. The documents listed in Table 1-1 can be obtained from the Navman website.

Jupiter Product	Product Brief	Data Sheet	Integrator's Guide
20	LA000509	LA000507	LA000508
21	LA000515	LA000516	LA000516
30	LA000575	LA000576	LA000577
32	LA000268	LA000267	LA000605
110	LA000511	LA000504	LA000504

Table 1-1: Jupiter series document numbers

1.2 Features

1.2.1 Jupiter series GPS Development Unit

The Development Unit is environmentally friendly and RoHS compliant. It houses a unit board fitted with a Jupiter GPS receiver module. The following resources are available on the unit board:

- USB 2.0 port
- two RS232 ports
- selectable bias voltages for active GPS antennas
- backup power source for SRAM and RTC
- test points for current measuring primary and backup power
- regulated DC power supply
- status indicator LEDs
- configurable GPIO functionality using DIP switches
- convenient interfaces for DR (Dead Reckoning) hardware

1.2.2 GPS antenna with preamp, magnetic base and SMA connector

A magnetic-mount, 50 ohm impedance active antenna is supplied with an RF cable (RG-174) already terminated with an SMA connector for attachment to the unit. The typical gain at the connector is approximately 18 dB. The supplied active antenna should be biased at +3.3 VDC, but an active antenna with a bias of +5 VDC may also be used. The antenna is designed to receive the L1 band of GPS satellites at 1575.42 MHz.

1.2.3 Power adapter for 120/240 VAC operation

DC power for the Development Unit is provided by either an AC/DC converter or car adapter (not supplied). The AC/DC converter operates from a nominal 120/240 VAC input and provides a 12 VDC at 500 mA output. The converter comes with four interchangeable power outlet plug adaptors for US, UK, EU and Australasia.

1.3 Using the Development kit

The Development kit is useful for product conceptualisation and design. It has facilities for evaluating the suitability of Navman Jupiter Series GPS modules. There are provisions for making current and voltage measurements as part of the hardware design process. The software allows full access to NMEA and SiRF binary commands which can monitor or fine tune the operating parameters of the GPS receiver.

Some of the important design factors that can be investigated and modified using the Development kit include:

1.3.1 Static and Dynamic Accuracy

Static accuracy requires collection of statistical data on the changing constellation of satellites and atmospheric conditions over a 24 hour period. The software provided permits the collection and analysis of this information.

Dynamic accuracy is the test of the performance of a GPS system in a real world environment. The Development Unit is mobile and can be used on drive tests in which the test route can be recorded and consistency measurements can be made.

Additional options for improving accuracy can be incorporated into a new product using the Development kit. The unit provides the means of investigating and incorporating accuracy enhancing technologies such as Dead Reckoning, Differential GPS and SBAS (Satellite Based Augmentation Systems) into a product.

GPS navigation settings can be altered by the customer to improve stationary tracking and improve the smoothness of a track under poor reception conditions. Differential GPS techniques such as RTCM and SBAS offer the highest accuracy to remove atmospheric errors.

1.3.2 Time To First Fix

The ability of a GPS receiver to quickly and accurately determine its location is an important feature. In Coldstart mode the receiver has no knowledge of its time or last location and satellite data are unavailable. The Development Unit provides a means of monitoring TTFF in Coldstart, Warmstart and Hotstart modes.

1.3.3 Power management

In portable or hand-held products that run on batteries, power management is crucial to a product’s success. Power saving modes give customers flexibility with regard to power versus performance trade-offs. TricklePower allows for a continuous tracking mode with a user-selectable position update interval. It saves power by cycling between full power, a reduced power setting using just the CPU, and a low power setting in a fixed-rate cycle. Push-to-Fix allows for a more infrequent, on-demand user position request with short TTFF. The Development kit provides the tools necessary for monitoring the power saving modes as well as measuring power consumption. See the Navman Low Power Operating Modes application note LA000513 for more information on this important feature.

1.3.4 Product antenna requirements and antenna uniformity

Antenna selection is one of the most important factors for GPS performance. There are several types of GPS antennas such as quad helices, choke rings, microstrips and patch antennas. The antenna that comes with the Development kit is a high quality amplified patch antenna that offers a performance standard to which other antennas can be compared. The Development kit provides all the tools needed for evaluating antenna performance and finding the perfect match for your product. In addition, the effects of multipath can be investigated by measurement and various antenna configurations can be tested under difficult conditions such as in dense foliage and urban canyons.

2.0 Getting Started

2.1 Development kit contents

The Quick start guide shows how to get started with the Development kit. Table 2-1 lists the contents of the Development kit. Please check to make sure everything is included. Figure 2-1 shows a typical setup for hooking up the Development kit.

Qty.	Item
1	Development Unit
1	GPS receiver module on adaptor board (fitted into Development Unit)
1	Quick Start Guide and Registration form
1	pre-amplified GPS antenna and cable
1	100-240 VAC (50Hz-60Hz) to 12 VDC power supply with US, UK, EU and Australasia plug adaptors
1	USB interface cable
1	Documentation and software CD contents: GPS module Product brief (pdf) GPS module Data sheet (pdf) GPS module Integrator's manual (pdf) Ant06 Product Brief (pdf) Application Notes - (module specific) Application Note - Low Power Operating Modes (pdf) Development kit User Guide (pdf) Navman NMEA reference manual (pdf) SiRF Binary Protocol reference manual (pdf) SiRFDemo, SiRFView and SiRFFlash user guides (pdf) Software: SiRFView / SiRFDemo / SiRFFlash Development Unit electronic schematic (pdf) USB device driver software and manual

Table 2-1: Development kit contents

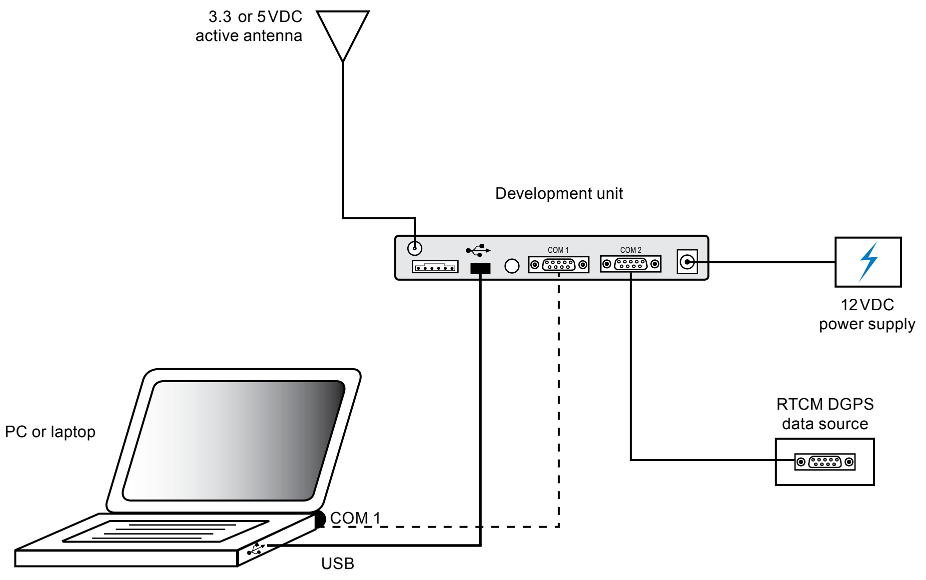

Figure 2-1: Development unit test equipment setup

2.2 Requirements

The Development kit software will run on any standard Microsoft Windows compatible laptop or PC that has a free USB or serial port. Adobe Acrobat Reader is required for reading the on-line documentation. This is a free download from www.adobe.com.

The following equipment is required to use the Jupiter Development Unit:

- IBM compatible PC
- Minimum one serial port (If your PC only has USB, a USB/RS232 converter can be used)
- Windows 95/98 or recent Windows operating system
- 486 100 MHz or higher processor
- SVGA at least 800 x 600 resolution
- 16 Megabytes of RAM
- 2 MB to 60 MB of hard disk space depending if documentation is loaded to hard drive

2.3 Setting up the USB Port

Windows will automatically detect and install the proper USB drivers using its built-in Plug-and-Play feature. For non-standard applications or installation on an older Windows system, a USB driver installation program is provided on the Development kit CD.

The USB driver will self install as soon as the unit's USB cable is plugged into the PC. The unit does not have to be powered on. A message will appear on the taskbar, saying that Windows has found new hardware and is installing it. Proper installation can be verified by viewing the device manager window. There will be a new entry for the CP2102 device in the Ports and Universal Serial Bus Controllers section as shown in Figure 2-2. If the device did not properly install the Port and Serial Bus entry may have a large yellow exclamation mark or question mark over its entry. In this situation the device can be uninstalled by right clicking the mouse and selecting delete.

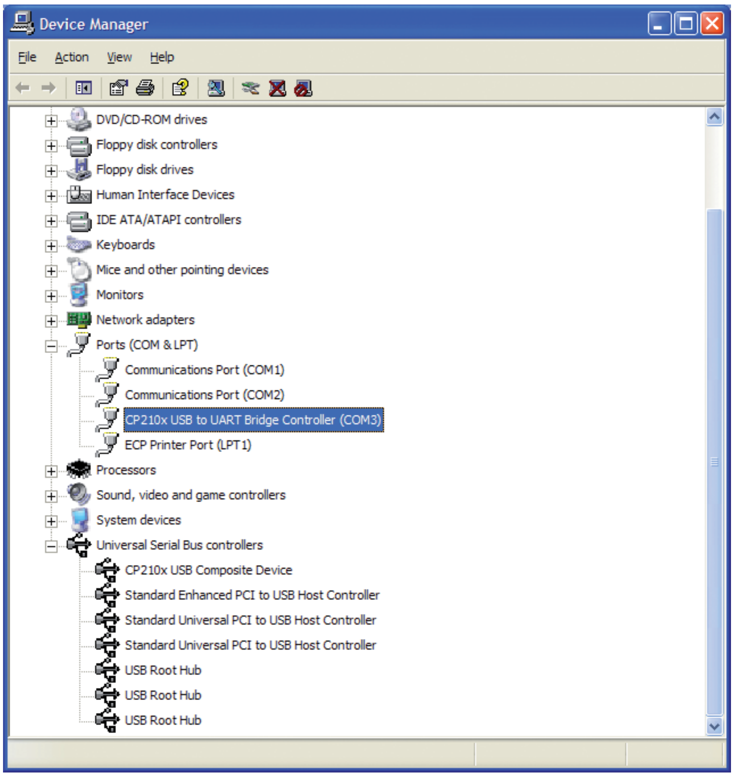

Figure 2-2: Correctly installed Port and USB Controller driver

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If the drivers did not install automatically or the USB connection is not working properly, it will be necessary to install the drivers from the CD. It is important that the USB cable NOT be plugged into the PC until after setup has completed in this case. Run the program CP2101_Drivers.exe to extract all of the device drivers. After following the prompts, the utility will copy the driver files to a specified directory or the default directory *C:\Cygnal\CP2101.* Run setup from this directory and the driver files will be placed in the proper Windows directory.

2.4 Operating the GPS analyser software

There are three software packages supplied with the GPS development kit: SiRFDemo, SiRFFlash and SiRFView.

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

For 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. Run the SiRFDemo software.
2. When the Data Source Setup window is displayed, Select the PC serial port that is being used from the pull down list and the Baud rate the receiver is operating at from the pull down list. The Serial Port list only displays available serial ports. If USB is being used, the USB port will be listed as an additional serial port.
3. Select Action / Open Data Source. If the development board is powered, and Serial port 1 is connected to the PC, NMEA data should appear in the Debug View window.
4. To change to SiRF binary, select Action / Switch to SiRF Protocol.

Information should now display in each window, similar to that of VisualGPS. While enabled in SiRF binary protocol, more of the analysis software's functionality can be accessed. To switch back to NMEA mode, select Action / Switch to NMEA Protocol. Select the appropriate baud rate and click on the Send button.

Note: All settings (including the current output protocol) are reset if power is removed from the board. For more information, refer to the SiRFDemo and SiRFFlash User Guides provided on the CD-ROM.

2.4.2 VisualGPS

VisualGPS graphically presents the serial data transmitted by the receiver. The VisualGPS program can be downloaded for free from the VisualGPS website (www.visualgps.net/VisualGPS/). The receiver output must be enabled in the NMEA protocol to use this software.

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 required Serial Port and Baud rate.

When the receiver output has been enabled and the development board is powered, raw NMEA data should appear in the NMEA Monitor Window. For more information on any of the analysis windows, use the Help function in the VisualGPS menu bar.

2.4.3 SiRFView

SiRFView can be used to analyse GPS data that has been collected using SiRFDemo. The GPS data is logged in the *.gps file format that can be imported into SiRFView and presented on screen in a number of numeric and graphical forms.

For further information about using SiRFView, refer to the SiRFView User guide provided with this Development kit.

3.0 Configuring the Development Unit

This section provides an overview of the hardware and configurable functionality of the Jupiter GPS Development Unit including software.

3.1 External interfaces

The Development kit provides external connectors and switches for basic functionality. See Figure 3-1.

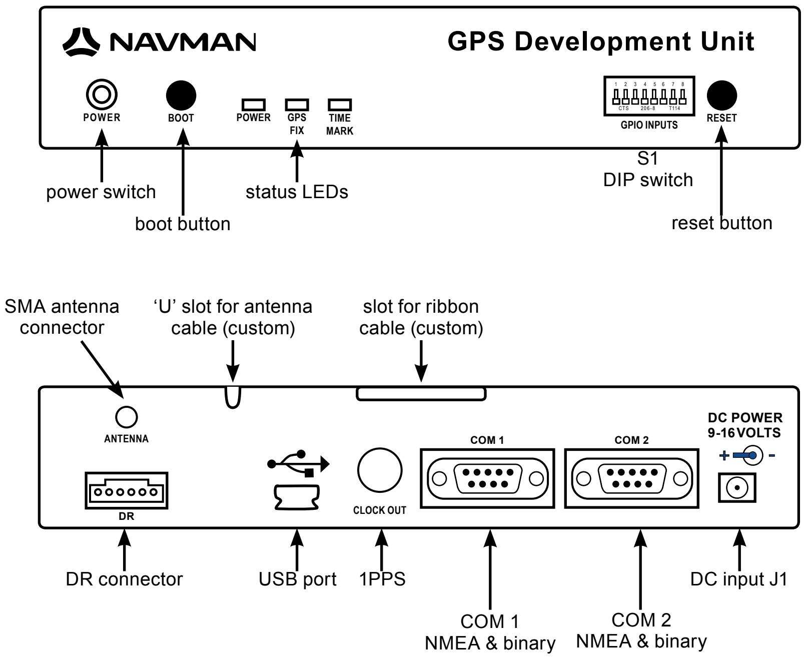

Figure 3-1: Front and back panels of the Development Unit

3.1.1 Power switch (On/Off)

The Power switch controls primary power to the receiver module inside. The green Power LED indicates the Unit and the GPS module has primary power supplied.

3.1.2 Boot push button

The boot push button can be used to select serial boot mode. In boot mode it is possible to upgrade the flash memory (the SiRFFlash software and user guide are provided in the Development kit). This feature allows users to upgrade firmware in the GPS module.

To initiate boot mode, do either of the following:

- Press the Boot button, turn the power on and then release the Boot button. For Jupiter 110 only, depress the Boot button and cycle power using the power switch.
- Press the Reset button first, then hold down the Boot button. Release the Reset button and then release the Boot button.

3.1.3 Status LEDs

The LEDs visible through the front panel indicate the current status of Development kit. See Table 3-1. The following conditions are indicated by the LEDs:

- Power - This green LED is lit when the Unit and GPS module are powered up.
- GPS Fix - This LED is lit when there is a valid fix available
- Time Mark - 1PPS signal is product dependant. All Jupiter series products generate this except Jupiter 20S, 110S and 110RS. This LED will flash on each transition of the 1 pulse per second output of the GPS receiver. The 1PPS LED flash when the receiver has a 3D fix.
- RF_ON - This LED is lit when the RF section of the GPS module is turned on. It may be off in power saving modes such as TricklePower mode. It is not active for all modules. See the Datasheet for more details.

• GPIO status LEDs. There are an additional 8 GPIO status LEDs that are visible through the front case. These show the state of each GPIO. The LED is lit for a logic HIGH.

Table 3-1 shows logic state of the GPIO LEDs.

LED	Function
PWR	Lit when Development Unit and GPS module are powered up
GPS_FIX	Lit when a fix is available (some modules only)
TIME MARK	flashes once per sec for some modules (some modules only)
RF_ON	Lit when RF section of GPS activated (some modules only)
GPIOA	Lit for logic HIGH
GPIOB	Lit for logic HIGH
GPIOC	Lit for logic HIGH
GPIOD	Lit for logic HIGH
GPIOE	Lit for logic HIGH
GPIOF	Lit for logic HIGH
GPIOG	Lit for logic HIGH
GPIOH	Lit for logic HIGH

Table 3-1: Development Unit LEDs

The GPIO LEDs use a generic lettering scheme. Each LED corresponds to different signals on different modules. The translations of these are shown in Table 3-2.

Dev Kit LED	Jupiter 20	Jupiter 21	Jupiter 30	Jupiter 32
GPIO_A	GPIO15/FR	FR	ANT_OC	GPIO4
GPIO_B	GPIO1/W-TICKS	W-TICKS	ACT_ANT DIS	GPIO1
GPIO_C	GPIO3/GYRO	GYRO	NANT_SC	GPIO14
GPIO_D	GPIO5/SDI	–	GPIO4	GPIO15
GPIO_E	GPIO6/SDO	–	GPIO13	GPIO13
GPIO_F	GPIO7/SCK	–	WAKE UP	WAKE UP
GPIO_G	1PPS	1PPS	1PPS	1PPS
GPIO_H	GPS_FIX	GPS_FIX	GPS_FIX	GPS_FIX

Table 3-2: Development kit LEDs and GPS module Signal Correspondence

3.1.4 External switch S1 and internal switch S4

The DIP switch S1, along with internal switch S4 I/O SELECT, are used to control the logic levels of the GPIO inputs. S1 controls the GPIO inputs when S4 is ON. When S4 is OFF, S1 has no control over the GPIO and it is an output. The switches can be changed according to the development application. DIP switch S4 I/O SELECT is in series with S1 and used for setting the GPIO outputs. When a GPIO is an output, S4 must be OFF. S1 has no control and the LEDs shows the status of the GPIO. When a GPIO is an input, S4 must be ON to allow S1 to control that GPIO's logic level. Once again, the LEDs show the status of the GPIOs. Table 3-3 show the relationship of the switch settings to their function and logic state.

Switch	Function	State
S1	Sets GPIO Input	ON sets GPIO input HIGH OFF sets GPIO input LOW.
S4	Enables corresponding S1 to control GPIO state.	ON enables S1 to act as GPIO input OFF disables S1 and GPIO acts as output

Table 3-3: Development kit S1 and S4 switches

Table 3-4 shows the default settings for specific Jupiter series modules.

Dev KiT LED	Jupiter 20		Jupiter 21		Jupiter 30		Jupiter 32	
	S4	S1	S4	S1	S4	S1	S4	S1
GPIO_A	1=OFF	1=OFF	1=OFF	1=OFF	1=ON	1=ON	1=OFF	1=OFF
GPIO_B	2=OFF	2=OFF	2=OFF	2=OFF	2=OFF	2=OFF	2=OFF	2=OFF
GPIO_C	3=OFF	3=OFF	3=OFF	3=OFF	3=ON	3=OFF	3=OFF	3=OFF
GPIO_D	4=OFF	4=OFF	4=OFF	4=OFF	4=OFF	4=OFF	4=OFF	4=OFF
GPIO_E	5=OFF	5=OFF	5=OFF	5=OFF	5=OFF	5=OFF	5=OFF	5=OFF
GPIO_F	6=OFF	6=OFF	6=OFF	6=OFF	6=ON	6=ON	6=ON	6=ON
GPIO_G	7=OFF	7=OFF	7=OFF	7=OFF	7=OFF	7=OFF	7=OFF	7=OFF
GPIO_H	8=OFF	8=OFF	8=OFF	8=OFF	8=OFF	8=OFF	8=OFF	8=OFF

Table 3-4: Switch S4 and S1 default settings

3.1.5 Reset push button

The reset push button on the front panel can be used to generate a receiver system hardware reset and restart the GPS module and Development Unit. The reset button will not reset a Jupiter 110 since it has no reset line.

3.1.6 DR connector

The DR connector is used to interface with a gyroscope, wheel tick pulses and forward/ reverse indicator when using a Jupiter DR module. This is only applicable for the Jupiter 20DR module. Refer to section 6.0 for further details.

3.1.7 1PPS clock out connector

The Clock out connector provides an interface to the Time Mark (1PPS) signal. The output of this signal is 5 VDC. This signal is product dependant. Refer to the specific product documentation to determine if it is available.

3.1.8 USB port

The USB port is used for receiver communication and is the preferred means of communication with the unit. This port will operate as the primary communications port (COM1) when connected. The USB port does not supply power to the Development Unit.

3.1.9 COM1/COM2

The two serial ports on the Development Unit are 9-pin D-type connectors. The baud rate of the ports are determined by the GPS module used. Refer to the Datasheet for this information. When the USB port is used, COM1 will not accept commands to the unit but will send out data from the GPS module which may be monitored.

COM1 is the host port and supports both SiRF binary and NMEA protocols.

COM2 is the auxiliary serial port. The convention is for COM2 to support RTCM SC-104 DGPS (Differential GPS) correction messages.

3.1.10 Antenna connector

The GPS antenna provided with the kit can be plugged into the SMA antenna connector on the rear panel of the Development Unit. The antenna bias voltage can be changed by changing the link on J19 (see Table 3-5).

3.1.11 DC power input

The supplied DC power adapter is to be plugged into the DC connector on the rear panel of Development Unit. The unit will accept voltages from 9 to 16 VDC.

The middle pin on J1 is of positive polarity, while the outer shell is negative. The voltage output from the regulator can be adjusted by potentiometer R123 from 3.0 to 3.5 V. It is preconfigured at the factory for 3.3 V.

3.2 Internal Interfaces

The Development Unit provides internal connectors for modules, switches for configuration and test points. See Figure 3-2 for their location.

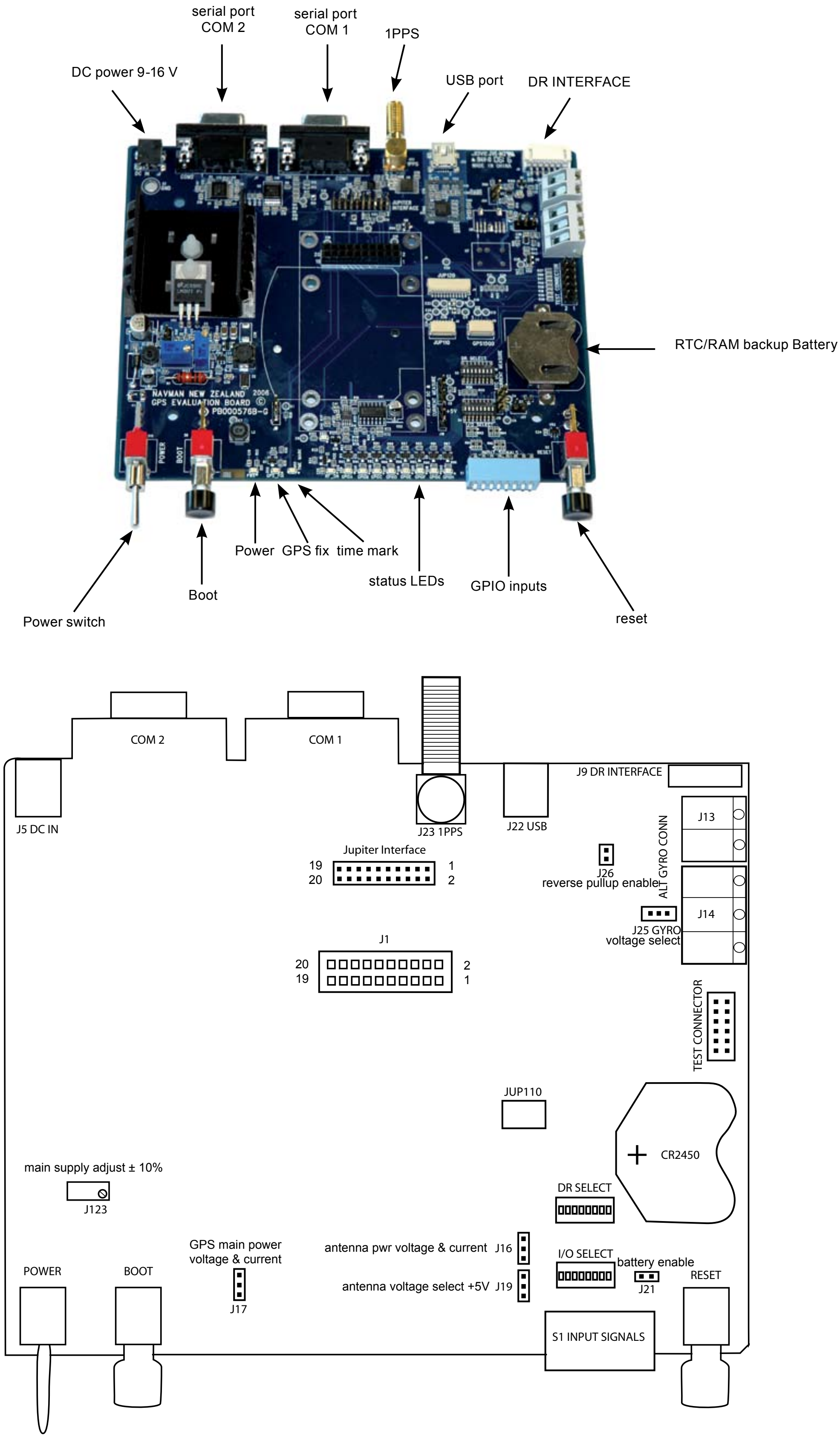

Figure 3-2: Layout of Development Unit

3.2.1 Connectors

A table of connectors along with their functions is presented in Table 3-5. Connectors J16, J17 and J18 are used for voltage and current measurements. See Figure 3-3.

Connector	Function
J1	Jupiter 20, 30, 32 module connector
J3	Jupiter 110 connector
J5	DC IN
J9	DR Interface See Figure 6.1
J11	Jupiter 21 module connector
J12	Test connector See Table 3.6
J13	DR Interface See Figure 6.2
J14	DR Interface See Figure 6.2
J16 pins 1, 2	antenna voltage and current measurement. See Figure 3-3
J17	main GPS supply voltage and current measurement. See Figure 3-3
J18 pins 1, 2	RTC/RAM voltage and current measurement. See Figure 3-3
J19	Antenna bias voltage - link 1-2 for 3.3V, link 2-3 for 5V
J21	Link for RTC/RAM battery, unlink to isolate
J25	Gyro voltage - pin 1-2 Linked for 5V, pin 2-3 linked for 3.3V
J26	Linked for DR reverse input pull-up

Table 3-5: Development kit connectors

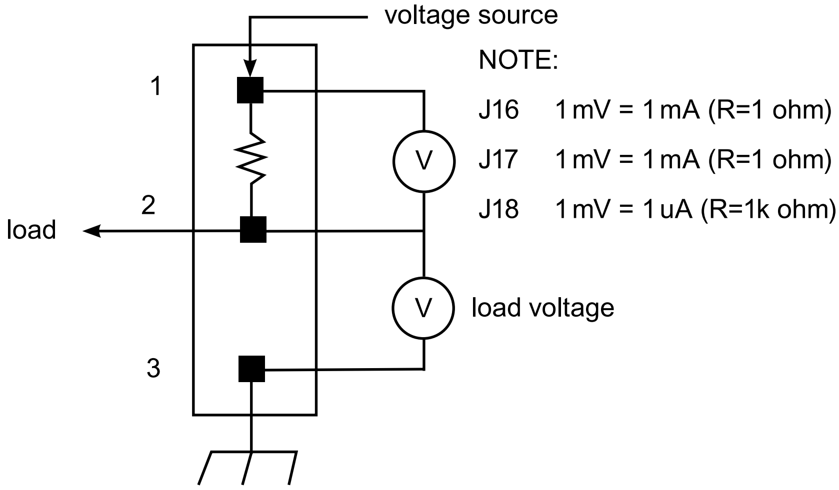

Figure 3-3 Arrangement for measuring current on J16, J17 and J18

Table 3-6 shows the signal correspondence for test connector J12.

Pin	Function
1	GPIO-A
2	GPIO-B
3	GPIO-C
4	GPIO-D
5	GPIO-E
6	GPIO-F
7	GPIO-G
8	GPIO-H
9	No Connection
10	No Connection
11	Ground
12	Main GPS supply

Table 3-6: Test Connector J12 Signals

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3.2.2 Module Connector Signals for J1

See Table 3-7.

Pin	Jupiter 20	Jupiter 30	Jupiter 32
1	V_ANT	ACTIVE PWR	V_ANT
2	VCC_RF	VCC_RF	NC
3	V_BATT	V_BATT	V_BATT
4	+3V	PWRIN	PWRIN
5	M_RESET	M_RESET	M_RESET
6	GPIO3 (GYRO)	NANT_SC	GPIO14
7	GPIO5/FR	ANT_OC	GPIO4
8	N_BOOT	N_BOOT	N_BOOT
9	GPIO1 (W_TICKS)	ACT_ANT DS	GPIO1
10	RFON	RFON	RF_ON
11	SDO1	SDO1	SDO1
12	SDI1	SDI1	SDI1
13	GPIO5/SDI1	GPIO4	GPIO15
14	SDO2	SDO2	SDO2
15	SDI2	SDI2	SDI2
16	SPIO7 (SCK)	WAKEUP	WAKEUP
17	GND	GND	GND
18	GPIO6	GPIO13	GPIO13
19	1PPS	1PPS	1PPS
20	GPS_FIX (SPIO10)	GPS_FIX	GPS_FIX (GPIO10)

Table 3-7: Module Connector Signals J1

3.2.3 DR Switch S5 - This switch is for setting the Dead Reckoning option on Jupiter 20. The normal non-DR settings are shown in Table 3-8.

Switch	Function	Normal non-DR Settings
1	INT_GYRO	OFF
2	EXT_GYRO	OFF
3	GPIOC	ON
4	WHEEL_TICK	OFF
5	GPIOB	ON
6	REVERSE	OFF
7	GPIOA	ON
8	not connected	OFF

Table 3-8: Development kit switch S5 (DR SELECT) settings for a non-DR system

3.3 RTC/RAM Battery

The Development kit contains a 3 V battery for backup of the programming information on the GPS device when the Development Unit is powered down. The battery can be replaced with a CR2450 which is a common 3 VDC 600 mAh coin cell lithium type battery. It should last for several years under normal use and has a shelf life of 10 years. The nominal voltage is 3.4 V, which can be measured on J18 (see Figure 3-3). The battery can be ordered from Navman (part number BT000024-G)

WARNING! Observe the correct polarity when changing the lithium battery. There is a danger of explosion if the battery is installed incorrectly. Replace battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions and local disposal requirements.

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3.4 Individual GPS module configuration

The Development Unit comes preassembled with a GPS module installed. In the event that a different module needs to be installed, follow the procedures and settings in the Table 3-9.

Procedure	Jupiter 20	Jupiter 21	Jupiter 30	Jupiter 32	Jupiter 110
Mount the adaptor board and plug it into the correct connector.	J1	J11	J1	J1	J3
Jumper J21 - RTC/RAM battery	link	link (some have battery on-board so link not needed)	link	link	link
connect antenna cable between module and back panel					
Set S1 - all OFF unless custom					
Set S4 - See Table 3-4					
Set S5 - See Table 3-4					
Connect power to unit and turn on.					
Connect Serial port					
Install and run SiRFDemo					
Set baud rate and port - see data sheet for baud rate					
Observe Time mark LED	Not used				Not used
Observe 3D fix LED	ON if 3D fix	ON if 3D fix	ON if 3D fix	ON if 3D fix	Not used

Table 3-9: Procedure for changing Jupiter GPS module on Development Unit board

4.0 Active Antenna

The active antenna included with the Development kit has been designed for optimal performance with Jupiter series GPS modules. It is configured to provide optimum tracking performance. It is an active medium gain antenna with an overall gain of 18 db. The antenna provided eliminates the risk of issues arising from incorrect antenna matching.

The supplied antenna is rated to IPx6 and features a sturdy waterproof aluminium housing with magnetic base or it can be permanently mounted with screws.

Other antennas can be used with the Development Unit and compared with the one provided as a reference. The antenna bias voltage is selectable for active antenna designs. See Table 3-5.

If a passive antenna is used, it will be affected by cable length and location with respect to the PCB ground planes. Other forms of connection close to the internal adapter card might be required and it may not be possible to use the front panel SMA connector. The antenna voltage will need to be turned OFF for a DC shorted passive antenna.

5.0 Connecting an RTCM differential source

The RTCM protocol (Radio Technical Commission for Maritime Services) is a protocol which provides real-time differential correction data for DGPS applications. The RTCM protocol specification is available from http://www.rtcm.org/. RTCM is not supported on Jupiter 20S, 21S, 110S, 30 and 32. SBAS based Differential GPS is available on Jupiter 20, 21, 110, 30 and 32

The Development Unit, PC and the RTCM SC-104 differential correction source are connected as shown in Figure 2-1. If RTCM SC-104 data needs to be logged at the same time it is sent to the receiver, you 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. If the RTCM cable is not connected to the receiver’s auxiliary port, DGPS operation will not be possible. Logging and subsequent review of the RTCM correction data often resolves performance or compatibility issues. For debugging purposes, it is suggested that users log both the GPS and RTCM data simultaneously.

6.0 Dead Reckoning (DR) configuration

The DR option is available only on Jupiter 20DR modules. The DR connector on the rear panel of the Development Unit provides an interface with the external inputs under DR operation. There are also two connector blocks, J13 and J14, which can also be used for DR interface. This functionality is to be used when evaluating Jupiter DR custom modules only.

The connectors are used for signals transmitted by:

- An angular rate sensor (gyro)
- A wheel ticks source
- A forward/reverse indicator

These signals are present on many late model vehicles and may be used to assist the DR receiver in determining position accuracy during the loss of signal conditions. Direct connection to the vehicle electrical system is possible if noise is under control. The inputs are 3 V to 16 V compatible. See Figures 6-1 and 6-2

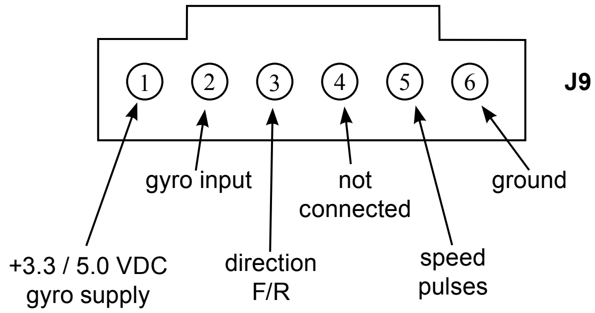

Figure 6-1: DR interface connector J9

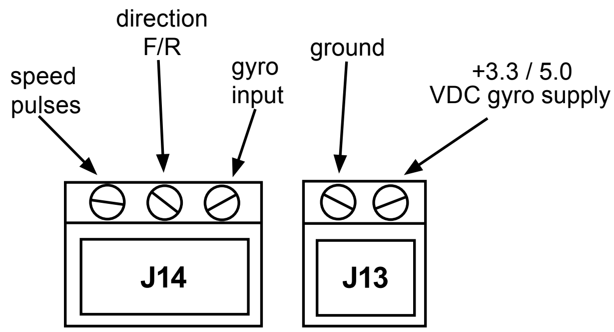

Figure 6-2: DR connector blocks J13 and J14

6.1 DR connector pin configuration

The following sections describe the functions of the external J9 DR connector pins.

Pin 1 – DC power supply
This pin can be used to power at either 3.3 or 5 VDC for external devices used in the DR operation. To modify the supply voltage refer to Table 3-5 for details of the jumper positioning.

Pin 2 – Heading rate gyro input
Table 6-1 details the gyro requirements. It is important to ensure that the rate gyro signals have the following characteristics:

- Range: 0 to 5 V
- Output (no gyro rotation): 2.5 V
- Clockwise rotation of the gyro causes the output voltage to rise
- Maximum voltage deviation due to rotation should occur with a turning rate of 90° per second or less

The gyro should be mounted so that its sensitive axis is as near vertical as practical.

Deviations from the vertical will reduce sensitivity for heading changes in the horizontal direction. Experiments have shown that acceptable performance can be achieved with mounting deviations of several degrees, but a better performance is achieved when the gyro is mounted closer to vertical. See Table 6-1 for gyro input specifications.

Pin 3 – Direction F/R sensor
Input from a signal that is normally at +0 V, but rises to +12 V when the vehicle is in the reverse gear. Use of this signal is optional; if it is not used, the effect of occasional reversing by the vehicle will not significantly degrade navigation performance. To ensure minimum current under backup power, be sure that this input is not pulled up external to the board.

If this signal is not connected, switch S3.2 should be left ON, with DIP switch 2 also ON to select 'forward'.

Pin 4 – Not used

Pin 5 – Speed pulses
The input to this pin is a pulse train generated in the vehicle. If this signal is derived from the vehicle's electrical system, external level shifting for this signal is required. The pulse frequency is proportional to the vehicle velocity. These pulses, or wheel ticks, are generated in most vehicles by the ABS (Anti-lock Braking System), the transmission, or the drive shaft. System design must restrict the pulses between 0 and 12 V.

Detection limits are as follows:

- Minimum detectable rate: 1 Hz
- Maximum detectable rate: 4 kHz

Pin 6 – Ground

6.2 Gyro input specifications

Characteristics	Symbol	Condition	Minimum	Standard	Maximum	Unit
Supply voltage	Vcc		+4.5	+5.0	+5.5	VDC
Max. angular velocity	ω max		–80		+80	deg/s
Output	Vo	angular velocity = 0 at –30 ~ 80°C	2.200	2.500	2.800	VDC
Scale factor	Sv	at –30 ~ 80°C	19.3	22.2	25.1	mV/deg/s
Asymmetry CW & CCW					3	deg/s
Temp coefficient scale factor		reference temp: –30 ~ 80°C			±10	%FS
Temp coefficient drift		reference temp: –30 ~ 80°C			9	deg/s
Noise level		7kHz noise			20	mVrms
Linearity		in the maximum angular velocity range			0.5	%FS
Operating temp range	Topr		–40		85	°C

Table 6-1: Gyro input specifications

7.0 Disposal

This product should not be treated as household waste. For more detailed information about recycling of this product, please contact your local waste management authority or the reseller from whom you purchased the product.

8.0 Compliances

The Jupiter Series Development kit complies with the following:

- Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- CISPR22 and FCC: Part 15, Class B for radiated emissions
- Manufactured in an ISO 9000:2000 accredited facility

9.0 Glossary and Acronyms used in this document

1PPS: One Pulse Per Second

DGPS: Differential GPS
A technique to improve GPS accuracy that uses pseudo-range errors recorded at a known location to improve the measurements made by other GPS receivers within the same general geographic area.

EGNOS: European Geostationary Navigation Overlay Service
The system of geostationary satellites and ground stations developed in Europe to improve the position and time calculation performed by the GPS receiver.

Ephemeris

A set of satellite orbital parameters that is used by a GPS receiver to calculate precise GPS satellite positions and velocities. The ephemeris is used to determine the navigation solution and is updated frequently to maintain the accuracy of GPS receivers.

GDOP: Geometric Dilution of Precision
A factor used to describe the effect of the satellite geometry on the position and time accuracy of the GPS receiver solution. The lower the value of the GDOP parameter, the less the error in the position solution. Related indicators include PDOP, HDOP, TDOP and VDOP.

GPS: Global Positioning System
A space-based radio positioning system that provides accurate position, velocity, and time data

GPIO: General Purpose Input Output

NMEA: National Marine Electronics Association

OEM: Original Equipment Manufacturer

Re-acquisition
The time taken for a position to be obtained after all satellites have been made invisible to the receiver.

RTC: Real Time Clock

SBAS: Satellite Based Augmentation System
Any system that uses a network of geostationary satellites and ground stations to improve the performance of a Global Navigation Satellite System (GNSS). Current examples are EGNOS and WAAS.

SRAM: Static Random Access Memory

RTCM: Radio Technical Commission for Maritime services

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