Jupiter 31

GPS receiver module

Comparison between Jupiter 21/J21S & Jupiter 31

Related documents

- Jupiter 31 Product Brief, LA010810
- Jupiter 31 Data Sheet, LA010811
- SiRF NMEA Protocol reference manual
- SiRF Binary Protocol reference manual

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1.0 Introduction

This application document describes the most significant differences between Navman Jupiter 31 GPS module and the Jupiter 21 GPS module.

This document is an aid for migrating from Jupiter 21 to Jupiter 31. While every effort has been made to identify differences, it is incumbent on all customers to qualify the Jupiter 31 in each application.

2.0 Technical description

Jupiter 21 and 21S are based on SiRF GSC2e LP GPS core architecture. Jupiter 31 is based on SiRF GSC3 LP core architecture. J31 consists of a carrier board and a Jupiter 30 module mounted with associated connectors and power circuitry for maximum backward compatibility with Jupiter 21 series products.

3.0 Product applications

Jupiter 21:

TU21-D450-021
TU21-D450-031
TU21-D450-041
TU21-D550-021
TU21-D550-031
TU21-D550-041

Jupiter 31:

AA003041-G
AA003042-G
AA003043-G

4.0 Hardware comparison

Feature	Jupiter 21	Jupiter 31	Performance differences
receiver design	SiRFStarIIe/LP chipset	SiRFStarIII GSC3e/LP chipset	1) J31 has faster TTFF 2) J31 has lower power consumption 3) J31 has greater receiver sensitivity

Table 4-1: Hardware comparison

4.1 Primary power

Parameter	J21	J21S	J31
Input voltage	3.1 to 5.5 VDC	3.1 to 5.5 VDC	3.3 VDC - 0.1/ + 0.3 VDC*
Current at full power (typical)	75 mA	85 mA	<41 mA
Current (max)	100 mA	110 mA	< 45 mA
Battery backup voltage	2.5 to 5.5 VDC	2.5 to 5.5 VDC	1.9 to 3.6 VDC **
Battery backup current	10 µA	10 µA	5 to 6 µA
Ripple	50 mV pp	50 mV pp	50 mV pp
Low voltage detector system reset	< 2.85 V	< 2.85 V	< 3.0 V
**5VDC input requires addition of a regulator to existing board layout; ** battery backup voltage must not fall below 1.4 v*			

Table 4-2: Primary power comparison

4.2 Antenna gain

Feature	Jupiter 21	Jupiter 31
antenna gain	active antenna gain should be in the range of 20 to 30 dB	best results achieved with an active antenna gain of 16 dB at the module input

Table 4-3: Antenna gain comparison

4.3 Pinout functions

All pin functions are the same with the exception of DGPS on Pin 15 and the Pin 20 functional difference:

Pin	Jupiter 21 name	Jupiter 31 name	Performance issues
15	RXB	RXB	J21: second serial data input port. J21/J21D only receives DGPS messages in RTCM (J21S does not support DGPS)
			J31: does not support DGPS messages
20	GPSFIX (active low)	WAKEUP	J21: outputs low when the receiver has a fix, high otherwise
			J31: Push-to-fix wakeup on positive going edge.

Table 4-4: Pinout function comparison

4.4 J31 Pin assignments

J1	Name	Type	Description
1	VANT	P	external power supply for active antenna
2	PWRIN	P	primary VDC power input
3	VBATT	P	backup battery input
4	PWRIN	P	primary VDC power input
5	RESET	I	master reset (active low)
6	GPIO 14	I/O	reserved - no connect
7	GPIO 15	I/O	reserved - no connect
8	BOOT	I	serial boot (active low; can be held high or open circuit for normal operation)
9	GPIO 1	I/O	reserved - no connect
10	GND	P	ground
11	TXA	O	CMOS level asynchronous output for UART A
12	RXA	I	CMOS level asynchronous input for UART A
13	GND	P	ground
14	TXB	O	CMOS level asynchronous output for UART B
15	RXB	I	CMOS level asynchronous input for UART B
16	GND	P	ground
17	GND	P	ground
18	GND	P	ground
19	PPS	O	pulse per second output 1uS wide
20	WAKE-UP	I	PTF wake-up, active on positive-going edge

Table 4-5: J1 connector pin functions

5.0 Data communications

5.1 Serial communications

The host serial I/O of the receiver serial data interface supports full duplex communications between the receiver and the user. The default serial modes are shown below:

5.2 Default baud rate and port assignments

Port	J21 (GSW2)	J21S (GSW2)	J31 (GSW3)
Port A	NMEA, 4800	NMEA, 4800	NMEA, 4800
Port B	DGPS, 9600	SiRF Binary, 38400	SiRF binary, 38400*
While these are the default baud rates, they can be changed using the "write-to-flash" feature. Refer to the Application note for WTF.			

Table 5-1: Default baud rate and port assignment comparison

6.0 Software

6.1 Software functionality

Feature	Description	J20/20S	J31
DGPS	Accepts DGPS corrections in the RTCM SC-104 format	Yes	No
PPS time message	PPS binary output message, MID52 (0 x 34)	Yes	No *
SBAS message	SBAS operating parameters binary output message, MID50 (0x32)	Yes	No †
User GPIO	Proprietary NMEA messaging control User GPIO	Yes	No
GPS Fix	GPS fix indication, active low, Pin 20	Yes	No
Wake Up	Push to Fix Power management wake up on positive going edge, Pin 20	No	Yes
** Planned implementation for later version of code; † See alternate MID 170*			

Table 6-1: Software functionality comparison

NOTE: Reset Push to Fix mode function not compatible. Wake up line PIN20 must be used for PTF MODE on J31.

6.1.1 Navigation settings

The J31 with its default navigation settings will outperform the J21/21S units with their default navigation settings. Therefore any input messages issued to J21 units for Navigation settings should be initially disabled until the performance is compared.

The J31 supports Config to Flash and User Profiles for advanced functionality not supported on the J21/21S. These settings can be set in production or by the user firmware.

6.1.2 1PPS pulse width

The 1PPS is far more accurate in the J31 but the pulse width is narrower at 1uS.

Note: The Binary 1PPS message Message ID 52 is not currently supported by the J31.

6.2 NMEA output messages

NMEA (National Marine Electronics Association) communications protocol is used for most navigation devices as the common standard interface protocol to transmit data. The messages below adhere to NMEA 0183 v.2.2 protocol. Please refer to SiRF NMEA Protocol Reference Manual for a detailed description.

6.2.1 Default NMEA output messages

Message description	Message ID	J21	J21S	J31
GPS fix data	GPGGA	1 s	1 s	1 s
GPS DOP and active satellites	GPGSA	1 s	1 s	1 s
GPS satellites in view	GPGSV	2 s	1 s	1 s
Recommended minimum specific GPS data	GPRMC	1 s	1 s	1 s
Track made good and ground speed	GPVTG	Off	Off	1 s
Latitude, longitude, UTC of position fix and status	GPGLL	Off	Off	1 s
PPS timing message	GPZDA	Off	n/a	Off
Navman proprietary Zodiac channel status	PRWIZCH	1 s	1 s	n/a
Off=not enabled by default; n/a=not available				

Table 6-2: NMEA output message comparison

6.2.2 NMEA message format

Message name	J31 NMEA structure	J21 NMEA structure (identical to J12)
GGA	$GPGGA,161229,.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M,1.0,M,0.0,0000*18	$GPGGA,161229,3723.2475,N,12158.3416,W,1,07,1.00,9.0,M,1.0,M, , *18
GSA	$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33	$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.80,1.00,1.50*33
RMC	$GPRMC,161229,.487,A,3723.2475,N,12158.3416,W,0.130,309.62,120598,23.1,E*10	$GPRMC,161229,A,3723.2475,N,12158.3416,W,0.130,309.6,120598,23.1,E*10
VTG	$GPVTG,309.62,T,286.52,M,0.13,N,0.20,K,A*23	$GPVTG,309.6,T,286.5,M,0.130,N,0.200,K,A*23
ZDA	$GPZDA,181813,14,10,2003,00,00*4F	$GPZDA,181813,.00,14,10,2003,00,00*4F

Table 6-3: NMEA message structure comparison

The J31 supports the NMEA 0183 v2.2, structure detailed in SiRF NMEA Protocol Reference Manual:

```
$GPZDA,133138.000,03,09,2007,,*52
$GPGGA,133138.000,5133.2768,N,00150.4530,W,1,05,2.5,102.7,M,48.1,M,,0000*47
$GPGLL,5133.2768,N,00150.4530,W,133138.000,A*24
$GPGSA,A,3,05,30,12,09,14,,,,,,,,5.1,2.5,4.4*38
$GPGSV,3,1,12,12,89,106,43,05,67,247,43,09,53,116,37,30,48,245,45*78
$GPGSV,3,2,12,14,44,296,37,17,19,041,,04,11,073,,22,10,256,22*7C
$GPGSV,3,3,12,31,09,293,,06,07,193,,01,02,327,,18,00,228,*77
$GPRMC,133138.000,A,5133.2768,N,00150.4530,W,0.05,26.96,030907,,*20
$GPVTG,26.96,T,,M,0.05,N,0.1,K*5F
```

Figure 6-1: Jupiter 31 NMEA message structure

6.2.3 ZDA message

	J31	J21
ZDA	$GPZDA,181813,14,10,2003,00,00*4F	$GPZDA,181813,00,14,10,2003,00,00*4F

Table 6-4: ZDA message comparison

In the J21 the hour, minute, second portion within the ZDA message will look like this:

(for hour: 01, minute: 02, and seconds 10, 11, 12,…)

,010210.00,
,010211.00,
,010212.00,

In the J31 the following will be output for the hour, minute and second:

,010210,
,010211,
,010212,

Thus the J21 format simply appends the fixed string ".00" to the two digit seconds field.

NOTE: With J31, the ZDA message format does not include the additional two digit fields as described above.

6.2.4 VTG message

	J31	J21
VTG	$GPVTG,309.62,T,286,52,M,0.13,N,0.20,K,A*23	$GPVTG,309.6,T,286,5,M,0.130,N,0.200,K,A*23

Table 6-5: VTG message comparison

NOTE: The J31 does not currently support Magnetic variation.

$GPVTG,26.96,T,,M,0.05,N,0.1,K*5F

6.2.5 RMC message

	J31	J21
RMC	$GPRMC,161229,487,A,3723.2475,N,12158.3416,W,0.130,309.62,120598,,E*10	$GPRMC,161229,A,3723.2475,N,12158.3416,W,0.130,309.6,120598,23.1,E*10

Table 6-6: RMC message comparison

Note:

There is additional resolution in the time field:

,161229,487,

There is additional resolution in the Course over Ground field:

,309.62,

Note: The J31 does not support magnetic variation.

J31 output:

$GPRMC,133138.000,A,5133.2768,N,00150.4530,W,0.05,26.96,030907,,*20

6.2.6 GSA message

	J31	J21
GSA	$GPGSA,A,3,07,02,26,27,09,04,15,,,,,,1.8,1.0,1.5*33	$GPGSA,A,3,07,02,26,27,09,04,15,,,,,,1.80,1.00,1.50*33

Table 6-7: GSA message comparison

Note:

There is reduced resolution on the DOP field indicators:

,1.8,1.0,1.5*33

J31 output:

$GPGSA,A,3,05,30,12,09,14,,,,,,,,5.1,2.5,4.4*38

6.2.7 GGA message

	J31	J21
GGA	$GPGGA,161229,487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M,1.0,M,0.0,0000*18	$GPGGA,161229,3723.2475,N,12158.3416,W,1,07,1.00,9.0,M,1.0,M,,*18

Table 6-8: GGA message comparison

Note:

There is additional resolution in the Time field:

,161229,487,

There is a reduction of resolution in the DOP field:

,1.0,

This was previously:

,1.00,

There are additional data fields:

,0.0,0.000*18

These are per the NMEA standard and are for the Differential station ID and Correction fields.

J31 output:

$GPGGA,133138.000,5133.2768,N,00150.4530,W,1,05,2.5,102.7,M,48.1,M,,0000*47

6.3 NMEA Input Messages

NMEA (National Marine Electronics Association) communications protocol is used for most navigation devices as the common standard interface protocol to transmit data. The messages below adhere to NMEA 0183 v.2.2 protocol. Please refer to SiRF NMEA Protocol Reference Manual for a detailed description.

Below is a list of supported NMEA input messages:

Message ID	J21 (GSW2)	J31 (GSW3)
100	Yes	Yes
101	Yes	Yes
102	Yes	Yes
103	Yes	Yes
104	Yes	Yes
105	Yes	Yes
106	Yes	Yes
107	No	Yes

Table 6-9: NMEA input message comparison

Start – up header info

J31:

```
$PSRFTXT,Version GSW3.2.4Pat1_3.1.100.12-SDK001P1.00
$PSRFTXT,TOW: 0
$PSRFTXT,WK: 1399
$PSRFTXT,POS: 6378137 0 0
$PSRFTXT,CLK: 96250
$PSRFTXT,CHNL: 12
$PSRFTXT,Baud Rate: 9600
$PSRFTXT,NAVMAN SW Version: Jupiter30 v2.2 build 1 [S3]
$PTTK,ANT,1*71
```

Figure 6-2: Jupiter 31 NMEA message structure

$PTTK,ANT,1*71 message output at start-up if antenna OK. This message is not supported on J21 platform. The J31 does not have antenna detection hardware and therefore the message is not available unless external antenna detection circuitry is added.

J21:

```
$Version 2.3.2-GSW2-2.05.024-C1Prod1.5
$TOW: 0
$WK: 1438
$POS: 6378137  0     0
$CLK: 96000
$CHNL: 12
$Baud Rate: 4800  System clock: 12.277MHz
$HW Type: S2AM
$Asic Version: 0x23
$Clock Source: GPSCLK
$Internal Beacon: None
$NAVMAN SW Version: Jupiter21 v1.9 build 2 [ST]
$PSRF150,1*3E
```

Figure 6-3: Jupiter 21 NMEA message structure

$PSRF150,1*3E message output at start-up to indicate input messages can now be sent. This message is not present on J31 SS3 software.

6.4 SiRF binary protocol

6.4.1 Binary output messages

Below is a list of supported output messages:

Message ID	J21 (GSW2)	J31 (GSW3)
1	Yes	No
2	Yes	Yes
3	No	No
4	Yes	Yes
5	No	No
6	Yes	Yes
7	Yes	Yes
8	No	Yes
9	Yes	Yes
10	Yes	Yes
11	Yes	Yes
12	Yes	Yes
13	Yes	Yes
14	Yes	Yes
15	Yes	Yes
16	Yes	No
17	Yes	No
18	Yes	Yes
19	Yes	Yes

Table 6-10: SiRF Binary output messages

Please refer to the SiRF Binary Protocol Reference Manual for additional information.

6.4.2 Binary input messages

Below is a list of supported input messages for the J21(GSW2) and J31(GSW3).

Message ID	J21 (GSW2)	J31 (GSW3)
53	No	No
128	Yes	Yes
129	Yes	Yes
130	Yes	Yes
131	No	Yes
132	Yes	No
133	Yes	No
134	Yes	Yes
135	No	Yes
136	Yes	Yes
137	Yes	Yes
138	Yes	No
139	Yes	Yes
140	Yes	Yes
141	No	No
142	No	No
143	Yes	Yes
144	Yes	Yes
145	Yes	No
146	Yes	Yes
147	Yes	Yes
148	Yes	No
149	Yes	Yes
150	Yes	Yes
151	Yes	No
152	Yes	Yes
165	Yes	Yes
166	Yes	Yes
167	Yes	Yes
168	Yes	Yes
170	2.3 or above	Yes
172	No	Yes
175	No	Yes
180	Yes	No
180 ~ 199	Yes	Yes
182	No	No
228	No	Yes (reserved)

Table 6-11: SiRF Binary input message comparison

Please refer to the SiRF Binary Protocol Reference Manual for additional information.

7.0 Support

7.1 Sales support

Americas:	Joe.tuttle@navmanwireless.com
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EMEA:	Alastair.worth@navmanwireless.com

7.2 Technical support:

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For technical questions, contact your local Navman OEM sales office or field applications engineer. Please refer to Navman Wireless OEM at www.navmanwireless.com