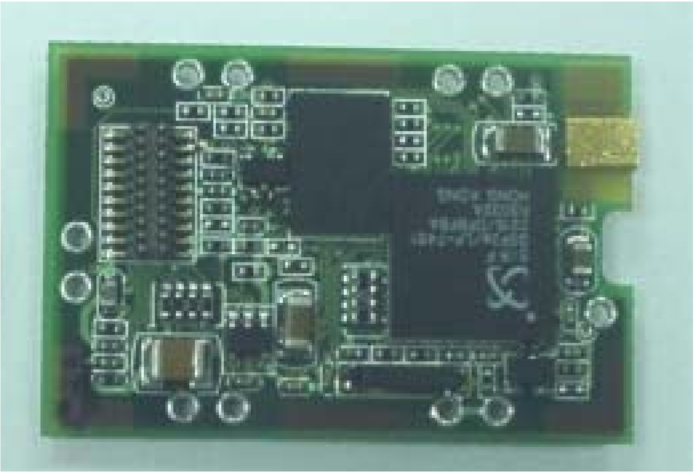
Rikaline GPS-21 / 21-LP

GPS Engine Board

SiRF Star II V1.0 Oct 06, 2002



Rikaline Marketing Corp.

5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116, R.O.C.
Phone: +886-2-2934-5456 Fax: +886-2-2934-4373
E-Mail: info@rikaline.com.tw Web: www.rikaline.com.tw

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Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

1. Introduction

1.1 Overview

The *Rikaline* **GPS-21 GPS Engine Board** is designed based on **SiRF Star II** Architecture with low power consumption, small size and easy integrated for a broad spectrum of OEM system applications. GPS-21 meets strict needs such as car navigation, mapping, surveying, security, agriculture and so on. Only clear view of sky and certain power supply are necessary to the unit. It communicates with other electronic utilities via compatible dual-channel through RS-232 or TTL and saves critical satellite data by built–in backup memory. The Trickle-Power allows the unit operates a fraction of the time and Push-to-Fix permits user to have a quick position fix even though the receiver usually stays off.

The GPS-21-LP utilizes the latest SiRF technology for applications where the power consumption is more critically required.

1.2 Features

The GPS-21 provides a host of features that make it easy for integration and use.

1. **SiRF Star II** chipset with embedded ARM7TDMI CPU available for customized applications in firmware.
2. High performance receiver tracks up to 12 satellites while providing first fast fix and low power consumption.
3. Differential capability utilizes real-time RTCM corrections producing 1-5 meter position accuracy.
4. Compact design ideal for applications with minimal space.
5. A rechargeable battery sustains internal clock and memory. The battery is recharged during normal operation.
6. User initialization is not required.
7. Dual communication channels and user selectable baud rates allow maximum interface capability and flexibility.
8. Optional communication levels, RS-232 and TTL meet ordinary application and new fashions of connecting PDA with TTL or RS-232 output.
9. FLASH based program memory: New software revisions upgradeable through serial interface.
10. Built-in WAAS and EGNOS demodulator.

1.3 Technical specifications

1.3.1 Physical Characteristics

Dimension: 36(L) x 24(W) x 6(H) mm
1.42"(L) x 0.95"(W) x 0.24"(H).

Weight: 7g

1.3.2 Environmental Characteristics

1) Operating temperature: -40°C to +85°C
2) Storage temperature: -55°C to +100°C.
-45°C to +80°C with battery

1.3.3 Electrical Characteristics

1.3.3.1 General:

1) Frequency: L1, 1,575.42MHz
2) C/A Code: 1.023MHz Chip Rate
3) Channels: 12

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

1.3.3.2 Power

	GPS-21 5V Version TTL	GPS-21 3.3V Version TTL
Main Power	+5VDC±5%	3.3VDC±10%
Supply Current	170mA Typical	170mA Typical
Backup Power	+2.5V to 3.3V	+2.5V to 3.3V
Backup Current	10µA Typical	10µA Typical
Packup Period	230hr (9.6 days)	230hr (9.6 days)

	GPS-21-LP 5V Version TTL	GPS-21-LP 3.3V Version TTL
Main Power	+5VDC±5%	3.3VDC±10%
Supply Current	100mA Typical	95mA Typical
Backup Power	+2.5V to 3.3V	+2.5V to 3.3V
Backup Current	10µA Typical	10µA Typical
Packup Period	230hr (9.6 days)	230hr (9.6 days)

1.3.3.3 Datum
WGS 84

1.3.4 Performance
1.3.4.1 Acquisition
1) Tracks up to 12 satellites.
2) Update rate: 1 second.
3) Acquisition time

Reacquisition	0.1 sec., averaged
Snap Start	3 sec, averaged
Hot start	8 sec., averaged
Warm start	38 sec., averaged
Cold start	45 sec., averaged

1.3.4.2 Position Accuracy: (Non Differential GPS)

Position	5-25 meter CEP without SA
Velocity	0.1 meters/second, without SA
Time	1 microsecond synchronized GPS time

1.3.4.3 DGPS Accuracy (Differential GPS)

Position	1 to 5 meter, typical
Velocity	0.05 meters/second, typical

1.3.4.4 Dynamic Conditions

Altitude	18,000 meters (60,000 feet) max
Velocity	515 meters / second (1,000 knots) max
Acceleration	4 G, max
Jerk	20 meters/second^3 , max

1.3.4.5 1PPS Pulse

Level	TTL
Pulse Duration	100ms
Time Reference	at the pulse positive edge
Measurements	Aligned to GPS second, ± 1 microsecond

1.3.5 Interfaces

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Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

1.3.5.1 Interface

Two full duplex serial communication, RS-232 or TTL compatible level, with user selectable baud rate (4800-Default, 9600, 19200, 38400).

1.3.5.2 Protocol Message

SiRF Binary – Position, Velocity, Altitude, Status and Control
NMEA 0183 Version 2.2 ASCII output -- GGA, GLL, GSA, GSV, RMC, ZDA and VTG.

1.3.5.2 DGPS Protocol

Real-time Differential Correction input (RTCM SC-104 version 2.00 message types 1, 5 and 9).

2. Operational characteristics

2.1 Initialization

As soon as the initial self-test is complete, the GPS-21 begins the process of satellite acquisition and tracking automatically. Under normal circumstances, it takes approximately 45 seconds to achieve a position fix, 38 seconds if ephemeris data is known. After a position fix has been calculated, information about valid position, velocity and time is transmitted over the output channel.

The GPS-21 utilizes initial data, such as last stored position, date, time and satellite orbital data, to achieve maximum acquisition performance. If significant inaccuracy exists in the initial data, or the orbital data is obsolete, it may take more time to achieve a navigation solution. The GPS-21 Auto-locate feature is capable of automatically determining a navigation solution without intervention from the host system. However, acquisition performance can be improved when the host system initializes the GPS-21 in the following situation:

1) Moving further than 500 kilometers.
2) Failure of data storage due to the inactive internal memory battery.

2.2 Navigation

After the acquisition process is complete, the GPS-21 sends valid navigation information over output channels. These data include:

1) Latitude/longitude/altitude
2) Velocity
3) Date/time
4) Error estimates
5) Satellite and receiver status

The GPS-21 sets the default of auto-searching for real-time differential corrections in RTCM SC-104 standard format, with the message types 1, 5, or 9. It accomplishes the satellite data to generate a differential (DGPS) solution. The host system, at its option, may also command the GPS-21 to output a position whenever a differential solution is available.

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

3. Hardware interface

3.1 Connectors

3.1.1 Antenna Connector

MCX, RSMA

3.1.2 Interface Connector

20-Pin and 10-Pin straight header, 2mm pitch

3.2 Pin Assignment of Connector

Table 1-1 Pin list of the 20-Pin Digital Interface Connector **(CN1)**

Pin Number	***Name***	***Type***	***Description***
1	ANT_PWR	PWR	Antenna DC Voltage (note 4)
2	VCC_5V	PWR	+5 DC Power Input (note 5)
3	BAT	PWR	Backup Battery (note 3)
4	VCC_3V	PWR	+3.3V DC Power Input (note 6)
5	PBRES	I	Push Button Reset Input. Active Low
6	GPIO3	I/O	SW dependent functions (note 2)
7	GPIO7	I/O	SW dependent functions (note 2)
8	GPIO6	I/O	SW dependent functions (note 2)
9	GPIO5	I/O	SW dependent functions (note 2)
10	GPIO10	I/O	SW dependent functions (note 1)
11	TXA	O	Serial Data Output A
12	RXA	I	Serial Data Input A
13	GPIO13	I/O	SW dependent functions (note 1)
14	TXB	O	Serial Data Output B
15	RXB	I	Serial Data Input B
16	NO USE		Reserve
17	BOOTSEL	I	Booting Mode Select
18	GND	PWR	Ground
19	TIMEMARK/GPIO9	I/O	1PPS Time Mark Output (note 2)
20	ALT/GPIO15	I/O	Alternative output (note 1)

Note: 1) Pulled high (VCC/VDD) through on-board 100K Ohm resister.
2) Pulled low (GND) through on-board 100K Ohm resister.
3) Maximum voltage is 1.9V
4) If the module is build-in antenna power type, the pin is no used.
5) If the module is 3.3V type, the pin is no used.
6) If the module is 5V type, the pin in no used.

Table 1-2 Pin list of the 10-Pin Digital Interface Connector **(JP1)**

Pin Number	**Name**	**Description**
1	GPIOF	SW dependent functions (note 1)

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2	JTDI	JTAG software debug function
3	GPIOG	SW dependent functions (note 1)
4	JTMS	JTAG software debug function
5	GPIOH	SW dependent functions (note 1)
6	JTCK	JTAG software debug function
7	GPIOI	SW dependent functions (note 1)
8	JTDO	JTAG software debug function
9	JTRST	JTAG software debug function
10	GND	Ground

Note: 1) Pulled high (VCC/VDD) through on-board 100K Ohm resister.
2) Pulled low (GND) through on-board 100K Ohm resister.

3.2.1 VCC_5V (+5V DC Power Input)

This is the main DC power supply for a +5V-powered board. (Required for the GPS-21 5V version)

3.2.2 VCC_3V (+3.3V DC Power Input)

This is the main DC power supply for a +3.3V-powered board. (Required for the GPS-21 3.3V version)

3.2.3 ANT_PWR

DC voltage for an active antenna. This voltage is not required for operation with a passive antenna. The antenna power may be supplied through the interface connector (CN1). The current limiting (<250mA) should be supplied externally.

3.2.4 GND

GND provides the ground for the board. Connect all grounds.

3.2.5 Serial Data: RXA, RXB, TXA and TXB

The board supports two full duplex serial channels. All support variable baud rates, and all can be controlled from the appropriate screens in GPS Monitor software. You can directly communicate with a PC serial port.（TTL level should be turned to RS-232 level）

3.2.6 RXA

This is the main receiving channel and is used to receive software commands to the board from GPS Monitor software or from user written software.

3.2.7 RXB

This is the auxiliary receiving channel and is used to input differential corrections to the board to enable DGPS navigation.

3.2.8 TXA

This is the main transmitting channel and is used to output navigation and measurement data to GPS Monitor or user written software.

3.2.9 TXB

For user's application

3.2.10 PBRES

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Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

This pin provides an active-low reset input to the board. It causes the board to reset and start searching for satellites. PB Reset is an optional input and, if not utilized, it may be left open.

3.2.11 Time mark

This pin provides 1 pulse per second output from the board, which is synchronized to within 1 microsecond of GPS time. The output is a TTL positive level signal.

This is not available in Trickle Power mode.

3.2.12 Battery (BAT)

This is the battery backup supply that powers the SRAM and RTC when main power is off. Typical current draw is 10 μA.

Without an external backup battery or supercap, the board will execute a cold start after every turn on. To achieve the faster start-up offered by a hot start or warm start, either a battery backup input must be connected or a recharge battery installed

.

Table 1-3 Backup Battery Voltage Range

Board	MIN	MAX
GPS-21	2.5	3.3

With a 3.3V Lithium-Ion (2.3mAh) rechargeable .To maximize battery lifetime (3~5 years), the battery voltage should not exceed 3.3V.

3.2.13 GPIO Functions

Several I/Os of CPU are connected to the digital interface connector for consumer applications and are labeled GPIO3 to GPIO15.

3.2.14 JTAG Functions

The JTAG interface provides a standard development/debugging interface. A simple header connects to a variety of the off-the-shelf emulators to provide single-step, trap and access to all the internal registers of the GSP2e.

3.3 TricklePower™ Description

The GPS-21 design includes all the functionality necessary to implement the SiRF TricklePower™ mode of operation. In this mode, the lowest average power dissipation is achieved by powering down the board (after a position is determined) in such a manner that when it is turned back on it can recomputed a position fix in the shortest amount of time. Standard TricklePower operates in three states:

3.3.1 Tracking State

In this state, the board is fully powered, tracking satellites, and gathering data.

3.3.2 CPU State

In this mode, the GRF2i has been turned off which removes the clock to the GSP2e. Without a clock, the GSP2e is effectively powered down (although the RTC keeps running). The CPU would switch to ECLK and kept running to process the GPS data until a position fix is determined and the result has been transmitted by the serial communication interface.

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

3.3.3 Trickle State

In this state, the CPU is in a low power standby state and the receiver clocks are off with only the RTC clock active. After a set amount of time, the RTC generates an NMI signal to wake up the ARM-7 microprocessor and reset the receiver back to tracking state.

The default time for each TricklePower mode and the approximate current consumed (in each mode) is shown in Table 1-4. For example, the TricklePower duty cycle (20%), the average receiver power dissipation is approximately 165mW (60mA at 3.3V) while maintaining one-second update rate.

Table 1-4 TricklePower™ Power Consumption

Mode	Time Msec	+5V Current mA	+3.3V Current mA
Tracking	220	170	160
CPU	360	33	29
Trickle	420	0.55	0.55

Note: Table 1-4 does not include the external antenna power, which must be controlled from the system power supply.

3.4 Push-to-Fix Description

The purpose of Push-to-Fix mode is to support applications where a position fix is only required when requested by the user (or the application). To support this, the board is left in the Trikle state until commanded to generate a fix.

3.4.1 Power-on State

In this state, the receiver calculates the position once, collects the ephemeris, and calibrates the RTC before going back to the Trickle State.

3.4.2 Trickle State

In this state only the RTC is running. The supply current is typically <500uA, which includes the standby current of the GSP2e and CPU.

There are three events that can happen which effectively return the CPU to normal operation:

3.4.3 Power-on

If power is removed, then re-applied to the board a reset signal is generated by the CPU supervisor. After the reset has been removed, the CPU will start up, get a fix and return to Trickle State. This typically takes 2 to 6 seconds.

3.4.4 Ephemeris Collection

Every 30 minutes the GSP2e WAKEUP signal is activated, wake up the CPU to calculate a fix, collect a new ephemeris, calibrate the RTC and then go to the Trickle State.

3.4.5 User Requested Fix

With each user request of a fix, the CPU will wake up by toggling PBRES low (pin 5 of the digital interface connector). The CPU is restarted and (following a Snap Start) a fix is calculated. Before going back to Trickle State, the CPU will check the ephemeris and the RTC calibration.

Note – The CPU will restart ~ 200-600 mSec after the PBRES input is brought high.

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
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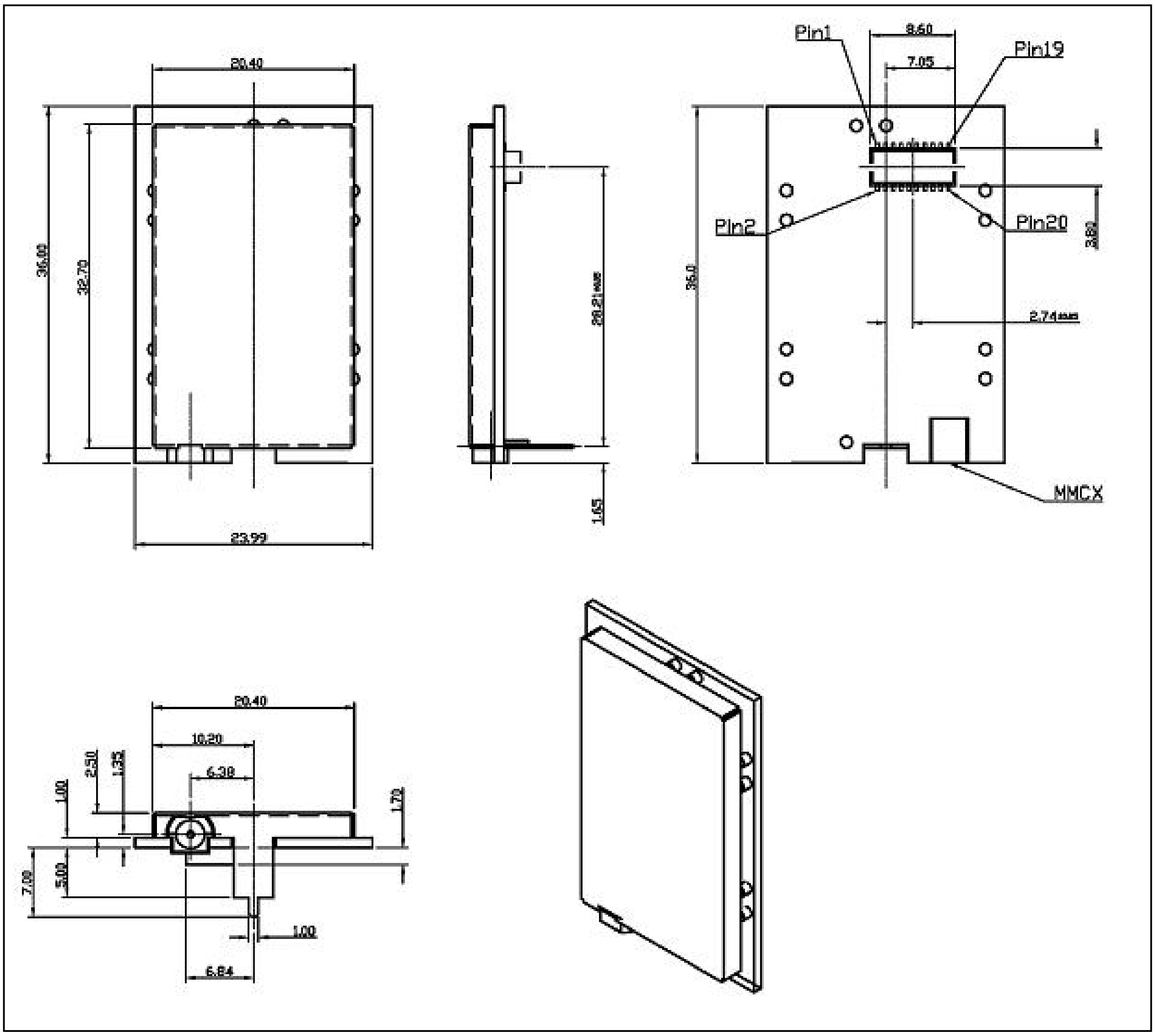
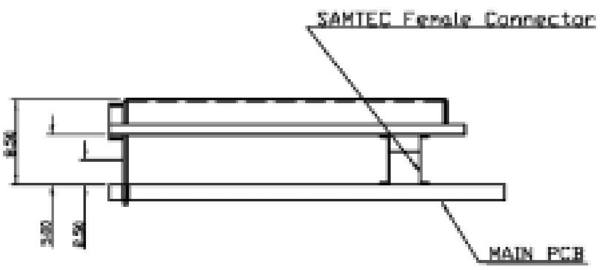
3.5 SRAM DATA BACKUP Description

SiRF chip has an internal 1Mb SRAM for GPS task and OS kernel; besides, we have added an external 4 Mb (Can be expanded to 8Mb) for user storing codes.

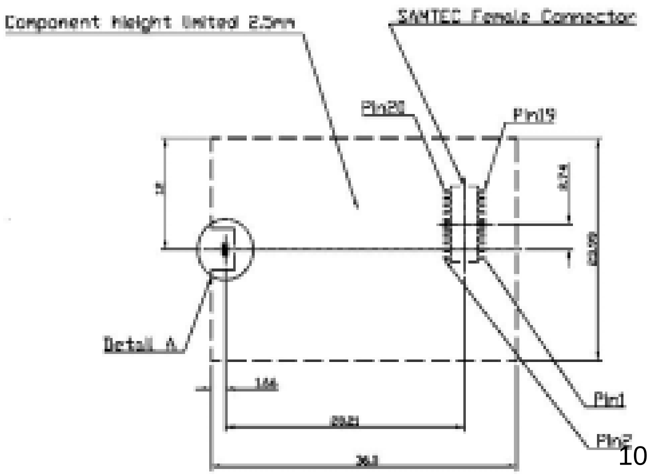
3.6 Mechanical Dimension

3.6.1 Drawing





PCB Assembly



PCB_LAYOUT

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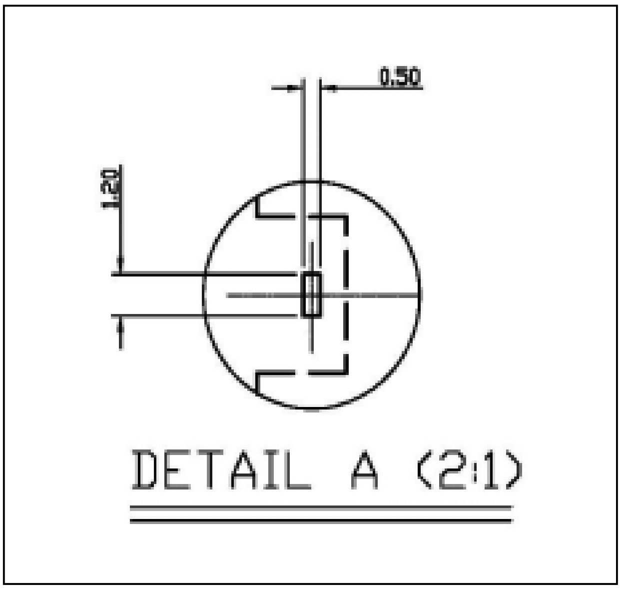

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4. Software Interface

4.1 NMEA Transmitted Messages

The GPS-21 supported by SiRF Technology Inc. also outputs data in NMEA-0183 format as defined by the National Marine Electronics Association (NMEA), Standard.

The default communication parameters for NMEA output are 4800 baud, 8 data bits, stop bit, and no parity.

Table 4-1 NMEA-0183 Output Messages

NMEA Record	Description
GPGGA	Globle positioning system fixed data
GPGLL	Geographic position- latitude/longitude
GPGSA	GNSS DOP and active satellites
GPGSV	GNSS satellites in view
GPRMC	Recommended minimum specific GNSS data
GPVTG	Course over ground and ground speed

4.1.1 Global Positioning System Fix Data (GGA)

Table 5-2 contains the values for the following example:

$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , ,0000*18

Table 4-2 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Time	161229.487		Hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 5-3
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	Meters	
Units	M	Meters	
Geoid Separation		Meters	
Units	M	Meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

Table 4-3 Position Fix Indicator

Value	Description
0	0 Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

4.1.2 Geographic Position with Latitude/Longitude (GLL)

Table 4-4 contains the values for the following example:

$GPGLL,3723.2475,N,12158.3416,W,161229.487,A*2C

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

Table 4-4 GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of message termination

4.1.3 GNSS DOP and Active Satellites (GSA)

Table 4-5 contains the values for the following example:

$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33

Table 4-5 GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 5-6
Mode 2	3		See Table 5-7
Satellite Used (1)	07		Sv on Channel 1
Satellite Used (1)	02		Sv on Channel 2
……			….
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

(1) Satellite used in solution.

Table 4-6 Mode 1

Value	Description
M	Manual—forced to operate in 2D or 3D mode
A	2D Automatic—allowed to automatically switch 2D/3D

Table 4-7 Mode 2

Value	Description
1	Fix Not Available
2	2D
3	3D

4.1.4 GNSS Satellites in View (GSV)

Table 4-8 contains the values for the following example:

$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71
$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

Table 4-8 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header

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Number of Messages	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		Range 1 to 12
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	degrees	Channel 1 (Maximum 90)
Azimuth	048	degrees	Channel 1 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
....	....		
Satellite ID	27		Channel 4 (Range 1 to 32)
Elevation	27	degrees	Channel 4 (Maximum 90)
Azimuth	138	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination

NOTE: Items <4>,<5>,<6> and <7> repeat for each satellite in view to a maximum of four (4) satellites per sentence. Additional satellites in view information must be sent in subsequent sentences. These fields will be null if unused.

4.1.5 Recommended Minimum Specific GNSS Data (RMC)

Table 4-9 contains the values for the following example:

$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10

Table 4-9 RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over Ground	309.62	Degrees	True
Date	120598		ddmmyy
Magnetic Variation (1)		Degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message termination

(1) SiRF Technology Inc. does not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.

4.1.6 Course Over Ground and Ground Speed

Table 4-10 contains the values for the following example:

$GPVTG,309.62,T, ,M,0.13,N,0.2,K*6E

Table 4-10 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		True
Course		Degrees	Measured heading
Reference	M		Magnetic (1)

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Speed	0.13	Knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometers per hour
Checksum	*6E		
<CR> <LF>			End of message termination

(1) SiRF Technology Inc. does not support magnetic declination. All "course over ground" data are geodetic WGS84 directions.

4.2 RTCM Received Data

The default communication parameters for DGPS Input are 9600 baud, 8 data bits, stop bit, and no parity. Position accuracy of less than 5 meters can be achieved with the GPS-21 by using Differential GPS (DGPS) real-time pseudo-range correction data in RTCM SC-104 format, with message types 1, 5, or 9. As using DGPS receiver with different communication parameters, GPS-21 may decode the data correctly to generate accurate messages and save them in battery-back SRAM for later computing.

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

5. Earth Datums

5.1 Earth Datums

The following is a list of the GPS-21 earth datum index and the corresponding earth datum name:

Item	Datum	Reference Ellipsoid	Data name
1	Adindan - Ethiopia	Clarke 1880	Data1.dat
2	Afgooye – Somalia	Krassovsky	Data2.dat
3	Alaska, Conus – North American 1983	GRS 1980	Data3.dat
4	Albania – S-42 (Pulkovo 1942)	Krassovsky 1940	Data63.dat
5	Argentina	South American 1969	Data4.dat
6	Australia	Australian – National	Data70.dat
7	Bahrain – Ain el ABD 1970	International	Data5.dat
8	Bangladesh	Everest 1830	Data6.dat
9	Bolivia	South American 1969	Data8.dat
10	Botswana – ARC 1950	Clarke 1880	Data7.dat
11	Brazil	South American 1969	Data9.dat
12	Brunel, East Malaysia	Everest (Sabah & Sarawak)	Data37.dat
13	Canada – North American 1983	GRS 1980	Data10.dat
14	Chile	South American 1969	Data13.dat
15	Colombia	South American 1969	Data12.dat
16	Colombia – Provisional American 1956	International	Data11.dat
17	Czechoslovakia – S-42 (Pulkovo 1942)	Krassovsky 1940	Data64.dat
18	Ecuador	South American 1969	Data14.dat
19	European 1950 – Central Regional Mean	International	Data29.dat
20	European 1950 – Cyprus	International	Data15.dat
21	European 1950 – Eastern Regional Mean	International	Data16.dat
22	European 1950 – Egypt	International	Data17.dat
23	European 1950 – Finland, Norway	International	Data18.dat
24	European 1950 – Greece	International	Data19.dat
25	European 1950 – Iran	International	Data20.dat
26	European 1950 – Italy (Sardinia)	International	Data21.dat
27	European 1950 – Italy (Sicily)	International	Data22.dat
28	European 1950 – Malta	International	Data23.dat
29	European 1950 – Northern Regional Mean	International	Data24.dat
30	European 1950 – Portugal, Spain	International	Data25.dat
31	European 1950 – Southern Regional Mean	International	Data26.dat
32	European 1950 – Tunisia	International	Data27.dat
33	European 1950 – Western Regional mean	International	Data28.dat
34	Guyana - South American 1969	South American 1969	Data30.dat
35	Hawaii-North American 1983	GRS1980	Data32.dat
36	Hong Kong	International	Data31.dat
37	Hu_Tsu_Shan Taiwan	International	Data33.dat
38	Hungary – S-42 (Pulkovo 1942)	Krassovsky 1940	Data65.dat
39	Indian 1960	Everest 1830	Data34.dat
40	Ireland – 1965	Modified Airy	Data35.dat
41	Kazakhstan – S-42 (Pulkovo 1942)	Krassovsky 1940	Data65.dat
42	Kenya, Tanzania- ARC 1960	Clarke 1880	Data53.dat
43	Latvia – S-42 (Pulkovo 1942)	Krassovsky 1940	Data67.dat
44	Liberia – 1964	Clarke 1880	Data36.dat
45	Mexico, central America	GRS1980	Data38.dat
46	OMAN	Clarke 1880	Data39.dat
47	Pakistan	Everest 1830	Data40.dat
48	Paraguay - South American 1969	South American 1969	Data42.dat
49	Peru1 – South American 1969	South American 1969	Data41.dat
50	Philippines	Clarke 1866	Data43.dat

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

51	Poland – S-42 (Pulkovo 1942)	Krassovsky 1940	Data68.dat
52	Potsdam	Bessel 1841	Data71.dat
53	Puerto Rico – Virgin Islands	Clarke 1866	Data44.dat
54	Qatar national	International	Data45.dat
55	Qornoq – Greenland (SOUTH)	International	Data46.dat
56	Regional Mean	South American 1969	Data48.dat
57	Reunion – Mascarene Islands	International	Data47.dat
58	Romania – S-42 (Pulkovo 1942)	Krassovsky 1940	Data69.dat
59	Rome 1940 – Italy	International	Data49.dat
60	Saudi Arabia – Ain el Abd 1970	International	Data50.dat
61	Singapore	Modified Fischer 1960	Data51.dat
62	South Africa	Clarke 1880	Data52.dat
63	Thailand 1975	Everest 1830	Data54.dat
64	Tokyo_Japan	Bessel 1841	Data60.dat
65	Tokyo_Korea	Bessel 1841	Data61.dat
66	Tokyo_Mean	Bessel 1841	Data59.dat
67	Tokyo_Okinawa	Bessel 1841	Data62.dat
68	Trinidad, Tobago	South American 1969	Data55.dat
69	Venezuela	South American 1969	Data57.dat
70	Venezuela – Provisional American 1956	International	Data56.dat
71	WGS84	WGS84	Data58.dat

5.2 Setting Syntax
5.2.1 Manufacturing Default:

Datum: WGS84.
Baud Rate: 4800.
Output: GGA, GSA, GSV, RMC.

5.2.2 Datum change syntax:

>DOS\Sirfprog /Fdataxx.dat –Px –Bx –Csh1

-Px: x is com port, 1= COM1, 2 = COM2
-Bx: x is baud rate, 4800, 9600, 19200 or 38400

Example:
Change Datum to WGS84,
Sirfprog /Fdata58.dat –P1 –B4800 –Csh1 <Entry>

After changing datum, the new datum will be kept in SRAM. If no power supplied to GPS-21 for more than 9 days, user must re-set datum when power on.

6. Ordering Information

6.1 Product Options
6.1.1 Input Power
GPS-21-5: 5V (Standard: TTL level, No backup battery)
GPS-21-3: 3.3V (Standard: TTL level, No backup battery)

6.2 Accessories
A-10302 Active Antenna, 2-Meter, MCX straight connector
A-10302-A Active Antenna, 2-Meter, MCX 90° connector
A-10305 Active Antenna, 5-Meter, MCX straight connector
A-10305-A Active Antenna, 5-Meter, MCX 90° connector

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw

Active Antenna with other connector is produced on demand.

7. Warranty

The GPS-21 is warranted to be free from defects in material and functions for one year from the date of purchase. Any failure of this product within this period under normal conditions will be replaced at no charge to the customers.

Rikaline Marketing Corp. 5F-1, 125, Roosevelt Road, Sec. 5, Taipei, Taiwan 116
Tel: ++886 2 2934 5456 Fax: ++886 2 2934 4373 E-Mail: info@rikaline.com.tw web: www.rikaline.com.tw