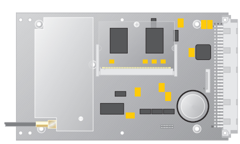
ZX-Sensor and ZX-Eurocard
Operation & Reference Manual

ZX-Sensor



ZX-Eurocard

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Introduction

The ZX-Eurocard and ZX-Sensor are two form-factors for the newest generation of the Ashtech Z-12 receiver. The Z-12 receiver tracks all the available signals from GPS satellites, both C/A and P code, both L1 and L2 frequencies, whether AS (Anti-Spoofing) is on or off. The benefit of dual-frequency is that it is excellent for RTK (Real Time Kinematic) applications, especially on longer baselines. RTK is typically used where centimeter accuracy is required in real time.

The Z-Family of receivers includes the Z-Eurocard, Z-Sensor, ZX-Eurocard, ZX-Sensor Z-Surveyor and Z-FX. This manual covers the ZX-Eurocard and ZX-Sensor. These two receivers have been built specifically with real-time industrial applications in mind, such as machine control in construction, mining, and precision agriculture; as well as precision navigation applications like docking, and dredging. The ZX-Eurocard and ZX-Sensor are built to withstand severe vibration requirements in their target applications. They also provide positions at the high update rates and low latencies required in control applications.

The ZX-Eurocard is mechanically and electrically compatible with the Ashtech GG24 GPS+GLONASS Eurocard, and the GG-RTK Eurocard. Thus once you have integrated one of these, you have essentially integrated them all. The same is true of the ZX-Sensor, GG24 Sensor, and GG-RTK Sensor.

Throughout this manual, the terms "ZX-Eurocard" and "OEM board" are used interchangeably. Because this manual describes both the ZX-Sensor and the ZX-Eurocard, the term "ZX-receiver" refers to both products.

Overview

The ZX-receiver processes signals from the GPS satellite constellation. The ZX-receiver provides real-time position, velocity, and time measurements using 36 dedicated separate and parallel channels, 12 each for Coarse/Acquisition (C/A) code-phase, and carrier-phase measurement on the L1 (1575 MHz), and Precise (P) code phase and carrier phase measurement on L1 and L2 (1227 MHz) bands. The ZX-receiver receives satellite signals via an L-band antenna and low-noise amplifier (LNA). The ZX-receiver operates stand-alone, and as a base (reference) station or remote (rover) station providing real-time differential GPS operation for code and real-time kinematic (RTK) operation for carrier phase. The unit implements the RTCM SC 104 V2.3 standard for differential and RTK operation, including the newly defined message types 18, 19, 20, and 21. These features allow the ZX-receiver to achieve centimeter accuracy while being compatible for differential and RTK operation with any other receiver that implements the RTCM standard.

Functional Description

The receiver is activated when power is applied to the power connector, and (in the case of the ZX-Sensor) the power switch is ON. After self test, the receiver initializes its 12x3 channels and begins searching for all space vehicles (SV) within the field of view of the antenna.

The receiver can track all Block I and Block II GPS SVs. All 32 PRN numbers as specified in Navstar GPS Space Segment/Navigation User Interfaces, ICD-GPS-200, Revision B are coded inside the product. As the receiver acquires (locks onto) each SV, it notes the time and then collects the ephemeris data about the orbit of that SV, and almanac data about the orbits of all the SVs in the constellation.

The receiver features 12-parallel channel/12-SV all-in-view operation; each of up to 12 visible SVs can be assigned to a channel and then continuously tracked. Each SV broadcasts almanac and ephemeris information every 30 seconds, and the unit automatically records this information in its non-volatile memory.

The unit has an L1/L2-band radio frequency (RF) port and four RS-232 serial input/output (I/O) ports. Ports A, B, and C are capable of two-way communication with external equipment. On the ZX-Sensor, port D can only be used with the optional internal radio. On the ZX-Eurocard, port D may be used with an on-board radio or externally via the DIN64 connector.

The RF circuitry receives satellite data from a GPS antenna and LNA via a coaxial cable, and can supply +5V to the antenna/LNA by means of that cable. No separate antenna power cable is required. Typical power consumption is approximately 5.0 watts even when powering an LNA.

The receiver incorporates a red/green LED which lights red to indicate power status and flashes green to indicate the number of satellites locked.

The receiver collects Coarse Acquisition (C/A) code-phase (pseudo-range) and full wavelength carrier phase measurement on L1 frequency (1575 MHz), Precise (P) code phase (pseudo-range) and full wavelength carrier phase on L1 and L2 frequency (1227 MHz). The receiver permits uninterrupted use even when anti-spoofing (AS) is turned on. When AS is on, the receiver automatically activates Ashtech’s patented Z-tracking mode that mitigates the effects of AS. The performance when AS is on is the same as when AS is off.

Technical Specifications

Table 1.1 lists the technical specifications of the receiver.

Table 1.1. Technical Specifications

Characteristic	Specifications	
	ZX-Sensor	**ZX-Eurocard**
Tracking	12 channels L1 CA/PL1 and PL2	
Size	2.30”H x 6.75”W x 10.31”L	0.6”H x 3.9”W x 6.8”L
Weight	3.75 lb	0.5 lb -- add 1 oz for heat sink plate + thermal pad*
Operating temperature	-30° to +55°C	-30° to +70°C*
Storage temperature	-40° to +85°C	-40° to +85°C
Humidity	100%	95% non-condensing
Environment	Resistant to wind-driven rain and dust per MIL-STD-810E	N/A
Power consumption	4.0 W with power saving mode ON 5.0 W with power saving mode OFF	
Power input	10—28V	5V ±5%
Interface	• Three RS-232 ports via a DB-25 connector (one internal RS-232 port) • One antenna connector • Event marker and 1PPS via DB-25 connector • Optional radio antenna connector	• Four RS-232 ports • One antenna connector • Event marker • 1PPS • Optional radio interface connector
MEASUREMENT PRECISION		
C/A (>10° elevation) • Pseudo-range (raw/smooth) • Carrier Phase	•25cm/3.6cm •0.9mm	
P-Code AS off (>10° elevation) • L1 Pseudo-range (raw/smooth) • L1 carrier phase • L2 Pseudo-range (raw/smooth) • L2 carrier phase	•15cm/0.9cm •0.9mm •21cm/1.3cm •0.9mm	
* Refer to “Heat-Sink Requirements” on page 15 for heat sinking information.		

Performance Specifications

One of the most important functions of the receiver is providing real-time position solutions with accuracy ranging from centimeter level to 100 meters. Table 1.1 summarizes the positioning modes and expected accuracy.

Table 1.1: Accuracy as Function of Mode

Positioning Mode	Typical Horizontal Accuracy (2drms), 5 SVs, PDOP<4	Maximum Update Rate	Maximum Operating Range
Autonomous	100 meters with SA on	5 Hz (10 Hz optional)	Anywhere
RTCM code differential	1.0 meters + 10 ppm	5 Hz (10 Hz optional)	Several hundred kilometers (depending upon datalink)
Static (post-processed)	5mm + 1ppm	5 Hz (10 Hz optional)	Several hundred kilometers (depending upon satellite geometry)
Real-time carrier phase differential in RTCM-RTK format or DBEN format	1.6cm +2ppm	5 Hz (10 Hz optional)	<15 kilometers (depending upon datalink)

All accuracies were computed from multiple trials of live satellite data collected in the San Francisco Bay area with receivers and survey grade antennas under average multipath conditions.

Receiver Options

Table 1.2 lists the available options. Each option is represented by a letter or number presented in a certain order. You can verify the installed options by issuing the following command to the receiver using an external handheld controller or PC, as described in the *Z-Family Technical Reference Manual*:

$PASHQ,RID

The command will display the options on an external handheld controller or PC. For example:

$PASHR,RID,UZ,30,ZC00,BUEXMFT3JKIGHN,0A16*0B

If the letter or number is displayed in the response message, the option is installed. If the letter/number is not displayed, the option is not installed. Table 1.2 lists the available options.

Table 1.2: Receiver Options

Option	Description
B	RTCM differential base
U	RTCM differential remote
E	Event marker
M	Remote monitor option
F	Fast data output
T	Point positioning
1,2,3	Observables
J	RTK rover
K	RTK base station
I	Instant RTK
G	Reserved
H	5 Hz synchronized RTK
N	Reserved

[B] RTCM Base

The receiver can be set as an RTCM differential base station and can output real-time differential corrections when this option is enabled.

The output will be in RTCM-104, Version 2.3 format message types 1, 3, 6, 16, and 22 as well as RTCM Carrier Differential 18, 19, 20, and 21. For messages 18, 19, 20, and 21, the J option is also required.

[U] RTCM Remote

The real-time differential corrections are available when this option is enabled.

The receiver will decode the RTCM-104, Version 2.3 format message types 1, 3, 6, 9, 16, and 22 as well as types 18, 19, 20, and 21. For messages 18, 19, 20, and 21, the J option is also required.

[E] Event Marker

The [E] option enables the storage of event times created from a trigger signal. The receiver measures and records event times with high accuracy (down to one microsecond). The receiver stores an event time at the rising edge of the trigger signal (or the falling edge on command) and the time is recorded in the receiver's PC memory card and/or output through the TTT NMEA message.

[M] Remote Monitoring

The remote monitoring option allows you to use the **REMOTE.EXE** to access and control the receiver via a modem from a remote location. It also allows you to use the session programming feature.

[F] Fast Data Output

This option enables the receiver to be programmed to output both raw position data and NMEA messages at user-selectable frequencies up to 10Hz. Without this option, only frequencies up to 5Hz are available.

[T] Point Positioning

The [T] option allows you to put the receiver into point positioning mode using the $PASHS,PPO command. Point positioning mode improves the accuracy of an autonomous position of a static point.

[3] Observables—1, 2, 3

This option determines the observables available in the receiver, where:

1—CA code and P-code on L1/L2 (No carrier)

2—CA code and carrier, P-code on L1/L2 (No carrier)

3—CA code and carrier, P-code on L1/L2 and carrier

[J] RTK Rover

The [J] option allows the receiver to act as a rover station that utilizes the carrier phase differential (both DBEN and RTCM message 18, 19, 20, and 21) data transmitted from the base to compute differentially corrected positions. This option requires the observables option to be 3. For RTCM messages type 18, 19, 20, and 21, the U option is required in addition to the J option.

[K] RTK Base

The [K] option allows the receiver to act as an RTK base station which outputs carrier phase differential data. This option requires the observables option to be 3. For RTCM 18/19 or 21/22, the B option is also required.

[I] Instant RTK

The [I] option, an extension of the J option, allows the receiver to use the new RTK system - Instant RTK™ which uses a new data processing strategy for integer ambiguity initialization. The initialization time using Instant RTK typically requires a single epoch of data if there are 6 or more satellites available with reasonable open sky and low multipath. The baseline length should be 7 km or less.

[G] Reserved for Future Options

[H] 5 Hz Synchronized RTK

The [H] option enables the receiver to output synchronized or matched time tag RTK positions at a rate up to 5 Hz (5 positions per second); 5 Hz synchronized RTK lets you attain the better accuracy of matched time tag RTK with nearly the same productivity as Fast CPD. This feature is available only when using DBEN or CMR format data.

[N] Reserved for Future Options

Equipment

Hardware Description

ZX-Eurocard

The ZX-Eurocard has four RS-232 serial ports embedded in a 64-pin connector. The RF circuitry receives satellite data from a GPS antenna and LNA via coaxial cable, and can supply power to the antenna/LNA by means of that cable. No separate antenna power is required. The LNA power consumption is approximately 150 milliwatts (depends on model and manufacturer).

The board includes a two-color LED; the LED lights red to indicate the power status, and flashes green to indicate the number of satellites locked. For example, red indicates power on, and four green flashes indicate four satellites locked.

An external two-color LED can be connected to the board by connecting the common cathode to ground, and the anodes to the LED-GRN and LED-RED pins. Connect current-limiting 100-ohm resistors in series with the output pins.

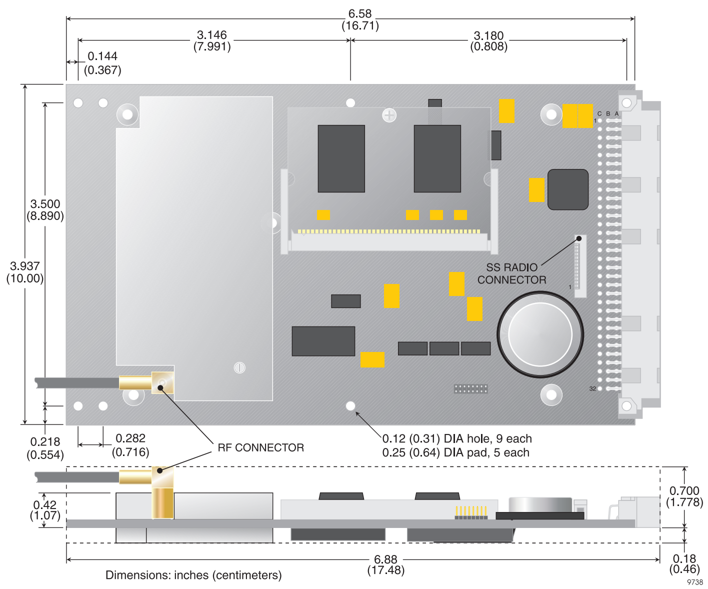

Figure 2.1. ZX-Eurocard Dimensions

Figure 2.2 shows the 64-pin DIN male power/input/output interface connector (this board is also available with a 64-pin straight header).

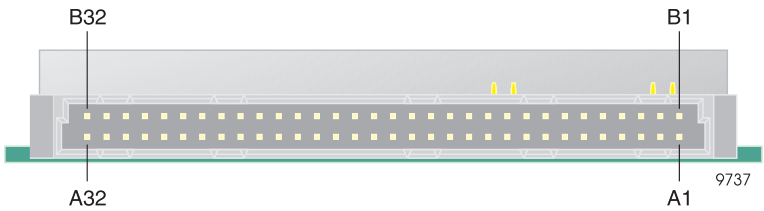

Figure 2.2. ZX-Eurocard Interface Connector

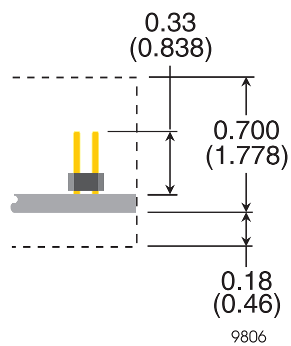

Figure 2.3. 64-Pin Straight Header Option

Figure 2.4 shows the pinout of the interface connector.

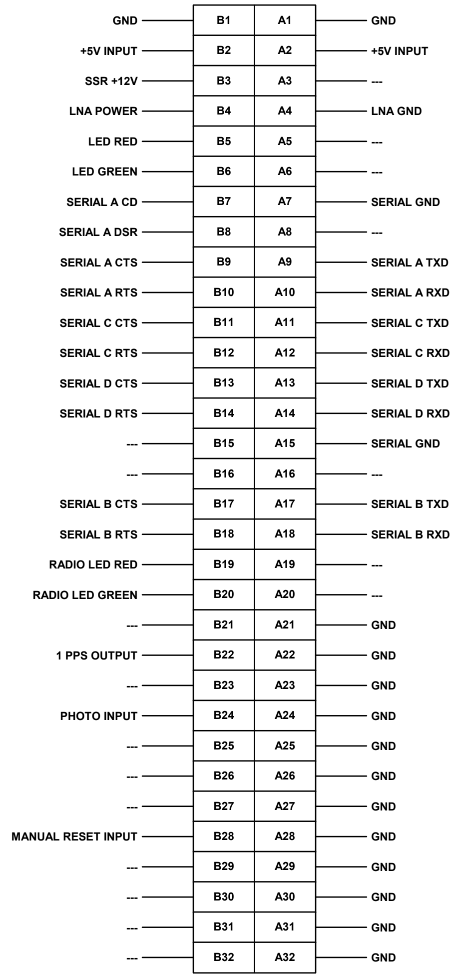

Figure 2.4. Interface Connector Pinout

Table 2.1 defines the pinout and signal designations of the 64-pin connector.

Table 2.1: ZX-Eurocard Interface Connector

Pin	Code	Pin	Code
A1	GND	B1	GND
A2	+5 Vdc input	B2	+5 Vdc input
A3	—*	B3	SSR +12 V**
A4	LNA GND	B4	LNA power†
A5	—	B5	LED red
A6	—	B6	LED green
A7	Serial GND	B7	Serial A carrier detect (CD)
A8	—	B8	Serial A data set ready (DSR)
A9	Serial A TXD	B9	Serial A CTS
A10	Serial A RXD	B10	Serial A RTS
A11	Serial C TXD	B11	Serial C CTS
A12	Serial C RXD	B12	Serial C RTS
A13	Serial D TXD	B13	Serial D CTS
A14	Serial D RXD	B14	Serial D RTS
A15	Serial GND	B15	—
A16	—	B16	—
A17	Serial B TXD	B17	Serial B CTS
A18	Serial B RXD	B18	Serial B RTS
A19	—	B19	Radio LED - red
A20	—	B20	Radio LED - green
A21	GND	B21	—
A22	GND	B22	1 PPS output
A23	GND	B23	—
A24	GND	B24	Photo input
A25	GND	B25	—
A26	GND	B26	—
A27	GND	B27	—
A28	GND	B28	Manual reset input‡
A29	GND	B29	—
A30	GND	B30	—
A31	GND	B31	—
A32	GND	B32	—

Table 2.1: ZX-Eurocard Interface Connector (continued)

Pin	Code	Pin	Code

* "—" means no connection.
** Required only if SSRadio is installed.
† Required only if LNA requires greater than 5Vdc.
‡Short to ground with a switch closure or open-collector transistor.

Port A can be connected to a modem. Refer to "Modem Support" on page 15 for more details.

Table 2.2 shows the pinout for the optional spread spectrum radio. This connector mates only with a flex circuit that is provided if the SSRadio is used. Connector specifications and flex circuit dimension requirements can be provided if you need to construct your own flex circuit.

Table 2.2: SSRadio Connector Pinout

Signal Name	Number	DIR	Description
PRTD_IN	1	I	Should be grounded by the radio to indicate that it is plugged in.
CLK20C	2	O	20 MHz square wave output
GND	3	P	Ground/power return
GND	4	P	Ground/power return
1PPSOUT	5	O	GPS 1 pulse per second
TXD3	6	O	Transmit data port D (RS232)
RXD3	7	I	Receive data port D (RS232)
+12V_INT	8	P	12 V radio power from 64-pin connector
RTS3	9	O	Request-to-send port D (RS232)
CTS3	10	I	Clear-to-send port D (RS232)
+5 V	11	P	Not connected on ZX-Eurocard
LED_EXT	12	I	Not connected on ZX-Eurocard

The 16-pin connector J101 on the ZX-Eurocard is for factory use only.

RF Connector

The RF connector is a standard 50-ohm SMB female wired for connection via coaxial cabling to a GPS antenna with integral LNA. The SMB connector shell is connected to the Z-Eurocard common ground. The SMB center pin provides +5Vdc to power the LNA (maximum 150 mA draw) and accepts 1227 and 1575 MHz RF input from the antenna; the RF and DC signals share the same path.

For installations compatible with the GG24-Eurocard, an SMB-to-SMA adapter is available (part number 730188).

Antenna

The ZX-Eurocard provides DC power on the center conductor for an LNA on the antenna cable. No external source is required to power a 5 Vdc LNA. An LNA requiring greater than 5 Vdc may be used by connecting an external power supply to LNA POWER and LNA GND on the 64-pin connector. No jumpering is required as long as the voltage is higher than 5 Vdc. *The maximum external LNA voltage should not exceed 15Vdc*.

The gain of the LNA less the loss of the cable and connectors should be between 20 and 45 dB. Connect the antenna cable directly to the antenna connector on the ZX-Eurocard. Antenna cables exceeding 15 dB of loss require a line amplifier. A line amp (part number 700389) compensates for 20 dB of cable loss. The line amplifier has N-type connectors to connect to the antenna cable.

Power Requirements

The ZX-Eurocard requires 5 Vdc regulated ±5% at the board connector, and consumes 5.0 watts.

Environmental Specifications

The operating temperature range of the ZX-Eurocard is -30°C to +70°C; storage temperature is -40°C to +85°C.

The operating humidity range is 0 to 95%, non-condensing.

The ZX-Eurocard is designed to operate while being subjected to random vibration per MIL-STD-810E Method 514.4, as well as a machine control vibration test of 5g for 20 hours in each orthogonal axis.

Mounting Requirements

The ZX-Eurocard should be mounted using, as a minimum, the four 0.110” holes in the corners of the board, on standoffs as described under the heat-sink requirements (refer to “Heat Sink Requirements” on page 15). In high-vibration applications, the two center 0.110” holes should also be used. The maximum diameter for the center standoffs is 3/16”.

This board can also be provided in a true Eurocard format with a 96-pin 3-row connector. The center row of pins is not loaded, for electrical compatibility, and the side edges are milled to 0.062” to allow insertion into a card rack. The length of the true Eurocard board is 6.300”; all other dimensions are the same as the standard ZX-Eurocard.

Heat Sink Requirements

The ZX-Eurocard has one large quad-flat-pack IC on the bottom side that requires a heat sink to keep it within its safe operating temperature range. If you wish to mount the board inside a metal case, use 0.200” standoffs with the adhesive thermal pads provided with the board filling the gap between the two ICs and the metal case.

If this arrangement is not possible, an aluminum heat-sink plate is available (part number 200541) so you can attach the board on the bottom side (again using the thermal pads) filling the gap between the ICs and the heat-sink). Attach the plate using the four plated-through holes as shown.

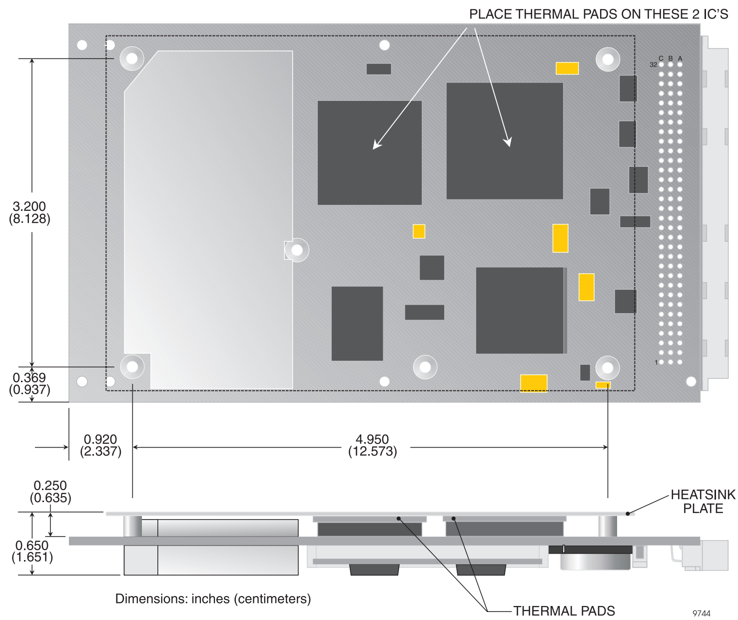

Figure 2.5. ZX-Eurocard Mounted with Heat-Sink

Applications requiring 70°C operation should provide either a substantial heat sink or forced-air cooling to limit the temperature rise on the board to less than 10°C above ambient.

Modem Support

The ZX-Eurocard can be interfaced to a modem through Port A. Refer to Table 2.1 and the modem user manual before making connections. After making connections, you can follow the steps below to configure and initialize the modem using ZX receiver commands. If using a modem other than US Robotics, refer to modem command (MDM) in the user manual for more detailed information.

1. Select an appropriate baud rate for Port A and modem; the baud rate should be identical for Port A and the modem. You may have to refer to the user manual if selecting a baud rate other than the default.
2. Set Port A for modem use with the command

   $PASHS,MDM,ON,A,O,[baud rate].

   The baud rate field in the command is optional, as indicated by the brackets. The above command can be sent through serial ports B, C, or D. The receiver acknowledges with the response message

   $PASHR,ACK.
3. Use the query command $PASHQ,MDM to verify the setting in step 2.
4. Send command $PASHS,MDM,INI to initialize the modem. The receiver should respond with the message

   $PASHR,MDM,INI,OK
5. The modem connected to Port A of the receiver is now initialized and ready for communication.
6. To establish a communication link, the modem on the other end has to dial the modem connected to the receiver.

ZX-Sensor

The sensor version of the receiver, Figure 2.6, has three RS-232 input/output (I/O) ports embedded in a DB25 connector (ports A,B, and C are available to the user, while port D can be used for an internal radio), an L1/L2-band RF port, and an optional radio RF port. The ZX-Sensor also supports an optional PCMCIA card (internal) for data recording purposes.

Figure 2.6. ZX-Sensor

Table 2.3 describes the front panel components of the ZX-Sensor.

Table 2.3: ZX-Sensor Front Panel Description

Component	Function
RADIO connector	Allows RF connection of the embedded Spread Spectrum Radio Receiver Board to the Spread Spectrum Antenna; TNC reverse polarity.
GPS ANT connector	The GPS ANT connector is a standard TNC female receptacle wired for connection via 50-ohm coax to a GPS antenna with an integral LNA. The connector shell is connected to the ZX-Sensor common ground. The TNC center pin provides +5Vdc to power the LNA, and accepts 1227 and 1575 MHz RF input from the antenna; RF and DC signals share the same path.
ON/OFF switch	Turns the unit on and off.
PWR/SATS LED	Flashing red indicates power is applied to the receiver. Number of green flashes indicates number of satellites the receiver is locked to.
SERIAL PORTS A, B, C, PWR STROBES	The multi-function 25-pin connector serves as the three RS-232 serial input/output ports (A, B, and C), the power input, event marker input, the 1PPS output, and LED connectors.

Mounting Dimensions

Figure 2.7 shows the mounting dimensions for the ZX-Sensor.

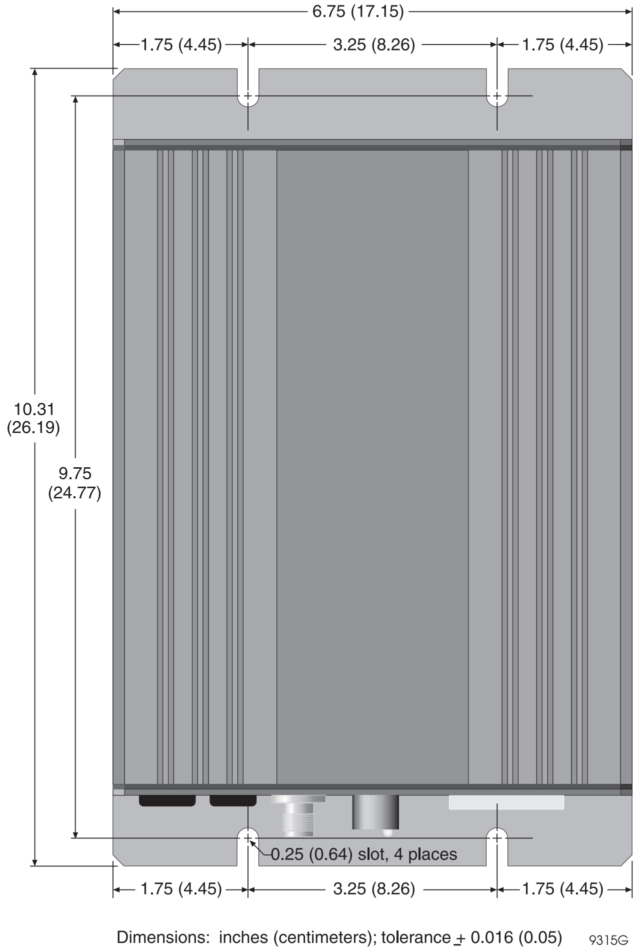

Figure 2.7. ZX-Sensor Mounting Dimensions

Power/Input/Output Connector

Figure 2.8 shows the pin arrangement for the DB25 power/input/output connector.

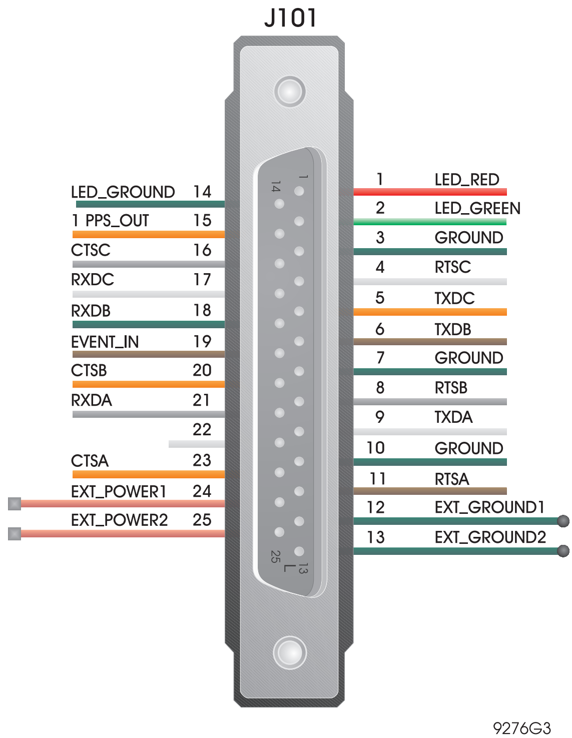

Figure 2.8. DB25 Connector

Table 2.4 lists the signal designations for the DB25 connector.

Table 2.4: ZX-Sensor DB25 Connector Pinout

Pin	Code	Pin	Code
1	LED RED	14	LED GND
2	LED GREEN	15	1PPS OUT
3	GND	16	CTSC-clear to send, port C
4	RTSC-ready to send, port C	17	RXDC-receive data, port C
5	TXDC-transmit data, port C	18	RXDB-receive data, port B
6	TXDB-transmit data, port B	19	EVENT IN

Table 2.4: ZX-Sensor DB25 Connector Pinout (continued)

Pin	Code	Pin	Code
7	GND	20	CTSB-clear to send, port B
8	RTSB-ready to send, port B	21	RXDA-receive data, port A
9	TXDA-transmit data, port A	22	No connection
10	GND	23	CTSA-clear to send
11	RTSA-ready to send, port A	24	EXT PWR 1
12	GND	25	EXT PWR 2
13	GND		

Power Requirements

The ZX-Sensor requires 10-28 Vdc and consumes 7.5 watts.

Environmental Specifications

The operating temperature range of the Z-Sensor is -30°C to +55°C; storage temperature range is -40°C to +85°C.

The ZX-Sensor will work at 100% humidity and is rated to MIL-STD-810E for wind driven rain and dust.

RF Connector

The RF connector is a standard 50-ohm female TNC wired for connection via coaxial cabling to a GPS antenna with integral LNA. The TNC connector shell is connected to the Z-Sensor common ground. The TNC center pin provides +5 Vdc to power the LNA (maximum 150 mA draw) and accepts 1227 and 1575 MHz RF input from the antenna; the RF and DC signals share the same path.

Serial/Power Cable

The serial/power cable, Figure 2.9, connects the ZX-Sensor to the power source, the PC or handheld unit, and any peripherals.

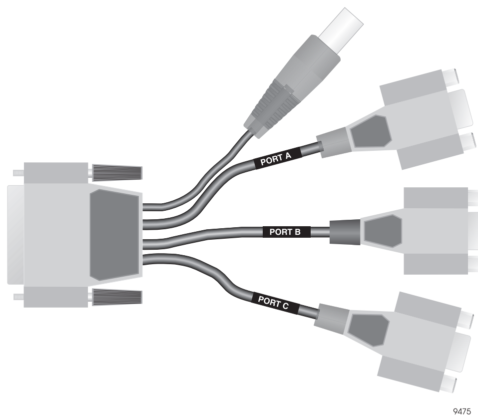

Figure 2.9. ZX-Sensor Serial/Power Cable

Antenna

The ZX-Sensor provides DC power on the center conductor for an LNA on the antenna cable. The gain of the LNA minus the loss of the cable and connectors should be between 20 and 45 dB. Connect the antenna cable directly to the antenna connector on the ZX-Sensor. Antenna cables exceeding 15 dB of loss require a line amplifier. A line amplifier (part number 700389) compensates for 20 dB of cable loss. The line amplifier has N-type connectors to connect to the antenna cable.

On-Board Battery

Both the ZX-Sensor and ZX-Eurocard contain a 3.6V lithium backup battery to maintain power to the non-volatile memory and real-time clock when the main power source is not available. This battery should last a minimum of 5 years. The firmware monitors the battery voltage, and detects a failure when it reaches 2.25 volts. You can obtain this information via any serial port with the $PASHQ,WARN command (refer to the *Z-Family Technical Reference Manual* for detailed information about this command).

Radio Interference

Some radio transmitters and receivers, such as FM radios, can interfere with the operation of GPS receivers. Before setting up your project, we recommend you verify that nearby handheld or mobile communications devices do not interfere with the ZX-receivers .

Development Kits

Figure 2.10 through Figure 2.13 list inventories for all items you should have received with your purchase of either the ZX-Eurocard or the ZX-Sensor.

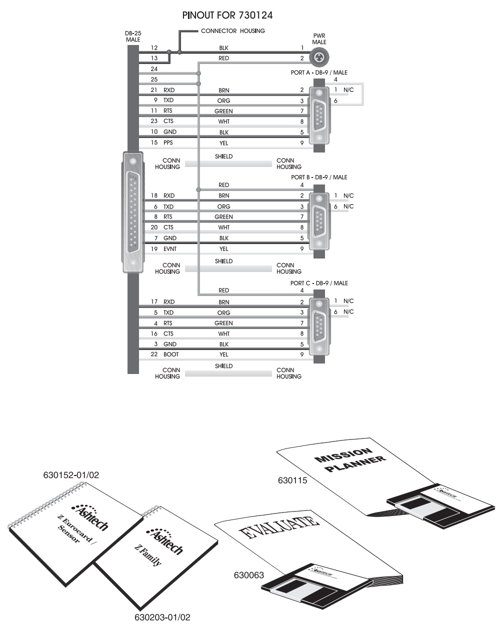

Figure 2.10. ZX-Sensor Development Kit (A)

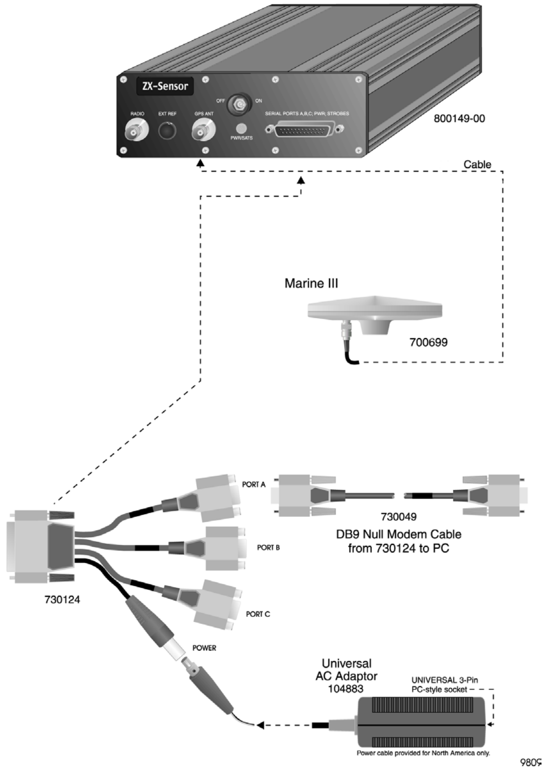

Figure 2.11. ZX-Sensor Development Kit (B)

Equipment

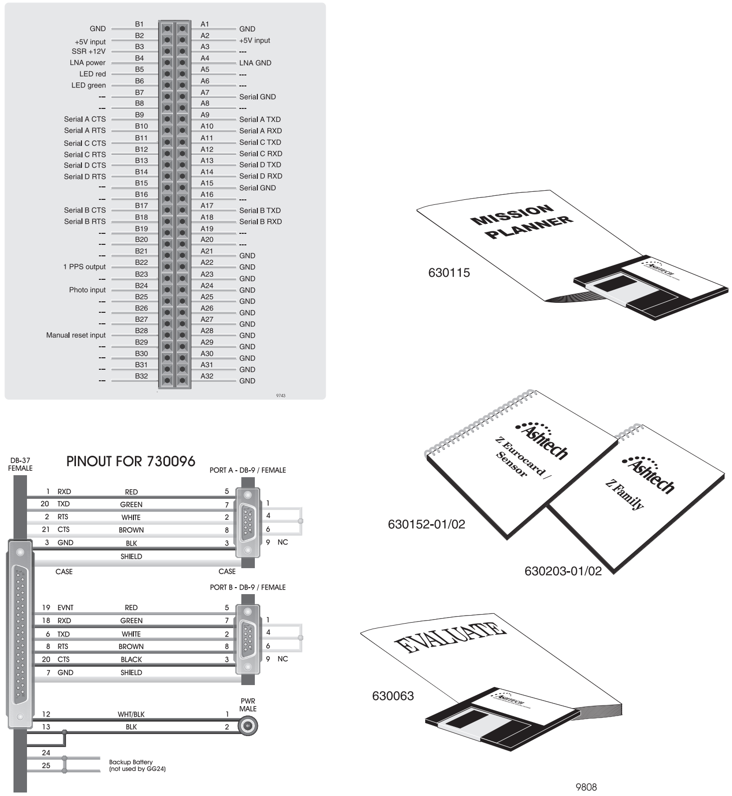

Figure 2.12. ZX-Eurocard Development Kit (A)

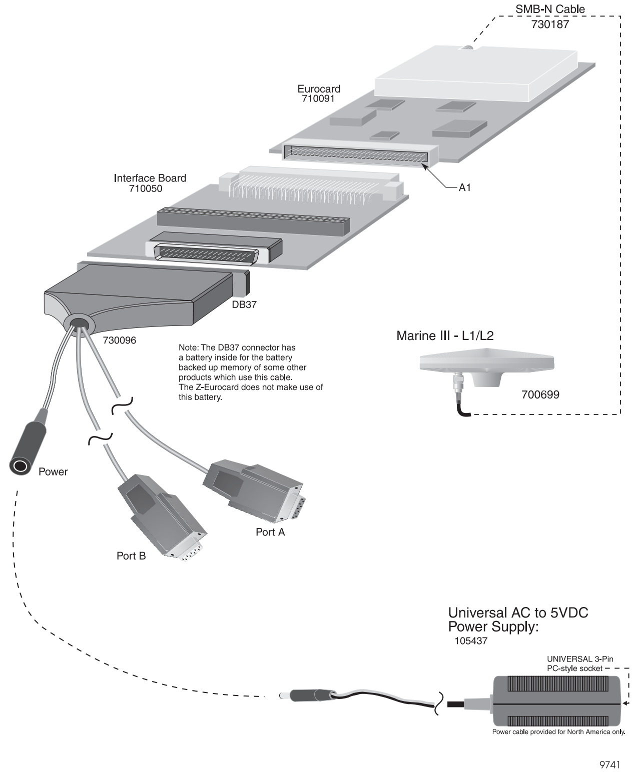

Figure 2.13. ZX-Eurocard Development Kit (B)

3

Getting Started

This chapter describes receiver operations.

Hardware Setup

Perform the following steps before turning on the receiver:

1. Connect the antenna cable from the GPS antenna to the antenna connector on the receiver.
2. Connect supplied power cable to the power connector on the receiver.
3. Connect serial port connectors of serial/power cable to appropriate connectors on external equipment.

Applying Power

Apply power after your equipment has been properly cabled.

Receiver Initialization

It is good practice to reset your receiver prior to operating it for the first time or when a system malfunction occurs. A reset of the internal memory clears the memory and restores the factory defaults. Send the following command:

- $PASHS,INI,5,5,5,5,1,0

Receiver Communication

After you have the receiver powered and running, you must send it commands in order to receive data. The following procedure describes how to send commands to and receive information from the receiver using an IBM-compatible PC. Many communicaiton software packages, such as the Ashtech *Evaluate* or *Receiver Communications Software*, allow you to interface with the receiver. Evaluate includes a communications package that automatically establishes communication with the receiver and allows you to send commands from a predefined menu, as well as tools for logging and playback of data, graphical display of position and velocity, and data analysis.

The default communciations parameters of the reciver are:

- 9600 baud
- 8 data bits
- no parity
- one stop bit

When first establishing communication, your interface must use this protocol. Having established communication, you may send commands.

All the default data output commands are set to NO. The receiver will not output any data until you send a message commanding it to do so.

If you have typed in and sent the command correctly, you should receive a response. To become familiar with receiver messages, send a few common commands and observe the responses.

Monitoring

The receiver provides the capability of monitoring receiver activity while data collection is occuring. The following is a step-by-step instruction of how to access important receiver status information such as:

- Satellite Tracking
- Position
- Remaining Memory

Satellite Tracking

If you wish to monitor the satellites the receiver is tracking and using for position solutions, perform the following steps:

1. Send the NMEA command $PASHS,NME,SAT,x,ON

   x—port designation

   ON—turns port on
2. SAT messages will be output every second through the designated port.
3. The response message contains the number of tracked satellites as well as whether individual satellites are used in the position solution.

Position

To view the current position of the Z-receiver, perform the following steps:

1. Send the NMEA command $PASHS,NME,POS,x,ON.

   x—port designation

   ON—turns port on
2. POS messages are output every second through the designated port.
3. The response message contains information about the current position of the receiver.

Setting Receiver Parameters

If you do not wish to use the factory default settings, you must change each setting individually. Refer to the *Command/Response* chapter of the Z-family reference manual.

Saving Parameter Settings

Ordinarily, Z-receiver parameters that have been changed will return to their default status after a power cycle. The Z-receiver allows you to save changed settings so they will be saved through a power cycle. Perform the following steps to save receiver settings:

1. Send the command $PASHS,SAV,*c*. This command enables or disables user parameters in memory, where *c* is Y (yes) or N (no). User parameters that were changed prior to issuing the SAV command are are saved until commands INI or RST are issued, or until SAV is set to No and a power cycle occurs.

Data Recording

Recording data directly onto your PC can be done with DATLOGR, using the **DATALOGR.EXE** program. DATALOGR will collect B- and E-files in real time onto your computer. Refer to your *DATALOGR User's Guide*. Alternatively, you can use the internal PCMCIA card (optional) in the ZX-Sensor for recording data. Refer to the Data Recording section of the user manual.

Default Parameters

During the normal course of receiver operation, you will often change one or more receiver parameters such as recording interval, port baud rate, or elevation mask. To save new settings, you must save the current setting to memory or else all parameters (with a few exceptions) will be reset to the default values during a power cycle. The exceptions are session programming parameters, modem setting parameters, MET (meteorological) and TLT (tilt) parameters, and the POW (power) parameters. Saving parameters can be done by issuing a $PASHS,SAV,Y command to a serial port. When parameters are saved to the memory, they are maintained until a memory reset or a receiver initialization is performed which resets all parameters to their default.

Figure 3.1 lists the default values of all user parameters.

Table 3.1: Default Values

Parameter	Description	Default
SVS	SV tracking selection	Y for all
PMD	Position mode selection	0
FIX	Altitude Hold Fix Mode Selection	0
PEM	Position elevation mask	10
ZEN_PEM	Zenith position elevation mask	90
FUM	Use of UTM coordinates	N
FZN	UTM zone selection	01
PDP	Position Dilution of Precision mask	40
HPD	Horizontal Dilution of Precision mask	04
VDP	Vertical Dilution of Precision mask	04
UNH	Use of unhealthy SV's	N
ION	Enable ionosphere model	N
PPO	Enable point positioning mode	N
SAV	Save parameters in battery backup memory	N
ANR	Antenna noise reduction	CPD
LAT	Antenna latitude	00N
LON	Antenna longitude	00W
ALT	Antenna altitude	+00000.000
DTM	Datum selection	W84
UDD	Datum user-defined parameters	Semi major axis = 6378137 Inverse flattening = 298.257224 Remaining parameters = 0
PHE	Photogrammetry edge selection	R
PPS	Pulse per second default parameters	Period= 1 second Offset = 000.0000 Edge = R
POW parameters	Power capacity of external battery	All 0'S

Table 3.1: Default Values (continued)

Parameter	Description	Default
Session Programming	Session Programming Default Parameters	INUSE flag = N REF day = 000 OFFSET = 00:00 For all Sessions: Session Flag = N Start Time = 00:00:00 End Time = 00:00:00 RCI = 20 MSV = 3 ELM = 10 RNG = 0
MDM	Modem Parameters	MODE=OFF TYPE = 0 (US Robotics) PORT = B BAUD RATE = 38400
BEEP	Warning beep	Off
CTS	Clear to send port setting	On
LPS	Loop parameter setting	01, 2, 3
MET	meteorological parameter setting	All ports off INIT-STR:No TRIG-CMD:*0100P9 INTVL:5
TLT	Tilt Meter parameter setting	All ports OFF INIT-STR:No TRIG-CMD:*0100XY INTVL:1
NMEA messages	NMEA Message Output Status	OFF in all ports
TAG	NMEA nessage format	ASH
PER	NMEA Messages Output Rate	001.0
RCI	Raw Data Output Rate	020.0
DOI	Data output interval	20
DRI	Data recording interval	20
MSV	Minimum Number of SV's for Raw Data Output	03
ELM	Elevation Mask for Raw Data Output	10
ZEN_ELM	Zenith elevation mask	90
REC	Record Data Flag (N/A)	E
MST	Minimum Number of SV's for Kinematic Operation	0
ANH	Antenna Height (before session)	00.0000

Table 3.1: Default Values (continued)

Parameter	Description	Default
ANA	Antenna Height (after session)	00.0000
SIT	Site ID Name	????
EPG	Kinematic Epoch Counter	000
RNG	Ranger Mode Selection (N/A)	0
RAW data	Raw Data Output Status	OFF in all ports
Raw data format	Raw Data Output Format	ASCII in all ports
Serial Port Baud Rate	Serial Ports Baud Rate Selection	9600 in all ports
RTCM MODE	RTCM Differential Mode Selection	OFF
RTCM PORT	RTCM Differential Mode Port Selection	A
AUT	Automatic differential/autonomous switching when rtcm differential mode enabled	N
RTCM SPD	RTCM differential bps speed setting	0300
STI	RTCM base or remote station id setting	0000
STH	RTCM base station health setting	0
MAX	Maximum age for old RTCM corrections to be used	0060
QAF	RTCM communication quality setting	100
SEQ	Use sequence number of RTCM correction in remote station	N
TYPE	RTCM differential messages enabled and output frequency of the enabled messages	1 = 99, 6 = ON, remaining messages 00
RTCM EOT	End of character selection for rtcm corrections	CRLF
MSG	Text for RTCM type 16 message	empty
IOD	IODE update rate	30
CPD MODE	CPD mode selection	Disabled
PED	DBEN output transmission period	001.0
DBEN PORT	Output port for dben messages in the base	B
CPD EOT	End of character selection for cpd corrections	CRLF
AFP	Setting of ambiguity fixing confidence level	099.0
MAX AGE	Maximum age of corrections for CPD	30
DYN	CPD rover mode dynamic operation	WALKING
POS Output		CPD
MTP	Level of multipath selection	MEDIUM

Table 3.1: Default Values (continued)

Parameter	Description	Default
CPD POS	Reference position of the other receiver	RECEIVED
FST	Fast CPD Mode Selection	ON
CPD PER	CPD Update Interval	01
CKR	Reserved	ON
IAF	Reserved	ON
ANT radius	Radius of the Antenna	0.0000
ANT offset	Distance from Antenna Phase Center to Antenna Edge	00.0000
ANT horizontal azimuth	Azimuth measured from Reference Point to Antenna Phase Center	00000.00
ANT horizontal distance	Distance from Reference Point to Antenna Phase Center	00.0000

A

Global Product Support

If you have any problems or require further assistance, you can contactTechnical Support by telephone, email, or Internet.

Please refer to the documentation before contacting Technical Support. Many common problems are identified within the documentation and suggestions are offered for solving them.

Ashtech Products Technical Support, Santa Clara CA USA

800 Numberr 800-229-2400

Direct Dial: (408) 615-2400

Switchboard: (408) 615-5100

FAX Line: (408) 615-5200

e-mail: support@thalesnavigation.com

Internet: http://www.ashtech.com

Nantes, France:

Direct Dial: 33 2 2809 3934

Switchboard: 33 2 2809 3800

e-mail: technical@thalesnavigation.com

Ashtech South America:

Tel: +56 2 234 56 43

FAX: +56 2 234 56 47

When contacting Technical Support, please have the following information:

Receiver serial number

Software version number

Software key serial number, if applicable

Firmware version number

A clear, concise description of the problem.

Solutions for Common Problems

- Check cables and power supplies. Many hardware problems are related to these simple problems.
- If the problem seems to be with your computer, re-boot it to clear RAM.
- If you are experiencing receiver problems, reset the receiver as documented in the set commands section of this manual. Reset clears receiver memory and resets operating parameters to factory defaults.
- Verify that the batteries are charged.
- Verify that the antenna view of the sky is unobstructed by trees, buildings, or other canopy.

Corporate Web Page

You can obtain data sheets, GPS information, application notes, and a variety of useful information from Ashtech's Internet web page at:

http://www.ashtech.com

Repair Centers

In addition to repair centers in California and England, authorized distributors in 27 countries can assist you with your service needs.

Thales Navigation

471 El Camino Real

Santa Clara, California 95050-4300 USA

Voice: (408) 615-3980 or (800) 229-2400

FAX: (408) 615-5200

e-mail: rmaprocessing@thalesnavigation.com

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First Base, Beacontree Plaza

Gillete Way

Reading RG2 OBP

United Kingdom

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FAX: 44 118 932 9601

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