

MBS-GPS-SS2-5HZ Novatel SuperStar II PC/104 GPS Module User's Manual

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Please read before installing your product.

MicroBee's products are designed to be high in performance while consuming very little power. In order to maintain this advantage, CMOS circuitry is used. CMOS chips have specific needs and some special requirements that the user must be aware of. Read the following to help avoid damage to your card from the use of CMOS chips.

Using CMOS Circuitry

Industrial Control originally used LSTTL circuits. Because many PC components are used in laptop computers, IC manufacturers are exclusively using CMOS technology. Both TTL and CMOS have failure mechanisms, but they are different. This section describes some of the common failures which are common to all manufacturers of CMOS equipment.

Improper power causes catastrophic failure.

If a card has had reverse polarity or high voltage applied, replacing a failed component is not an adequate fix. Other components probably have been partially damaged or a failure mechanism has been induced. Therefore, a failure will probably occur in the future. For such cards, MicroBee highly recommends that these cards be replaced.

Other over-voltage symptoms

In over-voltage situations, the programmable logic devices, EPROM's and CPU chips, usually fail in this order. The failed device may be hot to the touch. It is usually the case that only one IC will be overheated at a time.

Hot insertion

Hot insertion is not supported. Doing so voids your warranty.

PREFACE

This manual is a guide to the proper configuration, installation, and operation of your MBS-GPS-SS2-5HZ Interface. For setup and operation of the Novatel SSII Manuals included with this product. You can use your MBS-GPS-SS2-5HZ card in conjunction with other PC/104 expansion cards, tailoring your system for a wide variety of applications.

TECHNICAL SUPPORT

MicroBee Systems is committed to supporting our products. For this reason all user manuals as well as this manual are always available online in PDF format at http://www.microbee-systems.com/user_manuals.htm. If you do not find this online then please inform us and we will make it available immediately.

This unit has been tested with a number of operating systems including MSDOS, Linux, QNX, Microsoft Windows 98, NT, 2000 and XP. Any operating systems supporting an ISA legacy device should operate normally with this product. This unit defaults to 16C550 mode. Access to advanced features are via register access and thus may require modification to existing drivers. MicroBee Systems does not guarantee operation with unusual or custom "in house" operating systems or serial IO libraries. We will help you all we can.

If you have a question about the MBS-GPS-SS2-5HZ card and cannot find the answer in this manual, call Technical Support. They will be ready to give you the assistance you need.

- When you call, please have the following at hand:
- Your MBS-GPS-SS2-5HZ GPS Module Interface User's Manuals
- A description of your problem.

The direct line to Technical Support is 256-426-2431.

OVERVIEW

The MBS-GPS-SS2-5HZ PC/104 GPS Module is a high performance dual 16C550/850 UART PC/104 Bus Compliant 8 BIT interface based upon the Exar XR16C2850 Dual UART with user selectable 128 Byte deep FIFO buffers and integrated with the Novatel Super Star II 5Hz GPS. This interface supports two independent user selectable TTL and RS232 level 1 PPS GPS software and hardware selectable outputs. Port 1 is used as the Primary Data/Command Port and Port 2 is the Differential input when a RTCM compliant correction message is supplied.

This unit incorporates several unusual features. This unit uses either jumpers or UART Modem Control Register (MCR) control signals to transfer serial I/O to either the internally mounted GPS or the EXT serial I/O connector, J7. J7 is a RS-232 Level IO compatible and both Port 1 and Port 2 are routed to this connector as well as provisions for a 1PPS input and a Reset Line output. This facilitates the use of this module with other serial devices or GPS units and switching from the internal GPS to the EXT Serial Port is done by toggling the DTR bit of the Data Port MCR.

Once the unit is configured and installed it is treated as two standard serial ports on the PC/104 stack. As an example, if the Data Port is configured for an address of 0x3F8 and IRQ 4 then the MBS-GPS-SS2-5HZ is utilized simply as COM 1. Default operation is 16C550 mode with 16 byte FIFO's. Wide FIFO enable is via software writes to special registers. Please refer to the XR16C2850 UART datasheet. **This unit does not support flow control.**

The interface supports baud rates up to a maximum of 115,200 Baud. However, the Novatel SSII only supports maximum rates of 19,200 depending upon model requested. Operation with 16 byte FIFO's is satisfactory at this rate. However, the user can enable FIFO's up to 128 bytes

deep. This means that instead of an interrupt generated every 15 characters one could be generated only once per message greatly reducing overhead on the host processor to handle interrupt servicing.

The unit incorporates the 16 bit PC/104 ISA connector so 16 bit devices can be placed on the stack after the radio. Also interrupts 10, 11, 14 and 15 are accessed thru this connector. The MBS-GPS-SS2-5HZ, being an 8 BIT interface, does not require a 16 bit ISA card be prior to the radio unless operation requires IRQ 10, 11, 12, 14 or 15.

For more information on the PC-104 ISA bus please refer to the PC-104 specification at:
<http://www.pc104.org/technology/PDF/PC104Specv246.pdf>

Caution:

The MBS-GPS-SS2-5HZ contains static sensitive CMOS components. The greatest danger occurs when the card is plugged into the PC/104 stack. The card becomes charged by the user and the static discharges to the I/O bus from the pin closest to the card connector. If that pin happens to be an input pin, even TTL inputs may be damaged. **Follow sound ESD practices!!!!**
To avoid damaging your card and its components:

1. Ground yourself before handling the MBS-GPS-SS2-5HZ GPS Module.
2. Disconnect power before removing or inserting the MBS-GPS-SS2-5HZ GPS Module.

OPERATING PRECAUTIONS

Be sure that your PC/104 stack and/or power supply has sufficient current to supply the radio at the specified power setting. For use with an active antenna 12V is recommended although 5V is sufficient. Please refer to Jumper setting for Active Antenna Power Selection.

TECHNICAL SPECIFICATIONS

Baud Rate

The MBS-GPS-SS2-5HZ is fully 16C550A compliant and supports software selectable baud rates of 300, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 56K, 115.2K.

Environmental

-35° to 70° C operating.
-40° to 90° C non-operating.
RH 5% to 95%, non-condensing.

Power Specification

5V +/- 5% at 50 mA maximum..
Antenna common mode output 50mA Maximum.

Size

3.6 in. x 3.8 in x 0.5 in.
91.4 mm X 96.5 mm x 15.2 mm

INSTALLATION

Before installing the MBS-GPS-SS2-5HZ GPS Module, refer to Figure 1 for the location of various connectors and jumpers.

Interrupt Select Jumpers, JP3 & JP 4:

JP3 is used to select the IRQ Level for the DATA port. IRQ's 3, 4, 5, 6, 7, 9, 10, 11, 12, 14 and 15 are supported. Simply select the desired IRQ level by moving the jumper to the appropriate position.

Default configuration for JP3 is IRQ4 which is standard for COM1. Default configuration for JP4 is IRQ3 which is standard for COM 2. **Each port must use a unique IRQ.**

Caution:

Improper IRQ configuration can result in your CPU locking up due to an IRQ conflict. Most COM libraries allow for non-standard IRQ settings as will after market drivers. Windows 95, 98, ME, NT, 2000 and XP may limit your IRQ selection without aftermarket drivers. This is usually not required unless all IRQ's supported by the OS are already allocated.

Address Select Jumpers, JP1 & JP2:

For flexibility with most SW and Development libraries this unit will support any valid address between 0x000-0x007 and 0x7F8-0x7FF. However, most platforms have limited IO space. Please refer to your host CPU IO Map for available IO space for this product.

Most applications will use one of the common serial port addresses. The most common are: COM1 = 3F8, IRQ4, COM2 = 2F8, IRQ3 COM3 = 3E8, IRQ4 COM4 = 2E8, IRQ3
Most software development libraries for serial communication support non-standard address and/or IRQ assignments.

An excellent serial communication is the Comm/Drv Lib from Willies Computer Software at <http://www.wcsnet.com>. This company provides excellent serial communications products and is recommended by MicroBee Systems.

The default address of this interface is 0x3F8 & 0x2F8 which are COM1 & COM 2 respectively. To easily select the address you desire place jumpers on JP2 in the following order.

From left to right placing a jumper sets the address bit to 0.

Addressing Examples:

Hex	A10	A9	A8	A7	A6	A5	A4	A3
0x2F8	X		X					
0x300	X			X	X	X	X	X
0x310	X			X	X	X		X
0x3E8	X						X	
0x3F8	X							
0x7F8								

X = jumper installed meaning bit = 0.

GPS Identification Bits, JP5 and JP6

This module was designed to be used with multiple data sources through the use of both mezzanine cards to replace the Novatel SSII as well as multiple serial peripherals accessible from the EXT GPS/Data port, J7. To allow user software identification of the type of GPS/Module connected/installed on the MBS-GPS-SS2-5HZ JP5 and JP6 are available for use as identification bits. ID bits are read by polling the DCD, DSR and CTS bits of the Differential Port. By polling these register bits the user can identify the jumper settings and thus verify user assigned information to these settings. If desired these could be also unused or used as user digital inputs. Two sets of jumpers define this. These are routed dependant upon the selection of either the INT or EXT GPS. Thus unique ID bits are available when ports are switched. Jumper on represents a Logical 0 and jumper on represents a logical 1.

Internal or External Serial IO, JP8 and JP8A:

Note: All jumpers have positions 1-2 towards connector J7. Please refer to Figure 1.

JP7 Reset source.

In Position 1-2 reset is driven by the state of the Diff Port DTR Bit (DTR1). In Position 2-3 it is driven by the reset switch, SW1. For default minimal SW requirements use SW1 as the source. DTR1 requires software intervention to insure the reset line is held high. This has a advantage of allowing the host CPU to reset the GPS if required.

JP8 Controls the serial data source.

In position 1-2 the data, PPS signal and Reset lines are routed based upon the level of the DTR line of the Data Port. Thus if the data port is COM1 (0x3F8) then setting the DTR bit of COM1 to 1 will select the EXT Serial Port and setting the DTR bit to 0 will select the INT Novatel SSII.

In position 2-3 the data, PPS signal and Reset lines are routed based upon Jumper JP8A, not the DTR bit of the Data Port. JP8A 2-3 selects the Novatel SSII and JP8A 1-2 selects the EXT Serial Port.

Internal or Auxiliary 1 Pulse Per Second (1PPS) Selection, JP9 and JP9A:

JP9 Controls the 1PPS source.

In position 1-2 the 1PPS signal is routed based upon the level of the RTS line of the Data Port. Thus if the data port is COM1 (0x3F8) then setting the RTS bit of COM1 to 1 will select the AUX PPS input and setting the DTR bit to 0 will select the INT Novatel SSII.

In position 2-3 the data, PPS signal and Reset lines are routed based upon Jumper JP9A, not the RTS bit of the Data Port. JP9A 2-3 selects the Novatel SSII for the 1PPS source and JP9A 1-2 selects the AUX for the 1PPS source.

Internal or External Serial IO, JP10 and JP10A:

JP9 Controls the inversion of the 1 PPS signal.

In position 1-2 the 1PPS signal is inversion is based upon the level of the RTS line of the Differential Correction Port, or Port 2. Thus if the Diff Port is COM2 (0x2F8) then setting the RTS bit of COM2 to 1 will invert the PPS signal regardless of the source (GPS INT/EXT or AUX) and setting the RTS bit to 0 will un-invert the 1 PPS.

In position 2-3 the data, 1 PPS inversion is based upon Jumper JP10A, not the RTS bit of the Data Port. JP10A 2-3 un-inverts the 1PPS source and JP10A 1-2 inverts the 1PPS source.

NOTE:

Refer to the Novatel Super Star II GPS OEM Module Users Manual and Firmware Manuals for proper operation and setup of the onboard GPS.

Status Monitoring:

Overview:

Several unusual status features are available. These are provided to monitor primarily the 1PPS timing pulse from either the INT or EXT GPS (depending upon GPS source selection), or the AUX 1PPS source. The 1PP is primarily used for synchronization of MicroBee Systems PC/104 FreeWave data radio products in Masterless TDMA mode and Push To Talk (PTT) mode. In addition the 1PP is very useful for timetag and system synchronization uses. For these reasons advanced features allow an AUX PPS, primarily for development without a valid GPS signal, and polarity inversion of the signal should a system/device require this.

Additionally the 1PPS output is available in both TTL and RS-232 Levels. Please refer to the section on J6 for further information.

DSR0 of the Data Port monitors the GPS 1PPS input, whether INT or EXT, directly from the GPS regardless of the 1PP inversion capabilities. In other words, this is direct from the GPS.

RI0 of the Data Port monitors the 1PPS after before the inversion circuitry. Comparison of this BIT can be used to verify inversion is set.

RI1 of the Diff Port monitors the 1PPS after the inversion circuitry. If the 1PPS is non-inverted then this will be identical to DSR0. If inversion of the 1PP is selected then this will be the compliment of DSR0.

CTS0 of the Data Port is used to monitor the AUX PPS in. If the AUX PPS is unused then this can be ignored. This is used to monitor for the presence of a AUX PPS signal. If AUX PPS is selected then the other features will work upon the AUX signal instead of the INT/EXT GPS sources. The AUX is primarily used for development of systems requiring a 1PPS interrupt where no GPS signal is available. Most GPS systems will not provide a 1PPS without a valid fix.

PPS IO Connector, J6 Terminal Block

J6 is the IO for the 1PP signal. The pinouts are as follows:

J6.1:

1PPS Output. This represents the 1PPS output in RS-232 level. This signal depends upon the source and polarity selection as described previously.

J6.2:

This is the AUX PPS input. This input accepts RS-232 level signals. It is important to remember that if used with a TTL source you must invert the signal. This is because RS-232 level signals are inverted relative to TTL.

J6.3:

TTL level 1PPS output. It is identical to J6.1 except it is TTL level.

J6.4:

BAT IN is a optional input for an EXT battery to backup warm fix information on the Novatel SS2. The Novatel SS2 has a charge storage device to maintain this information for up to 1 week. Longer storage requires a battery. This battery is diode isolated and should range from 3.3 to a **MAXIMUM** of 4.5 volts. This should accommodate most common CMOS backup batteries with 4.5 V being nominal. This is battery type dependant.

Additionally this is tied to the CD0 input of the Data Port and can be used to monitor presence of a backup battery.

J6.5

This is a signal ground.

EXT GPS, J7 Terminal Block (All signals are RS-232 Level)

1= +12 Volts (600 mA MAX)
2 = TX0
3 = RX0
4 = RESET OUT
5 = TX1
6 = RX1
7 = PPS INPUT
8 = GND

Status Line	Function
DTR0	Internal or External Data Source Selection. Also routes the Reset as well as 1PPS
DTR1	Reset Line for GPS or Ext device at J7
CTS1	Device ID Bit, JP5
DSR1	Device ID Bit, JP5
CD1	Device ID Bit, JP5
DSR0	1PPS Presence monitor
CTS0	Aux 1PPS Input monitor
RTS0	1PPS Source Selection, GPS or Aux In
RI0	1PPS Monitor (Always shows PPS source state)
RI1	1PPS Post inversion circuit monitor (Shows if PPS is inverted or uninverted Will track RI0 unless PPS Inversion is forced.
RTS1	Inverts or un-inverts 1PPS signal output. Bit set = invert.
CD0	External backup battery monitor

Table 1, Signal Functions

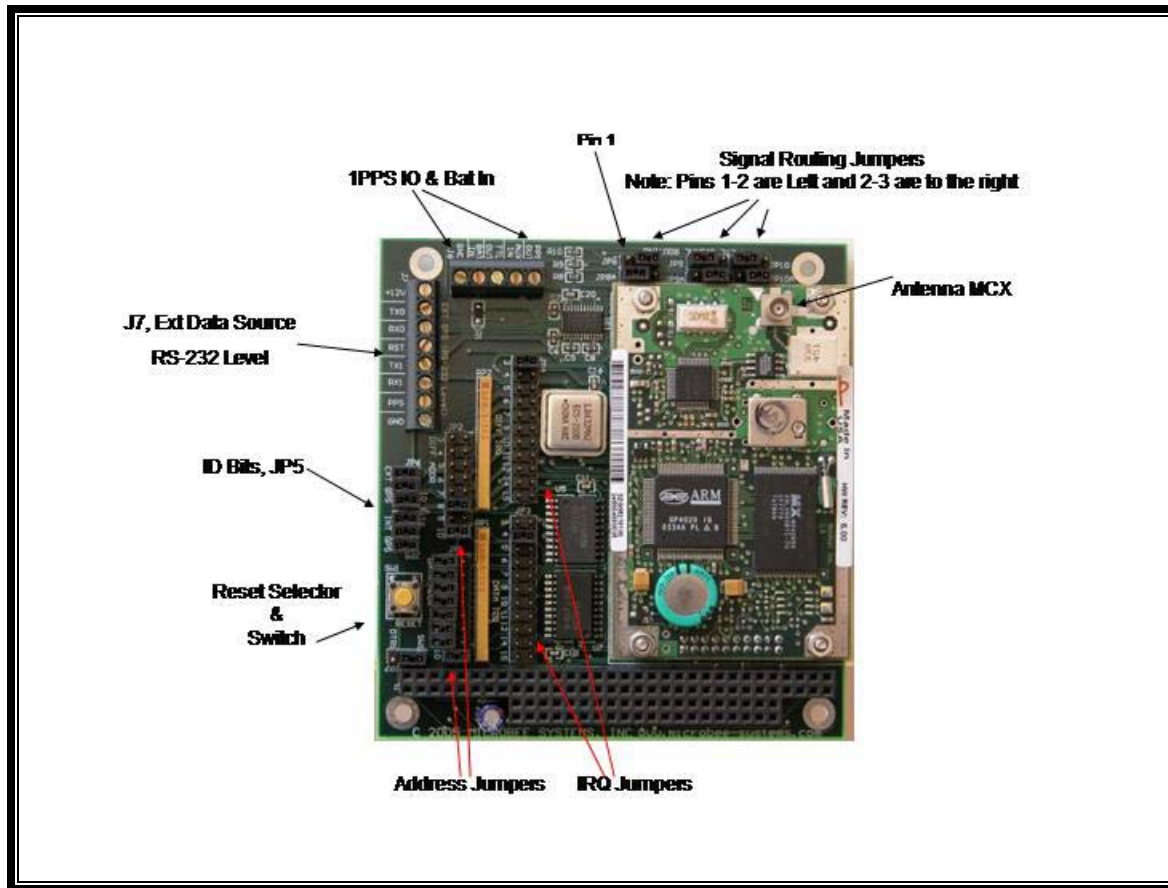


Figure 1, Jumper Layout

WARRANTY

MicroBee Systems Corporation (MicroBee), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service a period of one year from date of purchase. MicroBee's obligation under this warranty shall not begin until Buyer returns the defective product, freight prepaid to MicroBee's facility or another specified location.

MicroBee's only responsibility under this warranty is, at its option, to replace or repair, free of charge, any defective component part of such products.

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1. MicroBee's goal is to ship your product within 10 working days of receipt.
2. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.
3. Customers that return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

RETURNING A PRODUCT FOR REPAIR

Upon determining that repair services are required, the customer must:

1. Obtain an RMA (Return Material Authorization) number from the Customer Service Department, 256-426-2431.
2. If the request is for an out of warranty repair, a purchase order number or other acceptable information must be supplied by the customer.
3. Include a list of problems encountered along with your name, address, telephone, and RMA number.
4. Carefully package the product in an antistatic bag. (Failure to package in antistatic material will VOID all warranties.) Then package in a safe container for shipping.
5. Write RMA number on the outside of the box.

NOTE:

For products under warranty, the customer pays for shipping to MicroBee. MicroBee pays for shipping back to customer.

Other conditions and limitations may apply to international shipments.

NOTE:

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