

PCFW-104 PD M & P-Series Radio Modem PC/104 Interface 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 PCFW-104-PD Interface. For setup and operation of the FreeWave FGRM Radio Modem refer to the FreeWave Radio Users Manuals included with this product. You can use your PCFW-104 PD 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 FreeWave User manuals as well as this manual are always available online in PDF format at http://www.microbee-systems.com/user_manuals.htm.

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. MicroBee Systems does not guarantee operation with unusual or custom operating systems.

If you have a question about the PCFW-104 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 PCFW-104 Radio Modem Interface User's Manual and the FreeWave Radio Users Manual.
- A description of your problem.

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

OVERVIEW

The PCFW-104-PD PC/104 FreeWave Data Radio is a high performance semi-custom dual UART PC/104 Bus Compliant 8 BIT interface based upon the Exar XR16C2850 UART with user selectable 128 Byte deep FIFO buffers that allows the FreeWave Model FGRM-501X005 900 MHz & P501X005 1.3 Ghz data radio to be easily installed on any PC-104 stack. In addition to normal operation this interface supports TTL and RS232 level 1 PPS GPS inputs for Masterless TDMA and TDMA Push to Talk (PTT) mode for the ARDS Light system. Port 1 is used as the data port and is intended for data rates up to 230K baud. Port 2 is for the diagnostic/setup port only.

The PCFW-104-PD is fully PC/104 compliant in all aspects EXCEPT height. The PC/104 specifications calls for a height of 0.4 inches. The unit exceeds the recommended height by approximately 0.200 inch and is due to the RF Shield.

Once the unit is configured and installed it is treated like 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 PCFW-104-PD 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.

The interface supports baud rates up to a maximum of 230,400 Baud. 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 once per message greatly reducing the burden 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 PCFW-104-PD, 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 PCFW-104 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 PCFW-104 Radio Modem.
2. Disconnect power before removing or inserting the PCFW-104 Radio Modem.

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. It is recommended that the supply have a minimum of 1.0 Amps for the 12 VDC.

TECHNICAL SPECIFICATIONS

Baud Rate

The PCFW-104 is fully 16C550A compliant and supports software selectable baud rates of 300, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 56K, 115.2K & 230.4K. Maximum baud rate is dependant upon Jumper JP9 setting.

Environmental

-40° to 85° C operating.
-50° to 90° C non-operating.
RH 5% to 95%, non-condensing.

Power Specification

5V +/- 5% at 50 mA maximum..
12V +/- 5% at 500 mA minimum, Radio powered by PC/104 Bus.

Size

3.6 in. x 3.8 in x 0.6 in.
91.4 mm X 96.5 mm x 15.2 mm

INSTALLATION

Before installing the PCFW-104-PD Radio Modem, 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.

Two excellent libraries are from GreenLeaf Software at <http://www.Qleaf.com/main.asp> and Comm-Drv Libraries from Willies Computer Software at <http://www.wcscnet.com/>
Both of these products support a vast array of high and low level RS-232 communications functions.

The default address is 0x3F8 & 0x2F8 which are COM1 & COM 2 respectively. To 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 or low.

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.

Baud Clock Selection, JP9:

The PCFW-104-PD supports user selectable maximum baud rates. JP9 is used to select either 2X or 1X Baud Clock. 2X yields a maximum baud rate of 230,400 baud. 1X yields a maximum of 115,200 Baud. 230,400 is used primarily on the ARDS Lite system. **Note: To use 230,400 the radio must have MCU speed set to high. Please refer to the FreeWave User Manual.**

Radio Power:

The radio is powered directly by +12 VDC from the PC/104 Bus. Please insure your power supply can supply 1 AMP. No provisions for external radio power are available on this module.

Radio Setup Menu:

There are three ways to invoke the setup menu on the radio. In all cases you will need a PC terminal program such as ProComm or HyperTerminal. Access to the setup menu can be had through the primary data port, the secondary diagnostic port or the Diagnostic Connector, J4.

- **Primary Data Port Access:**

1. In order to access the FreeWave Radio setup menu it is necessary to drive the setup line on the radio low. The PCFW-104-PD incorporates a setup switch, SW1. Pressing this switch while in a terminal program such as Hyper Terminal will invoke the user setup menu and allow the radio to be configured for the users network. Access to the primary data port is via the host PC/104 CPU. This requires that a video card and terminal program be installed on the host CPU.
2. With the PC/104 unit installed and configured launch your terminal application and point it to the Com port you selected for the PC/104 Primary data port. You must select 19200 Baud for a Baud Doubler setting of 1X or 9600 for a setting of 2X (Yes, 9600). This typically would be COM1.
3. Press the setup switch and the menu should appear on the screen. Garbled data indicates improper baud rate selection. No data indicates you have a installation error. Double check your jumper settings and try again.

- **Secondary Diagnostic Port access, JP10:**

1. JP10 must be set to INT. Alternately, setup can be invoked via PORT 2 by sending either a SHIFT <U> (uppercase U) or pressing the setup switch. MicroBee Systems recommends that you access setup via this port. In fact, you can disable the main port setup menu thus allowing exclusive access to the setup via this port. This is detailed in the FreeWave User Manual.
2. With the PC/104 unit installed and configured launch your terminal application and point it to the Com port you selected for the PC/104 Secondary Diagnostic Port. You must select 19200 Baud for a Baud Doubler setting of 1X or 9600 for a setting of 2X (Yes, 9600). This typically would be COM 2.

- **Diagnostic Connector Setup, JP10 & J4:**

1. J4 is the preferred method for headless systems with no video. **This method requires a ASC0409DC Diagnostic Cable available from MicroBee Systems.** Move both JP10 jumpers to the EXT position. This routes the radio diagnostic port from the secondary UART channel to the connector J4. Insert the diagnostic cable into J4 and attach the DB-9 to a PC or Laptop. Invoke HyperTerminal and select 19200 Baud.
2. Press SHIFT <U> (Uppercase U) and the menu shall appear. Radio setup can thus be easily performed in the field with a laptop and cable with no provisions needed for a video display on the PC/104 system. As long as JP10 is in the EXT position no access to the Diagnostic port is available via the secondary UART channel. **Note: The Special TDMA Push to Talk Mode (PTT) does not respond to SHIFT <U> for setup. It is only in the mode that this limitation exists. In this case you must press the setup button.**

1PPS Input, JP5,JP6, JP7, JP 8 and J5:

A RS-232 Level 1 PPS GPS input is provided for radio synchronization. While the PCFW-104-PD is fully capable of supporting all common modes of radio operation such as Point to Point, Point to Multi-Point and Standard TDMA this module was primarily designed for use in either Masterless TDMA or Push to Talk mode (PTT). PTT mode is used only for the ARDS Lite participant nodes and is unique to that system. Masterless TDMA is used typically in applications where nodes can enter and leave the network. In a standard TDMA network if the master left the network, the network would die. Thus in masterless mode the network sync'd by GPS and no master radio is required.

J5 has 5 positions and they are defined as follows:

- **PPS IN** = RS-232 level tolerant input for the 1 PPS signal. Maximum input is +/- 12 VDC and this input can be used with both RS-232 or TTL Level 1PPS inputs.
- **PPS 232** is a RS-232 Level buffered output that mirrors the 1 PPS input. It is primarily used for daisy chaining the 1PPS level input to other devices.
- **PPS TTL** is identical to the PPS 232 output except the level is TTL only.
- **CTS** is a monitor output for the Primary Data Port CTS line. It is RS-232 Level.
- **GND** is the signal ground for the 1PPS I/O.

The 1PPS I/O is controlled via jumpers JP5 to JP8 and are defined as follows:

JP5 routes the FreeWave radio DTR line, and thus the 1PPS pulse to the radios, from either the external input, J5, or the Primary Data Port UART. In the INT position the DTR line is controlled by software manipulation of the UART control registers. In the EXT position the DTR is routed to the PPS IN. This is required for TDMA Masterless and PTT modes.

Note: INT position is closest to the radio.

JP6, JP7, & JP8 are inversion jumpers for PPS IN, PPS 232 out and PPS TTL out. **Note: INV is jumpers closest to the radios and norm is closest to the edge of the board.** *MicroBee Systems is aware the silkscreen was truncated at the boards edge and this will be addresses in future revisions.*

JP6 Inverts or Un-Inverts the 1PPS input. Typically this would be un-inverted for a RS-232 level 1PPS input and inverted for a TTL level input. This is because with a RS-232 input a positive voltage is a logical 0 and a negative or 0 voltage is a logical 1. Thus a TTL signal, by default, will be inverted by the PPS IN and thus the INV position should be selected for TTL.

JP7 Inverts or un-inverts the PPS 232 output independent of the PPS IN.

JP8 Inverts or un-inverts the PPS TTL output independent of the PPS IN.

Note: There is a anomaly in the TTL output invert. By selecting this it also inverts the signal to the radio and might prevent proper operation. This will be addressed in a future revision. It is recommended that the TTL invert be avoided unless operation is verified. This is typically OK as the TTL output was primarily intended for monitoring only.

Testing Installation

NOTE:

Refer to the FreeWave Radio Users manuals for proper radio operation and setup.

Once the unit is installed it is recommended that the unit be tested using a simple communications program such as Hyper Terminal under windows.

Open the communications program and select the proper COM port. Set the communications parameters to 19,200 Baud, 8 Bits, No Parity, 1 Stop Bits (19200,N,8,1) and press the setup button. The FreeWave Setup Menu should come up on the screen.

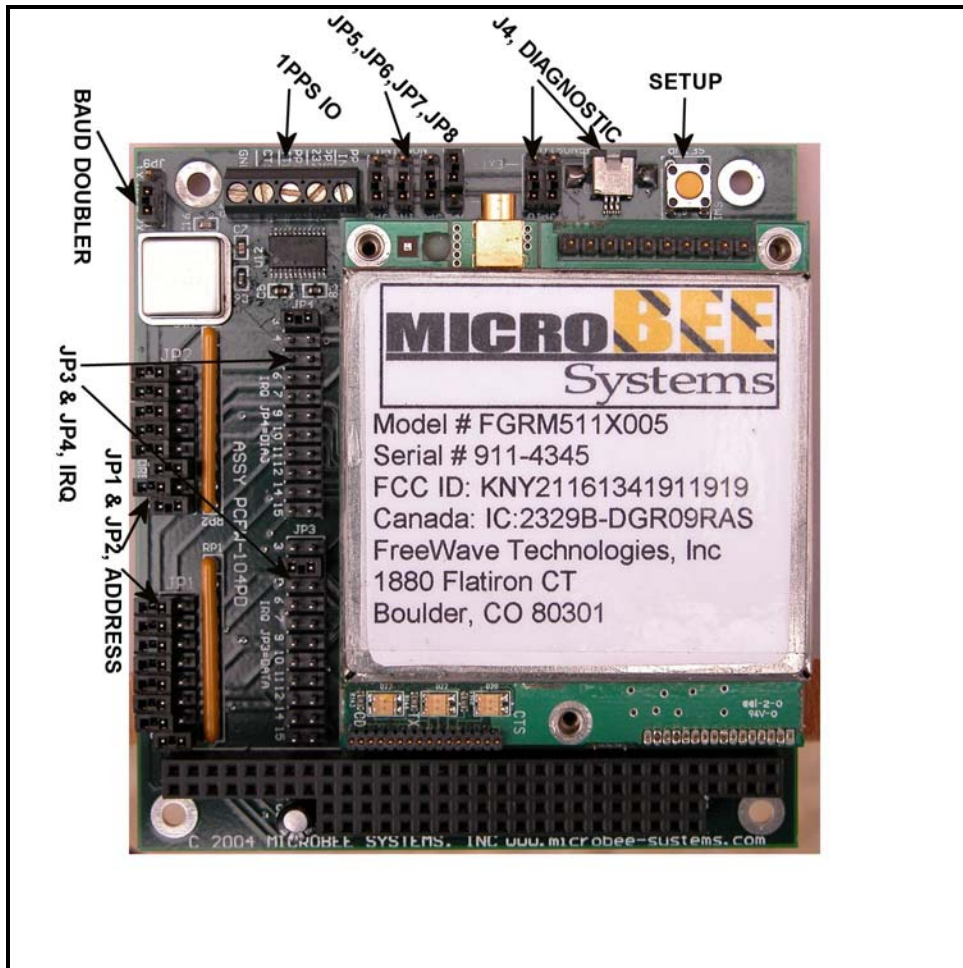


Figure 1, PCFW Jumper Layout

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.

LIMITATIONS ON WARRANTY

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than MicroBee personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by MicroBee.
2. Products which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.
3. The design, capability, capacity, or suitability for use of the Software. Software is licensed on an "AS IS" basis without warranty. The warranty and remedies set forth above are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which MicroBee specifically disclaims.
4. MicroBee neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. MicroBee shall have no liability for incidental or consequential damages of any kind arising out of the sale, delay in delivery, installation, or use of its products.

SERVICE POLICY

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:

PRODUCTS RETURNED TO MICROBEE FREIGHT COLLECT OR WITHOUT AN RMA NUMBER CANNOT BE ACCEPTED AND WILL BE RETURNED FREIGHT COLLECT.

RETURNS:

There will be a 15% restocking charge on returned product that is unopened and unused, if MicroBee accepts such a return. Returns will not be accepted 30 days after purchase. Opened and/ or used products, non-standard products, software and printed materials are not returnable without prior written agreement.

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