



# Computing Engines

## RPX Lite (RPXL\_CW) Getting Started

**Developing Embedded Applications & Products  
Utilizing Motorola PowerPC™ 8xx Processors**



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## RPX Lite

The RPX Lite (RPXL\_CW) is a highly integrated single-board computer (SBC) based on the Motorola MPC850 and MPC823. The RPX board reduces time to market and increases reliability for companies building complicated networking solutions. Scaleable in size and configuration, it provides a flexible, production-ready platform for tomorrow's networks.

Refer to the following user manuals (Table 1-2) for complete information about the RPX Lite board:

- RPX Lite, User Manual.
- RPX Lite, Programmer's Firmware Manual.
- RPX Lite, Expansion Card Design Guidelines.
- PlanetCore User Manuals.

## Board Control and Status Registers

Board control and status registers (BCSR) selectively enable or disable and setup the different interfaces available on the RPX board (i.e., CPU board). Refer to the *Programmer's Firmware Manual* for detailed information about these registers and about external interface setup.

## RPX Bus

The RPX Bus provides for I/O expansion. The physical RPX Bus consists of the bus expansion (P1) and I/O expansion (P2) connectors that link the CPU board and an I/O expansion board for communication. The bus combines patented I/O methodology and an innovative architecture to maximize the capabilities of the 8xx processor. It also helps reduce the cost of development by eliminating the need for an external bus.

The RPX Bus maps the special functions of the 8xx processors to the two standard 120-pin connectors. The 120-pin connectors provide direct access to the processor while allowing a modular and scalable product design. The P1 mapped functions include address, data, chip select, interrupt request, and VCC lines. The P2 mapped functions include the SCC, SMC, I2C, SPI, and other signals.

Information about the RPX Bus can be found in the *Expansion Card Design Guidelines* reference manual.

## PlanetCore

PlanetCore is a suite of three utilities:

- A target based application boot loader.
- A host based flash burner.
- Drivers and diagnostics for onboard functions and add-on I/O.

PlanetCore is included with each Embedded Planet software development platform and computing engine.

The RPX board is shipped with the boot loader program and the diagnostics and utilities program residing in FLASH memory. The boot loader utilities provide the ability to initialize the CPU board and auto execute an operating system on power-up. The diagnostics can be loaded to test the CPU board and I/O expansion board. Refer to the *PlanetCore User Manuals* for complete information about these utilities.

## Features and Benefits

- Production ready — design, develop, and deploy using the same computing device.
- Integrated hardware and firmware allows out-of-the-box application development.
- PlanetCore software provides compatibility with leading real-time operating systems (RTOS).
- RPX Lite accommodates the MPC823 and MPC850x processors.
- PC104 mechanical form factor.
- Standard configuration is 16 Mbytes FLASH with MPC823 processor or 4 Mbytes FLASH with MPC850x processor, and 16 Mbytes DRAM.
- 3 VDC, 1 Watt power consumption.
- Includes Ethernet debug cable accessories and Universal (5 VDC) power supply.
- Level one support through PlanetTrack (web-based customer service) is available for registered users.

## Peripheral Interfaces

- Dynamic Bus interface allows all features on the PowerPC Bus and CPM Bus to be brought out to your product or I/O module.
- 10BaseT Ethernet.
- PCMCIA Type II slot.
- RS-232 serial monitor.
- Communications interfaces: SCCs w/HDLC, SMCs, TSA, SPI, I2C.
- Debug and TAP port 1149.1.
- IrDA version 1.1 MAC up to 4 Mbps.

## Documentation and Resource CD Contents

The RPX Lite Documentation and Resource CD that comes with your computing engine contains the directories listed in Table 1-1.



Table 1-1. Documentation and Resource CD Contents

Directory			Description
root	acoread	win	Acrobat® Reader® 4.0 for Microsoft® Windows®
		linux	Acrobat Reader 4.0 for Linux
	docs		Reference documentation
	files	pcore	Backup PlanetCore image files
	index		Acrobat Search index
	manuals		RPX Lite user manuals PlanetCore user manuals
	specs		RPX Lite data sheet

## First Steps

While it may be tempting to jump right into application development, it is recommended that you take a few minutes to review the Getting Started material, paying special attention to the following recommended first steps.

1. Verify the contents of the shipping package (refer to [Chapter 2](#)).
2. Register your RPX board (refer to [Chapter 3](#)).
3. Complete the steps in [Chapter 5](#) when ready to connect and powerup the RPX board for development.

**Reminder** You must register your RPX board to become eligible for customer assistance or more detailed technical support from Embedded Planet. Refer to [Customer Sales and Support](#) in this chapter.

## About Embedded Planet

Embedded Planet offers software development platforms and embedded hardware systems solutions based on the Motorola embedded PowerPC family of processors. Embedded Planet can help manage embedded projects through the entire product or application life cycle from concept to production. We design and deliver a comprehensive array of embedded products and services including computing engines, I/O cards, and software.

Through our commitment to superior technology, highest quality software and hardware, and a dynamic and evolving partner program, Embedded Planet is dedicated to making embedded development easier, faster, and more economical than ever before.

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### Buy or Build? Embedded Planet simplifies the decision

If speed-to-market is crucial for the success of your product or application, Embedded Planet can assist with creative options for production run quantity orders, and licensing arrangements for Embedded Planet technology.

The RPX board is a highly reliable, application-proven computing engine, based on the Motorola PowerPC processor family. Once design and prototype work is complete for your application, you are able to move to production using the same computing engine.

Reviewing your application specifications, production run, and other variables, analysts at Embedded Planet are able to assist in your “build or buy” decision making.

## Production Planning

When planning for production quantity orders, Embedded Planet offers estimated annual use planning and production assistance. Call our sales offices for more information.

For production quantities over 50,000 annually, Embedded Planet offers a licensing program that provides you the benefit of Time to Market with the advantages of outsourcing design.

## Customer Sales and Support

**NOTE:** Technical Support is provided with the purchase of a Board Development Kit or can be purchased separately. Contact Embedded Planet for details.

Technical support is through the PlanetTrack™ support system (refer to [Chapter 4](#)). You must first register your RPX board to access support through PlanetTrack (refer to [Chapter 3](#)).

Our sales and customer support staff can be reached between the hours of 8:30 A.M.-5:30 P.M. Eastern Standard Time at 877.468.6899. E-mail requests for information and literature should be sent via the web to [info@embeddedplanet.com](mailto:info@embeddedplanet.com).

## Contact Embedded Planet

We encourage you to use our web-enabled PlanetTrack system (explained in detail in [PlanetTrack](#) in Chapter 4). However, if you have difficulty as you unpack your RPX board, or during hardware setup, use the contact information provided:

Embedded Planet  
749 Miner Rd., Cleveland, OH 44143  
Phone: 440-646-0077  
Fax: 440-461-4329  
Toll-Free: 877-got-m8xx (877-468-6899)  
[www.embeddedplanet.com](http://www.embeddedplanet.com)

Company E-mail Directory  
Marketing: [marketing@embeddedplanet.com](mailto:marketing@embeddedplanet.com)  
Sales: [sales@embeddedplanet.com](mailto:sales@embeddedplanet.com)  
Information Request: [info@embeddedplanet.com](mailto:info@embeddedplanet.com)  
Webmaster: [webmaster@embeddedplanet.com](mailto:webmaster@embeddedplanet.com)

## Reference Documents

Table [1-2](#) lists additional Embedded Planet documents for the RPX Lite board.

Table 1-2. Reference Documents

Document Number	Description
700M0002R__	PlanetCore, Diagnostics and Utilities (Release 1)
700M0003R__	PlanetCore, Boot Loader
700M0004R__	PlanetCore, Flash Burner
700M0014R__	PlanetCore, Diagnostics and Utilities (Release 2)



# What's In the Box

## Chapter 2

The RPX Lite board ships with the contents listed in Table 2-1. Contact Embedded Planet immediately if there are questions or if items are missing.

Table 2-1. Kit Contents

Qty	Description	Part Number
1	RPX Lite (RPXL_CW) Computing Engine	RPXL_CW
1	RPX Lite (LITE_DW), Board Development Kit CD - or - RPX Lite (LITE_DW), Single Board CD	700C0017R__ 700C0018R__
1	5 VDC power supply (domestic U.S.) - or - 5 VDC power supply (international)	DPS050240U-P6 DPS050280U-P6
1	Cable kit 1: RJ-45 serial cable with DB9 adapter Ethernet cross-over cable Ethernet loopback connector Reset cable	801K0001R00

The Documentation and Resource CD includes:

- RPX Lite (RPXL\_CW) manuals.
- PlanetCore manuals.
- Backup of the PlanetCore programs.
- Reference documentation.



**NOTE:** Technical Support is provided with the purchase of a Board Development Kit or can be purchased separately. Contact Embedded Planet for details.

Completing your registration today ensures that you will be able to take advantage of the full complement of support and customer assistance that is included with the purchase of your RPX Lite Computing Engine.

*Don't Delay!* Register your RPX board now using one of the following options:

**Online Web**

1. Go to [www.embeddedplanet.com/planettrack/register.htm](http://www.embeddedplanet.com/planettrack/register.htm).
2. Fill in all required fields and submit.

**E-Mail**

1. Assemble the required registration information using the following table as guidelines:

Information About Your Board	
Board part number	
Board serial number	
Information About Board Primary User	
Name	
Title	
Company	
Division	
Address 1	
Address 2	
City	
State	
Country	
Postal Code	
Phone	
E-mail	
Select a user name (up to 8 characters)	

**NOTE:** All fields are required.

2. Submit the information to [register@embeddedplanet.com](mailto:register@embeddedplanet.com).

**Telephone**

1. Assemble the same information as described previously for e-mail registration.

2. Phone Embedded Planet at 877.468.6899 (Monday through Friday, 9:00 AM – 5:00 PM Eastern Standard Time).

**Important**

The product registration process is the first step in our commitment to total customer satisfaction. Successful completion of your registration allows you to access our web-based PlanetTrack technical and customer support (refer to [PlanetTrack](#) in Chapter 4), and e-mail and phone assistance.

Registration is not complete unless you receive e-mail from Embedded Planet confirming the details of your registration. Your confirmation e-mail will include a user name for subsequent access to customer support.

If you have any difficulty with your registration or do not receive your confirmation within 24 hours of registration submission, contact Embedded Planet (refer to [Contact Embedded Planet](#) in Chapter 1).



**NOTE:** Technical Support is provided with the purchase of a Board Development Kit or can be purchased separately. Contact Embedded Planet for details.

With the successful completion of your RPX board registration (as described in [Chapter 3](#)), you are eligible for a variety of customer and technical support services.

The Embedded Planet technical support team provides service for all first level support inquiries. These include in-the-box issues and hardware setup related questions. Technical support for your RPX board is provided through the web-based PlanetTrack system. Log into PlanetTrack to submit a support issue or question.

## PlanetTrack

### Logging In

1. Go to <http://planettrack.embeddedplanet.com>.
2. Click on the illustration of the board.
3. Read the instructions and click *Log into PlanetTrack*.
4. On the log in menu (Fig. 4-1), type in your user name and password.

**NOTE:** User names and passwords are confirmed (i.e., sent to you by Embedded Planet) after successful completion of the registration process.

5. Click OK.

B00001A

Figure 4-1. PlanetTrack Log In

Once successfully logged in, you will be sent to your individual PlanetTrack user home page. Every Embedded Planet hardware customer has a page created based on their product purchases.

### Submitting an Issue

1. Click *Submit an Issue*.
2. Click on *Computing Engines*.
3. In the submit screen (Fig. 4-2), enter your information (fields highlighted in red are required).
4. When complete, click *Submit*. The issue is sent directly to Embedded Planet for follow-up.

B00002A

Figure 4-2. Submit an Issue

### Viewing an Issue

To check the status of issues that you submitted, log into your PlanetTrack page. The list of issues and the status of each will be displayed.

### Adding an Attachment

1. Click on the *Actions*: pull down menu in the top, center of the issue detail page.
2. Select *Add File*.
3. Fill in the required fields and submit.

### More Information

When you receive a request for more information:

1. Log into your PlanetTrack page.
2. Click on the specified issue.
3. To add more information, click on the *Actions*: pull down menu in the top, center of the issue detail page.

4. Select *Add Note*.
5. Enter the additional information and submit.

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### Getting Help

If you require further information about PlanetTrack, click on the ? button. Send additional questions to Embedded Planet via e-mail to the following address:

[customerservice@embeddedplanet.com](mailto:customerservice@embeddedplanet.com)



This chapter describes how to get the RPX board up and running including connection and powerup. An RS-232 serial monitor connection is required to access PlanetCore utilities. Refer to the *PlanetCore User Manuals* for further explanation. A network connection is required to transfer files using TFTP to the RPX board.

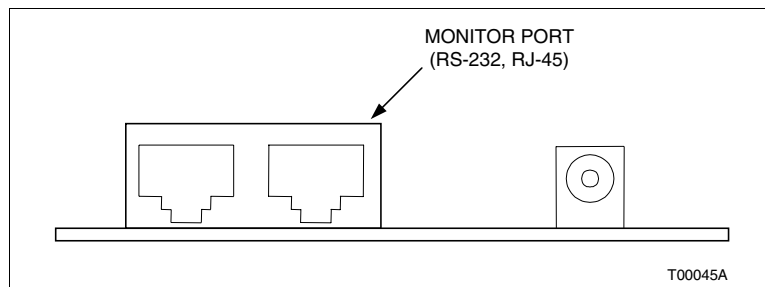
To start up and begin communicating with the RPX board:

1. Establish a serial connection (refer to [Serial Monitor Connection](#) in this chapter).
2. Establish a network connection if required (refer to [Network Connection](#) in this chapter).
3. Apply power (refer to [Power Up](#) in this section).

## Serial Monitor Connection

A terminal emulator program on the host machine (e.g., minicom or HyperTerminal) or a dumb terminal is required to interact with the RPX board. To establish a serial monitor connection with the host system:

1. Connect the RJ-45 patch cable into the RJ-45 monitor port (Fig. 5-1).
2. Connect the opposite end of the RJ-45 cable to the DB-9 converter.
3. Connect the DB-9 to a serial port on the host machine (or dumb terminal).



**Figure 5-1. Monitor Connection**

The default settings for the monitor port are:

- 9600 baud.
- 8 data bits.
- 1 stop bit.
- No parity.
- No flow control.

The PlanetCore utilities are accessed through the serial monitor port. Refer to the *PlanetCore User Manuals* for information about the boot loader program and the diagnostics and utilities program that come pre programmed into your RPX board.

## Network Connection

A network connection between the development target (i.e., RPX board) and host system is needed if planning to use TFTP services to transfer files to the RPX board. A TFTP server must be running on the host machine to use the network connection for file transfer. Connect to the RPX board in one of two ways: directly or through a network hub (Fig. 5-2).

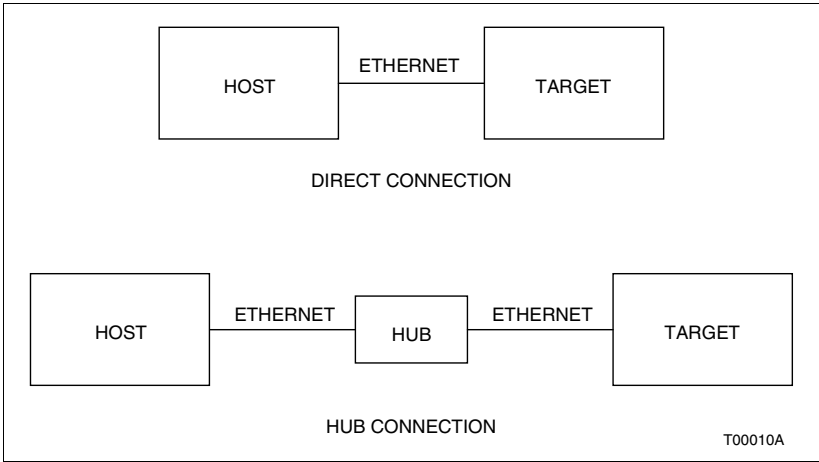


Figure 5-2. Network Connection Options

### Direct Connection

To directly connect to the host machine, use the Ethernet crossover cable connected between the RJ-45 Ethernet port on the RPX board (Fig. 5-3) and the Ethernet port on the host machine.

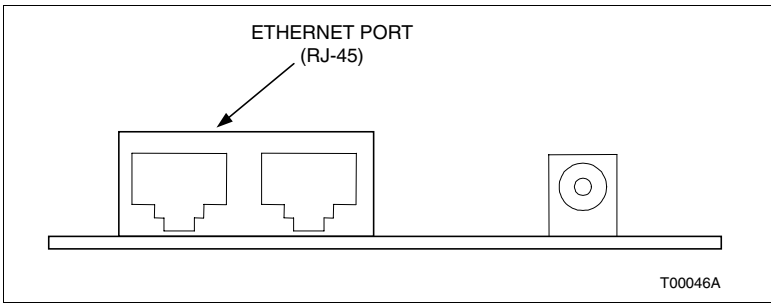


Figure 5-3. Ethernet Connection

### Hub Connection

To connect to the host machine via a hub, use a standard Ethernet patch cable connected between the RJ-45 Ethernet port on the RPX board (Fig. 5-3) and a free port on the hub.

# Power Up

**NOTE:** Start the terminal emulation program (e.g., minicom or HyperTerminal) or make sure the dumb terminal is connected before powering up the RPX board.

After all connections have been properly made, connect the 5 VDC power supply to the barrel connector (Fig. 5-4). The RPX board will boot up into PlanetCore automatically.

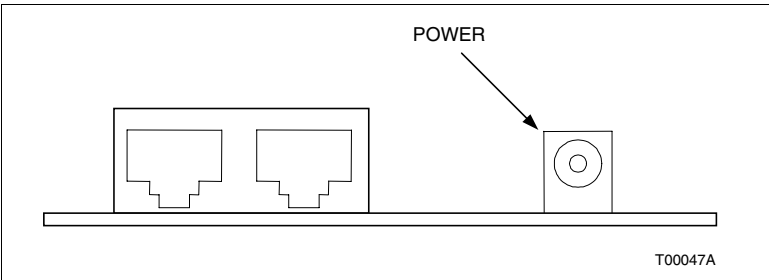


Figure 5-4. Power Connection









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