DeviceMate Development Kit

Integrated C Development System

Getting Started Manual

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DeviceMate Development Kit Getting Started Manual

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1. INTRODUCTION & OVERVIEW

The DeviceMate Development Kit provides a hardware platform based on the Rabbit 2000™ microprocessor and Dynamic C® to connect any programmable embedded device with a serial connection to the Internet/Ethernet. The intended user of the DeviceMate Development Kit should have a working knowledge of C and TCP/IP.

The DeviceMate Development Kit includes all the hardware and software needed to demonstrate the use of the DeviceMate with the two RabbitCore modules supplied, the RCM2200 (the hardware platform) and the RCM2300 (the target).

1.1 Definitions

The following terms are used throughout this manual.

DeviceMate refers to the Dynamic C software that enables any embedded device with a serial connection to be connected to the Internet/Ethernet.

The ***DeviceMate hardware platform***, also referred to as the DeviceMate Unit (DMU), is any Ethernet-enabled Z-World Rabbit-based single-board computer.

The ***DeviceMate target***, also referred to as the target device, is an embedded single-board computer that is connected to the DeviceMate hardware platform via a serial port.

1.2 DeviceMate Hardware

The DeviceMate hardware platform provided in the DeviceMate Development Kit is the RCM2200, an advanced module that incorporates 256K flash memory, 128K static RAM, digital I/O ports, and a 10Base-T Ethernet port. An RCM2300 module is included in the Development Kit to serve as a working sample target device.

Other Z-World Rabbit-based single-board computers with an Ethernet port can also be used as a DeviceMate hardware platform.

1.2.1 DeviceMate Capabilities

- Monitor inputs or variables remotely on the target device via a Web browser.
- Allows target device to send e-mail and serve Web pages via the DeviceMate hardware platform.
- Stores and retrieves files generated by target device.
- Download new programs via Internet/Ethernet to target device.
- Log information about events, data, or error conditions.
- Use as an external watchdog for the target device.

1.3 Development Software

The software includes library support to program the DeviceMate target and the DeviceMate hardware platform. The program that runs on the hardware platform is a canned program in source code form, and all you have to do is set some macros to enable the software features you will use, set the IP address, then compile and load the program on the hardware platform. Additional programming may be required for some subsystems or for custom user functionality. The target is then programmed separately to interact with the hardware platform via a serial port.

The subsystems are also provided in ANSI C using three nonRabbit architectures. Instructions for porting this code are provided in the ***DeviceMate Software User's Manual***. ANSI C sample programs, which can be ported to other processors, are included with the DeviceMate sample programs on the CD to illustrate how to use nonRabbit-based target devices with the RCM2200 hardware platform.

Dynamic C must be installed on a Windows workstation with at least one free serial (COM) port. See Chapter 3., "Software Installation & Overview." for complete information on installing Dynamic C.

> **NOTE:** Dynamic C v7.10 or later is required to develop applications for the DeviceMate hardware platform. The DeviceMate and other Dynamic C libraries are included on the Development Kit CD-ROM.

The DeviceMate hardware platform provides the following services.

- E-mail access
- File system facility
- Message logging (with multiple storage options)
- Remote monitoring of target I/O
- Remote program download (Rabbit-based targets only)
- External watchdog services for the target device
- TCP and UDP sockets
- Serve Web pages
- Update HTML pages with dynamic variables

1.4 How to Use This Manual

This *Getting Started* manual is intended to give users a quick but solid start with the RCM2200 as the DeviceMate hardware platform. The manual does not contain detailed information on the RCM2200 hardware capabilities, the Dynamic C development environment, or the TCP/IP software support for the integrated Ethernet port. More detailed information on some or all of these topics is available to allow you to make effective use of the DeviceMate hardware platform.

1.4.1 Additional Information

Detailed information about the RCM2200 and the RCM2300 will be found in the ***RabbitCore RCM2200 User's Manual*** and in the ***RabbitCore RCM2300 User's Manual***, which are provided on the accompanying CD-ROM in both HTML and Adobe PDF format.

> **TIP:** We recommend that anyone not thoroughly familiar with Z-World single-board computers at least read through the rest of this manual to gain the necessary familiarity to make use of the more advanced information.

In addition to the product-specific information contained in the hardware user's manuals, several higher-level reference manuals are provided in HTML and PDF form on the accompanying CD-ROM. Users will find these references valuable in developing specific applications for the DeviceMate.

- ***Dynamic C Premier User's Manual***
- ***DeviceMate Software User's Manual***
- ***An Introduction to TCP/IP***
- ***Dynamic C TCP/IP User's Manual***
- ***Rabbit 2000 Microprocessor User's Manual***

1.4.2 Online Documentation

The online documentation is installed along with Dynamic C, and an icon for the documentation menu is placed on the workstation's desktop. Double-click this icon to reach the menu. If the icon is missing, create a new desktop icon that points to **default.htm** in the **docs** folder, found in the Dynamic C installation folder.

The latest versions of all documents are always available for free, unregistered download from our Web site at www.zworld.com.

2. Hardware Setup

This chapter describes the DeviceMate hardware platform in more detail, and explains how to set up and use the accompanying Demonstration Board.

NOTE: This chapter (and this manual) assume that you have the DeviceMate Development Kit. If you purchased an RCM2200 hardware platform by itself, or if you plan to use a different hardware platform, you will have to adapt the information in this chapter and elsewhere to your test and development setup.

2.1 Development Kit Contents

Figure 1. DeviceMate Development Kit Contents

The DeviceMate Development Kit contains the following items.

- RCM2200 DeviceMate hardware platform with Ethernet port, 256K flash memory, and 128K SRAM.
- RCM2300 working sample target device.
- DeviceMate Demonstration Board, which conveniently provides power and connections for the RCM2200 and RCM2300 modules, and also includes an RS-232 chip to allow serial communication with nonRabbit-based target devices.
- Wall transformer power supply, 12 V DC, 500 mA. (Included only with Development Kits sold for the North American market. Overseas users will have to substitute a power supply compatible with local mains power.)
- 10-pin header to DE9 programming cable with integrated level-matching circuitry.
- Standard 10-pin header to DE9 cable.
- ***Dynamic C SE*** CD-ROM, with complete product documentation on disk.
- This ***Getting Started*** manual.
- ***DeviceMate Software User's Manual***
- ***Rabbit 2000 Processor Easy Reference*** poster.
- Registration card.

2.2 Overview of the Demonstration Board

The Demonstration Board included in the Development Kit makes it easy to connect the RCM2200 and RCM2300 modules to a power supply and a PC workstation for development and to run the sample programs. The Demonstration Board also provides some basic I/O peripherals (switches and LEDs), as well as a development area for more advanced hardware development.

For the most basic level of evaluation and development, the Demonstration Board can be used in conjunction with the RCM2200 and RCM2300 modules without modification.

As you progress to more sophisticated experimentation and hardware development, modifications and additions can be made to the Demonstration Board.

The Demonstration Board is shown below in Figure 2, with its main features identified.

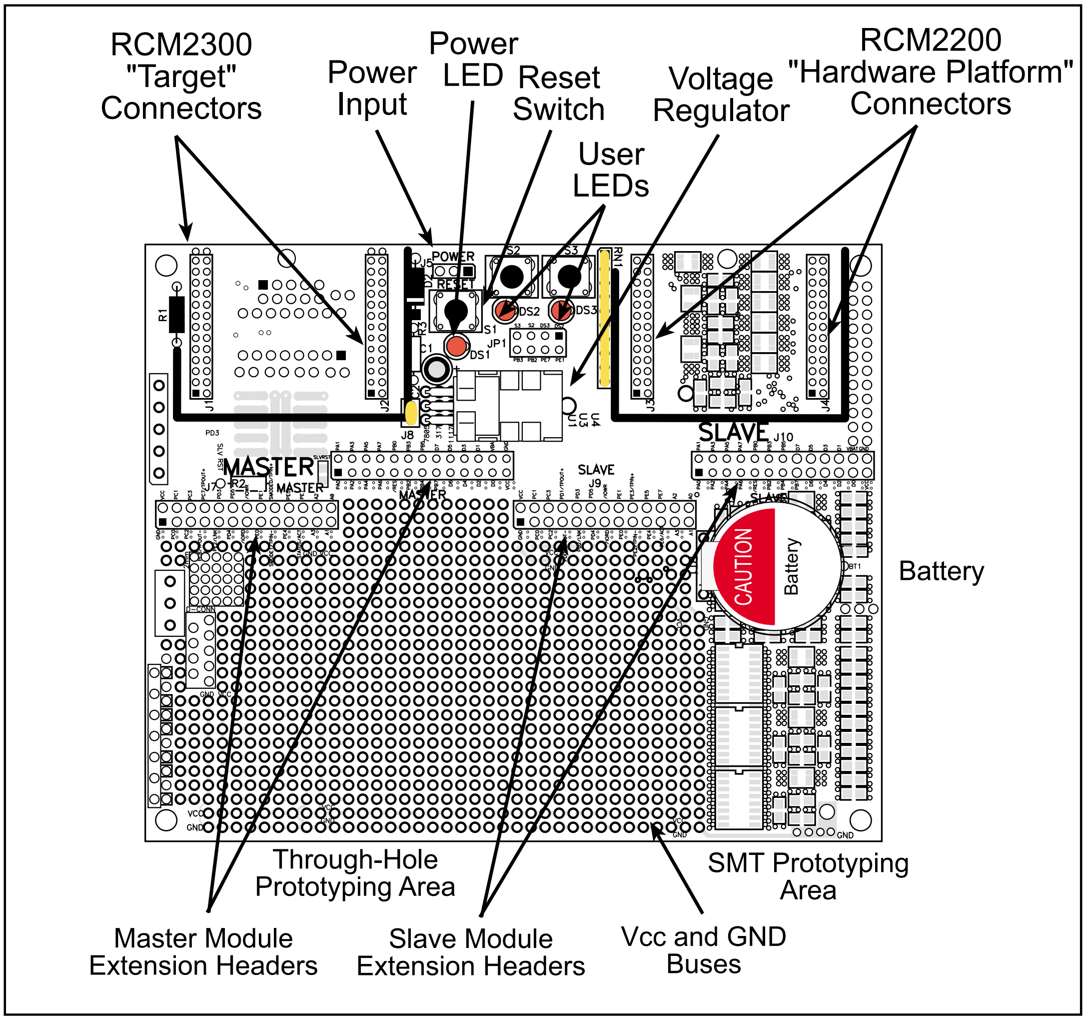


Figure 2. RCM2200 Demonstration Board

2.2.1 Demonstration Board Features

Master and Slave Module Connectors. A set of connectors is pre-wired to allow a sample DeviceMate hardware platform (the RCM2200) to be installed in the **SLAVE** slot to communicate with a target (the RCM2300) installed in the **MASTER** slot.

All the Demonstration Board features (switches, LEDs, serial port drivers, etc.) are connected to the **MASTER** slot.

Power Connection. A 3-pin header is provided for connection to the power supply. Note that it is symmetrical, with both outer pins connected to ground and the center pin connected to the raw V+ input. The cable of the wall transformer provided with the North American version of the Development Kit ends in a connector that is correctly connected in either orientation.

Users providing their own power supply should ensure that it delivers 8–12 V DC at not less than 500 mA. The voltage regulator will get hot while in use.

RS-232 Port. Two 2-wire serial ports or one 4-wire RS-232 serial port are available to the **MASTER** slot on the Demonstration Board. These are provided to facilitate using the DeviceMate hardware platform with a nonRabbit-based target where the DeviceMate hardware platform is installed in the **MASTER** slot. See Appendix B., “nonRabbit-Based Target Connections,” for more details.

A 10-pin 0.1-inch spacing header strip is installed at J6 to permit connection of a ribbon cable leading to a standard DE-9 serial connector.

Regulated Power Supply. The raw DC voltage provided at the POWER IN jack is routed to a 5 V linear voltage regulator, which provides stable power to the RCM2200 and RCM2300 modules, and to the Demonstration Board. A Shottky diode protects the power supply against damage from reversed raw power connections.

Power LED. The power LED lights whenever power is connected to the Demonstration Board.

Reset Switch. A momentary-contact, normally open switch is connected directly to the **/RES** pin of the board in the **MASTER** slot (the RCM2300 target). Pressing the switch forces a hardware reset of the RCM2300.

I/O Switches & LEDs. Two momentary-contact, normally open switches are connected to the PB2 and PB3 pins of the target RCM2300, and may be read as inputs by sample applications.

Two LEDs are connected to the PE1 and PE7 pins of the **MASTER** slot, and may be driven as output indicators by sample applications.

The LEDs and switches are connected through JP1, which has traces shorting adjacent pads together. These traces may be cut to disconnect the LEDs, and an 8-pin header soldered into JP1 to permit their selective reconnection with jumpers. See Figure 3 for details.

Expansion Areas. The Demonstration Board is provided with several unpopulated areas for expansion of I/O and interfacing capabilities. See the next section for details.

Prototyping Area. A generous prototyping area has been provided for the installation of through-hole components. Vcc (5 V DC) and Ground buses run around the edge of this area. An area for surface-mount devices is provided to the right of the through-hole area. (Note that there are SMT device pads on both top and bottom of the Demonstration Board.) Each SMT pad is connected to a hole designed to accept a 30 AWG solid wire.

2.2.2 Demonstration Board Expansion

The Demonstration Board comes with several unpopulated areas, which may be filled with components to suit the user’s development needs. After you have experimented with the sample programs in Section 3.4, you may wish to expand the board’s capabilities for further experimentation and development with your target. Refer to the Demonstration Board schematic (090–0122) for details as necessary.

Module Extension Headers. The complete pin sets of both the **MASTER** and **SLAVE** slots are duplicated at these two sets of headers. Developers can solder wires directly into the appropriate holes, or, for more flexible development, 26-pin header strips can be soldered into place. See Figure A-6 for the header pinouts.

Demonstration Board Component Header. Four I/O pins from the module are hardwired to the Demonstration Board LEDs and switches.

To disconnect these devices and permit the pins to be used for other purposes, cut the traces between the pin rows of JP1. Use a knife or similar tool to cut or break the traces crossing JP1 in the area between the silk-screened arrows, as indicated in Figure 3 below.

Use jumpers across the positions on JP1 if you need to reconnect any of the devices later on.

The headers and jumpers are included in a bag of parts that comes with the Development Kit.

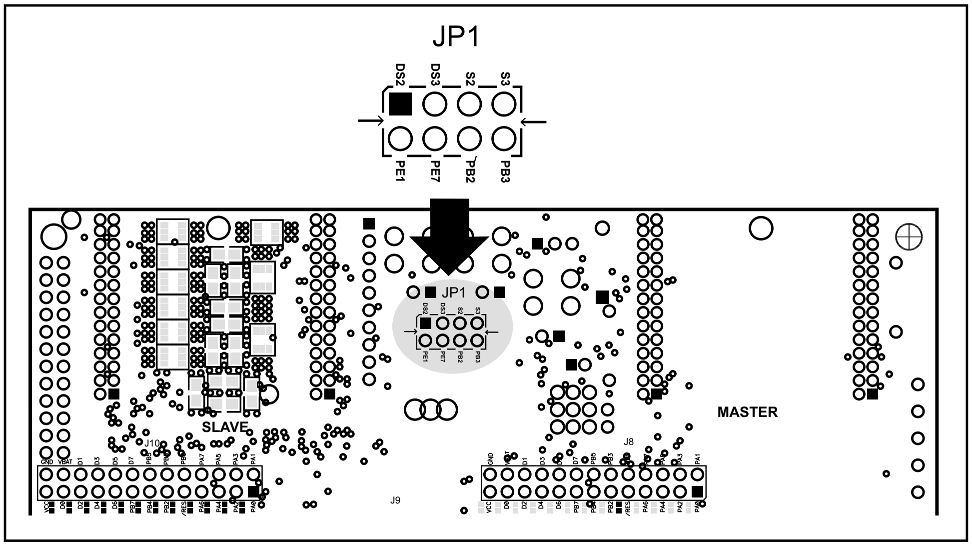


Figure 3. Where to Cut Traces to Permanently Disable Demonstration Hardware on Bottom of Demonstration Board

2.3 Development Hardware Connections

There are five steps to connecting the Demonstration Board for use with Dynamic C and the sample programs:

1. Attach the DeviceMate hardware platform (the RCM2200 module) to the **SLAVE** position on the Demonstration Board.
2. Attach the DeviceMate target (the RCM2300 module) to the **MASTER** position on the Demonstration Board.
3. Connect the programming cable between the hardware platform (the RCM2200) and the workstation PC.
4. Connect the hardware platform’s Ethernet port to a PC’s Ethernet port, or to an Ethernet network. The Ethernet/Internet connections are described in Section 4.1.1, “Ethernet Connections.” Step 4 may be done after the steps described in this chapter have been completed, and a sample program has been run to demonstrate that the hardware platform is hooked up and working correctly.
5. Connect the power supply to the Demonstration Board.

2.3.1 Attach Modules to Demonstration Board

1. Turn the RCM2200 module so that the Ethernet connector end of the module extends off the Demonstration Board, as shown in Figure 4 below. Align the module headers J4 and J5 into sockets J3 and J4 (the **SLAVE** slots) on the Demonstration Board. Press the module's pins firmly into the Demonstration Board headers.
2. Turn the RCM2300 module so that the header pins and the mounting hole of the RCM2300 line up with the sockets and mounting hole on the Demonstration Board as shown in Figure 4. Align the module headers J4 and J5 into sockets J1 and J2 (the **MASTER** slots) on the Demonstration Board. Press the module's pins firmly into the Demonstration Board headers.

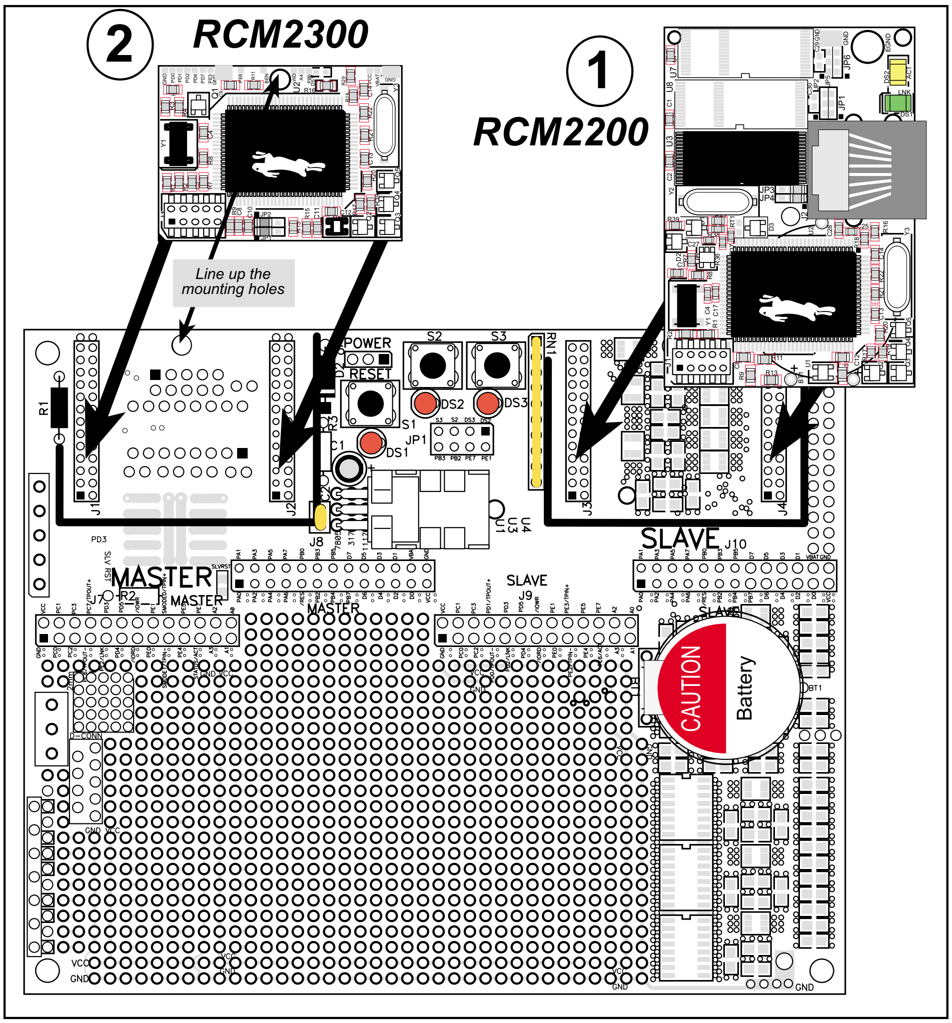


Figure 4. Install the Modules on the Demonstration Board

NOTE: It is important that you line up the pins of the module headers exactly with the corresponding pins on the Demonstration Board. The header pins may become bent or damaged if the pin alignment is offset, and the module will not work. Permanent electrical damage to the module may also result if a misaligned module is powered up.

2.3.2 Connect Programming Cable

The programming cable connects the RCM2200 module to the PC running Dynamic C to allow you to download and modify a canned program for the DeviceMate hardware platform.

Connect the 10-pin connector of the programming cable labeled **PROG** to header J1 on the RCM2200 module as shown in Figure 5 below. Be sure to orient the marked (usually red) edge of the cable towards pin 1 of the connector. (Do not use the **DIAG** connector, which is used for a normal serial connection.)

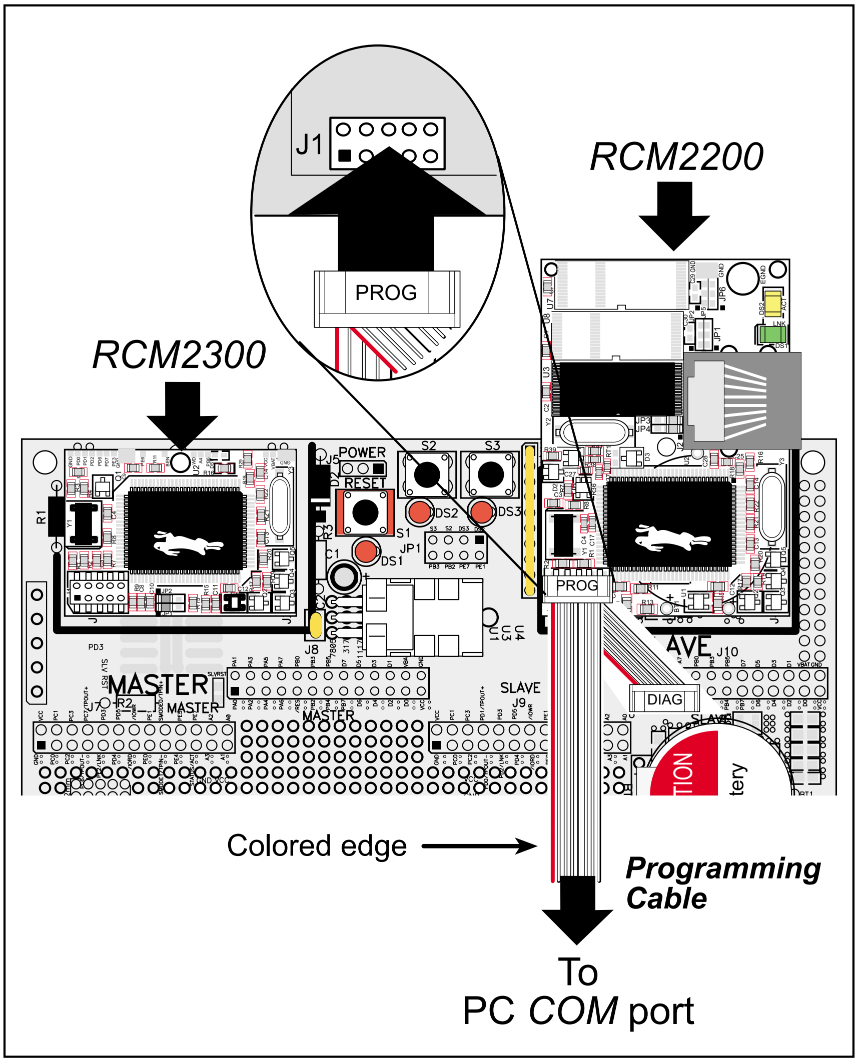


Figure 5. Attaching Programming Cable to the RCM2200

Connect the other end of the programming cable to a COM port on your PC. Make a note of the port to which you connect the cable, as Dynamic C needs to have this parameter configured when it is installed.

> **NOTE:** COM 1 is the default port used by Dynamic C.

2.3.3 Connect Power

When all other connections have been made, you can connect power to the Demonstration Board.

Hook the connector from the AC adapter to header J5 on the Demonstration Board as shown in Figure 6 below. The connector may be attached either way as long as it is not offset to one side.

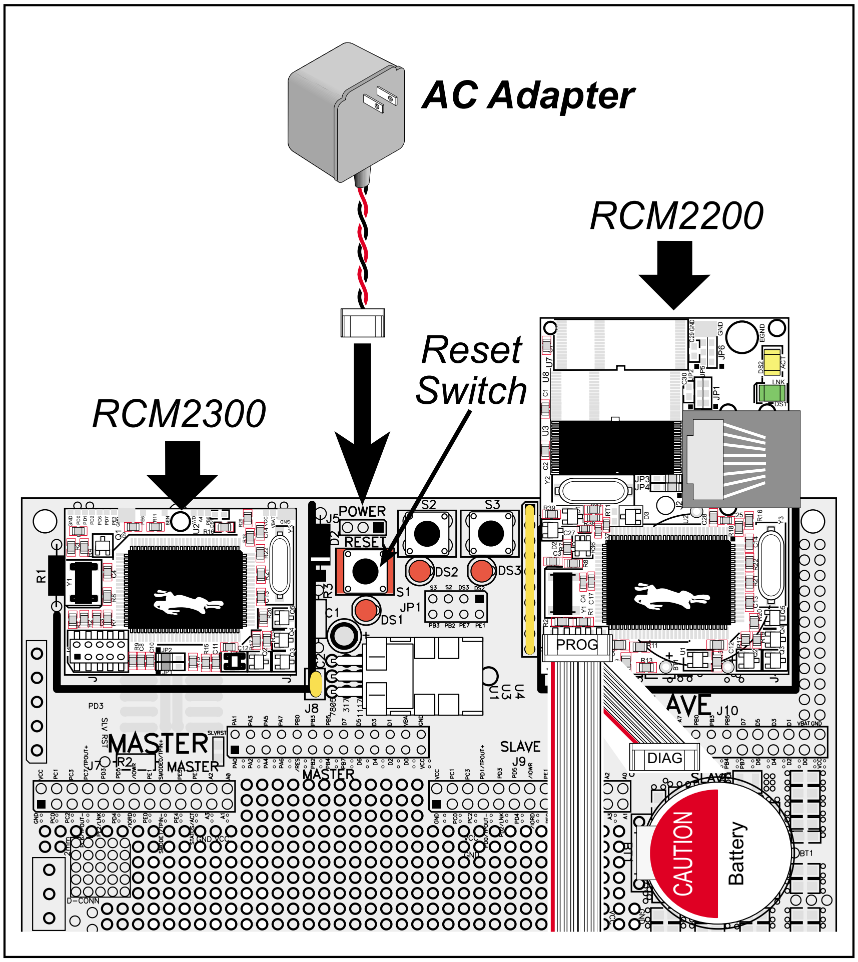


Figure 6. Power Supply Connections to Demonstration Board

Plug in the AC adapter. The power LED on the Demonstration Board should light up. The RCM2200 hardware platform and the RCM2300 target are now ready to be used.

> **NOTE:** Unplug the AC adapter, then plug it back in to reset the RCM2200 hardware platform in the **SLAVE** slot. A **RESET** button is provided on the Demonstration Board to reset the RCM2300 in the **MASTER** slot without disconnecting power.

To power down the Demonstration Board, unplug the power connector from J5. You should disconnect power before making any circuit adjustments in the Demonstration area, changing any connections to the board, or removing the modules from the board.

2.4 Where Do I Go From Here?

We recommend that you proceed to the next chapter and install Dynamic C (if you do not already have it installed), then run the first sample program to verify that the RCM2200 and the RCM2300 modules and the Demonstration Board are set up and functioning correctly.

If everything appears to be working, we recommend the following sequence of action:

1. Run all of the sample programs described in Section 3.4 to get a basic familiarity with Dynamic C and the RCM2200 module's capabilities.
2. Run the sample programs in Chapter 4 to become familiar with how the RCM2200 uses TCP/IP and its operation as a DeviceMate.
3. For further hardware development, refer to the ***RabbitCore RCM2200 User's Manual*** and the ***RabbitCore RCM2300 User's Manual*** for details of the modules' hardware and software components.

   A documentation icon should have been installed on your workstation's desktop; click on it to reach the documentation menu. You can create a new desktop icon that points to **default.htm** in the **docs** folder in the Dynamic C installation folder.
4. For advanced development topics, refer to the ***Dynamic C User's Manual***, the ***DeviceMate Software User's Manual***, and the ***Dynamic C TCP/IP User's Manual***, also in the online documentation set.

2.4.1 Technical Support

If there are any problems at this point:

- Check the Z-World Technical Bulletin Board at http://www.zworld.com/support/bb/index.html.
- E-mail your questions to support@zworld.com.
- Call Z-World Technical Support at (530)757-3737.

3. Software Installation & Overview

To develop and debug DeviceMate programs (and for all Z-World and Rabbit Semiconductor hardware), you must install and use Dynamic C. This chapter takes you through the installation of Dynamic C, and then provides a tour of its major features with respect to the RCM2200 and the RCM2300 modules.

3.1 System Requirements

To install and run Dynamic C, your system must be running one of the following operating systems:

- Windows 95
- Windows 98
- Windows NT
- Windows Me
- Windows 2000
- Windows XP

3.1.1 Hardware Requirements

The PC on which you install Dynamic C should have the following hardware:

- A Pentium or later microprocessor
- At least 125 MB of free hard drive space
- At least one free RS-232 COM port for communication with the target systems
- A 10Base-T Ethernet network interface port
  (optional if you will not be connecting directly to the RCM2200's Ethernet port)
- A CD-ROM drive (for software installation)

3.2 Installing Dynamic C

Insert the installation disk or CD in the appropriate disk drive on your PC. The installation should begin automatically. If it doesn’t, issue the Windows “Run...” command and type the following command.

```
‹disk›:\SETUP
```

The installation program will begin and will guide you through the installation process.

3.3 Starting Dynamic C

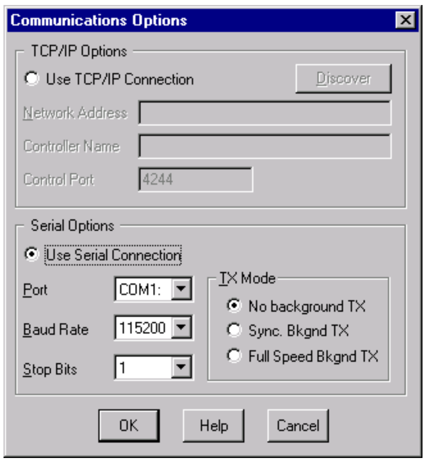
Once the RCM2200 and the RCM2300 modules are set up and connected as described in Chapter 2 and Dynamic C has been installed, start Dynamic C by double-clicking on the Dynamic C icon. Dynamic C should start, then look for the target system on the COM port you specified during installation (by default, COM1). Once detected, Dynamic C should go through a sequence of steps to cold-boot the module and compile the BIOS.

If you receive the message beginning **`"BIOS successfully compiled and loaded…"`** you are ready to continue with the sample programs.

3.3.1 Communication Error Messages

If you receive the message **`"No Rabbit Processor Detected,"`** the programming cable may be connected to a different COM port, a connection may be faulty, or the target system may not be powered up. First, check to see that the power LED on the Demonstration Board is lit. If the power LED is lit, check both ends of the programming cable to ensure that it is firmly plugged into the PC and the RCM2200’s programming port. Ensure that both modules are firmly and correctly installed on the Demonstration Board.

If there are no faults with the hardware, select a different COM port within Dynamic C. From the **Options** menu, select **Communications**. The dialog shown should appear.



Select another COM port from the list, then click **OK**. Press **<Ctrl-Y>** to force Dynamic C to recompile the BIOS. If Dynamic C still reports it is unable to locate the target system, repeat the above steps until you locate the active COM port.

If Dynamic C appears to compile the BIOS successfully, but you then receive a communication error message, it is possible that your PC cannot handle the 115,200 bps baud rate. Try changing the baud rate to 57,600 bps as follows.

- Locate the **Serial Options** dialog in the Dynamic C **Options > Communications** menu. Change the baud rate to 57,600 bps.

3.4 Sample Programs

You are now ready to test your set-up by running some sample programs. Loading, executing and studying these programs will give you a solid hands-on overview of the modules' capabilities, as well as a quick start with Dynamic C as an application development tool.

> **NOTE:** The sample programs assume that you have at least an elementary grasp of ANSI C and TCP/IP. If you do not, see the ***Dynamic C Premier User's Manual***, ***An Introduction to TCP/IP***, and the ***Dynamic C TCP/IP User's Manual***.

3.4.1 RCM2200 Hardware Platform

Find the sample program **`PONG.C`**, which is in the Dynamic C **`SAMPLES`** folder. To run the program, open it with the **File** menu (if it is not still open), compile it using **F5** or the **Compile** menu, and then run it by pressing **F9** or by selecting **Run** in the **Run** menu. The **STDIO** window will open and will display a small square bouncing around in a box.

3.4.2 RCM2300 Target Device

Before running any sample programs on the RCM2300, you will have to move the **PROG** connector on the programming cable from header J1 on the RCM 2200 to header J1 on the RCM2300 (see Figure 7). Remember to press **F4** before removing the programming cable to avoid getting a target communication error message.

> **TIP:** If you plan to do extensive programming and wish to access both the DeviceMate hardware platform and the target device, consider getting a second programming cable. Plug this second programming cable into another available RS-232 COM port on your PC, and start a second session of Dynamic C.

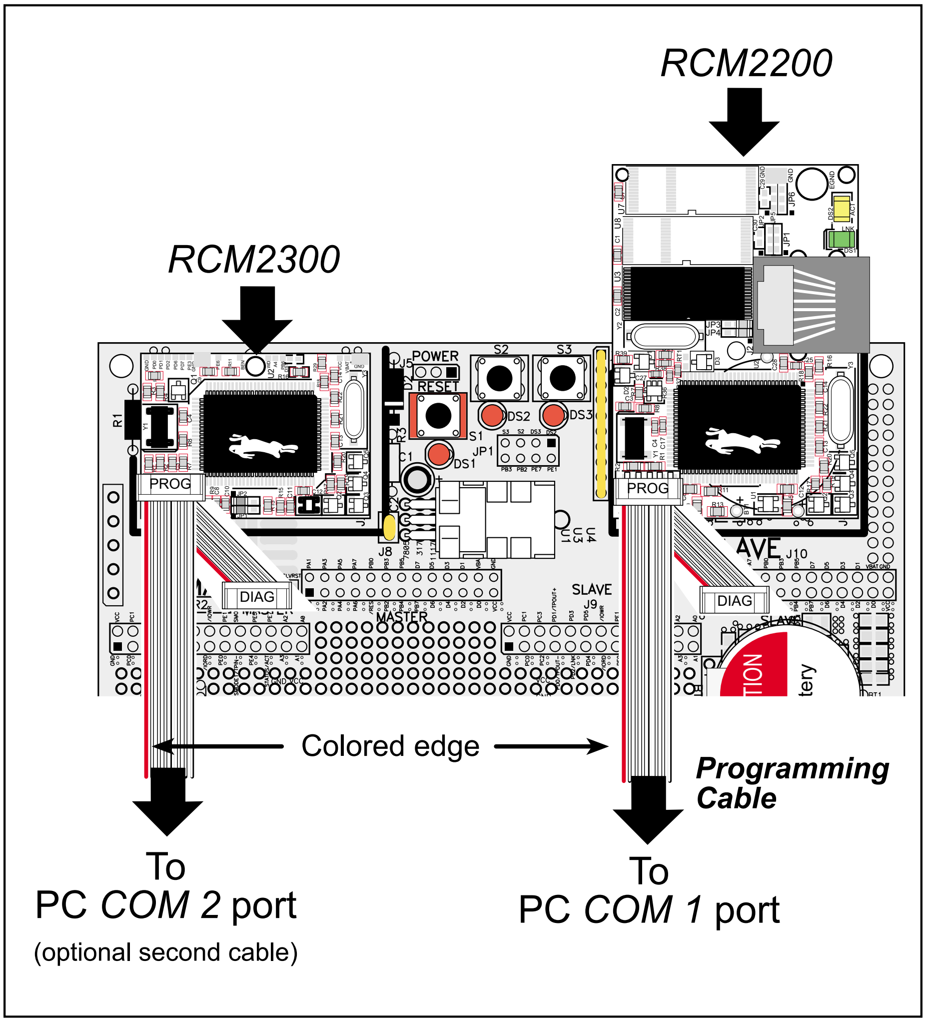


Figure 7. Programming Cable Connections to RCM2200 and RCM2300 (optional second programming cable serial COM 2 connection shown)

Find the sample program **PONG.C**, which you just ran on the RCM2200. To run the program, open it with the **File** menu (if it is not still open), compile it using **F5** or the **Compile** menu, and then run it by pressing **F9** or by selecting **Run** in the **Run** menu. The **STDIO** window will open and will display a small square bouncing around in a box.

Several sample programs in the **SAMPLES/RCM2300** folder illustrate the operation of the I/O on the RCM2300 modules.

- **FLASHLED.C**—RCM2300 repeatedly flashes LED DS3 on the Demonstration Board.
- **FLASHLEDS.C**—RCM2300 repeatedly flashes LEDs DS2 and DS3 on the Demonstration Board.
- **TOGGLELED.C**—RCM2300 flashes LED DS2 on the Demonstration Board and toggles LED DS3 on/off in response to pressing S3.

Each of these programs is fully commented within the source code. Refer to these comments for the details of how each program works.

3.4.3 Prepare DeviceMate Hardware Platform

Now that you have verified that both the RCM2200 hardware platform and the RCM2300 target device are mounted correctly and working, you can move on and try the DeviceMate sample programs in Chapter 4. If you only have one programming cable, reconnect it to header J1, the programming port on the RCM2200 hardware platform.

4. DEVICEMATE SAMPLE PROGRAMS

4.1 Ethernet Network Cables

Before proceeding you will need to have the following items.

- If you don't have Ethernet access, you will need at least a 10Base-T Ethernet card (available from your favorite computer supplier) installed in a PC.
- Two RJ-45 straight through Ethernet cables and a hub, or an RJ-45 crossover Ethernet cable.

The Ethernet cables and Ethernet hub are available from Z-World in a TCP/IP tool kit. More information is available at www.zworld.com.

4.1.1 Ethernet Connections

- If you do not have access to an Ethernet network, use a crossover Ethernet cable to connect the hardware platform to a PC with at least a 10Base-T Ethernet card.
- If you have Ethernet access, use a straight Ethernet cable to establish an Ethernet connection to the hardware platform from an Ethernet hub.

The PC running Dynamic C through the serial port on the hardware platform does not need to be the PC with the Ethernet card.

Figure 8 shows the two connections described above.

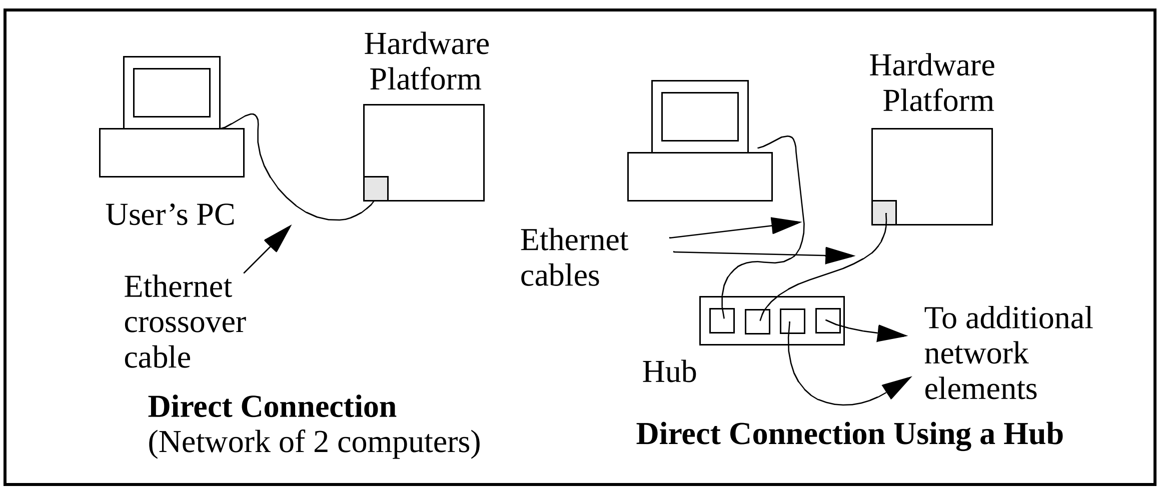


Figure 8. Ethernet Connections

4.1.2 Ethernet Networks

The DeviceMate hardware platform uses a 10Base-T type of Ethernet connection, which is the most common scheme. The RJ-45 connectors are similar to U.S. style telephone connectors, except they are larger and have 8 contacts.

An alternative to the direct connection using a crossover cable is a direct connection using a hub. The hub relays packets received on any port to all of the ports on the hub. Hubs are low in cost and are readily available. The hardware platform uses 10 Mbps Ethernet, so the hub or Ethernet adapter must be either a 10 Mbps unit or a 10/100 unit that adapts to either 10 or 100 Mbps.

In a corporate setting where the Internet is brought in via a high-speed line, there are typically machines between the outside Internet and the internal network. These machines include a combination of proxy servers and firewalls that filter and multiplex Internet traffic. In the configuration below, the hardware platform could be given a fixed address so any of the computers on the local network would be able to contact it. It may be possible to configure the firewall or proxy server to allow hosts on the Internet to directly contact the controller, but it would probably be easier to place the controller directly on the external network outside of the firewall. This avoids some of the configuration complications by sacrificing some security.

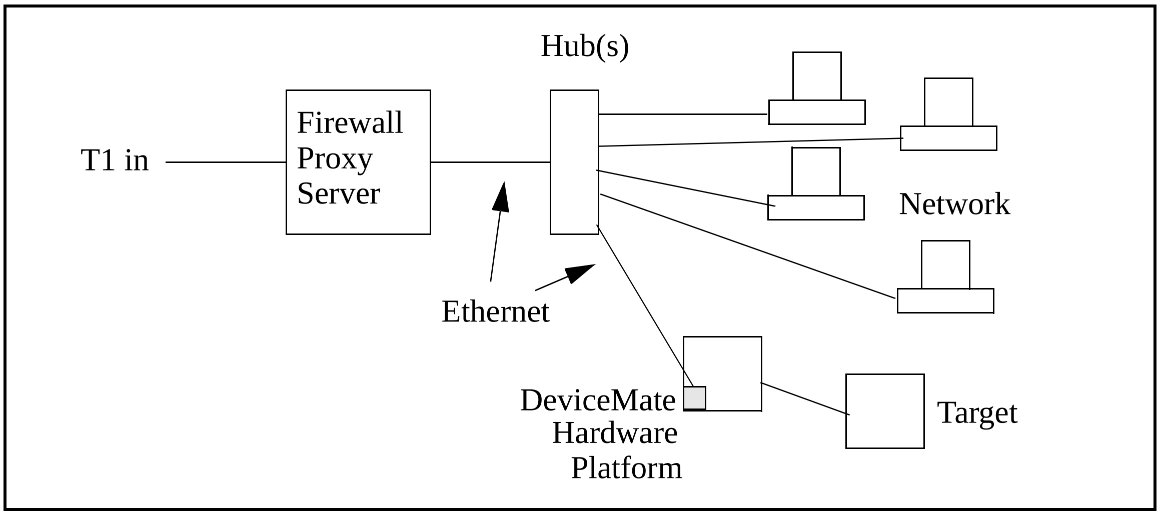


Figure 9. Typical Corporate Network

If your system administrator can give you an Ethernet cable along with its IP address, the netmask and the gateway address, then you may be able to run the sample programs without having to setup a direct connection between your computer and the hardware platform. You will also need the IP address of the nameserver, the name or IP address of your mail server, and your domain name for some of the sample programs.

4.2 Running TCP/IP Sample Programs

We have provided a number of sample programs demonstrating various DeviceMate uses. These programs require connecting the PC and the hardware platform together on the same network. This network can be a local private network (preferred for initial experimentation and debugging), or a connection via the Internet.

Obtaining IP addresses to interact over an existing operating network can involve a number of complications, and must usually be done with the cooperation of your ISP and/or network systems administrator (if your company has one). For this reason, we recommend that your first efforts be done via a direct connection between a PC and the hardware platform using an Ethernet crossover cable or a simple arrangement with a hub. (A crossover cable should not be confused with regular straight through cables.)

In order to set up this direct connection, use a virgin PC (right out of the box), or disconnect a PC from the corporate network, or as yet another approach install a second Ethernet adapter and set up a separate private network attached to the second Ethernet adapter. Disconnecting your PC from the corporate network may be easy or nearly impossible, depending on how it is set up. Mobile PCs, such as laptops, are designed to be connected and disconnected, and will present the least problem. If your PC boots from the network or is dependent on the network for some or all of its disks, then it probably should not be disconnected. If a second Ethernet adapter is used, be aware that Windows TCP/IP will send messages to one adapter or the other, depending on the IP address and the binding order in Microsoft products. Thus you should have different ranges of IP addresses on your private network from those used on the corporate network. If both networks service the same IP address, then Windows may send a packet intended for your private network to the corporate network. A similar situation will take place if you use a dial-up line to send a packet to the Internet. Windows may try to send it via the local Ethernet network if it is also valid for that network.

The following IP addresses are set aside for local networks and are not allowed on the Internet: 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255, and 192.168.0.0 to 192.168.255.255.

4.2.1 How to Set IP Addresses in the Sample Programs

Most of the sample programs use macros to define the IP address assigned to the hardware platform and the IP address of the gateway, if there is a gateway.

```
#define MY_IP_ADDRESS "216.112.116.155"
#define MY_NETMASK "255.255.255.248"
#define MY_GATEWAY "216.112.116.153"
```

In order to do a direct connection, the following IP addresses can be used for the hardware platform:

```
#define MY_IP_ADDRESS "10.1.1.2"
#define MY_NETMASK "255.255.255.248"
// #define MY_GATEWAY "216.112.116.153"
```

In this case, the gateway is not used and is commented out. The IP address of the board is defined to be 10.1.1.2. The IP address of you PC can be defined as 10.1.1.1.

4.2.2 How to Set Up your Computer's IP Address for Direct Connect

When your computer is connected directly to the hardware platform via an Ethernet connection, you need to assign an IP address to your computer. To assign the PC the address 10.1.1.1 with the subnetmask 255.255.255.248 under Windows 98, do the following.

Click on **Start > Settings > Control Panel** to bring up the Control Panel, and then double-click the Network icon. In the window find the line of the form **TCP/IP > Ethernet adapter name**. Double-click on this line to bring up the TCP/IP properties dialog box. You can edit the IP address directly and the subnet mask. (Disable "obtain an IP address automatically.") You may want to write down the existing values in case you have to restore them later. It is not necessary to edit the gateway address since the gateway is not used with direct connect.

The method of setting the IP address may differ for different versions of Windows, such as 95, NT, or 2000.

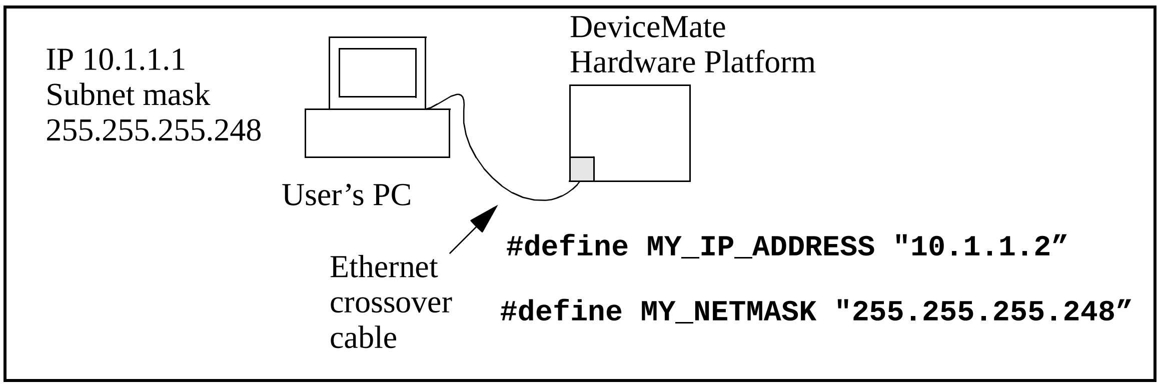


Figure 10. Direct Connection PC to DeviceMate Hardware Platform

4.2.3 Run the `PINGME.C` Demo

Find the **`PINGME.C`** program in the Dynamic C **`SAMPLES\TCPIP\ICMP`** folder.

1. Edit the IP address and netmask in to 10.1.1.2 and the netmask of your PC (available under the "IP Address" tab in "TCP/IP Properties" under "Network Settings").
2. Compile the program by pressing **F5** or using the **Compile** menu.
3. Connect an Ethernet crossover cable from your computer's Ethernet jack to the RCM2200's RJ-45 Ethernet connector. (Refer to Section 4.1, "Ethernet Network Cables," if you need more information on Ethernet network cables.)
4. Start the program running (press **F9** select **Run** in the **Run** menu). The green **LNK** light on the RCM2200 should be on to indicate an Ethernet connection is made. (Note: If the **LNK** light does not light, you may not have a crossover cable, or if you are using a hub perhaps the power is off on the hub.)
5. Ping the board from your PC. This can be done by bringing up the MS-DOS window and running the ping program:

   ```
   ping 10.1.1.2
   ```

   or by **Start** > **Run**

   and typing the command

   ```
   ping 10.1.1.2
   ```

Notice that the yellow **ACT** light flashes on the RCM2200 while the ping is taking place, and indicates the transfer of data. The ping routine will ping the board four times and write a summary message on the screen describing the operation.

4.3 DeviceMate Dynamic C Libraries and Sample Programs

Once you start looking at developing your own DeviceMate applications, the **DevMate** directory contains the Dynamic C libraries you will need. The libraries and the function calls are described in complete detail in the ***DeviceMate Software User's Manual***.

Two directories contain sample programs to illustrate the DeviceMate features of the hardware platform.

- The **DMUNIT** directory contains sample programs for a hardware platform interface with another Rabbit-based single-board computer or another single-board computer running Dynamic C.
- The **DMTARGET** directory contains sample programs for a hardware platform interface with Rabbit-based targets. The **DMTARGET\Arch** directory contains sample programs for use with nonRabbit-basedtargets.

4.3.1 Serving Web Pages

1. With the Rabbit programming cable connected to the RCM2200, open the program **DEVMATE.C** in the **SAMPLES\DMUNIT** directory, set the IP address, gateway, and netmask network parameters as you did in Section 4.2.1, then compile and run the program by pressing **F9**.
2. Move the Rabbit programming cable to the RCM2300 as shown in Figure 7, open the sample program **VAR.C** in the **SAMPLES\DMTARGET** directory, set the IP address, gateway, and netmask network parameters as you did in Section 4.2.1, then compile and run the program by pressing **F9**.
3. Remove the programming cable from the RCM2300 and set the programming cable aside.

The sample program **VAR.C** runs a Web server (http://10.1.1.2/var.shtml), and will accept variable updates from a target processor. These variables are included in .shtml pages that the DeviceMate hardware platform serves. Hence, these variables allow a simple means of having dynamic content in Web pages. The .shtml file **var.shtml** shows how these variables are included in a Web page.

4.3.2 FileSystem Access

1. With the Rabbit programming cable connected to the RCM2200, open the program **DEVMATE_FS.C** in the **SAMPLES\DMUNIT** directory, set the IP address, gateway, and netmask network parameters as you did in Section 4.2.1, then compile and run the program by pressing **F9**.
2. This program requires a small change to **RABBITBIOS.C** in the Dynamic C **BIOS** directory. The filesystem used in this example is a RAM filesystem (any FS2 filesystem may be used), and so room in RAM must be reserved. You will find the line:

   ```
   #define XMEMM_RESERVE_SIZE (0*0000L)
   ```

   at the top of the BIOS. Change it such that room is allocated in main system memory. For example, to allocate 16K, change the line to

   ```
   #define XMEMM_RESERVE_SIZE (4*0000L)
   ```

   but the exact amount is not as important.

3. Move the Rabbit programming cable to the RCM2300 as shown in Figure 7, open the sample program **FS_TINY.C** in the **SAMPLES\DMTARGET** directory, then compile and run the program by pressing **F9**.
4. Remove the programming cable from the RCM2300 and set the programming cable aside.

The sample program **FS_TINY.C** provides filesystem access to a target processor connected to the RCM2200. The target processor may make requests that will be serviced by the **DM_FS.LIB** library, such as uploading, removing (deleting), or renaming files.

Once a file is uploaded from the target, it will be available in the local filesystem for other applications to use, such as the Web (HTTP) or FTP servers. As this sample program makes use of the Web (HTTP) server, make sure the network information below is correct! After files are uploaded, you should be able to browse to:

```
http://[MY_IP_ADDRESS]/index.html
```

and be able to find your file there.

For more examples of using the **ZSERVER.LIB** library, there are several Web examples that use it, such as **samples\tcpip\http\static2.c**.

4.3.3 Running Your Own Set-Up

1. With the Rabbit programming cable connected to the RCM2200, open the program **DEVMATE.C** in **SAMPLES\DMUNIT**, set the IP address, gateway, and netmask network parameters as you did in Section 4.2.1, then compile and run the program with **F9**.
2. Move the Rabbit programming cable to the programming port of the target single-board computer, open the target program, then compile and the target board's program by pressing **F9**.
3. Remove the programming cable from the programming port and set it aside.

You are now ready to use the RCM2200 as a DeviceMate hardware platform to develop your own application.

Appendix B provides connection information on interfacing to a nonRabbit-based target board.

4.3.4 Reference Info

Table 1 lists the libraries used by Rabbit-based and nonRabbit-based target devices.

Table 1. Dynamic C Libraries for Rabbit and nonRabbit Targets

On Rabbit-Based Targets	Required by	On nonRabbit-Based Targets
DM_SMTP.LIB	E-Mail	**DM_SMTP.C** and **DM_SMTP.H**
DM_FS.LIB	File System	**DM_FS.C** and **DM_FS.H**
DM_LOG.LIB	Message Logging	**DM_LOG.C** and **DM_LOG.H**
DM_TCP.LIB	TCP/IP	**DM_TCP.C** and **DM_TCP.H**
DM_WD.LIB	Watchdogs	**DM_WD.C** and **DM_WD.H**
DM_VAR.LIB	Web Page Variables	**DM_VAR.C** and **DM_VAR.H**

These libraries or other files are not called directly when you develop your own application. Instead you will invoke one of the following.

#use TC_CONF.LIB (Rabbit-based target device)

or

#include TC_CONF.H (nonRabbit-based target device)

USE_TC_* macros need to be defined before the **#use** statement as explained in the ***DeviceMate Software User's Manual***.

4.4 Where Do I Go From Here?

If there are any problems at this point,

- Check the Z-World Technical Bulletin Board at http://www.zworld.com/support/bb/index.html.
- E-mail your questions to support@zworld.com.
- Call Z-World Technical Support at (530)757-3737.

If the sample programs ran fine, you are now ready to go on.

Refer to the ***DeviceMate Software User's Manual*** and the ***Dynamic C TCP/IP User's Manual*** to develop your own applications. ***An Introduction to TCP/IP*** provides background information on TCP/IP, and is available on the CD and on Z-World's Web site.

APPENDIX A. RABBITCORE SPECIFICATIONS

Appendix A provides the specifications for the RCM2200 hardware platform and the RCM22300 target device.

A.1 Electrical and Mechanical Characteristics

A.1.1 RCM2200

Figure A-1 shows the mechanical dimensions for the RCM2200.

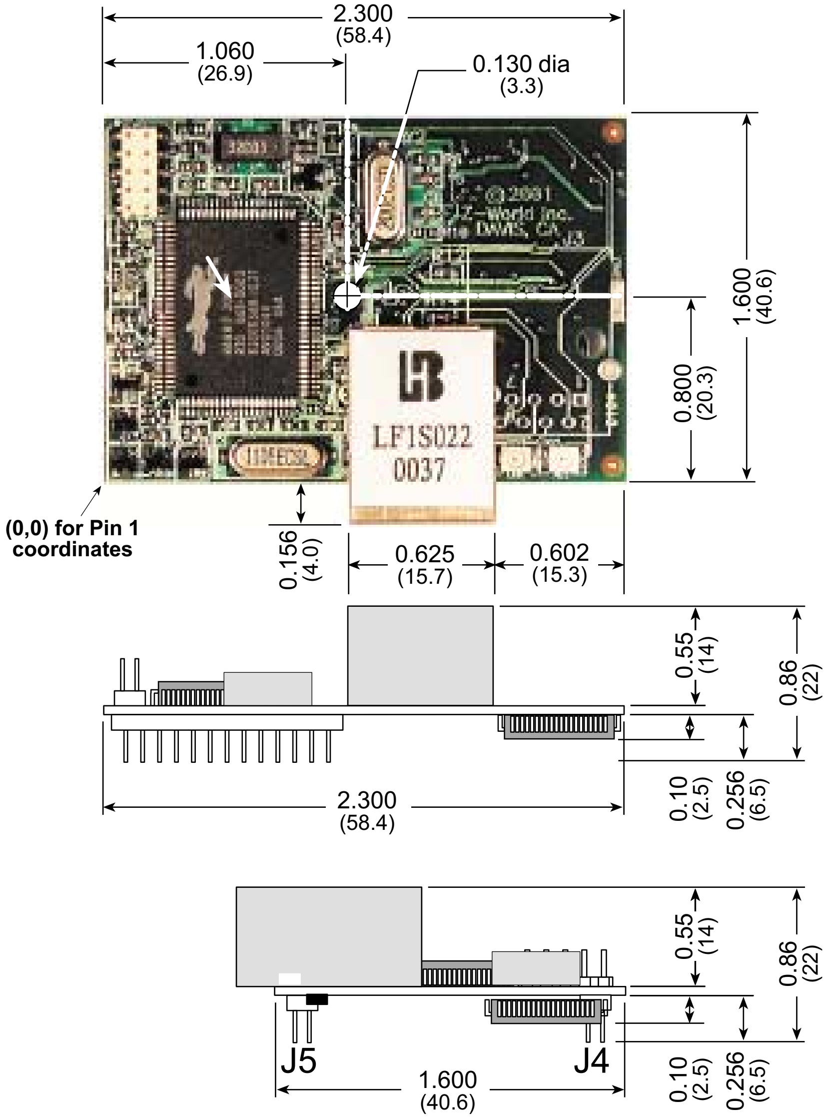


Figure A-1. RCM2200 Dimensions

Table A-1 provides the pin 1 locations for the RCM2200 headers viewed from the top side (as in Figure A-1).

Table A-1. RCM2200 Header Pin 1 Locations

Header	Description	Pin 1 (x,y) Coordinates (Inches)
J4	RabbitCore RCM2200 user board interface	(0.100, 1.445)
J5	RabbitCore RCM2200 user board interface	(0.100, 0.195)
J1	Programming header (top side)	(0.125, 1.515)
DS1	LNK LED	(1.815, 0.105)
DS2	ACT LED	(2.015, 0.105)

It is recommended that you allow for an "exclusion zone" of 0.25" (6 mm) around the RCM2200 in all directions when the RCM2200 is incorporated into an assembly that includes other components. This "exclusion zone" that you keep free of other components and boards will allow for sufficient air flow, and will help to minimize any electrical or EMI interference between adjacent boards. An "exclusion zone" of 0.12" (3 mm) is recommended below the RCM2200 when the RCM2200 is plugged into another assembly using the shortest connectors for headers J1 and J2 on the RCM2200. Figure A-2 shows this "exclusion zone."

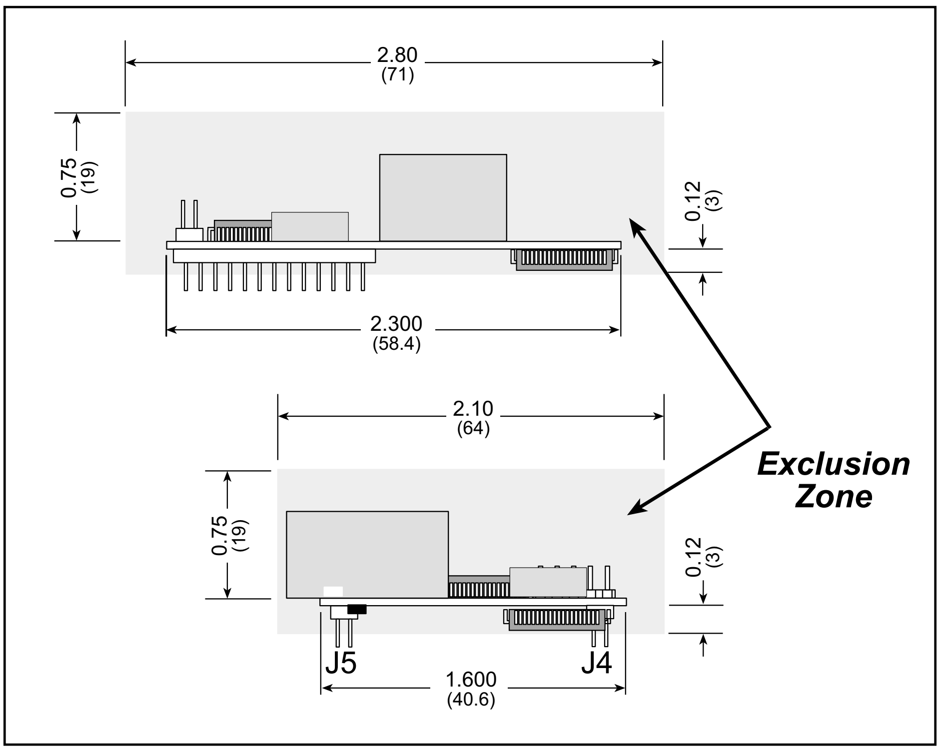


Figure A-2. RCM2200 "Exclusion Zone"

Table A-2 lists the electrical, mechanical, and environmental specifications for the RCM2200.

Table A-2. RabbitCore RCM2200 Specifications

Parameter	Specification
Board Size	1.60" × 2.30" × 0.86" (41 mm × 59 mm × 22 mm)
Operating Temperature	–40°C to +70°C
Humidity	5% to 95%, noncondensing
Input Voltage	4.75 V to 5.25 V DC
Current	134 mA at 22.1 MHz, 5 V DC; 10 mA additional with programming cable attached
General-Purpose I/O	26 parallel I/0 lines grouped in five 8-bit ports (shared with serial ports): 16 configurable for I/O, 7 fixed inputs, 3 fixed outputs
Memory, I/O Interface	4 address lines, 8 data lines, I/O read/write
Additional Digital Inputs	Startup mode (2), reset in, Serial Port A (1)
Additional Digital Outputs	Status, reset out, Serial Port A (1)
Ethernet Interface	10base-T
Microprocessor	Rabbit 2000™
Clock	22.1 MHz
SRAM	128K × 8, surface mount
Flash Memory	One 256K × 8, surface mount
Timers	Five 8-bit timers cascadable in pairs, one 10-bit timer with 2 match registers that each have an interrupt
Serial Ports	Three CMOS-compatible ports. One port is configurable as a clocked port, a fourth clocked pin is available on the programming port.
Serial Rate	CMOS: maximum asynchronous 691,200 bps maximum synchronous 5,529,600 bps
Slave Interface	A slave port allows the RabbitCore RCM2200 to be used as an intelligent peripheral device slaved to a master processor, which may either be another Rabbit 2000 or any other type of processor
Watchdog/Supervisor	Yes
Time/Date Clock	Yes
Socket Strip (for connection to headers J4 and J5)	2x13, 2 mm pitch
Backup Battery	Provision for user-supplied backup battery (2.85 V to 3.15 V) via connections on header J5

A.1.1.1 Headers

The RCM2200 uses headers at J4 and J5 for physical connection to other boards. J4 and J5 are 2 × 13 SMT headers with a 2 mm pin spacing. J1, the programming port, is a 2 × 5 header with a 2 mm pin spacing.

Figure A-3 shows the layout of another board for the RCM2200 to be plugged into. These values are relative to the header connectors.

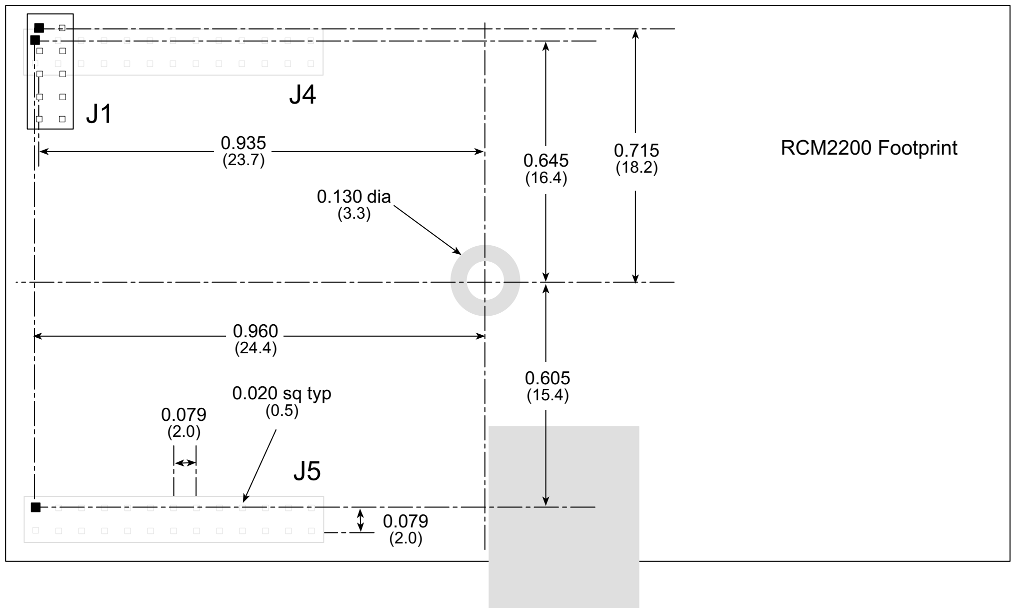


Figure A-3. User Board Footprint for RCM2200

A.1.1.2 Physical Mounting

A 9/32" (7 mm) standoff with a 4-40 screw is recommended to attach the RCM2200 to a user board at the hole position shown in Figure A-3.

A.1.2 RCM2300

Figure A-4 shows the mechanical dimensions for the RCM2300.

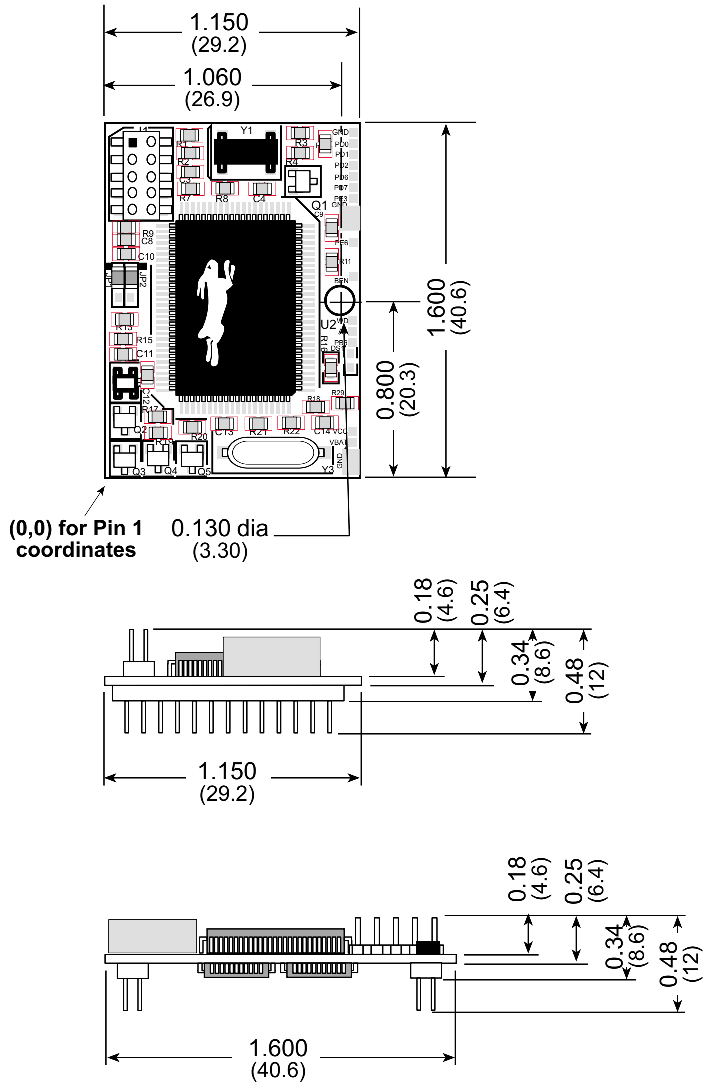


Figure A-4. RabbitCore RCM2300 Dimensions

Table A-3 provides the pin 1 locations for the RCM2300 headers viewed from the top side (as in Figure A-4).

Table A-3. RabbitCore RCM2300 Header Pin 1 Locations

Header	Description	Pin 1 (x,y) Coordinates (Inches)
J4	RabbitCore RCM2300 user board interface	(0.100, 1.445)
J5	RabbitCore RCM2300 user board interface	(0.100, 0.195)
J1	Programming header (top side)	(0.125, 1.515)
Top **GND**	Through-Hole Connection Points	(1.110, 1.560)

Table A-4 lists the electrical, mechanical, and environmental specifications for the RCM2300.

Table A-4. RabbitCore RCM2300 Specifications

Parameter	Specification
Board Size	1.15" × 1.60" × 0.48" (29 mm × 41 mm × 12 mm)
Operating Temperature	–40°C to +70°C
Humidity	5% to 95%, noncondensing
Input Voltage	4.75 V to 5.25 V DC
Current	108 mA at 22.1 MHz, 5 V DC; 10 mA additional with programming cable attached
General-Purpose I/O*	29 parallel I/0 lines grouped in five 8-bit ports (shared with serial ports): 17 configurable I/O, 8 fixed inputs, 4 fixed outputs
Memory, I/O Interface	4 address lines, 8 data lines, I/O read/write
Additional Digital Inputs	Startup mode (2), reset in
Additional Digital Outputs	Status, reset out
Microprocessor	Rabbit 2000™
Clock	22.1 MHz
SRAM	128K × 8, surface mount
Flash Memory	One 256K × 8, surface mount
Timers	Five 8-bit timers cascadable in pairs, one 10-bit timer with 2 match registers that each have an interrupt
Serial Ports	Four CMOS-compatible ports; two ports are configurable as clocked ports.
Serial Rate	CMOS: maximum asynchronous 691,200 bps maximum synchronous 5,529,600 bps
Slave Interface	A slave port allows the RCM2300 to be used as an intelligent peripheral device slaved to a master processor, which may either be another Rabbit 2000 or any other type of processor
Program/Debug	One clock line is available only on the programming header. The programming port is available both on the programming header (J1) and on J4, one of the headers that interfaces with the user board
Watchdog/Supervisor	Yes
Time/Date Clock	Yes
Socket Strip (for connection to headers J4 and J5)	2x13, 2 mm pitch
Backup Battery	Provision for user-supplied backup battery (2.85 V to 3.15 V) via connections on header J5

* 11 additional I/O are available via less convenient 0.30" diameter through-hole connection points

A.1.2.1 Headers

The RCM2300 uses headers at J4 and J5 for physical connection to other boards. J4 and J5 are 2 × 13 SMT headers with a 2 mm pin spacing. J1, the programming port, is a 2 × 5 header with a 2 mm pin spacing.

Figure A-5 shows the footprint of another board that the RCM2300 would be plugged into. These values are relative to the header connectors.

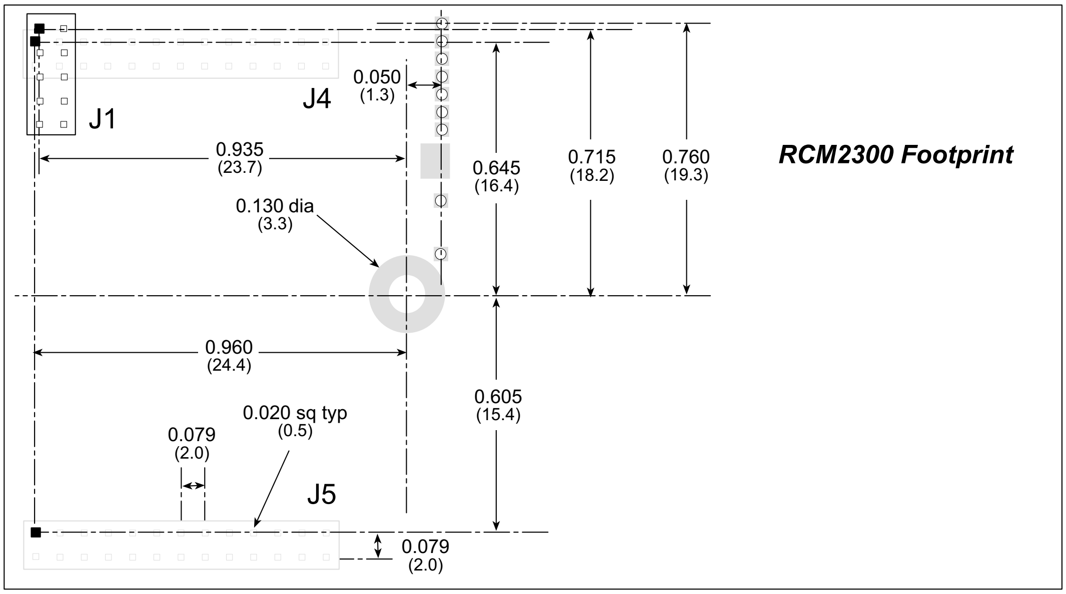


Figure A-5. User Board Footprint for RabbitCore RCM2300

A.1.2.2 Physical Mounting

An insulating 9/32" or ¼" (7 mm) standoff with a 4-40 screw is recommended to attach the RCM2300 to a user board at the hole position shown in Figure A-5.

A.2 Pinouts

The RCM2200 and RCM2300 modules have two 26-pin headers to which cables can be connected, or which can be plugged into matching sockets on a production device. The pinouts for these connectors are shown in Figure A-6 below.

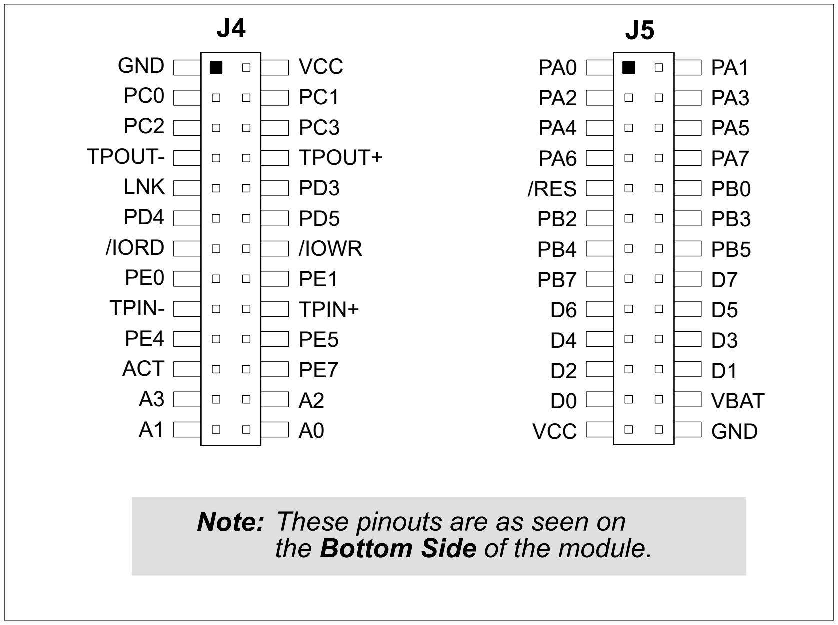


Figure A-6. RCM2200/RCM2300 Connector Pinout

A.3 Serial Communication

All DeviceMate serial communication for the purposes of the DeviceMate Development Kit is done via Serial Port D, and any programming is done via Serial Port B on the hardware platform to Serial Port A (the default Rabbit 2000 programming port) on the target device.

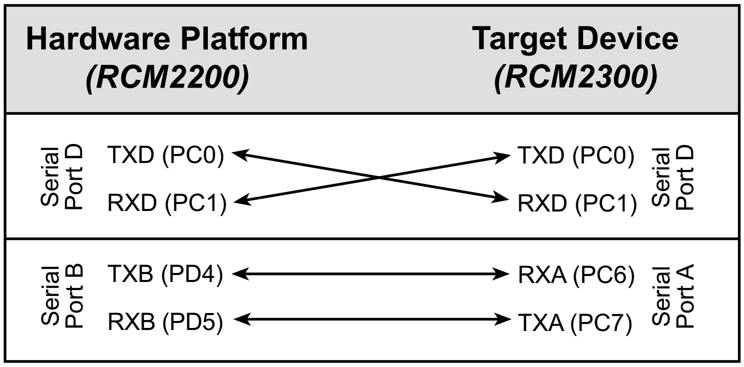


Figure A-7. DeviceMate Development Kit Default Serial Connections (for Rabbit-based targets)

The default serial communication channels are set using the following macros in the **TC_CONF.LIB** library in the **DEVGATE** folder. The macro setting is shown for Serial Port D.

```
/* Serial port to use on DeviceMate */
     #ifndef TARGETPROC_SERA
     #ifndef TARGETPROC_SERB
     #ifndef TARGETPROC_SERC
     #ifndef TARGETPROC_SERD
          #define TARGETPROC_SERD
```

APPENDIX B. NONRABBIT-BASED TARGET CONNECTIONS

Appendix B describes how to connect the RCM2200 hardware platform to a nonRabbit-based target.

B.1 Hookup Instructions

1. Connect the RCM2200 to the **MASTER** position on the Demonstration Board as shown in Figure B-1.

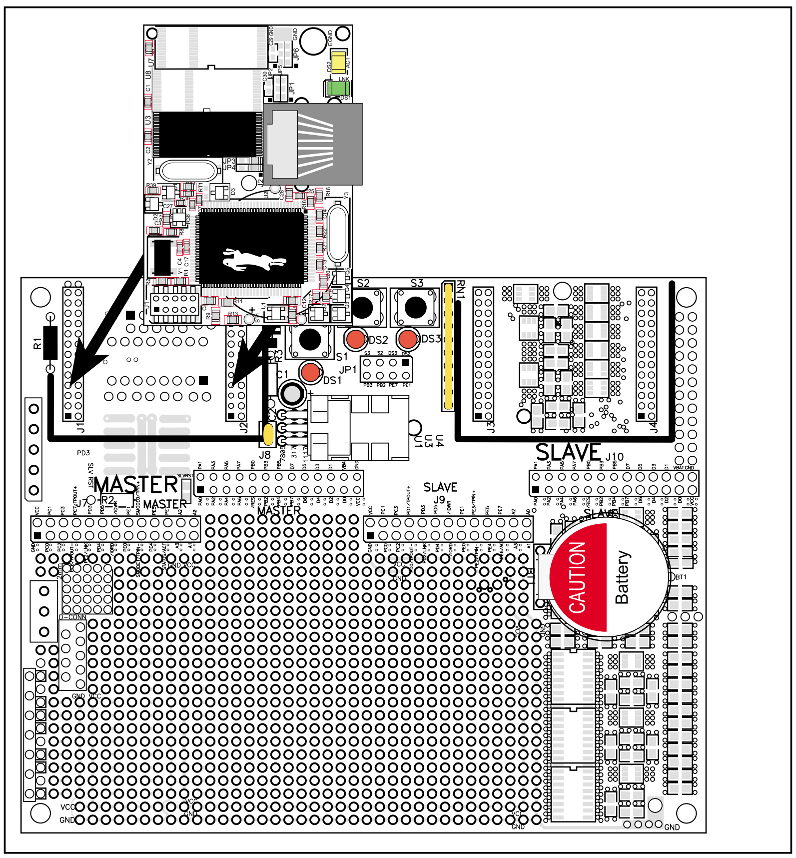


Figure B-1. Install the RCM2200 on the Demonstration Board

2. Connect the Rabbit programming cable to the RCM2200 as shown in Figure B-2.

   Connect the 10-pin connector of the programming cable labeled **PROG** to header J1 on the RCM2200 module as shown in Figure B-2 below. Be sure to orient the marked (usually red) edge of the cable towards pin 1 of the connector. (Do not use the **DIAG** connector, which is used for a normal serial connection.)

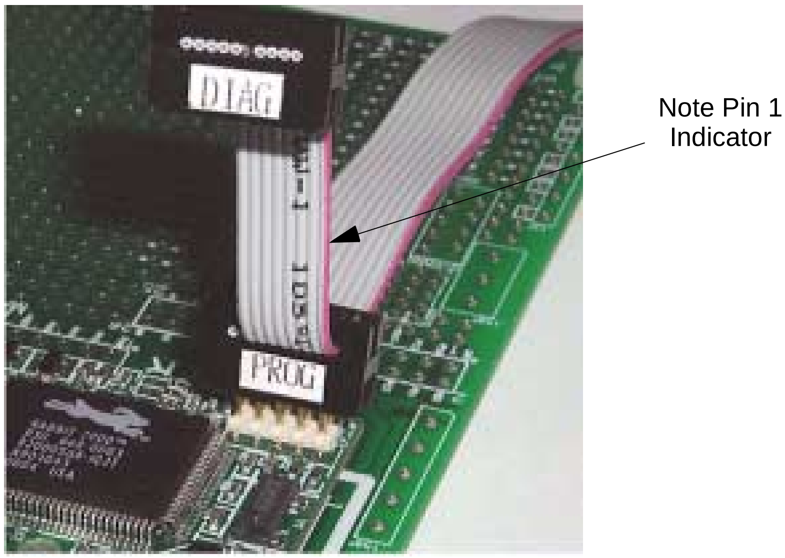


Figure B-2. Attaching Programming Cable to the RCM2200

Connect the other end of the programming cable to a COM port on your PC. Make a note of the port to which you connect the cable, as Dynamic C needs to have this parameter configured when it is installed.

> **NOTE:** COM 1 is the default port used by Dynamic C.

3. Load the desired sample program or the application you have developed into the RCM2200, the press **F9** to compile and run the program.
4. Remove and set aside Rabbit programming cable. Turn the Demonstration Board over, and connect a 10-pin to DE9 cable to header J6 on the bottom side of the Demonstration Board as shown in Figure B-3.

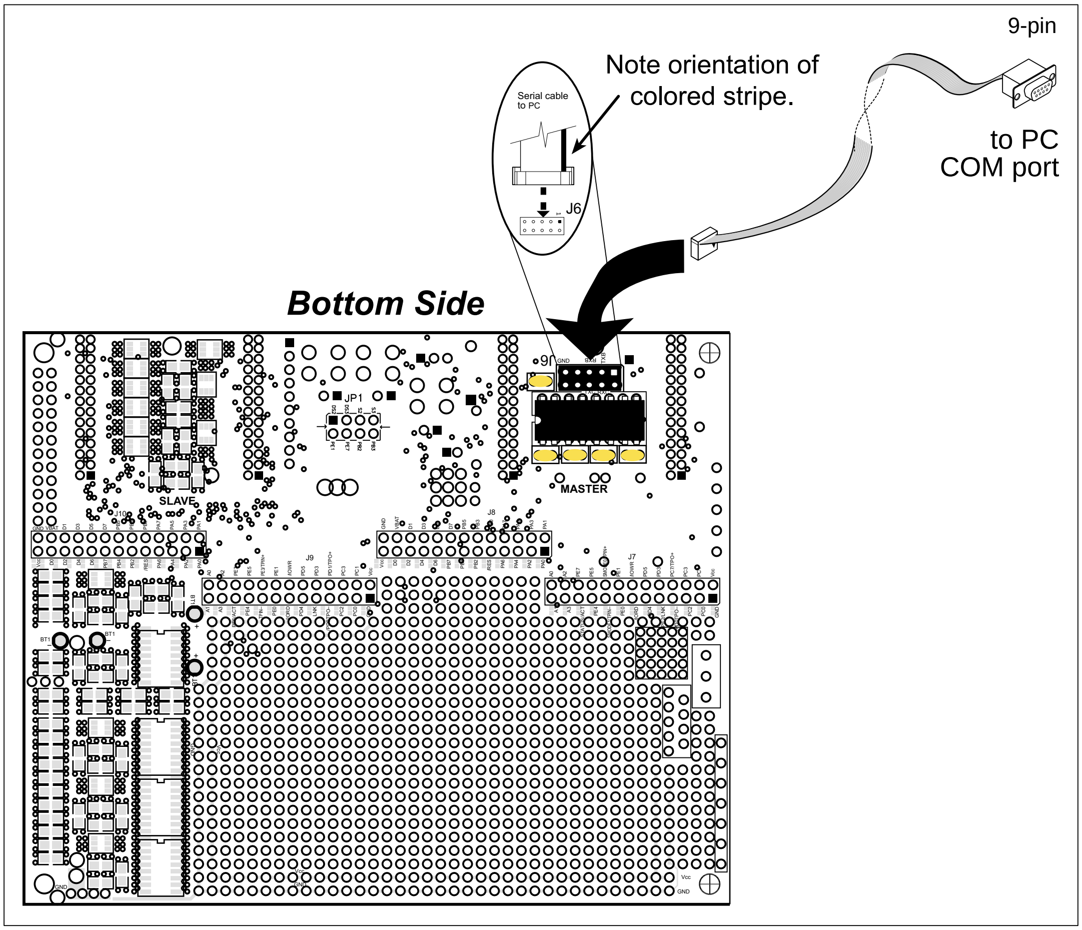


Figure B-3. PC Serial Connections to Demonstration Board

B.2 Connector Pinouts

Figure B-4 shows the pinouts on the Demonstration Board RS-232 header (J6) and on the DE9 connector of the 10-pin to DE9 cable.

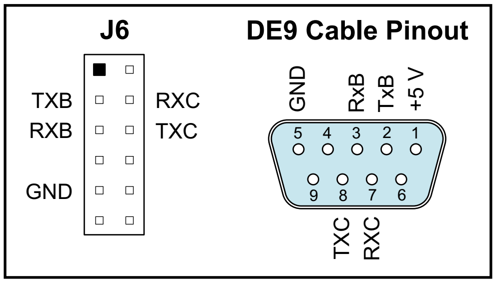


Figure B-4. RS-232 Serial Pinouts

The Rx/Tx/RTS/CTS/GND signals on the DE9 connector are compatible with the PC COM port, and so your PC may be used as a nonRabbit RS-232 device to demonstrate the RCM2200 DeviceMate hardware platform. The Rx/Tx signals are from Serial Port B on the Rabbit 2000 chip.

Alternatively, you may bring out the Rabbit 2000 Serial Port D signals from header J7 on the Demonstration Board to the prototyping area, and do your own wiring to your serial device. These signals will be at a CMOS level, and can be converted to RS-232 or RS-485 through RS-232 or RS-485 chips that you use in the prototyping area.

B.3 Serial Communication

All DeviceMate serial communication with nonRabbit-based targets for the purposes of the Demonstration Board included with the DeviceMate Development Kit is done via Serial Port B, and other data may be sent via Serial Port B.

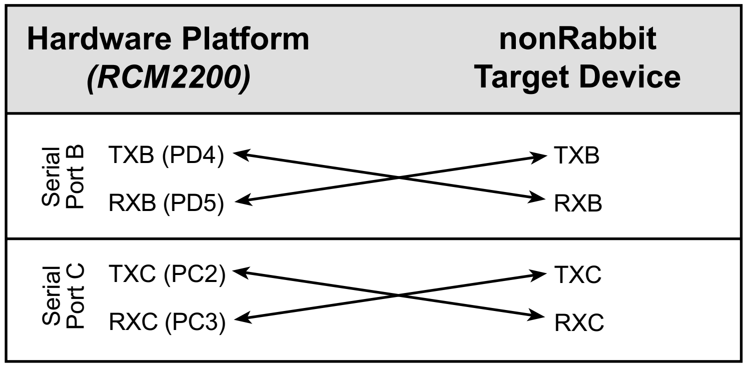


Figure B-5. DeviceMate Development Kit Default Serial Connections (for nonRabbit-based targets)

The default serial communication channels are set using the following **`#define`** statement before **`#use TC_CONF.H`**.

```
#define TARGETPROC_SERB
```

B.4 Sample Programs

Sample programs are available in the **`SAMPLES\Arch`** directory for 386EX, x86 running Linux, and a Sparc Solaris. Readme files in the ZIP and tar files have build and run instructions.

B.5 Where Do I Go From Here?

If there are any problems at this point,

- Check the Z-World Technical Bulletin Board at http://www.zworld.com/support/bb/index.html.
- E-mail your questions to support@zworld.com.
- Call Z-World Technical Support at (530)757-3737.

If the sample programs ran fine, you are now ready to go on.

Refer to the ***DeviceMate Software User's Manual*** (Chapter 6) and the ***Dynamic C TCP/IP User's Manual*** to develop your own applications. ***An Introduction to TCP/IP*** provides background information on TCP/IP, and is available on the CD and on Z-World's Web site.

APPENDIX C. PROGRAMMING CABLE

Appendix C provides additional information for the Rabbit 2000™ microprocessor when using the **DIAG** and **PROG** connectors on the programming cable. The **PROG** connector is used only when the programming cable is attached to the programming connector while a new application is being developed. Otherwise, the **DIAG** connector on the programming cable allows the programming cable to be used as an RS-232 to CMOS level converter for serial communication, which is appropriate for monitoring or debugging a system while it is running.

The programming port, which is shown in Figure C-1, can serve as a convenient communications port for field setup or other occasional communication need (for example, as a diagnostic port). There are several ways that the port can be automatically integrated into software. If the port is simply to perform a setup function, that is, write setup information to flash memory, then the controller can be reset through the programming port and a cold boot performed to start execution of a special program dedicated to this functionality.

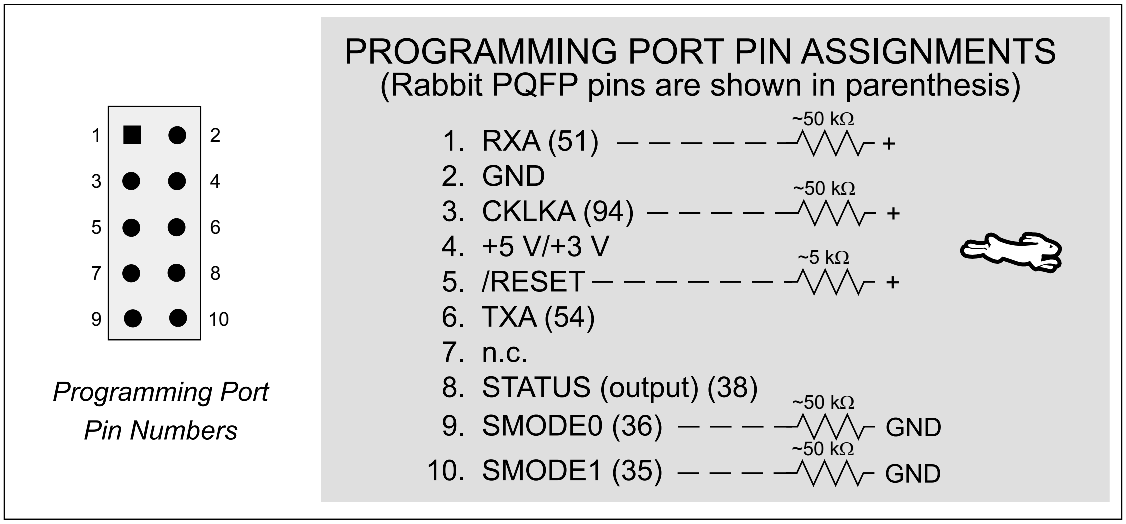


Figure C-1. Programming Port Pin Assignments

When the **PROG** connector is used, the /RESET line can be asserted by manipulating DTR and the STATUS line can be read as DSR on the serial port. The target can be restarted by pulsing reset and then, after a short delay, sending a special character string at 2400 bps. To simply restart the BIOS, the string 80h, 24h, 80h can be sent. When the BIOS is started, it can tell whether the programming cable is connected because the SMODE1 and SMODE0 pins are sensed as being high. This will cause the Rabbit 2000 to enter the bootstrap mode. The Dynamic C programming mode then can have an escape message that will enable the diagnostic serial port function.

Alternatively, the **DIAG** connector can be used to connect the programming port. The /RESET line and the SMODE1 and SMODE0 pins are not connected to this connector. The programming port is then enabled as a diagnostic port by polling the port periodically to see if communication needs to begin or to enable the port and wait for interrupts. The pull-up resistors on RXA and CLKA prevent spurious data reception that might take place if the pins floated.

If the clocked serial mode is used, the serial port can be driven by having two toggling lines that can be driven and one line that can be sensed. This allows a conversation with a device that does not have an asynchronous serial port but that has two output signal lines and one input signal line.

The TXA line (also called PC6) is low after reset if the cold-boot mode is not enabled. A possible way to detect the presence of a cable on the programming port is to connect TXA to one of the SMODE pins and then test for the connection by raising PC6 (by configuring it as a general output bit) and reading the SMODE pin after the cold-boot mode has been disabled.

Once you establish that the programming port will never again be needed for programming, it is possible to use the programming port for additional I/O lines. Table C-1 lists the pins available for this alternate configuration.

Table C-1. RCM2200/RCM2300 Programming Port Pinout Configurations

Pin	Pin Name	Default Use	Alternate Use	Notes
1	RXA	Serial Port A	PC7—Input	
2	GND			
3	CLKA		PB1—Bitwise or parallel programmable input	
4	VCC			
5	RESET			Connected to reset generator U1
6	TXA	Serial Port A	PC6—Output	
8	STATUS		Output	
9	SMODE0		Input	Must be low when RCM2200/RCM2300 boots up
10	SMODE1		Input	Must be low when RCM2200/RCM2300 boots up

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090-0120 RCM2200 Schematic

090-0122 DeviceMate Demonstration Board Schematic

090-0128 Programming Cable Schematic

REVISION HISTORY			REVISION APPROVAL			
REV	ECO	DESCRIPTION OF CHANGE	PROJECT ENGINEER	APPROVAL DATE	DOCUMENT CONTROL	APPROVAL DATE
A	E11400	INITIAL RELEASE	RJH	6/04/01	KIS	6/04/01
B	E11691	NEW BATTERY BACKUP CIRCUITRY, BATTERY, J2, AND J3				

STUFFING TABLE

	CIRCUIT	PART	RCM2300
POWER TO VRAM SWITCH	WITH BATTERY BACKUP CIRCUITRY	R33	NOT INSTALLED
CS CONTROL SWITCH	WITH BATTERY BACKUP CIRCUITRY	R27	NOT INSTALLED
FLASH	MAIN	U3	256K FLASH
FLASH	FLASH SELECT	JP1	ZERO ohm ACROSS PINS 1–2
FLASH	FLASH TYPE	JP2	ZERO ohm ACROSS PINS 1–2
LED	RED LED CIRCUIT	R29	NOT INSTALLED
LED	RED LED CIRCUIT	DS1	NOT INSTALLED
BATTERY	ON BOARD BATTERY	BT1	NOT INSTALLED
EXTRA CONN.	2MM THROUGH HOLE CONNECTORS	J2	NOT INSTALLED
EXTRA CONN.	2MM THROUGH HOLE CONNECTORS	J3	NOT INSTALLED

TABLE A

REF DES	DEVICE	DEVICE VOLTAGE INFORMATION					DEVICE: FILTER CAP REF DES(s)
			GND	VCC	VRAM	NO CONNECTS	
U1	ETC811L						C12
U2	RABBIT 2000		2,27,39 52,77,89	3,28,53, 78,92			C8,C10,C9,22,23
U3	FLASH		24	8			C16
U5	SRAM 128K X 8		24		8		C11

NOTES: UNLESS OTHERWISE SPECIFIED;

1. ALL RESISTOR VALUES ARE IN OHMS, 1/16W, 5%
2. ALL CAPACITORS ARE 50VDC OR HIGHER.
3. THE ORIGINATION SOURCE OF A VOLTAGE IS REPRESENTED BY (VCC ▲), AND ALL REFERENCES TO THAT VOLTAGE ARE REPRESENTED BY (VCC).
4 R27, R33, J2, J3, BT1, DS1, & R29 NOT NORMALLY STUFFED.
5. COMPONENT VALUES SHOWN WITH AN ASTERISK (*) FOLLOWING THE VALUE, MAY HAVE DIFFERENT VALUES, OR MAY NOT BE STUFFED DEPENDING ON MODEL. SEE STUFFING CHART FOR CLARIFICATION.
6. JP1 AND JP2 ARE JUMPERED POSITION 1 TO POSITION 2 BY FACTORY DEFAULT.

 OCT 08, 2001

APPEND THE FOLLOWING DOCUMENTS WHEN CHANGING THIS DOCUMENT:		DRAWING CONTENT:	
		DRAWN BY: (INITIAL RELEASE) RJH	3/22/01
		REVISED BY: RJH	08OCT01
		APPROVALS: INITIAL RELEASE	
		PROJECT ENGINEER:	
		ENGINEERING MANAGER:	
		SIGNATURES	DATE

TITLE: SCHEMATIC DIAGRAM RCM2300

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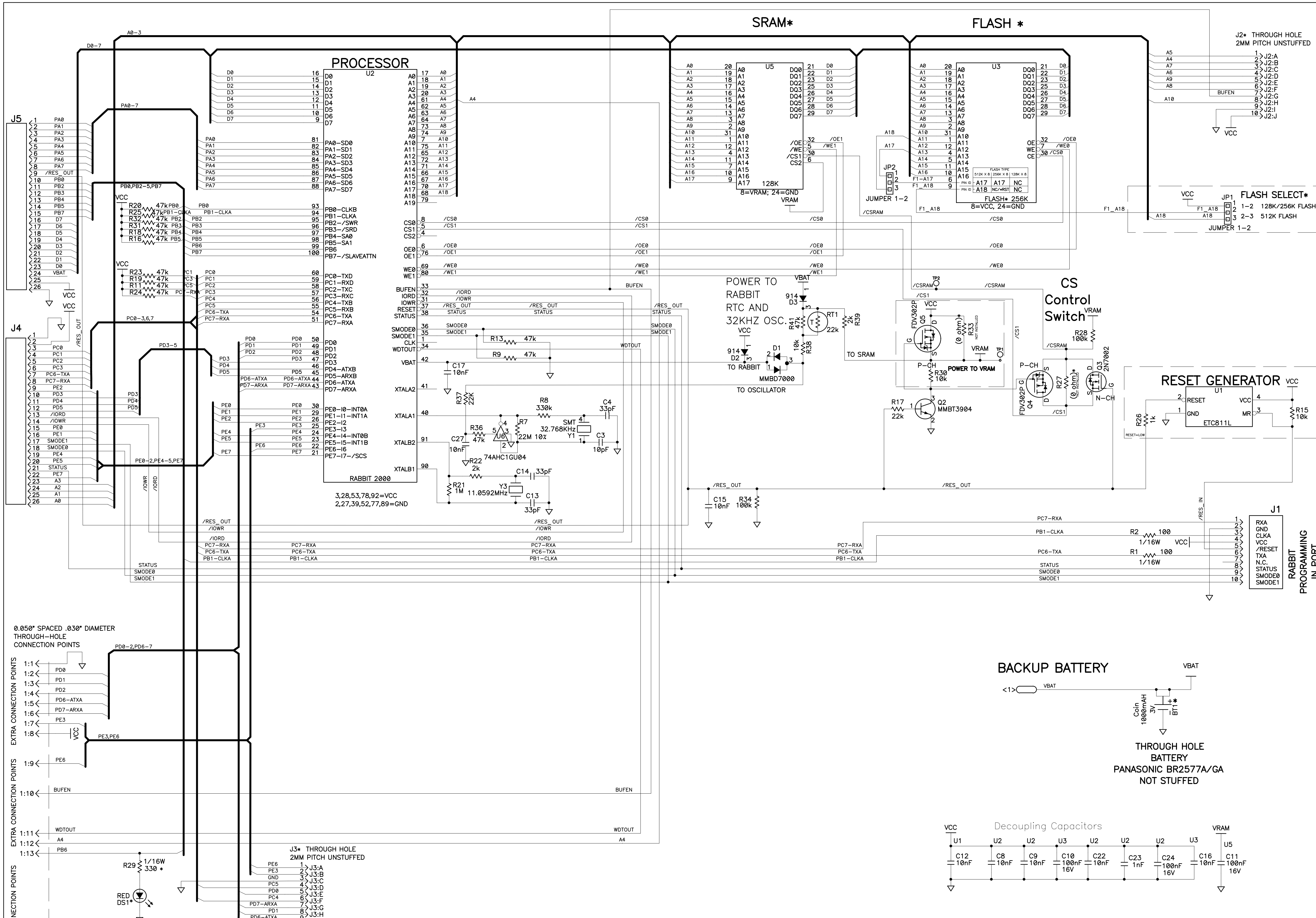
DAVIS, CA 95616
530 - 757-4616

SIZE: C | DWG NO.: 090–0119 | SCALE: NONE | RELEASE DATE: | SHEET 1 OF 2



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C	090-0119

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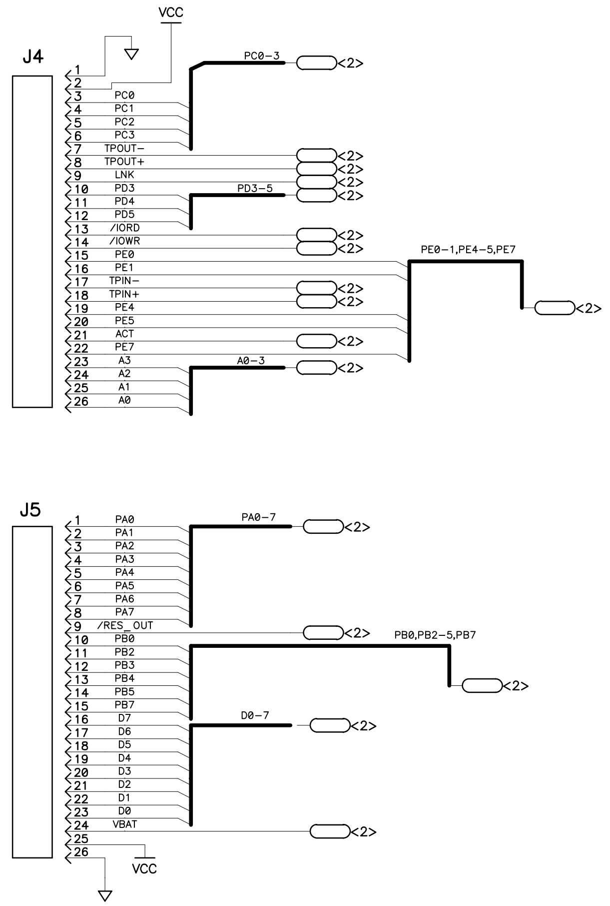

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REV	ECO	DESCRIPTION OF CHANGE	PROJECT ENGINEER	APPROVAL DATE	DOCUMENT CONTROL	APPROVAL DATE
A	E11399	INITIAL RELEASE	RJH	3/22/01	KIS	3/22/01
B	E11646	ADD CAP TO THE LEFT OF R17 (PAGE 2). ADD REFERENCE TO NEW RCM2210.	RJH	9/21/01	KIS	8/29/01
C	E11570	REMOVED R12, ADDED R42,R43				

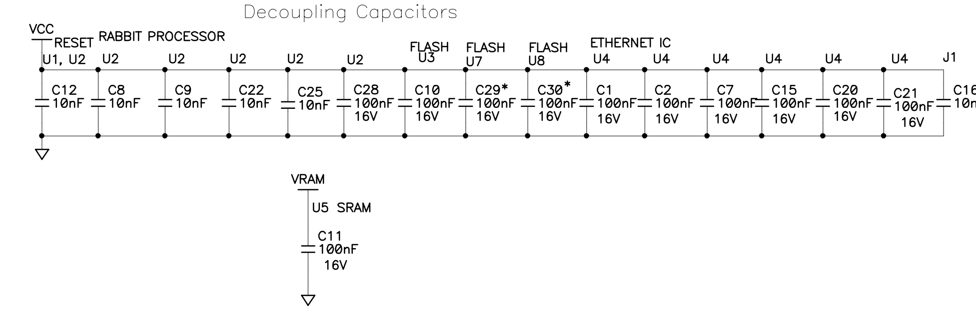
STUFFING TABLE

	CIRCUIT	PART	RCM2200	RCM2210	RCM2250
POWER TO VRAM SWITCH	WITH BATTERY BACKUP CIRCUITRY	R33	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
CS CONTROL SWITCH	WITH BATTERY BACKUP CIRCUITRY	R27	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
SRAM	MAIN	U5	128K SRAM	256K SRAM	512K SRAM
	SRAM SELECT	JP7	ZERO OHM ACROSS PINS 1–2	ZERO OHM ACROSS PINS 1–2	ZERO OHM ACROSS PINS 2–3
FLASH	FIRST	U3	256K FLASH	256K FLASH	256K FLASH
	FLASH MEMORY BANK SELECT	JP3	ZERO ohm ACROSS PINS 1–2	ZERO ohm ACROSS PINS 1–2	ZERO ohm ACROSS PINS 1–2
	FLASH TYPE	JP4	ZERO ohm ACROSS PINS 1–2	ZERO ohm ACROSS PINS 1–2	ZERO ohm ACROSS PINS 1–2
	CAPACITOR	C10	INSTALLED	INSTALLED	INSTALLED
	SECOND	U8	NOT INSTALLED	NOT INSTALLED	256K FLASH
	FLASH MEMORY BANK SELECT	JP2	NOT INSTALLED	NOT INSTALLED	ZERO ohm ACROSS PINS 1–2
	FLASH TYPE	JP1	NOT INSTALLED	NOT INSTALLED	ZERO ohm ACROSS PINS 1–2
	CAPACITOR	C30	NOT INSTALLED	NOT INSTALLED	INSTALLED
	THIRD	U7	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
	FLASH MEMORY BANK SELECT	JP5	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
	FLASH TYPE	JP6	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
	CAPACITOR	C29	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED
ETHERNET	RJ-45 CONNECTOR WITH BUILT IN MAGNETICS	J2	INSTALLED	NOT INSTALLED	INSTALLED
	FILTER CAPACITORS	C18	INSTALLED	NOT INSTALLED	INSTALLED
		C19	INSTALLED	NOT INSTALLED	INSTALLED
		C23	INSTALLED	NOT INSTALLED	INSTALLED
		C24	INSTALLED	NOT INSTALLED	INSTALLED
	LEDS	DS1	INSTALLED	NOT INSTALLED	INSTALLED
		DS2	INSTALLED	NOT INSTALLED	INSTALLED
		R34	INSTALLED	NOT INSTALLED	INSTALLED
		R35	INSTALLED	NOT INSTALLED	INSTALLED
BATTERY	ON BOARD BATTERY	BT1	NOT INSTALLED	NOT INSTALLED	NOT INSTALLED

TABLE A

REF DES	DEVICE	DEVICE VOLTAGE INFORMATION			DEVICE: FILTER CAP REF DES(s)
		GND	VCC	VRAM	
U1	ETC811L	1	4		C12
U2	RABBIT 2000	2,27,39 52,77,89	3,28,53, 78,92		C8,C9,C12,C22,C25,C28
U3	FLASH	24	8		C10
U8	FLASH	24	8		C30
U7	FLASH	24	8		C29
U4	RTL8019AS	14,28,44 52,83,86	6,17,47 57,70,89		C1,C2,C7,C15,C20,C21
U5	SRAM 128K X 8	16		32	C11

Decoupling Capacitors



NOTES: UNLESS OTHERWISE SPECIFIED;

1. ALL RESISTOR VALUES ARE IN OHMS, 1/16W, 5%
2. ALL CAPACITORS ARE 50VDC OR HIGHER.
3. THE ORIGINATION SOURCE OF A VOLTAGE IS REPRESENTED BY (VCC), AND ALL REFERENCES TO THAT VOLTAGE ARE REPRESENTED BY (VCC).
4. R27, R33, & BT1 NOT NORMALLY STUFFED.
5. COMPONENT VALUES SHOWN WITH AN ASTERISK (*) FOLLOWING THE VALUE, MAY HAVE DIFFERENT VALUES, OR MAY NOT BE STUFFED DEPENDING ON MODEL. SEE STUFFING CHART FOR CLARIFICATION.

 SEPTEMBER 11, 2001

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		DRAWN BY: (INITIAL RELEASE) RJH	3/15/01
		REVISED BY: RJH	11SEP01
		APPROVALS: INITIAL RELEASE	
		PROJECT ENGINEER: RICHARD HESS	3/22/01
		ENGINEERING MANAGER: R.MATTHEWS	3/22/01
		SIGNATURES	DATE

TITLE: SCHEMATIC DIAGRAM MICRO ETHERNET RABBITCORES RCM2200 SERIES

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2900 SPAFFORD ST.
DAVIS, CA 95616
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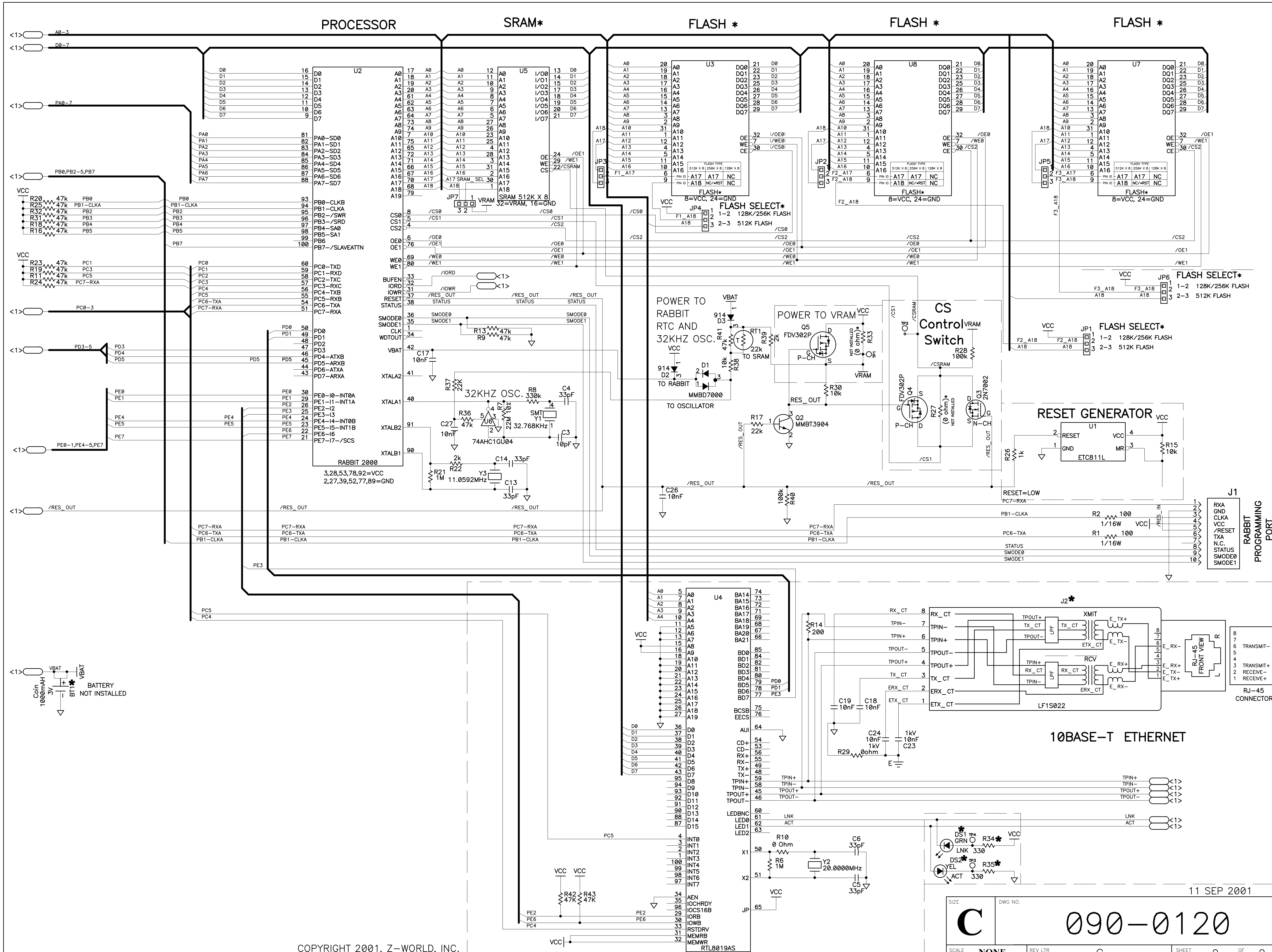

PROCESSOR
SRAM*
FLASH *
FLASH *
FLASH *
RABBIT 2000
3,28,53,78,92=VCC
2,27,39,52,77,89=GND
SRAM 512K X 8
32=VRAM, 16=GND
8=VCC, 24=GND
FLASH SELECT*
1–2 128K/256K FLASH
2–3 512K FLASH
POWER TO RABBIT RTC AND 32KHZ OSC.
POWER TO VRAM
CS Control Switch
TO RABBIT
TO SRAM
TO OSCILLATOR
32KHZ OSC.
32.768KHz
11.0592MHz
74AHC1GU04
RESET GENERATOR
ETC811L
RESET=LOW
RABBIT PROGRAMMING PORT
BATTERY NOT INSTALLED
10BASE–T ETHERNET
LF1S022
RJ–45 CONNECTOR
RTL8019AS
6,17,47,57,70,89=VCC; 14,28,44,52,83,86=GND
20.0000MHz
11 SEP 2001
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DWG NO. 090–0120
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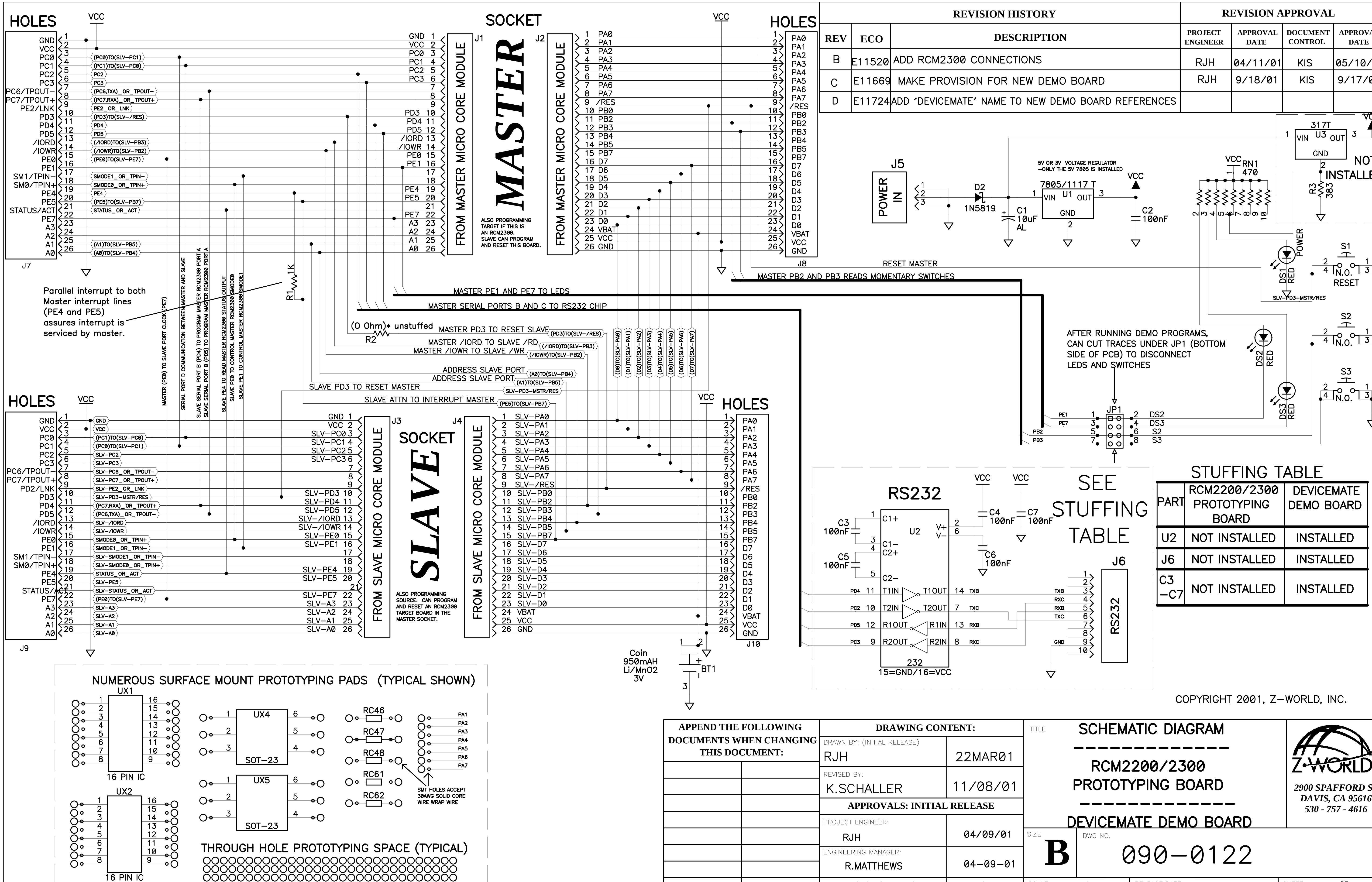
REV LTR C
SHEET 2 OF 2

REVISION HISTORY

REV	ECO	DESCRIPTION	PROJECT ENGINEER	APPROVAL DATE	DOCUMENT CONTROL	APPROVAL DATE
B	E11520	ADD RCM2300 CONNECTIONS	RJH	04/11/01	KIS	05/10/01
C	E11669	MAKE PROVISION FOR NEW DEMO BOARD	RJH	9/18/01	KIS	9/17/01
D	E11724	ADD 'DEVICEMATE' NAME TO NEW DEMO BOARD REFERENCES				

(REVISION APPROVAL spans the last four columns.)



STUFFING TABLE

PART	RCM2200/2300 PROTOTYPING BOARD	DEVICEMATE DEMO BOARD
U2	NOT INSTALLED	INSTALLED
J6	NOT INSTALLED	INSTALLED
C3 –C7	NOT INSTALLED	INSTALLED

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	DRAWN BY: (INITIAL RELEASE) RJH	22MAR01
	REVISED BY: K.SCHALLER	11/08/01
	APPROVALS: INITIAL RELEASE	
	PROJECT ENGINEER: RJH	04/09/01
	ENGINEERING MANAGER: R.MATTHEWS	04-09-01
	SIGNATURES	DATE

TITLE: SCHEMATIC DIAGRAM — RCM2200/2300 PROTOTYPING BOARD — DEVICEMATE DEMO BOARD

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B	090–0122

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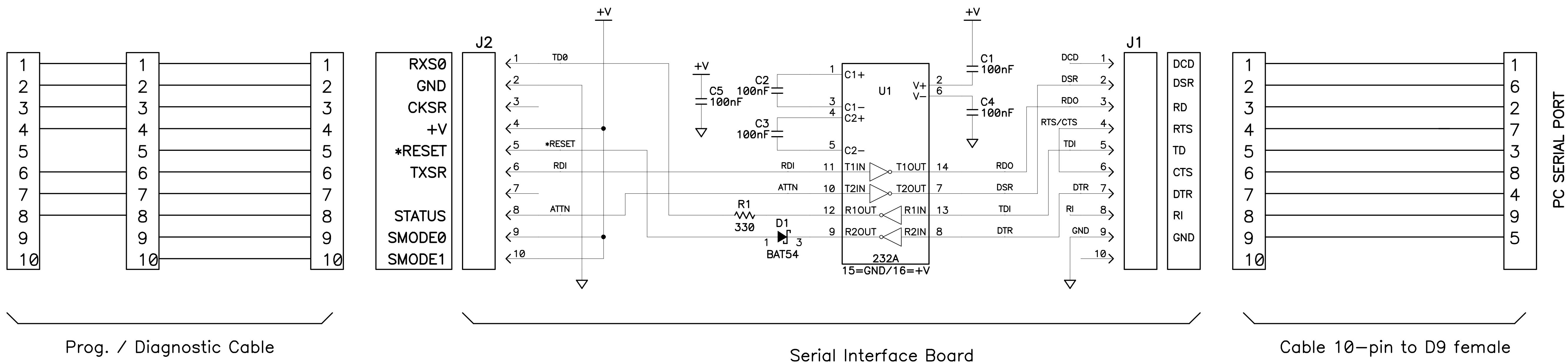
REVISION HISTORY			REVISION APPROVAL			
REV	ECO	DESCRIPTION	PROJECT ENGINEER	APPROVAL DATE	DOCUMENT CONTROL	APPROVAL DATE
A	E11523	INITIAL RELEASE OF SCHEMATIC	EP	5/14/01	KIS	5/14/01
B	E11691	CORRECT DE9 PINOUT				



NOTES: UNLESS OTHERWISE SPECIFIED;

1. ALL RESISTOR VALUES ARE IN OHMS, 1/10W, 5%
2. ALL CAPACITORS ARE 50VDC OR HIGHER.
3. THE ORIGINATION SOURCE OF A VOLTAGE IS REPRESENTED BY (VCC), AND ALL REFERENCES TO THAT VOLTAGE ARE REPRESENTED BY (VCC).

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		DRAWN BY: (INITIAL RELEASE) E. PEAK	14MAY01	SCHEMATIC DIAGRAM RABBIT PROG. CABLE
		REVISED BY: K.SCHALLER	10/04/01	
		APPROVALS: INITIAL RELEASE		
		PROJECT ENGINEER:		SIZE B
		ENGINEERING MANAGER:		DWG NO. 090−0128
		SIGNATURES	DATE	SCALE NONE · RELEASE DATE · SHEET 1 OF 1

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