



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





RabbitCore RCM3360/RCM3370

C-Programmable Core Module
with NAND Flash Mass Storage and Ethernet

User's Manual

019-0145 • 050910-B

RabbitCore RCM3360/RCM3370 User's Manual

Part Number 019-0145 • 050910-B • Printed in U.S.A.

©2005 Z-World Inc. • All rights reserved.

Z-World reserves the right to make changes and improvements to its products without providing notice.

Trademarks

Rabbit is a registered trademark of Rabbit Semiconductor.

Rabbit 3000 and RabbitCore are trademarks of Rabbit Semiconductor.

Z-World and Dynamic C are registered trademarks of Z-World Inc.

xD-Picture Card is a trademark of Fuji Photo Film Co., Olympus Corporation, and Toshiba Corporation.

Z-World, Inc.

2900 Spafford Street
Davis, California 95616-6800
USA

Telephone: (530) 757-3737
Fax: (530) 757-3792

www.zworld.com

Rabbit Semiconductor

2932 Spafford Street
Davis, California 95616-6800
USA

Telephone: (530) 757-8400
Fax: (530) 757-8402

www.rabbitsemiconductor.com

TABLE OF CONTENTS

Chapter 1. Introduction	1
1.1 RCM3360 and RCM3370 Features	2
1.2 Comparing the RCM3365/RCM3375 and RCM3360/RCM3370	4
1.3 Advantages of the RCM3360 and RCM3370	4
1.4 Development and Evaluation Tools	5
1.4.1 RCM3360/RCM3370 Development Kit	5
1.4.2 Software	6
1.4.3 Connectivity Interface Kits	6
1.4.4 Online Documentation	6
Chapter 2. Getting Started	7
2.1 Install Dynamic C	7
2.2 Hardware Connections	8
2.2.1 Attach Module to Prototyping Board	8
2.2.2 Connect Programming Cable	9
2.2.3 Connect Power	10
2.2.3.1 Alternate Power-Supply Connections	10
2.3 Starting Dynamic C	11
2.4 Run a Sample Program	11
2.4.1 Troubleshooting	11
2.5 Where Do I Go From Here?	12
2.5.1 Technical Support	12
Chapter 3. Running Sample Programs	13
3.1 Introduction	13
3.2 Sample Programs	14
3.2.1 Use of Serial Flash	15
3.2.1.1 SF1000 Serial Flash Card	15
3.2.2 Use of NAND Flash	15
3.2.3 Serial Communication	17
3.2.4 RabbitNet	19
3.2.5 Other Sample Programs	19
Chapter 4. Hardware Reference	21
4.1 RCM3360/RCM3370 Digital Inputs and Outputs	22
4.1.1 Memory I/O Interface	27
4.1.2 Other Inputs and Outputs	27
4.1.3 LEDs	27
4.2 Serial Communication	28
4.2.1 Serial Ports	28
4.2.2 Ethernet Port	28
4.3 Programming Port	29
4.3 Programming Cable	30
4.3.1 Changing Between Program Mode and Run Mode	30
4.3.2 Standalone Operation of the RCM3360/RCM3370	31

4.4 Other Hardware	32
4.4.1 Clock Doubler	32
4.4.2 Spectrum Spreader.....	32
4.5 Memory	33
4.5.1 SRAM.....	33
4.5.2 Flash EPROM.....	33
4.5.3 NAND Flash.....	33
4.5.4 Dynamic C BIOS Source Files.....	34
Chapter 5. Software Reference	35
5.1 More About Dynamic C	35
5.1.1 Developing Programs Remotely with Dynamic C	37
5.2 Dynamic C Functions.....	38
5.2.1 Digital I/O.....	38
5.2.2 Serial Communication Drivers	38
5.2.3 TCP/IP Drivers	38
5.2.4 NAND Flash Drivers.....	38
5.2.5 SRAM Use.....	39
5.2.6 Prototyping Board Functions.....	40
5.2.6.1 Board Initialization	40
5.2.6.2 Digital I/O.....	41
5.2.6.3 Switches, LEDs, and Relay	42
5.2.6.4 Serial Communication	43
5.2.6.5 RabbitNet Port	44
5.3 Upgrading Dynamic C	46
5.3.1 Add-On Modules	46
Chapter 6. Using the TCP/IP Features	47
6.1 TCP/IP Connections	47
6.2 TCP/IP Primer on IP Addresses	49
6.2.1 IP Addresses Explained.....	51
6.2.2 How IP Addresses are Used	52
6.2.3 Dynamically Assigned Internet Addresses.....	53
6.3 Placing Your Device on the Network	54
6.4 Running TCP/IP Sample Programs.....	55
6.4.1 How to Set IP Addresses in the Sample Programs.....	56
6.4.2 How to Set Up your Computer for Direct Connect.....	57
6.5 Run the PINGME.C Sample Program.....	58
6.6 Running Additional Sample Programs With Direct Connect	58
6.6.1 RabbitWeb Sample Programs.....	59
6.7 Where Do I Go From Here?.....	59
Appendix A. RCM3360/RCM3370 Specifications	61
A.1 Electrical and Mechanical Characteristics	62
A.1.1 Headers	66
A.2 Bus Loading	67
A.3 Rabbit 3000 DC Characteristics	70
A.4 I/O Buffer Sourcing and Sinking Limit.....	71
A.5 Jumper Configurations	72
A.6 Conformal Coating.....	74
Appendix B. Prototyping Board	75
B.1 Introduction	76
B.1.1 Prototyping Board Features	77
B.2 Mechanical Dimensions and Layout	79
B.3 Power Supply.....	81

B.4 Using the Prototyping Board.....	82
B.4.1 Adding Other Components.....	83
B.4.2 Digital I/O.....	84
B.4.2.1 Digital Inputs.....	84
B.4.3 CMOS Digital Outputs.....	85
B.4.4 Sinking Digital Outputs.....	85
B.4.5 Relay Outputs.....	85
B.4.6 Serial Communication.....	86
B.4.6.1 RS-232.....	87
B.4.6.2 RS-485.....	88
B.4.7 RabbitNet Ports.....	89
B.4.8 Other Prototyping Board Modules.....	90
B.4.9 Quadrature Encoder.....	90
B.4.10 Stepper-Motor Control.....	90
B.5 Prototyping Board Jumper Configurations.....	92
B.6 Use of Rabbit 3000 Parallel Ports.....	94
Appendix C. LCD/Keypad Module	97
C.1 Specifications.....	97
C.2 Contrast Adjustments for All Boards.....	99
C.3 Keypad Labeling.....	100
C.4 Header Pinouts.....	101
C.4.1 I/O Address Assignments.....	101
C.5 Mounting LCD/Keypad Module on the Prototyping Board.....	102
C.6 Bezel-Mount Installation.....	103
C.6.1 Connect the LCD/Keypad Module to Your Prototyping Board.....	105
C.7 Sample Programs.....	106
C.8 LCD/Keypad Module Function Calls.....	107
C.8.1 LCD/Keypad Module Initialization.....	107
C.8.2 LEDs.....	107
C.8.3 LCD Display.....	108
C.8.4 Keypad.....	128
Appendix D. Power Supply	131
D.1 Power Supplies.....	131
D.1.1 Battery-Backup Circuits.....	131
D.1.2 Reset Generator.....	132
Appendix E. RabbitNet	133
E.1 General RabbitNet Description.....	133
E.1.1 RabbitNet Connections.....	133
E.1.2 RabbitNet Peripheral Cards.....	134
E.2 Physical Implementation.....	135
E.2.1 Control and Routing.....	135
E.3 Function Calls.....	136
E.3.1 Status Byte.....	142
Notice to Users	143
Index	145
Schematics	149



1. INTRODUCTION

The RCM3360 and RCM3370 RabbitCore modules feature a compact module that incorporates the latest revision of the powerful Rabbit[®] 3000 microprocessor, flash memory, mass storage (NAND flash), static RAM, and digital I/O ports. The RCM3360 and RCM3370 feature an integrated 10/100Base-T Ethernet port, and provide for LAN and Internet-enabled systems to be built as easily as serial-communication systems.

In addition to the features already mentioned above, the RCM3360 and RCM3370 have two clocks (main oscillator and real-time clock), reset circuitry, and the circuitry necessary for management of battery backup of the Rabbit 3000's internal real-time clock and the static RAM. Two 34-pin headers bring out the Rabbit 3000 I/O bus lines, parallel ports, and serial ports.

The RCM3360's and the RCM3370's mass-storage capabilities make them suited to running the optional Dynamic C FAT file system module where data are stored and handled using the same directory file structure commonly used on PCs.

The RCM3360 or RCM3370 receives +3.3 V power from the customer-supplied motherboard on which it is mounted. The RCM3360 and RCM3370 can interface with all kinds of CMOS-compatible digital devices through the motherboard.

The Development Kit has what you need to design your own microprocessor-based system: a complete Dynamic C software development system and a Prototyping Board that allows you to evaluate the RCM3360 or RCM3370, and to prototype circuits that interface to the RCM3360 or RCM3370 module.

1.1 RCM3360 and RCM3370 Features

- Small size: 1.85" x 2.73" x 0.86"
(47 mm x 69 mm x 22 mm)
- Microprocessor: Rabbit 3000 running at 44.2 MHz
- 52 parallel 5 V tolerant I/O lines: 44 configurable for I/O, 4 fixed inputs, 4 fixed outputs
- Three additional digital inputs, two additional digital outputs
- External reset
- Alternate I/O bus can be configured for 8 data lines and 6 address lines (shared with parallel I/O lines), plus I/O read/write
- Ten 8-bit timers (six cascadable) and one 10-bit timer with two match registers
- 512K flash memory, 512K program execution SRAM, 512K data SRAM
- Fixed and removable mass-storage flash-memory options, which are required to run the optional Dynamic C FAT file system module.
- Real-time clock
- Watchdog supervisor
- Provision for customer-supplied backup battery via connections on header J4
- 10-bit free-running PWM counter and four pulse-width registers
- Two-channel Input Capture (shared with parallel I/O ports) can be used to time input signals from various port pins
- Two-channel Quadrature Decoder accepts inputs from external incremental encoder modules
- Five or six 3.3 V CMOS-compatible serial ports with a maximum asynchronous baud rate of 5.525 Mbps. Three ports are configurable as a clocked serial port (SPI), and two ports are configurable as SDLC/HDLC serial ports (shared with parallel I/O ports).
- Supports 1.15 Mbps IrDA transceiver

The RCM3300/RCM3310 and RCM3305/RCM3315 RabbitCore modules are similar to the RCM3360/RCM3370 and RCM3365/RCM3375, but they use fixed serial flash for their mass-storage flash memories instead of the fixed or removable NAND flash options of the RCM3360/RCM3370 and RCM3365/RCM3375.

Table 1 below summarizes the main features of the RCM3360 and the RCM3370 modules.

Table 1. RCM3360/RCM3370 Features

Feature	RCM3360	RCM3370
Microprocessor	Rabbit 3000 running at 44.2 MHz	
SRAM	512K program (fast SRAM) + 512K data	
Flash Memory (program)	512K	
Flash Memory (mass data storage)	16 Mbytes (fixed) + up to 128 Mbytes (removable) (NAND flash)	up to 128 Mbytes (removable) (NAND flash)
Serial Ports	6 shared high-speed, 3.3 V CMOS-compatible ports: <ul style="list-style-type: none"> • all 6 are configurable as asynchronous serial ports; • 4 are configurable as a clocked serial port (SPI) and 1 is configurable as an HDLC serial port; • option for second HDLC serial port at the expense of 2 clocked serial ports (SPI) 	

Two new RabbitCore modules, the RCM3365 and the RCM3375, are now available. They are similar to the RCM3360 and the RCM3370, but they feature a “hot-swap” capability for the removable *xD-Picture Card*. The two groups of RabbitCore modules are compared in detail in Section 1.2. The *RabbitCore RCM3365/RCM3375 User’s Manual* provides complete information on the RCM3365 and RCM3375 RabbitCore modules.

The RCM3360 and RCM3370 are programmed over a standard PC serial port through a programming cable supplied with the Development Kit, and can also be programmed through a USB port with an RS-232/USB converter, or directly over an Ethernet link using the Dynamic C download manager with or without a RabbitLink.

Appendix A provides detailed specifications for the RCM3360 and the RCM3370.

1.2 Comparing the RCM3365/RCM3375 and RCM3360/RCM3370

The RCM3365/RCM3375 provides enhanced functionality over the RCM3360/RCM3370 RabbitCore modules in that the removable *xD-Picture Card* can be hot-swapped. The design differences between the RCM3365/RCM3375 and the RCM3360/RCM3370 RabbitCore modules are summarized below.

- ***xD-Picture Card* hot-swapping.** The control and data signals from the *xD-Picture Card* are isolated on the RCM3365/RCM3375, and bit PB0 is used to detect the presence of the *xD-Picture Card*. If this card detect capability is not needed, resistor R96 may be removed to maintain pin compatibility with the RCM3360/RCM3370.
- **SPEED LED.** A **SPEED** LED has been added on the RCM3365/RCM3375 to indicate when the RCM3365/RCM3375 is connected to a 100Base-T Ethernet connection.
- **Ethernet chip.** A different Ethernet controller chip is used on the RCM3365/RCM3375. You will need to recompile existing applications written for the RCM3360/RCM3370 using the current version of Dynamic C to enable them to work with the RCM3365/RCM3375.
- **Maximum current.** The RCM3365/RCM3375 draws 250 mA vs. the 350 mA required by the RCM3360/RCM3370.

1.3 Advantages of the RCM3360 and RCM3370

- Fast time to market using a fully engineered, “ready-to-run/ready-to-program” micro-processor core.
- Competitive pricing when compared with the alternative of purchasing and assembling individual components.
- Easy C-language program development and debugging
- Program download utility (Rabbit Field Utility) and cloning board options for rapid production loading of programs.
- Generous memory size allows large programs with tens of thousands of lines of code, and substantial data storage.
- Integrated Ethernet port for network connectivity, with royalty-free TCP/IP software.
- Ideal for network-enabling security and access systems, home automation, HVAC systems, and industrial controls

1.4 Development and Evaluation Tools

1.4.1 RCM3360/RCM3370 Development Kit

The RCM3360/RCM3370 Development Kit contains the hardware you need to use your RCM3360 or RCM3370 module.

- RCM3360 module.
- Prototyping Board.
- AC adapter, 12 V DC, 1 A (included only with Development Kits sold for the North American market). A header plug leading to bare leads is provided to allow overseas users to connect their own power supply with a DC output of 8–30 V.)
- Programming cable with 10-pin header and DE9 connections.
- *Dynamic C*[®] and *Dynamic C* FAT file system module CD-ROMs, with complete product documentation on disk.
- *Getting Started* instructions.
- 32 MB *xD-Picture Card*[™].
- Accessory parts for use on the Prototyping Board.
- Screwdriver and Ethernet cables.
- *Rabbit 3000 Processor Easy Reference* poster.
- Registration card.

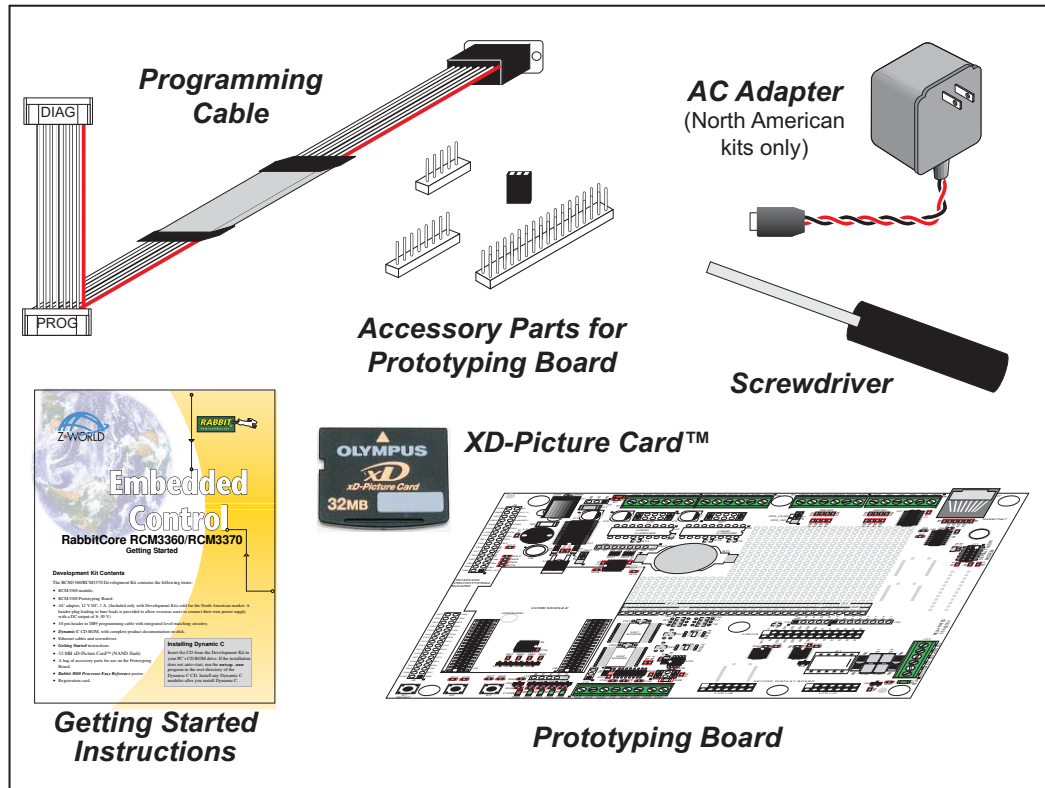


Figure 1. RCM3360/RCM3370 Development Kit

1.4.2 Software

The RCM3360 and the RCM3370 are programmed using version 9.01 or later of Dynamic C. A compatible version is included on the Development Kit CD-ROM.

Z-World also offers for purchase add-on Dynamic C modules including the popular μ C/OS-II real-time operating system, as well as point-to-point protocol (PPP), Advanced Encryption Standard (AES), FAT file system, Secure Sockets Layer (SSL), RabbitWeb, and other select libraries. In addition to the Web-based technical support included at no extra charge, a one-year telephone-based technical support module is also available for purchase. Visit our Web site at www.zworld.com for further information and complete documentation for each module, or contact your Z-World sales representative or authorized distributor.

NOTE: Version 2.05 or later of the Dynamic C FAT file system module is required to use the FAT file system with the RCM3360 and RCM3370 models.

1.4.3 Connectivity Interface Kits

Z-World has available additional interface kits to allow you to provide a wireless interface to the RCM3360/RCM3370 and to use the RCM3360/RCM3370 with header sockets that have a 0.1" pitch.

- **Wi-Fi Add-On Kit (Z-World Part No. 101-0997)**—The Wi-Fi Add-On Kit for the RCM3000–RCM3300 footprint consists of an RCM3000–RCM3300 Interposer Board, a Wi-Fi CompactFlash card with a CompactFlash Wi-Fi Board, a ribbon interconnecting cable, and the software drivers and sample programs to help you enable your RCM3360/RCM3370 module with Wi-Fi capabilities. The RCM3000–RCM3300 Interposer Board is placed between the RCM3360/RCM3370 module and the RCM3300 Prototyping Board so that the CompactFlash Wi-Fi Board, which holds the Wi-Fi CompactFlash card, can be connected to the RCM3360/RCM3370-based system via the ribbon cable provided.
- **Connector Adapter Board (Z-World Part No. 151-0114)**—allows you to plug the RCM3360/RCM3370 whose headers have a 2 mm pitch into header sockets with a 0.1" pitch.

Visit our Web site at www.zworld.com or contact your Z-World sales representative or authorized distributor for further information.

1.4.4 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, use your browser to find and load **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 sites as well.

2. GETTING STARTED

This chapter explains how to set up and use the RCM3360/RCM3370 modules with the accompanying Prototyping Board.

NOTE: It is assumed that you have a Development Kit. If you purchased an RCM3360 or RCM3370 module by itself, you will have to adapt the information in this chapter and elsewhere to your test and development setup.

2.1 Install Dynamic C

To develop and debug programs for the RCM3360/RCM3370 (and for all other Z-World and Rabbit Semiconductor hardware), you must install and use Dynamic C.

If you have not yet installed Dynamic C version 9.01 (or a later version), do so now by inserting the Dynamic C CD from the Development Kit in your PC's CD-ROM drive. If autorun is enabled, the CD installation will begin automatically.

If autorun is disabled or the installation otherwise does not start, use the Windows **Start | Run** menu or Windows Disk Explorer to launch **setup.exe** from the root folder of the CD-ROM.

The installation program will guide you through the installation process. Most steps of the process are self-explanatory.

Dynamic C uses a COM (serial) port to communicate with the target development system. The installation allows you to choose the COM port that will be used. The default selection is COM1. You may select any available port for Dynamic C's use. If you are not certain which port is available, select COM1. This selection can be changed later within Dynamic C.

NOTE: The installation utility does not check the selected COM port in any way. Specifying a port in use by another device (mouse, modem, etc.) may lead to a message such as "**could not open serial port**" when Dynamic C is started.

Once your installation is complete, you will have up to three icons on your PC desktop. One icon is for Dynamic C, one opens the documentation menu, and the third is for the Rabbit Field Utility, a tool used to download precompiled software to a target system.

Install any Dynamic C modules after you have installed Dynamic C. The modules may be installed in any order. You must install the modules in the same directory where Dynamic C was installed.

2.2 Hardware Connections

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

1. Attach the RCM3360/RCM3370 module to the Prototyping Board.
2. Connect the programming cable between the RCM3360/RCM3370 and the workstation PC.
3. Connect the power supply to the Prototyping Board.

2.2.1 Attach Module to Prototyping Board

Turn the RCM3360/RCM3370 module so that the Ethernet jack is facing the direction shown in Figure 2 below. Align the pins from headers J3 and J4 on the bottom side of the module into header sockets JA and JB on the Prototyping Board. The picture card (NAND flash) does not have to be inserted into header J6 on the RCM3360/RCM3370 at this time.

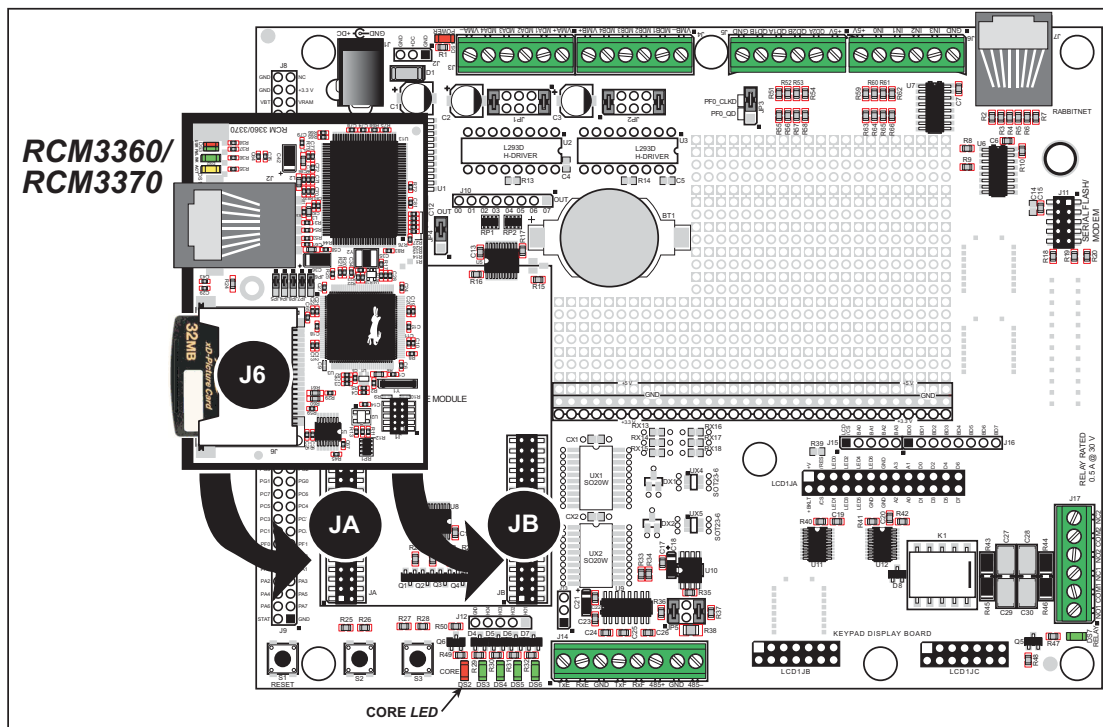


Figure 2. Install the RCM3360/RCM3370 Module on the Prototyping Board

NOTE: It is important that you line up the pins on headers J3 and J4 of the RCM3360/RCM3370 module exactly with the corresponding pins of header sockets JA and JB on the Prototyping 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.

Press the module's pins firmly into the Prototyping Board header sockets.

2.2.2 Connect Programming Cable

The programming cable connects the RCM3360/RCM3370 to the PC running Dynamic C to download programs and to monitor the RCM3360/RCM3370 module during debugging.

Connect the 10-pin connector of the programming cable labeled **PROG** to header J1 on the RCM3360/RCM3370 module as shown in Figure 3. There is a small dot on the circuit board next to pin 1 of header J1. 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 nonprogramming serial connection.)

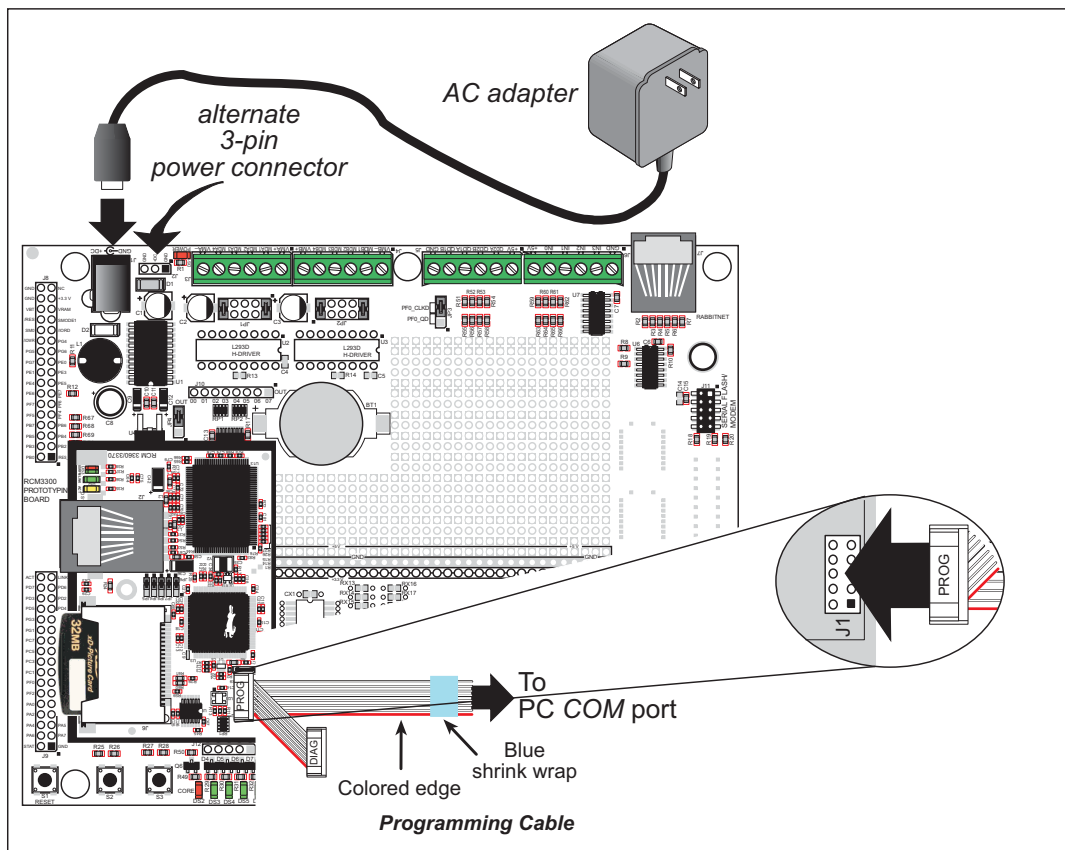


Figure 3. Connect Programming Cable and Power Supply

NOTE: Be sure to use the programming cable (part number 101-0542) supplied with this Development Kit—the programming cable has blue shrink wrap around the RS-232 converter section located in the middle of the cable. Programming cables with clear or red shrink wrap from other Z-World or Rabbit Semiconductor kits were not designed to work with RCM3360/RCM3370 modules.

Connect the other end of the programming cable to a COM port on your PC.

NOTE: Some PCs now come equipped only with a USB port. It may be possible to use an RS-232/USB converter (Z-World Part No. 540-0070) with the programming cable supplied with the Development Kit. An RS-232/USB converter is available through the Z-World Web store.

2.2.3 Connect Power

When all other connections have been made, you can connect power to the Prototyping Board. Connect the wall transformer to jack J1 on the Prototyping Board as shown in Figure 3.

Plug in the wall transformer. The core LED on the Prototyping Board should light up. The RCM3360/RCM3370 and the Prototyping Board are now ready to be used.

NOTE: A **RESET** button is provided on the Prototyping Board to allow a hardware reset without disconnecting power.

2.2.3.1 Alternate Power-Supply Connections

All Development Kits include a header connector that may be used to connect your power supply to 3-pin header J2 on the Prototyping Board. The connector may be attached either way as long as it is not offset to one side—the center pin of J2 is always connected to the positive terminal, and either edge pin is negative. The power supply should deliver 8 V to 30 V DC at 8 W.

2.3 Starting Dynamic C

Once the RCM3360/RCM3370 is connected as described in the preceding pages, start Dynamic C by double-clicking on the Dynamic C icon or by double-clicking on **dcrabXXXX.exe** in the Dynamic C root directory, where **XXXX** are version-specific characters.

Dynamic C uses the serial port on your PC that you specified during installation.

If you are using a USB port to connect your computer to the RCM3360/RCM3370 module, choose **Options > Project Options** and select “Use USB to Serial Converter” on the **Communications** tab.

2.4 Run a Sample Program

Since the RCM3360 and the RCM3370 run at 44.2 MHz and are equipped with a fast program-execution SRAM, you should first set the compiler to run the application in the fast program execution SRAM by selecting **Code and BIOS in Flash, Run in RAM** from the Dynamic C **Options > Project Options > Compiler** menu.

Use the **File** menu to open the sample program **PONG.C**, which is in the Dynamic C **SAMPLES** folder. Press function key **F9** to compile and run the program. The **STDIO** window will open on your PC and will display a small square bouncing around in a box.

This program shows that the CPU is working. The sample program described in Section 6.5, “Run the PINGME.C Sample Program,” tests the TCP/IP portion of the board.

2.4.1 Troubleshooting

If a program compiles and loads, but then loses target communication before you can begin debugging, it is possible that your PC cannot handle the default debugging baud rate. Try lowering the debugging baud rate as follows.

- Locate the **Serial Options** dialog in the Dynamic C **Options > Project Options > Communications** menu. Choose a lower debug baud rate.

If Dynamic C cannot find the target system (error message "**No Rabbit Processor Detected.** "):

- Check that the RCM3360/RCM3370 is powered correctly — the red core LED on the Prototyping Board should be lit when the RCM3360/RCM3370 is mounted on the Prototyping Board and the AC adapter is plugged in.
- Check to make sure you are using the **PROG** connector, not the **DIAG** connector, on the programming cable.
- Check both ends of the programming cable to ensure that they are firmly plugged into the PC and the programming port on the RCM3360/RCM3370.
- Ensure that the RCM3360/RCM3370 module is firmly and correctly installed in its connectors on the Prototyping Board.

- Select a different COM port within Dynamic C. From the **Options** menu, select **Project Options**, then select **Communications**. 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.

2.5 Where Do I Go From Here?

If the sample program ran fine, you are now ready to go on to other sample programs and to develop your own applications. The source code for the sample programs is provided to allow you to modify them for your own use. The *RCM3360/RCM3370 User's Manual* also provides complete hardware reference information and describes the software function calls for the RCM3360 and the RCM3370, the Prototyping Board, and the optional LCD/keypad module.

For advanced development topics, refer to the *Dynamic C User's Manual* and the *Dynamic C TCP/IP User's Manual*, also in the online documentation set.

2.5.1 Technical Support

NOTE: If you purchased your RCM3360/RCM3370 through a distributor or through a Z-World or Rabbit Semiconductor partner, contact the distributor or partner first for technical support.

If there are any problems at this point:

- Use the Dynamic C **Help** menu to get further assistance with Dynamic C.
- Check the Z-World/Rabbit Semiconductor Technical Bulletin Board at www.zworld.com/support/bb/.
- Use the Technical Support e-mail form at www.zworld.com/support/questionSubmit.shtml.

3. RUNNING SAMPLE PROGRAMS

To develop and debug programs for the RCM3360/RCM3370 (and for all other Z-World and Rabbit Semiconductor hardware), you must install and use Dynamic C.

3.1 Introduction

To help familiarize you with the RCM3360 and RCM3370 modules, Dynamic C includes several sample programs. Loading, executing and studying these programs will give you a solid hands-on overview of the RCM3360/RCM3370's capabilities, as well as a quick start using Dynamic C as an application development tool.

NOTE: The sample programs assume that you have at least an elementary grasp of the C programming language. If you do not, see the introductory pages of the *Dynamic C User's Manual* for a suggested reading list.

More complete information on Dynamic C is provided in the *Dynamic C User's Manual*.

In order to run the sample programs discussed in this chapter and elsewhere in this manual,

1. Your RCM3360/RCM3370 module must be plugged in to the Prototyping Board as described in Chapter 2, "Getting Started."
2. Dynamic C must be installed and running on your PC.
3. The programming cable must connect the programming header on the RCM3360/RCM3370 to your PC.
4. Power must be applied to the RCM3360/RCM3370 through the Prototyping Board.

Refer to Chapter 2, "Getting Started," if you need further information on these steps.

Since the RCM3360 and the RCM3370 run at 44.2 MHz and are equipped with a fast program execution SRAM, remember to allow the compiler to run the application in the fast program execution SRAM by selecting **Code and BIOS in Flash, Run in RAM** from the Dynamic C **Options > Project Options > Compiler** menu.

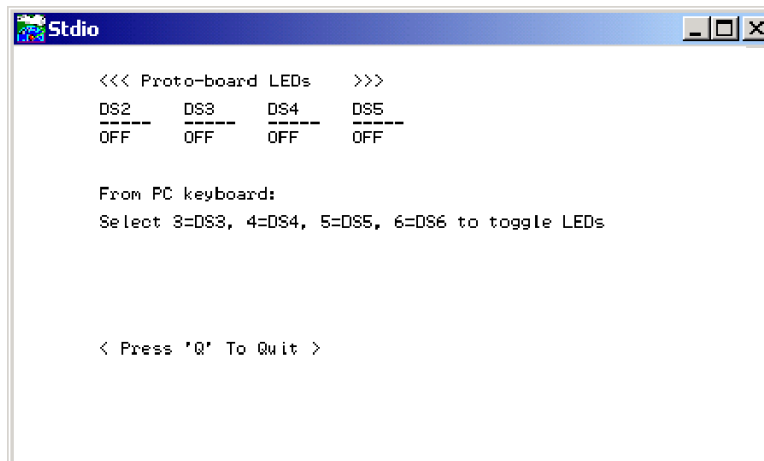
To run a sample program, open it with the **File** menu, then press function key **F9** to compile and run the program. The RCM3360/RCM3370 must be in Program Mode (see Figure 8) and must be connected to a PC using the programming cable.

3.2 Sample Programs

Of the many sample programs included with Dynamic C, several are specific to the RCM3360 and the RCM3370. Sample programs illustrating the general operation of the RCM3360/RCM3370, serial communication, and the NAND flash are provided in the `SAMPLES\RCM3360` folder. Each sample program has comments that describe the purpose and function of the program. Follow the instructions at the beginning of the sample program. Note that the RCM3360/RCM3370 must be installed on the Prototyping Board when using the sample programs described in this chapter.

- **CONTROLLED.c**—Demonstrates use of the digital inputs by having you turn the LEDs on the Prototyping Board on or off from the **STDIO** window on your PC.

Once you compile and run **CONTROLLED.c**, the following display will appear in the Dynamic C **STDIO** window.



```
<<< Proto-board LEDs >>>
DS2   DS3   DS4   DS5
---   ---   ---   ---
OFF   OFF   OFF   OFF

From PC keyboard:
Select 3=DS3, 4=DS4, 5=DS5, 6=DS6 to toggle LEDs

< Press 'Q' To Quit >
```

Press “2” or “3” or “4” or “5” on your keyboard to select LED DS3 or DS4 or DS5 or DS6 on the Prototyping Board. Then follow the prompt in the Dynamic C **STDIO** window to turn the LED on or off.

- **FLASHLED.c**—Demonstrates assembly-language program by flashing the USR LED on the RCM3360/RCM3370 and LEDs DS3, DS4, DS5, and DS6 on the Prototyping Board.
- **SWRELAY.c**—Demonstrates the relay-switching function call using the relay installed on the Prototyping Board through screw-terminal header J17.
- **TOGGLESWITCH.c**—Uses costatements to detect switches S2 and S3 using debouncing. The corresponding LEDs (DS3 and DS4) will turn on or off.

Once you have loaded and executed these four programs and have an understanding of how Dynamic C and the RCM3360/RCM3370 modules interact, you can move on and try the other sample programs, or begin building your own.

3.2.1 Use of Serial Flash

3.2.1.1 SF1000 Serial Flash Card

The following sample program can be found in the `SAMPLES\RCM3360\SF1000` folder.

- `SERFLASHTEST.c`—An optional SF1000 Serial Flash card is required to run this demonstration. Install the Serial Flash card into socket J11 on the Prototyping Board. This sample program demonstrates how to read and write from/to the Serial Flash card.

3.2.2 Use of NAND Flash

The following sample programs can be found in the `SAMPLES\RCM3360\NANDFlash` folder. As you run most of these sample programs, you will be prompted in the Dynamic C **STDIO** window to select either the soldered-in NAND flash (RCM3360 model only) or the socketed *xD-Picture Card* (0 = soldered, 1 = socketed).

- `NFLASH_DUMP.c`—This program is a utility for dumping the nonerased contents of a NAND flash chip to the Dynamic C **STDIO** window, and the contents may be redirected to a serial port.

When the sample program starts running, it attempts to communicate with the user-selected NAND flash chip. If this communication is successful and the main page size is acceptable, the nonerased page contents (non 0xFF) from the NAND flash page are dumped to the Dynamic C **STDIO** win. for inspection.

Note that an error message will appear when the first 32 pages (0x20 pages) are “dumped.” You may ignore the error message.

- `NFLASH_INSPECT.c`—This program is a utility for inspecting the contents of a NAND flash chip. When the sample program starts running, it attempts to initialize the NAND flash chip selected by the user. Once a NAND flash chip is found, the user can execute various commands to print out the contents of a specified page, clear (set to zero) all the bytes in a specified page, erase, or write to specified pages.

CAUTION: When you run this sample program, enabling the `#define NFLASH_CANERASEBADBLOCKS` macro makes it possible to write to bad blocks. The first two blocks on the *xD-Picture Card* are marked bad to protect the configuration data needed to use the card in a digital camera or PC. You will only be able to use the *xD-Picture Card* in Rabbit-based systems if either of the first two blocks is written to.

- `NFLASH_LOG.c`—This program runs a simple Web server and stores a log of hits in the NAND flash. As long as the *xD-Picture Card* is plugged in to its connector J6, this sample program will log hits to the *xD-Picture Card*. Remove the *xD-Picture Card* if you wish to log hits on the soldered-in NAND flash (RCM33600 model only).

This log can be viewed and cleared from a browser by connecting the RJ-45 jack on the RCM3360 to your PC as described in Section 6.1.

Follow these instructions to set up your PC or notebook. Check with your administrator if you are unable to change the settings as described here since you may need administrator privileges. The instructions are specifically for Windows 2000, but the interface is similar for other versions of Windows.

TIP: If you are using a PC that is already on a network, you will disconnect the PC from that network to run these sample programs. Write down the existing settings before changing them to facilitate restoring them when you are finished with the sample programs and reconnect your PC to the network.

1. Go to the control panel (**Start > Settings > Control Panel**), and then double-click the Network icon.
2. Select the network interface card used for the Ethernet interface you intend to use (e.g., **TCP/IP Xircom Credit Card Network Adapter**) and click on the “Properties” button. Depending on which version of Windows your PC is running, you may have to select the “Local Area Connection” first, and then click on the “Properties” button to bring up the Ethernet interface dialog. Then “Configure” your interface card for a “10Base-T Half-Duplex” or an “Auto-Negotiation” connection on the “Advanced” tab.

NOTE: Your network interface card will likely have a different name.

3. Now select the **IP Address** tab, and check **Specify an IP Address**, or select TCP/IP and click on “Properties” to assign an IP address to your computer (this will disable “obtain an IP address automatically”):

IP Address : 10.10.6.101

Netmask : 255.255.255.0

Default gateway : 10.10.6.1

4. Click **<OK>** or **<Close>** to exit the various dialog boxes.

As long as you have not modified the **TCPCONFIG 1** macro in the sample program, enter the following server address in your Web browser to bring up the Web page served by the sample program.

`http://10.10.6.100`

Otherwise use the TCP/IP settings you entered in the **TCP_CONFIG.LIB** library.

This sample program does not exhibit ideal behavior in its method of writing to the NAND flash. However, the inefficiency attributable to the small amount of data written in each append operation is offset somewhat by the expected relative infrequency of these writes, and by the sample program's method of “walking” through the flash blocks when appending data as well as when a log is cleared.

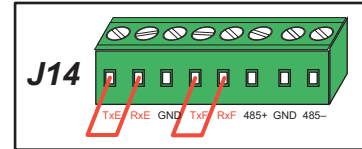
- **NFLASH_ERASE.c**—This program is a utility to erase all the good blocks on a NAND flash chip. When the program starts running, it attempts to establish communication with the NAND flash chip selected by the user. If the communication is successful, the progress in erasing the blocks is displayed in the Dynamic C **STDIO** window as the blocks are erased.

3.2.3 Serial Communication

The following sample programs can be found in the `SAMPLES\RCM3360\SERIAL` folder.

- **FLOWCONTROL.C**—This program demonstrates hardware flow control by configuring Serial Port F for CTS/RTS with serial data coming from TxE (Serial Port E) at 115,200 bps. One character at a time is received and is displayed in the **STDIO** window.

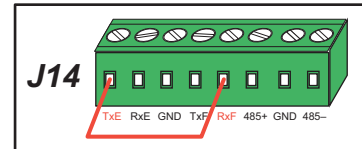
To set up the Prototyping Board, you will need to tie TxE and RxE together on the RS-232 header at J14, and you will also tie TxF and RxF together as shown in the diagram.



A repeating triangular pattern should print out in the **STDIO** window. The program periodically switches RTS (TxF) flow control on or off to demonstrate the effect of hardware flow control.

- **PARITY.C**—This program demonstrates the use of parity modes by repeatedly sending byte values 0–127 from Serial Port E to Serial Port F. The program will switch between generating parity or not on Serial Port E. Serial Port F will always be checking parity, so parity errors should occur during every other sequence.

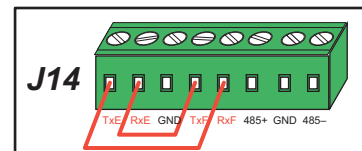
To set up the Prototyping Board, you will need to tie TxE and RxF together on the RS-232 header at J14 as shown in the diagram.



The Dynamic C **STDIO** window will display the error sequence.

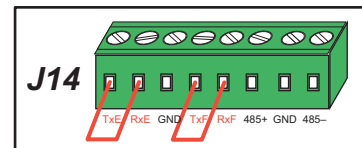
- **SIMPLE3WIRE.C**—This program demonstrates basic RS-232 serial communication. Lower case characters are sent by TxE, and are received by RxF. The characters are converted to upper case and are sent out by TxF, are received by RxE, and are displayed in the Dynamic C **STDIO** window.

To set up the Prototyping Board, you will need to tie TxE and RxF together on the RS-232 header at J14, and you will also tie RxE and TxF together as shown in the diagram.



- **SIMPLE5WIRE.C**—This program demonstrates 5-wire RS-232 serial communication by providing flow control (RTS/CTS) on Serial Port F and data flow on Serial Port E.

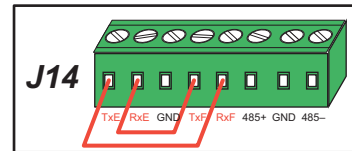
To set up the Prototyping Board, you will need to tie TxE and RxE together on the RS-232 header at J14, and you will also tie TxF and RxF together as shown in the diagram.



Once you have compiled and run this program, you can test flow control by disconnecting TxF from RxF while the program is running. Characters will no longer appear in the **STDIO** window, and will display again once TxF is connected back to RxF. (Do not disconnect the data path between TxE and RxE.)

- **SWITCHCHAR.C**—This program transmits and then receives an ASCII string on Serial Ports E and F. It also displays the serial data received from both ports in the **STDIO** window.

To set up the Prototyping Board, you will need to tie TxE and Rx F together on the RS-232 header at J14, and you will also tie Rx E and Tx F together as shown in the diagram.



Once you have compiled and run this program, press and release S2 on the Prototyping Board to send a message from Serial Port E to Serial Port F; press and release S3 on the Prototyping Board to send a message from Serial Port F to Serial Port E. The data sent between the serial ports will be displayed in the **STDIO** window.

Two sample programs, **SIMPLE485MASTER.C** and **SIMPLE485SLAVE.C**, are available to illustrate RS-485 master/slave communication. To run these sample programs, you will need a second Rabbit-based system with RS-485—the second system may be another RCM3360/RCM3370, or it may be any Z-World single-board computer or RabbitCore module that supports RS-485 serial communication as long as you use the master or slave sample program associated with that board.

Before running either of these sample programs on the RCM3360/RCM3370 assembly, make sure pins 1–2 and pins 5–6 are jumpered together on header JP5 to use the RS-485 bias and termination resistors. The sample programs use Serial Port C as the RS-485 serial port, and they use PD7 to enable/disable the RS-485 transmitter.

The RS-485 connections between the slave and master devices are as follows.

- RS485+ to RS485+
- RS485– to RS485–
- GND to GND
- **SIMPLE485MASTER.C**—This program demonstrates a simple RS-485 transmission of lower case letters to a slave. The slave will send back converted upper case letters back to the master and display them in the **STDIO** window. Use **SIMPLE485SLAVE.C** to program the slave—reset the slave before you run **SIMPLE485MASTER.C** on the master.
- **SIMPLE485SLAVE.C**—This program demonstrates a simple RS-485 transmission of lower case letters to a master. The slave will send back converted upper case letters back to the master and display them in the **STDIO** window. Compile and run this program on the slave before you use **SIMPLE485MASTER.C** to program the master.

3.2.4 RabbitNet

Sample programs are available for each RabbitNet peripheral card, and can be found in the Dynamic C `SAMPLES\RabbitNet` folder. When you run any of these sample programs in conjunction with the RCM3360/RCM3370 and the Prototyping Board, you need to add the line

```
#use rcm33xx.lib
```

at the beginning of the sample program.

TIP: You need to add `#use rcm33xx.lib` at the beginning of any sample program that is not in the Dynamic C `SAMPLES\RCM3360` folder.

3.2.5 Other Sample Programs

Section 6.6 describes the TCP/IP sample programs, and Appendix C.7 provides sample programs for the optional LCD/keypad module that can be installed on the Prototyping Board.