

Robcomm3
plus Other
Editor, Compiler, and Terminal
Options

UMI-R3-151



Robcomm3 plus Other Editors, Compiler, and Terminals

Revision		
Number	History	Date
	Pre-C500C editions released as UMI-R3-105 and UMI-R3-150	
001	First release as UMI-R3-151	99-05

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CHAPTER 1





Quick Start

Robcomm3 is a Windows-based software application designed for use with the RAPL-3 robot programming language. Robcomm3's integrated development environment allows you to:

- create and edit robot programs as source files.
- compile source files into object files.
- transfer files between the computer and the controller.
- simplify compiling and transferring with the application setup feature.
- communicate interactively with the controller using the terminal window.

Basics

This is a quick summary of the basics of Robcomm3.

Function	Button	Drop-down Menu	Comments
Edit Program		File/New or File/Open	Opens a program in an editor window for editing.
Set Up App		Application/New App or Application/Open App and Application/Setup	Automates compiling a program and sending a program to the controller.
Compile Program		Application/Compile	Compiles a program.
Transfer File (from within App)		Application/Send	Sends a program to an app directory on the controller.
Transfer File (without App)		C500/File Transfer	Sends/retrieves any file to/from the controller.
Communicate with Controller		C500/Terminal	Opens terminal to controller. Use system shell or ash commands.

CHAPTER 2

Installation

This chapter describes all procedures that you need for installing and configuring Robcomm3.

Preparing to Install

Before installing Robcomm3, ensure that you have the proper hardware and software.

Computer

Recommended specifications can be exceeded where available.

		Recommended	Minimum
CPU		Pentium	486
Speed		90 MHz	66 MHz
RAM		16 Mb	16 Mb
Operating System		Windows 95 or Windows NT 4.0 or higher	
Drive for Installation	Stand-Alone Robot	3.5 inch diskette	
	POLARA	CD-ROM	

Controller

The robot controller must be able to run CROS-500.

- If you purchased a controller for a CROS/RAPL-3 system, your controller meets CROS requirements. It is either:
 - C500B for an F3 arm, or
 - C500 (with a recent serial number) for an A465 or A255 arm
- If you are upgrading from RAPL-II to CROS/RAPL-3, you will need to check the controller. See the relevant section in the *CROS and System Shell*. An older controller may need a hardware upgrade.

Cable

You need a cable to connect the computer to the controller. It must be:

- Straight-through (not null modem).
- Controller end, 25 pin (male) connector.
- Computer end, to fit your serial port. If your computer is recently manufactured, you likely need a 9 socket (female) connector. An older computer may need a 25 socket (female) connector.

Multiple Serial Port Expander

You may be using a multiple serial port expander for other devices or POLARA instruments. We recommend that you avoid the expander for the connection between the computer and the controller. Use a serial port from the computer's mother board or regular serial i/o board.

Robcomm3 and CROS-500

You need Robcomm3 and CROS-500. Depending on your system, they are on diskettes or CD.

	Robcomm3	CROS-500
Stand-Alone Robot	2 diskettes	2 diskettes
POLARA	CD-ROM	

Installing Robcomm3

Installing Robcomm3 varies depending on your robot system.

- For a stand-alone robot, you install Robcomm3 from the diskettes provided with your robot.
- For a POLARA system, you install Robcomm3 from the POLARA CD, usually as part of the overall POLARA installation.

Even though the installation procedure is different, it is the same Robcomm3.

For a Stand-Alone Robot

You can use any one of the three standard methods available from the Start menu (Run Window, Explorer, or Add Program Utility). The Start menu is part of your Windows desktop toolbar.

From the Run Window

The Run function is available directly from the Start menu.

1. Insert Robcomm3 diskette 1 in your computer's diskette drive.
2. From the Start menu, select Run. The small Run window displays.
3. Select the drive and setup file.
 - In the Open box, type the name of the drive and the filename "setup.exe", such as
a:\setup.exe
and click OK.

- Click Browse, and from the Browse window, search for the drive and file named "setup.exe". After you have selected the file, click Open.

The Robcomm3 installation screen displays.

4. Follow the installation instructions.

From Explorer

Windows 95 Explorer or Windows NT Explorer is available from the Programs sub-menu of the Start menu.

1. Insert Robcomm3 diskette 1 in your computer's diskette drive.
2. Start Explorer. From the Start menu, point to Programs and click on Windows Explorer.
3. Select the drive by clicking on the icon for the appropriate drive.
4. Double-click on "setup.exe". The Robcomm3 installation screen displays.
5. Follow the installation instructions.

From the Add Program Utility

The Add Program utility is part of the Control Panel which is available from the Settings sub-menu of the Start menu.

1. Insert Robcomm3 diskette 1 in your computer's diskette drive.
2. Open the Add Program window. From the Start menu, point to Settings and click on Control Panel. The Control Panel window displays.
3. Select Add/Remove Programs. The Add/Remove Programs Properties window displays.
4. From the Install/Uninstall tab, click the Install button.
5. If your system does not locate the drive, click Browse, and from the Browse window, search for the drive and file named "setup.exe". After you have selected the file, click Open.
6. When the path is in the box of the Run Installation Program window, click Finish. The Robcomm3 installation screen displays.
7. Follow the installation instructions.

For a POLARA System

Install from the POLARA splash screen (the picture of a lab system with the POLARA logo). You can install only Robcomm3 now and install other POLARA components later. Or, you can install Robcomm3 with all other POLARA components now.

Automatically from the CD

The CD is set up to automatically display the POLARA splash screen when you insert the CD into the CD drive.

If you do not immediately get the POLARA splash screen, you can get to it by using any one of the three standard methods available from the Start menu (Run Window, Explorer, or Add Program Utility). The Start menu is part of your Windows desktop toolbar.

Manually from the Run Window

The Run function is available directly from the Start menu.

1. Insert the POLARA CD in your computer's CD drive.
2. From the Start menu, select Run. The small Run window displays.
3. Select the drive and POLARACD file.
 - In the Open box, type the name of the drive and the filename "POLARACD.exe", such as
e:\POLARACD.exe
and click OK.
 - Click Browse, and from the Browse window, search for the drive and file named "POLARACD.exe". After you have selected the file, click Open.

The POLARA splash screen displays.

4. Click on Robcomm3.
5. Follow the installation instructions.

Manually from Explorer

Windows 95 Explorer or Windows NT Explorer is available from the Programs sub-menu of the Start menu.

1. Insert the POLARA CD in your computer's CD drive.
2. Start Explorer. From the Start menu, point to Programs and click on Windows Explorer.
3. Select the drive by clicking on the icon for the appropriate drive.
4. Double-click on POLARACD.exe. The POLARA splash screen displays.
5. Click on Robcomm3.
6. Follow the installation instructions.

Manually from the Add Program Utility

The Add Program utility is part of the Control Panel which is available from the Settings sub-menu of the Start menu.

1. Insert the POLARA CD in your computer's CD drive.
2. Open the Add Program window. From the Start menu, point to Settings and click on Control Panel. The Control Panel window displays.
3. Select Add/Remove Programs. The Add/Remove Programs Properties window displays.
4. From the Install/Uninstall tab, click the Install button.
5. If your system does not locate the drive, click Browse, and from the Browse window, search for the drive and file named "POLARA.exe". After you have selected the file, click Open.
6. When the path is in the box of the Run Installation Program window, click Finish. The POLARA splash screen displays.
7. Click on Robcomm3.
8. Follow the installation instructions.

CROS-500 Requirement

If you are setting up a stand-alone robot, and the controller was delivered from the factory, complete the next procedure, *Installing CROS-500*.

If you have any of the following conditions, see the *CROS and System Shell*.

- Upgrading a RAPL-II controller to CROS/RAPL-3.
- Re-installing CROS on a controller.
- Installing CROS for Windows NT and CROS-500 on a computer as part of a POLARA installation.

Installing CROS-500

If you are going to write and compile programs to run on the controller, install CROS-500 on the computer.

For a Stand-Alone Robot

You can use any one of the three standard methods available from the Start menu (Run Window, Explorer, or Add Program Utility). The Start menu is part of your Windows desktop toolbar.

From the Run Window

The Run function is available directly from the Start menu.

1. Insert CROS-500 diskette 1 in your computer's diskette drive.
2. From the Start menu, select Run. The small Run window displays.
3. Select the drive and setup file.
 - In the Open box, type the name of the drive and the filename "setup.exe", such as
a:\setup.exe
and click OK.
 - Click Browse, and from the Browse window, search for the drive and file named "setup.exe". After you have selected the file, click Open.

The CROS-500 installation screen displays.

4. Follow the installation instructions.

From Explorer

Windows 95 Explorer or Windows NT Explorer is available from the Programs sub-menu of the Start menu.

1. Insert CROS-500 diskette 1 in your computer's diskette drive.
2. Start Explorer. From the Start menu, point to Programs and click on Windows Explorer.
3. Select the drive by clicking on the icon for the appropriate drive.
4. Double-click on setup.exe. The CROS-500 installation screen displays.
5. Follow the installation instructions.

From the Add Program Utility

The Add Program utility is part of the Control Panel which is available from the Settings sub-menu of the Start menu.

1. Insert CROS-500 diskette 1 in your computer's diskette drive.
2. Open the Add Program window. From the Start menu, point to Settings and click on Control Panel. The Control Panel window displays.
3. Select Add/Remove Programs. The Add/Remove Programs Properties window displays.
4. From the Install/Uninstall tab, click the Install button.
5. If your system does not locate the drive, click Browse, and from the Browse window, search for the drive and file named "setup.exe". After you have selected the file, click Open.
6. When the path is in the box of the Run Installation Program window, click Finish. The CROS-500 installation screen displays.
7. Follow the installation instructions.

Setting Up for Communication

You need to set up for communication if you are going to:

- transfer files between the computer and the controller.
- communicate interactively with the controller using the terminal window.

You do not need to set up for communication, if you are only going to:

- create, edit, and compile programs.

Installing the Cable

Communication uses a straight-through (not null modem) cable. The controller end of the cable is a DB-25 male/pin connector. The computer end of the cable must fit your computer's serial port and most likely needs to be a DB-9 female/socket connector.

1. Connect the computer end of the cable to a serial port of your computer. A serial port may be labelled "|O|O|O|", "serial", or "com". If you have more than one serial port, note the identifying number of this serial port. (If you are using a multiple serial port expander for many devices, use one of the computer's direct serial ports, not a port through the expander, for Robcomm3.)
2. Connect the controller end of the cable to the communication port inside the drop-down access door of the front panel of the controller.



Warning. Do not connect to the **SYSIO** connector on the rear panel of the controller. The **SYSIO** connector and the communication port are both 25 socket/female connectors. The **SYSIO** connector connects to controller operating circuits and includes a live 24 Volt power supply which will seriously damage you computer circuitry.

Configuring Communication

Robcomm3's communication settings must be set correctly.

1. Start Robcomm3. The Robcomm3 main window, which contains the main menu bar, is displayed.
2. From the C500 menu, choose COM Settings. The Communications Setup window is displayed.
3. Select the communication port being used by the computer. This is the computer's serial port where you connected the cable between the computer and the controller.
4. Select the baud rate to match the controller. The controller's default setting is 38400.
5. Click OK to accept the settings and close the box.

Note: If you set the controller to communicate at a different baud rate, you will have to set your computer to communicate at the same rate. Setting the controller's baud rate with the system shell's `siocfg` command is described in the *CROS and System Shell*.

CHAPTER 3

Editing

One of the primary uses of Robcomm3 is to create and edit a program. Robcomm3 has features for simplifying the editing process.

This chapter describes how to:

- Create a new source file or open an existing source file.
- Use the editing features.

Source File and Object File

RAPL-3 is a compiled language. You write your program in an editor. The file you write is the source file. It is processed through the compiler, which translates the file into a form that can be run easily and quickly on the operating system. This translated file is the object file. Both files are your program. One file you can read. The other file CROS can execute.

To write the source file, use an editor, like the editor window of Robcomm3.

Opening an Editor Window

When you open an editor window, you can work in a new or existing source file.

Opening a New Source File

To open a new file:



1. Open an editor window for a new file.
 - Click the New button.
 - Select New from the File menu.

The editor window opens. (The default colouring is white background with black letters.) “UnTitled” is in the title bar.

Preparing a Directory

If you are using Robcomm3 for the first time, you may want to create a directory for your RAPL-3 files. Use Explorer or a similar tool to create a directory.

Naming and Saving a New File

When you initially open a new file, the file has no name (“UnTitled” is in the title bar), and the file is not set up to be saved (the Save function from the

Save button and the Save option of the File menu are inactive). Before typing in this open window, use the Save As function to rename and save your file.

Note: If you have typed any text in the window, the Save function is active.

1. Select Save As.
 - From the File menu, select Save As.
 - If you have typed text in the file, click the Save button.

The Save As dialog box appears.

2. Select the drive and directory to save this file. If you have a standard robot system, you can save the file in any convenient directory. If you have a system with CROS for Windows NT, you are likely saving this file in program files\crs robotics\CROSnt\image\app*directory_name*
3. Type a name over the asterisk in the filename box. For a basic application, use the same name as your application. The Save As window will add the .r3 extension. Your source file must have a .r3 extension.
4. Click OK to accept this name. The file name appears in the title bar of this editor window.

Opening an Existing Source File

If you have an existing file, you can re-open it to work on that file.

To open an existing file:



1. Select the Open Existing File feature.
 - Click the Open button.
 - Select Open from the File menu.

The Open dialog box is displayed.

2. Select the drive and directory of the file. If you have a standard robot system, you may have files in any convenient directory. The standard examples are in crs\robcomm3\examples. If you have a system with CROS for Windows NT, you are likely saving files in program files\crs robotics\CROSnt\image\app*directory_name*
3. Select a file by:
 - double-clicking on the file
 - highlighting a file and clicking OK

An editor window opens with the file in it. The file name appears in the title bar of this editor window.

Using RAPL-3 Features

Robcomm3 has two features specifically for editing RAPL-3 programs:

- Highlighting of RAPL-3 program elements.
- Commenting and uncommenting sections of the program.

Turning Highlighting On or Off

The highlighting feature allows you to highlight different RAPL-3 program elements. You can turn this on or off.

The setting (on or off) is in effect as long as that editor window stays open. If you close and later re-open that file, open another file, or close and re-start Robcomm3, you lose the setting. When you open a file, Robcomm3's default setting is used, which is highlighting turned on.

To turn the highlighting on or off:

1. From the Edit menu, choose Options. If there is a check mark to the left of Syntax Hi-Lite, it is on. If there is no check mark to the left of Syntax Hi-Lite, it is off. Simply select Syntax Hi-Lite to change the state from off to on, or on to off.

Changing Colours for Highlighting

You can change the colours for the highlighted text and for the background. If you change the colour, this change is in effect for all editor windows.

A change is a permanent setting. It is in effect for all subsequent sessions of Robcomm3. If you close and later re-open that file, or close Robcomm3 and later re-start it, your settings are used.

To change the colour of the text or the background:

1. From the Edit menu, choose Options. Then choose Colour. The Colour Selector appears.
2. Select one of the seven program elements by clicking on it.
3. Select a colour for that element by clicking on a colour box.
4. Repeat steps 3 and 4 for any other elements.
5. Click OK to accept the colours.

Commenting and Uncommenting

In RAPL-3, a comment is preceded by two semi-colons. The comment feature from the Edit menu automatically adds two semi-colons at the beginning of any selected line(s).

This feature is helpful while debugging a program. For example, you can comment out sections of the program, compile for errors and revise until it is error free, and gradually uncomment sections to add them back to the portion being compiled and debugged.

As well, you can comment out a section and then a part of that section (or, conversely, a section and then a group of sections), in effect "nesting" commented text to exclude those pieces for different steps of debugging.

To comment lines of a program:

1. Highlight the lines of text by dragging the cursor with the mouse or holding down the Shift key and pressing the Up or Down arrow key. You only need to highlight part of the line you want to comment.

2. Select Comment from the Edit menu. Two semi-colons (;;) appear at the beginning of the lines. If syntax highlighting is turned on, the lines are greyed out.

To uncomment lines of a program:

1. Highlight the lines of text.
2. Select Uncomment from the Edit menu. Two (only two) semi-colons are removed from the beginning of each line. If this removes all semi-colons from a line and if syntax highlighting is turned on, the words in the line are highlighted according to highlighting colours.

Using Standard Editor Features

Robcomm3 has standard editing features:

- cut
- copy
- paste
- delete
- find
- find next
- replace
- undo

Cut and Paste

The Cut and Paste features allow you to remove text from one section and insert it in another section of that file or in another file.

To cut and paste text in your file:

1. Highlight the text that you wish to remove.
2. Cut the text by
 - selecting the Cut command from the Edit menu or from the right-mouse click menu
 - clicking the Cut button on the toolbar
 - pressing the control (Ctrl) and x keys
3. Place the cursor in the exact position where you want to insert the text.
4. Paste the text by
 - selecting the Paste command from the Edit menu or from the right-mouse click menu
 - clicking the Paste button on the toolbar
 - pressing the control (Ctrl) and v keys

Note: To remove text from your file completely, use one of the cutting options or press the Delete key on the keyboard.

Copy and Paste

The Copy and Paste features allow you to duplicate text in another section of that file or in another file.

To copy text in your file:

1. Highlight the text that you wish to copy.
2. Copy the text by
 - selecting the Copy command from the Edit menu or from the right-mouse click menu
 - clicking the Copy button on the toolbar
 - pressing the control (Ctrl) and c keys
3. Place the cursor in the exact position where you want the copied text to appear.
4. Paste the text by
 - selecting the Paste command from the Edit menu or from the right-mouse click menu
 - clicking the Paste button on the toolbar
 - pressing the control (Ctrl) and v keys

Delete

The Delete feature allows you to remove text from your document.

To delete text from your document:

1. Highlight the text you wish to delete.
2. Delete the text by
 - selecting the Delete command from the Edit menu
 - pressing the Delete key on your keyboard.

The text is removed.

Find

The Find feature allows you to search the open file to locate the text specified in the Find dialog box.

To find specified text:

1. Select the Find command from the Search menu or click the Find button.
2. Type the text you want to find in the Find What box.
3. Select the search options (Match Whole Word, Match Case) you want to use.
4. Specify whether you want to search Up towards the start of the file or Down towards the end of the file.

5. Click Find Next to search for the next occurrence of the specified text. Click Find Next repeatedly to find following occurrences.
6. Click Close to exit.

Options

Match Whole Word Only

Comment lines are not searched when Match Whole Word Only is selected.

Find Next

The Find Next feature allows you to search the open file to find the next occurrence of the last text string specified in the Find dialog box.

You can continue to click the Find Next feature until there are no more occurrences of the text, and a dialog box appears stating “No Matches Found”.

Replace

The replace function allows you to search for specific text in the open file and replace it with specified text. You can replace all instances of the text or have the computer prompt you to make the change for each occurrence of the text. The Replace feature is useful for changing a variable name throughout the file.

To replace occurrences of selected text:

1. Choose Replace from the Search menu.
2. Type the text you want to search for in the Find What box.
3. Type the text you want to replace the specified text with in the Replace With box.
4. Select the search options (Match Whole Word, Match Case) you want to use.
5. Specify the type of search:
 - Click Replace to replace the current instance of the specified text and locate the next occurrence.
 - Click Replace All to replace all instances of the specified text.
 - Click Find Next to find the next occurrence of the specified text without replacing the current occurrence.
 - Click Close to exit.

Options

Match Whole Word Only

Comment lines are not searched when Match Whole Word Only is selected.

Undo

The Undo function allows you to cancel your last action. For example, if you accidentally delete a section of your program, you can choose the Undo command from the Edit menu or the Undo button from the toolbar, and the last action completed will be reversed.

Changing the Display in the Editor Window

You can:

- change the font used for the text.
- turn on or off the highlighting feature.
- change the colours used for highlighting program elements and for the background.

Turning on or off the highlighting and changing colours are described in the Using RAPL-3 Features part of this chapter.

Changing Font

You can change the font for a specific editor window. You could change one editor window to one font and another editor window to another font.

A change is in effect as long as that editor window stays open. If you close that editor window, or close Robcomm3, you lose the changed font settings. When you open the file the next time, Robcomm3's editor window default settings are used.

To change the font of the text:

1. From the Edit menu, choose Options. Then choose Font. The Font dialog box appears.
2. Select a font, style, size, and script by clicking on each. An example is displayed in the Sample box.
3. Click OK to accept the selection.

Saving and Closing Files

You can save a file at any time. When you close an editor window, Robcomm3 prompts you for saving, if you have made changes since the last save.

Saving from a New Editor Window with No Text

If you have just opened an editor window and have not typed any text, you must use the Save As function to name and save your file.

1. Select Save As from the File menu. The Save As dialog box appears.
2. Select the drive and directory to save this file. If you have a standard robot system, you can save the file in any convenient directory. If you

have a system with CROS for Windows NT, you are likely saving this file in program files\crs robotics\CROStnt\image\app*directory_name*

3. Type a name over the asterisk in the filename box. For a basic application, use the same name as your application. The Save As window will add the .r3 extension. Your source file must have a .r3 extension.
4. Click OK to accept this name. The file name appears in the title bar of this editor window.

From now on, you can use any regular Save function.

Saving from a New Editor Window with Text

If you have just opened an editor window and have typed any text, the Save function is active.

To save the file:

1. Start the save process by selecting Save from the File menu or from the right-mouse click menu or by clicking the Save button. The Save As dialog box appears.
2. Select the drive and directory to save this file. If you have a standard robot system, you can save the file in any convenient directory. If you have a system with CROS for Windows NT, you are likely saving this file in program files\crs robotics\CROStnt\image\app*directory_name*
3. Type a name over the asterisk in the filename box. For a basic application, use the same name as your application. The Save As window will add the .r3 extension. Your source file must have a .r3 extension.
4. Click OK to accept this name and save the file. The file name appears in the title bar of this editor window.

From now on, you can use any regular Save function.

Saving Regularly

Any time that you are editing a file, you can save the file. To save a specific file, the cursor must be active in that file's editor window. When it is active, the editor window's title bar is the colour of your computer's setting for active title bars.

To save the file:

1. Save the file by
 - selecting the Save command from the Edit menu
 - selecting the Save command from the right-mouse click menu (when the pointer is over the editor window)
 - clicking the Save button on the toolbar

Saving the Text as a Different File

If you have taken an existing file and altered it, and you want to save it as another file, you must use the Save As command.

1. Select Save As from the File menu or from the right-mouse click menu. The Save As dialog box appears.
2. Select the drive and directory in which to save this file.
3. Type a new name over the existing name in the filename box. The Save As window will add the .r3 extension. Your source file must have a .r3 extension.
4. Click OK to accept this name. The file name appears in the title bar of the editor window.

Saving All Open Files

To save all files in all open editor windows:

1. From the File menu, select Save All.
All open files are saved.

Closing an Editor Window

Robcomm3 prompts you to save as you try to close an editor window. To close an editor window, the cursor must be active in that editor window.

1. Close the editor window by
 - clicking the Close (X) button in the upper right corner of the window.
 - selecting Close from the menu of the editor program icon in the upper left corner of the window
 - selecting the Close command from the File menu
 - pressing the control (Ctrl) and F4 keys
2. If you have not saved this file, a dialog box appears, stating “This document has been changed. Would you like to save it?” If you do not want to save, click No. If you want to save, click Yes. If you want to return to the editor window without saving, click Cancel.

Closing All Editor Windows

You can close all editor windows at once.

1. From the Window menu, select Close All.
2. If you made changes since the last save, Robcomm3 prompts you to save the changes. Robcomm3 prompts you for each unsaved file and identifies each, by file name and editor number, in the title bar of the saving prompt box.

Using an Alternative Editor

You do not have to use Robcomm3 to edit a source file.

For example, if you are away from your work site and do not have a computer with Robcomm3, but have a computer with another editor, you can write and save source files.

Considering Options

You can edit a source file using:

- any text editor such as Notepad
- any text-with-formatting editor such as WordPad
- any word processor such as Word or WordPerfect
- any software developer's editor such as GNU Emacs.

Saving the File

You must look after some functions that the editor of Robcomm3 looks after automatically.

Content

If you are using a text-with-formatting editor or a word processor, you must save the file as an ASCII text file. Saving the file with formatting fills the file with unwanted characters that cannot compile.

Extension

When you save, you must save the file with a .r3 extension. If you accidentally save it (or if the editor only allows you to save it) with a .txt extension, you have to change the extension using a rename function. Change the extension using a utility such as Explorer or at a command line.

Limiting Features

When you use another editor, you do not have features that are available in Robcomm3. These include:

- RAPL-3 keyword highlighting
- commenting/uncommenting using RAPL-3's two semi-colons

CHAPTER 4

Compilation

RAPL-3 is a “compiled” language. You write your program in an editor. This file is the source file. This file is processed through the compiler which translates the file into a form that can be run easily and very fast on the operating system. This file is the object file. Both files are your program. One file you can read. The other file CROS can execute.

Preparing to Compile

There is only one action you must perform before compiling.

Naming a File

Robcomm3 will compile a file, a program that has a name in the title bar of the editor window. If you have written a program in an editor window, but never created a file by giving it a name, by using the Save As feature, Robcomm3 will not compile it.

To turn your lines of editing into a file:

1. Select Save As.
 - From the File menu, select Save As.
 - If you have typed text in the file, click the Save button.

The Save As dialog box appears.

2. Select the drive and directory to save this file. If you have a standard robot system, you can save the file in any convenient directory. If you have a system with CROS for Windows NT, you are likely saving this file in program files\crs robotics\CROSnt\image\app*directory_name*
3. Type a name over the asterisk in the filename box. For a basic application, use the same name as your application. The Save As window will add the .r3 extension. Your source file must have a .r3 extension.
4. Click OK to accept this name. The file name appears in the title bar of this editor window.

Your program now has a name and is in a directory.

Not Having to Save Your File

Before compiling, you do not have to manually save the latest edits of your program. When compile your program, Robcomm3 automatically saves your edits and uses that just-saved file when it compiles.

Compiling

Compiling takes your source file and translates it into an object file.

To compile:

1. Make sure that the file you want to compile has its editor window active. The active editor window has its title bar in a colour. If you have more than one editor window open, or if you have a terminal window active, click anywhere on the file's editor window to make it active.
2. Compile your file by
 - selecting the Compile command from the Application menu or from the right-mouse click menu
 - clicking the "R3" Compile button on the toolbar

In Robcomm3's status bar (along the bottom of the Robcomm3 main window), the message "Compiling" is displayed. The time for compiling depends on the size of your program and the capacity of your computer's processor.

3. Finish the compiling task.
 - If the program successfully compiled, the RAPL-3 Compile dialog box appears. Click OK.
 - If the error window appears, review the errors and warning. See details in the next section.

If your program successfully compiled, the compiler placed the object file in the same directory as your source file.

If your program did not compile because Robcomm3 could not find the compiler, see the *Troubleshooting* section of this chapter.

If your program did not compile because the program had errors, see the *Handling Errors and Warnings* section of this chapter.

Handling Errors and Warnings

Errors and warnings assist you in de-bugging your program.

Understanding Errors and Warnings

The RAPL-3 compiler has two categories of messages.

Error

An error indicates a problem so serious that your program cannot compile. Errors include improper syntax such as: command names that do not exist; opening brackets without closing brackets; a looping construct that was started but never finished.

Every error must be corrected. Often, for one error in the program, the compiler displays several error messages.

Warning

A program compiles if it has warnings (and no errors).

A warning draws attention to a part of the program where you wrote in a way that might, or might not, be what you wanted the program to do. The compiler draws attention to it for you to check.

For example, you get a warning if you do not use a variable that you declared. This is acceptable if you are still developing your program, have not yet written the part that uses the variable, and want to de-bug the existing part of the program. This is a problem needing to be corrected, if you copied a section of the program, but did not yet change the new section to use the new variable.

For another example, you get a warning if you implicitly declare any variable. Any implicitly declared variable without a prefix is declared as an integer. This is acceptable if you wanted that variable as an integer. This is a problem needing to be corrected, if you did not insert the prefix and wanted the variable as a float.

Viewing Errors and Warnings

The error window displays errors and warnings in the following way.

Each line describes one error or warning.

The error/warning line displays the name of the program, the line in the program with the error or warning, and the description of the error or warning.

Simplifying Complex Compilation

When you are developing your application, you are editing and compiling repeatedly.

If you want to

- compile a master program while editing one or more included files
- compile with libraries
- compile to an object file with a name different from the source file
- change compiler options

you can configure settings for this to happen automatically each time you compile.

See the chapter on Application Setups.

Selecting Compiler Options (Robcomm3)

If you use the Application Setup feature, you can set different compiler options. You can specify any options from the following table.

General Options		
Syntax	Description	Example
-E	Preprocess only. Do not compile.	
-n	nothing Print commands but do nothing.	
-nolib	no libraries Do not automatically load any libraries.	
-tdir	temporary directory Place temporaries in directory <i>dir</i> .	
-v	verbose Print commands before execution.	

Preprocessor Options		
Syntax	Description	Example
-Dname	define name Define name as a macro with definition 1.	
-Dname=def	define name = definition Define name as a macro with definition <i>def</i> .	

Preprocessor commands are described in the Preprocessor chapter of the *RAPL-3 Language Reference Guide*.

Compiler Options		
Syntax	Description	Example
-fnat	no automatic teachables .	
-fnimp	no implicit declarations No implicit declarations allowed.	
-fstack=NNNN	Suggest minimum stack size (in words). Default is CROSnt 1000 words CROS-500 384 words	
-fstackck	stack check Produce extra stack checking code.	
-l	line numbers	

[lowercase letter l]	Include line numbers (even if stripping).	
-L <i>modulename</i> [uppercase letter L]	link <i>modulename</i> Include module "modulename" during compilation.	
-O0 [letter O, number zero]	optimize 0 Do not perform any optimization.	
-O1 [letter O, number one]	optimize 1 Optimize jumps and remove dead code.	
-s	strip Strip all symbols from output module.	
-Wmax	warn maximum Warn on anything even remotely questionable.	
-Wall	warn all Warn on all possible problems.	
-Wnone	warn none Do not give any warnings.	
-x	exclude Exclude all but essential symbols from a library.	

Compiling from the Command Line

You do not have to use Robcomm3 to compile. You can compile from the command line.

For example, if you are away from your work site, have a computer, and have CROS-500 or CROSnt, but not Robcomm3, you can compile your files.

The filename of the RAPL-3 compiler is r3c.exe.

During installation, the installation utility installed the compiler in
system_drive\program files\crs robotics\rapl-3\bin
 such as

C:\program files\crs robotics\rapl-3\bin
 unless you specified a different drive or directory during installation.

Setting Up Your Computer

To compile from the command line, you must:

- set an environment variable, the path to the compiler, so that you can compile from any directory, or
- always compile from the directory with the compiler, but use complete pathnames for the source file and the object file

Setting the environment variable for the path is the preferred option.

Windows NT

In Windows NT, you check or change the path from a system dialog box.

To add the path:

1. From the Start menu, select Settings, then Control Panel, then System. The System Properties dialog box appears.
2. Select the Environment tab.
3. Modify the path
 - If you have a variable called PATH, Path, or path
 - a) Select it by clicking on it. The name, path, appears in the Variable box and the settings appear in the Value box.
 - b) In the Value box, cursor to the end of the line, add a semi-colon (;) and the path to the compiler, for example
; C:\program files\crs_robotics\rapl-3\bin
 - If you do not have a variable called PATH, Path, or path, .
 - a) Place the cursor in the Variable box by clicking on it. Type the name
path
 - b) Place the cursor in the Value box by clicking on it. Type the path to the compiler, for example
C:\program files\crs_robotics\rapl-3\bin

You can now compile a RAPL-3 program from any directory.

To check that the path setting is working:

1. Open a command line window on your computer's operating system. From the Start menu, select Programs, then (MS-DOS) Command Prompt.
2. Enter
r3c
for the RAPL-3 compiler. Without any files to process, the compiler displays compiler options.

Windows 95

In Windows 95, you check or change the path by editing your computer's autoexec.bat file, located at the root (highest) level of your system drive (on most computers, the C: drive).

To add the path:

1. Before you begin, make a back-up copy of your autoexec.bat file. Use a utility such as Explorer to copy and paste the file.
2. Start a text editor such as Notepad. From the Start menu, select Programs, then Accessories, then Notepad. The Notepad editor window appears.
3. Open the autoexec.bat file located at the system drive root level, C:.
4. Add the path
 - If you have a line with SET PATH:

On the SET PATH line, cursor to the end of the line, add a semi-colon (;) and the path to the compiler, for example
; C:\PROGRAM FILES\CRS ROBOTICS\RAPL-3
 - If you do not have a line with SET PATH:

Add the entire line

```
SET PATH=C:\PROGRAM FILES\CRS ROBOTICS\RAPL-3
```

5. Save autoexec.bat file. Close the file and exit out of Notepad.
6. Re-boot your computer.

You can now compile a RAPL-3 program from any directory.

To check that the path setting is working:

1. Open a command line window on your computer's operating system. From the Start menu, select Programs, then (MS-DOS) Command Prompt.
2. Enter


```
r3c
```

 for the RAPL-3 compiler. Without any files to process, the compiler displays compiler options.

Compiling

This procedure assumes that you have set the path so that you can compile from any directory.

To compile from the command line:

1. Open a command line window on your computer's operating system. From the Start menu, select Programs, then (MS-DOS) Command Prompt.
2. Change to the directory where your source file is. For example


```
cd crs\robcomm3\myapp
cd program files\crs robotics\rosnt\image\app\myapp
```
3. Enter the r3c command with the name of the sourcefile and any options including the name for the object file. For example


```
r3c myapp.r3 -omyapp -Wall
```

Selecting Compiler Options (Command Line)

From the command line, you can use more options than you can from the Application Setup feature. You can specify any options from the following table.

Order

You can use more than one option at a time and list options in any order.

Limitation

The line for compiler options is limited to 1024 characters.

General Options		
Syntax	Description	Example

- <i>afile</i>	arguments from <i>file</i> Take the rest of the arguments from file.	-acompop1 (with arguments in text file named compop1)
-E	Preprocess only. Do not compile.	
-ofile	output Place output in <i>file</i> .	
-efile	errors Place errors in <i>file</i> .	
-h	help Print the help message.	
-n	nothing Print commands but do nothing.	
-nolib	no libraries Do not automatically load any libraries.	
-tdir	temporary directory Place temporaries in directory <i>dir</i> .	
-v	verbose Print commands before execution.	

Preprocessor Options

Syntax	Description	Example
- <i>Dname</i>	define <i>name</i> Define name as a macro with definition 1.	
- <i>Dname=def</i>	define <i>name</i> = definition Define name as a macro with definition <i>def</i> .	

Preprocessor commands are described in the Preprocessor chapter of the *RAPL-3 Language Reference Guide*.

Compiler Options

Syntax	Description	Example
-fnat	no automatic teachables No variables made teachable by default. Allow only variables declared with the teachable keyword. See the <i>Data Types and Variables</i> chapter in <i>RAPL-3 Language Reference Guide</i> .	
-fnimp	no implicit declarations No implicit declarations allowed. Allow only explicitly declared variables. See the <i>Data Types and Variables</i> chapter in <i>RAPL-</i>	

	<i>3 Language Reference Guide.</i>	
-fstack=NNNN	stack Suggest minimum stack size (in words). Default is CROSnt 1000 words CROS-500 384 words	
-fstackck	stack check Produce extra stack checking code.	
-l [lowercase letter l]	line numbers Include line numbers (even if stripping).	
-Lmodulename [uppercase letter L]	link modulename Include module "modulename" during compilation.	
-O0 [letter O, number zero]	optimize 0 Zero optimization. Do not perform any optimization.	
-O1 [letter O, number one]	optimize 1 Optimize jumps and remove dead code.	
-s	strip Strip all symbols from output module.	
-Wmax	warn maximum Warn on anything even remotely questionable.	
-Wall	warn all Warn on all possible problems.	
-Wnone	warn none Do not give any warnings.	
-x	exclude Exclude all but essential symbols from a library.	

Troubleshooting

The following are the most common problems.

RAPL3BASE

Problem from Robcomm3: Compile Dialog Box: "... RAPL3BASE .. "

You try to compile and get the RAPL-3 Compile dialog box with the message, "Environment variable RAPL3BASE must be set."

Problem from Command Line: "... 0:WARNING ..."

You try to run the compiler and you get the message, "r3c:0:WARNING: Cannot open configuration file . . ."

If, when you try to cd to %RAPL3BASE%, the prompt does not change to any directory.

Solution

The path to modules needed by the compiler and related processes, the RAPT3BASE environment variable, is not set. Set this environment variable.

Not Compiling: No Proper Path**Problem from Robcomm3: Compile Dialog Box: “Compile Error”**

You try to compile and get the RAPT-3 Compile dialog box with the message, “Compile Error.” (This message may indicate this or another problem.)

Problem from Command Line: “. . . not a command, program, or batch file”

You try to run the compiler and you get the message, “The name specified is not recognized as an internal or external command, operable program, or batch file.”

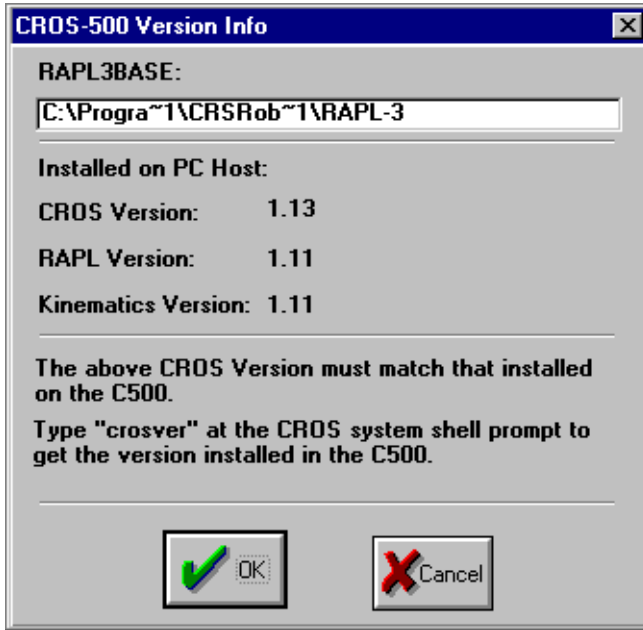
Solution

The path to the compiler is not set. For Windows NT change your environment variable. For Windows 95, edit your autoexec file. See *Setting Up Your Computer* in this chapter.

“Incompatible”: Programs Not Running**Problem from Terminal: “. . . signature incompatible . . .”**

You try to run a program on the C500 controller and get the message,
syslib: signature incompatible
System has CROS500 1.13 loaded; host configuration must
match

The controller is running one version of CROS and you compiled your program with a different version of CROS. One must have been upgraded to a higher version. Both must be the same for the program to run. Either the higher version on the computer must be transferred to the controller, or, the version on the computer must be changed back to match the version on the controller.



The CROS 500 Version dialog box, available from Robcomm3's C500/Version menu, indicating the version of CROS installed on your computer.

To determine which version is installed on the controller:

1. Make sure that Robcomm3 is started, and a terminal window is open, and the controller is running.
2. At the system shell prompt (\$), enter
`crosver`
 The version of CROS running on the controller is displayed.

To determine which version is installed on the computer:

- For standard robot installations:
 1. Make sure that Robcomm3 is started.
 2. From the C500 menu, select Version. The CROS-500 Version Info dialog box appears.
 3. Note which CROS version is installed.

If version info is unavailable, for example, if you get the message "Cannot open C:\Progra~1\CRSRob~1\CROS-5~1\version.mak", use an editor such as NotePad and open the file C:\Program Files\CRS Robotics\CROS-500\version.mak. The information "DIST_NAME=CROS500 DIST_MAJOR=1 DIST_MINOR=13" means CROS-500 1.13.

- For POLARA users who installed CROS-500 Compact:
 1. Start CROS for Windows NT.
 2. At the system shell prompt (\$), enter
`crosver`
 The version of CROSnt is displayed.
 3. Note the "minor" number (the number after the decimal point). These must match. The "major" number (the number before the decimal

point) does not have to match. For example, CROSnt 2.13 is compatible with CROS-500 1.13.

Solution 1: Upgrade CROS on the Controller

Upgrade CROS on the controller to match the version of CROS on the computer. Follow the upgrading instructions. They are detailed within, or immediately after, the *CROS and System Shell*.

Since all files on the controller will be erased, make sure that you back up, off the controller:

- configuration files: \conf\robot.cal, \conf\robot.cfg, \conf\servogrip.cal
- variable files: any variable file (with a .v3 extension) which is where your locations are stored
- \conf\rc if you changed it

Solution 2: Upgrade CROS on the Computer

Upgrade CROS on the computer to match the version of CROS on the controller. Follow the instructions for removing and then adding (uninstalling and then installing) CROS-500 on your computer. These instructions are detailed beside the Robcomm3 installation instructions in this *Robcomm3* part of this *Application Development Guide*, and also beside the CROS on C500 upgrade instructions within, or immediately after, the *CROS and System Shell* part of this *Application Development Guide*.

Make sure that you re-compile:

- your program
- any user-defined libraries and user-defined commands in \bin

CHAPTER 5

File Transfer

Preparing the Controller to Receive the File

Before you send a file to the controller, you need a directory to send the file to. You must do this at the system shell prompt (\$) before sending the file.

Before you begin, make sure that you:

- Opened the terminal window
- Powered on the controller
- Have a system shell prompt (\$)

Are at the root directory. You can check this by entering the command `pwd`. If the terminal displays a / (slash), then you are at the root directory. If you are at any other directory, enter `cd ..` (cd space dot dot) to move up to the root directory.

To make a directory, [relative path]

Change directories down to the application (app) directory, by entering

```
cd app
```

Make a directory, by entering

```
mkdir directory_name
```

For example

```
mkdir dispense
```

Check that the directory exists by entering

```
dir
```

Your new directory is listed with all other existing directories.

Transferring a File

1. From the C500 menu in Robcomm3, choose File Transfer. The File Transfer dialog box appears.
2. The directories currently on your computer are listed on the PC (left) side. The directories currently on the controller are listed on the controller

(right) side. Highlight the directory which contains the file you want to transfer from your computer to the controller.

3. On the left side is a list of the files found in the directory highlighted. Highlight the file you want to transfer.
4. On the right side, highlight the directory that you want to transfer the file to. A list of the files currently in that directory will be listed.

NOTE: You can transfer more than one file at a time. To highlight multiple files, hold down the CTRL key on the keyboard while using your mouse to highlight the files you wish to transfer.

5. There are two arrow keys in the middle of the dialog box. Once you have highlighted the files on your computer (PC) that you wish to transfer, and you have highlighted the chosen directory on the controller to transfer the files to, click on the arrow pointing to the controller side of the dialog box. A screen will quickly show you the transfer of information from your computer to the controller. The files will then be listed under the controller directory.
6. Once you have completed the file transfer, click the Exit button.

Simplifying File Transfer

When you are developing your application, you are repeatedly transferring your file to the controller to run it.

If you want to

- create a directory on the controller (if one is not already there)
- transfer the file, specifying the file and directory on your computer and the directory on the controller

you can configure settings for this to happen automatically each time you send.

See the chapter on Application Setups.

Transferring Other Files

You can transfer other files such as variable files and configuration files to the controller by using the File Transfer command from the C500 menu in Robcomm3.

Use the File Transfer dialog box to transfer these files. Refer to the Transferring a File section of this manual for complete details.

Backing-up Files

If you want to back up files from the controller, you can.

When you install a new version of CROS on the controller, you erase the existing version of CROS, including all the files on the controller. To preserve these files, back them up by transferring them from the controller to the computer.

Create a directory on your PC just for this back-up, in order to avoid any confusion later.

Use the File Transfer command from the C500 menu to transfer files from the controller to the computer. Repeat this procedure to copy all necessary files. Refer to the Transferring a File section of this manual for complete details.

CHAPTER 6

Application Setups

The Application (App) Setup feature allows you to simplify:

- compiling the source file to an object file
- making an application sub-directory on the controller
- transferring the object file to the controller.

After you have defined the app, you:

- do NOT have to use the command-line to specify compiler options
- do NOT have to manually make a sub-directory on the controller
- do NOT have to transfer the object file with the file transfer utility and setup information is stored for future re-use.

Defining an App

Defining an app specifies the settings.

You create an app for each robot application; in other words, for each main program.

Creating a New App

Creating a new app gives a name to the app and creates a file to store the app setup information.

1. From the Application menu, choose New App. The New Application Configuration window is displayed.
2. Select the drive and directory to save this file. For a basic application, specify the same directory where you are saving your program source file and object file.
3. Type a name over the asterisk in the filename box. For a basic application, use the same name as your program source file. The New App window will add the .app extension to differentiate this file from the other files with the same name.
4. Click OK to accept this name. The name appears in the title bar of the main Robcomm3 window and in the Robcomm3 taskbar button in your main Windows taskbar.

Setting Up the App

The Application Setup window captures settings for this app.

If you first created a new app, the Setup window inserts default names and options. For a basic application, you just click OK.

If you did not first create a new app, you can still setup the app by typing in names and options and use it for compiling and sending, but these settings will not be saved for future use.

1. From the Application menu, choose Setup. The Application Setup window is displayed.
2. If necessary, modify the four settings as described in the following paragraphs.
3. Click OK to save these settings.

Source File

This is the name of your program in source file format. For a basic application, use the same name as the app. This source file has a .r3 extension.

C500 Directory

This is the directory on the controller where your object file is sent. To use the application shell to teach locations, you must select a sub-directory of the \app directory. For a basic application, use the same name as the app, source file, and object file.

If you do not specify a C500 directory, Robcomm3 sends your file to the root (\) directory on the controller, when you send.

Object Name

This is the name of your program after you compile it into object file format. For a basic application, use the same name as the app and the source file. This object file has a no extension.

Compile Options

This is the option used when compiling. For a basic application, use -Wall which displays all warnings. You can change this to any of the options listed in the *Compiling* chapter.

Opening an Existing App

If you have an existing app, you can re-open it to work on that application either with the saved settings or with new settings.

1. From the Application menu, select Open App. The Select Application Configuration window is displayed.
2. Select the drive and directory and select the app by name.
3. Click OK. The name appears in the title bar of the main Robcomm3 window and in the Robcomm3 taskbar button in your main Windows taskbar.

Editing

You edit your program in the same way as any other program.

1. Open the file in an editor window. Edit as necessary.

Compiling and Sending from an App

With the settings saved in the app setup, compiling and sending is simplified.

As long as an app is open, compiling and sending is done on the files specified in the app setup. It does not matter what source files are open in any editor windows.

Compiling

Compiling is done according to the option saved in the App Setup setting.

To compile the source file to an object file:

1. Compile the file.
 - From the toolbar, click the Compile button.
 - From the Application menu, select Compile.
 - From any editor window, right mouse click which will display the working menu, and select Compile.

While compiling, the message “Compiling” is displayed in the status bar of the main Robcomm3 window.

2. If compiling is successful, the RAPL-3 Compile window displays the “Compile OK” message. Click OK. Your compiled object file (with the name you specified in the app setup) is in the same directory as the source file.

If there are errors or warnings (which are displayed according to the option you set in the app setup), correct the source file and try compiling again.

Sending

With App Setup you do NOT have to make a sub-directory in the \app directory on the controller before sending your program. The App Setup utility automatically makes the sub-directory, if there isn't one already.

With App Setup, you do NOT have to use the File Transfer utility (selecting the file on the computer, selecting the directory on the controller, and transferring the file). The App Setup utility automatically takes the object file and sends it to the controller.

To send the object file from the computer to the controller:

1. Send the file.
 - From the toolbar, click the Send App button.
 - From the Application menu, select Send.

- From the active editor window, right mouse click which will display the working menu, and select Send.

POLARA Developers

If you are writing and compiling for CROS for Windows NT, you normally do not need to send files to the controller.

Closing an App

If you want to work on another app, close this app.

1. From the Application menu, select Close App. The app name is removed from the title bar of the main Robcomm3 window and from the Robcomm3 taskbar button in your main Windows taskbar.

Working with a Multiple-File Program

The App Setup feature is helpful when working on a program that is composed of multiple files.

You can edit the various source files in editor windows and compile the entire program according to the settings in the app setup.

How to Write with Multiple Files: Quick Review

In the component file, write that component's portion of code. For example:

```
;; messages.r3

sub message_one()
  print("Hello \n")
end sub
```

In the main file, include the component file using the `.include` keyword. For example:

```
;; application_with_multiple_files.r3

.include messages.r3

main
  message_one()
end main
```

The preceding two files are the equivalent of:

```
;; application_with_single_file.r3

sub message_one()
  print("Hello \n")
end sub

main
  message_one()
end main
```

which has the same result as:

```
;; application_as_one_function.r3

main
  print("Hello \n")
end main
```

For other details, see the *RAPL-3 Language Reference Guide*.

Setting Up the Program for Compiling

Make sure that App Setup is set to compile the file with the main function.

1. Open the app.
2. Access the settings. From the Application menu, choose Setup.
3. Ensure that the source file is the file with the main function and all other settings are what you want.
4. Click OK to save these settings.

Editing Files and Compiling the Program

To edit and compile:

1. For each component file that you want to edit, open the file in an editor window. Edit as necessary.
2. To compile the program.
 - From the toolbar, click the Compile button.
 - From the Application menu, select Compile.
 - From any editor window, right mouse click which will display the working menu, and select Compile.

While compiling, the message “Compiling” is displayed in the status bar of the main Robcomm3 window.

3. If compiling is successful, the RAPL-3 Compile window displays the “Compile OK” message. Click OK. Your compiled object file (the whole program) is in the same directory as the source file of the main file.

If there are errors or warnings, they are displayed with the component filename at the beginning of the line.

Compiling Individual Files

You can still edit and compile an individual component file. Simply close the App and compile the component file from its active editor window. Any time you compile a file with App closed, the compiler compiles only the file in the active editor window and places the object file in the same directory as the source file.

When you want, open the App, set up the App, and compile the whole program.

Working with Libraries

The App Setup feature is helpful when working on a program that uses library files.

How to Write with Libraries: Quick Review

A library is a RAPL-3 program that can be used by other programs.

In the library file, write the code that is going to be used by various programs. For example:

```
;; messages.r3

sub message()
  print("Goodbye \n")
end sub
```

In your program, call the library subroutine, function, or command. For example:

```
;; application_calling_library_sub.r3

main
  message()
end main
```

For programs with libraries to work you need to write and compile in the following way.

Setting Up the Library

Make sure that App Setup is set to compile the library and send it to the proper directory.

1. Open the app for the library.
2. Access the settings. From the Application menu, choose Setup. The Application Setup window is displayed.
3. Modify the four settings as described in the following paragraphs.
4. Click OK to save these settings.

Source File

This is the same as the standard setup. This is the name of the library in source file format and has a .r3 extension.

Compile Options

Use the -x option, which keeps essential symbol information, but excludes unnecessary extra symbol information. Do not use the -s option which excludes all symbol information.

Object Name

Add a .r extension, which is the standard RAPL-3 library extension.

C500 Directory

Set the C500 directory to the \lib directory. The RAPL-3 interpreter looks in the \lib directory for a library used by any program.

Editing, Compiling, and Sending the Library

To edit and compile:

1. For the library file that you want to edit, open the file in an editor window. Edit as necessary.
2. Compile the program.
 - From the toolbar, click the Compile button.
 - From the Application menu, select Compile.
 - From any editor window, right mouse click which will display the working menu, and select Compile.

While compiling, the message “Compiling” is displayed in the status bar of the main Robcomm3 window.

If compiling is successful, the RAPL-3 Compile window displays the “Compile OK” message. Click OK. Your compiled object file is in the same directory as the source file.

If there are errors or warnings, they are displayed with the component filename at the beginning of the line.

3. Send the library file to the \lib directory.
 - From the toolbar, click the Send App button.
 - From the Application menu, select Send.
 - From the active editor window, right mouse click which will display the working menu, and select Send.
4. Close the app for the library.

Finishing with Libraries

Repeat the above procedures for each library file.

Setting Up Your Program

Make sure that App Setup is set to compile the file with the main function.

1. Close any currently open app, such as the app for the library.
2. Open the app for the program.
3. Access the settings. From the Application menu, choose Setup.
4. Modify the four settings as described in the following paragraphs.
5. Click OK to save these settings.

Source File

This is the same as the standard setup. This is the name of the program in source file format and has a .r3 extension.

C500 Directory

This is the same as the standard setup. This is the directory on the controller where your object file is sent. To use the application shell to teach locations, you must select a sub-directory of the \app directory. For a basic application, use the same name as the app, source file, and object file.

Object Name

This is the same as the standard setup. This is the name of your program after you compile it into object file format. For a basic application, use the same name as the app and the source file. This object file has a no extension.

Compile Options

Compile with the library module by using the -L option, such as -Lmodule.r or -Lmessages.r. List all needed libraries.

Editing, Compiling, and Sending Your Program

To edit and compile:

1. Open the program file in an editor window. Edit as necessary.
2. Compile the program.
 - From the toolbar, click the Compile button.
 - From the Application menu, select Compile.
 - From any editor window, right mouse click which will display the working menu, and select Compile.

While compiling, the message "Compiling" is displayed in the status bar of the main Robcomm3 window.

If compiling is successful, the RAPL-3 Compile window displays the "Compile OK" message. Click OK. Your compiled object file is in the same directory as the source file.

If there are errors or warnings, they are displayed.

3. Send the program to your sub-directory of the \app directory.
 - From the toolbar, click the Send App button.
 - From the Application menu, select Send.
 - From the active editor window, right mouse click which will display the working menu, and select Send.

Not Using an App

If you do not create a new app or open an existing app, the default setup settings are used. They are:

Source File

The file in the active editor window.

Compile Options

-Wall

Object Name

The same name as the source file with no extension.

C500 Directory

\app\test

Therefore, if no app is set, you compile with -Wall and send to \app\test.

CHAPTER 7

Terminal

The Robcomm3 Terminal window provides interactive communication with the controller. In a terminal session, you can use your computer's keyboard and screen as a command line interface to the controller.

Opening a Terminal Window

Before you begin, make sure that:

- The cable between your computer and the controller (front panel port) is installed.
- Robcomm3 is started.
- Robcomm3 is configured to open the computer's serial port that the cable is connected to. (To configure, see the section *Configuring Communication* in the chapter *Installing and Configuring Robcomm3*.)



```
Terminal #1
$ ls
app/          conf/         lib/          sbin/
bin/          dev/          log/          tmp/
$ cd app
$ ls
rc3test/     test/
$ cd test
$ ls
fib          hello1.r     sieve
$ hello1.r
(1) Hello, world
(2) Hello, world
(3) Hello, world
(4) Hello, world
(5) Hello, world
(6) Hello, world
(7) Hello, world
(8) Hello, world
(9) Hello, world
(10) Hello, world
$ ls
fib          hello1.r     sieve
$ sieve
```



1. Open a terminal window.
 - Click the Terminal button.
 - Select Terminal from the C500 menu.

The terminal window (black background with white letters) opens.

Using the Terminal Window: Some Basics

One Window at a Time

You can only have one terminal window to the controller open at one time. Robcomm3 prevents you from opening multiple windows.

If you accidentally start Robcomm3 a second time and try to open a terminal window from the second Robcomm3, you will get an error message that the computer's serial port is busy (with the first session of Robcomm3's terminal communication).

Window Numbering

If you close the terminal window and later open a new window, the number of the new window is one higher than the last one.

Capturing Start-up Information

If you want to capture all the information displayed by the controller when it starts up, open the terminal window before powering on the controller.

No Prompt

If, when the controller is already on, you open the terminal window and do not immediately see a prompt, press the Enter key to get a prompt.

Junk Characters

If, when you open the terminal window and press the Enter key, you get junk characters, the baud rate of Robcomm3 is different from the baud rate of the controller. Change the baud rate at Com Settings from the C500 menu.

Using Tools through the Terminal

The terminal allows you to use the system shell and the application shell. It can also allow you to use the teach pendant.

System Shell

The system shell allows you to enter operating system commands. Using these commands, you can:

- Manage directories, files, and devices, including:
 - List directories and files
 - Move, copy, and delete files
 - Display the contents of a text file
- Monitor processes (programs that are running), including:
 - Display the status of all processes

- Terminate a process
- Manage memory, including:
 - Display space in memory or on file system
 - Flush buffers and defragment memory
- Configure and maintain the robot, including:
 - Configure the number of axes, units of measurement, and gripper type
 - Calibrate axes
 - Calibrate a servo-gripper
- Setup and move the arm in a limited way, including:
 - Home the arm
 - Move the arm to standard positions like ready and calrdy
 - Limp the arm

For details on the system shell, see *CROS and the System Shell*.

Application Shell

The application shell allows you to work with the locations and other variables of a specific application program. Using these commands you can:

- Move the arm in many ways, including:
 - Move the arm by individual joint
 - Move the arm along or around a world axis
 - Move the arm along or around a tool axis
 - Move to an approach or depart position
 - Limp the arm
 - Move to a known location
 - Move the arm to standard positions like ready and calrdy
- Manipulate locations and other variables:
 - Teach locations
 - Set values to other variables
 - Create and delete variables
- Configure arm motion, including:
 - Set linear speed
 - Set accelerations
- Modify co-ordinate systems, including:
 - Set a base offset
 - Set a tool transform
 - Modify a location in a co-ordinate system
- Setup arm and display status, including:
 - Home the arm
 - Display positional data

- Operate the gripper, including:
 - Open and close the gripper
 - Open the gripper to a specific distance
- Use i/o, including:
 - Set outputs
 - Display inputs

For details on the application shell, see the *Application Shell* Guide.

Teach Pendant

The teach pendant is the hand-held equivalent to the command-line application shell. You can move the arm and work with locations and other variables from the teach pendant's hand-held keypad.

From the terminal, you can start up the teach pendant. You can also make the teach pendant start up automatically, if you modify the controller's rc file.

For details on the teach pendant, see the *Teach Pendant* Guide.

Installing an Alternative Terminal

You do not have to use Robcomm3 to communicate with the controller.

For example, if you are at your robot site and do not have a computer with Robcomm3, but have a computer with a terminal emulator, you can set it up to communicate with the controller so that you can troubleshoot problems with the robot.

Considering Options

You can communicate with the controller using:

- the terminal window of Robcomm3
- a computer in terminal emulation mode
- a simple serial terminal.

Limiting Other Functions

Any of these options give you terminal access to the controller. Other functions (that you need to perform if you are developing an application) are not possible with just a terminal.

File transfer is only possible with Robcomm3's file transfer utility.

Using Robcomm3

Function	Possibility
Editing	Editor window of Robcomm3.
Compiling	Compile function from within Robcomm3.

File Transfer	File transfer utility of Robcomm3.
Terminal Communication	Terminal window of Robcomm3.

Using a Computer with Terminal Emulation

Function	Possibility
Editing	Any text editor.
Compiling	Command line access to compiler.
File Transfer	NOT possible.
Terminal Communication	Terminal emulator's window.

Using a Simple Terminal

Function	Possibility
Editing	NOT possible.
Compiling	NOT possible.
File Transfer	NOT possible.
Terminal Communication	Terminal screen.

Installing the Cable

You need a cable to connect the controller to the computer or simple terminal. It can be a ribbon or cord-like cable. It must be:

- Straight-through (not null modem).
- Controller end, 25 pin (male) connector.
- Computer/terminal end, to fit your serial port. If your computer is recently manufactured, you likely need a 9 socket (female) connector. An older computer may need a 25 socket (female) connector. A serial terminal likely needs a 25 socket (female) connector.

All terminal communication uses the communication port located inside the front panel swing-down access door. The connector is a 25 socket (female) connector.



Warning. Do not connect to the SYSIO connector on the rear panel of the controller. The SYSIO connector and the communication port are both 25 socket (female) connectors. The SYSIO connector connects to controller operating circuits and includes a live 24 Volt power supply which will seriously damage your computer circuitry.

The front panel communication port is a full RS-232 port with control signals.

1. Connect the controller end of the cable to the communication port inside the drop-down access door of the front panel of the controller.

2. Connect the other end of the cable to the serial port of your computer or terminal. A serial port may be labelled “|O|O|O|”, “serial”, or “com”. If you have more than one serial port, note the identifying number of this serial port.

Setting Up the Terminal

Many computer systems have terminal emulator software as part of their standard installation. Third-party software is available. You do not need a modem. (Some terminal emulation software automatically inquires about a modem.)

Since serial terminals may vary by manufacturer, refer to the terminal's documentation for set up.

1. Configure the terminal for controller communication. If you are using terminal emulation software on a computer, open the software.
 - Com Port: This is the serial port where you connected the cable. If you are using a terminal emulator on a computer, there may be a number of ports.
 - Baud Rate: Match the rate of the controller. The default rate for the controller on this port is 38400. If you changed the rate on the controller, you must change the rate here.
 - Data Bits: 8
 - Parity: None
 - Stop Bits: 1
 - Flow Control: None
 - Emulation (if on a computer): TTY or ANSI, but almost any emulator is acceptable.

You may have to close down and then re-start a computer's terminal emulation software for these settings to take effect.

2. If it did not start automatically, start a terminal session. With terminal emulation software, this may be called “Start”, “Open”, or “Connect”.

CHAPTER 8

POLARA and Robcomm3

If you are a POLARA user, there are a few points to remember when using Robcomm3.

Terminals

POLARA operators have two terminals: one to CROS-500 (CROS on the C500 controller) and another to CROS for Windows NT (CROS on Windows NT on the computer).

Terminal to CROS-500

You can use Robcomm3's terminal window to communicate with CROS-500, the operating system on the C500 controller. Normally, POLARA operators use this terminal only to monitor what processes are running on the controller.

This terminal does not give any access to CROS on the computer.

Terminal to CROS on NT

You cannot use Robcomm3 to communicate with CROS on the computer.

To communicate with CROS for Windows NT on the computer, you use the CROSnt Command Prompt window, available when you start up CROS for Windows NT. Normally, POLARA operators use this terminal to teach locations, test servers, etc.

Editing and Compiling, but Not Sending

To write and compile programs, POLARA developers can use the editor windows of Robcomm3, the compiling feature, and some of the App Setup feature.

Editing

You can use editor windows to write RAPL-3 programs. To run these programs in the CROS for Windows Nt environment, you save these programs to directories under \CROSnt.

Compiling

You can use the compiling feature of Robcomm3 to compile a basic program. You can also use the App Setup feature to configure options for compiling a master program after editing included files or libraries.

Not Sending

POLARA developers run their programs on the computer, not on the C500 controller. Do not use the send feature to send your files to the controller.