



PROGRS08Z User Manual





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P&E Microcomputer Systems, Inc.
98 Galen St.
Watertown, MA 02472
617-923-0053
<http://www.pemicro.com>

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1 OVERVIEW

PROGRS08Z is PEmicro’s programming software for Flash/EEPROM modules that are attached to an MC9RS08 processor. PROGRS08Z talks to the processor's debug module using one of PEmicro’s compatible hardware interfaces. These interfaces connect a PC running Windows 7/8/10 to a debug connector on the target system. This connector provides access to the debug signals of the processor chip mounted on your target system hardware board.

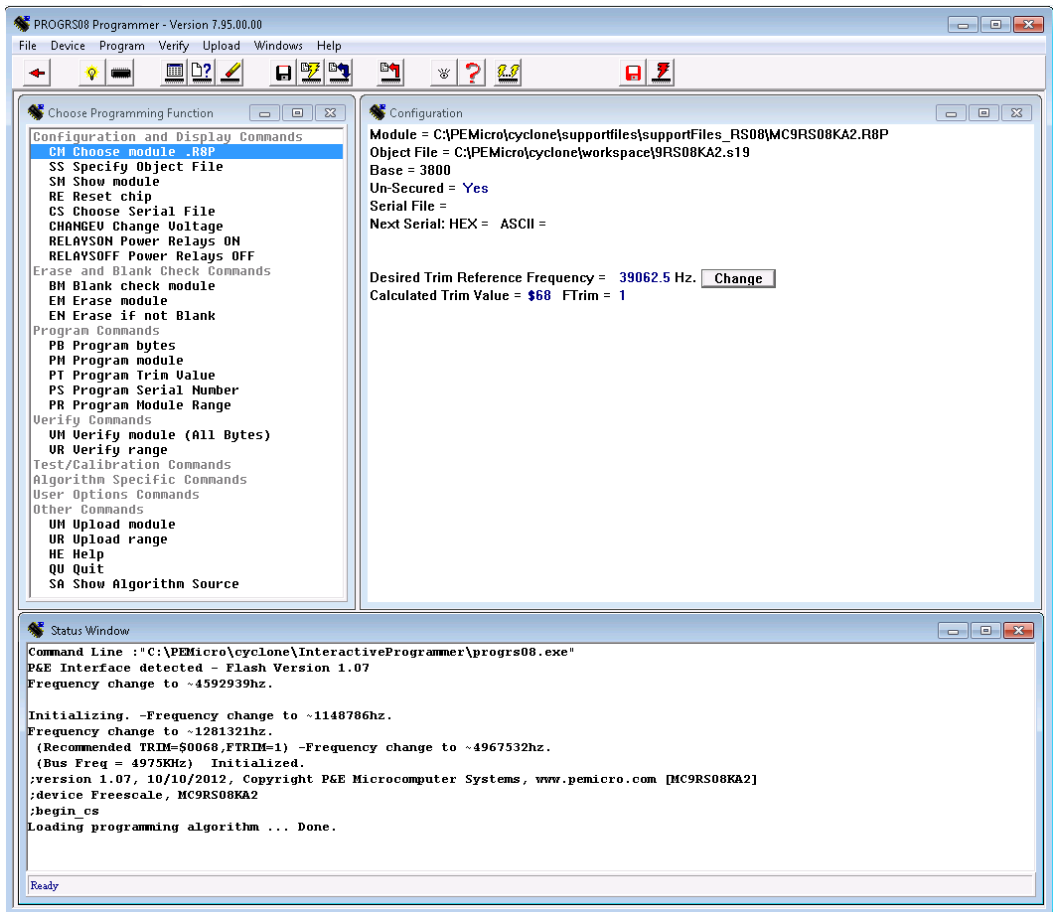


Figure 1-1: PROGRS08Z User Interface

As part of the programming procedure, the user will need to select a programming algorithm that will enable the PROGRS08Z software to properly manage their specific target device during programming. The user may also choose to set certain programming parameters before beginning to program. This chapter presents a brief overview of the programming procedure.

1.1 Programming Algorithms (.R8P Files)

PROGRS08Z runs on the PC and provides a set of general interface functions and processor-specific user functions that are used to control the erasing, verifying, programming and viewing of modules to be programmed. These general functions are implemented for a particular target configuration and chip set by using specific Programming Algorithm (.R8P) files that the user can modify to reflect the setup of their particular target interface. PROGRS08Z includes a library of these programming algorithms. For the most recent version of this library of algorithms, please visit our website, www.pemicro.com.

Programming algorithm files can also be modified by the user according to specific conventions. In addition, PE micro can create programming algorithms upon request if you are working with a device whose corresponding algorithm is not included in the current library. Some additional information about the contents and modification of programming algorithms is included in **CHAPTER 2 – PROGRAMMING ALGORITHMS**.

1.2 Start-Up Configuration

Certain programming parameters can be adjusted when launching the PROGRS08Z software by using the executable command-line to input the appropriate parameters. These may include settings related to the type of hardware interface you are using, S-record verification, and more, depending on your target device. A list of specific parameters with examples of their usage is included in **CHAPTER 4 – START-UP CONFIGURATION**.

1.3 Manual Programming

PROGRS08Z lists commands that are available to execute. Any of the programmer's enabled features can be selected by using the mouse, the up and down arrow keys, or by typing the selection letters to the left of the selection display. Pressing ENTER or double clicking the mouse will execute the highlighted entry if it is enabled. The user will be prompted for any additional information that is required to execute the selected function. Before you can program a module from an S record file, you must select

such a file. If you try to do a program module function and you have not selected an S-record file, you will be asked to select one. A list of programming commands and their functions may be found in **CHAPTER 6 – MANUAL PROGRAMMING**.

1.4 Scripted Programming

Programming commands, in addition to being executed manually, may also be collected into script files which can be used to automate the programming process. These scripts are executed by a command-line programming application called CPROGRS08Z, which is included with the PROGRS08Z software. More information about scripted programming is located in the accompanying CPROGRS08Z User Guide.

1.5 Hardware Interfaces

A change to RS08 compatibility with PE micro hardware will be announced with the launch of the next Rev. of our Multilink interfaces. Look for news on our website, pemicro.com.

2 PROGRAMMING ALGORITHMS

PEmicro's .R8P programming algorithm files define the functions necessary for PROGRS08Z to program a MC9RS08 processor's internal flash or connected external Flash/EEPROM. After you choose the appropriate algorithm, it will appear in the Configuration Window.

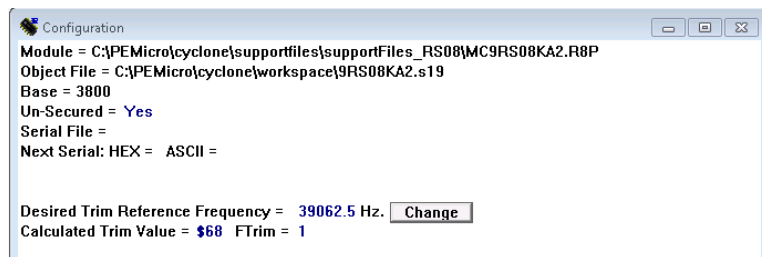


Figure 2-1: Configuration Window

2.1 Algorithm File Contents

You may view and, if necessary, modify the contents of an algorithm by opening it in any text editor. A .R8P programming algorithm file consists of four parts:

1. Comments
2. User-specified functions
3. Setup commands
4. S-records

2.1.1 Comments

Comments are usually placed in the file to identify the target system for which the .R8P file was written and what module on the target system it programs, as well as other useful information. If a specific .R8P file is selected in PROGRS08Z, these comments are shown in the window at the bottom of the PC screen. Within the algorithm file a semicolon is used to designate the beginning of a comment.

2.1.2 User Specified Functions

There can be up to six user-specified functions included in a .R8P file. Each user statement in the .R8P file must have a corresponding address in same order as the table part of the S-records and an appropriate set of code. A line which defines a user

".R8P" in order for PROGRS08Z to find them. The files are in ASCII and are thus readable using most text editors. The S records for a .R8P file can be generated using most assemblers.

2.2 Algorithm Timing Considerations

Most current flash devices have an on-chip programming monitor. The processor passes a command to the flash device, such as Program Word, and the flash device executes this command. On all processors with On-Chip flash, and on some external flash devices, the timing is provided by the processor. In order to program the flash device according to specification, the programming software on the PC has to know how fast the target processor is running. By default, the PROGRS08Z software tries to determine automatically how fast the target is running by loading a delay routine in the processor and timing how long it takes to execute. Under a multitasking environment, such as Windows 7/8/10, although they are usually very accurate, these timing measurements are not always correct.

PEmicro addresses this by providing a command-line mechanism that allows the user to inform the PROG software how fast the target processor is running. This ensures that the timing in the algorithms is always correct. To do this, the user would include the **FREQ** identifier on the executable command-line, followed by the **INTERNAL** clock frequency in Hertz. For instance, if your processor is an NXP RS08KA2 with a bus frequency of 10MHz, your command-line parameters should look like this:

```
PROGRS08Z freq 10000000
```

See **CHAPTER 4 – START-UP CONFIGURATION** for more information about how to use command-line parameters.

3 PROGRAMMING COMMANDS

When the user performs manual programming, commands are executed by selecting them from the Choose Programming Function Window pick list. The user may either use the up/down arrow keys or type the two-letter abbreviation for the command (listed below) on the command line to select a command. Pressing ENTER causes the selected command to execute. Commands can also be executed from the Menus or from the Button Bar. If there is any additional information needed in order to execute the command, the user will be prompted for this information in a new window. Errors caused by a command or any other responses will be presented in the Status Window.

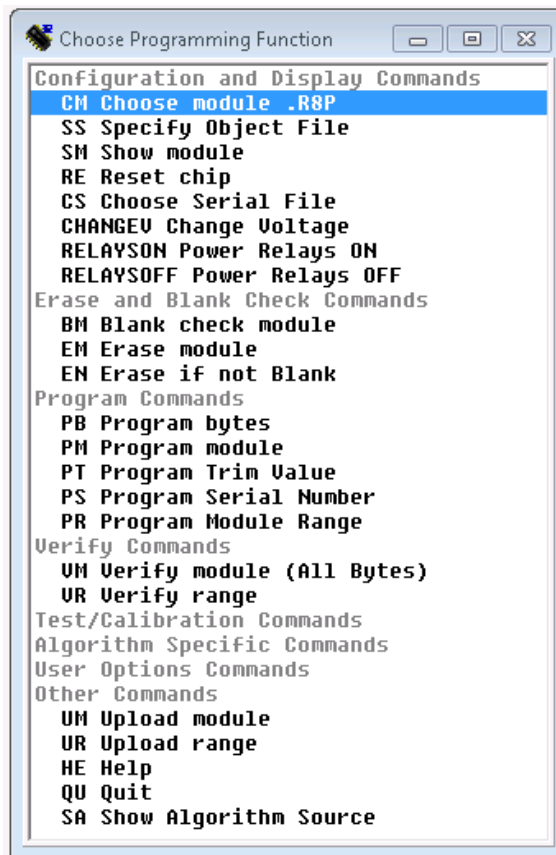


Figure 3-1: Choose Programming Function Window

Note: At any given time, or for a particular module, some of the commands may not be active. Inactive commands are indicated as such in the Choose Programming Functions Window and will not execute.

Below is a description of each of the PROGRS08Z commands used in manual programming. These same commands are also used in scripted programming. For more information about scripted programming, see the **CPROGRS08Z User Guide**.

3.1 **BM - Blank Check Module**

This command checks the entire module to see if it has been erased. If not, the address of the first non-blank location is given along with its contents.

3.2 **CHANGEV - Change the voltage provided to the target**

(Cyclone only)

The user will be prompted to enter a value between 0.00 and 5.00, inclusive, that specifies the new voltage. When CHANGEV is executed the Cyclone will immediately change to that voltage. If the Cyclone relays are off prior to calling this command, then the relays will turn on and set the new voltage value when this command is executed. Note that too low of a voltage value may put the device into low-power mode which can lose debug communication altogether. The user should make sure the Cyclone's jumper settings are set correctly to send the power to the right ports.

3.3 **CM - Choose Module .R8P**

The user is presented with a list of available .R8P files. Each .R8P file contains information on how to program a particular module. Usually, the name of the file indicates what kind of module it relates to. For example, the file MC9RS08KA2.R8P specifies how to program the 32 bytes block on a RS08KA2 processor. Setup information and further descriptions of the module are provided in ASCII text within the module file. This information is presented in the status window when a .R8P file is selected. The user can also look at this information inside of the module itself by using any standard text editor to view the module contents.

A particular .R8P file is selected by using the arrow keys to highlight the file name and then pressing ENTER. The currently selected .R8P file is shown in the .R8P file selected window. After a .R8P file is selected, the user is prompted for the base address of the module. This address is used as the beginning address for the module during programming and verification. Certain .R8P files, such as those for external flash algorithms, will prompt the user for the base address of the module.

3.4 CS - Choose Serial File

Used to select a Serial File generated by PEmicro's Serialize Utility.

3.5 EM - Erase Module

This command erases the entire module. If the entire Module is not erased, an error message will be returned.

3.6 EN - Erase If Not Blank

A blank check is performed to determine whether the flash is already erased. If not, an erase command is executed.

3.7 HE - Help

Opens this PROGRS08Z user manual.

3.8 PB - Program Bytes

The user is prompted for a starting address, which must be in the module. The user is then shown an address and a byte. Pressing ENTER shows the next location. The user can also enter in hex a byte to be programmed into the current location. In addition, the symbols +, -, or = may be appended to the value being written. They correspond respectively to increase the address (default), decrease the address, and hold the address constant. Failure to program a location, entering an invalid hex value or exceeding the address range of the module will exit the program bytes window. If a location fails to program, an error message will be returned.

3.9 PM - Program Module

For this command to work, the user must have previously selected an S-record file. The S-records are then checked to see if they all reside in the module to be programmed. If not, the user is asked if they want to continue. If the answer is yes, only those S-record addresses which lie in the module are programmed. If a location cannot be programmed, an error message will be returned.

3.10 PR - Program Module Range

Program the object file within specified starting and ending addresses.

3.11 PS - Program Serial Number

Program a serial number according to the .SER file selected using the CS command.

3.12 PT - Program Trim Value

Programs the non-volatile trim register or user-provided flash location. Devices that support trimming and have a dedicated non-volatile trim register will automatically program to that location. For devices that support trimming and do not have a dedicated non-volatile trim register, the user will need to provide a flash location where the trim values will be stored. The format and exact number of bytes programmed is device dependent.

Click on the "change" button found within the Configuration window to change the desired trim reference frequency between the default value or a custom value. For more information, please read the chip's reference manual about the clock generation modules.

3.13 QU - Quit

Terminates PROGRS08Z and returns to Windows.

3.14 RE - Reset chip

This causes a hardware reset to the microcontroller. This command can be used to recover from errors which cause the programmer not to be able to talk to the processor through the debug mode.

3.15 RELAYSOFF - Turn off the relays that provide power to the target

(only)

Includes a power down delay if specified. Especially useful for users who want to power cycle their board before running tests, allow their bootloader to run, or have the application code run after programming.

3.16 RELAYSON - Turn on the relays to provide power to the target

(only)

Includes a power up delay if specified. The voltage supplied will be based on the last voltage setting specified. For Cyclone users, the CHANGEV command can change the voltage value. Especially useful for users who want to power cycle their board

before running tests, allow their bootloader to run, or have the application code run after programming.

3.17 SA - Show Algorithm Source

Show the algorithm's source

3.18 SM - Show Module

The user is prompted for a starting address. If this address is not in the module and error is given. A window is opened which shows the contents of memory as hex bytes and ASCII characters if printable. Non-printing characters are shown as periods ("."). This window stays on the screen until the user presses ESCAPE.

3.19 SS - Specify S-Record

If the file is not found, an error message is given. The currently selected file is shown in the S19 file selected window. The programmer accepts S1, S2, and S3 records. All other file records are treated as comments. If the user does not specify a file name extension, a default of .S19 is used.

3.20 UM - Upload Module

The user is asked for a filename into which to upload S-records. The default filename extension is set to .S19 if none is specified by the user. S-records for the entire module are then written to the specified file.

3.21 UR - Upload Range

The user is prompted for a starting address, which must be in the module. Next, the user is asked for an ending address, which must also be in the module. The user is then asked for a filename into which to upload S-records. The default filename extension is set to .S19 if none is specified by the user. S-records are then written to the specified file.

3.22 VM - Verify Module

For this command to work, the user must have previously selected an S-record file. The S-records are then checked to see if they all reside in the module to be programmed. If not, the user is asked if they want to continue. If the answer is yes,

only those S-record addresses which lie in the module are verified. If a location cannot be verified, an error message will be returned which indicates the address, the contents of that address, and the contents specified in the S-record file.

3.23 VR - Verify Range

For this command to work, the user must have previously selected an S-record file. The user is prompted for a starting address, which must be in the module. Next, the user is asked for an ending address, which must also be in the module. S-record addresses which lie in the module are verified. If a location cannot be verified, an error message will be returned which indicates the address, the contents of that address, and the contents specified in the S-record file.

In addition, there is one function that is allowed to be unique to the module being programmed. The selection menu name and the length of up to one hexadecimal parameter may be specified in a supporting .R8P file.

3.24 VV - Verify Module CRC to Value

Verify against a specified CRC value. Used with the SC command to ensure each chip is programmed with the same data.

4 START-UP CONFIGURATION

The PROGRS08Z software may be started in a way that enables certain optional parameters, which can assist the programming process. To set these command-line parameters, highlight the Windows Icon for the PROGRS08Z executable, right-click, and select "Properties" from the pop-up File Menu. The "General" Properties tab should open by default. There are several parameters that you may then include on the command line. A description of each is listed below, followed by specific examples of how these parameters are used.

Syntax:

```
PROGRS08Z [freq n] [v] [interface=x] [port=y]
```

Where:

Optional parameters are in brackets []. The parameters are described as follows:

- [freq n]** This allows the user to specify the exact speed of the target. If this is not specified, the programmer tries to calculate the target's speed. The frequency specified is the INTERNAL clock frequency of the target. See **Section 2.2 - Algorithm Timing Considerations** for more information.
- [v]** If the optional parameter *v* is specified as either *V* or *v*, then the range of S-records is not verified during the programming or verification process. This can help speed up these functions.
- [interface=x]** where *x* is one of the following: (See examples section)
- USBMULTILINK (supports Multilink Universal, Multilink Universal FX, and OSJtag)
 - CYCLONE
- [port=y]** Where the value of *y* is one of the following (see the showports command-line parameter for a list of connected hardware; always specify the "interface" type as well):
- USBx Where *x* = 1,2,3, or 4. Represents an

enumeration number for each piece of hardware starting at 1. Useful if trying to connect to a Cyclone product. If only one piece of hardware is connected, it will always enumerate as USB1.

An example to select the first Multilink found is:

```
INTERFACE=USBMULTILINK  
PORT=USB1
```

Ethernet IP address ###. Each # symbol represents a decimal number between 0 and 255. Valid for Cyclone and Tracelink interfaces.

Connection is via Ethernet.

```
INTERFACE=CYCLONE PORT=10.0.1.223
```

NAME Some products such as the Cyclone support assigning a name to the unit, such as "Joe's Max". The Cyclone may be referred to by it's assigned name. If there are any spaces in the name, the whole parameter should be enclosed in double quotes (this is a Windows requirement, not a PEmicro requirement).

Examples:

```
INTERFACE=CYCLONE  
PORT=MyCyclone99
```

```
INTERFACE=CYCLONE "PORT=Joe's Max"
```

UNIQUEID USB Multilink products all have a unique

serial number assigned to them, such as PE5650030. The Multilink may be referred to this number. This is useful in the case where multiple units are connected to the same PC.

Examples:

```
INTERFACE=USBMULTILINK  
PORT=PE5650030
```

COMx Where x = 1,2,3, or 4. Represents a COM port number. Valid for Cyclone interfaces.

To connect to a Cyclone on COM1 :

```
INTERFACE=CYCLONE PORT=COM1
```

x Where x = 1,2,3, or 4. Represents a parallel port number

Example

```
CPROGRS08Z C:\ENGINE.CFG Interface=USBMULTILINK Port=USB1
```

Opens CPROGRS08Z with the following options:

- Run the C:\ENGINE.CFG script
- Interface is Multilink, first cable detected.

Example

```
CPROGRS08Z C:\ENGINE.CFG Interface=CYCLONE Port=209.61.110.251
```

Opens CPROGRS08Z with the following options:

- Run the C:\ENGINE.CFG script
- Interface is Cyclone LC and Cyclone FX via the Ethernet Port with an IP address of



209.61.110.251

5 CONNECTION MANAGER

Before programming your device, you will need to connect to your target using a compatible PEmicro hardware interface..

Once you have physically connected your PC to your target using the hardware interface, and the appropriate drivers are installed, the following Connection Manager dialog will appear:

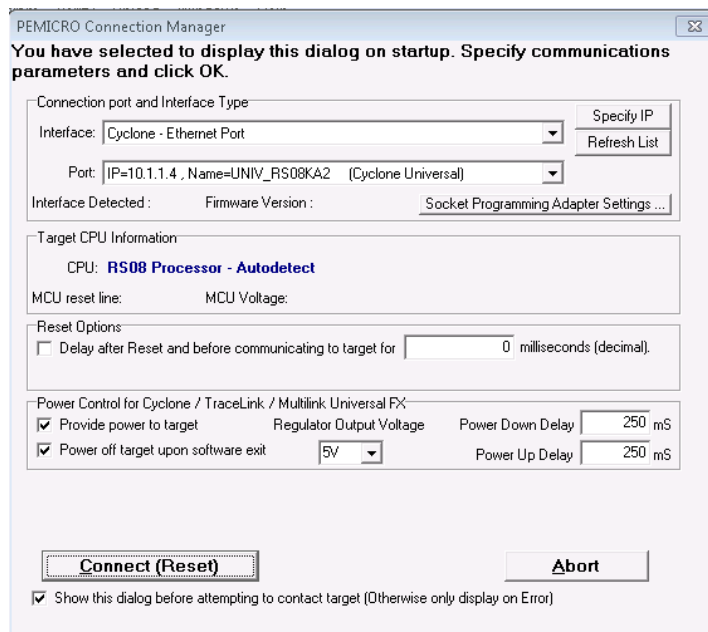


Figure 5-1: Connection Manager Dialog

The Connection Manger allows you to choose the interface that you wish to use and configure the connection.

Use the Interface drop-down menu to choose the type of interface that you plan to use.

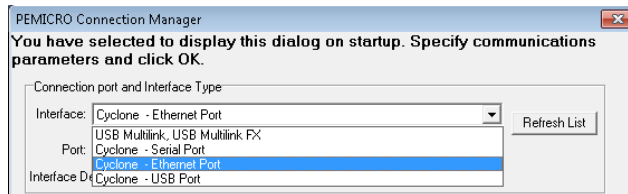


Figure 5-2: Connection Manager - Select Interface

Then select the interface from those available, which are listed in the Port drop-down list. The Refresh List button to the right may be used to update the list of available interfaces:

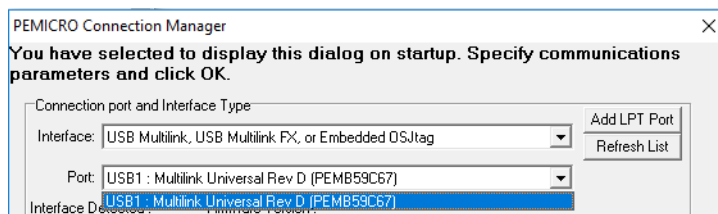
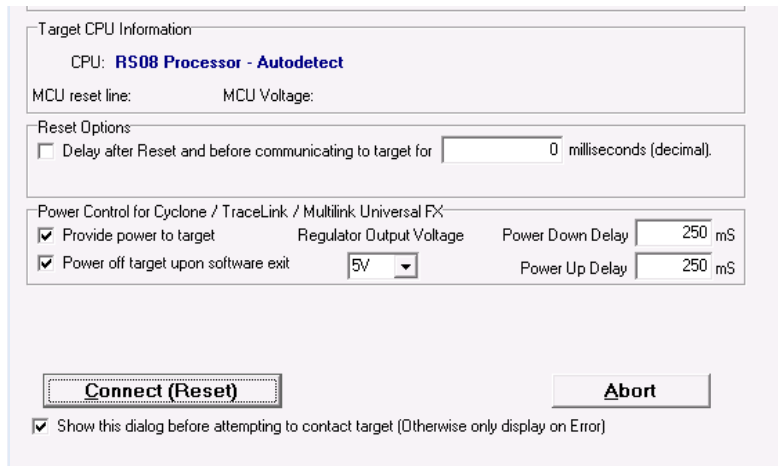


Figure 5-3: Connection Manager - Select Port

5.1 Additional Settings

The remainder of the PEMICRO Connection Manager allows the user to make settings related to BDM Communications Speed, MCU Internal Bus Frequency, and Power Control (for interfaces that can provide power to the target device).



Target CPU Information

CPU: **RS08 Processor - Autodetect**

MCU reset line: MCU Voltage:

Reset Options

Delay after Reset and before communicating to target for milliseconds (decimal).

Power Control for Cyclone / TraceLink / Multilink Universal FX:

Provide power to target Regulator Output Voltage Power Down Delay mS

Power off target upon software exit 5V Power Up Delay mS

Show this dialog before attempting to contact target (Otherwise only display on Error)

Figure 5-4: Connection Manager - Additional Settings

5.1.1 BDM Communications Speed

This software can automatically detect the proper communication speed to establish a connection with the target, but debug shift speed can also be set manually using the drop-down box.

5.1.2 Reset Options

If your board has any active components connected to your RESET signal such as a supply voltage supervisory circuit or a reset monitor, the RESET signal may have a longer rise time. This option can set a delay before beginning communication to give time for RESET to stabilize. A typical value is 300 milliseconds.

5.1.3 Power Control for Cyclone / TraceLink / Multilink Universal FX

This option controls how power is provided to the target board (only on supported debug interfaces).

5.2 Connect and Choose Algorithm

Once you have made all your selections in the PEmicro Connection Manager, Click the Connect (Reset) button to connect to the target. If you are successful, you will be prompted to choose a programming algorithm for your target using the following

browse window:

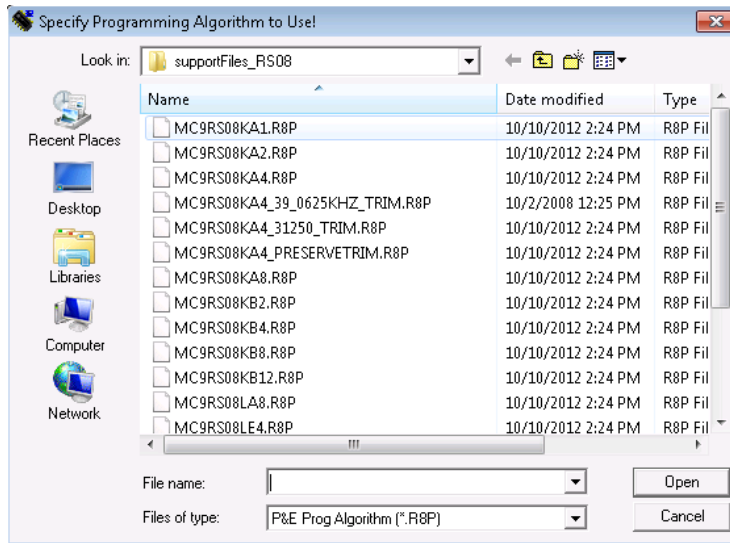
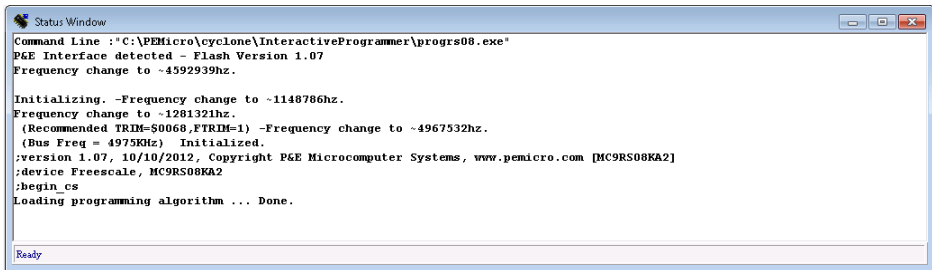


Figure 5-5: Select Algorithm

With the appropriate algorithm selected, you are ready to begin programming.

6 MANUAL PROGRAMMING

The Choose Programming Function Window (see **Figure 3-1**) lists commands that are available to execute. Any of the programmer's enabled features can be selected using the mouse, the up and down arrow keys, or by typing the two-letter command abbreviations that appear to the left of the list of programming functions into the Status Window. The Status Window also displays any error messages that might result from the commands that you perform.



```

Status Window
Command Line : 'C:\PEMicro\cyclone\InteractiveProgrammer\progrs08.exe'
P&E Interface detected - Flash Version 1.07
Frequency change to ~4592939hz.

Initializing. -Frequency change to ~1148786hz.
Frequency change to ~1281321hz.
(Recommended TRIM=0068,FTRIM=1) -Frequency change to ~4967932hz.
(Bus Freq = 4975KHz) Initialized.
;version 1.07, 10/10/2012, Copyright P&E Microcomputer Systems, www.pemicro.com [MC9RS08KA2]
;device Freescale, MC9RS08KA2
;begin cs
Loading programming algorithm ... Done.

Ready
  
```

Figure 6-1: Status Window

Pressing ENTER or double clicking the mouse in the Choose Programming Function Window will execute the highlighted entry if it is enabled. The user will be prompted for any additional information that is required to execute the selected function. Before you can program a module from an S record file, you must select such a file. If you try to execute a program module function and you have not selected a file, you will be asked to select one.

6.1 Manual Programming Procedure

Here is the procedure for performing manual programming:

1. Before turning on your power supply, check that the target power supply is on and the interface cable is connected to your target board. Be sure to apply proper target voltage before programming the flash. If you lose contact with your target board at any time during the procedure, you may double-click the "RE" command (Reset) to begin again.
2. Using the PROGRS08Z software, choose the programming algorithm by selecting the appropriate .R8P file. Double clicking the "CM" (Choose Module) command will allow you to select the algorithm you wish to use.
3. After you select the .R8P file, you may be asked for the base address.

This is the address at which you would like to program the code. Enter the appropriate base address.

4. a) Use the "EM" (Erase Module) command to erase the module at that location. The process of erasing the module will vary according to the size of the flash, but should take no longer than 30 seconds. If this procedure seems to be taking much longer than 30 seconds, then the computer is probably not getting a proper response from the board. If this is the case:
 - b) Check the jumper setting on your target board, as well as the programming voltage.
5. Some programming algorithms have a special command, such as "BE," for block erase. If you are unable to double-click the "EM" (Erase Module) command, try using the "BE" (Block Erase) command. Some commands are hidden and you may need to use the scroll bar to scroll down to these commands.
6. You may check to see whether or not the module has been erased by double-clicking the "BM" command (Blank Check Module). If the flash is not properly erased then this command will give you an error message. You may also check the contents of the memory locations by double-clicking the "SM" (Show Module) command. If the flash has been erased properly then all the memory locations will display "FF".
7. Now use the "SS" command (Specify S Record) to load the object file (.S19), which you should have generated previously by using a compiler or an assembler. This command will ask for the name of the .S19 file.
8. Now you ready to program the flash. Double click the "PM" command (Program Module) to begin the programming process.
9. In order to check the results, use the "SM" command (Show Module) with the appropriate base address to view the contents of the flash. You should see that the flash has been correctly programmed. You may also double-click the "VM" command (Verify Module) to verify that all the bytes of the flash are correctly programmed.

7 SCRIPTED PROGRAMMING (CPROGRS08Z)

Programming commands, in addition to be executed manually, may also be collected into script files which can be used to automate the programming process. These scripts are executed by a command-line programming application called CPROGRS08Z, which is included with the PROGRS08Z software. When you run the CPROGRS08Z.EXE application, it will look for the *prog.cfg* script file and automatically execute the commands in that file.

For complete instructions on how to configure and execute the CPROGRS08Z scripted programmer, please see the **CPROGRS08Z User Guide**.

8 PROGRAMMING UTILITIES

The following no-cost programming utilities are available on PE micro's website. www.pemicro.com, by navigating to Support -> Documentation & Downloads -> Utilities.

8.1 Serialize

The Serialize utility allows the generation of a .SER serial number description file. This graphical utility sets up a serial number which will count according to the bounds set by the user. The .SER file can be called by the PROG flash programmer to program a serial number into the target.

More information on how to use the Serialize utility can be found on PE micro's website at: www.pemicro.com/newsletter/experts_corner/2005_08_17/serialize.cfm.

APPENDIX A - SETUP COMMANDS

Setup Commands are commands that each appear on separate lines of a .R8P programming algorithm file, starting in column one. They are used to initialize the target CPU when it is not possible to do so using the enable function, which must first be loaded into target ram before execution. All setup commands must appear before the first S record in the .R8P file or they will be ignored.

The setup commands are:

BLANK_MODULE_ONLY

This command has 17 characters. It indicates to the programmer that if a blank byte address or blank word address is provided they can only be used to enable a blank module command.

SHORT_TABLE

This command has 11 characters. It indicates to the programmer that the algorithm table has 16 bit entries as opposed to the normal 32 bit entries. It is used to save space when only a small RAM is available.

BLOCKING_MASK=mmmmmmmm/

This command has 23 characters. First it tells the programmer that only full blocks of data can be programmed into the device and that blocks must occur on a block boundary. The mask *mmmmmmmm* is used to select those address lines which occur within a block. For example, blocks of 8 bytes would have a mask of 00000007. The buffer provided in the target must in size be an integral multiple of the blocking size in bytes.

SET_TIMING=nn/

This command has 14 characters and tells the programmer that at the end of executing an enable, it should calculate *nn* timing parameters. Enable passes back an address in ix which points to the timing parameters in target RAM. The number in each timing word (stored by enable) is multiplied by 10 microsecond timing constant and stored back in the same location.

ADDRESS_PAGING=mmmmmmmm/ooooooo/

This command has 33 characters and tell the programmer that some form of address paging is being used. Under these circumstances, the function **BEFORE_READ** must set up the paging configuration address. The mask *mmmmmmmm* is used to determine which bits of the address represent the page address so that page changes can be detected. The actual address read is calculated by the PROG software as (address and not(*mmmmmmmm*)) +

00000000.

NO_BASE_ADDRESS

or

NO_BASE_ADDRESS=bbbbbbbb/

This 15 character command version tells the prog software to use a base address of 0 and not to ask the user to enter one. The 25 character version is the same except it sets the base address to *bbbbbbbb*.

NO_ON_CHIP_RAM

This command has 14 characters and tells the programmer not to turn on the on chip ram. You must provide ram to run the calibration routines and load your .12P file S records. If not deactivated by this command, the on chip RAM is turned on after all other setup commands are executed.

NO_TIMING_TEST

This command has 14 characters and tells the programmer not to evaluate the target processor speed the initialization process. Instead, both timing constants are set to 1. This option is only used when programming timing functions are not needed.

WRITE_LONG=IIIIIII/aaaaaaaa/

This command has 29 characters. It writes the hex long *IIIIIII* to the hex address *aaaaaaaa* in the current space.

WRITE_WORD=www/aaaaaaaa/

This command has 25 characters. It writes the hex word *www* to the hex address *aaaaaaaa* in the current space.

WRITE_BYTE=bb/aaaaaaaa/

This command has 23 characters. It writes the hex byte *bb* to the hex address *aaaaaaaa* in the current space.

APPENDIX B - TABLE ENTRY

Users who wish to make significant modifications to a programming algorithm may need to modify the table entries in their assembly (.ASM) file. Table entries provide information to the PROG software, including what functions are in the algorithm and where they are located. Each table entry consists of 32 bits and must be in the following order:

Stack Address

Address of the stack during routine execution. The stack is initialized each time one of the user-supplied routines is called.

Buffer Address

Address of the buffer used to transfer data from the PC to the target. This is data to be placed into the module.

Buffer Length

Length of available buffer space in bytes. The buffer should be at least 8 bytes long in order to accommodate the largest possible S record.

Module Address

The physical address of the beginning of the module to be programmed or erased.

Module Length

Length of the module to be programmed in bytes.

Blank Bytes Address

The address of a routine to check a block of bytes to see if they are erased. R1 contains the starting address and R2 contains the number of bytes to check. Checking is done on a byte by byte basis. If R2<>0 on return then an error occurred at word address R1-1. R2 = 0.

Blank Words Address

The address of a routine to check a block of words to see if they are erased. R1 contains the starting address and R2 contains the number of bytes to check. Checking is done on a word by word basis. If R2<>0 on return then an error occurred at word address R1-2. R2 = 0.

Erase Bytes Address

The address of a routine to erase a block of bytes. R1 contains the starting address and R2 contains the number of bytes to erase. Erasing is done on a byte

by byte basis. R2 = 0.

Erase Long Address

The address of a routine to erase a block of longs. R1 contains the starting address and R2 contains the number of bytes to erase. Erasing is done on a word by word basis. If R2<>0 on return an erase error occurred. R2 = 0.

Erase Module Address

The address of a routine which erases the entire module. R1 contains the starting address to be erased, R2 contains the length in bytes. Returning to PROGARM with R2 non zero indicates an error.

Program Bytes Address

The address of a routine which programs a block of bytes residing in the buffer. R2 contains the length of the block in bytes. R1 contains the starting address at which they are to be programmed. R3 contains the address of the buffer. Returning with R2 non zero indicates an error.

Program Words Address

The address of a routine which programs a block of bytes residing in the buffer. R2 contains the length of the block in bytes. R1 contains the starting address at which they are to be programmed. R3 contains the address of the buffer. Returning with R2 non zero indicates an error.

On Volts Address

Routine to turn on the programming voltage to the module to effect an erase or program function. If the programming voltage is left on all the time, then this routine should be implemented only as a BGND instruction. If no routine is provided, then the user is asked to turn on the voltage.

Off Volts Address

Routine to turn off the programming voltage to the module. If the programming voltage is left on all the time, then this routine should be implemented only as a BGND instruction. If no routine is provided, then the user is asked to turn off the voltage.

Enable Address

Routine to set up the programming process. This routine is called once after a .12P module is selected and each time a command is executed. It is used to do things such as set up chip selects, turn devices on, etc. The chip can be set up using commands (such as WRITE_WORD) in the .12P file, however, these

commands are only done when a .12P file is selected.

Disable Address

Routine to provide a graceful shutdown of any target resources. Usually not required.

Before Read Address

Routine which is called before reading data from a module. Not required in most cases.

After Read Address

Routine which is called after reading data from a module. Not required in most cases.

User Function Address

Optional routine (and table entry) to provide an arbitrary user function if one is specified in the .xxP file. (See section on USER function).