Cyclone MAX User Manual

freescale™
Alliance Member

CYCLONEMAXUM

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1 INTRODUCTION

The Cyclone MAX is a versatile tool that can be used for the programming, debugging, and testing of microprocessor-based hardware. It can be controlled interactively via a Host PC, or operate independently of the PC in stand-alone mode. The Cyclone MAX can also be configured and operated via Serial, USB, and Ethernet communication interfaces. When in stand-alone mode, its programming functions can be initiated directly through user input buttons, or by using those same buttons to make selections from the LCD menu.

The Cyclone MAX is able to debug and program a variety of processor architectures using the target hardware's Background Debug Mode (BDM) or JTAG ports.

• **Supported Architectures**

- Power Architecture BDM (MPC5xx/8xx)
- Qorivva (MPC55xx/56xx)
- ColdFire V2/3/4 (MCF52xx/53xx/54xx)
- Kinetis ARM
- ARM Nexus (MAC7xxx Automotive Family)

In addition to the versatility of being able to debug and program the aforementioned processor families, and the ability to function in stand-alone mode, the Cyclone MAX includes these other features:

• **Multiple Communications Interfaces**

- Ethernet 10/100 baseT
- USB 1.1
- Serial Baud 115200, no parity, 8 data bits, 1 stop bit.

• **Onboard and CompactFlash Storage**

- Onboard storage of 7 Megabytes. Stores the image to be

programmed, programming algorithm, and any configuration settings.

- CompactFlash storage available with purchase of CompactFlash activation license.
- Multiple images may be saved using the onboard or CompactFlash (when activated) storage.

• **Multi-Voltage Operation**

- Automatically detects and caters to target voltages ranging from 1.8 to 5 Volts.

• **LCD Menu**

- Allows simple, menu-based control of the configuration and function of the Cyclone MAX.

In short, the Cyclone MAX is an all-in-one solution for debugging, programming, and testing of your hardware.

2 GETTING STARTED

Stand-alone programming is the most common use of the Cyclone MAX, therefore this section provides a simple quick-start guide to 1) configuring the Cyclone MAX with data, and 2) using it in stand-alone mode to program the flash of a target system. The user is encouraged to read this manual in its entirety for a complete description of the full feature set of the Cyclone MAX.

2.1 Software Installation

The first step is to install the accompanying software. This will install all of the applications and drivers that will be used to configure/control the Cyclone MAX. Once the installation is complete and the PC has been rebooted you may begin to configure the unit for operation.

2.2 Image Creation Utility

If you plan to use the Serial or USB ports for communication, then the Cyclone MAX can be used right out of the box. If you wish to use the Ethernet port, however, you will need to configure the corresponding IP numbers before use. The Ethernet port will not be functional until this configuration is complete. Please read **Section 8 - ETHERNET PORT CONFIGURATION** for more information about the Cyclone IP Setup Utility.

Once you have connected the Cyclone MAX to the PC via either a Serial, USB, or Ethernet cable, you can launch the Cyclone MAX Image Creation Utility in order to create a SAP image. A "SAP" Image, or Stand-Alone Programming Image, is a self-contained image of programming algorithms, programming procedures, and program data. Once the SAP Image has been created, it can be transferred to the Cyclone MAX or saved to disk for later use. The Cyclone MAX uses SAP Images to perform stand-alone programming of target devices

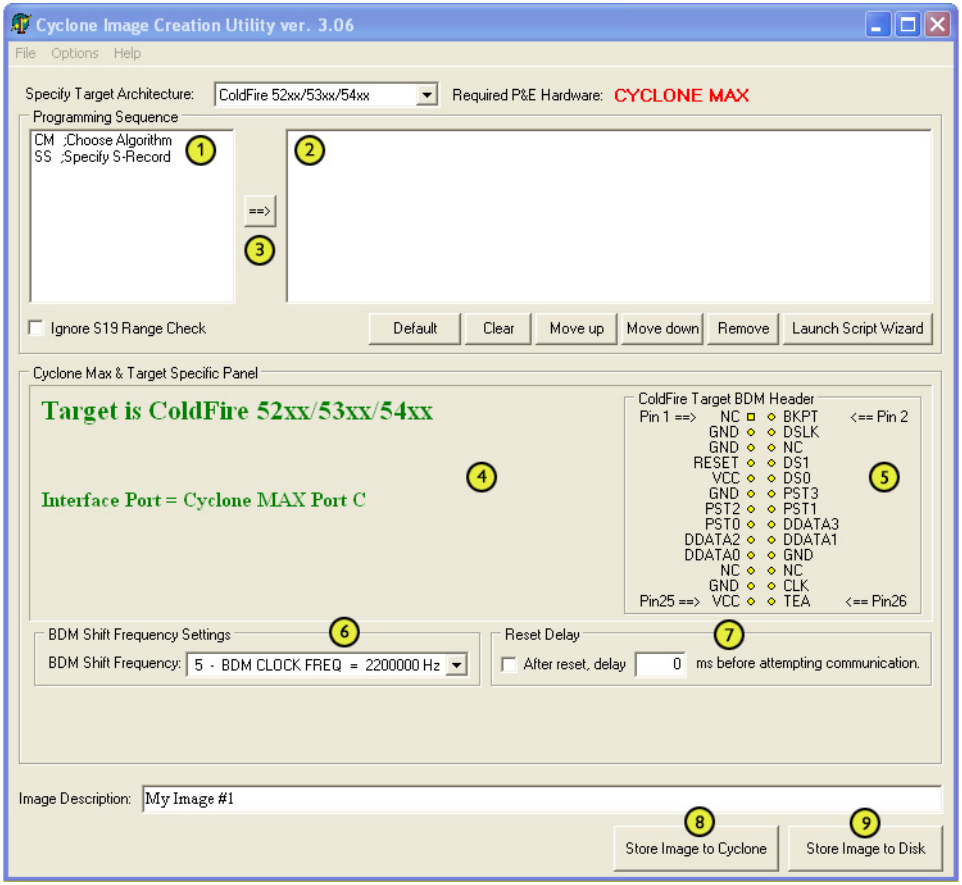

Figure 2-1: Cyclone Image Creation Utility

(1) Provides a list of available functions that the user may select and add to the programming sequence.

(2) This window is where the programming steps are sequenced.

(3) This button moves selected programming functions into the sequence window.

(4) Displays the processor architecture and the corresponding interface port on the Cyclone MAX.

(5) Displays the pinout configuration for the selected architecture.

(6) Allows the user to set the BDM Shift Frequency by selecting from the drop-down box.

(7) Allows the user to set the Reset Delay.

(8) The “Store Image To Cyclone” button allows the user to store the current image on the Cyclone MAX.

(9) The “Store Image To Disk” button allows the user to store the current image on their hard drive. The Manage Image Utility can be used to configure the Cyclone with one or more images.

At this stage you are simply configuring the Cyclone with the appropriate data file and programming procedure. Actual programming of the target hardware occurs later.

Once the information required in Areas 1-4 is complete, you may configure the Cyclone MAX by clicking the “Store Image to Cyclone” button.

After the image has been saved, you can program a target by simply pressing the “Start” button on the Cyclone MAX. This will begin the sequence that was specified in **Area 3** (in this example: erase, blank check, program, verify programmed data).

The complete functionality of the Cyclone MAX and its accompanying utilities is beyond the scope of this **Getting Started** section. Please read further to learn more about the full feature set and operation of the Cyclone MAX. For a detailed description of the Cyclone MAX Configuration Utility, please refer to **Section 4 - STAND-ALONE PROGRAMMER CONFIGURATION**.

Another option is to save the SAP Image to disk. This allows you to transfer the image to several different Cyclones, or conversely to transfer several images to one Cyclone. The utility that allows you to transfer multiple images to the Cyclone MAX (or its accompanying CompactFlash card) is called the Manage Images Utility.

2.3 Manage Images Utility

Once the programming images have been created and saved to the disk using the Create Image utility, they may then be loaded collectively onto the Cyclone. The Manage Images utility, shown in **Figure 2-2**, allows the Cyclone to store and manage multiple images in the Cyclone’s internal memory. If you have purchased a CompactFlash activation license it will also allow you to store and manage multiple images on any compatible CompactFlash cards

that are loaded into the Cyclone's CompactFlash port.

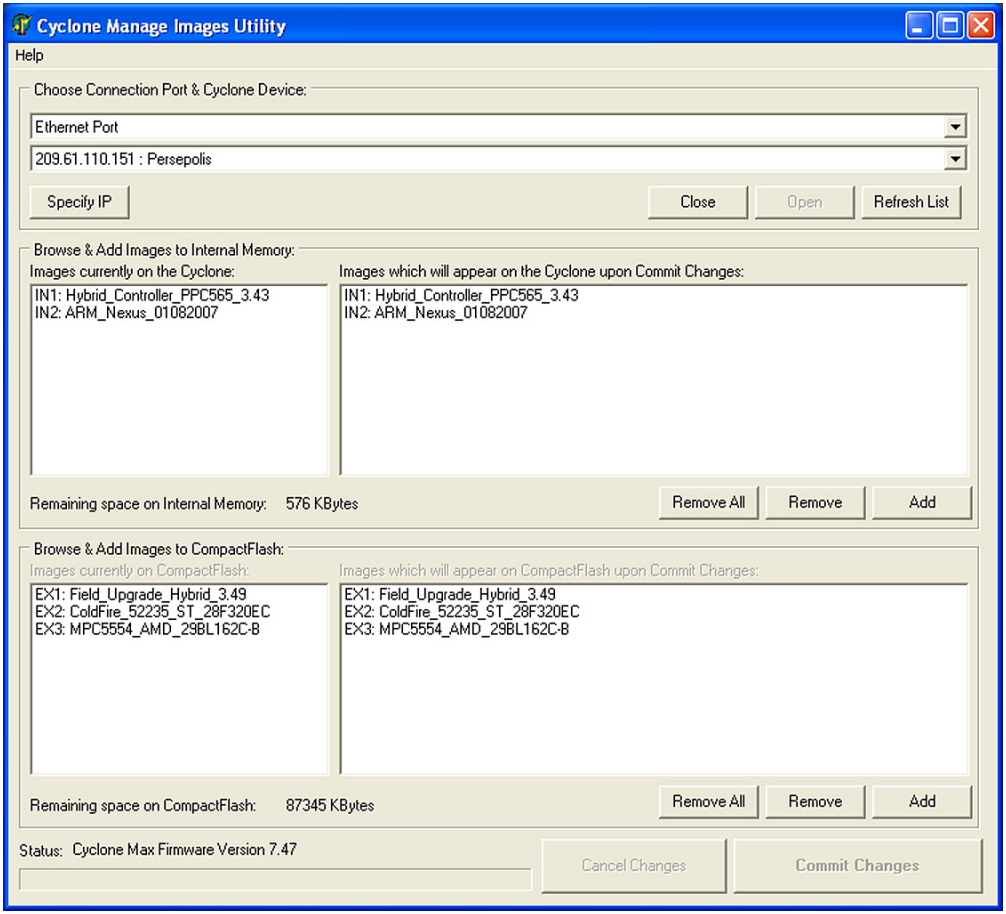

Figure 2-2: Manage Images Utility

Upon opening a selected Cyclone MAX, the user is provided in the top left panel with a list of the images currently on the unit's internal memory. If the CompactFlash license has been activated, a list of images on any connected CompactFlash card will also be displayed in the bottom left panel. The panels to the right can be used to add or delete additional images by using the Add and Remove buttons beneath each panel.

Once the images that you wish to load appear in the panels to the right, you must press “Commit Changes” to load the Cyclone accordingly. No changes made to the Cyclone MAX until the “Commit Changes” button is pressed.

Note: Any images that are already stored on the Cyclone MAX or CompactFlash can only be removed by using the “Remove All” button.

3 CYCLONE MAX HARDWARE

This section describes the various ports and inputs of the Cyclone MAX.

3.1 Power Source

The Cyclone MAX requires a regulated 6V DC Center Positive power supply with 2.5/5.5mm female plug. The Cyclone MAX receives its power from the power jack located on the side of the unit.

Figure 3-1: Power Jack

3.2 Serial (RS232) Communications Port

The Cyclone MAX provides a DB9 Female connector for communication with a host computer through the Serial (RS232) Port. Communication takes place at a fixed baud rate of 115200 Baud, 8 Data bits, No Parity, and 1 Stop Bit.

Figure 3-2: Serial Port

3.3 USB 1.1 Communications Port

The Cyclone MAX provides a USB connector for communicating with a PC via the Universal Serial Bus port. The Cyclone MAX is a USB 1.1 compliant device.

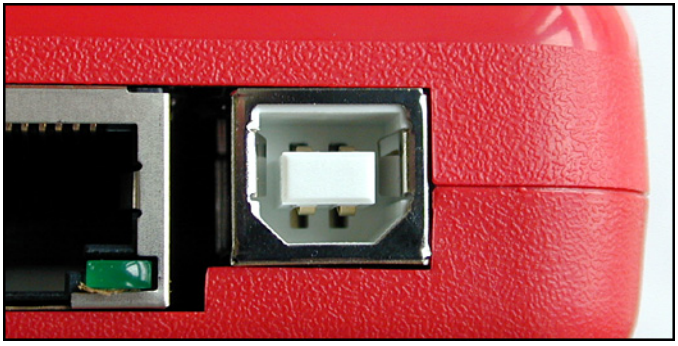

Figure 3-3: USB Port

3.4 Ethernet Communications Port

The Cyclone MAX provides a standard RJ45 socket for communication with a host computer through the Ethernet Port. The Ethernet Port of the Cyclone MAX is a 10/100 baseT port.

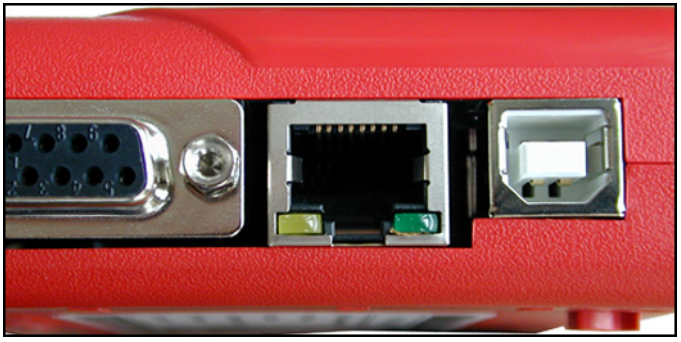

Figure 3-4: Ethernet Port

3.5 PORT A – Reserved

Port A is reserved for future use.

3.6 PORT B – Qorivva (MPC55xx/56xx) Interface

Port B can be used to connect to Qorivva (MPC55xx/56xx) targets. For the physical dimensions of the connector, please see **Section 3.14 - Ribbon Cable with IDC Socket**.

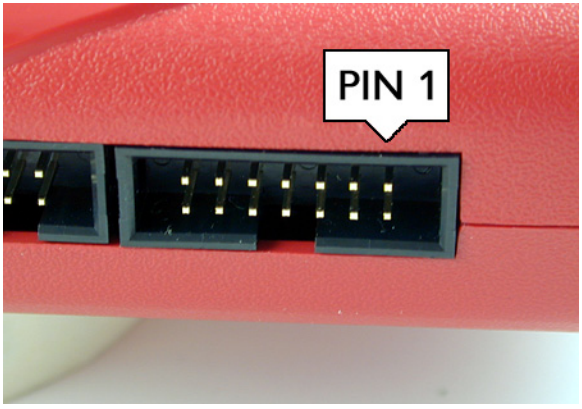

Figure 3-5: Port B - Qorivva Interface

Qorivva Pinout

TDI	**1**	**2**	GND
TDO	**3**	**4**	GND
TCK	**5**	**6**	GND
NC	**7**	**8**	NC
RESET	**9**	**10**	TMS
VDDE7	**11**	**12**	GND
RDY	**13**	**14**	JCOMP

3.6.1 BERG14-to-MICTOR38 Optional Connector (PORT B)

P&E offers a 14-pin BERG to 38-pin MICTOR adapter, sold separately, that may be used on Port B of the Cyclone MAX. The P&E part number is

BERG14-TO-MICTOR38.

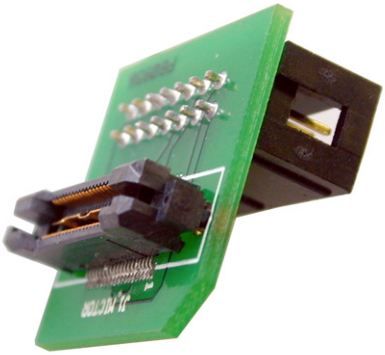

Figure 3-6: BERG14-TO-MICTOR38 Adapter (Sold Separately)

3.7 PORT C – ColdFire Interface & ColdFire Extension Cable

Port C is the interface for the ColdFire MCF52xx/53xx/54xx family of microprocessors. This port connects to the target hardware using either the ColdFire extension cable (for synchronous ColdFire targets) or a standard 26-pin ribbon cable (for asynchronous ColdFire targets). Both cables are provided in the Cyclone MAX package. Please refer to each processor's user manual to identify whether it is a synchronous or asynchronous interface. If you are not sure, or for test purposes, the synchronous cable will work with all 52xx, 53xx, and 54xx targets. For the physical dimensions of the connector, please see **Section 3.14 - Ribbon Cable with IDC Socket**.

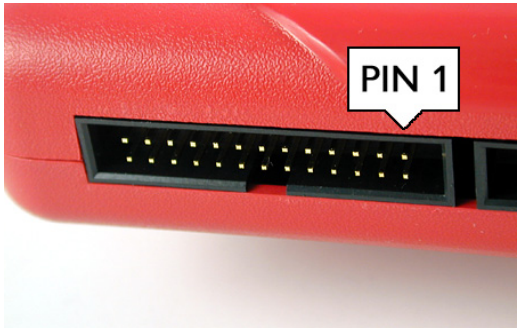

Figure 3-7: Port C - ColdFire Interface

ColdFire Pinout

N/C	**1**	**2**	BKPT
GND	**3**	**4**	DSCLK
GND	**5**	**6**	N/C
RESET	**7**	**8**	DSI
VCC	**9**	**10**	DSO
GND	**11**	**12**	PST3
PST2	**13**	**14**	PST1
PST0	**15**	**16**	DDATA3
DDATA2	**17**	**18**	DDATA1
DDATA0	**19**	**20**	GND
N/C	**21**	**22**	N/C
GND	**23**	**24**	CLK
VCC	**25**	**26**	TEA

The ColdFire extension cables, one for Synchronous targets and one for Asynchronous targets, are pictured below:

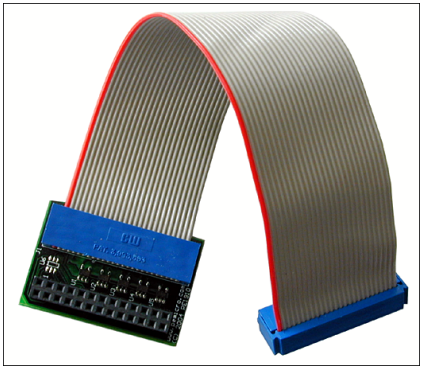

Figure 3-8: ColdFire Extension Cable With Adapter (Synchronous ColdFire Targets)

Figure 3-9: ColdFire Ribbon Cable (Asynchronous ColdFire Targets)

3.8 PORT D – Power Architecture BDM Interface

Port D can be used to connect to Power Architecture BDM (MPC5xx/8xx) targets. For the physical dimensions of the connector, please see **Section 3.14 - Ribbon Cable with IDC Socket**.

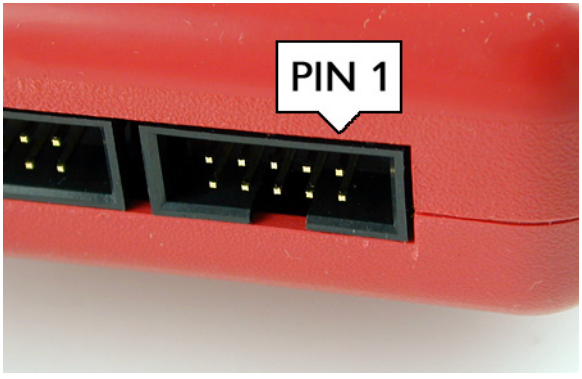

Figure 3-10: Port D - Power Architecture BDM Interface

Power Architecture BDM Pinout

N/C	**1**	**2**	SRESET#
GND	**3**	**4**	DSCLK
GND	**5**	**6**	N/C
HRESET#	**7**	**8**	DSDI
VDD	**9**	**10**	DSDO

3.9 PORT E – Kinetis & ARM Nexus

Port E can be used to connect to Kinetis and ARM Nexus (MAC7xxx) targets. For the physical dimensions of the connector, please see **Section 3.14 - Ribbon Cable with IDC Socket**. The Cyclone MAX also includes an adapter for users whose Kinetis target header is Mini-10 or Mini-20. A Mini-20 ribbon cable comes with the adapter.

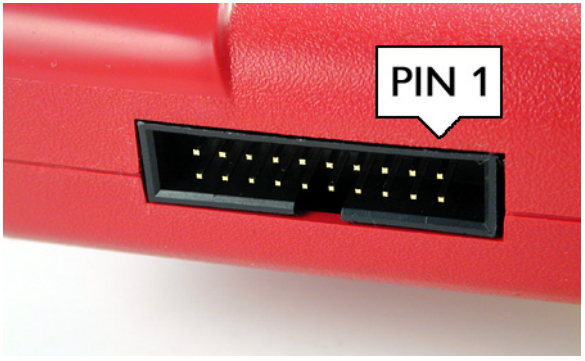

Figure 3-11: Port E- ARM Nexus

ARM Nexus Pinout

TVCC	**1**	**2**	N/C
TRST#	**3**	**4**	GND
TDI	**5**	**6**	GND
TMS	**7**	**8**	GND
TCK	**9**	**10**	GND
N/C	**11**	**12**	GND
TDO	**13**	**14**	GND
RESET#	**15**	**16**	GND
N/C	**17**	**18**	GND
N/C	**19**	**20**	GND

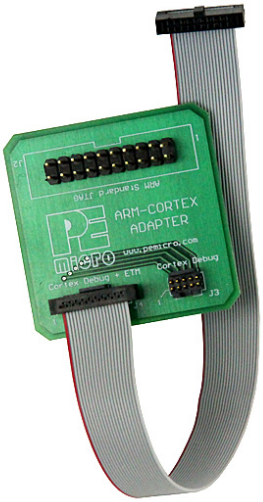

Figure 3-12: Kinetis Mini-10 and Mini-20 Adapter

PORT F - MINI 20

Kinetis

TVCC 1	▪ ▪	2 NC
GND 3	▪ ▪	4 TCK
GND 5	▪ ▪	6 TDO
NC 7	▪ ▪	8 TDI
GND 9	▪ ▪	10 $\overline{\text{RESET}}$
NC 11	▪ ▪	12 NC
NC 13	▪ ▪	14 NC
GND 15	▪ ▪	16 NC
GND 17	▪ ▪	18 NC
GND 19	▪ ▪	20 NC

PORT G - MINI 10

Kinetis

TVCC 1	▪ ▪	2 NC
GND 3	▪ ▪	4 TCK
GND 5	▪ ▪	6 TDO
NC 7	▪ ▪	8 TDI
GND 9	▪ ▪	10 $\overline{\text{RESET}}$

Figure 3-13: Kinetis Mini-10 and Mini-20 Pinouts

3.10 PORT F – Reserved

Port F is reserved for future use by P&E. Do not connect to this port.

3.11 CompactFlash Port

The CompactFlash port can be activated by purchasing a CompactFlash Activation License from P&E. The CompactFlash port accepts Type I CompactFlash cards. This allows the user to store programming images that are, individually or collectively, larger than the Cyclone's internal memory (7MB). It also makes swapping programming images much more quick and convenient. A 128MB CompactFlash card (shown below) is included with activation.

Figure 3-14: CompactFlash Port

Purchase of the CompactFlash activation license unlocks the CompactFlash panels in the included Manage Images utility. Programming images may then be managed on the CompactFlash in exactly the same way as they are in the Cyclone's internal memory. Please see **Section 2.3 - Manage Images Utility** for more information about using Manage Images.

3.12 Cyclone MAX Buttons

There are five (5) buttons on the top of the Cyclone MAX which are used for stand-alone programming and to navigate the LCD menus. They are specified as follows:

Button	Function
START / ⬆	Start executing the tasks pre-configured into the Cyclone MAX. **Menu Mode:** Navigate upwards in LCD menu.
AUX / ⬇	Perform auxiliary function (stand-alone verification). **Menu Mode:** Navigate downwards in LCD menu.
MENU / [SELECT]	Displays LCD Menu (enters Menu Mode). **Menu Mode:** Select highlighted item in LCD menu.
CANCEL	Cancel the tasks being executed and go back to the standby state.
RESET	Hardware reset of the Cyclone MAX.

3.13 LEDs

Eight LEDs are used to provide programming and Cyclone MAX status:

1. Power – Indicates power has been supplied to Cyclone MAX
2. Ready – The Cyclone MAX is ready to perform programming functions
3. Image – Indicates the presence of one or more images on board.
4. Erase – Erasing of target flash is in progress
5. Program – Programming of target flash is in progress
6. Verify – Verifying of target flash is in progress
7. Error – An error occurred during programming
8. Success – Programming functions completed successfully

3.14 Ribbon Cable with IDC Socket

The Cyclone MAX provides several standard 0.100-inch pitch dual row 0.025-inch square headers (Ports A-F, as described earlier in **Section 3 - CYCLONE MAX HARDWARE**). A typical layout for one such header is shown below. Using these headers, the Cyclone MAX can communicate with the target through a number of different-sized ribbon cables. Each of the ribbon cables have a 0.100-inch centerline dual row socket IDC assembly (not keyed). The ribbon cables are designed such that the Cyclone MAX Ports and

target BDM Ports must have the same pinout, i.e., Pin 1 of a Cyclone MAX Port is connected to Pin 1 of the target BDM header. Here is an example header:

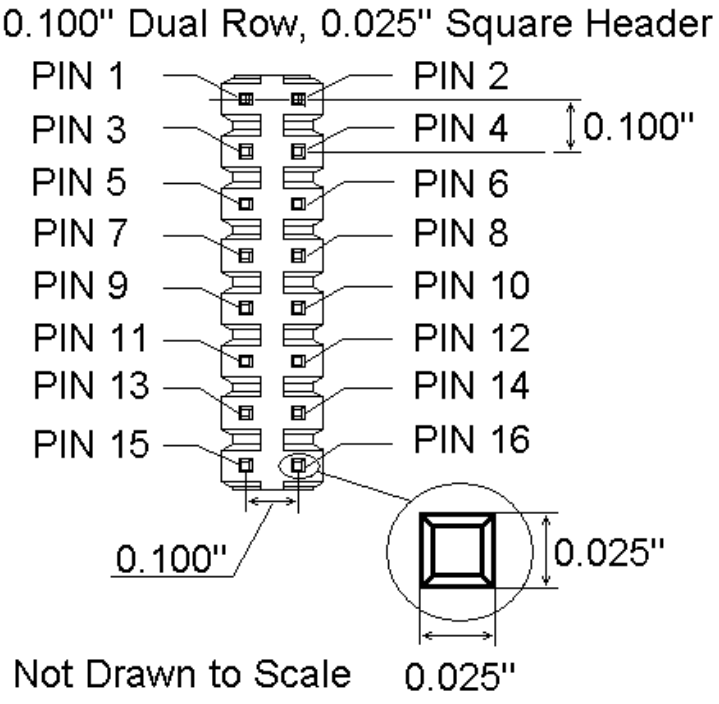

Figure 3-15: Example 16-Pin Header Diagram

The following notes relate to the pinout labels on Cyclone MAX Ports:

- N/C signifies a No Connect. This pertains to pins that are reserved for future use by Freescale or P&E Microcomputer Systems, and should not be connected.
- A signal name ending in # (e.g. RESET#) signifies an active-low signal.

4 STAND-ALONE PROGRAMMER CONFIGURATION

The Cyclone MAX may act as a stand-alone in-circuit programmer for Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM (MAC7xxx) targets. A simple user interface, the Cyclone Image Creation Utility, is provided for configuring the Cyclone MAX.

4.1 Cyclone MAX Image Creation Utility

The Cyclone MAX does not require a target to be connected when it is being configured. However, the Cyclone MAX must be powered on (indicated by the “Ready” LED), and either the PC Serial port, USB port, or Ethernet port must be connected to the Cyclone MAX. **Figure 4-1** shows the configuration dialog with an example configuration. The configuration details are explained below.

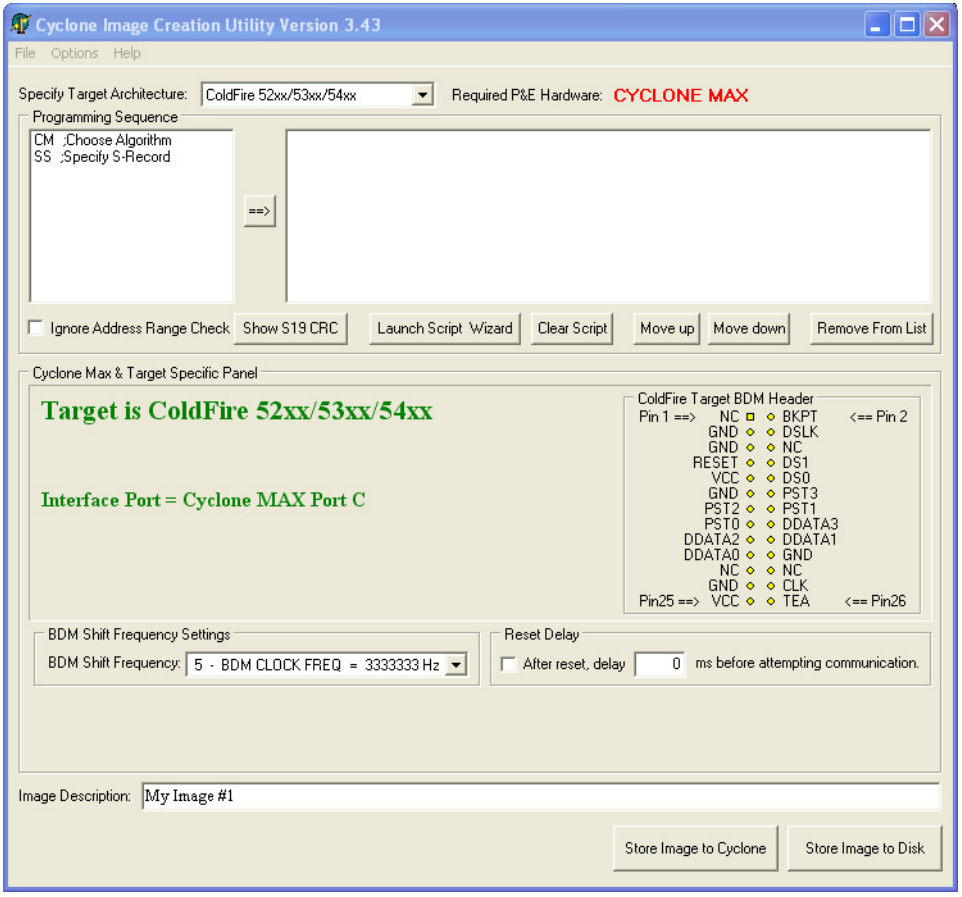

Figure 4-1: Image Creation Utility

4.1.1 Target Architectures

The Cyclone MAX supports the Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM MAC7xxx architectures.

The user may select the target architecture by clicking the corresponding tab.

Alternately, the user may select the target architecture through the File menu. **Figure 4-2** shows the selection.

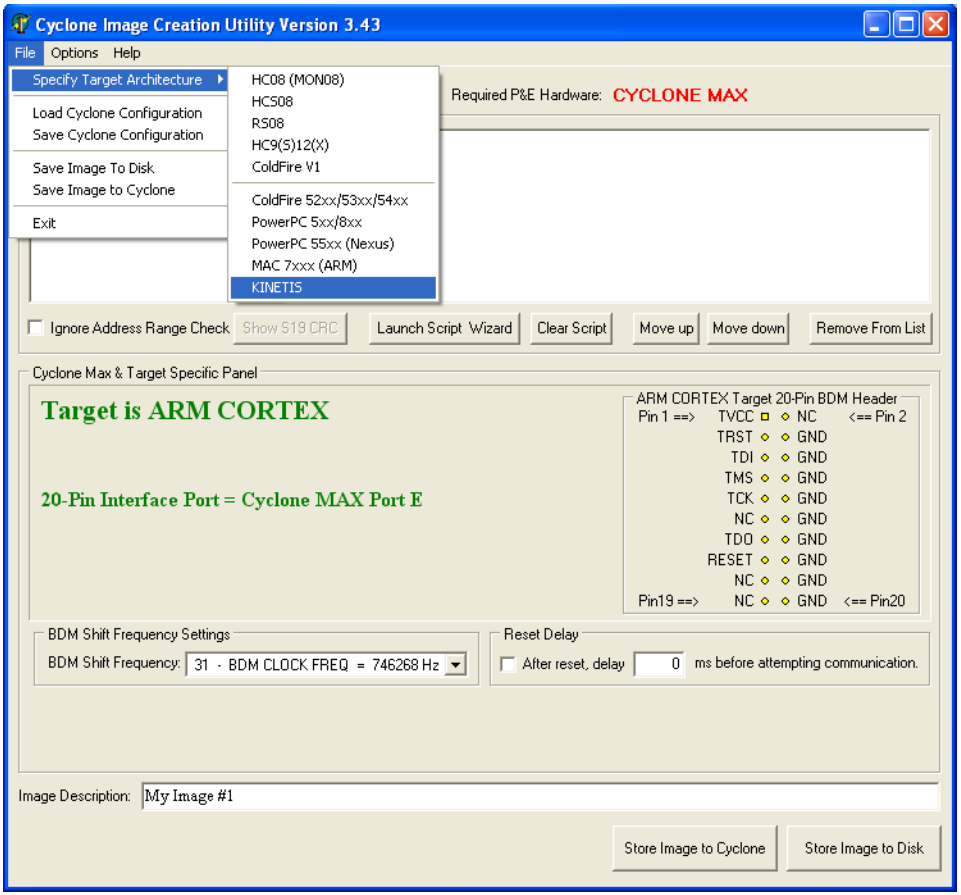

Figure 4-2: Target Class Selection via File Menu

4.1.1.1 Power Architecture BDM (MPC5xx/8xx)

The user may configure the Cyclone MAX to operate on a Power Architecture BDM (MPC5xx/8xx) target by switching to the corresponding option in the drop-down list.

Alternately, the user may select the target through the File menu.

Figure 4-3 shows the Power Architecture BDM specification configuration.

The target BDM header connections are shown on the right-hand side for

user reference.

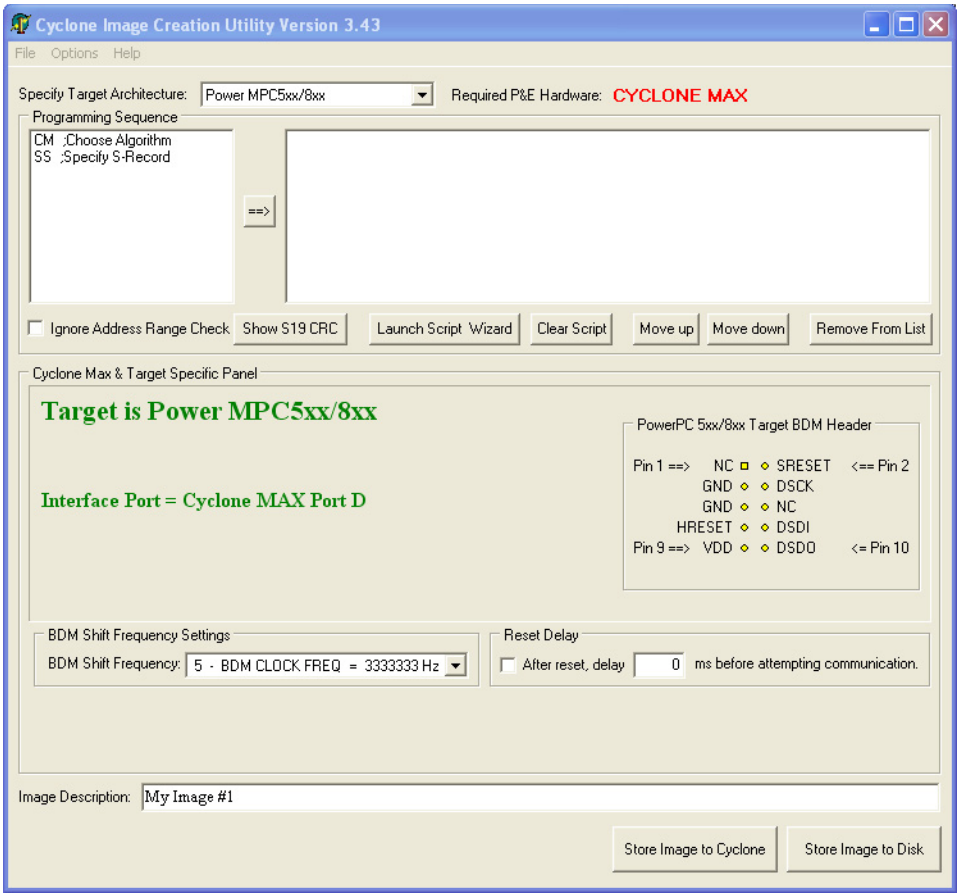

Figure 4-3: Power Architecture BDM Settings

4.1.1.2 ColdFire V2/3/4 (MCF52xx/53xx/54xx)

The user may configure the Cyclone MAX to operate on a ColdFire V2/3/4 target by switching to the ColdFire option in the drop-down list. Alternately, the user may select the ColdFire V2/3/4 target through the File menu.

Figure 4-4 shows the ColdFire V2/3/4 specification configuration. The target BDM header connections are shown on the right-hand side for user reference.

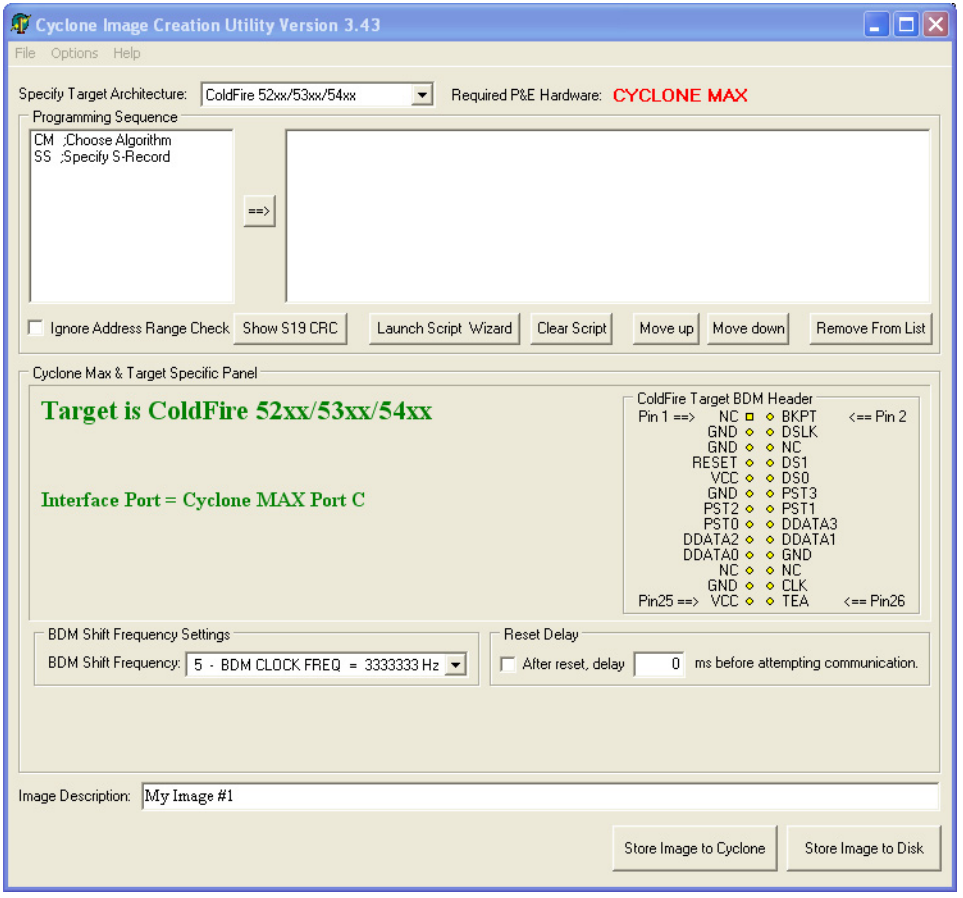

Figure 4-4: ColdFire Settings

4.1.1.3 ARM MAC7xxx

The user may configure the Cyclone MAX to operate on an ARM MAC7xxx target by switching to the ARM option in the drop-down list. Alternately, the user may select the ARM MAC7xxx target through the File menu.

Figure 4-5 shows the ARM MAC7xxx specification configuration. The 20-pin target header connections are shown on the right-hand side for user reference.

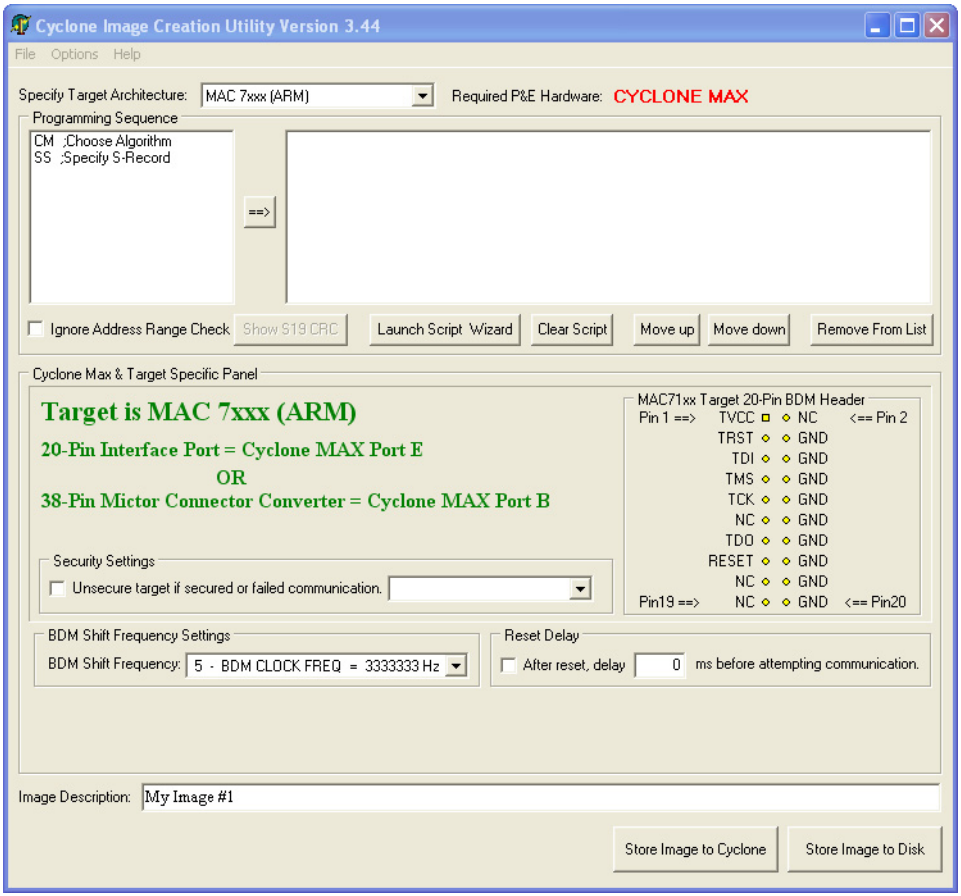

Figure 4-5: ARM MAC7xxxSettings

4.1.1.4 Kinetis

The user may configure the Cyclone MAX to operate on a Kinetis target by switching to the Kinetis option in the drop-down list. Alternately, the user may select the Kinetis target through the File menu.

Figure 4-5 shows the Kinetis specification configuration. The 20-pin target header connections are shown on the right-hand side for user reference.

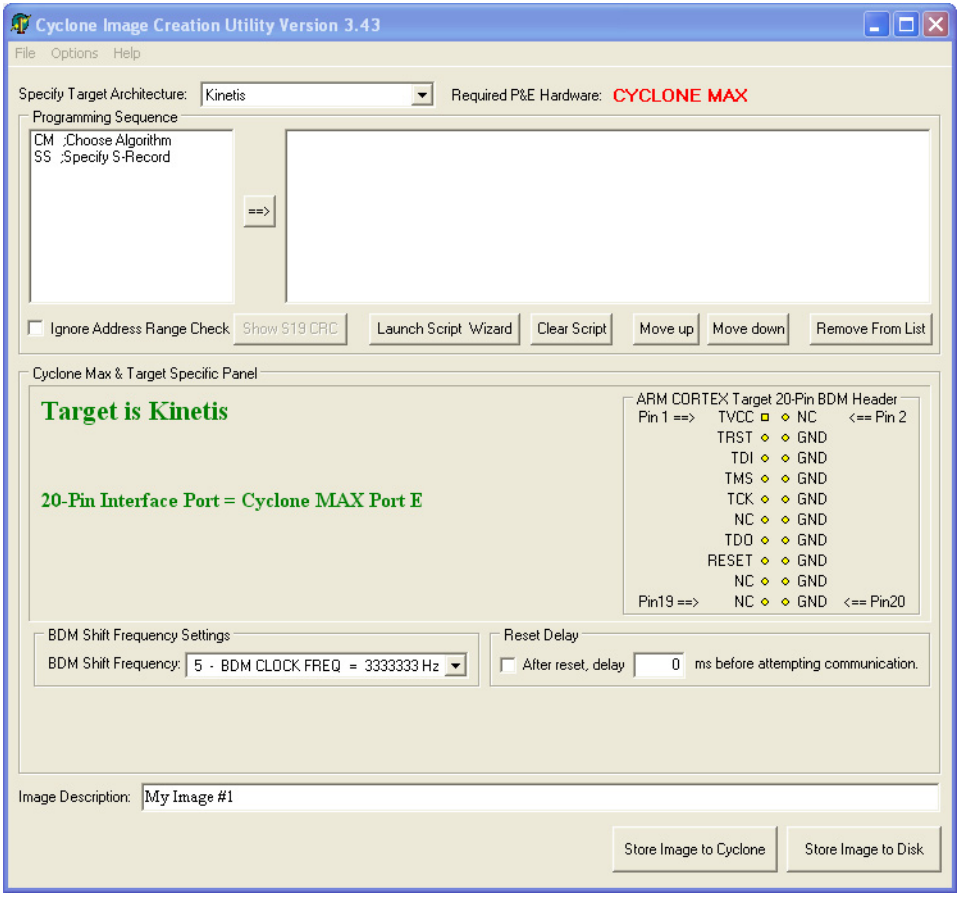

Figure 4-6: Kinetis Settings

4.1.1.5 Qorivva (MPC55xx/56xx)

The user may configure the Cyclone MAX to operate on a Qorivva (MPC55xx/56xx) target by switching to the corresponding option in the drop-down list.

Alternately, the user may select the target through the File menu.

Figure 4-7 shows the Qorivva specification configuration.

The 14-pin target header connections are shown on the right-hand side for user reference.

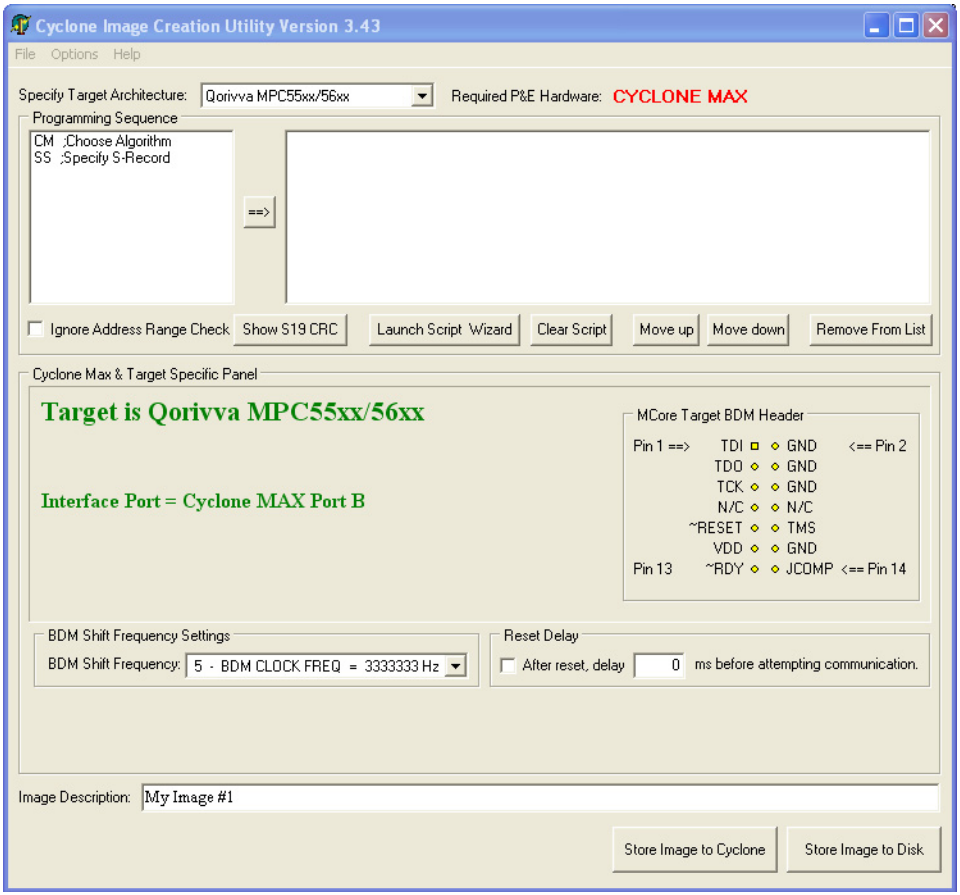

Figure 4-7: Qorivva Settings

4.1.2 BDM Shift Clock Delay Constant

The BDM Shift Clock Delay Constant allows the user to set the BDM shift clock speed of the Cyclone MAX. The equation for determining the shifting frequency is: 50000000 / (5 + 2*n). This clock cannot generally exceed a div 6 of the processor bus frequency.

4.1.3 Specify Programming Algorithm and S-Record

To specify the programming algorithm for the target, the user may simply

select the CM (Choose Module) command from the Programming Sequence list (1) and add it to the programming steps (2) using the add button (3).

Similarly, to specify the S-Record to be programmed into the target, the user may simply select the SS (Specify S-Record) command from the Programming Sequence list (1) and add it to the programming steps (2) using the add button (3).

See **Figure 2-1** for a visual reference.

4.1.4 Base Address

Depending on the programming algorithm, the user may be required to enter the base address for the module. If the programming algorithm requires a base address, the Module Base Address Settings will be displayed. The user must enter the correct base address. Otherwise, the default value (0) shown in the diagram will be used.

4.1.5 Script Wizard

The Script Wizard is a convenient addition to the Cyclone Image Creation Utility. The Script Wizard allows the user to simply select the programming functions to be executed. The Script Wizard then orders these functions automatically.

To begin, click the Launch Script Wizard button on the right side of the Cyclone Image Creation Utility. This opens the Script Wizard.

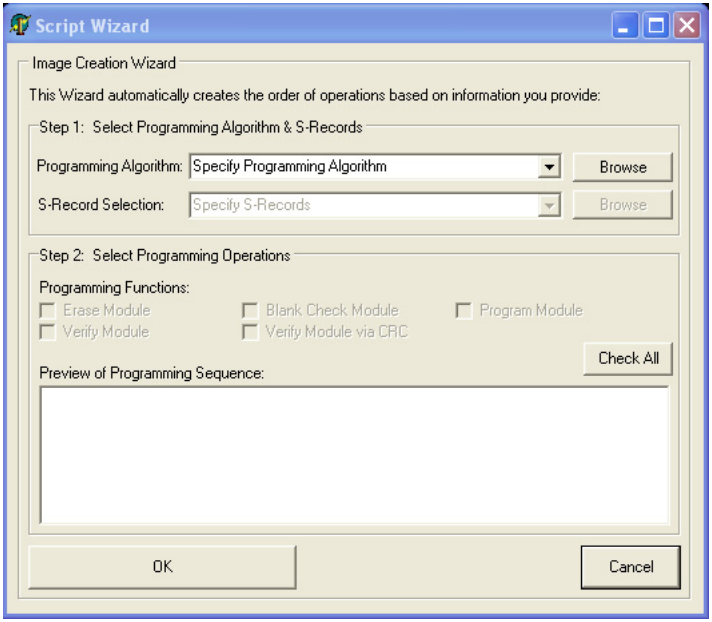

Figure 4-8: Script Wizard Dialog

The user must first select a programming algorithm and an S-Record. Click the corresponding Browse buttons to select a file, or use the drop-down list to choose a previously selected file.

Once this is complete, the programming functions are enabled. At this point the user has only to select the programming steps that are required, with no further attention to the order of operations.

For example, in **Figure 4-9**, three programming functions have been selected and sequenced by the Script Wizard.

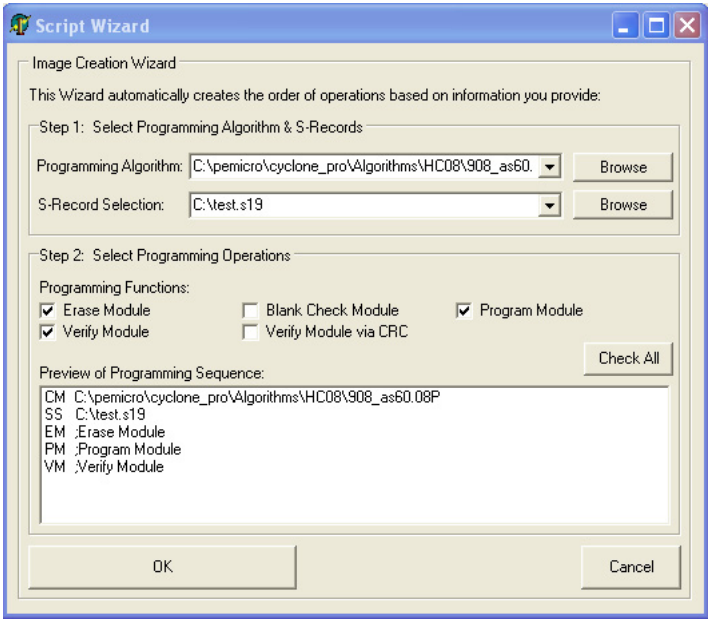

Figure 4-9: Script Wizard Dialog - Programming Functions Selected

Upon completion, click OK and the script information will appear in the Specify Programming Script dialog.

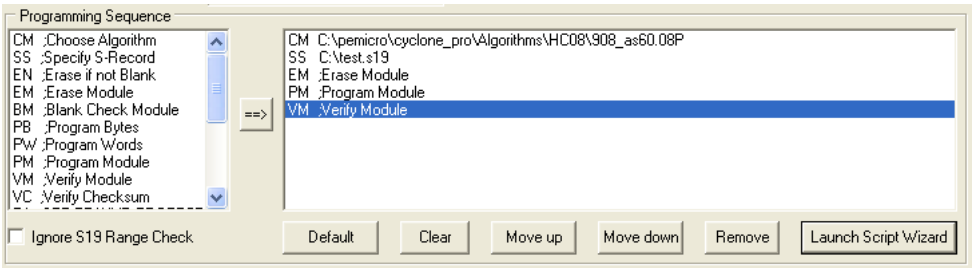

Figure 4-10: Results Of Script Wizard Dialog

4.1.6 Programming Operations

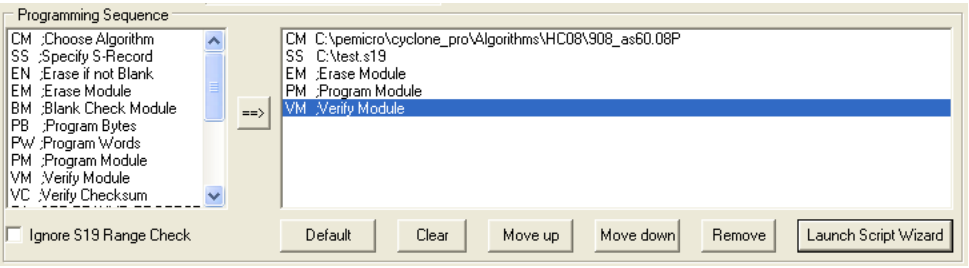

Figure 4-11: Programming Operations Dialog Section

In the Programming Sequence field, the user may specify the algorithm, S-Record, and operations to be carried out.

Choose Module

Presents a list of available programming files. Each programming file contains information on how to program a particular module. Usually, the name of the file indicates what kind of module it relates to.

Specify S-Record

Asks for the name (and/or path) to a file of Freescale S-records to be used in programming or verifying a module. 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 you do not specify a file-name extension, a default of .S19 is used. The programmer also supports ELF/Dwarf 2.0 object files.

Your S19 file may contain data for both EEPROM and flash. If you know that your S19 file contains the correct data, “Ignore S19 Range” may be checked. This will cause any out of range errors to be ignored.

Erase If Not Blank

This command performs a blank check of the module and erases it if it is not blank.

Erase Module

If “Erase Module” is specified, the Cyclone MAX will perform an “Erase Module” on the target device after entering the Monitor Mode or BDM mode.

Blank Check Module

If “Blank Check Module” is checked, the Cyclone MAX will perform a “Blank Check Module” on the target device.

Program Bytes

Prompts for a starting address, which must be in the module. You are then asked to enter a hexadecimal byte to be programmed into the current location. Clicking the OK button will automatically advance to the next data byte location.

Program Words

Prompts for a starting address, which must be in the module. You are then asked to enter a hexadecimal word to be programmed into the current location. Clicking the OK button will automatically advance to the next data word location.

Program Module

For this command to work, you must have previously selected an S-record file.

Verify Module

For this command to work, you must have previously selected an S-record file.

Verify Checksum

This command verifies the module content via a CRC calculation.

4.1.7 Store Image To Cyclone

“Store Image to Cyclone” allows the current configuration to be programmed into the Cyclone MAX. The Cyclone MAX will then be ready for operations.

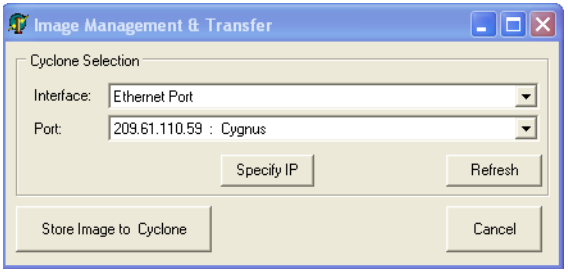

Figure 4-12: Image Management And Transfer Dialog

The Interface drop-down list allows the user to select either a serial, USB, or Ethernet communication interface. The Port drop-down list allows the user to select from one of the Cyclones available on that interface. In the case of a Cyclone present on a different network (i.e., not displayed automatically in the Port drop-down list), the user may specify its IP address by using the Specify IP button.

“Store Image to Cyclone” will then store the image on the selected Cyclone.

4.1.8 Save Image/Cyclone Configuration

“Store Image To Disk” allows the current configuration to be saved onto the hard drive. The image can then be transferred to the Cyclone MAX via the Manage Images Utility.

“Save Cyclone Configuration,” in the file menu, allows the user to save the configuration into a file, which may be used for future reference, e.g., comparing the Cyclone MAX contents with the file to see if they are the same.

4.2 Configuration Via LCD Menu

The following section describes configuration of the Cyclone MAX using the LCD menus. **Figure 4-13** shows an overview of the menu structure.

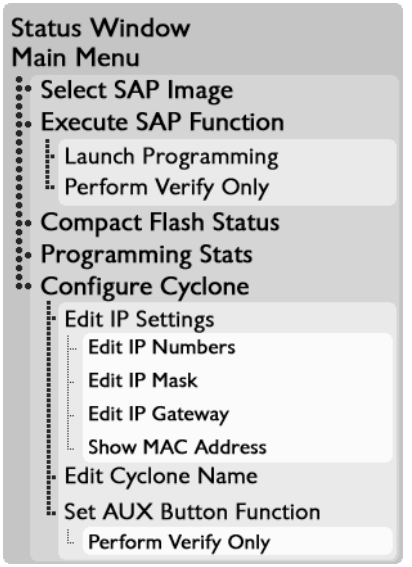

Figure 4-13: Overview Of Cyclone Menu Structure

4.2.1 Status Window

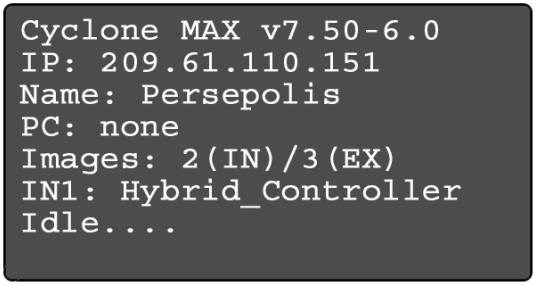

Figure 4-14: Status Window

The status window appears when the Cyclone MAX is powered on. This lists the following information:

1. The firmware version of the MAX.
2. The IP address assigned to the MAX.

3. The name assigned to the MAX.
4. Name of the PC connected to the MAX.
5. The number of programming images in the MAX's memory.
6. The name of the selected programming image.
7. Current status.
8. Results of the last operation performed.

Hit the MENU/[SELECT] button on the Cyclone MAX to enter LCD menu mode.

4.2.2 Main Menu

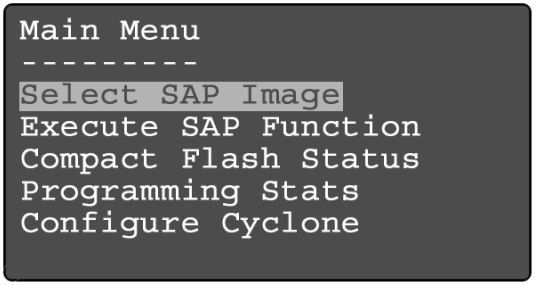

Figure 4-15: Main Menu

The Main Menu is accessible by pressing the MENU/[SELECT] button when the status window is displayed. The Main Menu contains the following selections:

4.2.2.1 Select SAP Image

Select SAP Image brings up a display listing the images that are stored in the memory of the Cyclone MAX. You may select the appropriate image by using the Up/Down arrows to highlight it, and then pressing the "Select" button. The image name shown is the one specified in the

Cyclone configuration utility when programming the image to the Cyclone.

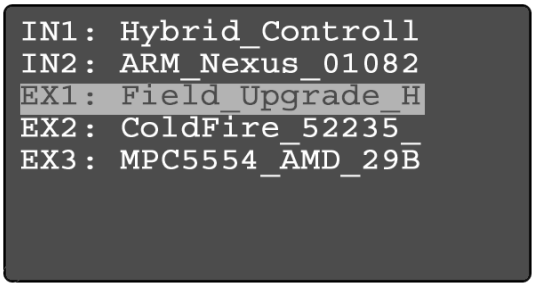

Figure 4-16: Select SAP Image

4.2.2.2 Execute SAP Function

The Execute SAP Function menu selection is discussed in **Section 5.2 - Operation Procedure via LCD Menu**. Please refer to that section for additional menu information.

4.2.2.3 Show Statistics

The Show Statistics menu selection is discussed in **Section 5.2 - Operation Procedure via LCD Menu**. Please refer to that section for additional menu information.

4.2.2.4 Configure Cyclone

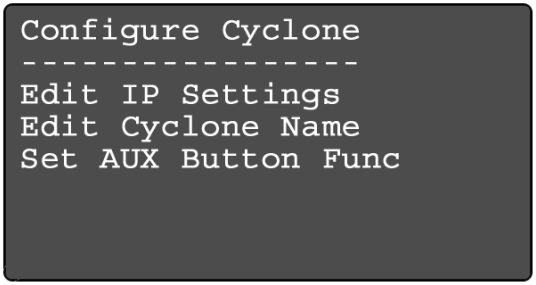

Figure 4-17: Configure Cyclone

Configure Cyclone brings up a submenu with three options from which to choose. Selecting Edit IP Settings brings up a submenu with four options:

Configure Cyclone: Edit IP Settings

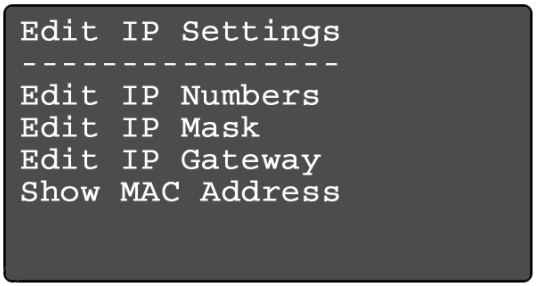

Figure 4-18: Configure Cyclone: Edit IP Settings

Edit IP Settings: Edit IP Number

Edit IP Number allows the user to set an IP number for the Cyclone MAX. The current IP number is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process. Press the Cancel button at any time to leave the IP number as is and return to the Main Menu.

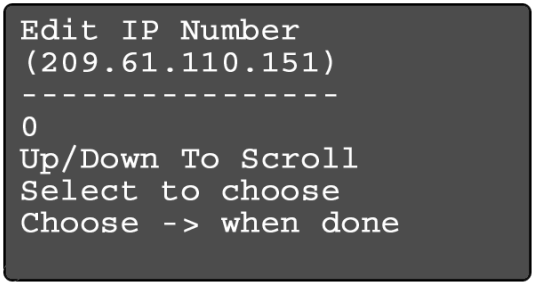

Figure 4-19: Edit IP Settings: Edit IP Number

Edit IP Settings: Edit IP Mask

Edit IP Mask allows the user to set an IP Mask for the Cyclone MAX. The current IP Mask is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach

the -> (right-arrow) character. Selecting this character will complete the process. The default IP mask is 255.255.255.0.

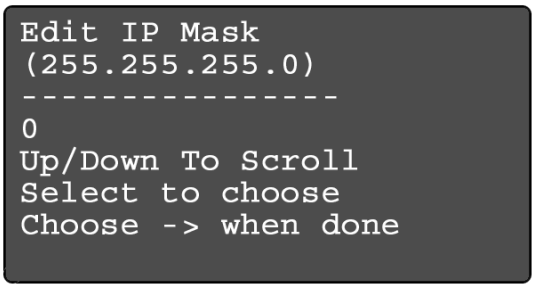

Figure 4-20: Edit IP Settings: Edit IP Mask

Edit IP Settings: Edit IP Gateway

Edit IP Gateway allows the user to set the IP Gateway for the Cyclone MAX. The current IP Gateway is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process.

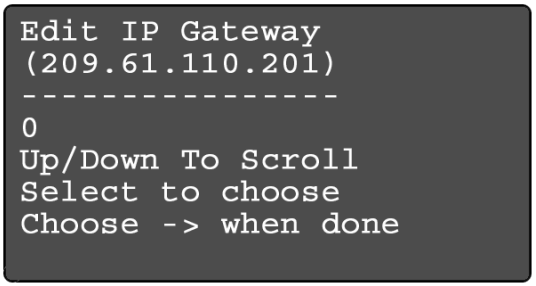

Figure 4-21: Edit IP Settings: Edit IP Gateway

Edit IP Settings: Show MAC Address

Show MAC Address displays the current MAC address for

the Cyclone MAX.

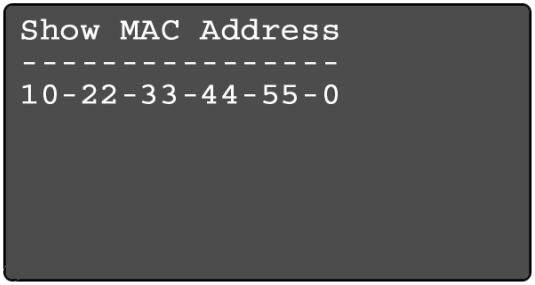

Figure 4-22: Edit IP Settings: Show MAC Address

Configure Cyclone: Edit Cyclone Name

Edit Cyclone Name allows the user to set the name for the Cyclone MAX. The current name is displayed on the second line. Use the Up/Down buttons to scroll through the characters. To select a character, hit the Select button. When you are finished, scroll through the characters until you reach the -> (right-arrow) character. Selecting this character will complete the process. Press the Cancel button at any point to leave the name as is and return to the Main Menu.

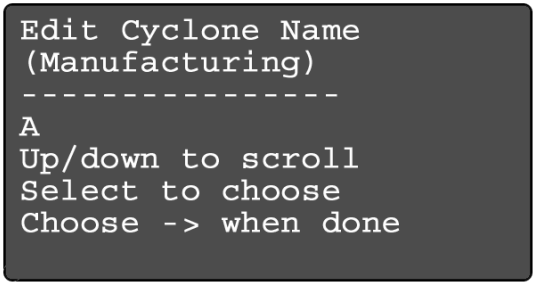

Figure 4-23: Configure Cyclone: Edit Cyclone Name

Configure Cyclone: Set AUX Button Func

Set AUX Button Func allows the user to assign a function to the AUX button of the Cyclone MAX. If more than one choice is available, highlight the function that you wish to assign to the AUX button and

press the Select button to choose it.

Figure 4-24: Configure Cyclone: Set AUX Button Func

5 STAND-ALONE PROGRAMMER MANUAL CONTROL

The Cyclone MAX must be configured before it may serve as a Stand-Alone Programmer for Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM (MAC7xxx) targets. The user may manually control the Cyclone MAX via the buttons/LEDs, LCD menu, or via PC software. The target power management schemes remain the same for each control method.

5.1 Via Cyclone MAX Buttons

There are five (5) buttons on the top of the Cyclone MAX which are used for stand-alone programming and to navigate the LCD menus. They are specified as follows.

Button	Function
START / ↑	Start executing the tasks pre-configured into the Cyclone MAX.
	Menu Mode: Navigate upward in LCD menu.
AUX / ↓	Perform auxiliary function (stand-alone verification).
	Menu Mode: Navigate downward in LCD menu.
MENU / [SELECT]	Displays LCD Menu (enters Menu Mode).
	Menu Mode: Select highlighted item in LCD menu.
CANCEL	Cancel the tasks being executed and go back to the standby state.
RESET	Hardware reset of the Cyclone MAX.

Pushing the START button launches the stand-alone programming image which is currently selected (i.e., programming is a one-click operation).

5.1.1 Cyclone MAX LED Indicators

The Cyclone MAX has eight (8) LEDs to indicate the current operation stage:

1. Power – Indicates power has been supplied to Cyclone MAX
2. Ready – The Cyclone MAX is ready to perform programming functions
3. Image – Indicates the presence of one or more images on board.
4. Erase – Erasing of target flash is in progress
5. Program – Programming of target flash is in progress

6. Verify – Verifying of target flash is in progress
7. Error – An error occurred during programming
8. Success – Programming functions completed successfully

5.2 Operation Procedure via LCD Menu

Rev. B of the Cyclone MAX may be operated by making selections from the LCD menu. This section describes the layout of the menus and the functions that each may be used to perform.

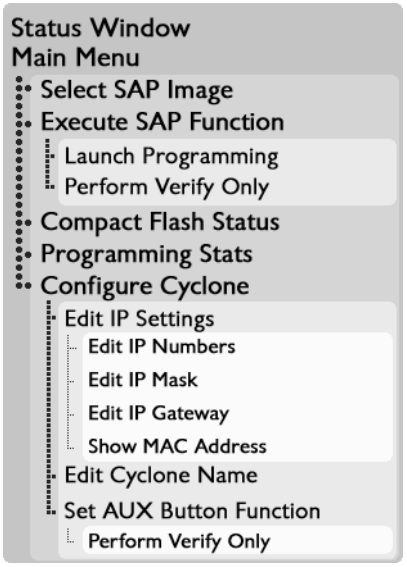

Figure 5-1: Overview Of Cyclone Menu Structure

5.2.1 Status Window

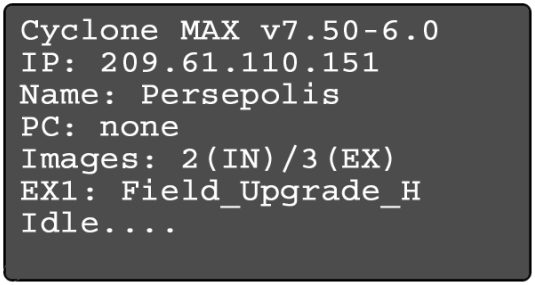

Figure 5-2: Status Window

The status window appears when the Cyclone MAX is powered on. This lists the following information:

1. The firmware version of the MAX.
2. The IP address assigned to the MAX.
3. The name assigned to the MAX.
4. Name of the PC connected to the MAX.
5. The number of programming images in the MAX's memory.
6. The name of the selected programming image.
7. Current status.
8. Results of the last operation performed.

5.2.2 Main Menu

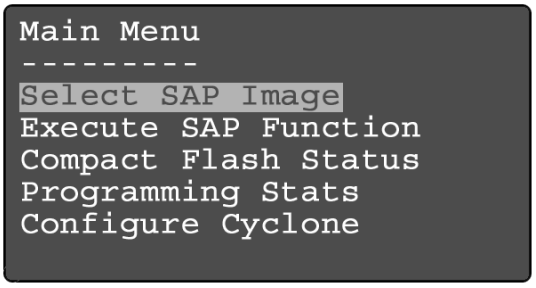

Figure 5-3: Main Menu

The Main Menu is accessible by pressing the “Menu” button when the status window is displayed. The Main Menu contains four selections. This section contains information on Execute SAP Function and Show Statistics. For information on Select SAP Image and Configure Cyclone, please refer to **Section 4.2 - Configuration Via LCD Menu**.

5.2.2.1 Execute SAP Function

Execute SAP Function presents two Stand-Alone Programming functions that you may execute by highlighting the function that you wish to perform and pressing the “Select” button.

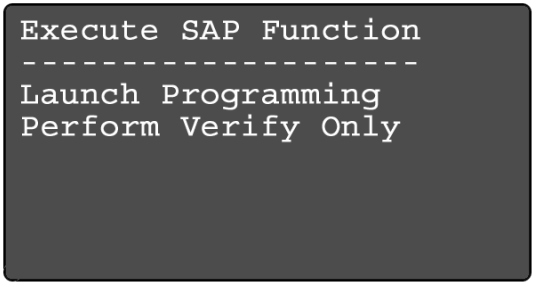

Figure 5-4: Execute SAP Function

5.2.2.2 Compact Flash Status

If a compatible CompactFlash card is loaded into the Cyclone, the Compact Flash Status menu selection displays information about that CompactFlash card, including its name, the number of images it contains, and the amount of free, used, and total memory it contains.

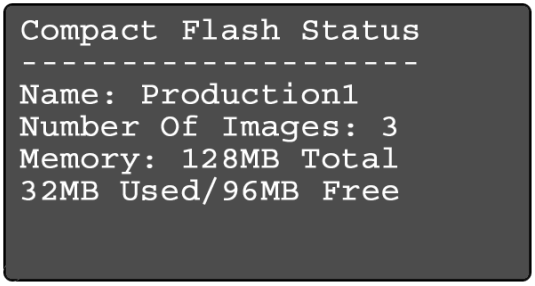

Figure 5-5: Compact Flash Status

5.2.2.3 Programming Stats

The fourth line (PCIP:) displays the IP address of the last PC to control the Cyclone MAX. The other categories listed are for future use and are not currently implemented.

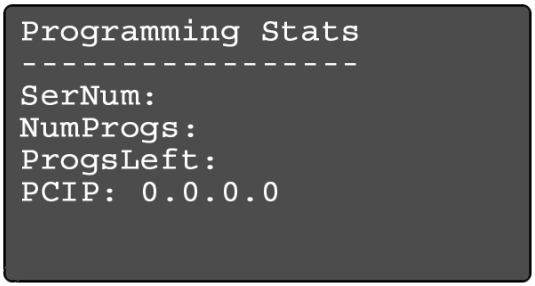

Figure 5-6: Programming Stats

5.3 Cyclone Battery Pack

Manual control of stand-alone mode is also useful for performing field updates. In this situation, there is often no access to a PC or power outlet. However, the Cyclone may be powered by using a Cyclone PowerPack, which is a lightweight and compact lithium ion battery (available separately).

Figure 5-7: Cyclone with Cyclone PowerPack

The combination of the Cyclone programmer and the battery pack creates a fully operational field programming setup that is lightweight, compact, and extremely portable. All that is required for a field update is to connect the battery-powered, pre-programmed Cyclone to the target and initiate programming.

6 STAND ALONE PROGRAMMER AUTOMATED CONTROL

There are various means of controlling the Cyclone MAX in an automated environment. Included with the Cyclone MAX is the Basic Edition of P&E's Cyclone Automated Control SDK, which includes:

1. The CYCLONE LAUNCH software, which allows control of a single Cyclone MAX via script files
2. A DLL which may be used by a host application to control a single Cyclone MAX

6.1 Automated .EXE Control of The Cyclone

The user can operate the Cyclone MAX in an automated production environment via PC software called CYCLONE_LAUNCH.EXE. The CYCLONE LAUNCH software performs all operations specified in a simple ASCII script file written by the user. A separate batch file would typically be used to launch the software with the correct parameters.

6.1.1 Startup

a) Connect the Cyclone MAX to the PC via Serial Port, USB Port, or Ethernet.

b) Connect the Cyclone MAX to the target system.

c) Power up the PC and the target system.

d) Run the software from the DOS prompt. Allowed command-line parameters are:

CYCLONE_LAUNCH [configuration script filename] [?] [!] [-O] [output filename]

Where **[configuration script filename]** is a configuration file containing all operations to be carried out. Refer to **Section 6.1.3 - Configuration Script File** for more details regarding the contents of configuration files. This must be the first parameter passed to the application. This parameter should be enclosed in quotes if it contains spaces.

[?] designates that Cyclone Launch should remain open when operations are completed. If this parameter is not specified, the utility will automatically close upon completion.

[!] designates that Cyclone Launch should remain open if any error is encountered. If there is no error, the software will automatically close upon completion.

[-O] designates that the results are saved in an output file following this parameter. The **[output filename]** parameter is mandatory if **[-O]** is used.

[output filename] is an output file that contains the operation results. A user can check the output file to see if the operations were successful.

6.1.2 Command-Line Parameter Examples

Example 1

```
CYCLONE_LAUNCH config_script.cfg !
```

The Cyclone MAX executes all operations specified in the “config_script.cfg” file. The CYCLONE_LAUNCH application remains open if any error occurs.

Example 2

```
CYCLONE_LAUNCH config_script.cfg –O output_log.txt
```

The Cyclone MAX executes all operations specified in the “config_script.cfg” file and logs all results to the “output_log.txt” file.

6.1.3 Configuration Script File

The configuration file contains two types of commands. The first type is SETUP commands which configures the communication port between the PC and the Cyclone units. The second type is Operation commands which carry

out the pre-configured Cyclone operations.

Comments are allowed in the script files. All lines beginning with the semi-colon character ; are treated as comments by the application.

6.1.3.1 Setup Commands

SETLOCALIP=ipaddress

Only needed if the host PC has more than one network card. “ipaddress” indicates the IP address of the network card that should be used during communications. If this command is used, it should be the first command in the script file. “ipaddress” should be in the format of xxx.xxx.xxx.xxx, where xxx=0...255.

OPENTYPE=x

Specifies whether the Cyclone MAX will be identified by IP address or by device name. Both of these Cyclone parameters are reconfigurable by the user. and need to be set up prior to using CYCLONE_LAUNCH. Please see **Section 8.6 - Cyclone IP Setup Utility User Interface (ConfigureIP)** for more information on how to configure the Cyclone IP number and the Cyclone Device Name. Note that this choice of Cyclone identification is not affected by how the Cyclone is connected to the PC (USB, Ethernet, or Serial).

The value of x may be:

IP- Cyclone units will be identified by their IP addresses

NAME- Cyclone units will be identified by their device names

PORT=y

Specifies the port that should be used for contacting the Cyclone MAX.

The value of y may be:

USB

ETHERNET

SERIAL

CYCLONE=identifier

Connects to the Cyclone MAX with the specified identifier. If OPENTYPE=IP, the identifier should be in the format of xxx.xxx.xxx.xxx, where xxx=0...255. If OPENTYPE=NAME, the identifier should be the name of the Cyclone unit.

6.1.3.2 Operation Commands

START

Executes stand-alone programming operations on the connected Cyclone MAX.

READDYNAMICDATA [address] [numbytes]

Reads dynamic data with Cyclone MAX. **[address]** is the starting memory address. **[numbytes]** is the number of bytes of data to read. All values should be in hexadecimal format. No more than 255 bytes may be read in this way.

A Cyclone unit may only use this command after it has performed its “START” command.

Configuration Script Examples

Example 1

```
; Setup commands
OPENTYPE=IP
PORT=USB
CYCLONE=192.168.1.1

; Operation commands
START
```

Example 2

```
; Setup commands
OPENTYPE=NAME
PORT=ETHERNET
CYCLONE=PE_Cyclone1

; Operation commands
START
```

6.1.4 DOS Error Returns

DOS error returns are provided so they may be tested in .BAT files. See **Section 12 - CYCLONE ERROR CODES** for a complete list of Cyclone error codes.

6.1.5 Sample Batch File

Here is an example of a way to call the CYCLONEMAX_LAUNCH utility and test its error code return in a simple batch file. Sample batch files are given for both Windows NT/2000/2003/Vista and Windows 95/98/ME/XP.

Windows NT/2000/XP/Vista:

```
CYCLONE_LAUNCH test.cfg
if errorlevel 1 goto bad
goto good
:bad
ECHO BAD BAD BAD BAD BAD BAD BAD BAD
:good
ECHO done
```

Windows 95/98/ME:

```
CYCLONE_LAUNCH test.cfg
```

```
if errorlevel 1 goto bad
goto good
:bad
ECHO BAD BAD BAD BAD BAD BAD BAD BAD
:good
ECHO done
```

6.2 Automated .DLL Control Of The Cyclone

Another automated means of controlling a Cyclone MAX unit is via a Windows .DLL. The .DLL allows a host application to connect to a Cyclone MAX and control stand-alone programming operations. Included with the Cyclone MAX is a .DLL which allows control of a single Cyclone MAX. Example code and documentation is included which demonstrates use of the .DLL with a Microsoft Visual C/C++ application, a Microsoft Visual C# application, and a Borland Delphi application, although the .DLL is not limited to these development environments. Any application which can load and use a .DLL can be used for automated control of a single Cyclone unit.

DLL Information, Interface Code, and Examples

Documentation on how to use the DLL can be found in the “Cyclone Automated Control SDK User’s Manual”, which is included in .pdf format with the Cyclone MAX. The documented interface routines are available in the CYCLONE_CONTROL.DLL library included in the software install. This .DLL is callable from almost any 32-bit Windows development environment. The method of calling the .DLL varies for different compilers, so .DLL interface code and sample applications are provided for each of the following compilers:

Microsoft Visual C++ 5.0+ - Visual MFC Application

Microsoft Visual C# 2005 – Visual Application

Borland Delphi 2.0+ (Pascal) - Visual Application

The sample applications come with project and workspaces defined for ease of use. Just open the project/workspace in your compiler and you will be able to build the sample application without any modifications.

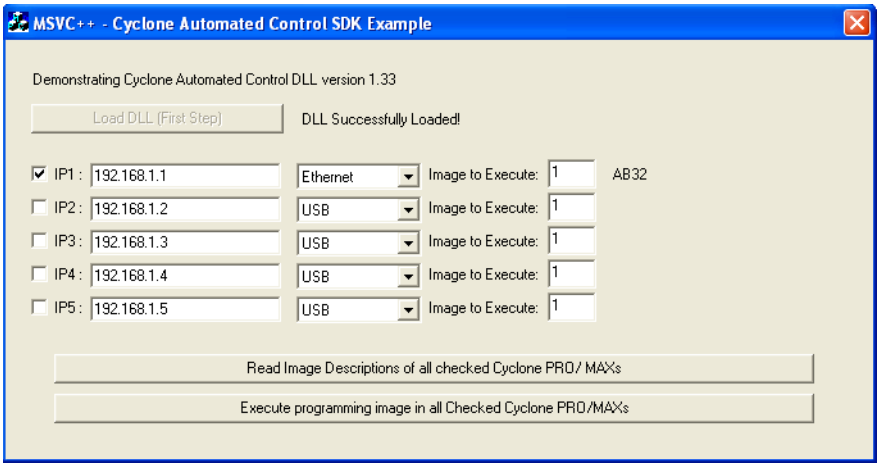

Figure 6-1: Cyclone Automated Control SDK Example Program

6.3 Control Of Multiple Cyclone Units

The utilities included with the Cyclone allow the unit to be updated and controlled in an automated fashion. The user can change the image in the Cyclone and execute the programming images resident on the unit under control from a host computer, or without a computer at all. These utilities/ drivers focus on controlling a single Cyclone unit.

However, it may also be desirable to control multiple Cyclone units simultaneously from a host PC. Since the Cyclone is a self-contained computer system, including all programming algorithms, data, and processing power necessary for programming, the host PC only needs to provide minimal control information. This means that an enormous number of Cyclone units may be controlled from a single PC.

P&E offers the Professional and Enterprise editions of the Cyclone Automated Control SDK separately. These editions update the Cyclone Launch software as well as the DLL to allow control of multiple Cyclone units simultaneously. In addition, they include support for automated programming of dynamic data and management of multiple programming images.

This SDK (software development kit) supports both the Cyclone PRO and the Cyclone MAX programmers, meaning that any supported Freescale devices can be programmed in parallel, even if they are different devices with different

data. More information may be found at www.pemicro.com.

6.4 Serial And Ethernet Protocol Specifications

All of P&E's automated control utilities and DLLs work via the serial port as well as the Ethernet and USB ports. Occasionally a customer will need access to the underlying protocol used by the P&E utilities. A specification for the serial and ethernet protocols used to control the Cyclone MAX are available as part of the Enterprise Edition of P&E's Cyclone Automated Control Package. This is useful for embedded or non-Windows platform control of the Cyclone Programmer.

7 PC-HOSTED DEBUG/PROGRAMMING SOFTWARE

Software options for interactively programming and debugging Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM (MAC7xxx) MCUs from the PC are sold separately by P&E Microcomputer Systems (www.pemicro.com). Descriptions of the functionality of some of these applications are listed below.

7.1 Freescale Codewarrior

7.1.1 Connecting the Cyclone MAX through CodeWarrior

Customers using the Freescale CodeWarrior Development Studio (version 5.7 and above) will now have the capability to interface to target hardware using the Cyclone MAX. In order to configure CodeWarrior to do so, the user can select the Preferences option from the Edit menu. This brings up the following dialog box:

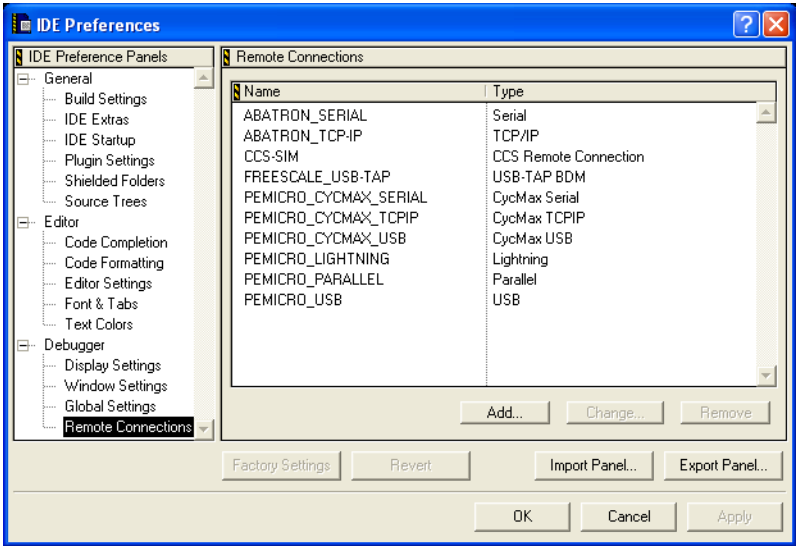

Figure 7-1: IDE Preferences Dialog

and the user can then select and configure one of Cyclone MAX's Serial, USB, or Ethernet ports.

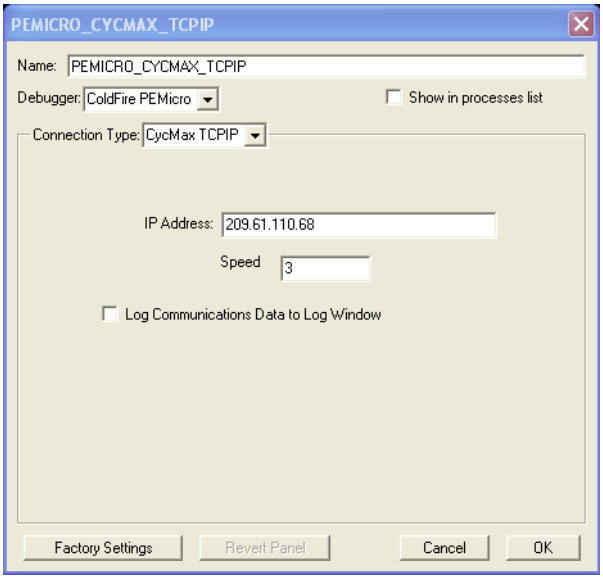

Figure 7-2: Codewarrior Cyclone MAX Ethernet Configuration

The image above displays the configuration settings for the Ethernet port of the Cyclone MAX. The user can set the IP number, and the BDM Frequency Speed to interface to the target. The higher this value is, the slower the BDM Frequency will be, and it is recommended that for slower targets a higher value be selected. For greater detail on the BDM Frequency Speed please refer to the CodeWarrior Help documentation.

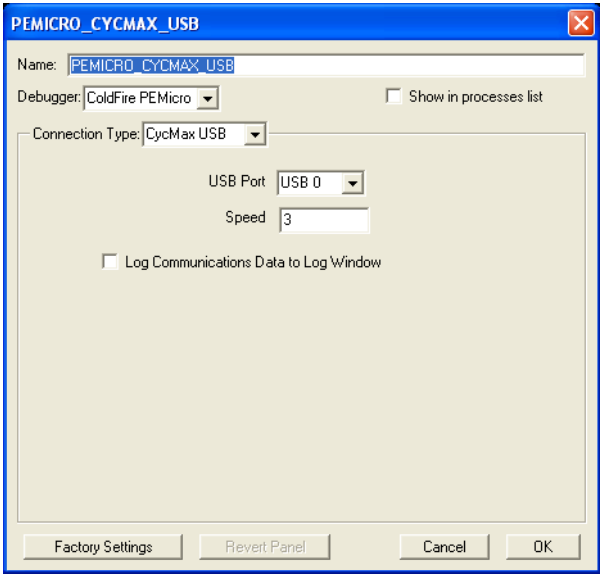

Figure 7-3: Codewarrior Cyclone MAX USB Port Configuration

The image above displays the configuration settings for the USB port of the Cyclone MAX. The user can select one of multiple Cyclone devices which are connected to the PC, in case more than one Cyclone MAX is attached via the USB port.

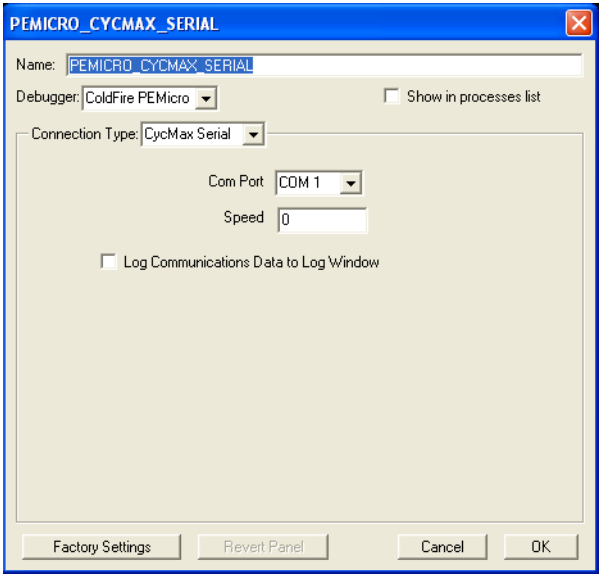

Figure 7-4: Codewarrior Cyclone MAX USB Port Configuration

The image above displays the configuration settings for the USB port of the Cyclone MAX. The user can select the COM port to which the Cyclone MAX is attached.

7.1.2 CodeWarrior Hardware Diagnostics

If the user wishes to test the Cyclone MAX connected to their PC, they can use the Hardware Diagnostics selection from the Tools menu. This allows the user to run hardware diagnostics and memory tests to ensure proper operation of all devices. For more information on the hardware diagnostic tool, please refer to the CodeWarrior Help documentation.

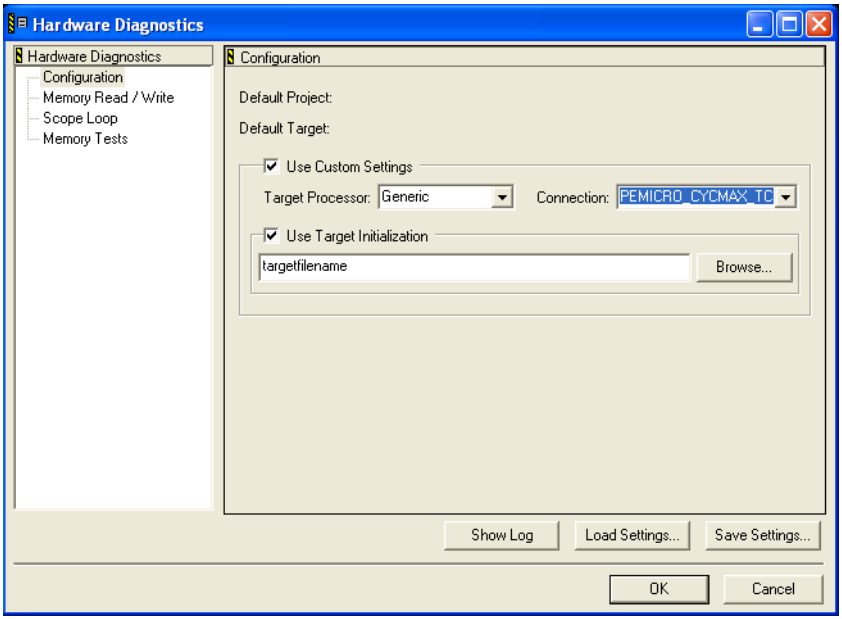

Figure 7-5: Codewarrior Hardware Diagnostics

7.2 P&E Microcomputer Systems' Software

7.2.1 In-Circuit Debugger

The ICD In-Circuit Debugger uses the Cyclone MAX to control the target devices. Separate ICD software is required for each of the Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM (MAC7xxx) architectures. With the ICD In-Circuit Debugger you can load code into the on-chip RAM, run code out of RAM or FLASH (already programmed by the In-Circuit Programmer), and set many software breakpoints and a single hardware (in FLASH) breakpoint. The main advantage of using the ICD is that your application runs in real-time at the full bus speed of the processor.

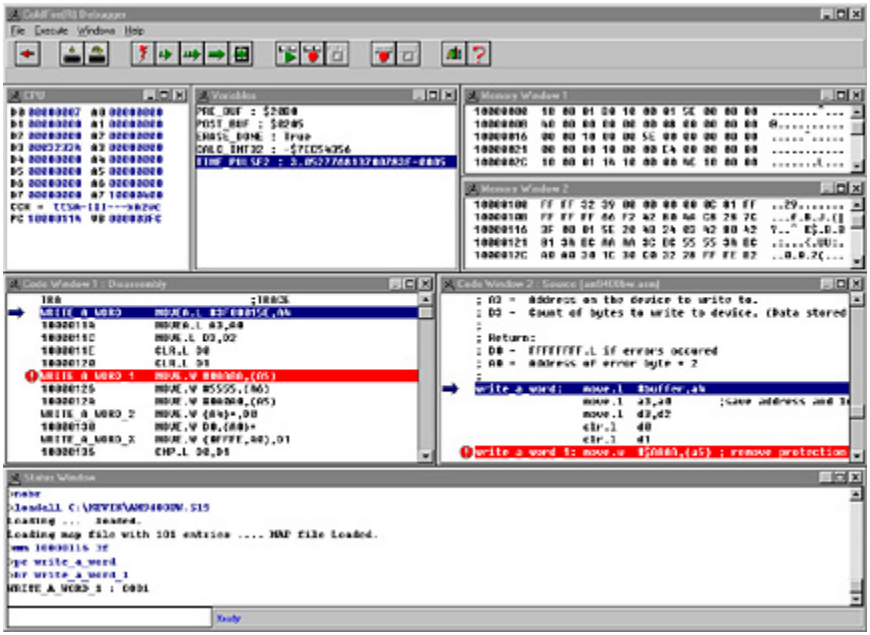

Figure 7-1: ICDCFZ Debugger Screen Snapshot

Debugger features include:

- Full-speed in-circuit emulation
- Breakpoints with counters on the Nth execution
- Variables window showing multiple data types
- Real-time execution as well as multiple tracing modes
- Startup and Macro files for automating the debug process
- Context-sensitive help for all commands
- Support for symbolic register files
- Full source-level debugging

7.2.2 In-Circuit Programmer

The PROG In-Circuit Programmer is a general-purpose programmer which allows the user to program a Power Architecture BDM (MPC5xx/8xx), Qorivva (MPC55xx/56xx), ColdFire (MCF52xx/53xx/54xx), and ARM (MAC7xxx) device with on-chip EEPROM/FLASH, either from an object file (S-record), or

byte by byte.

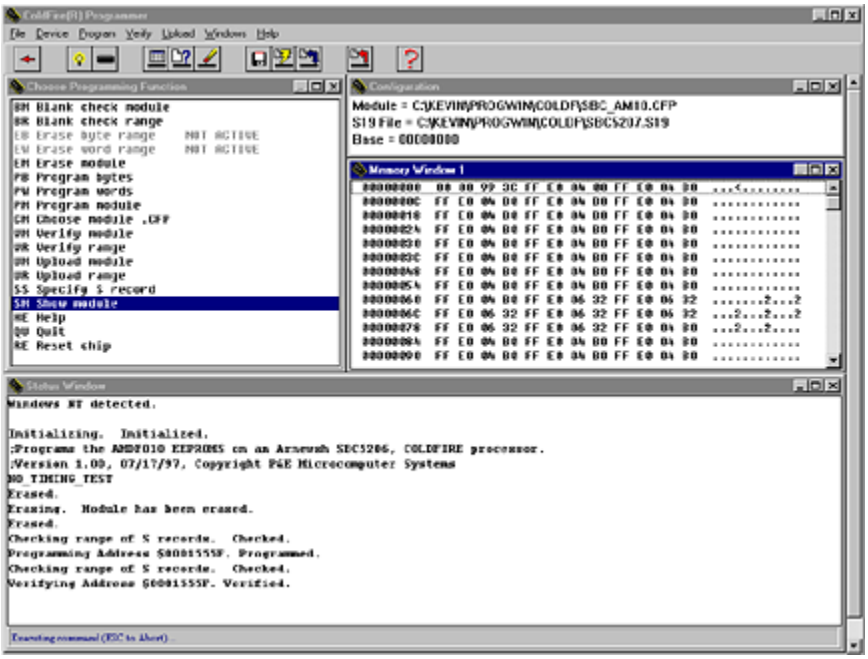

Figure 7-2: PROGCFZ Programmer Screen Snapshot

7.2.2.1 Command Line Programmer

CPROG is a command line programmer that allows quick turn-around time for programming target MCUs. The user may create a script file to instruct the software to execute specific commands in sequence. The CPROG software is normally included with P&E's PROG software. Please refer to CPROG documentation for more information.

7.2.3 P&E Microcomputer Systems PKG Software Packages

P&E's software packages contain the WinIDE integrated development environment, which pulls together an assembler, in-circuit simulator, flash memory programmer, and in-circuit debugger.

7.2.4 Latest Updates - P&E Software

The most recent updates of P&E's software products can be requested, after a brief registration, at:

http://www.pemicro.com/SRS/main_screen_user.cfm.

8 ETHERNET PORT CONFIGURATION

This chapter describes the mechanism used by the Cyclone MAX device to transact data over an Ethernet network. It primarily focuses on the User Datagram Protocol (UDP), which is a popular method for sending data over a network when the speed of a data transaction is of more concern than the guarantee of its delivery. The Cyclone takes advantage of the UDP protocol's penchant for speed, and adds an extra layer of logic to guarantee the delivery of UDP packets in order to offer a best-of-both-worlds solution.

Note: Users who are familiar with ethernet protocol may wish to skip ahead to **Section 8.6 - Cyclone IP Setup Utility User Interface (ConfigureIP)**.

8.1 Network Architecture

Before delving into the innards of Ethernet message passing, it is prudent to briefly describe the different network architectures in use today, and how they pertain to the operation of the Cyclone MAX. Computers are, of course, connected to one another through intermediary devices in order to form networks. There are several classes of these intermediary devices, but they generally fall into one of the following three groups:

Hubs

At the most basic level, computers are connected to one another through a Hub. A Hub is a device with several ports that are used to connect multiple computers together. It is a repeater device – a Hub simply copies incoming data on one of its ports as data outgoing on the other ports. In this manner, if there are four computers connected through a Hub, and if the first computer is sending data to the second computer, then the third and the fourth computers will also receive an identical copy of the data. Hubs are usually used to set up a small Local Area Network (LAN), which may have on the order of 10 to 20 computers.

Switches

The aforementioned types of process, where the data is simply replicated onto every available port, quickly becomes inefficient for larger sized networks. For this reason, a larger sized LAN employs the usage of Switches instead of Hubs. A Switch is essentially a smart Hub, in that it limits the input and output of data to the two transacting computers.

Routers

Larger networks, such as Wide Area Networks (WANs), or the Internet for

that matter, us progressively more sophisticated devices to transact data. At the core of these devices is the Router, which functions as a switch between networks.

The Cyclone performs irrespective of the connection mechanisms, with one very important caveat: it needs to be set up with the appropriate network parameters for the underlying network architectures.

8.2 Network Parameters

A typical network becomes operational not after the physical connections have been established, but after network parameters in the form of IP (Internet Protocol) numbers have been assigned to the individual computers. An IP number is unique string that consists of four numbers ranting between 0 and 255, separated by dots, e.g., 192.168.1.2. Every computer that is on a network needs to have a unique IP number. The computer uses this IP number to identify itself on the network, and also to address the recipient of its data.

Assignation of this IP number is sufficient information to transact data on a simple network connected by a hub. On a more complex network, however, routing information becomes important. The routing information consist of two more IP numbers. The first of these is called the Subnet Mask, and is used to determine whether or not the destination resides on the same subnet (i.e., doesn't need to be forwarded to another network). The other IP number is the Gateway Address, which is the address of the computer that handles forwarding and receiving of packets to and from other networks.

Before first use, the Cyclone needs to be programmed with a unique IP number, the Subnet Mask IP number, and also the default Gateway's IP number. This can be done via the USB or the Serial port, and is described in greater detail in **Section 8.7 - Configuring Via The Cyclone IP Configuration Utility** to configure the Cyclone MAX" section of this manual.

8.3 Internet Protocol

Once the network has been established, and the IP numbers have been assigned, data can be transacted over a network with one of several protocols. By far the most prevalent protocol is the Transmission Control Protocol (TCP), which runs on top of the Internet Protocol in what is collectively known as the TCP/IP protocol. The TCP/IP protocol was developed by the Department of Defense to connect different computers from

different vendors by a “network of networks,” which as become what is known as the Internet today.

The primary purpose of the TCP/IP protocol was to prevent a complete network outage in the case of a nuclear attack, by automatically rerouting data traffic through the functioning part of the network. As such, the TCP/IP mechanism guaranteed delivery of data packets by introducing a system of acknowledgments and sequence numbers for the data packets. This mechanism, which good for transacting large amounts of data (such as email or file transfers), is unsuitable in the real-time type environment in which the Cyclone operates. Because the Cyclone needs to transact data as quickly as possible to the target, it takes advantage of TCP/IP’s alternative, the UDP/IP protocol.

Unlike TCP/IP, the UDP/IP protocol is a connectionless, single-packet protocol that sends short data packets at the expense of not guaranteeing their delivery. This makes the UDP/IP protocol efficient in real-time applications such as broadcasting video over the Internet, where the occasional loss of a frame of data is not going to hamper the overall viewing experience. Left unmodified, the UDP/IP, with its lack of guarantees for packet delivery, would be unusable in an environment where the delivery of a single byte of data needs to be guaranteed. The Cyclone firmware adds mechanisms to the UDP/IP protocol, without affecting its underlying efficiency, to guarantee delivery of data packets.

8.4 Connecting the Cyclone Device

There are two methods for establishing a connection between a Cyclone and a PC with an Ethernet cable. The most basic method is to connect the Cyclone directly to a PC, via a cross-over Ethernet cable. However, the more common method is to place the Cyclone and the PC on the same network through a Hub.

8.4.1 Connecting the Cyclone to the PC over a network

The Cyclone was intended for use on a network of multiple computers (and other Cyclones). There are many possible network configurations, and to describe them all is beyond the scope of this document. However, most configurations are a modification of a basic theme, which is that of connecting one or more PCs through a Hub to one or more Cyclones. In order to connect these devices to the Hub, you will need to use the provided straight-through Ethernet cable. The straight-through cable, which is the “standard” Ethernet

cable, is used to connect devices of different types together, such as a PC to a Hub, or a Hub to a Cyclone. At this point it once again becomes necessary to program the Cyclone with valid IP numbers, the process for which is described in greater detail in the following section. However, it is important for the Cyclone and the PCs to have matching Subnet and Gateway IP numbers, and for each to have a unique IP number on the network. An example of a setting for above is as follows:

	IP Number	Gateway IP	Subnet Mask
PC1	192.168.100.1	192.168.100.3	255.255.255.0
PC2	192.168.100.2	192.168.100.3	255.255.255.0
CYCLONE	192.168.100.4	192.168.100.3	255.255.255.0
Gateway	192.168.100.3	192.168.100.3	255.255.255.0

It is important to briefly touch upon the underlying network architecture, which can be a 10Mb (Megabit), 100Mb, 10/100Mb, half-duplex, or a full duplex connection. The details of the underlying network architecture are beyond the scope of this document, but it is sufficient to note that most modern network cards, as well as the Cyclone device, have the capability to configure themselves for the underlying network through the Auto-negotiation mechanism. Auto-negotiation is performed as soon as a network cable is connected to the device, and it sets the operating parameters of the device to match those of the network.

8.4.2 Connecting Cyclone-to-PC via an Ethernet cable

In order to connect the Cyclone to a PC directly via an Ethernet cable, you need to use what is known as a cross-over cable. A cross-over cable, which is not provided by P&E, is normally used to connect two similar devices such as a PC to a PC, or a Hub to a Hub. It is a cable that has its receive and transmit wires crossed over so that the similar devices can effectively communicate with one another.

With this configuration, it is still important to assign IP numbers to both the PC and the Cyclone device. Although at first glance it may not seem necessary to assign a Gateway address in this configuration, the Cyclone was designed to operate on a network of more than two computers, and therefore it needs to be programmed with a Gateway address.

Assuming the desktop's IP number to be 192.168.100.1, this is an example of the three IP numbers that would need to be programmed into the Cyclone:

	IP Number	Gateway IP	Subnet Mask
PC	192.168.100.1	none	255.255.255.0
CYCLONE	192.168.100.2	192.168.100.1	255.255.255.0

8.5 Cyclone IP Setup Via LCD Menu

For instructions on how to configure the Cyclone MAX using the LCD Menu, please see **Section 5.2 - Operation Procedure via LCD Menu**.

8.6 Cyclone IP Setup Utility User Interface (ConfigureIP)

Before the Cyclone device transacts data on an Ethernet network, it will need to be configured with the relevant network parameters. The application that provides this capability is the Cyclone IP Setup Utility (ConfigureIP), which can be found as part of the distribution software.

This utility is used to configure the Cyclone MAX with network parameters, and also to update the firmware of the Cyclone MAX.

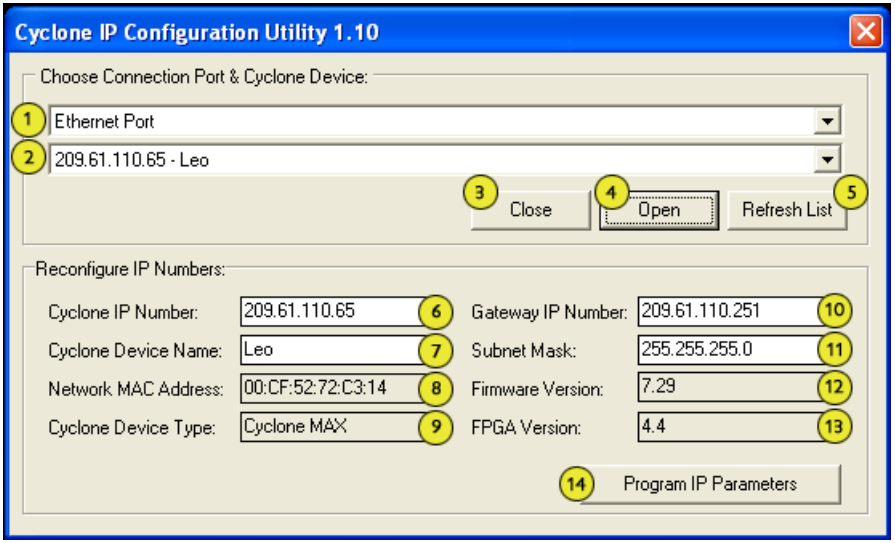

Figure 8-1: IPSetup.exe Default Screen

(1) Drop-down Box 1

There are three options available in this drop-down box, of which “Ethernet Port” is displayed. The other options are “Serial Port” and “USB Port”. Changing to any one of the three Ports will list the devices which are found over that specific Port.

(2) Drop-down Box 2

Once one of the three (Serial, USB, or Ethernet) communication interfaces has been selected in the first drop-down box, a list of all available Cyclone devices over that interface will be displayed for selection.

(3) Close Button

The “Close” button is active only when a device has been opened for access. Once a device has been opened for access, it needs to be closed before another device can be opened for access.

(4) Open Button

The “Open” button opens a device for access. This is a required step before changing the parameters on the selected device. Once a device has been selected through the second drop-down box and is opened for access, its information will be displayed at the bottom of the dialog box.

(5) Refresh List

Will refresh the dialog boxes by searching for devices which are currently connected via the Serial or USB interfaces, or are found on the network.

(6) Cyclone IP Number

This is the IP number which will be associated with the Cyclone MAX. It needs to be a unique IP number which can be accessible on the network.

(7) Cyclone Device Name

This is a label which can be used to identify the Cyclone MAX by name, e.g., “John’s Cyclone” or “Manufacturing Floor.”

(8) MAC Address

This is the Media Access Control address, the unique number of an Ethernet device on the network. This is programmed by P&E and cannot be modified.

(9) Cyclone Device Type

This displays the type of Cyclone hardware.

(10) Gateway IP Number

The IP number of a gateway on the network.

(11) Subnet Mask

The subnet mask of the network.

(12) Firmware Version

A read-only field which returns information pertaining to the build date and firmware version of the Cyclone MAX device.

(13) FPGA Version

A read-only field which returns the hardware version of the FPGA.

(14) Program Cyclone Parameters

This button saves the information as it appears in the "Reconfigure IP Numbers" area onto the Cyclone device.

8.7 Configuring Via The Cyclone IP Configuration Utility

Before the Cyclone MAX is ready to communicate over an Ethernet network, it will need to be configured with the relevant network parameters. The application that provides this capability is the Cyclone IP Configuration Utility, and is provided as part of the standard Cyclone MAX software distribution.

In order to update the network parameters, perform the following steps:

1. Connect a Cyclone MAX to the PC via a serial or a USB cable, and make sure that it is powered before launching the Cyclone Configuration Utility. The Cyclone MAX Configuration Utility starts up with the following screen:

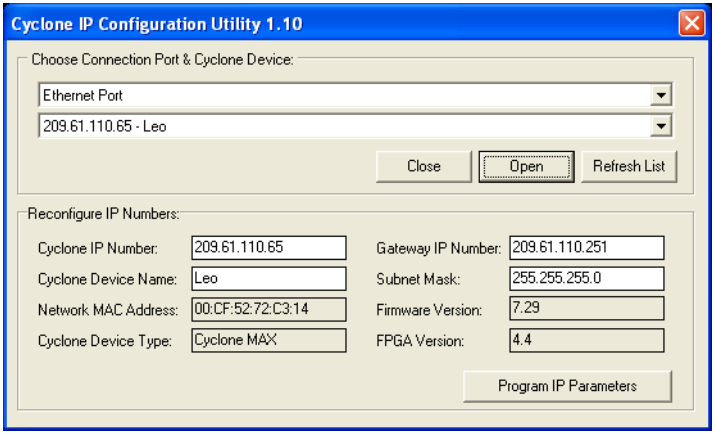

Figure 8-2: Cyclone IP Configuration Utility - Initial Screen

2. Assuming that the Cyclone MAX is connected to the COM1 serial port of the PC, switch from “Ethernet Port” to “Serial Port”, at which point the second drop-down box will display COM1. Click “Open” to get a dialog box similar to the following:

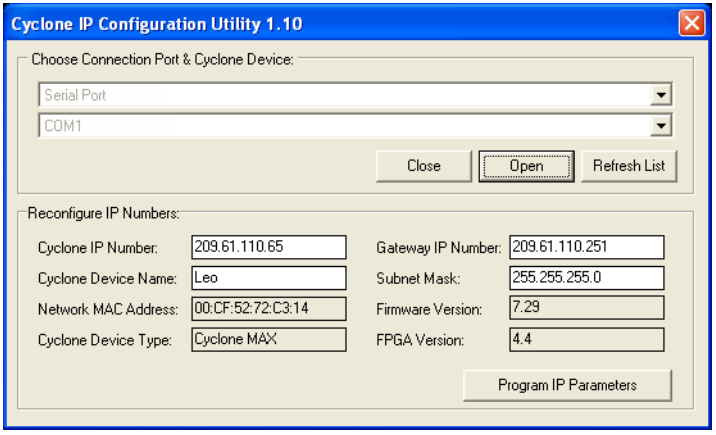

Figure 8-3: Cyclone IP Configuration Utility - Continue Setup

3. The Cyclone MAX now needs to be programmed with IP numbers for the network on which it will operate. The Cyclone IP Number field must contain a unique IP number.

8.8 Serial And Ethernet Protocol Specifications

All of the P&E utilities included with the Cyclone MAX will work via the Ethernet port, as well as the serial and USB ports. These utilities allow configuration and control of the Cyclone programmer. Occasionally a customer will need access to the underlying protocol used by P&E utilities to configure and control the Cyclone programmer. A specification for the serial and ethernet protocols used to control the Cyclone MAX is available as part of the Enterprise Edition of P&E's Cyclone Automated Control Package. This is useful for embedded or non-Windows platform control of the Cyclone Programmer.

9 SERIAL PORT CONFIGURATION

The Serial Port of the Cyclone MAX can be connected to any standard PC Serial Port. It should be noted that some terminal programs, such as the HyperTerm program are not designed to function with the Cyclone MAX. The Cyclone MAX operates at a fixed baud rate of 115200 Baud, 8 Data bits, No Parity, and 1 Stop Bit.

All of the P&E utilities included with the Cyclone MAX will work via the serial port, as well as the Ethernet and USB ports. These utilities allow configuration and control of the Cyclone programmer. Occasionally a customer will need access to the underlying protocol used by P&E utilities to configure and control the Cyclone programmer. A specification for the serial and ethernet protocols used to control the Cyclone MAX is available as part of the Enterprise Edition of P&E's Cyclone Automated Control Package. This is useful for embedded or non-Windows platform control of the Cyclone Programmer.

10 USB PORT CONFIGURATION

The Cyclone MAX can be connected to the USB port of a PC, or to a USB HUB through a standard USB cable. Cyclone MAX supports USB 1.1.

11 AUTOMATIC SERIAL NUMBER MECHANISM

When producing a microcontroller- or microprocessor-based product, it is often useful to program a unique serial number into the permanent memory (FLASH) of the product.

P&E has developed a serial number mechanism to automate this process. Each time you issue a serialization command in the programming software, the current serial number is programmed at a specified address. In addition, the serial number is incremented to the next available serial number and saved for future serialized programming operations.

The Cyclone MAX adopts this automatic serial number mechanism for its stand-alone operations.

11.1 Understanding Serialization

The automatic serial number mechanism supports serial numbers from 1 to 16 bytes in length. Each byte of a serial number ranges between a lower and an upper bound. This approach allows the individual bytes of the serial number to have distinct properties. Some of the forms these properties can take are:

Type	Lower Bound (hex)	Upper Bound (hex)
Constant	Constant	Constant
Binary	00	FF
ASCII Printable	20	7E
ASCII Numeric	30	39
ASCII Upper Case Letter	41	5A
ASCII Lower Case Letter	61	7A
Other	XX	YY

Each serial number and its properties are stored in a separate file. Any file name can be used for the serial number file, however the extension .ser is normally appended because it makes it simpler locate the file.

A free utility called Serialize has been developed to make it easy to create, visualize, edit, and maintain these serial number files. The Serialize utility can be downloaded from the FAQs, Manuals, & Downloads tab of the Cyclone MAX product page, at: www.pemicro.com/max.

11.2 Serialize Utility

This section is a modified excerpt from P&E's Serialize Help File and explains the Serialize utility in detail.

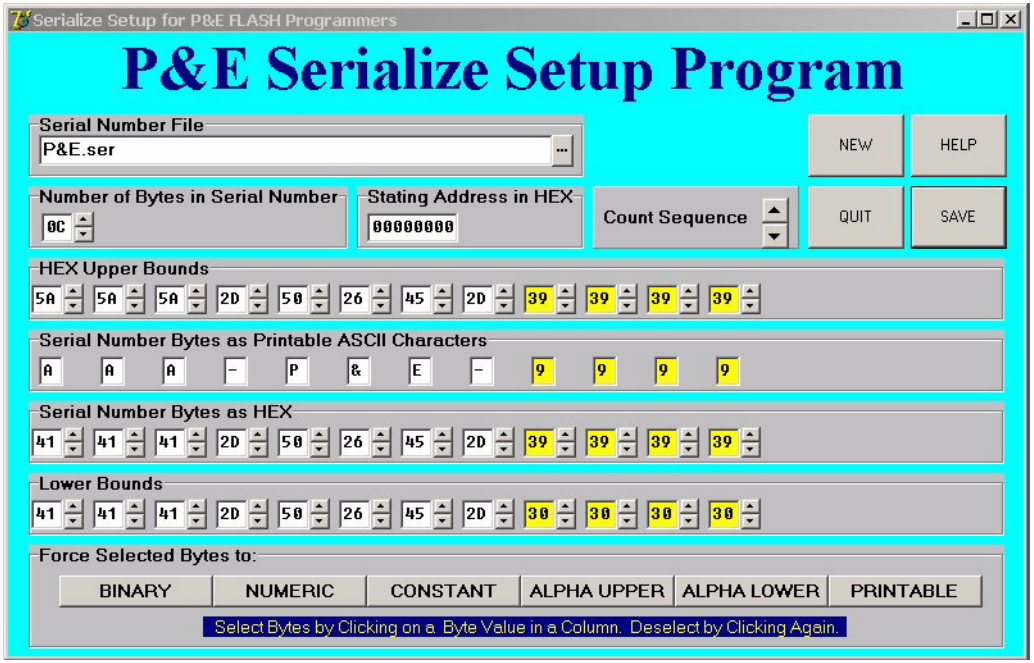

Figure 11-4: Serialize Main Screen

11.2.1 Serial Number File

This edit box shows the currently selected Serial Number File, or else indicates "None Selected". If you try to select a nonexistent file, the selection will revert to "None Selected". On startup the edit box, by default, shows the filename that was in effect the last time the QUIT button was clicked. You can select a new Serial Number File in the following ways:

- Single Click - Lets you directly edit the filename in the edit box. Pressing Enter will check for the existence of the file. If not found, the selected file gets set to "None Selected". If the file exists, the serial number and its properties are displayed on screen.
- Double Click or …Click - Opens a standard file browser and lets you

choose from existing files by disk, directory, name, and extension.

11.2.2 Number of Bytes in Serial Number

The up and down arrows let you add or delete bytes for the serial number, max=10 hex (16 base ten), min=1.

- Up Arrow Click - Adds new bytes to the Serial Number. Each byte added appears as a new column in the serial number representation. Added bytes are input as Binary Bytes, i.e. the upper bound is FF and the lower bound is 00.
- Down Arrow Click - Deletes bytes from the right end of the Serial Number. Any previously entered byte properties are lost.

11.2.3 Count Sequence

This window lets you count up or down through the sequencing of the serial number. The serial number is allowed to wrap over the top of the highest serial number or below the lowest serial number. Note that in P&E programmers, the serial number can only count up and any attempt to overflow will cause an error.

- Up Arrow Click - Counts the serial number up.
- Down Arrow Click - Counts the serial number down.

11.2.4 Serial Number Bytes as Hex

There is one display column for each byte in the serial number shown as printable ASCII characters. Non-printable ASCII characters are indicated by the small solid block graphic.

- Up Arrow Click - Counts the serial number up.
- Down Arrow Click - Counts the serial number down.

11.2.5 Hex Upper Bounds

There is one display column for each upper bound of the byte in the serial number in hex.

- Up Arrow Click - Increases the upper bound by one with a maximum of FF Hex.
- Down Arrow Click - Decreases the upper bound by one with a minimum of the current serial number byte value.

- Double Click on Hex - Selects or deselects the byte column. Selected shown in yellow. The serial number byte in this column may then be modified using the buttons at the bottom of the Serialize utility. Please refer to **Section 11.2.11 - BINARY, NUMERIC, CONSTANT, ALPHA UPPER, ALPHA LOWER, and PRINTABLE**.

11.2.6 Hex Lower Bounds

There is one display column for each byte of the lower bound of the serial number in hex.

- Up Arrow Click - Increases the lower bound by one with a maximum of the current serial number byte value.
- Down Arrow Click - Decreases the lower bound by one with a minimum of 00 Hex.

11.2.7 NEW

Instructs the program to start editing a NEW (as yet un-named) serial number file. It will throw away the information for any serial number currently being edited unless that information has been saved (Save Button). The new serial number is initialized with one (1) byte of binary.

11.2.8 SAVE

Instructs the program to save the current serial number being edited into the file name and path shown in the Serial Number File window. If a file name has not been provided, i.e. the window shows None Selected, then an error is displayed in a red window on the screen. If this happens, type in a filename in the window and click Save again.

11.2.9 HELP

Opens the Serialize help system (serialize.hlp file, i.e. this file) for perusal.

11.2.10 QUIT

Turns off the Serialize Program and saves any setup information in the file Serialize.ini. This file will initialize the setup information the next time the program is started. Xing out of the program (top right of screen) does not save the setup info.

11.2.11 BINARY, NUMERIC, CONSTANT, ALPHA UPPER, ALPHA LOWER, and

PRINTABLE

These buttons are used to set the properties of selected (colored yellow) bytes of the Serial Number. Individual bytes whose properties you wish to modify are selected or deselected by double-clicking in the Hex Upper Bounds box in the column that corresponds with the values for a particular byte.

11.3 Serialize Utility Example

This example shows:

1. Currently editing file C:\Example.ser
2. Number of bytes in the serial number is 10 Hex (= 16 base ten)
3. Starting address is 0000000 Hex
4. Next Serial number is AAA-P&E-9999 in ASCII
   a. First 3 bytes are Upper Case Alphabetic ASCII (AAA)
   b. Next 5 bytes are Constants (-P&E-)
   c. Last 4 bytes are Numeric ASCII (9999)
5. This provides for a maximum of 6,760,000 (26x26x26x10x10x10x10) serial numbers from AAA-P&E-0000 to ZZZ-P&E-9999.
6. The last 4 bytes of the serial number are selected (colored yellow) so that their properties can be changed using the forced selected byte buttons on the bottom of the screen.

11.4 Using Serial Number File

The command to invoke the serial number file in P&E's interactive programming software is "CS Choose Serial File". The command to actually program the serial number to target and automatically increment the serial number afterward is "PS Program Serial Number".

P&E's command line software uses the same commands in a command line fashion to invoke the serial number file, initiate its programming, and increment:

```
CS serial_number_file.ser
PS
```

11.5 Serial Number Handling in Cyclone MAX

The Cyclone MAX's firmware implements the automatic serial number mechanism. The same serial number files are used with the Cyclone Image Creation Utility, and the same commands are used to specify the serial number file and initiate serial number programming and incrementation. The serial number data structure is saved in the SAP image. Once a serial number is programmed, the Cyclone MAX firmware automatically increments the serial number and stores it in the Cyclone MAX's flash for internal images or external CompactFlash for external SAP images.

The CS and PS commands are not present in the Cyclone Image Creation Utility until a valid programming algorithm is specified.

To complement the Cyclone's usage in production environments, the Cyclone MAX supports multiple serial number structures for each programming algorithm block. Each SAP image may contain multiple programming algorithms for every memory module it needs to program, and each programming algorithm block may contain multiple serial number structures. The SAP image sequence below illustrates this briefly:

```
CM algorithm_file_1
SS object_code_1
EN
PM
VC
CS serial_file1.ser
PS
CS serial_file2.ser
PS
CS serial_file_3.ser
PS
CM algorithm_file_2
SS object_code_2
EN
PM
VC
```

```
CS serial_file4.ser
PS
CS serial_file5.ser
PS
```

12 CYCLONE ERROR CODES

The Cyclone will indicate errors using the following codes. Please contact P&E if you are unsure of the specific meaning of an error code.

12.1 Debug Mode Communication Errors

$0001: No target response

$0002: Invalid target response

$0003: Wait for target response canceled

$0004: Wait for target response failed

$0005: Error detecting communication speed

$0006: Failed to unsecure target

$0007: Error entering debug mode

$0008: Error entering debug mode while target is secured

$0009: Error entering debug mode for verification

$000A: Error writing a block of data to target

$000B: Error enabling or disabling module

$000C: Error in performing timing test

$000D: MON08 target had an invalid reset

12.2 SAP Image Handling Errors

$0011: SAP image ID is greater than total number of images

$0012: Error during SAP image validation

$0013: SAP operation was not configured

$0014: SAP image storage was not initialized

$0015: SAP image transfer error, invalid data length

$0016: SAP image transfer error, invalid start address

$0017: SAP image transfer error while writing to storage

$0018: Error writing serial number structure storage

$0019: Error writing LCD menu structure storage

$001A: Error erasing storage block

$001B: Error converting downloads counter structure

12.3 SAP Algorithm Header Operation Handling Errors

$0061: Undefined header operation, check software and firmware versions

12.4 SAP Operation Errors

$0081: SAP operation is not supported, check software and firmware versions

$0082: SAP operation error, SAP image contains different target type

12.5 SAP Blank Check Range and Module Errors

$1001: Blank check error, algorithm not supported

$1002: Blank check error, algorithm not found

$1003: Blank check operation failed

12.6 SAP Erase Range and Module Errors

$2001: Erase error, algorithm not supported

$2002: Erase error, algorithm not found

$2003: Erase error, module failed or canceled

$2004: Erase error, module failed, target is still secured

$2005: Erase error, module not performed, data is preserved

12.7 SAP Program Byte, Word, and Module Errors

$3001: Programming algorithm is not supported

$3002: Programming algorithm was not found

$3003: Program operation failed or canceled

$3004: Program operation failed, write protected

$300A: Error during reading data block, invalid data length

$300B: Error during reading data block, invalid start address

$300C: Error during reading data block, no target power

$300D: Error during programming data block, invalid data length

$300E: Error during programming data block, invalid start address
$300F: Error during programming data block, no target power

12.8 SAP Verify Checksum Errors

$4001: VC command not supported
$4002: VC failed, invalid algorithm
$4003: VC operation failed or canceled

$4011: VV command not supported
$4012: VV failed, invalid algorithm
$4013: VV operation failed or canceled

12.9 SAP Verify Range and Module Errors

$5003: Verification operation failed or canceled

12.10 SAP User Function Errors

$6003: User function failed or canceled

12.11 SAP Trim Errors

$7001: Trim operation not supported
$7003: No target response
$7004: Trim write error, trim value not set
$7007: Trim write error, trim value failed
$7008: Trim read error, trim value failed
$7009: Trim value invalid, value is blank or zero

12.12 Unrecoverable Fatal Errors

$8001: Fatal Error, please contact P&E
$8002: Fatal Error, please contact P&E
$8003: Fatal Error, please contact P&E

$8004: Fatal Error, please contact P&E
$8005: Fatal Error, please contact P&E
$8006: Fatal Error, please contact P&E
$8007: Fatal Error, please contact P&E
$8008: Fatal Error, please contact P&E
$8009: Fatal Error, please contact P&E
$800A: Fatal Error, please contact P&E
$800B: Fatal Error, please contact P&E
$800C: Fatal Error, please contact P&E
$800D: Fatal Error, please contact P&E
$800E: Fatal Error, please contact P&E
$800F: Fatal Error, please contact P&E
$8010: Fatal Error, please contact P&E
$8011: Fatal Error, please contact P&E
$8012: Fatal Error, please contact P&E
$8013: Fatal Error, please contact P&E
$8014: Fatal Error, please contact P&E
$8015: Fatal Error, please contact P&E
$8016: Fatal Error, please contact P&E
$8017: Fatal Error, please contact P&E
$8018: Fatal Error, please contact P&E
$8019: Fatal Error, please contact P&E
$8020: Fatal Error, please contact P&E
$8021: Fatal Error, please contact P&E

12.13 External Memory Errors

$A001: Error writing to external memory
$A002: Error formatting the external memory
$A003: External memory was disconnected during use
$A004: External memory has unsupported format

$A005: External memory has corrupted data

$A006: External memory disk error

$A007: Failed during internal image verification

$A008: Failed during external image verification

$A009: Error while reading external memory for image pointer

12.14 Serial Number Errors

$B001: Error erasing serial number storage

$B002: Error writing serial number

$B003: Total number of Serial Number Structures is over limit of 254.

$B004: Error converting serial number structure

$B005: Error updating serial number

12.15 Successful Download Counter Errors

$C001: Error erasing download counter storage

$C002: Error writing download counter

$C003: Total number of download counter is over limit of 254.

$C004: Error converting download counter structure

Freescale Controller Continuum

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