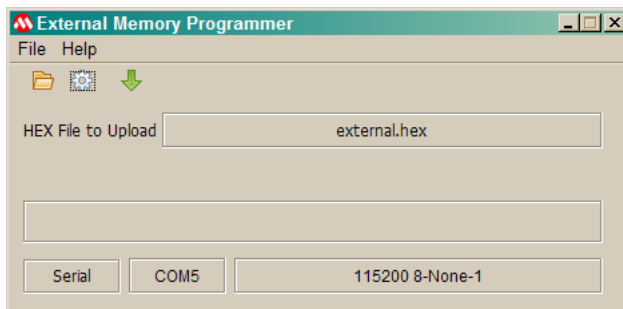


External Memory Programmer

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1 Introduction



The External Memory Programmer is a multi-platform utility used to transfer HEX file information to a device. The device will load the transferred information into a memory device. While the memory device is usually an external memory device, like SPI NOR flash, it can be the internal memory of the device. The External Memory Programmer can use two communication mediums to transfer data, serial or USB.

The utility uses a binary communication protocol which allows the device to dictate the maximum payload size up to 65,000 bytes. This allows an independency between devices that have limited resources and the utility.

While this utility was designed for uploading HEX files from the Graphics Resource Converter utility, it will upload any HEX file in Intel 380 format.

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3 Release Notes

Microchip External Memory Programmer

This application is based on the JAVA programming language. To effectively run this program, the computer must have JRE6 installed.

Version 1.00

Initial JAVA version

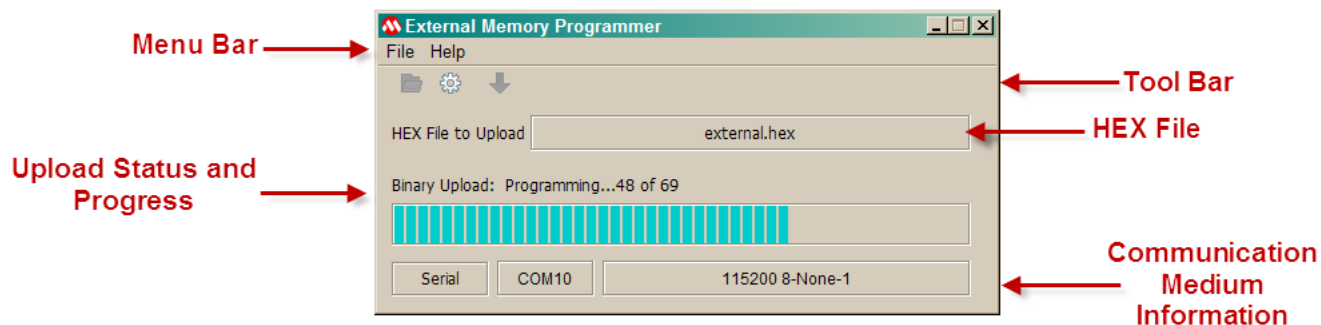
Features

1. Multi-communication support
 1. USB - uses the same drivers as MPLAB X
 2. Serial - uses the rxtx JAVA serial libraries (rxtx.org)
2. Binary file transfer - The HEX file is converted into binary packets
3. Communication protocol - header with checksum and ACK/NACK response
4. File upload verification
5. Drag and drop of the HEX file
6. Progress bar with status

Limitations

1. Using serial communication on the Mac OS X may be slower than running on a Windows machine. It is recommended that USB communication medium be used.

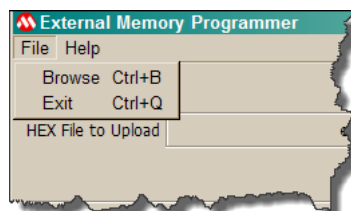
4 User Interface



4.1 Menu Bar

The menu bar can be used to load HEX files, exit the programmer, or launch the about window.

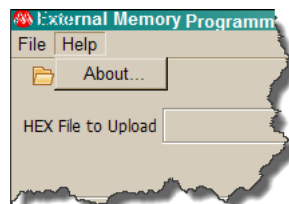
File



Browse - Loads a HEX file to be uploaded to a device.

Exit - Quits the application.

Help

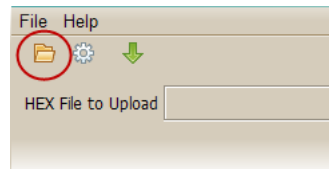


About... - Opens the About window.

4.2 Tool Bar

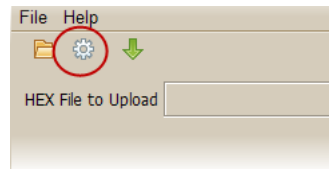
The tool bar button are used to load a Hex file, configure the communication medium and upload the HEX file.

Browse



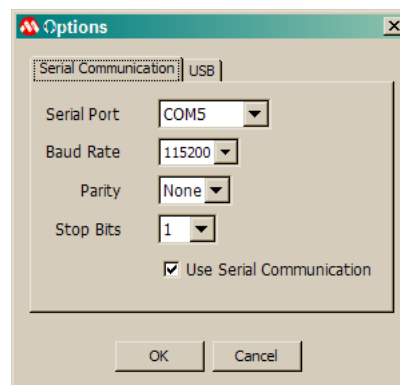
Opens a file dialog box, which allows the user to choose a HEX file to be uploaded.

Communication Settings



Opens a dialog box, which allows the user to select the type of communication, serial or USB, and specific communication settings.

Serial Communication - Uses RS-232 communication.



Serial Port - The serial port number (COM<x>) that will be used to communicate to the device.

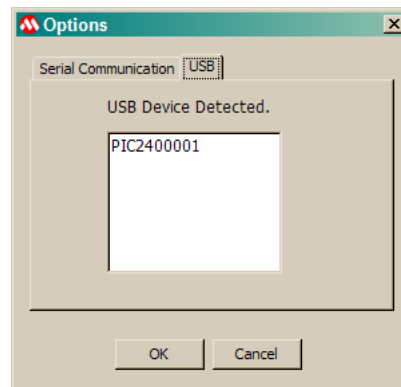
Baud Rate - The baud rate used to communication to the device.

Parity - The parity used.

Stop Bits - The length of the stop bits used.

NOTE: The serial settings must be the same settings as the device.

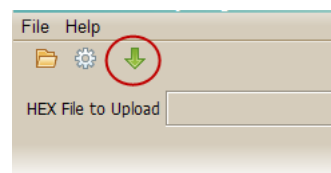
USB



List Box - If there are any USB devices which match the product and vendor ID associated with the External Memory Programmer, a list of the serial numbers will be present. The user must select the serial number of the device to communicate to.

NOTE: The device should have a serial number and the correct product and vendor ID. Please refer to the External Memory demo in the MAL for the correct information.

Upload

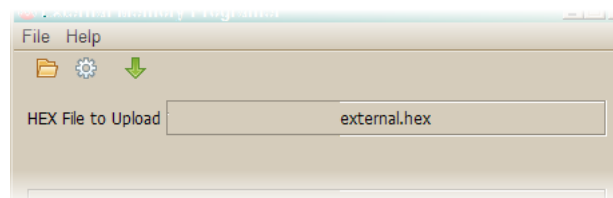


Uploads the HEX file to the device. The button is only enabled after a HEX file and communication settings have been configured.

4.3 HEX File

The uploading HEX file edit box indicates the name of the HEX file to upload. Hovering over the file edit box will display the absolute path of the HEX file, provided one is loaded.

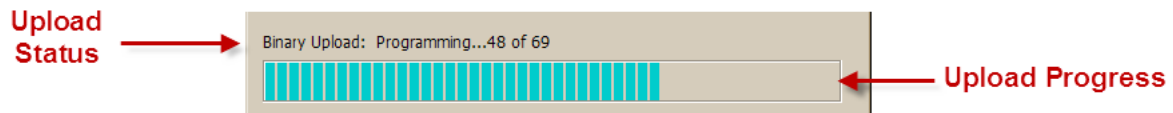
HEX File Box



This displays the current HEX file name. By hovering over the file name, the absolute file path will be displayed. The file box also serves as a drag and drop location for HEX files.

4.4 Upload Status and Progress

When uploading a HEX file, the current status will be display along with a progress bar. This can be used to indicate the amount of data that has been transferred.



Upload Status

The upload status displays the current status of the communication to the device. Some of the messages that are displayed are:

- Binary Upload: Sending ECHO
- Binary Upload: Getting Max packet Size
- Binary Upload: Erasing Memory
- Binary Upload: Programming.....<x> of <y>
- Binary Upload: Verifying...<x> of <y>

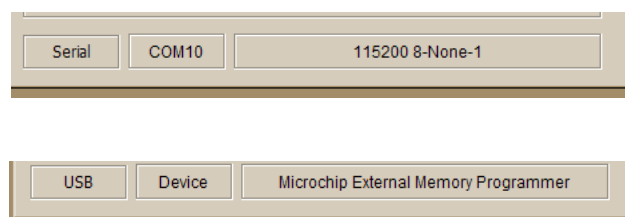
Where <x> is the current packet and <y> is the total number of packets to be sent

Upload Progress

The upload progress is a graphical status of the communication when programming or verifying the device.

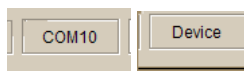
4.5 Communication Medium Information

The communication medium information displays the type of medium used, serial or USB and other details that relate to the medium being used. For serial communication, the communication port (COMM) will be displayed and the baud rate, data bits, parity and stop bits. For USB communication, the devices manufacturer and product strings are displayed.



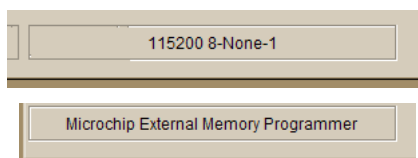
Communication Medium

The type of medium used for communication, either serial or USB.

Communication Interface

For serial communication, the serial port (COMM<x>) will be displayed.

For USB communication "Device" will be displayed.

Communication Settings/Information

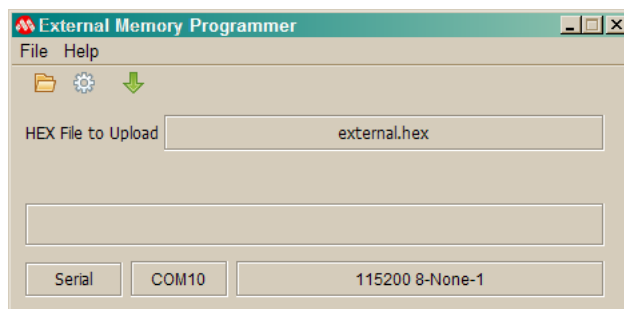
For serial communication, the baud rate, data bits, parity and the stop bits will be displayed.

For USB communication, the product string will be displayed.

5 Using the Utility

5.1 Loading a HEX file

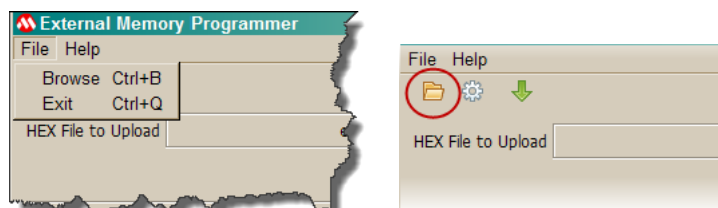
Loading a HEX file to upload to a device can be done two ways, through a file dialog box or dragging and dropping it.



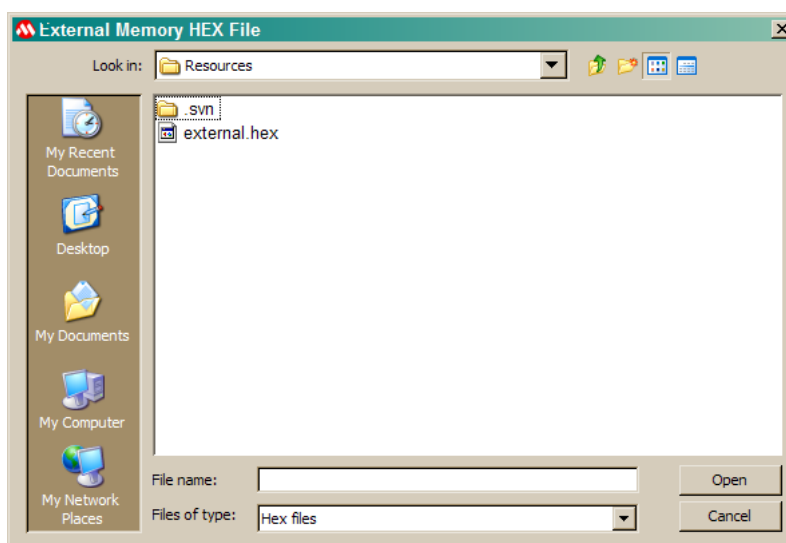
Loading a HEX file from a File Dialog Box

Follow these steps to load a HEX file from a file dialog box

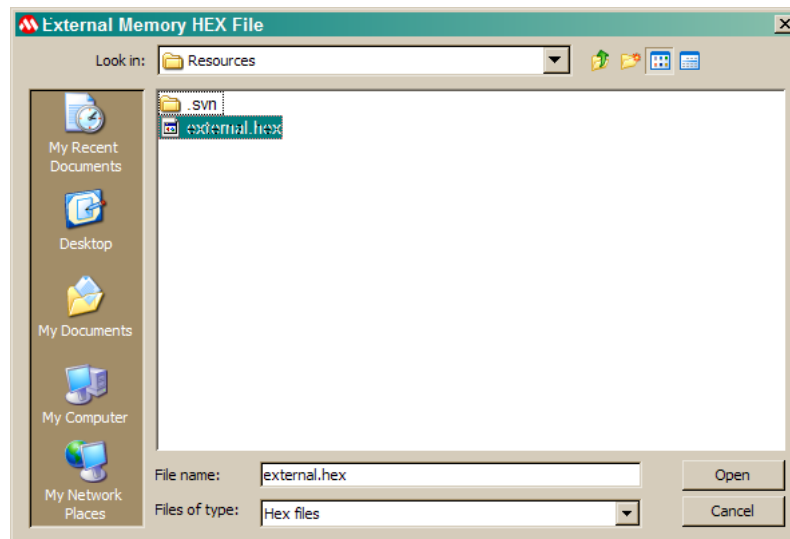
1. Launch a file dialog by either choosing the Browse menu option or tool bar button.



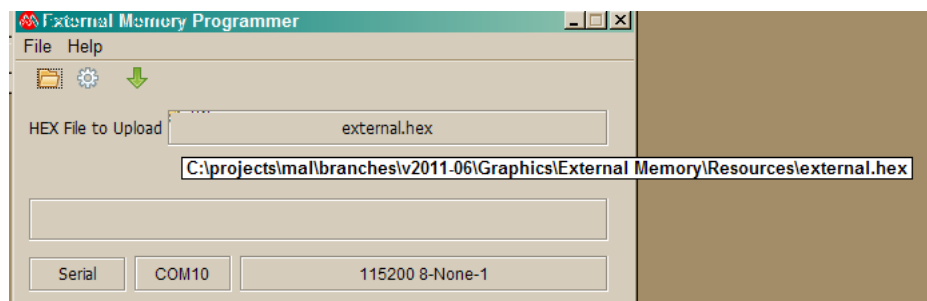
2. Use the file dialog box to navigate to the HEX file directory



3. Select the HEX file to load



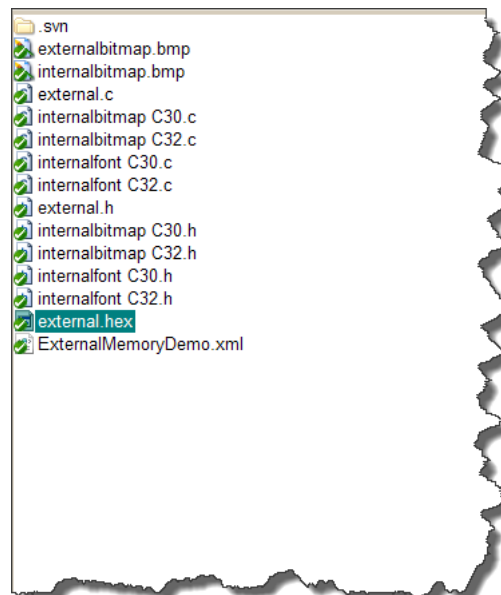
4. The HEX file name will appear in the HEX File to Upload box, hovering over the box will show the absolute path.



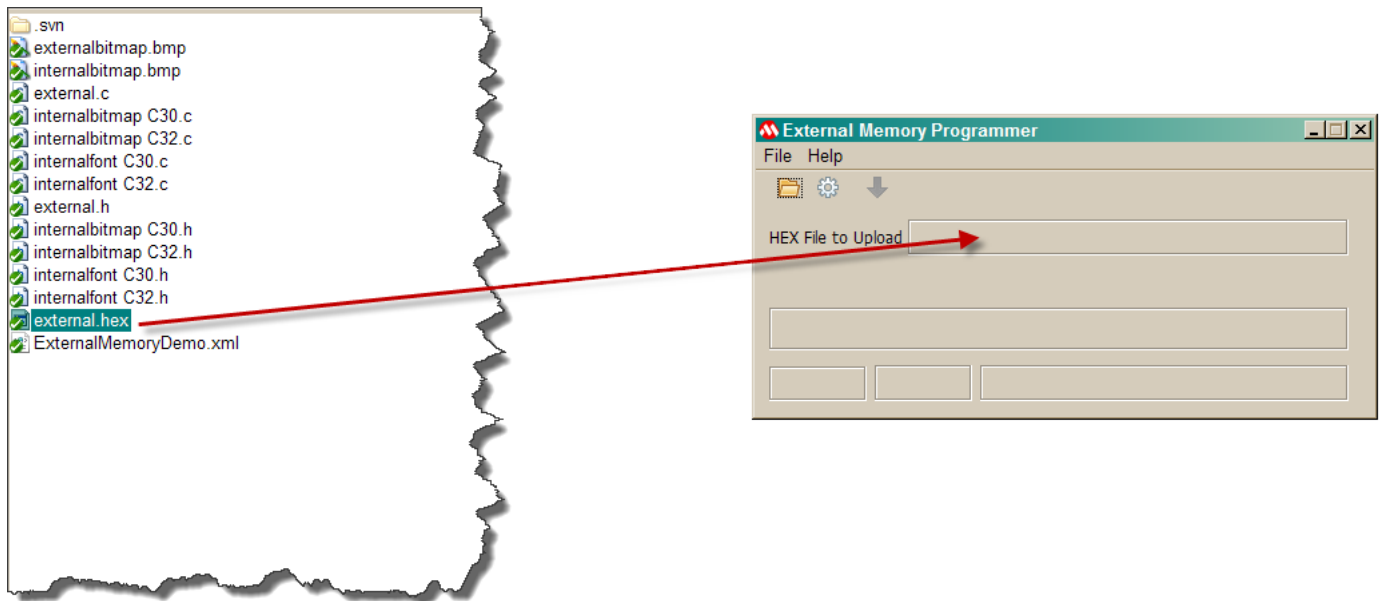
Loading a HEX File by drag and drop

Follow these steps to load a HEX file by drag and drop

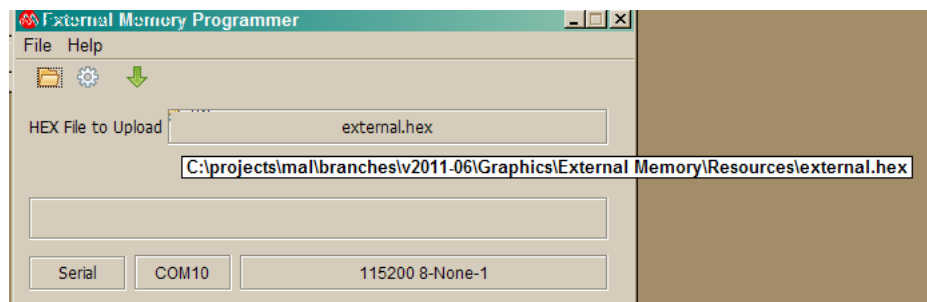
1. Navigate to the directory or location of the HEX file.



2. Drag the file, by using the drag feature, to the HEX File to Upload box and drop it.



3. The HEX file name will appear in the HEX File to Upload box, hovering over the box will show the absolute path.



5.2 Setting the Communication Parameters

Setting the communication medium and parameters can be done with the Options dialog box. The dialog handles setting the serial and USB communication parameters.

Serial Communication Settings

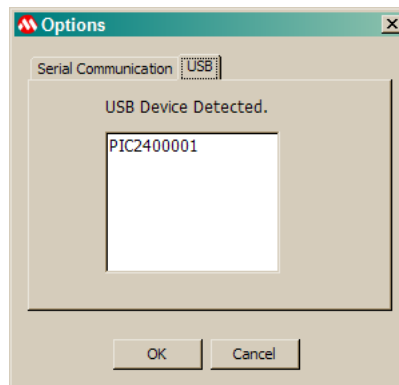


Follow these steps to configure the serial communication parameters

1. Select the serial port. The drop down combo box will be populated with all of the serial ports that are available.
2. Select the baud rate.*
3. Select the parity.*
4. Select the stop bits.
5. Check the "Use Serial Communications"

* It is important that the device has the same settings for proper communication.

USB Communication Settings



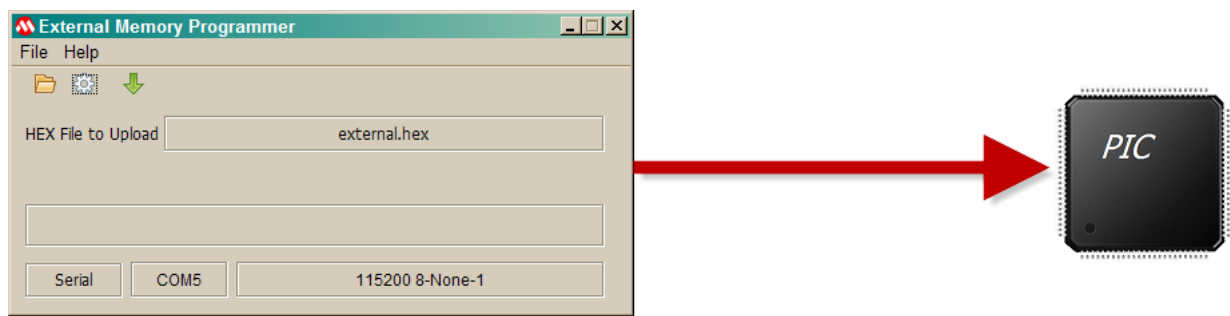
Follow these steps to configure the UAB communication parameters

1. Plug in the USB device into the host PC running the External Memory Programmer.
 1. The host PC may require a driver and *.inf file to be associated with the USB device. Please refer the the USB driver section for more information.
2. Under the USB tab on the Options dialog, there will be a list box that is populated with the USB serial numbers of all valid USB devices.
3. Select the serial number corresponding to the USB device to upload.

After the communication method has been configured, the information will be displayed on the main panel.

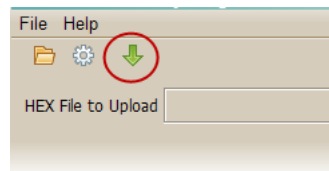
5.3 Uploading a HEX file

After selecting the HEX file to upload and configuring the communication method, the programmer will enable uploading to a device.

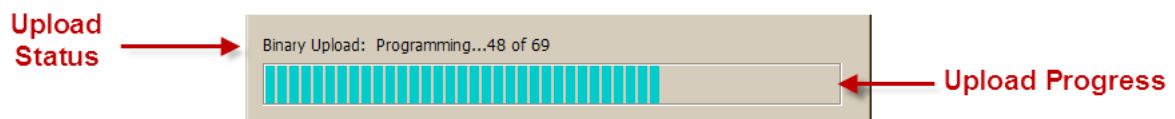
Uploading a HEX file to a device

Follow these steps to upload a HEX file to a device

1. Make sure that the device is properly connected to the host.
2. Select a HEX file and configure the communication method
3. The upload button will be enabled.
4. Press the upload button



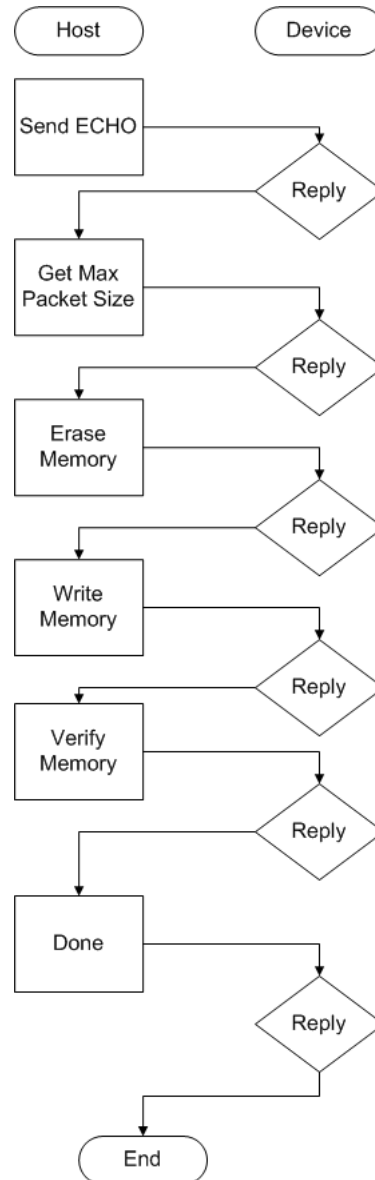
5. The upload status and progress bar will display the current progress of the upload



6. A message box will appear at the end of a successful upload indicating the time to upload.

6 Binary Communication Protocol

The External Memory Programmer uses an ACK/NACK communication method to transfer the data contained in the HEX file to the device. All packets from the host to device must be ACK/NACKed, but do not require a payload.

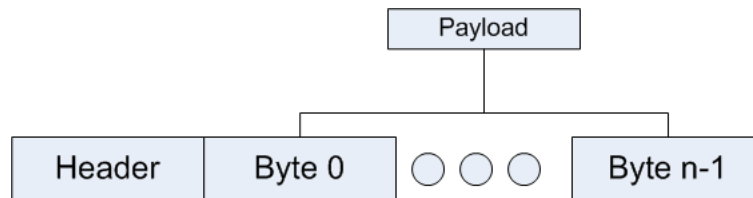


The following is a description of the communication method with uploading a HEX file.

1. An echo packet is sent. This packet has no payload and is used to establish communication between the host and device.
2. A packet requesting the maximum packet size is sent. This is used by the host to ensure that the packet length is never larger than the device's resources. Devices are able to dictate the resource requirements for the packet.
3. A packet requesting that the memory be erased. The device will need to make sure that the memory is in the proper state to write data.
4. The memory write packets are sent. The amount of packets required depend on the HEX file and the maximum packet size.
5. The verify memory packets are sent. The device will perform a checksum over a memory region.
6. The done packet will be sent. The device is notified that all memory uploading and verifying are complete.

6.1 Binary Packet

The binary packets used in the External Memory consist of a header followed by a payload. The payload size can range from 0 to 65,000 bytes. The payload size is determined by the device.



Packet Header

The packet header is four bytes in length.

ACK/NACK (1 bit)	Reply (1 bit)	Command (6-bits)	Checksum (8-bits)	Length (16-bits)
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ACK/NACK - This bit is a response to a command and the reply bit must be set.

Reply - This bit is set when a response to a command is processed. Every command packet must have a reply

Command - The command of the packet. All reply packets will reply with the same command.

Checksum - The checksum of the entire packet. If the calculated checksum does not match the header's checksum, the packet must be NACKed.

Length - The length of the payload, ranging from 0 - 65,000.

Packet Payload

The packet payload is variable length. The length member of the header will indicate the size of the payload in bytes.

6.2 Binary Commands

The binary packets use commands to instruct the device what actions are required.

The following commands are supported by the External Memory Programmer

- **ECHO** - A zero payload command. Used to establish communication with a device.
- **MEMORY ERASE** - requesting that the memory be prepared to be written to.
- **MEMORY WRITE** - write the data in the payload to a memory section
- **MAX PAYLOAD SIZE** - requesting the maximum payload size accepted by the device
- **MEMORY VERIFY** - requesting a checksum over a memory range
- **DONE** - all memory programming and verifying are done

7 USB Drivers

The External Memory Programmer provides two communication mediums to upload HEX files, serial and USB. The MAL provides the serial communication drivers needed for Windows and MAC operating systems.

The following drivers and files are needed to run use the USB medium.

- The inf file is provided by the Graphics demos External Memory. The file, MCHPEXternalMemory.inf, is located under the MAL installation directory at /Graphics/External Memory.
- The USB drivers are located in the WinUSB directory of the USB demos. The drivers are located under the MAL installations directory at /USB/Device - MCHPUSB - Generic Driver Demo/Driver and .inf.
 - If MPLAB X IDE has been installed on the host machine, the USB drivers used by REALICE can be used and are preferred.

8 Trouble Shooting

The following topics may be helpful when debugging the External Memory Programmer.

Why doesn't the External Memory Programmer run when a double click on the memory_programmer.jar?

1. Make sure that you have JRE 6 or higher installed on the host machine.
2. Make sure that the JRE is associated with the jar extension.

Why doesn't the communication settings dialog box appear after a click on the settings tool bar button?

When you select the communication settings, the available serial ports will be populated. This requires the serial libraries to be in the same directory as the External Memory Programmer utility.

Why can't I find the available serial port I need?

Make sure that you have the serial port available before selecting the communication settings. For example, if using a USB to serial connector, make sure it is plugged in and enumerated by the host before selecting the communication settings.

Why doesn't the HEX file load with a select upload with serial communication?

1. Make sure that the settings of the External Memory Programmer match the settings of the device.
2. Make sure that the serial cable is correctly connected.

Why can't the USB device be selected?

1. Make sure that the device is enumerated. See USB Drivers for more information.
2. Make sure that the device has the proper USB product and vender ID. See the USB descriptor of a MAL graphics demo External Memory for an example of the proper product and vender ID.
3. Make sure that you have USB serial number. If using multiple devices, use a unique USB serial number for each device.

What if I lose communication with my target device?

If communication is lost, there is a timeout of 3 seconds along with a retry counter of 10. The communication status will show the retry count.

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