MPLAB®-ICE

Processor Module and Device Adapter Specification

1.0 INTRODUCTION

The Processor Modules for MPLAB-ICE are interchangeable personality modules that allow the MPLAB-ICE to be reconfigured for emulation of different PICmicro® microcontrollers (MCUs). This modularity allows the emulation of many different devices by the addition of just a Processor Module and Device Adapter, which makes for a very cost effective multiprocessor emulation system.

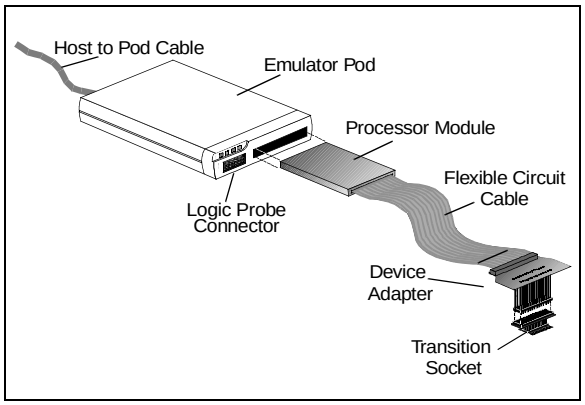
The Device Adapters for MPLAB-ICE are interchangeable assemblies that allow the emulator system to interface to a target application system. Device Adapters also have control logic that allows the target application to provide a clock source and power to the Processor Module. The Device Adapters support PICmicro MCUs in DIP, SDIP, and PLCC packages.

Transition Sockets, used along with a Device Adapter, provide a method of accommodating all PICmicro MCU packages, including SOIC, SSOP, PQFP, and TQFP packages.

2.0 TERMINOLOGY

Here's a brief overview of the different components of the system.

FIGURE 2-1: MPLAB-ICE EMULATOR SYSTEM



2.1 Host to Pod Cable

This is a standard parallel interface cable. MPLAB-ICE is being tested with a 6-foot cable. It connects to a parallel port on the PC. If a PC has a printer connected to an LPT device, it is recommended that an additional interface card be installed, rather than using a splitter or an A/B switch.

2.2 Emulator Pod

The Emulator Pod contains emulator memory and control logic. The MPLAB-ICE 2000 contains a main board and an additional board for expanded trace memory and complex control logic.

The MPLAB-ICE Processor Module is inserted into the pod for operation.

2.3 Processor Module

The Processor Module contains the emulator chip, logic and low-voltage circuitry. There are no field serviceable parts mounted on the printed circuit board housed within the Processor Module enclosure.

2.4 Flex Circuit Cable

Once the Processor Module is inserted into the Emulator Pod, the flex circuit cable extends the emulator system to the target application. This is a custom cable that is attached inside the Processor Module enclosure and can be replaced in the field by removing the end cap of the Processor Module enclosure.

Please, DO NOT PULL on the flex circuit cable to remove the Processor Module from the pod. Use the fins of the Processor Module end cap to leverage the module from its seat inside the pod.

2.5 Device Adapter

The Device Adapter provides a common interface for the device being emulated. They are provided in standard DIP and PLCC styles. The adapter also contains a special device that provides an oscillator clock to accurately emulate the oscillator characteristics of the PICmicro MCU.

2.6 Transition Socket

The Transition Sockets are available in various styles to allow the common Device Adapter to be connected to one of the supported surface mount package styles. There are various pin counts and pitches for SOIC, QFP and other styles.

An emulator system is ordered as separate components consisting of:

- An Emulator Pod (including among other things the host to pod cable and power supply)
- A Processor Module (including the flex circuit cable)
- A Device Adapter and
- An option Transition Socket

3.0 PROCESSOR MODULES

The Processor Modules are identified on the top of the assembly by the Processor Module name (i.e., PCM17XA0). To determine which processors are supported for a specific module, refer to the *Development Systems Ordering Guide* (DS30177) or our web site (www.microchip.com).

A typical Processor Module contains a special bond-out version of a PICmicro MCU, device buffers to control data flow, and control logic. It provides the means of configuring the MPLAB-ICE emulator for a specific PICmicro MCU family and handles the low-voltage emulation when needed.

Note:	When removing the Processor Module, DO NOT pull on the flex cable. Use the tabs on the Processor Module or damage to the flex cable may occur.

3.1 POWER

The operating voltage for most of the control logic and buffering on the Processor Module is +5V and is supplied by the Emulator Pod. Power to the emulator processor and some of its surrounding buffers is user selectable, and can be powered by the Emulator Pod (at +5V only) or the target application system (from 2.0V to 5.5V). This is software selectable and is configurable through the MPLAB IDE. At no time will the emulator system directly power the target application system. ALWAYS insert the Processor Module into the Emulator Pod before applying power to the pod.

When connecting to a target application system the user may notice a voltage level on the target application even though they have not yet applied power to the target application circuit. This is normal, and is due to current leakage through V_{CC} of the Device Adapter. The current leakage will typically be less than 20 mA. However, if the target application is using a voltage regulator, it should be noted that some regulators require the use of an external shunt diode between V_{IN} and V_{OUT} for reverse-bias protection. Refer to the manufacturer's data sheets for additional information.

3.1.1 EMULATOR PROCESSOR POWER SUPPLIED BY EMULATOR SYSTEM

If the emulator system is selected to power the emulator processor in the Processor Module, the emulator system can be operated without being connected to a target application. If the system is being connected to a target application, the power to the pod should be applied before applying power to the target application.

Note that the target application system's V_{CC} will experience a small current load (10 mA typical) when the emulator system is connected via a Device Adapter. This is because the target system must always power the clock chip in the Processor Module.

3.1.2 EMULATOR PROCESSOR POWER SUPPLIED BY TARGET APPLICATION SYSTEM

When the MPLAB IDE software is brought up, the emulator system is first initialized with the emulator system powering the emulator processor. The Processor Power Supplied by Target Board may then be selected using the Power tab of the Options/Development Mode dialog to power the Processor Module from the target board.

When operating from external power, the Processor Module will typically represent a current load equivalent to the device being emulated (according to its data sheet) plus 100 mA. Keep in mind that the target application will affect the overall current load of the Processor Module, dependent upon the load placed upon the processor I/O.

When the processor power is supplied by the target application system, an external clock (from the target board) may also be provided. The MPLAB IDE will not allow use of an external clock without the use of external power.

3.1.3 OPERATING VOLTAGE OF 4.6 TO 5.5 VOLTS

If the target application system's operating voltage is between 4.55V (±120 mV) and 5.5V, the Processor Module will consider this a STANDARD VOLTAGE condition. In this mode the processor can run to its highest rated speed (as indicated in its data sheet).

The recommended power-up sequence is:

1. Apply power to the PC host.
2. Apply power to the Emulator Pod and Processor Module assembly.
3. Invoke the MPLAB IDE.
4. Configure system for Processor Power Supplied by Target Board through the Power tab of the Options/Development Mode dialog box.
5. At the error message, apply power to the target application circuit. Then acknowledge the error.
6. Issue a System Reset (from the Debug Menu) before proceeding.

3.1.4 OPERATING VOLTAGE OF 2.0 TO 4.6 VOLTS

If the target application system's operating voltage is between 2.0V and 4.55V (±120 mV), the Processor Module will consider this a LOW VOLTAGE condition. In this mode the processor is limited to its rated speed at a given voltage level (as indicated in its data sheet).

When the MPLAB IDE software is started, the emulator system is first initialized with the emulator system powering the emulator processor. Therefore, it is advised that the Pod and Processor Module be powered on, the system be initialized by the MPLAB IDE, and the Processor Power Supplied by Target System function be selected BEFORE connecting the emulator system to the target application system. This sequence will minimize the amount of reverse current that the target system is exposed to.

The target application system can then be powered up and a system reset can be performed. Select *Options > Development Mode* and click the Power tab. Verify that the dialog says "Low Voltage Enabled." Click **Cancel** to close the dialog.

3.2 OPERATING FREQUENCY

The Processor Modules will support the maximum frequency (except where noted in Section 4.0) of the device under emulation. Note that the maximum frequency of a PICmicro MCU device is significantly lower when the operating voltage is less than 4.5V.

The Processor Modules will support a minimum frequency of 32 kHz. When operating at low frequencies, response to the screen may be slow.

3.3 CLOCK OPTIONS

The MPLAB-ICE allows internal and external clocking. When set to internal, the clock is supplied from the internal programmable clock, located in the Emulator Pod. When set to external, the oscillator on the target application system will be utilized.

3.3.1 CLOCK SOURCE FROM EMULATOR

Refer to the *MPLAB-ICE User's Guide*, "Chapter 3, Using the On-Board Clock" for configuring the MPLAB IDE to supply the clock source.

3.3.2 CLOCK SOURCE FROM THE TARGET APPLICATION

If the Target Application is selected to provide the clock source, the target board must also be selected to power the emulator processor (see the *MPLAB-ICE User's Guide*, "Chapter 3. Using a Target Board Clock").

At low voltage, the maximum speed of the processor will be limited to the rated speed of the device under emulation.

An oscillator circuit on the Device Adapter generates a clock to the Processor Module and buffers the clock circuit on the target board. In this way, the MPLAB-ICE emulator closely matches the oscillator options of the actual device. All oscillator modes are supported (as documented in the device's data sheet) except as noted in Section 4.0. The OSC1 and OSC2 inputs of the Device Adapter have a 5 pF to 10 pF load. Note this when using a crystal in HS, XT, LP or LF modes, or an RC network in RC mode.

The frequency of the emulated RC network may vary relative to the actual device due to emulator circuitry. If a specific frequency is important, adjust the RC values to achieve the desired frequency. Another alternative would be to allow the emulator to provide the clock as described in Section 3.3.1.

3.4 ESD PROTECTION AND ELECTRICAL OVERSTRESS

All CMOS chips are susceptible to electrostatic discharge (ESD). In the case of the Processor Modules, the pins of the CMOS emulator are directly connected to the target connector, making the chip vulnerable to ESD. Note that ESD can also induce latch-up in CMOS chips, causing excessive current through the chip and possible damage. The MPLAB-ICE has been designed to minimize potential damage by implementing over-current protection and transient suppressors. However, care should be given to minimizing ESD conditions while using the system.

During development, contention on an I/O pin is possible (e.g., when an emulator pin is driving a '1' and the target board is driving a '0'). Prolonged contention may cause latch-up and damage to the emulator chip. One possible precaution is to use current limiting resistors (~100 Ω) during the development phase on bidirectional I/O pins.

3.5 FREEZE MODE

The MPLAB-ICE system allows the option of "freezing" peripheral operation or allowing them to continue operating when the processor is halted. This option is configured in the MPLAB IDE. The Freeze function is available on all Processor Modules except the PCM16XA0.

This function is useful to halt an on-board timer while at a break point. Note that at a break point and while single stepping, interrupts are disabled.

4.0 EMULATOR RELATED ISSUES

Processor Modules PCM16XB0, PCM16XE0: TIMER1 does not operate in low voltage mode. This was addressed in PCM16XB1 and PCM16XE1.

In addition, the following general limitations apply to the MPLAB-ICE 2000 Emulator.

- All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through `MPASM _ _CONFIG` directive
- TIMER1 with eternal crystal loading issue
- Limitations for 12-Bit Core devices include:
  - No peripheral freeze at a breakpoint
  - No data monitoring
  - No support for weak pull-ups (some devices)
  - No support for wake-up sources (some devices)
- No parity errors will be generated for devices with parity

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS

Processor Module	Devices	Support Limitations
PCM12XA0	PIC12C671 PIC12C672	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **Calibration on internal 4 MHz oscillator** Feature not supported. Use the programmable clock source in the MPLAB-ICE pod.
	PIC12CE673 PIC162CE674	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **Calibration on internal 4 MHz oscillator** Feature not supported. Use the programmable clock source in the MPLAB-ICE pod. **Data EEPROM not displayed or modified** Data EEPROM can be accessed during program execution, but the MPLAB IDE currently will not display or modify it.
PCM14000	PIC14C000	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. The maximum speed of emulation is 40 kHz. Care must be taken when selecting the components for the oscillator during emulation of this feature.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XA0	PIC12C508/508A	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the MPASM _ _CONFIG directive. **No freeze on halt** Watchdog timer and TIMER0 work properly. Additional timers may keep running, making it difficult to debug timer-related code. **No internal data bus visibility** No ability to break on register address or value. No ability to trace register value. **Internal pull-up on master clear not fully emulated** A hardware switch on Device Adapter may be toggled for either MCLR function with pull-up or MCLR tied to VDD. **Internal weak pull-ups on GP0/1/3 not fully emulated** GP0, GP1, and GP3 have user selectable pull-ups (via a software bit in the OPTION register. These are not emulated. If desired, they may be manually switched in or added to the target board. **No wake up from sleep on GP0/1/3 pin change** The wake up on change feature on pins GP0, GP1, and GP3 is not emulated. **No on-board RC oscillator** There is NO on-board RC oscillator on the emulator Processor Module. By using the programmable clock source in the MPLAB-ICE pod, you can run the emulator as if it had the on-board clock. **Calibration location:** Location 01FF on the PIC12C508 and 03FF on the PIC12C509 is the address for the calibration value for the on-board RC oscillator. This value is not used on the emulator. To emulate this, insert a MOVLW command with a constant that represents the oscillator calibration value. PIC12C508 Example: ORG 0x1FF MOVLW 0x12 **Extra Cycle Skidding** Processor Modules will skid one extra instruction when the Ignore FNOP is selected.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XA0	PIC12CE518/519	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **No freeze on halt** Watchdog timer and TIMER0 work properly. Additional timers may keep running, making it difficult to debug timer-related code. **No internal data bus visibility** No ability to break on register address or value. No ability to trace register value. **Internal pull-up on master clear not fully emulated** A hardware switch on Device Adapter may be toggled for either MCLR function with pull-up or MCLR tied to VDD. **Internal weak pull-ups on GP0/1/3 not fully emulated** GP0, GP1, and GP3 have user selectable pull-ups (via a software bit in the OPTION register. These are not emulated. If desired, they may be manually switched in or added to the target board. **No wake up from sleep on GP0/1/3 pin change** The wake up on change feature on pins GP0, GP1, and GP3 is not emulated. **No on-board RC oscillator** There is NO on-board RC oscillator on the emulator Processor Module. By using the programmable clock source in the MPLAB-ICE pod, you can run the emulator as if it had the on-board clock. **Calibration location:** Location 01FF on the PIC12CE518 and 03FF on the PIC12CE519 is the address for the calibration value for the on-board RC oscillator. This value is not used on the emulator. To emulate this, insert a MOVLW command with a constant that represents the oscillator calibration value. PIC12C508 Example: ORG 0x1FF MOVLW 0x12 **Data EEPROM on different I/O pins** The EE data on the emulator is accessed on different I/O pins from the actual part. Use the example I2C code for the CE family with internal EE found on the Microchip web site located at www.microchip.com. From our home page, select **Knowledge Base** (under Development Tools), then click **Example Code**. Data EEPROM not displayed or modified Data EEPROM can be accessed during program execution, but the MPLAB IDE currently will not display or modify it. **Extra Cycle Skidding** Processor Modules will skid one extra instruction when the Ignore FNOP is selected.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XA0	PIC16C505	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **No freeze on halt** Watchdog timer and TIMER0 work properly. Additional timers may keep running, making it difficult to debug timer-related code. **No internal data bus visibility** No ability to break on register address or value. No ability to trace register value. **Internal pull-up on master clear not fully emulated** A hardware switch on the Device Adapter may be toggled for either MCLR function with pull-up or MCLR tied to VDD. **Internal weak pull-ups on GP0/1/3 not fully emulated** GP0, GP1, and GP3 have user selectable pull-ups (via a software bit in the OPTION register. These are not emulated. If desired, they may be manually switched in or added to the target board. **No wake up from sleep on GP0/1/3 pin change** The wake up on change feature on pins GP0, GP1, and GP3 is not emulated. **No on-board RC oscillator** There is NO on-board RC oscillator on the emulator Processor Module. By using the programmable clock source in the MPLAB-ICE pod, you can run the emulator as if it had the on-board clock. **Calibration location:** Location 03FF on the PIC16C505 is the address of the calibration value for the on-board RC oscillator. This value is not used on the emulator. To emulate this, insert a MOVLW command with a constant that represents the oscillator calibration value. PIC12C508 Example: ORG 0x1FF MOVLW 0x12 **PORT B has more bits** PORTB and TRISB registers have six bits on the actual device, but eight bits on the emulator. **Extra Cycle Skidding** Processor Modules will skid one extra instruction when the Ignore FNOP is selected.
	PIC16C52 PIC16C54/54A/54C PIC16C55/55A PIC16C56/56A PIC16C57/57C PIC16C58A/58B PIC16CR54A/54B/54C PIC16CR56A PIC16CR57B/57C PIC16CCR58A/58B	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **No freeze on halt** Watchdog timer and TIMER0 work properly. Additional timers may keep running, making it difficult to debug timer-related code. **No internal data bus visibility** No ability to break on register address or value. No ability to trace register value. **Extra Cycle Skidding** Processor Modules will skid one extra instruction when the Ignore FNOP is selected.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XB0/B1	PIC16C62A PIC16C63 PIC16C64A PIC16C65A PIC16CR63 PIC16CR65	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120pF. The maximum speed of emulation is 40 KHz. Care must be taken when selecting the components for the oscillator during emulation of this feature.
PCM16XB1	PIC16C72 PIC16C73A PIC16C74A	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. The maximum speed of emulation is 40 kHz. Care must be taken when selecting the components for the oscillator during emulation of this feature.
PCM16XC0	PIC16C554 PIC16C558	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive.
	PIC16C620/620A PIC16C621/621A PIC16C622/622A	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive.
	PIC16CE623 PIC16CE624 PIC16CE625	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **Data EEPROM not displayed or modified** Data EEPROM can be accessed during program execution, but the MPLAB IDE currently will not display or modify it.
PCM16XD0	PIC16C642 PIC16C662	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **No parity checking** Parity checking is not supported.
PCM16XE0/E1	PIC16C62B PIC16C63A PIC16C65B PIC16C66 PIC16C67	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. The maximum speed of emulation is 40 kHz. Care must be taken when selecting the components for the oscillator during emulation of this feature.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XE0/E1	PIC16C712 PIC16C716	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. Care must be taken when selecting the components for the oscillator during emulation of this feature. **PORTC pins hardware switch enabled** Three pins in the real part • RB1/OSO/T1CKI • RB2/T1OSI • RB3/CCP1 have to be manually configured via DIP switches on the emulator Device Adapter - RC0/T1OSO/T1CKI - RC1/T1OSI - RC2/CCP1 See Table 5-4.
PCM16XE1	PIC16C72A PIC16C73B PIC16C74B PIC16C76 PIC16C77	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. The maximum speed of emulation is 40 KHz. Care must be taken when selecting the components for the oscillator during emulation of this feature.
PCM16XF0	PIC16C71	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. Care must be taken when selecting the components for the oscillator during emulation of this feature. **PORTC pins hardware switch enabled** Three pins in the real part • RB1/OSO/T1CKI • RB2/T1OSI • RB3/CCP1 have to be manually configured via DIP switches on the emulator Device Adapter - RC0/T1OSO/T1CKI - RC1/T1OSI - RC2/CCP1 See Table 5-4.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XF0	PIC16C710 PIC16C711	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive.
PCM16XG0	PIC16C715	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **No parity checking** Parity checking is not supported.
PCM16XH0/H1	PIC16F83 PIC16F84/84A	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **10 MHz only (on PCM16XH0)** Processor module has a maximum speed of 10 MHz. **No single step on EEPROM read/write** Cannot single step through EEPROM read/write operations.
PCM16XJ0	PIC16C923 PIC16C924	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **8 MHz maximum speed** Although the emulator Processor Module may be set to speeds greater than 8 MHz, the actual chip has a maximum speed of 8 MHz. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120pF. Care must be taken when selecting the components for the oscillator during emulation of this feature.
PCM16XK0	PIC16F873 PIC16F874 PIC16F876 PIC16F877	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120 pF. Care must be taken when selecting the components for the oscillator during emulation of this feature. **Reading/Writing program memory not real-time** A read or write of program memory causes the emulator system to halt, run a routine that examines the states of registers affecting the read/write, performs the read/write and then begins running again. Therefore, checksums may take some time. **Reading/Writing cannot be single-stepped** Program memory and data memory reads and writes cannot be single stepped.

TABLE 4-1: EMULATOR-RELATED DEVICE SUPPORT LIMITATIONS (CONTINUED)

Processor Module	Devices	Support Limitations
PCM16XL0	PIC16C773 PIC16C774	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **TIMER1 external crystal oscillator loading** When using the external crystal oscillator for TIMER1, the oscillator may not operate correctly due to the loading of the Device Adapter and the flex circuit cable. The loading may be as high as 120pF. Care must be taken when selecting the components for the oscillator during emulation of this feature.
PCM17XA0	PIC17C42/42A PIC17C43 PIC17C44 PIC17CR42A PIC17CR43 PIC17C752 PIC17C756/A PIC17C762 PIC17C766	**Setting configuration bits** All configuration bit settings are enabled/disabled through *Options > Development Mode* of the MPLAB IDE rather than through the `MPASM _ _CONFIG` directive. **Extra Cycle Skidding** Processor Modules will skid one extra instruction when the Ignore FNOP is selected. Processor Module PCM17XA0 will skid one extra cycle when halting or tracing if processor frequencies are above 30 MHz. **No single step on table read/write** Cannot single step on table read/write operations.

5.0 DEVICE ADAPTERS

This section details Processor Specific considerations that have been made on Device Adapters.

There will be a max of 10 mA of current draw from the users target system even when the emulator Processor Module is being powered by the emulator system, and running internal clock. This is due to components on the Device Adapter being powered by the user target board.

5.1 DVA12XP080

This Device Adapter is intended for use with PIC12C50X 8-pin DIP devices. It has four mechanical switches that allow target pins GP2 to GP5 to be routed to the PIC16C01 on the PCM16XA0 Processor Module or the oscillator chip on the Device Adapter, as shown in Table 5-1.

In addition, a 24C00 EEPROM (U1) is connected to RA0 and RA1 to the PIC16C01 to support the EEPROM capabilities of the PIC12CE51X family devices. See the information for the PCM16XA0, PIC12CE518/519 devices in Table 4-1 for information on how to use EEPROM memory.

5.2 DVA12XP081

This Device Adapter is intended for use with PIC12C67X 8-pin DIP devices. It has two mechanical switches that allow target pins GP4 and GP5 to be routed to the PIC12C67X-ME device on the PCM12XA0 Processor Module or the oscillator device on the Device Adapter, as shown in Table 5-2.

5.3 DVA16XP140

This Device Adapter is intended for use with the PIC16C505 14-pin DIP device. It has four mechanical switches that allow target pins RB4 and RB5 to be routed to the PIC16C01 device on the PCM16XA0 Processor Module or the oscillator device on the Device Adapter. Target pin RB3 routed MCLR and target pin RC5 routed to TOCKI of the PIC16C01 device on the PCM16XA0, as shown in Table 5-3.

5.4 DVA16XP182

This Device Adapter is intended for use with PIC16C712/716 18-pin DIP devices. It has a second oscillator device incorporated to allow for TIMER1 oscillator input support ranging from 32-40 kHz. It has four mechanical switches that allow target pins RB1 and RB2 to be routed to the PIC16C77-ME device on the PCM16XE1 Processor Module or the TIMER1 oscillator device on the Device Adapter. Target pin RB1 routed T1CKI and target pin RB3 routed to CCP1 of the PIC16C77-ME of the PCM16XE1, as shown in Table 5-4.

5.5 DVA16XP200

This Device Adapter is intended for use with PIC16C770/771 20-pin DIP devices. It has three mechanical switches that allow target pins RA6 and RA7 to be routed to the PIC16C771-ME device on the PCM16XM0 Processor Module or the oscillator device on the Device Adapter. Target pin RA5 routed MCLR of the PIC16C771-ME device on the PCM16XM0, as shown in Table 5-5.

Target pins RB6 and RB7 can be routed (via software) to the PIC16C771-ME device of the PCM16XM0 or a second oscillator supporting a TIMER1 oscillator input ranging from 32 to 40 kHz.

5.6 DVA16XP282, DVA16XP401, DVA16XL441, and DVA16PQ441

These Device Adapters are intended for use with PIC devices supported by the PCM16XB0/B1, PCM16XE0/E1, PCM16XK0, PCM16XL0, and the PCM18XA0 Processor Modules. The Device Adapters have a second oscillator device incorporated to allow for TIMER1 oscillator input support ranging from 32 to 40 kHz.

For PCM16XB0/B1, PCM16XE0/E1, PCM16XK0 and PCM16XL0 configure jumper J1 per Table 5-6.

For PCM18XA0 leave the jumper on pins 1-2 (**OFF**); the timer1 oscillator enable/disable function is software configurable.

5.7 Emulating a .600 28-Pin Part

When emulating a .600 wide, 28-pin device, an adapter will be needed to convert the standard .300 wide socket on the Device Adapters to the .600 wide socket on the target board.

There are many adapters available for this purpose. The following adapter is readily available.

DIGIKEY: A502-ND

TABLE 5-1: DVA12XP080 DEVICE ADAPTER SWITCH ASSIGNMENT

Desired Function	Switch Positions
RB2	Set S4 to **RB2**.
RB3	Set S3 to **RB3**.
RB4	Set S2 to **RB4**.
RB5	Set S1 to **RB5**.
MCLR	Set S3 to **MCLR**.
External Oscillator Input	Set S1 to **OSC1** and set S2 to **OSC2**.
TIMER0 Clock Input	Set S4 to **T0CLK**.

TABLE 5-2: DVA12XP081 DEVICE ADAPTER SWITCH ASSIGNMENT

Desired Function	Switch Positions
GP4	Set S2 to **GP4**.
GP5	Set S1 to **GP5**.
External Oscillator Input	Set S1 to **OSC1** and set S2 to **OSC2**.

TABLE 5-3: DVA16XP140 DEVICE ADAPTER SWITCH ASSIGNMENT

Desired Function	Switch Positions
RC5	Set S4 to **RC5**.
RB3	Set S3 to **RB3**.
RB4	Set S2 to **RB4**.
RB5	Set S1 to **RB5**.
MCLR	Set S3 to **MCLR**.
External Oscillator Input	Set S1 to **OSC1** and set S2 to **OSC2**.
TIMER0 Clock Input	Set S4 to **TOCKI**.

TABLE 5-4: DVA16XP182 DEVICE ADAPTER SWITCH ASSIGNMENT

Desired Function	Switch Positions
RB1	Set S2-1 to position **B**.
RB2	Set S2-2 to position **B**.
RB3	Set S2-3 to position **B**.
CCP1	Set S2-3 to position **A**.
TIMER1 Clock Input	Set S2-1 to position **A** and set S1 to position **B**.
TIMER1 Oscillator Input	Set S2-1 to position **A** and set S2-2 to position **A** and set S1 to position **A**.

TABLE 5-5: DVA16XP200 DEVICE ADAPTER SWITCH ASSIGNMENT

Desired Function	Switch Positions
RA5	Set S1 to **RA5**.
RA6	Set S3 to **RA6**.
RA7	Set S2 to **RA7**.
MCLR	Set S1 to **MCLR**.
External Oscillator Input	Set S3 to **OSC1** and set S2 to **OSC2**.

TABLE 5-6: DVA16XP282, DVA16XP401, DVA16XL441, AND DVA16PQ441 JUMPER SETTINGS

Desired Function	Switch Positions
TIMER1 Oscillator Input enabled	Short J1 pins 2-3 (**ON**).
TIMER1 Oscillator Input disabled	Short J1 pins 1-2 (**OFF**).

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