
Operational Issues

When designing applications that use the MPLAB® ICD 3, these operational issues should be considered:

- Oscillator Circuit Setup
- ICSP™ Implementation and Considerations
- Recommended Configuration
- Alternate Configuration
- Communication Channel
- Grounding and AC Applications
- Correcting Crosstalk
- Hibernation

Refer to the “*MPLAB® ICD 3 In-Circuit Debugger User’s Guide*” (DS51766) for general operational information.

MPLAB® ICD 3 Design Advisory

OSCILLATOR CIRCUIT SETUP

Primary Oscillator

Often differences between the MPLAB IDE default settings and the unique target requirements cause the following message to display in the output window “The target device is not ready for debugging. Please check your configuration bit settings and program the device before proceeding.” To correct this, set the Configuration bits to match the oscillator setting of the target configuration.

For debugging operations, the application (target) oscillator must be functioning before in-circuit debugging can take place. Ensure the oscillator configuration and the MPLAB IDE Configuration bit setup are configured properly. For example, if your application uses a 20 MHZ crystal oscillator, select the HS (High Speed) selection in MPLAB IDE. For any other applicable device oscillator modes, consult the device data sheet.

Crystal Oscillator

If the MPLAB ICD header or processor extension packs are used to connect to the target, there may be problems with starting the crystal resonator. To avoid potential problems, consider the following:

1. Ensure the crystal is connected near the device footprint.
2. Keep all lines as short as possible in the target application without unnecessary discontinuities such as PCB vias and test points.
3. Minimize any capacitive loading on these nodes.
4. Avoid using a socket for the placement of the crystal and capacitor. Solder the devices directly to PCB pads.

ICSP™ IMPLEMENTATION AND CONSIDERATIONS

The MPLAB ICD 3 uses a serial signaling scheme to program and debug a target device. The signals utilized are a clock and a data signal. In most devices they are also mapped to a port (typically RB6 and RB7), but they are also defined in some data sheets as PGC and PGD or ICSPCLK and ICSPDAT.

Additionally, $\overline{\text{MCLR}}$ is also used as either a high voltage programming signal or as an attention indicator to the device.

In order to have trouble free in-circuit debugging, careful planning must be done by the designer to avoid any problems during the application development or production phase of the product.

RECOMMENDED CONFIGURATION

The signals PGC and PGD are active bidirectional signals driven by the MPLAB ICD 3 and target emulation device. If these signals can be kept free from any other passive circuits or active logic in the application, it will ensure trouble free debugging and programming sessions. Also, cable length and/or type may be negligible with this configuration.

Additionally, the $\overline{\text{MCLR}}$ signal is used by MPLAB ICD 3 to provide the voltage used for programming some devices or to signal attention. In instances where the application has a large capacitor, it will cause the signal rise and fall time to degrade. This will hinder the ability of MPLAB ICD 3 and the device to communicate effectively. It is recommended to keep the signal pulled up to VDD with a 10K resistor, and to utilize the power-on timer features of the device to ensure a proper power-up sequence.

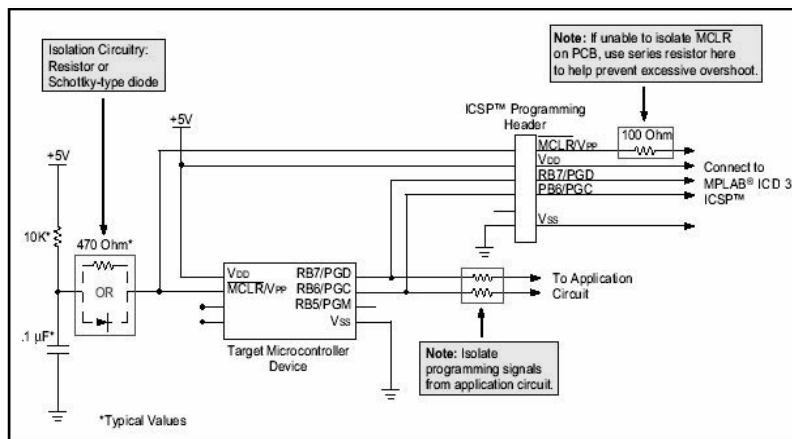
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ALTERNATE CONFIGURATION

In some cases, especially with low pin count devices, the pins must be utilized by the application.

If this is the case, as a minimum, a resistive isolation is required between the device and the application active node. This will ensure that both the application circuit and MPLAB ICD 3 are able to drive the PGC or PGD node to ground and to the proper VDD levels. Figure 1-1 depicts this configuration.

FIGURE 1-1: TYPICAL ICSP™ APPLICATION CIRCUIT



The resistive isolation value will differ depending on the application and how it is being used. Values ranging from 1K to 10K are suggested. In any case, ensure the levels on PGD and PGC can be driven to their appropriate logic voltage levels.

COMMUNICATION CHANNEL

Some devices have the flexibility to use one of several communication channels or pins for programming and debugging. These channels are generally referred to in data sheets as PGCx/PGDx, where x is channel number identifier. These channels are often multiplexed with some peripherals (I²C™, SPI, A/D). If your application uses those peripherals and pins which are common to the default PGC/PGD pins, you must select a different channel and make provisions for the required ICSP connections.

Likewise, when using MPLAB IDE to communicate with the target using this new channel pin assignment, you must ensure that the Configuration bits in MPLAB IDE match the connection channel in your target.

MPLAB® ICD 3 Design Advisory

GROUNDING AND AC APPLICATIONS

The MPLAB ICD 3 connects to earth ground from the USB connector interface through the PC.

For AC line powered applications which are not referenced to ground, this presents a path where the different system voltage potential can cause damage to both systems. In these instances, the MPLAB ICD 3 must be isolated. Carefully consider the ground system and signal return connections before connecting the MPLAB ICD 3 to the target.

For hot or floating applications, a USB self-powered isolated hub should be used between the PC and the MPLAB ICD 3 to provide isolation from the PC's earth ground through the USB cable (see Figure 1-2). USB isolated Hub such as the following are suggestions:

- High/Low-Speed 4-port USB HUB, Model UIISOHUB 4, B&B Electronics Mfg. Co.
- High-Speed, 7-port USB HUB, Model HUB7P, SEALEVEL Systems, Inc.

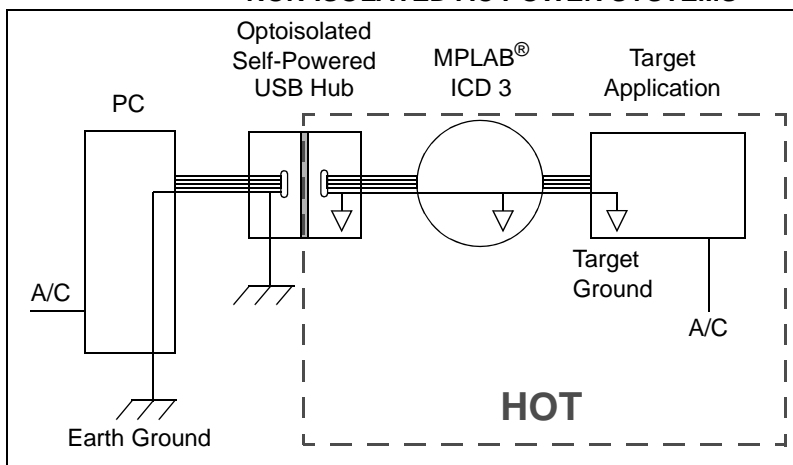
WARNING



Using the MPLAB ICD 3 without ensuring ground isolation will result in damage to the MPLAB ICD 3 or the target system as the full AC mains voltage will be applied.

This condition can be hazardous to the operator in the form of an electric shock; therefore, take adequate precautions to avoid this situation.

FIGURE 1-2: EXAMPLE MPLAB[®] ICD 3 SETUP FOR NON-ISOLATED AC POWER SYSTEMS



WARNING



Using an optoisolated USB hub will create a hot area marked with the dotted line in Figure 1-2.

This condition can be hazardous to the operator in the form of an electric shock, therefore, take adequate precautions to avoid this situation.

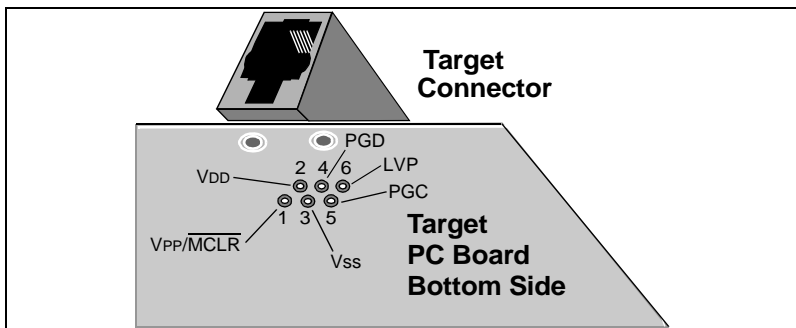
MPLAB® ICD 3 Design Advisory

CORRECTING CROSSTALK

In some cases a crosstalk problem may exist when the device is being programmed. Due to the locations of the PGC and PGD pins, crosstalk may degrade the signal and cause the MPLAB ICD 3 to fail programming of the target device. To correct this, try the following:

- Construct a RJ12 modular cable and replace the cable that comes with the MPLAB ICD 3. Keep the length as short as possible, preferably under 6 inches. Also, remove the jacket from the cable, so that the conductors are far apart from each other (especially the PGC and PGD signals). The standard MPLAB ICD 3 modular cable is wired as shown in Figure 1-3, that is, RJ12 pin 1 on one end connects to RJ12 pin 6 on the other end. This solves the problem in nearly all cases.

FIGURE 1-3: TARGET CONNECTOR PINOUT



Note 1: Noise-inducing equipment (motors, light dimmers, etc.) must be on separate power strips from the target application and the MPLAB ICD 3.

- 2: The use of any cable (other material, length, etc.) other than the one provided with the MPLAB ICD 3 may result in unreliable device behavior.

HIBERNATION

When using the MPLAB ICD 3 for prolonged periods of time, especially while the debugger is in emulation mode, disable the Hibernate mode in the Power Options Dialog window of the PC's operating system. Click on the **Hibernate** tab and clear or uncheck the "Enable hibernation" check box. This will ensure that all communication is maintained across all the USB subsystem components.

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