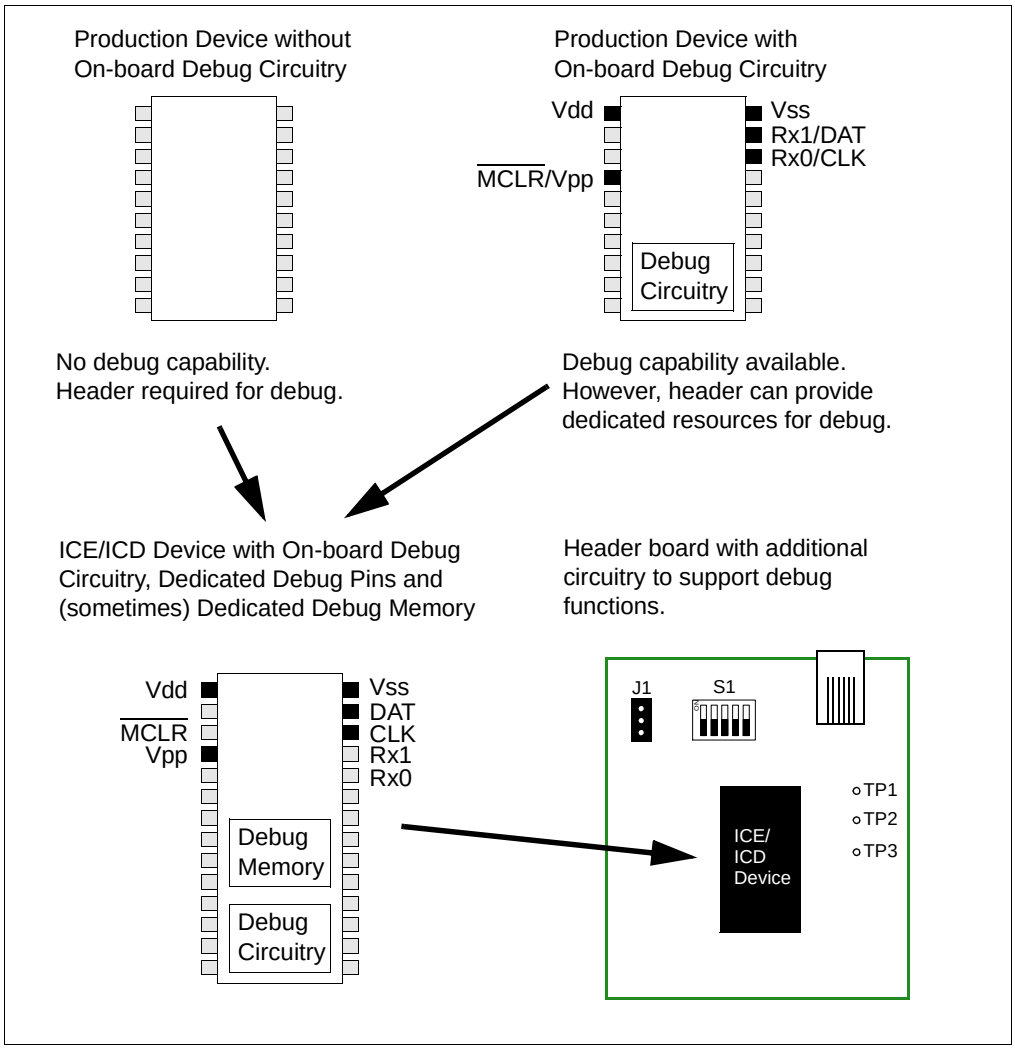
Header Board Specification

INTRODUCTION

Next-generation in-circuit emulators (such as the MPLAB® REAL ICE™ in-circuit emulator) and in-circuit debuggers work with devices that have on-chip debug circuitry. Sometimes the actual production device will have this circuitry and sometimes a special version of this device is required or available for code debugging. This special version of the chip, with the suffix -ICD or -ICE, is mounted on a header board (Figure 1).

FIGURE 1: DEBUG OPTIONS



In general, ICE devices are designed for next-generation in-circuit emulator use and ICD devices are designed for in-circuit debugger use. However, ICE devices may be used with an in-circuit debugger and ICD devices may be used with a next-generation in-circuit emulator, but will provide only basic ICD functionality.

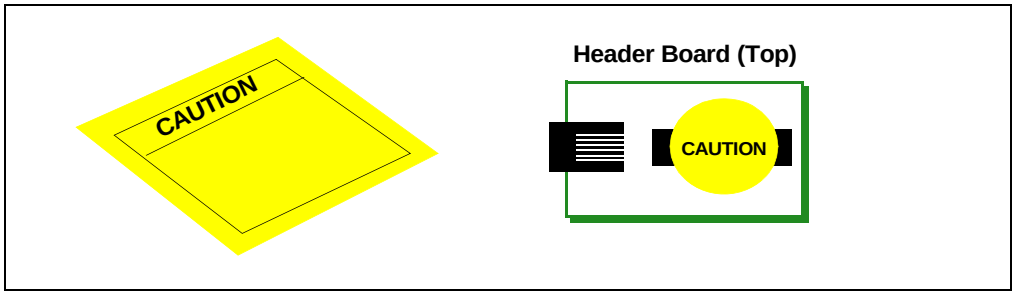
To determine what device resources must be dedicated to debugging for either a device with on-board debug capability or the special ICE/ICD device, see the “Resources used by ...” section of the in-circuit emulator or in-circuit debugger on-line help file.

GENERAL HEADER SETUP

To set up your header, do the following:

1. Check the header board for any stickers and the header box for any paper inserts that may specify special operating instructions (Figure 2). Follow these instructions before doing anything else.

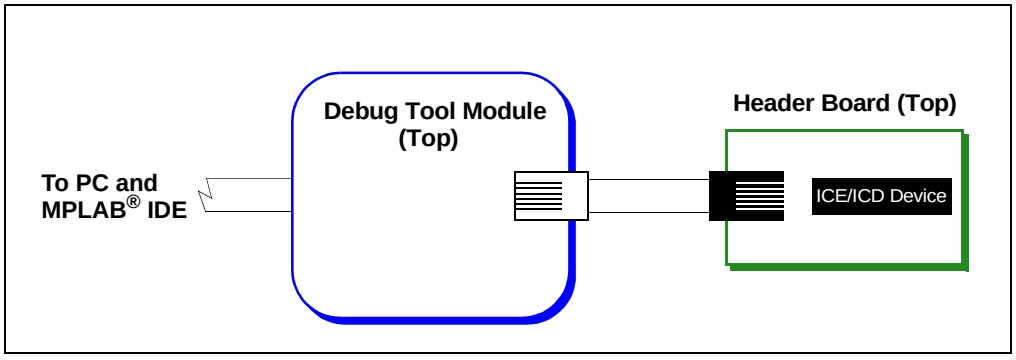
FIGURE 2: SPECIAL HEADER INSTRUCTIONS



2. Set any jumpers or switches on the header to determine device functionality or selection as specified for that header. See the sections “Optional Headers” or “Required Headers” for information on how to set up individual headers.
3. Connect the header to your desired debug tool by consulting the tool documentation for connection options. An example connection is shown in Figure 3.

   The special ICE/ICD device is mounted on the top of a header and its signals are routed to the emulator or debugger connector. These special device versions are labeled with the appropriate suffix (i.e., either *Device*-ICE or *Device*-ICD).

FIGURE 3: CONNECT HEADER TO DEBUG TOOL

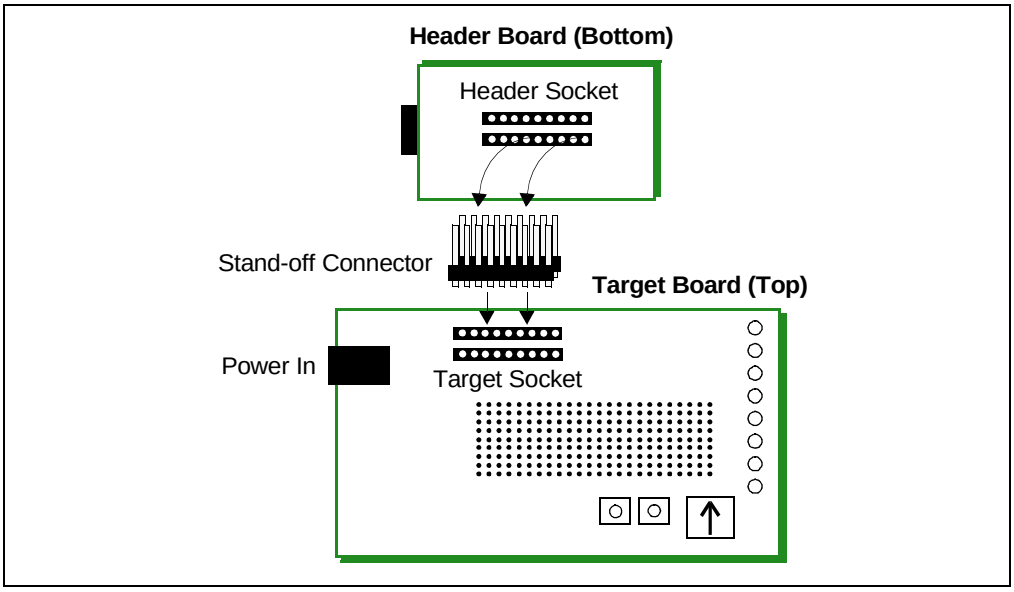


4. Connect the header to the target board. On the bottom of the header is a socket that is used to connect to the target board. The header may be connected to the target board as follows:
   a) PDIP header socket to PDIP target socket with a stand-off (male-to-male) connector
   b) Header socket to plug on the target board
   c) Header socket to target socket with a transition socket (see the "*Transition Socket Specification"*, DS51194)

   An example connection is shown in Figure 4.

   The header socket will have the same pin count as your selected device. The ICE/ICD device on the top of the header usually has a larger pin count because it has additional pins that are dedicated to debug.

FIGURE 4: CONNECT HEADER TO TARGET



5. If using a debug tool that can power the target, power that tool now.
6. Power the target, if needed.

PROGRAMMING ICE/ICD AND NON-ICE/ICD DEVICES

The header board is designed to be used with the in-circuit emulator or the in-circuit debugger selected as a Debugger, not a Programmer, in MPLAB IDE. Any programming of the ICE/ICD device on the header is for debug purposes and includes the debug executive. See your related debug tool documentation for details on using it as a debugger.

To program production (non-ICE/ICD) devices with your debug tool, use the Universal Programming Module (AC162049) or design a modular interface connector on the target. See the appropriate specification for connections. For the most up-to-date device programming specifications, see the Microchip website (www.microchip.com).

Also, production devices may be programmed with the following tools:

- MPLAB PM3 device programmer
- PICSTART® Plus development programmer
- PICkit™ 1, 2 or 3 development programmer

CALIBRATION BITS

The calibration bits for the band gap and internal oscillator are always preserved to their factory settings.

PERFORMANCE ISSUES

The PIC® MCU devices do not support partial program memory erase; therefore, users may experience slower performance than with other devices.

Also, see either the in-circuit emulator or the in-circuit debugger Help file for information on specific device limitations that may affect performance.

RELATED DEBUG TOOLS

The following tools support the use of headers:

- MPLAB REAL ICE In-Circuit Emulator
- MPLAB ICD 2 In-Circuit Debugger
- MPLAB ICD 3 In-Circuit Debugger
- PICkit 2 or 3 Debug Express

See the Microchip website (http://www.microchip.com) for the latest documentation.

Optional Headers

INTRODUCTION

Devices that have built-in debug circuitry do not require a header to use debug tools. However, some pins and memory must be used to support the debug function. Special ICE/ICD versions offering additional pins, memory and emulator functions can be used to provide superior emulating/debugging capabilities.

Currently-available headers and their associated ICE/ICD devices are shown below by supported device.

TABLE 1: OPTIONAL HEADERS BY DEVICE

Device	Pin Count	Header Part Number	ICE/ICD Device Used	VDD Max
PIC18F1230/1330	28	AC162078	PIC18F1330-ICD	5.5V
PIC18F24J10 PIC18F25J10	28/40	AC162067	PIC18F45J10-ICE	3.6V
PIC18LF24J10 PIC18LF25J10				3.6V 2.75V(1)
PIC18F44J10 PIC18F45J10				3.6V
PIC18LF44J10 PIC18LF45J10				3.6V 2.75V(1)
PIC18F44J10 PIC18F45J10	44	AC162074	PIC18F45J10-ICE	3.6V
PIC18LF44J10 PIC18LF45J10				3.6V 2.75V(1)
PIC18F63J11 PIC18F63J90 PIC18F64J11 PIC18F64J16 PIC18F64J90 PIC18F64J95 PIC18F65J11 PIC18F65J90	64/80	AC162079	PIC18F85J90-ICE	3.6V
PIC18F83J11 PIC18F83J90 PIC18F84J11 PIC18F84J16 PIC18F84J90 PIC18F84J95 PIC18F85J11 PIC18F85J90				

Note 1: VDDCORE Max.

TABLE 1: OPTIONAL HEADERS BY DEVICE (CON'T)

Device	Pin Count	Header Part Number	ICE/ICD Device Used	VDD Max
PIC18F65J10 PIC18F65J15 PIC18F66J10 PIC18F66J15 PIC18F67J10	64/80	AC162062	PIC18F87J10-ICE	3.6V
PIC18F85J10 PIC18F85J15 PIC18F86J10 PIC18F86J15 PIC18F87J10				
PIC18F65J16 PIC18F66J11 PIC18F66J16 PIC18F67J11	64/80	AC162091	PIC18F87J11-ICE	3.6V
PIC18F85J16 PIC18F86J11 PIC18F86J16 PIC18F87J11				
PIC18F65J50 PIC18F65J55 PIC18F66J50 PIC18F66J55 PIC18F67J50	64/80	AC162087	PIC18F87J50-ICE	3.6V
PIC18F85J50 PIC18F85J55 PIC18F86J50 PIC18F86J55 PIC18F87J50				
PIC18F66J60 PIC18F66J65 PIC18F67J60	64/80/ 100	AC162064	PIC18F97J60-ICE	3.6V
PIC18F86J60 PIC18F86J65 PIC18F87J60				
PIC18F96J60 PIC18F96J65 PIC18F97J60				

Note 1: VDDCORE Max.

TABLE 1: OPTIONAL HEADERS BY DEVICE (CON'T)

Device	Pin Count	Header Part Number	ICE/ICD Device Used	VDD Max
PIC24FJ16GA002 PIC24FJ32GA002 PIC24FJ48GA002 PIC24FJ64GA002	28	AC162088	PIC24FJ64GA004-ICE	3.6V
PIC24FJ16GA004 PIC24FJ32GA004 PIC24FJ48GA004 PIC24FJ64GA004	44	AC162094		
PIC24FJ64GA006 PIC24FJ64GA008 PIC24FJ64GA010	64/80/100	AC162065 AC244022	PIC24FJ128GA010-ICE	3.6V
PIC24FJ96GA006 PIC24FJ96GA008 PIC24FJ96GA010				
PIC24FJ128GA006 PIC24FJ128GA008 PIC24FJ128GA010				
dsPIC33FJ GP	64/80/100	AC244020	dsPIC33FJ256-ICE	3.6V
dsPIC33FJ MC		AC244021		

Note 1: VDDCORE Max.

AC162062

Header Setup and Operation

For this header, there are no jumpers/switches. MPLAB IDE will use its selected device to choose the correct device to emulate.

Test points are available on this header to check the following: VDD, VDDcore and ground.

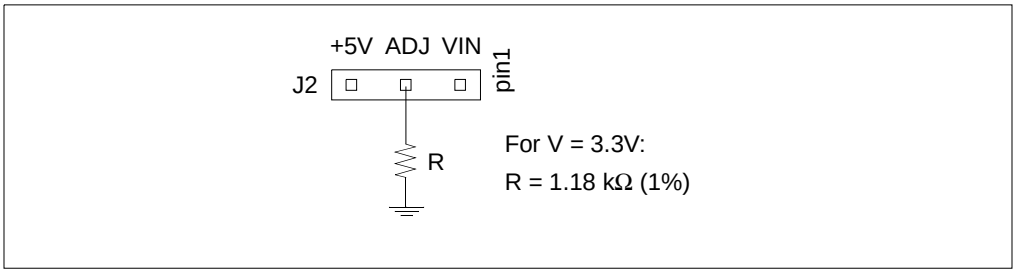
CAUTION

This header cannot be plugged directly into the PICDEM™ HPC Explorer Board or device damage will result.

The PICDEM™ HPC Explorer Board is 5V, whereas the ICD device on the header is 3.6V max. Therefore, modification to the demo board is necessary before the header can be used.

1. Switch S3 should be set to ICE.
2. Jumper J2 must be connected as shown in Figure 1 to modify the operating voltage. See demo board documentation for more information.

FIGURE 1: DEMO BOARD J2 CONNECTIONS



Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

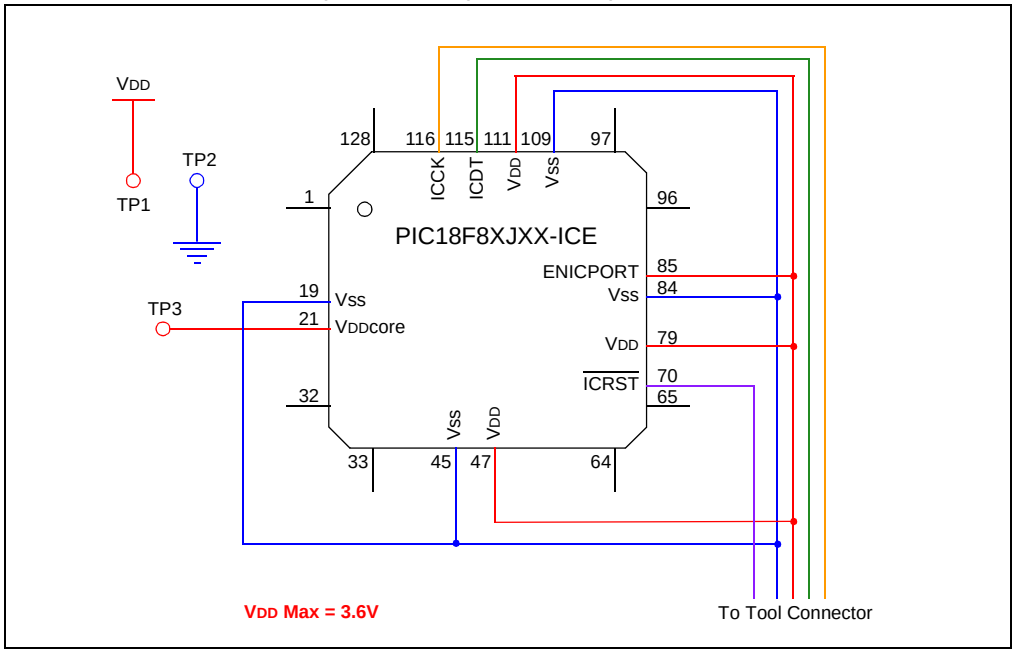
TABLE 2: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162062	2.325	1.800	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 2: AC162062, AC162079, AC162087, AC162091



AC162064

Header Setup and Operation

For this header, there are no jumpers/switches. MPLAB IDE will use its selected device to choose the correct device to emulate.

Test points are available on this header to check the following: VDD, VDDcore and ground.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

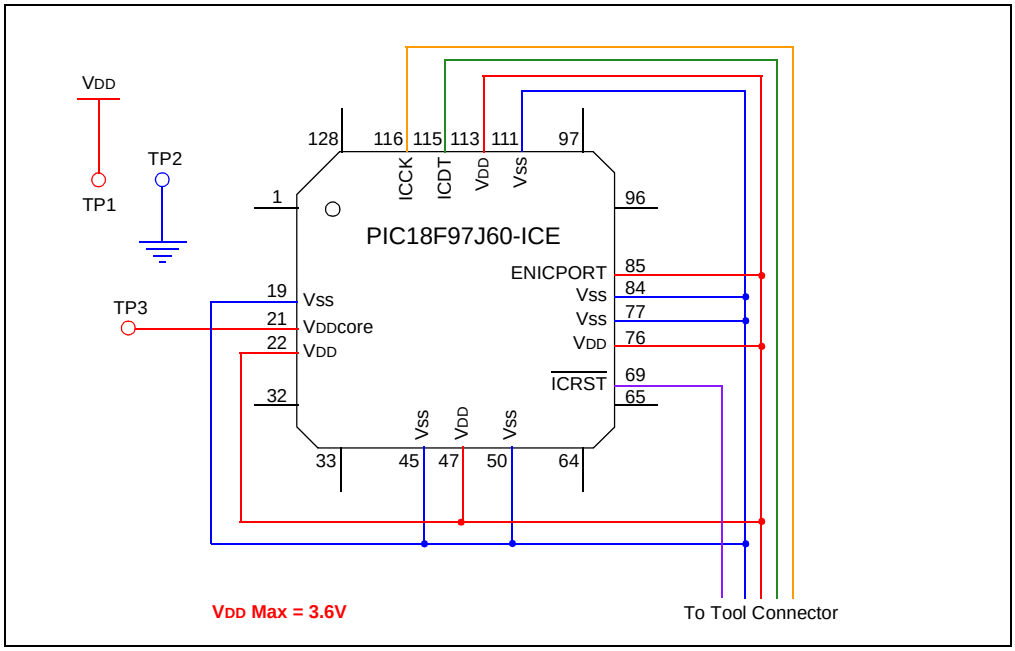
TABLE 3: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162064	2.250	1.750	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 3: AC162064



AC162065, AC244022

Header Setup and Operation

For this header, there are no jumpers/switches. MPLAB IDE will use its selected device to choose the correct device to emulate.

Test points are available on this header to check the following: VDD, VDDcore and ground.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

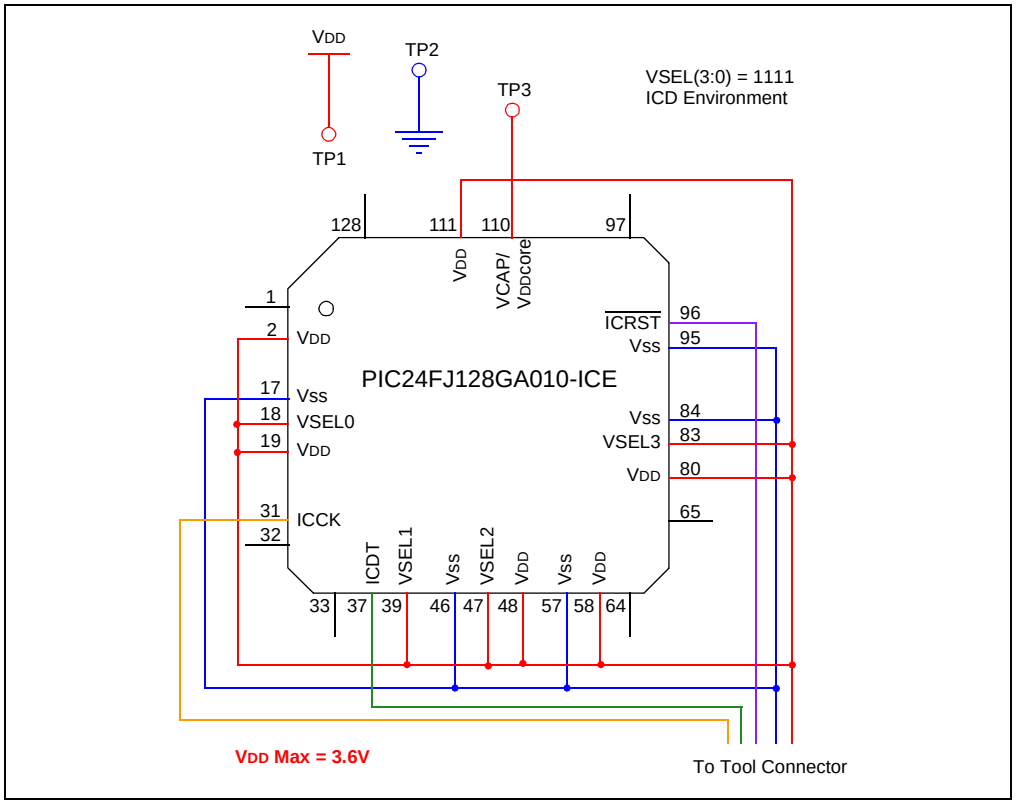
TABLE 4: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162065	2.250	1.750	0.540
AC244022	2.250	1.750	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 4: AC162065, AC244022



AC162067, AC162074

Header Setup and Operation

For these header, you will need to connect jumpers J2 and J3 to select between the LF and F versions of devices.

Device	Device Type	Jumper J2	Jumper J3	Function
PIC18LFXXJ10	LF	1-2	1-2	Disable voltage regulator*
PIC18FXXJ10	F	2-3	2-3	Enable voltage regulator

* VDDcore must be supplied externally.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

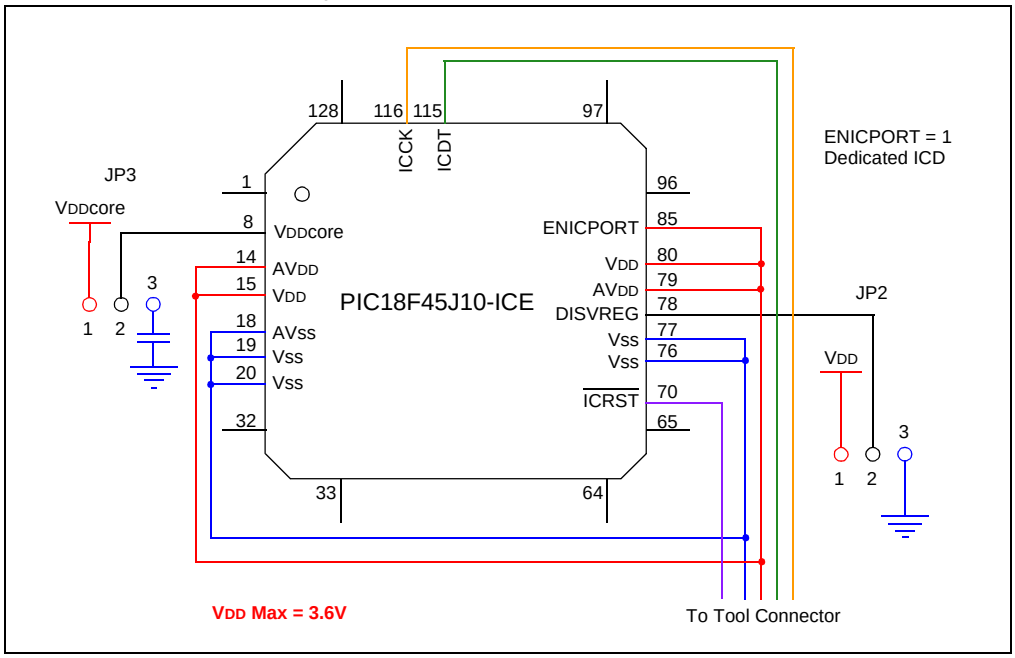
TABLE 5: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162067	2.300	1.800	0.540
AC162074	1.800	1.350	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 5: AC162067, AC162074



AC162078

Header Setup and Operation

This header board can be used with the following targets:

1. Customer target board for PIC18F1230/1330 devices. The target board should have an 18-pin DIP socket to connect to the 18-pin DIP socket on the header board.
2. PICDEM MC motor control demo board. Use the 28-pin DIP socket on both boards to mount the header board on to the PICDEM MC board.
3. PICDEM MC LV motor control demo board. Use the 28-pin DIP socket on both boards to mount the header board on to the PICDEM MC LV board.

The following sections detail the configuration of the jumpers on the header board for use with the above-mentioned boards. For more details, refer to the Figure 6 and Figure 7.

CUSTOMER TARGET BOARD

The default configuration is to remove all jumpers.

S1 is not populated and should not be used.

After the header board is set up, do the following:

1. Connect the header to the target board.
2. Power the target board. You should see the red LED on the header board turn on.
3. Connect the MPLAB ICD 2 to the header board.
4. Use MPLAB IDE and MPLAB ICD 2 to develop your application.

PICDEM MC/MC LV MOTOR CONTROL DEMO BOARDS

To run a BLDC motor on the PICDEM MC board or PICDEM MC LV board using the supplied firmware, use the following jumper setup:

Jumper	Jumper Setting	Jumper	Jumper Setting
J1	2-3	JP1	Open
J2	2-3		
J3	2-3	JP2	Open
J5	2-3		
J6	1-2	JP3	Open
J7	1-2		

S1 is not populated and should not be used.

After the header board is set up, do the following:

1. Connect the header to the PICDEM MC/MC LV target board.
2. Power the target board. You should see the red LED on the header board turn on.
3. Connect the MPLAB ICD 2 to the header board.
4. Program the part with the demo code.
5. Run the program.
6. Press and release switch S2 on the target board to toggle the direction of rotation of the motor.
7. Press and release switch S1 on the target board to toggle between run and stop the motor.
8. If the motor stops while reversing from a high speed, there could be a overcurrent condition detected by the system. Reset the system to run the program again.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

TABLE 6: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162078	2.300	2.050	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 6: AC162078 – PART 1

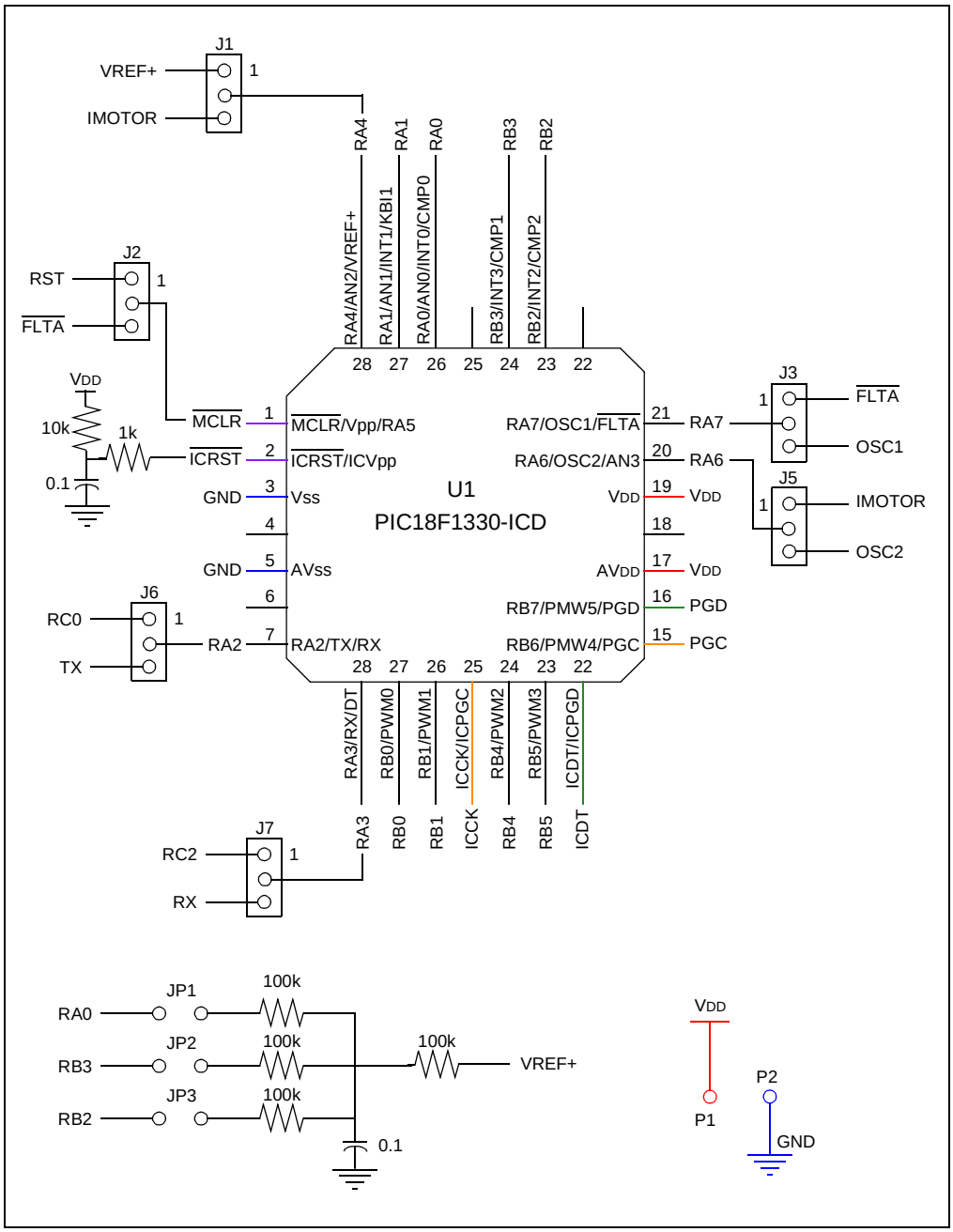
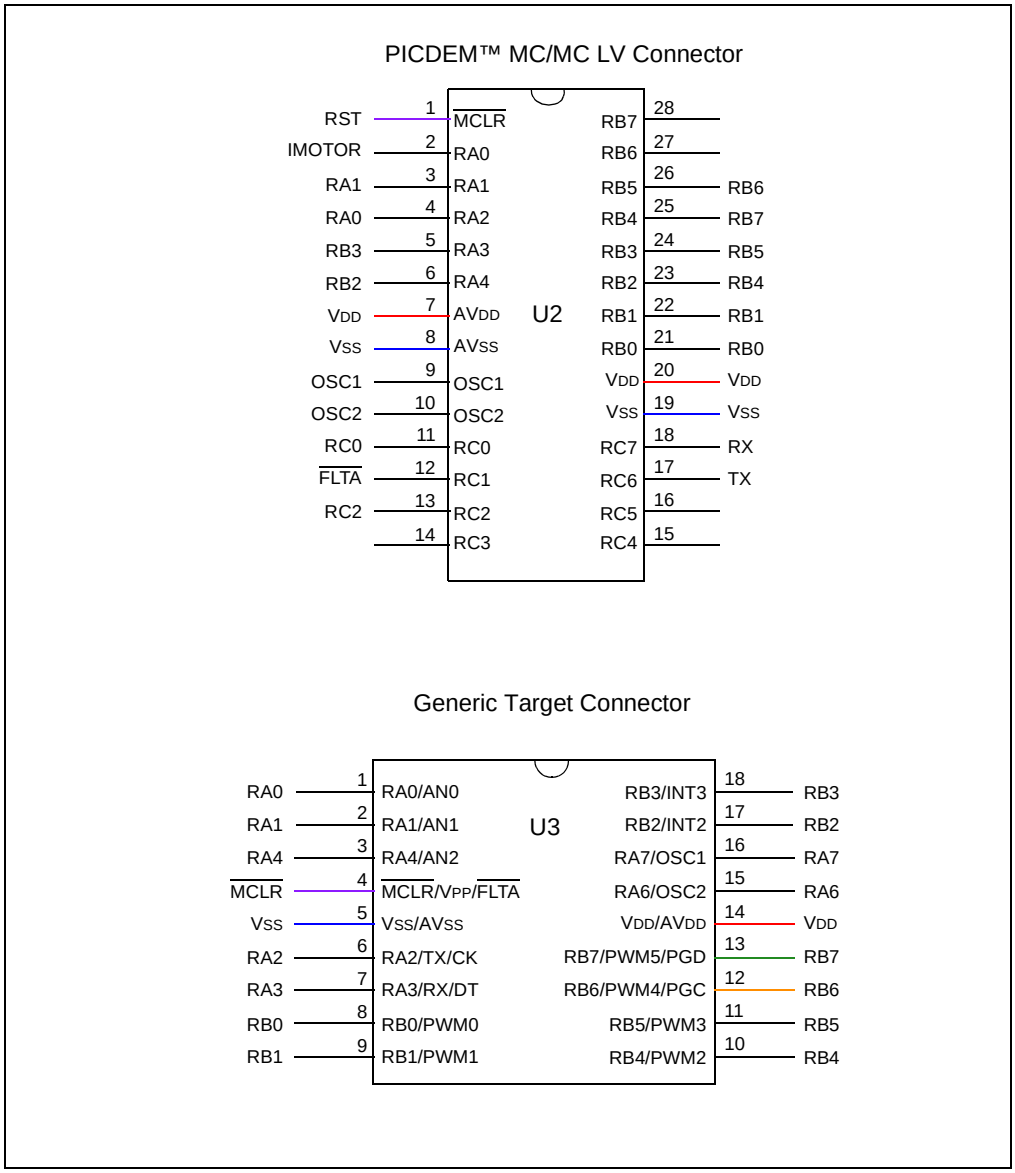


FIGURE 7: AC162078 – PART 2



AC162079, AC162087, AC162091

Header Setup and Operation

For this header, there are no jumpers/switches. MPLAB IDE will use its selected device to choose the correct device to emulate.

Test points are available on this header to check the following: V_{DD}, V_{DD}core and ground.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

TABLE 7: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162079	2.325	1.800	0.540
AC162087	2.325	1.800	0.540
AC162091	2.325	1.800	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

Same as AC162062 (Figure 2).

AC162088, AC162094

Header Setup and Operation

Both 28-pin and 44-pin device headers have jumpers related to the enabling or disabling of the on-chip 2.5 volt voltage regulator. Please see the section entitled “On-Chip Voltage Regulator” in the “*dsPIC33F Family Reference Manual*” (DS70165) for more details.

Jumper J2	Function
1-2	Disable voltage regulator
2-3	Enable voltage regulator
No connection	DISVREG controlled by target

Test points are available on this header to check the following:

Test Point	Color	Signal	Test Point	Color	Signal
TP1	Black	Ground	**TP5**	White	DISVREG
TP2	Red	V_{DD}	**TP6**	White	PGC
TP3	Black	AV_{SS}	**TP7**	White	PGD
TP4	Red	AV_{DD}	**TP8**	Yellow	$\overline{\text{ICRST}}$

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

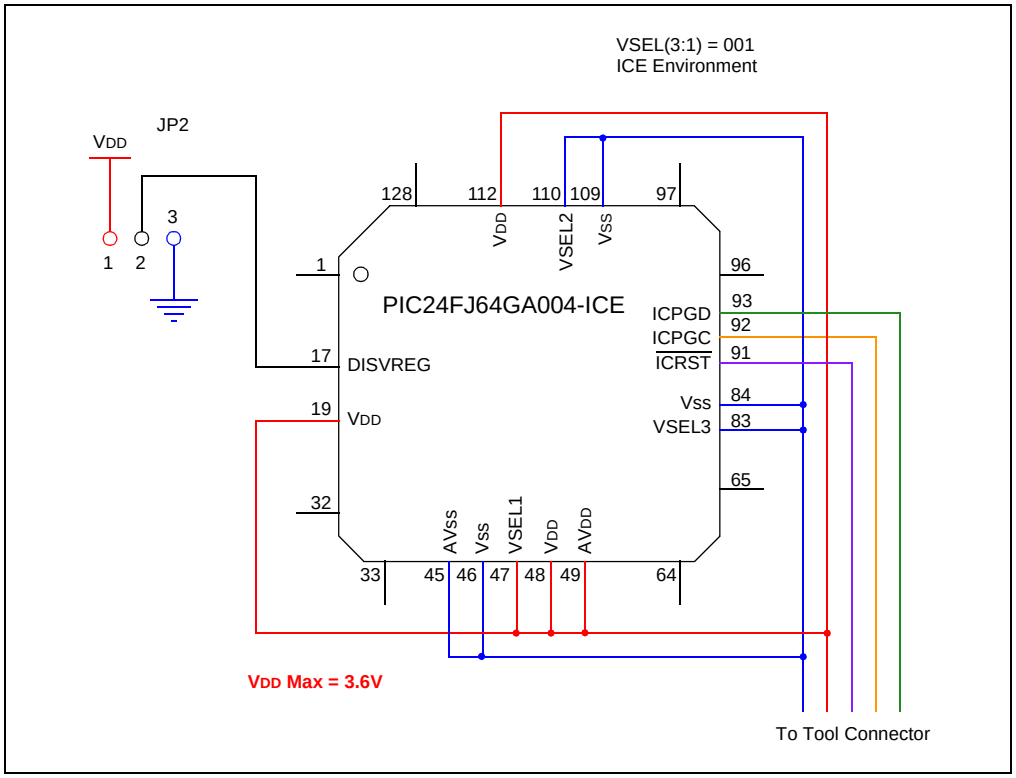
TABLE 8: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162088	2.450	1.600	0.540
AC162094	2.400	1.600	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 8: AC162088, AC162094



AC244020, AC244021

Header Setup and Operation

Both dsPIC33FJ GP (General Purpose) and dsPIC33FJ MC (Motor Control) DSC device headers have jumpers which need to be set before use.

Jumpers J4 and J5 relate to the enabling or disabling of the on-chip 2.5 volt voltage regulator. Please see the section entitled “On-Chip Voltage Regulator” in the “*dsPIC33F Family Reference Manual”* (DS70165) for more details.

Jumper J4	Jumper J5	Function
1-2	1-2	Enable voltage regulator
2-3	NC	Disable voltage regulator

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

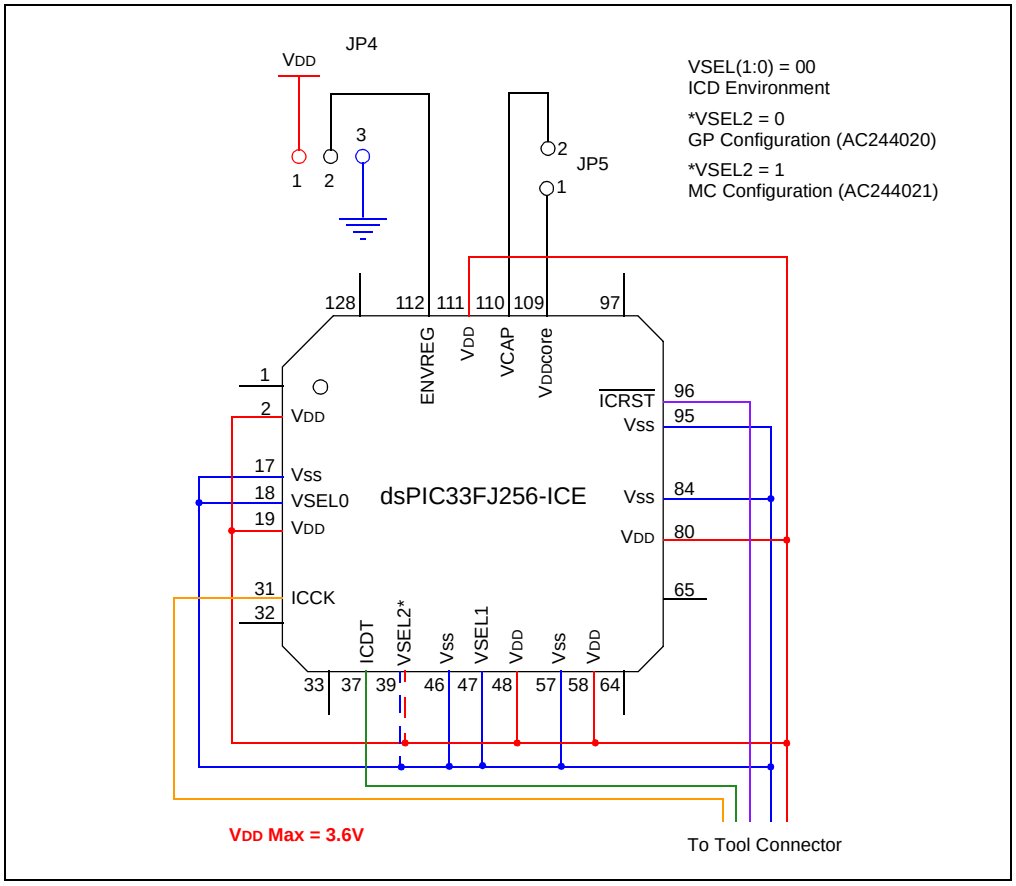
TABLE 9: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC244020	2.250	1.750	0.540
AC244021	2.250	1.750	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 9: AC244020, AC244021



Required Headers

INTRODUCTION

Some devices have no built-in debug circuitry. Therefore, special ICE/ICD versions of these devices are required for debug tool operation.

Currently-available headers and their associated ICE/ICD devices are shown below by supported device.

TABLE 1: REQUIRED HEADERS BY DEVICE

Device	Pin Count	Header Part Number	ICE/ICD Device Used	VDD Max
PIC10F200/2/4/6	8/14	AC162059	PIC16F505-ICD	5.5V
PIC10F220/2	8/14	AC162070	PIC16F506-ICD	5.5V
PIC12F508/509	8/14	AC162059	PIC16F505-ICD	5.5V
PIC12F510	8/14	AC162070	PIC16F506-ICD	5.5V
PIC12F519	8/14	AC162096	PIC16F526-ICD	5.5V
PIC12F609/HV609	28	AC162083	PIC16F616-ICD	5.5V
PIC12F615/HV615	28	AC162083	PIC16F616-ICD	5.5V
PIC12F629	8	AC162050	PIC12F675-ICD(1)	5.5V
PIC12F635	14	AC162057	PIC16F636-ICD	5.5V
PIC12F675	8	AC162050	PIC12F675-ICD(1)	5.5V
PIC12F683	8	AC162058	PIC12F683-ICD	5.5V
PIC16F505	8/14	AC162059	PIC16F505-ICD	5.5V
PIC16F506	8/14	AC162070	PIC16F506-ICD	5.5V
PIC16F526	8/14	AC162096	PIC16F526-ICD	5.5V
PIC16F610/HV610	14/16	AC162083	PIC16F616-ICD	5.5V
PIC16F616/HV616	14/16	AC162083	PIC16F616-ICD	5.5V
PIC16F627A/628A	18	AC162053	PIC16F648A-ICD	5.5V
PIC16F630	14	AC162052	PIC16F676-ICD	5.5V
PIC16F631	20	AC162061	PIC16F690-ICD	5.5V
PIC16F636	14	AC162057	PIC16F636-ICD	5.5V
PIC16F639 (Dual die)	20	AC162066	PIC16F636-ICD	5.5V
PIC16F648A	18	AC162053	PIC16F648A-ICD	5.5V
PIC16F676	14	AC162052	PIC16F676-ICD	5.5V
PIC16F677	20	AC162061	PIC16F690-ICD	5.5V
PIC16F684	14	AC162055	PIC16F684-ICD	5.5V
PIC16F685/687	20	AC162061	PIC16F690-ICD	5.5V

Note 1: These ICE/ICD devices have limitations. See header section for details.

2: VDDCORE Max.

TABLE 1: REQUIRED HEADERS BY DEVICE (CON'T)

Device	Pin Count	Header Part Number	ICE/ICD Device Used	V_{DD} Max
PIC16F688	14	AC162056	PIC16F688-ICD	5.5V
PIC16F689/690	20	AC162061	PIC16F690-ICD	5.5V
PIC16F716	18	AC162054	PIC16F716-ICD(1)	5.5V
PIC16F785/HV785	20	AC162060	PIC16F785-ICD	5.5V
PIC18F13K50 PIC18F14K50	20	AC244023	PIC18F14K50-ICE	3.6V
PIC18LF13K50 PIC18LF14K50	20	AC244024	PIC18LF14K50-ICE	3.6V 2.75V(2)

Note 1: These ICE/ICD devices have limitations. See header section for details.

2: V_{DDCORE} Max.

AC162050

Header Setup and Operation

For this header, device peripherals need to be selected by setting jumper J1 to the appropriate position. This will have the effect of selecting the device.

Header	Jumper J1	Function	Device Selected
AC162050	2-3	A/D Disabled	PIC12F629
	1-2	A/D Enabled	PIC12F675

Limitation:

These headers cannot be programmed while the GP1/RA1 pin is high (VIH) due to an –ICD debug silicon issue. There are two work arounds:

1. Move the circuitry that makes GP1/RA1 high to another I/O pin during programming.
2. Manually make GP1/RA1 low during programming:
   a) Disconnect the header from the target circuit.
   b) For MPLAB ICD 2 or 3: Select *Debugger>Settings*, **Power** tab, and check "Power target circuit from MPLAB ICD X (5V Vdd)" if it is not already checked, where X = 2 or 3.
   c) Connect GP1 to VSS on the header.
   d) Program the header by selecting *Debugger>Program*.
   e) Disconnect GP1 from VSS on the header.
   f) If you were NOT using MPLAB ICD 2 or 3 to power your target board, select *Debugger>Settings*, **Power** tab, and uncheck "Power target circuit from MPLAB ICD X (5V Vdd)", where X = 2 or 3.
   g) Insert the header into the target board.
   h) Code is now programmed into the device and ready to be debugged.
   i) Repeat the process to reprogram the device.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

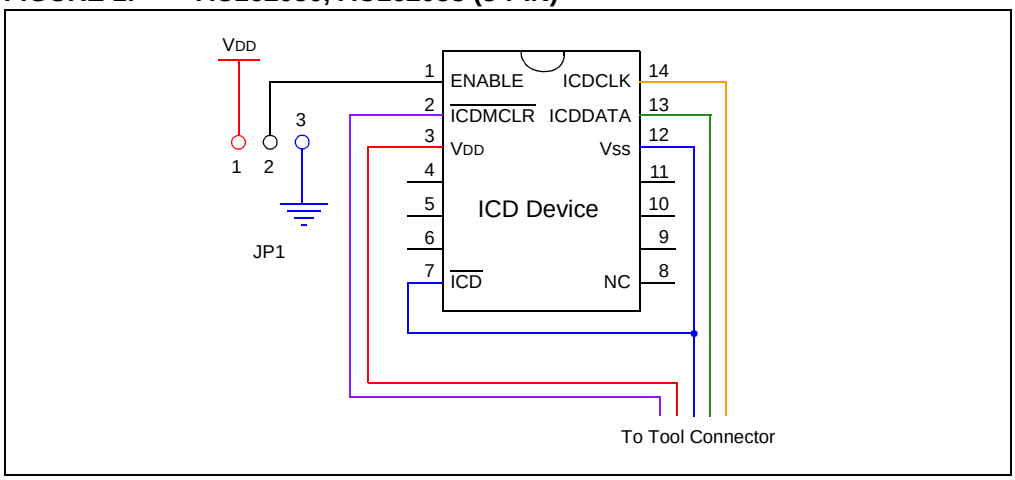
TABLE 2: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162050	1.275	1.000	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 1: AC162050, AC162058 (8-PIN)



AC162052

Header Setup and Operation

For this header, device peripherals need to be selected by setting jumper J1 to the appropriate position. This will have the effect of selecting the device.

Header	Jumper J1	Function	Device Selected
AC162052	2-3	A/D Disabled	PIC16F630
	1-2	A/D Enabled	PIC16F676

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

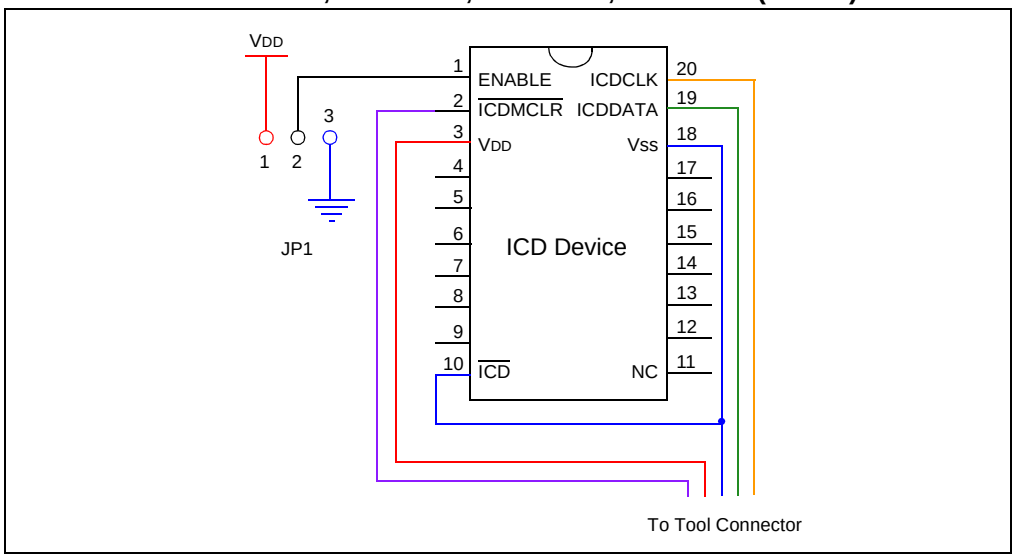
TABLE 3: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162052	1.300	1.275	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 2: AC162052, AC162055, AC162056, AC162057 (14-PIN)



AC162053

Header Setup and Operation

For this headers, there are no jumpers/switches. The device with the most program memory is always selected.

If PIC16F627A or PIC16F628A devices are selected for development in MPLAB IDE, the warning “Invalid target device ID” may be received in the build window and as a dialog. The reason is the PIC16F648A-ICD device supports PIC16F648A, PIC16F627A and PIC16F628A, but only reports the device ID for the PIC16F648A.

Ignore this warning or disable it under the **Warnings** tab on the ICD Programming dialog.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

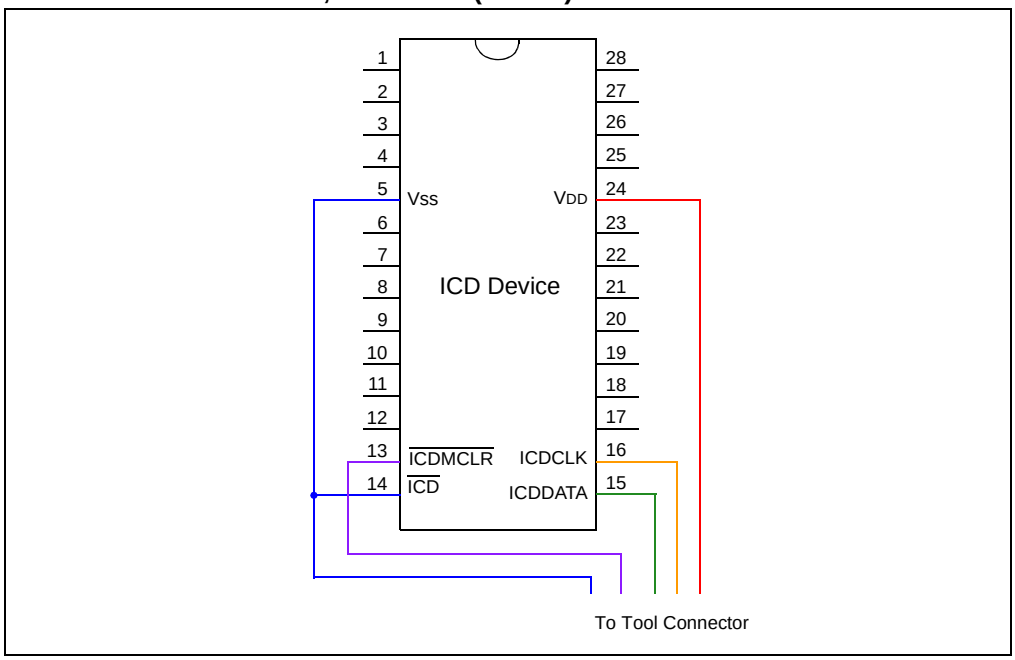
TABLE 4: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162053	2.350	0.750	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 3: AC162053, AC162054 (18-PIN)



AC162054

Header Setup and Operation

This header supports one device (PIC16F716) so there are no jumpers or switches.

Limitation:

When driving a clock oscillator of more than 4 MHz into OSC1 in HS oscillator mode, the device will not go into Debug mode. Therefore crystal caps will be required. The 32 kHz to 4 MHz range does not have this issue.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

TABLE 5: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162054	2.350	0.750	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

Same as AC162053 (Figure 3).

AC162055, AC162056

Header Setup and Operation

For these headers, although a jumper J1 exists on the board, it is not used to select device peripherals or the device.

Header	Jumper J1	Function	Device Selected
AC162055	Don't care	N/A	PIC16F684
AC162056	Don't care	N/A	PIC16F688

Header Dimensions

The table below lists the dimensions for the header boards. Dimensions are design values in inches.

TABLE 6: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162055	1.300	1.275	0.525
AC162056	1.300	1.275	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

Same as AC162052 (Figure 2).

AC162057

Header Setup and Operation

For this header, device peripherals need to be selected by setting jumper J1 to the appropriate position. This will have the effect of selecting the device.

Header	Jumper J1	Function	Device Selected
AC162057	2-3	PORTC, Comparator 2 Disabled	PIC12F635
	1-2	PORTC, Comparator 2 Enabled	PIC16F636

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

TABLE 7: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162057	1.300	1.275	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

Same as AC162052 (Figure 2).

AC162058

Header Setup and Operation

For this header, device peripherals need to be selected by setting jumper J1 to the appropriate position.

Header	Jumper J1	Function	Device Selected
AC162058	1-2	A/D Enabled	PIC12F683

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

TABLE 8: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162058	1.275	1.000	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

Same as AC162050 (Figure 1).

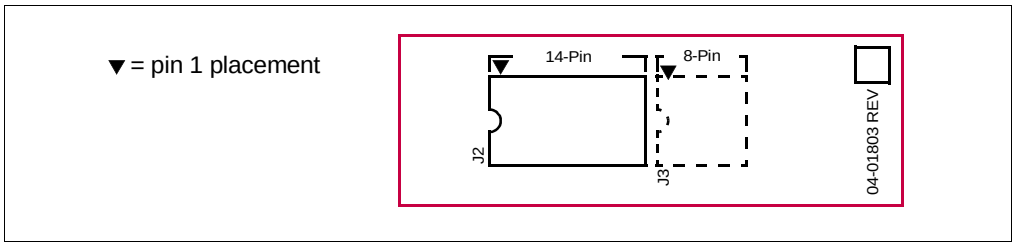
AC162059, AC162070, AC162096

Header Setup and Operation

The ICD devices on these headers are specifically designed to select a device without the use of additional jumpers or switches.

These headers support 8- and 14-pin devices. For the AC162059 and AC162070, there is an 8-pin and a 14-pin connector. For the AC162096, there is only a 14-pin connector. (The 8-pin connector is not populated.) Use the 14-pin connector for 8-pin devices, but make sure device pin 1 is placed as shown in Figure 4.

FIGURE 4: BOTTOM OF THE HEADER BOARD



Header Dimensions

The table below lists the dimensions for the header boards. Dimensions are design values in inches.

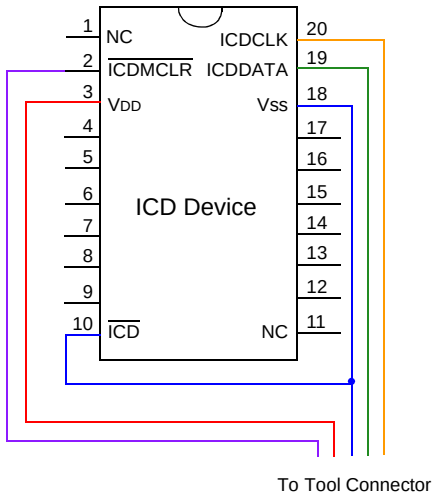
TABLE 9: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162059	2.25	0.75	0.525
AC162070	2.25	0.75	0.525
AC162096	2.25	0.75	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 5: AC162059, AC162070, AC162096 (14-PIN)



AC162060

Header Setup and Operation

For the PIC16F785 20-pin header, you will need to connect the jumper J2 to enable the shunt regulator.

Device	Device Type	Jumper Setting	Function
PIC16F785	F	1-2	Disable shunt regulator
PIC16HV785	HV	2-3	Enable shunt regulator

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

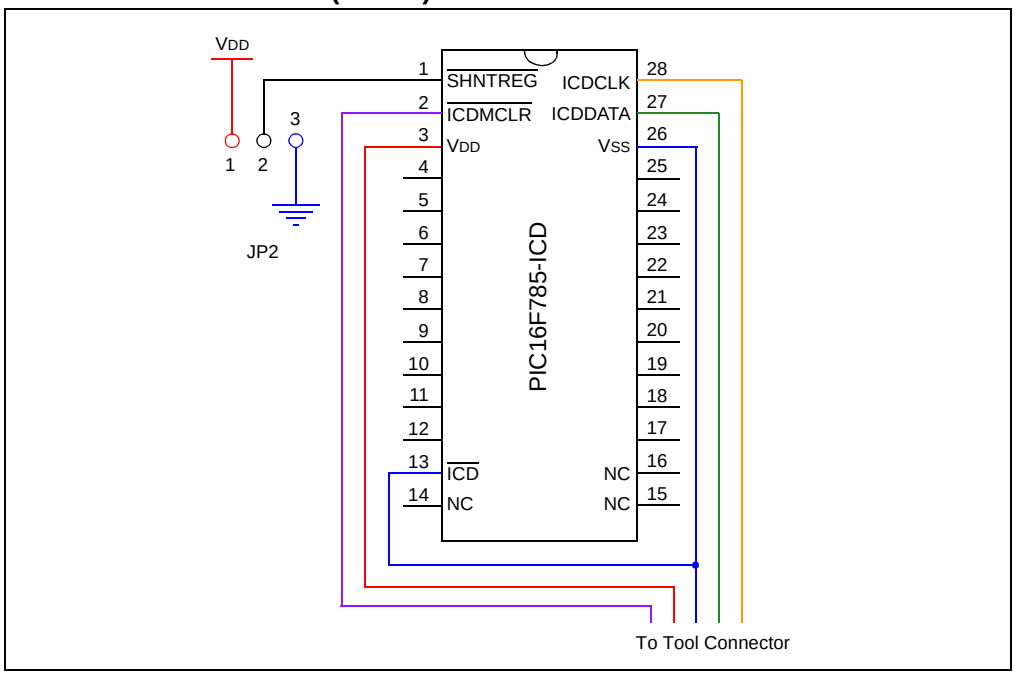
TABLE 10: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162060	2.25	0.75	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 6: AC162060 (20-PIN)



AC162061

Header Setup and Operation

For the PIC16F690 20-pin header, you will need to set the S1 switches (Figure 7) to enable peripherals and choose devices (Table 11).

FIGURE 7: S1 SWITCH HARDWARE

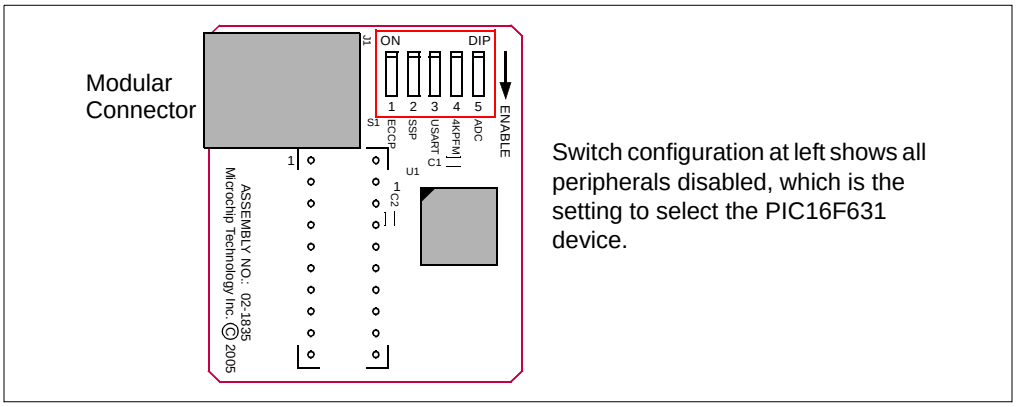


TABLE 11: S1 SWITCH DEVICE SELECTION

Device	Switches				
	1 ECCP	2 SSP	3 USART	4 4k PFM	5 ADC
PIC16F631	0	0	0	0*	0
PIC16F677	0	1	0	0**	1
PIC16F685	1	0	0	1	1
PIC16F687	0	1	1	0**	1
PIC16F689	0	1	1	1	1
PIC16F690	1	1	1	1	1

Legend: 1 = Enabled 0 = Disabled * = 1k PFM ** = 2k PFM

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

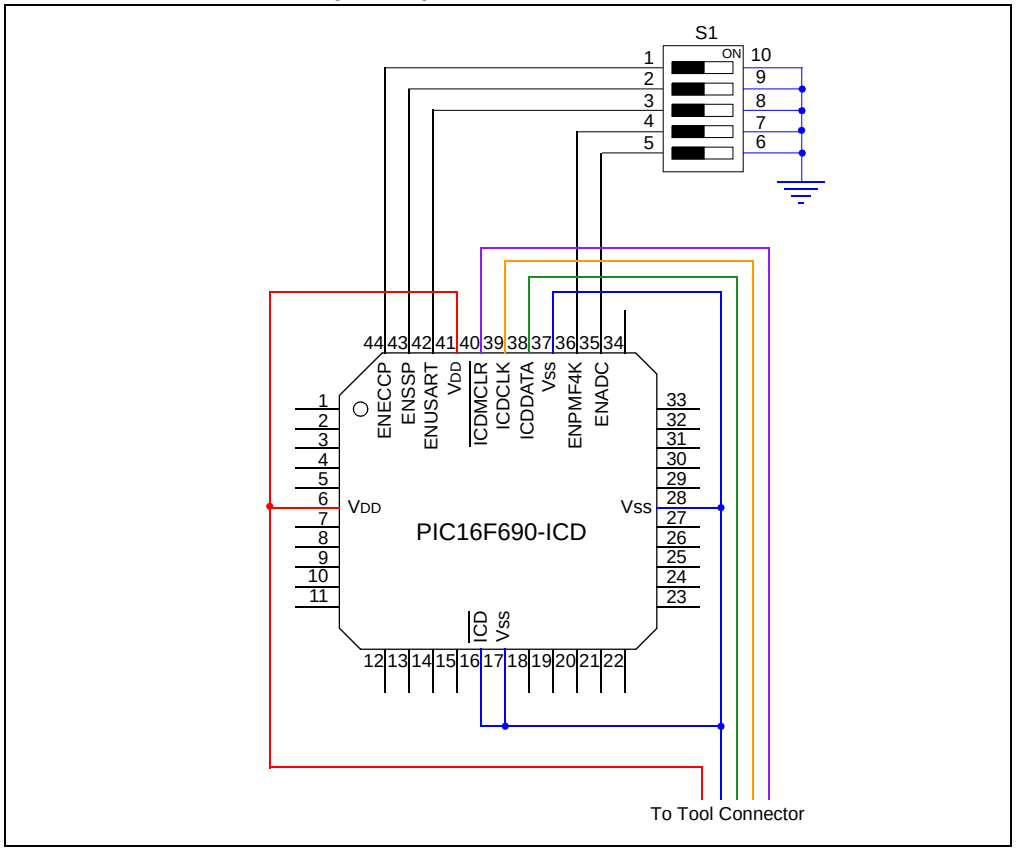
TABLE 12: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162061	1.650	1.450	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 8: AC162061 (20-PIN)



AC162066

Header Setup and Operation

For the PIC16F639 20-pin header, you will need to connect the jumper J3 as specified below.

Tool	Jumper Setting	Function
MPLAB® ICE 2000	1-2	Run/program as production device
In-circuit debuggers, next generation in-circuit emulators	2-3	Run/program as ICD device

In addition to being used with debug tools that normally use headers, this header is used with the PCM16YM0 processor module to emulate a PIC16F639 on the MPLAB ICE 2000 in-circuit emulator. Plug the end of the processor module into the header, and then plug the header into the transition socket or directly onto the target board.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

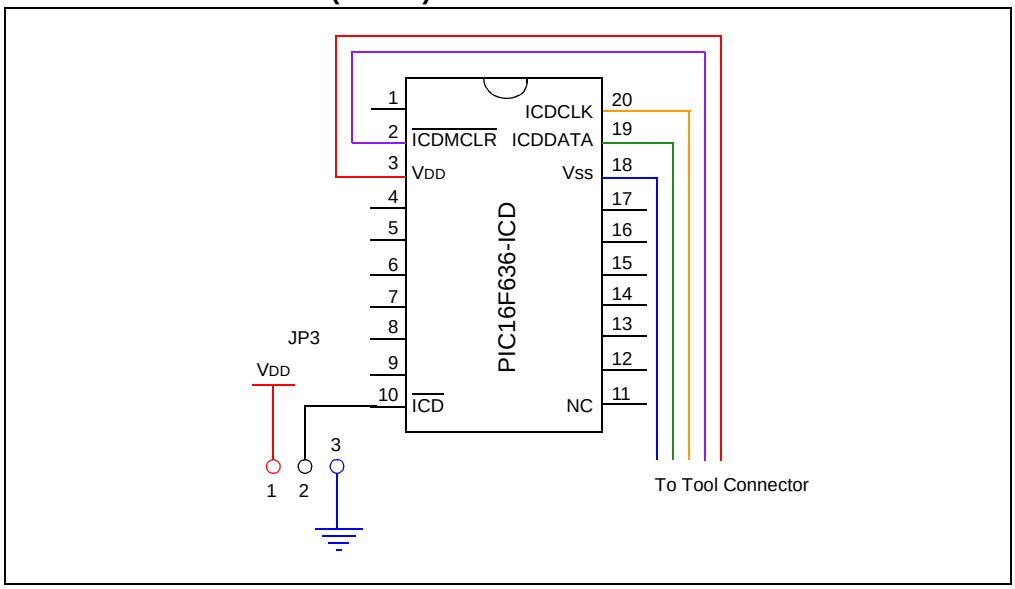
TABLE 13: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162066	2.325	0.850	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 9: AC162066 (20-PIN)



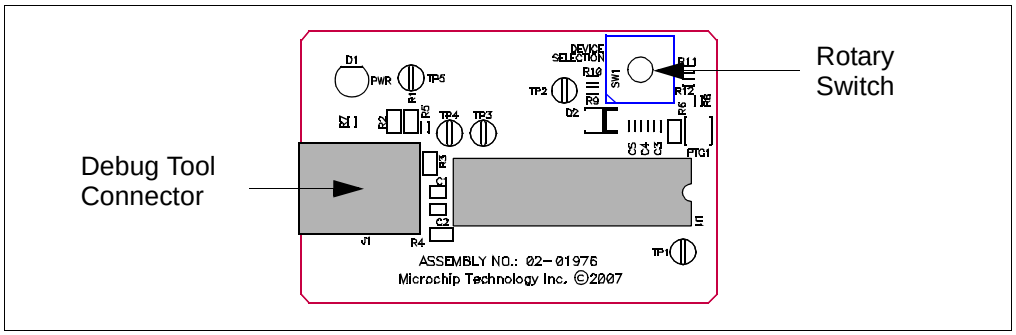
AC162083

Header Setup and Operation

CAUTION

Incorrect rotary switch settings may irreparably damage the header. Ensure rotary switch settings are correct before powering or connecting the header. Do not change the rotary switch setting while the header is powered or connected to a debug tool.
Do not power shunt regulator (HV) devices from the debug tool.

FIGURE 10: HEADER BOARD LAYOUT



Test points are available on this header to check the following: Ground (TP1), VDD (TP2), ICD Clock (TP3), ICD Data (TP4) and ICD MCLR/VPP (TP5).

TABLE 14: ROTARY SWITCH SETTINGS

Switch Position	Device	Switch Position	Device
0	**PIC12HV609**	8	**PIC12F609**
1	**PIC12HV615**	9	**PIC12F615**
2	Reserved HV	A	Reserved F
3	**PIC16HV610**	B	**PIC16F610**
4	**PIC16HV616**	C	**PIC16F616**
5	Reserved HV	D	Reserved F
6	Reserved HV	E	Reserved F
7	Reserved HV	F	Reserved F

POTENTIAL ISSUES

HV device selected instead of F device

If you inadvertently select a shunt regulator (HV) device and attempt to use it in a target board designed for a non-shunt regulator (F) device, the shunt may draw excessive current due to the lack of current-limiting circuitry on the target board and damage the device mounted on the header.

F device selected instead of HV device

If you inadvertently select a non-shunt regulator (F) device and attempt to use it in a target board designed for a shunt regulator (HV) device, the device may draw excessive current due to the higher voltage used on a target board designed for HV devices and damage the device mounted on the header.

HV devices cannot be powered from MPLAB ICD 2

Do not select in MPLAB IDE to power the target (debug header) from the MPLAB ICD 2 or the MPLAB ICD 3 when using shunt regulator (HV) devices since this will also cause the shunt to draw excessive current.

DETERMINING DAMAGE

A damaged header will cause MPLAB IDE to report a device ID of 0. However, there are other issues that can cause the device ID to report as 0. Please consult your debug tool documentation on troubleshooting to identify the problem. If you believe you have a damaged header, please contact Microchip technical support at: http://support.microchip.com.

Header Dimensions

The table below lists the dimensions for the header board. Dimensions are design values in inches.

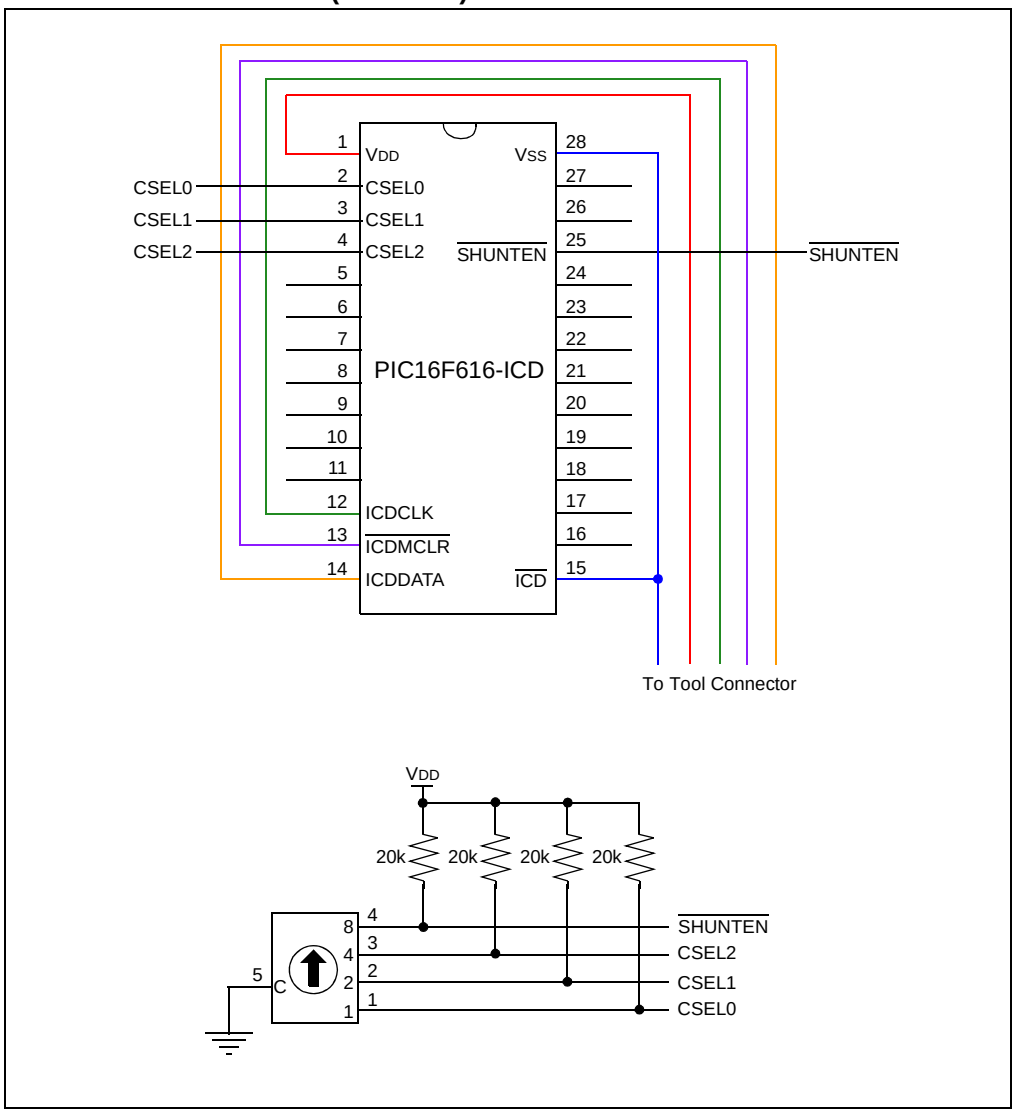
TABLE 15: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC162083	2.450	1.600	0.525

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 11: AC162083 (14/16-PIN)

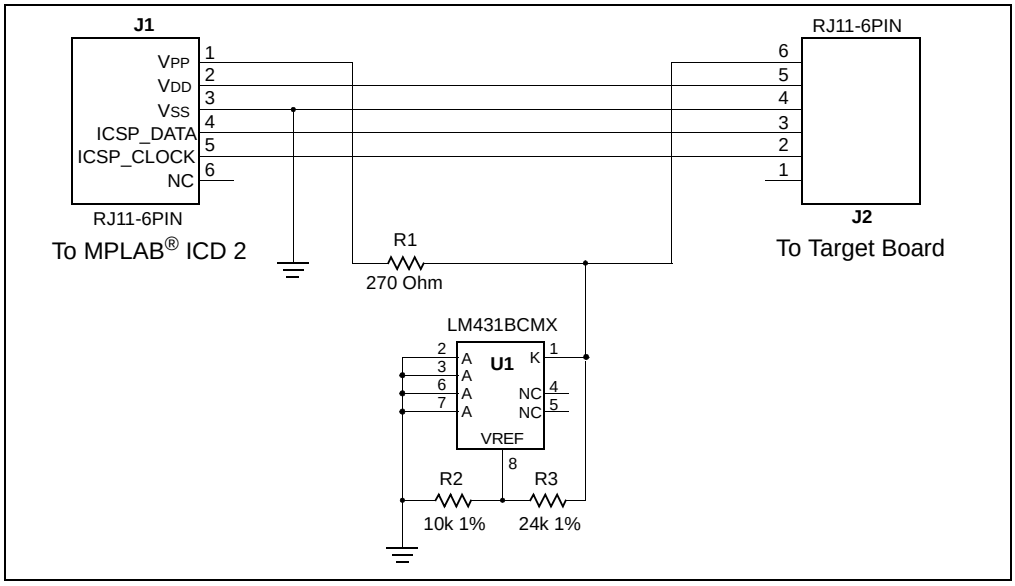


AC244023, AC244024

Header Setup and Operation

When the MPLAB ICD 2 is used with this header, you must use the Vpp Limiter (AC164112).

FIGURE 12: VPP LIMITER SCHEMATIC



Header Dimensions

The table below lists the dimensions for the header boards. Dimensions are design values in inches.

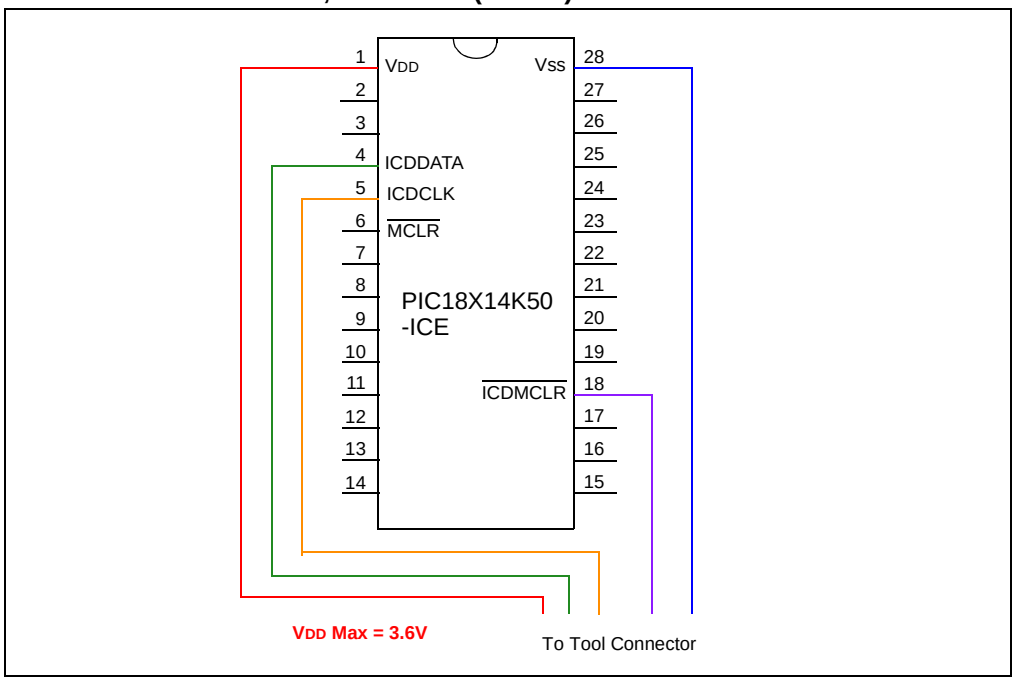
TABLE 16: HEADER DIMENSIONS

Header Part Number	Length	Width	Height
AC244023	1.800	1.150	0.540
AC244024	1.800	1.150	0.540

If the length and/or width of the header board is too large a footprint for the target board, consider using stand-offs, transition sockets or other extenders in the header connection socket to raise the header above the target.

Header Pin Connections

FIGURE 13: AC244023, AC224024 (20-PIN)



APPENDIX A: REVISION HISTORY

A.1 Revision N (February 2006)

- Added Appendix A: Revision History
- Updated document to reflect support of additional tools
- Additional minor corrections throughout document text

A.2 Revision P (September 2007)

- Updated document to reflect support of additional tools
- Additional minor corrections throughout document text

A.3 Revision Q (December 2008)

- Add limitations to header setup sections as needed.
- Change “ICD Headers” and “ICE Headers” to “Required Headers” and “Optional Headers” and move sections as necessary.
- Rearrange sections to organize by header (AC) number.

NOTES:

Index

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
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