User's Manual

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M68EML08AP64
Emulation Module

User's Manual

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M68EML08AP64 Quick Start Guide

Make sure that power is disconnected from your M68EML08AP64 Emulator Module and from your target system. Then follow these quick-start steps to make your M68EML08AP64 ready for use as quickly as possible.

1 - Set Header Jumpers

Jumper header J8 specifies the clock source for the MCU when you enable its external clock.

- Place the jumper between pins 1 and 2 of header J8 (factory default) to specify the debugger-controlled oscillator from the platform board.
- Place the jumper between pins 3 and 4 to specify the 32.768 kHz on-board crystal oscillator.
- Place the jumper between pins 5 and 6 to specify the OSC1 clock source from target connector P3(39).
- Place the jumper between pins 7 and 8 to specify the on-board oscillator socket which can be populated with an oscillator of a different value.

Jumper headers J3 and J4 together specify the voltage sources for the AP64 analog module.

- Place the jumpers between pins 3 and 4 (factory default) on headers J3 and J4 to specify the on-board voltage sources LVDD and GND for the AP64 MCU analog module
- Place the jumpers between pins 1 and 2 on headers J3 and J4 to specify voltage sources on the target system from target connectors P2(7) and P3(7), respectively.

Jumper headers J5 and J6 together specify the ADC input reference for the AP64 MCU ADC module.

- Place the jumpers between pins 3 and 4 (factory default) on headers J5 and J6 to specify the on-board voltage reference LVDD and GND for the AP64 MCU ADC input reference.
- Place the jumpers between pins 1 and 2 on headers J5 and J6 to specify the voltage reference on the target system from target connectors P3(15) and P2(15) respectively.

2 - Install the Emulation Module into the Development System

To install the M68EML08AP64 in an MMDS0508 Motorola Modular Development System (MMDS), take the following steps:

- Remove the access panel of the MMDS station-module enclosure.
- Insert the M68EML08AP64 through the access-panel opening.
- Fit together M68EML08AP64 connectors J1 and J2 (on the bottom of the board) to connectors P11 and P12, respectively
- Snap the corners of the EM onto the plastic standoffs.
- Connect the target cable, if appropriate
- Replace the panel.

To install the M68EML08AP64 in an MMEVS0508 Motorola Modular Evaluation System (MMEVS), take the following steps:

- Fit together EM connectors J1 and J2 (on the bottom of the board) and platform-board connectors P6 and P7, respectively.
- Snap the corners of the EM onto the plastic standoffs
- Connect the target cable, if appropriate

3 - Connect the Emulation Module to the Target System

Use the supplied target flex cable, appropriate target head adapter, and surface mount adapter to connect the emulation module to your target system.

If the M68EML08AP64 is in an MMDS station module:

- Remove the access panel

- Plug the appropriate end of the flex cable plugs into M68EML08AP64 connectors P2 and P3.
- Run the flex cable through the slit in the station-module enclosure,
- Replace the access panel.
- Plug the free end of the flex cable into the target head.
- Solder the appropriate surface mount adapter to your target if necessary. Plug the target head into the surface mount adapter on your target system.

If the M68EML08AP64 is in an MMEVS platform board:

- Plug the appropriate end of the flex cable plugs into M68EML08AP64 connectors P2 and P3.
- Plug the free end of the flex cable into the target head.
- Solder the appropriate surface mount adapter to your target if necessary. Plug the target head into the surface mount adapter on your target system.

4 - Install the Development Software

Please refer to the software manual (P&E or Code Warrior IDE) for proper installation onto your PC.

5 - Copy Personality Files to your Computer

The factory ships MC68HC908AP16, MC68HC908AP32 and MC68HC908AP64 MCUs personality files on the documentation CD-ROM.

- If you will be using the CodeWarrior IDE development software, copy personality files `00E42Vxx.MEM`, `00E43Vxx.MEM` and `00E44Vxx.MEM` from the documentation CD-ROM to the `...\prog\mem` subdirectory of the CodeWarrior IDE installation directory.
- If you will be using the P&E development system, copy personality files `00642Vxx.MEM`, `00643Vxx.MEM and 00644Vxx.MEM` from the documentation CD-ROM to the installation directory that contains file `MMDS08.EXE or MMEVS08.EXE`.

6 - Connect MMDS or MMEVS to your Computer and Re-apply Power

Connect RS-232 cable to MMDS/MMEVS serial port.

Connect the another end of RS-232 cable to COM1 on the host computer.

Make sure that cable connections between your development system and your computer are sound.

You are now ready to re-apply power and use your M68EML08AP64.

This completes the quick start for your M68EML08AP64.

Section 1. General Information

1.1 Introduction

This user’s manual explains the connection and configuration of the Motorola M68EML08AP64 Emulator Module (EML08AP64).

The M68EML08AP64 emulator module (EML08AP64) is a low-voltage emulator operating in the range 2.7 to 5 Vdc. It makes possible the emulation and debugging of target systems based on MC68HC908AP16, MC68HC908AP32 and MC68HC908AP64 microcontroller units.

The EML08AP64 can be part of two development systems. This section describes those systems and explains the layout of the EML08AP64.

1.2 Development Systems

Your EML08AP64 can be part of two Motorola HC08 processor family development systems: the MMDS0508 Motorola Modular Development System (MMDS) or the MMEVS0508 Evaluation System (MMEVS). Refer to the specific development system user’s manual for more information.

1.2.1 Motorola Modular Development System

Motorola Modular Development System is an emulator system that provides a bus state analyzer and real-time memory windows for designing and debugging a target system. A complete MMDS consists of:

- **A station module** — the metal MMDS enclosure, containing the platform board and the internal power supply. Most system cables connect to the MMDS station module.
- **An emulator module (EM)** — such as the EML08AP64, a separately-purchased printed circuit board that enables system functionality for a specific set of MCUs. The EM fits into the station module through a removable panel in the enclosure top. The EM has connectors for a target cable and for cables to a logic analyzer. The cable runs to an optional target system through an aperture in the station-module enclosure, to connect directly to the emulator module.

- **Two logic clip cable assemblies** — two twisted-pair cables that connect the station module to your target system, a test fixture, an oscillator, or any other circuitry useful for evaluation or analysis. One end of each cable assembly has a molded connector, which fits into station module pod A or pod B. Leads at the other end of each cable terminate in female probe tips. Ball clips come with the cable assemblies and may be attached to the female probe tips.
- **A 9-lead RS-232 serial cable** — the cable that connects the MMDS to the host computer RS-232 port.
- **System software** — development software, on CD-ROM.
- **MMDS0508 documentation** — an MMDS operations manual (MMDS0508OM/D) and the appropriate EM user's manual.

You could select the MMDS baud rate in the system software: 1200, 2400, 4800, 9600, 19200, 38400, or 57600.

Substituting a different EM enables your MMDS to emulate target systems based on different MCUs or MCU families. (Your Motorola representative can explain all the EMs available.)

1.2.2 Motorola Modular Evaluation System

An MMEVS is an economical tool for designing, debugging, and evaluating target systems. The system described here is the MMEVS0508. A complete MMEVS consists of:

- **A platform board (PFB)** — the bottom board, which supports the emulator module. The platform board has connectors for power and the the terminal or host computer.
- **An emulator module (EM)** — such as the EML08AP64, a separately purchased printed circuit board that enables system functionality for a specific set of MCUs. The EM fits onto the PFB and has connectors for the target cable and for cables to a logic analyzer.
- **A 9-to-25-pin adapter** — a molded assembly that lets you connect the 9-pin cable to a 25-pin serial port.
- **A 9-lead RS-232 serial cable** — the cable that connects the station module to the host computer RS-232 port.
- **System software** — development software, on CD-ROM.

- **MMEVS0508 documentation** — an MMEVS operations manual (MMEVSOM/D) and the appropriate EM user's manual.

An MMEVS features automatic baud rate selection: 2400, 4800, 9600, 19200, 38400, or 57600.

Substituting a different EM enables your MMEVS to emulate target systems based on different MCUs or MCU families. (Your Motorola representative can explain all the EMs available.).

1.3 System Requirements

Proper board operation requires that the host be an IBM PC or compatible running Windows® 98, Windows® 2000, or Windows NT® (version 4.0) with at least 32MB of RAM and an RS-232 serial port.

1.4 EML08AP64 Layout

Figure 1-1 shows the layout of the EML08AP64:

- Jumper header J8 specifies the clock signal source.
- Jumper headers J3 and J4 specify the voltage source for analog modules on the M68EML08AP64.
- Jumper headers J5 and J6 specify the voltage reference for the M68EML08AP64 ADC module.
- Target interface connectors P2 and P3 connect the EML08AP64 to a target system via the included target cable assembly. If you use your EML08AP64 as part of an MMDS, run the target cable assembly through the slit in the station module enclosure.
- Connector P1 connects to a logic analyzer.
- DIN connectors J1 and J2, on the bottom of the board connect the EML08AP64 to the platform board.
- The emulation MCU is at location U11.
- The FPGA U26 is the logic control of the emulation modules on the EML08AP64.
- Jumper header J7 is used for EM board design and factory use only.

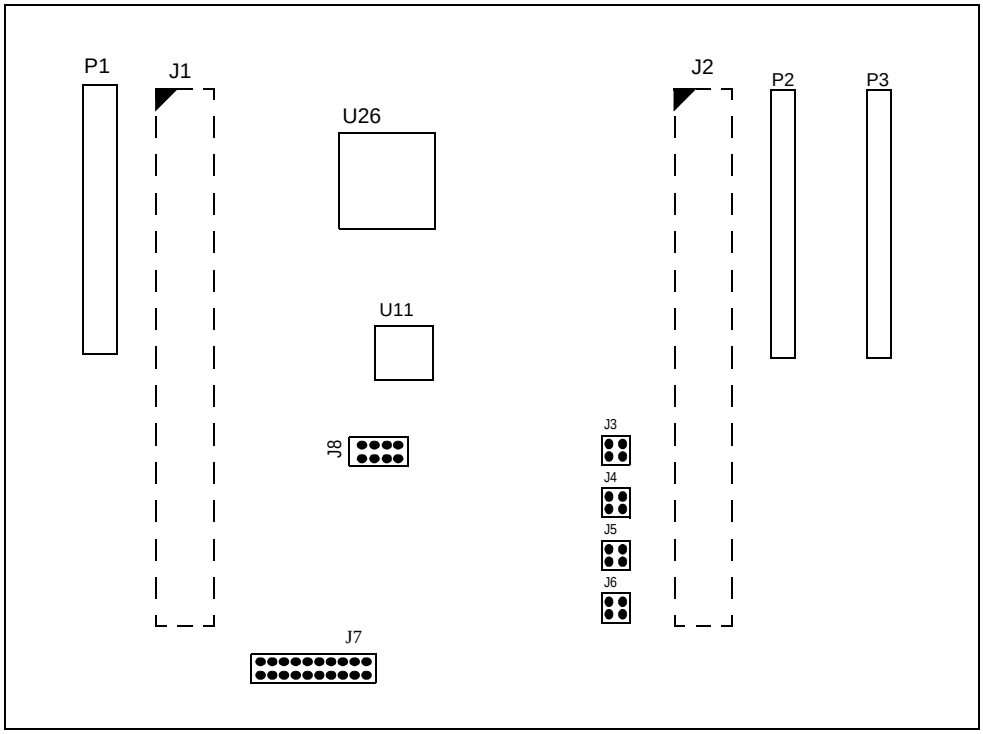


Figure 1-1 M68EML08AP64 Emulator Module

1.5 Specifications

Table 1-1 lists EML08AP64 specifications

Table 1-1 Specifications

Characteristic	Specifications
Maximum Clock speed	32 MHz at 5V, 16 MHz at 3V
Temperature operating storage	 -10° to +50° C -40° to +85° C
MCU Extension I/O	HCMOS Compatible at MCU voltage (5V or 3V)
Relative humidity	0 to 90% (noncondensing)
Power requirements	5VDC supplied from the MMDS or MMEVS
Dimensions	4.8 X 6.7 X 0.83 inches (122 x 170 x 21 mm)

1.6 Target Cable Assemblies

To connect your EML08AP64 to a target system, you need the included target cable and adapters shown in Figure 1-2.

The cable assembly for a 48-pin thin quad flat pack (LQFP) package consists of: a flex cable, a target head adapter, a socket-saver and a LQFP surface mount adapter.

One end of the target cable plugs onto EML08AP64 connectors P2 and P3. The other end of the flex cable plugs onto the target head adapter, which plugs onto the LQFP surface mount adapter.

You should solder the LQFP surface mount adapter directly onto the target-system board in place of the MCU.

The socket-saver goes between the target head adapter and surface mount adapter. If you use the socket-saver, it will reduce wear on the target head adapter. After many insertions, you can replace the socket-saver without replacing the entire target head adapter.

Table 1-2 lists the target cable and head part numbers that are appropriate for the EML08AP64.

Table 1-2 EML08AP64 Target Cable and Head Assemblies

MCU Package	Flex Cable Part Number	Target Head Adapter Part Number	Surface Mount Adapter Part Number	Socket-Saver Part Number
42-pin SDIP	M68CBL05B	M68TB08AP64B42	None	None
44-pin QFP	M68CBL05C	M68TC08AP64FB44	M68TQP044SAMO1	M68TQS044SAG1
48-pin LQFP	M68CBL05C	M68TC08AP64FA48	M68TQP048SD1	M68TQS048SDG1

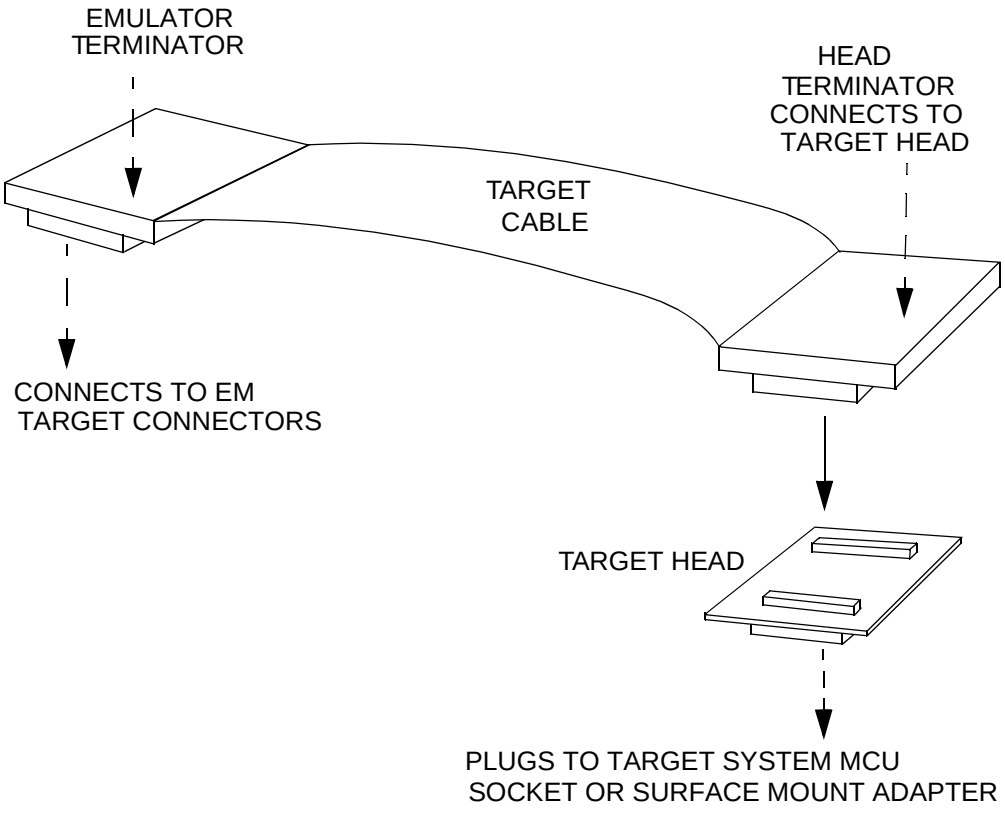


Figure 1-2 Target Cable Assembly

Section 2. Preparation and Operation

2.1 Introduction

This section explains EML08AP64 preparation: how to set board jumpers and how to make system connections.

Note that you can reconfigure an EML08AP64 already installed in an MMDS0508 station module enclosure. To do so, switch off station-module power and target power, remove the panel, then follow the guidance of this section. Similarly, you can reconfigure an EML08AP64 already installed on the MMEVS platform board, provided that you disconnect platform-board power and target power.

CAUTION: ESD Protection

Motorola development systems include open-construction printed circuit boards that contain static-sensitive components. These boards are subject to damage from electrostatic discharge (ESD). To prevent such damage, you must use static-safe work surfaces and grounding straps, as defined in ANSI/EOS/ESD S6.1 and ANSI/EOS/ESD S4.1. All handling of these boards must be in accordance with ANSI/EAI 625.

2.2 Configuring Board Components

Table 2-1 is a summary of configuration settings.

Table 2-1 Configuration Components

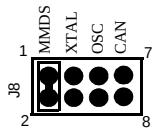
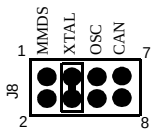
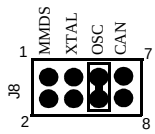
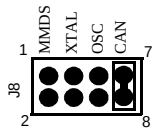
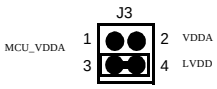
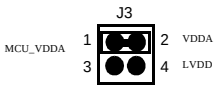
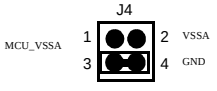
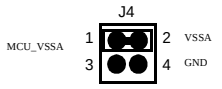
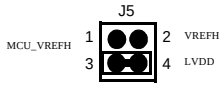
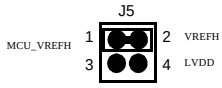
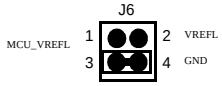
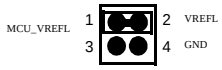
Component	Position	Effect
Clock Select Header, J8 (Use only one jumper in this header.)		**MMDS:** Specifies the oscillator clock signal from the platform board (MMEVS) or MMDS0508 station module (MMDS). **Factory setting**
		**XTAL:** Specifies the clock signal from the 32.768 kHz on board crystal oscillator.
		**OSC:** Specifies the clock signal received on target connector P3 (pin39) from the target system (OSC1).
		**CAN:** Specifies the clock signal from the user-specified oscillator of the EM board at U12 (CAN).
MCU VDDA Select Header, J3		**LVDD:** Specifies the AP64 MCU VDDA from on board LVDD. **Factory setting**
		**VDDA:** Specifies the AP64 MCU VDDA from target system (VDDA) on target connector P2(7).
MCU VSSA Select Header, J4		**GND:** Specifies the AP64 MCU VSSA from on board GND. **Factory setting**

Table 2-1 Configuration Components (Continued)

Component	Position	Effect
		**VSSA:** Specifies the AP64 MCU VSSA from target system (VSSA) on target connector P3(7).
MCU VREFH Select Header, J5		**LVDD:** Specifies the AP64 MCU VREFH from on board LVDD. **Factory setting**
		**VREFH:** Specifies the AP64 MCU VREFH from target system (VREFH) on target connector P3(15).
MCU VREFL Select Header, J6		**GND:** Specifies the AP64 MCU VREFL from on board GND. **Factory setting**
		**VREFL:** Specifies the AP64 MCU VREFL from target system (VREFL) on target connector P2(15).

2.3 Limitations

Limitations listed here apply to using your EML08AP64 emulator, as opposed to using the actual MCU in your target system:

Limitation 1 - Continuous Autoscan Mode in ADC module:

The emulator may not be able to obtain correct ADC conversion value on ADC channel ATD0 to ATD3 if the ADC module is configured in continuous autoscan mode.

2.4 Remaining System Installation

Once you have configured the jumper headers, you are ready to complete EML08AP64 installation.

2.4.1 MMDS Installation

To install the EML08AP64 in an MMDS0508 station module:

- Remove the panel from the station module top
- Fit together EM connectors J1 and J2 (on the bottom of the board) and platform-board connectors P11 and P12, respectively.
- Snap the corners of the EM onto the plastic standoffs.
- Connect the target cable, if appropriate, then replace the panel.

If your EML08AP64 is already installed in the station module:

- Reconnect the target cable (if necessary)
- Replace the panel

2.4.2 MMEVS Installation

To install the EML08AP64 on an MMEVS platform board:

- Fit together EM connectors J1 and J2 (on the bottom of the board) and platform-board connectors P6 and P7, respectively.
- Snap the corners of the EM onto the plastic standoffs

2.4.3 P & E Software Installation

If you will be using the P&E development system, you must copy the personality file 00642Vxx.MEM, 00643Vxx.MEM and 00644Vxx.MEM from the documentation CD-ROM to the installation directory that contains file MMDS08.EXE or MMEVS08.EXE.

2.4.4 CodeWarrior Software Installation

If you will be using the CodeWarrior IDE development software, you must copy the personality file `00E42Vxx.MEM, 00E43Vxx.MEM and 00E44Vxx.MEM` from the documentation CD-ROM to the `...\prog\mem` subdirectory of the CodeWarrior IDE installation directory.

Additionally, if you will be using CodeWarrior IDE development software, you will need to copy the EML08AP64 register file `MCU0E42.REG`, `MCU0E43.REG and MCU0E44.REG` from the documentation CD-ROM to the `...\prog\reg` subdirectory of the CodeWarrior IDE installation directory.

The CodeWarrior IDE uses these files to implement optional functionality such as letting you view or modify register contents by name rather than by address.

A register file is an ASCII text file, which you may customize. The CodeWarrior IDE user's manual explains how to create and use such files.

2.4.5 Finish Installation

At this point, you are ready to make any remaining cable connections and re-apply power. For specific instructions, consult the MMDS or MMEVS operations manual.

Section 3. Support Information

3.1 Introduction

This section consists of connector pin assignments, connector signal descriptions, and other information that may be useful in your development activities.

3.2 Logic Analyzer Connector (P1)

Connector P1 is the EML08AP64 logic analyzer connector. **Figure 3-1.** shows the pin assignments for connector P1. **Table 3-1** gives the signal descriptions.

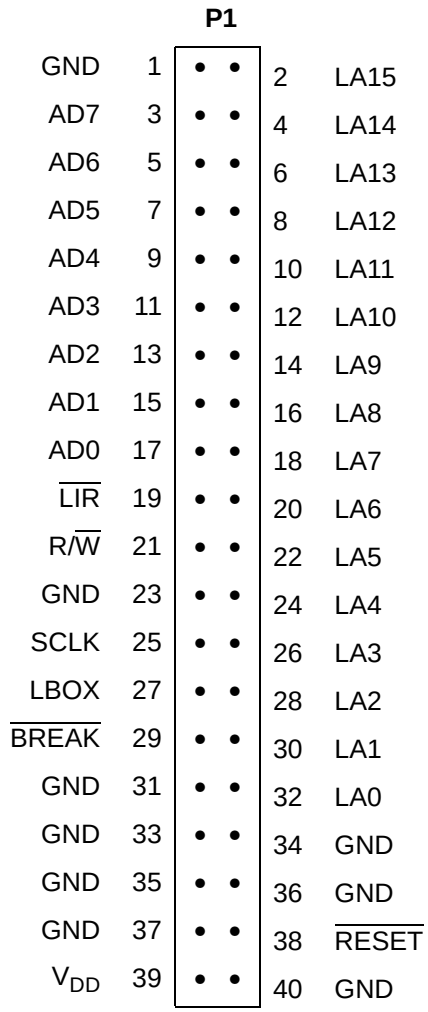


Figure 3-1. Logic Analyzer Connector (P1) Pin Assignments

Table 3-1 Logic Analyzer Connector (P1) Signal Descriptions

Pin	Mnemonic	Signal Description
1	GND	GROUND
2	LA15	Address bus bit 15 — MCU output address bus
3	AD7	Data bus bit 7 — MCU bidirectional data bus
4	LA14	Address bus bit 14 — MCU output address bus
5	AD6	Data bus bit 6 — MCU bidirectional data bus
6	LA13	Address bus bit 13 — MCU output address bus
7	AD5	Data bus bit 5 — MCU bidirectional data bus
8	LA12	Address bus bit 12 — MCU output address bus
9	AD4	Data bus bit 4 — MCU bidirectional data bus
10	LA11	Address bus bit 11 — MCU output address bus
11	AD3	Data bus bit 3 — MCU bidirectional data bus
12	LA10	Address bus bit 10 — MCU output address bus
13	AD2	Data bus bit 2 — MCU bidirectional data bus
14	LA9	Address bus bit 9 — MCU output address bus
15	AD1	Data bus bit 1 — MCU bidirectional data bus
16	LA8	Address bus bit 8 — MCU output address bus
17	AD0	Data bus bit 0 — MCU bidirectional data bus
18	LA7	Address bus bit 7 — MCU output address bus.
19	$\overline{\text{LIR}}$	Load instruction register — Active-low output signal, asserted when an instruction starts
20	LA6	Address bus bit 6 — MCU output address bus
21	R/$\overline{\text{W}}$	Read/Write — Output signal that indicates the direction of data transfer
22	LA5	Address bus bit 5 — MCU output address bus
23	GND	GROUND
24	LA4	Address bus bit 4 — MCU output address bus
25	SCLK	System clock — Internally generated output clock signal used as a timing reference
26	LA3	Address bus bit 3 — MCU output address bus

Table 3-1 Logic Analyzer Connector (P1) Signal Descriptions

Pin	Mnemonic	Signal Description
27	LBOX	Last bus cycle — Input signal that the emulator asserts to indicate that the target system MCU is in the last bus cycle of an instruction
28	LA2	Address bus bit 2 — MCU output address bus
29	$\overline{\text{BREAK}}$	Active low signal that the EM asserts to stop the target system MCU from running user code
30	LA1	Address bus bit 1 — MCU output address bus
31	GND	GROUND
32	LA0	Address bus bit 0 — MCU output address bus
33	GND	GROUND
34	GND	GROUND
35	GND	GROUND
36	GND	GROUND
37	GND	GROUND
38	$\overline{\text{RESET}}$	Active-low bidirectional signal for starting an EVS reset
39	V_{DD}	Input voltage (+5 Vdc @ 1A (max)) used by the EM logic circuits
40	GND	GROUND

3.3 Target Connectors (P2 and P3)

Figure 3-2. shows the pin assignments for connectors P2 and P3. **Table 3-2.**, and **Table 3-3.** give the signal descriptions for these pins.

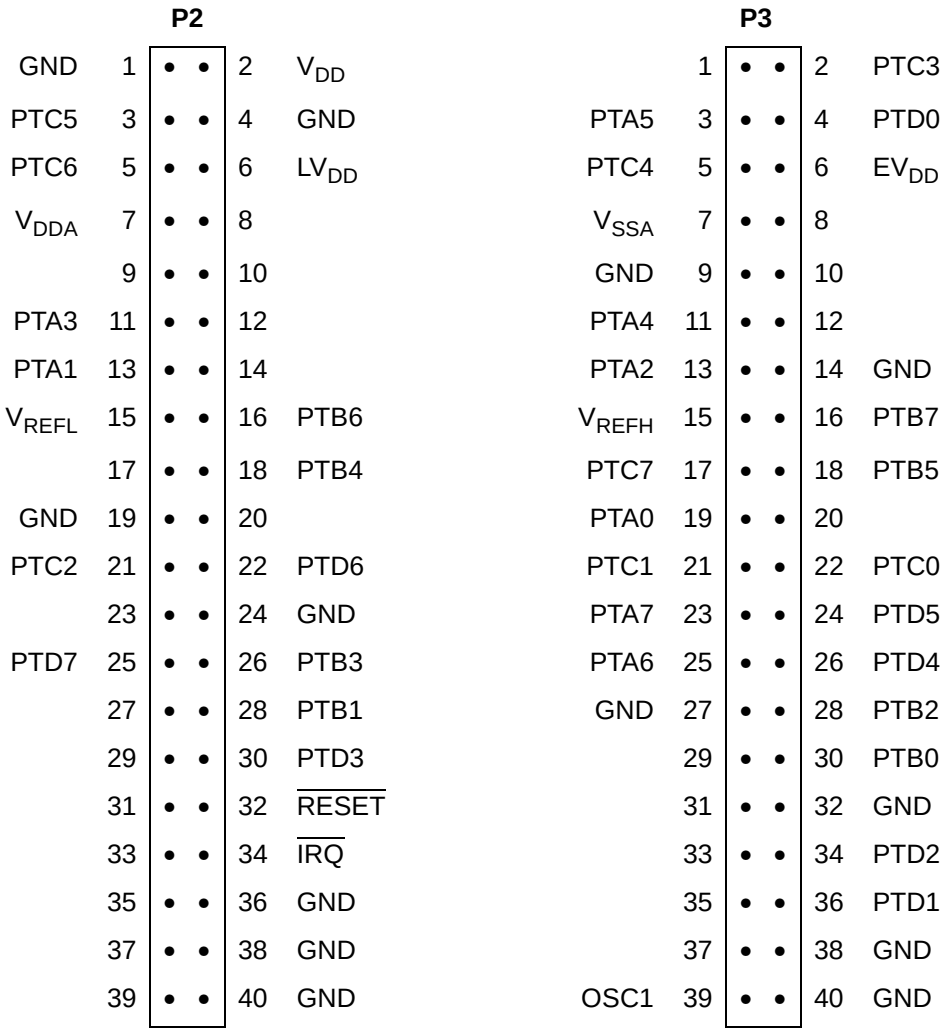


Figure 3-2. Target Connectors (P2 and P3) Pin Assignments

Table 3-2. Target Connector (P2) Signal Descriptions

Pin	Mnemonic	Signal Description
1	GND	Ground signal of the EM board
2	VDD	5V DC HIGH — Used for factory testing only
3	PTC5	PORT C (bit 5) — General-purpose I/O lines controlled by software via data direction and data registers
4	GND	Ground signal of the EM board
5	PTC6	PORT C (bit 6) — General-purpose I/O lines controlled by software via data direction and data registers
6	LVDD	AP64EM Voltage HIGH — Used for factory testing only
7	V_{DDA}	Analog Module Power Supply
8-10	NC	No connect
11	PTA3	PORT A (bit 3) — General-purpose I/O lines controlled by software via data direction and data registers
12	NC	No connect
13	PTA1	PORT A (bit 1) — General-purpose I/O lines controlled by software via data direction and data registers
14	NC	No connect
15	V_{REFL}	ADC input reference low
16	PTB6	PORT B (bit 6) — General-purpose I/O lines controlled by software via data direction and data registers
17	NC	No connect
18	PTB4	PORT B (bit 4) — General-purpose I/O lines controlled by software via data direction and data registers
19	GND	Ground signal of the EM board
20	NC	No connect
21	PTC2	PORT C (bit 2) — General-purpose I/O lines controlled by software via data direction and data registers
22	PTD6	PORT D (bit 6) — General-purpose I/O lines controlled by software via data direction and data registers
23	NC	No connect
24	GND	Ground signal of the EM board
25	PTD7	PORT D (bit 7) — General-purpose I/O lines controlled by software via data direction and data registers

Table 3-2. Target Connector (P2) Signal Descriptions

Pin	Mnemonic	Signal Description
26	PTB3	PORT B (bit 3) — General-purpose I/O lines controlled by software via data direction and data registers
27	NC	No connect
28	PTB1	PORT B (bit 1) — General-purpose I/O lines controlled by software via data direction and data registers
29	NC	No connect
30	PTD3	PORT D (bit 3) — General-purpose I/O lines controlled by software via data direction and data registers
31	NC	No connect
32	$\overline{\text{RESET}}$	Active-low bidirectional control line that initializes the MCU
33	NC	No connect
34	$\overline{\text{IRQ}}$	INTERRUPT REQUEST — Active-low input line for requesting MCU asynchronous non-maskable interrupt
35	NC	No connect
36	GND	Ground signal of the EM board
37	NC	No connect
38	GND	Ground signal of the EM board
39	NC	No connect
40	GND	Ground signal of the EM board

Table 3-3. Target Connector (P3) Signal Descriptions

Pin	Mnemonic	Signal Description
1	NC	No connect
2	PTC3	PORT C (bit 3) — General-purpose I/O lines controlled by software via data direction and data registers
3	PTA5	PORT A (bit 5) — General-purpose I/O lines controlled by software via data direction and data registers
4	PTD0	PORT D (bit 0) — General-purpose I/O lines controlled by software via data direction and data registers
5	PTC4	PORT C (bit 4) — General-purpose I/O lines controlled by software via data direction and data registers
6	EV_{DD}	Target system Voltage high
7	V_{SSA}	Analog Module Power Ground
8	NC	No connect
9	GND	Ground signal of the EM board
10	NC	No connect
11	PTA4	PORT A (bit 4) — General-purpose I/O lines controlled by software via data direction and data registers
12	NC	No connect
13	PTA2	PORT A (bit 2) — General-purpose I/O lines controlled by software via data direction and data registers
14	GND	Ground signal of the EM board
15	V_{REFH}	ADC input reference High
16	PTB7	PORT B (bit 7) — General-purpose I/O lines controlled by software via data direction and data registers
17	PTC7	PORT C (bit 7) — General-purpose I/O lines controlled by software via data direction and data registers
18	PTB5	PORT B (bit 5) — General-purpose I/O lines controlled by software via data direction and data registers
19	PTA0	PORT A (bit 0) — General-purpose I/O lines controlled by software via data direction and data registers
20	NC	No connect
21	PTC1	PORT C (bit 1) — General-purpose I/O lines controlled by software via data direction and data registers

Table 3-3. Target Connector (P3) Signal Descriptions

Pin	Mnemonic	Signal Description
22	PTC0	PORT C (bit 0) — General-purpose I/O lines controlled by software via data direction and data registers
23	PTA7	PORT A (bit 7) — General-purpose I/O lines controlled by software via data direction and data registers
24	PTD5	PORT D (bit 5) — General-purpose I/O lines controlled by software via data direction and data registers
25	PTA6	PORT A (bit 6) — General-purpose I/O lines controlled by software via data direction and data registers
26	PTD4	PORT D (bit 4) — General-purpose I/O lines controlled by software via data direction and data registers
27	GND	Ground signal of the EM board
28	PTB2	PORT B (bit 2) — General-purpose I/O lines controlled by software via data direction and data registers
29	NC	No connect
30	PTB0	PORT B (bit 0) — General-purpose I/O lines controlled by software via data direction and data registers
31	NC	No connect
32	GND	Ground signal of the EM board
33	NC	No connect
34	PTD2	PORT D (bit 2) — General-purpose I/O lines controlled by software via data direction and data registers
35	NC	No connect
36	PTD1	PORT D (bit 1) — General-purpose I/O lines controlled by software via data direction and data registers
37	NC	No connect
38	GND	Ground signal of the EM board
39	OSC1	OSCILLATOR — Crystal oscillator amplifier input signal
40	GND	Ground signal of the EM board

3.4 Board Factory Test Connector J7

Factory tests use this connector. The setting of J7 must not be changed.

3.5 Clock Oscillator J8

When you select the CAN option on header J8 by placing a jumper on pins 7-8, the clock signal generated by the clock oscillator at U12 is supplied to the external inputs of the MCU. You can replace the clock oscillator U12 with another compatible clock oscillator to provide a different clock frequency.

HOW TO REACH US:

World Wide Web Address

Motorola: http://www.motorola.com/General/index.html

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