

MMEVS0508

Target Interface

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Table of Contents

1	General Description	5
1.1	Introduction	5
1.2	MMEVS Features	5
1.3	System Components	6
2	Installation	7
2.1	Introduction	7
2.2	Configuring the Platform Board	8
2.2.1	Factory Test Header (J1)	9
2.2.2	Port Voltage Control Headers (J2–J4)	9
2.3	Installing the EM	10
2.4	Removing the EM	11
2.5	Making Cable Connections	11
2.5.1	Host Computer Connection	11
2.5.2	Target Cable Connection	11
2.5.3	Power Connection	12
2.6	Reset Switch	12
2.7	RS232 Serial Connector	12
3	MMEVS Target Interface	15
3.1	Introduction	15
3.2	General	16
3.2.1	MMEVS0508	16
3.2.2	Configuration	16
3.3	Definitions, Acronyms and Abbreviations	16
3.3.1	DLL	16
3.3.2	Dynamic Linking	17
3.3.3	MMEVS0508 Server	17
3.3.4	Modal Dialog	17
3.3.5	MCU	17
3.3.6	EM	17
3.4	Interfacing Your System and the Target	17
3.4.1	Hardware Connection	17
3.5	Loading the MMEVS0508 Target	18
3.6	Communication Configuration	19

Table of Contents

3.6.1	Communication Device Specification	20
3.6.2	Data Format	21
3.7	Debugger Status Bar for the MMEVS	21
3.8	MMEVS0508 Menu Entries	21
3.8.1	Communication Baud Rate	22
3.8.2	Communication	22
3.8.3	Maximum Baud Rate	23
3.8.4	Show Protocol	23
3.8.5	Memory Configuration	23
3.8.6	Personality (.MEM) Files	24
3.8.7	Memory	26
3.8.8	Signals Emulation	26
3.8.9	MCU Clock	26
3.8.10	Reset	26
3.9	Default Target Setup	27
3.10	Motorola ESL Parameters	28
3.10.1	COMDEV	28
3.10.2	BAUDRATE	28
3.10.3	SHOWPROT	28
A	Appendix	1
A.1	MMEVS Commands	1
A.1.1	Baud Rate Command	1
A.1.2	Target Signal Emulation Command	2
A.1.3	Reset Command	3
A.2	Other Commands	3

General Description

1.1 Introduction

The M68MMEVS05/08 Motorola Modular Evaluation System (MMEVS) is a tool for developing embedded systems based on an MC68HC05 or MC68HC08 microcontroller unit (MCU). A modular emulation system, the MMEVS provides interactive control of a microcontroller application when connected to your target system.

A complete MMEVS includes a platform board (M68MMPFB0508), an emulation module (EM), and a target cable assembly. The EM completes MMEVS functionality for a particular MCU or MCU family.

1.2 MMEVS Features

MMEVS features include:

- Real-time, non-intrusive, in-circuit emulation
- MC68HC11K1 system controller, for fast command transfer
- 64 kilobytes of emulation memory, to accommodate the largest available ROM size
- 64 hardware instruction breakpoints over the 64-kilobyte memory map
- A personality file for each EM. (Each personality file defines a foreground memory-map.)
- Latch-up resistant design (47- Ω series resistor on I/O connections to the target system) to make power-up sequencing unimportant.
- RS-232 operation speeds as high as 57600 baud
- Compact size: 8.25 inches deep, 10.5 inches wide

For connection instructions, configuration instructions, and other related information, see the installation section of this hardware addendum. For similar information with regard to EMs, see the corresponding EM user's manual.

1.3 System Components

The MMEVS components include:

- **Platform board:** the M68MMPFB0508 platform board.
- **9-lead RS-232 serial cable:** the cable that connects the platform board to the host computer RS-232 port.
- **Serial adapter:** a DB9M-to-DB25F RS-232 adapter, for use with a 25-pin host-computer serial port.

Separately purchased components are:

- **Emulation module (EM):** a printed circuit board that completes MMEVS functionality for one or more MCUs. The two DIN connectors on the bottom of the EM fit into connectors on the top of the platform board, providing power and signal connections. The EM also has a connector for the target cable. Each EM comes with its own user's manual.
- **Target cable:** a flat, flexible cable that connects the MMEVS to the target system. The cable's emulator terminator mates to the EM target connectors; the cable's head terminator mates to a target head adapter. (A target cable and a target head adapter make up a target cable assembly.)
- **Target head adapter:** a target-cable adapter that plugs into the MCU socket of the target system. (For some EMs, the target head adapter plugs into a surface-mount adapter.)
- User supplied components are:
- **Host computer:**
- **Power supply:** Required power is +5 volts @ 1 amp

Installation

2.1 Introduction

Complete MMEVS installation consists of:

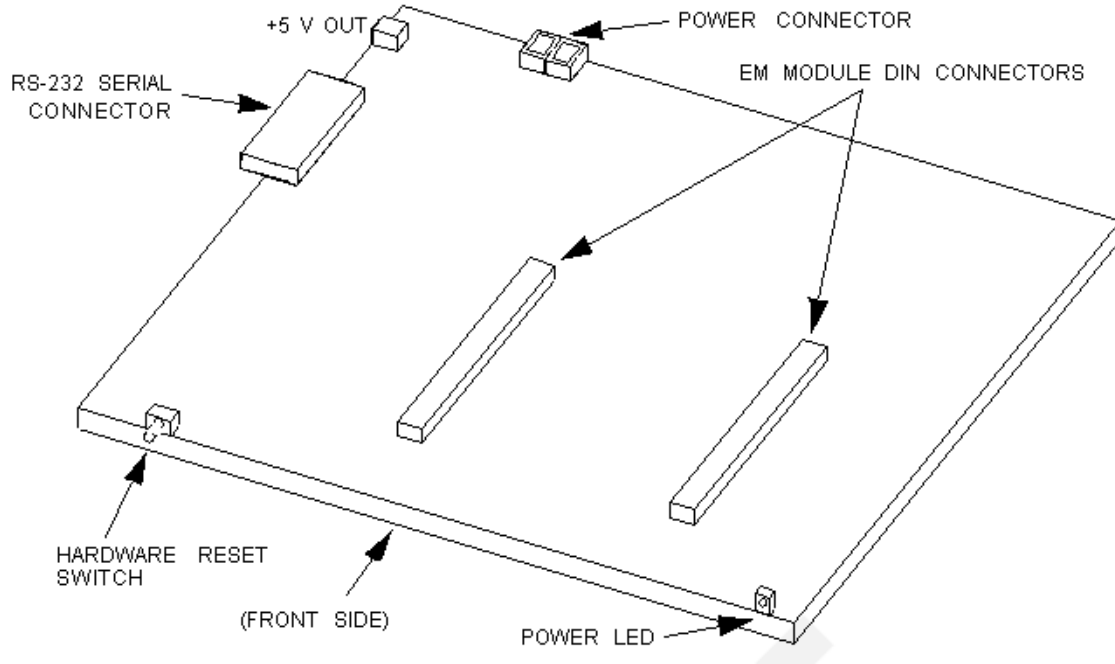
- Configuring the platform board,
- Configuring the emulation module (EM),
- Installing the EM, and
- Making system cable connections.

This section explains all items except EM configuration. (As EM configuration is specific to each EM, you must follow the instructions of your EM user's manual.)

In addition, this section explains the reset switch, and provides pin assignments and signal descriptions for the platform-board serial connector.

[Figure 2.1](#) shows the M68MMPFB0508 platform board. The hardware reset switch and power LED are on the front of the platform board. The power connector is to the back and the 25-pin RS-232 serial connector is on the left. The circular, +5-volt out connector (P4), also on the left side of the platform board, is reserved for future features.

Figure 2.1 M68MMPFB0508 Platform Board



2.2 Configuring the Platform Board

The MMEVS platform board has four jumper headers, all located near the front. Jumper header J1 is for factory test. Jumper headers J2, J3, and J4 control the voltage levels for ports A through D.

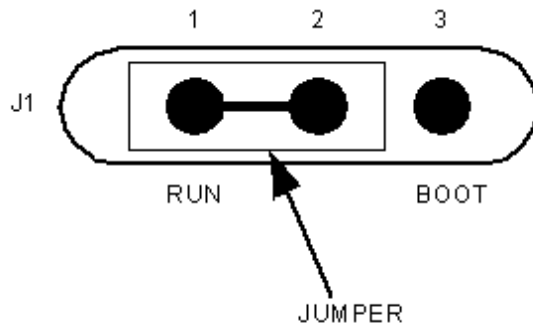
NOTE

Before shipping platform boards, factory personnel configure them correctly for virtually all users. You should not reconfigure platform-board headers unless your EM user's manual tells you to.

2.2.1 Factory Test Header (J1)

The [Figure 2.2](#) shows the factory configuration of jumper header J1. The jumper between pins 1 and 2 is correct for MMEVS operation.

Figure 2.2 Factory Test Header (J1)



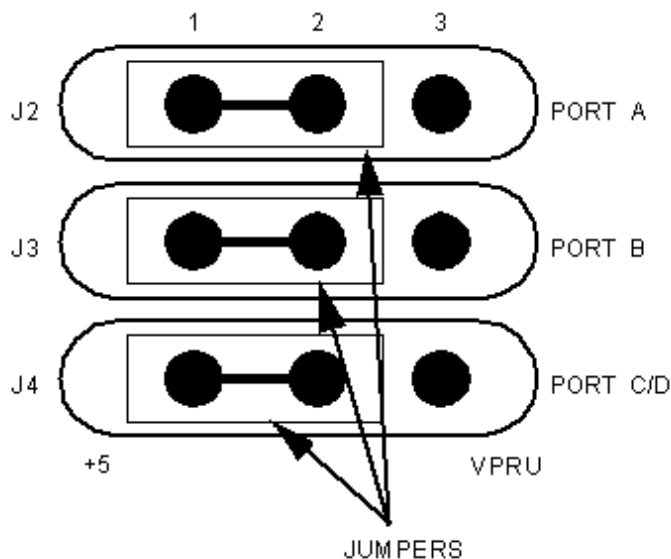
(Ignore the alternate jumper position, which is reserved for factory tests.)

2.2.2 Port Voltage Control Headers (J2–J4)

Jumper headers J2 through J4, near the right front corner of the platform board, set the voltage levels for ports A through D. Header J2 is the port A control; header J3 is the port B control; and header J4 is the control for port C or D (whichever pertains to your EM).

The [Figure 2.3](#) shows the factory configuration. The jumpers between pins 1 and 2 of these headers set the +5-volt level for all ports. This is the correct configuration for MMEVS operation, unless your EM user's manual says that your EM is a low-voltage board.

Figure 2.3 Port Voltage Control Headers (J2–J4)



If your EM can operate at low voltage, you can configure any of the ports for the low-voltage level. To do so, reposition the corresponding header’s jumper to pins 2 and 3.

2.3 Installing the EM

CAUTION Be sure to turn off power to the MMEVS when you install or remove an EM. This prevents power surges that could damage MMEVS circuits.

Follow these steps to install an EM:

1. Make sure that platform board power is off.
2. Make sure that nylon spacers are in the correct positions for the emulation module (EM).
3. Install the EM on the platform board: Carefully fit the female 96-pin DIN connectors (on the bottom of the EM) onto the corresponding male DIN connectors (on the top of the platform board). Snap the EM onto the spacers and make sure that the DIN connectors are joined firmly.

NOTE Many EM boards have 64-pin female DIN connectors. Like their 96-pin counterparts, these smaller connectors also mate with the male DIN connectors of the platform board. The connector keys ensure proper alignment.

2.4 Removing the EM

Follow these steps to remove an EM:

1. Make sure that platform-board power is off.
2. Unsnap all nylon spacers from the edges of the EM.
3. Carefully lift the EM straight up, separating it from the platform board.

2.5 Making Cable Connections

You must connect the platform board to the host computer and to a power supply. According to your specific application, you also may need to connect the EM to your target system.

2.5.1 Host Computer Connection

Connect the 9-lead serial cable between the platform-board serial connector (on the left side) and a serial port of the host computer.

A 9-to-25-pin adapter came with your MMEVS. If the host serial port is a 25-pin connector, use this adapter between the port connector and the serial cable.

2.5.2 Target Cable Connection

To connect the MMEVS to a target system, you must use a target cable assembly: a target cable and a target head.

CAUTION Press only on the rigid plastic terminators of the cable. Pressing on the flexible part of the cable can damage the cable.

Follow these instructions:

1. Make sure that platform-board power is off; make sure that power is not applied to the target system.

2. The EM has one or two target connectors, on its right side. Connect the target cable's emulator terminator to the EM target connectors.
3. Connect the target cable's head terminator to the appropriate target head adapter.

NOTE The EM user's manual should identify the target head adapter appropriate for your target system. Make sure that the adapter and the target cable mate correctly.

4. Plug the target head adapter into the MCU socket (or surface-mount adapter) of the target system.

2.5.3 Power Connection

The final MMEVS connection is to a +5 Vdc @ 1.0 amp power supply that you provide.

Lever terminal P3 is the MMEVS power connector. Contact 1 (black lever) is the ground. Contact 2 (red lever) is for V_{DD} , the +5 Vdc power. Use 20 or 22 AWG wire for power connections. For each wire, trim the insulation back a short distance from the end, lift the appropriate P3 lever, insert the bare wire into P3, and close the lever.

Do not use wire larger than 20 AWG. Such wire could damage connector P3.

This completes the cable connections.

2.6 Reset Switch

RS-232 handshake signals control MMEVS resets. A reset initializes the control board from its startup point. If the host serial port does not implement handshaking, you must reset the MMEVS manually. Press gently to trip the switch.

2.7 RS232 Serial Connector

This subsection provides pin assignments and signal descriptions for the platform-board serial connector. For similar information about EM connectors, see the corresponding EM user's manual.

The [Figure 2.4](#) shows pin numbering for the platform board's 25-pin serial connector. [Table 2.1](#) lists the signals transmitted on the 9-lead serial cable.

Figure 2.4 Serial Connector

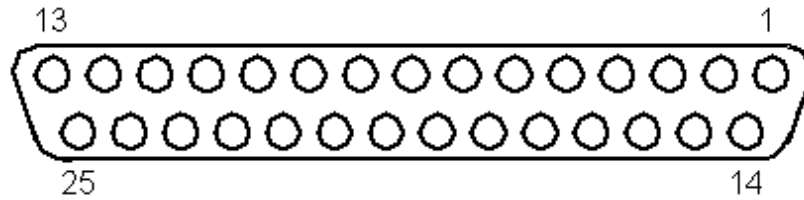


Table 2.1 Serial Connector and Cable Pin Assignments

Connector Pin	Mnemonic	Signal
1	GND	GROUND
2	TX	TRANSMIT DATA — Serial data input line
3	RX	RECEIVE DATA — Serial data output line
4	RTS	REQUEST TO SEND — Input signal that requests permission to transfer data
5	CTS	CLEAR TO SEND — Output signal that indicates a ready-to-transfer data status
6	DSR	DATA SET READY — Output signal that indicates on-line/in-line service/active status
7	SIG-GND	SIGNAL GROUND — Signal ground or common return connection between the MMEVS and host computer
8	DCD	DATA CARRIER DETECT — Output signal that indicates detection of an acceptable carrier signal
9 — 19, 21 — 25	—	No connection
20	DTR	DATA TERMINAL READY — Input signal that indicates on-line/in-line/active status

3

MMEVS Target Interface

3.1 Introduction

An advanced feature of Debugger for the embedded systems development world is the ability to load different target components, which implement the interface with target systems. This document introduces the MMEVS0508 Modular Evaluation System for the MC68HC05 and MC68HC08 MCU Families.

The MMEVS is a Motorola interface that the debugger uses to communicate with an external system (also called a *target system*).

With this interface, you can download an executable program from the Debugger environment. The destination of this program is an external target system, based on a Motorola MCU, that executes the program. Debugger receives feedback of real target-system behavior.

Debugger fully supervises and monitors the target-system MCU. That is, Debugger controls the CPU execution. You can read and write in internal or external memory (even when the CPU is running); you can single-step, run, or stop processes in the CPU.

CAUTION As an external MCU executes the code, the MMEVS target component cannot provide memory statistics. This means that you cannot use the MMEVS target component for profiling, coverage analyzing, watchpoints, or I/O simulation.

3.2 General

This chapter describes the specific features of the MMEVS0508. The explanations of windows and dialog boxes are with the explanations of corresponding MMEVS0508 features.

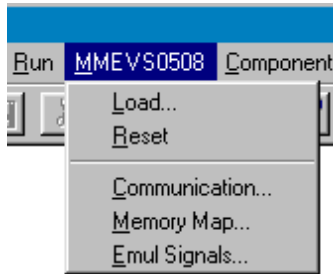
3.2.1 MMEVS0508

The MMEVS0508 is an emulator system, for CPU05 or CPU08 MCUs, that provides emulation memory.

3.2.2 Configuration

The functions above are specific for the MMEVS0508, so are available only with this emulator component. To use these features, select the corresponding menu commands, such as *MMEVS0508* | ..., as shown in [Figure 3.1](#).

Figure 3.1 MMEVS Menu



These functions are part of the MMEVS0508 Motorola Modular Development System. Their supporting libraries consist of dialog boxes and routines to interface the debugger and the hardware.

3.3 Definitions, Acronyms and Abbreviations

3.3.1 DLL

Dynamic Link Library: A Microsoft Windows library file for dynamic linking.

3.3.2 Dynamic Linking

Dynamic Linking: A Windows process that links a function call in one module to the actual function (in the library module), at run time.

3.3.3 MMEVS0508 Server

The MMEVS hardware access library that interfaces across the RS-232 port to the MMEVS0508 station.

3.3.4 Modal Dialog

A dialog that requires a response before you can continue.

3.3.5 MCU

Micro Controller Unit

3.3.6 EM

Emulation Module

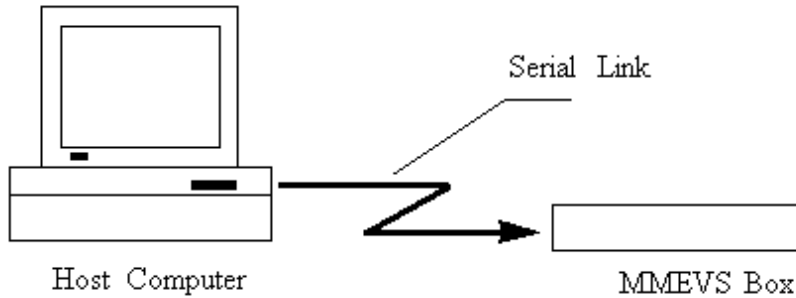
3.4 Interfacing Your System and the Target

The MMEVS0508 connects to an RS-232 serial port of your system.

3.4.1 Hardware Connection

Use the cables that came with the MMEVS0508 for the hardware connection (the [Figure 3.2](#) depicts this connection). Configure the host to be a data terminal, so that it sends data on the TxD lead and receives data on the RxD lead (as the MMEVS0508 hardware manual explains).

Figure 3.2 Hardware Connection

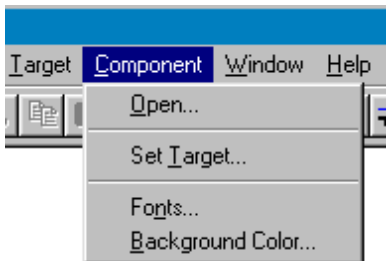


3.5 Loading the MMEVS0508 Target

Usually, the `PROJECT.INI` file specifies the target. To make the MMEVS the target, change the file's "Target=" line to "Target=Motosil". The MotoSIL driver automatically detects the MMEVS connection to your system. However, if the driver detects nothing, an error message informs you that the target is not connected to the expected port. Additionally, the *Communications Device Specification* dialog box appears, so that you can set the correct baud-rate and communication-port parameter values. See the *Communication Configuration* section of this document for more details.

Another way to load the MMEVS0508 target is selecting *Set Target...* from the *Component* Menu (See [Figure 3.3](#)), then choosing **MotoSIL** from the list of possible targets.

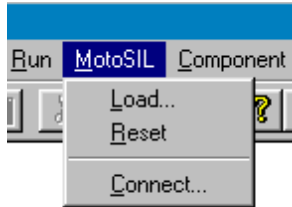
Figure 3.3 Set Target menu



The MotoSIL driver automatically tries to find the MMEVS target, behaving as text above explains.

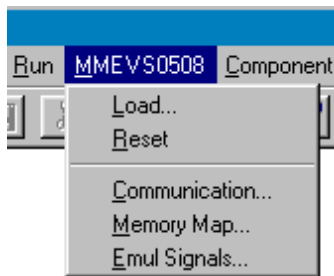
If MotoSIL does not detect a target, the *MotoSIL* menu remains in the main menu bar, as shown in [Figure 3.4](#):

Figure 3.4 Motosil Entry in menu bar



But after successful target loading, the *MMEVS0508* menu replaces the *Target* or *MotoSIL* menu in the main menu bar, as the [Figure 3.5](#) depicts it.

Figure 3.5 MMEVS0508 in menu bar

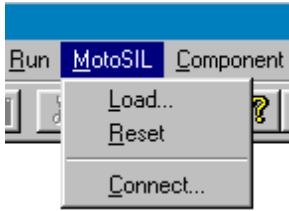


3.6 Communication Configuration

In most situations, Debugger uses its default values to set communication with the MMEVS automatically. In case of any problem, the dialog box below appears, so that you can correct settings.

NOTE Another way to open this dialog box is selecting **MotoSIL | Connect...** from the menu bar (see [Figure 3.6](#)). This method is appropriate if when previous connection attempts failed and Motosil still is in the main menu.

Figure 3.6 To change the connection settings

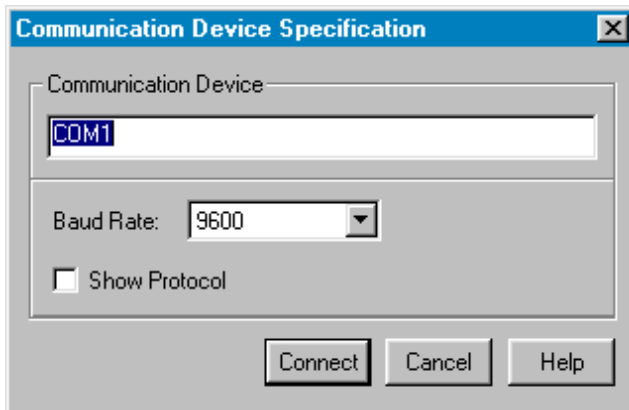


Make sure that host-computer parameter values are correct; make sure that the serial-communication setting is correct. Otherwise, communication between Debugger and the target is not possible.

3.6.1 Communication Device Specification

If the host and target are not connected, or if the communication device is not properly indicated, the *Communications Device Specification* ([Figure 3.7](#)) dialog box appears:

Figure 3.7 Communication Device Specification dialog



Type the name of an available communication device in the *Communication Device* edit box, use the drop-down control to set the baud rate, then click *Connect*. (The default communication device is COM1.)

Once connection succeeds, Debugger saves the settings as defaults for later debug sessions. Should the connection fail, a message box so informs you, so that you can define a new communication device. To quit the dialog box and the environment, click *Cancel*.

NOTE Saving the communication device and the baud rate through this dialog box overrides environment variables BAUDRATE and COMDEV of the `default.env` file

3.6.2 Data Format

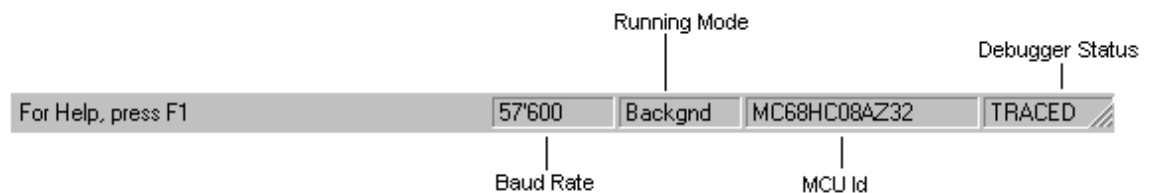
The MMEVS0508 data format is 8 data bits, 1 stop bit, no parity, and a variable baud rate. The default speed is 9600 baud, unless you change this default via the menu selection *MMEVS0508 | Communication...*

Communication speeds of 1200 through 115200 baud are available, depending on the host-computer hardware.

3.7 Debugger Status Bar for the MMEVS

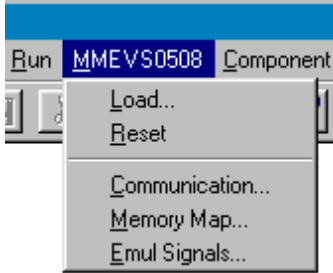
Once you have loaded the MMEVS target component, the Debugger status bar gives specific information, as explained by [Figure 3.8](#).

Figure 3.8 Status Bar



From left to right, this information is: the serial-communication baud rate, the Debugger running mode, the MCU name (depending on the MCU-Id), and the debugger status.

3.8 MMEVS0508 Menu Entries



3.8.1 Communication Baud Rate

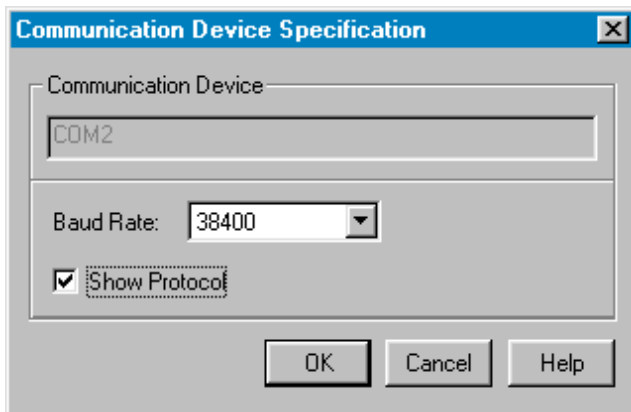
You should specify the baud rate for host-computer-to-MMEVS0508 communication early in a session. The system operates most efficiently at the maximum baud rate that the host computer supports.

You can modify this baud rate, as text below explains.

3.8.2 Communication

Select *MMEVS0508 | Communication...* to display the *Communication Device Specification* dialog box, as shown in [Figure 3.9](#). Use the drop-down control to specify the maximum value (115200 baud), or to specify the maximum rate your host supports. If communication fails, Debugger reverts to the previous successful baud rate.

Figure 3.9 Communication device specification



3.8.3 Maximum Baud Rate

The maximum baud rate depends on the speed and interrupt load of the host computer. For slow notebook computers, or for computers running in a network, the maximum baud rate may be as low as 19200. A buffered I/O card may allow the maximum rate of 115200 for any host computer. The default value is 9600.

3.8.4 Show Protocol

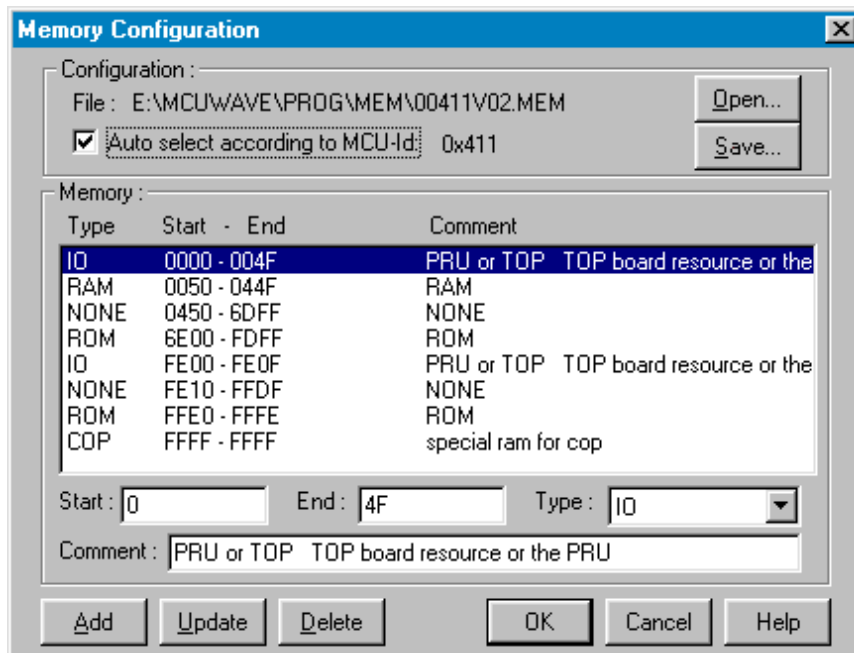
If you check the *Show Protocol* check box, the system reports all commands and responses in the command line window.

NOTE Motorola or Metrowerks support personnel use this feature.

3.8.5 Memory Configuration

To view the memory layout, choose *MMEVS0508 | Memory Map...* This opens the Memory Configuration dialog box, illustrated by [Figure 3.10](#)

Figure 3.10 Memory Configuration



This dialog box shows the target's memory setup. The system automatically loads this setup if you check the *Auto select according to MCU-Id* check box. Debugger

identifies and sets the memory map through the processor MCU-Id. To open another configuration, click the *Open* button. To save modifications to the current configuration, click the *Save...* button.

3.8.6 Personality (.MEM) Files

For proper operation, the Motosil target must load the personality file (.MEM file) that matches the connected Emulation Module (EM).

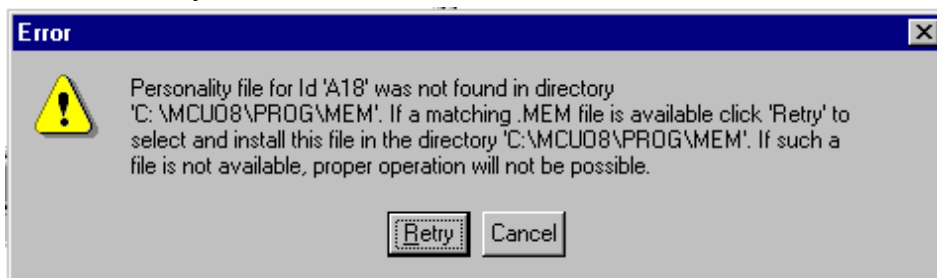
The .MEM file filename format is:

0nnnnVxx.MEM

where 'nnnn' is the four-digit, hexadecimal 'MCU-Id' number of the MCU, and 'xx' is a two-digit version number.

If that target cannot find this file, or if the file is not valid, the *Error* message box shown in [Figure 3.11](#) appears.

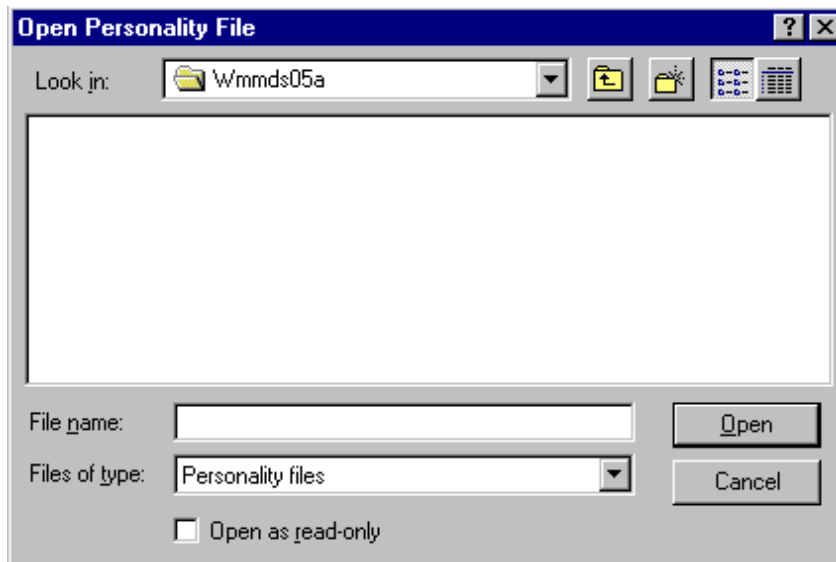
Figure 3.11 Personality file not found



Click *Cancel* to open the *Communication Device Specification* dialog box, instead of establishing the connection.

Click *Retry* to bring up the *Open Personality File* dialog box, represented in [Figure 3.12](#)

Figure 3.12 Open personality file



This dialog box lets you browse to find and open the necessary .MEM file.

If you select another invalid .MEM file, the error message box and the *Communication Device Specification* dialog box reappear.

If the .MEM file is valid, the target loads the file, copying it into the \PROG\MEM directory, with 'V00' as the version number (for example, 00A18V00 .MEM).

Note that the *Memory Configuration* dialog box displays the current memory map.

When starting Debugger:

If you have checked the *Auto Select according MCU-ID* checkbox, the system automatically loads the default personality file for the MCU-ID. If this checkbox is clear, the system automatically loads the most recently opened or saved memory map file.

You can use the *Memory Configuration* dialog box to modify the memory configuration, then save this new configuration into a memory configuration file. (Click the *Save* button.)

You can use the *Memory Configuration* dialog box to load a different memory configuration file (one that you previously defined and saved). (Click the *Open* button.)

Another way to load personality files (or any memory configuration files) is to enter the **LOADMAP** command in the command line.

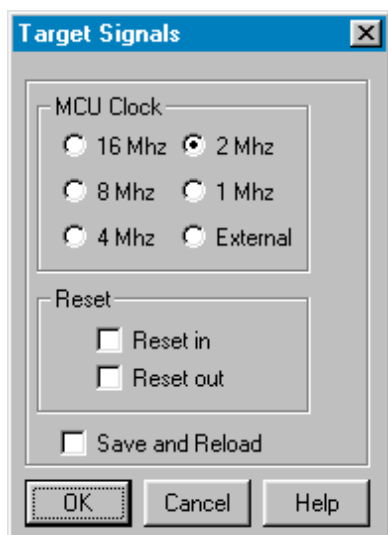
3.8.7 Memory

The *Memory* area lets you specify the “Real-Time Memory”. For the MMEVS0508, this is dual-ported memory that you can assigned to any valid RAM or ROM address. While the MMEVS0508 is running, Debugger can display and modify this “Real-Time Memory”. However, if a portion of this memory overlays internal MCU I/O, RAM, or EEPROM, the *Memory Configuration* dialog box can only display, not monitor, that memory portion.

3.8.8 Signals Emulation

To specify MMEVS0508 emulator signals, choose the *MMEVS0508 | Emul Signals...* menu selection. This opens the Target Signals dialog box, depicted in [Figure 3.13](#).

Figure 3.13 Target Signal dialog



This dialog box lets you specify the MCU clock and the reset signal connection. Warning: in order to use any of these clock signals, you must configure EM jumper headers correctly.

3.8.9 MCU Clock

The *MCU Clock* area lets you specify a different MCU clock, provided that the EM configuration is correct.

3.8.10 Reset

The *Reset* area lets you specify the reset-signal connection with the target system.

The *Target Signals* dialog box displays settings that the system reads from the MMEVS0508. Click *Ok* to close the dialog box, and to write values back to the MMEVS0508. Check the *Save and Reload* checkbox to have the system save the configuration, then reload this configuration the next time you start the Debugger debugger.

3.9 Default Target Setup

As with any target, you can use the *Target* menu to load the MMEVS target component, or you can set the MMEVS target component as a default in the PROJECT . INI file. This file should be in the project directory .

Example of PROJECT . INI file:

```
[DEFAULTS]
Window0=Source      0   0  50  40
Window1=Assembly  50   0  50  40
Window2=Register  50  40  50  30
Window3=Memory    50  70  50  30
Window4=Data      0  40  50  25
Window5=Command   0  65  50  20
Window6=Module    0  85  50  15
Target=Motosil

[Motorola ESL]
COMDEV=COM2
BAUDRATE=57600
SHOWPROT=1
```

NOTE For more information about the PROJECT . INI file, please see the Debugger manual.

3.10 Motorola ESL Parameters

In normal use, you set these parameters in the PROJECT . INI file once, interactively, during installation. You use these parameter values in subsequent debugging sessions.

3.10.1 COMDEV

This parameter specifies the host-computer communication port. COM1 is the default communication device for PCs. The default for UNIX systems is /dev/ttya.

For a PC: Any valid communication device (COM1, COM2, etc.).

Example:COMDEV=COM2

For SUN:Any valid communication device (/dev/ttya, etc.).

Example:comdev=/dev/ttyb

3.10.2 BAUDRATE

This parameter specifies the communication baud rate between the host computer and the target system. The Debugger default is 9600 baud, but you may set any of these baud rates:

1200, 2400, 4800, 9600, 19200, 28800,
38400, 57600, 115200.

Example:BAUDRAUTE=19200

3.10.3 SHOWPROT

This parameter specifies whether to report commands and responses in the command line window. To have the system report the commands and responses, give this parameter the value 1. To have the system *not* do this reporting, give this parameter the value 0. (Another way to specify reporting is checking the *Show Protocol* checkbox of the *Communication Device Specification* dialog box.)

Please see the section *Communication Configuration, Communication Device Specification*.

Appendix

A.1 MMEVS Commands

This section explains the commands specific to the MMEVS.

Use these commands as you would any others, typing them in the Command Line component or when inserting them into a command file.

For further details about commands, please see the *Debugger* manual appendix, *Debugger Commands*, as well as the section *Command Line Component*.

A.1.1 Baud Rate Command

BAUD

A.1.1.1 Short Description

sets the communication baud rate

A.1.1.2 Syntax

BAUD [rate]

rate: specifies the new baud rate; must be one of these decimal integer constants:
1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600, 115200.

A.1.1.3 Description

The **BAUD** command sets or displays the baud rate for communication between the system controller and the host computer. For maximum performance, the baud rate should be as high as the host computer can accommodate. The maximum rate is 115200; the default baud rate is 9600.

Without a rate value, the command displays the Communications Baud Rate Specification dialog box for interactive rate selection. If the system does not support the requested rate, the red message, “Error: <baud rate> is not a supported baud rate.” appears in the Command Line window.

Example:

```
BAUD 57600
```

Changes the communication baud rate to 57600.

A.1.2 Target Signal Emulation Command

SIG

A.1.2.1 Short Description

sets emulator signals

A.1.2.2 Syntax

```
SIG [ [ENABLE] signal {signal}] [ DISABLE signal {signal}]
```

signal: The signal to be enabled or disabled: **RESETIN** or **RESETOUT**.

ENABLE: Connect the signal from the target system.

DISABLE: Disconnect the signal from the target system.

A.1.2.3 Description

The **SIG** command enables or disables reset control signals from the target MCU. If the command specifies any signals, but lacks either keyword **ENABLE** or **DISABLE**, the command enables the signals.

Examples:

```
SIG ENABLE RESETIN
```

Enables the “reset in” signal from the target system.

A.1.3 Reset Command

RESET

A.1.3.1 Short Description

resets target MCU

A.1.3.2 Syntax

```
RESET [GO | STOP]
```

GO: Resets the MCU and does a Go from Reset.

STOP: Resets the MCU and stops (default).

A.1.3.3 Description

The **RESET** command resets the target MCU.

Examples:

```
Reset Go
```

Resets the MCU and does a GO from Reset.

```
Reset
```

Resets the MCU and stops (default setting).

After the system asserts the reset is asserted, it executes the `RESET .CMD` command file.

A.2 Other Commands

LOADMAP

A.2.0.1 Short Description

loads memory map

A.2.0.2 Syntax

```
LOADMAP fileName | MCUID
```

fileName: the full pathname of a file that defines a memory map.

MCUID: the MCU identifier. If the command includes an MCUID value, the system loads a memory map from the file that matches this value.

A.2.0.3 Description

The LOADMAP command loads a memory map from a file. The file specification must be the full pathname. If the file is in the current directory, the characters “. \” must precede the name (for example: LOADMAP . \00123V22 .MEM).

Example:

```
LOADMAP 0xC17
```

Loads a memory map from a file that matches this MCU identifier (for the 68HC08AX48 MCU).

Note that the MCUID identifies an MCU, not an EM Board. The memory map filename has this format:

```
0nnnnVvv.MEM
```

where ‘nnnn’ is the four-digit, hexadecimal ‘MCU-ID’, and ‘vv’ is a two-digit version number.

MEM

A.2.0.4 Short Description

displays the memory map

A.2.0.5 Syntax

```
MEM
```

A.2.0.6 Description

The **MEM** command displays the current memory map.

Example:


```

in>MEM
Type      Addresses  Comment
-----
IO        0.. 3F    PRU or TOP    TOP board resource or the PRU
NONE     40.. 4F    NONE
RAM      50.. 64F    RAM
NONE    650.. 7FF    NONE
EEPROM   800.. A7F    EEPROM
NONE    A80..3DFF    NONE
ROM     3E00..FDFF    ROM
IO     FE00..FE1F    PRU or TOP    TOP board resource or the PRU
NONE   FE20..FFDB    NONE
ROM    FFDC..FFFE    ROM
COP    FFFF..FFFF    special ram for cop
RT MEM  0.. 3FF    (disabled)
-----

```

OSC

A.2.0.7 Short Description

selects emulator clock frequency

A.2.0.8 Syntax

```
OSC [rate | source]
```

A.2.0.9 Description

The **OSC** command selects the emulator clock frequency: one of five internally generated frequencies (16 Mhz, 8 Mhz, 4 Mhz, 2 Mhz, or 1 Mhz) or an external clock source. The firmware sets the default emulator clock rate, adapting it to the current frequency.

Entering this command without parameters opens the corresponding dialog box.

```
OSC [rate | source]
```

where rate is: OSC1MHZ Selects the 1 Mhz oscillator.

OSC2MHZ	Selects the 2 Mhz oscillator.
OSC4MHZ	Selects the 4 Mhz oscillator.
OSC8MHZ	Selects the 8 Mhz oscillator.
OSC16MHZ	Selects the 16 Mhz oscillator.
Where source is: EXT	Selects an external clock source.

Example:

```
OSC OSC8MHZ // Use the 8 Mhz internal emulator clock.
```

PROTOCOL

A.2.0.10 Short Description

controls *Show Protocol* functionality

A.2.0.11 Syntax

```
PROTOCOL [ON | OFF]
```

ON: Reports commands and responses in the command line window (default value for this command).

OFF: Does not report commands or responses in the command line window; does not log commands or responses in the log file.

A.2.0.12 Description

The **PROTOCOL** command controls reporting commands and responses in the command line window. Entering this command without a parameter value has the same effect as entering the command with the parameter value **ON**.

Index

Symbols

.MEM 24

B

BAUD 1

BAUDRATE 21, 27, 28

C

Cables, Connecting

Host Computer 11

Power 11

Target 11

COMDEV 21, 27, 28

Commands 1

Communication Baud Rate 22

Communication Configuration 17

Configuration 16

Memory 23

Connector, Cable

Pin Assignments 12

Signal Descriptions 12

D

Data Format 21

default.env 21

DLL 16

Dynamic Linking 17

E

EM

Installing 10

Removing 11

Emulation 26

H

Hardware Connection 17

Hardware Installation

Configuring the Platform Board 8

Connecting Cables 11

Installing the EM 10

Introduction 7

Pin Assignments, Connector 13

Removing the EM 11

Reset Switch 12

Signal Descriptions, Connector 13

I

Introduction 5

J

Jumper Headers

Factory Test (J1) 9

Port Voltage Control (J2–J4) 9

L

LOADMAP 25

M

MCU Clock 26

MCU clock 26

MCU-Id 23

MEM 4

Memory 26

Memory Configuration 23

Menu 21

MMEVS05

Introduction 5

MMEVS0508 16

MMEVS0508 Server 17

MMEVS08

Introduction 5

MotoSIL 18

Motosil 27

O

OSC 5

P

Parameters 27

Personality file 24

Pin Assignments, Connector 13

Platform Board, Configuration 8

Port Voltage Control Jumper Headers (J2–J4) 9

PROJECT.INI 18, 27

PROTOCOL 6

R

RESET 3

Reset 26

Reset signal connection 26

S

SHOWPROT 28

SIG 2

Signals 26

System

 Components 6

 Connections

 11

T

Target 18

Target Setup 27