MMC14EBDIUM/D

February 2000

M•CORE
14-PIN ENHANCED BACKGROUND DEBUG INTERFACE (14EBDI) USER'S MANUAL

1 INTRODUCTION

Figure 1 shows the Motorola MMC14EBDI02 14-Pin Enhanced Background Debug Interface (14EBDI). The 14EBDI lets you use an IBM PC-compatible computer or a Sun Solaris computer to manage debugging and other embedded code development tasks with an appropriate target board.

The target board does not require on-board debug firmware, nor does debugging consume MCU resources. Instead, the 14EBDI exercises the target MCU and performs all the debugger functions through the OnCE or Background Debug Mode (BDM) connector.

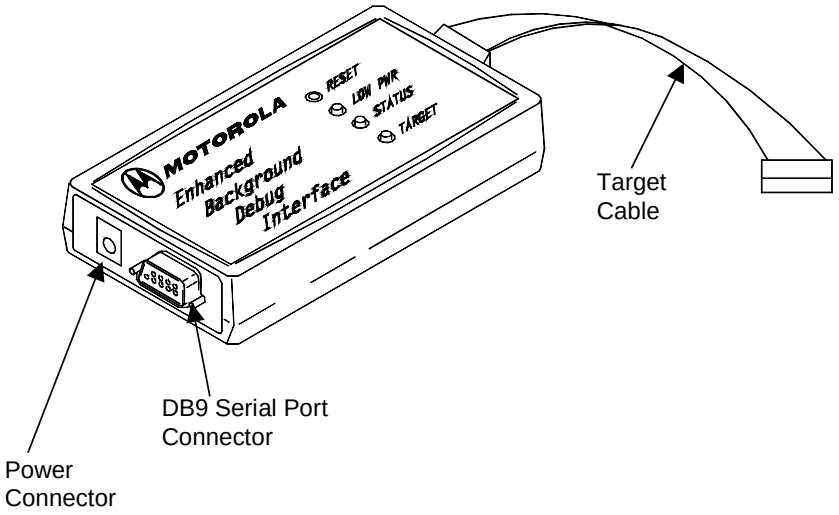

Figure 1. 14-Pin Enhanced Background Debug Interface

NOTE

The 14EBDI replaces Motorola's earlier EBDI (the MMCEBDI01), adding compatibility for MMC2080 and MMC3401 microcontrollers.

14EBDI features are:

- Support for M•CORE™ target systems that have OnCE™ debug connectors.
- Support for CPU32 target systems that have BDM connectors.
- Target interface cables for CPU32 and OnCE connections.
- Operating power from a separate supply or from the target system.

- A separate universal power supply.
- User-upgradable firmware.
- An EIA-232 serial cable to the host computer.

Connection to the target system is via a recessed connector of the 14EBDI module, and a separate, detachable target cable. Connection to the host system is via the 9-pin serial port connector.

Push the RESET button to restart 14EBDI internal operations.

1.1 SYSTEM REQUIREMENTS

To use the 14EBDI, you need an M•CORE evaluation board (EVB), a comparable development system, or a target system that uses a OnCE debug connector.

Alternatively, you need a CPU32 target system, a comparable target, or a development system that uses a BDM connector.

You also need:

- The supplied power supply or a separate power supply: 4.5 to 8 volts, at 0.2 amperes.
- An IBM PC-compatible computer, or a Sun Solaris computer, that has an EIA-232 serial port.
- The supplied communications cable. (The cable may require an adapter to match the host.)
- The appropriate supplied target cable.
- A development and debugging host software tool suite compatible with the 14EBDI and the appropriate target CPU.

1.2 14EBDI LEDS

Three LEDs indicate the operating status of the 14EBDI:

- **LOW PWR:** If ON, this red LED indicates insufficient voltage for the 14EBDI.
- **STATUS:** This green LED indicates the mode of operation or indicates a problem. (Table 4, at the end of this document explains the indications of this LED.
- **TARGET:**
  - If ON and *green*, this LED indicates that the target is running.
  - If ON and *red*, this LED indicates that the target is halted.
  - If OFF, this LED indicates a disconnected or unknown target.

1.3 SPECIFICATIONS

Table 1 lists interface specifications.

Table 1. 14EBDI Specifications

Characteristic	Specification
Operating power	+ 4.5 volts–8 volts @ 0.2 amps
Operating temperature	0°C to 40°C
Storage temperature	0°C to 85°C
Shell dimensions	5.0 x 2.75 x 1.25 inches (127 x 69.85 x 31.75 mm)
Weight	3.6 ounces (102.06 grams)
Compatible with controller and memory boards (CMBs)	MMCCMB1200, MMCCMB2080, MMCCMB2102, MMCCMB2103, MMCCMB4301
Compatible with evaluation boards (EVBs)	MMCEVB1200, MMCEVB2080, MMCEVB2103

2 TARGET HOOKUP

Figure 2 shows how to hook up your 14EBDI.

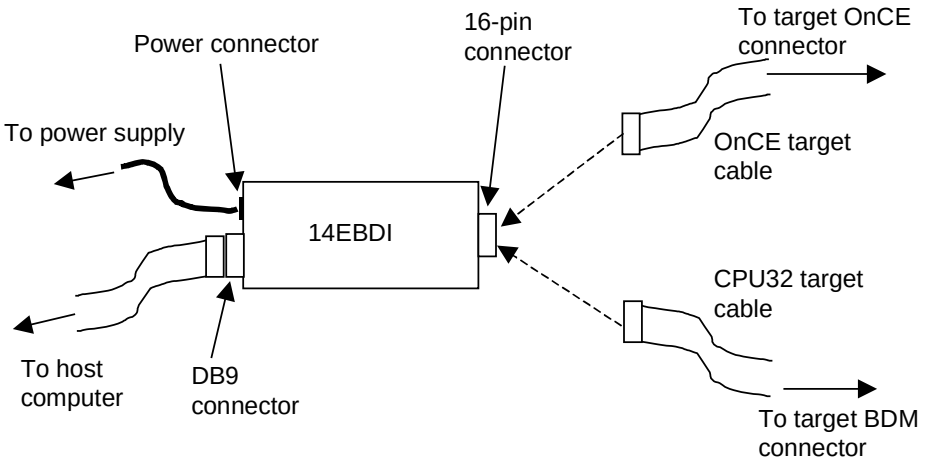

Figure 2. Hookup Diagram

CAUTION

Turn off 14EBDI and target system power when connecting or disconnecting the target cable. Sudden power surges could damage 14EBDI or target system integrated circuits.

Follow these steps to make connections:

1. Turn off target-system power.
2. Connect the communications cable between the 14EBDI D-shell connector and the host computer EIA-232 serial port. (If the computer serial port is a 25-pin connector, use a 9-to-25-pin adapter.)
3. **For an M•CORE target:** Connect the 16-pin end of the OnCE target cable to the 14EBDI. Then connect the 14-pin end of the cable to the OnCE connector of the target system or development system.
4. **For a CPU32 target:** Connect the 16-pin end of the CPU32 target cable to the 14EBDI. Then connect the 10-pin end of the cable to the 10-pin header of the target system
5. If the target does not supply at least 4.5 volts, connect the external power supply to the 14EBDI and the power outlet. (This may require reconfiguring the power supply to match your national electrical standards.)
6. Turn on target-system power. This completes the hookup. You may begin code development activity per your software's user's manual.

3 PIN ASSIGNMENTS AND SIGNAL DESCRIPTIONS

Your 14EBDI connects to an M•CORE target system through a 14-pin OnCE connector. It connects to a CPU32 target system through a 10-pin BDM port connector.

3.1 ONCE CONNECTOR

Figure 4 shows the pin assignments for the OnCE debug port connector of an M•CORE target system. (The marking on the connector identifies Pin 1.) Table 2 lists the signal descriptions for such a connector and the 14EBDI OnCE target cable.

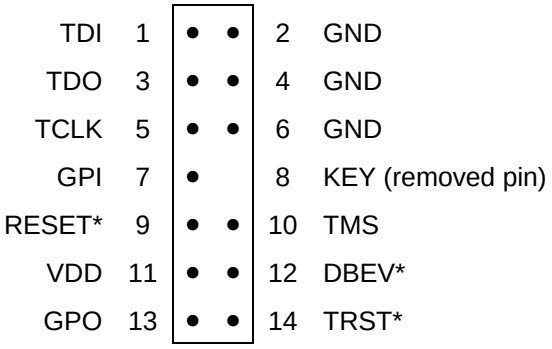

Figure 4. OnCE Connector Pin Assignments

Table 2. 14EBDI OnCE Connector Signal Descriptions

Pin	Name	Function
1	TDI	TEST DATA IN — Serial data input signal for OnCE debug logic.
2,4,6	GND	GROUND — Power and signal return.
3	TDO	TEST DATA OUT — Serial data output signal for OnCE debug logic.
5	TCLK	TEST SERIAL CLOCK — Clock input signal for OnCE debug logic.
7	GPI	GENERAL PURPOSE INPUT — General data input to the target.
9	RESET*	RESET — Active-low, bidirectional signal to reset the system.
10	TMS	TEST MODE SELECT — Input pin used to sequence the OnCE controller state machine.
11	VDD	Power supply — Interface operating power (not used for low-voltage or separate power hookups).
12	DBEV*	DEBUG EVENT — Active-low, bidirectional signal to force the target into debug mode. The target processor can also pull this signal low to indicate that it has entered debug mode.
13	GPO	GENERAL PURPOSE OUT — General data output from the target.
14	TRST*	TEST RESET — Active-low signal to reset the OnCE state machine and debugging logic.

3.2 BDM CONNNECTOR

Figure 5 shows the pin assignments for the BDM connector of a CPU32 target system. (The marking on the connector identifies pin 1.) Table 3 lists the signal descriptions for such a connector and the 14EBDI 10-pin CPU32 target cable.

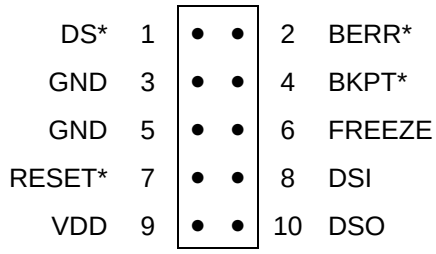

Figure 5. BDM Connector Pin Assignments

Table 3. BDM Connector Signal Descriptions

Pin	Name	Function
1	DS*	DATA STROBE — Active-low output signal. During a read cycle, indicates that an external device should place valid data on the data bus. During a write cycle, indicates that valid data is on the data bus.
2	BERR*	BUS ERROR — Active-low input signal of an invalid bus operation attempt.
3, 5	GND	GROUND — Power and signal return.
4	BKPT* DSCLK	BREAKPOINT — Active-low input signal that signals a hardware breakpoint to the CPU; DEVELOPMENT SERIAL CLOCK — Clock input signal for background debug mode.
6	FREEZE	FREEZE — Signal that the CPU has acknowledged a breakpoint.
7	RESET*	RESET — Active-low, bi-directional signal to reset the system.
8	DSI	DEVELOPMENT SERIAL IN — Serial data input signal for background debug mode; INSTRUCTION FETCH for CPU32-based MCUs.
9	VDD	VOLTAGE DRAIN — DRAIN — Interface operating power (not used for low-voltage or separate-power hookups).
10	DSO	DEVELOPMENT SERIAL OUT — Serial data output signal for background debug mode.; INSTRUCTION PIPE for CPU32-based MCUs.

4 SELFTEST AND LED INFORMATION

When you apply power to the 14EBDI, it runs a built-in selftest. The LEDs indicate the condition of the 14EBDI. To run the 14EBDI selftest:

1. Make sure that the 14EBDI is *not* connected to a target, and that it is *not* connected to the host computer.
2. Apply power to the 14EBDI
3. Examine the LEDs. If the 14EBDI is operating properly,
   - The low-power LED is off,
   - The status LED blinks every one or two seconds, and
   - The target LED is off.

As you use the 14EBDI, the LEDs convey other status information, which Table 4 explains.

Table 4. LED Status Indications

LED State	Meaning	Corrective Action
Status LED blinks every one or two seconds.	If connected to a PC host computer: the 14EBDI is idle, ready for connection to the debugger.	None — This is a normal condition.
	If not connected to a host computer: corrupted firmware.	Contact Motorola customer service.
Status LED stays lit without blinking.	If connected to a Solaris host computer: the 14EBDI is idle, ready for connection to the debugger.	None — This is a normal condition.
Status LED blinks quickly and erratically.	The 14EBDI is receiving data from the host computer.	None — This is a normal condition.
Status LED goes off for extended periods of time.	The 14EBDI is executing a command.	None — This is a normal condition.
Status LED blinks, but low-power LED is on.	Marginal power.	Verify the voltage and current of power supplied to the 14EBDI.
Status LED off, low-power LED on.	Insufficient power.	Supply power in the range 4.5-to-8 volts, at 0.2 amperes.

Table 4. LED Status Indications (continued)

LED State	Meaning	Corrective Action
All LEDs off	Insufficient power.	Verify that power is getting to the 14EBDI.
	External power has wrong polarity.	Correct the polarity of the external power. (Pin is +, sleeve is -.)
	External voltage is too high; internal regulator shut down.	Supply power in the range 4.5-to-8 volts.
Status LED blinks several times quickly, pauses, then repeats this pattern.	Internal 14EBDI hardware failure.	Contact Motorola customer service.