CME-2107

Single Board Computer for the Motorola MMC2107 M-CORE Microcontroller

xiom
anufacturing

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FEATURES

The CME-2107 is a low cost development system for the Motorola MMC2107 M-Core Microcontroller operating in Single-Chip or 16 bit wide Master (Expanded Bus) modes. This development kit provides software and hardware to evaluate the MMC2107 or to develop custom applications. The system is Plug and Play with the supplied CME-2107 Development Board, Mbug Monitor/Debugger in the on-board firmware memory sockets, 256K x 16 SRAM for program debugging, Serial Cable, 9v 300ma Wall Plug, hardware manual and the Axiom MCORE support CD with PC compatible terminal software, Assembler and C compiler (GNU), programming utilities, and sample software. Features include:

- MMC2107 MCORE Controller
  - 32bit RISC CPU, 33MHz / 33MIPs
  - 128K Byte Flash
  - 8K Byte SRAM
  - Dual SCI
  - SPI
  - 2 Timers w/ Capture, Compare, Pulse count, PWM
  - 8 Channel 10 bit QADC
  - 8 Channel Interrupt / Edge Port
  - Clock Synthesizer (PLL) w/ 4MHz Crystal ref.
- Master and Single-Chip Modes Supported
- Standard fixed memory: 256K x 16 (512KByte) SRAM
- One Pair of Configurable 32pin memory sockets for 32K to 2MByte EPROM (MBUG Installed)
- COM1 - SCI0 w/ RS232 type DB9-S Connection
- COM2 – SCI1 w/ RS232 type DB9-S Connection and TX/RX swap option.
- 16 Bit Data Bus with even/odd 8 bit memory control
- LCD Interface Port w/ Contrast Adj., Memory Mapped (80 or 160 character)
- Keypad Interface Port, up to 16 Keys
- MCU PORT provides digital, timer, and analog I/O
- BUS PORT provides data and address bus I/O or Digital I/O for same ports in Single-Chip Mode.
- CONTROL PORT provides control signals and auxiliary chip select I/O
- OnCE Debug Port
- All I/O connectorized on .1 grid
- Solderless Breadboard and Prototype Areas
- Easy Power Connection and Tap points
- 7 to 20V DC input to 5 and 3.3V Power Supply
- Operating Power: 100ma @ 3.3V
- Board Size: 6.0 x 6.5 inches

Hardware Specifications

Oscillator	4 MHz Ref. Crystal
External Clock	Programmable up to 32 MHz
Operating temperature	0°C to +70°C
Power requirement	7 - 20V DC @ 100 ma Typical

GETTING STARTED

This section assumes that you have just received your board from the manufacturer. If this is not the case then jumpers and switches may have been changed so that the board may not function as expected. In this case, see the "Jumpers and Switches" section of this manual and return everything to "default" positions before proceeding.

To get started quickly, perform the following test now to make sure the board is working correctly:

1. Connect one end of the supplied 9-pin serial cable to a free COM port on your PC. Connect the other end of the cable to the COM-1 port on the board.
2. Run a standard ANSI terminal communications program set to 19200 baud, N,8,1. Any terminal program will work, including the simple terminal that comes with MS Windows. Installing the AxIDE terminal on the CD will provide additional terminal features.
3. Apply power to the board by plugging in the 9V transformer that came with the system.
4. If everything is working properly, you should see the utilities menu on in your terminal, similar to the following:

```
M     M
MM   MM
M M M M
M  M  M
M     M bug

Version: 1.6b

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Reset Source was:
    Power on Reset

Mbug >>
```

Your board is now ready to use. If you do not see the menu, press then release the RESET button on the board. If still no go, verify that MAP_SWITCH 5 is on and 1 is off. If you see garbage on your terminal, the COM settings are probably not correct. Your terminal program should be set to 19200 baud. See the **TROUBLESHOOTING** section of this manual for more help.

Program Memory Addressing

When debugging your software using Mbug or a source level debugging tool you should locate your code to start at a valid RAM address. This will most likely be **0x8080 0000** for CS1 if using Mbug with the default switch settings.

You can also change the switch settings to map external RAM to **0x8000 0000** for CS0 if using a ONCE debugger for full featured debugging, including interrupts.

When you're ready to write your program to flash memory, you should change it's starting address to **0x0000** and re-compile it. This will be the location of your Text or Code section. Your Data and Stack sections should remain in RAM. You can use external or internal (On-Chip) RAM or both. See the Memory Map for more information.

Using the Mbug Monitor

The Motorola Mbug Debugger is programmed into the EEPROM's in sockets U4/U5. This is a simple interactive Monitor / Debugger that can be accessed via any ASCII terminal program and a serial cable connected to COM-1.

Mbug uses a command line interface where you type commands with parameters to view and modify memory. You can load and execute programs, set breakpoints and examine code, data and registers.

Mbug should start automatically when power is applied to the board. See "Getting Started" above fore more information. Type MENU at the Mbug >> prompt to see a list of commands. For complete operating instructions and command descriptions, see the Mbug Users Guide provided on the CD.

Following is a quick command reference for Mbug:

About	About...
As	Assemble
Br	Breakpoint Set
Br	Breakpoint List
Nobr	Breakpoint Delete
Da	Define Alias
Ds	Disassemble
Dl	Download
Go	Go
Help	Help
Log	Log session
Menu or '?'	Menu
Md	Memory Display
Mdh	Memory Display Halfword
Mdb	Memory Display Byte
mf	Memory Fill
mm	Memory Modify
mmh	Memory Modify Halfword
mmb	Memory Modify Byte
mv	Memory Move
ms	Memory Search
rd	Register Display
rm	Register Modify
ra	Run Alias
si	Set Input
tm	Transparent Mode
tr	Trace
ver	Verify download
.	Repeat last command

Type Help followed by the command name for additional information.

Writing to the Flash Memory

Before writing your program onto the Flash Memory you should first relocate your program to the address 0x0000 which will allow it to boot (see the Memory Addressing section). Return the switch settings to default modes to get the Mbug prompt (see "Getting Started") then follow these steps to write your program to On-chip flash memory:

1. At the Mbug prompt type:

   `go 80010000`

   You should see the "Axiom CME-2107 Utilities" menu.

2. Select 'E' to erase the flash. After about 5 seconds the Flash memory will be erased.

3. Select 'P' to begin writing the flash. You will be prompted to send your program to the board.

4. Upload your program in Motorola S-Record format to the board now. This should be done in TEXT mode if given the option by your terminal program, for example: "Send Text File" under Windows Hyperterminal. **NOTE**: You should enable the "wait for reply character" or add pacing delay so lines aren't sent too fast for the programmer to keep up.

5. When your file has completed uploading, you should see the "Finished Programming" message followed by the menu again. If you receive errors or other problems, see the TROUBLESHOOTING section of this manual.

6. To test your program, remove power from the board and move MODE_SWITCH 1 OFF. Your program should start when you re-apply power.

NOTE: Moving MODE_SWITCH 1 OFF also disables the RESET button. An alternate method is to move MODE_SWITCH 7 OFF, 2 and 3 ON. This allows the RESET button to function normally.

To return to MBug, simply move the MODE_SWITCH back to it's default positions (**1** and **7 ON** the rest OFF) and press RESET or re-apply power.

MEMORY MAP

0000 0000	External RESET Vector with /MOD asserted
0000 0004	128K On-chip Flash 00000 – 1FFFF
0080 0000	8K On-Chip RAM 800000 – 801FFF 80:0800 – 80:1FFF used by Mbug
00C0 0000	On-chip peripherals See MMC2107 Technical Reference Manual
8000 0000	**CS0** **EPROM** (U4/5) with MAP_SWITCH **5** ON (default) **RAM** with MAP_SWITCH **1** ON
8080 0000	**CS1** **RAM** with MAP_SWITCH **2** ON (default) **EPROM** (U4/5) with MAP_SWITCH **6** ON
8100 0000	**CS2** **RAM** with MAP_SWITCH **3** ON **EPROM** (U4/5) with MAP_SWITCH **7** ON

8180 0000	**CS3** – Peripherals
8180:0000	XCS0 Aux. Peripheral Chip Selects
8180:0010	XCS1
8180:0020	XCS2
8180:0030	XCS3
8180:0040	XCS4
8180:0050	XCS5
8180:0060	XCS6
8180:0070	XCS7 LCD PORTS

8200 0000 FFFF FFFF	Unused

JUMPERS and SWITCHES

MAP_SWITCH

These switches control the device selection for Memory and Peripheral devices. Changing these switches will change the addresses assigned to the memory devices. See the "**Memory Map**" section in this manual for addressing.

	Default	
1	OFF	On enables CS0 to External RAM (U2)
2	**ON**	On enables CS1 to External RAM (U2)
3	OFF	On enables CS2 to External RAM (U2)
4	OFF	On enables CS3 to External RAM (U2)
5	**ON**	On enables CS0 to External EEPROM (U4/5)
6	OFF	On enables CS1 to External EEPROM (U4/5)
7	OFF	On enables CS2 to External EEPROM (U4/5)
8	**ON**	On enables CS3 to Peripheral Chip Selects 0-7

MODE_SWITCH

	Default			
1	**ON**	On enables the external CONFIG word		
2	OFF	On = Single Chip mode Off = Master Mode		
3	OFF	On = 32-bit internal boot Off = 16-bit external boot		
4	OFF	On = Default Strength I/O Drive Off = Full Strength I/O Drive		
5	OFF	off	off	crystal w/ PLL on
6	OFF	on	off	ext. clock w/ PLL on
		x	on	with JP1 ON - ext. clock w/ PLL = 1:1 mode
		x	off	with JP1 OFF - ext. clock NO PLL
7	**ON**	Off = Enable 2107 Internal Flash On = Disable 2107 Internal Flash		

Board Jumpers

		Default
JP1	VDDsyn enable, off for ext. clock and no PLL support	ON
JP2	LCD Module voltage polarity select	ON / ON
JP3	On enables COM1 RXD1 to 2107	ON
JP4	On enables COM1 TXD1 to 2107	ON
JP5	On enables COM2 RXD2 to 2107	ON
JP6	On enables COM2 TXD2 to 2107	ON
JP7	COM2 RXD /TXD swap (pins 2 and 3 on COM2)	ON / ON, same as COM1

MEM-0PT Jumpers

Device selection for EPROM memory sockets (U4 and U5)

1	2	3	4	5	Device Type	
X		X	X	X	27256 / 512	32K / 64K Byte devices – **Default**
X	X		X	X	27010 – 080	128K – 1M Byte devices

MEM-VOLT Jumper

Selects U4/U5 memory device operating voltage – +3.3 or +5 Volt. 3.3V devices recommended (default).

PORTS and CONNECTORS

- The **BUS_PORT** supports off-board memory devices by bringing out the address and data bus pins.
- The **CONTROL_PORT** supports off-board memory and peripheral devices.
- The **MCU_PORT** provides access to the peripheral features and I/O lines of the 2107

All pins are labeled on the board. See the MMC2107 Reference Manual for detailed peripheral and pin information.

LCD-PORT

The LCD Port provides a versatile connector to attach 80 character display modules, 160 character display modules, and some graphics display modules with embedded drivers. The Programmable Logic Device provides address decode and LCD select control signals for the LCD port. The LCD ports are controlled by chip select CS3 when enabled by MAP_SWITCH 8 ON.

The interface supports all OPTREX™ DMC series displays up to 80 characters and provides the most common pinout. Power, ground, and Vee are also available at the LCD-PORT connector. LCD-Vee is adjusted by the CONTRAST Potentiometer (adjustable resister) next to the port.

USE CAUTION: when connecting your LCD to the LCD-PORT - make sure the power signals match the end of the cable from the LCD module.

The LCD-PORT is memory map offset 0x7E from the CS3 base address.

See the file LCD.C for an example program and more information using this connector.

KEYPAD Connector

The KEYPAD connector is a passive 8-pin connector that can be used to connect a 4 x 4 matrix (16 key) keypad device.

1	PE0
2	PE1
3	PE2
4	PE3
5	INT0
6	INT1
7	INT2
8	INT3

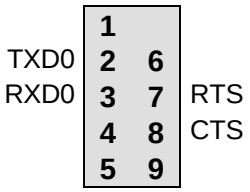
The connector is mapped to 2107 I/O ports as shown . This interface is implemented as a software keyscan. Pins PE0-3 are used as column drivers which are active high outputs. Pins INT0-3 are used for row input and will read high when their row is high.

See the file **KEYPAD.C** for an example program using this connector.

See the MMC2107 Reference Manual for a full description of these pins.

COM-1

The COM-1 port has a Female DB9 connector that interfaces to the MMC2107 internal **SCI1** serial port. It uses a simple four wire asynchronous serial interface with hard wired Clear to Send (CTS) and Request to Send (RTS). These two logic level signals are coupled thru a RS232 level shifter to the COM1 connector.



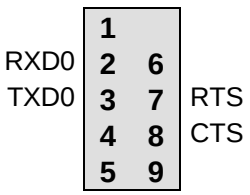
COM-1 is the default serial interface for the M-Bug Debugger.

See also Jumpers 3 and 4.

Pins 1,4 and 6 = default DTR, DSR handshake. Pin 7 = Request to send input, Pin 8 = clear to send output.

COM-2

The COM-2 port has a Female DB9 connector that interfaces to the MMC2107 internal **SCI2** serial port. It uses a simple four wire asynchronous serial interface with hard wired Clear to Send (CTS) and Request to Send (RTS). These two logic level signals are coupled thru a RS232 level shifter to the COM2 connector.



See also Jumpers 5, 6 and 7.

Pins 1,4 and 6 = default DTR, DSR handshake. Pin 7 = Request to send input, Pin 8 = clear to send output. These 2 pins are shorted. NOTE also that RXD0 and TXD0 are swapped on this port.

POWER PORT

GND	1
+V	2
+5v @ 100ma	3
3.3v @ 50ma	4
VSTBY	5

The POWER PORT is an Alternate Power connector. This can be used either as an input power supply to the board or to supply power to external devices.

ONCE Port

The ONCE Port connector can be used to connect OnCE standard debug hardware – such as a Motorola EBDI.

TROUBLESHOOTING

- Make sure all the jumpers and switches are set correctly on the board. If 2 devices are set to the same Chip Select, one of them will not work. If you change the installed EEPROMS in U4/U5 you may need to change the MEM-OPT jumpers accordingly.
- Verify the power supplied to the board, the cable connections and the serial port settings on your terminal program.
- When setting up your terminal program, if options exist - Flow Control should be set to HARDWARE, Emulation should be ANSI and upload (send file) mode should be Text.
- If uploading software fails – try adding pacing delay's. 1 or 2 ms for example. This is an option in the AxIDE terminal upload dialog box.
- For the latest software and documentation updates for this board, see the manufacturer's web site at: **www.axman.com.**