

# MPC562BC (Badge Card)

Evaluation Board for the Motorola MPC562 Microcontroller

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## Users Manual

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# CONTENTS

<b>CAUTIONARY NOTES</b> .....	<b>3</b>
<b>FEATURES</b> .....	<b>4</b>
BLOCK DIAGRAM.....	5
<b>GETTING STARTED</b> .....	<b>6</b>
REFERENCE DOCUMENTS.....	6
TERMINAL SETTINGS.....	7
SOFTWARE DEVELOPMENT.....	7
APPLYING A BDM CABLE.....	7
TUTORIAL.....	8
<i>Using the Debug Monitor</i> .....	8
EXAMPLE:.....	8
<b>DEBUG MONITOR COMMANDS</b> .....	<b>9</b>
<b>MEMORY AND DEFAULT MEMORY MAP</b> .....	<b>10</b>
MPC562BC MEMORY MAP.....	10
FLASH MEMORY.....	10
<b>OPTION JUMPER AND SELECTIONS</b> .....	<b>11</b>
JP3 OPTION JUMPERS.....	11
<i>BRK_EN Option</i> .....	11
<i>BDM Port Interface Level</i> .....	11
<i>CFG 1 – 5: External Reset Configuration Word (RCW) Options</i> .....	11
<b>I/O PORTS AND OPTIONS</b> .....	<b>12</b>
COM1.....	12
<i>AT1/2, AR1/2 - SCI Channel to Serial Port Configuration</i> .....	12
CAN PORT AND OPTIONS.....	12
PWR JACK, POWER PORT AND POWER OAK SUPPLY.....	13
<i>Power Port Connections</i> .....	13
<i>ON Option</i> .....	13
<i>PWR Jack</i> .....	13
POWER OAK OPTIONAL OUTPUTS.....	14
TPU_PORT.....	14
MGPIO_PORT.....	14
TIMER_PORT.....	15
QADC_PORT.....	15
QSM_PORT.....	15
OUTPUT PORT, MC33291DRIVER, AND LED1 > 8 INDICATORS.....	16
USER SWITCHES 1 > 4.....	16
<b>TROUBLESHOOTING</b> .....	<b>17</b>

## Specifications

Clock	56 MHz Maximum (default), 4Mhz reference
Operating temperature	0°C to +70°C
Power requirement	7 – 26V DC, 12VDC @ 200 ma Typical
Power output	5.8V @ 1.5A output with 5V, 3.3V, and 2.6V regulated supplies
Board Size	3.50 x 5.00 inches, 6 layers

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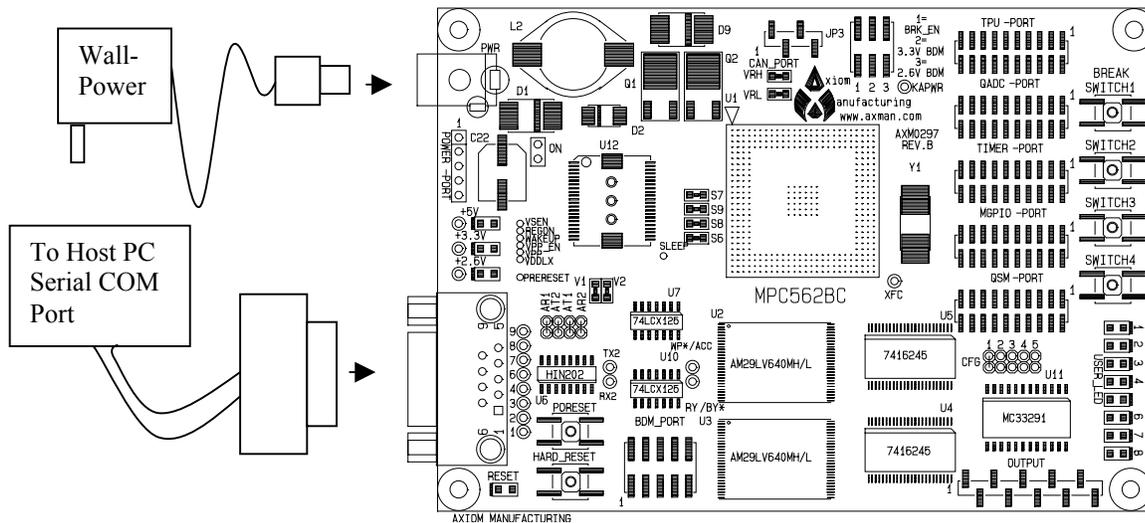
### EMC Information on MPC562BC

1. This product as shipped from the factory with any associated power supplies and cables, has not been tested to meet the requirements of any regulatory standards.
2. This product is designed and intended for use as a development platform for hardware or software in an educational or professional laboratory.
3. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
4. Anti-static precautions must be adhered to when using this product.
5. Attaching additional cables or wiring to this product or modifying the products operation from the factory default as shipped may effect its performance and also cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

**\*\*\*\* ESD PRECAUTIONS ARE REQUIRED WHEN HANDLING THIS PRODUCT \*\*\*\***

# Features

The MPC562BC Badge Card is an evaluation board for the Motorola MPC562 PowerPC microcontroller. The board provides for evaluating target applications applied to MPC562 microcontroller. The evaluation system is Plug and Play with the supplied Debug Monitor firmware in the on-board 16M Byte flash memory. Other features include the Power Oak MPC500 series companion power supply, RS232 and CAN communication ports, a MC33291 driver with Output port, and User Switches and Indicators. The kit version provides Serial Cable, Wall Plug power source, printed hardware manual, and the MPC5xx support CD with example software, support software, GNU C/C++ compiler, and technical manuals. For MPC562 hardware or software Development support refer to the MPC564EVB, CME564, or CMD-562 development boards. Note: The MPC564 is identical in operation and features to the MPC562 but also provides internal flash memory.

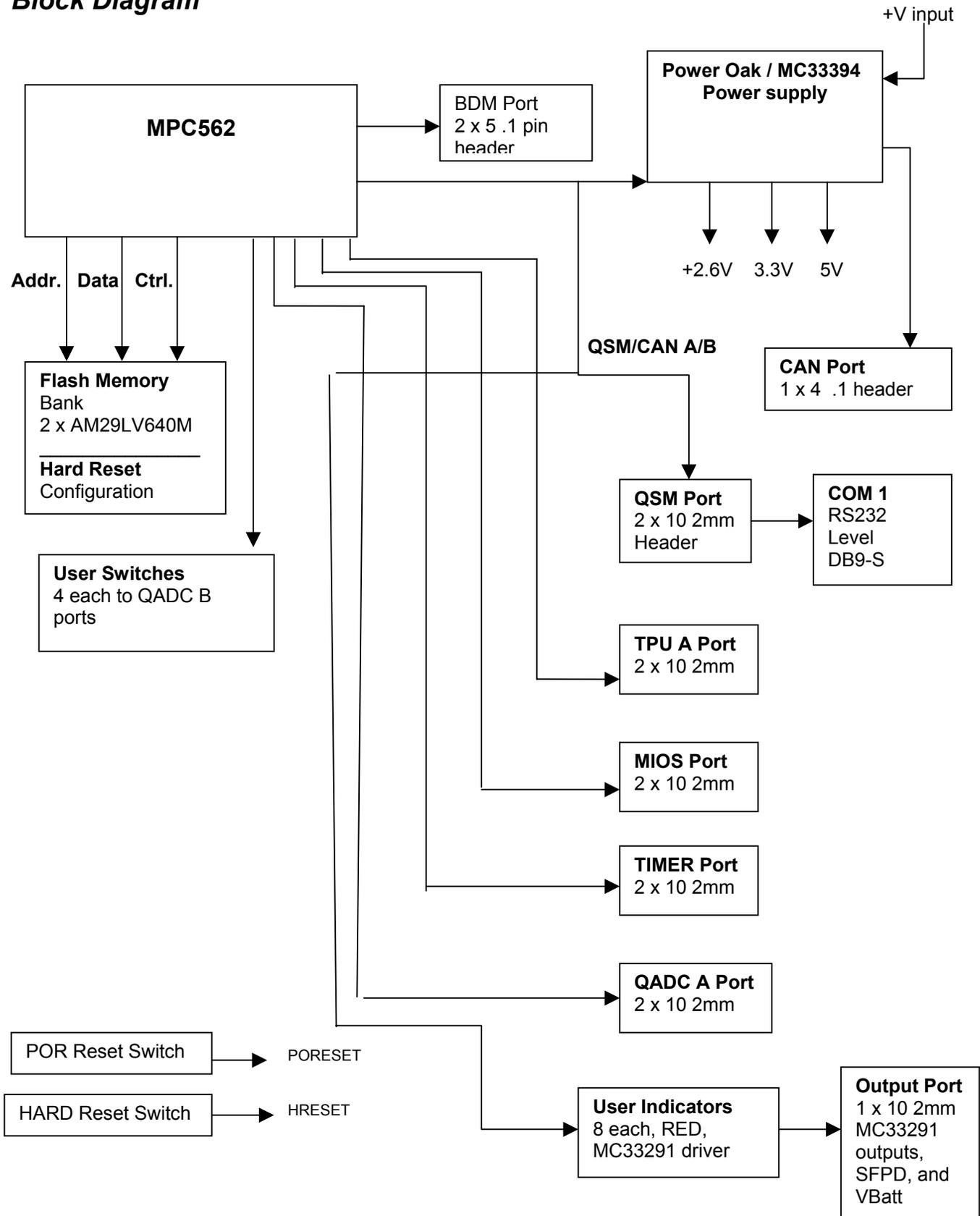


MPC562BC

## MPC562 Badge Card Features (MPC562BC)

- **MPC562** Microcontroller capable of 56Mhz operation
- **4Mhz reference oscillator**
- **Flash Memory**, 4M x 32 (2 x AMD AM29LV640M)
- **Power Oak** (MC33394) Power supply w/ CAN\_A transceiver, QSPI\_A controlled.
- **BDM** Development Port, 10 pin standard with 3.3 or 2.6V optional I/O.
- **COM1** - SCI\_1 w/ RS232 type DB9-S Connection
- **CAN\_A Port** - 1 x 4 header with CAN\_A channel from Power Oak transceiver
- **QSM Port** - 2 x 10 pin 2mm header with QSM and CAN I/O
- **MIOS Port** - 2 x 10 pin 2mm header with MGPIO digital I/O.
- **TIMER Port** - 2 x 10 pin 2mm header with MDA and PWM I/O.
- **TPU\_A Port** - 2 x 10 pin 2mm header with Timing Processor I/O.
- **QADC\_A Port** - 2 x 10 pin 2mm header with Analog I/O.
- **OUTPUT Port** - 1 x 10 pin .1 inch header with MC33291 outputs, QSPI\_A controlled.
- **POWER Port** – no header, Power supply access.
- **Power Indicators** - Supply voltage indications for 5, 3.3, and 2.6V supplies
- **Reset Switches** - POR and Hard reset buttons.
- **User Components:**
  - 8 indicators, Output port controlled or by user connections to I/O.
  - 4 push switches, QADC\_B inputs, SW1 option for Monitor Abort or Break function.
- **Debug Monitor** firmware installed in flash.
- **Hard Reset** configuration is fixed, No bus access by header pins.

### Block Diagram



# Getting Started

This section assumes that you have just received your board from the manufacturer. If this is not the case then options may have been changed so that the board may not function as expected. See the "Option Jumper and Selections" section of this manual and return 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 a standard 9-pin serial cable to a free COM port on your PC. Connect the other end of the serial cable to the Serial connector on the board. See FEATURE view for example of cable installation.
2. Install from the MPC5xx support CD and launch the provided terminal software AXIDE or run a standard ANSI terminal communications program set to 19.2K baud, N,8,1. Any terminal program will work, including the simple terminal that comes with MS Windows (HyperTerminal).
3. Launch the AXIDE program and select "√" check mark tool button. Set the baud rate to 19.2K and enable the XON /XOFF controls. Note that the XON/XOFF flow controls are required with the monitor on this board.
4. Connect the +12VDC wall plug power supply or other power source to a wall outlet and then install the power plug into the MPC562BC power jack. Observe the +5V, +3.3V, and +2.6V Voltage Indicators on the board for all on. If any indicators are not lighted, remove and reapply the power plug into the power jack.

Notes:

- 1) The Power Oak supply may fault on the ground bounce induced by the application of power the first time.
- 2) If you are applying a BDM cable, see the "Applying a BDM Cable" chapter in the manual.
5. Press the PORESET button (RESET indicator should light). If everything is working properly, you should see the dBUG monitor prompt, similar to the following:

```
Part Number: 0x36
```

```
MaskNum: 0x10
```

```
Copyright 1995-2002 Motorola, Inc. All Rights Reserved.
```

```
MPC562 MPC562BC Firmware v3b.1a.1a (Build XXX on XXX XX 20XX xx:xx:xx)
```

```
Enter 'help' for help.
```

```
dBUG>
```

Your board is now ready to use! If you do not see the monitor prompt, press then release the PORESET button on the board again and verify the RESET indicator did light during the switch press. If the text is corrupt, verify host software serial settings, connections and PC COM port operation. See the **TROUBLESHOOTING** section of this manual if operation is questionable.

## Reference Documents

The Provided MPC5xx support CD contains many documents that the user will find valuable during development. Following is a partial list:

```
/Documents/boards/MPC562BC/MPC562BC_man.pdf
/Documents/boards/MPC562BC/MPC562BC_dBUG_V0.pdf
/Schematics/MPC562BC/MPC562BC_SCH_a.PDF
/Documents/Manuals/MPC561-4/START.pdf
/Documents/components/PC33394_P24.pdf
/Documents/components/AM29LV640MH.pdf
/Documents/components/MC33291.pdf
```

```
MPC562BC board user manual
dBUG monitor manual for the MPC562BC board version.
MPC562BC rev A schematic diagrams.
MPC562 Microcontroller Device user guide
MC33394 Power Oak device data sheet
AM29LV640ML Flash memory device data sheet.
MC33291 Driver device data sheet
```

## **Terminal Settings**

The utility software provided uses the serial port connected to your PC running a terminal program as described under "Getting Started". While you can use almost any commercial or free serial communications terminal interface, it is important that you configure it to work properly with this board. The following settings are important:

1. BPS: 19.2K baud, Data Bits 8, Parity none, Stop Bits 1
2. Flow Control should be set to SOFTWARE or XON/ XOFF method to support this monitor.
3. Emulation should be ANSI
4. When uploading files to the board, be sure to send in Text mode.
5. When programming FLASH type memory, you must use the XON / XOFF flow control.

The free terminal program that works well with this board called "AXIDE" is provided on the support CD. It is also available for download from the manufacturers web site at [www.axman.com](http://www.axman.com).

## **Software Development**

The provided monitor software initializes the clock to run this board at 56 MHz and configures the SCI1 baud rate to 19.2K baud at this clock frequency. The default clock frequency is 20Mhz from Hard Reset condition. User can set the clock frequency by changing the PLL Registers of the MPC562 in the initialization software. Software operated under the monitor's control should not change the clock setting or baud rate unless necessary. Changing the baud rate or clock setting will effect the monitor's communication and may require application of Reset to recover the monitor.

The MPC562BC is best applied with operating evaluation software that will exercise different features of the MPC562 device. The **dBUG** Monitor installed will provide supervision of loading and executing software examples.

## **Applying a BDM Cable**

The MPC562BC board is not recommended for BDM tool assisted software development and debugging. The BDM port is provided primarily to initialize and test the board at the factory. The user may apply BDM based tools to the board without warranty or support. The following notes apply to BDM operation on the MPC562BC board:

- 1) Power Sequencing: The BDM cable should only be installed while the MPC562BC board is not powered. If the MPC562BC board is powered off, the BDM cable should be removed and reapplied prior to applying power to the MPC562BC board again.
- 2) JP3 = 3.3V BDM: Some BDM cables may prevent proper power up by the Power oak power supply device when the JP3 BDM voltage selection is set to the 3.3V position. The trouble symptom in this case is that power is applied to the MPC562BC board but the voltage indicators will not light and no voltages are available. The cure to this problem is to remove the JP3 = 3.3V BDM option jumper prior to applying power to the MPC562BC board with the BDM installed. After power-up, install the JP3 = 3.3V BDM option jumper and press the PORESET button once. This problem should not occur in the JP3 = 2.6V BDM option setting if correct sequencing of connections and power are performed.
- 3) User Memory space: The BDM environment user memory space is limited to the MPC562 internal SRAM memory from 0x3F8000 > 0x3FFFFFF. The BDM will not be able to load the external flash memory unless it has utilities to perform a parallel 2 x 16 bit wide flash memory programming operation. BDM code execution control may not operate in the external memory space unless hardware breakpoint features are provided.

## Tutorial

The following brief tutorial will help you become familiar with software development on this board quickly.

### Using the Debug Monitor

This board ships with a **dBUG** monitor installed in the flash memory. See the **dBUG** Monitor manual provided on the support CD for complete commands and instructions, see the reference document list for the CD location.

Applying the monitor program and any serial communications terminal program, it is possible to display and modify memory and registers on the board from any host PC. Debug operations are also supported such as loading object code and symbols, stepping or tracing code operation, and setting breakpoints to halt execution at a certain point. These are performed by typing commands into the terminal program on the PC. Type help at the **dBUG** command prompt and hit <enter> for a complete list of available commands.

Experiment with some of the commands like reading (MD) and modifying (MM) memory. Make sure that memory space being manipulated is mapped to valid addresses or the monitor program will perform an exception process. When applying the monitor be aware that it also requires resources for operation such as memory and the serial port. Review the Memory map section to identify User space and Monitor memory space. Note that User SRAM memory is provided from 0x3FA000 to 0x3FFFFFF. The monitor program applies SRAM from 0x3F9800 - 0x3F9FFF for its own use. If the monitor ram memory region is modified while the monitor is operating, it may require a RESET sequence. The monitor will also apply the external flash memory for user code space from 0xFF00 0000 to 0xFFEF FFFF and monitor space from 0xFFFF 0000 to 0xFFFF FFFF.

### EXAMPLE:

A simple "hello world" program example is provided on the CD in the \Examples\MPC562BC directory. Follow these steps to load and execute the example from internal RAM using the **dBUG** monitor program:

1. At the monitor prompt **dBUG>** type **DL** and hit <enter>.
2. Select the **AXIDE Upload** button (or send text file command from your terminal program) and locate the file named "**HELLO\_R.S19**" included on the support CD in the \Examples\MPC562BC directory. Send this file to the board.
3. When finished uploading, type **go 3FA004** at the command prompt. You should see the phrase "Hello World!" echoed back to the screen, which is all that this simple test program does, each time you hit a key.
4. To exit from this test program, hit a RESET button on the board.

This example program was compiled with the Diab Data compiler. The source files and scripts used are included on the support CD as follows:

HELLO.C	Main source code file
SERIAL.C	Serial port I/O and ASCII text conversion routines
HELLO_R.DLD	Diab Linker script - specifies the programs memory organization
HELLO_R.BAT	DOS batch file used to build the program

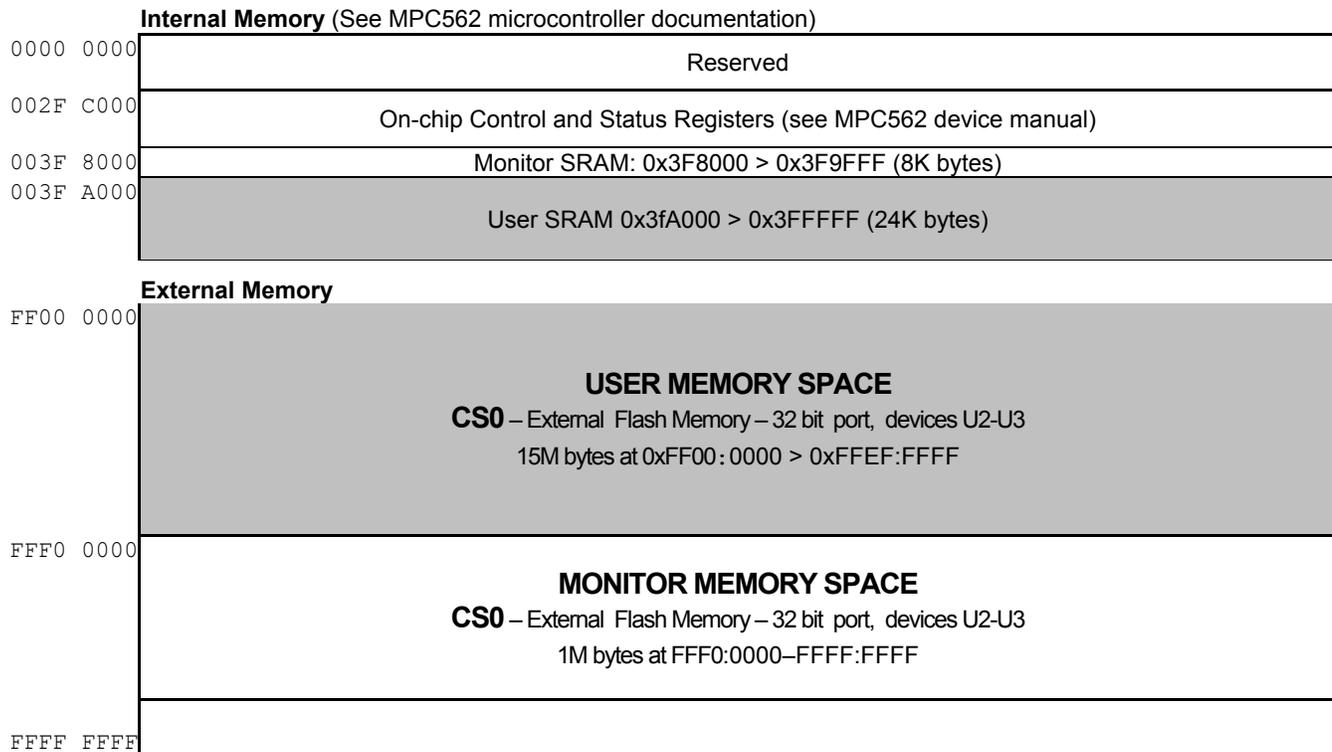
# dBUG Monitor Commands

MNEMONIC	SYNTAX	DESCRIPTION
ASM	asm <<addr> stmt	Assemble
BC	bc addr1 addr2 length	Block Compare
BF	bf <width> begin end data <inc>	Block Fill
BM	bm begin end dest	Block Move
BR	br addr <-r> <-c count> <-t trigger>	Breakpoint
BS	bs <width> begin end data	Block Search
DC	dc value	Data Convert
DI	di<addr>	Disassemble
DL	dl <offset>	Download Serial
DLDEBUG	dldbug	Download Debug Update
FL	fl <command> dest <src> size	Flash Load or erase
GO	go <addr>	Execute
GT	gt addr	Execute To
HBR	hbr addr <-r>	Hardware Breakpoint
HELP	help <command>	Help
IRD	ird <module.register> Internal	Register Display
IRM	irm module.register data	Internal Register Modify
LR	lr<width> addr	Loop Read
LW	lw<width> addr data	Loop Write
MD	md<width> <begin> <end>	Memory Display
MM	mm<width> addr <data>	Memory Modify
MMAP	mmap	Memory Map Display
RD	rd <reg>	Register Display
RM	rm reg data	Register Modify
RESET	reset	Reset
SD	sd	Stack Display (contents)
SET	set <option value>	Set Configurations
SHOW	show <option>	Show Configurations
STEP	step	Step (Over)
SYMBOL	symbol <symp> <-a symb value> <-r symb> <-C  s>	Symbol Management
TRACE	trace <num>	Trace (Into)
VERSION	version	Show Version

# Memory and Default Memory Map

The MPC562BC board provides one external memory bank of 16M Byte flash memory. The MPC562 chip select CS0 is applied to the external memory bank. The MPC562BC board requires that start-up code be available in the external memory bank at all times. The Monitor provided will protect itself from being erased or programmed over. User must use caution not to bulk erase the external flash memory devices in user code or the board may become inoperable. In the case of a complete external flash erasure, the BDM must be applied to recover the operation.

## MPC562BC Memory Map



Note: Shaded areas are user memory space.

## Flash Memory

The Flash Memory Bank consists of two Am29LV640M flash memory devices installed as U2 and U3 on the MPC563BC board. These devices require a 32 bit wide port and must be written in 32 bit word size data as two parallel 16 bit devices. Read operations are possible in bytes, half words, or words. Wait states (6) are required to access in asynchronous mode and burst type access is not allowed. Refer to the specific device data sheet and sample software provided for configuring the flash memory.

User should note that the Debug Monitor firmware is installed in these same flash devices and the user must prevent removal of the utility boot block section. Development tools or user application programs may overcome the monitor self-protection and erase or corrupt the Debug Monitor. If the Debug Monitor becomes corrupted and monitor operation is desired, the firmware must be programmed into the flash again by applying a BDM cable and supporting host software. The files required to reload the monitor in the flash erased state are provided on the support CD. User should use caution to avoid the reprogramming of the monitor's situation.

Due to the application of the flash as parallel 16 bit wide devices, the sector size is doubled. Each flash sector is 128K bytes or 0x20000 hex is size. This fact should be noted when applying the **dBUG** monitor FL commands. Following is an example of the USER flash sector size and address locations:

Sector 0 = 0xFF00 0000 > 0xFF01 FFFF

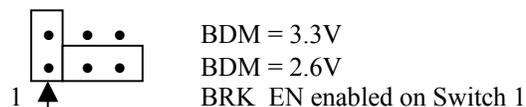
Sector 1 = 0xFF02 0000 > 0xFF03 FFFF

Sector 2 = 0xFF04 0000 > 0xFF05 FFFF ...

Sector 119 = 0xFFEE 0000 > 0xFFEF FFFF

# Option Jumper and Selections

## JP3 Option Jumpers



JP3 Default positions indicated.

### BRK\_EN Option

The BRK\_EN or Break Enable option is provided to allow an IRQ0 NMI interrupt to occur on SW1 being pressed. This feature is provided to support the **dBUG** Monitor ABORT operation to stop user code execution and return to the Monitor command prompt. When the option jumper is installed, depressing SWITCH 1 will cause a low active level to be applied to the MPC562 IRQ0/NMI.

### BDM Port Interface Level

JP3 provides the option of 2.6V or 3.3V interface levels on the BDM port. This allows the use of legacy MPC555 BDM tools on the MPC562. The option is set for 2.6V interface from the factory. See the Applying a BDM Cable section of this manual for other notes.

### CFG 1 – 5: External Reset Configuration Word (RCW) Options

CFG1, 2, 3, 4, and 5 provide the user access to 5 of the external Reset Configuration Word (RCW) bits not normally required for default MPC562BC operation. The CFG1 option is connected by default to move the Reset and interrupt vector table to the 0xFFFF0000 base address for **dBUG** monitor operation. CFG1 maybe isolated by cutting the trace between the 2 option pin pads on the top of the board. The CFG2 – 5 options are not connected and defaulted to the 0 level. The user may apply a wire jumper between the 2 pad positions of each CFG1 – 5 option to provide a logic high level on the respective bit position during external RCW operation. Following is the option definition table:

CFG OPTION	MPC562 RCW Bit	Default operation	Option operation
CFG1	IP bit / D1	1 = IP at address 0xFFFF0000	0 = IP at address 0x00000000
CFG2	BDIS / D3	0 = Memory controller active	1 = Memory controller disabled
CFG3	EN_COMP / D21	0 = Code compression off	1 = Code compression on
CFG4	EXC_COMP / D22	0 = Exception compression off	1 = exception compression on
CFG5	DME / D31	0 = dual mapping off	1 = dual mapping on

# I/O Ports and Options

## COM1

COM-1 serial port with female DB9 connector is available for RS232 operation of the MPC562 SCI channel 1. MPC562 SCI channel 2 is provided with RS232 levels at the TX2 and RX@ test Pad locations. COM1 port provides direct connection to a host PC with a straight through type 9 pin serial cable. Following is the standard pin out for the 9 pin serial connector (DB9-S):

DB9-S connections:

- Pin 1, 4, and 6 = group connected for DTR/DSR flow control null back to host
- Pin 2 = TXD output (RS232 level)
- Pin 3 = RXD input (RS232 level)
- Pin 5 = Ground/Vss/Common
- Pin 7 and 8 = group connected for RTS/CTS flow control null back to host
- Pin 9 = open

### Notes:

1. COM ports provide connection pads 1 – 9 behind the DB9 cable connector so the user may modify operation of the serial connections. Each connection pad is numbered for the associated serial connector pin. Each connection pad can be isolated from the others if grouped above, by cutting the associated trace to the pad on the bottom side of the board.
2. RS232 translators available to SCI channel 2 may be applied to the COM port by isolating the MPC562 SCI signals to the RS232 transceiver and applying the associated RS232 level input or output. User should refer to the schematic diagrams of the board to make sure correct signals and connections are isolated and reconnected for the new application.

## AT1/2, AR1/2 - SCI Channel to Serial Port Configuration

The Axx cut-away options provide a means of isolating the individual SCI RXD and TXD signals from the RS232 interface translator device (U6) and COM port operation. This allows the SCI channels to be used for other purposes, possibly on the QSM port connector. Following is a table of the SCI signals and AT/R\_ positions used for enabling RS232 and COM port operation. Note: 2mm pin header maybe installed after cutaways are cut to allow jumper option.

AT_ Position	SCI Channel Signal	RS232 COM Port Connection	COM_PORT Signal Direction to RS232 interface translator
AT1	SCI_A_TXD1	COM-1	Output
AR1	SCI_A_RXD1	COM-1	Input
AT2	SCI_A_TXD2	TX2 Test Pad	Output
AR2	SCI_A_RXD2	RX2 Test Pad	Input

## CAN PORT and Options

The MPC562BC board provides one CAN transceiver with I/O port: CAN\_PORT. The CAN\_PORT is supported by the Power Oak CAN transceiver. The MPC562 CAN\_A port is directly interfaced to the Power Oak transceiver and can not be isolated easily. The MPC562 CAN\_B and C ports are provided on the QSM\_PORT and MGPIO\_PORT respectfully.

**CAN\_PORT:** The MPC562 CAN\_A channel transceiver is provided by the Power Oak (PC33394). This transceiver has software selectable options via the A\_QSPI0 channel which may communicate with the Power Oak device. See the PC33394 data sheet for details. A 4.7K ohm pull-up is provided on the CAN\_A TX signal. Options S6 – S9 are provided near the Power Oak device to allow isolation of the QSPI signals to the Power Oak.

### CAN\_PORT Connector

These ports provide the CAN transceiver input and output connection to the CAN bus. The bias or termination for the CAN bus is provided on the EVB board but not populated. If required, the user must install these components in the RAX, RBx, or RCx locations near the respective CAN port. Following are the pin connections for the ports:

- Pin 1 = CAN-Hi level signal
- Pin 2 = CAN-Lo level signal
- Pin 3 = Ground or common (this is required for proper return path on CAN bus)
- Pin 4 = +5Vsupply for remote use or bias of CAN bus.

### CAN\_PORT Termination Options

The RA1-3 option locations provide the CAN\_PORT with the ability to add bias and/or termination resistance. RA1 location provides low bias (to ground) on the CAN Hi signal. RA3 location provides high bias (to +5V) on the CAN Low signal. RA2 location is 120 Ohms by default and provides termination between the respective CAN Port CAN Hi and CAN Low signals.

### PWR Jack, Power Port and Power Oak Supply

The Motorola MPC5xx Oak series companion power supply Power Oak (PC33394) is provided on the MPC562BC board. This device provides many features designed for automotive application but may also be useful for industrial or general purpose applications. See the PC33394 data sheet on the support CD for full description of features, operation, and capability.

The Power Oak provides a regulated switch mode power source for the 2.6V, 3.3V, and 5V supplies on the EVB board. The basic application of the Power Oak provides the Reset signals, back-up supplies for the KAPWR and IRAMSTBY to the MPC562, and the CAN A port transceiver. Options are available on the board and some under software control via the MPC566 QSPI port to modify the Power Oak application.

The Power Port provides tap points for the power supply outputs from the Power Oak. Following is the Power Port pin assignment:

#### Power Port Connections

PIN	SIGNAL
1	+VIN DC supply
2	+5V
3	+3.3V
4	+2.6V
5	GND

Refer to Power Oak document for application of the provided power sources.

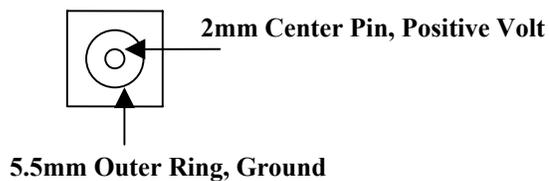
#### ON Option

The ON option provides a constant enable to the VIGN signal so the Power Oak is enabled upon power application. The ON option maybe opened by cutting the trace between the 2 option pads on the top side of the board. This will allow application of the VIGN signal externally with a switch or other source. Basic operation of the VIGN signal is to apply +VIN to enable the Power Oak supplies.

#### PWR Jack

PWR jack connection provides power input from the supplied wall plug power source. Typical input is +12VDC. The PWR jack provides a center positive terminal and ground outside sleeve. The jack accepts 2.1mm inside x 5.5mm outside power plugs.

#### PWR Front View



## Power Oak Optional Outputs

Several test or tap points surround the Power Oak supply to allow the user access to many of the features. Following is the summary table (also refer to MPC562BC schematic sheet 4):

Power Oak Signal	Description
VSEN	Switched +V output, SPI programmable
REGON	Power down control, see PC33394 data
WAKEUP	CAN activity interrupt output
VPP_EN	Enable VPP output
VPP	VPP output, level programmable by SPI.
VDDLX	2.6V low voltage boost enable
SLEEP	Sleep control input, see PC33394 data.

## TPU\_PORT

The TPU (Timing Processor Unit) Ports provide access to the MPC562 TPU A on a 20 pin header. TPU B is not available on the BC board.

### TPU\_PORT connections

SIGNAL	PIN	PIN	SIGNAL
GND	20	19	GND
+5V	18	17	T2CLK
TPU CH15	16	15	TPU CH14
TPU CH13	14	13	TPU CH12
TPU CH11	12	11	TPU CH10
TPU CH9	10	9	TPU CH8
TPU CH7	8	7	TPU CH6
TPU CH5	6	5	TPU CH4
TPU CH3	4	3	TPU CH2
TPU CH1	2	1	TPU CH0

## MGPIO\_PORT

The MGPIO Port provides access to the MPC562 MIOS14 module MGPIO signals on a 20 pin header.

### MGPIO\_PORT connections

SIGNAL	PIN	PIN	SIGNAL
GND	20	19	+5V
IRQ1	18	17	IRQ0
MGPIO15	16	15	MGPIO14
MGPIO13	14	13	MGPIO12
MGPIO11	12	11	MGPIO10
MGPIO9	10	9	MGPIO8
MGPIO7	8	7	MGPIO6
MGPIO5	6	5	MGPIO4
MGPIO3	4	3	MGPIO2
MGPIO1	2	1	MGPIO0

## TIMER\_PORT

The TIMER Port provides access to the MPC562 MIOS14 module MDA and PWM timer signals on a 20 pin header.

### TIMER\_PORT connections

GND	20	19	+5V
MPWM19	18	17	MPWM18
MPWM17	16	15	MPWM16
MPWM3	14	13	MPWM2
MPWM1	12	11	MPWM0
MDA31	10	9	MDA30
MDA29	8	7	MDA28
MDA27	6	5	MDA15
MDA14	4	3	MDA13
MDA12	2	1	MDA11

## QADC\_PORT

The QADC Port provides access the MPC566 QADC\_A port A and B connections on a 20 pin header. QADC\_B port A0 > A3 are applied to the User Switches, all other QADC\_B ports are not available on the BC board.

### QADC PORT connections

SIGNAL	PIN	PIN	SIGNAL
VRL	20	19	VRH
ETRIG2	18	17	ETRIG1
A_PQB7/AN51	16	15	A_PQA7/AN59
A_PQB6/AN50	14	13	A_PQA6/AN58
A_PQB5/AN49	12	11	A_PQA5/AN57
A_PQB4/AN48	10	9	A_PQA4/AN56
A_PQB3/AN3	8	7	A_PQA3/AN55
A_PQB2/AN2	6	5	A_PQA2/AN54
A_PQB1/AN1	4	3	A_PQA1/AN53
A_PQB0/AN0	2	1	A_PQA0/AN52

### VRH and VRL QADC Reference Supplies

MPC562BC cut-away pads VRH and VRL provide connection to MPC562 VDDA and VSSA for the VRH and VRL reference signals respectfully. One or both of these pads may be cut to apply an external reference voltage to the QADC PORT.

## QSM\_PORT

The QSM (Queued Serial Module) Ports provide access to the MPC562 QSM I/O ports, SCI ports, SPI ports, CAN ports and 2 Interrupt signals on a 20 pin header. The signals are provided directly from the MPC562. User should note other connections and options for the communication interfaces mentioned earlier in the manual before applying these ports.

### QSM\_PORT connections

EVB USE	SIGNAL	PIN	PIN	SIGNAL	EVB USE
	GND	20	19	+5V	
	IRQ3	18	17	IRQ2	
	B_CANRX	16	15	B_CANTX	
CAN_A	A_CANRX	14	13	A_CANTX	CAN_A
AR2 / RX2	RXD2	12	11	RXD1	COM1 / AR1
AT2 / TX2	TXD2	10	9	TXD1	COM1 / AT1
	PULL-SEL	8	7	SCK	POWER OAK / MC33291
POWER OAK / MC33291	MOSI	6	5	MISO	POWER OAK / MC33291
	PCS3	4	3	PCS2	MC33291 select
POWER OAK select	PCS1	2	1	PCS0 / SS*	

## **OUTPUT Port, MC33291Driver, and LED1 > 8 Indicators**

The MPC562BC board provides an OUTPUT port that provides the MC33291 high current sink outputs or User Indicator LED1 > 8 inputs. The user should not apply the Output port as indicator inputs while operating the MC33291 outputs. The LED1 > 8 Indicators will light if the associated MC33291 output is enabled or if a user applied signal is of the low logic level (Ground or Vss). The MC33291 device is controlled by commands on the MPC562 QSPI serial channel and the device select signal PCS2 active low. MPC562BC boards revision B and later apply MPC562 QADC\_B port B0 as a Reset signal to the MC33291 device. Example software to operate the MC33291 is on the support CD under Examples/MPC562BC/Test source. The device manual is also provided on the CD. Following is port connection chart:

### **OUTPUT Port connections**

<b>OUTPUT Port Pin</b>	<b>User LED</b>	<b>MC33291 Output Driver</b>
1	LED1	Out 0, pin 24
2	LED2	Out 1, pin 23
3	LED3	Out 2, pin 14
4	LED4	Out 3, pin 13
5	LED5	Out 4, pin 12
6	LED6	Out 5, pin 11
7	LED7	Out 6, pin 2
8	LED8	Out 7, pin 7
9	SFPD	pin 15 = short fault mode
10	VPWR	pin 21 = +VIN or external battery, whichever is greater

## **USER SWITCHES 1 > 4**

The MPC562BC provides 4 push button switches (SWITCH1 > 4) that maybe applied in user applications or for testing purposes. Switch 1 provides user input and the dBUG Monitor Break or Abort signal if the JP3 BRK\_EN jumper position is installed. Switches 2 > 4 provide user input. All switches connect to the MPC562 QADC\_B port A0 > port A3 in order. Switch 1 provides an active low input level and switches 2 > 4 provide an active high input level when depressed.

### **Switch connections**

<b>Switch</b>	<b>MPC562 QADC_B input</b>	<b>Active level</b>	<b>Alternate Function</b>
1	PORT_A0	Low	BREAK
2	PORT_A1	High	
3	PORT_A2	High	
4	PORT_A3	High	

# TROUBLESHOOTING

1. No operation and no Voltage Indications on MPC562BC board:
  - a. If applying a BDM, see the applying a BDM notes in this manual.
  - b. Remove PWR jack power connection and all external connections except COM cable.
  - c. Remove option jumpers on JP3.
  - d. Wait 30 seconds.
  - e. Verify wall plug or power source is installed in an AC outlet.
  - f. Install the PWR jack power connection from wall plug or 12VDC power source.
  - g. If no voltage indicators: verify input source between Power Port pins 1 (VIN) and 5 (GND).
  - h. Verify ON option has not been cut or that option jumper is installed.
  - i. Contact factory: [support@axman.com](mailto:support@axman.com)
2. Voltage indications ok, no monitor prompt:
  - a. Press PORESET switch and verify RESET indicator lights.
  - b. Verify AxIDE or serial terminal software baud rate and settings.
  - c. Remove BDM if installed.
  - d. Verify CFG1 option is not cut or is closed, CFG2 > 5 are open.
  - e. Verify AT1 and AR1 options are not cut or are closed.
  - f. Contact factory: [support@axman.com](mailto:support@axman.com)
3. If you have applied a BDM or executed software that can erase or modify the flash memory, you may have corrupted or erased the monitor.
4. When connecting a serial cable to the board, make sure you're using a "straight-through" serial cable (such as the one provided).
5. If you get an exception error or if your program "hangs" or appears to jump out into unused memory, it is usually caused by trying to access "un-mapped" or improperly configured memory addresses. Look at the Memory Map page of this manual for the default memory map as set by the monitor program.
6. If you want to re-map the board to the 0x0000 address space you may have an address conflict with the internal nonexistent CMFI flash memory. Make sure the IMMR (SPR638) register does not enable the FLEN bit. Also note that the internal MPC562 register space will be in the external flash memory map.

Contact [support@axman.com](mailto:support@axman.com) for additional help or information.