Mercury EVM Getting Started

Rev B03 : March-10-2010

This document contains information on a product under development. The parametric information contains target parameters that are subject to change.

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1 Introduction

Congratulations on your purchase of a Elevate Semiconductor Mercury EVM evaluation system. You will find that it serves as an invaluable development platform to help get your product to market in the shortest possible time. The Mercury EVM and Graphical User Interface (GUI) allow the customer to demonstrate and evaluate the Mercury performance and functionality.

This document provides the instructions to install, setup, and operate the Mercury EVM. Refer to the ***Elevate Semiconductor EVM User's Guide*** for a detailed description of the EVM system.

1.1 Mercury Loadboard Revisions

There are 3 different loadboard revisions; Rev A, Rev B, and Rev C. The differences between the 3 board revisions are minor; they are highlighted in Figure 7.

1.2 Motherboard Rev A/B versus Rev C/D

There are 4 different motherboard revisions; Rev A/B and Rev C/D. The motherboard Rev C/D contains a PLL to generate the PLL_CK reference. The Motherboard Rev C/D are only supported by software Versions 3.4.0 and later. The Motherboard Rev D uses generic silkscreen names for the SMAs while the Rev A/B/C silkscreen is specific to the Venus product.

This document supports all the various board revisions.

1.3 Unpacking - Mercury EVM Contents

Please check the contents of the Mercury EVM shipping carton to make sure you have received all of the items listed in Table 1. The system is already configured for the best setup, except for connections to the power supply, PC controller, and test equipment.

Table 1: Mercury EVM Contents

Qty	Description
1 ea.	Mercury EVM System (3 boards)
1 ea.	Mercury EVM Getting Started (this document)
1 ea.	Mercury EVM User Interface Program Installation CD
1 ea.	DB25M-DB25M, 6 Foot Parallel Port Cable

1.4 Recommended Test and Measurement Setup

Oscilloscope: A 500 MHz 4-Channel scope is recommended.

1.4.1 Power Supply

Table 2 provides the required power supplies and current rating. The power supplies are connected using standard banana plugs. The customer needs to provide the power supply cables.

Table 2: Power Supply Requirements

Supply	Current Rating
+20V	1 A
+5V	1 A
-15V	1 A

1.4.2 PC Controller

To use the Mercury EVM User Interface Program (UIP), a PC with the following configuration is required:

- Win98, Win2000, WinNT 4.0+, or Win XP
- Parallel/Printer Port – 25-pin female connector

1.4.3 Pulse Generators

PLL_CK: 100 MHz Differential Pulse Generator (only required for Motherboard Rev A/B)
DATA/EN: 50 MHz Single-Ended Pulse Generator

1.5 Software Installation

There are 2 steps to install the Mercury EVM demonstration program. The first step is to install the Mercury EVM UIP from the CD-ROM. The second step requires installing the parallel port driver (ParPort2k).

Figure 1 illustrates the default directory structure. The user may change the <root dir> during the installation.

Figure 1: Installation Directory Structure

```
<Root Dir>\Planet ATE\EVM GUI
                          Documents
                          ParPort2k
```

1.5.1 Mercury EVM UIP Installation

To install the Mercury EVM software package, simply run the SETUP program on the distribution disk and follow the prompts. The **PlanetATE.exe** executable will be installed in the ***Evm GUI*** sub-directory. In addition, a short-cut will be installed onto the desktop and in the **Start->Programs** folder. The **Start->Programs** folder also contains links to the different product datasheets, EVM User's Guide, and documentation folder.

1.5.2 Parallel Port (ParPort2K) Installation

To install the ParPort2K parallel port driver, run the **setup.exe** from the ***ParPort2k*** sub-directory after the main installation is complete and click the **Install** button. For WinNT users, the user must have administration rights.

Note: ParPort2k is a copyright of Zeecube Software.

1.5.3 Reboot Machine

After the Mercury EVM and Parallel Port software is installed, it is recommended to re-boot the machine.

1.5.4 Launching the Mercury EVM Program

The user can launch the Mercury EVM GUI from the desktop, **Start->Programs** folder, or ***EVM GUI*** sub-directory.

1.5.5 Software Un-Installation

The Mercury EVM demonstration program may be un-installed using the **Add/Remove Program** from the Windows Control Panel.

2 Getting Started

The Mercury EVM is shipped in a pre-configured state that allows a customer to evaluate the basic driver and comparator output performance as well as the PMU Force Voltage (FV) / Force Current (FI) modes.

Note: Any external equipment providing digital signals into Mercury should only be enabled after the Mercury EVM is enabled. Also, the external equipment should be disabled prior to disabling the Mercury EVM.

2.1 PLL_CK Setup Options

The PLL_CK is used to determine the Mercury deskew range and resolution.

2.1.1 Motherboard Rev C+ PLL_CK Option

The Motherboard Rev C+ contains a differential clock generator.

- Short E11 & E12 (on Motherboard) between Pin 1-2 (towards rear of board)

The software automatically detects if the PLL is present. Use the ***EVM Config->FVMI Configuration*** dialog box to set the desired PLL frequency. The PLL can operate from 25 MHz to 175 MHz in 3.25 MHz steps.

2.1.2 Motherboard Rev A/B PLL_CK Options

It is strongly recommended a differential pulse generator be connected to the Motherboard PLL_CK SMA connectors.

- Connect differential pair to PLL_CK & PLL_CKB SMA connectors (on Motherboard)
- Short E11 & E12 (on Motherboard) between Pin 2-3 (towards front of board)

The user needs to set the PLL_CK Freq in the GUI to match the external equipment. This allows the software to determine the appropriate range and resolution.

If a differential clock generator is unavailable, the PLL will clamp at its frequency clamp. The data outputs are more likely to have jitter and will be more sensitive to thermal and voltage changes.

- Short E11 & E12 (on Motherboard) between Pin 1-2 (towards rear of board)

2.2 Default Configuration Setup Options

The EVM has several default options for providing a DATA stream and/or configuring for PMU mode.

Mode	Brief Description	Reference
Hardware Reset	All registers default to the hardware default state.	None
Three-State (High-Z)	Puts Mercury Driver and PMU in three-state (high-Z).	None
Real Time Data (default)	Use motherboard DATA# SMA connectors	Section 2.2.1
Ring Oscillator Mode	Use Mercury's internal Ring Oscillator. Only Chan#0 is triggered.	Section 2.2.2
PMU FV Chan #0	Configures PMU into FV mode outputting 1.5V and connects to Channel #0	Section 2.2.3
PMU FV All GND Force	Configures PMU into FV mode outputting 0.0 V and connects to all channels	Section 2.2.3
PMU FI Chan #0	Configures PMU into FI mode outputting 0uA and connects to Channel #0	Section 2.2.3

2.2.1 Real Time Data & Comparator Inputs

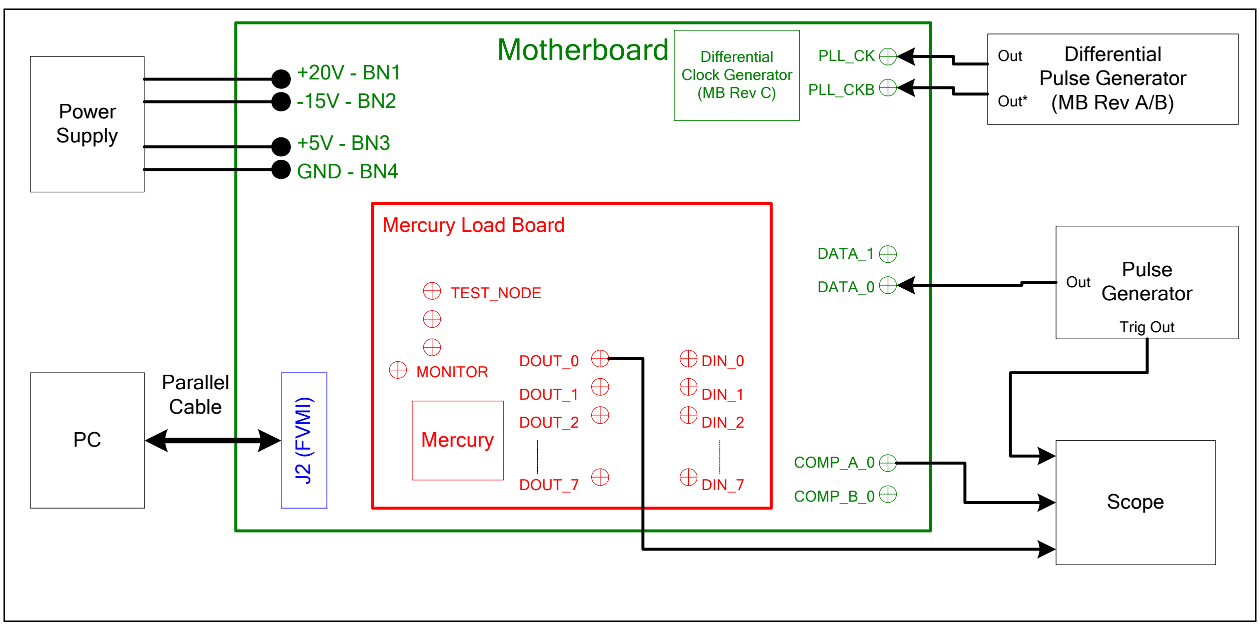
Figure 2 illustrates the recommended EVM configuration. This option sources the DATA# from the motherboard SMA connectors. The ENABLE# is set to CPU Control and high (always enabled). The DATA# input term is set to High (open). The VBB is connected to the VOH supply which defaults to 2.0V; therefore the customer must ensure their input signal swings across 2.0V.

- Channel #0: Short E3 & E4 (on Motherboard) between Pin 2-3 (towards front of board)
- Channel #0: Connect pulse generator to DATA_# SMA connectors (on Motherboard)

Notes

1) Channel #1 to #3 could be configured in a similar fashion; not shown in diagram. To evaluate Chan #4 to #7, set the Digital Bank Select in the **EVM Config->Pluto/Mercury EVM Config** dialog box.
2) To evaluate the Comparator Inputs (not shown in diagram)
   a. Connect the pulse generator to the DIN signal.
   b. In the **Mercury->Channel #->Driver/Comparator Config** dialog box: set the **Con-DIN-Comp** switch and clear the **Con-DOUT-Comp** switch.

Figure 2: Real Time DATA Block Diagram

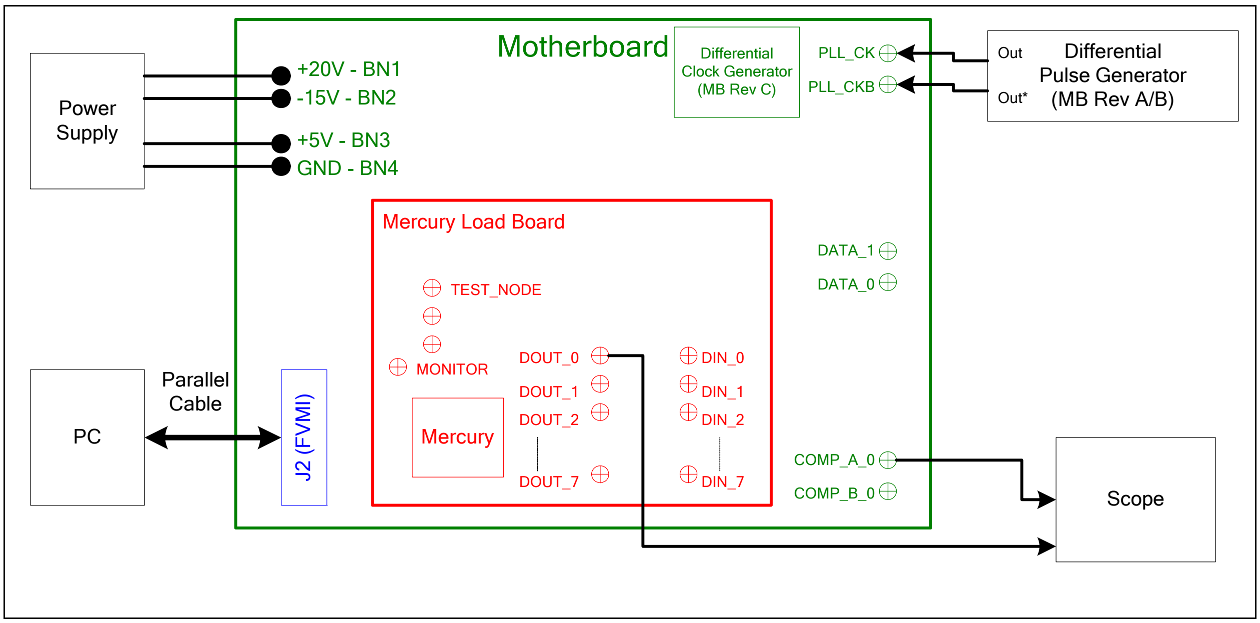


2.2.2 Ring Oscillator Mode (No Pulse Generator)

Figure 3 illustrates the recommended configuration for customers without any pulse generator. This option uses the Mercury Ring Oscillator feature to generate a ~20 MHz pulse with a ~15 nS period. Setup the scope to trigger on DOUT_0.

Note: With Mercury Rev 2, the Ring Oscillator is not reliable when a PLL_CK is not present.

Figure 3: Ring Oscillator Block Diagram

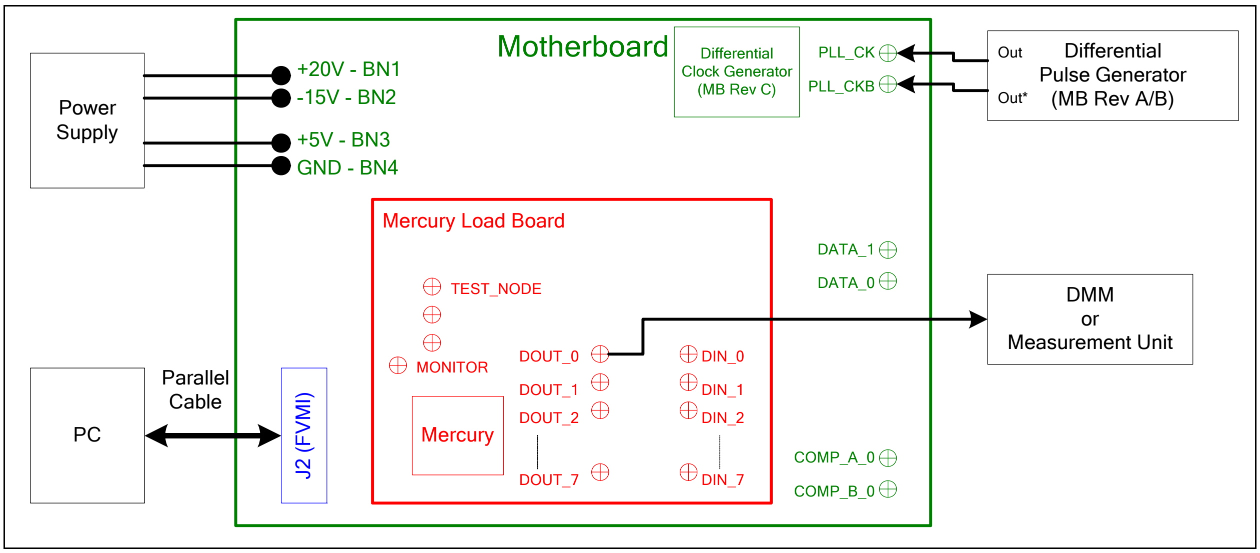


2.2.3 PMU Force Voltage or Force Current Modes

Figure 4 illustrates the recommended configuration for PMU FV/FI evaluation. The external measurement unit (MU) should be configured in the opposite mode as Mercury. After the configuration is completed, use the **PMU FV/FI Levels** dialog box the change the Mercury output levels.

Mercury	MU
FVMI	FIMV
FIMV	FVMI

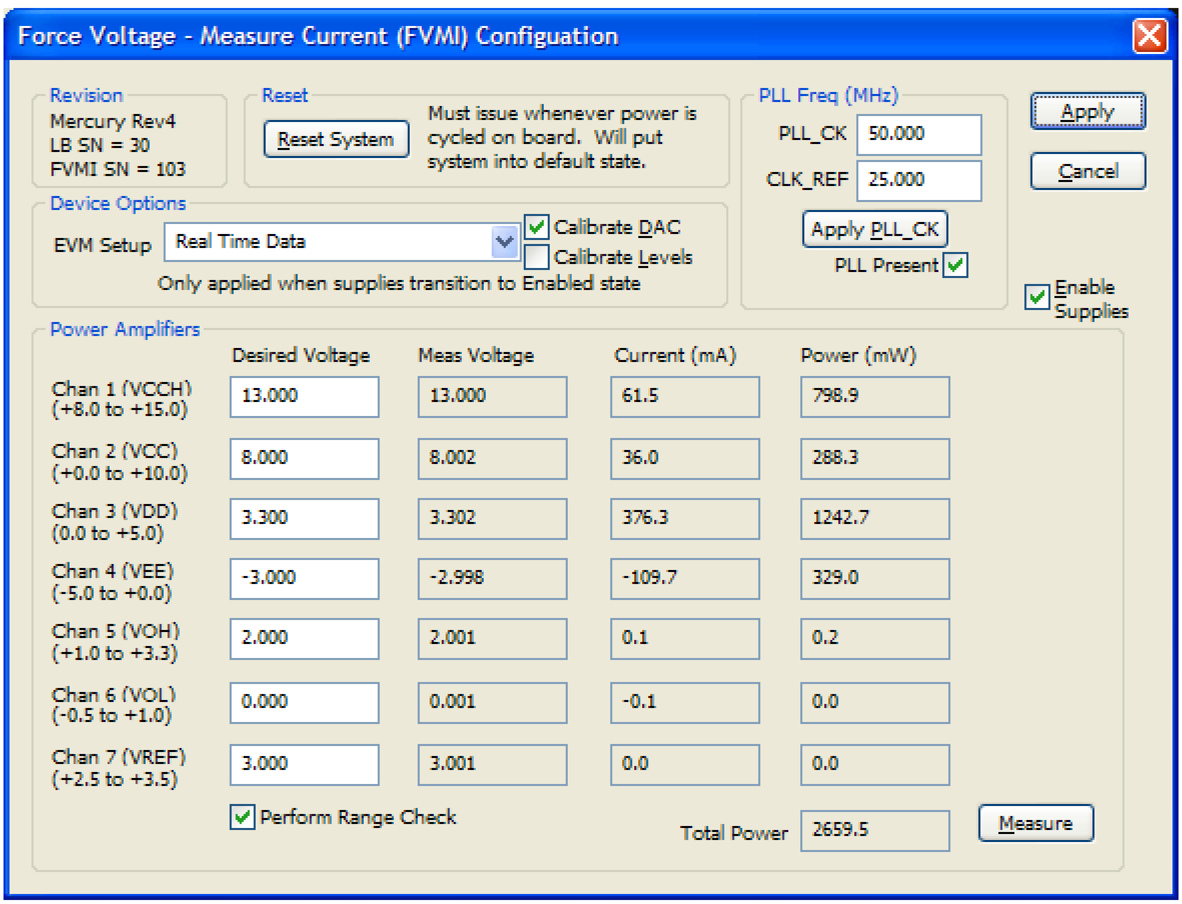
Figure 4: PMU FV/FI Block Diagram



2.3 Quick Start Instructions

1. Disable external power supply
2. Connect the power supplies cables (not provided) from the power supply to the Elevate Semiconductor EVM Motherboard.
3. Connect the parallel cable (provided) from the PC to J2 on the Octal FVMI board.
4. Connect the EVM to any external equipment; refer to Section 2.2.
5. Setup Motherboard Jumpers; refer to Section 2.4
6. Set external power supply voltages and current limits.
7. Enable external power supply.
8. Run the Elevate Semiconductor GUI software, refer to Section 1.5.4 for details.
9. At the Force Voltage – Measure Current dialog box (refer to Figure 5 below):
    a. Select the **EVM Setup** option based on the desired configuration.
    b. Select the **Enable Supplies** check box
    c. Hit the **Apply** button to power up the Mercury device.
    d. The software will also measure the current consumption. Figure 5 illustrates the expected current readings.
10. Enable the external DATA source (if running real-time data)
11. At this point, the Mercury Driver and Comparator should be outputting the desired signal.

Figure 5: Expected Current Readings



The **Reset System** will put the EVM and Mercury device into the default state. The **Reset System** should be issued whenever the power supply is powered OFF then ON. The **Reset System** is automatically performed when the program is initially launched.

2.4 Motherboard Jumper and SMA Definitions

Table 3 lists the Motherboard Jumper definitions for the Mercury EVM. The silkscreen varies depending on the motherboard revision.

Table 3: Motherboard Jumper Definitions

MB Rev A/B/C Silkscreen	MB Rev D+ Silkscreen	Mercury Usage	Jumper	Configuration
PLL_CK	TC_30	PLL_CK	E12	See Section 2.1
PLL_CKB	TC_29	PLL_CKB	E11	See Section 2.1
EXT_FORCE	TC_28	SDI_DATA	E14	Short Pin 1 & 2. Towards back of board
EXT_SENSE	TC_27	SDI_SCK	E15	Short Pin 1 & 2. Towards back of board
SV1	TC_26	SDI_RCK	E2	Short Pin 1 & 2. Towards back of board
ENN1	TC_25	EN_3/7	E10	As desired
EN1	TC_24	EN_2/6	E9	As desired
DATAN1	TC_23	DATA_3/7	E8	As desired
DATA1	TC_22	DATA_2/6	E7	As desired
SV0	TC_21	DIG_BANK_SEL	E1	Short Pin 1 & 2. Towards back of board
ENN0	TC_20	EN_1/5	E6	As desired
EN0	TC_19	EN_0/4	E5	As desired
DATAN0	TC_18	DATA_1/5	E4	As desired
DATA0	TC_17	DATA_0/4	E3	As desired
DUT_GND1	TC_16	TC_16	E13	Open
DUT_GND0	TC_15	TC_15	E20	Open

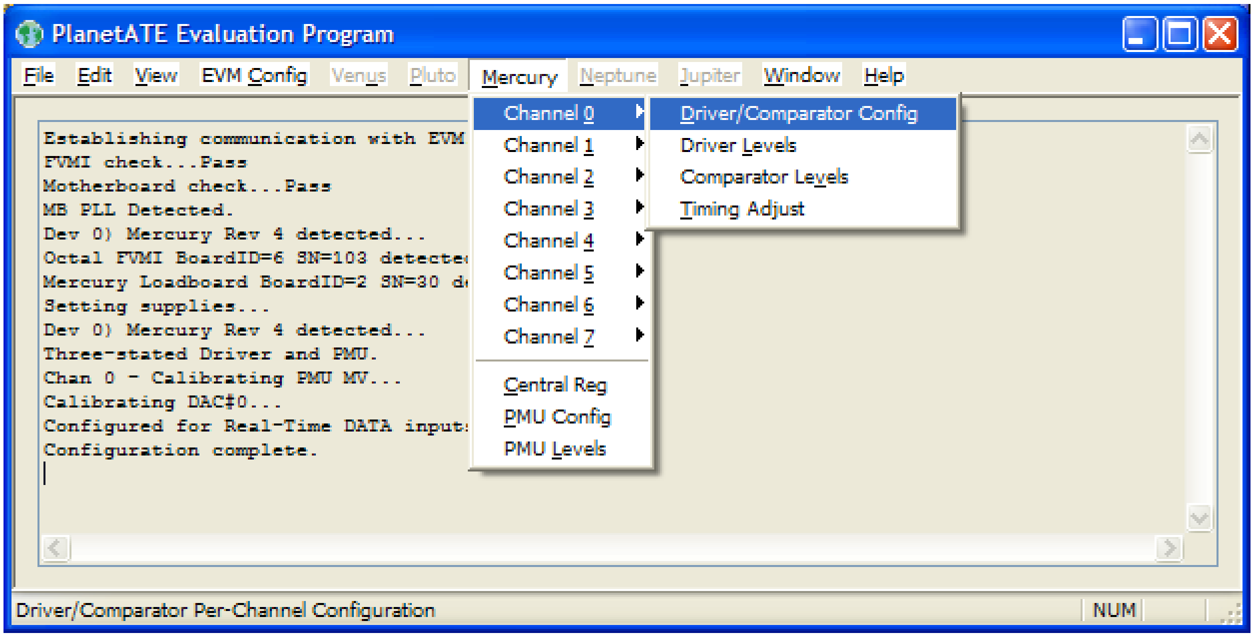
Table 4: Motherboard SMA Definitions

MB Rev A/B/C Silkscreen	MB Rev D+ Silkscreen	Mercury Usage
COMPBN1	TC14	COMPA3/7
COMPB1	TC13	COMPB3/7
COMPAN1	TC12	COMPA2/6
COMPA1	TC11	COMPB2/6
COMPBN0	TC9	COMPA1/5
COMPB0	TC8	COMPB1/5
COMPAN0	TC6	COMPA0/4
COMPA0	TC5	COMPB0/4

2.5 Mercury Menu Dialog Boxes

Figure 6 illustrates the Mercury menu options. These provide access to the Mercury registers.

Figure 6: Device Config Menu Options



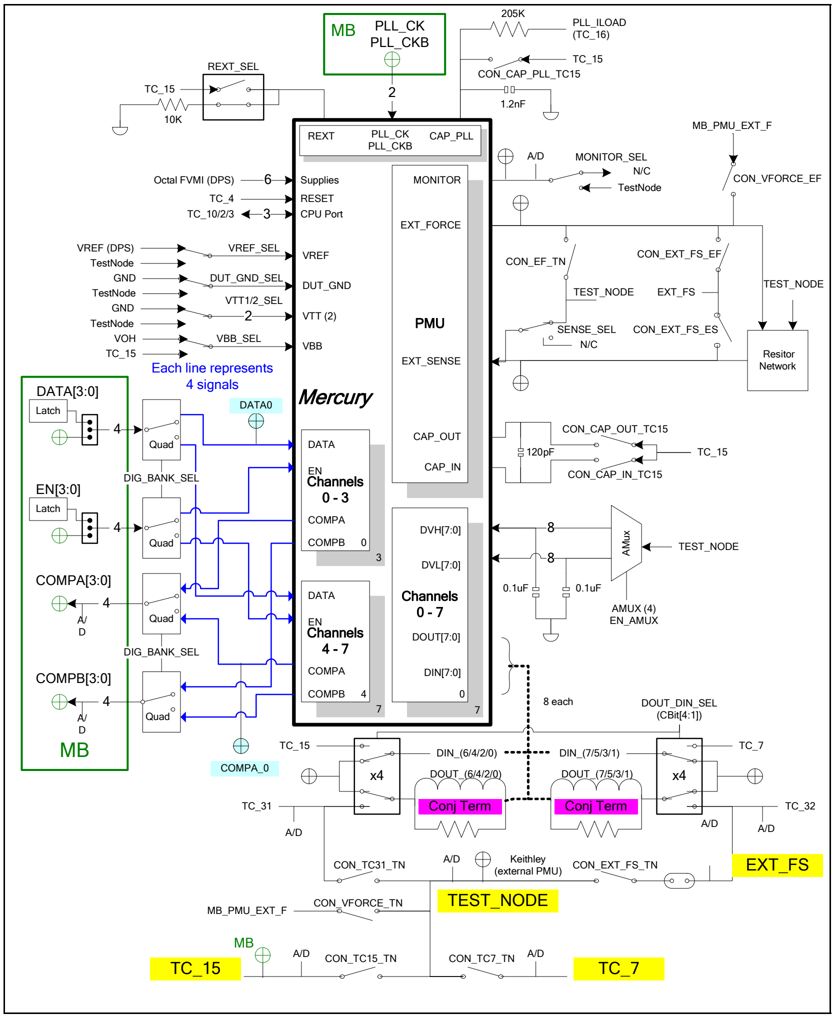
3 Mercury Loadboard Detailed Description

Figure 7 illustrates the Mercury EVM loadboard. The loadboard contains the Mercury device as well as the necessary circuitry to validate & characterize on the bench environment.

Note:

- The turquoise nodes are new to Mercury Loadboard Rev B and Rev C.
- The Rev C loadboard also contains conjugate termination of the DOUT pins. This is noted in pink.

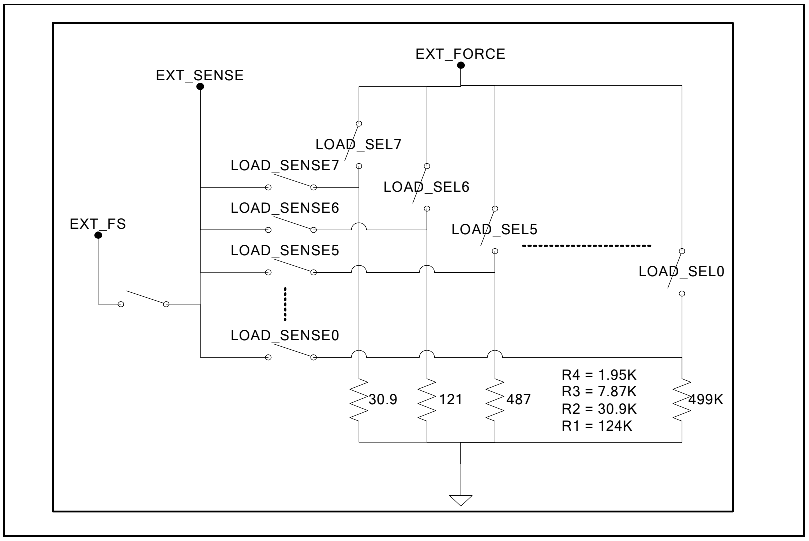
Figure 7: Mercury EVM Detailed Block Diagram



3.1 Resistor Network Definitions

Figure 8 illustrates the Mercury EVM resistor network definitions. The software only allows a single resistor value to be switched in.

Figure 8: Mercury EVM Resistor Network Block Diagram



3.2 ADC and Analog Mux

The Octal FVMI contains a 24-bit ADC and analog muxes. **Table 5** lists the Mercury EVM loadboard specific mux input sources.

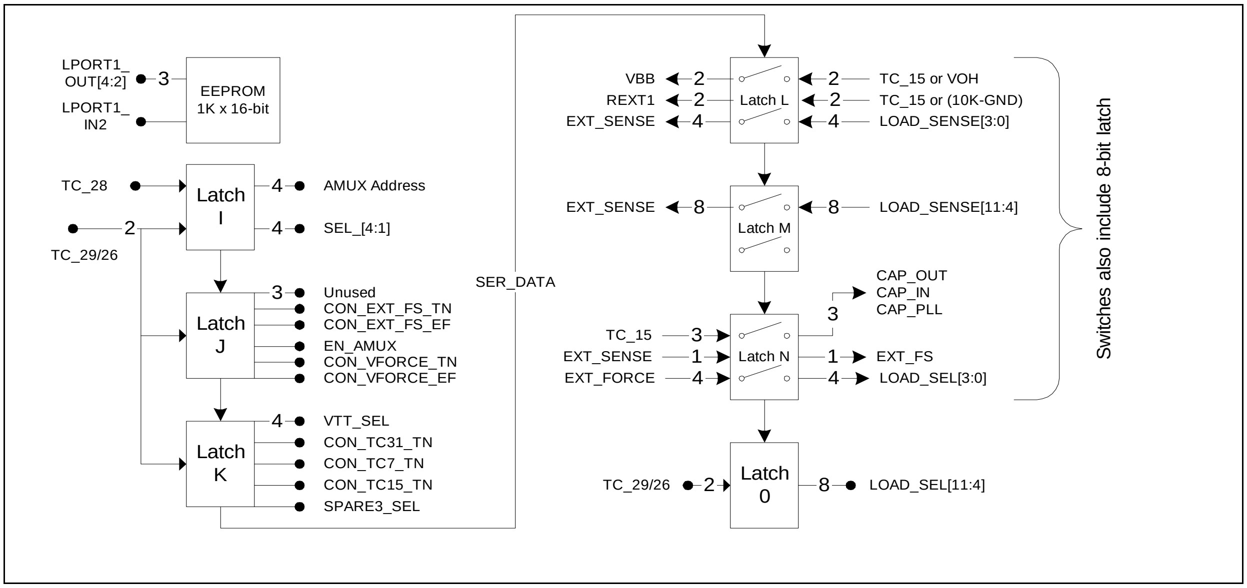
Table 5: FVMI Analog Mux – VINPOS(A) & VINNEG(A) Mapping

Addr	VINP#	VINPOS(A)	VINN#	VINNEG(A)
7	VINP8	Reserved	VINN8	No connect
8	VINP9	EXT_FS	VINN9	No connect
9	VINP10	TEST_NODE	VINN10	No connect
10	VINP11	MONITOR	VINN11	No connect
11	VINP12	TC_15	VINN12	TC_7
12	VINP13	TC-31 (DOUT EVEN)	VINN13	No connect
13	VINP14	TC-32 (DOUT_ODD)	VINN14	No connect

3.3 Controller Logic

The Mercury loadboard contains seven 8-bit latches (registers) and a 16K EEPROM. The Cbit1 to CBit7 are also used to control various relays; the C-Bits originate from the Octal FVMI board. Figure 9 illustrates the Mercury EVM controller section.

Figure 9: Mercury EVM Controller Section Detailed Block Diagram



The following table shows how the control signals are used for the different board revisions.

Color	Usage
White	All revisions
Turquoise	New or modified with Rev B and Rev C loadboard
~~Strikethrough~~	No longer present on Rev B or Rev C loadboard

Table 6: Loadboard C-Bit (J6) Signal Definitions

CBIT#	Def	Bit Name	Bit Description
1	0	DOUT_DIN_SEL01	Connect DOUT/DIN Chan#0/1 Select 0 = Short DOUT to DIN. Also connects to SMA 1 = Test Path
2	0	DOUT_DIN_SEL23	Connect DOUT/DIN Chan#2/3 Select 0 = Short DOUT to DIN. Also connects to SMA 1 = Test Path
3	0	DOUT_DIN_SEL45	Connect DOUT/DIN Chan#4/5 Select 0 = Short DOUT to DIN. Also connects to SMA 1 = Test Path
4	0	DOUT_DIN_SEL67	Connect DOUT/DIN Chan#6/7 Select 0 = Short DOUT to DIN. Also connects to SMA 1 = Test Path
5	0	TC31_32_SEL	Connect TC_31/32 Select 0 = Towards DUT 1 = Towards Test Node Note: Requires additional switches to be enabled to complete connection to DUT/Test Node.
6	0	CBIT6	Unused
7	0	CBIT7	Unused
8	-	Reserved	Used by ATE test board
9	-	Reserved	Used by Octal FVMI board

The latches are daisy chained together using the SDI_SCK/RCK/CS signals originating from the Motherboard. The EEPROM is controlled by the LPORT1_OUT[4:2] signals originating from the motherboard. The loadboard latches are labeled STB_I to STB_P. This was named as an extension to the REG_A to REG_H Octal FVMI / Motherboard registers.

Table 7: STB_I (U8: Mercury AMUX & SEL) Signal Definitions

STB_I Bit	Bit Name	Bit Description
3:0	AMUX	Analog MUX 7 – 0 = DVL[0:7] 15 – 8 = DVH[0:7]
4	SENSE_SEL	SENSE Select (SEL_1) 0 = TEST_NODE 1 = EXT_FORCE
5	DUT_GND_SEL	DUT_GND Select (SEL_2) 0 = GND 1 = TEST_NODE
6	MONITOR_SEL	MONITOR Select (SEL_3) 0 = VINP11 (to A/D) 1 = TEST_NODE
7	VREF_SEL	VREF Select (SEL_4 0 = VREF (DPS) 1 = TEST_NODE

Table 8: STB_J (U9: Mercury MISC Switches) Signal Definitions

STB_J Bit	Bit Name	Bit Description
0	Unused	
1	Unused	
2	Unused	
3	CON-EXT_FS-TN	Connect EXT_FS to TEST_NODE. Active Low (TC_32_SEL1)
4	CON-EXT_FS-EF	Connect EXT_FS to EXT_FORCE. Active Low (TC_32_SEL2)
5	EN_AMUX	Enable Analog MUX
6	CON_VFORCE_TN	Connect VFORCE to TEST_NODE. Active Low (VFORCE_SEL1)
7	CON_VFORCE_EF	Connect VFORCE to EXT_FORCE. Active Low (VFORCE_SEL2)

Table 9: STB_K (U10: Mercury VTT_SEL) Signal Definitions

STB_K Bit	Bit Name	Bit Description
0	VTT1_A_SEL	Connect VTT1 to TEST_NODE. Active Low
1	VTT2_A_SEL	Connect VTT2 to TEST_NODE. Active Low
2	VTT1_B_SEL	Connect VTT1 to GND. Active Low
3	VTT2_B_SEL	Connect VTT2 to GND. Active Low
4	CON_TC31_TN	Connect TC_31 (DOUT Even) to TEST_NODE. Active Low
5	CON_TC7_TN	Connect TC_7 to TEST_NODE. Active Low
6	CON_TC15_TN	Connect TC_15 to TEST_NODE. Active Low
7	CON_EF_TN	Connect EXT_FORCE to TEST_NODE. Active Low

Table 10: STB_L (U31: Mercury VBB, REXT & LOAD_SENSE) Signal Definitions

STB_L Bit	Bit Name	Bit Description
1:0	VBB_SEL	00 = Open Both (only use if an external VBB is provided) 01 = Connect VBB to TC_15 (used for continuity/leakage test) 10 = Connect VBB to VOH (normal operation) 11 = Connect VBB to both TC_15 & VOH (don't use)
3:2	REXT_SEL	00 = Open Both (don't use) 01 = Connect REXT to TC_15 (used for continuity/leakage test) 10 = Connect REXT to 10K Resistor (normal operation) 11 = Connect REXT to both TC_15 & 10K Resistor (don't use)
7:4	LOAD_SENSE[3:0]	Connect EXT_SENSE to Low Current Resistor #

Table 11: STB_M (U34: Mercury LOAD_SENSE) Signal Definitions

STB_M Bit	Bit Name	Bit Description
7:0	LOAD_SENSE[11:4]	Connect EXT_SENSE to Low Current Resistor #

Table 12: STB_N (U32: Mercury LOAD_SEL & EXT_FS) Signal Definitions

STB_N Bit	Bit Name	Bit Description
0	CON_CAP_OUT_TC15	Connect CAP_OUT to TC_15 (used for continuity/leakage test).
1	CON_CAP_IN_TC15	Connect CAP_IN to TC_15 (used for continuity/leakage test).
2	CON_CAP_PLL_TC15	Connect CAP_PLL to TC_15 (used for continuity/leakage test).
3	CON_EXT_FS_ES	Connect EXF_FS to EXT_SENSE
7:4	LOAD_SEL[3:0]	Connect EXT_FORCE to Low Current Resistor #

Table 13: STB_O (U33: Mercury LOAD_SEL) Signal Definitions

STB_O Bit	Bit Name	Bit Description
3:0	LOAD_SEL[7:4]	Connect EXT_FORCE to Low Current Resistor #
7:4	LOAD_SEL[11:8]	Connect TEST_NODE to High Current Resistor #. Active Low

4 Document Revision History

Revision	Date	Description
A01	9/18/03	Initial Draft
B01	1/28/05	Loadboard Rev B and Motherboard Rev C Support • Added Section 1.1 • Updated Figure 7 Motherboard Rev C Support • Added Section 1.2 • Updated Section 2.1 • Updated Setup Option Block Diagrams Added Detailed Block Diagram, see Section 3 • Moved from ‘Elevate Semiconductor User’s Guide’ • Added Resistor Network block diagram, see Section 3.1 • Added Controller Logic block diagram, see Section 0 Updated GUI screen shots.
B02	5/31/06	Document Motherboard silkscreen differences
B03	3/10/10	Added Mercury Rev C loadboard.