Pluto2 EVM Getting Started

Rev A05: 29 Aug 2018

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1 Introduction

Congratulations on your purchase of an Elevate Pluto2 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 Pluto2 EVM and Graphical User Interface (GUI) allow the customer to demonstrate and evaluate the Pluto performance and functionality.

This document provides the instructions to install, setup, and operate the Pluto2 EVM. Refer to the ***Elevate EVM User's Guide*** for a detailed description of the EVM system.

1.1 Unpacking - Pluto2 EVM Contents

Please check the contents of the Pluto2 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: Pluto2 EVM Contents

Qty	Description
1 ea.	Pluto2 EVM System (3 boards: Motherboard, FVMI Board, Pluto Loadboard)
1 ea.	Pluto2 EVM Getting Started (this document)
1 ea.	Planet ATE User Interface Program Installation CD
1 ea.	USB A/B Cable

1.2 Recommended Test and Measurement Setup

1.2.1 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	0.5 A
+5V	1.0 A
-15V	0.5 A

1.2.2 PC Controller

To use the Pluto2 EVM User Interface Program (UIP), a PC with the following configuration is required:

- Windows XP, Windows 2007, Windows 2008, Windows 2010
- USB Port (a USB cable is provided)

1.2.3 DMM or Source Measurement Unit

- Voltage and/or Current Meter
- Voltage and/or Current Source

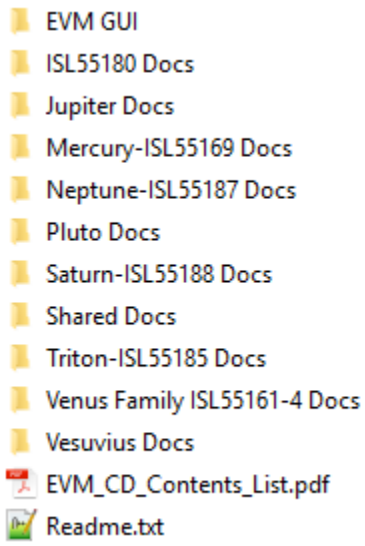
1.3 Software Installation

There are 2 steps to install the Pluto2 EVM demonstration program.

1. Install the Pluto2 EVM UIP from the Flash Drive.
2. Install the USB driver.

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

Figure 1: Installation Directory Structure



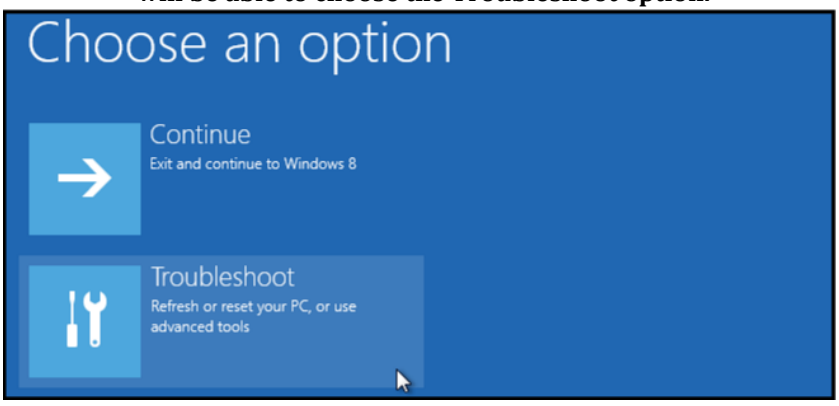
1.3.1 Pluto2 EVM UIP Installation

Follow section 1.3.2.1 for installation instructions on the Windows 10/8 operating systems, section 1.3.2.2 for instructions for Windows 7, or section 1.3.2.3 for Windows XP

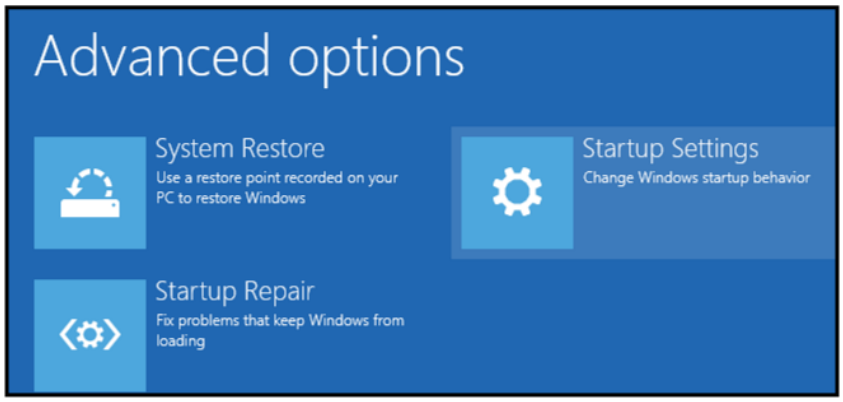
1.3.1.1 Window 10/8

To install the USB driver on Windows 10/8, the Driver Signature Verification needs to be disabled. This is accomplished using the following method.

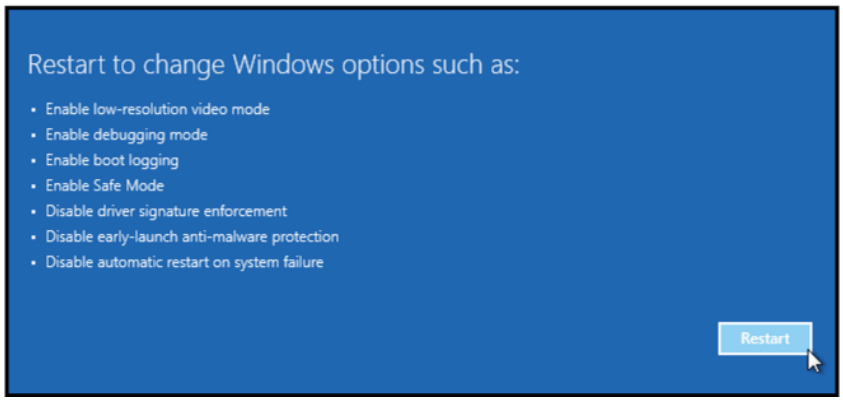
1.3.1.1.1 Enter the Troubleshoot menu. Click "Restart" from the power options menu and hold down the "Shift" key at the same time. Once the computer has rebooted, you will be able to choose the Troubleshoot option.



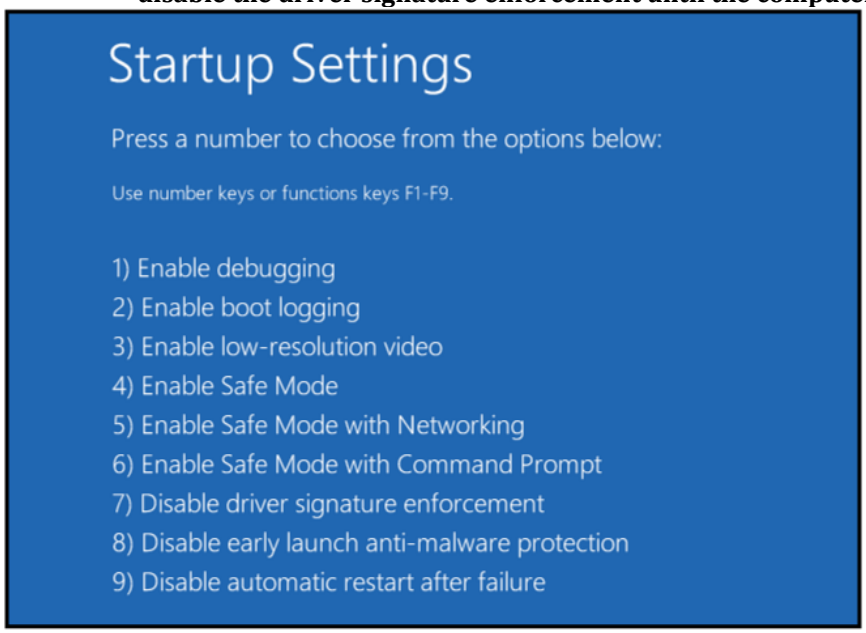
1.3.1.1.2 Select "Advanced options" and "Startup Settings".



1.3.1.1.3 You need to restart your computer one last time to modify boot time configuration settings.



1.3.1.1.4 You will be given a list of startup settings, including "Disable driver signature enforcement". To choose the setting, you need to press the "F7" key. This will disable the driver signature enforcement until the computer is rebooted.

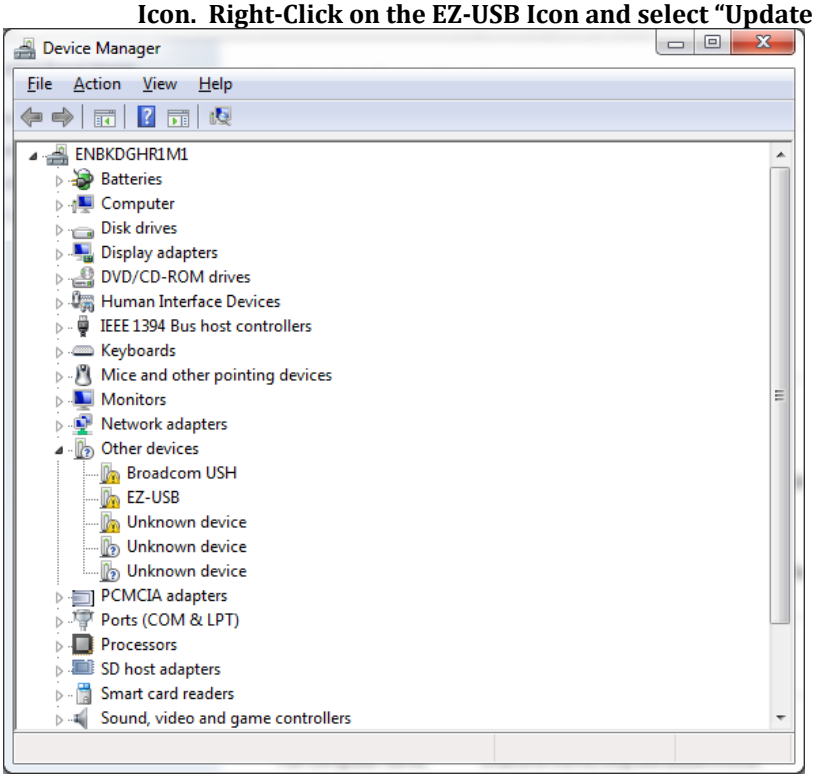


1.3.1.1.5 Continue with section 1.3.2.2 to finish installation of USB driver except choose the windows 10 or windows 8 option.

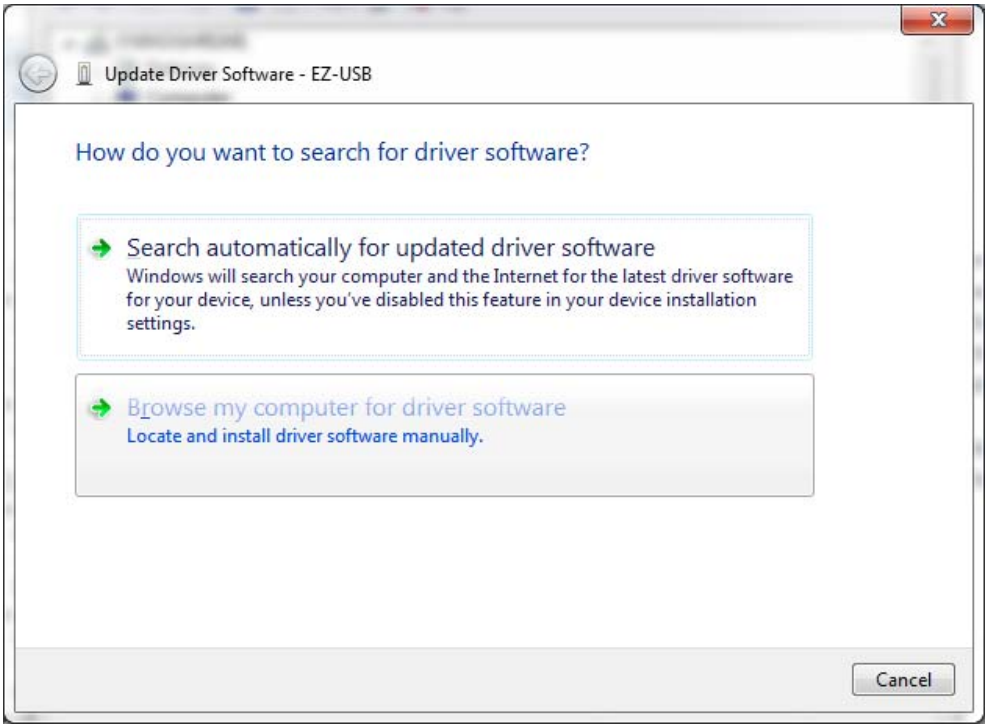
1.3.1.2 Windows 7

To install the USB device driver on a Windows 7 system, connect the "USB FX2 to Parallel" board to a USB port using the included USB A/B cable. The "USB FX2 to Parallel" board does not need any external power or need to be connected to any other board for the device driver installation.

1.3.1.2.1 After connecting the USB cable from the PC to the "USB FX2 to Parallel" board, navigate to the Device Manager screen on your computer and look for the EZ-USB Icon. Right-Click on the EZ-USB Icon and select "Update Drive Software…"



1.3.1.2.2 Select "Browse my computer for driver software".



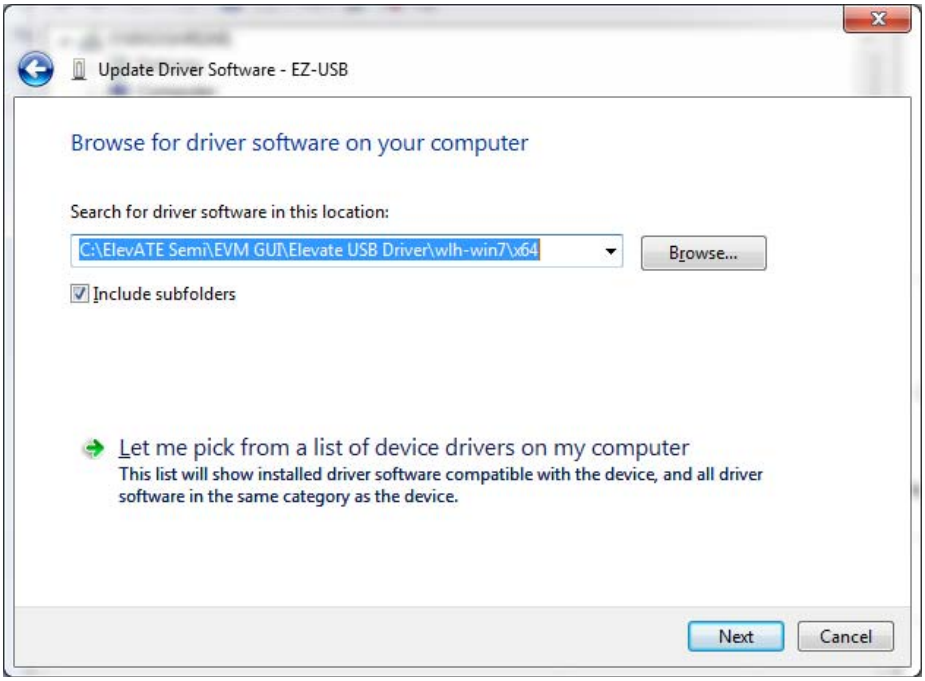
1.3.1.2.3 Install driver from the newly installed folder on your computer:

Windows 7: **\ElevATE Semi\EVM GUI\Elevate USB Driver\wlh-win7**(x64 or x86)

Select x64 for a 64-bit system.

Select x86 32-bit system.

Select “Next”. The USB driver will be installed.

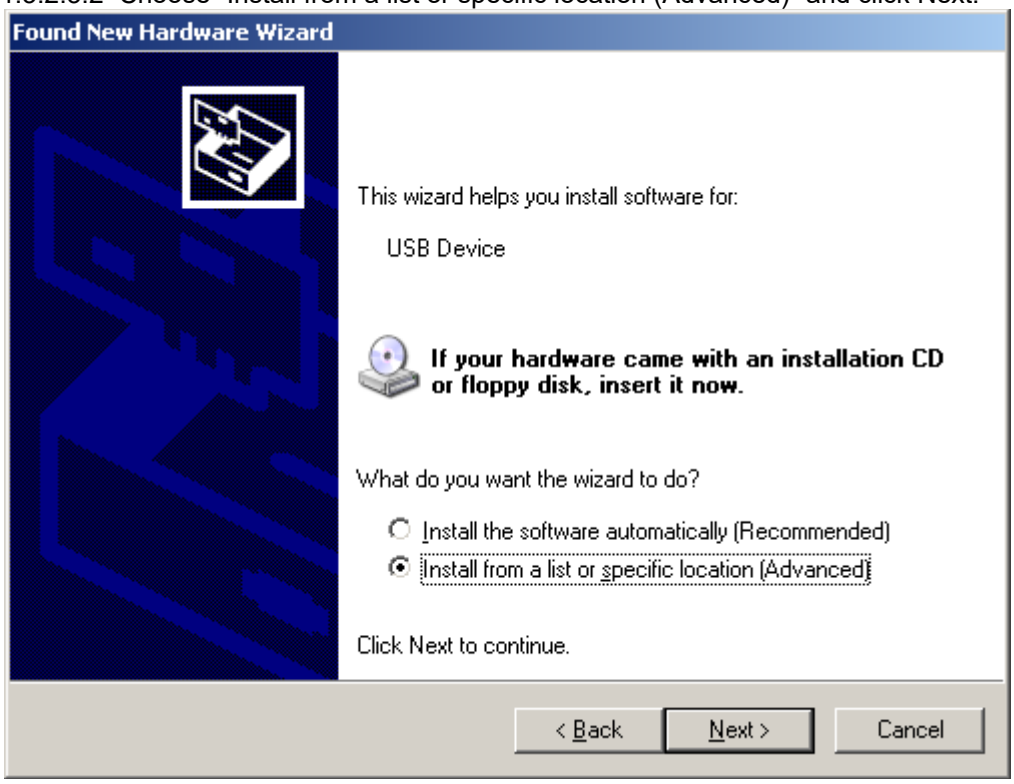


1.3.1.3 Windows XP

To install the USB device driver on a Windows XP system, connect the “USB FX2 to Parallel” board to a USB port using the included USB A/B cable. The USB FX2 to Parallel board does not need any external power or need to be connected to any other board for the device driver installation.

1.3.2.3.1 After connecting the USB cable from the PC to the “USB FX2 to Parallel” board, the following window appears. Select “No, not this time” and click Next.

1.3.2.3.2 Choose “Install from a list or specific location (Advanced)” and click Next.



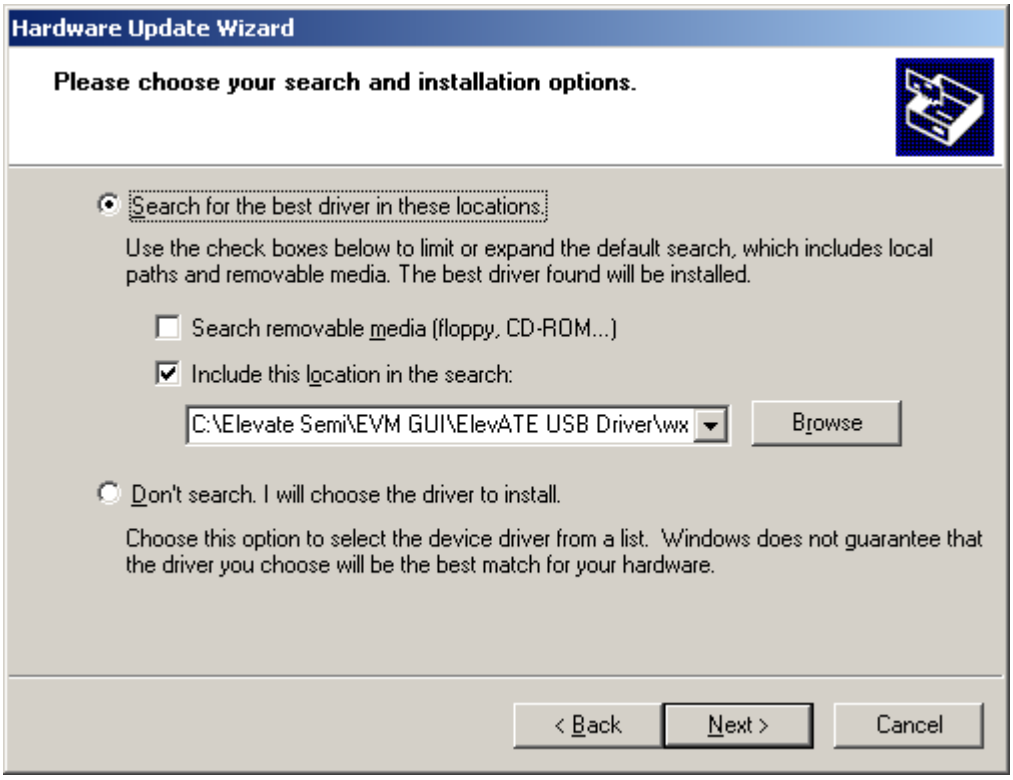
1.3.2.3.3 Select the top radio button, and check “Include this location in the search.” Type the following path into the text box.

Windows XP: **\ElevATE Semi\EVM GUI\Elevate USB Driver\wxp**(x64 or x86)

Select x64 for a 64-bit system.

Select x86 32-bit system.

Select “Next”. The USB driver will be installed.



1.3.2 Reboot Machine

After the Pluto2 EVM and USB software is installed, it is recommended to re-boot the machine.

1.3.3 Launching the Elevate Semiconductor Program

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

1.3.4 Software Un-Installation

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

2 Getting Started

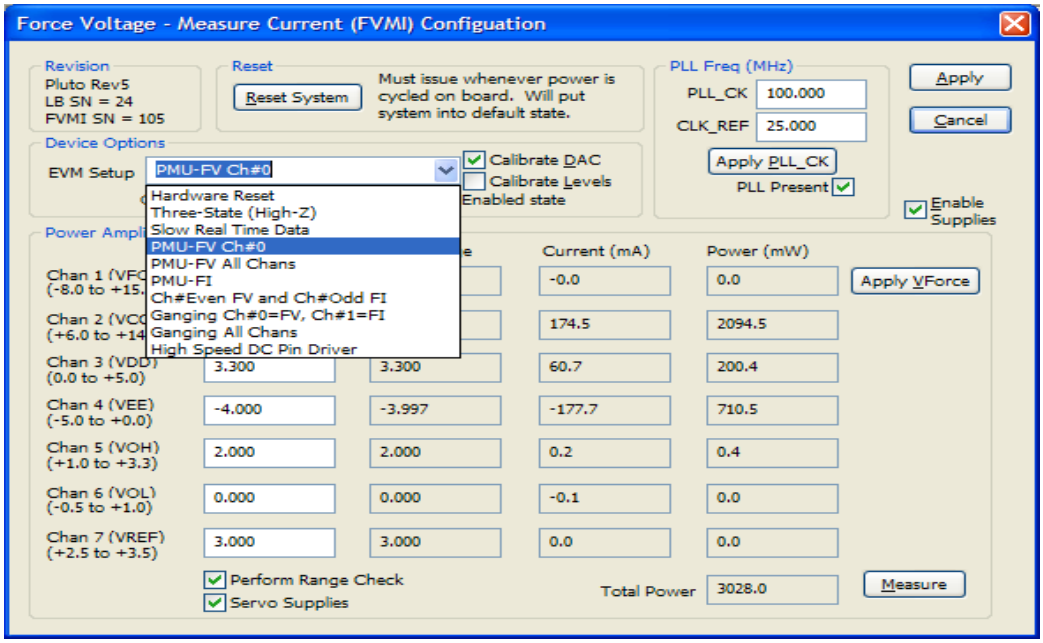
The Pluto2 EVM is shipped in a pre-configured state that allows a customer to evaluate the PMU Force Voltage (FV), Force Current (FI), Ganging, and Real-Time Driver modes.

Note: Any external equipment providing digital signals into the Pluto device should only be enabled after the Pluto2 EVM is enabled. Also, the external equipment should be disabled prior to disabling the Pluto2 EVM.

2.1 Quick Start Instructions

1. Disable external power supply
2. Connect the power supplies cables (not provided) from the power supply to the Planet ATE EVM Motherboard.
3. Connect the USB cable (provided) from the PC to the USB port on the “USB FX2 to Parallel” board.
4. Connect the EVM to any external equipment; refer to Section 2.2.
5. Setup Motherboard Jumpers; refer to Section 2.3
6. Set external power supply voltages and current limits.
7. Enable external power supply.
8. Run the Planet ATE GUI software; refer to Section 1.3.3 for details.
9. At the Force Voltage – Measure Current dialog box (refer to Figure 2 below):
    a. Select the **EVM Setup** option based on the desired configuration, see Section 2.2
    b. Select the **Enable Supplies** check box
    c. Hit the **Apply** button to power up the Pluto device.
    d. The software will also measure the current consumption. Figure 2 illustrates the expected current readings.
10. At this point, the Pluto should be outputting the desired signal.

Figure 2: Expected Current Readings



The **Reset System** will put the EVM and Pluto 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.

2.2 Default Configuration Setup Options

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

Table 3: Pluto Default Configuration Options

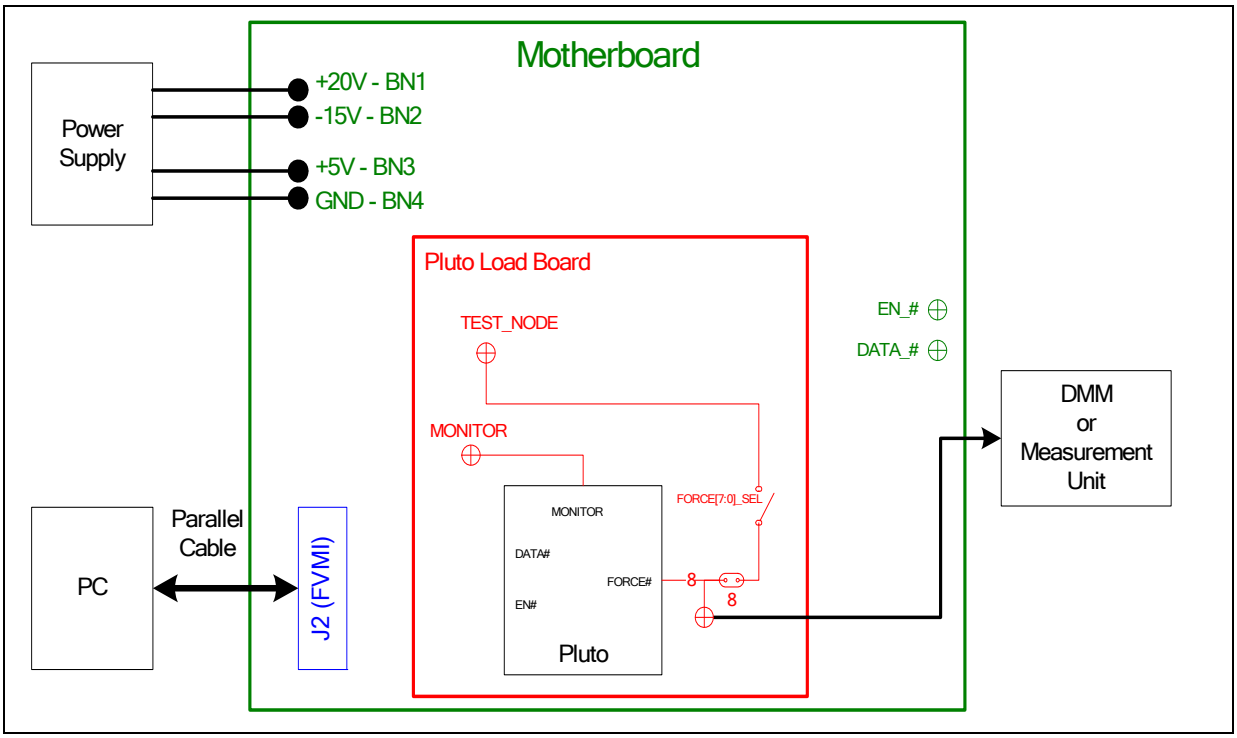
Mode	See Section #	Brief Description
Hardware Reset	N/A	All registers default to the hardware default state.
Three-State (High-Z)	N/A	Puts PMU in three-state (high-Z). Opens all switches.
Real Time Data	N/A	Low speed DC Pin Driver
FV Chan #0	Section 2.2.1	Ch#0 FV mode outputting 1.5V, Irange=2mA, LOCAL sense feedback. Measure the voltage output at the FORCE#0 SMA MONITOR is enabled and setup to measure Ch#0 MV voltage FORCE is NOT connected to TEST_NODE.
FV Chan All Chans	Section 2.2.1	All Chans FV mode outputting Ch#+1V in VR2, Irange=2mA, LOCAL sense feedback. Measure the voltage output at the FORCE# SMA MONITOR is enabled and setup to measure Ch#0 MV voltage FORCE is NOT connected to TEST_NODE.
PMU-FI	Section 2.2.1	All Chans FI mode outputting 0.0uA, Irange=2mA Measure the current output at the FORCE# SMA MONITOR is enabled and setup to measure Ch#0 MV voltage FORCE is NOT connected to TEST_NODE.
FV Ch#0 FI Ch#1	Section 2.2.2	Ch#0 FV mode outputting 1.5V, Irange=2mA, LOCAL sense feedback. FORCE #1:0 pin connected to the EVM TEST_NODE SMA. MONITOR is enabled and setup to measure Ch#0 MV voltage
Ganging FV Chan#0 FI Chan#1	Section 2.2.3	Ch#0 FV mode outputting 1.5V, Irange=32mA, remote sense feedback. Ch#1 FI mode sourcing from MI #0, Irange=32mA FORCE #1:0 pin connected to the EVM TEST_NODE SMA. EVM Amux connects TEST_NODE back to SENSE #0 pin for remote sense. MONITOR is enabled and setup to measure Ch#0 MV voltage
Ganging All Chans	Section 2.2.3	Ch#0 FV mode outputting 1.5V, Irange=32mA, remote sense feedback. Ch#7:1 FI mode sourcing from MI #0, Irange=32mA FORCE #7:0 pin connected to the EVM TEST_NODE SMA. EVM Amux connects TEST_NODE back to SENSE #0 pin for remote sense. MONITOR is enabled and setup to measure Ch#0 MV voltage
DC Pin Driver	Section 2.2.4	High speed DC Pin Driver

2.2.1 General PMU FV/FI Configurations

Figure 3 illustrates the recommended configuration for Pluto2 EVM evaluation. The external measurement unit (MU) should be configured in the opposite mode as Pluto. After the configuration is completed, use the **PMU FV/FI Levels** dialog box the change the Pluto output levels.

Pluto	MU
FVMI	FIMV
FIMV	FVMI

Figure 3: Pluto EVM Simplified Block Diagram



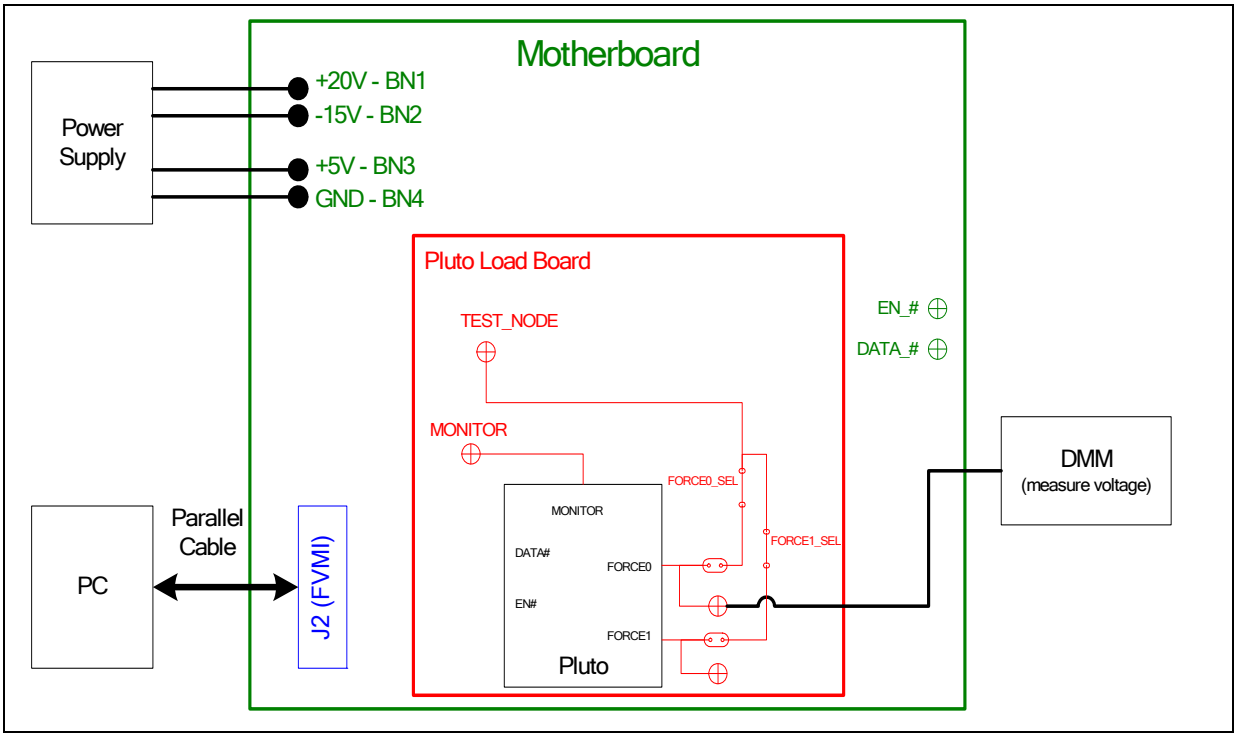
2.2.2 Ch#0 FV and Ch#1 FI Configuration

Figure 4 illustrates the recommended configuration for PMU Chan #0 FV and Chan #1 FI evaluation. The other channel is used to provide a proper load (current load or voltage load depending on which channel is being evaluated). This option is useful when the customer doesn't have an external measurement unit. Instead, the customer can use the EVM to evaluate the Pluto PMU.

Use the **VFI Levels** field in ***Pluto->Channel 1->PMU Levels*** dialog box to adjust the channel #1 current load.

Measurement	How To
Measure Voltage	Use a DMM on the FORCE#0 SMA or TEST_NODE SMA Use the PMU-MV or TEST_NODE in the ***the EVM Config->FVMI Measure*** dialog box.
Measure Current	Use the PMU-MI in ***the EVM Config->FVMI Measure*** dialog box. Chan #0 and Chan #1 will measure opposite polarities

Figure 4: Pluto Ch#0 FV/Ch#1 FI Block Diagram

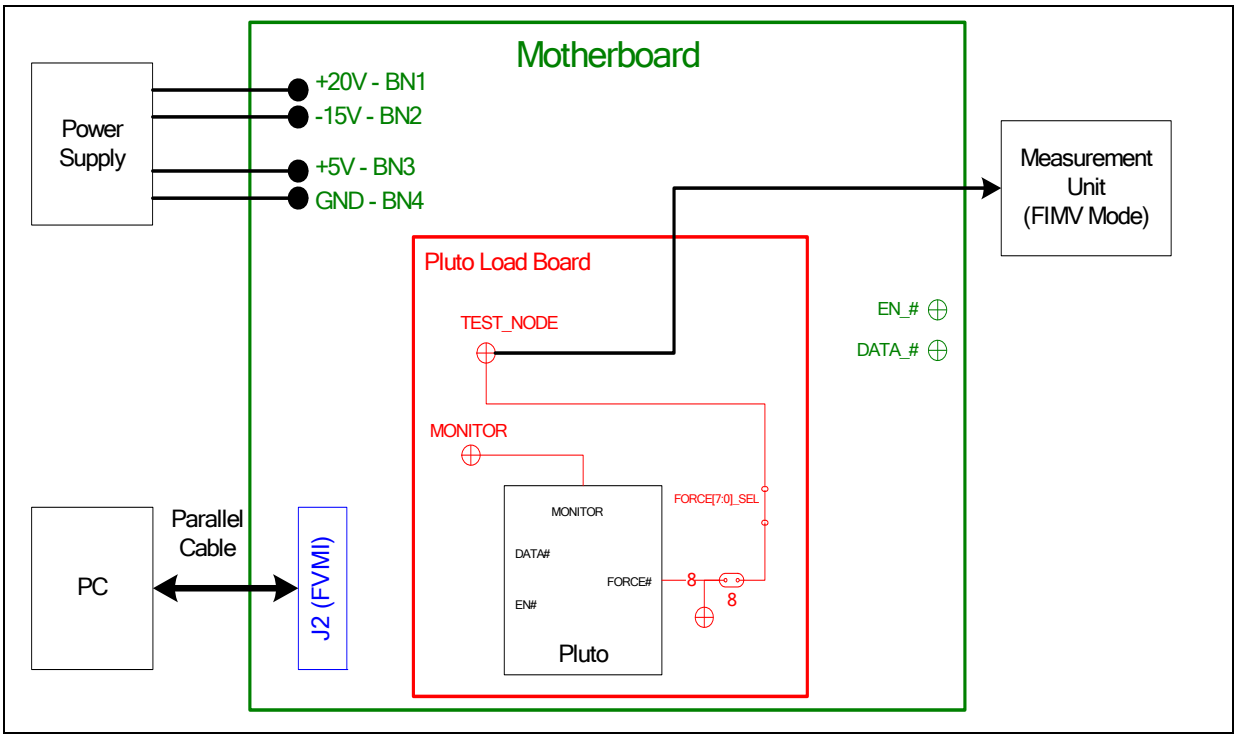


2.2.3 Ganging Configurations

Figure 5 illustrates the recommended configuration for PMU Ganging evaluation. Channel #0 (FV mode) is the master. The other channels are in FI mode (slaves).

Warning: When all 8 channels are enabled and the current load becomes significant, the socketted device can not tolerate the thermal increase. Proper airflow should be provided or the current load should be decreased. The temperature can be measured in the ***EVM Config->FVMI Measure*** dialog box.

Figure 5: Pluto EVM Ganging Block Diagram



2.2.4 High Speed DC Pin Driver Configuration

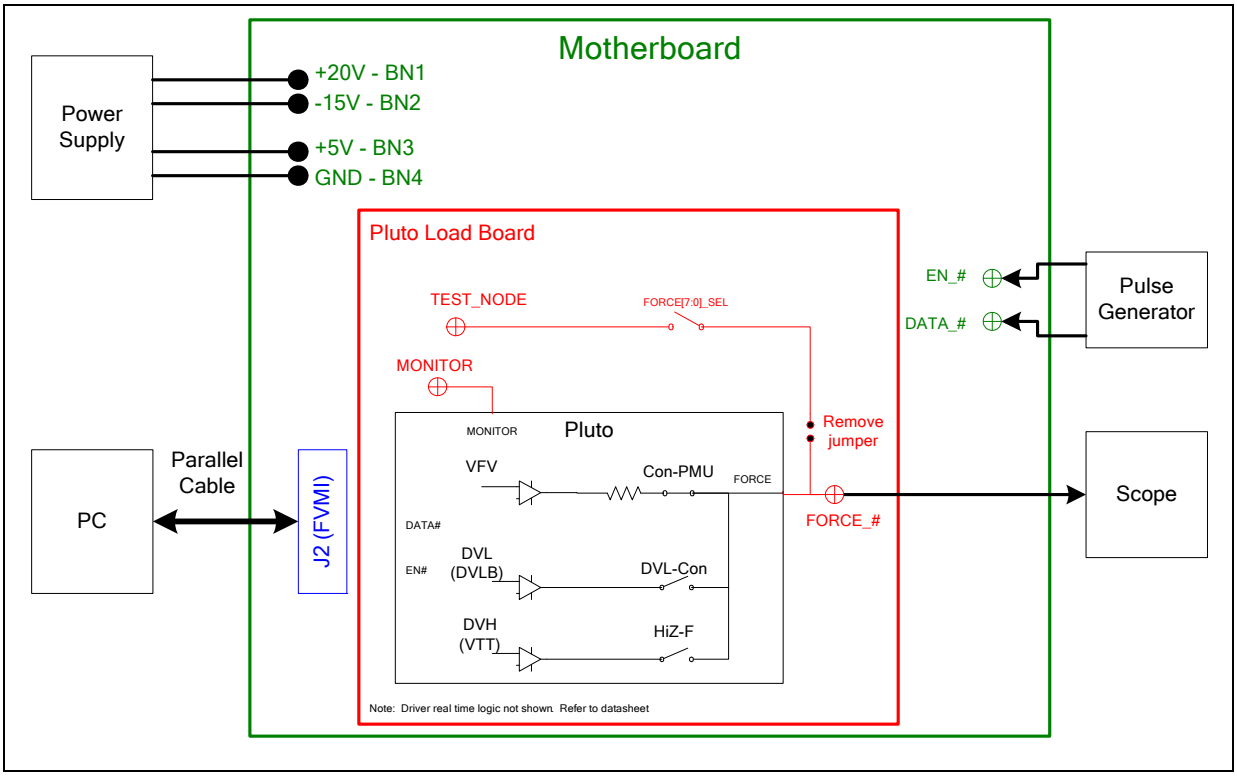
The High-Speed DC Pin Driver configuration uses the PMU-FV (high) and DVL (low) to create a DC pin driver. The DVH (HiZ-Force) can optionally be used to create a 3-level driver. The DATA signal is used to toggle the DC pin driver between the FV (high) and DVL (low) state. The EN signal is used to toggle between the driver state and Hiz-Force.

Setup (refer to Figure 6):

- Connect a scope to FORCE#0 SMA.
- Remove the FORCE# Jumper (i.e. E4) on the Loadboard to reduce the capacitance.
- Select the ***High Speed DC Pin Driver*** option from the **EVM Setup** menu
- Move the E3 jumper (DATA_0) between pins 2 & 3 (towards the Pluto device)
- Connect a single ended pulse generator to the DATA_0 SMA on the motherboard
- To optionally demonstrate a 3-level driver (HiZ-F)
  - Move the E5 jumper (EN_0) between pins 2 & 3 (towards the Pluto device)
  - Connect a single ended pulse generator to the EN_0 SMA on the motherboard
  - Set the **Sel-RT-EN = RT EN** (found in **Pluto->Channel #->PMU Config** dialog box)

Note: The pulse generator must be disabled whenever the Pluto device is powered down.

Figure 6: Pluto DC Pin Driver Configuration Block Diagram



The following lists the Pluto register and EVM configuration for the High Speed DC Pin application:

- Pluto PMU to VR0, VFV=3V (high), Tight Loop, IR=32mA
- Pluto DVL (DVL-B) = 0V (low) and DVH (VTT) = 1.5V (HiZ-Force)
- Pluto Drive-Mode = 1
- Pluto Sel-RT-DATA = 1 (real time control)
- Pluto Sel-RT-En = 0 (CPU control) and CPU-En = High
  - Sel-RT-En =1 (real time control) when performing the optional 3-level driver mode
- All other non-pertinent Pluto and EVM switches are left open

2.3 Motherboard Jumper Definition

Table 4 lists the Motherboard Jumper definitions for the Pluto2 EVM.

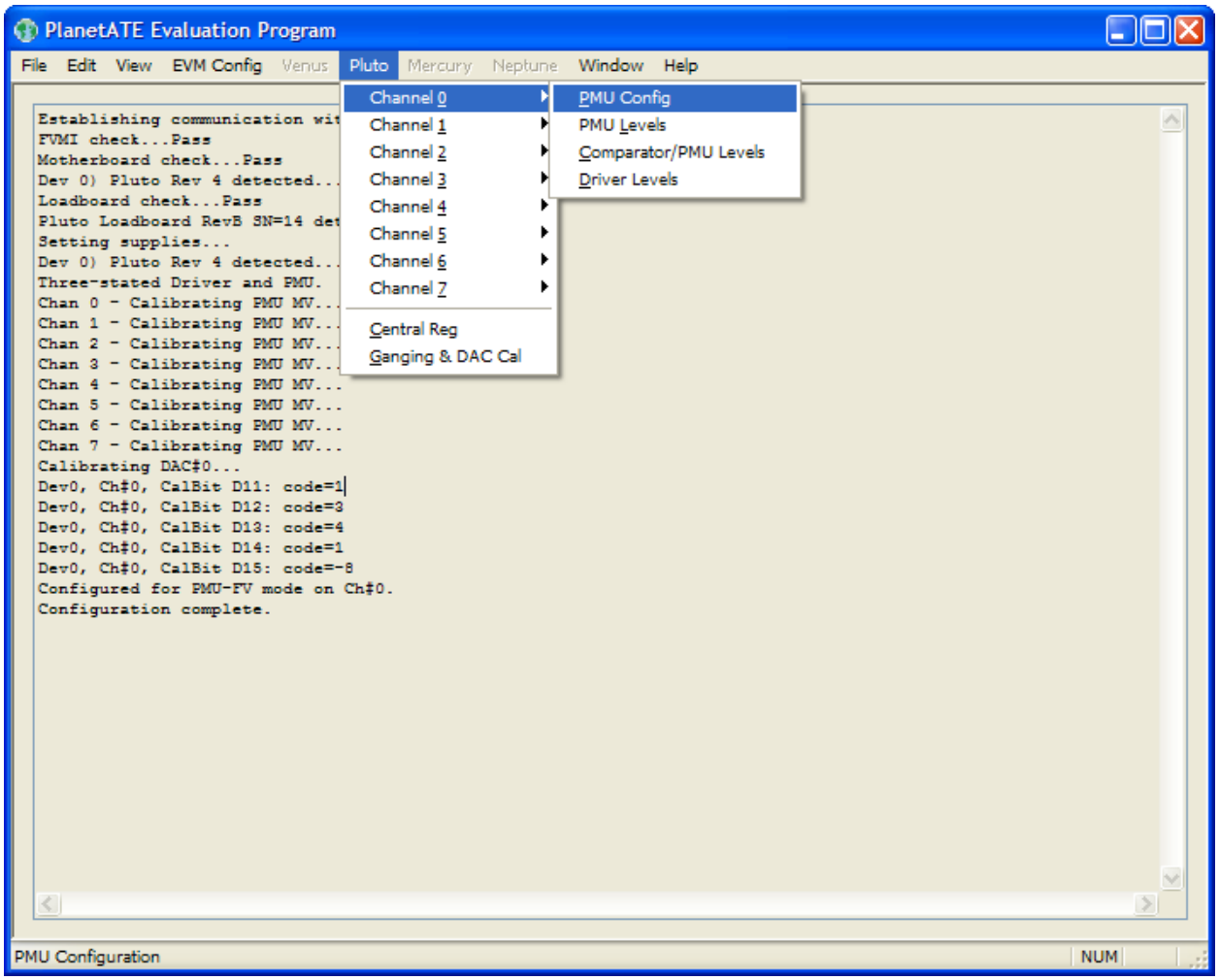
Table 4: Motherboard SMA & Jumper Definitions

Pluto2 EVM	Jumper	Configuration
N/A	E12	
N/A	E11	
SDI_DATA	E14	Short Pin 1 & 2. towards back of board
SDI_SCK	E15	Short Pin 1 & 2. towards back of board
SDI_RCK	E2	Short Pin 1 & 2. towards back of board
EN_3/7	E10	As desired.
EN_2/6	E9	As desired.
DATA_3/7	E8	As desired.
DATA_2/6	E7	As desired.
DIG_BANK_SEL	E1	Short Pin 1 & 2. towards back of board
EN_1/5	E6	As desired.
EN_0/4	E5	As desired.
DATA_1/5	E4	As desired.
DATA_0/4	E3	As desired.
N/A	E13	
N/A	E20	

2.4 Pluto2 Menu Dialog Boxes

Figure 7 illustrates the Pluto menu options. These provide access to the Pluto registers.

Figure 7: Device Config Menu Options

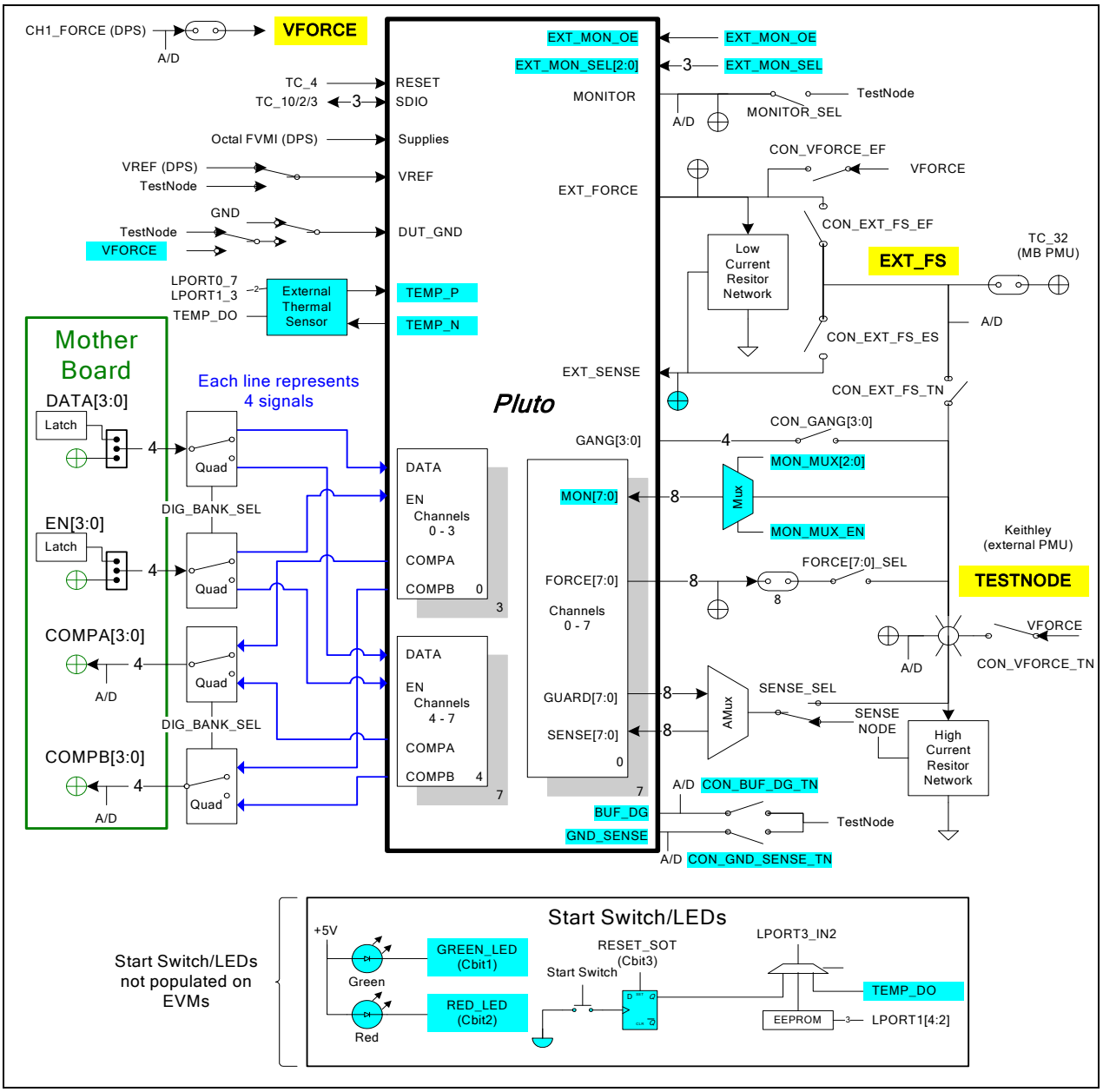


3 Pluto Loadboard Detailed Description

Figure 8 illustrates the Pluto EVM loadboard. The loadboard contains the Pluto device as well as the necessary circuitry to validate & characterize on the bench environment.

Note: The turquoise nodes are new to Pluto Rev 4 and Pluto Loadboard Rev C.

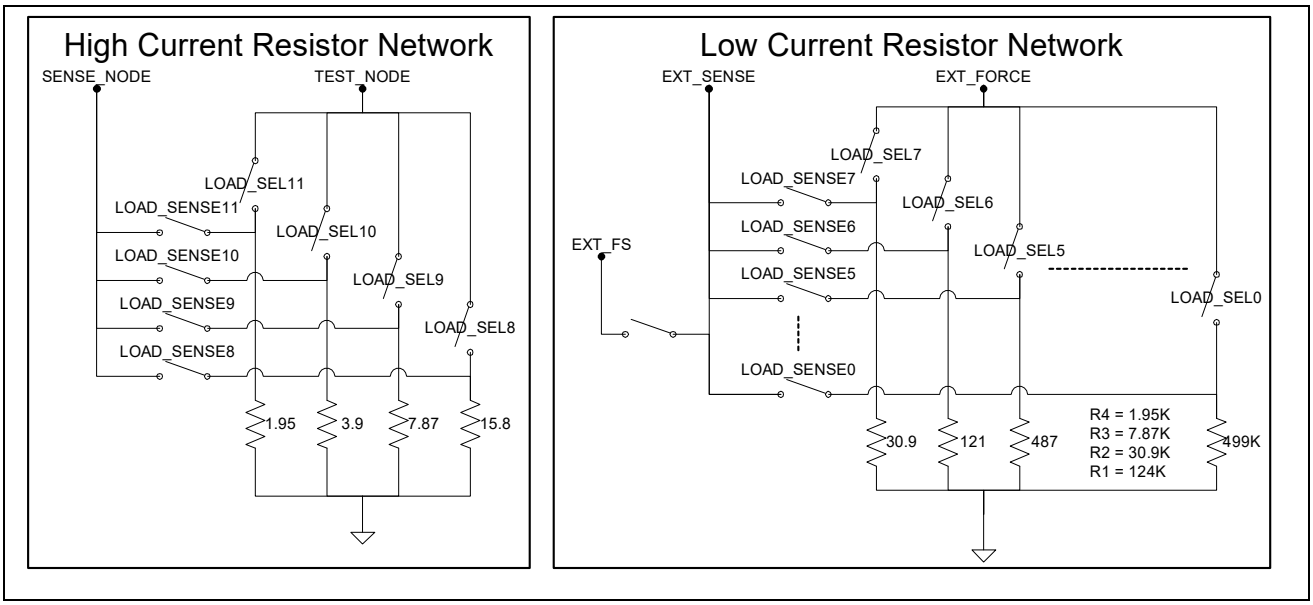
Figure 8: Pluto EVM Detailed Block Diagram



3.1 Resistor Network Definitions

Figure 9 illustrates the Pluto2 EVM resistor network definitions. The software only allows a single resistor value to be switched in.

Figure 9: Pluto2 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 Pluto2 EVM loadboard specific mux input sources.

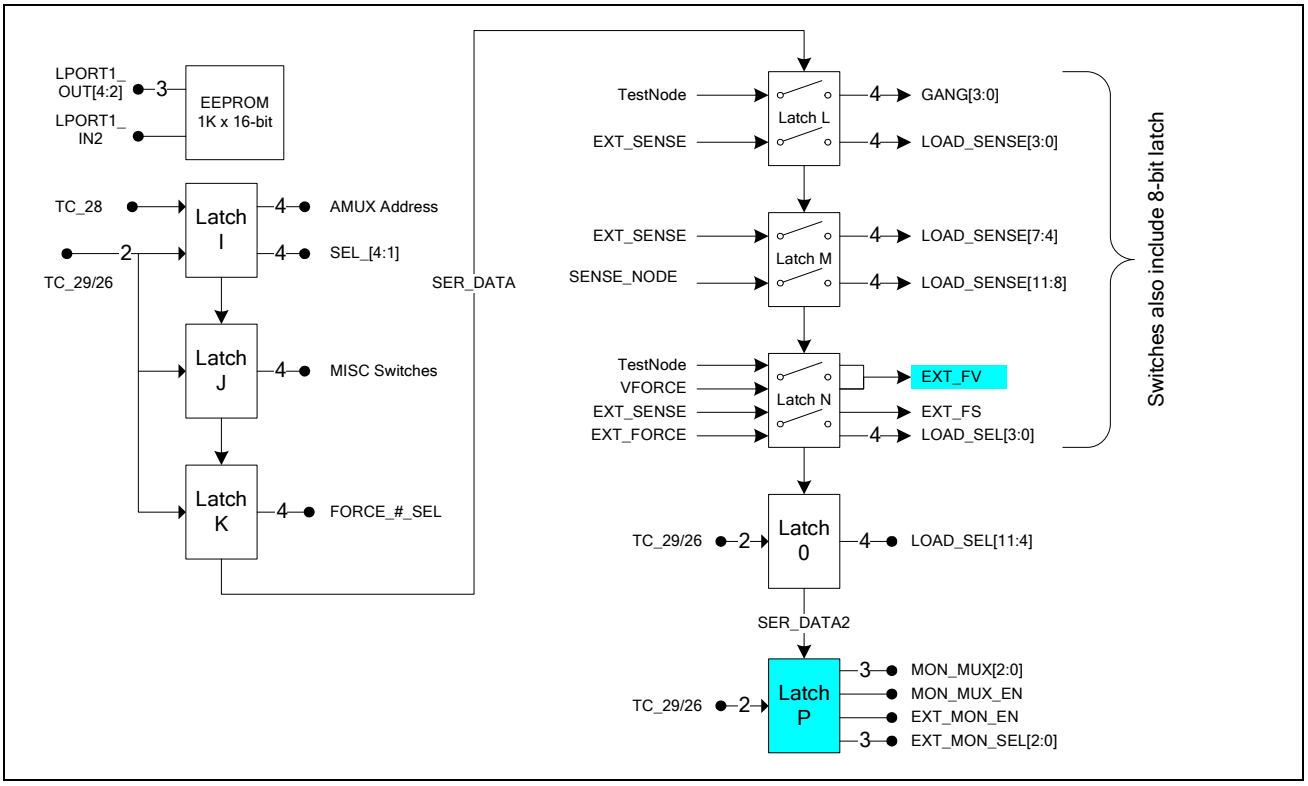
Table 5: FVMI Analog Mux – VINPOS(A) & VINNEG(A) Mapping

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

3.3 Pluto Loadboard Controller

The Pluto loadboard contains eight 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 10 illustrates the Pluto EVM controller section.

Figure 10: Pluto 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 C loadboard
~~Strikethrough~~	No longer present on Rev C loadboard

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

CBIT#	Def	Bit Name	Bit Description
1	0	GREEN_LED	0=LED off. 1=LED on.
2	0	RED_LED	0=LED off. 1=LED on.
3	0	RESET_SOT	0=Normal. 1=Reset SOT Latch (Start Of Test switch)
4	0	CBIT4	Unused
5	0	CBIT5	Unused
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.

The LPORT0_OUT7 bit controls the MAX6627 temperature sensor CS signal.

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

STB_I Bit	Bit Name	Bit Description
3:0	AMUX	Analog MUX 7 – 0 = GUARD[0:7] 15 – 8 = SENSE[0:7]
4	SENSE_SEL	SENSE Select (SEL_1) 0 = SENSE_NODE 1 = TEST_NODE
5	DUT_GND_SEL	DUT_GND Select (SEL_2) 0 = GND 1 = DG_REF (see Table 12)
6	MONITOR_SEL	MONITOR Select (SEL_3) 0 = no connection 1 = TEST_NODE
7	VREF_SEL	VREF Select (SEL_4) 0 = VREF (DPS) 1 = TEST_NODE

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

STB_J Bit	Bit Name	Bit Description
0	MON_MUX_EN	Enables MON_MUX (0=Disable, 1=Enable)
2:1	RDB_SEL[1:0]	Selects LPORT3_IN2 source: 0 = EEPROM 1 = Temperature Sensor 2 = Start Switch 3 = Reserved
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_SENSE	Enable Analog MUX, see Table 7
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: Pluto FORCE_#_SEL) Signal Definitions

STB_K Bit	Bit Name	Bit Description
7:0	FORCE_#_SEL	Connect FORCE_# to TEST_NODE. In Gang Mode, more than one FORCE can be connected at a time. Active Low

Table 10: STB_L (U31: Pluto GANG & LOAD_SENSE) Signal Definitions

STB_L Bit	Bit Name	Bit Description
3:0	GANG[3:0]	Connect GANG# to TEST_NODE
7:4	LOAD_SENSE[3:0]	Connect EXT_SENSE to Low Current Resistor #

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

STB_M Bit	Bit Name	Bit Description
3:0	LOAD_SENSE[7:4]	Connect EXT_SENSE to Low Current Resistor #
7:4	LOAD_SENSE[11:8]	Connect SENSE_NODE to High Current Resistor #

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

STB_N Bit	Bit Name	Bit Description
0	CON_DG_REF_TN	Connect DG Ref to TEST_NODE
1	CON_DG_REF_VF	Connect DG Ref to VFORCE
2	Unused	
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: Pluto 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

Table 14: STB_P (U36: Pluto EXT-MON) Signal Definitions

STB_O Bit	Bit Name	Bit Description
3:0	MON_MUX[3:0]	MON_MUX select. (connects to TEST_NODE) 7-0 = MON# 8 = BUF_DG 9 = GND_SENSE 15-10 = No connect
4	EXT_MON_OE	EXT_MON_OE control
7:5	EXT_MON_SEL	EXT_MON_SEL. 7-0 for EXT_MON_SEL[7:0]

4 Document Revision History

Revision	Date	Description
A01	3/16/04	Initial Draft
A02	9/9/04	Add Loadboard Rev B and Pluto Rev 4 support Added Detailed Block Diagram (moved from 'Planet ATE User's Guide')
A03	12/23/04	Added Resistor Network block diagram, see Section 3.1 Added Controller Logic block diagram, see Section 3.3
A04	8/26/14	Updated software installation to support USB interface
A05	8/29/18	Updated document to include support for Windows 8/10.