



# TRK-MPC5634M User Manual



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P&E Microcomputer Systems, Inc.  
98 Galen St.  
Watertown, MA 02472  
617-923-0053  
<http://www.pemicro.com>

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1	INTRODUCTION .....	1
1.1	Overview .....	1
1.2	Package Contents .....	1
1.3	Supported Devices .....	1
1.4	Recommended Materials .....	1
1.5	Handling Precautions .....	2
2	HARDWARE FEATURES .....	2
2.1	TRK-MPC5634M Board Features .....	2
2.2	On-Board Virtual USB Port .....	4
2.3	TRK-MPC5634M Jumper/Connector Quick Reference .....	5
3	GETTING STARTED WITH THE TRK-MPC5634M .....	9
4	SYSTEM SETUP .....	10
4.1	Overview .....	10
4.2	Operating System Requirements .....	10
4.3	Software Setup .....	10
4.4	Quick Startup .....	11
4.5	Hardware Setup .....	11
5	OPERATING MODES .....	12
5.1	Overview .....	12
5.2	Debug Mode .....	12
5.3	Run Mode .....	12
5.4	External JTAG/Nexus Mode .....	12
6	JUMPER SETTINGS .....	13
6.1	System Power .....	13
6.2	I/O Pins .....	13
6.3	Debug Mode .....	14
6.4	CAN Port .....	15
6.5	Virtual Serial Port .....	15
6.6	LIN Channels/Connectors .....	16
6.7	MCU .....	18
6.8	Boot Configuration .....	19

6.9	Clock Selection .....	20
6.10	Push Buttons .....	21
6.11	LED Display Port .....	22
6.12	DIL Switch.....	22
6.13	Analog Input Enable .....	23
6.14	Photo Sensor Enable .....	24
6.15	Reset Sources .....	24
6.16	OSJTAG Bootloader Enable .....	25
6.17	eTPUA LED Enable .....	25
7	TRK-MPC5634M CODE DEVELOPMENT SOFTWARE.....	26
7.1	Using CodeWarrior With The TRK-MPC5634M.....	26
7.2	Using P&E Software With The TRK-MPC5634M.....	26
8	TRANSITIONING TO YOUR OWN TARGET .....	26
8.1	Hardware Solutions At A Glance .....	27
8.2	Working With P&E's Multilink Universal or USB Qorivva Multilink.....	28
8.3	Working With P&E's Cyclone MAX.....	29
9	TROUBLESHOOTING.....	30
9.1	TRK-MPC5634M Is Undetected .....	30
10	TRK-MPC5634M ERRATA (REV. A ONLY).....	31

# 1 INTRODUCTION

## 1.1 Overview

The TRK-MPC5634M is a low-cost development system supporting Freescale MPC5634M microcontrollers in 144LQFP packages. The Embedded OSJTAG circuitry on the TRK-MPC5634M board allows the processor on the board to be debugged and programmed via USB from a PC. In addition, the demo board can be powered using the USB bus.

## 1.2 Package Contents

The TRK-MPC5634M package includes the following items:

- TRK-MPC5634M Board
- CodeWarrior Development Studio DVD-ROM
- TRK-MPC5634M Resources CD
- USB A-to-B Cable
- Freescale Warranty Card

## 1.3 Supported Devices

The TRK-MPC5634M supports the following devices:

- MPC5634M microcontrollers in 144LQFP packages

## 1.4 Recommended Materials

- Freescale MPC5634M reference manual and datasheet
- TRK-MPC5634M board schematic

## 1.5 Handling Precautions

Please take care to handle the package contents in a manner such as to prevent electrostatic discharge.

## 2 HARDWARE FEATURES

The TRK-MPC5634M is a demonstration and development system for Freescale's MPC5634M microcontrollers in 144LQFP packages. Application development is quick and easy using Embedded OSJTAG. An optional 14-pin JTAG port is provided to allow the use of an external Qorivva MPC55xx/56xx interface such as P&E's USB Multilink or Cyclone MAX automated programmer. P&E's USB Multilink provides faster communication speeds and can be used to debug both the TRK-MPC5634M and the user's own targets.

**Note:** The DEMO board's Embedded OSJTAG is intended to function with the on-board processor only. It cannot be used to communicate with other devices.

### 2.1 TRK-MPC5634M Board Features

- Soldered MPC5634M LQFP144 device
- Access to MCU pins with standard headers
- Embedded OSJTAG: USB to JTAG circuitry which allows host PC to communicate with the microcontroller through USB 2.0.
- On-board Virtual Serial Port
- ON/OFF Power Switch w/ LED indicator
- A 9VDC to 12VDC power supply input barrel connector
- Power Input Selection Jumpers for selecting the input voltage source:
  - Power Input from USB Connector
  - Power Input from DC Power Jack
    - Freescale MC3390x
- Jumper to select BAM source:
  - From internal memory
  - From CAN
  - From LIN Flex

- RESET Push Button and LED indicator w/ enable
- User Features:
  - 4 User Push Buttons w/ enable and pull-up & pull-down options
  - 4 DIL switches w/ enable and pull-up & pull-down options
  - 10K Ohm POT connected to an ADC input channel w/ enable
  - 1 photocell w/ enable
  - 4 User LED's w/ enable
  - 1 RS232 interface w/ enable (DB9 and transceiver footprint only)
  - 1 CAN interface w/ enable to high-speed CAN transceiver with DB9 CAN connector
  - 2 LIN channels w/ enable sharing one LIN transceiver with two standard LIN connectors
  - 4 distinct GND test points
- Specifications:
  - Board Size 4.7" x 4.3"
  - Power Input:
    - USB Cable: 5VDC, 500mA max
    - DC Power Jack: 2.1/5.5mm barrel connector, 9VDC to 12VDC Center Positive

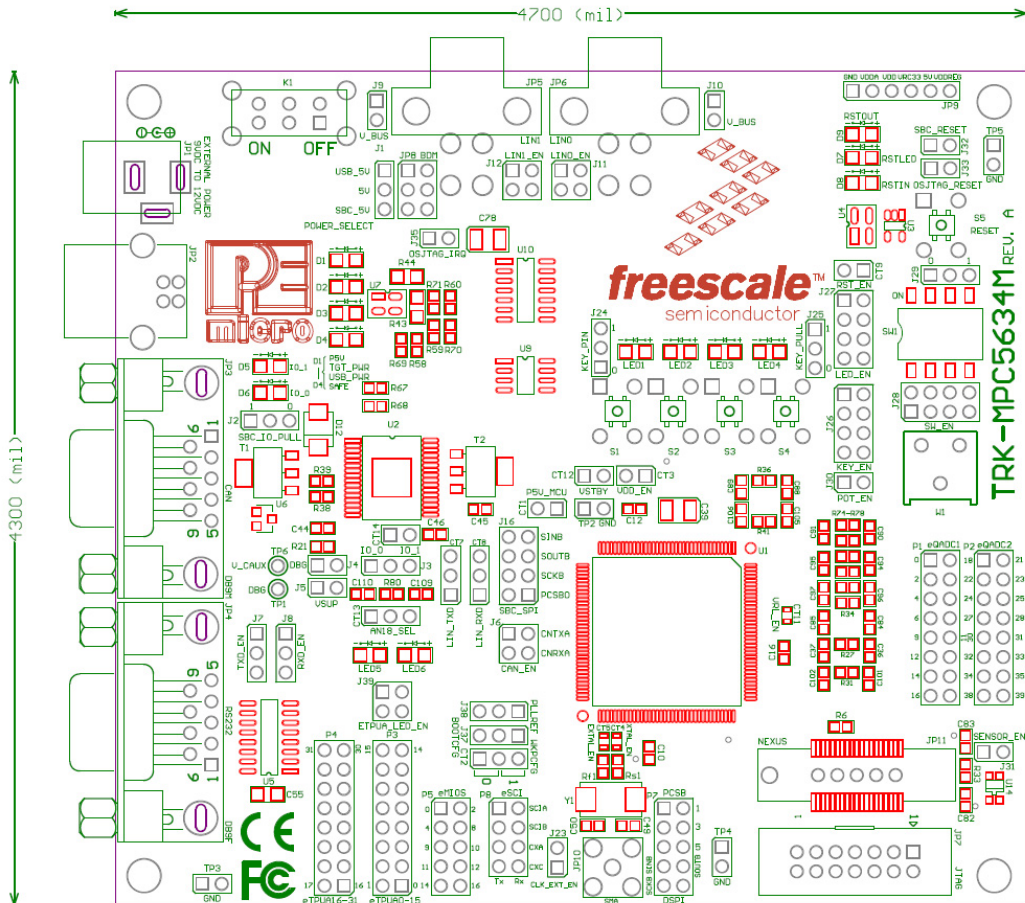


Figure 2-1: Top Component Placement

## 2.2 On-Board Virtual USB Port

The TRK-MPC5634M board has a built-in virtual serial port which may be connected to the MPC5634M processor’s SCI RXD/TXD. This allows certain PC applications to be able to connect in a serial fashion to the microcontroller without the actual use of serial port hardware.



## 2.3 TRK-MPC5634M Jumper/Connector Quick Reference

### Default Jumper Settings

The following is a list of default jumper settings for TRK-MPC5634M board. The settings listed indicate the “on” (or installed) position.

#### Default Jumper Settings

JUMPER	OPTION	SETTINGS	DESCRIPTION
J1	System Power Source Select	1-2 (default)	USB OSJTAG Supplies 5VDC
		2-3	SBC MC33905 Supplies 5VDC
J2	SBC I/O LED Pull Up/Down	1-2 (default)	Pull Up
		2-3	Pull Down
J3	SBC I/O Signal	1-2 (default)	I/O-0
		2-3	I/O-1
J4	SBC DBG Short to GND (default: OFF)	1-2	Short SBC DBG Pin to GND, Bypass R21 and D13
J5	SBC DBG Pull Up (default: OFF)	1-2	Pull Up SBC DBG Pin to SBC Power Supply via 330 Ohm Resistor
J6	CAN Signals to Transceiver Enable	1-2, 3-4 (default)	Enables TXD and RXD signals to CAN Transceiver

### Default Jumper Settings

J7	RS232 TXD Signal	1-2 (default)	MCU TXD to Virtual Serial Port
		2-3	MCU TXD to RS232 Transceiver
J8	RS232 RXD Signal	1-2 (default)	MCU RXD to Virtual Serial Port
		2-3	MCU RXD to RS232 Transceiver
J9	LIN1 VBus Enable (default: OFF)	1-2	Provides Power to LIN1 Connector
J10	LIN0 VBus Enable (default: OFF)	1-2	Provides Power to LIN0 Connector
J11	LIN0 Signals to Connector Enable	1-2 (default), 3-4 (default)	Connects LIN0 Signals to LIN0 Connector
J12	LIN1 Signals to Connector Enable (default: OFF)	1-2, 3-4	Connects LIN1 Signals to LIN1 Connector
CT7	LIN TXD Signal	1-2 (default)	MCU LIN0TX to Transceiver
		2-3	MCU LIN1TX to Transceiver
CT8	LIN RXD Signal	1-2 (default)	MCU LIN0RX to Transceiver
		2-3	MCU LIN1RX to Transceiver

### Default Jumper Settings

CT1	Cut Trace	shorted (default)	Provides Power to MCU; Current Measurement
J16	SBC SPI	Cut traces on PCB board: 1-2 (default) 3-4(default) 5-6(default) 7-8(default)	Connects MCU SPI signals to SBC SPI
CT4	External Crystal Circuitry Enable Cut Trace (default: ALL ON)	shorted (default)	XTAL
CT5	External Crystal Circuitry Enable Cut Trace (default: ALL ON)	shorted (default)	EXTAL
J23	External Oscillator via SMA Enable (default: OFF)	1-2	EXTAL
J24	Push Button Active High or Low; Opposite of J25	1-2 (default)	Active Low
		2-3	Active High

### Default Jumper Settings

J25	Push Button Pull Up/Down Enable; Opposite of J24	1-2 (default)	Pull Up
		2-3	Pull Down
J26	Push Button Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port EMIOS0, EMIOS2, EMIOS4, and EMIOS8 to Push Buttons Correspondingly
J27	LED Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port EMIOS9, EMIOS10, EMIOS11, and EMIOS12 to LEDs Correspondingly
J28	DIL Switch Signals Enable (default: ALL ON)	1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default)	Connects MCU Port eTPUA20, eTPUA21, eTPUA22, and eTPUA23 to DIL Switch Correspondingly
J29	DIL Switch Active High or Low	1-2 (default)	Active High
		2-3	Active Low
J30	Analog Input Enable	1-2 (default)	Connects MCU AN17 to Potentiometer
J31	Photo Sensor Enable	1-2 (default)	Connects MCU AN35 to Photo Cell
J32	SBC Reset to MCU Enable (default: OFF)	1-2	Enables SBC Reset Signal to Trigger MCU Reset
J33	OSJTAG Reset to MCU Enable	1-2 (default)	Enables OSJTAG Reset Signal to Trigger MCU Reset

### Default Jumper Settings

CT9	System Reset Enable	1-2 (default)	Connects Reset Sources to MCU Reset Signal
J35	OSJTAG Bootloader Enable (default: OFF)	1-2	Forces OSJTAG to start up in bootloader mode for firmware updates
J37	BOOTCFG1	1-2	Processor uses serial boot mode
		2-3 (default)	Processor uses internal boot mode
J38	PLLREF	1-2 (default)	Processor uses a crystal clock source
		2-3	Processor uses an external clock source
CT2	WKPCFG	1-2 (default)	Processor pins are configured as weak pull down
		2-3	Processor pins are configured as weak pull up

## 2.4 External Power Supply Requirement

DC Power Jack: Center Positive 2.1mm/5.5mm Barrel Connector  
 Input Voltage Range: 9VDC to 12VDC

**Note:** In order for LIN and CAN to operate properly, SBC must be powered externally.

### 3 GETTING STARTED WITH THE TRK-MPC5634M

The TRK-MPC5634M is a low-cost board targeting quick microcontroller evaluation. Please refer to the TRK-MPC5634M Quick Start Guide for instructions on how to install software, connect the TRK-MPC5634M to your PC, and run quick demonstrations.

### 4 SYSTEM SETUP

#### 4.1 Overview

The Embedded OSJTAG driver is required to operate the TRK-MPC5634M using a PC. The Embedded OSJTAG driver should be installed with the CodeWarrior Development Studio software before the PC is connected to the TRK-MPC5634M.

Because new features and bug fixes are implemented frequently, it is strongly recommended that the user download and install the latest OSJTAG drivers from <http://www.pemicro.com/osbdm>.

#### 4.2 Operating System Requirements

The following are the resources required to run the CodeWarrior Development Studio and the TRK-MPC5634M:

- A PC-compatible system running Windows 2000, Windows XP, Windows Vista, or Windows 7
- 128MB of available system RAM, and 1GB of available hard disk space
- A DVD-ROM drive for software installation
- A USB port

#### 4.3 Software Setup

##### 4.3.1 Installing CodeWarrior Development Studio

To install the CodeWarrior Development Studio, follow the instructions on the DVD-ROM.

### 4.3.2 Installing P&E Resources

Use the TRK-MPC5634M Resources in the DVD-ROM to access and install P&E resources for the DEMO board. These materials are not required for operation. The TRK-MPC5634M Resources CD-ROM contains the following support materials:

- TRK-MPC5634M User Manual (this document)
- TRK-MPC5634M Board Schematic
- TRK-MPC5634M Component Breakdown List
- P&E Evaluation Software
- Links to Freescale documentation, P&E Discussion Forums, and TRK-MPC5634M FAQs.

## 4.4 Quick Startup

Only a few steps are required to get the TRK-MPC5634M up and running. Please reference the Quick Start Guide.

## 4.5 Hardware Setup

### 4.5.1 First-Time Connection

The TRK-MPC5634M may be connected to a PC through a USB port. Connection steps are listed below in typical order:

1. Install the required software, as described in the previous section.
2. Make sure the jumper USB\_5V for POWER\_SELECT is installed.
3. Plug the USB cable A-M connector into a free USB port of the PC.
4. Plug the USB cable B-M connector into the USB connector on the TRK-MPC5634M Board.
5. The operating system will recognize the Embedded OSJTAG circuitry and P&E's USB to Serial circuitry. Depending on the operating system, you may see the "Found New Hardware Wizard" dialog to assist you with installation. Follow the onscreen Windows instructions to install the OSJTAG driver (these instructions may vary slightly depending on your specific operating system).
6. Select the "Install the software automatically (Recommended)" option

and click the “Next” button. Windows will install the driver files to your system. At the end of the installation, click the “Finish” button.

**Note:** Depending on the operating system, you may see the “Found New Hardware Wizard” dialog again to assist you with software installation for “PEMicro USB Serial Port (i1).” Follow the onscreen Windows instructions.

1. Select the “Install the software automatically (Recommended)” option and click the “Next” button.
2. Windows will install the driver files to your system. Click the “Finish” button to exit the “Found New Hardware Wizard.”

If the TRK-MPC5634M hardware interface driver is now properly installed on your system, the green USB LED on the TRK-MPC5634M Base Board should be illuminated. In addition, if you turn on the system power of the TRK-MPC5634M you will see the yellow Power LED illuminate.

## 5 OPERATING MODES

### 5.1 Overview

The TRK-MPC5634M’s Embedded OSJTAG circuitry, featured hardware components, and optional external JTAG header make it a versatile development tool. Below are some of the featured operating modes of the TRK-MPC5634M.

### 5.2 Debug Mode

A host communicates with the TRK-MPC5634M through the Embedded OSJTAG circuitry. Either the CodeWarrior Development Studio or P&E’s Qorivva software tools will work with the TRK-MPC5634M. Please refer to **Section 7 - TRK-MPC5634M CODE DEVELOPMENT SOFTWARE** for more information.

### 5.3 Run Mode

The TRK-MPC5634M’s rich component list empowers it to perform a variety of tasks. Once an application is developed, debugged, and programmed properly into the microcontroller’s internal flash memory, it can run with or without connecting to a host.



## 5.4 External JTAG/Nexus Mode

The TRK-MPC5634M has an optional JTAG/Nexus header for debugging and programming the on-board MPC5634M microcontroller using an external Qorivva hardware tool, such as P&E's USB Multilink or Cyclone MAX. Please refer to **Section 8 - TRANSITIONING TO YOUR OWN TARGET** for more information. A user can take advantage of this mode to develop a target-specific MPC5634M system and compare it with the TRK-MPC5634M when necessary.

## 6 JUMPER SETTINGS

This section describes the various jumpers settings that are available on the TRK-MPC5634M. Figures depict the default setting for each jumper.

Some board options are implemented as cut-trace options. To change from the default settings, the traces need to be cut and jumpers added to set the desired feature.

### 6.1 System Power

The TRK-MPC5634M board provides 3 power options: SBC MC33905 or LDO can regulate external power to 5VDC, or USB can provide 5VDC through OSJTAG.

#### 6.1.1 J1 - System Power

1-2 USB OSJTAG Supplies 5VDC (default)

3-4 SBC MC33905 Supplies 5VDC

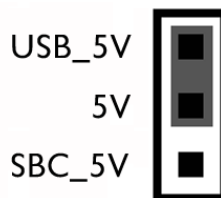


Figure 6-2: System Power (J1)

## 6.2 I/O Pins

The SBC MC33905 provides three I/O pins. Two of them are jumper (J3) selectable to two LEDs, which are further jumper (J2) selectable to pull-up or pull-down.

### 6.2.1 J2 - SBC I/O LED Pull Up/Down

1-2 Pull Up (default)

3-4 Pull Down

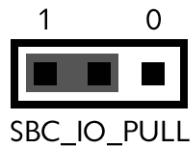


Figure 6-3: SBC I/O LED Pull Up/Down (J2)

### 6.2.2 J3 - SBC I/O Signal

1-2 I/O-0 (default)

2-3 I/O-1

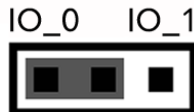


Figure 6-4: SBC I/O Signal (J3)

## 6.3 Debug Mode

The SBC MC33905 has a DBG pin to put it into debug mode. Jumpers J4 and J5 are designed for this purpose.

### 6.3.1 J4 - SBC DBG Short To GND

1-2 Short SBC DBG Pin to GND, Bypass R21 and D13 (default: OFF)



**Figure 6-5: SBC DBG Short To GND (J4)**

### 6.3.2 J5 - SBC DBG Pull Up

1-2 Pull Up SBC DBG Pin to SBC Power Supply via 330 Ohm Resistor (default: OFF)



**Figure 6-6: SBC DBG Pull Up (J5)**

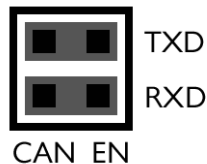
## 6.4 CAN Port

The TRK-MPC5634M board has implemented a CAN port.

**Note:** In order for LIN and CAN to operate properly, SBC must be powered externally.

### 6.4.1 J6 – CAN Signals To Transceiver Enable CAN\_EN

Enables TXD and RXD signals to the CAN transceiver. By default, the jumpers are installed.



**Figure 6-7: CAN\_EN (J6)**

## 6.5 Virtual Serial Port

The TRK-MPC5634M board has a built-in virtual serial port which may be connected to the MPC5504P processor's SCI. This allows certain PC

applications to be able to connect in a serial fashion to the microcontroller without the actual use of serial port hardware. It can be enabled or disabled by installing or removing the jumpers J7 and J8.

### 6.5.1 J7 - RS232 TXD Signal



Figure 6-8: TXD\_EN (J7)

### 6.5.2 J8 - RS232 RXD Signal



Figure 6-9: RXD\_EN (J8)

## 6.6 LIN Channels/Connectors

The TRK-MPC5634M board provides two jumper selectable LIN channels to two jumper selectable LIN connectors.

**Note:** In order for LIN and CAN to operate properly, SBC must be powered externally.

### 6.6.1 J9 - LIN1 VBus Enable

1-2 Provides Power to LIN1 Connector (default: OFF)

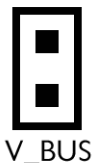


Figure 6-10: LIN1 VBus Enable (J9)

**6.6.2 J10 - LIN0 VBus Enable**

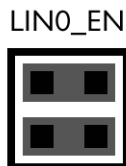
1-2 Provides Power to LIN0 Connector (default: OFF)



**Figure 6-11: LIN0 VBus Enable (J10)**

**6.6.3 J11 - LIN0 Signals To Connector Enable**

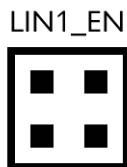
1-2, 3-4 Connects LIN0 Signals to LIN0 Connector (default)



**Figure 6-12: LIN0 Signals To Connector Enable (J11)**

**6.6.4 J12 - LIN1 Signals To Connector Enable**

1-2, 3-4 Connects LIN1 Signals to LIN1 Connector (default: OFF)

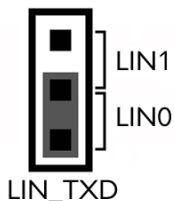


**Figure 6-13: LIN1 Signals To Connector Enable (CT7)**

**6.6.5 CT7 - LIN TXD Signal**

1-2 MCU LIN0TX to Transceiver (default)

2-3 MCU LIN1TX to Transceiver

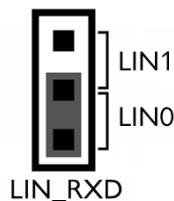


**Figure 6-14: LIN TXD Signal (CT7)**

### 6.6.6 CT8 - LIN RXD Signal

1-2 MCU LIN0RX to Transceiver (default)

2-3 MCU LIN1RX to Transceiver



**Figure 6-15: LIN RXD Signal (CT8)**

## 6.7 MCU

### 6.7.1 CT1 - Cut Trace

1-2 shorted (default)



**Figure 6-16: MCU VDD Enable (CT1)**

### 6.7.2 J16 - SBC\_SPI

Cut traces on PCB: 1-2 (default), 3-4 (default), 5-6 (default), 7-8 (default) -

connects MCU\_SPI signals to SBC\_SPI

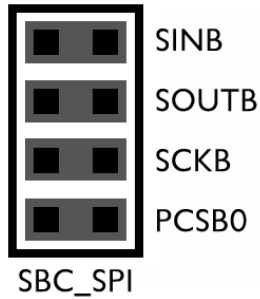


Figure 6-17: SBC\_SPI (J16)

## 6.8 Boot Configuration

### 6.8.1 J37 - BOOTCFG1

- 1-2 Processor uses serial boot mode
- 2-3 Processor uses internal boot mode (default)



Figure 6-18: BOOTCFG1 (J37)

### 6.8.2 J38 - PLLREF

- 1-2 Processor uses a crystal clock source (default)
- 2-3 Processor uses an external clock source



Figure 6-19: PLLREF (J38)

### 6.8.3 CT2 - WKPCFG

- 1-2 Processor pins are configured as weak pull down (default)
- 2-3 Processor pins are configured as weak pull up



Figure 6-20: MPC5634M WKPCFG (CT2)

## 6.9 Clock Selection

### 6.9.1 CT4- External Crystal Circuitry Enable Cut Traces

- 1-2 XTAL
- (default: shorted)



Figure 6-21: External Crystal Circuitry Enable (CT4)

### 6.9.2 CT5- External Crystal Circuitry Enable

- 1-2 EXTAL
- (default: shorted)



Figure 6-22: External Crystal Circuitry Enable (CT5)



### 6.9.3 J23 - External Oscillator via SMA Enable

1-2 EXTAL (default: OFF)



Figure 6-23: External Oscillator via SMA Enable (J23)

## 6.10 Push Buttons

The TRK-MPC5634M board is designed with 4 jumper enabled push buttons with jumper selectable active high or low states.

### 6.10.1 J24 - Push Button Active High or Low (Opposite of J25)

1-2 Active Low (default)

2-3 Active High



Figure 6-24: Push Button Active High or Low (J24)

### 6.10.2 J25 - Push Button Pull Up/Down Enable (Opposite of J24)

1-2 Pull Up (default)

2-3 Pull Down



Figure 6-25: Push Button Pull Up/Down Enable (J25)

### 6.10.3 J26 - Push Button Signals Enable

1-2, 3-4, 5-6, 7-8 Connects MCU Port EMIOS0, EMIOS2, EMIOS4 and EMIOS8 to Corresponding Push Buttons (default: ALL ON)

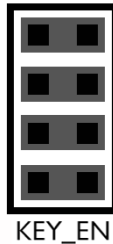
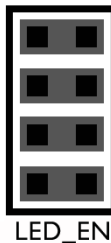


Figure 6-26: Push Button Signals Enable (J26)

### 6.11 LED Display Port

The TRK-MPC5634M has 4 LEDs connected to signals EMIOS9, EMIOS10, EMIOS11, and EMIOS12. They can be enabled or disabled by installing or removing the corresponding jumper, J27, in the LED\_ENABLE header.

#### 6.11.1 J27 - LED Display Enable Port LED\_ENABLE



Enables all LED outputs. This is the default setting.

Figure 6-27: LED Display Enable Header LED\_ENABLE (J27)

### 6.12 DIL Switch

The TRK-MPC5634M board is designed with a 4 jumper-enabled DIL Switch signal with jumper-selectable active high or low states.

### 6.12.1 J28 - DIL Switch Signals

1-2, 3-4, 5-6, 7-8 Connects MCU Port eTPUA20, eTPUA21, eTPUA22, and eTPUA23 to Corresponding DIL Switch (default: ALL ON)

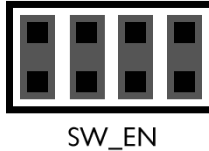


Figure 6-28: DIL Switch Signals (J28)

### 6.12.2 J29 - DIL Switch Active High or Low

1-2 Active Low (default)

2-3 Active High



Figure 6-29: DIL Switch Active High or Low (J29)

## 6.13 Analog Input Enable

### 6.13.1 J30 - Analog Input Enable

1-2 Connects MCU AN17 to Potentiometer (default)



Figure 6-30: Analog Input Enable (J30)

## 6.14 Photo Sensor Enable

### 6.14.1 J31 - Photo Sensor Enable

1-2 Connects MCU AN35 to Photo Sensor (default)

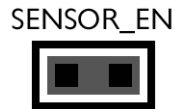


Figure 6-31: Photo Sensor Enable (J31)

## 6.15 Reset Sources

The TRK-MPC5634M board is designed with 3 reset sources: From SBC MC33905, from OSJTAG, and from the Reset Button.

### 6.15.1 J32 - SBC Reset to MCU Enable

1-2 Enables SBC Reset Signal to Trigger MCU Reset (default: OFF)



Figure 6-32: SBC Reset to MCU Enable (J32)

### 6.15.2 J33 - OSJTAG Reset to MCU Enable

1-2 Enables OSJTAG Reset Signal MCU Reset (default)



Figure 6-33: OSJTAG Reset to MCU Enable (J33)

### 6.15.3 CT9 - System Reset Enable

1-2 Connects Reset Sources to MCU Reset Signal (default)



Figure 6-34: System Reset Enable (CT9)

### 6.16 OSJTAG Bootloader Enable

#### 6.16.1 J35 - OSJTAG Bootloader Enable

1-2 Forces OSJTAG to start up in bootloader mode for firmware updates (default: OFF)



Figure 6-35: OSJTAG IRQ Enable (J35)

### 6.17 eTPUA LED Enable

#### 6.17.1 J39 - eTPUA LED Enable

1-2 Connects MCU eTPUA2 to LED (default)

3-4 Connects MCU eTPUA5 to LED (default)

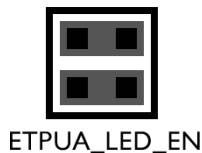


Figure 6-36: eTPUA LED Enable (J39)

## 7 TRK-MPC5634M CODE DEVELOPMENT SOFTWARE

The TRK-MPC5634M includes P&E's OSJTAG circuitry, so no external Qorivva hardware tool is needed to debug and program the TRK-MPC5634M. A user only needs to connect the TRK-MPC5634M to their PC to start developing code for it.

The TRK-MPC5634M package comes with a special edition of Freescale's CodeWarrior studio. In addition, P&E's evaluation software for Qorivva is available in the TRK-MPC5634M Resources section of the TRK-MPC5634M Resources CD, or online at [www.pemicro.com](http://www.pemicro.com). A user may use either CodeWarrior or P&E software tools to develop code for the TRK-MPC5634M.

### 7.1 Using CodeWarrior With The TRK-MPC5634M

The CodeWarrior studio supports Freescale's Qorivva devices. It offers C, C++, and assembly-level support, and provides debugging capabilities based on P&E's debug and programming technologies.

A programming or debug session with the project-based CodeWarrior IDE may be launched by double-clicking on the project name (the format is *projectname.mcp*) from your file storage. Its tutorials, FAQs, and quick start guides are easy to follow and will allow you use pre-built templates to begin creating a new project in a short time. Codewarrior tutorials can be followed based on the instructions provided.

### 7.2 Using P&E Software With The TRK-MPC5634M

P&E offers an integrated development environment for Freescale's Qorivva devices, which combines a GNU C compiler, in-circuit debugger, and flash memory programmer. The debugger supports both assembly and C source-level debugging. The programmer can program/reprogram both internal and external flash devices in-circuit.

## 8 TRANSITIONING TO YOUR OWN TARGET

Once you have finished working with the TRK-MPC5634M and are ready to build your own target, you will need a hardware tool to allow you to develop using your own board.

The Multilink Universal and USB Qorivva Multilink are development tools that are functionally comparable to the Embedded Multilink circuitry on the TRK-

MPC5634M. Either interface will enable you to debug your code and program it onto your target. The Cyclone MAX is a more versatile and robust development tool with advanced features and production capabilities.

These solutions all work with Freescale's CodeWarrior as well as P&E software, and provide a seamless transition to working with your own hardware. More information is available below to assist you in choosing the appropriate development tool for your needs.

## 8.1 Hardware Solutions At A Glance

The Multilink Universal and USB Qorivva Multilink each offer an affordable and compact solution for your development needs, and allow debugging and programming to be accomplished simply and efficiently. Those doing rapid development will find these interfaces easy to use and fully capable of fast-paced debugging and programming.

The Cyclone MAX is a more complete solution designed for both development and production. The Cyclone MAX features automated power switching, multiple communications interfaces (including USB, Ethernet, and Serial), stand-alone programming functionality, and many other advanced capabilities.

Below is an overview of the features and intended use of the Multilink Universal and USB Qorivva Multilink, as well as the Cyclone MAX.

### 8.1.1 Multilink Universal and USB Qorivva Multilink Features

- Direct user control of target's execution
- Programming and debugging capabilities
- Read/write registers and memory values
- Compact and lightweight
- Communication via USB 2.0
- Supported by P&E software and Freescale's CodeWarrior
- USB Qorivva Multilink supports Freescale Qorivva MPC55xx/56xx.
- Multilink Universal supports Freescale Qorivva MPC55xx/56xx, HCS08, HC(S)12(X), RS08, ColdFire V1/+V1, ColdFire V2-4, and Kinetis ARM.

## 8.1.2 Cyclone MAX Key Features

Advanced programming and debugging capabilities, including:

- PC-Controlled and User-Controlled Stand-Alone Operation
- Interactive Programming via Host PC
- In-Circuit Debugging, Programming, and Testing
- Compatible with Freescale's ColdFireV2/3/4, Power Architecture 5xx/8xx, Qorivva MPC55xx/56xx, and Kinetis ARM microcontroller families
- Communication via USB, Serial, and Ethernet Ports
- Multiple image storage
- LCD screen menu interface
- Supported by P&E software and Freescale's CodeWarrior

## 8.2 Working With P&E's Multilink Universal or USB Qorivva Multilink

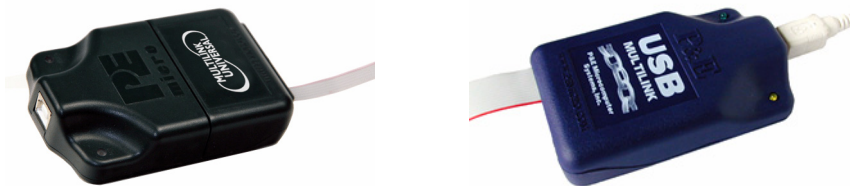


Figure 8-1: Multilink Universal (left) & USB Qorivva Multilink (right)

### 8.2.1 Product Features & Implementation

P&E's Multilink Universal and USB Qorivva Multilink each connect your target to your PC and allow the PC access to the debug mode on Freescale's Qorivva MPC55xx/56xx microcontrollers (the Multilink Universal also supports several other Freescale processors). These interfaces connect between a USB port on a Windows 2000/XP/2003/Vista/7 machine and a standard 14-pin JTAG/Nexus connector on the target.

By using either of these interfaces, the user can take advantage of the background debug mode to halt normal processor execution and use a PC to control the processor. The user can then directly control the target's



execution, read/write registers and memory values, debug code on the processor, and program internal or external FLASH memory devices. The Multilink Universal and USB Qorivva Multilink each enable you to debug, program, and test your code on your board.

## 8.2.2 Software

The Multilink Universal and USB Qorivva Multilink interfaces each work with Codewarrior as well as P&E's in-circuit debugger and flash programmer to allow debug and flash programming of the target processor. P&E's USB Qorivva Multilink Development Packages come with the USB Qorivva Multilink interface, as well as flash programming software, in-circuit debugging software, Windows IDE, and a register file editor.

## 8.3 Working With P&E's Cyclone MAX



Figure 8-2: P&E's Cyclone MAX

### 8.3.1 Product Features & Implementation

P&E's Cyclone MAX is an extremely flexible tool designed for debugging, testing, and in-circuit flash programming of Freescale's ColdFireV2/3/4, Power Architecture 5xx/8xx, Qorivva MPC55xx/56xx, and Kinetis ARM microcontrollers. The Cyclone MAX connects your target to the PC via USB, Ethernet, or Serial Port and enables you to debug your code, program, and test it on your board. After development is complete the Cyclone MAX can be used as a production tool on your manufacturing floor.

For production, the Cyclone MAX may be operated interactively via Windows-based programming applications as well as under batch or .dll commands from a PC. Once loaded with data by a PC it can be disconnected and operated manually in a stand-alone mode via the LCD menu and control buttons. The Cyclone MAX has over 7Mbytes of non-volatile memory, which

allows the on-board storage of multiple programming images. When connected to a PC for programming or loading it can communicate via the ethernet, USB, or serial interfaces.

### 8.3.2 Software

The Cyclone MAX comes with intuitive configuration software and interactive programming software, as well as easy to use automated control software. The Cyclone MAX also functions as a full-featured debug interface, and is supported by Freescale's CodeWarrior as well as development software from P&E.

P&E's Cyclone MAX is also available bundled with additional software as part of various Development Packages. In addition to the Cyclone MAX, these Development Packages include in-circuit debugging software, flash programming software, a Windows IDE, and a register file editor.

## 9 TROUBLESHOOTING

### 9.1 TRK-MPC5634M Is Undetected

**Q:** The connection assistant indicates that my TRK-MPC5634M is undetected even though I have connected the hardware to my USB port. What should I do?

**A:** The connection assistant, which displays in either Codewarrior or P&E's development software, is a dialog which allows the user to connect to the TRK-MPC5634M hardware. If this dialog indicates that the TRK-MPC5634M hardware is not connected to the PC, the first step is to make sure that the TRK-MPC5634M hardware is connected to the PC via a USB 2.0 high-speed cable. If it is connected, unplug and then plug in the USB cable on the TRK-MPC5634M board and click refresh in the connection assistant. If the hardware still does not show up, try the following remedies:

#### **(A) Re-Install the USB driver**

If the Multilink device does not show up in the device manager, re-install the CodeWarrior Development Studio software from the DVD-ROM. After driver installation, unplug the TRK-MPC5634M from the PC and reboot the PC. When the reboot has completed, connect the interface to the PC with the USB 2.0 cable. Run the software again to see if the interface is now detected.

#### **(B) USB Hub Usage**

The TRK-MPC5634M is a high-power USB device. If a USB Hub is used, it must be a self-powered hub (i.e., with its own power supply). If the Hub is not self-powered the TRK-MPC5634M will not work. In general, USB ports located directly on the PC are high-power (self-powered) ports.

## 10 TRK-MPC5634M ERRATA (REV. A ONLY)

The following errata should be noted for Rev. A of the TRK-MPC5634M. Workarounds are listed, when available.

1. VDDREG is floating.

Workaround : Rev. A boards are shipped with an extra jumper between pins 5+6 of JP9 to connect VDDREG to the 5V power supply.

2. JCOMP is not connected on the 14-pin JTAG header (JP7) used for external debug tools.

Workaround : Rev. A boards have a wire soldered to connect the JCOMP signal. If the user wishes to install the Nexus/Mictor connector, this wire may need to be removed. OSJTAG is not affected by this erratum.

3. OSJTAG is operating at 5V debug logic instead of 3.3V.

No workaround available. However, this should not affect OSJTAG debug functionality.

4. J1 Silkscreen incorrect.

The J1 silkscreen text for the system power source selection (USB vs. SBC) is incorrectly swapped. Pins 1+2 select SBC power, but the silkscreen indicates USB power. Likewise, pins 2+3 select USB power, but the silkscreen indicates SBC power.

5. J7 and J8 jumpers not populated by default.

Workaround : Install 1x3 headers onto J7 and J8. These jumpers are required to connect the processor's TXD and RXD signals to the OSJTAG virtual serial port.

6. Wrong barrel size for JP1.

On Rev. A boards, the barrel connector for JP1 is 2.5mm/5.5mm instead of 2.1mm/5.5mm.

Workaround : Use a 2.5mm/5.5mm barrel power supply.

7. J16 jumpers not populated by default

Workaround : Install 2x4 header onto J16. These jumpers are required to connect the processor's SPI signals to the SBC MC33905. Future revisions will implement this as cut traces.



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P&E Micrcomputer Systems, Inc.  
98 Galen St., 2nd Floor  
Watertown, MA 02472

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