Touch Panel System Using E-Field Sensor Setup Instructions

Reference Design Documentation for the RDTOUCHEFRM

freescale™
semiconductor

PREFACE

This user's guide provides the installation and setup instructions for the Touch Panel System using the MC33794 E-Field Sensor. It describes how to easily program the embedded MCU and the basic hardware configurations to start the demo.

AUDIENCE

This document is intended for application developers who are setting up Freescale's E-Field Sensor Reference Design.

SUGGESTED READING

- Additional documentation may be found at www.freescale.com
- Design Reference manual.
- Application note, AN1985: Touch Panel Applications using the MC34940/MC33794 E-field IC.

CONVENTIONS

This document uses the following conventions:

Term or Value	Definition	Examples
Terminal Names	Terminal names are the physical connections and are shown in text as all upper case.	... the external supply voltage VSUP1.
Terminal Values	Terminal values are the currents to/from a terminal and are shown as upper and subscripted text.	In Stop Mode the voltage regulator still supplies the MCU with V_{DD}
Decimal Values	No special symbol attached to the number	1.0 34
Numbers	Considered positive unless specifically noted as a negative value	5.0 -10
Blue Text	Linkable on-line	... refer to Table 1, page 2

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INTRODUCTION

DEFAULT SETTINGS

This kit contains everything you need to get started except the 9V battery. This document will guide you through the steps necessary to download your own program using Serial Bootloader Tool interface or MON08 Multi-link. The default jumper configuration is shown in table 1.

Default Jumper Configuration

JP1	Position 1-2 (10nF)
JP3	Position 1-2 (Non-amp LEVEL)

The configuration jumpers within the analyzer board are JP1 and JP3. JP1 selects if the input to Microcontroller's AD channel is feed directly from the output pin (LEVEL) or if the output signal is first amplified by the on board op-amp with adjustments in offset and amplitude, and then feed into the MCU (LEVEL_AMP).

JP3 selects between two values of LP_CAP, 10nF and 1nF, the recommended value in the data sheet is 10nF.

Source code is available on the design reference manual of the touch panel system using E-field sensors.

In order to start running the application, touch panel board (TPB) or a customized electrodes board should be connect to analyzer board (AB) using the 15-pins connector "JP2".
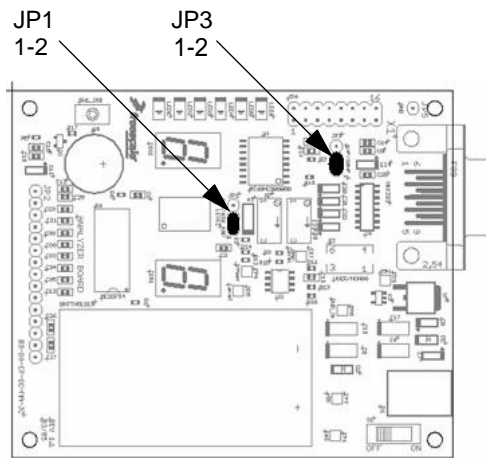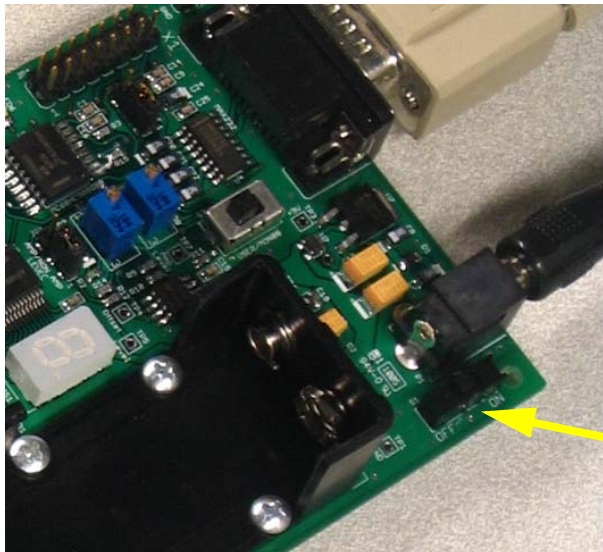

Figure 1. Default Jumper Configuration

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VOLTAGE SUPPLY

The first step is to prepare the Analyzer Board by plugging the 9V battery or connecting an external 9V source to the Jack "P1", when connecting battery and external supply at the same time, the external power supply jack will disconnect the battery VCC terminal.

On/Off Switch

For powering Analyzer Board make sure power supply, either battery or external power supply doesn't exceed 15V.Place a common 9 volts battery on the battery holder with the appropriate polarity, or connect +9V center positive on the jack for external power supply and then move "S1" to the "ON" position.

With the default firmware up into the microcontroller and the default settings described above, the application should be running; LED's, 7 segments displays and audio transducer will provide feedback as the system detects a pressed condition within the touch pads.

PROGRAMMING SETTINGS

PROGRAMMING THROUGH SERIAL BOOTLOADER TOOL

When running the loaded program in the demo, the USER/MON08 switch "S2" should be on the USER position; USER mode is also used when programming the microcontroller using the serial bootloader tool.

To download the firmware using the bootloader tool:

1. Make sure all the required programs are available in the programmer PC, you must have the *.S19 file to be downloaded into the MCU, TeraTerm software used for serial communications, and the required bootloader already programmed into the demo board MCU.

2. Open and configure TeraTerm software, a new connection window will appear, select on the same window "Serial", select the serial port available at your computer and then press the [OK] button.

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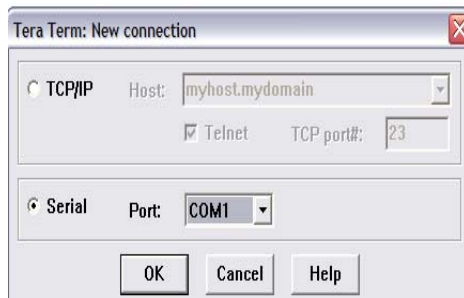
3. On the Setup menu, select *Serial Port…* and configure serial port with baud rate at 9600 bps, 8 bit, no parity, 1 stop bit and flow control set to none. Make sure the transmit delay is set to 3ms/char and 3ms/line in order to ensure a proper communication.
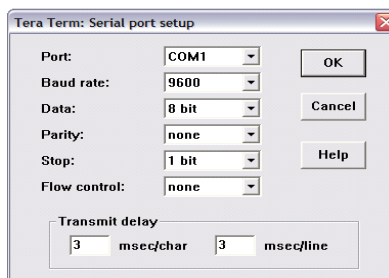
4. Make sure demo board jumpers are configured as default and that the USER/MONO8 switch "S2" is set to USER.
5. Turn on the demo board while holding the sw1_irq button pressed, a *(p)rogram (w)ipe e(x)it* message should appear into the TeraTerm screen.
6. Press *w* to wipe any data already loaded into the MCU flash, note this operation does not erase the bootloader code.
7. Press *p* and a waiting… message should appear, use the TeraTerm File->Send File option to send the.S19 file, a progress dialog will show up.
8. Once the code is downloaded the *(p)rogram (w)ipe e(x)it* message will appear again, press *x* and the downloaded code will start running.
9. Each time the demo board is turned on with out pressing the *sw1_irq* button at the same time the user code will be run directly.

PROGRAMMING USING MON08 MULTI-LINK INTERFACE

To download the firmware using a MONO8 pod:
1. Make sure the USER/MONO8 switch "S2" is set to MONO8 position.
2. Hook the MONO8 adapter into the *JP4* connector, make sure the connector pin alignment is correct to avoid any MCU damage. Apply power to the MON08 Multi-link interface and connect it to you PC port.
3. Using Code Warrior download the code to the demo board, since this operation will erase the bootloader if any was already on the MCU, make sure the interrupt vectors are located on the standard interrupt vector area.

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4. Within the Code Warrior project, click the "Debug" button in the menu bar under the project window, or hit F5. The "Attempting to contact target and pass security…" window should appear. If not, change the Debug mode to "In-Circuit Debug/Programming" in the PEDebug menu. Make sure you have the same values for the following options:
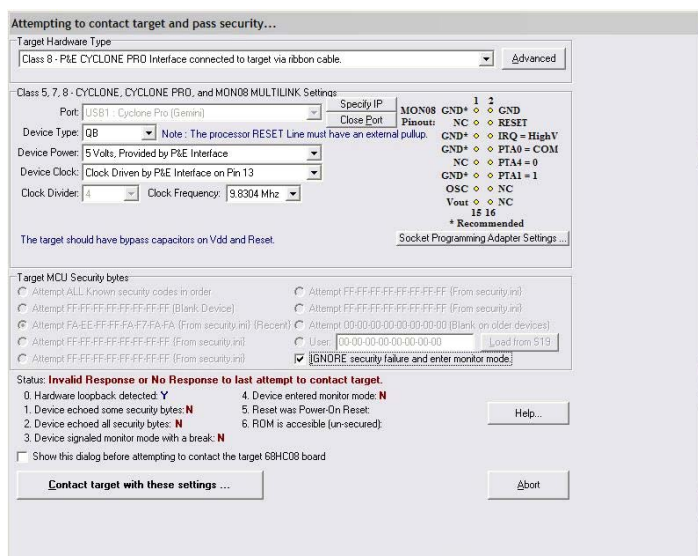
Target Hardware Type: Class VIII

LPTx: Parallel Port x

(Could vary depending on the PC Parallel port used)

Device Type: QB

Device Power: 5 Volts, provided by P&E Interface

Device Clock: 9.8304 MHz, provided by P&E Interface Pin13

Clock Divider: 4

Target MCU Security Bytes:

"IGNORE security failure and enter monitor mode"

Finally click the "Contact target with these settings…" button and if you are asked to "Erase and program flash" click "Yes". After that the MCU Flash will be programmed.

5. the following message should appear, press *yes* button to program flash memory.

6. Once the flash programming process is finished unplug the MONO8 connector and set the switch to USER position.

GENERAL BOARD CONFIGURATION

TOUCH PANEL BOARD CONNECTOR "JP2"

PIN#	Description	PIN#	Description	PIN#	Description
1	GND	6	E3	11	E8
2	SHIELD	7	E4	12	E9
3	SHIELD	8	E5	13	REF_A
4	E1	9	E6	14	REF_B
5	E2	10	E7	15	GND

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TEST POINTS DESCRIPTION

Test point number	Signal name	Description
TP1	GND	System Ground, electrical reference test point.
TP2	+5V	5V power supply output.
TP3	+9V	External power supply or battery voltage. After ON/OFF switch and reverse battery protection stages.
TP4	Offset	DC signal entering Op-amp non-inverter inputs. Output of potentiometer R8.
TP5	Level	output
TP6	PWR_IN	Charge pump output, 10 volts typically measured
TP7	Amp_Level	Amplifier stage output, output with adjustment in offset and amplitude.

ANALYZER BOARD JUMPERS AND SWITCHES

Jumper name	Functional description
JP1	**Position 1-2:** Connects microcontroller A/D input channel 3 to E-field output "LEVEL" directly. **Position 2-3:** connects microcontroller A/D input channel 3 to the Op-Amp output. Op-Amp adjusts gain and offset of "LEVEL" (E-field output). **Other:** NO valid
JP3	**Position 1-2:** E-field LPF filter capacitor = 10nF. **Position 2-3:** E-field LPF filter capacitor = 1nF. **Other:** NO valid
S1	**OFF:** Power supply or battery is disconnected internally to all modules. **ON:** Power up all AB modules
S2	**USER:** Microprocessor in user mode, firmware running. Also used when programming using serial bootloader. **MON08:** microprocessor is ready to be programmed using the MON08 connector.

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