Introduction

This evaluation board provides a platform for testing the ISL1208 and ISL1209 Real Time Clock (RTC) devices. Device features include a crystal oscillator, clock and date counters, and an alarm. The ISL1209 device includes an event-detection feature for recording the time of an event.

The evaluation board provides a platform to test all of these functions, as well as evaluate device performance criteria, such as long-term clock accuracy. Hardware options such as battery and crystal types can also be tested. The software is designed to allow easy setup and monitoring of all major device functions. The two-piece construction utilizing a motherboard and a daughtercard enables the board and software to operate the RTC device residing on a remote board.
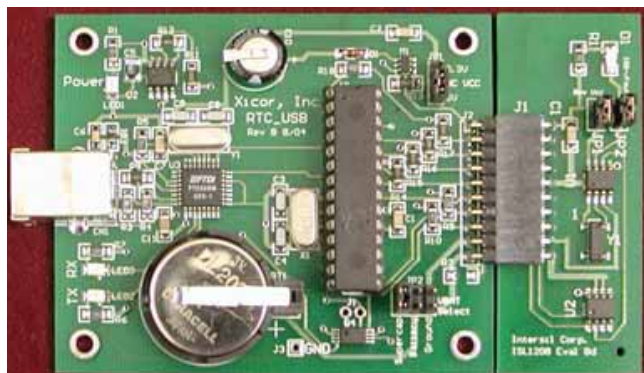

FIGURE 1.

Operation of the RTC Evaluation Board

Hookup and Power

CONNECTIONS

The eval board consists of a motherboard and daughtercard and these need to be connected together. The evaluation board uses hardware and software from FTDI for USB communications and these drivers must be installed on each PC that talks to the RTC eval board. A USB cable, with type A and B connectors on the ends, is required to hook up the board to a PC. The cable should be connected to the PC first and then to the eval board. Once connected, LED1 will illuminate indicating +5V power is available from the USB cable.

POWERING DOWN

The daughter card contains backup power, consisting of a battery or supercap. When powering down, the daughtercard will operate off the backup source determined by JP2 (after the V_{CC} voltage discharges from the V_{CC} supply capacitors). If the user wishes to totally power down

the RTC device once V_{CC} is removed, then either remove the daughtercard from the motherboard or set JP2 to GND. Keep in mind there is a decoupling capacitor on the daughtercard (0.1µF) which must discharge fully before the RTC device stops operating. This discharge time can be up to one second when using a V_{CC} of 5V. Note that when powered down, the RTC board cannot be monitored by the RTC software.

Installing the RTC Software and USB Drivers

USB DRIVERS AND COM PORT SETUP

Insert the Intersil RTC_USB CDROM in the PC to be used. Open the folder "Install USB". Then open the ZIP file "FTDI.zip". Extract this set of files to a separate folder on your main hard drive. For example, create a folder titled "FTDI" on your C: drive, then extract the contents of the ZIP file to that folder. In the "Install USB" folder, there is a pdf file titled "Windows Drivers Installation Guide". Open that file and follow the instructions for the FTDI 232 device (you will need to connect the RTC_USB Eval Board to your PC's USB port, this will bring up a prompt to install the USB hardware and software drivers).

Note that both a hardware AND a software driver need to be installed for correct USB operation. These are two procedures that are best done sequentially per the FTDI Installation Guide.

Once the USB drivers are loaded, locate the RTC program, titled "Intersil 12xx_2.exe" on the CD. This program can be placed anywhere on the PC, or may be run from the CD. Double-click to execute the program (note that the ".._2" may be changed as the program is updated and the revision changes).

After starting the program, an error window may appear indicating that a certain COM port is not available. Dismiss this window by clicking "OK". A timeout error may follow and this should be dismissed as well.

On the Intersil RTC Data Analyzer main window, click on the "Setup" pulldown menu. Click on "Autodetect" and the program will search each COM port to find which is connected to the USB device on the eval board. A small "COM Auto Detect" window will appear and monitor the polling process. Once the correct COM port is detected, it is noted in the "COM Auto Detect" window and that window will close. If you wish to review which COM port is being used, just click again on the "Setup" pulldown menu.

If no COM port is detected, make sure the board is connected to the PC with a USB cable and that the board jumpers are in the appropriate places (see hardware section). If there is still no COM port detected after any

corrections, see the troubleshooting section at the end of this document.

If the COM port number is known in advance (it may be located by looking in the Hardware Device Manager on your PC while the board is plugged in), it may be selected manually by using the setup menu. The software may then be used normally.

Software Time/Date Operation

After opening the RTC program, you will be viewing the RTC Data Analysis Screen. The RTC device requires an initial write to the clock/calendar registers to begin keeping time.

Open the "Set RTC date and time" window and by clicking on the clock icon in the menu bar. The easiest way to set the current time is to click the "Set date and time from PC clock" button, although the time and date can be manually entered using the calendar and time windows. Also choose the time format, either 12- or 24-hour. When complete, click on "Done", bringing you back to the RTC data analyzer window.

Next, click on the "Poll RTC" button. The PC Time, RTC Time, and RTC Deviation windows should constantly update with their respective information. This is the normal mode for RTC operation/monitoring. If the RTC Time fails to update or is not set correctly, use the following troubleshooting steps.

1. **RTC time stuck at 12:00:00 and not advancing** The proper time was not initially written to the RTC registers. Go back to the "Set RTC Time and Date" window and set the time again. Also, be sure to check the USB cable hookup and daughtercard connections to insure these are correct.

2. **RTC time is showing widely varying readings, not consistent and advancing** Most likely the eval board was plugged in after the software was started, which causes issues. Exit the software program (File > Exit, or the X in the upper right corner), and re-open the program. It should detect the board and function correctly.

As the program polls the RTC and updates time, there will be a difference between the RTC time and the PC time due to finite PC communications delays. This should be a constant +1 or -1 second difference, and the window will alternately display between zero and one-second error.

As the RTC or the PC clock drifts, the RTC time window will change color. If the RTC time is faster than PC time, the window will turn red, first light red then dark red, as the error increases. If the RTC time is slower than PC time, the window will turn blue, first light blue then dark blue, as the error increases.

During Polling the temperature of the daughtercard is displayed and updated once per second as well. The ATR register is also displayed, but will likely not change unless Temperature Compensation feature has been enabled (discussed later).

The Polling can be turned off by clicking on the polling button again. The RTC device will still be keeping time, and when Polling is turned on again, it will display the RTC current time.

Modifying RTC Registers

Open the RTC Register screen using the shortcut key in the menu bar (the group of 1s and 0s). The RTC Registers are available using the pulldown menu on the left. Using these registers, the functions of the RTC device can be enabled, modified, or monitored, including:

• Frequency output

• Alarm settings

• Analog Trimming Registers (ATR)

• Digital Trimming Registers (DTR)

• Event-Detection (ISL1209 only)

The clock/calendar registers are available also, but are more easily modified by using the clock/calendar window.

Once the correct register is located, the byte is displayed in the horizontal window along with its hex value. Changes to the individual bits can be made by clicking on a location. A zero is indicated with a white background, and a one is indicated by yellow background. Once the value of the byte is set, the byte is written to non-volatile memory by clicking on "Write". A register value can be read by clicking on "Read".

Using the RTC Deviation/Temperature Recorder

The program is able to record continuous time measurements of the RTC deviation from PC Clock and the board temperature and create a plot of the results. Time frames from a few minutes to many days are possible. From the RTC Data Analysis screen, first select the deviation range from the lower right set of pulldown windows. The Temperature Range and Time Base should also be set as desired from their pulldown windows.

Set the RTC time from the PC time as described above (see Software Time/Date Operation section). This will insure the PC time is close to the RTC time to begin recording.

To begin recording, select "Start" from the "Record Data" pulldown menu (or click on the right arrow in the menu bar). Data will be recorded periodically until the end of the time frame selected or until the Stop function is selected. Note that multiple samples are recorded and averaged before being plotted on the chart recorder.

The status of the recorder is shown in the windows at the bottom of the RTC Data Analysis screen. These windows will continually update with information on the data recording. Recorded data can be saved to a file, as well as imported from a saved data file.

Note that for long recordings of deviation, it is advisable to use a PC program that automatically updates the PC time, such as that available from NIST:
http://www.boulder.nist.gov/timefreq/service/its.htm

Temperature Compensation

Compensation for crystal frequency variation over temperature is accomplished using the Temperature Compensation Settings window. Click on the thermometer icon in the menu bar to open this window. There are six different ranges of temp control available from 0°C to 60°C. Slide the control bar up or down to change the setting for a particular range. To save settings, click the Write button. Click on the Temperature Compensation Enabled button start using the temp compensation. Note that when using the data recorder is functioning, temp compensation is automatically enabled.

DEVIATION STATISTICS

Click the Bell curve icon in the menu bar. The time and temperature statistics are presented here for the current chart recorder data.

DAUGHTERCARD ON/OFF CONTROL

The normally open switch icon in the menu bar controls whether V_{CC} power is applied to the daughtercard. Click on the icon once to shut off V_{CC} power and the icon will turn from black to grey. Click again on the icon to reapply V_{CC} power and the icon will turn black. Note that when V_{CC} power is turned off, the RTC device will operate from backup power selected by JP2 on the motherboard. No communication with the device is possible in backup mode.

Event-Detection Software

The Event-Detection window (shown here) is opened by clicking on the pushbutton switch icon in the menu bar. The button functions are defined as follows:
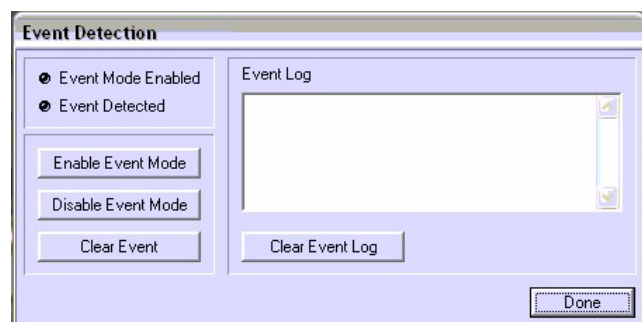

FIGURE 2. EVENT-DETECTION WINDOW

ENABLE EVENT MODE

This will enable the event detection function (set EVEN bit to "1") and put it into a standard mode with input debouncing enabled (ESYSx set to 01) and sampling enabled (ESMPx set to 01). The Event Register is set to 00010101b. The software will poll the Status Register once per second to test the EVT bit. If the EVT bit is set to "1", then the software will read and display the time of the event.

DISABLE EVENT MODE

Disables the Event Mode. Resets the EVEN, EVENx, and ESMPx bits to "0"and stops polling of the Event Register.

CLEAR EVENT

Resets the EVT bit to "0". The Event Input will ignore any activity on the Event Input pin while the EVT bit is set to 1.

CLEAR EVENT LOG

This will clear the window display of all recorded times of events. The window display will retain the list of events, even when closed, until the Clear Event Log button is selected.

Hardware and Software Detailed Descriptions

USB RTC Evaluation Board - General Description

The evaluation board consists of the motherboard and daughtercard. The motherboard contains all the main support functions for the RTC device, including:

- Microcontroller for communicating with the PC and the RTC using serial interfaces.

- USB interface IC for translating the PC USB interface to the microcontroller serial port interface.

- Regulator to produce 3.3V from the 5V board supply.

- Connectors for the USB interface and the daughtercard.

- A 0.22F supercapacitor and a 3V CR2032 lithium battery for backup power.

- Jumpers for selecting the backup battery or supercapacitor, and also for selecting the V_{CC} voltage of 5V or 3.3V.

- A MOSFET switch for disconnecting the V_{CC} supply to the daughtercard for backup testing.

- EEPROM and microprocessor reset (X40411) for storing temperature data.

The daughtercard contains the Intersil RTC device, crystal, temperature sensor IC, decoupling capacitor, and pullup resistor for the open drain output.

Evaluation Board - Functional Description (see Figure 3 and schematic file RTC_USB_schem.pdf)

POWER SUPPLY

The motherboard draws its power from the USB +5V ±5% supply. If the eval board is used to provide power for other circuitry, care must be taken to keep the current draw on this supply well below 500mA which is the maximum for a USB hub-type device. There is an on-board regulator (ICL7663, U2) which produces 3.3V. The V_{CC} for the Intersil RTC chip as well as the serial interface pullup resistors is selectable using JP1 for either 3.3V or 5V. V_{CC} power can be obtained

by clipping a test lead to the JP1 shunt, or if an external V_{CC} supply is used it should be connected to the center pin of JP1 (shunt is removed). A ground connection is available at J3.

BACKUP SUPPLY

There are two sources of backup supply available. A 0.22µF supercapacitor (C10) is on the board. It will provide enough backup power for the typical RTC chip to last many days at room temperature when V_{CC} is set to 5V. There is also a CR2032 battery included in a socket to allow removal/ replacement without soldering. This battery will last up to ten years in normal backup operation. The backup supply is selectable via jumper JP2 as shown in Figure 3. One row of JP2 is connected to the device V_{BACK}, and the other row to the power sources. There are three positions possible on JP2, Supercap, Battery, and Ground. If no backup is used the Ground position should be used. The jumper may be removed altogether and an alternative source for V_{BACK} can be attached to the board via the exposed header.

MICROCONTROLLER

The microcontroller used is the PIC16C63A. It has a dedicated serial interface which connects to the FDTI USB device. There is a dedicated I^{2}C serial interface connected to the Intersil RTC device, EEPROM, and the temperature sensor. The power for the microcontroller comes from the USB 5V input, so the microcontroller will always be powered from 5V. Note that the RB1 to RB4 I/O pins for the microcontroller are available at the daughtercard connector,

J3. This is to enable identification of the RTC daughtercard and thus enable functions for a particular device family. The device is socketed to allow removal or replacement for development activity and software upgrades with a newly-programmed device.

DAUGHTERCARD CONNECTOR (J3)

This connector provides power and interface signals to the daughtercard containing the Intersil RTC device as follows:

Pin 1: V_{CC}

Pin 2: RB4

Pin 3: RB3

Pin 4: RB2

Pin 5: RB1

Pin 6: RB0 or Event Input

Pin 7: SDA

Pin 8: SCL

Pin 9: V_{BAT}

Pin 10: GND

This configuration allows these signals to control the Intersil device on an external board by connecting the serial interface and ground, available at the connector. Also available are the RB0 to RB4 I/O signals from the microcontroller (see Microcontroller section).
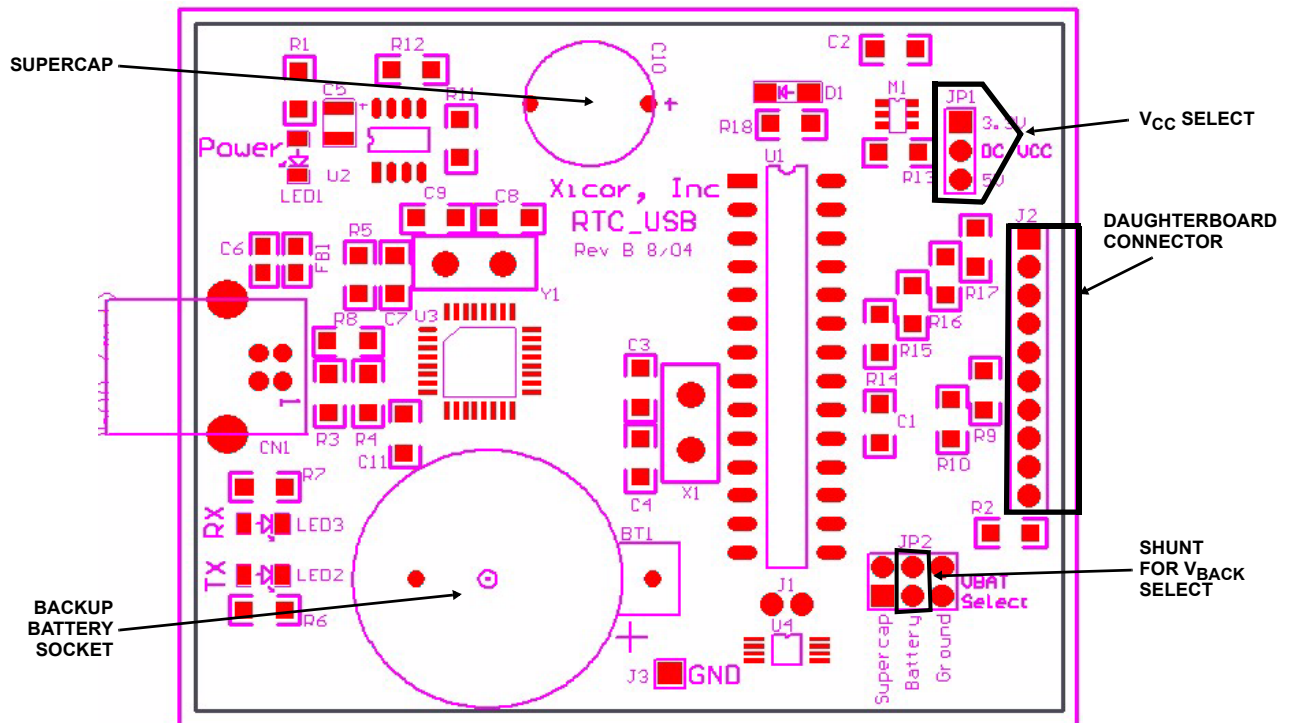

FIGURE 3. RTC-USB MOTHERBOARD LAYOUT

USB connector (CN1). This connector is a standard USB type B connector which goes to the USB port of a PC using a USB type A-B cable.

LEDs

There are three surface-mounted LEDs on the board. LED2 and LED3 monitor the TX and RX functions of the serial port. They should be observed to insure that communication is taking place with the serial port. LED1 monitors the power

supply and will light when the +5V power is applied from the USB cable.

ISL1208 Daughtercard - Functional Description (see Figure 4)

The ISL1208 daughtercard contains the ISL1208 device, crystal, decoupling capacitor, temp-sensor, and an LED (D1), for monitoring the open drain output.
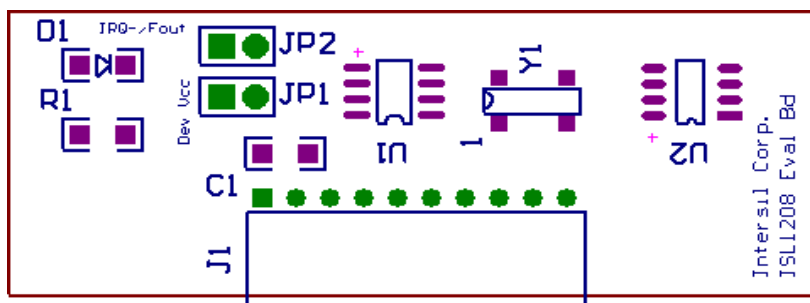

FIGURE 4. ISL1208 DAUGHTERCARD

POWER

Jumper JP1 connects to the V_{CC} pin of the ISL1208 device and must have a shunt in place for the device to function in normal mode.

OPEN DRAIN OUTPUT

The open drain output of the ISL1208 is the IRQ-$\overline{F_{OUT}}$ signal. There is a jumper (JP2) which connects D1 when a shunt is in place, and also enables hooking up an external pullup resistor if it is desired to use the logic signal. The pullup resistor should terminate to a voltage that is less than or equal to V_{CC}.

CRYSTAL

A standard 32.768kHz surface-mounted crystal is supplied on the daughtercard. A through-hole device can only be attached by surface mounting the leads after the surface mount device is removed.

TEMPERATURE SENSOR

There is an LM76 temperature sensor on the board which measures ambient temperature, digitizes it, and provides it to the microcontroller when prompted. Mounting on the daughtercard enables remote sensing of temperature should the daughtercard be placed in a temp chamber and wired to the motherboard.

MEASUREMENTS

The V_{CC} supply current may be monitored by adding a series ammeter to JP1. D1 provides visual indication of IRQ-$\overline{F_{OUT}}$ status, and at low frequencies it will indicate that F_{OUT} is enabled. At higher F_{OUT} frequencies it is possible to monitor the pin with an oscilloscope. This allows good monitoring of the crystal frequency, up to 32kHz. It is possible to probe the X2 oscillator output with a scope

probe, but this is not recommended as it alters the oscillator frequency or possibly stop it momentarily due to introduction of a transient. If it is absolutely necessary to monitor the oscillator output, use a low-capacitance probe (<2pF) or an active probe and note that the absolute frequency monitored will be higher than that without the probe.

ISL1209 Daughtercard - Functional Description (see Figure 5)

The ISL1209 daughtercard contains the ISL1209 device, crystal, decoupling capacitor, temp-sensor, and an LED (D1), for monitoring the open drain output, similar to the ISL1208 daughtercard. In addition there is a microswitch, S1, and a connection block, J3, for the event-detect function. Also, another LED (D2) is available for event monitoring. The main functions of this daughtercard are similar to the ISL1208. The important differences are discussed here.

EVENT-DETECT SWITCH, S1

This is a normally CLOSED switch which is typically connected to ground. A shunt should be installed on J3 from the EVT to GND position for this purpose. Depressing the switch with the event detection software enabled will cause an event to be recorded.

EVENT-DETECT OUTPUT

The event-detect output is open-drain and can be connected to LED D2 by placing a shunt on JP3. With this output enabled, the LED will light when an event occurs.

EVENT CONNECTION BLOCK

J3 contains all signals needed to connect a remote event generating circuit to the evaluation board. V_{CC}, V_{BAT}, the EVIN device input (labeled EVI), Ground, and a high value pulldown resistor are all brought to this block. The 6th
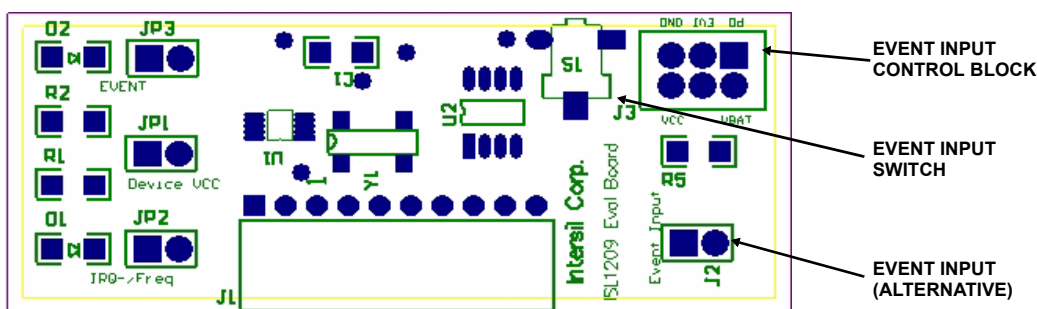
FIGURE 5. ISL1209 DAUGHTERCARD

position is unused. Default connection is for a shunt to be placed across the EVI and GND terminals. Note that if V_{CC} is used to provide power to remote circuitry, that current should be limited to less than 50mA to prevent loading the power switch, shunts, and board traces. The V_{BAT} connection should likewise be limited to less than 10mA to maintain reasonable battery life.

EVENT INPUT, J2

This can be used as a separate input for event detection. If the connections on J3 are left open, then a normally closed switch can be connected across J2 for event detection. Pin 1 (square pad) is the input and the other pin is ground.

Troubleshooting

This section will cover commonly-encountered problems in both hardware and software/USB connections and how to solve them.

Hardware Troubleshooting

1. **Device doesn't respond to software commands**
   Check the V_{CC} select shunt on JP1 on motherboard to make sure it is in place for either 5V or 3.3V V_{CC}. Check shunt on JP1 on daughtercard to make sure its installed or an ammeter is connected across the terminals.

2. **Device loses time or resets to zero time in backup mode** Check shunt on JP2 to make sure it is on either supercap or battery setting. Check to make sure a battery is installed in BT1 socket if using battery backup power.

3. **Power LED doesn't light when plugging into USB cable** This can happen on older PCs that do not have sufficient USB +5V power or may have had a that power fail. Try the board on another PC.

4. **Software reads incorrect time when using FREQ output LED and V_{CC} = 3.3V** In this mode it is possible to get enough noise on the V_{CC} line to cause communications problems with the microcontroller. If FREQ output testing is done at V_{CC} = 3.3V, it may be necessary to disable the FREQ output when doing other tests, or use an external pullup of value >10kΩ connected to JP2 of the daughtercard.

5. **ISL1209 board - device shows event is detected immediately after clearing an event** This indicates the event switch is open continuously or the event pin is

open. The event pin needs to be held to ground (normally closed) in order to detect an event.

Software and USB Troubleshooting

Keep in mind that the RTC_USB board uses a serial to USB converter to communicate, therefore it needs to have a COM port assigned to it. Many problems can be solved quickly by noting the COM port number for the PC your are using and checking the setup menu in the software for that COM port. Using the Autodetect function in the setup menu will usually do this automatically for you.

Also note that the serial USB drivers will only work on WIN98, WIN2000, and EXP machines. WIN NT and earlier operating systems will not work with the drivers.

1. **Software doesn't communicate with the evaluation board (Error message "timeout waiting for a response from device")**

   a. First make sure all connections are secure, USB cable at PC and eval board, and also the daughtercard connector. If no daughtercard is connected then there will be an error message. Also check V_{CC} shunts on the motherboard (JP1) and daughtercard (JP1) are installed.

   b. Check COM port used. Although there are 256 possible COM port addresses, the RTC software will only use the first eight. COM ports 1 and 2 are used for serial port communications and should be avoided if the serial port is used. In the FTDI Windows installation guide and app note, it shows a simple procedure to change COM ports. Make sure the COM port selected for the FTDI device is the same as that selected by the PC. If one COM port is not working, change to another and try again.

   c. The software was opened before the board was plugged into the USB cable. This will cause setup problems. Close the software (exit program) and reopen. If still not working, close software, unplug board, wait a few seconds, then plug the board in and open the software.

   d. Multiple USB drivers in system. Check the Hardware Uninstall window (WIN98, WIN2000) and see if there are multiple serial USB devices shown. Uninstall any extra ones. Also, check the number of other USB devices shown. There may be other multiple USB drivers and some may need to be uninstalled to resume correct communications.

2. **Error Message**

3. **PC just will not recognize the USB_RTC board** If this happens and all methods described above haven't helped, then uninstall the drivers using the FTDI uninstall program (see the Installation Manual on the CD). Then install the drivers again and check for proper operation.

Suggested RTC Tests

ISL1208 or ISL1209

1. **Set time of day and turn on time and temperature recorder** Board can now be exposed to temperature, shock, or other environmental influences to determine effects on time accuracy. Main V_{CC} can be turned on and off to determine backup mode accuracy. Note that the motherboard devices are only rated for commercial temperature range (0°C to 70°C), but the RTC crystal is good for full -40°C to +85°C. If wide temperature range testing is desired, then the daughtercard can be placed in a chamber with remote wiring from the motherboard to the daughtercard. Consult the schematics for the boards for any details on the connections.

2. **Test the frequency output (FREQ)** Go to register 08h (INT) and set bits 0 to 3. Note that the LED D1 will illuminate or flash to indicate FREQ is active (or alarm has occurred). This LED will go off if the V_{CC} is shut down. The jumper JP2 will allow connection to an external pullup or separate board for other tests. Note that a ground connection will be required as well, available at the motherboard (J3). Be careful with low external pullup values (<10kΩ) as the decoupling on the daughtercard may allow large voltage dips when the open drain output is turned ON.

3. **Test the temperature compensation feature** Do a temperature test as in #1, but enable the Temperature Compensation function as described previously in the instructions. The sliders can be used to set the value of the ATR registers, and then those settings are saved by clicking the Save button, then clicking to Enable Temperature Compensation button. Note that it will take many days to see small drifts of time with temperature, but if a frequency counter is available a frequency test can be done as the temp changes. Enable the frequency output as in #2. Add a pullup resistor (10k or higher advised) from JP2, pin 2 (daughtercard) to V_{CC} (available at the shunt of JP1, motherboard). The counter can then be connected to the JP2-2 connection and ground, and the absolute frequency monitored on the counter. For best results it is suggested to use the 1.0Hz frequency selection and use seven or more digits of counter resolution to get one PPM of accuracy.

4. **Test the I_{CC}** An ammeter can be connected in series with the JP1 terminals to monitor the V_{CC} supply current to the device. Note that when using the software and polling is enabled, the I_{CC} will increase and vary quite a bit when the serial interface is communicating.

5. **Test the backup supply current, I_{BAT}** An ammeter can be connected between the terminals of the backup source and the V_{BAT} input on JP2 of the motherboard. Only one source may be selected at a time, so the shunt needs to be removed when doing this. Click on the normally closed switch icon in the menu bar to disconnect V_{CC}, then monitor the I_{BAT} current.

6. **Talk to an RTC device on a remote board** Use the motherboard connector pins and jumper wires to enable communications with an RTC device on a separate test board. The SDA, SCL and ground pins are mandatory for this, and the test board Vcc should match the motherboard Vcc within 5% for best results.

ISL1209 Only

The ISL1209 eval board provides event-detection functions and includes special pins for external circuitry.

1. **Test the event detection function** The on-board switch can be tested by connecting a shunt from the EVT to the GND pins on J3 of the ISL1209 daughtercard. Then open the Event Detection window by clicking on the pushbutton switch icon in the menu bar, and enable event detection. Any touch of the event detect switch will result in a recorded event. Manually setting event-detect function and options can also be done by writing to register 09h. Please see the ISL1209 data sheet for details on event detection options.

2. **External event detection switches** Since the switch function is a Normally Closed (NC) function, external circuits must use a break in the circuit to cause a recorded event. Such breaks are possible using foil with wire contacts inside of an enclosure or on a door frame. Note that a long wire return is required on the door itself. For simple switch circuits such as these, remove the shunt from J3, and run wires from J2 to the external switch.

3. **External event detection circuits** Since the ISL1209 Event Input is triggered by a low to high transition, and the internal pullups can be disabled, external comparator circuits can be used to trigger an event. Such circuits can detect light or darkness, sound, movement, or temperature limits. The connector J3 has and event input pin, as well as V_{CC} and V_{BAT} supply pins, a ground pin and a 10MΩ pulldown to ground. These signals can be jumpered over to another board to enable event detection circuits that run from V_{CC} or V_{BAT}, and can remotely trigger the event pin.

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Using the RTC-USB Motherboard with Older X1227 Daughtercards

The RTC-USB board is compatible with and can be used with the older X1227 daughtercards that were supplied with the serial-port based evaluation platform, similar to the USB platform. The USB motherboard will actually detect the X1227 daughtercard and enable communications with that register set. Here are the specifics required:

1. Plug the daughtercard into the motherboard then plug into the USB cable. Then open the software which will run the detection program.

2. Once the software is running, all functions available on the eval board can be used. Note that there is no temp sensor on the X1227 daughtercard, so there is no temp monitoring available.

3. The X1227 device has a watchdog timer function that can inhibit communications if it is enabled. To disable it, you must repeatedly write to the BL register of the X1227 (see the X1227 data sheet) until the write is accepted by the device.

RTC Motherboard Bill of Materials

DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	MFR	PART #	MFR	PART NUMBER
BT1	CR2032 Socket	BATTX	Battery and Socket	MPD	BS-3-ND	Panasonic or other	CR2032
C1	0.1µF	1206	0.1µF 50v X7R Ceramic Aurface Mount	AVX	12065C104KAT2A	*	*
C10	0.22F SCAP	SCAP	0.22F 5.5V Super Cap - Through Hole	Panasonic	EEC-S0HD224H	DigiKey	P10788-ND
C2	0.1µF	1206	0.1µF 50v X7R Ceramic Surface Mount	AVX	12065C104KAT2A	*	*
C3	18pF	1206	22pF 50v NPO Ceramic Surface Mount	AVX	08055A220KAT2A	*	*
C4	18pF	1206	Capacitor	AVX	08055A220KAT2A	*	*
C5	10µF	CAP SMB	10µF 10v Tantalum Surface Mount	Panasonic	ECS-T1AY106R	*	*
C6	0.01µF	805	Capacitor	*	*		
C7	0.1µF	1206	Capacitor			*	*
C8	20p	1206	Capacitor			*	*
C9	20p	1206	Capacitor			*	*
C11	0.033µF	1206	Capacitor			*	*
CN1	CN-USB	USB_CONN				Molex	67068-1000
D1	1N4148	MiniMELF	Diode			*	*
FB1	FERRITE BEAD	805		DigiKey # 240-1018-1	*		
J1	CON2	CONN_2	Connector	*	*		
J3	CON1	CONN_1	Connector	*	*		
J2	CON10	CONN_10	Connector			Samtec	TSW-110-08-G-S-RA
JP1	HEADER 3	CONN_3	Single Row Header, Breakaway, Tin Finish, Straight	Molex		*	*
JP2	HEADER 3X2	CONN_3X2	Dual Row Header, Breakaway, Tin Finish, Straight	Molex		*	*

RTC Motherboard Bill of Materials (Continued)

DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	MFR	PART #	MFR	PART NUMBER
LED1	RED SM LED	1206 LED	Red Low Current LED Surface Mount	Lumex	SML-LX23IC-TR	*	*
LED2	GREEN SM LED	1206 LED	Green Low Current LED Surface Mount	Lumex	SML-LX23GC-TR	*	*
LED3	YELLOW SM LED	1206 LED	Yellow Low Current LED Surface Mount	Lumex	SML-LX23YC-TR		
M1	SI3443BDV	TSOP-6	P-channel MOSFET	Siliconix	SI3443BDV	*	*
R1	470	1206	1/8W 5% Carbon Comp. Surface Mount		680Ω	*	*
R10	2.2K	1206	Resistor			*	*
R11	200K	1206	Resistor			*	*
R12	130K	1206	Resistor			*	*
R13	20K	1206	Resistor			*	*
R14	100K	1206	Resistor			*	*
R15	100K	1206	Resistor			*	*
R16	100K	1206	Resistor			*	*
R17	100K	1206	Resistor			*	*
R18	47K	1206	Resistor			*	*
R2	10K	1206				*	*
R3	27	1206				*	*
R4	27	1206				*	*
R5	470	1206				*	*
R6	330	1206			470Ω	*	*
R7	330	1206	Resistor			*	*
R8	1.5K	1206				*	*
R9	2.2K	1206	Resistor			*	*
U1	PIC16C63A	SDIP28	PIC 16C63 8-bit CMOS Microcontroller Through Hole	Socket	28-DIP x 0.3"	Microchip	PIC16C63A-04/SP
U2	ICL7663CBA	LSOIC8	Dual Mode 5V Programmable Micropower Voltage Regulators			Intersil	*
U3	FT232BM	QUAD32	USB to Serial Converter			FTDI	FT232BM
U4	X40411-A	MSOP8	Dual Supply Monitor with 4K EEPROM			Intersil	X40411IV8-A
X1	CTS 3.57954MHZ	XTAL_1	3.579545MHz 18pF Crystal Surface Mount	DigiKey	CTX400-ND	CTS	MP036S
Y1	6MHz	XTAL_1	Crystal	DigiKey	CTX405-ND	CTS	MP060
SH1 - SH4	Shunts	0.1"	0.1" Shunt, Closed Top, Tin Plated	DigiKey		Molex	15-38-1026

ISL1208 Bill of Materials

DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	MFR	MFR PART NUMBER	PART NUMBER
C1	0.1µF	1206	Capacitor	*	*	*
R1	360	1206	Resistor	*	*	*
J1	CON10	CONN_10_A	Connector	Samtec	SSQ-110-02-S-S-RA	*
JP1	HEADER 2	CONN2		Molex	0.1" 2-pin header	*
JP2	HEADER 2	CONN2		Molex	0.1" 2-pin header	*
U2	LM76	LSOIC8	Temperature Sensor, Digital	National	LM76CHM-5	DigiKey LM76CHM-5-ND
D1	LTST-C230KRKT	1206		LED RED	LTST-C230KRKT	DigiKey #160-1457-2-ND
Y1	MC-206	XTL_206	Crystal	Epson	SE2406CT-ND	MC-206 32.768KA-A2
U1	X1208	SO-8	RTC	Intersil	ISL1208S8I	*

ISL1209 Bill of Materials

DESIGNATOR	PART TYPE	FOOTPRINT	DESCRIPTION	MFR	MFR PART NUMBER	PART NUMBER
C1	0.1µF	1206	Capacitor	*	*	*
D1	LTST-C230KRKT	1206		LiteOn	LTST-C230KRKT	DigiKey #160-1457-2-ND
D2	LTST-C230KGKT	1206		LiteOn	LTST-C230KGKT	DigiKey #160-1456-2-ND
J1	CON10	CONN_10_A	Connector	Samtec	SSQ-110-02-S-S-RA	*
J2	CON2	CONN2	Connector	Molex	0.1" 2-pin header	*
J3	HEADER 3X2	CONN3X2		Tyco	534206-3	DigiKey #A26453-ND
JP1	HEADER 2	CONN2		Molex	0.1" 2-pin header	*
JP2	HEADER 2	CONN2		Molex	0.1" 2-pin header	*
JP3	HEADER 2	CONN2		Molex	0.1" 2-pin header	*
R1	360	1206	Resistor	*	*	*
R2	360	1206	Resistor	*	*	*
R5	10M	1206	Resistor	*	*	*
S1	KSM-11310	KSM_3	Tactile momentary NC switch	ITT-Cannon	KSM-11310	DigiKey #401-1092-1-ND
U1	X1209	MSOP10	RTC and Event Detect	Intersil	ISL1209S8I	*
U2	LM76	LSOIC8	Temperature Sensor, Digital	National	LM76CHM-5	DigiKey LM76CHM-5-ND
Y1	MC-206	XTL_206	Crystal	Epson	SE2406CT-ND	MC-206 32.768KA-A2

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AN1176.0
June 20, 2005

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