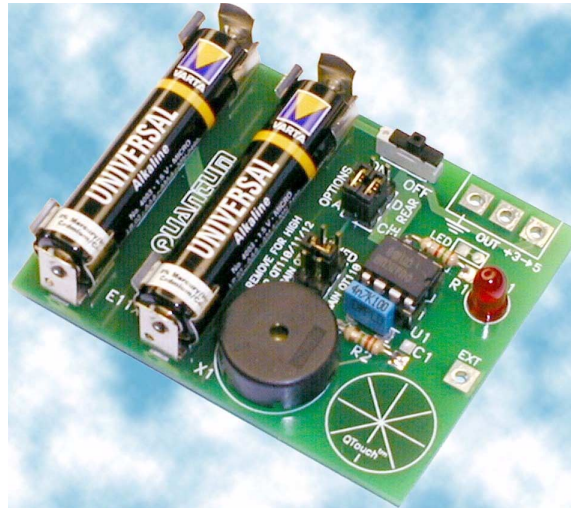


# E11x USER'S GUIDE

## Overview

The E11x demo board works with Quantum's QT110, QT111, QT112, and QT113 QTouch ICs. Depending which IC is supplied with the board, some components and values will vary. The QT11x variants require at a minimum only a single external component – a capacitor (C1) – to operate properly. For the QT110 and QT111, a piezoelectric audio transducer can be added to provide acoustic touch feedback. The capacitor C1 is socketed to allow experimentation.

**For detailed information about the ICs for this board please refer to the QT110 and QT11x datasheets.**



## Fast Start

**To begin using the board right away:**

1. Insert 2 AAA alkaline batteries into the battery holders.
2. Turn on the power slide switch, keeping your fingers away from the QTouch pad area, the piezo beeper (if installed) and generally the entire lower right quadrant of the board on either surface, to prevent the IC from calibrating to your fingertips. If possible just hold the board by the battery side (it's OK to grab the batteries from all sides).
3. Touch the 'QTouch' pad area. The LED will light while touched, and (with the QT110 and QT111 ICs) the beeper will beep briefly.

If you do not obtain these results please look at the option jumper setups configurations (see page 3).

If you are touching the lower right quadrant of the board when you turn the switch on, it will calibrate to ignore your fingers. If this happens, after taking your fingers away for 5 to 15 seconds the sensitivity will return to normal (time depends on the IC installed, the value of C1, and the amount of contact it had with your fingers).

Because of Kirchoff's Current Law ("all currents must return to their origin", which also applies to capacitive fields), the sensor is generally less sensitive if you are not holding it or if the board's 'ground' is not electrically coupled to something else. Thus, placing the board on your desk will result in less sensitivity than if you hold it by the batteries or connect the board's ground to something larger (or to earth ground).

An external piece of metal foil or a wire loop can be connected to the board and attached to the rear of a surface of your choice (plastic, glass, wood, or stone will all work fine) to create a fully self-calibrating touch button (be sure to connect the board's ground to something else for best results - or, power from a wall transformer or other power supply).

**QT110 note:** For the QT110 and QT111 ICs, both the 'QTouch' area and the beeper itself are touch sensitive. The beeper is less sensitive to touch because of the air gap in the plastic housing of the beeper.

**External power - please note!** When using external power, limit the voltage to 5v DC max, using the marked connection points at the top of the board. Be sure to remove the batteries first, or you may cause an explosion and leakage hazard as the batteries will try to charge up from the external supply!

### **Batteries**

Use 2x AAA alkaline batteries for best performance. With most QT11x ICs under normal conditions the battery life will be measured in years. External power may be used if the batteries are removed.

### **Power Connections**

The provided connection points can be used to power the board. The voltage should be between +2.5 and +5 volts DC, regulated. Power should be free from switching noise and short-term fluctuations for best performance. Almost any linear regulator will work. Be sure not to share this power with other circuits that may inject noise or supply fluctuations into the board, as erroneous operation will result (example: relays, digital logic, etc). If external power is used, be sure to remove the batteries.

### **'Out' Connection**

The Out pin is driven directly by the Out pin of the IC. Be careful not to load this pin excessively (see QT110 specifications). The onboard LED is also driven from this line (see schematic diagram). Depending on the variant of IC, this output may be active high or active low.

***It is not advised** to use an external pullup resistor to a voltage source other than the same source powering the board. An external voltage source can back-feed the board with current and attempt to charge the batteries, if present. This will lead to electrolyte leakage and a possible explosion hazard.*

### **'Ext' Sense Connector**

This pin provides a way to connect the device to an external sensing electrode. The load should have low capacitance (Cx) for best results. High Cx will decrease apparent sensitivity. Shielded cable can be used over limited distances, usually with an increase in C1 to compensate for the increased Cx loading.

### **C1 Capacitor**

The C1 capacitor (referred to as Cs in QT110 and QT11x datasheets) is socketed and can be replaced for experimentation. Generally, higher values of C1 will increase sensitivity, however on the QT110, QT111, and QT112 this increase is limited due to these devices' processing characteristics. On the QT113, this increase is directly proportional to C1. Use decent grade capacitors (avoid cheap ceramic capacitors in favor of plastic film types for best results). A typical minimum total value of C1 is 12nF on this board (but see also notes under 'Acoustic Beeper' below).

### **R2 Resistor**

This resistor is only required on QT110- and QT111- installed boards. As described in the QT110 datasheet, its purpose is to dampen a residual 'clicking' sound made by the Piezo at the sampling burst rate. This resistor is not required for proper operation.

### **Acoustic Beeper**

The acoustic beeper functions only with the QT110 and QT111 ICs. On other versions of this board the beeper is not installed. If you desire to install your own beeper, you can use almost any type having 20nF of capacitance or less. This capacitance adds to the value of C1, so the use of a beeper can reduce the required value of C1 or eliminate its need altogether.

### **LED**

The LED is driven directly from the IC. On boards using the QT113, its value is much higher to reduce power supply loading, thus reducing supply sag when the LED comes on. Thus, on QT113- installed boards the LED is much dimmer. When used with H-suffix parts (active high output) the LED remains on until touched.

### **Option Jumpers**

There are two sets of option jumpers, whose function varies from one IC to another. See Page 3.

## Board Variations

### E110 / QT110

The QT110 permits an acoustic beeper drive, and is optimized for ultra-low power touch sensing. It's sensitivity can be altered by jumpers.

OPTIONS FOR E110	A	C	A	D	B	C	B	D
OUTPUT	DC	PULSE	DC	DC	DC	DC	DC	DC
TIMEOUT	10s	10s	60s	60s	10s	10s	10s	10s
TOGGLE	OFF	OFF	OFF	OFF	ON	ON	ON	ON

C1 on the E110 should be from 4.7nF (with beeper installed) to 20nF, or 10nF minimum with no beeper installed.

On high gain the gain jumper can be removed or placed as shown.

The E110 supports -H suffix variants but the LED will indicate in reverse.

E110, E111, E112 GAIN	HIGH	MED	LOW

### E111 / QT111

The QT111 is the same as the QT110 except that it has longer recalibration timeouts, including a setting for infinity. It also permits an acoustic beeper drive.

OPTIONS FOR E111	A	C	A	D	B	C	B	D
OUTPUT	DC	PULSE	DC	DC	DC	DC	DC	DC
TIMEOUT	300s	300s	∞	∞	300s	300s	300s	300s
TOGGLE	OFF	OFF	OFF	OFF	ON	ON	ON	ON

Like the E110, C1 on the E111 should be from 4.7nF (with beeper installed) to 20nF, or 10nF minimum with no beeper installed.

On high gain the gain jumper can be removed or placed as shown.

The E111 supports -H suffix variants but the LED will indicate in reverse.

E110, E111, E112 GAIN	HIGH	MED	LOW

### E112 / QT112

The QT112 is the same as the QT110 except that it has a much faster response time, but it does not have an acoustic beeper drive. If a beeper is installed it will make constant clicking sounds.

OPTIONS FOR E112	A	C	A	D	B	C	B	D
OUTPUT	DC	PULSE	DC	DC	DC	DC	DC	DC
TIMEOUT	10s	10s	60s	60s	10s	10s	10s	10s
TOGGLE	OFF	OFF	OFF	OFF	ON	ON	ON	ON

C1 on the E112 should be from 10nF to 20nF.

On high gain the gain jumper can be removed or placed as shown.

The E112 supports -H suffix variants but the LED will indicate in reverse.

E110, E111, E112 GAIN	HIGH	MED	LOW

### E113 / QT113

The QT113 is similar to the QT110 but has a much faster response time, a variable gain which is set by C1, and different recalibration timeout settings including infinite.

OPTIONS FOR E113	A	C	A	D	B	C	B	D
OUTPUT	DC	DC	DC	DC	DC	DC	DC	DC
TIMEOUT	10s	∞	60s	60s	10s	10s	10s	10s
TOGGLE	OFF	OFF	OFF	OFF	ON	ON	ON	ON

Increasing C1 will increase gain. The IC does not support an acoustic beeper drive, and if one is installed it should be removed.

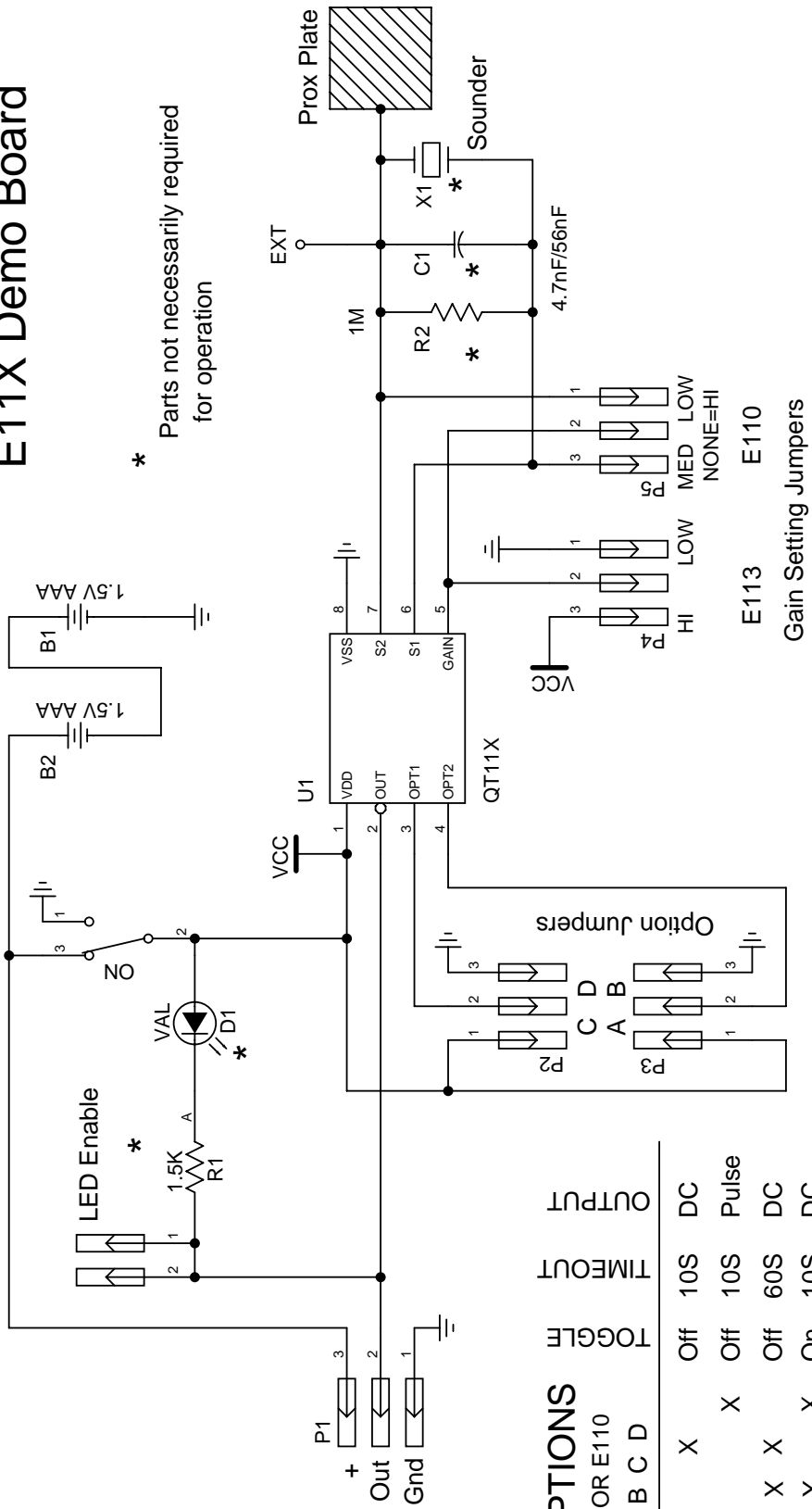
C1 on the E113 board should be from 10nF to 0.5uF although often good results can be had with values beyond 1uF (with non-polarized capacitors).

E113 GAIN	HIGH	LOW

The gain jumper can be placed in either of two positions as shown.

The E113 supports -H suffix variants but the LED will indicate in reverse.

# E11X Demo Board



\* Parts not necessarily required for operation

OPTIONS		TOGGLE		TIMEOUT		OUTPUT
FOR E110						
A	B	C	D			
X	X	Off	10S	DC		DC
X		X	Off	10S		Pulse
	X	X	Off	60S		DC
	X		X	On		DC

E11X Demo Board  
26 April 2000  
E11X.S01