Application Notes for Touch Screen

Revision A

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1. General Information

The FT Series transparent touch screens are resistive touch screens designed to fit in front of a display and for use with fingers, gloved fingers, or stylus. There are three different types; 4-wire, 5-wire, and digital. The 4-wire has many standard options available while 5-wire is more tolerant of wear. The digital is for simpler interface where the screen buttons are in fixed locations. The 5-wire and 4-wire touch screens have optional controllers available with either USB or RS232 interface. Custom options are also available.

These application notes should be used in conjunction with the FT Series Touch Screen data sheet.

2. Part Numbers

The following is a list of the FT Series Touch Screen part numbers.

5-Wire Part Numbers	Description
• FTAS00-104A5	10.4 inch screen
• FTAS00-121A5	12.1 inch screen
• FTAS00-150A5	15.0 inch screen

4-Wire Part Numbers	Description
• FTAS00-57AS4	5.7 inch screen
• FTAS00-65AS4	6.5 inch screen
• FTAS00-84AS4	8.4 inch screen
• FTAS00-104AS4	10.4 inch screen, side tail
• FTAS00-104AV4	10.4 inch screen, top tail
• FTAS00-121A4	12.1 inch screen
• FTAS00-121AS4	12.1 inch screen
• FTAS00-150A4	15.0 inch screen

Digital Part Number	Description
• FTAS225-57AN	5.7 inch digital screen

3. Controller Boards

There are four different controller boards so that USB and RS232 are available for both the 4-wire and the 5-wire touch screens.

	USB Controller	RS232 Controller
5-wire Touch Screens	FTCU05B	FTCS05B
4-wire Touch Screens	FTCU04B	FTCS04B

4. Connectors

There are four connectors on the control boards:

Connectors	Description	Mfr and Part Number	Mates with
CN1	Touch Screens Ribbon Cable	Molex 39-53-2084	NA
CN2	RS232	Hirose DF3A-3P-2DS	Hirose DF3-3S-2C
CN3	Power Supply	Hirose DF3Z-2P-2H(20)	Hirose DF3-2S-2C
CN4	USB Communication	USB mini-B	NA

CN1 Connector for Touch Panel (8 pin) for FTCU05B, FTCS05B (5-wire)		
Pin Number	Signal Code	Terminal Name
1	UR	UR
2	UL	UL
3	NC	-
4,5	SENSE	SENSE
6	NC	-
7	LL	LL
8	LR	LR

CN1 Connector for Touch Panel (8 pin) for FTCU04B, FTCS04B (4-wire)		
Pin Number	Signal Code	Terminal Name
1,2	Y0	Y_{UP}
3,4	Y1	Y_{LO}
5,6	X0	X_{LE}
7,8	X1	X_{RI}

CN2 Connector for RS232 (3 pin) for FTCS05B, FTCS04B			
Control Board			Computer
Pin Number	Signal Code	Terminal Name	
1	RD	Data In	Data Out
2	SD	Data Out	Data In
3	GND	GND	GND

CN3 Power Supply (2 pin) for FTCS05B, FTCS04B		
Pin Number	Signal Code	Terminal Name
1	V_{CC}	+
2	GND	GND

CN4 Connector for USB (5 pin) for FTCU05B, FTCU04B		
Pin Number	Signal Code	Terminal Name
1	V_{CC}	USB V_{CC}
2	D-	USB D-
3	D+	USB D+
4	GND	USB GND
5	GND	Sealed GND

5. Controller Dimensions

Controller dimensions for USB (FTCU05B, FTCU04B)
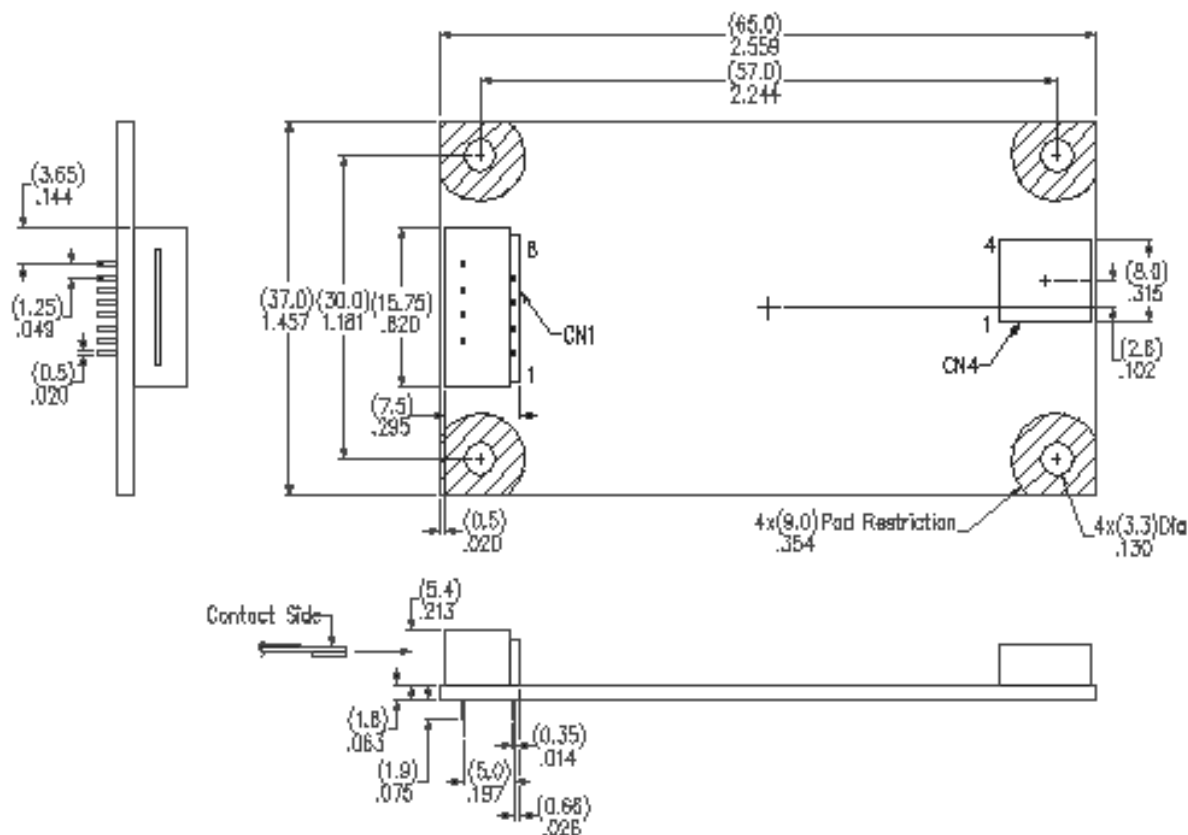
Controller dimensions for RS232 (FTCS05B, FTCS04B)
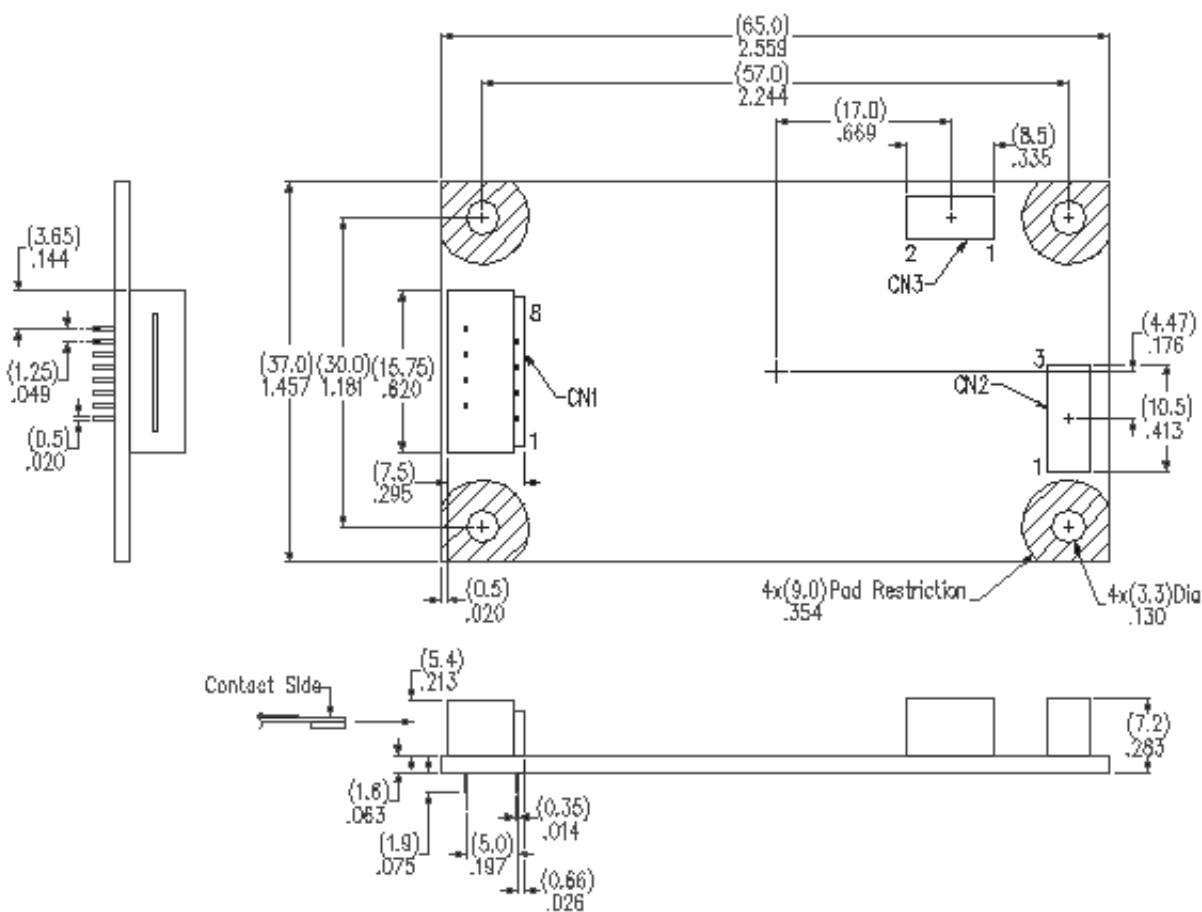
6. Drivers

For USB:
1. Download driver for Win XP, Vista and 7: updd_xp_103_A.exe

2. Follow directions given by program on how to install driver.

7. Cable Installation Procedures

1. Follow directions given by program on how to install driver.
2. The controller ribbon cable connector, CN1, is delivered in the locked position. It is difficult, but not impossible, to put the cable into the connector in this configuration.
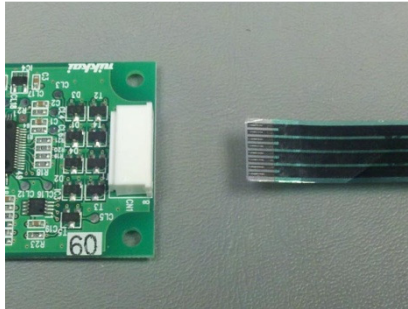

3. The recommended procedure is as follows:
4. First, the connector should be pulled forward.
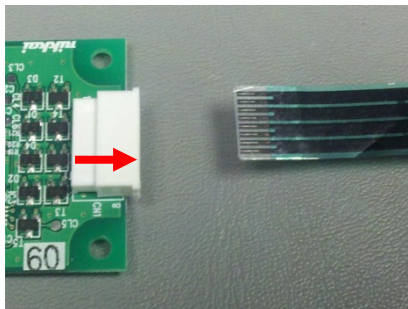
5. The ribbon cable should be installed with the black lines facing up. It should slide in until it is firmly in place. There is a flat plastic support on the bottom of the ribbon cable that can be used for pushing the cable into the connector.
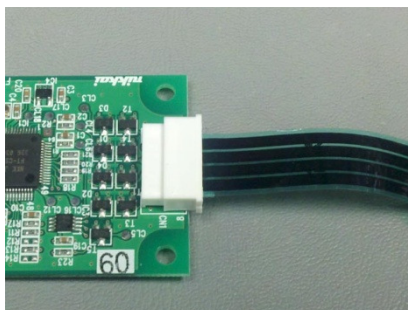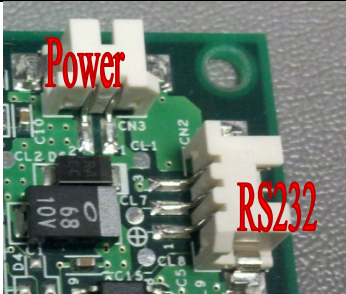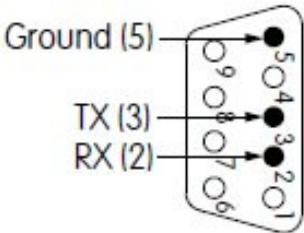
6. The connector should then be pulled back until firmly in place.
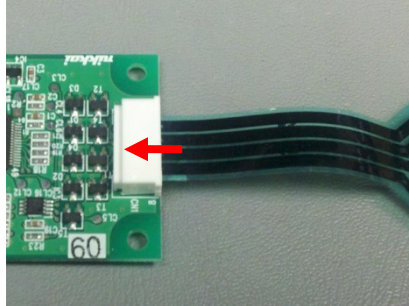
7. For FT-CU04B, FT-CU05B, FT-CSU564 USB controllers insert small USB connector into controller.
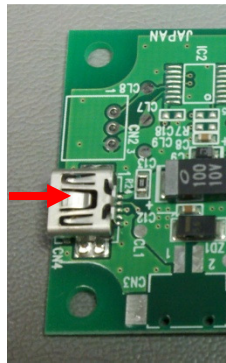

8. Insert standard USB connector into USB port on computer.

9. For the FT-CS04B, FT-CS05B RS232 controllers insert the AT714 connector assembly into the power receptacle. Attach the red wire to 5VDC and the black to ground. The AT713 connector connects to the RS232 receptacle and goes to the serial port or other RS232 ready connector. The blue wire goes to the RX pin (2) on the serial port. The yellow wire goes to the TX pin(3). The black wire goes to the ground pin(5).

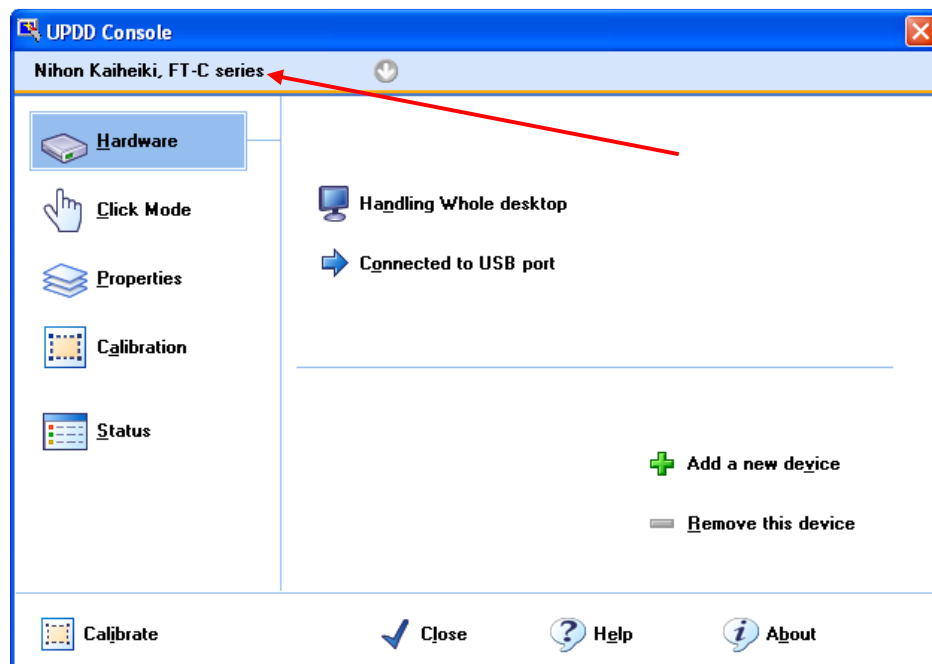10. The green LED on controller shall blink.

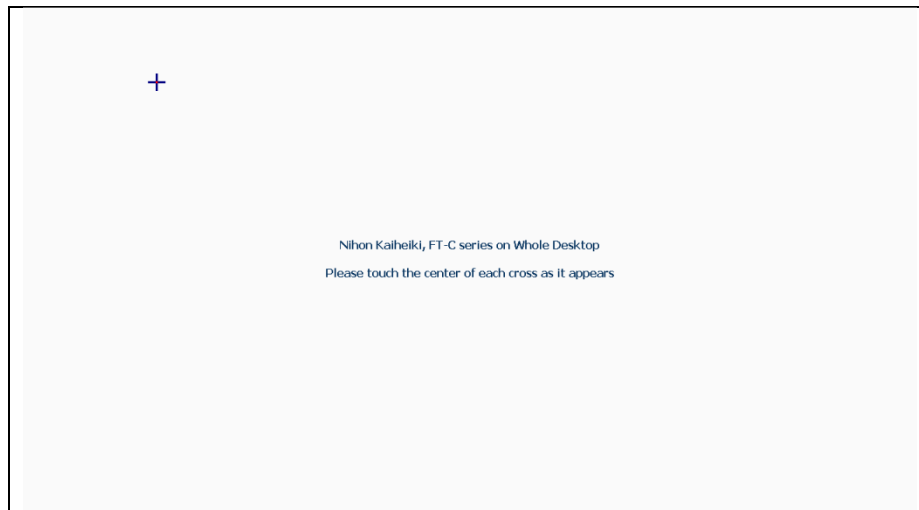| FT-CS04B, FT-CS05B Power and RS232 connectors	RS232 connector on computer.

8. UPDD Console

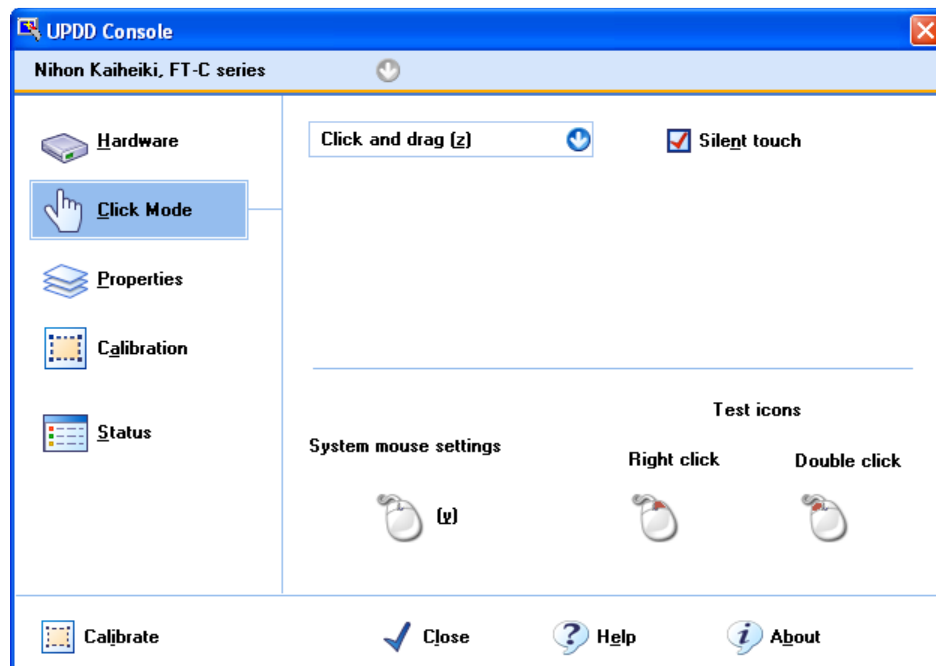1. Select UPDD Setting program from Start menu.
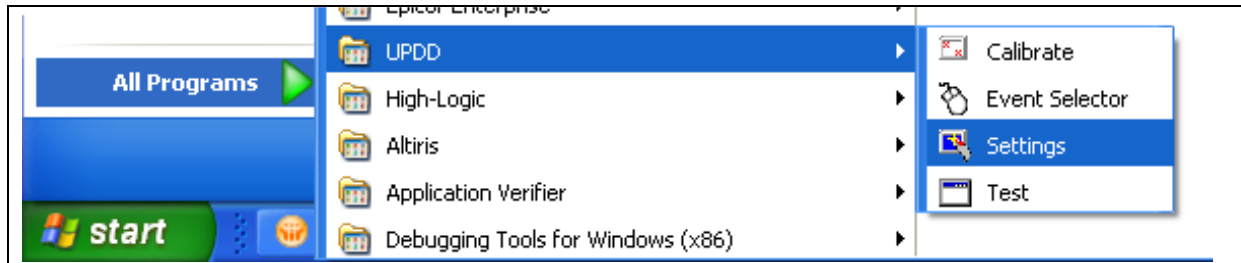
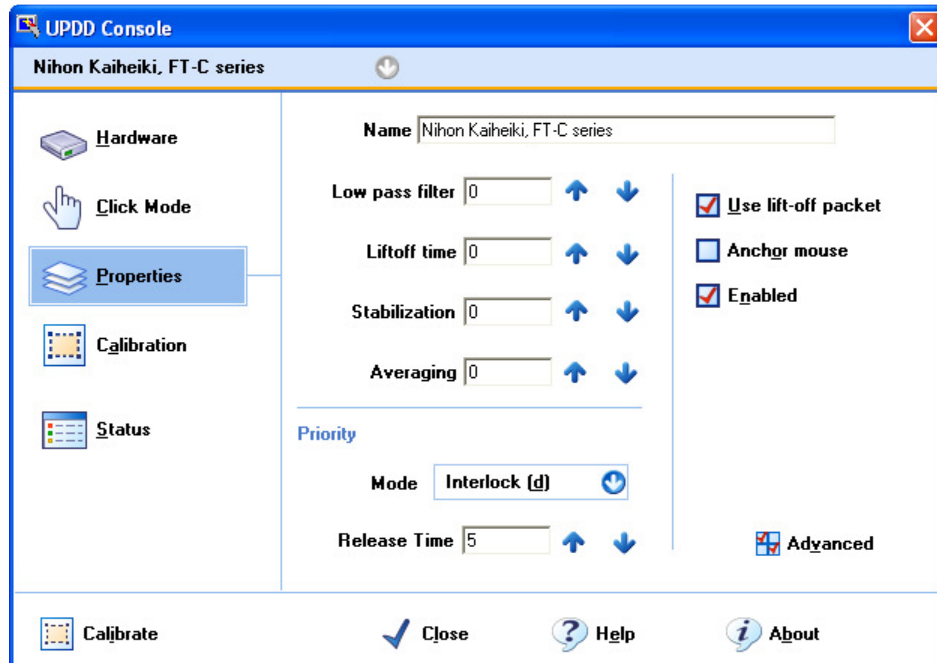2. Name of device shall be black when connected and red when not connected.

3. Touch the touch screens and move around to test functionality.
4. Calibrate the screen by touching the "Calibrate" button in lower left corner of program window.

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Nihon Kaiheiki, FT-C series on Whole Desktop
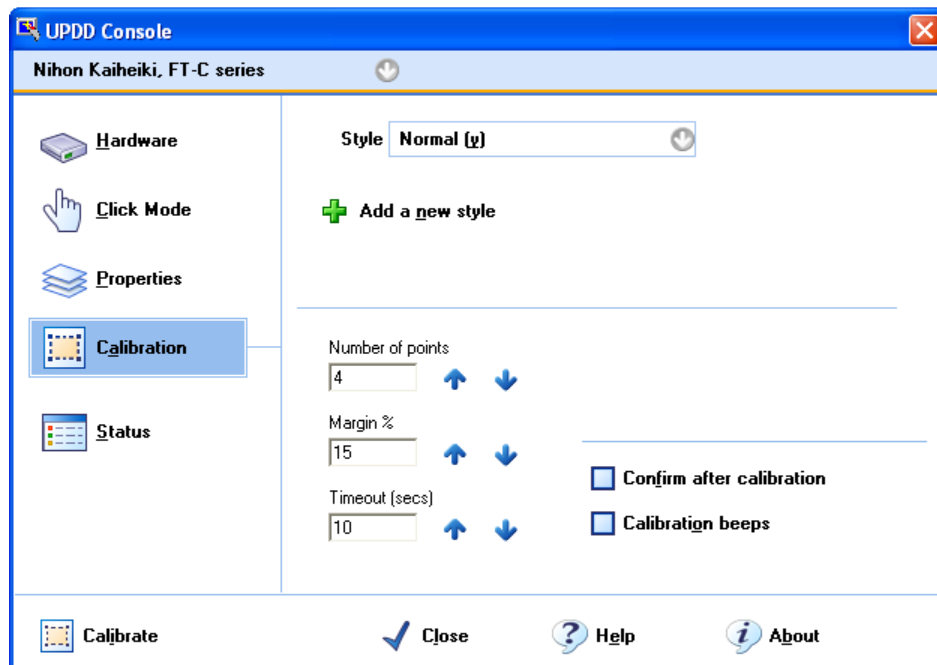
Please touch the center of each cross as it appears

5. Touch the center of each cross to calibrate screen.
6. Click Mode shall be "Click and drag".
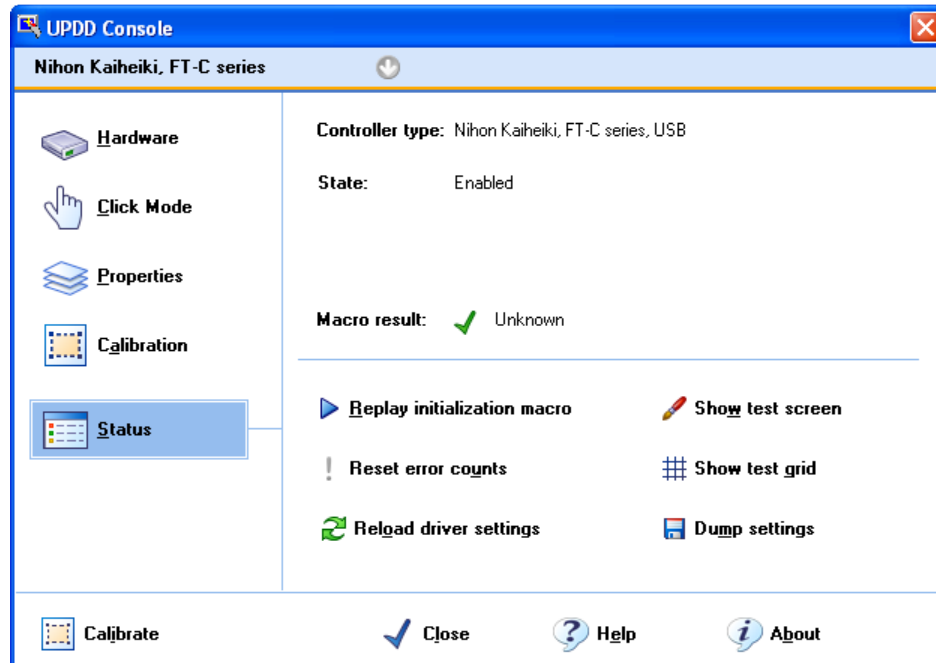7. The rest of the images show the various menu items. The Help Menu explains each of the items.

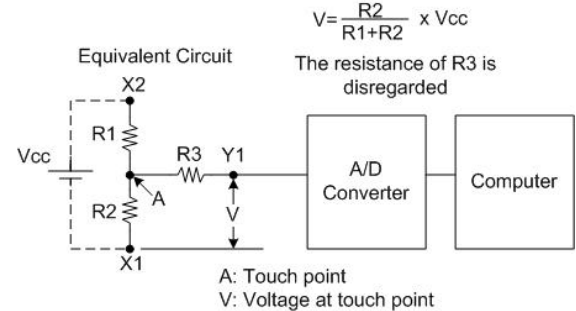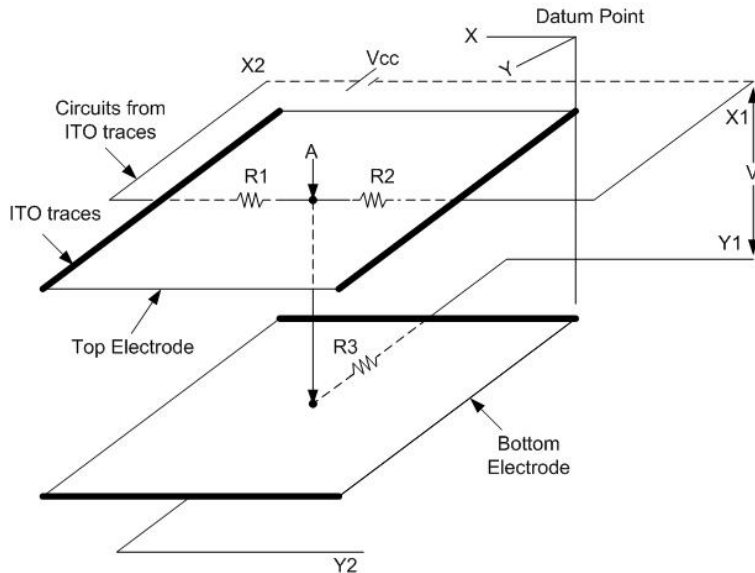Properties Default Setup:

Calibration Default Setup:

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Status Default Setup:

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9. How Resistive Touch screens Work

4-Wire Touch Screen Operation
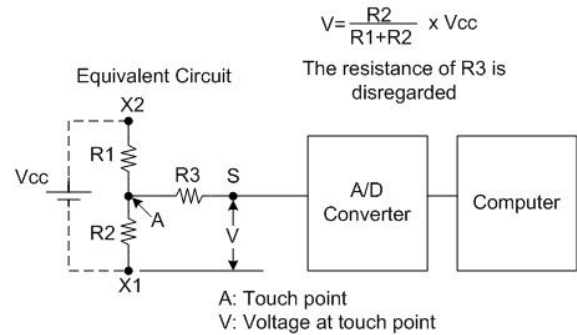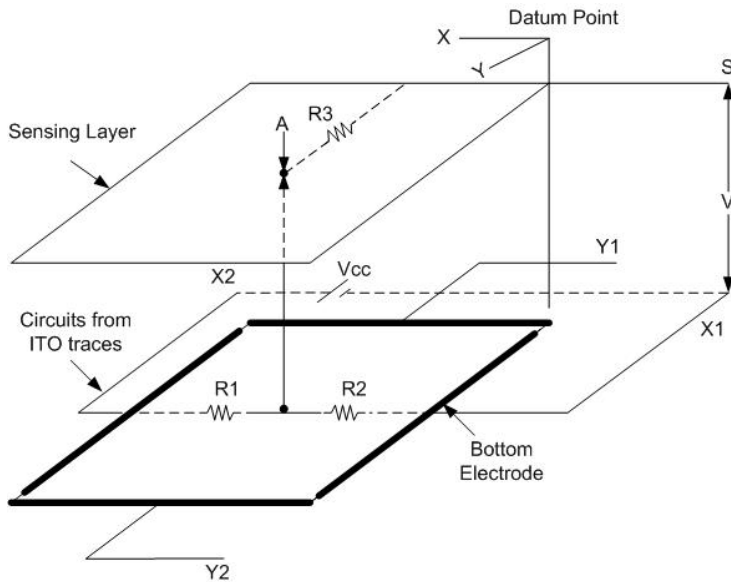

Detection Method:

Detecting X Coordinates:
Voltage (Vcc) is applied between X1 and X2. If point "A" is touched a voltage will occur at Y1. Since the ITO side has uniform resistance a proportional relationship is established between distance and resistance. The distance from "A" to electrodes X2 and X1 are considered equivalent to resistance R1 and R2. Therefore, as the equivalent circuit shows, the voltage (V) at "A" can be found from the relationship between R1 and R2 when R3 is disregarded. A linear voltage drop from Vcc to 0 determines X-position.

Detecting Y Coordinates:
Voltage (Vcc) is applied between Y1 and Y2. If point "A" is touched, voltage will occur at X1. As established above a linear voltage drop from Vcc to 0 determines Y-position.

Alternating between detecting X and Y gives the full coordinates of point "A". The A/D conversion of the voltage gives a digital value of the coordinates. For instance, at 8 bits the X and Y coordinates would be 256x256 and so fine detection can be performed such as handwriting.

5-Wire Touch Screen Operation

Detection Method:

Detecting X Coordinates:
Voltage (Vcc) is applied between X1 and X2. Y1 and Y2 are left to float. If point "A" is touched a voltage will occur on the Sensing Layer. A linear voltage drop from Vcc to 0 determines X-position.

Detecting Y Coordinates:
Voltage (Vcc) is applied between Y1 and Y2. X1 and X2 are left to float. If point "A" is touched, voltage will occur on the Sensing Layer. As established above a linear voltage drop from Vcc to 0 determines Y-position.

Alternating between applying voltage to X then Y gives the full coordinates of point "A". The A/D conversion of the voltage gives a digital value of the coordinates. For instance, at 8 bits the X and Y coordinates would be 256x256 and so fine detection can be performed such as handwriting.

Digital Type

Clear ITO-film electrodes are arranged in a pattern consisting of short strips and placed on polyester (or PET) film or glass plate. The top electrodes (X1 to Xn) and bottom electrodes (Y1 to Yn) are crossed at right angles to constitute touch panel switches. The digital units do not use the controllers as described above. Dot-shaped spacers are formed on the bottom electrodes to maintain space between the top and bottom electrodes. When the panel is pressed with a finger, etc., the X and Y coordinates of the pressed position are detected by the applicable matrix switches to determine the position. The pull-up resistors are generally between 100kΩ and 1MΩ.
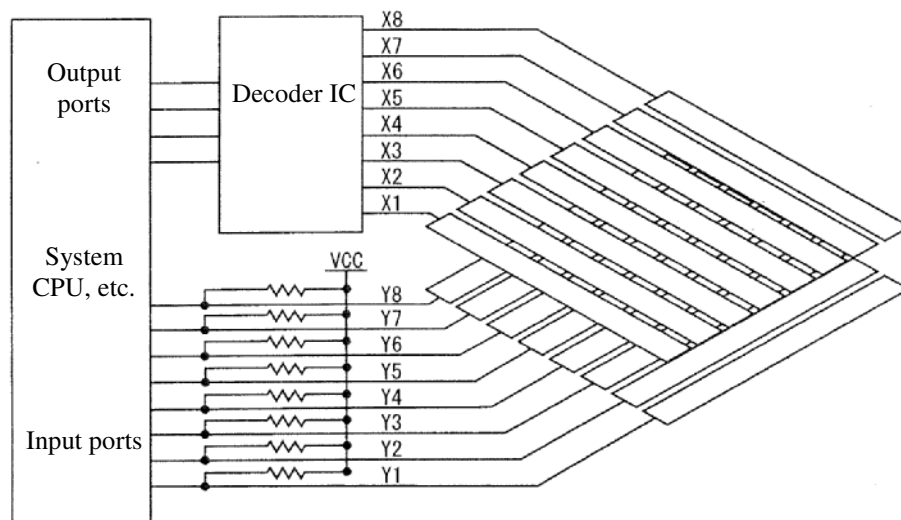
Clear ITO-film electrodes are arranged in a pattern consisting of short strips.

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Peripheral circuits are simpler and development cost can be reduced.

The basic detection method is the same as the one used by a normal key matrix. Peripheral circuits can be made simpler and the overall cost, including the cost of peripherals, also becomes lower than what an equivalent analog type would normally require.

However, raising the resolution (number of keys) increases the number of lead wires and consequently practical utility would be compromised.

Accordingly, digital touch panels can only have moderate resolutions and also require a special button layout to be displayed on operation screens and enough space for positioning the buttons. Due to these restrictions, caution must be exercised when designing the operation screens.

The areas of two buttons are interfering here. In the design stage, exercise caution to prevent interference between adjacent button areas.