Setup and Users Manual

ITM Controller Board

for 4-Wire Resistive Touch Screen

(Revision 0.0)

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Warning:

Although ITM has taken steps to protect your touch screen controller from transient voltage, it is important to make all grounding, communication and touch screen connections to the controller and touch screen before powering on our computer, video monitor or touch screen controller.

Failure to follow this procedure may result in damage to your controller and/or communication port.

NOTE:

All connection settings are identical. Please contact ITM if you have any questions regarding your hardware revision. The board revision and firmware release can be found directly on your ITM touch screen controller board.

INFORMATION TO THE USER

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one more of the following measures:

-. Reorient or relocate the receiving antenna.
-. Increase the separation between the equipment and receiver.
-. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-. Consult the dealer or an experienced radio/TV technician for help.

WARNING

Changes or modifications not expressly approved by the manufacturer could void the user' s authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operations.

Introduction:

This manual has been written for users of the ITM Inc. TouchHand touch screen controller boards in combination with the ITM TouchHand device drivers.

The ITM TouchHand controllers were developed for high performance touch input applications.

The ITM TouchHand touch screen controller and software described within this document is assumed to be used with four wire analog resistive touch screen products manufactured by a variety of touch screen manufactures.

Touch screens vary with regard to light transmission, sensitivity and electrical characteristics between manufactures.

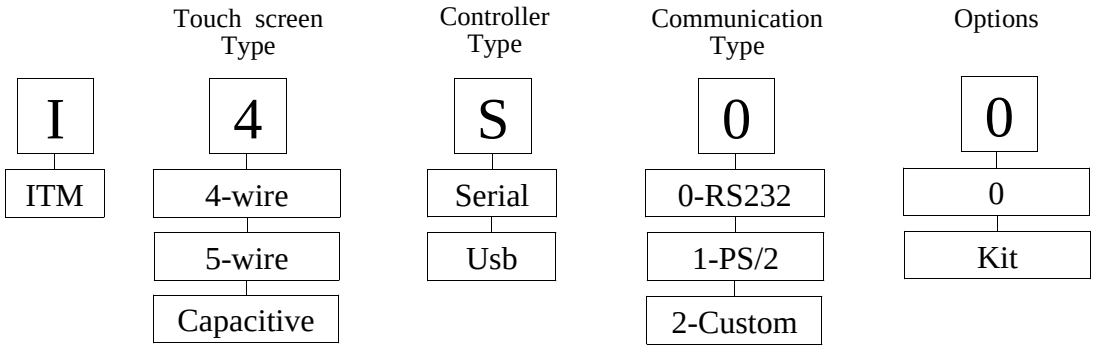
The ITM TouchHand controller allows for 12-bit resolution of an analog resistive touch screen. The resolution of the ITM ™ controller is 4,096 x 4,096(16,777,216 point in the field).
Because touch screen quality and resistance varies from touch screen technologies and manufacturers the actual overall resolution may vary (slightly) between touch screen overlay manufacturer's products.

ITM TouchHand device drivers are designed to integrate smoothly with PC based operating systems. If you have a touch only application you may save considerable cost by using the ITM controller. Please contact ITM for information regarding our lower cost touch screen controller products.

A great deal of attention has been paid to eliminate potential problems with various touch screen manufactures. ITM has tested the ITM controllers with the following touch screen overlay manufacturer's analog resistive touch screens: ITM™, Gunze™, MicroTouch™, Dynapro™, Nisha™.

ITM TouchHand ordering and part identification

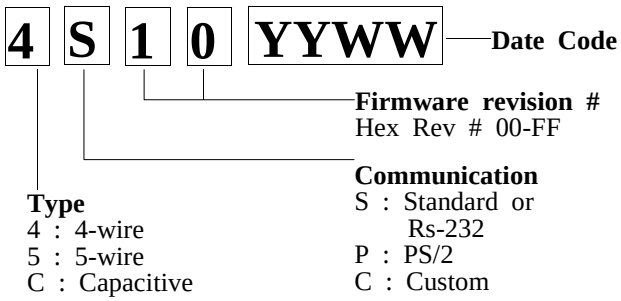
ITM TouchHand controller board part numbering guide:



Example:

I4S00 Standard 4-Wire Resistive Analog Touch screen controller for RS-232

ITM TouchHand controller firmware label identifier guide:



Example:

4S10-[date code] 4-wire resistive, Standard firmware, rev: 10

Features of ITM TouchHand touch screen controller

ITM Software and Device Drivers:
All ITM products are designed be used with ITM TouchHand device drivers. ITM Company develops, supports and maintains all products sold with the ITM™ or TouchHand trademark.

ITM does not use third party technical resources to develop any of its software or hardware products. Typically there is no additional charge for ITM™ device drivers. Drivers are available for Windows™, Windows NT™, Windows CE™, Linux™.

If you require a custom or modified driver for your application, please contact ITM Inc. All user manuals and drivers are available at the ITM web site.

Communication Options

RS232 (9600 or 19200 baud rate)
1 Start Bit, 8 Data Bits, 1 Stop Bit, no parity
PS/2, Personal System / 2

Transmission Speed

~192 points per second @9600 Baud

Touch Screen Interface

Analog Resistive 4 wire

Resolution

12 bit (4096 x 4096)

Calibration

Internal calibration available for custom configuration only.
Software (driver) calibration for all PC configurations.

Note about software calibration

The touch screen can be connected upside down. The calibration routine will identify the correct position of the touch screen overlay.

Power Requirement

DANGER: If the static ground mounts are not terminated to ground, the static protection will not function properly and you may destroy your ITM TouchHand controller board, your communication port or both. See diagram for more details

External Regulated power: 5Vdc +/- 10%

Communication Format

The controller communicates at 9600 bits per second (baud), 8 data bits, no parity bit, and 1 stop bit When the controller is started, it sends a Plug and Play (PnP) message. The content of this PNP message has yet to be determined. For now, it is "Hello PnP". After the PnP message, the controller sends packets while the touch panel is touched.

Packet Format

Packets send three values:

12 bit x coordinate
12 bit y coordinate
8 bit z

Z is a rough, non-linear, non-calibrated, measure of pressure or contact area. A value of 0 means no pressure or contact. 0xFF is maximum pressure or contact.

As long as contact is maintained, 192 packets per second will be sent. When contact is lost, one more packet with a z value of 0 will be sent. The x and y values of such a packet are meaningless.

The format of packets is:

	msb d7	d6	d5	d4	d3	d2	d1	lsb d0
First Byte	0	LIFT	RFE	y11	y10	y9	y8	y7
Second Byte	0	z7	z6	x11	x10	x9	x8	x7
Third Byte	0	y6	y5	y4	y3	y2	y1	y0
Fourth Byte	0	x6	x5	x4	x3	x2	x1	x0
Fifth Byte	1	0	z5	z4	z3	z2	z1	z0

x0, y0 and z0 are the least significant bits.

RFE means reserved for future expansion. For now it is zero.
LIFT = if '1' process as lift off packet.

The packets are variable length. Bytes at the beginning of a packet that are the

same as the respective bytes of the previous packet may be omitted. Once a different byte is found, it and the rest of the packet must be sent. The last byte must always be sent. After starting the controller, the first packet sent must be sent complete. Also, while packets are being sent, at least one packet per second must be sent complete. Although it is permissible for controllers to omit leading redundant bytes, controllers are not required to omit them. However, all receivers must correctly accept variable length packets.

For example, consider the following two packets.
The first packet is 0x13, 0x61, 0x54, 0x32 and 0xBF.
The second packet is 0x13, 0x61, 0x55, 0x32 and 0xBF.
For the second packet, only 0x55, 0x32 and 0xBF must be sent.
Notice that the 0x32 byte was resent even though it did not change.

Another example is where the packets are identical.
The first packet is 0x13, 0x61, 0x57, 0x32 and 0xBF.
The second packet is 0x13, 0x61, 0x57, 0x32 and 0xBF.
For the second packet, only 0xBF must be sent.

Programmer Tip: Notice that only the last byte of a packet has the most significant bit set. This eases parsing for the receiver, especially with the complication of variable length packets. When a byte with the most significant bit is received, the packet should be complete. (If not enough bytes have been received to complete a packet, then you do not have a packet yet; keep looking.) No timers are required to figure out when the end of the packet has arrived. Also, ASCII data with high bit cleared can safely pass through and be ignored.

Alignment:

Draw a line between where you want the (0,0) point to be and where you want the (max,max) point to be. The first alignment point is 10% of the way from the (0,0) point to the (max,max) point. The second alignment point is 10% of the way from the (max,max) point to the (0,0) point.

To tell the controller to begin alignment, send the 'K' ASCII character to it. The controller will stop transmitting packets and will wait for you to touch the first alignment point. When you have touched it long enough, the controller will send a 0xC1 byte to indicate that it got the first point and is ready for you to touch the second point. When you have touched the second point long enough, the

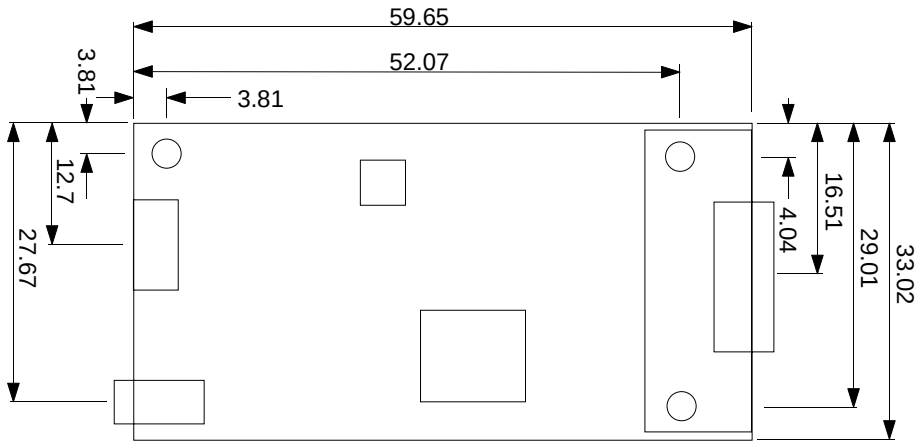
controller will send a 0xC2 byte to indicate that it got the second point, and that the alignment was successful and is finished.

The controller will send a 0xC0 byte to indicate that the alignment was unsuccessful. Unsuccessful alignment is usually due to the two alignment points being too close.

Programmer Tip: Notice that the 0xC0, 0xC1 and 0xC2 alignment status bytes that can be sent by the controller can not be confused for packet data because the two most significant bits are set.

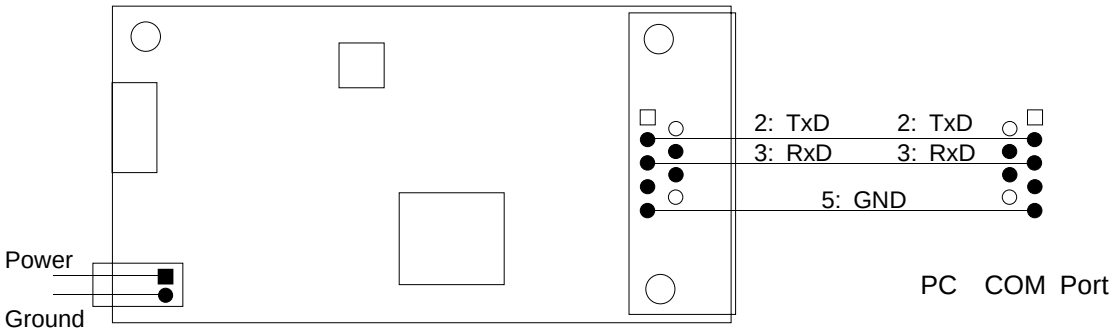
Whenever the controller receives serial data, it stops transmission of packets for several seconds.

ITM TouchHand Board Diagram

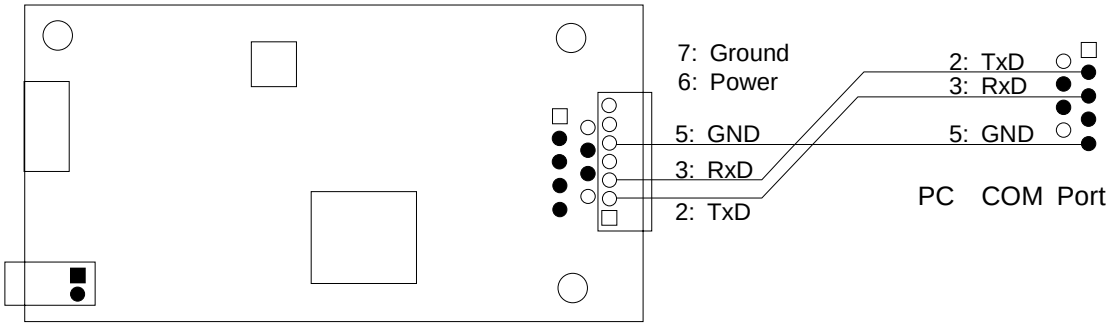


Communication Cable and Connection Diagrams

RS-232 Communication Diagram External Power:



RS-232 Communication Diagram External Power:



TM Touch Screen Connection Diagrams

4-wire touch screen: