

INTELLITOUCH 2500S SERIAL CONTROLLER

The following figure shows the mounting dimensions, jumper locations, and connections for the IntelliTouch® 2500S serial controller (P/N 351077-000): For detailed drawings, see page 13.

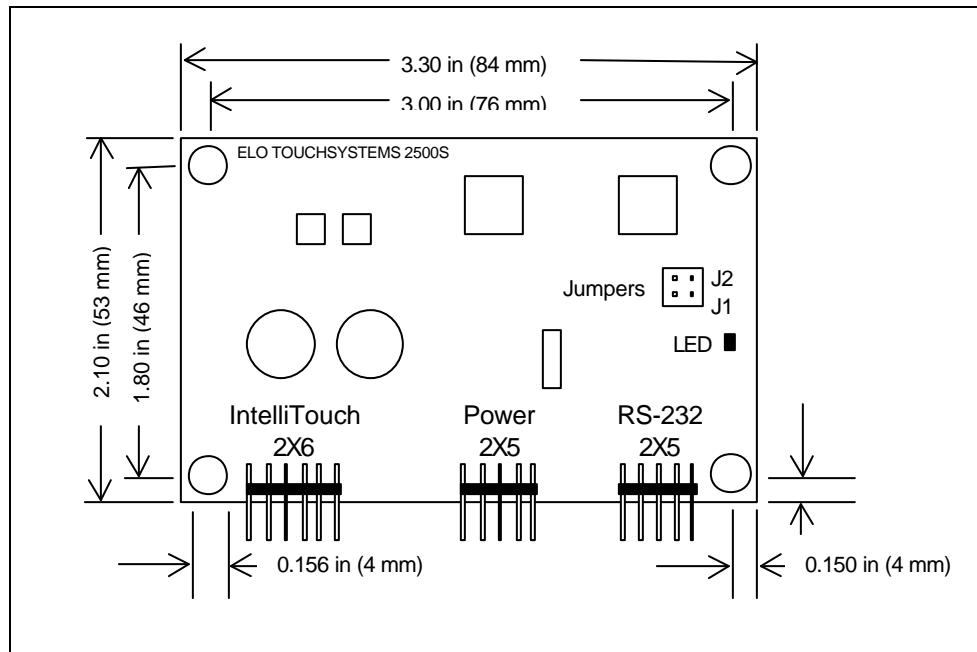


Figure 1. IntelliTouch 2500S Serial Controller

Jumpers

The 2500S controller is shipped with a spare jumper fitted vertically on the right side of the jumper block. To enable J1 or J2, install the jumper horizontally.

The following table lists the jumper settings for the 2500S controller:

(From Top)*	Function	Default
J2	E281A-4002 Emulation Mode	Not installed
J1	Set NVRAM to defaults on power up	Not installed

*From Top refers to board when the connector pins are pointed down

Set NVRAM to Defaults on Power Up

Install this jumper only if the controller configuration has been incorrectly programmed through software to recover the standard settings.

E281A-4002 Emulation Mode

If you are using driver software that does not directly support the SmartSet™ serial protocol, the controller can be set up through jumper J2 for hardware compatibility with the IntelliTouch E281A-4002 controller (see page 116 in the SmartSet manual).

Serial Controller Installation

This section assumes you are integrating the 2500S serial controller board into your system as a component.

The following information gives you mounting dimensions, touchscreen connections, power connections and requirements, and data output connections. It is your responsibility to determine how best to mount the controller and data connector in the display or separate enclosure, and provide a power supply.

Mounting the Controller and Connecting Chassis Ground

The mounting dimensions for the 2500S controller are shown in Figure 1. Remember that the cable headers will increase the space required.

The mounting holes fit common 0.156-inch plastic snap-in standoffs. A chassis ground connection is required through one of the plated through mounting holes (PTH) or P4 pin 8 to provide adequate shielding for the touchscreen cable. Conductive mounting hardware can provide a chassis ground connection for the controller. Grounding all four mounting holes will give the best EMI performance.

Serial Controller Connections

Power Connection

The 2500S controller operates on a single voltage, positive with respect to ground. See page 11 for power requirements.

Connect a power cable harness to P4 on the controller, a 2x5 header with pins on 0.100" centers. Use a ribbon cable with an IDC connector or crimp-to-wire pin receptacles. An acceptable plug can be selected from Molex series 70450, AMP AMPMODU Mod. IV product line, or Berg mini-latch housing with Mini-PV pins. Connect a power supply to the harness and then to AC. Elo cable P/N 889507-000 may be used which has flying leads for power and ground.

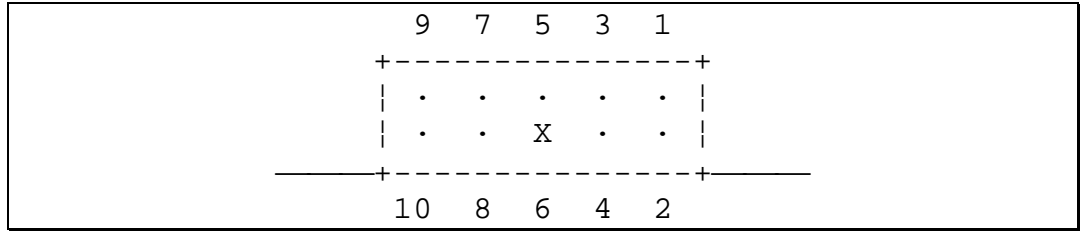


Figure 1. P4 Power Supply Connector Pin Positions, End View

P4 Pins	Signal	Function
1	+Pwr	Supply voltage positive
2	PwrCom	Supply voltage negative (tied to pin 4)
3	N/C	
4	PwrCom	Supply voltage negative (tied to pin 2)
5	LED Remote	External LED driver
6		Key
7	N/C	
8	Chassis	Frame ground connection
9	-Reset	Open collector input: open = normal operation; short to PwrCom = hardware reset.
10	N/C	

CAUTION

Observe polarity when connecting the power leads to the power supply. Reversing polarity may damage the controller.

Serial Connection

The E281-2310 controller operates at standard RS232C levels. The serial port connector, P2, is a 2x5 header with pins on 0.100" centers. It is configured so a ribbon cable and commonly available insulation displacement connectors (IDCs) may be used.

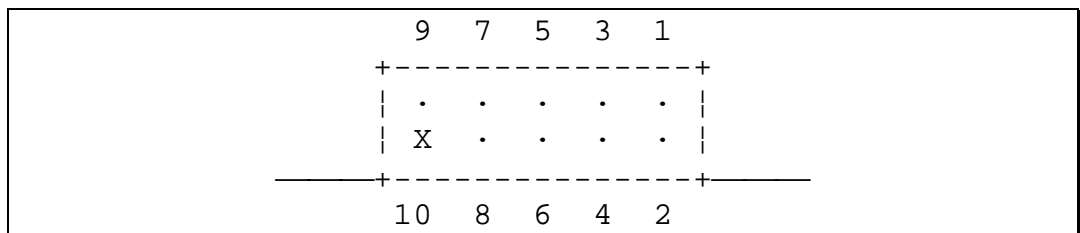


Figure 2. P2 Serial Connector Pin Positions, End View

P2 Pins	DB25	DB9	Host Signal
1	8	1	DCD (N/C)
2	6	6	DSR
3	3	2	RXD
4	4	7	RTS
5	2	3	TXD
6	5	8	CTS
7	20	4	DTR
8	22	9	RI (N/C)
9	7	5	GND
10			Key

The controller only requires a 2-wire connection, controller Transmit Data (P2 pin 3) and Signal Ground (P2 pin 9). For two-way communications, the controller Receive Data (P2 pin 5) should also be connected to the host Transmit Data pin.

Data Set Ready (DSR) and Clear to Send (CTS) may be used by the host to verify controller connections and operation. DSR is asserted when power is applied to the controller and CTS is asserted when the controller's power-on sequence is complete. Data Terminal Ready (DTR) and Request to Send (RTS) can also be connected for full hardware handshaking.

Note that if the application uses the SmartSet RESET command ('Rx' where x is the type of reset required), CTS should be monitored by the host to detect the completion of the reset. If CTS is not monitored, then the host should delay for approximately 5 seconds after issuing a RESET command.

Elo driver software typically requires two-way communication (unless specifically disabled), and all four handshaking lines.

As the controller is typically installed inside a display, we recommend that you make a cable that connects P2 to a DB9 female connector mounted on the back of the display, or use Elo's serial cable P/N 942741-000. The shell of this connector should be tied to chassis ground. Use an additional DB9 male to DB9 female straight-through cable from the back of the display to your serial port, such as Elo P/N 454173-000.

Elo can provide suitable adapters and cabling. See the *IntelliTouch Product Manual* for details.

Touchscreen Connection

A round multi-conductor cable terminated in a 2x6 female connector is attached to the IntelliTouch touchscreen. The controller is normally placed inside the display with the touchscreen cable connecting directly to the 2x6 header at P3 on the controller (see Figure 1, page 1).

Unlike the serial cable, the touchscreen cable has a special construction. Use only Elo touchscreen cables and adapters.

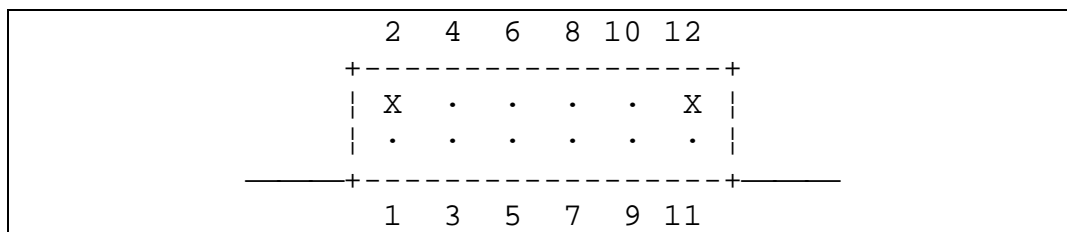


Figure 3. P3 Touchscreen Connector Pin Positions, End View

Diagnostic LED

The 2500S controller has one green diagnostic LED. Following power on, the controller performs a short self-test, where the LED stays lit. After the self-test, the LED flashes once per second, indicating normal operation. The self-test results are displayed by most Elo driver software.

During normal operation, the LED also indicates controller/host communication is in progress. When the touchscreen is touched, the LED should light continuously, then return to the normal flash rate. If the host does not remove the packet from the controller, the LED will stay lit.

The LED will also stay lit without a touch if the touchscreen or cabling is disconnected or not functioning.

If the LED flashes about two times per second, a warning error condition is indicated, such as improper communication from the host. Suspect an invalid command sequence from the host.

Remote LED Capability

The diagnostic LED drive is connected to pin 5 of the P4 power supply connector. This signal may be used to drive an external indicator such as another LED.

To operate an external LED, connect the LED cathode to ground and the anode to pin 5 of the P4 connector. Nominal current through the LED will be 6 mA so a low-operating current LED should be used. An external resistor is not required.

COMMAND REFERENCE

The following changes/additions are to Command Descriptions found in the SmartSet Touchscreen Controller Family Technical Reference Manual:

page 82	'O'	30h	No Warning
	'9'	39h	Reserved
	'H'	48h	Reserved
	'J'	4ah	Reserved
	'L'	4ch	Operation failed
	'M'	4dh	Measurement warning
	'N'	4eh	Measurement error

page 83 Untouch factory default value is 3 for the 2500S controller.

RepDelay factory default value is 1 for the 2500S controller.

page 84 Controller-driven calibration sequence is not supported.

page 85 Controller-Driven Two Point Calibration Sequence

Not supported.

page 86 Z-axis calibration is supported.

page 87 Replace with the following:

Query:

0 1 2 3 4 5 6 7

'd'								
-----	--	--	--	--	--	--	--	--

Set:

0 1 2 3 4 5 6 7

'D'	MaskC	Mask T						
-----	-------	-----------	--	--	--	--	--	--

Response:

	0	1	2	3	4	5	6	7
'D'	MaskC	Mask T						

During a Set, MaskC and MaskT are bit maps specifying the individual tests to be run by the microprocessor. During a Response, the masks contain set bits for tests that failed and cleared bits for tests that passed.

This command allows the user to either run or query the results of the on board diagnostic routines. When a Set command is issued, a bit set to 1 in the test mask byte would run the corresponding test while a bit reset to 0 would ignore the test. Exceptions to this rule are bits MaskC.7, MaskC.5, MaskT.1, and MaskT.0. None of these bits has any effect in a Set command.

When a Query is issued, the result byte will have bits set to one corresponding to failed tests while successfully completed tests will have these bits cleared. Note: THIS COMMAND DOES AN IMPLICIT QUERY AFTER A SET COMMAND IS ISSUED RETRIEVING THE RESULTS OF THE TESTS RUN BY THE SET.

The available tests are mapped into the test mask and result bytes as follows:

MaskC bit position	Error indication
.0	ID Test (always returns 0)
.1	CPU Test
.2	ROM Test
.3	reserved
.4	reserved
.5	Drive Test failed
.6	reserved
.7	Drive Test incomplete

MaskT bit position(s)	Error indication
.2, .1, .0	Drive Test
.3	ADC Test
.4	PROM Checksum Test
.5	External RAM Test
.6	Internal RAM Test
.7	CPU Test (always returns zero)

The three-bit field comprising MaskT.0, MaskT.1, and MaskT.2 is the error code resulting from the drive test. This field is interpreted as a numeric value, and it has the following significance.

MaskT[.2, .1, .0] value	Error indication
0	Test passed (this test always passes)
1	X axis failure
2	Y axis failure
3	X receive channel failure (test disabled)
4	Y receive channel failure (test disabled)
5	X transmit channel failure (test disabled)
6	Y transmit channel failure (test disabled)
7	General failure Analog electronics and touchscreen

Note that upon running the tests, bits specified as zero in the test mask will cause corresponding bits in the result to be set to zero. This will effectively mask any failed values from previous tests.

page 88-89 The ('E', 'e') command is not supported.

page 90 **Set or Response:**

0	1	2&3	3	4	5	6
'F'	Type	Rep	Ofs	MinLen	MaxLen	

The `Rep` word specifies the maximum number of times (1-65535) that a repeating coordinate value is permitted to be measured by the controller. If the number of times that a coordinate repeats in X, Y, and Z exceeds this value, then the controller relearns the touchscreen waveform. This parameter determines the tolerance of contaminants on the touchscreen. The factory default value is 12000 (2EE0h), which is 120 seconds.

The `Ofs` byte specifies the amount (0-255) of surface wave energy absorption that is recognized as a touch. A small value increases touch sensitivity. A large value increases noise rejection. The factory default value is 1.

The `MinLen` byte specifies the minimum width of a touch (0-255). As with the previous argument, a small value increases the sensitivity and a large value increases noise rejection. The factory default is 2.

The `MaxLen` byte specifies the maximum width of a touch (0-255). This parameter controls the rejection of multiple touches and splattered contaminants. The factory default is 22.

page 92 Not supported.

page 93 `IFlag` is set to '6' identifying the 2500S controller.

page 95 `X1` is a bitmap specifying which option jumpers are installed:

X1 Bit Position	Description
0	Always '0'
1	J1 installed
2	J2 installed

`X2` is a bitmap specifying whether cross-connected jumpers are installed:

X2 Bit position	Description
0	Jumper connects J0 to J1

`S1` is 05h or 06h, indicating 9600 or 19,200 baud (respectively). These are the only baud rates available.

`S2` is undefined.

`S3` is an ASCII '1' indicating that SmartSet binary mode is selected.

page 97 Not supported.

page 98 Not supported.

page 99 Mode1:

Bit	Description
6	Reserved (0)
7	1 - Z-axis Enable

Mode2:

Bit	Description
6	Reserved

page 104-107 The only bits that may be modified are bit 0, 1 and 2 of `ser1` byte. These bits are set to 101 for 9600 baud, and 110 for 19,200 baud. The `IO` byte must be 30H, and the `ser2` byte must be 04H for this command to function.

page 108 Not supported.

page 109 `RType` is one of the ASCII values '0', '1' and '2' and is used to specify the type of reset to use. If `RType` is '0' then a "hard" reset (cold boot) will occur. If `RType` is '1' then a "soft" reset (warm boot) will occur. If `RType` is '2', then a hard reset occurs, and the NVRAM is reset to its default values (the serial number is not modified).

A "hard" reset runs the firmware diagnostic routines; a "soft" reset does not.

This command is used to immediately cause the touchscreen controller to reset and boot up according to the configuration jumpers. Any software setup information in the controller at this time will be lost.

Note: The 'R0' and 'R2' commands are not followed by an Acknowledge packet. The 2500S controller asserts `-CTS` while performing its self-test diagnostic routines and initialization. If the application does not allow the host to monitor `-CTS`, then approximately 5 seconds should be allowed for the reset procedure to take place.

page 111 Z-Axis scaling is supported.

page 112 The touch query function is not supported. Touch response packets are generated automatically.

2500S SPECIFICATIONS

Electrical

Supply Voltage and Current

+5 Vdc, nominal (+4.75 to +5.25 Vdc).

60 mA, typical at +5 Vdc. Average power dissipation is 0.3 W, typical.

Supply must be capable of sourcing 100 mA, minimum.

Total noise and ripple requirement must be less than 100 mV (p-p) for frequencies below 1 MHz, and less than 50 mV (p-p) for frequencies above 1 MHz.

Interface

EIA 232E (Serial RS-232), DCE configuration. 8 Data Bits, 1 Stop Bit, No Parity, Full Duplex.

Hardware handshaking: RTS/CTS.

DSR is pulled HIGH (>+3V) by the 2500S when connected and powered. DTR is ignored.

Baud Rate

9600 (default) and 19200 (software programmable).

Operating Modes

Full IntelliTouch SmartSet or E281A-4002 protocols, jumper selectable.

Initial/ Stream/ Untouch/ Z-axis Enable Modes.

Touch Resolution

4096x4096, size independent, 255 levels of Z (pressure).

Conversion Time

Approximately 10.4 ms per coordinate set.

Reliability

MTBF greater than 300,000 hours per MIL-HDBK-217-F2 using the parts stress calculation method for ground benign environment with an ambient temperature of 25°C.

Environmental

Temperature

Operating: 0°C to 65°C.

Storage: -25°C to 85°C.

Humidity

Operating: 10% to 90% RH, non-condensing.

Storage: 10% to 90% RH, non-condensing.

Operating Altitude

10,000 feet.

Shock and Vibration

Three axis sine wave, 50 Hz to 2kHz, 1 G, 2 minutes/Octave with dwell on resonances.

ESD

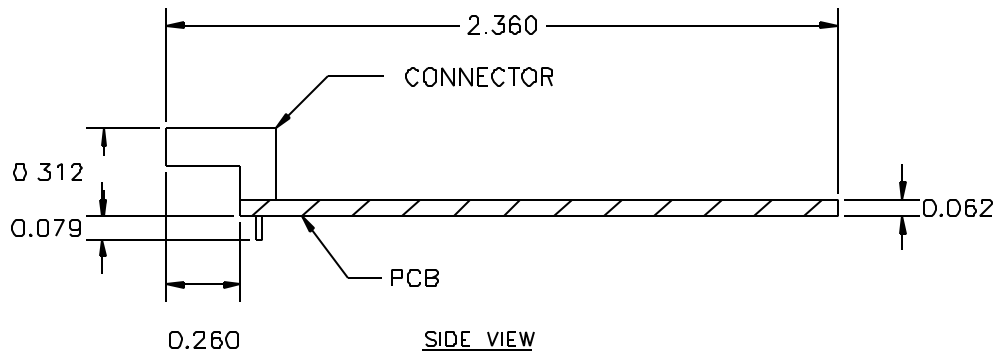
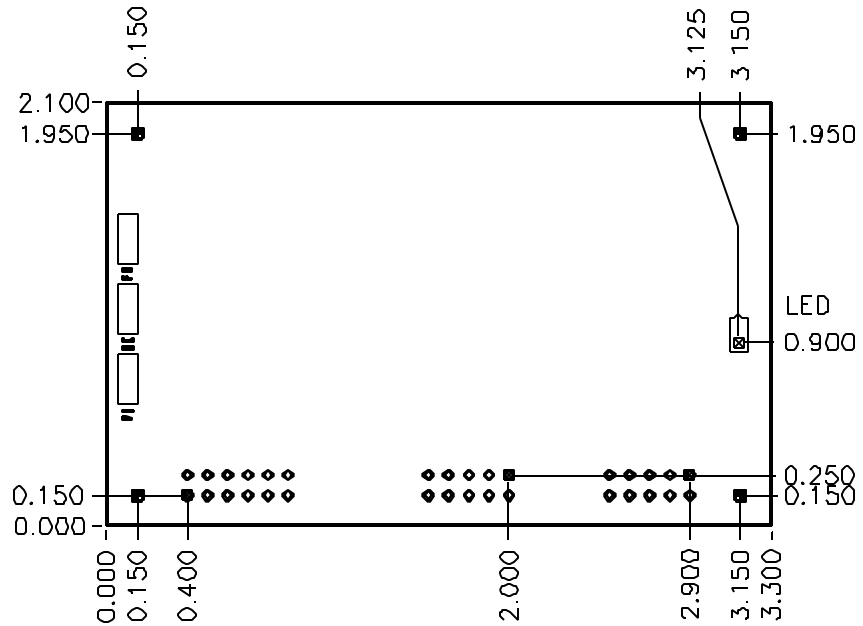
Per EN 6100-4-2 1995: Level 4. Contact discharge 8kV, air discharge 15kV.

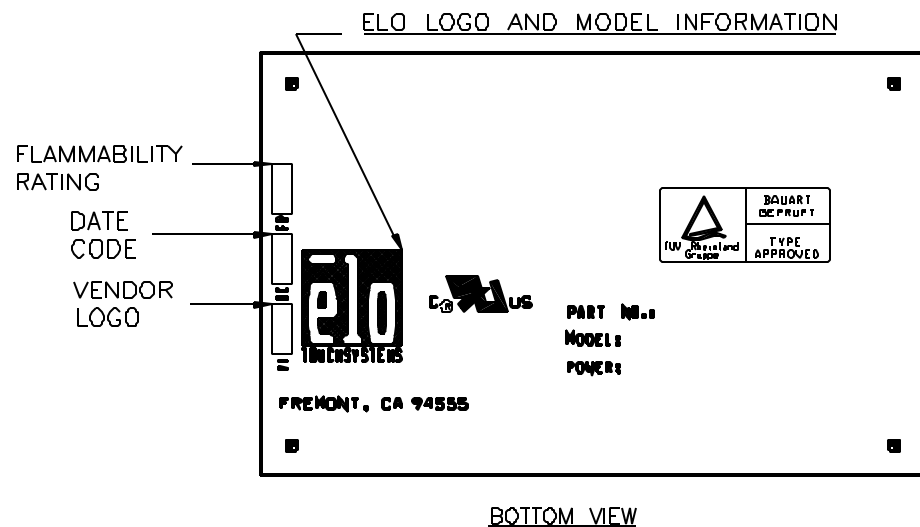
Flammability

The printed circuit board substrate is rated 94V0. All plastic components, such as headers and connectors, are also rated 94V0.

Physical Characteristics

Dimensions in inches. (To convert to mm, multiple by 25.4.) Side view values represent typical dimensions.





Construction

Four-layer surface-mount design with internal ground plane for EMI suppression.

Dimensions

Width: 2.36 inches (59.94 mm), including connectors

Length: 3.30 inches (83.82 mm)

Height: 0.40 inches (10.16 mm)

All mounting holes are plated through for chassis ground connection. Refer to Figure 1, page 1.

Agency Approvals

Elo controllers are “CNR/USR” UL Recognized Components for USA and Canada, Category NWGQ2, Information Technology Equipment Including Business Equipment.

Elo controllers are TÜV Bauart certified as components.

Elo controllers have been tested for compliance with FCC Part 15 Class B limits*.

*Depending on the application, it may be necessary to pay special attention to system grounding and shielding, and it may be necessary to apply ferrite suppressor beads.