

## E281-2310 Serial Controller

The following figure shows the mounting dimensions, jumper locations, and connections for the IntelliTouch® E281-2310 serial controller:

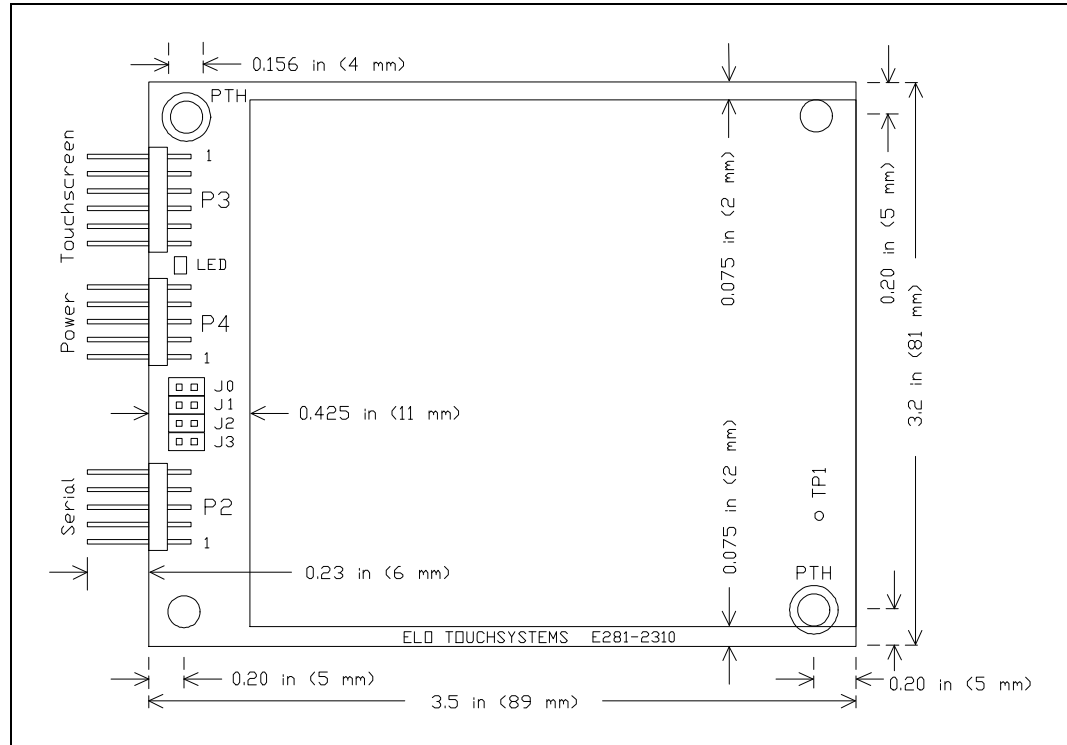


Figure 1. E281-2310 Serial Controller

The following table lists the jumper settings for the E281-2310 controller:

	<b>(From Top)</b>
Reserved	J0 - N
Reserved	J1 - N
Emulation Mode	
None	J2 - N
E281A-4002	J2 - Y
Reserved	J3 - N

### E281-2310 Emulation Modes

If you are using driver software that does not directly support the SmartSet™ serial protocol (E281-23xx, E271-22xx), the controller can be set up through jumper J2 for hardware compatibility with the IntelliTouch E281A-4002 controller.

## Serial Controller Installation

This section assumes you are integrating the E281-2310 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 E281-2310 controller are shown in Figure 1, page 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.

## Serial Controller Connections

### Power Connections

The E281-2310 controller operates on a single voltage, positive with respect to ground. See page 10 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.

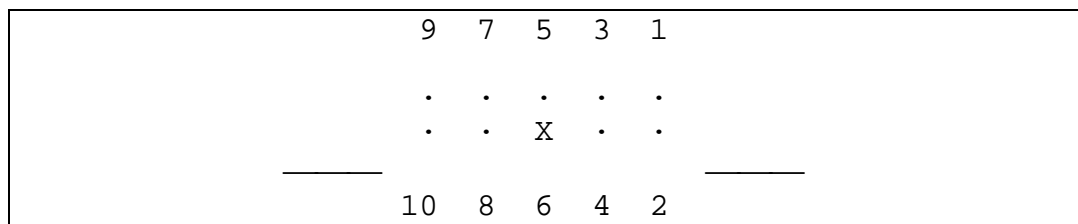


Figure 2. P4 Power Supply Connector Pin Positions, End View

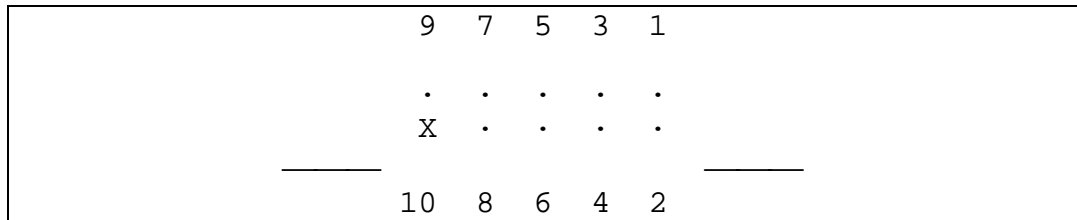
P4 Pins	Signal	Function
1	+Pwr	Supply voltage positive
2	PwrCom	Supply voltage negative (tied to pin 4)
3	N/C	
4	PwrCom	Supply voltage negative (tied to pin 2)
5	LED Remote	External LED driver
6		Key
7	N/C	
8	Chassis	Frame ground connection
9	-Reset	Open collector input: open = normal operation; short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

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 3. 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.

Elo driver software typically requires two-way communication (unless ELODEV's -p- flag is used), and all four handshaking lines.

If you are installing the controller 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 012138. (Male connectors are used on TouchMonitors with external controllers.) The shell of this connector should be tied to chassis ground. Use an additional cable from the back of the display to your serial port.

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

### Touchscreen Connections

A round multi-conductor cable terminated in a 2x6 female connector is attached to the IntelliTouch touchscreen. One of the following cabling options normally applies:

- If the controller will be located inside the display, the touchscreen cable connects directly to the 2x6 header at P3 on the controller (see Figure 1, page 1).

- If the controller will be external to the display, the touchscreen cable should be terminated at the back of the display with a DB9 male connector. Use Elo's IC1 adapter cable (P/N 012226). Then connect a cable from the DB9 male connector to the controller using Elo's cable P/N 002863-6-2 with the Elo 002861-2-12 adapter. Unlike the serial cable, the touchscreen cables have a special construction. Use only Elo Touchscreen cables and adapters.

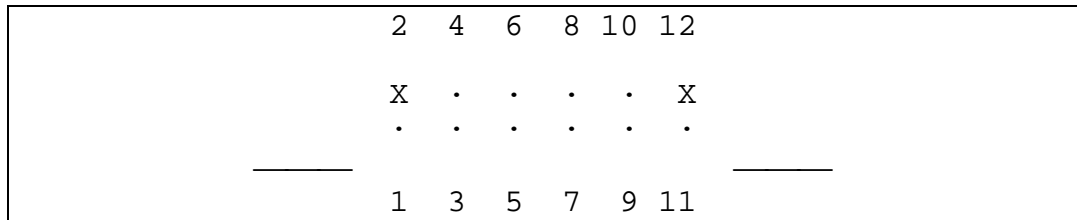


Figure 4. P3 Touchscreen Connector Pin Positions, End View

## Diagnostic LEDs

The E281-2310 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 microprocessor pin that drives the status LED is connected to pin 5 of the P4 power supply connector. This signal from the microprocessor may also be used to drive an external indicator such as another LED.

To operate an external LED, connect the LED anode to a +5 Vdc power supply and the cathode to pin 5 of the P4 connector. (Nominal current through the LED will be 3 mA—the LED will be comparatively dim.)

## COMMAND REFERENCE

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

page 82	'0'	30h	No Warning
	'9'	39h	Reserved
	'H'	48h	Reserved
	'I'	49h	Reserved
	'J'	4ah	Reserved
	'L'	4ch	Operation failed
	'M'	4dh	Measurement warning
	'N'	4eh	Measurement error

page 83      `Untouch` factory default value is 2 for the E281-2310 controller.

page 84      Not supported.

page 87      `DMask`

### **Bit      Description**

7	Touchscreen Drive test incomplete
5	Touchscreen Drive test failed

`DMask2` - byte 2

### **Bit      Description**

7	Microprocessor logic failure
6	Internal RAM read/write test failure
5	External RAM read/write test failure
4	PROM checksum failure
3	DAC hardware test failure
2-0	Touchscreen drive test results
000	No failure
001	X-axis failure
010	Y-axis failure
011	X receive channel failure
100	Y receive channel failure
101	X transmit channel failure
110	Y transmit channel failure
111	General failure (touchscreen may not be connected)

page 88-89 The following combinations of the `TouchFlag` and `Format` number are supported:

<b>Touch Flag</b>	<b>Format</b>
'0'	'0'
'0'	'4'
'0'	'6'
'1'	'0'
'1'	'4'
'1'	'6'

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Set or	0	1	2&3	4	5	6	7
Response:	'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 2432, which is about 25 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 2.

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 91 Not supported.

page 92 Not supported.

page 93	Features byte:  Bit 7 is 1 - Z-axis available.																		
page 95	x1 is a bitmap specifying which option jumpers are installed:  <table> <thead> <tr> <th><b>X1 Bit Position</b></th> <th><b>Description</b></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>J0 installed</td> </tr> <tr> <td>1</td> <td>J1 installed</td> </tr> <tr> <td>2</td> <td>J2 installed</td> </tr> <tr> <td>3</td> <td>J3 installed</td> </tr> </tbody> </table> x2 is a bitmap specifying whether cross-connected jumpers are installed:  <table> <thead> <tr> <th><b>X2 Bit position</b></th> <th><b>Description</b></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>jumper connects J0 to J1</td> </tr> <tr> <td>1</td> <td>jumper connects J1 to J2</td> </tr> <tr> <td>2</td> <td>jumper connects J2 to J3</td> </tr> </tbody> </table>	<b>X1 Bit Position</b>	<b>Description</b>	0	J0 installed	1	J1 installed	2	J2 installed	3	J3 installed	<b>X2 Bit position</b>	<b>Description</b>	0	jumper connects J0 to J1	1	jumper connects J1 to J2	2	jumper connects J2 to J3
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6	Reserved (0)																		
7	1 - Z-axis Enable																		
page 102	Not supported.																		
page 104	Not supported.																		
page 108	Not supported.																		
page 109	Hard Reset Command: If the host cannot monitor -CTS, approximately 5 seconds should be allowed for the reset procedure to take place.																		
page 110	Not supported.																		
page 112	Set or query commands are not supported. Touch packets are generated automatically.																		



Status bits:

<b>Bit</b>	<b>Description</b>
6	Reserved (0)
7	If 1, the Z coordinate is measured, not simulated at the maximum value.

## E281-2310 SPECIFICATIONS

### Electrical

#### Supply Voltage and Current

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

140 mA, typical at +5 Vdc. Average power dissipation is 0.7 W, typical.

Supply must be capable of sourcing 200 mA, minimum, and have a rise time of less than 100 ms. Conformance to this specification is yet to be determined.

Total noise and ripple requirement must be less than 100 mV (p-p) for frequencies below 1 MHz, and less than 5 mV (p-p) for frequencies above 1 MHz.

#### Interface

EIA 232D (Serial RS-232), DCE configuration. 8 Data Bits, 1 Stop Bit, No Parity, Half Duplex. Hardware handshaking: DTR/DSR, RTS/CTS.

Acknowledgments for command set and query.

#### Baud Rate

9600 only.

#### Operating Modes

Binary in SmartSet or E281A-4002 protocols, jumper selectable.

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

#### Touch Resolution

Approximately 4095x4095, size independent, 255 levels of Z (pressure).

#### Conversion Time

Approximately 10.4 ms per coordinate report.

#### Reliability

MTBF greater than 60,000 hours per MIL-HDBK-217E Notice 1 update part count calculation. Conformance to this specification is yet to be determined.

Reliability is enhanced by Elo's standard manufacturing practice of submitting all controllers to a 10-hour burn-in at 50°C with 50% power on/off cycle.

## Environmental

### Temperature

Operating: 0°C to 65°C.

Storage: -25°C to 85°C.

Conformance to this specification is yet to be determined.

### Humidity

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

Storage: Same.

Conformance to this specification is yet to be determined.

### Altitude

10,000 feet. Conformance to this specification is yet to be determined.

### Shock and Vibration

National Safe Transit Association Project 1A Test Procedure. Conformance to this specification is yet to be determined.

### ESD

Per IEC 801-2(E): 1991. Conformance to this specification is yet to be determined.

### Flammability

The printed circuit board substrate is rated 94V0. All plastic components also rated 94V0.

## Physical Characteristics

### Construction

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

### Dimensions

See Figure 1, page 1. Total height including shield less than 0.75".

### Mounting Hole Dimensions

See Figure 1, page 1. Two mounting holes are plated through-holes (PTH) for chassis ground connection.

### Connectors and Pin Definitions

The connector configuration permits the controller to be placed in-line between the touchscreen and serial I/O attachments.

#### *Serial Input/Output Connector*

2x5 0.025" post latching header on 0.100" centers. Acceptable mating insulation displacement connectors (IDC): Berg series 71600, 71602, 66900, 66902, Molex series 40312, Amp series 746285 and 746288. When the mating IDC receptacle is cabled to an IDC DB9 connector, the interface assumes a DCE configuration.

#### *Touchscreen Connector*

2x6 0.025" square post friction lock header on 0.100" centers. Mates with Berg Mini-Latch receptacle on the IntelliTouch touchscreen cable. The withdrawal force exceeds 3.9 lb.

#### *Power Connector*

2x5 0.025" square post friction lock header on 0.100" centers. Acceptable mating receptacle connectors: Molex series 70450, Amp AMPMODU Mod. IV product line, or Berg mini-latch housing with Mini-PV pins.

## Agency Approvals

Elo TouchSystems controller board model E281-2310 is a UL Recognized Component, CCN NWGQ2, per UL 1950, Safety of Information Technology Equipment Including Electrical Business Equipment. Recognition information is contained in File E162681.

Elo TouchSystems controller board model E281-2310 is a UL Recognized Component for use in Canada, CCN NWGQ8, per UL 1950, Safety of Information Technology Equipment Including Electrical Business Equipment Certified for Canada. Recognition information is contained in File E162681.

The E281-2310 has been tested to verify compliance with FCC Class B commercial limits. Test results are on file. Conformance to these or to more stringent limits may require special attention to system grounding and shielding, and it may be necessary to apply ferrite suppressor beads to cables.