**Electrical components for the Swift line improvement Project**

# ****Labjack T7****

**-Data sheet in the folder**

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* **https://labjack.com/products/t7**

##### [**Analog Input**](https://labjack.com/support/datasheets/t-series/ain)

* **14 Analog Inputs built in (16-24 Bits Depending on Speed & Device Type)**
* **Expand to**[**84 analog inputs with Mux80**](https://labjack.com/accessories/mux80-ain-expansion-board)**add-on**
* T7: 16-bit high-speed ADC ([up to 100k samples/s](https://labjack.com/support/datasheets/t-series/appendix-a-1))
* T7-Pro: 24-bit low-speed ADC (resolution as low as [1uV noise-free](https://labjack.com/support/datasheets/t-series/appendix-a-3-1))
* Software Configurable Resolution Settings
* Single-Ended Inputs (14) or Differential Inputs (7)
* **Analog input ranges: ±10V, ±1V, ±0.1V and ±0.01V**
* All analog input features are software programmable by configuring the [Analog Input Registers](https://labjack.com/support/datasheets/t-series/ain)
* High speed sampling configurable by using [Stream Mode](https://labjack.com/support/datasheets/t-series/communication/stream-mode). Speeds up to 100kS/s
* Low Latency Sampling and Control (less than 1ms) is made easy with [Command-Response](https://labjack.com/support/datasheets/t-series/communication) Modbus messages
* Easy integration with sensors like thermocouples, load cells, bridges, and more ...

##### [**Analog Output**](https://labjack.com/support/datasheets/t-series/dac)

* **2 analog outputs (12-bit, 0-5V)**
* Waveform generation via Stream Out
* Integrated [LJTick-DAC](https://labjack.com/accessories/ljtick-dac) support for multiple +/-10V outputs

##### [**Digital I/O**](https://labjack.com/support/datasheets/t-series/digital-io)

* **23 Digital I/O**
* Supports SPI, I2C, and more... (Master Only)
* 5 PWM Outputs with individual phase control
* 5 Pulse Outputs with configurable number, frequency, and width
* 2 Frequency Inputs returning both frequency and period
* 2 Pulse Width Inputs measuring time spent high and low as well as duty cycle
* 2 Line-to-Line Inputs measuring the time between edges on 2 different lines
* 4 High-Speed Counters
* 6 Software Counters with debounce capabilities
* 3 Pairs of Quadrature Inputs
* Many of these DIO Extended Features share pins and cannot be used at the same time. See the [DIO Extended Features](https://labjack.com/support/datasheets/t-series/digital-io/extended-features) section of the T7's datasheet

##### [**Fixed Current Outputs**](https://labjack.com/support/datasheets/t-series/200ua-and-10ua)

* **200 µA**
* **10 µA**

##### [**Communication Options**](https://labjack.com/support/datasheets/t-series/communication)

1. USB
2. Ethernet
3. 802.11b/g WiFi (T7-Pro only)

##### **Other Highlights**

* Capable of stand-alone operation by running [Lua Scripts](https://labjack.com/support/datasheets/t-series/lua-scripting)
* Built-In CJC Temperature Sensor for easy thermocouple temperature readings
* [Watchdog system](https://labjack.com/support/datasheets/t-series/watchdog)
* Field Upgradable Firmware
* Programmable Startup Defaults
* Industrial temperature range (-40 to +85C)
* For more information please visit the [hardware overview](https://labjack.com/support/datasheets/t-series/hardware-overview/t7-hardware) section of the [T7's datasheet](https://labjack.com/support/datasheets/t-series)

# CB37 Terminal Board

A picture containing electronics

Description automatically generated

Datasheet: https://labjack.com/support/datasheets/accessories/cb37-v21

The CB37 terminal board connects to the DB37 connector on the LabJack U6, UE9, or T7, and provides convenient screw terminal access. The CB37 is designed to connect directly to the LabJack (see image below) but can also connect via a 37-line 1:1 male-female cable (not included). Since the CB37 V2.1 has screw-terminals with the same IO/IO/GND/VS arrangement as the U6/UE9/T7 itself, it is compatible with LJTick signal conditioning modules.

# PS12DC Power Switching Board (We have it)

A picture containing electronics, circuit

Description automatically generated

Datasheet: https://labjack.com/support/datasheets/accessories/ps12dc

Controlled through 12 digital outputs, the PS12DC can switch power sources ranging **from 5 to 28V DC**. Attach the PS12DC to the DB15 connector presented on all compatible devices and toggle the states of the EIO and CIO digital output lines to turn the switches on/off. Designed for medium to low current DC power switching applications.

**12 digitally controlled switches with LED indicators**

Optical isolation

**Handles 5 - 28 Volt supply**

**Up to 750mA/ch**

Thermal (self-resetting) fuse protection

Flyback protection

# RB12 Relay Board

A picture containing electronics, circuit

Description automatically generated

Provides 12 industry standard relay module sockets to a U3, U6, UE9, T4, or T7. Commonly used to interface a LabJack with high voltages/currents. The RB12 relay board connects to the DB15 connector on the LabJack, using the 12 EIO/CIO lines to control up to 12 I/O modules.

I/O modules are available from a variety of manufacturers such as Grayhill, Crydom, or Kyoto, and allow the LabJack to control or monitor 120/240 VAC and/or 3-60 VDC. The RB12 is designed to accept G4 series digital I/O modules from Opto22, and compatible modules from other manufacturers such as the G5 series from Grayhill. Opto22 modules are available from opto22.com, alliedelec.com, and newark.com. Grayhill modules are available from digikey.com. The RB12 does not require a cable or power supply.

* Relay modules are NOT included
* Supports output or input module control types
* Modules are available with voltage ratings up to 200 VDC or 280 VAC, and current ratings up to 3.5 amps

# LJTick-CurrentShunt

A picture containing electronics

Description automatically generated

Datasheet: https://labjack.com/support/datasheets/accessories/ljtick-currentshunt

The LJTick-CurrentShunt (LJTCS) is a signal-conditioning module designed to convert **2x 4-20 mA current loop signals into voltage signals that vary from 0.472-2.360 volts**. The 4-pin design plugs into the standard AnalogInput/AnalogInput/GND/VS screw terminal block found on newer LabJacks such as the U3, U6, UE9, T4, and T7. The major advantages of the LJTCS, compared to using a simple load resistor, are ease of use, high common-mode range, and lower voltage drop on the 4-20 mA signal.

**Pressure Transducer**

## 1. Pressure Transmitter 20 mA Current Output, DIN C Connection, 0-100 PSI **(CAD135.28)**

Diagram

Description automatically generatedTable

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## 2.OEM Style, Compact, Vacuum and Absolute Pressure Transducers **(C$343.00)**

**The PX480A series has been replaced by the new and improved**[**PX190 series**](https://www.omega.com/en-us/sensors-and-sensing-equipment/pressure-and-strain/pressure-transducers/px190/p/PX191-075GV5)**. Many ranges are in stock, available for immediate shipment.**

<https://www.omega.ca/en/pressure-measurement/pressure-transducers/px480a/p/PX480A-001GV>

Graphical user interface, application

Description automatically generated

OMEGA’s PX480A Series transducers, designed for general industrial and commercial requirements, offer excellent performance in a wide range of applications. They are based on proven micro-machined silicon technology, providing high reliability, long-term stability, and low cost. They are extremely accurate with less than 0.3% FS reference accuracy. Wetted parts are made of 316L stainless steel for a wide range of media compatibility.  
  
**SPECIFICATIONS  
Excitation:** 10 Vdc (regulated)  
**Output:** 0 to 50 mV for 0-1 psi model, all other ranges 0 to 100 mVdc  
**Load Resistance:** 50,000 Ohms minimum  
**Accuracy:** 0.3% BFSL maximum (includes linearity, hysteresis, and repeatability)  
**Operating Temperature:** -40 to 80°C (-40 to 176°F)  
**Compensated Temperature:** -25 to 75°C (-13 to 167°F),  
0 to 50°C (32 to 122°F) for 6 psi ranges and below  
**Process Temperature:** -40 to 100°C (-40 to 212°F)  
**Thermal Zero Effect:**2% FS maximum over compensated temperature range  
**Thermal Span Effect:** 2% FS maximum over compensated temperature range  
**1 Year Stability:**<0.25% FS  
**Proof Pressure:** 2x FS  
**Burst Pressure:**3x FS  
**Wetted Parts:**316L stainless steel  
**Vibration:**10 G, 55 to 2000 Hz  
**Shock:**30 G  
**Process Connection:**1/8 NPT male  
**Electrical Connection:** 0.4 m (18') 24 gage cable  
**Weight:** 142 g (5 oz)

## **3.0** OEM Style, Compact, Vacuum and Absolute Pressure Transducers (Selected)

https://www.omega.ca/en/pressure-measurement/pressure-transducers/px480a/p/PX481A-006G5V

Graphical user interface, application

Description automatically generated

**The PX480A series has been replaced by the new and improved**[**PX190 series**](https://www.omega.com/en-us/sensors-and-sensing-equipment/pressure-and-strain/pressure-transducers/px190/p/PX191-075GV5)**. Many ranges are in stock, available for immediate shipment.**

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**Weight:** 142 g (5 oz)

**Solenoid values**

## 1. High-Pressure Compact Solenoid On/Off Valve

Datasheet: <https://www.mcmaster.com/1190N24/>

A close-up of a water faucet

Description automatically generated with low confidence Table

Description automatically generated

## 2. 2-Way, NO, NC, 316 SS, Very High-Pressure Solenoid Valves

**https://www.omega.ca/en/flow-instruments/valves/solenoid-valves/svh-120-series/p/SVH-121-NO**

Graphical user interface, text, application, email

Description automatically generated

**Data sheet in the folder**

A picture containing kitchenware

Description automatically generatedSpecifications  
Materials Of Construction  
Valve Body: 316 SS  
Pistons: PAEK  
O-Rings: Buna-N/FKM “-VT”/PTFE  
Backing Rings: Buna-N/FKM “-VT”/PTFE  
Piston Rings/Seal: PTFE/302 SS  
Cartridge: 316 SS/430 SS  
Pilot/Seal: 303 SS/PTFE  
Spring: 302 SS  
Plunger: 430 SS  
Bonnet Retainer: 430 SS  
Cartridge Gasket: Nylon  
Fluid Temp Range: -37 to 121°C (-35 to 250°F), -26 to 204°C (-15 to 400°F) (-VT)  
Shipping Weight: 1.8 Kg (4 lbs){SVH-121}, 3.2 Kg (7 lbs) {SVH-122}  
**Cv: 4.5**  
Port Connections: ¼ NPT (SVH-121), ½ NPT (SVH-122)  
Electrical  
Duty: Continuous  
Connection: ½ NPT, 18" leads  
Power: 10 watts, 22 watts (-XP)  
    A C Inrush: 1 amp @120 Vac, 2.5 amp @120V AC (-XP)  
    AC Holding: 0.1 amp @ 120 Vac, 0.2 amp @ 120 Vac -XP  
Insulation: Class “F”, Class “H” -XP  
Maximum Operating Pressure:  
    A C Voltage: 7,500 Psig, 10,000 psig -XP  
    DC Voltage: 3,600 PSIG, 7,200 psig -XP  
Minimum Pressure: 100 psig

## 3.0 [SVH-110 | 2-Way, NO, NC, 316 SS, Very High Pressure Solenoid Valves (omega.ca)](https://www.omega.ca/en/flow-instruments/valves/solenoid-valves/svh-110-series/p/SVH-111-24A) (We are planning to get this one) (Selected)

Graphical user interface, application

Description automatically generated

A close-up of a light bulb

Description automatically generated with low confidenceThe SVH-110 Series direct acting solenoid valves are normally closed valves that open when energized and close when de-energized. When the coil is energized the plunger lifts the piston off the valve seat, opening the valve. Upon de-energizing the coil, a spring closes the piston to seat it. The normally open valve operates similarly, closing when energized and opening when de-energized. No minimum pressure is required. The SVH-110 Series are used to control the flow of high pressure air, water, hydrogen, nitrogen and other gases or light liquids compatible with materials of construction. They are also suitable for cryogenic applications.  
  
**Specifications:**  
**Materials of Construction**  
**Fluid Shipping Weight:** 48 oz (3 lb)  
**Temperature:** -212 to 204°C (-350 to 400°F)  
**Valve Body:** 316 SS  
**Piston/Seal:** 303 SS/FEP  
**O-Ring Seal:** FEP  
**Spring:** 302 SS  
**Plunger:** 430 SS  
**Bonnet:** 316 SS/430 SS  
**Bonnet Retainer:** 430 SS  
**Port Connections:** ¼ NPT  
**Cv:** 0.005 (SVH-111), 0.02 (SVH-112)  
**Electrical**  
**Power:** 22 Watts  
**AC Inrush:** 2.5 Amp @ 120 Vac  
**AC Holding:** 0.2 Amp at 120 Vac  
**Insulation:** Class “H”  
**Duty:** Continuous  
**Enclosure:** NEMA 4 and 7(optional)  
**Connection:** ½ NPT, 457 mm (18") leads

# ****Stepper motor: NEMA 23(use counterweight Alter)****

NEMA 23 Stepper Motor Specifications

* Voltage Rating: 3.2V
* Current Rating: 2.8A
* Holding Torque: 270 oz. in
* Step Angle: 1.8 deg.
* Steps Per Revolution: 200
* No. of Phases: 4
* Motor Length: 3.1 inches
* No. of Leads: 4
* Inductance Per Phase: 3.6mH
* Note: LabJack devices can be used to control various types of motors, including [stepper motors](https://labjack.com/support/app-notes/digital-IO/stepper-motor-controller) and [PID controllers](https://labjack.com/support/software/examples/lua-scripting/advanced-scripts/pid-example). In addition, LabJack devices can output PWM signals for accurate duty cycle control, voltage regulation and motor speed control for maximum torque at low speeds.

# ****Digital Pressure Gauge (we have it)****

Datasheet: [Advanced Digital Pressure Gauge with Output and Alarms (omega.ca)](https://www.omega.ca/en/pressure-measurement/pressure-gauges/digital-pressure-gauges/dpg9000/p/DPG9030-10K)

A picture containing parking, meter, watch, gauge

Description automatically generated

Accuracy: ±0.25% of span, terminal point (0.13% BFSL)  
Case Size: 76 mm (3'), 114 mm (4.5')  
Case Material: 3' stainless steel, 4.5' fiberglass-reinforced thermoplastic  
Case Encl. Rating: Weatherproof, NEMA 4 (IP65)  
Wetted Materials: 17-4 SS (sensor), 316 SS (socket)  
Socket Size: ¼ NPT Standard; Custom: ½ NPT, JIS, DIN, SAE, (½ NPT only with 4.5' case, others on application). Consult Engineering to order custom socket.  
Socket Connection: Lower (standard); 3, 9 and 12 o'clock optional  
Operating Temp: 10 to 60°C (14 to 140°F)  
Temp Error: (Zero and span) 0.08%/°C (0.04%/°F) (<0.04%°C typical)  
Storage Temp: -20 to 70°C (-4 to 158°F)  
Display: 5-digit LCD  
Character Height:  
   3' Case: 15 mm (0.60')  
   4.5' Case: 22 mm (0.88')  
Backlight: Standard  
Bar Graph: Standard  
Battery Life: 3' >1000 hr, 4.5' > 3600 hr  
Power Options:  
   DC Power: 12 to 36 Vdc, 2 VA max  
   Loop Power: 12 to 36 Vdc

# ****Limit switch****

## 1.SS-01GL-E-2D (Selected)

A picture containing electronics, projector

Description automatically generatedTable

Description automatically generated with medium confidence

## 2. DB3CB1LB

A picture containing text, electronics

Description automatically generatedGraphical user interface

Description automatically generated

## 3. SS-01GL-ED

A picture containing electronics

Description automatically generatedGraphical user interface

Description automatically generated with low confidence

**Block Diagram:**

T7

Stepper motor

Stepper motor

Limit switch

Limit switch

Sol Value

Sol Value

Low pressure gauge

Sol Value

DAC

Sol Value

Digital

Pressure gauge

DAC

DAC

DAC

ADC

Low pressure gauge

ADC

Low pressure gauge

ADC

ADC

Low pressure gauge

ADC

ADC

Low pressure gauge

DAC

ADC

Low pressure gauge

DAC

ADC

State machine

State\_fail

Flags and records the unit that has failed

HP Test

Diagram:

Return to end

State\_Emergery\_Stop

Stop the test and release air and close the solonid

State\_Test\_0

Pressurizes to 0 PSI and stay at 0 PSI for X min

State\_Test\_4000

Pressurizes to 4000 PSI and stay at 4000 PSI for X min

State\_Test\_2000

Pressurizes to 2000 PSI and stay at 2000 PSI for X min

So, if the pressure reading 4 mbar and if the swift pressure reading is > 50 PSI

So, if the pressure reading 4 mbar and if the ref pressure differs by ±5%

So, if the pressure reading 4 mbar or if the ref pressure differs by ±5%

If i <3

<2 3

If the door opens while in progress and if the pressure increased by 5 PSI

If the door opens while in progress and if the pressure increased by 5 PSI

So, if the pressure reading 4 mbar

So, if the pressure reading 4 mbar

If the door opens while in progress and if the pressure increased by 5 PSI

If the door opens while in progress and if the pressure increased by 5 PSI

State\_End

Display the result

Screening test

If i ==3

<2 3

Counter

I++

State\_SC\_0

Decrease the pressure from 4000 to 0

State\_SC\_4000

Pressurizes to from 0 to 4000

# GUI for the test

Graphical user interface

Description automatically generated

Graphical user interface, application, Teams

Description automatically generated