

LJTick-Divider Datasheet

Mar 10, 2006, Revision 1.00

The LJTick-Divider (LJTD) is a signal-conditioning module designed to divide 2 single-ended channels of 0-10 volt analog signals down to 0-2.5 volt signals. The 4-pin design plugs into the standard AIN/AIN/GND/VS screw terminal block found on newer LabJacks such as the U3 and UE9. The use of large resistors and a precision op-amp buffer provide an input impedance of 1 M Ω . By adding or replacing resistors, many other configurations are possible, such as a level shifter that converts ± 10 volts to 0-2.5 volts.



Figure 1: LJTick-Divider



Figure 2: LJTick-Divider With UE9

VINA/VINB: These screw terminals are for the 2 single-ended channels of input analog voltages. With the factory default configuration of 4:1 attenuation with no level shifting, the input to either of these terminals is typically 0-10 volts and produces 0-2.5 volts on the respective OUT pin.

GND: Same as LabJack ground. VINA/VINB must be referred to this ground.

VREF: A 2.5 volt reference voltage output. Internally this reference is used for optional level shifting, but very little current is used, leaving substantial current available to the user if a very accurate 2.5 volt reference is needed.

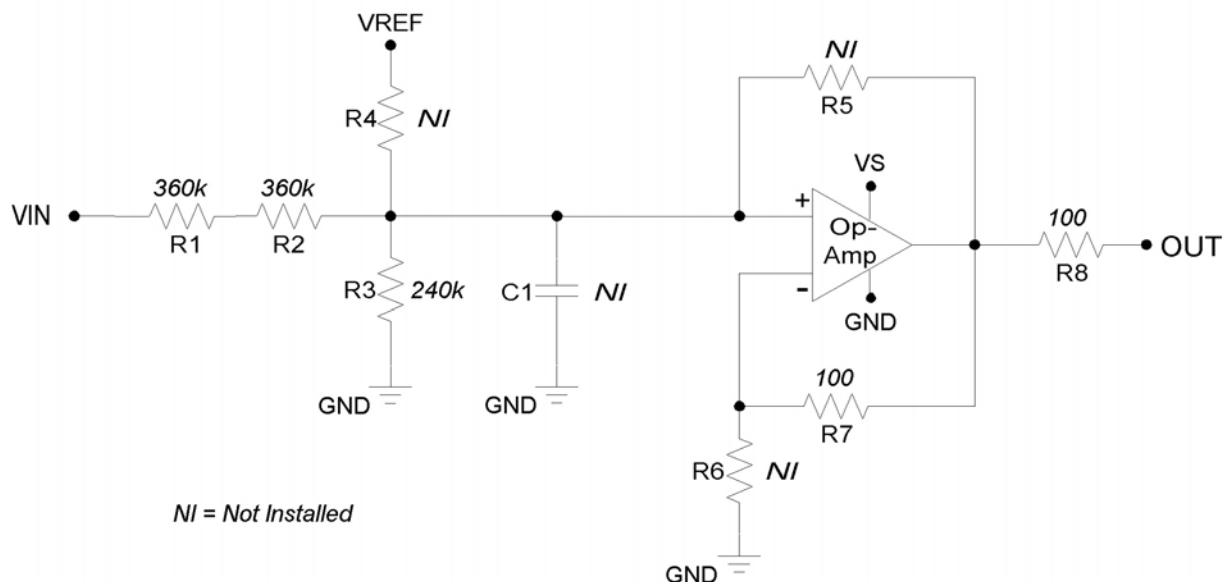


Figure 2: Schematic For Each Channel

The above figure is a schematic for one channel of the LJTD, showing the standard factory installed values. The input/output relationship is described by the below equation, assuming the op-amp is in the default unity gain configuration.

$$OUT = \frac{1}{\left(\frac{1}{R1+R2} + \frac{1}{R3} + \frac{1}{R4}\right)} * \left(\frac{VIN}{R1+R2} + \frac{VREF}{R4}\right)$$

The resistors R1+R2, R3, and R4, can be changed to provide other ranges as shown in the table below. The table shows the input voltage at the typical output voltage limits of 0.0 and 2.5 volts. It also shows the input voltage for an output voltage of 3.5 volts, as the internal buffer amplifier accepts a maximum input voltage of 3.5 volts when powered by VS=5.0 volts, and thus when the amp is configured for unity gain the maximum output voltage is 3.5 volts.

The packages for resistors R1-R4 are 0805, while all other resistors and capacitors are 0603. The tolerance of the factory installed resistors is 0.1%, so a good option for the 180k resistor that is added to create a range of ±10 volts would be digikey.com part number RR12P180KBCT.

R1+R2 [ohms]	R3 [ohms]	R4 [ohms]	VIN (OUT=0) [volts]	VIN (OUT=2.5) [volts]	VIN (OUT=3.5) [volts]
720k	240k	∞	0.0	10.0	14.0
240k	240k	∞	0.0	5.0	7.0
720k	680k	∞	0.0	5.1	7.2
720k	220k	∞	0.0	10.7	15.0
720k	100k	∞	0.0	20.5	28.7
360k	∞	360k	-2.5	2.5	4.5
720k	240k	180k	-10.0	10.0	18.0
360k	360k	180k	-5.0	5.0	9.0

Specifications:

Parameter	Conditions	Min	Typical	Max	Units
General					
VS, Supply Voltage (1)		2.8	5	5.5	volts
Supply Current			1.2		mA
Operating Temperature		-40		85	°C
VREF					
Output Voltage		2.495	2.50	2.505	volts
Initial Accuracy				±0.2	%
Maximum Output Current				24	mA
4:1 Input/Output Configuration					
Offset Voltage				±200	μV
Attenuation Error				±0.3	%
Input Impedance (2)			960		kΩ
Input Bias Current (2)	VIN = 10 V		10		μA

(1) The maximum input voltage to the buffer amplifier is $V_S - 1.5$, so for proper operation with signals up to 2.5 volts, V_S must be greater than 4.0 volts.

(2) The input impedance and bias current is dominated by the input resistors not the buffer amplifier. The input bias current of the internal buffer amplifier is less than ± 200 pA across the voltage range, which is an important number as far as sizing the input resistors to not create excessive offset.

Declaration of Conformity

Manufacturers Name: LabJack Corporation

Manufacturers Address: 13701 W Jewell Ave, STE 284, Lakewood, CO 80228, USA

Declares that the product

Product Name: LJTick-Divider

Model Number: LJTD

conforms to the following Product Specifications:

EMC Directive: 89/336/EEC

EN 55011 Class A

EN 61326-1: General Requirements