

LJTick-Divider Datasheet

Jan 17, 2008, Revision 1.04

The LJTick-Divider (LJTD) is a signal-conditioning module designed to divide 2 single-ended channels of higher voltage analog signals down to 0-2.5 volt signals. The stock builds are for 0-10 volt inputs (UNI10V) or ± 10 volt inputs (BIP10V). 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.

Prior to December 2007, all shipped LJTick-Dividers were the UNI10V configuration and were not specifically labeled. Starting December 2007, all shipped LJTick-Dividers have a label specifying UNI10V, BIP10V, or other.



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 configurations (UNI10V or BIP10V), the input to either of these terminals is typically 0-10 or ± 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 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.

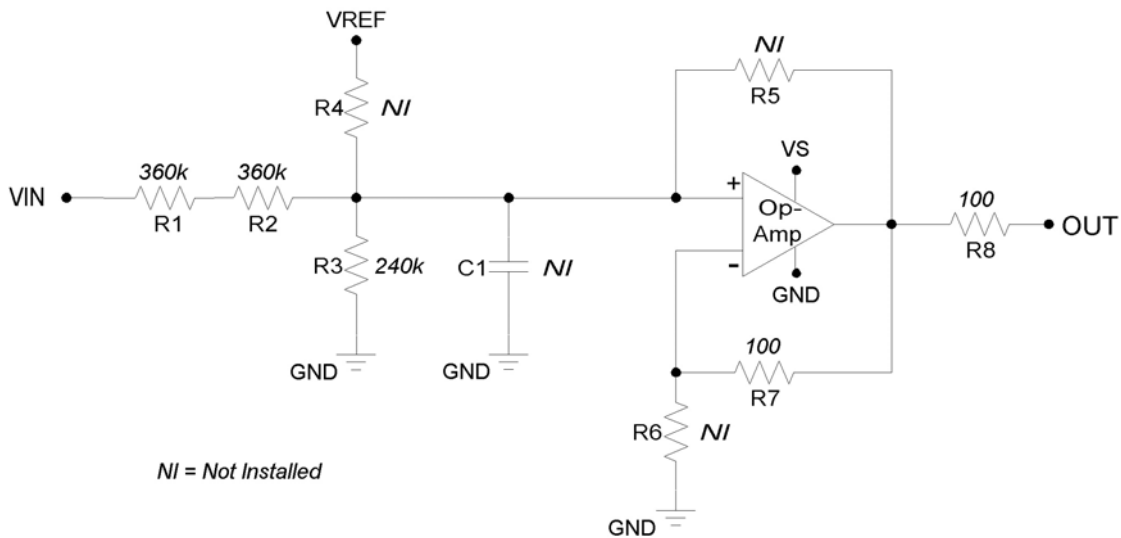


Figure 2: Schematic For Each Channel

The above figure is a schematic for one channel of the LJTD, showing the standard factory installed values for UNI10V. 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 Slope and Offset columns go with the formula $V_{out} = \text{Slope} * V_{in} + \text{Offset}$. The labels in the Name column are used when ordering custom configurations.

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 below would be digikey.com part number RG20P180KBCT.

R1+R2 [ohms]	R3 [ohms]	R4 [ohms]	Slope [volts/volt]	Offset [volts]	VIN (OUT=0) [volts]	VIN (OUT=2.5) [volts]	VIN (OUT=3.5) [volts]	Name
720k	680k	∞	0.4857	0.000	0.0	5.1	7.2	UNI5V
360k	240k	∞	0.4000	0.000	0.0	6.3	8.8	UNI6V
720k	240k	∞	0.2500	0.000	0.0	10.0	14.0	UNI10V
720k	220k	∞	0.2340	0.000	0.0	10.7	15.0	UNI11V
720k	100k	∞	0.1220	0.000	0.0	20.5	28.7	UNI21V
720k	68k	∞	0.0863	0.000	0.0	29.0	40.6	UNI29V
720k	47k	∞	0.0613	0.000	0.0	40.8	57.1	UNI41V
720k	33k	∞	0.0438	0.000	0.0	57.0	79.9	UNI57V
360k	∞	360k	0.5000	1.250	-2.5	2.5	4.5	BIP2.5V
360k	240k	180k	0.2222	1.111	-5.0	6.3	10.8	BIP5V
720k	240k	180k	0.1250	1.250	-10.0	10.0	18.0	BIP10V
720k	68k	68k	0.0451	1.194	-26.5	29.0	51.1	BIP25V

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
Op-Amp Buffer					
Typical Input Voltage Range		-0.1		VS - 1.5	volts
Typical Output Voltage Range	Load ≥ 100 kΩ	0.001		VS - 0.001	volts
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 VS-1.5, so for proper operation with signals up to 2.5 volts, VS 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: 3232 S Vance St STE 100, Lakewood, CO 80227, 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