
STRAIN GAUGE LOAD CELL &
PRESSURE SENSOR
KIT
SHAKTI

Introduction

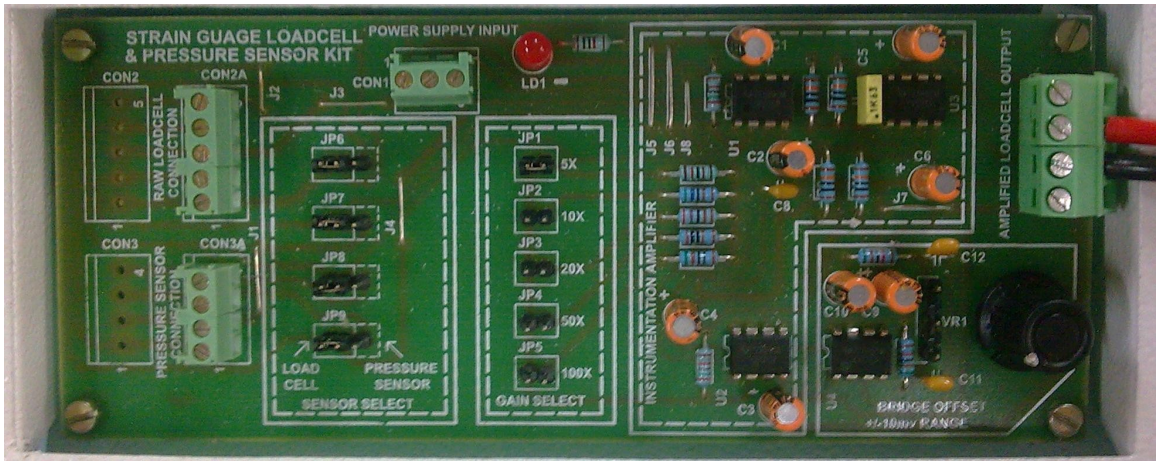
Congratulations on purchasing the Load cell and pressure sensor trainer kit from SHAKTI INDUSTRIES. This kit has been specifically developed for IIT Bombay to demonstrate the use of Load cell as well as other bridge type sensors such as diaphragm type pressure sensors.

The trainer kit is supplied with one low capacity single point cantilever type loadcell installed, and having the working range of 1.2Kg (11.77N). The kit also has a provision to connect MPX205X and similar PCB mounting *silicon strain gauge* 'bridge type' pressure sensors from FREESCALE SEMICONDUCTOR. Standard weights are supplied with the kit to facilitate the calibration of the load cell.

The trainer kit allows the selection of either or none of the bridge sensors as an input to a low-noise adjustable gain[1] instrumentation amplifier. Amplified output is available on a terminal type connector to facilitate measurements.

Description of the Printed Circuit Board:

The acrylic 'dust cover' may be removed to uncover the printed circuit board shown below-



Connector CON1 is the power supply connector. +5V & -5V regulated DC voltage may be tapped from this connector for external use, meeting the loading condition of a maximum of 250ma.

Connector CON2 & CON2A have been used to connect the loadcell. Un-amplified loadcell output may be taken directly from CON2A if required.

The pressure sensor may be (optionally) mounted at CON3. In such a case, un-amplified pressure sensor output is available at CON3A.

Bridge unbalance to the extent of +-4mv may be balanced with the help of the potentiometer available at the lower right corner of the PCB.

Sensor selection area is clearly marked, and provided with 4 jumpers to make the selection. Likewise, gain select area has been clearly de-lineated. A single jumper is

[1] In fixed steps of 1x, 5x, 10x, 20x, 50x, 100x

needed to select the gain. It may be noted that if none of the gain selection jumper points are selected, the effective gain is 1x.

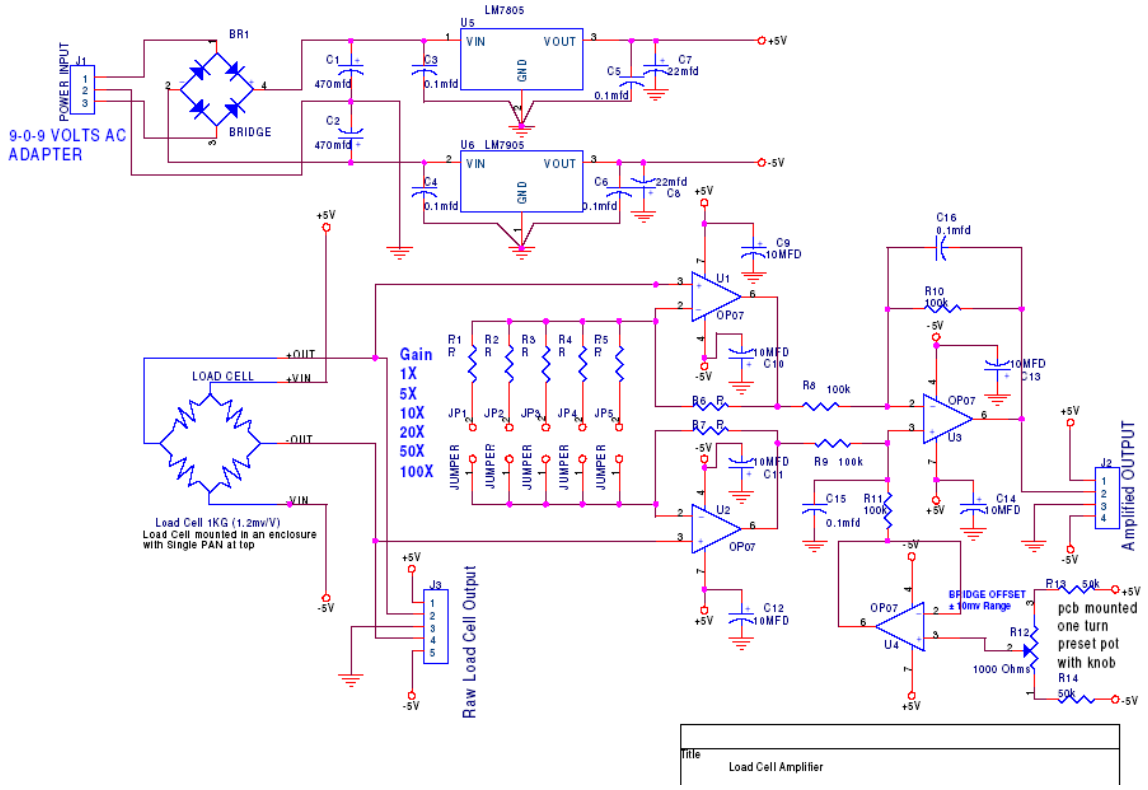
Specification of the load cell:
The precision low range loadcell from Minebea Co. Ltd., Japan has the following specifications-

Type	-	BCL-1.2K
Rated Capacity	-	11.77N (1.2Kgf)
Input resistance	-	42 Ω (+30Ω – 20Ω tolerance)
Non linearity	<	0.020%
Hysteresis	<	0.020%
Output resistance	-	350Ω ±5.0Ω
Zero Balance	-	±0.0400mV/V
Rated Output	-	0.9 mV/V ±0.1mV/V

	Input		Output	
	(+)	(-)	(+)	(-)
Cable Leads	Red	White	Green	Blue
Standard Connector Wiring	A	C	D	B

Other details may be obtained from the manufacturer’s data sheet included at the end.

Circuit diagram



Circuit description:

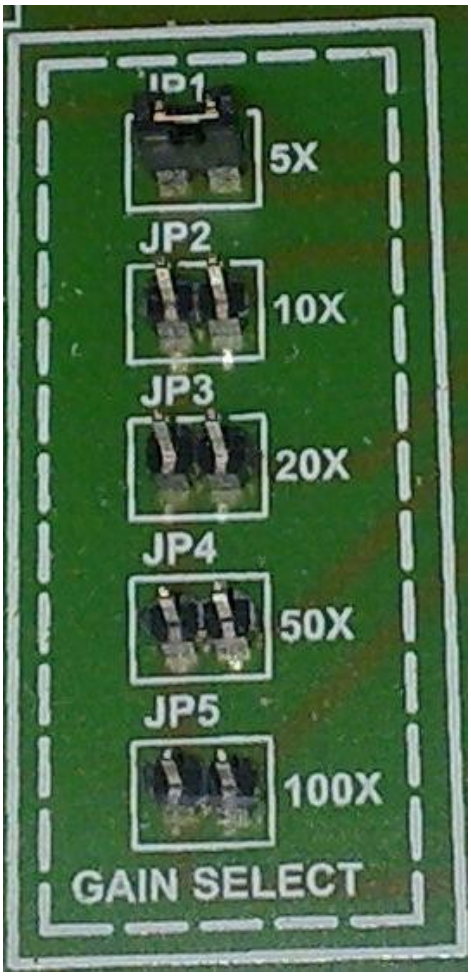
The load cell excitation voltage has been set at 10VDC. The operational amplifiers U1-U3 constitute a classical 3 op-amp instrumentation amplifier circuit. The Loadcell may be directly connected to external amplifier (e.g. that of the SHAKTI 8051 microcontroller kit) through CON2A (not shown in circuit diagram).

U4 has been employed to introduce an offset in U3 so as to compensate for the bridge offset. Gain selection may be made by placing jumper at the respective terminals. If none of the jumper terminals are shorted, the effective gain is 1.

The power supply regulators may be loaded up to 0.3A. The instrumentation amplifier load is limited to 0.05A. Thus an external load of up to 0.25A may be connected at the power supply terminals on CON1 (not shown in the circuit above).

Gain selection Jumpers

Only one jumper should Be installed for gain selection. If none of the gain selection terminals are shorted, the effective gain is one.



Sensor Selection Jumpers

To select load cell, short the two pins on the left side of JP6-JP9, as shown in the diagram. To select the pressure sensor, move the jumpers and insert these to short the other two pins.
To altogether disconnect a sensor, remove all jumpers.