



LOAD CELL AMPLIFIER BOARD

MODEL LA - 1041

OPERATION MANUAL

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§ 1. Summary

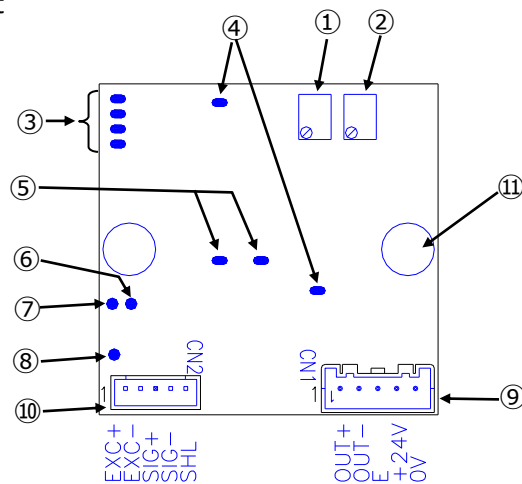
This unit is a built-in board which amplifies a signal from a strain gauge transducer and can output voltage signal 0~±5V (maximum ±10V at specified condition).

This unit is consisted of input signal part, amplification part and power supply part for transducers.

The power supplied voltage is DC24V and isolated from voltage output signal.
Excitation voltage to Load Cell is selected from 5V or 2.5V at jumper setting.

§ 2. Appearance and Each name

Appearance of this unit



- | | |
|------------------|--|
| ① SPAN TRIMMER | Span adjustment trimmer (14 rotation) |
| ② ZERO TRIMMER | Zero adjustment trimmer (14 rotation) |
| ③ JP 1-1 to 4 | Soldering jumper for setting amplification range |
| ④ JP2, 3 | Soldering jumper for setting excitation voltage to Load Cell |
| ⑤ JP4, 5 | Soldering jumper for setting a cut off frequency of filter |
| ⑥ RT | Land for soldering additional resistor (setting Tare subtraction) |
| ⑦ RZ | Land for soldering additional resistor (setting offset) |
| ⑧ C | Common land for soldering RT or RZ |
| ⑨ CN1 | Connector of power line and voltage output line.
There are lands on backside for soldering cables directly. |
| ⑩ CN2 | Connector of Load Cell line.
There are lands on backside for soldering cables directly. |
| ⑪ MOUNTING HOLES | Holes 2-Φ3.2 for fixing this board to the attached hexagonal post with M3 screw |

§ 3. Operation

This unit outputs up to $\pm 5V$. (Max. $\pm 10V$ depending on intensity of input signal from a sensor)
 Recommend to use lead-free (Pb-free) solder because this unit is lead-free.

3 – 1) Soldering jumper for setting excitation voltage to Load Cell, JP2,3

Excitation voltage is 5V as standard, but 2.5V is available when soldering jumper JP2,3. When 2.5V is set, amplification range should not be changed, but output voltage becomes unstable slightly.

Solder jumper JP2,3 according to the following table.

Excitation voltage to Load Cell	Setting Jumper
EXC = 5V	JP2,3: Not solder (Open)
EXC = 2.5V	JP2,3: Solder (Short)

3 – 2) Soldering jumper for setting amplification range, JP1

By soldering an appropriate jumper, a small signal from Load Cell 0.3~2.2mV/V can be amplified to output 0 to $\pm 5V$. JP1-2 is soldered at the time of shipment. When a input signal is out of this range(0.7~1.2mV/V), solder jumper according to the following table.

JP 1-1, 1-2, 1-3 or 1-4 should be soldered single, not multiple.

Setting Jumper JP1-1 to 1-4				Amplification		Span amount to output 5V (mV/V)	Span amount to output 10V (mV/V)
1-1	1-2	1-3	1-4	EXC=5V	EXC=2.5V		
○	×	×	×	439~1047	878~2094	2.27~0.96	----
×	○	×	×	730~1742	1460~3484	1.36~0.58	2.74~1.15
×	×	○	×	1065~2544	2130~5088	0.93~0.40	1.87~0.79
×	×	×	○	1752~4184	3504~8368	0.57~0.24	1.14~0.48

○ : Solder, × : Not solder

3 – 3) Soldering jumper for setting a cut off frequency of filter, JP4,5

When an input signal from Load Cell fluctuates due to external vibration, set a cut off frequency of filter to be lower and make the output voltage becomes less affected from that fluctuation.

Solder JP4,5 according to the following table

Cut off frequency	Setting Jumper
$f_c = 100 \text{ Hz}$	JP4,5: Not solder (Open)
$f_c = 2 \text{ Hz}$	JP4,5: Solder (Short)

Noise level originated from amplifier itself at $f_c=2\text{Hz}$ decreases half compared to the one at $f_c=100\text{Hz}$. The measured value should be more stable.

3 – 4) ZERO adjustment trimmer

Unbalanced voltage of Load Cell or an equivalent voltage of Tare amount can be canceled to zero by adjusting ZERO trimmer (14 rotation).

If the output voltage cannot be adjusted to be zero, additional resistor, RT or RZ is required to mount.

3 – 5) SPAN adjustment trimmer

This is a span adjustment trimmer (14 rotation) to set the output voltage to the desired level.

If the output voltage cannot be adjusted to the desired level, change the amplification range by soldering jumper, JP1. Refer to 3-2)

3 – 6) RT (Additional resistor for initial Tare subtraction)

When an equivalent voltage of Tare amount is so large that the output voltage cannot be adjusted to be zero, mount an additional resistor RT to cancel it. Output voltage decreases toward minus.

When a resistor value of RT is small, cancellation of Tare amount is larger. Select an appropriate resistor value according to the following table. Use a metal film resistor with temperature coefficient 50ppm/°C or less.

Cancellation of Tare amount	Required resistor value, RT	
	Load Cell 350Ωtype	Load Cell 700Ωtype
0.2mV/V	about 430kΩ	about 910kΩ
0.4mV/V	about 220kΩ	about 430kΩ
0.6mV/V	about 150kΩ	about 300kΩ
0.8mV/V	about 110kΩ	about 220kΩ
1.0mV/V	about 91kΩ	about 180kΩ

3 – 7) RZ (Additional resistor to offset the output voltage)

If there is an offset level of output voltage toward minus and output voltage cannot be adjusted to be zero, mount an additional resistor RZ to increase the output voltage to cancel the offset level. This operates as an opposite role of RT. Select an appropriate resistor value according to the above table 3-6). Use a metal film resistor with temperature coefficient 50ppm/°C or less.

§ 4. Calibration

Calibration is done by two steps. One is that set the output voltage to zero when no load is applied. Two is that set the desired output voltage when an object is loaded, which is operated by actual load calibration using a reference weight as an actual load.

When this unit and Load Cell are combined to ship from TOYO, calibration has been done at our factory.

4 – 1) Calibration method with actual load

- 1). Put nothing on Load Cell (only the initial Tare load is applied).
- 2). Turn a ZERO trimmer to adjust the output voltage to 0V.
- 3). Place a weight such as a reference weight on Load Cell and turn a SPAN trimmer to adjust the output voltage to the relevant value of the weight.
- 4). Remove a weight such as a reference weight from Load Cell.
- 5). Confirm that the output voltage is 0V. If not, repeat from step 2) above.

If calibration cannot be done properly, refer to section §5 Troubleshooting and take measures to solve a problem.

§ 5. Troubleshooting

If this unit is malfunctioning, please contact us if the problem cannot be solved by the following measures. At this time, please inform us of the model name, product serial number, the malfunction symptoms and usage as much as possible. The model name of Load Cell or sensor connected to this unit should be also informed.

5 – 1) Basic check point

- 1). Check whether the power supplied voltage DC24V is normal and stable
- 2). Check whether the terminals are connected correctly and firmly

5 – 2) What to do if the desired calibration is not achieved

- 1). Zero adjustment cannot be done.

Zero adjustment range is $\pm 15\%$ against rated output voltage

If the output is more than 0V even if ZERO trimmer is turned fully counterclockwise (CCW), mount an additional resistor, RT, to decrease the output voltage.

If the output is less than 0V even if ZERO trimmer is tuned fully clockwise (CW), mount an additional resistor, RZ, to increase the output voltage.

- 2). When span adjustment, the desired output voltage cannot be set.

If the output goes below the desired value even if SPAN trimmer is turned fully clockwise (CW), solder JP-1 to increase the amplification by one step.

If the output exceeds the desired value even if SPAN trimmer is turned fully counterclockwise (CCW), solder JP-1 to decrease the amplification by one step.

4 steps can be set according to JP-1 jumper setting. If the desired output is not obtained even if all the JP-1 jumper setting has been done, check whether Load Cell output satisfies the sensitivity adjustment range of this unit.

The sensitivity adjustment range of this unit is -2.2mV/V to 2.2mV/V .

Signal from Load Cell, 0.3 to 2.2mV/V is required to output 0 to 5V. Output 10V is possible when a signal from Load Cell is more than 0.6mV/V

- 3). Output voltage is out of range of $\pm 5V$ even though it is not overloaded.
 - ① When a part of Load Cell cable is disconnected. (Refer: Section 5-4)
 - ② Additional resistor RT, RZ is inappropriate. (Refer: Section 3-6)
 - ③ When Load Cell becomes defective. (Refer: Section 5-4)

5 – 3) Judgement whether this unit is malfunction

- 1). Check the excitation voltage of Load Cell

Check whether the excitation voltage between #1 (+EXC) and #2 (–EXC) of CN2 is stable at $5V \pm 0.25V$ ($2.5V \pm 0.13V$). If it is not stable, a power supply circuit inside this unit may be defective.

- 2). Short the output voltage of Load Cell (making an electric short between terminal #3 (+SIG) and #4 (–SIG)). In other words, the input voltage to this unit is made zero.

In this state, the voltage which adjusted by ZERO trimmer is output, so the output does not become 0V, but it can be checked whether the output is stable.

If it is not stable, an amplification circuit in this unit may be defective. If it is stable, check Load Cell side.

5 – 4) Check Load Cell

Since Load Cell is composed of a bridge circuit, it is possible to make a rough judgement by measuring the input / output resistance and insulation resistance.

* Please be sure to turn power OFF of this unit before checking Load Cell.

- 1). Failure judgement method by Load Cell resistance value.

- ① Remove all Load Cell cables.
- ② Measure the bridge resistance of Load Cell with a tester and check if there is any abnormality in the input / output resistance.

- 2). Failure judgement method based on Load Cell insulation resistance

- ① Remove all Load Cell cables.
- ② Measure the insulation resistance between shield and each cable of Load Cell at a voltage within 50V.

In addition, the insulation resistance between a metal case of Load Cell and each cable other than shield is also measured at a voltage within 50V.

- ③ If the insulation resistance is 1000M Ω or more, Load Cell is mostly good

§ 6. Installation and connection method

6 – 1) Installation environment, etc.

- 1) The operating temperature range of this board is 0 °C to 40°C.
Consider installing in a place not exposed to the direct sunlight.
- 2) This board is operated with power supplied voltage DC24V±10%.
Note that connecting to a different voltage may cause failure or damage.
- 3) Fix this board with holes 2-Φ3.2 using attached hexagonal posts or M3 screw

6 – 2) Terminal connection

The shield line of each cable shall be grounded by either this unit or each connected instrument, so that there is no ground loop.

1). Power line and output voltage cable connection (CN1)

Connector: B05B-XASK-1 (JST)

No.	Connection signal	
1	OUT+	Output voltage (+)
2	OUT-	Output voltage (-)
3	E	Grounding (Earth)
4	+24V	Power supplied voltage (DC+24V)
5	0V	Power supplied voltage (DC0V)

- ※#3(E) is connected to one of the fixing holes 2-Φ3.2 inside
- ※Signal between #2(OUT-) and #5(0V) is isolated. Make them apart when wiring.
- ※When wiring a cable of output voltage, use a shielded cable and terminate a shield at the connected unit side.

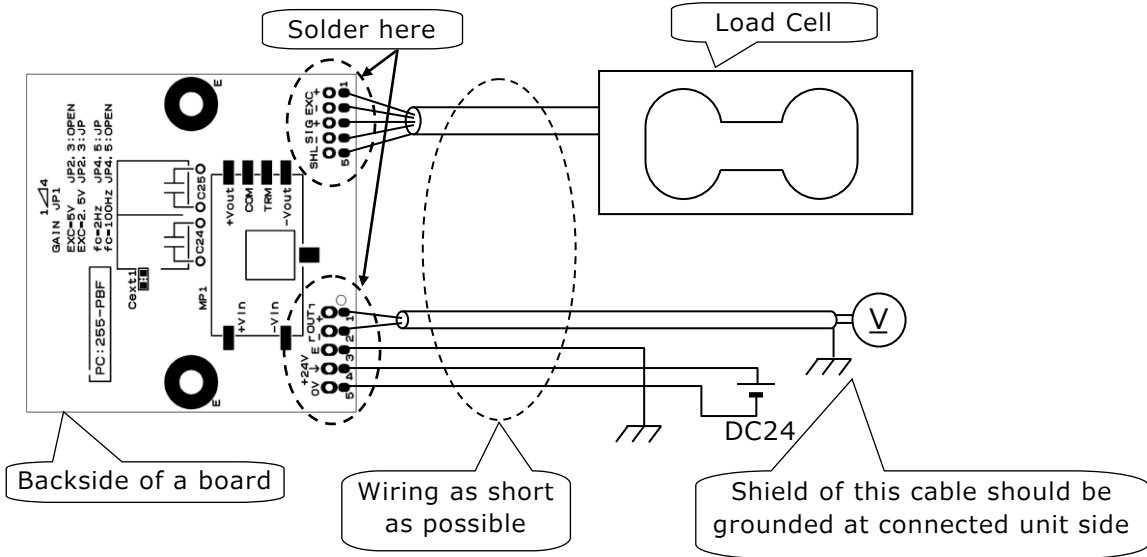
2). Load Cell cable connection (CN2)

Connector: B5B-PH-K-S (JST)

No.	Connection signal	
1	EXC+	Excitation voltage to Load Cell (+)
2	EXC-	Excitation voltage to Load Cell (-)
3	SIG+	Input signal from Load Cell (+)
4	SIG-	Input signal from Load Cell (-)
5	SHL	Shield line of Load Cell cable

- ※There are lands on backside of this board to solder each wires of cable directly, instead of use of connector CN1 and CN2

6 - 3) How to connect wires of cable directly



§ 7. Specifications

7 – 1) Power supply part for Load Cell

- 1). Excitation Voltage DC5V±5% as standard
DC2.5V±5% is available when soldering jumper, JP2,3
- 2). Output current 22mA maximum
able to connect one Load Cell 350Ω type when EXC=5V,
one Load Cell 350Ω/120Ω type when EXC=2.5V.

7 – 2) Amplifire part

- 1). Zero adjustment Range ±15% against rated output voltage, Max. 5V
Multi-turn trimmer adjustment, 14 rotations
- 2). Sensitivity adjustment Span of input voltage 0.3 to 2.2mV/V can output 0 to 5V
by 14 rotations trimmer and soldering jumper of range, JP1
RANGE-1: 1.1 to 2.2mV/V
RANGE-2: 0.7 to 1.2mV/V (at the time of shipment)
RANGE-3: 0.45 to 0.8mV/V
RANGE-4: 0.3 to 0.5mV/V
Standard sensitivity : Output 0 to 5V when EXC=5V,
0 to 1mV/V input, Gain=1000
- 3). Output signal 0 to 5V voltage signal, (Load resistance 2kΩ or more)
For span of 0.6mV/V or more, output of 0 to +10V is possible.
- 4). Non linearity ±0.1%FS
- 5). Cut-off frequency approx. 100Hz (-3dB)
2Hz (-3dB) is available when soldering jumper, JP4,5
- 6). Temperature coefficient
Zero ±0.01% FS/°C typ. (standard sensitivity)
(twice the above at EXC=2.5V)
Sensitivity ±0.01% FS/°C typ.

7 – 3) General

- 1). Power stability ±0.05% FS (Power supplied voltage fluctuation within±10%)
- 2). Power supplied voltage DC24V±10%
- 3). Current consumption 100mA typ.
- 4). Operating Temp./Humidity 0~+40°C、20~85% R.H. (without condensation)
- 5). Mass approx. 30g
- 6). Mounting method Fix by using holes 2-Φ3.2 of this board

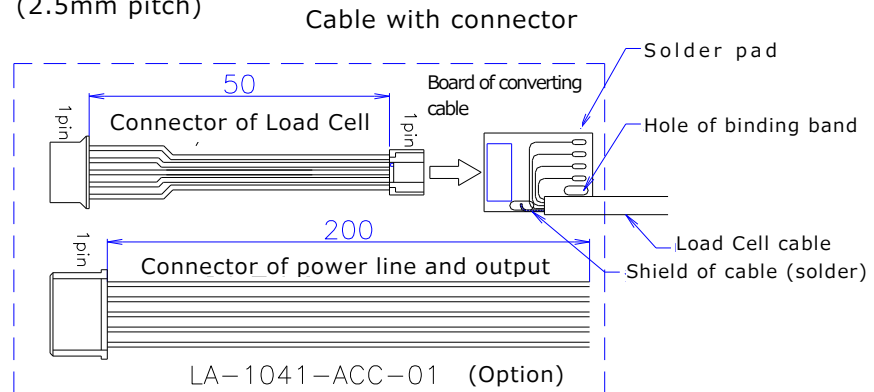
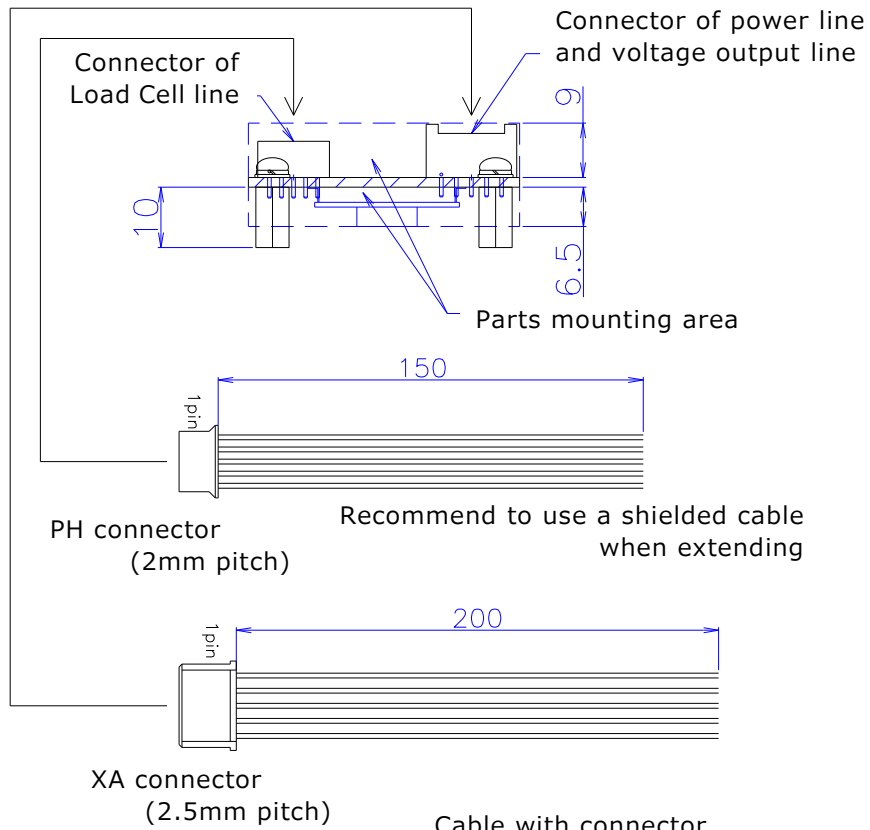
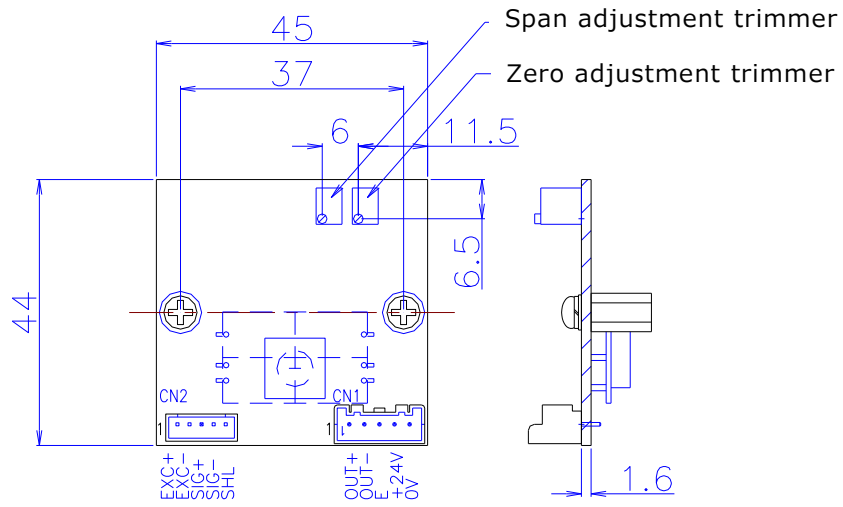
7 – 4) Included Accessories

- 1). Cable with connector for connecting power line and output line 1 pc
- 2). Cable with connector for connecting Load Cell 1 pc
- 3). Operation Manual 1 copy

7 – 5) Warranty

This board is covered by one year warranty against TOYO's manufacturing or design fault.
(The board is taken over and repaired)

§ 8. Dimensional Drawing



MA4-00296-R0