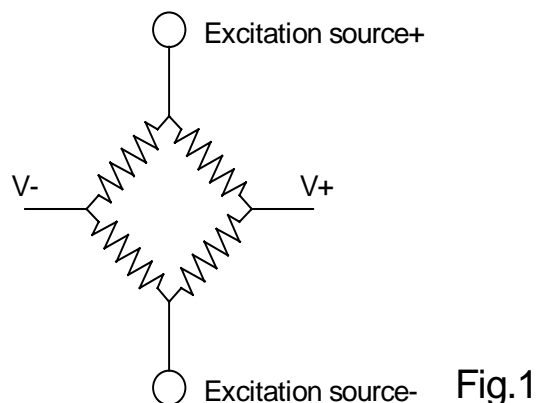


LoadCell Board Application Note

1. What is loadcell

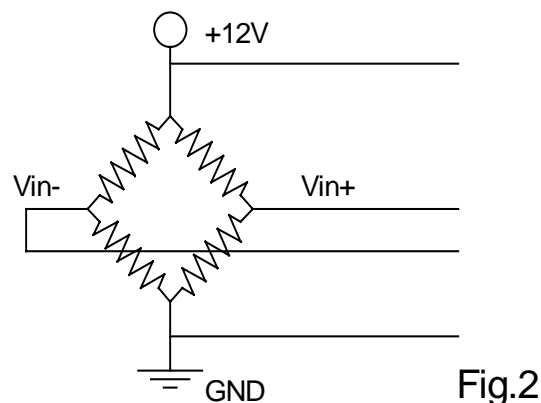
1.1. Loadcell

Loadcell is one kind of bridge sensor. Loadcell is a passive resistant sensor. The resistance varies for the change of the force. The loadcell is shown in fig.1. The excitation source may be voltage or current source. The $V+$ and $V-$ is the differential voltage output, the voltage is propotional to the force. Typically the difference between $V+$ and $V-$ is about serval mV.



1.2. Connect ISO-LDH/L loadcell input

The ISO-LDH/L may connect a loadcell which is powered by excitation voltage. The ISO-LDH/L have the on-board excitation +12V voltage source for loadcell excitation source. The $V+/V-$ connect to the input $Vin+/Vin-$. The connection show in Fig2.



2. How to get data from loadcell

2.1. Amplify the raw signal

The output of loadcell is very small. The typical output is about serval mV. For this reason, the amplifier is needed for

enlarge the input signal. Typical the gain is about hundreds to thousands for enlarge this small signal before been sampled by analog-to-digital converter. This is essential for accuracy measurement.

2.2. Bias voltage

The signal of loadcell output is going with common voltage when we want to measure the dynamic variation of the force. After amplify the signal, the common voltage may cause the signal been exceed the measurable dynamic range. For eliminate the common mode voltage, we need supply an extra bias voltage to adjust the signal to the measurable range.

2.3. ISO-LDH/L amplifier and bias voltage

In ISO-LDH/L board, we use two stage amplifier for flexiable signal condition. The first amplifier, which is fixed gain, with digital controable bias voltage can adjust the input signal from loadcell to the suitable range for next amplifier. The next amplifier is digital controllable from 1/10/100/1000 (for ISO-LDH or 1/2/4/8 for ISO-LDL). When measure the dynamic variation of signal, we may amplify the signal as large as possiable without clamping. The amplifier diagram is shown in fig.3

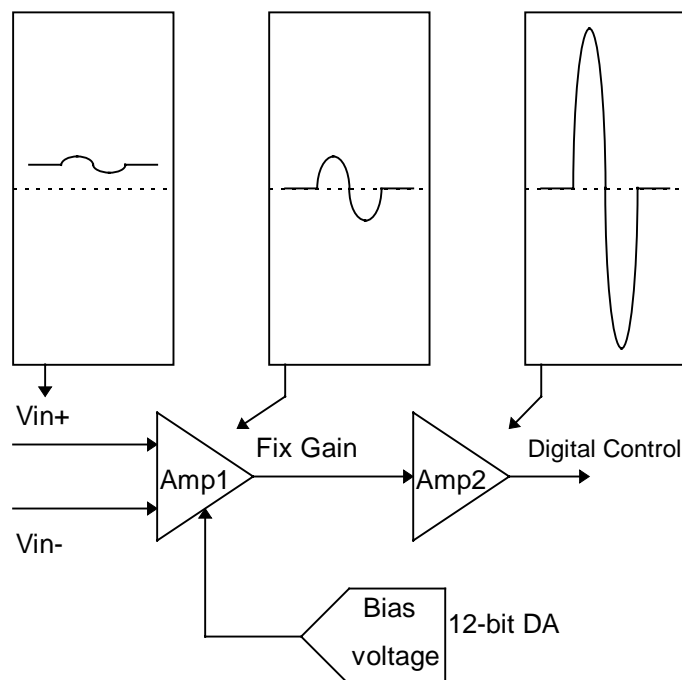


Fig.3

2.4. Example of amplifier and bias voltage select

2.4.1. For example, the loadcell signal is 2mV with 0.2mV Vp-p, and we choice ISO-LDH to acquire this loadcell signal. The first amplifier is fixed gain in 400 V/V. For get the maximum dynamic readable range, we select the second amplifier in gain=100 to get the dynamic signal range in 8V Vp-p.

$$0.2\text{mV} * 400(\text{first amplifier}) * 100(\text{second amplifier}) = 8\text{V}$$

2.4.2. With our AD input range is 0 to 10V, we should the shift the common voltage in about 5V. With the second amplifier is select in gain 100V/V, the common mode voltage of first amplifier's output is adjusted to 50mV. To this requirement, we set the bias voltage to 750mV.

$$2\text{mV} * 400 - 750\text{mV} = 50\text{mV}$$

3. Why need 2 channels in loadcell measure

3.1. Typical system connection

When we measure force, we often have another analog indicator like position or distance to show the physical change by the force. In such a system with this reference analog response, we should have another channel to measure.

4. Isolated digital input and output

4.1. Programmable digital input mode

The ISO-LDH/L support 8 isolated digital input. The input signal may from 12 to 30V. These signals are suitable for connect with relay or PLC digital output. The 8 digital input signal may programmable to active high or active low for different input signal. Each input have corresponding latched input with different input mode.

4.2. Open collector digital output

The ISO-LDH/L support 7 isolated digital output. These output is open collector. We may use these output to drive LED, relay or other digital input. (See fig.4)

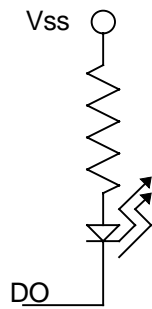


Fig.4-1 : Digital output drive LED
External power source
Vss and external resistor
is needed for drive LED.

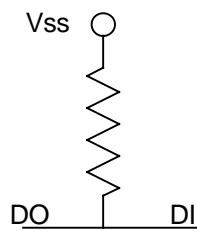


Fig.4-2 : Digital output connect to
digital input
External power source
Vss and external resistor
is needed.

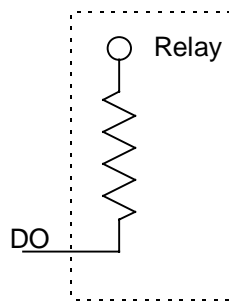


Fig.4-2 : Digital output driverelay
Connect relay input node
directly. External resistor
may cause problem to
drive relay.

Fig.4

5. FIFO

5.1. Reduce CPU loading

With on-board FIFO and micro controller design, we may convert analog signal to digital data and store into FIFO without CPU time.

5.2. Benifit in multitasking operating system

When operate ISO-LDH/L in a multitasking operating system, like MS Windows 95 or MS Windows NT, the CPU time is divided into piece for service each process. In this situation, the FIFO may store data for a while before CPU service our routine to read back these data. Otherwise, we may acquire data and compute at the same time, the CPU only need to read data from FIFO and compute. This will help us to do a gap-free analysis while we may read and compute data before the FIFO full.

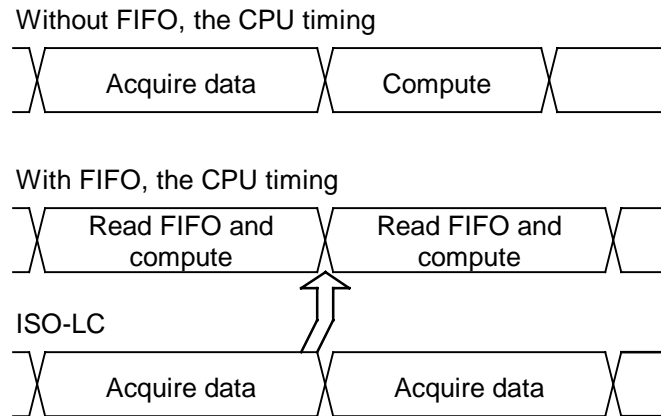


Fig.5

6. Isolated architecture

6.1. High protection from external damage

The isolated design help us avoid the damage from signal. When an unconditional input signal exceed the safe input signal range of ISO-LDH/L, the PC will not direct damage for the isolated architecture supply 500VDC protect from PC to analog input.

7. Programming

7.1. Command type programming

The ISO-LDH/L use command word to operate and control. With on-board micro controller, we may control ISO-LDH/L by send commands. These commands is more flexible and user friendly than traditional control registers, and may reduce the program complex.

7.2. Register address

The ISO-LDH/L only use 4 registers.

Address	Read	Out
Base	Status	Command
Base+4	Data	Clear FIFO

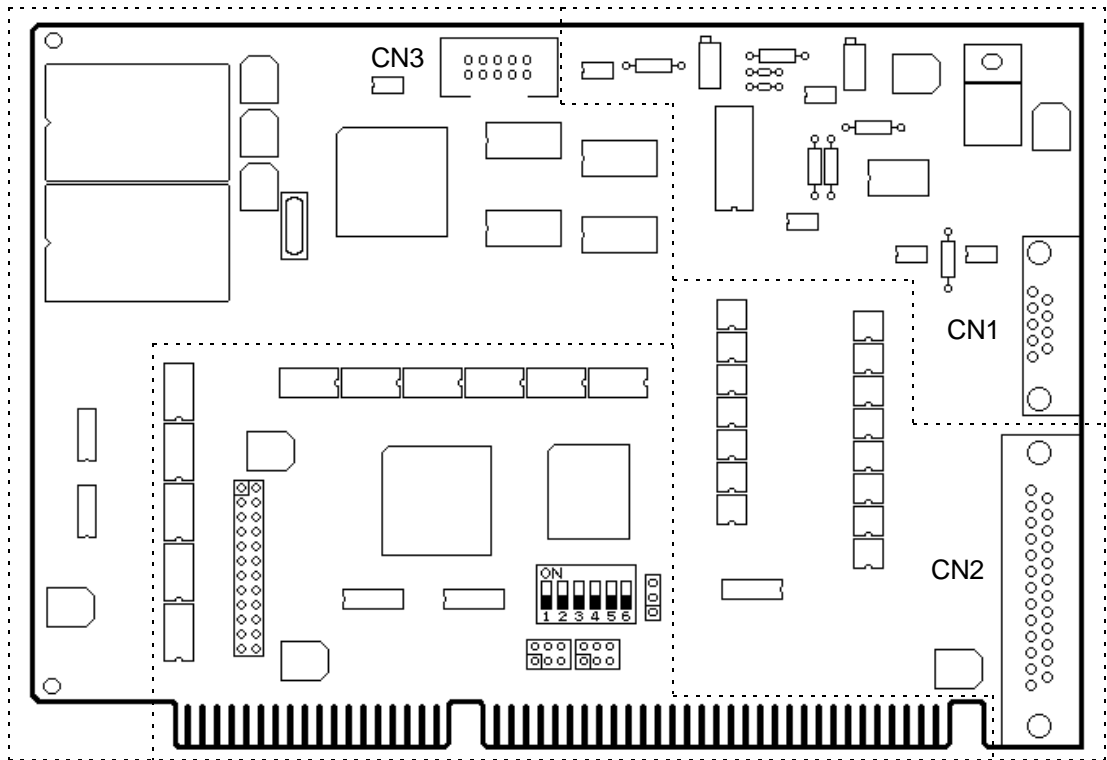
7.3. Command list

- 7.3.1. Read current AD
- 7.3.2. Start AD software trigger
- 7.3.3. Start AD external trigger
- 7.3.4. Set timer
- 7.3.5. Set bias voltage
- 7.3.6. Set digital output
- 7.3.7. Set digital input mode

- 7.3.8. Clear digital input latch
- 7.3.9. Set LED display parameter
- 7.3.10. Set channel configuration
- 7.3.11. Auto set bias voltage
- 7.3.12. Read timer setting
- 7.3.13. Read bias voltage
- 7.3.14. Read non-latched digital input
- 7.3.15. Read latched digital input
- 7.3.16. Read digital mode
- 7.3.17. Read digital output
- 7.3.18. Read LED display parameter
- 7.3.19. Read channel configuration

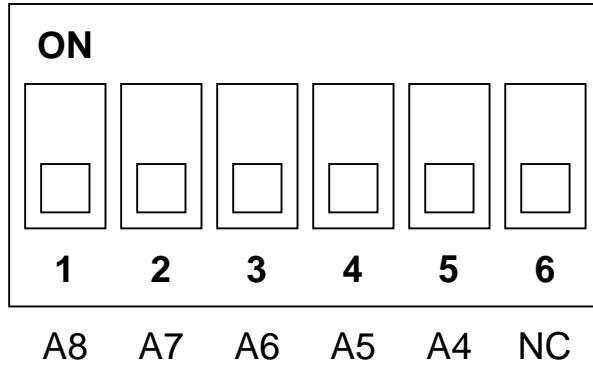
8. Hardware description

8.1. Board view



8.2. Switch and Jumper setting

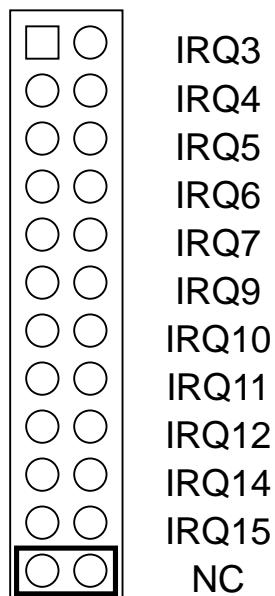
- 8.2.1. SW1 : Base address select
(Default address is 0x220H)



Base Addr	A8	A7	A6	A5	A4
200	On	On	On	On	On
210	On	On	On	On	Off
220	On	On	On	Off	On
230	On	On	On	Off	Off
250	On	On	Off	On	Off
:	:	:	:	:	:
300	Off	On	On	On	On
:	:	:	:	:	:
3F0	Off	Off	Off	Off	Off

8.2.2. JP1 : IRQ select

The default is no interrupt, jumper in NC.

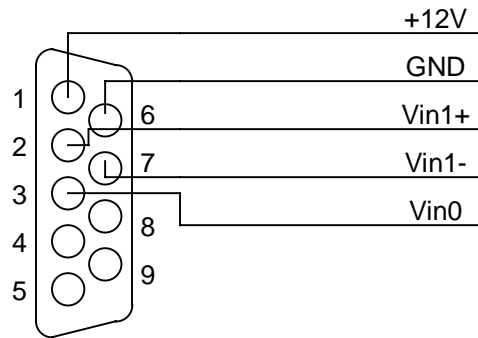


8.2.3. JP3 : DRQ select (Useless)

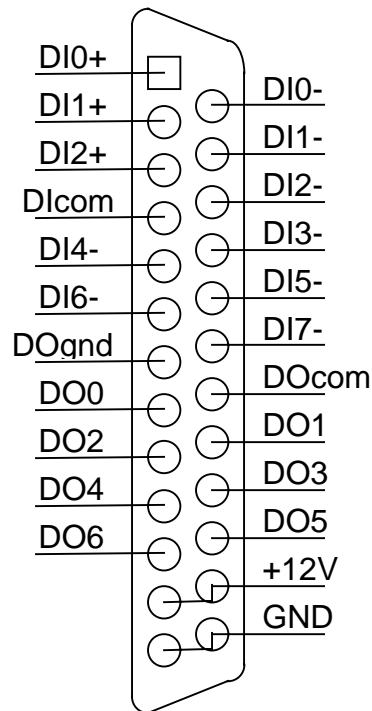
8.2.4. JP4 : DACK select (Useless)

8.3. Connector

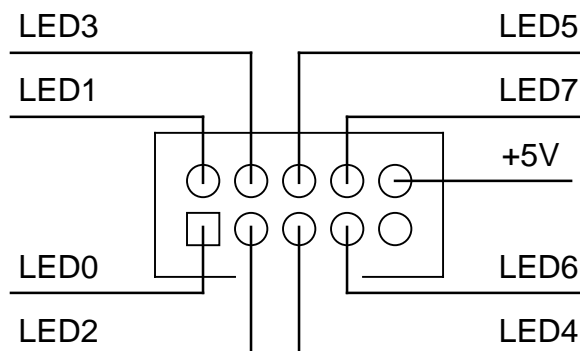
8.3.1. CN1 : Analog input/output connector 9 pin D-sub male



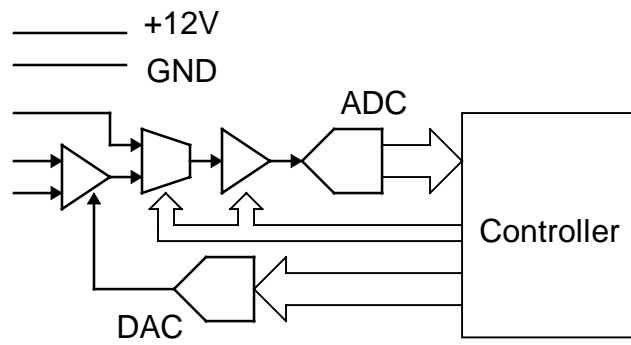
8.3.2. CN2 : Digital input/output connector 25 pin D-sub female



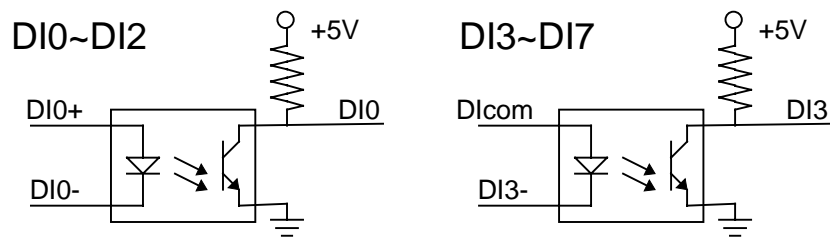
8.3.3. CN3 : 8 LEDs output 10 pin male



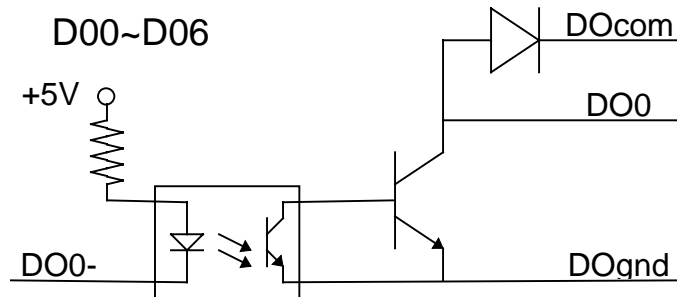
8.4. Analog block diagram



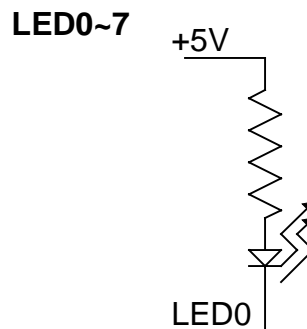
8.5. Digital input block diagram



8.6. Digital output block diagram



8.7. LED output block diagram



8.8. Bus interface

