



CHAPTER 1

INTRODUCTION

The USB 14/16 bit data acquisition board is a high precision data conversion/acquisition system. It contains 16 analog to digital(A/D) input channels with unipolar or bipolar selection, 2 digital to analog(D/A) output channels and 1 digital I/O channel with 16 bit line.

The USB 14/16 bit data acquisition board provides Plug and Play (PnP) features; it is a programmable I/O interface card for PC/486, Pentium, or compatibles. The on board high speed 8051 uC provides USB functions run at 12Mbps full speed or 1.5Mbps low speed.

The USB 14/16 bit data acquisition board can be connected to computer by using USB or RS232, RS422/RS485 communication links.

❖ **The features of the USB 14/16 bit data acquisition board are:**

- USB 2.0 with Plug and Play (PnP) features.
- High speed 8051 uC core.
- Support USB ID selection to identify USB device.
- Provides 16 A/D input channels and the resolution is 14/16 bits.
- Provides 2 D/A output channels and the resolution is 16 bits.
- Provides 1 digital input/digital output channels and the resolution is 16 bits.

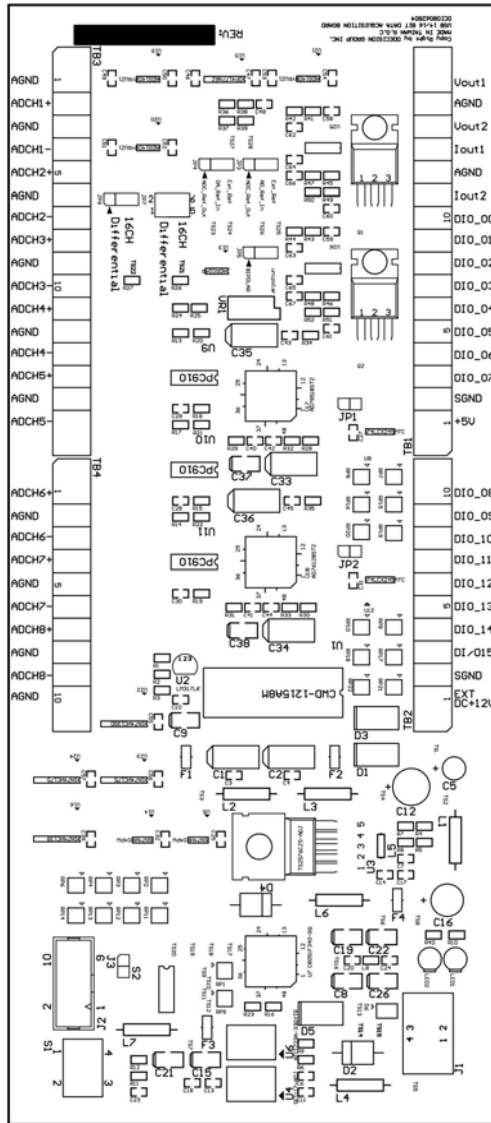


- Provides unipolar or bipolar input voltage range for A/D channel.
- Provides Differential mode for A/D channel.
- A/D input voltage range from 0 to 5V, 0 to 10V, -5V to 5V, or -10V to 10V.
- D/A voltage output range from 0 to 5 V, 0 to 10V, -5V to 5V, or -10V to 10V selectable.
- D/A current output range from 4 mA to 20 mA, 0 to 20 mA, or 0 mA to 24 mA.
- D/A output could set to normal or 10% over range.
- Allow to connect RS232 or RS422/RS485 extension board with DB9 connector.
- POWER from External DC+12V 1.5A ($\geq 1.5A$)
- By using software commands to set up unipolar, bipolar, voltage range, current range,...etc.
- Suitable for Linux, WINDOWS/XP/VISTA/7, ... etc.
- Operating temperature range from 0 to 55°C.
- Relative humidity rage from 0 to 90%.

❖ **PACKAGE CONTENTS:**

- USB 14/16 bit data acquisition board.
- USB cable.
- Optional extension board with DB9 connector, select one of the following:
 1. RS232 KIT DCI09031800_A
 2. RS422/485 KIT DCI09031800_B
- User's manual.
- Decision Studio CD for USB LAB KITS software.
- Warranty form.





CHAPTER 2 HARDWARE CONFIGURATION

Before you use the USB 14/16 bit data acquisition board, please ensure that the jumpers and switches setting. The proper jumper and switches settings for the USB 14/16 bit data acquisition board are described in the following.

2.1 Switch Settings

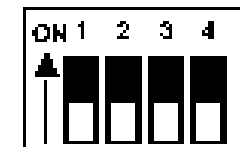
1. S1 Reset



The S1 switch is used to reset 8051, the signal assignments are shown in the following.

| Pin | Signals |
|-----|-----------|
| 3,4 | Reset SW+ |
| 1,2 | Reset SW- |

2. S2 USB ID





The S2 switch is used to identify USB card ID. Please set different card ID to each card (do not duplicate card ID setting).

| 1 | 2 | 3 | 4 | Card ID |
|-----|-----|-----|-----|---------|
| ON | ON | ON | ON | -- |
| OFF | ON | ON | ON | 14 |
| ON | OFF | ON | ON | 13 |
| OFF | OFF | ON | ON | 12 |
| ON | ON | OFF | ON | 11 |
| OFF | ON | OFF | ON | 10 |
| ON | OFF | OFF | ON | 9 |
| OFF | OFF | OFF | ON | 8 |
| ON | ON | ON | OFF | 7 |
| OFF | ON | ON | OFF | 6 |
| ON | OFF | ON | OFF | 5 |
| OFF | OFF | ON | OFF | 4 |
| ON | ON | OFF | OFF | 3 |
| OFF | ON | OFF | OFF | 2 |
| ON | OFF | OFF | OFF | 1 |
| OFF | OFF | OFF | OFF | 0 |

3. Down load revised firmware

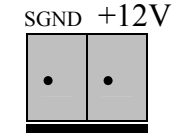
When the S2 switch is set to ON ON ON ON status, means download revised firmware. Please follow the steps shown in the following:

1. Set S2 to ON ON ON ON.
2. Run USBBootloader program to down load revised firmware.



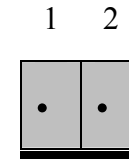
2.2 Jumper Settings

1. External Power Input (TB2)



The power of USB 14/16 bit data acquisition board can be supplied from USB; however, if USB can not supply enough power, the external power is need. To input external power, please use the pin 1 and pin 2 connectors of TB2. Be careful to input DC +12V power.

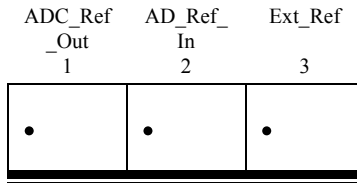
2. Digital Input/Digital Output Mode Selection (JP1 to JP2)



JP1 and JP2 are used to select input/output mode of digital I/O. When short JP1 means select input mode for DIO0 to DIO7, otherwise open JP1 means select output mode for DIO0 to DIO7. When short JP2 means select input mode for DIO8 to DIO15, otherwise open JP2 means select output mode for DIO8 to DIO15.

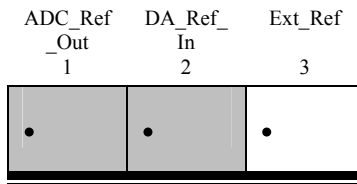


3. Voltage Reference Source Selection for ADC (JP3)



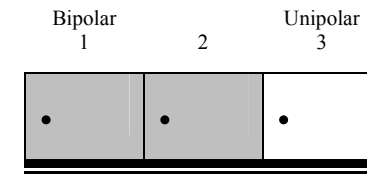
Please open all of jumpers as default value.

4. Voltage Reference Source Selection for DAC (JP4)



JP4 is used to select voltage reference source for DAC. When short pin 1 and pin 2 means select a default +5V as reference source for DAC, otherwise short pin 2 and pin 3 means select an adjusted +5V (which is adjustable using VR1) as reference source for DAC.

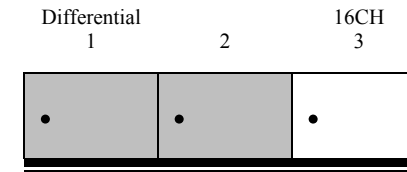
5. ADC converter range selection (JP5)



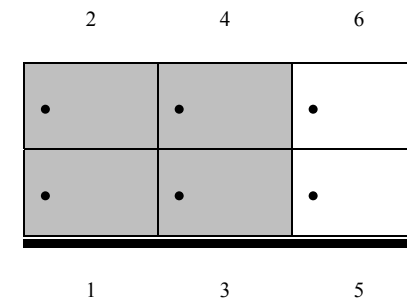
JP5 is used to select Bipolar/Unipolar of ADC converter range. When short pin 1 and pin 2 means select bipolar of ADC input, otherwise short pin 2 and pin 3 means select unipolar of ADC input.

6. ADC input mode selection (JP6 to JP7)

JP6



JP7





JP6 and JP7 are used to select ADC input mode. When short pin 1 and pin 2 of JP6 and pin 1 and pin 3, pin 2 and pin 4 of JP7 means select Differential mode of ADC input. In Differential mode, the ADC provides 8 input channels. To short pin 2 and pin 3 of JP6 and pin 4 and pin 6, pin 3 and pin 5 of JP7 means select 16 channels of ADC input.

The channel address of Differential mode and 16 channels modes are shown in below:

| Channel address | Differential mode | | 16 channels mode | |
|-----------------|-------------------|---------|------------------|---------|
| | + input | - input | + input | - input |
| 0 | ADCH1+ | ADCH1- | ADCH1+ | AGND |
| 1 | ADCH2+ | ADCH2- | ADCH2+ | AGND |
| 2 | ADCH3+ | ADCH3- | ADCH3+ | AGND |
| 3 | ADCH4+ | ADCH4- | ADCH4+ | AGND |
| 4 | ADCH5+ | ADCH5- | ADCH5+ | AGND |
| 5 | ADCH6+ | ADCH6- | ADCH6+ | AGND |
| 6 | ADCH7+ | ADCH7- | ADCH7+ | AGND |
| 7 | ADCH8+ | ADCH8- | ADCH8+ | AGND |
| 8 | N/A | N/A | ADCH1- | AGND |
| 9 | N/A | N/A | ADCH2- | AGND |
| 10 | N/A | N/A | ADCH3- | AGND |
| 11 | N/A | N/A | ADCH4- | AGND |
| 12 | N/A | N/A | ADCH5- | AGND |
| 13 | N/A | N/A | ADCH6- | AGND |
| 14 | N/A | N/A | ADCH7- | AGND |
| 15 | N/A | N/A | ADCH8- | AGND |



2.3 USB Connector

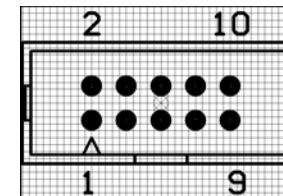
1. USB Connector (J1)



The USB connector is connected to computer USB port by using USB cable.

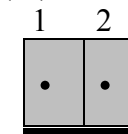
2.4 Connector and Jumper for Serial Communication

1. The connector of serial communication (J2)



To use RS422/RS485/RS232, please connect J2 to extension board by 10 pins flat cable.

2. Enable Serial Port (J3)





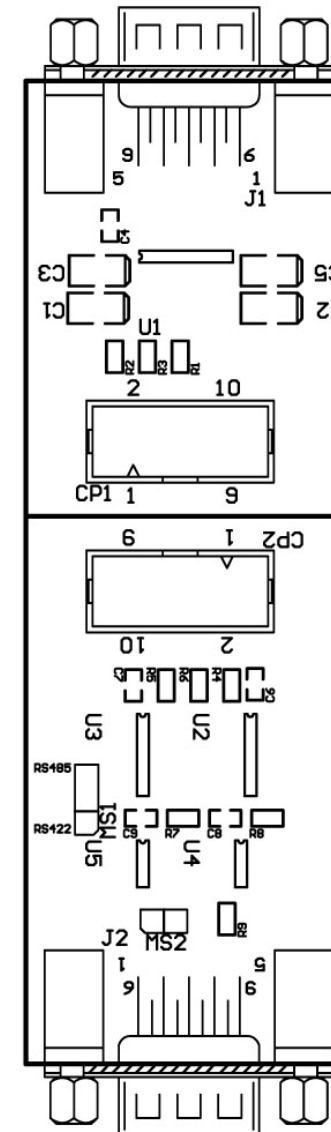
J3 is used enable serial port communication, when short the J3, means enable serial port, otherwise, when open the J3, the serial port communication is disabled.

2.5 Extension Board for Serial Communication

Extension boards with DB9 connector for RS232 or RS422/RS485 are optional products; user can connect USB industry control board to computer by using serial communication. Please follow the steps in bellows:

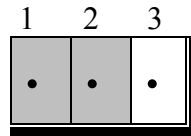
1. By using 10 pins flat cable to connect J2 of USB 14/16 bit data acquisition board and CP1(RS232)/CP2(RS422/RS485) on the extension board.
2. Connect J1(RS232)/J2(TS422/RS485) of extension board to computer RS232 or RS422/RS485 port.

The diagram of these extension boards are shown in the following:





5. RS422/RS485 Selection (MS1)



The MS1 is located at RS422/RS485 extension board. MS1 is used to set RS422/RS485 communication, when short pin 1 and pin 2, means set RS422. When short pin 2 and pin 3, means set RS485.

6. Long Distance Communication (MS2)

The MS2 is located at RS422/RS485 extension board. MS2 is used to set long distance communication, when short the MS2, means long distance communication. Otherwise, open the MS2, means normal distance communication.

2.6 Connector Assignments

The input/output signals of USB 14/16 bit data acquisition board are assigned in the TB1 to TB4 connector, its pin assignments are show in the below.



TB1

| Pin | Signal | Description |
|-----|--------|----------------------|
| 1 | +5V | +5V |
| 2 | SGND | Signal Ground |
| 3 | DIO_07 | DIO Line 7 |
| 4 | DIO_06 | DIO Line 6 |
| 5 | DIO_05 | DIO Line 5 |
| 6 | DIO_04 | DIO Line 4 |
| 7 | DIO_03 | DIO Line 3 |
| 8 | DIO_02 | DIO Line 2 |
| 9 | DIO_01 | DIO Line 1 |
| 10 | DIO_00 | DIO Line 0 |
| 11 | IOUT2 | D/A Current Output 2 |
| 12 | AGND | Analog Ground |
| 13 | IOUT1 | D/A Current Output 1 |
| 14 | VOUT2 | D/A Voltage Output 2 |
| 15 | AGND | Analog Ground |
| 16 | VOUT1 | D/A Voltage Output 1 |





TB2

| Pin | Signal | Description |
|-----|------------|------------------------|
| 1 | EXT DC+12V | External DC +12V Power |
| 2 | SGND | Signal Ground |
| 3 | DIO_15 | DIO Line 15 |
| 4 | DIO_14 | DIO Line 14 |
| 5 | DIO_13 | DIO Line 13 |
| 6 | DIO_12 | DIO Line 12 |
| 7 | DIO_11 | DIO Line 11 |
| 8 | DIO_10 | DIO Line 10 |
| 9 | DIO_9 | DIO Line 9 |
| 10 | DIO_8 | DIO Line 8 |

TB3

| Pin | Signal | Description |
|-----|--------|--------------------------|
| 1 | AGND | Analog Ground |
| 2 | ADCH1+ | Analog input channel 1 + |
| 3 | AGND | Analog Ground |
| 4 | ADCH1- | Analog input channel 1 - |
| 5 | ADCH2+ | Analog input channel 2 + |
| 6 | AGND | Analog Ground |
| 7 | ADCH2- | Analog input channel 2 - |
| 8 | ADCH3+ | Analog input channel 3 + |
| 9 | AGND | Analog Ground |
| 10 | ADCH3- | Analog input channel 3 - |
| 11 | ADCH4+ | Analog input channel 4 + |
| 12 | AGND | Analog Ground |
| 13 | ADCH4- | Analog input channel 4 - |
| 14 | ADCH5+ | Analog input channel 5 + |
| 15 | AGND | Analog Ground |
| 16 | ADCH5- | Analog input channel 5 - |



TB4

| Pin | Signal | Description |
|-----|--------|--------------------------|
| 1 | ADCH6+ | Analog input channel 6 + |
| 2 | AGND | Analog Ground |
| 3 | ADCH6- | Analog input channel 6 - |
| 4 | ADCH7+ | Analog input channel 7 + |
| 5 | AGND | Analog Ground |
| 6 | ADCH7- | Analog input channel 7 - |
| 7 | ADCH8+ | Analog input channel 8 + |
| 8 | AGND | Analog Ground |
| 9 | ADCH8- | Analog input channel 8 - |
| 10 | AGND | Analog Ground |



Return Authorization: It is necessary that any returned goods are clearly marked with an RA number that has been issued by SmartLab. Goods returned without this authorization will not be attended to.



APPENDIX B External Power Installation:

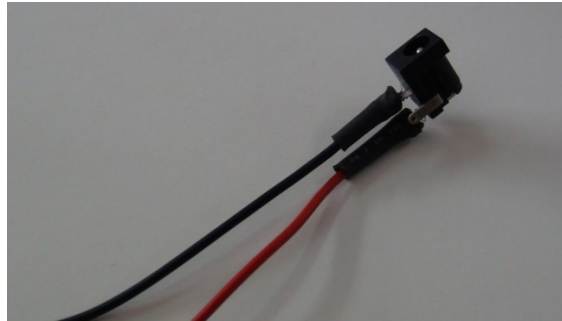
***Optional for Decision Group USB I/O series of items
** The materials of the external power for Decision Group USB I/O series items are customer-self-supplied or optional purchase, they are not covered in the standard package of Decision Group USB I/O series items.*

1. The Materials of the external power (customer-self-supplied)



** 12V / 1.5A AC adapter (Power plug type is subject to the different varieties in different country.).*





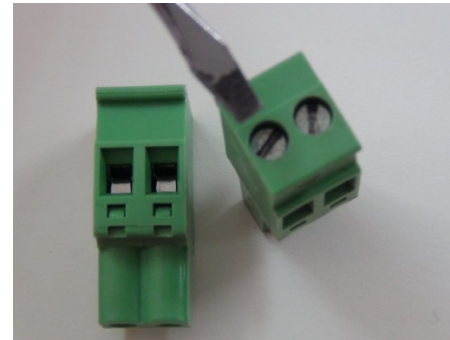
* AC power cord

2. Terminal blocks built-in on Decision Group USB I/O series of Items:

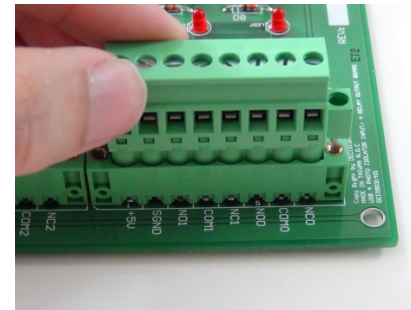


e.g. PCB pluggable terminal blocks. (for PRO type only)

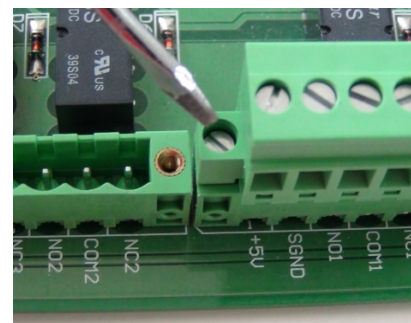
3. External Power Installation procedure:



To tight / loose the terminal with a minus screwdriver.



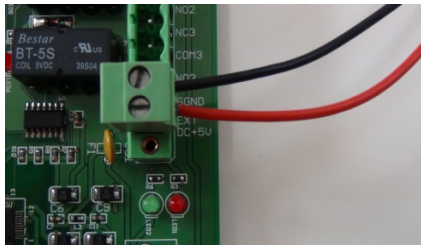
Plug the terminal blocks into the socket. (PRO type only)



Fasten both sides of the screws (PRO type only)



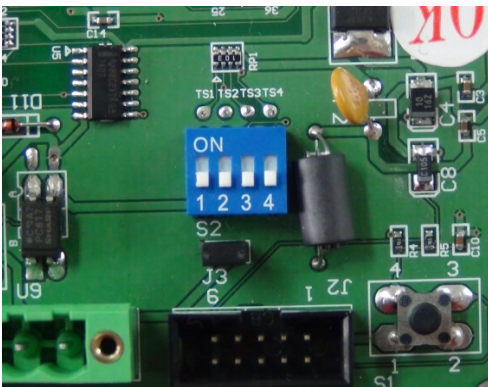
Operations Manual
USB 14/16 BIT Data Acquisition Board



Attach the **black** cord to the **SGND** and the **red** cord to the **EXT VIN**, as well as the signals cords depending on



Connect your device to the computer with a USB cable



To confirm all the switches and jumper setting are correct in compliance

