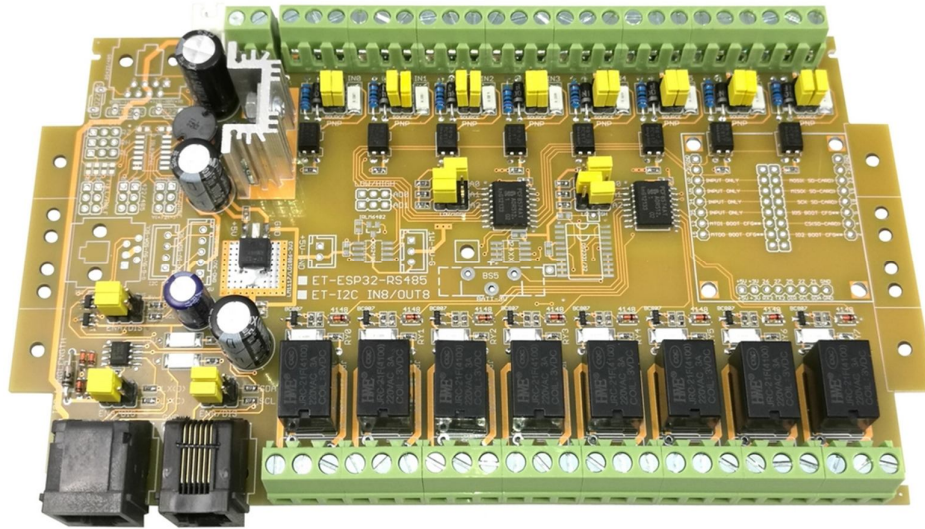


ET-I2C IN8/OUT8



Board ET-I2C IN8/OUT8 expands I/O through I2C Bus. Internal board includes OPTO Input to interface to Sensors that support both NPN Sensor and PNP Sensor; moreover, there are 8 channels of Relay Output as NO/Common/NC to control operation of electrical appliances. The operation of board can be controlled by this I2C Bus Interface; it can be connected through I2C Bus as TTL 5V or I2C Bus Long Length for a long distance communication of 20 meters.

SPECIFICATIONS OF BOARD

- 8-Port Output Relay 1 Contact: NO/Common/NC (3A Contact Rating) is separately controlled via CHIP PCF8574 and 8 Address Positions can be setup independently.
- 8-Port OPTO Input can choose Input Type to be either NPN(Sink) or PNP(Source) as preferred; check its status through PCF8574A; and 8 Address Positions can be setup independently.
- 1-Channel I2C Long Length Bus Driver supports I2C Communication for a long distance of 20 meters.
- 1-Port 5V I2C Bus as RJ11 6Pin Male
- Switching Regulate 5V/1A is compatible with a maximum of Input Voltage 35V, provided with LDO Regulate 3.3V/1A
- PCB Size: 10.5cm X 19cm supports in mounting ADAPTER RAIL DIN35 and DIN Box

HOW TO USE I2C BUS COMMUNICATION SYSTEM

There are 2 types of Connector on Board ET-I2C IN8/OUT8 in order to be connected to I2C Bus and each type has different level of electrical signal; so, the device that will be connected must have the same level of electrical signal. For example, if it is I2C Bus 5V, it must be connected with the same I2C Bus 5V device; or, if it is I2C Bus Long Length, it also must be connected with the same I2C Bus Long Length Board. The method of writing program to communicate to I2C Devices that are I2C Bus 5V or I2C Bus Long Length remains unchanged.

- PCF8574 that is CHIP I2C Output controls the operation of 8-CH Relay Output and it is connected with Board through I2C Bus 3.3V.
- PCF8574A that is CHIP I2C Input reads the status of 8-CH OPTO Input and it is connected with Board through I2C Bus 3.3V.
- I2C Bus Long Length is used when it has to be connected together with I2C Bus Long Length device for a long distance communication of 20 meters; in this case, it requires Cable Twisted pair CAT5E and Connector RJ45 8Pin.
- I2C Bus 5V is connected to I2C Bus device that runs by +5V Power Supply and its Connector type is RJ11 6Pin.

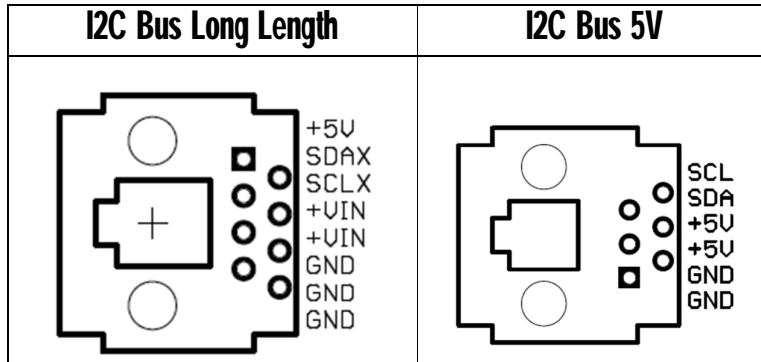
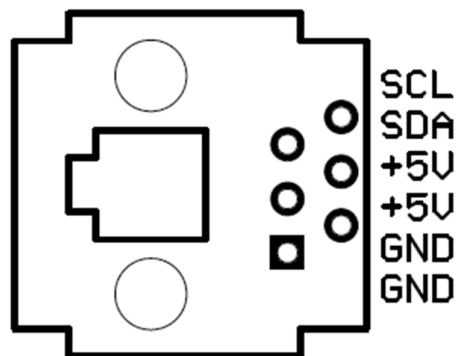
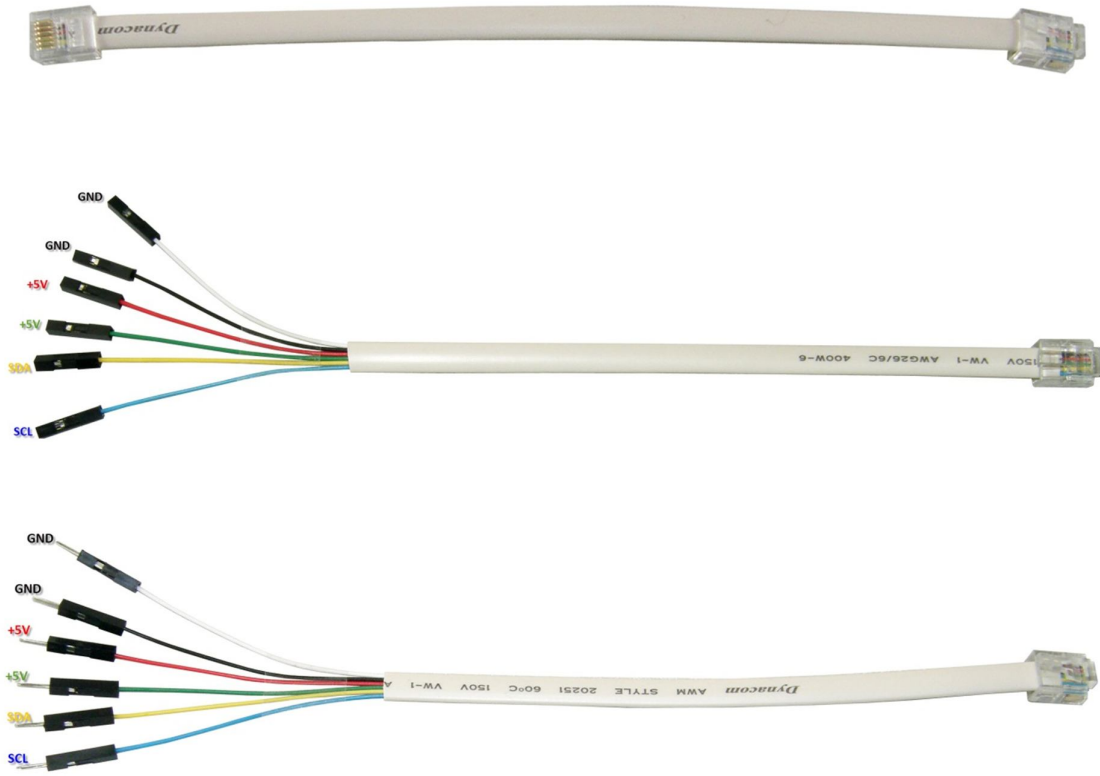


Table shows arrangement of Signal of various types of Connector I2C Bus.

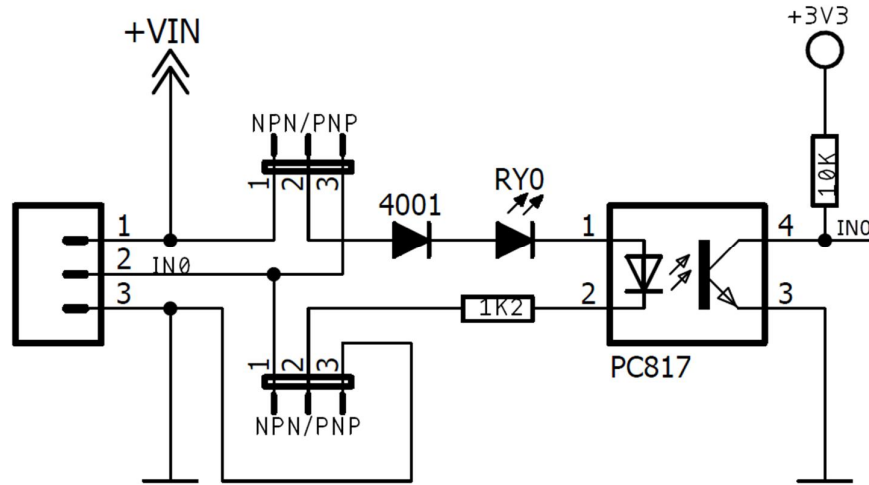




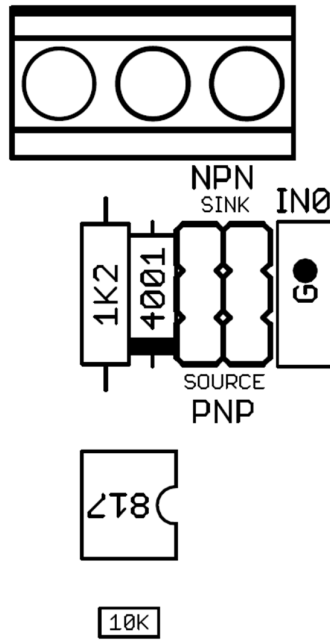
It shows example of various types of Cable I2C.

HOW TO USE OPTO-INPUT

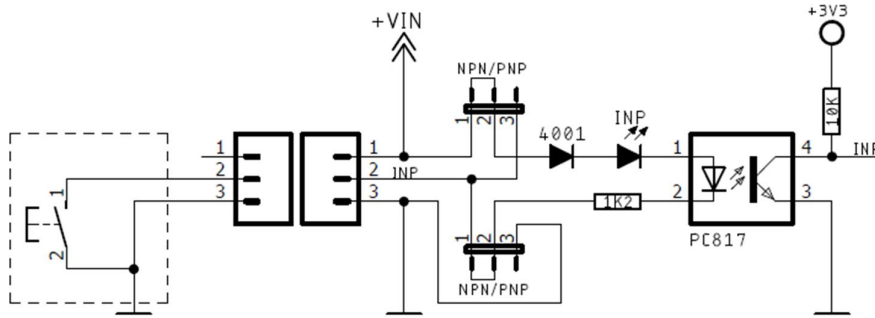
There are 8 sets of Circuit OPTO-Input on Board ET-I2C IN8/OUT8 and each set runs separately; moreover, there is Jumper to choose type of Input either to be NPN(Sink) or PNP(Source) as preferred. It supports Input Voltage 12V that can be used with various types of Input Sensor; Contact Switch/Relay or NPN(Sink) or PNP(Source) as preferred. Moreover, there is LED that shows operating status of Input in each channel.



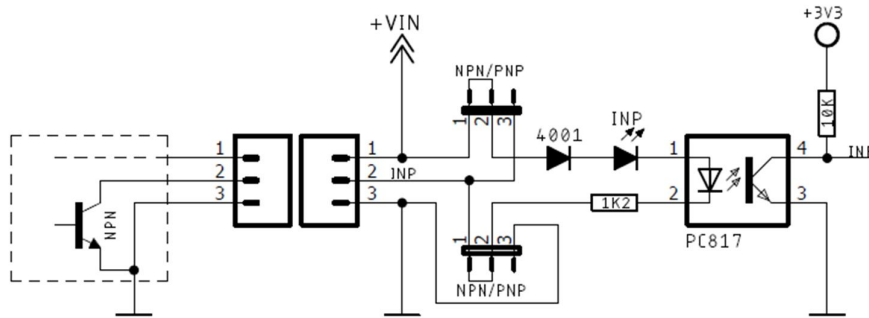
It shows the Circuit of OPTO Input.



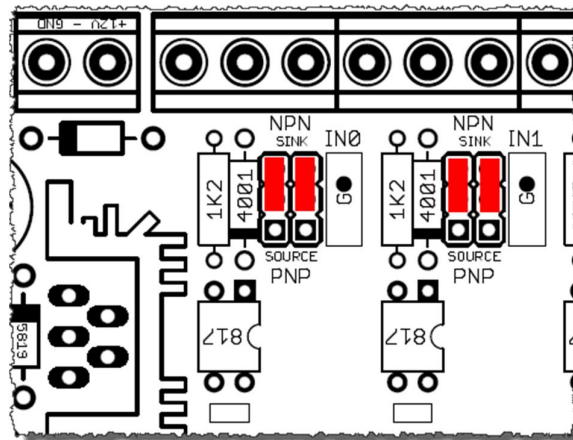
HOW TO APPLY OPTO INPUT AS NPN



An example shows how to connect Input Contact Switch with NPN Input.

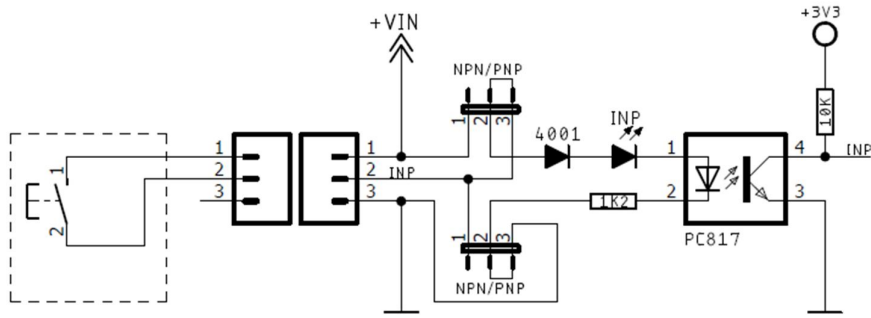


An example shows how to connect Input with NPN Sensor.

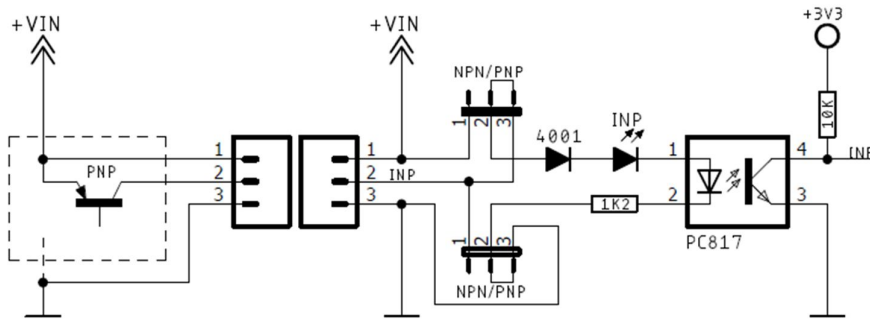


It shows how to setup Jumper of OPTO INPUT as NPN.

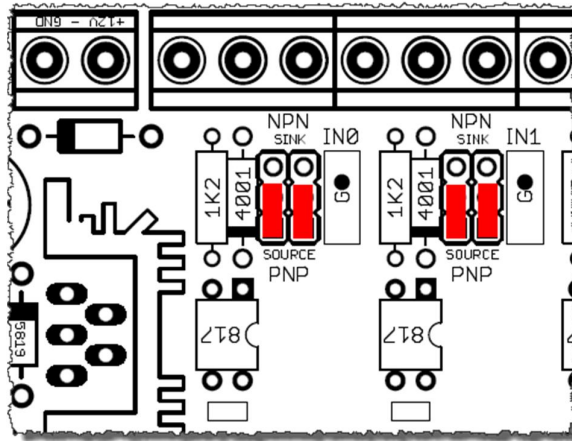
HOW TO APPLY OPTO INPUT AS PNP



An example shows how to connect Input Contact Switch with PNP Input.



An example shows how to connect OPTO INPUT with PNP Sensor.

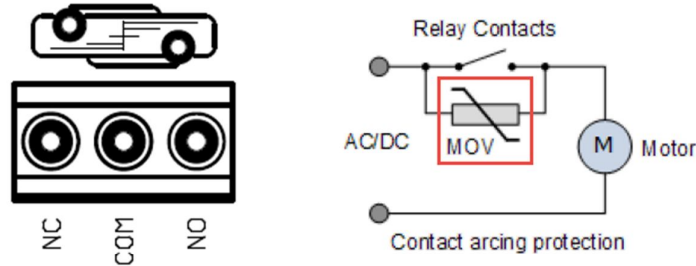


It shows how to setup Jumper of OPTO INPUT as PNP

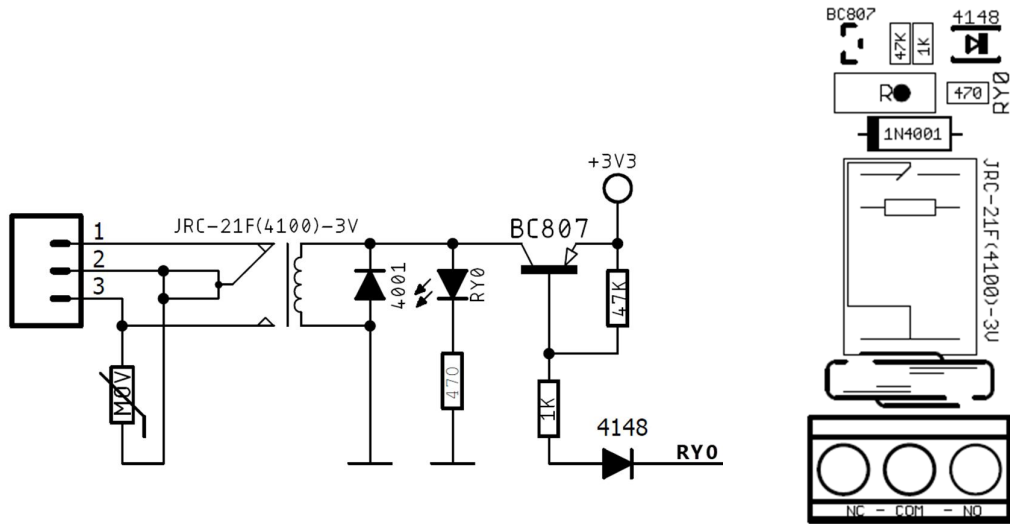
HOW TO USE RELAY OUTPUT

There is a Circuit 8-CH Relay Output as 1 Contact NC/COMMON/NO on Board ET-I2C IN8/OUT8 and the operation of Relay is controlled through PCF8574. When Signal Output Pin of PCF8574 is setup as LOW, it enables "ON Relay"; but, if Signal Output Pin of PCF8574 is setup as HIGH, it becomes "OFF Relay", instead. In this case, it always setup the Default value of board as "OFF" in order to reduce problem with auto-running Output after initially provided Power Supply into board. A set of Board ET-I2C IN8/OUT8 consists of 8-CH Output Relay and each channel runs separately. Each set of Output has got Connector Terminal 3Pin 5mm that is used as connecting point for Contact Relay NO/COMMON/NC; and each set of Contact can receive a maximum Current of 3 Amp. The specifications of Contact are similar to Switch ON/OFF of electrical appliances. When the Relay is in the normal status that is inactive, this Contact is disconnected like Switch OFF; but, when the Relay is active, this Contact is connected together like Switch ON. So, it can apply this Contact Relay to turn on/turn off electrical appliances instead of switches as preferred. This Contact Relay is more special than general Contact Switches because it is not commanded by finger to turn on/turn off any device, it only setup preferable conditions to command the program instead. In this case, if Logic Output of PCF8574 is setup as LOW, it enables "ON Relay"; but, if Logic Output of PCF8574 is setup as HIGH, it becomes "OFF Relay", instead.

If this Contact Relay is used to turn on/ turn off electrical appliances that require high range of current, especially coil devices such as electrical valve and motors; these devices pull high range of current through its own up to 2 or 3 times in order to start and boot up. While it is in a process of ON and OFF, the sudden surge of electricity on the Contact always occurs, arc happens and signal interrupts other electrical appliances that are connected together in the same electrical system. In this case, it can put MOV(Varistor) across the Contact to reduce this serious surge of electricity on the Contact. It installs MOV beside each set of Connector of Contact NO and COMMON of Board ET-ESP32 IN8/OUT8 in order to prevent the Contact from arc while being ON/OFF Contact. There are various sizes of MOV, please choose the most proper size and types of voltage, direct current or alternating current, in order to be Switch ON/OFF of electrical appliances.



It shows position and circuit for installing MOV to prevent Contact Relay from Arc or sudden surge.



It shows the circuit for controlling Relay of board.

HOW TO SETUP ADDRESS I2C OF PCF8574/A

There are 2 numbers of CHIP that can be installed on Board ET-I2C IN8/OUT8; CHIP PCF8574 or PCF8574A; it controls the operation of Relay Output and reads the state of OPTO Input. For standard ETT Board, it normally installs CHIP No.PCF8574 to control Relay Output and No.PCF8574A to read value of OPTO Input completely. It can set Jumper A0, A1 and A2 internal Board to choose and setup 8 different Address Positions for Chip's connection as shown in the table below.

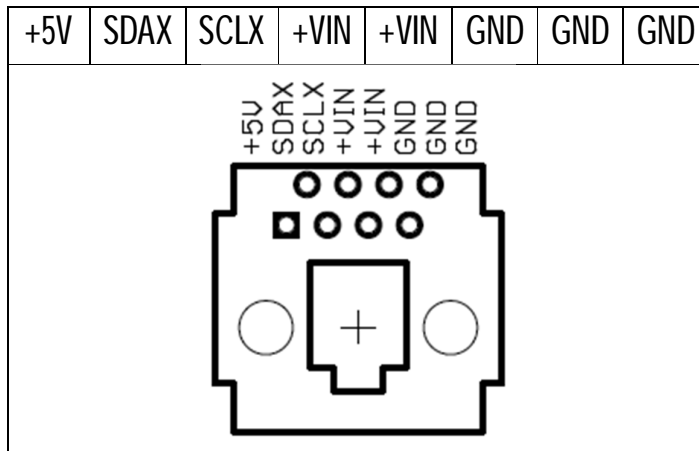
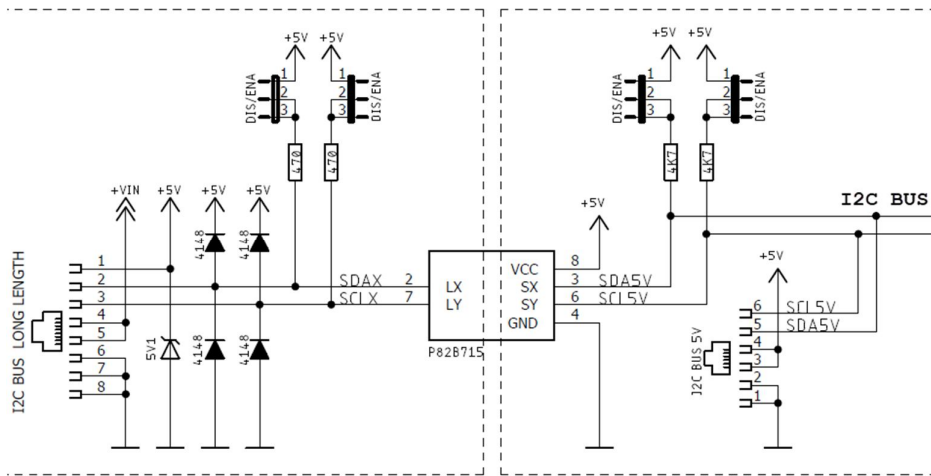


Setting Jumper to choose Address			Address Position		
A2	A1	A0	Address	PCF8574	PCF8574A
LOW	LOW	LOW	0	0x20 : 0010 0000(0:W)	0x38 : 0011 1000(0:W)
LOW	LOW	HIGH	1	0x21 : 0010 0001(0:W)	0x39 : 0011 1001(0:W)
LOW	HIGH	LOW	2	0x22 : 0010 0010(0:W)	0x3A : 0011 1010(0:W)
LOW	HIGH	HIGH	3	0x23 : 0010 0011(0:W)	0x3B : 0011 1011(0:W)
HIGH	LOW	LOW	4	0x24 : 0010 0100(0:W)	0x3C : 0011 1100(0:W)
HIGH	LOW	HIGH	5	0x25 : 0010 0101(0:W)	0x3D : 0011 1101(0:W)
HIGH	HIGH	LOW	6	0x26 : 0010 0110(0:W)	0x3E : 0011 1110(0:W)
HIGH	HIGH	HIGH	7	0x27 : 0010 0111(0:W)	0x3F : 0011 1111(0:W)

Table shows Address Positions of I2C BUS of Board when using with Library of Arduino.

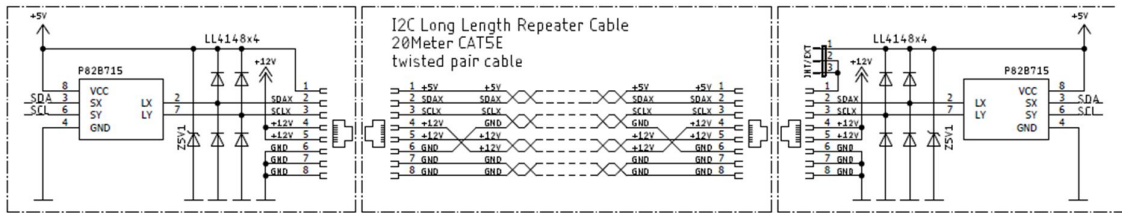
HOW TO USE LONG LENGTH I2C BUS

Normally, the I2C Bus Communication that uses Electrical Signal as TTL Logic can be connected to communicate in the same circuit; or, it is connected between boards by cable for a short distance communication of a 12-inch long or it does not exceed 1 meter long. Some applications require connecting to I2C Bus device for a longer distance communication such as I2C Bus Sensor. To respond to various requirements of Board ET-I2C IN8/OUT8, it adds additional Circuit Long Length Driver internal I2C Bus; the distance of communication is expanded to 20 meters long when connecting via Cable. It uses CHIP P82B715 to convert Signal from TTL and send data for a longer distance. In this case, the device at the destination must use the same CHIP P82B715 to be Line Driver as the Board, and then both devices can be communicated for a long distance through Cable Twisted pair CAT5E, without any problem.

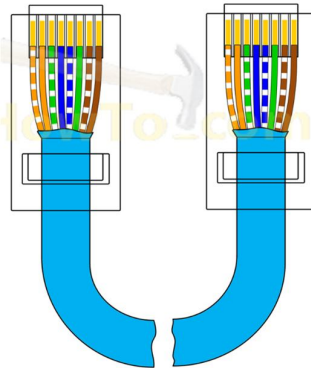


It shows arrangement of Signal I2C Long Length and Connector RJ45

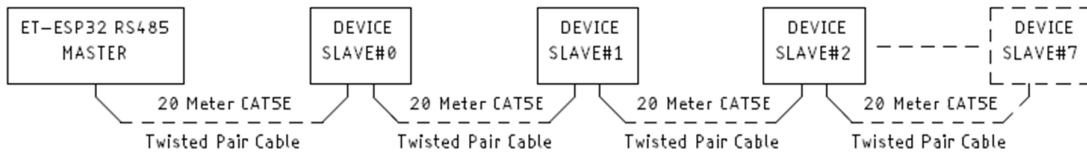
When connecting many boards together in a format of I2C BUS Long Length like network, it requires Cable Twisted Pair (CAT5E) that is connected as same as Direct LAN Network under the standard of EIA/TIA T-568B. This Cable is used to communicate and provide Power Supply to devices on board at the same time. However, if it must connect additional devices more than existing devices on board and those devices requires high Current, this cable size and Contact of Connector RS45 may not support. It should separate Cable that is used to be a pair of Power Supply; in this case, it should choose the proper size in order to support high Current enough for electrical appliance's demand.



It shows diagram of connecting many boards together in a format of I2C Long Length by using Cable Twisted Pair (CAT5E).

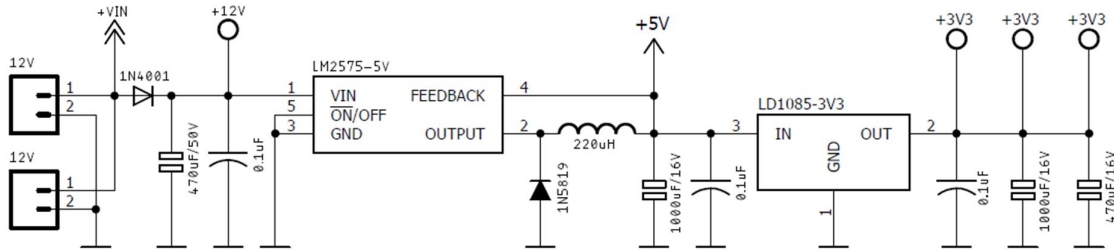


It shows features of Cable used with I2C Long Length (20 meter long).



It shows diagram of connecting many boards together in a format of I2C Long Length like Network.

POWER SUPPLY



Board ET-I2C IN8/OUT8 requires 3 levels of POWER SUPPLY; +12V, +5V and +3.3V. It receives external DC Input 12V through Circuit Regulate and then convert into +5V and +3.3V to provide to circuits internal board. There are 4 positions of Connector that can receive incoming DC Input Voltage as listed below;

- Connector Terminal 2Pin receives external Power Supply to board.
- Connector Wafer 2Pin receives external Power Supply to board.
- Connector RJ45 of I2C Long Length receives external Power Supply to board and it also provides Power Supply from its own board to other connective boards through this Connector RJ45 of I2C Long Length.

Terminal 2Pin	Connector 2Pin	RJ45 I2C Long Length

Table shows position of Power Supply internal different types of Connectors.