EC DATA TECHNOLOGIES PTE LTD
Specialist in Electronics & Data Communication
Block 208 Hougang Street 21
#04-213 Singapore (530208)
Tel: (65)62843373 Fax: (65)62857737

ECD485IR USERS MANUAL

RS-485 ISOLATED REPEATER

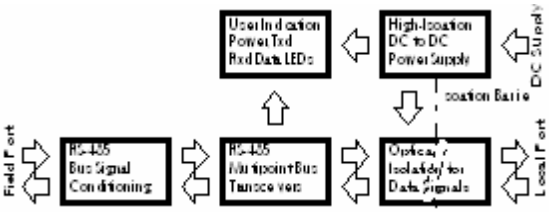
SUMMARY

RS-485 has become one of the most common data communication standards in "open" multi-vendor automation projects. More robust than RS-232 and more flexible than RS-422, it allows a single master device to communicate with multiple slave devices.

The following sections describe:

1) FUNCTIONAL DESCRIPTION
2) ABSOLUTE TERMINAL NAMES
3) INSTALLATION
4) TECHNICAL SPECIFICATION

1. FUNCTIONAL DESCRIPTION



1.1. Isolated Power Supply

High isolation DC-to-DC converters convert an external DC supply (5vdc or 9-36vdc) to two isolated 5vDC supplies. One supply powers RS-485 port-A(field) and the other powers RS-485 port-B(Local).

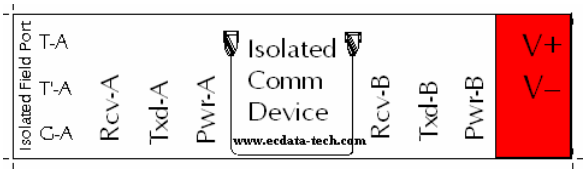
1.2. Optical Isolation for Data Signals

Digital opto-couplers are used to move the data signals between the two sides of the repeater. These are superior to the more common analog opto-couplers, as they add little distortion and therefore support high baud rates. The isolated power supplies and optical data signals together complete the 3-port galvanic isolation required.

1.3. RS-485 Bus Transceiver

Line interface driver/receiver chips convert the field signals to standard TTL-level signals. The full EIA/RS-485 specification is meet by using SN75176 compatible chips. Since the repeater cannot know on which of its sides the active transmitter is on, it can only “transmit” when it sees data on it’s receive side. (A technical detail - the ECD485ir5 is actually 2 parallel 2-wire RS-485 repeaters). For this change from transmit to high-impedance, the ECD485ir5 uses a unique and effective method to do this with 100% transparency.

1.4. User Indication



The face of the ECD485ir is shown above. Each side of the repeater has 3 LED’s. Green LED’s (Pwr-A & Pwr-B) light showing isolated power is available from the isolated DC-to-DC converters. Yellow LED’s (Rcv-A & Rcv-B and Txd-A & Txd-B) light when data is received and transmitted.

1.5. Signal Conditioning

For normal operation, the ECD485ir has 8 jumpers installed on each wire pair to terminate and bias the RS-485 interface. These are only removed when more than two (2) units of ECD485ir are connected to the same RS-485 wire pair. For example, if 4 units of ECD485ir connect to a wire pair, at least 2 of them must have all TT & RT jumpers removed (Read the application note for details). Both ports have transient suppression diodes rated at over 500w.

Note: The unit can be selected for 2Wires or 4Wires communication mode using the 2w & 4w jumper for the each end.

The ECD485ir can be used as RS485 bus “converter”, select the 2W & 4W jumper at the each end, it can work in the 4W-4W, 2W-4W and 4W-2W conditions.

2. ABSOLUTE TERMINAL NAMES

Due to a lack of naming conventions, wiring multi-vendor RS-485 devices often involves wiring "apples" to "oranges". It may even require some bench-top experimentation. While the word "experimentation" sounds bad, it is often required when integrating multi-vendor systems. The RS-485 interface cannot be damaged by reverse wiring or short-circuits to ground.

2.1. Per EIA-485

EIA-485 defines the labels "A" and "B" to be used as follows: Voltage of A shall be negative in respect to B for a binary 1. Sounds simple? Unfortunately, there are two common logic. Computer systems treat 0v and 5v as 0 and 1 respectively, while many transistor circuits (and general telecommunications) treat 0v and 5v as 1 and 0 respectively. For whatever reason, the most common RS-485 chips label the terminals assuming 5v is 0 and 0v is 1 -- backwards to common usage in intelligent devices. To avoid the issue, many vendors select other naming conventions.

2.2. Determining terminal names

EC Data names it's A/B terminals as “-“ and “+” respectively. Another common naming conventions is to label them as "X"/"not X", where X is a name like DAT or BUS, and the "not" condition is marked either by a bar over the name or a leading "*". An example would be "DAT+/DAT-" or "DAT/*DAT". Generally the "--" and "not" terminals correspond to "A", but vendors are free to label them opposite here as well.

A direct method to determine the absolute A/B terminals would be helpful. If your asynchronous device outputs a voltage when idle, then the terminal with the higher voltage is "+". Unfortunately, most devices will show no measurable voltage difference between their

terminals; slave devices are normally in receive mode and do not affect the terminal voltage.

3. INSTALLATION

3.1. Plan your wiring

For 4-wire RS-485, a master device transmits on a transmit wire pair to the receive terminals of ALL slave device. The masters "T+" terminal connects to all "R+" terminals of the slave devices, and similarly all "-" terminals connect on the other wire. In turn, all the of slave devices share a common receive wire pair to respond to the master device. The slave "T+" terminals connect to the master "R+" and so on. The ECD485ir can be freely placed into such a system. On the "master" side, it acts like a slave (Master "T+" ⇨ ECD485ir "R+" etc.), and on the "slave" side the ECD485ir acts as the master device.

As a convention, EC Data suggests choosing the darker wire (or solid color) for "+" and lighter color (or striped) for "-". Since the bus is bi-directional, all terminals "+" and "-" both transmit and receive when appropriate. *Remember, RS-485 is NOT a loop.*

On the ECD485ir5, the removable terminals this are labeled as "T+", "T-", "R+", "R-", "G". Due to a space limitation, only the transmit signals are echoed on the top terminals as Tx+A, Tx-A, Gnd-A and so on.

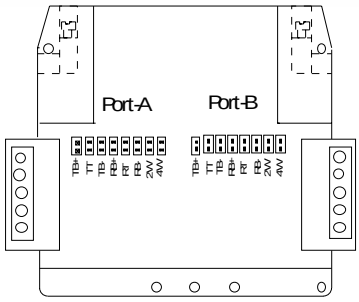
Only T+, T- and G work, if you select the unit works in the 2W mode.

It is also critical that the Signal Ground be properly connected. If your RS-485 bus does not have the 5th ground wire, then you should at least connect the Signal Ground of the connected port of the ECD485ir to the nearest device's digital ground or use the shield drain wire for a "signal ground" (not desirable, but …). The ECD485ir5 will be damaged over time if this ground is not properly connected.

3.2. Placing your bus terminators:

Each RS-485 segment requires a 120 ohm terminating resister at each end - assuming your cable has a characteristic impedance of 120 ohms. Therefore an RS-485 system with a repeater will require at least 4 terminating resisters. (Read the application note for details).

Below is a drawing of the ECD485ir showing the location of the jumpers for Port-A and Port-B. Those label "B" are the bias jumpers, and the terminating resistor is labeled "T".



3.3. Planning the panel wiring:

Power Supply: The ECD485ir-dv (9 to 36vdc) is fully protected from reverse wiring and will sustain no damage. The ECD485ir5-5v (5vdc +- 5%) model is partially protected and if a fuse is installed in the V+ supply wire, should not sustain any damage.

RS-485 Fuses: RS-485 field wires should be protected by 250mA fuses. RS-485 interface ICs are internally protected from short-circuits. These fuses protect the system from over-voltages caused by miswiring - for example wiring 110vac to the bus.

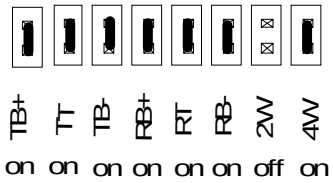
RS-485 Lightning Protection: If required, the RS-485 field wires should be protected by standard lightning protection devices. EC Data suggests 15v or 16v surge protection. While many venders suggest clamping surges to 6v or 7v, this disregards that RS-485 can work up to +12 volts. Clamping at too low of a voltage can lead to the RS-485 drivers operating at near short-circuit conditions and driving at the full current. This can cause over-heating of device and/or power supply.

3.4. Physical installation

The unit mounts on a standard DIN rail as listed in the specification.

3.5. Jumper Setting (default)

The default setting for the ECD485ir both end are same as following, for the communication mode, only can choice either 2W or 4W



TECHNICAL SPECIFICATION

4.1. RS-485 port Description

4.1.1. 4-wire Signals; T+A, T-A, R+A, R-A, Gnd-A, and T+B, T-B, R+B, R-B, Gnd-B

4.1.2. **Duplex**; full duplex. direction automatic.

4.1.3. **Line Voltage**; -7v to +12v permits 7vdc ground difference between devices.

4.1.4. **Bias**; 470 pull-up (T+ & R+) 470 pull-down (T-A & R-) jumper selectable.

4.1.5. **Bus Termination**; 120 jumper selectable.

4.1.6. **Official maximum Bus Length**; 1200m per EIA-485, 500m per ISO 8482

4.1.7. **Practical maximum Bus Length**; 3000m with high-quality cable and other conditions.

4.1.8. **Maximum Speed**; At least 115Kbps

4.2. Isolation

4.2.1. **Power Supply,** between input supply and data signals; full galvanic isolation; 3kV test voltage

4.2.2. **Data,** between RS-485 port A and port B; optical isolation; 5kV test voltage

4.2.3. **Encapsulant**: 14,000v per mm

4.2.4. **Overall rating at least 2500v**

4.3. Power Supply

4.3.1. **5v Model**; Supply of 4.75v to 5.25v

4.3.2. **9-36v Model**; 2watt (at 24vdc about 80mA)

4.4. Environmental

4.4.1. **Ambient operating temperature**; 0C to +60C

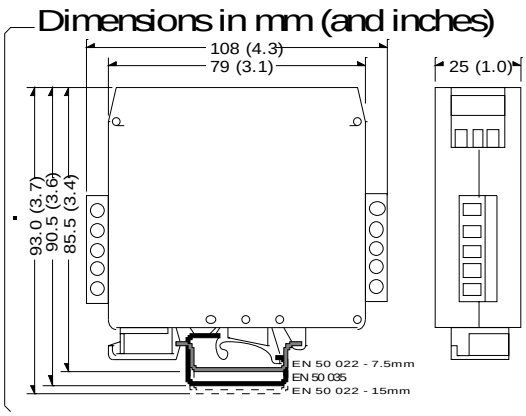
4.4.2. **Ambient storage temperature**; -40C to +100C

4.4.3. **Relative Humidity**; 10 to 95% RH, non condensing

4.4.4. **Casing; fungus and termite resistance**; Good.

4.4.5. **Casing; flame characteristics**: self-extinguishing.

4.5. Mechanical Dimensions



4.5.1. **Height; Width; Depth** (See drawing).

4.5.2. **Weight**; 130g.

4.5.3. **Terminal Capacity**;
2.5mm strand (12 AWG)
4.0mm solid (12 AWG).

4.5.4. **Mounting Rail**;
DIN EN 50022 (35mm "symetrical")
DIN EN 50025 (32mm "asymetrical")

Note: it fits best on the DIN 50022 style rail.