# ECD422IR USERS MANUAL

ISOLATED RS-422 REPEATER

1. WHAT IS RS-422?

RS-422 is a full-duplex, point-to-point data communication standard. It uses two twisted wire pairs; one pair to transmit and one pair to receive. Data is transmitted by a differential voltage signal. *The two wires in a pair are not a loop* -- both are really '+' signals sourcing current to a third "virtual" ground conductor. For example, here is the differential signal for an ASCII character 'I'.

ASCII "I"
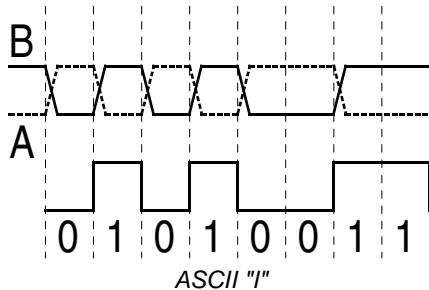
Though labels vary from vendor to vendor, the EIA/RS-422 standard labels one wire A and the other B. Data is represented by the relative voltage of A to B. When $V_A < V_B$, then the data is a binary 1. When $V_A > V_B$, then the data is a binary 0. An idle line without data will be in the binary 1 state. This differential voltage signal is quite robust and not susceptible to noise or minor shifts in signal reference ground.

Although some vendors refer to "multi-drop" RS-422, the EIA/RS-422 standard only supports one transmitter per wire. These vendors are using 4-wire RS-485, but keeping the RS-422 name (perhaps due to product history).

2. INSTALLATION

2.1. Plan your wiring

The ECD422ir terminals are labeled T+, T--, R+, R--, and SG. The "+" terminals correspond to the "B" terminals and the "—" terminals correspond to the "A" terminals. The "+" terminals are named "+" because when the data communications line is idle, they will have a higher voltage than the "—" terminals. *Do remember that even thought labeled + and --, they are not a "loop".*

Due to a lack of naming conventions, wiring any RS-422 device may require some bench-top experimentation. While the word "experimentation" sounds bad, it is often required when integrating multi-vendor systems. **The RS-422 interface cannot be damaged by reverse wiring or short-circuits to ground.**

2.2. Mapping out the wire pairs:

RS-422 4-wire has 2 uni-directional wire pairs connected as shown at right. (For clarity, the "twists" in the pairs are not shown.) Transmit (T) terminals of one device must connect to the receive (R) terminals of the other device. Also the "+" terminals connect to "+" terminals, and likewise "--" connect to "--".
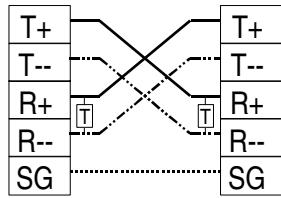
2.3. Placing your bus terminators:

For 4-wire RS-422, 100 (or 220) resisters must be placed at the receive end of each pair (total 2 pieces - see the drawing above). The actual value required depends on the impedance of the cable installed. The ECD422ir normally comes with one 100 resister (Trm1) and one 220 resister (Trm2). One of these can be field selected by the jumpers labeled "Trm1", "Trm2", "1", or "2". The factory default is Trm1. For custum values, you could disable both internal jumpers and install an external resister.

You will also notice two other jumpers labeled "Bias+" and "Bias--" with wire links installed. These are bias resisters which force a floating or open-circuit receive pair to an idle/1 state. The factory default is to solder these jumpers in place. These force the wire idle when the remote device is powered off, the cable is disconnected, or a broken wire creates an open-circuit. Depending on the wire capacitance and design of the other RS-422 device, these situations may generate a great deal of noise. If not prevented, this noise may cause a very high interrupt load on the receiving device -- and even system failure. These line bias resisters eliminate this problem. If the bias resisters cause a problem due to the remote device design, these links can be cut with a sharp-nosed wire cutter.

2.4. Planning the panel wiring:

Power Supply: The 12v and 24v models are fully protected from reverse wiring and will sustain no damage. The 5v model is partially protected and if a fuse is installed in the V+ supply wire, should not sustain any damage.

RS-422 Fuses: RS-422 field wires may be protected by 250mA fuses. RS-422 interface ICs are internally protected from short-circuits. These fuses protect the system from over-voltages caused by mis-wiring or a failure of the lightning protection system.

RS-422 Lightning Protection: If required, the RS-422 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 modern RS-422 devices can work normally up to +12 volts. Clamping at too low of a voltage can lead to the RS-422 drivers operating at near short-circuit conditions and driving at the full current. This can cause over-heating of device and/or power supply, plus shorten product life.

3. TECHNICAL SPECIFICATION

3.1. Port Description

3.1.1. **Port1 & 2**; 4-wire RS-422; Signals: T+, T-, R+, R-, SG; Working voltage range 0 to +5vdc; Max voltage range -7 to +12vd; Max surge ±25vdc

3.1.2. **Duplex**; Operation can be either half or full-duplex; No configuration required

3.1.3. **Speed**; Tested up to 115K baud; operates independent of baud rate; No configuration required

3.1.4. **Character Setting**; Operates with any combination of parity, data, stop, and start bits; No configuration required

3.2. Isolation (Per ISO/IEC 9549)

3.2.1. **RS-422 #1 to RS-422 #2**; 2.5Kv (optical, 5Kv test)

3.2.2. **RS-422 #2 to Supply**; 2.5Kv (galvanic, 3Kv test)

3.2.3. **RS-422 #1 to Supply**; depends on configuration; 2-port model has no isolation; 3-port model has 500v isolation.

3.2.4. **Casing**; dielectric strength per DIN VDE 0303/part 2 is 400kV/cm

3.3. Power Supply

3.3.1. **Model ECD422ir-5v-2p**; 5vdc ±5%; Current to be announced

3.3.2. **Model ECD422ir-5v-3p**; 5vdc ±5%; 250mA normal operation

3.3.3. **Model ECD422ir-dv**; 9 to 36vdc 1.25Watt normal operation; 1.5Watt maximum

3.4. Environmental

3.4.1. **Ambient Operating Temperature**; 0C to +60C

3.4.2. **Ambient Storage Temperature**; -40C to +100C

3.4.3. **Relative Humidity**; 10 to 90%, non condensing

3.4.4. **Casing;** fungus and termite resistant

3.4.5. **Casing; flame characteristics**: self-extinguishing per UL 94 V2
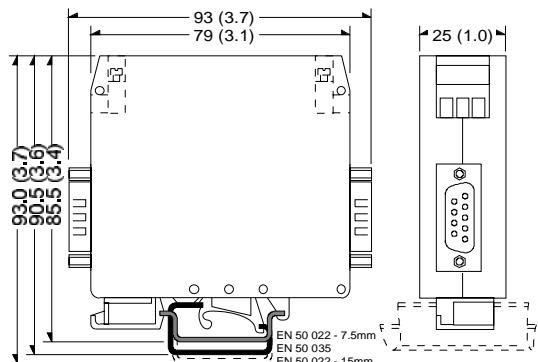
3.5. Mechanical Dimensions

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

3.5.2. *Weight; 130g.*

3.5.3. *Terminal Capacity; 2.5mm strand (12 AWG)*

3.5.4. *Mounting Rail; DIN EN 50022 (35mm sym) DIN EN 50025 (32mm asym)*