



## ECD422IC USERS MANUAL

ISOLATED RS-232 TO RS-422 CONVERTER

### 1. INTRODUCTION

#### 1.1. Product Over-view

For robust operation, the ECD422ic is the finest choice for your industrial applications. It provides the following unique combination of features:

The ECD422ic converts "3-wire" RS-232 (TXD/RXD with signal ground) into "4-wire" RS-422 (T+, T-, R+, R-, with signal ground). The signal is full duplex at speeds up to 115kbps.

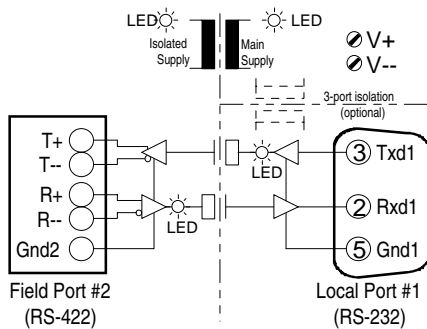
2.5kv optical/galvanic isolation is provided between the RS-422 and RS-232 data lines (power supply is 3kv test, optical is 5kv test)

With a floating field signal ground, cable runs up to 1000m can be guaranteed. With quality, low-capacitance cable like Beldon 1420A (at 42pF/m) this can often extend up to 3000m.

For rapid troubleshooting, LED indicators are provided for transmit and receive data signals.

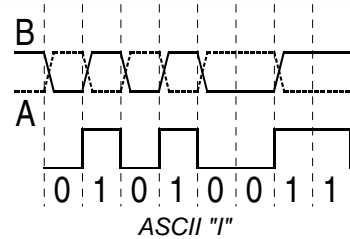
DIN rail mounting and DC power supply ranges of 5v, 12v, and 24v allow simple installation within your industrial panels.

#### 1.2. Block Diagram



## 2. 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'.



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.

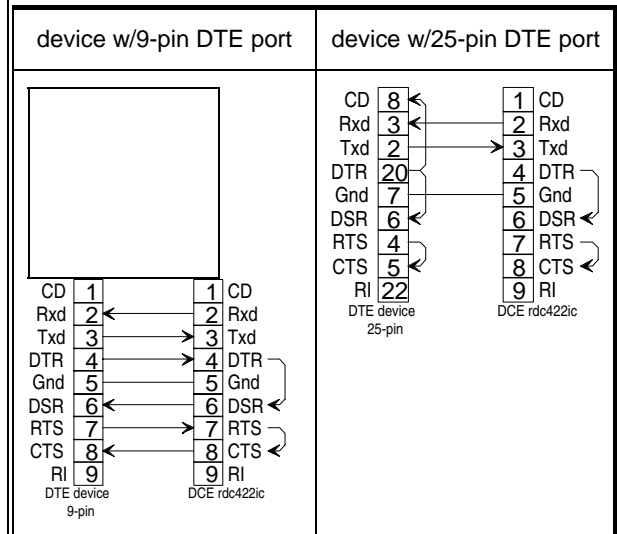
Although some vendors refer to "multi-drop" RS-422, the EIA/RS-422 standard only supports one transmitter per wire. These vendors are using 4-wire RS-485, but keeping the RS-422 name (perhaps due to product history).

### 3. INSTALLATION

#### 3.1. RS-232 (option -dd and -cd)

For these options the ECD422ic RS-232 port is a 9-pin DCE port. Since the DTR and RTS signals are not required, they are internally connected to the out-going DSR and CTS pins. A simple 9-pin ribbon cable or modem cable can be used and you will still have DTR/DSr and RTS/CTS looped back if required.

Alternatively, any cable with 3-wires Txd, Rxd, and SGnd can be used. Connection of DTR/DSR, RTS/CTS, or CD is only required if your device software requires and active DSR, CTS, and/or CD signal to operate



#### 3.2. RS-422 (option -cc and -cd)

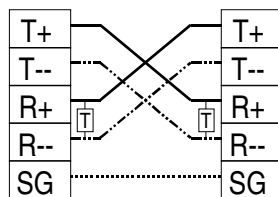
The ECD422ic terminals are labeled T+, T-, R+, R-, and SG. The "+" terminals correspond to the "B" terminals and the "-" terminals correspond to the "A"



terminals. The "+" terminals are named "+" because when the data communications line is idle, they will have a higher voltage than the "-" terminals. Remember that even though 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.**

RS-422 4-wire has 2 unidirectional wire pairs connected as shown. (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 "--".



**3.3. Placing your bus terminators:**

For 4-wire RS-422, 100 (or 220 ) resistors 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 ECD422ic normally comes with one 100 resistor (Trm1) and one 220 resistor (Trm2). One of these is field selected by the jumpers labeled "Trm1", "Trm2", "1", or "2". The factory default is Trm1. For custom values, you could disable both internal jumpers and install an external resistor.

You will also notice two other jumpers labeled "Bias+" and "Bias--" with wire links installed. These are bias resistors which force a floating or open-circuit receive pair to an idle/1 state. 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 resistors eliminate this problem. If the bias resistors cause a problem due to the remote device design, these links can be cut with a sharp-nosed wire cutter.

**3.4. 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 be damaged.

**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 vendors suggest clamping surges to 6v or 7v, this ignores 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, causing over-heating of device and/or power supply, plus shorten product life.

**4. TECHNICAL SPECIFICATION**

**4.1. Port Description**

- 4.1.1. **Port 1;** 3-wire RS-232; Signals: Txd, Rxd, SG; Working voltage ±10vdc; Max surge ±25vdc
- 4.1.2. **Port 2;** 4-wire RS-422; Signals: T+, T-, R+, R-, SG; Working voltage range 0 to +5vdc; Max voltage range -7 to +12vdc; Max surge ±25vdc
- 4.1.3. **Duplex;** Operation can be either half or full-duplex; No configuration required
- 4.1.4. **Speed;** Up to 115K baud; operates independent of baud rate; No configuration required
- 4.1.5. **Character Setting;** Operates with any combination of parity, data, stop, and start bits

**4.2. Isolation (Per ISO/IEC 9549)**

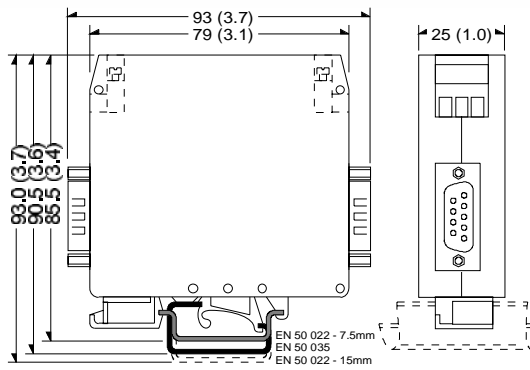
- 4.2.1. **RS-232 to RS-422;** 2.5Kv (optical, 5Kv test)
- 4.2.2. **RS-422 to Supply;** 2.5Kv (galvanic, 3Kv test)
- 4.2.3. **RS-232 to Supply;** 2-port model has no isolation; 3-port model has 2500v isolation.
- 4.2.4. **Casing;** dielectric strength per DIN VDE 0303/part 2 is 400kv/cm

**4.3. Power Supply**

- 4.3.1. **Model ECD422ic-5v;** 5vdc ±10%; Current to be announced
- 4.3.2. **Model ECD422ic-dv;** 9 to 36vdc 1.25Watt normal operation; 1.5Watt maximum

**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 90%, non condensing
- 4.4.4. **Casing;** fungus and termite resistant
- 4.4.5. **Casing; flame characteristics:** self-extinguishing per UL 94 V2



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