# RDC485IH USERS MANUAL

(Previously known as rdc485hub)

ISOLATED RS232 AND RS485 3-WAY INTELLIGENT HUB

1. INTRODUCTION

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.

1.1. Block Diagram

Full (4-port) isolation model
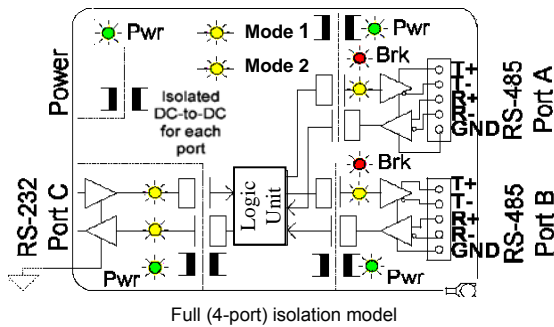
1.2. Product Over-view

The rdc485ih is an incredibly handy device for use in distributed industrial applications. It provides an electrically safe, fool-proof, hands-off method to "share" an RS-232 programming port with both a remote engineering work-station (EWS) and a local work-station or note-book computer (LPC). Once you use one, you'll never want to design a system without it again.

❑ In Master-Slave mode, full duplex data flows freely between either ports A & C, or ports B & C. It allows one master device to talk to 2 slaves, or two devices (a primary & backup) to share one resource.

❑ In Hub mode, half-duplex data flows freely between all three ports A, B, & C. It allows the rdc485ih to act like a 3-node RS-485 network without the need for RS-485.

❑ In Switch mode, full duplex data flows either between ports B & C, or A & C, depending on whether the external terminal SWITCH is left open or shorted to ground respectively.

❑ In the full 4-of-4 ground isolation model (option -4p), all 3 ports have 2500v optical isolation between each other and the power supply.

❑ With an isolated floating ground, RS-232 cable runs up to 50m can be guaranteed with quality, low-capacitance cable like Beldon 1422A at 42pF/m. (RS-232 requires less than 2500pF per signal)

❑ For rapid troubleshooting, there are LED indicators for the Txd, Rxd, operating modes, input power and isolated power.

❑ Wide power supply range (9 to 36vdc) allows use with 9v, 12v, 15v, 24v power supplies or direct from 12v or 24v battery systems.

❑ All three ports have either a 9-pin d-sub shell (AT style) or C-type connector (A & B only) and large capacity compression screw terminals, giving maximum flexibility in installation in panels and terminal boxes.

❑ 500-Watt transient suppresser diodes are installed on all ports. (500 W for 1 ms with less than 1 psec response to over-voltage)

2. INSTALLATION

2.1 Making Direct Cables

The rdc485ih has one 9-pin male port (Port C) configured as in a standard "AT" style COM port. Txd, Rxd and SGnd (pins 2, 3, 5) must be connected properly for normal 3-wire RS-232 communications. No control signals (DTR, DSR, RTS, CTS, CD or RI) pass through the RS-232 port. RTS and CTS are permanently shorted to each other.
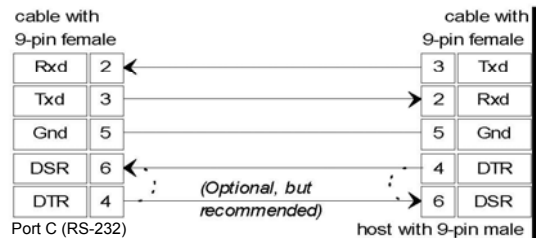
Wiring Diagram A : host with 9-pin DTE port
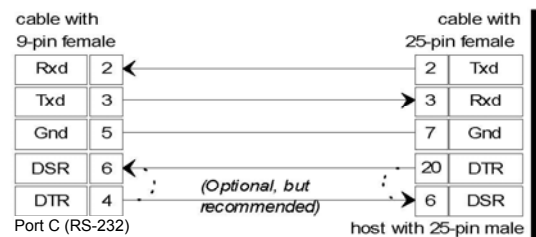
Wiring Diagram B : host with 25-pin DTE port

2.2. Compression screw terminals

The RS-232 port also has Txd, Rxd and Gnd signals available as screw terminals along the top. It will hold wires with lugs or ferrules up to 2.5 mm^2. It may be more effective in some system designs.

The screw terminals can be used with a DVM or volt-meter to instantly verify the correct cable wiring. When properly wired, both Txd and Rxd must be in the range of –3 to –15 Vdc. If you have your wires swapped, then Txd will be in the correct range and Rxd will 0 V.

### 2.3 Plan your RS-485 wiring (Screw Terminal Models – cd)

For 2-wire RS-485, all the "+" terminals must be connected together. The same thing applies to the "-" terminals. As a convention, RDC suggests choosing the darker wire (or solid colour) for "+" and the lighter colour (or striped) for "-". Since the bus is bi-directional, all terminals "+" and "-" transmit and receive as appropriate.

Remember, RS-485 is NOT a loop.

For ports A and B, the top screw terminals are physically labeled D+A, D-A, Gnd-A and D+B, D-B, Gnd-B respectively. On the removable terminals this is labeled T+, T-, R+, R-, SG. Note that the important thing is the "+" and "-" in the names. The D+A top terminal and the T+ terminal are internally connected, as are the D-A and T-, so is port B. With 2-wire RS-485, you can easily use 2 wire lugs on the Port A side - great when you are doing a multi-drop bus without stubs.
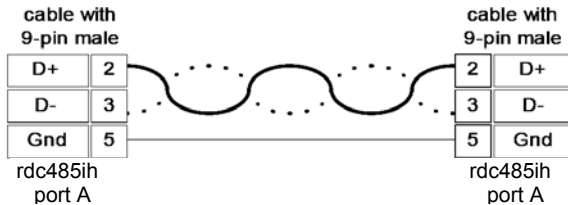

RS-485 2-wire Cable
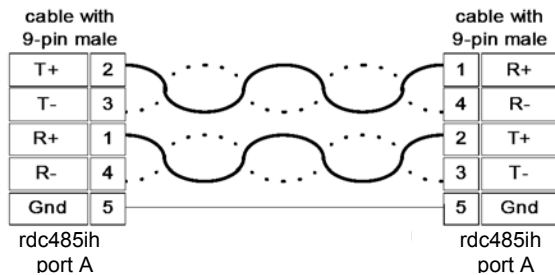
RS-485 4-wire Cable

With the 9-pin D-sub shell option for the RS-485, the same 2 or 4-wire signals are available on pins 2, 3, 5 and 1, 2, 3, 4, 5 respectively. The diagram above shows how to wire a cable between 2 units of RS485. To facilitate making multi-drop cables each signal (but ground) is available on 2 pins. Pin #1 (R+) is also on pin #6, pin #2 (T+) is also on pin #7, pin #3 (T-+) is also on pin #8, and pin #4 (R-) is also on Pin #9.

It is also critical that the Signal Ground be properly connected - you void your warrantee if you do not connect this ground properly. If your RS-485 bus does not have the third ground wire, then you should at least connect the Signal Ground (Gnd-A or SG) of RS485 to the nearest device's digital ground. See RDC application note AN005 (Grounding for RS-422/485) for more information on the importance and possible designs for this ground.

2.4 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.
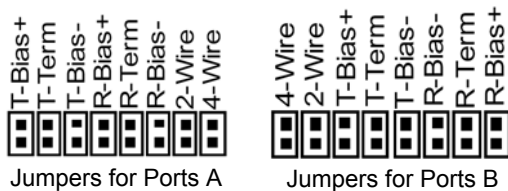
Default : 4-wire operation
Shorted : Enabled, Opened : Disabled

2.5. Planning the panel wring

Power Supply: A fuse should be installed in the V+ supply wire. Models with full (4-port) isolation have internal diodes for full protection against reverse wiring the supply.

RS-232 Connection: The RS-232 connection is wired as described above. You may need to jumper the DTR/DSR or RTS/CTS pins in the host end of the cable - this depends on your application software (it never hurts to do it!). 24 to 28 AWG shielded cable with a shield drain wire is suggested. Ground the shield only at the remote end (not at the rdc485ih).

RS-232 Lightning Protection: If required, RS-232 field wires can be protected by standard lightning protection devices. RDC suggests 15v or 16v surge protection - but if you expect lightning problems then RS-232 is a bad standard to use. It is both limited in distance and sensitive to capacitance > 2500pF - and all good lightning protection devices will add 10,000pF or more.

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 mis-wiring - for example wiring 110 Vac to the bus.

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

3.   Operation

There are 3 available operating modes as shown below.

J2	J3	Mode	Operation
OPEN	CLOSE	1 (Default)	Master (C) Slave (A & B)
OPEN	OPEN	2	3-way Hub
CLOSE	X	1 & 2 Alternating	Switch

X = Don't Care
PORT C PINS 7 (RTS) & 8 (CTS) SHORTED
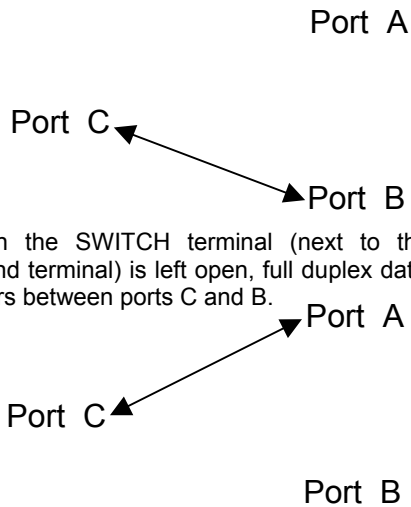
3.1 Master/Slave mode (Default)
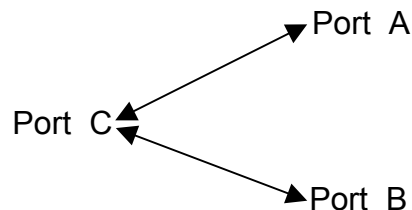
Full duplex data transfer between Port C (RS232, Master) and Port A, or between Port C and Port B is enabled. Ports A and B will not be able to communicate directly.

3.2 Hub mode

Port A

Port C

Port B
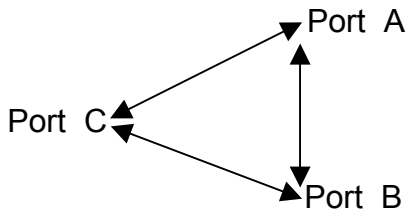
Half duplex data transfer can occur between any ports as data received from one port is echoed out to the other two.

3.3 Switch mode

Port A

Port C

Port B

When the SWITCH terminal (next to the supply ground terminal) is left open, full duplex data transfer occurs between ports C and B.

Port A

Port C

Port B

When the SWITCH terminal is shorted to the supply ground, full duplex data transfer occurs between ports C and A.

4. TECHNICAL SPECIFICATION

4.1. RS-232 port Description

4.1.1 **RS-232**; 3-wire RS-232; Signals: Txd, Rxd, SGnd; Working voltage range ±9vdc; Max voltage range ±15vdc; Max surge ±25vdc

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

4.1.3 **Speed**; Tested to 115K baud; No configuration required

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

4.2 RS-485 port Description

4.2.1 **2-wire/4-wire comm mode:** Jumper Selectable

4.2.2 **Duplex:** depends on the mode, direction automatic.

4.2.3 **Line Voltage:** -7v to +12v permits ±7vdc ground difference between devices

4.2.4 **Bias:** 470Ω pull-up (D+A, D+B) 470Ω pull-down (D-A, D-B) jumper selectable.

4.2.5 **Bus Termination**; 120Ω jumper selectable

4.2.6 **Official maximum Bus Length:** 1000m per EIA-485 500m per ISO8482

4.2.7 **Practical maximum Bus Length:** 3000m with high quality cable and other conditions.

4.2.8 **Maximum Speed**; At least 115Kbps

4.3 Isolation (Per ISO/IEC 9549)

4.3.1 **Port A to B & C**; 2.5Kv (optical, 5Kv test)

4.3.2 **Port C to Supply**; 2.5Kv (galvanic, 3Kv test)

4.3.3 **Port A to B**; model "-2p" none ; model "-4p" 2.5Kv

4.3.4 **Port A to Supply**; model "-2p" none ; model "-4p" 2.5Kv

4.3.5 **Port B to Supply**; model "-2p" none ; model "-4p" 2.5Kv

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

4.4 Power Supply

4.4.1 **Model rdc485ih-5v-4p**; 5vdc ±5%; 260mA

4.4.2 **Model rdc485ih-dv-4p**; 9 to 36vdc; 1.5w

4.4.3 **Model rdc485ih-hv-4p**; 38 to 58 vdc, 1.5w

4.5 Environmental

4.5.1 **Ambient Operating Temperature**; -20C to +60C

4.5.2 **Ambient Storage Temperature**; -40C to +100C

4.5.3 **Relative Humidity**; 10 to 90%, non condensing

4.5.4 **Casing;** fungus and termite resistant
Casing; flame characteristics: self-extinguishing per UL 94 V2

4.6 Mechanical Dimensions
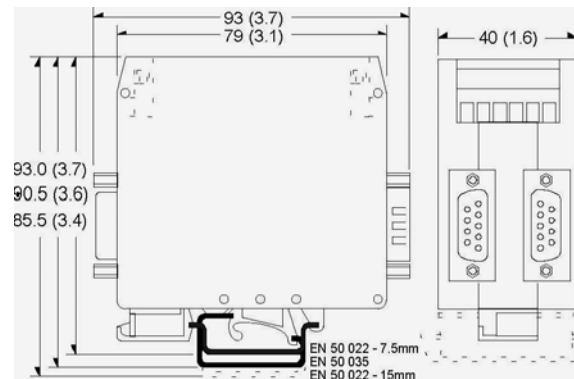
4.6.1 **Height; Width; Depth** (See drawing).

4.6.2 **Weight**; 200g.

4.6.3 **Terminal Capacity**; 2.5mm strand (12 AWG)

4.6.4 **Mounting Rail**; DIN EN 50022 (35mm sym) DIN EN 50025 (32mm asym) Note: removal from a DIN EN 50025 rail is difficult.