

RS-232 / RS-485 INTERFACE CONVERTER



USER MANUAL

IC-485S / IC-485SI

Read this guide thoroughly and follow the installation and operation procedures carefully in order to prevent any damage to the units and/or any devices that connect to them.

This package contains:

- 1 IC-485S or IC-485SI Interface Converter
- 1 Power Adapter (DC 9V; 300mA)
- 1 User Manual

If anything is damaged or missing, contact your dealer.

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Warning! This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Subpart J of Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.



2005-01-04

OVERVIEW

Although RS-232 serial ports are found on almost every computer, because of their slow transmission speeds, limited range, and limited networking capabilities, they are not an effective solution for industrial strength long distance communications systems.

Systems based on the RS-485 standard, however, utilize different voltage lines for the data and control signals, so they are not subject to the RS-232 limitations.

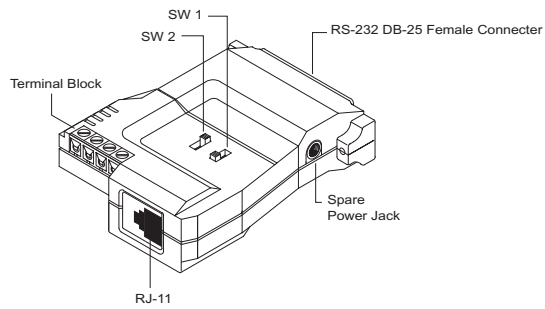
The IC-485S / IC-485SI is a bidirectional converter that transparently converts RS-232 signals to RS-485 signals (and vice versa). The IC-485S / IC-485SI provides Point-to-Point; Multidrop; and Simplex operations over distances of up to 1200 m (4000 ft.), thus permitting the creation of reliable long distance data communications systems using standard computer hardware.

SWITCH CONFIGURATION

The IC-485S / IC-485SI's operating mode parameters are set with two slide switches:

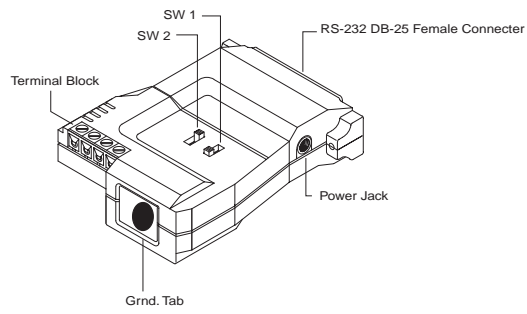
- ◆ SW1 sets the Device Mode
- ◆ SW2 sets the Transmitting and Receiving Mode

IC-485S SWITCH SETTINGS



Position	Setting	
	SW1	SW2
1	DCE	TxO, RxON
2	DTE	TxRTS, RxRTS
3	Monitor	TxRTS, RxON

IC-485SI SWITCH SETTINGS



Position	Setting	
	SW1	SW2
1	DTE	TxO, RxON
2	DCE	TxRTS, RxRTS
3	X	TxRTS, RxON

TERMINOLOGY

Explanations of the SW1 and SW2 terms are given in the table below:

Term	Explanation
DCE	Data Communications Equipment; if the IC-485S / IC-485SI is going to be plugged into a DTE device, the IC-485S / IC-485SI must be set to DCE.
DTE	Data Terminating Equipment; if the IC-485S / IC-485SI is going to be plugged into a DCE device, the IC-485S / IC-485SI must be set to DTE.
TxON, RxON	This setting is used in Point-to-Point operations, in which the unit is always in Transmitting and Receiving Mode.
TxRTS, RxRTS	This setting is used in Multidrop operations, in which the unit is in Transmitting Mode when the RTS signal is high, and is in Receiving Mode when the RTS signal is low.
TxRTS, RxON	This setting is used in Multidrop Full Duplex operations to monitor the RS-485 line signals. Receiving Mode is always ON. Transmitting mode only occurs when the RTS signal is high.

OPERATING MODES

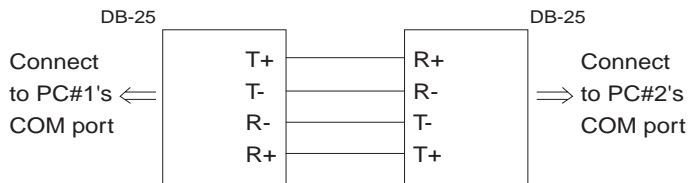
The IC-485S / IC-485SI supports four operating modes: Point-to-Point; Multidrop; Simplex; and Monitor (IC-485S only). Point-to-Point and Multidrop can be configured for Full or Half Duplex. Each of the operating modes is explained in the sections that follow.

POINT-TO-POINT

A Point-to-Point configuration is one in which two devices, located at two different places are linked for communication by a pair of IC-485S or IC-485SI units. There are two configurations: Point-to-Point Full Duplex, and Point-to-Point Half Duplex.

1. Point-to-Point Full Duplex

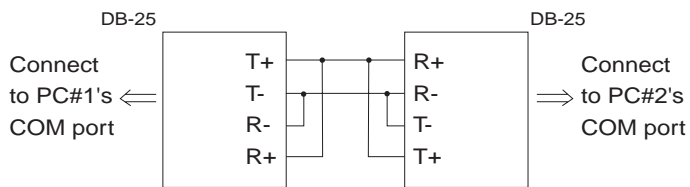
- ◆ Point-to-Point Full Duplex uses reverse four wire cabling, as shown in the diagram below:



- ◆ For both IC-485S / IC-485SI units, set SW1 to DCE or DTE depending on what type of device the IC-485S / IC-485SI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For both IC-485S / IC-485SI units, set SW2 to TxON, RxON.

2. Point-to-Point 2 Wire Half Duplex

- ◆ Point-to-Point Half Duplex uses straight through four wire cabling, as shown in the diagram below:



- ◆ For both IC-485S / IC-485SI units, set SW1 to DCE or DTE depending on what type of device the IC-485S / IC-485SI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For both IC-485S / IC-485SI units, set SW2 to TxRTS, $\overline{\text{RxRTS}}$.

Note: The RTS signal is controlled by an external software command. The IC-485S / IC-485SI has no capability to control this signal by itself.

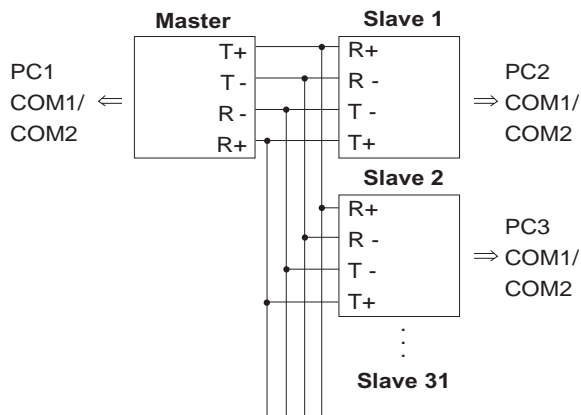
MULTIDROP

A Multidrop configuration is one in which more than two devices are linked for communication using several IC-485S / IC-485SI units.

One of the devices that one of the IC-485S / IC-485SIs connects to is designated as the *Master* device. All the remaining devices that the rest of the IC-485S / IC-485SIs connect to are designated as *Slave* devices. There are two configurations: Multidrop Full Duplex, and Multidrop Half Duplex.

1. Multidrop 4 Wire Full Duplex

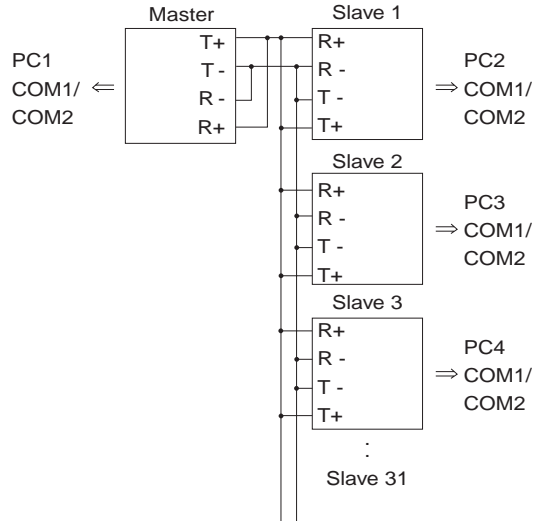
- ◆ Multidrop Full Duplex uses reverse four wire cabling to link all the connected IC-485S / IC-485SI units:



- ◆ For all IC-485S / IC-485SI units, set SW1 to DCE or DTE depending on what type of device the IC-485S / IC-485SI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For the Master unit, set SW2 to TxON, RxON.
- ◆ For all Slave units, set SW2 to TxRTS, RxON.

2. Multidrop Half Duplex

- ◆ Multidrop Half Duplex uses straight-through four wire cabling, to link all the connected IC-485S / IC-485SI units:



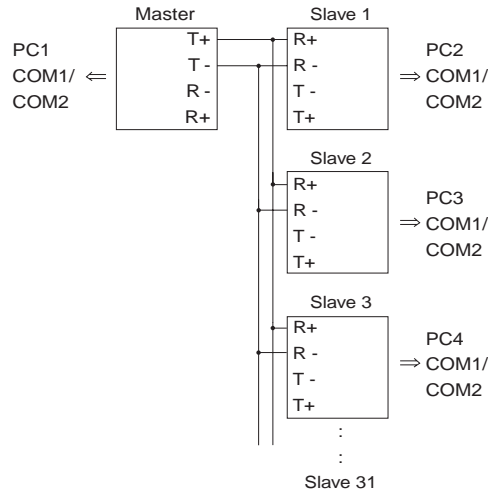
- ◆ For all IC-485S / IC-485SI units, set SW1 to DCE or DTE depending on what type of device the IC-485S / IC-485SI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For all IC-485S / IC-485SI units set SW2 to TxRTS, $\overline{\text{RxRTS}}$.

Note: The RTS signal is controlled by an external software command. The IC-485S / IC-485SI has no capability to control this signal by itself.

SIMPLEX

A Simplex configuration is one in which more than two devices are linked for communication using several IC-485S / IC-485SI units in a manner similar to Multidrop. The difference is that in a Simplex configuration, the Master device can only talk, and the Slave devices can only listen.

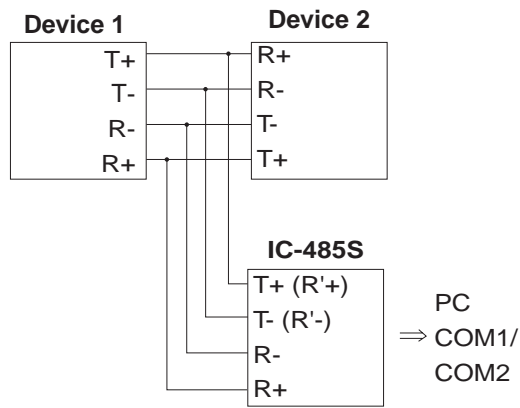
- ◆ Simplex uses reverse two wire cabling to link all the connected IC-485S / IC-485SI units, as shown in the figure below:



- ◆ For all IC-485S / IC-485SI units, set SW1 to DCE or DTE depending on what type of device the IC-485S / IC-485SI will plug into (if it will plug into a DCE device, configure it for DTE, and vice versa).
- ◆ For all of the units (Master and Slave), set SW2 to TxON, RxON.

MONITOR (IC-485S ONLY)

With Monitor Mode, the RS-485 can be wired to the lines of an RS-485 or RS-422 device to monitor the line signals. In this configuration, the RS-485S changes the functions of T+ and T- to R'+ and R'- respectively.



- ◆ Set SW1 to Monitor.
- ◆ Set SW2 to TxRTS, RxON

Note: 1. The RTS must be Low in Monitor Mode.
2. The R+ and R- signals are converted and linked to the RS-232 port, DB-25 pin 3. The R'+ and R'- (T+ and T-) signals are converted and linked to the RS-232 port, DB-25 pin 2.

INSTALLATION

1. Set each IC-485S / IC-485SI's configuration switches according to the information provided in the Switch Configuration and Operating Modes sections.
2. Plug the IC-485S / IC-485SI's DB-25 female connector into the computer's RS-232C port.
3. Connect the IC-485S / IC-485SI units to each other:
 - ◆ Use two or four wire twisted pair cable in a reverse or straight through configuration according to the information provided in the Switch Configuration and Operating Modes sections.
 - ◆ For the IC-485S, you may use either the RJ-11 telephone socket, or wire directly to the Terminal Block. (See the Terminal Block section for pin assignment details.)
 - ◆ For the IC-485SI, you must ground the device by connecting a grounding wire from the Grounding Tab to the grounding source.
4. Power on the computers. The units are now ready for operation.

APPENDIX

THE TERMINAL BLOCK

The four screw terminal block has different pin assignments depending on the operating mode:

- ◆ In DCE/DTE mode, terminals 1 (+V) and 2 (-V) are configured to transmit data (the transmitter); while terminals 3 (-V) and 4 (+V) are configured to receive data (the receiver).
- ◆ In Monitor mode (IC-485S only), terminals 1 and 2 are, respectively, the positive and negative of receiver 1; while terminals 3 and 4 are, respectively, the positive and negative of receiver 2.

Pin	DCE/DTE	Monitor
1	Transmitter +V	Receiver 1 +V
2	Transmitter -V	Receiver 1 -V
3	Receiver -V	Receiver 2 -V
4	Receiver +V	Receiver 2 +V

DCE / DTE CONNECTION TABLE

Because of the polarity of the communication signals, a DTE configured device must connect to a DCE configured device. The shaded area in the figure below is an example of a DTE to DCE connection:

Device's Connector Pin #				Cable	IC-485ASI	
DCE DB-9	DTE DB-9	DCE DB-25	DTE DB-25	25/25 or 9/25 pin	DCE DB-25	DTE DB-25
2	3	3	2	Tx → Rx	2	3
3	2	2	3	Rx ← Tx	3	2
8	7	5	4	RTS → CTS	4	5
7	8	4	5	CTS → RTS	5	4
4	6	20	6	DSR → DTR	6	20
6	4	6	20	DTR → DSR	20	6
5	5	7	7	GND	7	7

SELF TEST

To test the internal circuit of the interface converter, connect a dumb terminal to the unit and do the following:

1. Set SW1 to DCE (if the dumb terminal is configured for DCE).
2. Set SW2 to TxON, RxON.
3. Connect a wire from pin 1 (Tx+) to pin 4 (Rx+)
4. Connect a wire from pin 2 (Tx-) to pin 3 (Rx-)
5. Set the terminal to full duplex and enter data.

If the data displays on the screen, the internal circuit is operational.

TROUBLESHOOTING

Problem	Action
Data Transmission Failure	Check that the power adapter is plugged in and working properly.
	Check that the IC-485S / IC-485SI units are securely plugged into the computers' serial ports.
	Check that the cables are properly set up and properly connected.
	Check that SW1 and SW2 are set properly.
Data Loss or Error	Check that the Data Rate and Data Format are the same for all devices.

LIMITED WARRANTY

IN NO EVENT SHALL THE DIRECT VENDOR S LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT FORM DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THE PRODUCT, DISK, OR ITS DOCUMENTATION.

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