

### OVERVIEW

**TS-ISO485** is a PC/104 (standard format) peripheral board that provides two PC compatible COM ports capable of running up to 115K baud. The TS-ISO485 is compatible with any Technologic Systems' SBC that has a PC/104 connector built-in.

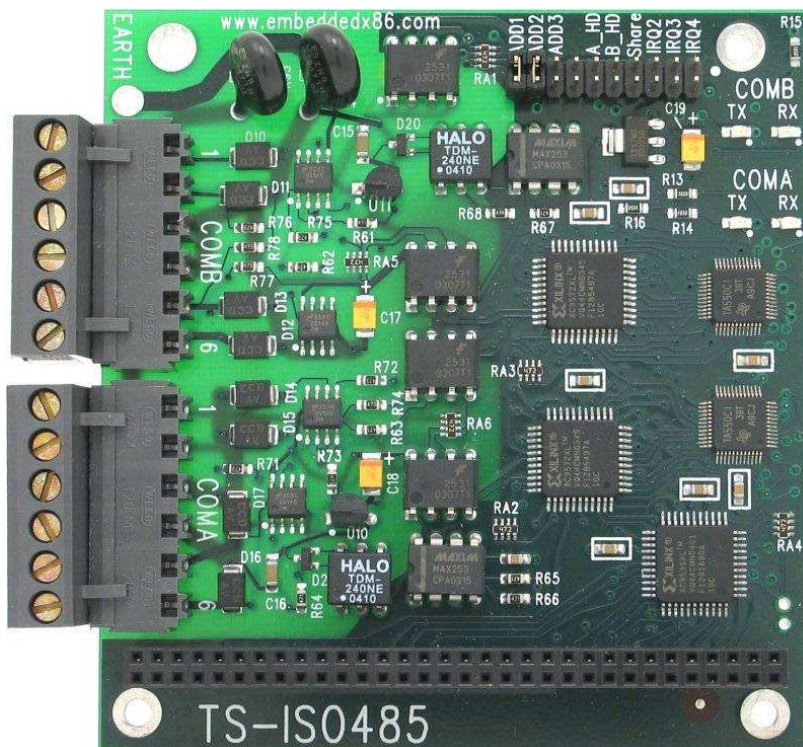
Each COM port has opto-isolated RS-485/RS-422 drivers capable of running in full or half duplex mode. Full-duplex RS-485 is the same as the RS-422. The mode of operation can be selected through on-board jumpers.

On-board logic automatically controls transmit enable for half duplex operation. If RTS is asserted true, then TX driver is forced always on, enabling the full-duplex RS-485 or RS-422 mode. For half-duplex RS-485 mode, RTS must be always deasserted because the TX driver must be turned off in order to receive.

**TS-ISO485** features include:

- ✓ Two RS-485/RS-422 capable serial ports
- ✓ Automatic RS-485 mode
- ✓ Full or Half Duplex modes supported (Jumper Configurable)
- ✓ Standard 16C550 UART with 16 byte FIFO
- ✓ Jumper selectable COM port (8 distinct IO locations)
- ✓ Jumper selectable IRQ (IRQ 4,5,6,7,9 are available)
- ✓ Supports IRQ line sharing
- ✓ Compatible with TS ARM and x86 SBCs
- ✓ Transient suppression circuitry for noise immunity
- ✓ Galvanically isolated serial ports
- ✓ Hardware detection of receive character gap of 3 character times
- ✓ On board LEDs show TX and RX activity for each COM port

### HARDWARE CONFIGURATION



**COMA and COMB terminal strip Pin-Out**

COM Pin	Full-Duplex Signal	Half-Duplex Signal
1	Trasmit +	Tx/Rx +
2	Trasmit -	Tx/Rx -
3	GND	GND
4	GND	GND
5	Receive -	N/C
6	Receive +	N/C

**Full-Duplex/Half-Duplex Jumper Settings**

- ✓ **A\_HD** Jumper installed will set **COMA** for **half-duplex**, jumper open is full duplex
- ✓ **B\_HD** jumper installed will set **COMB** for **half duplex**, jumper open is full duplex

## HARDWARE CONFIGURATION

### Jumper settings for COM/IO selection

COM port selected		Jumpers ADD3-1		
COMA	COMB	ADD3	ADD2	ADD1
COM3(3E8)	COM4(2E8)	OFF	OFF	OFF
COM4(2E8)	COM5(3A8)	OFF	OFF	ON
COM5(3A8)	COM6(2A8)	OFF	ON	OFF
COM6(2A8)	COM7(3A0)	OFF	ON	ON
COM7(3A0)	COM8(2A0)	ON	OFF	OFF
COM9(398)	COM10(298)	ON	OFF	ON
COM11(390)	COM12(290)	ON	ON	OFF
COM15(368)	COM16(268)	ON	ON	ON

### Jumpers settings for IRQ selection

IRQ selected		Jumper IRQ4-2		
COMA	COMB	IRQ4	IRQ3	IRQ2
None	None	OFF	OFF	OFF
Reserved		OFF	OFF	ON
IRQ3	IRQ4	OFF	ON	OFF
IRQ5	IRQ6	OFF	ON	ON
IRQ4	IRQ3	ON	OFF	OFF
IRQ6	IRQ7	ON	OFF	ON
IRQ7	IRQ9	ON	ON	OFF
IRQ9	IRQ1	ON	ON	ON

- ✓ The share jumper will enable IRQ sharing for COMA and COMB using the IRQ selected for COMA.



### Notes

If you are using TS-ISO485 with a Technologic Systems' ARM SBC, only IRQ lines 5, 6 and 7 are available, then IRQ sharing is recommended (Shared Jumper ON). With a X86 SBC, all the IRQ lines can be used.

## DRIVER SUPPORT

The standard serial 16C550 COM port interface appears as a selectable PC-compatible COM port for software compatibility and no special drivers are required. For example, the TS-Linux distribution already includes Linux drivers for the 16C550 UART chip by default. One can use any terminal emulator, as minicom, to open and configure the serial port in use by this board with the appropriate /dev entry, enabling communication to the modem device plugged on the socket.

### TESTING TS-ISO485 WITH LINUX AND ARM

All the Technologic Systems' ARM SBCs include Linux installed by default with built-in support for the standard 16C550 UART, making the TS-ISO485 an out-of-the-box solution.

Address decode and IRQ jumpers need to be configured prior to use the system. For IRQ selection, remember that only IRQ 5, 6 and 7 are available on ARM systems. On these boards, the ISA IRQ 5 corresponds to ARM IRQ 22, ISA IRQ 6 is ARM IRQ 33 and ISA IRQ 7 is ARM IRQ 40. For that reason, IRQ sharing is highly recommended on ARM systems (Shared Jumper ON).

After jumper configuration and power on, Linux will automatically detect the serial ports and will install the proper device entries at /dev. Use the setserial utility to make sure the TS-ISO485 serial ports are configured properly, or to change any parameter. That is specially useful for IRQ configuration, for example:

```
$ setserial -g /dev/cua/2
/dev/cua/2, UART: 16550A, Port: 0x89c003e8, IRQ: 40
$ setserial /dev/cua/2 IRQ 22
$ setserial -g /dev/cua/2
/dev/cua/2, UART: 16550A, Port: 0x89c003e8, IRQ: 22
```

In addition, the file /proc/tty/driver/serial on the Linux proc filesystem provides information about the serial driver and configuration:

```
$ more /proc/tty/driver/serial
serinfo:1.0 driver:5.05c revision:2001-07-08
2: uart:16550A port:89C003E8 irq:22 baud:9600 tx:104 rx:32 RTS|DTR
3: uart:16550A port:89C002E8 irq:33 baud:9600 tx:88 rx:0
```

In order to test communication, use the simple echo and cat commands on the Linux shell prompt. For example:

```
$ cat < /dev/cua/2 &
$ echo "testing serial" > /dev/cua/3
testing serial
$
```

Assuming that COMA and COMB are connected, all the TX and RX LEDs will blink and the sent data will be correctly received. If you are using Full-Duplex, wire-connect terminals 5 and 6 of one COM port to the terminals 2 and 1 of the other COM port, respectively, in order to create a connection between COMA and COMB. For Half-Duplex, connect terminal 1 of one COM port to the terminal 1 of the other COM port. Do the same for the terminal 2.

### **NOTE ON MODE SELECTION**

When one of the serial ports is open under Linux, Linux asserts RTS true by default. This disables RS-485 half-duplex operation. When RTS is not asserted, RS-485 works normally, meaning that whenever TX data is being sent, PLD logic turns on the TX enable on the RS-485 transceiver.

To use the board in RS-485 full-duplex mode or RS-422 mode, the user will frequently want the TX enable always on. The TX enable can be forced on by asserting RTS. This will keep the TX driver always on, which is frequently desired when operating in RS-422 mode.

However, some RS-422 implementations do not want the TX always enabled. In a few unusual implementations, two twisted pairs are used in a "multi-drop" manner. This means that multiple devices may be driving one of the twisted pairs. In this case, the TX enable signal must be true only when transmitting data (this is the same as RS-485 mode). The TS-ISO485 supports these various modes through use of the RTS signal as a mode selector.

The TS-ISO485 features **automatic RS-485 mode**. In many implementations of RS-485, the user software must control which mode the transceiver is in (TX enabled or RX enabled). Since the UART has a FIFO and TX shift register, it is very difficult for software to know when it is time to switch from TX enabled, to the RX enabled mode. The TS-ISO485 has logic on board that switches it automatically at exactly the correct time, which is when the last bit of the TX character has been shifted out of the UART shift register.

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11.25.2008 – Added information about RS-422 and RTS control signal