



Connecting Your CrystalFontz Intelligent Serial Display

STATIC SENSITIVE DEVICE --USE PROPER ESD PROCEDURES

Connection to Personal Computers

For non-backlight operation when the display is connected to a PC's 9-pin serial port, all you need is a "straight through" 9-pin female DB9 to 9-pin female DB9 cable. This cable is available from CrystalFontz as part number WR232Y01, or from Radio Shack as Cat No 26-152.

This is a view looking into the male DB9 connector on CrystalFontz Display.

Pin Number	CrystalFontz Display Function	Corresponding PC pin name
1	Not Connected	DCD (Data Carrier Detect)
2	Not Connected	Rx (Receive Data)
3	Data In	Tx (Transmit Data)
4	Power A (9 volts to 15 volts)	DTR (Data Terminal Ready)
5	Ground (Vss)	Signal Ground
6	Connected to Power A if JPD is closed	DSR (Data Set Ready)
7	Power B (9 volts to 15 volts)	RTS (Request To Send)
8	Connected to Power B if JPC is closed	CTS (Clear To Send)
9	Not Connected	RI (Ring Indicator)

Most RS-232 ports will be able to power the display through their DTR and RTS lines. Just have the software drive these lines high—most software already will.

To power the backlight, you must connect a regulated 5v supply capable of sourcing 600mA to the LED+ terminal of the LCD's solder connector. The supply's ground should connect to the Vss terminal of the LCD's solder connector:

Pin Number	Pin Name	CrystalFontz Display Function
1	Vss	Ground (backlight and controller)
2	Vdd	Controller and LCD power (+5volt only)
3	LED+	LED Backlight power (+5volt only)
4	DATA_IN	SPI or RS-232 data in (input)
5	/SPI_CS	SPI Chip Select (active low input)
6	SPI_CLK	SPI Clock (input)
7	SPI_BUSY	SPI Busy (output)

The easiest place on a PC to get 5v is from a disk drive power connector. The red wire is typically 5v, the black wires are typically ground. CrystalFontz sells a cable that will connect from a spare power connector on your PC to the display's LED backlight. The cable is part number WR232Y02. If you make your own cable, be sure and measure the output voltage before you connect the display. The colors are usually correct, but some computers may have non-conventional colors.

WARNING: Do not use the yellow wire of the disk drive power cable. This wire is typically the 12 volt supply and will ruin the display if it is connected instead of 5 volts.

Connections in Embedded Systems

To connect the display in most embedded systems, you need only use the LCD's solder connector. This connector has standard 0.1 inch spacing. Generally, you would connect a regulated 5v supply for the controller to Vdd, Ground to Vss, and RS-232 data to DATA_IN. DATA_IN will accept full +10v to -10v swing RS-232 signals and will also accept 0v to 5v "CMOS" or "TTL" levels. If your RS-232 data is inverted, you can close JPB.

If you would like, you can connect an unregulated 9 volt to 15 volt supply to Power A or Power B of the DB9 connector instead of connecting a regulated +5 volt supply to Vdd. Power A and Power B will only power the LCD itself, not the backlight. Do not connect a supply greater than 5.25 volts to Vdd or LED+. Damage to your LCD module will result.

To use the backlight, connect a regulated 5v supply capable of sourcing 600mA to the LED+ terminal. This may be the same supply that is used for Vdd. The backlight brightness is controlled by PWM (Pulse Width Modulation). The PWM may cause noise on supplies that have high output impedance. If this noise causes problems in your application, you may want to connect a filter capacitor from Vdd to Vss close to the display, or operate the backlight at full brightness, which disables the PWM.

To use the SPI interface, close JPA. Please refer to the SPI timing diagrams in the data sheet. In some situations, the SPI interface can deliver data faster than the display can execute the commands. The host should check the SPI_BUSY line and wait for it to go low before sending the next SPI data.

Handshaking

The display can execute commands faster than the RS-232 serial interface can deliver them, so no handshaking is necessary from the display's point of view.

Some host hardware or software may require the display to assert its DSR and/or CTS lines before it will send data to the display. In that case, JPC and/or JPD may be closed. Closing JPC will connect DSR to DTR through a 1K resistor. Closing JPD will connect CTS to RTS through a 1K resistor.

Crystalfontz Intelligent Serial Display Jumper Settings

Your display has four jumpers. The jumpers are normally open. The jumpers may be closed by melting a ball of solder across their gap. You may re-open the jumpers by removing the solder (solder-wick works well for this). The following table describes the jumper's operation:

Jumper	State	Function
JPA	Open	RS-232 interface selected
	Closed	SPI interface selected
JPB	Open	RS-232 data is normal
	Closed	RS-232 data is inverted
JPC	Open	DSR is open
	Closed	DTR is fed back on DSR through 1K resistor
JPD	Open	CTS is open
	Closed	RTS is fed back on CTS through 1K resistor