CYB-003

Kit for LCD and Prototyping Applications

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Table of Contents

Overview 1

Assembled CYB-003 Board 4

CYB-003 Prototyping Board for the CY325 LCD Windows Controller 5
- Networking with the CY233 6
- 8051 Prototyping 6

CYB-003 Specifications 7

Tools Required 7

CYB-003 Component Locations and Values 8

Parts List 9
- 8051 Socket Option 12
- Other Options 13

Assembly Procedure 14
- Using the Demonstration Chip 20
- Assembled CYB-003-1, CYB-003-2 21

CYB-003 Theory of Operation 22
- Serial I/O 23
- CYB-003 Schematic 24
- The CY325 27
- The CY233 27
- The Serial Driver/Receiver 28
- Address Decoding 29
- The 8051 Socket 30
- Using the CYB-003 as an 8051 Development Board 30
- Power and I/O Options 31

Using the CYB-003 Connectors, Switches, and Jumpers 32
How to Use the Serial Jacks 32
Daisy Chaining CYB-003s - Networks 33
The Serial Cable 33
DB25 to RJ11 Connector 34
The Reset Switch - SW1 35
Chip Select Switch - SW2 36
The Address Switches - SW3 37
Soft Keys 38
LCD Header 38
Signals Passed to the LCD 39
Using the CY327 on the CYB-003 39
Selecting LCD Size 40
The CY325 Parallel Interface 40
CY233 Network Communications 41
CY325 Mode Control 41
Jumper Functions 42
Power Connector Pinouts 44
Alternate LCD Contrast Power 45

Final Assembly and Checkout 46
CYB-003 Debugging 47
CY325 Tests 47
CY233 Tests 48

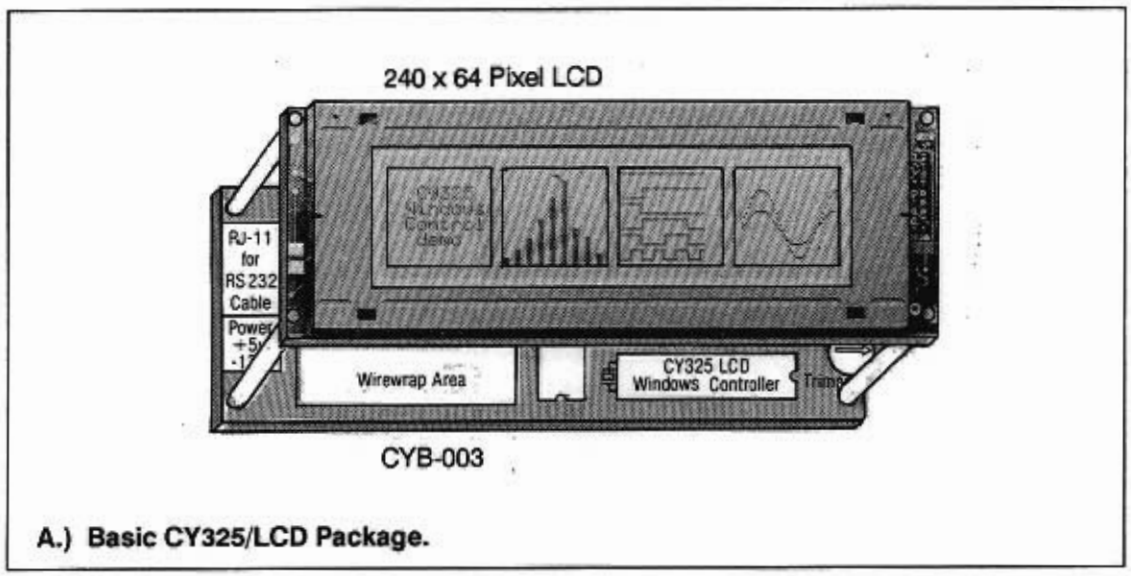
Displays Compatible with the CY325 50

LCD Suppliers ..... BC

The CYB-003 Multi-Purpose Prototyping Board

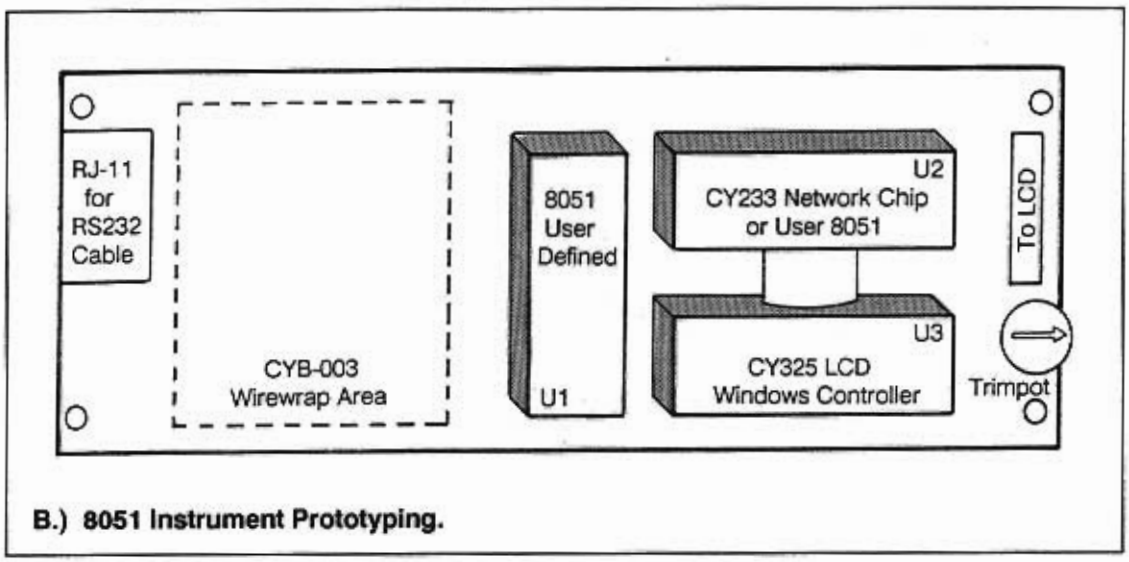
Overview

The CYB-003 is an unusually powerful prototyping board designed to serve several purposes. The primary purpose is to support development of the CY325 LCD Windows Controller. Although the CY325 controls numerous LCDs, the board is form factor compatible with 240 x 64 pixel displays. Such LCD displays can be mounted on the CYB-003 to form a neat, compact display system. LCDs with other form factors can be connected via a 20 wire ribbon cable. In the simplest case, the RS-232 or TTL 8 bit parallel interface is used to control the display.



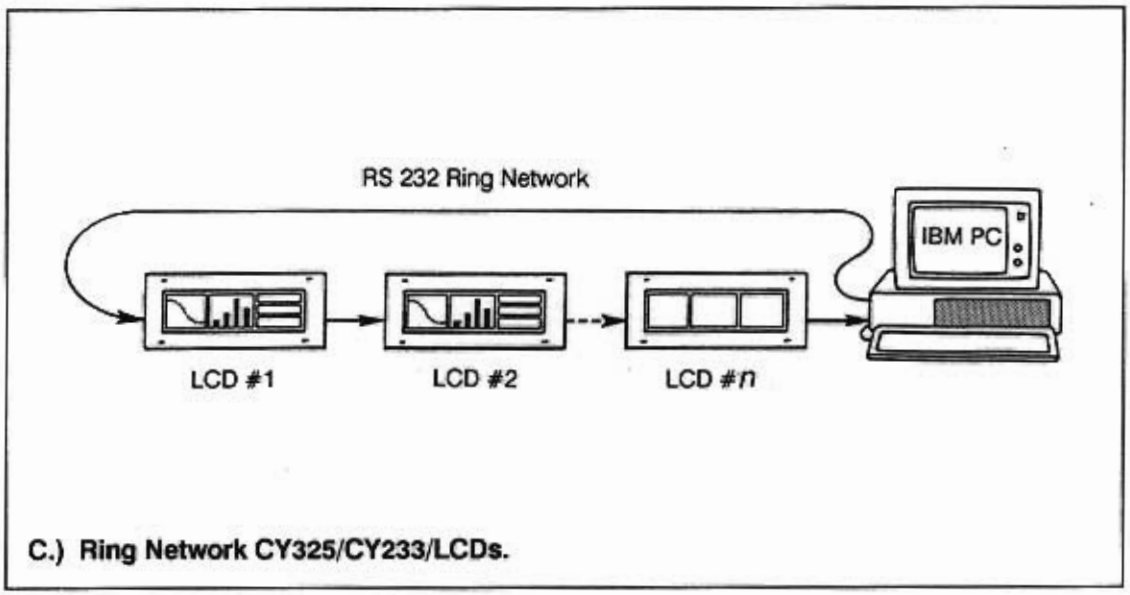
A.) Basic CY325/LCD Package.

The secondary purpose of the CYB-003 is to serve as a general purpose instrument development system, with a bias towards 8051 micro computer based applications. The 8051 was chosen for several reasons: It is the world's most popular 8-bit micro controller. It is available from numerous suppliers (Intel, AMD, Signetics, OKI, Siemens, Harris, etc...). It is powerful, low cost, and comes in many configurations of RAM/ROM/EPROM/I/O.



B.) 8051 Instrument Prototyping.

In support of either the basic CY325/LCD system or a more complete CYB-003 based instrument, the CYB-003 also accomodates a CY233 Local Intelligent Network Controller (LINC) in such a way that up to 255 CYB-003s can be linked on one serial RS-232 line (IBM-PC COM1 or equivalent). This allows up to 255 LCDs or LCD- based instruments, with user feedback from each CYB-003, to be controlled by one PC!



C.) Ring Network CY325/CY233/LCDs.

The CY233 40-pin socket is compatible with the 8051 single chip computer, so the socket is available to the user if the Network chip is not desired. The board provides a parallel TTL interface between this socket and the CY325. This allows you to use 8051s or EPROM 8751s to control the CY325/LCD. (Window Demo chips are available from Cybernetics that use this socket.) Finally, a third 8051 compatible socket is located next to the wire-wrap area, and is generally uncommitted, except that

the TxD and RxD pins can be connected to the CY325 (via a switch) to allow this chip to control the LCD display (in addition to the possible concurrent control from the CY325 parallel port!) The wire wrap area is available for A/Ds, D/As, op amps, etc., or could even be used for up to three 40-pin ICs allowing up to 5 computers on a single card with LCD graphic display, RS-232 connecters, power connectors, crystals, etc! Clearly, in it's maximum configuration, the CYB-003 is a powerhouse.

TO SUMMARIZE: The CYB-003 can provide a simple LCD windows control package that receives all commands from an off-board host/RS-232 or 8-bit TTL. It can support up to 255 LCDs connected to one IBM-PC COM port or RS-232 equivalent. It can support multiple single chip computers with auxiliary circuits on one board that is form factor compatible with a 240 x 64 pixel graphics LCD.

CYB-003 Board Specs

Size: 2.56" x 7.20" (65mm x 183mm)

Height: 0.85" max @ PWR connector, 0.75" board separation to LCD board.

Mounting holes match 240 x 64 LCD holes, and use 0.75" board standoffs.

Below-board connection allow 0.5"

Power Requirements without LCD:
+5v @ 250mA, GND
-12v is only used by the LCD
+12v is accommodated but not used.

Serial Jack(s)

Single Jack for serial communications connects via 4-conductor cable to DB25 pins 2, 3, 7, 5 (or 20). Single Jack can also be used on the last board in a network when the Address "T" Switch is set, thus allowing room for the power connector on the last board.

Double Jack for networks receives data on Input Jack1 and transmits data on Output Jack2. +5v and -12v may be transmitted through the network if a six-conductor cable is used, thus eliminating power source on all but one board.

Serial Switch

Serial communications can be directed to:

1. CY233 (U2) with U1 and U3 communicating with each other.
2. CY325 (U3)
3. 8051 (U1)

Reset Switch

All three chip reset lines are tied together to this one switch. Normally used in hardware reset position.

Power-on or Hardware Reset.

Optional Software Reset through DB25 pin 20.

Spare access to the combined Reset Lines of u1, u2, and u3.

Power LED

LED indicates power present on board.

Address Switch

Address switch is normally used for network modes. Switch positions 1-8 are connected to CY233 address lines AØ-A7. In non-network modes, these switches may be used for any general purposes.

Closing switch 9, or "T" causes TxD to return on serial Jack1 instead of Jack2, allowing use of a single jack instead of a double serial jack. This Turnaround switch is also used for the terminating board on a network.

Switch position 10, or "S", is a spare SPST switch available to user.

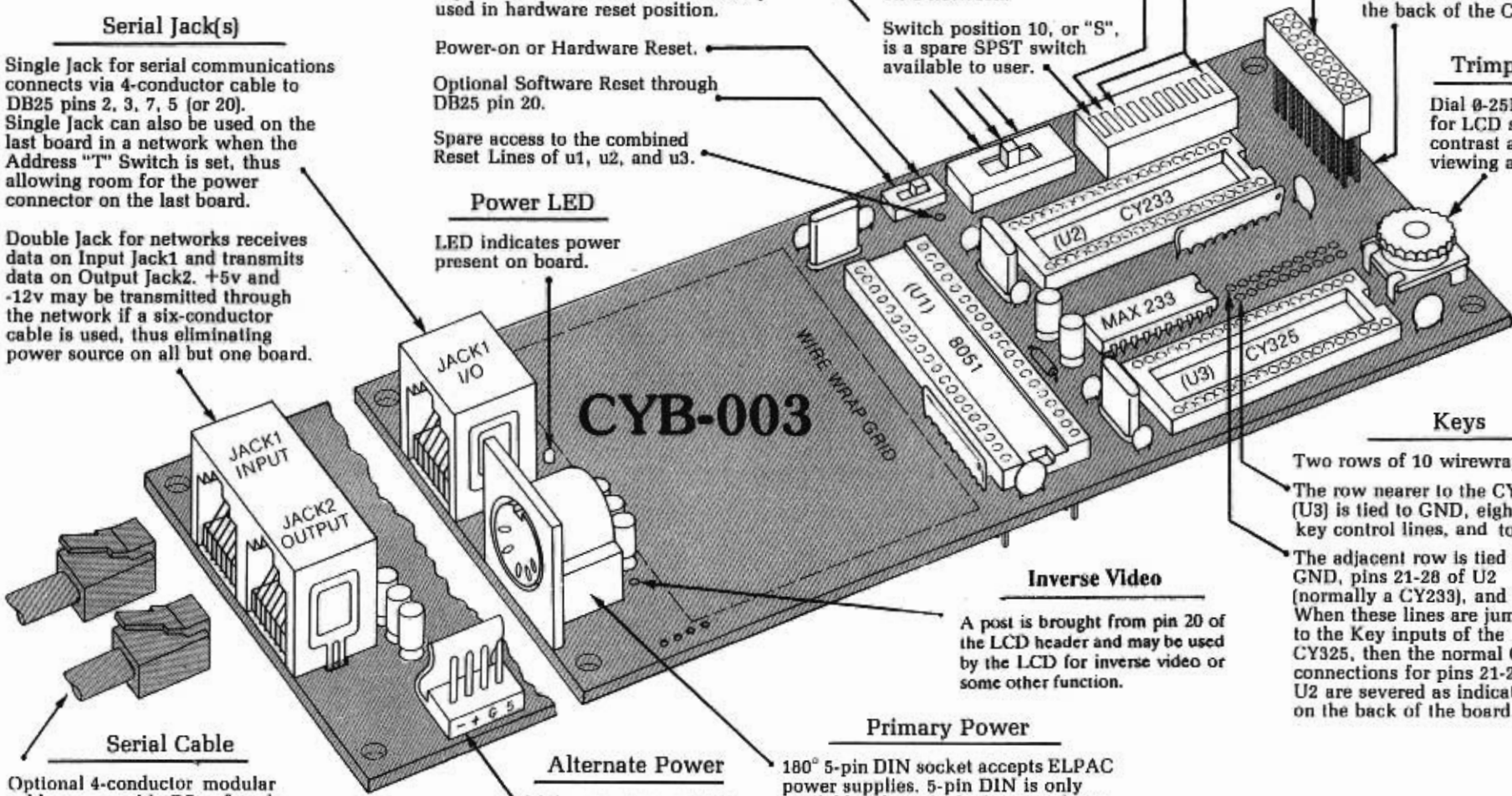
LCD Header

240 x 64 LCD stacks directly onto CYB003, with a board separation of 0.75 inches.

For prototype use, the Board and LCD may be separated using a standard 20-wire female/female cable. For proper polarity, the cable should be connected to the back of the LCD board and to the header extension on the back of the CYB003.

Trimpot

Dial Ø-25K ohms for LCD screen contrast and viewing angle.



Keys

Two rows of 10 wirewrap pads.

The row nearer to the CY325 (U3) is tied to GND, eight CY325 key control lines, and to +5v.

The adjacent row is tied to GND, pins 21-28 of U2 (normally a CY233), and +5v. When these lines are jumpered to the Key inputs of the CY325, then the normal CY233 connections for pins 21-28 of U2 are severed as indicated on the back of the board.

Inverse Video

A post is brought from pin 20 of the LCD header and may be used by the LCD for inverse video or some other function.

Serial Cable

Optional 4-conductor modular cable comes with DB25 female connector. Cable maintains pin 1 polarity (unlike standard phone cable).

Alternate Power

Make-your-own power connection, or if power is needed when using double Serial Jack.

Primary Power

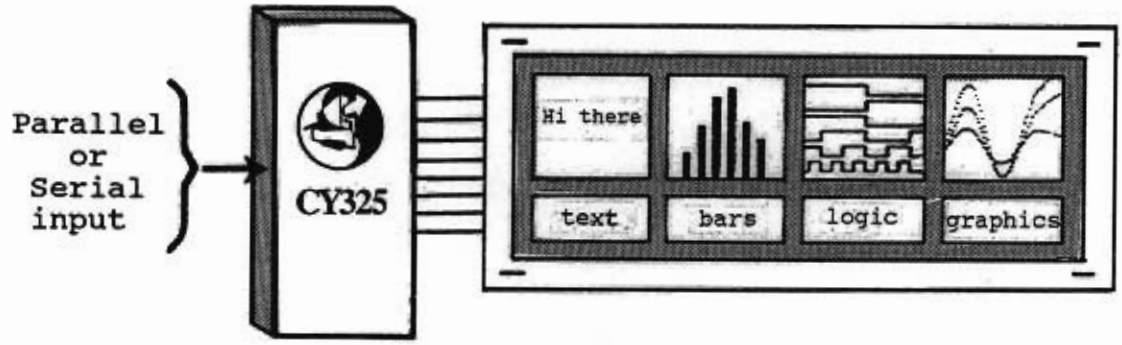
180° 5-pin DIN socket accepts ELPAC power supplies. 5-pin DIN is only available when single Serial Jack1 is used. Double Jack does not leave room for DIN.

Assembled CYB-003 Board

CYB-003 Prototyping Board for the CY325 LCD Windows Controller

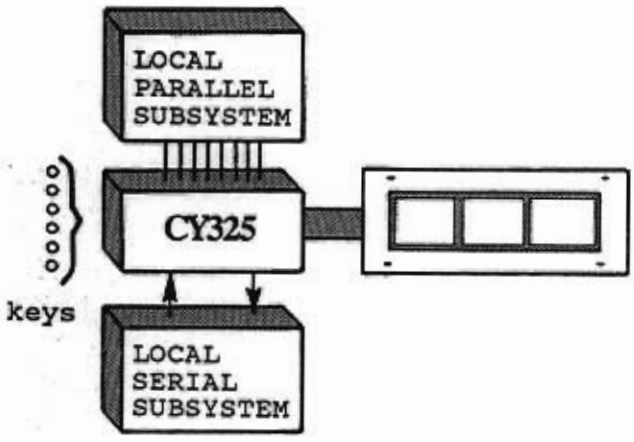
The CY325 LCD Windows Controller from Cybernetic Micro Systems, is a special integrated circuit that implements LCD window management and display functions in one chip.

In its simplest "stand-alone" application, the CY325 provides an easy-to-use LCD controller with parallel and/or serial interface. Its primary purpose in such stand-alone applications is to simplify the display of messages in windows with sophisticated bargraph, logic waveform, and graphics support.



Instead of having to send low-level pixel-oriented commands, the CY325 allows you to send high-level ASCII commands with decimal, hexadecimal, or binary arguments. These commands create windows, erase windows, draw bargraphs, analog waveforms, etc. While you issue four or five commands to the CY325, the CY325 may issue hundreds of commands to the LCD, thus relieving you of the effort involved. The CY325 also allows you to use simple coordinate systems, while the LCD actually requires complicated mapping of pixel coordinate locations into the display coordinate space.

An exceptionally powerful feature of the CY325 is its ability to accept inputs via either the serial or the parallel channel or BOTH serial AND parallel. Another input channel consists of six keys or special signal lines that offer several unique functions. The combination of these signal channels allows the CY325 to link **two subsystems** (of your choice) together via sophisticated switching between the CY325 parallel bus and the CY325 serial bus, as shown at right.



Networking with the CY233

The optional CY233 Local Intelligent Network Controller allows the user to connect many external devices to a single serial port of a host computer, and control the devices individually through the shared port. Within the CY233 are all the functions needed for network message processing, device address decoding, and local data transfers with the external devices. The settings of various CY233 control pins are used to specify operating characteristics, such as baud rate, parity, and basic message format. These options make the CY233 easily adaptable to many communications environments.

The CY233 is used to connect a serial network with external parallel hardware. This allows a serial device, normally a computer system, to control the parallel hardware through a single serial port of the system. Only a standard RS-232 port is required, with no other special communications hardware. The CY233 handles the serial communications with the host system, and decodes addresses for passing data in parallel to the appropriate local parallel hardware. The CY233, support circuits, address decoding, and parallel interface logic are implemented on and supported by the CYB-003 board.

Multiple CYB-003 boards may be connected to the same host serial port, in a daisy chain or ring fashion. This allows the host to control many CYB-003 boards, each with possibly unique parallel hardware, through only one serial port. The CY233 on each board handles the network communications between itself, other boards of the network, and the host computer. It recognizes when messages are meant for this board, to be transferred to the local parallel hardware, and when the messages should be passed to other boards in the network.

8051 Prototyping

An alternative use of the CYB-003 is as an 8051 development board. In this case, the board can support one 8051 family processor (8751, 8031, 8051, etc.) in the U1 location on the board. Direct serial connections to the 8051 TxD and RxD signals are also provided.

In this application, the CY233 device location may be used to add networking capabilities to the 8051 design, or a second 8051 processor could replace the CY233. This allows for a large variety of potential circuit configurations.

CYB-003 Specifications

- The CYB-003 board may communicate with the host computer over a standard three-wire RS-232 interface, or it may be used in a stand-alone configuration with an on-board parallel or serial host.
- The board can operate at standard baud rates between 300 and 19,200 baud.
- One LED indicates when the 5V power supply is on.
- Compact size 65mm x 183mm (2.56" x 7.20") matches format of a 240 x 64 pixel LCD. Height: 0.85" max at Power connector, with 0.75" board separation to LCD board. Wire wrap area included for customization.
- Power requirements without LCD:

  Board voltage: +5V (250 mA max)

  Optional + and - voltage connections are provided for custom circuits and for use by the LCD. RS-232 voltages are generated internally.

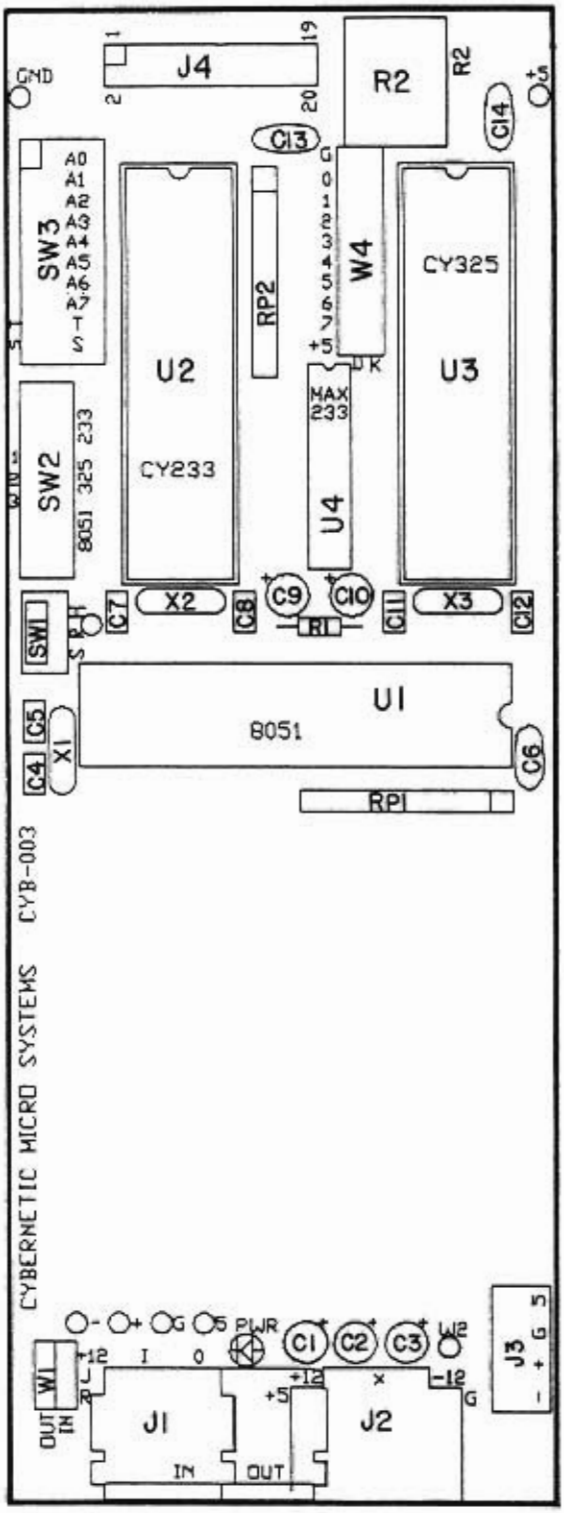
Tools Required

Assembly of the CYB-003 may require the following tools:

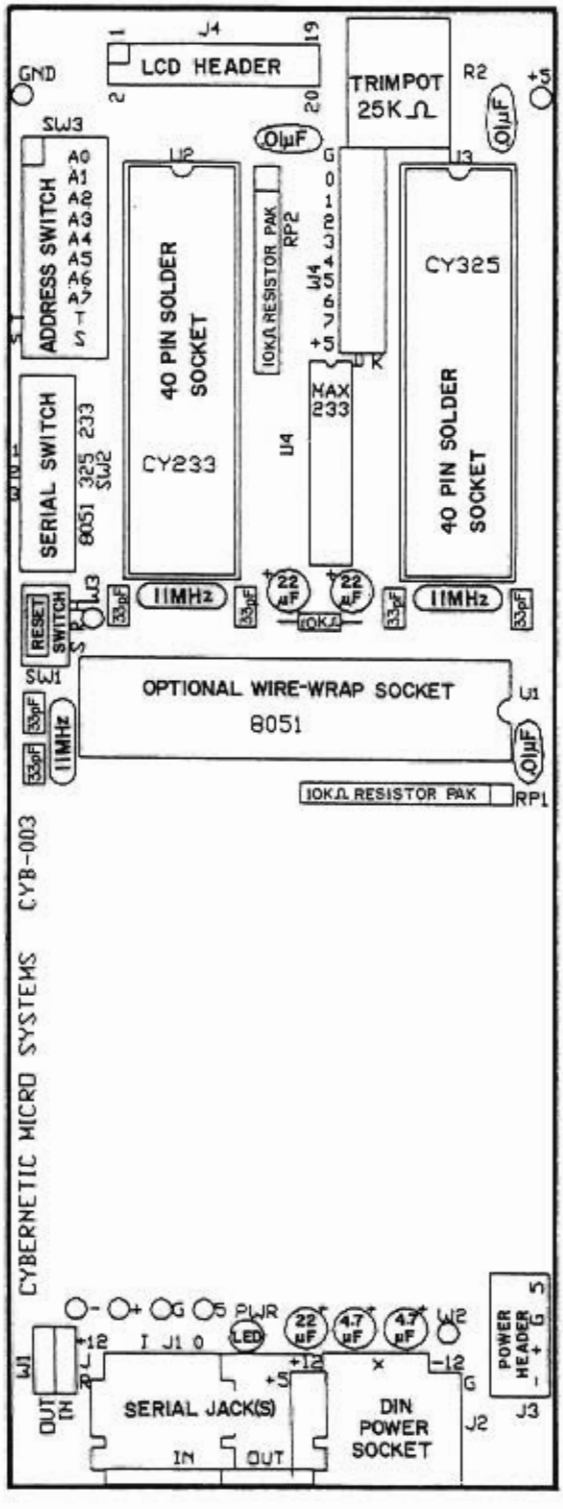
- ☐ A pair of needle-nose pliers
- ☐ A pair of small diagonal cutters
- ☐ A soldering iron
- ☐ Some rosin core solder
- ☐ A Volt-Ohm-Milliamp meter for testing

NOTE: Before assembling this board, you may wish to read the sections following Theory of Operation in order to decide if you will want to modify any of the board configurations. It may NOT be necessary to install some of the components, depending on your application.

CYB-003 Component Locations



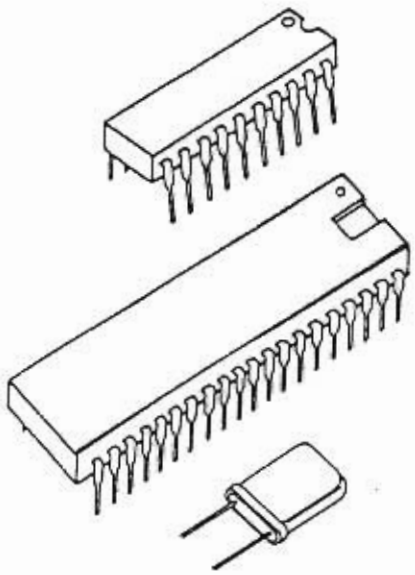
CYB-003 Component Values



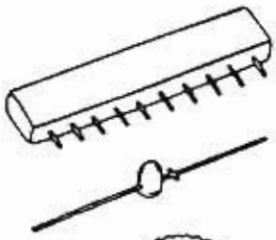
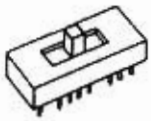
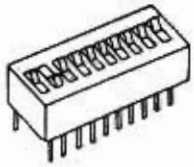
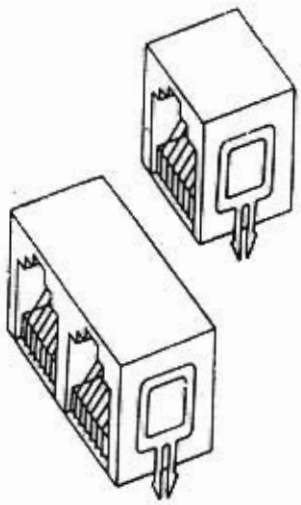
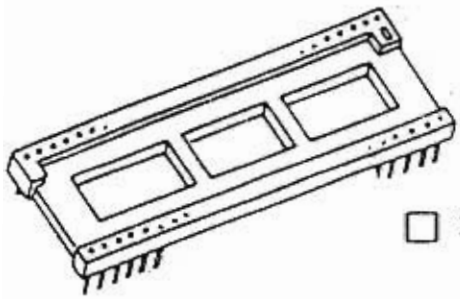
Parts List

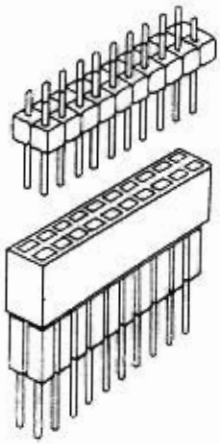
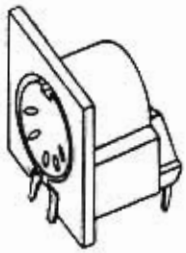
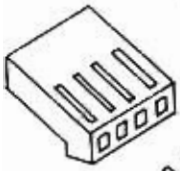
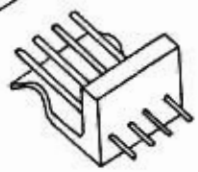
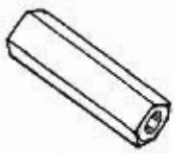
The following parts list describes the parts included with the CYB-003. Check the kit to be sure it is complete. The novice assembler may also use this opportunity to become more familiar with the various types of components supplied. NOTE: DO NOT REMOVE INTEGRATED CIRCUITS FROM THE CONDUCTIVE FOAM UNTIL READY TO USE.

CYB-003 Basic Board



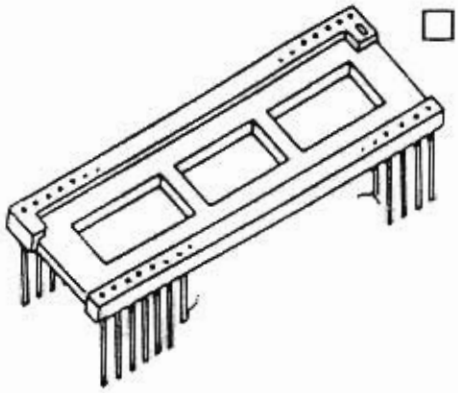
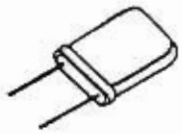
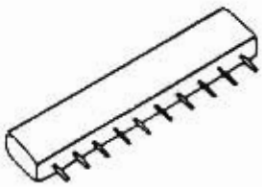
QTY	PART #	DESCRIPTION
☐ 1	CYB003PWB	Printed Wiring Board
☐ 1	CYB003Man	Assembly Manual
☐ 1	MAX233	RS-232 driver/receiver
☐ 1	CY325	LCD Windows Controller
☐ 2	MP110	11 MHz Crystal
☐ 2	TCD103M	0.01uF 50V ceramic disc capacitor
☐ 4	CCD330	33pF ceramic disc capacitor
☐ 2	513D475M063JA4	4.7uF 63V single-ended electrolytic capacitor
☐ 3	513D226M025JA4	22uF 25V single-ended electrolytic capacitor
☐ 1	R10K	BRN-BLK-ORG-gld 10K ohm 1/4 Watt Resistor

	QTY	PART #	DESCRIPTION (cont)
	☐ 1	CSC10A-01-10K	10K ohm Resistor Pak 10 pin SIP
	☐ 1	HLMP-6600	Red LED w/internal Resistor
	☐ 1	RVG1214V253	0-25K ohm Trimmer Potentiometer
	☐ 1	SSA-12	SPDT Slide Switch
	☐ 1	MMS-43	4P3T Slide Switch
	☐ 1	76SB10	10 position DIP Switch
	☐ 1	TM2REA-0606	Single RJ11 Jack for RS-232
	(or)		
	☐ 1	TM2REA-1212	Double RJ11 Jack for RS-232
	☐ 2	440-AG49D	40 pin low profile IC socket

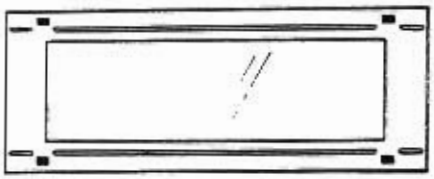
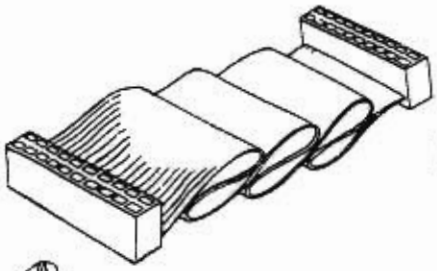
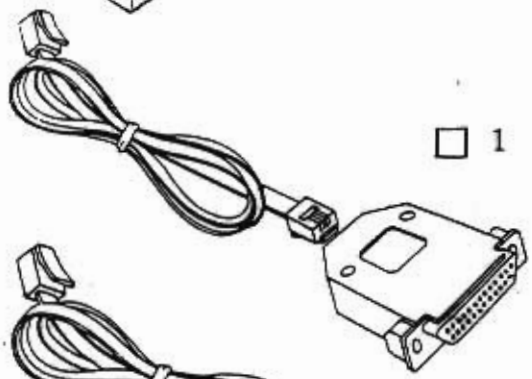
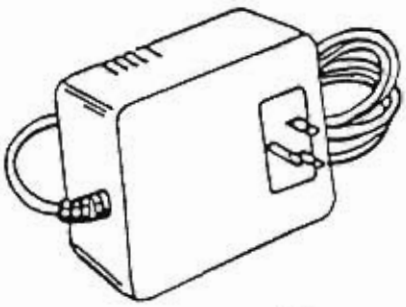
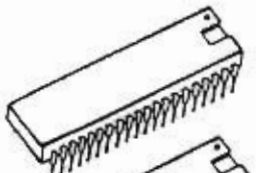
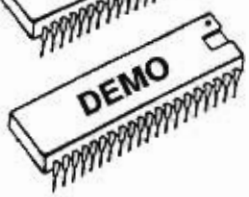
	QTY	PART #	DESCRIPTION (cont)
	☐ 1	TSW-110-07-T-D	2x10 wire wrap header, Solder tail
	☐ 1	ESQ-110-34-T-D	2x10 IDC socket, WW tail
	☐ 1	WMPCBA	180° 5-pin DIN power socket
		(or)	
	☐ 1	09-50-3041	4 pin housing, .156 centers, with locking ramp
	☐ 1	09-65-1041	4 pin polarized Header, .156 centers, .045 round post
	☐ 4	08-50-0106	Crimp pins for above housing
	☐ 4	4309	Hex Nylon threaded spacer, 4-40 x 3/4"
	☐ 8	2501	Nylon Screw, binding head, 4-40 x 3/8"

NOTE: Certain items may have other values or part numbers substituted for those indicated. These will not affect performance of your kit.

8051 Socket Option

	QTY	PART #	DESCRIPTION
	☐ 1	540-AG11F	40 pin wire wrap socket
	☐ 1	MP110	11 MHz Crystal
	☐ 1	TCD103M	0.01uF 50V ceramic disc capacitor
	☐ 2	CCD330	33pF ceramic disc capacitor
	☐ 1	CSC10A-01-10K	10K ohm Resistor Pak 10 pin SIP

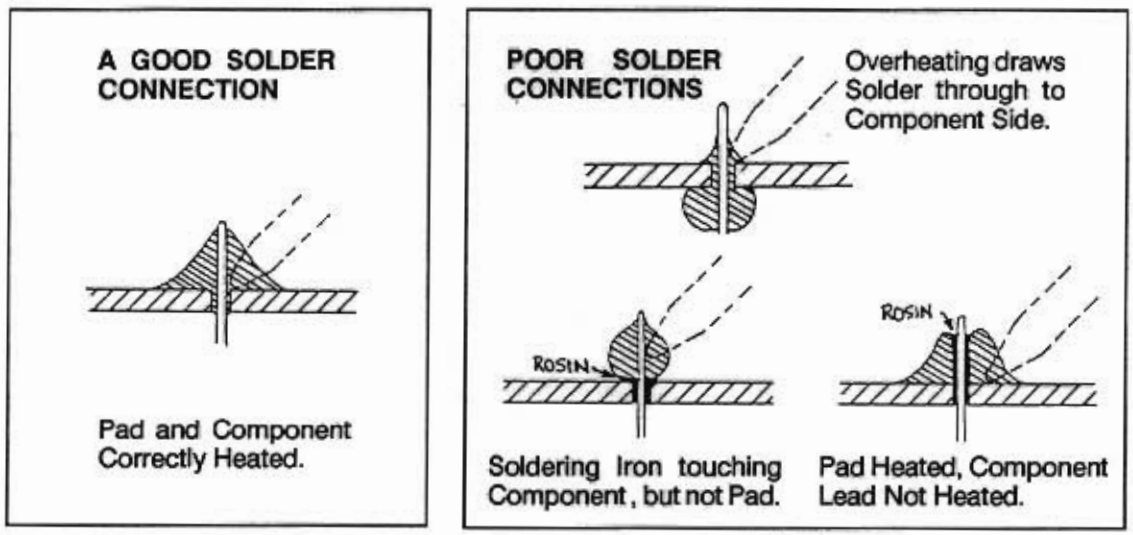
Other Options

	QTY	PART #	DESCRIPTION
	☐ 1	AND711AST TLX711A DMF5005N LM24014	240x64 pixel super twist LCD
	☐ 1	CABLE-20	18" 20-wire ribbon cable with female connectors
	☐ 1	4RJ-DB25F	4-conductor modular cable with DB25 connector
	☐ 1	Cable-06	6-conductor modular cable
	☐ 1	Power-4	Elpac WM063 Power Supply +5 @380mA, +12 @180mA, –12 @180mA, and GND
	☐ 1	CY233	Network Controller IC
	☐ 1	Demo Chip	LCD Demonstration Routines IC

Assembly Procedure

The CYB-003 will be assembled in stages, with similar components installed at the same time. Soldering technique is very important when assembling a PC board. The soldering iron tip should be kept reasonably clean during soldering. This usually requires that it be wiped on a damp sponge after every few components. While the iron is not being used, a slight residue of solder on the tip will keep it from overheating, prolonging the tip life. Components should be installed so they rest fairly close to the board surface on the component side (front side, with silk screened printing). Components with long leads (resistors, capacitors) should have the leads cut before soldering. Leads should extend between 1/8 and 1/4 inch from the solder side (back side) of the board.

To solder a component in place, install the component at the proper location on the board. This may require bending the leads of some parts. All components are installed from the component side of the board. Be sure that all leads show through the solder side before soldering, especially when installing the integrated circuits. If required, cut the leads from the solder side of the board. The component is now ready to solder in place. Heat the component lead and the board pad to which it will be soldered for one to two seconds, from the solder side. Then, with the iron still in place, apply some solder to the area. Keep the iron in place until the solder flows around the component lead and pad, then remove. The whole procedure should take from two to five seconds, depending on the size of the component and the board area to which it is attached. When properly done, solder will flow through the hole in which the component is placed, and be visible from the component side. CAUTION: DO NOT OVERHEAT THE COMPONENT DURING SOLDERING. THIS MAY DAMAGE THE PART. Also, if the parts are not heated enough, cold solder joints and connections will result. A properly soldered component will have the solder firmly and smoothly melted around both the component lead and over the pad to which it is attached. Solder should flow through the mounting hole and be visible from the component side, but the part should not be overheated and damaged in the process.

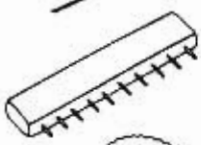


The following pages give a step-by-step procedure for assembly of the CYB-003, including photographs of the completed Board.

RESISTORS

The resistors will be the first components installed on the CYB- 003. To install each resistor, the leads must be bent and cut to fit. Resistors are installed as follows:

☐ Install the 10K ohm resistor (BRN-BLK-ORG-gld) in location R1.

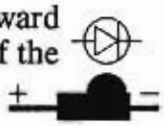


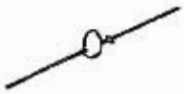
☐ Install a 10-pin 10K ohm resistor SIP in location RP2 for the standard board, and at location RP1 if the 8051 option was selected.

☐ Install the 20K or 25K ohm Trimmer Potentiometer in location R2. Preset the dial toward the "R2" designator.

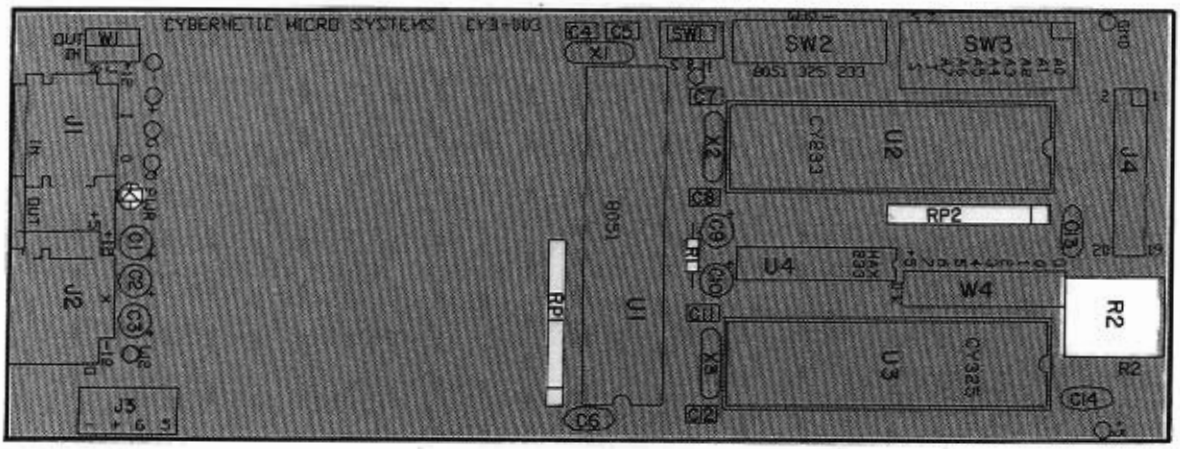
DIODES

There is one miniature light emitting diode (LED) indicating power is applied to the CYB-003. The LED is polarized and must be installed properly to work. The cathode (negative) side is shown as a bar on the silkscreen. It may be indicated on the component by a bar across the lead, a silver stripe on the lens body, or the lens may be offset toward that direction. This cathode side should face W1. The positive or anode side of the LED is shown on the silkscreen as a triangle and is connected to +5 volts.





☐ Install Power LED at location PWR, between J1 and wirewrap area.



CAPACITORS

Capacitors will be installed next. Leads should be trimmed to the proper length before soldering. The electrolytic capacitors are polarized and must be installed with the proper orientation. All polarized capacitors are noted by a "+" on the board and a "+" or "-" on the capacitor body. The capacitors are installed as follows:

- ☐ Install four 33 pF ceramic discs in C7,C8,C11,C12, and two 33 pF ceramic discs in C4,C5 for 8051 option.
- ☐ Install two 0.01 uF ceramic discs in C13,C14, and install one 0.01 uF ceramic disc in C6 for 8051 option.

- ☐ Install the 22 uF electrolytic capacitors in C1,C9,C10.
- ☐ Install the 4.7 uF electrolytic caps in C2,C3.

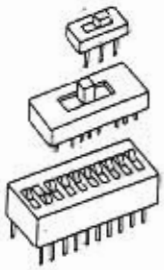
CRYSTALS

There are three 11 MHz crystals on the CYB-003, one each for the CY325, the CY233 and the 8051 socket Option. The crystals are installed standing up, to minimize occupied board space.

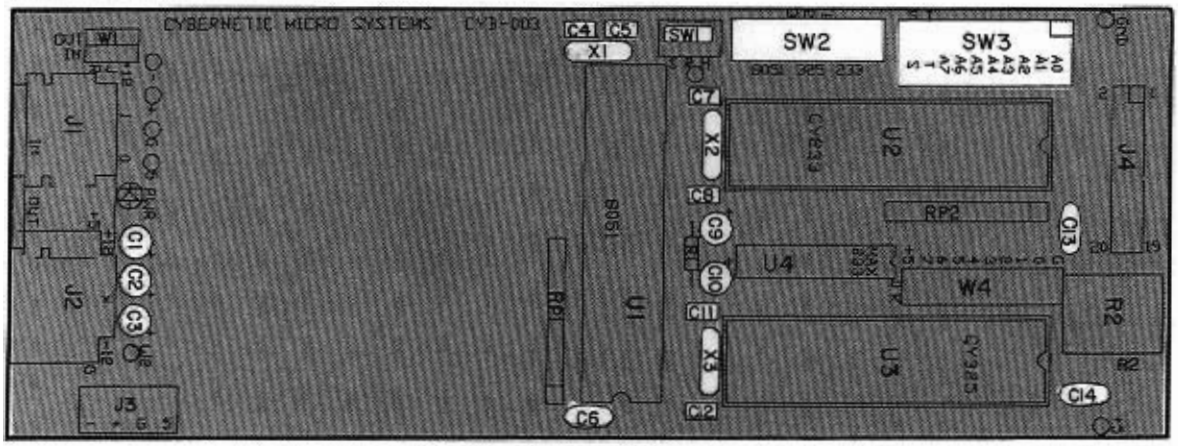
- ☐ Install two 11 MHz crystals in locations X2 and X3.
- ☐ Install an 11 MHz crystal in X1 if using the 8051 socket.

SWITCHES

There are three switch locations on the CYB003, at locations SW1 to SW3, all next to each other. There is no electrical polarity to these switches. Only the 10 position DIP switch at SW3 has a proper orientation, due to the numbering scheme of the 10 switches, requiring switch position number one at the J4 end of the board. These miniature plastic switches are sensitive to overheating and should be soldered carefully.

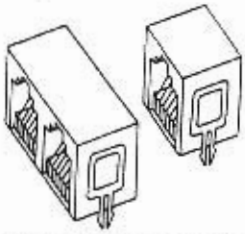


- ☐ Install the small reset switch at location SW1.
- ☐ Install the 10-pin chip select switch at location SW2.
- ☐ Install the 10-pin DIP switch at location SW3.



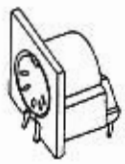
CONNECTORS AND HEADERS

The CYB-003 is supplied with a single or double female RJ11 telephone-style serial connector for the RS-232 interface. If a single jack is supplied, it should be installed at the Input side of location J1. If a double jack is supplied, it should span both the Input and Output sides of location J1. The receptacle should face away from the board.

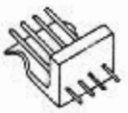


☐ Install the RJ11 RS232 connector in location J1.

The power connector supplied is either a 180° 5-pin DIN connector or a 4-pin power header, depending on the board configuration chosen. The 5-pin DIN connector will only fit on the board at location J2 if a single RJ11 jack is used. If a double RJ11 jack is used and a power connector is needed on the board, then the 4- pin connector may be used at location J3. The header half of the 4-pin power connector is installed on the board, and the connector housing and crimp pins are for fabricating a connection to your power supply.

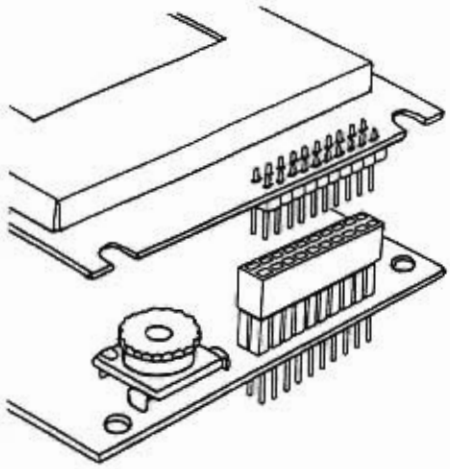


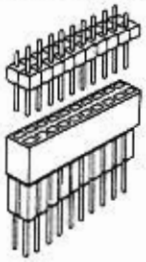
☐ Install the 5-pin DIN power connector in location J2.



☐ Optionally install the 4-pin power header in location J3.
The polarizing clip should be next to the W2 post.
The connection pins should face the edge of the board.

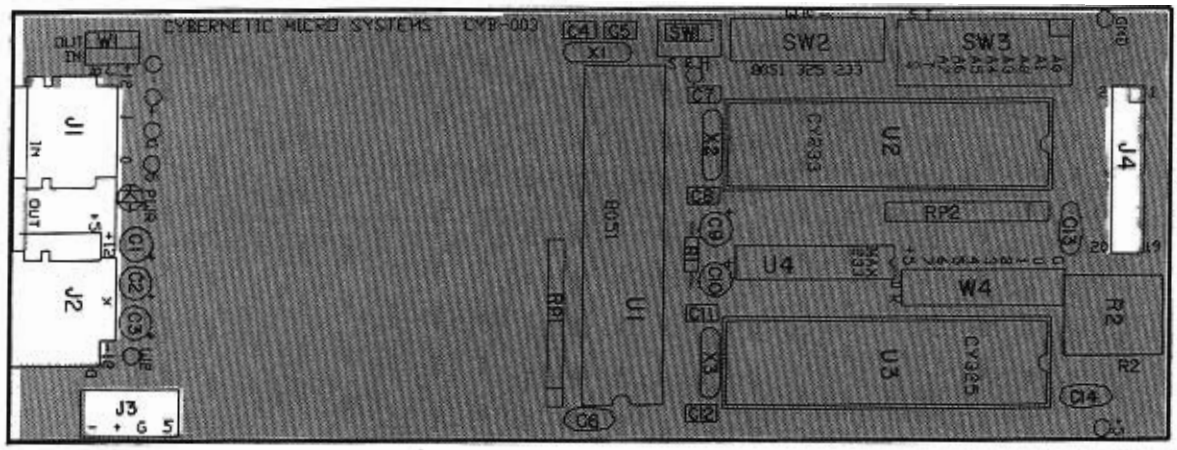
A 2x10 header socket is supplied for the CYB-003, with built-in spacers for the proper standoff height between the CYB-003 and the LCD header. The header socket has wire wrap posts that will extend through the back of the CYB-003. A 2x10 wire wrap header is supplied for the LCD, not the CYB-003, and should be inserted from the bottom of the LCD so that the solder pins pass through the LCD board and are soldered on the top, or LCD side. The plastic spacer and wire wrap posts should be on the back of the LCD in order to plug into the header socket.





☐ Install the 2x10 header posts in the 2x10 pattern on the LCD.

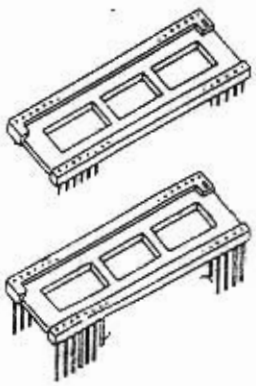
☐ Install the 2x10 header Socket at location J4 on the CYB003.



Wire wrap posts are not needed in the standard CYB-003 configuration, and are not provided. If needed for the user application, they are usually supplied in single-row strips which are broken into the appropriate lengths and soldered into the jumper pads, such as those designated W1 to W4. Jumpers are then wired together by wrapping a short piece of wire wrap wire between the appropriate posts or by using shorting plugs. Solder tail posts, which have one section slightly longer than the other, may be used on the CYB-003. The solder tail posts should be inserted with the short, solder tails protruding through the board to the solder side. This leaves the slightly longer section of the post available on the component side for attaching the jumper wires. Wire wrap posts, which have one section much longer than the other, may also be used on the CYB-003 board. These posts should be inserted with the longer wire wrap tails protruding through the solder side of the board. Connections from these jumpers would be wired from the solder side.

INTEGRATED CIRCUIT SOCKETS

Two solder tail sockets are provided, for the CY325 and the CY233. An optional 40-pin wire wrap socket may be used in the 8051 location. The sockets have a notch or other marking to designate the pin 1 side, and should be installed to match the patterns of the CYB-003 silkscreen.



☐ Install the 40 pin solder tail sockets in locations U2 for the CY233 and U3 for the CY325.

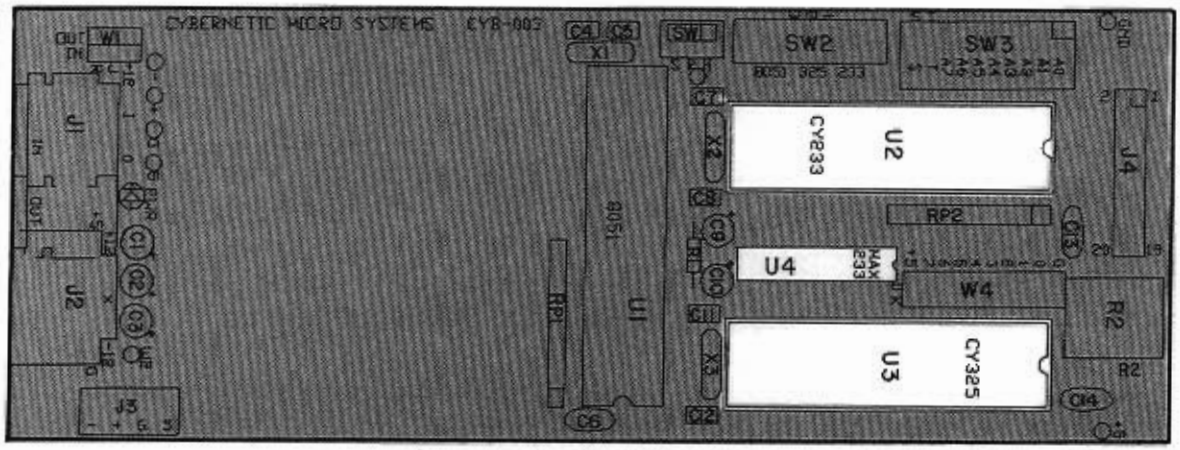
☐ Install the 40 pin wire wrap socket in location U1 if using the 8051 option.

INTEGRATED CIRCUITS

The Integrated Circuits (ICs) are the last components to be installed. They are also the most sensitive to damage from static electricity and overheating during soldering. When handling the ICs, touch the pins as little as possible. Keep them in the conductive foam until ready to install. In order to fit the pins into the hole patterns, it may be necessary to bend them in slightly, so they are perpendicular to the IC package. This is most easily accomplished by laying the IC on its side on the work surface and pushing on the body until the pins are straight. This procedure should be repeated for each side. The ICs must be properly oriented when installed. Any part installed backwards will be damaged when power is applied to the CYB-003. Each IC package has a notch or dot on one end, which corresponds to the pin 1 side of the IC, and should be installed to match the notched pattern of the silk screen. Before soldering the IC in place, be sure every pin is through the proper hole in the pattern. It is very difficult to remove and correct a pin problem once the IC is soldered. Finally, during soldering, heat the pins just enough to make a good solder bond. If the ICs are overheated during soldering, they may be damaged. Be sure to solder each pin and be careful to not leave any solder bridges between the pins.

☐ Install the MAX233 in location U4.

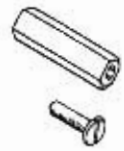
Clean the board according to the following instructions and follow the "Final Assembly and Checkout" procedures at the end of this manual before inserting the CY325 and CY233 in the 40 pin sockets at U3 and U2. Be careful to match the notch in the chip with the silkscreen pattern on the CYB-003.



When all the parts have been installed, the board should be cleaned to remove the solder flux residue which results from the soldering operation. It is only necessary to clean the solder side of the board. The board should be cleaned with rubbing alcohol,

which does not leave a residue. It is often helpful to use a toothbrush or similar device to help scrub the board. Once the flux has been removed, the solder side may be scrubbed with a mild soap and water solution, then rinsed with clean water. Do not immerse the board, as this may damage some components. Rather, rinse the solder side of the board gently under running water. The board should be reasonably clean and free of flux when this operation is complete. Dry the board gently to remove all water. Do not apply power to the board until it is completely dry.

The screws and spacers are used to connect the 711 LCD to the CYB-003 at the four corners. Optionally, the spacers may be used as feet for the four corners of the CYB-003 when the LCD is separated from the CYB-003 by a ribbon cable.

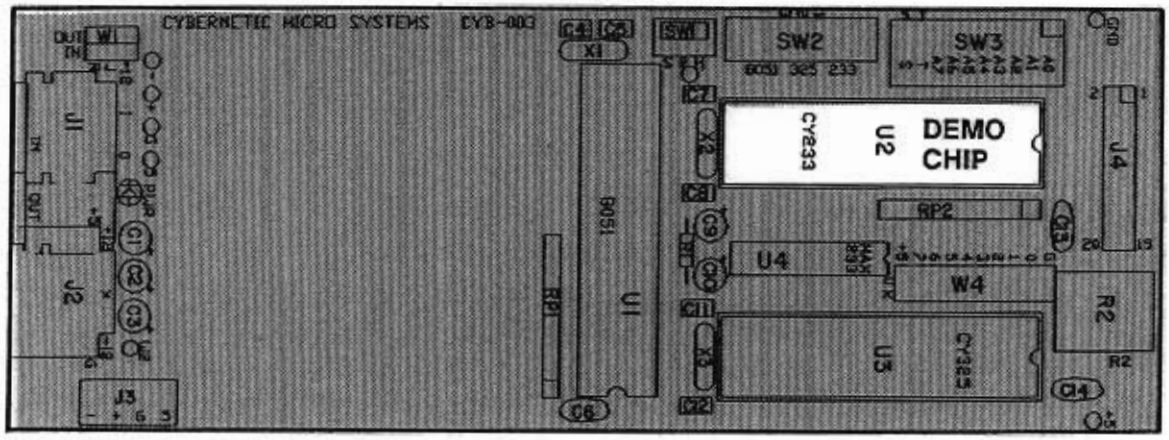


☐ Install the 4 spacers and screws on the four corner mounting holes.

This completes the main assembly procedure. The following sections explain the theory of operation, which must be understood to determine the proper jumper connections and switch settings. Then the jumper options are explained and the connector pinouts are listed. This will allow the user to make the cables necessary to connect the board to the local computer, the power supply, and other parts of the system, as required.

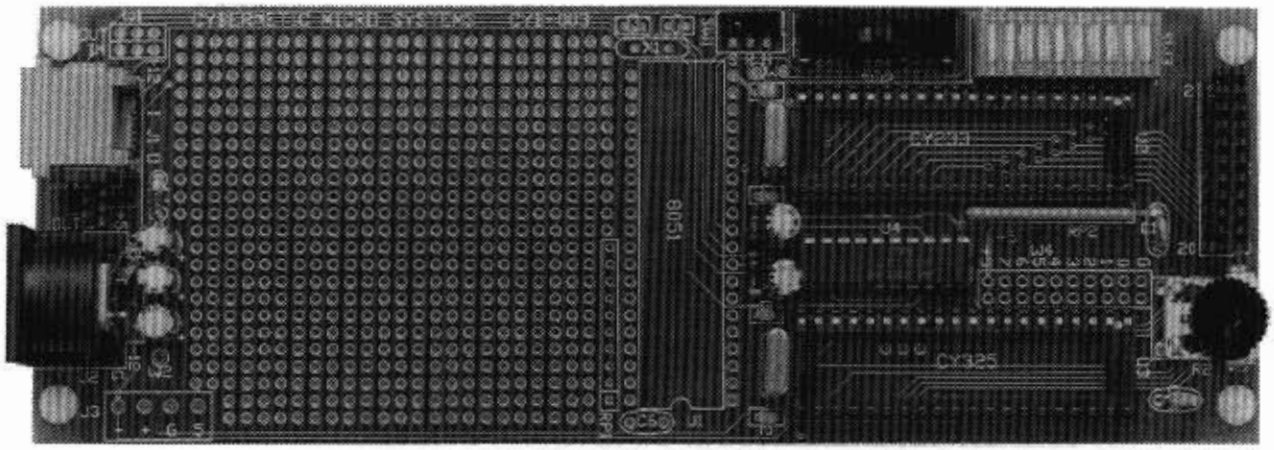
Using the Demonstration Chip (Optional)

After the CYB-003 board has been completely assembled and the CY325 chip has been inserted into the socket at location U3, the demonstration chip may be viewed. Insert the chip into location U2 (CY233 socket), as shown below. Be careful to match the notch in the chip with the silkscreen pattern on the CYB-003. Mount the display and plug the power supply into the DIN power socket on the board, and watch it run! (If there is no image, adjust the brightness by turning the trimmer potentiometer at location R2.) Remove the demo chip to program your own routines, or to use the demo diskette.



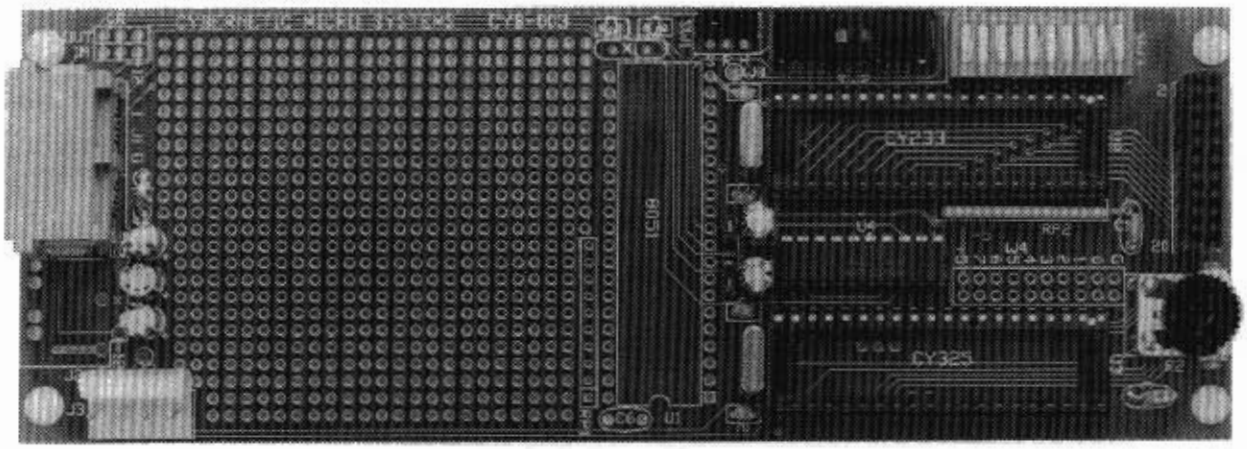
Assembled CYB-003-1

(Without 8051 Option)



Assembled CYB-003-2

(Without 8051 Option)



CYB-003 Theory of Operation

The CYB-003 is a very general purpose prototyping board that can support up to six single-chip computers in a number of configurations. Three 40-pin sockets are designed into the board while three more can be added in the wire-wrap area. The three 40-pin sockets are pre-wired for power, ground, clock crystal, and serial I/O connections. However, the user can sever these connections and use the 40-pin socket(s) for chips that are incompatible with the pre-wiring. In this case the user must make his own connections to ground, power, etc. The general purpose wire-wrap area is uncommitted and can be used for A/Ds, D/As or whatever the user desires.

CY325 Socket (U3)

In most cases the CYB-003 will be used with a CY325 LCD Windows Controller in the 40-pin socket labeled U3. This chip is supported by clock crystal (11 MHz), power and ground, reset switch, RS-232-buffer-RJ11 socket, 20 wire connection to a graphic LCD (controlled by on-board T6963C) and handshake lines to socket U2.

CY233 Socket (U2)

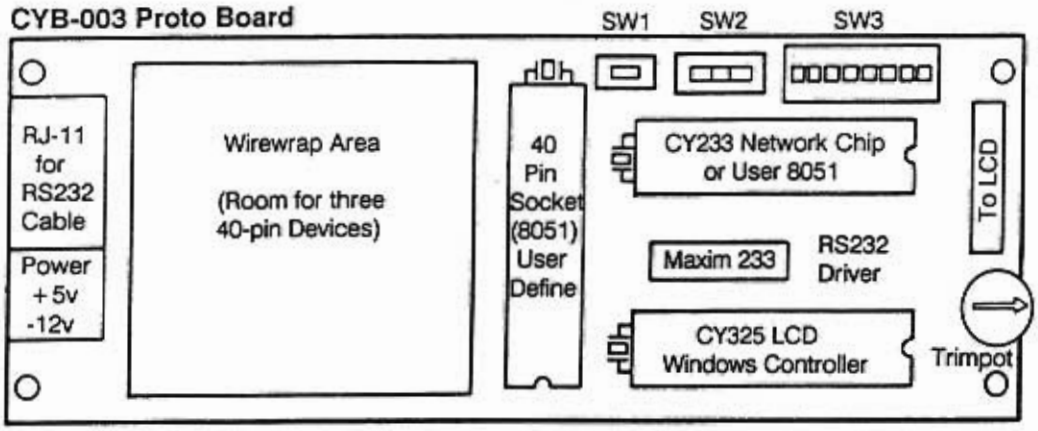
Adjacent to the CY325 is a 40-pin socket (U2) that is prewired to accept an 8051 compatible micro computer or a Cybernetic CY233 Local Intelligent Network Controller (LINC). In either case, the 11 MHz crystal, power, ground, data bus, handshake lines, and serial I/O are prewired. If the CY233 network controller is used, it is simply plugged into the circuit as is. The mode control lines have been pre-wired to select a particular operating mode of the CY233. These lines may be cut and altered for other operational modes. In addition, 8 switches (SW3) are mounted on the CYB-003 to allow up to 256 addresses to be set for each CY233. This allow up to 256 CY233/CY325/LCD/CYB-003s to be linked using one serial I/O line, such as an IBM-PC COM1 or COM2 port.

Alternative to CY233 (U2)

Although the CYB-003 is prewired to accept a CY233 LINC Network chip, the socket is generally compatible with a 40-pin 8051 microcomputer. In fact, the 8051 is used in several CY325 DEMO chips that exercise various features of the CY325. In this case the 8051 serial port can be connected to the RJ11 socket as described below, and the 8051 parallel port is connected to the CY325 data bus (shared with the LCD data bus). The 8051 handshake lines to the CY325 LCD controller are prewired so it is recommended that the user pre-define these particular I/O pins as CY325 interface lines. Examples of the code involved are given in the CY325 user manual. In non-CY233 systems, the CY233 mode control lines are generally not needed and must be cut if these lines are to be used for other purposes (by default they are tied high or low). The CY233 address switches (SW3) are connected to the 8051 port 1 and can be used as desired by the 8051.

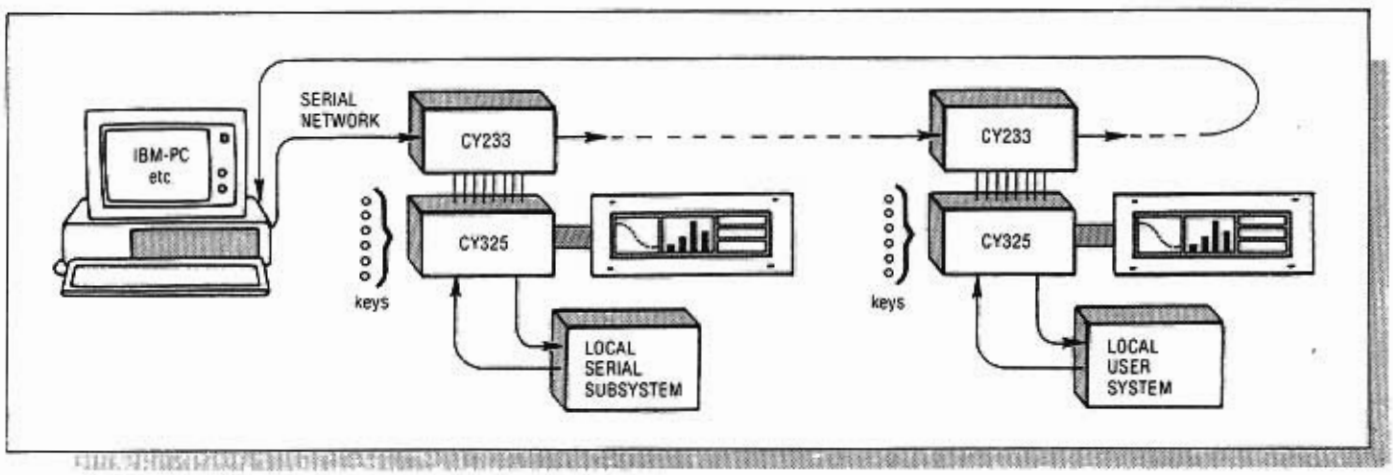
Auxiliary 8051 (U1)

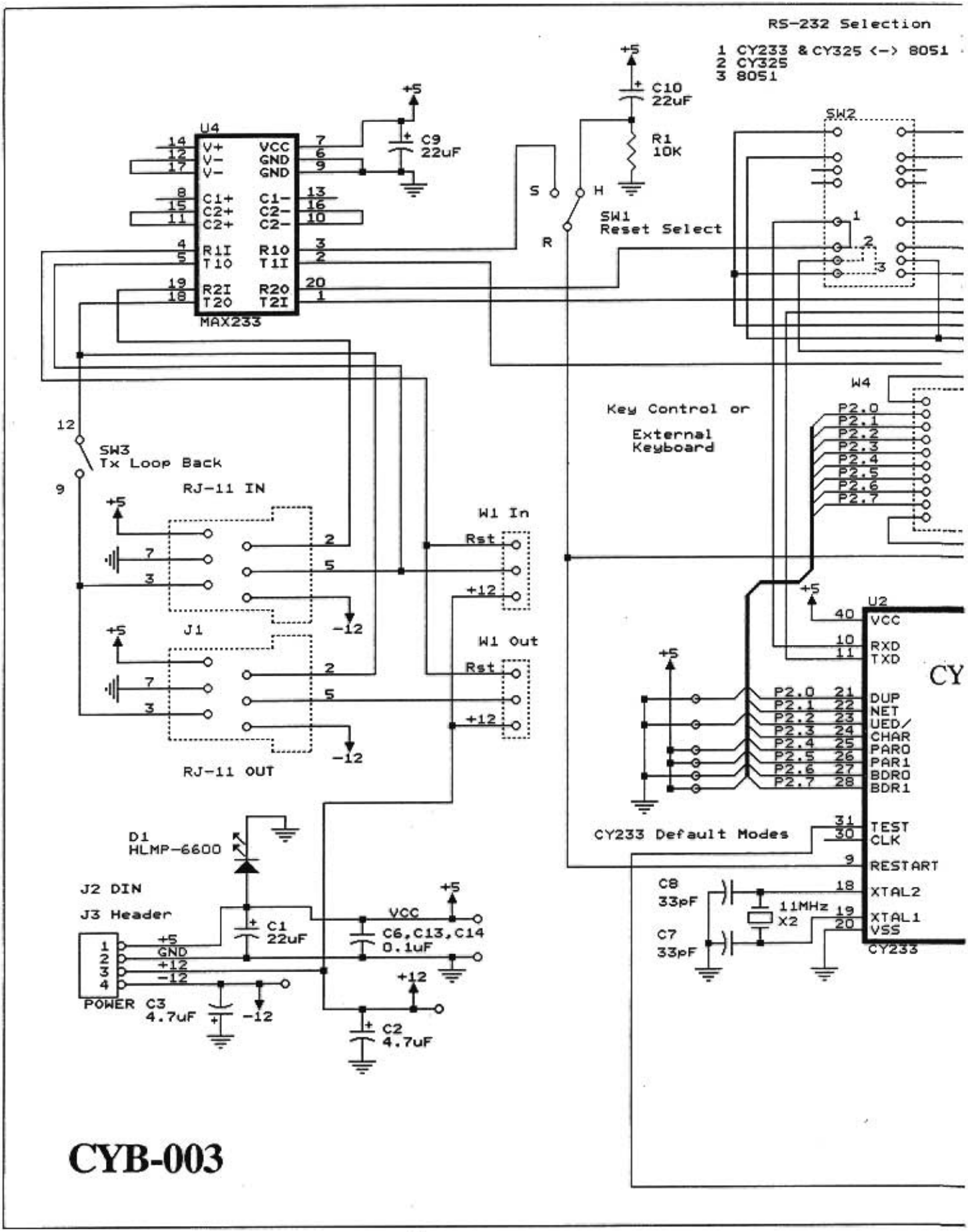
In addition to the CY325 and the CY233/8051 sockets, there is a third 40-pin socket on the CYB-003. This socket is prewired (power, ground, clock crystal, reset, and 2 serial I/O lines) to accept an 8051 single chip micro computer, but, as mentioned, you can cut traces and rewire to accept other 40-pin microcomputers. 8051s were chosen because they are the most popular 8-bit microcontroller in the world, are available from numerous manufacturers in numerous configurations (RAM, ROM, I/O, A/D, etc.).



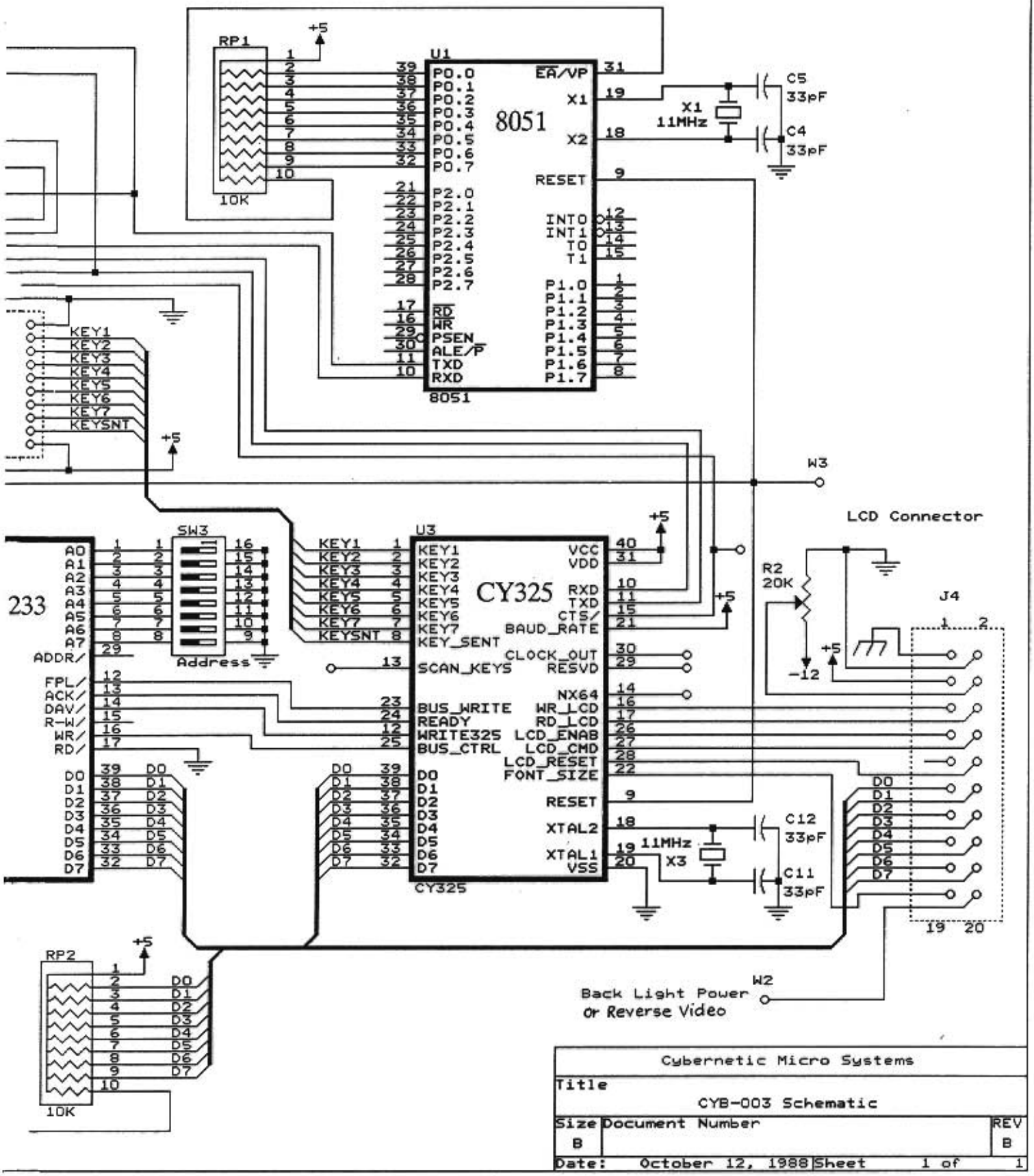
Serial I/O - Theory of Operation

The CYB-003 supports three 40-pin devices, each capable of communicating over RS-232 serial I/O lines. In applications, one of these will be connected to the RJ-11 socket on the board, as determined by the setting of switch SW2. By proper selection of this switch, the serial communications to the RJ11 (from your computer) can be connected directly to the CY325 (U3) LCD Windows controller, the CY233 LINC (U2) controller for networked applications, or to the auxiliary 8051 (U1) for special applications. Note that if the CYB-003 serial I/O is dedicated to the Network Controller




RS-232 Selection
1 CY233 & CY325 <-> 8051
2 CY325
3 8051
U4
MAX233
C9 22uF
C10 22uF
R1 10K
SW1 Reset Select
SW2
W4
Key Control or External Keyboard
SW3 Tx Loop Back
RJ-11 IN
RJ-11 OUT
J1
W1 In
W1 Out
U2
CY233
CY233 Default Modes
D1 HLMP-6600
J2 DIN
J3 Header
POWER
C1 22uF
C6,C13,C14 0.1uF
C2 4.7uF
C3 4.7uF
C8 33pF
C7 33pF
11MHz X2

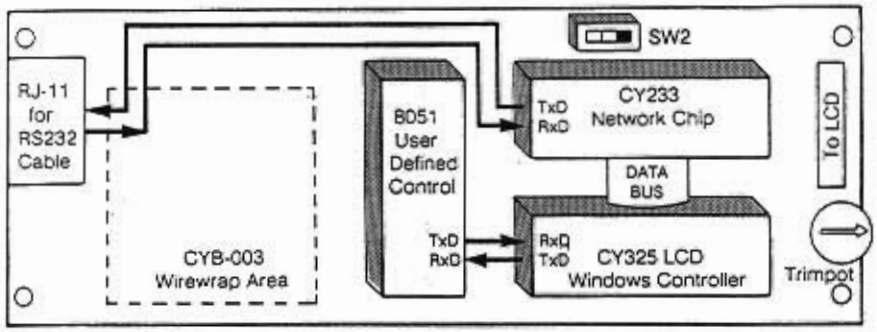
CYB-003



Cybernetic Micro Systems		
Title: CYB-003 Schematic		
Size: B	Document Number:	REV: B
Date: October 12, 1988	Sheet 1 of 1	

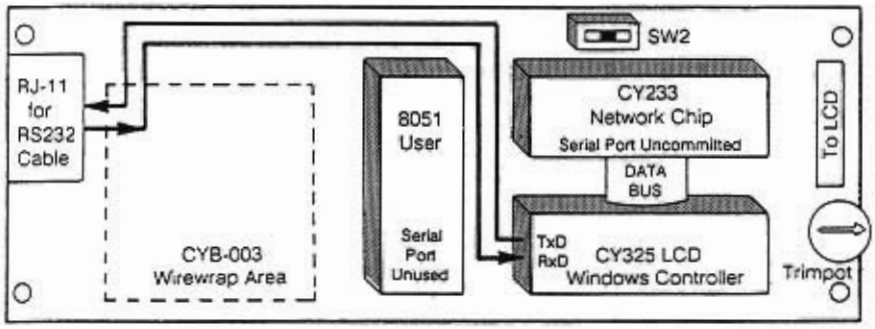
(CY233), both the CY325 and the 8051 Serial I/O lines would be unconnected. Therefore switch SW2 has been designed to interconnect the CY325 and 8051 so that they can communicate with each other. This powerful scheme allows you to build a local instrument that uses the 8051 (U1) for instrument processing, with a serial link to the CY325 for LCD display and also a link to the serial network (to the CY233 through the CY325) for communication with a network master.

The discussion of how the local 8051 (U1) can communicate with the Network through the CY325 is provided in the CY325 manual. The figure below provides an overview of the major serial connection schemes. You select the scheme you want by simply setting switch SW2 to position 1, 2, or 3.



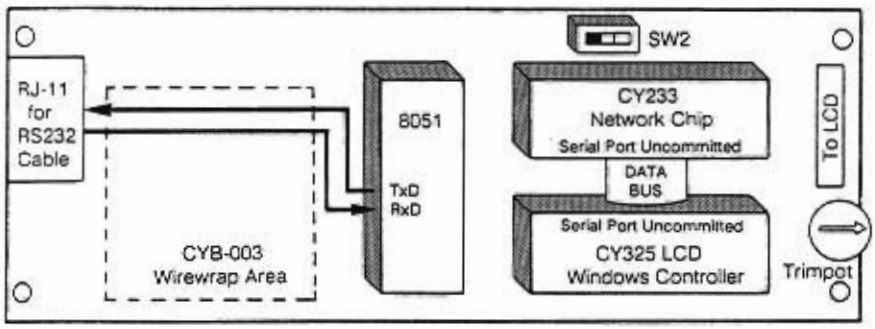
Switch Position 1

Serial Connections
CY233 ↔ RJ11
CY325 ↔ 8051
8051 ↔ CY325



Switch Position 2

Serial Connections
CY233 ↔ NC
CY325 ↔ RJ11
8051 ↔ NC



Switch Position 3

Serial Connections
CY233 ↔ NC
CY325 ↔ NC
8051 ↔ RJ11

CONCLUSION: The remainder of the section is devoted to circuit details concerning the above. Application details for the CY325, the CY233, and the 8051 can be found in relevant user manuals available from Cybernetic Micro Systems (CY325 & CY233) or from Intel (8051).

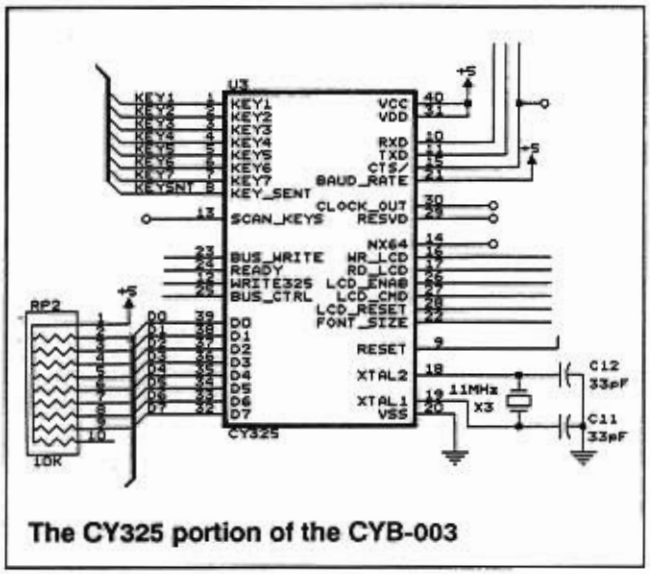
Major sections of the CYB-003 are the CY325, the CY233, RS-232 serial interface, and the 8051 optional socket. The schematic for the CYB-003 is included in this section and is the basis for this discussion.

The CY325

The CY325 is the major component of the CYB-003 board. It is described in detail in the CY325 User Manual, so the information will not be repeated here.

Support circuits for the CY325 include an 11 MHz crystal circuit, for generating basic timing and baud rate functions, and a 22 uF capacitor and resistor, which provide an automatic reset when power is applied to the board. The Restart signal is also available at a jumper post, for connection to a switch or other reset logic.

The CY325 data bus is connected to the CY233 data bus and may be driven by the CY233 or by an 8051 device in the CY233 socket. The data bus includes a pull-up resistor pack.



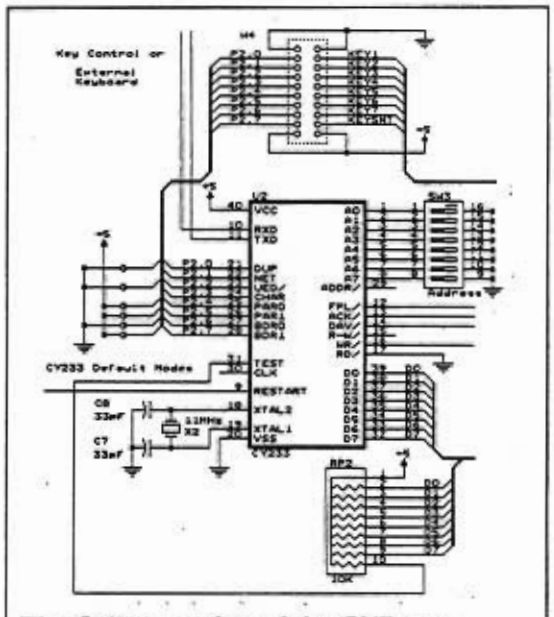
The CY325 portion of the CYB-003

The CY233

The CY233 allows the CYB-003 to be used in a Network mode, with address support and message based serial communications, or in the UART mode, with simple serial to parallel data transfers. The address lines of the CY233 are connected to address switches allowing the use of decoded addresses on the CYB-003.

The eight CY233 mode control signals are hard wired on the board, for use with the CY325. The signals are either floating, tied to +5 volts, or tied to ground. These connections determine the basic operating characteristics of the CY233.

Finally, the data transfer control signals are hardwired between the CY325 and the CY233.



The CY233 portion of the CYB-003

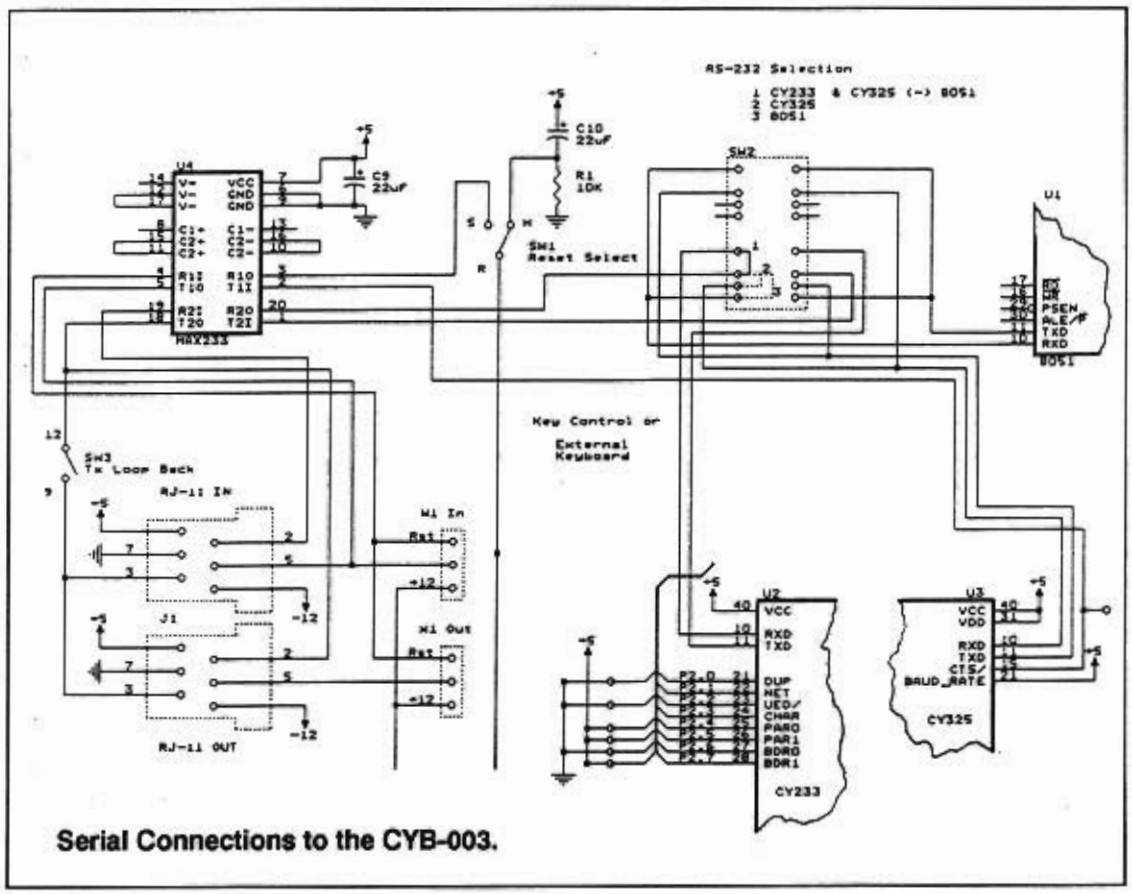
The Serial Driver/Receiver

The CY325, CY233, and 8051 serial data lines connect to the RS- 232-C interface, consisting of a driver/receiver device, chip select switch, and RJ11 serial connector. The signals from the serial lines of the CY325, CY233, and 8051 are all at TTL levels, so the drivers and receivers are required to translate the TTL levels of these chips into the RS-232-C levels required between boards and the host controller system.

A MAX233 integrated circuit implements the level translation in one chip. It contains two drivers, two receivers, and a voltage converter for generating +/- 10 volts from the single +5 volt supply input.

One driver and one receiver are used for the serial connection to the CY325, the CY233, or the 8051, while the other driver and receiver are used for CTS and Software Reset through the RJ11 Serial connector.

Note that CY233 communications require only transmitted data and received data, and the CY325 may additionally require CTS. Other status signals are not needed or supported by the design. If the local system requires additional connections, these must be explicitly wired into the local RJ11 Serial connector. V+ and V- supply connections from the MAX233 could be used to generate any additional signals required.



Serial Connections to the CYB-003.

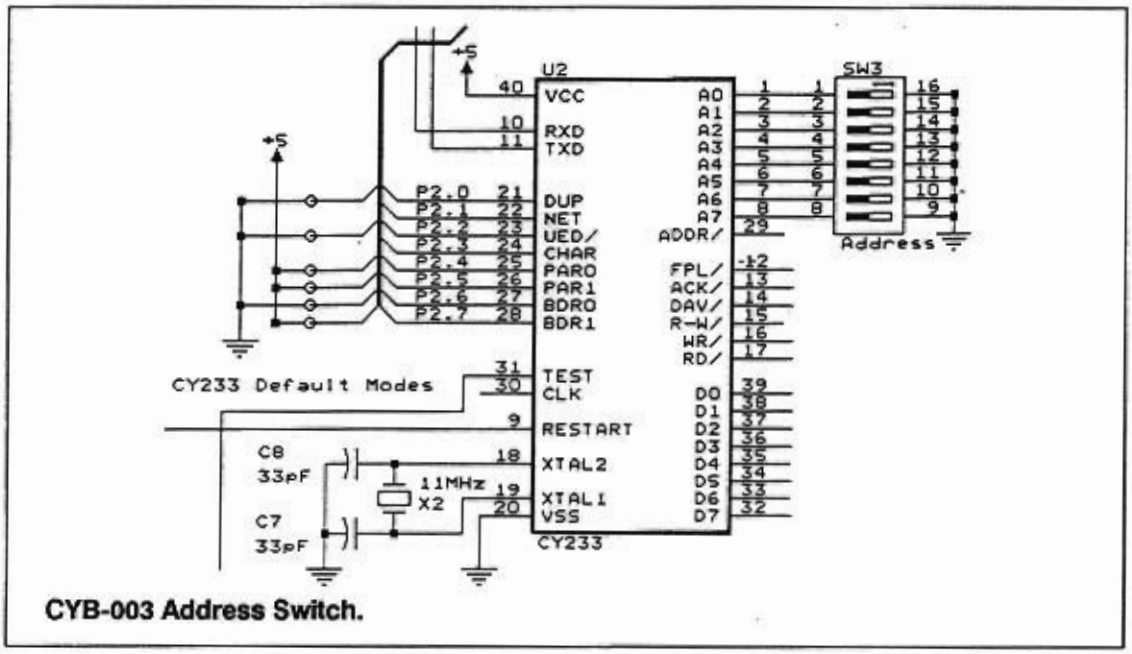
The serial driver/receiver pair from the MAX233 associated with TxD and RxD are hardwired to the RJ11 Serial Connector. The other driver/receiver pair is connected to a jumper block, and through this block to the RJ11 Serial Connector on the board. The W1 jumper block associated with the RJ11 connector makes it easier to match the functions of the pins to those required by the circuit. The board's received and transmitted data are connected to pin 2 and pin 3, respectively, of the RJ11 connector, and signal ground is connected to pin 7. CTS is transmitted on Pin 5, but CTS may be severed and the pin may be used for Software Reset via DB25 pin 20.

If serial communications will not be used, the following parts need NOT be installed on the CYB-003:

- ☐ J1 Serial RJ11 jack
- ☐ SW2 Chip select switch
- ☐ SW3 Address Switch
- ☐ U4 MAX233 Transmit/Receive Driver

Address Decoding

The circuit is designed to function with the CY233 in the decoded address mode, where only one address line may be low on each CYB- 003 board. This limits the possible addresses to eight.



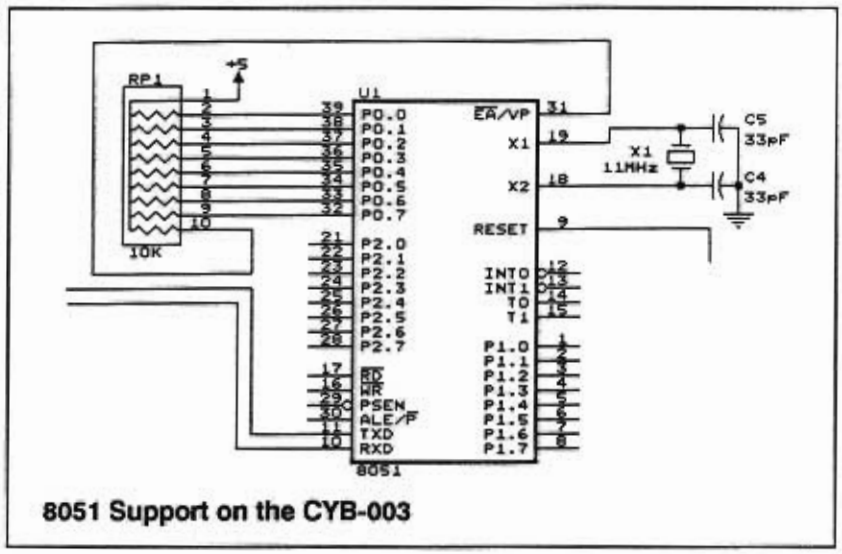
CYB-003 Address Switch.

When larger networks are required, custom address decoding logic may be added. In the encoded address mode, all eight address lines are used to select one of 255 possible values, and the user supplied circuitry must compare these values for a desired address. With custom address decoding logic, up to 255 CYB-003 boards could be connected into one network. See the CY233 manual for specific information on encoded addressing.

The combination of a CY233 and CY325 on the CYB-003 board makes a very powerful distributed system. The CY233 provides the serial communications link and network protocol that allows the system to be tied together, while the CY325 provides the local intelligence and specific control functions required by the LCD application. One serial port on the host computer is all that is required to control the system or a whole network of systems.

The 8051 Socket

The 8051 socket of the CYB-003 board is provided to allow the user to design custom circuitry for stand-alone operation of the Board. Prewired connections include the power supply pins, crystal circuits, reset circuits, and pull-up resistors on Port 0.



8051 Support on the CYB-003

Using the CYB-003 as an 8051 Development Board

Several of the previously described sections may be combined in a different manner when the CYB-003 is used as an 8051 development board. There are two possible choices for the location of the 8051 chip. First, you can use the 8051 socket, as described above. This represents a minimal 8051 design, connecting the power, crystal, reset, and serial port signals. In addition, pull-up resistors are provided for port 0. No other I/O port connections are made, so the entire device is available for custom applications, with additional circuitry added in the wire wrap area adjacent to the 8051 socket.

The second option for 8051 development is to place the 8051 into the CY233 socket, which connects many of the I/O signals to other circuits on the board. This design includes a parallel interface to the CY325, including data bus interconnections and handshake control signals. In addition, the CY325 soft key inputs can be controlled from the 8051 port 2, through jumper W4, and port 1 connects to switch SW3.

Note that any member of the 8051 family may be used in these applications, including the 8751, 8031, and 8051. In these cases, the CYB-003 board represents a convenient external hardware environment for 8051 development.

Switch SW2 is very important to the 8051 design, if the serial interface is being used. This switch provides the connections between the CY233 or 8051 socket sites, and the RS-232 driver and receiver signals of the MAX233 device. When set in the proper position, this switch allows the 8051 to directly send and receive serial data through RJ11 connector J1.

Other portions of the CYB-003 board, including the CY325 and the address switches, may not be required by a basic 8051 design. However, they may be useful to some applications. For example, the CY325 could be used when an 8051 based design requires visible output of data or messages on a display. These portions of the board may be used as required for the specific 8051 based design.

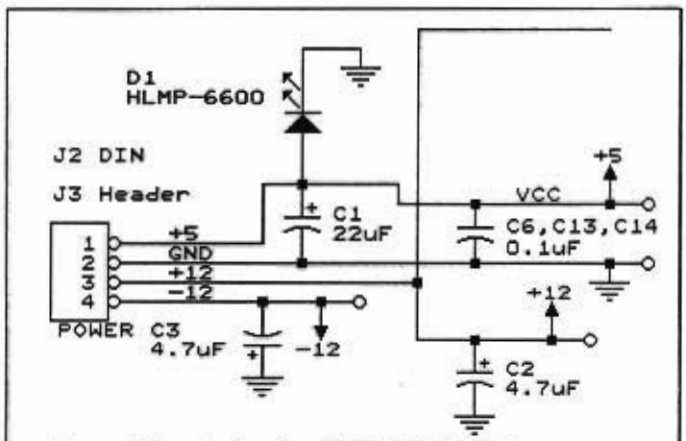
Power And I/O Options

The final section of the CYB-003 board shows the power supply connections and possible I/O options. The RS-232 voltage levels are generated on-board by the MAX233, so only +5 volts is required for the board. An indicator LED is provided on the 5 volt supply. It will be on when power is applied to the board.

The RS-232 level signals are applied at J1, an RJ11 connector. Jumper area W1 controls the connection of some of the signals between the RJ11 socket and the CYB-003 internal signals, allowing the signals to match custom designs.

The standard power connector supplied with the board is a 180° 5-pin DIN connector at J2. The Alternate power connection is at J3, using a four pin, polarized connector.

The LCD power (normally -10v to -15v) should be applied to the -12 pin of the power connector. Any other voltage required by the user application may use the extra power input pin, designated +12. The supplies are avaliable at the top left of the wire wrap area.



Power Signals for the CYB-003 Board.

The wire wrap area of the board could then be used to implement any special circuits required, including LCD backlighting and power circuits, address decoding, or custom applications logic.

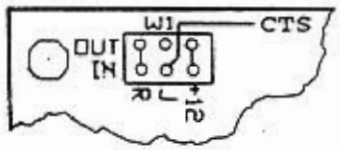
Using the CYB-003 Connectors, Switches, and Jumpers

How to Use the Serial Jacks

The RJ11 telephone style jack accepts a four- to six-wire telephone cable. The pin numbers on the RJ11 serial Jack1 (IN) and Jack2 (OUT) at location J1 are labeled to correspond with the pin numbers of an IBM PC compatible DB25 connector. The signals TxD, RxD, GND, and CTS are hardwired at J1 IN and may be brought off the board to a standard DB25 (or DB9) connector. Only these four signals should be connected to a computer. Two additional signals labeled + and - are hardwired to +5 volts and -12 volts and should not be connected to the host computer. These two signals are used in multi-board networks.

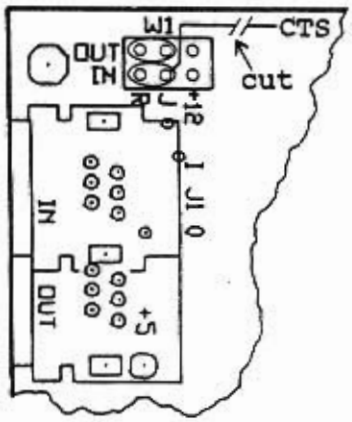
Note that the function of RxD is to receive data into the CYB-003 board, while TxD transmits data from the board.

Clear to Send



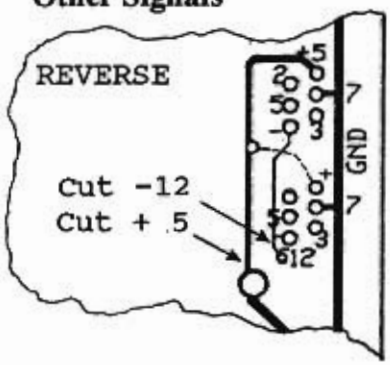
CTS, an output from the board, is only used in a direct serial connection to the CY325, and is hardwired to only Jack1 (IN).

Software Reset



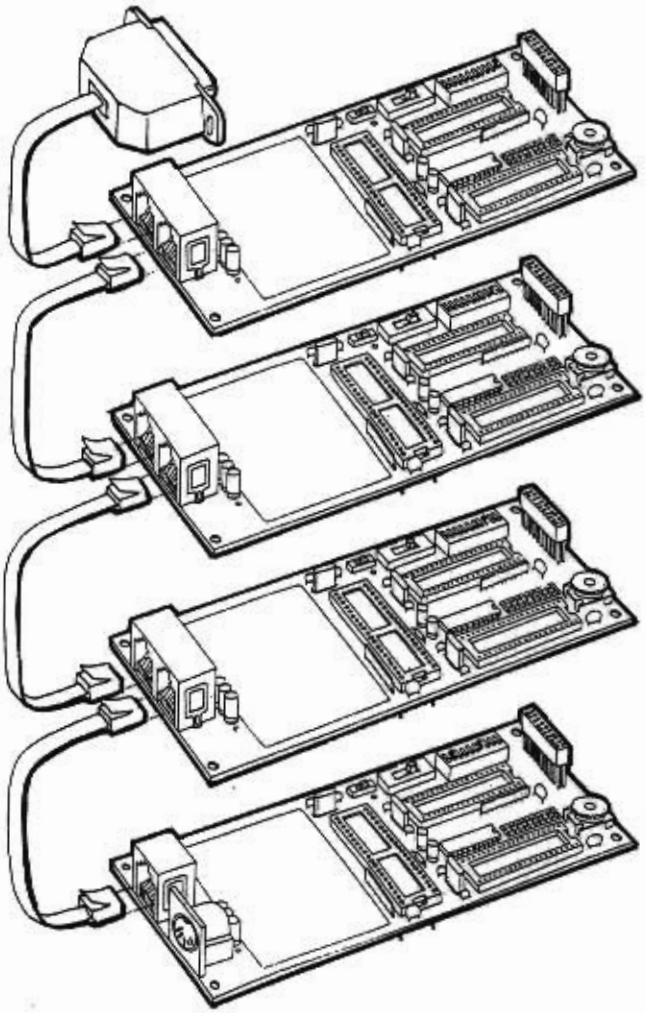
If the serial connection is made through the CY233, which then communicates in parallel with the CY325, then the CTS signal is not used. It may be more desirable to use the RJ11 to transmit a software reset signal. In this case, instead of using DB25 pin 5, the DB25 pin 20 (DTR) may be connected to the RJ11. The CTS line should be severed at W1 and the Reset lines of W1 should be jumpered to the center posts of W1, which transmit the signals to the RJ11 Jack1 and Jack2. Be sure to cut CTS before making this connection, as CTS is an output and DB25 pin 20 is an input to the board.

Other Signals



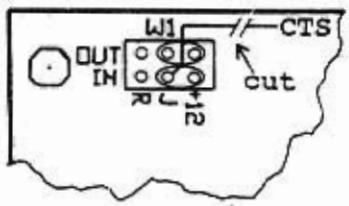
The +5v and -12v signals on the RJ11 can be easily cut from the RJ11 on the back of the board, without affecting the rest of the board circuitry. These pins may then be used to transmit any other signals over a 6-wire cable.

Daisy Chaining CYB003s - Networks



The CYB-003 can be used in a serial network. Connections between boards can be made via 4-wire cables or 6-wire cables with telephone type jacks. The 6-wire cables can carry both data signals and power as shown in the figure.

The RJ11 jack on the board is capable of delivering up to 6 signals. The 4 inner signals transmit TxD, RxD, Gnd, and CTS, and the 2 outer signals transmit +5v and -12v. When connecting several boards in a serial network, it may be advantageous to transmit the power signals through the network, with power originating on the terminating board.



If +12v (or any other signal) is also needed on the network, it may be sent through the RJ11 by usurping pin 5 (by severing CTS on W1) and then jumpering +12v from W1 to the center posts. Remember not to connect these power signals to the host computer.

The Serial Cable

The double RJ11 is designed for use with data-type cables, where pin 1 polarity is maintained. Cybernetic Micro Systems provides this style of cable with its products. When using the single RJ11, the data-type cable is recommended, but a standard phone cable will work as long as the proper adjustments are made within the DB25 connector.

Standard Phone Cables:

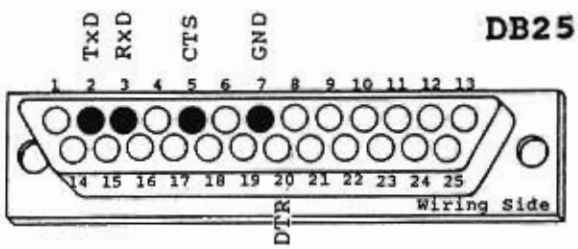
Data Cables Maintain Pin 1 Polarity:

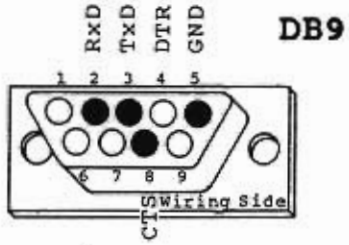
DB25 to RJ11 Connector

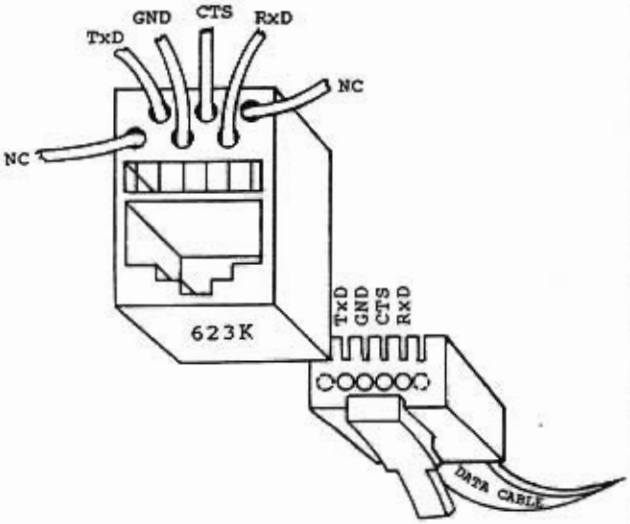
Making your own connector: The RJ11 insert on the RJ11-to-DB25 connector is often designated 623K. Looking at the side of the 623 with the wires, you will see that there are two rows of wires offset from each other. The wire colors and the direction of the offset vary with brands. In making a 4-wire connection, select the inner four wires and line them up left to right as follows:

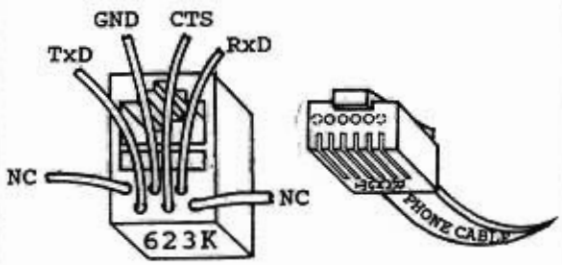
either  or 

Lay out the components to be connected, as shown below. When using a data-type cable, the 623 should be positioned so that the locking key for the cable is toward you and facing down. The wires should be facing up and should be on the end away from you. The wiring side of the DB connector should be facing up, with the computer side of the DB facing down. Connect the 4 signals as shown in the figure. If using the 2 extra outside lines for custom circuitry, connect them last. Note that the pin labels refer to the signals as seen from the IBM PC.



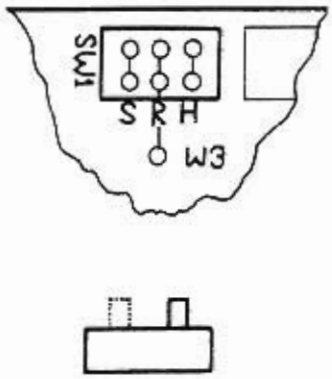






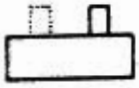
If using a standard phone cable instead of a data-type cable, then turn the 623K 180° so that the wires are toward you and the locking key is away from you. This reverses the phone cable wires, while the left to right 623 wires will still be labeled TxD, GND, CTS, and RxD.

The Reset Switch - SW1



The reset switch (SW1) connects all the U1, U2, and U3 reset lines together at the center pole of the switch. The switch provided with the CYB-003 kit may be either SPDT or DPDT, hence the double row of holes to accommodate either. The preferred action is Break-before-Make, but Make-before-Break is not harmful here. A spare access to the combined reset lines is provided at a single post at jumper W3. Normally, the capacitor and resistor provide an automatic reset to the CY325 when power is applied to the board. However, if a reset switch or other reset logic is required, it may be placed in the wire wrap area and connected to jumper W3.

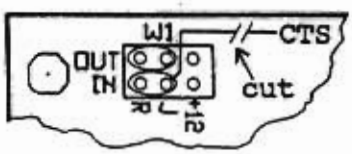
Hardware Reset

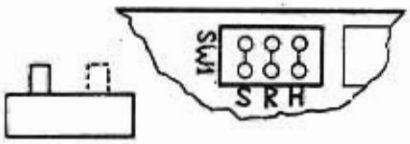


The switch would normally be used in the hardware (H) reset position. This causes the board to reset at power-on.

Software Reset

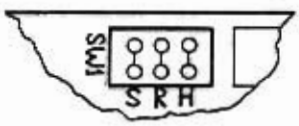
To use the switch in the software (S) reset position, W1 must first be properly wired. CTS must be severed from the center post of W1, and the R signal on W1 must be jumpered to the center post. The reset may then be sent from the host computer using DB25 pin 20 (DTR) on the RJ11.

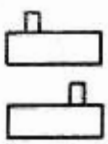




Local Reset

If not using the software reset feature, the reset switch may be utilized for both hardware and local reset positions. Since the software reset signal originates at W1 (R) and is transmitted through the MAX233 voltage level converter/inverter, the MAX233 provides a +5v level at pole S on switch SW1 when the reset signal at W1 (R) is left unconnected. The switch may be momentarily placed in the local (S) reset position. Do not leave it there! It won't harm the system, but if forgotten, the system will not run. Return it to the H position immediately after local reset.



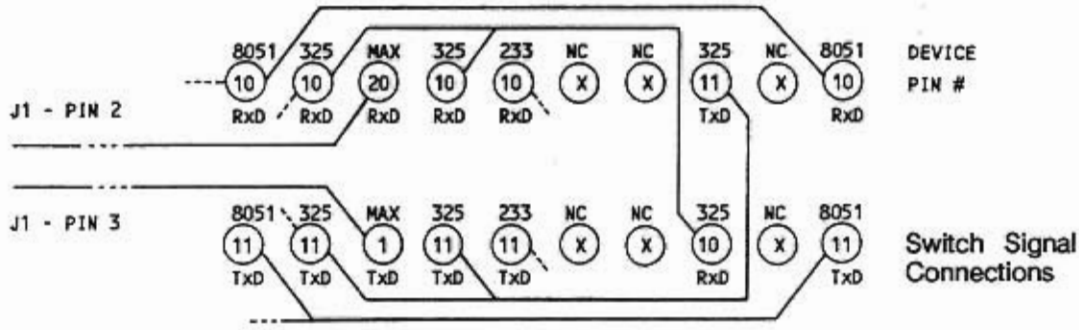


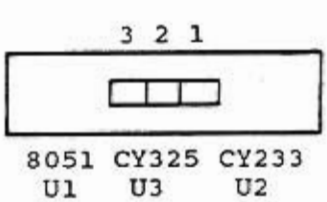
Local (Momentary)

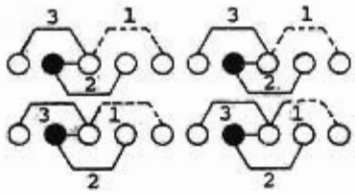
Hardware (Normal)

Chip Select Switch - SW2

The chip select switch at location SW2 directs serial communications from the RJ11 serial jack, through the MAX233, to either the CY233, CY325, or 8051. This complicated switching is provided by a 4P3T switch. A standard 4P3T switch has a pin pattern that provides polarity. This board has been designed to accept the switch in either polarity, allowing the use of various vertical or right angle switches, if desired. Although Break- before-Make action is preferred, Make-before-Break has no harmful effect. The switch positions provide the following connections:



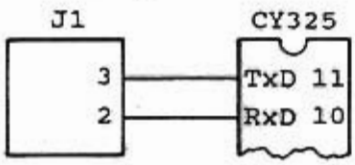




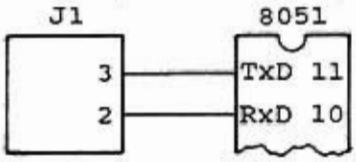
Switch Action

Position 1 connects the CY233 serial signals to the RJ11 and also connects the 8051 and CY325 serial lines to each other:

Position 2 connects the CY325 serial signals to the RJ11:

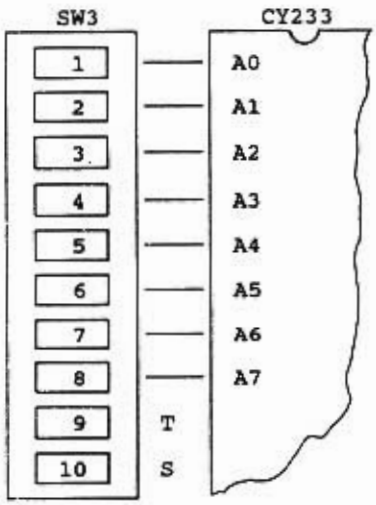


Position 3 connects the 8051 serial signals to the RJ11:



The Address Switches - SW3

Address Switch



Address switch (SW3) is a 10 position DIP switch (SPST, Make or Break) package. The first eight positions are connected to the CY233 address lines A0-A7, and provide one-of-eight addressing for use in network configurations. Closing only one switch selects the address for the board. If the address mode is not used, the eight switches are ignored and become available to the user for any purpose.

More than eight boards may be networked using encoded addressing in the wirewrap area. See the CY233 manual for details.

Turnaround Switch

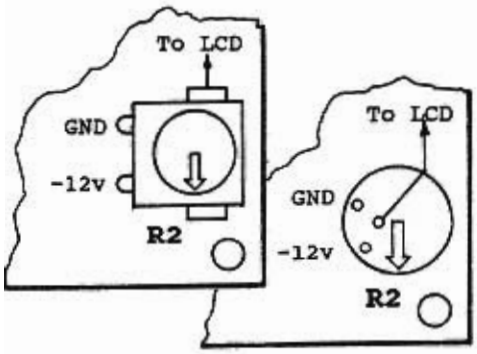
Switch position 9, or T, is used as a TxD turnaround switch when only a single RJ11 Jack1 is used, as in the terminating board of a network. This switch is normally closed, unless the board is used in a network of boards.

Spare Switch

The tenth switch, labeled "S", is not used. It is available to the user for any type of SPST application. To use the switch for Display size selection, connect the CY325 Nx64 pin 14 to one side of the switch and ground the opposite side. An open switch (High) selects displays up to 64 pixels high, while a closed switch (Low) selects larger displays up to 128 pixels high.

No Switch

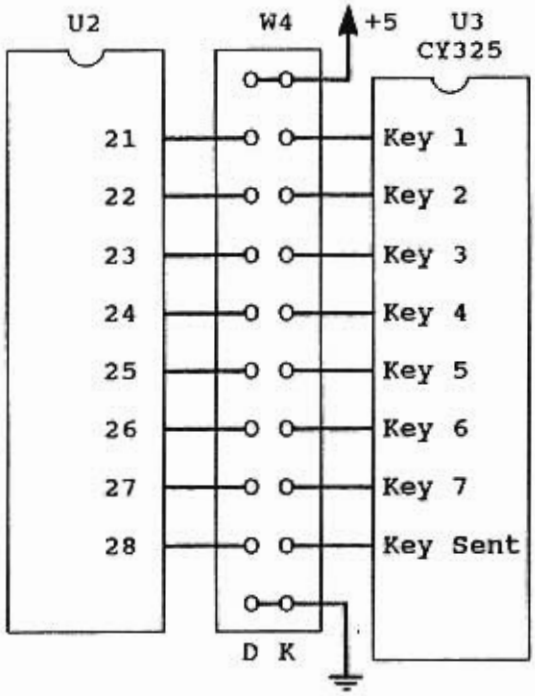
If Network addressing is not used, it may be desirable to omit the DIP switch and use wirewrap posts for custom applications. You will note an additional row of holes in SW3 to accommodate a double row of wire wrap posts. If the switch is omitted, be sure to connect, or close, the TxD Turnaround signal at position 9 if serial communications are to be used.



Trimpot

The Trimmer Potentiometer at R2 provides variable resistance from 0 ohms to 25K ohms, for adjusting the contrast and viewing angle on the LCD. When first using the LCD, set the trimpot pointer to 20K ohms as shown in the figure, and then adjust as needed. Setting the trimpot in the opposite direction with low resistance results in a blank LCD screen and may mislead the user into believing the board is not functioning.

Soft Keys

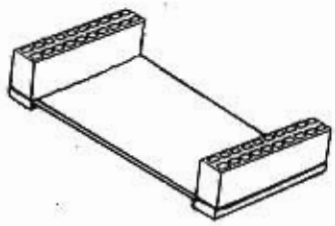


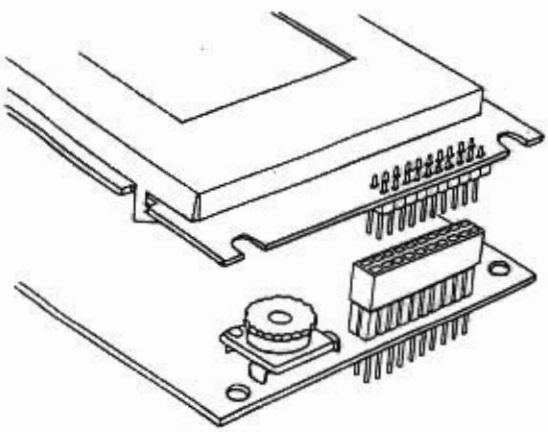
A single row "K" of wirewrap pads at W4 provides access to the eight CY325 key control lines, as well as to +5v and GND. These lines may be brought out to a set of 6 softkeys, a 4x4 key matrix, a 7-bit ASCII keyboard, or to digital signals from an A-D converter. Data lines from U2 pins 21-28 are brought to the adjacent row "D" on W4. When a CY233 is not used, the signals from U2 may be used to drive the key lines of the CY325, if desired.

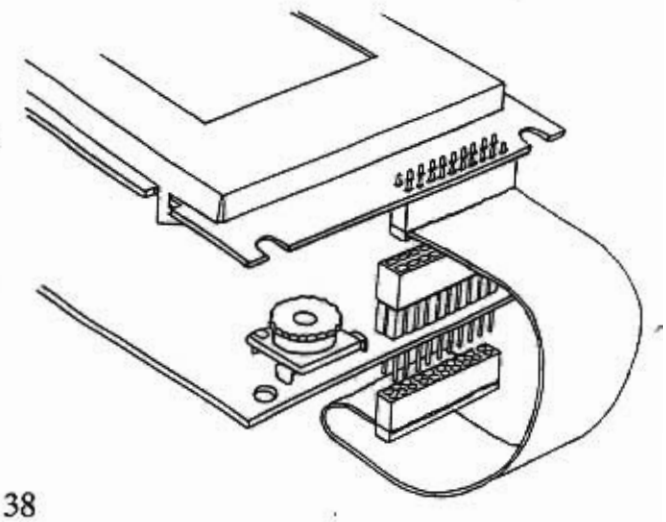
The Key Scan Enable pin 13 is left floating, or disabled, on the CYB-003 and is brought to a jumper pad on the back of the board at U3. To use the six soft keys, the Scan Enable pin 13 should be tied low, or should be forced low by the user circuit.

LCD Header

The 240 x 64 pixel LCD stacks directly onto the CYB-003. The other recommended displays will also plug directly into the LCD header socket, but they may be offset in various directions. A 20-wire ribbon cable is recommended for the odd size LCDs and for prototyping applications where constant access to the prototyping board is necessary. For proper polarity, the ribbon cable should be connected to the back of the LCD and to the header extension on the back of the CYB-003, as shown in the figure. When using displays larger than 64 pixels high, be sure to tie the CY325 Nx64 pin 14 low.



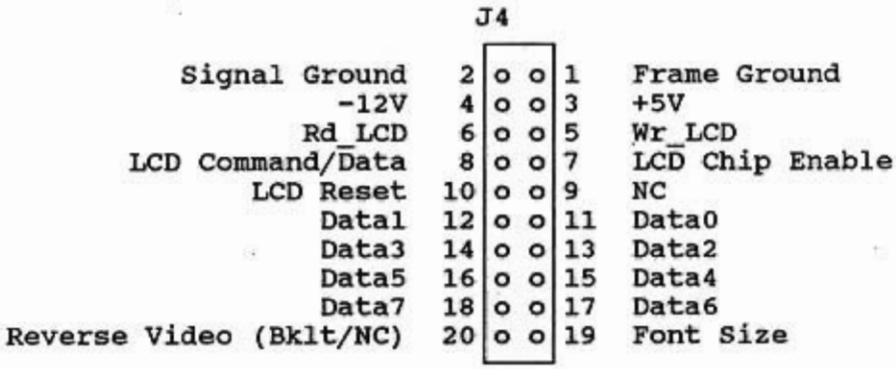




Signals Passed to the LCD

The CY325 controls all aspects of the LCD through the LCD's pixel driver chip, the T6963C. All of the LCD controls are passed to this device through the 2x10 header at location J4. The functions of the 20 pin header remain constant through most of the compatible displays. There are a few displays (see back cover) that do not maintain the pinout shown below, although they still utilize the T6963C driver. To use those displays, a special cable or header would need to be wired to bring the appropriate signals to the display.

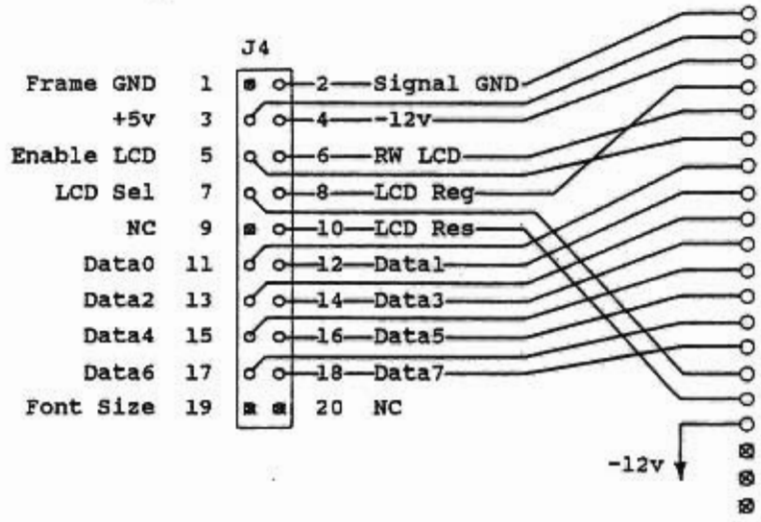
The CYB-003 J4 Connector Passes the Following Signals:



Using the CY327 on the CYB-003

The CY327 controls all aspects of the LCD through the LCD's HD61830 pixel driver chip. The CY327 has a pinout identical to the CY325, and may be used on the CYB-003. However, the LCD header is not properly configured for displays that use the HD61830. Below is a diagram for rewiring a 1x20 header, for the most popular display, in the wirewrap area. Check your LCD documentation for the proper signal locations for your particular display.

Wirewrap Side of CYB-003 - J4 Header



1 x 20 LCD Header

Pin No.	Symbol	Function
1	V_{SS}	Ground
2	V_{CC}	+5VDC
3	V_0	Operating voltage for LC drivers
4	RS	Register Select
5	R/W	Read/Write
6	E	Enable
7	DB0	Data Bus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	$\overline{CS}$	Chip Select
16	RES	Reset
17	V_{EE}	Power supply for LC drivers*
18	N.C	No Connection
19	N.C	No Connection
20	N.C	No Connection

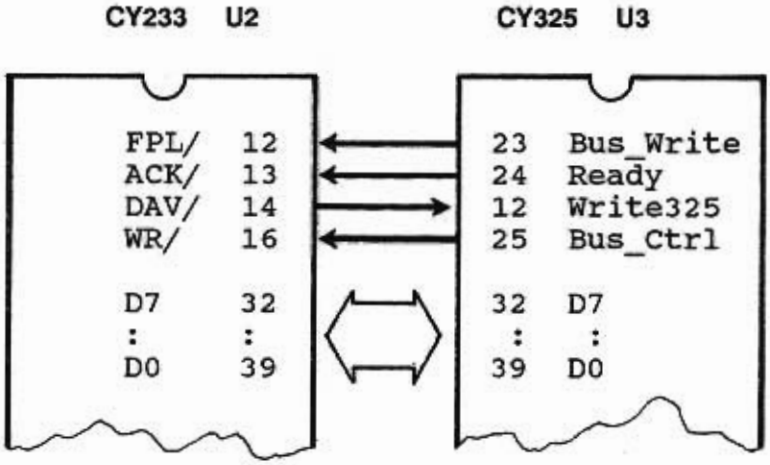
Selecting LCD Size

The vertical size of the LCD is selected by pin 14 on the CY325. When left floating, as it is on the CYB-003, or when tied high, 64 pixel LCDs, such as the 711A, are selected. When tied low, the CY325 will treat the display as having 128 vertical pixels, as with the 1301 display.

Horizontal character size is selected on pin 22. If the pin is high then 6x8 font is selected, if low, 8x8 is selected. This pin is left floating on the CYB-003 to allow software selection of the font through the CY325 Mode command. Alternatively, the pin could be externally wired high or low to ignore the software selection.

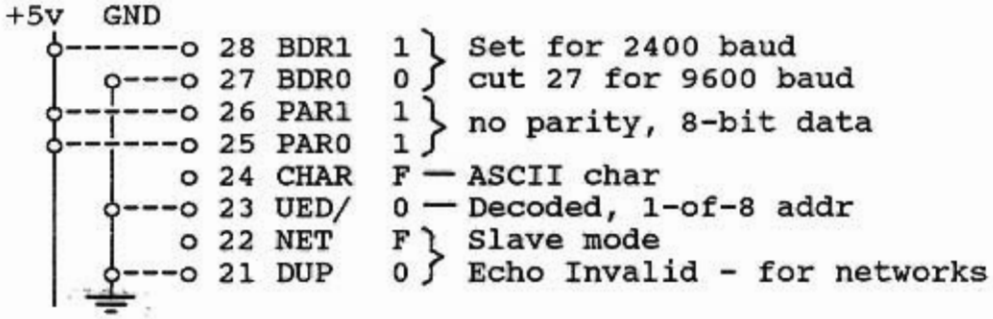
The CY325 Parallel Interface

The parallel interface is hardwired between the CY325 and the CY233. An 8051 may be used in the U2 socket to address the CY325 in parallel, as long as the same signals are used for bus protocol as are wired into the CYB-003. To use the CY325 parallel bus with another processor, the following signals may be picked up from the U2 socket to be wired into the wire wrap application circuit.



CY233 Network Communications

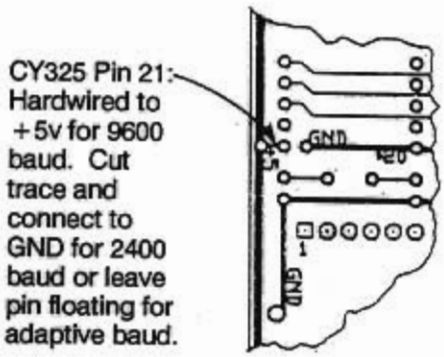
The CY233 serial communications parameters are hardwired on the CYB-003 to select 2400 baud, no parity, 8-bit data, ASCII characters, decoded 1-of-8 addressing, slave mode, and echo invalid. If any other baud rate or protocols are needed for the system, these signals may be altered on the back of the CYB-003. Refer to the CY233 manual for details on different parameters.



U2 - Back of CYB-003

CY325 Mode Control

The baud rate on pin 21 is hardwired to +5v, selecting 9600 baud. The pin should be tied low to select 2400 baud or left floating to select self adaptive mode. When the Self Adaptive mode is used, two carriage return characters must be sent to the CY325 before any other communication occurs. With the fixed rates, the CY325 is ready for messages when power is applied and the device has been properly reset. The CY325 accepts 8-bit serial data with no parity and one stop bit required.

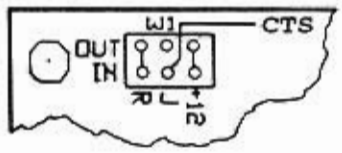


Jumper Functions

Various options on the CYB-003 circuit design are selected by connecting the appropriate jumper pads together. Each jumper group is indicated by a Wx jumper number, with individual jumper pads in each group designated by unique labels. Small wire wrap posts in a strip may be used with the CYB-003. These posts may be broken to the appropriate length and soldered into the jumper pads. Jumpers may then be connected by shorting plugs or wire wrap wires between the pads involved.

The following sections describe each jumper and discuss the possible connection options. All jumpers are also shown on the CYB-003 schematic.

W1 RJ-11 to RST or +12 Volts



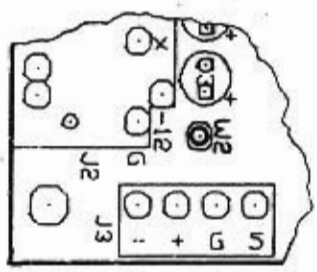
Jumper W1 is split into two parts, an input side and an output side. These jumpers are used for connecting optional signals between the RJ-11 serial jacks and the internal board circuits.

In order to use these options on the J1 IN side, you must cut the CTS signal so it is disconnected from both J1 IN and the middle post of W1. This is shown in the previous section, "How to Use the Serial Jacks", and should be referenced for more information.

One side of jumper W1 allows you to connect a host controlled software reset signal into the CYB-003. This signal is normally driven by the host's DTR signal, and allows the host computer to control the hardware reset of the CYB-003 board directly. This may be especially useful in a network of CYB-003 boards, where the one signal can reset the entire network into a known operating condition.

The other side of W1 allows you to optionally connect the +12 volt power supply to the RJ-11 jacks, for networking this supply among multiple boards. This supply is not required by the CYB- 003 circuits or the LCD, so it is not normally used. However, custom circuitry, implemented in the wire wrap area, may require this voltage, so the option to connect it across a network is provided. Note that connecting the +12 volt supply means not using the CTS or software reset option, since the supply voltage takes the place of these signals on the six pin RJ-11 based cable.

W2 Back Light Power or Reverse Video Pin

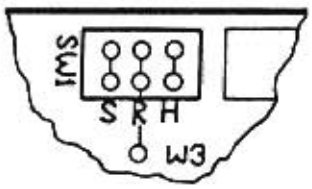


Jumper W2 is a single post, near the wire wrap area, that provides a signal between the CYB-003 and the LCD connector at pin 20. This pin is normally unused by most LCDs and may provide a reverse video selection on some LCDs, so we provide the connection as a mechanism for bringing an additional power or signal to the LCD.

For Backlighting, this post may be used with back lit versions of the displays, that require a separate back light voltage. You may add a special DC-to-DC power converter to the wire wrap area, to implement the required back light voltage. This voltage may then be connected to the display through jumper W2. Note that this will also require the connection of pin 20 of the LCD header to the back light power tab on the display.

For Reverse Video, you may tie the signal high or low to select the proper video display, or drive it high or low from your application.

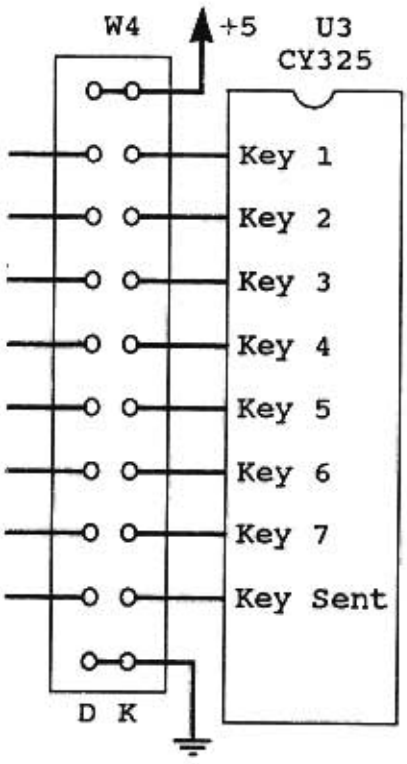
W3 Reset Signals



Jumper W3 is a single post connected to the Reset signals of the CY325, CY233, and 8051 socket. If you wish to add custom circuitry to control the reset signals, jumper W3 provides access to them. Otherwise, jumper W3 may be left unused.

Normally, the device reset is controlled by the hardware on the CYB-003 board, as selected through the "H" setting of the reset switch. It may also be controlled through the serial interface and jumper W1, as discussed above, by selecting the "S" setting of the reset switch.

W4 Soft Key Access



Jumper W4 is a double row of 20 wirewrap pads. One row provides access to the 8 CY325 key control lines, with 5 volt and ground power connections as well. This would allow you to add an external keyboard or other signal function to these lines, as discussed earlier in the section "Soft Keys".

The second row of wirewrap pads connects to the CY233 Port 2 socket, providing a mechanism for interconnecting a device in the CY233 socket with the CY325 key control signals. One example of such a connection is the 8051 based demonstration software, which uses this connection to drive the CY325 key control signals in the digital waveform display mode.

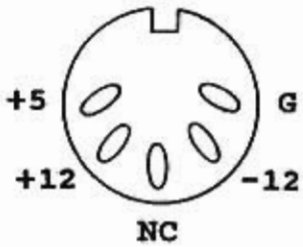
By connecting the first and second rows together, the key control signals are made available at the CY233 socket. Note that the normal CY233 mode selection signals share funtions on these lines, so the CY233 traces connected to 5 volts and ground must be cut if they are to be used for CY325 key control signals. (See these traces described previously in this section under CY233 Network Communications.)

Power Connector Pinouts

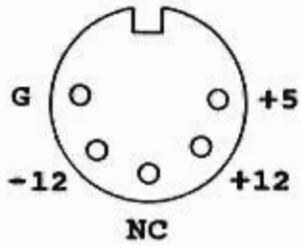
J2 The DIN Power Connector

The connector at J2 is the primary power supply connector for the board. The 5-pin 180° 1/2 inch diameter DIN receptacle is compatible with the Elpac WM063 series of wall mount regulated power supplies. Power supplies with incompatible connectors may be used by removing the supply's output connector and replacing it with a custom wired DIN plug on the power supply output lines, using the figures below for reference. Alternatively, the supplies may be brought to alternate power connector J3, to be custom wired as indicated later under the "Power Header" description.

The Board Receptacle



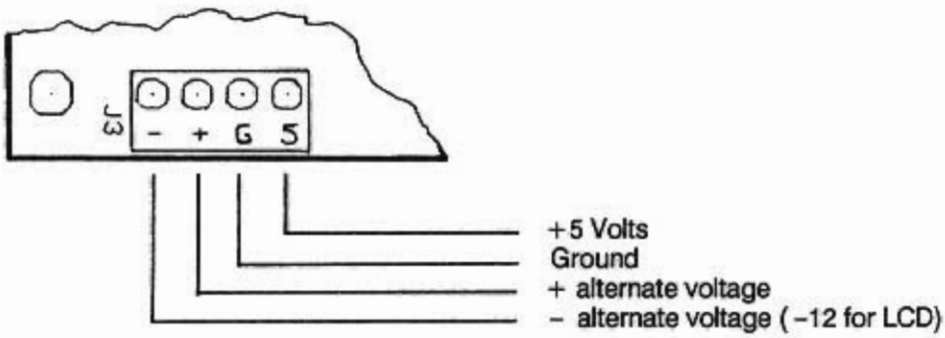
The Power Supply Plug



J3 The Power Header

Connector J2 is the primary power connector to the CYB-003. Alternatively, connector J3 may be used to bring power to the CYB-003 circuits. It is a standard 4 pin header, with pins on 0.156" centers. The mating connector is also supplied with the CYB-003 standard board. Pin 1, the +5 volt input, is physically closest to the wirewrap area while pin 4, the negative voltage input, is closest to the J1 connector side of the CYB003 Board.

J3 Power Connector

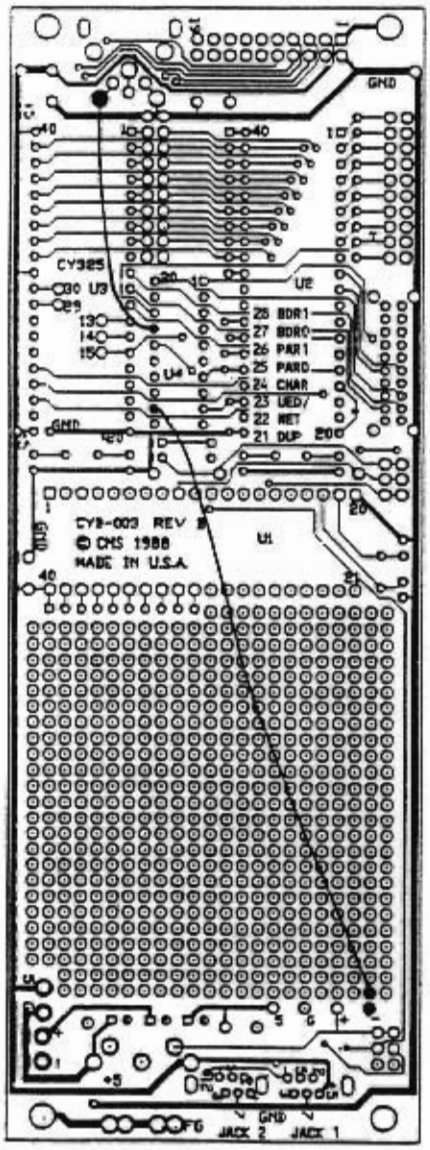


Note that the standard CYB-003 board only requires the +5 volt supply, while the LCD requires –10 to –15 volts, so pin 3 of the power connector may be unused. These supply inputs are provided to support custom circuits, as required by the application.

Alternate LCD Contrast Power

The CYB-003 provides a power connection for bringing the negative contrast voltage onto the board. This option is provided because different displays have different voltage and current requirements. However, the Max233 on the CYB-003 can provide a –9.5 volt source, which may be adequate for the contrast voltage on smaller LCDs, such as the 240x64 pixel display recommended for use with this kit. Larger displays which require larger supplies should not use the Max233 as a contrast voltage source. Below is the connection scheme for utilizing the Max233 voltage source. Note that you should not connect an external negative voltage into the circuit once the Max233 is connected, as you could damage the Max233.

BACK SIDE OF CYB-003



Permanent Connection

Connect the outermost pin of the contrast dial to pin 17 of the Max233.

Use either option to utilize on-board voltage for LCD contrast.

Tempory Connection

Add 2 wirewrap posts to the –V pad in the wirewrap area.

Connect the Max233 pin 12 to the uncommitted post near the –V pad.

Use a shorting plug or wirewrap wire to connect the Max233 wire to the –V circuit.

Remove Shorting plug to use external negative voltage instead of on-board voltage. Do NOT connect external source to onboard source.

Final Assembly And Checkout

This section will discuss the completion of the CYB-003 board and initial operation. The remaining tasks are concerned mainly with connections between the board and the rest of the system, whether it be a terminal or computer. The user must decide, based on the specific requirements, which jumpers will be used. The appropriate jumper pads for the various options must then be connected together.

☐ Install jumpers as required.

Next, cables must be made for any applications circuits, connecting the data interface, and the power supplies. See the listing of connector pinouts for the appropriate signal, those lines which are not used may be left disconnected. They do not require any special terminations.

☐ Construct connection cables as required.

Before the board is connected to the power supply, perform a careful visual inspection to insure that all parts have been placed in the right locations and that LEDs, electrolytic capacitors, and ICs observe the proper polarities. This is very important for proper operation of the board.

☐ Perform visual inspection for correct part placement.

☐ Install board standoffs at the four corners.

☐ Connect the +5 volt logic supply and turn it on.

Now, use a VOM to see that +5 volts can be measured at various points on the board. In particular, +5 volts should be across C1, and at the power supply pins of all the ICs. No part on the board should be hot from applications of power.

☐ Check for +5 volts to various components on board.

☐ Turn off power supply.

NOTE: NEVER LEAVE THE POWER SUPPLIES ON WHEN CHANGING CONNECTIONS OR ADDING PARTS TO THE BOARD.

When the board checks out satisfactorily, the CY325 may be installed into the 40 pin socket at location U3 and the CY233 may be installed at location U2. Be sure to observe proper polarity when installing these parts. The notch on the pin 1 side should face the LCD connector. Install the part by starting the pins on one side into the socket, without pushing them completely into the socket. Then do the same on the other side. Once all the pins have been started, gently push the entire part into the socket until the pins are well seated. Be sure that none of the pins are bent or go under the part. They should all fit smoothly into the socket.

- ☐ Insert a CY325 into the socket at location U3.
- ☐ Insert the optional CY233 into the socket at location U2.
- ☐ Connect the serial cable to J1.
- ☐ Turn on power.

The capacitors on the Restart line of the CY325 should provide an automatic reset on power up.

CYB-003 Debugging

The following section explains a check-out procedure for the CYB- 003 board.

In case of difficulty with one of the steps above, be sure that the parts have been installed correctly (especially those with fixed polarity), jumpers are connected properly, and cables are wired according to the connector pinouts listed.

CY325 Tests

If a sample IBM-PC compatible Basic language program disk has been supplied with the board, then running this program is a good test of the serial interface to the CY325.

- ☐ Set the reset switch to the Hardware (H) reset position.
- ☐ Close switch 9 (T) on the Address Switch SW3.
- ☐ Set the Chip select switch to the center position to select the CY325 for communications.
- ☐ Set the trimpot to 20K ohms, so that the pointer points to the "R2" designation on the CYB-003 board.
- ☐ Attach the LCD at J4 and check the polarity if using a 20- wire ribbon cable.
- ☐ Check that the DB25 connections to pins 2,3,5,7 match the RJ11 pinouts.
- ☐ Run the demo program.

CY233 Tests

This check-out of the CYB-003 board will require at least a serial terminal. A computer with a terminal emulator program will also work well. The only requirements are the ability to control transmitted characters and the ability to display received characters. (A BASIC language driver that performs this function on an IBM-PC class computer is provided in the CY233 Users Manual.)

We will assume this CYB-003 board is set for address 01 in describing the following tests. If you use a different address, substitute your selected address for that shown. When an invalid address is needed, be sure to use an address different from the one(s) selected for your board.

- ☐ Set the CY233 for ASCII Character mode and Echo Invalid. Choose parity, baud rate, and other functions to match those of your serial test system.

- ☐ The default settings of the CYB-003 board provide 2400 baud, 8 data bits, no parity, ASCII Character mode, decoded addressing, and Echo Invalid. Try to set your system to match these selections. Otherwise, you must cut some of the traces on the CY233 mode selection signals.

- ☐ Connect your test terminal to J1, the serial input connector. Be sure switch 9 is closed, for bidirectional communications through the single RJ-11 jack.

- ☐ Reset the CY233 by cycling the power supply or touching the Restart Post at W3 to +5 volts.

- ☐ Send an invalid message to the CY233:
  W 03 Test <CR>

  Spaces are shown for clarity, but should not be included with the message, so you actually send: W03Test <CR> where "<CR>" is the carriage return character.

- ☐ The CY233 should echo back:
  W03Test <CR>

  The echo will start after the W command and 03 address have been received. If the echo is correct, the CY233 is functioning, with baud rates, parity, etc. matching those selected for your terminal.

  If no echo occurs, be sure to verify your operating mode selections, connections to J1, switch 9, etc.

- ☐ Now send to the CY233:
  W 01 To Local Device < CR >

- ☐ Since this is a valid message, the CY233 will not echo it, but after the W and 01 are received, each character in the data portion of the message will be passed in parallel to the CY325. Thus, the message "**To Local Device < CR >**" should be shown in the LCD.

- ☐ When the above sequence is successful, you may send any message to the CY325, commanding it to change display windows, plot a histograph, etc.

This completes the test of the CYB-003 board. The CY325 and CY233 have been checked, and messages have been passed between the CY233 and the CY325. If the above tests failed, be sure to carefully check the assembly of the board, all jumper connections, and all switch settings. Try to verify that serial data is getting to the RxD signal at J1 when your terminal is transmitting, and that the data reaches the CY233 at its RxD pin, pin 10. You can also check if the CY233 is alive, by seeing that the Restart line, pin 9, is low during normal operation, and that a 1.8 MHz clock is being generated from the CLK line, pin 30.

If the above tests do not resolve the problem, contact Cybernetic Micro Systems.

Displays Compatible with the CY325

MFG	DISPLAY	SIZE HxV	LCD VOLT	AVAILABLE TYPES BKLT	TRN	REF	ST	CY325	CY325B	Modify CYB003	Fonts n x 8	SIZE W x H mm View Area mm	Overall Size mm	SIZE approx. W x H inches View Area - in.	Overall Size - In.
AND	AND711A	240x64	-9v	●	●	●	●	●	●		6, 8	132x39	180x65	5.2 x 1.5	7.1 x 2.6
AND	AND1021	120x64	-9v	●	●	●	●	●	●		8	63x44	85x70	2.5 x 1.7	3.3 x 2.8
AND	AND1101	160x32	-9v			●		●	●		8	82x21	140x40	3.2 x 0.8	5.5 x 1.6
AND	AND1013	160x128	-9v	●	●	●	●	●			8	101x82	129x105	4 x 3.2	5.1 x 4.1
AND	AND1091	240x128	-9v			●		●			8	180x102	241x125	7.1 x 4	9.5 x 4.9
AND	AND682	160x64	-12v			●		●	●	●	8	75x32	125x50	3 x 1.3	4.9 x 2
AND	AND1301	240x128	-15v	●	●	●	●		●		6, 8	180x102	241x125	7.1 x 4	9.5 x 4.9
AND	AND1391	128x128	-15v	●		●	●		●		6, 8	62x62	85x100	2.4 x 2.4	3.3 x 3.9
AND	AND1781BST	240X64	-9v	●	●		●	●	●		6,8	131x38	180x70	5.2x1.8	7.1x2.8
AND	AND1741MST	240x128	-15v	●	●		●		●		6,8	126x70	170x105	4.9x2.8	6.7x4.1
AND	AND1361YST	128x48	-15v	●	●		●	●	●		6,8	94x36	133x61	3.7x1.4	5.2x2.4
TOSHIBA	TLX711A	240x64	-9v	●	●	●	●	●	●		6, 8	132x39	180x65	5.2 x 1.5	7.1 x 2.6
TOSHIBA	TLX1021	120x64	-9v	●	●	●	●	●	●		8	63x44	85x70	2.5 x 1.7	3.3 x 2.8
TOSHIBA	TLC1101	160x32	-9v			●		●	●		8	82x21	140x40	3.2 x 0.8	5.5 x 1.6
TOSHIBA	TLX1013	160x128	-9v	●	●	●	●	●			8	101x82	129x105	4 x 3.2	5.1 x 4.1
TOSHIBA	TLC1091	240x128	-9v			●		●			8	180x102	241x125	7.1 x 4	9.5 x 4.9
TOSHIBA	TLC682	160x64	-12v			●		●	●	●	8	75x32	125x50	3 x 1.3	4.9 x 2
TOSHIBA	TLX1301	240x128	-15v	●	●	●	●		●		6, 8	180x102	241x125	7.1 x 4	9.5 x 4.9
TOSHIBA	TLX1391	128x128	-15v	●		●	●		●		6, 8	62x62	85x100	2.4 x 2.4	3.3 x 3.9
TOSHIBA	TLX1781	240X64	-9v	●	●		●	●	●		6,8	131x38	180x70	5.2x1.8	7.1x2.8
TOSHIBA	TLX1741	240x128	-15v	●	●		●		●		6,8	126x70	170x105	4.9x2.8	6.7x4.1
TOSHIBA	TLX1361V	128x48	-15v	●	●		●	●	●		6,8	94x36	133x61	3.7x1.4	5.2x2.4
OPTREX	DMF5005	240x64	-12v	●	●	●	●	●	●		6, 8	132x39	180x65	5.2 x 1.5	7.1 x 2.6
OPTREX	DMF5001	160x128	-18v	●	●	●	●		●	●	8	101x82	129x102	4 x 3.2	5 x 4
OPTREX	DMF5002	112x128	-18v	●	●	●	●		●	●	8	77x66	110x91	3 x 2.6	4.3 x 3.6
OPTREX	DMF5003	160x128	-18v	●			●		●	●	8	101x82	152x104	4 x 3.2	5 x 4
SHARP	LM24014	240x64	-12v		●	●	●		●		6, 8	133x39	180x65	5.2 x 1.5	7.1 x 2.6
DENSITRON	LM264	240x64	+ 5v*	●	●		●		●	●	8				

* -12v internally generated

BKLT: On-board Backlight Panel
TRN: Transflective Display for use with backlighting
REF: Reflective Display
ST: Supertwist Display
Modify CYB003: Modify connections to LCD

LCD Suppliers

AND Displays:

AND711A	240x64
AND1021	120x64
AND1101	160x32
AND1013[a]	160x128
AND1091[a]	240x128
AND682[c]	160x64
AND1301[b]	240x128
AND1391[b]	128x128
AND1781	240x64
AND1741	240x128
AND1361	128x48

AND Corporation
770 Airport Blvd
Burlingame CA 94010 USA
Phone: (415) 347-9916
Fax: (415) 340-1670

TEKSERV AG
PO Box 570
CH-6301 Zug
SWITZERLAND
Phone: (42) 217-850
Fax: (42) 22-4171

SHARP Displays:

LM24014[b]	240x64

SHARP Electronics Corp
5700 NW Pacific Rim Blvd
Camas WA 98607 USA
Phone: (206) 834-2500
Fax: (206) 834-8903

SHARP Corporation - Japan
Electronic Components Grp
22-22,Nagaike-cho,Abeno-ku
Osaka 545 JAPAN
Phone: (06) 621-1221
Fax: (06) 621-8478

SHARP Electronics - Europe
Electronic Component Dept
Sonninstrasse 3
D-2000 Hamburg 1
FR GERMANY
Tel: (040) 23775-0
Fax: (40) 231480

OPTREX Displays:

DMF5005	240x64
DMF5001[bc]	160x128
DMF5002[bc]	112x128
DMF5003[bc]	160x128

OPTREX Corporation
3-14-9, Yishima, Bunkyo-ku
Tokyo 113 JAPAN
Phone: (03) 832-5357
Fax: (03) 832-5350

OPTREX America
44160 Plymouth Oaks Drive
Plymouth MI 48170 USA
Phone: (313) 416-8500
Fax: (313) 416-8502

SATORI Electric America Inc
Suite 101
3830 Del Amo Blvd
Torrance CA 90503 USA
Phone: (213) 214-1791
Fax: (213) 214-1721

OPTREX European Office
Kennedydamm 19
D-4000 Düsseldorf 30
FR GERMANY
Phone: +49 (0211) 4397-366 /217
Fax: +49 (0211) 4542-864

DENSITRON Displays:

LM264[bc]	240x64

DENSITRON Corp of America
2540 W 237th Street
Torrance CA 90505 USA
Phone: (213) 530-3530
Fax: (213) 534-8419
Telex: 910-349-6200

DENSITRON International
Unit 4 Airport Trading Estates
Biggin Hill, Westerham
Kent TN16 3BW UK
Phone: (0959) 76600
Fax: (0959) 71017

TOSHIBA Displays:

TLX711A	240x64
TLX1021	120x64
TLC1101	160x32
TLX1013[a]	160x128
TLC1091[a]	240x128
TLC682[c]	160x64
TLX1301[b]	240x128
TLX1391[b]	128x128
TLX1781	240x64
TLX1741	240x128
TLX1361	128x48

TOSHIBA Corporation
1-1, Shibaura 1-Chome,
Minato-ku,
Tokyo, 105 JAPAN
Phone: (03) 457-4511
Fax: (03) 456-1631, ... , 456-1633

TOSHIBA America - Main
1 Parkway North, Suite 500
Deerfield IL 60015 USA
Phone: (312) 945-1500
Fax: (312) 945-1044

TOSHIBA America - East
67 South Bedford Street
Burlington MA 01803 USA
Phone: (617) 272-4352
Fax: (617) 272-3089

TOSHIBA America - West
1220 Midas Way
Sunnyvale CA 94086 USA
Phone: (408) 737-9844
Fax: (408) 737-9905

TOSHIBA Electric - Europe
Hansaallee 181
D-4000 Düsseldorf 11
FR GERMANY
Phone: (0211) 5296-0
Fax: (0211) 5296-400

TOSHIBA Corp
14th Floor, Gold Fields, House
No. 1, Alfred Street, Sydney Cove,
Sydney NSW 2000 AUSTRALIA
Phone: 27-4301, ... , 27-4305
Fax: (2) 251-2969

[a] Display works only with CY325.
[b] Display works only with CY325B.
[c] CYB003 requires modifications to LCD connector to use Display.

01/17/94