CY308

LED Controller

CYB-308

Kit for LED and Prototyping Applications

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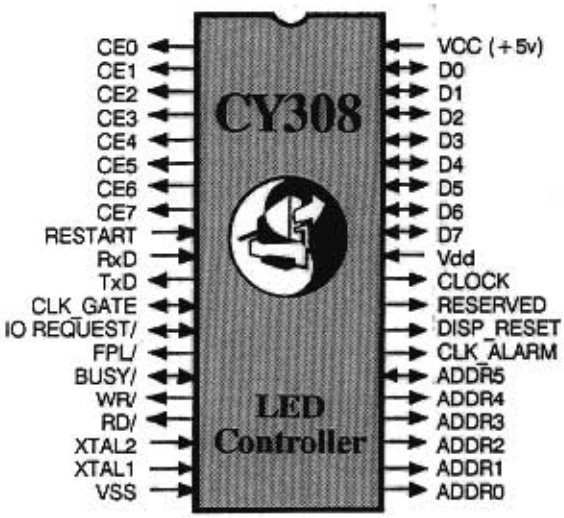
The CY308 Display Controller is a standard 5 volt 40 pin CMOS LSI device designed to control multiple intelligent LED based display modules. These modules contain ASCII encoded character fonts, with 5 by 7 dot matrix or 17 segment character displays, plus control registers for functions such as blinking and display intensity. Each module can contain from one to eight characters, with four and eight character sizes being the most popular. The CY308 will directly drive eight such modules (up to 64 characters), with no external logic, and it can drive up to 256 such modules with external address decoding and module selection. The CY308 allows you to use these modules as an integrated display, without worrying about addressing each one or having words flow across multiple modules. It provides the ability to write to individual character locations, or to write a string of characters, with automatic display update, blanking, and rewriting as selectable options. User programmable address selection functions allow the CY308 to control most intelligent display modules available. Also, access to the control registers of the modules allows you to implement special display functions, such as blinking or custom fonts, without additional hardware or software requirements over those needed to operate the basic display functions.

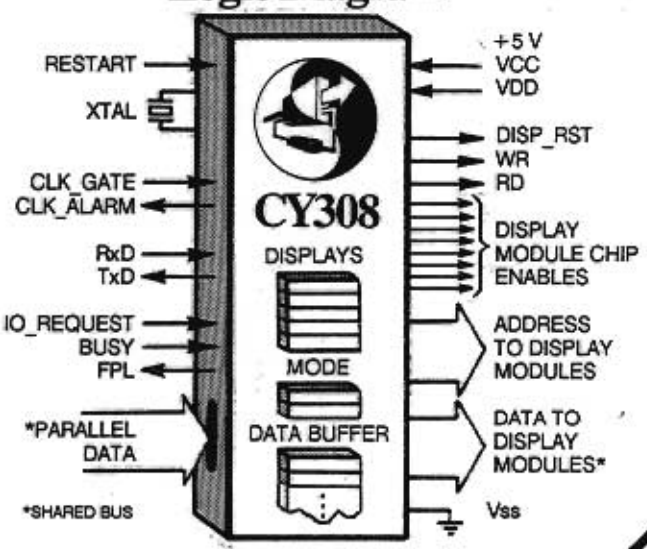
Standard Features

- CMOS, 5 volt, 40 pin LSI device
- ASCII decimal, Hex, and Binary data formats
- Handles most 1 to 8 char intelligent displays
- Decoded mode supports 8 modules
- Encoded mode supports up to 256 modules with only external address decoding and CS
- Directly access display features and registers
- Write to display sequentially or at specified positions
- Internal 56 character buffer for scrolling
- Time of day, elapsed time, and count down timer
- Serial or Parallel interface with simple handshake
- User selectable operating modes

Pin Configuration



Logic Diagram



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CY308 Command Summary

A complete description of the CY308 commands may be found in the user manual available from Cybernetic Micro Systems.

Command		Function
	^C	Command mode select
	^D	Display mode select
	^H	Back space over previous display character
	^K	Clear the display
	^R	Scroll display window to the left
	^S	Scroll display window to the right
	^Z	Fix display window at start of RAM buffer
A	a	Use LSBit to Set CLK_ALARM
B	base	Define address Base parameter
C	mode,hr,min,sec,hun	Set Clock mode and initial time
D	d	Delay for specified milliseconds (to 64k)
F	chr,row1..row7	Define custom Font for display (HDSP only)
G	g	Use LSbit to set CLK_GATE
L	mod,addr	Load module char count and address
M	mode	Mode command sets mode byte to value
N	num,chars	Number of modules, characters per module
O	mode	Define general Operational modes
P	pos	Set internal RAM buffer Pointer Position
S	addr,data	Write data to single address of all modules
W	mod,addr,data	Write data to address of one module
?	Cmd	Query specified parameter values

CYB-308 Proto Board

The CYB-308 prototyping board supports all of the features of the CY308. In its minimum configuration, the CYB-308 will support up to 4 display modules (32 characters). An additional 4 display modules may be added in the maximum (64 character) configuration. The board provides both parallel or serial interfaces.

For multi-board systems, a CY233 network chip is fully supported, and provides addressing for up to 255 boards on a single serial network.

The CYB-308 is provided in kit form and is 188mm x 53mm (7.40" x 2.1"). The board requires +5volts and internally generates RS232 level signals for the serial interface.

Electrical Specifications

Absolute Maximum Ratings:	
Ambient Temperature under bias	0°C to 70°C
Storage Temperature	-65°C to +150°C
Voltage on any pin with respect to GND	-0.5V to V_{CC} +0.5V
Power Dissipation	0.2 watts

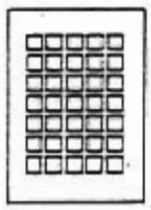
DC & Operating Characteristics
(T_A = 0°C to 70°C, V_{CC} = +5V +/-10%)

SYM	PARAMETER	MIN	MAX	UNIT	REMARKS
I_{CC}	pwr supply current		18	mA	
V_{IH}	input high level	1.9	V_{cc}	V	(3.5V for XTAL RESTART)
V_{IL}	input low level	-.5	0.9	V	
I_{LO}	data bus leakage		10	uA	high impedance state
V_{OH}	output high level	2.4		V	I_{OH} = -60 uA
V_{OL}	output low level		.45	V	I_{OL} = 1.6 mA
F_{CY}	crystal frequency	3.5	12	MHz	see clock circuits

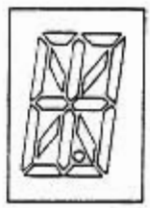
Supported Display Modules

Char.	Type	Part #
8	5x7 dot matrix	HDSP-211x
4	5x7 dot matrix	PD243x PD343x PD353x
8	17 segment	DL1814
4	17 segment	DL141x DL2416 DL3416
Other		DL413x DL713x

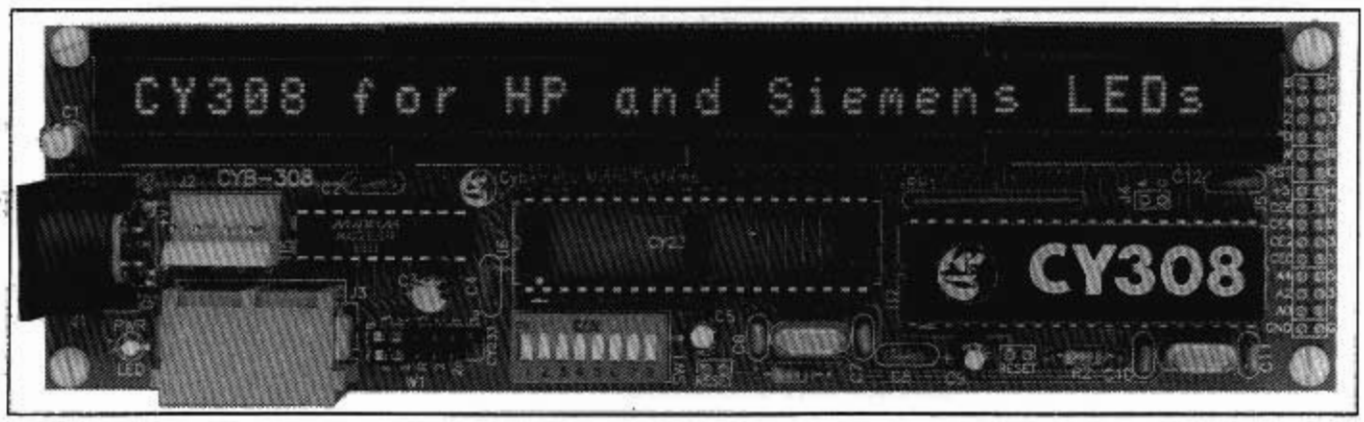
Note: The CY308 should support any display module with built-in ASCII decoder, multiplexer, memory, and driver.



5x7 Dot Matrix Display Format



17 Segment Display Format



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1 General Introduction 1

The CY308 LED Controller

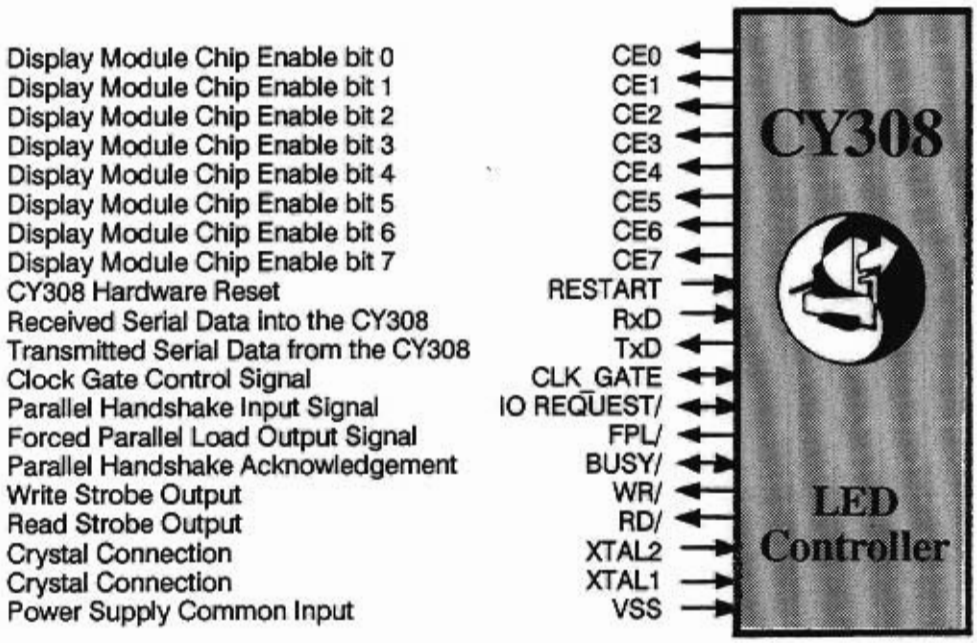
The CY308 Display Controller is a standard 5 volt 40 pin CMOS LSI device designed to control multiple intelligent LED based display modules. These modules contain ASCII encoded character fonts, with 5 by 7 dot matrix or 17 segment character displays, plus control registers for functions such as blinking and display intensity. Each module can contain from one to eight characters, with four and eight character sizes being the most popular. The CY308 will directly drive eight such modules (up to 64 characters), with no external logic, and it can drive up to 256 such modules, with external address decoding and module selection. The CY308 allows you to use these modules as an integrated display, without worrying about addressing each one or having words flow across multiple modules. It provides the ability to write to individual character locations, or to write a string of characters, with automatic display update, blanking, and rewriting as selectable options. User programmable address selection functions allow the CY308 to control most intelligent display modules available. Also, access to the control registers of the modules allows you to implement special display functions, such as blinking or custom fonts, without additional hardware or software requirements over those needed to operate the basic display functions.

Standard Features

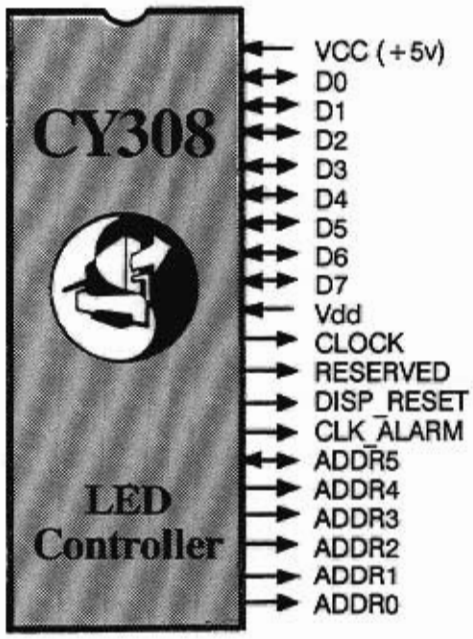
- Handles most 1 to 8 character intelligent display modules.
- Decoded mode supports up to 8 modules with no external logic.
- Encoded mode supports up to 256 modules, with only extenal address decoding and selection logic.
- Supports Command mode and Display mode.
- Direct access to display module special features and control registers.
- Direct writing to the display at sequential or specified positions.
- Internal 56 character buffer for scrolling messages.
- Time of day, elapsed time, and count down timer functions.
- Parallel interface with simple handshake.
- Serial interface.
- CMOS, 5 volt, 40 pin LSI device.
- ASCII decimal, Hex, and Binary data formats.
- User selectable operating modes.
- User definable display size and module number parameters.
- Network CY308 systems with the CY233 LINC chip.

2 Pin Configuration and Description 2

CY308 Pin Configuration



Display Module Chip Enable bit 0
Display Module Chip Enable bit 1
Display Module Chip Enable bit 2
Display Module Chip Enable bit 3
Display Module Chip Enable bit 4
Display Module Chip Enable bit 5
Display Module Chip Enable bit 6
Display Module Chip Enable bit 7
CY308 Hardware Reset
Received Serial Data into the CY308
Transmitted Serial Data from the CY308
Clock Gate Control Signal
Parallel Handshake Input Signal
Forced Parallel Load Output Signal
Parallel Handshake Acknowledgement
Write Strobe Output
Read Strobe Output
Crystal Connection
Crystal Connection
Power Supply Common Input



+5 Volt Power Supply Input
Parallel Data bit 0
Parallel Data bit 1
Parallel Data bit 2
Parallel Data bit 3
Parallel Data bit 4
Parallel Data bit 5
Parallel Data bit 6
Parallel Data bit 7, MSB
Connect to +5 Volts
Clock Output Signal, 1/6 Crystal Rate
Reserved Signal, not used by CY308
Display Module Reset Signal
Clock Overflow or Period Indication
Display Module Address bit 5
Display Module Address bit 4
Display Module Address bit 3
Display Module Address bit 2
Display Module Address bit 1
Display Module Address bit 0

CY308 Pin Description

Pin		Mnemonic	Function
1	(O)	CE0	Display Module Chip Enable bit 0
2	(O)	CE1	Display Module Chip Enable bit 1
3	(O)	CE2	Display Module Chip Enable bit 2
4	(O)	CE3	Display Module Chip Enable bit 3
5	(O)	CE4	Display Module Chip Enable bit 4
6	(O)	CE5	Display Module Chip Enable bit 5
7	(O)	CE6	Display Module Chip Enable bit 6
8	(O)	CE7	Display Module Chip Enable bit 7

These pins control the Chip Enable signals of the display modules. In Decoded mode (default), one pin will go low to select a unique module, in a one-of-eight scheme. In Encoded mode, all eight pins represent a binary module address. External logic must select the desired module in this case, but up to 256 modules can be supported.

9 (I) **Restart** CY308 hardware reset

The CY308 is hardware reset by this active high signal. Reset duration must be at least 10 msec after power is applied and within operating limits, but need only be 10 usec once the device is running.

10 (I) **RxD** Received serial data into the CY308

TTL level serial data is input to the CY308 on this pin.

11 (O) **TxD** Transmitted serial data from the CY308

TTL level serial data is output from the CY308 on this pin.

12 (I/O) **CLK_GATE** Clock gate control signal

In the gated clock modes, this signal controls the operation of the clock function. When the signal is high, the clock function runs, and when the signal is low, the clock value stops counting. The signal may be applied from outside the CY308, or it may be driven from inside the CY308, using the G command.

13 (I/O) **IO_REQUEST/** Parallel handshake input signal

This signal is driven low when a parallel command is issued to the CY308. It is used as part of the parallel command handshake. If the parallel command function is not used, this signal may select a fixed serial baud rate as follows:

0 - 300 baud, 1 - 2400 baud, F - 9600 baud

Pin	Mnemonic	Function
14 (O)	**FPL/**	Forced Parallel Load output signal

This signal is driven low when the CY308 outputs data on the parallel data bus. Normally, the CY308 accepts commands and display data from the host system, and operates the local display modules as requested. However, it is possible to query the CY308 for the values of its internal parameters. When the CY308 generates the response to such a query, the FPL/ signal is driven low, to indicate that the CY308 will output parallel data with the next parallel handshake sequence. This signal is compatible with the FPL/ signal of the CY233 LINC, allowing it to act as a network controller front end to the CY308.

15 (I/O)	**BUSY/**	Parallel handshake acknowledgement

BUSY/ is used with IO_REQUEST/ to implement the two line parallel data handshake. This signal indicates that the CY308 has accepted a parallel data character from the host system that is driving the IO_REQUEST/ signal. If the parallel handshake is not used, this pin may be tied low to select fixed baud rates through the IO_REQUEST/ signal.

16 (O)	**WR/**	Write strobe output
17 (O)	**RD/**	Read strobe output

These strobe signals are active while the CY308 is writing to or reading from the local display modules. The CY308 will generate the proper address and chip enable signals, then perform a data transfer using these strobes.

18 (I)	**XTAL2**	Crystal connection
19 (I)	**XTAL1**	Crystal connection

An external crystal or clock source is connected to these pins, with a value between 3.5 MHz and 12 MHz. For serial communications, an 11 MHz crystal will give standard baud rate values.

20 (I)	**VSS**	Power supply common input
21 (O)	**ADDR0**	Display Module Address bit 0
22 (O)	**ADDR1**	Display Module Address bit 1
23 (O)	**ADDR2**	Display Module Address bit 2
24 (O)	**ADDR3**	Display Module Address bit 3
25 (O)	**ADDR4**	Display Module Address bit 4
26 (I/O)	**ADDR5**	Display Module Address bit 5

These pins control the character address select signals of the display modules. The signals are connected to every display module in parallel. When the CY308 reads from or writes to a particular display module, it generates the module character or register address on these signals, and it selects a particular module through the chip enable

Pin	Mnemonic	Function

signals, CE0 to CE7. This combination should select a unique location in one display module of the modules connected to the CY308. Modules with fewer than eight characters may not use all of the ADDR signals. If ADDR5 is tied low, the CY308 will default to internal parameters to handle 4 character modules, otherwise it defaults to parameters for the 8 character modules. If other sized modules are used, you must issue commands to the CY308 to properly set the module parameters before displaying any data.

27 (O) **CLK_ALARM** Clock overflow or period indication

This signal toggles state to indicate a clock overflow or underflow condition. It may be used as an alarm, indicating that the clock has counted down to zero, or beyond its 12 or 24 hour limit. It may also be used to specify an AM or PM indication in the 12 hour modes. Two mode bits control the operation of this signal. In additon, the A command may be used to explicitly set or clear this signal.

28 (O) **DISP_RST** Display module Reset signal

When the CY308 is hardware or software reset, a strobe is issued on this pin. It is normally high, and will strobe low to hardware reset the display modules. This signal allows you to simultaneously reset all display modules, synchronizing their clock signals and blink functions.

29 (O) **RESERVED** Reserved signal, not used by the CY308

30 (O) **CLK** Clock output signal, 1/6 crystal rate

31 (I) **VDD** Connect to +5 volts

32 (I/O) **D7** Parallel data bit 7, MSB
33 (I/O) **D6** Parallel data bit 6
34 (I/O) **D5** Parallel data bit 5
35 (I/O) **D4** Parallel data bit 4
36 (I/O) **D3** Parallel data bit 3
37 (I/O) **D2** Parallel data bit 2
38 (I/O) **D1** Parallel data bit 1
39 (I/O) **D0** Parallel data bit 0, LSB

These bi-directional lines are the parallel data bus of the CY308. The bus is shared between a parallel connected host controller and the local display modules. The CY308 accepts parallel commands, generates parallel query responses, and generates display data through these signals. The signals are open drain, and require external 10K pull-up resistors.

40 (I) **VCC** +5 volt power supply input.

3 Command Summary 3

CY308 Command List

The following is a list of CY308 commands, including the command letter and argument structure. Arguments without a suffix should be numeric values not exceeding 255, to fit in one byte, while arguments with a "16" suffix may be numbers up to 65535, to fit in two bytes. Commands are entered as the single upper case ASCII letter, followed by a space, and the argument value. Multiple arguments may be separated by a space or comma. The command ends with a carriage return character. Commands without arguments simply use the command letter, followed directly be the carriage return. Binary mode command format and alternative argument structures are discussed in another section.

Command		Function
A	Val	Set CLK_ALARM bit from LSBit of value
B	Base	Define address base parameter
C	Mode,Hrs,Min,Sec,Hun	Set clock mode and initial time
D	Del16	Delay for specified milliseconds
F	Char,F,F,F,F,F,F,F	Define custom font for HP display
G	Val	Set CLK_GATE bit from LSBit of value
L	Mod,Addr	Set direct display module and address values
M	Mode	Define display mode bits
N	Num,Chars	Set number of modules and characters per mod
O	Mode	Define general operation mode bits
P	Pos	Set internal RAM buffer pointer position
S	Addr,Data	Write data to single address of all modules
W	Mod,Addr,Data	Write data to address of one module
?	Cmd	Query specified parameter values

The following control characters are special single letter commands. They are acted on immediately as received, and all except the ^H (back space) are valid in both the command and display modes. Back space is only valid in the display mode.

^C	Command mode select
^D	Display mode select
^H	Back space over previous display character
^K	Clear the display
^R	Scroll display window to the right
^S	Scroll display window to the left
^Z	Fix display window at beginning of RAM buffer

CY308 Command Format and Data Types

While in display mode, incoming characters are simply sent to the display modules, except for the control characters listed above, which act as special single letter commands. The actual displayed characters will depend on the exact module being used, and the extent of its character generation capabilities. For example, some modules may only display upper case characters, while others will display upper and lower case characters. The most sophisticated versions will even have some custom definable character codes.

In the command mode, the CY308 will interpret the incoming characters as commands, controlling some aspect of the display function. All CY308 commands have specific formats, which fall into two cases, the ASCII mode or the Binary mode of operation.

The ASCII mode format is as follows:

C P1,P2, ... ,Pn<cr>

where "C" is the ASCII command letter. If the command has parameters, the command letter is followed by a single space, and the list of parameter values. Otherwise, the command letter is immediately followed by the carriage return terminator.

The values P1 to Pn are relevant parameter values, separated by commas and terminated by a carriage return. Each command will have a specific number of parameters that are expected before the carriage return.

Parameter values can be expressed as ASCII decimal or ASCII hex numbers. The decimal values use the digits 0 to 9, while the hex numbers use 0 to 9 and A to F, and must be followed by an "H" suffix. All hex numbers must start with a digit. Valid numbers are shown below:

123 72 65437 7FH 0A6H 3FC7H 0DEFAH

Parameter values range from 0 to the maximum value supported by the parameter. If a larger number is entered, it is evaluated modulo the size of the parameter.

The Binary command mode format is as follows:

C N P1 P2 ... Pn

where "C" is still the ASCII code for the command letter. This is immediately followed by "N", which is a single byte count of the number of data bytes to follow. Note that this is a binary byte value, NOT an ASCII digit character. Commands that have no parameters use zero (ASCII Nul) as the byte count.

The byte count is followed by N parameter bytes, representing the binary values of the command parameters. Commands with 16 bit parameters use two bytes to represent the parameter value, with the least significant byte sent first. For example:

44 02 7F 03

is a four byte Binary mode Delay command, with each byte shown by its hex value. You would actually send only four bytes to the CY308, not the eight digits shown in the above example. The first byte is the ASCII code for the letter "D". Next is the data byte count of two, followed by the 16 bit parameter 037FH, sent as two bytes, least significant byte first. The above Binary sequence is equivalent to the ASCII commands:

D 37FH <cr> or **D 895 <cr>**

The CY308 defaults to the ASCII mode when reset, and may be switched to Binary mode by an ASCII "O" command with the most significant bit zero.

CY308 Command Details

The CY308 operates in one of two basic modes, the Display mode or the Command mode. In the Display mode, all received characters, except for certain control codes, are used to show characters on the display. The display mode is the default mode on power-up or reset.

The CY308 is switched to the Command mode by reception of a Ctrl-C (03h) control code. In the command mode, characters are interpreted by the CY308, rather than being sent to the display modules. Commands are used to define the characteristics of the display modules and to set the various operating modes of the CY308. Once the proper commands have been issued, you switch back to the Display mode by sending a Ctrl-D (04h) control code to the CY308.

If the CY308 is in the Display mode, and it receives a Ctrl-D character, the character is ignored. A redundant Ctrl-C character in the Command mode is also ignored. Display and command characters may be received through either the serial or parallel interface. In fact, characters may be mixed between the two interfaces, however, this must be done with great care to prevent scrambling of the data stream!

Thus, two control characters are always interpreted specially, and act as single letter commands:

Ctrl-C select Command mode operation

Ctrl-D select Display mode operation

Other control codes are also reserved for special functions. The Ctrl-H (08h or Back space) is valid only in the Display mode. When this character is received, it causes the CY308 to move back to the previous display character, and over write it with a space. This may be repeated until all display characters have been erased, after which additional back spaces are ignored.

Ctrl-H Back space over previous display character

The Ctrl-K (0Bh) control code may be used to clear the display. This character is valid in both the Display and Command modes of operation. The display position is not reset when the display is cleared, so the next displayable character will appear at the position following the last character, unless a command is issued to reset the display position.

Ctrl-K Clear the display

Several control code commands are used with the internal CY308 display buffer. This buffer is 56 characters in size, and is most useful for implementing scrolling messages. The control codes implement the scrolling function of the buffer. Ctrl-R (12h) is used to scroll the display window to the right, while Ctrl-S (13h) is used to scroll the display window to the left. The display window may be any number of characters less than or equal to the 56 character buffer size, and represents the number of characters that can actually be shown on the display modules. When the buffer is bigger than the modules, the modules represent a window into a subset of the display buffer.

An additional control command, Ctrl-Z (1Ah) is used to reset the display window to the front of the display buffer. After many scrolling commands, this command makes it easy to align the display and internal display buffer again.

Ctrl-R Scroll display window to the right

Ctrl-S Scroll display window to the left

Ctrl-Z Fix display window at beginning of RAM buffer

One additional common control code may have special meaning in the Display mode, the Ctrl-M (0Dh or carriage return) code. If enabled by the mode command, this character resets the display cursor so the next character is displayed at the first position of the display modules. It can also cause the display to be cleared before the next character is displayed. In the Command mode, the carriage return is the command terminator for ASCII commands.

The following sections describe the various CY308 commands in greater detail. The commands have been grouped into related units, rather than alphabetical order.

Operating Modes

Two mode commands specify which operating options you would like to enable. The "M" mode command specifies how the CY308 handles the display modules. It deals with options in the use of the displays or functions associated with the displays. The Mode command has a single argument, which is a single byte quantity, so valid inputs are in the range 0 to 255 (0 to 0FFH). The default value for Mode is all bits zero on power-up or reset.

M Mode Define display mode bits

Each of the lower 7 bits of the argument value has a specific function. The most significant bit is reserved for future use, so actual values range from 0 to 127 (0 to 7FH). Each time the Mode command is issued, all seven bits are set by the new value of the argument. Be sure to preserve bits you do not wish to change, by supplying the proper argument value to the Mode command. The bits of the Mode command argument are defined as follows:

EncodeAddr	**bit 0**	lo--1 of 8, hi--1 of 256 CE
SaveDisp	**bit 1**	lo--blank fill disp on char after cr
KeepCount	**bit 2**	lo--clear char count on cr
BufScroll	**bit 3**	lo--display RAM , hi--CY308 buffer
ClrDisp	**bit 4**	clear display if set
Clk12hr	**bit 5**	12 hour clock mode if set
AlrmToggle	**bit 6**	defeat auto clear of alarm if set

Bit 0 selects between decoded (default) addressing and encoded addressing. In the decoded mode, one of the CY308 CE signals will go low to select a display module, while the other seven CE signals remain high. This is a one-of-eight, active low chip select of the display modules, and allows the CY308 to directly support up to eight display modules.

When encoded addressing is selected, the eight CE signals are all driven at the same time, with a binary value for the display module desired. This allows the CY308 to support up to 256 display modules! However, external logic is required to decode this binary module number into a unique chip select signal for each module.

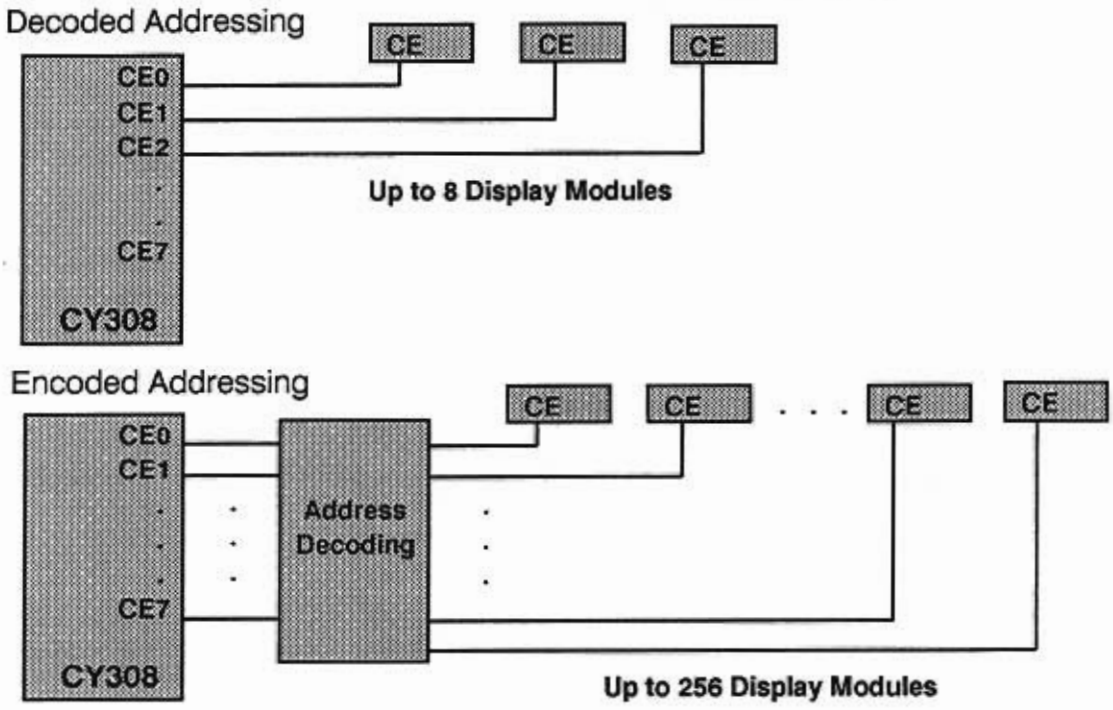


Figure 1. Decoded and Encoded Addressing

When eight or fewer modules are required, we strongly recommend using the decoded addressing mode, as this will significantly reduce the external logic required by the CY308. In fact, the CY308 can support up to eight display modules with no external logic at all. For those systems that require more than eight display modules, the encoded addressing mode must be used.

When bit 1 of the Mode argument is zero (default), the display clear function is enabled. This allows the display to be automatically cleared, with the character after a carriage return, when bit 2 is zero. It also allows the display to be cleared when bit 4 is set, requesting an explicit clear of the display. The display is always cleared when the next character is received. This causes the display to be stable and readable until the next character arrives. The CY308 will then clear the display, and show the new character.

When Bit 1 is set, the display clearing function is disabled, both after a carriage return, and if bit 4 (described below) is set.

Bit 2 selects between clearing (default) or not clearing the internal CY308 character count after a carriage return. If the count is cleared, the next character after the carriage return will be displayed in the first position of the display modules. Otherwise, the next character simply follows the position of the carriage return. Also, the display will be automatically cleared if bit 1 is a zero value.

Note that when bit 2 is zero (default), carriage returns are not displayed, they simply reset the CY308 character count to zero. However, when the bit is set, any received carriage return will be displayed, and what character actually shows on the display will depend on the display module being used.

Mode command bits 1 and 2 are often used together. When both bits are zero, the CY308 will treat the display modules as a single line display, showing one line of characters until a carriage return is received. When the next character arrives, the display is cleared, and this new character is written in the first display position, starting the display of a new line.

Bit 3 selects how the display modules are used by the CY308. If the bit is zero (default), the display modules are written to directly. As each character is received, it is written to the next character address of the display modules. In this mode, the CY308 can support any number of characters and modules, up to the 256 module addressing limit of the device.

When bit 3 is set to one, the CY308 will use its internal 56 character RAM buffer for displaying the characters received. While this limits the number of characters that can be displayed to 56, it does offer some additional features.

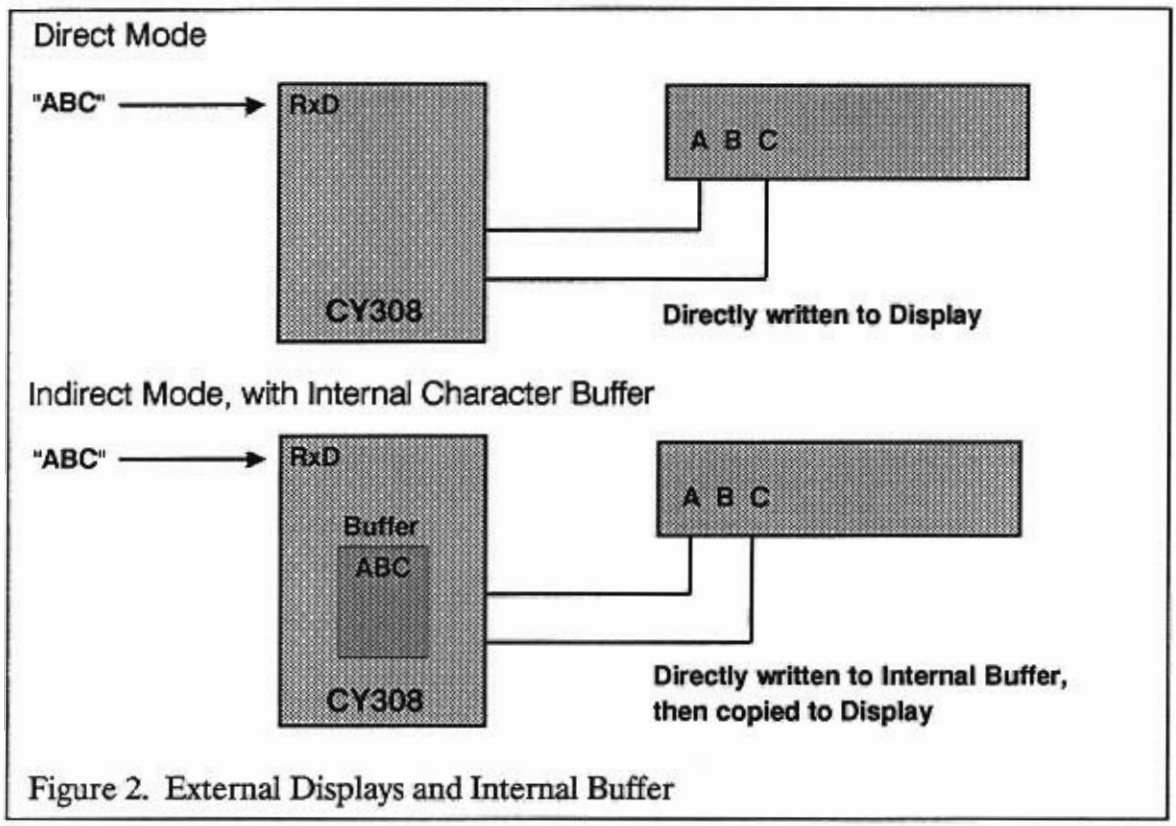


Figure 2. External Displays and Internal Buffer

The display window may be scrolled through the internal buffer, with messages scrolling left or right, selected by the Ctrl-R and Ctrl-S command characters. It is not possible to scroll messages in the direct mode, since almost all the display modules are not readable.

Also, CY308 display maintenance will keep up with higher serial data rates when the internal display buffer is used. It can keep up with a continuous stream of serial data at 9600 baud with the internal buffer, but in the direct mode, continuous data must be limited to 2400 baud if all display functions are desired. The CY308 can keep up with higher continuous rates if characters are only displayed (9600 baud is ok), but extra time is required when the display must be cleared before showing the next character.

Finally, the special clock mode displays, described below, all use the internal buffer to update and display the clock value. When a clock function is selected, the CY308 automatically sets bit 3 of the Mode register, forcing the use of the internal buffer.

When bit 4 is set, the CY308 will clear the display before showing the next displayable character. When the auto clear after carriage return (bit 2) is not used, this bit allows you to explicitly control when the display will be cleared. Note that bit 1 must be zero for bit 4 to function. If bit 1 is set, the value of bit 4 is ignored.

Bit 5 is used to select the format for the clock functions of the CY308. When the bit is zero (default), a 24 hour clock format is used. When the bit is one, a 12 hour clock format is used.

The value of bit 6 allows you to control the action of the CLK_ALARM signal. When this bit is zero (default), the CLK_ALARM signal will be cleared when a clock overflow or underflow occurs. The signal will then be set back to a high level when the next command or display character is received by the CY308. In this function, the CLK_ALARM signal may be used as an interrupt request, which goes active when the alarm condition occurs, and goes inactive when the host responds with a new character.

When bit 6 is set, the CLK_ALARM signal is not set high on the reception of the next character. Instead, the signal maintains its current value until another overflow or underflow condition occurs. It then toggles from its current value to the opposite value.

Note that the "A" command may be used to force the CLK_ALARM signal to any desired value in this case. If bit 6 is zero, the "A" command has little effect, because the CLK_ALARM signal will always be driven high again on the reception of the next character.

When the clock functions are being operated in a 12 hour format, setting bit 6 allows you to use the CLK_ALARM signal as an AM or PM indicator. The signal will toggle when ever the clock passes a 12 hour boundary, changing the indication between AM and PM every 12 hours.

The second mode command, "O", is used to define general operating modes of the CY308. This command also has a single byte value argument, with 4 bits defined. Other bits should have a zero value specified in the supplied argument.

O Mode Define general operation mode bits

The default value for the mOde command argument is 128 (80H), which selects the ASCII command mode and serial output for query command responses. The bits of the mOde command are defined as follows:

Parll	**bit 0**	Parallel display output selection
HexOut	**bit 1**	Hex format Query output
BaudSet	**bit 6**	Baud rate setup by command
ASCIIbin	**bit 7**	ASCII mode if set

Bit 0 selects between the serial (default) and parallel command channels for data output from the CY308. Normally, the CY308 receives display data and commands from the host system, so it is primarily an input device. However, there is a query command, described later, that allows the host to query the CY308 for the values of some of the registers. In response to the query command, the CY308 generates an output string, which may be sent out the serial or parallel command interface.

Bit 1 selects the format for output from the CY308. There are two choices for output in the ASCII mode, the decimal value (default) of the requested parameter, or the

hexadecimal value of the parameter. In the decimal format, the output is fixed at five digits, with leading zeros used as required. For example, the value 636 is output in decimal as:

00636 < cr >

The hexadecimal format is also fixed at five digits, plus an "h" suffix. The same value 636 would be output in hexadecimal as:

0027Ch < cr >

When bit 6 is a one, the CY308 uses the entire mOde command argument to set the serial baud rate. The lower four bits of the mOde byte value select the actual serial baud rate. This allows a parallel command to set the serial rate to a desired value, without tieing the IO_REQUEST and BUSY lines to a particular state, and allows a parallel command source to set up the CY308 for serial communications, such as showing messages on a serial display.

For this function, the CY308 does not store the mOde byte value in its internal mOde register, so if B6 is set, no other operating modes of the CY308 are effected, only the baud rate selection. Bits 0 to 3 are treated as a binary value, selecting the baud rate as shown in the table below:

B3-B0	Selected Rate
0	300
1	600
2	1200
3	2400
4	4800
5	9600
6	19200
7	57600
8	Self Adaptive
9 - F	Undefined

The CY308 will set the baud rate during the execution of the mOde command, and the new rate will be in effect until a hardware reset occurs or another mOde command is issued, with bit 6 set. When the adaptive rate is selected, the CY308 must receive two carriage returns before the operating baud rate will be defined again, so this selection may only be used if serial data is coming into the CY308. No transmissions will occur until the baud rate is again defined.

Finally, bit 7 of the mOde argument selects between the ASCII (default) and Binary command modes. These modes were described earlier. Recall that the ASCII mode uses a space after the command letter and decimal or hexadecimal argument values, terminated by a carriage return. In the binary mode, the command letter is followed by a data byte count, then the binary values of the arguments, sent as a string of bytes. There is no terminator character in the Binary mode.

Note that the default ASCII mode setting of bit 7 is that the bit value be a one. This is opposite the default bit settings of the other bits. Be sure to preserve this bit setting when changing other bits, since you will not be able to issue more commands to the CY308 if you accidentally change command format.

Display Module Characteristics

The next set of CY308 commands define the characteristics of the display module connected to the CY308. First, the "N" command sets the number of modules connected to the CY308 and the number of characters to count per module.

N Num,Chars Set number of modules and characters per mod

The "N" command has two parameters. First is the number of modules connected to the CY308. The default value is 8, to match the number of chip select lines available in the decoded address mode. This number may be left alone if fewer than eight modules are attached, so long as the CY308 performance is sufficient for the particular application. With fewer modules attached and selected, functions such as the display clear will require proportionally less time to execute.

The second "N" command parameter is the number of characters per module. The default value for this parameter is 8 if address line ADR5 is left floating, and 4 if address line ADR5 is connected to ground. This offers two default selections, one for the eight character HDSP-211x displays, and one for the four character standard displays. Other types of display modules require you to set the proper number of characters per display. The CY308 uses this parameter to increment the character position count, and will select the next display module when the current module has all characters written.

The Base command allows you to define the base address used by the CY308. This value is exclusive ored with the character count to generate the actual character address for the display. Lines ADR0 to ADR5 are affected by the base value XOR the current character count.

B Base Define address base parameter

The base address should represent the address of the display module control register used to write data. The current character count will vary between zero and the number of characters per module minus one. Note that when the base address is XORed with the current character count, a value of zero in the lower bits of the base address will load characters in the sequence defined by the display, i.e. left to right, while a value of one for the lower bits loads characters in the opposite sequence, i.e. right to left.

The default value for the base address is 38h for the 8 character display selection, and 27h for the 4 character displays. These values load characters from left to right for both types of displays, even though the 4 character displays are designed for right to left sequencing. If these defaults are not the desired values, you must issue the "B" command to change the base address to the proper value.

For the HDSP-211x 8 character displays, the base address value of 38h will cause the display characters to be written into the display. These modules use address lines ADDR0 to ADDR5 to address the various functions of the display, and have assigned addresses 38h to 3Fh to the 8 character positions, in left to right order. Note that this assignment has been made by the display manufacturer, not by the CY308 design. Reference the HDSP-211x data sheets for more details. Other addresses are used to access the control registers and memory for the fonts of the custom definable characters. When the current character number (0 to 7) is XORed with the base address of 38h, values 38h to 3Fh are generated, so the character codes are written to the display portion of the module.

Four character modules, such as the PD 243x, only support 3 address lines, ADDR0 to ADDR2, and can respond to "character" addresses 0 to 7 within each module. Addresses 0 to 3 write to the control register, which controls display intensity, test, and blinking functions. Addresses 4 to 7 write to the display characters, with address 4 being the rightmost character, and address 7 being the leftmost character. Reference the PD 243x data sheets for more details.

The CY308 uses a base address of 27h as the default for these types of displays, selected by tying line ADDR5 low. Note that the "2" of the 27h base value corresponds to the ADDR5 signal line, and should be a 1 to allow the address line to be externally driven. If this value would be a zero, the ADDR5 signal would not be bidirectional, and should not be tied high or low externally. The "7" of the base address will be XORed with the character count values 0 to 3, to generate the actual character address. This has the effect of inverting the lower 3 address signals, making character 0 write to the leftmost display location, for left-to-right loading of characters! With a base value of 24h, character codes 0 to 3 would write to the display module in right-to-left order. Thus, the choice of the base address can be used to control the order in which characters are loaded into the display modules. This is shown in the figure below:

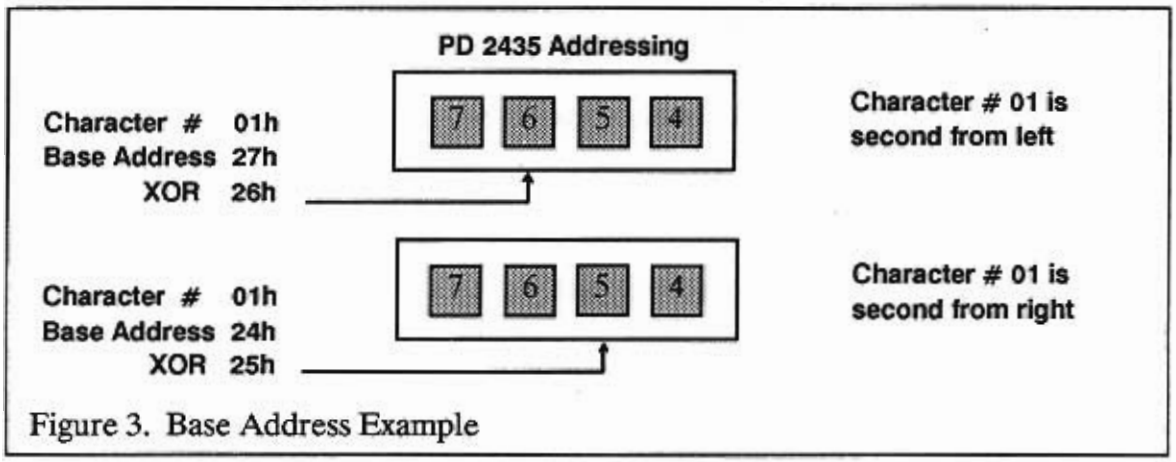


Figure 3. Base Address Example

The Load command allows you to specify the current values for the display module address and the character count within the module. Normally, the CY308 will sequence these numbers from zero, first incrementing the current character count, and when this count matches the number of characters per display, incrementing the current module address, while resetting the character count to zero.

L Mod,Addr Set direct display module and address values

The module address is the first parameter of the "L" command, and the character count is the second parameter. These values will be used when the CY308 writes directly to the display modules. When the internal 56 character scroll buffer is used, these values get reset to zero before the scroll buffer data are written to the display modules.

The Position command has a single parameter, the current position used within the 56 character buffer inside the CY308. The CY308 will normally sequence this number between zero and 55 when the whole display is used, and between 11 and 55 when the current clock value uses the first 11 characters of the display.

P Pos Set internal RAM buffer pointer position

By specifying a particular value with the "P" command, you can control where the CY308 will place the next character in the display buffer.

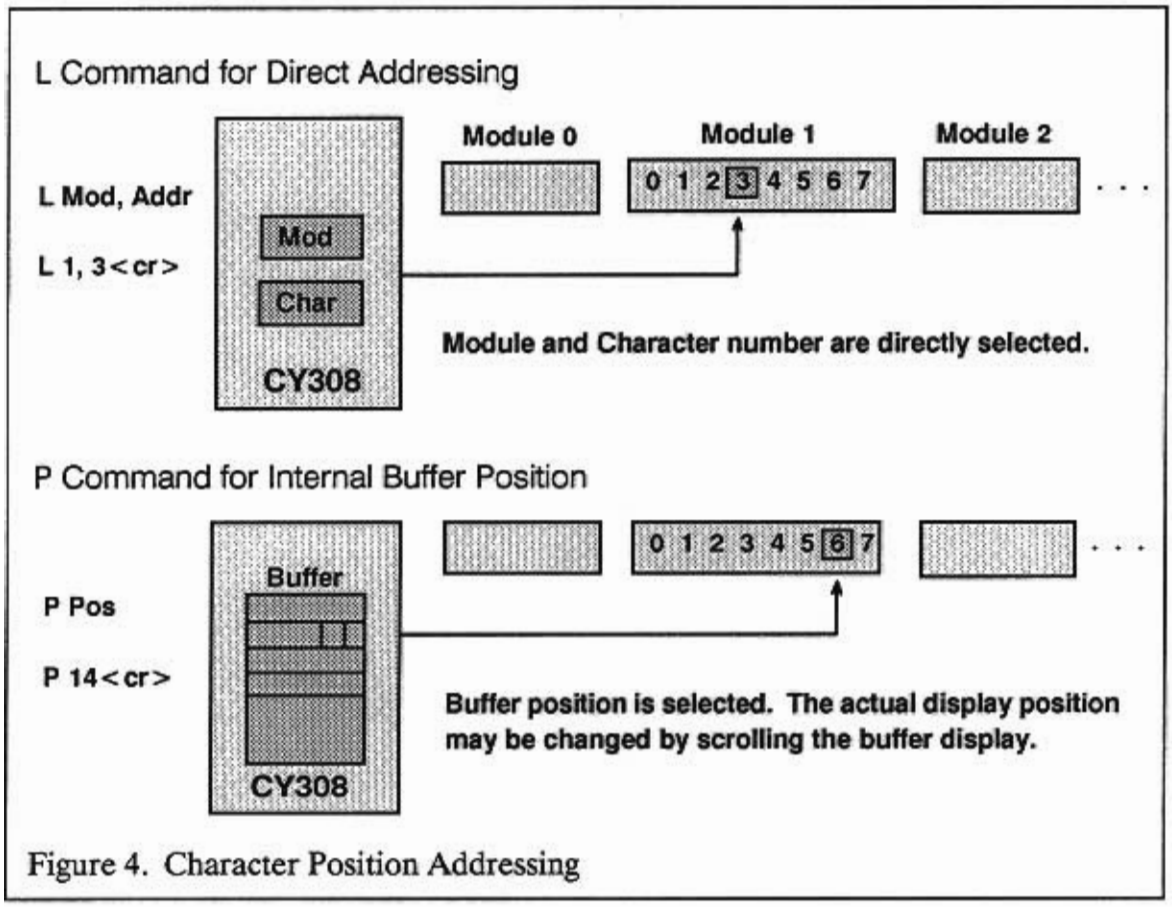


Figure 4. Character Position Addressing

The next two commands are useful for writing data to a particular display location. This is especially handy for manipulating the value of a display control register without resetting the current module and character address or base address values. These commands make it fairly easy to control such attributes as display intensity and blinking.

The first command, the "S" command, allows you to write the same value to all modules. This command is useful for setting the display intensity or another attribute that would be used by all modules connected to the CY308.

S Addr,Data Write data to single address of all modules

The first parameter is the exact display address used for the write. This address will be placed on the address lines ADR0 to ADR5. It is not XORed with the base address value. This allows you to specify some other address than the base for writing to the display control register.

The second parameter of the "S" command is the data to be written to all the modules. A full 8 bit value is supported for this parameter. Only one data byte is written to each display module, and the same address will be used for all modules. The CY308 sequences the chip enable signals, while keeping the address and data signals constant.

The next command, the "W" command, allows you to write data explicitly to one location within one module. This is useful for changing the characteristics of one display character, such as making it blink.

W Mod,Addr,Data Write data to address of one module

The "W" command has three parameters. First is the module address. This value is used to generate the pattern on the chip enable signals, CE0 to CE7, of the CY308. The other two parameters are the same as used by the "S" command, the display address within the module, and the data to be written.

For the "W" command, the CY308 performs only one write operation. The command affects only one module connected to the CY308.

Clock Functions

The following group of commands are related to the clock functions of the CY308. When a clock mode is selected, the CY308 uses the internal 56 character scroll buffer to display the current value of the clock. The first 11 characters of the buffer are reserved for the clock value, while the rest of the buffer is available for message displays. When the mode to auto clear the character count after a carriage return is selected, the buffer position pointer will be set to 11, not zero, so that a new message line will not overwrite the clock value.

The clock display is a fixed format, using 11 characters. It displays hours, minutes, seconds, and hundredths of a second. One of the Mode command bits selects between a 12 hour and a 24 hour format.

The Clock command selects and enables the clock functions. When this command is issued, the CY308 automatically selects the internal scroll buffer for displays, and starts the clock function as specified by the selected clock mode.

C Mode,Hrs,Min,Sec,Hun Set clock mode and initial time

The Clock command has several parameters. First is the selected mode of operation, as described below. Next are four parameters that specify the initial value of the clock hours, minutes, seconds, and hundredths. All parameters must be specified when the clock command is used. The clock will tick 100 times per second, and is calibrated for an external crystal of 11 MHz.

The Clock mode has the following values:

0	Disable clock function and turn off clock
1	Standard clock run mode
2	Gated clock run mode
3	Gated clock run mode with auto clear
4	Count down timer run mode
5	Gated Count down timer run mode
6	Count down timer with stop at zero
7	Gated count down timer with stop at zero

Clock mode 0 is used to turn off any of the other clock functions. It disables the clock from operation, but does not reset the display mode, so the internal scroll buffer is still enabled. If you wish to go back to the direct display mode, issue a Mode command to disable the scroll buffer display.

Clock mode 1 is the standard clock run mode. In this mode, the clock counts elapsed time, from the initial value issued with the Clock command. At the 24 hour or 12 hour boundary, depending on which clock format is selected, the CLK_ALARM signal will toggle opposite its current state. The clock will continue running until disabled.

Clock mode 2 is the gated clock run mode. This mode is similar to mode 1, in which elapsed time is measured. However, the clock run is enabled by the CLK_GATE signal. When this signal is high, the clock will run, and when this signal is low, the clock stops. If the signal is toggled high and low several times, the CY308 will continue to count elapsed time as long as the signal is high. The CLK_ALARM signal is toggled at the 12 or 24 hour overflow points.

Figure 5. Gated Clock Mode

Clock mode 3 is also a gated clock run mode. However, when the gate is brought low to stop the clock, the clock display value will be frozen, and the internal clock value will be reset to zero. This auto clear function resets the clock, so that it always measures elapsed time from the last gate enable signal.

Clock mode 4 uses the clock as a count down timer. The intial value is loaded by the command, and the clock runs in a count down mode. When zero is reached, the CLK_ALARM signal is toggled, and the clock continues to run. It will be set to 12 or 24 hours after the underflow, depending on the selected clock display format.

Clock mode 5 is also a count down timer mode, but it uses the CLK_GATE signal to control the operation of the clock. When the gate signal is high, the clock runs, and when the gate signal is low, the clock stops. Otherwise, this mode is the same as mode 4, with the CLK_ALARM signal toggling at the underflow, and the clock continuing to run while the gate signal is high.

Clock mode 6 is a count down mode similar to mode 4. The only difference is that the clock will stop counting when it reaches zero. The CLK_ALARM signal is still toggled when zero is reached, then the clock stops counting. Issue another Clock command to restart the clock.

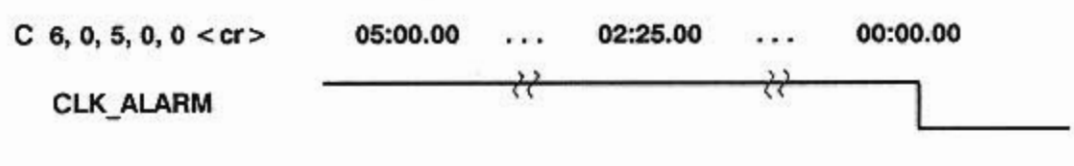


Figure 6. Count Down to Zero

Finally, clock mode 7 is similar to clock mode 5, the gated count down timer. In mode 7, the clock will run while the gate signal is high, and stop when the gate signal is low. Also, the clock will stop counting when zero is reached, and the CLK_ALARM signal will toggle. Another Clock command must be issued to restart the clock.

The next two commands are related to the clock functions, but they can also be used independent of the clock modes. The "A" command may be used to specify a value for the CLK_ALARM signal.

A Val Set CLK_ALARM bit from LSBit of value

The single parameter of the "A" command specifies the value of the signal. The least significant bit of the value is used for the CLK_ALARM signal value. Note that a Mode command with bit 6 set must be issued before the CLK_ALARM signal can be controlled by command. Otherwise, the signal will always be driven high again on the reception of the next character by the CY308.

On overflow or underflow of the clock functions, the CLK_ALARM signal will be toggled from its current state to the opposite state. The "A" command may be used to set the initial state of the CLK_ALARM signal. The signal is high after a reset.

The "G" command is used to set the state of the CLK_GATE signal.

G Val Set CLK_GATE bit from LSBit of value

The least significant bit of the parameter is used to set the value. When a gated clock mode is not being used, this command can control the CLK_GATE signal as a general purpose output signal.

In the gated clock modes, the signal may be driven from the outside of the CY308. In this case, the CLK_GATE signal should be left in the high state as driven from inside the CY308. In this state, the CY308 uses a weak pull-up resistor to maintain the high, so it can easily be driven low from outside the part. If the signal is driven low from inside the CY308, it can only be driven high externally by a very strong driver. This may eventually cause damage to the CLK_GATE signal.

Alternatively, the gated clock mode functions can be controlled by command, with the "G" command used to turn these functions on and off! This gives command control over the gated clock operations. While this may not be very useful in a real application, which uses an external signal to synchronize the clock functions to an external event, it may be very useful for initial testing and prototyping.

Special Commands

The next set of commands are additional special CY308 commands. The Font command is implemented specifically for the HDSP-211x eight character displays. These displays have additional memory for the definition of 16 custom characters, which are then displayed using ASCII codes 80h to 8Fh.

F Char,F,F,F,F,F,F,F Define custom font for HP display

The Font command has 8 parameters. First is the character code that is being defined. This value ranges from 0 to 0Fh, and is associated with the display codes 80h to 8Fh.

The next seven parameters define the dot patterns for your custom character. Each parameter represents one horizontal row of dots in the 5 by 7 pattern. The lower 5 bits are used for the display, with the least significant bit being the right most bit of the character. A logic one represents an LED that is on, and a logic zero represents an LED that is off. For example, the character "F" is represented by the seven row parameters:

1Fh,10h,10h,1Eh,10h,10h,10h

The Delay command is used to pause execution for the specified time period. The CY308 simply stays busy for the specified time, then is ready to execute the next command.

D Del16 Delay for specified milliseconds

The single parameter of the "D" command specifies the number of milliseconds to delay. This is a 16 bit parameter value, so it may range from 1 to 65535, giving a delay of 1 msec to about 65.5 seconds.

The final CY308 command is the Query command. This command is used to find the current values of various CY308 registers, and the current clock value, if the clock function is being used.

? Cmd Query specified parameter values

The general format for the Query command is a question mark command character, with one parameter. The parameter specifies which value is being queried. The only exception is the clock value query, which uses two parameters. The arguments to the Query command are as follows:

B	Base address register
N	Number of modules and characters per module
L	Module number and character count values
P	Display start and buffer pointer values
M	Display mode register
O	Operating mode register
C,Cnt	Clock value, to specified length

Each form of the Query command requires the letter of the registers to be queried. The queries of N, L, and P will output two eight bit registers as a single 16 bit value, as explained below. Queries of B, M, and O output a single 8 bit value. The clock query will output the number of digits specified by the second argument, which is required for the clock query. This value must stay between 1 and 11, and specifies how much of the current clock value to query, starting at the hours value.

In response to the Query command, the CY308 will output the value requested, in a fixed format. First is the letter being queried. This is followed by an equal sign, and the value being queried. The value may be in decimal or hexadecimal format, as selected by the mOde command bit.

Decimal formats use 5 digits to represent the values. For 8 bit quantities, the first two digits will always be zero. Hexadecimal formats use a leading zero, 4 hex digits to represent the value, and an "h" suffix.

When the CY308 is in the Binary command mode, the values are output as two binary bytes, representing the 16 bits of data. An exception is the clock value, which is always output as its ASCII string, with 1 to 11 characters specified.

In the ASCII modes, the query response is terminated by a carriage return.

The Query command response is sent out the selected interface, also as specified by the mOde command. If the serial port is selected, the CY308 transmits the characters of the response on the TxD signal.

For the parallel interface, the CY308 will drive the FPL signal low as long as it has data to output. It then waits for the host to drive IO_REQUEST low, requesting a data byte. The CY308 will write the byte value on the data bus lines, then lower the BUSY signal, indicating that data is available. This state will be maintained until the host drives IO_REQUEST high again. The CY308 will then remove the data from the data bus, and drive BUSY high also. This sequence is repeated until all bytes have been written by the CY308. The FPL signal will then be driven high, and the CY308 will change back to the command input mode, waiting for more commands.

As an example, a query of the base address register would be:

? B < cr >

with a possible response of:

B = 00056 < cr > or **B = 00038h < cr >**

A clock query might be:

? C,5 < cr >

to query for the hours and minutes value of the clock. A response could be:

C = 10:48 < cr >

As mentioned previously, the N, L, and P queries output two register values as one response. The two 8 bit values are simply combined into one 16 bit response.

The N query outputs both the number of modules and the characters per module values. The number of modules is the most significant byte value. For example, with 6 modules connected, and 8 characters per module, the response to an N query would be:

N = 01544 < cr > or **N = 00608h < cr >**

The L query outputs the current module number and current character count within the module. The module number is the most significant byte.

The P query outputs the display starting address, and the current display buffer pointer, both used with the internal 56 character scroll buffer. The display start address is the most significant byte, and is changed as the display window scrolls through the buffer (Ctrl-R, Ctrl-S, and Ctrl-Z control commands). Values for this register range from 48h to 7Ch. The current buffer pointer value ranges from 0 to 55 (37h), as set by the "P" command or incremented when data is written to the buffer.

4 CY308 Application Example 4

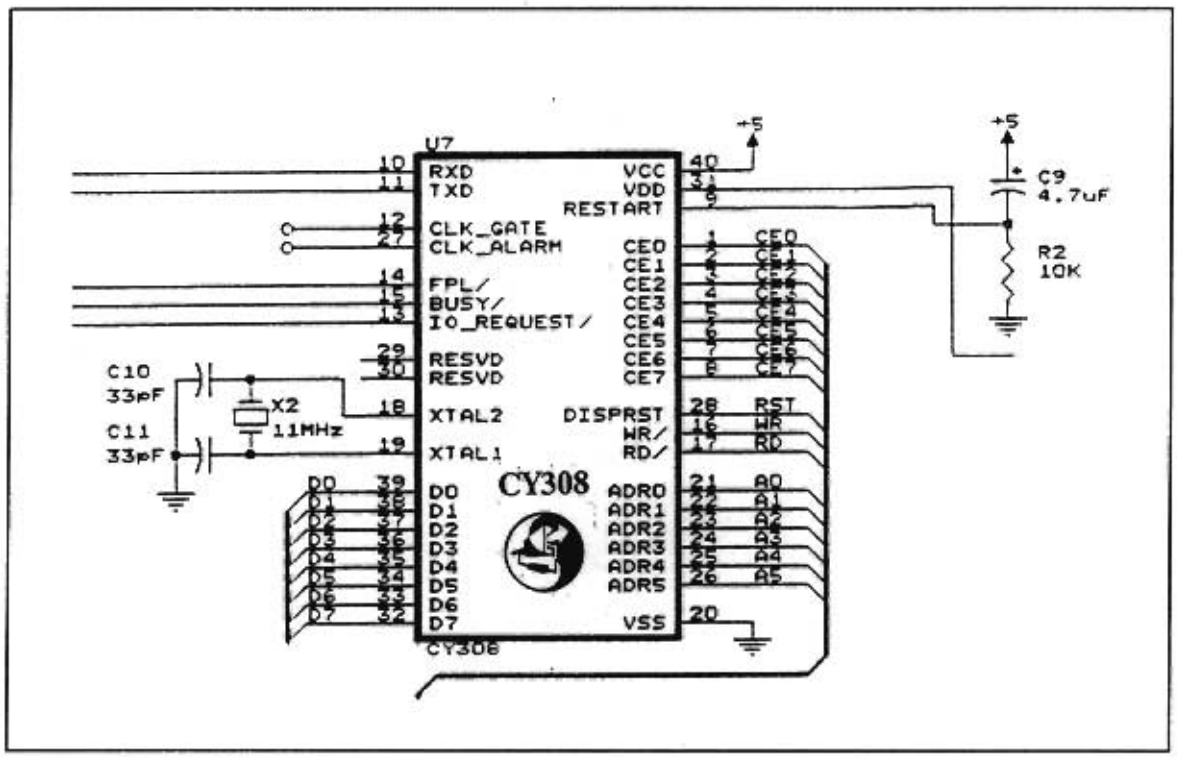
CYB-308 Prototyping Board

The CYB-308 is a prototyping board for the CY308 LED Controller, provided by Cybernetic Micro Systems. It contains all support for the CY308, a serial interface with RJ-11 telephone style jacks, direct interface to four 8-character HDSP-211x displays, support for the CY233 LINC network controller, and the ability to expand the system for support of additional display modules.

This board represents a good applications example of the CY308. The design of the board will be discussed in this section, while the following sections will deal with the assembly and operation of the board.

The CY308

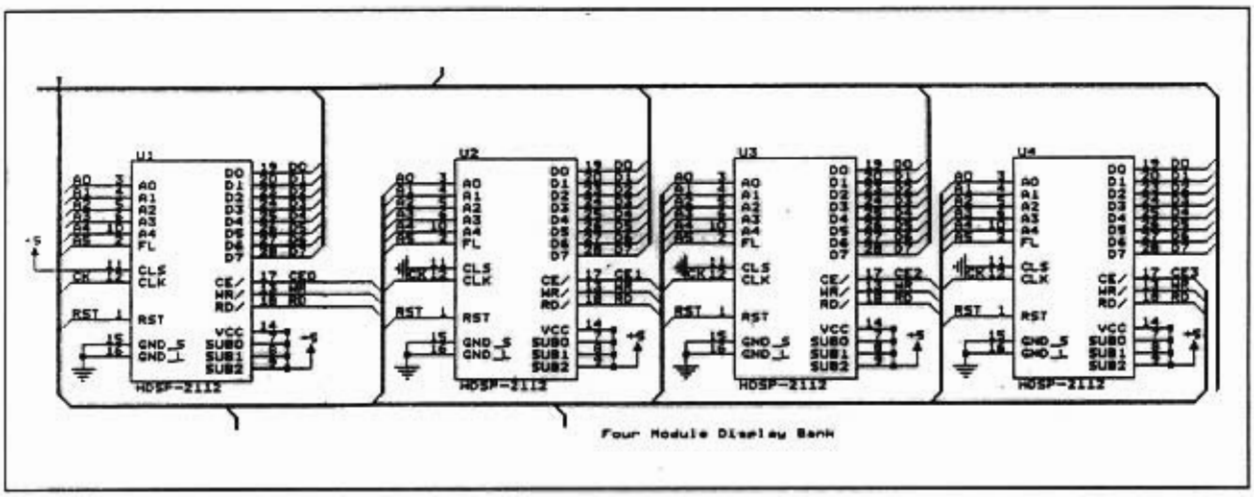
There are only three integrated circuits on the CYB-308. First, we will discuss the CY308. Support circuitry for it includes a reset capacitor and resistor, providing an automatic reset at power on, an 11 MHz crystal circuit, and a 10K ohm pull-up resistor pack on the data bus signals. These are the only support devices required. A jumper is also provided for manual reset control. You may place a small push-button switch in this location, to easily reset the CY308 if needed.



Display Module Interface

The CY308 is directly connected to the four HDSP-211x display modules. The data bus, address bus, and control signals (RD, WR, and DISPRST) are connected to all displays in parallel. The display chip enable signals (CE0 to CE3) are connected to each module individually, implementing the decoded (1-of-8) mode of display selection. This mode would allow the direct connection of four additional display modules. If more than eight total display modules are required, you must use the encoded addressing mode, with external address decoders to select the individual display modules.

Display module number 1, device U1, is configured as the master display device, through its CLS signal. The other modules are all slaves, meaning that they derive their clock signals from the master. This allows all displays to be synchronized if a display blink function is enabled.

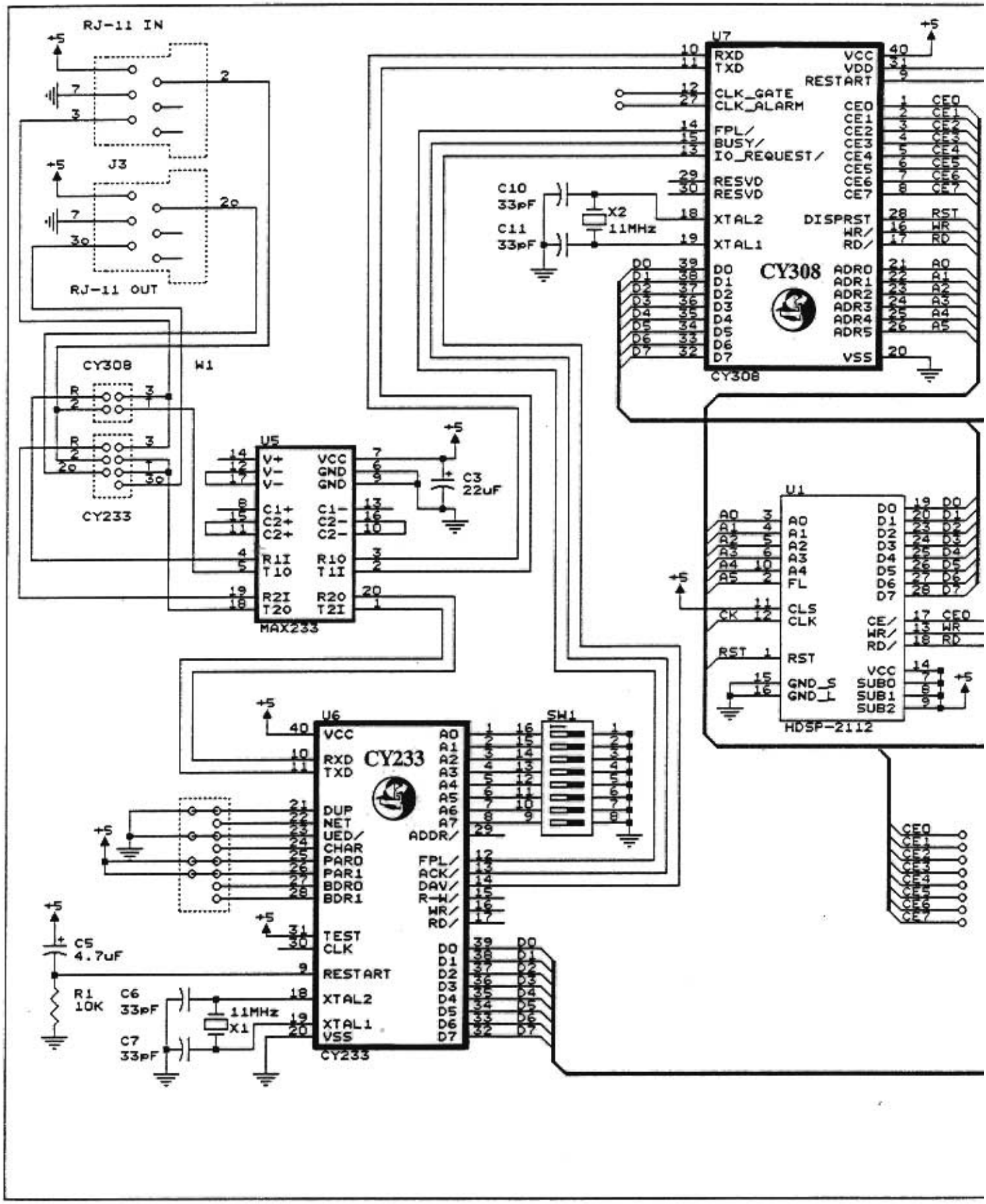


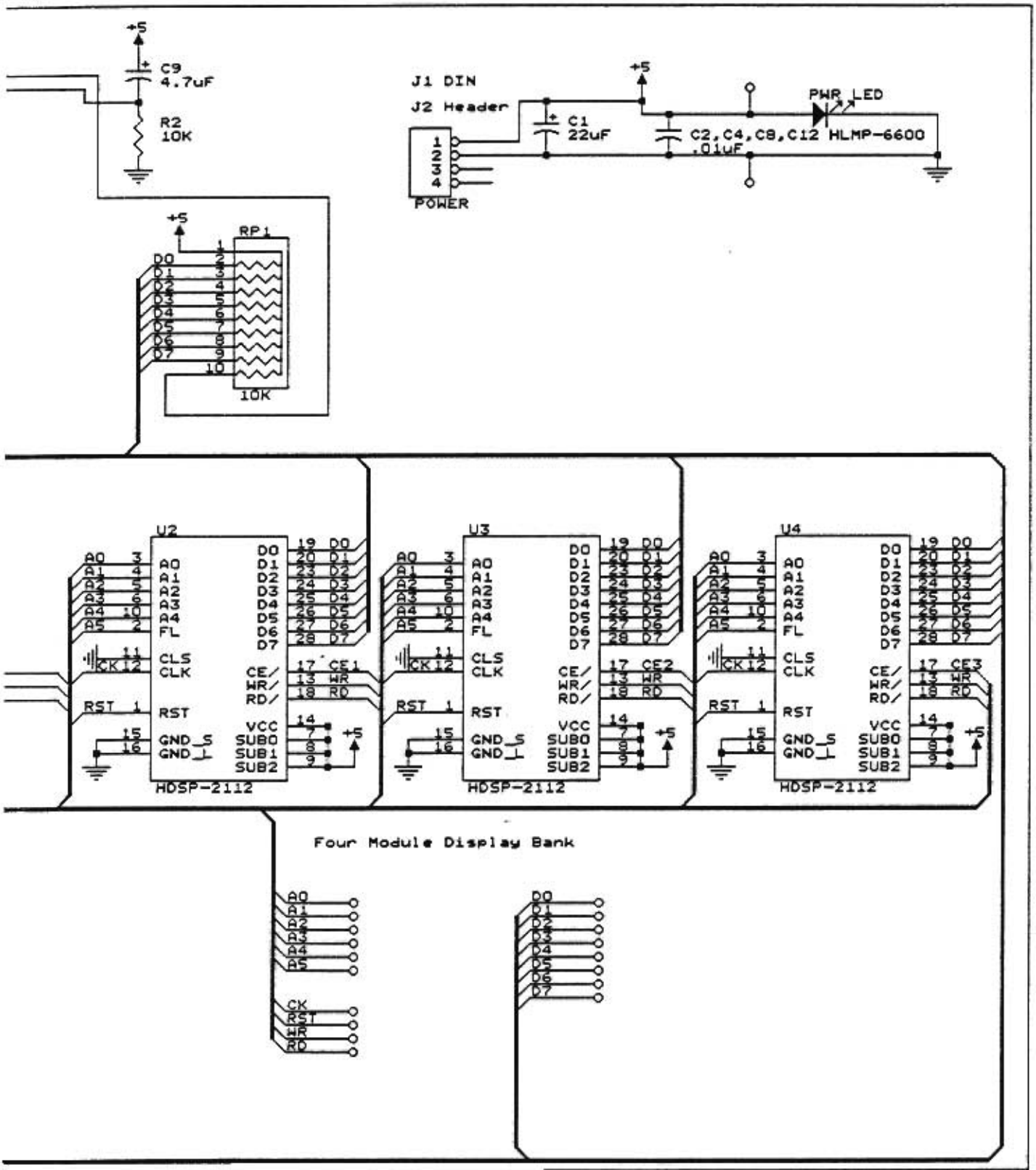
The CY233

The other major integrated circuit on the CYB-308 is the Cybernetic Micro Systems CY233 Local Intelligent Network Controller. This device is optional, and allows multiple CYB-308 boards to by operated from one master computer serial port. The CY233 provides address decoding of serial messages in a network, allowing up to 255 boards to be controlled from one serial port!

Support circuitry for the CY233 includes an address selection switch, reset capacitor and resistor, and an 11 MHz crystal. A jumper for manual reset control is also provided to this device.

The CY233 operating mode is connected for adaptive baud rate, 8 data bit characters with no parity, ASCII character mode, decoded addressing, and slave mode with echo invalid. These settings may be changed by cutting or connecting the appropriate signals from +5 volts and ground. See the CY233 manual for details on the various operating modes.

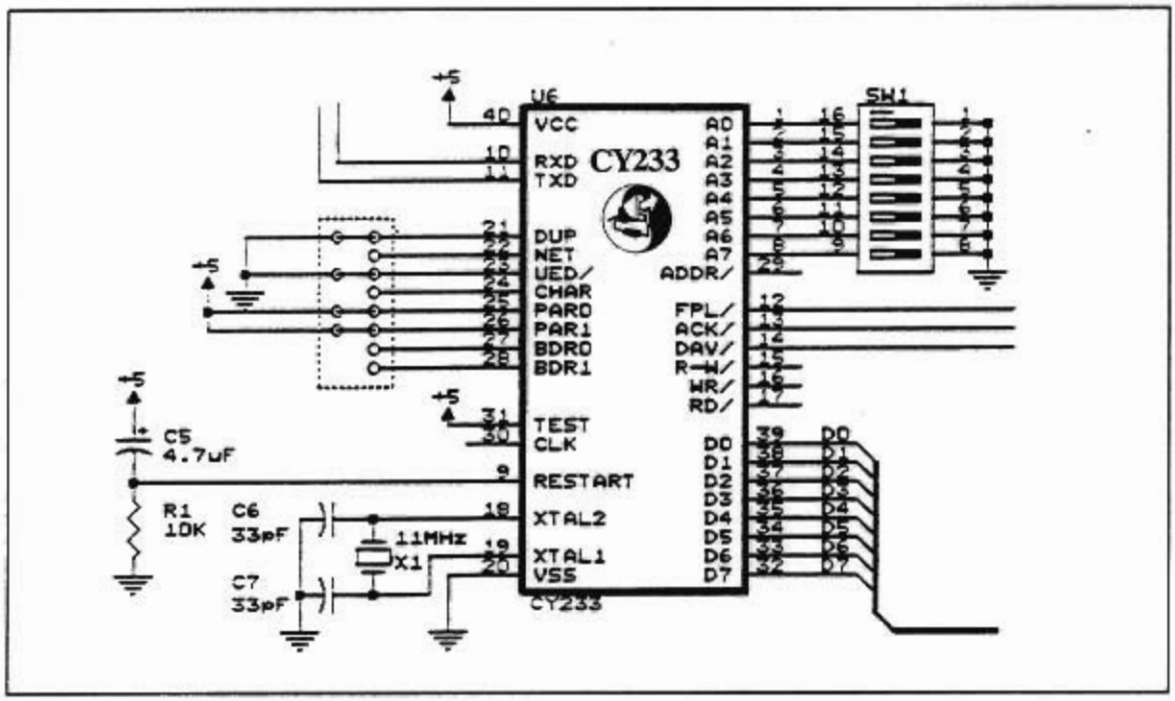

RJ-11 IN
J3
RJ-11 OUT
CY308
W1
CY233
U5
MAX233
C3
22uF
U7
CY308
C10
33pF
C11
33pF
X2
11MHz
U1
HDSP-2112
U6
CY233
SW1
C5
4.7uF
R1
10K
C6
33pF
C7
33pF
X1
11MHz


+5
C9
4.7uF
R2
10K
J1 DIN
J2 Header
C1
22uF
C2,C4,C8,C12
.01uF
PWR LED
HLMP-6600
POWER
RP1
10K
U2
U3
U4
HDSP-2112
Four Module Display Bank
Cybernetic Micro Systems
Title
CYB-308 Schematic
Size
B
Document Number
REV
A
Date:
June 16, 1989
Sheet
1 of
1

Note that the CY233 also supports encoded and decoded addressing modes. In the decoded mode, which is selected by the default board design, the CY233 can react to one of eight addresses, so all the address switches except the desired one should be left open. The CY233 will respond to message addresses 00 to 07.

The parallel interface of the CY233 is connected to the parallel input of the CY308. This involves the data bus signals, and three handshake control signals. The CY233 signals are DAV, ACK, and FPL. On the CY308, these signals are IO_REQUEST, BUSY, and FPL respectively.

As the CY233 receives messages from the serial network, the data characters of the messages are passed to the CY308 on this parallel interface. Each character is passed with a handshake, implemented automatically by the CY233. The CY308 responds with its BUSY signal, indicating when each character has been accepted. The FPL signal is used to write query responses from the CY308 into the CY233, where they will be sent as reply messages on the serial network.



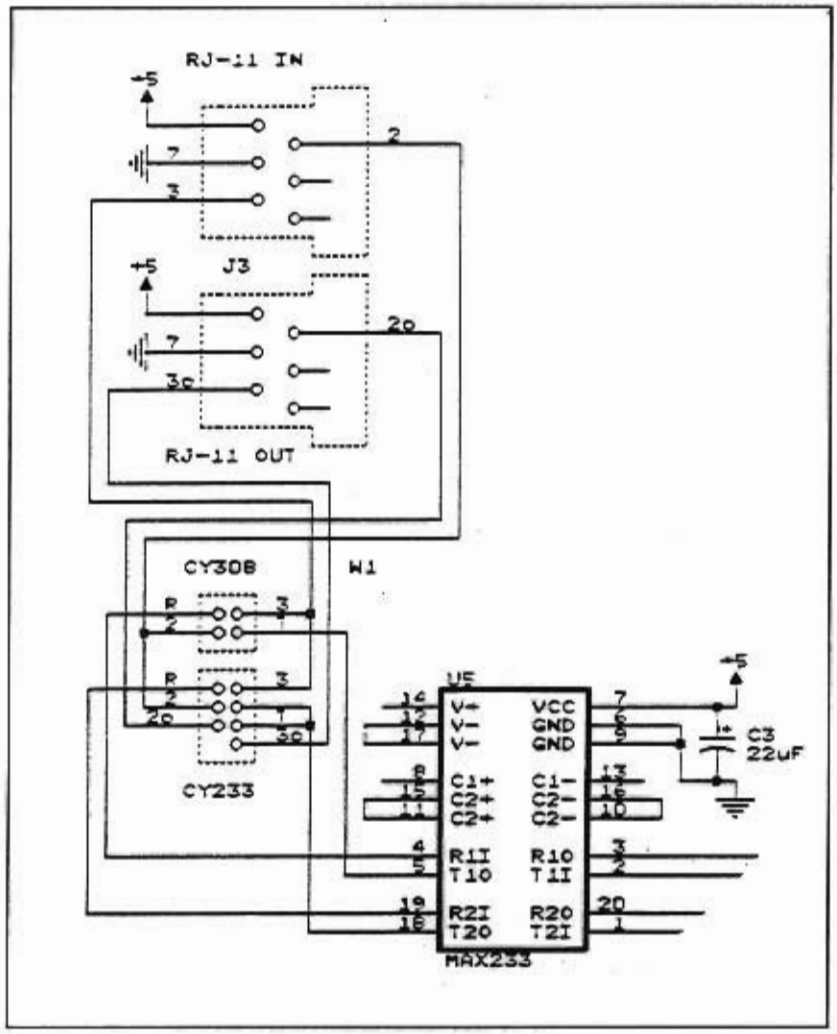
The Serial Interface

The last integrated circuit on the CYB-308 is the MAX233, which provides the serial driver/receiver interface to the CY308 and CY233. This device provides the voltage level translations between the RS-232 side, which operates at +/- 10 volts, and the CY308 and CY233, which operate with TTL compatible signals. Included in the MAX233 is a voltage doubler and inverter, so the device produces its own +/- 10 volt power supplies from the +5 volt supply of the CYB-308. This means the entire CYB-308 board can be operated with a single +5 volt supply.

The MAX233 is connected directly to the CY308 and CY233. Each driver/receiver pair is connected to one of the controllers. The RS-232 side of the interface is connected to the MAX233 through jumper W1, which allows you to select which pin of the interface is used to drive the receiver and transmitter signals. Details on the jumper connections are provided in a later section of this manual.

The RS-232 signals are brought to the dual RJ-11 telephone connectors, where the CYB-308 may be connected to a host computer or terminal. Cybernetic Micro Systems also provides the cables which convert the RJ-11 telephone interface into a standard DB-25 connector used by RS-232 devices. A dual RJ-11 connector is provided for supporting networks of CYB-308 boards. The IN connector receives serial messages from the network, while the OUT connector plugs into the IN connector of the following board. Note that this function works only with the CY233.

When using a single CYB-308, or when communicating directly with the CY308, only the IN connector is used, supporting both the transmit and receive signals.

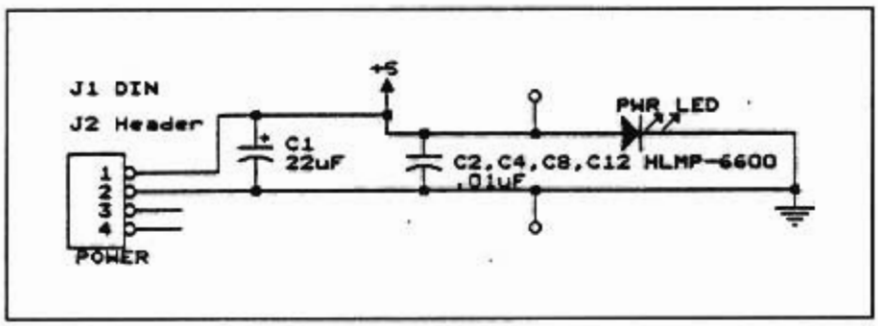


Power and I/O

The final portion of the CYB-308 is the power and I/O section. The CYB-308 uses only a +5 volt supply for all components on the board. There are two power supply connectors. One is a 4 pin Molex style header, and the other is a 5 pin DIN connector. Both connectors allow for alternate supply voltages if this is required by your system. An LED is connected to the +5 volt supply, giving a visual indication when the supply is on.

Connectors J4 and J5 represent the primary I/O connections from the CYB-308 board. These connectors include all the control signals from the CY308 that are needed to connect additional displays to the system. You would be able to add four more display modules to the CYB-308 without any changes to the circuitry. This would allow a 64 characters to be directly supported by the CYB-308 design.

If more display modules are needed, you must implement an encoded address scheme for all the modules, with external address decoding and select signals provided for each. The CY308 must be operated in the encoded address mode, and it will generate a binary address combination on all eight Chip Enable signals.



CYB-308 Specifications

- The CYB-308 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 53mm x 188mm (approximately 2.1" x 7.4").
- Power requirements:

  Board voltage: +5V (150 mA max) for basic board with no display module.
  (for each display module used, add 450 mA).

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

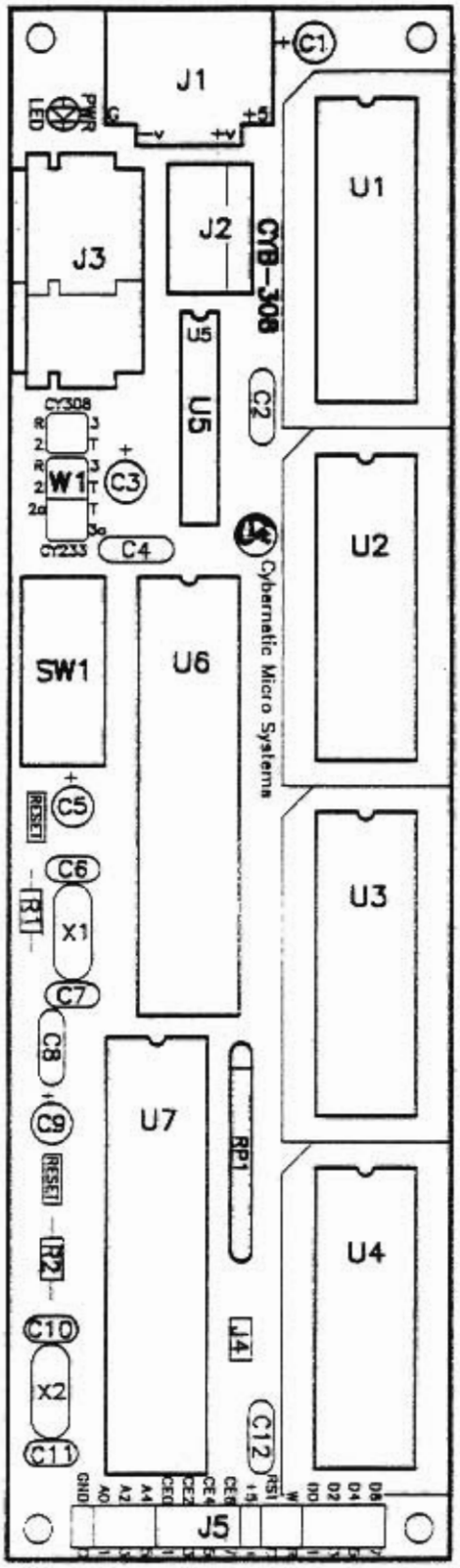
Tools Required

Assembly of the CYB-308 may require the following tools:

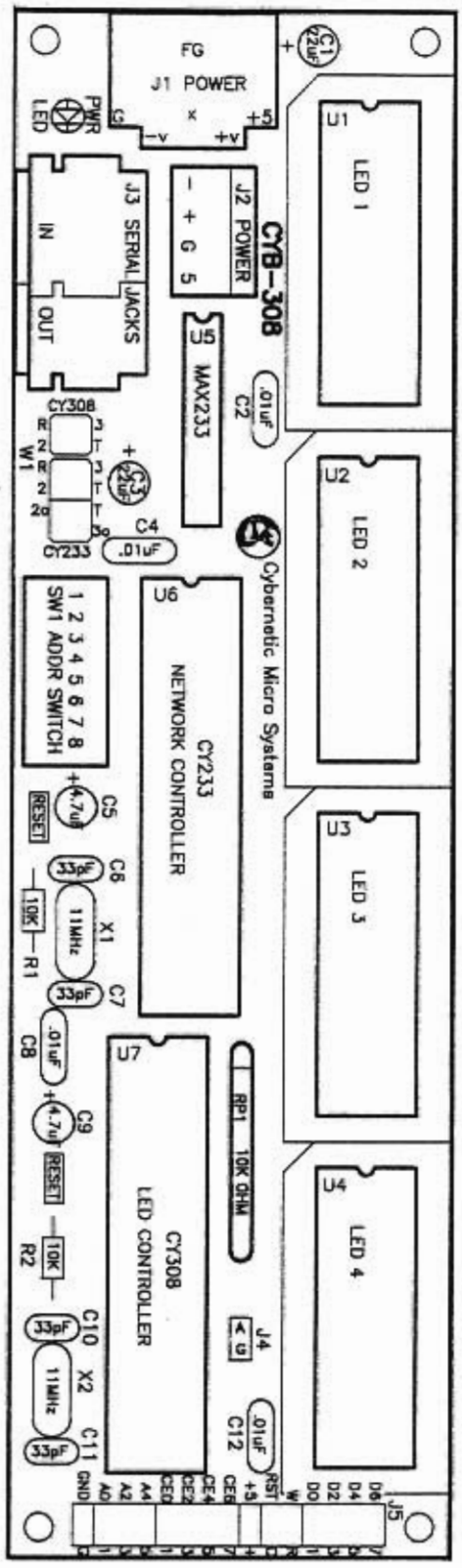
- ☐ A pair of needle-nose pliers
- ☐ A pair of small diagonal cutters
- ☐ A soldering iron
- ☐ Some rosin core solder
- ☐ A Volt-Ohm-Milliamp meter for testing

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-308 Component Locations



CYB-308 Component Values

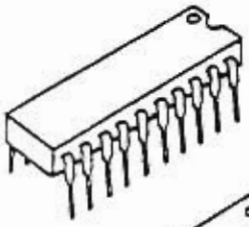


Parts List

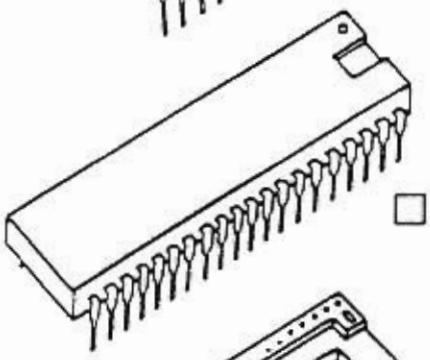
The following parts list describes the parts included with the CYB-308. Check the kit to be sure it is complete. The novice assembler may also use this opportunity to become more familiar with the various types of components supplied. NOTE: DO NOT REMOVE INTEGRATED CIRCUITS FROM THE CONDUCTIVE FOAM UNTIL READY TO USE.

CYB-308 Basic Board

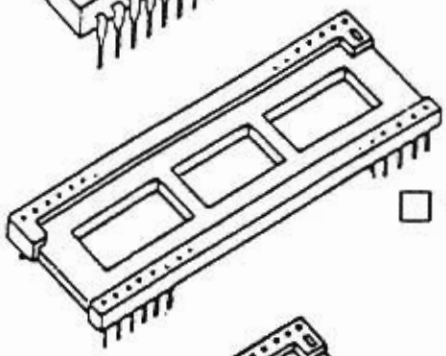
QTY	PART #	DESCRIPTION
☐ 1	CYB308PWB	Printed Wiring Board
☐ 1	CYB308Man	Assembly Manual



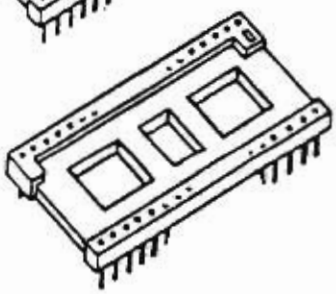
☐ 1 MAX233 RS-232 driver/receiver



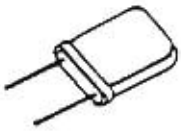
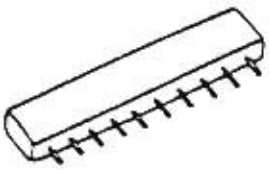
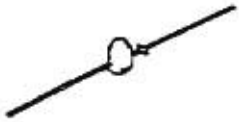
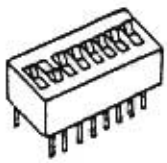
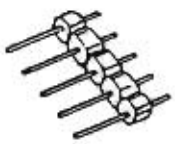
☐ 1 CY308 LED Controller

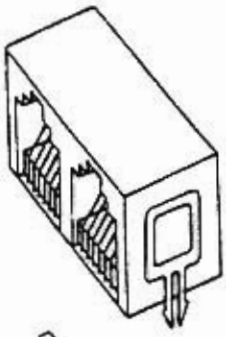


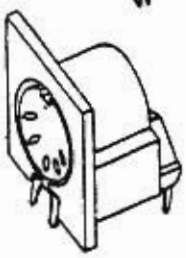
☐ 2 C89-40-01 40 pin low profile IC socket

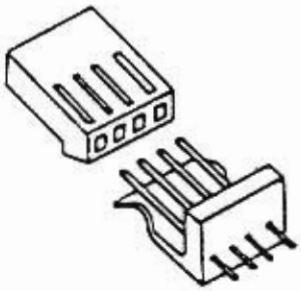


☐ 4 C89-28-01 28 pin low profile IC socket

	QTY	PART #	DESCRIPTION (cont.)
	☐ 2	MP110	11 MHz Crystal
	☐ 4	TCD103M	0.01uF 50V ceramic disc capacitor
	☐ 4	CCD330	33pF ceramic disc capacitor
	☐ 2	513D475M063JA4	4.7uF 63V single-ended electrolytic capacitor
	☐ 2	513D226M025JA4	22uF 25V single-ended electrolytic capacitor
	☐ 2	R10K	BRN-BLK-ORG-gld 10K ohm 1/4 Watt Resistor
	☐ 1	CSC10A-01-10K	10K ohm Resistor Pak 10 pin SIP
	☐ 1	HLMP-6600	Red LED w/internal Resistor
	☐ 1	76SB08	8 position DIP Switch
	☐ 1/2	CA-S36 SP100-230-430	18 headers, solder tail (strips)
	☐ 2		Shorting Plugs







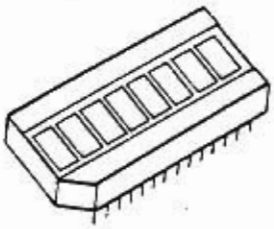
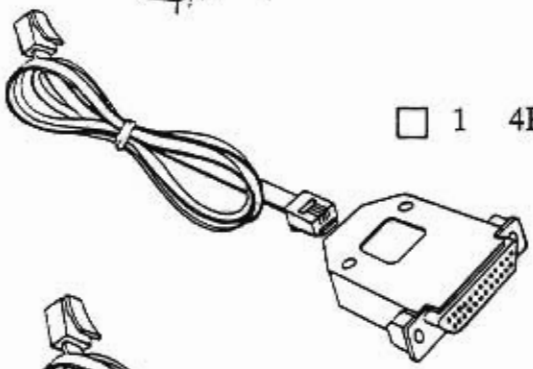
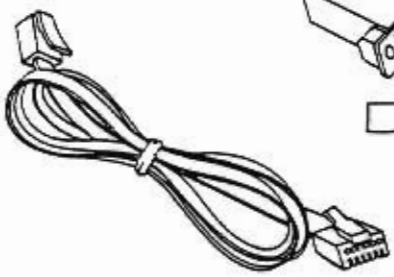
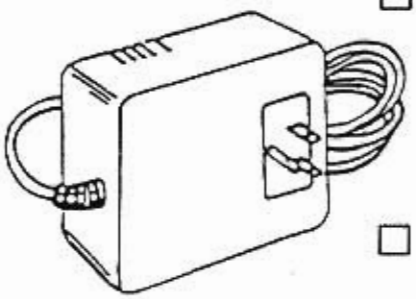
QTY	PART #	DESCRIPTION (cont.)
☐ 1	TM2REA-1212	Double RJ11 Jack for RS-232
☐ 1	WMPCBA	180° 5-pin DIN power socket
☐ 1	09-50-3041	4 pin housing, .156 centers, with locking ramp
☐ 1	09-65-1041	4 pin polarized Header, .156 centers, .045 round post
☐ 4	08-50-0106	Crimp pins for above housing
☐ 4	4309	Hex Nylon threaded spacer, 4-40 x 3/4"
☐ 4	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.

For a flush mount panel display:
All components may be mounted on back of board **except**:

Displays
Max233
CY233
CY308
DIN Power Connector (omit)
Double Serial Jacks (omit)

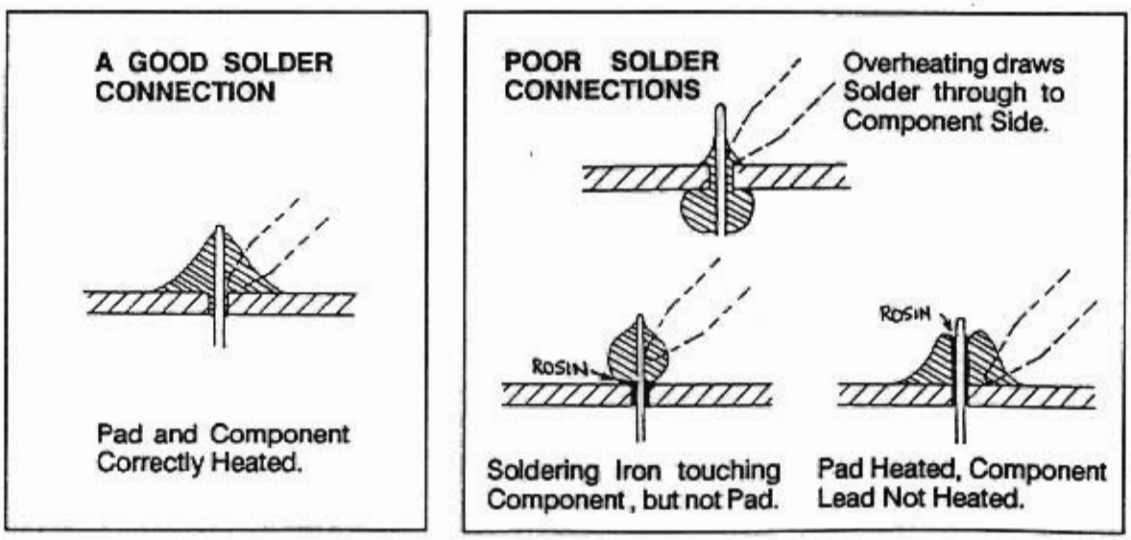
Options

	QTY	PART #	DESCRIPTION
	☐ 1	CY233	Serial/Parallel Network Controller IC
	☐ 4	HDSP-2112	8 character LED Display
	☐ 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 Will supply adequate power for basic board with one display. If using four display modules, a larger power supply will be needed. (1.9A for full brightness, or 1A for the default, which is at half brightness) The Power 1 HTA-16W supplies 1.2A.
	☐ 1	Power-4.1	

Assembly Procedure

The CYB-308 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-308, including photographs of the completed Board.

For a flush mount panel display, all components may be mounted on the back of the board **except:**
- Displays
- Max233
- CY233
- CY308
- Din Power Connector (omit)
- Double Serial Jacks (omit)

Resistors

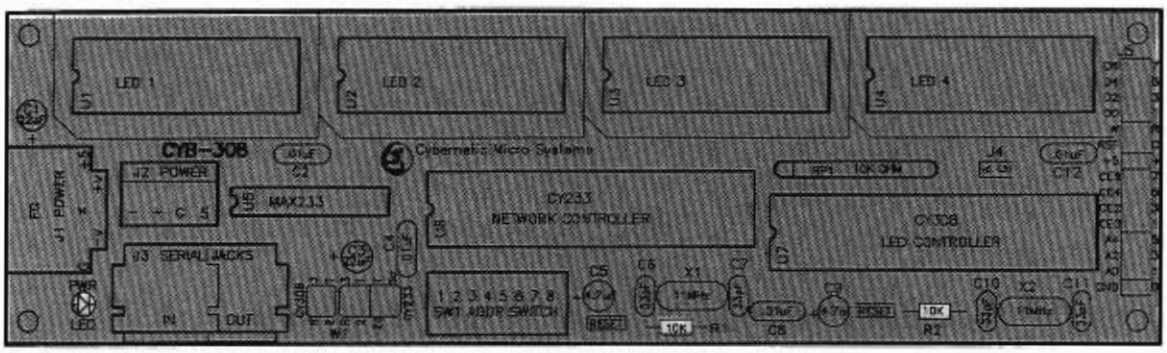
The resistors will be the first components installed on the CYB-308. To install each resistor, the leads must be bent and cut to fit. Resistors are installed as follows:

☐ Install the 10K ohm resistors (brn-blk-org-gld) in locations R1 and R2.

Diodes

There is one miniature light emitting diode (LED) indicating power is applied to the CYB-308. The LED is polarized and must be installed properly to work. The cathode (negative) side is indicated by a bar across the lead, and is shown as a bar on the silkscreen. This cathode side should face the edge of the board. The positive or anode side of the LED is shown on the silkscreen as a triangle and is connected to +5 volts.

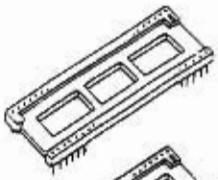
☐ Install the Power LED at location PWR, next to J1.



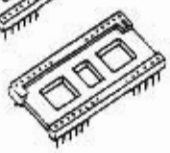
Note:
The negative side of the LED may be indicated by a painted silver stripe on body.

Integrated Circuit Sockets

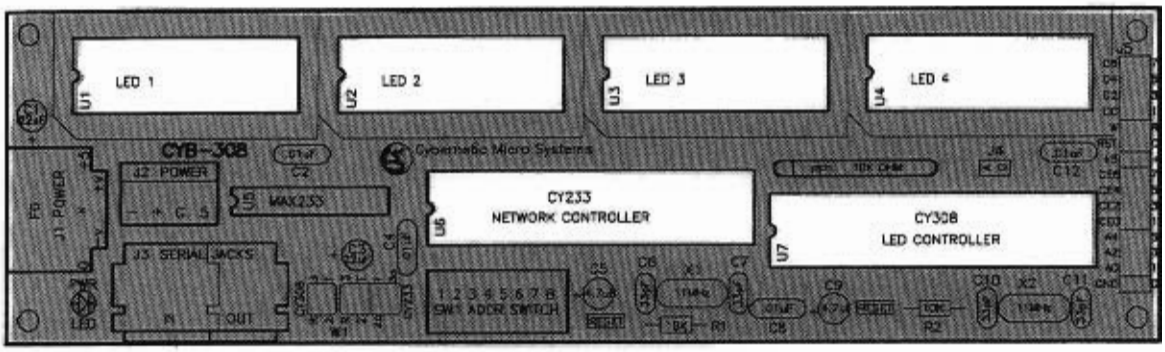
Solder tail sockets are provided for the CY308, the CY233, and LED Displays. The sockets have a notch or other marking to designate the pin 1 side, and should be installed to match the patterns of the CYB-308 silkscreen.



☐ Install the 40 pin solder tail sockets in locations U7 for the CY308, and U6 for the CY233.

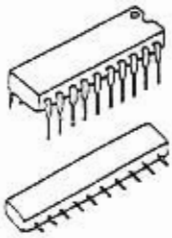


☐ Install the 28 pin solder tail sockets in locations U1, U2, U3, U4.



Integrated Circuits

The Integrated Circuits (ICs) are the next components to be installed. They are 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-308. 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 U5.

☐ Install a 10-pin 10K ohm resistor SIP in location RP1. The common pin of the resistor pak, indicated by a dot or other marking, should match the square pad on the board, nearest the RP1 label.

Capacitors

Capacitors will be installed next. Leads should be trimmed to the proper length before soldering. The ceramic disc capacitors have no polarity, while 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 C6, C7, C10, and C11.

☐ Install four 0.01 uF ceramic discs in C2, C4, C8, and C12.

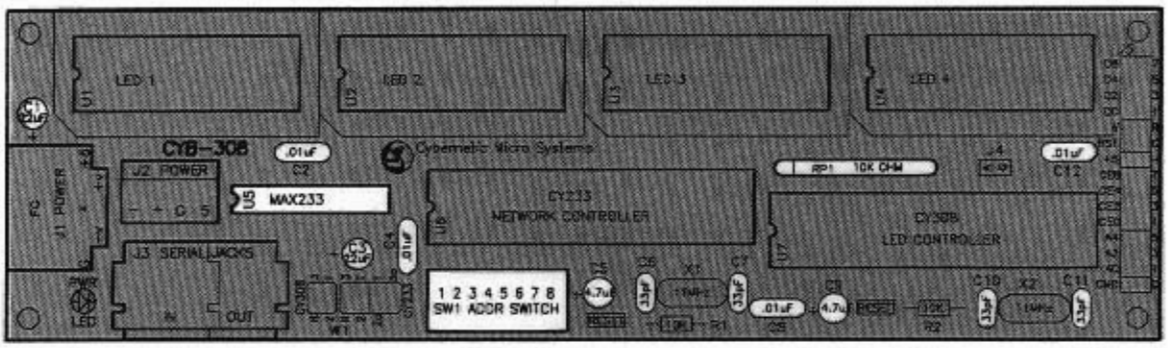
☐ Install the two 22 uF electrolytic capacitors in C1 and C3.

☐ Install the two 4.7 uF electrolytic caps in C5 and C9.

Switches

There is one 8 position DIP switch on the CYB-308, at location SW1. There is no electrical polarity to this switch, however, it does have a proper orientation, due to the numbering scheme of the 8 switches, requiring switch position number one to match the pattern on the board.

☐ Install the 8-position DIP switch at location SW1.



Strip Line Headers

Solder tail posts are provided in single-row strips which are broken into the appropriate lengths and soldered into the jumper pads, such as those designated W1. 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, 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.

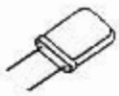
☐ Install solder tail posts in jumper W1. The 2 shorting plugs are for use on W1.

☐ Install solder tail posts in location J4.
(Install posts in J5 only if it is necessary to control additional LED display modules.)

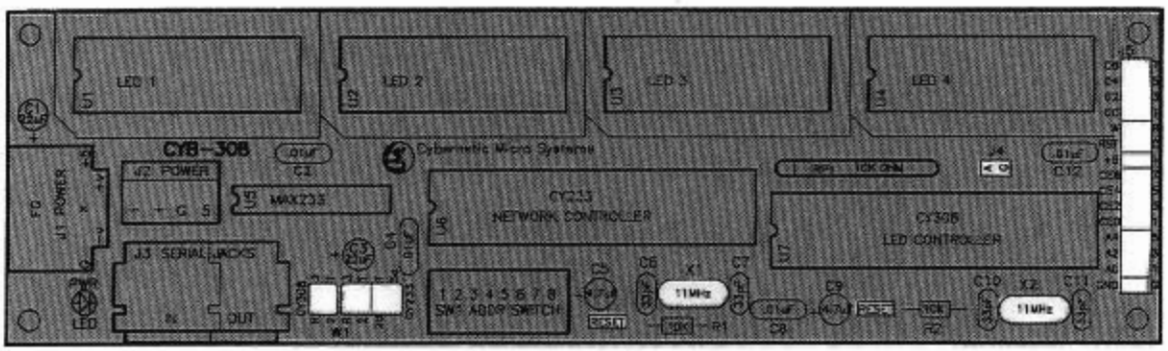
☐ Install solder tail posts in the pads marked reset (optional).
There are two sets of reset pads, one for the CY233 and one for the CY308. Shorting across a pair of pads connects the restart signal to +5 volts, resetting the controller. It may be useful to place a push button switch here if your prototyping application requires a lot of experimentation and thus a need for resetting the hardware often.

Crystals

There are two 11 MHz crystals on the CYB-308, one each for the CY308 and the CY233. The crystals are installed standing up, to minimize occupied board space.



☐ Install two 11 MHz crystals in locations X1 and X2



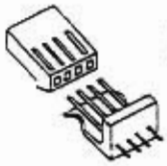
Connectors

The CYB-308 is supplied with a double female RJ11 telephone-style serial connector for the RS-232 interface. The receptacle should face away from the board.

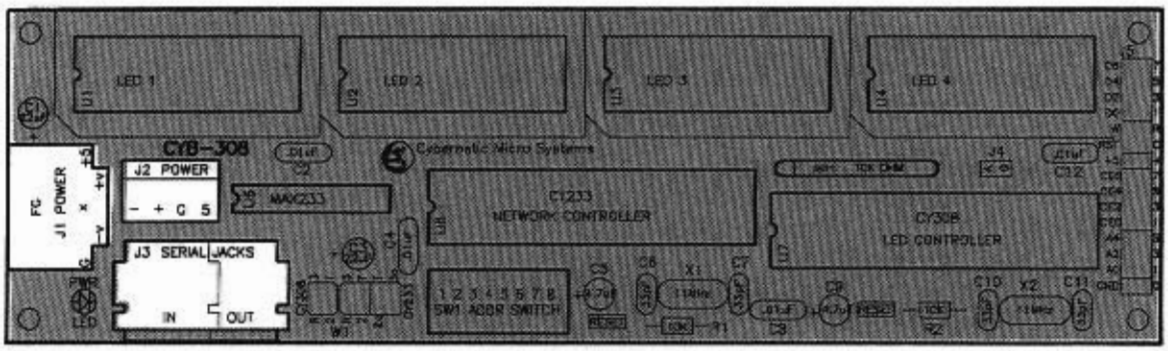
☐ Install the RJ11 RS232 connector in location J3.

Two power connectors are supplied with the board: a 180° 5-pin DIN connector and a 4-pin power header. 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 J1.



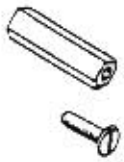
☐ Install the optional 4-pin power header in location J2.
The connection pins should face the serial connector.



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 CY233 and CY308 in the 40 pin sockets at U6 and U7, or the LED displays at U1 through U4. Be careful to match the notch in the chip with the silkscreen pattern on the CYB-308.

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.

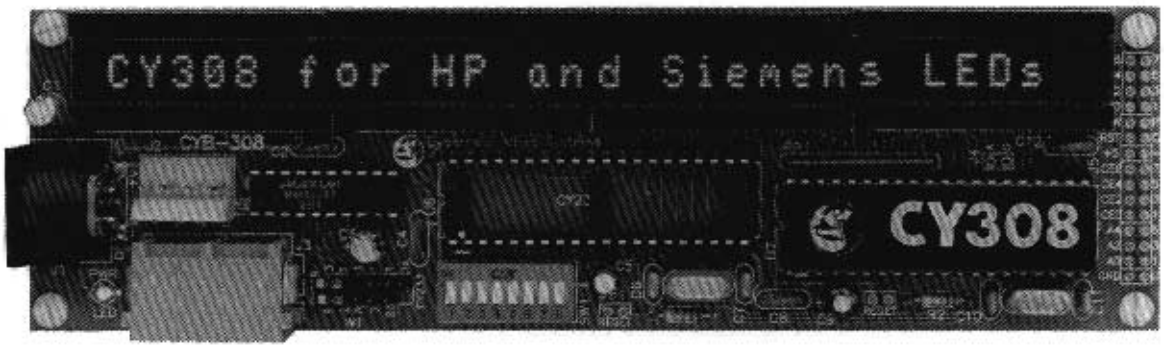
The screws and spacers are used as feet for the four corners of the CYB-308 board.



☐ 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, motor driver, and other parts of the system, as required.

Assembled CYB-308



Jumper Functions

Various options on the CYB-308 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 are provided in a strip with the CYB-308. 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-308 schematic.

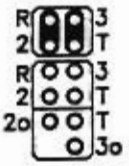
W1 RS-232-C Connections to J3

Jumper W1 is used to connect the serial line driver and receiver from the CY308 to the appropriate pins of the J3 RJ11 connector. Since what line is used for transmitting and receiving information depends on whether the CYB-308 is acting as data communications equipment or data terminal equipment, this jumper allows pins 2 and 3 of the connector to be set as required.

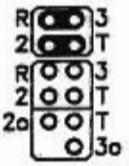
Alternatively, this jumper allows serial signals from the CY233 to be optionally connected to J3. Note that these connections would be used if the board is to be connected to a serial network, or if two or more boards are connected to one host.

The jumper labels fall into two groups. The pins labeled as RxD (R) and TxD (T) indicate the functions of those lines from the internal board circuits, while the pins labeled numerically, as 2 and 3, correspond to the labels on the RJ11 and to the pin numbers of a DB25 connector.

The W2 jumper layout allows you to connect either the CY308 or the CY233 to the RJ11 connector. The upper four pin group of W2 is used by the CY308, with 2 options:

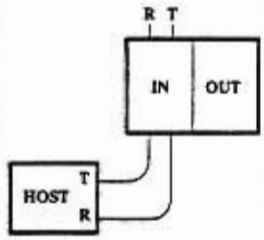


A. To connect the CY308 device as data communications equipment:
2 - RxD DB25 (RJ11) pin 2 to CY308 RxD
3 - TxD DB25 (RJ11) pin 3 to CY308 TxD
(Most applications will use this setting)



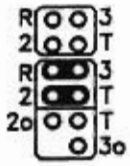
B. To connect the CY308 device as data terminal equipment:
3 - RxD DB25 (RJ11) pin 3 to CY308 RxD
2 - TxD DB25 (RJ11) pin 2 to CY308 TxD

Direct Serial communications to CY308 on a single-board system



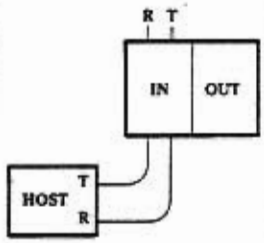
The remaining 7 pins allow you to connect the CY233 to the RJ11 connector in various configurations. When using only the input jack, make connections in the four pin group immediately below the CY308 connections.

C. To connect the CY233 as data communications equipment using a single serial jack:
2 - RxD DB25 (RJ11) pin 2 to CY233 RxD
3 - TxD DB25 (RJ11) pin 3 to CY233 TxD



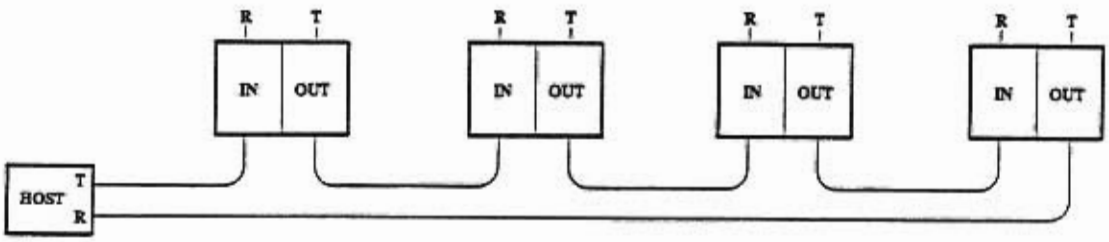
D. To connect the CY233 as data terminal equipment using a single serial jack:
3 - RxD DB25 (RJ11) pin 3 to CY233 RxD
2 - TxD DB25 (RJ11) pin 2 to CY233 TxD

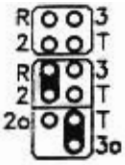
Single node for prototyping network applications, or for line turnaround on terminating board in a network



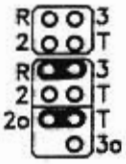
When daisy chaining multiple boards in a host ring network, the input jack recieves data from the network, while the output jack transmits data to the next board of the network. In this case, the "T" pin may be left disconnected from the input jack, and connected to pin 2 or 3 of the output jack, by the posts labeled "2o" and "3o" of the lower pin group of W2.

Host Ring Network (easy to conceptualize)



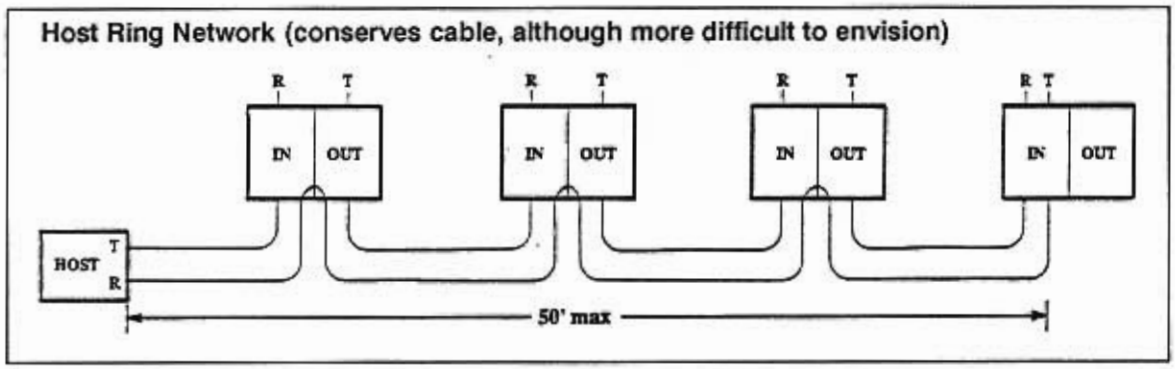


E. To connect the CY233 as data communication equipment using the double serial jack in a host ring network:
2 - RxD DB25 (RJ11) pin 2 on input side of RJ11 to CY233 RxD
3 out - TxD DB25 (RJ11) pin 3 on output side of RJ11 to CY233 TxD

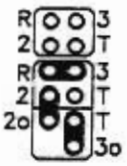


F. To connect the CY233 as data terminal equipment using the double serial jack in a ring network:
3 - RxD DB25 (RJ11) pin 3 on input side of RJ11 to CY233 RxD
2 out - TxD DB25 (RJ11) pin 2 on output side of RJ11 to CY233 TxD

To minimize cable requirements in a ring network, the following connections will allow a single cable to act as a loop of cable (similar to Xmas tree lights). The ring signal is received on one jack and transmitted out of the second jack. The unused signals on both jacks are connected together, without passing through the Max233, to serve as a signal interconnect for the single, long, return signal to the host. The terminating board in this scheme does not implement the interconnect, but merely receives and transmits on one jack.



G. To connect the CY233 as data communication equipment using the double serial jack in a wire-conserving ring network:
2 - RxD DB25 (RJ11) pin 2 on input side of RJ11 to CY233 RxD
2 out - TxD DB25 (RJ11) pin 2 on output side of RJ11 to CY233 TxD
3 - 3 out DB25 (RJ11) pin 3 in input to pin 3 on output.
Use the previous option C for the terminating board in this network.



H. To connect the CY233 as data terminal equipment using the double serial jack in a wire-conserving ring network:
3 - RxD DB25 (RJ11) pin 3 on input side of RJ11 to CY233 RxD
3 out - TxD DB25 (RJ11) pin 3 on output side of RJ11 to CY233 TxD
2 - 2 out DB25 (RJ11) pin 2 on input to pin 2 on output.
Use the previous option D for the terminating board in this network.

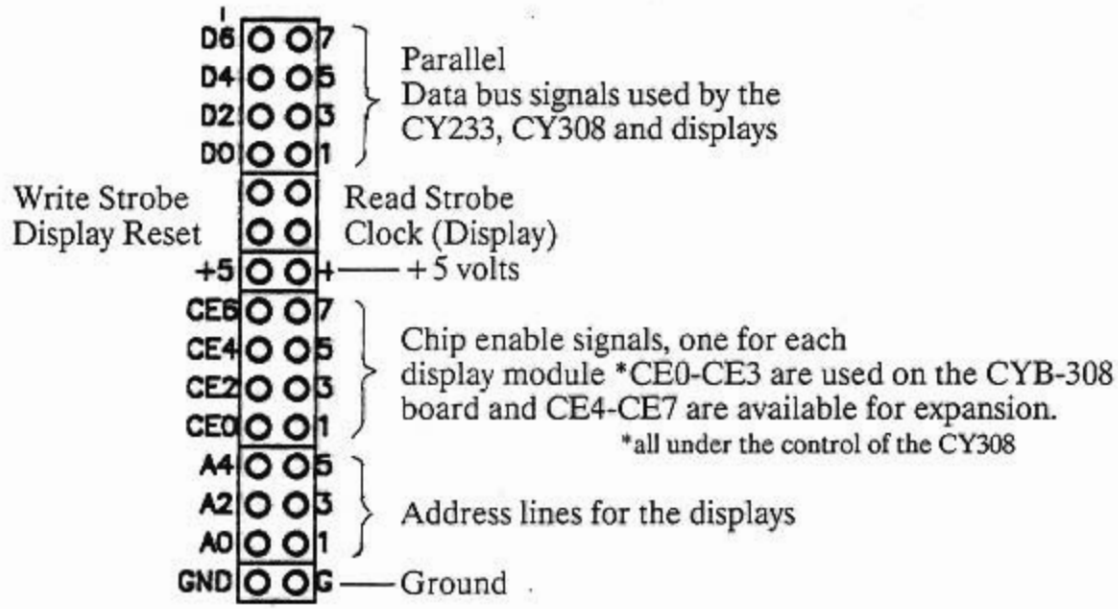
Generally, the user will select only one of these eight possible settings. Note that the function of RxD is to receive data into the CYB-308 board, while TxD transmits data from the board. Also, the IBM PC uses the same pins as data terminal equipment (a CRT) when communication is through the COM1 channel, so the CYB-308 board should be set up as data communications equipment when connected to an IBM PC (first example in each set).

J4 Clock/Timer Signals

A Clock Alarm
G Clock Gate

J5 Expansion Header

Several groups of signals are brought to pads at the end of the board, allowing expansion to up to eight 8-character display modules under the control of one CY308.



Reset

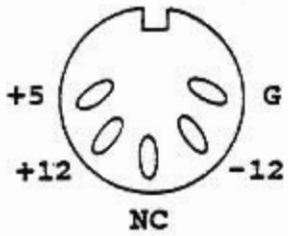
There are two sets of reset pads, one for the CY233 and one for the CY308. Shorting across a pair of pads connects the restart signal to +5 volts, resetting the Controller. It may be useful to place a push button switch here if your prototyping application requires a lot of experimentation and thus a need for resetting the hardware system.

Power Connector Pinouts

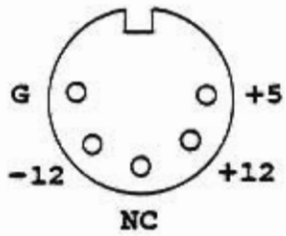
J1 DIN Power Connector

The connector at J2 is the power supply connector for the board. The 5-pin 180° 1/2 inch diameter DIN receptacle is compatible with the Elpac WM 063 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.

Board Receptacle



Power Supply Plug

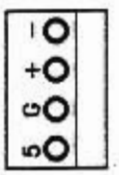


Note that the CYB-308 board only requires the +5 volt supply (the RS-232 voltage levels are generated on the board by the Max233), so the + and - voltages on J1 and J2 may be unused. These additional supply inputs are provided to support custom circuits, as required by the application.

J2 Power Header

Connector J2 is used to bring power to the CYB-308 circuits and is the alternate power supply connector for the board. It is a standard 4 pin header, with pins on 0.156" centers. The mating connector is also supplied with the CYB-308. Pin 1, the +5 volt input, is physically closest to the capacitors, while pin 4, the negative voltage input, is closest to the edge of the board.

J1 Power connector



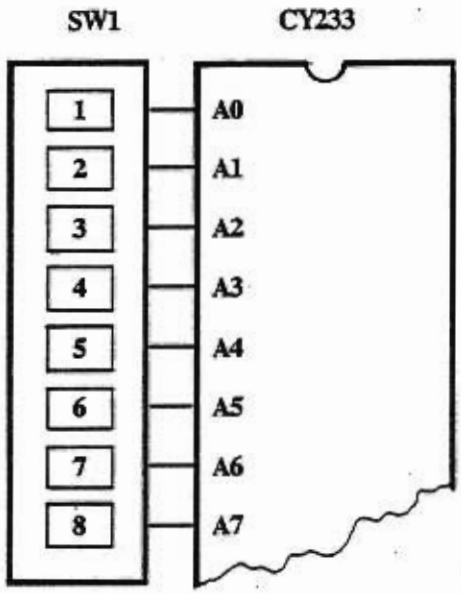
4	- alternate voltage
3	+ alternate voltage
2	Ground
1	+5 volts

SW1 Network Address Switch

The Address Switch (SW1) is an 8 position DIP Switch (SPST Make-or-Break) package. The 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 by connecting that address line to ground. If the address mode is not used, the eight switches are ignored and become available to the user for any purpose.

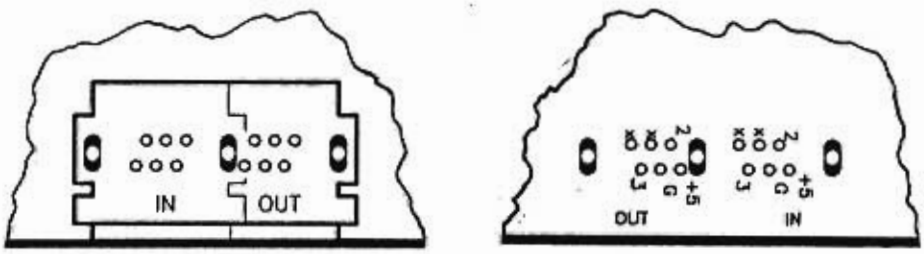
More than eight boards may be networked using encoded addressing in the wirewrap area. See the CY233 manual for details.

If the CY233 is not used, it may be desirable to omit the DIP switch and use wirewrap posts for custom applications.



J3 Double Serial Jack

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 J3 are labeled to correspond with the pin numbers of an IBM PC compatible DB25 connector. The signals TxD, RxD, and GND are available at J1 IN and J1 OUT when the appropriate connections are made at W2. A +5 volt signal is also available at J1 IN and J1 OUT for use in a multi-board network. The +5v signal should not be connected to the host computer. Two extra signals could be transmitted on the 2 spare input and 2 spare output lines of the RJ11 (labeled x).

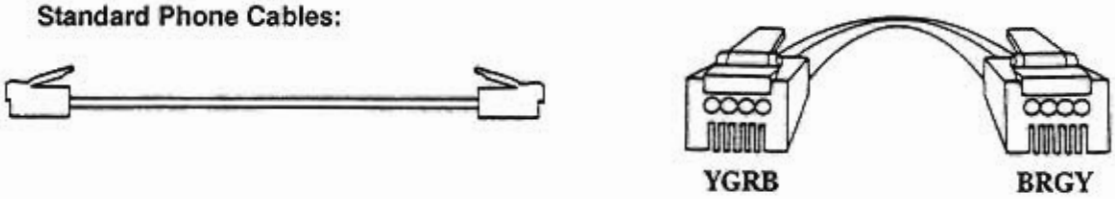


TOP BOTTOM

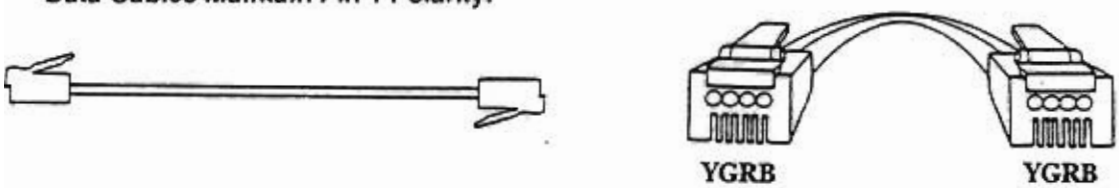
The Serial Cable

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:

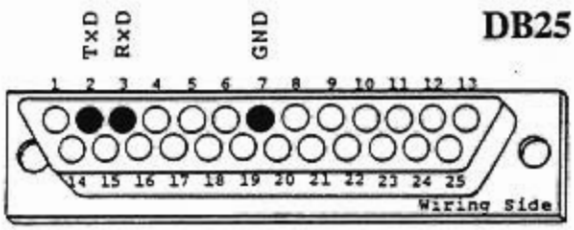


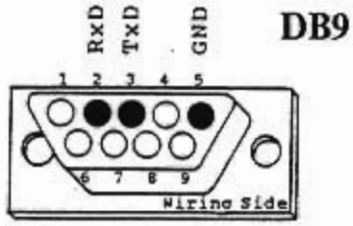
DB25 to RJ11 Connector

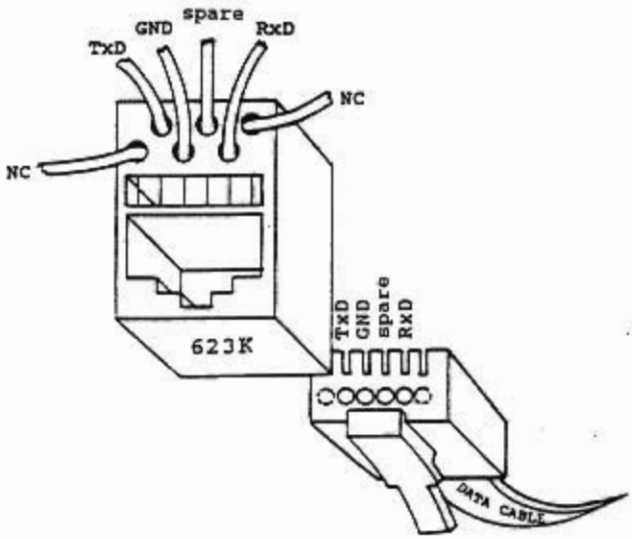
Making your own connector: The RJ11 insert on the RJ11-to-DB25 connector is often designated 623K. Looking at the side of the 623 with the wires, you will see that there are two rows of wires offset from each other. The wire colors and the direction of the offset vary with brands. In making a 4-wire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

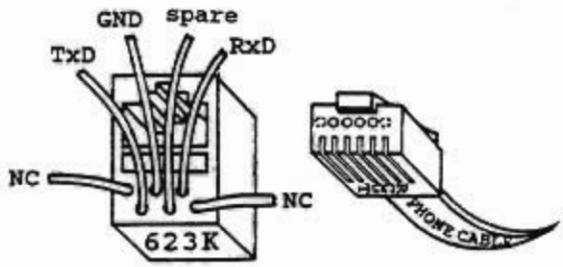
either  or 

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.



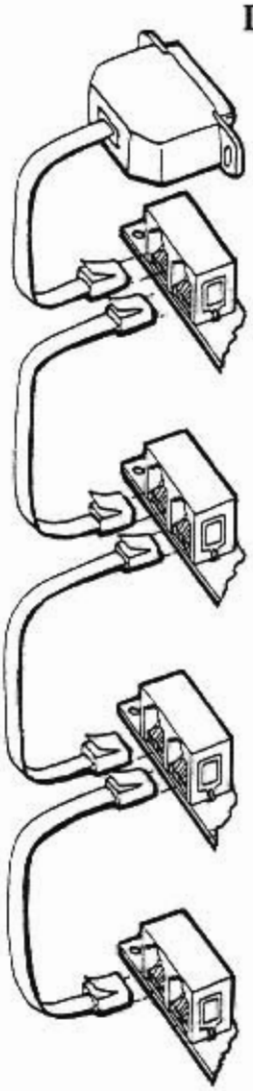






If using a standard phone cable instead of a data-type cable, then turn the 623K 180° so that the wires are toward you and the locking key is away from you. This reverses the phone cable wires, while the left to right 623 wires will still be labeled TxD, GND, spare, and RxD.

Daisy Chaining CYB-308s - Networks



The CYB-308 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 (4-wire cable) transmit TxD, RxD, Gnd, and a spare. The 2 outer signals (6-wire cable) transmit +5v and a spare. 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.

Any other signals that may also be needed in your network may be transmitted on the 2 spare lines available on the RJ11 Jack. Remember not to connect any power transmission signals to the host computer.

CY233 Network Communications

The CY233 serial communications parameters are hardwired on the CYB-308 to select 2400 baud, no parity, one stop bit, 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-308. Refer to the CY233 manual for details on different parameters.

CY308 Serial Communications

The CY308 is designed for adaptive serial communications from 300 - 19,200 baud after the receipt of 2 carriage returns. The protocol is fixed as no parity, 8-bit data, one stop bit, and ASCII characters

Final Assembly and Checkout

This section will discuss the completion of the CYB-308 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 CY308 may be installed into the 40 pin socket at location U7 and the CY233 may be installed at location U6. Be sure to observe proper polarity when installing these parts. The notch on the pin 1 side should face the power 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 CY308 into the socket at location U7.
- ☐ Insert the optional CY233 into the socket at location U6.
- ☐ Connect the serial cable to J3.
- ☐ Turn on power.

The capacitors on the Restart line of the CY308 should provide an automatic reset on power up.

CYB-308 Debugging

The following section explains a check-out procedure for the CYB- 308 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.

This check-out will require at least a serail 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.

CY308 Tests

- ☐ Set jumper W1 to connect the CY308 to the serial interface.
- ☐ Be sure the DB25 connections to pins 2, 3, 5, and 7 match the RJ11 pinouts.
- ☐ Configure your host computer or terminal for the desired baud rate, 8 data bits, 1 stop bit, and no parity.
- ☐ Send two carriage return codes to the CY308 to configure its operating baud rate.
- ☐ Try sending some display characters, such as:
  Test 1
- ☐ The display modules should display the message just sent.
- ☐ If the above sequence works, you are successfully communicating with the CY308. You may try other messages, or exercise other CY308 functions.

CY233 Tests

We will assume this CYB-308 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. Note that a BASIC language driver that performs terminal emulation functions on an IBM-PC class computer is provided in the CY233 Users Manual.

- ☐ The default settings on the CYB-308 board provide adaptive baud rate, 8 data bits, no parity, ASCII Character mode, decoded addressing, slave mode, and Echo Invalid. Try to set your system to match these selections. Otherwise, you may cut some of the traces on the CY233 mode selection signals, and reconnect them as required.

- ☐ Set jumper W1 to connect the CY233 to the serial interface.

- ☐ Send two carriage return codes to the CY233 to configure its operating baud rate.

- ☐ 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 >**

- ☐ 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.

- ☐ Now send to the CY233:
  W 01 To Local Display < 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 CY308.
  Thus, the message "To Local Display" should be shown on the display modules.

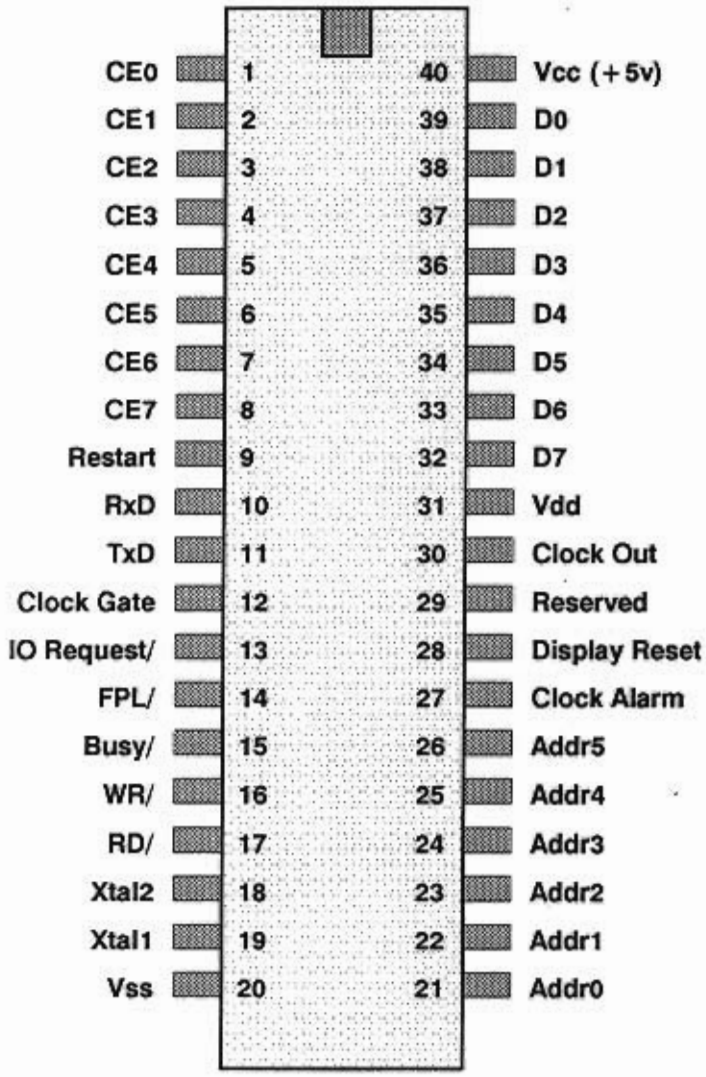
- ☐ When the above sequence works, you are commanding the CY308 through a network, and can control multiple CYB-308s through one serial port. Other boards may be added to the network as required, and commanded in the same way.

This completes the test of the CYB-308 board. The CY308 and CY233 have been checked, and messages have been passed between the CY233 and the CY308. If the above tests failed, be sure to carefully check the assembly of the board, any jumper connections, and all option selections. Try to verify that serial data is getting to the RxD signal at W1 when your terminal is transmitting, and that the data reaches the CY308 or CY233 at its RxD pin, pin 10. You can also check that the parts are 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 signal, pin 30.

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

CY308 Summary

CY308 Pins



CY308 Commands

^C Command mode set
^D Display mode set
^H Backspace delete
^K Klear current window
^R Scroll display window to right
^S Scroll display window to left
^Z Fix display window at start of Ram buffer

A a LSbit Sets Clock-Alarm
B b Base address parameter
C mode,hr,min,sec,hun Set clock
D d Delay for milliseconds
F f,... Font Creation char,data
G g,... LSbit Sets Clock-Gate
L l,addr Set Direct Display module and address values
M m Mode bits for display
N n,char Number of modules and characters per module
O m Operational Mode bits
P p Pointer into Ram buffer
S s,data Send data to address of all display modules
W w,data Send data to addres of one display module

? cmd Query parameter value