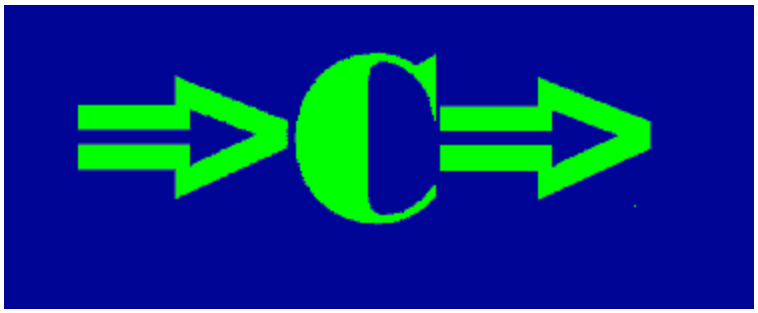
CyberSense



CyQ®702

OPERATORS MANUAL

Version 7.1

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INSTALLATION

1. Test

A. Plug the wall transformer into a mains (115 USA / 240 EUR) vac outlet. Plug the barrel connector into the back of the 701. While viewing the front panel LED's turn on the power switch (red handle, up is on). The blue power light should come on followed by a one-half second flash from each of the eight green LED's in order from input channels 1 to 4 followed by output channels 1 to 4. The yellow Tx LED should flash briefly. This confirms that the micro controller and power supply are good.

To further test the device, and to become familiar with the command set we need to talk to the 702. A terminal emulator program such as Hyper Terminal or Tera Terminal allows us to do this. Both programs, as well as numerous others, are available on CNet as either freeware or demo versions.

HYPER TERMINAL

(Included with MS Windows. Updates are on Cnet along with many similar programs such as Tera Term)

From windows
1). Click on programs
2). Click on Accessories
3). Select hyper terminal if available. If it does not appear on the list of accessory programs, then go to: How to install Hyper terminal.

HOW TO SET UP WINDOWS HYPER TERMINAL
" \I 2 FOR A COM PORT

Most of the settings correspond to the defaults for a PC.

1) In hyper terminal create a "**new connection**" this can be done by clicking the **Hypertrm.exe** icon or via the menu within HyperTerminal "**File:NewConnection**".

2) Type in a name for the connection (for example, cyq).

3) Under "**connect using**" select "**Direct to Com 2**" if your available com port is com 2 otherwise select the appropriate com port. (Modems are relentlessly selfish about interrupts. So if a modem is present, then avoid the modem port and it's cousin. That is, if the modem is on com 1 then avoid both com 1 and 3. Com 1 and 3 share an interrupt while com 2 and 4 share a different interrupt; in this case avoid 2 and 4.

4) Set "**Bits per second**" to 9600.

5) Set "**Data Bits**" to 8.

6) Set "**Stop Bits**" to 1.

7) Set "**Flow control**" to None.

8) Click OK - the hyper terminal screen should appear.

9). Select **properties** from the menu bar.

8) Click on "**settings**", use default: **autodetect** and **back scroll 500 lines**.

9) For **"ASCII setup**" use

a). Sending - check: "**echo typed characters locally**" box. This lets you see the commands you type in. On some versions of windows this may not work. A "ck;" command to the CyQ module will enable keystroke echo (received characters will be echoed) by the module.

b). Receiving - check: "**append line feeds**" and "**wrap long lines**". The emits a carriage return (CR), but no line feed. This keeps data from being overwritten on the screen. Not needed if keystroke echo is enabled on the 702.

10) Under "**File**" menu select "**Save As**" and save the configuration file to a convenient folder.

You can create a shortcut to the configuration file and put it on the desktop, this makes life a bit simpler. The configuration files have a naming convention of *.ht where star is the name you chose when setting up the new connection. For example, "cyq.ht".

1. Connect a serial cable from the DB-9 on the back of the 702 to the serial COM port that you intend to use.

2. Apply power: the word "CyQ702_7.1" will be sent by the 702. That is why the yellow Tx LED blinks on power up.

Notes:
1. To change the baud rate DURING a session you must (after going through properties to change the rate) click the 'call' button then 'disconnect' and then 'connect'.
2. The ANSI terminal option will display all ASCII characters including symbols for the unprintable ones.

HOW TO INSTALL HYPER TERMINAL

1). Click on **Control panel**
2). Click on **My Computer**
3). Click on **Install/Remove Programs**
4). Click on **Windows settings**
5). Click on **Communications**
6). Select **Hyper terminal** and click **apply** or OK at the bottom. You will be prompted for your Windows CDROM.
7). Done and out'ta there.

CyQ 702 COMMANDS

Introduction

Logic conventions for an optoisolator interface:

There are two ways to connect the output transistor: emitter follower (resistor from emitter to common connection, collector to +vdc) or inverting amplifier (resistor from collector to +vdc, emitter to return). The intuitive logic is inverted between these two cases.
If the output transistor is operated with the load connected between the collector and a positive voltage supply, and the emitter is connected to the return for this supply, then when the transistor is on the output voltage will be low, and when it is off the output voltage will be high. These high and low voltage levels represent logic True and False respectively. Note that from a load current flow or output transistor perspective this logic is inverted from the intuitive on is true and off is false that would be the case for the emitter follower.

It is important that the panel lights on the 702 correspond to the intuitive: led ON is logic TRUE, and led OFF is logic FALSE . Since we have no way of knowing how you will connect this up we have provided an option in the configure menu to let you have it either way (see clc; cle;). In the following command description the collector connection option will use the terms high and low, and the emitter option will use the terms on and off.

A bit has a value of 1 or 0 corresponding to logical true or false states. For the collector option the true or false states represent a voltage level from the 702, either high (1 or true) or low (0 or false). In the emitter option a TRUE (1) will turn the output transistor on while a FALSE (0) will turn it off.

In CyQ702 read and write commands where a logical value, L, is needed true may be represented by either T or t or 1, your choice; false may be represented by F, f, or 0. The default is TRUE, that is, sending w1; is the same as sending w1T; . Configure commands should use only T,t and F,f.

Commands

Commands may be either upper or lower case characters. All commands **MUST end** with either a semi-colon '**;**' or \r (the ENTER key). The command is buffered, but not processed by the 702 until a ';' or '\r' (ENTER key) is received. The backspace key may be used for corrections. For brevity we will use the following symbols for values in commands:

L is a logical value where TRUE is T or t or 1, and FALSE is F or f or 0.
X is a hexadecimal number.
N is an integer number.

Summary of commands:
w write outputs
r read inputs
e turn error light off
s stop
g go
? status (command summary and current values).

ckL; configure keystroke (received character) echo on or off.
cft; configure format text
cfx; configure format hexadecimal.

crL; configure read on change either on or off.
crhL; configure read on change from low to high either on off for all channels.
crlL; configure high to low either on or off for all channels.
crh#NL; configure channel N read on change from low-to-high either on or off.
crl#NL; configure channel N read on change high to low on or off.

cwL; configure local lookup table write control on or off.
cwmrX; configure lookup table read mask to value X.
cwmw; configure lookup table write enable mask to value X.
cwtXX; configure lookup table input entry X to cause output value X.

"clc;" Collector logic, logic TRUE(1) is collector high, output transistor off.
"cle;" Emitter logic, logic TRUE(1) is output transistor on.

mss; memory save setup, causes current configuration to be saved.
mls; memory load setup, loads the saved setup configuration.
msd; memory save as default, saves the current configuration as the power up default.
mpd; purges the power up default settings.

NOTE: on power up, while the lights are flashing, pressing the Esc key ONCE will cause our original safe configuration to be loaded. Do NOT hold down the Esc key.

cq@X; configure baud rate to value X.

cq?; will cause “cyq” to be transmitted.

$@R (case sensitive) will cause the module to reset.

an isolated ‘; ‘ or ENTER will cause a cr lf to be transmitted.

1. Write output command: w

The permanent defaults at power up are all channels are set to FALSE (binary 0).
Emitter logic : The output transistor is off.
Collector logic: The output transistor is on. There will be a low voltage at the open drain output if the drain is connected to (pulled up by) a voltage via a resistor, and the emitter is connected to a return (digital ground).

Single channel w commands

"wNL;" Single channel output control examples: The letter w followed by an output channel number between 1 and 4, followed by either true or false. That is wN1; or wN0 where N is a channel number between 1 and 4. wN; defaults to true.

Emitter logic:
"w1t;" or "w1;" Turns on the output transistor for channel 1; output 1 LED will light).
"w1f;" or "w10;" Turns off the output transistor for channel 2; output 1 LED will go off).
"w2T;" or w2; Turns on the output transistor for channel 2, output 2 LED will light).
"w2F;" Turns off the output transistor for channel 2; output 2 LED will go off).

Collector logic:
"w1t;" or "w1;" Turns off the output transistor for channel 1 causing the output voltage to be pulled high; output 1 LED will light).
"w1f;" or "w10;" Turns on the output transistor for channel 2 causing the output voltage to be forced to low by the voltage drop across the pullup resistor; output 1 LED will go off).
"w2T;" or w2; Turns off the output transistor for channel 2 causing the output voltage to be pulled high, output 2 LED will light).
"w2F;" Turns on the output transistor for channel 2 causing the output voltage to be forced to low by the voltage drop across the pullup resistor; output 2 LED will go off).

Byte wide output examples:
1). Text format
"wLLLL;" where L is logic true or false (T,t,1 or F,f,0)

2). Hexadecimal encoded integer format.

"wX;" where X is a hexadecimal character. In hexadecimal format the hexadecimal character (8 bit) is translated to the 4 bit binary representation of the hexadecimal digit. The channels are in bit order: bit 0 corresponds to channel 1, bit 1 corresponds to channel 2 .
Note that in text format the order corresponds to the front panel 1234. It is customary in English to read increasing from left to right. In hex format a string of binary digits (ones and zeros, 0 is off and 1 on), such as 1101, are numbered from 0 for the least significant bit ascending to the left. For 1101: Bit 0 is 1, bit 1 is 0, bit 2 is 1, and bit 4 is 1. In binary the

bits are numbered in order of increasing significance. The right most bit is the least significant (bit 0) while the left most (bit 7) is the most significant. This is the same as money; in price $421 the least significant digit is the 1, and the most significant digit is 4. The channels are bit mapped accordingly: channel 1 corresponds to bit 0, channel 2 is bit 1, channel 3 is bit 2, and channel 4 is bit 3.

Examples, hexadecimal:
Emitter logic:
"w7;" Channels 1,2 and 3 are on; channel 4 is off with output low. The binary representation of hexadecimal digit 7 is 0111

"wA;" Hexadecimal digit A is binary 1010, therefore, channels 2 and 4 are on, one and three are off.

Collector logic:
"w7;" Channels 1,2 and 3 are off with outputs high ; channel 4 is on with output low. The binary representation of hexadecimal digit 7 is 0111

"wA;" Hexadecimal digit A is binary 1010, therefore, channels 1 and 3 are high, two and four are low.

The following table may be helpful:

emitter / collector logic

HEX	binary	Channel 4	Channel 3	Channel 2	Channel 1
0	0000	off/low	off/low	off/low	off/low
1	0001	off/low	off/low	off/low	on/high
2	0010	off/low	off/low	on/high	off/low
3	0011	off/low	off/low	on/high	on/high
4	0100	off/low	on/high	off/low	off/low
5	0101	off/low	on/high	off/low	on/high
6	0110	off/low	on/high	on/high	off/low
7	0111	off/low	on/high	on/high	on/high
8	1000	on/high	off/low	off/low	off/low
9	1001	on/high	off/low	off/low	on/high
A	1010	on/high	off/low	on/high	off/low
B	1011	on/high	off/low	on/high	on/high
C	1100	on/high	on/high	off/low	off/low
D	1101	on/high	on/high	off/low	on/high
E	1110	on/high	on/high	on/high	off/low
F	1111	on/high	on/high	on/high	on/high

2. Read Input Channel Command: r

This is a 2 character string; the letter rN (the character r followed by an input channel number between 1 and 4.

At power up, with nothing connected, all input channels are set to FALSE (binary 0). If the input pin is voltage is increased to 5 volts then the channel is TRUE(binary 1).

Read Examples:

a. Single channel input detection.

"r1;" If Pin 2 on input channel 1 (the leftmost two pins on the upper row of the connector) is low, then the string "1f" will be transmitted in text format. In hex format a "10" will be sent. If input 1 (PIN 2) is high, then an r1; command causes the string "11" to be transmitted in hex format, and "1T" in text format. Channel 1 panel LED on the input (top) row will be ON if input 1 is TRUE.

"r4;" If input channel 4 (the last two pins on the upper row) is low, then the text format string "4f" will be transmitted. In hex format a "10" will be sent. If input 4 (PIN 8) is high (PIN 7), then the either the hex string "41" or the text string "4T" is transmitted. Channel 4 LED on the input (top) row will be on if input 4 is TRUE.

The channel number is sent because the serial inputs and outputs are asynchronous. The lag between computer command and computer response to an input from the 702 is unknown. Without the channel number it is quite easy to lose track of the relationship between outgoing commands and incoming data.

b. Byte wide read

"r;"

Text format: 4 characters are transmitted. The characters are either T or f corresponding to either high or low input. Input channel 1 is sent first followed 2, 3, and 4. Therefore TfTf means that input 1 is high, input 2 low, input 3 high, input 4 low.

Hex format: a byte is transmitted with bits 4 through 7 (the high nibble) set to 0; the low bits 0 through 3 contain the logic state of **input** channels 1 through 4. The resulting byte is an integer number that the computer converts to hexadecimal character format for transmission. Thus, the reception of 0b means that input channel 1 is high, 2 is high, 3 is low, and 4 is high.

3. Configure commands:

Configure commands should use only t,f or T.F for true and false; using 1,0 may confuse both you and the 701 in mixed channel, logic cmmands.

"cft;" Configure output format text. The single channel write case is not affected; in the all channel case the write command must use be of the form "wLLLL;" where L is T,F or t,f. Single channel read output will always use only T or f.

"cfx;" Configure output format hexadecimal encoded integer. The single channel case will not be affected. The all channel case must be of the form "wX; where X is is a hexadecimal number between 0 and F. Single channel read output will always use only 1 or 0.

"cdN;" Configure debounce value. N is an integer number from 0 to 250. It is the time in tenth of a millisecond that the input is allowed to settle after a change is detected. When all inputs are stable the input channels readings are transmitted. Optocouplers turn on slowly and may create spurious output as the logic threshold is crossed. In read on change mode this could cause several hundred reads to be done and transmitted.

Read on Change Configure Commands

"crL;" If L is either ';' or true (T,t) then read on change is activated. A change on any input will cause an all channel read. The initial change will be detected; after a delay equal to the debounce time the input will be read again. If the change is still present, then the read will be transmitted. If L is false (F,f) then read on change will be deactivated.

"cr(edge)#NL; where edge is either 'l' (letter ell), or h. The channel number is N. Activates read on change for channel N for closed to open contacts, and open to closed contacts. Default is all channels and both changes.

crh; or crht; Read when any channel goes high.
crhf; Disable read on change to high for all channels.
crh#1t : Read when channel 1 input goes from low to high.
crh#1f : Disable read when channel one goes from low to high.
crl#1t : Enable read when channel one changes from high to low.

When in text format output and read on change, the read will produce 4 logical values in braces with True indicating the channel(s) that changed; this will be followed by the current logical values of the 4 channels.

In hex format the first digit will be a bit map of the channel(s) that changed and the second digit will be the current values of the 4 channels.

Local Lookup Table Write Control Configure Commands

"cwL;" Enable local write control. The outputs are determined from the inputs by a look

up table stored in memory. The look up table is programmable, and is saved by the memory save command. In this mode the 702 will control the outputs without the need for serial communication with a computer; it becomes a stand alone device.

"cwt;" : enables local control. ("cl;" also works for this.)
"cwf;" : disables local control.

Set Read and Write Masks for look up table control
"cwmrX;" sets the read mask (a logical AND mask) to hexadecimal X (default is 0xF, 1111, use all inputs). For example:

"cwmrE;" corresponds to 1110 and channel 1 input is forced to zero,
"cwmr7;" corresponds to 0111 and channel 4 input is forced to zero.
This command reduces the number of entries needed in the look up table.

"cwmwX;" sets the write enable mask. A zero bit blocks an individual output from being written to. These outputs may then be used for other purposes. For example:

"cwmw7;" will block output 1 from being written to from the look up table.

Load Lookup Table
"cwtXX;" loads lookup table location first X with second X. The first hexadecimal character X is the input state. The second X is the output state that is produced. For example:

"cwt9F" will cause all outputs to go to high when the inputs are high on channels 3 and 4 and low on channels 1 and 2. In binary 1100 -> 1111.

Write logic
"clc;" Sets collector logic. Logic TRUE (1) is collector voltage high because the output transistor is off in an open drain output load circuit).
"cle;" Sets emitter logic. Logic TRUE (1) is output transistor on, and emitter voltage high (in emitter follower circuit}.

4. Memory commands:

"mss;" : Save setup. The present status is written to nonvolatile memory. This includes configure commands and baud rate. Useful for testing before saving as default. Allows multiple configuration settings to be switched on the fly with one command.

"mls; Loads the saved setup.

"msd;" Save default. Saves the current configuration as the power up default.

"mpd;" Purges the saved power up default. The module will boot as originally shipped.

5. ERROR reset Command: "**e;**" turns off the error LED.

6. Baud rate Command: "**cq@X**;" where X ranges from 0 to A.
This sets the transmit and receive baud rates for the serial output. **The DEFAULT rate at power up is 9600**. There is always 1 start bit, 8 data bits, and 1 stop bit; no parity; no handshaking. The computer baud rate must be changed to match **after** this command is executed (in hyper terminal you must click properties, and then configure. The baud rate will not change until you click disconnect, and then connect on the main toolbar).

The values are: 0=1200, 1=2400, 2=4800, 3=9600, 4=14,400, 5=19,200, 6=28,800, 7=38,400, 8=57,600, 9=115,200, A=230,400.

7. You found me command: "cq?;" Causes "cyqVERSION" to be transmitted.

8. RESET command: "$@R" will cause the module to do a power up reset. This command is CASE Sensitive, $@r will not work.

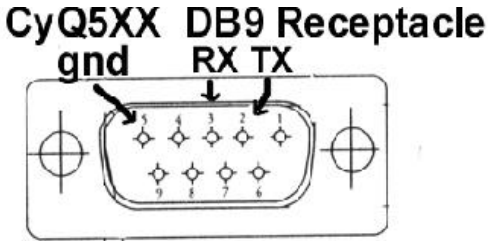
SERIAL HARDWARE INTERFACE

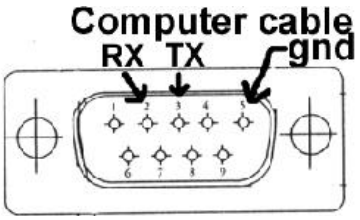
RS232C

This is a **standard serial cable** for DB9 interconnection. It is NOT a null modem cable. The crossover from transmit to receive is done at the receptacle on the A/D. The required condition is that transmit from the computer connects with receive at the peripheral (A/D) while transmit from the A/D connects to receive at the computer.

CyQ.....CyQ5XX A/D

TX PI 3.....Pin 3 RX
RX Pin 2.....Pin 2 TX
GND Pin 5.....Pin 5 GND





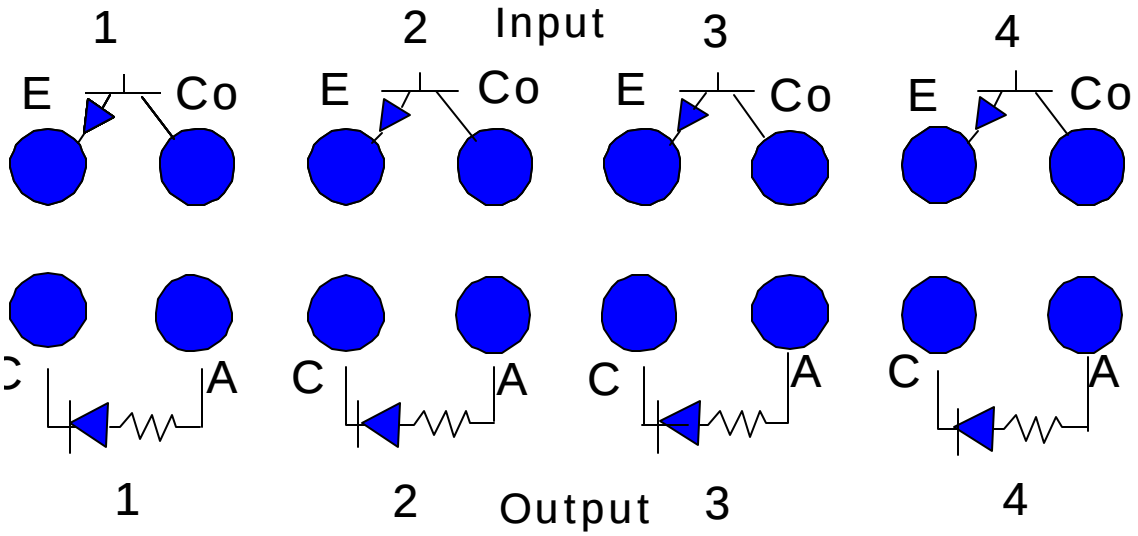
The interface is implemented with a MAX232A integrated circuit from Maxim Inc. It has been tested to 115.2 kb on a 6 foot cable. (9600 baud at 24 feet) Note: to change baud rates in Hyper terminal you must first click the call button on the menu bar, disconnect, and

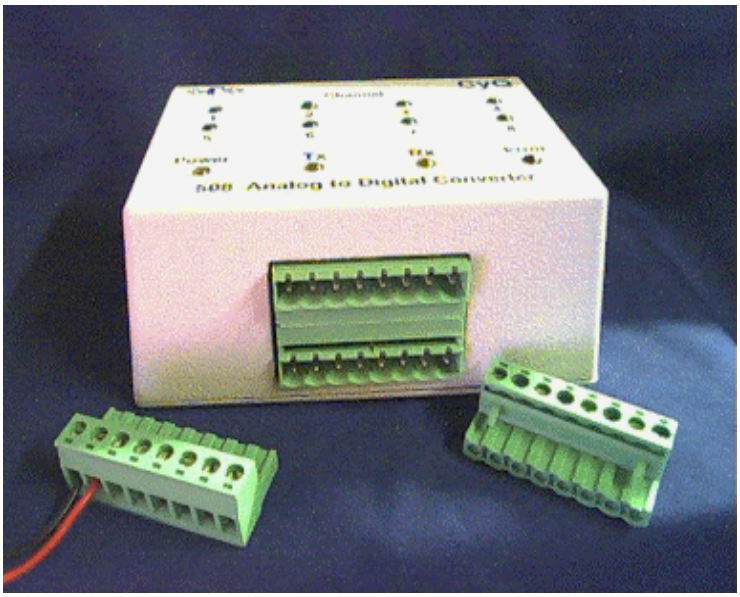
then connect.

Warning: The DB9 and DB25 connector pinouts are completely different. Specifically - pins 2 and 3 are switched for Tx and Rx. If you are making your own connector - watch out for the TX,RX pinout mind set trap.

INPUTS/OUTPUTS

SIGNAL





A 2200 ohm resistor is connected between the input pin on the connector and the optoisolator anode and protection diodes to ground. Any dc voltage in excess of 2 vdc will produce a logic high (1 or true). A logic low input voltage should be less than 1.2 vdc.

Output collector-emitter pins

For the H11G1 optoisolator the breakdown voltage is 100 vdc. Maximum current is 60 ma. Switching time is 100 us for on and 5us for off. The maximum reverse voltage is 6 VDC.

POWER

A 7.5 to 12 vdc unregulated wall transformer with 100 ma or more current capability will work. This is a 2.1 mm barrel connector. Center positive. The red handle power switch is directly above. Up is on and down is off. This power input is diode protected against reverse polarity. It is varistor protected above 18 volts. Further protection is provided by a 500 ma self resettable fuse in series with varistor.

Error Codes

1. Receive buffer overrun. Too many instructions were sent too fast. Generally seen when a computer is issuing instructions. Insert a wait or delay instruction in your program.

2. Transmit buffer overrun. Too many messages being sent from the module. May be caused by switch changes occurring too rapidly when in read on change mode.

3. Command buffer overflow. The command exceeds 10 characters in length. May be due to a stuck key on the keyboard or failing to use ';' or cr to end commands.

4. Read command buffer overflow. Commands may arrive while another read is waiting on debounce to complete. These are buffered. Too many reads were received during debounce or debounce time is set too long.

Actions by CyQXXX due to overflows: An error message is sent. The buffer is flushed and all pointers are set to zero.

10. Unrecognized top level ecommand. The first letter of the command is invalid.
11. Expecting a channel number.
12. Write command length is wrong.
13. A logical value is expected T,F or t,f or 1,0 or ;
14. Expecting an 'r' or 'w' in look up table write command.
15. Debounce number is too big.
16. Configure command is unrecognizable.
17. In read on change a '#' or t,f or 1,0 was expected.
18. Configure format hasn't heard of this format.
19. A hexadecimal character was expected.
20. Baud rate code is between hex 0 and A was expected.
21. An 'e' or 'c' was expected in output logic command.

31. Memory write command, what to write is wrong.
32. Attempt to load a saved setup when no setup has been saved.
33. Memory command is unknown; what to do, the second character.

702 SPECIFICATIONS

- Outputs: 4 sets of emitter -collector pins for optocoupler.H11G1
  H11G1 rated 100 vdc, 60 ma.
- Isolaton voltage 2500 vdc.
- Turn on time 100 us, off time 5 us.
- Inputs: 4 pin pairs for 4 optoisolator input diodes.
- Input series resistance 2000 ohms.
- Input protective diodes for reverse voltage at optocoupler.
- Input pin current: 2 ma at 5 vdc.
- Input logic TRUE : a dc voltage greater than 2.0.
- Maximum safe input voltage 50 vdc.
- Input logic FALSE : a dc voltage less than 1.2 volts.
- Serial communications RS232, connector: standard DB9 female. TX, RX, Gnd.
- Contact Interface connector: Phoenix Contact MDSTB2,5/G1-5.08 (1762431);
- Two removable wire connect plugs. Phoenix Contact MSTB2.5/8-ST-5.08
- Pins interface connector UL/CSA rated Nominal 300 v/ 10 amp, surge 4 kv.
- **Power supply:** 7.5 to 12 vdc unregulated wall transformer, 300 ma,
- 2.1 mm barrel connector.
- **Power input:** reverse polarity diode protected, 500 ma self resetting fuse,
- surge protected above 18 vdc to 600 amps.
- **Power supply current : 125 ma max**
- **Size**: width 4 in.(10 cm), depth 3 in.(7.6 cm), height 2.0 in. (5 cm)
- . **Weight**: 7.7 oz (218 g)**.**
- **Material**: ABS plastic case, textured gray, 4.49 X 3.25 inches (11.2X8.3 cm).

LEGAL STUFF

Limited Warranty

CyberSense warrants to the original purchaser or end-user complete satisfaction for 90 days; we pay shipping within USA. This product is warranted to be free from defects in material or workmanship for a period of five years. During this period the product will be replaced or repaired without charge for either parts or labor.

This warranty is voided if the product is modified, misused, subjected to abnormal environments (examples: submergence in water or harsh chemicals, ovens, etc) or conditions (vaporized parts due to application of mains to a signal input, etc). This warranty is void if the case is opened for any reason without contacting us. Specifically - if you attempt repairs then, at our discretion, you abandon this warranty and all benefits of this warranty. We will gladly assist with trouble shooting your setup by phone or email.

Fragile sensors such as force, low pressure, and 36 gauge thermocouples are excluded from this warranty, and are sold without warranty. You must test immediately upon receipt. We test immediately prior to shipping. You will know it is a fragile sensor because it will be packed with a picture of a broken wine glass and a trash can.

Purchase price refund including shipping (exception on shipping: international orders) for 90 days (30 days international) or repair and replacement for a period of 5 years (1 year international) are the ONLY REMEDY of the purchaser. This warranty is in lieu of all other warranties either express or implied; specifically, any warranties of implied merchantability or fitness for a particular use or purpose. CyberSense shall in no way be liable for indirect or consequential damages of ANY kind or nature.

Some jurisdictions do not allow exclusion or limitation of consequential or incidental damages, or how long implied warranties last; therefore, the above limitations may not apply to you. This warranty gives you specific legal rights. In some states you may have other rights.

Use in life support systems: NO!

Trademarks

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