

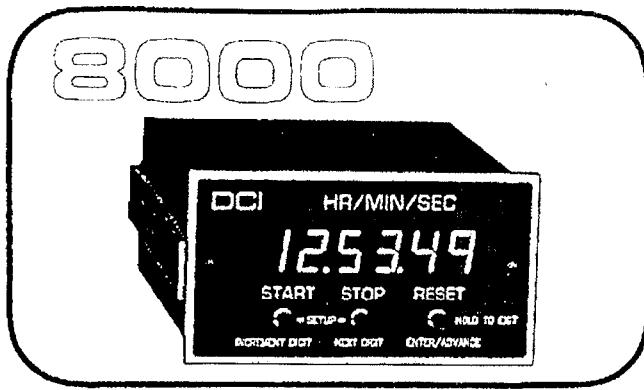
**MODEL 8000
COUNTER/TIMER
OPERATOR'S MANUAL**

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COUNTER/TIMER

FEATURES

- IBM PC™ compatible RS232 or RS422 output (optional)
- Front panel and remote inputs for start, stop, reset, and setup
- Up to 20 KHz count rate
- Timer resolutions down to 1 millisecond
- Microprocessor based unit programmable for different modes of operation
- 6½ digits of display
- Quadrature input counting logic (optional)
- Differential receivers available on count inputs for high noise immunity
- 5VDC @ 150mA output for external circuitry or encoder (optional)
- Programmable multiplier (.001 to 199.999) for special scaling and English/Metric conversion
- Programmable divider 1 to 250 (can be used with multiplier to increase resolution of multiplier to 1.99999)
- Four limit set points
- Count stored indefinitely after loss of power without battery

The Series 8000 is a new microprocessor based Counter/Timer with optional RS232 or RS422 outputs which facilitate easy interfacing to computers or programmable controllers. The microprocessor based unit is easily programmed for special scaling with six digit multiplier programmable from .001 to 199.999 and programmable divider (1 to 250) which can be used to increase resolution of multiplier to 1.99999. In the event of a power loss the accumulated count, multiplier, and limits are stored in solid state memory until power is reapplied. The big (.56") high-efficiency LED display is easily read at 20 to 30 ft. and the attractive black and silver bezel with non-glare lens will enhance the appearance of any control panel. The 8010 can be programmed for all modes of operation, except quadrature input counting, from the front panel switches. Timer ranges are 1999.999 sec, 19999.99 sec, 199999.9 sec, 199.59.59 hr/min/sec, 19999.99 min, and 1999.999 min which are programmable via the front panel switches or the remote inputs.

SPECIFICATIONS

Accuracy: (Timer) Crystal time base, ± 1 count, ± 2 PPM/degrees Celsius from zero to fifty degrees Celsius. Totalizer accuracy ± 1 digit. Tachometer accuracy ± 1 digit, $\pm 1 \times 10^{-3}$ time base accuracy.

Display: 6½ digits .56" high efficiency red LED ± 1999999 . Decimal points are user programmable.

Controls: Front panel start, stop and reset pushbutton switches which are also used to set limits and multiplier.

Remote Inputs: Start, stop and reset signals: require closure to logic common or TTL logic zero. Input loading one LPTTL load. Can also be used to set limits and multiplier.

Z Reference Input: Normally low requires pull up to +5 VDC. Resets on "A" channel transition when Z input is high. (8033 only)

Outputs: ASCII RS232 compatible; (optional) ASCII RS422 compatible; (optional) Programmable baud rates. Baud Rates: 300, 1200, 9600. Excitation Output: 5VDC @ 150mA maximum (optional).

Limit Outputs: TTL compatible output can be programmed to go high or low at limit and hold until reset. Will drive 4TTL loads. Limits are set by putting unit in setup mode and then logging through numbers.

Sine Wave/Pulse Count Input: (option -08). Minimum signal 100 mVRMS DC to 10 KHz. Maximum signal 115VAC without damage to circuitry. Input impedance 100 Kohm.

Differential Count Input: (optional) Differential receivers on up and down count inputs. DS8820 type receivers.

TTL Count Input: Schmitt trigger type with no limit on rise or fall time of input pulse. Maximum count rate 20 KHz, input loading one LPTTL load.

Power: 115VAC 50-400hz 8 watts maximum.

Optional 5VDC @ 500mA maximum.

Optional 10-15VDC @ 400mA maximum.

Optional 230VAC 50-400hz, 8 watts maximum.

Optional 10-30VDC @ 400mA maximum.

Operating Temperature Range: Zero to fifty degrees Celsius.

I/O Method: Card edge connector with solder tabs. (supplied) 25 pin sub-miniature "D" connector for RS232/RS422 output. (optional)

Case Size: "A" SEE QUICK REFERENCE CHART

OPTIONS

- | | | |
|------|---|-------------------------|
| • 01 | ASCII RS232 Compatible output | \$65.00 |
| • 02 | ASCII RS422 Compatible output | \$65.00 |
| • 05 | 5VDC input power | \$ 5.00 |
| • 08 | input amplifier for sine wave/pulse input signals. Adjustable threshold | \$25.00 |
| • 10 | Remove front panel start/stop/reset switches | \$ 3.00 |
| • 11 | Differential line receiver input for count inputs | \$25.00 |
| • 12 | 10-15VDC input power | \$15.00 |
| • 18 | Reset switch only | \$ 3.00 |
| • 19 | Excitation output 5VDC at 150 mA. Nonvolatile memory for displayed count not operable when this option is installed | \$15.00 |
| • 22 | 230VAC $\pm 10\%$, 50-400hz, input power | \$10.00 |
| • 23 | Green LED display | \$50.00 |
| • 24 | 10-30VDC input power | \$50.00 |
| • 25 | Special legends and/or logo | One time charge \$55.00 |
| | (Special artwork to be supplied by customer) | Plus Per Lens \$ 5.00 |
| • 26 | No logo | \$ 3.00 |
| • 27 | Screw terminal I/O connector | \$35.00 |
| • 28 | Blank lens | \$ 3.00 |
| • 29 | I/O subminiature "D" connector for RS232/RS422 output | \$15.00 |
| • 31 | "SECONDS" legend | \$ 5.00 |
| • 33 | "MINUTES" legend | \$ 5.00 |
| • 34 | "HR/MINUTES/SECONDS" legend | \$ 5.00 |
| • 35 | "MILLISECONDS" legend | \$ 5.00 |
| • 36 | "COUNTER" legend | \$ 5.00 |
| • 37 | "RPM" legend | \$ 5.00 |
| • 38 | "DEG/MIN/SEC" legend | \$ 5.00 |
| • 39 | "DEG/MIN" legend | \$ 5.00 |
| • 50 | Sunlight readable .6" LED display. No polarity available | \$35.00 |

MODELS

	Functions	Maximum Count Rate
8010	Timer/counter Bi-directional counter frequency meter/tachometer. Programmable via the front panel switches or remote inputs.	5KHz
8033	Bi-directional counter with quadrature interface and Z reference input. Edge detection and multiplication of X2 and X4 must be specified when ordering unit. Count rate is reduced to 10KHz for X2 and 5kHz for X4 multiplication.	20KHz
8034	Bi-directional counter with quadrature counting logic to interface to encoder with 10800 PPR and read out to 359.59 degrees/minutes.	20KHz
8035	Bi-directional counter with quadrature counting logic to interface to encoder with either 900, 1800 or 3600 PPR (specify one) and read out to 359.9 degrees.	20KHz
8040	Frequency meter/tachometer. Gate time programmable from .001 sec to 9.999 sec to read out in engineering units.	20KHz

General: (8010 only)

The Model 8010 is a new microprocessor based Counter /Timer with optional RS232 or RS422 outputs which facilitate easy interfacing to computers or programmable controllers. Because the unit is microprocessor based, it can be easily programmed for special scaling. In the event of a power loss the accumulated count is stored in solid state memory until power is re-applied. The large (.56") high-efficiency LED display is easily read at 20 to 30 ft, and the attractive black and silver bezel with non glare lens will enhance the appearance of any control panel.

The 8010 may be purchased with special options to meet the various requirements of the user. The 8010 may also be changed to preform several different functions by grounding a program pin on the rear connector, and selecting a new function with the control switches. This will be explained later in the manual.

The basic function's and the corresponding numbers are;

- 8011 Timer
- 8012 Totalizer
- 8013 Bi-Directional Counter
- 8014 Frequency Meter /Tachometer

Power requirements:

115VAC 50-400Hz, 8 Watts Maximum. Applied to J2 pins 7 & 9

Power up:

On power up the display lights up all 8's, and all decimals for a period of 2 seconds, then displays the number that was last displayed when power was last removed.

Power down:

On loss of power the number on the display is stored in memory, so when power is reapplied, the display is updated to the last number on the display.

Accuracy:

(Timer) Crystal time base, +-1 count, +-2 PPM/degrees Celsius.

(Counter) +-1 digit.

Remote inputs:

Start, stop, reset and, model number select signals require contact closure to logic common or TTL logic zero. Input loading, one TTL load.

High Speed Start, Stop, Reset:

These inputs are normally high, negative going pulses, 50 microseconds. to 200us. in length. Input loading, one TTL load.

General: (8033, 8034, and 8035 only)

The Series 803X is a version of the Series 8000 that has input signal conditioning for quadrature outputs from an optical shaft encoder or other devices with quadrature outputs. The unit automatically detects direction, counts up or down, and will display a negative sign when the count goes through zero. It is a single function unit and cannot be switched to be used as a timer or frequency meter/tachometer. All other parameters are set up the same as the standard 8000.

Power requirements:

115VAC 50-400Hz, 8 Watts Maximum. Applied to J2 pins 7 & 9

Remote inputs:

Start, stop, reset and, model number select signals require closure to logic common or TTL logic zero. Input loading, one TTL load.

High Speed Start, Stop, Reset:

These inputs are normally high, negative going pulses, 50us. to 200us. in length. Input loading, one TTL load.

Count inputs:

The model 803X bi-directional counter is configured for two count lines. One phase "A" and one phase "B" quadrature signal. Both inputs are TTL level 0 to 5 volt signals, driving into CMOS Schmitt trigger with a 10K ohm pull up to 5VDC. The input count rate is from 0 to 20khz. Differential input optional.

Z reference input:

The Z reference input is a TTL level input used to reset the count to zero on the condition that A input changes state while the Z input is high.

The setup sequence is as follows;

1. Limits
2. Preset Counter
3. Prescale
4. Program Divide (1-250)
5. Decimal point
6. Auto Start Select
7. Dimming
8. Address (0-99)
9. Baud Rate

CHANGING FROM ONE FUNCTION TO ANOTHER (8010 only)

The four counter, timer functions may be selected on power up. To change from one function to another, jumper J2 pin 3 to J2 pin 14. Apply power and the display will show the currently selected function number. To change the function press start. When the function number you want appears on the display, press reset to exit. Remove jumper.

8011 TIMER

The timer resolution is selectable from 1 millisecond to 1 second. This is accomplished using the start, stop and reset switches much the same way as on a digital watch. Below is a list of display resolutions to choose from.

F-0	1XXX.XXX	SECONDS
F-1	1XXXX.XX	SECONDS
F-2	1XXXXX.X	SECONDS
F-3	1XX.XX.XX	HOUR.MIN.SEC
F-4	1XXXX.XX	MINUTES
F-5	1XXX.XXX	MINUTES

8012 Totalizer

The 8012 mode is configured as a unidirectional counter. The count input is TTL level, 0 to 5 VDC driving into a Schmitt trigger with a 10K ohm pull up to 5VDC. The input count rate is 0 to 10khz. Sine wave and differential input, optional.

8013 BI-DIRECTIONAL COUNTER

The 8013, bi-directional counter mode is configured for two count lines. One count up input and one count down input. Both inputs are TTL level 0 to 5 volt signals, driving into CMOS Schmitt trigger with a 10K ohm pull up to 5VDC. The input count rate is from 0 to 10khz. Sine wave and differential input, optional.

SETUP

The setup sequence is as follows;

8011	8012, 8013	8014
1. Limits (1-4)	1. Limits (1-4)	1. Limits (1-4)
2. Preset Count	2. Preset Count	2. Prescale
3. Display Format	3. Prescale	3. Decimal Point
4. Auto Start Select	4. Program Divide	4. Dimming
5. Count Direction	5. Decimal Point	5. Address (0-99)
6. Dim Select	6. Auto Start Select	6. Baud Rate
7. Address (0-99)	7. Dimming	
8. Baud Rate	8. Address (0-99)	
	9. Baud Rate	

All Models

To enter the setup mode, simultaneously press start and stop until display blanks. To exit the setup mode at any time, press reset until display reads (End-Su) then release the reset button. The program version number will appear as (Pro.-X.X) momentarily before the (End-Su) appears. This version number is helpful when consulting the factory with a problem.

LIMITS

The first setup parameter to set up is the limits, and their active direction. The display will show "L1-H" or "L1-L". The L1-H is limit 1 output active High. The L1-L is limit 1 output active Low. To toggle press start. to enter and go on press reset. The display will then show a number with the right digit flashing. This is the value of limit one. Press start to increment the flashing digit. Press stop to advance to the next digit. Press reset to enter and advance to the next limit. This is done for limit 1-4.

PRESET COUNT

After the limits are set the display will momentarily display "PC". the next number will be the preset number which the counter may be preset to. Set this number the same as setting a limit. Press reset to enter and advance to Count direction

FORMAT

The next setup mode will display "F-X". X being a number from 0 to 5 to set the timer resolution as shown in table above. Press start to change. Press reset to go to the next setup parameter.

PRESCALE

Prescale is a number from .001-199.999 which the input is multiplied. After entering the Preset number the display will momentarily display "PS" for prescale. The next number will be the prescale number. Set this number the same as setting a limit. Press reset to enter and advance to program divide. When the model 8010 is set up as a 8014 frequency counter tachometer, this number is gate time in seconds.

PROGRAM DIVIDE

Program divide is a number from 1-250 which the input is divided by. After entering the Prescale number the display will show "Pd XXX". This is the number the input is divided by. To increment press start. To decrement press stop. Press reset to enter and advance to decimal point program.

DECIMAL POINT

The display will then show "dp" for decimal point select. To move the decimal point press start and the decimal point will move one digit to the left. When the decimal point is in the desired position, press reset to enter and advance to next setup mode.

AUTO START

The next setup mode will display "AS-0 or 1". This is the auto start mode. Selecting "AS-0", the counter will power up in a stop mode. Selecting "AS-1", the counter will power up in a start mode. To select, press start. To enter and advance to the next setup mode, press reset.

COUNT DIRECTION

The next setup mode will display "Cd-0" for count up, and "Cd-1 for count down. To change press start. Press reset to go to the next setup parameter.

DIMMING

The next setup mode will show all 8's. This is dimming select mode. Pressing start dims the display one step. There are six stages of dimming. Press reset to enter dimming level, and advance to the next setup mode.

The next setup mode is for the serial port if you have option -01, or -02 installed. If you do not, it will toggle back to Preset select mode. Serial Port setup explained under options. To exit the setup mode at any time, press and hold reset until display blanks.

OPTIONS

-01 RS232C, -02 RS422

ADDRESS SELECTION:

The unit address is only used when the optional serial interface has been installed. The unit address when selected is stored in the non-volatile memory and retained during power failure. Selection is accomplished by entering set up mode and toggling the stop switch until the display reads "A XX". The "XX" being the address of that unit. To advance press start. To enter press stop. To exit press reset.

BAUD RATE SELECTION:

If the optional serial interface has been installed the baud rate (rate at which the serial data is received and transmitted) may be selected. The baud rate when selected is stored in the non-volatile memory and retained during power failure. Selection is accomplished by entering set up mode and toggling the stop switch until the display reads current baud rate. To advance press start. To enter press stop. To exit press reset.

Serial Input/Output:

If the serial input/output option is installed it allows the 8010 to communicate with a remote computer or terminal. Two standard signal levels are provided, RS232C which allows only one unit at a time to be connected and RS422 which has three-state outputs, so many units can be connected in parallel. With this option the units may be addressed individually with their own serial number, this allows only that unit to communicate with the host computer. Almost all functions available from the front switches can be duplicated by the host computer. Below is a list of all the commands, with a full description following.

- AD Address Disable
- AE Address Enable
- AU Abort Update
- CU Continuous Update
- DC Down Count (8010only)
- DD Display Dimming
- DP Decimal Point Select (8012-8014 only)
- EH Echo
- FM Display Format (8011 only)
- LF Line Feed
- RD Read Display
- RS Reset Count
- RX Read Nonvolatile Ram
- S1 Set Limit 1
- S2 Set Limit 2
- S3 Set Limit 3
- S4 Set Limit 4
- SP Stop Count
- ST Start Count
- SX Store Nonvolatile Ram
- UC Up Count (8011 only)
- V1 Verify Limit 1
- V2 Verify Limit 2
- V3 Verify Limit 3
- V4 Verify Limit 4

The serial data is transmitted as Ascii characters, using the selected baud rate, each word or character is made up of eight data bits, one stop bit and no parity bit. The format of data transmitted depends on the command, and is expected to be transmitted or receive left most character first and terminated with a carriage return (c.r.) when an additional number is required leading zeros or place holders may be omitted. Plus sign is optional but must proceed the number. Received numbers will have the decimal point ignored. Transmitted numbers will have a period to conform to the display format. In the command descriptions below the command string will be shown within brackets ([]), the sign if required will be shown as a lower case (s), and the number as upper case (X). Each command will be executed

when received and only once except for display data which may be enabled to continuously update until disabled.

Address Disable: [ADXXc.r],[ADc.r.]

Address disable is a command used with the RS422 serial interface when several units will be in parallel on the serial buss, or with RS232C, to disable the unit. This command allows the unit specified by the address number XX to be turned off or disabled. The address must be in the range of 1 to 99. If no number is supplied all units on the serial buss will be turned off or disabled. If the unit is disabled by unit address number the unit will respond with [BYEc.r.].

Address Enable: [AEXXc.r.]

Address enable is a command used with the RS422 serial interface when several units will be in parallel on the serial buss, or with RS232C, to enable the unit. This command allows the unit specified by the address number XX to be turned on or enabled, the address must be in the range of 1 to 99. Address 0 will select all units on the buss to receive only, may be used to start, stop, or reset all units at same time, units will not respond when selected with AEO. When enabled with address 1 to 99 the unit will respond with [HELLOc.r.].

Abort Update: [AUc.r.]

Abort update is a command that will turn off the unit from continuous update of display data. The unit will respond with [OKc.r.].

Continuous Update: [CUc.r.]

Continuous update is a command that will put the unit in a mode where it will send the display reading continuously, (at a rate which is possible by baud rate, counting rate, etc.) when the display count changes, until disabled by either an AU or AD command. The unit will respond with [OKc.r.].

Display Dimming: [DDXc.r.]

Display dimming and a number 0 to 6 will select the brightness of the display. where 0 is the brightest and 6 is the dimmest.

Down Count: [DCc.r.]

8011 only. Tells the timer to count down.

Decimal Point Select: [DPXc.r.]

Where X is from 0-7. "0" is off. "1" is the LSD.

Echo: [EHXc.r.]

Echo where X=1 will echo all character received, where X=0 will not echo character received. This value is saved in the nonvolatile ram.

Format Display: [FMXc.r.]

The format display command will select the 8011 timer resolution and is selectable from 1 millisecond to 1 second. Format X where X is a number between 0 and 5 to select the resolution. Below is a list of display resolutions to choose from.

FM0	1XXX.XXX	SECONDS
FM1	1XXXX.XX	SECONDS
FM2	1XXXXX.X	SECONDS
FM3	1XX.XX.XX	HOUR.MIN.SEC
FM4	1XXXX.XX	MINUTES
FM5	1XXX.XXX	MINUTES

Line Feed: [LFXc.r.]

Line Feed where X is 1 will select auto line feed after c.r., where X is 0 will select no auto line feed after c.r. this setup value is stored in the nonvolatile ram.

Preset Count: [PCXXXXXXXc.r.]

Preset Display where X is 0 to MAX display reading, X may be precede by + or - to set sign the + is optional and may be omitted leading zero may also be omitted.[Error] will be returned if format is not acceptable such as alpha characters imbedded in number.[OK] will be returned if number is accepted.

Read Display: [RDc.r.]

Read display is a command that will return the display reading. The returned data format will be as appears on the display.

Reset Count: [RSc.r.]

Reset count is used to reset the display.

Read X: [RXc.r.]

Reads the count and setup data out of the nonvolatile ram.

Set limit: [S#XXXXXXXc.r.]

Set limit is a command that will set the value of one of the four limits. S is the command. # is the limit number between 1 and 4. X is the numeric value from 0 to 1999999. X may be preceded by + or - to set the sign. The + is optional).

Stop Count: [SPc.r.]

Stop count is used to stop the counter.

Start Count: [STc.r.]

Start count is used to start the counter.

Save X: [SXc.r.]

Saves current count on display and all set up data into the nonvolatile memory.

Up count: [UCc.r.]

8011 only. Tells the timer to count up.

Verify Count [VXc.r.]

Reads the limit when V,(X) is the display number 1-4.

Serial Interface connections:

TXD (Transmit Data):

Transmit data is an output signal where the unit will transmit its serial data.

RXD (Receive Data):

Receive data is an input signal where the unit will receive its serial data.

RTS (Ready To Send):

Ready to send is an output signal where the unit requests permission from the host to send data, or the unit is ready to send data.

CLS (Clear To Send):

Clear to send is an input signal which must be high to allow the unit to send data. If not used it must be tied high.

Data Outputs (J1)

Connector type: DB-25S

Pin 1	Logic Ground	
Pin 2	Transmit Data	RS232C - Transmit Data High RS422
Pin 3	Receive Data	RS232C - Receive Data Low RS422
Pin 4	Ready to Send	RS232C - Ready to Send High RS422
Pin 5	Clear to Send	RS232C - Clear to Send Low RS422
Pin 6	Logic Ground	
Pin 7	Signal Ground	RS232C
Pin 8	No Connection	
Pin 9	No Connection	
Pin 11	No Connection	
Pin 12	No Connection	
Pin 13	No Connection	
Pin 14	No Connection	
Pin 15	No Connection	
Pin 16	No Connection	
Pin 17	No Connection	
Pin 18	No Connection	
Pin 19	Logic Ground	
Pin 20	No Connection	
Pin 21	No Connection	
Pin 22	No Connection	
Pin 23	No Connection	
Pin 24	No Connection	
Pin 25	No Connection	

OPTIONS CONTINUED

- 05 5VDC INPUT POWER 500 Milliamp \pm .25volt.
Positive J2 pin 15. Negative J2 pin 14.
- 08 Input amplifier for sine wave/pulse input signals.
100mv RMS to 115volt RMS. High J2 pin C. Low J2 pin P.
For DC offset tie high to J2 pin 4.
- 10 Remove front panel start, stop, reset switches.
(Setup must be accomplished by remote inputs.)
- 11 Differential line receiver, for count input lines.
- 12 10 to 15VDC input power. 500milliamp.
- 18 Reset switch only.
- 19 Excitation output 5 volt dc at 150 milliamp.
- 22 230VAC \pm 10%,50 to 400hz input power.
- 24 10 to 30VDC input power. 250milliamp.
- 25 Special legends and or logo.
- 26 No logo
- 28 Blank lens
- 29 I/O subminiature "D" connector for option -01, or -02
- 31 "SECONDS" legend
- 32 "MIN/SECONDS" legend
- 33 "MINUTES" legend
- 34 "HOUR/MINUTES/SECONDS" legend
- 35 "MILLISECONDS" legend
- 36 "COUNTER" legend
- 37 "RPM" legend
- 38 "DEG/MIN/SEC" legend
- 39 "DEG/MIN" legend

Series 8000 Terminal Designation

February-2003

J1 Connector

Installed only with 01 & 02 Options

Pin	RS232 Function Option -01	RS422 Function Option -02
1	Logic Common	
2	Transmit Data	Transmit Data High
3	Receive Data	Receive Data Low
4	Ready to Send	Ready to Send High
5	Clear to Send	Clear to Send Low
6	Logic Common	
7	Logic Common	
8		
9		
10		
11		
12		
13		
14		Transmit Data Low
15		Receive Data High
16		Request to Send Low
17		Clear to Send High
18		
19	Logic Common	
20		
21		
22	Logic Common	
23		
24		
25		

J 2 Connector

Function	PIN	PIN	Function
High Speed Start	A	1	Remote Reset
High Speed Reset	B	2	High Speed Stop
High, zero crossing input Option -08 only	C	3	Model Select Input
(Option -11) Differential Receive Input "B" (-)	D	4	High, non zero crossing input Option -08 only
Quadrature Input "B", Or TTL down count input "B", Or (Option -11) Differential Receive Input "B" (+)	E	5	Remote Start
Limit 2 Output	F	6	Remote Stop
	H	7	115VAC Option -12 & -24 (+input) Option - 22 (230VAC)
	J	8	NC
	K	9	115VAC Option -12 & -24 (Supply return) Option - 22 (230VAC)
Quadrature Input "A", Or TTL Up Count Input "A", Or (Option -11) Differential Receive Input "A" (+), Or Single count input	L	10	Limit 4 Output
(Option -11) Differential Receive Input "A" (-)	M	11	Spare Output
Limit 3 Output	N	12	Z Input (Model 8033 Only)
Logic Common	P	13	Logic Common
Logic Common	R	14	Logic Common
Limit 1 Output	S	15	+ 5 VDC