Instruction manual

ASL-53 MULTIFUNCTION TIMER V1.1

A. Features

This multifunctional relay control device is designed to provide automation solution for a broad range of applications. It can be used as timer, counter, frequency meter, or tachometer. It allows you to activate the relay at a specific time, number of count, frequency, or rotation speed.

The timer function covers almost every application that needs a timed relay action. It can be set as single delay, double delay, pulsed output, or cumulative timer. It can display the timing in either count up or count down mode. The range of timing can be as short as 0.01 second and as long as 9999 days. The timer can be activated by the power up, front key pad, or remote switch.

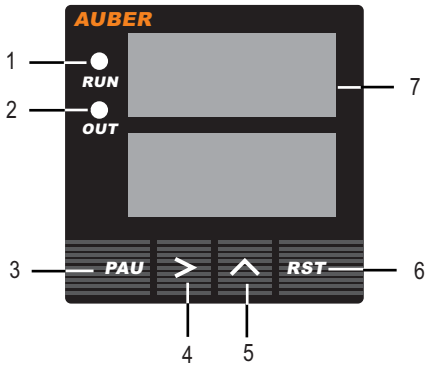
The counter and frequency meter offer advanced signal discriminator that can remove noise triggered false count. It can perform multiplication and division so that more meaningful number will be displayed. e.g, if each mold injection produces four parts but counter only receive one pulse, user can set the counter to multiply the pulse by 4 to display the actual parts count.

For customers that use our temperature controller, the timer can enhance the performance of their system. One example is to cycle a circulation fan in the oven with preset time, on and off. The other example is using the alarm output of the controller to trigger the timer. When the preset temperature reached, the alarm will start the timer. When the timer delay is reached, the timer will shut off the heater.

B. Specification

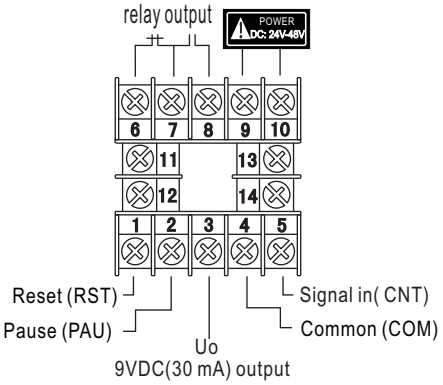
Timer range: 0.01s to 9999days.
Timer mode: single time delay, double time delay, cumulative time.
Timer trigger: power on, front key pad, remote switch or sensor.
Timer accuracy: <1s/day.
Frequency counter range: 0.1-9999hz
Counter: Max speed, 0.1ms. Max no. 100 million.
Counter/tachometer signal input low: -30~0.5V; high: 4~30V.
Tachometer range,60-9999 rpm.
Power supply: 24-48V DC.
Power Consumption: <2W
Relay output: 7A@240V AC and 24V DC, 12A@120V AC (resistive load)
Relay life: 100,000 times.
Operating temperature: 0-60 °C.
Humidity: 0-95%RH
Panel cutout: 44.5x44.5mm

C. Front Panel

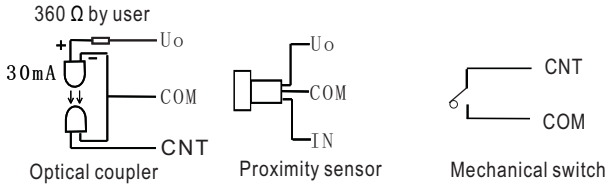


1. RUN LED. Flashing during delay, cumulating or counting. Stay on in other conditions.
2. OUT LED. On when relay pulls in. Off when relay drops out.
3. PAU Key. Pause key.
4. ⊳ Shift key. For selecting the digit to be changed. Press and hold it for 10 second will enter the function setting mode.
5. ∧ Up key. For changing the value of the digit selected. The value can only be changed in one direction. When pass 9, it starts from 0 again.
6. RST key. Reset key.
7. LED digital display. During normal operation as timer, frequency counter or counter, the top displays the actual time, frequency, or count; the bottom displays the set value. For cumulative timer and 8 digits counter, both top and bottom are used for displaying the time or counter.

D. Terminal Assignment



E. Counter Wiring Sketch



1. Proximity sensor wiring above is for NPN type sensor. Add a 1 kohm resistor between IN and COM for PNP type sensor.
2. When using the DC power source, there is no polarity difference for the terminal 9 and 10.
3. For the relay output, ⌐┴┐ is normally closed (NC) and ⌐┘└ is normally open (NO).

F. Function Code and Range

Function	Range	Code	Relay mode	Multiply factor
Time delayed on or off (cnt up)*	0.01S-99.99S	01	1~6	
Time delayed on or off (cnt down)	0.01S-99.99S	02	1~6	
Time delayed on or off (cnt up)	1M-9999M	03	1~6	
Time delayed on or off (cnt down)	1M-9999M	04	1~6	
Time delayed on or off (cnt up)	1S-9999S	05	1~6	
Time delayed on or off (cnt down)	1S-9999S	06	1~6	
Time delayed on or off (cnt up)	1S-99M59S	07	1~6	
Time delayed on or off (cnt down)	1S-99M59S	08	1~6	
Time delayed on or off (cnt up)	1M-99H59M	09	1~6	
Time delayed on or off (cnt down)	1M-99H59M	10	1~6	
Time delayed on and off (cnt up)	1M-99H59M	11	1, 2	
Time delayed on and off (cnt down)	1M-99H59M	12	1, 2	
Time delayed on and off (cnt up)	1S-99M59S	13	1, 2	
Time delayed on and off (cnt down)	1S-99M59S	14	1, 2	
Time delayed on and off (cnt up)	1S-9999S	15	1, 2	
Time delayed on and off (cnt down)	1S-9999S	16	1, 2	
Time delayed on and off (cnt up)	1M-9999M	17	1, 2	
Time delayed on and off (cnt down)	1M-9999M	18	1, 2	
Cumulative time (instantly reset)	0-99H59M59.99S	19	1~6	
Cumulative time (8s reset)	0-99H59M59.99S	20	1~6	
Cumulative time (instantly reset)	0-9999H59M59S	21	1~6	
Cumulative time (8s reset)	0-9999H59M59S	22	1~6	
Cumulative time (instantly reset)	0-9999D23H59M	23	1~6	
Cumulative time (8s reset)	0-9999D23H59M	24	1~6	
Frequency counter	1Hz-9999Hz	25	1, 3	
Frequency counter	1.0Hz-999.9Hz	26	1, 3	
Tachometer	60-9999RPM	27	1, 3	
Frequency/Tachometer	0-9999	28	1, 3	a, b
Counter	0-9999	29	1, 3, 5	
Counter	0-9999	30	1, 3, 5	a
Counter	0-99999999	31	1, 3, 5	
Counter	0-99999999	32	1, 3, 5	a

Note,
* "cnt up", The top display starts from zero and counts up until the set value is reached.
"cnt down", The top display starts from set value and counts down until zero is reached.

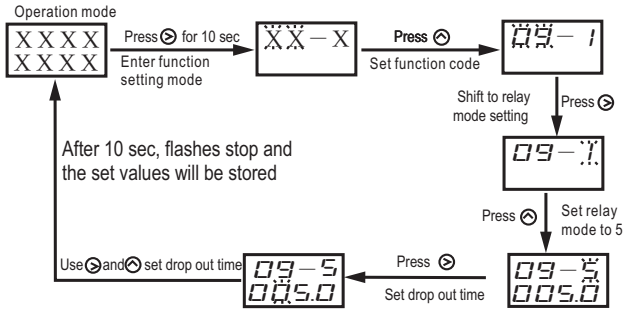
G. Relay working mode

NO	Relay Operating Modes
1	Starts counting when on. Relay pulls-in when reaches the set value.
2	Starts counting by reset. Relay pulls-in when reaches the set value.
3	Starts counting when on. Relay drops-out when reaches the set value.
4	Starts counting by reset. Relay drops-out when reaches the set value.
5	Starts counting when on. Relay pulls-in for the set duration after reached the set value. Restart again automatically.
6	Starts counting by reset. Relay pulls-in for the set duration after reached the set value. Restart again automatically.

Note, For mode 5 and 6, the duration range for the relay pull-in is 0.1-999.9s.

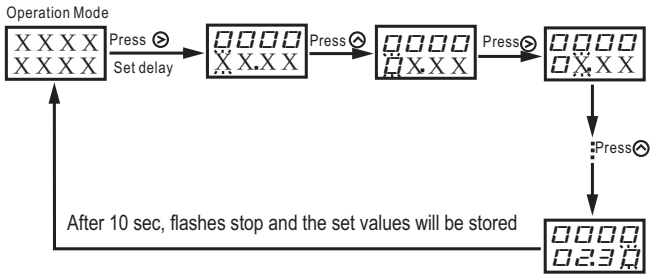
H. Function and relay mode set up

Example, set the function 09 and relay mode 05. Relay set to pull in for 5 sec.



I. Timer, Single delay (Function 01-10)

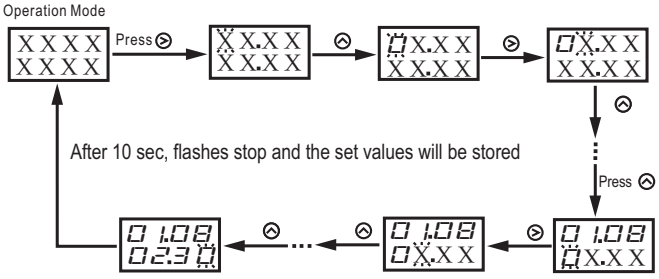
1. These functions offer one delay time. At the end of delay, the relay will activate once. It can be either pull-in or drop-out, depending on the relay working mode selected.
2. During operation, top display shows the delay time, the lower display shows the set value.
3. Example, set the delay time to 2'30" for Function 07.



4. The PAUSE key (PAU): When the timer is running, press and hold the key will pause the counting until the key is released.
5. RESET key (RST): Press and release the key will start the time delay from beginning no matter the timer is running or stopped.
6. PAU terminal: Connecting the PAU terminal to the COM terminal will function the same as pressing the PAU key.
7. RST terminal. Connecting the RST to COM terminal will function the same as pressing the RST key.
8. CNT terminal. This terminal has no effect on the timer.

J. Timer, Double delay (Function 11-18)

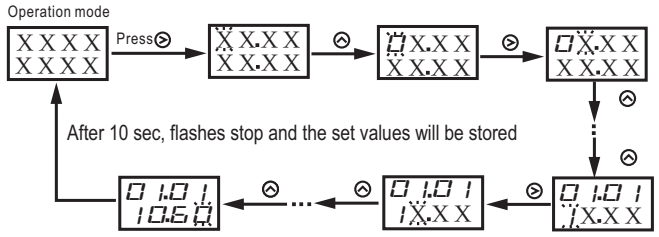
1. These functions offer two delay times. At the end of first delay, the relay will pull in and start the second delay. At the end of second delay the relay will drop out. The first delay will start again automaticly.
2. During operation, top display shows the time of the delay that is running. The lower display shows the set value of the cresponding delay.
3. Example, Function 13. Set the first delay time to 1'08" and second delay to 2'30" .



4. The PAUSE key (PAU): When the timer is running, press and hold the key will pause the counting until the key is released.
5. RESET key (RST): Press and release the key will start the time delay from beginning no matter the timer is running or stopped.
6. PAU terminal: Connecting the PAU terminal to the COM terminal will function the same as pressing the PAU key.
7. RST terminal. Connecting the RST to COM terminal will function the same as pressing the RST key.
8. CNT terminal. This terminal has no effect on the timer.
9. To view the value of both delays during the operation, press ^ key. All digits will flash. The top display shows the pull-in delay time, and the bottom display shows the drop-out delay time.

K. Cumulative Timer (Function 19-24)

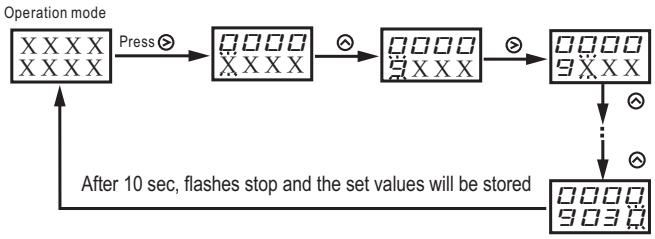
1. These functions is similar as single delay timer but delay does not reset when powered up. It has much longer time range. 8 digits (both lines) are used for displaying the single delay time. This allows up to 9999 days of delay with 1 minute resolution. To prevent accidental reset, function 20, 22, and 24 require the reset key be pressed for 8 sec to reset the timer. One application example is to let the operator to know when the equipment service schedule is due.
2. Example, Function 19. Set the delay time to 1hr.1 min, 10.6 s



4. The PAUSE key (PAU): When the cumulation is running, press and hold the key will pause the counting until the key is released.
5. RESET key (RST): Press the key will start the cumulation from beginning no matter the it is running or stopped. For function 20, 22, and 24, the key needs to be hold for 8 second before reset.
6. PAU terminal: Connecting the PAU terminal to the COM terminal will function the same as pressing the PAU key.
7. RST terminal. Connecting the RST to COM terminal will function the same as pressing the RST key.
8. CNT terminal. This terminal has no effect on the cumulative timer.
9. To view the value of delay during the operation, press the ⌃ key. All digits will flash. The top display and the bottom display show the total time needed before relay action.

L. Frequency Counter (Function 25-26)

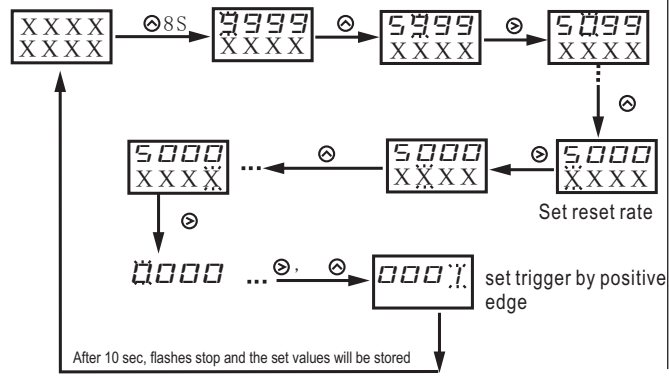
1, These functions offer frequency counter and frequency controlled relay action. When frequency reaches the preset value, the relay will be activated. It can be either pull-in or drop-out, depending on relay working mode selected.
2, During operation, top display shows the current frequency, the lower display shows the set value.
3. Set up example. We want the relay to pull-in at 9030Hz. Set the function 25 and relay mode1 as in section F. Then, set the frequency as following.



4. The PAUSE key (PAU), RESET key (RST), PAU terminal, and RST terminal are disabled.
5. CNT terminal is used for pulse input
6. If the frequency exceed 9999Hz, the display will show EEEE.
7. Frequency upper limit, reset rate and trigger mode setting.
At the normal operation mode, press ⌃ 8s to enter the setting mode.

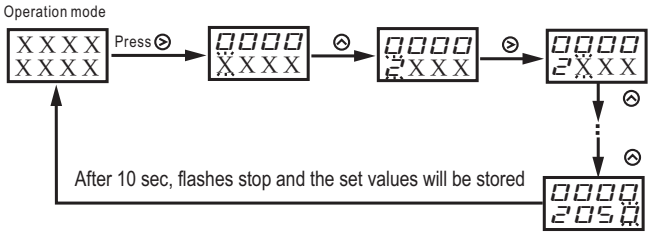
A. The top display is the frequency upper limit.
B. The lower display shows the reset rate in Hz. The lower limit is 0.1Hz. 0.1Hz means if the input suddenly stopped, the display will wait for 10 s before drop to 0. That is not suitable for high frequency signals. User should set the reset rate based on the lowest frequency measured. It should allow the display drops to 0 at reasonable time when the input pulse stopped. Please note that it should not be set to zero.
C. After change the screen, the top display shows trigger setting. 0000 is for triggering at negative edge, and 0001 is for triggering at positive edge of the pulse.

Following is a example on setting the upper limit to 5000 hz and using positive edge to trigger.



M. Tachometer (Function 27)

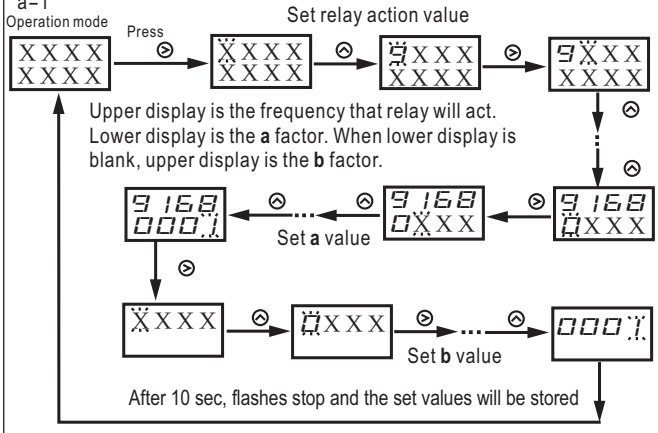
1. This function offers rotation speed measurement and can activate the relay when rotation speed reaches the preset value. The relay can be either pull-in or drop-out, depending on relay working mode selected.
2. During operation, top display shows the speed in RPM, the lower display shows the set value.
3. Example. We want the relay to pull-in at 2050 rpm. Set the function to 28 and relay mode 1 as in section F. Then, set the rpm as following.



4. The PAUSE key (PAU), RESET key (RST), PAU terminal, and RST terminal are disabled.
5. CNT terminal is used for pulse input
6. If the frequency exceed 9999rpm, the display will show EEEE.
7. RPM upper limit, reset rate and trigger mode setting.
At the normal operation mode, press ⌃ to enter the setting mode. The details is the same as in Section J (7). The difference is that for RPM measurement, the upper limit is not as critical as the frequency measurement..

N. Frequency Counter / Tachometer with Multiplier (Function 28)

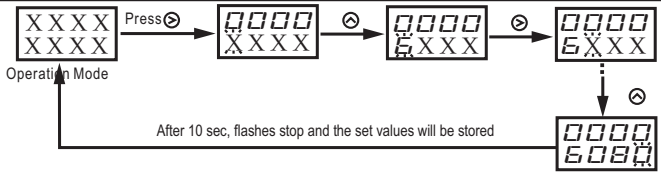
1. This function can be used as frequency counter or tachometer. The multiplier allows the sensor signal to be displayed by multiplying a factor. e.g. If two pulses were received for each rotation, the counter can divide the signal by 2 to display the true frequency or rpm (by multiplying 60).
2. During operation, top display shows the current frequency, the lower display shows the set value.
3. Set up example. We want the relay to pull-in at 9168Hz. Multiply factor a=1



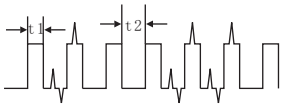
4. The PAUSE key (PAU), RESET key (RST), PAU terminal, and RST terminal are disabled.
5. CNT terminal is used for pulse input
6. Frequency upper limit, reset rate and trigger mode setting.
At the normal operation mode, press ⌃ 8s to enter the setting mode. This is very similar to Section J, (7).
7. The range of multiply factor for **a** and **b** are 0-9999 and 1-9999 respectively.
The displayed frequency = signal frequency x **a/b**
To use it as a tachometer instead of frequency counter, multiply **a** by 60.
8. During the operation, press ⌃, the top display will flash the frequency that relay will act. The lower display will flash the value of **a**. Press ⌃ again, the top display flash the value of **b**.

O. Counter (Function 29)

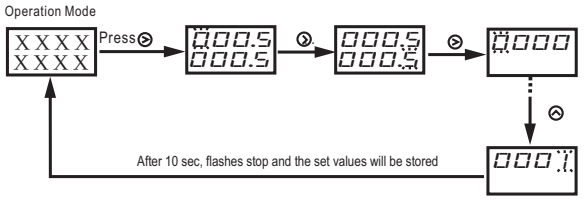
1. This function counts the input signal and can activate the relay when counter reaches the preset value. The relay can be either pull-in or drop-out, depending on the relay working mode selected. The counter can count up and down.
2. During operation, top display shows the current count value, the lower display shows the set value.
3. Example. We want the relay to pull-in at 6080 count. Set the function to 29 and relay mode 1 as in section F. Then, set the count value as following.



4. Define the signal. The signal in some working environments might contain noise spike that can cause in false counting. Using the pulse width discriminator can help the counter to remove the noise spike. Press ^ for 8s to enter the pulse width setting mode. The top LED is t1 value and bottom is the t2 value. The relationship of t1 and t2 is shown at the figure blow. The range is 0.1-999.9ms. When the pulse width is less than t1 or t2, it will not count. When the frequency of the signal is >5kHz, set t1=0 and t2=0. The table below is a reference for the pulse width at different frequency of the signal. Please note that t1 and t2 might not be the same. t1 should be close to the real pulse width. t1 too short could result in losing the pulse count . t1 too long could result in counting extra noise. Press ^ again to enter the signal level setting screen. 0 is for counting the low level pulse (or CNT connects to COM), 1 is for high level pulse (or CNT and COM open). The setting also applies to NPN sensor.



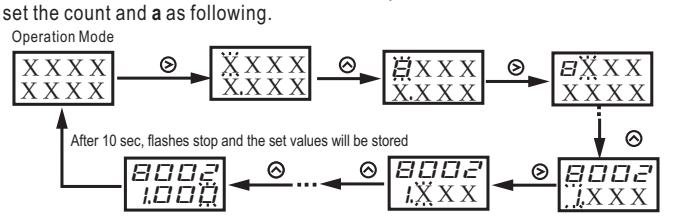
F (Hz)	T (ms, t1 + t2)
1	1000. 0
10	100. 0
100	10. 0
1000	1. 0
2000	0. 5
10000	0. 2



5. PAU terminal controls whether it is count up or down. When connected to COM, it counts down. Disconnect will count up.
6. RST terminal. Connecting the RST to COM terminal reset the counter. Disconnect will start the counting.
7. RST key. Press it will reset the counter, release it starts the counter.
8. CNT terminal is used for pulse input.
9. PAU Key is disabled.

P. Counter w/ Multiplier(Function 30)

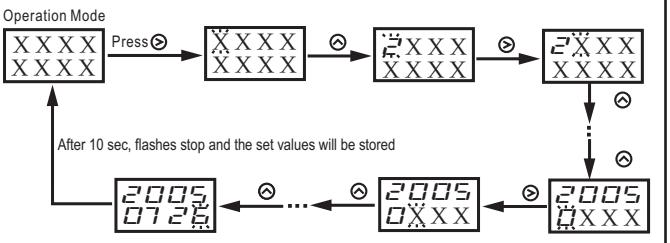
1. This function is similar as the Function 29. However, the multiplier allows the sensor signal to be displayed with a multiplying factor. e.g. If one pulse signal represents two events, the counter can multiply the count of signal by 2 to display the correct counts of the events.
2. During operation, top display shows the current count, the lower display shows the set value.
3. Set up example. We want the relay to pull-in at 8002 counts, and multiplying factor a=1.000. Set the function to 30 and relay mode1 as in section F. Then, set the count and **a** as following.



4. Set the signal discriminator such as pulse width and triggering voltage level in the same way as described in Section M (4).
5. PAU terminal controls whether it is count up or down. When connected to COM, it counts down. Disconnect it from COM will count up.
6. RST terminal. Connecting the RST to COM terminal resets the counter. Disconnect will start the counting.
7. RST key. Press it will reset the counter, release it starts the counter.
8. CNT terminal is used for pulse input.
9. PAU Key is disabled.
10. The range of multiplying factor. **a**, is 0.001-9.999.
The displayed count = signal count x **a**
11. To find out the counter and **a** setting during operation, press ^ key. The top display will shows the counter set value. The lower display will show the multiplying factor.

Q. Eight Digits Counter (Function 31)

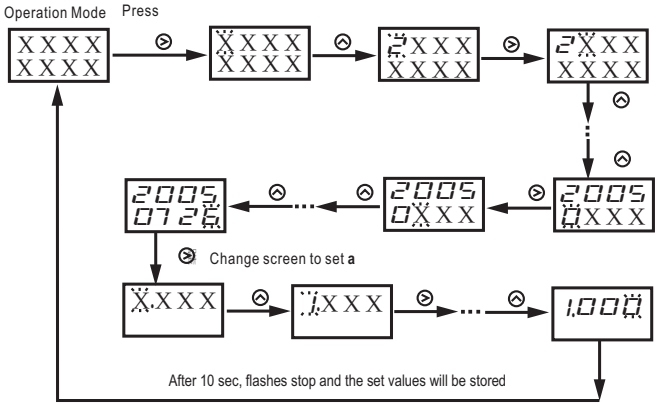
1. This function is the same as Function 29 except the maximum count number is 9999 times larger.
2. During operation, both upper and lower displays are used to show the current count value.
3.Example. We want the relay to pull-in at 20050726 count. Set the function to 31 and relay mode 1 as in section F. Then, set the count value as following.



4. Set the signal discriminator such as pulse width and triggering voltage level in the same way as described in Section M (4).
5. PAU terminal controls whether it is count up or down. When connected to COM, it counts down. Disconnect it from COM will count up.
6. RST terminal. Connecting the RST to COM terminal resets the counter. Disconnect will start the counting.
7. RST key. Press it will reset the counter, release it starts the counter.
8. CNT terminal is used for pulse input.
9. PAU Key is disabled.
10. To find out the counter setting during operation, press ^ key.

R. 8 Digits Counter w/ Multiplier(Function 32)

1. This function is similar as the Function 31. However, the multiplier allows the sensor signal to be displayed with a multiplying factor. e.g. If one pulse signal represents two events, the counter can multiply the count of signal by 2 to display the correct counts of the events.
2. During operation, both upper and lower displays are used to show the current count value.
3. Example. We want the relay to pull-in at 20050726 counts, and multiplying factor a=1.000. Set the function to 32 and relay mode 1 as in section F. Then, set the count and **a** as following.



4. Set the signal discriminator such as pulse width and triggering voltage level in the same way as described in Section M (4).
5. PAU terminal controls whether it is count up or down. When connected to COM, it counts down. Disconnect it from COM will count up.
6. RST terminal. Connecting the RST to COM terminal resets the counter. Disconnect will start the counting.
7. RST key. Press it will reset the counter, release it starts the counter.
8. CNT terminal is used for pulse input.
9. PAU Key is disabled.
10. The range of multiplying factor. **a**, is 0.001-9.999.
The displayed count = signal count x **a**
11. To find out the counter and **a** setting during operation, press ^ key. Both top and bottom display will show the counter set value. Press ^ key again, the top display will show the value of multiply factor, **a**.

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