Timer Relay Module FRM01 User Manual V1.1

Contents

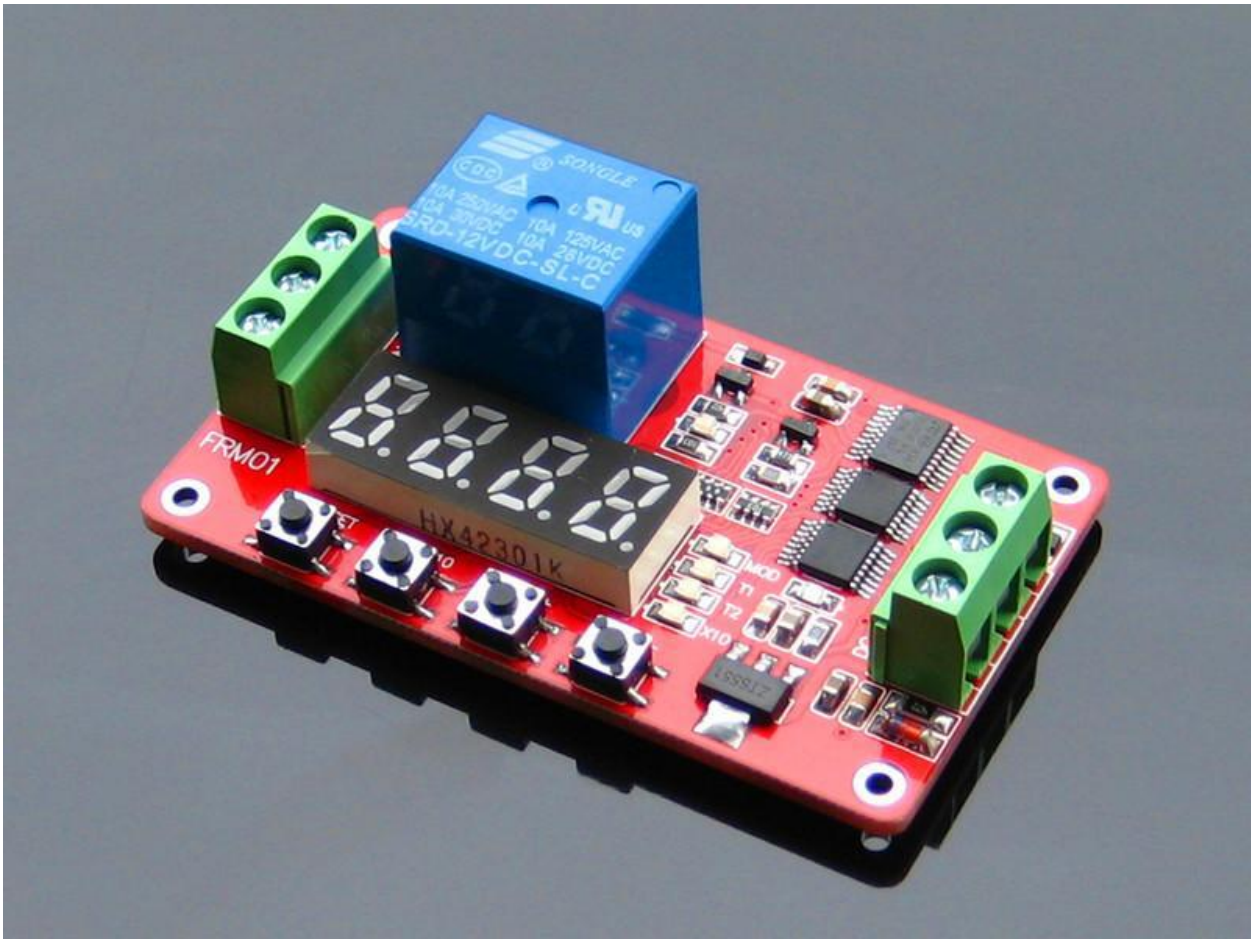
Change Log

May 30, 2017 – Fixed “Summary of Functions” table

- Removed “Notes” from Function 04
- Added “Notes” to Function 06

Introduction

The multifunctional relay control module, FRM01, is designed for customers with different timing and control needs. The FRM01 is controlled by a micro controller. There are 18 functions available. Each function can be customized to meet the customer's needs. The FRM01 is equipped with a high quality power relay, a high power voltage transistor, red and blue indicator LED's, a LED display all on a double sided PCB board. The FRM01 can be used in a variety of timing and power control applications. The output of the board is driven by a high quality power relay capable of controlling AC and DC loads.



Module Functions

The user can select one of 18 functions as shown below to control the FRM01 timings. All parameters are permanently saved once set. The functions and parameters can be reviewed or changed at a later time. The timer resolution can be set as low as .005 seconds.

NOTES:

- Functions 01 to 08 start automatically when the power is turned on!
- Function 09 to 18 a high start plus ≥20ms is required via the CH1 input
- Function 09 is self-locking mode
- Function 10 is a level control mode
- T1 = Timer 1
- T2 = Timer 2
- CH1 = Pulse input 1
- NX = Repeat count

Timer Relay Module FRM01 User Manual V1.1

Summary of Functions

Function	Relay at Power on	When T1=0	When T2=0	NX Value	High Pulse on CH1 (Also restarts all functions)	Notes
01	OFF	ON				
02	ON	OFF				
03	OFF	ON	OFF			
04	ON	OFF	ON			
05	OFF	ON	OFF			Repeats when done
06	ON	OFF	ON			Repeats when done
07	OFF	ON	OFF	Count #		
08	ON	OFF	ON	Count #		
09	OFF				ON / OFF Via pulse on CH1	
10	OFF	OFF			Relay On – Start T1 AFTER CH1=LOW	
11	OFF	ON			Start T1	
12	OFF	OFF			Relay On - Start T1	
13	OFF	ON	OFF		Start T1	
14	OFF	OFF	ON		Relay On – Start T1	
15	OFF	ON	OFF		Start T1	Repeats when done
16	OFF	OFF	ON		Relay On – Start T1	Repeats when done
17	OFF	OFF	ON	Count #	Start T1	
18	OFF	OFF	ON	Count #	Relay On – Start T1	

Detailed Functions

Function 01 - Timing Pull-in

- Power on starts T1 and relay will be off
- When T1 = 0 the relay will turn on
- Function stops
- T1 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 02 - Timing Disconnect

- Power on turns on the relay and starts T1
- When T1 = 0 the relay will turn off
- Function stops
- T1 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 03 - Timing Pull-in Then Disconnect

- Power on starts T1 and relay will be off
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off

- Function stops
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 04 - Timing Disconnect Then Pull-in

- Power on turns on the relay and starts T1
- When T1 = 0 the relay will turn off
- T2 Starts
- When T2 = 0 the relay will turn on
- Function stops
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will repeat the function

Function 05 - Unlimited Cycle Timing Mode A

- Power on starts T1 and relay will be off
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off
- Repeat the function
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will reset and restart the function

Function 06 - Unlimited Cycle Timing Mode B

- Power on turns on the relay and starts T1
- When T1 = 0 the relay will be off
- T2 Starts
- When T2 = 0 the relay will turn on
- Repeat the function
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- High pulse on CH1 will reset and restart the function

Function 07 - Limited Cycle Timing Mode A

- Power on starts T1 and relay will be off
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off
- Repeat the function NX times
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- NX can be between 1 and 9999 cycles
- High pulse on CH1 will reset and restart the function

Function 08 - Limited Cycle Timing Mode B

- Power on turns on the relay and starts T1
- When T1 = 0 the relay will be off
- T2 Starts

- When T2 = 0 the relay will turn on
- Repeat the function NX times
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- NX can be between 1 and 9999 cycles
- High pulse on CH1 will reset and restart the function

Function 09 - Self-locking Mode

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- High pulse on CH1 will turn off the relay

Function 10 - Trigger Mode with delay off function

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- T1 will start AFTER CH1 is at a Low level
- When T1 = 0 the relay will turn off
- High pulse on CH1 will restart function
- Note: If T1 is set to 0000, High on CH1 will turn on the relay. A Low on CH1 will turn off the relay
- T1 can be adjustable between 0.005 seconds and 270 hours

Function 11 - Trigger timing mode A

- At power on relay will be off
- High pulse on CH1 will start T1
- When T1 = 0 the relay will turn on
- High pulse on CH1 will restart function
- T1 can be adjustable between 0.005 seconds and 270 hours

Function 12 - Trigger timing mode B

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- T1 will start
- When T1 = 0 the relay will turn off
- High pulse on CH1 will reset and restart the function
- T1 can be adjustable between 0.005 seconds and 270 hours

Function 13 - Trigger timing mode C

- Power on starts T1 and relay will be off
- High pulse on CH1 will start T1
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off
- High pulse on CH1 will reset and restart the function
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours

Function 14 - Trigger timing mode D

- At power on relay will be off

- High pulse on CH1 will turn on the relay
- T1 will start
- When T1 = 0 the relay will turn off
- T2 Starts
- When T2 = 0 the relay will turn on
- High pulse on CH1 will reset and restart the function
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours

Function 15 - Unlimited Cycle Timing Mode A

- Power on relay will be off
- High pulse on CH1 will start T1
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off
- High pulse on CH1 will reset and restart the function
- Repeat the function
- T1 can be adjustable between 0.005 seconds and 270 hours

Function 16 - Unlimited Cycle Timing Mode B

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- T1 will start
- When T1 = 0 the relay will turn off
- T2 Starts
- When T2 = 0 the relay will turn on
- High pulse on CH1 will reset and restart the function
- Repeat the function
- T1 can be adjustable between 0.005 seconds and 270 hours

Function 17 - Limited Cycle Timing Mode A

- At power on relay will be off
- High pulse on CH1 will start T1
- When T1 = 0 the relay will turn on
- T2 Starts
- When T2 = 0 the relay will turn off
- Repeat the function NX times
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- NX can be between 1 and 9999 cycles
- High pulse on CH1 will reset and restart the function

Function 18 - Limited Cycle Timing Mode B

- At power on relay will be off
- High pulse on CH1 will turn on the relay
- T1 will start
- When T1 = 0 the relay will turn off

- T2 Starts
- When T2 = 0 the relay will turn on
- Repeat the function NX times
- T1 & T2 can be adjustable between 0.005 seconds and 270 hours
- NX can be between 1 and 9999 cycles
- High pulse on CH1 will reset and restart the function

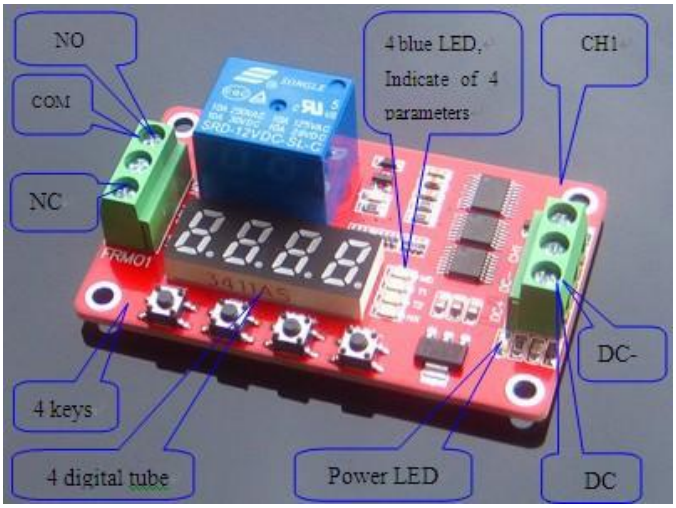
Timer Relay Module FRM01 User Manual V1.1

Operating Instructions

The operating mode and timing parameters can be set with the four buttons and the LCD display. All parameters will be automatically saved when they are set.

Buttons

- There are 4 buttons:
  - SET
  - SWI
  - NUM +
  - NUM-
- They all have short and long presses:
  - Short presses are less than 1 second long
  - Long presses are more than 1 second long



Operating modes

- Normal Operation
- Parameter view
- Parameter setting

LED display

- Used to set or view the timing parameters

LED indicators

- 4 blue parameter indicators
  - MD:
    - Active program function (01 to 18)
    - On = Timing stopped
    - Flashing = Timing function has completed
  - T1:
    - Timer one - 1 to 9999 seconds
    - On = Displays current T1 value
    - Flashing = T1 is counting

  - T2:
    - Timer two - 1 to 9999 seconds
    - On = Displays current T2 value
    - Flashing = T2 is counting
  - NX:
    - Varies for each function. See NX Function below
    - On = Displays current NX value
- 1 red power on indicator
- 1 blue relay active indicator

NX Functions

- Functions 01-06 and 11-16
    - LED display indicate the “time multiplier” for T1 and T2
    - Time base varies from 00 to 99
    - 00 = .005 second time multiplier (very fine timing)
    - 01 = 1 second time multiplier
    - 99 = 99 second time multiplier
    - First two LED digits indicate time multiplier for T1
    - Send two LED digits indicate time multiplier for T2
    - Examples:
        - NX = 0101 T1=0015 T2=0060
            - T1 and T2 each have a 01 second time multiplier
            - T1 will count 15 seconds
                - 01 * 15 = 15 seconds
            - T2 will count 60 seconds
                - 01 * 60 = 60 seconds
        - NX = 0050 T1=0015 T2=0060
            - T1 has a .005 second time multiplier
            - T2 has a 50 second time multiplier
            - T1 will count 0.075 seconds
                - .005 * 15 = 0.075 seconds
            - T2 will count 3000 seconds
                - 50*60=3000 seconds
        - NX = 9999 T1=9999 T2=9999
            - T1 and T2 have 99 second time multipliers
            - T1 and T2 will count:
                - 989,901 seconds or
                - 16,498.35 minutes or
                - 274.9725 hours
                - This is the maximum timing
- Functions 07, 08, 17 and 18:
    - LED display indicates “number of cycles”
    - In these functions the “time multiplier” is set to 01 or 1 second per T1 and T2 unit
    - The number of cycles can range from 1 to 9999 cycles

Timer Relay Module FRM01 User Manual V1.1

Operating Mode

When turned on

- The LED display shows the current function in operation
- When the function is complete, the LED display shows the current function number
  - Such as: " - - 0 1 " for function 01

SET Button

- Short press on the SET button enters into the power saver mode
  - The LED display goes blank
  - The program continues to work normally
  - Press SET again to turn the LED display back on
- Long press the SET button enters into Parameter Setting Mode

SWI Button

- Long press on the SWI button enters into Parameter View Mode

NUM+ Button

- Long press NUM+ button puts the unit into the 10 second automatic power saving mode
  - The LED display will blink twice to signal that the mode has been enabled
- After entering the power saving mode, if no buttons are pressed within 10 seconds, the LED display and LED's will turn off (Power and Relay LED's are not turned off)
- The program will continue to run
- Short press SET to turn on the LED display temporarily
- Long press NUM+ again to exit the automatic power saving mode
  - LED display must be on before you can disable automatic power saving mode
    - Short press on Set to turn on LED display
  - The LED display will blink three times to indicate the mode has been canceled

NUM- Button

- Long press on NUM- causes a timing reset and stop
  - MD light on solid = Stopped
- A short press NUM- will start the timing from the beginning
  - MD light flashing = Running

Timer Relay Module FRM01 User Manual V1.1

Parameter View Mode

- You can view the parameters of the current function
- Long press on SWI will enter into parameter view mode
- The MD LED indicator will be on
- Short presses on the SET button will rotate through the parameters. The MD, T1, T2 and NX LED's indicate what parameter is being displayed
- Long press the SWI button will enter back into Operating Mode

Parameter Setting Mode

- This mode allows you to set the active function and its timing parameters
- Long press on SET button will enter into Parameter Setting mode
- Short press the SET button will rotate through the four parameters as shown by the LED's:
    - MD – Function select
    - T1 – Timer 1
    - T2 - Timer 2
    - NX – Options
- The LED display will be flashing, showing the value of the current parameter
- Short press of the SWI button will rotate through the four parameter choices (MD, T1, T2 & NX)
- Short press the NUM+ or NUM- button will increment or decrement the currently flashing digit
- Long press the SET button to save the parameters and enter back into Operating Mode

Examples:

- Example 1
    - Control a lamp
    - Turn on for one hour, then turn off
    - Setup:
        - MOD="- - 02" Function 02 - Timing Disconnect
        - T1="3600" 3600 seconds or 1 hour
        - T2="xxxx" x can be any value as this setting is not needed
        - NX="01xx" 01 = T1 setting is in 1 second units. (xx= don't care)
    - long press on SET button to enter into Parameter Setting Mode
        - MD LED should be on
            - If not, short press on SET button several times until MD LED is on
        - Press NUM+ or NUM- buttons to adjust the LED display to "- - 12"
            - Use SWI button to switch between digits
        - Short press SET button to turn on T1 LED
        - Press NUM+ or NUM- buttons to adjust the LED display to "3 6 0 0"
            - Use SWI button to switch between digits
        - Short press SET button TWICE to turn on NX LED
            - No need to set T2 as Function 02 does not use Timer 2
        - Press NUM+ or NUM- buttons to adjust the LED display to "0 1 0 1 ";
            - Use SWI button to switch between digits
        - Long press SET button to save settings and exit Parameter Setting Mode

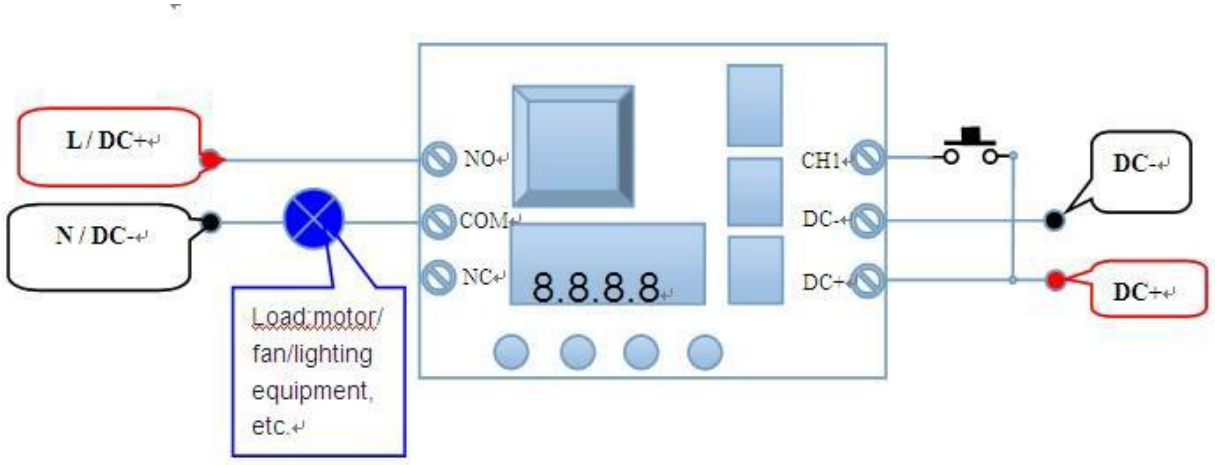
        - The function starts running immediately
- Example 2
    - When power on, the machine will to the following:
        - Run for 1 hour
        - Stop for 10 minutes
        - Repeat the above 5 total times
        - Turn off
    - Parameters:
        - MD="- - 0 8” Function 08 - Limited Cycle Timing Mode B
        - T1="3 6 0 0” Timer 1 = 3600 seconds or 1 hour
        - T2="0 6 0 0” Timer 2 = 600 seconds or 10 minutes
        - NX="0 0 0 5" Cycle count = 5

Wiring Reference

If the DC power supply used is insufficient or wiring connections are poor, the module may appear unstable. Please always follow the following:

Separate wiring

- The DC power supply should power the module and the relay via separate wires. Do not just jumper from the FRM01’s DC+ to the relay or the FRM01’s DC- to the relay.
- Make sure your DC power supply has sufficient current capability to run the FRM01 and your load. Some loads can draw 3 to 7 times their rated current. If the DC power supply is too small, the load can cause the DC voltage going to the FRM01 to drop too low. This will cause the FRM01 module to reset.
- If the above two items do not help, add a electrolytic capacitor of 470uf/35V or higher across the DC- and DC+ connector.



Timer Relay Module FRM01 User Manual V1.1

Electrical parameters

Operating Voltage

- 5V/12V/24V（+/-10%)
  - The voltage will depend on the model of FRM01 you purchased
  - Look at the relay for the VDC value of 5VDC, 12VDC or 24VDC

Working Current

FRM01 model=>	5 Volt	12 Volt	24 Volt
Relay On	90ma	50ma	35ma
Relay Off	15ma	15ma	15ma
Relay & Display Off	3ma	3ma	3ma

Temperature

- Working: -20℃ to 60℃
- Storage: -30℃ to 70℃

Load Capacity

- NO contacts DC 0-30V/10A, AC 0-250V/10A
- NC contacts DC 0-28V/10A, AC 0-125V/10A
-

Restrictions

- Relay life: 100,000 cycles. It is more suitable for use in low frequency and high current operation. Is not suitable for repeated use in fast acting situations.
- Power margin:
  - For purely resistive loads you should more than doubled power margins
  - For inductive or capacitive loads you should triple the power margins

Module Interface

- Module Voltage/Signal Input
  - DC+ ：DC power positive
  - DC- ：DC power negative
  - CH1 ：Input signal interface
    - +3V to +30V = High level
    - 0 to 1.5V = Low level
    - 1.5V to 3V = unpredictable
- Module Output
  - NO Normally open relay connection
  - COM Common relay connection
  - NC Normally closed relay connection

Module Size

- Dimensions: 66mm * 40mm * 20mm (L * W * H)
- Screw Size: 4*ϕ3.0mm
- Screw holes center distance: 59mm * 33mm