

## Time Delay Relays – Application Data

### Definition:

Time Delay is defined as the controlled period between the functioning of two events. A Time Delay relay is a combination of an electromechanical output relay and a control circuit. The control circuit is comprised of solid state components and timing circuits that control operation of the relay and timing range. Typical time delay functions include On-Delay, Repeat cycle (starting off), Interval, Off-Delay, Retriggerable One Shot, Repeat cycle (starting on), Pulse Generator, One Shot, On/Off Delay, and Memory Latch. Each function is explained in the table below. Time delay relays have a broad choice of timing ranges from less than one second to many days. There are many choices of timing adjustments from calibrated external knobs, DIP switches, thumbwheel switches, or recessed potentiometer. The output contacts on the electromechanical output relay are direct wired to the output terminals. The contact load ratings are specified for each specific type of time delay relay.

Understanding the differences between all the functions available in time delay relays can sometimes be a daunting task. When designing circuits using time delay relays questions such as:

“What initiates a time delay relay?”

“Does the timing start with the application or release of voltage?”

“When does the output relay come on?”

must be asked.

Time delay relays are simply control relays with a time delay built in. Their purpose is to control an event based on time. The difference between relays and time delay relays is when the output contacts open & close: on a control relay, it happens when voltage is applied and removed from the coil; on time delay relays, the contacts will open or close before or after a pre-selected, timed interval.

Typically, time delay relays are initiated or triggered by one of two methods:

- application of input voltage (On Delay, Interval On, Flasher, Repeat Cycle, Delayed Interval & Interval/Flasher).
- opening or closing of a trigger signal (Off Delay, Single Shot & Watchdog).

These trigger signals can be one of two designs:

- a control switch (dry contact), i.e., limit switch, push button, float switch, etc.
- voltage (commonly known as a power trigger).

To help understand, some definitions are important:

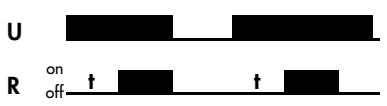

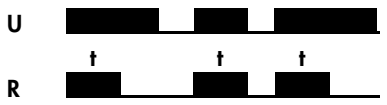
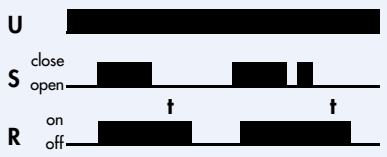
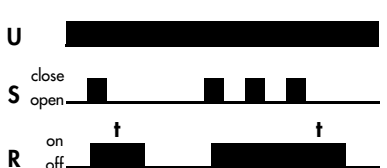
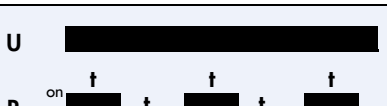
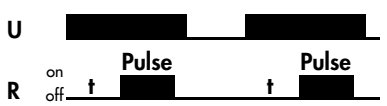
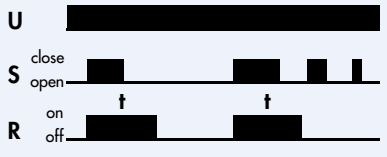
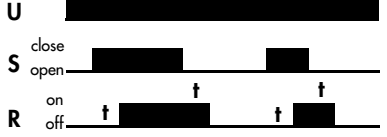
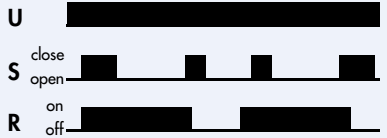
**Input Voltage:** Control voltage applied to the input terminals (see wiring diagrams below). Depending on the function, input voltage will either initiate the unit or make it ready to initiate when a trigger signal is applied.

**Trigger Signal:** On certain timing functions, a trigger signal is used to initiate the unit after input voltage has been applied. As noted above, this trigger signal can either be a control switch (dry contact switch) or a power trigger (voltage).

**Output (Load):** Every time delay relay has an internal relay (usually mechanical) with contacts that open & close to control the load. They are represented by the dotted lines in the wiring diagrams. Note that the user must provide the voltage to power the load being switched by the output contacts of the time delay relay.

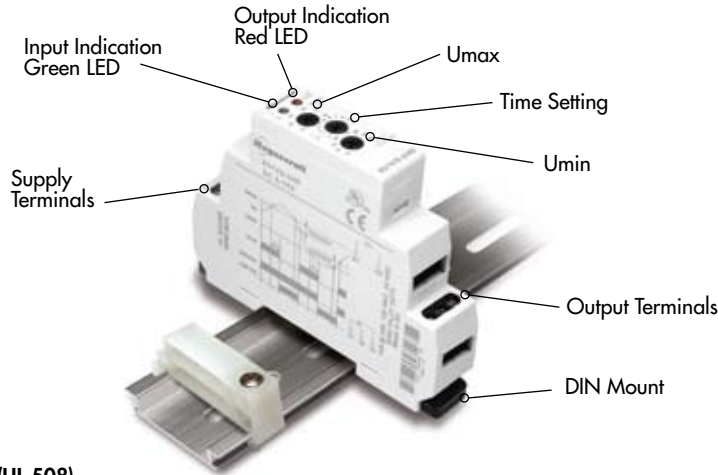
The following tables contain both written and visual descriptions on how the common timing functions operate. A Timing Chart shows the relationship between Input Voltage, Trigger Signal (if present) and Output Contacts.

## FUNCTION DEFINITION TABLES

Function	Operation	Timing Chart
<b>A.</b> <b>ON DELAY</b> Power On	When the input voltage <b>U</b> is applied, timing delay <b>t</b> begins. Relay contacts <b>R</b> change state after time delay is complete. Contacts return to their shelf state when power <b>U</b> is removed. Control switch is not used in this mode.	
<b>B.</b> <b>REPEAT CYCLE</b> Starting Off	When input voltage <b>U</b> is applied, time delay <b>t</b> begins. When time delay <b>t</b> is complete, relay contact <b>R</b> change state for time delay <b>t</b> . This cycle will repeat until input voltage <b>U</b> is removed. Control switch is not used in this mode.	
<b>C.</b> <b>INTERVAL</b> Power On	When input voltage <b>U</b> is applied, relay contacts <b>R</b> change state immediately and timing cycle begins. When time delay is complete, contacts return to shelf state. When input voltage <b>U</b> is removed, contacts return to their shelf state. Control switch is not used in this mode.	
<b>D.</b> <b>OFF DELAY</b> S Break	Input voltage <b>U</b> must be applied continuously. When control <b>S</b> is closed, relay contacts <b>R</b> change state. When control <b>S</b> is opened delay <b>t</b> begins. When delay <b>t</b> is complete, contact <b>R</b> return to their shelf state. If signal <b>S</b> is closed before time delay <b>t</b> is complete, then time is reset, the delay begins again, and relay contacts remain in their energized state. If input voltage <b>U</b> is removed, relay contact <b>R</b> return to their shelf state.	
<b>E.</b> <b>RETRIGGERABLE ONE SHOT</b>	Upon application of input voltage <b>U</b> , the time delay relay is ready to accept trigger signals <b>S</b> . Upon application of the trigger signal <b>S</b> , the relay contacts <b>R</b> transfer and the preset time <b>t</b> begins. At the end of the preset time <b>t</b> , the relay contacts <b>R</b> return to their normal condition unless the trigger signal <b>S</b> is opened and closed prior to time out <b>t</b> (before preset time elapses). Continuous cycling of the trigger signal <b>S</b> at a rate faster than the preset time will cause the relay contacts <b>R</b> to remain closed.	
<b>F.</b> <b>REPEAT CYCLE</b> Starting On	When input voltage <b>U</b> is applied, relay contacts <b>R</b> change state immediately and time delay <b>t</b> begins. When time delay <b>t</b> is complete, contacts return to their shelf state for time delay <b>t</b> . This cycle will repeat until input voltage <b>U</b> is removed. Control switch is not used in this mode.	
<b>G.</b> <b>PULSE GENERATOR</b>	Upon application of input voltage <b>U</b> , a single output pulse of 0.5 seconds long is delivered to relay after time delay <b>t</b> . Power must be removed and reapplied to repeat pulse. Control switch <b>S</b> is not used in the mode.	
<b>H.</b> <b>ONE SHOT</b>	Upon application of input voltage <b>U</b> , the time delay relay is ready to accept trigger signals <b>S</b> . Upon application of the trigger signal <b>S</b> , the relay contacts <b>R</b> transfer and the preset time <b>t</b> begins. During time-out, the trigger signal <b>S</b> is ignored. The time delay relay resets by applying the trigger signal <b>S</b> when the relay is not energized.	
<b>I.</b> <b>ON/OFF DELAY</b> S Make/Break	Input voltage <b>U</b> must be applied continuously. When control <b>S</b> is closed, time delay <b>t</b> begins. When time delay <b>t</b> is complete, relay contacts <b>R</b> change state and remain transferred until control <b>S</b> is opened. If input power <b>U</b> is removed relay contacts <b>R</b> return to their shelf state.	
<b>J.</b> <b>MEMORY LATCH</b> S Make	Input voltage <b>U</b> must be applied continuously. Output changes state with every control <b>S</b> closure. Returned to rest condition when power is removed.	

**U** = Input Voltage    **S** = Control Switch    **R** = Relay Contacts    **t** = Time Delay

# 831 Voltage Sensing Relay/SPDT 15 Amp Rating



## General Specifications (UL 508)

Output Characteristics		Units	831VS-120A	831VS-240A
Number and type of Contacts			SPDT	SPDT
Contact Material			Silver Alloy	Silver Alloy
Current rating	@ 240 VAC, 24 VDC	A	15	15
Switching voltage		V	240 AC, 50/60 Hz	240 AC, 50/60 Hz
		V	24 DC	24 DC
		HP	1/2 @ 120VAC	1/2 @ 120VAC
		HP	1 @ 240 VAC	1 @ 240 VAC
		Pilot Duty	B300	B300
Minimum Switching Requirement		mA	100	100
Indication	LED	Blinks = Timing On = Energized	Red	Red
Input/Sensing Characteristics				
Voltage Range		V	120 AC	240 AC
Absolute Input Voltage Maximum		V	200 AC	280 AC
Upper Sensing Voltage Range		V	80...150 AC	160...276 AC
Lower Sensing Voltage Range		%	30...99	30...99
Maximum consumption	AC/DC	VA	1.2	1.2
Indication	LED		Green	Green
Timing Characteristics				
Time Scales			1	1
Time Ranges Available		sec	0...10	0...10
Tolerance	Mechanical Setting	%	5	5
Repeatability	Constant Voltage and Temperature	%	1	1
Operate Time	Maximum	ms	25	25
Release Time	Maximum	ms	20	20
Performance Characteristics				
Electrical Life	Operations @ Rated Current (Resistive)		100,000	100,000
Mechanical Life	Unpowered		10,000,000	10,000,000
Dielectric strength	Input to Contacts	V	2500 AC	2500 AC
	Between Open Contacts	V	1000 AC	1000 AC
Terminal Wire Capacity		AWG (mm <sup>2</sup> )	14 (2.1)	14 (2.1)
Terminal Torque (maximum)		in lb (Nm)	7.1 (0.8)	7.1 (0.8)
Environment				
Product certifications	Standard version		UL, CE	UL, CE
Ambient air temperature around the device	Storage	°C	-30...+70	-30...+70
	Operation	°C	-20...+55	-20...+55
Degree of protection			IP 20	IP 20
Weight		grams	71	71



Optional Panel Adapter  
(16-788C1)  
See Section 3 p.18

The 831 voltage sensor is a single phase AC voltage sensing device that is capable of monitoring and reacting to over and under voltage conditions. This product is designed to be wired across terminals A1 and A2 with the voltage that is being monitored. The two LED lamps indicate both when the input voltage is present (Green LED) and also when the output is energized (Red LED). The Umax dial is used to set the upper trip-point for the voltage sensor. The Umin dial is a percentage of the Umax dial and is used to set the lower trip-point for the voltage sensor. The timing dial is used to delay the transfer of the contacts, from 0 to 10 seconds, when a set point has been violated.

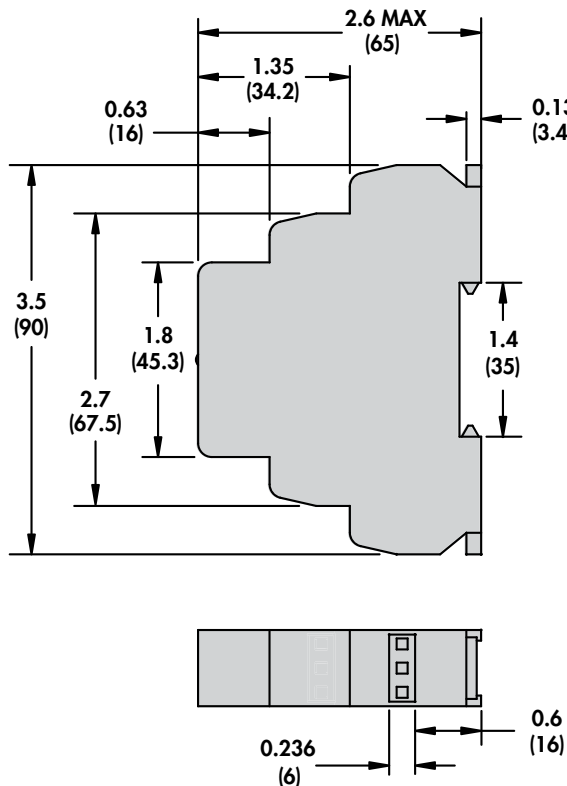
**Standard Part Numbers**

**BOLD-FACED PART NUMBERS ARE NORMALLY STOCKED**

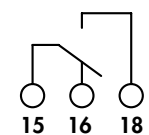
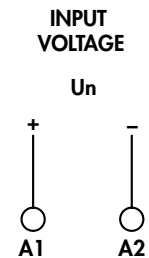
Part Number	Input Voltage	Timing Range	Sensing Voltage Range	Contact Configuration	Rated Load Current
<b>831VS-120A</b>	120 VAC	0s...10s	Upper: 80...150 VAC Lower: 30...99%	SPDT	15 Amps
<b>831VS-240A</b>	240 VAC	0s...10s	Upper: 160...276 VAC Lower: 30...99%	SPDT	15 Amps

**Part Number Builder**

Series	Relay Style	-	Input Voltage
831 = SPDT	VS = Voltage Sensor		120A = 120 VAC
			240A = 240 VAC



**WIRING DIAGRAM**



15 - COMMON  
16 - NORMALLY CLOSED  
18 - NORMALLY OPEN