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).

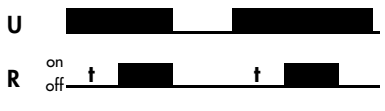
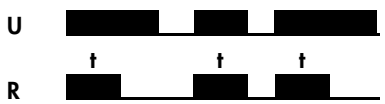
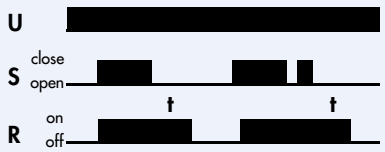
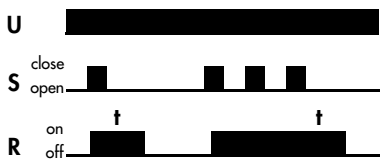
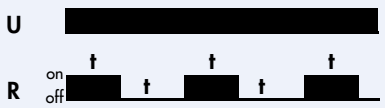
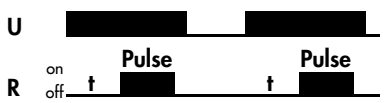
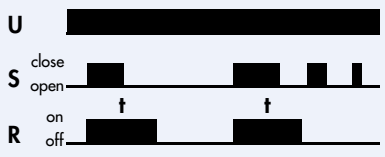
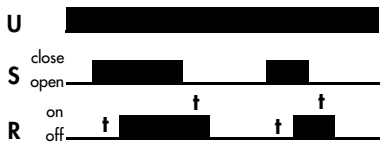
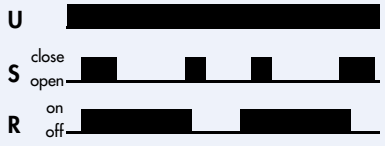
To help understand, some definitions are important:
Input Voltage: Control voltage applied to the input terminals (see wiring diagrams below). Depending on the function, input voltage will either initiate the unit or make it ready to initiate when a trigger signal is applied.

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.

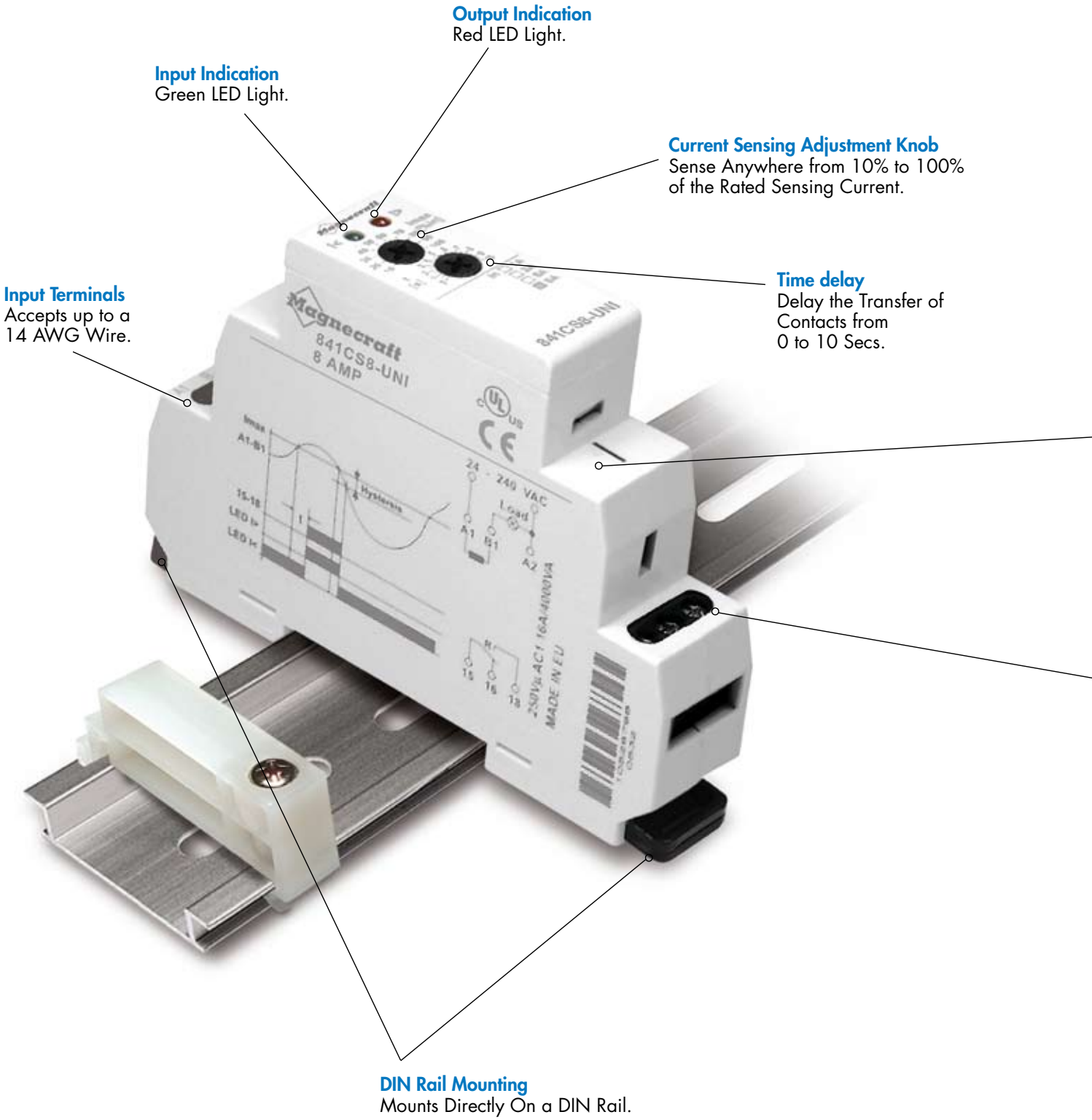
The following tables contain both written and visual descriptions on how the common timing functions operate. A Timing Chart shows the relationship between Input Voltage, Trigger Signal (if present) and Output Contacts.

FUNCTION DEFINITION TABLES

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

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

Advantages of the 841 Current Sensing Relay



The 841 Current Sensor Series is a complete current sensing solution in one modular package which mounts directly to a DIN rail. This product allows the user to monitor the current of one circuit (1 to 8 amps) and switch another circuit in case of an over current or under current condition. The built in time delay feature allows the user to accurately switch the output anytime between 0 to 10 seconds after the preset current monitoring condition is violated. Also, the 841 has the capability to extend the sensing range up to 600 A through the use of current transformers.

Solid State Circuitry
Used for Sensing and Timing Control.

Output Terminals
Accepts up to a 14 AWG wire.

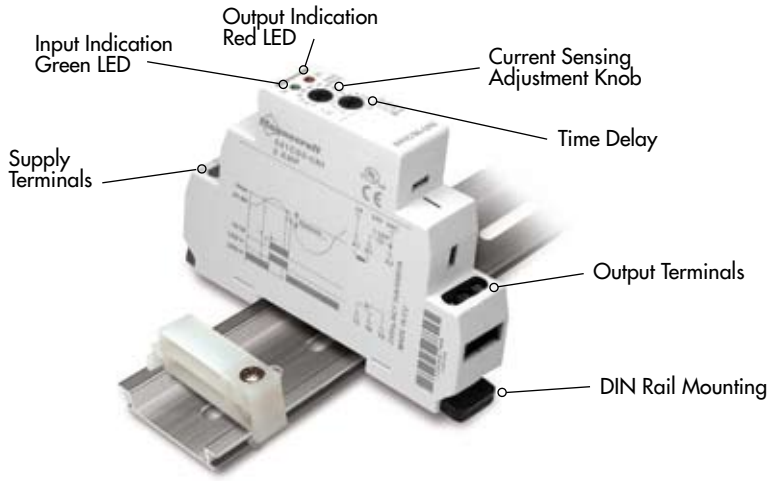
- **The variable trip point feature allows the user to accurately sense over/under loads.**
- **Offers a "one stop solution" for your power management system.**
- **Two LED status indicators; indicate status at a glance.**
- **The Green LED is on when power is applied to the input terminals. The Red LED blinks during time-out, and is ON when the output is generized.**
- **Color and appearance designed for high visibility in all environments.**
- **The wide input voltage range of 24 to 240 AC enables the device to work with all popular AC voltages.**
- **Only 17.5 mm wide making it ideal for tight spaces.**
- **Engineering availability allows for customized relay solutions.**

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

841 Current Sensing Relay/SPDT 15 Amp Rating

UL Listed
File No. E234203

RoHS Compliant



General Specifications (UL 508)

Output Characteristics		Units	841CS1-UNI	841CS2-UNI	841CS5-UNI	841CS8-UNI
Number and type of Contacts			SPDT	SPDT	SPDT	SPDT
Contact Material			Silver Alloy	Silver Alloy	Silver Alloy	Silver Alloy
Current rating	@ 240 VAC, 24 VDC	A	15	15	15	15
Switching voltage		V	240 AC, 50/60 Hz	240 AC, 50/60 Hz	240 AC, 50/60 Hz	240 AC, 50/60 Hz
		V	24 DC	24 DC	24 DC	24 DC
		HP	1/2 @ 120VAC	1/2 @ 120VAC	1/2 @ 120VAC	1/2 @ 120VAC
		HP	1 @ 240 VAC	1 @ 240 VAC	1 @ 240 VAC	1 @ 240 VAC
		Pilot Duty	B300	B300	B300	B300
Minimum Switching Requirement		mA	100	100	100	100
Indication	LED	Blinks = Timing On = Energized	Red	Red	Red	Red
Input Characteristics						
Voltage Range		V	24....240 AC	24....240 AC	24....240 AC	24....240 AC
Maximum consumption	LED	VA	1.5	1.5	1.5	1.5
Indication			Green	Green	Green	Green
Sensing Characteristics						
Sensing Range		A	0.1....1	0.2....2	0.5....5	0.8....8
Timing Characteristics						
Time Scales			1	1	1	1
Time Ranges Available		sec	0....10	0....10	0....10	0....10
Tolerance	Mechanical Setting	%	5	5	5	5
Repeatability	Constant Voltage and Temperature	%	1	1	1	1
Operate Time	Maximum	ms	25	25	25	25
Release Time	Maximum	ms	20	20	20	20
Performance Characteristics						
Electrical Life	Operations @ Rated Current (Resistive)		100,000	100,000	100,000	100,000
Mechanical Life	Unpowered		10,000,000	10,000,000	10,000,000	10,000,000
Dielectric strength	Input to Contacts	V	2500 AC	2500 AC	2500 AC	2500 AC
	Between Open Contacts	V	1000 AC	1000 AC	1000 AC	1000 AC
Terminal Wire Capacity		AWG (mm2)	14 (2.1)	14 (2.1)	14 (2.1)	14 (2.1)
Terminal Torque (maximum)		in lb (Nm)	7.1 (0.8)	7.1 (0.8)	7.1 (0.8)	7.1 (0.8)
Environment						
Product certifications	Standard version		UL, CE	UL, CE	UL, CE	UL, CE
Ambient air temperature around the device	Storage	°C	-30...+70	-30...+70	-30...+70	-30...+70
	Operation	°C	-20...+55	-20...+55	-20...+55	-20...+55
Degree of protection			IP 20	IP 20	IP 20	IP 20
Weight		grams	60	60	60	60

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

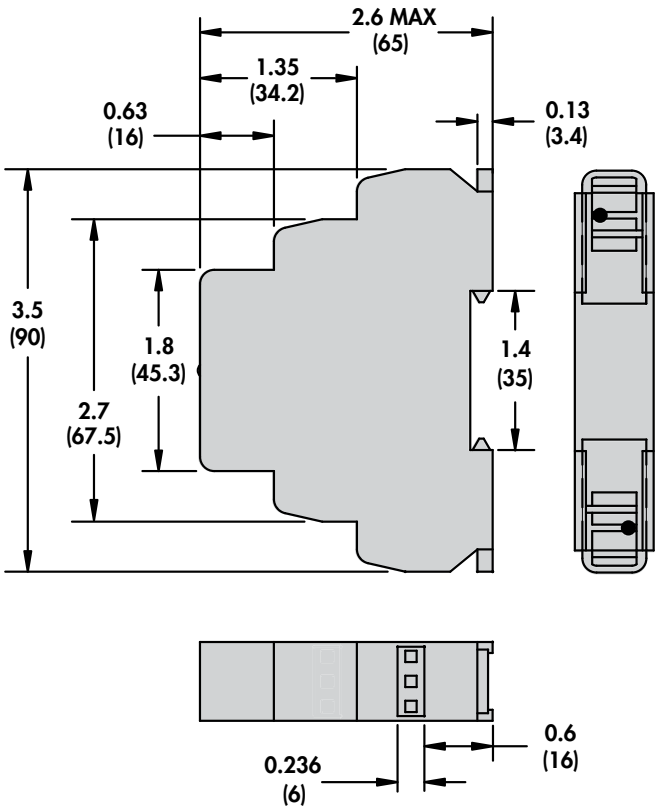
Standard Part Numbers

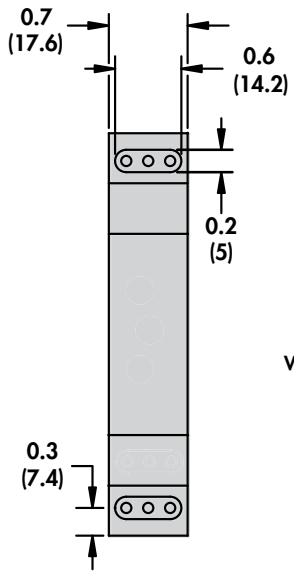
BOLD-FACED PART NUMBERS ARE NORMALLY STOCKED

Part Number	Input Voltage	Timing Range	Sensing Current Range	Contact Configuration	Rated Load Current
841CS1-UNI	24...240 VAC	0.1s...10s	0.1...1A	SPDT	15 Amps
841CS2-UNI	24...240 VAC	0.1s...10s	0.2...2A	SPDT	15 Amps
841CS5-UNI	24...240 VAC	0.1s...10s	0.5...5A	SPDT	15 Amps
841CS8-UNI	24...240 VAC	0.1s...10s	0.8...8A	SPDT	15 Amps

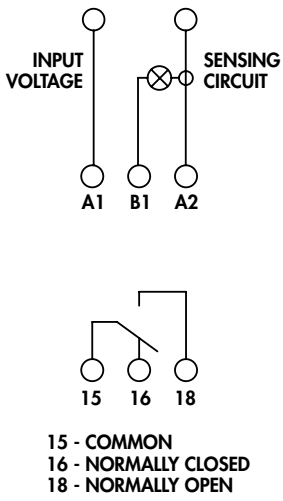
Part Number Builder

Series	Relay Style	Sensing Current	–	Input Voltage
841 = SPDT	CS = Current Sensor	1 = 0.1...1 Amp		UNI = 24...240 VAC
		2 = 0.2...2 Amp		
		5 = 0.5...5 Amp		
		8 = 0.8...8 Amp		





WIRING DIAGRAM



15 - COMMON
16 - NORMALLY CLOSED
18 - NORMALLY OPEN