Digital Timing Relay

Bulletin 700-HX

Description

This document provides the general specifications, installation procedures, and programming instructions for the Bulletin 700-HX digital timing relay.

The Bulletin 700-HX digital timing relay is a programmable timing device. You can program it to display either elapsed or time remaining. The timing relay has a four-character liquid crystal display (LCD) for monitoring and display purposes. The four-digit display is back-lit for easy visibility and shows all the functions of the timer, including the mode, time setting, and the time elapsed or remaining. Refer to Figure 1 and Table 1.

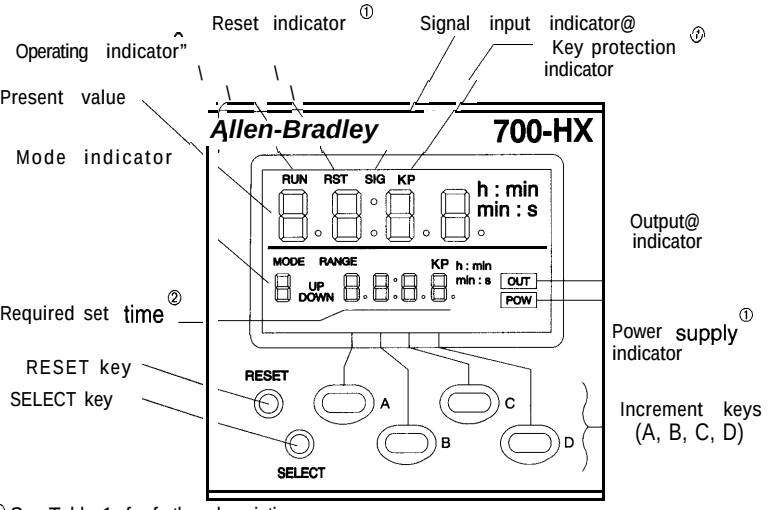
The timer can be programmed only after it is de-energized or removed from the socket. This device has a key protection (KP) feature that is indicated on the LCD. Key protection prevents the changing of mode, range, and direction, but the time setting can be adjusted. Use the protective cover to protect the timing relay and prevent inadvertent tampering.

It is recommended that the timing relay be mounted in an enclosure door using the mounting bracket provided (Bulletin 700-HN130).

ATTENTION: The 700-HX digital timing relay contains a lithium battery to retain the program and timing setting when power is removed. When the battery is worn out, the device must be replaced. The timing program will be lost and operation will become unpredictable. One indication of a worn out battery is a dim display. This dimness indicates the useful life of the timing relay has expired, and it must be replaced.

The life of the battery is estimated at 10 years when used at 25°C. At the end of this time, remove the lithium battery before discarding the timer. Do not incinerate, crush, unsolder, open, or dispose of the lithium battery in the general trash. Cut the battery leads and recycle at a battery disposal center.

Figure 1
Nomenclature



① See Table 1 for further description.
② Required set time is the time setting in seconds; min. : sec.; hours : min.; or hours.

Table 1
Display Indicators

Display①	Location	Description
RUN	Operating Indicator	Digital timer program operating
RST	Reset Indicator	Reset key operated or pin 3 connected to pin 1
SIG	Signal Input Indicator	Signal applied with pin 4 connected to pin 1
OUT	Output Indicator	Output relay energized, form C contact ②
KP	Key Protection Indicator	Key program protection enabled ③
POW	Power Supply Indicator	Power applied, pin 2 & 7 rated voltage

① The LCD is backlit when power is applied.
② Form C contact: pin 8 (corn) to 5 normally closed
pin 8 (corn) to 6 normally open
③ The timing mode and range cannot be changed. The time can be changed at any time.

General Specifications

Rating		Specification
Setting or repeat accuracy tolerances		• ±0.03% of the setting or +50 ms, whichever is greater (started by a power supply) • ±0.03% of the setting or +20 ms, whichever is greater (started by a signal input)
Minimum reset time requirements		• Power source input is 500 ms minimum. • Signal source input is 20 ms (minimum) all ranges except 0.050 sec. scale which is ! ms (minimum).
Allowable voltage range		. 85 to 110% U_e
Allowable operatinq temperature		• -10 to +55° C (avoid icing)
Allowable storage temperature		• -25 to +65° C (avoid icing)
Allowable humiditv		• 35 to 85% (non-condensing)
Power consumption		• AC model - Approx. 1.5 VA (at 240V 50 Hz.) • DC model - Approx. 0.8 W (at 24V DC) • Allowable ripple DC - full wave
Output		• SPDT (1 form C contact)
Maximum switching current/volts		• 5 Amps/240 VAC, 5 Amps/24 VDC
Contact ratina		• C300 pilot duty
Minimum switch current		• 10ma at 5 VDC
Mechanical life of relav		• 10,000,000 operations
Electrical life		• 100.000 operations (5 A at 250 VAC res., 1800/hr)
Insulation resistance		• 100 M ohms min., 500V DC meqqer
Dielectric strength		• 2,000 VAC for 1 min. (between terminals to ground) • 2,000 VAC for 1 min. (between output contacts and control circuit) • 1,000 VAC for 1 min. (between open contacts)
Noise resistance		• ±2000V by noise simulator
Surge resistance		• ±4500V (1.2X50 us wave) • ±500V:24 VDC voltage
Vibration	malfunction durability mechanical durability	• 10 to 55 Hz double amplitude 0.5 mm (0.02") • 10 to 55 Hz double amplitude 0.75 mm (0.03")
Shock	malfunction durability mechanical durability	• 100 m/s^2 (about 1 OG) • 500 m/s^2 (about 50G)
Weight		• Approx. 120 grams (4.2 oz.)

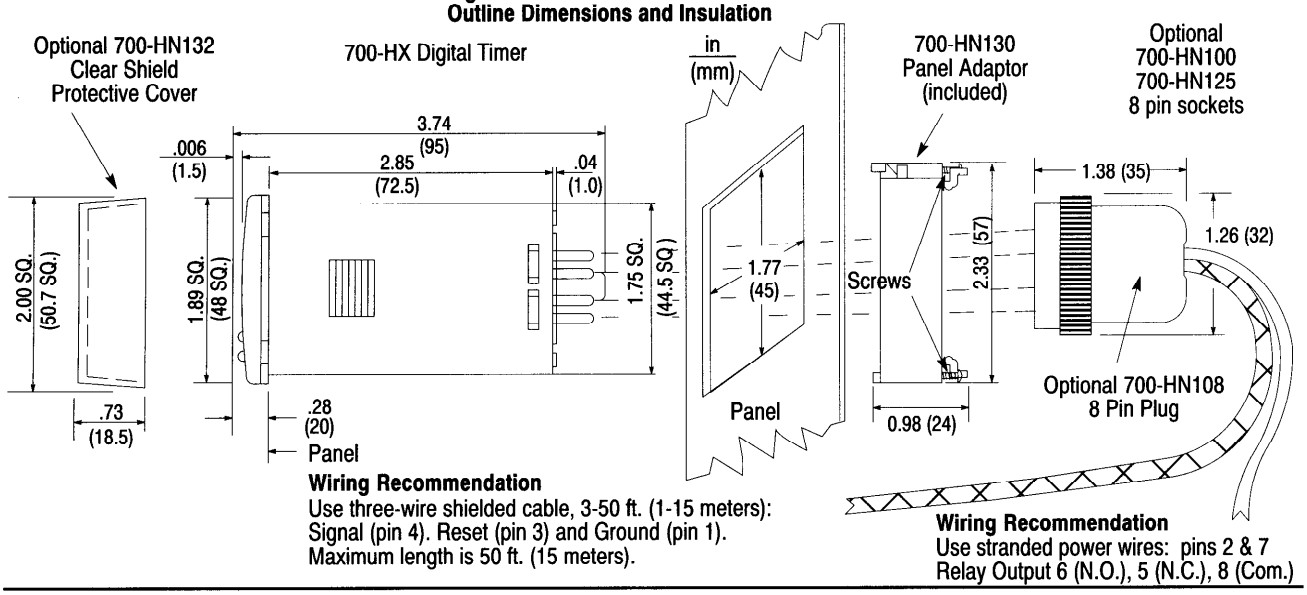
Installation Instructions

The Bulletin 700-HX is recommended for installation through a 45 mm^2 (1.77 in^2) square cutout in the enclosure door or operator's station. Use the 700-HN130 panel adapter that is included with each device. Follow the procedure below to install the timing relay.

1. Place the 700-HX timing relay through the hole and slip the panel adapter over the back of the timer.
2. Push the timer and adapter together to get a snug fit, and tighten screws as necessary for a tighter fit.
3. Guide the wires through the optional 700-HN108 connector cover and solder wires to the proper socket tabs. See wiring recommendations on page 3.
4. Screw the cover of the optional 700-HN108 over the wires.

The 700-HN132, optional protective cover, is clear for easy visibility and protects the buttons from accidental operation.

Figure 2
Outline Dimensions and Insulation



Wiring Recommendation
Use three-wire shielded cable, 3-50 ft. (1-15 meters):
Signal (pin 4). Reset (pin 3) and Ground (pin 1).
Maximum length is 50 ft. (15 meters).

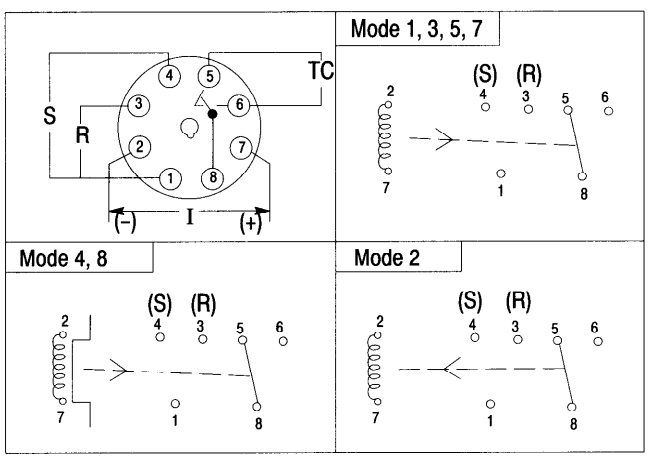
Wiring Recommendation
Use stranded power wires: pins 2 & 7
Relay Output 6 (N.O.), 5 (N.C.), 8 (Com.)

ATTENTION:

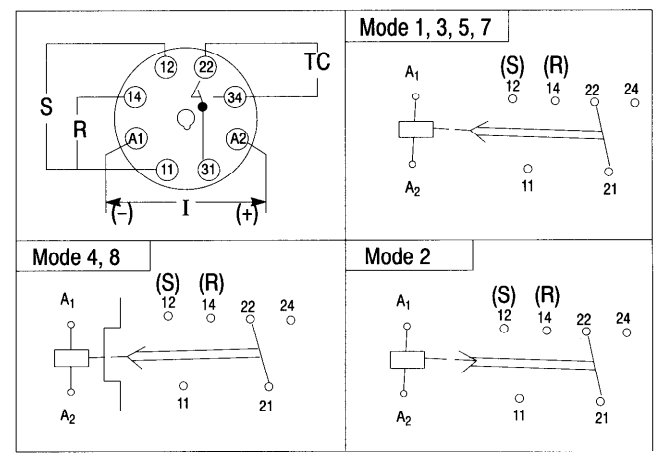
- Do not remove timer from housing. Such action invalidates product warranty.
- Remove power before changing the mode.
- Time setting can be changed with power on. (Use clear shield 700-HN132 to prevent tampering).
- The AC/DC type timer uses a transformerless supply.
- When two or more timers are connected together, use pin 1 as ground.

Figure 3
Typical Wiring Diagrams

U.S./Canada



International



Key

(I) Input Power (terminals 2 (A1) and 7 (A2))
- Power to terminals 2 (A1) and 7 (A2) must be applied continuously. (Time delay and output contact can reset immediately.)
- Mode 6 power interruption. (Continues timing when returned.)

(TC) Timed Contacts SPDT
(1 form C contact)
(terminals 5 (22) N.C.,
6 (24) N.O., and 8 (21) Com.)

(S) Start Signal
(terminals 4 (12) and 1 (11))
- This signal can be either momentary or maintained.

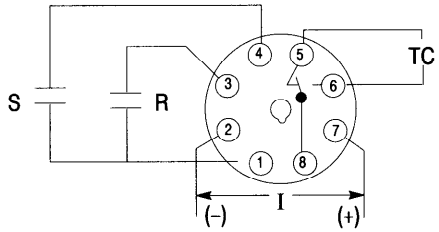
(R) Reset Signal
(terminals 3 (14) and1 (11))
- Reset signal not required for normal operations.
- This is used to reset the timer without the loss of power.
- Reset signal will override the start signal.

Note: International Socket Terminal Numbers are shown in ( ).

ATTENTION: Do not connect inductive loads or voltages higher than 30V to the start or reset gate inputs pins 3 or 4.

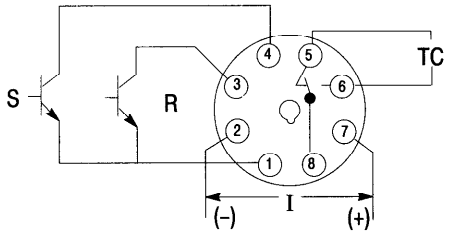
Contact Signal Input Connection

For reliability use external contacts or reeds that are designed for 5VDC low power switching. (700-HC54, 700-R, or 700-CPR). The 5VDC is provided internally by the Timing Relay.



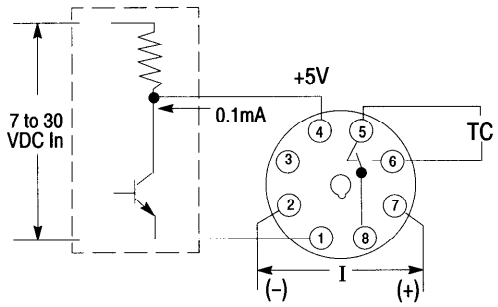
Solid-state Signal Input Connection

Use an open collector transistor with maximum leakage current 25 µA. A residual voltage of 2V maximum with transistor on is considered low. 3V or higher is considered a high signal.



Solid-state Circuit Connection

A 2V maximum voltage, on the gate pin 4 (12) or reset pin 3 (14) is low. With 3V or higher, the signal is high (or "On") signal.



Programming Instructions

ATTENTION: Program timer only after removing it from socket or with no power applied to the 700-HX (pins 2 (A1) & 7 (A2)).

To program the Bulletin 700-HX Digital Timing Relay, follow the procedure below.

1. Disable Key Protect

If Key Protect (KP) is displayed the function is enabled. Press Select and any increment key together to disable the key protection feature.

2. Mode Selection

Press the Select key until the mode indicator (1–8) is flashing (on the LCD display). Press any increment key (A, B, C, or D) and observe the mode number using the following code:

- 1 – Power-up on-delay
- 2 – Signaled off-delay
- 3 – One shot (interval delay)
- 4 – Flicker (repeat cycle) ($T_{on} = T_{off}$)
- 5 – Signaled on-delay
- 6 – On-delay (electronic reset)
- 7 – On-delay (integration)
- 8 – Unequal repeat cycle ($T_{on} \neq T_{off}$)

Press the Select key for the next selection.

3. Range Selection

Press any increment key to select the range. Range selection includes:

- 0.050–9.999 sec.
- 0.05–99.99 sec.
- 0.1–999.9 sec
- 1–9999 sec.
- 0:01–99:99 min.:sec.
- 0:01–99:99 hrs.:min.
- 1–9999 hrs.
- Press the Select key for the next selection.

4. Timing Direction Selection

For Direction, toggle any increment key and observe the "Up" or "Down" counting direction on the LCD. The "Up" direction displays the time elapsed by starting at zero and then increasing to the time set. The "Down" direction displays the time remaining by starting at the set time and decreasing to zero.

Press the Select key to set the direction required and for the next selection.

5. Key Protection Selection

For Key Protection (tamper lockout) toggle this feature On or Off by pressing any increment key A, B, C, or D. "KP" in the display indicates that the feature is activated.

Press the Select key for the next selection.

6. Time Setting

Set the Time value. To do this, press the four increment keys (A, B, C, and D). The key farthest right (D) controls the least significant digit on the LCD display.

7. End Programming

Press Reset key. The timer is now programmed.

ATTENTION: Do not use this timing relay in direct sunlight. High temperatures will cause the LCD to dim and shorten the timer's useful life.

Table 2
Programming Quick Reference: Bulletin 700-HX Operational Overview

To program timing relay, the device must be de-energized or removed from the socket.
To disable Key Protection "KP" to begin programming, press Select and any increment key simultaneously .

Setting Timer	Explanation
To Set Mode Mode 1-7 1 - Power On 5 - Sig. On 2 - Sig. Off 6 - Rst. On 3 - One Shot 7 - Integration 4 - Flicker 8 - See Table 3.	Press Select until the mode indicating number flashes. Press any increment key (A, B, C, or D) until the mode number needed is displayed. → Mode 1 → Mode 2 ..... → Mode 8 →
To Set Range 0.000s to 9999h	Press Select. "Range" will appear and digits below will flash. Press any increment key (A, B, C, or D) to obtain the needed range. → 0.000s → 00.00s → 000.0s → 0000s 00min:00s → 00h:00min → 0000h
To Set Display of Time Elapsed "Down" or time remaining or "Up" time elapsed.	Press Select to observe Down or Up. Press any increment key (A, B, C, or D) to toggle. → Up → Down
To Set Key Protection On or Off	Press Select to Key Protection and observe. KP On or Off will flash. Press any increment key (A, B, C, or D) to toggle. → On → Off
To Set the Time	Press Select, and the set time will appear. Press the four increment keys (A, B, C, and D) to set the "required time setting" on the display. Key A is the most significant, and Key D is the least significant.
To Complete Setting	Press Reset.

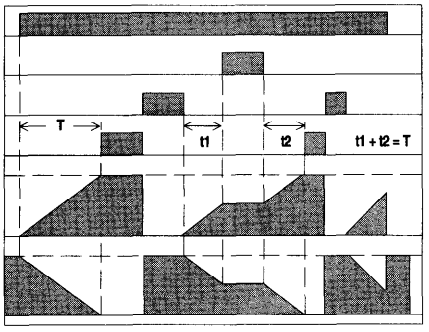
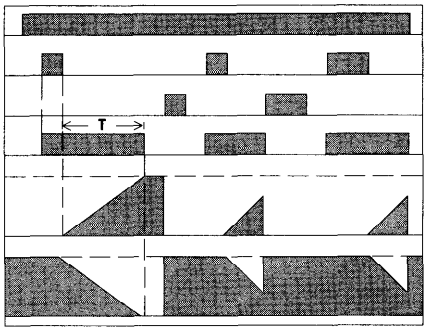
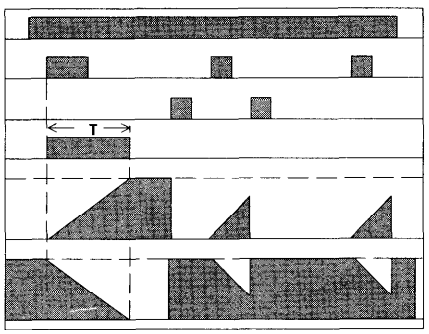
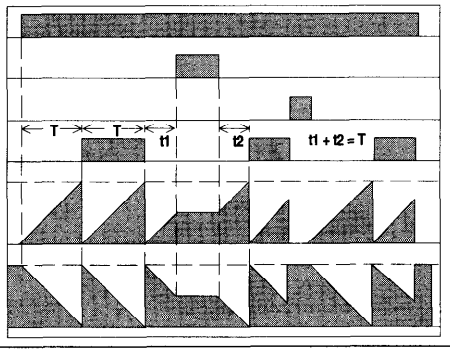
Table 3
Programming Quick Reference: Bulletin 700-HX Operational Overview for Unequal Repeat Cycle (Mode 8)

To program timing relay, the device must be de-energized or removed from the socket.
To disable Key Protection "KP" to begin programming, press Select and any increment key simultaneously .

Setting Timer	Explanation
To Set Mode Mode 8	Press Select until the mode indicating number flashes. Press any increment key (A, B, C, or D) until the mode number is on 8. → Mode 1 → Mode 2 ..... → Mode 8 →
To Set "Off" Time Range	Press Select "Off," and "Range" will appear and digits below will flash. Press any increment key (A, B, C, or D) to obtain the needed range. → 0.000s → 00.00s → 000.0s → 0000s 00min:00s → 00h:00min → 0000h
To Set "Off" Time Preset Mode	Press Select. Set time by pressing each increment key (A, B, C, or D). → 0 1 2 → ..... → 9
To Set "On" Time Range	Press Select "On," and "Range" will appear and digits below will flash. Press any increment key (A, B, C, or D) to obtain the needed range. → 0.000s → 00.00s → 000.0s → 0000s 00min:00s → 00h:00min → 0000h
To Set "On" Time Preset Mode	Press Select. Set time by pressing each increment key (A, B, C, or D) to set "On" time. → 0 1 2 → ..... → 9
To Set Display to "Down" or "Up"	Press Select. Press any increment key (A, B, C, or D). → Up → Down
To Set Key Protect Selection Mode	Press Select. Press any increment key (A, B, C, or D) . → On → Off
To Complete Setting	Press Reset key.

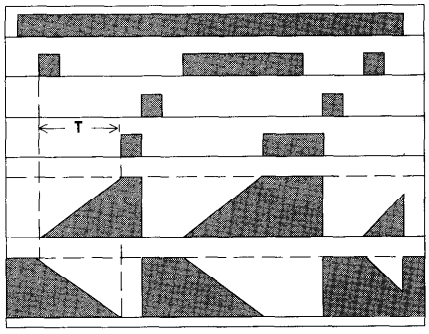
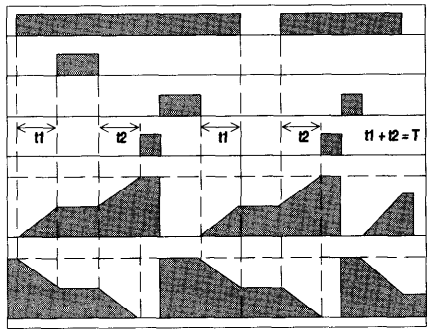
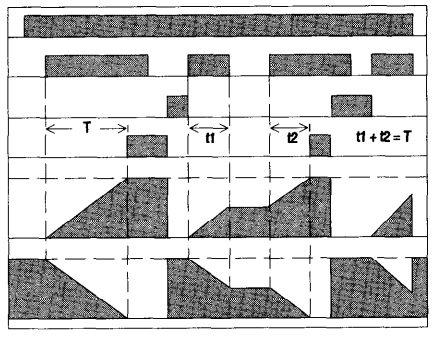
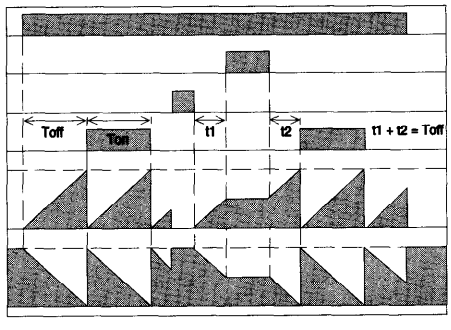
To operate output contacts, energize or insert timer into the socket.

Timing Charts

No.	Mode	Input/Output	Time Chart	Explanation
1	Power On-delay	Power (2-7) Start signal (gate) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Power On-delay (Mode 1).** Input power starts the time delay. • Start signal - Holds time event until released. • Reset signal - Resets display when applied. Timing starts when released.
2	Signal Off-delay	Power (2-7) Start signal (start) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Signal Off-delay (Mode 2).** Input power must be applied continuously. • Start signal - Application operates the output relay. Release (off) starts the timing event. Input again, operates relay (if timed out) and release (off) starts the timing event again. • Reset signal - Resets display when applied. Release has no effect. Start signal (off) needed for timing event.
3	Interval (One Shot)	Power (2-7) Start signal (start) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**One Shot (Mode 3).** Input power must be applied continuously. • Start signal - Momentary input, operates output relay and also start timing event. Release has no effect. • Reset signal - Resets display and releases output relay (if energized) when applied. Release has no effect.
4	Flicker (Repeat Cycle)	Power (2-7) Start signal (gate) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Flicker (Mode 4).** Input power starts the equal On and Off cycling. • Start signal - Holds either time event until released. • Reset signal - Resets display and releases output relay (if energized) when applied. The equal On and Off cycling begins with the output relay de-energized when released.

① Display shows either time elapsed (referred to here as "set timer up") or time remaining ("set timer down").

Timing Charts (cont.)

No.	Mode	Input/Output	Time Chart	Explanation
5	Signal On-delay	Power (2-7) Start signal (start) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Signal On-delay (Mode 5).** Input power must be applied continuously. • Start signal - Momentary input, starts the timing event. Release has no effect. Relay operates at end of the event. • Reset signal - Resets the display and the output relay (if energized) when power is applied. Start signal needed to start timing event.
6	On-delay (Electrical Reset)	Power (2-7) Start signal (gate) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Reset On-delay (Mode 6).** Power is applied continuously. However, if there is a loss of power, time is held until power is reapplied. • Start signal - Holds timed event until released. • Reset signal - Resets the display and the relay (if energized) when applied. Starts timing event when released.
7	On-delay (Integration)	Power (2-7) Start signal (Integration) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Integration (Mode 7).** Input power must be applied continuously. • Start signal - Input starts time delay but continues only as long as the signal is maintained. Release does not reset. Delay continues (integrates) with input. • Reset signal -Resets the display and the relay (if energized) when applied. Start signal needed to begin integration.
8	Repeat (Unequal)	Power (2-7) Start signal (gate) (1-4) Reset (1-3) Output (6-8) Display ① Set timer Up 0 / Set timer Down 0		**Unequal Repeat Cycle (Mode 8).** Input power starts unequal cycling. • Start signal - Holds On or Off cycling event until released. • Reset signal - Resets the display and the relay (if energized) when applied. Unequal cycling begins again with the output relay de-energized when released.

① Display shows either time elapsed (referred to here as "set timer up") or time remaining ("set timer down").

Rockwell Automation
Allen-Bradley

Publication 700-5.7 - March 1996
Supersedes Publication 700-5.7 Dated December 1995