



Solid State Timers and Controllers



4970 & 5100

Configurable Controllers

User's Manual

(including 4973 & 5103)

The 4970 and 5100 configurable controllers provide a level of flexibility previously unavailable with products in its class. These devices allow the OEM to configure the products to suit numerous applications by providing the ability to configure many operating parameters, including: time range, user's adjustability within the time range, style of beeping and LED display activity at the end of the timing cycle, power conservation, recovery from power loss during timing, and alarming before the end of the timing cycle, all in one controller.

The 4973 and 5103 models provide an input for a remote switch used to start/pause/stop the timing cycle, all other configurations are identical

Version 1.80

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Solid State Timers and Controllers

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Section 1 - Basic Configuration

The basic configuration for these controllers is to select the time range, this maintains backwards compatibility with previous versions of these controllers. To access the basic controller configuration, hold the Down button, apply power, and release the button. The controller displays a single digit indicating the time range:

Code	Timing Range
0	Seconds 0.01 to 99.99
1	Minutes:Seconds, 00:01 to 99:59
2	Seconds 1 to 9999
3	Hours:Minutes, 00:01 to 99:59

Use the up and down buttons to change to the desired range then turn the controller off. The other default operating parameters shown below can be modified using the Advanced Configuration option in the next section.

Timing is adjustable over the whole timing range
The internal alarm beeps 3 times per second for 5 seconds at the end of the timing cycle
The output relay is on during the timing cycle
The LED display is on continuously
The controller will resume the timing cycle if power is interrupted during a timing cycle
The controller does not alarm before the end of the timing cycle

If setting the timing range is all that is required you can skip to Section 3 for details about the operation of the controller.

The firmware version of the controller can be displayed by pressing and holding both the up and down arrows then applying power to the controller.



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Section 2 - Advanced Configuration

To access the advanced controller configuration press and hold the Start/Stop button, apply power, and release the button. The unit then displays the first configuration item which is the timing range showing **rA** on the left side of the display. Pressing and releasing the Start/Stop button again move to the next configuration item which is the cycle adjustment type (full, partial, single value) indicated by the **CA** on the display. Use the Start/Stop button to cycle through all the configuration items, and use the Up and Down arrow buttons to change the value of each configuration item as required. The last item on the list is a configuration check code which is calculated based on all the values of the configuration items and can be used to verify the proper setting of the controller configuration.

The three time values are shown as **---** which indicates that they are not used, the options which enable their use are disabled. The time values are adjusted just like the time setting in normal operation, the Up and Down buttons change the value, holding them down scrolls the value. All time values will wrap around at either end of their range and are in the units selected for the time range

To reset the controller to its default values as shown below, press and hold the Up button while applying power to access the self test and configuration reset. The controller displays **---** until the Up button is released, after which it displays **UP --**. Press the Up button and it displays **- dn -**, now press the Down button. The unit then displays **--SS**, press the Start/Stop button. After this button test, the controller display scrolls through the digits 0 through 9, illuminating the LED above the display every other value. The output relay is closed for ½ second, then the configuration memory is tested and reset back to the default values above. Finally the controller resets and displays **0:05**. This feature can also be used as a basic controller test.

DEFAULT FACTORY CONFIGURATION:

Code	Description
rA:00	Timing in minutes:seconds
CA:00	Time adjustable over full range
tl:01	Time increments by 1
---	No time limiting or fixed timing
---	No time limiting
CE:00	Triple beeps for EL secs @ end of cycle
EL:05	Length of annunciation = 5 sec
Ot:00	Output relay on during timing
LP:00	LED display on continuously
Pr:00	Continues timing cycle if power interrupted
AL:00	Alarming disabled
Ad:00	Alarming disabled
---	Alarming disabled
0006	Configuration check code

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Section 3 - Timing Configuration

Timing Cycle Range Options

This is the primary option to be configured for any application. Use the Start/Stop button to display the **rA** option code. Use the Up and Down buttons to set the timing range to **rA00** for minutes and seconds up to 99:59 (default), **rA01** for hours and minutes up to 99:59, **rA02** for seconds up to 9999, **rA03** for seconds up to 99.99, **rA04** for minutes up to 9999, or **rA05** for hours up to 9999.

Cycle Time Adjustment

If you need your users to have the ability to set any time within the full timing range you configured above, leave this value at **CA00** (default). With this value configured the following time values will display as **----** indicating that they are *not* available for this configuration.

If your application requires *limiting* the users time range, use the Up or Down button to set this option to **CA01**, the press Start/Stop to access the first time value. Use the Up and Down buttons to set this to the *minimum* time, then press Start Stop again and use the Up and Down buttons to set the next value to the *maximum* time. *Note: Be sure to set the first time less than second time.*

Finally, you can prevent any time adjustments by the operator by setting this option to **CA02**. With this option the first time is set for the fixed cycle time value, the second time value will display as **----** indicating that it is not used.

Timing Increment

This value is the amount that the time displayed changes when using the Up and Down arrows. The default value is **tI01** and can be set to any value up to **tI99**. Setting the value to **tI15** will cause the time to change in 15 second increments. The controller will always round off the current value to increments of this value, for example if the lower limit is set to 1:10 by using the CA codes and the time increment is 15, the will not allow times lower than 1:15 to be set.

Timing Cycle Range	
rA:00	Minutes:Seconds, 00:01 to 99:59
rA:01	Hours:Minutes, 00:01 to 99:59
rA:02	Seconds 1 to 9999
rA:03	Seconds 0:01 to 99.99
rA:04	Minutes 1 to 9999
rA:05	Hours 1 to 9999

Cycle Time Adjustment	
CA:00	Full time range available
CA:01	Adjustable between limits
CA:02	Timing fixed

Time Adjustment Increment	
tI:XX	Time increment value, default = 1

Lower Limit or Fixed Time	
----	Disabled by code CA:00
XXXX	Displays Lower Time Limit for CA:01
XXXX	Displays Fixed Time for CA:02

Upper Limit Time	
----	Disabled by code CA:00 or CA:02
XXXX	Displays Upper Time Limit for CA:01

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Section 4 - Notification Configuration

Cycle End Notification and End Length

This option configures the length and type of the audible and visual indication that the timing cycle is complete.

The selected pattern can be set to end automatically after the configured End Length (*default*) or to continue until the operator presses any of the three keys thereby acknowledging the end of the timing cycle. The beeper can be configured to either emit triple beeps once per second (*default*) or to turn on continuously. The LED display can be set to stay fully lit (*default*) or to flash twice per second.

See the table to the right for details on configuring this option. Press the Up and Down buttons to change this option to the desired value.

If the pattern selected uses the End Length, press Start-Stop again to access the **EL** code, then use the Up and Down arrows to configure the number of seconds the end notification is to last up to 99 seconds, setting this value to 00 turns the Cycle End Notification off.

Code	Length		Beeper		Display	
	EL	Key	Triple	Cont	Cont	Flash
CE00	X		X		X	
CE01		X	X		X	
CE02	X			X	X	
CE03		X		X	X	
CE04	X		X			X
CE05		X	X			X
CE06	X			X		X
CE07		X		X		X

EL = End Length configured for **EL** code

Section 5 - Operation Configuration

Output Relay Type

The output relay of the 4970 can be configured to operate in several different modes. The default mode (**Ot00**) is for the relay to be energized during the timing cycle for standard countdown timer operation. The next two options allow the relay to be off during timing and to energize at the end of the cycle, this is typically used to trigger other means of indicating that the timing cycle is ended. Option **Ot01** turns the relay on for the duration of the Cycle End Notification. Depending on the **CE** and **EL** configurations this can be either the time defined in the EL parameter or until the operator presses a key. Option **Ot02** turns the relay on at the end of the timing cycle for one second regardless of the setting of the CE and EL values. Finally, option **Ot03** keeps the relay off always, generally used to conserve power.

LED Display Power

This option changes the operation of the LED display when the controller is left idle. Setting this to **LP00** leaves the display energized continuously as long as the controller has power applied (*default*).

If this option is changed to **LP01** the controller dims the display after 1 minute of no button activity when in the idle state. The display will stay at full brightness when either actively running a timing cycle or when paused during a timing cycle. It is only when the timing cycle is fully complete does the 1 minute countdown start. Once the display dims pressing any button restores the display to full brightness and resets the 1 minute countdown.

Setting this option to **LP02** will cause the display to *turn off completely* instead of dimming after the 1 minute countdown. This can provide significant power savings when the unit is powered by 12V DC thereby extend the life of battery and solar powered systems.



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Section 5 - Operation Configuration (cont)

Recovery From Power Interruption

When power is lost during a timing cycle, proper operation of the controller upon restoration of power can be critical to many applications. This factory default for this option is **Pr00** which enables the controller to immediately return to the point in the timing cycle when power was lost. The time on the display when the power was lost is restored and the output relay is energized allowing the controller to complete it's timing cycle.

The next option is to have the controller restore the last known time as per the above option, but to be placed into the *pause* mode with the relay off, thereby requiring the operator to press Start/Stop to continue the interrupted timing cycle. Set this option to **Pr01** in order select this power recovery mode.

The final option is code **Pr02** which forces the controller to reset to the *beginning* of a new timing cycle when power returns, needing Start/Stop to be pressed for a new timing cycle. This would be used for applications which requires full timing cycles with no interruptions for proper operation.

Output Type	
Ot:00	Output relay on during timing
Ot:01	Relay on for end notification length
Ot:02	Relay on for 1 second @ end
Ot:03	Relay always off

LED Display Power	
LP:00	LED display always on
LP:01	Display dims after 1 minute in idle mode
LP:02	Display OFF after 1 minute in idle mode

Recovery from Power Interruption	
Pr:00	Return to last time, output on, continue timing
Pr:01	Return to last time, output off, in pause mode
Pr:02	Return to full cycle time, ready for new cycle

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Section 6 - Alarming Configuration

The 4970 and 5100 controllers provide the ability to create alarms in order to inform the operator the timing cycle is about to end. The Alarm Notification (**AL**) and the Alarm Duration (**Ad**) options are used to configure the alarming parameters along with the Time Value .

The first step in configuring the alarming is to set the Alarm Notification option to a value other than **AL00** (default). This must be done *first* in order to be able to change the Alarm Duration and Time Value 1 options. Option **AL01** uses the triple beep pattern of the beeper, **AL02** turns the beeper on continuously, **AL03** again uses the triple beep pattern but adds LED display flashing, and finally option **AL04** enables continuous beeper operation with LED display flashing.

Once the alarm pattern is set, the next item to be set is for how long the controller alarms. Press Start/Stop to display the **Ad** value and use the Up and Down arrows to change the last two digits to the length of time in seconds you require the notification pattern to last. For example, setting this option to **Ad10** will turn the alarming on for 10 seconds.

The final option to configure is *when* the alarming starts. Press Start/Stop again to access this time value. The controller now displays the value which indicates *at what time* before the end of the cycle the alarming should start. This value is based on the timing range selected. For example: setting this value to **1:00** when in range 01 (mm:ss) indicates that the alarming starts one minute before the end of the cycle, *but if you are in timing range 02 (hh:mm)* you would have to set it to **0:01** to start the alarming pattern at 1 minute.

Alarming Notification	
AL:00	No alarming enabled
AL:01	Triple beeping
AL:02	Continuous tone
AL:03	Triple beeping with display flash
AL:04	Continuous tone with display flash

Alarm Duration	
Ad:00	Disabled by code AL:00
Ad:XX	Alarm length in seconds, 01 - 99

Alarm Time	
----	Disabled by code AL:00
XXXX	Displays alarm time for AL:01-AL:04

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Section 7 - Configuration Example and Form

Configuration Example

The desired operation for this example is: 1) the timing range is minutes and seconds (mm:ss), 2) cycle times to be adjustable from 15 to 25 minutes in 15 second increments, 3) continuous tone with LED display flashing at the end of the cycle until the operator presses a key, 4) the output relay turns on until the operator presses a key, 5) the LED will dim after 1 minute of inactivity, 6) interrupted timing cycles must be manually continued for safety, 7) alarming is enabled triple beeps for 10 seconds, and finally 8) the alarming starts 30 seconds before the end of the timing cycle. These are the configuration options to be set to meet these requirements:

Code	Description
rA:00	Timing in minutes:seconds
CA:01	Time adjustable between limits
tl:15	Time adjustable in 15 second increments
15:00	Minimum adjustable time value
25:00	Maximum adjustable time value
CE:07	Continuous tone with LED flash until key press
LP:01	LED displays goes dim after 1 minute
Pr:01	Recovers to interrupted cycle time in pause mode
AL:01	Triple beep alarming
Ad:10	Alarming for 10 seconds maximum
00:30	Alarming starts 30 seconds before end

Controller Configuration

Timing Cycle Range		✓	Value
rA00	Minutes:Seconds, 00:01 to 99:59		
rA01	Hours:Minutes, 00:01 to 99:59		
rA02	Seconds 1 to 9999 (default)		
rA03	Seconds 0.01 to 99.99		
rA04	Minutes 1 to 9999		
rA05	Hours 1 to 9999		
Cycle Time Adjustment			
CA00	Full time range available (default)		
CA01	Adjustable from Time Value 2 to Time Value 3		
CA02	Timing fixed at Time Value 2		
Timing Increment			
tIXX	Timing change increment, tI01 (default)		
Lower Limit or Fixed Time			
----	Not used (default)		
XXXX	Lower Time Limit for CA01 or Fixed Time for CA02		
Upper Limit			
----	Not used (default)		
XXXX	Upper Time Limit for CA01		
Cycle End Notification			
CE00	Triple beep for End Length (default)		
CE01	Triple beep until key pressed		
CE02	Continuous tone for End Length		
CE03	Continuous tone until key pressed		
CE04	Triple beep for End Length, LED display flashing		
CE05	Triple beep until key pressed, LED display flashing		
CE06	Continuous tone for End Length, LED display flashing		
CE07	Continuous tone until key pressed, LED display flashing		
End Notification Length			
ELXX	Notification @ cycle end in seconds, EL05 (default)		
Output Relay Type			
Ot00	Relay on during timing cycle (default)		
Ot01	Relay on for Cycle End Notification length		
Ot02	Relay on for 1 second at end of timing cycle		
Ot03	Relay always OFF		
LED Display Power			
LP00	LED display always on (default)		
LP01	Display dims after 1 minute in idle mode		
LP02	Display OFF after 1 minute in idle mode		
Recovery from Power Interruption			
Pr00	Return to last time, output on, continue timing (default)		
Pr01	Return to last time, output off, in pause mode		
Pr02	Return to full cycle time, ready for new cycle		
Alarming Notification			
AL00	Alarming disabled (default)		
AL01	Triple beeping		
AL02	Continuous tone		
AL03	Triple beeping with LED display flashing		
AL04	Continuous tone with LED display flashing		
Alarm Duration			
Ad00	Alarming disabled (default)		
AdXX	Alarm length in seconds, 01 - 99		
Alarm Time			
----	Not used (default)		
XXXX	Alarm time for AL01 through AL04		
Notes:			





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Section 8 - Controller Operation

Once the controller has been configured, apply power with no buttons pressed to operate the controller normally. The controller is now in idle mode, ready for adjustment of the time (if configured as such) and running of timing cycles. The first step is to set the cycle time

Setting the Cycle Time

The Up and Down arrows are used to set the time for the interval cycle. Pressing either the Up or Down button once will change the time up or down by a single digit. Pressing and holding these buttons will start continually changing the time, the longer the button is held the faster the time will change. If the time value is increased past the upper limit it will wrap around to the lower limit and continue increasing. The same holds true for decreasing the time below the lower limit, it will wrap around and start decreasing from the upper limit. *NOTE - 5100 & 5103 Only:* To save the current time as one of the preset times, press and hold the A, B, or C button for two seconds until the controller chirps twice

Running a Timing Cycle

To run a timing cycle, simply press and release the Start/Stop button (*or remote switch for 4973/5103*). The output contacts switch and the time starts counting down on the LED display. The LED above the display will start alternating on and off, and the colon will also alternate on the time display if you are in the minutes:seconds or hours:minutes time ranges, the colon is not used when in either of the seconds ranges.

Once the display counts down to 0, the output contacts switch back to the off position, the LED above the time display turns on continuously, and the beeper and/or LED display will start the end of cycle alarming pattern selected. If the length of the end of cycle notification was configured to use the EL value, after that configured time all of the beeper & display activity will stop and the display will change from 0 back to the initial cycle time and the LED turns off, the controller is back in idle mode. Pressing any button during this time will also stop the notification and return to the preset cycle time. If the length of the end of cycle notification was set to wait for a key press, the beeper and display activity will continue until any of the buttons are pressed, at that time the display agains returns to the initial cycle time and the beeper and LED above the display turns off.

Pausing a Timing Cycle

When the controller is running a cycle, pressing the Up or Down buttons will have no affect on its operation. Pressing the Start/Stop button will immediately stop the time display at the current value and turn the output contacts off. The controller is now in the pause mode. Pressing the Start/Stop button again will energize the output contacts and continue the timing cycle. Pressing and holding the Start/Stop button for at least 2 seconds will reset the display back to the beginning of a new timing cycle and put the controller into idle mode. Pressing the Up or Down buttons while paused will adjust the current time up or down and set this time as the default cycle time. *NOTE - The remote switch is used instead of the Start/Stop switch on the 4973 & 5103 models*

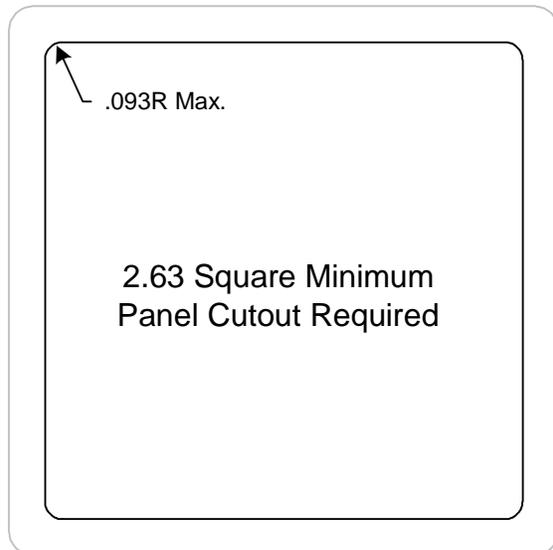
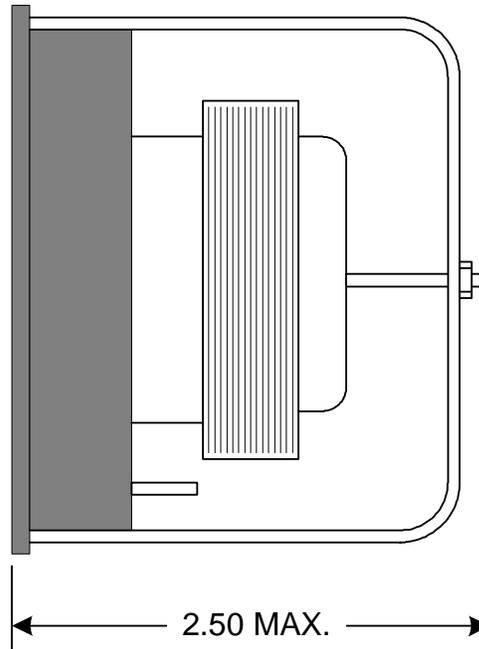
Alarming During a Timing Cycle

If alarming has been enabled, once the alarm sounds the operator can press either the Up or Down buttons to silence the alarm, the controller continues counting down in the timing cycle. Pressing the Start/Stop button both silences the alarm and puts the controller into pause mode.



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Section 9 - Installation



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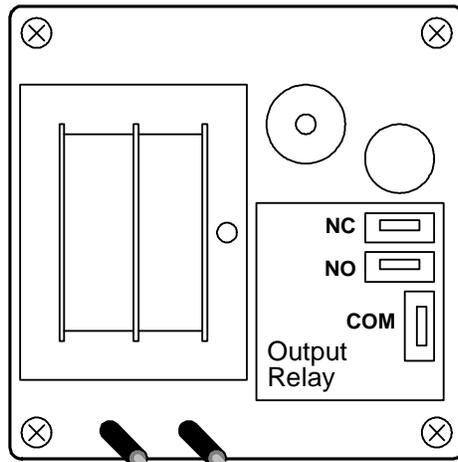
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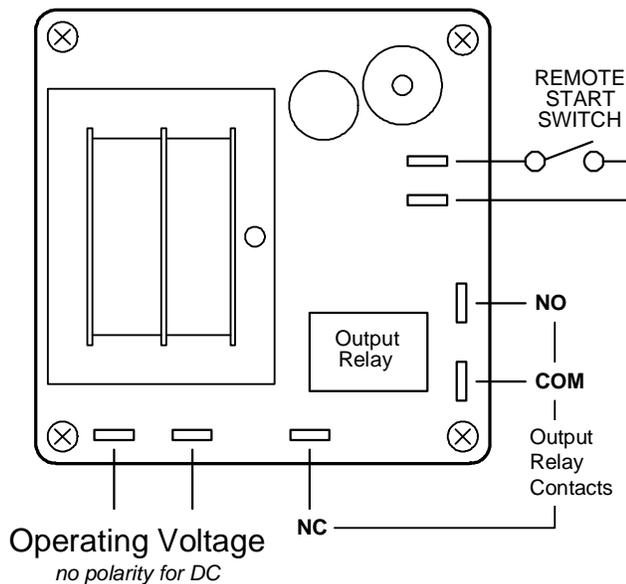
Section 10 - Wiring

All terminals are 0.25" Q.D.



**WIRING FOR
4970 & 5100**

All terminals are 0.25" Q.D.



**WIRING FOR
4973 & 5103**

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