

SC-2000 Shutter Controller Instruction Manual



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SC-2000 Operation

The SC-2000 is a two-channel shutter controller that provides several means for control of the shutters. Shutter can be activated from a front panel switch, from TTL signals, from foot switches, or via RS-232 serial computer control. In addition to simple on/off control, the controller can also be configured to provide a programmable fixed shutter exposure time. Please note that any control input that places the shutter in an energized state will do just that, i.e., *activate* the shutter. To de-energize the shutter, *all* control inputs must be returned to their inactive state.

Activation Logic

| Hardware Control | | | Software Control | | | Shutter Response | |
|--------------------|---------------|-------------------|-----------------------|--------------------|----------------|-----------------------|-------------------------|
| Front Panel Switch | Trigger Input | | RS-232 Serial Command | Foot Switch Action | | Normally Open Shutter | Normally Closed Shutter |
| | TTL | Jumpers J6 / J5 * | | Toggle Mode | Timed Exposure | | |
| Down | No Input | | Inactive | Inactive | Inactive | Open | Close |
| Up | Don't Care | | Don't Care | Don't Care | Don't Care | Close | Open |
| Don't Care | Low | 1-2 | Don't Care | Don't Care | Don't Care | Close | Open |
| Down | High | 1-2 | Inactive | Inactive | Inactive | Open | Close |
| Down | Low | 2-3 | Inactive | Inactive | Inactive | Open | Close |
| Don't Care | High | 2-3 | Don't Care | Don't Care | Don't Care | Close | Open |
| Down | No Input | | Activate | Inactive | Inactive | Close | Open |
| Down | No Input | | Don't Care | Press↓ | n/a | Toggle | Toggle |
| Down | No Input | | Inactive | n/a | Press↓ | Expose | Expose |

* Polarity of the TTL logic can be selected using the internal jumpers J6 and J5 for TTL Triggers 1 and 2 respectively (see figure 3). The factory default setting is with the jumper placed over the upper two pins (1-2). In this setting, the logic polarity is "Active Low".

↓ Foot Switch Closure or TTL High-to-Low Transition

SC-2000 Front Panel Controls



Figure 1: Front Panel Controls and Indicators

The switches on the front panel of the SC-2000 controller allow the user to directly activate the shutters. In the Up position, the shutter is energized (activated). In the Down position, control returns to the serial command, foot switch, or TTL Trigger inputs.

For computer, external TTL Trigger input, or Foot Switch control of a shutter, its front panel shutter switch must be placed in the Down (inactive) position.

The LED indicators above the switches indicate the presence of active SYNC signals. On shutters equipped with sync sensors, the indicator is illuminated when the shutter is **open**.

SC-2000 Back Panel Connections



Figure 2: Back Panel Connections

| Connection | Description |
|---------------|---|
| RS-232 SERIAL | Serial interface for computer commands. Use a Null Modem cable connection with settings: 9600 baud, 1 start bit, 1 stop bit, no parity. |
| SYNC OUT | Active Low signal indicates shutter is OPEN. |
| TTL TRIGGER | Use these inputs for direct control of the shutter. Polarity of trigger can be changed with an internal jumper (see figure 3). Default is Active LOW, i.e., a Low signal causes shutter to activate. |
| FOOT SWITCH | These are TTL inputs, configured Active on a High-to-Low Transition, and suitable for connection to foot switches. This is a programmable input where the action will depend upon whether the controller mode is configured as either 1) Toggle state, or 2) Initiate timed exposure. |
| SHUTTERS | Multi-pin connectors for the shutter cables. |
| Fuse | Fuse Holder containing 1.6 amp fast-blow fuse. |
| Power | Three-pin connector for power module. |

SC-2000 Serial Commands

(Applicable to Firmware Version 1.1 and newer)

The SC-2000 shutter controller responds to single character commands on the RS-232 serial port. The basic open and close commands follow the Uniblitz® command set. In addition, there are setup commands, which allow the controller to be customized for a particular application and to function with either Normally Open (NO), or Normally Closed (NC) shutters.

Set-Up Commands:

| ASCII character | Decimal equivalent | Hexadecimal equivalent | Function | Factory Default |
|-----------------|--------------------|------------------------|--|-----------------|
| O | 79 | 4F | Shutter 1 type is "Normally Open (NO)" | ☀ |
| o | 111 | 6F | Shutter 2 type is "Normally Open (NO)" | ☀ |
| C | 67 | 43 | Shutter 1 type is "Normally Closed (NC)" | |
| c | 99 | 63 | Shutter 2 type is "Normally Closed (NC)" | |
| 1 | 49 | 31 | Controller uses "Address 1" commands | ☀ |
| 2 | 50 | 32 | Controller uses "Address 2" commands | |
| X | 88 | 58 | Set Exposure Time for Shutter 1 in milliseconds | 100 ms |
| x | 120 | 78 | Set Exposure Time for Shutter 2 in milliseconds | 100 ms |
| g | 103 | 67 | Set "Foot Switch" inputs to toggle shutter state | ☀ |
| e | 101 | 65 | Set "Foot Switch" inputs to trigger timed exposure | |
| s | 115 | 73 | Save current settings to Flash non-volatile memory | |
| d | 100 | 64 | Return to Factory Default settings | |

Query Commands:

| ASCII character | Decimal equivalent | Hexadecimal equivalent | Question | Controller Response |
|-----------------|--------------------|------------------------|---------------------------------|--------------------------------|
| v | 118 | 76 | What version is the firmware? | Version number |
| T | 84 | 54 | What type is Shutter 1? | "O" or "C" |
| t | 116 | 74 | What type is Shutter 2? | "o" or "c" |
| L | 76 | 4C | What is the controller address? | "1" or "2" |
| G | 71 | 47 | How are the triggers set? | "g" (toggle) or "e" (exposure) |
| R | 82 | 52 | Read Status | (See below) |

Read Status returned characters from an "R" query command (above):

| Character | Normally Open Shutter | Normally Closed Shutter | Hardware Control |
|-----------------------------|-----------------------|-------------------------|------------------|
| 1 st = Shutter 1 | "o" = open | "C" = closed | "S" = Activated |
| 2 nd = Shutter 2 | "o" = open | "C" = closed | "S" = Activated |
| 3 rd = Sync 1 | "H" = open | "L" = closed | |
| 4 th = Sync 2 | "H" = open | "L" = closed | |
| 5 th = Ft Sw 1 | "H" = high | "L" = low | |
| 6 th = Ft Sw 2 | "H" = high | "L" = low | |

Action Commands:

| Address 1 Commands | | | | | | |
|--------------------|--------------------|------------------------|-------------------|--------------------|------------------------|------------------|
| ASI Command | | | Uniblitz® Command | | | Function |
| ASCII character | Decimal equivalent | Hexadecimal equivalent | ASCII character | Decimal equivalent | Hexadecimal equivalent | |
| ^N | 14 | 0E | @ | 64 | 40 | Open Shutter 1 |
| ^O | 15 | 0F | A | 65 | 41 | Close Shutter 1 |
| ^Q | 17 | 11 | D | 68 | 44 | Open Shutter 2 |
| ^R | 18 | 12 | E | 69 | 45 | Close Shutter 2 |
| ^P | 16 | 10 | B | 66 | 42 | Expose Shutter 1 |
| ^X | 24 | 18 | none | | | Expose Shutter 2 |

| Address 2 Commands | | | | | | |
|--------------------|--------------------|------------------------|-------------------|--------------------|------------------------|------------------|
| ASI Command | | | Uniblitz® Command | | | Function |
| ASCII character | Decimal equivalent | Hexadecimal equivalent | ASCII character | Decimal equivalent | Hexadecimal equivalent | |
| ^S | 19 | 13 | (ALT-0128) | 128 | 80 | Open Shutter 1 |
| ^T | 20 | 14 | (ALT-0129) | 129 | 81 | Close Shutter 1 |
| ^V | 22 | 16 | (ALT-0144) | 144 | 90 | Open Shutter 2 |
| ^W | 23 | 17 | (ALT-0145) | 145 | 91 | Close Shutter 2 |
| ^U | 21 | 15 | (ALT-0146) | 146 | 92 | Expose Shutter 1 |
| ^Y | 25 | 19 | none | | | Expose Shutter 2 |

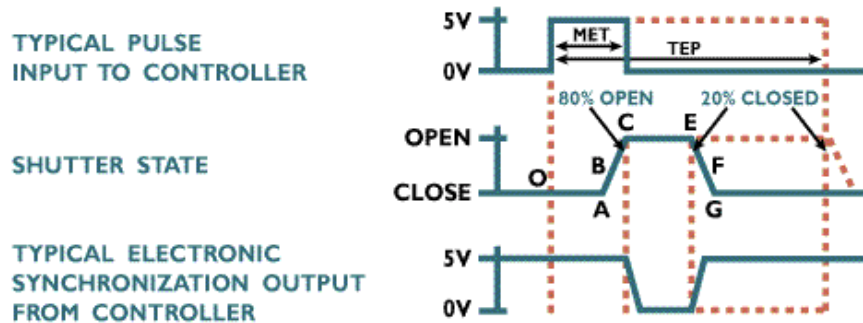
All commands are single-character except for the “x” and “X” commands, which set exposure times. For these commands, the ASCII characters representing a decimal number in milliseconds must immediately follow the “x/X” command, terminated by a carriage return <CR> character (Decimal 13, Hexadecimal 0D). The exposure time cannot exceed 65536 ms. The current value of the exposure setting can be queried by using the command “x?” or “X?”

SC-2000 Specifications

| | |
|---|-------|
| Number of shutter channels per controller | Two |
| Opening Time (25mm N.C. shutter) | 8 ms |
| Closing Time (25mm N.O. shutter) | 7 ms |
| Peak Unsustained Repetition Rate | 40 Hz |
| Maximum Sustained Repetition Rate | 5 Hz |

SC-2000 Shutter Timing

The following diagram illustrates timing of pulse input and synchronization output relative to shutter state.



The following chart lists typical timing values (in milliseconds) using 25 mm aperture shutters equipped with standard black Teflon[®] coated shutter blades, and controlled by an SC-2000 shutter controller.

| Period | Description | Normally Open Shutter | Normally Closed Shutter |
|-------------|--|-----------------------|-------------------------|
| O-A: | Delay time on opening after current is applied | 3 ms | 4 ms |
| A-C: | Transfer time on opening | 4 ms | 4 ms |
| O-C: | Total opening time | 7 ms | 8 ms |
| C-E: | Minimum dwell time with minimum input pulse | 8 ms | 4 ms |
| B-F: | Minimum equivalent exposure time | 13 ms | 5 ms |
| E-G: | Transfer time on closing | 2 ms | 6 ms |
| A-G: | Total window time | 14 ms | 14 ms |
| MET: | Minimum Exposure Time | 7 ms | |
| TEP: | Typical Exposure Pulse | > 8 ms | |

Maintenance and Configuration

Lubrication

The question regarding enhancement of shutter speed with the application of user-supplied lubricants has been repeatedly asked. It is the experience of the shutter manufacturer that lubricating the shutter blades will actually slow the shutter down and eventually renders the shutter inoperable. Under no circumstances should any type of lubricant be applied to the shutter blade area.

Fuse

If the fuse fails, use an exact replacement. The SC-2000 uses a 1.6 Amp fast blow fuse.

Firmware Update

The controller's firmware may be updated via its serial port using a PC computer. Visit the SC-2000 web page at ASI's website (<http://www.ASIimaging.com/sc-2000.html>) to check the newest current firmware version available. Contact ASI for the update procedure and files.

TTL Trigger Polarity Jumpers

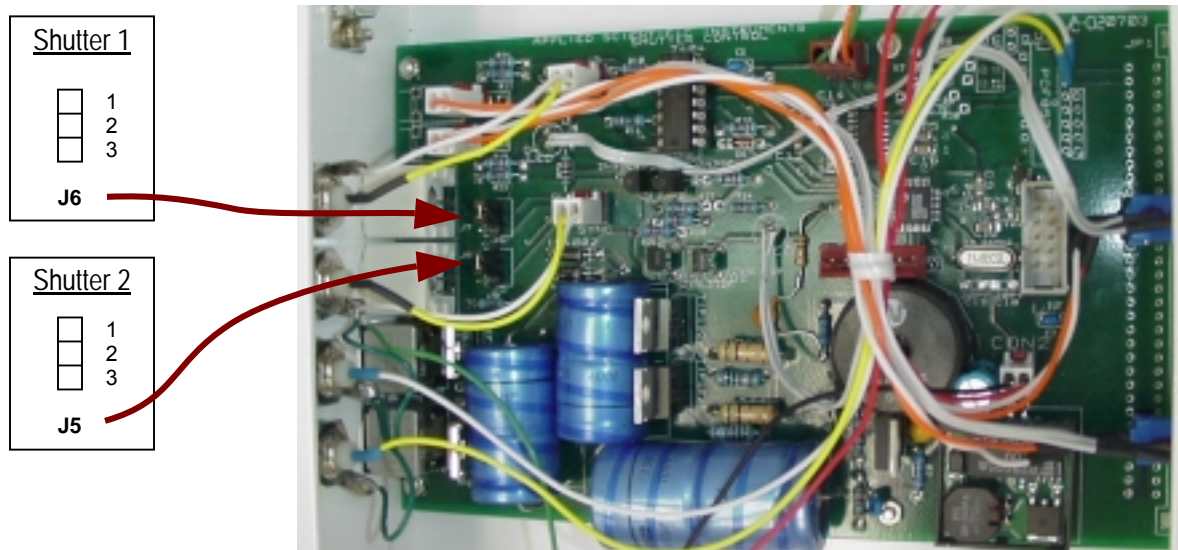


Figure 3: J6 / J5 Jumper Locations for TTL Triggers 1 and 2 respectively

WARRANTY

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