

PS-500
SQUARE APERTURE
PHOTOMETRIC SHUTTER

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CONTROL

Hardware Components

Sci-in Tech shutter
Shutter Control Box
External Power Supply
USB to Isolated RS232 cable

User Control

Hardware control via isolated BNC inputs.
Inputs are contact closure or TTL level.
Output is isolated open collector transistor output.
 Shutter OPEN/CLOSE command input
 RESET command input
 FAULT output

Software Control via isolated USB to RS232 link.

Commands for remote operation:

\$B <CR><LF> Blade State – returns blade position as read by the switches.
\$C <CR><LF> Close the shutter.
\$H <CR><LF> Home the blades to a known position.
\$O <CR><LF> Open the shutter. Also can be used for timed operation.
\$R <CR><LF> Reset the micro controller in the shutter.

Normal Operation

Power is supplied from an external power supply of **18 to 24V DC** connected to the Shutter Control box supplied with the shutter. Power and signals are supplied to the shutter via the cable connected to the Shutter Control box.

On power up, the shutter blades will seek a “**Home**” position, which is a closed shutter state with both blades on the same side of the shutter. The shutter can be operated by hardware inputs or by an RS232 link.

Under hardware control, the “**OPEN**” BNC input is used to command the shutter open for the duration of the input signal. The input can be a contact closure or a TTL level signal. The standard input is low active. The shutter will open when the BNC input is low or closed contacts, and will close when the BNC input is high or open contacts. This polarity can be inverted by moving a jumper in the Shutter Control box.

The “**RESET**” BNC input is used to reset the controller in the shutter. When this is used, the shutter will use its power up routine and seek a Home position. This can be used to recover from an unknown state or to cancel a long time exposure set by software via the RS232 link. The standard input is low active. Reset will be active when the BNC input is low or closed contacts, and will be inactive when the BNC input is high or open contacts. The polarity of this signal can also be inverted by moving a jumper in the Shutter Control box.

CONTROL

The “FAULT” output BNC is not yet defined, but will probably be used to indicate that an error was generated, and an error message will be sent to the computer via the RS232 interface. This output is an isolated open collector transistor which appears as a low impedance or closed contacts when the Fault output is present.

Under software control, the isolated USB to RS232 cable is used to establish an RS232 communication link between the shutter and the user computer. The Hyperlink application native to Windows PCs can be used to send and receive commands. The format for the interface is ASCII characters at 9600 baud, 8 bits, no parity, and 1 stop bit. All messages start with the "\$" character and end with <CR><LF>.

Commands for remote operation:

\$B <CR><LF> Blade State – returns the position of the blades as read by the switches.

\$C <CR><LF> Close the shutter.

\$H <CR><LF> Home the blades to a known position.

\$O <CR><LF> Open the shutter. Also can be used for timed operation.

\$R <CR><LF> Reset the processor.

The orientation of the shutter is described as follows:

The connector side of the shutter is the right side. The motors are located on the right side at the top and bottom. Limit switches at the top left and top right indicate the limits of the left shutter blade. Limit switches at the bottom left and bottom right indicate the limits of the right shutter blade.

The \$B command can be used to determine the position of the shutter from the limit switches. The number returned by the command is the sum of switch values for all four switches. The switch values are as follows:

Switch Left Top (SWLT) = 8

Switch Right Top (SWRT) = 4

Switch Left Bottom (SWLB) = 2

Switch Right Bottom (SWRB) = 1

A switch is read as true when contacted by the shutter blade. The number formed by the sum of the contacted switches is the value returned by the \$B command. For example, a value of 5 would indicate that both switches are at the rightmost position, while a value of 10 would indicate that both switches are at the leftmost position. These are the “Home” positions. A value of 9 indicates the open position.

The \$C command is used to close the shutter after it has been opened by the \$O command. In RS232 operation, the open and close commands are issued separately. The duration between commands can be used to determine the exposure time.

The \$H command causes the shutter blades to seek the Home position which is either both blades to the left or both blades to the right. This is also the starting point for the Open command.

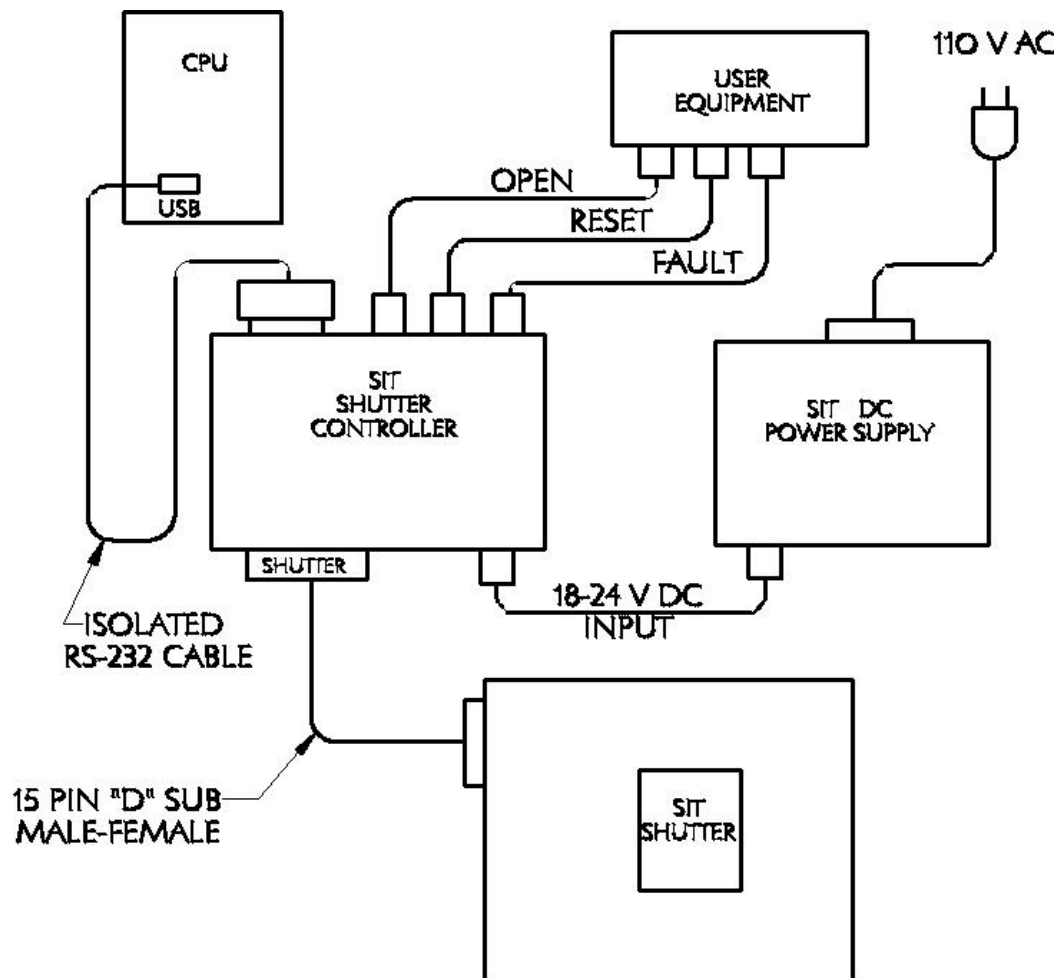
CONNECTIONS

The \$O command causes the shutter blades to open which is the left blade to the left and the right blade to the right. The shutter will remain open indefinitely if the command is issued as \$O <CR><LF>. The shutter will remain open until the \$C command is issued. The \$H and \$R commands will also result in closing the shutter, but the closure will occur at a slower speed. The last 2 commands should not be used to close the shutter unless some problem has occurred and the exposure is to be aborted.

The \$O command can also be used for a timed exposure. The time value is entered along with the command and represents the exposure time in 10ms steps. For example, the command \$O 100<CR><LF> is a command to open the shutter for 1000ms. The \$C command does not have to be issued to complete the exposure. The range of values for the exposure time is from 1 to 9999, or from 10 to 99990ms, although the accuracy is not specified below 20ms. New open commands are ignored during a shutter open cycle.

The \$R command will momentarily reset the micro controller in the shutter. After the command is issued, the micro controller will initialize itself as it does on power up, and the shutter blades will seek the Home position. This command should only be used if some problem has occurred and the exposure is to be aborted. This command will not function if RS 232 communication is lost.

CONNECTIONS & CONTROL



SCI-IN TECH CABLE CONNECTIONS

OPERATIONAL DESCRIPTION

This shutter is a precision mechanism designed for long life, with periodic lubrication intervals of approximately 500,000 cycles. The life span should provide 2 to 3 million cycles and can be rebuilt to new condition at a fraction of the original purchase.

It is important to handle and treat this device with appropriate care. Dropping or badly configured mounting can cause the device to malfunction. This can cause an interruption and might require returning it to SIT for repair or adjustments or replacement of costly components. Careful handling is important to a long life with minimal problems.

It is **photometric** meaning the aperture is evenly illuminated with a high degree of accuracy over the entire field. A great deal of engineering has been done to provide you, the customer, a large aperture with precision exposures. Designed for use on telescopes with varying vectors means the operational orientation can be in any direction.

The **carbon-fiber** blades are strong, lightweight and dimensionally stable. They provide protection to any objects such as wrenches or hands, etc., prior to contact with camera optics. If an object impedes the aperture while blades are closing, no damage will occur to the mechanism. After the object has been removed, a **reset** will be needed to setup and home the mechanism. **DO NOT CARRY OR HANDLE THE SHUTTER WITH THE BLADES.**

PHYSICAL CONSTRAINT

Minimal weight and high accuracy mean consideration of where and how the shutter is to be used very important.

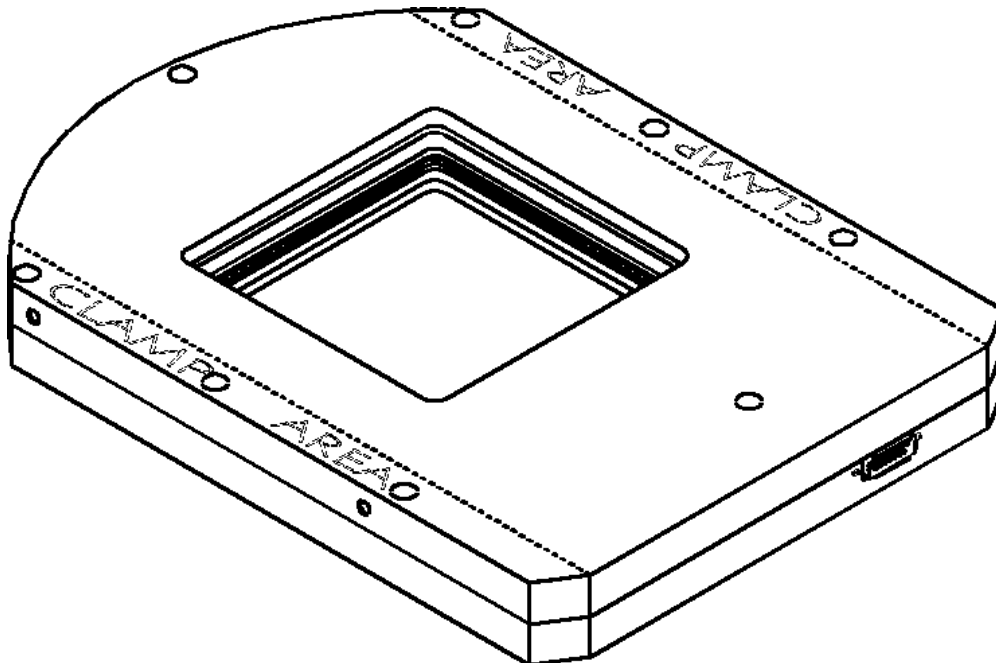
Good environments:

- clean
- no extreme temperature conditions
- atmospheric pressure in air
- no forces above 1.5G

Things to avoid:

- dusty environment
- water susceptible to shutter mechanism and electronics
- shaking and vibrations
- high humidity in freezing temperatures
- solvents or anything that can get trapped in the mechanism

Mounting is achieved 3 ways. Any of the 6 holes in the shutter face, 2 sets of paired screw holes along the sides, or clamping to a flat surface.



TROUBLESHOOTING

If the shutter function ceases, it has to be returned to SIT. It is not to be opened in the field. It is a mechanism with special high quality components that need to be serviced in-house. You, the user, are not allowed to disassemble it for any reason. There are too many components and subtleties that need to be checked.

SIT will help to diagnose problems. If disassembly of the mechanism or electronics is needed, returning to SIT will be required. Repairs of this type are the highest priority and will be worked on immediately for quick return.

Simple things to check

POWER?

CONNECTIONS?

SIGNAL DELIVERED?

ANY MECHANICAL OBSTRUCTIONS IN THE APERTURE?

SHUTTER PROPERLY MOUNTED WITHOUT STRESS?

ANY CLAMPING OR FORCE ON THE SHUTTER FACE(S)?



CONTACT INFORMATION

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