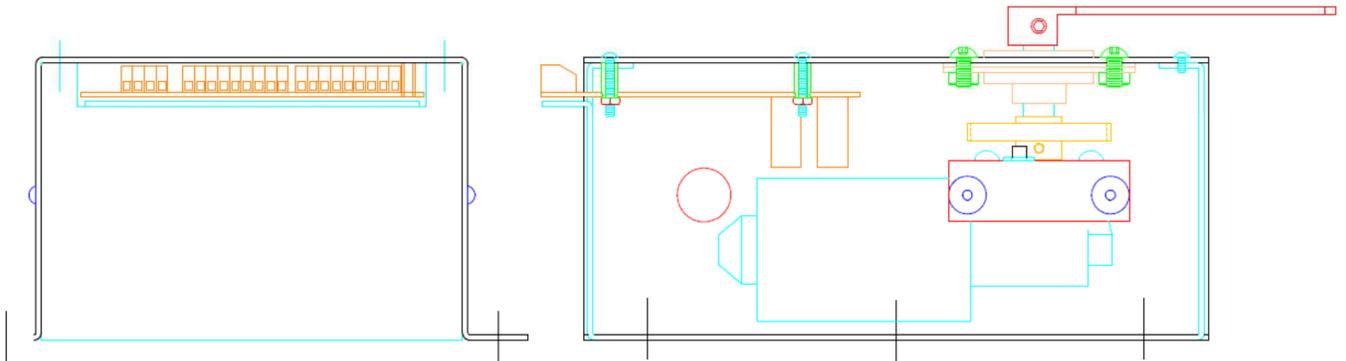
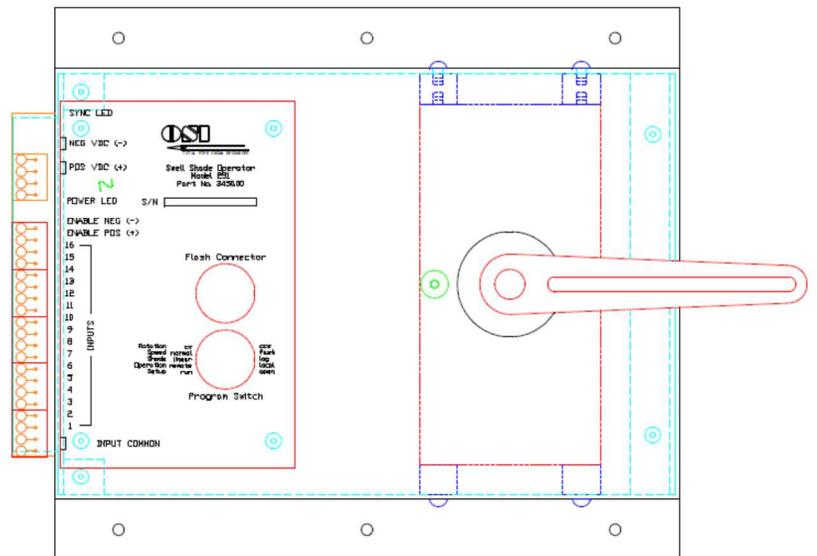
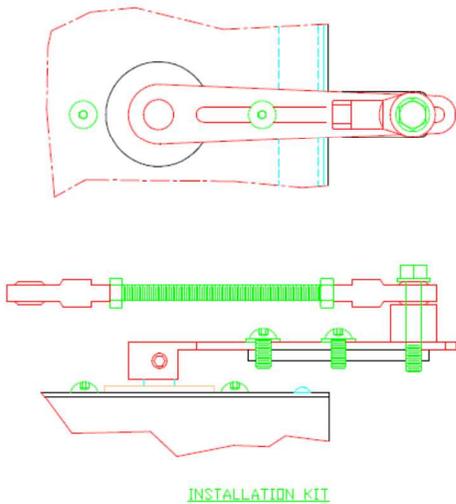


OSI Swell Shade Operators Instruction Manual

2016 Instruction Packet
Organ Supply Industries, Inc
2320 West 50th Street
Erie, PA 16506
1/800-374-3674
www.organsupply.com

Model 251 – 3450.00
SOPD – 3450.12
Model 251-I – 3450.01



Preparing for Installation:

The Model 251 – 3450.00 and 251-I – 3450.01 Swell Shade Operator (SSO) are stand-alone controllers intended for new swell shade installations as well as replacement situations. All the necessary tools and fasteners needed for new installations are included with an installation kit. Retrofitting existing installations will require modifications, special fasteners and tools provided by the installer. In all cases, the skill, expertise and good judgement of the installer is essential for a trouble-free and safe installation.

If this is your first time installing the OSI Swell Motor, **Carefully** Read through the entire packet **BEFORE** attempting to install in the Organ. It is strongly recommended that this unit be set up in a shop environment to test and thoroughly understand the operation features of the unit before installation. If there are any questions regarding the unit, please contact us at 1-800-374-3674.

Precautions

Always – securely mount the SSO with six screws before applying power.

Never – allow any part of your body or loose clothing near the operating arm or shade linkage with the power on. Make provisions to turn the power off before and during installation, setup and/or adjustment. Carefully follow the setup steps outlined in this manual paying particular attention to when the power is on and when it is off.

Always – measure the DC voltage from the power supply with a voltmeter and insure that it is between 12.5 and 18.0 VDC before connecting it to the Swell Shade Operator.

Never – connect the shade linkage to the operating arm before checking and verifying the program switch [Setup] is in the **RUN** position. Failing to do so may damage the shade mechanism.

Always – read and understand the Installation and Operation Instructions before starting. Pay particular attention to the electrical connections. Take the time to thoroughly understand **ALL** the wiring examples.

Never – connect 120 VAC to any of the terminal blocks. The SSO does not require a direct connection to any AC voltage source. All voltages are DC and come from the organ power supply and/or other system DC Power Supplies.

Power Requirements and Considerations

Operating Voltage: 12.5 – 18.0 VDC

Operating Amperage: 3 AMP MAX

SOPD Amperage: 6.5 AMP MAX @ Start < 0.3 sec.

12 VDC Wire Gauge: #18 AWG or Larger

Keying Wire Gauge: #26 AWG or Larger

Internal Fuse (a) [power]: 40A Max / Hold 3A / Trip 6A

Internal Fuse (b) [logic]: 40A Max / Hold 750mA / Trip 1.5 A

Both SSO models use existing DC voltage normally available in the chamber from the organ rectifier. These units require reasonably regulated voltage between 12.5 and 18.0 volts with a maximum motor draw of 3 Amps. Use of a SOPD module or SSO with incorporated Open on Power Down feature will draw up to 6.5 Amps at start up for less than 0.3 sec. Both models are protected by a thermo self-resetting fuse. **NEVER** connect 120 VAC to any of the terminal blocks. The SSO **does not require a direct connection to an AC voltage source.**

All electrical connections are made with screw terminal blocks, sized for #12 to #26 AWG wire. The four-position block directly connects to the organ DC power supply with #18 AWG or larger, wire. Only one POS and NEG connects are required. The second POS and NEG terminal block positions can be used to provide voltage to other SSO Functions (i.e. Enable Terminals of 3450.00)

MODEL 251 – 3450.00

The **ENABLE NEG** and **ENABLE POS** terminal blocks are used to turn the SSO Control (logic) on and off independently. A separate power supply can be used to do this or the terminals can be wired through an on/off switch connected to the organ power supply. When the unit is activated (on) the **POWER LED** [red] will light.

MODEL 251-I – 3450.01

Model 251-I incorporates a Shade Open on Power Down module (3450.12) internally. This model **DOES NOT** provide ENABLE NEG and ENABLE POS positions as they are wired internally.

The remaining eighteen terminal block positions are used to connect directly to a swell shoe or an organ control system. The sixteen stages [1-16] and two input common connections are optically isolated and can either be configured as positive or negative common [see wiring diagrams].

The **SYNC LED** [green] is used for system startup and only lights temporarily to confirm proper arm positioning on power up. When power is applied to the SSO, the operating arm will rotate to the “shade closed position” and turn 5 degrees beyond closed, the SYNC LED will light momentarily before the arm rotates to “current shade position”.

Program Switch Functions:

Model 251 and 251-I Swell Shade Operators **DOES NOT** have a writeable memory on board. All setup features used in controlling Swell Shade Operation are performed either mechanically and/or through Wiring.

Under the removable cap labeled *Program Switch* [Fig. 1] is a five position dip switch used for setup of SSO preferences. Each of the five positions have a function. From top to bottom they are:

ROTATION:

Sets the rotation of the motor shaft as power is applied from stages 1-16. *Please note that both 3450.00 and 3450.01 operate only as [Make-to-Open] or Shades Open as Power is applied units. Older pneumatic engines operating on a [Break-to-Open] principle require modification to the switch/roller providing keying information.* Clockwise [cw] or Counter-Clockwise [ccw]. (As viewed from the top of the SSO)

SPEED:

Determines how fast the shades react to stage input either open or closed. Factory setting is *Normal*.

SHADE:

Two different settings for the amount of movement between stage input. Factory setting of *Log* starts with smaller movement between stages 1 and 2, and logarithmically increases the amount of movement between stages over the 175 degrees of travel. *Linear* allows for equal movement between stages and is recommended for difficult tonal egress.

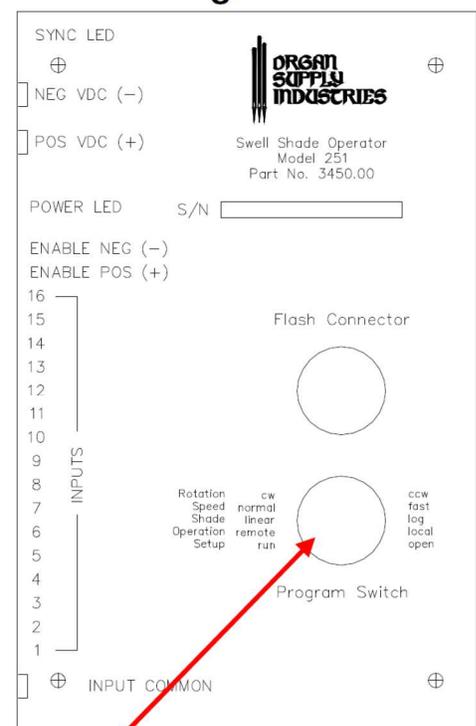
OPERATION:

Future preparation, should remain in *Local* at all times.

SETUP:

A diagnostic feature. When placed in the Open Position, the shade arm will move and lock in the full open position [Stage 16]. **CAUTION:** When using this feature insure hand or loose clothing is free from the path of the Shade Arm. This switch will allow a single service technician to see the full range of movement of the motor without wiring, or a secondary technician at the console.

Fig. 1



Compatible Shoe Styles:

Model 251 and 251-I SSO work with two types of Swell Shoes either directly or through an Organ Control System. They can be broadly categorized as:

Type 1:

A series of normally open switches that close (Make to Open) as the shoe is depressed and the shades open. Each switch is considered a stage and SSO can accommodate up to 16 stages. This type of shoe requires 1 wire per stage plus 1 common wire for a total of 17 wires for 16 stages maximum. Fewer stages may be wired by using less stages per wiring diagrams. (**PLEASE NOTE:** stage 1 and 16 must be used at all times, limiting travel of the unit **MUST** be done mechanically)

In some cases of retrofitting this unit into existing shoes, please note that the contact arrangement may be opposite in cases of some pneumatic expression motors. (Break to Open) A series of normally closed switches that open as the shoe is depressed. For this type of arrangement, the Contact Arrangement on the shoe must be reconfigured to accommodate the Make to Open System.

Type 2:

A binary encoder that generates a 5-bit "Gray Code" as the shoe is depressed and the shades open. This type of shoe requires 1 wire per bit plus 1 common wire for a total of 6 wires for 32 stages.

Open on Power Down Feature:

Model 251 – 3450.00

Model 251 Shade Operators with External Enable Positive and Negative Terminals are programmed to position the Shade Arm at position 16 when power is removed from the Enable Positive and Negative Terminals only, and 12 VDC still remains on the Main Positive and Negative Terminals to power the motor. This flexible arrangement allows the builder/installer the use of control system, time delay relays, or a series of options to open the unit when the organ power is shut down. If no relays are used, the motor will stay in the position left by the organist.

Shade Open on Power Down Module – 3450.12

This stand-alone module designed to work with Model 251 is placed between the Organ Rectifier 12 VDC, and the SSO Main Positive and Negative, Enable Positive and Negative Terminals. The Main Positive and Negative Terminals are passed through a series of capacitors to hold charge on the SSO when the Organ Rectifier is turned off. Remaining power in the capacitors will be utilized by the SSO to move in the Open Position [Stage 16]. **PLEASE NOTE:** depending on size, power, and drag on the motor, shades may not return to fully open position in all cases.

Model 251-I – 3450.01

Model 251-I Shade Operator integrates the Shade Open on Power Down Module for cleaner installation. Enable wiring is removed for internal wiring, and operation of the SOPD module is selected by toggle switch on side of the unit. Recommended for newer installations where a Solid State Control System is present, and Expression Shades on Bearings Minimize Drag.

Installation Procedure - Mechanical

Step One: Mounting the Swell Shade Operator

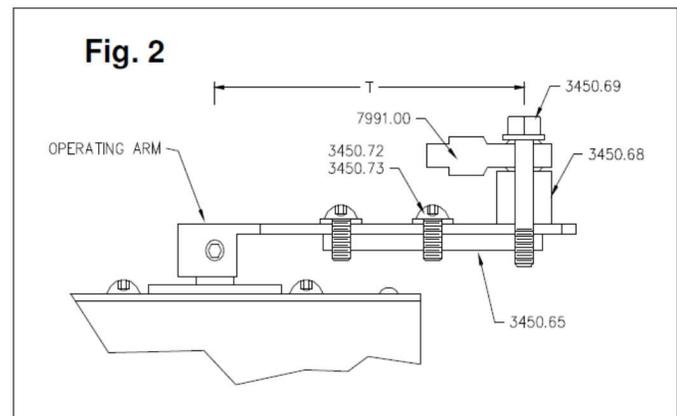
- Locate the assembly so that the operating arm is clear of all obstructions. *[Due to the 5 degree SYNC on startup it is important to remember that connection from SSO and the Shade Trace be as Parallel as possible. A starting point with trace perpendicular to the control arm WILL result in binding of the motor and failure to operate]*
- Secure the base of the Swell Shade Operator with six (6) #8 Wood Screws or other suitable fasteners.
- Loosen the two hex set screws securing the operating arm to the motor shaft and manually swing through a full 360 degrees of rotation to insure free from obstruction.

Since the operator motor is internally mounted with 3-axis isolation and a floating bearing support, it is NOT NECESSARY to use rubber, felt, or any other means to isolate the Swell Shade Operator.

Step Two: Assemble the Operating Arm [Fig. 2]

- Calibrate Travel: **IMPORTANT: LINEAR TRAVEL OF THE TRACE ROD MUST BE MEASURED FROM FULL CLOSED TO 90 DEGREE OPEN.**
- Slide the retaining plate [3450.65] until (T) equals $\frac{1}{2}$ or less of the TOTAL TRACE ROD TRAVEL.
- Tighten the hex head screw [3450.69] and both the button head screws [3450.72].

DO NOT TIGHTEN OPERATING ARM TO MOTOR SHAFT AT THIS TIME. Operating Arm should be free to manually rotate on Motor Shaft.



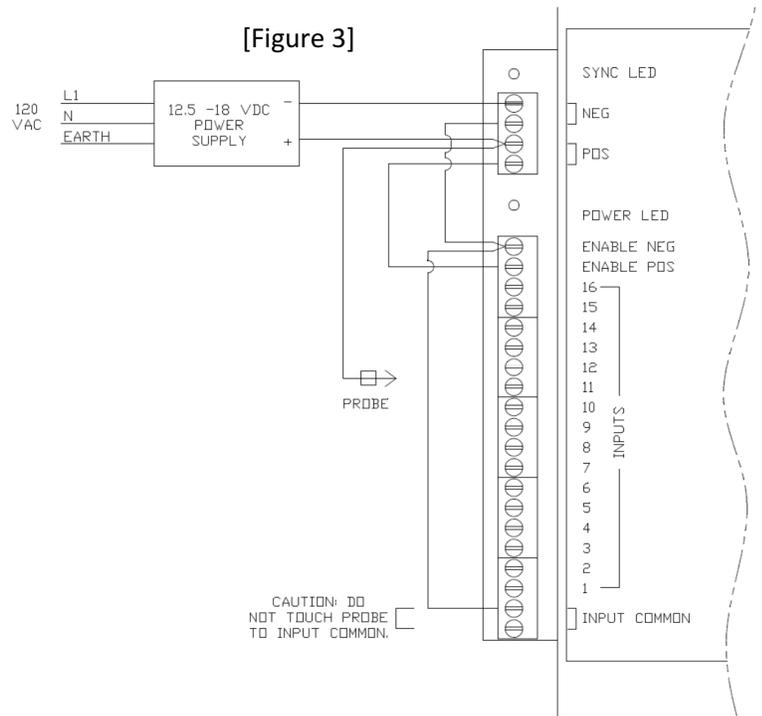
Step Three (A): Electrical Connections Model 251 3450.00

- Insure that the SSO is Powered Down and that the SSO Operating Arm is free to rotate on the shaft.
- Wire the SSO as shown in the INITIAL WIRING diagram [Fig. 3]
- Apply Power to the SSO. The POWER LED [red] will light and the Motor will rotate to sync. The SYNC LED [green] will light momentarily then turn off as the operating arm rotates five degrees in the shade open direction.
- Remove Power from the SSO. Manually rotate the operating arm until the swell shades are closed.
- TIGHTEN the two hex setscrews that hold the operating arm on the motor shaft at this time. Apply Power to SSO. WITH NO INPUTS WIRED [Initial Wiring Diagram] the SSO will power up for testing. Stages can be tested with test probe at this time.

Figure 3 – Initial Wiring

The Diagram on the Right shows the initial wiring for testing of the Model 251. 12 VDC from the Organ Power Source is Connected to NEG and POS. NEG and POS are connected to ENABLE NEG and ENABLE POS to activate Logic.

INPUT COMMON – is the opposite polarity of which you intend to key stages 1-16 [Key Input]. Negative Input Common will require Positive Keying as found in the figure to the right. Positive INPUT COMMON is also possible for Negative Keying.

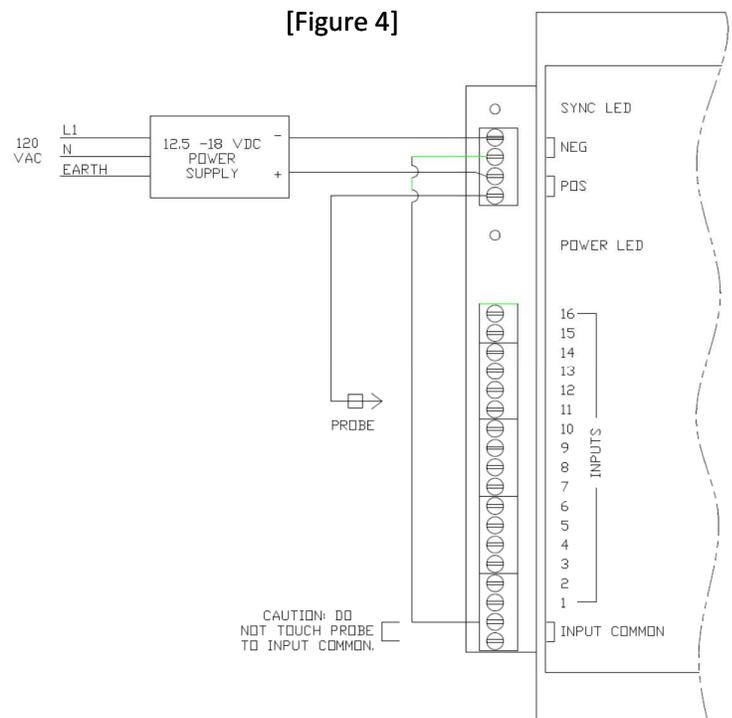


Step Three (B): Electrical Connections Model 251-I 3450.01

- Insure that the SSO is Powered Down and that the SSO Operating Arm is free to rotate on the shaft.
- Wire the SSO as shown in the INITIAL WIRING diagram [Fig. 4]
- Apply Power to the SSO. The POWER LED [red] will light and the Motor will rotate to sync. The SYNC LED [green] will light momentarily then turn off as the operating arm rotates five degrees in the shade open direction.
- Remove Power from the SSO. Manually rotate the operating arm until the swell shades are closed.
- TIGHTEN the two setscrews that hold the operating arm on the motor shaft at this time. Apply Power to SSO. WITH NO INPUTS WIRED [Initial Wiring Diagram] the SSO will power up for testing.

Figure 4 – Initial Wiring

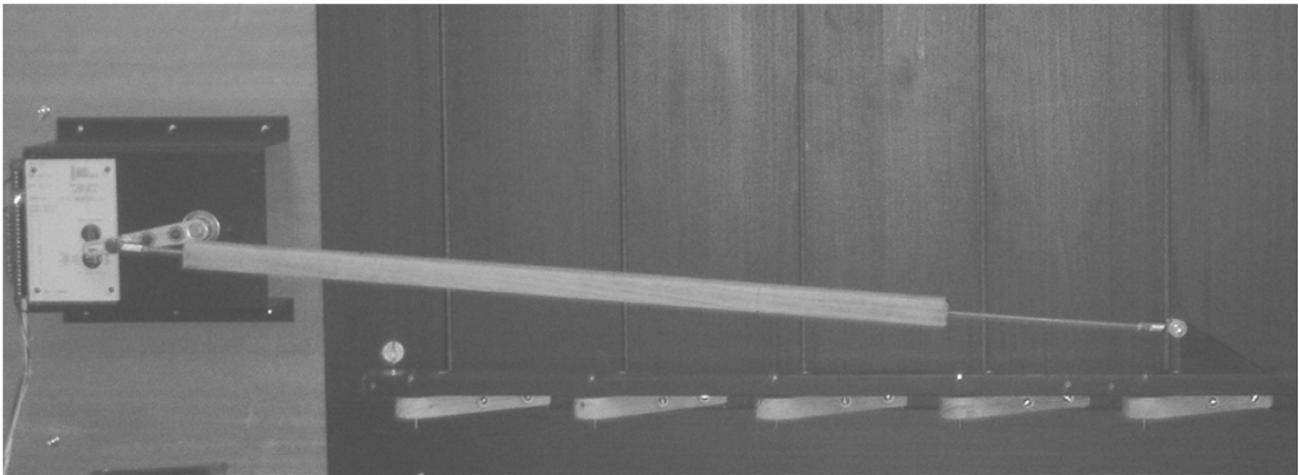
Model 251-I with integrated SOPD Module requires only Positive and Negative from Organ Rectifier and INPUT COMMON Line to be wired. INPUT COMMON with Negative jumper will be Keyed [stages 1-16] with Positive. INPUT Common with Positive jumper will be Keyed [stages 1-16] with Negative.



Step Four: Connecting a Shoe

Model 251 and Model 251-I Shade Operators operate with Analog/Digital 12 VDC signal through a Make-to-Open Roller/Contact Assembly, or Solid State Organ Control System. Wiring for Grayscale Encoders can be found in Alternate Wiring Diagrams [page _]

- a. Once steps 1 through 3 have been successfully completed, using the test probe in [fig. 4] will allow for individual testing of stages [1-16]. Once complete the SSO is ready to accept wiring from Expression Control.
- b. Wire the SSO as shown in the INITIAL WIRING diagram [Fig. 4]
- c. Please insure that your mechanical connection to the trace rod starts from a parallel position to the operating arm. If the connection is perpendicular the motor will bind during startup [SYNC] procedures. Typical Installation of Trace to SSO pictured below.

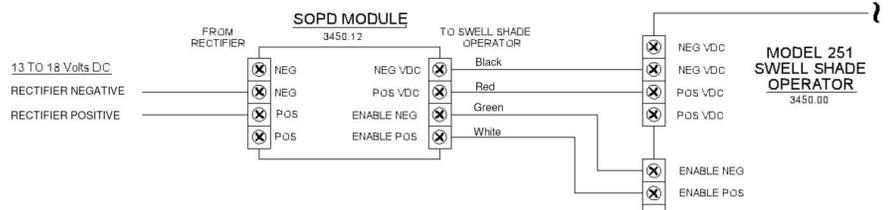


Shade Open on Power Down Module [SOPD] – 3450.12

SOPD Module 3450.12 is a companion module for SSO MODEL 251. This module is integrated into the direct DC Connection between Organ Rectifier and SSO. The module is equipped with capacitors to provide power to the motor after the Organ Rectifier has been turned off. Residual Power fed to NEG VDC and POS VDC on the SSO while Enable Neg and Enable Pos shut down with Organ Rectifier, allows motor to move to position 16. PLEASE NOTE: complete opening of shades depends on size, mechanical restrictions, and/or power supply.

The figure on the right shows typical wiring. A 3-foot long, four conductor cable assembly is supplied pre-wired to the SOPD module and must be connected to the Model 251 SSO as follows:

- Black #18 AWG to SSO Terminal NEG VDC
- Red #18 AWG to SSO Terminal POS VDC
- Green #18 AWG to SSO Terminal ENABLE NEG
- White #18 AWG to SSO Terminal ENABLE POS



The rectifier is wired to the input terminal block as shown with a spare set of terminals available for convenience. When the rectifier is turned OFF, the RED LED on the SSO will remain lit for some time depending on the load and ampacity of the rectifier. When the RED LED on the SSO turns OFF or starts getting dim, the shades will open.

Wiring Charts Model 251 3450.00 and SOPD 3450.12

Please note in wiring configurations for less than 16 stages that above pin ten [10] two adjacent pins [i.e. 12/13] must be wired in succession. Wiring all even or all odd pins will engage grayscale setting and cause sporadic behavior.

	Test Configuration for SSO 251	No SOPD Module - Basic Operation	SOPD Module Installed - Basic Operation	No SOPD Module - Encoder Installed GRAY CODE ONLY	SOPD Module Installed - Encoder Installed GRAY CODE ONLY
Neg VDC (-)	-	-	SOPD (Black)	-12 VDC	SOPD (Black)
Neg VDC (-)	-	-	SOPD (Black)	-	SOPD (Black)
Pos VDC (+)	+	+	SOPD (Red)	+12 VDC	SOPD (Red)
Pos VDC (+)	+	+	SOPD (Red)	+	SOPD (Red)
Power LED					
Enable Neg (-)	-	-12 VDC	SOPD (Green)	-12 VDC	SOPD (Green)
Enable Pos (+)	+	+12 VDC	SOPD (White)	+12 VDC	SOPD (White)
16		+	+	+	+
15		+	+	+	+
14		+	+	+	+
13		+	+	+	+
12		+	+	+	+
11		+	+	+	+
10		+	+	+	+
9		+	+	+	+
8		+	+	+	+
7		+	+	+	+
6		+	+	+	+
5		+	+	+	+
4		+	+	+	+
3		+	+	+	+
2		+	+	+	+
1		+	+	+	+
Input Common	-	-	-	-	(Encoder Com)
Input Common	-	-	+	-	-

	Test Configuration	8 Stage Positive Keying	16 Stage Positive Keying	8 Stage Negative Keying	16 Stage Negative Keying
16	+	+	-	-	-
15	+	+	-	-	-
14	+	+	-	-	-
13	+	+	-	-	-
12	+	+	-	-	-
11	+	+	-	-	-
10	+	+	-	-	-
9	+	+	-	-	-
8	+	+	-	-	-
7	+	+	-	-	-
6	+	+	-	-	-
5	+	+	-	-	-
4	+	+	-	-	-
3	+	+	-	-	-
2	+	+	-	-	-
1	+	+	-	-	-

	8 Stage Positive Keying	16 Stage Positive Keying	8 Stage Negative Keying	16 Stage Negative Keying
16	+	+	-	-
15	+	+	-	-
14	+	+	-	-
13	+	+	-	-
12	+	+	-	-
11	+	+	-	-
10	+	+	-	-
9	+	+	-	-
8	+	+	-	-
7	+	+	-	-
6	+	+	-	-
5	+	+	-	-
4	+	+	-	-
3	+	+	-	-
2	+	+	-	-
1	+	+	-	-

	UAE Five Bit Operation (32 Stage)	UAE Six Bit Operation (64 Stage)
16	+	+
15	+	+
14	+	+
13	+	+
12	+	+
11	+	+
10	+	+
9	+	+
8	+	+
7	+	+
6	+	+
5	+	+
4	+	+
3	+	+
2	+	+
1	+	+

	UAE Five Bit Operation (32 Stage)	UAE Six Bit Operation (64 Stage)
16	+	+
15	+	+
14	+	+
13	+	+
12	+	+
11	+	+
10	+	+
9	+	+
8	+	+
7	+	+
6	+	+
5	+	+
4	+	+
3	+	+
2	+	+
1	+	+

Troubleshooting

Symptom	Description
SSO is unresponsive, or turns without stopping on initial power up.	Unit has been damaged in Shipping, contact OSI Immediately
SSO tests ok, but does not open Shade Front when attached	Insure unit is being fed with #18 AWG Wire, Voltage of 12.5 VDC to 18 VDC With Meter set to AC, check older rectifiers that no AC Leakage is passing to the unit.
SSO tests ok, when notes played on organ motor jumps or reacts sporadically.	As a solid state device, Isolation from EMF spiking is critical. Insure that the unit DC supply is completely separate from the rest of the organ. In minor cases, a 1N4004 diode on input common (Negative Common) can correct minor issues. 0.1 Mfu capacitors on stage inputs may also rectify issues. Please insure the solid state unit is free from electronic noise of old organs.
SSO tests ok, Operates Shades, but unit does not respond after organ is power cycled.	Insure that the mechanical connection to the shade trace is parallel to the control arm. SSO performs self test every power cycle. If mechanical connection is too tight on close, the unit cannot perform 5 degree self test and will bind the unit from operation.
SSO with SOPD - Unit Closes on power down and does not complete the open cycle	SSO with SOPD will respond to solid state control system until the rectifier is completely shut down. If the SSO moves to the closed position on shut down, the solid state system is removing expression information before the rectifier has fully discharged.