

**SX-16 Nightsun® Searchlight**  
**Safety and Service Bulletin # SL 0898-02**

Issue Date: 09/25/98

Amended Date: 02/09/06

**Subject: SX-16 Nightsun® Junction Box Wiring Modification**

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**Affected Products:**

**All SX-16 Nightsun® Searchlight Junction Boxes manufactured through August 4<sup>th</sup>, 1998. The Junction Box is the power distribution box for Nightsun® Searchlight systems.**

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Dear Nightsun® Searchlight Product User:

Certain electrical connections in the SX-16 Junction Boxes may not have sufficient mechanical strength to remain tight and sustain reliable electrical connections. This may cause your Nightsun® searchlight system to malfunction.

Electrical connections that become loose or corroded can create smoke and /or cause circuit breakers to “open” unexpectedly.

**WARNING: TO AVOID A POTENTIALLY DANGEROUS SITUATION WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE, ENSURE THAT THE JUNCTION BOX WIRING IS MODIFIED AS DESCRIBED IN THIS BULLETIN.**

Spectrolab, Inc. Safety and Service Bulletin # SL 0898-02 dated 09/25/98 (continued)

**What you should do:**

Perform the service procedure described in document # SL 0898-02A, which follows. The procedure will guide you through the rewiring process.

**What is included with this bulletin:**

1. Document # SL 0898-02A– *SX-16 Junction Box Searchlight Power Cable Rewiring Instructions.*
2. Mounting hardware.

If you would like to have Spectrolab perform this service for you, please call our Customer Service Department at 1-800-936-4888 to obtain a return authorization number. Customers that have Junction Boxes less than one year old will not be charged for this modification.

If you have any questions or comments, please contact me at any of the numbers below.

Sincerely,  
Edward Ringo  
Customer Service Manager  
Spectrolab, Inc.

Phone: (818) 898-2881  
Fax: (818) 365-7680



# **INSTALLATION WIRING INSTRUCTIONS FOR SX-16 JUNCTION BOXES P/N 020706**

**Effective for boxes**

**Revision V and higher,  
S/N 3307 and up,  
Manufactured after March 1, 1999**

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**INSTALLATION WIRING INSTRUCTIONS FOR SX-16 JUNCTION BOX**

**1. SCOPE**

This document applies to the installation of all SX-16 Junction Boxes, P/N 020706, Revision V and higher, Serial Number 3307 and up, manufactured on or after March 1, 1999.

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If the new style E1(+)/(-) block P/N 032199 is added to update an older 020706 junction box, installation wiring would also proceed as described below.

## **2. INTRODUCTION AND PURPOSE**

A substantial change in the internal configuration of the SX-16 junction box was implemented with Revision V. A new E1(+) terminal post was added as a connection point for several of the heavy gauge wires. This change was made to make a more reliable and safer searchlight system. Concurrently with the new hardware, changes were made in the routing and connection points of some of the high amperage (+) wiring. This document gives detailed wiring instructions to be followed during installation of the junction box. Mechanical installation of the Junction Box is not addressed in this document.

## **3. RESPONSIBILITY**

It is the responsibility of the junction box installer to follow these instructions. It is the responsibility of Spectrolab's Illumination Systems Engineering Department to update this document as needed if and when changes are made to the hardware discussed in the document.

## **4. DEFINITIONS (does not apply)**

## **5. REFERENCE DOCUMENTS**

Electrical schematics 020720 Rev R and 030518 Rev G (IR IFCO) reflect the changes associated with the new E1(+) terminal, as do wiring diagrams 031661 Rev E and 030519 Rev L (IR).

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# WARNING

## LETHAL VOLTAGES EXIST IN COMPONENTS

Junction box components contain hazardous AC and DC voltages up to 150 volts when powered.

To reduce risk of death or serious injury:

- Read and follow all instructions
- Junction box should never be opened nor work performed on components inside except by properly trained personnel
- Use only properly operating test equipment rated for these voltages
- Disconnect aircraft battery and/or de-energize 28 VDC bus before opening junction box
- If power is restored while junction box is open treat all components as live
- Do not touch live components with bare hands or conductive tools
- Never leave live open junction box unattended

## 6. PROCEDURE

### 6.1. Install Control Box Cable

6.1.1 Remove the junction box cover and remove the rubber grommet from the side hole labeled "CONTROL." Insert the nine-conductor intermediate control box cable p/n 018479 1 into the grommet one lug at a time. If an IR IFCO system is being installed, the cable will be a 12-conductor cable, p/n 030534 2. Pass the lugs through the hole in

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1 This cable has ring lugs on the junction box end and a bulkhead-style connector on the other, which is installed in the cockpit area. It is part of the most commonly used control box wiring layout. The commonly used retractile control box cable plugs into the bulkhead fitting. A one-piece cable which wires directly from the junction box to the control box is available, p/n 030295.

2 Similar to the white-light system discussed in note 1, this cable is an intermediate j-box to control box cable which terminates in a bulkhead fitting in the aircraft cockpit. The retractile control box cable mates with it. Alternately, a one-piece IFCO control cable is available, p/n 030727.

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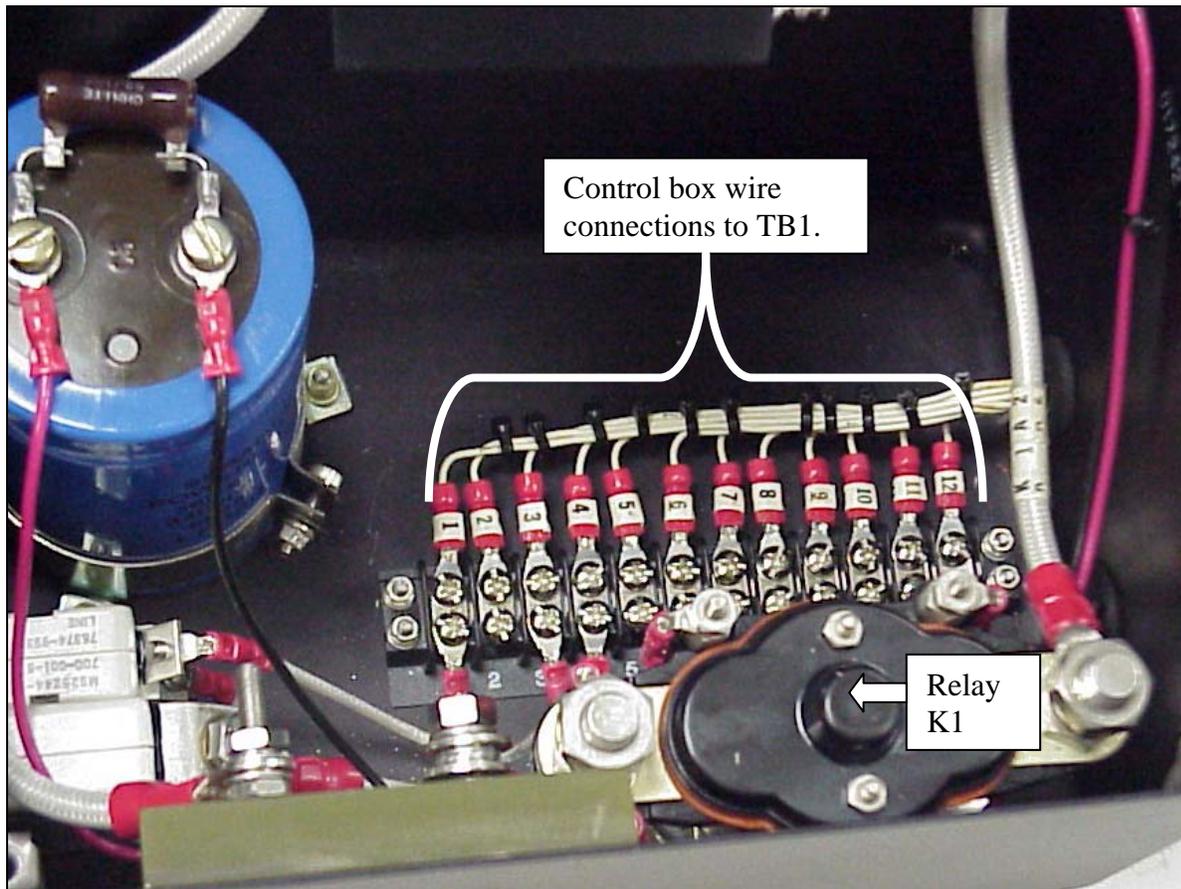
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the box from which the grommet was removed. Reinstall the grommet with cable into the hole in the box. See **Figure 1**.

6.1.2. Connect all the crimp lugs on the control cable's wires to TB1 as shown in Figure 1. They are secured under the single row of screw terminals farthest away from the main power relay K1 and closest to the large blue capacitor C1. The wires run in almost a straight line from the grommet-lined hole in the box to the terminal strip.

6.1.3. Connect the wire identified as "1" to the terminal strip position TB1-1, which is identified as #1 on the marker strip. Connect the remaining numbered wires to the matching numbered terminals of TB1. Position and adjust the wire lugs so they enter the terminal strip neatly at a right angle and are well separated from each other.



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**Figure 1. Step 1. CONTROL BOX CONNECTIONS** as seen when looking inside the junction box with the lid open and moved aside. Note numbered wires are connected to same numbered screws on the terminal strip row opposite the power relay K1. The cable feeds into the box through the grommet lined hole marked "CONTROL."

6.1.4. Before final tightening of any screws, double check to make sure the correct wires are on the correct terminal strip positions.

6.1.5. Tighten the terminal strip screws fully with a #1 Phillips or a blade screwdriver large enough to completely span the head of the screws.

6.1.6 Press the wires down as far as possible toward the bottom of the Junction Box as shown in **Figure 1**.

## 6.2. Install Junction Box-to-Searchlight Cable

6.2.1. Insert the junction box-to-bulkhead searchlight/gimbal cable p/n 0183053 through the cord grip in the Junction Box hole labeled "LIGHT". If this is an older box with a large rubber grommet instead of a cord grip, remove the grommet from the hole, feed the cable into it one lug at a time, run the lugs and wires into the hole and replace grommet.

6.2.2. Connect the nine AWG 20 wires with numbered lugs to the like numbered terminals of terminal strip TB1 in the row opposite the one to which the wires from the control box are connected. If an IR IFCO system is being installed 4, there will be twelve AWG 20 wires instead of nine. See **Figure 2**.

6.2.3. Remove the 1/4-20 hex nut and outer washers from the negative (**lower**) E1 terminal. Install the ring lug of the **negative** AWG 6 searchlight power cable marked **E1(-)** on to this E1(-) terminal of the terminal block. Loosely install the flat washer, lock

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3 This is the most commonly used intermediate cable used in a white light installation. It terminates in a bulkhead connector at the skin of the aircraft into which the flexible external cable P/N 018306 is connected. Alternately, a one-piece j-box to searchlight cable is available, p/n 017617.

4 Just like the white-light system discussed in note 3, this IFCO cable, p/n 030512 is an intermediate j-box to searchlight/gimbal/IFCO cable which terminates in a bulkhead fitting penetrating the skin of the aircraft. External cable p/n 030511 mates with it. Alternatively, a one-piece j-box to searchlight/gimbal/IFCO cable, p/n 030511 may be used.

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washer and the nut to temporarily hold the cable in place. (Another wire will be stacked onto this one in Paragraph 3.4.) See **Figure 3** for E1 Terminal Block details.

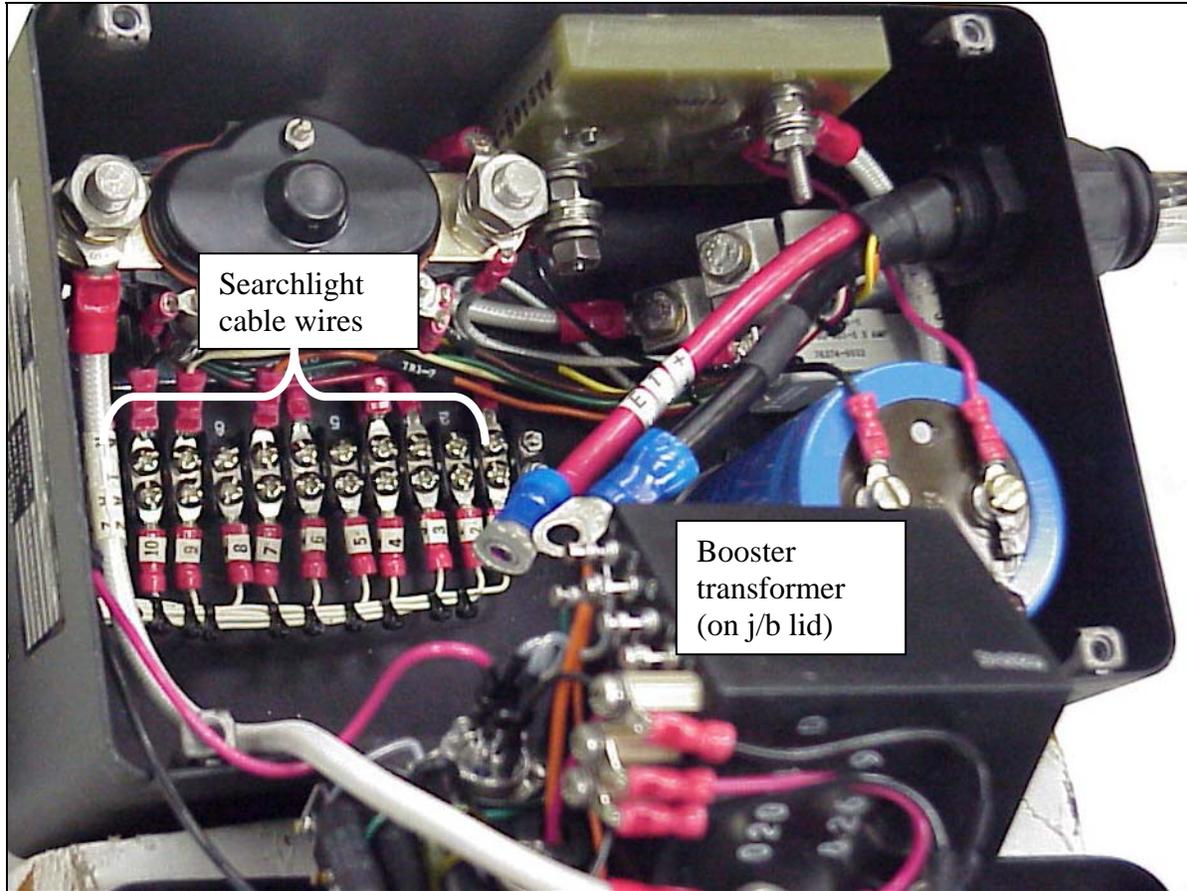
6.2.4. Remove the #10-32 hex nut and outer washers from the positive (**upper**) terminal of the E1 power block. Connect the **positive** AWG 6 searchlight power cable marked **E1(+)** (or C1(+)) on older units) to the E1(+) terminal of the terminal block. Install the flat washer, lock washer and nut, in this order on top of the lug. Fully tighten the connection.

6.2.5. After completing the electrical connections of the searchlight power cable in the junction box, verify that all the wires in the box are routed and dressed neatly. Tighten the cord grip or reinstall the rubber grommet onto the searchlight power cable where it exits the junction box. This completes the wiring of the searchlight-to-junction box cable. See details in **Figure 4**.

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**Figure 2 Step 2. SEARCHLIGHT CABLE CONTROL WIRE CONNECTIONS** to terminal strip TB1. Numbered AWG 20 wires are connected to the row of screws across from control cable wire connections. Wire numbers correspond to those on control cable wires. (booster transformer in foreground)

### 6.3. Install Gimbal Cable p/n 017482 (If a separate gimbal cable is used)<sup>5</sup>

#### 6.3.1. Remove the small rubber grommet from the hole marked "GIMBAL".

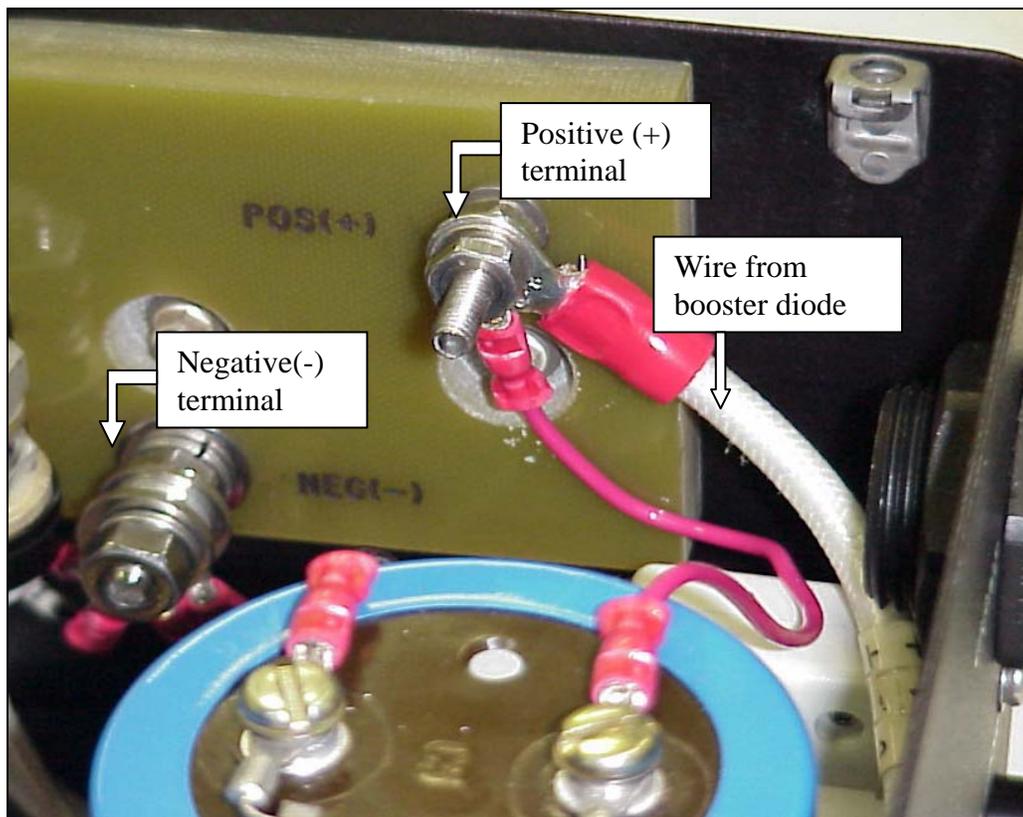
<sup>5</sup> This is an infrequently used alternate configuration. The most common wiring layout uses a single cable, which combines the searchlight and gimbal conductors under one jacket into a single cable, as discussed in the preceding section.

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- 6.3.2. Insert the 4-conductor gimbal cable into the grommet, one lug at a time.
- 6.3.3. After the cable is fed through the grommet, reinstall the grommet into the hole in the side of the junction box.
- 6.3.4. Connect the wires from this cable to the TB1 terminals opposite those to which the control box cable wires are connected, matching lug numbers.
- 6.3.5. After all lugs are tightened, push the wires down to the bottom of the box.

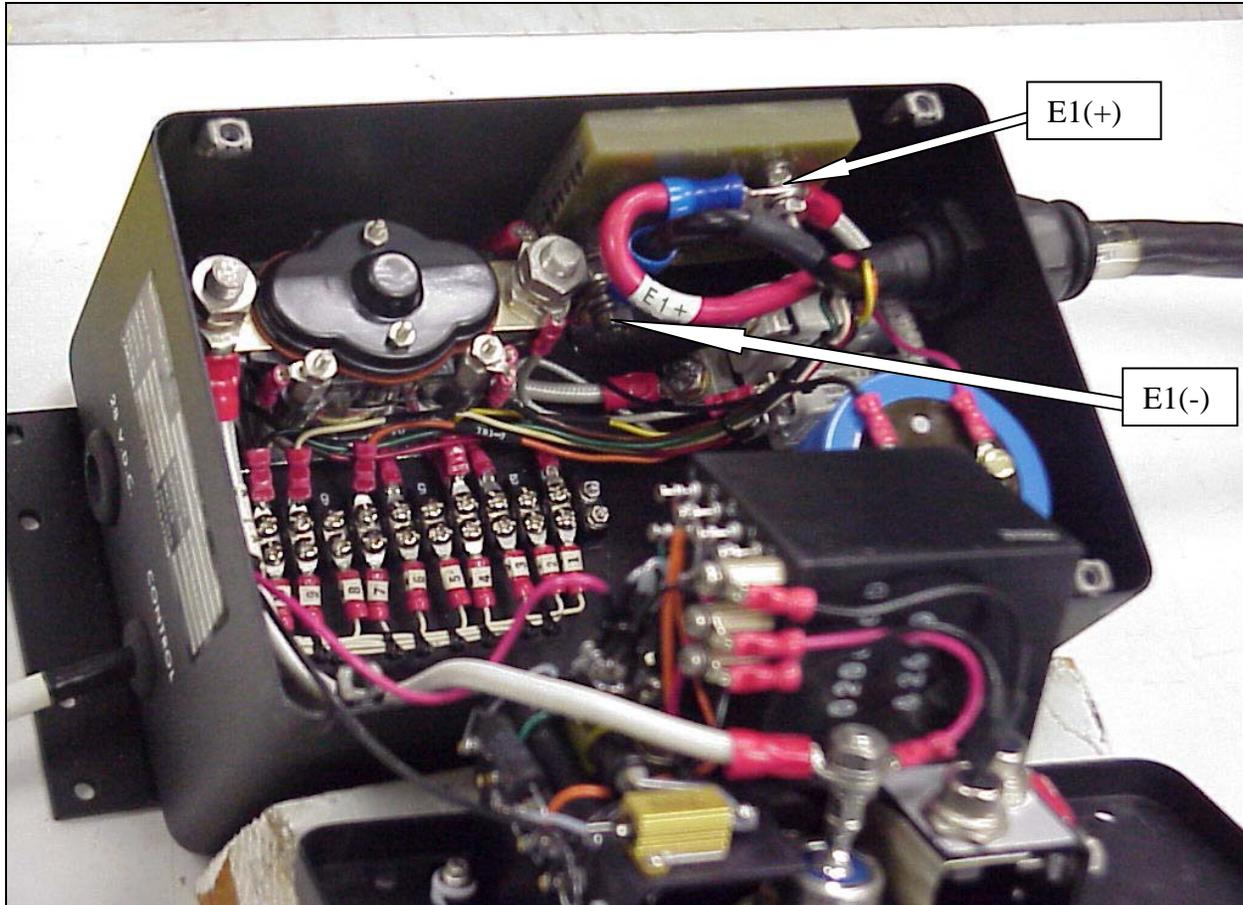


**Figure 3. CLOSE UP VIEW OF E1 TERMINAL BLOCK.** Negative terminal at bottom has 1/4-20 threads. The positive terminal at top has 10-32 threads. The wires (shown) attached to the positive terminal are from the capacitor and the booster. They remain in **SPECTROLAB NIGHTSUN® and STARBURST® SEARCHLIGHTS**

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place and the lamp(+) wire is installed on top of them, under the same washers and nut. To install the negative wires, remove the nut and washers from the negative terminal, stack the added heavy wires onto the existing ones and reinstall washers and nut.



**Figure 4. Step 3. CONNECTING AWG 6 SEARCHLIGHT POWER CABLES.** Positive searchlight power wire, marked E1+ is attached to upper terminal. Negative, marked E1- is attached to lower terminal.

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#### 6.4. Connect Input Power (+) and (-) Cables to Junction Box

## WARNING

### HAZARDOUS VOLTAGES

Aircraft bus contains hazardous voltages when powered up

To reduce the risk of death or serious injury:

- Read and follow all instructions
- Disconnect aircraft battery and/or de-energize 28 VDC bus before opening junction box
- Verify aircraft bus is de-energized prior to making any electrical connections
- All electrical connections must be performed by qualified personnel
- All junction box power connections must be capable of withstanding voltages as high as 30 volts and continuous currents of 70 amps with peak currents up to 120 amps

6.4.1. **Verify that 28 VDC power to the (+) cable is OFF.** Insert the input power (+) and (-) cables through the rubber grommet in the junction box hole labeled “28 VDC”. These cables are typically AWG 6. On some installations where the total one-way length of the power wires is over 25 feet (8 meters), larger gauge wire, AWG 4 or AWG 2, may be used. Feed the cables into the box one at a time. Make sure the correct ring lugs are fed into the junction box. The ring lug size may differ from one end of the cable to the other. If the wiring is being done per a wiring diagram with each cable identified, make sure the cable markers on the cables correspond with the diagram.

6.4.2. Connect the positive power lead to the top lug of the 70 amp circuit breaker, CB1. Make sure there is a flat washer between the bolt head and the lug. Fully tighten the bolt into the locking insert in the circuit breaker tab.

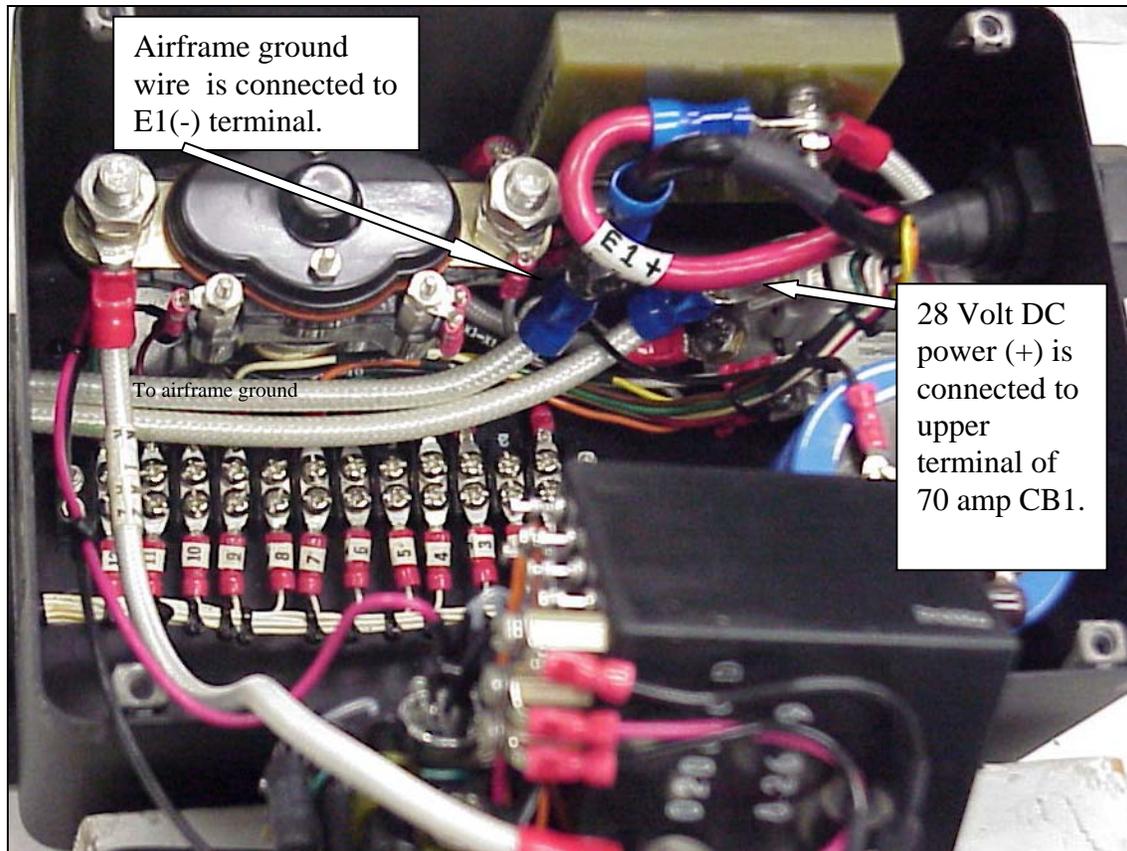
6.4.3. Remove the loose 1/4-20 nut, lock washer, and the outer flat washer from the negative (lower) terminal of the E1 terminal block. Place the negative input power cable’s ring lug on top of the negative searchlight power wire already in place. Install

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the flat washer, lock washer and nut in this order. Neatly dress the wires and tighten the nut fully. See **Figure 5**.



**Figure 5. Step 4. CONNECTIONS OF AIRCRAFT POWER (+) AND (-) CABLES INTO JUNCTION BOX.** Positive input power is connected to upper terminal of 70 amp circuit breaker. Negative input power (i.e. airframe ground) is connected to E1(-) terminal, on top of searchlight power (-) wire.

#### 6.5. Verification, quality assurance check and full functional tests

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6.5.1. Verify all connections to the terminal strip TB1, circuit breaker CB1 and terminal block E1 (POS) and E1 (NEG) are tight.

**6.5.2. VERIFY THAT NO WIRES FROM THE SEARCHLIGHT CABLE ARE DIRECTLY ATTACHED TO THE LARGE BLUE CAPACITOR.**

6.5.3. As you close the Junction Box cover, verify that the heavy-gauge wire that connects the booster to the positive (+) terminal of the E1 terminal block is routed behind the large capacitor. See **Figure 6** for correct wire routing.

6.5.4. Continue closing the junction box cover. Gently press it closed. If cover does not go into place easily, a wire may be misrouted and is getting pinched. If needed, reopen the cover, verify and/or adjust wire routing, then close.

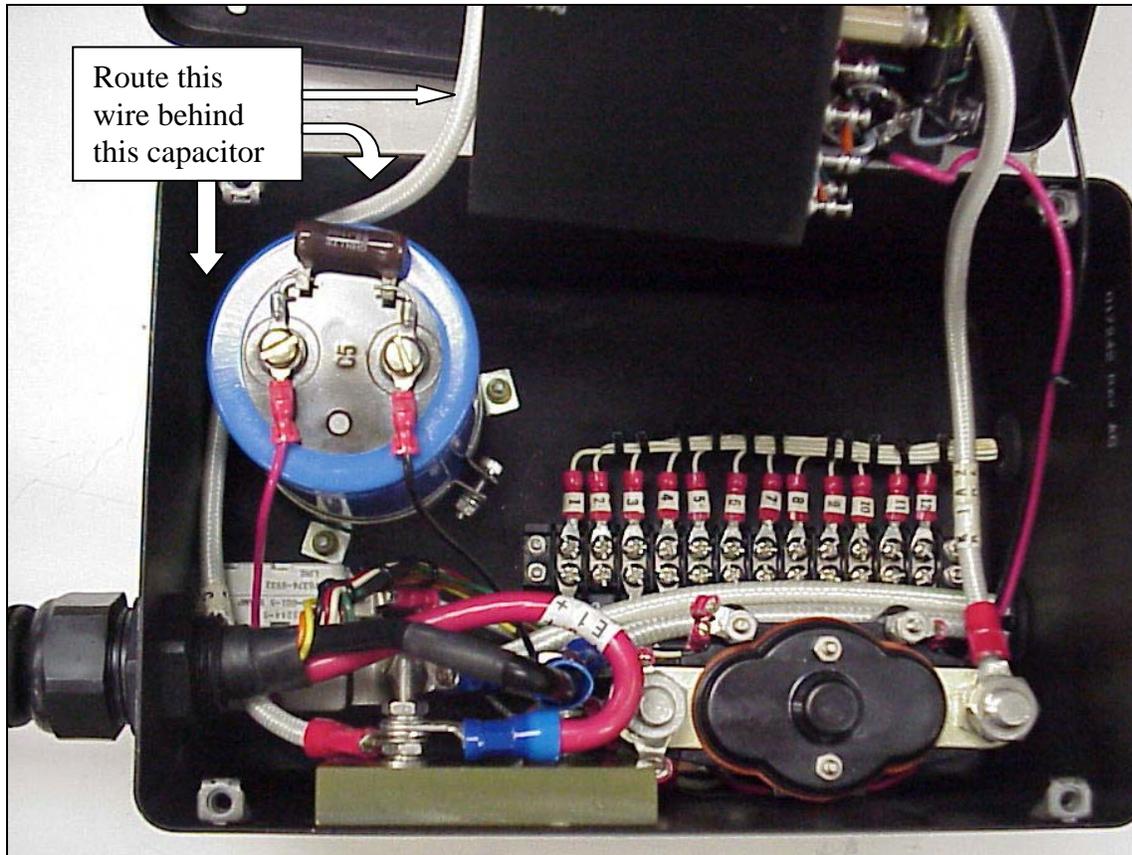
6.5.5. Install the four cover retaining screws and their flat washers. Tighten with a #2 Phillips screwdriver.

6.5.6. With the junction box 70 amp and 5 amp circuit breakers pulled out, restore aircraft 28 volt DC power. Full functional tests of the searchlight will be made shortly.

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**Figure 6. Step 5. FINAL ROUTING OF WIRES IN JUNCTION BOX BEFORE CLOSING COVER.** Routing the (+) wire from the top of the booster diode behind the large blue capacitor is necessary to prevent damaging the wire or its insulation. Make one final verification that all wires are properly placed and all terminals are tight before replacing cover.

#### NOTE

To perform a full functional test of a searchlight system, a minimum of 27.0 volts is required. This voltage can be obtained from an APU connected to AC line power, a fully charged battery cart that has recently been removed from a charger or the aircraft generator with the engine running. If a partially charged battery is used to test the

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system, the searchlight may not start and could be damaged by continuous repeated attempts to start it.

6.5.7. Install and connect the rest of the SX-16 searchlight system.

6.5.8. With the OFF/ON/START switch on the control box in the OFF position, push in the junction box circuit breakers. Nothing should happen.

6.5.9. Move the control box power switch from OFF to the ON position. **DO NOT ACTIVATE THE START SWITCH OR ATTEMPT TO START THE LIGHT AT THIS TIME.** Verify that the fan runs, that the focus motor operates when the focus switch is depressed (audible check) and that the gimbal moves up, down, left, right per commands from the control box. If this is an IR IFCO searchlight, verify the IR filter moves properly.

If there is a reversal of the left-right motion control function, it is probably caused by a wiring reversal in the two wires which supply 28 VDC power to the azimuth (left-right) gimbal motor. The wires connected to junction box terminal strip position 11 and 12 control the left-right motion. Wiring is correct when 11 becomes positive (and 12 is negative) under LEFT motion command. The cover of the junction box must be removed to check polarity or make a wiring change.

The gimbal up-down motion is slightly more difficult to verify. The 8-way control switch is set up to cause the searchlight to move in the direction indicated by the printing surrounding the switch. The switch wiring and printing were selected to be most meaningful when the control box is held in the horizontal position. Pulling the switch towards the operator will raise the front of the searchlight. The wires connected to junction box terminal strip positions 9 and 10 control the up-down motion. Wiring is correct when 10 becomes positive 28 VDC (and 9 is negative) under the DOWN motion command.

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6.5.10. Perform full start and operational test of the searchlight as follows:

# WARNING

## HAZARDOUS AC AND DC VOLTAGES

AC and DC voltages up to 150 volts exist within the junction box during the lamp start cycle

To reduce the risk of death or serious injury:

- Read and follow all instructions
- Never apply power to junction box with lid removed
- Disconnect aircraft battery and/or de-energize 28 VDC bus before opening junction box
- All electrical connections must be performed by qualified personnel

# WARNING

## HAZARDOUS LIGHT BEAM

Searchlight produces a high intensity light beam when operating

To reduce the risk of serious injury or fire:

- Read and follow all instructions
- Never look directly into operating searchlight
- Do not expose personnel to light beam
- Alert all nearby personnel that searchlight will be operating
- Keep all flammable objects away from light beam
- Never walk through light beam

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- Always wear protective eyewear when looking at closely illuminated objects
- Prior to starting searchlight, verify it is pointed down and not toward any objects that may be damaged by the high intensity light beam

# WARNING

## HAZARDOUS INFRARED LIGHT BEAM

**IR fixed or IFCO IR filtered searchlight produces a hazardous light beam that can not be seen with the unaided eye when operating. There are no visible clues that searchlight is on**

To reduce the risk of serious injury or fire:

- Read and follow all instructions
- Never look directly into searchlight when searchlight is running
- Do not expose personnel to light beam
- Alert all nearby personnel that searchlight with an invisible beam will be operating
- Keep all flammable objects away from light beam
- Never walk through invisible light beam
- Prior to starting searchlight, verify it is pointed down and not toward any objects that may be damaged by the high intensity light beam

Full details of system testing are given in the Inspection and Maintenance Manual. See the manual for further testing and adjusting details.

1. At the control box, turn the system ON. Verify the fan starts immediately and runs smoothly.
2. Activate the START function. Watch the area in front of the searchlight where the light is pointed. Within 3 to 4 seconds the searchlight should start (or at least blink). If the light starts, immediately verify it is pointed away from personnel and flammable

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objects. Reposition or redirect the searchlight if required. Let the light continue to run and warm up. If the searchlight will not start, check the Inspection and Maintenance manual for troubleshooting information.

3. Point the light towards a target 50 to 100 meters away, if possible, and verify the focus function works properly, going from a very small intense beam to moderate size and lower intensity. The light beam should not have a dark center.
4. Verify the gimbal's elevation and azimuth stops are set properly to prevent shining the light onto parts of the aircraft which could be damaged by the intense light or heat generated by the absorbed light. Also verify that there are adequate service loops in the flexible exterior searchlight and gimbal cables to prevent kinking or stressing the wires. Run the light through its full range of motion and keep watching the cables. The cables must never tighten in use or restrict the searchlight's motion.
5. Continue running the light for 10 to 15 minutes. Touch all components, cables and connectors. Verify that nothing other than the searchlight and the junction box are more than warm to the touch. If any wires or connectors are hot, this indicates a probable faulty connection, which must be examined and remedied as needed.
6. Turn the light off and restart it several times. It should relight within 3 or 4 seconds. If the light does not relight reliably and consistently, check the Inspection and Maintenance manual for troubleshooting and repair information.
7. Turn the light off. Turn the power back ON to let the fan run to cool the lamp. Let the fan run for 3 to 5 minutes, then turn it off. This is a technique which will tend to extend lamp and searchlight life.

This completes the verification and testing of the system electrical installation.

**7. CONTROL PLAN (Does not apply)**

**8. APPENDIX (Does not apply)**

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Installation Wiring Instructions for  
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Procedure 032384 Revision N/C  
Date: 12/06/99

If you have any problems or questions, do not hesitate to call Spectrolab's Customer Service Department at 1-800-936-4888 or 1-818-898-2895, or fax us at 1-818-361-5102, or contact us by E-mail at [customerservice@spectrolab.com](mailto:customerservice@spectrolab.com).

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