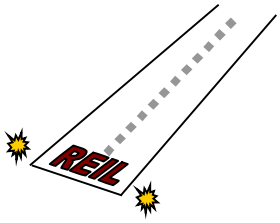
STROBE APPROACH LIGHTING TECHNOLOGY



Technology

L-849I, STYLE A & E
LED CURRENT-POWERED
APPROACH LIGHTING SYSTEM

SAL-1030-I USER'S MANUAL

STROBE APPROACH LIGHTING TECHNOLOGY
108 Fairgrounds Drive, Manlius, NY 13104
603-598-4100

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SCOPE

This manual contains Installation, Operation, and Maintenance information for an LED-based L-849I, Style A/E, Unidirectional Runway Approach Lighting system manufactured by Strobe Approach Lighting Technology (SAL Technology) for use in constant-current powered applications. The manufacturer's designation for this equipment is SAL-1030-I REIL System.

CARTON LABELING

The SAL-1030-I REIL System is packaged into a single carton that includes two (2) Head Assemblies, two (2) Junction Boxes, one (1) Master Control Unit (MCU), and three (3) frangible fittings. Some systems may have accessory items that require separate packaging.

UNPACKING

Inspect each shipping carton for external damage immediately upon receipt. There could be damage to the contents if the carton is damaged. Promptly file a claim with the freight carrier if you have received damaged equipment.

TOOLS RECOMMENDED

#2 Phillips screwdriver; 10-inch shank.
3/16-inch, flat blade screwdriver; 10-inch shank.
Large (3-inch) slip-joint pliers (for pipe and lock nuts)
Wire strippers.
Wire cutters (for small gage wire).
Volt-Ohm meter

ABBREVIATIONS USED IN THIS MANUAL

CSM → Current Sensing Module
CCR → Constant Current Regulator
EMT → Electrical Metallic Tubing
JB → Junction Box
LSM → Light System Master (a circuit card)
MCU → Master Control Unit
NPS → National Pipe Straight thread (not tapered)
NPT → National Pipe Tapered thread
REIL → Runway End Identifier Lights
SLC → Series Lighting Circuit

DISCLAIMER

The information in this manual is believed to be accurate and up to date, however, Strobe Approach Lighting Technology assumes no liability for damages or injuries that may result from errors or omissions, or from the use of information presented herein. Strobe Approach Lighting Technology reserves the right to modify this manual at its own discretion without notification to any person or organization.

APPLICABLE SPECIFICATIONS

This equipment meets or exceeds the requirements in the FAA Advisory Circular, AC 150/5345-51B, and EB 67D.

WARRANTY

Strobe Approach Lighting Technology warrants this equipment and all of its components when used under normal conditions. Failure of any component within one year from the date of shipment will be corrected by repair or replacement, FOB Manlius, NY 13104.

USE OF GENERIC PARTS

Using parts not manufactured or supplied by Strobe Approach Lighting Technology, or unauthorized modification of any part of this equipment, voids the warranty and could render the equipment noncompliant with applicable FAA specifications.

IMPROPER INSTALLATION

This equipment can be damaged if the procedures and recommendations contained herein are not observed during installation. Any damage resulting from incorrect installation will void warranty.

CONTACT INFORMATION

Strobe Approach Lighting Technology may be contacted by the following methods:
Tele: 603-598-4100

Email: sales@saltechnology.com OR info@saltechnology.com

WARNING

Do Not Depend on Interlocks For Safety

Never depend on an interlock switch alone to render the equipment safe. Always turn off and lock out upstream power when performing maintenance on this equipment.

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GENERAL DESCRIPTION

The SAL-1030-I is a current-powered REIL System consisting of two Light Units and a Master Control Unit (MCU). Each Light Unit is made up of an Optical Head and a Junction Box. The heads and junction boxes are separated for shipment and must be enjoined mechanically and electrically during installation. Each Junction Box contains a current-to-dc-voltage power supply and provides a convenient location for electrical connections without having to access the Optical Heads.

The MCU is in a separate enclosure that is electrically connected to the two Junction boxes by means of an RS-485 data bus. The MCU and one of the Head/Junction Box assemblies are intended to be co-located on one side of the runway and derive power from a single (shared) L-830-18 (150 watt) isolation transformer. This is considered to be the Master station.

The SAL-1030-I has three flash intensity modes and switches automatically from one to another as a function of the input CCR current level, or it may be set up to flash at only one of the three available modes.

Fig. 1a
Optical Flash Head

Fig. 1b
Master Control Unit (MCU)

Fig. 1c
SAL 1030-I System
(Second flash head not shown)

EQUIPMENT SPECIFICATIONS

PHYSICAL: Dimensions are in inches (mm); Weight in lbs (kg).

Master Control Unit (Figure 1a).
Dimensions ---------- 6.5H x 13.5W x 12D (165 x 343 x 305)
Weight: ---------- 10.2 (4.6)

Optical Head (Figure 1b).
Dimensions ---------- 15H* x 15W x 4.8D (381* x 381 x 122)
Weight: ---------- 24.6(11.2)
*Height is overall-See Figure 3.

Junction Box (Figure 1c).
Dimensions: ---------- 7.9 x 9.0W x 4.5D (201 x 229 x 114)
Weight: ---------- 8.8 (4.0)

OPERATIONAL:
Current (rms) ---------- 2.8 to 6.6 Amps, 50/60 Hz
Power: (Watts) ---------- 50
Flashes Per Minute ---------- 120
Intensity: (Effective Candelas*, total beam spread) High: 7500 to 22500
Med: 750 to 2250
Low: 150 to 450
Beam Spread: ---------- 30º Horizontal, 10º Vertical.

INSTALLATION

In this section you will find instructions and recommendations for the following:

- Emplacement preparations.
- Installation sequence.
- Accessing the various components of the system.
- Mounting the Master Control Unit (MCU).
- Mounting the Junction Boxes.
- Mounting the Optical Heads
- Zeroing the Horizontal Aiming Scale.
- Zeroing the Vertical Scale and Pointer.
- Electrical connections.

Emplacement Preparations

The SAL 1030-I LED REIL system requires two prepared emplacements: one for the MCU with an adjacent light fixture (Optical Head and Junction Box), and another for the light fixture on the other side of the runway. Each emplacement requires a foundation with 2-inch NPS or NPT female threaded receivers such as floor flanges bolted to a concrete pad, or an in-ground can cover with threaded holes. Detailed drawings for the emplacement foundations are furnished by others.

Recommended Sequence of Steps (Abbreviated)

- Install the Junction Boxes at the prescribed light positions.
- Zero the Horizontal Scale at each light emplacement.
- Install each Optical Head onto its Junction Box with the Horizontal Pointer at the prescribed offset angle (obtained from site drawings).
- Level the Optical Head and Zero the Vertical Pointer.
- Set the prescribed elevation angle at each head.
- Install the Master Control Unit (may be done at any point in the sequence).
- Make electrical connections.

Equipment Access

- The cover to the MCU is secured by quarter-turn latches with padlock provisions on the two front corners of the enclosure.
- Each light emplacement has an Optical Head and Junction Box.
- Each Junction Box has a removeable cover secured by captive screws at each corner.

Optical Heads do not have to be accessed for installation.

INSTALLATION (cont.)

The Master Control Unit (See Figure 2)

Accessories needed but not shipped with the equipment due to variable site requirements.

- 2-inch EMT; length as required to set the MCU at its designated or preferred height above local terrain.

The Master Control Unit (MCU) is provided with a factory-installed compression fitting for 2-inch EMT at the bottom surface of the enclosure. A length of 2-inch EMT is needed but typically provided by others, unless designated as an accessory item at the time of purchase.

IMPORTANT NOTICE

When the MCU is supported by the cover of an in-ground can the EMT support is generally open to the can and serves as a conduit for electrical wiring. But this also allows air to be freely exchanged between the in-ground can and the MCU enclosure, which is exposed to the atmospheric environment. This can lead to the formation of condensation on the inside walls of the enclosure and on components within the enclosure during certain conditions of atmospheric temperature and humidity.

The MCU is shipped with a foam plug that is slotted to allow wire passage. This plug will prevent the free exchange of air between the in-ground can and the MCU enclosure. Failure to install this plug or to provide other means of preventing free air exchange will void the equipment warranty.

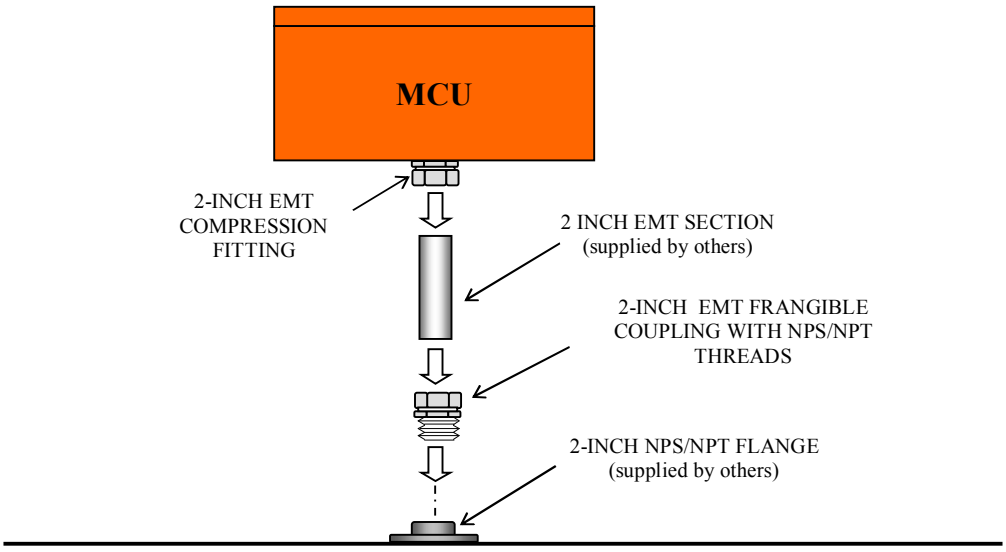

Figure 2
MCU Mounting Details

INSTALLATION (cont.)

The Optical Heads

Junction boxes and Optical Heads are shipped unattached and must be joined together during installation, but the Junction Boxes should be installed before the Optical Heads are attached.

Parts needed for this procedure (at each emplacement):

- Optical Head
- Junction Box
- 2-inch, EMT
  > Length determined by site requirements
  > Not furnished with equipment
- Frangible coupling (with compression fitting)

Installation overview

The Optical Heads are mounted onto Junction Boxes and located on each side of the runway near the runway threshold. Location details are typically obtained from drawings provided by others.

Each Junction Box is supported by a single 2-inch section of EMT and various couplings as shown in Figure 3. The length of the EMT will generally be different from site to site; therefore it is not furnished with the equipment. The length is usually chosen to achieve a certain overall height above grade as called out on site drawings provided by others.

The MCU and one of the light units are intended to be co-located at an emplacement with two threaded receivers separated by 8 inches (203 mm) center-to-center. This is considered to be the Master station.

Mounting and Assembly Details (Refer to Figure 3)

Use the following procedure as a guide:

- Install the frangible coupling onto the ground attachment device (typically an in-ground can cover or a threaded floor flange bolted to a concrete pad).
- Install the EMT and securely tighten the compression fitting.

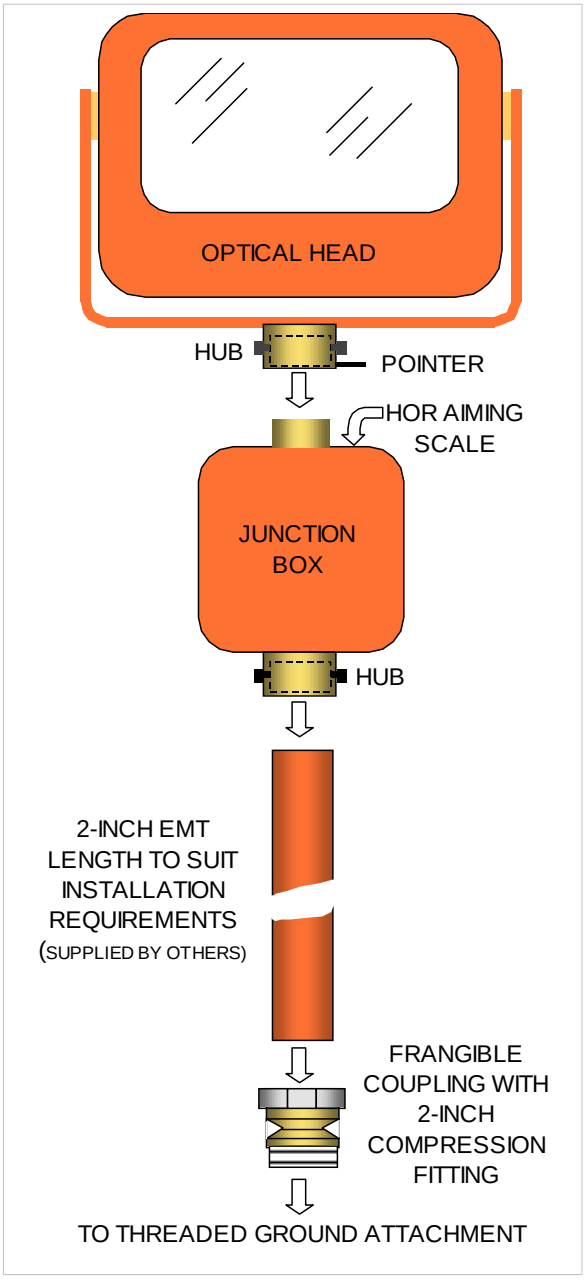

Fig 3
Typical Head Mounting Details

- Set the Junction Box onto the upper end of the EMT and lightly tighten the two hex-head bolts. Firm tightening will be done later during the aiming procedure.

Do not turn the setscrew. It has been properly set at the factory.

INSTALLATION (cont.)

Zeroing and Aiming Instructions

Horizontal

Optically enhanced LEDs, unlike conventional light sources, have very sharply defined beams; aiming is therefore very critical. A horizontal scale has been provided to assist in aiming, but it must be properly aligned with the runway in order to use it effectively. Horizontal scale alignment (zeroing) can be performed before setting the Optical Head onto the Junction Box.

The horizontal scale is attached to the top surface of the Junction Box. The scale ranges from –15º to +15º in increments of 1º. A pointer affixed to the Optical Head assembly indicates the aiming direction of the head, but first, the scale must be accurately referenced to the runway. This requires orienting the Junction Box to face exactly downrange; that is, parallel to the centerline of the runway. This can be achieved by following the steps below:

- Establish an aiming target such as a stake or a person placed the same offset distance from the runway centerline as the light emplacement. The target should be at least 200 feet down range from the emplacement.
- Use an edge of the Junction Box as a sighting line and rotate the Junction Box about its supporting pipe until the edge points directly towards the target.
- Securely tighten the hex-head bolts when the Junction Box is aligned with the aiming target. The cone-point setscrew prevents the Junction Box from turning while the bolts are being tightened. The horizontal scale is now referenced to the runway.
- Install the Optical Head onto the Junction Box by setting the head's hub over the mounting post on the top surface of the J-B.
- Lightly tighten the hub's two hex-head bolts.

Do not turn the setscrew. It has been properly set at the factory.

- Rotate the head until the pointer rests on the horizontal offset angle defined for this emplacement and firmly tighten the two hex-head bolts.

Vertical

The head is secured vertically by a zero-backlash turnbuckle. Turning the body of the turnbuckle tilts the head. In normal operation the head will be pointing somewhat upwards; that is, above the horizon.

You should avoid tilting the head to point below the horizon because the turnbuckle end-fittings can become disengaged which would allow the head to swing freely on its pivots.

You will use the spirit level residing in a cavity just above the vertical pointer to zero the vertical scale.

To zero the vertical pointer:

- Rotate the body of the turnbuckle until the level bubble lies symmetrically between the two reference lines.
- Loosen the setscrew that holds the vertical pointer and set the pointer to 0º on the scale.
- Tighten the setscrew while the pointer rests on zero.

Use the turnbuckle to set in the vertical aiming angle prescribed for this emplacement.

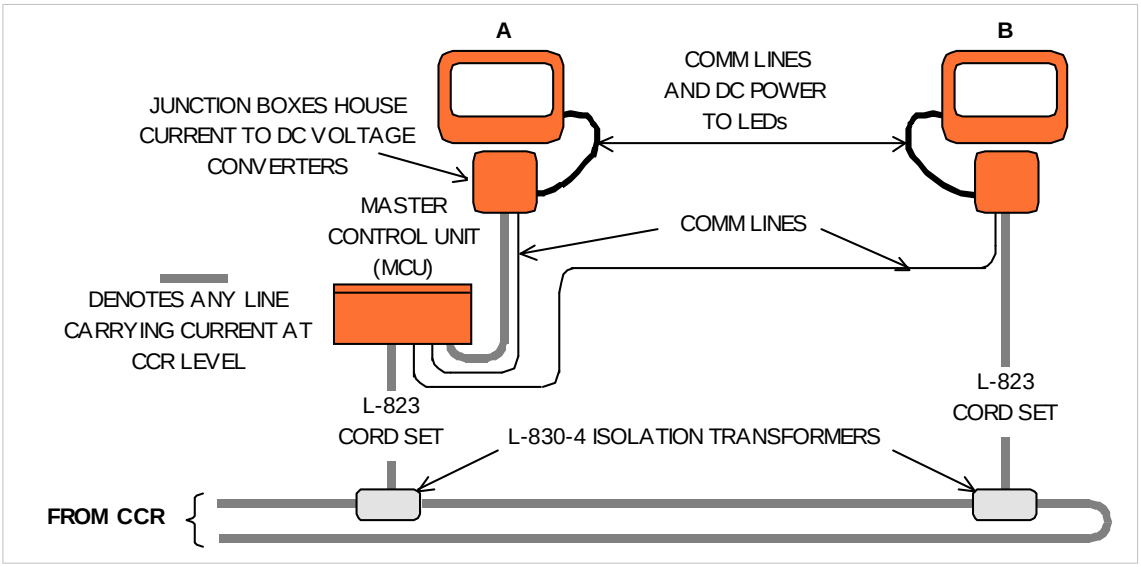

Fig. 4
Electrical Overview

Wiring Connections

Installation wiring consists of making the electrical connections for power and communications (Comm). All connections are made at terminal blocks that accept bare-wire insertions under screw clamps; no special wire terminations or tools are required.

There are two stations designated as A and B in Figure 4. The MCU and one light unit reside at the A station. This is considered to be the Master station. The MCU is not co-mounted on the same supporting pipe as the light unit, but they both may be mounted on the ground attachment base at 8 inches separation (standard in-ground can cover spacing).

Power wiring consists of attaching L-823, two-wire, cord sets to designated terminal blocks. At station A the L-823 is connected to TB101 in the MCU. Two power conductors to the light A Junction Box are also connected at TB101. Power wiring at station B consists of attaching the L-823 cord set directly to designated terminals at TB201 in the Junction Box.

Comm wiring must satisfy the requirements for an EIA RS-485 data bus. The comm cable must have an overall shield and at least three conductors. Two of the conductors are for balanced-line data transmission (designated as Comm A and Comm B), and must be twisted together. The third conductor is an ***isolated*** ground conductor and must not be twisted in with Comm A and Comm B. The isolated ground connection is designated as **CGi** at the terminal blocks.

Do not connect the CGi conductor to chassis ground.

For separation distances typically encountered in REIL installations (< 500 ft) a shielded cable consisting of two twisted pairs is generally acceptable. One twisted pair would be used for Comm A and Comm B as described above; the other twisted pair could be tied together as one conductor and used for the CGi function. This type of cable would be used between the MCU and the light unit at station B.

Connections at the MCU

TB101 is the ***input*** terminal block for Primary Power. See Figure 5.

- Connect the two conductors L-823 cord set conductors to the positions marked A and B on the terminal block. These connections are not polarity sensitive.

- Power to light A is distributed from positions 5 & 6 on TB101 via two conductors that are part of a harness from light A to the MCU. ***These connections are polarity sensitive.*** The black wire must be connected to position 5 and the red wire to position 6.

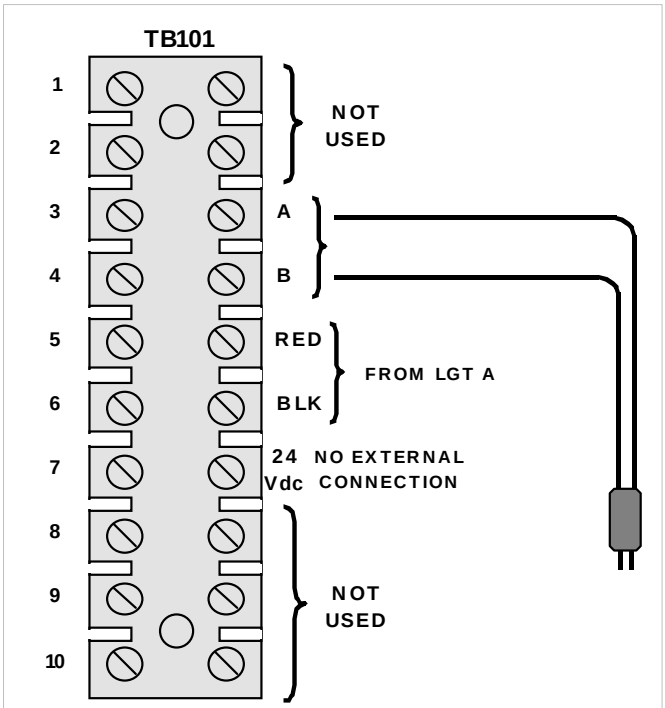

Fig. 5
MCU Input Terminal Block

TB102 is the ***output*** terminal block. See Figure 6. It provides connections for communications to both Optical Heads through their respective Junction Boxes.

An RS-485 compatible cable with AWG 22 (min) wire such as Belden 3106A or 3107A is required as a Comm cable to Station B. This cable is not normally provided with the equipment.

A low capacitance, shielded cable with two twisted pairs may be used in lieu of the Belden cable mentioned above. In this instance the two conductors of the second twisted pair would be used as a single conductor for the CGi connection.

The RS 485 data transmission signal is phase-sensitive; therefore a line originating as Comm "A" at the MCU must be connected to Comm "A" at its designated Junction Box.

Optical Heads are identified as #1 and #2 (Station A & Station B) at the MCU output terminal block (TB102). Observe and follow the labeling to ensure proper head addressing for automatic data logging.

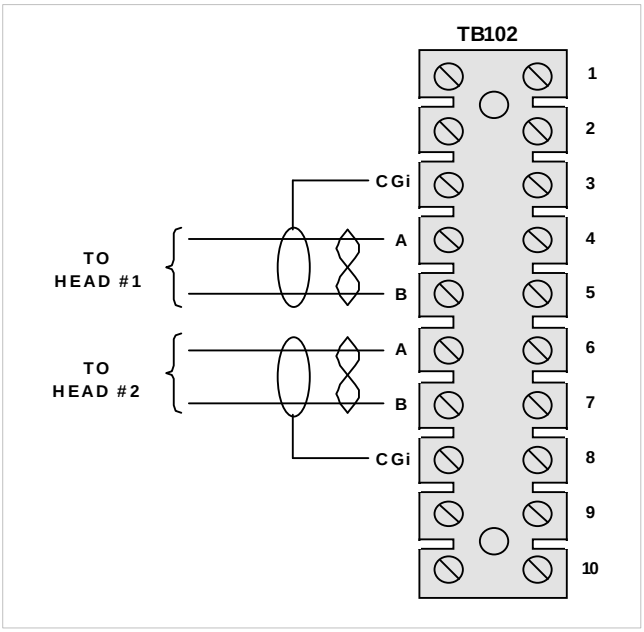

Fig. 6
MCU Output Terminal Block

Do not connect CGi to <u>chassis</u> ground.

Connections at the Junction Boxes

Communications and ac power conductors are brought into the Junction Boxes through the 2-inch EMT columns supporting them. Five-conductor, color-coded harnesses carry communications and dc power from the Junction Boxes to the Optical Heads.

The electrical connections at station A, the Master location) are shown in Figure 7.

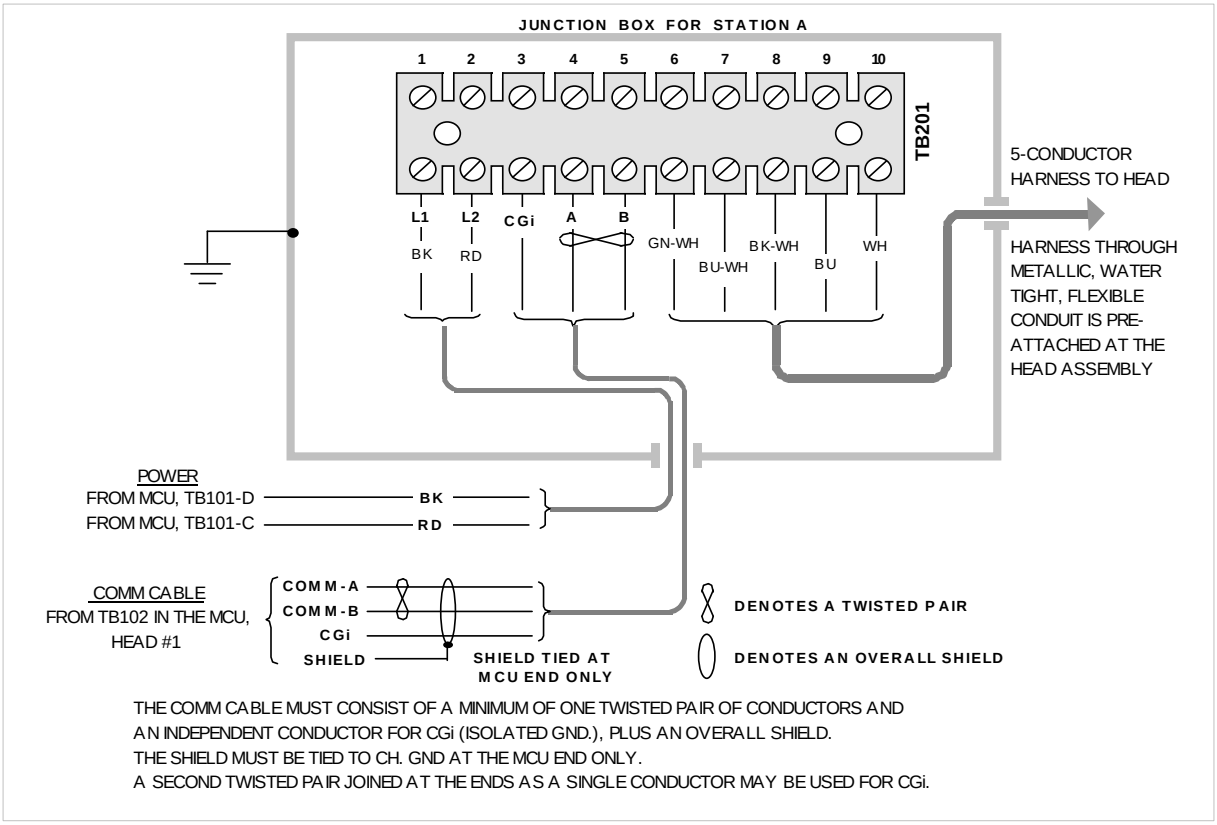

Fig. 7
Junction Box at Station A

The constant-current ac power to this Junction Box comes in on Red and Black conductors from TB101, positions 5 & 6, in the MCU. These power connections are phase sensitive so the color coding shown in Figure 7 must be maintained.
The Comm connections between the MCU and the light unit originate at TB102 in the MCU. Figure 6 shows that there are two head designations for Comm signals at TB 102: Head #1, and Head #2. The head at station A is arbitrarily designated as Head #1 in these instructions.

The connections to the Optical Head are made via a five-conductor harness through a flexible, metallic conduit that is pre-attached to the head. Connections are made at TB 201 in the Junction Box at color-coded terminals.

The housing of the Junction Box must be attached to a grounding stake as shown in Figure 9.

Connections at the Junction Boxes (cont)

The electrical connections at station B are shown in Figure 8.

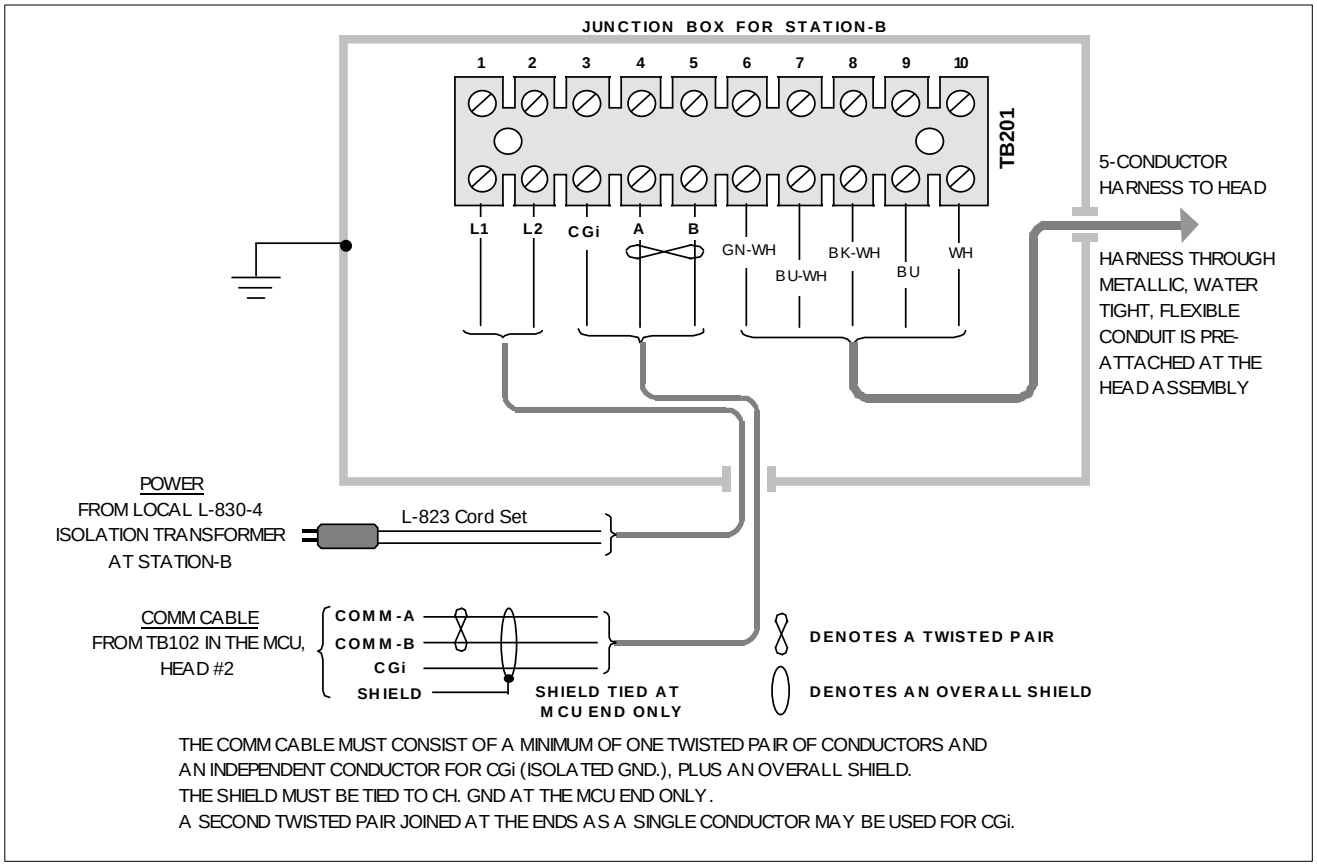

Fig. 8
Junction Box at Station B

The electrical connections at this Junction Box are similar to those described for station A, but the ac power originates directly from a local L-830-18 Isolation Transformer instead of from the MCU. Furthermore, the connections are not polarity sensitive, therefore the two conductors of the L-823 cord set may be arbitrarily connected at TB201-1 & 2.

Output connections to the head are the same as those already described for station A.

Lightning Protection

System grounding and lightning protection are two different electrical circuits that should never be interconnected. Grounding is part of the internal signal circuit that may be carried (if necessary) from one light unit to another.

This system derives its power from Isolation Transformers and is thus not referenced to earth through the source of power. The communication lines are also isolated and not referenced to ground. Thus each station is electrically isolated by design, but it is necessary to provide a grounding rod at each location in order to achieve satisfactory lightning protection. The grounding rod is connected to metallic housings or to internal metallic structures. This is depicted in Figure 8.

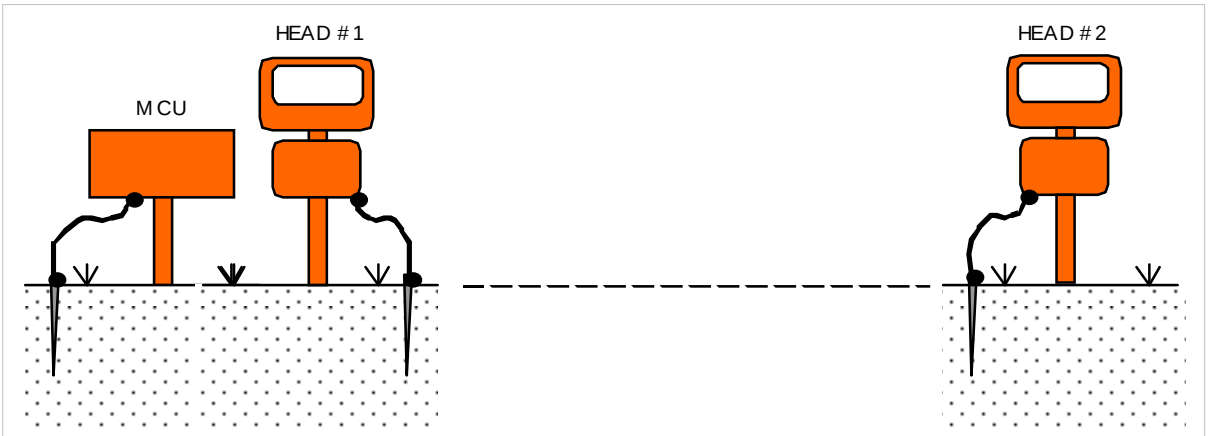

Fig. 9

GROUNDING THIS EQUIPMENT TO A COUNTERPOISE CONDUCTOR COULD INCREASE THE RISK OF LIGHTNING DAMAGE

THIS COMPLETES INSTALLATION INSTRUCTIONS

FUNCTIONAL DESCRIPTION

The SAL 1030-I REIL is a Style A/E, current-powered system consisting of two Optical Heads and a Master Control Unit (MCU). Each head has an associated Junction Box that contains a dc Power Supply.

The heads receive flashing and other operating commands from the MCU, and send monitored status information in return. Selected operating parameters are shown visually on a numerical array accommodating values up to 8888. See Figure 10.

Operation is typically automatic, but flash intensity functions can be set in manually for checkout purposes. The two Optical Heads flash simultaneously upon a single command from the MCU. Programming set in at the factory controls flash rate. There are no selective programming requirements that must be set in at the field.

The light beam is slightly greater than 10º vertically by 30º horizontally. This beam coverage is formed by the composite effect of an array of high-performance, white LEDs.

The array is monitored in such a way that a failure of a complete row or column, or a combination that exceeds a certain number of LEDs at random locations, will turn on an alarm signal light and cause an alarm relay to operate. The alarm relay is for external remote distribution.

Certain Error Codes are generated as a result of monitoring. These are displayed intermittently on the four-segment numerical display.

THEORY OF OPERATION

The SAL 1030-I REIL is a micro-controller based system consisting of two Optical Heads and a Master Control Unit (MCU). Each Optical Head consists of an array of 60, optically enhanced, high performance, LEDs arranged geometrically to form a vertical beam coverage of at least 10º and a horizontal coverage of at least 30º.

The MCU has a single micro-controller card (LSM card) for all input and output functions. An RS-485 data bus provides communications between the MCU and the Optical Heads. A micro-controller card in each head communicates with the LED arrays in that head, collecting status information to send back to the LSM card. Each head is identified by an address code for data tagging at the MCU.

A low-capacitance data transmission line, suitable for RS-485 drivers and receivers, can support satisfactory communications at the baud rate of this system for up to 4000 feet.

While the heads communicate only with the MCU, the MCU has connections outside of the system such as primary power, and, optionally, a remote alarm activating circuit. These lines may be subjected to voltage surges or other electrical disturbances. The externally connected lines are provided with over-voltage protection within the MCU. Similar surge protection guards the RS-485 data bus to the Optical Heads.

The MCU is powered by a 24 Vdc switchmode power supply driven by constant current from a CCR.

Each Optical Head is powered by a 50 Vdc switchmode power supply located in a Junction Box (part of each head emplacement).

The Head Controller cyclically scans the LED array collecting temperature, voltage, and flash information. An alarm signal is generated if either head develops an operating condition that falls below a prescribed safe level (EB67D). Examples are: more than 11 (20%) failed LEDs in a single head, or an incomplete column or row of LEDs. A fail-safe Alarm Relay that can be used for remote alarm signaling is also activated.

OPERATING INSTRUCTIONS (See Figure 10)

Controls

SW 101, which is a cover-activated interlock switch, controls primary power. The plunger of SW 101 may be pulled up to energize the MCU for service.
There are two switches in the MCU for operating control:
The MODE CONTROL rotary switch (SW 102) selects operating modes, manual or automatic (remote).
The INDEX pushbutton switch (SW 103) selects parameters for the four-digit numerical display.

The operating modes from SW 102 are:

- REM (Remote)
- Off
- MAINT (Maintenance)
- LOW
- MED (Medium)
- HIGH

Use REM to control flash intensity from CCR current level (via the Current-Sensing Module).
Use OFF to inhibit flashing while the system is energized.
Use MAINT to operate the heads in a low-level, steady (non-flashing) mode (May help to identify the location of a non-operating LED).
Use LOW to flash the LEDs at Low intensity.
Use MED to flash the LEDs at Medium intensity.
Use HIGH to flash the LEDs at High intensity.

Depressing the INDEX switch cycles the status LEDs and the data displayed on the numerical LED array.
VOLTS: When lit the numeric array displays the average voltage across each group of 12 LEDs in both heads combined.
TEMP: When lit the numeric array displays the average operating temperature of the LEDs in both Optical Heads combined.
HOURS: When lit the numeric array displays the total no-fault operating hours at HIGH intensity.

To activate the system when the cover to the MCU is open and primary power is applied:

- Pull the Interlock Switch up (Service mode).
- Turn the Rotary Switch to any of the positions below:
  > MAINT
  > LOW
  > MED
  >HIGH

To activate the system for Normal Operation:

- Place the Rotary Switch in the REM position.
- Close the cover
- Apply primary power (CCR)

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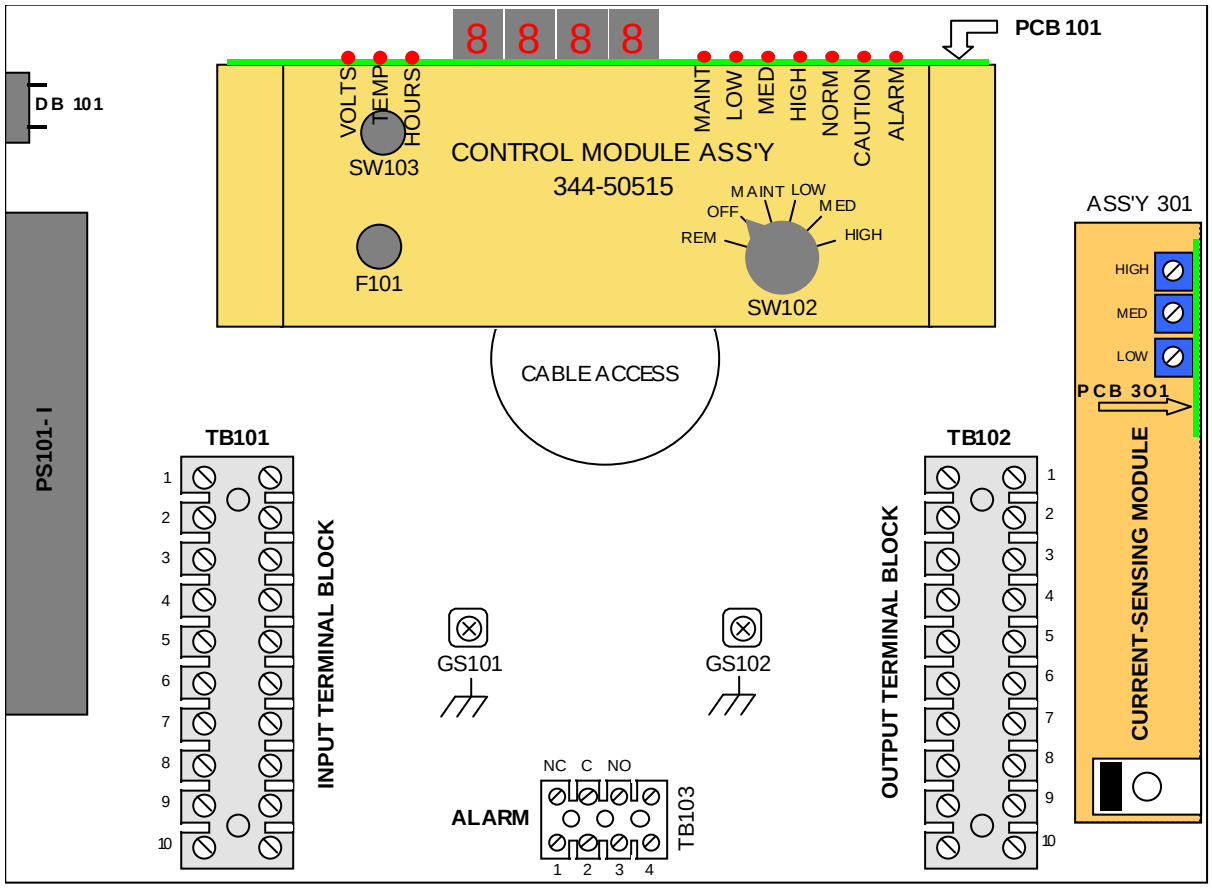


Fig. 10
Component Location Diagram

Status Monitoring

The default display parameter when power is applied to the MCU is High mode hours. If an Error is detected the display will alternate between the Error Code (or Codes) and the selected display parameter (Volts, Temp, or Hours).

There are two LEDs for critical status monitoring.

CAUTION: This LED lights when an abnormal, but not disabling, condition exists. It signals attention and further investigation into the condition and its cause. Examples are:

- More than 2 LEDs have failed (composite of both heads).
- Temperature has been reported to be more than **80 ºC**.
- LED voltage has been reported as below **28 Vdc**.

See the troubleshooting section for recommended actions if any of these conditions arise.

ALARM: This LED lights and an ALARM relay operates (de-energizes) when a disabling condition has developed. Examples are:

- More than 1**2** LEDs fail to flash or report in either head.
- One head is not reporting.

See the troubleshooting section for recommended actions if any of these conditions arise.

SET UP INSTRUCTIONS

This equipment is powered by current from a CCR, and derives flash intensity instructions by detecting the level of the CCR current. Potentiometer adjustments are necessary in order to associate specific flash intensities with specific levels of current. These adjustments are made at the current-sensing card (PCB301) depicted in Figure 10.
There are two principal types of CCRs used to power this equipment.
The basic type is L-828, Class 1 (6.6 amps). In this class there are two styles:

- Style 1 (3-step).
- Style 2 (5-step).

Setting up for 3 intensities from a 3-step CCR

- Open the cover of the MCU and set the interlock switch (SW101) to the Service Position (pull up).
- Turn all three potentiometers on PCB301 fully counter-clockwise (CCW).
- Set the Mode Switch (SW102) on the Control Module to REM.
- Set the CCR to Step 1.
- Adjust the LOW pot (on PCB301) slowly clockwise (CW) until the adjacent LED turns on.
  >The LED marked LOW on the LSM card (PCB101) should also illuminate.
- Set the CCR to Step 2.
- Adjust the MED pot slowly clockwise until the adjacent MED LED on the CSM card turns on.
  >The LOW LED on PCB301 should remain on.
  >The LED marked MED on PCB101 should illuminate and the LOW LED should turn off.
- Set the CCR to Step 3.
- Adjust the HIGH pot slowly clockwise until the adjacent HIGH LED on the CSM card turns on.
  >The MED & LOW LEDs on PCB301 should remain on.
  >The MED & LOW LEDs should remain on.
- Run the CCR back down through the Steps while observing automatic intensity mode changes. Re-adjust any potentiometer if necessary.

Setting up for a single intensity from a 3-step CCR

The procedure below applies to single HIGH intensity operation. It would be similar if the single intensity were MED or LOW.

- Open the cover of the MCU and set the interlock switch (SW101) to the Service Position (pull up).
- Turn the LOW and MED potentiometers on PCB301 fully counter-clockwise (CCW).
- Turn the HIGH potentiometer fully clockwise (CW).
- Set the Mode Switch (SW102) on the Control Module to REM.
- Set the CCR to Step 3.
- Adjust the LOW pot on PCB301 slowly CW until the adjacent LED turns on.
  >The HIGH LED on PCB301 should also illuminate.
  >The MED LED on PCB301 should remain off.
  >The HIGH LED on PCB101 should turn on.
- Set the CCR to Step 2.
  >The HIGH & MED LEDs on PCB301 should turn off.
  >The mode indicating LEDs on PCB101 should be off.
- Re-adjust the LOW potentiometer on PCB301 for the turn-off condition if necessary.

SETUP INSTRUCTIONS (cont)

Setting up for 3 intensities from a 5-step CCR:

- Open the cover of the MCU and set the interlock switch (SW101) to the Service Position (pull up).
- Turn all three potentiometers on PCB301 fully counter-clockwise (CCW).
- Set the Mode Switch (SW102) on the Control Module to REM.
- Set the CCR to Step 1.
- Adjust the LOW pot (on PCB301) slowly clockwise (CW) until the adjacent LED turns on.
  >The LED marked LOW on the LSM card (PCB101) should also illuminate.
- Set the CCR to Step 2.
  >Do not make any potentiometer adjustments.
  >The LOW LED on PCB301 should remain on.
  >The LOW LED on PCB101 should remain on.
- Set the CCR to Step 3.
- Adjust the MED pot slowly clockwise until the adjacent MED LED on PCB301 turns on.
  >The LOW LED on PCB301 should remain on.
  >The LED marked MED on PCB101 should illuminate and the LOW LED should turn off.
- Set the CCR to Step 4.
- >Adjust the HIGH pot slowly clockwise until the adjacent HIGH LED on PCB301 turns on.
  >The MED & LOW LEDs on PCB301 should remain on.
  >The HIGH LED on PCB 101 should turn on.
- Set the CCR to Step 5.
  >Do not make any potentiometer adjustments.
  >The High, MED, & LOW LEDs on PCB301 should remain on.
  >The HIGH LED on PCB101 should remain on.
- Run the CCR back down through the Steps while observing automatic intensity changes as indicated by the status LEDs, and make any necessary potentiometer re-adjustments.

Setting up for a single intensity from a 5-step CCR

The procedure below applies to single HIGH intensity operation. It would be similar if the single intensity were MED or LOW.

- Open the cover of the MCU and set the interlock switch (SW101) to the Service Position (pull up).
- Turn the LOW and MED potentiometers on PCB301 fully counter-clockwise (CCW).
- Turn the HIGH potentiometer fully clockwise (CW).
- Set the Mode Switch (SW102) on the Control Module to REM.
- Set the CCR to Step 5.
- Adjust the LOW pot on PCB301 slowly CW until the adjacent LED turns on.
  >The HIGH LED on PCB301 should also illuminate.
  >The MED LED on PCB301 should remain off.
  >The HIGH LED on PCB101 should turn on.
- Set the CCR to Step 4.
  >The HIGH & MED LEDs on PCB301 should turn off.
  >The mode indicating LEDs on PCB101 should be off.

Re-adjust the LOW potentiometer on PCB301 for the turn-off condition if necessary.

TROUBLESHOOTING

Problems addressed in this section fall into two broad categories: Those encountered upon initial turn-on following installation, and evolving problems that occur after the system has been operating properly for any length of time. The most common problem that will likely be encountered is a failure to flash. This could involve either one, or both, Optical Heads.

A. Problems occurring at installation

The most common problems occurring when a system is first turned is failure to flash at all, and Remote Control problems.

1. Failure to Flash.

   A number of conditions could cause initial failure to flash.

   - Upon applying power observe whether the numeric display and status LEDs on the Master Control Board light up. If not, check the source of primary power.
   - Make sure the Mode Selector Switch in the MCU is set to REM.
   - Check both Comm lines to verify that Comm-A in the MCU (TB102) goes to Comm-A in the respective remote Junction Box (TB201), and that Comm-B similarly goes to Comm-B.
   - Verify with a meter that there is 24 Vdc on the TB101 terminal block in the MCU (see Figure 5). >Check F101 if there is no voltage present.
   - Verify that there is 48 to 50 Vdc on the TB201 terminal block marked "+48V in each of the junction boxes. There is no fuse.

2. Remote Control Problem

   The system fails to respond to remote control commands or responds incorrectly.

   - Be sure the Mode Selector Switch is set to the REM position.
   - Verify the set up procedure for this installation.
     >Replace PCB301 if setup cannot be performed as instructed.

B. Evolving Problems

The manifestation of an evolving problem is nearly always a failure of one or both heads to flash. When flashing has been shut down due to a serious malfunction the system will override the shutdown briefly upon cycling primary power. This enables one to evaluate the cause by directly viewing each of the heads, as power is re-applied.

- Choose the MAINT MODE position on the Mode Selector Switch. In this mode the heads operate at a low level of steady illumination that is suitable for direct viewing. One can quickly ascertain which head has created the malfunction either by not lighting at all, or by having many LEDs that do not turn on.
- If none of the LEDs in one of the heads are operating check the power supply in that head's Junction Box. Look for 48 Vdc between the Blue and White wires (plus & minus 48 Volts) at TB201. If there is no dc voltage at those terminals verify that primary power is present at terminals L1 & L2. With primary power present but no dc voltage the power supply is defective and must be replaced.
- If the dc voltage checks OK then the problem could be in the Comm cable or connections.
- If dc voltage is present and the LEDs are on (steady mode), but a portion of the array is unlit the problem resides within the head. Contact Customer Service at SAL Technology if this condition has been ascertained.

MAINTENANCE

The following tips will help assure long, reliable operation.

- Keep door and cover seals in good condition. Repair or replace any that are damaged.
- Inspect and maintain grounding at each emplacement.
- Keep earth grounds separate from any counterpoise conductor.
- Be sure there is no free air exchange between an in-ground chamber and the MCU.
- Be sure there is no free air exchange between an in-ground chamber and a Junction Box.
- Periodically check the tightness of terminal block clamping screws.
- Inspect the flexible conduit between the Optical Heads and associated Junction Boxes
- Repair or replace any damaged conduit or fitting.

REPLACEABLE PARTS

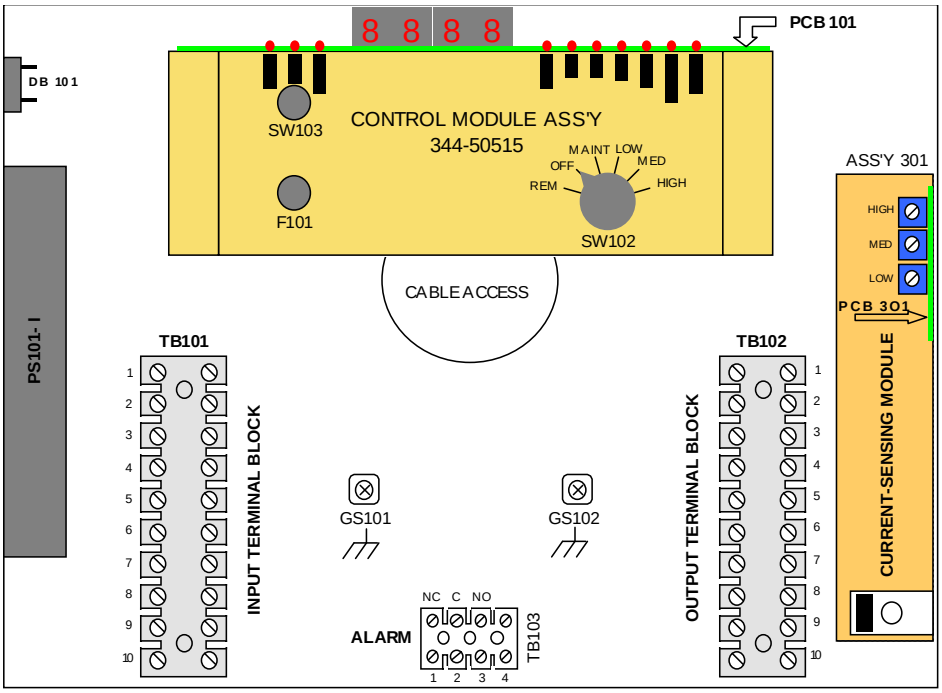
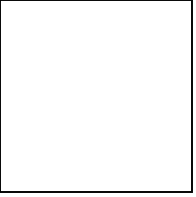


Figure 10
Component Location Diagram

Table 1, Replaceable Parts

REF	DESCRIPTION	PN
DB101	Diode Bridge	44-00174
F101	Fuse	55-00267
GDT	Gas Discharge Tube	44-00177
PS 101-I	24 Vdc Power supply	44-00175
PS 201-I	50 Vdc Power Supply (located in Junction Boxes)	44-00176
PCB-101	Printed Circuit Board, LSM-I	344-30105-I
PCB-301	Printed Circuit Board, CSM	255-20086
SW101	Interlock Switch	55-00201
FH 1030	Flash Head	344-30520



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