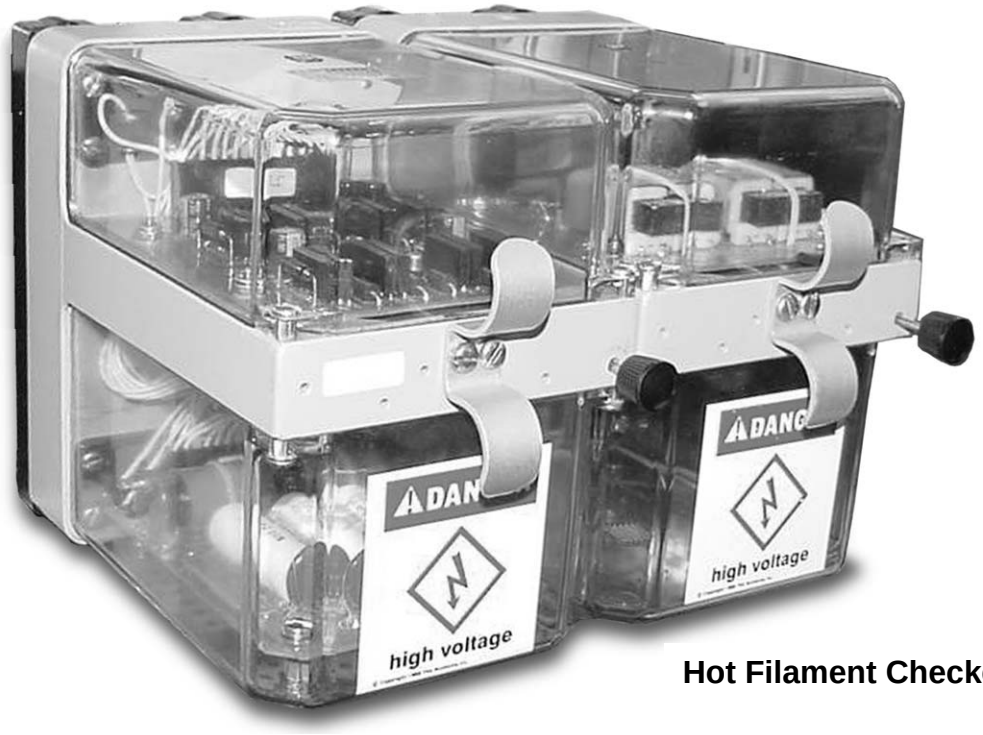
AC LAMP DRIVER

HOT FILAMENT CHECKER (OPTIONAL)
REDUNDANCY PCB (OPTIONAL)
(Part Numbers N40104901, N40104904)



Hot Filament Checker

AC Lamp Driver

Proprietary Notice

Important Notice

ASTS USA constantly strives to improve our products and keep our customers apprised of changes in technology. Following the recommendations contained in the attached service manual will provide our customers with optimum operational reliability. The data contained herein purports solely to describe the product, and does not create any warranties.

Within the scope of the attached manual, it is impossible to take into account every eventuality that may arise with technical equipment in service. Please consult an ASTS USA local sales representative in the event of any irregularities with our product.

ASTS USA expressly disclaims liability resulting from any improper handling or use of our equipment, even if these instructions contain no specific indication in this respect. We strongly recommend that only approved ASTS USA spare parts are used as replacements.

Revision History

Rev.	Date	Nature of Revision
0	March 2001	Original Issue
1	August 2003	Incorporated ECO 139876-2; Added 24-volt version of the lamp driver to the manual.
2	April 2009	Incorporated ECO 140104-8; revised Sections 1.1, 2.1.3, 11.1, 11.2, 11.5, and Figure 3-1.
3	April 2010	New signal lighting transformer information added to Section 3.2.2, Section 5.1, Section 11.5, Table 11-5, and Figure 11-1.

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1. INTRODUCTION

1.1. Description

This manual explains the components and their usage, integrated with Microlok II, for the control of Signal lamps using alternating current as the power source.

NOTE

In the original application of the lamp Driver (N401104901) and Filament Checker (N40104905), two 25 watt incandescent lamps were the intended load. The Filament Checker was designed with an output to satisfy a 12 volt Microlok input when both lamps were lit. When only one lamp was lit, the output would drop below the Microlok threshold. The Microlok logic interpreted this as light-out condition.

New components have been added to extend the range of applications. Specifically, variations of the Lamp Driver, Filament Checker, and Lighting Transformer extend the frequency range (50Hz - 100Hz). The new design will work with 25 watt incandescent lamps or AREMA-compliant LEDs.

There are four components:

1. AC Lamp Driver: It switches the nominal 115 VAC power to four independently controlled outputs. Each output is activated by either nominal 12 or 24 volt DC inputs.

2. Step-down transformers: They have multiple secondaries that serve as the primary means to adjust lamp voltage. They are designed with exceptionally low magnetizing current so that light out detection can be implemented by sensing primary current.

3. Hot Filament Checkers: A passive device that converts AC current into a proportional DC output.

4. Redundancy Printed Circuit Board: It consists of four diode "OR" channels intended for AC lamp control with redundant Microlok applications.

The AC Lamp Driver provides power outputs to drive up to four separate ac lamp circuits. The unit is designed to drive lamp circuits that each consist of a W2 transformer and two 10 VAC, 25W lamps maximum (see Section 2.1.6, Electrical Specifications). Two enable inputs (primary and secondary) are required to provide a power output. In most applications, these 12 VDC or 24 VDC commands are generated by ASTS USA MICROLOK® II or MICROTRAX® wayside systems. The AC Lamp Driver is specifically designed for compatibility with these systems.

An optional component - the Hot Filament Checker (P/N N40104902) - can be installed with the AC Lamp Driver to check filament integrity for up to four lamp circuits. The unit provides output signals that correspond to the presence or absence of lamp filaments. The Hot Filament Checker is designed to function with a W2 transformer and a maximum of two 10 VAC, 25 W lamps per circuit (minimum of one 25 W lamp).

When installed with the optional Redundancy Printed Circuit Board (PCB) (P/N N17003201), the AC Lamp Driver can receive enable inputs from two separate control units (MICROLOK® II or MICROTRAX®).

1.2. Applications

Figure 1-1 and Figure 1-2 are simplified block diagrams that provide an overview of a typical lamp circuit application. Figure 1-1 shows a typical application of the AC Lamp Driver; Figure 1-2 shows an application using the Hot Filament Checker.

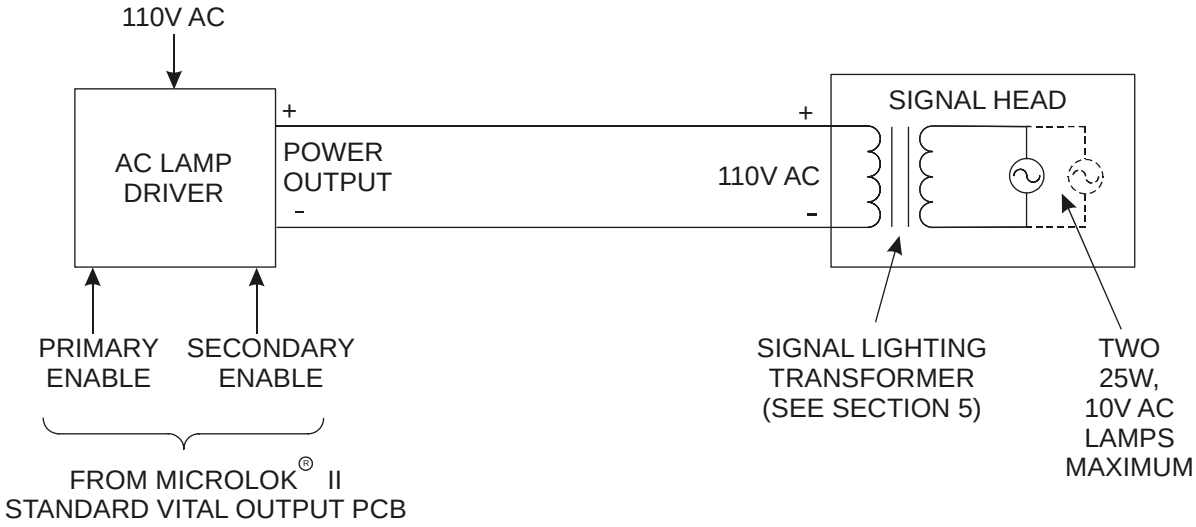


Figure 1-1. Typical Application - AC Lamp Driver

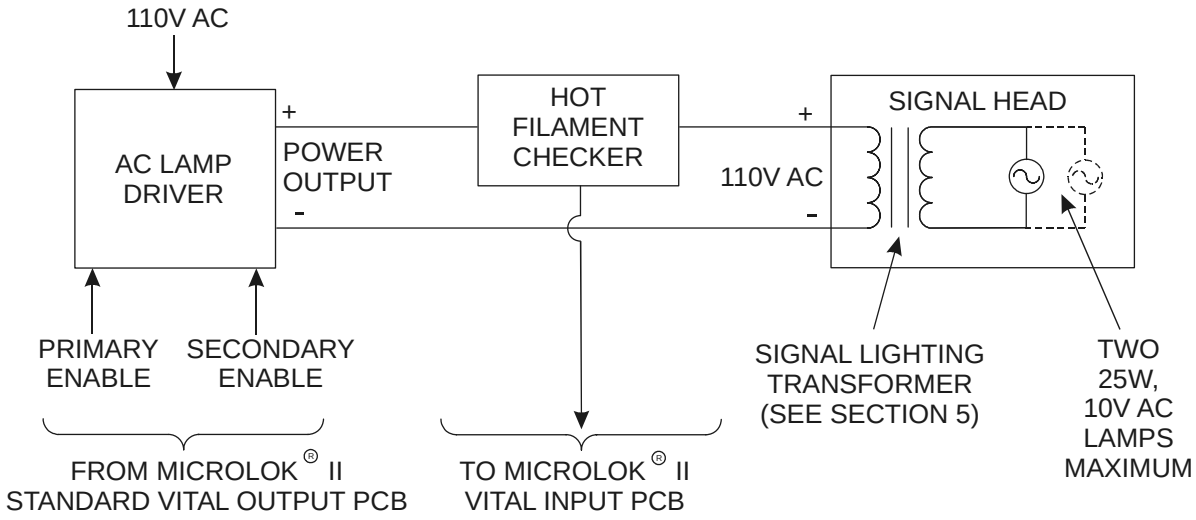


Figure 1-2. Typical Application - AC Lamp Driver with Optional Hot Filament Checker

1.3. Purpose of Manual

This service manual provides descriptive information, specifications, and installation and maintenance procedures for the AC Lamp Driver, the optional Hot Filament Checker, and the optional Redundancy PCB.

1.4. Conventions in Manual

1.4.1. Abbreviations and Acronyms

A Ampere

ac alternating current

ASTS USA Ansaldso STS USA (formerly known as Union Switch & Signal)

AWG American wire gauge

cm centimeter

dc direct current

LED light-emitting diode

MOV metal oxide varistor (protection device for electronic components)

PCB printed circuit board

rms root-mean-square (method for expressing ac voltage rating)

Hz	Hertz
in.	inch
kg	kilogram
lb	pound
oz	ounce
V	Volt
Ω	ohm

1.4.2. Definitions

Application engineering	The organization responsible for the design and integration of the overall system of which the AC Lamp Driver, Hot Filament Checker, and Redundancy PCB are constituent parts.
CAUTION	Caution statements indicate conditions that could cause damage to equipment.
Reference designator	An abbreviation assigned to designate an electrical component. It generally consists of a capital letter and a number. Each letter designates a particular type of component. For example, "L1" identifies an inductor and "R1" identifies a resistor.
WARNING	Warning statements indicate conditions that could cause physical harm, serious injury, or loss of life.

1.5. Safety

Read and thoroughly understand this manual before attempting any of the procedures listed. Pay particular attention to the Warning and Caution statements that appear throughout this manual. Always observe standard precautions familiar to trained electrical technicians. Always adhere to all safety regulations stipulated by the railroad.

2. EQUIPMENT DESCRIPTION

2.1. AC Lamp Driver

2.1.1. Physical Description

The AC Lamp Driver consists of two main components - a mounting base and a plug-in module. The plug-in module is secured to the base by a latch. See Figure 2-1 and Figure 2-2.

This size and type of packaging is referred to as "PN-250" by ASTS USA. Many ASTS USA product lines use the PN-250 module and mounting base. To prevent incorrect module installation, each product line has a unique indexing arrangement. Refer to Section 2.1.3 for more information on indexing.

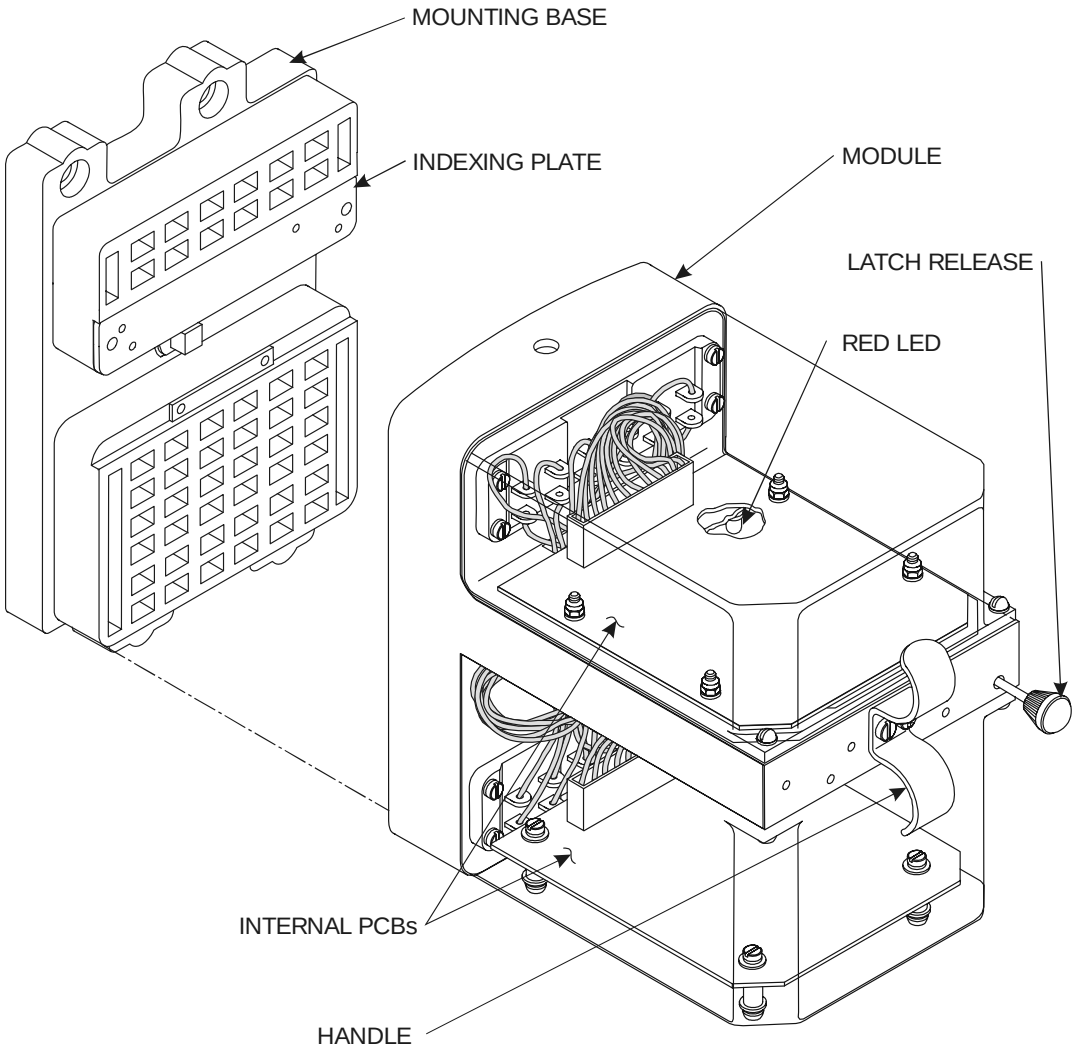


Figure 2-1. AC Lamp Driver (Front of Module)

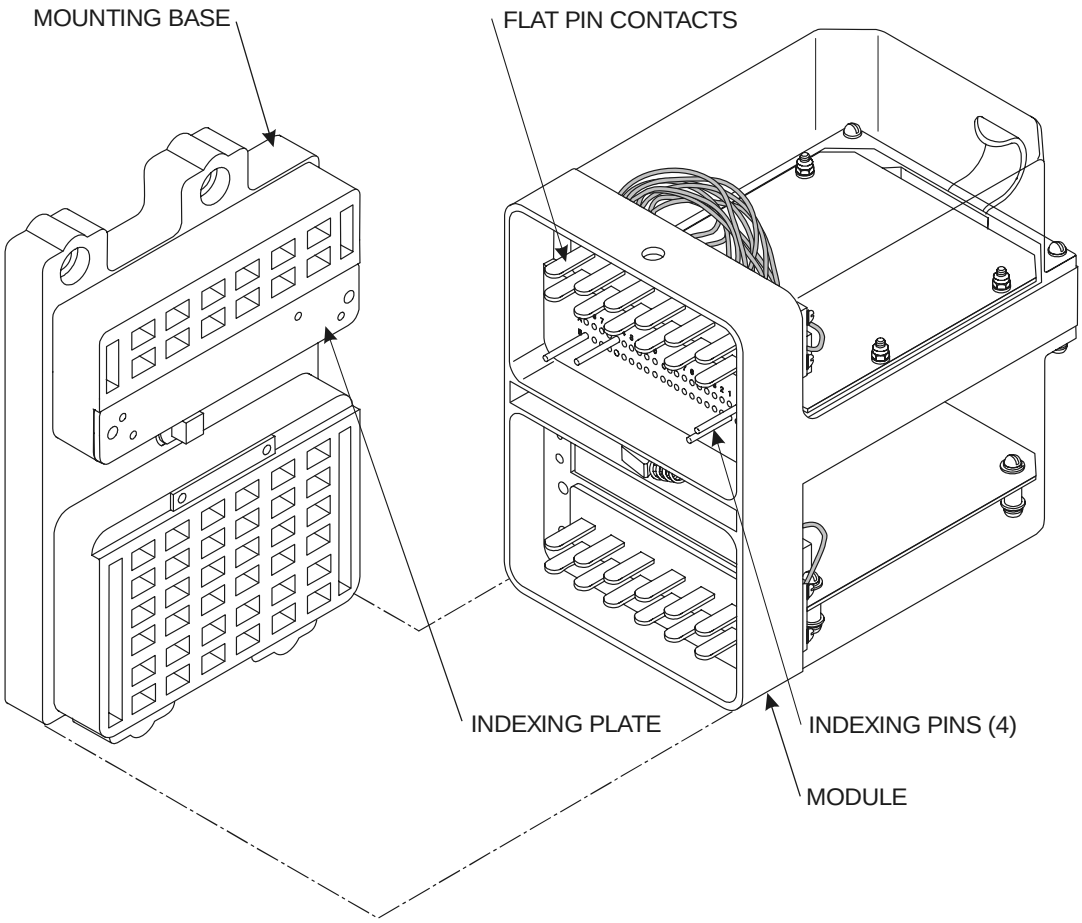


Figure 2-2. AC Lamp Driver (Back of Module)

2.1.2. Indicator

A red light-emitting diode (LED) illuminates when primary enable voltage (see Figure 3-1) is applied to the AC Lamp Driver. See Figure 2-1 for the LED's location.

2.1.3. Indexing

Indexing pins on the module fit into holes in the mounting plate. Figure 2-3 shows the general layout for indexing pins. Each module includes four pins - one in each letter group: A, B, C, and D. The index pin location is determined by the last four digits of the part number. The fourth digit from the end is assigned to Group A, third digit from the end is assigned to group B, etc. The index number corresponds to the pin locations. Figure 2-3 illustrates the corresponding pin locations for a part number that has "1234" as the last four digits. Refer to Section 2.1.4, Mechanical Specifications, for the particular indexing number for the AC Lamp Drivers.

CAUTION

Do not change the indexing pins on the module. Never drill holes into the mounting base indexing plate. If the indexing arrangement is altered, an incompatible module could be installed and damage to equipment could result.

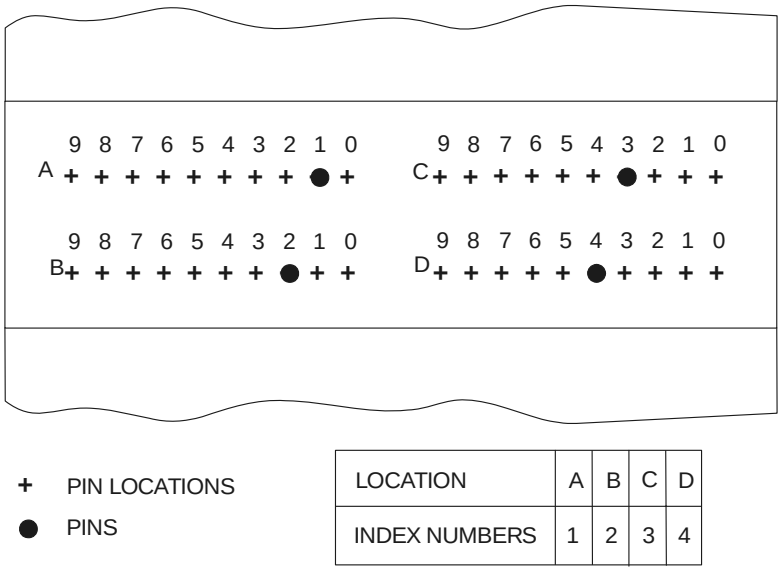


Figure 2-3. Example of Indexing Pin Layout

2.1.4. Mechanical Specifications

Table 2-1 lists the mechanical specifications for the AC Lamp Driver.

Table 2-1. AC Lamp Driver Mechanical Specifications

Parameter	Value
Module Dimensions:	Height: 7.06 in. (17.9 cm) Width: 4.94 in. (12.5 cm) Depth: 8.38 in. (2.5 cm)
Base Dimensions:	Height: 7.94 in. (20.1 cm) Width: 4.94 in.(12.5 cm) Depth: 1.78 in. (4.5 cm)
Indexing Arrangement: 12-Volt System 24-volt System	 4901 (A4, B9, C0, D1) 4904 (A4, B9, C0, D4)
Module Weight:	8.0 lb (3.64 kg)
Base Weight:	18 oz (0.51 kg)
Operating Temperature:	-40 ˚F to +158 ˚F (-40 ˚C to +70 ˚C)
Humidity Range:	0 to 95 % non-condensing

2.1.5. Electrical Connections

2.1.5.1. Contacts

Contacts provide the electrical connection between the mounting base and module. Receptacle spring contacts are located in the base. Flat pin contacts on the module plug into these receptacles. Figure 2-4 is a cross-sectional view of a contact pair.

Each receptacle spring contact can accommodate up to two wires. Receptacle spring contacts are available in three sizes for different wire gauges (see Table 11-4).

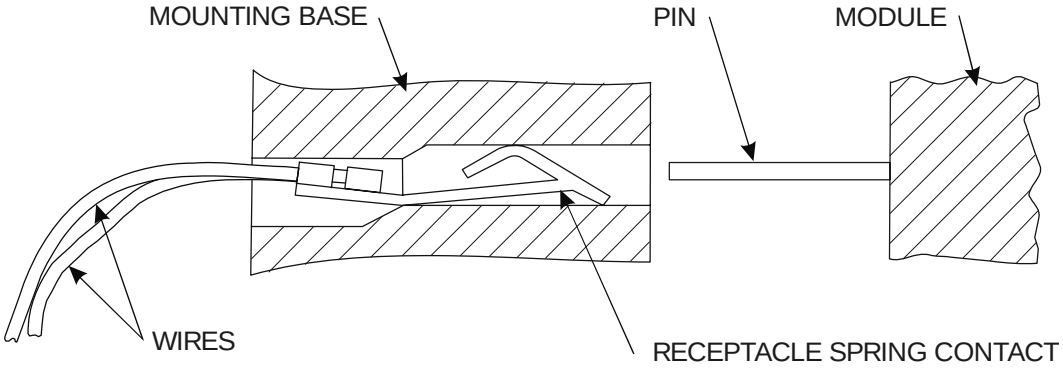


Figure 2-4. Contact Pair

2.1.5.2. Contact Arrangement

Figure 2-5 shows the contact arrangement for the AC Lamp Driver as seen from the back of the mounting base.

NOTE

Figure 2-5 shows the AC Lamp Driver contact arrangement without the optional Redundancy PCB. See Figure 2-8 for the contact arrangement with the Redundancy PCB.

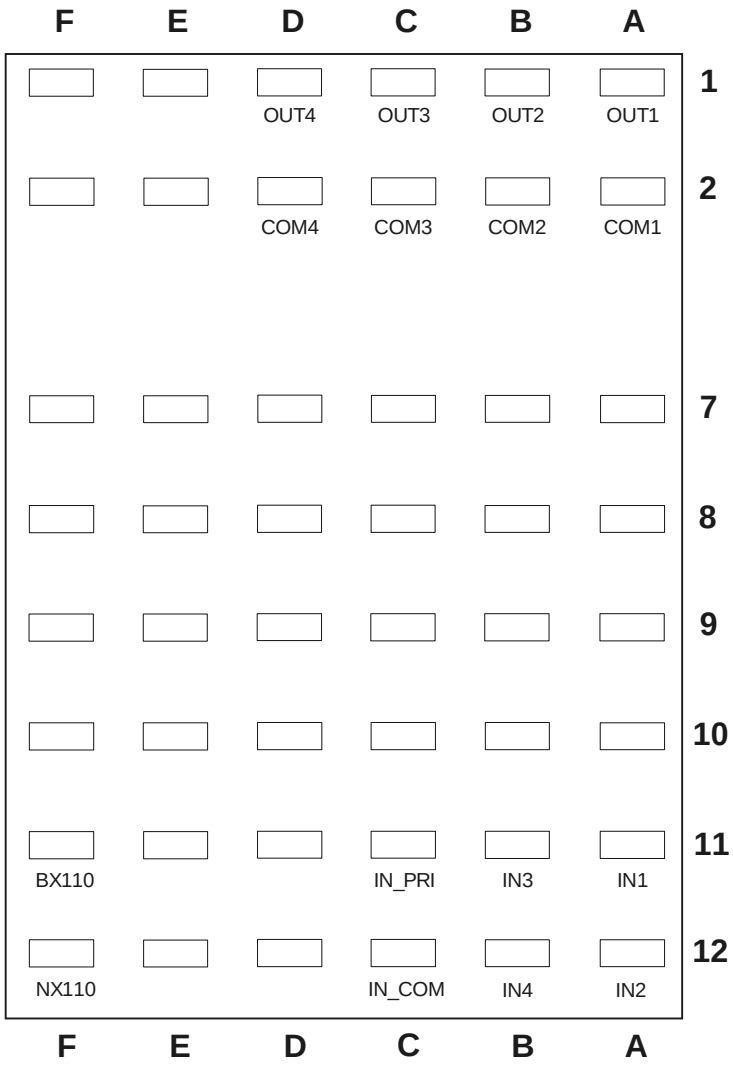


Figure 2-5. AC Lamp Driver Contact Arrangement <u>without</u> Optional Redundancy PCB

2.1.5.3. Contact Assignments

Table 2-2 lists the contact assignments (pinouts), the designation for each contact, and a description of the inputs and outputs for the AC Lamp Driver.

Table 2-2. AC Lamp Driver Contact Assignments

Contact	Designation	Description
1A	OUT1	Output to lamp circuit 1
1B	OUT2	Output to lamp circuit 2
1C	OUT3	Output to lamp circuit 3
1D	OUT4	Output to lamp circuit 4
2A	COM1	Output common for lamp circuits
2B	COM2	Output common for lamp circuits
2C	COM3	Output common for lamp circuits
2D	COM4	Output common for lamp circuits
7A	IN2A*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 2.
7C	IN1A*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 1.
7E	IN3A*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 3.
7F	IN4A*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 4.
8A	IN2B*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 2.
8C	IN1B*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 1.
8E	IN3B*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 3.
8F	IN4B*	Used only with Redundancy PCB. Secondary enable input for lamp circuit 4.
11A	IN1	Secondary enable input for lamp circuit 1
11B	IN3	Secondary enable input for lamp circuit 3
11C	IN_PRI	Primary enable input for all 4 lamp circuits
11F	BX110	AC input +
12A	IN2	Secondary enable input for lamp circuit 2
12B	IN4	Secondary enable input for lamp circuit 4
12C	IN_COM	Common for all secondary enable inputs: IN_1, IN_2, IN_3, IN_4
12F	NX110	AC input –

* Used only with Redundancy PCB to accommodate two secondary enable inputs from two control units

2.1.6. Electrical Specifications

Table 2-3 lists the electrical specifications for the AC Lamp Driver.

Table 2-3. AC Lamp Driver Electrical Specifications

Parameter	Value
Input voltage	110 to 130 VAC rms, 60 Hz Only
Output voltage	Directly proportional to input voltage: 110 to 130 VAC rms. Applied to lamp transformer primary.
Input enable voltage (12-volt model)	12 VDC nominal from external power source
Input primary enable current	25 mA @ 12.5 VDC
Input secondary enable current	12 mA @ 12.5 VDC
Input enable voltage (24-volt model)	24 VDC nominal from external power source
Input primary enable current	18 mA @ 25 VDC
Input secondary enable current	18 mA @ 25 VDC
Maximum lamp load	50 W maximum, each lamp circuit
Maximum total lamp load	150 W maximum (for 25 W lamp pairs, only three of the four outputs may be on simultaneously)
Isolation	2000 VAC control to output
Operating Temperature	-40°C to +70°C

CAUTION

The maximum total lamp load of the AC Lamp Driver is 150 W. If this limit is exceeded, equipment damage could result.

2.1.7. External Electrical Protection Requirements

2.1.7.1. Fusing

CAUTION

It is essential that the AC Lamp Driver external fusing requirements of Figure 3-1 are followed. If these requirements are not followed, equipment damage could result.

Fusing requirements are shown in Table 2-4. See Figure 3-1 for the placement of these fuses.

Table 2-4. External Fusing Requirements

Fuse Location	Fuse Specification	ASTS USA Part Number
Each of the four outputs to the lamp circuits	1.5 A (3AG)	J071042
Power input	2.0 A, fast acting (3AG)	J710021

2.1.7.2. Transient Protection

Table 2-5 lists the transient protection devices for lightning environments.

NOTE

External transient protection is recommended for environments where lightning is considered a hazard. See Figure 3-1 for instructions for placement of these devices.

Table 2-5. Transient Protection Devices

Transient Protection Device/Designation (Figure 3-1)	ASTS USA Part Number
Inductor / L1, L2	J7065380002
Metal oxide varistor / MOV	J7355500020

2.2. Hot Filament Checker

2.2.1. Physical Description

The Hot Filament Checker is externally similar to the AC Lamp Driver. The plug-in module and mounting base of the Hot Filament Checker and the AC Lamp Driver are identical (ASTS USA "PN-250"); though the indexing, internal electronics, and electrical connections differ. The Hot Filament Checker does not have an indicator LED. See Figure 2-1 and Figure 2-2 for isometric views of the AC Lamp Driver module and mounting base.

2.2.2. Indexing

Indexing pins on the module fit into holes in the mounting base indexing plate. The arrangement of these pins and holes is unique for the Hot Filament Checker.

Refer to Section 2.1.3 for a general description of indexing. Refer to Section 2.2.3, Mechanical Specifications, for the particular indexing number for the Hot Filament Checker.

2.2.3. Mechanical Specifications

Table 2-6 lists the mechanical specifications for the Hot Filament Checker

Table 2-6. Hot Filament Checker Mechanical Specifications

Parameter	Value
Module dimensions:	Height: 7.06 in. (17.9 cm) Width: 4.94 in. (12.5 cm) Depth: 8.38 in. (2.5 cm)
Base dimensions:	Height: 7.94 in. (20.1 cm) Width: 4.94 in.(12.5 cm) Depth: 1.78 in. (4.5 cm)
Indexing arrangement:	4902 (A4, B9, C0, D2)
Module weight:	8.0 lb (3.64 kg)
Base weight:	18 oz (0.51 kg)
Operating temperature:	-40 ˚F to +158 ˚F (-40 ˚C to +70 ˚C)
Humidity range:	0 to 95 % non-condensing

2.2.4. Electrical Connections

2.2.4.1. Contacts

Refer to the description of Section 2.1.5.1.

2.2.4.2. Contact Arrangement

Figure 2-6 shows the contact arrangement for the Hot Filament Checker as seen from the back of the mounting base.

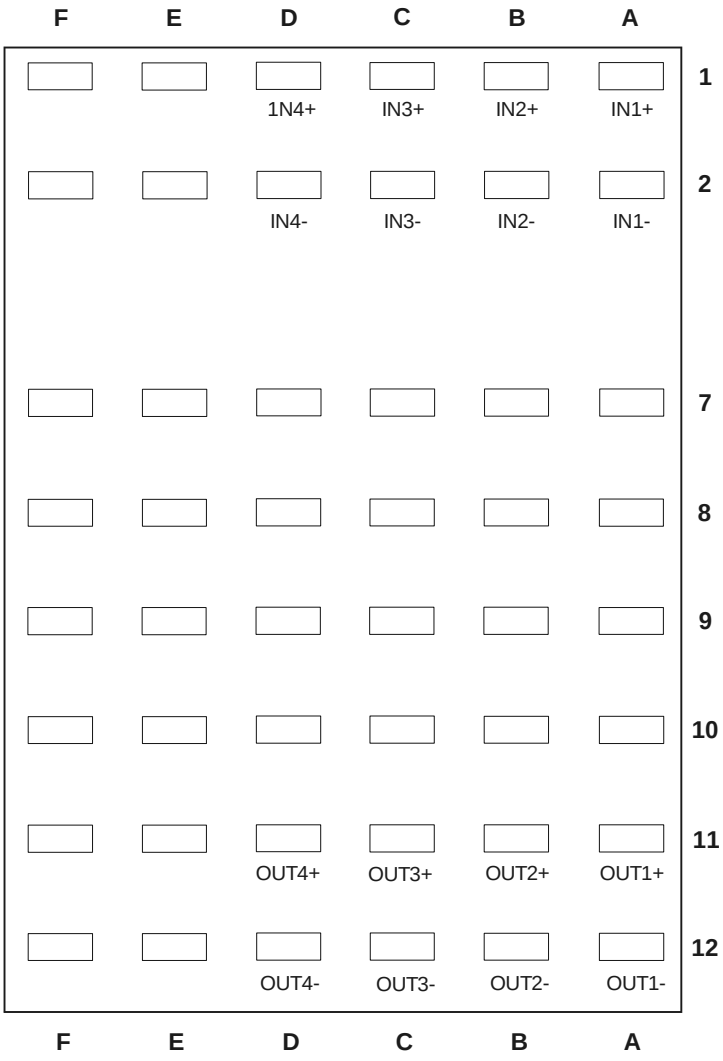


Figure 2-6. Hot Filament Checker Contact Arrangement

2.2.4.3. Contact Assignments

Table 2-7 lists the contact assignments (pinouts), the designation for each contact, and a description of the inputs and outputs for the Hot Filament Checker.

Table 2-7. Hot Filament Checker Contact Assignments

Contact	Designation	Description
1A	IN1+	Input + from AC Lamp Driver for lamp circuit 1
1B	IN2+	Input + from AC Lamp Driver for lamp circuit 2
1C	IN3+	Input + from AC Lamp Driver for lamp circuit 3
1D	IN4+	Input + from AC Lamp Driver for lamp circuit 4
2A	IN1–	Input – from AC Lamp Driver for lamp circuit 1
2B	IN2–	Input – from AC Lamp Driver for lamp circuit 2
2C	IN3–	Input – from AC Lamp Driver for lamp circuit 3
2D	IN4–	Input – from AC Lamp Driver for lamp circuit 4
11A	OUT1+	Output + for lamp circuit 1 hot filament check indication
11B	OUT2+	Output + for lamp circuit 2 hot filament check indication
11C	OUT3+	Output + for lamp circuit 3 hot filament check indication
11D	OUT4+	Output + for lamp circuit 4 hot filament check indication
12A	OUT1–	Output – for lamp circuit 1 hot filament check indication
12B	OUT2–	Output – for lamp circuit 2 hot filament check indication
12C	OUT3–	Output – for lamp circuit 3 hot filament check indication
12D	OUT4–	Output – for lamp circuit 4 hot filament check indication

2.2.5. Electrical Specifications

Table 2-8 lists the electrical specifications for the Hot Filament Checker.

Table 2-8. Hot Filament Checker Electrical Specifications

Parameter	Value
Input current range:	AC lamp load current reflected to primary of the lamp transformer.
Input voltage:	The input voltage is derived from the primary current of the lamp transformer. **Note**: The Hot Filament Checker must be used with a transformer specified in Table 11-5.
Output voltage range:	1.7 to 30 VDC dependant upon input current and line voltage.
Output voltage indications:	> 9.5 VDC indicates filament intact. (If the circuit has two parallel filaments, then one *or* both filaments are intact.) < 7.5 VDC indicates filament failure. (If the circuit has two parallel filaments, then *both* filaments failed.)
Lamp load:	Maximum: two 25 W lamps. Minimum: one 25 W lamp.

2.3. Redundancy Printed Circuit Board (PCB)

2.3.1. Physical Description

The Redundancy PCB (see Figure 2-7) is installed in the mounting base of the AC Lamp Driver. Wires from the PCB are terminated in receptacle spring contacts in the base.

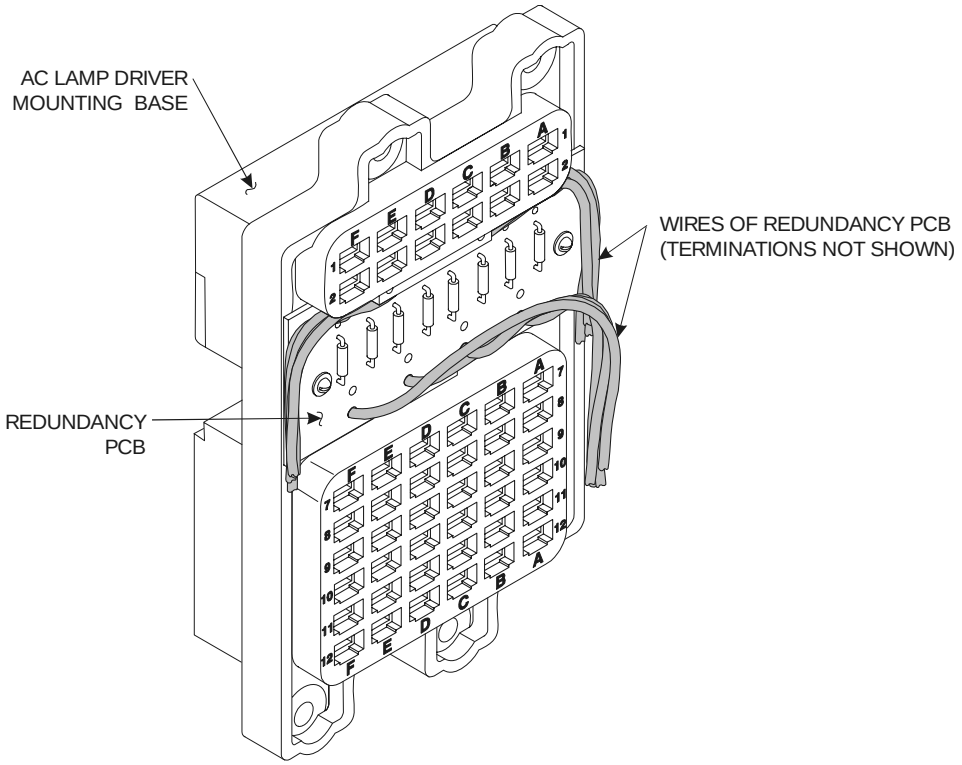


Figure 2-7. Redundancy PCB (Shown Installed)

2.3.2. Electrical Connections

2.3.2.1. Contact Arrangement

Figure 2-8 shows the contact arrangement of the AC Lamp Driver with the optional Redundancy PCB as seen from the mounting base.

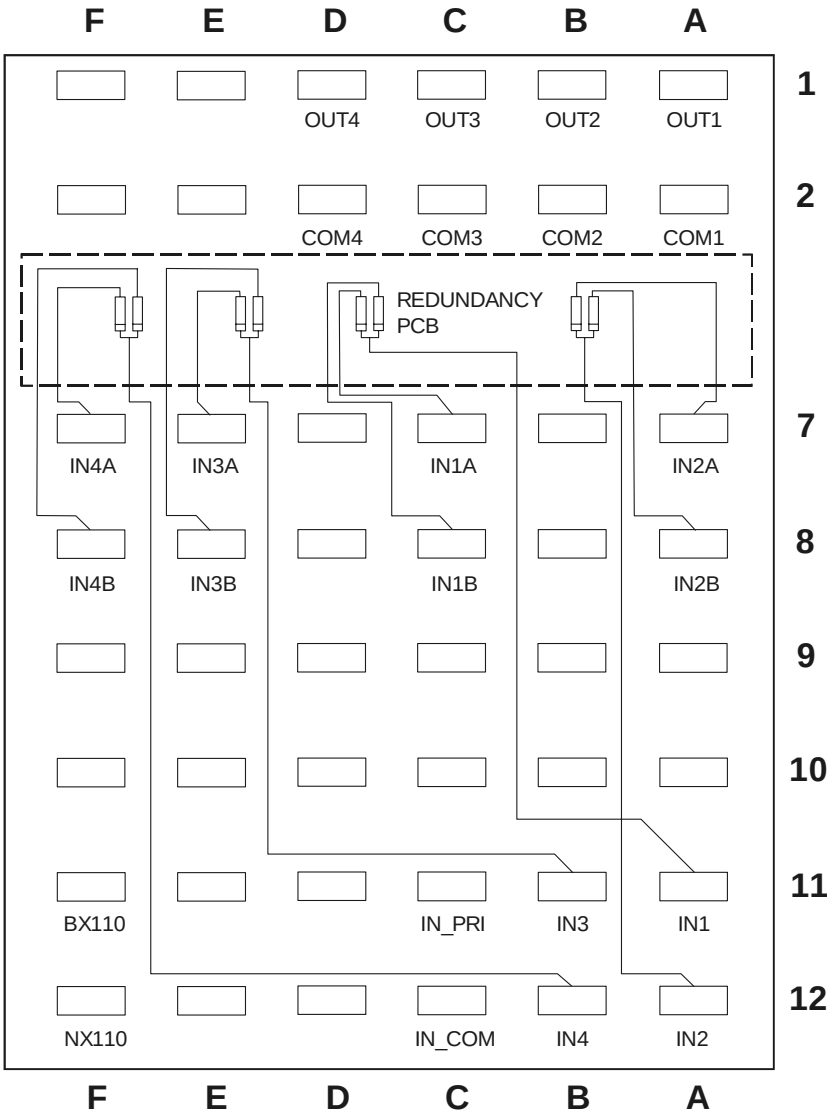


Figure 2-8. AC Lamp Driver Contact Arrangement with Optional Redundancy PCB

3. FUNCTIONAL DESCRIPTION

3.1. Functional Overview

3.1.1. AC Lamp Driver and Hot Filament Checker

A wiring diagram showing the implementation of an AC Lamp Driver and Hot Filament Checker for four lamp circuits is shown in Figure 3-1. The pinout designations (OUT1, OUT2, etc.) shown on the diagram are described in Table 2-2 and Table 2-7.

Referring to Figure 3-1, a power source of 110 VAC is connected to the AC Lamp Driver. Application of 12 VDC to the primary enable input and one of the secondary enable inputs of the AC Lamp Driver activates a lamp circuit. The maximum total lamp load of the AC Lamp Driver is 150 W (see caution statement below).

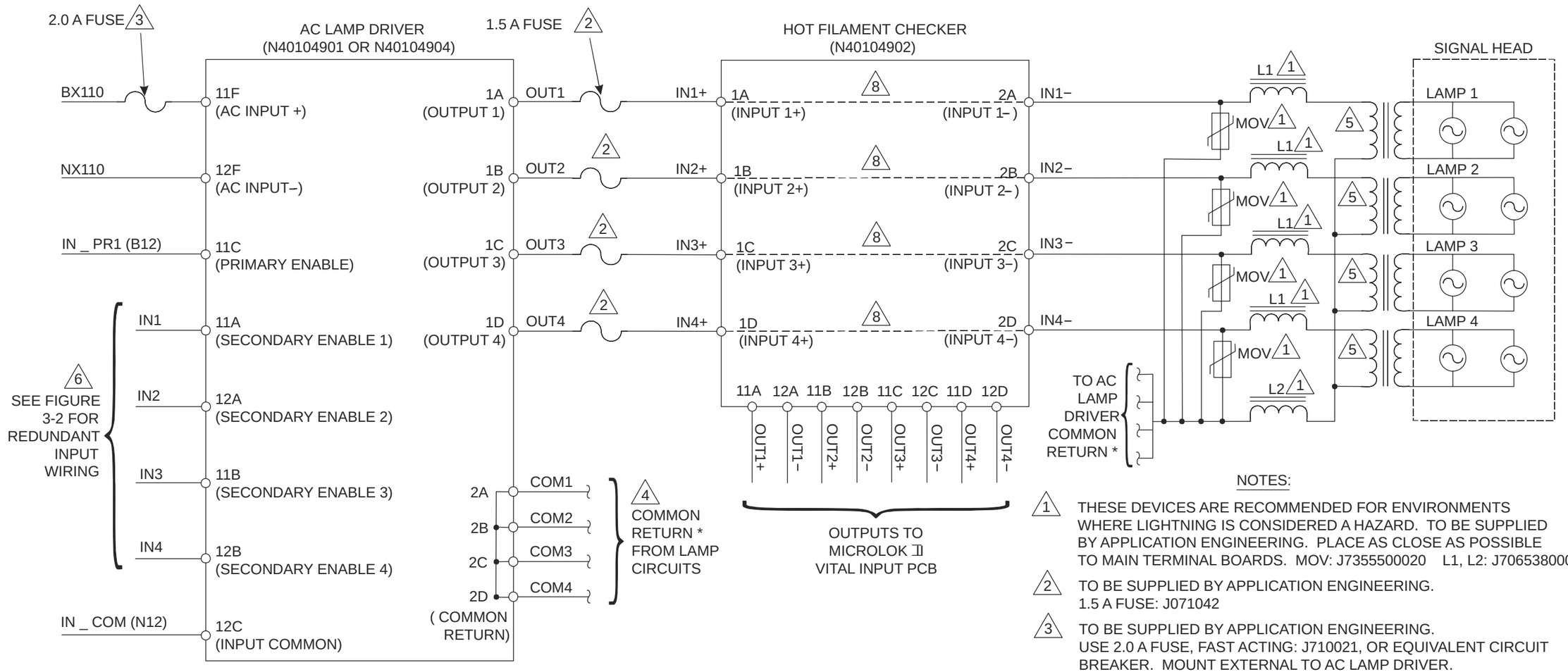
One Hot Filament Checker can monitor up to four lamp circuits. For each lamp circuit, the Hot Filament Checker provides a voltage output that indicates filament integrity.

CAUTION

It is essential that the AC Lamp Driver external fusing requirements of Figure 3-1 are followed. If these requirements are not followed, equipment damage could result.

It is essential that the implementation requirements of Figure 3-1 are followed. If these requirements are not followed, equipment damage could result.

The maximum total lamp load of the AC Lamp Driver is 150 W. If this limit is exceeded, equipment damage could result.



NOTES:

1. THESE DEVICES ARE RECOMMENDED FOR ENVIRONMENTS WHERE LIGHTNING IS CONSIDERED A HAZARD. TO BE SUPPLIED BY APPLICATION ENGINEERING. PLACE AS CLOSE AS POSSIBLE TO MAIN TERMINAL BOARDS. MOV: J7355500020 L1, L2: J7065380002
2. TO BE SUPPLIED BY APPLICATION ENGINEERING. 1.5 A FUSE: J071042
3. TO BE SUPPLIED BY APPLICATION ENGINEERING. USE 2.0 A FUSE, FAST ACTING: J710021, OR EQUIVALENT CIRCUIT BREAKER. MOUNT EXTERNAL TO AC LAMP DRIVER.
4. COM1 - 4 ARE WIRED TOGETHER INTERNAL TO AC LAMP DRIVER.
5. TRANSFORMER IS A STEP-DOWN TYPE AS SPECIFIED IN TABLE 11-5.
6. REDUNDANCY PCB/WIRING: N17003201.
7. ALL WIRING TO BE 14 AWG MINIMUM.
8. DASHED LINES SHOW WIRING FOR APPLICATION WITHOUT HOT FILAMENT CHECKER.

Figure 3-1. AC Lamp Driver and Hot Filament Checker Wiring Diagram

3.1.2. Redundancy PCB

Figure 3-2 shows how to use the Redundancy PCB to adapt an AC Lamp Driver for control by two separate control units.

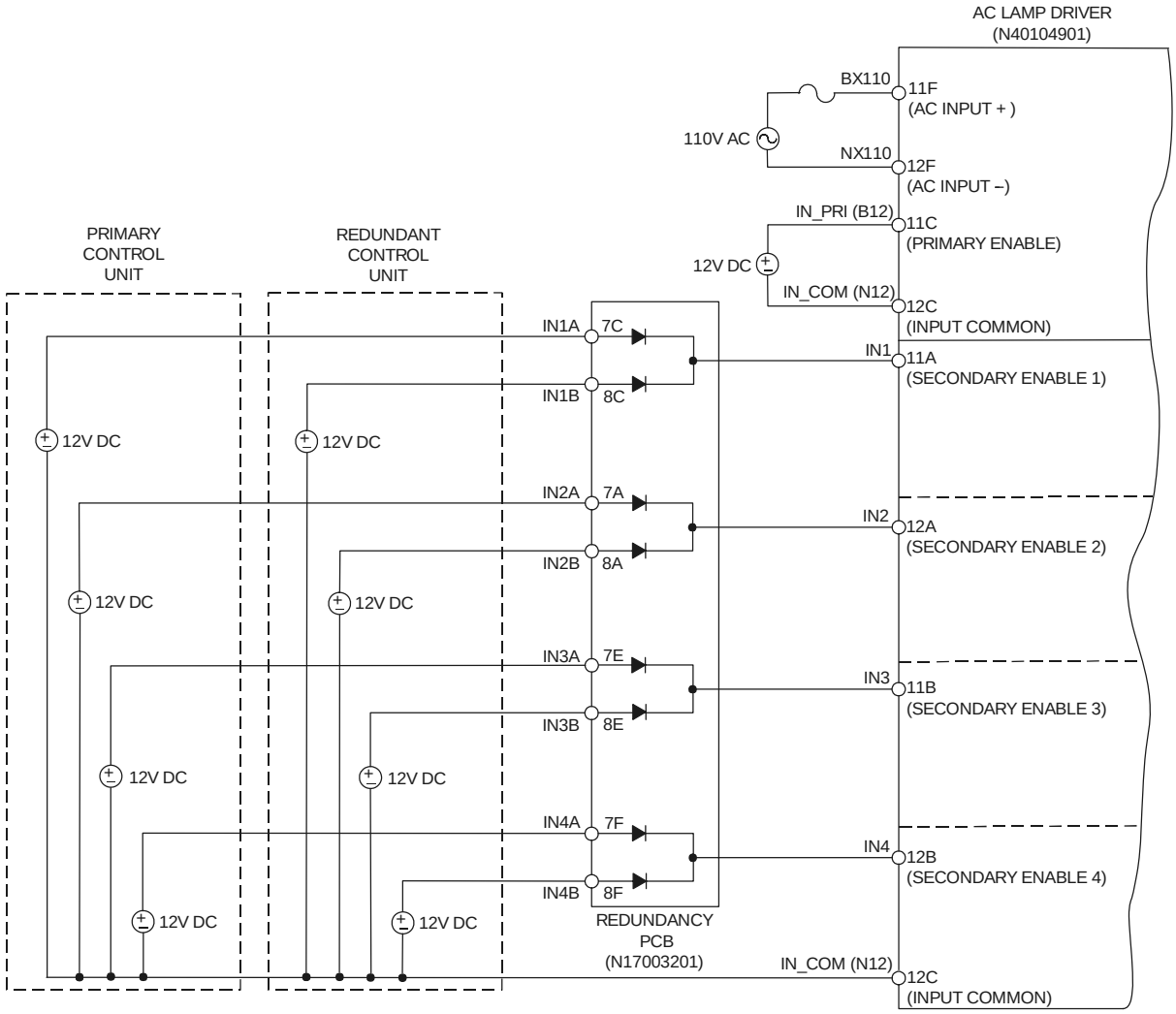


Figure 3-2. AC Lamp Driver Input Block Diagram with Redundancy PCB

3.2. Detailed Functional Description

The ac lamp driver and filament detection system consists of two main elements: the AC Lamp Driver and the Hot Filament Checker. These elements are designed for use with MICROLOK® II or MICROTRAX® to enable the wayside systems to illuminate signal lamps and make logic decisions based on filament integrity.

Figure 3-1 shows a typical application: a three-lamp signal head with a common return and a separate marker lamp. As shown, the filaments of each lamp circuit are monitored using the Hot Filament Checker. However, the user has complete flexibility in using the Hot Filament Checker: all or any combination (or none) of the filaments can be monitored.

3.2.1. AC Lamp Driver

Referring to Figure 3-1, inputs to the AC Lamp Driver include power (110 VAC, 60 Hz), and one primary and four secondary enable voltages (12 VDC or 24 VDC). A lamp output is activated by the driver in response to the application of voltage to the primary enable and to one secondary enable input. For example, output 1 is activated when 12 VDC or 24 VDC is applied at contact 11C (primary enable) and at contact 11A (secondary enable 1). Each output can drive a lamp circuit of 50 W maximum. The maximum total lamp load of the AC Lamp Driver is 150 W.

CAUTION

Do not connect 24 VAC to the 12 VAC Lamp Driver. Connecting 24 volts to the 12-volt lamp driver will cause damage to the driver.

3.2.2. Hot Filament Checker

The Hot Filament Checker monitors current through the high-voltage side of the lighting transformer and produces a proportional DC voltage output. It is intended for applications where two 25 watt signal lamps are wired in parallel. If both filaments are intact and the lamps are lit, sufficient DC voltage is developed to satisfy a Microlok 12 volt input. If either or both filaments are open, the output voltage is less than the detection threshold of a 12 volt Microlok input. The Microlok logic determines this as a “lamp out” condition.

A W-2 transformer or transformer part number J7314000159 is intended for this application These are 60 VA transformers limited to 60Hz in providing reliable light-out detection. Transformers are available for 30 VA applications (part numbers J7314000183 and J7314000202). Transformers other than these, may not work in this situation.

3.2.3. Redundancy PCB

The Redundancy PCB provides the means of applying enable inputs to the AC Lamp Driver from two separate control units. The Redundancy PCB contains eight 1000 V, 1 A diodes wired in four groups of two diodes in an “or” configuration. The Redundancy PCB is shown schematically in Figure 3-2.

Referring to Figure 3-2, an input voltage application to either 7C or 8C (IN1A or IN1B) will be applied at 11A (IN1 or secondary enable 1). This will activate output 1 (provided voltage is also applied at the primary enable input).

4. INSTALLATION

4.1. Installation Overview

WARNING

Before beginning any installation procedure, make sure that all power that could cause a hazard is disabled. Failure to do so could result in physical harm, serious injury, or loss of life.

Perform the following procedures in the order listed for the AC Lamp Driver and for the Hot Filament Checker:

1. Mounting Base Assembly (Section 4.2)
2. Redundancy PCB Installation, if required (Section 4.3)
3. Mounting Base Installation (Section 4.4)
4. Wire Termination and Contact Installation (Section 4.5)
5. Module Installation (Section 4.6)
6. Installation Checklist (Section 4.7)

4.2. Mounting Base Assembly

An indexing plate, identifying tags, and the attaching hardware for these parts are supplied in a bag delivered with the module. This is a different parts bag than the one delivered with the mounting base.

CAUTION

The indexing plate must be attached to the mounting base to prevent incorrect module installation. If an incorrect module is installed in a base, equipment damage could result.

Attach the indexing plate and identification tags to the mounting base as shown in Figure 4-1 and Figure 4-2.

NOTE

Mounting bases may be supplied with self-adhesive identification tags. These tags can be applied without using attaching screws.

The identification tags are supplied blank so the user can mark them with designations specific to device and location.

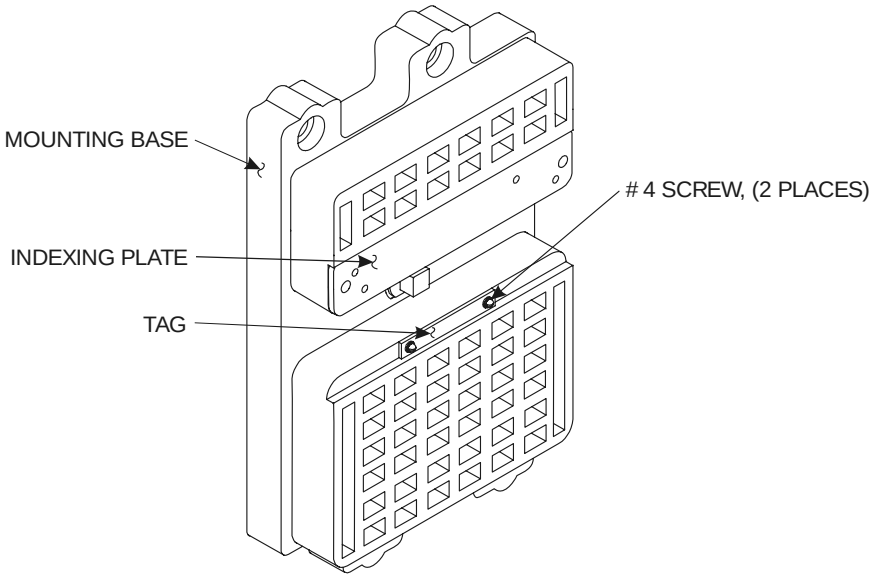


Figure 4-1. Mounting Base Assembly, Front View

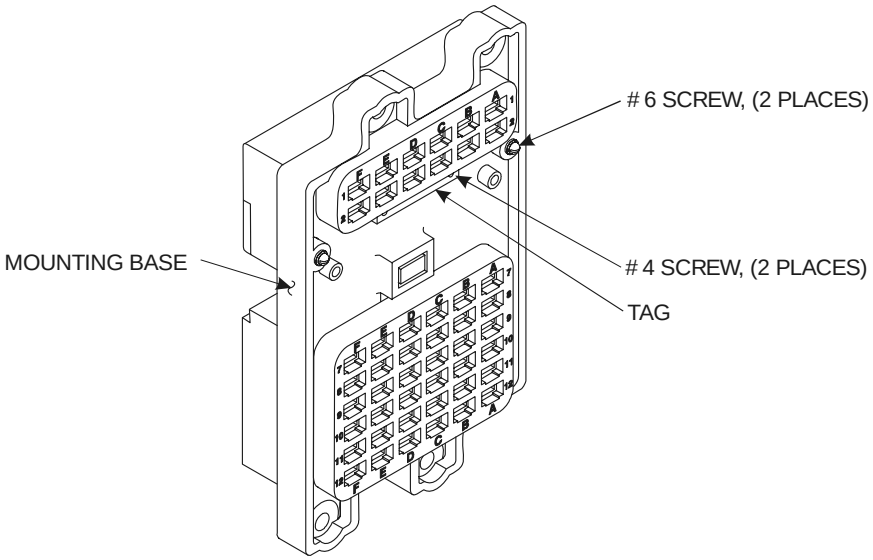


Figure 4-2. Mounting Base Assembly, Back View

4.3. Redundancy PCB Installation

If required by your application, position the Redundancy PCB in the AC Lamp Driver mounting base (see Figure 2-7). Attach as shown in Figure 4-3. The attaching hardware is included with the Redundancy PCB. Instructions for wire termination and contact installation are provided in Section 4.5.

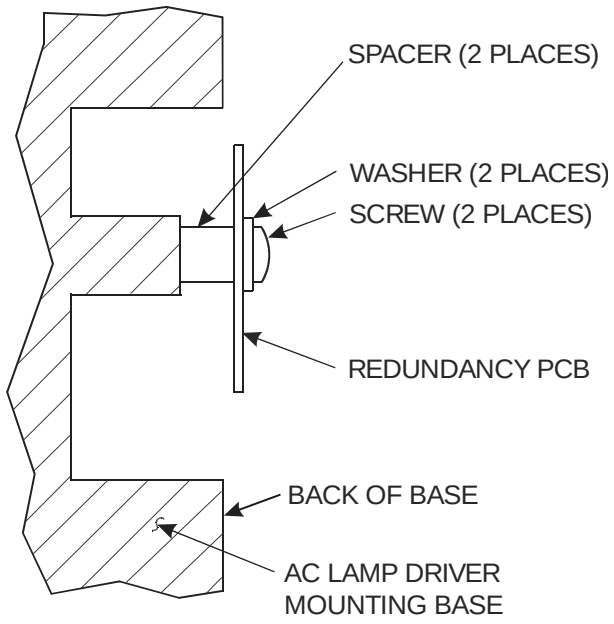


Figure 4-3. Redundancy PCB Installation

4.4. Mounting Base Installation

1. Verify that you have the correct mounting base for the intended location. Check that the mounting base indexing holes line up with the indexing pins of the module.

2. The parts required for installing the mounting base are in the parts bag delivered with the base.

3. Secure the mounting base to the equipment rack using the parts provided. Refer to your applicable installation drawing.

4.5. Wire Termination and Contact Installation

WARNING

Make sure that all power that could cause a hazard is disabled. Failure to do so could result in physical harm, serious injury, or loss of life.

4.5.1. Wire Termination

The available contacts, wire sizes accommodated by each contact, and the required crimping tools are listed in Table 4-1.

Table 4-1. Contacts and Crimping Tools

Receptacle Spring Contact	Wire Size (AWG)	Crimping Tool
M451142-2702 (supplied with base)	#14-16	J397139 (for #14-16 AWG) J397188 (for #16 AWG only with this contact)
M451142-2703	#10-12	J397138 (for #10-12 AWG with this contact)
M451142-2701	#18-20	J397188 (for #18-20 AWG with this contact)

1. Strip 3/16 in. (0.48 cm) of insulation from end of wire to be terminated.

2. The receptacle spring contact has two wire crimping barrels. If wires are to be terminated into both barrels, crimp the wire into outer barrel first. If only one wire is to be terminated, crimp it into the inner barrel.

3. Place the contact barrel into the jaws of the appropriate crimping tool (see Table 4-1). Partially close the jaws to hold the contact in place.

4. Insert the stripped end of the wire all the way into the barrel. Squeeze the tool handle until crimping is complete and the jaws release.

5. Inspect the termination. Check that the insulation is flush with and does not enter the crimped barrel. Check that there are no loose strands of wire.

NOTE

Also follow the crimping instructions supplied by the manufacturer of the crimping tool.

4.5.2. Contact Installation

See Figure 4-4 for a cross-sectional view of contact installation.

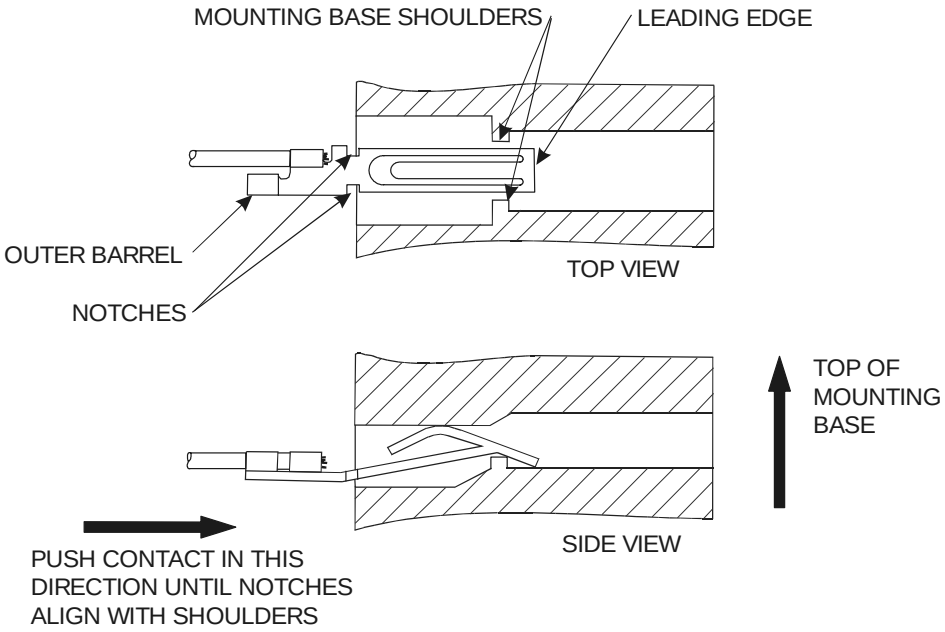


Figure 4-4. Contact Installation

1. After wire termination, orient the contact in the appropriate cavity of the mounting base as shown in Figure 4-4. Follow the schematic drawings and wiring instructions for your application.

2. Push the contact until it locks into place. Locking is accomplished when the notches in the contact fit around the shoulders in the mounting base cavity.

3. If it is necessary to remove a contact from the base, insert an extraction tool (J772383) as shown in Figure 4-5. Hold the wire and the tool together firmly and pull steadily away from the base.

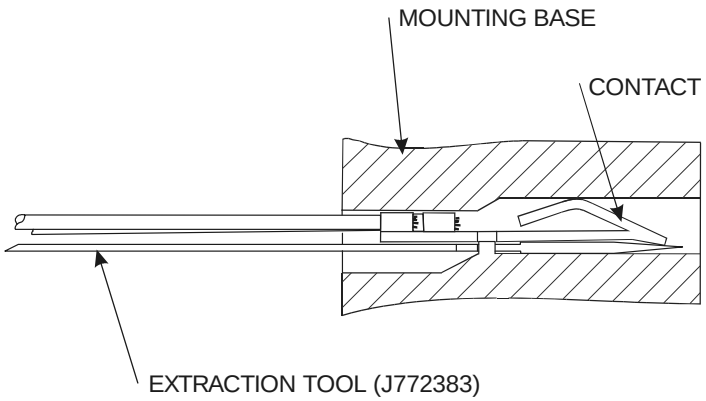


Figure 4-5. Contact Removal

4.6. Module Installation

Follow this procedure to install the AC Lamp Driver and Hot Filament Checker modules.

1. Orient the module to the mounting base. Press and hold the latch button on the module and push the module into place. Because of the resisting tension of the receptacle spring contacts, pushing the module into place requires moderate force (about 10-20 lb).

2. After the module is seated, release the latch button and pull the handle to verify that the module is locked in place.

4.7. Installation Checklist

1. Complete the installation checklist, Figure 4-6.

2. Make a copy of the completed checklist for future reference.

3. Proceed to Section 5, Commissioning.

Installer _____ Date _____

Installation Location _____

AC Lamp Driver □ Yes □ No Serial No. _____

Redundancy PCB □ Yes □ No

Hot Filament Checker □ Yes □ No Serial No. _____

	Yes	No
Indexing plate installed on mounting base of AC Lamp Driver.	❒	❒
Indexing plate installed on mounting base of Hot Filament Checker.	❒	❒
Redundancy PCB installed in the AC Lamp Driver mounting base.	❒	❒
Electrical specifications of this manual have been followed.	❒	❒
Fusing requirements of Figure 3-1 have been followed.	❒	❒
Wiring is in accordance with applicable schematic diagrams and wiring instructions.	❒	❒
Plug-in modules are properly seated and latched.	❒	❒

Figure 4-6. Installation Checklist

5. COMMISSIONING

Commissioning is the testing process performed to verify proper installation before a unit or system is placed into regular service. The commissioning procedure is a functional test of the unit and the system of which it is a part.

5.1. Loading Considerations

There are two signal lighting transformer types under ASTS USA inventory control that are acceptable for use with the AC Lamp Driver. The AC Lamp Driver must drive one of these transformers. Under no circumstances is the AC Lamp Driver to be left unloaded. The transformers to be used are:

- **ASTS USA W2 Style Transformer**

  All of the "W2" Style transformers are acceptable for use with the AC Lamp Driver and the Filament Check Module.

- **ASTS USA 60 VA Signal Lighting Transformer (J7314000159)**

  The assembly, which includes the transformer, terminal block, and mounting bracket, carries the part number N44322101. This is a 60VA transformer with 115 VAC primary and multiple secondary taps from 6 Vrms to 12 Vrms in 1-volt increments.

- **ASTS USA 30 VA Signal Lighting Transformers (J7314000183 and J7314000202)**

  These are 30 VA transformers with 115 VAC primary and multiple secondary taps from 7 VAC to 12 VAC (nominal) in one volt increments.

  Part number J7314000183 includes the transformer, nameplate, and mounting bracket.

  Part number J7314000202 is identical to part number J7314000183 with the addition of a top-mounted terminal plate that has all of the primary and secondary taps wired to terminals on the plate.

5.2. Loading Precautions

Do not apply power to the AC Lamp Driver without having the proper signal transformer connected to the driven outputs. This applies to the factory test, field test, and final installation.

If any of the four outputs of the AC Lamp Driver are not used, be sure the MICROLOKII application program **does not** turn on those unused outputs.

Be sure to use one of the signal lighting transformers or transformer assemblies specified above as a load to the active AC Lamp Driver outputs.

5.3. Commissioning

To properly commission the AC Lamp Driver (and Hot Filament Checker and Redundancy PCB as required), follow the procedure listed below.

1. Make sure that all the requirements of Section 4, Installation, have been met. Make sure that all the electrical requirements of this manual have been followed.

2. Enable power to the system and issue a primary enable command to the AC Lamp Driver. Verify that the red LED of the AC Lamp Driver illuminates.

3. Issue a secondary enable command for each lamp circuit and verify that the appropriate lamps illuminate.

4. If the optional Hot Filament Checker is included in the system, verify for each lamp circuit that the control unit indication is correct.

5. If the optional Redundancy PCB is included in the system, repeat Steps 2, 3, and 4 for each control unit.

If the verification criteria of the above steps are not met, refer to Section 9.

6. OPERATING PROCEDURES

The AC Lamp Driver, Hot Filament Checker, and Redundancy PCB operate continuously without intervention. Operating procedures are not required.

7. FIELD MAINTENANCE

7.1. Schedule

There are no Federal Railroad Administration (FRA) requirements for periodic inspection or testing of the devices covered by this manual. Periodic inspection is at the customer's discretion.

7.2. Procedures

7.2.1. Preventive Maintenance

WARNING

Before beginning any cleaning procedure, make sure that all power that could cause a hazard is disabled. Failure to do so could result in physical harm, serious injury, or loss of life.

1. Clean dust and dirt from the AC Lamp Driver and Hot Filament Checker modules with a clean, dry cloth.

2. Clean dust and dirt from the mounting bases of the AC Lamp Driver and Hot Filament Checker using compressed air. Use caution to avoid damage to electrical connections.

7.2.2. Visual Input Check - AC Lamp Driver

To check that primary enable voltage (see Figure 3-1) is applied to the AC Lamp Driver, observe that the LED (see Figure 2-1) illuminates. If a problem is suspected, see Section 9, Troubleshooting.

7.2.3. Calibration

There are no calibration procedures that can be performed by the customer.

7.2.4. Adjustment

There are no adjustment procedures that can be performed by the customer.

8. SHOP MAINTENANCE

The AC Lamp Driver, the Hot Filament Checker, and the Redundancy PCB are not repairable by the user. Return a malfunctioning unit to ASTS USA for service. Call the ASTS USA service shop at 1-800-652-7276 for assistance.

9. TROUBLESHOOTING

Table 9-1, Table 9-2, and Table 9-1 are the troubleshooting tables for the AC Lamp Driver, Hot Filament Checker, and the Redundancy PCB, respectively.

Table 9-1. AC Lamp Driver Troubleshooting Chart

Symptom	Possible Cause	Corrective Action	Section Reference
LED on AC Lamp Driver does not illuminate.	Module not seated properly.	Check module installation.	4.6
	Wiring failure.	Perform continuity tests on applicable circuits. Check fuses. Check receptacle spring contacts for integrity.	
	System failure.	Perform system test.	
	AC Lamp Driver internal failure.	Replace AC Lamp Driver module.	4.6
Lamps on signal head do not illuminate.	Module not seated properly.	Check module installation.	4.6
	Lamp failure.	Check lamps in signal head.	
	Wiring failure.	Perform continuity tests on applicable circuits. Check fuses. Check receptacle spring contacts for integrity.	
	System failure.	Perform system test.	
	AC Lamp Driver internal failure.	Replace AC Lamp Driver module.	4.6

Table 9-2. Hot Filament Checker Troubleshooting Chart

Symptom	Possible Cause	Corrective Action	Section Reference
Indication generated by control unit does not correspond with observed lamp status.	Signal head transformer or lamp size incompatible with Hot Filament Checker.	Review electrical specifications for the Hot Filament Checker and verify system compatibility.	2.2.5
	Module not seated properly.	Check module installation.	4.6
	Wiring failure.	Perform continuity tests on applicable circuits. Check fuses. Check receptacle spring contacts for integrity.	
	System failure.	Perform system test.	
	Hot Filament Checker internal failure.	Replace Hot Filament Checker module.	4.6

Table 9-3. Redundancy PCB Troubleshooting Chart

Symptom	Possible Cause	Corrective Action	Section Reference
Command issued from one or both control units does not produce intended result.	Module not seated properly.	Check installation of applicable module(s).	4.6
	Wiring failure.	Perform continuity tests on applicable circuits. Check fuses. Check receptacle spring contacts for integrity.	
	System failure.	Perform system test.	
	Redundancy PCB internal failure.	Replace Redundancy PCB.	4.3

10. REPAIRING/REPLACING COMPONENTS

The AC Lamp Driver, Hot Filament Checker, and Redundancy PCB are not repairable by the user. Return a malfunctioning unit to ASTS USA for service. Call the ASTS USA service shop at 1-800-652-7276 for assistance.

11. PARTS LISTS

11.1. AC Lamp Driver

All Lamp Driver variations are housed in a PN-250 relay frame and all functional termination points are identical.

Table 11-1. AC Lamp Driver Parts List

Description	Output Power	Frequency Range	DC Control Input	Part Number
AC Lamp Driver module	50 W each 150 W total	60Hz	12 VDC nominal	N40104901
Parts Bag (for AC Lamp Driver module N40104901). Contains tags, indexing plate, screws. Included with AC Lamp Driver module.				N3497114901
AC Lamp Driver module	50 W each 150 W total	60Hz	24 VDC nominal	N40104904
Parts Bag (for AC Lamp Driver module N40104904). Contains tags, indexing plate, screws. Included with AC Lamp Driver module.				N3497114904
AC Lamp Driver module	25 W each 75 W total	50 - 100Hz	12 VDC nominal	N40104907
Parts Bag (for AC Lamp Driver module N40104907). Contains tags, indexing plate, screws. Included with AC Lamp Driver module.				N3497114907
AC Lamp Driver module	25 W each 75 W total	50 - 100Hz	24 VDC nominal	N40104908
Parts Bag (for AC Lamp Driver module N40104908). Contains tags, indexing plate, screws. Included with AC Lamp Driver module.				N3497114908
Base (PN-250) Parts bag included with base contains receptacle spring contacts and attaching hardware for base.				N438689003

11.2. Hot Filament Checker

All Hot Filament Checkers are housed in a PN-250 relay frame and all functional termination points are identical.

Table 11-2. Hot Filament Checker Parts List

Description	Part Number
Hot Filament Checker module, two 25 Watt lamps. Detect with one open, 60Hz only. Microlok 12 volt compatible. Use with transformer J731400159.	N40104902
Parts bag (for Hot Filament Checker module N40104902). Contains tags, indexing plate, screws. Included with Hot Filament Checker module.	N3497114902
Hot Filament Checker module, 25 Watt lamps or AREMA LED, 50 to 100Hz. Microlok 12 volt input compatible.	N40104905
Parts bag (for Hot Filament Checker module N40104905). Contains tags, indexing plate, screws. Included with Hot Filament Checker module.	N3497114905
25 Watt lamps or AREMA LED, 50 to 100Hz. (VPI 12 volt input compatible)*	N40104906
Parts bag (for Hot Filament Checker module N40104906). Contains tags, indexing plate, screws. Included with Hot Filament Checker module.	N3497114906
Base (PN-250) Parts bag included with base contains receptacle spring contacts and attaching hardware for base.	N438689003
* VPI input is characterized by two diodes in series with 590 ohms. The required current is 12.8 to 33 milliamperes. Output of the filament checker is 20 milliamperes.	

11.3. Redundancy PCB

Table 11-3. Redundancy PCB Parts List

Description	Part Number	Notes
Redundancy PCB	N17003201	
Screw, #8-32 x 5/8 in. pan head	J5072950110	Attaching hardware supplied with PCB
Spacer, 1/4 x 1/4 in. alum.	J578582	Attaching hardware supplied with PCB
Washer, plate, #8	J4751200109	Attaching hardware supplied with PCB

11.4. Contacts and Tools

Table 11-4. Contacts and Tools Parts List

Description	Part Number	Notes
Receptacle spring contact, #14-16 AWG	M451142-2702	Supplied with base
Receptacle spring contact, #10-12 AWG	M451142-2703	
Receptacle spring contact, #18-20 AWG	M451142-2701	
Crimping tool (for #14-16 AWG)	J397139	For M451142-2702
Crimping tool (for #10-12 AWG)	J397138	For M451142-2703
Crimping tool (for #16-20 AWG)	J397188	For M451142-2701 (#18-20 AWG) and -2702 (#16 AWG only)
Contact extraction tool	J772383	

11.5. Lightning Transformers

Table 11-5 lists the specifications for the two types of lighting transformers that can be used in this application. Figure 11-1 shows the dimensions of the transformers. The basic mounting dimensions of all three transformers are the same. Part number J7314000202 has an additional top plate that measures 2.5 inches by 4 inches.

Table 11-5. Lighting Transformer Specifications

Transformers			
Frequency	VA Rating	Secondary Voltage Taps	ASTS USA Part Number
60	60	7, 8, 9, 10, 11, 12, 13	J7314000159
50-100	30	7, 8, 9, 10, 11, 12	J7314000183
50-100	30	7, 8, 9, 10, 11, 12	J7314000202

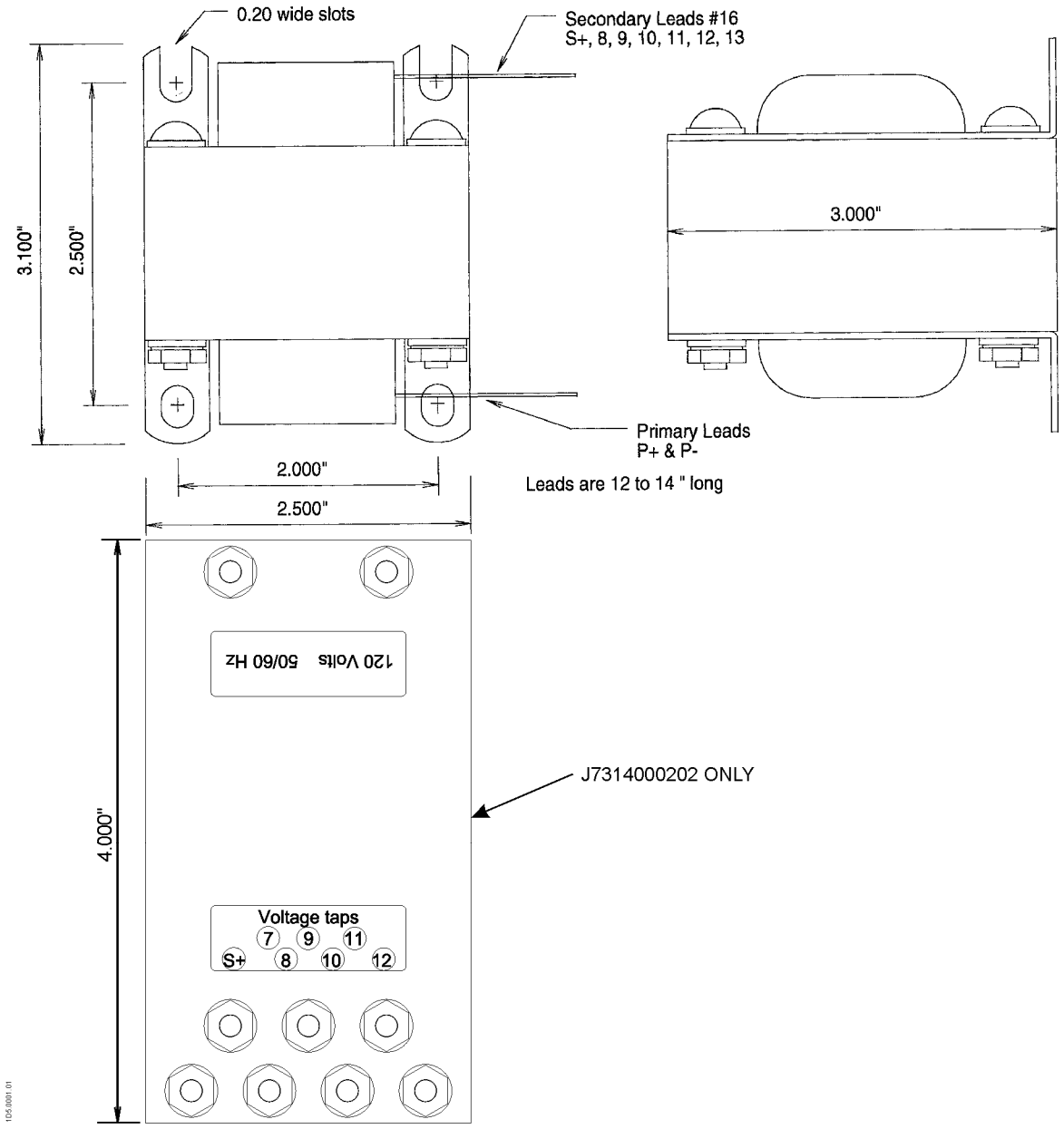


Figure 11-1. Lighting Transformer Dimensions

12. TECHNICAL SUPPORT

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team in the United States at 1-800-652-7276 or by e-mail at railteam@ansaldo-sts.us.

End of Manual