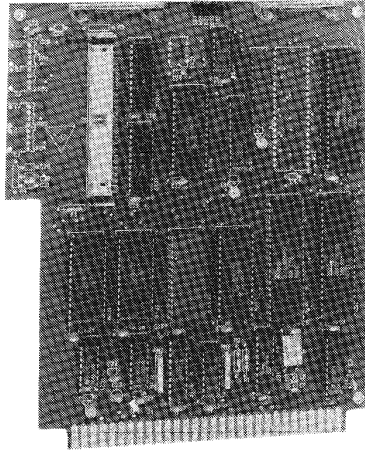


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MOTION CONTROL SYSTEMS, MSC-850	OCTOBER 1989
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HPL-850

PROGRAMMABLE LIMIT SWITCH CONTROLLER

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.	
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Revision - 0 Approved By:	
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1.0 INTRODUCTION

1.1 About This Instruction Book

This document is part of a series of books that support Industrial Indexing Systems' MSC-850 based Motion Control System. It provides information about the HPL-850 Programmable Limit Switch Controller

(Figure 1-1) including a product overview, product description, product specifications, description of controls and indicators, and connection diagrams.

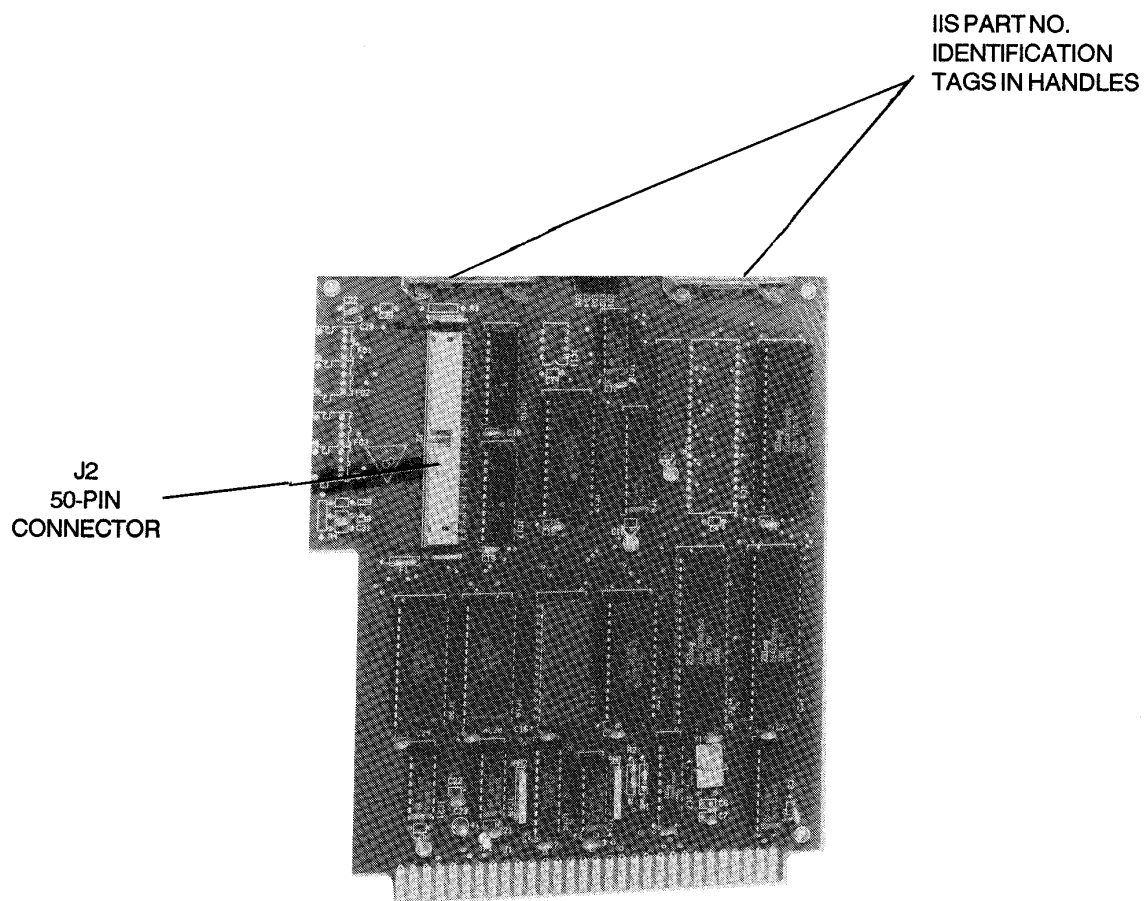
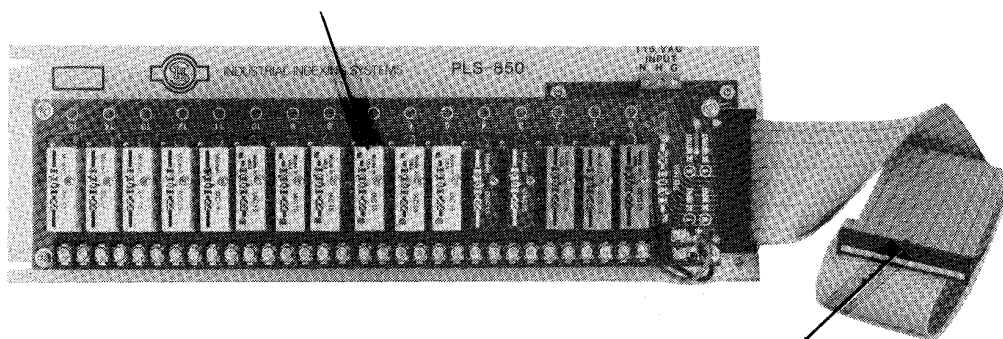


Figure 1-1 HPL-850 Programmable Limit Switch Controller

TYPICAL OUTPUT MODULE



50-PIN RIBBON CABLE CONNECTOR
FOR CONNECTION TO HPL-850 CONTROLLER

Figure 1-2 PLS-850 Programmable Limit Switch Assembly

1.2 Product Overview

The HPL-850 Programmable Limit Switch Controller is an edge connector printed circuit board that can be plugged into any one of the controller slots of the MSC-850 System Unit. It provides high performance control of position dependent outputs to simulate cam or drum switching.

The HPL-850 Controller is used in conjunction with the PLS-850 Programmable Limit Switch Assembly to provide as many as 16 AC or DC hardware outputs. In addition the controller can provide 8 software outputs of which 4 can be interrupt sources. On multi-turn motion control applications, a 360-degree rollover point can be programmed.

A unique feature of this controller is its ability to provide output prelead using a software time advance on 8 of the hardware outputs. Time advance can be used to anticipate activation of the output module for actuator delay compensation.

2.0 DESCRIPTION

2.1 General

The HPL-850 Programmable Limit Switch Controller is an intelligent circuit board used in conjunction with the PLS-850 Programmable Limit Switch Assembly to produce position related outputs (Figure 2-1). These outputs can simulate the functions of mechanical cam switching or drum switching techniques.

2.2 HPL-850 Controller Functional Description

The Macroprogram can command the HPL-850 Programmable Limit Switch Controller to produce an output that closes or opens a solid-state relay switch (OPTO22 type Output Module) at a specified angle. Since the Programmable Limit Switch Controller does not have a direct position sensor input, the position information is provided through a Master Angle Bus.

In a linear system, the maximum length is programmable (using the 'set_pls_cnt' instruction) in bits per system cycle. The Angles are then programmed in bits proportional to the 'set_pls_cnt'. For example, a 20-turn system traverses 81,920 ibts/360 degrees. On at 40960 and off at 61440 means an output will be on between 180 degrees and 270 degrees.

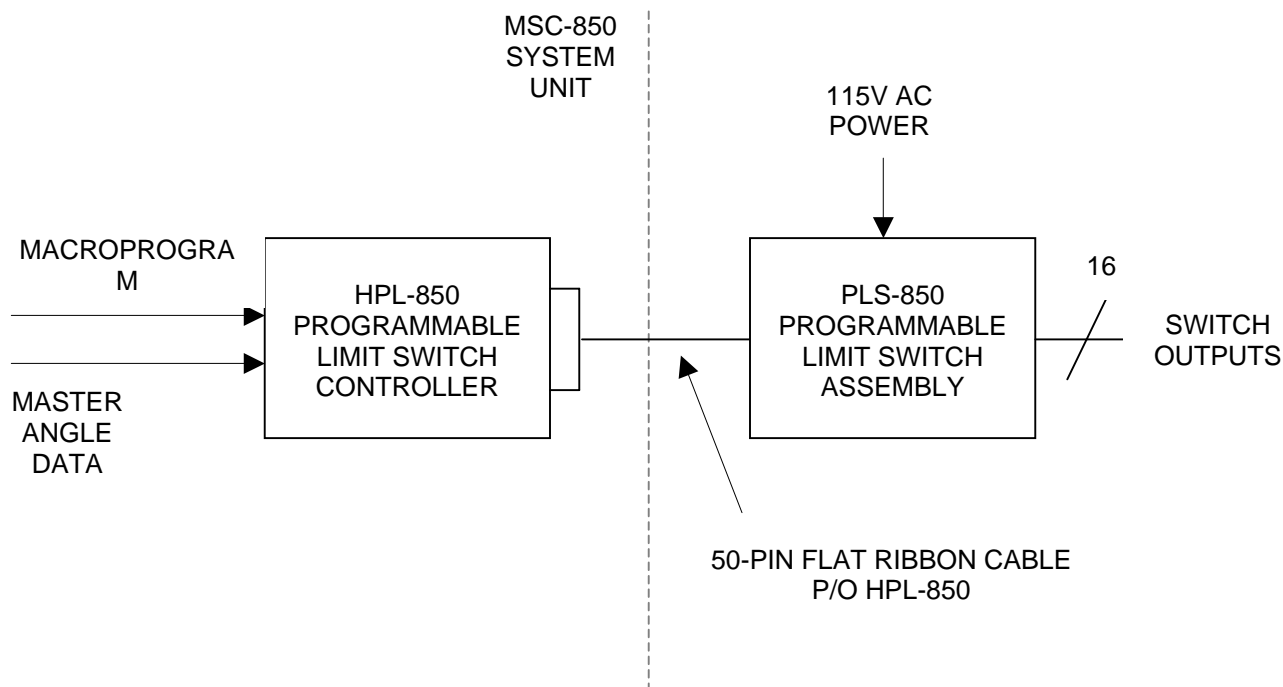


Figure 2-1 Programmable Limit Switch, Block Diagram

2.3 PLS-850 Programmable Limit Switch Assembly

The HPL-850 Programmable Limit Switch Controller (Figure 2-2) consists of an accumulator, comparator, calculator, and data table. The change in Master Angle Data from one of the System Unit's angle buses is accumulated until it reaches a value determined by the 'set_pls_cnt' instruction from the Macroprogram. The resulting count per 360-degree value is fed into a data table. The data table, which is 8192 counts in length, holds the output state for each output function and outputs the angle data used to close and open the limit switch.

The preset Macroprogram instruction is used to set the accumulator to a known position for initialization and the 'get_angle' instruction returns the present accumulator value.

The PLS-850 Programmable Limit Switch Assembly contains 16 positions in which OPTO 22 type modules can be mounted. Each position is equipped with a module-on indicator. When the indicator is lighted, the module is operating. The assembly is powered by an 115V-ac source, which is converted to 15V dc by an on-board power supply. The assembly is connected through a 50-pin 2 ft. (610 mm) flat ribbon cable, supplied as part of the PLS-850 Programmable Limit Switch Assembly, to the HPL-850 Programmable Limit Switch Controller.

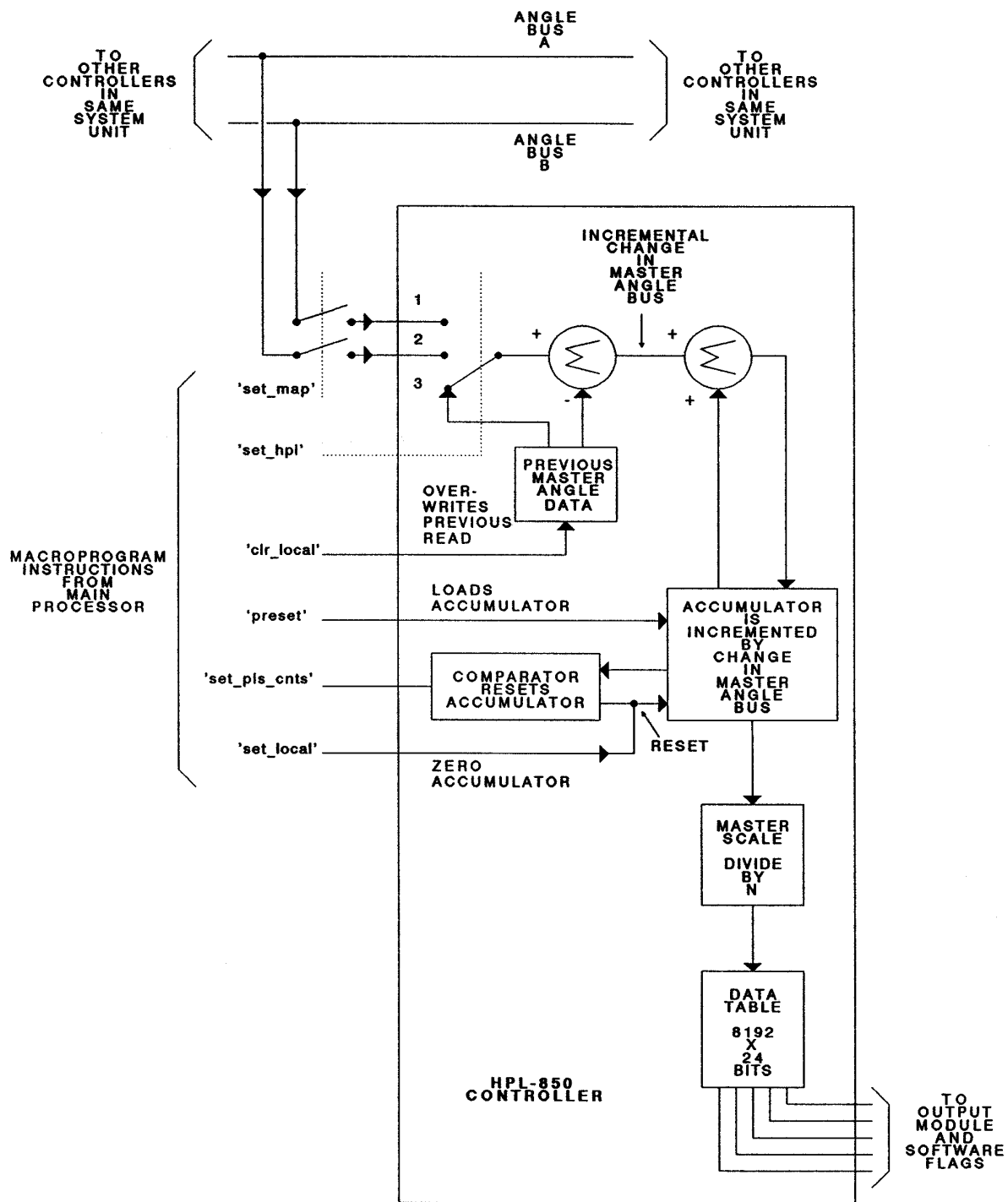


Figure 2-2 HPL-850 Controller, Functional Block Diagram

3.0 SPECIFICATIONS

3.1 Functional Characteristics

Hardware Outputs

16-industry standard
ODC15 and OAC15
output type solid

Optically Isolated Output Modules

AC Output Module (OAC15)
Operating Voltage Range
Current Rating @ 70 C
Output Voltage Drop (Peak)
Off-state Leakage @ 120V ac

12 to 140V ac
2 Amps Max
1.6V ac Max
5 mA Max

DC Output Module (ODC15)
Operating Voltage Range
Current Rating @ 70 C
Output Voltage Drop (Peak)
Off-state Leakage @ 60V dc

5 to 60V dc
2 Amps Max
1.6V dc Max
1 mA Max

Software Outputs

8 Polling flags of
which 4 can cause
software interrupts

Source of Angle Data

Programmable from either
Angle Bus

Time Advance Relative to Master Angle

Outputs
Time Advance Range

8
0 to 2.55 seconds

3.2 Performance Characteristics

Reaction Time Delay (no time advance)

Hardware Outputs	
Type ODC15	1.5 milliseconds max
Type OAC15	1.5 milliseconds + ½ line cycle
Software Outputs	Program dependent

Reaction Time Delay (time advance with constant velocity)

Hardware Outputs	
Type ODC15	1.5 milliseconds max
Type OAC15	1.5 milliseconds + ½ line cycle
Software Outputs	Program dependent

Reaction Time Delay (time advance with changing velocity)

Hardware Outputs	
Type ODC15	10 milliseconds max
Type OAC15	10 milliseconds + ½ line cycle
Software Outputs	Program dependent

Resolution

Up to 1 part in 8192

Input Power to PLS-850 Assembly

Voltage	100 to 130V ac
Frequency	48 to 62 HZ
Current	0.5A Max

Environmental

Operating Temperature	32° to 140° F (0° to 60° C)
Operating Humidity	30 to 90 % (Non-condensing)

3.3 Physical Characteristics

HPL-850 Programmable Limit Switch Controller

Dimensions	
Width	5.5/16 in. (135 mm)
Depth	6.5/16 in. (160 mm)
Weight	1 lb. (0.45 Kg.)
Mounting	Occupies any controller slot in MSC-850 System Unit

PLS-850 Programmable Limit Switch Assembly

Dimensions	
Height	5 in. (127 mm)
Width	15- ³ / ₄ in. (394 mm)
Depth	2- ¹ / ₂ in. (63.5 mm)
Weight	3 lbs. (1.36 Kg.)
Mounting	Panel

4.0 CONTROLS AND INDICATORS

4.1 General

The HPL-850 Programmable Limit Switch Controller is equipped with five status indicators. These indicators are visible through a cutout in the faceplate of the System Unit. The indicators are illustrated in Figure 4-1 and listed in Table 4-1.

There are no setable devices on the HPL-850 Controller. All parameters and functional controls are established by the Macroprogram.

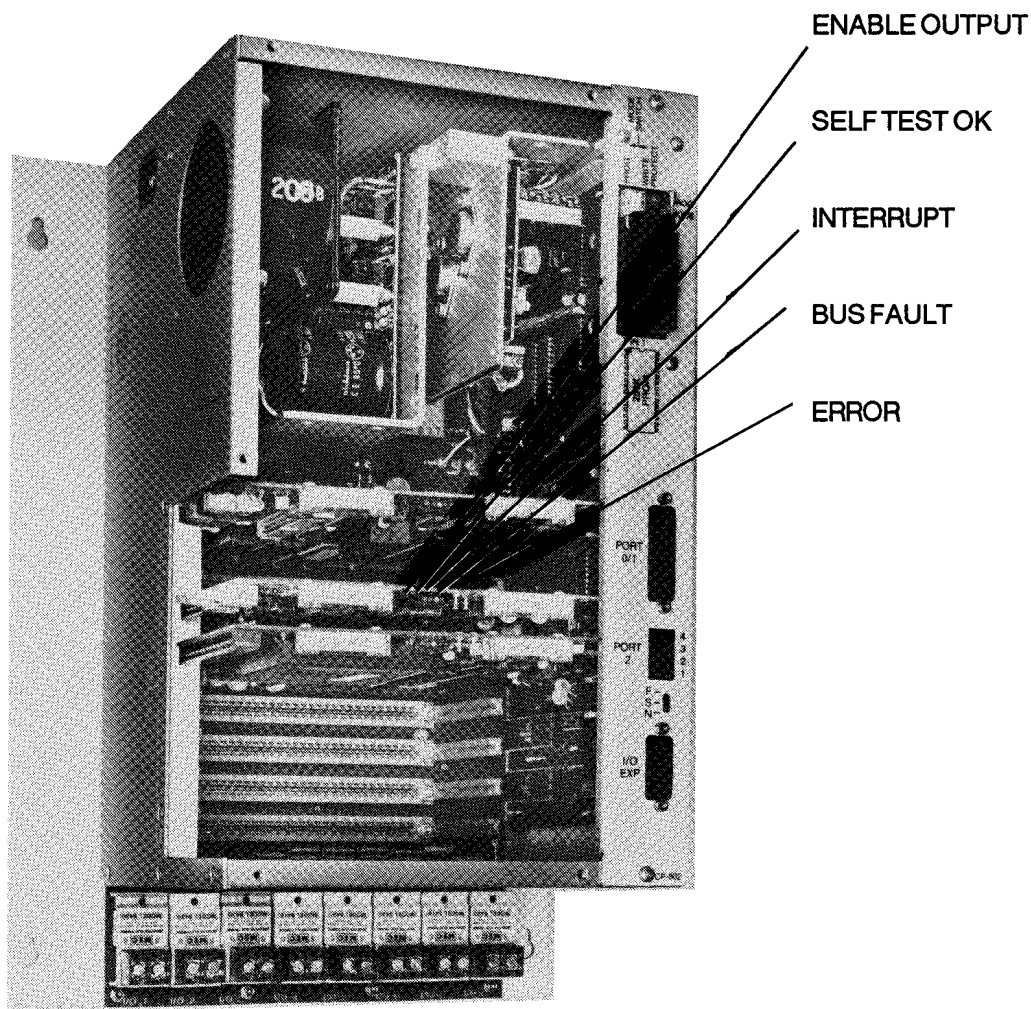


Figure 4-1 Identification of Status Indicators

Table 4-1 Identification of Status Indicators

PANEL MARKING	DESCRIPTION	OBSERVED INDICATION	INDICATION FUNCTION
ENABLE OUTPUT	Green LED	Steady On	When HPL-850 accumulator is 0 +/- 32 bits.
SELF TEST OK	Green LED	Steady On	The controller passed the self-test during start up.
INTERRUPT	Yellow LED	Flashing	The controller is communicating with the Main Processor.
BUS FAULT	Red LED	Steady On	Communication on the C-bus between the controller and the Main Processor was faulty. A subsequent good communication sequence resets the BUS FAULT indicator.
ERROR	Red LED	Flashing	A controller error has been detected.

NOTE

If, during startup, the SELF TEST OK, INTERRUPT, BUS FAULT AND ERROR indicators come on, a controller start-up fault has occurred. A start-up retry should be attempted and if the same combination of indicators is lighted, then the controller can be suspected of being faulty.

5.0 FUNCTIONALITY

5.1 General

The HPL-850 Programmable Limit Switch Controller and the PLS-850 Programmable Limit Switch Assembly operating in conjunction with one another. The PLS-850 Assembly is connected to the controller through a 50-pin flat ribbon cable. The optically isolated output modules are powered by an on-board 15V-dc power supply. This power supply is connected to an 115V-ac source. The following tests can help isolate the faulty element in this group of components.

5.2 Mechanical and Software Tests

1. Turn off the system power.
2. Check to make sure the controller is in the right slot and is properly seated in the connector.
3. Verify that the Macroprogram is directing the programmable switching commands to the right slot in the System Unit.
4. Turn on the system power and observe the status indicators on the front edge of the HPL-850 Programmable Limit Switch Controller.
 - The green SELF TEST OK indicator should come on and stay on. If the green SELF TEST OK indicator does not stay on, replace the HPL-850 Programmable Limit Switch Controller
 - If the green SELF TEST OK indicator comes on along with yellow INTERRUPT indicator and red BUS FAULT indicator, replace the HPL-850 Programmable Limit Switch Controller.

5.3 HPL-850 Controller Functional Description

1. Observe the indicators on the PLS-850 Programmable Limit Switch Assembly in which output modules are located. If none of the indicators are lighted, proceed as follows:
 - Set a Multimeter to the 15Vdc scale.
 - Connect the red and black meter leads to the + and – terminals located next to the ribbon cable connector (Figure 5-1).
 - The meter should indicate 15V-dc +/-V dc. If the 15V-dc indication is within specification, go to step 2. If not, proceed as follows.
 - Set the Multimeter to the 115ac scale.

WARNING

Lethal voltages. Proceed with caution.

- Connect the meter leads to the “N” and “H” terminals (Figure 5-1).
- The meter should indicate between 100 and 130V ac.
- If the meter indication is within specification, replace the PLS-850 Programmable Limit Switch Assembly. If out of specification, check the incoming power cord and the ac power source.

2. Turn off the system power.
 - Check the 50-conductor ribbon cable between the PLS-850 Programmable Limit Switch Assembly and the controller for open conductors or shorts between conductors.
 - Replace the PLS-850 Programmable Limit Switch Assembly if any problems are suspected.
3. Turn on the system power.
 - If problems still exist, replace the HPL-850 Programmable Limit Switch Assembly.

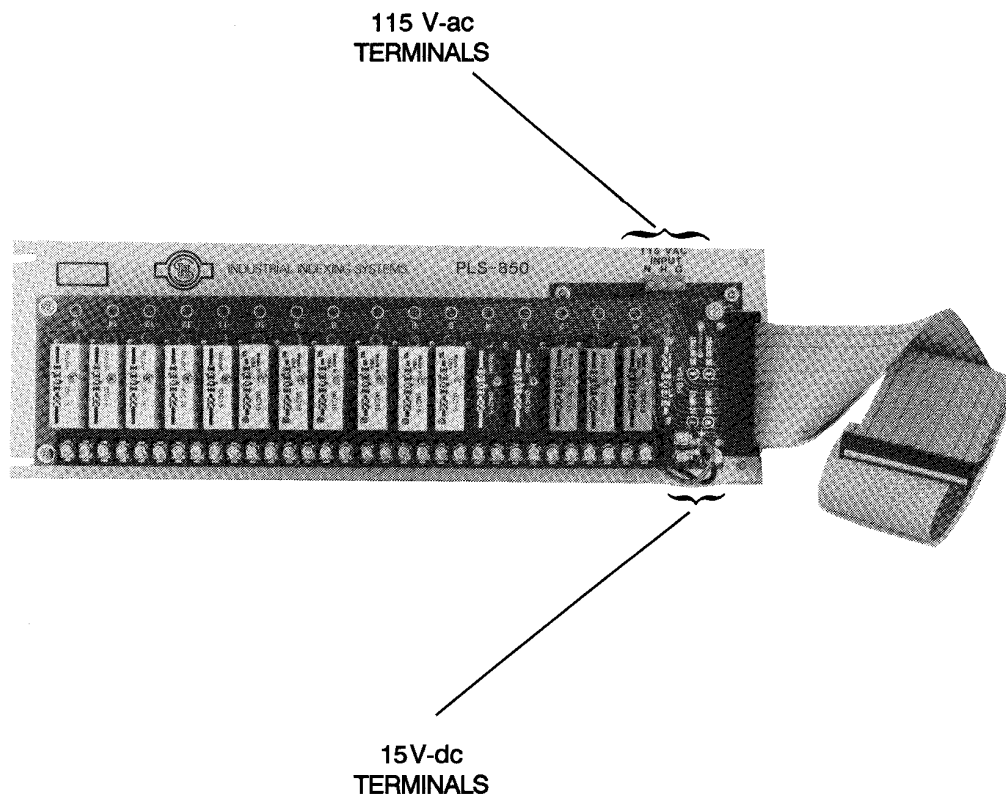


Figure 5-1 Location of AC and DC Test Terminals

6.0 INTRODUCTION

6.1 General

This section contains the electrical connections for the programmable limit switch functions. Detailed information on the proper connection of the OPTO 22 type output modules is included in Figures 6-1 and 6-2. The 50-pin

connector which connects the PLS-850 Programmable Limit Switch Assembly to the HPL-850 Programmable Limit Switch Controller is given in Figure 6-3.

Figure 6-4 illustrates the mounting dimension requirements for the PLS-850 Programmable Limit Switch Assembly.

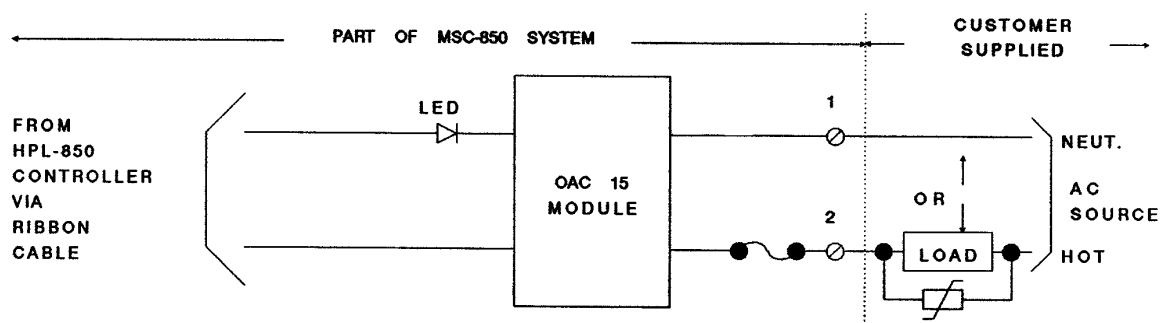


Figure 6-1 AC Output Module, Connection Diagram

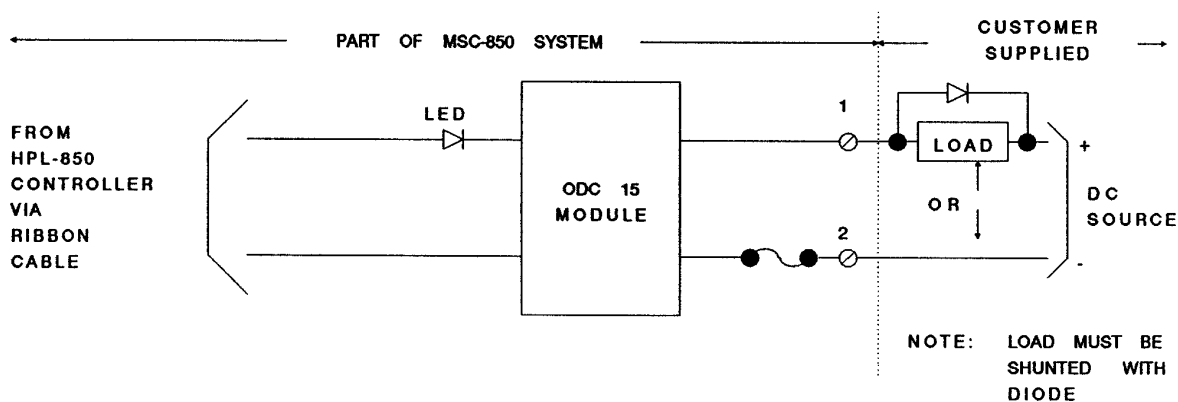


Figure 6-2 DC Output Module, Connection Diagram

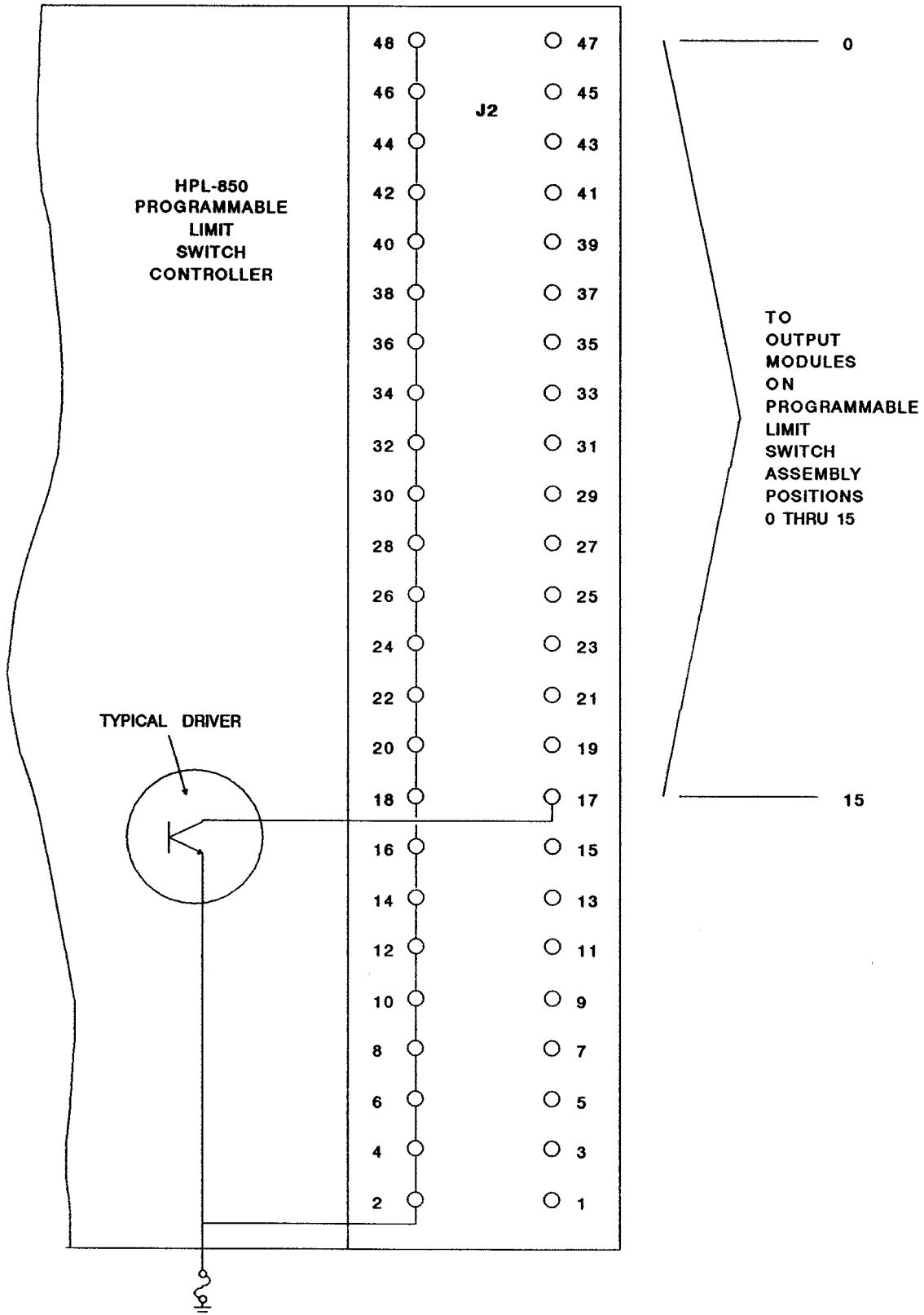


Figure 6-3 HPL-850 Controller, Connection Diagram

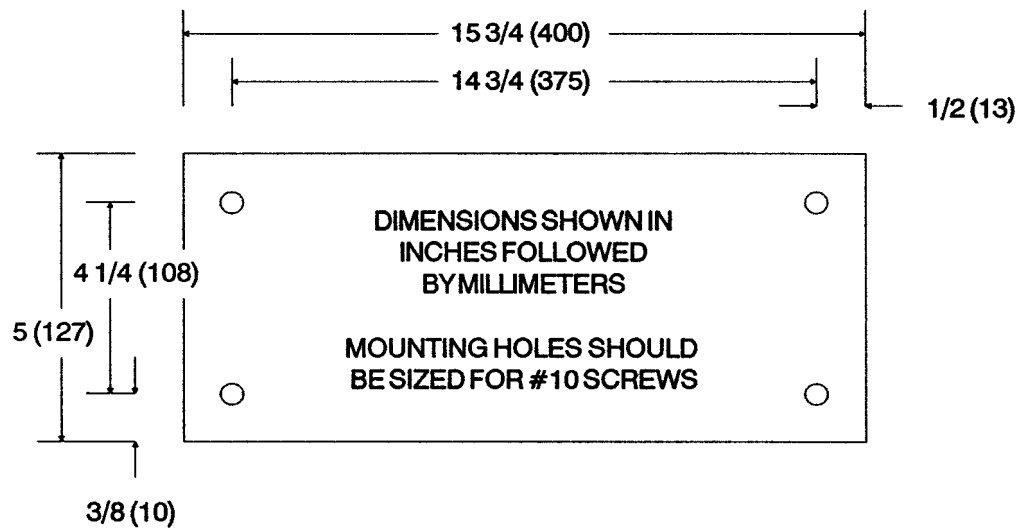


Figure 6-4 PLS-850 Assembly, Mounting Requirements

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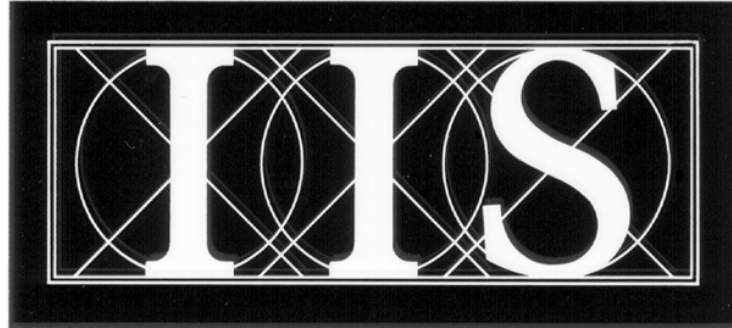
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