SOLVES-IT! RANGE COMPARE APPLICATION MODULE

Revision 0 for Software Version 1.0.0.0

PLC on a Chip Patent 7,299,099

A larger format of this manual may be found at http://www.divelbiss.com

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2008009.0

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WARNING!

The SI-APPMOD-RANGECOMPARE, as with programmable controllers, must not be used alone in applications which would be hazardous to personnel in the event of failure of this device. Precautions must be taken by the user to provide mechanical and/or electrical safeguards external to this device. This device is NOT APPROVED for domestic or human medical use.

PACKAGE CONTENTS

Whats Included

Qty	Description	Part Number	Location
1	SI-210 with Software Pre-loaded	SI-210	In Box
1	SI-APPMOD-RANGECOMPARE Manual	2008009.X	In Box
1	Din-rail Socket	115-105328	In Box
6	Commutating Diodes	111-101012	In Box

GETTING STARTED

This section explains how to read this manual and understand the symbols.

HOW TO USE THIS MANUAL

In this manual, the following conventions are used to distinguish elements of text:

BOLD　　　　Denotes labeling, commands, and literal portions of
　　　　　　　syntax that must appear exactly as shown.

italic　　　　Used for variables and placeholders that represent the type of text
　　　　　　　to be entered by the user.

SMALL CAPS　　Used to show key sequences or actual buttons, such as OK, where the user clicks
　　　　　　　the OK button.

In addition, the following symbols appear periodically in the left margin to call the readers attention to specific details in the text:

Warns the reader of a potential danger or hazard that is associated
with certain actions.

Appears when the text contains a tip that is especially helpful.

Indicates that the text contains information to which the reader
should pay particularly close attention.

All Information and Specifications Subject to Change without Notice

MODULE BASICS

This section describes the SI-APPMOD-RangeCompare Application Module including input/output assignments and an operational description.

GETTING TO KNOW THE MODULE
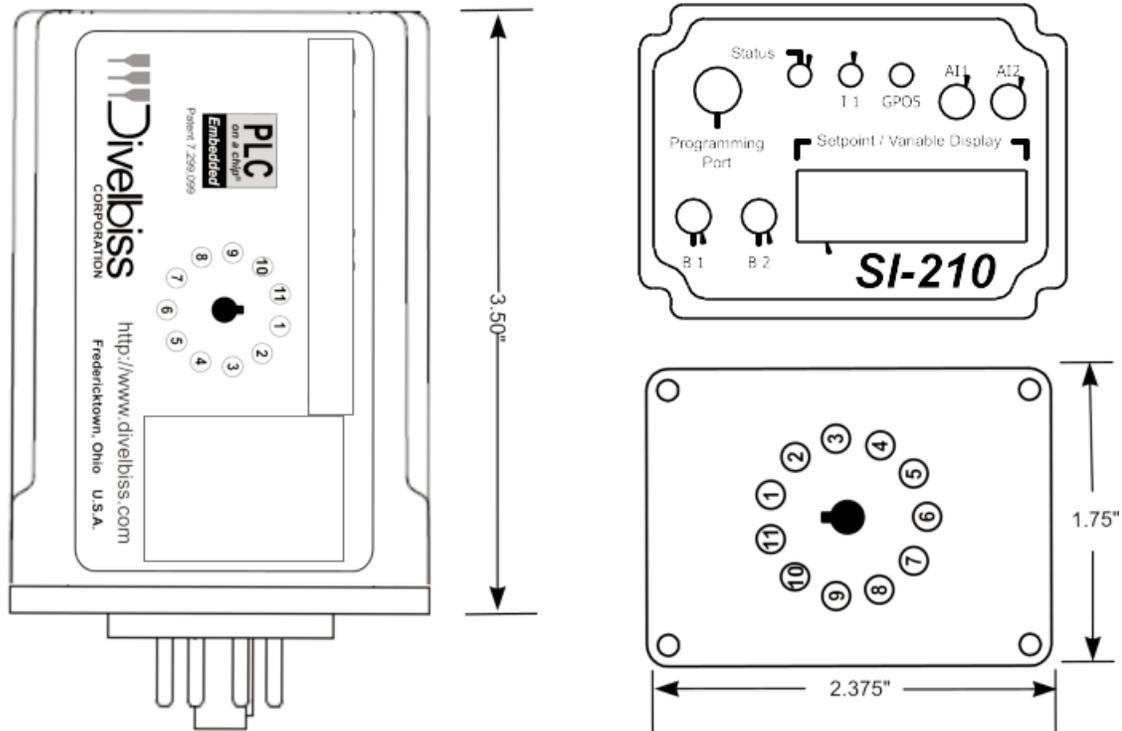
The module is connected to external devices via its included mounting socket.

Connector Pin out

Bottom View (Solves-It! Connector)

Pin 1   Below Range Output
Pin 2   Not Used - GPIO3 / HSC
Pin 3   Not Used - GPO4
Pin 4   Fault Output
Pin 5   - Analog Input Signal
Pin 6   + Analog Input Signal
Pin 7   Earth Gnd
Pin 8   Input Power Common
Pin 9   10-32VDC Input Power
Pin 10   Above Range Output
Pin 11   In-Range Output
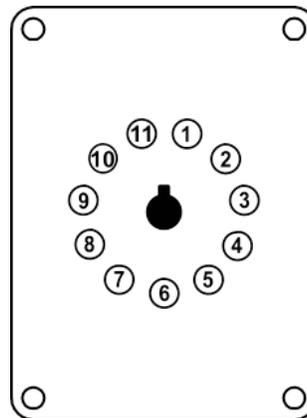
Figure 2.1 - Module Pin-Out

MODULE MOUNTING

The Module mounts to an industry standard 11-pin Octal relay socket. To mount the module, align with the socket and firmly push into position.

MODULE INPUT POWER

The module can be powered with 10-32VDC. The input power must be of sufficient supply to drive the module and the outputs (based on the load currents for each) Maximum current for the module is 150mADC and maximum load for each outputs is 300mADC. For the pre-programmed software, only 4 outputs are used and only 1 output may be on at a time. Exceeding a total output load of greater than 1ADC (more than 3 outputs at full load simultaneously) can damage the module.

+10-32VDC
POWER IN

-DC /
POWER
COMMON

EARTH
GND

11   10   9   8   7

Status

I 1   GPO5   AI1   AI2

Programming
Port

Setpoint / Variable Display

**APPLICATION MODULE
INPUT POWER**

**Shown installed in provided
mounting socket**

B 1   B 2

SI-210

1   2   3   4   5   6
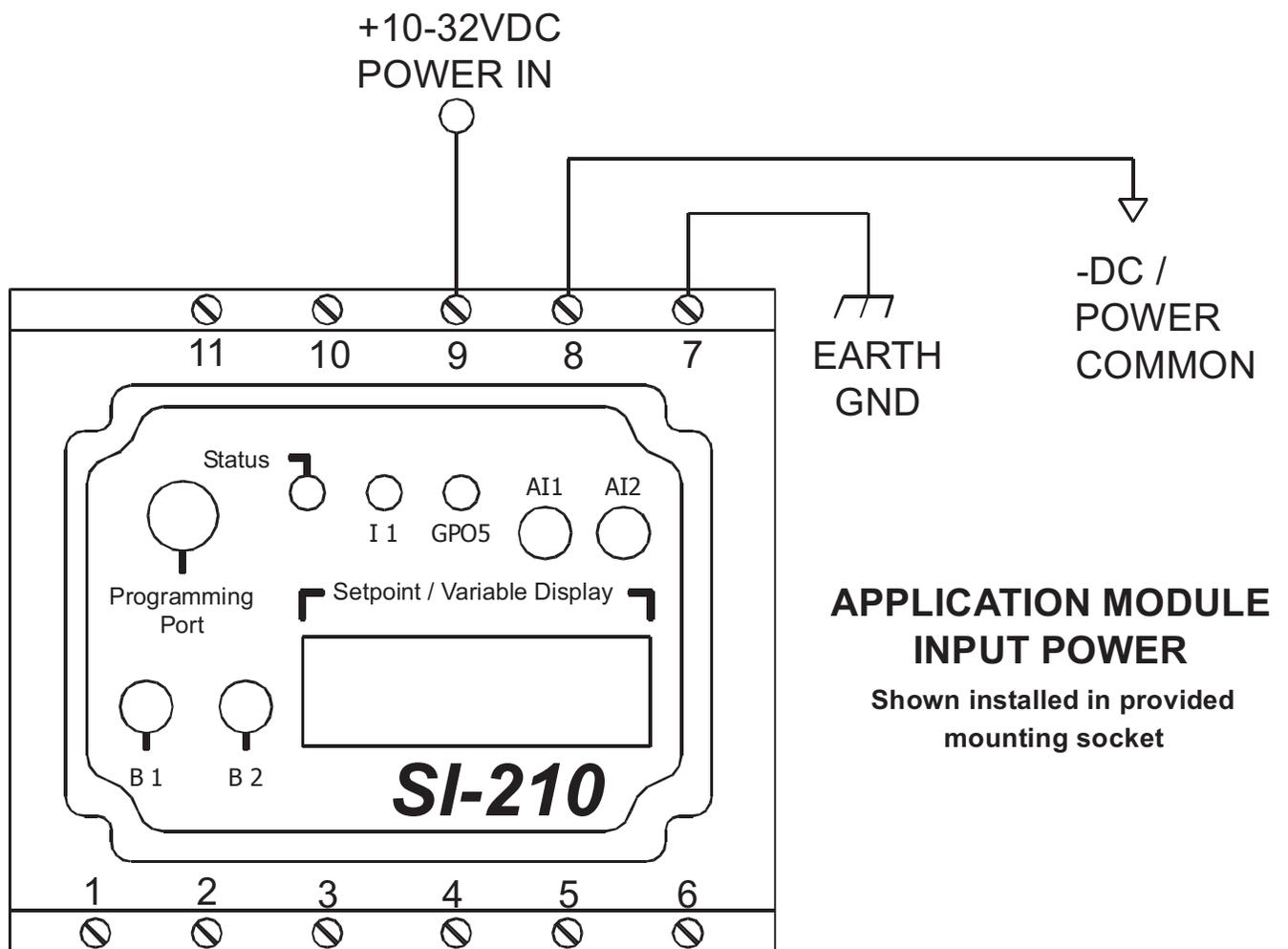
Figure 2.2 - Module Input Power Diagram

MODULE OPERATION

The SI-APPMOD-RangeCompare module compares the *analog input signal* to two other signals; the *upper range limit* and the *lower range limit*. If the analog input signal is between the two signals; it is considered in-range and the In-Range Output will be energized. If the analog input signal is less than the lower range limit; it is considered below range and the Below Range Output will be energized. If the analog input signal is greater than the upper range limit; it is considered above range and the Above Range Output will be energized.

For operation, an five-count hysteresis has been programmed into the range comparison. When Above Range, the analog input signal must fall five counts to trigger it is back In-Range. When Below Range, the analog input signal must rise five counts to trigger it is back In-Range.

The lower range limit is adjusted using the AI1 potentiometer located on the front of the user interface. The upper range limit is adjusted using the AI2 potentiometer located on the front of the user interface. Both limits can be viewed from the user interface.

The analog input signal and the two limit signals are processed through the on-board analog to digital converter. Each signal (0-10VDC) is now represented as an integer number from 0 to 1023. 0VDC would be represented as integer 0 while 10VDC would be represented as 1023. 1023 for the top of the scale is approximate. Due to circuit tolerances and other factors, a typical top end scale for the analog input signal could be 990 - 1000.

USER INTERFACE

The user interface consists of two push-buttons; labeled B1 and B2, the Setpoint/Variable Display, the I1 LED indicator and the two limit adjustment potentiometers; AI1 and AI2.
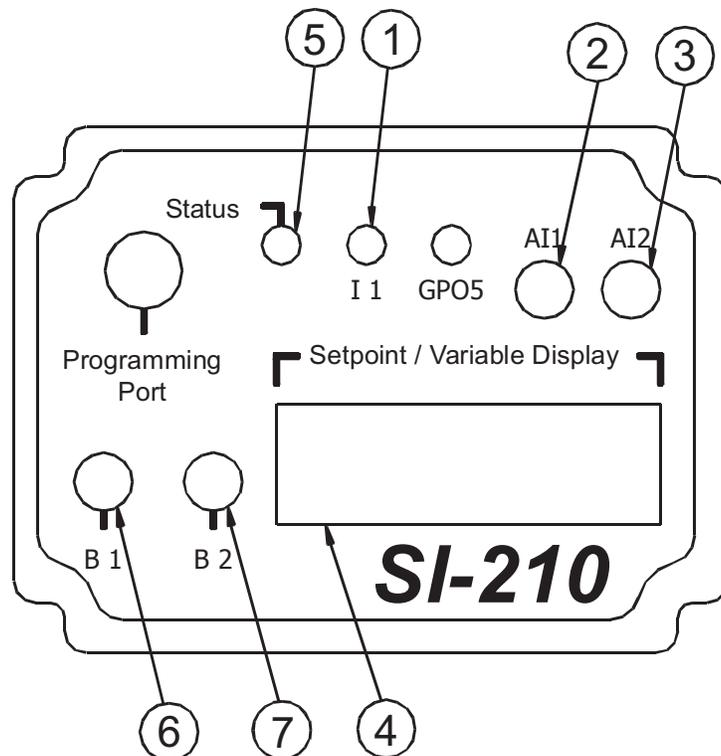
1. Display View Indicator
Slow Flashing indicates analog input signal is displayed, Medium Flashing indicates lower limit signal is displayed, and Fast Flashing indicates upper limit is displayed.

2. Lower Limit Setpoint
Adjustment of Lower Range Limit from 0 to approximately 1023.

3. Upper Limit Setpoint
Adjustment of Upper Range Limit from 0 to approximately 1023.

4. Setpoint / Variable Display
View the analog input signal, lower range limit or upper range limit. Signals are viewed as Integer of 0-1023.

5. Module Status Indicator
Flashing slowly indicates module problem
Flashing quickly indicated module is operating .

6. B1 Push-button
Each press will display each input signal in order.
   1. **Analog Input Signal**
   2. **LowerRange Limit**
   3. **Upper Range Limit**

7. B2 Push-button
Not Used

Figure 2.3 - User Interface

ANALOG INPUT SIGNAL CONNECTIONS

The analog input signal accepts a differential 0 to 10VDC input voltage. The input may be connected as either a differential or single-ended input. Shielded cable should be used as wiring for the analog input signal to promote noise immunity. Figure 2.4 shows typical analog input signal connection wiring diagrams.

Differential Wiring Diagram   **Single-Ended Wiring Diagram**
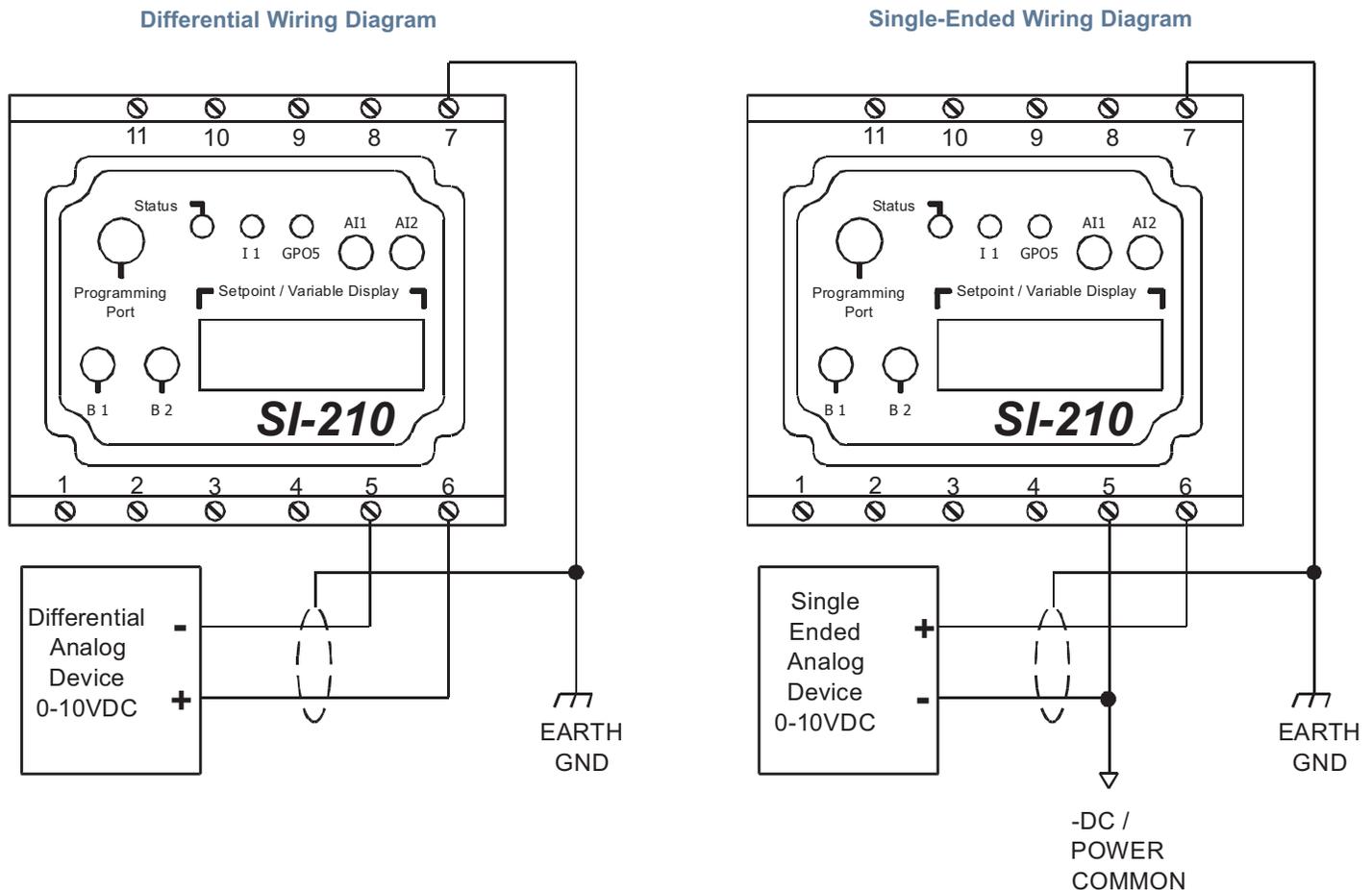
Figure 2.4 - Input Analog Signal Connections

OUTPUT CONNECTIONS

When outputs are energized, the output pin will be sourced with +V (equal to the module input power voltage). Each output can drive a load up to 300mA maximum (resistive). Depending upon the device connected to an output, a minimum load resistor may be required. If the output is energized at all times, connect a 470Ω to 1KΩ load from the output to common. Figure 2.5 is a typical output wiring diagram.

The factory installed software for this module will only allow one output to be energized at a time. In the event the software is modified; note, all outputs cannot be ON simultaneously. Max total current for outputs is 1ADC. Simultaneous output loads greater than 1A may result in damage to the module.
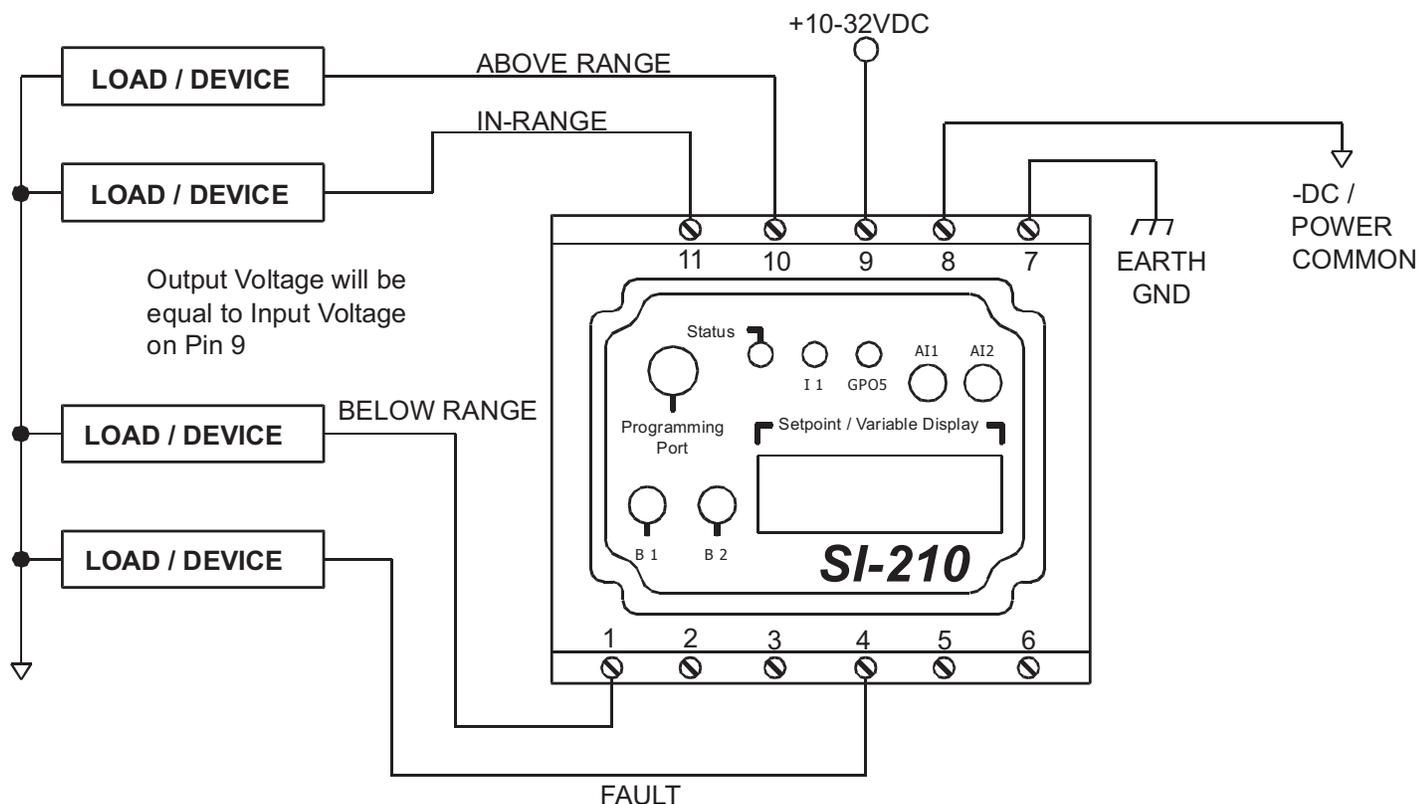
Figure 2.5 - Typical Output Connections

TUNING THE MODULE

On power up, the display will default to the Analog Input Signal (I1 indicator will be flashing the slowest). Pressing the B1 button will cause the display to change and view the Lower Range Limit (I1 indicator will be flashing at a medium speed). Another press will cause the display to change and view the Upper Range Limit (I1 indicator will be flashing at the fastest speed). A third press will cause the original Analog Input Signal to be displayed (I1 indicator will be flashing at the slowest speed).

LOWER LIMIT TUNING

1. Press the B1 button until the I1 indicator is flasing at a medium speed. Pressing the B1 button several times will allow you to determine the 3 speeds at which the indicator flashes.

2. With the I1 indicator flashing at a medium speed, the Lower Range Limit's value is displayed (0-1023). Adjust the AI1 potentiometer above the display to increase or decrease this limit. The Analog Input Signal may be viewed at any time by pressing the B1 button until it is displayed.

UPPER LIMIT TUNING

1. Press the B1 button until the I1 indicator is flasing at a fast speed. Pressing the B1 button several times will allow you to determine the 3 speeds at which the indicator flashes.

2. With the I1 indicator flashing at a fast speed, the Upper Range Limit's value is displayed (0-1023). Adjust the AI2 potentiometer above the display to increase or decrease this limit. The Analog Input Signal may be viewed at any time by pressing the B1 button until it is displayed.

TUNING ERRORS

When the Fault Output (and GPO5 indicator on the module) are flashing, this indicates a tuning error. The module has detected either the Upper Range Limit is less than the Lower Range Limit or the Lower Range Limit is greater than the Upper Range Limit. Adjust the limit that is not tuned correctly to stop the fault.

EXPANDABILITY / CUSTOMIZATION

As the module is based on the Solves-It! Analog, Model SI-210, the program can be customized and its functionality expanded. Accessories are required. The program that was factory installed can be downloaded from *http://www.divelbiss.com*. The program can be edited to add additional functionality and logic. To gain functionality of some inputs and/or outputs, it may be necessary to re-assign the I/O that was factory configured. For more information about changing the functionality, download the Solves-It! Analog User Manual and the EZ LADDER User Manual.

The following accessories are required to re-program the module and are included in the SI-APPMOD-PGMKIT:

    1. SI-PGM   Solves-It! Programming Cable
    2. EZLDCD-02   EZ LADDER Lite on CD.

PROGRAMMED FROM FACTORY SPECIFICATIONS

Processor:	Solves-It! Analog Model 210, Based on PLC on a Chip^{TM}
Memory:	64K Flash
Outputs:	4 Sourcing SSR Outputs, rated 10-32VDC @ 300mADC Max. each. Max total output load = 1ADC @ 24VDC power input. Output Voltage = Input Power
	Functionality: Above Range , Below Range, In-Range and Fault
Power Requirements:	10-32VDC @ 150mADC Max
Indicators:	I1 LED Indicator, 1 Status LED Indicator, 1 Output LED Indicator (GPO5)
Analog Inputs:	1 0-10VDC External Analog Input Signal
	1 Internal Potentiometer - Lower Range Limit
	1 Internal Potentiometer - Upper Range Limit
Display:	4 Digit, 7 Segment Programmable LED Display
Push Buttons:	1 Programmable Push Buttons
Operating Temp:	0-60º C
Dimensions:	3.62" Wide x 5.21" Length x 1.21" Tall.
Mounting:	Plugs into Industry standard 11-pin Octal Relay Socket
Type:	Plastic Housing

Limited Warranty

Divelbiss Corporation warrants equipment will be free from defects in material and workmanship for a period of one (1) year from the date of the Divelbiss invoice that the equipment was furnished. Divelbiss Corporation will not be liable for any design furnished by Buyer and incorporated into the equipment.

In no event shall Divelbiss Corporation be liable for anticipated profits, consequential damages or loss of use of equipment or of any installation into which the equipment covered by this order may be put.

Divelbiss Corporation shall not be liable or responsible for any loss, injury, or damage resulting directly or indirectly from the use of software and/or programming in any way associated with the equipment of this order.

Obligations are to be limited to the repair or replacement at the Divelbiss Corporation plant, Fredericktown, Ohio, upon return of the part or component in question, prepaid by Buyer. The return freight charges to be paid by Divelbiss. The part or component is only to be returned to Divelbiss with a Returned Material Authorization number issued by the Divelbiss Service Department. Any warranty service (consisting of time, travel, and expenses related to such services) performed other than at Divelbiss Corporation plant, shall be at Buyer's expense.

Warranty of repaired or replacment products will be limited to ninety (90) days or the remainder of the original warranty whichever is greater.

Warranty is available only if Divelbiss Corporation is promptly notified in writing upon discovery of any alleged defect and examination of the subject product discloses, to Divelbiss satisfaction, that any defect has not been caused by misuse; neglect; improper installation; improper operation; improper maintenance, repair, or alteration; accidents; or unusual deterioration or degradation of the equipment or parts thereof due to physical environment or due to electrical or electromagnetic noise environment.

This warranty is in lieu of all other warranties, expressed, implied, or statutory, including warranties of merchantability or fitness for a specific purpose.