SOLVES-IT!
SI-DEMO-01 &
SI-DEMO-02
User's Manual

REV .0

PLC
on a chip ™
Embedded

PLC on a Chip Patent 7,299,099

![Divelbiss CORPORATION]

Smart Parts for Managing Automation

2008001.0

TABLE OF CONTENTS

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 Specifications Subject to Change without Notice

SI-DEMO-01

This section describes the hardware features and options for the SI-DEMO-01 Solves-It! Demo Board. This demo is designed for use with SI-100 and SI-200 Solves-it! Plug-in PLC models.

🚫 Use only the models approved for the SI-DEMO-01. Installing other Solves-It! models may damage the Solves-It! and / or the Demo Board and void the warranty.

PACKAGE CONTENTS

What's Included

Qty	Description	Part Number	Location
1	SI-DEMO-01 Board	SI-DEMO-01	In Box
1	Solves-It! Demo Board Manual	2008001.X	In Box
1	Wall-mount Power Pack	130-106047	In Box

GETTING TO KNOW THE SI-DEMO-01
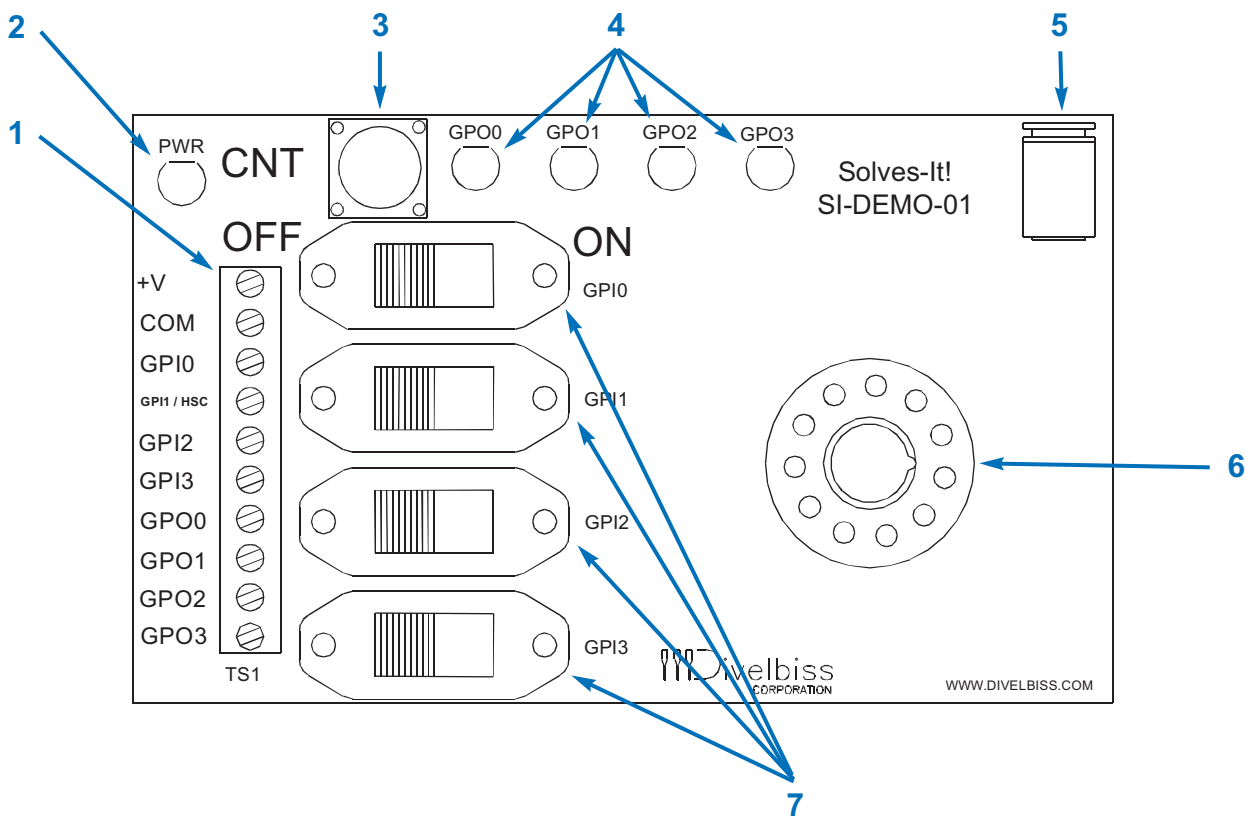
|		
1	**TS1** - Input Terminal Connections	
2	**PWR** - Input Power Indicator	
3	**CNT** - High Speed Counter Momentary Normally Open Pushbutton	
4	**GPO0-GPO3** - Output LED Indicators	
5	**VIN** - Input Power Jack	
6	Solves-It! Plug in Connector	
7	**GPI0-GPI3** - Input Normally Open Slide Switches	

TS1 CONNECTION DESCRIPTIONS

The SI-DEMO-01 provides the TS1 terminal connections block for accessing the Digital I/O of the installed Solves-It! Plug-in PLC. Please refer to the descriptions for each.

|	
+V	This terminal provides an access point for the power pack's unregulated +12VDC supply.
COM	This terminal provides an access point for the COMMON of power pack's output supply.
GPI0	This terminal connects directly to the GPI0 general purpose input of the installed Solves-It! Plug-in PLC. Connecting this terminal to COM will cause the input to be true. The GPI0 slide switch on the SI-DEMO-01 board must be turned off to allow proper operation of this pin.
GPI1 / HSC	This terminal connects directly to the GPI1 general purpose input and the High Speed Counter of the installed Solves-It! Plug-in PLC. Connecting this terminal to COM will cause the input to be true. Each transition from High to Low will cause the High Speed Counter to increment by one. The GPI1 slide switch on the SI-DEMO-01 board must be turned off to allow proper operation of this pin.
GPI2	This terminal connects directly to the GPI2 general purpose input of the installed Solves-It! Plug-in PLC. Connecting this terminal to COM will cause the input to be true. The GPI2 slide switch on the SI-DEMO-01 board must be turned off to allow proper operation of this pin.
GPI3	This terminal connects directly to the GPI3 general purpose input of the installed Solves-It! Plug-in PLC. Connecting this terminal to COM will cause the input to be true. The GPI3 slide switch on the SI-DEMO-01 board must be turned off to allow proper operation of this pin.
GPO0	This terminal connects directly to the GPO0 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO0 indicator will also be on.
GPO1	This terminal connects directly to the GPO1 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO1 indicator will also be on.
GPO2	This terminal connects directly to the GPO2 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO2 indicator will also be on.
GPO3	This terminal connects directly to the GPO3 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO3 indicator will also be on.

INSTALLING A SOLVES-IT! PLUG-IN PLC

To install the Solves-It! into the SI-DEMO-01 board, align the Solves-It! over the provided connector. Ensure the polarity 'notch' aligns correctly. Firmly push the Solves-It! into the connector as far as possible. The Solves-It! is now installed.

Solves-It!

SI-DEMO-01 Board

Polarity Notch

Polarity Notch

SI-DEMO-01
CONNECTOR
TOP VIEW
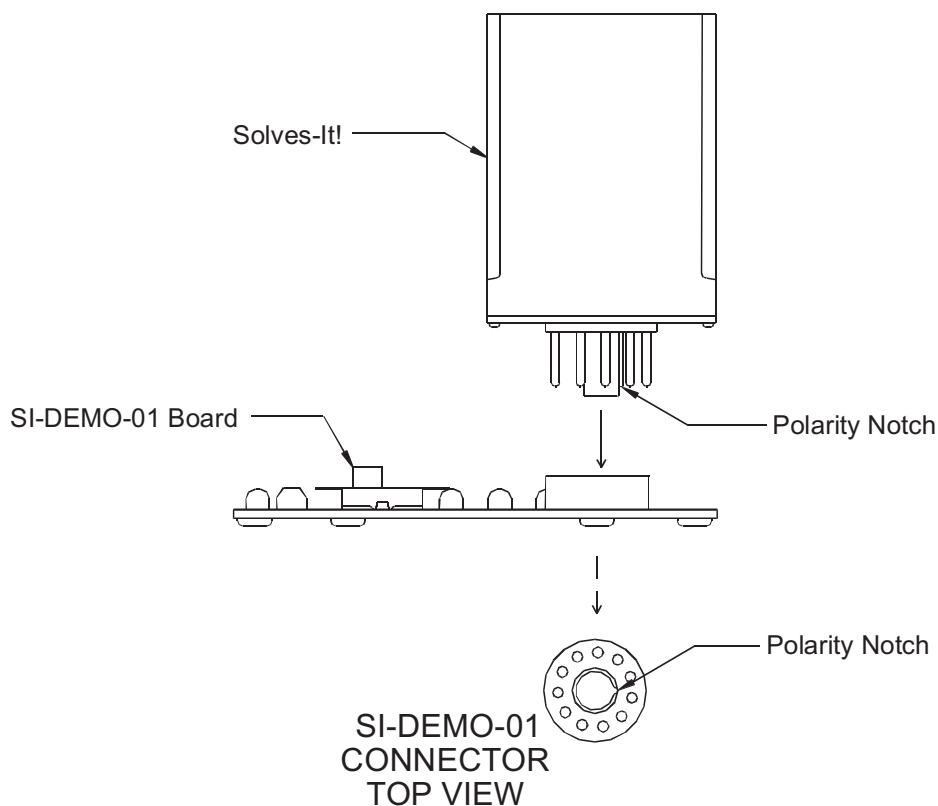
INPUT POWER

The input power for the SI-DEMO-01 is included. Power is provided by a wall pack power supply with an unregulated 12VDC output. The wall pack plugs into any standard 115 VAC wall outlet. The cord plugs into the VIN connector on the SI-DEMO-01. This power supply provides power for all on-board demo functions and the Solves-It! Plug-in PLC.

Wall Pack
Powersupply

TO 115VAC
Wall Outlet

GPO3

Solves-It!
SI-DEMO-01

VIN
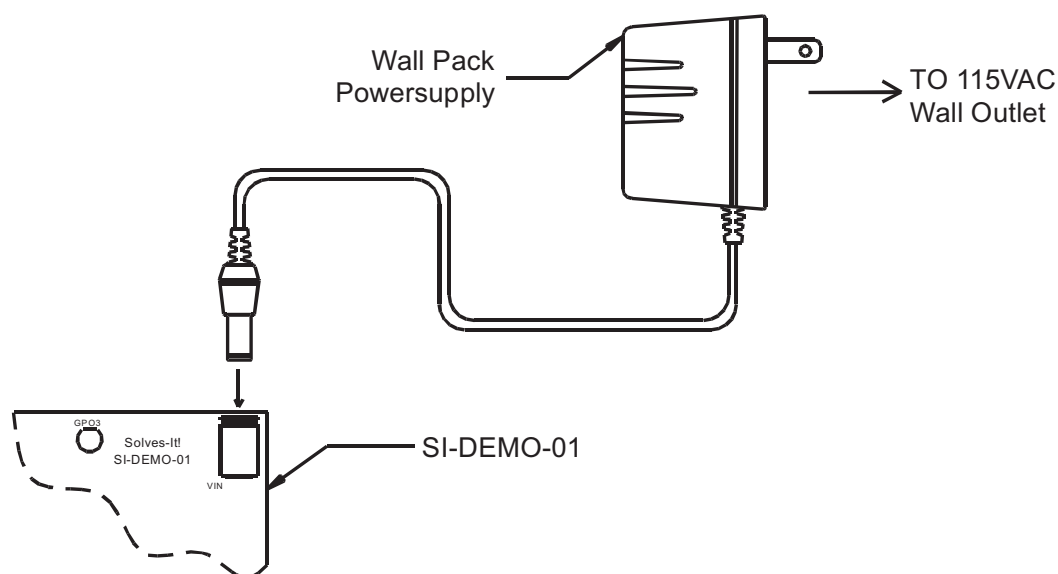
SI-DEMO-01

DIGITAL INPUTS

There are two ways to control the digital inputs using the SI-DEMO-01 (inputs actually located on the installed Solves-It!). The input can be enabled on-board using the provided slide switches for each or an external device connected to TS1 can be used to drive the inputs.

The methods can be mixed, but any input using an external source must have the Slide switch turned OFF.

ON-BOARD

There are four slide switches located on the demo board, labeled GPI0 through GPI3. Each of these switches, when closed, will apply the DC common to the Solves-It! digital input causing it to be On or True. Conversely, opening the slide switch, opens the circuit and causes the digital input to be OFF or False.

OFF   ON
                              GPI0

SLIDE LEFT   SLIDE RIGHT
FOR OFF   FOR ON
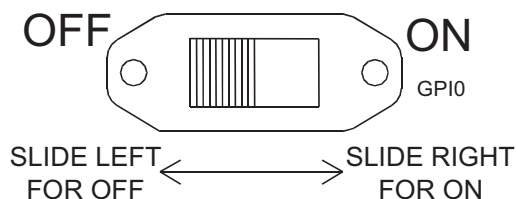
EXTERNAL

The inputs may be connected using the TS1 connection block. Each input may be turned ON or True by connecting the Input to the COM. Opening this connection makes the input turn OFF or False. Whatever device is used to drive the inputs, must cause the input to be closed to COM for proper operation.

For any input connected to an external device, the input's slide switch must be OFF for proper operation. The methods can be mixed, but any input using an external source must have the Slide switch turned OFF.
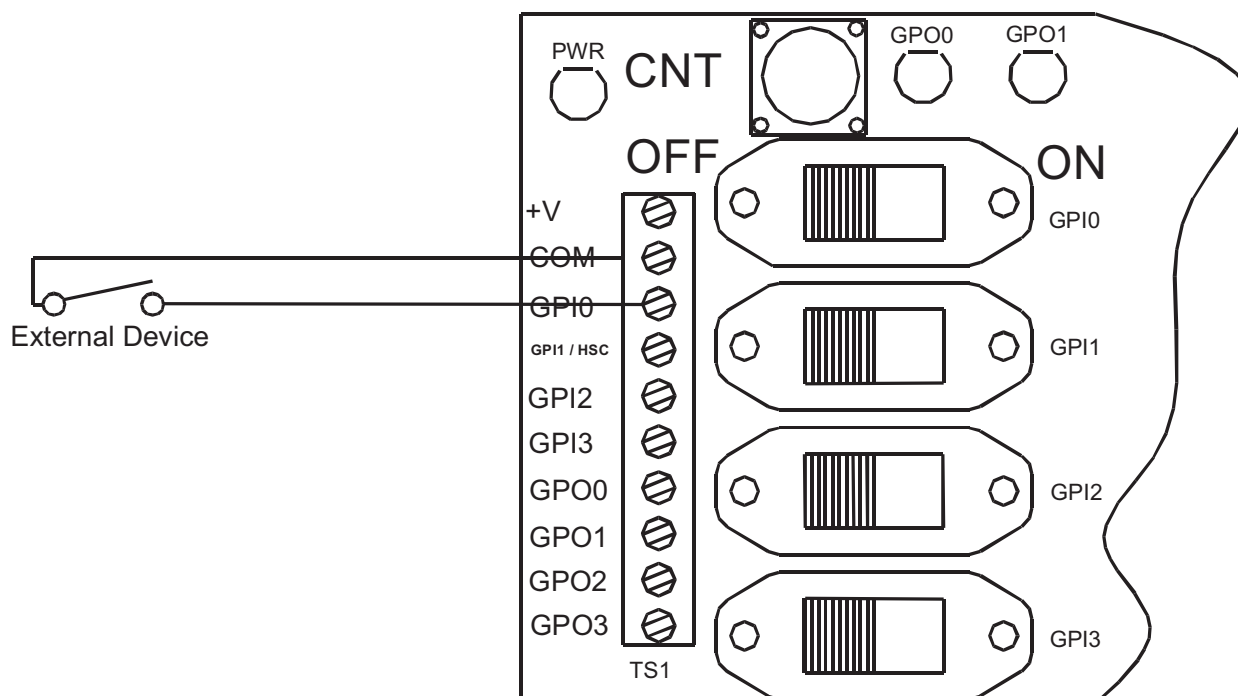
DIGITAL OUTPUTS

The SI-DEMO-01 provides both status indicator and a terminal block connection for each output. The status of each output is indicated using red LED indicators labeled GPO0 through GPO3. These indicators are illuminated when the output is ON or True.

An external load may be connected to the output using the GPO0 - GPO3 connection block TS1. Any load connected is subject to the maximum load of the Solves-It! model installed on the SI-DEMO-01. Each output sources +12VDC, Nominal.

470Ω load resistors are installed on each output to provided the minimum current required for each output to operate properly. This load resistor must be factored into the maximum load of the Solves-It! in relation to any external load connected. The LED indicators will operate whether an external load is connected or there is not an external load.
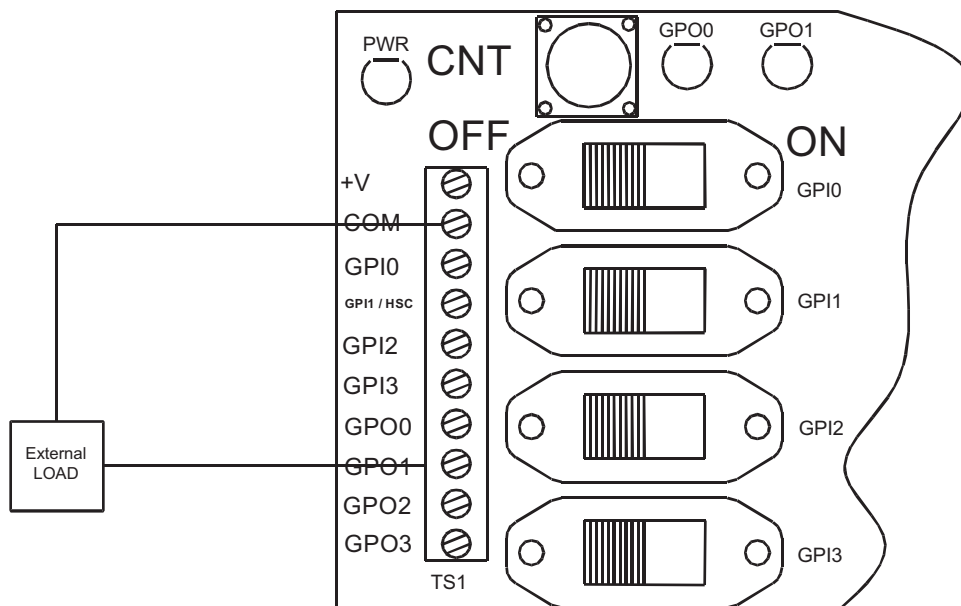

HIGH SPEED COUNTER

GPI1 on the Solves-It! may also be used as a High Speed Counter Input. This input may be driven by the on-board CNT push-button or externally using the GPI1 / HSC connection block. A counter must be used in software to be able to use these features.

For on-board use, each time CNT is pressed, the counter will increment.

An external device may be used to drive the High Speed Counter. This device must connect to COM for proper operation.

Typically the GPI1 / HSC input is only used as a Digital Input or a High Speed Counter.

SI-DEMO-01 SCHEMATIC

SI-DEMO-01 Schematic
Revision B
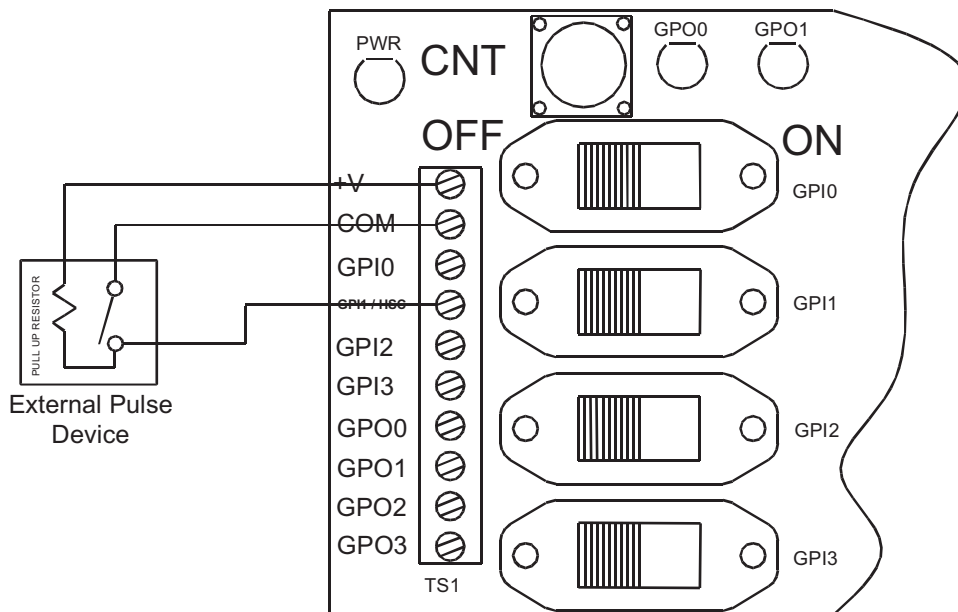
SI-DEMO-02

This section describes the hardware features and options for the SI-DEMO-02 Solves-It! Demo Board. This demo is designed for use with SI-110, SI-120, SI-210 and SI-220 Solves-it! Plug-in PLC models.

🚫 Use only the models approved for the SI-DEMO-02. Installing other Solves-It! models may damage the Solves-It! and / or the Demo Board and void the warranty.

PACKAGE CONTENTS

What's Included

Qty	Description	Part Number	Location
1	SI-DEMO-02 Board	SI-DEMO-02	In Box
1	Solves-It! Demo Board Manual	2008001.X	In Box
1	Wall-mount Power Pack	130-106047	In Box

GETTING TO KNOW THE SI-DEMO-02
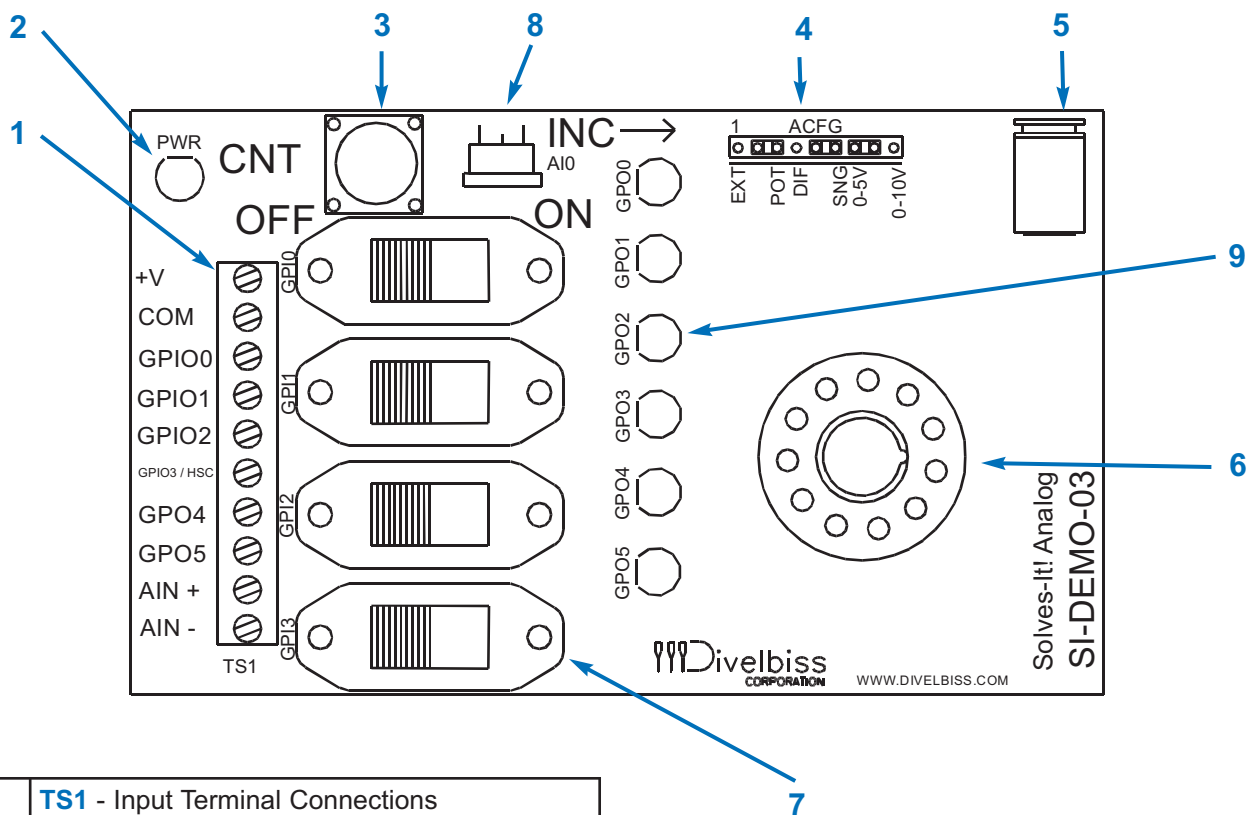
1	**TS1** - Input Terminal Connections
2	**PWR** - Input Power Indicator
3	**CNT** - High Speed Counter Momentary Normally Open Pushbutton
4	**ACFG** - Analog Input 0 Configuration Jumpers
5	**VIN** - Input Power Jack
6	Solves-It! Plug in Connector
7	**GPIO0-GPI3** - Input Normally Open Slide Switches
8	**AI0** - Analog Input 0, On-board Potentiometer
9	**GP00-GP05** - Digital Output Indicators

> **GPIO0 - GPIO3 are dual function I/O Pins. They can be configured as either inputs or outputs. Function is controlled by the EZ LADDER program.**

TS1 CONNECTION DESCRIPTIONS

The SI-DEMO-02 provides the TS1 terminal connections block for accessing the Digital and Analog I/O of the installed Solves-It! Plug-in PLC. Please refer to the descriptions for each.

+V	This terminal provides an access point for the power pack's unregulated +12VDC supply.
COM	This terminal provides an access point for the COMMON of power pack's output supply.
GPIO0	This terminal connects directly to the GPIO0 general purpose input / output of the installed Solves-It! Plug-in PLC. This is a dual purpose I/O point. The Programming determines if this is an INPUT or an OUTPUT. **As an input:** Connecting this terminal to +V will cause the input to be true. The GPI0 slide switch on the SI-DEMO-02 board must be turned off to allow proper operation of this pin. As an output: 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO0 indicator will also be on.
GPIO1	This terminal connects directly to the GPIO1 general purpose input / output of the installed Solves-It! Plug-in PLC. This is a dual purpose I/O point. The Programming determines if this is an INPUT or an OUTPUT. **As an input:** Connecting this terminal to +V will cause the input to be true. The GPI1 slide switch on the SI-DEMO-02 board must be turned off to allow proper operation of this pin. As an output: 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO1 indicator will also be on.
GPIO2	This terminal connects directly to the GPIO2 general purpose input / output of the installed Solves-It! Plug-in PLC. This is a dual purpose I/O point. The Programming determines if this is an INPUT or an OUTPUT. **As an input:** Connecting this terminal to +V will cause the input to be true. The GPI2 slide switch on the SI-DEMO-02 board must be turned off to allow proper operation of this pin. As an output: 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO2 indicator will also be on.
GPIO3 / HSC	This terminal connects directly to the GPIO3 general purpose input / output of the installed Solves-It! Plug-in PLC. This is a dual purpose I/O point. The Programming determines if this is an INPUT or an OUTPUT. **As an input:** Connecting this terminal to +V will cause the input to be true. The GPI3 slide switch on the SI-DEMO-02 board must be turned off to allow proper operation of this pin. As an output: 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO3 indicator will also be on. This terminal also connects to the High Speed Counter. It may be used as pulse or counter input.

| GPO4	This terminal connects directly to the GPO4 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO4 indicator will also be on.
GPO5	This terminal connects directly to the GPO5 general purpose output of the installed Solves-It! Plug-in PLC. 12VDC will be present when the output is on or true. A 470Ω load resistor is installed to provide the minimum load required for output operation. The GPO4 indicator will also be on.
AIN +	This terminal connects directly to the AI0 analog input of the Solves-It! Dependent upon Solves-It! model, it will accpet 5VDC or 10VDC signals. This pin is either enabled or disabled as well as the mode of operation (Single-Ended or Differential) depending upon the configuration of the ACFG jumpers.
AIN -	This terminal either connects to the Solves-It! analog input negative in differential mode or is connected to COM in Single-ended mode. The mode of operation (Single-Ended or Differential) depending upon the configuration of the ACFG jumpers. .

INSTALLING A SOLVES-IT! PLUG-IN PLC

To install the Solves-It! into the SI-DEMO-02 board, align the Solves-It! over the provided connector. Ensure the polarity 'notch' aligns correctly. Firmly push the Solves-It! into the connector as far as possible. The Solves-It! is now installed.

Solves-It!

SI-DEMO-02 Board

Polarity Notch

Polarity Notch

SI-DEMO-02
CONNECTOR
TOP VIEW
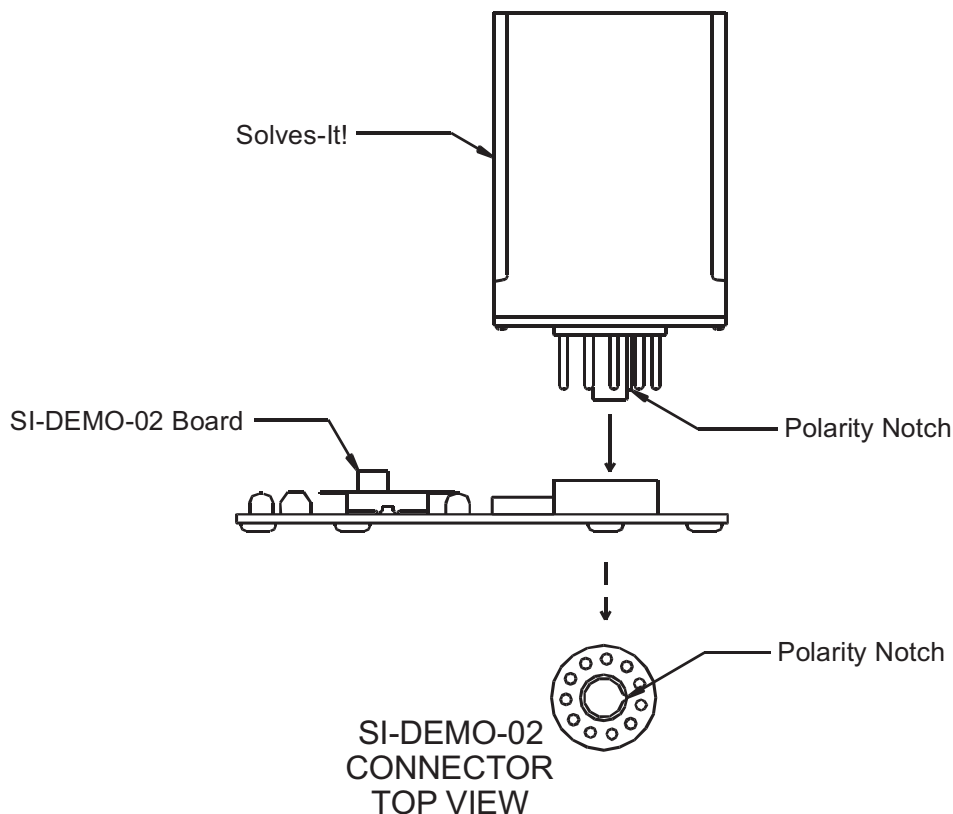
INPUT POWER

The input power for the SI-DEMO-02 is included. Power is provided by a wall pack power supply with an unregulated 12VDC output. The wall pack plugs into any standard 115 VAC wall outlet. The cord plugs into the VIN connector on the SI-DEMO-02. This power supply provides power for all on-board demo functions and the Solves-It! Plug-in PLC.
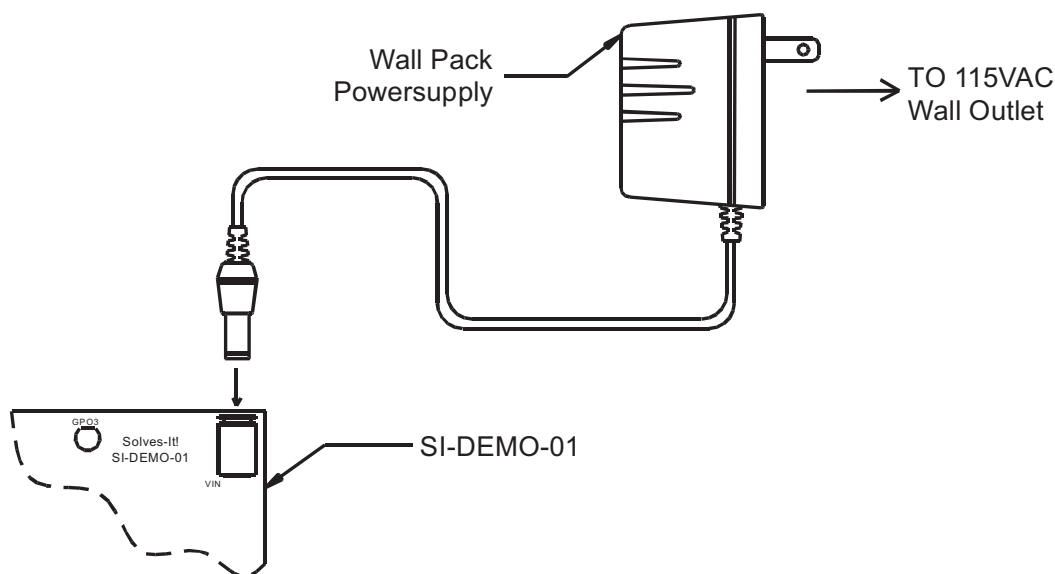
DUAL FUNCTION I/O

The SI-DEMO-02 takes advantage of the SI-110, SI-120, SI-210 and SI-220 dual function I/O. Each of these Solves-It! models has 4 I/O that **can be configured as either a digital input OR a digital output**. The SI-DEMO-02 allows operation of both modes (input and output) per point. The I/O configuration is controlled by the EZ LADDER program.

I/O Configured as Inputs

There are two ways to control I/O configured digital inputs using the SI-DEMO-02 (inputs actually located on the installed Solves-It!). The input can be enabled on-board using the provided slide switches for each or an external device connected to TS1 can be used to drive the inputs.

The methods can be mixed, but any input using an external source must have the Slide switch turned OFF.

INPUTS - ON-BOARD

There are four slide switches located on the demo board, labeled GPI0 through GPI3. Each of these switches, when closed, will apply the +12VDC to the Solves-It! digital input causing it to be On or True. Conversely, opening the slide switch, opens the circuit and causes the digital input to be OFF or False.
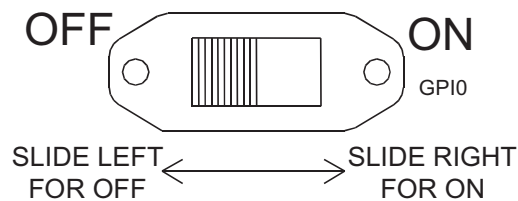
INPUTS - EXTERNAL

The inputs may be connected using the TS1 connection block. Each input may be turned ON or True by connecting the Input to the +V. Opening this connection makes the input turn OFF or False. Whatever device is used to drive the inputs, must cause the input to be closed to +V for proper operation.

For any input connected to an external device, the input's slide switch must be OFF for proper operation. The methods can be mixed, but any input using an external source must have the Slide switch turned OFF.
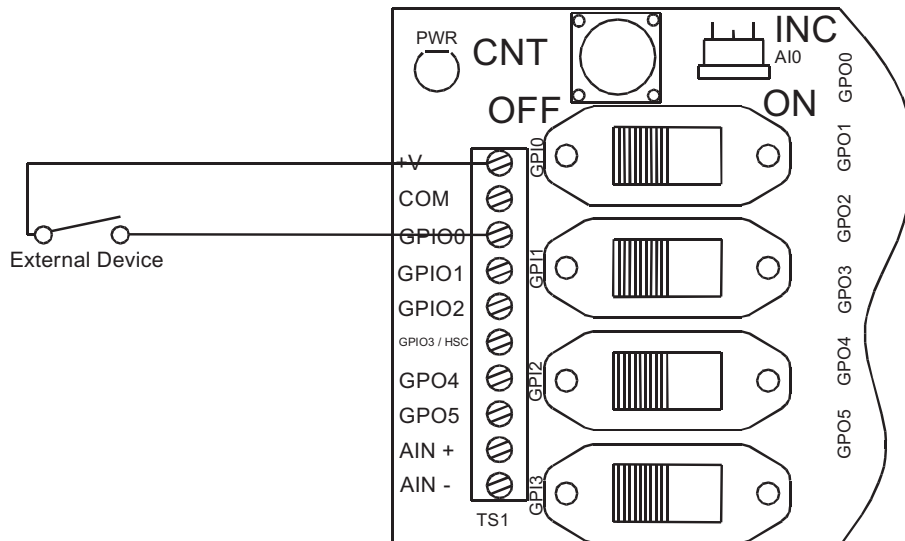
I/O Configured as Outputs

The dual function I/O may be configured at digital outputs. The SI-DEMO-02 provides both status indicator and a terminal block connection for each output. The status of each output is indicated using red LED indicators labeled GPO0 through GPO3. These indicators are illuminated when the output is ON or True.

An external load may be connected to the output using the GPIO0 - GPIO3 connection block TS1. Any load connected is subject to the maximum load of the Solves-It! model installed on the SI-DEMO-02. Each output sources +12VDC, Nominal.

470Ω load resistors are installed on each output to provided the minimum current required for each output to operate properly. This load resistor must be factored into the maximum load of the Solves-It! in relation to any external load connected. The LED indicators will operate whether an external load is connected or there is not external load.
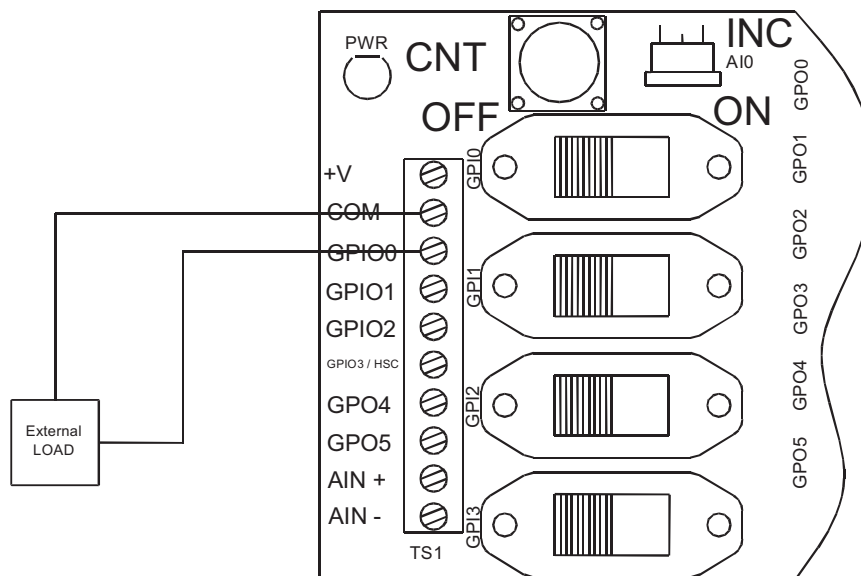
DIGITAL OUTPUTS

In addition to the dual function I/O, the SI-DEMO-02 provides access to the Solves-It! PLC's two dedicated digital outputs. The SI-DEMO-02 provides both status indicator and a terminal block connection for both dedicated outputs. The status of each output is indicated using red LED indicators labeled GPO4 and GPO5. These indicators are illuminated when the output is ON or True.

An external load may be connected to the outputs using the GPO4 - GPO5 connection block TS1. Any load connected is subject to the maximum load of the Solves-It! model installed on the SI-DEMO-02. Each output sources +12VDC.

470Ω load resistors are installed on each output to provided the minimum current required for each output to operate properly. This load resistor must be factored into the maximum load of the Solves-It! in relation to any external load connected. The LED indicators will operate whether an external load is connected or there is not an external load.
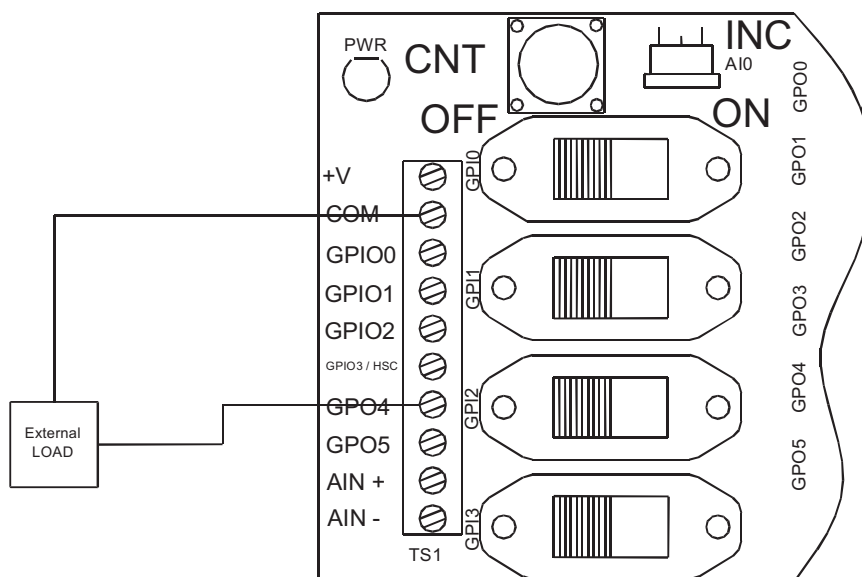
HIGH SPEED COUNTER

GPIO3 on the Solves-It! may also be used as a High Speed Counter Input. This input may be driven by on-board CNT push-button or externally using the GPIO3 / HSC connection block. A counter must be used in software to be able to use these features.

For on-board use, each time CNT is pressed, the counter will increment.

An external device may be used to drive the High Speed Counter. This device must connect to +V for proper operation.

Typically the GPIO3 / HSC input should only be sued Digital Input / High Speed Counter OR a Digital Output.
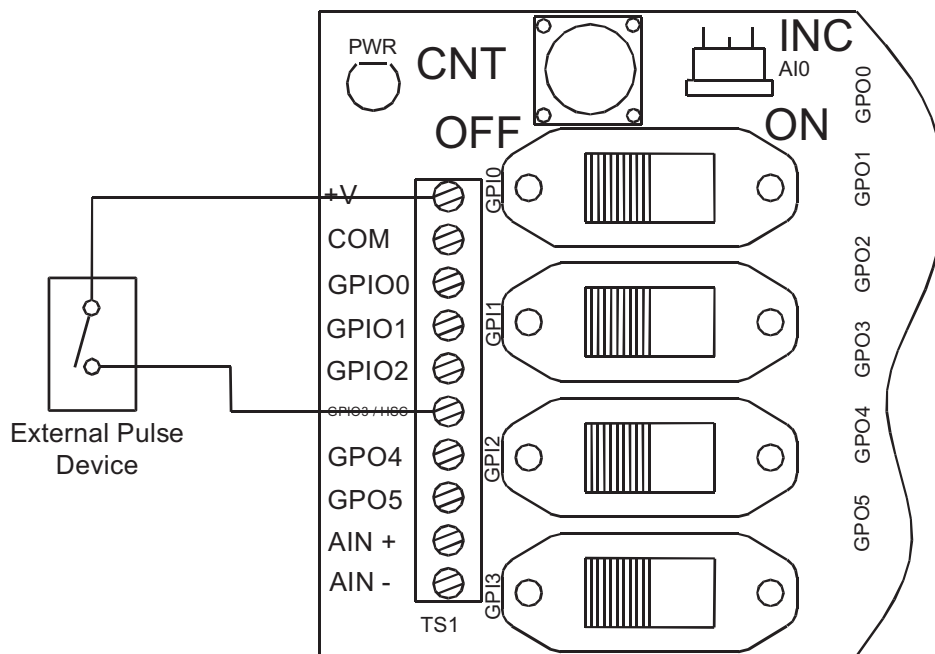
ANALOG INPUTS

The SI-DEMO-02 provides easy access for the Solves-It! PLC's analog input. Using the demo board, the analog input can be source on-board and externally.

The analog features on the demo board are configured using the ACFG jumper block. By configuring jumpers, you may configure the analog input as Single-ended, Differential, 0-5VDC or 0-10VDC analog input. The analog source is configured here as the on-board POT or an external source.
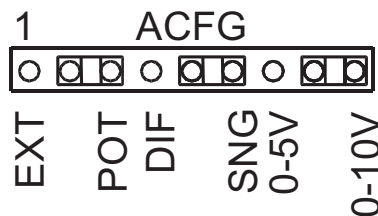
ON-BOARD ANALOG SOURCING

The SI-DEMO-02 provides an on-board potentiometer for a quick analog input source. To use this source, the ACFG jumper block must be configured for POT, SNG (Singled-Ended) and the correct voltage for the model of installed Solves-It! (0-5V or 0-10V).

Verify the correct Voltage Setting on the AFCG jumper block for the model Solves-It! installed. Incorrect voltage settings may damage the SI-DEMO-02 and / or the Solves-It! and void the warranty.
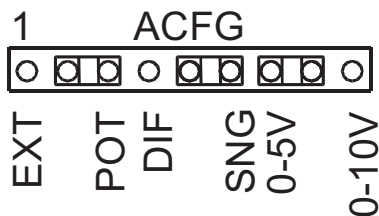
ACFG Configured for POT, SNG and 0-5VDC SOURCE

ACFG Configured for POT, SNG and 0-10VDC SOURCE

EXTERNAL ANALOG SOURCING

The SI-DEMO-02 may also be sourced externally using the AIN- and AIN + connection block terminals.

The sourcing device and wiring, the AFCG configuration jumper block and the Solves-It! model must be correct. Incorrect voltage settings may damage the SI-DEMO-02 and / or the Solves-It! and void the warranty.

To be able to use an external source, the ACFG jumper block must be configured at EXT (External). When configured as EXT, the 0-5V / 0-10V jumper has no function. Verify the external source does not exceed the Solves-It! PLC's analog input specifications or damage may result.
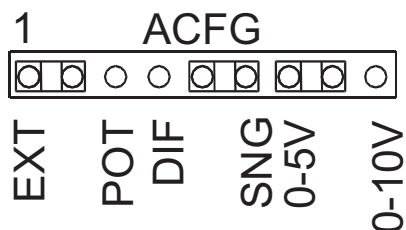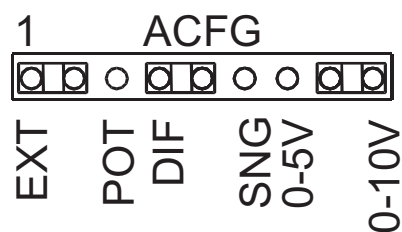
ACFG Configured for an
External Analog Source

The SI-DEMO-02 board can be configured for the external source to be Singled-Ended or Differential. When ACFG is configured as Singled-Ended, it connects the Solves-It! PLC's AIN- to the COM. When configured as Differential, the Solves-It! PLC's AIN- is connected to the AIN- on TS1. This provides a true differential analog input. When configured as EXT, the 0-5V / 0-10V jumper has no function.

The sourcing device and wiring, the AFCG configuration jumper block and the Solves-It! model must be correct. Incorrect voltage settings may damage the SI-DEMO-02 and / or the Solves-It! and void the warranty.
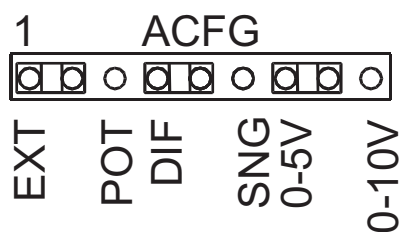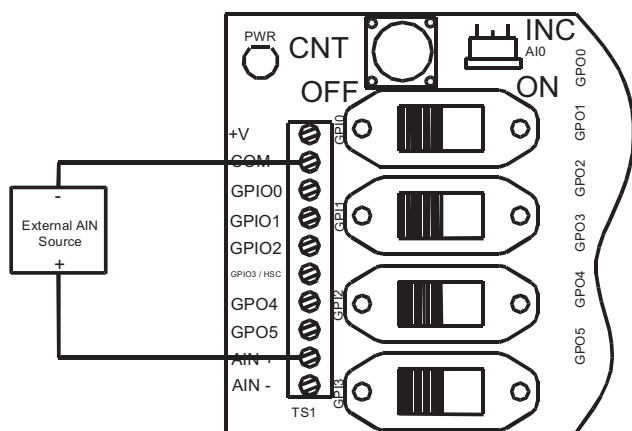
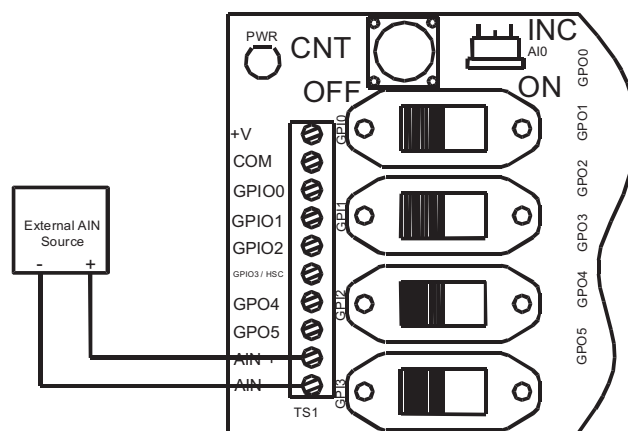ACFG Configured External
Source and Single-Ended

ACFG Configured External
Source and Differential

To use an external source, it must be wired to the TS1 AIN+ and AIN - terminals for differential or the TS! AIN+ and COM for Single-ended.
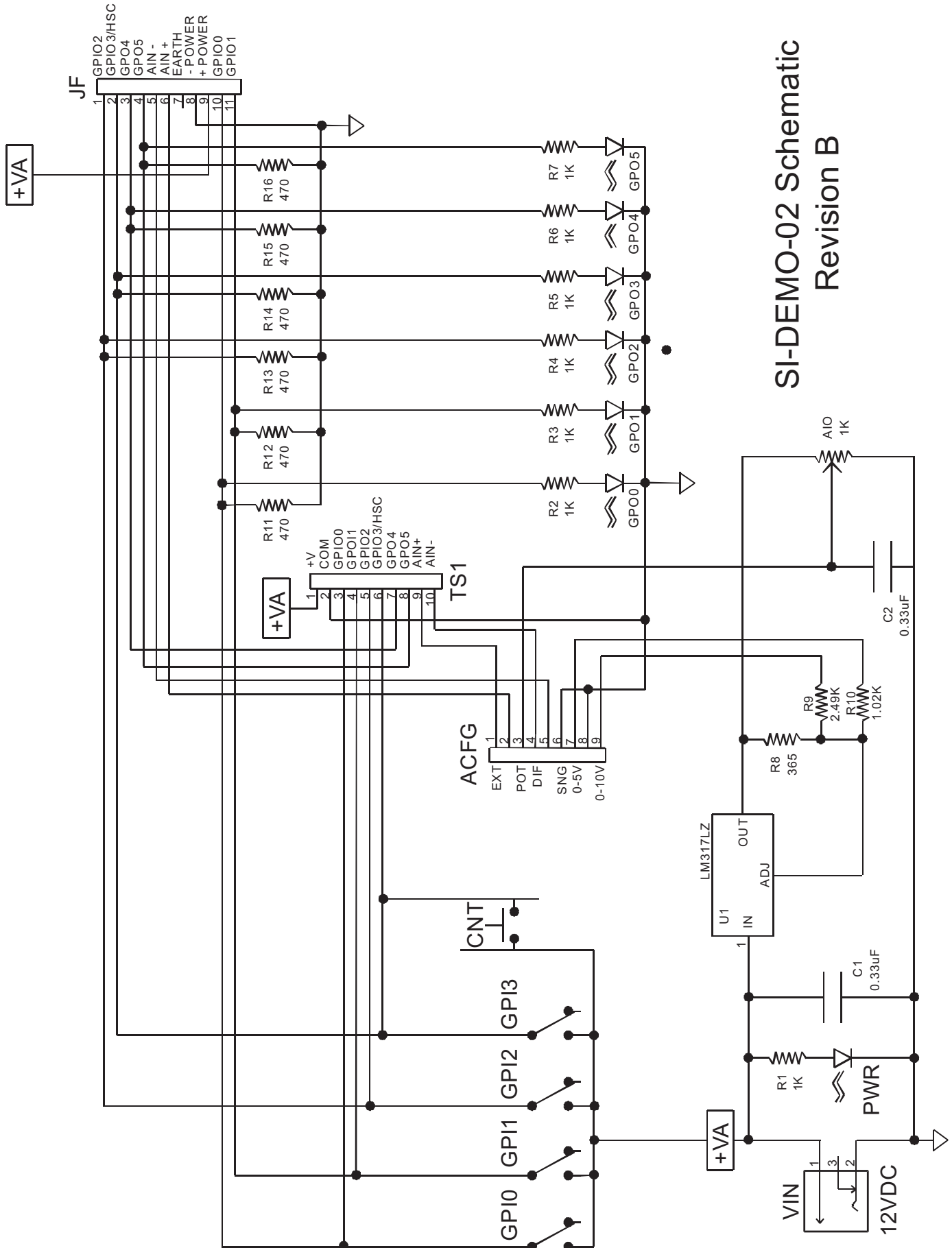

**Single Ended External
Analog Source**

**Differential External
Analog Source**

A 0-20mADC or 4-20mADC input signal may be used with the addition of an external resistor connected from the AIN+ to the AIN- terminal. For a 0-5VDC Solves-It!, use a 249Ω resistor. For a 0-10VDC Solves-It!, use a 499Ω resistor.

SI-DEMO-02 Schematic
Revision B

Divelbiss Corporation ● 9778 Mt. Gilead Rd. ● Fredericktown, Ohio 43019 ● 1-800-245-2327 ● www.divelbiss.com

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.