

# SIL Solver® Enterprise User Instructions

SIS-TECH Solutions, LP

**We're Proven-in-Use®**



# Welcome

- Welcome to SIL Solver® Enterprise.
- This presentation is sectioned to make it easier to navigate. You can collapse the slides to the sections using the tool bar.
- **If you need assistance or would like to provide us with feedback, contact:**
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# SIL Solver®

## **We are Proven in Use**

- More than 100 companies have chosen SIL Solver® for their functional safety verification since 2002

## **We Build upon Field Experience**

- The built-in SIL Solver® database uses field failure data as a basis, reflecting real-world device performance

## **We are Internationally Recognized**

- SIL Solver® uses internationally recognized methods for PFD and STR calculation
- SIL Solver® is used by companies worldwide



# User Instructions

## Table of Contents

1. Logging in
2. Creating a new project and functions
3. Editing, Copying or deleting a project
4. Generating reports
5. Importing/Exporting projects and functions
6. Datasheets
7. Troubleshooting



# 1. LOGGING IN

- Licensing
- Assigning username and password for new user
- Logging in



# Licensing

- SIL Solver<sup>®</sup> is licensed software
  - Each enterprise license includes one administrator account and two user licenses
  - Additional user licenses can be purchased
- To request a quote for a new license, contact SIS-TECH at:  
<http://sis-tech.com/applications/sil-solver>



# Assigning username and password to new user

- Assignment/re-assignment of usernames and passwords is performed through the administrator account of the purchasing company

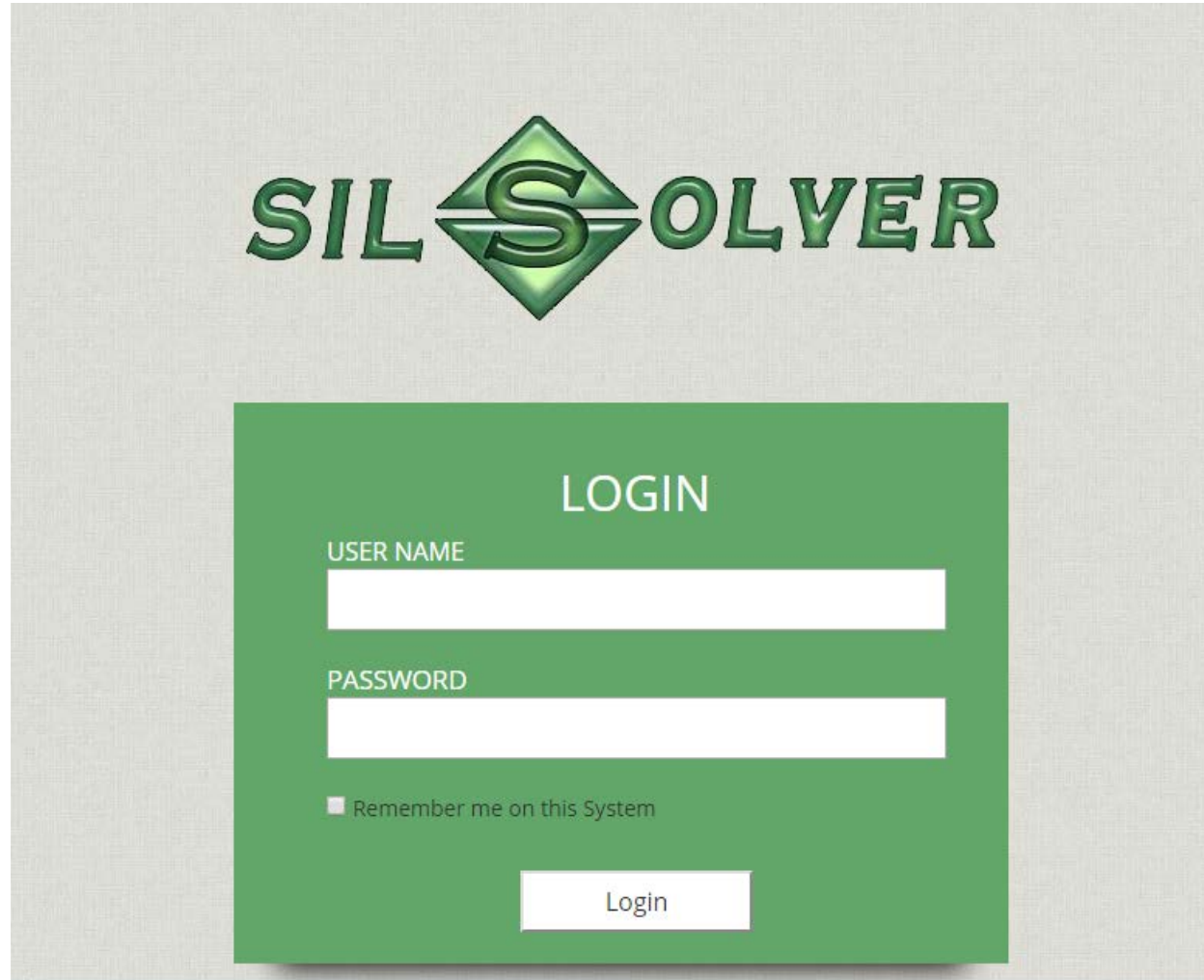


# Logging In: User Name and Password

Purchasing companies  
will have their own server  
locations

For training classes,  
in any web browser go to,  
[http://silsolver.sis-  
tech2.com/](http://silsolver.sis-tech2.com/)

Log in with your assigned  
User name and Password



The image shows a screenshot of the SIL SOLVER login interface. At the top, the text "SIL SOLVER" is displayed in a stylized green font with a diamond-shaped logo containing a green "S" between the words. Below this, the word "LOGIN" is centered in a white font on a green rectangular background. Under "LOGIN", there are two white input fields: the first is labeled "USER NAME" and the second is labeled "PASSWORD". Below the password field, there is a checkbox labeled "Remember me on this System". At the bottom of the green box, there is a white button labeled "Login".



## 2. CREATING A NEW PROJECT

- Setting up the project information
- Creating a safety function
- Copying a safety function
- Editing a safety function



Starting a new project

Exit the software



Welcome, srtzvi

Site: BOGCI  
Projects

Project ID: SPLPNCwork

		Open	New	Edit	Copy	Delete	Exit	Project Revision	User Guide
DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary

Site	Location	Project ID	Project Name

No data to display

Create Filter

Project List

Filters may be useful to users with long project lists



Site: [BOGCI](#) Project ID: [SPLPNCwork](#)

# Projects

		Open	<b>New</b>	Edit	Copy	Delete	Exit	Project Revision	User Guide	
DBF Import		Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary

Site	Location	Project ID	Project Name
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

No data to display

[Create Filter](#)

Click to create a new project

The window below pops up,  
type in relevant information  
and click "Save"

Add New Project

Site:

Location:

Project ID:

Name:

Save Close

Add New Project

Site:

Location:

Project ID:

Name:

Save Close



# Success!

**SIL SOLVER** Welcome, srizvi

Site: **SIS-TECH** Project ID: **Practice**

Projects

**Saved Successfully**

DBF Import Import Export Print Reports PF Documentation Project Data Sheets PF Details PF Data Summary PF Target Results PF Result Summary

Open Review Edit Copy Delete Exit **Project Revision** User Guide

Site	Location	Project ID	Project Name
SIS-TECH	Pretend location 1	Practice	Practice setting up

Set initial project revision information

**SIL SOLVER** Welcome, srizvi

Site: **SIS-TECH** Project ID: **Practice**

New Open Delete Report Exit

Project Version	Performed By	Date	Approved By	Date
My Training Class Project 1	S. Rizvi	5/22/2019		

No data to display

☒ Begins with([Project Version], 'My Training Class Project 1') And Begins with([Performed By]),...

Clear



# Steps for adding a safety function

1. Obtain functional description from Hazard and Risk Analysis (H&RA) documentation
2. Open Project
3. Select new function and enter function identification fields
4. Enter performance targets
5. Enter function architecture through GUI interface and populating the architecture with devices
6. Perform calculation
7. Re-iterate with design modifications if necessary to get successful design



# Example SIF

Information from H&RA and related process requirement specification (PRS) information

- SIF 01
- SIL-1 (20% design margin)
- Low Demand mode
- Spurious trip target = 20 yrs
- Desired test interval = 5 yrs
- V-101 High DP (2oo3, DP-101A/B/C) trip closes XV-101A and XV-101B (1oo2) ball valves spring loaded to the closed position, each with a single ETT solenoid (XY-101A and XY-101B)
- Power supply is monitored and is tested at 5 yr interval
- Existing logic solver (SIS-A) is safety configured system with 1oo2D CPU and simplex I/O



# Opening the project

Start from Project home page

Select the Project by left-click (first project in list is selected by default)

Click Open



Welcome, srtzvi

Site: SIS-TECH Project ID: Practice

Projects

Site	Location	Project ID	Project Name
SIS-TECH	Pretend location 1	Practice	Practice setting up

Create Filter



# Protective Function Level

- The layout is the same as the main page with list of projects except that on the project level, we have the project information listed and do NOT have the DBF import function

**SIL SOLVER** Welcome, srizvi

Site: [SIS-TECH](#) Project ID: [Practice](#) Function ID:

**Protective Function**

		Import	Export	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
				Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result		
No data to display										

Create Filter

Project information.



# Start a new safety function

**SIL SOLVER** Welcome, srizvi

Site: **SIS-TECH** Project ID: **Practice** Function ID:

**Protective Function**

Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result

No data to display

Create Filter

- Enter ID, brief version of H&RA description, Mode of Operation, and Save

**Protective Function**

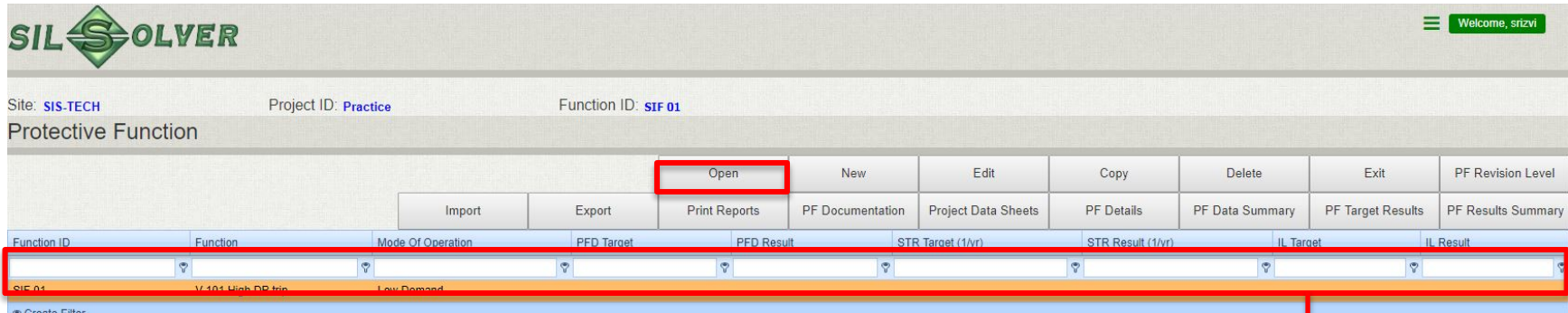
Function ID:

Function :

Mode of Operation:



# Success!



- Select function and click Open to begin configuring SIF

Fields for filtering can be useful for projects with long lists of protective functions



# GUI Interface

SIF project information

SIF calculation results both numerical and graphical

The screenshot shows the SIL SOLVER GUI interface. A red box highlights the top section containing project information: Site: SIS-TECH, Project ID: Practice, Function: V-101 High DP trip, and Function ID: SIF 01. Another red box highlights the PFD/SIF Breakdown section, which includes a table for PFDavg and STR, and a section for HFT results. A third red box highlights the left sidebar, which contains a list of system configuration options: SRS, PROCESS HAZARD, DESCRIPTION, DIAGNOSTICS, RESET, SHUTDOWN, REFERENCE, COMMENTS, LOGIC SOLVER, INPUT CONFIGURATION, INPUT DEVICE, ACTION CONFIGURATION, ACTION DEVICE, SUPPORT CONFIGURATION, SUPPORT SYSTEM, and CUSTOMER DEVICE. Red arrows point from the text labels to these specific areas. A red text box with an arrow points to the Backward and Forward buttons in the sidebar, stating: 'The Backward and Forward buttons only have meaning when you have multiple functions in the project'. A diagram of a reactor vessel is shown in the center of the interface.

Site : SIS-TECH  
Project ID: Practice  
Function : V-101 High DP trip  
Function ID : SIF 01

Welcome, srizvi

SIL SOLVER

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS					
RESULTS					
TARGETS MET?					

PFD/SIF Breakdown

PFDavg: No data  
STR: No data

HFT<sub>IN</sub> HFT<sub>LS</sub> HFT<sub>ACT</sub>  
HFT<sub>SPT1</sub> HFT<sub>SPT2</sub> HFT<sub>MIN</sub> HFT<sub>MACT</sub>

Calculate and Save Print Reset

Backward Forward

SRS  
PROCESS HAZARD  
DESCRIPTION  
DIAGNOSTICS  
RESET  
SHUTDOWN  
REFERENCE  
COMMENTS  
LOGIC SOLVER  
INPUT CONFIGURATION  
INPUT DEVICE  
ACTION CONFIGURATION  
ACTION DEVICE  
SUPPORT CONFIGURATION  
SUPPORT SYSTEM  
CUSTOMER DEVICE

The Backward and Forward buttons only have meaning when you have multiple functions in the project

Modelling panel, where you select system configuration and component.



# Zooming

Use the + and – buttons to zoom in and out on the figure

*You cannot interact with certain features in a zoomed state*

The screenshot displays the SIL SOLVER software interface. At the top, the header shows 'Site: SIS-TECH Practice' and 'Function: V-101 High DP trip SIF 01'. A 'Welcome, srizvi' message is on the right. Below the header, there are several data tables and a central workspace. The left sidebar contains a list of navigation options: SRS, PROCESS HAZARD, DESCRIPTION, DIAGNOSTICS, RESET, SHUTDOWN, REFERENCE, COMMENTS, LOGIC SOLVER, INPUT CONFIGURATION, INPUT DEVICE, ACTION CONFIGURATION, ACTION DEVICE, SUPPORT CONFIGURATION, SUPPORT SYSTEM, and CUSTOMER DEVICE. The main workspace shows a diagram of a process with two 'Noon' labels. The zoom controls (+ and - buttons) and the Reset button are highlighted with red boxes and arrows. The text 'Use the Reset to return to the base view required for editing' is written in red.

Use the Reset to return to the base view required for editing



# Entering Performance Targets

Click any cell in Targets row of table to open dialog box

Site : SIS-TECH  
Project ID: Practice

Function : V-101 High DP trip  
Function ID : SIF 01

Welcome, srizvi

SIL SOLVER

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS					
RESULTS					
TARGETS MET?					

PFDavg

STR

HFT<sub>IN</sub>

HFT<sub>LS</sub>

HFT<sub>ACT</sub>

HFT<sub>SPT1</sub>

HFT<sub>SPT2</sub>

HFT<sub>MIN</sub>

HFT<sub>MACT</sub>

Exit

Calculate and Save

Print

Reset

SRS

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS

LOGIC SOLVER

INPUT CONFIGURATION

INPUT DEVICE

ACTION CONFIGURATION

ACTION DEVICE

SUPPORT CONFIGURATION

SUPPORT SYSTEM

CUSTOMER DEVICE

Target Specification

PFDavg

0.08

MTTFs (Yr)

20

Save

Enter performance targets and save



# Success!

The screenshot displays the SIL SOLVER software interface. At the top, a status bar shows 'Site: SIS-TECH Practice' and 'Function: V-101 High DP trip SIF 01'. A central dialog box titled 'Silsolver' displays the message 'Target saved successfully..!!' with an 'OK' button. The main window features a 'Breakdown' section with a table of HFT values and a 'Logic Solver' menu on the left. The 'Logic Solver' menu is highlighted with a red box, indicating the next step in the configuration process.

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20	0
RESULTS					
TARGETS MET?					

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>	
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>	HFT <sub>MACT</sub>

Logic Solver Menu Items:

- SRS
- PROCESS HAZARD
- DESCRIPTION
- DIAGNOSTICS
- RESET
- SHUTDOWN
- REFERENCE
- COMMENTS
- LOGIC SOLVER**
- INPUT CONFIGURATION
- INPUT DEVICE
- ACTION CONFIGURATION
- ACTION DEVICE
- SUPPORT CONFIGURATION
- SUPPORT SYSTEM
- CUSTOMER DEVICE

Close dialog box and select Logic Solver on left to begin configuration

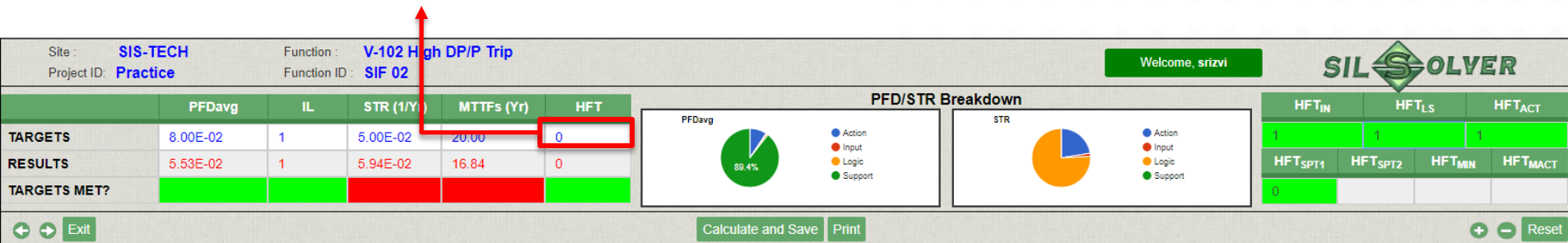


# HFT Target

HFT target is based on the SIL Target and Mode of. If no PFDavg target has been entered (which would result in no SIL target), HFT target will be set to null.

SILTarget	Mode of Operation	HFT target for each subsystem
1	Low Demand	0
1	High Demand	0
2	Low Demand	0
2	High Demand	1
3	Low Demand	1
3	High Demand	1

## HFT Target






# Picking Logic Solver (LS)


Left click desired logic solver to copy  
Move the mouse to the box in the middle and click to paste.


Site : <b>SIS-TECH</b> Project ID: <b>Practice</b>		Function : <b>V-101 High DP trip</b> Function ID : <b>SIF 01</b>		Welcome, srizvi		<b>SIL SOLVER</b>	
	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown	
TARGETS	8.00E-02	1	5.00E-02	20	0	PFDavg	STR
RESULTS						No data	No data
TARGETS MET?							
						HFT <sub>IN</sub>	HFT <sub>LS</sub>
						HFT <sub>SP1</sub>	HFT <sub>SP2</sub>
						HFT <sub>MIN</sub>	HFT <sub>MACT</sub>
Exit						Calculate and Save	Print
						+	-
						Reset	


SRS


LOGIC SOLVER



  
GENERIC 2004D DUAL MP, DUAL I/O



  
GENERIC 1002D DUAL MP, SIMPLEX I/O


  
NON-SC D/D  
NON SC PES DUAL MP, DUAL I/O


  
NON-SC D/S  
NON SC PES DUAL MP, SIMPLEX I/O


  
NON-SC S/S  
NON SC PES SIMPLEX MP, SIMPLEX


  
FC  
RELAY - FAIL TO CLOSE


  
FO  
RELAY - FAIL TO OPEN



Wrong one?  
To delete the logic solver, move the mouse to icon and right click to delete



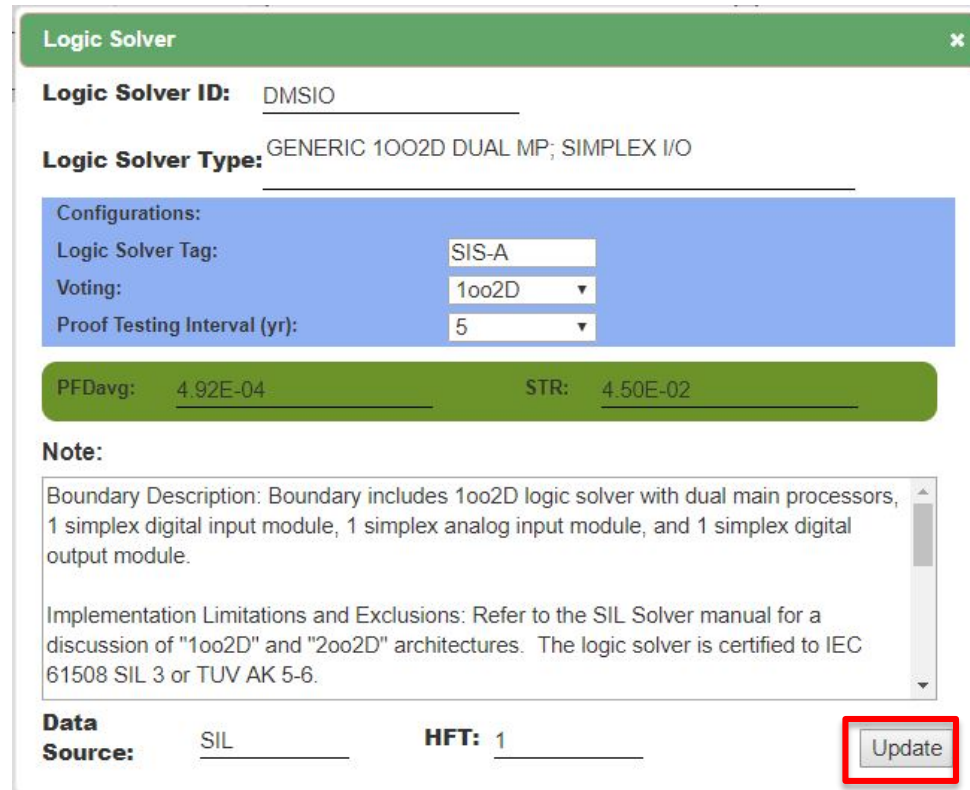
# Adding LS details

Edit the logic solver parameter by left click the logic solver icon on in the box. Where Assign a tag name, select the voting, and enter the test interval (TI)

**Note:** the voting needs to be selected before test interval.

**Caution:** Logic Solver test interval may be prescribed in vendor safety manual or prior use justification documentation

Tool will automatically calculate LS contributions to PFDavg and STR

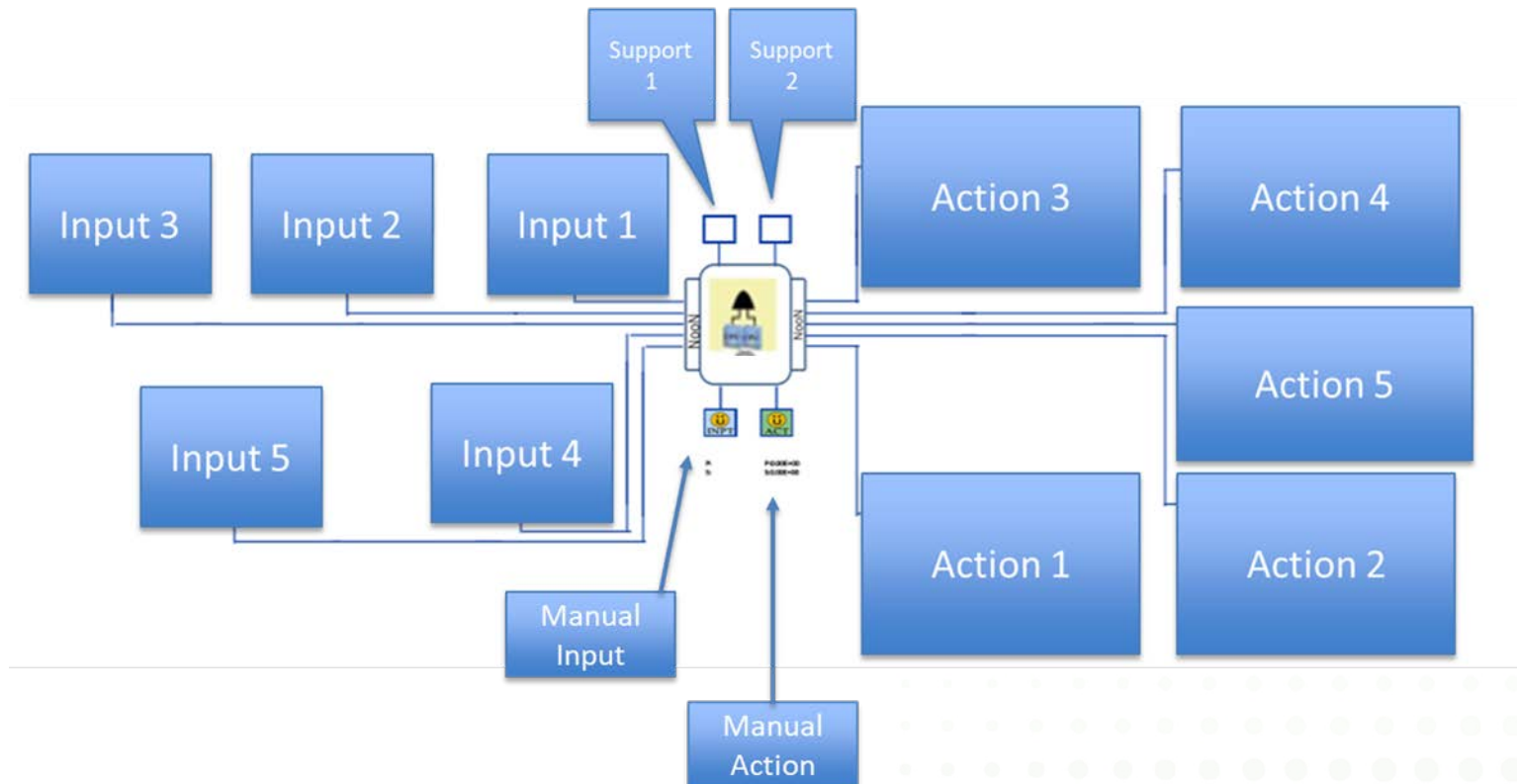


The screenshot shows a 'Logic Solver' configuration window. At the top, the title bar says 'Logic Solver'. Below it, the 'Logic Solver ID' is 'DMSIO' and the 'Logic Solver Type' is 'GENERIC 1002D DUAL MP; SIMPLEX I/O'. A blue-shaded section titled 'Configurations:' contains three fields: 'Logic Solver Tag' with the value 'SIS-A', 'Voting' with a dropdown menu showing '1oo2D', and 'Proof Testing Interval (yr)' with a dropdown menu showing '5'. Below this, a green bar displays 'PFDavg: 4.92E-04' and 'STR: 4.50E-02'. A 'Note:' section contains two paragraphs of text. At the bottom, the 'Data Source' is 'SIL' and 'HFT' is '1'. A red box highlights the 'Update' button in the bottom right corner.

Click Update to return to GUI page



# Other Subsystems are added to the GUI in the order selected





# Adding Inputs (aka Sensors)

Adding an input is divided into two steps

1. add the input configuration
2. add each device.



# Input Configuration

Click “Input Configuration” to open selection list

Select the desired voting. Click the selected configuration to add to the GUI.

Wrong choice? Hover over that portion of the architecture until grey selection box appears and right-click to get option to delete.

Site : SIS-TECH  
Project ID: Practice

Function : V-101 High DP trip  
Function ID: SIF 01

Welcome, srizvi

SIL SOLVER

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

PF/D/STR Breakdown

HFT<sub>IN</sub>

HFT<sub>LS</sub>

HFT<sub>ACT</sub>

HFT<sub>SPT1</sub>

HFT<sub>SPT2</sub>

HFT<sub>MIN</sub>

HFT<sub>IMACT</sub>

Exit

Calculate and Save

Print

Reset

SRS

LOGIC SOLVER

INPUT CONFIGURATION

ONE DEVICE

TWO DEVICES

THREE DEVICES

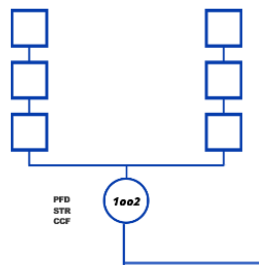
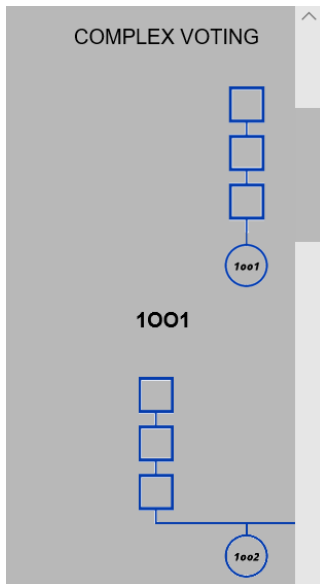
1003

2003

3003



# Complex Voting Architectures



- If a single variable value is made up of multiple devices, use a **Complex Voting Architecture**
- All the devices for each separate value go in a single vertical channel

Common examples:

- Sensor Transmitter with a Signal Splitter, Trip Amp, or a Relay
- Pressure/Temperature compensated flow



# Picking Technology

Click “input device” to access to the list of device categories  
Left-click the relevant category to access the list of devices technology

Site : SIS-TECH  
Project ID: Practice  
Function : V-101 High DP trip  
Function ID : SIF 01  
Welcome, srizvi  
SIL SOLVER

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					






PFD/STR Breakdown

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>

HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>	HFT <sub>MACT</sub>

← → Exit Calculate and Save Print + - Reset

**INPUT DEVICE**

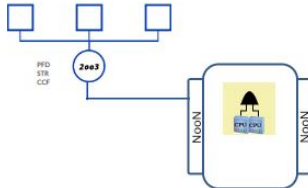
- TRIP AMPLIFIER
- ANALYZER
- PRESSURE
  -  DIFFERENTIAL PRESSURE TRANSMITTER
  -  PNEUMATIC PRESSURE SWITCH
  -  PNEUMATIC PRESSURE TRANSMITTER
  -  PRESSURE SWITCH - NORMAL SERVICE
  -  PRESSURE TRANSMITTER

PFD/STR CCF

2out

NoON

NO ON





# Selecting the Device

Scroll to the desired device

Left click device in list to copy (right-click to open datasheet – more later)

Left click in device box on diagram to add device to the input subsystem

Site : SIS-TECH  
Project ID: Practice

Function : V-101 High DP trip  
Function ID : SIF 01

Welcome, srizvi

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20.00	0
RESULTS					
TARGETS MET?					

PFD/STR Breakdown

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>

← → Exit

Calculate and Save Print

+ - Reset

INPUT DEVICE

TRIP AMPLIFIER

ANALYZER

PRESSURE

DIFFERENTIAL PRESSURE TRANSMITTER

PNEUMATIC PRESSURE SWITCH

PNEUMATIC PRESSURE TRANSMITTER

PRESSURE SWITCH - NORMAL SERVICE

PRESSURE TRANSMITTER

To delete or copy the device, move the mouse to device icon in function diagram and right click.



# Adding Device Details

White boxes are editable fields. Some are pre-populated

Device

Device ID: DPTR

Device Type: DIFFERENTIAL PRESSURE TRANSMITTER

Configurations:

Device Tag:

Proof Testing Interval (yr):

0

Voting:

1001

Subsystem Diagnostic Level: ?

NO DC

Maintenance:

Mean Time to Repair (hr):

72

Diagnostic Interval (hr):

0.500

Overhaul Interval (yr):

20

Proof Testing Coverage (%): ?

100

User Specified

☐

Properties:

Failure Dangerous Failure Rate (1/yr):

8.00E-03

Failure Spurious Failure Rate (1/yr):

1.67E-02

CCF Dual(%):

2

CCF Triple(%):

2

Diagnostic Coverage Simplex(1/yr):

60.00

Diagnostic Coverage Dual(1/yr):

80.00

Diagnostic Coverage Triple(1/yr):

90.00

PFDavg:

0.00E+000

STR:

0.00E+000

Note:

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: Clean

Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SIL Solver Enterprise User Manual).

Data Source: SIL

Update



# Filled In

Test Interval  
is in years

Define  
Voting of  
one device.  
Use 1001  
most of the  
time

Define  
Diagnostic  
NO DC in  
this case.

Define OI, default  
is 20Year

Define PTC,  
default is 100 %

Device

Device ID: DPTR

Device Type: DIFFERENTIAL PRESSURE TRANSMITTER

Configurations:

Device Tag: DP-101A

Proof Testing Interval (yr): 5

Voting: 1001

Subsystem Diagnostic Level: ? NO DC

Maintenance:

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): 0.500

Overhaul Interval (yr): 20

Proof Testing Coverage (%): ? 100

User Specified ☐

Properties:

Failure Dangerous Failure Rate (1/yr): 8.00E-03

Failure Spurious Failure Rate (1/yr): 1.67E-02

CCF Dual(%): 2

CCF Triple(%): 2

Diagnostic Coverage Simplex(1/yr): 60.00

Diagnostic Coverage Dual(1/yr): 80.00

Diagnostic Coverage Triple(1/yr): 90.00

PFDavg: 0.00E+000

STR: 0.00E+000

Note:

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: Clean

Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SIL Solver Enterprise User Manual).

Data Source: SIL

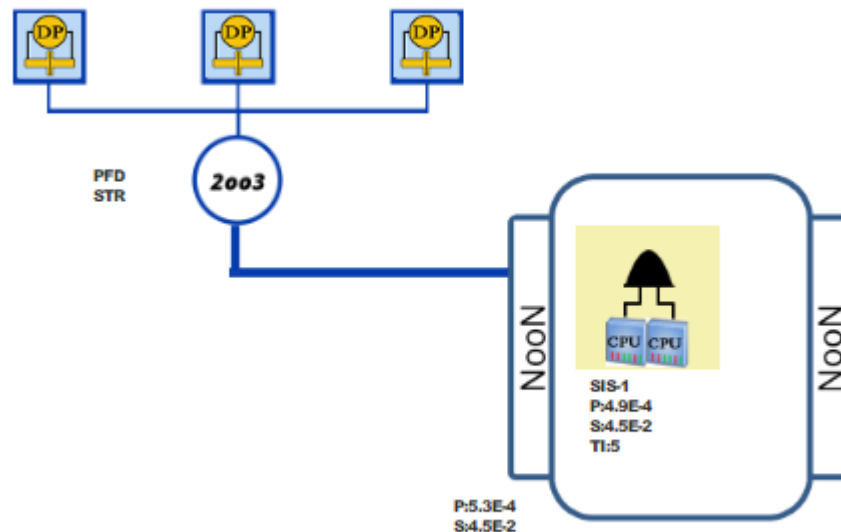
Update

Click Update to save change



# Completing the subsystem

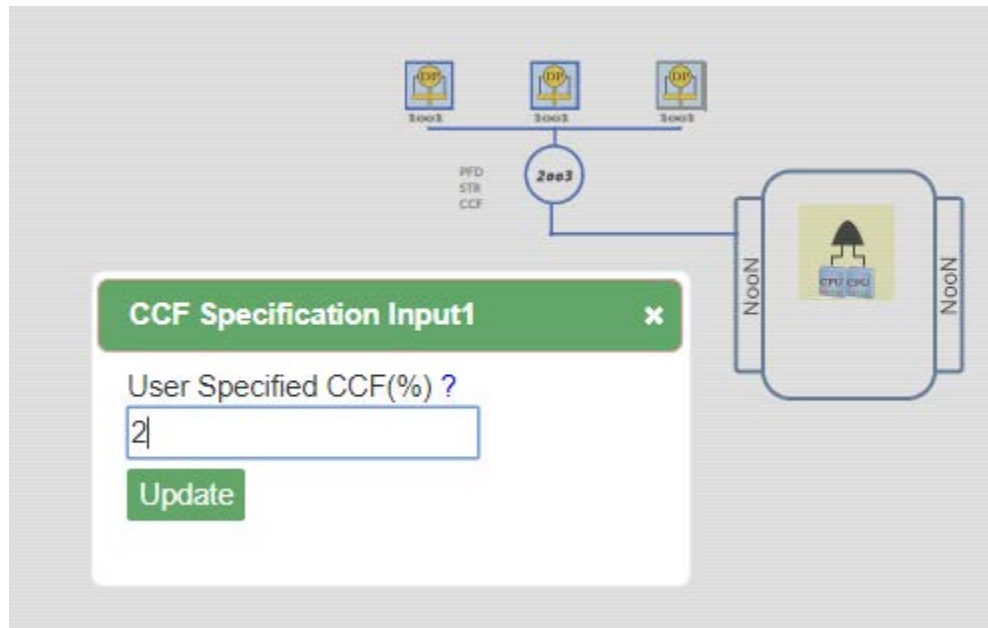
1. Copy DP-101A Pressure transmitter
2. Paste DP pressure transmitter to each of box in the 2003 input configuration
3. Update the tags for DP-101B and DP-101C and any other parameters that were modified for DP-101A.





# Adding Common Cause

- Left-click on the voting 2oo3 circle
- Put in CCF value as a percentage (for example, 2%)  
Note: Recommended values for duplex and triplex architectures are shown in the device datasheet under “Properties”
- Click Update to close the dialog box



CCF is not used in non-redundant (i.e., 1oo1 or 2oo2) architectures



# Partial Calculation

Click “Calculate and Save”

PFD and STR of the 2003 input and LS subsystems will be calculated

Results are displayed graphically and numerically on the GUI

Customer: **SIS-TECH**  
Project: **Practice proj 1**

Function: **V-101 High DP trip**  
Function ID: **SIF 01**


Welcome, eloisier

**SIL SOLVER**


	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)
TARGETS	8E-02	1	5E-02	2E+01
RESULTS	2.05E-3	2	4.92E-2	20.33
TARGETS MET?				

**PFD/STR Breakdown**

**PFDavg**



**STR**





Reset Exit  
Calculate and Save Print


**INPUT CONFIGURATION**


**INPUT DEVICE**


ANALYZER  
PRESSURE

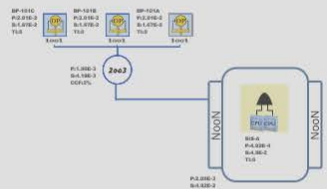

  
DIFFERENTIAL PRESSURE TRANSMITTER


  
PNEUMATIC PRESSURE SWITCH


  
PNEUMATIC PRESSURE TRANSMITTER


  
PRESSURE SWITCH - NORMAL SERVICE





**Silsolver**

PFD Value get Successfully

OK

A warning will be generated if a function does not have at least one input and one action



# 2003D vs. 2003

- What if automated diagnostics is going to be used to take safe action on diagnosed failure?
- Enter each device and change the Diagnostic level to DC3 (diagnostic level for intercomparison of 3 transmitters)
- Click Update to close dialog box

Define Diagnostic  
DC3 is used since 3  
PTs are used for  
comparison. The DC  
used in 90%

Device

Device ID:

DPTR

Device Type:

DIFFERENTIAL PRESSURE TRANSMITTER

Configurations:

Device Tag:

DP-101A

Proof Testing Interval (yr):

5

Voting:

1oo1

Subsystem Diagnostic Level: ?

DC3

Maintenance:

Mean Time to Repair (hr):

72

Diagnostic Interval (hr):

0.500

Overhaul Interval (yr):

20

Proof Testing Coverage (%): ?

100

User Specified

☐

Properties:

Failure Dangerous Failure Rate (1/yr):

8.00E-03

Failure Spurious Failure Rate (1/yr):

1.67E-02

CCF Dual(%):

2

CCF Triple(%):

2

Diagnostic Coverage Simplex(1/yr):

60.00

Diagnostic Coverage Dual(1/yr):

80.00

Diagnostic Coverage Triple(1/yr):

90.00

PFDavg:

2.01E-002

STR:

1.67E-002

Note:

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: Clean

Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SIL Solver Enterprise User Manual).

Data Source: SIL

Update

37



# Calculate and Save to Update Partial Results

Site : SIS-TECH  
Project ID: Practice

Function : V-101  
Function ID: SIF 01

**Silsolver**

Calculation complete

OK

Welcome, srizvi

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20	0
RESULTS	2.05E-03	2	4.92E-02	20.33	1
TARGETS MET?					

← → Exit
Calculate and Save Print
+ - Reset

SRS

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS

LOGIC SOLVER

INPUT CONFIGURATION

INPUT DEVICE

ACTION CONFIGURATION

ACTION DEVICE


SUPPORT CONFIGURATION

SUPPORT SYSTEM

CUSTOMER DEVICE

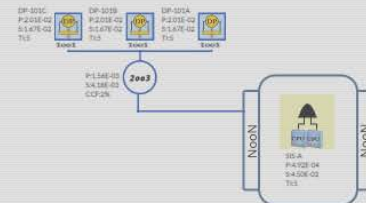
**Breakdown**

STR



HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
1	1	

HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>	HFT <sub>MACT</sub>



Other warnings may occur if some of the required information was left incomplete!



# FYI:

## DC for other architectures

For all other input configurations with safe action on diagnosed failure, the general rule for the selection of Diagnostic level is as below:

1oo1D → DC1 (Diagnostic Coverage Simplex)

1oo2D and 2oo2D → DC2 (Diagnostic Coverage Dual)

1oo3D, 2oo3D and 3oo3D → DC3 (Diagnostic Coverage Triplicated)

May need to select a lower DC when diverse devices are used in the same voting.

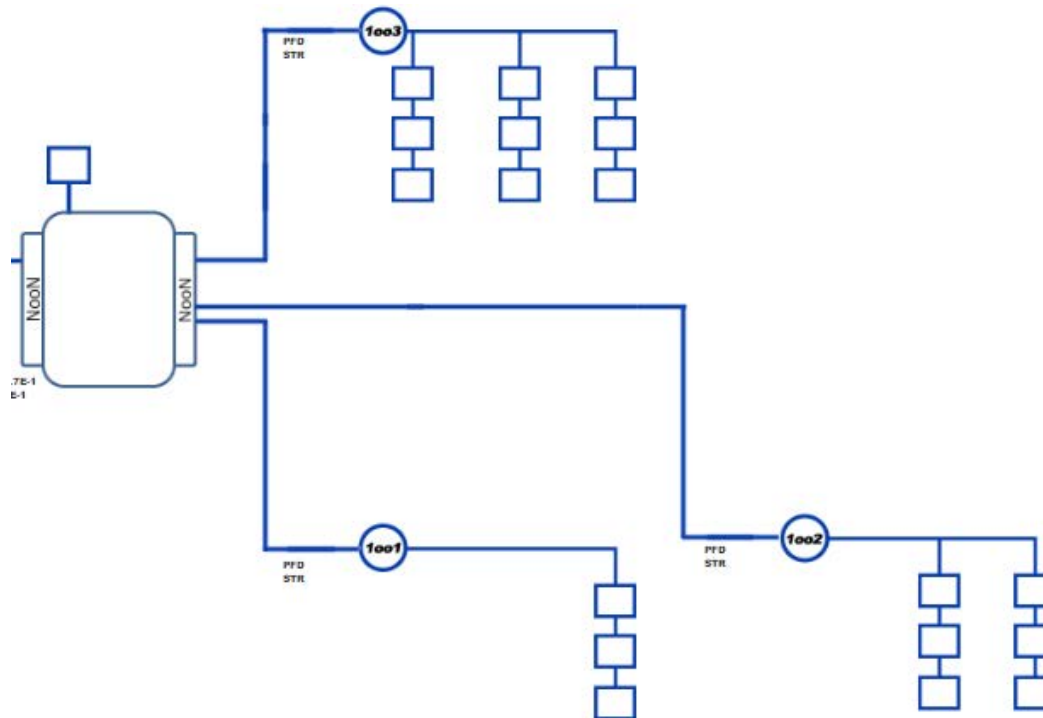
May select a higher DC when an external independent reading can be used for inter-comparison with the SIF sensor.



# Adding the rest of the system

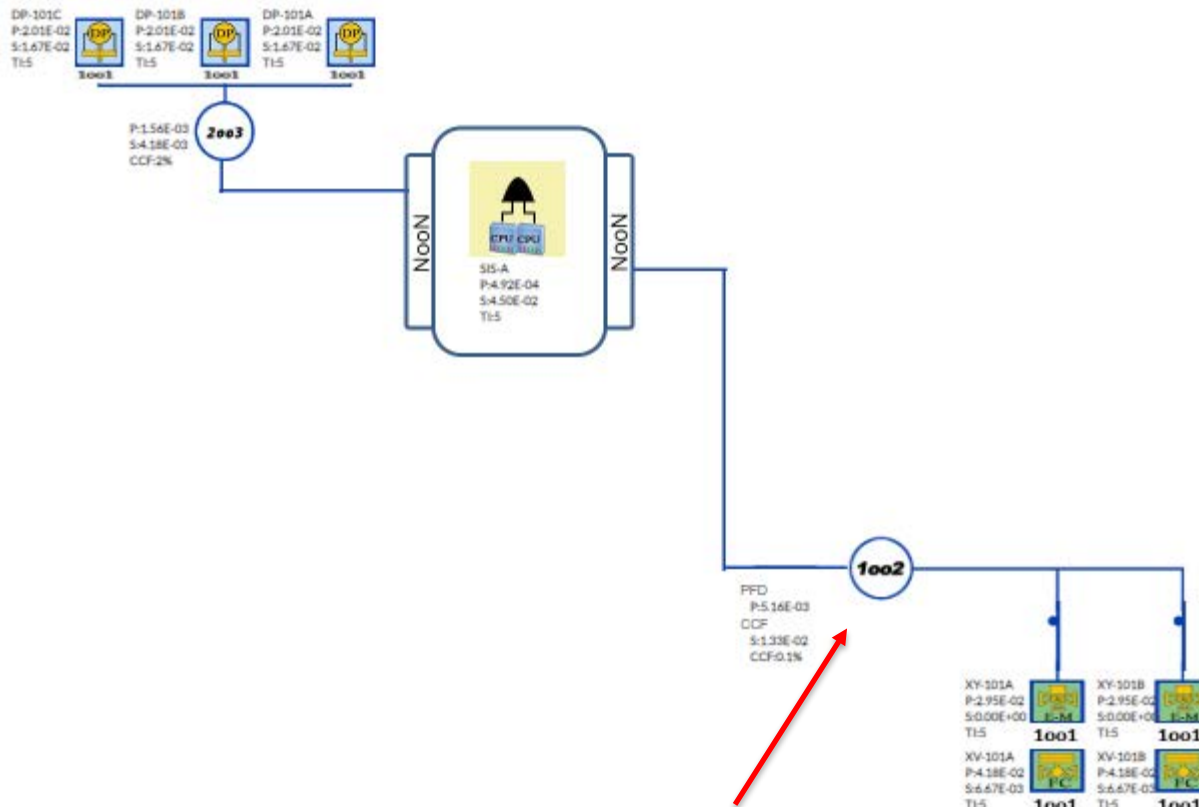
The support system and final actions are modelled in a similar way as the input.

1. Select the action configuration
2. Select the action device (Identical logic as SIL Solver® V 7.0)
3. Specify relevant parameters





# Adding valves and solenoids



Don't forget to enter CCF

**Device**

Device ID: SVETM Device Type: SOLENOID VALVE - ETT - MONITORED

**Configurations:**

Device Tag: XY-101A  
 Proof Testing Interval (yr): 5  
 Voting: 1001  
 Subsystem Diagnostic Level: ? NO DC

**Properties:**

Failure Dangerous Failure Rate (1/yr): 1.18E-02  
 Failure Spurious Failure Rate (1/yr): 0  
 CCF Dual(%): 1  
 CCF Triple(%): 1  
 Diagnostic Coverage Simplex(1/yr): 0.00  
 Diagnostic Coverage Dual(1/yr): 0.00  
 Diagnostic Coverage Triple(1/yr): 0.00

**Maintenance:**

Mean Time to Repair (hr): 72  
 Diagnostic Interval (hr): 0.000  
 Overhaul Interval (yr): 20  
 Proof Testing Coverage (%): ?  
 User Specified

**Note:**

Boundary Conditions: Boundary includes solenoid and solenoid wiring up to monitoring device.  
 Process Severity Assumption: N/A  
 Implementation Limitations and Exclusions: Vent port for redundant configurations is unobstructed and protected from debris.

Data Source: SIL Update

**Device**

Device ID: BVFCO Device Type: BLOCK VALVE-BALL-FTC-CLEAN

**Configurations:**

Device Tag: XV-101A  
 Proof Testing Interval (yr): 5  
 Voting: 1001  
 Subsystem Diagnostic Level: ? NO DC

**Properties:**

Failure Dangerous Failure Rate (1/yr): 1.67E-02  
 Failure Spurious Failure Rate (1/yr): 6.67E-03  
 CCF Dual(%): 0.1  
 CCF Triple(%): 0.1  
 Diagnostic Coverage Simplex(1/yr): 85.00  
 Diagnostic Coverage Dual(1/yr): 85.00  
 Diagnostic Coverage Triple(1/yr): 85.00

**Maintenance:**

Mean Time to Repair (hr): 72  
 Diagnostic Interval (hr): 0.000  
 Overhaul Interval (yr): 20  
 Proof Testing Coverage (%): ?  
 User Specified

**Note:**

Boundary Conditions: Boundary includes spring return, pneumatically-operated ball valve, operating in a standby (dormant) mode of operation. The solenoid is NOT INCLUDED. Safe-state specified is fail closed.  
 Process Severity Assumption: Clean

Data Source: SIL Update



# What if the design has a complicated “black box” subsystem?

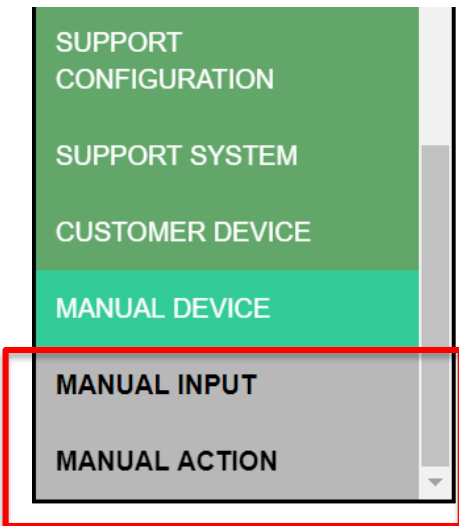
Most commonly used for complex designs where there is a complicated subsystem in the design that is evaluated using an advanced method such as FTA

SIL Solver® allows for a MANUAL ACTION subsystem and a MANUAL INPUT subsystem

**THESE ARE NOT POPULATED LIKE NORMAL DEVICES**

The PFDavg and STR contributions for these subsystems are entered directly into the tool

These performance of these subsystems are additive to the overall PFD and STR analysis



Click to add  
field to GUI



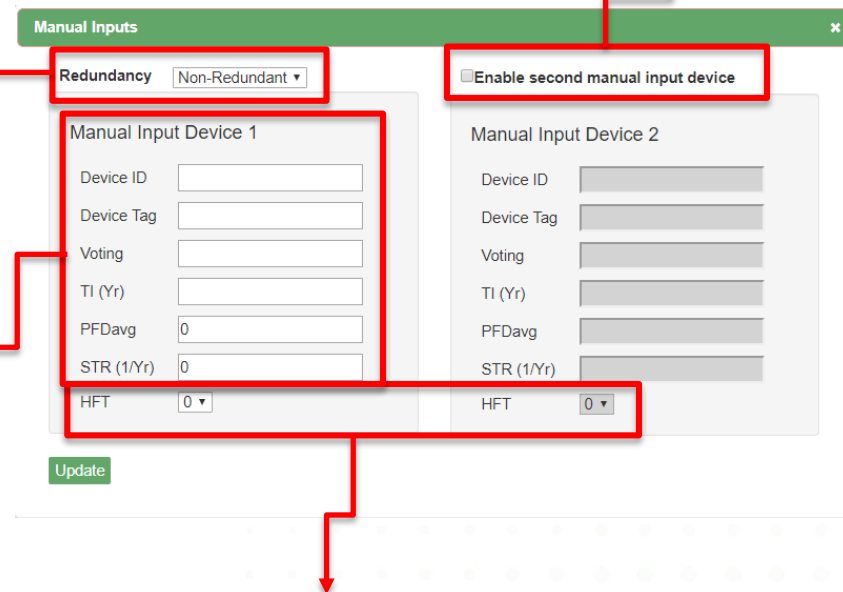
# Manual Inputs

The user can enter two parts of a Manual Input analysis:

If two are used, the user must define whether they are redundant to each other (i.e., EITHER subsystem working will allow the overall Manual Input to work) or non-redundant (i.e., BOTH parts must work for the overall Manual Input to work)

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input

Check to allow entry of the second Manual Input

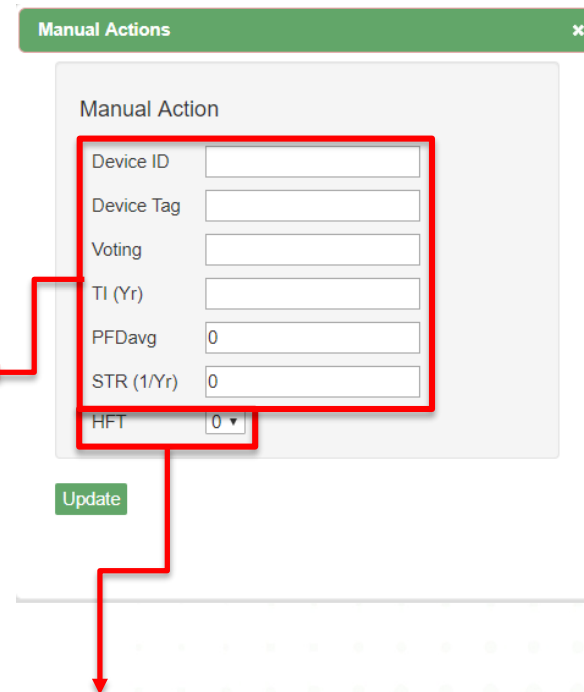


The user selects the Hardware Fault Tolerance value appropriate for each part of the Manual Input



# Manual Action

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input



Manual Actions

Manual Action

Device ID

Device Tag

Voting

TI (Yr)

PFDavg 0

STR (1/Yr) 0

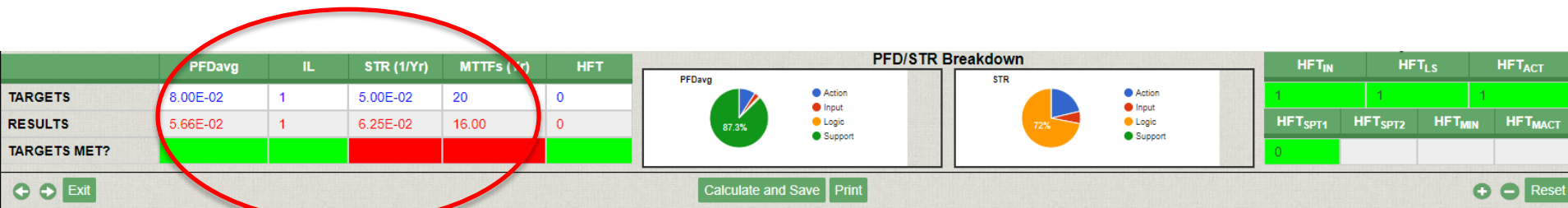
HFT 0 ▾

Update

User enters Manual Action HFT Value



# Are PFDavg and STR good enough?



Numerical results and red-green pass-fail indicator on top left of GUI and most SIF reports

Graphical Charts provide information on which components are dominating PFDavg and STR

If necessary, modify design until performance targets are achieved.



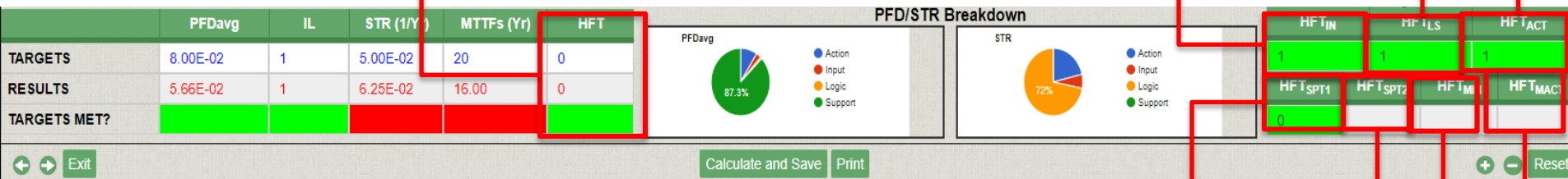
# Don't forget Hardware Fault Tolerance (HFT)

HFT Target and  
Overall HFT  
Result

HFT for Input(s)

HFT for  
Logic  
Solver

HFT for  
Action(s)



Overall HFT result is the minimum HFT out of the seven main subsystems (see far right side of GUI) for those subsystems that are configured for use in that architecture

HFT for Support  
System 1

HFT for Support  
System 2

HFT for Manual  
Input

HFT for Manual  
Action



# HFT for Device

The HFT for each field device box (Moon) is determined by the selected architecture within that box as below. The resulting HFT value for each field device is not shown on the GUI, except for logic solver, support system, manual input, and manual action in their respective data sheets.

Architecture(s)	HFT = N - M
1001, 1001D	0
1002, 1002D	1
2002, 2002D	0
1003, 1003D	2
2003, 2003D	1
3003, 3003D	0
2004, 2004D	2
HFAT/HPATD (unused for LS, but used for some action devices)	1

Site : **SIS-TECH**  
Project ID: **Practice**

Function : **V-102 High DP/P Trip**  
Function ID : **SIF 02**


Welcome, srizvi

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
<b>TARGETS</b>	8.00E-02	1	5.00E-02	20.00	0
<b>RESULTS</b>	5.53E-02	1	5.94E-02	16.84	0
<b>TARGETS MET?</b>					


**PFD/STR Breakdown**

PFDavg



- Action
- Input
- Logic
- Support

STR



- Action
- Input
- Logic
- Support

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
1	1	1
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
0		

← → Exit

Calculate and Save Print

+ - Reset



# HFT for Logic Solver

The HFT value for the logic solver (MooN) is determined by the selected architecture. The resulting HFT value for the logic solver is shown on the logic solver data sheet and on the GUI as below. Default value is 0 when importing a logic solver that is not in the current SIL Solver logic solver datasheet.

In this case,  
MooN is 1oo2D  
 $2-1=1$

Logic Solver  
HFT Value

HFT for  
Logic  
Solver

Site : SIS-TECH  
Project ID : Practice

Function : V-102 High DP/P Trip  
Function ID : SIF 02

Welcome, srizvi

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20.00	0
RESULTS	5.53E-02	1	5.94E-02	16.84	0
TARGETS MET?					

**PFD/STR Breakdown**

PFDavg: 89.4%

- Action
- Input
- Logic
- Support

STR

- Action
- Input
- Logic
- Support

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
1	1	1
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
0		

← → Exit

Calculate and Save Print

+ - Reset



# HFT for Support System

The HFT value for the support system is shown on the support system data sheet and on the GUI as below. Default value is 0 when importing support systems that are not in the current SIL Solver support system datasheet.

Support System

Support System ID: UPSE5S

POWER SUPPLY - ETT - 5

Support System Type: YEAR TESTING

Support System Tag: UPSE5S-101

Proof Testing Interval (yr): 5

PFDavg: 4.94E-002

STR: 0.00E+000

Note:

Boundary Description: The boundary includes: the incoming ac surge-protection rectifier stage, input capacitors, dc/dc converter or chopper circuit, dc battery circuit and a dc pulse with modulation (PWM) inverter.

Implementation Limitations and Exclusions: Energize-to-trip (ETT) circuits must include: " Line monitoring and loss of circuit continuity alarm

Data

Source: SIL

HFT: 0

Update

Support System  
HFT Value

HFT for Support  
System 1 and  
Support System 2

Site: SIS-TECH

Project ID: Practice

Function: V-102 High DP/P Trip

Function ID: SIF 02

Welcome, srizvi

SIL SOLVER

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
TARGETS	8.00E-02	1	5.00E-02	20.00	0
RESULTS	5.53E-02	1	5.94E-02	16.84	0
TARGETS MET?					

PFDavg

89.4%

Action

Input

Logic

Support

STR

Action

Input

Logic

Support

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
1	1	1
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
0		

Calculate and Save

Print

+

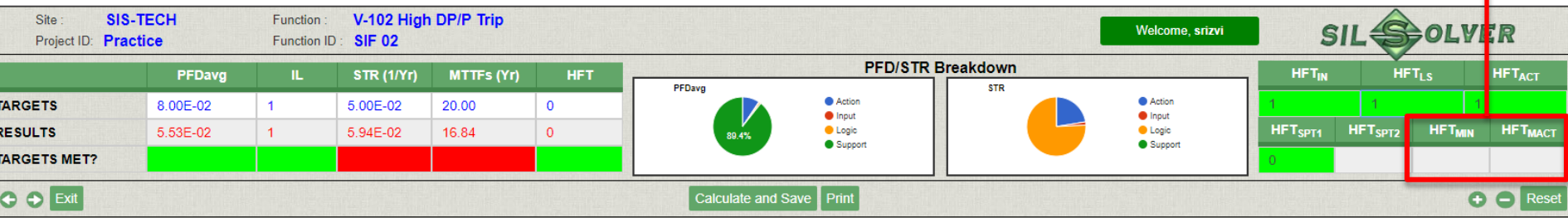
-

Reset



# HFT Results for Manual Input and Manual Action

HFT Results for Manual Input and Manual Action





## Is that all?

- The SIL Calculation is performed within a context of performance assumptions and other SIL evaluations (e.g., independence of SIF from other functions in the hazard case the SIF is designed for)
- The documentation of the SIL calculation should include sufficient SRS information to provide this context



# SRS Info

Site : **SIS-TECH**  
Project ID: **Practice**

Function : **V-101**  
Function ID : **SIF 01**

Welcome, srizvi

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
<b>TARGETS</b>	8.00E-02	1	5.00E-02	20.00	0
<b>RESULTS</b>	5.51E-02	1	5.83E-02	17.14	0
<b>TARGETS MET?</b>					

**PFDavg**

99.7%

- Action
- Input
- Logic
- Support

**STR**

77.1%

- Action
- Input
- Logic
- Support

← → Exit

Calculate and Save Print

+ - Reset

**SRS**

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS

**Process Hazard**

Save



# Done with SIF 01

Site : **SIS-TECH**  
Project ID : **Practice**

Function : **V-101**  
Function ID : **SIF 01**

Welcome, srizvi

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
<b>TARGETS</b>	8.00E-02	1	5.00E-02	20.00	0
<b>RESULTS</b>	5.51E-02	1	5.83E-02	17.14	0
<b>TARGETS MET?</b>					

**PFD/STR Breakdown**

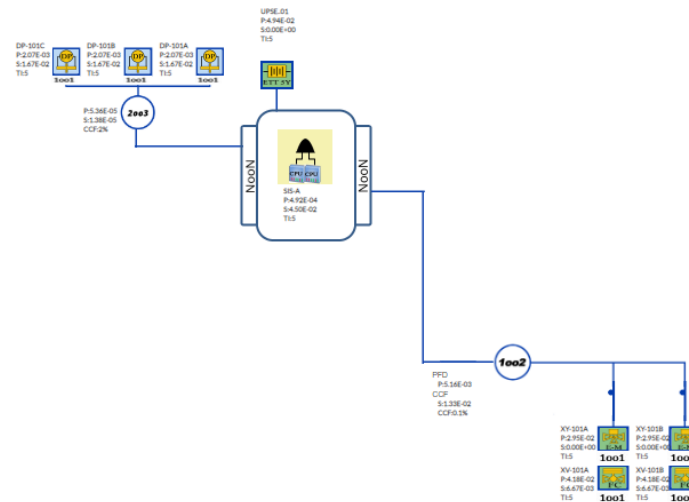
**PFDavg**

**STR**

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>	
1	1	1	
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>	HFT <sub>MACT</sub>
0			

Exit to return to  
main Protective  
Function screen  
for this project

- SRS
- PROCESS HAZARD
- DESCRIPTION
- DIAGNOSTICS
- RESET
- SHUTDOWN
- REFERENCE
- COMMENTS
- LOGIC SOLVER
- INPUT CONFIGURATION
- INPUT DEVICE
- ACTION CONFIGURATION
- ACTION DEVICE
- SUPPORT CONFIGURATION
- SUPPORT SYSTEM
- CUSTOMER DEVICE
- MANUAL DEVICE





## Second Function

- This project includes V-102 as well
- V-102 has an analogous protective function, SIF 02
- Key difference, SIF 02 uses a single pressure transmitter as the third device, instead of a DP
- Tags: DP-102A/B, PT-102, XV/XY-102A/B



# Copy SIF 01

**SIL SOLVER** Welcome, srizvi

Site: [SIS-TECH](#) Project ID: [Practice](#) Function ID: [SIF 01](#)

Protective Function

		Open	New	Edit	<b>Copy</b>	Delete	Exit	PF Revision Level		
		Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result		
SIF 01	V-101	Low Demand	8.00E-02	7.21E-03	5.00E-02	6.25E-02	1	2		

[Create Filter](#)

From the main Protective Function page, selecting the function to be copied and clicking the Copy button...

**SIL SOLVER** Welcome, srizvi

Site: [SIS-TECH](#) Project ID: [Practice](#) Function ID: [SIF 01](#)

Protective Function

		<b>Paste</b>	Open	New	Edit	Copy	Delete	Exit	PF Revision Level	
		Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result		
SIF 01	V-101	Low Demand	8.00E-02	7.21E-03	5.00E-02	6.25E-02	1	2		

[Create Filter](#)

Causes the Paste button to activate...



# Create SIF 02

Clicking the Paste button opens the dialog box to enter the new function ID and description

Site: SIS-TECH

Project ID: Practice

Function ID: SIF 01

## Protective Function

			Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level	
			Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result			
SIF 01	V-101	Low Demand	8.00E-02	7.21E-03	5.00E-02	6.25E-02	1	2			
Create Filter											

Protective Function

Function ID:

SIF 02

Function :

V-102 High DP/P Trip

Save

Close



# Success!

Site: SIS-TECH

Project ID: Practice

Function ID: SIF 01

Protective Function

Function ID Saved Successfully

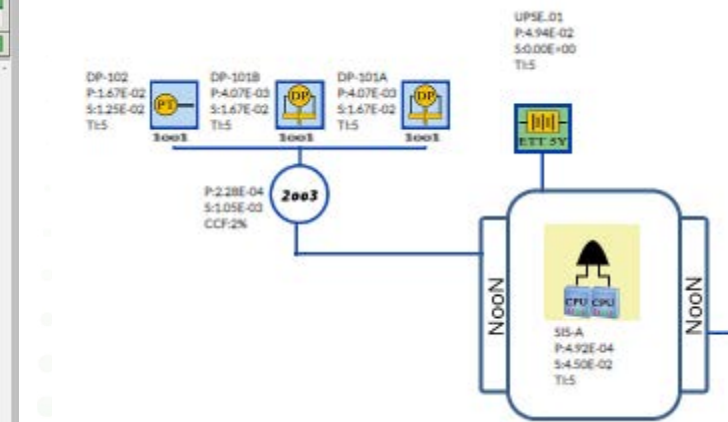
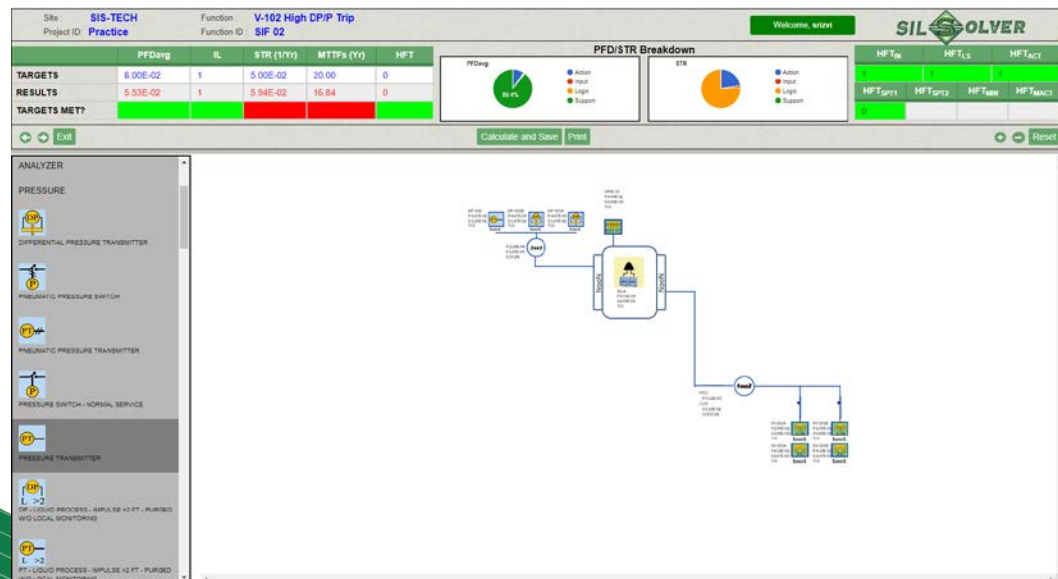
				Open	New	Edit	Copy	Delete	Exit	PF Revision Level
		Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result		
SIF 01	V-101	Low Demand	8.00E-02	7.21E-03	5.00E-02	6.25E-02	1	2		
SIF 02	V-102 High DP/P Trip	Low Demand	8.00E-02	7.21E-03	5.00E-02	6.25E-02	1	2		
Create Filter										

Select the new function and Open  
Update tag ID fields for all devices



# Modeling diverse sensors

1. Delete the third DP sensor
2. Copy General Pressure transmitter
3. Paste General pressure transmitter to the last box in the 2003 input configuration
4. Change Diagnostic level to DC2 for the two DP pressure transmitters and keep the General PT Diagnostic level as NO DC (no device to compare with).



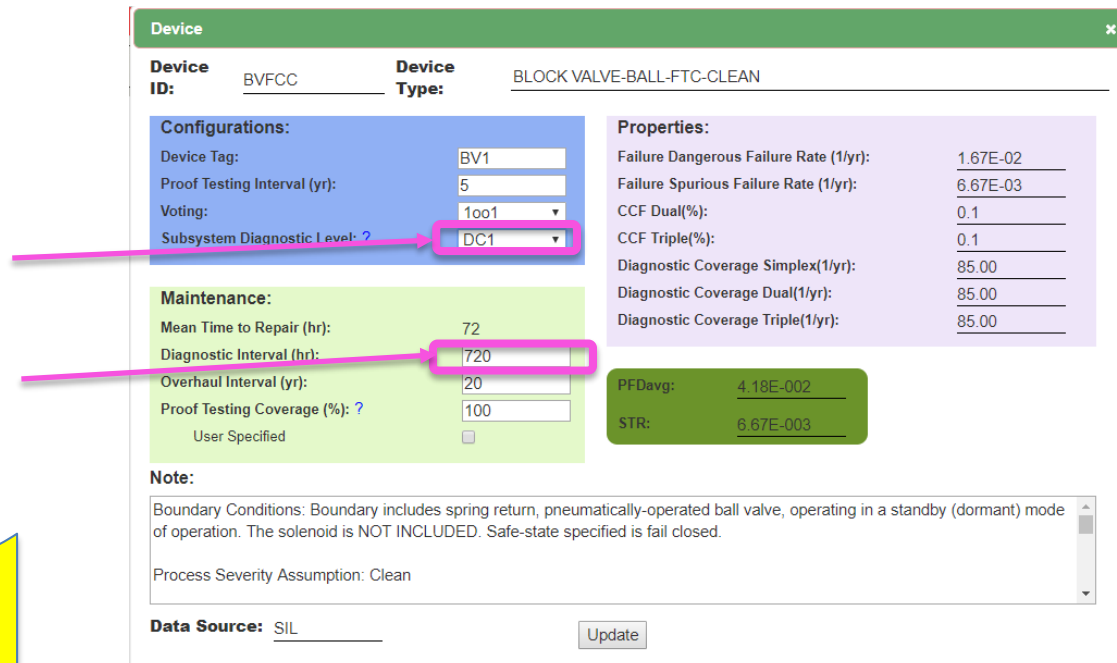


# Partial Stroke Testing of Valves

- For valves, the DC selection can be used to model partial stroke testing.

1. Set the diagnostic level to DC1

2. Set the diagnostic interval to partial stroke testing interval



**Device**

Device ID: BVFCC Device Type: BLOCK VALVE-BALL-FTC-CLEAN

**Configurations:**

Device Tag: BV1

Proof Testing Interval (yr): 5

Voting: 1oo1

Subsystem Diagnostic Level: ? **DC1**

**Maintenance:**

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): **720**

Overhaul Interval (yr): 20

Proof Testing Coverage (%): ? 100

User Specified ☐

**Properties:**

Failure Dangerous Failure Rate (1/yr):	1.67E-02
Failure Spurious Failure Rate (1/yr):	6.67E-03
CCF Dual(%):	0.1
CCF Triple(%):	0.1
Diagnostic Coverage Simplex(1/yr):	85.00
Diagnostic Coverage Dual(1/yr):	85.00
Diagnostic Coverage Triple(1/yr):	85.00

PFDavg: 4.18E-002

STR: 6.67E-003

**Note:**

Boundary Conditions: Boundary includes spring return, pneumatically-operated ball valve, operating in a standby (dormant) mode of operation. The solenoid is NOT INCLUDED. Safe-state specified is fail closed.

Process Severity Assumption: Clean

Data Source: SIL

Update

Both fields must be configured for correct use of equation.



# Partial Interim Testing of Sensors

- Sometimes an imperfect test is performed on a sensor at a shorter interval, with a 100% proof test (or complete replacement) performed at a longer interval
- Use the Proof Test coverage and Overhaul interval to model this

Example:  
Sensor installation with an 85% test performed annually with 100% test or full replacement done every 10 years

Both fields must be configured for correct use of equation.

Device

Device ID: THMLS

Device Type: THERMOCOUPLE - LOW STRESS ENVIRONMENT

Configurations:

Device Tag: TT1

Proof Testing Interval (yr): 1

Voting: 1oo1

Subsystem Diagnostic Level: ? NO DC

Maintenance:

Mean Time to Repair (hr): 72

Diagnostic Interval (hr): 0.500

Overhaul Interval (yr): 10

Proof Testing Coverage (%): 85

User Specified ☒

Properties:

Failure Dangerous Failure Rate (1/yr): 5.00E-03

Failure Spurious Failure Rate (1/yr): 4.00E-02

CCF Dual(%): 2

CCF Triple(%): 2

Diagnostic Coverage Simplex(1/yr): 60.00

Diagnostic Coverage Dual(1/yr): 80.00

Diagnostic Coverage Triple(1/yr): 90.00

PFDavg: 0.00E+000

STR: 0.00E+000

Note:

Boundary Conditions: Boundary includes thermocouple element and insulators, terminal head and protecting tube or thermowell.

Process Severity Assumption: Clean

Implementation Limitations and Exclusions: A low stress environment does not include the following: high vibration application.

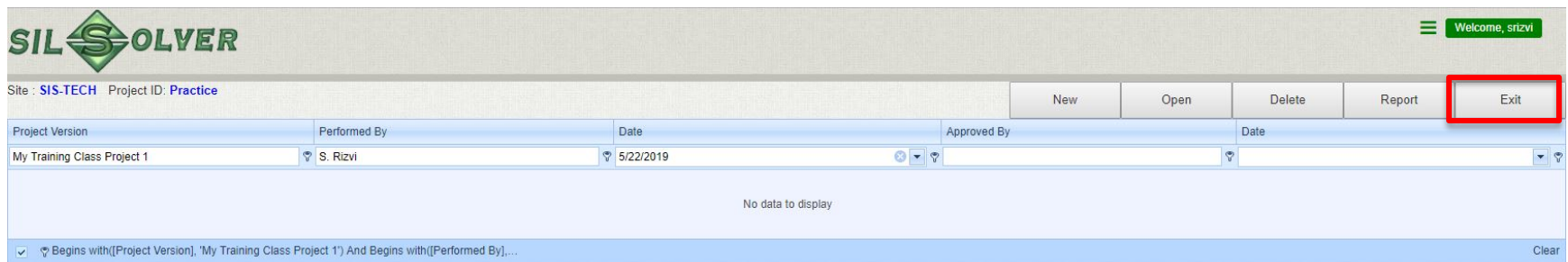
Data Source: SIL

Update

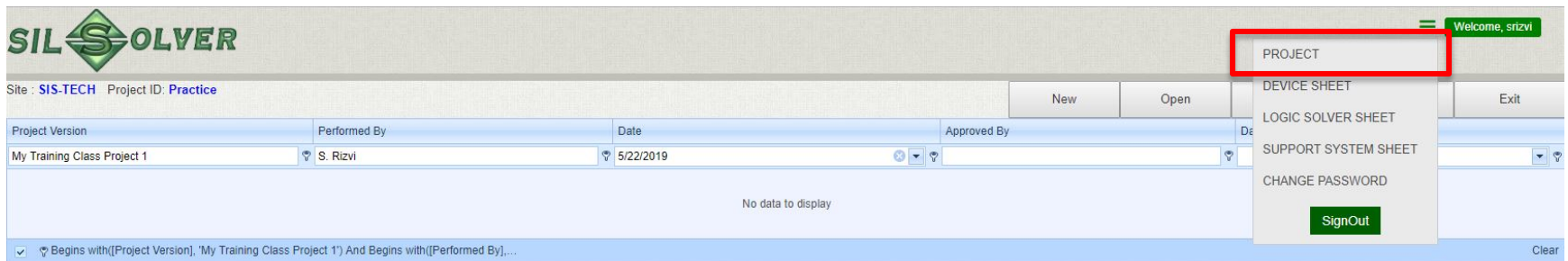


# Getting back to Project Home

2 WAYS



The screenshot shows the SIL SOLVER Project Home interface. The top header includes the SIL SOLVER logo and a welcome message 'Welcome, srizvi'. Below the header, the site is identified as 'SIS-TECH' and the project as 'Practice'. A navigation bar contains buttons for 'New', 'Open', 'Delete', 'Report', and 'Exit'. The 'Exit' button is highlighted with a red box. Below the navigation bar, there is a table with columns for 'Project Version', 'Performed By', 'Date', 'Approved By', and 'Date'. The table contains one row with the data: 'My Training Class Project 1', 'S. Rizvi', '5/22/2019', and empty fields for 'Approved By' and 'Date'. Below the table, a message states 'No data to display'. At the bottom, there is a search bar with a filter icon and a 'Clear' button.



The screenshot shows the SIL SOLVER Project Home interface with the 'PROJECT' dropdown menu open. The top header includes the SIL SOLVER logo and a welcome message 'Welcome, srizvi'. Below the header, the site is identified as 'SIS-TECH' and the project as 'Practice'. A navigation bar contains buttons for 'New', 'Open', 'Delete', 'Report', and 'Exit'. The 'PROJECT' dropdown menu is highlighted with a red box and contains the following options: 'PROJECT', 'DEVICE SHEET', 'LOGIC SOLVER SHEET', 'SUPPORT SYSTEM SHEET', 'CHANGE PASSWORD', and a 'SignOut' button. Below the navigation bar, there is a table with columns for 'Project Version', 'Performed By', 'Date', 'Approved By', and 'Date'. The table contains one row with the data: 'My Training Class Project 1', 'S. Rizvi', '5/22/2019', and empty fields for 'Approved By' and 'Date'. Below the table, a message states 'No data to display'. At the bottom, there is a search bar with a filter icon and a 'Clear' button.



# Exiting SIL Solver®?

Exit the software  
from the main  
screen



Welcome, srizvi

Site: SIS-TECH  
Project ID: Practice

		Open	New	Edit	Copy	Delete	Exit	Project Revision	User Guide
DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary

SignOut from  
the menu  
dropdown at top  
right of main  
screen



Welcome, srizvi

Site: SIS-TECH  
Project ID: Practice

		Open	New	Edit	Copy	Delete			
DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data		

- PROJECT
- DEVICE SHEET
- LOGIC SOLVER SHEET
- SUPPORT SYSTEM SHEET
- CHANGE PASS WORD
- SignOut

User Guide
PF Result Summary

Site	Location	Project ID	Project Name
------	----------	------------	--------------



# **3. EDITING, COPYING OR DELETING AN EXISTING PROJECT**



# If click Edit on main screen when there are No projects...

By default, the first project in the project list is selected.

Error text will pop up if user attempts a feature (e.g., Edit) that requires a project to be selected and there are no projects in the list.

Site:  
Projects

Project ID:

Must Select Project..

		Open	New	Edit	Copy	Delete	Exit	Project Revision	User Guide
DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary

Site	Location	Project ID	Project Name

No data to display

Create Filter



# Function Revision Info

To create/edit function revision information, select the function and click “function Revision level” to get to the editing page, where you can create/edit and delete the function revision information



Welcome, srizvi

Site: SIS-TECH

Project ID: Practice

Function ID: SIF 02

Protective Function

				Open	New	Edit	Copy	Delete	Exit	PF Revision Level
		Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result		
SIF 02	V-102 High DP/P Trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1		
SIF 01	V-101	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1		
Create Filter										



Welcome, srizvi

Site: SIS-TECH Project ID: Practice Function: SIF 02

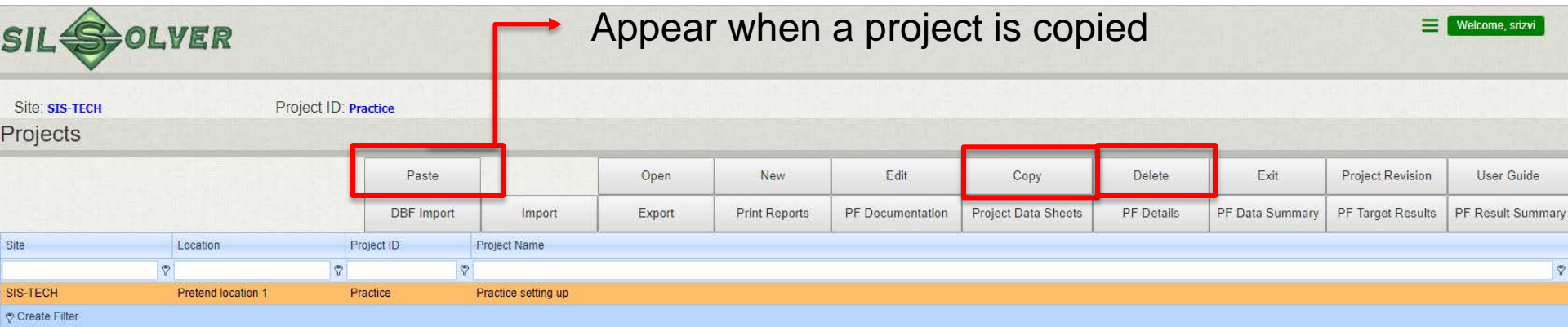
			New	Open	Delete	Report	Exit
Function Version	Performed By	Date	Approved By	Date			

No data to display

Create Filter



# Copying or deleting a project works like copying or deleting a function



Select the project

Copy → Make a copy of the selected project and after that a paste button will appear, when “paste” is click a window will pop up for you to enter new project designation.

Delete → Delete the selected project



# 4. GENERATING REPORTS

- Project Reports
- Function Reports



# Same Reports

- The reports from SIL Solver® V7.1 have been replicated in SIL Solver® Enterprise



# Project Report generation

Print the reports for the whole project by selecting project and click relevant report tab.

When the project reports are printed, the report will include project revision information



Welcome, srtzvi

Site: [SIS-TECH](#) Project ID: [Practice](#)

Projects

Site	Location	Project ID	Project Name	Open	New	Edit	Copy	Delete	Exit	Project Revision	User Guide		
SIS-TECH	Pretend location 1	Practice	Practice setting up	DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary

Create Filter



# Function Report generation

Print the reports for a function by going to the function list, select a function and click relevant report tab.

When the function level reports are printed, the report will include function revision information

## Protective Function

				Open	New	Edit	Copy	Delete	Exit	PF Revision Level		
				Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Results Summary
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result				
SIF 02	V-102 High DP/P Trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1				
SIF 01	V-101	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1				



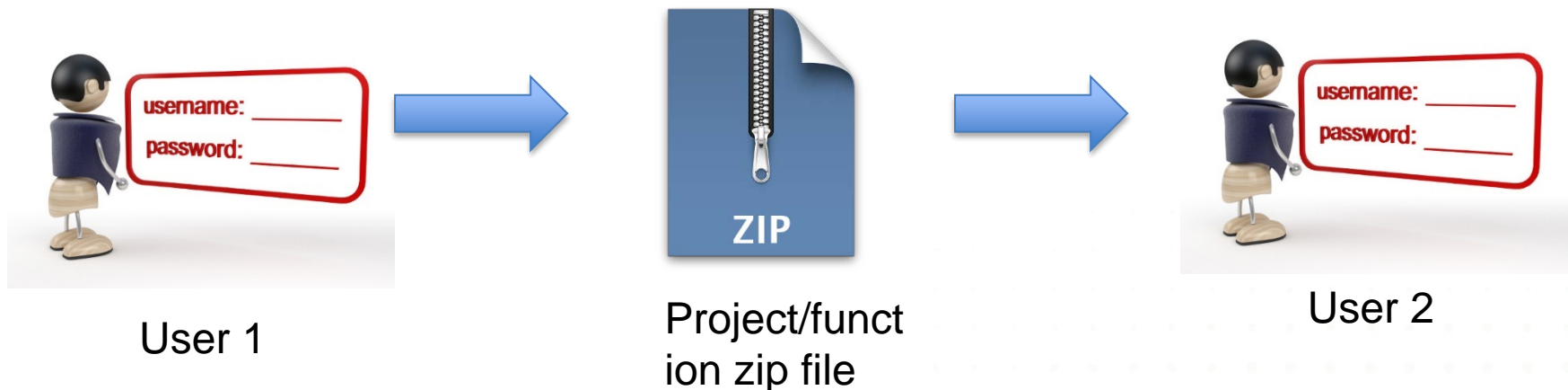
# 5. IMPORTING/EXPORTING

- Project export from SIL Solver® Enterprise
- SIL Solver® Enterprise project import
- Function Export/Import
- Importing SIL Solver® V7.1 files into SIL Solver® Enterprise (DBF Import)



# Import and export

- The way to share a project/function between users



- The way to transfer information between SIL Solver® V7.1 and SIL Solver® Enterprise



Site: [SIS-TECH](#)

Project ID: [Practice](#)

## Projects

				Open	New	Edit	Copy	Delete	Exit	Project Revision	User Guide		
				DBF Import	Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary
Site	Location	Project ID	Project Name										
SIS-TECH	Pretend location 1	Practice	Practice setting up										
Create Filter													

Used to transfer information

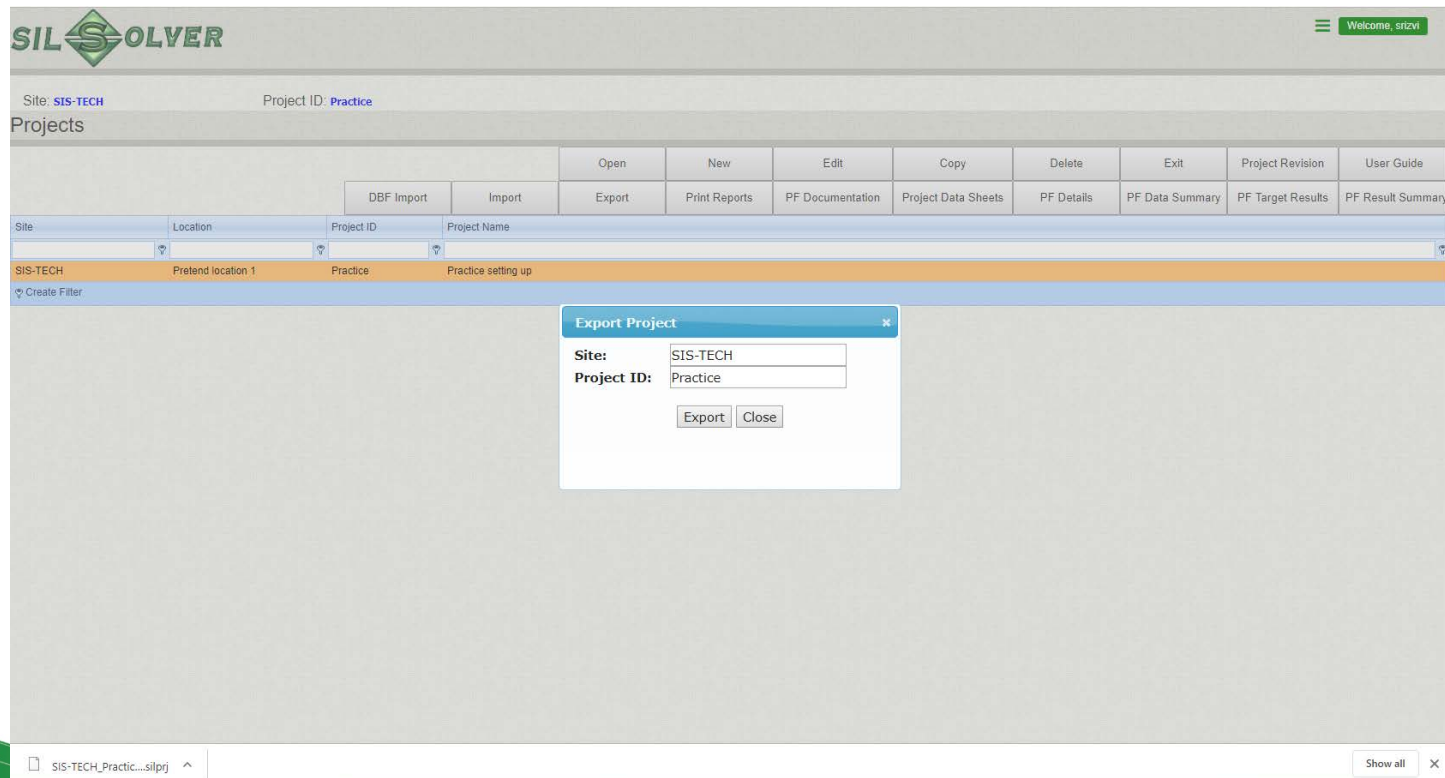
- between people
- between SIL SOLVER® tool versions



# Project export

To export a project:

1. Go to the project page
2. Select the project
3. Click export
4. A zip file of the project will be created in the download folder

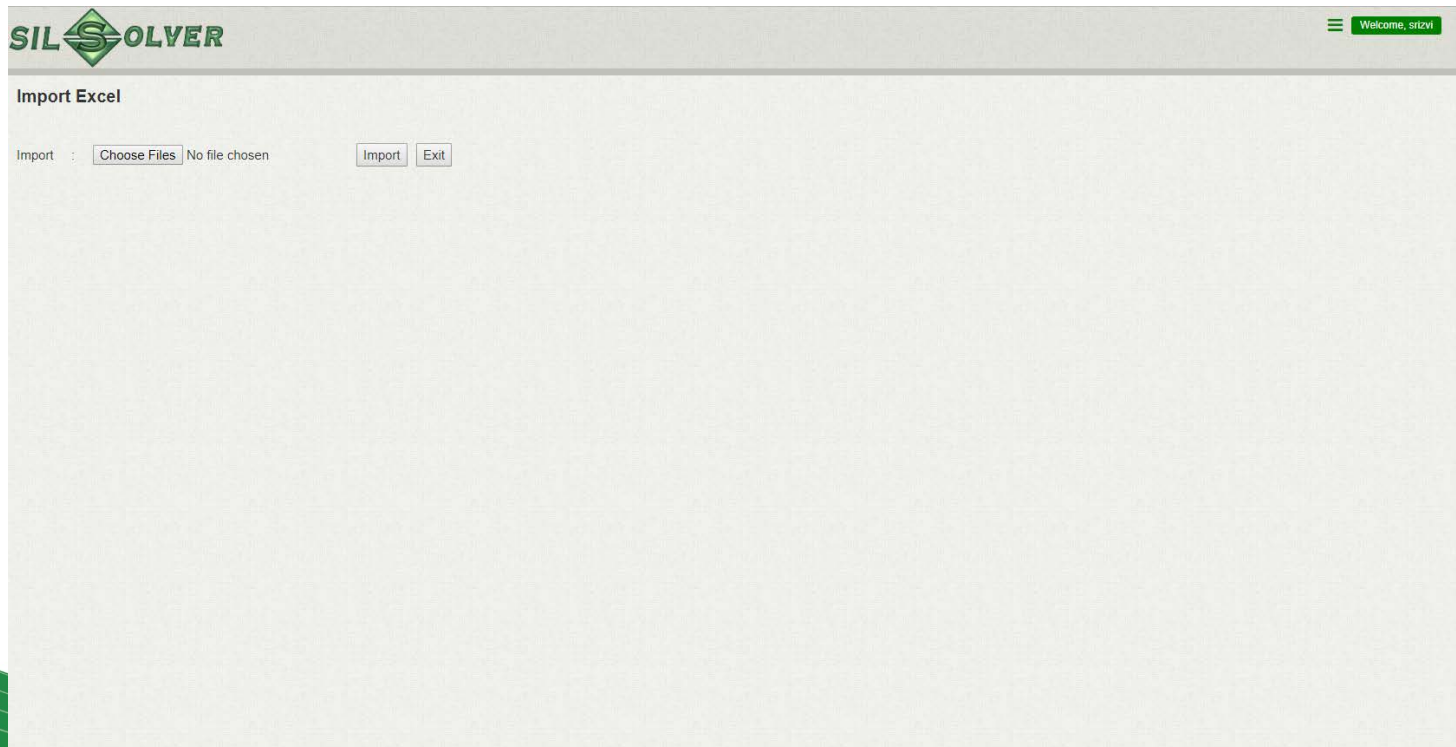




# Project import

To import a project:

1. Go to the project page
2. Click import, the following project will pop up
3. Click “choose files”, then changed the directory to the project (zip) file you want to import
4. The file will be imported





# SIL Solver® Enterprise

## Function export/import

To import a function is the same as for a project, the only difference is that the operations are on the function level page.



# DBF import

To import a **project** from SIL Solver® V7.1

1. Go to the folder where you saved the project. For example the default directory: C:\SILSolver\_Projects
2. Zip the project that you want to import to SIL Solver® Enterprise
3. Go to the SIL Solver® Enterprise project page
4. Click “DBF import” tab, the following page will pop up
5. Click “Choose files”, pointing to the Zipped project file
6. Click “Upload\_zip File”
7. When the upload is ready, click import
8. A message will pop up when the import is done.

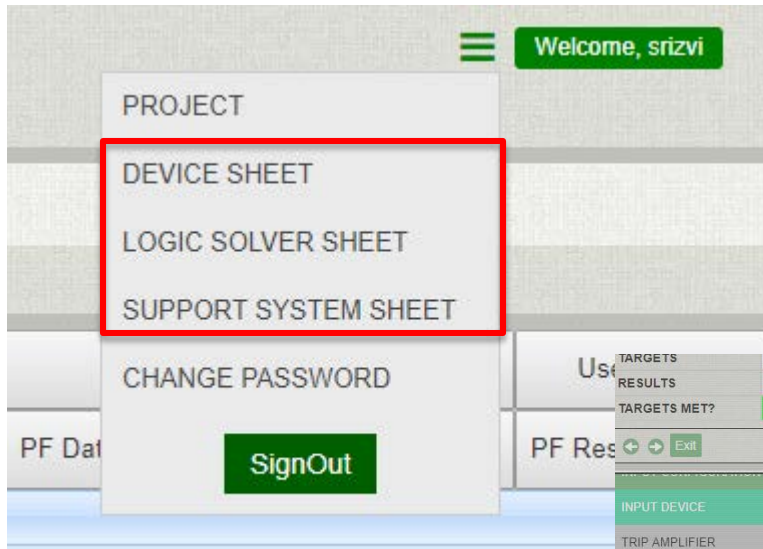


## 6. DATASHEETS

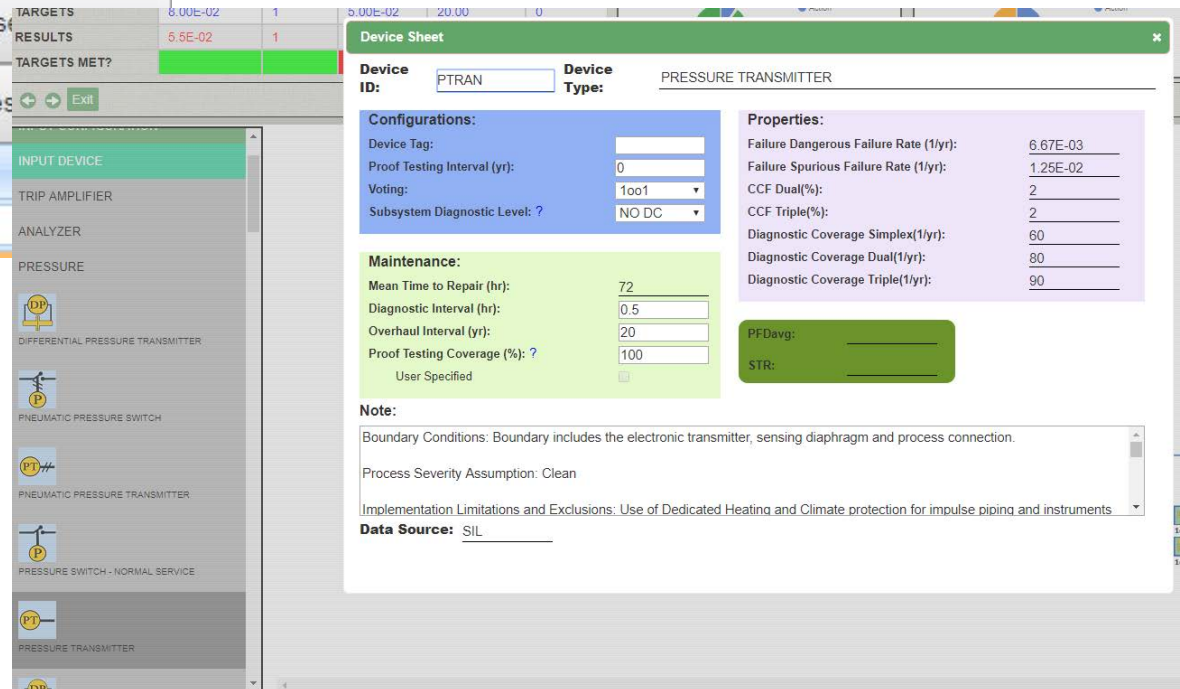
- Device
- Logic Solver
- Support System



# Accessing Datasheets



Access from main page dropdown menu or for individual devices right-click when in device list on GUI





# Device datasheet list

**SIL SOLVER** Welcome, srizvi

SIL Solver Data Sheet

Back Version History Data ID List

Page 1 of 5 (248 items) < [1] 2 3 4 5 >

Open	Data Version	Source	Device ID	Device Image	Device Description	Fail_Dangerous	Fail_Spurious
Open	8	SIL	ACC		ACCELERATION MONITOR	1.25E-02	1.13E-01
Open	8	SIL	ALANN		ALARM ANNUNCIATOR	1.33E-02	1.33E-02
Open	8	SIL	ANBTU		BTU ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCLR		CHLORINE ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCMO		CARBON MONOXIDE ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCO2		CARBON DIOXIDE ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCON		CONDUCTIVITY ANALYZER	2.00E-01	2.00E-01
Open	8	SIL	ANDO2		DISSOLVED OXYGEN ANALYZER	2.00E-01	2.00E+00
Open	8	SIL	ANH2S		HYDROGEN SULFIDE ANALYZER	3.33E-02	5.00E-02
Open	8	SIL	ANHCT		HYDROCARBON ANALYZER-CATALYTIC	2.00E-02	2.00E-02
Open	8	SIL	ANHIR		HYDROCARBON ANALYZER-INFRARED	2.00E-02	2.00E-02

- Click open (far left) to look at the datasheet for that device



# Device Datasheet




Welcome, srizvi

SIL Solver Data Sheet

DATA SHEET

Back

DataSource

Device Id  

Device Type

Fail Dangerous Failure Rate(1/yr)

Fail Spurious Failure Rate(1/yr)

Mean Time to Repair(hrs)

Common Cause Factor Dual Mode(%)

Common Cause Factor Triple Mode(%)

Diagnostic Interval(hrs)

Diagnostic Coverage in Simplex Mode(%)

Diagnostic Coverage in Dual Mode(%)

Diagnostic Coverage in Triplicated Mode(%)

## Notes

Boundary Conditions: Boundary includes process connection, sampling system and analyzer.

Process Severity Assumption: Clean














Implementation Limitations and Exclusions: Calculation assumes the sampling system is monitored and alarmed. Calibration may be required more frequently than the calculation indicates due to sensor degradation and replacement.

Diagnostic coverage and common cause factors are based on common sampling system. If sampling system is separate for each analyzer, the use of these values will result in a conservative PFDavg.

Data Sources:

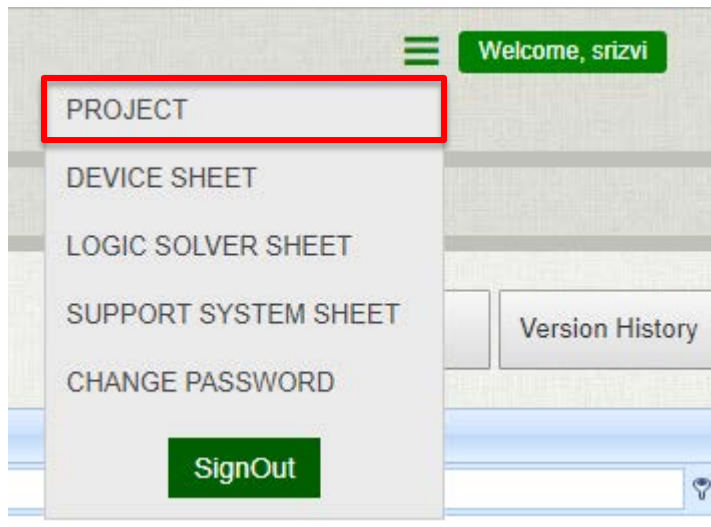


# Same for LS and Support Systems

SIL SOLVER					
SIL Solver Logic Solver Sheet					
Open	Data Version	Source	Logic Solver ID	Logic Solver Image	Logic Solver Description
Open	8	SIL	DWDIO		GENERIC 2004D DUAL MP, DUAL I/O
Open	8	SIL	DMSIO		GENERIC 1002D DUAL MP, SIMPLEX I/O
Open	8	SIL	N500	NON-SC D/D	NON SC PES DUAL MP, DUAL I/O
Open	8	SIL	N5DS	NON-SC D/S	NON SC PES DUAL MP, SIMPLEX I/O
Open	8	SIL	N5SS	NON-SC S/S	NON SC PES SIMPLEX MP, SIMPLEX
Open	8	SIL	RELFC		RELAY - FAIL TO CLOSE
SIL SOLVER					
SIL Solver Support System Data Sheet					
Open	Data Version	Source	Support System ID	Support System Image	Support System Description
Open	8	SIL	IAD RMS		INSTRUMENT AIR-DIVERSITY/MONITORED RECEIVER
Open	8	SIL	IAD RS		INSTRUMENT AIR-DIVERSITY/RECEIVER
Open	8	SIL	IAD S		INSTRUMENT AIR-COMPRESSOR DIVERSITY
Open	8	SIL	IADVS		INSTRUMENT AIR-NO DIVERSITY
Open	8	SIL	IADVCS		INSTRUMENT AIR-RECEIVER
Open	8	SIL	IAD RMS		INSTRUMENT AIR-MONITORED RECEIVER
Open	8	SIL	UPSDMS		UPS - POWER SUPPLY - DTT - MONITORED
Open	8	SIL	UPSDTS		POWER SUPPLY - DTT
Open	8	SIL	UPSET5		POWER SUPPLY - ETT - 1 YEAR TESTING
Open	8	SIL	UPSET25		POWER SUPPLY - ETT - 2 YEAR TESTING
Open	8	SIL	UPSET35		POWER SUPPLY - ETT - 3 YEAR TESTING
Open	8	SIL	UPSET45		POWER SUPPLY - ETT - 4 YEAR TESTING



# Returning to Project View



Click Project on the dropdown menu or use Back buttons on the datasheet pages

Back

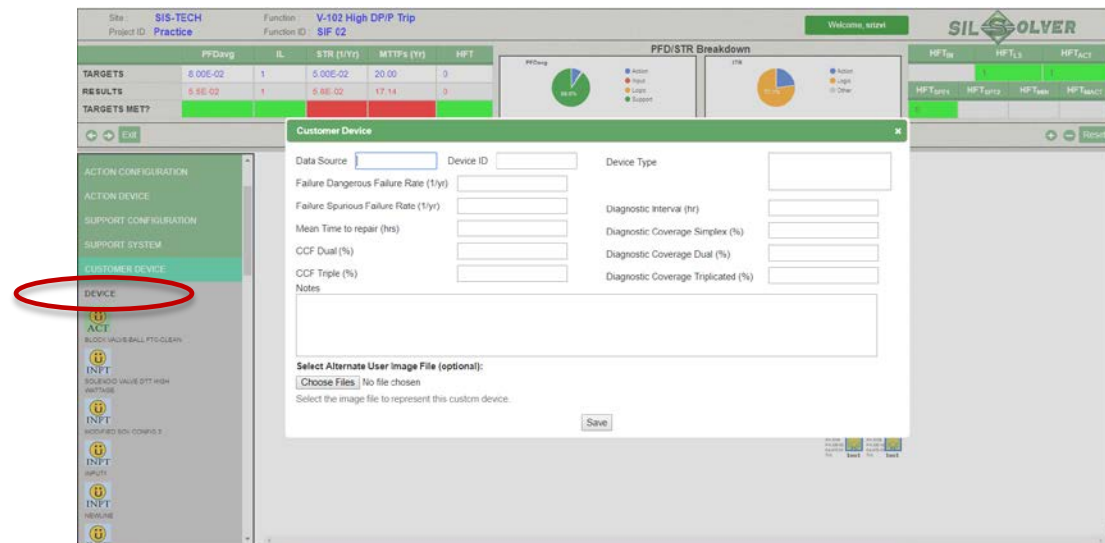
Version History

Open	Data Version	Source	Support System ID	Support System Image	Support System Description



# Adding a Custom Datasheet

- From GUI page, go to bottom of lists to the Customer Device section
- Left-click the **header** for the type of sheet this will be
- Enter the data for the new custom device and Save
  - Do not use special characters in the Data Source or Device ID fields
  - If desired, browse to a new image for this device to replace the default



Once created, custom datasheets are available to anyone on the server!



# 7. TROUBLESHOOTING

- Lost passwords
- Screen settings
- Import challenges
- Disconnects/timing out



# Troubleshooting: Lost Username or Password

- Individual username and password assignment is performed by the company that purchases the license through the ADMIN account for that license



# Troubleshooting: Screen Settings

- Some SIL Solver® Enterprise application screen content may be obscured if
  - Window is not maximized
  - Zoom >100% is used on the window



# Troubleshooting: Import Challenges

- When importing, confirm the final function successfully transferred into SIL Solver® Enterprise



# Troubleshooting: Disconnects/Timing Out

- Do not delay too long before saving.
- SIL Solver® Enterprise will time out after **90 minutes** of inactivity.
- A warning screen will pop up during the last minute.
  - Click “Yes” to extend the session

