

Getting the Most Out of SmartPlant Instrumentation

Fluor's SmartPlant
Implementation
Initiative



FLUOR[®]

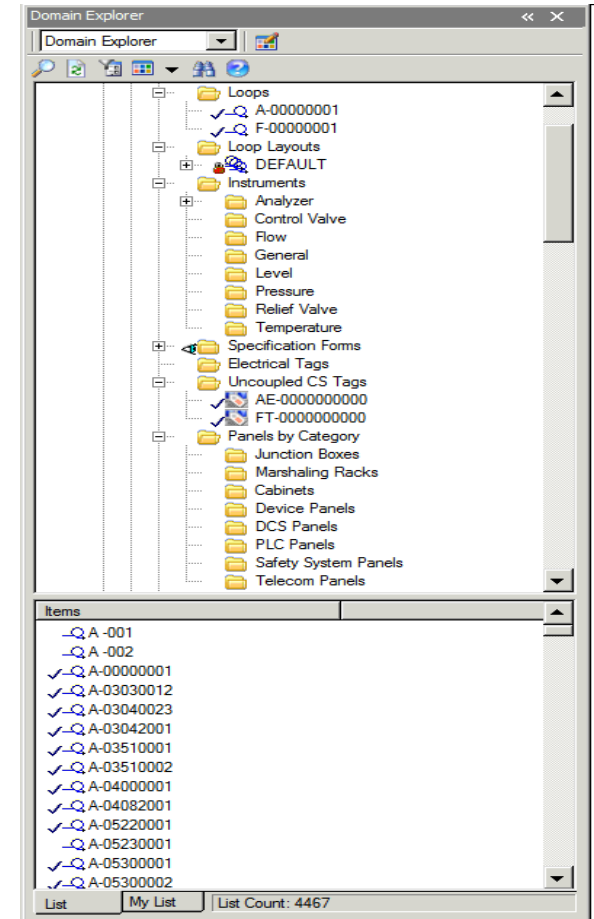
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By: John Dressel

Most Used SPI Modules



- ◆ Instrument Index Module
 - Add & Edit Tag Numbers
 - Browse Component Table
 - Create Index Reports
- ◆ Instrument Spec Module
 - Maintain Spec Libraries
 - Create Instrument Specs
- ◆ Instrument Wiring Module
 - Design Field Wiring Matrix
 - Generate Wiring Reports
 - Generate Loops & Segments



Seldom Used SPI Modules



◆ Process Module

- Handles multiple Process Cases
- Fluid properties lookup Tables
- Data entered by Tag or Line
- Unit of Measure conversion
- Copy data from other Tags
- Additional Physical Properties
- Base and Ambient Conditions
- 12 Levels of Alarm / Trip Settings
- Process Specific User Defined Fields
- Process Workflow Control
- Process datasheets with Revisions

The screenshot displays the configuration interface for a process module, organized into several sections:

- GENERAL:** Case: CASE 1; Service: Feed from V-8; Fluid state: Liquid; Fluid phase: Single phase; Fluid name source: User-defined; Fluid name: Lean Feed; Location: Line; Line number: 4; Line size: 4 in; Line schedule: 80.
- PROPERTIES:** Report tags: Specific Gravity, Density, Molecular Mass. Volumetric flow: 25 m³/h; Upstream pressure: 12 bar; Temperature: 150 °C; Viscosity: 0.1 cP; Velocity: 0.936 m/s; Density: 890 kg/m³; Specific gravity: 0.881; Compressibility: 0.881; Specific heats ratio: 0.9; Vapour pressure: 1.00 bar; Critical pressure: 1.00 bar; Molecular mass: 1.00.
- ADDITIONAL PROPERTIES:** Design pressure minimum: 50 bar; Design pressure maximum: 50 bar; Design temperature minimum: 250 °C; Design temperature maximum: 250 °C; Entrained gas: %; Angle of repose: °; Required range: From 0 m³/h To 35 m³/h; Limits on press. drop across flowmeter: 1 mbar @ 20 °C.
- BASE CONDITIONS:** Pressure: 1 bar; Temperature: 15.5 °C; Absolute Density: kg/m³; Specific gravity: ; Compressibility: .
- ALARM:** Alarm and Trip settings for Low-Low, Low, High, High-High, and High-High-High. Engineering units: m³/h.
- API 2540 STANDARD:** Density at reference temperature: kg/m³; Specific gravity at reference temperature: ; API settings for minimum/normal/maximum: ; Reference temperature: °C.
- USER DEFINED FIELD:** (Empty)
- NOTE:** (Empty)

Seldom Used SPI Modules



◆ Calculation Module

- Automatic results in Spec Sheets
- Data Exchange with Process Data
- Sizing Calculation of Control Valves
- Sizing Calculation of Flow Elements
- Sizing Calculation of Relief Valves
- Thermowell ASME PTC 19.3 TW
- Batch Calculations
- Unit Conversion
- Calculation Reports
- Global Revisions
- Documented Basis of Calculation

The screenshot displays the FLUOR software interface. The main window is titled 'GENERAL' and contains the following fields:

- Case: CASE 1
- Service: Feed from V-8
- Fluid state: Liquid
- Fluid phase: Single phase
- Fluid name source: User-defined
- Fluid name: Lean Feed
- Location: Line
- Line number: 4-P1501-11H
- Line size: 4 in
- Line schedule: B0

The 'PROPERTIES' tab is active, showing a table of properties:

Report flag:	Specific Gravity	Density	Molecular Mass	Units
Volumetric flow:	25	80	82	m ³ /h
Upstream pressure:	12	1.9	1.4	bar
Temperature:	150	160	150	°C
Viscosity:	0.1	0.1	0.1	cP
Velocity:	0.936	1.12	1.2	m/s
Density:	890	890	890	kg/m ³
Specific gravity:	0.891	0.891	0.891	
Compressibility:				
Specific heats ratio:				
Vapour pressure:	0.9	0.9	0.9	bar
Critical pressure:	1.200			bar
Molecular mass:				

The 'ADDITIONAL PROPERTIES' section includes:

- Design pressure minimum: 50 bar
- Design pressure maximum: 50 bar
- Design temperature minimum: 250 °C
- Design temperature maximum: 250 °C
- Empirical gas: %
- Angle of repose: °
- Required range: From 0 To 35 m³/h @flow
- Corrosive: No
- Erosive: No
- Toxic: No
- Colored: No
- Transparent: No
- Build-up tendency: No

The 'Body Type' dialog box is open, showing the following settings:

- Calculation method: ISA
- Flow coefficient: Cv
- Noise calculation method: Masonian
- Body type: Single Seat Globe
- Critical flow factor (FLCF): 0.86
- Pressure drop ratio factor (Xf): 0.6213
- Valve style modifier (Fd): 1
- Relative capacity (Cv/d²): 12.3
- Number of flow passages: 1
- Valve size: 2 in
- Outlet pipe diameter: 3.826 in

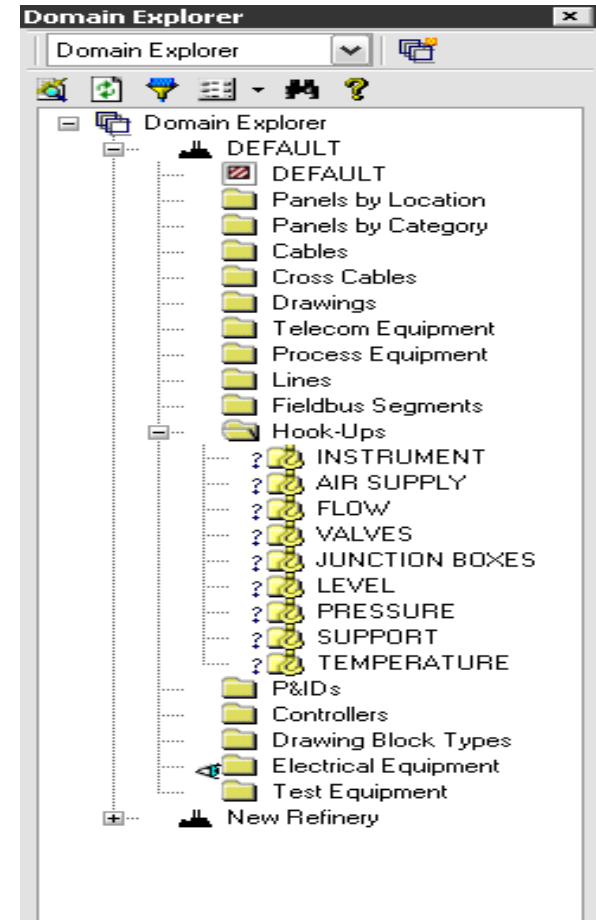
Buttons: OK, Cancel, Help

Seldom Used SPI Modules



◆ Hook-Up Module

- Hook-up Seed files are Provided
- Hook-up Bill of Material Are Created
- Multiple Hook-ups can be assigned to each Tag
- Hook-ups can be grouped into categories
- Hoop-up Cad drawings can be generated in SPI
- Hook-ups can be associated to external drawings
- Bill of Material can be Exported to Material Management Programs



Seldom Used SPI Modules



◆ Calibration Module

- Traceable/Auditable Calibration history
- Standard Default Profiles Provided
- Multiple Profiles for Different Instrument Types
- Point Calibration Errors Recorded
- Snapshot of the calibration results
- Built-in Calibration Certificate
- Customizable Setting Form
- Customizable Results Form
- Interface to FLUKE Calibrators

General	Tag number:	U01-FT -5		
	Service:			
	Serial number:			
	Function:	FLOW TRANSMITTER		
	Location:			
Ranges	Variable min.:	3	Units of measure:	bar
	Variable max.:	10	Units of measure:	bar
	Output signal min.:	4		
	Output signal max.:	20		
	Output signal units of measure:	mA		
	Output type:	Linear		
Errors / Points	Calibration type:	Multiple points		
	Number of points:	10	Measuring point:	
	Upper tolerance:	2	Intermediate upper:	1
	Lower tolerance:	-2	Intermediate lower:	-1
	Tolerance:	% of Span		
Miscellaneous	Procedure:			
	Calibration:			
	Done by:			
	Calibration:			
	Verification:			
Codes	Verification:			
	PM order:			
	Notes:	ound.		
	Result:			
	Action:			
	Diagnosis:			
	Damage code:	no damage		
	First test equipment:	FLUKE SN#1234		



Seldom Used SPI Modules



◆ Maintenance Module

– Breakdown Maintenance

- Work Requests for Possible Repair required in the future
- Repair Forms for Approved Repair with A Log of Activities

– Preventive Maintenance

- Schedule Periodic Maintenance Activities

– Connect to Asset Management System using SAP

Maintenance records
✓ 010-AIT-001
✓ 010-AIT-002
✓ 010-AIT-003
✓ 010-AIT-005
✓ 010-AIT-008
✓ 010-AIT-009
✓ 010-AIT-010
✓ 010-AIT-011
✓ 010-AIT-012
✓ 010-AIT-013
✓ 010-AIT-013(2)
✓ 010-AT-004
✓ 010-DI-001
✓ 010-DIT-001
✓ 010-FIT-001
✓ 010-FIT-002
✓ 010-FIT-003
✓ 010-FIT-004
✓ 010-FIT-006
✓ 010-FIT-007

Repairs	
Status	Tag Num
✓	010-FIT-004
✓	010-FIT-006
✓	010-FIT-007

Work requests	
Work Request	Tag Num

Seldom Used SPI Modules



◆ DDP Module

- Establishes 3D Dimensional Data
- Built-in Group Libraries
- End Class and Prep Defined
- Index Module
 - Tag Number associated to Group
 - Manufacture and Model Numbers
- Data Status
 - Preliminary
 - Design
 - Certified
- DDP Export Utility to SP3D

Description Line 1	Polish Globe or Rotary Valve	Group	SP1	Tag Number	588OV 270211A
Description Line 2		SBM: Preliminary	SBM: 688	588OV 270211A	
Sheet Document		Unit	Inlet	Outlet	Process Conn. #1
Manufacturer		Size	3	3	Process Conn. #4
Model		Size UOM	in	in	
PLD	533-88-07-468-04-4-024	Class	303	303	
Welding Design Area (SBO)		Weld Prep	RF	RF	
Line Number	588OV270211A-024-000000	Design Code	ADMG-015	ADMG-015	
Equipment	N/A	Plan Sheet	435	435	
Unit of measure	mm	Weight	UOM kg	Qty	280

V1	169.1
V2	388
V3	180
A1	0
A2	734
A3	345
A4	382
A5	259
A6	170
A7	536
A8	142
A9	211
A10	170
A11	69
C1	85
C11	328
C12	871
C21	488
C32	690
H1	0
H2	1
H3	1
H4	1
P1	0
P2	214.7
P3	188.1
P4	218.7
P5	486.7
H	180

ACTUATOR ORIENTATION (A1)

POSITIONER ORIENTATION (P1)

WINDMILL ORIENTATION (H1)

ENTERING ONLY THE BEST DIM WILL RESULT IN A VALUE W/O DIM A10 WITH THE RETURN ENTERED ON THE VALUE 0000000000000 (IF ALWAYS USE ZERO THEN THAT ITEM IS SENSITIVE)

ACTUATOR TOP ACCESSORY REQUIRED DIMENSIONS ARE A8, A9, AND A11

CYLINDER #1 REQUIRED DIMENSIONS ARE C1, C12 (OPTIONAL C1 WILL OFFSET C11) AND #2

CYLINDER #2 REQUIRED DIMENSIONS ARE C11, C12

WINDMILL REQUIRED DIMENSIONS ARE H2, H3, H4

POSITIONER REQUIRED DIMENSIONS ARE P2, P3, P4, P5 (P2 MAY BE ZERO OR NEGATIVE)

DIMENSIONAL DATASHEET

FLUOR
CORPORATION
SHEET 1 OF 1

NO.	BY	DATE	REVISION	CAO CODE	SP3D	DWG. NO.	588OV 270211A-COMP-01
01	RES	5/23/2010	PRELIMINARY DATA				

Seldom Used SPI Modules

◆ Document Binder Module

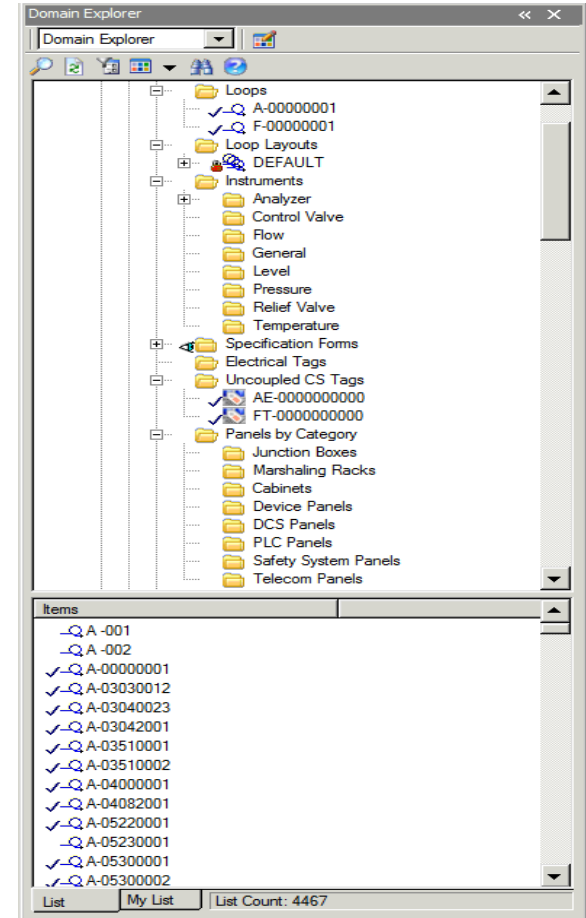
- Specification Binder Packages
- General Document Binder Packages
- External Files attached Binder Packages
- Manage Revisions for Documents
- Document Binder Uses
 - Requests for Quotes
 - Purchase Orders
 - Work Packages
 - Loop Folders



GENERAL	1	Tag Number	4717-PCV-301						
	2	Service	4717-T-003 HYDRATE INHB STRIG TANK SUPPLY						
	3	Line Type	F&D Number	AD182-4717-D-11638					
	4	Tightness Requirements							
PROCESS CONDITIONS	5	Fluid	NITROGEN						
	6	Flow Operating	0.6	Nm ³ /h					
	7	Flow Max. Min.	2.5	Nm ³ /h 0.3 Nm ³ /h					
	8	Heat Pressure Max. Operating	3.5	bara 3.5 bara					
	9	OP Valve Setting Operating	3.49	bar					
	10	OP Valve Setting Min. Max.	3.49	bar 3.49 bar					
	11	Shut - OP DP Max.	3.5	bar					
	12	Temperature Min. Operating	-29	°C 45 °C					
	13	Spec. Gravity at Base Operating							
	14	Molecular Mass							
	15	Viscosity at Base Operating	28	cP					
	16	% Flushing							
BODY	17	Vapor Pressure Critical Pressure	bara	bara					
	18								
	19	Cv Calculated Max. Min.							
	20	Size Trim Size Cv							
	21	Form or Type	PRESSURE REDUCING						
	22	End Connections & Rating	ASME 150# RF						
	23	Body Material	A216 WC6						
	24	Stem Type	STANDARD						
	25	Stem Material Packing Material	316 SS	N/A					
	26	Flow Action to							
	27	Lubricator Iso. Valves	N/A	N/A					
	TRIM	28	Outing No. Ports Characteristics	STEM	1 QUICK OPEN				
29		Plug Material	316 SS						
30		Seal Material	316 SS						
31		Ball Material	N/A						
ACTUATOR / PILOT	32	Gasket Material	316 SS						
	34	Model Size							
	35	Type	SPRING DIAPHRAGM						
	36	Pilot	N/A						
	37	Supply to Pilot	N/A						
	38	Self Connection External Connection	YES	NO					
ACCESSORIES	39	Diaphragm Material							
	40	Spring Range							
	41	Set Point	0.01	bar					
	42								
PURCHASE	44	Fiber Regulator	NO						
	45	Line Strainer	NO						
	46	Housing Vent							
	47	Internal Relief							
INSTRUMENT SPECIFICATION	48	NACE Requirement	NO						
	49								
	50								
	51	Manufacturer							
FLUOR	52	Model							
	53	Purchase Order Number							
	54	Procurement Item Number							
55	Serial Number								
Notes: See notes									
				INSTRUMENT SPECIFICATION					
				Pressure Regulator					
				FLUOR					
0	CK	RL	RT	6/12/2011	Issued Approved for Design				
B	AA	RL	RT	6/24/2011	Issued for Client Comments				
A	AA	RL	RT	6/18/2011	Issued for Internal Review				
No.	By	Chk.	App.	Date	Revision Description	Form No. 28	Doc. No.	AD182-4717-1-0594-85348-501	Sheet 1 of 2

Most Used SPI Functions

- ◆ Domain Explorer
- ◆ Browser Functions
 - Index Browse
 - Spec Browser
 - Custom Browser
- ◆ Duplicate Loops or Tags
- ◆ Save As Function
- ◆ Document Generation
- ◆ Spec Page and Form Editor
- ◆ Spec Templates

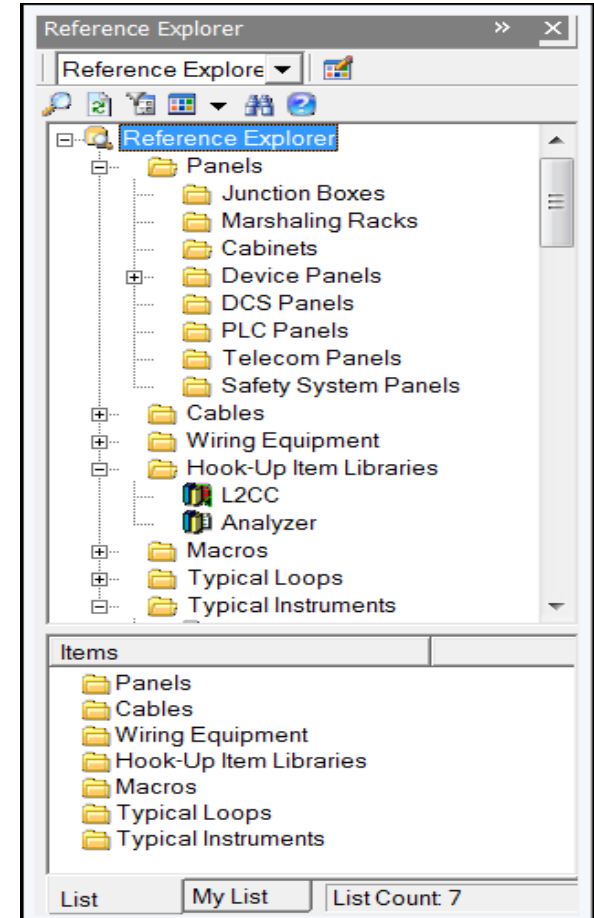


Seldom Used SPI Functions

◆ Reference Explorer

- Panel Definitions
- Cable Definitions
- Wiring Equipment Definitions
- Hook-Up Item Libraries
- Macro Definition
- Typical Loop Definitions
- Typical Instrument Definitions

◆ Reference Data Can be Used More Effectively On a Project

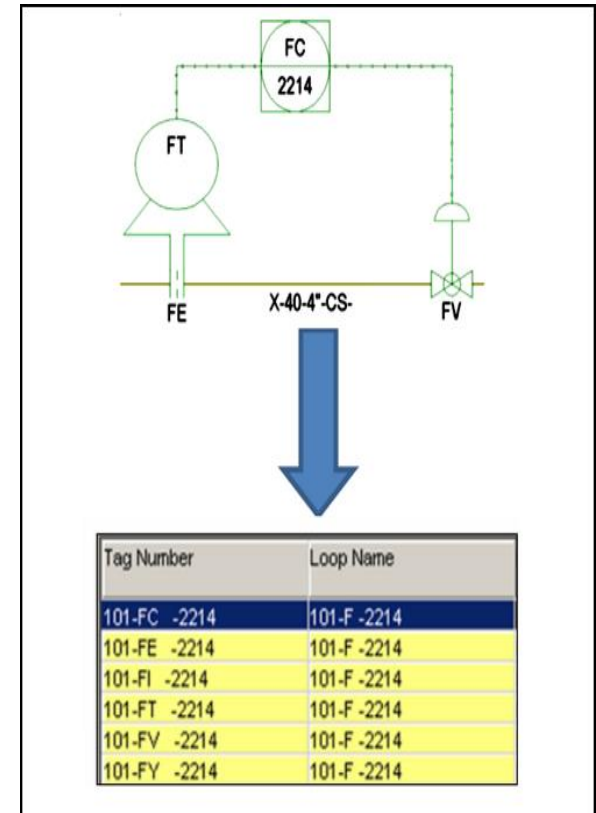


Seldom Used SPI Functions



◆ Macro Expansion

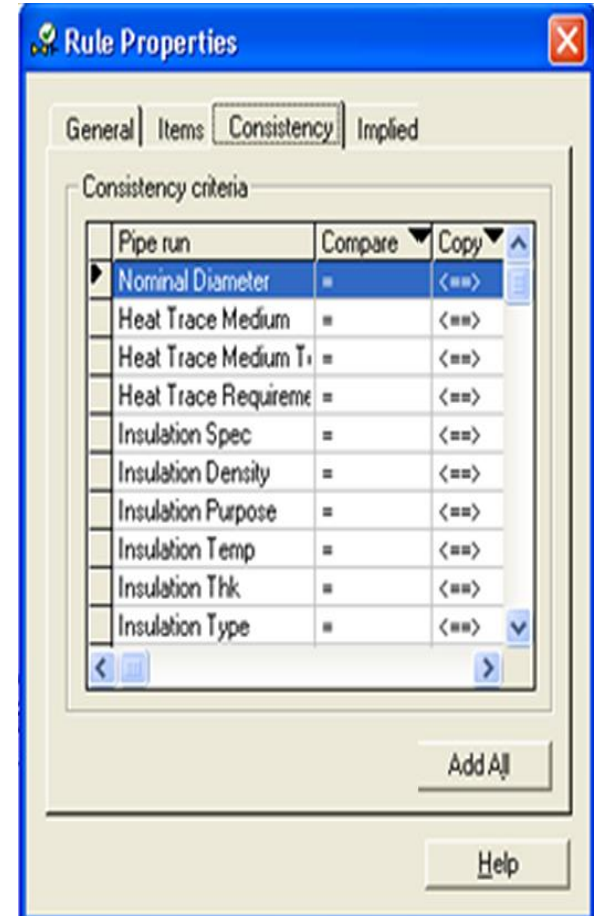
- Macros defined in the Reference Explorer contain all Tags in a Loop Typical Template
- Macros are attached to Carrier Tags (Usually a Transmitter)
- Creating the Carrier Tag creates the Complete Loop with all Tags
- Can be used with P&ID Integration to Facilitate Instrument Types
- Can be used as Loop Templates for Batch Loop creation



Seldom Used SPI Functions

◆ Rule Manager

- Launches Consistency Rules when SPI Entities are Changed
- Relation Rules Govern the Relationship between Two Entities
- Validation Rules apply to Single Components in the Database
- GUI Rules apply to Entity Properties
- Rule Governance Actions
 - Check or Copy data between Fields
 - Apply Data Consistency to Fields
 - Prevent errors or bad data entry

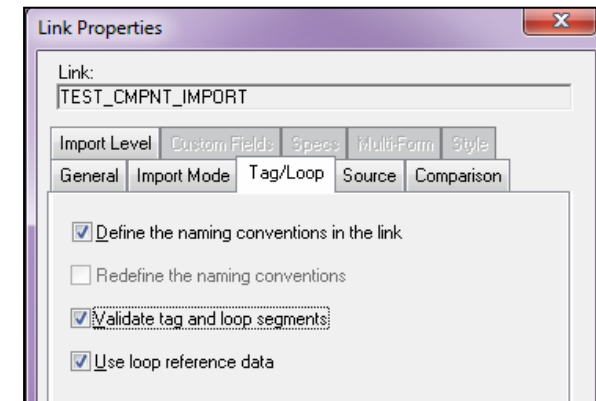
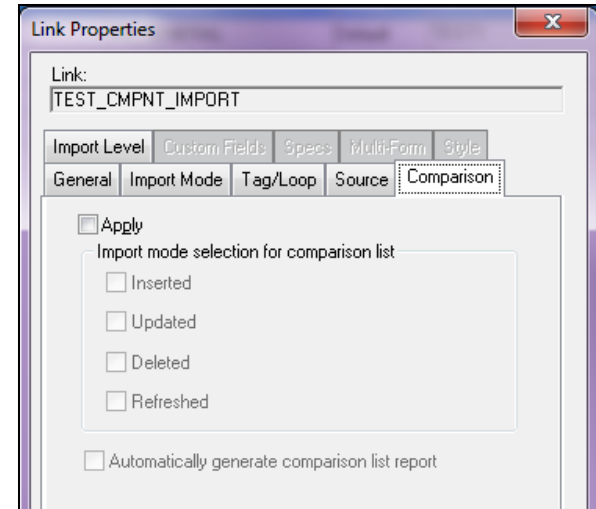


Seldom Used SPI Functions

◆ Import Utility

- Allows Data to be imported by Table or Module
- Can Append, Overwrite or Skip Populated Fields
- Source file can be Excel, Access, CSV, Text or Dbase
- Best use it to Export Tags – Edit Data – Import Data back into SPI

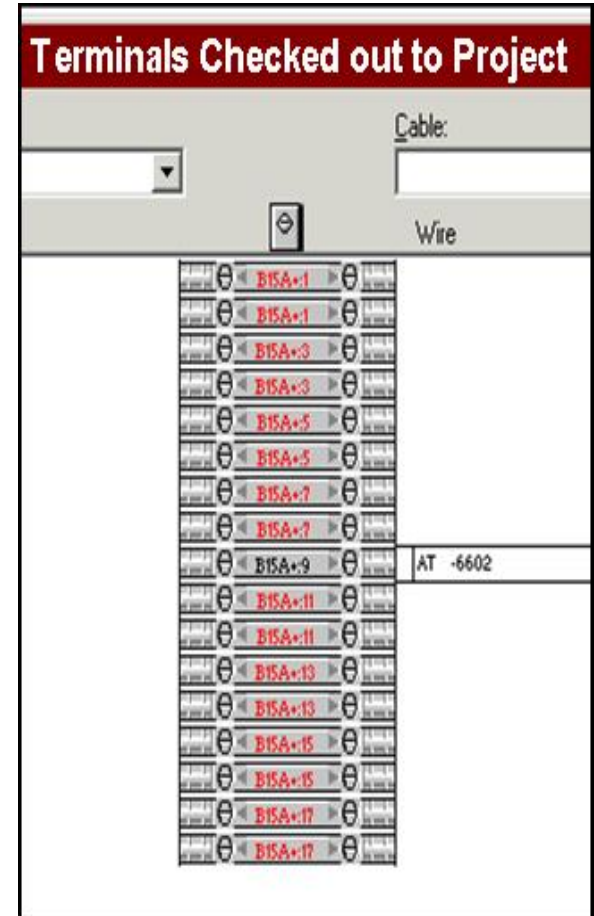
NOT TO BE USED FOR NEW TAGS!



Seldom Used SPI Functions



- ◆ Merger Utility
- ◆ Two types of Merger
 - Database Merger
 - User to Merge two Databases together
 - Requires consistency in Primary Tables
 - Not very successful in large databases
 - Most people use “Data Migration”
 - Project Merger
 - Used for Owner Operator Mode
 - Projects are defined in the Database
 - Entities are checked out to Projects
 - Project data is Merged into As-Built



Seldom Used SPI Functions



◆ Symbol Editor

- Create Custom Symbols for Loops and Wiring Drawings
- Add SmartText to a Symbol File
- Assign an Item Type to a Symbol
- Add a Macro to a Symbol File
- Add Connection Points to Symbols
- Add Starting Points to a Symbol File for Placement
- Define new symbol Libraries for Telecommunications Elements



Seldom Used SPI Functions

◆ Telecom Functions

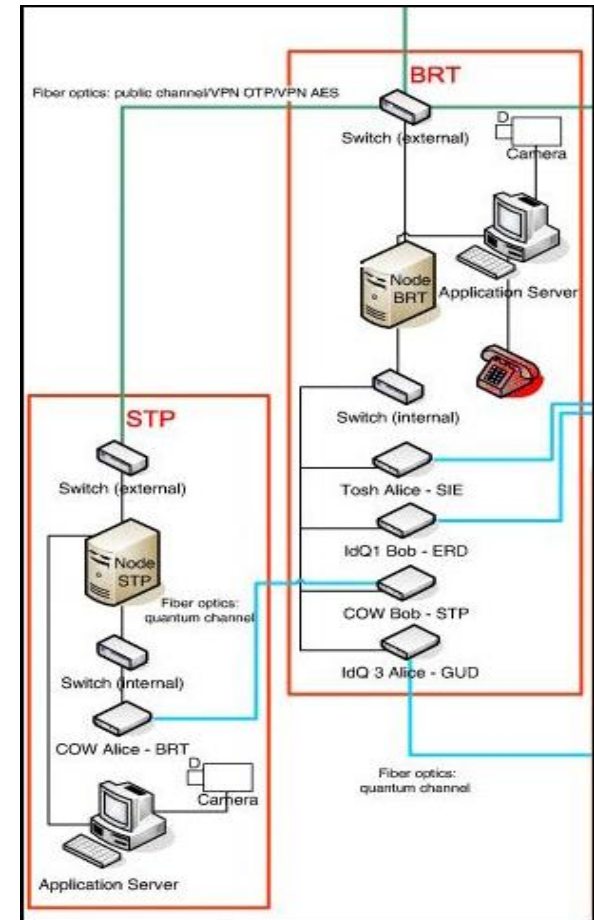
– Telecommunication Capabilities

- Build and Index all Communication Devices
- Fiber Optic and Network wiring definitions

– Spec and Symbols Library for Communication Devices

– Communications Wiring Systems

- Uses Block Diagrams or Point to Point Diagrams
- SmartPlant Instrumentations Cable Block Diagram needs enhancement



Seldom Used SPI Functions



◆ IS and FF Validation

- Tags assigned to a segment or IS Loop
- Wired Tags not connected to a segment
- The number of instruments in a segment
- The number of devices on a given spur
- A spur length is exceeds the maximum
- Total cable length exceeds the maximum
- Less than two terminators in a segment
- Actual voltage at instrument
- Total current exceeds the maximum
- Total capacitance exceeds maximum

◆ May use Global Parameters Instead

Validation Summary					
Validation					Status
Number of instruments in the segment					Pass
Voltage at instruments					Pass
Total Cable length					Pass
Total current consumption					Pass
Total capacitance					Pass
Assigned instruments that has not been connected to the trunk					Pass
Number of terminators					Pass
Number of devices per spur					Pass
Maximum spur cable length					Pass

Total cable length					
Formula: $(L1/Unsat + Ln/Unsat) * 1$					
Cable Type	Maximum Length (F)	Total Length (F)	Cable Name	Cable Length (F)	Status
Type A	100	103	101 FT -1501	1	Pass
			101 FT -1502	1	
			HR - SEGMENT S1	100	
			101 FT -1500	1	

Voltage at Instrument							
Device Name	Section Length (F)	Resistance (Ohm)	Section Consumption	Section Voltage Drop (V)	Voltage at Instrument (V)	Min Working Voltage (V)	Status
101 FT -1500	1.0	0.04	0.02	0	0.24	23.76	9.00
	100.0	4.00	0.06	0.24			
101 FT -1501	1.0	0.04	0.02	0	0.24	23.76	9.00
	100.0	4.00	0.06	0.24			
101 FT -1502	1.0	0.04	0.02	0	0.24	23.76	9.00
	100.0	4.00	0.06	0.24			

Total current consumption		
Actual (mA)	Rule (mA)	Status
60.00	100.00	Pass

Total capacitance		
Actual (pF)	Rule (pF)	Status
35.45	200.00	Pass

Number of devices per spur		
Spur Number	Total Instruments	Status
101 FT -1500	1	Pass
101 FT -1501	1	Pass
101 FT -1502	1	Pass

Maximum spur cable length against rules			
Cable Name	Cable (F)	Rule (F)	Status
101 FT -1500	1.0	90	Pass
101 FT -1501	1.0	90	Pass

Command: DEMO					
No.	By	Date	Description	Signed By	Date

Fieldbus Segment Validation Report	
Segment S1	
Intrinsically Safe No.	
Valid Name: Foundation Fieldbus	
Page 1 of 2	

FLUOR		
All cable lengths are in meters.		

Seldom Used SPI Functions



◆ External Spec Editor Program

- Stand Alone Editor for SPI Spec Forms
- Export Import Process data as .isf file
- Allows Editing of all Spec Data in the Body of the Spec Form
- Changes are Marked on the Screen
- Drop Down Windows match those in SmartPlant Instrumentation
- Changes can only be Imported back to Source Spec Form in SmartPlant Instrumentation
- Full Printing Capabilities for Instrument Spec Sheets

The screenshot shows the 'External Editor' window with a spec form for 'ULGTP17-PCV-2700'. The form is organized into several sections:

- GENERAL:** Includes Tag Number (ULGTP17-PCV-2700), Service (TANK LIQ CORROSION INHIBIT TANK NO BLANKET), Line Type (P&ID Number 2' AC308A), Tightness Requirements (ANSI V), and Fluid (NO).
- PROCESS CONDITIONS:** Lists operating parameters such as Flow (1.8 Nm³/h), Inlet Pressure (3.4 bar), DP Valve Sizing (3.5 bar), and Temperature (-30 °C).
- BODY:** Details construction materials like Body Material (A316 WCB), Bonnet Type (STANDARD), and Stem Material (316 SS).
- TRIM:** Specifies materials for Plug, Seal, Bolt, Gasket, and Bushing, all listed as 316 SS.
- ACTUATOR / PILOT:** Indicates a Spring Diaphragm actuator with a set point of 0.01 bar.
- ACCESSORIES:** Lists various options like Filter Regulator, Line Strainer, and Housing Vent, all marked as 'NO'.
- PURCHASE:** Fields for Manufacturer, Model, Purchase Order Number, Price, Item Number, and Serial Number.

At the bottom, there is a 'Notes' section and a revision table:

No.	By	Chk	App	Date	Revision Description
0	CK	RL	RT	8/12/2011	Issued Approved for Design
B	AA	RL	RT	7/5/2011	Issued for Client Comments
A	AA	RL	RT	6/18/2011	Issued for Internal Review

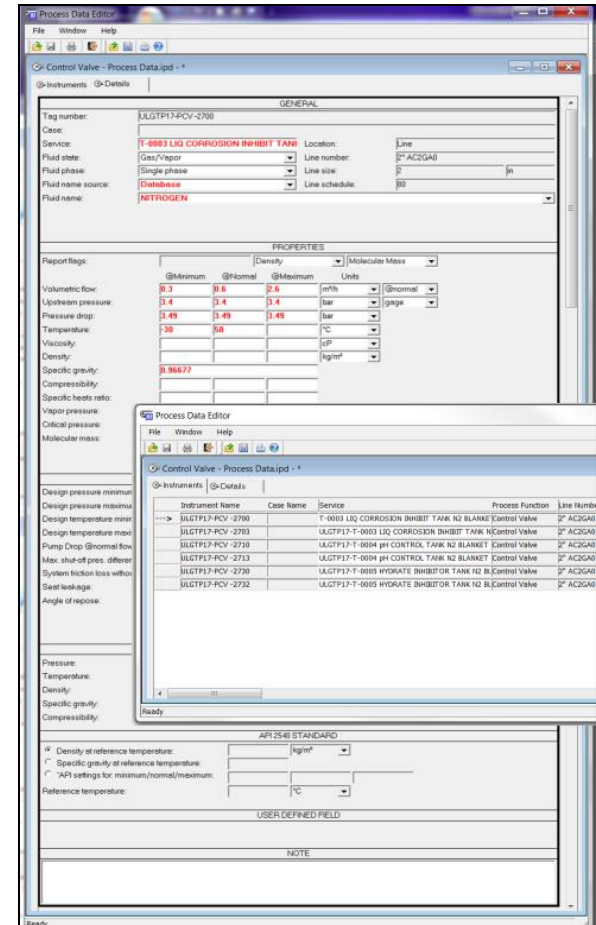
The bottom right corner includes the text 'INSTRUMENT SPECIFICATION Pressure Regulator Sheet of' and 'Form No. 26'.

Seldom Used SPI Functions



◆ External Editor for Process

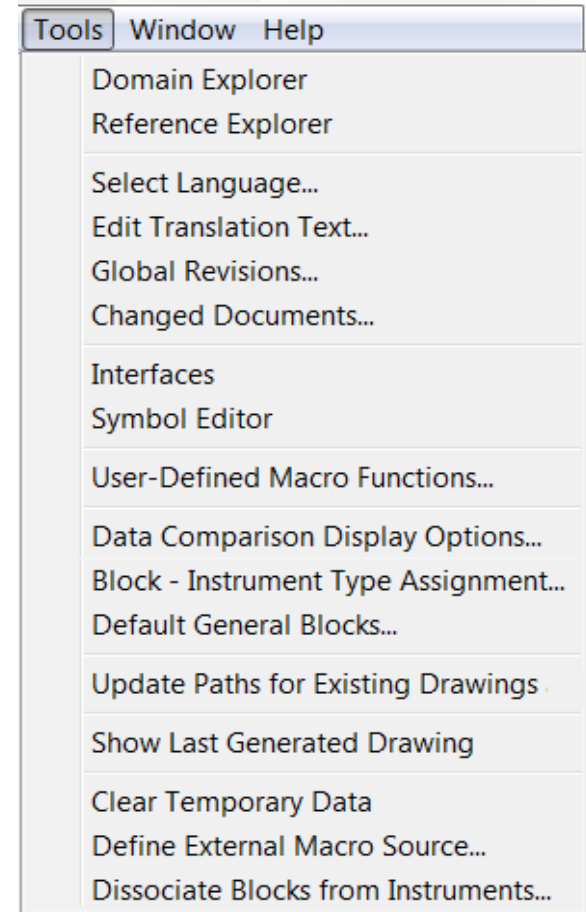
- Stand Alone Editor for Process Data
- Export Import Process data as .ipd file
- Allows Editing of all Process Data
- Has Detailed and Browser View for Editing Process Data
- Changes are Marked on the Screen
- Drop Down Windows match those in SmartPlant Instrumentation
- Changes can only be Imported back to Source Tag in SmartPlant Instrumentation
- Full Printing Capabilities for Process Data Sheets



Additional Seldom Used SPI Functions



- ◆ Language Options
- ◆ Preloading and Auto Wiring
- ◆ Interfaces to Vendor Software
- ◆ Global Revisions
- ◆ Unit Of Measure Editing
- ◆ Data Comparison Options
- ◆ Report Title Block Management
- ◆ Cable Routing and Drumming
- ◆ Numerous Available Reports
- ◆ And Many More . . .



Conclusion



- ◆ Only a Limited Number of SPI Modules and Functions are Being Used Effectively by Most Users
- ◆ To Get the Most Out of SPI – Users Must Take Advantage of the Full Capabilities of the Software

Questions?