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Implementation Team

# SPI – SPEL Interface workshop

Based on SPI 7.0 and SPEL 3.0 SP1

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**FLUOR**®

**INTERGRAPH**

# Workshop Agenda



## ◆ General

- This workshop will show how to design an electrical system, that includes IO signals crossing from the electrical discipline to the instrumentation, and have the instrumentation wiring details, and the complete SPI Enhanced SmartLoop drawing embedded into the schematics of a motor.

## ◆ Prerequisites settings

- Makes sure to define the right settings in the SPEL Options Manager:
  - - Enable SmartPlant reports
  - - Define the SPI Domain name

# SmartPlant Electrical Activities

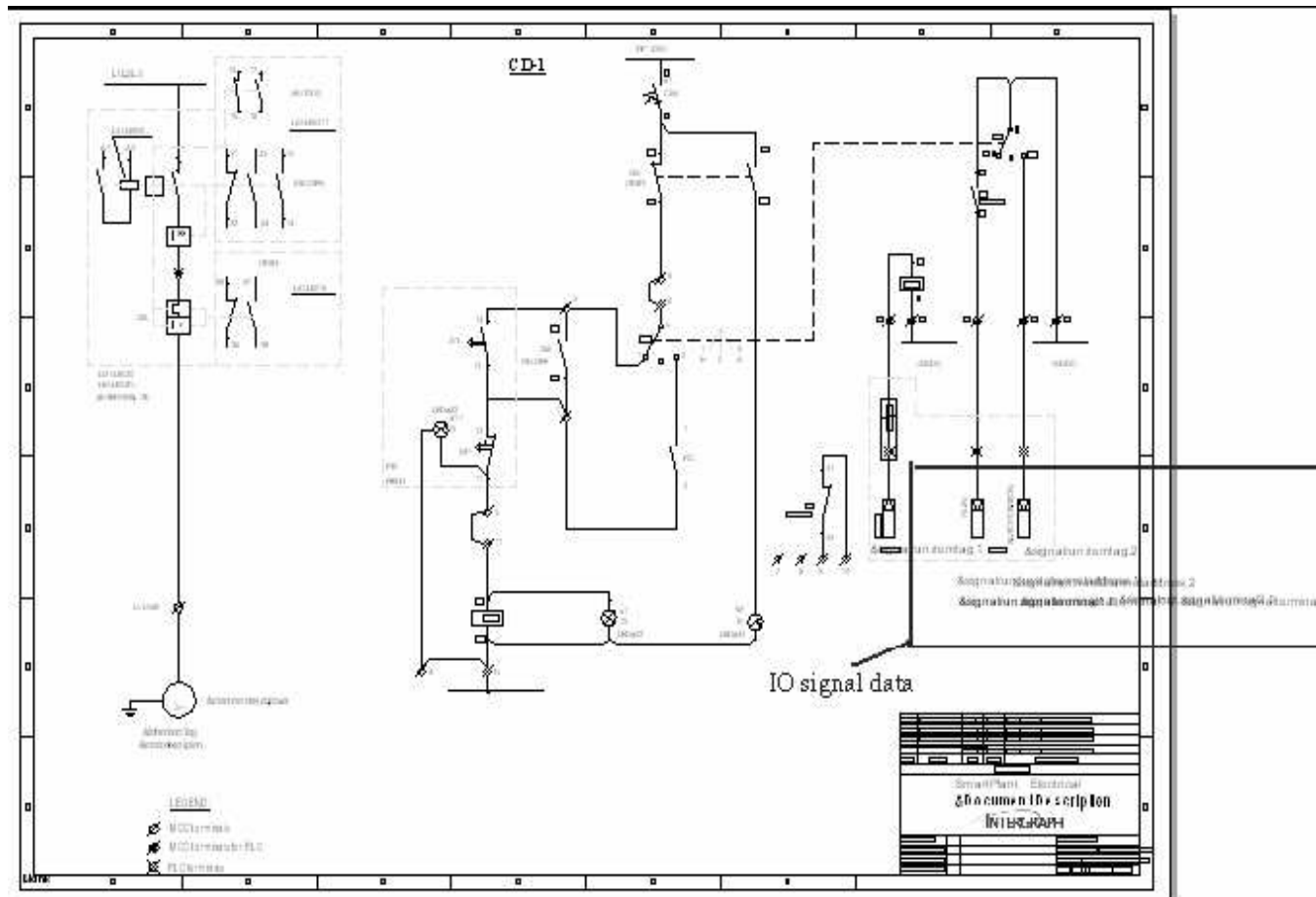


## ◆ Overview

- ◆ We shall use motor M-100 schematics, as shown in Figure 1. The motor is connected to a standard feeder, direct online supply, operated by a local start-stop push button station, connected to the control diagram shown in the schematics. A “Motor Run” status and a “Motor in Manual” status digital input I/O signals are provided at the terminal strip of the motor control center cubicle and from there, connected by the instrumentation to a PLC.



# SmartPlant Electrical Activities





## ◆ The target of this workshop is to show 3 new features:

- Retrieving the terminal numbers of the PLC channel for the signals
- Retrieving the ESL data into SPEL motor schematics
- View the schematics of the motor that the signals belong to in SPI

# SmartPlant Electrical Activities



## ◆ Detailed workflow

- The following data should be designed in SPEL to accomplish the SPEL side:
  - Create M-100, apply a profile on it so to create a power cable and a control station and connect it to a Feeder circuit, as shown in the Figure 2

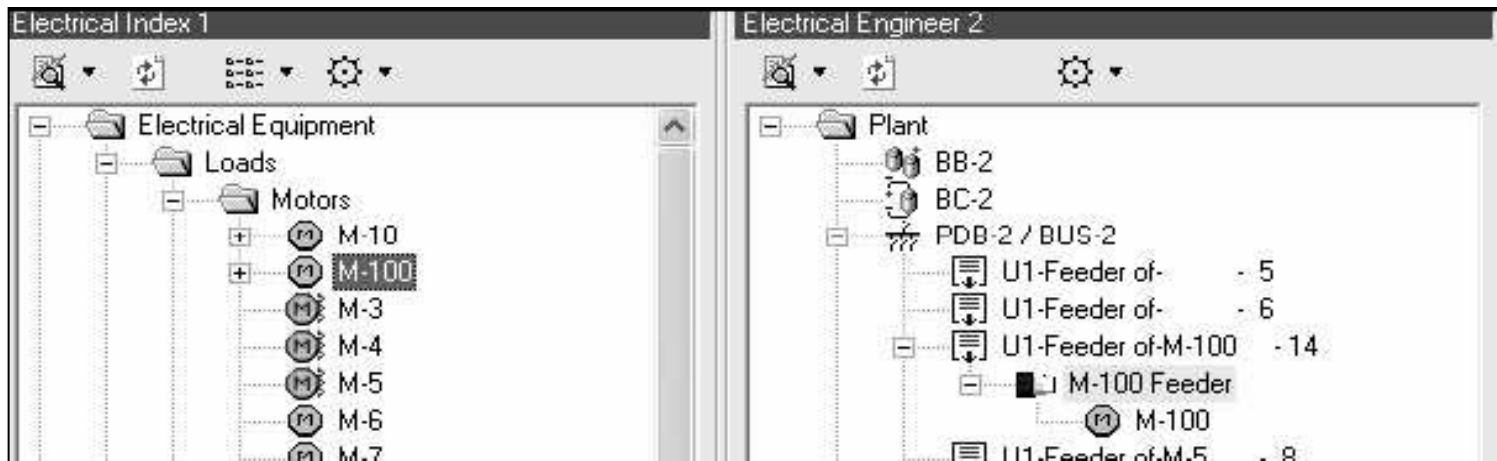


Figure 2

# SmartPlant Electrical Activities

- ◆ Create the 2 - I/O signals under the Feeder M-100 circuit:



- ◆ Signal A= M-100 Run status
- ◆ Signal B= M-100 in Auto status



# SmartPlant Electrical Activities

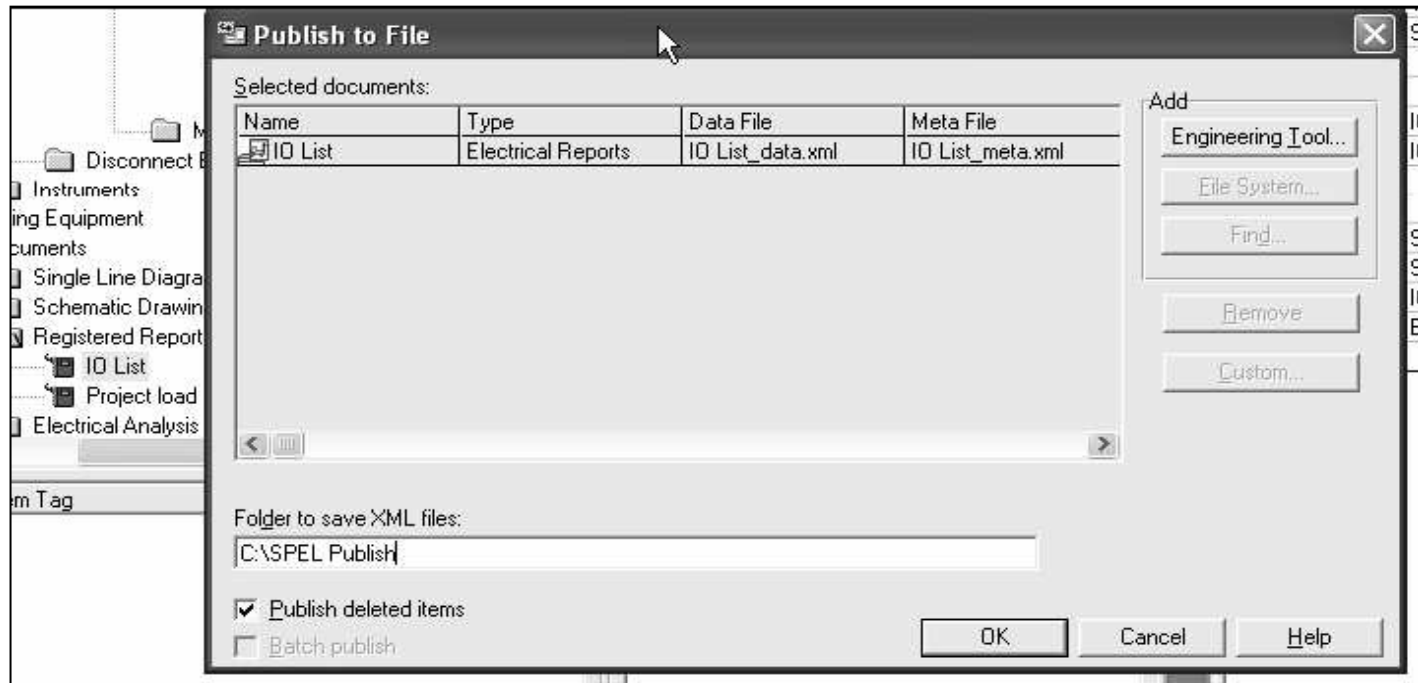
- ◆ Make sure you created an I/O registered report, and open it to view your I/O list that will be published:

The screenshot shows a Microsoft Excel window titled "IO Signal List". The spreadsheet contains the following data:

	A	B	C	D	E	F	G	H
1								
2								
3								<b>Control system I/O Signals</b>
4								
5		Tag		Description		IO type		Host
6								
7		U1-JS-M-100	-A	M-100 Run status		DI		
8								
9		U1-JS-M-100	-B	M-100 in Auto status		DI		
10								

# SmartPlant Electrical Activities

- ◆ Publish this registered report to the folder you prepared upfront:





# SmartPlant Electrical Activities

## ◆ Create a typical schematics

- Define a typical schematics so to include a motor block and a circuit block that will include 2-I/O signals and the required properties:

The screenshot shows a software interface for defining schematic blocks. The main window is titled 'Typical Schematic Blocks [Full motor circuit]'. It contains a table of blocks, a 'Block details' section, and a 'File name' field. To the right of the dialog is a schematic diagram of a motor circuit.

Block Name	Block Type	File Name
Full motor circuit	Circuit	Motor with signals
Microstation Feeder circ	Circuit	FeederCircuitA.d
Motor Feeder Circuit A	Circuit	FeederCircuitA.sy
AutoCad Control Station	ControlStation	ControlStationA.c
Control Station type A	ControlStation	ControlStationA.s
Microstation control stati	ControlStation	ControlStationA.c
AutoCad Motor	Motor	MotorTypeA.dwg
Microstation Motor	Motor	MotorTypeA.dwg

Block details:  
Block name: Full motor circuit  
Block type: Circuit  
File name: Motor with signals.sym

**Note:** In this example, the I/O signals are part of the circuit, therefore we created a circuit block that include signals.

# SmartPlant Electrical Activities



- ◆ Create the full typical schematics:

Typical Schematic Common Properties [Motor with signals]

Name: "Motor with signals" Template: A3 Wide.spe

Typical schematic block properties

Block Name	Block Type	Sequence	Sheet Number
Full motor circuit	Circuit	1	1
Motor 1	Motor	1	1

Block details

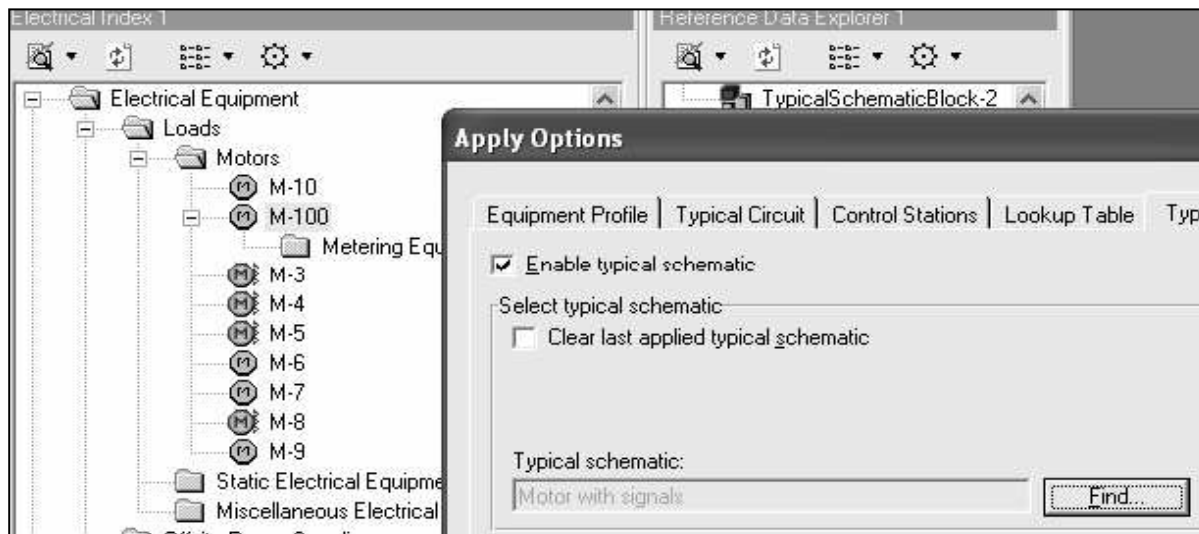
Block name: Full motor circuit Block type: Circuit Sequence: 1 Sheet number: 1 X: 0 Y: 0

Multi-Tag Options...

OK Cancel Apply Sheets... View Help

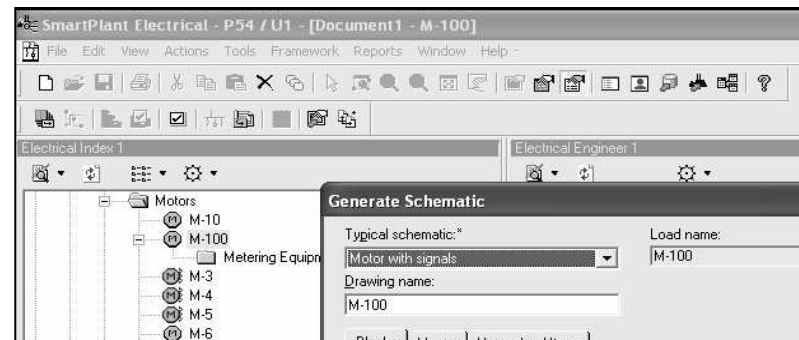
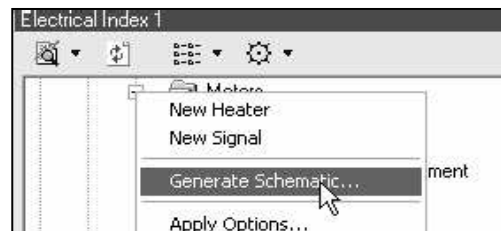
# SmartPlant Electrical Activities

- ◆ Apply this typical schematics to the M-100 motor:



# SmartPlant Electrical Activities

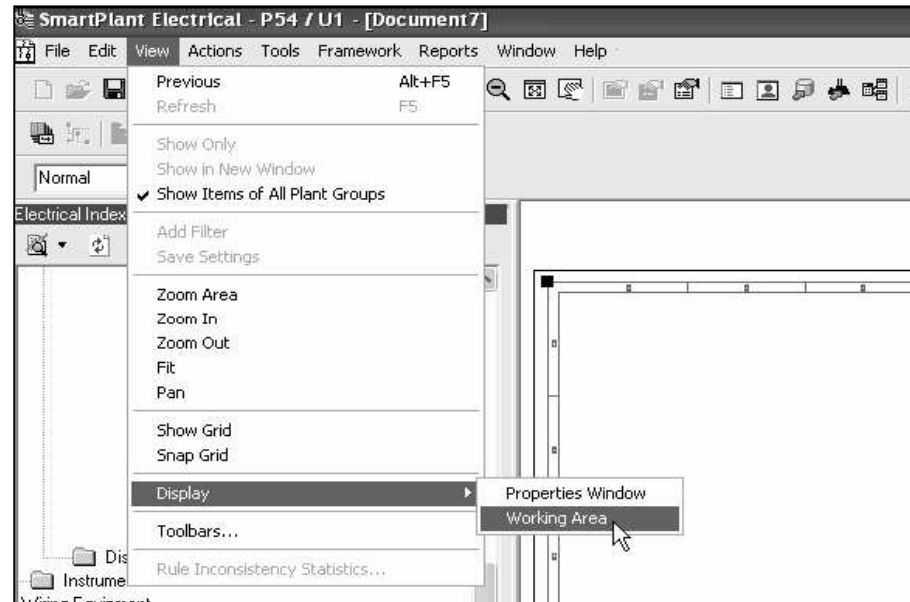
- ◆ Select motor M-100 and Generate the schematics then Save the generated drawing:



# SmartPlant Electrical Activities



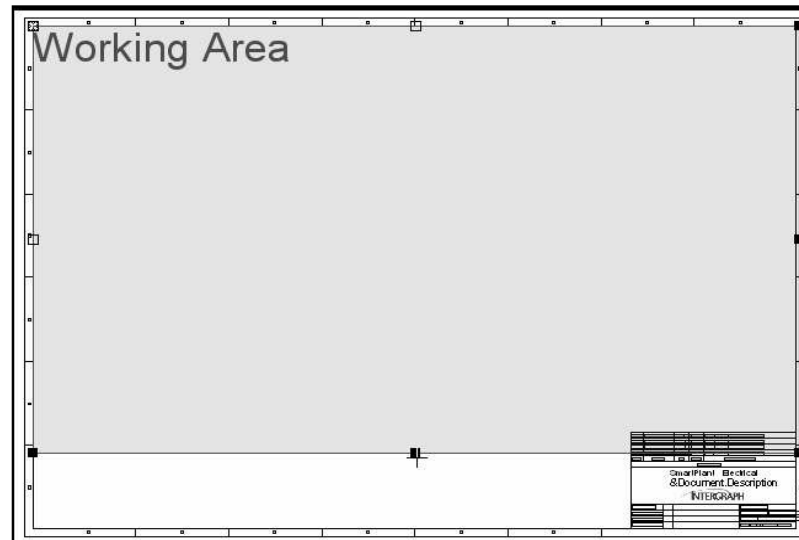
- ◆ **Define the area within the schematics into which the SP report (ESL) will be embedded**
  - To define the working area of the smart plant report, open the template that you want to use for the schematics, and View--Display--Working Area:



# SmartPlant Electrical Activities



- ◆ The template will now show the default Working area into which the ESL will be embedded:



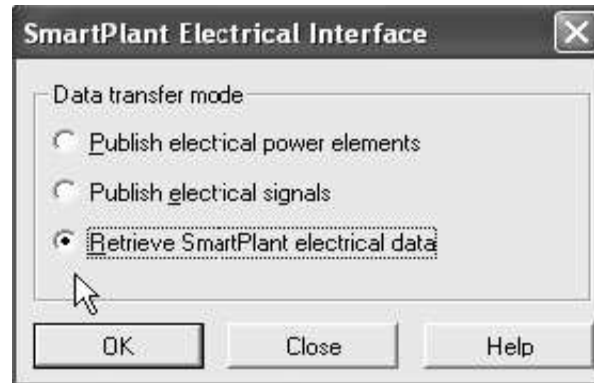
Adjust the rectangle size by moving the black handles and then save the template.



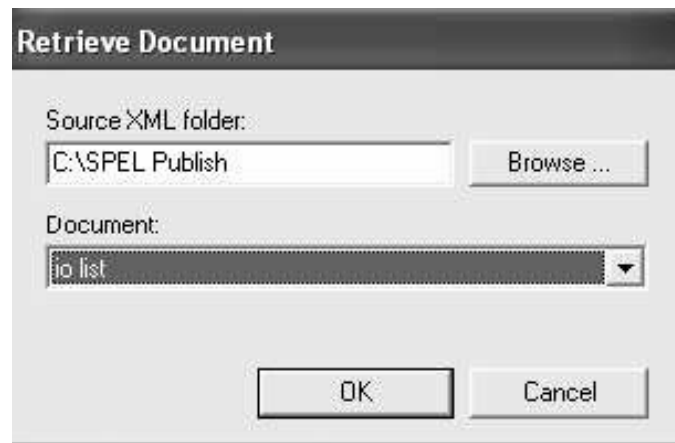
# SmartPlant Instrumentation Activities



- ◆ Followed by the retrieve:



- ◆ Browsing to the folder into which SPEL published the data:





# SmartPlant Instrumentation Activities

- ◆ Following the OK and committing the “To-do-list” (Framework--To-do-list), these Signals will be retrieved into SPI as Electrical Tags, with their associated Motor, circuit, motor typical schematics and schematics:

U1-JS-M-100	-A		SPEL	General	DI
U1-JS-M-100	-B		SPEL	General	DI

- ◆ And their properties:

Tag Number Properties

General | Power Supply | **Electrical** | Custom Tables

Tag number:  
U1-JS-M-100 -A

Circuit:  
U1-Feeder of M-100 -14

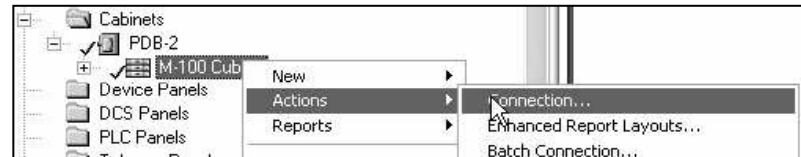
Electrical Equipment Name	Electrical Equipment Type	Schematic	Typical Schematic
M-100	Motor	M-100	Motor with signals

- ◆ Notice the data for the circuit, the motor and the schematics and typical schematics names.



# SmartPlant Instrumentation Activities

- ◆ **Step 2- Associate the 2 electrical tags to a new loop named “JM-100”**
- ◆ **Step 3- Design the full wiring of the 2 electrical tags from the MCC right into the PLC I/O channel**
  - Create a terminal strip under the PDB panel that was automatically created, create a PLC with a DI IO card in one of the slots within a rack, as per the following details
- ◆ Here are the details for the PDB side wiring:



Connection - PDB-2, M-100 Cubicle

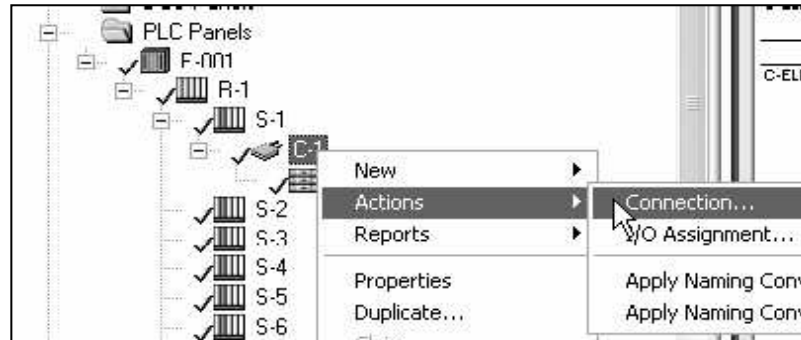
Cable:

Wire	Set	Cable
X-1 U1-JS-M-100 -A	PR1	C-ELECT-DI-01
X-2 U1-JS-M-100 -A		
X-3 U1-JS-M-100 -B	PR2	
X-4 U1-JS-M-100 -B		
X-5 W1	PR3	
X-6 W2		
X-7 W1	PR4	
X-8 W2		
X-9		
X-10		



# SmartPlant Instrumentation Activities

- ◆ Here are the details for the PLC side wiring:



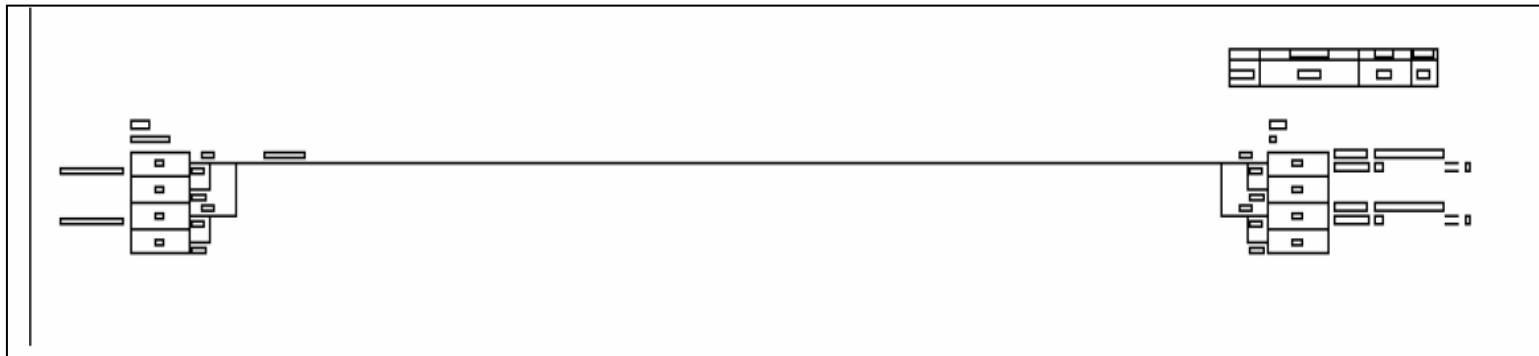
The screenshot shows the 'Connection - E-001, E1' dialog box. The 'Terminal strip' is set to 'E-001, R-1, S-1, C-1, E1'. The table below shows the connection details:

Cable	Set	Wire	Terminal Strip
C-ELECT-DI-01	PR1	U1-JS-M-100 -A	2-1
		U1-JS-M-100 -A	2-2
C-ELECT-DI-01	PR2	U1-JS-M-100 -B	2-3
		U1-JS-M-100 -B	2-4
C-ELECT-DI-01	PR3	W1	2-5
		W2	2-6
C-ELECT-DI-01	PR4	W1	2-7
		W2	2-8

# SmartPlant Instrumentation Activities



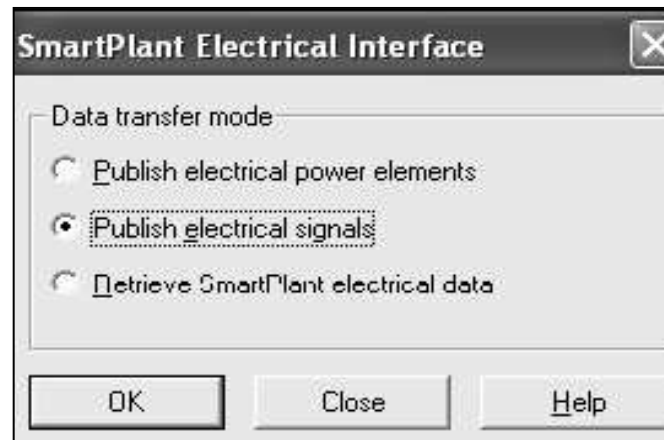
- ◆ The complete Enhanced SmartLoop will look like this:



# SmartPlant Instrumentation Activities



- ◆ **Step 4- Publish the data back to SPEL**

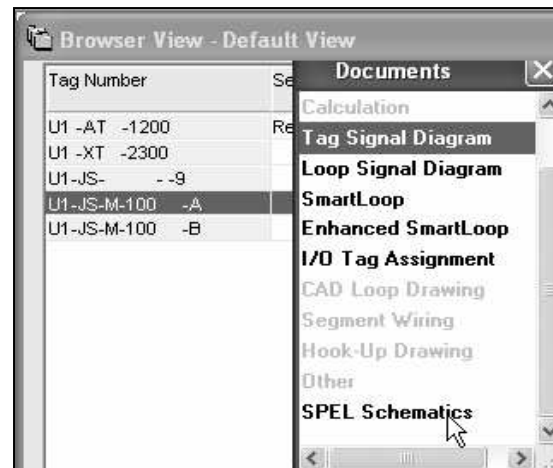


# SmartPlant Instrumentation Activities



## ◆ Step 5- View motor schematics

- Select one of the tags in the Browse of the Index, select Document--SPEL Schematics and view the motor schematics:

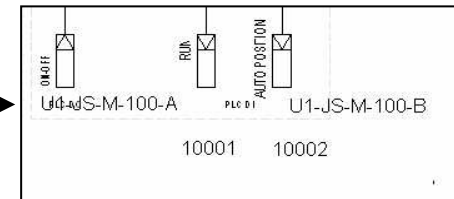
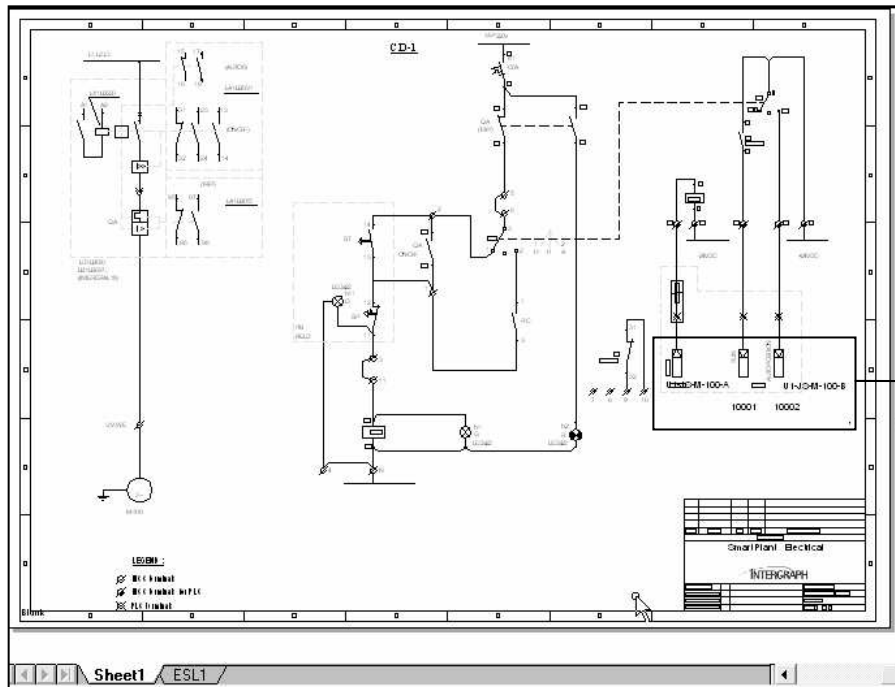




# SmartPlant Electrical Activities

## ◆ Retrieving the data in SPEL

- Retrieve and commit the “to-do-list” of the IO signal data into SPEL, notice that the signals (in property grid) have now Loop number, Host addresses and terminal strips data.
- Select M-100, and generate schematics; observe the signal information and the additional ESL pages that were added to the original typical circuit

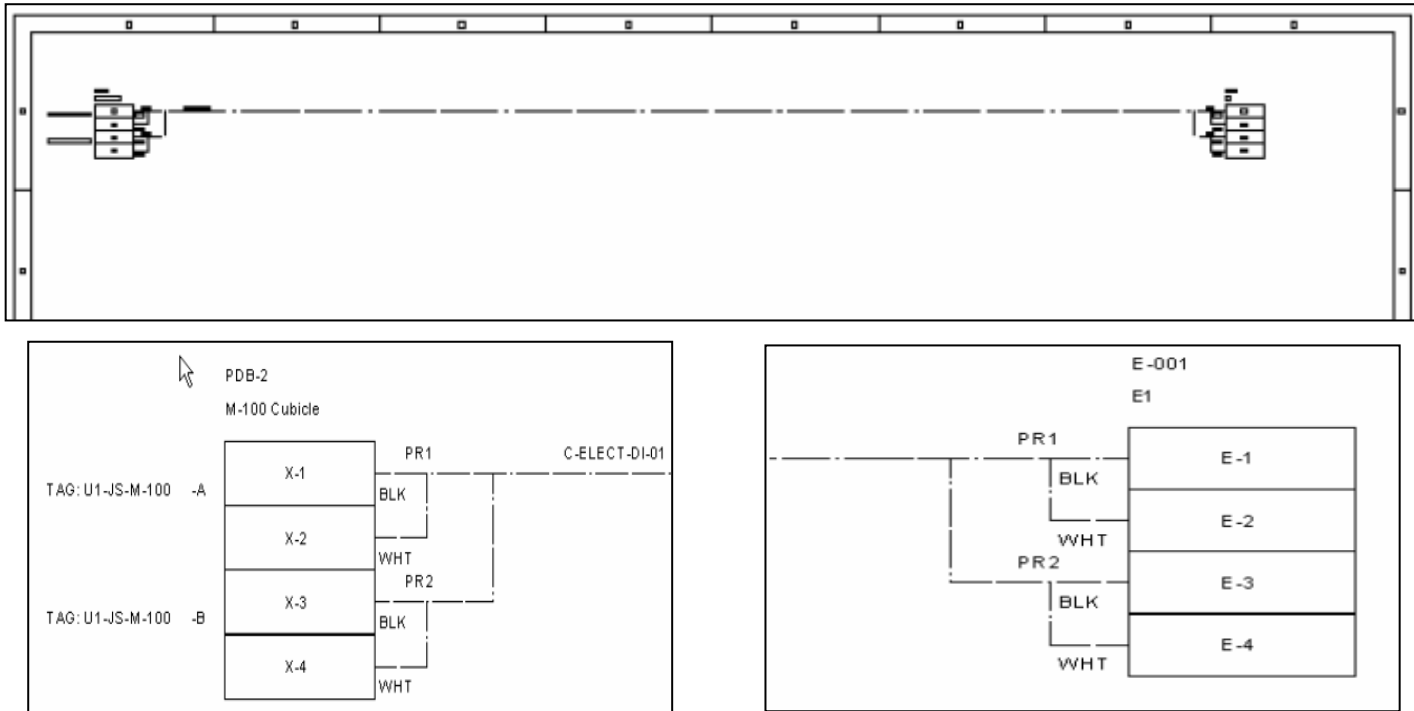


Observe that signal data have been added to the schematics (right bottom corner of the drawing):



# SmartPlant Electrical Activities

- ◆ Opening the second page of the schematics:



Observe: The left side, showing the PDB side and the right side, showing the PLC connection.