

Automatic Drawing Creation with AutoCAD Electrical

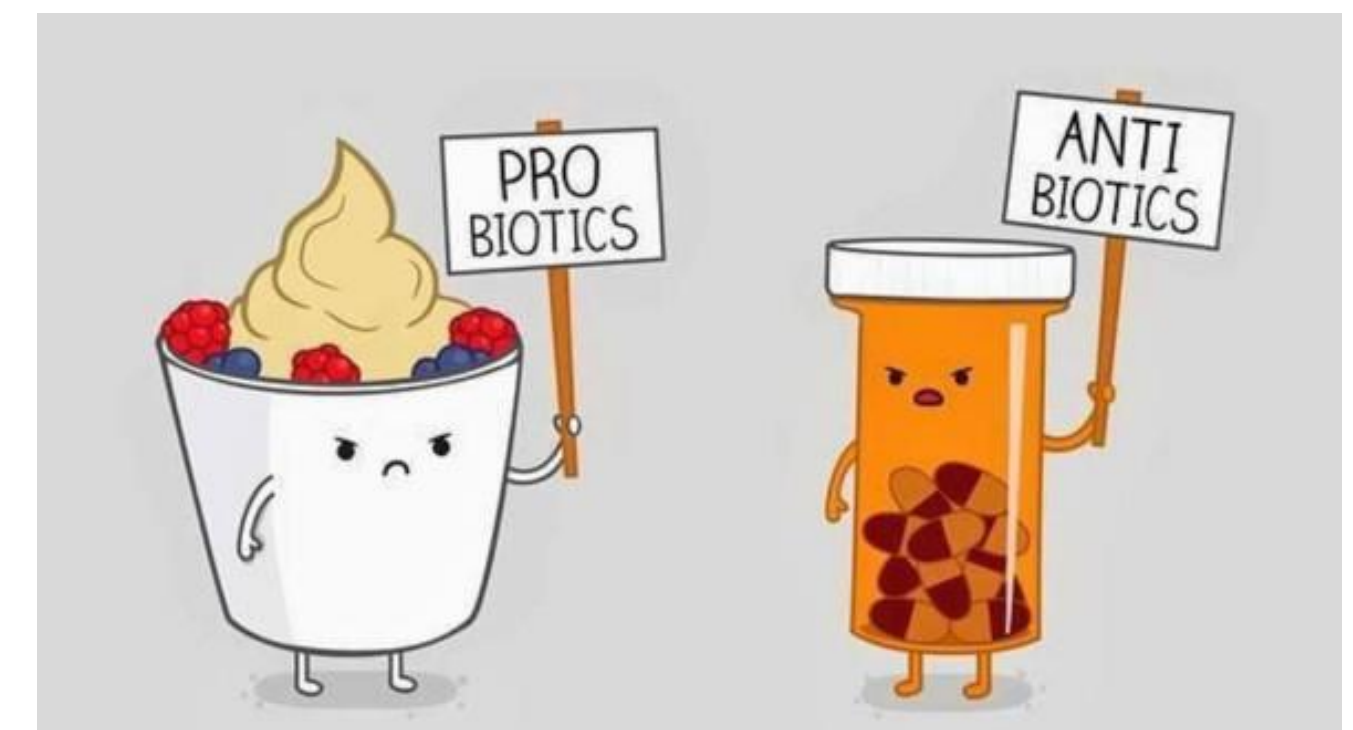
Randy Brunette

AutoCAD Electrical Subject Matter Expert



Agenda

- Introduction
- Review default Spreadsheet to PLC (SS2PLC) Files
 - Mapping and Settings for the SS2PLC
 - Automatically create drawings
- Non-PLC style Drawings set-up
 - Standard ladder style drawings
 - Multi-Line drawings
- SS2PLC does not work for point-to-point style drawings



About me (technical)

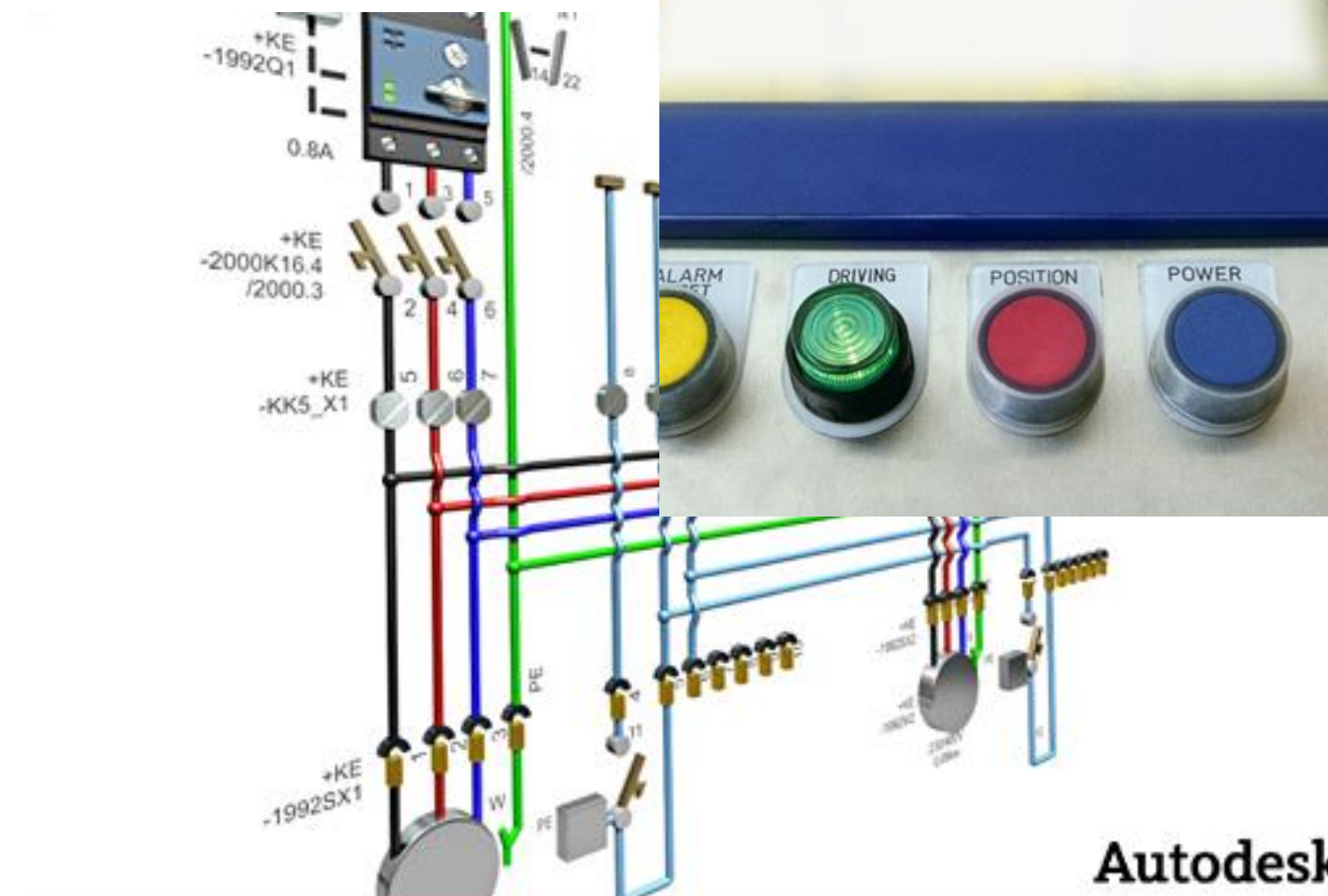


- 11 years owner of Brunette Technologies, LLC

Now with Spatial Business Systems, Inc.

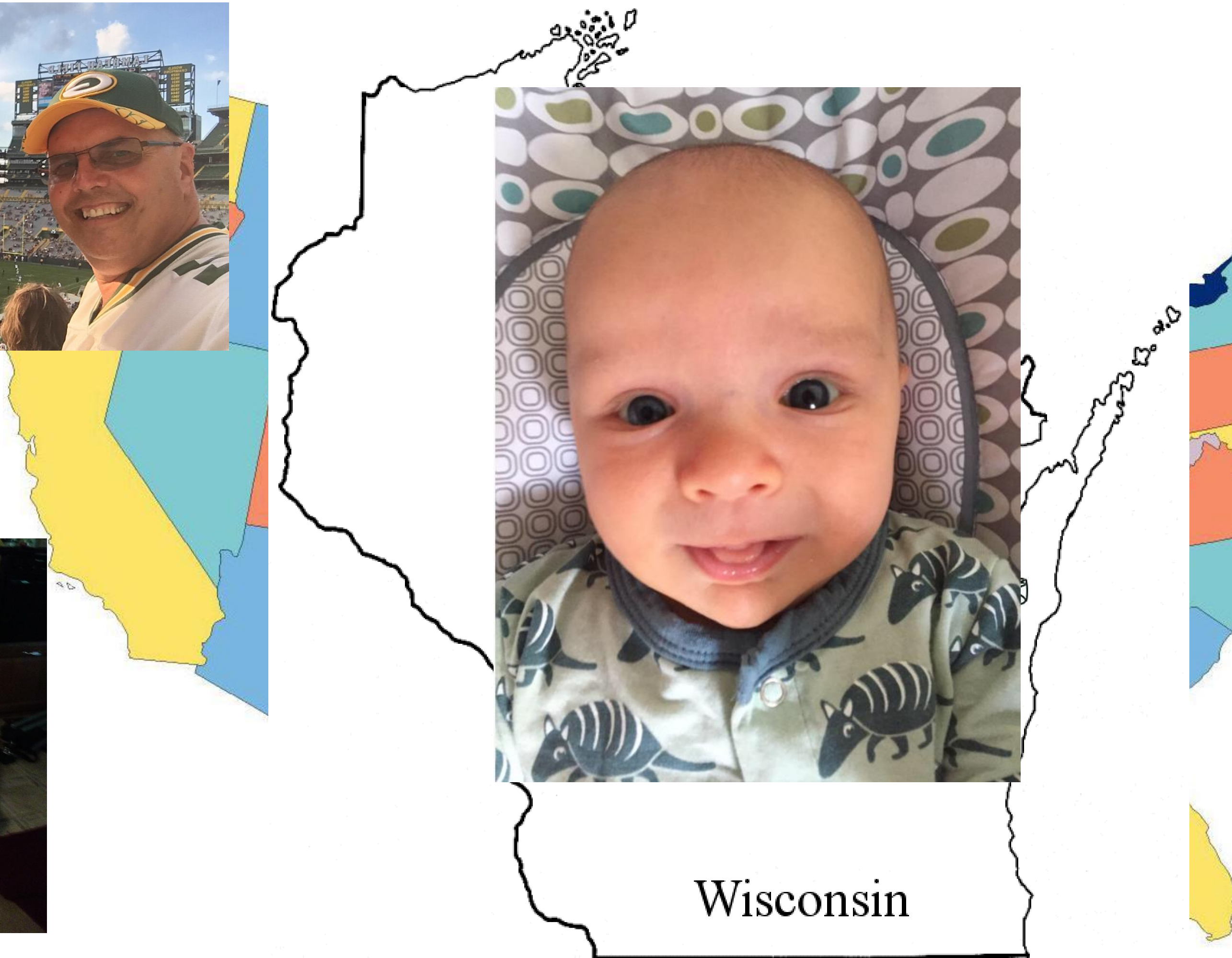
- 34 years in industry as worker and designer
- AutoCAD since 1984
- AutoCAD Electrical since 1996
- 23 years as Application Engineer
- 12+ years authoring AutoCAD

Electrical materials, including AOTC



About Me... (personal)

- Hometown – Chilton, Wisconsin, USA
- Married, two daughters, two son-in-laws, one grand child, and a dog



Fly Radio Control Aircraft

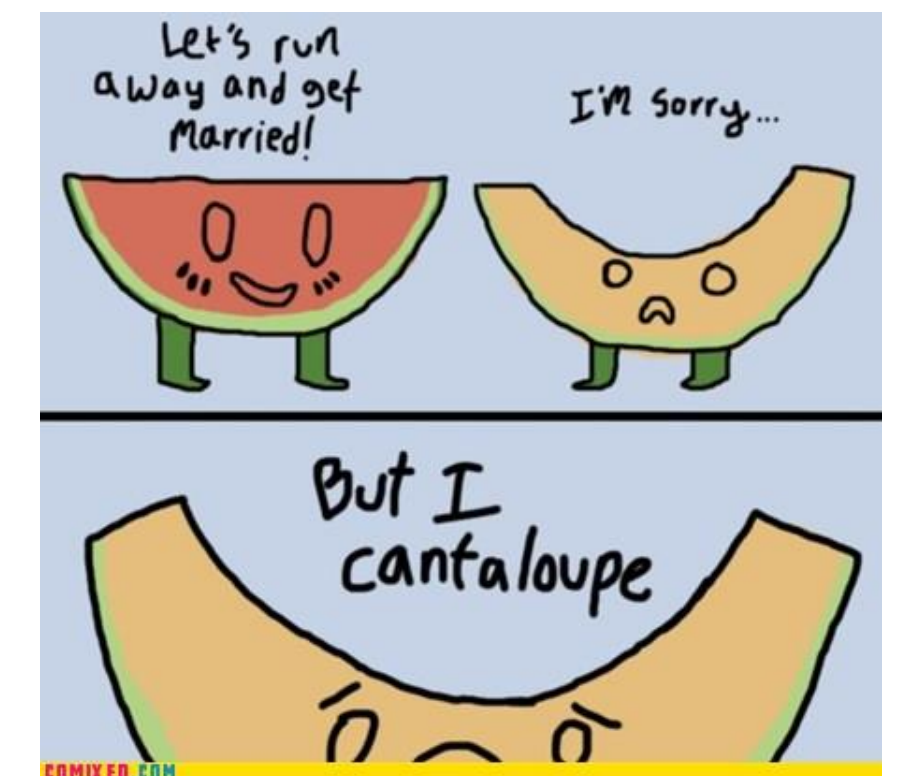


**First rule of flying:
Takeoffs are optional,
Landings are mandatory.**



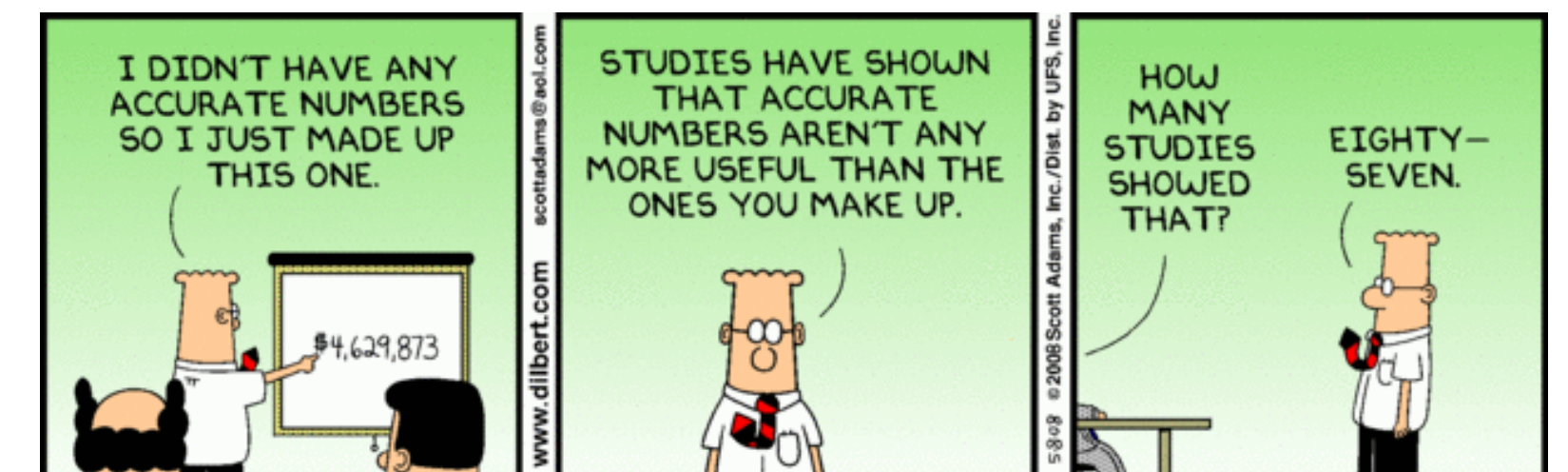
Default Spreadsheet to PLC Files

- The DemoPLC.XLS and DemoPLC_IEC.XLS files are included in standard AcadE installation
- Mapping Files
 - Settings for DemoPLC.XLS are hard coded in WDIO.LSP file, WDI file is optional
 - The WDI file for DemoPLC_IEC.XLS is included in standard AcadE installation
 - All other *PLC.XLS files will need WDI files created for them
- Any Excel file can be used, the WDI will enable mapping to the correct data



Codes Used in Spreadsheet

- **BREAK** – Breaks PLC at this rung
- **SPACER** – Add space between rungs
- **SKIP** – Skips a ladder before next module
- **NEW_DWG** – Starts next module on new drawing
- * (Asterisk) – Triggers Insert Circuit in place of Insert Component



67% of all statistics are made up on the spot.



Review of DemoPLC.XLS

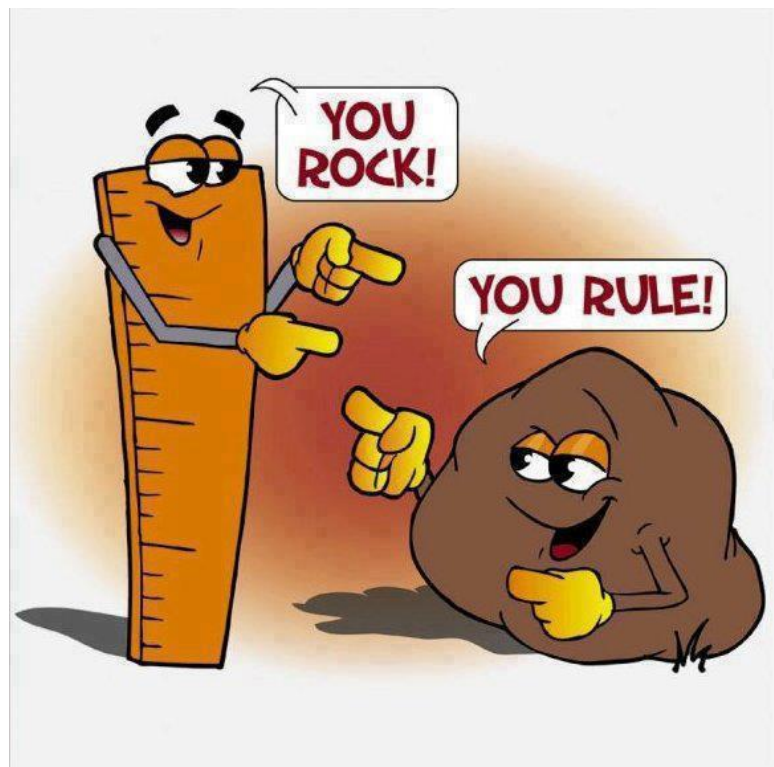
- Working sample to demonstrate functionality
- Creates 3 drawings, all containing PLC modules
- Up to 9 symbols on each rung, (only 6 shown)
- More component columns can be used, (only 4 shown)
 - Installation, Manufacturer, Catalog, and Assembly



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
1	CODE	R1	S2	G3	ADDR	RTP	DESC1	DESC2	DESC3	DESC4	DESC5	VOLTAGE	D1TAG	D1DESC	D1BLK	D1LOC	D2TAG	D2DESC	D2BLK	D2LOC	D3TAG
2	1771-IAD	1	2	0	I:002/00	TB20	BANK #1 FIBER	WASTE REMOVAL BLOWER	START HS100BR	REMOTE		120VAC INPUTS	TB1		HT0001	JBOX1	HS100BR	CYCLE START	HPB11	FIELD	TB1
3					I:002/01		BANK #1 FIBER	WASTE REMOVAL BLOWER	STOP HS100BS				TB1		HT0001	JBOX1	HS100BS	STOP	HPB11	FIELD	TB1
4					I:002/02		BANK #2 FIBER	WASTE REMOVAL BLOWER	START HS1001BR	REMOTE			TB1		HT0001	JBOX1	HS1001BR	START	HPB11	FIELD	TB1
5					I:002/03		BANK #2 FIBER	WASTE REMOVAL BLOWER	STOP HS1001BS				TB1		HT0001	JBOX1	HS1001BS	STOP	HTS11	FIELD	TB1
6					I:002/04		TUB OUTLET TEMPERATURE	NOT LOW(ALARM)					TB1		HT0001	JBOX1	D568TS	TUB OUTLET TEMP	HTS12	FIELD	TB1
7					I:002/05		TUB INLET TO HEATER FLOW	NOT LOW (TRIP)					TB1		HT0001	JBOX1	D2150FS	TUB INLET	HFS11	FIELD	TB1
8					I:002/06		SPARE														
9					I:002/07		COMBUSTION BLOWER	RUNNING					TB1		HT0001	JBOX1	MS101		HMS21	MCC	TB1
10					I:002/10		INSTRUMENT AIR PRESSURE	NOT LOW (IPS)					TB1		HT0001	JBOX1	D006PS	AIR PRESS OKAY	HPS11	CAB5	TB1
11					SPACER												D007PS	ALT AIR OKAY	HPS11	FIELD	
12					I:002/11		AIR DAMPER	AT HIGH FIRE (>80%)(PFS)					TB1		HT0001	JBOX1	D003WS2	HIGH FIRE	HLS11	FIELD	TB1
13					I:002/12		AIR DAMPER	AT LOW FIRE (<20%)(LFS)					TB1		HT0001	JBOX1	D003WS1	LOW FIRE	HLS11	FIELD	TB1
14					I:002/13		PURGE AIR FLOW	NOT LOW (PAS)					TB1		HT0001	JBOX1	D581FS	PURGE OKAY	HFS11	CAB5	TB1
15					I:002/14		COMBUSTION AIR PRESSURE	NOT LOW (AS)					TB1		HT0001	JBOX1	D582PS	COMB AIR OKAY	HPS11	FIELD	TB1
16					I:002/15		SPARE														
17					I:002/16		STACK TEMPERATURE	NOT HIGH					TB1		HT0001	JBOX1	D004TS	STACK TEMP	HTS12	FIELD	TB1
18					SPACER																
19					I:002/17		STEAM PRESSURE	NOT LOW (>20PSIG)					TB1		HT0001	JBOX1		STEAM PRESS	HPS12	FIELD	TB1
20																					
21	1771-IAD	1	2	1	I:003/00	TB21	FLAME DETECTED NO.1					120VAC INPUTS	TB1		HT0001	JBOX1	D576WT1	FLAME No. 1	HTS11	FIELD	
22					I:003/01		FLAME DETECTED NO.2						TB1		HT0001	JBOX1	D576WT2	FLAME No. 2	HTS11	FIELD	

Review of WDI Settings...

- Spreadsheet defines data
- WDI define graphics and locations
 - Ladder dimensions
 - Rung spacing
 - Component locations



Spreadsheet to PLC I/O Utility Setup

Ladder

Origin:

X:

Y:

Orientation:

☒ Vertical

☐ Horizontal

Reference numbers:

Width:

Distance between:

Ladders per drawing:

Rungs per ladder:

Rung spacing:

Rung count skip for I/O start:

Suppression:

☐ Rungs

☐ Side bus rails

☐ Do not erase unused, blank rungs

Signal arrow style:

Module

PLC graphical style:

Input offset from neutral:

Output offset from hot bus:

Maximum I/O per ladder:

I/O point spacing:

Scale:

☐ 1.0 ☐ 16 ☐ 25.4 ☐ 0.039

☒ Apply this scale to module outline only

In-Line Devices

First input device from hot bus:

First output device from neutral bus:

Spacing between multiple devices:

Drawing template:

Mapping Spreadsheet/Table Columns...



TOY YODA

- Virtual view of selected spreadsheet
- First page is PLC data
- Addition pages are in-line connected devices
- Select column of data to match to AcadE

Spreadsheet to PLC I/O Drawing Generator

Spreadsheet data

Col11	Col12	Col13	Col14	Col15	Col16	Col17	Col18	Col19	Col110	Col111	Col112	Col113	Col114	Col115
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
1771-I 1	2	0		I:002/	TB20	BANK # WASTE	START	REMOTE			120VAC	TB1		HT001
				I:002/		BANK # WASTE	STOP H					TB1		HT001
				I:002/		BANK # WASTE	START	REMOTE				TB1		HT001
				I:002/		BANK # WASTE	STOP H					TB1		HT001
				I:002/		TUB OU NOT LO						TB1		HT001
				I:002/		TUB IN NOT LO						TB1		HT001

Assign spreadsheet or table column numbers to data categories below

1	Module part numbers	N/A	Module's tag	7	Description 1
5	Address	N/A	Module's Installation	8	Description 2
2	Rack numbers	N/A	Module's Location	9	Description 3
4	Group numbers			10	Description 4
3	Slot numbers			11	Description 5
6	Remote terminal panel			12	Voltage/Input/Output
5	Wire numbers				

OK Cancel More In-line connected devices

Connected device(s)

Your spreadsheet data can define up to nine series-connected devices. These are defined on a per input or output point basis.

Devices for an input point insert left to right or top to bottom.
Output devices insert in reverse order, right to left or bottom to top.

Spreadsheet data

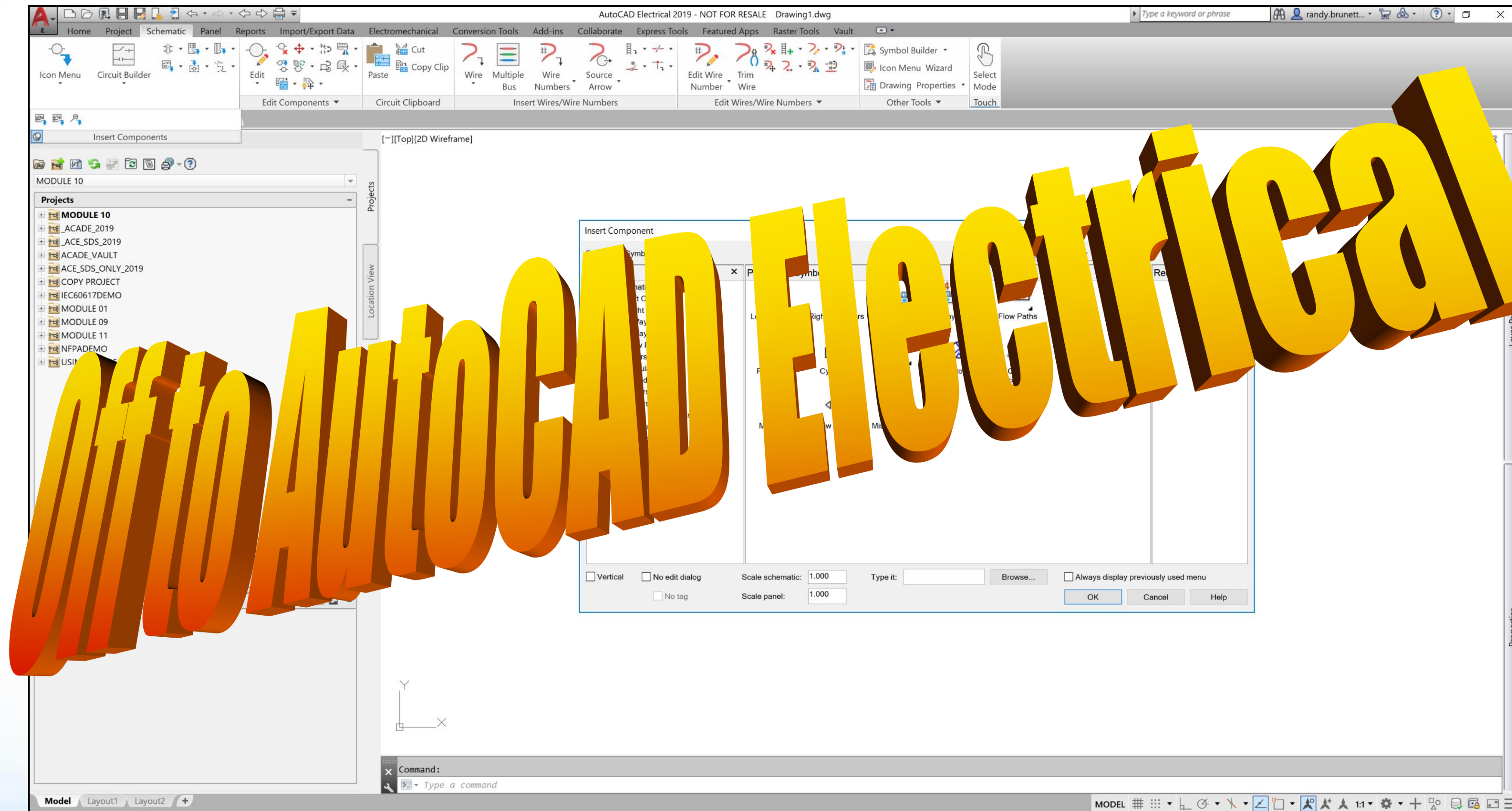
Col11	Col12	Col13	Col14	Col15	Col16	Col17	Col18	Col19	Col110	Col111	Col112	Col113	Col114	Col115	Col116	Col117	Col118	Col119	Col120	Col121
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21
1771-I 1	2	0		I:002/	TB20	BANK # WASTE	START	REMOTE			120VAC	TB1		HT001	JBOX1	HS100B	CYCLE	HPB11	FIELD	TB1
				I:002/		BANK # WASTE	STOP H					TB1		HT001	JBOX1	HS100B	STOP	HPB11	FIELD	TB1

Assign spreadsheet/table column numbers to device categories below

1st device		2nd device		3rd device		4th device		5th device	
13	Tag	17	Tag	21	Tag	25	Tag	29	Tag
14	Description	18	Description	22	Description	26	Description	30	Description
15	Block	19	Block	23	Block	27	Block	31	Block
16	Location	20	Location	24	Location	28	Location	32	Location
N/A	Installation	N/A	Installation	N/A	Installation	N/A	Installation	N/A	Installation
N/A	Manufacturer	N/A	Manufacturer	N/A	Manufacturer	N/A	Manufacturer	N/A	Manufacturer
N/A	Catalog	N/A	Catalog	N/A	Catalog	N/A	Catalog	N/A	Catalog
N/A	Assembly	N/A	Assembly	N/A	Assembly	N/A	Assembly	N/A	Assembly

OK Cancel More More in-line connected devices

Auto-create Drawings and Compare to Settings

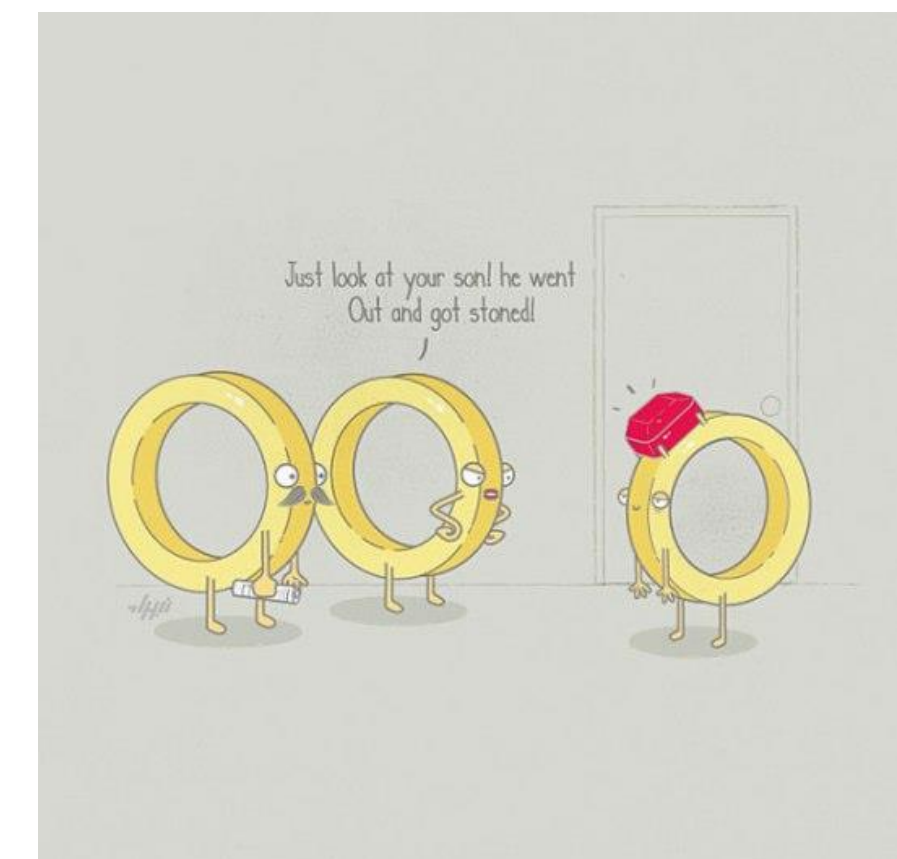


First Rule of the Spreadsheet to PLC Tool

- To create non-PLC drawings, we need to bend the rule...
- Or implement outright skullduggery...
- Is a PLC really required? (Yes)
- What happens when a PLC is inserted?
 - Component (PLC) is inserted
 - Wires are trimmed
- Do these things have to happen?
 - What is needed to insert a PLC??
 - What does a PLC look like?
 - Does it have to look this way?

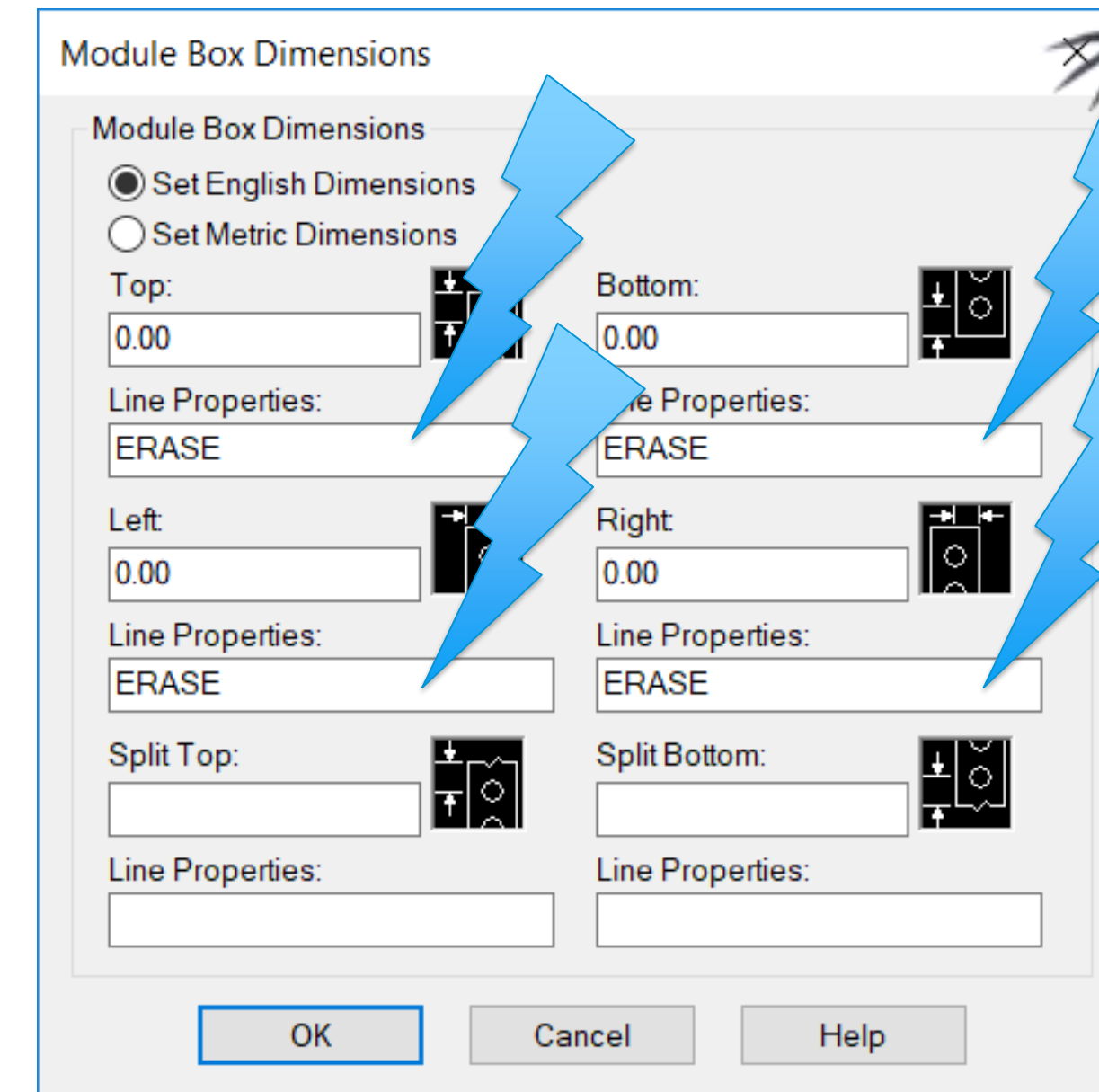


PLC Module is
required for
creation of
ladder



Defining a Phantom PLC

- A PLC that's there, but not there
- Phantom I/O point
 - Only three attributes, all invisible
 - TAGX_ – address tag
 - X?Term?? – wire connection
 - DELETE_ME – flag for later deletion
- Define a PLC using Phantom I/O points
- Remove boundary of PLC
 - Erase in Module Box Dimensions



WHAT DO YOU CALL AN
ALLIGATOR IN A VEST?



AN INVESTIGATOR.

First you see, then you don't...

- Delete unneeded PLC
 - Del_Blank_PLCIO.Isp



WHAT JOB DID THE FROG HAVE
AT THE HOTEL?



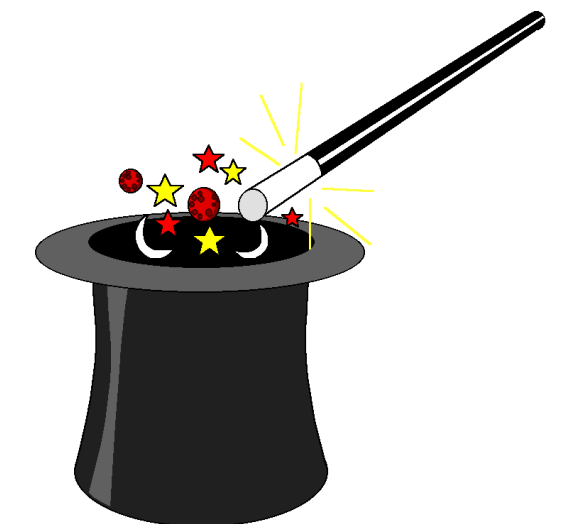
BELLHOP.

Module Specifications

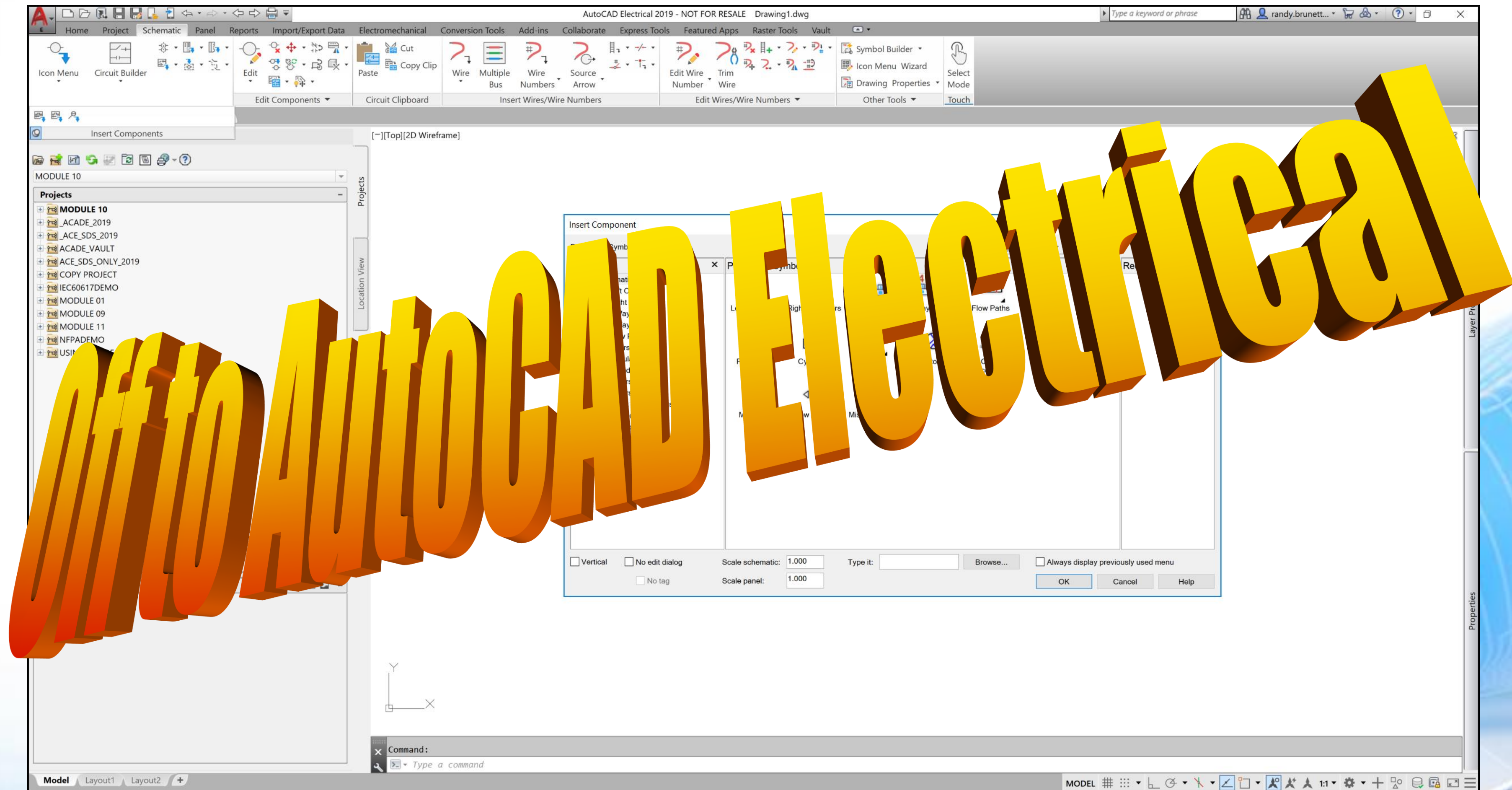
Manufacturer: SS2PLC	Series: SS2PLC_Rung
Series Type: Single_Rung	Code: SS2PLC20
Description: 20 Rung Ladder	Module Type: Combo
Base Addressing: Decimal	Rating: None
Terminals: 20	Addressable Points: 20
AutoCAD Block to insert: <input type="text"/> Browse...	
Autolisp file to run at module insertion time: Del_Blank_PLCIO.Isp Browse...	
Spreadsheet to PLC I/O Utility Insertion Position: Right/Bottom	
Module Box Dimensions...	
Module Prompts...	
OK Cancel Help	

it's ...
auto-magical

All that is left is
an empty ladder,



Create Phantom PLC Module and Auto-create Single Phase Ladder Drawings



Two-line, Three-line, or Mour-line



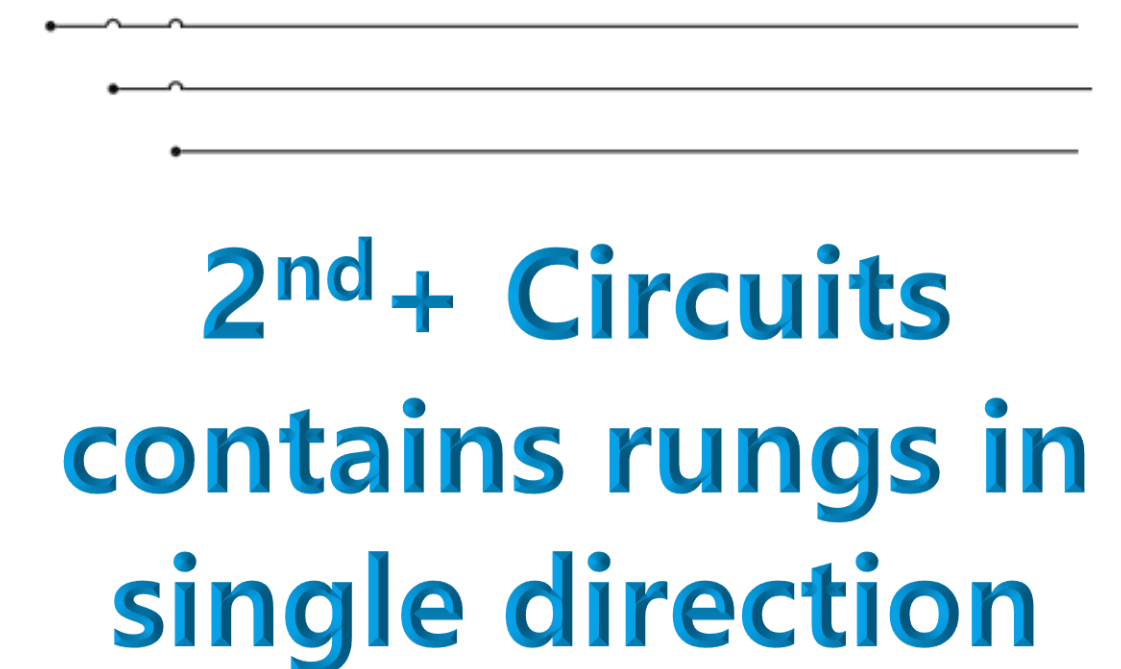
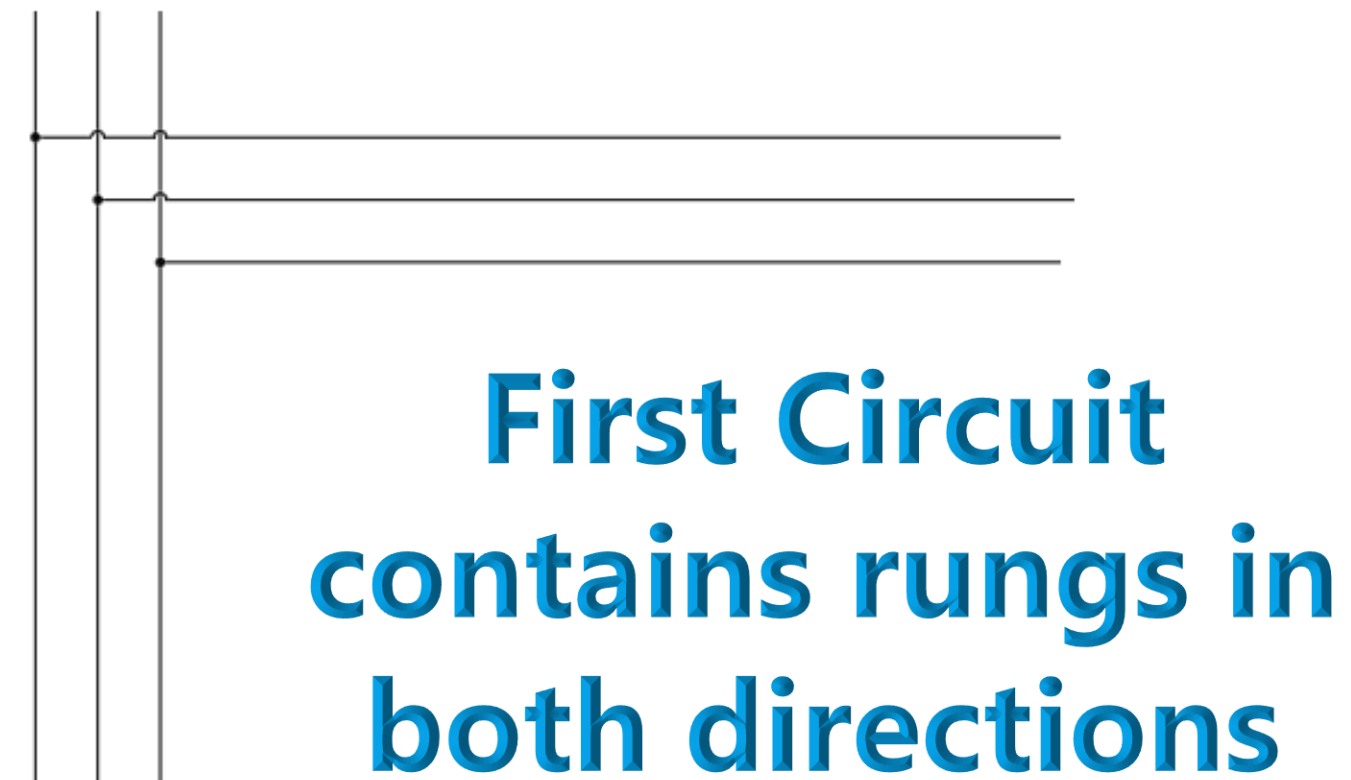
- More chicanery is required for multi-line schematics...

Challenge #1

- The spreadsheet tool was designed for single-phase ladders, so all X-phase wires attach to one bus wire

Solution:

- Circuits are inserted containing X-phase wires



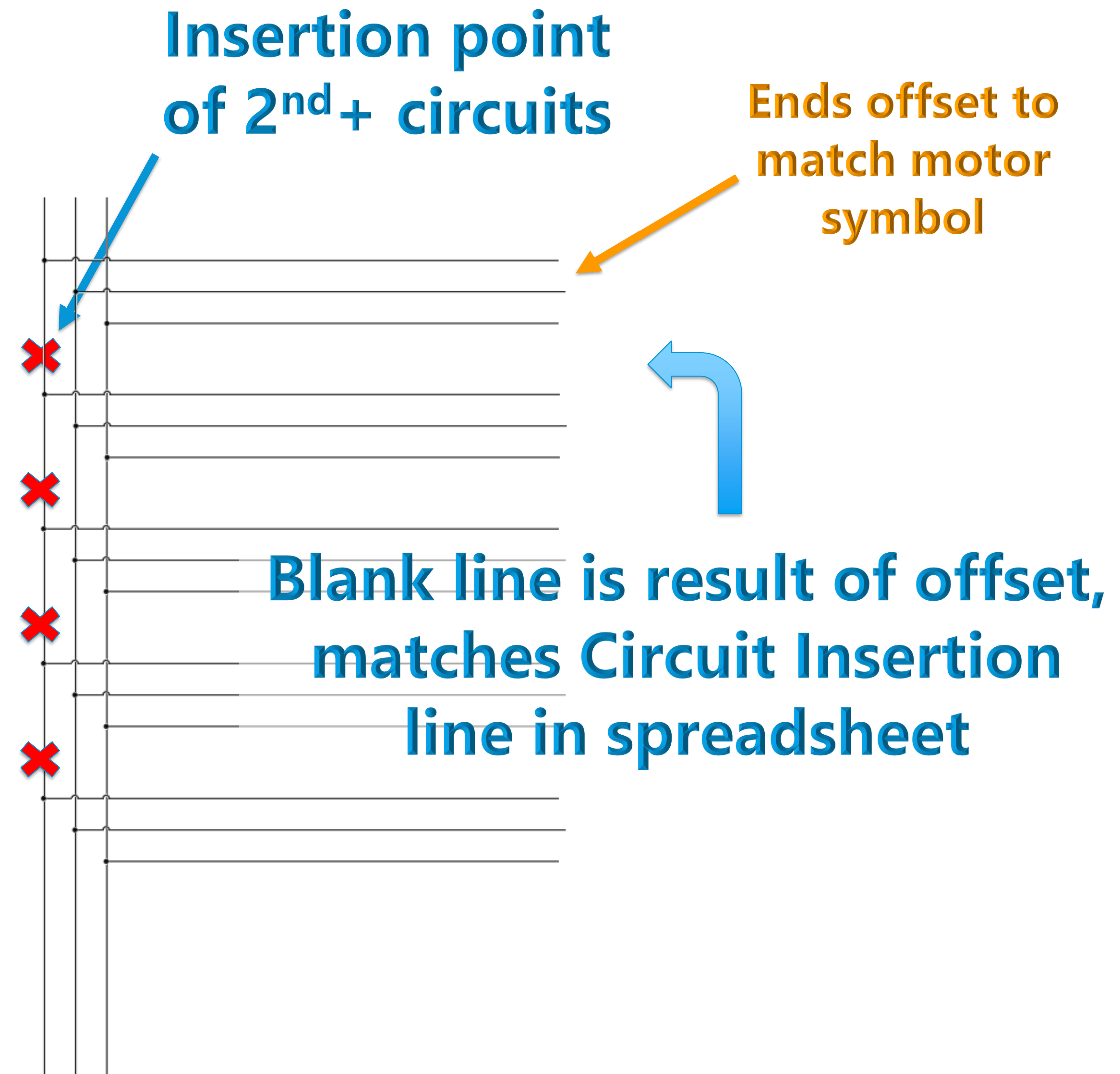
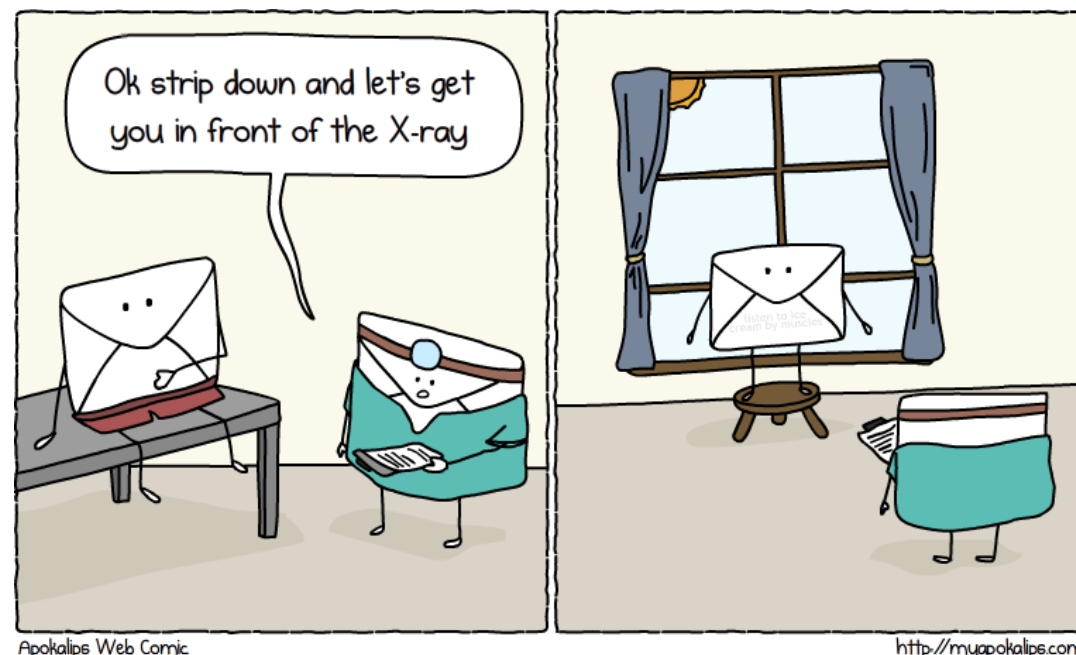
Two-line, Three-line, or Mour-line (cont.)

Challenge #2

- Wires must exist before components can be inserted

Solution:

- Offset insertion point of circuits
- Draw back is that a single blank line is required between X-phase busses
- Notice the offset end points



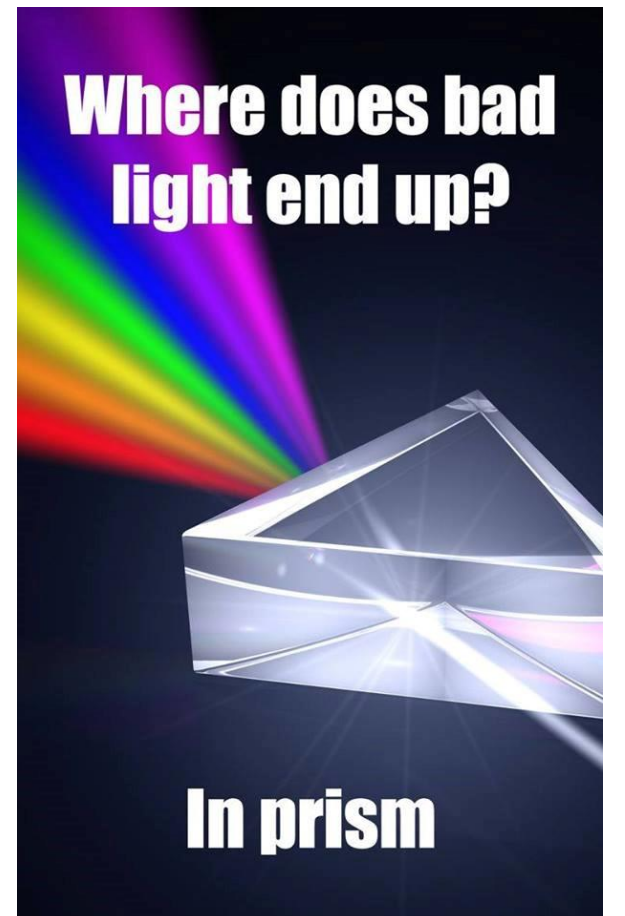
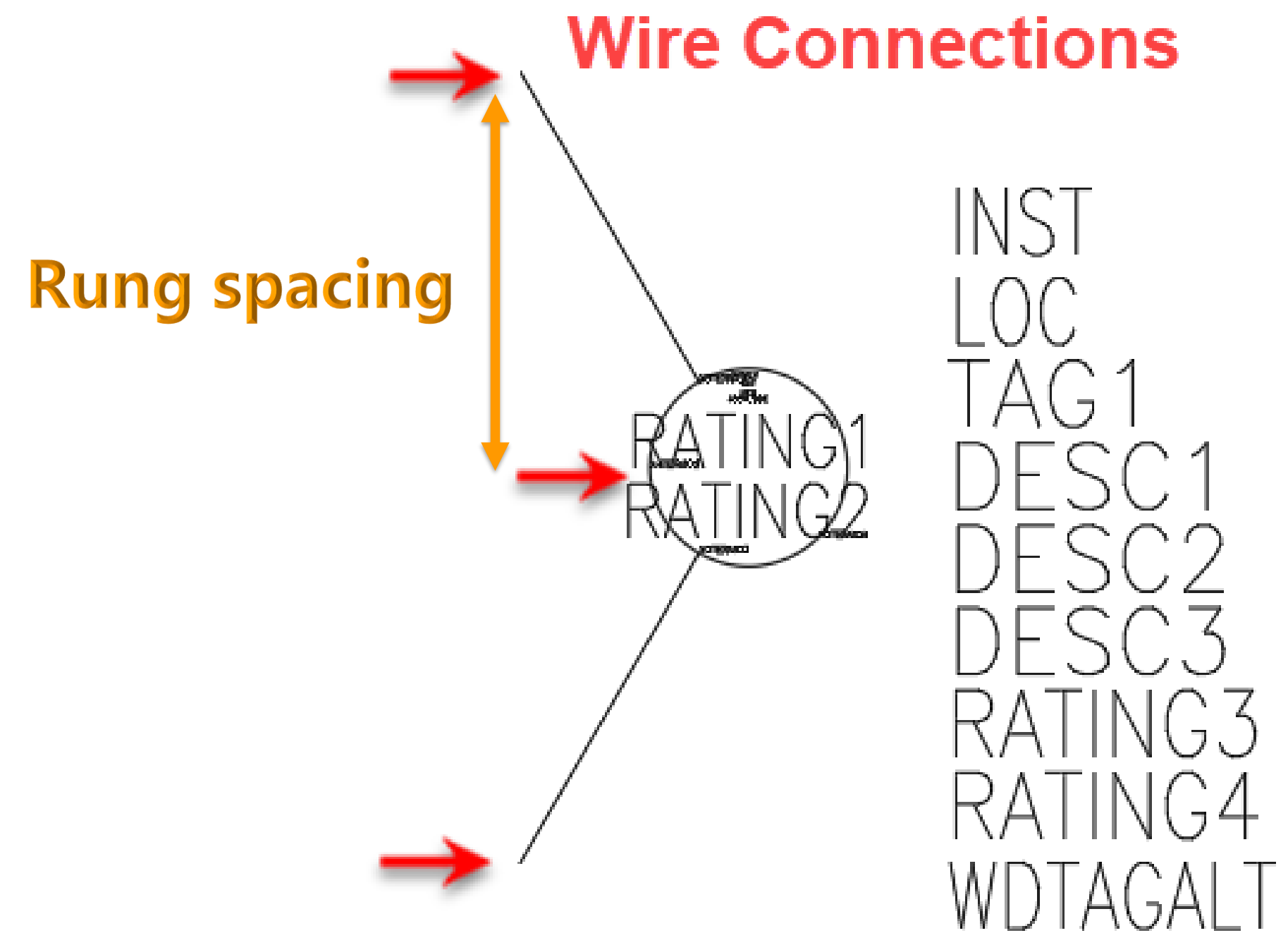
Two-line, Three-line, or Mour-line *(cont.)*

Challenge #3

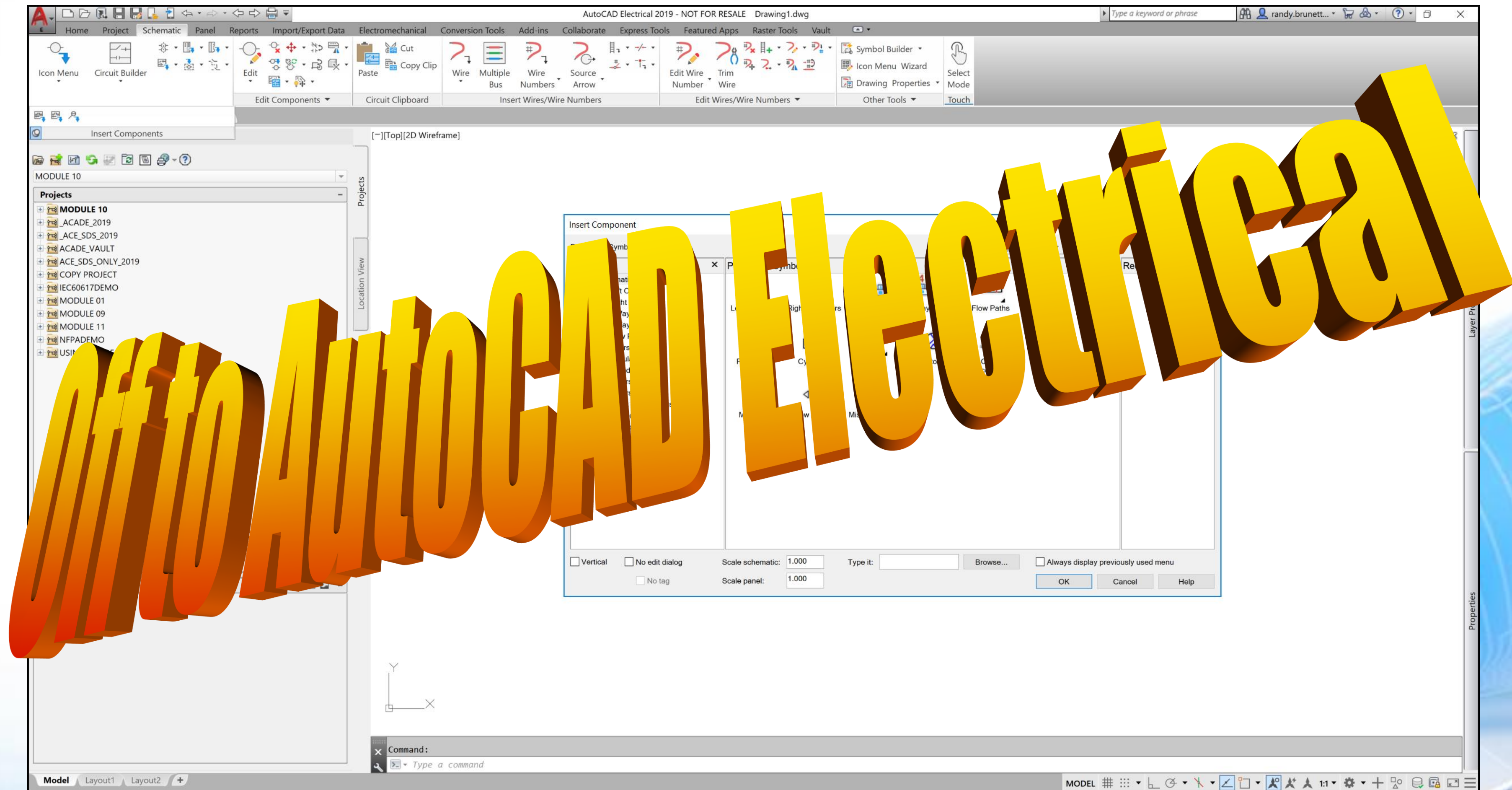
- Standard 3PH motor symbol with radial attributes doesn't work in PLC spreadsheet.

Solution:

- Create custom motor symbols that include wires for each rung spacing used.
- End points of rungs in previous step must match wire connection point offsets.



Auto-create Multiple Phase Ladder Drawings



Summary

Today we...

- Reviewed and edited the Spreadsheet to PLC (SS2PLC) Excel file
- Created mappings and settings for the SS2PLC
- Automatically created drawings
- Reviewed shenanigan's needed to create non-PLC ladder style drawings
- Reviewed the subterfuge needed to create 3-Line drawings



Any questions?

Please, please, please
fill out class evaluations.

Randy Brunette IM226475

Thank You

Remember,
the correct
answer is...

Awesome!





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