

Power*Tools for Windows Enhancement List

Version 6.5



Chosen By 39 Of The Top 40 Electrical Engineering Firms In The World.



Key Enhancements for Power*Tools for Windows Version 6.5

TECHNOLOGY AT WORK FOR YOU

- 1. Added manufacturer specific selective coordination tables to the PTW library. Allows search for upto-down and down-to-up selective coordination pairs. Filter for devices based on voltage, frame amps, interrupting amps, and selective level.
- 2. New Report Viewer user interface and format (.rp2) allows for image insertion along with enhanced text and picture editing and formatting. The Report Viewer includes saving to .doc, .txt, and .pdf formats.
- 3. Support for larger one-line drawing areas and navigation to sub-drawings and other PTW internal and external document types.
- 4. Nametag and Datablock orientations and default placement relative to the symbol body.
- 5. Support the creation of Legend tags (annotated poly-line symbols) on the one-line and report/ display Legends.
- 6. Option to report results based on the worst-case scenario in Arc Flash Evaluation. Expanded the Arc Flash study option dialog for specialized calculation and efficiency.
- 7. Option to select user-defined levels of upstream mis-coordination checking in Arc Flash.
- 8. Added ability to customize the reporting fields and sorting orders in the Arc Flash spreadsheet report.
- 9. Many additions to the Arc Flash PPE Table and Custom Labels including dynamic pictures for protection equipments, multiple copies of labels to print for different locations, etc.
- 10. Added NESC 2007 standard option for incident energy and flash boundary determination.
- 11. New protective devices added and new quick search and query capability. Approximately 1400 new devices have been added. Also includes Equipment Specific Arc Flash equations.
- 12. Ability to specify phase or neutral sensor location and to model differential, directional, summation, and zone interlock devices within Captor and to shift the TCC accordingly.
- 13. Ability to model differential, directional, summation, and zone interlock devices in Arc Flash.
- 14. Device and TCC notes area can store links to other documents, including external files.
- 15. Ability to plot the entire range of fuse sizes simultaneously. Also added ability to plot Bus Damage Curve, Capacitor Case Rapture Curve, Reduced Voltage Motor Starting Curve, Motor Asymmetrical Inrush, Transformer User-Define Inrush Curve/Points, etc.
- 16. Improved the multiple protection function interface to verify the functions to be plotted in the same TCC drawing. This includes the settings from the functions to be displayed in the one-line Datablock; the functions to be included in Equipment Evaluation; and the function types and sensor locations.
- 17. Variable Frequency Drive (VFD) model as a standard component type in PTW. Includes model regenerative and bypass modes.
- 18. New Thermal equations added to model the ANSI 49 function for SEL 701, 710, 749M for both Curve and Rating methods. New models added for Merlin Gerin Sepam 20, 40, 80 Series, and Startco FPU-32 and MPU-32.
- 19. TMS has been enhanced and includes the power and capability of the I*SIM study module to the extent required for motor starting analysis. Generator machine, exciter, turbine governor models, and flux induction motor models are added, branch power and current can be plotted in TMS.
- 20. Addition of polynomial and damping load model in I*SIM / TMS library. Also includes Variable Frequency Drive as a new Starter and Controller Model.
- 21. Addition of motor starter and controller models, turbine governor model, and wind generator controllers in I*SIM.
- 22. New Excel reports for TMS and I*SIM.
- 23. New HIWAVE iterative solution method when Voltage and Current Harmonic sources coexist in the system.
- 24. New Harmonic Source Component Editor subview menu for the VAR Compensator, Generator, and Schedules.
- 25. Resistance adjustment based on the harmonic frequency based on the recommended modeling concepts in section 10.5 of IEEE Standard 399-1997.
- 26. Added Harmonic Models for 6, 12, and 18 Pulse Drives with 0%, 3%, 5%, and 8% Line Reactors in HI_WAVE section of the PTW library.

Power*Tools for Windows Interface

- 1. Dynamic link on the one-line that will jump to the other end of the connection, or open up another one-line to continue to an extended or related drawing.
- 2. Dynamic link from the one-line to user specified components on another one-line.
- 3. Dynamic link from the one-line to any external documents outside of PTW including *.bmp, *.pdf, *.doc, *.xls, TCC drawings, reports, etc.

Users can specify the one-line drawing to dynamically link to in the "One-Line File" area and can specify the component in the one-line to focus in on the "Component" area. Descriptions for the link tags can be entered in the "Text" area.

One-Line Window Help	
Component Color Symbol Rotation Nametags	・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・
Datablocks Datablocks and Nametags	Link
Align Distribute Data State Connection Points	Link To Type: Oneline C TCC C Report C External One-Line File Labus19.drw
Textblock Legend Tag	Component (Optional) B-SWBD1
Jump to Next Symbol Annotation Annotation Line	Attributes Text Use Ctrl+Enter for new line LABUS19.DRW Attributes
Refresh Symbols from Library Refresh Meter Data Templates	OK Cancel Help

- 4. "Jump to Next Symbol" feature will jump from the selected component to the nearest component based on the location of the mouse cursor.
- 5. Support the creation of Legend tags (annotated poly-line symbols) on the one-line and report/display Legends.



Power*Tools for Windows Interface (cont'd)

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

6. Option to rotate nametags and Datablocks on one-line drawings.



 Option to specify defaults for Datablock and Nametag visibility, rotation orientation, and position relative to a symbol. Defaults for each component type can be different. Project menu > Options > One-Line > Default ANSI/IEC Symbol Assignment...

Options	Graphic Symbol Select 🔀
Option Groups Startup Application Project Titles Meter Option Subview Current Project S Current Project S New Project O	Component Types Bus Cable Pi Equivalent 77 Pi R X G B Ti Tie Breaker Series Reactor Series Capacitor Utility
ок	Visible Orientation Position Zoom Symbol Upright/Vertical
Help	Name Tag Image: Constraint of the second

- Increased the one-line drawing area to allow for larger one-line drawings to be created. Display a border for the one-line's allowed area and disable the user from going out of the allowed area.
- 9. Ability to change the Data State for multiple selected components on one-line drawings.

Power*Tools for Windows Interface (cont'd)

- 10. Ability to color Datablock and nametag as the symbol color.
- 11. Ability to color buses and protective devices using the Arc Flash Category colors.
- 12. Textblock to have separate color options for the text, background, and border. Border to have line width and style.
- 13. Annotation Rectangle with graphical attributes.
- 14. Color Toolbar for Data State color, Arc Flash Category color, Input Evaluation Failed color, Equipment Evaluation Failed color, and color Datablock and nametag as the symbol color.
- 15. Added "Find Not In One-Line" feature to find components that do not exist in any one-line drawings.
- 16. Added the "Find In Other One-lines" feature within the one-line to find the selected component in other one-line drawings.
- 17. Sort components within the "Component Existing" dialog to display components not in the selected one-line drawings together.
- 18. Enhanced the One-line's Find feature to "Search" by device name and to find of next component of the same starting character.
- 19. Auto Save the one-line at a user-defined interval.
- 20. Create a backup of the one-line for disaster recovery.
- 21. Mouse wheel double click for window zoom.
- 22. Option to "Show Difference" and "Show Comment" in the Data Visualizer.
- 23. Option to highlight the scenario cell with the maximum or minimum value throughout all scenarios.
- 24. Option in Data Visualizer to change cell color of scenarios if values/settings are different from the Base project.
- 25. Ability to model the UPS impedance in the Bypass mode.
- 26. Ability to model the UPS in the Reliability module.
- 27. VFD as a standard component type in PTW. Includes model regenerative and bypass modes.
- 28. Added IEC909 lb SLG, lk SLG, and other IEC_909 data fields to the Datablock attributes.
- 29. Option to report user-definable time T1, T2, T3, and T4 in IEC363 and IEC909 Datablocks.
- 30. Enabled scenario names to be used in Crystal Reports and Arc Flash labels.
- 31. Option in the TCC Starting Curve subview to "Link Inrush with SC Contribution".
- 32. LRA as input data and option in the ANSI/IEC Contribution subview to "Link X/R with Starting PF" (locked rotor PF) and link Xd" with LRA.
- 33. Option in the Transformer Impedance subview to Size To "Full Load kVA or Nominal kVA".
- 34. Added Manufacturer name and Type field for 3-winding transformers.
- 35. Provide a Motor Loading Table in Project > Options > Motor to specific global table for different load factors and their associated power factors and efficiencies.
- 36. Option in Component Editor for Induction Motors to use the Global Table or store the different load factors and their associated power factors and efficiencies with each individual Motors.
- 37. Allow both Fed From Buses and Schedules to be displayed in the schedule component in the Component Editor.
- 38. New paper sizes for Print Using Forms:
 - ANSI A, B, C, D, E
 - ANSI Arch A, B, C, D, E, E1
 - ISO A0, A1, A2, A3, A4
 - ISO B0, B1, B2, B3, B4
- 39. Five Project Titles in the Options > Project Titles and Logo subview are now displayed in Datablock reports and Crystal Reports.
- 40. New "Device Notes" dialog for all components. Ability to enter extended notes with locations/ links to other documents and to launch these external documents

Power*Tools for Windows Interface (cont'd)

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

41. Consolidated all report options into one dialog for selection of different report types.



42. New expanded Report Viewer user interface and format (.rp2) allows for image insertion along with enhanced text and picture editing and formatting. The Report Viewer includes saving to .doc, .txt, and .pdf formats.

HW_LF.RP2					
[Normal]	PIXymbolsExtended - 13	• B <i>I</i> <u>U</u>	≣ ≝ 🔳 50%.	▼ }∃ :≡ ⊡ ¶	
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	LDAD TO: Ma BUS CBL1 B SVD: 0.02	File name: HW_LF.de	oc		Save
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Page 1 Line 1 Col 0	50 % NUM	Text File (Word File ("doc) "bt)		

Arc Flash Evaluation

1. Option to report results based on the worst-case scenario.



The "Scenario" button in the Arc Flash window will allow users to report results based on the selected scenarios. If the project has multiple scenarios, users can choose to report the worst case (highest incident energy) or best case (lowest incident energy) from the selected scenarios.

This will greatly help in printing arc flash label for the worse case situation for many selected scenarios without the hassle of reviewing scenarios on an individual basis .

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

2. In PTW32 V6.5, the Arc Flash Study options are now separated into 3 pages.

Standard and Units

Study Options 🔀
Standard and Unit Fault Current Report Options
Standard
Flash Boundary Calculation Adjustments Above 1 kV, Trip Time <= 0.1s:
<= 240 ∨ ▼ Report Calculated Values From Equations ▼
Units Incident Energy Distance and Boundary Metric J/cm^2< Cal/cm^2
OK Cancel Help

Fault Current

Study Options	
Standard and Unit Fault Current Report Option	s
Max Arcing Duration Use Global Max Arcing Time > 240 Volts: 2.0 sec <= 240 Volts: 2.0 sec <= 240 Volts: 2.0 sec <= Enter for Each Bus Max Arcing Time for Each Bus Arcing Tolerances Pre-Fault Voltage Fixed or Movable for Each Bus ✓ Include Transformer Tap Include Transformer Tap Include Transformer Phase Shift Define Grounded as SLG/3P Fault >= : 5.0 %	Reduce Generator / Synchronous Motor Fault Contribution To 300.0 % of Rated Current after 10.0 cycles Apply To Generators Apply To Synchronous Motors Recalculate Trip Time Using Reduced Current Induction Motor Fault Contribution Include for: 5.0 cycles Exclude if <
	OK Cancel Help

Report Options

Study Options	
Standard and Unit Fault Current Report Options	
Report Option Bus Protective Device Load Side Protective Device Line Side Bus + Protective Device Line Side	Upstream Mis-Coordination Options Check Upstream devices for mis-coordination Upstream Levels to Search: 3
Line Side + Load Side Fault Contribution Options Include Line + Load Sides Contributions Include Line Side Contributions Only	Cleared Fault Threshold: 80 % of Total Auto Update Arc Flash Results Increase PPE Category by 1 for high marginal IE
Device to Report in Labels and Summary View	Label Options Default Label # Prefix #
Additional Incident Energy and Flash Boundary Shock Approar	ch Boundary Report Data and Order
	OK Cancel Help

3. Added ability to allow users to customize how all twenty available fields are to be displayed in the Arc Flash spreadsheet report. Furthermore, the user can also specify the order in which they will appear in the Arc Flash spreadsheet report.

For instance, if you don't want to show the equipment type, you can simply uncheck the display checkbox next to that field. If you want the "Bus kV" field to show up on the first column, you can just type in the number "1" in the column order next to that field and the bus voltage will them show up on the first column of the report. You can access "Report Data & Order" window by clicking on the "Report Data & Order" button in the "Report Options" tab of the Arc Flash Study Options window.

eport	Data & Order			X
	Data Header	Display	Column Order	
1	Bus Name	V	1	
2	Protective Device Name	×	2	
3	Bus kV	M	3	
4	Bus Bolted Fault (kA)	×	4	
5	Bus Arcing Fault (kA)	M	5	
6	Prot Dev Bolted Fault (kA)	M	6	
	••• •••	×	13	
13	Arc Flash Boundary (in)	×	13	
14	Working Distance (in)	×	14	
15	Incident Energy (cal/cm2)	M	15	
16	Required Protective FR Clothing Category	×	16	
17	Label#	×	17	
18	Cable Length From Trip Device		18	
19	Incident Energy at Low Marginal		19	
20	Incident Energy at High Marginal		20	
	OK Cancel	Reset	Re-arrange	

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

4. Added ability to allow users to customize the Shock approach boundary table.

	Voltage Range	Limited Approach Boundary (Movable)	Limited Approach Boundary (Fixed)	Restricted Approach Boundary	Prohibited Approach Boundary
1	50.00	0.00	0.00	0.00	0.00
2	300.00	120.00	42.00	0.00	0.00
3	750.00	120.00	42.00	12.00	1.00
4	15000.00	120.00	60.00	26.00	7.00
5	36000.00	120.00	72.00	31.00	10.00
6	46000.00	120.00	96.00	33.00	17.00
7	72500.00	120.00	96.00	38.00	25.00
8	121000.00	128.00	96.00	39.00	32.00
9	145000.00	132.00	120.00	43.00	37.00
0	169000.00	140.00	140.00	48.00	42.00
1	242000.00	156.00	156.00	63.00	57.00
2	362000.00	184.00	184.00	102.00	96.00
3	550000.00	550000.00 228.00		135.00	129.00
4	800000.00	285.00	285.00	179.00	173.00
5					
6					
7					
8					
9					
20					

This window allows the users to customize the Shock approach boundary table. You can access the "Shock Approach Boundaries" window by clicking on the "Shock Approach Boundary..." button in the "Report Options" tab of the Arc Flash Study Options window.

5. User-defined levels of upstream mis-coordination checking is now available.



The number entered determines the number of additional branches, consisting of a protective device or a set of protective devices that are away from the first protective device protecting the faulted bus, that the software will search for mis-coordination. This will greatly help when completing a coordination and arc flash study to see if any protective devices several braches away from the fault are mis-coordinated with the protective device next to the faulted bus.

6. Arc Flash Label # with user-definable prefixes. Label # is available within Datablocks and custom labels.



Default Label # Prefix - This allows the user to specify the prefix character that will go on the "Label #" column in the Arc Flash spreadsheet report. This field can help organizing labels when they are printed.

7. Ability to enable/disable the "Auto Update Study Result" feature.

Auto Update Arc Flash Results

When this checkbox is checked, the software will automatically update the arc flash results when there is a change in the system model. For instance, when user opens up a tie-breaker or change the size of a motor in the system model, the software will automatically update the arc flash results based on those changes. Users will not need to re-run the arc flash study.

8. Ability to specify the Maximum Arcing Duration for each bus.

In this window, users can specify the maximum arcing duration for each buses in the system modeled. For convenience, users can also sort the window by bus name, bus voltage, or maximum arcing duration by selection one of the available options button.

Furthermore, users can change the maximum arcing duration of all the buses globally by clicking on the "Global Change" button. This helps in modeling your system accurately for arc

flash study, since each bus location you are analyzing may have different maximum arcing duration depending on the situation.

Users can access "Maximum Arcing Duration for Each Bus" window by clicking on the "Maximum Arcing Time For Each Bus" button in the "Fault Current" tab of the Arc Flash Study Options window.



ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

9. Ability to specify for each bus whether it is defined as "Fixed" circuit part or "Movable" conductor.



The will affect the shock limited approach boundary reported by the arc flash label. A bus defined as "Movable" will have a higher limited approach boundary than a "Fixed" bus. For convenience, the user can also sort the window by bus name, bus voltage, or by "Fixed/ Movable" selection options. Furthermore, the user can change the Fixed/Movable" selection of all the buses globally by clicking on the "Global Change" button. This window can be accessed by clicking on the "Fixed or Movable For Each Bus..." button in the "Fault Current" tab of the Arc Flash Study Options window.

10. In the protective device component editor, there is now a new option check box for "Main, Include in Line Side Report". If this is checked, the software will always include this device in the Arc Flash line side report.

Series Rating:	40 kA	Phase
Main, Include in Arc I	Flash Line Side	Eunction

Previously, a protective device may be excluded from the Line Side Report if the power does not flow from the "From End to the To End" of the protective device.

11. Option to exclude bus component from the Line Side calculation.

Exclude Bus Side Calc. From Arc Flash							
Exclude Line Side Calc. From Arc Flash							
Exclude From Load Flow, Short Circuit, and Equipment Evaluation							
Library Notes:	Device No <u>t</u> es						

In the component editor of the Bus > "Equipment & Arc Flash Subview" component editor, there are now option check boxes to include/exclude a bus from the Bus or Line Side Arc Flash Report.

- 12. Exclude Bus and Line Side from Arc Flash Calculation automatically when user switches from a regular Bus to a Node Bus.
- 13. Ability to model the 2 and 3 winding transformer instantaneous protection for protective device Line Side calculations.



In the 2 and 3 winding transformer component editor, there is now an check box option to model special instantaneous protection for protective device Line Side calculations.

14. Ability to increase the arc flash PPE results by 1 category whenever the calculated incident energy is greater than the high marginal value set in the PPE table.

```
✓ Increase PPE Category by 1 for high marginal IE
```

15. Added IE Low Marginal and IE High Marginal columns in the PPE table

The values entered in the "IE Low Marginal" and "IE High Marginal" columns are the low and high threshold value of for each category. If the calculated incident is higher than "IE High Marginal" entered for that category and "Increase PPE Category by 1 for high IE" checkbox is checked, the software will automatically increase the arc flash PPE category results by 1 in the main report and labels.

🔲 P	ersonnel Prot	ection Eq	uipment Ta	ble	0						
	Incident Energy From (cal/cm2)	Incident Energy To (cal/cm2)	IE Low Marginal (cal/cm^2)	IE High Marginal (cal/cm^2)	Hazard Risk Category	Clothing Description	Clothing Layers	Required Minimum Arc Rating of PPE (cal/cm2)	Notes	Category Background Color	Category Foreground Color
1	0.0	1.2	0.000	1.190	Q	Untreated Cotton	1	N/A			
2	1.2	4.0	1.210	3.900	1	FR Shirt & Pants	1	4			
3	4.0	8.0	4.100	7.800	2	Cotton Underwear + FR Shirt & Pants	1 or 2	8			
4	8.0	25.0	8.200	24.000	3	Cotton Underwear + FR Shirt & Pant + FR Coverall	2 or 3	25			
5	25.0	40.0	26.000	38.000	4	Cotton Underwear + FR Shirt & Pant + Multi Layer Flash Suit	3 or more	40			
6	40.0	999.0	41.000	998.000	Dangerous	No FR Category Found	Do not work on live!	N/A	Do notwork on live!		

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

P	ersonnel Prot	ection Equ	ipment Ta	ble							
	Incident Energy From (cal/cm2)	Incident Energy To (cal/cm2)	IE Low Marginal (cal/cm^2)	IE High Marginal (cal/cm^2)	Hazard Risk Category	Clothing Description	Clothing Layers	Required Minimum Arc Rating of PPE (cal/cm2)	Notes	Category Background Color	Categ Foregr Coli
1	0.0	1.2	0.000	1.190	0	Untreated Cotton	1	N/A			
2	1.2	4.0	1.210	3.900	1	FR Shirt & Pants	1	4			
3	4.0	8.0	4.100	7.800	2	Cotton Underwear + FR Shirt & Pants	1 or 2	8			
4	8.0	25.0	8.200	24.000	3	Cotton Underwear + FR Shirt & Pant + FR Coverall	2 or 3	25			
5	25.0	40.0	26.000	38.000	4	Cotton Underwear + FR Shirt & Pant + Multi Layer Flash Suit	3 or more	40			
6	40.0	999.0	41.000	998.000	Dangerous	No FR Category Found	Do not work on live!	N/A	Do not work on live!		

16. Re

This allows the users the flexibility to add descriptions for the Notes, Head & Eye Protection, Hand & Arm Protection, Foot Protection, and other columns for the PPE Dangerous category.

17. Four dynamic pictures for each PPE Category can be specified. Switching pictures among the categories is done automatically. In the PPE table, there are now four new picture columns where the user can specify different pictures or logos for each PPE Category. This allows the users the flexibility to add up to four different pictures or logos for each PPE category in their custom arc flash label.

18. Ability to print multiple copies of the same label when multiple labels are selected to print in Custom Label Group Print.

E	Gro	oup Print								
		Bus Name Bus Kv		Bus KV	Required Protective FR Clothing Category	Label #	Print	#Copies		<u> </u>
	1	1 001-UTILITY CO 69.00		69.00	Dangerous! (*N1) (*N2) (*N9)	#1	M	1		
	2	2 002-TX A PRI 69.00		69.00	Category 3 (*N6) (*N1)	#2	2	2		
	3	003-HV SV	VGR	13.80	Category 3 (*N9)	#3	M	5		
	4	004-TX B F	PRI	13.80	Category 0	#4	M	1		
	5	005-TXD PRI 13.80		13.80	Category 1 (*N9)	#5	M	1		
	6	020-DS SWG3 4.16 Category 1		Category 1	#19	1	3		-	
ĺ	Sort <u>C</u> heck Print		< Print	Uncheck Print C	ontinue		<u>C</u> ancel	<u>E</u> xport	<u>H</u> elp	

19. Added the protective device's LTPU, LTD, STPU, STD, INST, INST Delay, GFPU, GFD, Manufacturer, Type, Description, Frame/Rating, Sensor/Trip, etc. to the Arc Flash Custom Label Designer as individual fields.

ields	Field Layout Settings (Inc	hes)		176	
Flash Boundary at Hazard 1 Flash Boundary at Hazard 2 Flash Boundary at Hazard 3 Flash Boundary at Hazard 4 ProtDev Feeds ProtDev Manufacturer ProtDev Type ProtDev Feeds ProtDev Type ProtDev Frame/Rating ProtDev Sensor/Trip ProtDev Setting_LTPU ProtDev Setting_TD ProtDev Setting_STD ProtDev Setting_INST ProtDev Setting_INST	 X: 0 Y: 3 Show Field Border 1/4 Point ▼ Text Format Arial, 10, Regular Vertical Alignment: Horizontal Alignment: Text Wrapping 	Width: 1.5 Height: 0.75 Image: Second Opaque Image: Second Opaque Image: Second Opaque Image: Second Opaque	e xolor nt		
	🔽 Show Label Border	Copy Paste F	Reset OK	Cancel	<u>H</u> elp

This will allow users to show on the arc flash label the protective device setting information.

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

20. Increased the number of allowable picture fields to eight for Arc Flash labels.



21. When "Metric" unit is selected, provided option to report incident energy as cal/cm^2 and flash boundary/working distance in mm, cm, m. When "English" unit is selected, option is provided to report flash boundary/working distance in inches or feet.

Units			
C English	Incident Energy		Distance and Boundary
 Metric 	🕤 J/cm^2	(● cal/cm^2	⊙mm ⊙cm ⊙m

22. Expanded the Arcing Fault and UDF Flags window.

TCC Device- Setting Properties	X							
Device SC Flag Datablocks Arcing Fault and UD Flags								
Device: LVP2, 480V, TCC Ref: 480V								
✓ Show User Defined Flags Amps (dot) Erom (s) To (s) Current 1: 2000 Time: 1000.000 0.010 Current 2: 10000								
✓ Show Constant Category Lines or User Defined C-Line From To Current: 5.0 100000.0 Amps ✓ Extend to Pickup								
Category C-Lines								
Select a bus to apply a 3-phase fault. Arcing Fault Current flag plotted will be based on the Arc Flash 'Bus' option only								
008-DS SWG1 C Buses Directly Connected 009-TX C PRI C 1 Branch Away 016-H2A C All Buses in Organiza								
LV DISTRIB C All Buses in <u>Project</u>								
✓ Show Arcing Fault Current for Worst Case Incident Energy ✓ Show Other Arcing Fault Current (dash-dot)								
OK Cancel Help								

- a. Users can now show two user defined flags on the TCC (see Figure A).
- b. Users can now also show both the Arcing Current for worse case Incident energy (the arcing current that produces bigger IE calculated from either 85% and 100% arcing current) and the non-worst case arcing fault current (normally 100% of the calculated arcing current) on the TCC (see Figure B).
- c. Users can now also show constant incident energy line (C-Line) on the TCC. Constant incident energy line (C-Line) is a sloped line on a TCC that describes the relationship of a finite series of time and current combinations for which the energy remains constant. For buses or system with single source of contribution, this C-Line can then be used as an aid in overcurrent device coordination to demonstrate visually which setting regions might be adjusted to reduce the arc flash hazard. (See Figure C).





Figure C

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

23. Added NESC 2007 standard option for calculating incident energy and flash boundary

Study Options			X
Standard and Unit Fault Current Report Options Standard FIEEE 1584 - 2002/2004a Edition (Industry's Preferred Method)	© NFPA 70E-2000/2004 Edition	C NESC 2007 Edition	

If NESC 2007 method is selected, the tables from NESC 2007 are used to calculate the incident energy and minimum approach distance.

24. Added a window to specify default arc flash settings for new projects.

Options		×
Option Groups: Startup Application Project Titles and Logo One-Line Report Library Miscellaneous Files Are Flash Equipment Evaluation	Default Arc Flash settings for new projects Standard IEEE 1584 INFPA 70E INESC (Industry's Preferred Method)	
Compared and a second a	Units C English C Metric Metric C cal/cm^2 C feet	
OK Cancel Help	Max Arcing Duration > 240 Volts: 2.00 sec <= 240 Volts: 2.00 sec	

25. Support additional Protection Function Types (Over Current, Differential, Directional, Summation, and Zone Interlocking) in the Arc Flash equation.

Desci	Descriptions: Help												
New Insert Update													
Funct	ion Selected: 4	one Interlock		Cut	Сор	y	Paste		Advanced Settings				
	Function Name	Settings in One-Line Datablock	Used in Arc Flash	Used in Equip Eval	Sensor		Туре		Summation/Direction				
1	Phase	V	~		Phase	•	Over Current	-					
2	Zone Interlock				Phase	-	Zone Interlock	•					
3						•	Over Current						
4						•	Differential						
5						Ŧ	Summation Directional						
6						•	Zone Interlock						
7						-	Over Current	•					



1. Selective Coordination

PTW is now able to find selective coordination pairs! There is no need to search through long manufacturers tables!

- a. Added manufacturer specific selective coordination tables to the Ptw.lib file.
- b. Manufacturers include Cutler-Hammer, GE, and Square D.
- c. Feature is available in TCC drawings, one-lines, and Component Editor.
- d. Software allows for up-to-down and down-to-up selective coordination.
- e. Filter for devices based on voltage, frame amps, interrupting amps, and selective level. Allows for ease of use and search through desired devices.

Refer to PTW Selective Coordination FAQ for additional information: http://www.skm.com/support.shtml

From the Component Editor:

B-SWBD1	1 60/w5 005	лтп РРТ 🕴 тІзо 3Р	
	Iso 3P 428 A Iso 3P 428 A Iso 5L6 235 A Iso 3P 100	Selective Coordination	X
LV DISTRIB Iso 3P 21174 A Iso 5L6 27229 A SWBD 1	LVP2 LVP3	Celected Device C LVP1 is the Downstream Device C LVP1 is the Upstream Device	
🚺 Component Editor 🗉 Se	enario[Base Project]	Selectively Coordinated Device Display Options	
Component Subviews: Protective Device Settings Reliability Data User-Defined Fields	Ereme: 480V JGE 250A (25)KA	Image: All in the Oursent TCC Select the Upstream Device as Reference: Image: All in the Associated One-line B-SWBD1 Image: All in the Project Image: All in the Project	
Datablock	Sensor: 50 💌 Plug:	LVP1 Frame Selection Options Bus Voltage: 480 Volts Fault Current: 21.174 kA Frame Voltage Frame Amps Frame Interrupting Rating KA Tested Up To	
Go To V Jump	Settings Setting1 I Ir. 50A Sensor A & B(20) I Ir. 50A Sensor Image: A & B(20) Image: Comparison of the sentence of th	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
	✓ 3 STPU, (2-12×Ir) ✓ 2 ✓ ✓ 4 STD, (FLAT) ✓ J.K.L ✓	Selectively Coordinated Device and Frames: IA01200002E UGE/S/H_DT 310+_LSI, 59-250A_UL_Frame 480V_JGE_250A (25)kA_SelCoor Up To: 2kA	•
Europed Shink	Library Eunction Phase Insert Segm Delete Segm Selective Coordination	J250 E/S/H 70-250A, 3-4 Pole Frame 480V JGH 90A 65KA SelCoor Up To: 2kA J250 E/S/H 70-250A, 3-4 Pole Frame 480V JGS 100A 35kA SelCoor Up To: 2kA J250 E/S/H 70-250A, 3-4 Pole Frame 480V JGS 00A 35kA SelCoor Up To: 2kA J250 E/S/H 70-250A, 3-4 Pole Frame 480V JGS 90A 35kA SelCoor Up To: 2kA J250 E/S/H 70-250A, 3-4 Pole Frame 480V JGS 90A 35kA SelCoor Up To: 2kA JGE E/S/H, DT 310+ LSI 50-250A UL Frame 480V JGS 250A (25)kA SelCoor Up To: 2kA JGE E/S/H, DT 310+ LSI 50-250A UL Frame 480V JGE 250A (25)kA SelCoor Up To: 2kA	^
		JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100/10UA SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /40A SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /45A SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /50A SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /50A SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /80A SelCoor Up To: 2kA JG E/S/H, DT 310+ LSI, 50+250A, UL Frame 480V JGE 250A (25)A/100 /80A SelCoor Up To: 2kA	

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

2. Ability to show the level of selectivity on the TCC drawing. In 'Selected Device Settings > SC Flag' of the downstream device, the marker and the label can be set.



From the TCC:

When selecting a device in the TCC, you can tell (by the check) that it is selectively coordinated by the 'On' check box to the right of the selective coordination button.



Functions

- 3. The functions menu dialog has been completely redesigned for enhanced ease of use and additional flexibility. Users may now:
 - a. Select functions to be used in the Arc Flash calculation.
 - b. Select multiple functions to be plotted in TCC drawings simultaneously.
 - c. Select multiple functions to be evaluated in Equipment Evaluation.
 - d. Select multiple functions to be displayed in the datablock.
 - e. Option to choose a sensor location (Phase or Neutral)
 - f. Model different Sensor Types:
 - g. Differential, Directional, Overcurrent, Summation, and Zone Interlock

Pro	tection Func	tions	-		_					×
Low	Voltage Break		ОК							
Туре	:	C	ancel							
Desc	riptions:	GF, 200-63	00A							Help
Func	Function Selected: Ground				New Cut	Ins Co	ert Update py Paste		Advanced Se	ttings
	Function Settings in Used in Used One-Line Arc Flash Equip		Used in Equip Eval	Jsed in Juip Eval Sensor Type				Summation/ Direction		
1	Phase	v	v		Phase	•	Directional	-	<msb-1> -> <cbl-009></cbl-009></msb-1>	
2	Ground	V			Neutral	•	Over Current	-		
3						•	Over Current			
4						•	Differential			
5						•	Directional			
6						•	Zone Interlock			

To Create a New Function

- a. Click on the New button in the center of the screen.
- b. Type in the name of the New Function. Ex: Ground, Neutral, Special Protection,
- c. Click on Update

*You can now select the options to go along with your function. (more information on the options below)

To Switch Between Functions, highlight the one you want and press OK. Or you can just select the other function in the TCC if you are plotting both functions.

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

In the TCC

4. Shift protective devices based on sensor selection

- a. Right-Click > TCC Settings > Fault Current tab
- b. You now have the option to use the branch fault current through your protective device and have the ability to shift your device based on predetermined situations.

Device = Device to be shifted based on the branch fault current

Voltage = Voltage of the device

Ratio Shifted = The ratio is based on your reference choice and the type of function you are modeling. Press the calculate button to recalculate and update the ratios. **Sensor:**

- a. You have the option of selecting Phase or Neutral for your sensor .
- b. Set this to the type of current you want the function to monitor.

Type:

You will then see a table to choose the type of shifting you want to use:

<u>Overcurrent</u> = This is the default. It is used to model time over current devices in the TCC (ANSI functions 50 and 51).

<u>Differential</u> = This will model the ANSI 87 function. Once you select this option you will be asked to select the devices from the project/one-line that use the current references you want the software to monitor. This will model the difference of two currents.

<u>Directional</u> = This will model the ANSI 67 function. Once you select this option you will be asked to select the From and To devices from the project/one-line. This will model an Overcurrent flowing in a predetermined direction.

<u>Summation</u> = This will model the summation of two or more currents into a protective device. Once you select this option you will be asked to select the devices from the project/one-line that use the current references you want the software to add.

<u>Zone Interlock</u> = Is used to model Zone Selective Interlocking in Arc Flash. This option does not modify or move the curves in the TCC. In Arc Flash it will use the trip time based on the preset settings and allow you to modify this field (the trip delay time). You can put in the actual trip delay time of the device when it uses ZSI to reflect no intentional delay.

тсс -	Setting Pr	operti					X			
Layo	out Fault Curr	ent Ba	ckground All D	evices Arc	Flash Notes					
(*	Study Result	c	User Defined in Study Re	TCC sult Options	C Use	Defined in Component		CURRENT IN AMPERES	s	
C	Bus Fault Cu	rrent	FaultTyp	e: _InitSyl	m 3P	. .		Summation of Current fr	om Selec	ted Devices
	Branch Fault	Current	Through Protect	ve Device		C In One-Line				
	Faulted Bus:	LVD	STRIB	▼ Type:	_InitSym SLG	 Show All 		Sensing Devices: F-M25	~	C In One-line
-	Shift TCC Be	sed on	Reference Fault	Current	Sensor:	Calculate	1	LVP1		Show All
Re	eference:	Total Fa	ult@LVDISTRI	B> 🔻	Phase	 Advanced Settings 		LVP3		
-						_				
	Device	Volts	Ratio Shifted	Sensor	Туре	Summation/ Direction	-	MCP M28 #3		
1	LVP2	480	0.115	Phase 👻	Summation 🚽	LVP1 + LVP2 + LVP3		MCP M28 #4 R G1		
2	B-SWBD1	480	0.115	Phase 👻	Over Current 📘	-		R G2		
3	TX3	4160	1.000	-	Over Current			R G3		
4	F TX 3	4160	1.000	Phase 🔻	Differential			R MIU R M4		
5	C5	4160	1.000		Directional			R M8		
6	F5	4160	1.000	Phase 👻	Zone Interlock		-	R SWG3		OK
								RTXF		Cancel
						200-2		B2	*	
					ок	Cancel Help		1		Help

5. Plot ANSI 49 function of motor relays

- a. For Merlin Gerin, Startco, and SEL Thermal Curve and Rating methods.
- b. All settings can be changed in the TCC.



- 6. Plot cable damage curves as Single, Parallel, or N-1.
 - a. If a cable has more than one conductor in Parallel/Phase, then the damage curve for single conductor will represent the lowest short-circuit current withstand capability of the cable that is used as default for protection.



ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

- 7. TCC notes area can now store links to other documents.
 - a. Notes regarding a specific TCC drawing as well as other related documents or websites can be attached under the File Link.
 - b. A viewer is included to quickly open and view the document/link.

WL&ABUS19.TCC (LABUS19.DRW)	
TCC Device List: LVP2 Library: SQUA	RE D, LE, Micrologic, LSI, 100-600A, 661-1
Device Settings Datablock One-Line Name: LVP2 Complete Bus Voltage and Fault Current Bus Voltage: 480 V Isc Amps: 9789 Phase	CURRENT IN AMPERES
Bedraw Library Eunction (. Device/TCC Notes)	Device/TCC Notes
Library Info: Low Volkage Breakers Static Trip SQUARE D, LE, Micrologic, LSI, 100-600A, 651-1 Max Dev Volts: 600 Series Rating: 0.0 KA Connection Connected Protected Connection From: LV DISTRIB LV DISTRIB To: C16 C16	Notes: Type my TCC Notes here and link documents below!
	Document File Link Browitzer 1 C.VPTW32VPTW 6.0 Enhancements.pdl

- 8. Ability to plot the entire range of fuse sizes simultaneously.
 - a. Curves for each fuse size can easily be seen to coordination with other devices without switching through all the available sizes.
 - b. Once the size is selected you can uncheck the "Show all" box to show just that one fuse.



9. Ability to plot the transformer inrush as a curve or as separate points.a. Plotted as separate points:

極 TCC4.TCC ()		
TCC Device List: TX3 Library:		
2 Winding Transformer Damage Curve Datablock One-Line Standard: ANSI C57.109	CURRENT IN AMPERES	^
2 2 4.9999 X/R: 4.8389 Prii. Isc 200000. Isc X/R: 6.2 Damage Curve Intush Factor / Intush Time	100	
C 3 Phase Image: Constraint of the sector of	10	TIME IN SECC
Freguent Fault Curve All Text Labels Max Plot Line: 30		NDS
	0.10 TX Intel	
	0.01 0.5 1 10 100 1K 10K too4 too Ref. Voltage: 480V Current in Amps × 100	~

b. Plotted as a curve:

Standard: ANSI C57.109	1000	CURREI	NT IN AMPERES		
2 4 9999 X/R: 4 8989 Pri. Isc 200000. Isc X/R: 5.2 Demane Curve Kriteh Factor / Insteh Time 5.2	100				
C 3 Phase C Show Point C Show Curve C Unbalanced Current PU Time (sec) ▲ Both 2 40000 0.50 2 40000 0.20 0.20	10		1/-	тхз	TIME IN S
	1	\sim			ECONDS
Max Plot Time: 30Bedraw	0.10		T)	
	0.01 0.5 1	10	100	1K	10K

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

- 10. Show FLA markers based on Full load kVA
 - a. Users may select the transformer's FLA marker to be plotted at the nominal or full load rating:
 - b. Right-click on the TCC drawing > Selected device settings > SC Flag tab



Added ability to plot user-defined capacitor and bus damage curves.
 a. Capacitor: User-defined curve



b. Bus: Option for using the IEEE Buff Book or a user-defined curve.



- 12. Added current limiting markers (1/2 and 1/4 cycles).
 - a. Current limiting markers can now be added to TCC drawings.
 - b. The amperage and clearing times will be shown with the marker.
 - c. Right-click on the TCC drawing > Selected device settings > SC Flag tab



13. Added option to terminate the curve.



ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

14. Ability to specify and report the time adder and shifter for each device in the TCC.

TCC Device- Setting Properties						
Device SC Flag Datab	locks Arcing Fault and UD Flags					
<u>C</u> urrent Multiplier:	1.0000					
Time Multiplier:	1.0000					
Time <u>A</u> dder:	0.0000 sec					

- 15. Ability to plot the motor asymmetrical inrush current.
 - a. Option in the TCC to plot the Asymmetrical Inrush using:
 - i. FLA x Inrush x 1.6 (default) or any user-defined value.
 - li. Option to choose the maximum time in seconds to plot.



16. Ability to plot a 2nd reduced voltage motor starting curve in the TCC with user-defined or default parameters. The dotted line below shows a 80% reduced voltage curve.



17. Additional options have been added to the Arcing fault and UDF Flags tab:

TCC Device- Setting Properties						
Device SC Flag Datablocks Arcing Fault and UDF Flags						
Device: B-SWBD1, 480V, TCC Ref: 4160V						
From (s) Io Solution Amps (dot) Time: 1000.00 0.010 Current 1: 0.000						
Show Constant Category Lines or User Defined C-Line From To Current: 0.5 10000.0 Amps Extend to Pickup						
Time: 0.010 0.010 Sec Category C-Lines						
Select a bus to apply a 3-phase fault, Arcing Fault Current flag plotted will be based on the Arc Flash 'Bus' option only						
O09-TX C PRI Image: Buses Directly Connected LV DISTRIB Image: Directly Connected						
C All Buses in One-line C All Buses in Project						
Show Arcing Fault Current for Worst Case Incident Energy						
OK Cancel Help						

- a. Display device and reference voltage of selected device.
- b. Plot two user-defined current flags (Current 1 and Current 2).
- c. Plot single, multiple, or user-defined constant energy lines showing the PPE category.
- d. Plot maximum and minimum arcing fault current flags. (Options a. through d. are further discussed under the Arc Flash Enhancement list)
- 18. Added additional options for TCC backgrounds:
 - a. Number of ticks per decade.
 - b. User-definable axis line and outside boarder widths of the TCC drawing.
 - c. Grid and label enhancements.
 - d. Ability to add up to 10 labels per decade on the TCC.
 - e. Ability to have a dual density for time and current.
 - f. Right-click on TCC drawing > TCC Settings > Background tab.



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ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5
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- CURRENT IN AMPERES 1000 110 A 69 A LVP2 F5 100 тхз -TX3 B-SWBD1-10 TIME INSECONDS 1 ТΧ 0.10 0.01 0.5 100 10K 1 10 1K L&ABus19.tcc Ref. Voltage: 4160V Current in Amps x 1 InitSym 3P LABUS19.DRW
- 19. Ability to add the fault current type to TCC drawing and Forms. Right-click on TCC drawing > TCC Settings > Show Fault Type.

20. Include or exclude cables, buses, and capacitors from the TCC "GoTo" command.

Options		
Option Groups: Startup Application Project Titles and Logo One-Line	Lock Mouse Drag Pen Width:	1+1/4 Point
Report Library Miscellaneous Files ArcFlash Equipment Evaluation	Use Individual Font Use Universal Font Arial, Regu	lar, 8
TEC User-Defined Fields Multi-User Meter	 ⊂ Show Amps • Show Device Name 	 C Show Amps I Show Device Name
Option Subviews: Device Appearance	Automatic Arrangement	Plot Parallel Cables
Device Flag Device Datablock TCC Layout TCC Fault Current TCC Background TCC All Devices	For Printing Only Hide Arcing Fault Flags and Arc Flash Constant Category Lines Hide User-Define Flags	Exclude From Go To TCC Exclude Cables Exclude Buses Exclude Capacitors
<u>H</u> elp		

- 21. Added multiple voltage scales on TCC drawings.a. When plotting devices of varying voltage levels on the TCC, you now have the option to show the conversion factor between them.
 - b. Right-click on TCC drawing > TCC Settings > Layout tab.

	тхс	- Ha	Layout Fauit Current Background All Devices Arc Hash Notes
			Current Axis Range
	F1TXC		Min: D.E Max: 10000
	CB1 SWBD		Time Axis Range
			Min: 0.0100 Max: 1000
			Reference Voltage: 480
			Current Scale X 10 [^] : 1
			Show One-Line Name
-			TX0 Show Hault Type
ļ			OK Cancel Help
	1 10	100	

- 22. Use highest or lowest voltage as the reference in TCC drawings.
 - a. Option to use the highest or lowest voltage of the selected devices when creating a TCC drawing from the GoTo menu.
 - b. Go to: Project > Options > TCC > TCC Layout.

Options	×
Option Groups: Startup Application Project Titles and Logo One-Line Report Library Miscellaneous Files Arc Flash Equipment Evaluation TCC User-Defined Fields Multi-User Meter	Current Axis Range Min: 0.5 Max: 10000 Time Axis Range Min: 0.0100 Max: 1000 Reference Voltage New TCC: • Use Highest Voltage from Go To devices
Option Subviews: Device Appearance Device Flag Device Datablock TCC Layout TCC Fault Current TCC Bauk Current TCC All Devices OK Cancel Help	480 Volts Use Lowest Voltage from Go To devices Current Scale X 10^: 0 Show One-Line Name Show Fault Type Show Multiple Voltage Scales

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

- 23. Ability to hide arcing fault and user-defined flags for printing purposes.
 - a. Option to not display the arcing fault and user defined flags on TCC drawings when printing.
 - b. Go to: Project > Options > TCC > TCC All Devices :

Options		×
Option Groups: Startup Application Project Titles and Logo One-Line Report Library Miscellaneous Files	□ Lock Mouse Drag Pen Width: □ Device Font ○ Use Individual Font ○ Use Universal Font Arial, Regula	1+1/4 Point
Arc Flash Equipment Evaluation TCC User-Defined Fields Multi-User Meter	⊂ Pickup Label ⊂ Show <u>A</u> mps ☞ Show <u>D</u> evice Name	Short Circuit Flag C Show A <u>m</u> ps Show D <u>e</u> vice Name
Option Subviews: Device Appearance Device Flag	✓ Automatic Arrangement	Plot Parallel Cables
Device Datablock TCC Layout TCC Fault Current TCC Background TCC All Devices OK Cancel	For Printing Only Hide Arcing Fault Flags and Arc Flash Constant Category Lines Hide User-Define Flags	Exclude From Go To TCC Exclude Cables Exclude Buses Exclude Capacitors

24. Option to disable the prompt when using the GoTo TCC command when creating new TCC drawings.



Note: Go to Project > Options > Application > Clone and TCC Prompt to reset this dialog.



- 25. Ability to print onto K&E paper.
 - a. New form template has been created for K&E paper.
 - b. User-definable line widths of the axis lines and outside borders of the TCC.
- 26. Multiple Protection Functions can now be displayed on the one-line Datablock. Project > Options > Application > Datablock
 - a. Show Multiple Settings Only
 - b. Show Multiple Functions (All)
 - c. Show Multiple Settings + CTs
- 27. Added additional options to the TCC Textblock
 - a. New option to set the text and background colors.
 - b. Select Transparent or Opaque text.
 - c. Ability to change the color of the border

Textblock	×
TCC Textblock	Text ✓ Size to text Font
-	Front Color
Current Font: Arial 8	Opaque
Shadow Leader	Border Visible
Direction <u>O</u> rigin Down and right ▼	Thickness Thinnest
Dgpth Type Thin Closed arrow	Line Solid 💌
	Color
OK Cancel	Help

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

Library

28. New Thermal equations have been added to model ANSI 49 function for the following devices:

- a. SEL 701, 710, 749M
- b. Rating and Curve method
- c. Revisions R100 and R201
- d. Merlin Gerin Sepam 20, 40, 80 Series
- e. Startco FPU-32 and MPU-32

levice Class Trip Curves	5
Segment List:	Segment Data
49 Time Dial (0.1-1.5) 50P1P (0.1-20 x FLA) 50P1D (0.01-5.0 sec)	Name: 49 Time Dial (0.1-1.5)
	Type: SEL 749_R105 Service Factor Range <=: 1.50 Method: Rating Method Turn: SF <1 < 2.5
	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $
	$\overrightarrow{r} = 60 \times RTC \times Lr(\frac{l^2 - l^2}{l^2 - SF^2})$
Segment Operation	CT Pri: 100 / CT Sec $T_p = LRTNOT \times TD \times LRA^2$
New Cut	C Disc Step: C Cont 0.010C

29. Added quick search and query capability when searching for devices.

a. When searching for devices in the library you can use up to seven filter criteria to help you find what you need.

	\sim	\sim				
All Search Manufacturer:	Al Manufacturers)	Desc:		Amps Rating: < 💌		Voltage: < 🗸
Manufacturer Type	ABB	🔷 🛛 🗌 Voltage	TCC No.	Catalog No. Date Time Created	Date Time Modified	
	BBC					
	CARRIERE					
	CHALLENGER					
	CUTLER-HAMMER					
	EATON					
	FEDERAL PIONEER					
	FUCHS					
	UE .					
	GE1	~				
	HYUNDAI					

30. Selective coordination screen

a. Added a column/field to the library to be able to determine if a device has selective coordination information.

ufacturer Type	Descrip	otion		Voltage TCC No.	Catalog No. SelCoor Notes	
JTLER-HAMMER CHKD, Optim 550	LS (LT	D=I4t), 63-40	IQA.	600 SC-6926-98, 6927	. CHKD3 IA01200002E	
Z:\PERSONAL\BROC.FINNEGAN\PTW_R	EMOVED_M	C_DUPLICA	TES.LIB :	CUTLER-HAMMER, CHKD, Optin	n 550, LS (LTD=I4t), 63-400A - Static Trip	
		b Selection	Coordina	tion		
evice Hame Sensor Hug Thip cur	res AIC Flas	II Delective	Coordine			
lpstream Device Frame / Sensor.	Down	stream Devic	e No	tes: IA01200002E		
CHKD 240V 136A 100+A / 62A	-	-			- 1	
CHKD 240V 125A 100kA / 70A	<u>^</u>	lsc kA	Series	Frame	Device	
CHKD, 240V, 125A, 100kA / 90A		11400 0000	naleu			
CHKD, 240V, 125A, 100kA / 100A	1	3.00		BAB, 240V, 15A, 10kA	BAB, 1-Pole10-70ASC-3500-77C	
CHKD, 240V, 125A, 100kA / 110A	2	3.00		BAB, 240V, 15A, 10kA	BAB, 2-Pole10-125ASC-3501-77C	
.HKD, 240V, 125A, 100kA	= 3	3.00		BAB, 240V, 15A, 10kA	BAB, 3-Pole15-100ASC-3502-77C	
JHKD, 480V, 125A, 65KA / 63A	4	2.50		BAB, 240V, 20A, 10kA	BAB, 1-Pole10-70ASC-3500-77C	
CHKD, 480V, 125A, 65KA / 70A	5	2.50		BAB 240V 20A 10kA	BAB 2-Pole10-125ASC-3501-77C	
THKD 480V 125A 65kA / 100A	6	2.50	F	BAB 240V 20A 10kA	BAB 3-Pole15-100ASC-3502-77C	
CHKD 480V 125A 65kA / 110A	7	2.50	-	DAD 2401 25A 10KA	PAP, 1 Pala10 70ASC 2500 77C	
CHKD, 480V, 125A, 65kA	1	2.50	-	DAD, 2407, 254, 10KA	DAD, 14 01610-10430-3300-770	
CHKD, 600V, 125A, 35kA / 63A	8	2.50	-	DAD, 240V, 23A, TUKA	BAB, 2-FOIETU-120A3C-3001-77C	
CHKD, 600V, 125A, 35kA / 70A	9	2.50	1	BAB, 240V, 25A, 10KA	BAB, 3-Pole15-100ASL-3502-77L	
CHKD, 600V, 125A, 35kA / 90A	10	2.50	1	BAB, 240V, 30A, 10kA	BAB, 1-Pole10-70ASC-3500-77C	
HKD, 600V, 125A, 35KA / 100A	11	2.50	12	BAB, 240V, 30A, 10kA	BAB, 2-Pole10-125ASC-3501-77C	
2HKD, 600V, 125A, 35KA7 110A	12	2.50	- E	BAB, 240V, 30A, 10kA	BAB, 3-Pole15-100ASC-3502-77C	
CHKD 240V 250A 100kA / 125A	13	1.50		BAB, 240V, 35A, 10kA	BAB, 1-Pole10-70ASC-3500-77C	
CHKD 240V 250A 100kA / 150A	14	1.50		BAB, 240V, 35A, 10kA	BAB, 2-Pole10-125ASC-3501-77C	
CHKD, 240V, 250A, 100kA / 160A	15	1.50	Г	BAB 240V 354 10k4	BAB 3-Pole15-100ASC-3502-77C	
CHKD, 240V, 250A, 100kA / 175A	40	1.50	-	DAD 0404/ 404 1054	040 1 D-I-10 70400 3500 770	
THKD 240V 250A 100kA / 200A		102020202	on of the	a second second second second		

- 31. Allow for maximum settings as a function of various ratings for modeling of devices.
- 32. Continuous settings can now be entered in amperes.
- 33. Option to enter minimum interrupting current for fuses.
 - a. When a value for minimum interrupting current is entered into the library it will display smaller values on the TCC with a dotted line.



- 34. Delay segments (definite time) in the library can be entered in seconds, cycles, ms, or 100ms.
- 35. New library categories: Generator decrement curves and Recloser 2
 - a. Generator decrement curves can now be stored under Motor/Gen Protection

				-			
C:\Documents and Settings\broc.fin	All Search Manu	facturer: KAII Manufacture	🐼 💌 Type:	Desc:	TCC#	Amps Rating:	Isc kA: < 💌
⊕ bow Voltage Breakers	Manufacturer	Туре	Description	Voltage	TCC No.	Catalog No. SelCoor Notes	Date Time Creal
Motor/Lien Protection	CATERPILLAR	SR4B, Frame 824	1500 · 1725kW	480			12/17/2007 7:5
Motor Circuit Protector							
- ∉O Motor/Gen Relay							
Generator Decrement							
E - D Fuses							
H-HV/MV Breakers							

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

b. Added a new recloser category to support all breaker functions and relay equations with a tolerance.

C:\Documents and Settings\broc.fi	All County	Manufacture: All Manufactures		- Davis -	TOOM Annu Bating	
🛱 🏮 CAPTOR	All Search	Manufacturer. Jown Manufacturers	v • Type:	Desc:		
∃ Low Voltage Breakers	Manufacturer	Туре	Description	Voltage	TCC No. Catalog No. SelCoor Notes	Date Time 🔨
(M) Motor/Lien Protection	COOPER	ETC Control	Phase/Ground, B-N	35000	R280-91-31	3/6/2007
Motor Diver Load	🟚 COOPER	Form 3A, CVE/CXE/CZE	Ground, 1-18 & K	72500	R280-91-25/ S280	1/5/2007 =
- O Motor/Gen Belay	🛱 COOPER	Form 3A, CVE/CXE/CZE	Phase, A-Z	72500	R280-91-25/S280	1/5/2007
Generator Decrement	COOPER	Form 3A, ME	Ground, 1-18 & K	15500	R280-91-25 / S28	1/5/2007
	🛱 COOPER	Form 3A, ME	Phase, A-Z	15500	R280-91-25	1/5/2007
	COOPER	Form 3A, MLE	Ground, 1-18 & K	15500	R280-91-25 / S28	1/5/2007
HV/MV Breakers	COOPER	Form 3A, MLE	Phase, A-Z	15500	R280-91-25	1/5/2007
Specialty Devices	COOPER	Form 3A, MVE	Ground, 1-18 & K	27000	R280-91-25 / S28	1/5/2007
🖳 🖪 Recloser	COOPER	Form 3A, MVE	Phase, A-Z	27000	R280-91-25	1/5/2007
Specialty Device	COOPER	Form 3A, PWE/PWVE	Ground, 1-18 & K	27000	R280-91-25 / 285	1/5/2007
Recloser 2	COOPER	Form 3A, PWE/PWVE	Phase, A-Z	27000	R280-91-25 / 285	1/5/2007
	COOPER	Form 3A, RE/RVE/RXE	Ground, 1-18 & K	27000	R280-91-25	1/5/2007
	🛱 COOPER	Form 3A, RE/RVE/RXE	Phase, A-Z	27000	R280-91-25	1/5/2007

36. Added all existing relay equations to the breaker categories and enabled equation tolerances. 37. New protective devices added:

Approximately:

- -160 new Static Breakers
- -80 new Ground Fault Breakers
- -110 Thermal Magnetic Breakers
- -110 LV Fuses
- -100 HV Fuses
- -60 Electronic Relays
- -35 Motor relays
- -200 HV Breakers
- -250 Reclosers
- -40 Switches
- -Others Approximately 1400 new devices.
- 38. Updated manufacturer specific incident energy/flash boundary equations in the protective device library "Arc Flash" tab:
 - b. Equations in the back of the IEEE 1584 standard
 - c. Various manufacturer specific data.
 - d. Units can now be changed for the 'Current From' column.

Device	Fuse Rating	Trip Trip	Curves At	rc Flash						
Frame	e Size List:	Equipr	nent-Specific	: Equations f	or Incident En	ergy and Fla	ash Boundary	r.		
40.0 45.0	Amp 🔨 Amp		Current From	kA To	A2	A	В	C2	с	D
50.0	Amp	1	1.16	1.60	0.00	-77.0226	152.1090	0.00	0.0000	0.0000
70.0	Amp	2	1.60	3.16	0.00	-17.8346	57.4080	0.00	0.0000	0.0000
80.0	Amp	3	3.16	106.00	0.00	0.0000	1.0460	0.00	0.0000	0.0000
90.0	Amp	4								
100.0	Amp	5								
110.0	Amp	6								
125.0	Amp	7								
175.0	Amp	8								
200.0	Amp	9								
225.0	Amp	10								
250.0	Amp									
350.0	Amp	•								•
400.0	Amp									
450.0	Amp	kA Fror	m < lbf <= kA	То	Current Fror	n Unit 🛛 kA			▼	
500.0	Amp	Inciden	t Energy (ca	lories/cm^2)) = A2 * lbf^2 +	A*lbf+B				
600.0	Amp 🧹	Elech E) (C		9.0*ILF.D					
1		Flash E	soundary (cr	n) = C2 ~ 16t	2+0"lbt+D					

39. Added ability to select a different CT secondary current from the component editor without having to select a new library file.

🗌 Component Editor - Scenario[Base Project]					
Component Subviews:	Scenario Manager				
Protective Device Settings	Model: BE1-50/51B	•			
Reliability Data User-Defined Fields Datablock	CT Ratio: 400				
All ▼ Jump	Segment:	Setting1 Setting2			
	2 I, Inverse	• 6.9 • •			
D LVP3	INST	▼ 19			
LVP4	🗹 4 INST Delay, SW3-2 & -3	▼ Both Off ▼			
Ф МСР М28 #3	5				
ф мСР м28 #4 💛	Library Eunction	Phase Notes			
D R G2 ▼ Expand Shrink	Insert Segm	Adder/Shifter/TestPoint			

40. Added a section to identify the test standard in the library for ANSI, IEC, or UL.

Device Frame	Trip Plug Trip Curves Arc Flas	h Selective Coord	lination	
Manufacturer:	GE	Type:	FC, 2 & 3-Pole 600V	
Description:	15-100A	Max Voltage:	600	
TCC No:	DES-013B to -025B	Catalog No:	FCTER_	
C DC Device			☐ Use Arc Flash Equation Number of Poles	
08/05 Record Plus Ty	ире FC			*

41. For Arc Flash, added an option to treat fuses as current limiting (yielding ½ and ¼ cycle trip times) or to use the equipment specific equations in the Arc Flash tab.

C:\USERS\BROG	C.FINNEGAN\DESKTOP\P1 iting Trip Trip Curves	TW VERSIONS\PTW32_TESTING\LIB\PTW.LIB : BUSSMA 👝 💷 🔤
Manufacturer:	BUSSMANN	Type: LPJ, 600V Class J
Description:	1-600A	Max Voltage: 600
TCC No:	See Notes	Catalog No: LPJSP
DC Device	Current Limitin	g (1/4 or 1/2 cycles Trip Time) 🔽 Use Arc Flash Equation
Test Standar C ANSI © UL O IEC Notes:	d	
Amp Range 1-12A 15-600A	Min. Melt 363 (4-15-91) 51017 (5-15-02)	Total Clearing 364 (4-15-91) 50913-2 Rev. A (5-15-02)
Manufacturer's 200, 250, 400,	TCC only lists curves for 1, 2 and 600A. All intermediate c	2. 3, 5, 6, 8, 10, 12, 15, 30, 60, 80, 100, 125, urves interpolated based on these curves.

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

Datablock

42. Display "Settings" for protective functions in the datablock.

- a. Added several new attributes to the datablock for protective devices.
- b. One example would be the LTPU, LTD, STPU, STD, INST, INST Delay, GFPU, and GFD settings as individual fields. All settings were previously combined.



DAPPER, A_FAULT, and Sizing

- 1. Swing bus definition is no longer required for all fault calculations. The generator with the biggest kVA rating as the swing bus will be used to provide fault current calculations.
- 2. Option to include or exclude Load Flow Current in the Comprehensive Fault.



3. Calculated data for LF_KW, LF_KVAR, LF_KVA, LF Amp LF_PF and PFunits at Bus Output is now saved. These fields provide a summary of the load flow for a "Down-stream system" from a "Bus" point of view. One of many interesting usage of these fields is to show the effective PF after a PFC is applied to a bus. From the system illustrated below, the PF improved from 0.8 to 0.96 after inserting a 176 KVAR capacitor bank.



DAPPER, A_FAULT, and Sizing (cont'd)

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

4. New option for ANSI Fault to report "Complete" or "Summary" 30-cycle results.

30 Cycles Duty		Report:	Complete	•	
	ОК	Canc	Summary	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

5. New option for Sizing program to limit maximum cable size and parallel conductor permitted by user-defined values. The maximum parallel permitted cable entered by user will be used as the ceiling of the parallel conductor permitted instead of the available data in cable library.

Sizing Options		
• Use maximum cable size and p	parallel conductors	To meet conditions:
permitted from selected Cable	Library	1. Number of parallels allowed
C Limit maximum cable size to:	1200 AWG,	2. Branch voltage drop limit under FLA
Limit parallel conductors permitted to:	5 #	3. Minimize circular mils.
 Limit maximum cable size to: Limit parallel conductors permitted to: 	1200 AWG, 5 #	 Branch voltage drop limit under FLA Minimize circular mils.

6. Added optional Schedule Report to select multiple formats, and to report each selected format in a different file.

Unbalanced/Single Phase Study Setup				
Studies DL Sizing LF SC Sche	edule DMS LF SE OPF Output			
Panel Report Setup C All Loads on 1st Pole Individual Loads on Individual Poles	Panel Format: Format 2: Center Circuit/Phase Totals Format 3: Left/Right Circuits Format 4: Left/Right Circuits and Load Qty			
	Format 5: Left Circuits and Load Qty Format 6: Left/Right Circuits and Notes			

- 7. Content and name of ampacity and voltage drop reference tables in the IEE Wiring category of the PTW library has been updated based on the 17th Edition of the IEE Wiring Regulations.
- 8. IEE Wiring cable library consists of new descriptions based on the updated names of the ampacity and voltage drop tables in the 17th Edition.

TRANSIENT MOTOR STARTING (TMS)

TMS has been enhanced and includes the power and capability of the I*SIM study module to the extent required for motor starting analysis.

Modeling

 Added access and application of dynamic models for sources of supply such as generators and utilities in TMS > Source Model Setup. This was previously available only in the I*SIM study module.

TMS - Source Mode	Setup 🔀
Source Name: G1	Bus Name: 008-DS SWG1 Voltage: 4160 V
- ISIM Source Library-	Library
Machine Model:	Round Rotor Steam Unit < 300MVA (Round Rotor Fossil Steam < 300 MVA)
Exciter Model:	1981 IEEE Type AC1 (1981 IEEE Recommended Type AC1)
Governor Model:	Standard Steam Turbine (Standard Steam)
	OK <u>H</u> elp

2. Addition of Flux Induction Motor modeling concept to Motor Model in I*SIM / TMS library.



ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

3. Addition of Polynomial and Damping load modeling concept to the Load Model in I*SIM / TMS library.

🚰 C:\PTW32\LIB\PTW.LIB : Equation2Load1 - F	Polynomial
Equation 2 Load	
Name: Equation2Load1	T - Torque %
$T = T_0 \qquad \text{rpm} = 0$ $T = A_0 + A_1 \text{rpm}^{P_1} + A_2 \text{rpm}^{P_2} + A_3 \text{rpm}^3 \text{rpm} > 0$	40
Synchronous RPM: 1800	≈ 39-
Rated <u>T</u> orque: 1518 ft-lbs	
Moment of Inertia: 235 WK2 (Ib-ft2)	Ĕ ₃₇ Ē
Unit of Torque in: ft-lbs	
T0: 560 rpm = 0, Break Away Torque	36
A0: 530 rpm > 0	35
A1: 0.05 P1: 1.000	0 10 20 30 40 50 60 70 80 50 100
A2: 0.000000 P2: 2.000	Speed %
A3: 0.000000 P3: 3.000	Update

C:\PTW32\LIB\PT	TW.LIB : Damping1 - Damping	
Damping Load		
<u>N</u> ame:	Damping1	
[$T = T_n \cdot (1 + s)^D$	
Nominal Torque (T	Tn): .8 Per Unit	
Inertia Time Consta	ant: 1 Sec.	
Damping (D)	2	

4. Addition of Variable Frequency Drive as a new Starter and Controller Model for motor starting analysis.

Aotor	C X
Models D	ynamic Events
Motor and	I Load Model Library
Library.	Deselect Motor Model: Flux Induction Motor Deselect Load Model: JSIM Load Model
Current Ba	se: 411.722 A Torque Base: 8868.625 ft-lbs Link with Rated
Moment of Wk2: 19 Starter an	f Inertia for Motor Only 99.982 bs-ft2 Approximate d Controller Models
Model:	Full Voltage Full Voltage Solid State Current Ramp Solid State Current Imit Series Reactance Series Resistance Series Resistance Star Deta Part Working
	Auto Transformer Save As the Default Variable Frequency Drive
	OK Cancel Apply Help

Interface

1. The Transient Motor Starting Subview is now removed from the Component Editor. You can access this window now by highlighting a motor in a TMS case, right mouse click, and then select the "Model Setup & Dynamic Events" options. This allows the same motor component in the project to have different model and dynamic event saved for each case. This makes the comparison between cases easier.

The "Save As Default" and "Get Default Setting" functions are designed to make the process of assigning motor, load, and controller for multiple TMS cases easier.

"Save As Default" button

When the user clicks on this button, all the information in the "Models" tab page will be save as the default settings for the selected motor. These values will be used whenever the user assigns the same motor to an existing case or onto a new case for the project. "Get Default Setting" button

When the user clicks on this button, all the information in the "Models" tab page will be filled in by the default settings.

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

2. Double clicking on any motor modeled within TMS will display the following interface for data editing.

- 3. Addition of available Sources to TMS. Selected Components for each case can now include application of dynamic models from the library (Machine, Exciter, Governor) for the sources of supply.
- 4. Addition of Branch to available Select Components for each case to monitor P, Q, and I as new output data channels.

TMS - Select Components	TMS - Select Components
Source Motor Bus Branch	Source Motor Bus Branch
Available Sources	Available Branches Selected Branches
	C1 C11 C12 C12 C14 C13B C16 C13B C17 C13B C18 C13B C19 C13C C3 C4 C5 C6 C7 V
Connection Info: 008-DS SWG1	Voltage (V):
Voltage (V): 4160	From Bus: 027-DSB 3 480
Status: In Service	To Bus: 028-MTR 28 A 480
	Status: In Service
Close Cancel Apply Help	Close Cancel Apply Help

Motor B	ranch			
A A	0	O.		
(A) (A)	<u>}</u> {	8. (S)	1. CAS	فال
la la		K /	N S	
C11				
C13 A	V			
C12 D	-			

- MS_Folder1_Cas <u>- 0 ×</u> G 4 EN 1 Bus Name Complex numbers: Rated Power PF 6 Motor tag lflc Load Factor Istart/IfIc PF start lstart 1 1.00 s **[A]** 601.41 **[A]** 4209.85 7 8 028-MTR 28 A [**kW]** 415.00 Start 1 Run 1 0.83 M 28 # 1&2 6.24 9 TOTAL AMPS STARTING 10 TOTAL AMPS WHEN RUNNING 11 12 025-MTR 25 1604.30 0.82 271.53 1.00 4.00 0.06 1900.71 M25 13 TOTAL AMPS STARTING 14 TOTAL AMPS WHEN RUNNING 15 2104.92 2104.92 16 028-MTR 28 B 207.50 300.70 1.00 6.24 2104.92 300.70 M28#3 0.83 0.06 Х 17 028-MTR 28 B
 17
 028-MTR 28 B
 M28 #4

 18
 TOTAL AMPS STARTING

 19
 TOTAL AMPS WHEN RUNNING
 207.50 0.83 300.70 6.24 0.06 1.00 2104.92 2104.92 300.70 300.70ロ 20 21 If I I I TM5_Folder1_Case2 14
- 5. New Excel report for group motor acceleration/starting.

6. New Excel report for TMS study results of all selected plot channels at user-defined interval.

E] T	MS_Folder1	_Case2_Ch	annel.xls										_	
	Α	В	С	D	E	F	G	Н		J	K	L	M	
1	Channel Dat	1												_
2														
3		Motor: M 28	#1&2											
4	Time	rotor_spd	v_terminal	i_line	i_stator	i_rotor	elec_torq	mech_torq	acc_torque	power_facto	r motor_slip	power_elec	q_elec	
5	0.0	1785.799	0.000	511.325	0.000	0.000	0.000	1492.907	-1492.907	0.731	0.008	317.894	296.620	
6	0.1	1785.890	492.578	510.540	510.540	0.000	1493.290	1493.054	0.236	0.727	0.008	316.704	299.043	
7	0.2	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062	
8	0.3	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062	
9	0.4	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062	
10	0.5	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062	
11	0.6	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062	-
	II I I III TM5_Folder1_Case2													

HI_WAVE

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

1. Added new Harmonic Source Subview to Component Editor for the VAR Compensator, Generator, and Schedules components as the source of harmonic for HI_WAVE.

🔟 Component Editor - Scenario[Base Project]	Component Editor - Scenario[Base Project]
Component Subviews: Harmonic Source Library Var Compensator Harmonic Source Library Reliability Data Optimal Power Flow User Defined Fields Datablock Scenario Manager Go To Jump * Mark Coop * Expand Shrink	Component Subviews: Schedule Panel Notes Harmonic Source Library Detablick Scenario Manager Scenario Manager Scenario Manager Scenario Manager Scenario Manager Bablick Bablick Scenario Manager Bablick B

- 2. Added Harmonic Models for 6, 12, and 18 Pulse Drives with 0%, 3%, 5%, and 8% Line Reactors in HI_WAVE section of PTW library.
- 3. The resistance portion of Synchronous Generator, Cable, and Transmission Line components are now changed based on the harmonic frequency per recommended modeling concept in section 10.5 of IEEE Standard 399-1997 (Brown Book).
- 4. The impact of motor drive AC reactor on reduction of injected harmonic currents by the drive can now be considered through adding the Line Reactor % to Motor Controller (VFD).

Name: VFD-0001	Line Side Short Circuit Info Load Side Short Circuit Info
Rated Size: 3000.0000 kW PF: 0.87 Rated Voltage: 4160 V (L-L) Efficiency: 0.93 Line Reactor: 5.00 % Service Factor: 1.00 Manufacturer:	✓ Regenerative/Four-Quadrant ✓ 100% Let-through on Load Side Contribution to Line Side Contribution to Load Side 3P: 150 % Rating SLG: 50 % Rating X/R: 8.000 X/R:
Bus Connection From: 010-MTR 10 To: BUS-0005	3P: % kVA Rating (for 3 phases) SLG: % kVA Rating (for 1-phase) By Pass Mode Impedance Based on Rated kVA Z% X/R Pos: 0.00001 8.0000 Zero: 0.00001 8.0000

HI_WAVE (cont'd)

- 5. The Voltage and Current Distortion models from HI_WAVE Library can now be used at the same time to represent the impact of both on the total voltage and current Distortions in electrical system.
- 6. Expanded the Load Flow Setup Menu for HI_WAVE to use the Newton Method as the new LF solution method covering the Load Tap Changing (LTC) transformer model.

Load Flow Study	
System Modeling Include Utility Impedance Include Swing Generator Impedance Image: Transformer Phase Shift Image: LTC Transformer Calculation Method	Solution Method <u>Exact (Iterative)</u> <u>Approximate</u> Max. Iteration: 50
C <u>C</u> urrent Injection (Newton Mismatch (KVA): 0.348085 User Defined Mismatch (√oltage): 1e-005
Load Specification Directly Connected Loads From Demand I <u>C</u>onnected Load <u>Demand</u> <u>Demand</u> <u>1st Level Demand or Energy Factor</u> Design I <u>Design I</u> 	Load Study I Load Load
Solution Criteria Bus Voltage Dr Generation Acceleration Factor: 1 Bus Voltage Dr Load Acceleration Factor: 1 Branch Voltage	op %: 5 Drop %: 3
OK Cancel <u>H</u> elp	

INDUSTRIAL SIMULATION (I*SIM)

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

New industry accepted motor and load models have been added to I*SIM. I*SIM is now capable of modeling and analyzing more extensive motor starting than ever before. I*SIM will be a good choice for transient motor starting as well as transient stability analysis if more sophisticated and detailed scenarios are needed in comparison with the newly enhanced TMS study module.

Modeling

- 1. Added the availability and application of dynamic models for all Motor and Load models currently available in newly enhanced TMS module. This also includes Flux Motor Models. The new models consists of:
 - a. Motor Model
 -Single Rotor
 -Double Rotor
 -Graphical Motor
 b. Load Model
 - -Exponential -Graphical Load -Polynomial
 - -Damping



2. Add the availability and application of all Starter and Controllers Models currently available in TMS module study module including the Variable Frequency Drive.

Motor	Motor
Models Dynamic Events Motor and Load Model Library Deselect Library Deselect Load Model: Typical Dbl Rtr Library Deselect Load Model: 2000 HP FAN Current Base: 2715300 A Torque Base: 5912.4170 tHbs Moment of Inertia for Motor Only Vk2: 1234.2800 Ibs-ft2 Approximate Starter and Controller Models Model: Full Voltage Solid State Ourrent Ramp Solid State Ourent Ramp Solid State Voltage Ramp Solid State Ourent Ramp Solid State Ourent Limit Series Reactance Series Reactance Shurt Cepacitors Shurt Cepacitors Shurt Cepacitors Shurt Delta Part Vinding Part Vinding Save As Default Vanable Frequency Drive Venes Default	Models Dynamic Events Motor Name: M25 Bus Name: Event Data Bus Voltage: 4160 V Initial Status Time Dependent Event © Off Line On Line Event List: Status 1.00 Statt @ Time Qn Line 2000 Trip @ Time Voltage Multiplier: 2000 Trip @ Time Voltage Dependent Event C Start Motor Voltage: Other Bus Voltage: Other Multiplier: Delete Event Other Multiplier: Delete Event Other Multiplier:
OK Cancel Apply	OK Cancel Apply Help

INDUSTRIAL SIMULATION (I*SIM) (cont'd)

3. New Excel report for group motor acceleration/starting.

<u>عا</u>	🖳 TMS_Folder1_Case2_Input.xls											
	A	В	С	D	E	F	G	Н	1	J	K	L 🖌
4												
5				EQUIF	MENT							
6	Bus Name	Motor tag	Rated Power	PF	lflc	Load Factor	lstart/lflc	PF start	lstart	1	Complex I	numbers:
7			[kW]		[A]				[A]	1.00 s	Start 1	Run 1
8	028-MTR 28 A	M 28 # 1&2	415.00	0.83	601.41	1.00	6.24	0.06	4209.85			
9	TOTAL AMPS START	FING										
10	TOTAL AMPS WHEN	RUNNING										
11												
12	025-MTR 25	M25	1604.30	0.82	271.53	1.00	4.00	0.06	1900.71			
13	TOTAL AMPS START	FING										
14	TOTAL AMPS WHEN	RUNNING										
15												
16	028-MTR 28 B	M28#3	207.50	0.83	300.70	1.00	6.24	0.06	2104.92	х	2104.92	300.70
17	028-MTR 28 B	M28 #4	207.50	0.83	300.70	1.00	6.24	0.06	2104.92			
18	TOTAL AMPS START	FING								2104.92	2104.92	
19	TOTAL AMPS WHEN	RUNNING								300.70ロ		300.70
20												
21												
4	(()) TMS_Folder1_Case2 /											

4. New Excel report for I*SIM study results of all selected plot channels at user-defined interval.

₿] T	MS_Folder1	_Case2_Ch	annel.xls										
	Α	В	С	D	E	F	G	Н		J	K	L	M $\overline{+}$
1	Channel Dat	2											
2													
3		Motor: M 28	#1&2										
4	Time	rotor_spd	v_terminal	i_line	i_stator	i_rotor	elec_torq	mech_torg	acc_torque	power_factor	motor_slip	power_elec	q_elec
5	0.0	1785.799	0.000	511.325	0.000	0.000	0.000	1492.907	-1492.907	0.731	0.008	317.894	296.620
6	0.1	1785.890	492.578	510.540	510.540	0.000	1493.290	1493.054	0.236	0.727	0.008	316.704	299.043
7	0.2	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062
8	0.3	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062
9	0.4	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062
10	0.5	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062
11	0.6	1785.892	492.589	510.516	510.516	0.000	1493.220	1493.056	0.164	0.727	0.008	316.672	299.062 📿
		_Folder1_C	ase2/					1	•				/ اح

5. Added new turbine governor models:

🚰 C:\PTW32\LIB\PTW.LIB		
E 🚸 C:\PTW32\lib\PTW.lib	Name	Model Type
E CAPTOR	Ocombustion Turbine CT251	User Defined Model
B 🗗 🗗 I*SIM / TMS	S Compound Double Reheat Steam Turbine (ST3)	User Defined Model
Machine Model	S Compound Single Reheat Steam Turbine (ST2)	User Defined Model
Synchronous Motor Model	S Detroit Diesel DDEC Governor Turbine (DDEC)	User Defined Model
Flux Induction Motor Model	S Diesel Engine (DT)	User Defined Model
E Exciter Model	🛇 Gas Turbine Governor (GT2)	User Defined Model
Governor Model	🛇 Gas Turbine Governor (non-windup limit) GT3	User Defined Model
A C Motor Model	🛇 Gas-Turbine (GT)	User Defined Model
	S GE H25 Governor Droop	User Defined Model
	S GE H25 Governor Isochronous	User Defined Model
	GE101 DLEDF	User Defined Model
	GE101 DLEDF1 Gas	User Defined Model
H 44 Iransmission Line	S General Isochronous	General Purpose
Transformer	🛇 General Use	General Purpose
	S General Use Switching From Droop-to-Iso in 4s	User Defined Model
🕀 🕵 IEE Wiring Cable	🛇 Hitachi H25 Governor	User Defined Model
■ 7 Single Core - PipeType	SIEEE Gas-Turbine (SGT)	User Defined Model
- 😥 Motor Control Center	🚫 Isoch. Diesel Tmax = .165	Isochronous Diesel
Bus	🚫 Isoch. Diesel Tmax = .22	Isochronous Diesel
🚽 🗗 Load Profile	🚫 Isoch. Diesel Tmax = .325	Isochronous Diesel
🗄 🔆 Reliability	S Isochronous Diesel	Isochronous Diesel
🛨 🛋 DC Equipment	S Isochronous Solar Turbine	User Defined Model
	SRB211 Isochronous	User Defined Model
	Simple Gas Turnbine	Simplified Gas
	Single Reheat Steam Turbine	User Defined Model
	Solar Single Shaft Turbine (droop mode)	User Defined Model
	Solar Single Shaft Turbine (isochronous)	User Defined Model
	Standard Hydro	Standard Hydro
	Standard Steam Turbine	Standard Steam
	Synchronous Diesel	Synchronous Diesel
	SWoodward 2301A	User Defined Model
	S Woodward PID 701A	User Defined Model

UNBALANCED/SINGLE PHASE

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

- Datablocks with "UbSC_xxxSimFault" has been renamed and enhanced to the following format: "UbSC_xxx". For example, "ubSC_InitSymSimFault" to "ubSC_InitSym." The following fields now store the unbalanced SC results based on the last unbalanced short circuit study option that was completed: either a Fault bus by bus or simultaneous faults. This will keep the datablock to a minimum (it is now not necessary to list datablocks for 3P, SLG, LL, LLG, etc. if you are only looking for the results that was previously evaluated).
- 2. Added option in Unbalanced/Single Phase Load Flow to include utility and swing generator impedance separately and option to use the sub-transient or transient impedance.

Unbalanced/Single Phase Study Setup								
Studies DL Sizing LF SC Sched System Modeling ✓ Include Utility Source Impedance ✓ Include Swing Generator Impedance Swing Generator ● Sub-transient (R + Xd") ● Transient (Ra + Xd') ● Transformer Phase Shift ● LTC Transformer	dule DMS LF SE OPF Output Solution Method Exact (Iterative) Approximate Calculation Method Radial System Newton							

3. Added option in Unbalanced/Single Phase Short Circuit use the sub-transient or transient impedance as swing generator impedance, and option for cable temperature adjustment.

Unbalanced/Single Phase Study Setup 🛛 🔀								
Studies DL Sizing LF SC Sc	hedule DMS LF SE OPF Output							
Fault All Buses	○ Fault Selected Buses							
IV <u>3</u> Phase IV <u>S</u> LG A ▼	 Fault <u>O</u>ne by One Si<u>m</u>ultaneous Fault 							
	Faulted <u>B</u> uses and Configs							
Generator Impedance	Cable Resistance Adjustment							
 Sub-transient (R + Xd") Transient (Ra + Xd') 	Temperature:							

UNBALANCED/SINGLE PHASE (cont'd)

- 4. Swing bus definition is no longer required for fault calculations. The generator with the biggest kVA rating as the swing bus will be used to provide fault current calculations.
- 5. Option to include or exclude Load Flow Current in the Unbalanced/Single Phase Short Circuit.
- 6. Added option in Unbalanced/Single Phase Schedule to select multiple formats, and to report each selected format in a different file.

Unbalanced/Single Phase Study Setup								
Studies DL Sizing LF SC Sche	edule DMS LF SE OPF Output							
 All Loads on 1st Pole Individual Loads on Individual Poles 	Format 2: Center Circuit/Phase Totals							

7. Option to report Arc Flash results on the schedule header.

Benort on Schedule Header	
Arc Flash Incident Energy, Flash Boundary, and PPE Category	

DC SYSTEMS ANALYSIS

ENHANCEMENTS FOR POWER*TOOLS FOR WINDOWS VERSION 6.5

1. Added a new Derating Factor field in the Battery Subview of Component Editor to represent the aging factor of the battery capacity. This factor will be multiplied by the Battery Discharge Curve values to give the actual derated Amps and Amp-hours of the battery capacity.

Component Subviews:						
Battery Sizing Short Circuit (ANSI) User-Defined Fields Datablock	Name: BAT-0001 Library Image: Link to Lib Battery Type: Lead Acid Manufacturer: NONE	Data State: Complete				
Scenario Manager	Description: Typical Data					
All Jump	Rated Voltage: 250.000 Volts Num	n Positive Plate: 73				
BUS-0001	Number of Cells: 108 Min 1	Voltage (V/Cell): 2.130				
BUS-0004 BUS-0002	Bus Type: 🖲 V Bus 🔿 P Bus Dera	ating Factor: 0.8				
LOAD-0001 LOAD-0002	Notes:					
〒 <u>BAT-0001</u>						

2. The Load Flow Setup menu has a new option for considering the source impedance for Battery and Swing Generator.

DC Study Setup							
Battery Sizing Setup Load Flow ANSI SC IEC SC							
Maximum Iteration:	50.00						
Mismatch (Voltage):	0.0001						
Bus Voltage Drop:	5.00	%					
Branch Voltage Drop:	5.00	Volts					
Time Step:	10.00	Minutes					
Total Simulation Time:	200.00	Minutes					
Double Circuit Rx2							
Include Source Impedance for Battery and Swing Generator							
OK Canc	upply Help						

DC SYSTEMS ANALYSIS (cont'd)

3. The ANSI and IEC Short-Circuit Setup menus have a new option for ignoring the Battery Impedance.

Battery Sizing Setup Load Flow ANSI SC (ECSC)	
Double Circuit Px2 Ignore Battery Impedance	

4. The "Discharge Current of "Sizing" and "Temperature Correction" tabs for NiCAD Batteries model in the DC Equipment Section of PTW Library can be defined by the user for any number of time intervals.

NiCAD Battery Sizing Temperature Correction Discharge Curve															
Discharge Current for Battery Sizing:						Chaneg Time Values]\						
	Cell Type	Rated Amp-Hour	1 sec	1 min	15 min	30 min	60 min	90 min	120 min	1	т	ime Values			
	KM1040P	1040.0	2464.0	1770.0	941.0	750.0	583.0	469.0	390.0					ОК	٦
	KM1150P	1150.0	2726.0	1954.0	1041.0	831.0	645.0	519.0	431.0			Minutes			4
	KM1220P	1220.0	2896.0	2074.0	1106.0	882.0	684.0	550.0	457.0			0.0167	1	Cancel	
	KM1390P	1390.0	3299.0	2365.0	1257.0	1000.0	776.0	627.0	521.0			1.0000		Lista	1
	KM369P	369.0	878.0	627.0	334.0	266.0	207.0	166.0	138.0			15,0000		Help	
	KM392P	392.0	927.0	666.0	355.0	282.0	220.0	177.0	147.0			30,0000			
	KM415P	415.0	984.0	705.0	375.0	299.0	233.0	187.0	155.0			0000.03			
	KM438P	438.0	1041.0	743.0	396.0	315.0	246.0	198.0	164.0			90,0000			
	KM461P	461.0	1090.0	786.0	417.0	332.0	258.0	208.0	173.0			120.0000			
	KM505P	505.0	1197.0	857.0	457.0	364.0	283.0	228.0	189.0			180.0000			
	KM555P	555.0	1317.0	942.0	502.0	400.0	311.0	250.0	208.0			300.0000			
	KM625P	625.0	1480.0	1062.0	565.0	450.0	350.0	282.0	234.0			480.0000			
	KM690P	690.0	1635.0	1175.0	624.0	497.0	387.0	311.0	258.0						
	KM740P	740.0	1756.0	1260.0	669.0	533.0	415.0	334.0	277.0						
	KM830P	830.0	1968.0	1409.0	754.0	598.0	465.0	374.0	311.0						
	KM920P	920.0	2181.0	1565.0	833.0	663.0	516.0	415.0	345.0	•					
	•								•				•		



Electrical Engineering Software

• **DAPPER**[®] Integrated Electrical Analysis Software

Comprehensive Three Phase and Unbalanced Short-Circuit Studies, Load Flow Study, Demand Load Study, Feeder and Transformer Sizing Study, Impact Motor Starting Study, and Load Schedules.

CAPTOR® Time-Overcurrent Coordination

Graphical Time-Overcurrent Coordination. Integrated with one-lines, short-circuit modules, Equipment Evaluation, and Arc Flash. Comprehensive protective device library.

ARC FLASH EVALUATION

Calculates the incident energy and arc flash boundary for each bus in the system. Trip times are automatically determined from the protective device settings and arcing fault current values. Incident energy and arc flash boundaries are calculated based on accumulated fault values. Clothing requirements are specified from a user-defined clothing library. Clearing times can be reduced based on current-limiting capabilities. Complies with OSHA, NFPA 70E, NEC 110.16, and IEEE 1584 requirements. Generates custom labels and work permits. *Also available as ArcCalc, a simplified stand-alone Arc Flash calculator.*

• A_FAULT ANSI Short-Circuit Study

Three Phase and Unbalanced Short-Circuit based on the ANSI/IEEE C37 Standards. Separate solutions for low, medium and high voltage systems and for symmetrical, momentary and interrupting calculations.

IEC_FAULT IEC Short-Circuit Study 909 or 363

Three Phase and Unbalanced Short-Circuit Study based on the IEC 60909 or IEC 61363 Standards.

EQUIPMENT EVALUATION Equipment Evaluation Report

Automatically compares short-circuit ratings, withstand ratings. Applies de-rating adjustments and user defined pass/ marginal/failed criteria. Includes error checking for input data and topology.

IEE WIRING REGULATION SIZING

Integrates the rules and data tables from the IEE Wiring Regulation to size cables based on the design loads of the power system. Automatically select the correct table from the IEE Wiring Regulation and pick the proper cable size.

TMS Transient Motor Starting Simulation

Time-based motor starting simulation with graphical output. Includes reduced voltage and capacitor starting, graphical motor and load models.

HI_WAVE Harmonic Investigation and Filter Design

Frequency Scan, Harmonic Current, Voltage Distortion, Harmonic Load Flow and Interactive Filter Design.

I*SIM Dynamic Simulation and Transient Stability

Dynamic Response to Power System Electro-Mechanical Disturbances, Generator Sizing and Stability, Flux Level Machine Representation. User Defined Graphical Models for Exciter, Turbine Governor, PSS, and other controllers.

UNBALANCED/SINGLE PHASE STUDIES

Load flow, short-circuit, demand load analysis, sizing, and load schedules. Reports single-phase loads and unbalanced operating conditions including phase and sequence currents and voltages.

DISTRIBUTION RELIABILITY Reliability Analysis

Calculates the reliability indices of individual load points and the overall distribution systems with either radial or loop configuration. Includes Load Point MTTF, Failure/Year, MTTR, Annual Outage, EENS, ECOST, and other IEEE indices. Cost-related factors and aging factors are included in the analysis to compare alternative designs.

DC SYSTEMS ANALYSIS

Battery Sizing, Load Flow, & Short Circuit Analysis. Evaluate all loading conditions for DC duty cycle loads and AC emergency loads. Complies with IEEE std. 485, 1115, 399, 946, and IEC std. 61660.

PTW VIEWER

Read-only version of PTW for displaying, printing, and exporting all study results. Create or expand one-lines and apply datablocks. View Time-Current Curves. View and create customized Arc Flash Labels and Work Permits.

• **GROUND MAT** Substation Ground Grid Design and Analysis

Optimizes grid design using general purpose finite element algorithm for potential analysis and graphical facilities to validate grounding systems efficiency.

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Solves complex three-dimensional cable pulling tension and sidewall pressure calculations.













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