SKM Power*Tools®
Electrical Engineering Software

simplifying Power Systems Analysis & Design

SKM
Systems Analysis, Inc.

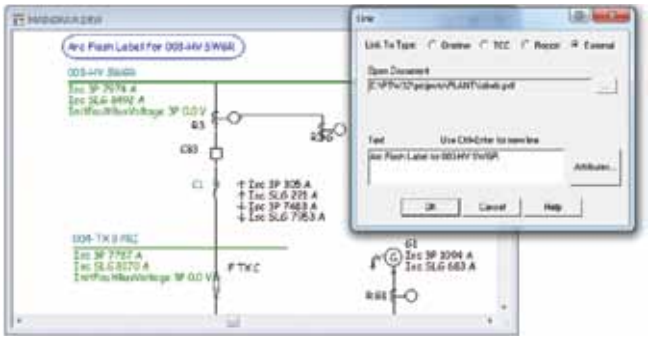
Chosen By 39 Of The Top 40 Electrical Engineering Firms In The World.

SKM SYSTEMS ANALYSIS, INC.
40th
ANNIVERSARY
1972 ~ 2012

SKM Power*Tools for Windows

INTEGRATED SOFTWARE FOR POWER ENGINEERS

Design and analyze electrical power systems with the powerful and flexible features found in SKM's Power*Tools software, the world's leading integrated power analysis software package. SKM has been bringing efficiencies to design processes for more than 40 years. Interactive graphics, rigorous calculations and a powerful database efficiently organize, process, and display information. Used by over 40,000 engineers worldwide, Power*Tools offers robust design tools and powerful modeling and documentation capabilities.



Unique Feature Links can automatically open any internal or external files and documents with ease.

Comprehensive Library

- 11,000 unique library models!
- 4,000 breaker models
- 3,500 relay models
- 750 fuse models
- Extensive equipment libraries for cables, transformers, generators, governors, excitor, motors and more!

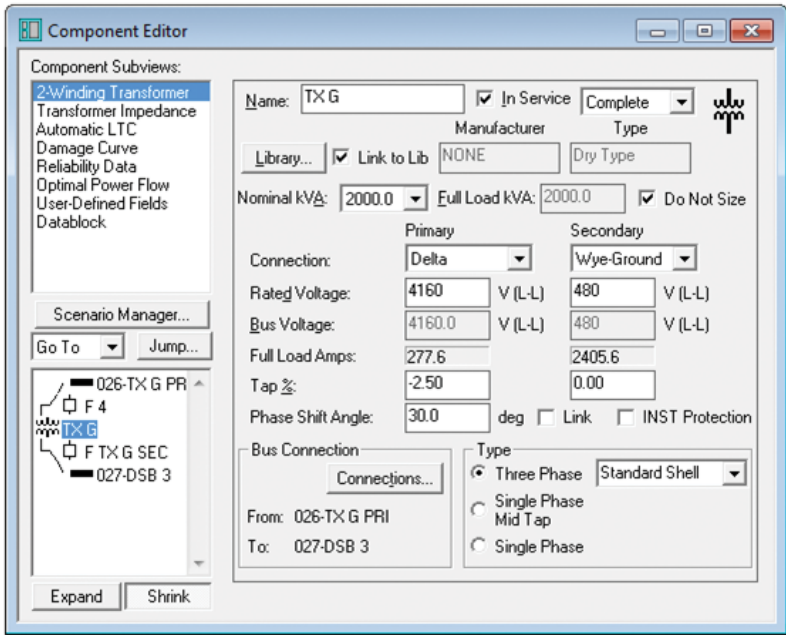
Intelligent One-line diagrams Automate Design & Documentation

- Multiple one-line diagrams can be associated with each project for better system organization and presentation.
- Datablocks let you define custom formats to dynamically display input data and study results on your one-line diagrams.
- Powerful drawing tools quickly create a structured, interactive one-line diagram system model.
- Templates saves time by replicating components or portions of a power system for insertion into current or new projects.
- Undo feature let you revert back to your previous one-line diagram state with ease.
- Zoom, Zoom Area, Zoom Previous, Mouse-wheel Pan and Auto-scroll let you navigate large drawings quickly.
- Interchangeable ANSI and IEC symbols support global projects.
- Move, delete, and place equipment in or out of service with a click of the mouse.
- Automatically expand and collapse areas of the one-line diagrams to create custom drawings that best communicate the system design and study results.

- User-defined textblocks can be placed on the one-line diagrams to display notes, output reports and load schedules.
- Links to internal and external files and documents provide versatility.
- Powerful querying capability to search components based on custom criteria.
- De-energized portions of the one-line are automatically color-coded.
- Dynamic symbols indicate automatic transfer switch position and transformer connections.
- User-definable symbols and annotation allow you to customize your one-line diagrams.

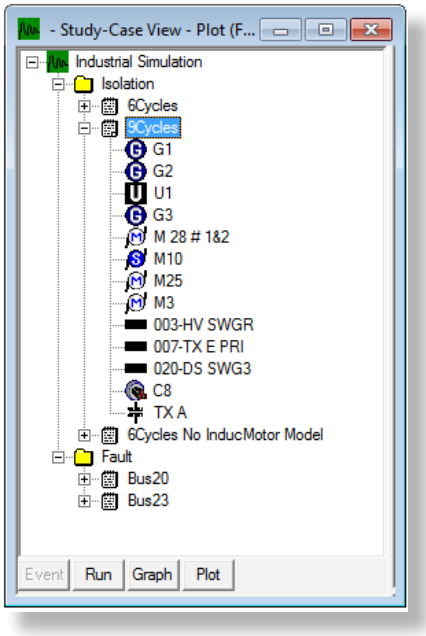
Component Editor Provides Efficient Interface to Display and Edit Data

- Component Editor is a dialog box that lets you easily add, edit, copy, and delete system components in a convenient list format.
- Automatically generate one-line diagrams from system data entered through the Component Editor.
- Equipment list expands to show connections between system components allowing easy navigation.
- Sort devices by type, or run queries to list equipment according to your own criteria such as component type, voltage drop limits, voltage range, group association, etc.



SKM Power*Tools for Windows

INTEGRATED SOFTWARE FOR POWER ENGINEERS

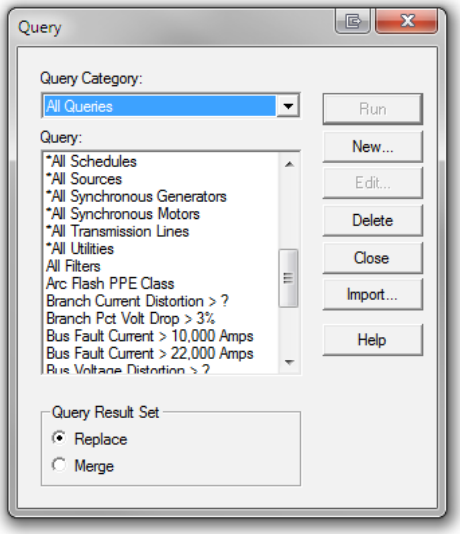


Integrated Studies Provide Maximum Efficiency

- Run single studies or a group of studies with a single mouse-click.
- Compare study results to evaluate “what if ” scenarios.
- Study messages help you locate and resolve system topology or data entry errors.
- Comprehensive studies include: Short Circuit (Traditional, ANSI, IEC), Demand Load Study, Load Flow, Feeder and Transformer Sizing, Motor Starting, Load Schedules, Protective Coordination, Equipment Evaluation, Arc Flash, Reliability, Transient Stability, DC Systems, Single-Phase and Unbalanced Three-phase studies, Ground Grid Design, 3-D Cable Pulling, and more.

Arc Flash Labels

- Choose from over 60 predefined labels!
- Create your own labels with custom company logos, text, pictures, and more!
- Design labels in different languages.
- Print to virtually any inkjet, laser, or vinyl label printer.



Queries Simplify Data Management

- Queries automate the selection of common groups such as all LV transformers, equipment at a selected voltage level, cables with greater than 3% voltage drop, etc.
- Numerous pre-defined queries are provided for convenience.
- Easily define custom queries to organize data into manageable groups. Base your criteria on any combination of input data and study results.
- View query results either from one-line diagrams or the Component Editor

Libraries Save Time, Automate Data Entry, and Standardize Designs

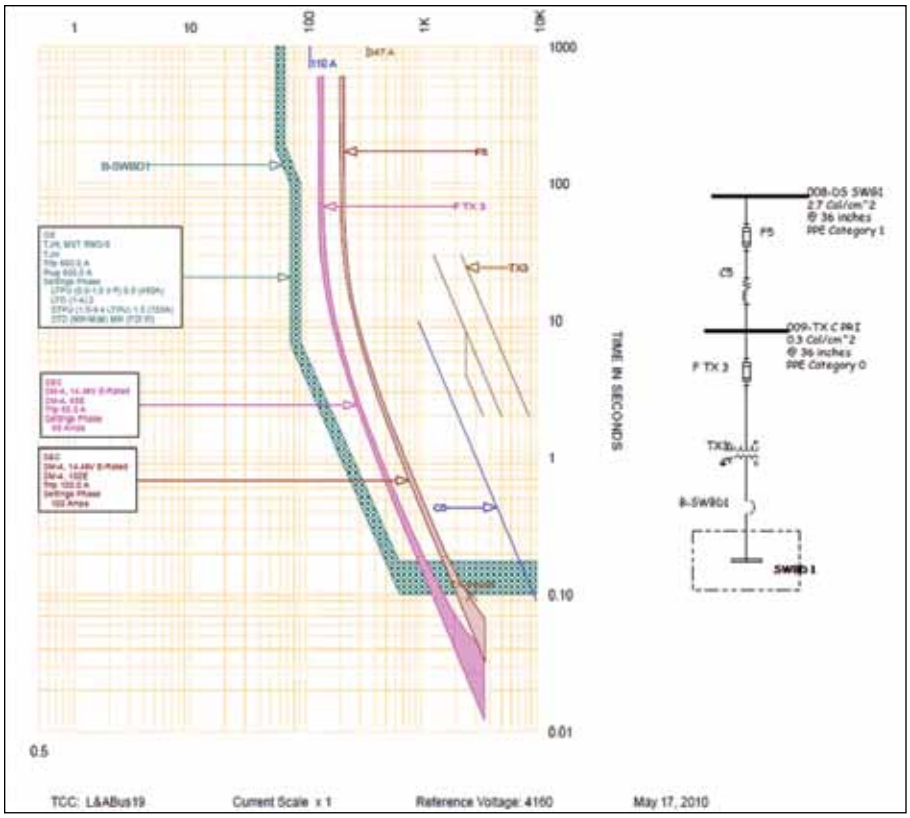
- User-definable libraries for cables, transformers, loads, motors, and protective devices ensure consistency and minimize data entry.
- Customize libraries to precisely model equipment from the manufacturer's published data.
- Default and typical data for Cables, Transformers, Motors, Generators, and Transmission Lines provide consistency throughout your project.
- Switch libraries within a single project to rapidly evaluate "what if" scenarios.
- Extensive default libraries can be applied directly to any project.
- Advanced libraries for generator and motor models, user-definable governors, exciters, power system stabilizers, frequency-sensitive loads, protective devices, harmonic sources, reliability failure rates, DC components, and transmission line configurations.

Import/Export Provides Flexibility, Saves Time and Reduces Errors

- Import and Export PTW project data to conveniently integrate with other databases.
- Enter, edit, and review project data in spreadsheet format and import changes.
- Export project data, one-line diagrams, TCC drawings, and graphical study results to common file formats for use with spreadsheets, databases and presentation software.
- Export report files to a wide range of industry formats including Excel, Word, and RTF.
- Create custom report formats through datablock spreadsheets or Crystal Reports®.
- Project Merge allows portions of the system to be defined separately and merged together.

SKM Power*Tools for Windows

INTEGRATED SOFTWARE FOR POWER ENGINEERS



Powerful One-lines!

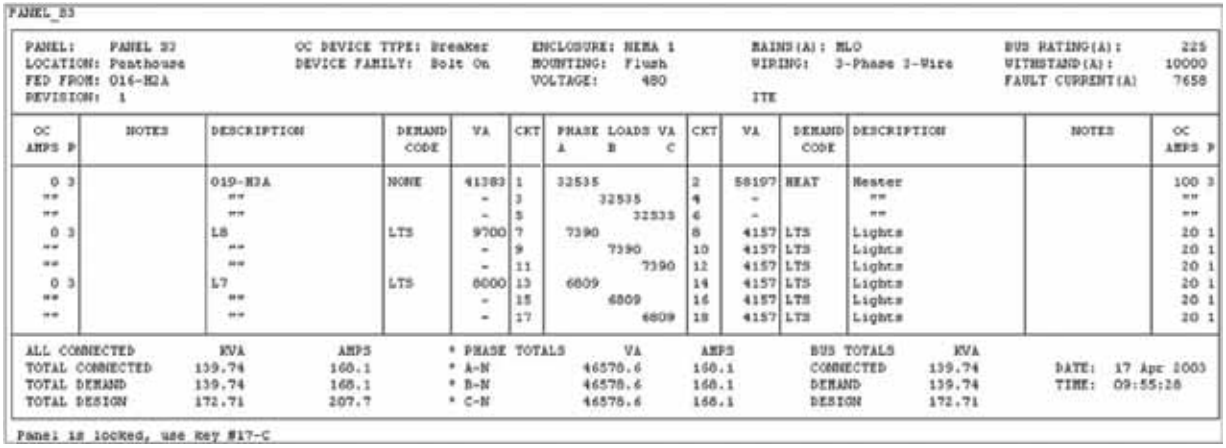
- One-line templates allow quick insertion of frequently used configurations!
- Use Legend tags to group and identify areas/zones of interest.
- Place Links on one-line drawings to instantly jump to other one-lines, TCCs, reports, pdf documents, or any other external files!
- Data states quickly identify components where input data is complete, verified, estimated, or incomplete at a glance.

Plot or Print to any Windows Printer

- Print one-line diagrams, TCC drawings, reports, title blocks, and logos to a single formatted page.
- Print one-line diagrams on multiple pages or automatically shrink to fit a single page.
- Print all or selected groups of One-lines, TCCs, and reports with a single Group Print function.
- Print or plot to various paper sizes, including full size plotters.
- Print comprehensive reports of input data and study results.
- Display input data and study results on the drawing for detailed presentation.
- Compatible with any printer or plotter configured for Windows.

Document System Components in Efficient Schedule Formats

- Panels, MCC, Switchboards.
- User-Defined Schedule Formats for Cables, Transformers, Motors, Loads, and Protection.
- Custom Formatted Crystal Reports for printing or exporting.



PANEL_B3

PANEL: PANEL B3		OC DEVICE TYPE: Breaker		ENCLOSURE: NEMA 1		MAINS(A): MLO		BUS RATING(A):	225
LOCATION: Penthouse		DEVICE FAMILY: Bolt On		MOUNTING: Flush		WIRING: 3-Phase 3-Wire		WITHSTAND(A):	10000
FED FROM: 016-H2A				VOLTAGE: 480				FAULT CURRENT(A)	7658
REVISION: 1						ITE			

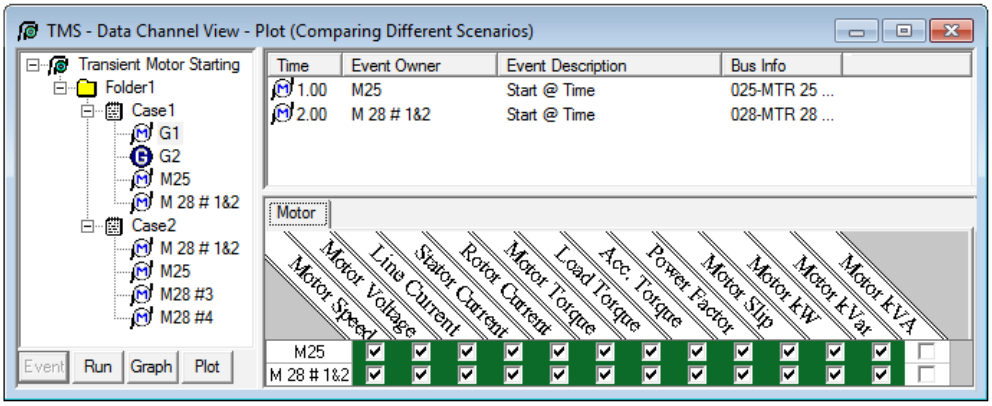
OC AMPS P	NOTES	DESCRIPTION	DEMAND CODE	VA	CKT	PHASE LOADS VA A	B	C	CKT	VA	DEMAND CODE	DESCRIPTION	NOTES	OC AMPS P
0 3		019-H2A	NONE	41383	1	32535			2	58197	HEAT	Heater		100 3
"		"		-	3		32535		4	-		"		"
"		"		-	5			32535	6	-		"		"
0 3		L8	LTS	9700	7	7390			8	4157	LTS	Lights		20 1
"		"		-	9		7390		10	4157	LTS	Lights		20 1
"		"		-	11			7390	12	4157	LTS	Lights		20 1
0 3		L7	LTS	8000	13	6809			14	4157	LTS	Lights		20 1
"		"		-	15		6809		16	4157	LTS	Lights		20 1
"		"		-	17			6809	18	4157	LTS	Lights		20 1

ALL CONNECTED	KVA	AMPS	* PHASE TOTALS	VA	AMPS	BUS TOTALS	KVA	
TOTAL CONNECTED	139.74	160.1	* A-N	46578.6	160.1	CONNECTED	139.74	DATE: 17 Apr 2003
TOTAL DEMAND	139.74	160.1	* B-N	46578.6	160.1	DEMAND	139.74	TIME: 09:55:28
TOTAL DESIGN	172.71	207.7	* C-N	46578.6	166.1	DESIGN	172.71	

Panel is locked, use Key #17-C

Study/Case Manager Stores and Compares Studies

- The PTW Study/Case Manager is the ultimate tool for storing and comparing study results.
- Display any combination of variables from multiple studies/cases on a single graph.
- Communicate results more efficiently with graphical comparisons.
- Design better systems by comparing alternatives.
- Save time with copy/paste of existing cases.
- Print directly or export to common file formats.
- Annotate plots with custom notes.
- Plot in actual values or per unit.
- Full control of axis ranges.
- Full control of plot colors.
- Print multiple curves and reports together in a custom Form Print layout.



SKM Power*Tools for Windows

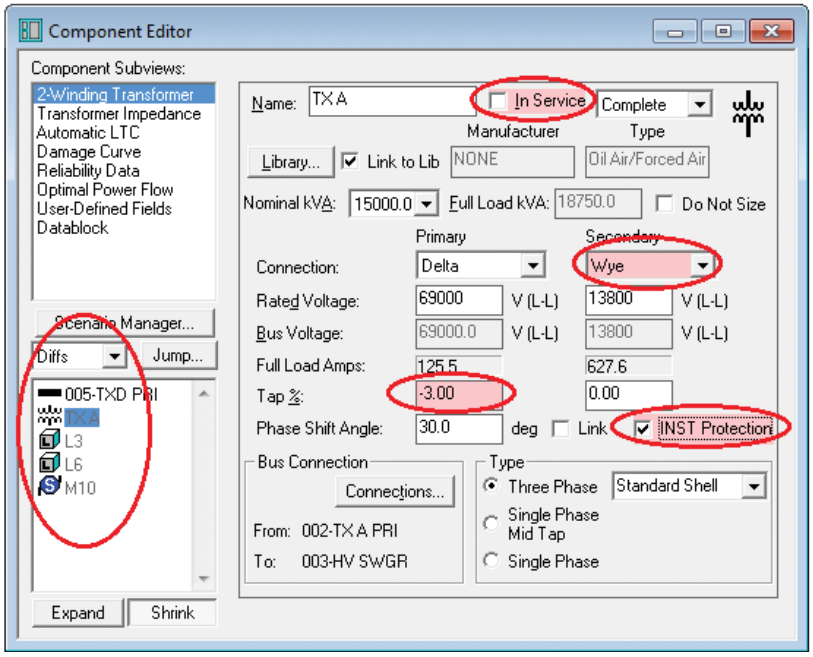
INTEGRATED SOFTWARE FOR POWER ENGINEERS

Scenario Manager Compares Multiple System Configurations

- Switch quickly between different project operating states.
- Each revision highlights components and component data that differs from the base project saving you time through visual feedback and better organization.
- Output results are stored with each revision for automated comparison.
- Changes in the base project can be promoted to all revisions.
- Copy and rename existing revision as starting point for new revision.
- Revisions can include new components and deleted components as well as state, connections, and data changes to existing components.

Calculators Save Time!

- Transmission Line Impedance
- Cable Parameters
- Motor Parameters
- Transformer Impedance
- Neutral Impedance
- Per Unit Conversions
- Phase to Sequence Conversion states

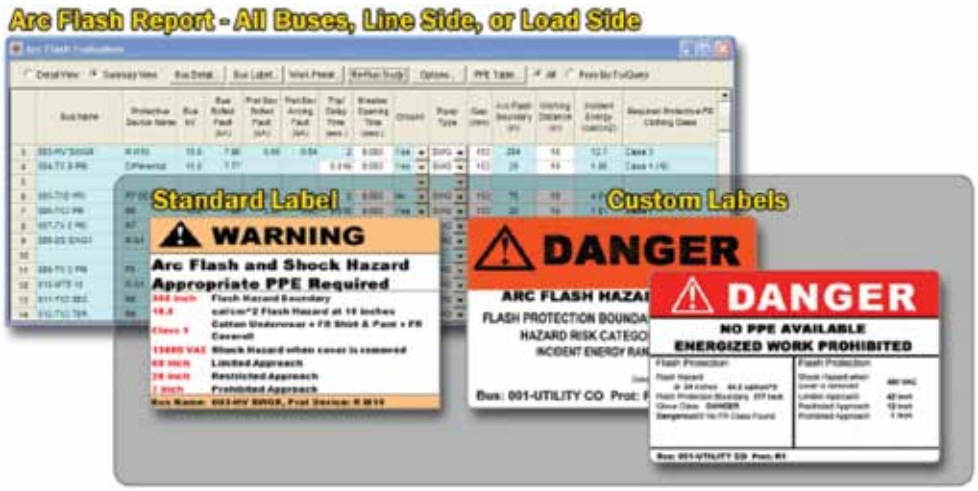


Unique Feature Comparison Table for Revisions

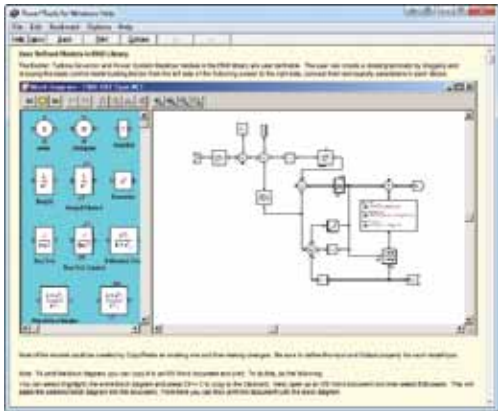
		Base Version	Revision 1	Revision 2	Revision 3
MV Sub 1	**LF Voltage**	4028 V	4010 V	4035 V	4102 V
	3-Phase Isc	8005 A	7950 A	8750 A	9025 A
LV Sub 2LF	**Voltage**	460 V	450 V	465 V	472 V
	3-Phase Isc	65050 A	62200 A	68200 A	69010 A

Integrated Arc Flash Calculations Improve Safety and Compliance

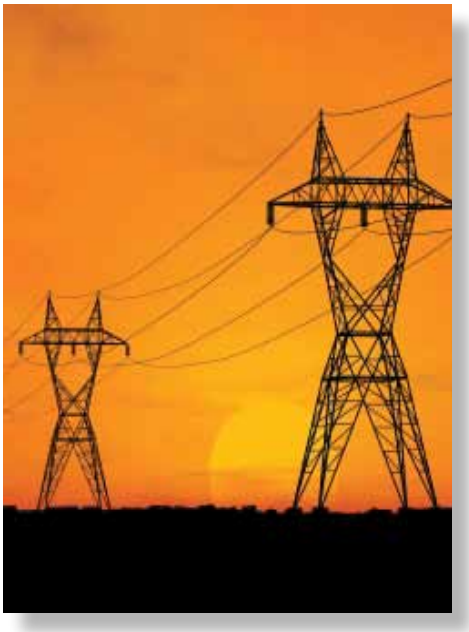
- Arc Flash automatically calculates arcing fault currents, determines protective device trip times, and reports incident energy, flash boundary, and PPE in convenient label formats.
- Full compliance with IEEE 1584, NFPA 70E, OSHA, CSA-Z462, NEC, and NESC 2007.
- Current-limiting equations may be used to improve analysis accuracy.
- Option to check upstream protective devices for mis-coordination.
- Automatically accumulates energy from parallel contributions that clear at different times.



Extensive Documentation and Tutorials Reduce Learning Time



DAPPER Studies



DAPPER is an integrated set of modules for Three-Phase Power System Design and Analysis including rigorous load flow and voltage drop calculations, impact motor starting, traditional fault analysis, demand and design load analysis, feeder, raceway and transformer sizing, and panel, MCC, and switchboard schedule specification.

Benefits

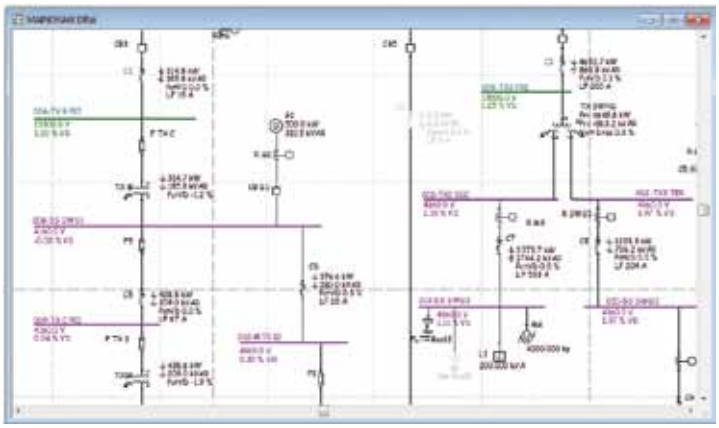
- Generate better designs by comparing alternatives quickly.
- Improve accuracy with DAPPER's rigorous solution methods.
- Save time by sharing a common project database and interface.
- Improve consistency with standard design libraries.
- Design safer systems by comparing calculations with short circuit and continuous ratings.
- Communicate designs effectively with presentation quality graphics, reports, and equipment schedules.

Load Flow/Voltage Drop

With DAPPER, users can calculate the voltage drop on each feeder and transformer branch, voltage on each bus, projected power flow, and losses in the power system.

This program may be used for conventional voltage drop analysis, loss analysis, power factor studies, capacitor placement, long-line charging effects, impact loading for motor starting studies, generator sizing, and for cogeneration analysis.

With DAPPER, a single load flow program models loop and radial power systems. Double precision sparse matrix current injection solutions are used for faster, more accurate convergence. This allows for better modeling of ill conditioned systems.



Load flow study results are automatically displayed on the one-line diagram and in tabular report form.

- Models radial, loop, and multiple independent systems.
- Models utility and generator equivalent impedance calculated from short circuit duty.
- Models up to 50 utilities/swing bus generators, 400 regulated, and unregulated co-generators.
- User definable per unit driving voltage at each utility and swing bus generator.
- Models transformer primary and secondary taps and off nominal rated voltages.
- Model load tap change transformer and zig-zag transformer.
- Model static var compensator, dynamic var compensator, and power factor correction equipment.
- Full transmission line modeling with built in line parameter calculators.
- Models any combination of motor and non-motor loads with global and/or local load factors.
- Models any combination of constant kVA, constant impedance and constant current loads.
- Reports bus voltage, voltage angle, and voltage drop at each bus.
- Reports branch voltage drop, power factor, and power flow in kW, kVAR, kVA, and Amps.
- Reports branch loss in kW, kVAR, kVA, and total system losses.
- User definable report criteria for bus and branch voltage drops.
- Percentage voltage drops based on system voltage per ANSI standards.
- Double precision calculations improve solution accuracy.
- Rapid solution convergence.
- Suitable for impact motor starting, capacitor placement, and power factor studies.
- Load flow results validated to match with benchmark calculations and IEEE examples.

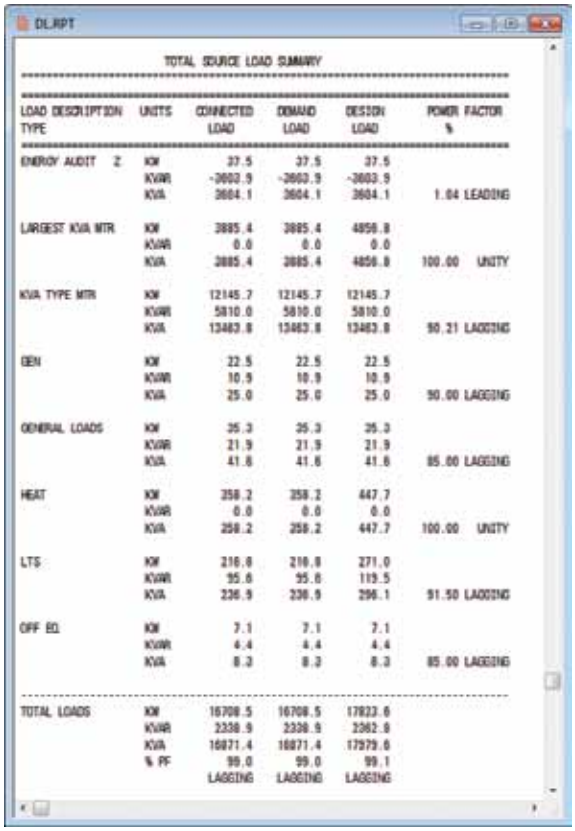
Comprehensive Fault Analysis

The DAPPER Comprehensive Fault Analysis program provides a network solution of three-phase, single-line to ground, line-to line, and double line to ground fault currents; RMS momentary fault currents; asymmetrical fault duties at three, five, and eight cycles; the positive, negative, and zero sequence impedance values between each fault location, and contributions from utilities, generators, and motors. At each fault location, the direction, X/R, and magnitude of fault currents are reported, thus providing a clear view of the conditions that exist during the fault.

Bus Name	Contributions			Initial Symmetrical Amps 3 Phase	Initial Symmetrical Amps SLG	Initial Symmetrical Amps LLG	Initial Symmetrical Amps LL	Asymmetrical Amps 3 Phase	Asymmetrical Amps SLG	Asymmetrical Amps LLG	Asymmetrical Amps LL	Init Sym Neutral Amps SLG	Init Sym Neutral Amps LLG
001-UTILITY CO				4,632	3,716	0	0	7,412	4,884	0	0		
	TXL1	X-LINE	In	449	245	0	0	718	302	0	0		
	U1	UTILITY	In	4,184	3,470	0	0	6,695	4,282	0	0	3,715	
002-TX A PRI				1,847	1,169	0	0	2,809	1,669	0	0		
	TX A	2W-XFMR	In	600	259	0	0	913	369	0	0		
	TXL1	X-LINE	In	1,248	911	0	0	1,897	1,301	0	0	1,169	
003-HV SWGR				7,966	8,478	0	0	11,688	11,992	0	0		
	C1	CABLE	In	287	208	0	0	418	294	0	0		
	C2	CABLE	Out										
	C3	CABLE	In	2,036	1,517	0	0	2,966	2,146	0	0		
	C4	CABLE	In	479	352	0	0	698	470	0	0		
	TX A	2W-XFMR	In	3,665	5,365	0	0	5,338	7,589	0	0	8,478	
	M10	SYN-MTR	In	659	482	0	0	960	681	0	0		
	M8	SYN-MTR	In	833	577	0	0	1,213	816	0	0		

- Symmetrical and Asymmetrical values reported at 1/2, 3, 5, 8, and 30 cycles.
- Asymmetrical values reported at user selected fault time.
- Asymmetrical values reported as peak or RMS values.
- Models two and three winding transformer taps, phase shift, and off nominal rated voltages.
- Asymmetrical exponential DC decay is based on X/R to each contribution.
- Reports Thevenin equivalent impedance and X/R at the faulted bus.
- Detailed and summary reporting options.
- Reports bus voltages and branch flows throughout the system for each faulted bus.
- Reports phase or sequence current and voltage.
- Reports ground return current for double line to ground faults.
- Models transformer and generator neutral grounding impedances.
- User-defined pre-fault voltage at each bus, using load flow results, no load with tap, or user-defined value.

DAPPER Studies



DLRPT

TOTAL SOURCE LOAD SUMMARY

LOAD DESCRIPTION TYPE	UNITS	CONNECTED LOAD	DEMAND LOAD	DESIGN LOAD	POWER FACTOR %	
ENERGY AUDIT Z	KW	37.5	37.5	37.5		
	KVAR	-3602.9	-3602.9	-3603.9		
	KVA	3604.1	3604.1	3604.1	1.04	LEADING
LARGEST KVA MTR	KW	3885.4	3885.4	4856.8		
	KVAR	0.0	0.0	0.0		
	KVA	3885.4	3885.4	4856.8	100.00	UNITY
KVA TYPE MTR	KW	12145.7	12145.7	12145.7		
	KVAR	5810.0	5810.0	5810.0		
	KVA	13463.8	13463.8	13463.8	90.21	LAGGING
GEN	KW	22.5	22.5	22.5		
	KVAR	10.9	10.9	10.9		
	KVA	25.0	25.0	25.0	90.00	LAGGING
GENERAL LOADS	KW	35.3	35.3	35.3		
	KVAR	21.9	21.9	21.9		
	KVA	41.6	41.6	41.6	85.00	LAGGING
HEAT	KW	358.2	358.2	447.7		
	KVAR	0.0	0.0	0.0		
	KVA	358.2	358.2	447.7	100.00	UNITY
LTS	KW	216.8	216.8	271.0		
	KVAR	95.6	95.6	119.5		
	KVA	236.9	236.9	296.1	91.50	LAGGING
OFF EQ	KW	7.1	7.1	7.1		
	KVAR	4.4	4.4	4.4		
	KVA	8.3	8.3	8.3	85.00	LAGGING
TOTAL LOADS	KW	16708.5	16708.5	17823.6		
	KVAR	2338.9	2338.9	2362.8		
	KVA	16871.4	16871.4	17979.6		
	% PF	99.0	99.0	99.1		
		LAGGING	LAGGING	LAGGING		

Demand Load Analysis

The DAPPER Demand Load Analysis program provides a consistent summary of the loads throughout the power system. Connected, demand, and design loads are calculated for each load bus. All load calculations are based upon the global application of demand and design factors and the complex addition of loads, to properly account for the differences between load types. This method assures complete compliance with local and national electric code requirements while permitting flexibility in design for special applications.

The demand load information can be used directly by the DAPPER sizing and load flow modules. This data calculation procedure greatly simplifies the user interface while providing rigorous analytical results.

- Reports Connected, Demand, and Design loads.
- All load calculations account for individual load power factors.
- Automatically creates input load data for Load Flow and Voltage Drop Studies.
- Automatically creates loads for sizing feeders and transformers.
- System demand loads calculated using methods recognized by the NEC.
- Automatically tracks largest motor fed by each bus to meet NEC requirements.
- Automatic compliance with NEC and local codes for multi-level load diversity.
- Sensitivity studies, future load growth studies and load diversity studies by scaling load factors globally.
- “What if” analysis of loading conditions, i.e. light loading versus normal loading, or winter versus summer loading.
- Meet utility company requirements for providing a load summary by load type for connected, demand, and design loads at each utility bus.
- Generate sufficient information for sizing feeders, transformers, and other elements of the power system.

Feeder and Transformer Sizing

DAPPER will size feeder cables, ground wires, raceways, bus ducts, duct banks, and transformers throughout the power system to the load requirements calculated by the Demand Load Analysis. Feeders are selected to meet user-defined criteria for conductor material, voltage level, insulation type, and environmental conditions. Transformer primary and secondary feeders are sized to the transformer full load as specified by the user. Feeders and transformers may be included, excluded, or evaluated in the sizing study.

- AWG, Bus Duct, ACSR, or metric sizes may be used.
- Feeders and transformers with “Do Not Size” are evaluated for capacity.
- Feeder libraries permit user to include metric sizes and ampacity.
- Transformers can be sized to Demand or Design load.
- Option to comply with the IEE wiring regulations for international wiring installation.
- Suitable for impact motor starting, capacitor placement and power factor studies.
- Load flow results validated to match with benchmark calculations and IEEE examples.

Cable Name	From Bus To Bus	In/Out New/Exist	Number Size	Duct Bank Material	Ground Size Neutral Size	Qty/Ph. Size	Conductor Insulation	Length (feet)	Ambient (deg C)	Design Load (Amps)	Derated Rating (Amps)
C1	003-HV SWGR	In	1	310-67 90C	N/A	1	Copper	200	30	47	110
	004-TX B PRI	New	N/A	Non-Magnetic	N/A	6	EPR				
C10	BLDG 115 SEC	In	1	NONE	2	1	Copper	500	30	162	480
	026-TX G PRI	Existing	5"	Non-Magnetic	3/0	500	XLP				
C11	BLDG 115 SEC	In	1	NONE	2	1	Copper	500	30	339	480
	025-MTR 25	Existing	5"	Non-Magnetic	3/0	500	XLP				
C12	022-DSD 2	In	4	NONE	3/0	4	Copper	100	30	937	1,140
	023-MTR 23	New	2 1/2"	Non-Magnetic	3/0	300					

Load Schedules

The DAPPER Load Schedule module provides detailed documentation of load fed through Panels, Motor Control Centers (MCCs) and Switchboards. Input is simplified through the use of libraries and copy and paste functions. The schedules can be displayed, printed, and exported in a variety of different formats.

- Schedules are automatically updated with available short circuit values and sub-feed totals.
- Panel & switch board schedules are automatically generated from connected branch loads.
- MCC schedules can reference a default design library for automatic selection of feeder and raceway sizes, or the complete cable library for more detailed specification.

PANEL: PANEL 53 — OC DEVICE TYPE: Breaker — ENCLOSURE: NEMA 1 — MAINS(A): MLO — CONTINUOUS(A): 225
LOCATION: Penthouse — DEVICE FAMILY: Bolt On — MOUNTING: Flush — WIRING: 3-Phase 3-Wire — BUS SC RATING(A) 10000
FED FROM: — VOLTAGE: 480 — FAULT CURRENT(A): 12670
INCIDENT ENERGY: 1.05 Cal/cm2 a18.00(in) — BOUNDARY:16.61(in) — PPE Category: 0
REVISION: 1 — ITE

OC AMPS P	NOTES	DESCRIPTION	DEMAND CODE	VA	OCT	PHASE LOADS VA A	B	C	OCT	VA	DEMAND CODE	DESCRIPTION	NOTES	OC AMPS P
0 3		019-HOA	NONE	41283	1	32535			2	58197	HEAT	Heater		100 3
"		"		-	3		32535		4	-		"		"
"		"		-	5			32535	6	-		"		"
0 3		L8	LTS	9700	7	7290			8	4157	LTS	Lights		20 1
"		"		-	9		7290		10	4157	LTS	Lights		20 1
"		"		-	11			7290	12	4157	LTS	Lights		20 1
0 3		L7	LTS	8000	13	6809			14	4157	LTS	Lights		20 1
"		"		-	15		6809		16	4157	LTS	Lights		20 1
"		"		-	17			6809	18	4157	LTS	Lights		20 1

ALL CONNECTED	KVA	3P AVE AMPS	* PHASE TOTALS	VA	AMPS	BUS TOTALS	KVA	
TOTAL CONNECTED	129.74	168.1	* A-N	46578.6	168.1	CONNECTED	129.74	DATE: Feb 09, 2010
TOTAL DEMAND	129.74	168.1	* B-N	46578.6	168.1	DEMAND	129.74	TIME: 12:27:53
TOTAL DESIGN	172.71	207.7	* C-N	46578.6	168.1	DESIGN	172.71	

Panel is locked, use key #17-C

CAPTOR

CAPTOR produces time versus current coordination drawings with one-line diagrams and setting reports. It lets you coordinate protective devices with interactive on screen graphics, and provides a comprehensive library. You can print on preprinted graph paper or on plain paper with custom grids and layouts.

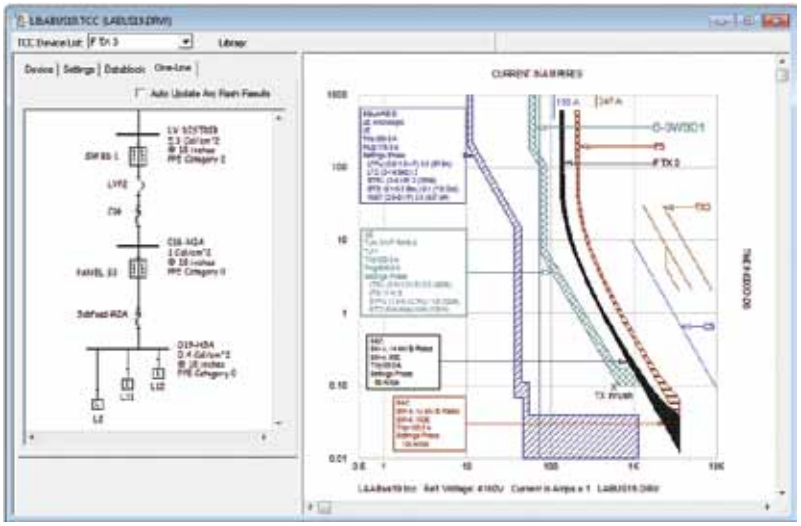
CAPTOR may be used on any electrical power system including utility, industrial, commercial, manufacturing, and process systems. Devices may be plotted at any voltage, current or application frequency. The most comprehensive library containing protective devices from all of the popular equipment manufacturers is included.

CAPTOR's advanced device modeling and curve fitting techniques make library additions fast and easy.

CAPTOR contains manufacturer specific selective coordination tables and allows searches for up-to-down and down-to-up selective coordination pairs.

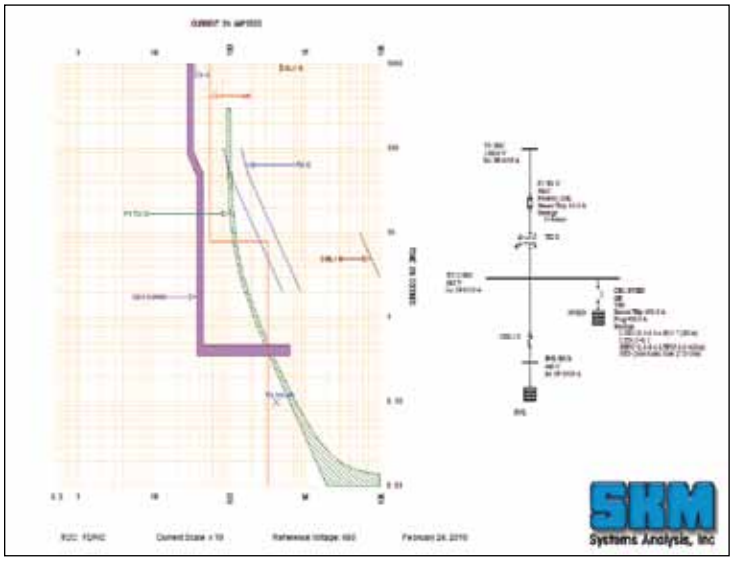
Benefits

- Design safer power systems by quickly and easily evaluating all devices for proper short circuit levels, and application within acceptable voltage ratings.
- Save time with automatic TCC drawing and associated one-line creation from the main one-line diagram interface.
- Design efficiently by using CAPTOR's clone command to copy individual components, one-line diagrams, and TCC drawings.
- Fully customizable output organized to locate and interpret results quickly.
- Eliminate errors by keeping all input data, one-line diagrams, TCCs and study results in a single project database.
- Communicate designs effectively with high quality graphical output and custom formats.
- Automatically find selective coordination pairs. There is no longer a need to search through long manufacturer tables!



Features

- Use the branch fault current protective devices at a single user-defined fault location to automatically terminate the curves and simulate sequential protection operations.
- Search across all TCCs or one-lines to identify which documents contain a specific device.
- Globally turn on/off device labels, short circuit flags, and datablocks for all TCCs in the project.
- Continuous display of TCC drawings with real-time graphical editing of device settings.
- An extensive library including thousands of protective devices created and validated by electrical engineers.
- A flexible library for adding new device models makes it easy to add new devices and to match setting descriptions.
- Custom output layouts to position TCC, one-line, setting sheet, and company logo on a single page.
- Option to group print all TCCs in a single action to printer, clipboard, Metafile, or PDF.
- Full control over colors, fill patterns, line weights, grid density, fonts, data display, and axis scales for high quality output.
- TCC Drawings and the associated one-lines are generated automatically from the main one-line or manually by adding new devices to a TCC.
- Plot multifunction relays and store both ‘as-found’ and ‘recommend’ settings, or ‘phase’ and ‘ground’ settings, and multiple protection functions in the same TCC.
- Supports Overcurrent, Differential, Directional, Summation, and Zone Interlocking protection functions.
- Plot ANSI 49 functions of motor relays from Merlin Gerin, Startco, and SEL thermal curve and rating methods.
- On-screen locator to quickly display and evaluate clearing times between devices.
- Adjust device settings graphically by dragging curve segments on the TCC drawing with your mouse (movement is restricted to valid device settings).
- Display one-lines next to TCC drawings and apply different datablocks in both areas.
- Export multiple TCCs to DXF or AutoCAD Xrefs.
- Suitable for impact motor starting, capacitor placement and power factor studies.
- Load flow results validated to match with benchmark calculations and IEEE examples.

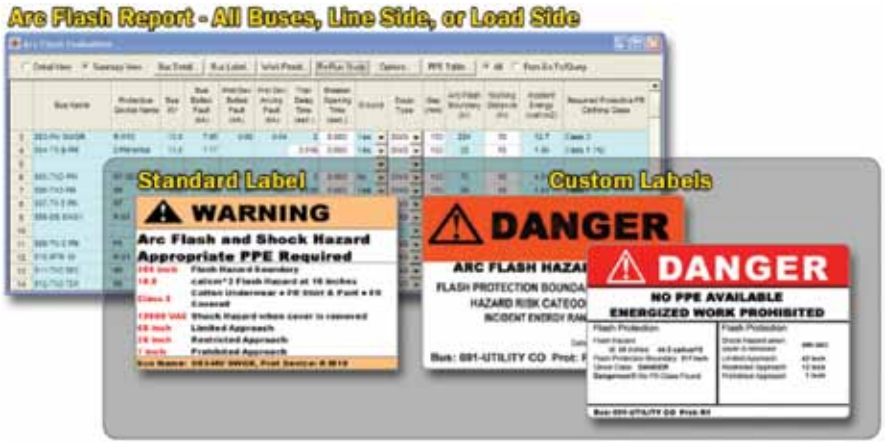


Arc Flash Evaluation

PTW Arc Flash Evaluation calculates the incident energy and arc flash boundary for each location in a power system. Arc Flash saves time by automatically determining trip times from the protective device settings and arcing fault current values. Incident energy and arc flash boundaries are calculated following the NFPA 70E, IEEE 1584, CSA-Z462, and NESC standards. Clothing requirements are specified from a user-defined clothing library. Clearing times can be automatically reduced based on current-limiting capabilities.

Benefits

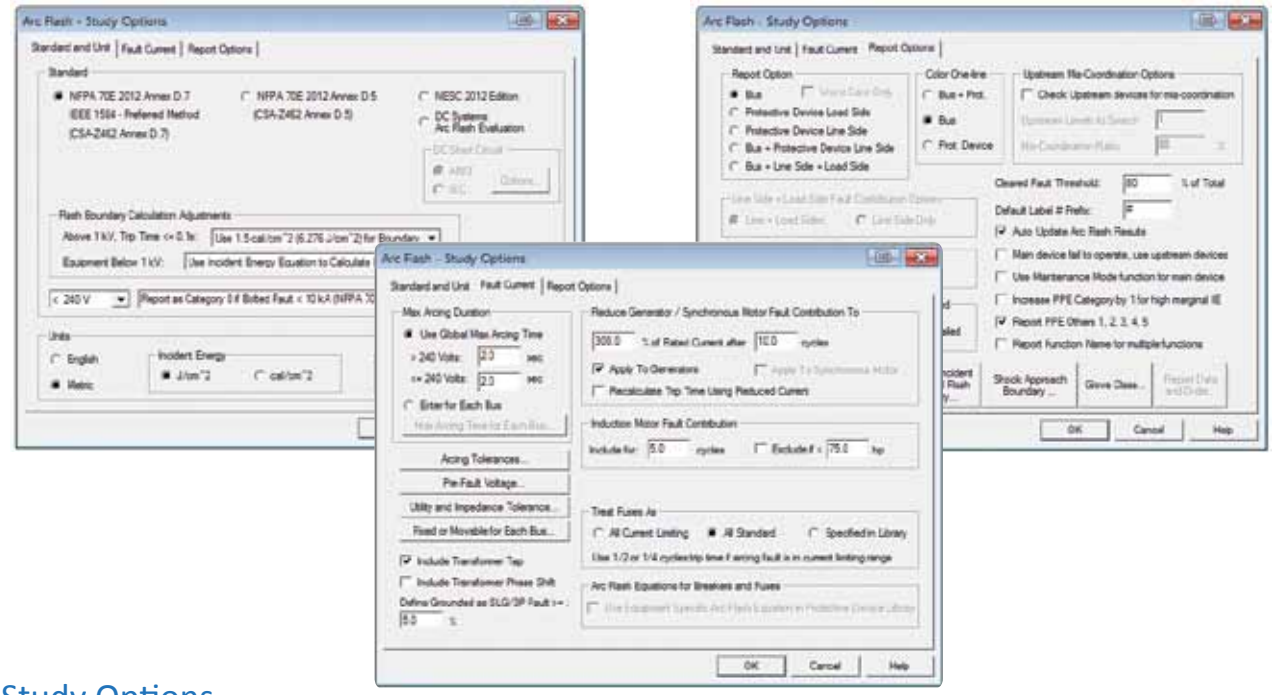
- Design safer power systems while insuring compliance with NEC 110.16, OSHA, NFPA 70E, IEEE 1584, CSA-Z462, and NESC 2007 standards.
- Design safer power systems while insuring compliance with NEC 110.16, OSHA, NFPA 70E, IEEE 1584, CSA-Z462, and NESC standards.
- Save time with the fully integrated Short Circuit, Over-Current Coordination, Equipment Evaluation and Arc Flash Evaluation modules working together with libraries of clothing levels, protective devices, and bus ratings.
- Provide a safer working environment by specifying the proper level of clothing. Wearing inadequate clothing is dangerous for obvious reasons, but wearing too much clothing is also dangerous due to limited mobility and visibility.
- Evaluate alternatives quickly and easily to establish an optimal design.
- Ability to perform Arc Flash Evaluation on AC and DC systems.
- Improve safety margins with user-definable arcing fault tolerances.
- Save time by automatically generating arc flash labels and work permits.
- Avoid potential fines, lost productivity, and increased insurance and litigation costs.



Arc Flash Evaluation

Interface Options

- Simple to use tabular interface for system design, PPE selection, and reviewing study results.
- Summary and detail view enables complete bus by bus examination of study data.
- Pre-populated library of protective clothing allows user-defined PPE additions.
- Bus and branch arcing fault values are automatically calculated and trip times are automatically determined from the protective device settings.
- Arc Flash labels are automatically produced to comply with NEC 110.16 labeling requirements and can be printed to several standard size label sheets.
- Create custom labels in any size with user-defined logos, text, comments, field placement, and local language support.
- Report selected bus locations using custom queries or go-to function.
- Full featured reporting including bus report, line-side report, and load-side report.



Study Options

- Option to follow the NFPA 70E, IEEE 1584, CSA-Z462, and NESC standards.
- Option to report in English or Metric units.
- Fuses and breakers may be modeled as current limiting devices with user-defined equations.
- Allows representation of differential, zone-interlocking, photo-sensing, and other special instantaneous protection schemes.
- Induction motors can be included, excluded, or included for a user-defined time.
- Automatically accumulates energy from parallel contributions that clear at different times.
- Compare results from multiple project scenarios in a single table.
- Option to check upstream protective devices for mis-coordination.

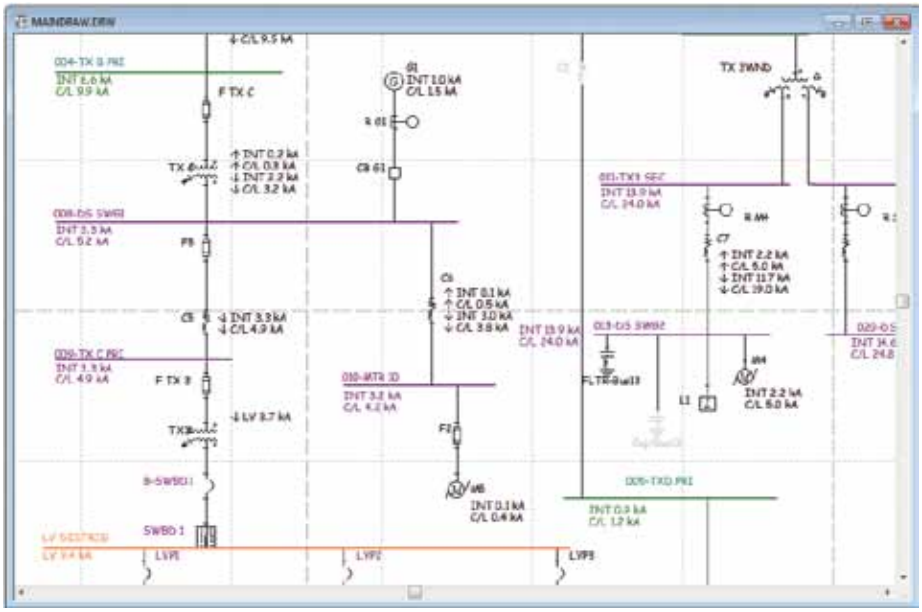
ANSI_FAULT

A_FAULT provides fault calculations in full compliance with the ANSI C37 standards. It offers separate solutions for low, medium and high voltage systems and for symmetrical, momentary and interrupting calculations as defined in the standards.

For medium and high voltage systems, the momentary and interrupting values may be calculated using either the E/X or E/Z methods permitted by the standards. Both AC and DC decrement curves required by the total current rated standard (C37.5) and the symmetrical rated standard (C37.010) are used by the program.

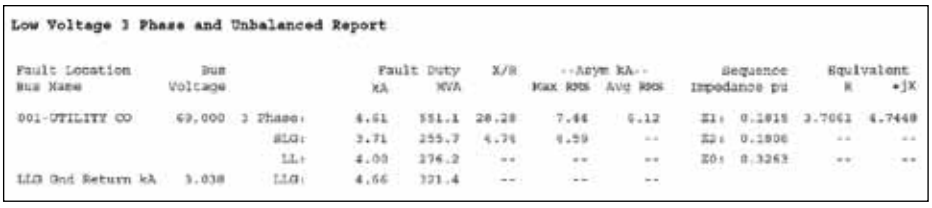
Benefits

- Design safer power systems by calculating equipment ratings per ANSI standards.
- Save time by automatically applying ANSI C37 and IEEE 141 multiplying factors to generators and motors.
- Increase efficiency with custom data reporting featuring X/R, E/X or E/Z methods and values for the application of low, medium, and high voltage breakers.
- Communicate effectively with quality reports.



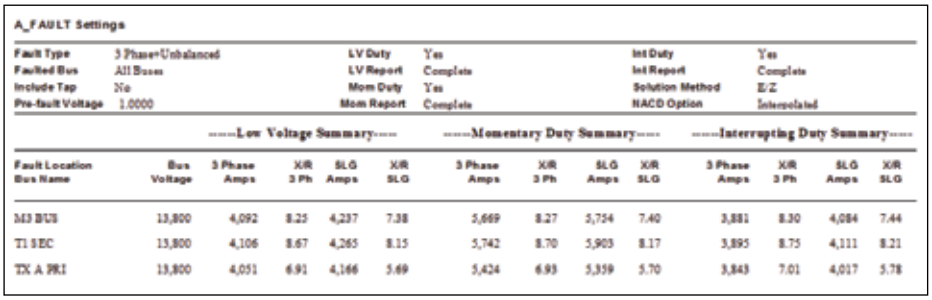
Features

- Reports three-phase, single-line to ground, line to line, and double line to ground fault values.
- Reports values for both total current and symmetrical rated breakers.
- Models transformer primary and secondary taps and off nominal rated voltages.
- Use either AC/DC, DC only, interpolated or no AC decay options.
- Reports calculated remote/local status for each generator.
- Interrupting study reports total and symmetrical 2, 3, 5, 8 and 30 cycle values.
- Complies with ANSI standards and IEEE recommended procedures.
- Provides separate network solutions for reporting X/R values.
- Momentary and interrupting studies can report E/X or E/Z values.
- Low voltage study complies with ANSI C37.13.
- Momentary and interrupting studies comply with ANSI C37.010 and C37.5.
- Custom reports using datablocks or crystal reports.
- Display study results on the one-line.
- User defined pre-fault voltage.
- Option to report 30-cycle results in Complete or Summary format.



Low Voltage 3 Phase and Unbalanced Report

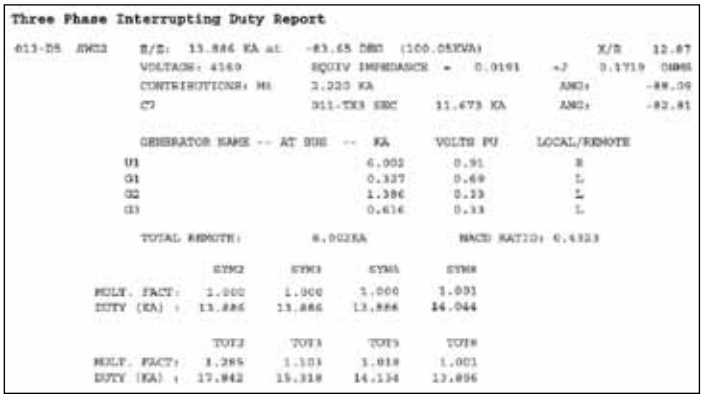
Fault Location / Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	Asym kA Max RMS	Asym kA Avg RMS	Sequence Impedance pu	Equivalent R	Equivalent +jX
001-UTILITY CO	69,000	3 Phase:	4.61	551.1	28.28	7.84	6.12	Z1: 0.1815	3.7061	6.7448
		SLG:	3.71	255.7	4.76	4.59	--	Z2: 0.1806	--	--
		LL:	4.00	276.2	--	--	--	Z0: 0.3263	--	--
LLG Gnd Return kA	3.038	LLG:	4.66	321.4	--	--	--			



A_FAULT Settings

Fault Type	3 Phase+Unbalanced	LV Duty	Yes	Int Duty	Yes
Faulted Bus	All Buses	LV Report	Complete	Int Report	Complete
Include Tap	No	Mom Duty	Yes	Solution Method	E/Z
Pre-fault Voltage	1.0000	Mom Report	Complete	NACD Option	Interpolated

Fault Location / Bus Name	Bus Voltage	Low Voltage Summary: 3 Phase Amps	Low Voltage Summary: X/R 3 Ph	Low Voltage Summary: SLG Amps	Low Voltage Summary: X/R SLG	Momentary Duty Summary: 3 Phase Amps	Momentary Duty Summary: X/R 3 Ph	Momentary Duty Summary: SLG Amps	Momentary Duty Summary: X/R SLG	Interrupting Duty Summary: 3 Phase Amps	Interrupting Duty Summary: X/R 3 Ph	Interrupting Duty Summary: SLG Amps	Interrupting Duty Summary: X/R SLG
M3 BUS	13,800	4,092	8.25	4,237	7.38	5,669	8.27	5,754	7.40	3,881	8.30	4,084	7.44
T1 SEC	13,800	4,106	8.67	4,265	8.15	5,742	8.70	5,903	8.17	3,895	8.75	4,111	8.21
TX A PRI	13,800	4,051	6.91	4,166	5.69	5,424	6.93	5,359	5.70	3,843	7.01	4,017	5.78



Three Phase Interrupting Duty Report

613-D8 SWS3	S/C: 13.886 KA at	-83.65 DEG (100.05KVA)		X/R	12.87
	VOLTAGE: 4160	EQUIV IMPEDANCE = 0.0161	+J	0.1719	OHMS
	CONTRIBUTIONS: M6	2.220 KA		ANG:	-88.09
	C7	311-TX3 SEC 11.673 KA		ANG:	-82.81

GENERATOR NAME -- AT BUS --	KA	VOLTS PU	LOCAL/REMOTE
U1	6.003	0.91	R
G1	0.327	0.69	L
G2	1.386	0.33	L
G3	0.616	0.33	L

TOTAL REMOTE: 8.002KA NACD RATIO: 0.4323

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.093
DUTY (KA) :	13.886	13.886	13.886	14.044

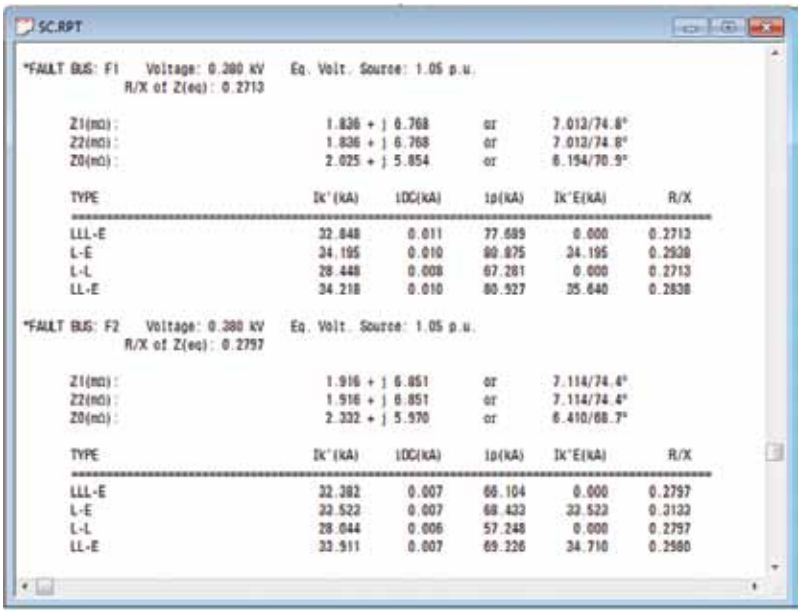
	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.285	1.103	1.018	1.001
DUTY (KA) :	17.842	15.318	14.134	13.896

IEC_60909 Short Circuit Study

PTW IEC_60909 calculates short-circuit currents using the equivalent voltage source as required by the IEC 60909 standard. With PTW IEC 60909, three-phase and unbalanced fault duties for electrical power systems are calculated in compliance with the IEC 60909 standards for low, medium, and high voltage systems.

Benefits

- Design safer systems utilizing IEC rated equipment by complying with IEC 60909 standard for short circuit current determination.
- Improve accuracy by using load flow results or the voltage factor table to assign system prefault voltages for minimum and maximum fault level calculations.
- Eliminate duplicate entry by sharing the same project database and one-line diagrams with other PTW study modules.
- Communicate effectively with one-line datablocks and tabular reports.



SC.RPT

*FAULT BUS: F1 Voltage: 0.380 kV Eq. Volt. Source: 1.05 p.u.
R/X of Z(eq): 0.2713

Z1(mΩ):	1.836 + j 6.768	or	7.012/74.8°
Z2(mΩ):	1.836 + j 6.768	or	7.012/74.8°
Z0(mΩ):	2.025 + j 5.854	or	6.194/70.9°

TYPE	Ik"(kA)	IDC(kA)	Ip(kA)	Ik"E(kA)	R/X
LLL-E	32.848	0.011	77.689	0.000	0.2713
L-E	34.195	0.010	80.875	34.195	0.2528
L-L	28.448	0.008	67.281	0.000	0.2713
LL-E	34.218	0.010	80.927	35.640	0.2838

*FAULT BUS: F2 Voltage: 0.380 kV Eq. Volt. Source: 1.05 p.u.
R/X of Z(eq): 0.2797

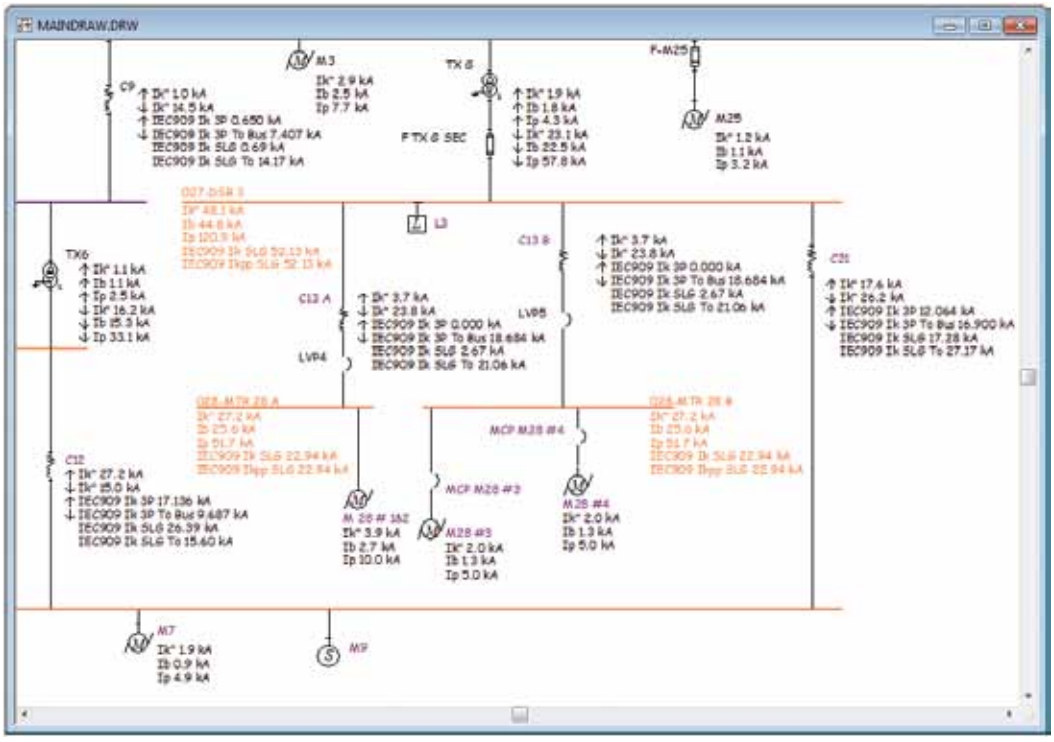
Z1(mΩ):	1.916 + j 6.851	or	7.114/74.4°
Z2(mΩ):	1.916 + j 6.851	or	7.114/74.4°
Z0(mΩ):	2.332 + j 5.970	or	6.410/68.7°

TYPE	Ik"(kA)	IDC(kA)	Ip(kA)	Ik"E(kA)	R/X
LLL-E	32.382	0.007	66.104	0.000	0.2797
L-E	32.522	0.007	68.423	32.523	0.3133
L-L	28.044	0.006	57.248	0.000	0.2797
LL-E	33.911	0.007	69.226	34.710	0.2580

IEC_60909 Short Circuit Study

Features

- Three phase, single-line to earth, double-line to earth, and line to line faults.
- Earth return current for single-line and double line to earth faults.
- Options to use load flow results or the voltage factor table for assigning system prefault voltages.
- Models transformer and generator neutral impedances.
- Models transformer taps in all three sequence networks.
- Complete representation of the positive, negative, and zero sequence networks.
- Calculates near/far and meshed/non-meshed status for each source.
- Reports positive, negative, and zero sequence Thevenin impedance at each bus.
- Reports total initial symmetrical current I”k, and apparent power S”k.
- Reports total peak current, Ip.
- Reports total asymmetrical breaking current, Ib at four different user defined times.
- Reports symmetrical breaking current, Ib at four user defined times.
- Reports total aperiodic component of short circuit current, idc at four user defined times.
- Reports steady state symmetrical current, Ik at four user defined times.
- Reports steady state symmetrical apparent power, Sk.
- Reports Ib, and Idc for single phase to ground fault at four different user defined times.
- Reports system branch contributions to each fault location.



IEC_61363 Short Circuit Study

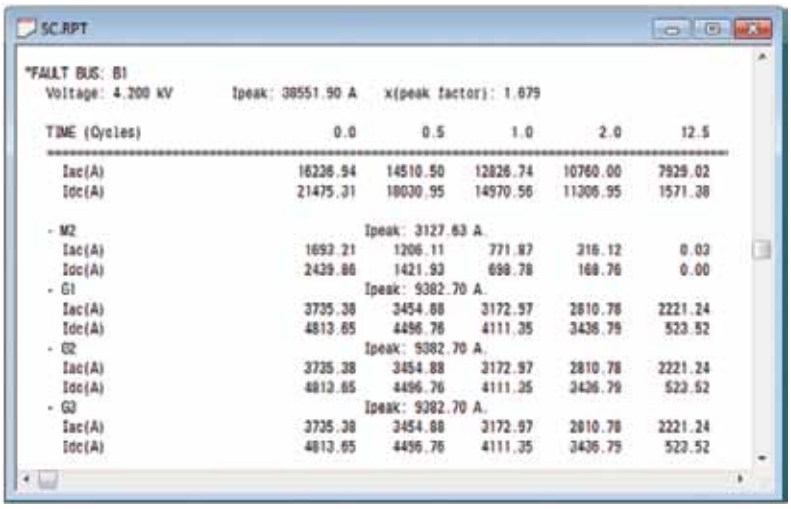
The IEC_61363 Short Circuit Study module calculates the current that flows in an electrical power system under abnormal conditions. These currents must be calculated in order to adequately specify electrical apparatus withstand and interrupt ratings and selectively coordinate time current characteristics of electrical protective devices.

The IEC 61363 Short Circuit study represents conditions that may affect typical marine or offshore installations more significantly than land-based systems, due to more emphasis on generator and motor decay.

The calculation methods are intended for use on unmeshed three-phase AC systems operating at 50Hz or 60Hz; having any system voltage specified in IEC 60092-201 table 2; having one or more different voltage levels; comprising generators, motors, transformers, reactors, cables and converter units; having their neutral point connected to the ship's hull through an impedance; or having their neutral point isolated from the ship's hull.

Benefits

- Save time by easily obtaining the short circuit magnitude at each point in the power system.
- Design safer systems by comparing the calculated fault current to the ratings of installed equipment.
- Increase design reliability by supporting proper selection of circuit protection equipment for protection and coordination.
- Reports AC and DC fault currents for 4 user defined times.
- Reports zero crossing time of total current.

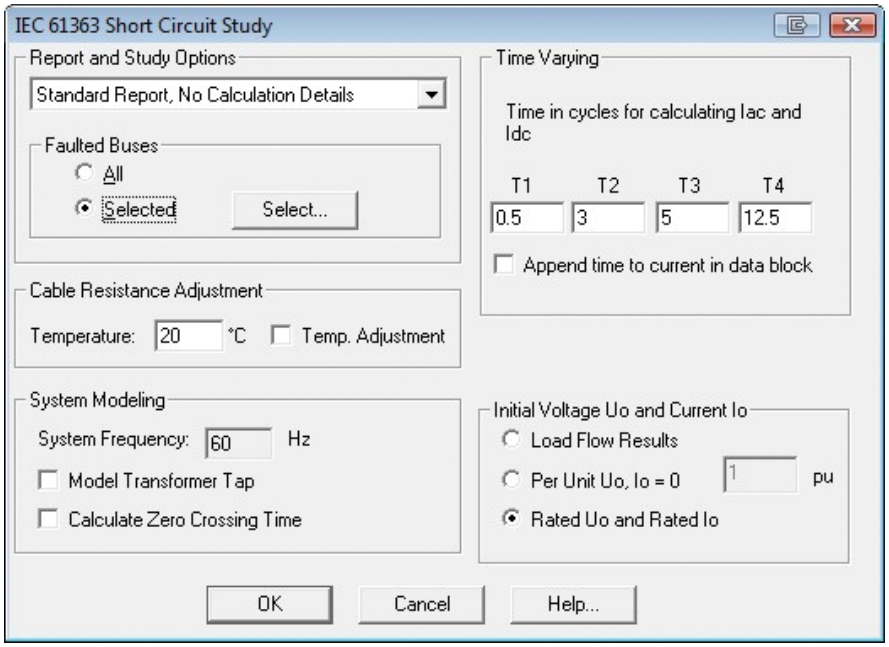

SC.RPT

*FAULT BUS: B1
Voltage: 4.200 kV Ipeak: 38551.90 A x(peak factor): 1.679

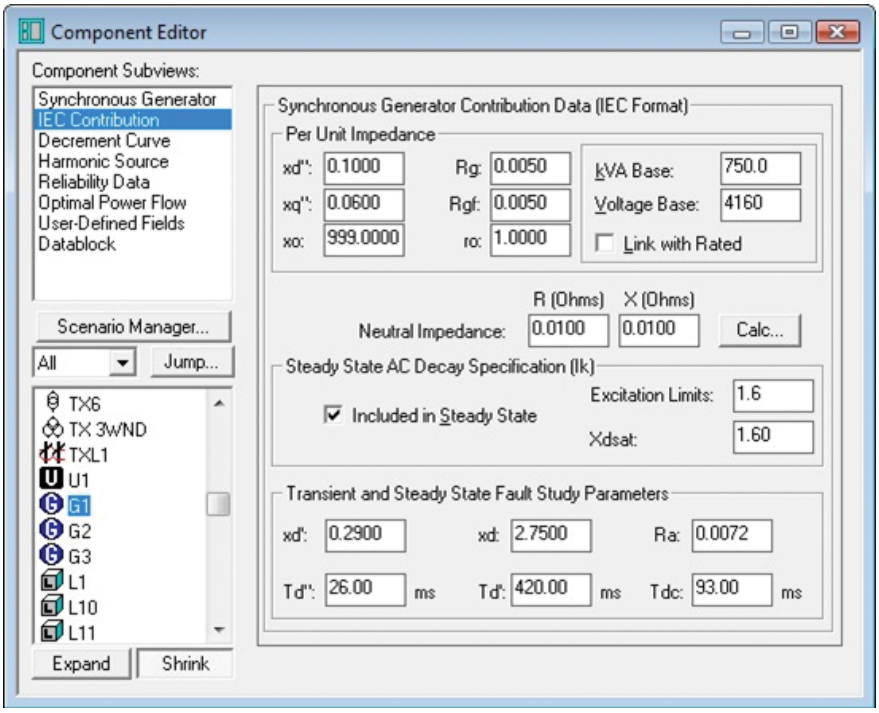
TIME (Cycles)	0.0	0.5	1.0	2.0	12.5
Iac(A)	16236.94	14510.50	12826.74	10760.00	7929.02
Idc(A)	21475.31	18030.95	14970.56	11306.95	1571.38
- M2	Ipeak: 3127.63 A.				
Iac(A)	1693.21	1206.11	771.87	316.12	0.03
Idc(A)	2439.86	1421.93	698.78	168.76	0.00
- G1	Ipeak: 9382.70 A.				
Iac(A)	3735.38	3454.88	3172.97	2810.78	2221.24
Idc(A)	4813.65	4496.76	4111.35	3436.79	523.52
- G2	Ipeak: 9382.70 A.				
Iac(A)	3735.38	3454.88	3172.97	2810.78	2221.24
Idc(A)	4813.65	4496.76	4111.35	3436.79	523.52
- G3	Ipeak: 9382.70 A.				
Iac(A)	3735.38	3454.88	3172.97	2810.78	2221.24
Idc(A)	4813.65	4496.76	4111.35	3436.79	523.52

Interface Options

- Use existing IEC 60909 input data with minimum IEC 61363 specific data required.
- Study report options to include different levels of calculation detail.



- Options to use Load Flow Results, Per Unit U0 (I0=0), or Rated U0 and I0 as the initial voltage and current.

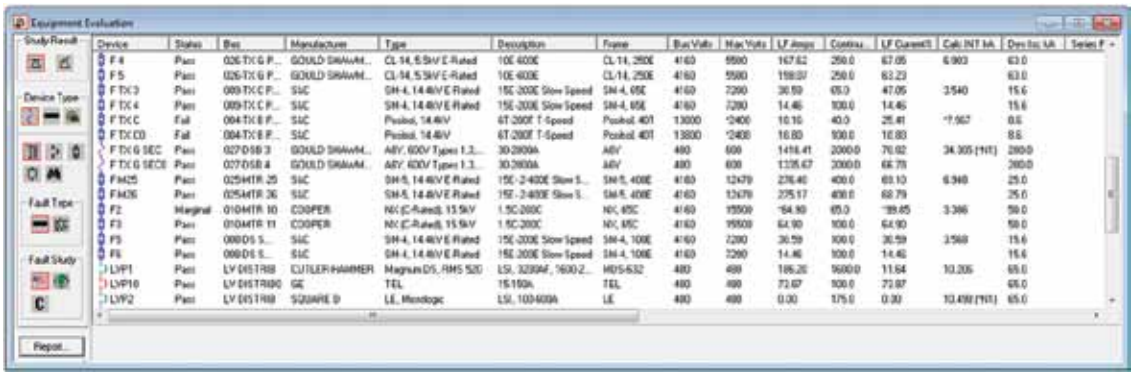


Equipment Evaluation

The Equipment Evaluation Study module compares protective device ratings against short-circuit calculations. The program also checks for missing input data and compares continuous ratings to calculated design and operating conditions. Equipment that fails the evaluation are reported in table form and color-coded in one-line diagrams. As with all PTW study modules, Equipment Evaluation uses the same project database, integrating all balanced and unbalanced/single-phase study modules, and allowing you to examine existing projects without additional input requirements.

Benefits

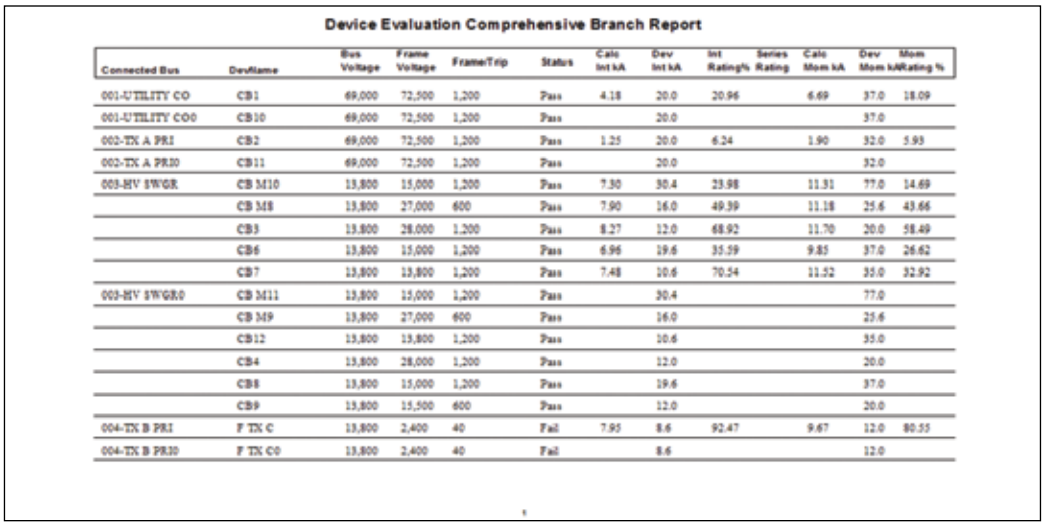
- Design safer and more cost effective power systems.
- Reduces mistakes by systematically comparing continuous and short circuit currents to equipment ratings.
- Save time by making all de-rating adjustments and by summarizing all necessary data into a single easy-to-read table.
- Save time by flagging equipment that is in the marginal range or failed in the rating checks.
- Save time by running all related studies in a single mouse-click.
- Increases flexibility by allowing user-defined criteria for pass/marginal/fail.
- Increases flexibility by evaluating short circuit ratings, continuous ratings, or both.
- Communicate designs more effectively with professional reports and annotated one-line diagrams.



Equipment Evaluation

Interface Options

- Intuitive graphical interface enables navigation of device type and generation of study results and reports.
- Study results can be printed in a concise report format or exported to an Excel compatible spreadsheet.
- Choose from Equipment Evaluation reports and Datablocks or graphically identify equipment that fails the evaluation in a color-coded one-line diagram.
- Clear and concise reporting of all equipment in a system enables easy diagnosis of potential problems. Sort results by device type, status, bus, voltage, ampacity, and more.
- Input data evaluation and reporting to identify missing data or errors in input data.



Device Evaluation Comprehensive Branch Report

Connected Bus	DevName	Bus Voltage	Frame Voltage	Frame/Trip	Status	Calc Int kA	Dev Int kA	Int Rating%	Series Rating	Calc Mom kA	Dev Mom kA	Mom Rating %
001-UTILITY CO	CB1	69,000	72,500	1,200	Pass	4.18	20.0	20.96		6.69	37.0	18.09
001-UTILITY COO	CB10	69,000	72,500	1,200	Pass		20.0				37.0	
002-TX A PRI	CB2	69,000	72,500	1,200	Pass	1.25	20.0	6.24		1.90	32.0	5.93
002-TX A PRIO	CB11	69,000	72,500	1,200	Pass		20.0				32.0	
003-HV SWGR	CB M10	13,800	15,000	1,200	Pass	7.30	30.4	23.98		11.31	77.0	14.69
	CB M8	13,800	27,000	600	Pass	7.90	16.0	49.39		11.18	25.6	43.66
	CB3	13,800	28,000	1,200	Pass	8.27	12.0	68.92		11.70	20.0	58.49
	CB6	13,800	15,000	1,200	Pass	6.96	19.6	35.59		9.85	37.0	26.62
	CB7	13,800	13,800	1,200	Pass	7.48	10.6	70.54		11.52	35.0	32.92
003-HV SWGR0	CB M11	13,800	15,000	1,200	Pass		30.4				77.0	
	CB M9	13,800	27,000	600	Pass		16.0				25.6	
	CB12	13,800	13,800	1,200	Pass		10.6				35.0	
	CB4	13,800	28,000	1,200	Pass		12.0				20.0	
	CB8	13,800	15,000	1,200	Pass		19.6				37.0	
	CB9	13,800	15,500	600	Pass		12.0				20.0	
004-TX B PRI	F TX C	13,800	2,400	40	Fail	7.95	8.6	92.47		9.67	12.0	80.55
004-TX B PRIO	F TX C0	13,800	2,400	40	Fail		8.6				12.0	

Study Options

- Continuous rating checks includes cables, transformers, transmission lines, buses, generators, protective devices, panels, and protective devices on individual panel circuits.
- Short circuit interrupting and withstand rating checks for protective devices, buses, and schedules.
- Choose between balanced and unbalanced study results, protection, and non-protection device types.
- Choose between bus or branch fault study results from ANSI, IEC, or comprehensive fault analysis methods for evaluation.
- Equipment evaluations can be performed based upon used-defined limits or system defaults.
- Considers X/R ratios when evaluating low voltage protective devices.

TMS

The Transient Motor Starting Analysis module (TMS) is a state-of-the-art time simulation program to analyze all aspects of motor starting problems accurately.

TMS models up to 1500 motors dynamically throughout starting, stopping, or reacting to load changes. In order to completely examine motor starting problems, TMS has the capability to dynamically represent motors which are already online at the beginning of the simulation.

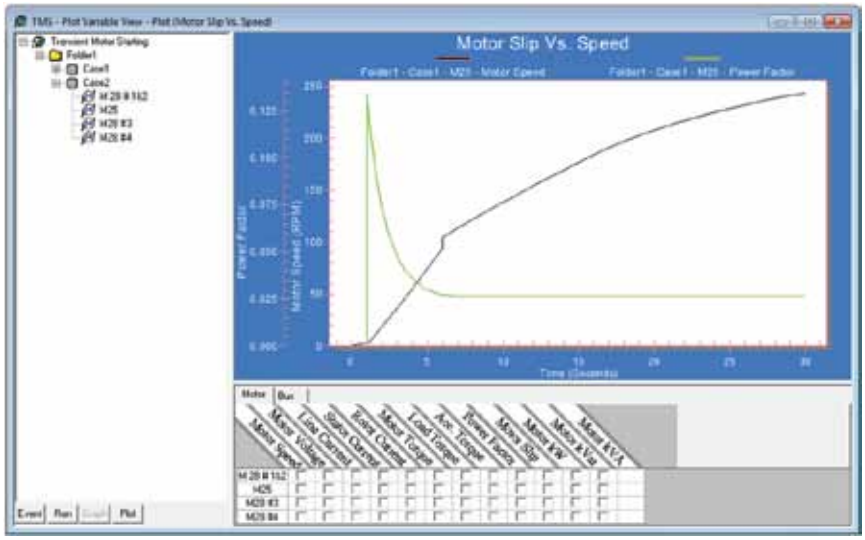
The complete network is continuously modeled throughout the time simulation in order to properly represent the interactions between motors and to be able to examine the effects of static loads, transformer taps, generator voltage set points, and all other network parameters.

Benefits

- Quickly examine and evaluate motors in your system for a variety of situations including; group motors starting, motor starting with different system load configurations, motor start heating problems, and evaluation of up to 9 motor starter types for reduced voltage starting schemes.
- Design efficient systems by determining optimal timing of staggered motor starting and re-acceleration schemes.
- Customize solutions with adjustable source voltage, include/exclude utility source equivalent impedance, and user definable time step for analysis.
- Communicate designs effectively with professional graphics and reports.

TMS Output

- Bus voltage
- Motor voltage
- Motor rotor current
- Load torque
- Motor speed
- Motor stator current
- Motor torque
- Accelerating torque
- Motor slip
- Reactive power (kVAR)
- Power factor
- Real power (kW)
- Total power (kVA)

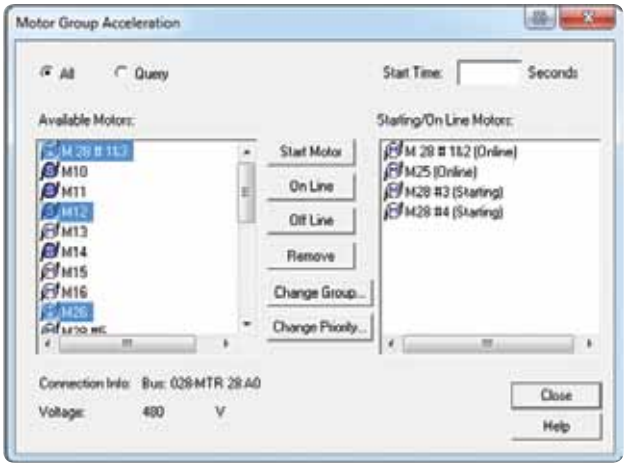


Features

- Compare alternative designs graphically on a single plot.
- Analyze torque speed characteristics of motors in actual system operation.
- Analyze motor load changes.
- Determine voltage dip impact of motor starting.
- Determine motor accelerating times.
- Allow modeling of sources
- Create user defined graphical data for loads and motors.
- Includes typical models for pumps, fans, compressors, grinders, blowers, and MG sets.
- Evaluate the interaction between multiple motors during starting conditions.
- Evaluate motor starting with different system load conditions and network configurations.
- Evaluate motor starting heating problems (I^2t).
- Evaluate application of reduced voltage starters.
- Determine the optimal timing of staggered motor starting and re-acceleration schemes.
- Determine the impact of motor starting on other online motors.
- The time related output data includes: bus voltage, motor speed, motor slip, motor torque, load torque, accelerating torque, stator voltage, stator current, input power, VARs, power factor, and rotor current.
- Time and voltage dependent switching is provided to start or trip motors or to enact motor load changes.
- Switch motors based on group and priority in motor group acceleration setup.
- Excel reports of selected plot channels

Motor Starter Options

- Series resistance
- Series reactance
- Solid state, current limit
- Solid state, voltage ramp
- Solid state, current ramp
- Full voltage
- Auto transformer
- Part winding
- Star-delta
- Shunt capacitors
- Variable frequency drives (VFD)



Motor Group Acceleration Setup

Solution Modeling

- Models stator and rotor circuits of multiple motors with the entire system network in order to model interaction between motors.
- Load models include torque-speed equations for fans, pumps, linear functions of speed, and user specified torque speed curves.
- Utilizes a load flow solution to model multiple motors within the full network for each time step.
- Network may include any combination of constant kVA loads, constant current loads, and constant impedance loads as well as generators which can schedule power and voltage within VAR limits.

HI_WAVE

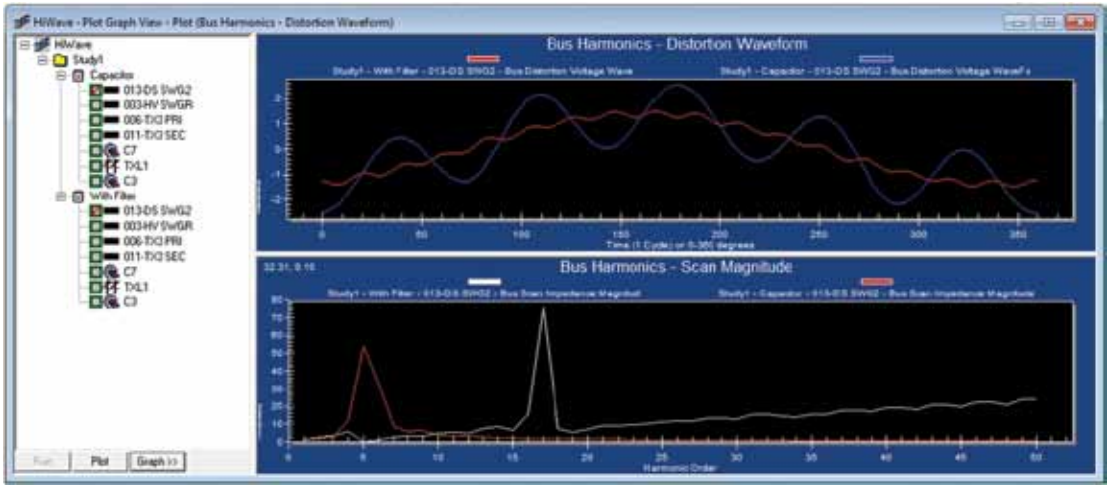
HI_WAVE simulates resonance and harmonic distortion in industrial, commercial, and utility power systems. New power systems may be examined before they are built and the harmonic effects addressed during the design. Existing power systems may be studied and corrective filter designs evaluated before they are installed. Every bus and branch in the power system may be quickly evaluated for harmonic content and for resonant impedance characteristics.

Harmonic current and voltage sources may be defined at multiple locations in the power system. Capacitor banks, single tune filters and high pass filters may be included in the voltage and current distortion evaluation, impedance resonance scans, and in harmonic load flow results.

Any type of system design, with any combination of voltage levels may be evaluated with this highly interactive, user friendly software.

Benefits

- Save time and money by troubleshooting harmonic problems and evaluating alternative solutions quickly.
- Improve power system reliability by identifying potential resonance conditions and minimizing harmonic distortion.
- Minimize I^2R heating losses and increase equipment life.
- Save money and improve designs by predicting resonance, distortion and filter effectiveness before the system is built.



Features

- Large library of feeders, transformers, and harmonic sources.
- Models radial, loop systems, and multiple independent systems with multiple voltage levels.
- Models harmonic voltage sources at buses, and/or current sources at loads and motors.
- Automatic modeling of all standard transformer connections, phase shift, and triplet harmonic paths.
- Automatic modeling of positive, negative and zero sequence networks.
- User-definable utility harmonic impedance.
- Models all filters and capacitors in harmonic load flow.
- Models loads as series RL or parallel RL at harmonic frequencies.
- Models non-linear frequency dependent effects for cables and transmission lines.
- Models non-linear frequency dependent effects for transformers.
- Harmonic source phase angles included in calculations.
- Single tune and high pass filter design calculators.
- Calculate telephone interference factors (TIF, IT).
- Frequency spectrum and locus plots for current and voltage distortion.
- Up to 20 steps per harmonic order frequency scan for all system resonance points with self or mutual impedance options.
- Graphical results for voltage and current wave distortion.
- Graphical results for voltage and current frequency spectrum in log or linear scale.
- Graphical results for impedance frequency scan in log or linear scale.
- Comparison of multiple studies on the same graph.
- Detailed reports for distortion and frequency scan.
- Advanced sparse matrix and current injection techniques provide extremely fast solution times.
- Comprehensive documentation with teaching tutorial.
- Option to specify Point of Common Coupling (PCC) definitions.
- Compares calculated distortions for voltage and current at each harmonic and total distortions (THD) at the Points of Common Coupling with the limits of the 1992 and 1996 IEEE 519 standards.

FILTER SPECTRUM REPORT

Filter Name: FLTR-Bus13 (SingleTuned)
Bus Name: 013-DS SWG2 (4160V)

Harmonic Order	IR (Amp)	IL (Amp)	IC (Amp)	R (kW)	L (kVAR)	C (kVAR)	R (V)	L (V)	C (V)
1	490.86688	490.86688	490.86688	36.15411	144.70195	3615.42452	42.52392	170.19626	4252.40811
5	226.01602	226.01602	226.01602	7.66494	153.38941	153.29934	19.57983	391.82805	391.59797
7	49.24915	49.24915	49.24915	0.36394	10.19630	5.19914	4.26647	119.53170	60.94975
11	23.51144	23.51144	23.51144	0.08294	3.65173	0.75405	2.03680	89.67229	18.51645
13	11.53113	11.53113	11.53113	0.01995	1.03809	0.15347	0.99895	51.97586	7.68422
17	15.99535	15.99535	15.99535	0.03839	2.61206	0.22582	1.38568	94.28204	8.15110
19	2.77869	2.77869	2.77869	0.00116	0.08810	0.00610	0.24072	18.30546	1.26695

Capacitor Rated Voltage: 4160.00 Rated 3 Phase KVA: 3460.00
V_RMS: 4270.891 V_CREST: 4740.575 I_RMS: 543.515 KVA: 3775.062
V_RMS: 102.6656% V_CREST: 113.9561% I_RMS: 113.1851% KVA: 109.1059%
Limit: 110.0% Limit: 169.7% Limit: 180.0% Limit: 135.0%

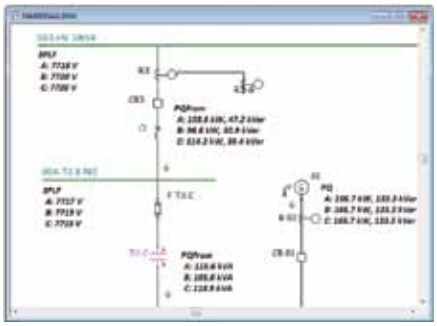
Unbalanced & Single Phase Studies

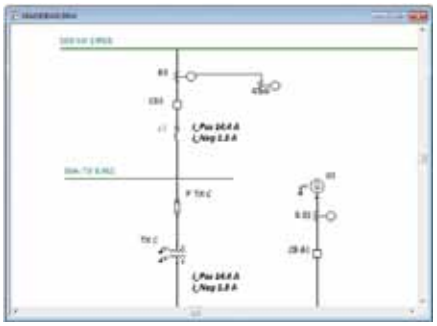
PTW Unbalanced Studies simulates systems with single-phase, two-phase and unbalanced three-phase load conditions. Phase and sequence currents can be displayed for different operating and load conditions including open-phase and simultaneous faults.

Studies include demand load analysis, sizing, load flow/voltage drop and short circuit. Reports also include three-phase and single-phase panel schedules. Modeling includes single-phase, two-phase and three-phase lines, transformers, loads, and capacitors as well as single-phase mid-tap transformers.

Benefits

- Design better systems where single-phase distribution and unbalanced conditions may exist.
- Identify undersized circuits caused by unbalanced loads before problems occur.
- Set negative sequence relays based on unbalanced fault and load simulations to identify problems that would otherwise go undetected until damage occurs.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.





Interface Options

- Display phase or sequence values with magnitude only, magnitude and angle, magnitude and power factor, or real and imaginary.
- Display individual phase values, maximum phase, or phase summation.
- Represent any combination of 1-phase, 2-phase and 3-phase systems including systems with mid-tap transformers.
- Shares common interface with balanced DAPPER studies, harmonic analysis, transient stability, equipment evaluation, reliability, and CAPTOR protective coordination modules.

Unbalanced & Single Phase Studies

Analysis Options

- Connected, demand, and design load analysis for each phase.
- Cable and transformer sizing based on design load of the largest phase.
- Load flow and voltage drop through each 1-phase, 2-phase, and 3-phase branch.
- Representation of transformer automatic Load-Tap-Change (LTC) options.
- Representation of mid-tap transformers.
- Representation of transformer no-load losses.
- Short circuit calculations including individual or simultaneous faults at different locations and on any phase combinations.
- Optional capacitance to earth representation.
- Unbalanced load representation in three-phase and single-phase panels and sub-feeds.
- Cable parameter calculator.
- Sequence to Phase and Phase to Sequence impedance conversions.
- Transmission line parameter calculator including multiple circuits, bundling, transposition, and line sag effects.
- Option to specify sub-transient or transient generator impedance.

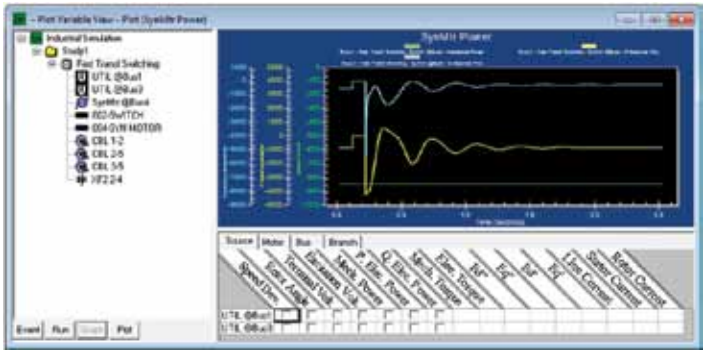
From Bus To Bus	Component Name In/Out Service		% VD	kW	kvar	kVA	kW Loss	kvar Loss	KVA Loss	LF Amps	LTC Tap %	% PF
026-TX G PRI	TX G	A:	1.04	490.35	330.06	591.08	5.36	30.36	30.83	255.32	-2.50	82.96
027-DSB-3	In	B:	0.99	488.34	327.51	588.00	5.26	29.80	30.26	252.94		83.05
		C:	-2.56	35.33	1.11	35.34	0.02	0.10	0.10	14.41		99.95
027-DSB-3	C13 A	A:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
028-MTR 28 A	In	B:	7.54	452.87	299.10	542.73	37.87	20.22	42.93	2,044.24		83.44
		C:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00

Typical Applications

- City distribution systems with three-phase and single-phase feeds.
- Rural utility distribution systems with three-phase and single-phase feeds.
- Campus distribution systems.
- Industrial plants to identify normal and abnormal unbalanced conditions.
- Commercial and institutional buildings with three-phase and single-phase loads and panels.
- Setting negative sequence relays to detect abnormal unbalanced conditions.
- Sizing equipment to projected design loads on largest phase.
- Short circuit, voltage drop or equipment sizing calculations for any single-phase, three-phase, or mixed-phase power system.

I*SIM

PTW I*SIM is a program for transient stability analysis. It is designed to simulate system response during and after transient disturbances such as faults, load changes, switching, motor starting, loss of utility, loss of generation, loss of excitation, and blocked governor events. I*SIM is designed to study today's most challenging simulation problems in one convenient and easy-to-use program.



Benefits

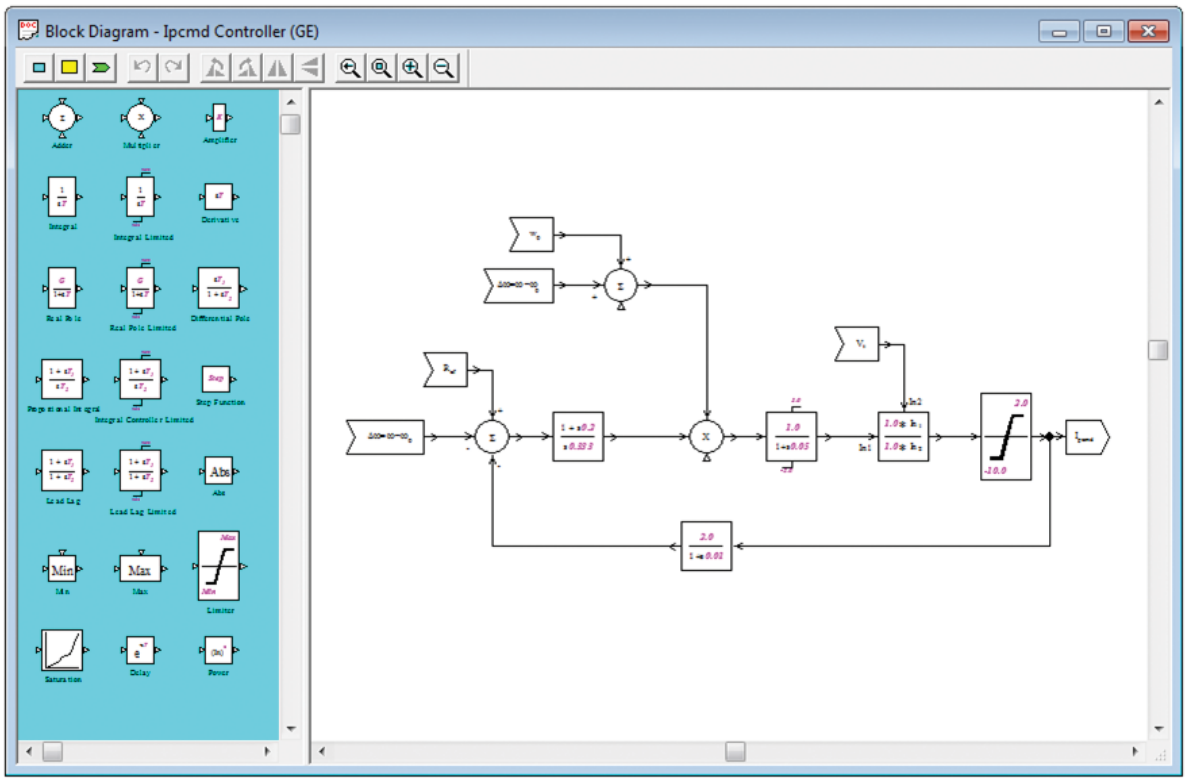
- Simulate complicated disturbances and system responses to design safer and more reliable power systems.
- Save time with built in IEEE standard exciter, turbine governor, power system stabilizers, static VAR compensator (SVC), and wind generator controller models.
- Increase flexibility with a powerful graphical builder for user-defined controllers.
- Save time by running multiple case scenarios from a single action.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.

Interface Options

- Graphical interface for system design, model selection, and study results.
- Stores multiple study scenarios with dynamic events and output graphics for each project.
- Expanding tree structure to manage study scenarios.
- Copy, paste, and rename study scenarios to compare alternative designs.
- Run multiple study scenarios as a single action.
- Compare results from multiple scenarios on the same graph.
- Plot phase and sequence voltage and current, speed, frequency, real and reactive power, rotor angle, voltage angle, torque, Efd, Ifd, Ed", Ed', Eq", Eq', and more.

Custom Models in User-Defined Library

- Choose from over 100 standard models for machines, governors, exciters, power system stabilizers (PSS), static VAR compensator (SVC), loads, overcurrent relays, under voltage, under frequency relays, and distance relays.
- Graphical drag and drop interface for building custom control block diagrams.



Analysis Options

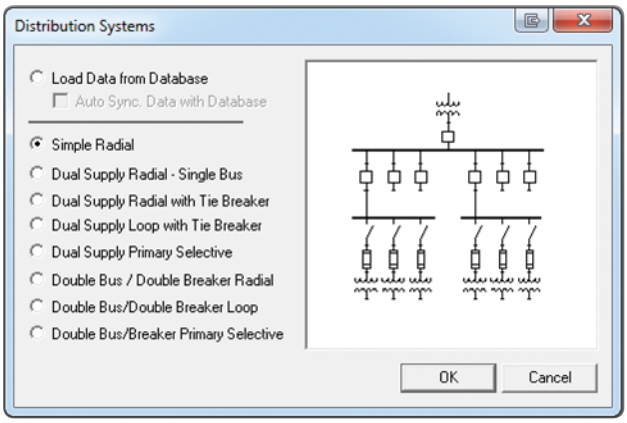
- Dynamic response to power system disturbances.
- Flux-level representation of all machines including induction motors and doubly fed induction generators in wind farms.
- Full dynamic representation of independent power systems (no infinite bus required).
- Simulate fault conditions and fault clearing for three-phase, single line, double line bus faults, and branch faults anywhere along the line.
- Start, trip, and reclose on induction motors.
- Integrated motor parameter estimation for flux-level model.
- Frequency dependent network modeling with positive, negative, and zero sequence networks.
- Control event sequence with adjustable relay settings.
- Simulate load shedding, isolation from utility, transfer switching, loss of excitation, blocked governor, block load changes, motor starting, and fault conditions.

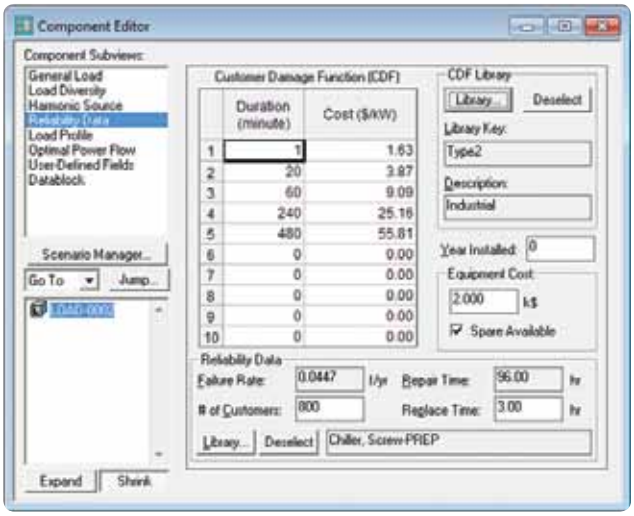
Distribution Reliability

PTW Distribution Reliability calculates reliability indices and cost effects for alternative system designs. Calculations include alternative supplies, alternative network configurations, spare equipment, time to repair, and cost impact of lost production. Libraries for time-adjusted component failure rates and costs are provided to save time and simplify system modeling.

Benefits

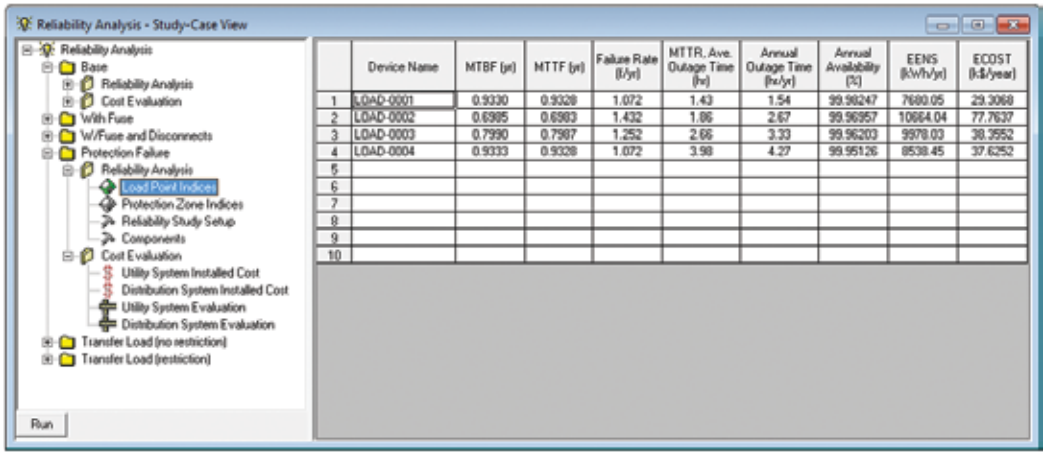
- Design more reliable power systems.
- Save costs by identifying and correcting system weaknesses efficiently and systematically.
- Save time by using standard libraries of time-adjusted failure rates and costs.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- Save time with pre-defined utility system configuration selections.





Interface Options

- Shares common interface with balanced DAPPER studies, harmonic analysis, transient stability, equipment evaluation, and CAPTOR protective coordination modules.
- Expanding tree structure to manage and compare multiple cases.
- User-defined time-based cost function for each load lost in outage.
- Repair time specification for each system component.
- Replace time and cost of spare specification for each systems component.
- Permanent, active, and temporary failure rates for each transformer.
- Permanent and active failure rates for each cable and cable termination.
- User-definable library of standard component reliability data.
- User-definable library for default cost function for loads lost in outage.



Study Options

- Repair, replace and switching options automatically evaluated.
- Reliability indices reported at each load and each bus.
- IEEE indices reported at each protective device.
- Options to include or exclude switches, fuses and load reliability in calculations.
- Option to repair or replace transformers.
- Cost evaluations for standard utility supply configuration alternatives.
- User-defined weighting preferences for operation, reliability, maintenance, recovery, and cost factors.
- User-defined aging factors for failure rate and repair time.
- Reliability reports include MTTF, Failure Rate, MTTR, Annual Outage, ENNS, ECOST.
- Cost evaluation reports include equipment lists and costs for utility and distribution systems.
- Cost evaluation reports include summary value based on user-defined weighting factors.

DC Systems Analysis

The DC System Analysis includes Battery Sizing, DC Load Flow, DC Short Circuit (ANSI), and DC Short Circuit (IEC).

Comply with Industry Standards

Battery Sizing - *IEEE standard 485 for sizing Lead-Acid batteries and IEEE standard 1115-2000 for sizing Nickel-Cadmium batteries.* Determine the size of batteries to supply the worse case DC duty cycle loads and AC emergency loads.

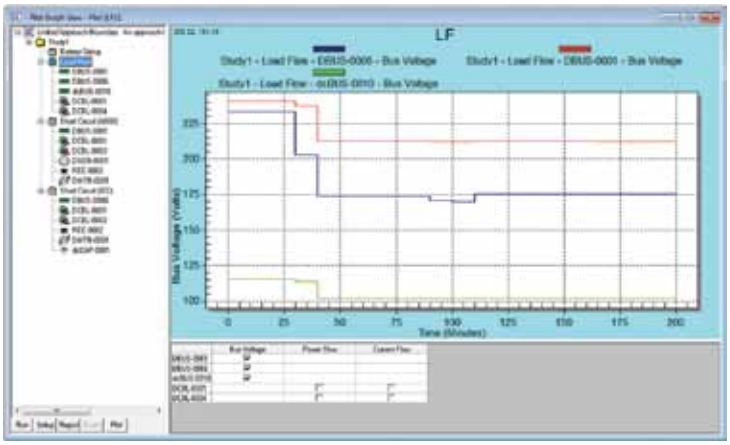
DC Load Flow - *Calculates power, current, and voltage drop profiles.* Represents constant kW, I, and Z load types, and evaluates all loading conditions for duty cycle loads and AC emergency loads.

DC Short Circuit - *ANSI standard 399 and 946.* Calculates the initial rate of rise and peak fault current.

DC Short Circuit - *IEC standard 61660.* Calculates the peak fault current, time constants, time to peak, and steady state conditions.

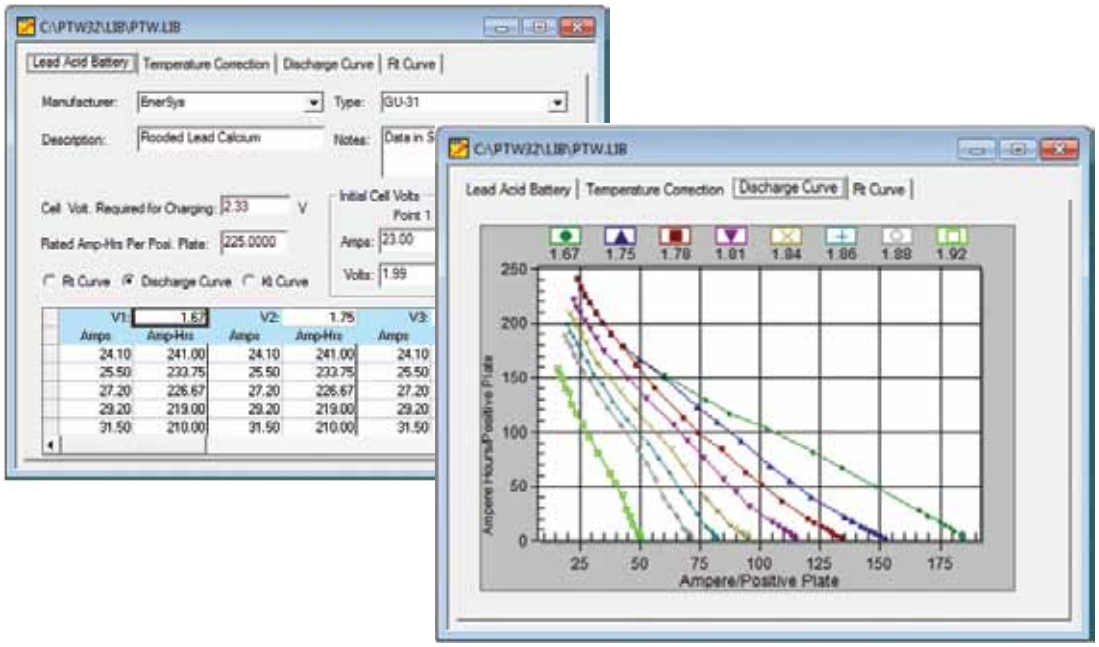
Benefits

- Save time with an intuitive scenario manager interface.
- Communicate designs effectively with graphical and text base results.
- Improve decisions by quickly comparing resulting curves from different scenarios.
- Increase productivity by modeling both DC and AC systems in a single project.
- Reduce mistakes by evaluating all loading conditions and duty cycle loads.
- Battery Sizing and Load Flow automatically calculates AC emergency loads and their impact on the DC system to help you design safer and more reliable systems.
- Option to include/exclude source impedance for batteries and swing generators load flow studies.



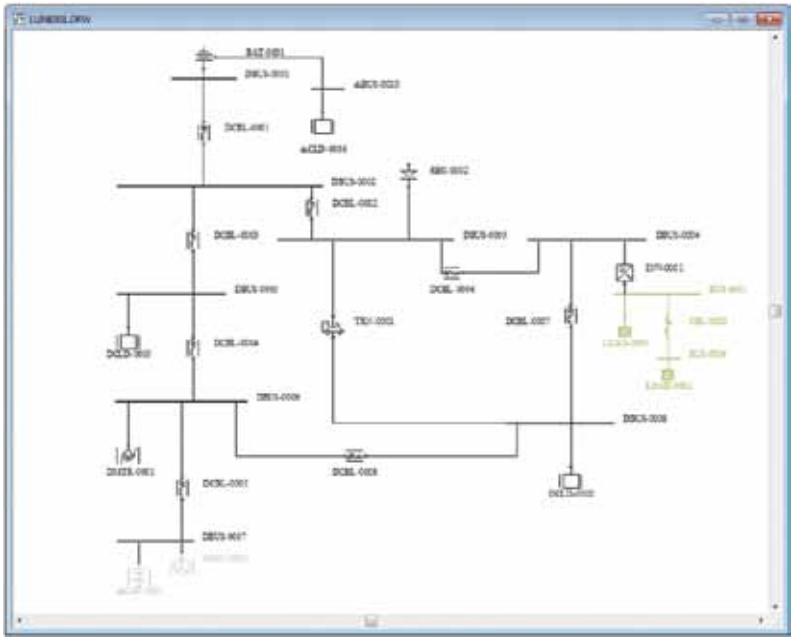
DC Equipment Library

- Battery Library - Rt Curve and Discharge Curve for Lead-Acid and Nickel-Cadmium batteries.
- DC Generator Library - Name Plate data, Transient Resistance, and Inductance.
- DC Motor Library - Name Plate data, Transient Resistance, and Inductance.



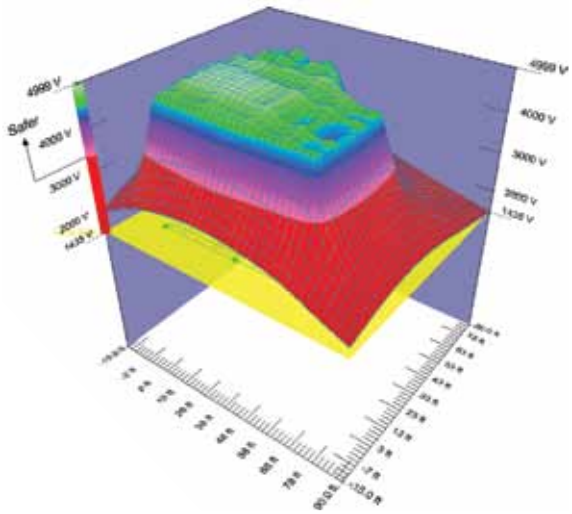
DC Component Types

- Lead-Acid Battery
- Nickel-Cadmium Battery
- Rectifier
- DC Cable
- DC Bus/Node
- DC Load
- DC Motor



GroundMat

PTW GroundMat is a program for substation ground grid design and analysis. It is designed to help optimize grid design or reinforce existing grids of any shape. It uses a general-purpose finite element algorithm for potential analysis and graphical facilities to validate ground system efficiency.

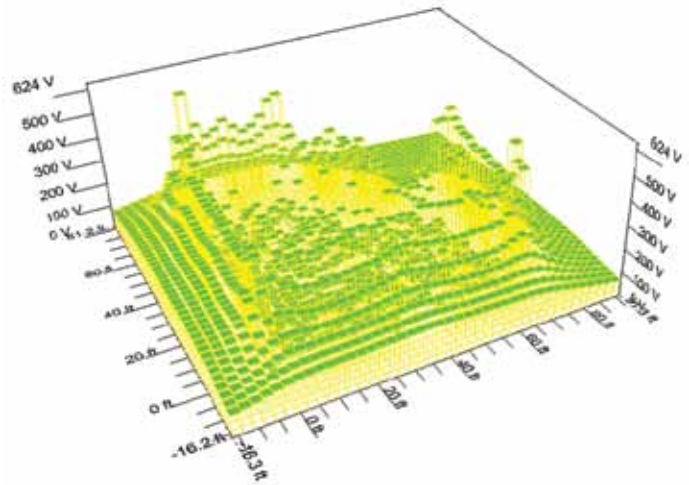


Benefits

- Design safer and more cost effective ground grids.
- Save time with graphical entry and display.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- Save time with design wizard capabilities.
- PTW GroundMat is an important tool every power system engineer should have.

Solution Algorithms

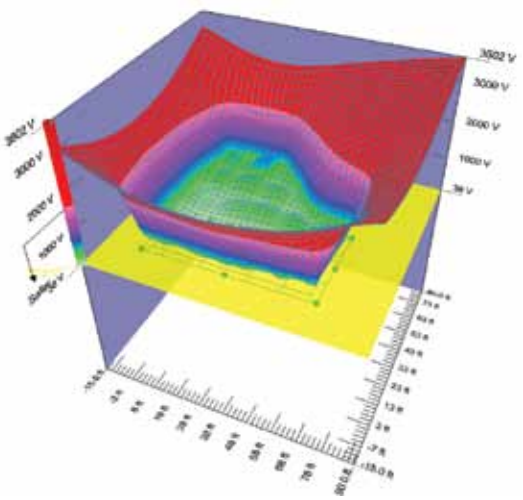
- Finite element analysis of the ground conductors.
- Finite element analysis of the ground rods.
- Grid conductor current displacement using Matrix analysis.



Analysis Options

- Calculate touch voltage, step voltage, and earth potential.
- Calculate grid potential and grid equivalent resistance.
- Report a bill of materials according to material types.
- Report current distributions in all grid conductors.
- Option to use IEEE standard 80 or IEC standard 479 for safety analysis.
- Earth model analysis from field measurements based on IEEE standard 80, Sunde method, or gradient method.
- User-definable fault current or fault current calculation.
- Ability to analyze multiple ground systems.
- Ability to analyze the potential rise for each grounding system including neighboring passive grids or rods.
- Safety analysis including surface materials, based on body weight and exposure time.
- Calculation of maximum permissible touch and step voltages.
- Comprehensive report for grid and rod configuration.
- Comprehensive report for surface potential analysis featuring station data and currents diffused to ground by the grid elements.
- Danger point evaluation.

Interface Options



- 2D Grid Editor for graphical layout of grid conductors.
- Tree list for multiple grid groups.
- Multiple line segments available to form any station site shape.
- Create and store alternative designs with a simple copy/paste.
- Data entry for grid and rods in spreadsheet format.
- Data entry for earth model in spreadsheet format.
- Grid/rod/profile wizards to setup initial system.
- 3D/2D representation of grid and rod configuration.
- 3D display of touch voltage, step voltage, and earth potential plot
- Report viewer for text reports.
- Cut, copy, and paste grid/rod segments in spreadsheet.
- Range-checking for simulation parameters.
- User-defined thresholds for danger area evaluation.
- User-defined color coding for graphical safety analysis.
- Metric and English units.
- Group print function.

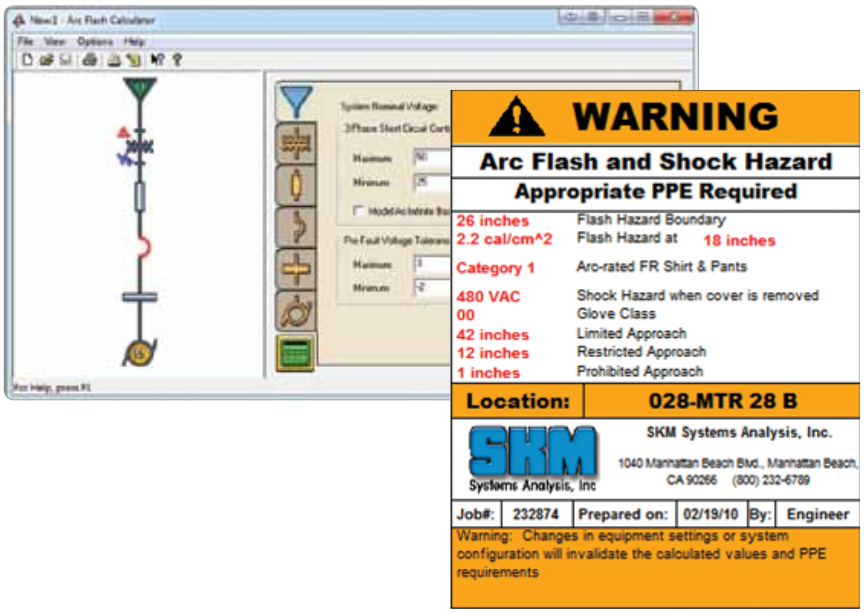
Project Setup Options

- Equivalent ground fault calculator for fault current estimation.
- Store multiple study revisions for each project.
- Expanding tree structure to manage project revisions.
- Input data and output results saved for each study.
- Copy, paste, and rename study revisions to compare alternative designs.
- Run studies for multiple study revisions as a single action.

ArcCalc

ArcCalc calculates the incident energy and arc flash boundary for any point in a power system. Minimum and maximum arcing short circuit currents are calculated using broad tolerances to provide conservative results with estimated system data.

ArcCalc saves time by automatically determining trip times from the protective device settings. Incident energy, arc flash boundaries, and PPE are calculated following the NFPA 70E, IEEE 1584, and CSA-Z462 standards.

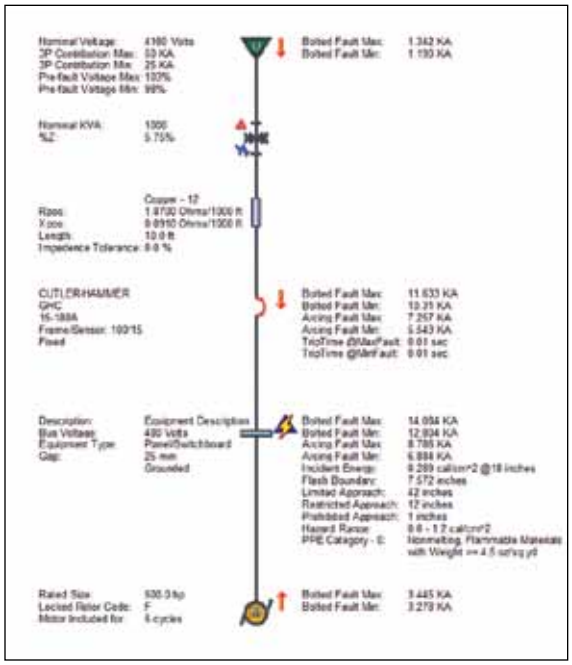


Benefits

- Calculator-style interface makes complex calculations easy to understand.
- Provide a safer working environment by specifying the proper level of PPE.
- Wearing inadequate clothing is dangerous for obvious reasons, but wearing too much clothing is dangerous due to limited mobility and visibility.
- Design safer power systems while insuring compliance with NEC 110.16, OSHA, NFPA 70E, IEEE 1584, and CSA-Z462 standards.
- Evaluate alternatives quickly and easily to understand the possible hazard.
- Improve safety margins with user-definable arcing fault tolerances.
- Improve safety margins with user-definable fault source and impedance tolerances.
- Save time by automatically generating arc flash labels and work permits.
- Avoid potential fines, lost productivity, and increased insurance and litigation costs.

Interface Options

- Simple calculator-style interface.
- Network one-line includes user-definable fault source, cable, transformer, and motor.
- Protection can be located anywhere on the one-line relative to the equipment bus.
- Intelligent default data for fault sources, transformers, cables, and motors.
- Intelligent default data for arcing fault variables including bus gap and working distance.
- Comprehensive library with thousands of validated protective device trip characteristics.
- One-line display annotated with input data, short circuit values, trip times, and flash hazard.
- Bus and branch arcing fault values are calculated, and trip times are automatically determined from the protective device settings.
- Arc Flash labels are automatically produced to comply with NEC 110.16 labeling requirements and can be printed in any size.
- Create custom labels in any size with user-defined logos, text, comments, field placement, and local language support.



Study Options

- Option to follow the NFPA 70E,IEEE 1584, and CSA-462 standards.
- Option to report in English or Metric units.
- Option to adjust arcing fault tolerance.
- Allows representation of differential, zone-interlocking, photo-sensing, and other special instantaneous protection schemes.
- Induction motors can be included for a user-defined time.
- Maximum arc duration may be specified for situations with long trip times.

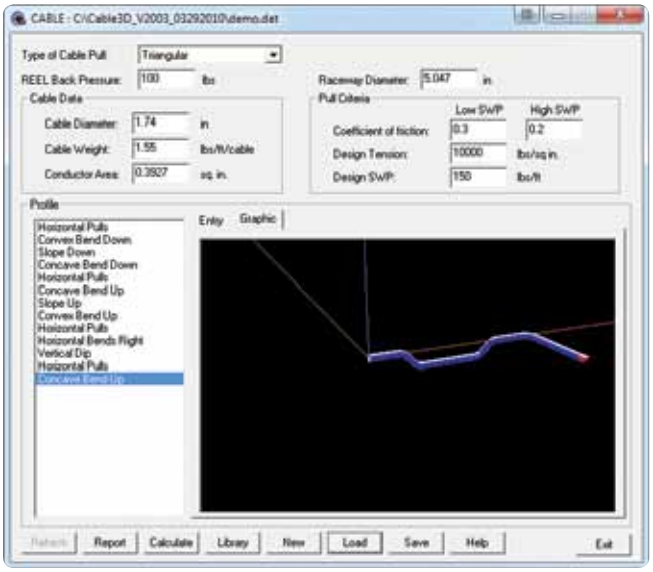
ArcCalc versus Arc Flash Evaluation

ArcCalc calculates the incident energy and arc flash boundary and selects the Personal Protection Equipment (PPE) for a single point in a simplified power system. Minimum and maximum arcing short circuit currents are calculated using broad tolerances to provide conservative results with estimated system data.

PTW Arc Flash Evaluation allows you to build a system model for your entire power system. Once the system model is built, the Arc Flash module calculates the incident energy and flash boundary at every location in the power system.

CABLE-3D

CABLE quickly solves complex three-dimensional cable pulling tension and sidewall pressure calculations, allowing you to make rapid and accurate design decisions. Don’t leave installation to chance.



Benefits

- Eliminate costly cable damage.
- Save time with graphical entry and display.
- Communicate designs more easily with professional reports and graphs.
- Evaluate alternatives quickly and easily to establish an optimal design.
- CABLE-3D is an important tool every power system engineer, designer, and contractor needs.

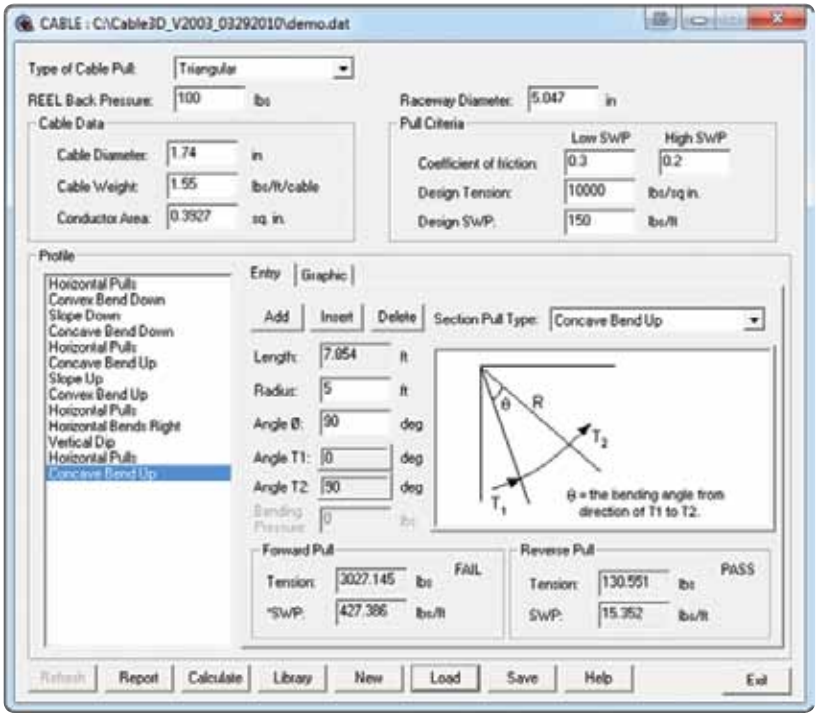
FORWARD PULL					REVERSE PULL			
Section Length	Total Pounds	Total lbs/ft	SWP Limits	PULL Length	Total Pounds	Total	SWP lbs/ft	PULL Limits
1	50.0	182.0		PASS	452.1	2252.4		PASS
2	65.7	237.1	7.0	PASS	402.1	2170.4	63.8	PASS
3	85.7	194.5		PASS	386.4	1600.2		PASS
4	101.4	197.3	5.8	PASS	366.4	1511.2	44.4	PASS
5	201.4	361.3		PASS	350.7	1143.2		PASS
6	217.1	479.8	14.1	PASS	250.7	979.1	28.8	PASS
7	237.1	568.7		PASS	235.0	787.1		PASS
8	252.8	809.6	23.8	PASS	215.0	829.7	24.4	PASS
9	302.8	891.6		PASS	199.3	631.2		PASS
10	334.2	1554.7	45.7	PASS	149.3	549.2	16.1	PASS
11	434.2	2062.1	9.7	PASS	117.9	311.0	1.5	PASS
12	444.2	2078.5		PASS	17.9	147.0		PASS
13	452.1	3027.1	427.4	FAIL	7.9	130.6	15.4	PASS

Analysis Options

- Calculates cumulative pulling tension through each pull profile.
- Calculates side wall pressure for each segment of the pull profile.
- Calculates jam ratios, clearances and percent fills.
- Automatically calculates forward and reverse pulls through each pull profile.
- Simulates single, triangular, cradled and diamond cable configurations.
- Suitable for any type of cable and pulling profile.

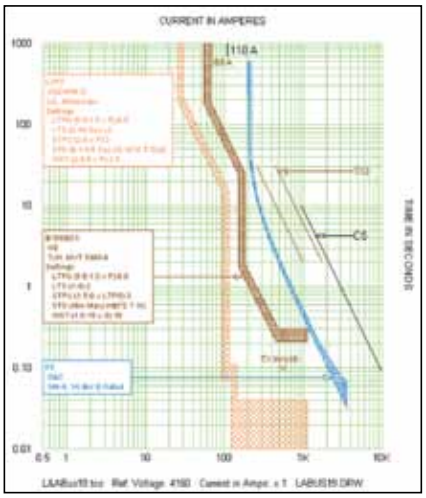
Interface Options

- Unlimited pulling profiles.
- Unlimited segments in each pulling profile.
- Cable, raceway and lubricant library.
- 3D graphical display.
- Extensive on-line help.
- Simple single-screen interface.



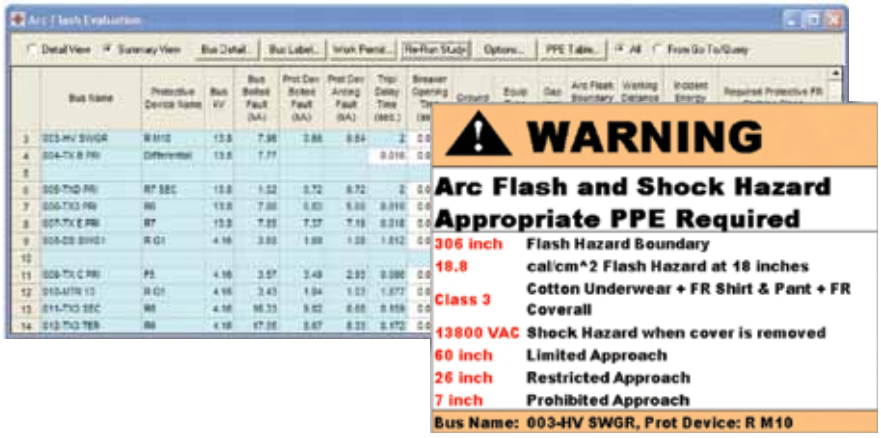
PTW-Viewer

PTW Viewer is the perfect tool to provide an interactive electrical model to your customers. Rather than paging through long reports, your customers can display results on the interactive one-line, view time-current curves, print arc flash labels, and many other activities. With the Viewer there is no chance of inadvertent modifications to the power system model.

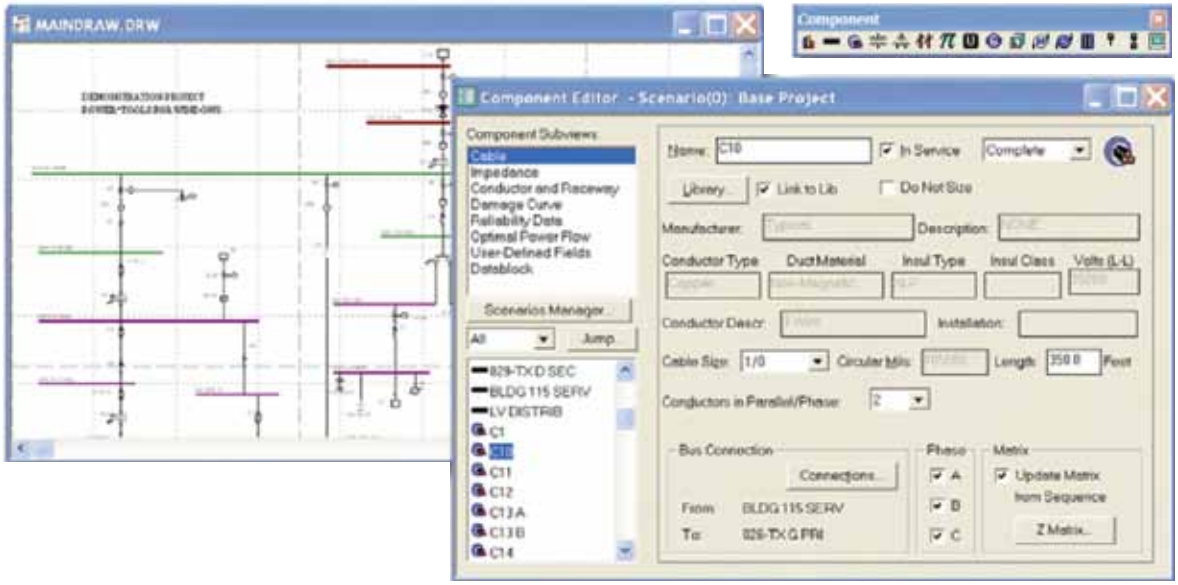


Benefits

- Open, view, print, and export all study results from any project without a full version of PTW.
- Create new one-lines from existing components and expand the one-lines.
- Modify or create new datablocks and apply them to any one-line and TCC.
- Adjust component position in existing one-lines and add annotations.
- View different scenarios created from the base project and compare the results of mulitple scenarios in the DataVisualizer.
- Create customized Arc Flash labels, print Warning Labels and Work Permits.



- Access to the Component Editor to view specifications of each component for all designs and projects.



- View tabular and graphical representations of completed studies.

- PTW Viewer is a tool that can be used by anyone to easily grasp the content of an existing power system model without having to purchase the full PTW software package!

SKM Power*Tools for Windows

INTEGRATED SOFTWARE FOR POWER ENGINEERS

Interface	SKM Power*Tools	Competition
◆ Multiple one-line diagrams can be associated with each project for better system organization and presentation.	YES	NO
◆ Datablocks define custom formats for viewing and printing input data and study results on one-line diagrams and TCCs.	YES	NO
◆ User-defined queries select and display groups of data with common attributes.	YES	NO
◆ Component Editor to display and edit components from scrolling list.		
◆ Data Probe to display interactive full size datablock.	YES	NO
◆ Interchangeable ANSI, IEC, and custom symbols.	YES	NO
◆ Automatically expand and collapse areas of the one-line diagrams to create custom drawings that best communicate the system design and study results.	YES	NO
◆ User-defined textblocks can be placed on one-line diagrams to display notes, study reports, and load schedules.	YES	NO
◆ Context sensitive on-line help with linked examples.	YES	FEW
◆ Project Revision and Scenario Manager for “what if” comparisons.	YES	FEW
	YES	NO

Studies		
◆ Protective coordination fully integrated with one-line diagram and component editor interface.	YES	NO
◆ Arc Flash calculations fully integrated with protective coordination and fault studies.	YES	NO
◆ Selective Coordination allow searches for up-to-down and down-to-up equipment pairs.	YES	NO
◆ User-definable levels of upstream mis-coordination in Arc Flash.	YES	NO
◆ Fault analysis options for traditional, ANSI, and IEC methods.	YES	FEW
◆ Efficient current injection power flow solutions.	YES	FEW
◆ Demand load analysis for reporting connected, demand and design loads for global diversity and sizing calculations.	YES	NO
◆ Feeder and transformer sizing calculations.	YES	FEW
◆ Dynamic Motor Starting calculations.	YES	FEW
◆ Integrated Panel, MCC, and Switchboard Load Schedules.	YES	FEW
◆ Integrated Single-Phase and Unbalanced 3-Phase Studies for Demand Load, Load Flow, Short Circuit, and Panel Schedules.	YES	NO
◆ Integrated DC Studies.	YES	FEW
◆ Integrated Transient Stability Studies and User-defined models.	YES	NO
◆ Integrated Harmonic Analysis.	YES	FEW

Compatibility		
◆ Multi-user network support.	YES	FEW
◆ User-defined Import/Export data templates.	YES	NO
◆ Export to Windows Metafile, DXF, and ASCII compatible files.	YES	FEW

Reporting		
◆ Output form options to print one-line diagrams, reports, and TCC drawings to custom formatted page layout.	YES	NO
◆ Printing support for shrink to fit or multi-page output.	YES	NO
◆ Custom report formats through Crystal Reports.	YES	FEW
◆ Custom spreadsheet formats for reports, tables, and schedules.	YES	NO
◆ Group print function to print selected group of one-lines, labels, TCCs, and reports in custom form layout (batch printing).	YES	NO

SKM Power*Tools®
Electrical Engineering Software

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.

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.

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.

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.

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.

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.

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.

CABLE-3D

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

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.

Printed In Taiwan

SKM Power*Tools®
Electrical Engineering Software

WHO BENEFITS FROM PTW?

Any engineer or designer who needs to:

- Design new electrical power systems
- Document an existing power system
- Check available system fault currents
- Check system protective coordination
- Summarize system loads and size equipment
- Evaluate capacitor size and placement
- Evaluate generator stability and protection
- Study harmonic sensitivity
- Study motor starting effects
- Document Arc Flash hazard levels

SKM
Systems Analysis, Inc.

www.skm.com

One Pearl Street
Redondo Beach, CA 90277
United States

Phone 1-800-500-4SKM
Fax 1-800-222-4SKM

sales@skm.com
support@skm.com