

# Short Circuit Analysis

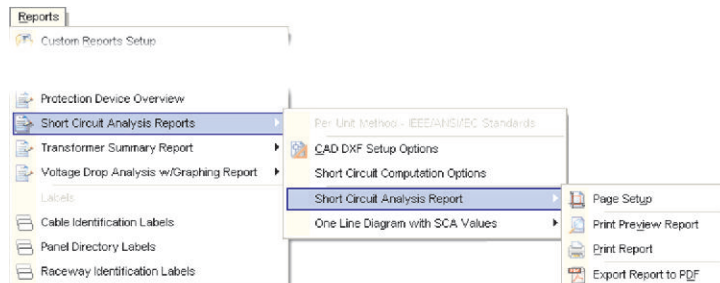


## Protect Your Equipment from Short Circuit Damage

All electrical systems are vulnerable to short circuits and the irregular current that they cause. Because of this vulnerability and the potential costs of repairing the damage that is done, it is extremely important to calculate short circuit currents before any problems can occur. Following IEEE Std. 141 and 242, Volts allows you to perform a per unit calculation on any system you are working with. Volts automatically converts the entire system (panel boards, transformers, generators, motorized items and cables) into a unique impedance unit from which you can obtain the rating of the short circuit current at any given point. The process is simple, efficient and will save you both money and time.

## Short Circuit Functions in Volts:

- IEEE standard computations of symmetrical short circuit current for each panel board
- Asymmetrical short circuit current computations using first article of decay formulation
- Computes contributions from generators, motors, transformers with reductions from cables
- Calculations for power distribution applications are as quick and easy as a menu selection



## Verification and Accuracy

You'll know what you've got when Volts displays the short circuit values in a report or one line riser diagram. These reports will include every buss in the system and

will be based on the input values of each entered device, transformer, generator and panel. Accuracy doesn't get any easier than that.

In addition, Volts checks every cable in the system, comparing the panel board's SCA capacity with the cable's SCA capacity to ensure that the insulation won't degrade. Volts makes it simple to know exactly what your system is going to do.

### Medium Voltage Momentary Short Circuit Analysis Report

Per Unit Method - IEEE Standards 141, 242

Friday, Sep. 19, 2008  
Prepared By: Dan Laws

Utility Co.:  
Utility Line Starting Power: 386 MVA

### Low Voltage Momentary Short Circuit Analysis Report

Per Unit Method - IEEE Standards 141, 242

Tuesday, Sep. 16, 2008  
Prepared By: Dan Laws  
Company: Dolphins Software  
File Name: Auto Body Shop.eic

Utility Co.:  
XFMR Type: Delta to Wye  
1000 kVA, 3Ø, 60Hz  
Voltages: 13,200V pri / 480V sec  
Impedance: 3.2%  
XR Ratio: 5.7

Supplied Information and Base Values  
Utility Line Starting Power: 1,000 MVA  
Base Line Voltage: 13.2 kV  
Base Transformer Power: 1,000 kVA  
Base XR Ratio: 5.7  
Cables' Resistance (R) Computed At: 25°C  
Max. Available Fault L-L: 43,739 Amperes  
Max. Available Fault L-G: 30,669 Amperes

Panel Name	#	Voltage	Maximum Fault Amperes		Protection Values	
			Symmetrical	Asymmetrical	OCPD Type	Duty Amperes
OfficePanel H	3	208	1,222.6	1,223.2	LVPGB MCCB 10-20 kA MCCB > 20 kA	1,222.6 1,687.2 1,670.6
Office Panel G	3	208	1,424.3	1,425.4	LVPGB MCCB 10-20 kA MCCB > 20 kA	1,424.3 1,965.6 2,179.2
Panel A-1	3	480	232.8	232.9	LVPGB MCCB 10-20 kA MCCB > 20 kA	232.8 321.3 356.3
Panel A	3	480	539.5	539.5	LVPGB MCCB 10-20 kA MCCB > 20 kA	539.5 744.4 625.4

### Cable Insulation Stability Under Short Circuit Report

Per Unit Method - IEEE Standards 141, 242

Tuesday, Sep. 16, 2008  
Prepared By: Dan Laws  
Company: Dolphins Software  
File Name: Auto Body Shop.eic

Utility Co.:  
XFMR Type: Delta to Wye  
1000 kVA, 3Ø, 60Hz  
Voltages: 13,200V pri / 480V sec  
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Supplied Information and Base Values  
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Base Line Voltage: 13.2 kV  
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Base XR Ratio: 5.7  
Cables' Resistance (R) Computed At: 25°C  
Max. Available Fault L-L: 43,739 Amperes  
Max. Available Fault L-G: 30,669 Amperes

Cable From	To	Cable Size	FLA	SCA sym	Max. A	Actions
MDP	Utility Transformer	7-Sets (3) 20 ga., THHN, Cu	907.37 A 480V, 3Ø	43,877 A	77,192 A	none
Transformer #1	MDP	(3) 1 ga., THHN, Cu	36.08 A 480V, 3Ø	43,877 A	48,539 A	none
Transformer #2	MDP	(3) 1/0 ga., THHN, Cu	90.21 A 480V, 3Ø	43,877 A	61,243 A	none
Transformer #3	MDP	(3) 400 kcmils, THHN, Cu	90.21 A 480V, 3Ø	43,877 A	231,881 A	none
Shop Panel F	Transformer #1	(3) 3/0 ga., THHN, Cu	13.01 A 208V, 3Ø	1,470 A	97,316 A	none
GAS HEATER	Shop Panel F	(1) 12 ga., THHN, Cu	5.46 A 120V, 1Ø	1,470 A	3,787 A	none
GAS HEATER	Shop Panel F	(1) 12 ga., THHN, Cu	6.58 A 120V, 1Ø	1,470 A	3,787 A	none
LIFT	Shop Panel F	(2) 12 ga., THHN, Cu	13.49 A 208V, 1Ø	1,470 A	3,787 A	none
LIFT	Shop Panel F	(2) 12 ga., THHN, Cu	13.49 A 208V, 1Ø	1,470 A	3,787 A	none
Shop Panel E	Transformer #2	2-Sets (3) 1/0 ga., THHN, Cu	59.22 A 208V, 3Ø	1,802 A	61,243 A	none
Receptacle Load #1	Shop Panel E	(1) 12 ga., THHN, Cu	12.63 A 120V, 1Ø	1,802 A	3,787 A	none
Receptacle Load #2	Shop Panel E	(1) 12 ga., THHN, Cu	12.63 A 120V, 1Ø	1,802 A	3,787 A	none
Receptacle Load #3	Shop Panel E	(1) 12 ga., THHN, Cu	12.63 A 120V, 1Ø	1,802 A	3,787 A	none
Receptacle Load #4	Shop Panel E	(1) 12 ga., THHN, Cu	12.63 A 120V, 1Ø	1,802 A	3,787 A	none
Receptacle Load #5	Shop Panel E	(1) 12 ga., THHN, Cu	12.63 A 120V, 1Ø	1,802 A	3,787 A	none
Receptacle Load #6	Shop Panel E	(1) 14 ga., THHN, Cu	11.36 A 120V, 1Ø	1,802 A	3,284 A	none

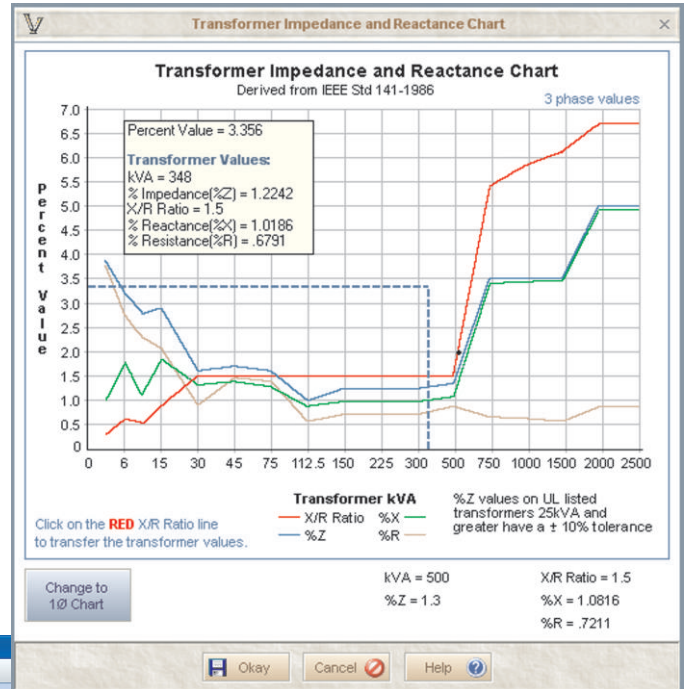
# Short Circuit Analysis

continued



## Other Short Circuit Related Features, Functions and Capabilities

- Compute SCA with mixed phase systems
- Compute motor LRA as contribution (sensitive to reduced voltage motors, not inaccurate ratios)
- Adjustable ambient temperature in addition to IEEE standard 25°C for cable impedance reduction
- Utilize UL 7.5% tolerance for transformer percentage of impedance (Z)
- Utility Line Starting Power in MVA
- Base Line Voltage in kV or Utility Transformer Primary Voltage
- Base Transformer Power in kVA or Utility Transformer rated kVA
- Volts includes the IEEE std. 141 Average Utility Transformer percent of impedance, XR ratio, Reactance and Resistance values
- Infinite Buss computations based on either base values or utility transformer values



**Schedules Setup**

**Short Circuit Default Selections**

Per Unit Method Utility Line and Short Circuit Base Default Values

Utility Line Starting Power: 1000 MVA

Base Line Voltage kV: 0 kilovolts (kV)

Base Transformer MVA: 0 Megavolt Amperes (MVA)

Ambient Temperature: 25 °C

Transformers Percentage of Impedance Tolerance: [ ]

Per Unit Method Motor Contribution (IEEE / ANSI Std. 141, 242)

Type of Motor	Subtransient X	Transient X
DC	0.15	0.30
6 Pole Synchronous	0.15	0.23
8-14 Pole Synchronous	0.20	0.30
Induction = 600v	0.25	-
Induction = 600v	0.17	-

**Utility Transformer Characterization**

These values are used in all reports and short circuit analysis

Utility Company Name: [ ]

Transformer Type: Delta to Wye Transformer

Transformer Nameplate Data:

- kVA Rating: 1000
- Short Circuit Amperes (SCA): 43799
- Primary Voltage: 13200
- Secondary Voltage Line to Line (high): 480
- Secondary Voltage Line to Neutral (low): 277
- Phase: 3, Hertz: 60

Impedance (%Z): 3.2

X/R Ratio: 5.7

Per Unit Short Circuit Base Values:

- Utility Line Starting Power: 1000 MVA
- Base Line Voltage kV: 0 kilovolts (kV)
- Base Transformer Power: 1 Megavolt Amperes (MVA)
- Base X/R Ratio: 1.5 X/R Ratio