

Transient Stability Analysis with PowerWorld Simulator



T8: Viewing Transient Stability Results



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Viewing Results

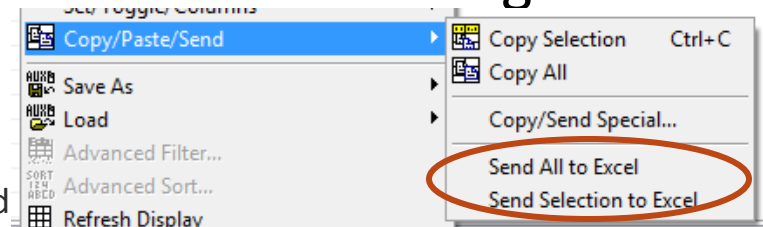


- Plots Display
- Results Display
- Time Values
- Events
- Plot Interaction

After the Transient Stability Run Finishes



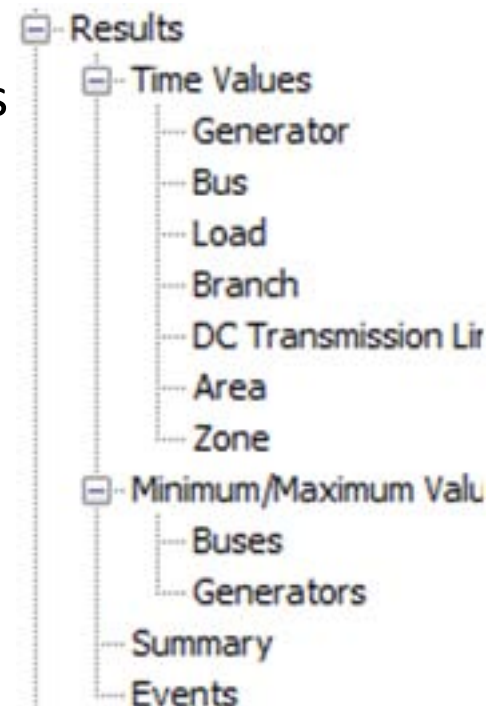
- Plots that are defined on the Plots Page are available
- The Results Page which contains the result data may be viewed
 - Time step values for results of fields saved in RAM
 - A minimum/maximum summary of values from the simulation
 - A summary of the run
 - Events that occurred
 - Solution details
- Much of the Results Page data appears in standard PowerWorld Simulator case information displays, so the results can easily be transferred to other programs (such as Excel) by right-clicking on a field and selecting “Copy/Paste/Send”



Transient Stability Results



- Times Values
 - Tabs represent the types of objects for which results are stored
 - Shows in case information displays all the results
- Minimum/Maximum Values
 - Shows in case information displays information about the minimum and maximum voltages, angles, and frequencies
 - Shown for Buses and Generators
- Summary of the stability run
- Events
 - The stability run will record events that occur as the stability run progresses
 - Shows action specified with Simulator, and may show relay trips or other events which occur



Result: Time Values



- Columns represent all the object/field pairs presently being viewed
 - Option is available to group columns by object or field
 - Column filtering by object available
 - Column filtering by field available
- Rows represent all the time steps stored

	Time	Bus ABERDEEN V (pu)	Bus ABERDEEN Frequency
1	0	1.045	60
2	0.008	1.045	60
3	0.017	1.045	60
4	0.025	1.045	60
5	0.033	1.045	60
6	0.042	1.045	60
7	0.05	1.045	60
8	0.058	1.045	60
9	0.067	1.045	60
10	0.075	1.045	60
11	0.083	1.045	60
12	0.092	1.045	60
13	0.1	1.045	60
14	0.108	1.045	60
15	0.117	1.045	60
16	0.125	1.045	60
17	0.133	1.045	60
18	0.142	1.045	60
19	0.15	1.045	60
20	0.158	1.045	60
21	0.167	1.045	60
22	0.175	1.045	60

- # Results tabs
-
- The screenshot displays the 'Transient Stability Analysis' software interface. The 'Results' tab is selected in the left sidebar and the main window. The main window shows a table of results with columns for Time, Gen Bus1 #1 Rotor Angle, Gen Bus1 #1 Speed, Gen Bus1 #1 Mech Input, Gen Bus1 #1 MW Terminal, and Gen Bus1 #1 Mvar Terminal. The table contains 27 rows of data. The 'Results' tab is highlighted in the left sidebar, and the 'Results' tab is also highlighted in the main window. Blue arrows point from the 'Results tabs' title to the 'Results' tab in the sidebar and the 'Results' tab in the main window.
- Simulation Status: Finished at 10.000
- Run Transient Stability [Pause] [Abort] For Contingency: My Transient Contingency
- Select Step
- Simulation
 - Options
 - Result Storage
 - Plots
 - Results**
 - Time Values From RAM
 - Minimum/Maximum Values
 - Summary
 - Events
 - Solution Details
 - Transient Limit Monitors
 - States/Manual Control
 - Validation
 - SMIB Eigenvalues
- Results
- Time Values From RAM Minimum/Maximum Values Summary Events Solution Details
- Generator Bus Load Branch DC Transmission Line Multi-Terminal DC Converter Area Zone
- Column Order
Object then Field
- Column Filtering
Filter [Modify...]
- ☐ Use Area/Zone Filters
- Choose Fields to Display Bus
- ☒ Accel MW
 - ☒ Field Current
 - ☒ Field Voltage (pu)
 - ☒ Mech Input
 - ☒ Mvar Terminal
 - ☒ MW Terminal
 - ☒ Rotor Angle
 - ☒ Rotor Angle, No Shift
 - ☒ Speed
 - ☒ Stabilizer Vs
 - ☒ States of Exciter
 - ☒ States of Governor
 - ☒ States of Machine
 - ☒ States of Stabilizer
 - ☒ Term. PU
 - ☒ VOEL
- | | Time | Gen Bus1 #1 Rotor Angle | Gen Bus1 #1 Speed | Gen Bus1 #1 Mech Input | Gen Bus1 #1 MW Terminal | Gen Bus1 #1 Mvar Terminal |
|----|------|-------------------------|-------------------|------------------------|-------------------------|---------------------------|
| 1 | 0 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 2 | 0.02 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 3 | 0.04 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 4 | 0.06 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 5 | 0.08 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 6 | 0.1 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 7 | 0.12 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 8 | 0.14 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 9 | 0.16 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 10 | 0.18 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 11 | 0.2 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 12 | 0.22 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 13 | 0.24 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 14 | 0.26 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 15 | 0.28 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 16 | 0.3 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 17 | 0.32 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 18 | 0.34 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 19 | 0.36 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 20 | 0.38 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 21 | 0.4 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 22 | 0.42 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 23 | 0.44 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 24 | 0.46 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 25 | 0.48 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 26 | 0.5 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
| 27 | 0.52 | 3.586 | 60 | 71.645 | 71.645 | 27.039 |
- Check All Uncheck All

Results:

Plotting of Time Values



- You can make the normal Case Information Display Plots from here
 - These plot definitions aren't saved but just prove a quick and dirty way for you to look at the results.
- Can also create a plot definition by selecting a group of columns and choosing **Columns > Create Plot Definition**
 - Automatically creates a new plot definition
 - Immediately shows that plot

	Time	Bus ALKALI_69 Frequency	Bus ALLSTON_5 Frequency	Bus ALLSTON_2 Frequency	Bus ALLSTON_2 Frequency	Bus ALVEY_500 Frequency	Bus ALVEY_230 Frequency	Bus ALVEY_115 Frequency	Bus ALVEY_115 Frequency
1	0	60	60	60	60	60	60	60	60
2	0.008	60	60	60	60	60	60	60	60
3	0.017	60	60	60	60	60	60	60	60
4	0.025	60	60	60	60	60	60	60	60
5	0.033	60	60	60	60	60	60	60	60
6	0.042	60	60	60	60	60	60	60	60

Quickly Plotting Results



- In this example, all Generator and Bus fields are being stored to RAM (see the Result Storage page of the Transient Stability Analysis dialog)
- Time value results can be quickly plotted by using the standard case information display plotting capability
 - Right-click on the desired column
 - Select Plot Columns; this opens the Column Plot Dialog
 - Use the Column Plot Dialog to customize the results
 - Right-click on the plot to save, copy or print it
- You can view plots of any available results or create new Plot Definitions from the Time Values tab
- You do not have to create Plot Definitions before the run

Example: Time Values



- Each tab shows the time values for different object types

Bus
Object
tab

Fields for Bus Objects

Results
now
grouped
by Field
first

Results

Time Values From RAM

Minimum/Maximum Values Summary Events Solution Details

Generator Bus Load Branch DC Transmission Line Multi-Terminal DC Converter Area Zone

Column Order: Field then Object

Column Filtering Filter Modify...

Use Area/Zone Filters

Choose Fields to Display

- ☒ Angle
- ☒ Angle, No Shift
- ☒ Frequency
- ☒ Gen Mvar Total
- ☒ Gen MW Total
- ☒ Load Mvar Total
- ☒ Load MW Total
- ☒ V (pu)

Check All Uncheck All

Load from Hard Drive File into RAM results specified by Store to RAM Options

	Time	Bus Bus 1 Frequency	Bus Bus 2 Frequency	Bus Bus 3 Frequency	Bus Bus 4 Frequency	Bus Bus 5 Frequency	Bus Bus 6 Frequency	Bus Bus 7 Frequency	Bus Bus 8 Frequency	Bus Bus 9 Frequency	Bus Bus 1 V (pu)	Bus Bus 2 V (pu)	Bus Bus 3 V (pu)
1	0	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
2	0.02	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
3	0.04	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
4	0.06	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
5	0.08	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
6	0.1	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
7	0.12	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
8	0.14	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
9	0.16	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
10	0.18	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
11	0.2	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
12	0.22	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
13	0.24	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
14	0.26	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
15	0.28	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
16	0.3	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
17	0.32	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
18	0.34	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
19	0.36	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
20	0.38	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
21	0.4	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
22	0.42	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
23	0.44	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
24	0.46	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
25	0.48	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
26	0.5	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
27	0.52	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025
28	0.54	60	60	60	60	60	60	60	60	60	1.04	1.025	1.025

Example: Time Values



- Use the right-click menu for the desired column
- Right click on the Generator 1 Rotor Angle column and select Plot Column

Results currently grouped by Object first

Generator Object tab

Click here to view a plot

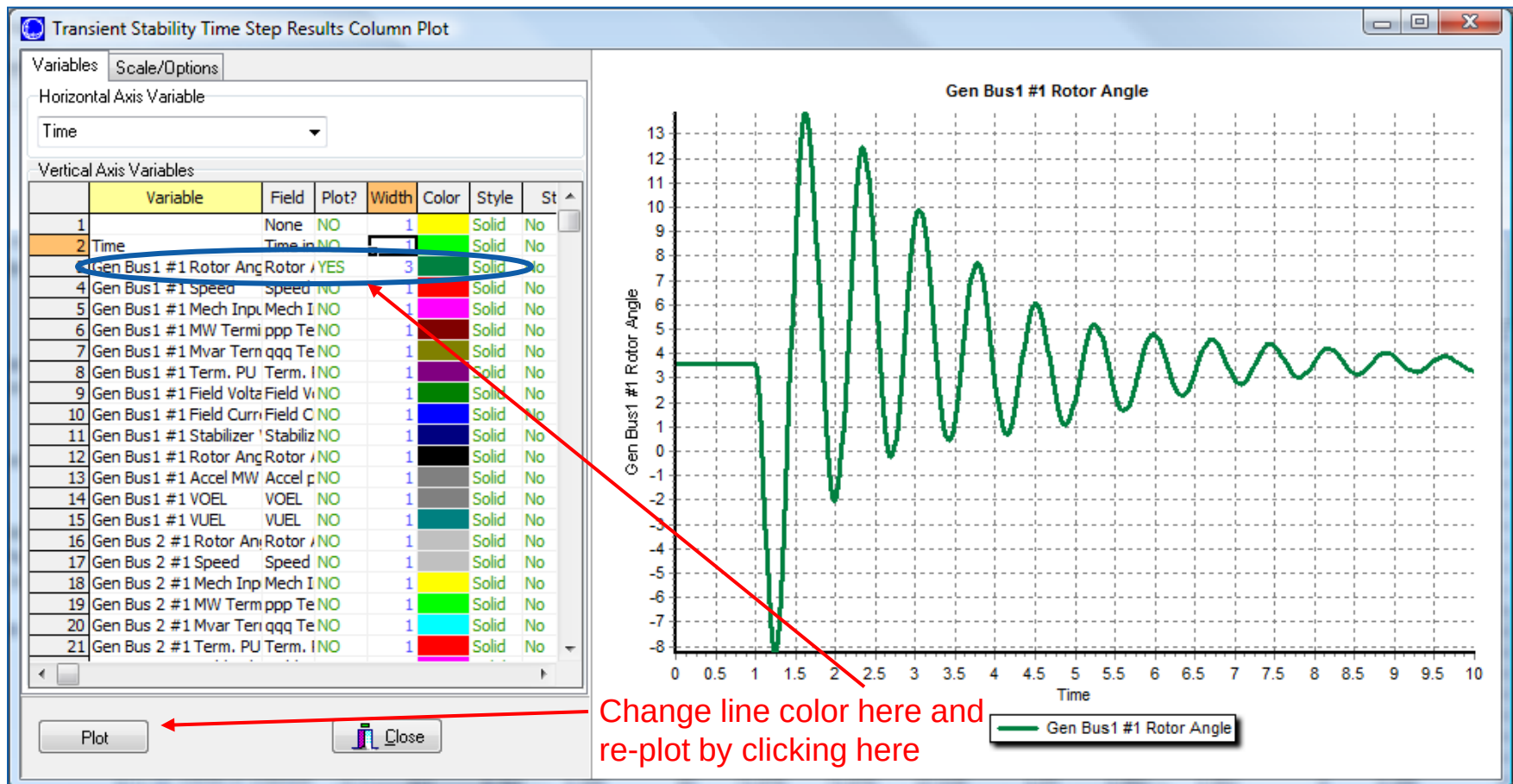
Can also create a Plot Definition from here

Time	Gen Bus1 #1 Rotor Angle	Gen Bus1 #1 Speed	Gen Bus1 #1 Mech Input	Gen Bus1 #1 MW Terminal	Gen Bus1 #1 Mvar Terminal	Gen Bus1 #1 Term. PU	Gen Bus1 #1 Field Voltage (pu)	Gen Bus1 #1 Field Current	Gen Bus1 #1 Stabilizer Vs	Gen Bus1 #1 Rotor Angle, No Shift	Gen Bus1 #1 Accel MW	Gen Bus1 #1 VOE	
1	0	3.586	60	71.645	71.645	27.039	1.04	1.082	1.082	0	3.586	0	
2	0.02	3.586	60	71.645	71.645	27.039	1.04	1.082	1.082	0	3.586	0	
3	0.04	3.586	60	71.645	71.645	27.039	1.04	1.082	1.082	0	3.586	0	
4	0.06						0.39	1.04	1.082	1.082	0	3.586	0
5	0.08						0.39	1.04	1.082	1.082	0	3.586	0
6	0.1						0.39	1.04	1.082	1.082	0	3.586	0
7	0.12						0.39	1.04	1.082	1.082	0	3.586	0
8	0.14						0.39	1.04	1.082	1.082	0	3.586	0
9	0.16						0.39	1.04	1.082	1.082	0	3.586	0
10	0.18						0.39	1.04	1.082	1.082	0	3.586	0
11	0.2						0.39	1.04	1.082	1.082	0	3.586	0
12	0.22						0.39	1.04	1.082	1.082	0	3.586	0
13	0.24						0.39	1.04	1.082	1.082	0	3.586	0
14	0.26						0.39	1.04	1.082	1.082	0	3.586	0
15	0.28						0.39	1.04	1.082	1.082	0	3.586	0
16	0.3						0.39	1.04	1.082	1.082	0	3.586	0
17	0.32						0.39	1.04	1.082	1.082	0	3.586	0
18	0.34						0.39	1.04	1.082	1.082	0	3.586	0
19	0.36						0.39	1.04	1.082	1.082	0	3.586	0
20	0.38						0.39	1.04	1.082	1.082	0	3.586	0
21	0.4						0.39	1.04	1.082	1.082	0	3.586	0
22	0.42						0.39	1.04	1.082	1.082	0	3.586	0
23	0.44						0.39	1.04	1.082	1.082	0	3.586	0
24	0.46						0.39	1.04	1.082	1.082	0	3.586	0
25	0.48						0.39	1.04	1.082	1.082	0	3.586	0
26	0.5						0.39	1.04	1.082	1.082	0	3.586	0
27	0.57						0.39	1.04	1.082	1.082	0	3.586	0

Example: Time Values



- Customize the plot- select horizontal axis variable, select which objects and fields to plot on vertical axis, width, color, style



Results:

Minimum/Maximum Values



- Shows the Minimum and Maximum Value that a particular generator or bus experienced during the stability run
- Note: The option under “Result Options” determines at what time we start checking for minimum and maximum values

General Power System Model **Result Options** Generic Limit Monitors

Time to Begin Checking for Minimum and Maximum Results

☒ After last event
☐ Immediately
☐ Custom Time

Results

Time Values Minimum/Maximum Values Summary Events

Buses Generators

	Number of Bus	Name of Bus	ID	Area Name of Gen	Original Angle	Min Angle	Time Min Angle	Max Angle	Time Max Angle	Max Angle Change	Min Fr Hz	Time Min Freq	Max Freq, Hz	Time Max Freq	Max Abs Hz
1	29478	FOSTERCK_13.8_1001	1	AESO	14.388	6.473	5.133	66.841	3.433	52.453	-0.343	4.450	0.002	2.025	0.343
2	29476	FOSTERCK_13.8_1101	1	AESO	14.388	6.478	5.133	66.828	3.433	52.440	-0.343	4.450	0.002	2.025	0.343
3	29550	GENESEE_20_1002	1	AESO	42.634	36.036	5.150	93.235	3.433	50.600	-0.327	4.350	0.002	1.992	0.327
4	30679	PRIMROSE_13.8_1001	1	AESO	36.879	31.042	5.158	87.782	3.450	50.904	-0.324	4.375	0.002	1.983	0.324
5	30945	SCOT4_8_13.8_1001	1	AESO	-13.354	-17.425	5.225	38.538	3.492	51.892	-0.322	4.425	0.002	1.967	0.322
6	30233	MAHKESES_13.8_1001	1	AESO	22.532	19.231	5.217	74.148	3.483	51.616	-0.318	4.417	0.002	1.958	0.318
7	30234	MAHKESES_13.8_1101	1	AESO	25.166	22.013	5.217	76.846	3.483	51.680	-0.317	4.417	0.002	1.958	0.317

Example: Min/Max Values



Bus tab

Minimum voltages at each bus during the run

Maximum voltages

Range of change of each bus voltage

Results

Time Values From RAM Minimum/Maximum Values Summary Events Solution Details

Buses Generators

Records Set Columns Options

	Number	Name	Area Name	Original Volt	Min Volt	Time Min Volt	Max Volt	Time Max Volt	Max-Min Volt
1	1	Bus 1	1	1.0400	1.0072	1.120	1.0661	2.200	0.0589
2	2	Bus 2	1	1.0250	0.8943	1.120	1.0616	2.240	0.1673
3	3	Bus 3	1	1.0250	0.9181	1.120	1.0599	2.240	0.1417
4	4	Bus 4	1	1.0258	0.9612	1.120	1.0564	2.240	0.0952
5	5	Bus 5	1	0.9956	0.9086	1.120	1.0294	2.260	0.1208
6	6	Bus 6	1	1.0127	0.9312	1.120	1.0452	2.240	0.1139
7	7	Bus 7	1	1.0258	0.9072	1.120	1.0616	2.240	0.1544
8	8	Bus 8	1	1.0159	0.9043	1.120	1.0508	2.240	0.1465
9	9	Bus 9	1	1.0324	0.9276	1.120	1.0668	2.240	0.1393

Bus Min/Max values

Times when the Min/Max occurred

Generator tab

Results

Time Values From RAM Minimum/Maximum Values Summary Events Solution Details

Buses Generators

Records Set Columns Options

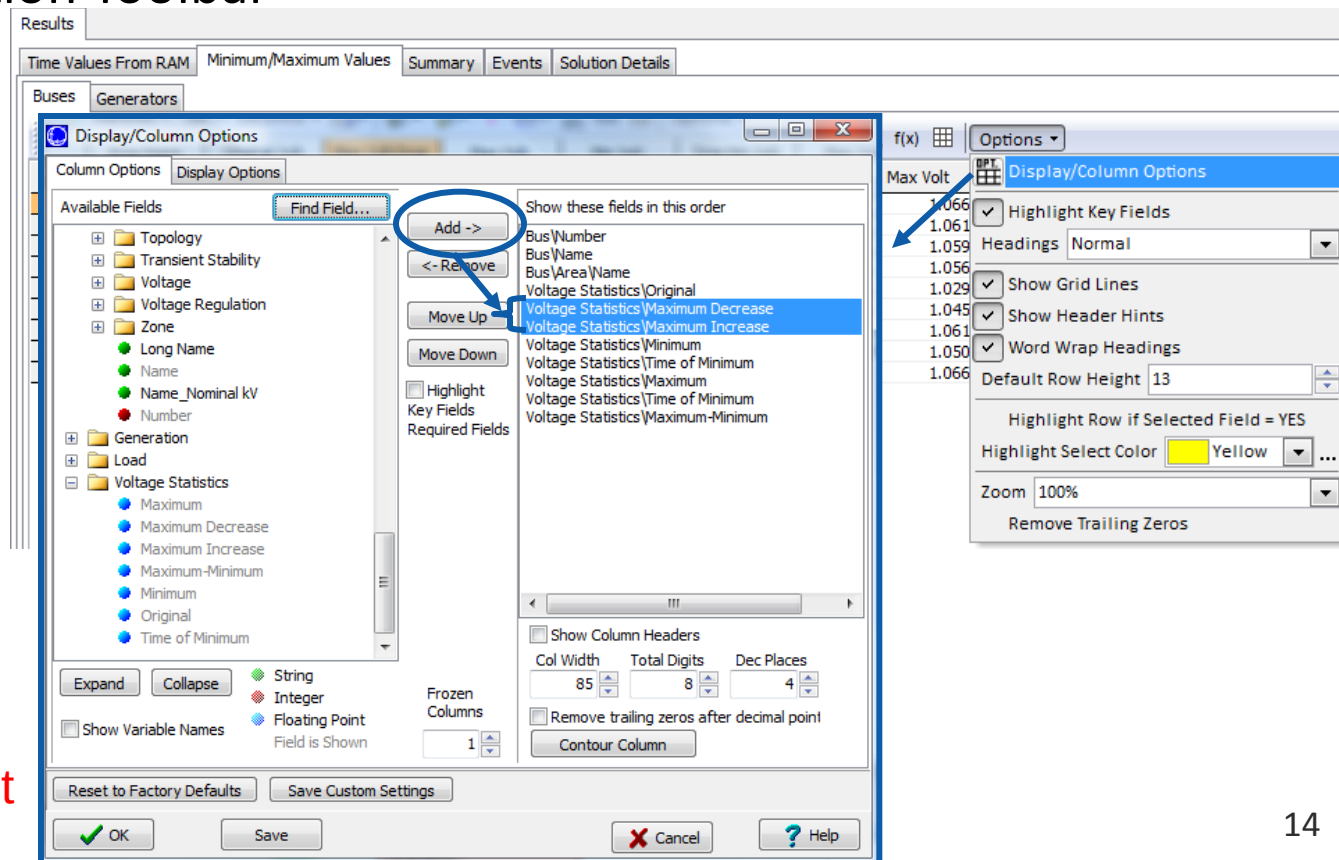
	Number of Bus	Name of Bus	ID	Area Name of Gen	Original Angle	Min Angle	Time Min Angle	Max Angle	Time Max Angle	Max Angle Change	Min Freq, Hz	Time Min Freq	Max Freq, Hz	Time Max Freq	Max Abs Hz O
1	1	Bus 1	1	1	-2.790	-8.277	1.240	13.884	1.620	16.675	-0.025	3.960	0.377	1.440	0.377
2	2	Bus 2	1	1	64.895	52.831	1.640	69.654	1.280	12.064	-0.093	3.600	0.510	1.800	0.510
3	3	Bus 3	1	1	56.720	50.938	2.360	58.114	1.200	5.781	-0.043	3.600	0.405	1.120	0.405

Generator Min/Max values

Example: Min/Max Values



- More choices of fields to add are available from Display/Column Options, like other standard Simulator case information displays
- You can access “Display/Column Options” from the right-click menu or the Case Information Toolbar
- Open “Display/Column Options,” and “Voltage Statistics” folder
- Select “Maximum Increase” and “Maximum Decrease,”
- Click “Add” button



Example: Min/Max Values



Column Options | Display Options

Available Fields Find Field...

Generator Display/Column options

- Governor Inputs
- Governor Other Fields
- Governor Setpoint
- Governor States
- Machine Inputs
- Machine Other Fields
- Machine States
- Mechanical Power MW
- Over Excitation Voel
- Rotor Angle
- Speed
- Stabilizer Feedback Vs
- Stabilizer States
- Terminal Voltage [pu] (behind step-up transformer)
- Under Excitation Voel
- Angle Statistics
 - Maximum
 - Maximum Change
 - Maximum Decrease
 - Maximum Increase
 - Minimum
 - Original
 - Time of Maximum
 - Time of Minimum
- d-q axis
 - Direct Axis Current [pu]
 - Direct Axis Voltage [pu]
 - Quadrature Axis Current [pu]
 - Quadrature Axis Voltage [pu]
- Eigenvalues
- Frequency Statistics
- Generator
- PMech Statistic
- PMech Statistics
- Power

Buttons: Add -> (circled), <- Remove, Move Up, Move Down, Highlight Key Fields, Required Fields

Bus tab

Time Values From RAM		Minimum/Maximum Values		Summary	Events	Solution Details
Buses	Generators					
Number	Name	Area Name	Original Volt	Max Volt Drop	Max Volt Increase	Min Volt
1	1 Bus1	1	1.0400	0.026106	0.032842	1.0
2	2 Bus 2	1	1.0250	0.036578	0.130704	0.8
3	3 Bus 3	1	1.0250	0.034862	0.106853	0.9
4	4 Bus 4	1	1.0258	0.030639	0.064571	0.9
5	5 Bus 5	1	0.9956	0.033720	0.087054	0.9
6	6 Bus 6	1	1.0127	0.032524	0.081412	0.9
7	7 Bus 7	1	1.0258	0.035845	0.118586	0.9
8	8 Bus 8	1	1.0159	0.034918	0.111623	0.9
9	9 Bus 9	1	1.0324	0.034458	0.104804	0.9

Increase digits displayed

Many field choices are available to view Transient Stability Results, especially for generators

Can see which bus voltages experienced the greatest drop or increase

See generator algebraic variables and maximum angle decrease and increase

Generator tab

Results

Generator tab

Time Values From RAM

Minimum/Maximum Values

Summary

Events

Solution Details

Buses

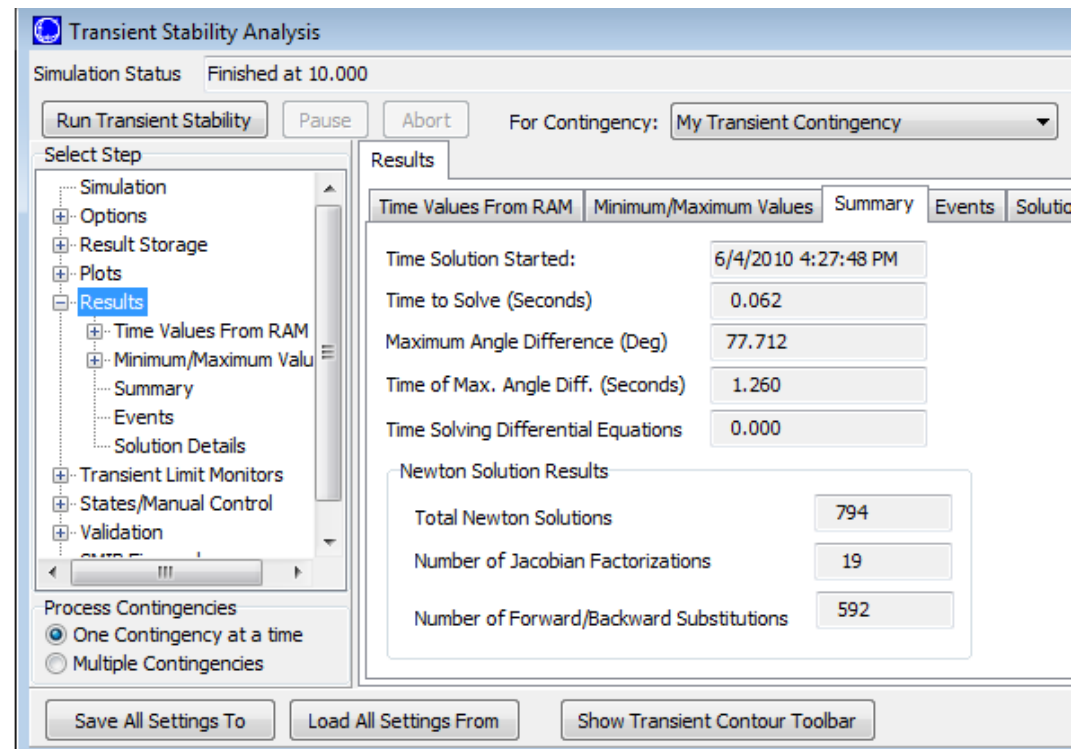
Generators



Results: Summary



- Time solution started- Time the transient stability analysis started
- Time to solve- Amount of computing time needed to solve the analysis
- Maximum angle difference- Maximum angle difference between any two generator rotors at any time during the analysis
- Time of maximum angle difference- Analysis time at which the maximum angle difference occurred
- Newton Solution Results- Information about the Newton solutions needed during the simulation



Results: Events



- Events tab shows a list of events which occurred during the run
- Events related to user-defined contingency elements will be listed
- Other actions will also appear here
 - Relay or motor tripping action of a stability model
 - Generic and Transient Limit Monitors

The screenshot shows the 'Transient Stability Analysis' window. The 'Simulation Status' is 'Finished at 10.000'. The 'For Contingency' dropdown is set to 'My Transient Contingency'. The 'Results' tab is active, and the 'Events' sub-tab is selected. The 'Events' table is displayed with the following data:

	Time (Seconds)	Object	Model Type	Description	Level
1	1.0000	Bus '5'	TXBusObject	Apply Solid Fault (3PB)	Info
2	1.1000	Bus '5'	TXBusObject	Clear Fault	Info

Looking at the events after a simulation is a good way to find an explanation for anything unusual that might have affected the run.

Example: Solution Details



- Summary information about the Newton solution results

Transient Stability Analysis

Simulation Status Finished at 10.000

Run Transient Stability Pause Abort For Contingency: My Transient Contingency

Select Step

- Simulation
- Options
- Result Storage
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- States/Manual Control
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Process Contingencies

☒ One Contingency at a time

☐ Multiple Contingencies

Results

Time Values From RAM Minimum/Maximum Values Summary Events Solution Details

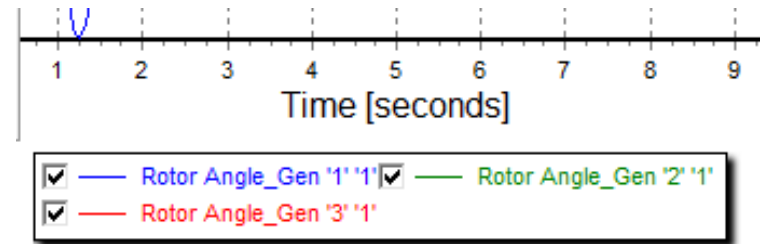
	Time	Mismatch 1	Mismatch 2	Mismatch Bus 1	Mismatch Bus 2	# Jacobian Factorizations 1	# Jacobian Factorizations 2	# Mismatch 1	# Mismatch 2	# Forward/Backward 1	# Forward/Backward 2
1	0.000	0.000	0.000	5	5	0	0	1	1	0	0
2	0.020	0.000	0.000	5	0	0	0	1	0	0	0
3	0.040	0.000	0.000	5	5	0	0	1	1	0	0
4	0.060	0.000	0.000	5	0	0	0	1	0	0	0
5	0.080	0.000	0.000	5	5	0	0	1	1	0	0
6	0.100	0.000	0.000	5	0	0	0	1	0	0	0
7	0.120	0.000	0.000	5	5	0	0	1	1	0	0
8	0.140	0.000	0.000	5	0	0	0	1	0	0	0
9	0.160	0.000	0.000	5	5	0	0	1	1	0	0
10	0.180	0.000	0.000	5	0	0	0	1	0	0	0
11	0.200	0.000	0.000	5	5	0	0	1	1	0	0
12	0.220	0.000	0.000	5	0	0	0	1	0	0	0
13	0.240	0.000	0.000	5	5	0	0	1	1	0	0
14	0.260	0.000	0.000	5	0	0	0	1	0	0	0
15	0.280	0.000	0.000	5	5	0	0	1	1	0	0
16	0.300	0.000	0.000	5	0	0	0	1	0	0	0
17	0.320	0.000	0.000	5	5	0	0	1	1	0	0
18	0.340	0.000	0.000	5	0	0	0	1	0	0	0
19	0.360	0.000	0.000	5	5	0	0	1	1	0	0
20	0.380	0.000	0.000	5	0	0	0	1	0	0	0
21	0.400	0.000	0.000	5	5	0	0	1	1	0	0

Save All Settings To Load All Settings From Show Transient Contour Toolbar Close

User Interaction with Plots



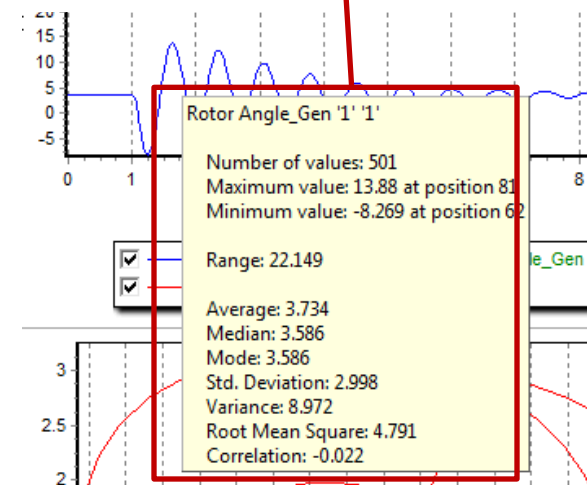
- Panning: **Right**-Click and Drag on the plot
- Zoom In: **Left**-Click and Drag to the Right
- Zoom Out: **Left**-Click and Drag to the Left
- Making Plot Series visible or invisible:
Checkboxes on Legend



User Interaction with Plots



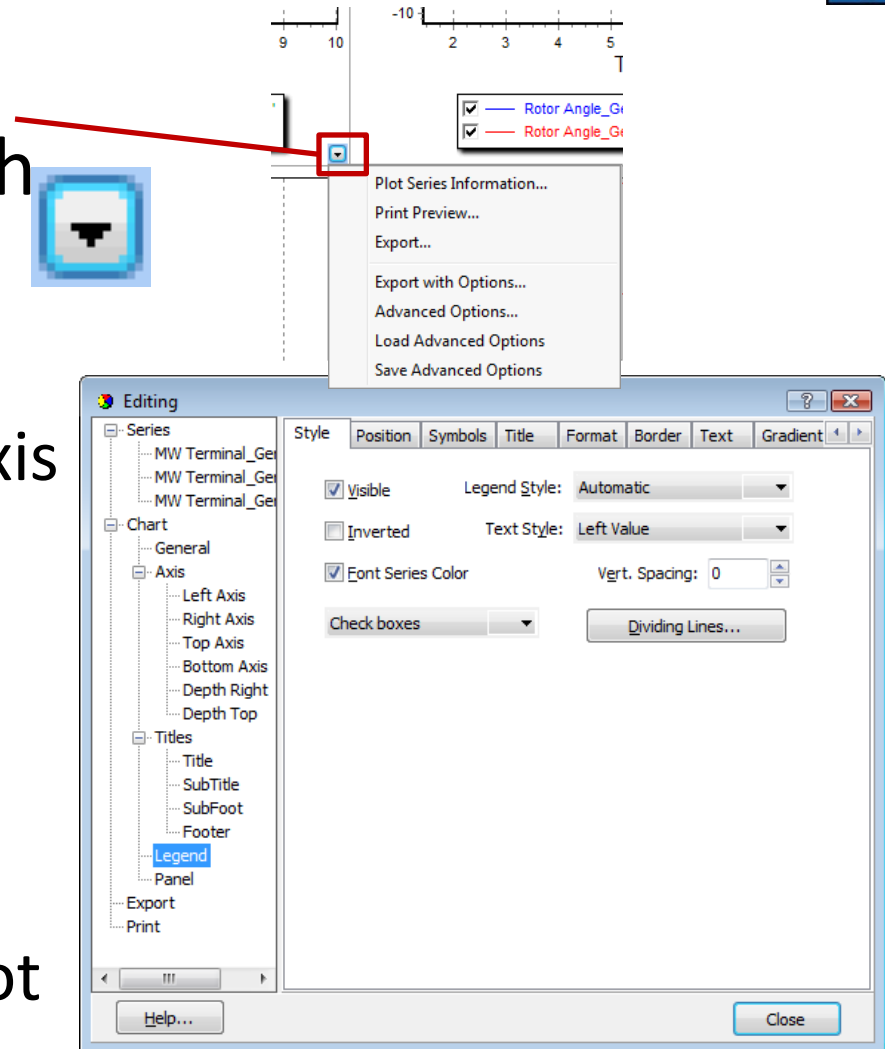
- Get Information about a Plot Series
 - Hover mouse over series and wait for a Hint
 - Right-Click on the series and choose Plot Series Information



Advanced Options



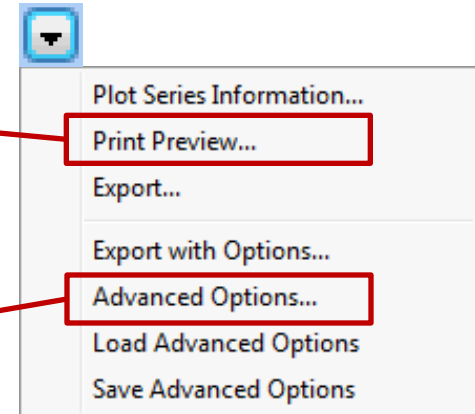
- Click on the button in the lower-right of each subplot and choose Advanced Options...
 - Or right-click on the axis or legend
 - Thousands of more obscure options
 - Advanced options can only be stored in a file referenced by a subplot



Print Preview of Chart



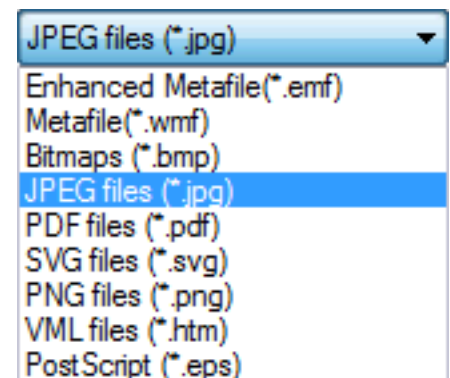
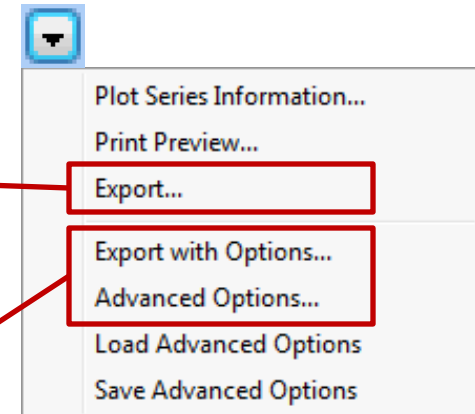
- A particular chart (subplot) can be printed directly to the printer
 - Choose **Print Preview...** from chart menu
 - Can also choose **Advanced Options...** from menu and then navigate to **Print**



Exporting Picture of Chart



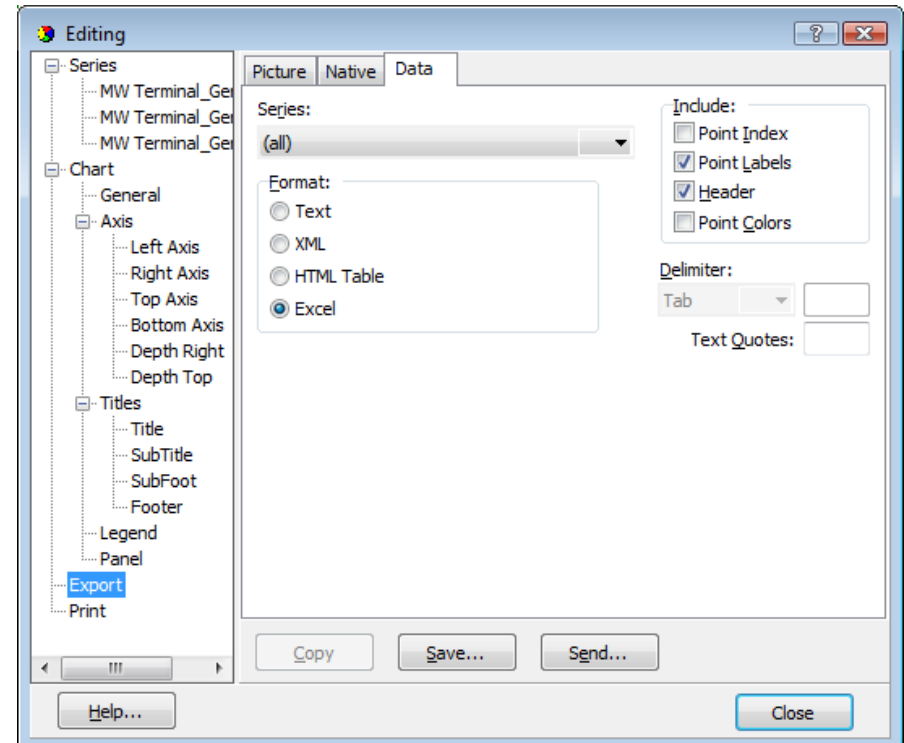
- A particular chart (subplot) can be exported directly to an image
 - Choose **Export...** from chart menu
 - File Types Supported
 - Enhanced Metafile, Bitmap, JPEG, PDF, SVG, PNG, VML, EPS
 - Can also choose **Export with Options...** or **Advanced Options..** from menu
 - Opens the Advanced Options dialog to the export portion



Exporting Data



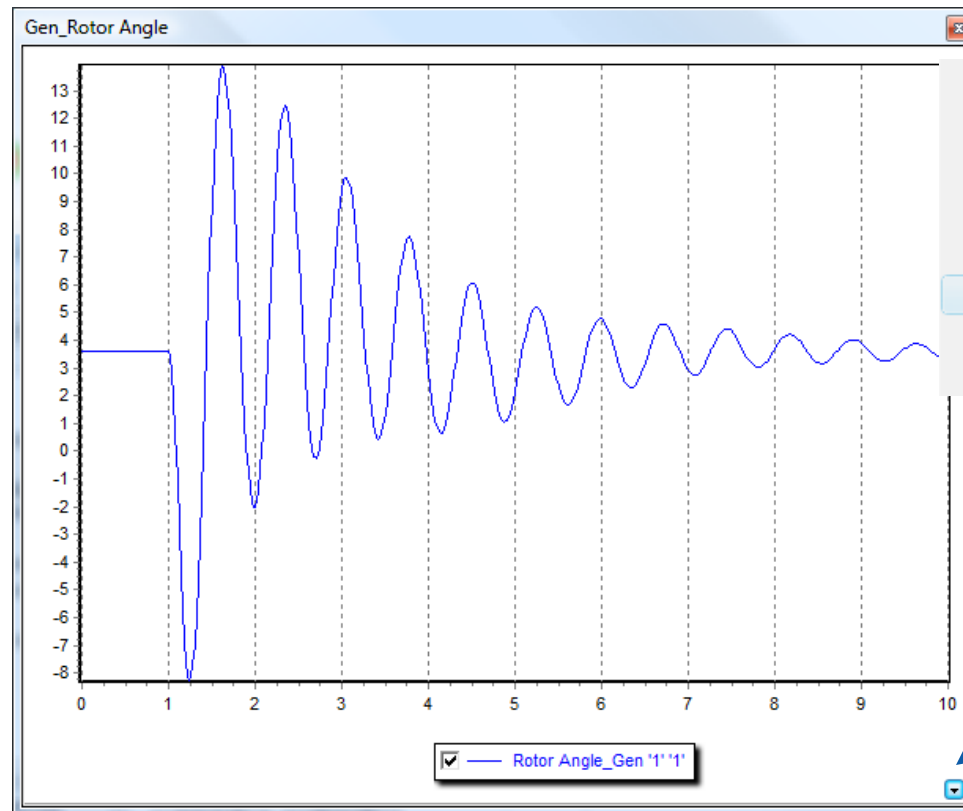
- Data underlying a particular chart (subplot) can be exported directly to another format
 - Text, XML, HTML, or Excel
 - Accessed from the Advanced Options dialog
 - Can also choose **Export with Options...** from menu



Example: A simple plot



- Open “**TS9Bus Bus Fault SimplePlot**” created in the Plot Definition Section
- Click “Run Transient Stability”
- A plot of the rotor angle at bus 1 is generated



Right click menu

Plot Series Information...
Print Preview...
Export...
Copy
Export with Options...
Advanced Options...
Load Advanced Options
Save Advanced Options

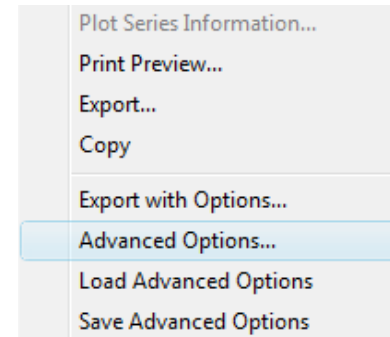
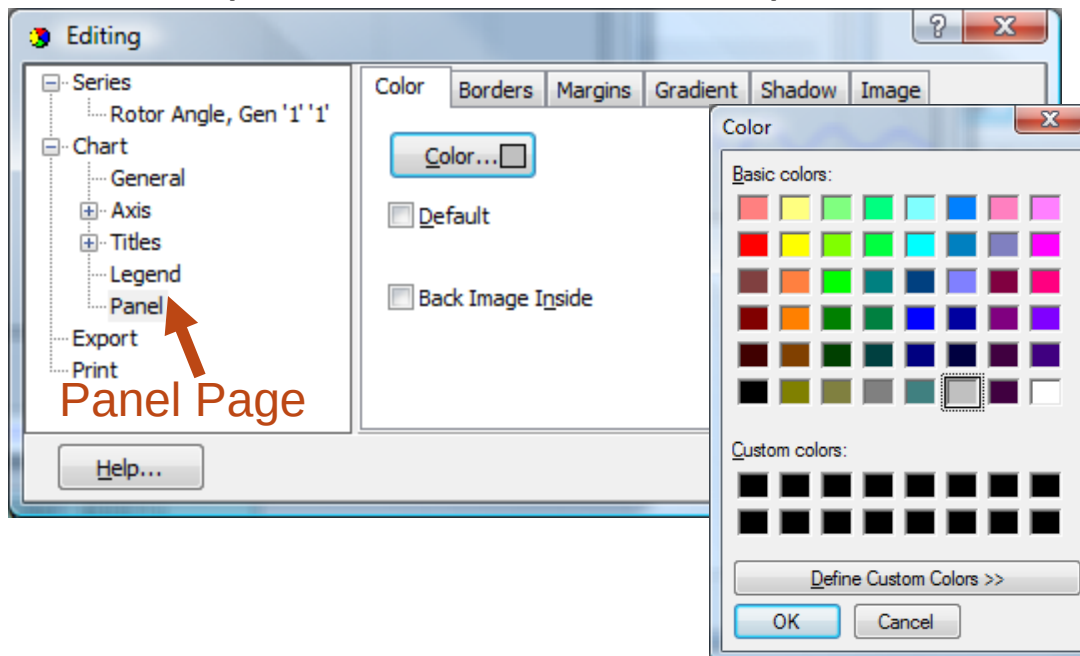
Click on
Advanced Options

Can also click here
to show the menu

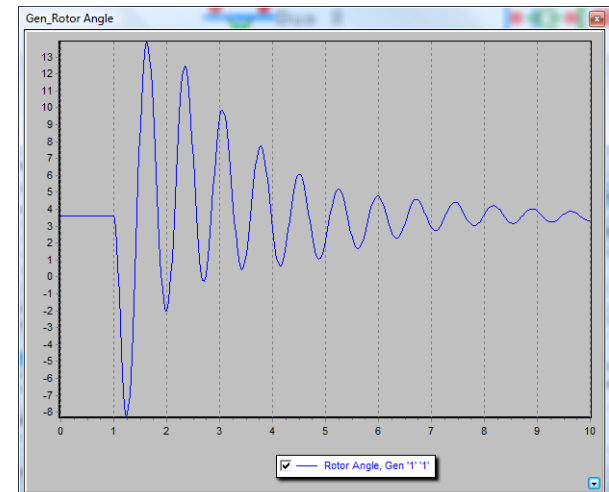
Example: Plot Advanced Options



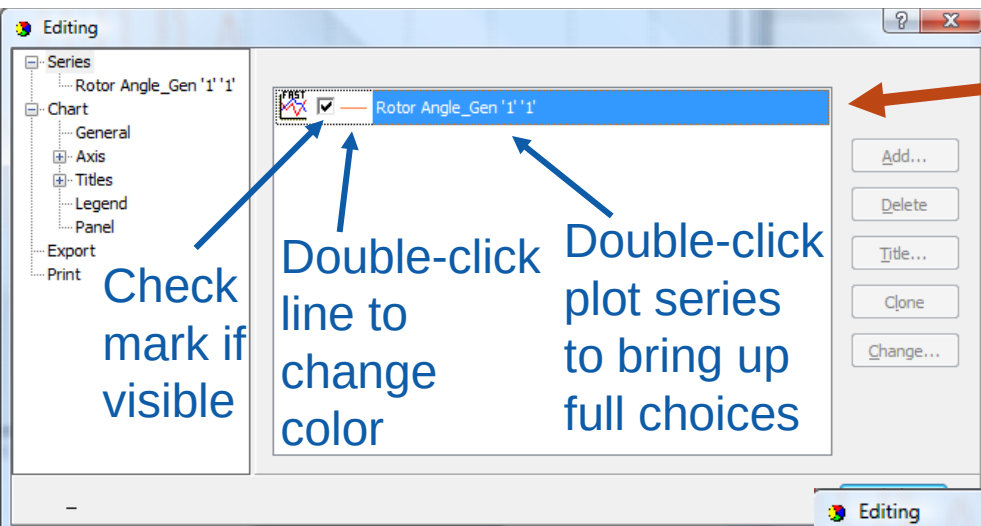
- Customize the plot
 - Titles
 - Appearance
 - Axes
- Experiment with the options



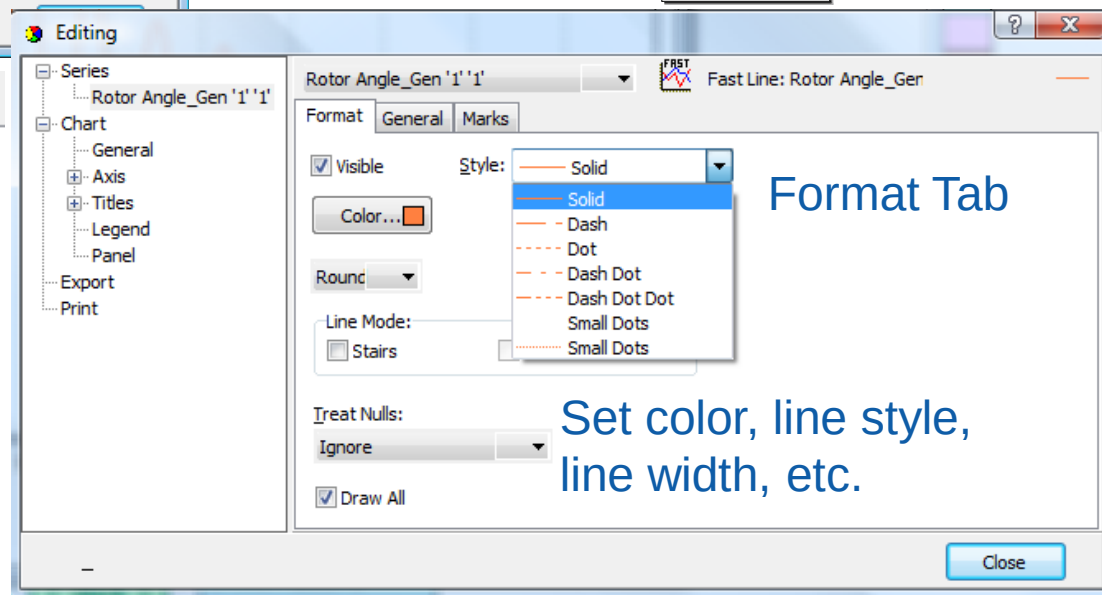
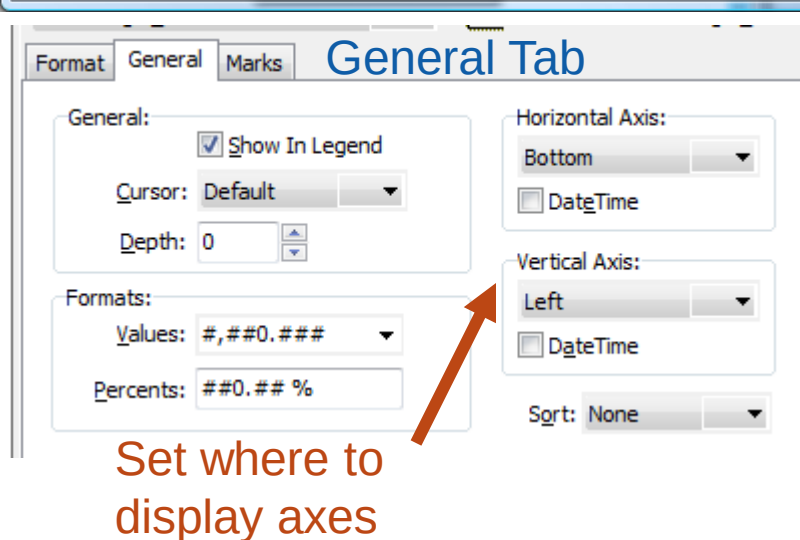
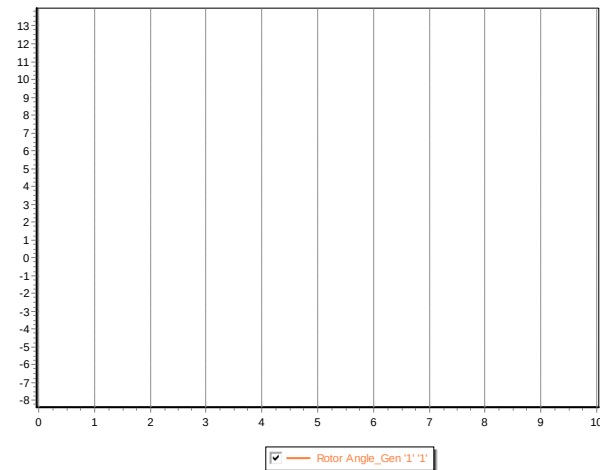
- Several different pages with tabs of relevant options



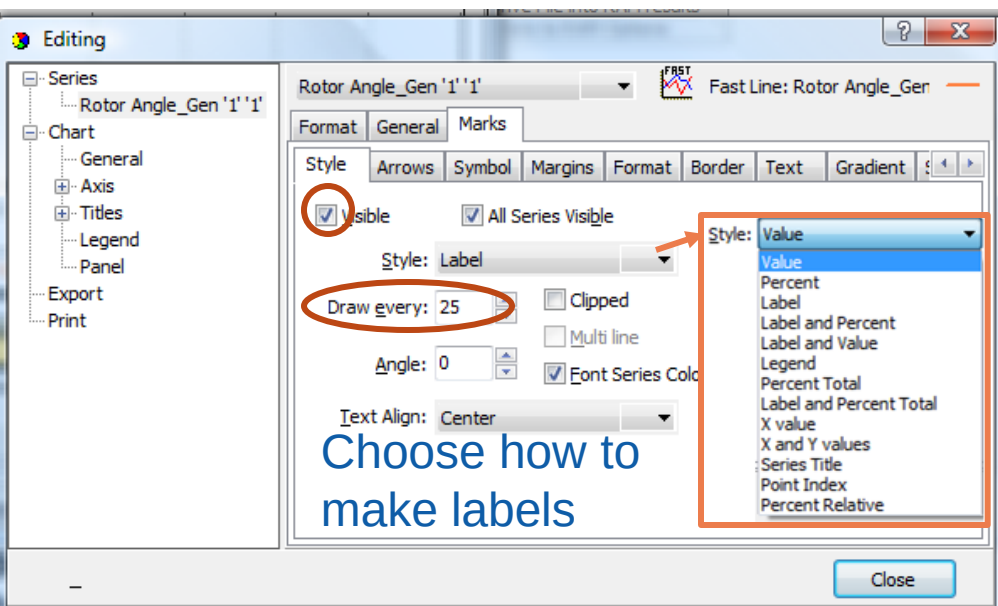
Advanced Options- Series Page



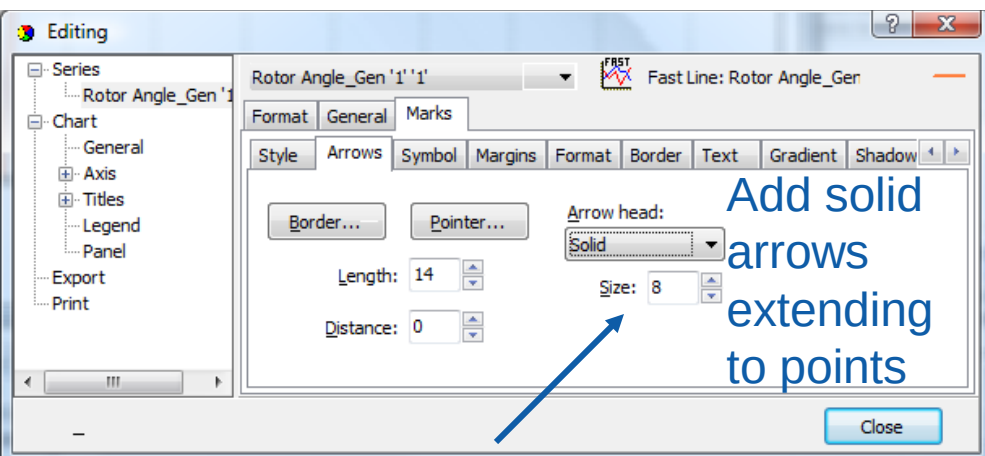
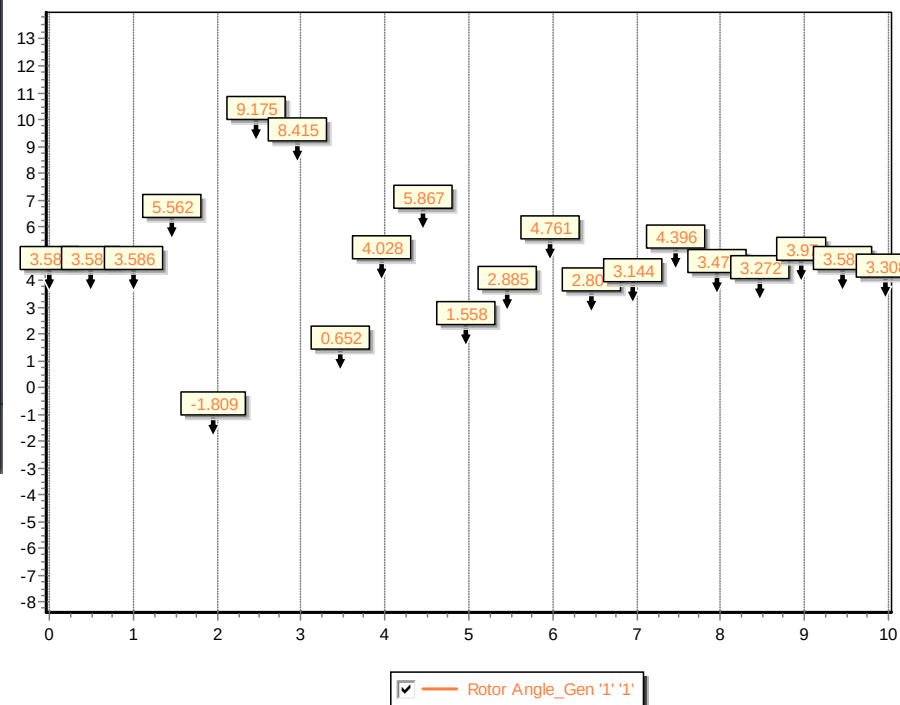
The plot series show up here



Advanced Options- Series Page



Automatically add value labels to the plot



Many options are available for customizing how the plot looks

Advanced Options: General Page

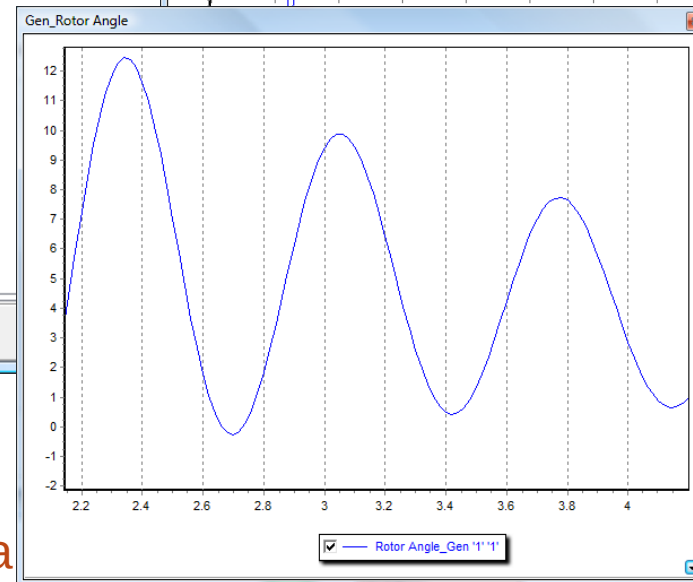
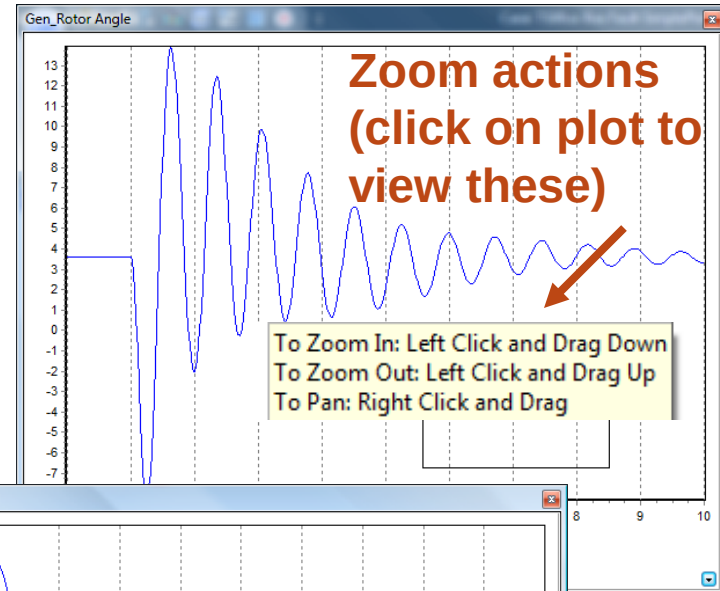


Zoom, scroll,
and cursor
options

Can change
font settings
here

Select object
to change

Zoom in to
desired area



Panel Page: Options for Plot Border



Editing

Series

- Rotor Angle_Gen '1' '1'

Chart

- General
- Axis
- Titles
- Legend
- Panel**
- Export
- Print

Color Borders Margins Gradient Shadow Image

Bevel inner: Raised

Bevel outer: Raised

Width: 2

Separation: 0

Border...

Round border:

Border Editor

☒ Visible

Style: Solid

Color...

Width: 5

Space: 1

Flat

OK Cancel

Gen_Rotor Angle

12

10

8

6

4

2

0

-2

-4

-6

-8

0 1 2 3 4 5 6 7 8 9 10

☒ Rotor Angle_Gen '1' '1'

Gen_Rotor Angle

13

12

11

10

9

8

7

6

5

4

3

2

1

0

-1

-2

-3

-4

-5

-6

-7

-8

0 1 2 3 4 5 6 7 8 9 10

☒ Rotor Angle_Gen '1' '1'

Editing

Series

- Rotor Angle

Chart

- General
- Axis
- Titles
- Legend
- Panel**
- Export
- Print

Color Borders Margins Gradient Shadow Image

☒ Visible

Size:

Horiz: 4

Vert: 4

Color...

Transparency: 0

☒ Smooth

Blur:

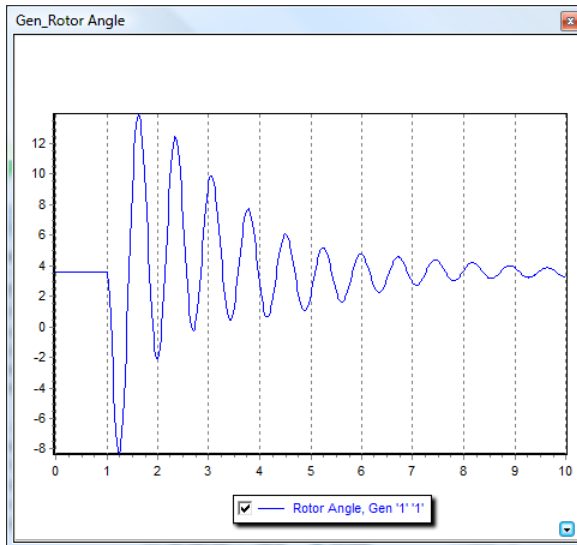
☐ Clip

Help...

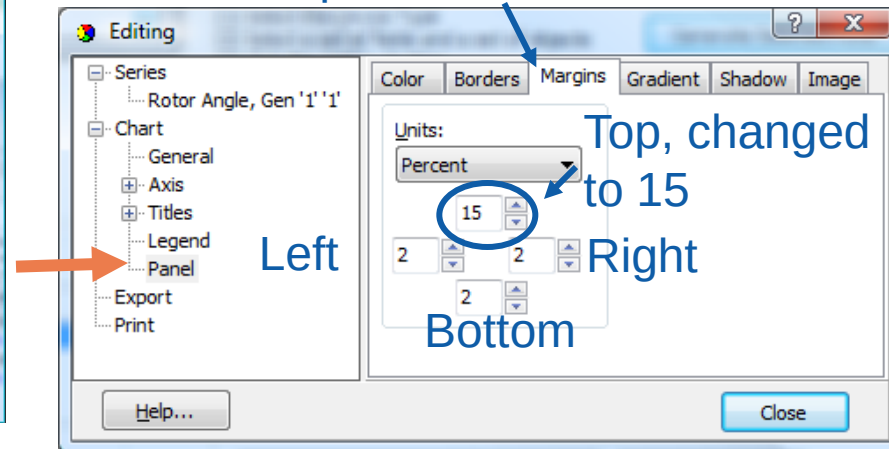
Close

Can add a shadow to the border

Panel Page: More Options for Plot Background

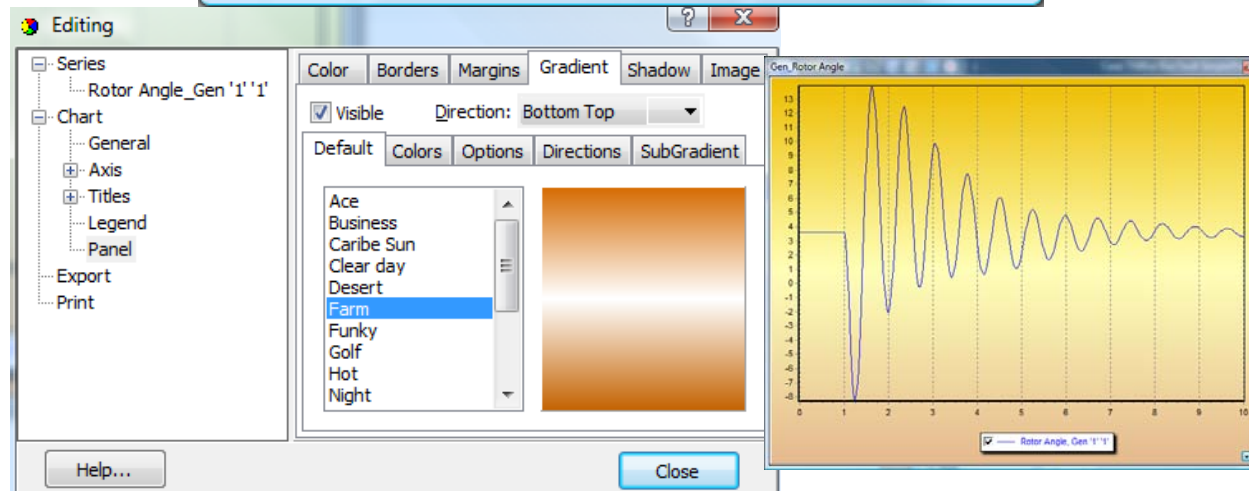


Set the margins between the plot and the border

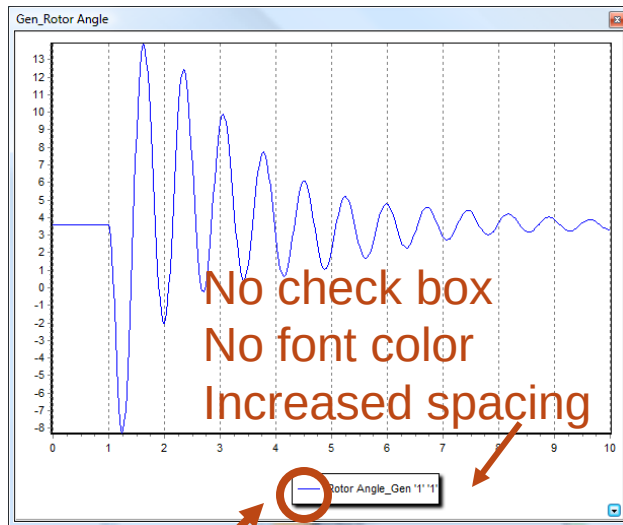


Not generally necessary to change these: When adding a title, the plot will automatically fit the title

Can also add gradients or an image to the background



Advanced Options: Legend Page

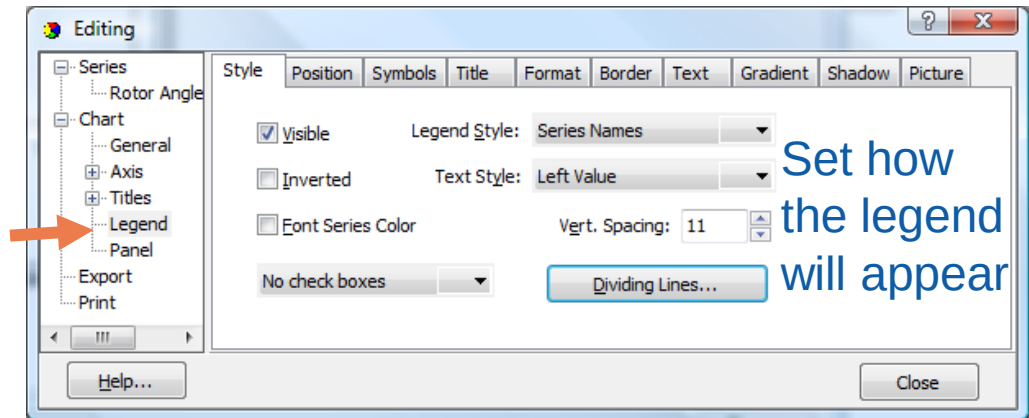


No check box
No font color
Increased spacing

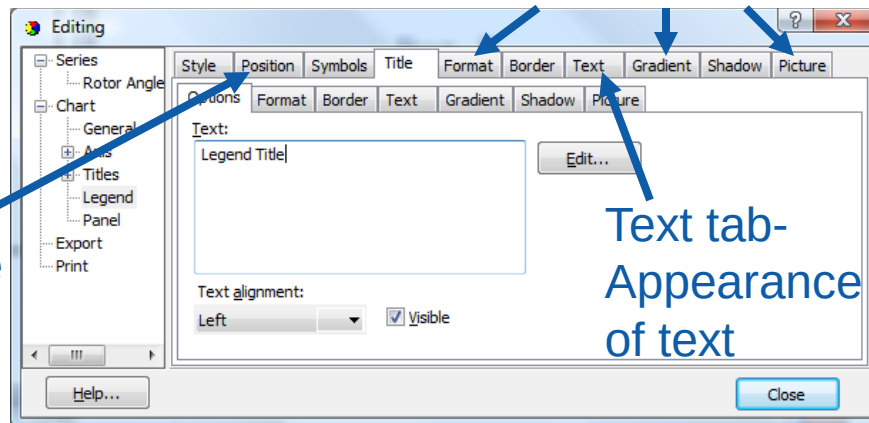
Symbols tab—
Format the
symbol next
to the label

Title tab- Create a
title for the legend

Position tab-
Change where
the legend
appears



Format, Gradient, and
Picture tabs- Legend
background



Text tab-
Appearance
of text

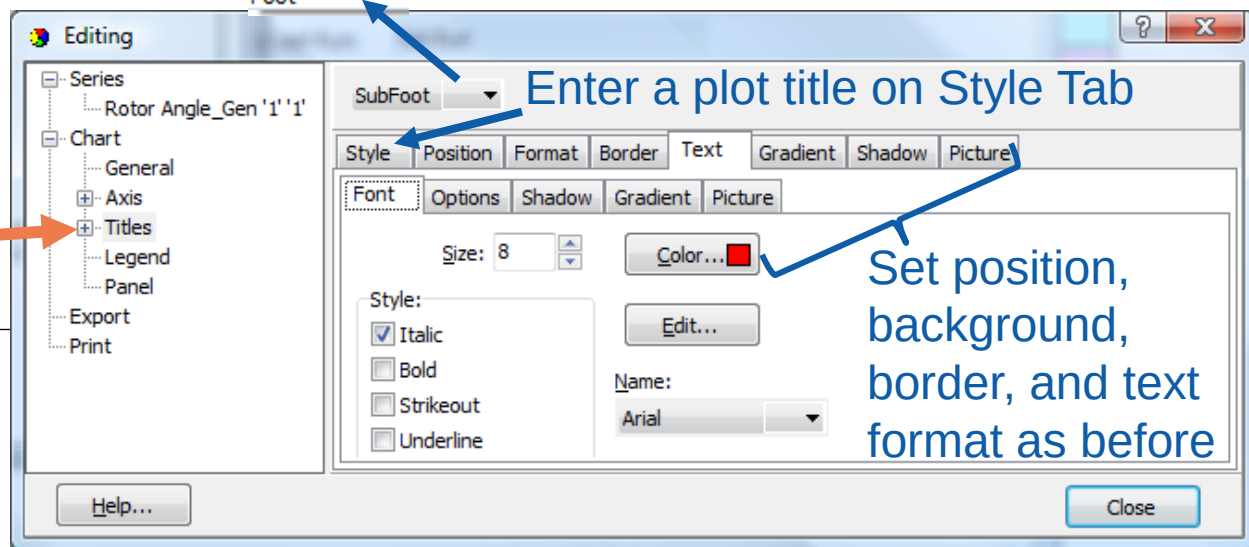
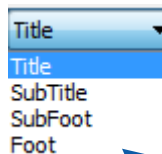
Legend Title
✓ Rotor Angle_Gen '1' '1'



Advanced Options: Title Page



Title Page drop
down menu- select
which title to format

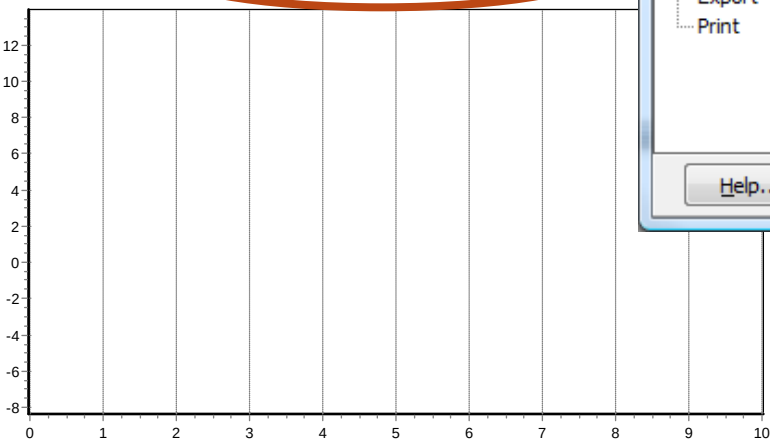


Enter a plot title on Style Tab

Set position,
background,
border, and text
format as before

Machine 1 Rotor Angle Plot

Add a Subtitle



✓ Rotor Angle_Gen '1' '1'

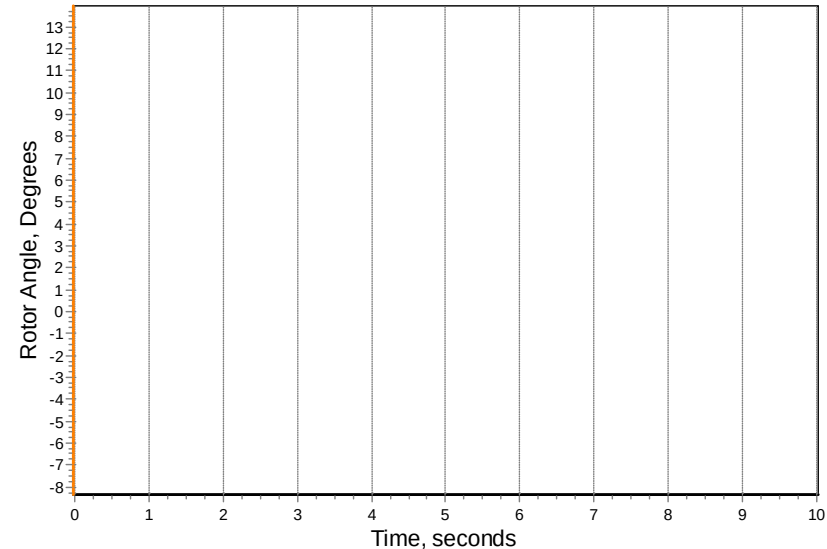
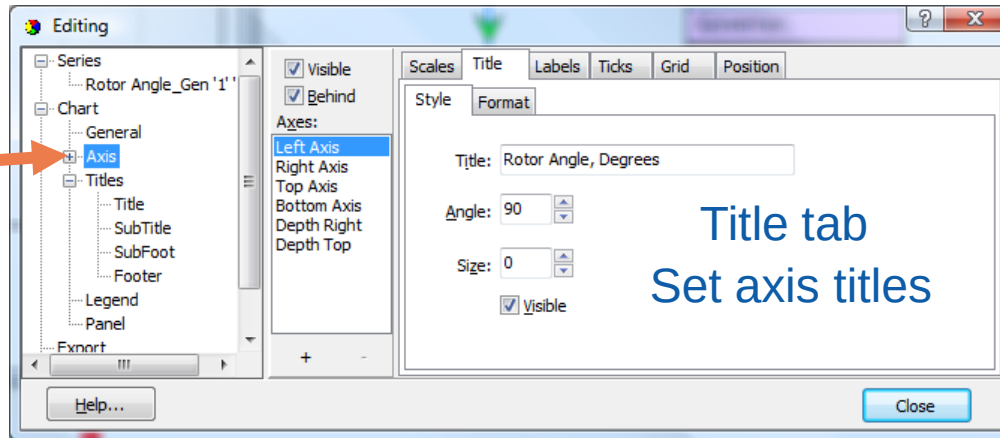
Add a Subfooter

Add a Footer

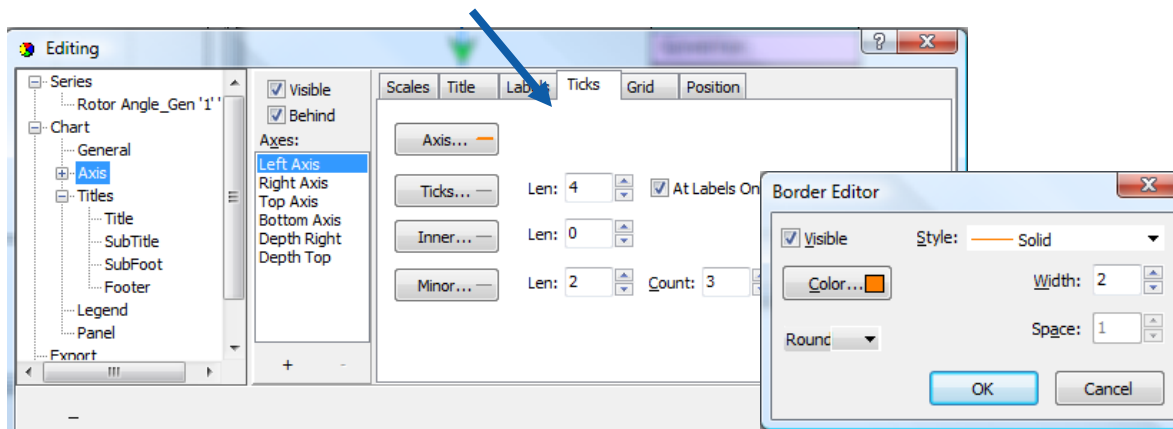
Advanced Options: Axis Page



Set display of axes



Change axis color and display of tick marks



Blank Page

Blank Page