APPENDIX 5A

610-MW System Impact Study

CITY OF VERNON
VERNON POWER PLANT

SYSTEM IMPACT STUDY

March 28, 2006

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EXECUTIVE SUMMARY

Southern California Edison Company ("SCE") performed under direction of the California Independent System Operator ("CAISO"), an Interconnection System Impact Study ("SIS") as requested by the City of Vernon for a proposed Vernon Power Plant ("VPP") pursuant to the Interconnection System Impact Study Agreement entered into by SCE and Vernon on October 13, 2005. The initial VPP project was studied with a net plant output of 890 MW. However, the net plant output was recently revised to have a plant output of 610 MW ("net") and will interconnect to the SCE owned Laguna Bell 230 kV Substation. The project is scheduled to be online by summer of 2008.

The purpose of the System Impact Study is to determine if the proposed interconnection is technically viable and to provide incremental transmission system impacts on the CAISO's controlled area.

Results of the System Impact Study will be used as the basis to determine project cost allocation for facility upgrades in the Facilities Study. Study accuracy and results for assessment of system adequacy are contingent on the accuracy of technical data provided by the customer.

The study was performed for two system conditions: a 2008 heavy summer one-in-ten load forecast and a 2008 light spring load forecast (65% of the heavy summer load).

The report provides detailed study assumptions and conditions of the system in which the study was conducted. Furthermore power flow contingencies for the SCE 230 kV system, post-transient governor power flow for 500 kV line contingencies, transient stability for significant 220 and 500 kV contingencies, and short-circuit duty assessments were completed for this study and are summarized below.

Based on this analysis, existing SCE facilities are not adequate to accommodate the City of Vernon's Vernon Power Plant Project interconnecting at the SCE owned Laguna Bell 230 kV Substation for 2008 operation.

Studies identified that with addition of the VPP Project, one Category "C" contingency affected element was identified for the 2008 light spring system conditions, which is tabulated in **Table E-1**.

Table E-1. Power Flow Contingency Analysis – Percent Loading.

			2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**Normal/Emergency Rating (Amps)**	**Pre-Project (%)†**	**Post-Project (%)†**
Lighthipe - Mesa #1 230 kV	Laguna Bell - Rio Hondo #1 230 kV & Mesa - Redondo #1 230 kV	2400/2568	100.8	111.4

†Percent loading based on the normal rating.

The Lighthipe – Mesa #1 230 kV transmission line is limited by its 2,400 amp wave trap at the Mesa 230 kV substation. Replacing the 2,400 amp wave trap with a 3,000 amp rated wave trap would mitigate this affected element. It is estimated that replacement of the wave trap would cost $86,000 based on 2007 dollars, no ITCC Tax.

No bus voltages in the LA Basin violated the established SCE voltage criteria.

The transmission system remained in operating equilibrium throughout all transmission contingencies with inclusion of the Project. In an effort to determine a critical clearing time for the Project, the clearing time for loss of the VPP-Laguna Bell 230 kV was increased from 4 cycles (normal clearing time for 230 kV transmission lines) until system instability was observed at 62 cycles.

The Vernon Power Plant did not trigger any buses with fault duties that increased by 0.1 kA from the pre-project case and exceeded its minimum breaker fault duty of 60%. However, there were several SCE replacement/upgrade circuit breakers identified by generation projects ahead in the queue. Studies indicate that 21 SCE owned circuit breakers require replacement and 41 SCE owned circuit breakers require upgrades. It is estimated that circuit breaker replacement/upgrades will yield a total cost of $17.123 million. Generation queue projects that triggered replacement or upgrades to circuit breakers will be identified in the Facilities Study.

Two alternatives have been identified for connecting the VPP circuits into the Laguna Bell 230 kV substation. Both proposed alternatives will be documented in the Facilities Study; however, the preferred alternative is documented below.

Preferred Alternative:

Proposed double-circuit 230 kV tower line route at the Laguna Bell 230 kV substation:
-Travel east along the north side of the substation, then;
-Travel south along the east side of the substation passing the 230 kV switch rack, then;
-Turn north to approach the rack from the south side.

To accommodate the new tower line, the Laguna Bell substation would need to be reconfigured as follows:
-Underground fourteen (14) 66kV circuits on the north/northwest side of the station (includes duct work for two available positions) to the 66kV rack;
-Underground one (1) 66-16kV transformer lead to the 66kV rack;
-Relocate water tank and salt house from north side of substation;
-Raise one double-circuit 230 kV tower for under-crossing.

The transmission schedule would be the controlling element of the Project. All other elements would be well within the 30-Month time frame shown below.

	1 Year				2 Year				3 Year			
	1 Qtr	2 Qtr	3Qtr	4 Qtr	1 Qtr	2 Qtr	3Qtr	4 Qtr	1 Qtr	2 Qtr	3Qtr	4 Qtr
Engineering												
Procurement												
Construction												

Order of magnitude of Cost: $20 million.

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CITY OF VERNON
VERNON POWER PLANT PROJECT

SYSTEM IMPACT STUDY
March 28, 2006

INTRODUCTION

Southern California Edison Company ("SCE") performed under direction of the California Independent System Operator ("CAISO"), an Interconnection System Impact Study ("SIS") as requested by the City of Vernon for a proposed Vernon Power Plant ("VPP") pursuant to the Interconnection System Impact Study Agreement entered into by SCE and Vernon on October 13, 2005. The initial VPP project was studied with a net plant output of 890 MW. However, the net plant output was recently revised to have a plant output of 610 MW ("net") and will interconnect to the SCE owned Laguna Bell 230 kV Substation. The project is scheduled to be online by summer of 2008.

The purpose of the System Impact Study is to determine if the proposed interconnection is technically viable and to provide incremental transmission system impacts on the CAISO's controlled area.

Results of the System Impact Study will be used as the basis to determine project cost allocation for facility upgrades in the Facilities Study. Study accuracy and results for assessment of system adequacy are contingent on the accuracy of technical data provided by the customer.

The study was performed for two system conditions: a 2008 heavy summer one-in-ten load forecast and a 2008 light spring load forecast (65% of the heavy summer load).

The report provides detailed study assumptions and conditions of the system in which the study was conducted. Furthermore, power flow contingencies for the SCE 230-kV system, post-transient governor power flow for 500 kV line contingencies, transient stability for significant 230 and 500 kV contingencies, and short-circuit duty assessments were completed for this study and are summarized below.

STUDY CONDITIONS AND ASSUMPTIONS

A. Planning Criteria

The study was conducted by applying the SCE Transmission Planning Criteria and Guidelines, as well as the CAISO Reliability Criteria. More specifically, the main criteria applicable to this study are shown in the table below:

	Normal Condition Base Case Rating	N-1 Contingency Rating	N-2 Contingency Rating
Transmission Lines	100% normal continuous	115% normal continuous*	135% normal continuous*
Banks (AA-Banks)	100% of Nameplate (NPL)	110% of Nameplate (24-hours)#	110% of Nameplate (24-hours)#
Banks (AA-Banks) Purchased after 1970		150% of Nameplate (1-hour)#	150% of Nameplate (1-hour)#

* Except when specific lower limitations have been identified

\# If no factory heat run studies (FHR) or load capability studies (LCS) are available. Higher limits can be used if FHR or LCS is available, as long as they do not exceed 120% and 160% of NPL for long-term and short-term respectively.

For AA-Banks purchased before 1970, the above limits are the same, except for the long-term limit, which is only 100% of Nameplate. The main criteria applicable to this study are as follows:

Power Flow Analysis

The following study criteria were used to evaluate power flow performance for both pre- and post-contingency analysis:

a.) Normal Conditions
- i. Under normal conditions, bus voltages must be maintained between 0.95 per unit and 1.05 per unit, except for the Palo Verde 500 kV bus voltages which must be maintained between 1.0 per unit and 1.02 per unit (525 kV base).
- ii. All line and transformer loadings must be below normal continuous ratings.

b.) Single Contingency Outage Conditions
- i. For a single contingency, no transmission element will be loaded above its emergency rating.
- ii. Established loading limits for other utilities will be monitored.
- iii. Equipment emergency voltage limits (high or low) will not be exceeded for single contingency outages.
- v. Single contingency outages on the 230 kV and EHV systems will not result in loss of load.

Appendix C contains a complete list of power flow contingencies used for this analysis.

Post-Transient Governor Power Flow Analysis

The following assumptions were modeled in the studies:

a) All loads will be modeled as constant power during the first few minutes following an outage or disturbance.

b) All voltages at distribution substations will be restored to normal values by the transformer tap changers and other voltage control devices.

c) Generator VAR limits will be modeled as a single value for each generator since the reactive power capability curve will not be modeled in the power flow program.

d) There will be no manual operator intervention to increase the generator VAR output.

e) Remedial actions such as generator dropping, load shedding and blocking of automatic generation control (AGC) will not be considered.

f) Alpha min and Gamma min of the PDCI and IPPDC will be adjusted to 5 degrees and 13 degrees, respectively.

g) Shunt capacitors (132 MVAR) at Adelanto and Marketplace will be used if the post-transient voltage deviation exceeds 5% at those buses.

h) Other Assumptions
- Area Interchange: Disabled;
- Governor Blocking: Per WECC Modeling & Validation Work Group recommendations - Diablo, Palo Verde, and San Onofre;
- DC Line Transformer Tap Automatic Adjustment: Enabled;
- Generator Voltage Control set to local except for San Onofre, Palo Verde, and selected Northwest generation;
- Phase Shifter Control: Disabled;
- Switched Shunt Devices: Disabled - except in Sierra Pacific Power's system.

Voltage dips should meet the following combined SCE and WECC Reliability Criteria:

Performance Level	Disturbance	Post Transient Voltage Deviations
B	N-1	Not to exceed 7% at any bus.
C	N-2	Not to exceed 10% at any bus.
D	N-3	Cascading Not Permitted

The following system contingencies were simulated and compared between the pre and post project base cases:

N-1 Contingencies

1. Devers – BEP2500 500-kV line
2. Devers – Midpoint #1 500-kV line
3. Devers – Midpoint #2 500-kV line
4. Midpoint – BEP2500 500-kV line
5. BEP2500B – BEP2500 500-kV line
6. El Dorado–Lugo 500-kV line
7. Lugo – Mira Loma #2 500-kV line
8. Lugo – Mira Loma #3 500-kV line
9. Lugo – Mohave 500-kV line
10. Lugo – Rancho Vista 500-kV line
11. Lugo – Victorville 500-kV line
12. Lugo – Vincent #1 500-kV line
13. Lugo – Vincent #2 500-kV line
14. Midway – Vincent #1 500-kV line
15. Midway – Vincent #2 500-kV line
16. Midway – Vincent #3 500-kV line
17. Mira Loma – Serrano 500-kV line.
18. Mohave – El Dorado 500-kV line
19. Rancho Vista – Serrano 500-kV line
20. Rancho Vista – TOT128 #1 500-kV line
21. Rancho Vista – TOT128 #2 500-kV line
22. Valley – Calpine 500-kV line
23. Valley – Devers 500-kV line
24. Valley – Serrano 500-kV line

N-2 Contingencies

25. Lugo – Mira Loma #2 & #3 500-kV lines
26. Lugo – Vincent #1 & #2 500-kV lines
27. Lugo – Rancho Vista 500-kV line & Lugo – Mira Loma #2 500-kV line
28. Serrano – Rancho Vista 500-kV line & Serrano – Mira Loma 500-kV line
29. Midway – Vincent #1 & #2 500-kV lines
30. Devers – Midpoint #1 500-kV line & Valley – Devers 500-kV line
31. Lugo – Mohave 500-kV line & Lugo – Mira Loma #2 500-kV line
32. Lugo – Mohave 500-kV line & Lugo – Mira Loma #3 500-kV line
33. Lugo – Vincent #2 500-kV line & Lugo – Victorville 500-kV line
34. Lugo – Vincent #2 500-kV line & Midway – Vincent #3 500-kV line

Transient Stability Analysis

The following criterion was applied for the transient stability analysis:

a.) All machines in the system shall remain in synchronism as demonstrated by their relative rotor angles.

b.) All stability simulation cases will be run for a minimum of 10 seconds.

c.) Generators with a base load flag of zero will not respond to contingencies.

d.) System stability is evaluated based on the damping of the relative rotor angles and the damping of the voltage magnitude swings.

e.) The transient voltage dip should be maintained above 0.80 per unit at Adelanto and Sylmar.

f.) Other transient voltage dips must meet the following WECC Reliability Criteria:

Performance Level	Disturbance	Transient Voltage Dip Criteria
B	N-1	Transient Voltage Dip: Not to exceed 25% at load buses or 30% at non-load buses. Also, not to exceed 20% for more than 20 cycles at load buses. Minimum Transient Frequency: Not below 59.6 Hz for 6 cycles or more at a load bus.
C	N-2	Transient Voltage Dip: Not to exceed 30% at any bus. Also, not to exceed 20% for more than 40 cycles at load buses. Minimum Transient Frequency: Not below 59.0 Hz for 6 cycles or more at a load bus.
D	N-3	Not Specified

The following system contingencies were simulated for both the 2008 heavy summer and 2008 light spring conditions:

Category "B" Contingencies

1. Full load rejection of the VPP
2. Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.
3. Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.
4. Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.
5. Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.

6. Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.
7. Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.
8. Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.
9. Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.
10. Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.
11. Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.
12. Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.
13. Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.
14. Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.

Category "C" Contingencies

15. Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.
16. Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.
17. Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.
18. Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.
19. Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.
20. Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.

Category "D" Contingency

21. A pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then a three-phase fault at the VPP 230 kV bus followed by loss of a double circuit tower removing both the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV circuits.

Short-Circuit Analysis

The following study assumptions were used for conducting the short-circuit analysis:

a) Shunt capacitor banks will be omitted at all stations. Normally, shunt capacitors produce a minimal effect on fault currents. When they are large enough to be significant, their effect is to reduce total fault current. Results are more conservative to neglect them altogether.

b) Shunt reactors will also be neglected since their contribution is minimal.

c) Reactors connected to autotransformer delta tertiary windings will be neglected since they cannot contribute fault current to the system.

d) Phase shifting transformers will be by-passed as this would be the worst case from the fault current standpoint.

e) If zero sequence data is not available, the assumption will be made that Xo=3X1 and Ro=0 or R1.

Circuit breakers exposed to fault currents in excess of 100 percent of their interrupting capacities will be replaced or upgraded, whichever is appropriate.

Sub-synchronous Resonance Analysis (SSR)

It is not anticipated that there will be any SSR impacts. Hence, the SSR studies are not required.

B. City of Vernon – Vernon Power Plant Project

The project is scheduled to be online by summer 2008.

Proposed Vernon Power Plant ("VPP")

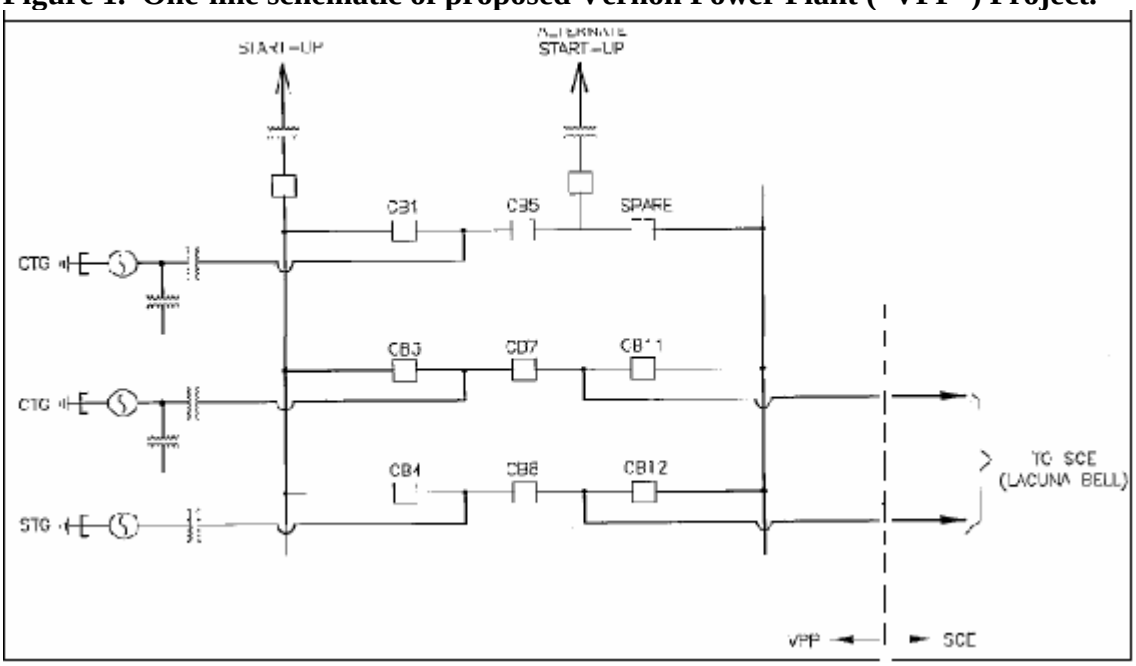
Interconnection of the VPP will be achieved with construction of a new double circuit 230 kV line to SCE's Laguna Bell Substation. It is assumed that the City of Vernon will build the Project, the 230 kV bus and substation at the proposed project site and, unless otherwise agreed to by SCE, the double circuit 230 kV line. The project will have a gross output of 639 MW, plant auxiliary load of 29 MW and a net project output of 610 MW.

Following is a summary of 2008 project additions modeled in the Project base cases:

1. A new Vernon Power Plant 230 kV substation will be constructed.
2. Two 4 mile VPP – Laguna Bell 230 kV circuits rated at 786 MVA will be constructed. Per unit impedance for resistance, reactance and line charging are 0.00048, 0.00512 and 0.00064, respectively.

3. Two 230/15 kV, 225 MVA transformers will be installed at the VPP 230 kV Substation to be used for the combustion turbines.
4. One 230/18 kV, 320 MVA transformer will be installed at the VPP 230 kV Substation to be used for the steam turbine.
5. Two 220 MVA combustion turbine generators will be connected to the VPP 230 kV Substation.
6. Two 14.5 MW, 7.63 MVAr plant auxiliary loads will be modeled at the combustion turbine buses for a total plant auxiliary load of 29 MW.
7. One 285 MVA steam turbine generator will be connected to the VPP 230 kV Substation.

Figure 1. One-line schematic of proposed Vernon Power Plant ("VPP") Project.



C. System Conditions

To simulate the SCE transmission system for analysis, the study used a SCE internal planning case that modeled 2008 heavy summer. In addition, an additional SCE internal planning case modeled 2008 Light Spring conditions. Both starting base cases were updated to represent system conditions in 2008. Most significantly, SCE's 2008 heavy summer load was escalated to a one-in-ten load forecast. System generation is based upon the application queue. That is, all projects ahead in SCE's queue regardless of the in-service date of such prior projects are modeled.

The 2008 light spring scenario assumes 65% of the heavy summer load.

D. Load Flow Study

Load flow studies were conducted under 2008 heavy summer and 2008 light spring conditions. Further descriptions of each case follow:

a). 2008 Heavy Summer without the transmission project, Case 1.

Case includes a 2008 heavy summer load level. Generation patterns were maximized in the LA Basin to fully stress the SCE 230 kV system.

b). 2008 Heavy Summer with the VPP Project, Case 2.

Case 1 modified to include the VPP Project with a net generation of 610 MW. The TOT139 generation was reduced by 610 MW to accommodate Project generation.

c). 2008 Light Spring without the transmission project, Case 3.

Case includes a 2008 light spring load level. Generation patterns were maximized in the LA Basin to fully stress the SCE 230 kV system.

d). 2008 Light Spring with the transmission project, Case 4.

Case 3 modified to include the VPP Project with a net generation of 610 MW. The TOT139 generation was reduced by 610 MW to accommodate Project generation.

Table 1 summarizes SCE area system demand and resources for both the 2008 heavy summer and 2008 light spring cases.

Table 1. Summary of case attributes.

SOUTHERN CALIFORNIA IMPORT TRANSMISSION ("SCIT"), EAST-OF-RIVER ("EOR") AND WEST-OF-RIVER ("WOR") FLOWS SCE AREA TOTAL GENERATION, IMPORT, LOAD AND LOSSES (MW)				
	2008 Heavy Summer		**2008 Light Spring**	
	Case 1 Pre-project	Case 2 Post-Project	Case 3 Pre-Project	Case 4 Post-Project
SCIT	9,688	9,635	6,190	6,194
EOR	8,158	8,159	8,819	8,831
WOR	6,989	6,998	7,709	7,723
Generation*	18,167	18,171	12,835	12,848
Import	-6,380	-6,380	-2,917	-2,919
Load	24,117	24,146	15,330	15,359
Losses	431	405	422	408

*Changes in generation can be attributed to swing bus adjustments compensating for loss increases.

E. Post-Transient Governor Power Flow Study

All 500 kV contingencies were simulated with the post-transient governor power flow methodology. The governor power flow methodology utilizes Special Protection Scheme ("SPS") for loss of bulk system contingencies. In addition, loss of a significant amount of generation would be spread throughout the system instead of at the system swing bus.

F. Transient Stability Study

Transient stability studies were performed for both the 2008 summer peak and light load base cases to ensure that the transmission system remains in operating equilibrium through abnormal operating conditions after the new facility begins operation.

The critical clearing time for the Project will be determined based on the fault clearing time increasing for loss of the VPP – Laguna Bell 230 kV #1 circuit. The critical clearing time is the time during which a fault can persist without causing instability.

G. Short Circuit Duty Study

Short circuit studies were conducted to determine the fault duties on existing SCE facilities before and after the proposed project addition. Fault duty results were used to identify overstressed equipment, if any, that results solely from addition of the proposed facility.

STUDY RESULTS

A. Load Flow Study

1. Base Case

Studies identified that with addition of the VPP Project, there were no pre-contingency thermal overloaded elements for the 2008 heavy summer and 2008 light spring system conditions. In addition, no bus voltages in the LA Basin violated the SCE pre-contingency voltage criteria.

Refer to **Appendix A** for pre and post-project power flow plots for the 2008 heavy summer and 2008 light spring cases.

2. Power Flow Contingency Results.

Studies identified that with addition of the VPP Project, there were no NERC/WECC Category "B" contingency affected elements for the 2008 heavy summer or 2008 light spring system conditions. In addition, there were no NERC/WECC Category "C" contingency affected elements for the 2008 heavy summer conditions; however, one Category "C" contingency affected element was identified for the 2008 light spring system conditions, which is tabulated in **Table 2**.

Table 2. Power Flow Contingency Analysis – Percent Loading.

			2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**Normal/Emergency Rating (Amps)**	**Pre-Project (%)†**	**Post-Project (%)†**
Lighthipe - Mesa #1 230 kV	Laguna Bell - Rio Hondo #1 230 kV & Mesa - Redondo #1 230 kV	2400/2568	100.8	111.4

†Percent loading based on the normal rating.

The Lighthipe – Mesa #1 230 kV transmission line is limited by its 2,400 amp wave trap at the Mesa 230 kV substation. Replacing the 2,400 amp wave trap with a 3,000 amp rated wave trap would mitigate this affected element. It is estimated that replacement of the wave trap would cost $86,000 based on 2007 dollars, no ITCC Tax.

There were no voltage violations observed with addition of the VPP Project.

Appendix B tabulates all power flow contingency results.

The study focused on identifying system thermal overloads within the SCE service territory. Reported thermal overloads were limited to the condition where a modeled transmission component was loaded over 98% of its appropriate normal rating (as entered

in the power flow database). In addition, only element loadings greater than 1% between the pre and post-project cases were reported.

B. Post-Transient Governor Power Flow Study

Results from the post-transient governor power flow analysis did not reveal any thermally overloaded elements.

C. Transient Stability Study

The transmission system remained in operating equilibrium throughout all transmission contingencies with inclusion of the Project. Refer to **Appendix D** for all simulated contingency plots. In an effort to determine a critical clearing time for the Project, the clearing time for loss of the VPP-Laguna Bell 230 kV was increased from 4 cycles (normal clearing time for 230 kV transmission lines) until system instability was observed at 62 cycles.

D. Short Circuit Duty Study

The starting short-circuit analysis case includes all projects based on their application date [Project Queue]. Single-phase-to-ground-short-circuit duties will be provided in the completed Facilities Study.

The Vernon Power Plant did not trigger any buses with fault duties that increased by 0.1 kA from the pre-project case and exceeded its minimum breaker fault duty of 60%. However, there were several SCE replacement/upgrade circuit breakers identified by generation projects ahead in the queue. Studies indicate that 21 SCE owned circuit breakers require replacement and 41 SCE owned circuit breakers require upgrades. It is estimated that circuit breaker replacement/upgrades will yield a total cost of $17.123 million. Generation queue projects that triggered replacement or upgrades to circuit breakers will be identified in the Facilities Study.

CONCLUSIONS

Studies identified that with addition of the VPP Project, there were no NERC/WECC Category "B" contingency affected elements for the 2008 heavy summer or 2008 light spring system conditions. In addition, there were no NERC/WECC Category "C" contingency affected elements for the 2008 heavy summer conditions; however, there were Category "C" contingency affected elements for the 2008 light spring system conditions.

Based on this analysis, existing SCE facilities are not adequate to accommodate the City of Vernon's Vernon Power Plant Project interconnecting at the SCE owned Laguna Bell 230 kV Substation for 2008 operation. In addition, the identified NERC/WECC Category "C" affected element, which was identified in the 2008 light spring conditions, will require system upgrades. Replacing the Lighthipe – Mesa #1 230 kV 2,400 amp rated wave trap with a 3,000 amp wave trap would mitigate this affected element. It is estimated that replacement of the wave trap would cost $86,000 based on 2007 dollars, no ITCC Tax.

The transmission system remained in operating equilibrium throughout all transmission contingencies with inclusion of the project. It was determined that a critical clearing time of 62 cycles causes system instability.

The Vernon Power Plant did not trigger any buses with fault duties that increased by 0.1 kA from the pre-project case and exceeded its minimum breaker fault duty of 60%. However, there were several SCE replacement/upgrade circuit breakers identified by generation projects ahead in the queue. Studies indicate that 21 SCE owned circuit breakers require replacement and 41 SCE owned circuit breakers require upgrades. It is estimated that circuit breaker replacement/upgrades will yield a total cost of $17.123 million. Generation queue projects that triggered replacement or upgrades to circuit breakers will be identified in the Facilities Study.

Two alternatives have been identified for connecting the VPP circuits into the Laguna Bell 230 kV substation. Both proposed alternatives will be documented in the Facilities Study; however, the preferred alternative is documented below.

Preferred Alternative:

Proposed double-circuit 230 kV tower line route at the Laguna Bell 230 kV substation:
-Travel east along the north side of the substation, then;
-Travel south along the east side of the substation passing the 230 kV switch rack, then;
-Turn north to approach the rack from the south side.

To accommodate the new tower line, the Laguna Bell substation would need to be reconfigured as follows:
-Underground fourteen (14) 66kV circuits on the north/northwest side of the station (includes duct work for two available positions) to the 66kV rack;
-Underground one (1) 66-16kV transformer lead to the 66kV rack;

-Relocate water tank and salt house from north side of substation;
-Raise one double-circuit 230 kV tower for under-crossing.

The transmission schedule would be the controlling element of the Project. All other elements would be well within the 30-Month time frame shown below.

	1 Year				2 Year				3 Year			
	1 Qtr	2 Qtr	3Qtr	4 Qtr	1 Qtr	2 Qtr	3Qtr	4 Qtr	1 Qtr	2 Qtr	3Qtr	4 Qtr
Engineering												
Procurement												
Construction												

Order of magnitude of Cost: $20 million.

Following is a list of items required for the Facilities Study.

A Facilities Study will be required to determine the facilities and upgrades required to interconnect the proposed VPP project. The study should:

1. Perform single-phase-to-ground short-circuit duty analysis.

2. Develop a list of generation projects ahead in the queue that triggered circuit breaker replacement/upgrades.

3. Develop a list of all generation and transmission projects modeled in this study.

4. Document the 2nd alternative for interconnection at the Laguna Bell 230 kV Substation.

5. Determine and develop estimated cost and schedule for construction of network facility upgrades required for the Project.

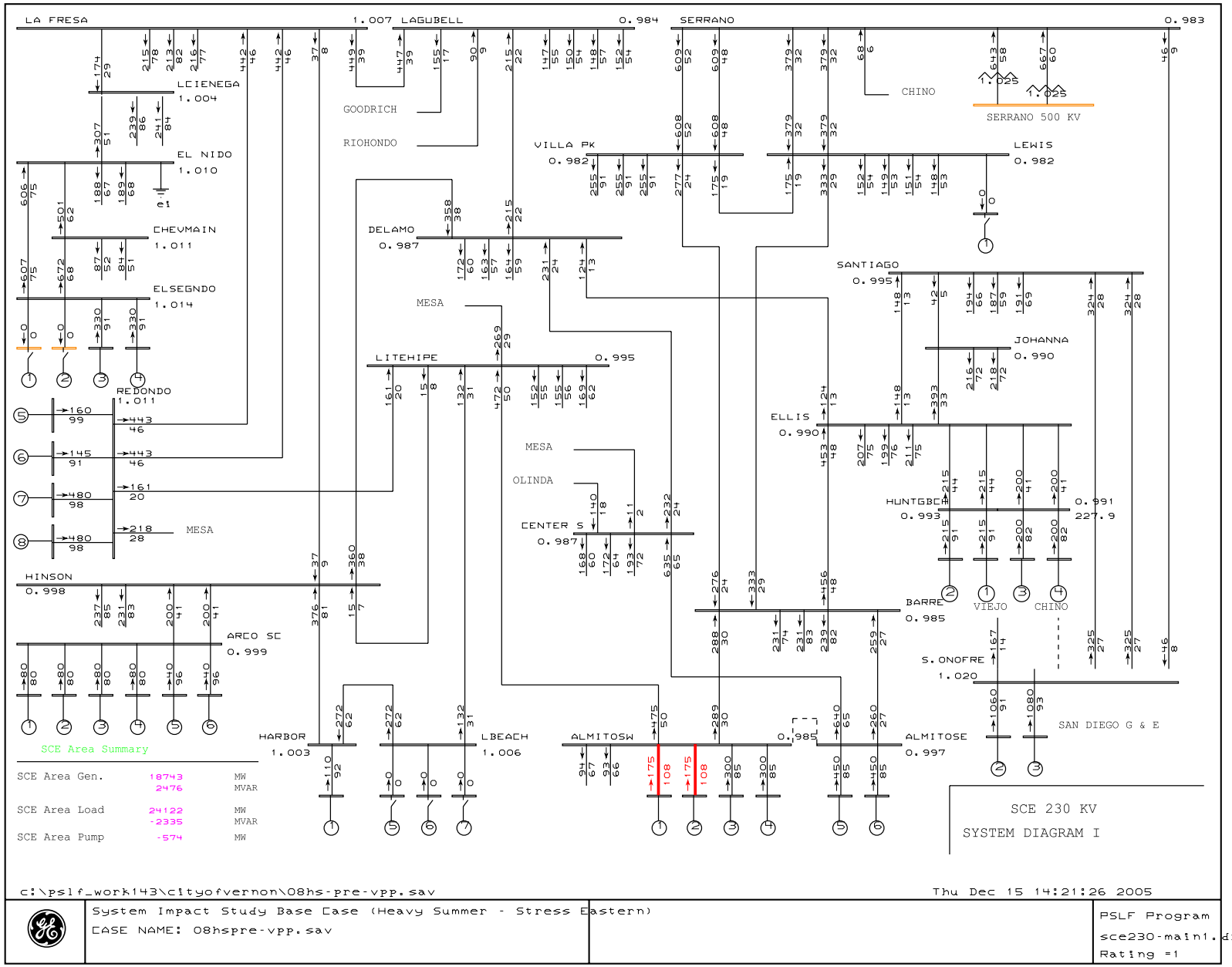
Appendix A

Load Flow Plots

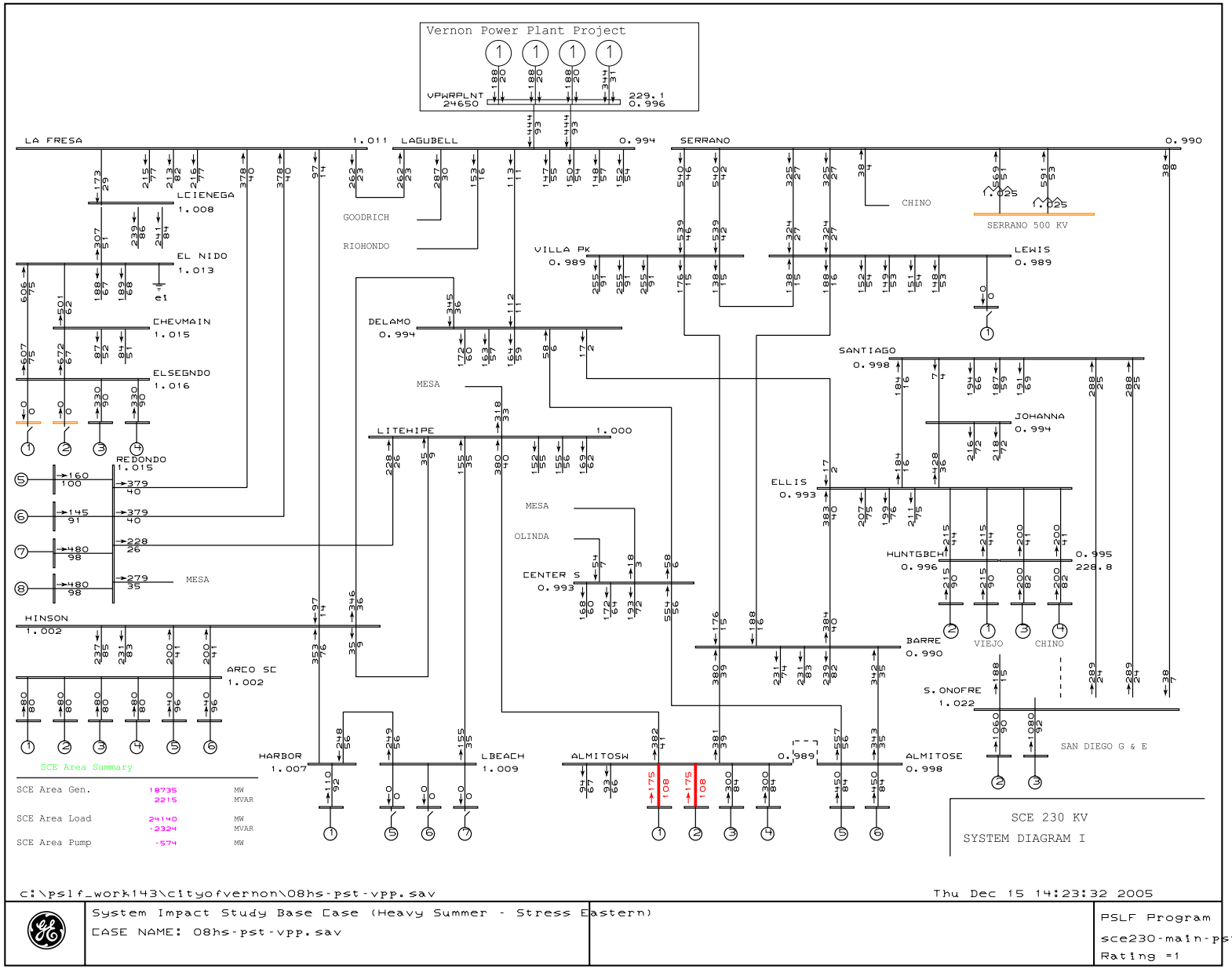
Vernon Power Plant Project SIS Load Flow Plots

Plot	Description
Plot #1	2008 Heavy Summer – Before Project (MVA/%)
Plot #2	2008 Heavy Summer – Vernon Power Project Included (MVA/%)
Plot #3	2008 Light Spring – Before Project (MVA/%)
Plot #4	2008 Light Spring – Vernon Power Project Included (MVA/%)

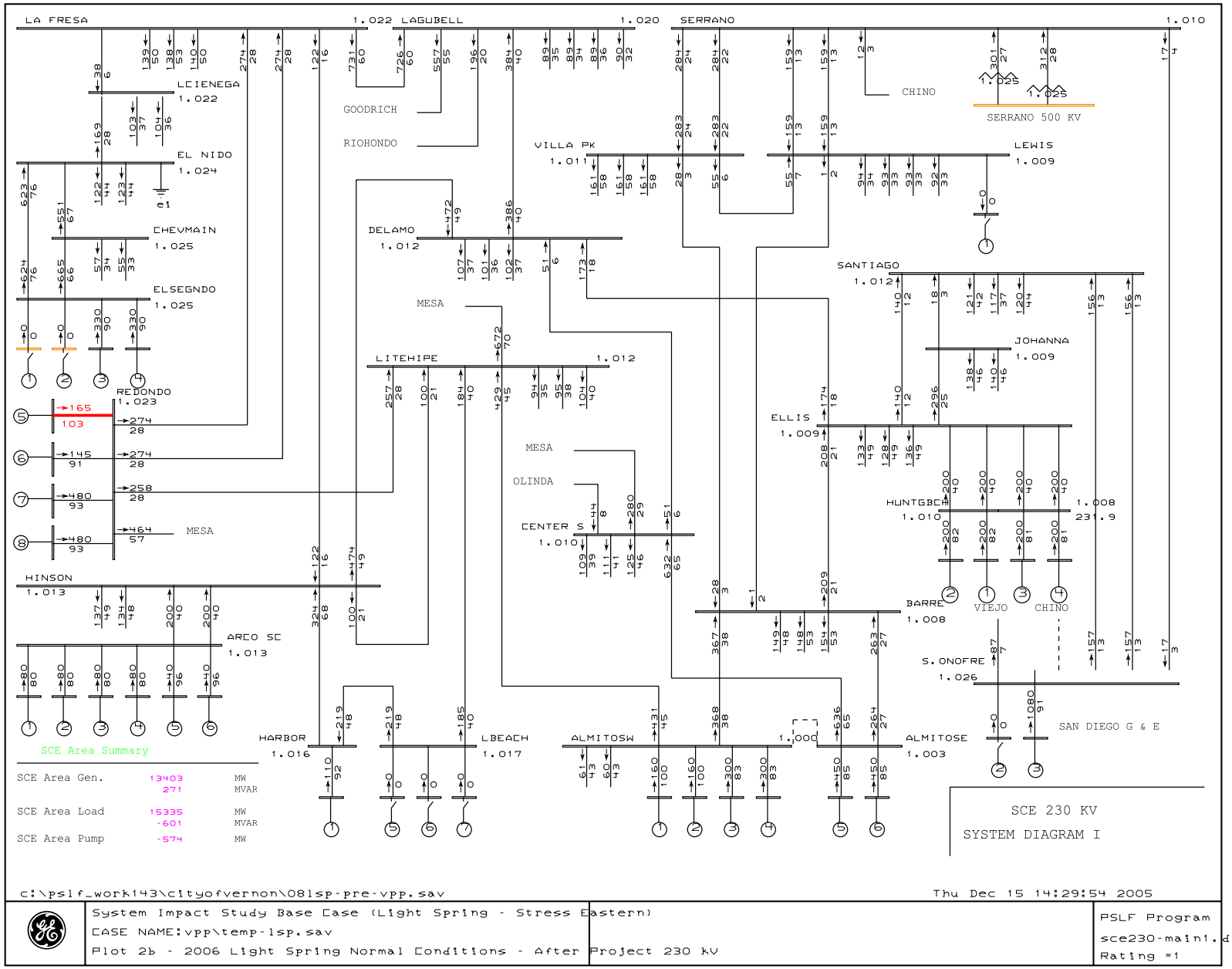
Plot 1a – 2008 Heavy Summer, <u>Without</u> Vernon Power Plant Project.



Plot 1b – 2008 Heavy Summer, <u>With</u> Vernon Power Plant Project.



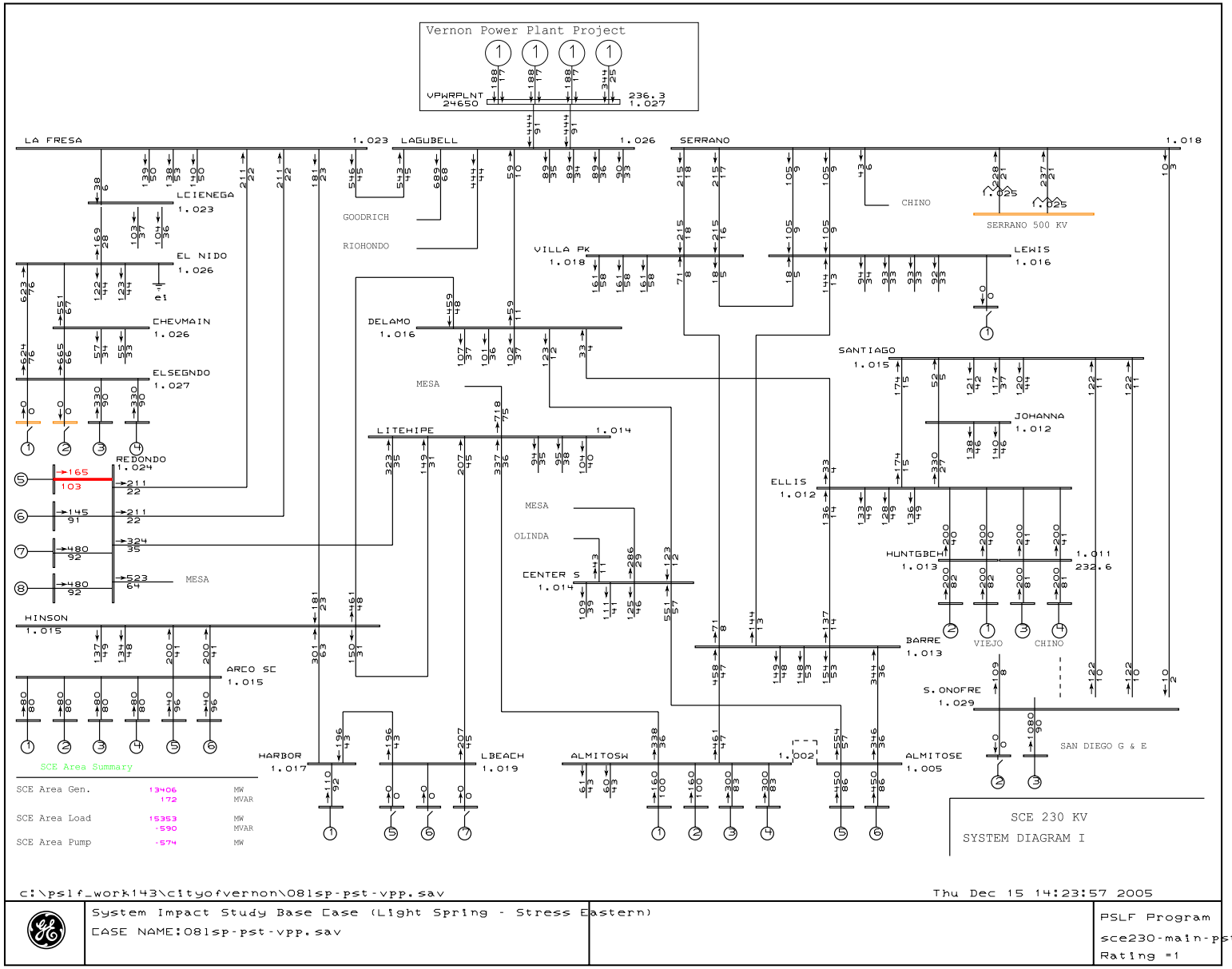
Plot 2a – 2008 Heavy Summer, <u>Without</u> Vernon Power Plant Project.



System Impact Study Base Case (Light Spring - Stress Eastern)
CASE NAME:vpp\temp-lsp.sav
Plot 2b - 2006 Light Spring Normal Conditions - After Project 230 kV

PSLF Program
sce230-main1.drw
Rating =1

Plot 2b – 2008 Heavy Summer, <u>With</u> Vernon Power Plant Project.



Appendix B

Complete List of Power Flow Results

Following is a complete list of power flow results for both the 2008 Heavy Summer and 2008 Light Spring system conditions. Only Project transmission lines loaded above their normal/emergency rating of 478 MVA.

Table B-1. NERC/WECC Category "B" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**N RATE**	**PRE**	**POST**	**PRE**	**POST**
LAGUBELL 230-VPWRPLNT 230 #2	LAGUBELL 230-VPWRPLNT 230 #1	1200	NA	186.9	NA	181.2
LAGUBELL 230-VPWRPLNT 230 #1	LAGUBELL 230-VPWRPLNT 230 #2	1200	NA	186.9	NA	181.2
Element loading decreases.						
HINSON 230-HARBOR 230 #1	LBEACH 230-LITEHIPE 230 #1	1185	109.7	108.6	-	-
LBEACH 230-TOT138 230 #1	ALMITOSW 230-BARRE 230 #2	1067	103.3	101.5	-	-
LBEACH 230-TOT138 230 #1	LA FRESA 230-HINSON 230 #1	1067	103.6	101.5	-	-
LBEACH 230-TOT138 230 #1	REDONDO 230-LITEHIPE 230 #1	1067	103.6	101.6	-	-
LBEACH 230-TOT138 230 #1	TOT135 230-WALNUT 230 #1	1067	103.8	101.8	-	-
RANCHVST 230-ETIWANDA 230 #1	ETIWANDA 230-RANCHVST 230 #2	2480	-	-	118.3	64.5
RANCHVST 230-ETIWANDA 230 #2	ETIWANDA 230-RANCHVST 230 #1	2480	-	-	118.3	64.5
SANBRDNO 230-TOT109 230 #1	TOT109 230-SANBRDNO 230 #2	2289	118.4	116.9	-	-
SANBRDNO 230-TOT109 230 #2	TOT109 230-SANBRDNO 230 #1	2289	118.4	116.9	-	-
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-MESA CAL 230 #1	465	-	-	107.3	105.7
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-SYLMAR S 230 #1	465	-	-	105.0	103.2
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-VINCENT 230 #1	465	-	-	106.5	104.6
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-S.CLARA 230 #1	465	-	-	104.9	103.0
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-MESA CAL 230 #1	1240	-	-	108.0	105.8
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1	1240	-	-	100.4	97.9
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-SYLMAR S 230 #1	1240	-	-	100.1	97.6
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1	1240	-	-	119.0	117.6
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-SYLMAR S 230 #1	1240	-	-	101.3	98.7
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-SYLMAR S 230 #2	1240	-	-	101.3	98.7
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-VINCENT 230 #1	1240	-	-	121.0	117.9
VINCENT 230-ANTELOPE 230 #1	VINCENT 230-S.CLARA 230 #1	1240	-	-	109.1	106.3

Results for the NERC/WECC Category "C" contingencies are tabulated in **Table B-2**.

Table B-2. NERC/WECC Category "C" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**N RATE**	**PRE**	**POST**	**PRE**	**POST**
ANTELOPE 66-ANTELOPE 230 #2	PARDEE 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	124 MVA	100.2	102.7	-	-
HINSON 230-LITEHIPE 230 #1	HINSON 230-DELAMO 230 #1 LBEACH 230-LITEHIPE 230 #1	1185	-	-	108.1	120.2
KRAMER 115-SUNGEN 115 #1	VICTOR 230-LUGO 230 #1 VICTOR 230-LUGO 230 #2	920	-	-	97.6	101.9
LBEACH 230-LITEHIPE 230 #1	HINSON 230-DELAMO 230 #1 LITEHIPE 230-HINSON 230 #1	1150	-	-	97.7	107.1
LITEHIPE 230-MESA CAL 230 #1	LAGUBELL 230-RIOHONDO 230 #1 MESA CAL 230-REDONDO 230 #1	2400	-	-	98.8	113.8
LITEHIPE 230-MESA CAL 230 #1	GOODRICH 230-LAGUBELL 230 #1 LAGUBELL 230-RIOHONDO 230 #1	2400	-	-	86.7	100.7
LITEHIPE 230-MESA CAL 230 #1	GOODRICH 230-LAGUBELL 230 #1 MESA CAL 230-REDONDO 230 #1	2400	-	-	99.4	108.7

Table B-2. (continued) NERC/WECC Category "C" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**N RATE**	**PRE**	**POST**	**PRE**	**POST**
MESA CAL 230-ANTELOPE 230 #1	VINCENT 230-S.CLARA 230 #1 VINCENT 230-ANTELOPE 230 #1	886	-	-	98.9	101.5
MIDPINTS 500-DEVERS 500 #2	VSTA 230-DEVERS 230 #1 DEVERS 500-MIDPINTS 500 #1	2700	119.1	123.2	128.1	131.7
MIDPINTS 500-DEVERS 500 #2	DEVERS 230-MIRAGE 230 #1 DEVERS 500-MIDPINTS 500 #1	2700	119.4	123.7	131.1	135.1
MIDPINTS 500-DEVERS 500 #2	DEVERS 500-MIDPINTS 500 #1 J.HINDS 230-MIRAGE 230 #1	2700	120.0	124.3	130.5	134.5
MIDPINTS 500-DEVERS 500 #2	DEVERS 500-MIDPINTS 500 #1 COACHELA 230-DEVERS 230 #1	2700	121.2	125.4	131.6	135.6
REDONDO 230-MESA CAL 230 #1	LAGUBELL 230-RIOHONDO 230 #1 LITEHIPE 230-MESA CAL 230 #1	2001	-	-	88.3	104.0
REDONDO 230-MESA CAL 230 #1	LA FRESA 230-LAGUBELL 230 #1 REDONDO 230-LITEHIPE 230 #1	2001	-	-	104.9	105.9
VSTA 230-ETIWANDA 230 #1	ETIWANDA230-SANBRDNO 230 #1 MIRALOME 230-VSTA 230 #2	2001	-	-	99.0	103.3
Element loading decreases.						
ANTELOPE 66-ANTELOPE 230 #2	PARDEE 230-S.CLARA 230 #1 VINCENT 230-S.CLARA 230 #1	124 MVA	102.1	101	-	-
ETIWANDA 230-RANCHVST 230 #2	ETIWANDA 230-RANCHVST230 #1 RANCHVST 230-PADUA 230 #1	2480	-	-	118.2	64.4
HINSON 230-DELAMO 230 #1	LA FRESA 230-LAGUBELL 230 #1 LITEHIPE 230-MESA CAL 230 #1	2400	-	-	111.7	103.1
HINSON 230-HARBOR 230 #1	LA FRESA 230-HINSON 230 #1 LBEACH 230-LITEHIPE 230 #1	1185	110.5	109.4	-	-
HINSON 230-HARBOR 230 #1	LA FRESA 230-REDONDO 230 #1 LA FRESA 230-REDONDO 230 #2	1185	114.1	103.7	-	-
MIRALOME 230-CHINO 230 #3	MIRALOME 230-OLINDA 230 #1 RANCHVST 500-SERRANO 500 #1	2480	100.6	86.3	-	-
NAVAJO 500-CRYSTAL 500 #1	MOENKOPI 500-ELDORDO 500 #1 PISGAH 230-ELDORDO 230 #2	2088	-	-	101.1	99.2
NAVAJO 500-CRYSTAL 500 #1	MOENKOPI 500-ELDORDO 500 #1 PISGAH 230-ELDORDO 230 #2	1901	-	-	111.0	109.0
RANCHVST 230-ETIWANDA 230 #2	ETIWANDA-RANCHVST 230 #1 RANCHVST 500-SERRANO 500 #1	2480	-	-	120.9	67.5
SERRANO 230-VILLA PK 230 #2	LEWIS 230-SERRANO 230 #1 SERRANO 230-VILLA PK 230 #1	3000	103.9	91	-	-
SERRANO 230-VILLA PK 230 #2	LEWIS 230-SERRANO 230 #2 SERRANO 230-VILLA PK 230 #1	3000	103.9	91	-	-
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #1	465	-	-	104.5	102.8
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	465	-	-	104.5	102.8
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	465	-	-	104.5	102.8

Table B-2. (continued) NERC/WECC Category "C" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	CONTINGENCY	N RATE	PRE	POST	PRE	POST
VICTORVL 500-VICTORVL 287 #1	MESA CAL 230-WALNUT 230 #1 MESA CAL 230-ANTELOPE 230 #1	465	-	-	104.5	102.4
VICTORVL 500-VICTORVL 287 #1	LA FRESA 230-LAGUBELL 230 #1 LITEHIPE 230-MESA CAL 230 #1	465	-	-	104.6	102.5
VICTORVL 500-VICTORVL 287 #1	CENTER S 230-OLINDA 230 #1 MESA CAL 230-WALNUT 230 #1	465	-	-	104.6	102.2
VICTORVL 500-VICTORVL 287 #1	MIRALOME 230-OLINDA 230 #1 MIRALOMW 230-WALNUT 230 #1	465	-	-	104.7	102.3
VICTORVL 500-VICTORVL 287 #1	ALMITOSW 230-LITEHIPE 230 #1 DELAMO 230-LAGUBELL 230 #1	465	-	-	104.7	102.0
VICTORVL 500-VICTORVL 287 #1	CENTER S 230-MESA CAL 230 #1 MESA CAL 230-WALNUT 230 #1	465	-	-	104.7	102.5
VICTORVL 500-VICTORVL 287 #1	EL NIDO 230-CHEVMAIN 230 #1 ELSEGNDO 230-EL NIDO 230 #1	465	-	-	104.8	103.1
VICTORVL 500-VICTORVL 287 #1	ALMITOSE 230-CENTER S 230 #1 DELAMO 230-ELLIS 230 #1	465	-	-	104.9	102.5
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-BAILEY 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	104.9	103.0
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-PASTORIA 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	104.9	103.0
VICTORVL 500-VICTORVL 287 #1	S.CLARA 230-MOORPARK 230 #2 VINCENT 230-S.CLARA 230 #1	465	-	-	105.0	103.1
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-S.CLARA 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	105.0	103.1
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-PARDEE 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	105.2	103.3
VICTORVL 500-VICTORVL 287 #1	ALMITOSE 230-CENTER S 230 #1 ALMITOSW 230-LITEHIPE 230 #1	465	-	-	105.2	103.0
VICTORVL 500-VICTORVL 287 #1	MESA CAL 230-ANTELOPE 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	105.5	103.6
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-ANTELOPE 230 #1 MIDWAY 500-VINCENT 500 #1	465	-	-	106.0	104.0
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-ANTELOPE 230 #1 MIDWAY 500-VINCENT 500 #2	465	-	-	106.0	104.0
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-ANTELOPE 230 #1 MIDWAY 500-VINCENT 500 #3	465	-	-	106.0	104.1
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-PARDEE 230 #1 EAGLROCK 230-SYLMAR S 230 #1	465	-	-	106.2	104.6
VICTORVL 500-VICTORVL 287 #1	DELAMO 230-LAGUBELL 230 #1 LA FRESA 230-LAGUBELL 230 #1	465	-	-	106.2	102.8
VICTORVL 500-VICTORVL 287 #1	RANCHVST 500-SERRANO 500 #1 LUGO 500-VINCENT 500 #1	465	-	-	106.3	104.2
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-MESA CAL 230 #1	465	-	-	106.3	104.4
VICTORVL 500-VICTORVL 287 #1	LUGO 500-VINCENT 500 #2 MIDWAY 500-VINCENT 500 #3	465	-	-	106.5	104.4
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-PARDEE 230 #1 PARDEE 230-VINCENT 230 #1	465	-	-	106.9	105.0
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-MESA CAL 230 #1 EAGLROCK 230-SYLMAR S 230 #1	465	-	-	107.1	105.5
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-MESA CAL 230 #1 VINCENT 230-MESA CAL 230 #1	465	-	-	107.4	105.7

Table B-2. (continued) NERC/WECC Category "C" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**N RATE**	**PRE**	**POST**	**PRE**	**POST**
VICTORVL 500-VICTORVL 287 #1	EAGLROCK 230-MESA CAL 230 #1 EAGLROCK 230-PARDEE 230 #1	465	-	-	107.4	105.7
VICTORVL 500-VICTORVL 287 #1	MESA CAL 230-ANTELOPE 230 #1 VINCENT 230-ANTELOPE 230 #1	465	-	-	107.9	106.1
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-S.CLARA 230 #1 VINCENT 230-ANTELOPE 230 #1	465	-	-	108.3	106.4
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-S.CLARA 230 #1	465	-	-	109.0	107.1
VICTORVL 500-VICTORVL 287 #1	LUGO 500-VINCENT 500 #2 LUGO 500-VICTORVL 500 #1	465 MVA	100.9	99.7	-	-
VICTORVL 500-VICTORVL 287 #1	VINCENT 230-S.CLARA 230 #1 VINCENT 230-ANTELOPE 230 #1	465 MVA	101.0	98.8	-	-
VICTORVL 500-VICTORVL 287 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-S.CLARA 230 #1	465 MVA	101.4	99.3	-	-
VICTORVL 500-VICTORVL 287 #1	LUGO 500-VINCENT 500 #1 LUGO 500-VINCENT 500 #2	465 MVA	106.1	102.5	-	-
VINCENT 230-ANTELOPE 230 #1	CENTER S 230-OLINDA 230 #1 MESA CAL 230-WALNUT 230 #1	1240	-	-	100.0	96.6
VINCENT 230-ANTELOPE 230 #1	MIRALOME 230-OLINDA 230 #1 MIRALOMW 230-WALNUT 230 #1	1240	-	-	100.2	96.7
VINCENT 230-ANTELOPE 230 #1	ALMITOSE 230-CENTER S 230 #1 DELAMO 230-ELLIS 230 #1	1240	-	-	100.3	96.9
VINCENT 230-ANTELOPE 230 #1	ALMITOSE 230-BARRE 230 #1 ALMITOSE 230-CENTER S 230 #1	1240	-	-	100.4	97.3
VINCENT 230-ANTELOPE 230 #1	CENTER S 230-MESA CAL 230 #1 MESA CAL 230-WALNUT 230 #1	1240	-	-	100.6	97.5
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1 PARDEE 230-PASTORIA 230 #1	1240	-	-	100.7	98.1
VINCENT 230-ANTELOPE 230 #1	LITEHIPE 230-MESA CAL 230 #1 MESA CAL 230-REDONDO 230 #1	1240	-	-	100.9	98.3
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-MOORPARK 230 #3 PARDEE 230-SYLMAR S 230 #1	1240	-	-	100.9	98.2
VINCENT 230-ANTELOPE 230 #1	ALMITOSE 230-CENTER S 230 #1 ALMITOSW 230-LITEHIPE 230 #1	1240	-	-	101.0	97.7
VINCENT 230-ANTELOPE 230 #1	EL NIDO 230-CHEVMAIN 230 #1 ELSEGNDO 230-EL NIDO 230 #1	1240	-	-	102.1	98.9
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #1	1240	-	-	102.2	99.6
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	1240	-	-	102.2	99.6
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	1240	-	-	102.2	99.6
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-MESA CAL 230 #1 VINCENT 230-MESA CAL 230 #1	1240	-	-	103.0	99.9
VINCENT 230-ANTELOPE 230 #1	GOODRICH 230-LAGUBELL 230 #1 VINCENT 230-MESA CAL 230 #1	1240	-	-	103.7	102.2
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1 EAGLROCK 230-SYLMAR S 230 #1	1240	-	-	105.6	103.4
VINCENT 230-ANTELOPE 230 #1	GOODRICH 230-LAGUBELL 230 #1 LAGUBELL 230-RIOHONDO 230 #1	1240	-	-	106.1	104.1

Table B-2. (continued) NERC/WECC Category "C" Contingencies.

			2008 Heavy Summer		2008 Light Spring	
AFFECTED ELEMENT	**CONTINGENCY**	**N RATE**	**PRE**	**POST**	**PRE**	**POST**
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-MESA CAL 230 #1 EAGLROCK 230-PARDEE 230 #1	1240	-	-	108.0	105.7
VINCENT 230-ANTELOPE 230 #1	S.CLARA 230-MOORPARK 230 #2 VINCENT 230-S.CLARA 230 #1	1240	-	-	109.3	106.4
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-PASTORIA 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	109.3	106.5
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-MESA CAL 230 #1 EAGLROCK 230-SYLMAR S 230 #1	1240	-	-	109.4	107.1
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-S.CLARA 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	109.4	106.6
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-BAILEY 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	109.7	106.9
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	111.9	109.1
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	1240	-	-	116.9	114.0
VINCENT 230-ANTELOPE 230 #1	LAGUBELL 230-RIOHONDO 230 #1 MESA CAL 230-ANTELOPE 230 #1	1240	-	-	117.4	114.1
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-MESA CAL 230 #1	1240	-	-	117.5	113.4
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1 VINCENT 230-RIOHONDO 230 #1	1240	-	-	118.0	115.8
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1 RIOHONDO 230-VINCENT 230 #2	1240	-	-	118.0	115.8
VINCENT 230-ANTELOPE 230 #1	CENTER S 230-MESA CAL 230 #1 MESA CAL 230-ANTELOPE 230 #1	1240	-	-	118.8	117.4
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-WALNUT 230 #1 MESA CAL 230-ANTELOPE 230 #1	1240	-	-	119.0	117.6
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1 MIDWAY 500-VINCENT 500 #1	1240	-	-	119.6	118.1
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1 MIDWAY 500-VINCENT 500 #2	1240	-	-	119.6	118.1
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1 MESA CAL 230-ANTELOPE 230 #1	1240	-	-	122.3	121.0
VINCENT 230-ANTELOPE 230 #1	EAGLROCK 230-PARDEE 230 #1 PARDEE 230-VINCENT 230 #1	1240	-	-	125.0	121.9
VINCENT 230-ANTELOPE 230 #1	MESA CAL 230-ANTELOPE 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	131.0	129.3
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-S.CLARA 230 #1	1240	-	-	139.5	136.1
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-MESA CAL 230 #1	1240	101.1	96.9	-	-
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-VINCENT 230 #1 VINCENT 230-S.CLARA 230 #1	1240	112.5	109.5	-	-
VINCENT 230-ANTELOPE 230 #1	PARDEE 230-SYLMAR S 230 #1 PARDEE 230-SYLMAR S 230 #2	1240	127.2	123.7	-	-

Appendix C

List of Power Flow Contingencies

2008 Heavy Summer and 2008 Light Spring list of contingencies.

```
Category “B” Contingency List.
#   The following contingencies are included.
#   B2 - All single transmission circuit outages (230 kV).
#   B3 - All single transformer outages (500/230kV) under the ISO control.
#   Selected overlapping (single generator unit and transmission circuit outages).
#

#   Base Case -- Case Number 0
0
#
########################## B2 - LINE CONTINGENCIES (230 kV) ############################
# All 500-kV line contingencies were simulated with the governor power flow method.
#
#   Case Number 1
1  "MEAD S   230.00"  "ELDORDO  230.00"  "1"  0
0
#
#   Case Number 2
1  "MEAD S   230.00"  "ELDORDO  230.00"  "2"  0
0
#
#   Case Number 3
1  "ALMITOSE 230.00"  "BARRE    230.00"  "1"  0
0
#
#   Case Number 4
1  "ALMITOSE 230.00"  "CENTER S 230.00"  "1"  0
0
#
#   Case Number 5
1  "ALMITOSW 230.00"  "BARRE    230.00"  "2"  0
0
#
#   Case Number 6
1  "ALMITOSW 230.00"  "LITEHIPE 230.00"  "1"  0
0
#
#   Case Number 7
1  "TOT137   230.00"  "LITEHIPE 230.00"  "1"  0
21
0
#   Case Number 8
1  "ARCO SC  230.00"  "HINSON   230.00"  "1"  0
0
#
#   Case Number 9
1  "ARCO SC  230.00"  "HINSON   230.00"  "2"  0
0
#
#   Case Number 10
1  "BARRE    230.00"  "ELLIS    230.00"  "1"  0
0
#
#   Case Number 11
1  "BARRE    230.00"  "VILLA PK 230.00"  "1"  0
0
#
#   Case Number 12
1  "BARRE    230.00"  "LEWIS    230.00"  "1"  0
0
#
#   Case Number 13
1  "CAMINO   230.00"  "MEAD S   230.00"  "E"  0
0
#
#   Case Number 14
1  "CAMINO   230.00"  "MEAD S   230.00"  "W"  0
```

```
0
#
#   Case Number 15
1  "CAMINO   230.00"  "GENE     230.00"  "1"  0
0
#
#   Case Number 16
1  "CENTER S 230.00"  "MESA CAL 230.00"  "1"  0
0
#
#   Case Number 17
1  "CENTER S 230.00"  "OLINDA   230.00"  "1"  0
0
#
#   Case Number 18
1  "CHINO    230.00"  "MIRALOMW 230.00"  "1"  0
0
#
#   Case Number 19
1  "CHINO    230.00"  "MIRALOMW 230.00"  "2"  0
0
#
#   Case Number 20
1  "CHINO    230.00"  "SERRANO  230.00"  "1"  0
0
#
#   Case Number 21
1  "CHINO    230.00"  "MIRALOME 230.00"  "3"  0
0
#
#   Case Number 22
1  "DELAMO   230.00"  "CENTER S 230.00"  "1"  0
0
#
#   Case Number 23
1  "DELAMO   230.00"  "ELLIS    230.00"  "1"  0
0
#
#   Case Number 24
1  "DELAMO   230.00"  "LAGUBELL 230.00"  "1"  0
0
#
#   Case Number 25
1  "EAGLROCK 230.00"  "MESA CAL 230.00"  "1"  0
0
#
#   Case Number 26
1  "EAGLROCK 230.00"  "PARDEE   230.00"  "1"  0
0
#
#   Case Number 27
1  "EAGLROCK 230.00"  "SYLMAR S 230.00"  "1"  0
0
#
#   Case Number 28
1  "EL NIDO  230.00"  "LA FRESA 230.00"  "3"  0
0
#
#   Case Number 29
1  "EL NIDO  230.00"  "LA FRESA 230.00"  "4"  0
0
#
#   Case Number 30
1  "EL NIDO  230.00"  "LCIENEGA 230.00"  "1"  0
0
#
#   Case Number 31
1  "EL NIDO  230.00"  "CHEVMAIN 230.00"  "1"  0
0
#
```

```
#   Case Number 32
1  "ELLIS    230.00"  "HUNTGBCH 230.00"  "1"  0
0
#
#   Case Number 33
1  "ELLIS    230.00"  "HUNTGBCH 230.00"  "3"  0
0
#
#   Case Number 34
1  "ELLIS    230.00"  "JOHANNA  230.00"  "1"  0
0
#
#   Case Number 35
1  "ELLIS    230.00"  "SANTIAGO 230.00"  "1"  0
0
#
#   Case Number 36
1  "ELLIS    230.00"  "HUNTBCH1 230.00"  "2"  0
0
#
#   Case Number 37
1  "ELLIS    230.00"  "HUNTBCH1 230.00"  "4"  0
0
#
#   Case Number 38
1  "ELSEGNDO 230.00"  "EL NIDO  230.00"  "1"  0
0
#
#   Case Number 39
1  "ELSEGNDO 230.00"  "CHEVMAIN 230.00"  "1"  0
0
#
#   Case Number 40
1  "ETIWANDA 230.00"  "SANBRDNO 230.00"  "1"  0
0
#
#   Case Number 41
1  "ETIWANDA 230.00"  "VSTA     230.00"  "1"  0
0
#
#   Case Number 42
1  "HARBOR   230.00"  "HINSON   230.00"  "1"  0
0
#
#   Case Number 43
1  "HARBOR   230.00"  "LBEACH   230.00"  "1"  0
0
#
#   Case Number 44
1  "HINSON   230.00"  "DELAMO   230.00"  "1"  0
0
#
#   Case Number 45
1  "JOHANNA  230.00"  "SANTIAGO 230.00"  "1"  0
0
#
#   Case Number 46
1  "LA FRESA 230.00"  "HINSON   230.00"  "1"  0
0
#
#   Case Number 47
1  "LA FRESA 230.00"  "LAGUBELL 230.00"  "1"  0
0
#
#   Case Number 48
1  "LA FRESA 230.00"  "REDONDO  230.00"  "1"  0
0
#
#   Case Number 49
1  "LA FRESA 230.00"  "REDONDO  230.00"  "2"  0
```

```
0
#
#   Case Number 50
1  "LAGUBELL 230.00"  "RIOHONDO 230.00"  "1"  0
0
#
#   Case Number 51
1  "LBEACH   230.00"  "LITEHIPE 230.00"  "1"  0
0
#
#   Case Number 52
1  "LCIENEGA 230.00"  "LA FRESA 230.00"  "1"  0
0
#
#   Case Number 53
1  "LITEHIPE 230.00"  "HINSON   230.00"  "1"  0
0
#
#   Case Number 54
1  "LITEHIPE 230.00"  "MESA CAL 230.00"  "1"  0
0
#
#   Case Number 55
1  "MESA CAL 230.00"  "REDONDO  230.00"  "1"  0
0
#
#   Case Number 56
1  "MESA CAL 230.00"  "RIOHONDO 230.00"  "1"  0
0
#
#   Case Number 57
1  "MESA CAL 230.00"  "WALNUT   230.00"  "1"  0
0
#
#   Case Number 58
1  "MESA CAL 230.00"  "ANTELOPE 230.00"  "1"  0
0
#
#   Case Number 59
1  "MIRALOMW 230.00"  "WALNUT   230.00"  "1"  0
0
#
#   Case Number 60
1  "MOORPARK 230.00"  "ORMOND   230.00"  "1"  0
0
#
#   Case Number 61
1  "MOORPARK 230.00"  "ORMOND   230.00"  "2"  0
0
#
#   Case Number 62
1  "MOORPARK 230.00"  "ORMOND   230.00"  "3"  0
0
#
#   Case Number 63
1  "MOORPARK 230.00"  "ORMOND   230.00"  "4"  0
0
#
#   Case Number 64
1  "OLINDA   230.00"  "WALNUT   230.00"  "1"  0
0
#
#   Case Number 65
1  "PARDEE   230.00"  "MOORPARK 230.00"  "1"  0
0
#
#   Case Number 66
1  "PARDEE   230.00"  "MOORPARK 230.00"  "2"  0
0
#
```

```
#   Case Number 67
1  "PARDEE   230.00"  "MOORPARK 230.00"  "3"  0
0
#
#   Case Number 68
1  "PARDEE   230.00"  "PASTORIA 230.00"  "1"  0
0
#
#   Case Number 69
1  "PARDEE   230.00"  "S.CLARA  230.00"  "1"  0
0
#
#   Case Number 70
1  "PARDEE   230.00"  "SYLMAR S 230.00"  "1"  0
0
#
#   Case Number 71
1  "PARDEE   230.00"  "SYLMAR S 230.00"  "2"  0
0
#
#   Case Number 72
1  "PARDEE   230.00"  "VINCENT  230.00"  "1"  0
0
#
#   Case Number 73
1  "PARDEE   230.00"  "SAUG TAP 230.00"  "1"  0
0
#
#   Case Number 74
1  "PARDEE   230.00"  "SAUG TAP 230.00"  "2"  0
0
#
#   Case Number 75
1  "REDONDO  230.00"  "LITEHIPE 230.00"  "1"  0
0
#
#   Case Number 76
1  "RIOHONDO 230.00"  "VINCENT  230.00"  "2"  0
0
#
#   Case Number 77
1  "S.CLARA  230.00"  "GOLETA   230.00"  "1"  0
0
#
#   Case Number 78
1  "S.CLARA  230.00"  "GOLETA   230.00"  "2"  0
0
#
#   Case Number 79
1  "S.CLARA  230.00"  "MANDALAY 230.00"  "1"  0
21
0
#
#   Case Number 80
1  "S.CLARA  230.00"  "MANDALAY 230.00"  "2"  0
21
0
#
#   Case Number 81
1  "S.CLARA  230.00"  "MOORPARK 230.00"  "1"  0
0
#
#   Case Number 82
1  "S.CLARA  230.00"  "MOORPARK 230.00"  "2"  0
0
#
#   Case Number 83
1  "S.ONOFRE 230.00"  "SANTIAGO 230.00"  "1"  0
0
#
```

```
#   Case Number 84
1  "S.ONOFRE 230.00"  "SANTIAGO 230.00"  "2"  0
0
#
#   Case Number 85
1  "S.ONOFRE 230.00"  "SERRANO  230.00"  "1"  0
0
#
#   Case Number 86
1  "SANBRDNO 230.00"  "DEVERS   230.00"  "1"  0
0
#
#   Case Number 87
1  "SERRANO  230.00"  "VILLA PK 230.00"  "1"  0
0
#
#   Case Number 88
1  "SERRANO  230.00"  "VILLA PK 230.00"  "2"  0
0
#
#   Case Number 89
1  "SYLMAR S 230.00"  "GOULD    230.00"  "1"  0
0
#
#   Case Number 90
1  "VINCENT  230.00"  "MESA CAL 230.00"  "1"  0
0
#
#   Case Number 91
1  "VINCENT  230.00"  "RIOHONDO 230.00"  "1"  0
0
#
#   Case Number 92
1  "VINCENT  230.00"  "S.CLARA  230.00"  "1"  0
0
#
#   Case Number 93
1  "VINCENT  230.00"  "SEAWEST  230.00"  "1"  0
0
#
#   Case Number 94
1  "PISGAH   230.00"  "ELDORDO  230.00"  "2"  0
0
#
#   Case Number 95
1  "PISGAH   230.00"  "LUGO     230.00"  "1"  0
0
#
#   Case Number 96
1  "PISGAH   230.00"  "LUGO     230.00"  "2"  0
0
#
#   Case Number 97
1  "PISGAH   230.00"  "CIMA     230.00"  "1"  0
0
#
#   Case Number 98
1  "TOT005   230.00"  "VICTOR   230.00"  "1"  0
21
0
#   Case Number 99
1  "VICTOR   230.00"  "LUGO     230.00"  "1"  0
0
#
#   Case Number 100
1  "VICTOR   230.00"  "LUGO     230.00"  "2"  0
0
#
#   Case Number 101
1  "CIMA     230.00"  "ELDORDO  230.00"  "1"  0
```

```
0
#
#   Case Number 102
1  "KRAMER   230.00"  "LUGO     230.00"  "1"  0
0
#
#   Case Number 103
1  "KRAMER   230.00"  "LUGO     230.00"  "2"  0
0
#
#   Case Number 104
1  "KRAMER   230.00"  "COLWATER 230.00"  "1"  0
0
#
#   Case Number 105
1  "KRAMER   230.00"  "COLWATER 230.00"  "2"  0
0
#
#   Case Number 106
1  "BLM EAST 230.00"  "BLM WEST 230.00"  "1"  0
21
0
#
#   Case Number 107
1  "BLM WEST 230.00"  "KRAMER   230.00"  "1"  0
21
0
#   Case Number 108
1  "LUZ LSP  230.00"  "KRAMER   230.00"  "1"  0
21
0
#   Case Number 109
1  "LUZ8     230.00"  "LUZ LSP  230.00"  "1"  0
0
#
#   Case Number 110
1  "LUZ9     230.00"  "LUZ LSP  230.00"  "1"  0
0
#
#   Case Number 111
1  "OAK_VLLY 230.00"  "SANBRDNO 230.00"  "1"  0
0
#
#   Case Number 112
1  "DEVERS   230.00"  "OAK_VLLY 230.00"  "1"  0
0
#
#   Case Number 113
1  "DEVERS   230.00"  "MIRAGE   230.00"  "1"  0
20
0
#
#   Case Number 114
1  "DEVERS   230.00"  "VSTA     230.00"  "2"  0
0
#
#   Case Number 115
1  "VSTA     230.00"  "SANBRDNO 230.00"  "2"  0
0
#
#   Case Number 116
1  "VSTA     230.00"  "DEVERS   230.00"  "1"  0
0
#
#   Case Number 117
1  "GOODRICH 230.00"  "GOULD    230.00"  "1"  0
0
#
#   Case Number 118
1  "GOODRICH 230.00"  "LAGUBELL 230.00"  "1"  0
```

```
0
#
#   Case Number 119
1  "LEWIS    230.00"  "SERRANO  230.00"  "1"  0
0
#
#   Case Number 120
1  "LEWIS    230.00"  "SERRANO  230.00"  "2"  0
0
#
#   Case Number 121
1  "LEWIS    230.00"  "VILLA PK 230.00"  "1"  0
0
#
#   Case Number 122
1  "EAGLEMTN 230.00"  "IRON MTN 230.00"  "1"  0
0
#
#   Case Number 123
1  "IRON MTN 230.00"  "CAMINO   230.00"  "1"  0
0
#
#   Case Number 124
1  "J.HINDS  230.00"  "MIRAGE   230.00"  "1"  0
0
#
#   Case Number 125
1  "J.HINDS  230.00"  "EAGLEMTN 230.00"  "1"  0
0
#
#   Case Number 126
1  "MIRALOME 230.00"  "MIRALOMW 230.00"  "1"  0
0
#
#   Case Number 127
1  "MIRALOME 230.00"  "OLINDA   230.00"  "1"  0
0
#
#   Case Number 128
1  "MIRALOME 230.00"  "PADUA    230.00"  "1"  0
0
#
#   Case Number 129
1  "MIRALOME 230.00"  "VSTA     230.00"  "2"  0
0
#
#   Case Number 130
1  "CHINO    230.00"  "S.ONOFRE 230.00"  "1"  0
0
#
#   Case Number 131
1  "TOT109   230.00"  "SANBRDNO 230.00"  "1"  0
0
#
#   Case Number 132
1  "TOT109   230.00"  "SANBRDNO 230.00"  "2"  0
0
#
#   Case Number 133
1  "VIEJOSC  230.00"  "CHINO    230.00"  "1"  0
0
#
#   Case Number 134
1  "VIEJOSC  230.00"  "S.ONOFRE 230.00"  "1"  0
0
#
#   Case Number 135
1  "ETIWANDA 230.00"  "RANCHVST 230.00"  "1"  0
0
#
```

```
#   Case Number 136
1  "ETIWANDA 230.00"  "RANCHVST 230.00"  "2"  0
0
#
#   Case Number 137
1  "ETIWANDA 230.00"  "RANCHVST 230.00"  "3"  0
0
#
#   Case Number 138
1  "RANCHVST 230.00"  "PADUA    230.00"  "1"  0
0
#
#   Case Number 139
1  "RANCHVST 230.00"  "PADUA    230.00"  "2"  0
0
#
#   Case Number 140
1  "RANCHVST 230.00"  "MIRALOME 230.00"  "1"  0
0
#
#   Case Number 141
1  "RANCHVST 230.00"  "MIRALOME 230.00"  "2"  0
0
#
#   Case Number 142
1  "MIRALOMW 230.00"  "TOT107   230.00"  "1"  0
0
#
#   Case Number 143
1  "TOT107   230.00"  "VSTA     230.00"  "1"  0
0
#
#   Case Number 144
1  "TOT135   230.00"  "WALNUT   230.00"  "1"  0
21
0
#   Case Number 145
1  "ETIWANDA 230.00"  "TOT139DL 230.00"  "1"  0
21
0
#   Case Number 146
1  "DEVERS   230.00"  "TOT032   230.00"  "1"  0
21
0
#   Case Number 147
1  "TOT138   230.00"  "LBEACH   230.00"  "1"  0
21
0
#
########################## B3 - TRANSFORMER CONTINGENCIES (500/230 kV) ############################
#
#   Case Number 148
2  "ELDORDO  500.00"  "ELDORDO  230.00"  "1"  0
0
#
#   Case Number 149
2  "ELDORDO  500.00"  "ELDORDO  230.00"  "2"  0
0
#
#   Case Number 150
2  "LUGO     500.00"  "LUGO     230.00"  "1"  0
0
#
#   Case Number 151
2  "LUGO     500.00"  "LUGO     230.00"  "2"  0
0
#
#   Case Number 152
2  "MIRALOMA 500.00"  "MIRALOMW 230.00"  "1"  0
0
```

```
#
#   Case Number 153
2  "MIRALOMA 500.00"  "MIRALOMW 230.00"  "2"  0
0
#
#   Case Number 154
2  "MIRALOMA 500.00"  "MIRALOME 230.00"  "3"  0
0
#
#   Case Number 155
2  "MIRALOMA 500.00"  "MIRALOME 230.00"  "4"  0
0
#
#   Case Number 156
2  "SERRANO  500.00"  "SERRANO  230.00"  "1"  0
0
#
#   Case Number 157
2  "SERRANO  500.00"  "SERRANO  230.00"  "2"  0
0
#
#   Case Number 158
2  "SERRANO  500.00"  "SERRANO  230.00"  "3"  0
0
#
#   Case Number 159
2  "VINCENT  500.00"  "VINCENT  230.00"  "1"  0
21
0
#   Case Number 160
2  "VINCENT  500.00"  "VINCENT  230.00"  "2"  0
0
#
#   Case Number 161
2  "VINCENT  500.00"  "VINCENT  230.00"  "3"  0
0
#
#   Case Number 162
2  "VINCENT  500.00"  "VINCENT  230.00"  "4"  0
0
#
#   Case Number 163
2  "DEVERS   500.00"  "DEVERS   230.00"  "1"  0
0
#
#   Case Number 164
2  "DEVERS   500.00"  "DEVERS   230.00"  "2"  0
0
#
#   Case Number 165
2  "RANCHVST 500.00"  "RANCHVST 230.00"  "1"  0
0
#
#   Case Number 166
2  "RANCHVST 500.00"  "RANCHVST 230.00"  "2"  0
0
#
##################################################################################################################
#
# PROJECT CONTINGENCIES
#
##################################################################################################################
#
#   Case Number 167
1  "LAGUBELL 230.00"  "VPWRPLNT 230.00"  "1"  0
0
#
#   Case Number 168
1  "LAGUBELL 230.00"  "VPWRPLNT 230.00"  "2"  0
0
```

```
#
#   Case Number 169
3  "VERNNST1  18.00"  "0"  "1"  0
0
#
#   Case Number 170
3  "VERNNCT1  18.00"  "0"  "1"  0
0
#
#   Case Number 171
3  "VERNNCT2  18.00"  "0"  "1"  0
0
#
#   Case Number 172
3  "VERNNCT3  18.00"  "0"  "1"  0
0
#
-1
# EOF
```

2008 Heavy Summer and 2008 Light Spring list of contingencies.

Category “C” Contingency List.

```
#   The following contingencies are included.
#   C3 - Selected combination of two successive category B outages (except those included above in Category "B").
#   C5 - Outages of double circuit tower lines.

#   Base Case -- Case Number 0
0
#
########################## C3 & C5 CONTINGENCIES ##############################
#
#   Case Number 1
#
1 24006 24016  "1 "    0      line from ALMITOSE 230.00  to  BARRE    230.00
1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
21
0
#
#   Case Number 2
 1 24006 24016  "1 "    0      line from ALMITOSE 230.00  to  BARRE    230.00
 1 24008 24016  "2 "    0      line from ALMITOSW 230.00  to  BARRE    230.00
0
#
#   Case Number 3
 1 24006 24016  "1 "    0      line from ALMITOSE 230.00  to  BARRE    230.00
 1 24008 24084  "1 "    0      line from ALMITOSW 230.00  to  LITEHIPE 230.00
0
#
#   Case Number 4
 1 24006 24016  "1 "    0      line from ALMITOSE 230.00  to  BARRE    230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 5
 1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
 1 24008 24016  "2 "    0      line from ALMITOSW 230.00  to  BARRE    230.00
0
#
#   Case Number 6
# 1 24008 24016  "2 "    0      line from ALMITOSW 230.00  to  BARRE    230.00
# 1 24008 24084  "1 "    0      line from ALMITOSW 230.00  to  LITEHIPE 230.00
#0
#
#   Case Number 7
 1 24008 24016  "2 "    0      line from ALMITOSW 230.00  to  BARRE    230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 8
 1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
 1 24008 24084  "1 "    0      line from ALMITOSW 230.00  to  LITEHIPE 230.00
0
#
#   Case Number 9
 1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
 1 24029 24021  "1 "    0      line from DELAMO   230.00  to  CENTER S 230.00
0
#
#   Case Number 10
 1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 11
 1 24006 24021  "1 "    0      line from ALMITOSE 230.00  to  CENTER S 230.00
 1 24065 24029  "1 "    0      line from HINSON   230.00  to  DELAMO   230.00
0
```

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#
#   Case Number 12
 1 24008 24084  "1 "    0      line from ALMITOSW 230.00  to  LITEHIPE 230.00
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
0
#
#   Case Number 13
 1 24008 24084  "1 "    0      line from ALMITOSW 230.00  to  LITEHIPE 230.00
 1 24065 24029  "1 "    0      line from HINSON   230.00  to  DELAMO   230.00
0
#
#   Case Number 14
 1 24015 24065  "1 "    0      line from ARCO SC  230.00  to  HINSON   230.00
 1 24015 24065  "2 "    0      line from ARCO SC  230.00  to  HINSON   230.00
21
0
#
#   Case Number 15
 1 24029 24021  "1 "    0      line from DELAMO   230.00  to  CENTER S 230.00
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
0
#
#   Case Number 16
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
 1 24065 24029  "1 "    0      line from HINSON   230.00  to  DELAMO   230.00
0
#
#   Case Number 17
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
 1 24074 24076  "1 "    0      line from LA FRESA 230.00  to  LAGUBELL 230.00
0
#
#   Case Number 18
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
 1 24084 24091  "1 "    0      line from LITEHIPE 230.00  to  MESA CAL 230.00
0
#
#   Case Number 19
 1 24029 24076  "1 "    0      line from DELAMO   230.00  to  LAGUBELL 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 20
 1 24016 24044  "1 "    0      line from BARRE    230.00  to  ELLIS    230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 21
 1 24016 24154  "1 "    0      line from BARRE    230.00  to  VILLA PK 230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 22
 1 24016 25201  "1 "    0      line from BARRE    230.00  to  LEWIS    230.00
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
0
#
#   Case Number 23
 1 24016 24154  "1 "    0      line from BARRE    230.00  to  VILLA PK 230.00
 1 24016 25201  "1 "    0      line from BARRE    230.00  to  LEWIS    230.00
0
#
#   Case Number 24
 1 24016 24154  "1 "    0      line from BARRE    230.00  to  VILLA PK 230.00
 1 25201 24137  "1 "    0      line from LEWIS    230.00  to  SERRANO  230.00
0
#
#   Case Number 25
 1 24016 24154  "1 "    0      line from BARRE    230.00  to  VILLA PK 230.00
 1 25201 24137  "2 "    0      line from LEWIS    230.00  to  SERRANO  230.00
```

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0
#
#   Case Number 26
 1 24016 24154  "1 "    0     line from BARRE    230.00  to  VILLA PK 230.00
 1 25201 24154  "1 "    0     line from LEWIS    230.00  to  VILLA PK 230.00
0
#
#   Case Number 27
 1 25201 24137  "1 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 25201 24154  "1 "    0     line from LEWIS    230.00  to  VILLA PK 230.00
0
#
#   Case Number 28
 1 25201 24137  "2 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 25201 24154  "1 "    0     line from LEWIS    230.00  to  VILLA PK 230.00
0
#
#   Case Number 29
 1 25201 24137  "1 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 25201 24137  "2 "    0     line from LEWIS    230.00  to  SERRANO  230.00
0
#
#   Case Number 30
 1 25201 24137  "1 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 24137 24154  "1 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 31
 1 25201 24137  "1 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 24137 24154  "2 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 32
 1 25201 24137  "2 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 24137 24154  "1 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 33
 1 25201 24137  "2 "    0     line from LEWIS    230.00  to  SERRANO  230.00
 1 24137 24154  "2 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 34
 1 24137 24154  "1 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
 1 24137 24154  "2 "    0     line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 35
 1 24065 24029  "1 "    0     line from HINSON   230.00  to  DELAMO   230.00
 1 24074 24065  "1 "    0     line from LA FRESA 230.00  to  HINSON   230.00
0
#
#   Case Number 36
 1 24065 24029  "1 "    0     line from HINSON   230.00  to  DELAMO   230.00
 1 24077 24084  "1 "    0     line from LBEACH   230.00  to  LITEHIPE 230.00
0
#
#   Case Number 37
 1 24065 24029  "1 "    0     line from HINSON   230.00  to  DELAMO   230.00
 1 24084 24065  "1 "    0     line from LITEHIPE 230.00  to  HINSON   230.00
0
#
#   Case Number 38
 1 24074 24065  "1 "    0     line from LA FRESA 230.00  to  HINSON   230.00
 1 24084 24065  "1 "    0     line from LITEHIPE 230.00  to  HINSON   230.00
0
#
#   Case Number 39
 1 24077 24084  "1 "    0     line from LBEACH   230.00  to  LITEHIPE 230.00
 1 24084 24065  "1 "    0     line from LITEHIPE 230.00  to  HINSON   230.00
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0
#
#   Case Number 40
 1 24061 24065  "1 "    0      line from HARBOR   230.00  to  HINSON   230.00
 1 24077 24084  "1 "    0      line from LBEACH   230.00  to  LITEHIPE 230.00
21
0
#
#   Case Number 41
 1 24074 24065  "1 "    0      line from LA FRESA 230.00  to  HINSON   230.00
 1 24077 24084  "1 "    0      line from LBEACH   230.00  to  LITEHIPE 230.00
0
#
#   Case Number 42
 1 24061 24065  "1 "    0      line from HARBOR   230.00  to  HINSON   230.00
 1 24061 24077  "1 "    0      line from HARBOR   230.00  to  LBEACH   230.00
21
0
#
#   Case Number 43
 1 24074 24065  "1 "    0      line from LA FRESA 230.00  to  HINSON   230.00
 1 24074 24076  "1 "    0      line from LA FRESA 230.00  to  LAGUBELL 230.00
0
#
#   Case Number 44
 1 24074 24065  "1 "    0      line from LA FRESA 230.00  to  HINSON   230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 45
 1 24074 24065  "1 "    0      line from LA FRESA 230.00  to  HINSON   230.00
 1 24125 24084  "1 "    0      line from REDONDO  230.00  to  LITEHIPE 230.00
0
#
#   Case Number 46
 1 24074 24076  "1 "    0      line from LA FRESA 230.00  to  LAGUBELL 230.00
 1 24125 24084  "1 "    0      line from REDONDO  230.00  to  LITEHIPE 230.00
0
#
#   Case Number 47
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24125 24084  "1 "    0      line from REDONDO  230.00  to  LITEHIPE 230.00
0
#
#   Case Number 48
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24125 24084  "1 "    0      line from REDONDO  230.00  to  LITEHIPE 230.00
0
#
#   Case Number 49
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
 1 24125 24084  "1 "    0      line from REDONDO  230.00  to  LITEHIPE 230.00
0
#
#   Case Number 50
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24082 24074  "1 "    0      line from LCIENEGA 230.00  to  LA FRESA 230.00
0
#
#   Case Number 51
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24082 24074  "1 "    0      line from LCIENEGA 230.00  to  LA FRESA 230.00
0
#
#   Case Number 52
 1 24040 24074  "3 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24082 24074  "1 "    0      line from LCIENEGA 230.00  to  LA FRESA 230.00
0
#
#   Case Number 53
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 1 24040 24074  "4 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24082 24074  "1 "    0      line from LCIENEGA 230.00  to  LA FRESA 230.00
0
#
#   Case Number 54
 1 24040 24082  "1 "    0      line from EL NIDO  230.00  to  LCIENEGA 230.00
 1 24082 24074  "1 "    0      line from LCIENEGA 230.00  to  LA FRESA 230.00
21
0
#
#   Case Number 55
 1 24040 24198  "1 "    0      line from EL NIDO  230.00  to  CHEVMAIN 230.00
 1 24049 24040  "1 "    0      line from ELSEGNDO 230.00  to  EL NIDO  230.00
21
3  25501     0  "6 "    0
0
#
#   Case Number 56
 1 24040 24198  "1 "    0      line from EL NIDO  230.00  to  CHEVMAIN 230.00
 1 24049 24198  "1 "    0      line from ELSEGNDO 230.00  to  CHEVMAIN 230.00
21
0
#
#   Case Number 57
 1 24040 24074  "3 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24040 24074  "4 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
0
#
#   Case Number 58
 1 24040 24074  "3 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
0
#
#   Case Number 59
 1 24040 24074  "3 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
0
#
#   Case Number 60
 1 24040 24074  "4 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
0
#
#   Case Number 61
 1 24040 24074  "4 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
0
#
#   Case Number 62
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
0
#
#   Case Number 63
 1 24040 24074  "3 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 64
 1 24040 24074  "4 "    0      line from EL NIDO  230.00  to  LA FRESA 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 65
 1 24074 24125  "1 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 66
 1 24074 24125  "2 "    0      line from LA FRESA 230.00  to  REDONDO  230.00
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 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 67
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 68
 1 24074 24076  "1 "    0      line from LA FRESA 230.00  to  LAGUBELL 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 69
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 70
 1 24084 24091  "1 "    0      line from LITEHIPE 230.00  to  MESA CAL 230.00
 1 24091 24125  "1 "    0      line from MESA CAL 230.00  to  REDONDO  230.00
0
#
#   Case Number 71
 1 24074 24076  "1 "    0      line from LA FRESA 230.00  to  LAGUBELL 230.00
 1 24084 24091  "1 "    0      line from LITEHIPE 230.00  to  MESA CAL 230.00
0
#
#   Case Number 72
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
 1 24084 24091  "1 "    0      line from LITEHIPE 230.00  to  MESA CAL 230.00
0
#
#   Case Number 73
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24084 24091  "1 "    0      line from LITEHIPE 230.00  to  MESA CAL 230.00
0
#
#   Case Number 74
 1 25001 24059  "1 "    0      line from GOODRICH 230.00  to  GOULD    230.00
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
0
#
#   Case Number 75
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
0
#
#   Case Number 76
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
20
0
#
#   Case Number 77
 1 25001 24076  "1 "    0      line from GOODRICH 230.00  to  LAGUBELL 230.00
 1 24155 24091  "1 "    0      line from VINCENT  230.00  to  MESA CAL 230.00
0
#
#   Case Number 78
 1 24021 24091  "1 "    0      line from CENTER S 230.00  to  MESA CAL 230.00
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
0
#
#   Case Number 79
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24091 24126  "1 "    0      line from MESA CAL 230.00  to  RIOHONDO 230.00
0
#
#   Case Number 80
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 1 24076 24126  "1 "    0     line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
0
#
#   Case Number 81
 1 24076 24126  "1 "    0     line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24091 24401  "1 "    0     line from MESA CAL 230.00  to  ANTELOPE 230.00
0
#
#   Case Number 82
 1 24091 24126  "1 "    0     line from MESA CAL 230.00  to  RIOHONDO 230.00
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
0
#
#   Case Number 83
 1 24091 24126  "1 "    0     line from MESA CAL 230.00  to  RIOHONDO 230.00
 1 24091 24401  "1 "    0     line from MESA CAL 230.00  to  ANTELOPE 230.00
0
#
#   Case Number 84
 1 24021 24091  "1 "    0     line from CENTER S 230.00  to  MESA CAL 230.00
 1 24091 24126  "1 "    0     line from MESA CAL 230.00  to  RIOHONDO 230.00
0
#
#   Case Number 85
 1 24021 24091  "1 "    0     line from CENTER S 230.00  to  MESA CAL 230.00
 1 24021 24100  "1 "    0     line from CENTER S 230.00  to  OLINDA   230.00
0
#
#   Case Number 86
 1 24021 24091  "1 "    0     line from CENTER S 230.00  to  MESA CAL 230.00
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
0
#
#   Case Number 87
 1 24021 24091  "1 "    0     line from CENTER S 230.00  to  MESA CAL 230.00
 1 24091 24401  "1 "    0     line from MESA CAL 230.00  to  ANTELOPE 230.00
0
#
#   Case Number 88
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
 1 24091 24401  "1 "    0     line from MESA CAL 230.00  to  ANTELOPE 230.00
0
#
#   Case Number 89
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
 1 24093 24158  "1 "    0     line from MIRALOMA 230.00  to  WALNUT   230.00
0
#
#   Case Number 90
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
 1 24100 24158  "1 "    0     line from OLINDA   230.00  to  WALNUT   230.00
0
#
#   Case Number 91
 1 24021 24100  "1 "    0     line from CENTER S 230.00  to  OLINDA   230.00
 1 24091 24158  "1 "    0     line from MESA CAL 230.00  to  WALNUT   230.00
0
#
#   Case Number 92
 1 24021 24100  "1 "    0     line from CENTER S 230.00  to  OLINDA   230.00
 1 25656 24100  "1 "    0     line from MIRALOMA 230.00  to  OLINDA   230.00
0
#
#   Case Number 93
 1 24021 24100  "1 "    0     line from CENTER S 230.00  to  OLINDA   230.00
 1 24093 24158  "1 "    0     line from MIRALOMA 230.00  to  WALNUT   230.00
0
#
#   Case Number 94
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 1 24021 24100  "1 "    0      line from CENTER S 230.00  to  OLINDA   230.00
 1 24100 24158  "1 "    0      line from OLINDA   230.00  to  WALNUT   230.00
0
#
#   Case Number 95
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
 1 24100 24158  "1 "    0      line from OLINDA   230.00  to  WALNUT   230.00
0
#
#   Case Number 96
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
 1 24100 24158  "1 "    0      line from OLINDA   230.00  to  WALNUT   230.00
0
#
#   Case Number 97
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 25001 24059  "1 "    0      line from GOODRICH 230.00  to  GOULD    230.00
0
#
#   Case Number 98
 1 25001 24059  "1 "    0      line from GOODRICH 230.00  to  GOULD    230.00
 1 24155 24091  "1 "    0      line from VINCENT  230.00  to  MESA CAL 230.00
21
0
#
#   Case Number 99
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
0
#
#   Case Number 100
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
0
#
#   Case Number 101
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
#   Case Number 102
 1 24036 24091  "1 "    0      line from EAGLROCK 230.00  to  MESA CAL 230.00
 1 24155 24091  "1 "    0      line from VINCENT  230.00  to  MESA CAL 230.00
0
#
#   Case Number 103
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
0
#
#   Case Number 104
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
#   Case Number 105
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
 1 24114 24147  "1 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
0
#
#   Case Number 106
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
 1 24114 24147  "2 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
0
#
#   Case Number 107
 1 24114 24147  "1 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
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#   Case Number 108
 1 24114 24147  "2 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
#   Case Number 109
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
#   Case Number 110
 1 24114 24147  "1 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
 1 24114 24147  "2 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
0
#
#   Case Number 111
 1 24044 24069  "1 "    0      line from ELLIS    230.00  to  HUNTGBCH 230.00
 1 24044 24369  "2 "    0      line from ELLIS    230.00  to  HUNTBCH1 230.00
0
#
#   Case Number 112
 1 24044 24369  "2 "    0      line from ELLIS    230.00  to  HUNTBCH1 230.00
 1 24044 24069  "3 "    0      line from ELLIS    230.00  to  HUNTGBCH 230.00
0
#
#   Case Number 113
 1 24044 24069  "3 "    0      line from ELLIS    230.00  to  HUNTGBCH 230.00
 1 24044 24369  "4 "    0      line from ELLIS    230.00  to  HUNTBCH1 230.00
0
#
#   Case Number 114
 1 24044 24072  "1 "    0      line from ELLIS    230.00  to  JOHANNA  230.00
 1 24044 24134  "1 "    0      line from ELLIS    230.00  to  SANTIAGO 230.00
0
#
#   Case Number 115
 1 24044 24134  "1 "    0      line from ELLIS    230.00  to  SANTIAGO 230.00
 1 24072 24134  "1 "    0      line from JOHANNA  230.00  to  SANTIAGO 230.00
0
#
#   Case Number 116
 1 24131 24134  "1 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
 1 24131 24134  "2 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
0
#
#   Case Number 117
 1 24131 24134  "1 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
0
#
#   Case Number 118
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24131 24134  "1 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
0
#
#   Case Number 119
 1 24131 24134  "2 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
0
#
#   Case Number 120
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24131 24134  "2 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
0
#
#   Case Number 121
 1 24128 24058  "1 "    0      line from S.CLARA  230.00  to  GOLETA   230.00
 1 24128 24058  "2 "    0      line from S.CLARA  230.00  to  GOLETA   230.00
21
0
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#
#   Case Number 122
 1 24128 24088  "1 "    0      line from S.CLARA  230.00  to  MANDALAY 230.00
 1 24128 24088  "2 "    0      line from S.CLARA  230.00  to  MANDALAY 230.00
21
0
#
#   Case Number 123
 1 24099 24106  "1 "    0      line from MOORPARK 230.00  to  ORMOND   230.00
 1 24099 24106  "2 "    0      line from MOORPARK 230.00  to  ORMOND   230.00
0
#
#   Case Number 124
 1 24114 24115  "1 "    0      line from PARDEE   230.00  to  PASTORIA 230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 125
 1 24114 24403  "1 "    0      line from PARDEE   230.00  to  BAILEY   230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 126
 1 24114 24099  "1 "    0      line from PARDEE   230.00  to  MOORPARK 230.00
 1 24114 24099  "2 "    0      line from PARDEE   230.00  to  MOORPARK 230.00
0
#
#   Case Number 127
 1 24114 24128  "1 "    0      line from PARDEE   230.00  to  S.CLARA  230.00
 1 24128 24099  "1 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
0
#
#   Case Number 128
 1 24114 24128  "1 "    0      line from PARDEE   230.00  to  S.CLARA  230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 129
 1 24128 24099  "1 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
 1 24128 24099  "2 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
0
#
#   Case Number 130
 1 24128 24099  "2 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 131
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
0
#
#   Case Number 132
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24114 24155  "1 "    0      line from PARDEE   230.00  to  VINCENT  230.00
0
#
#   Case Number 133
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24155 24091  "1 "    0      line from VINCENT  230.00  to  MESA CAL 230.00
0
#
#   Case Number 134
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 135
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 24155 24401  "1 "    0      line from VINCENT  230.00  to  ANTELOPE 230.00
```

```
0
#
#   Case Number 136
 1 24114 24155  "1 "    0      line from PARDEE   230.00  to  VINCENT  230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 137
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
0
#
#   Case Number 138
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 24126 24155  "2 "    0      line from RIOHONDO 230.00  to  VINCENT  230.00
0
#
#   Case Number 139
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 24155 24126  "1 "    0      line from VINCENT  230.00  to  RIOHONDO 230.00
0
#
#   Case Number 140
 1 24126 24155  "2 "    0      line from RIOHONDO 230.00  to  VINCENT  230.00
 1 24155 24126  "1 "    0      line from VINCENT  230.00  to  RIOHONDO 230.00
0
#
#   Case Number 141
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
0
#
#   Case Number 142
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
0
#
#   Case Number 143
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
0
#
#   Case Number 144
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
0
#
#   Case Number 145
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
0
#
#   Case Number 146
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
0
#
#   Case Number 147
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
0
#
#   Case Number 148
 1 24025 24093  "1 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24025 24093  "2 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
0
#
#   Case Number 149
 1 24025 24093  "2 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24025 25656  "3 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
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0
#
#   Case Number 150
 1 24025 25654  "1 "    0     line from CHINO    230.00  to  VIEJOSC  230.00
 1 24025 24137  "1 "    0     line from CHINO    230.00  to  SERRANO  230.00
0
#
#   Case Number 151
 1 24237 24112  "1 "    0     line from RANCHVST 230.00  to  PADUA    230.00
 1 24237 24112  "2 "    0     line from RANCHVST 230.00  to  PADUA    230.00
0
#
#   Case Number 152
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 25656 24901  "2 "    0     line from MIRALOMA 230.00  to  VSTA     230.00
0
#
#   Case Number 153
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24056 24901  "1 "    0     line from ETIWANDA 230.00  to  VSTA     230.00
0
#
#   Case Number 154
 1 24804 24132  "1 "    0     line from DEVERS   230.00  to  SANBRDNO 230.00
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
0
#
#   Case Number 155
 1 24804 24901  "2 "    0     line from DEVERS   230.00  to  VSTA     230.00
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
0
#
#   Case Number 156
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24132 24804  "1 "    0     line from SANBRDNO 230.00  to  DEVERS   230.00
0
#
#   Case Number 157
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24901 24132  "2 "    0     line from VSTA     230.00  to  SANBRDNO 230.00
0
#
#   Case Number 158
 1 24056 24132  "1 "    0     line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24901 24804  "1 "    0     line from VSTA     230.00  to  DEVERS   230.00
0
#
#   Case Number 159
 1 24901 24132  "2 "    0     line from VSTA     230.00  to  SANBRDNO 230.00
 1 24901 24804  "1 "    0     line from VSTA     230.00  to  DEVERS   230.00
0
#
#   Case Number 160
 1 24132 24804  "1 "    0     line from SANBRDNO 230.00  to  DEVERS   230.00
 1 24901 24132  "2 "    0     line from VSTA     230.00  to  SANBRDNO 230.00
0
#
#   Case Number 161
 1 24804 24132  "1 "    0     line from DEVERS   230.00  to  SANBRDNO 230.00
 1 24901 24132  "2 "    0     line from VSTA     230.00  to  SANBRDNO 230.00
0
#
#   Case Number 162
 1 24804 24132  "1 "    0     line from DEVERS   230.00  to  SANBRDNO 230.00
 1 24804 24901  "2 "    0     line from DEVERS   230.00  to  VSTA     230.00
0
#
#   Case Number 163
 1 24804 24132  "1 "    0     line from DEVERS   230.00  to  SANBRDNO 230.00
 1 24901 24804  "1 "    0     line from VSTA     230.00  to  DEVERS   230.00
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0
#
#   Case Number 164
 1 24804 24901  "2 "    0      line from DEVERS   230.00  to  VSTA     230.00
 1 24132 24804  "1 "    0      line from SANBRDNO 230.00  to  DEVERS   230.00
0
#
#   Case Number 165
 1 24132 24804  "1 "    0      line from SANBRDNO 230.00  to  DEVERS   230.00
 1 24901 24804  "1 "    0      line from VSTA     230.00  to  DEVERS   230.00
0
#
#   Case Number 166
 1 24804 24806  "1 "    0      line from DEVERS   230.00  to  MIRAGE   230.00
 1  8311 24804  "1 "    0      line from COACHELA 230.00  to  DEVERS   230.00
20
0
#
#   Case Number 167
 1 24804 24806  "1 "    0      line from DEVERS   230.00  to  MIRAGE   230.00
 1 25406 24806  "1 "    0      line from J.HINDS  230.00  to  MIRAGE   230.00
20
0
#
#   Case Number 168
 1 24601 24085  "1 "    0      line from VICTOR   230.00  to  LUGO     230.00
 1 24601 24085  "2 "    0      line from VICTOR   230.00  to  LUGO     230.00
21
0
#
#   Case Number 169
 1  8695 24806  "1 "    0      line from RAMON    230.00  to  MIRAGE   230.00
 1 25406 24806  "1 "    0      line from J.HINDS  230.00  to  MIRAGE   230.00
0
#
#   Case Number 170
 1  8311 24804  "1 "    0      line from COACHELA 230.00  to  DEVERS   230.00
 1 25406 24806  "1 "    0      line from J.HINDS  230.00  to  MIRAGE   230.00
0
#
#   Case Number 171
 1  8695 24806  "1 "    0      line from RAMON    230.00  to  MIRAGE   230.00
 1  8311 24804  "1 "    0      line from COACHELA 230.00  to  DEVERS   230.00
0
#
#   Case Number 172
 1 19012 24041  "1 "    0      line from MEAD S   230.00  to  ELDORDO  230.00
 1 19012 24041  "2 "    0      line from MEAD S   230.00  to  ELDORDO  230.00
0
#
#   Case Number 173
 1 24019 19012  "E "    0      line from CAMINO   230.00  to  MEAD S   230.00
 1 24019 19012  "W "    0      line from CAMINO   230.00  to  MEAD S   230.00
0
#
#   Case Number 174
 1 24219 24085  "1 "    0      line from PISGAH   230.00  to  LUGO     230.00
 1 24219 24085  "2 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 175
 1 24042 24086  "1 "    0      line from ELDORDO  500.00  to  LUGO     500.00
 1 24219 24041  "2 "    0      line from PISGAH   230.00  to  ELDORDO  230.00
0
#
#   Case Number 176
 1 24042 24086  "1 "    0      line from ELDORDO  500.00  to  LUGO     500.00
 1 24219 24085  "1 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
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#   Case Number 177
 1 24042 24086  "1 "    0      line from ELDORDO  500.00  to  LUGO     500.00
 1 24219 24085  "2 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 178
 1 24086 24092  "2 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
 1 24086 24092  "3 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 179
 1 24086 24092  "2 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
 1 24086 24236  "1 "    0      line from LUGO     500.00  to  RANCHVST 500.00
0
#
#   Case Number 180
 1 24056 24132  "1 "    0      line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24086 24092  "2 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 181
 1 24056 24901  "1 "    0      line from ETIWANDA 230.00  to  VSTA     230.00
 1 24086 24092  "2 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 182
 1 24056 24132  "1 "    0      line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24086 24092  "3 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 183
 1 24056 24901  "1 "    0      line from ETIWANDA 230.00  to  VSTA     230.00
 1 24086 24092  "3 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 184
 1 24086 24097  "1 "    0      line from LUGO     500.00  to  MOHAVE   500.00
 1 24219 24085  "1 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 185
 1 24086 24097  "1 "    0      line from LUGO     500.00  to  MOHAVE   500.00
 1 24219 24085  "2 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 186
 1 24025 24093  "1 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 187
 1 24025 24093  "2 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 188
 1 24025 25656  "3 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 189
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 190
 1 24056 24237  "1 "    0      line from ETIWANDA 230.00  to  RANCHVST 230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
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#   Case Number 191
 1 24056 24132  "1 "    0      line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 192
 1 24056 24901  "1 "    0      line from ETIWANDA 230.00  to  VSTA     230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 193
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 194
 1 24237 24112  "1 "    0      line from RANCHVST 230.00  to  PADUA    230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 195
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
0
#
#   Case Number 196
 1 24086 24156  "1 "    0      line from LUGO     500.00  to  VINCENT  500.00
 1 24086 24156  "2 "    0      line from LUGO     500.00  to  VINCENT  500.00
0
#
#   Case Number 197
 1 30060 24156  "1 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
 1 30060 24156  "2 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 198
 1 24155 24401  "1 "    0      line from VINCENT  230.00  to  ANTELOPE 230.00
 1 30060 24156  "1 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 199
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 30060 24156  "1 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 200
 1 30060 24156  "2 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
 1 30060 24156  "3 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 201
 1 24155 24401  "1 "    0      line from VINCENT  230.00  to  ANTELOPE 230.00
 1 30060 24156  "2 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 202
 1 24091 24401  "1 "    0      line from MESA CAL 230.00  to  ANTELOPE 230.00
 1 30060 24156  "2 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 203
 1 24155 24401  "1 "    0      line from VINCENT  230.00  to  ANTELOPE 230.00
 1 30060 24156  "3 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 204
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24092 24138  "1 "    0      line from MIRALOMA 500.00  to  SERRANO  500.00
0
#
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#   Case Number 205
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24092 24138  "1 "    0      line from MIRALOMA 500.00  to  SERRANO  500.00
0
#
#   Case Number 206
 1 14002 24042  "1 "    0      line from MOENKOPI 500.00  to  ELDORDO  500.00
 1 24219 24041  "2 "    0      line from PISGAH   230.00  to  ELDORDO  230.00
0
#
#   Case Number 207
 1 24097 24042  "1 "    0      line from MOHAVE   500.00  to  ELDORDO  500.00
 1 24219 24041  "2 "    0      line from PISGAH   230.00  to  ELDORDO  230.00
0
#
#   Case Number 208
 1 24804 24806  "1 "    0      line from DEVERS   230.00  to  MIRAGE   230.00
 1 24801 24900  "1 "    0      line from DEVERS   500.00  to  MIDPINTS 500.00
0
#
#   Case Number 209
 1 24801 24900  "1 "    0      line from DEVERS   500.00  to  MIDPINTS 500.00
 1  8311 24804  "1 "    0      line from COACHELA 230.00  to  DEVERS   230.00
0
#
#   Case Number 210
 1 24801 24900  "1 "    0      line from DEVERS   500.00  to  MIDPINTS 500.00
 1 25406 24806  "1 "    0      line from J.HINDS  230.00  to  MIRAGE   230.00
0
#
#   Case Number 211
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
 1 24138 24151  "1 "    0      line from SERRANO  500.00  to  VALLEYSC 500.00
0
#
#   Case Number 212
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24138 24151  "1 "    0      line from SERRANO  500.00  to  VALLEYSC 500.00
0
#
#   Case Number 213
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24138 24151  "1 "    0      line from SERRANO  500.00  to  VALLEYSC 500.00
0
#
#   Case Number 214
 1 24025 24093  "1 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
0
#
#   Case Number 215
 1 24025 25654  "1 "    0      line from CHINO    230.00  to  VIEJOSC  230.00
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
0
#
#   Case Number 216
 1 24801 24151  "1 "    0      line from DEVERS   500.00  to  VALLEYSC 500.00
 1 24801 24900  "1 "    0      line from DEVERS   500.00  to  MIDPINTS 500.00
0
#
#   Case Number 217
 1 24901 24804  "1 "    0      line from VSTA     230.00  to  DEVERS   230.00
 1 24801 24900  "1 "    0      line from DEVERS   500.00  to  MIDPINTS 500.00
0
#
#   Case Number 218
 1 24804 24901  "2 "    0      line from DEVERS   230.00  to  VSTA     230.00
 1 24132 24804  "1 "    0      line from SANBRDNO 230.00  to  DEVERS   230.00
0
#
```

```
#   Case Number 219
 1 24804 24806  "1 "    0      line from DEVERS   230.00  to  MIRAGE   230.00
 1  8695 24806  "1 "    0      line from RAMON    230.00  to  MIRAGE   230.00
0
#
#   Case Number 220
 1 19012 24041  "2 "    0      line from MEAD S   230.00  to  ELDORDO  230.00
 1 24219 24041  "2 "    0      line from PISGAH   230.00  to  ELDORDO  230.00
0
#
#   Case Number 221
 1 24627 24041  "1 "    0      line from CIMA     230.00  to  ELDORDO  230.00
 1 19012 24041  "1 "    0      line from MEAD S   230.00  to  ELDORDO  230.00
0
#
#   Case Number 222
 1 24029 24044  "1 "    0      line from DELAMO   230.00  to  ELLIS    230.00
 1 24044 24134  "1 "    0      line from ELLIS    230.00  to  SANTIAGO 230.00
0
#
#   Case Number 223
 1 24016 24044  "1 "    0      line from BARRE    230.00  to  ELLIS    230.00
 1 24044 24072  "1 "    0      line from ELLIS    230.00  to  JOHANNA  230.00
0
#
#   Case Number 224
 1 24061 24065  "1 "    0      line from HARBOR   230.00  to  HINSON   230.00
 1 24061 24077  "1 "    0      line from HARBOR   230.00  to  LBEACH   230.00
21
0
#
#   Case Number 225
 1 24015 24065  "2 "    0      line from ARCO SC  230.00  to  HINSON   230.00
 1 24065 24029  "1 "    0      line from HINSON   230.00  to  DELAMO   230.00
0
#
#   Case Number 226
 1 24086 24092  "3 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
 1 24086 24097  "1 "    0      line from LUGO     500.00  to  MOHAVE   500.00
0
#
#   Case Number 227
 1 24042 24086  "1 "    0      line from ELDORDO  500.00  to  LUGO     500.00
 1 24086 24092  "2 "    0      line from LUGO     500.00  to  MIRALOMA 500.00
0
#
#   Case Number 228
 1 24236 24138  "1 "    0      line from RANCHVST 500.00  to  SERRANO  500.00
 1 24086 24156  "1 "    0      line from LUGO     500.00  to  VINCENT  500.00
0
#
#   Case Number 229
 1 24086 24156  "2 "    0      line from LUGO     500.00  to  VINCENT  500.00
 1 24086 26105  "1 "    0      line from LUGO     500.00  to  VICTORVL 500.00
0
#
#   Case Number 230
 1 24601 24085  "2 "    0      line from VICTOR   230.00  to  LUGO     230.00
 1 24219 24085  "2 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 231
 1 24701 24085  "1 "    0      line from KRAMER   230.00  to  LUGO     230.00
 1 24219 24085  "1 "    0      line from PISGAH   230.00  to  LUGO     230.00
0
#
#   Case Number 232
 1 24025 24093  "2 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 24093 24158  "1 "    0      line from MIRALOMA 230.00  to  WALNUT   230.00
0
```

```
#
#   Case Number 233
 1 24025 25656  "3 "    0      line from CHINO    230.00  to  MIRALOMA 230.00
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
0
#
#   Case Number 234
 1 24056 24237  "1 "    0      line from ETIWANDA 230.00  to  RANCHVST 230.00
 1 24237 24112  "1 "    0      line from RANCHVST 230.00  to  PADUA    230.00
0
#
#   Case Number 235
 1 24099 24106  "3 "    0      line from MOORPARK 230.00  to  ORMOND   230.00
 1 24114 24099  "1 "    0      line from PARDEE   230.00  to  MOORPARK 230.00
0
#
#   Case Number 236
 1 24099 24106  "4 "    0      line from MOORPARK 230.00  to  ORMOND   230.00
 1 24128 24099  "2 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
0
#
#   Case Number 237
 1 25656 24100  "1 "    0      line from MIRALOMA 230.00  to  OLINDA   230.00
 1 24100 24158  "1 "    0      line from OLINDA   230.00  to  WALNUT   230.00
0
#
#   Case Number 238
 1 24076 24126  "1 "    0      line from LAGUBELL 230.00  to  RIOHONDO 230.00
 1 24126 24155  "2 "    0      line from RIOHONDO 230.00  to  VINCENT  230.00
0
#
#   Case Number 239
 1 24056 24132  "1 "    0      line from ETIWANDA 230.00  to  SANBRDNO 230.00
 1 24132 24804  "1 "    0      line from SANBRDNO 230.00  to  DEVERS   230.00
0
#
#   Case Number 240
 1 24128 24058  "1 "    0      line from S.CLARA  230.00  to  GOLETA   230.00
 1 24128 24099  "1 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
0
#
#   Case Number 241
 1 24128 24058  "2 "    0      line from S.CLARA  230.00  to  GOLETA   230.00
 1 24128 24099  "2 "    0      line from S.CLARA  230.00  to  MOORPARK 230.00
0
#
#   Case Number 242
 1 24044 24134  "1 "    0      line from ELLIS    230.00  to  SANTIAGO 230.00
 1 24131 24134  "2 "    0      line from S.ONOFRE 230.00  to  SANTIAGO 230.00
0
#
#   Case Number 243
 1 24036 24114  "1 "    0      line from EAGLROCK 230.00  to  PARDEE   230.00
 1 24114 24115  "1 "    0      line from PARDEE   230.00  to  PASTORIA 230.00
0
#
#   Case Number 244
 1 24114 24099  "3 "    0      line from PARDEE   230.00  to  MOORPARK 230.00
 1 24114 24147  "1 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
0
#
#   Case Number 245
 1 25201 24137  "2 "    0      line from LEWIS    230.00  to  SERRANO  230.00
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
0
#
#   Case Number 246
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 25201 24137  "2 "    0      line from LEWIS    230.00  to  SERRANO  230.00
0
```

```
#
#   Case Number 247
 1 24025 24137  "1 "    0      line from CHINO    230.00  to  SERRANO  230.00
 1 24137 24154  "2 "    0      line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 248
 1 25201 24137  "1 "    0      line from LEWIS    230.00  to  SERRANO  230.00
 1 24137 24154  "1 "    0      line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 249
 1 24131 24137  "1 "    0      line from S.ONOFRE 230.00  to  SERRANO  230.00
 1 24137 24154  "1 "    0      line from SERRANO  230.00  to  VILLA PK 230.00
0
#
#   Case Number 250
 1 24114 24147  "1 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
 1 24147 24059  "1 "    0      line from SYLMAR S 230.00  to  GOULD    230.00
0
#
#   Case Number 251
 1 24036 24147  "1 "    0      line from EAGLROCK 230.00  to  SYLMAR S 230.00
 1 24114 24147  "2 "    0      line from PARDEE   230.00  to  SYLMAR S 230.00
0
#
#   Case Number 252
 1 24086 24156  "2 "    0      line from LUGO     500.00  to  VINCENT  500.00
 1 30060 24156  "3 "    0      line from MIDWAY   500.00  to  VINCENT  500.00
0
#
#   Case Number 253
 1 24155 24128  "1 "    0      line from VINCENT  230.00  to  S.CLARA  230.00
 1 24155 24401  "1 "    0      line from VINCENT  230.00  to  ANTELOPE 230.00
0
#
#   Case Number 254
 1 24114 24155  "1 "    0      line from PARDEE   230.00  to  VINCENT  230.00
 1 24155 24091  "1 "    0      line from VINCENT  230.00  to  MESA CAL 230.00
0
#
#   Case Number 255
 1 25201 24137  "1 "    0      line from LEWIS    230.00  to  SERRANO  230.00
 1 25201 24154  "1 "    0      line from LEWIS    230.00  to  VILLA PK 230.00
0
#
#   Case Number 256
 1 24016 25201  "1 "    0      line from BARRE    230.00  to  LEWIS    230.00
 1 25201 24137  "2 "    0      line from LEWIS    230.00  to  SERRANO  230.00
0
#
#   Case Number 257
 1 24016 24154  "1 "    0      line from BARRE    230.00  to  VILLA PK 230.00
 1 24137 24154  "1 "    0      line from SERRANO  230.00  to  VILLA PK 230.00
0
#
##################################################################################################
#
# PROJECT CONTINGENCY
#
##################################################################################################
#
#   Case Number 258
1  "LAGUBELL 230.00"  "VPWRPLNT 230.00"  "1"  0
1  "LAGUBELL 230.00"  "VPWRPLNT 230.00"  "2"  0
21
0
#
-1
# EOF
```

Appendix D

2008 Heavy Summer
And
Light Spring
Transient Stability Plots

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Plot 20. Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.

2008 Heavy Summer – Category "D" Contingency

Plot 21. Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.

2008 Light Spring – Category "B" Contingencies

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Plot 30. Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.
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Plot 36. Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.
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Plot 38. Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.
Plot 39. Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.
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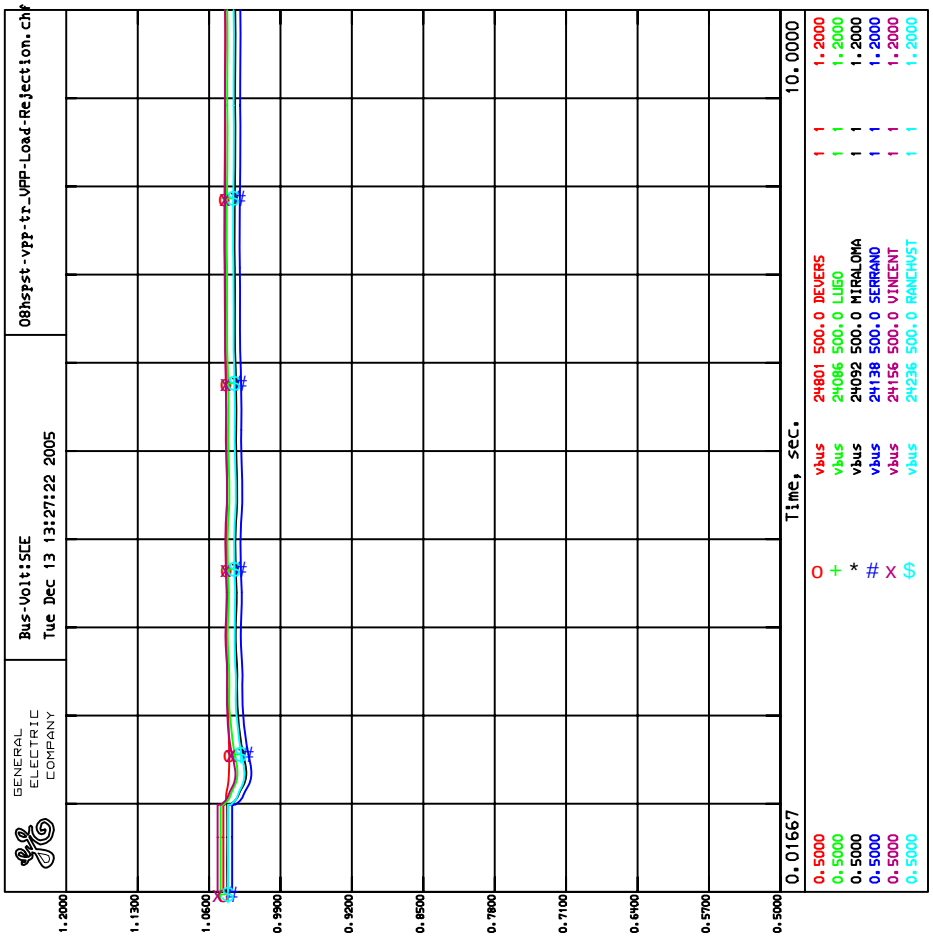
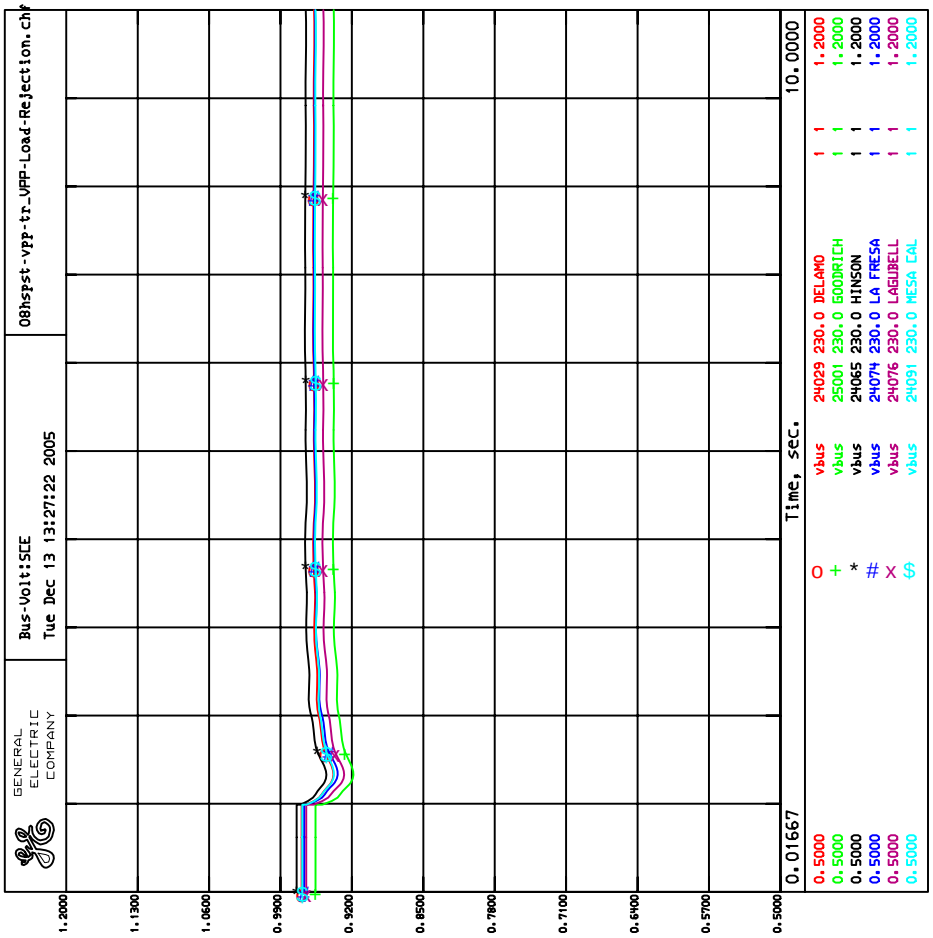
2008 Light Spring – Category "D" Contingency

Plot 42. Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.

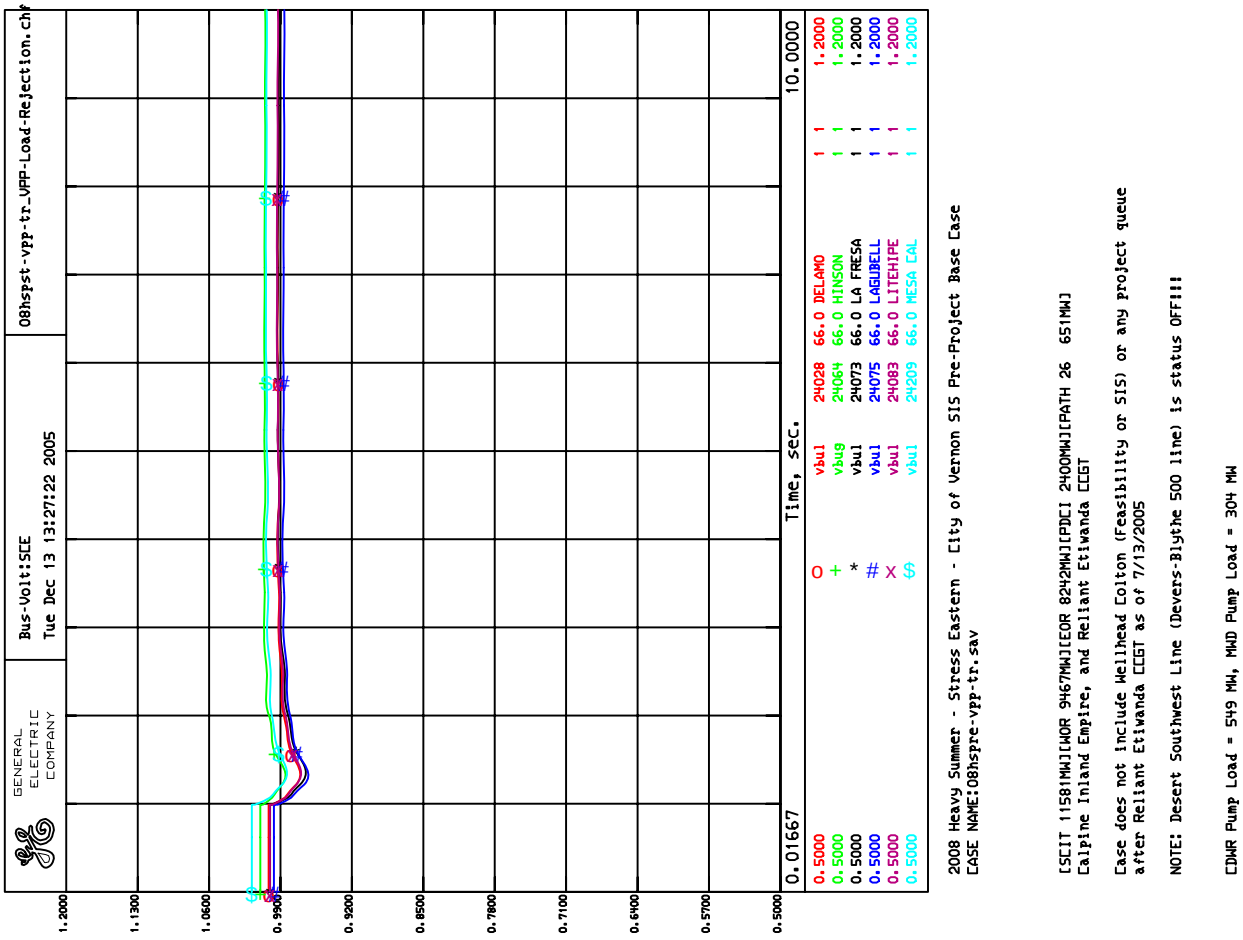
Plot 1 - 1: Full load rejection of the VPP.



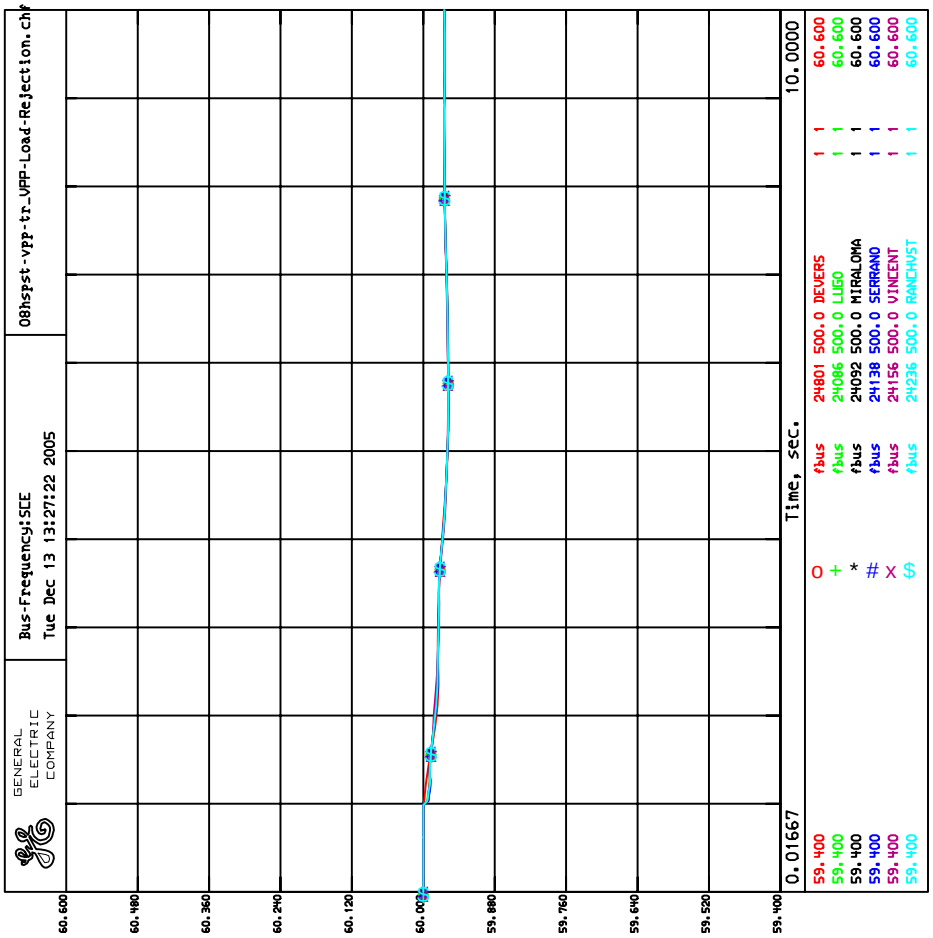
Plot 1 - 2: Full load rejection of the VPP.



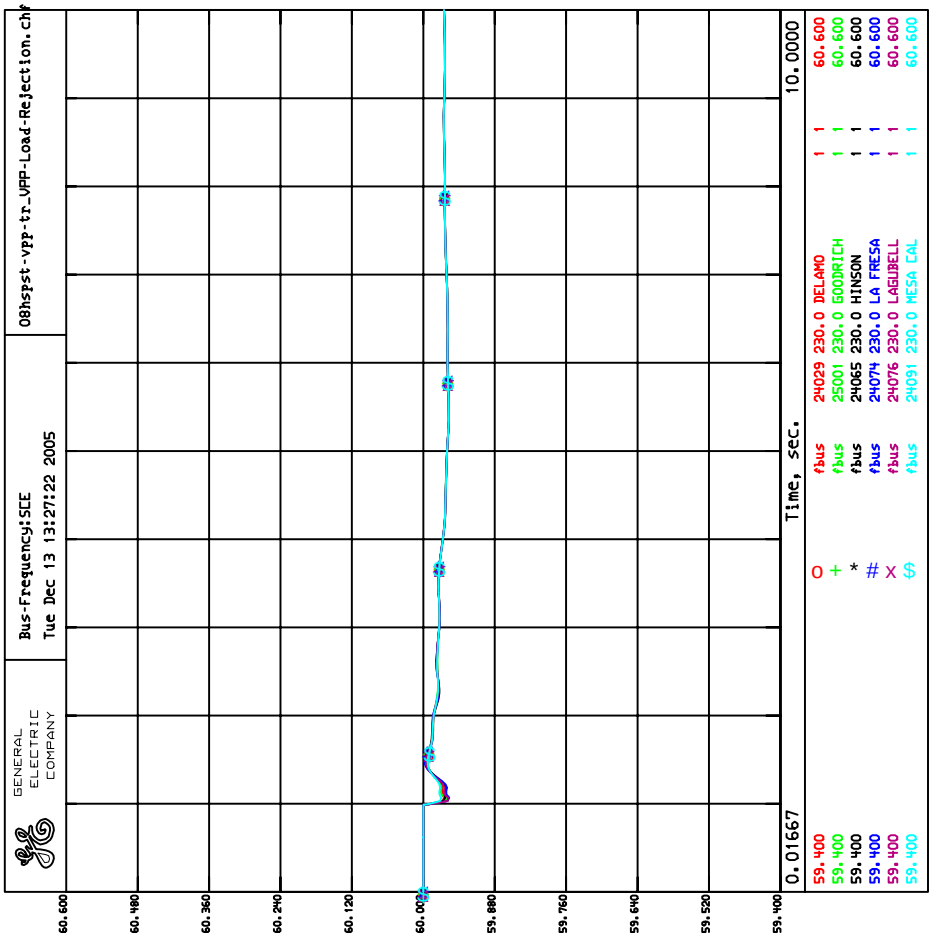
Plot 1 - 3: Full load rejection of the VPP.



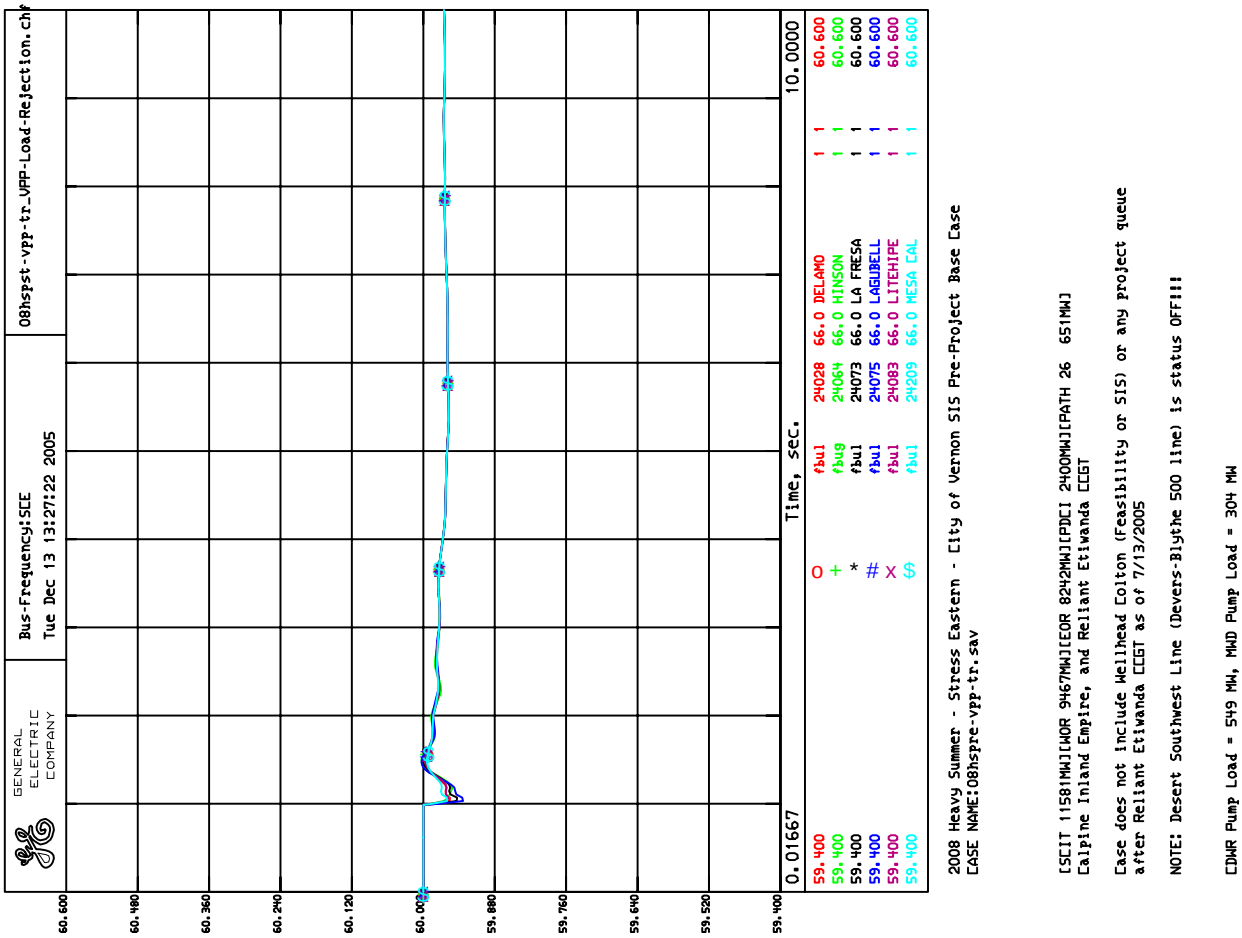
Plot 1 - 4: Full load rejection of the VPP.



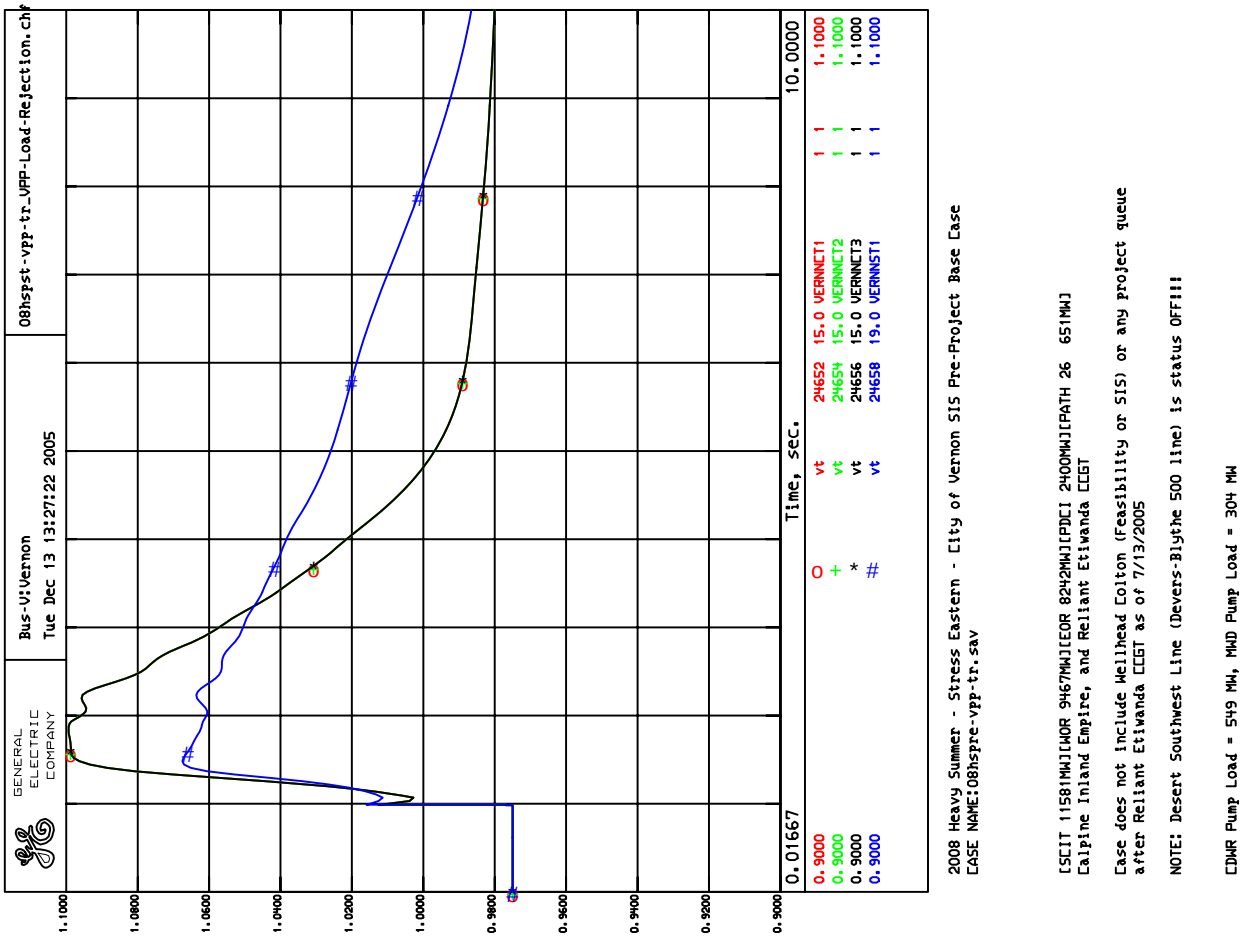
Plot 1 - 5: Full load rejection of the VPP.



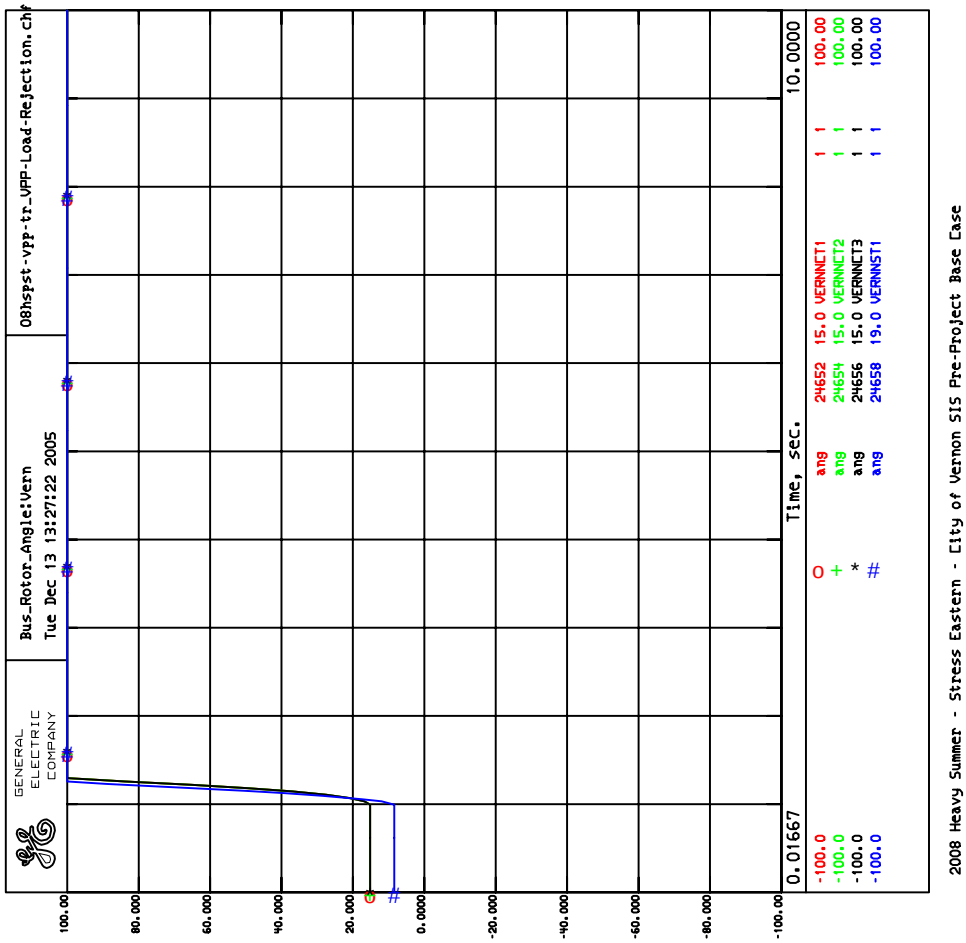
Plot 1 - 6: Full load rejection of the VPP.



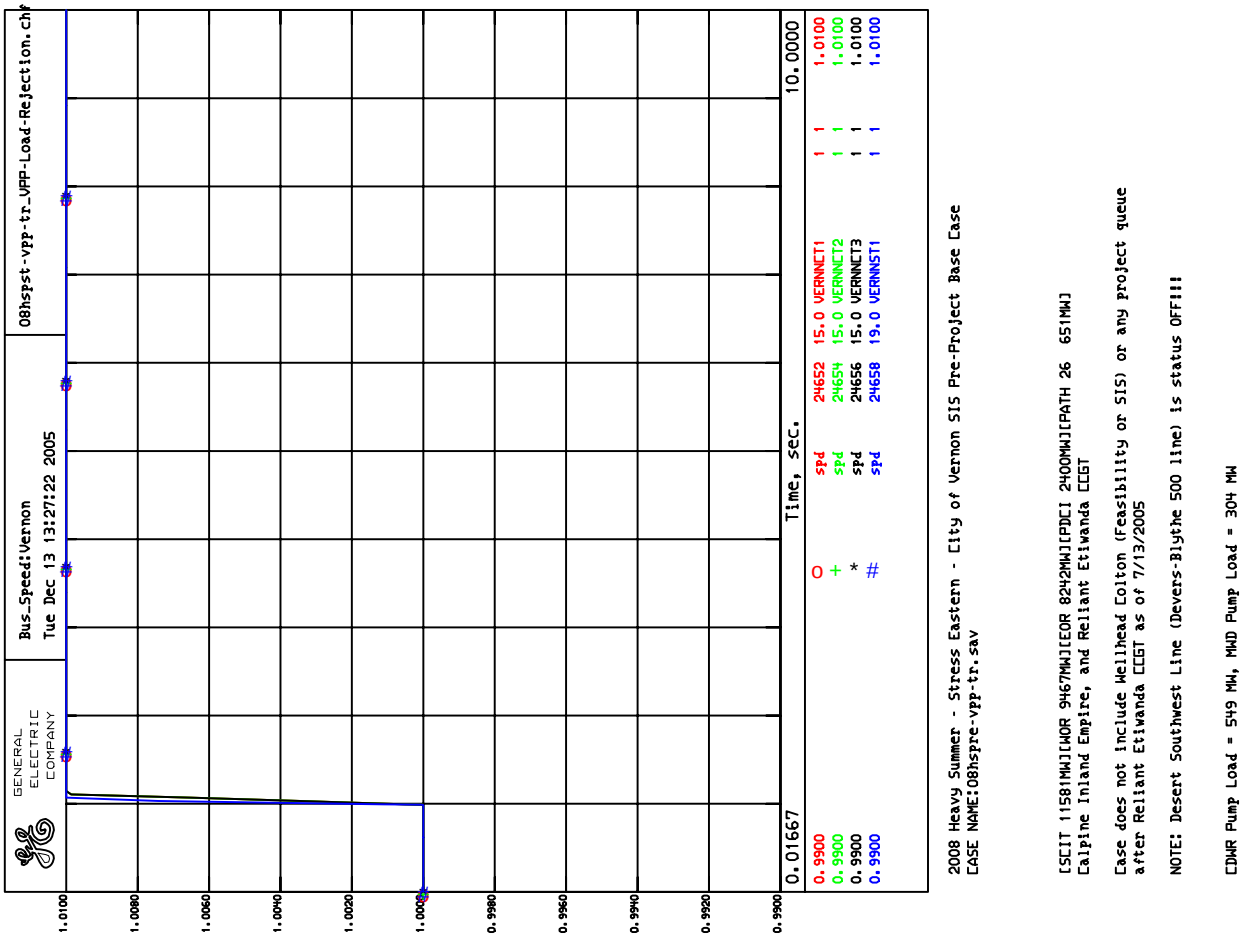
Plot 1 - 7: Full load rejection of the VPP.



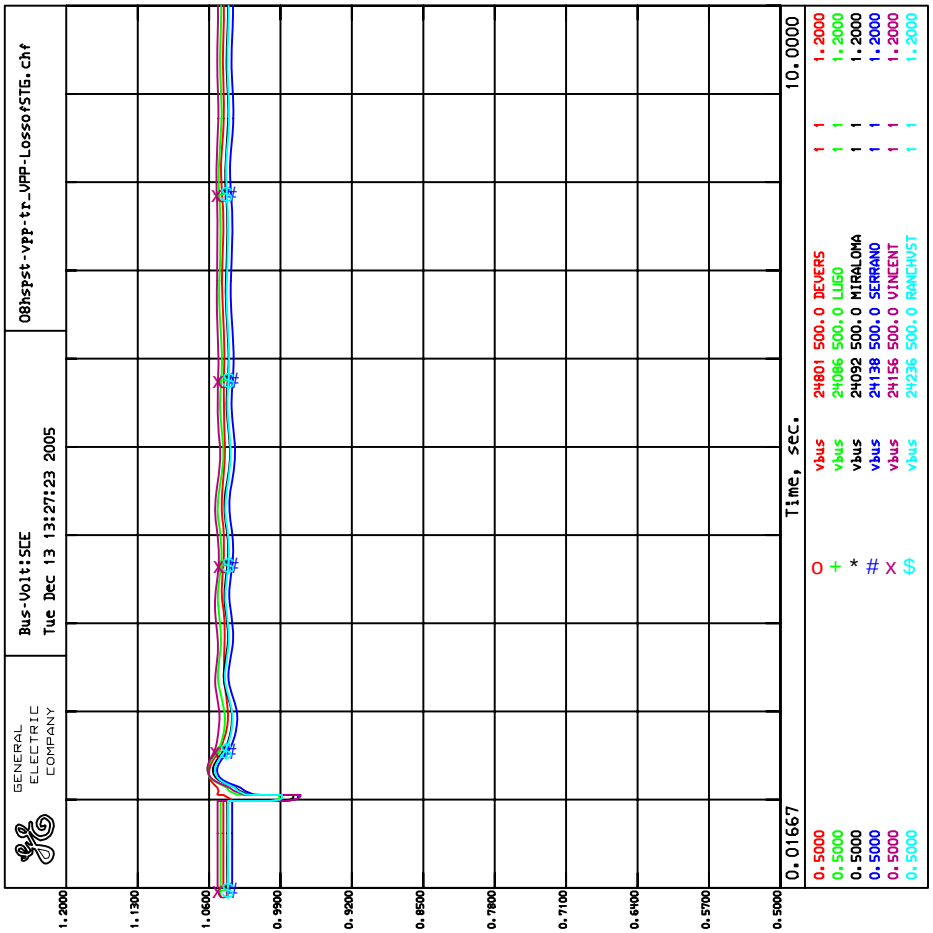
Plot 1 - 8: Full load rejection of the VPP.



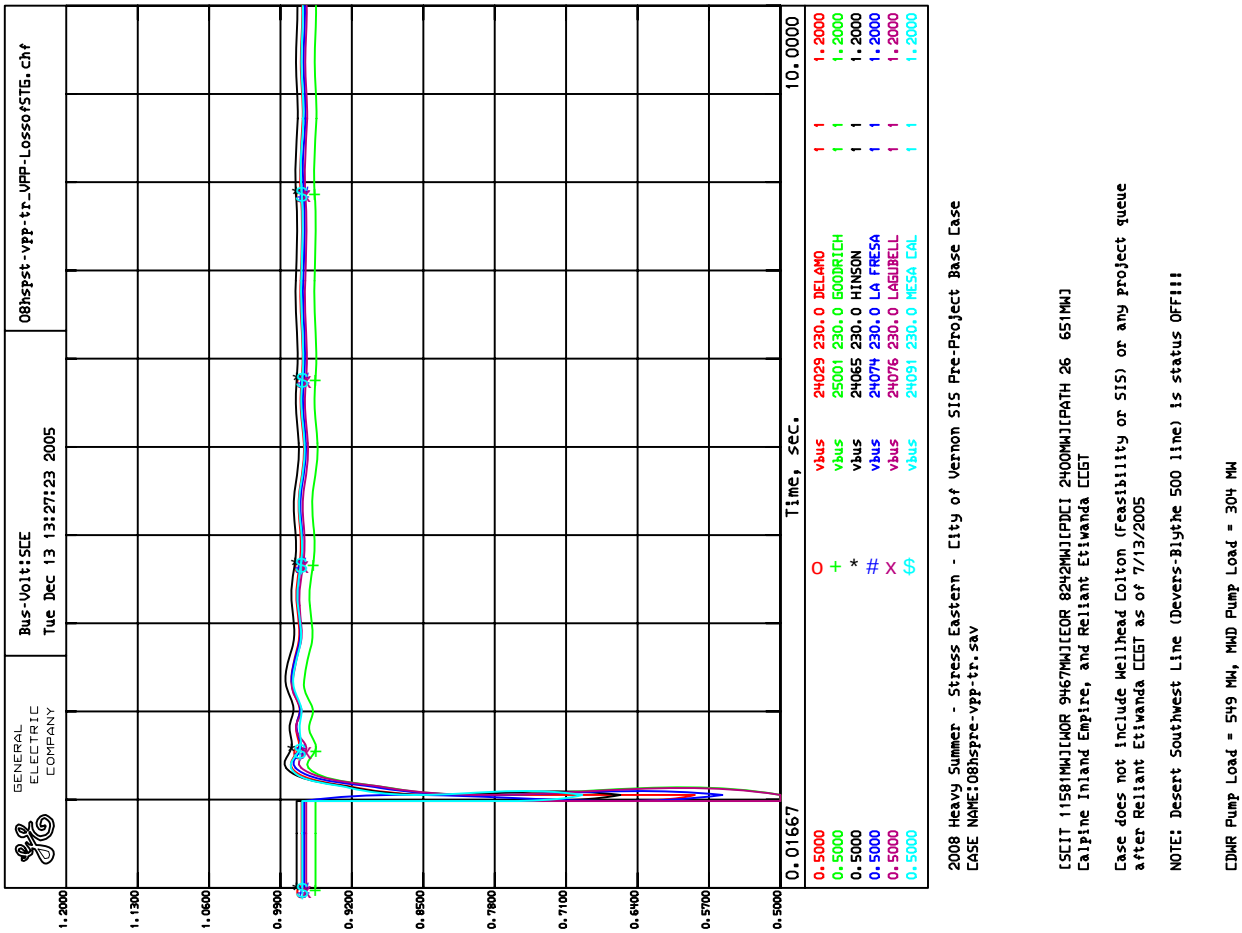
Plot 1 - 9: Full load rejection of the VPP.



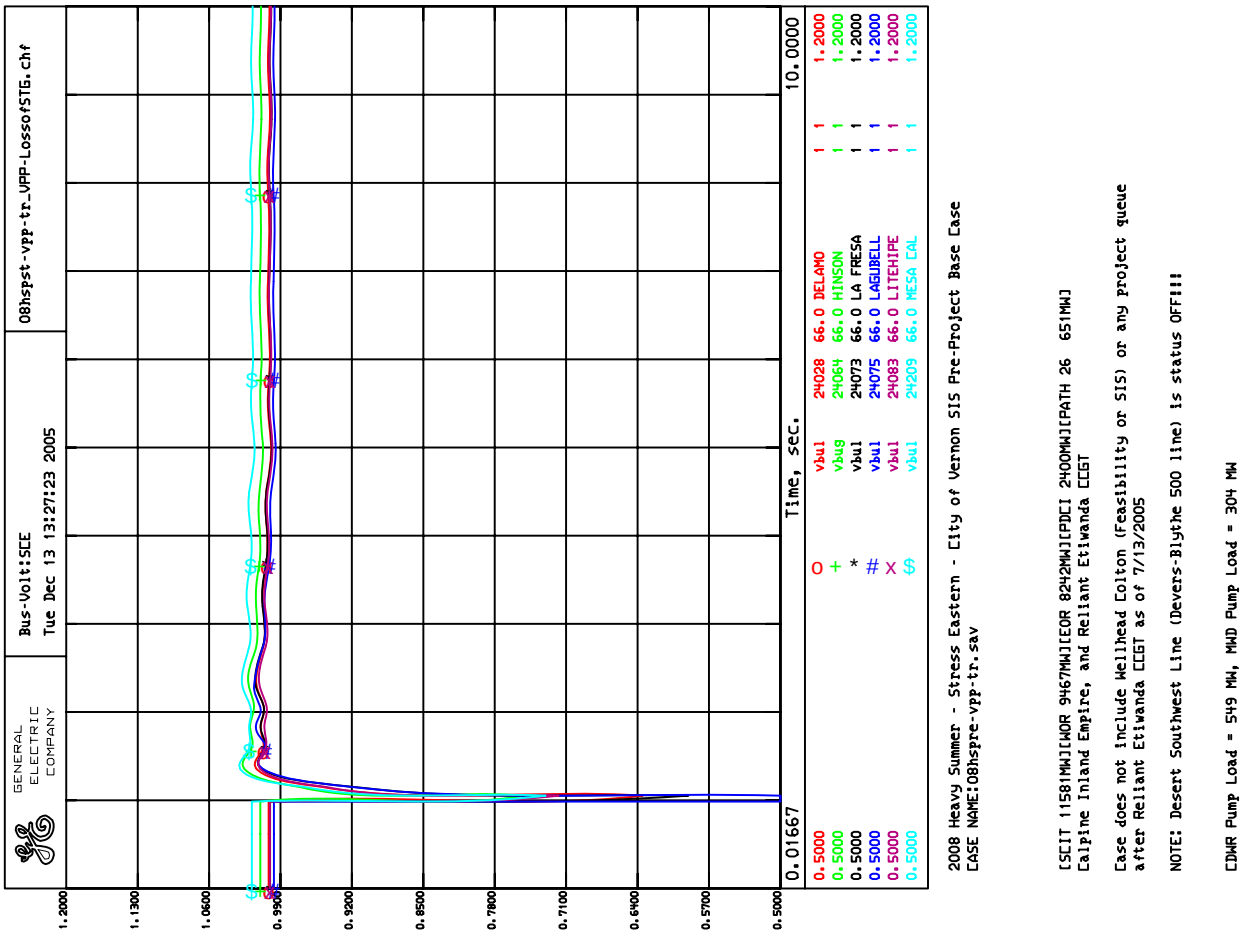
Plot 2 - 1: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



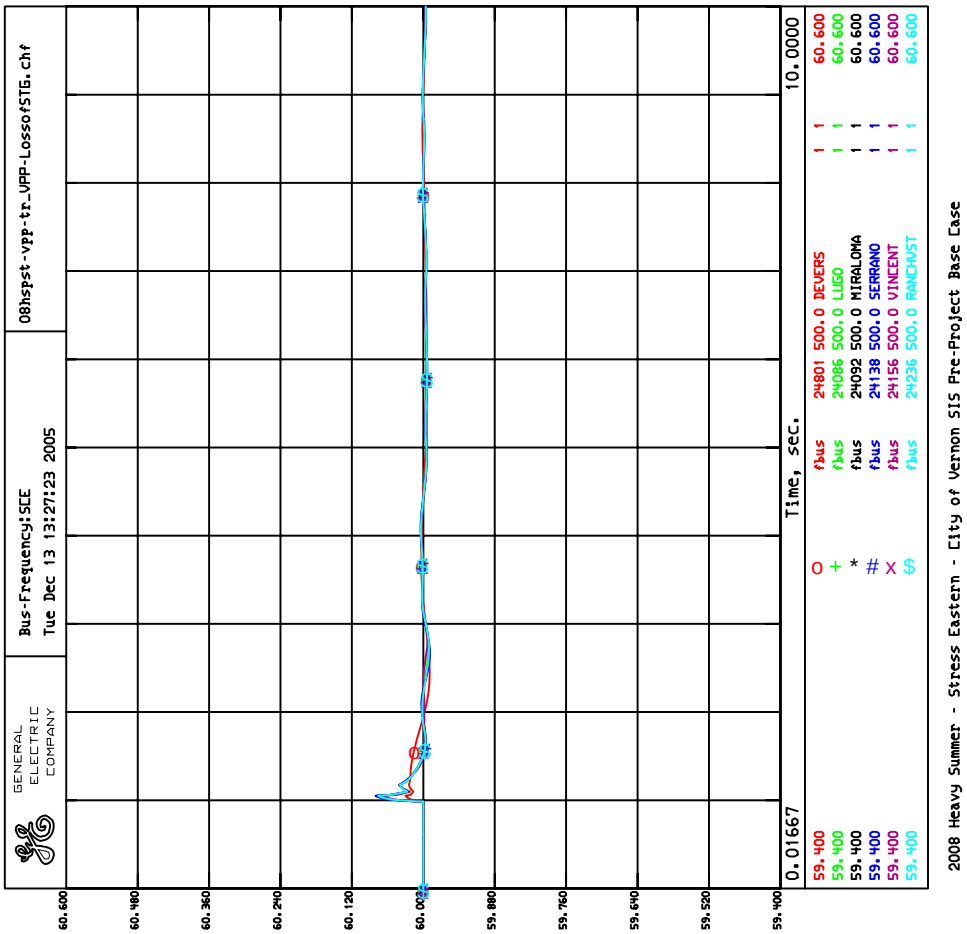
Plot 2 - 2: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



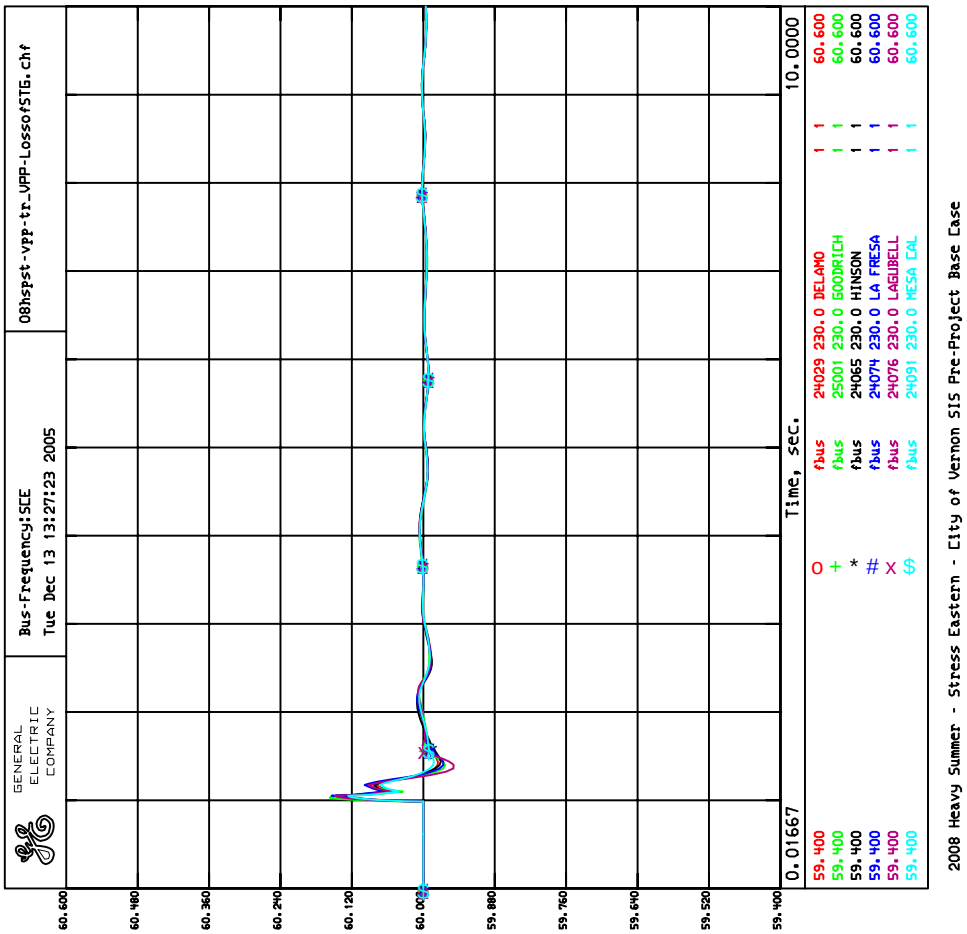
Plot 2 - 3: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



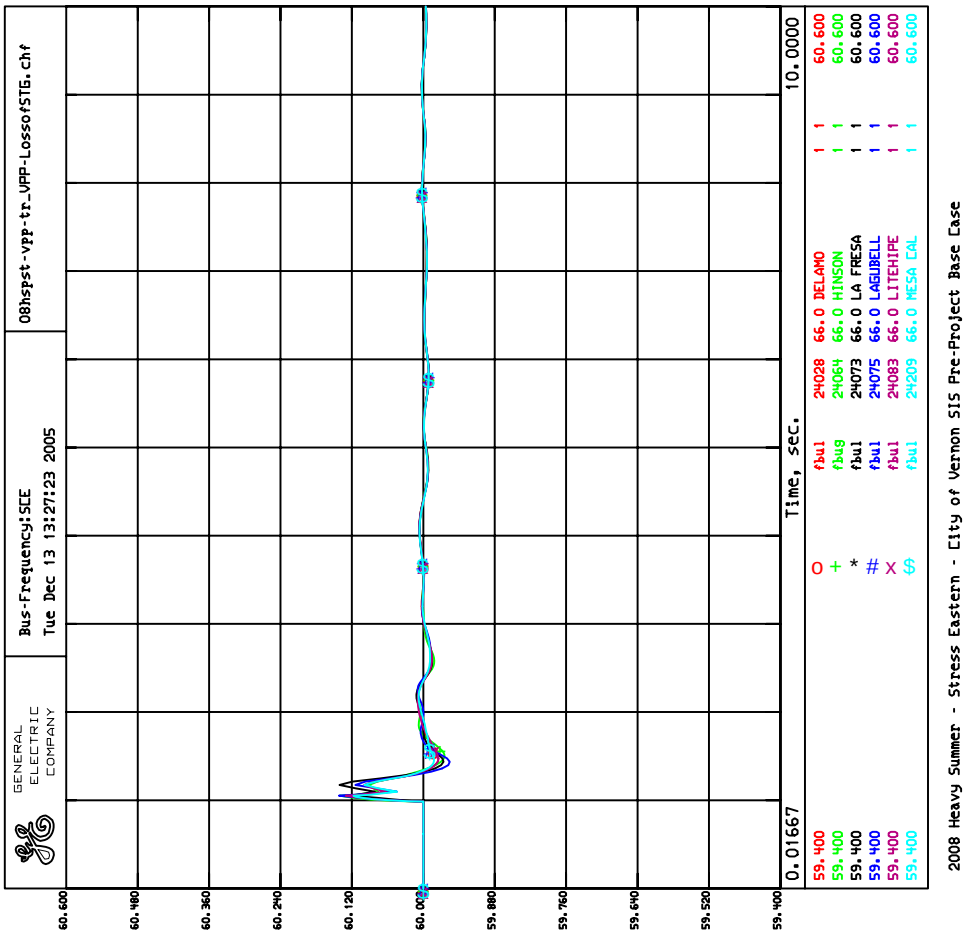
Plot 2 - 4: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



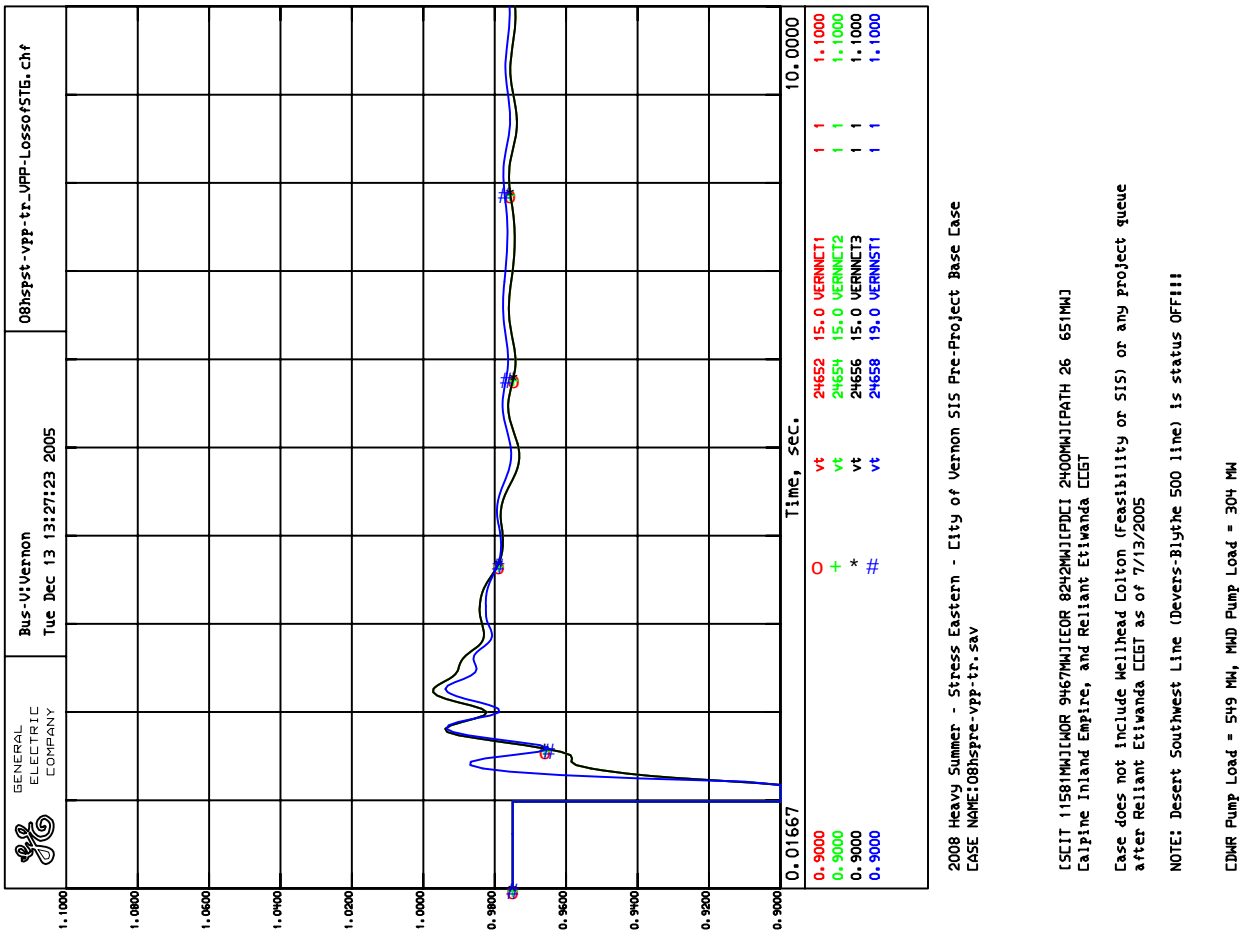
Plot 2 – 5: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



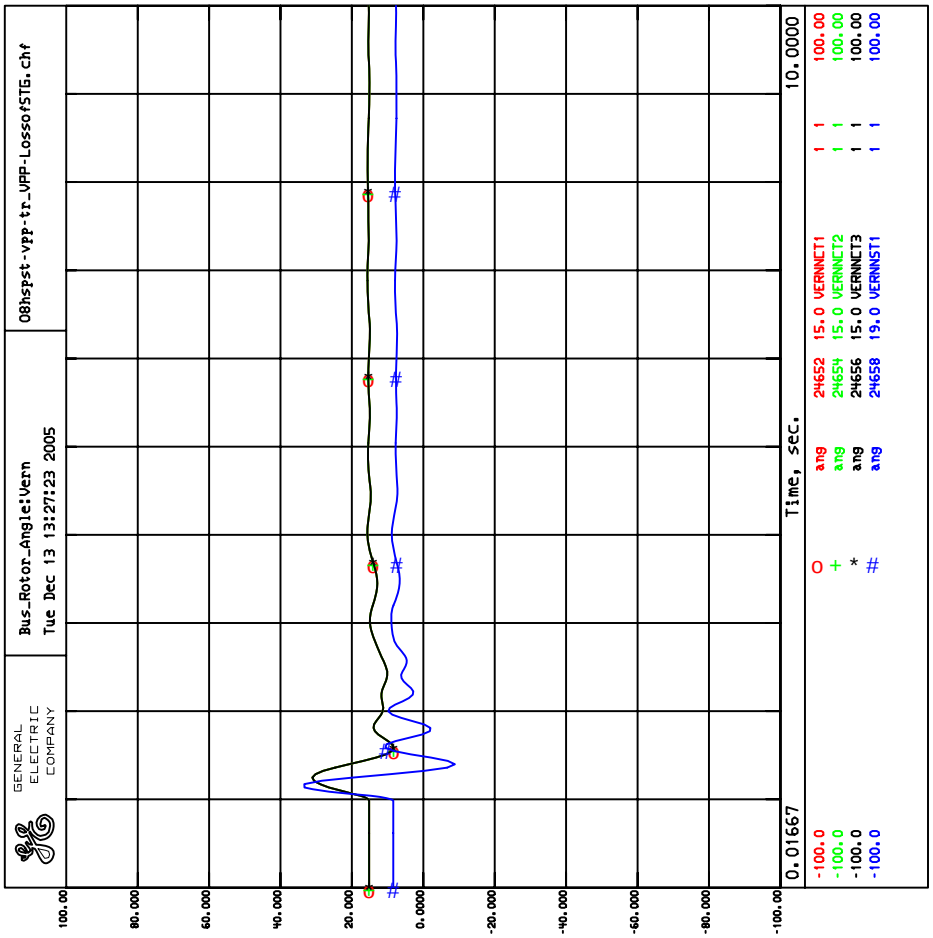
Plot 2 - 6: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



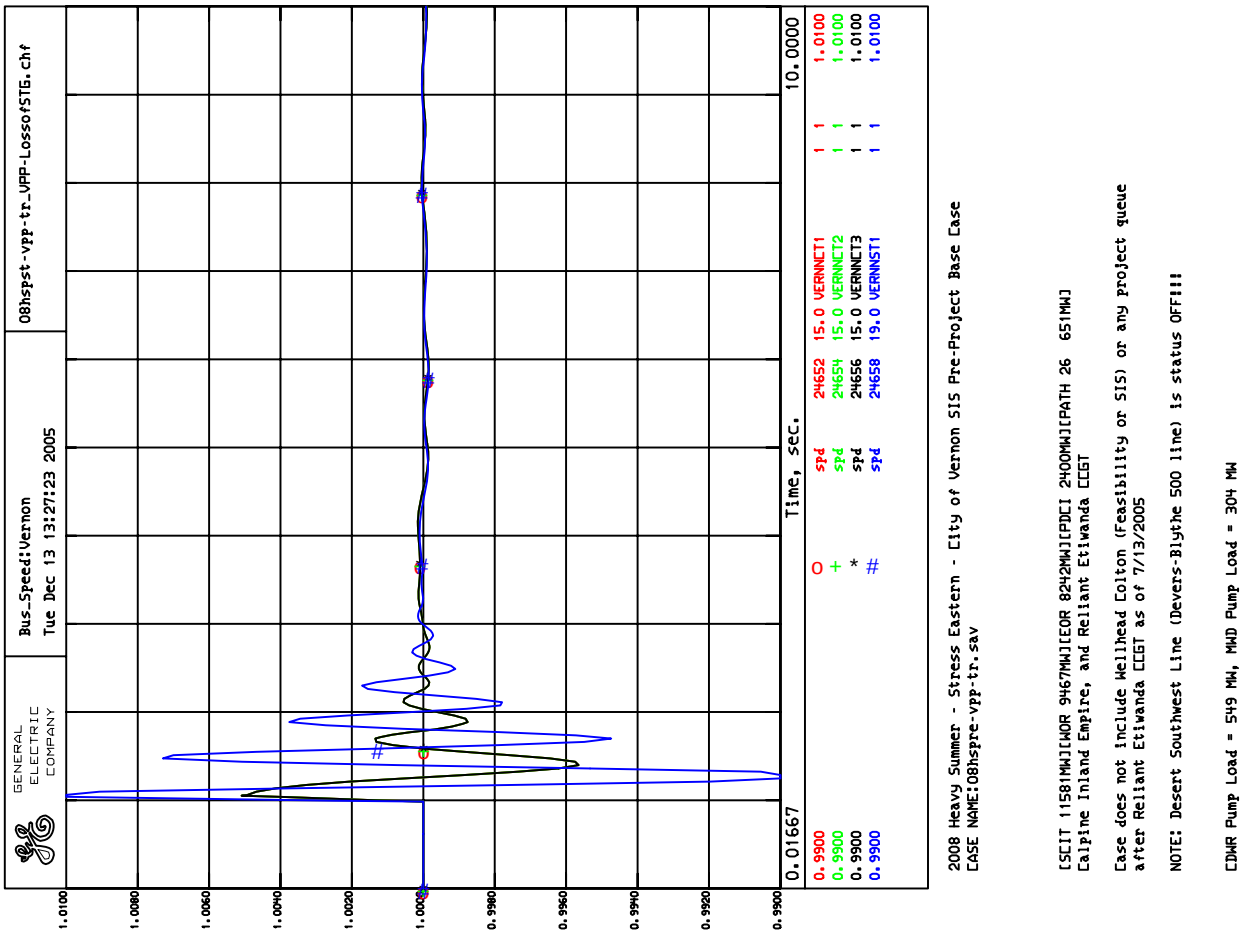
Plot 2 - 7: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



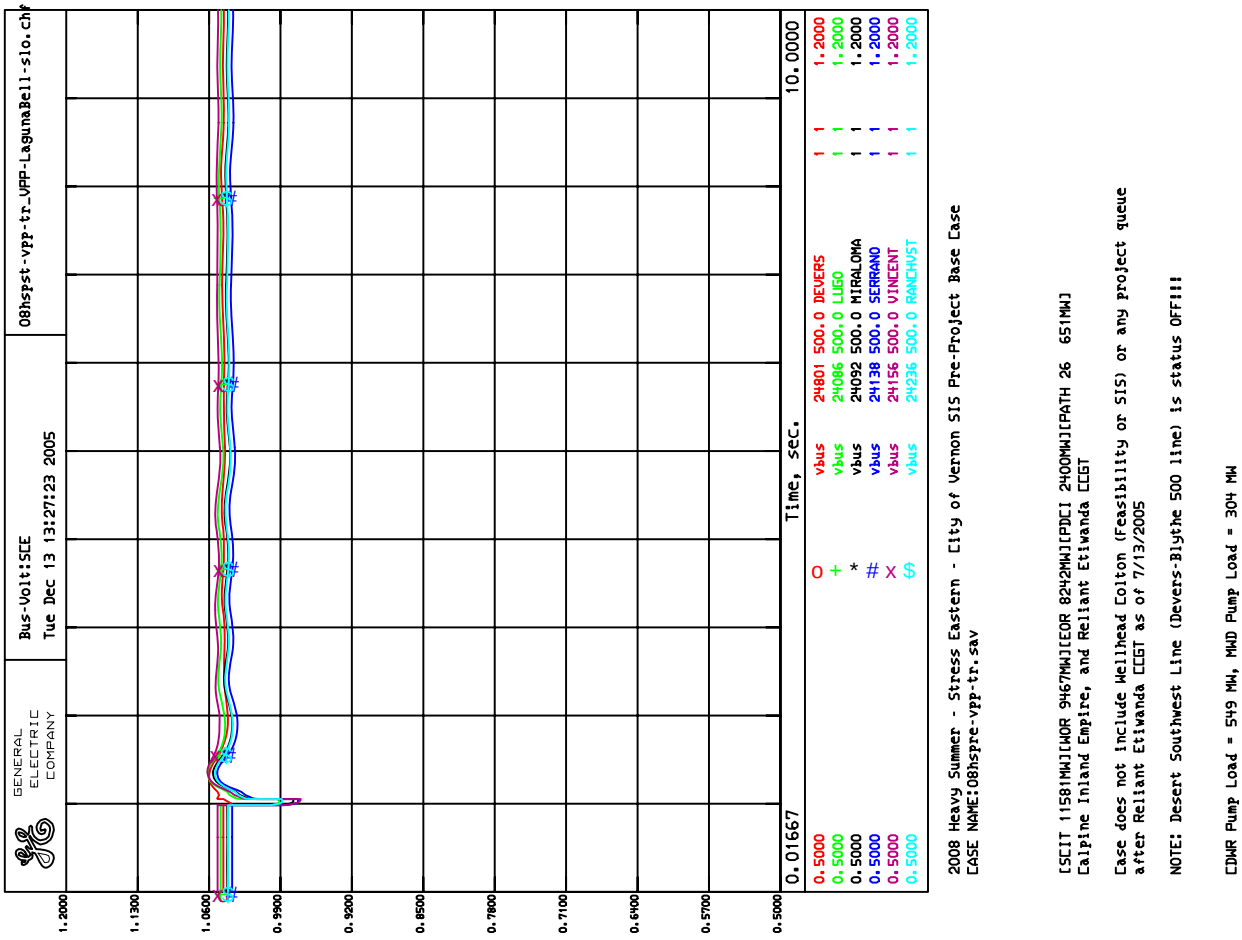
Plot 2 - 8: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



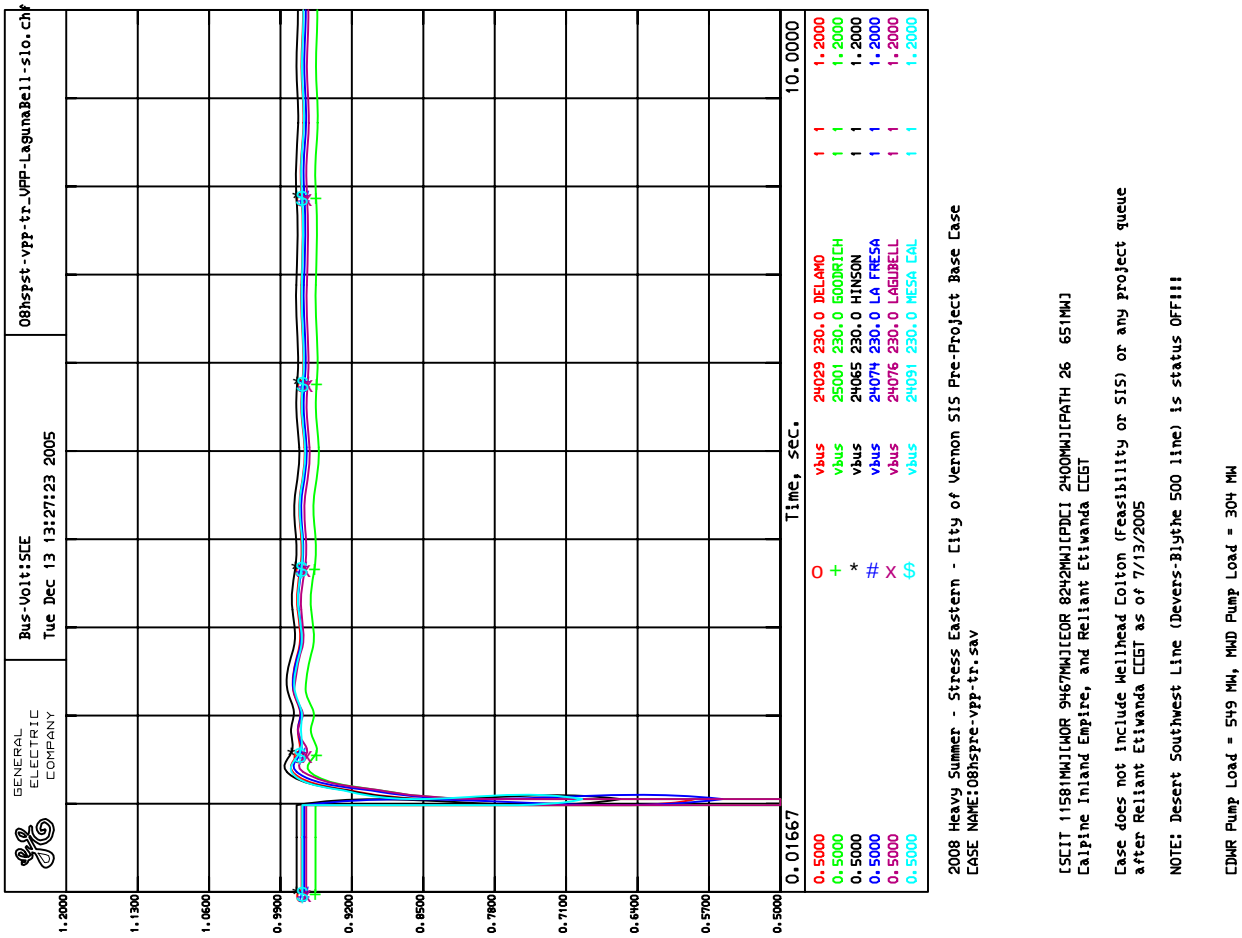
Plot 2 - 9: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



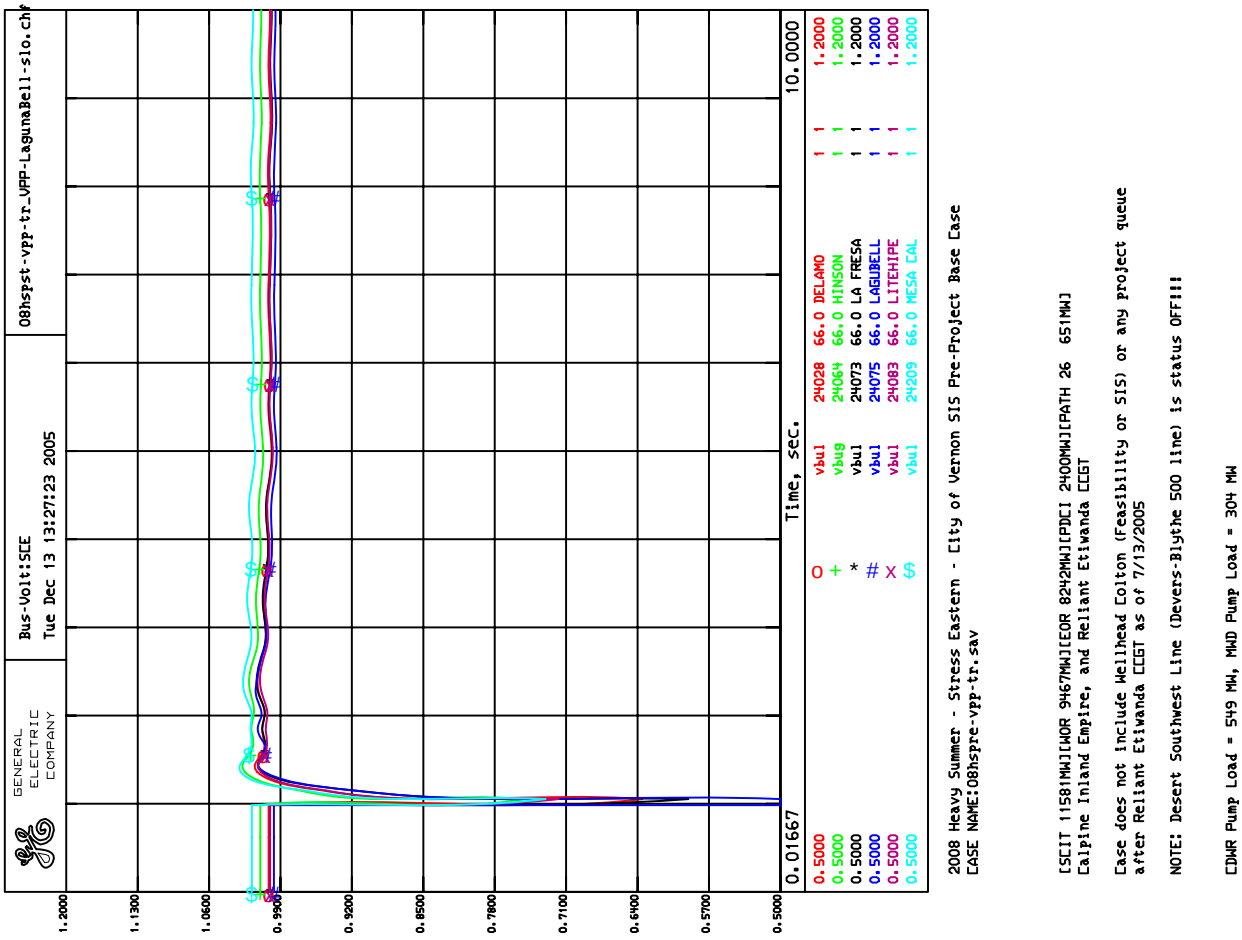
Plot 3 - 1: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



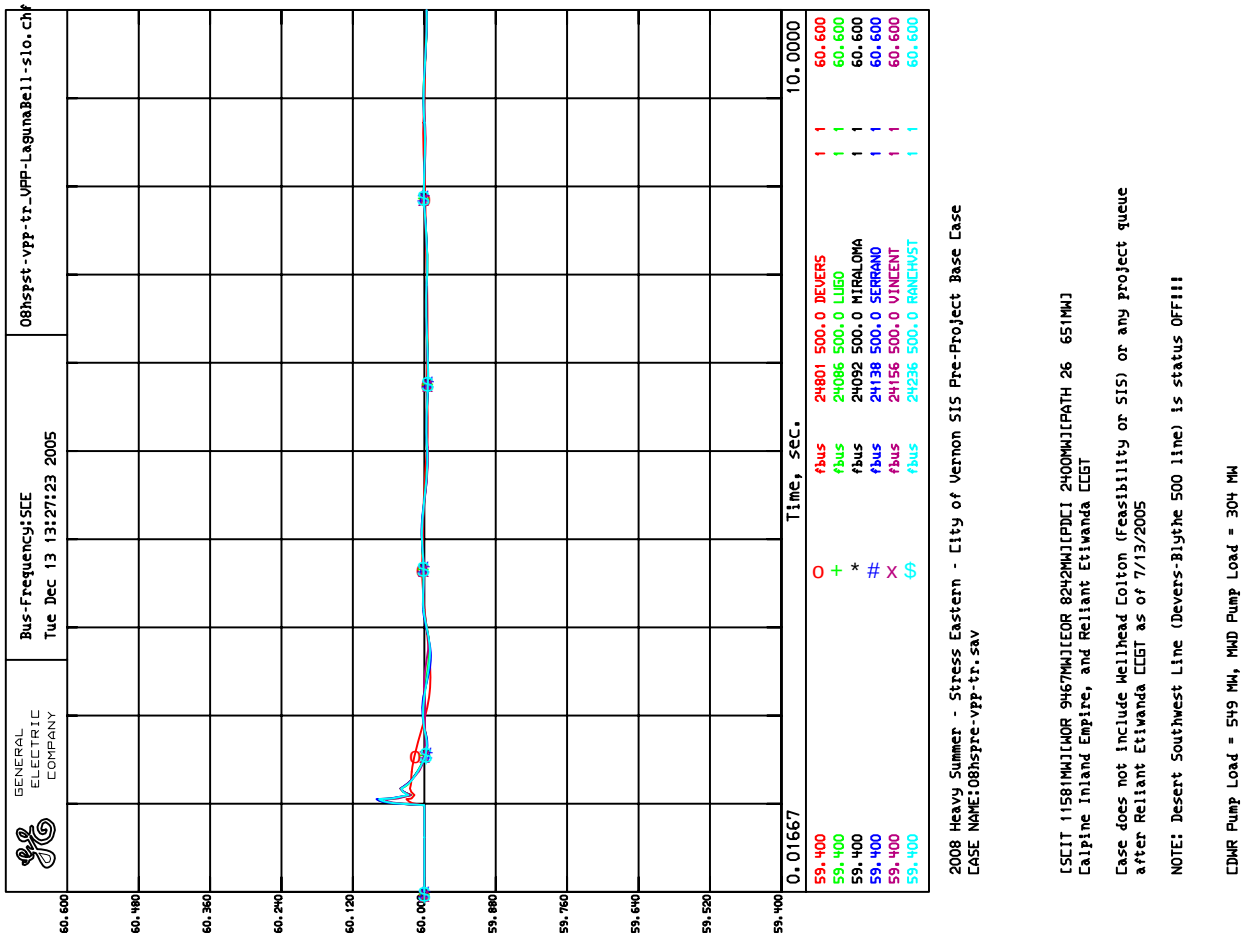
Plot 3 - 2: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



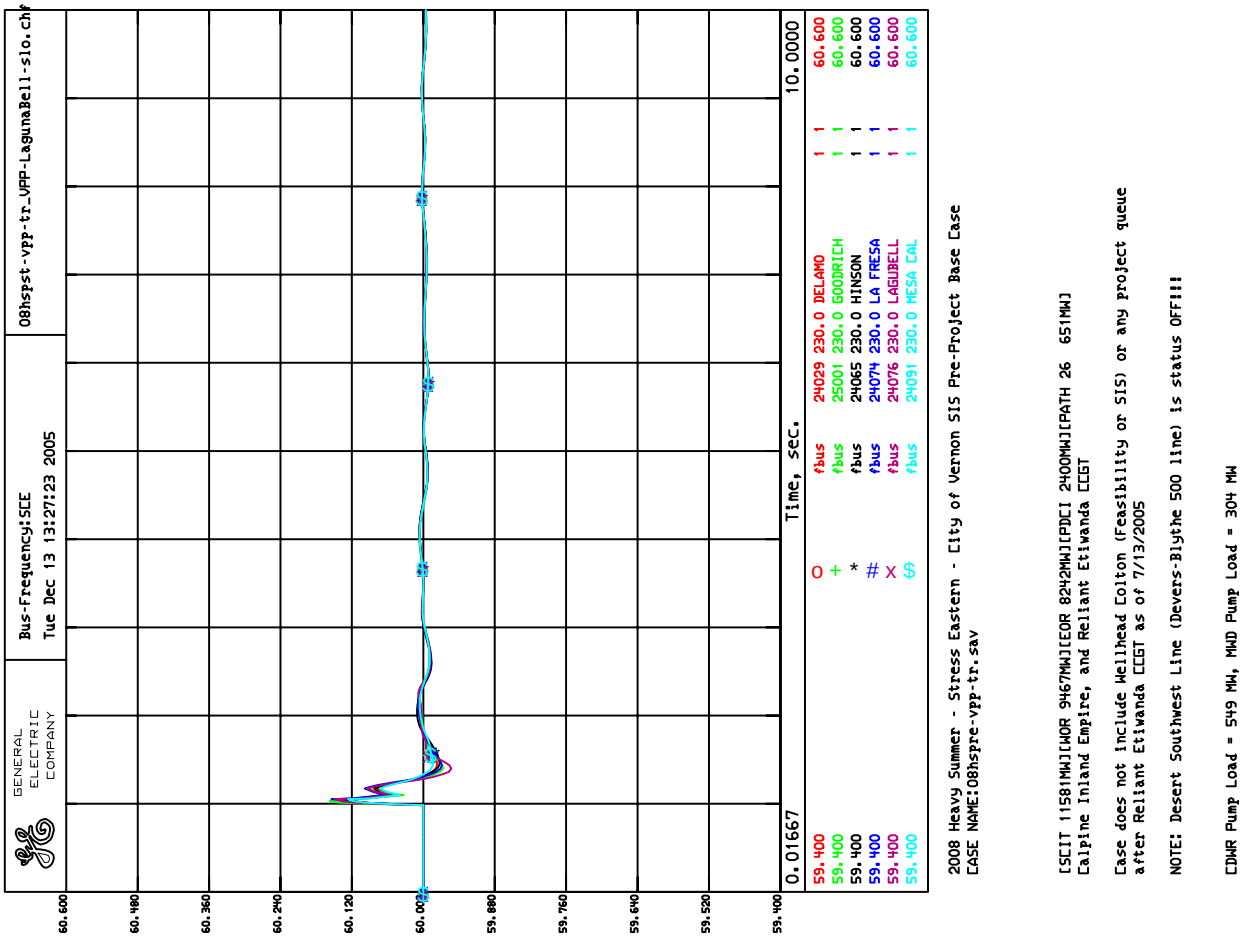
Plot 3 - 3: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



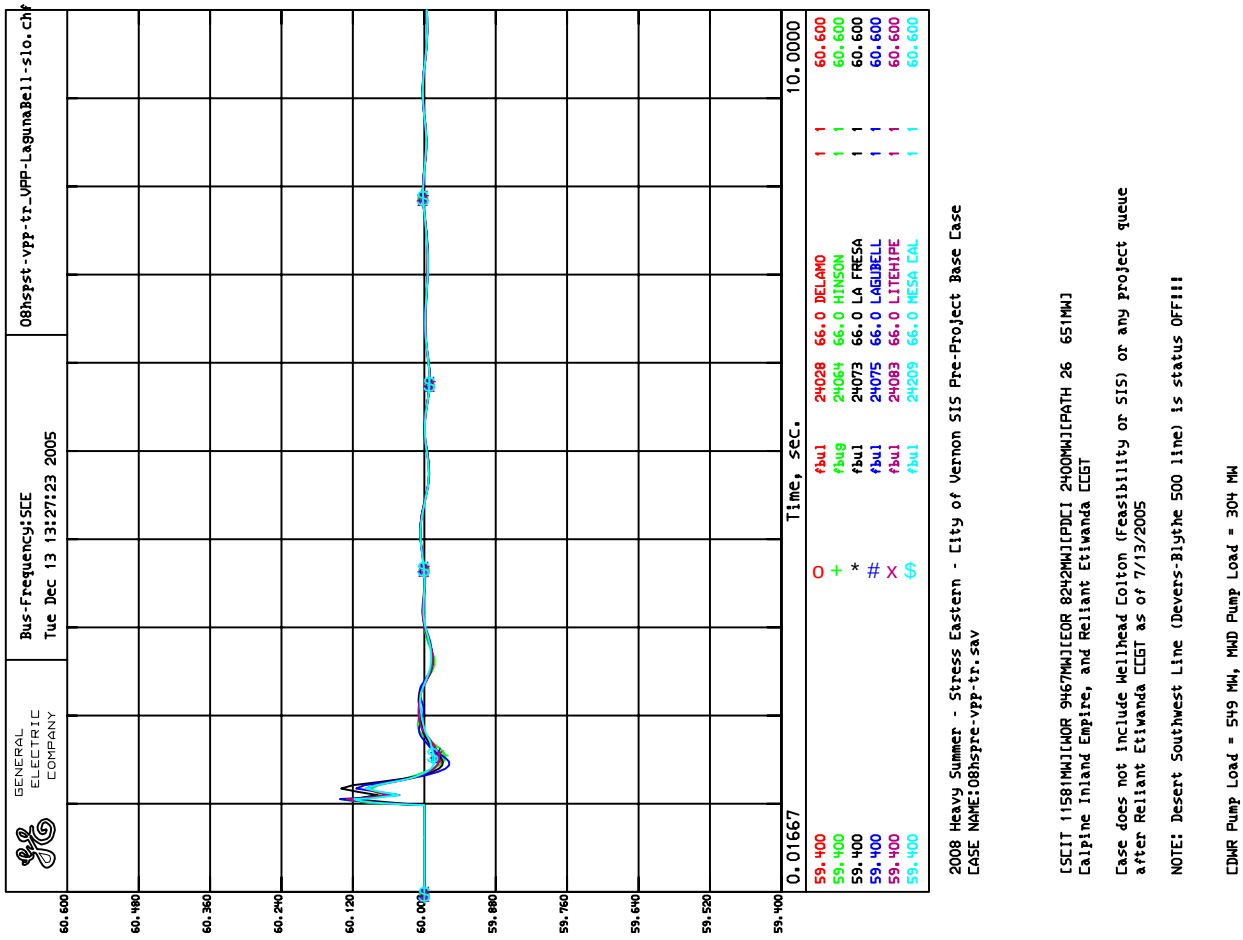
Plot 3 - 4: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



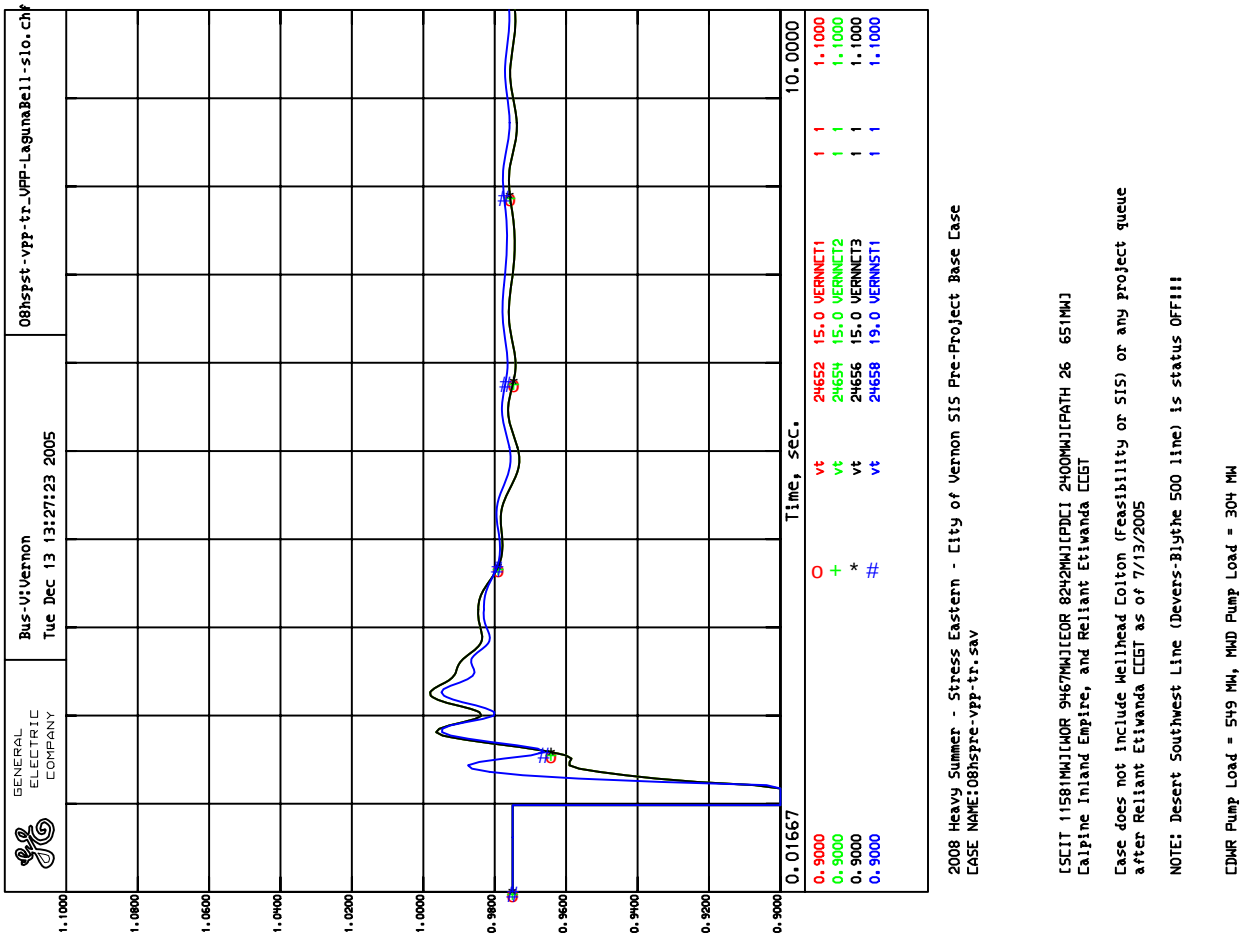
Plot 3 - 5: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



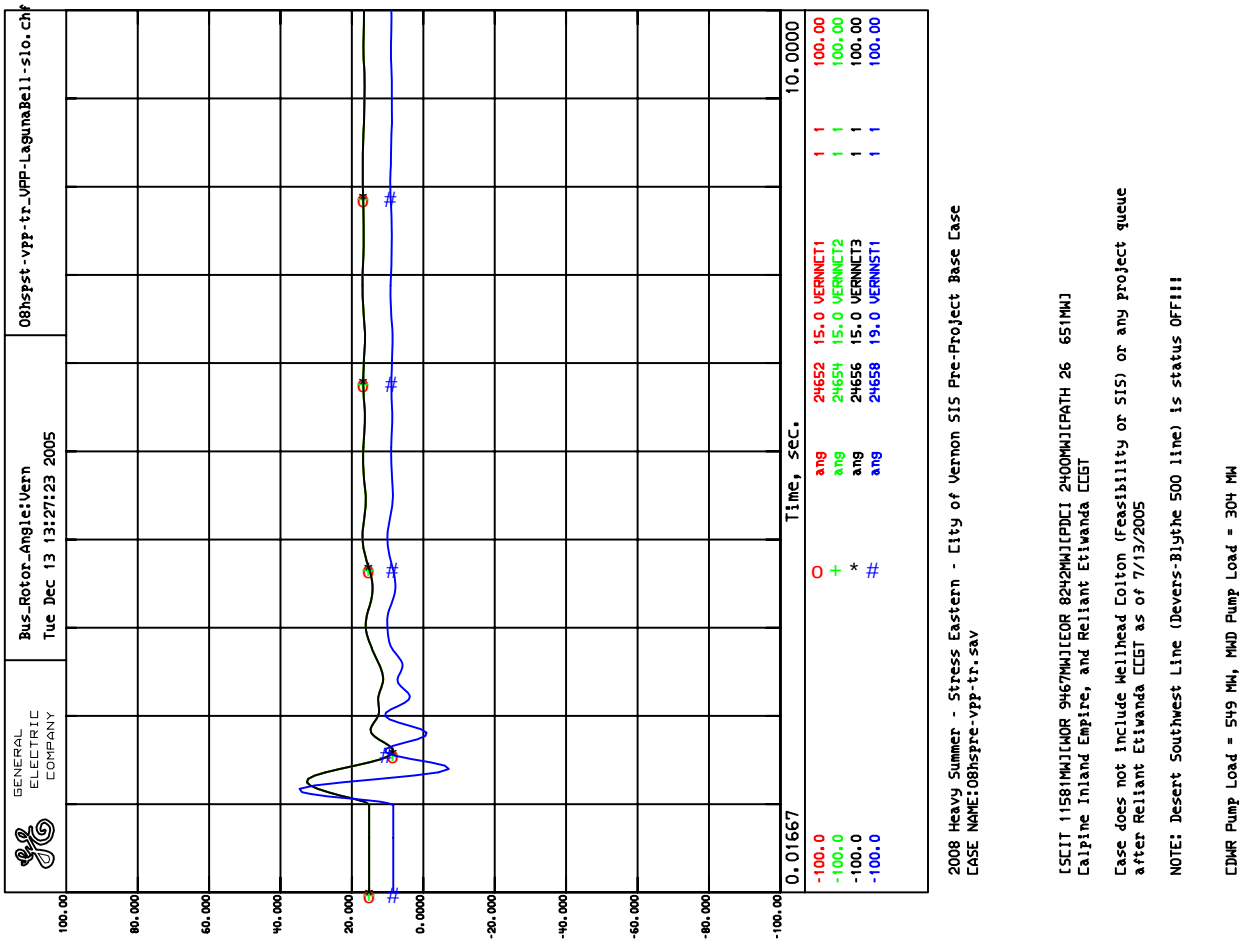
Plot 3 - 6: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



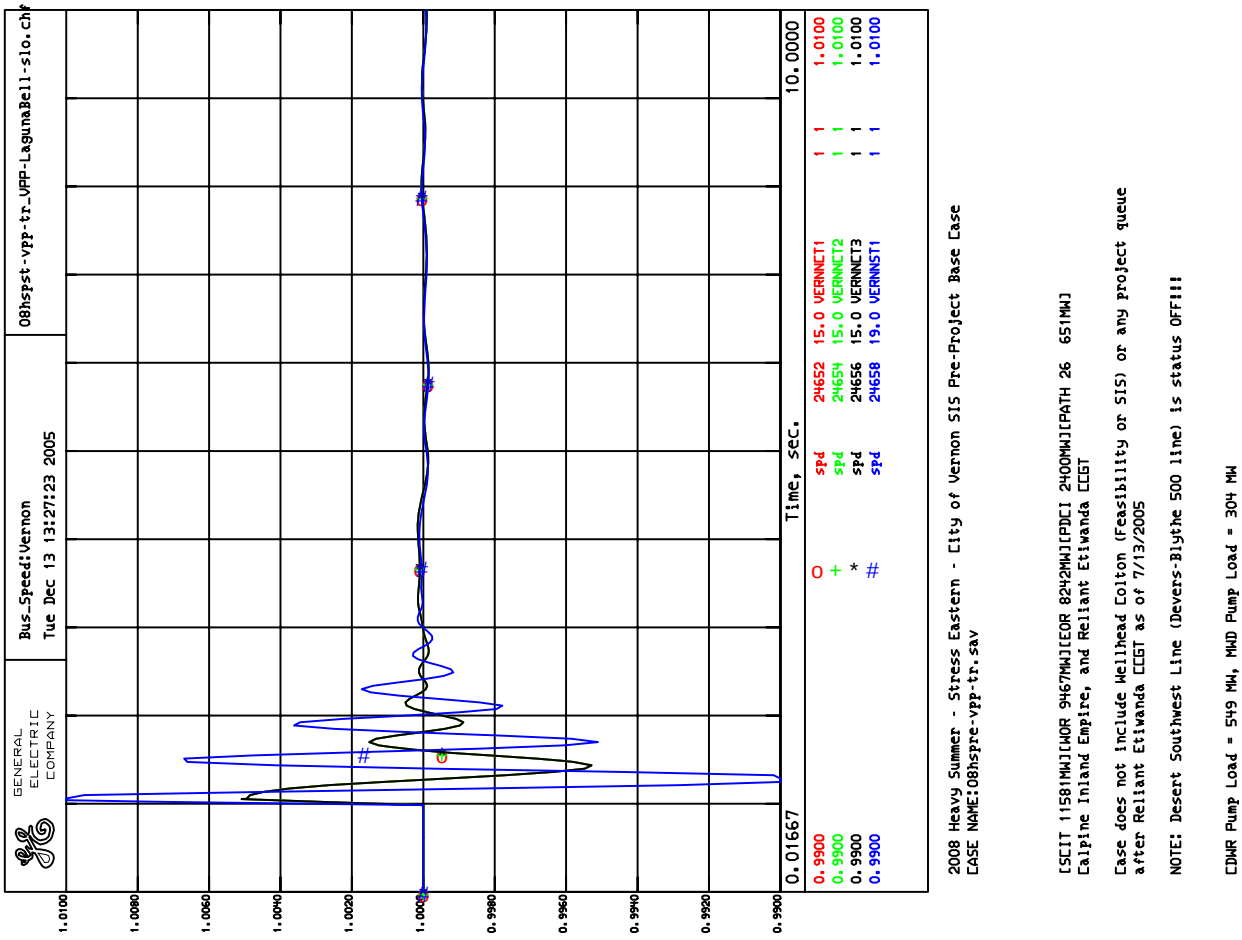
Plot 3 - 7: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



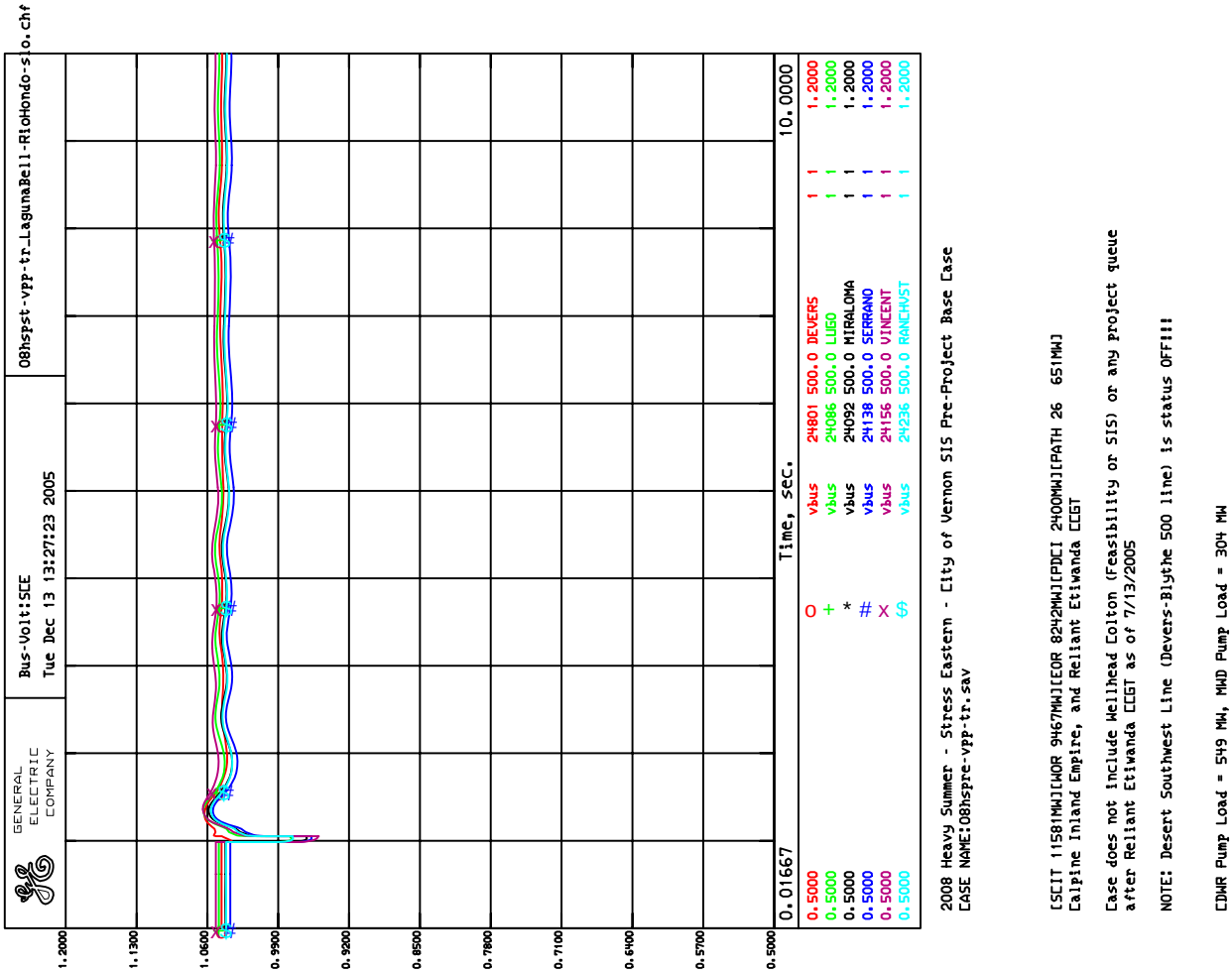
Plot 3 - 8: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



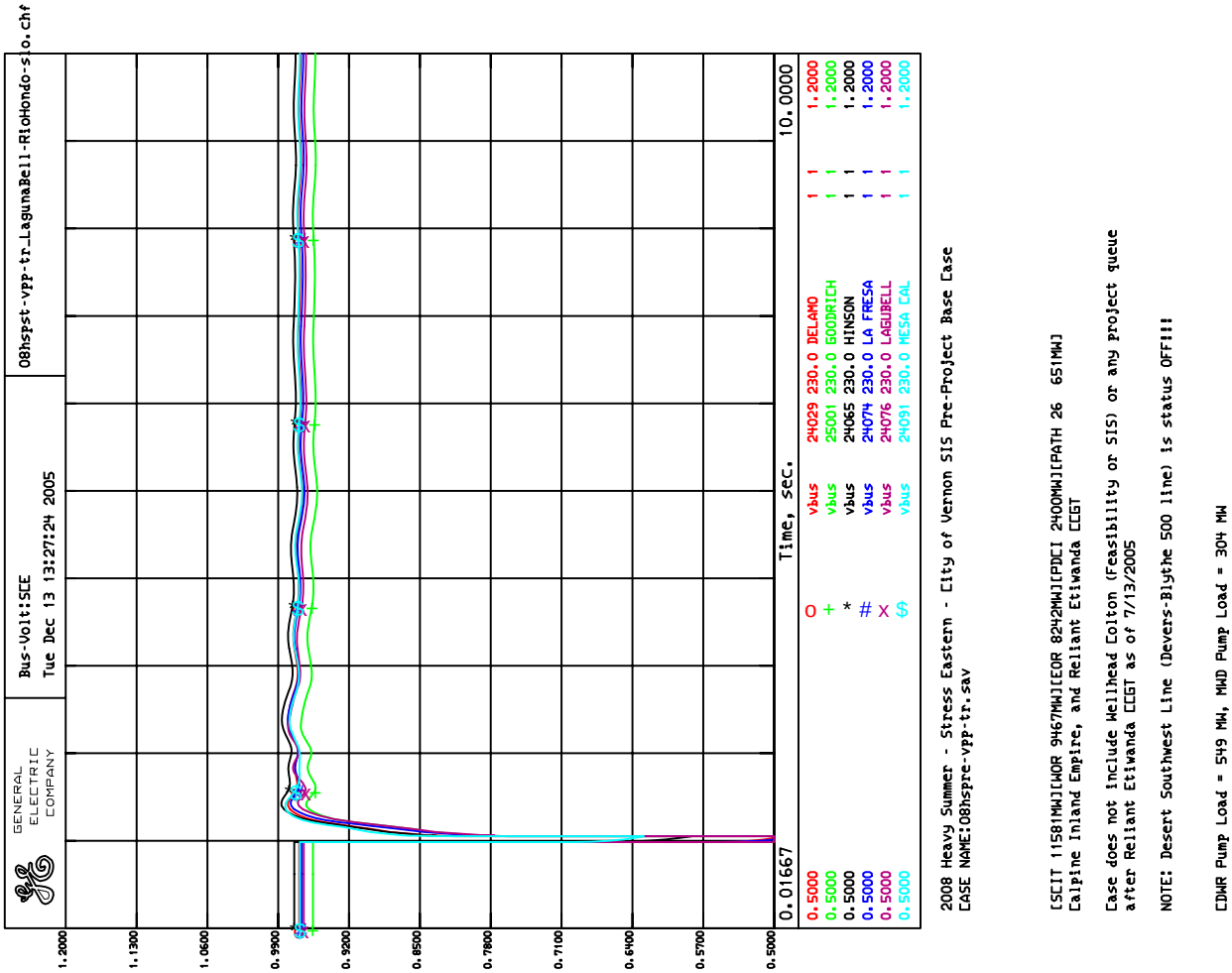
Plot 3 - 9: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



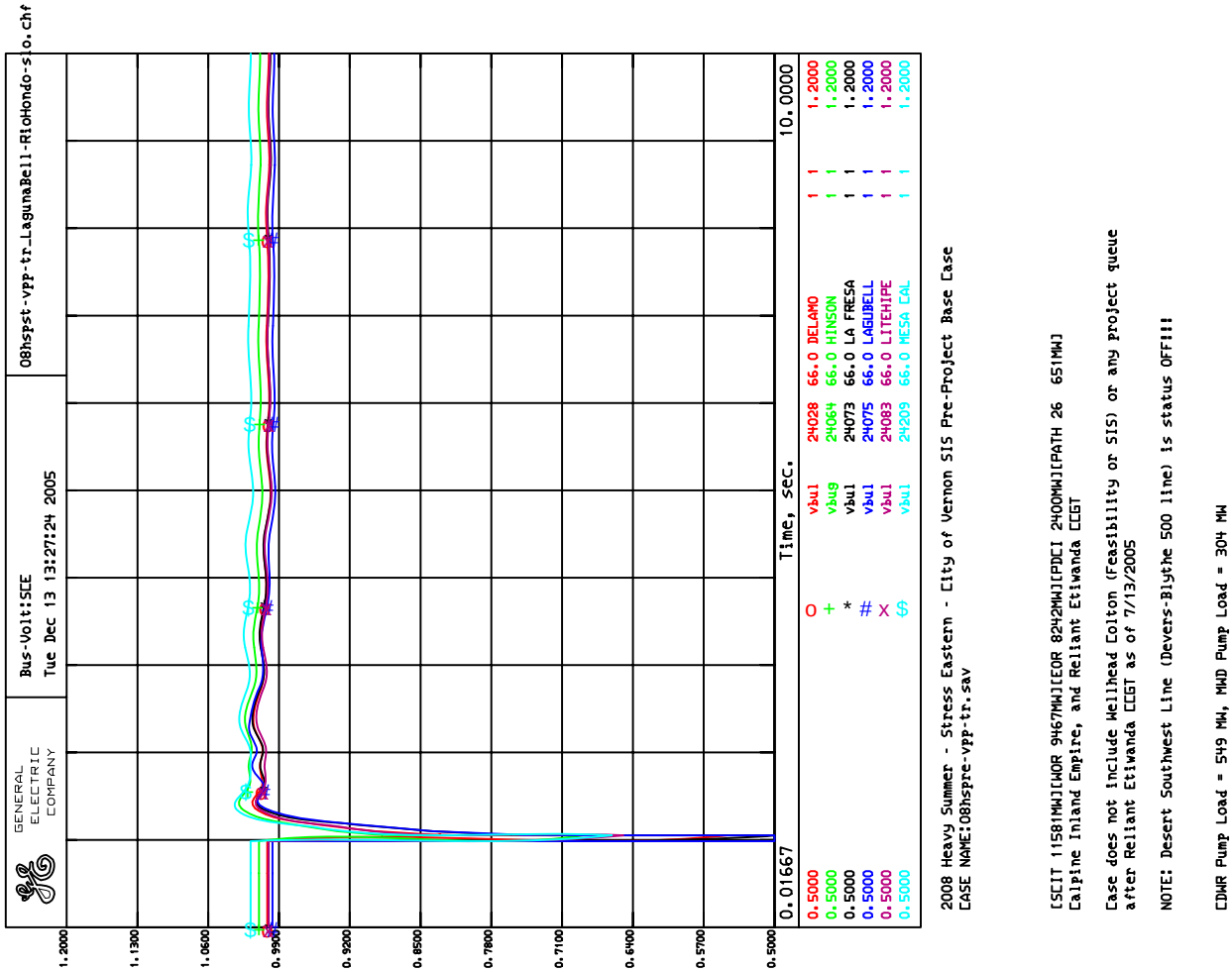
Plot 4 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



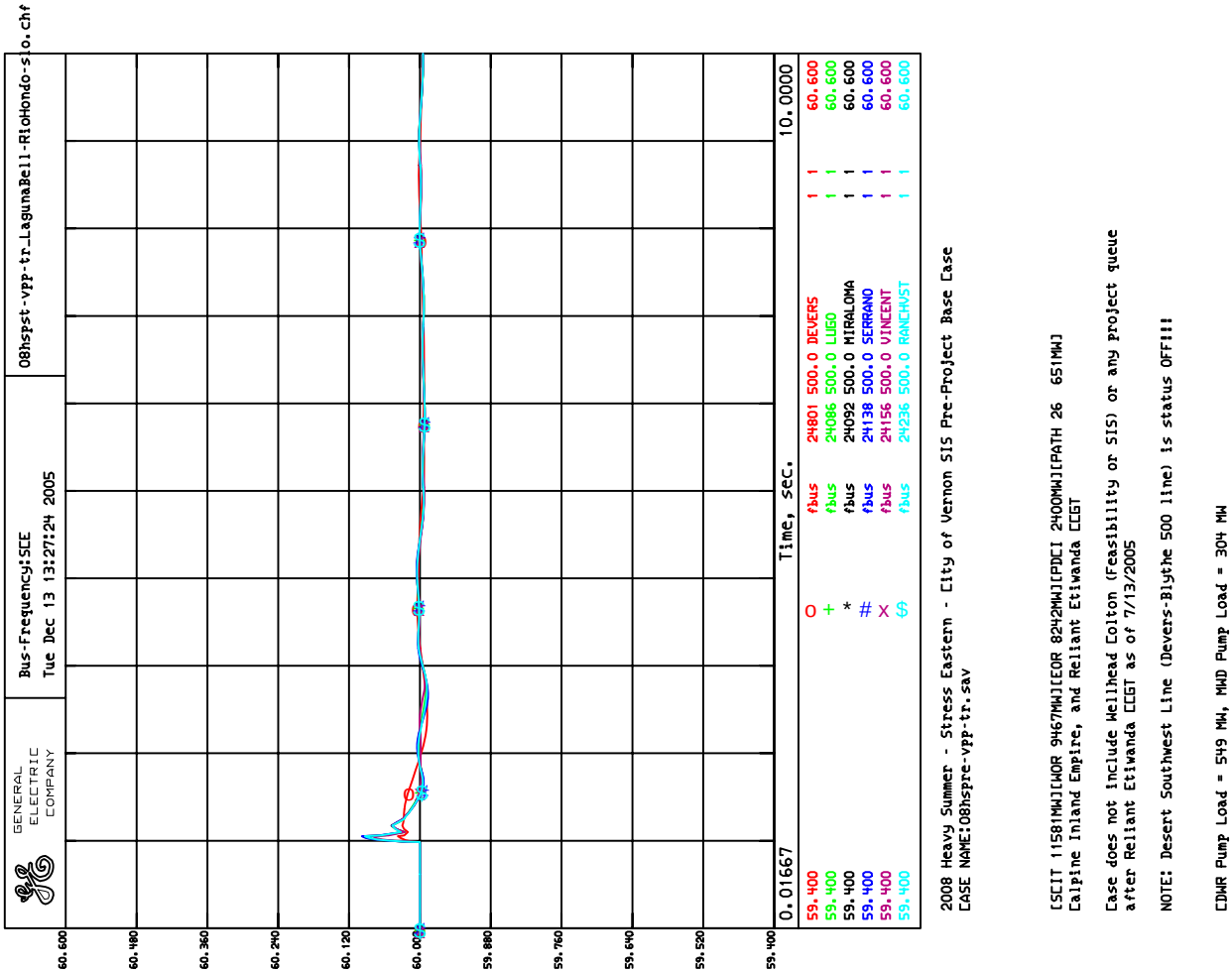
Plot 4 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



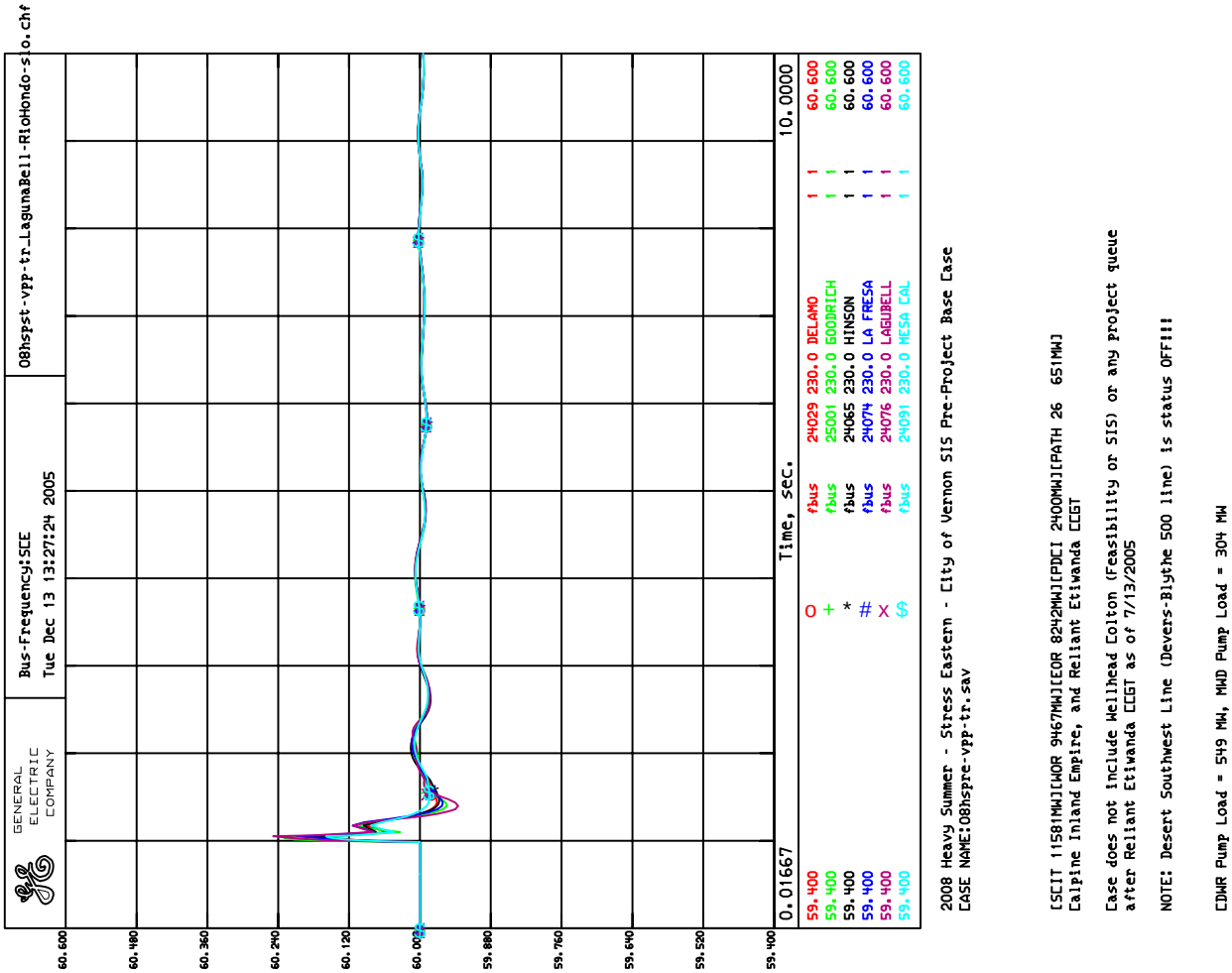
Plot 4 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



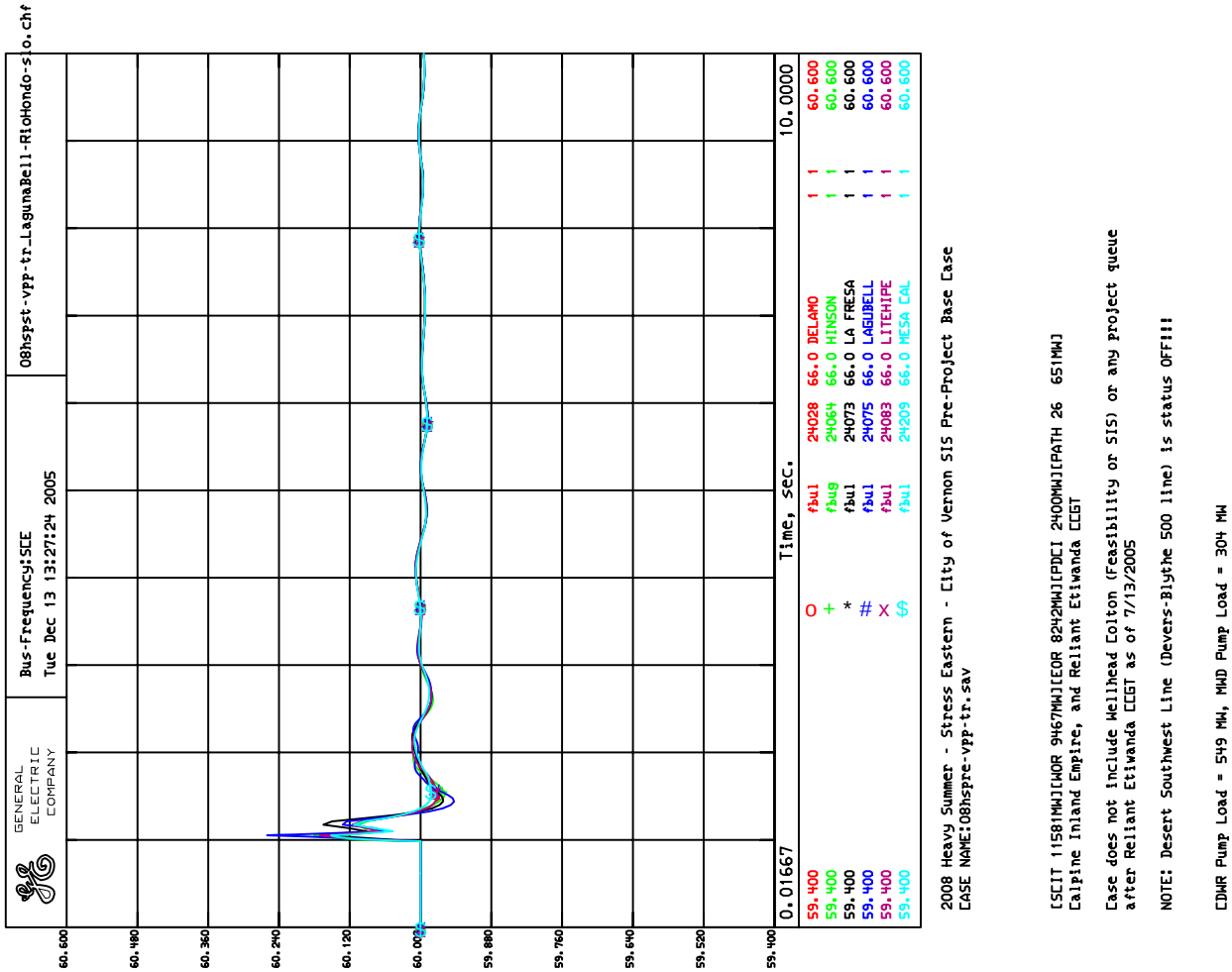
Plot 4 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



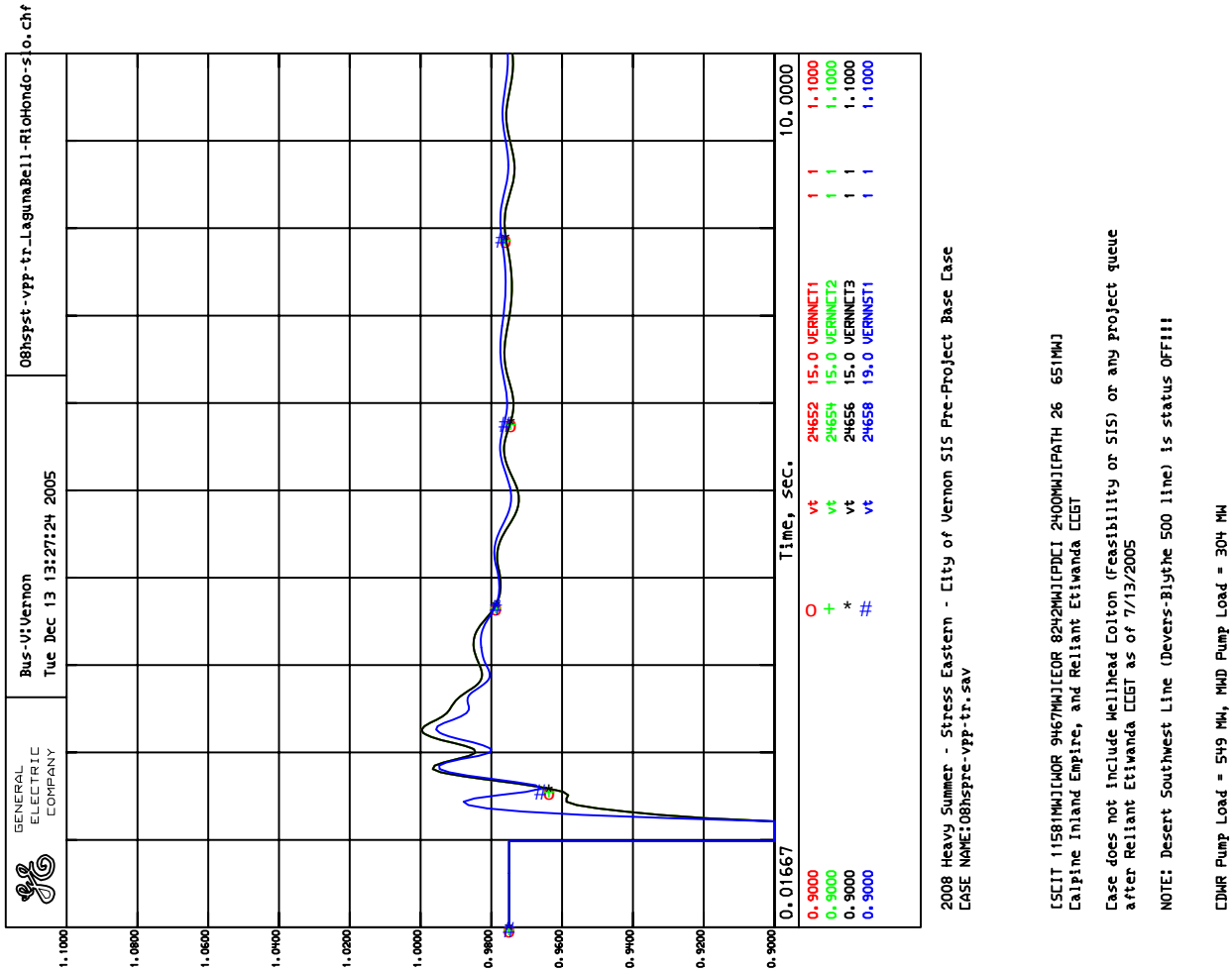
Plot 4 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



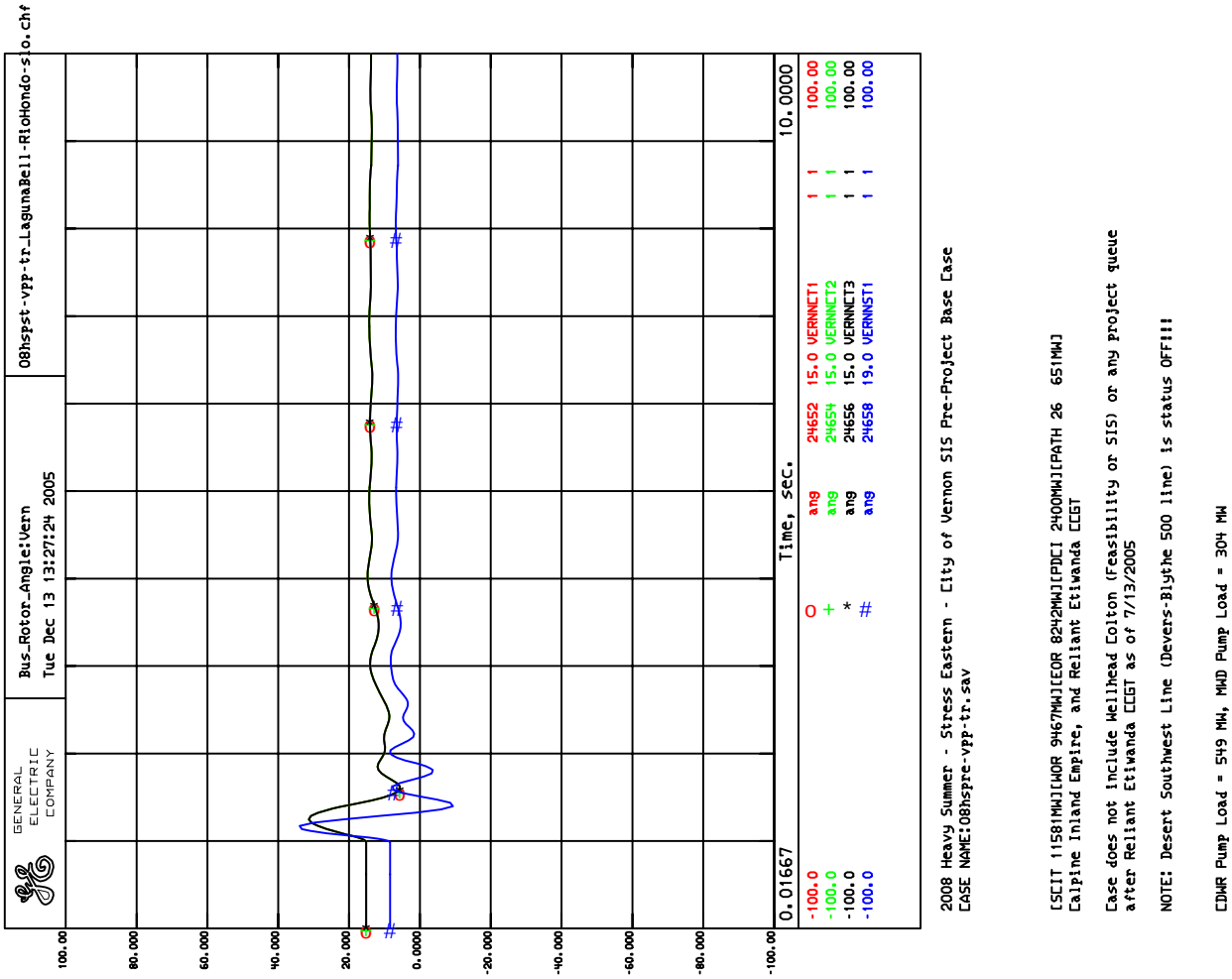
Plot 4 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



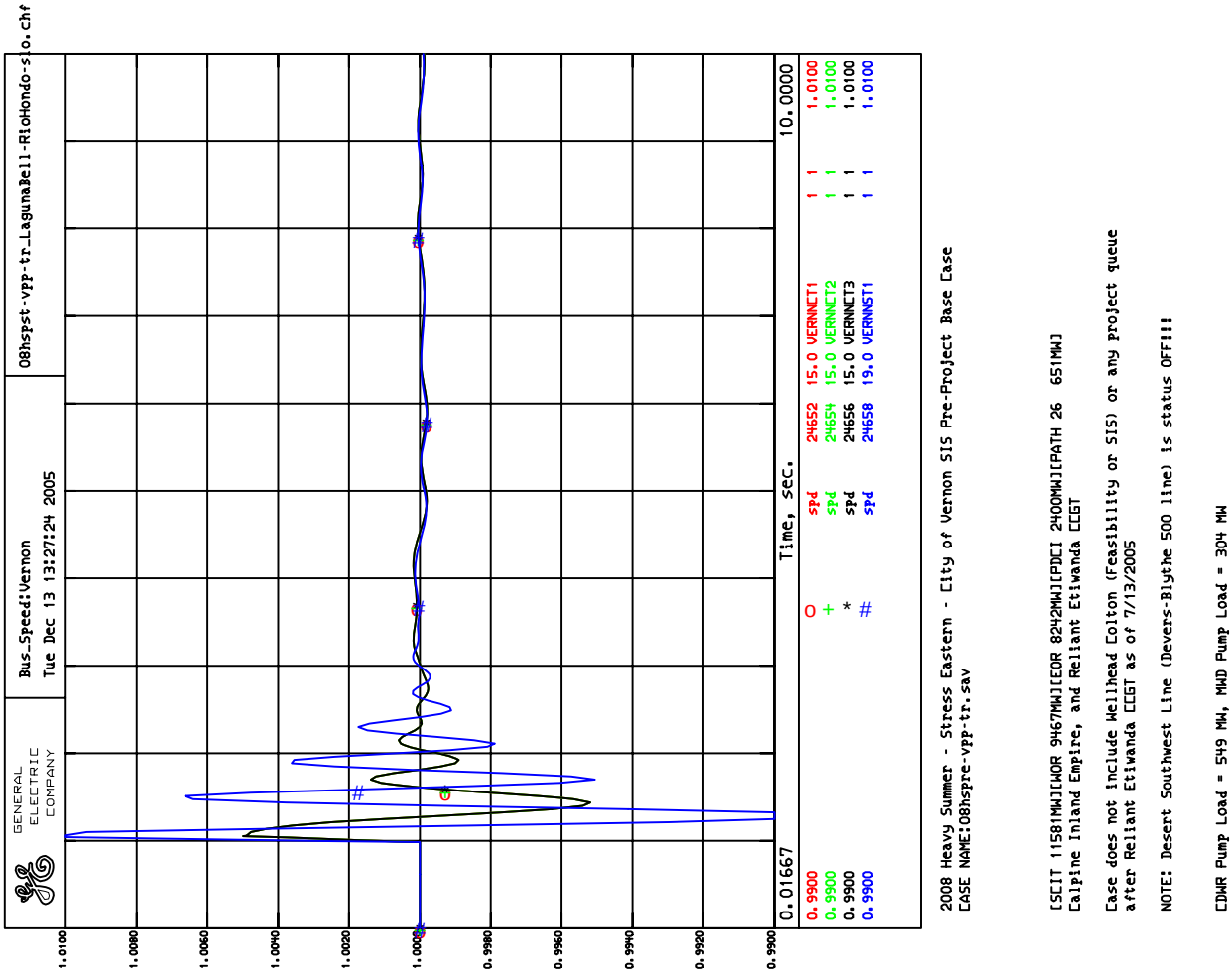
Plot 4 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



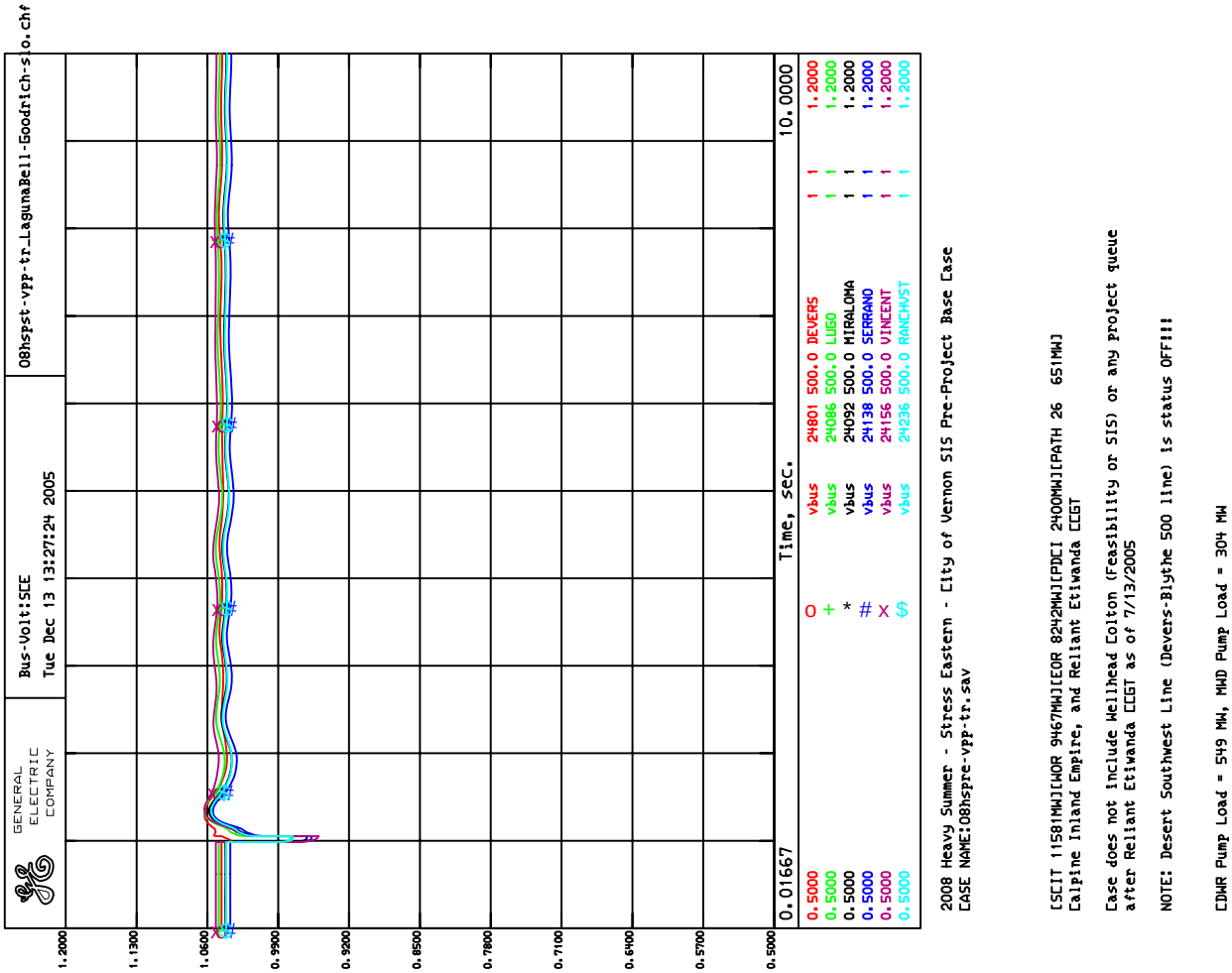
Plot 4 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



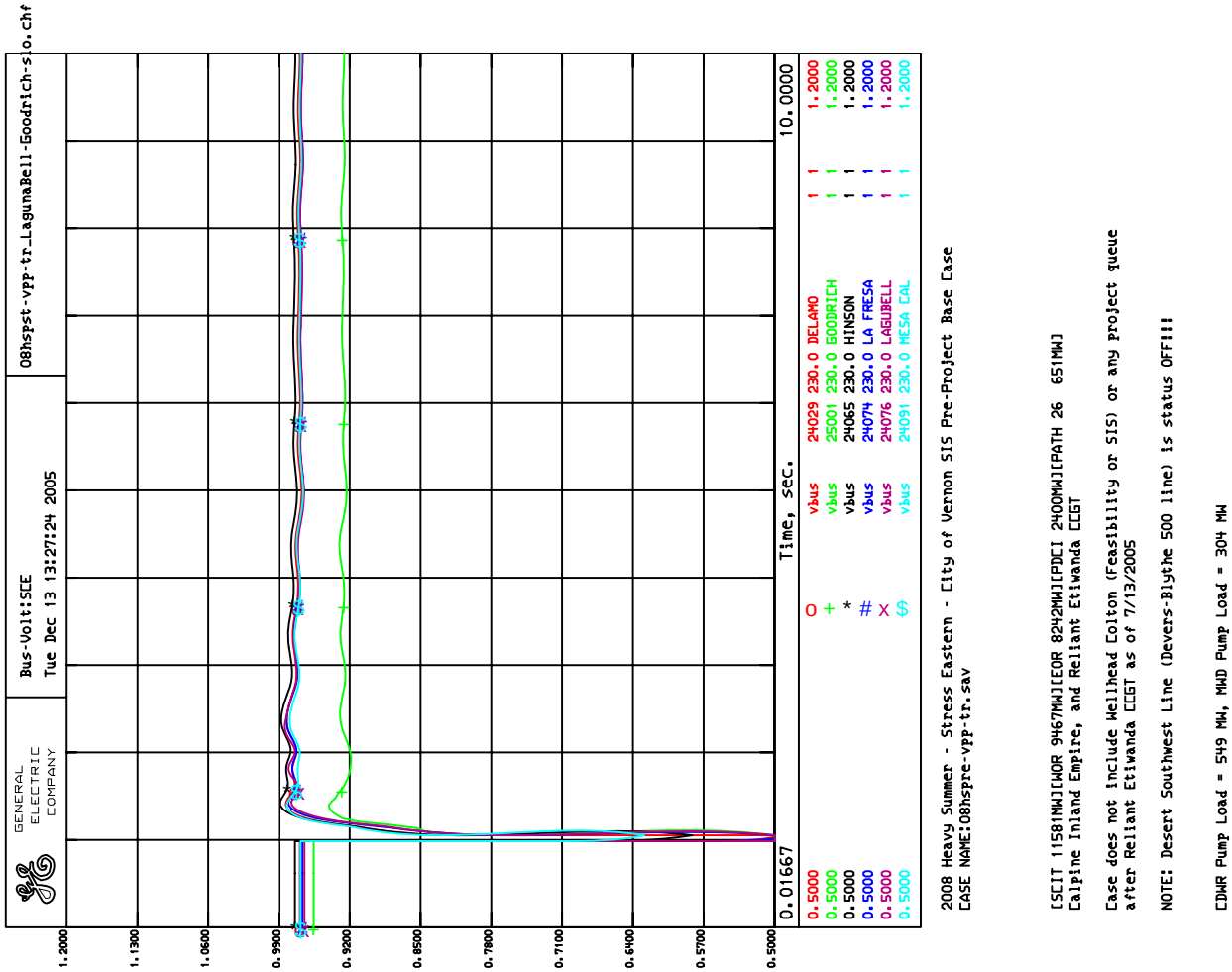
Plot 4 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



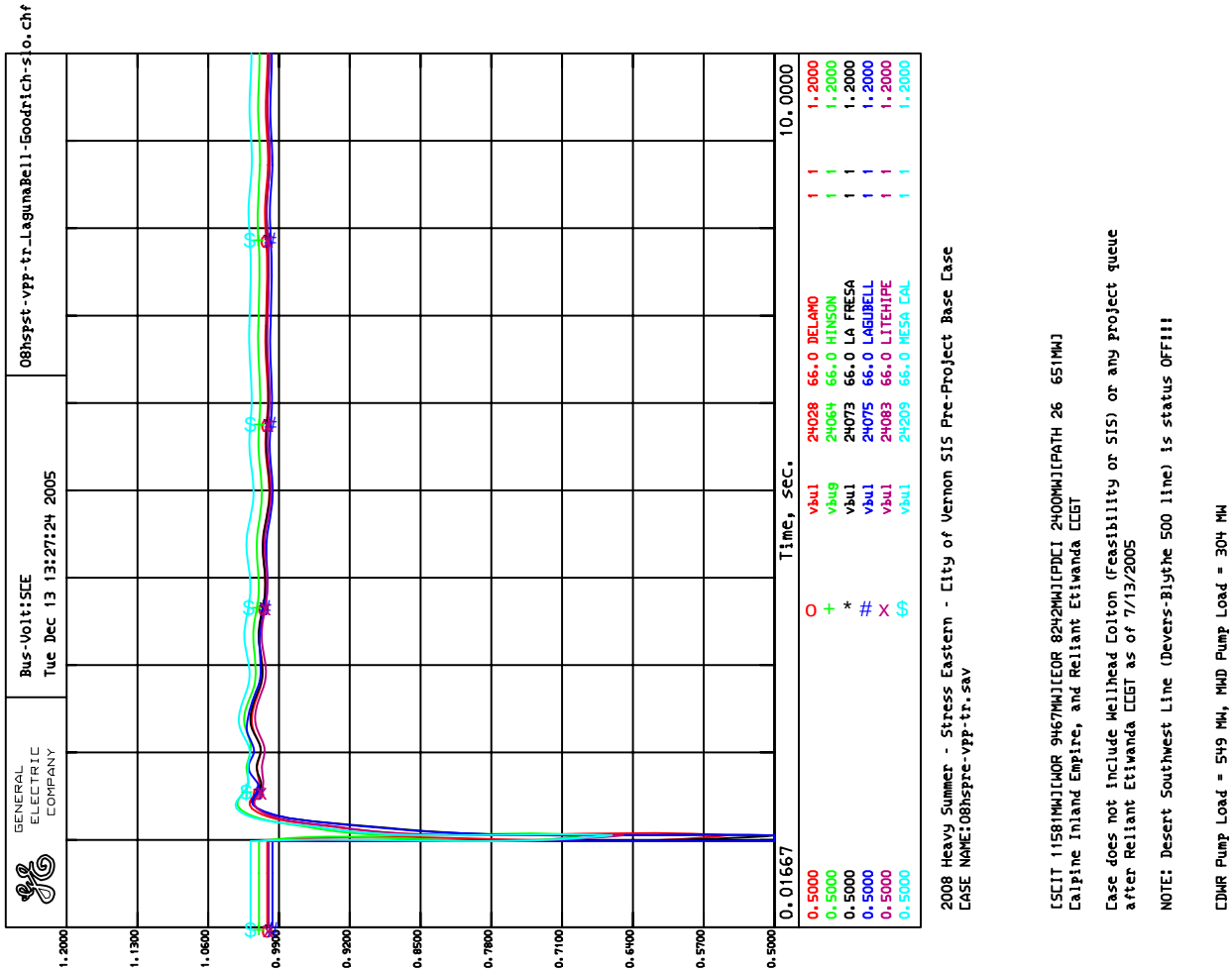
Plot 5 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



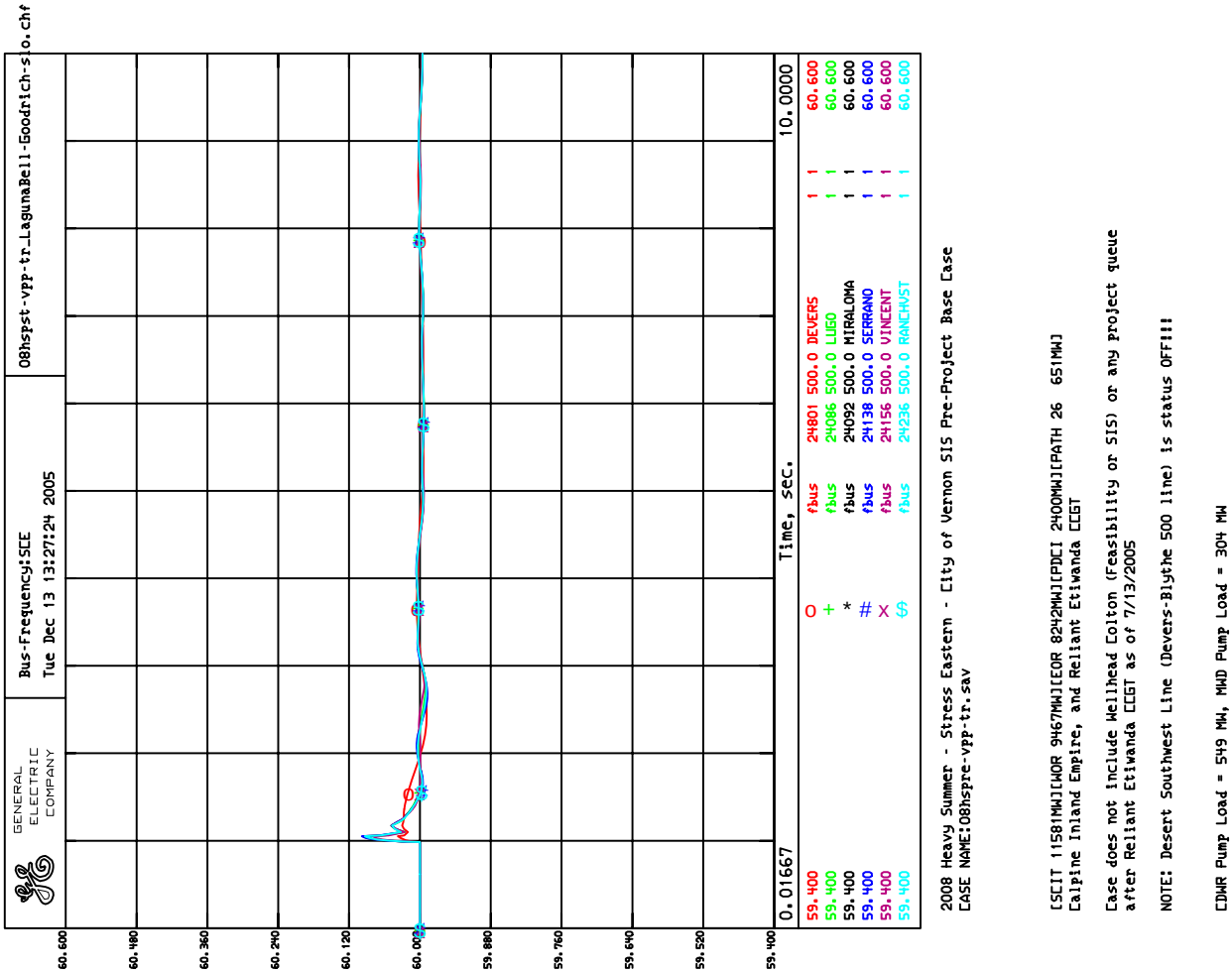
Plot 5 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



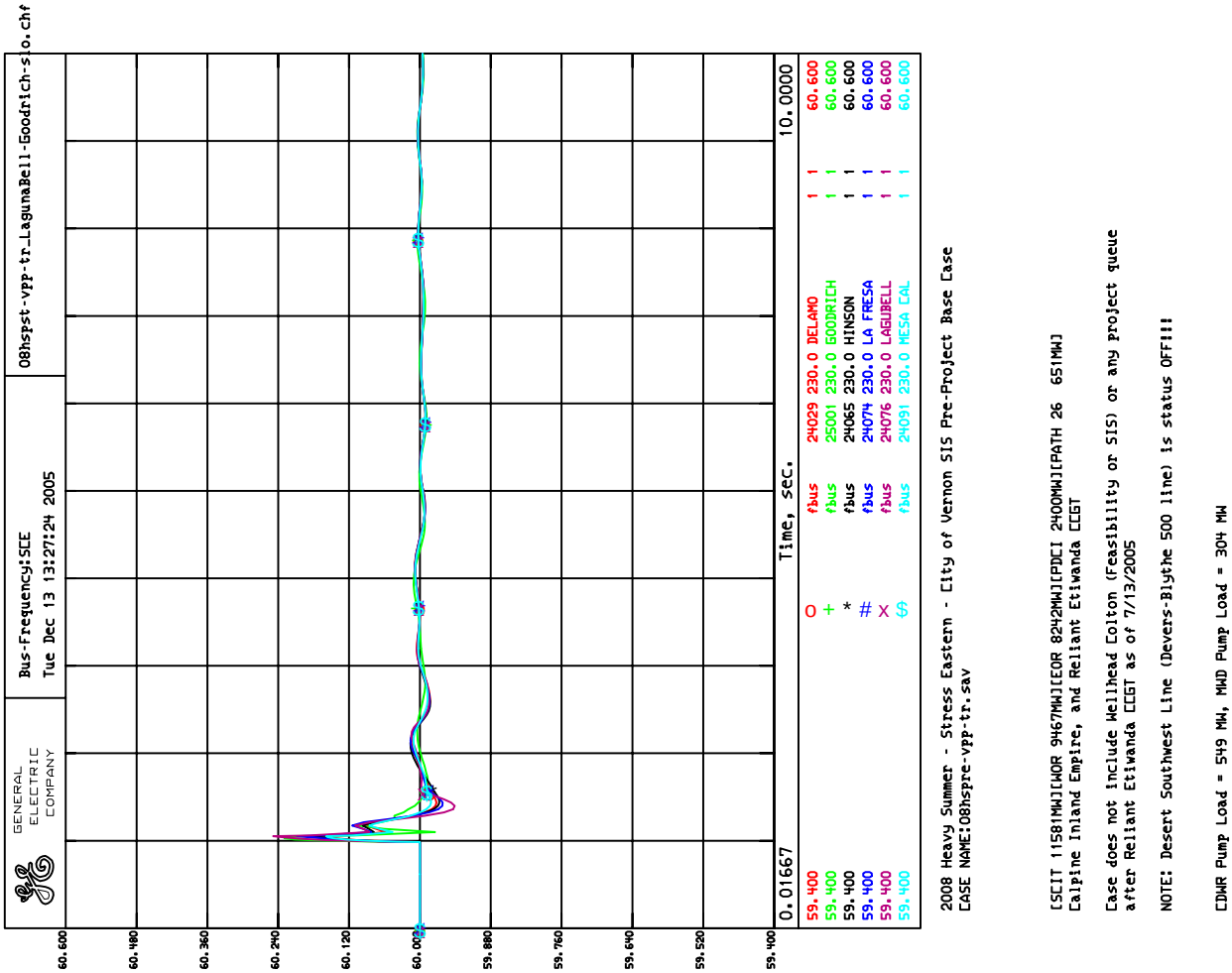
Plot 5 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



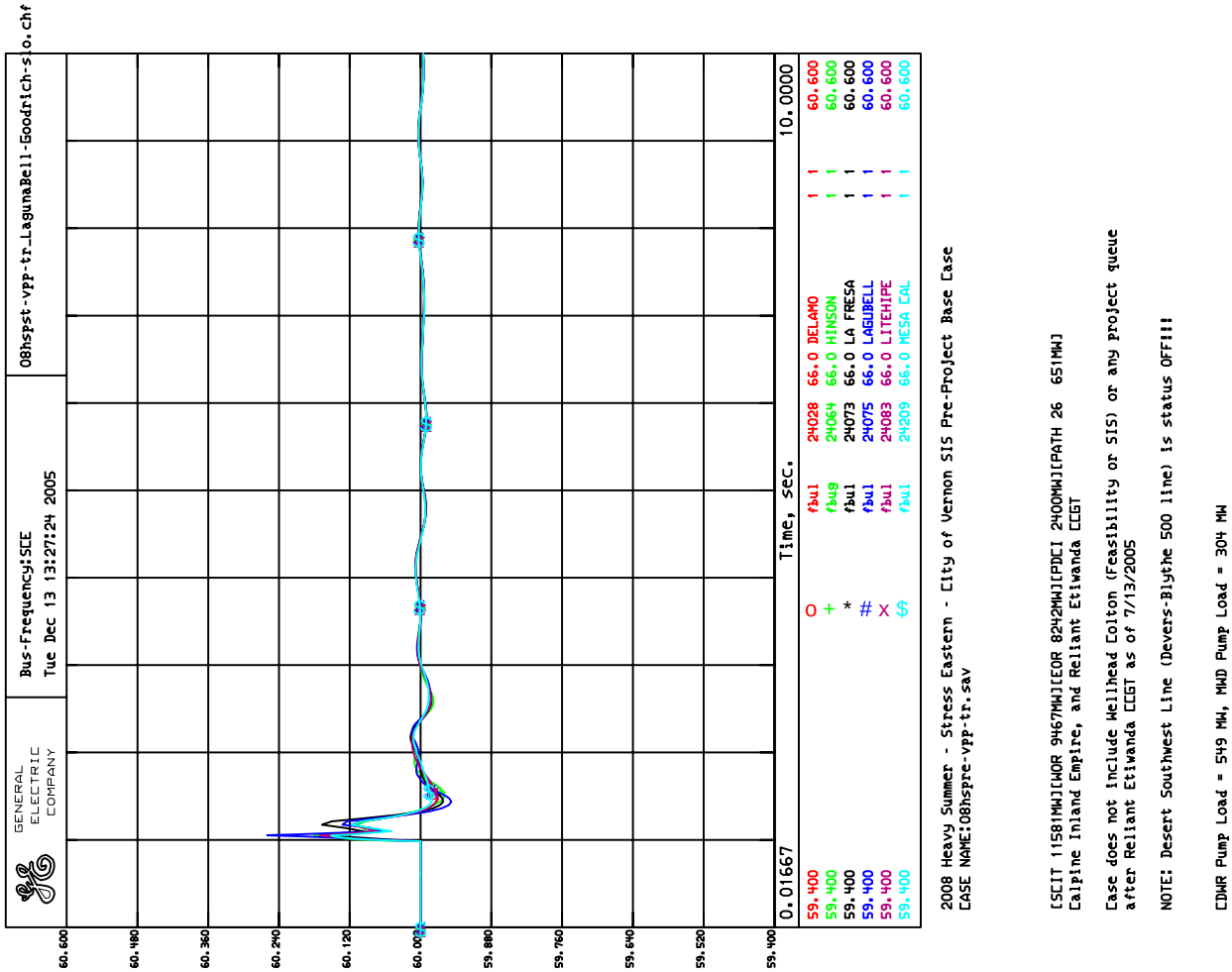
Plot 5 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



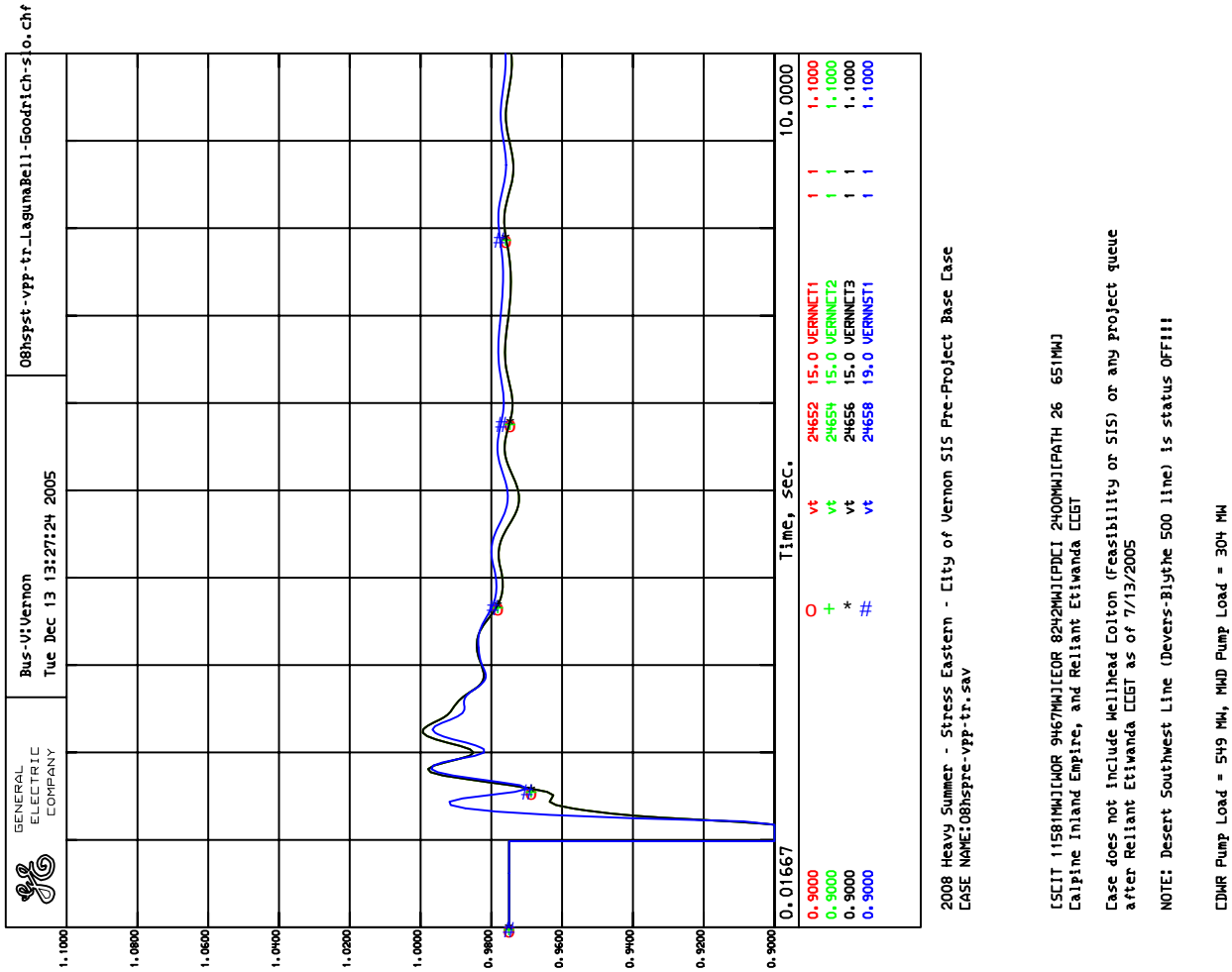
Plot 5 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



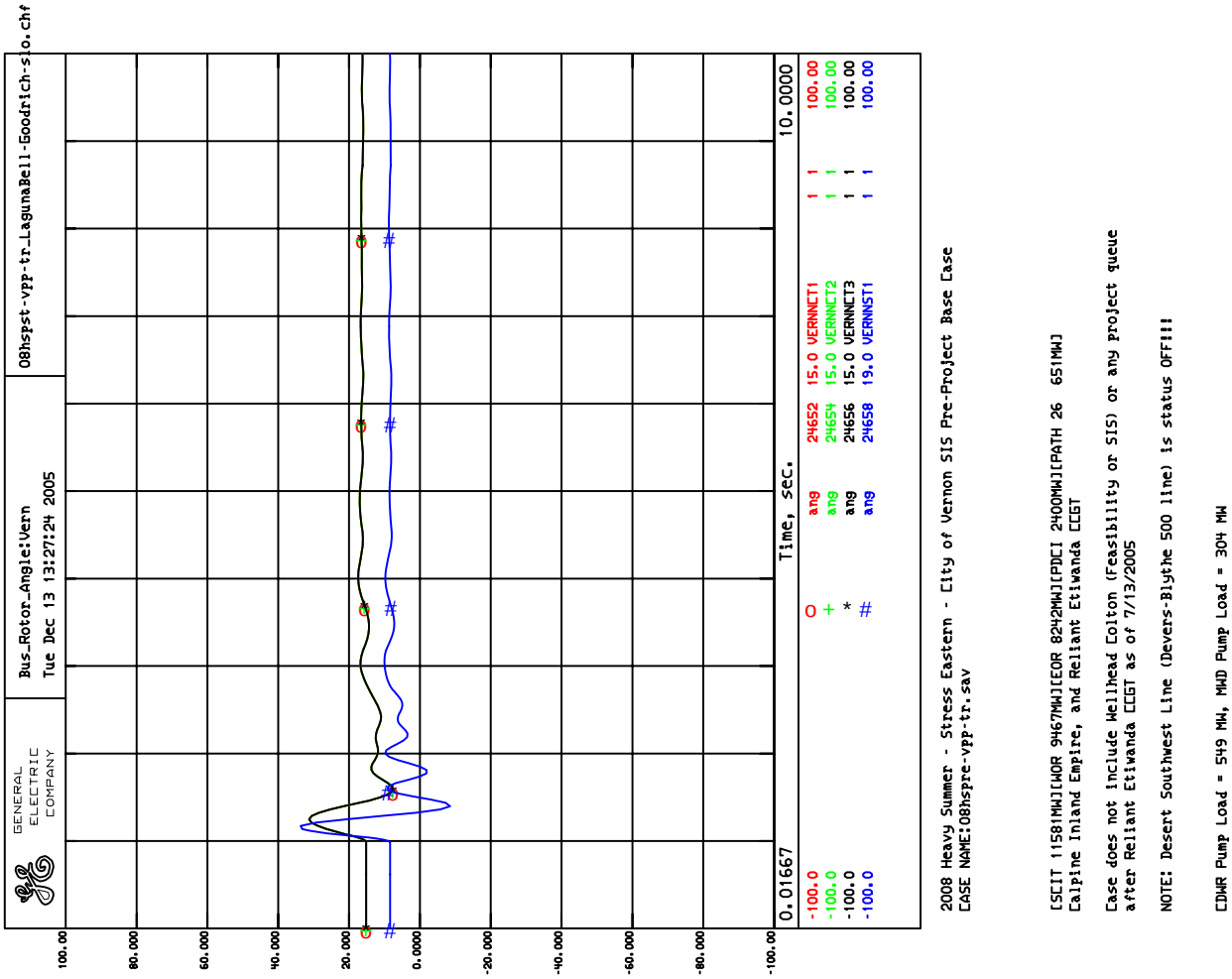
Plot 5 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



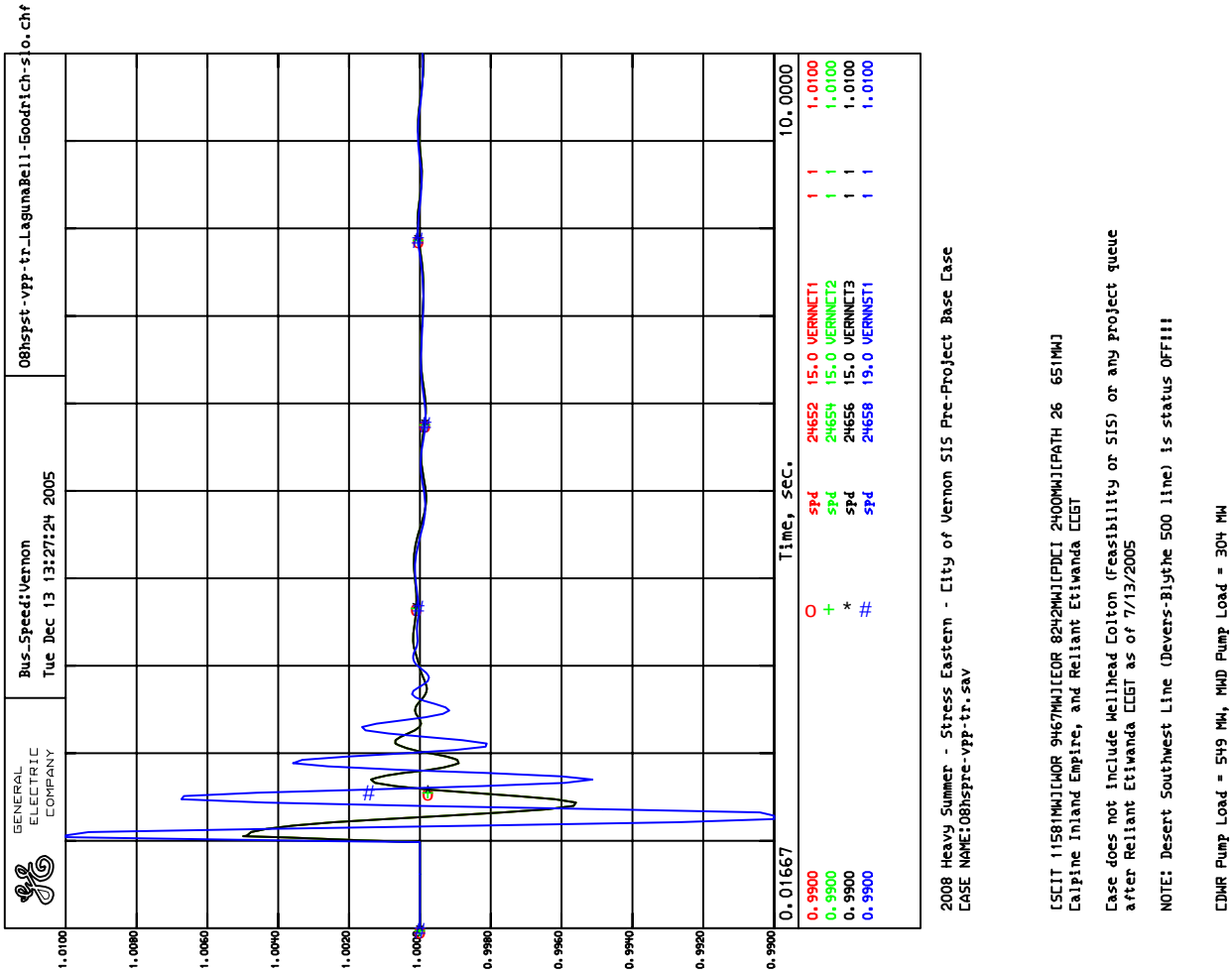
Plot 5 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



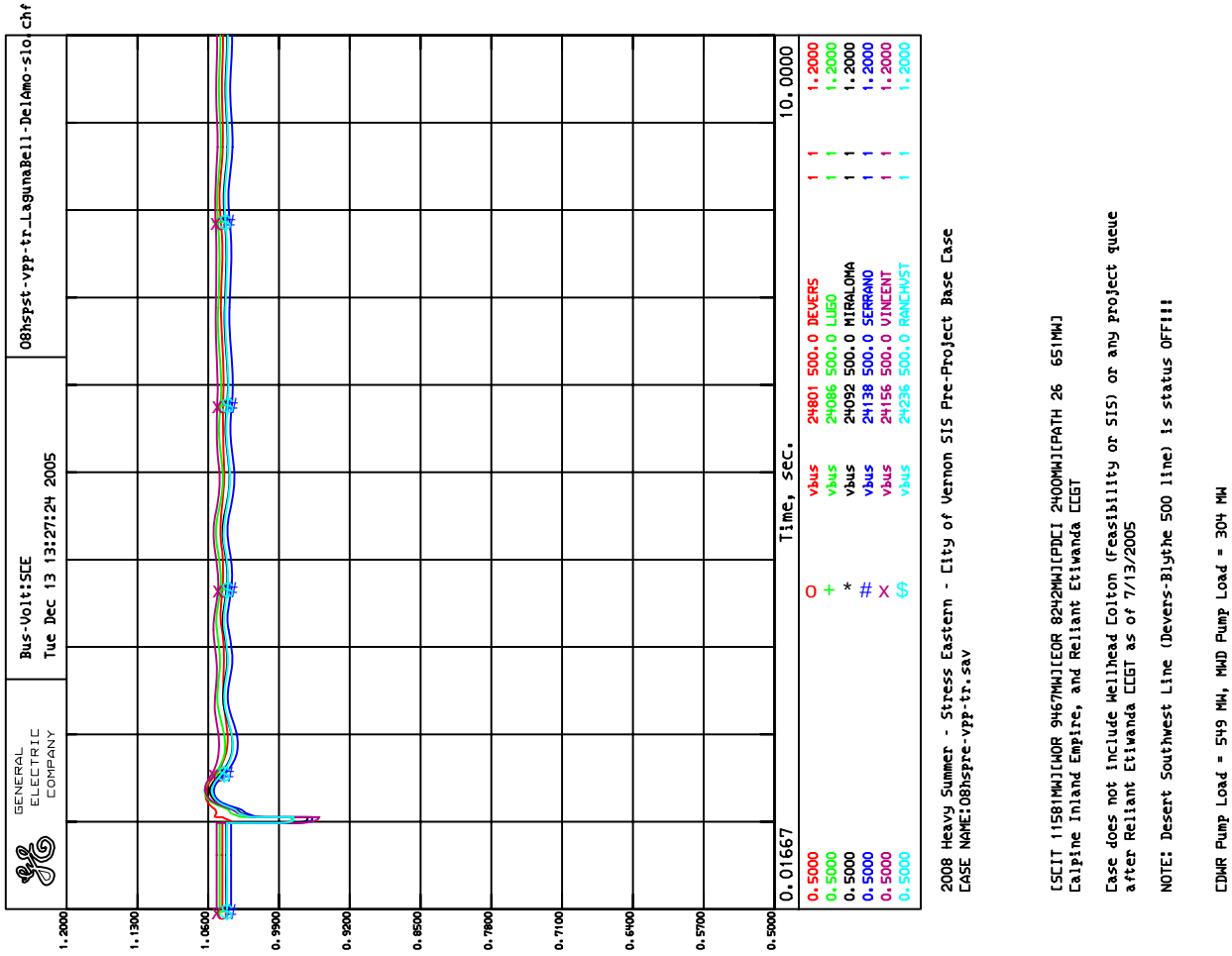
Plot 5 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



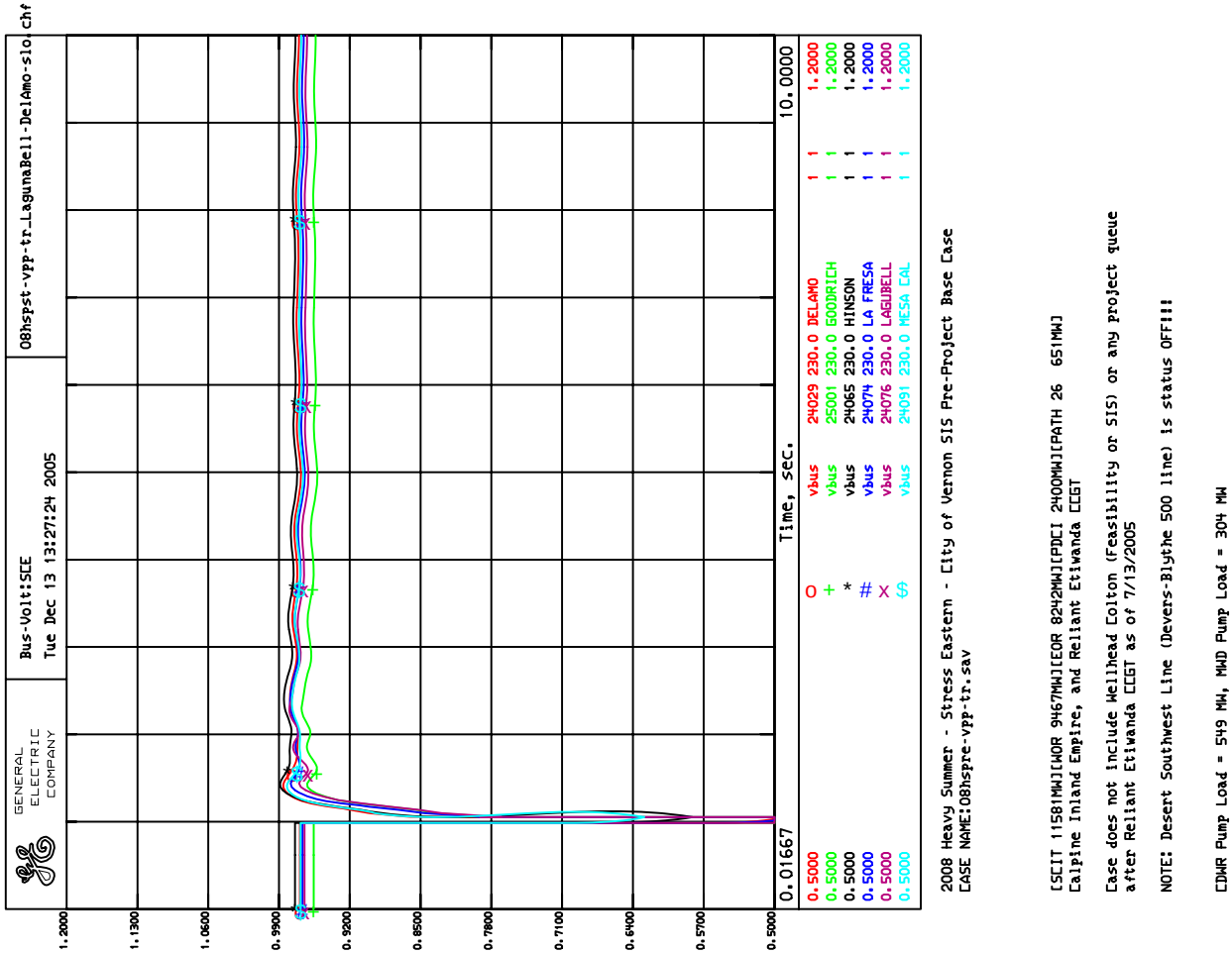
Plot 5 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



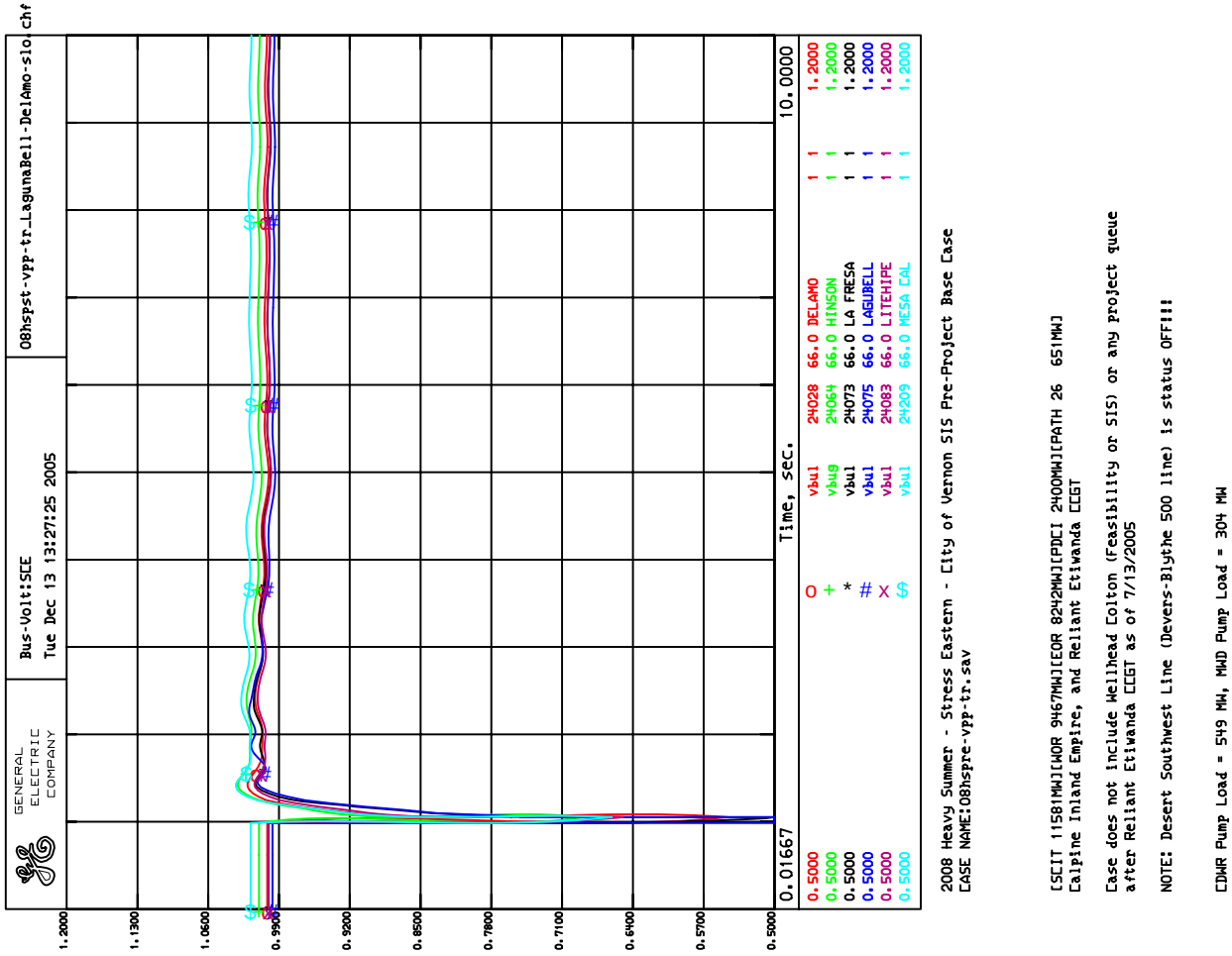
Plot 6 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



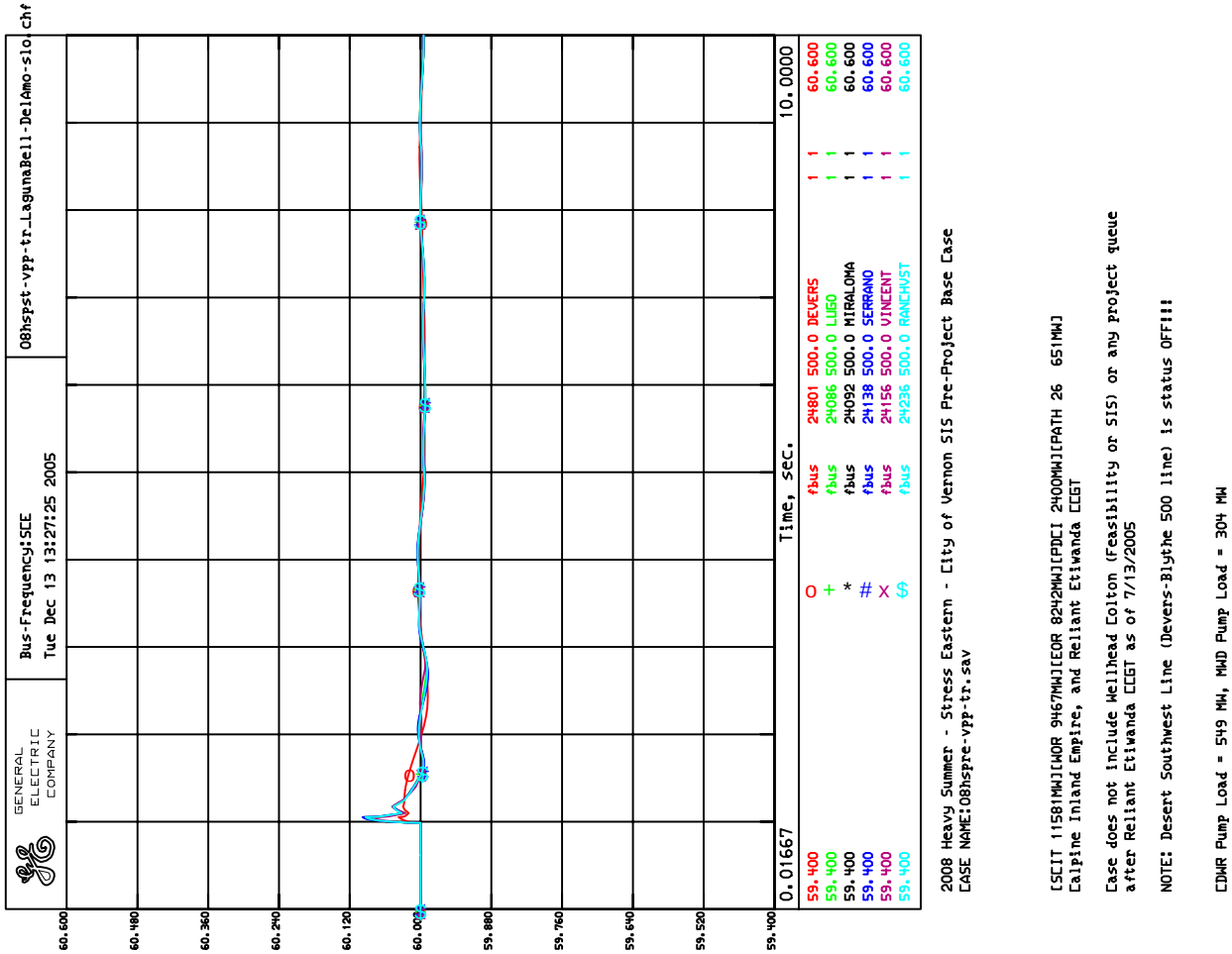
Plot 6 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



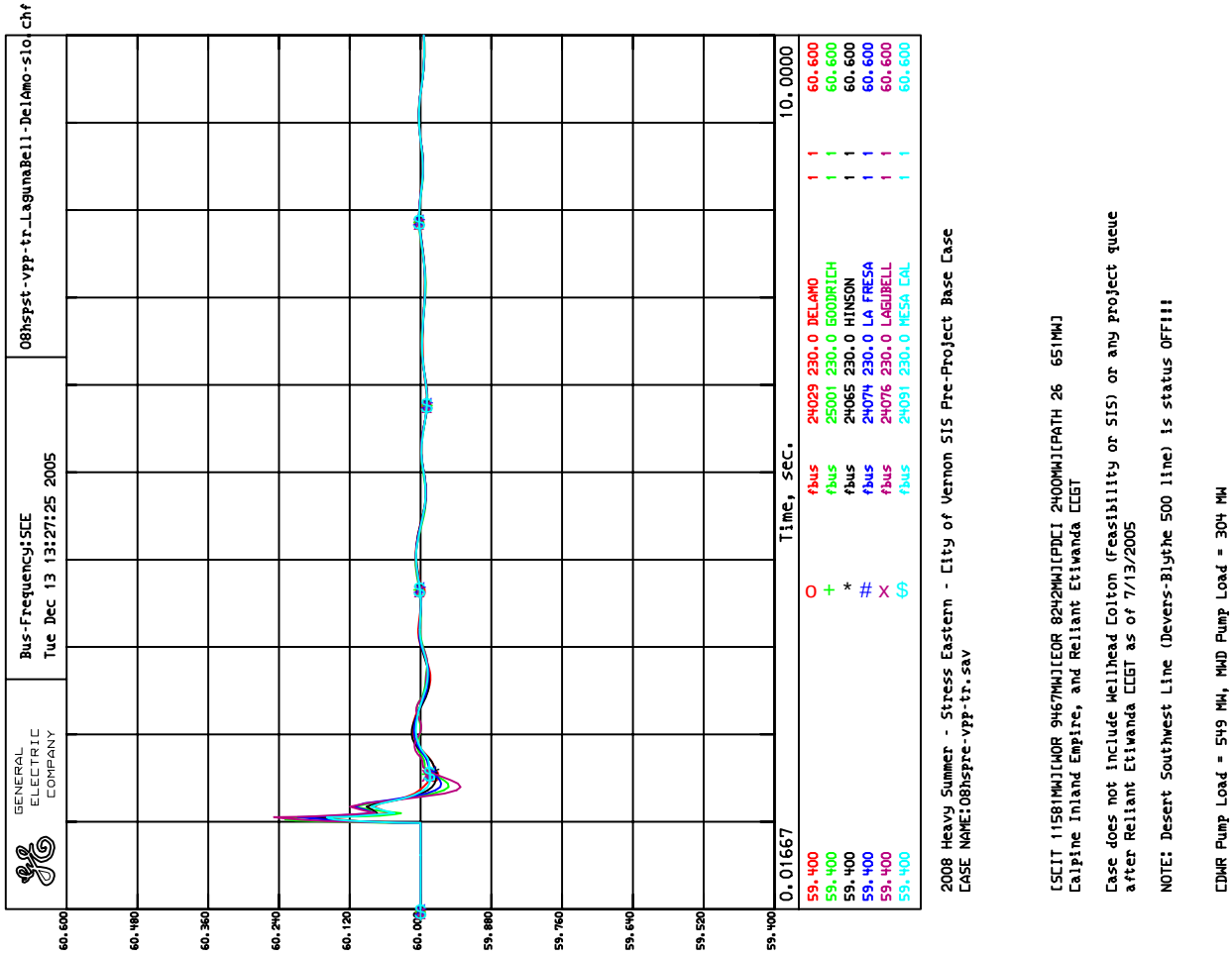
Plot 6 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



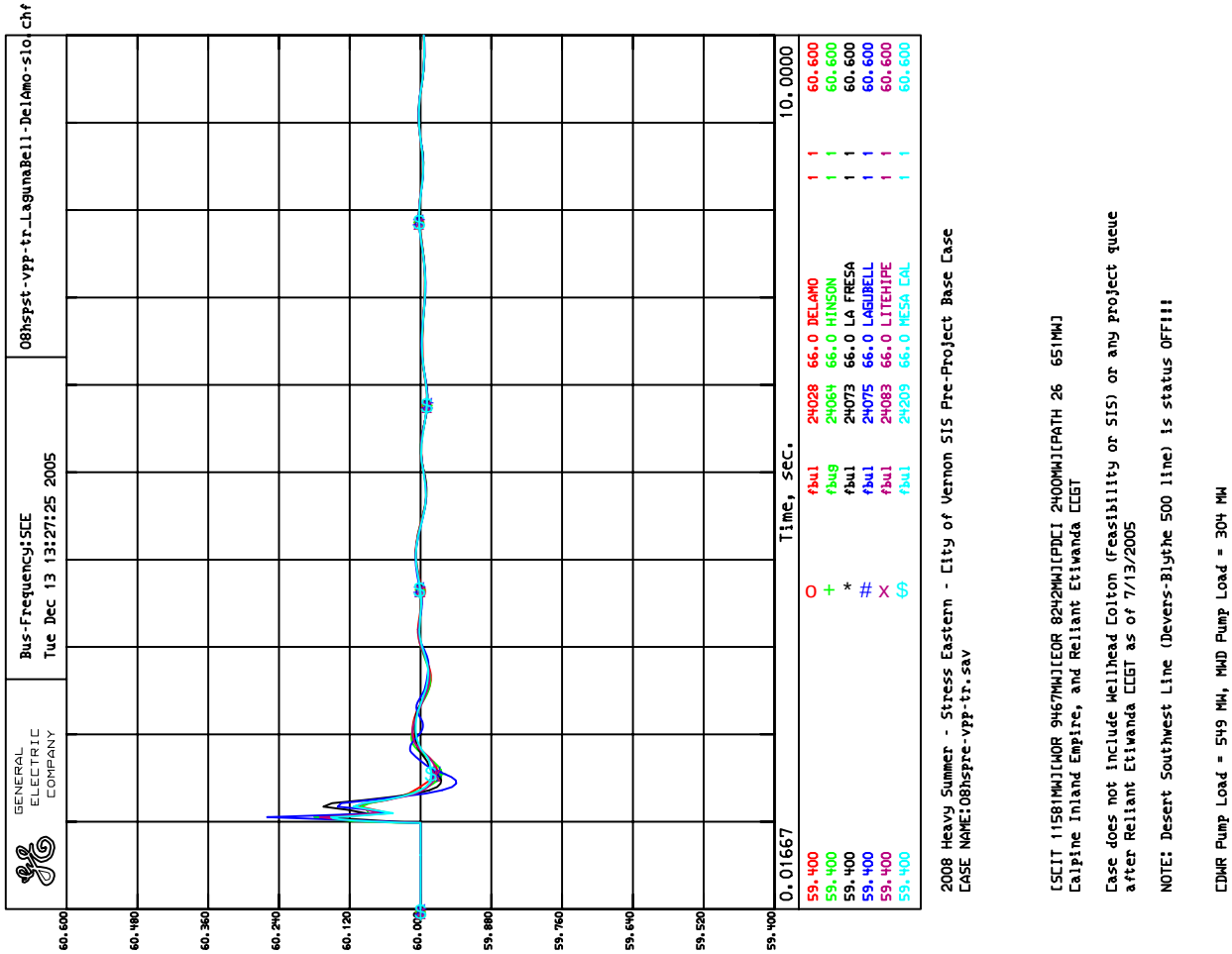
Plot 6 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



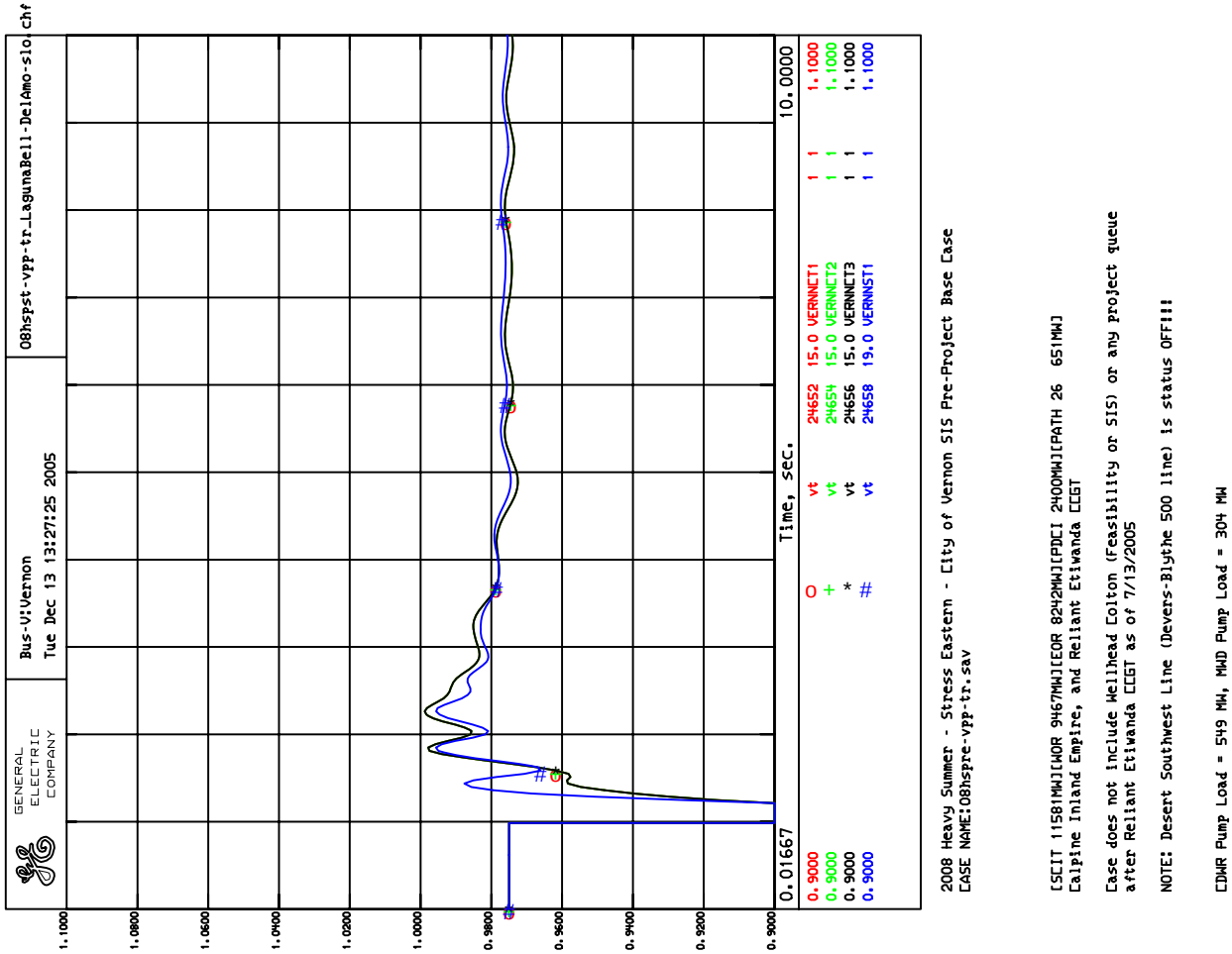
Plot 6 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



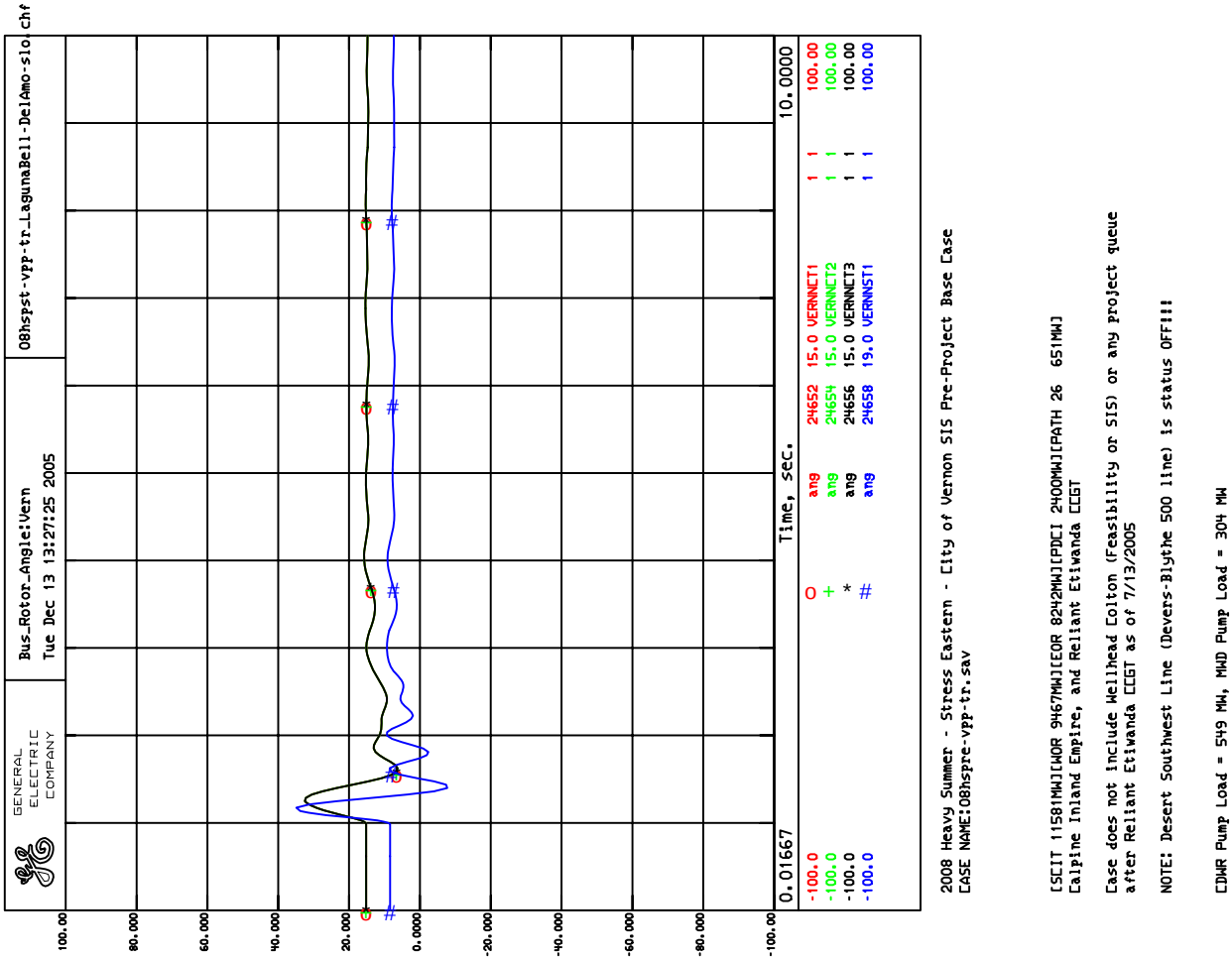
Plot 6 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



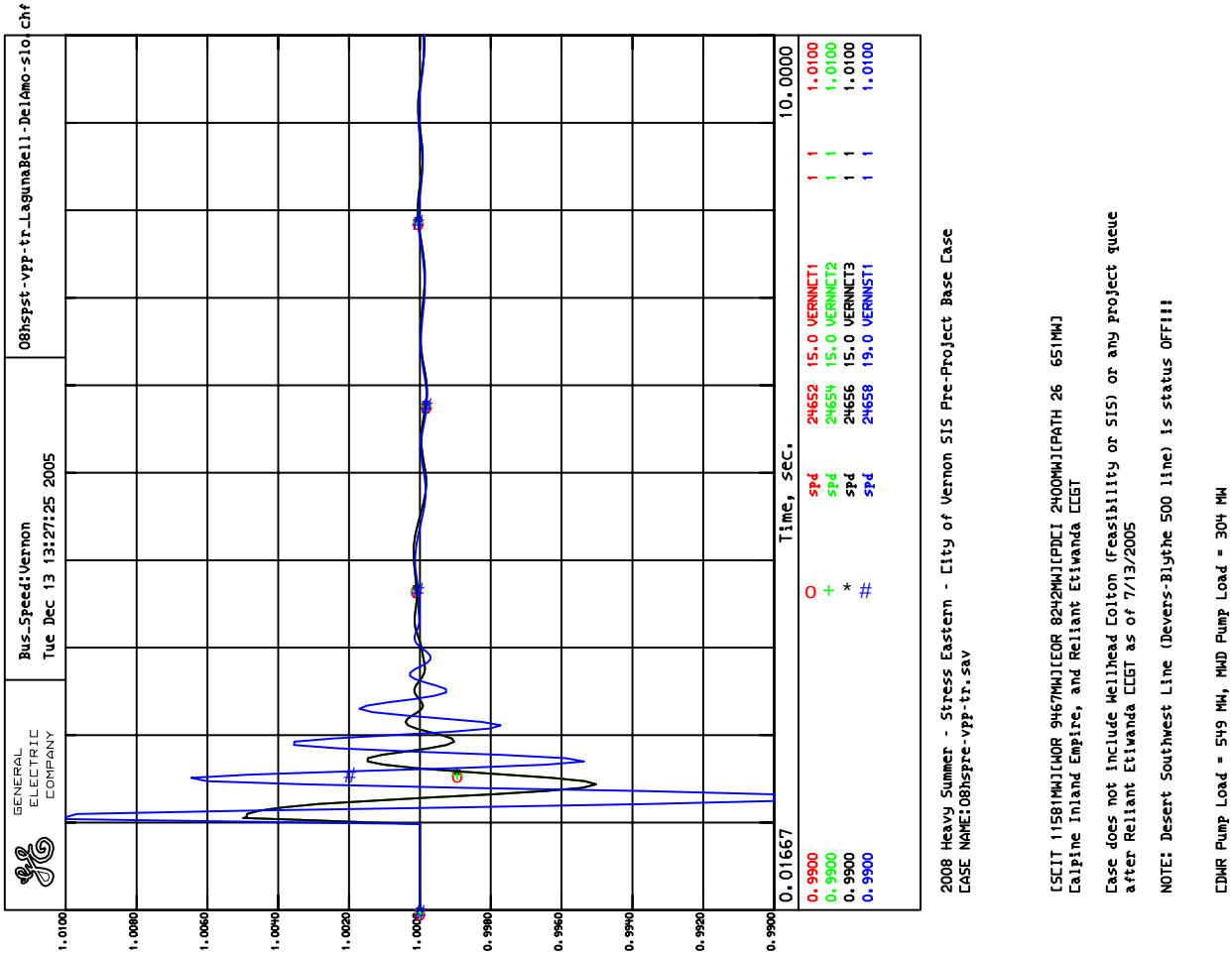
Plot 6 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



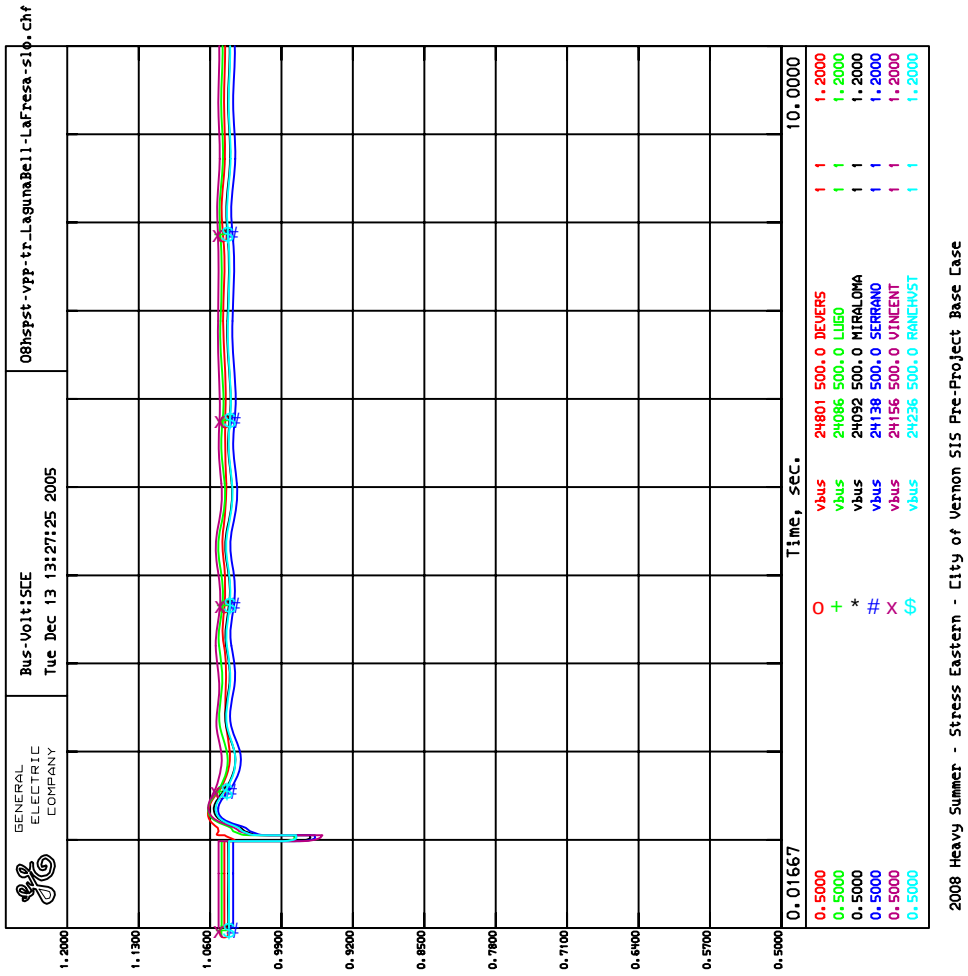
Plot 6 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



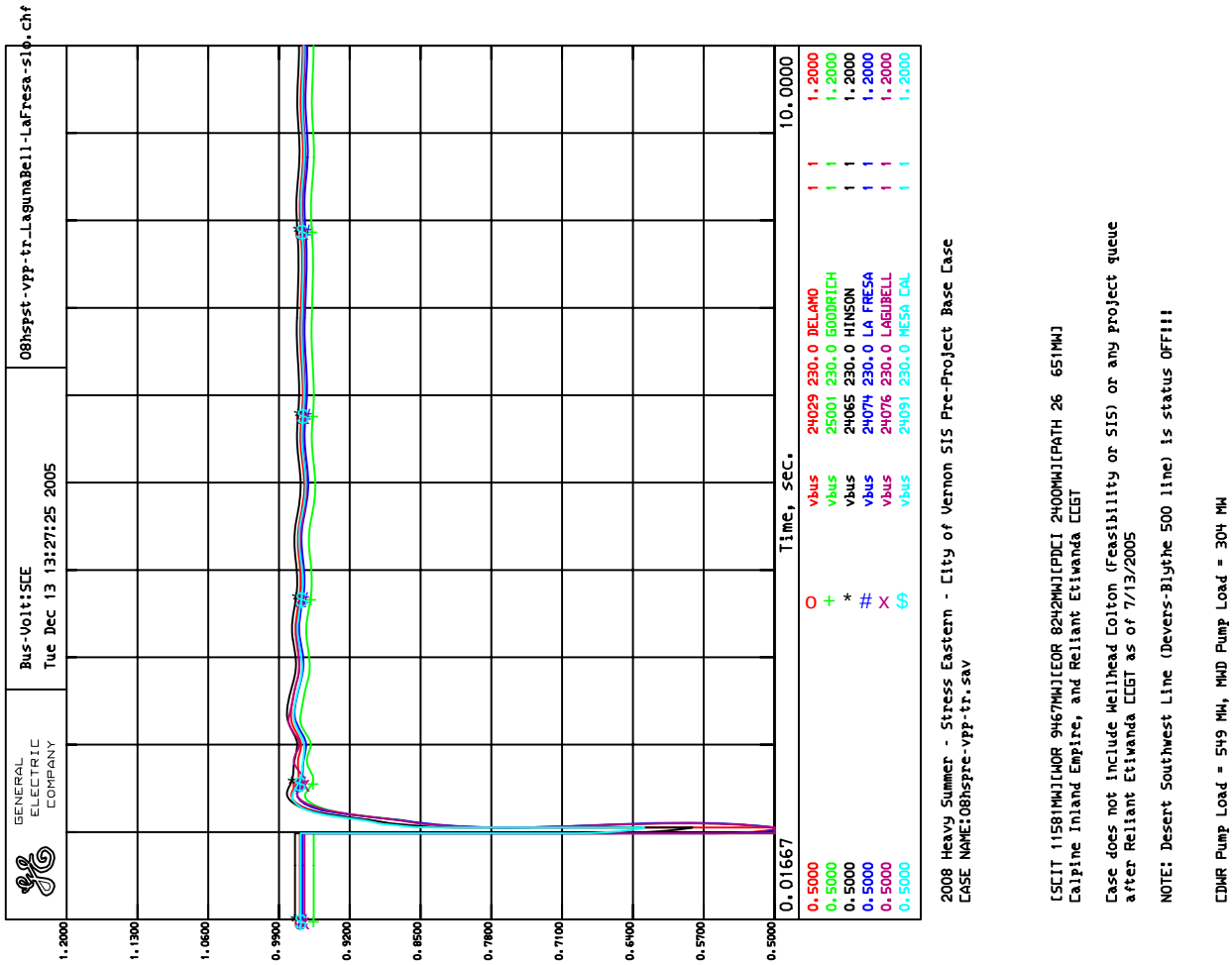
Plot 6 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



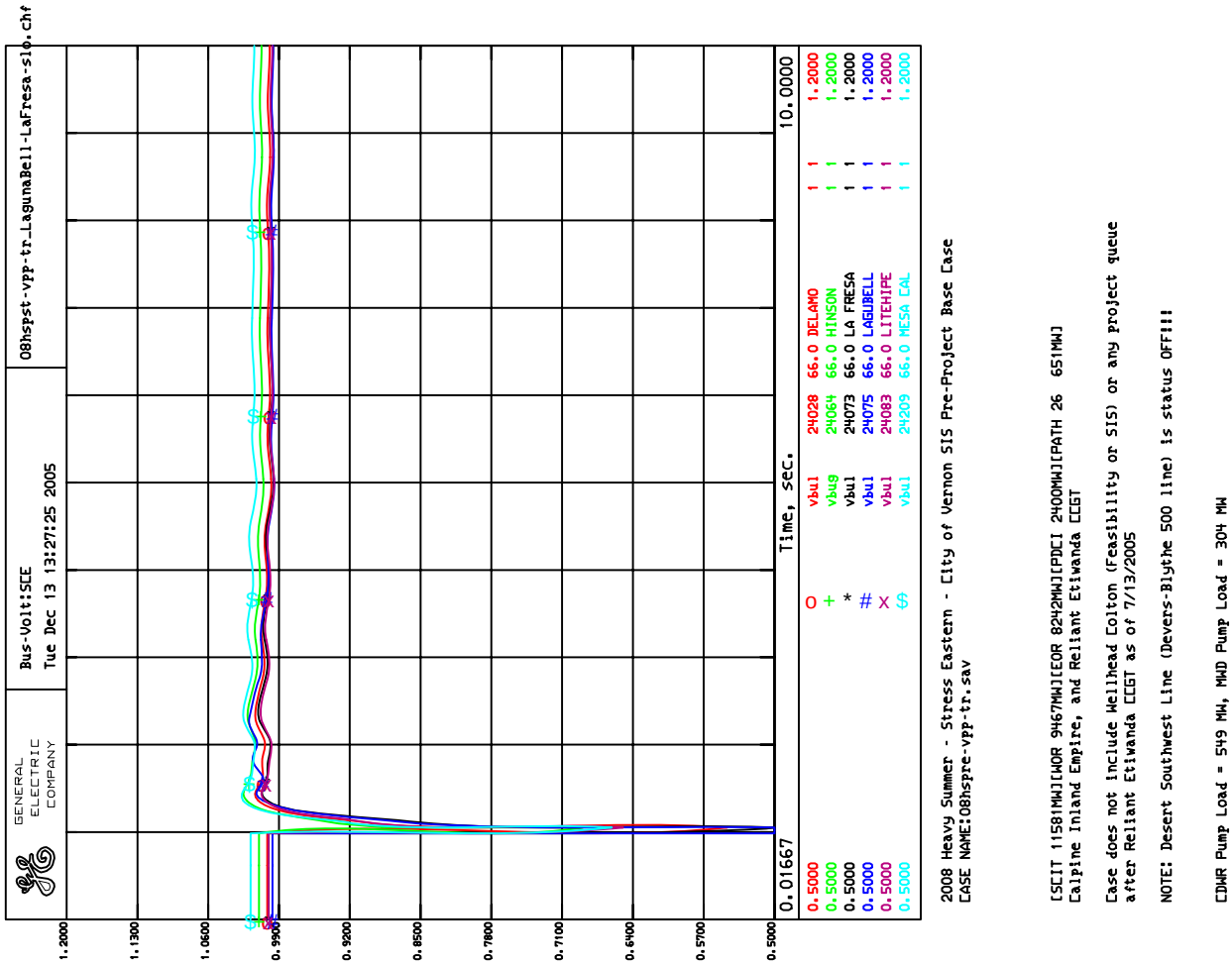
Plot 7 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



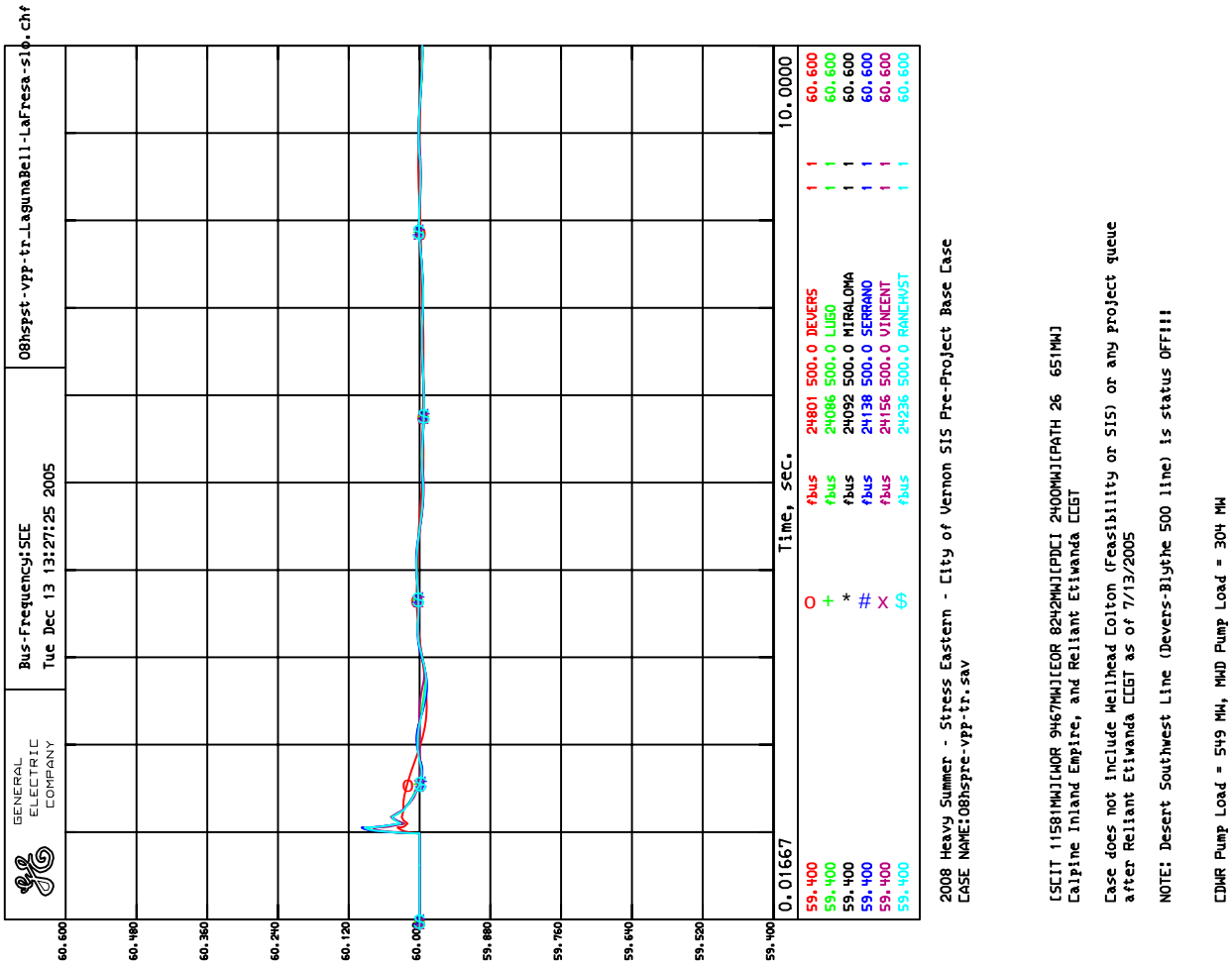
Plot 7 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



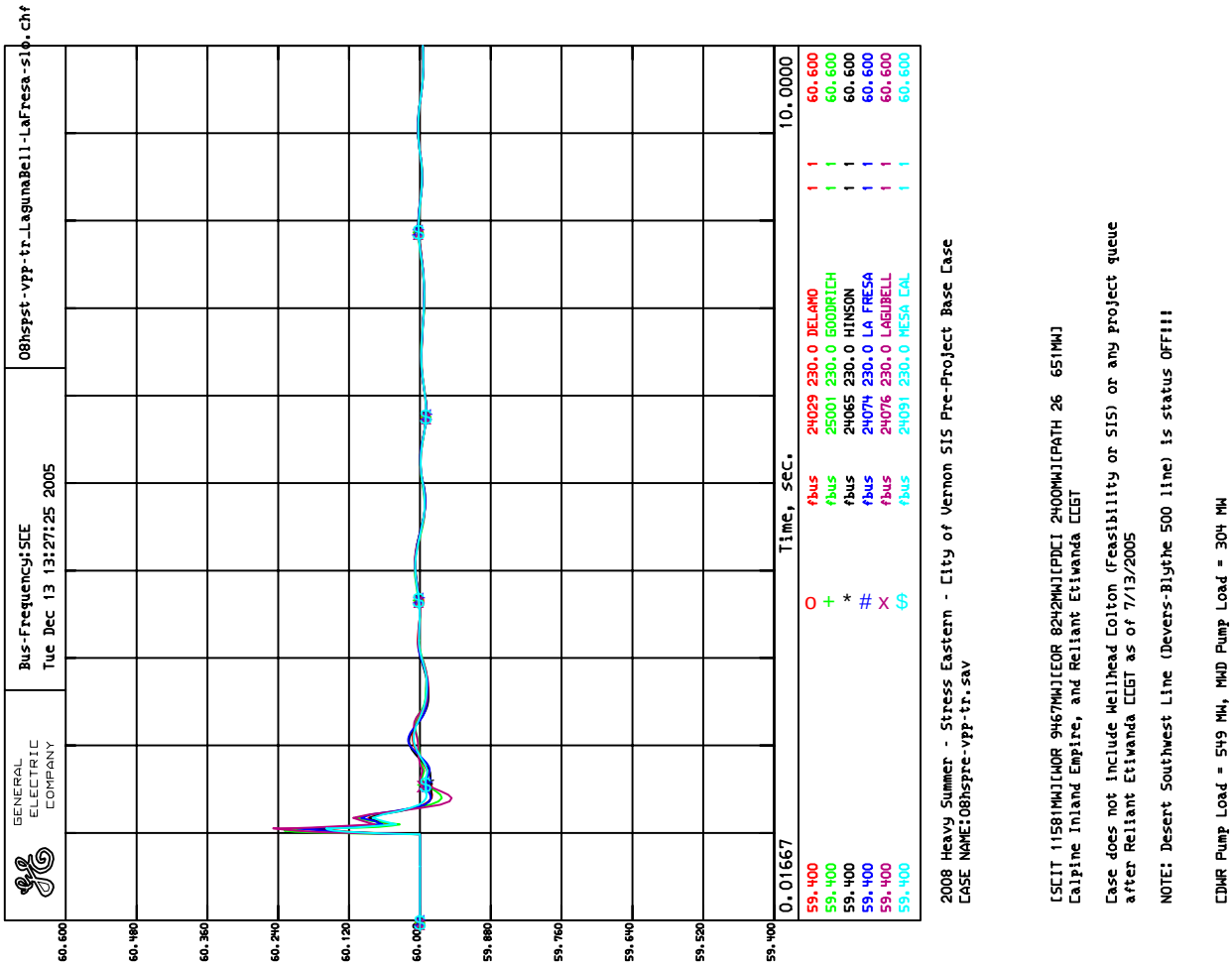
Plot 7 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



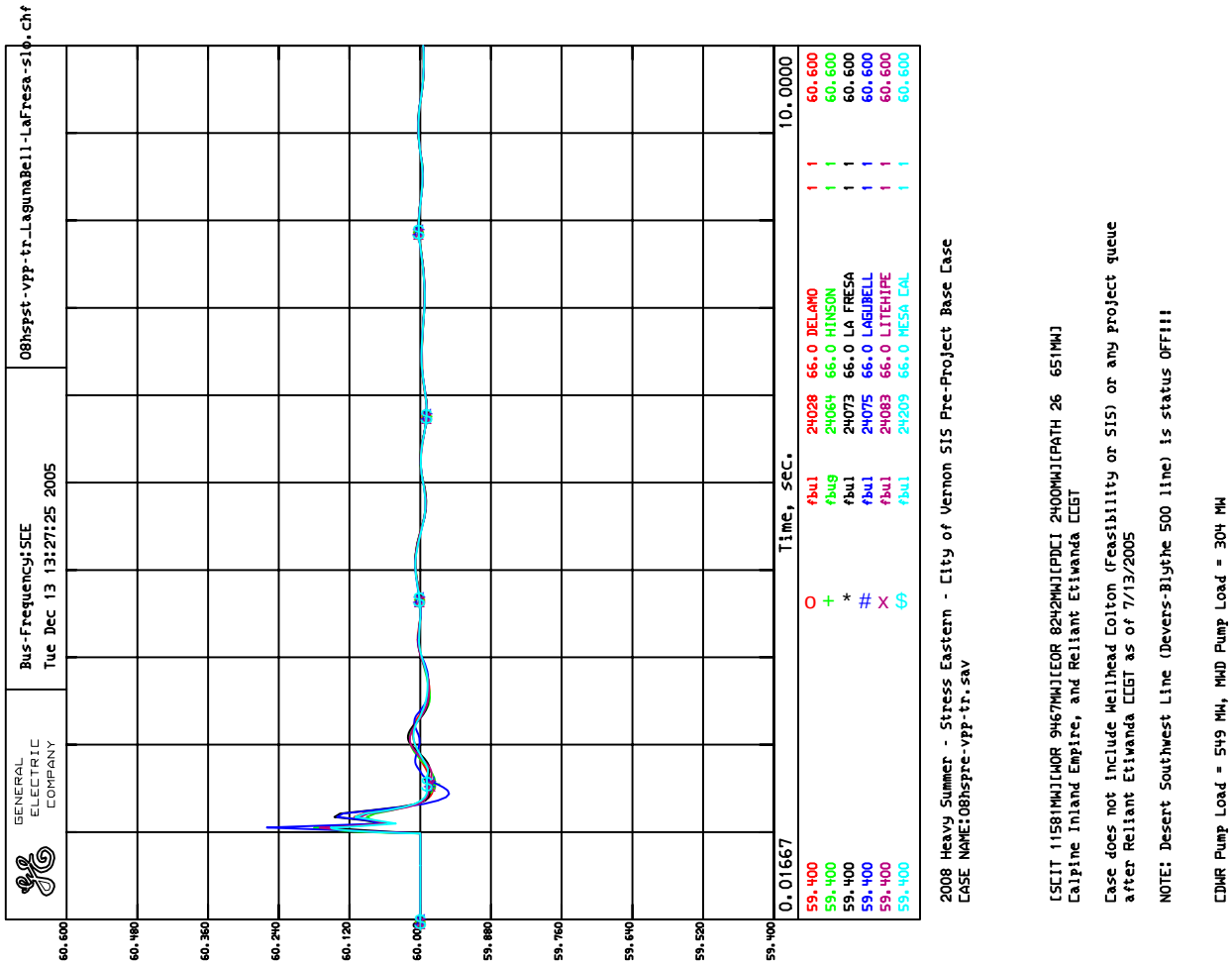
Plot 7 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



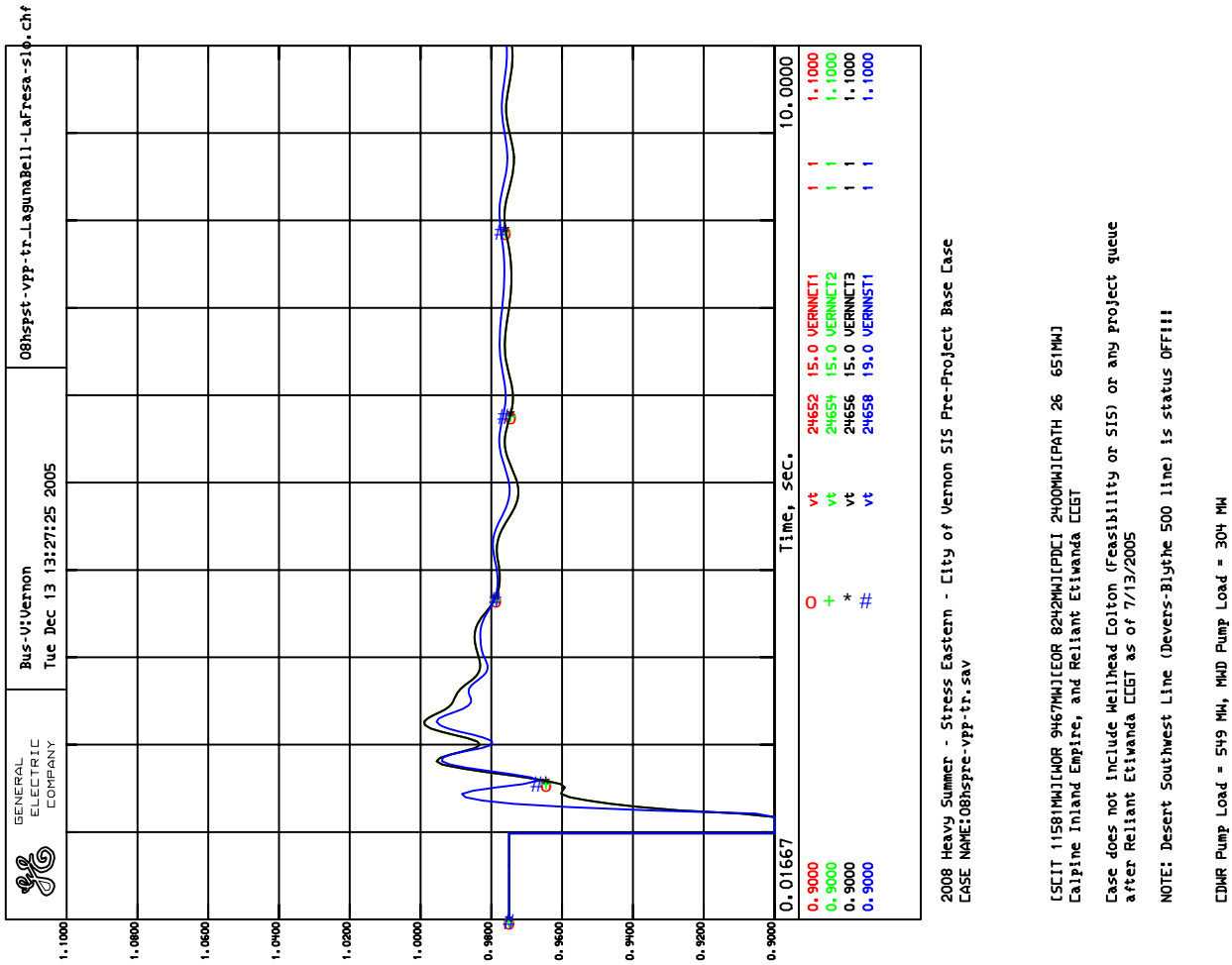
Plot 7 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



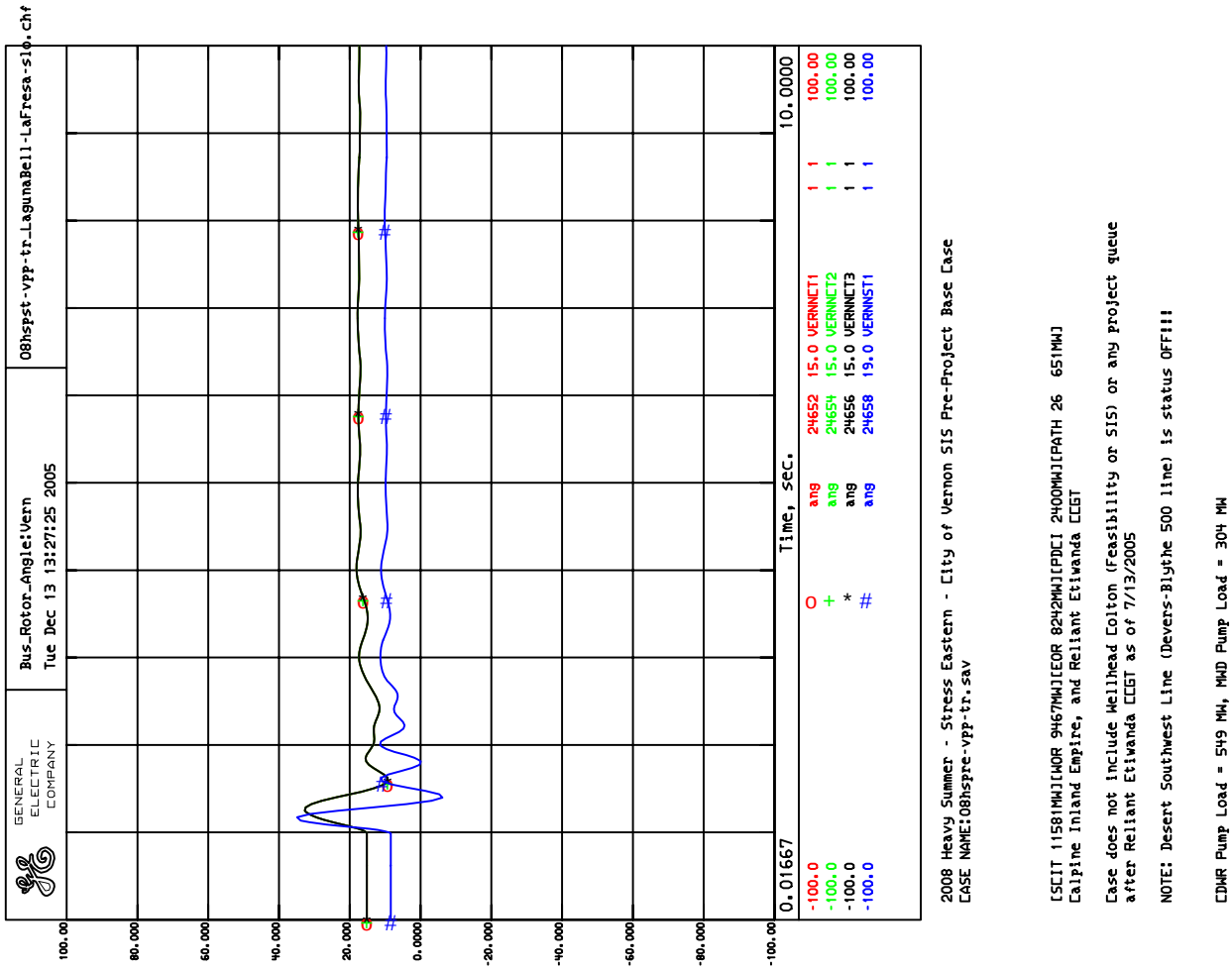
Plot 7 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



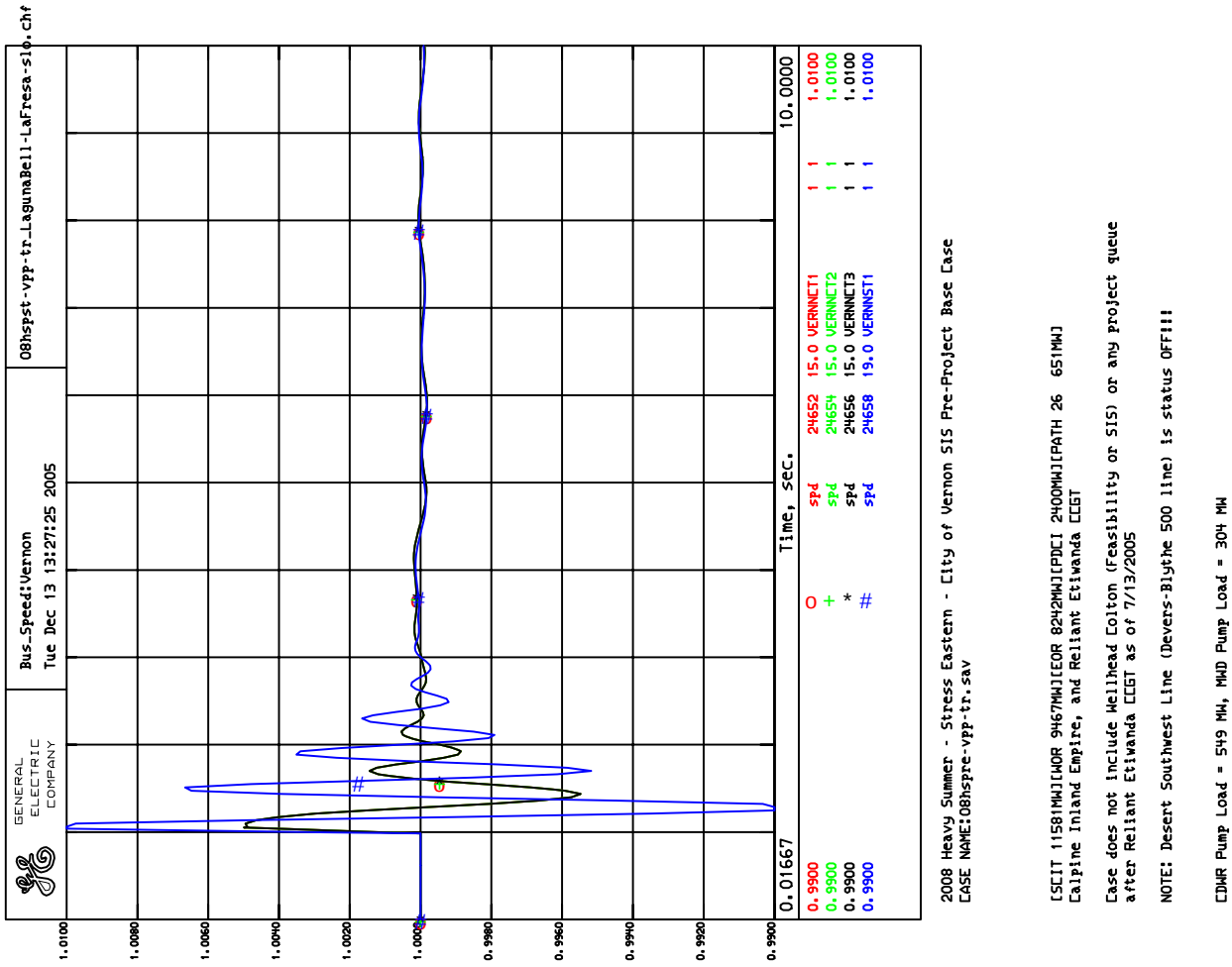
Plot 7 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



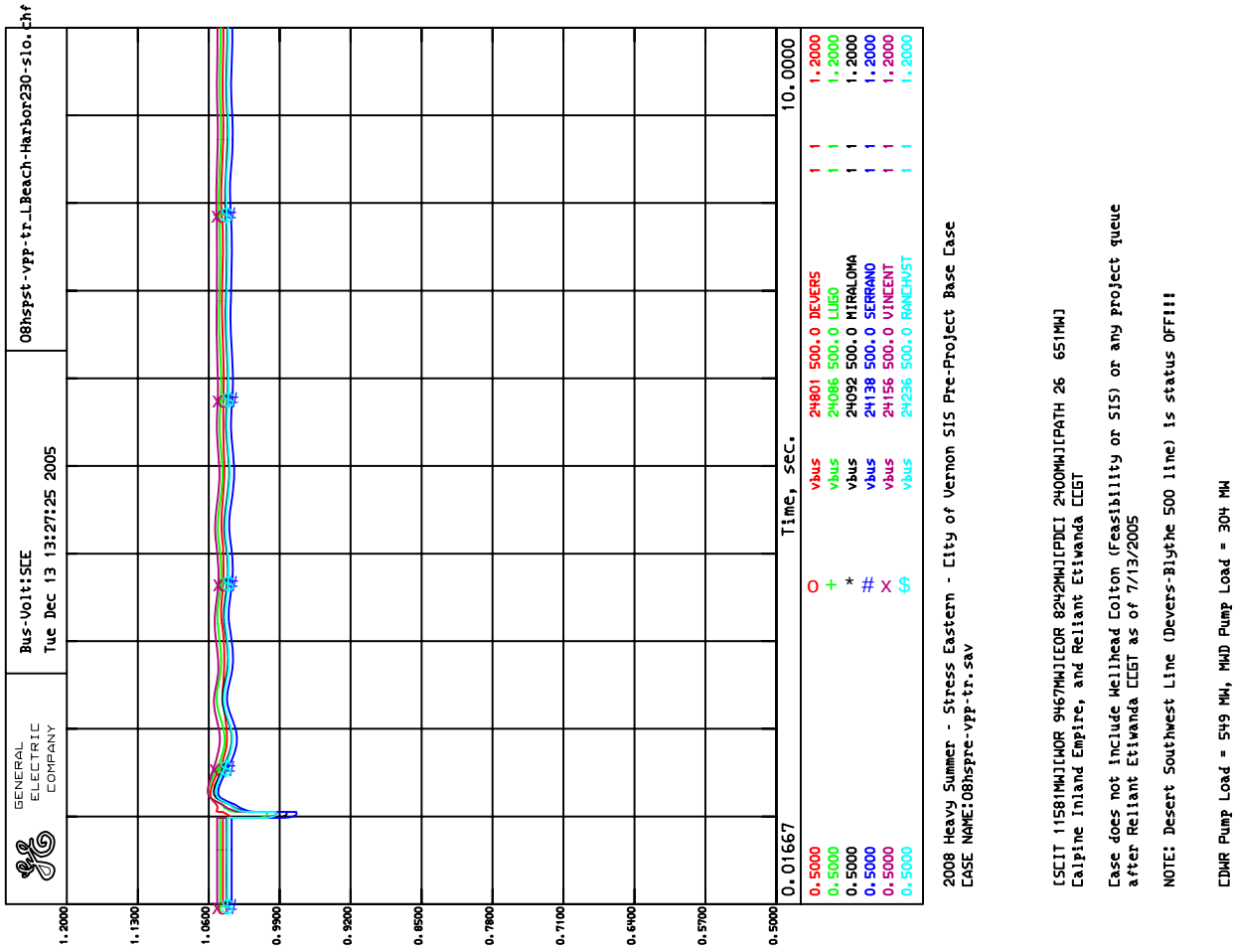
Plot 7 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



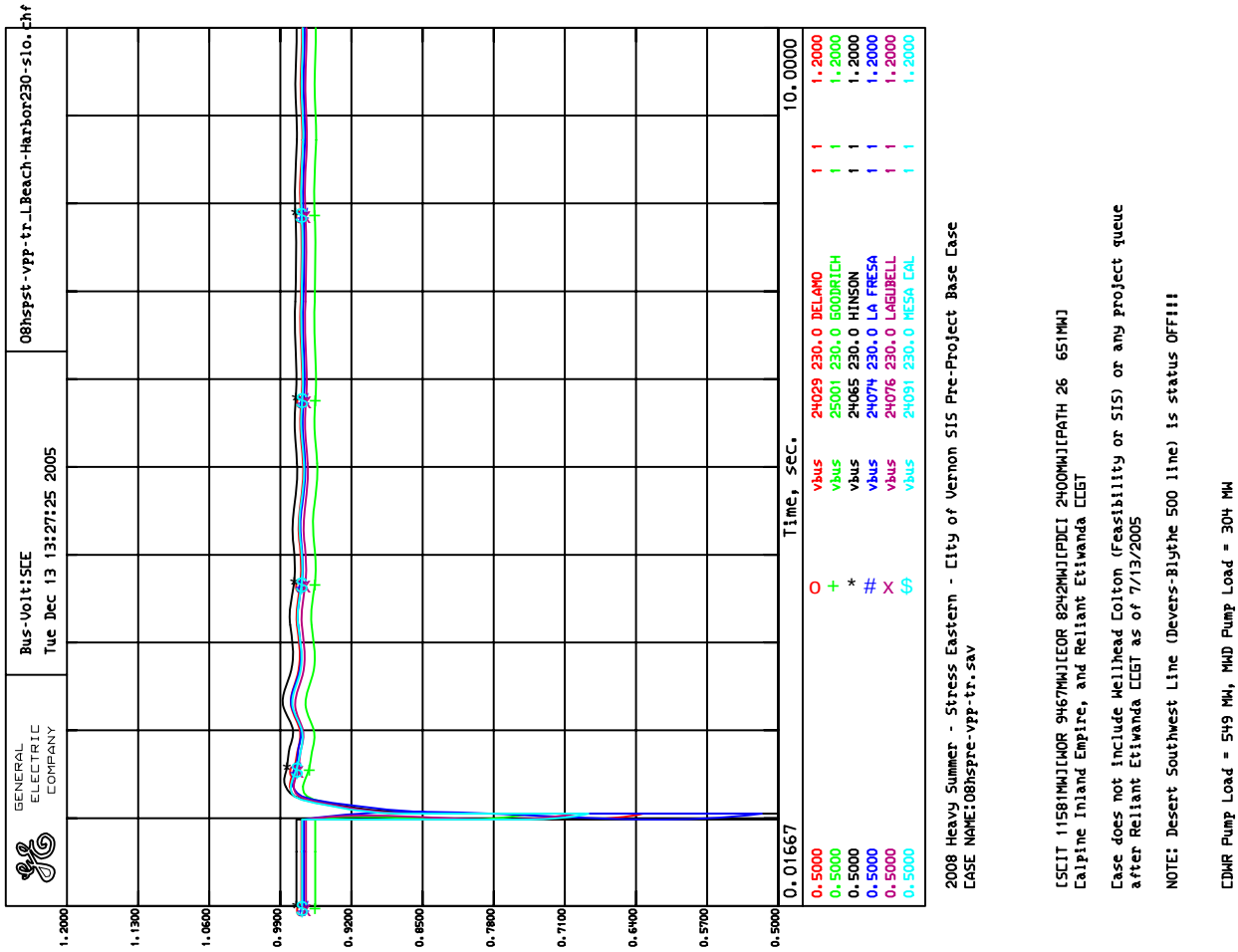
Plot 7 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



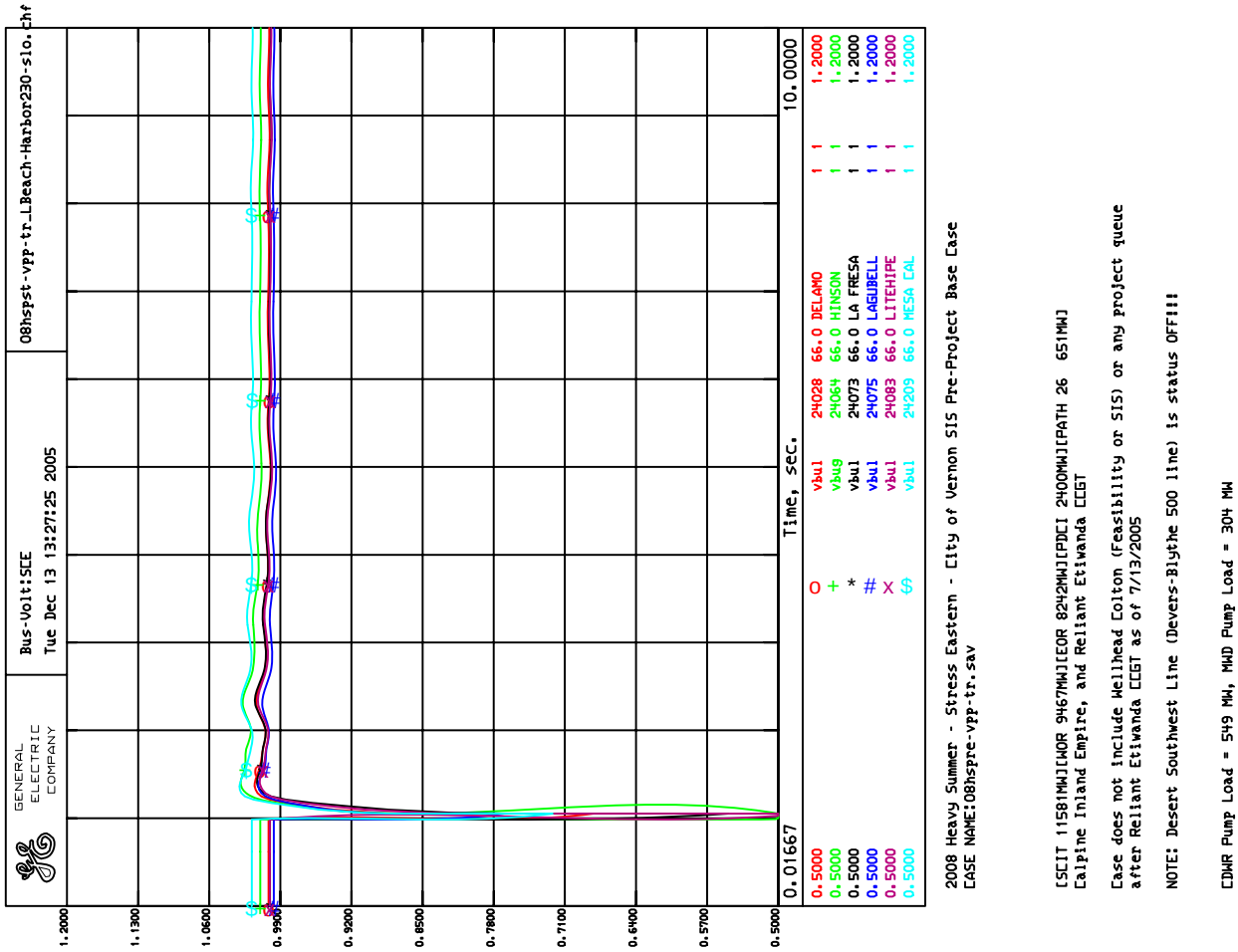
Plot 8 - 1: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



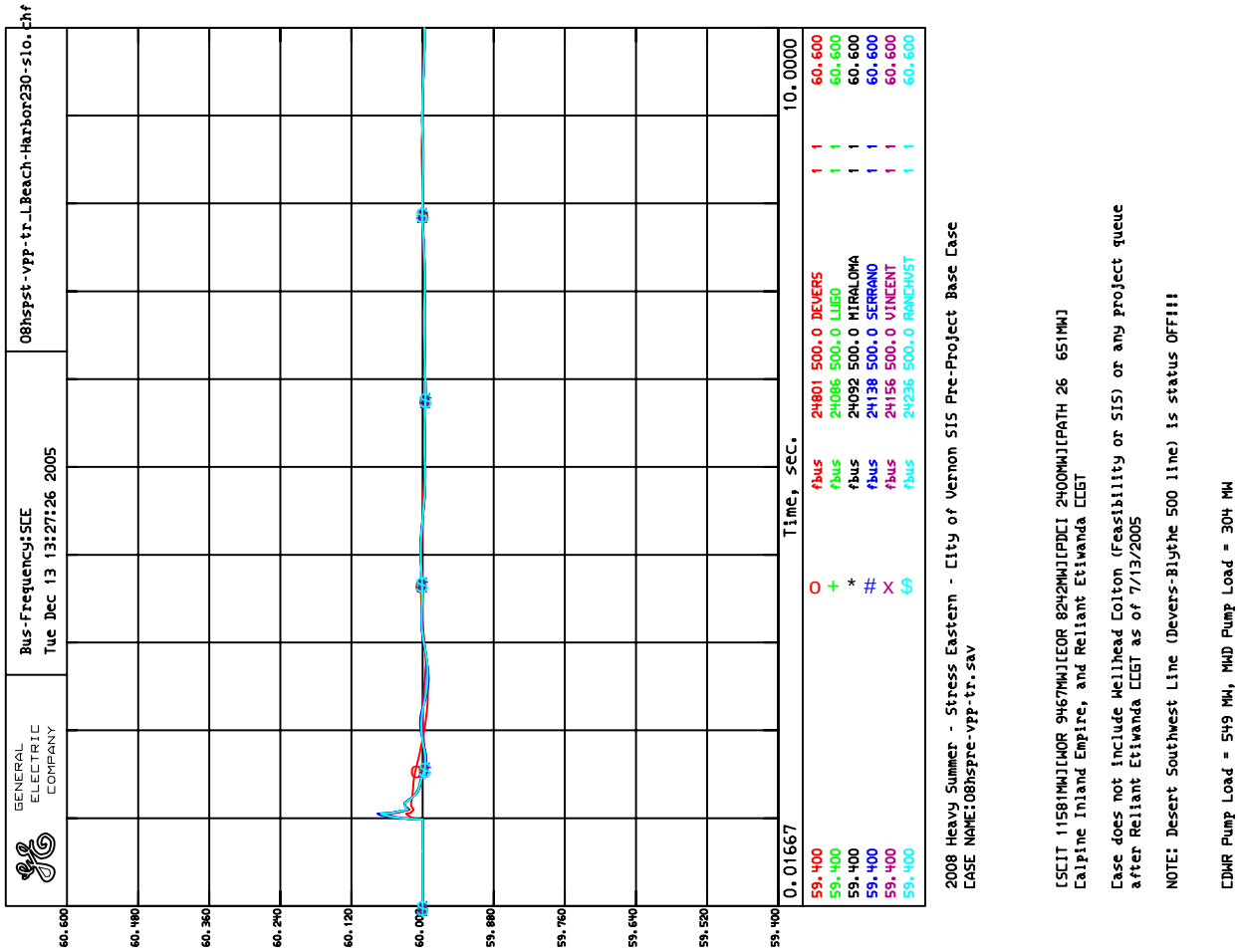
Plot 8 - 2: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



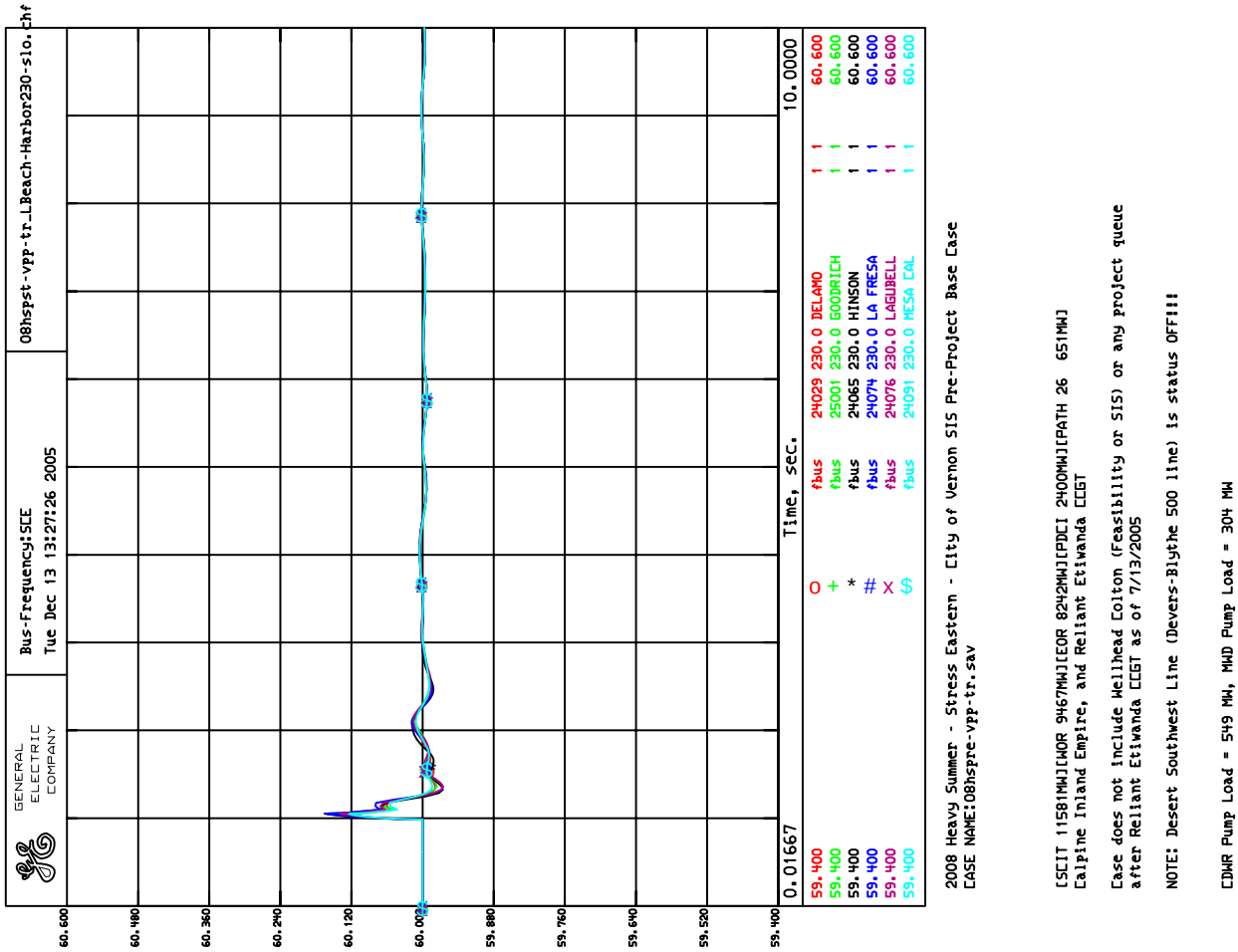
Plot 8 - 3: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



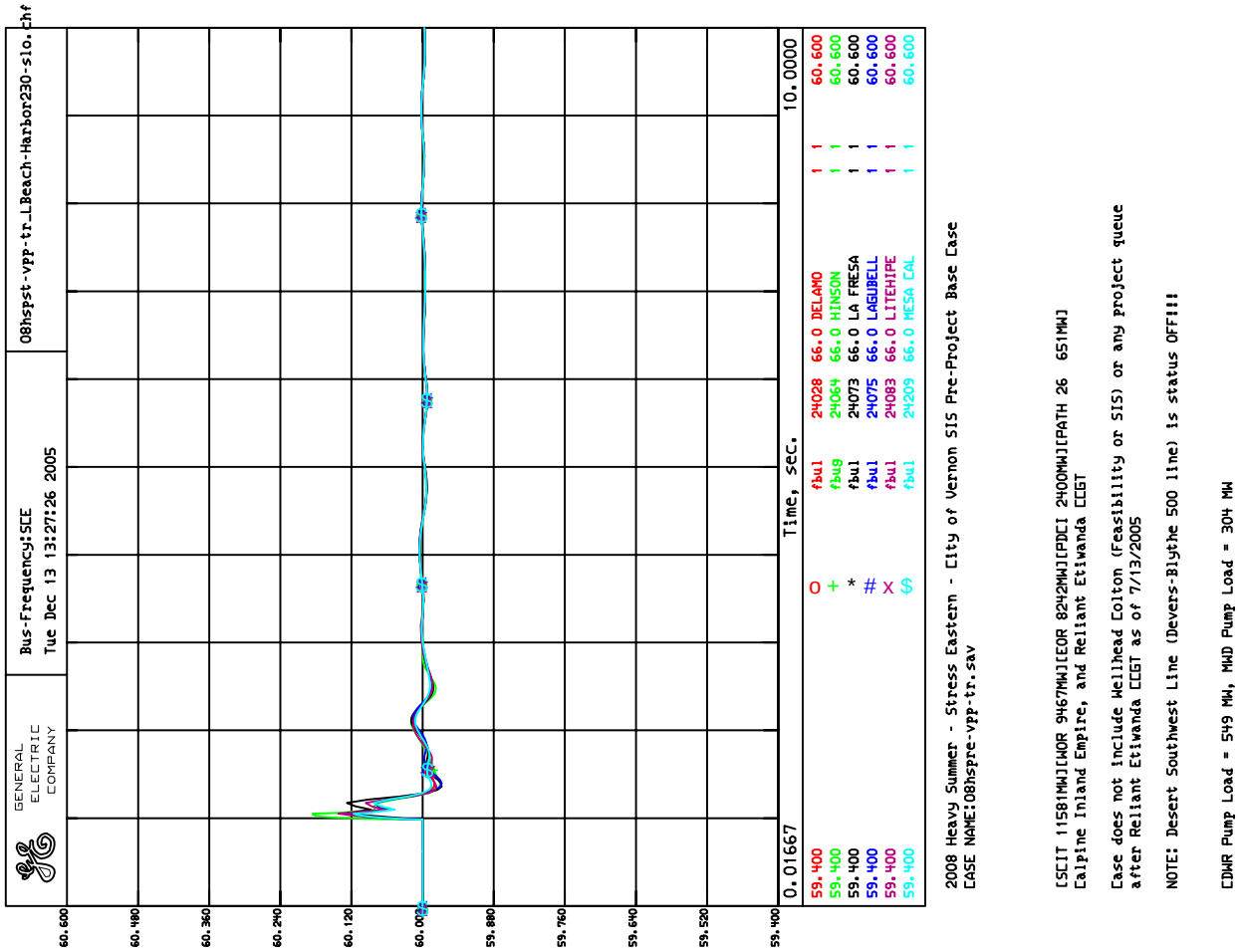
Plot 8 - 4: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



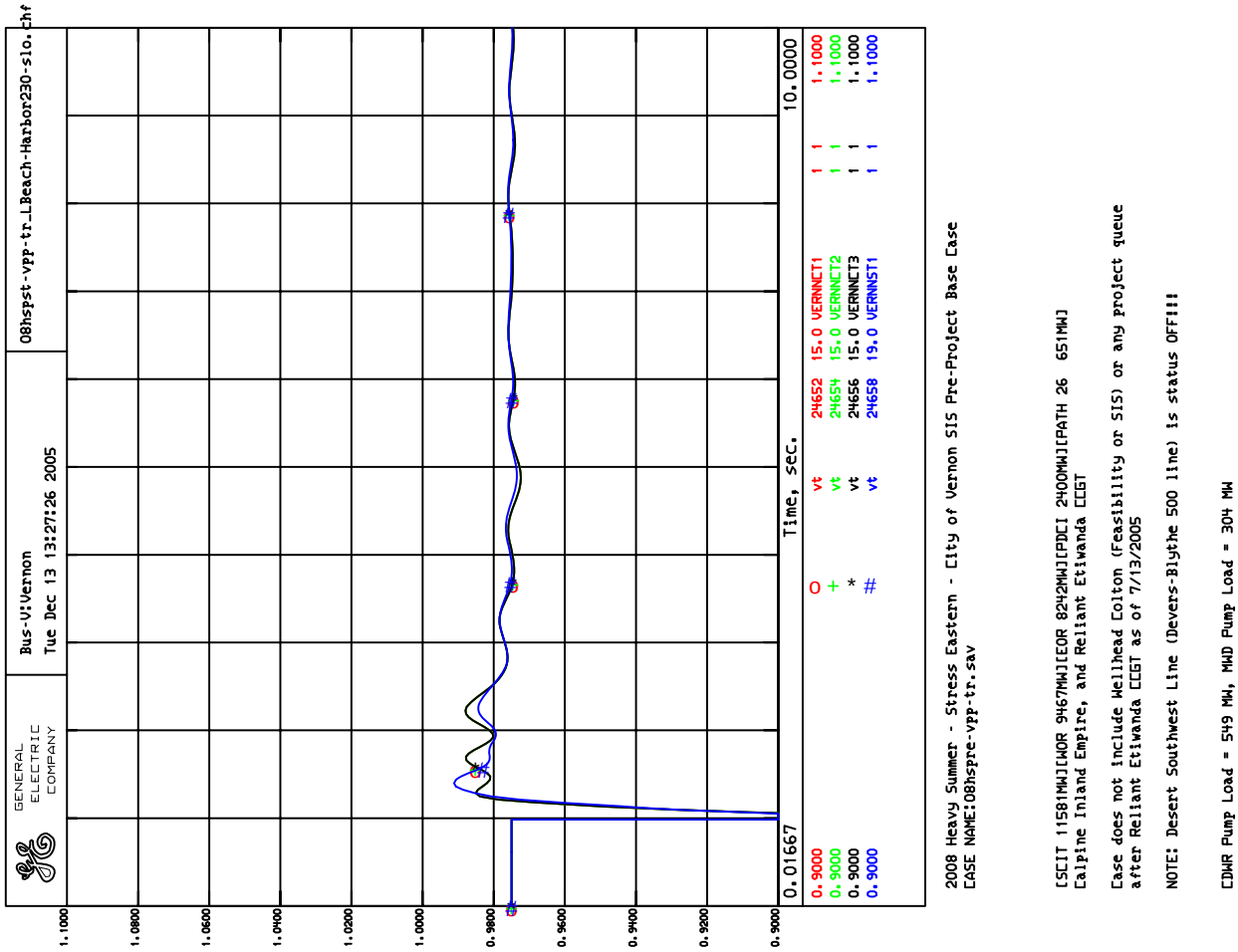
Plot 8 - 5: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



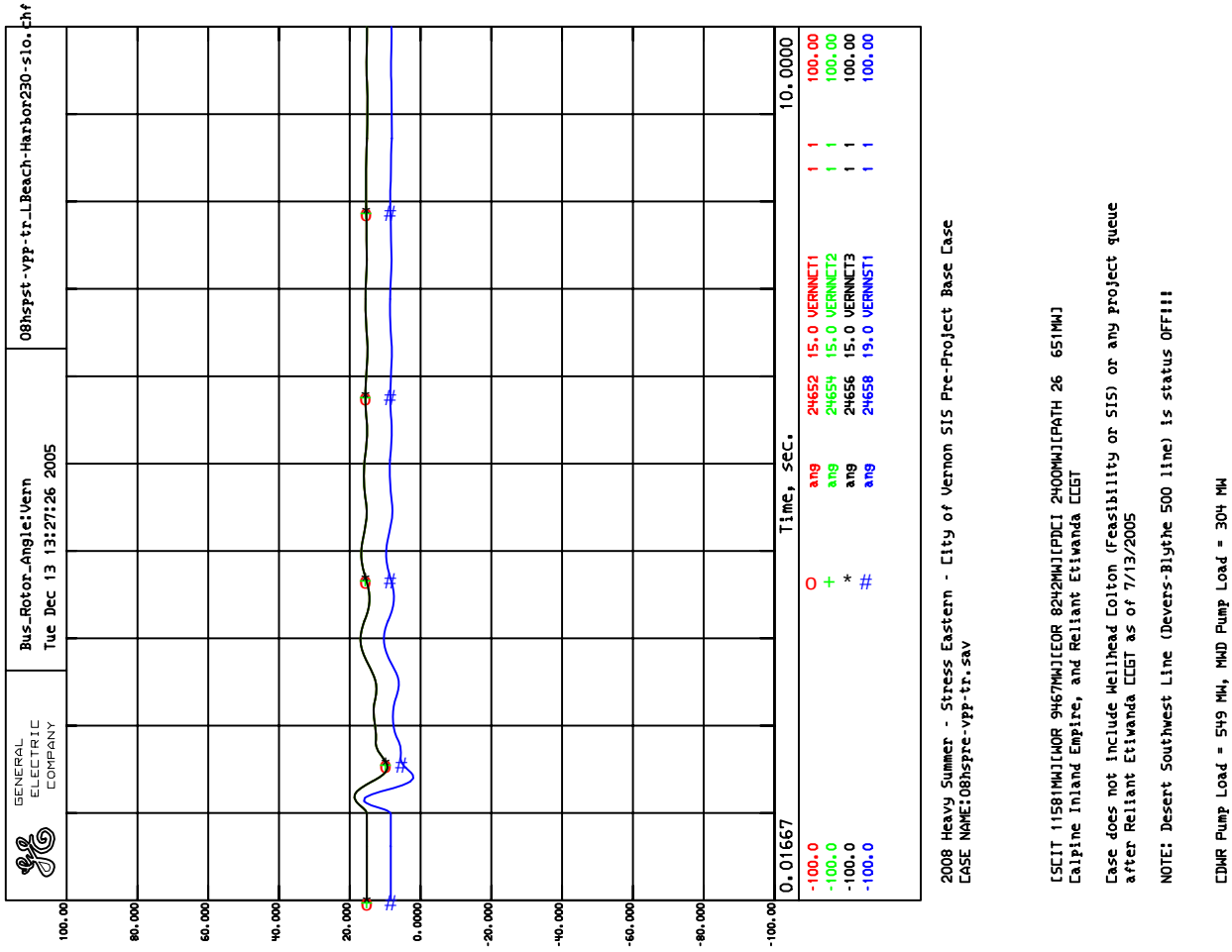
Plot 8 - 6: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



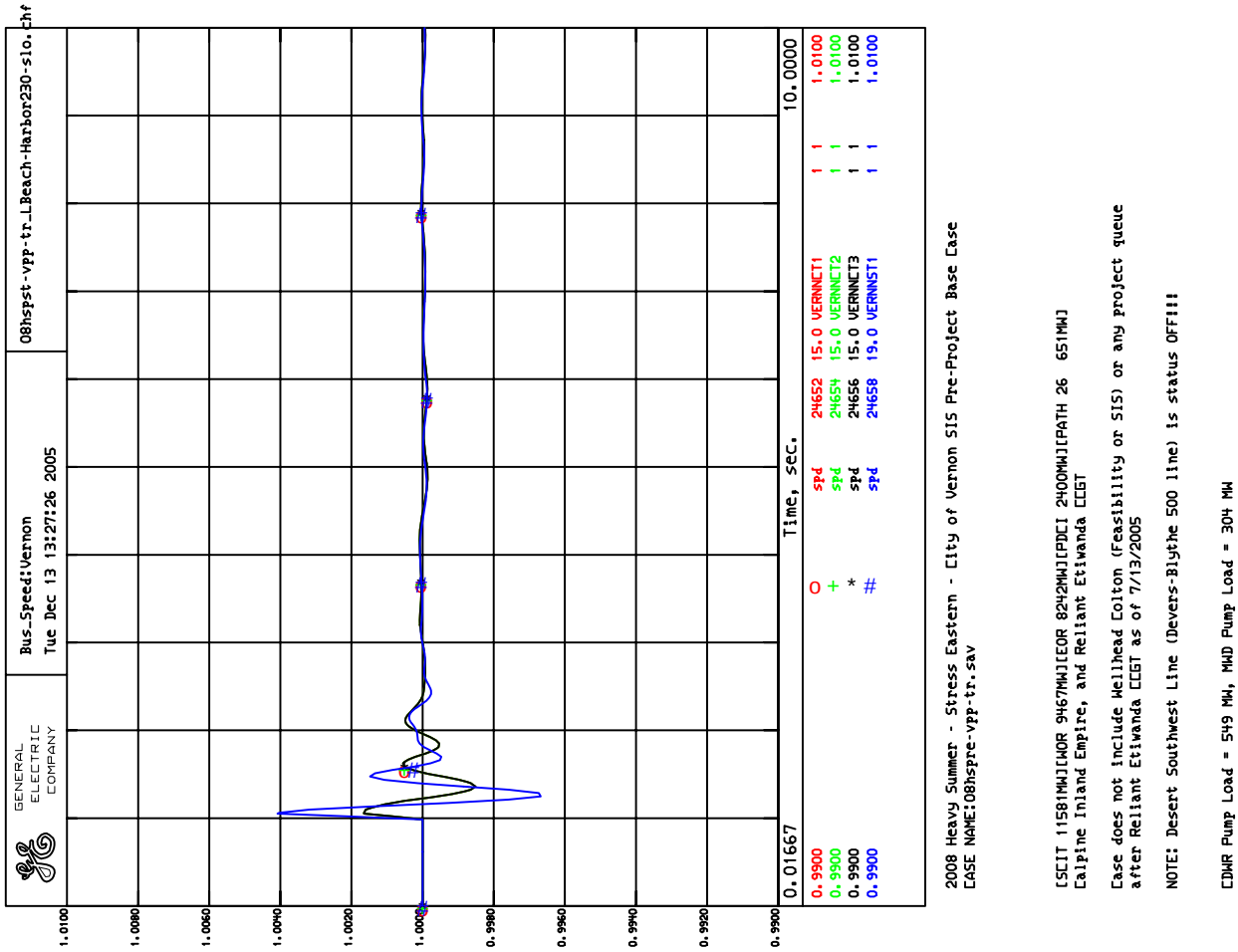
Plot 8 - 7: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



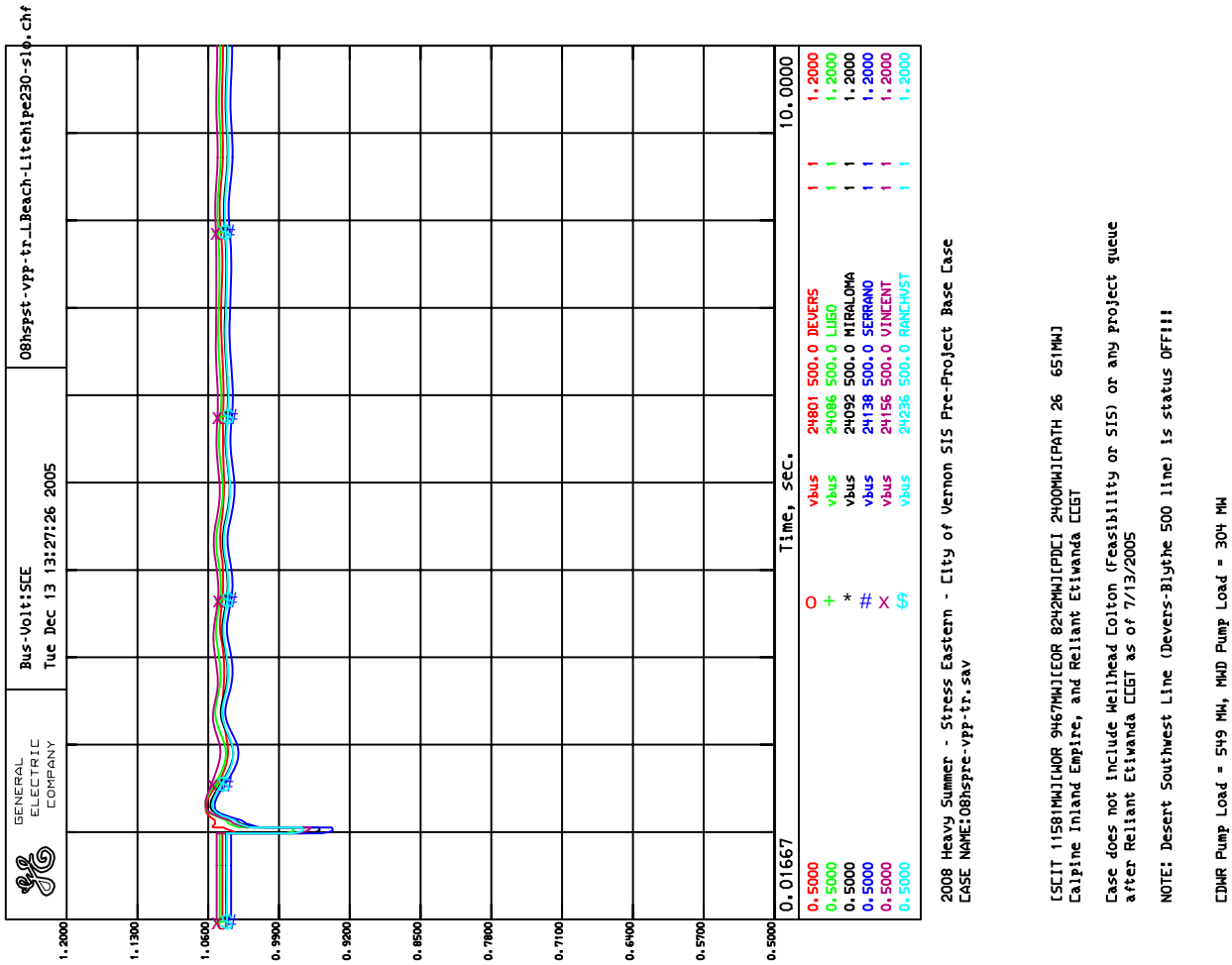
Plot 8 - 8: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



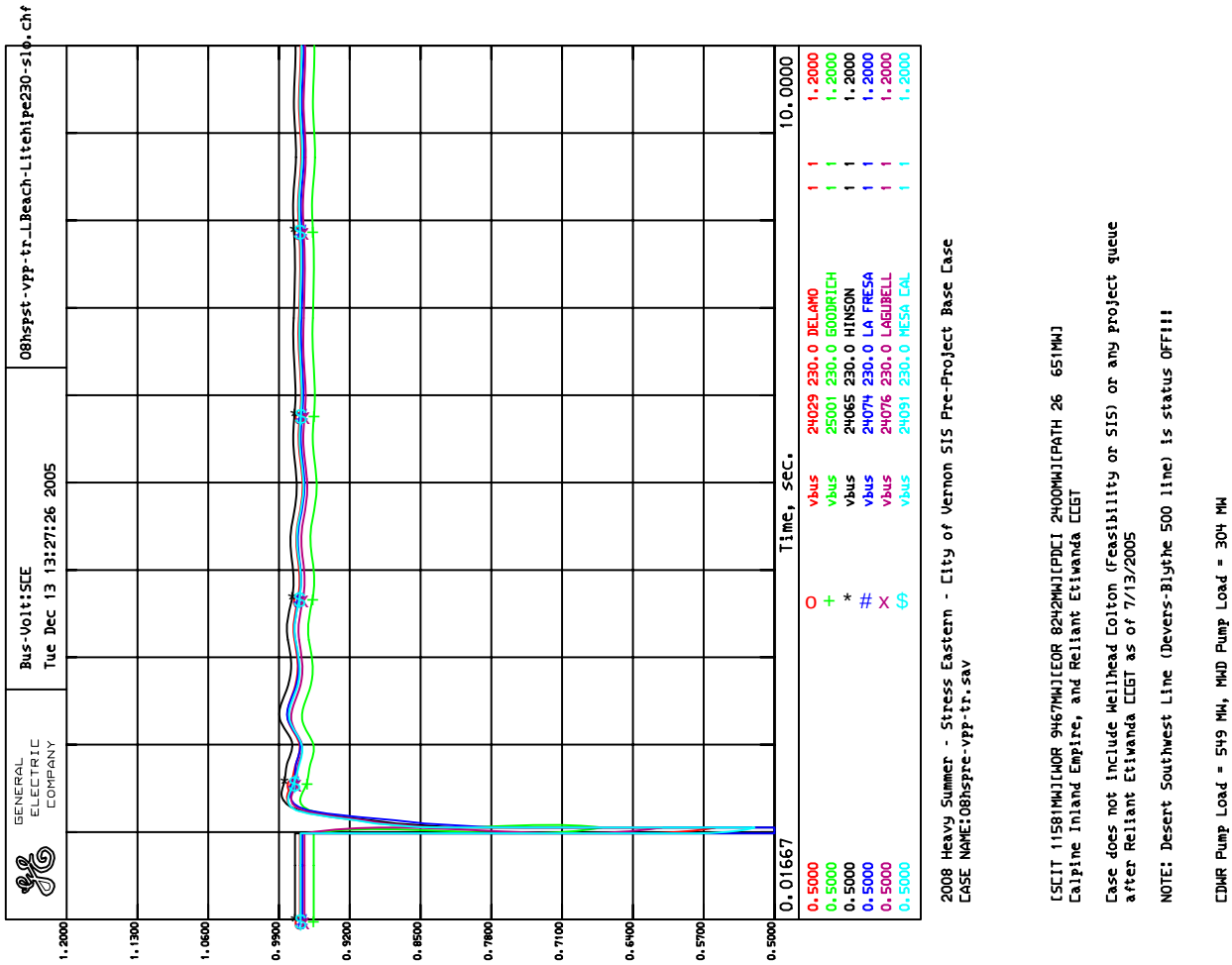
Plot 8 - 9: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



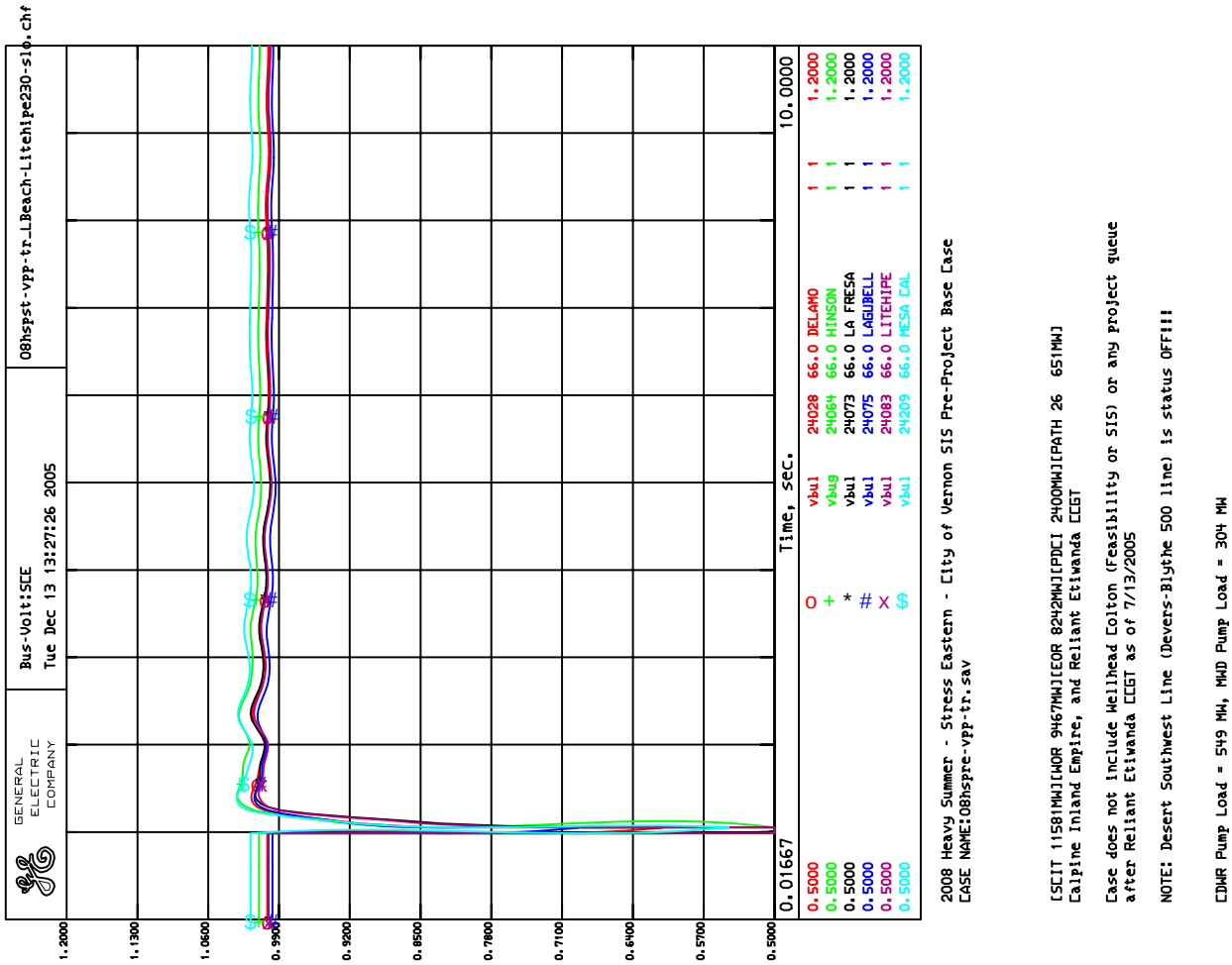
Plot 9 - 1: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



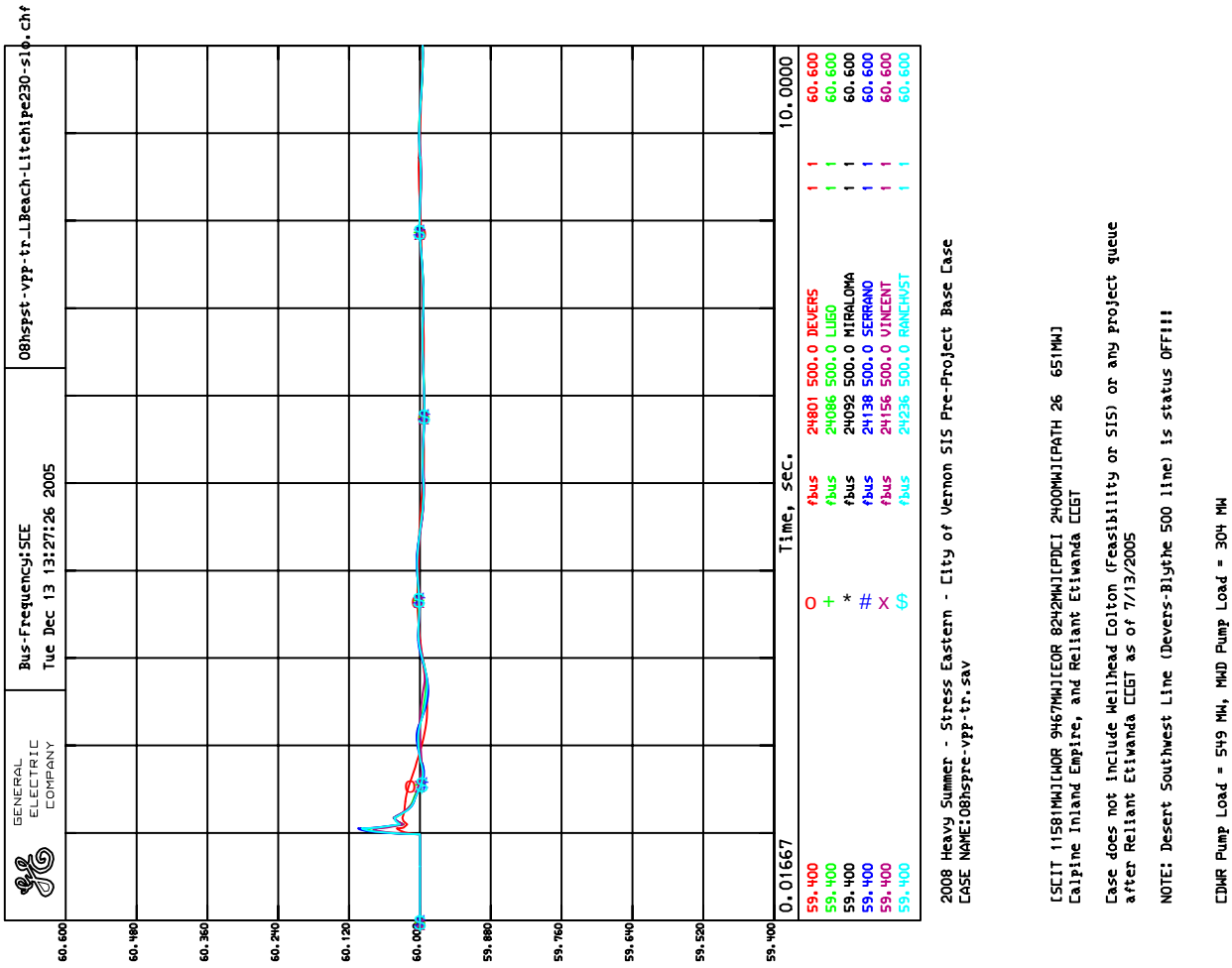
Plot 9 - 2: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



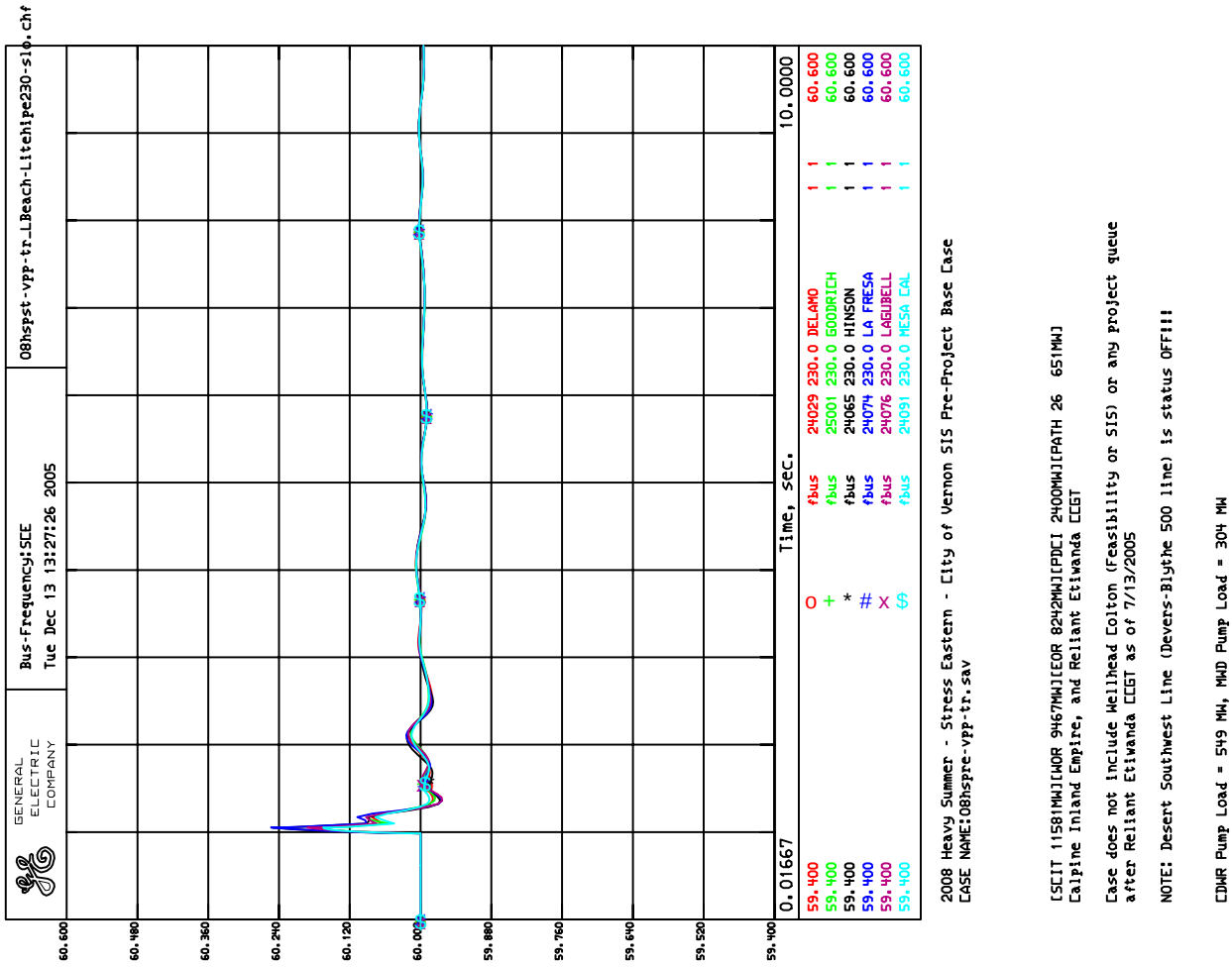
Plot 9 - 3: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



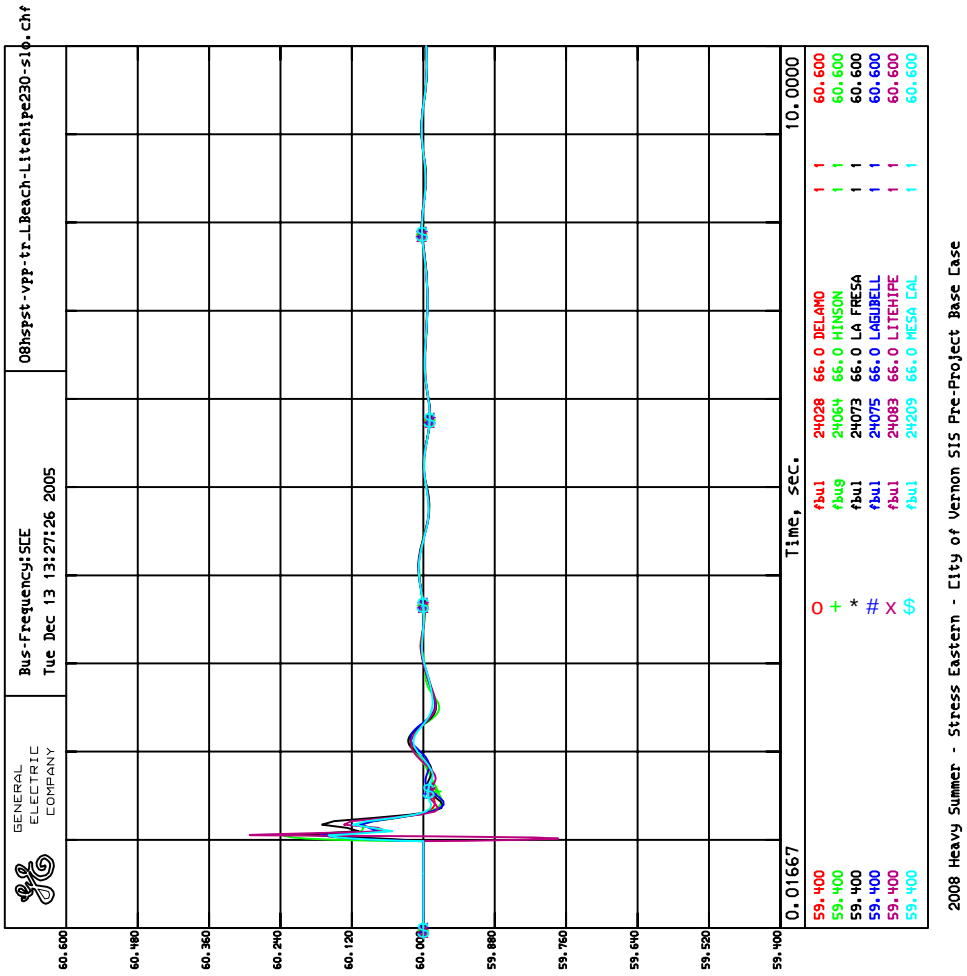
Plot 9 - 4: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



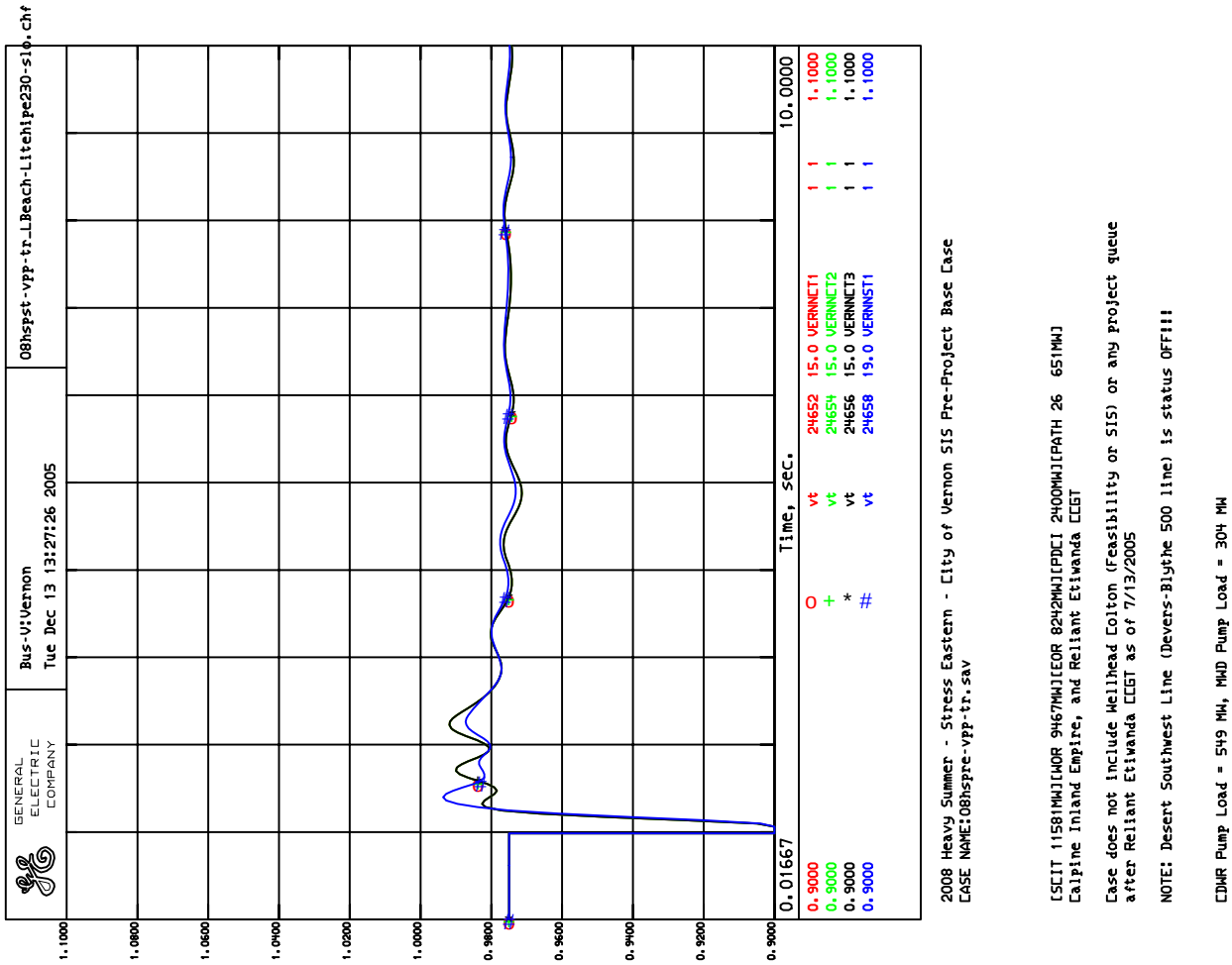
Plot 9 - 5: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



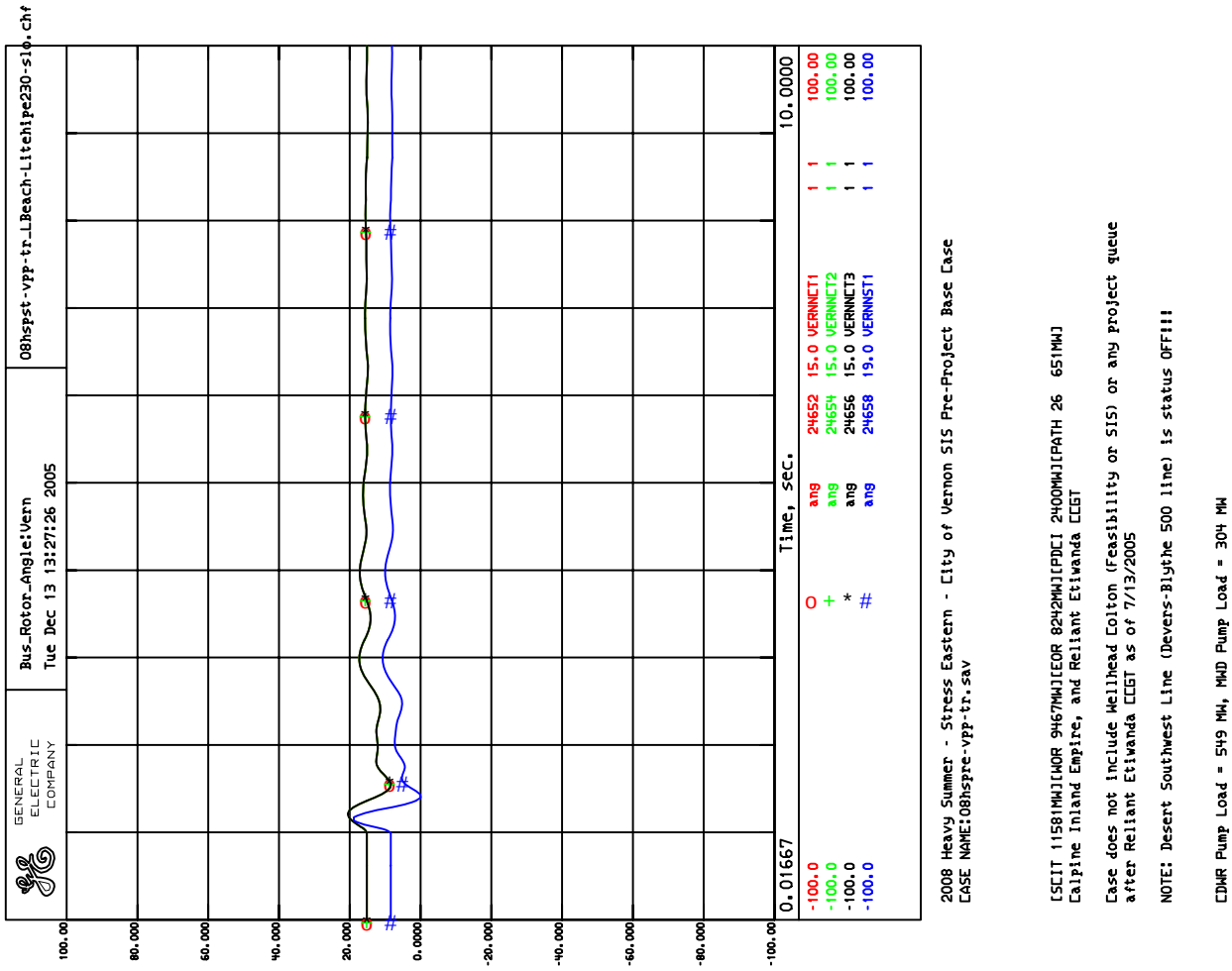
Plot 9 – 6: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



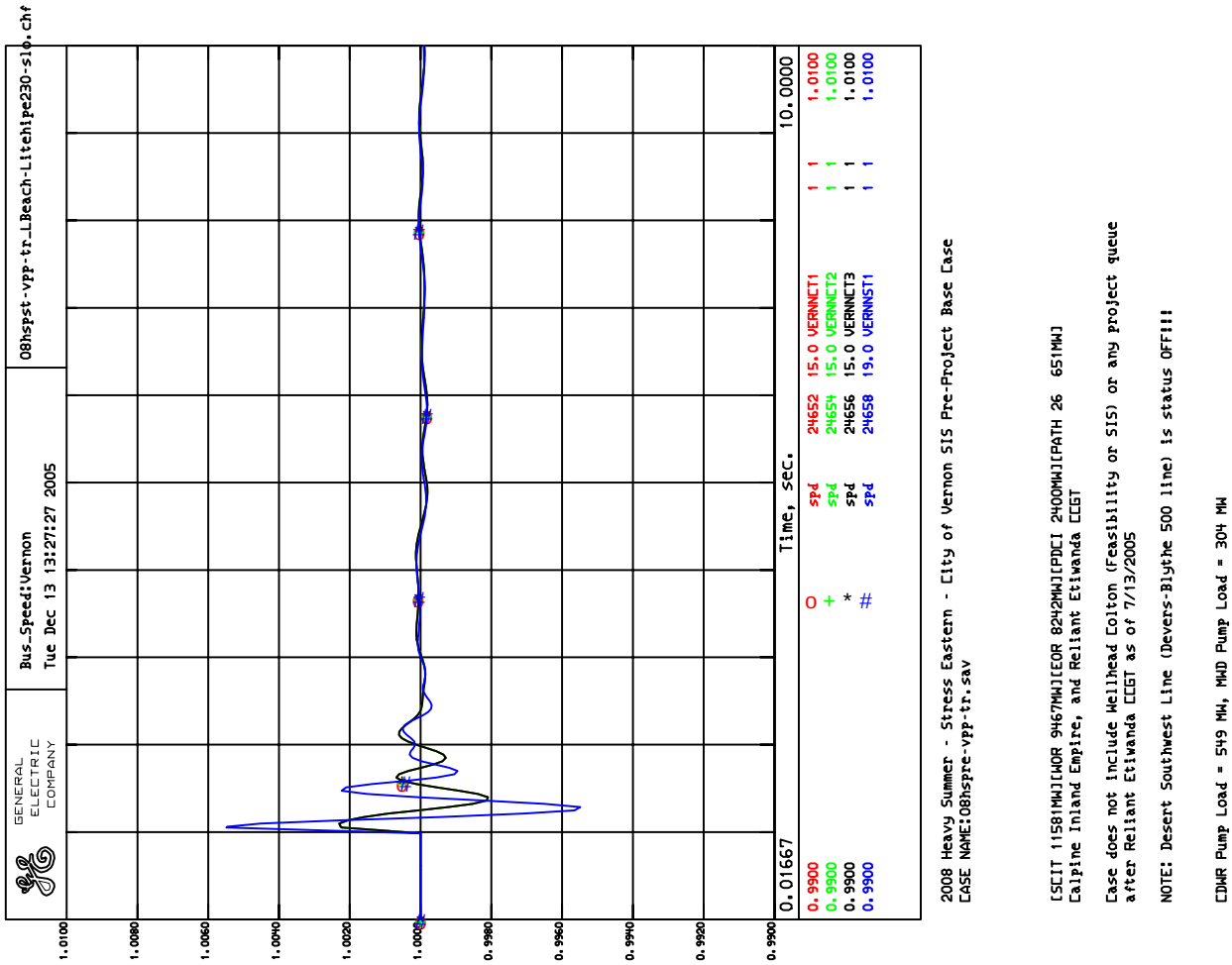
Plot 9 - 7: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



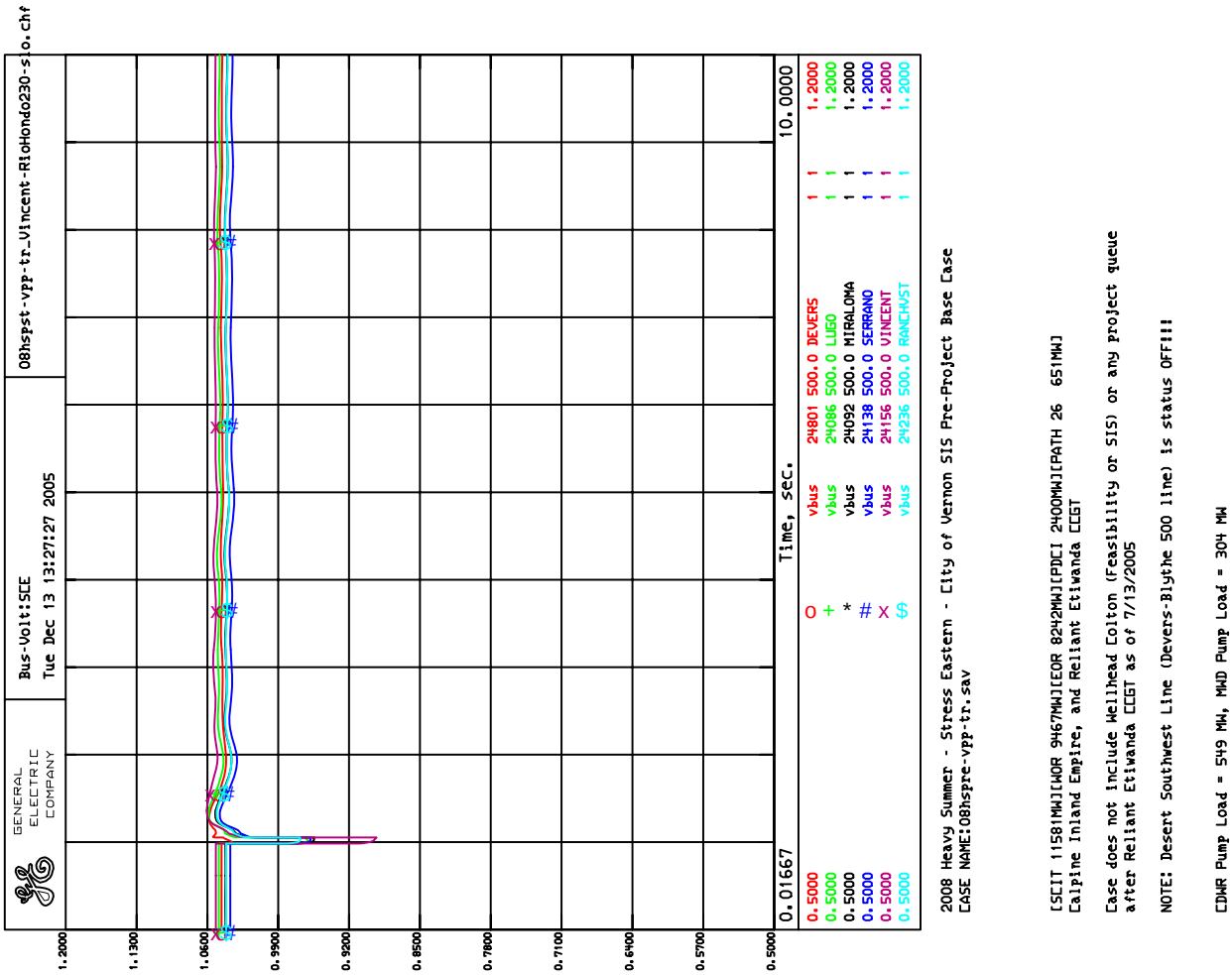
Plot 9 - 8: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



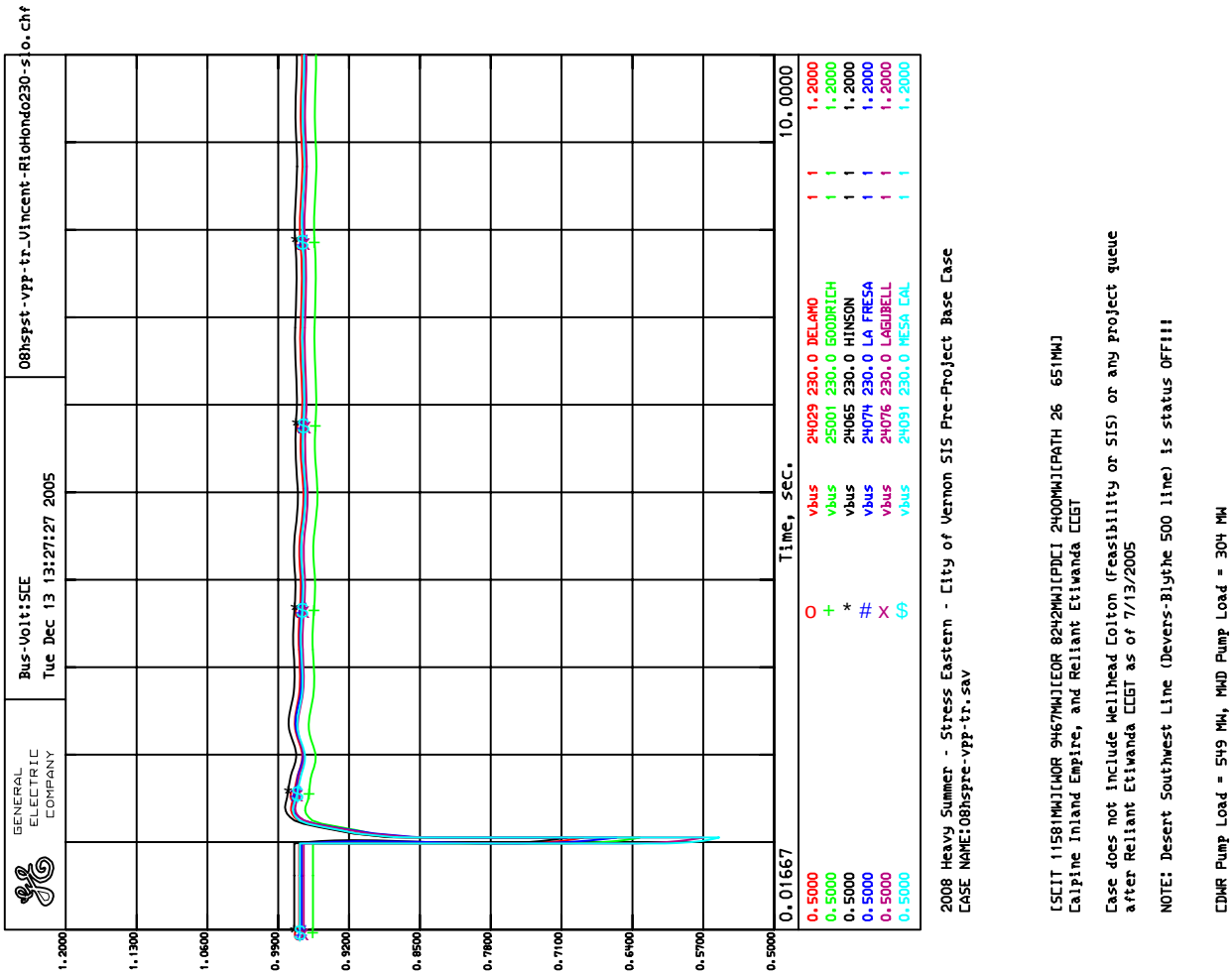
Plot 9 - 9: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



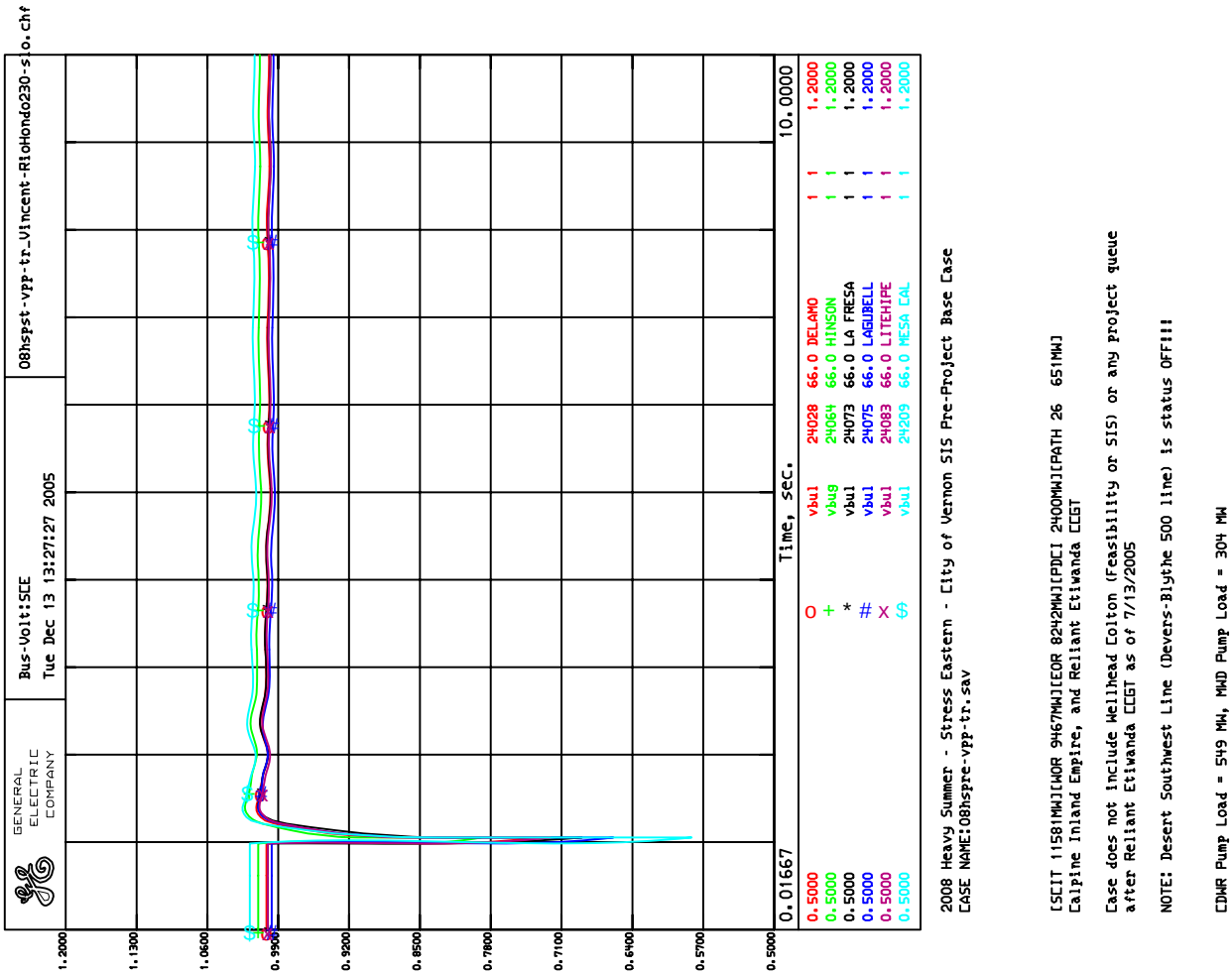
Plot 10 - 1: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



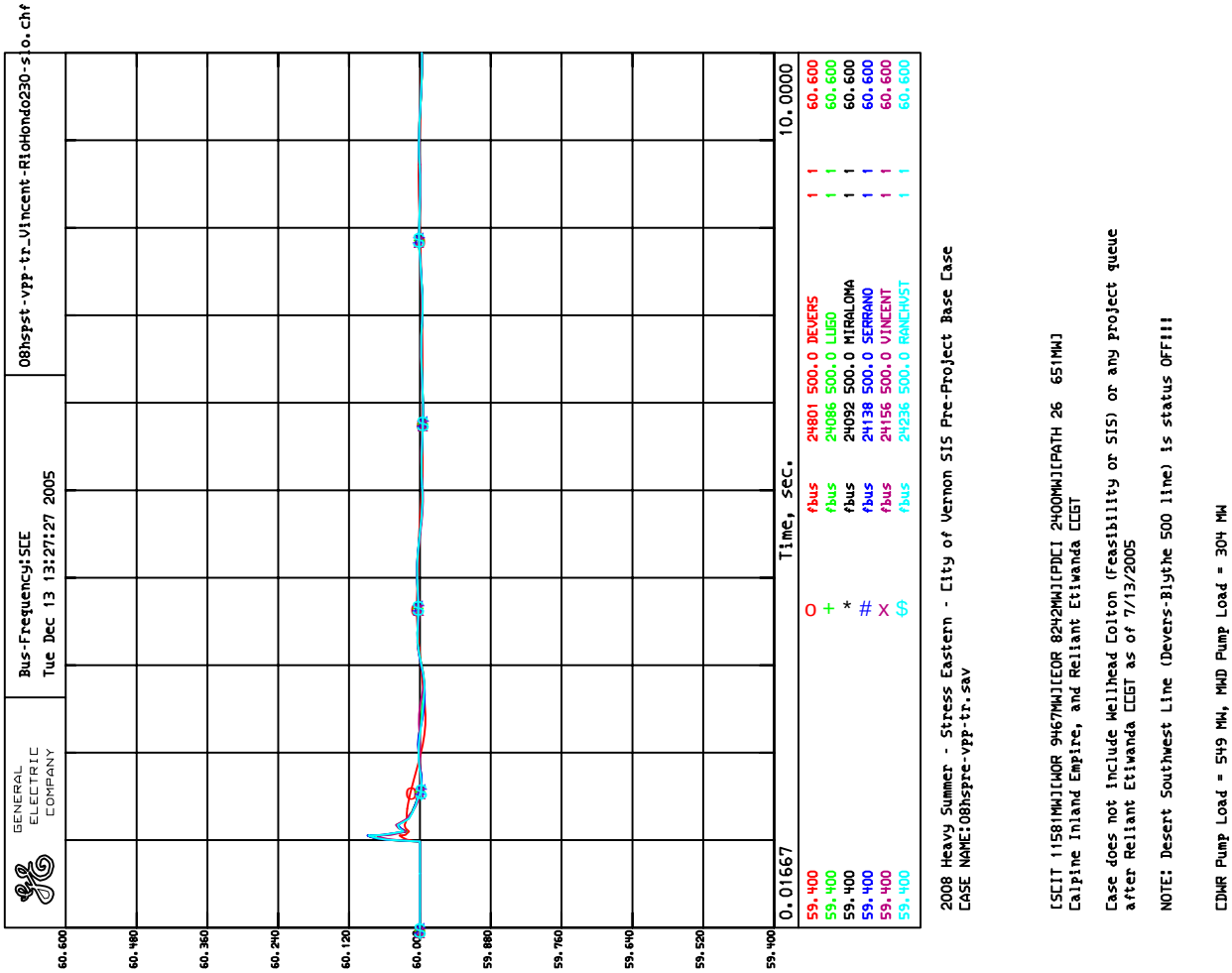
Plot 10 - 2: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



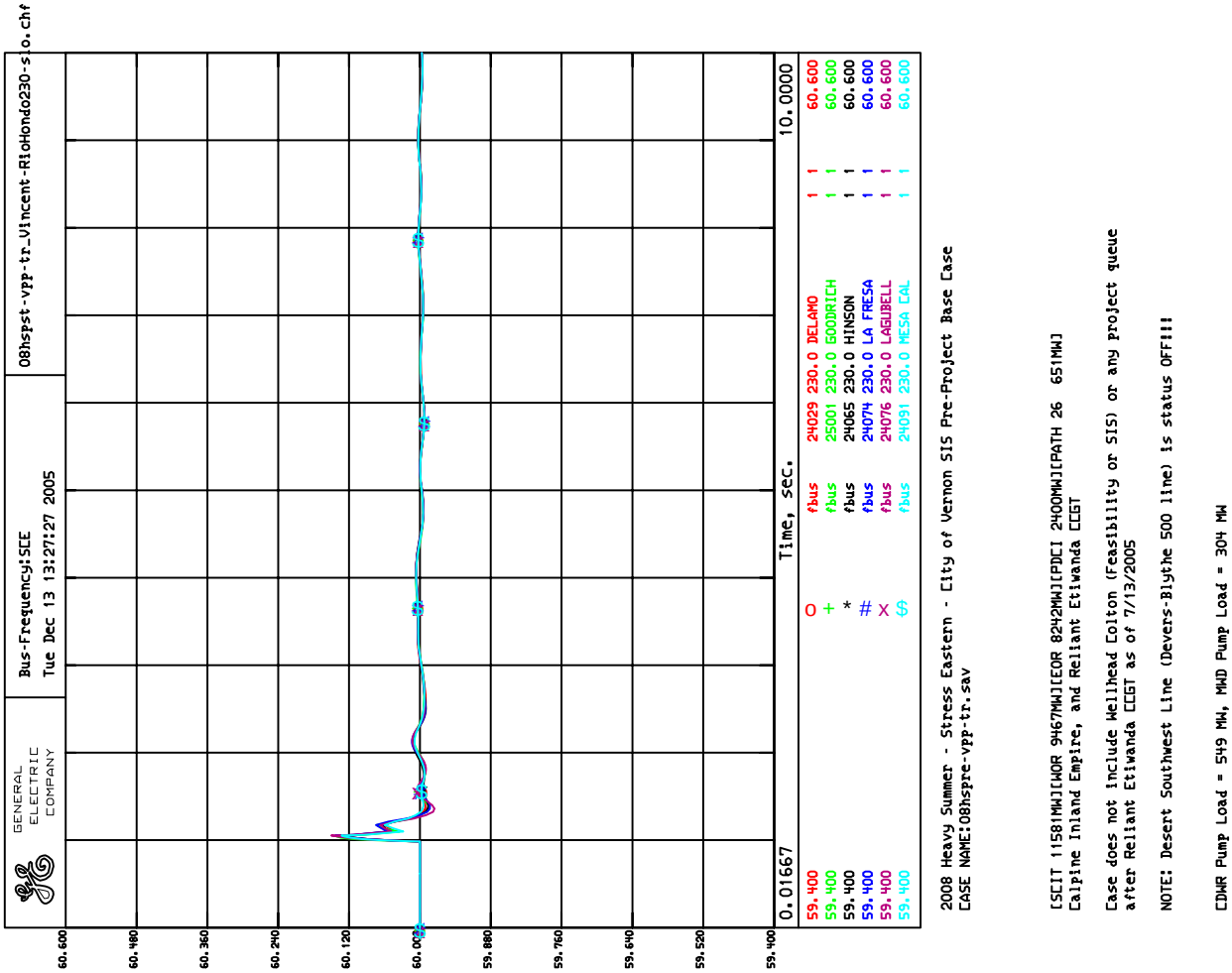
Plot 10 - 3: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



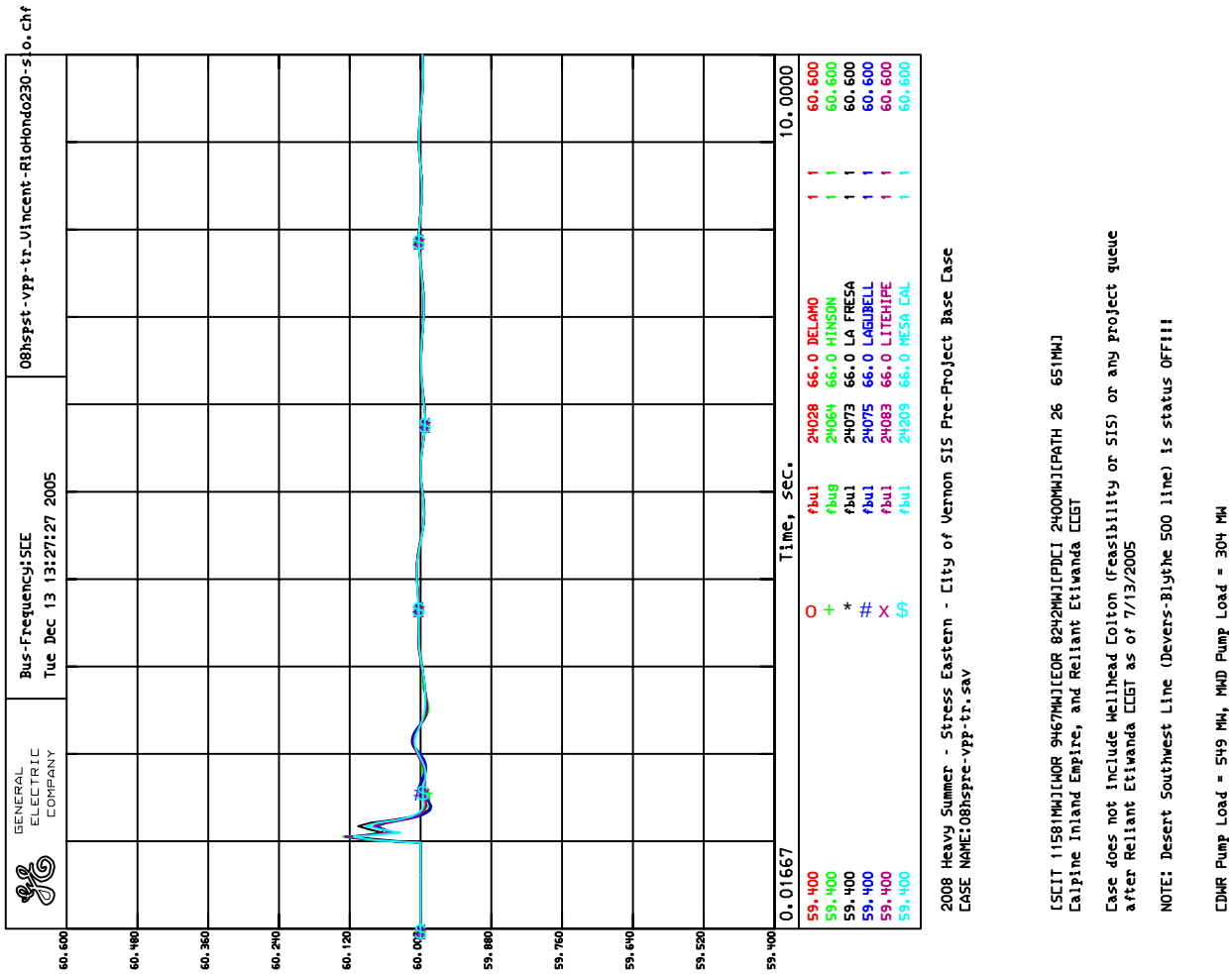
Plot 10 - 4: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



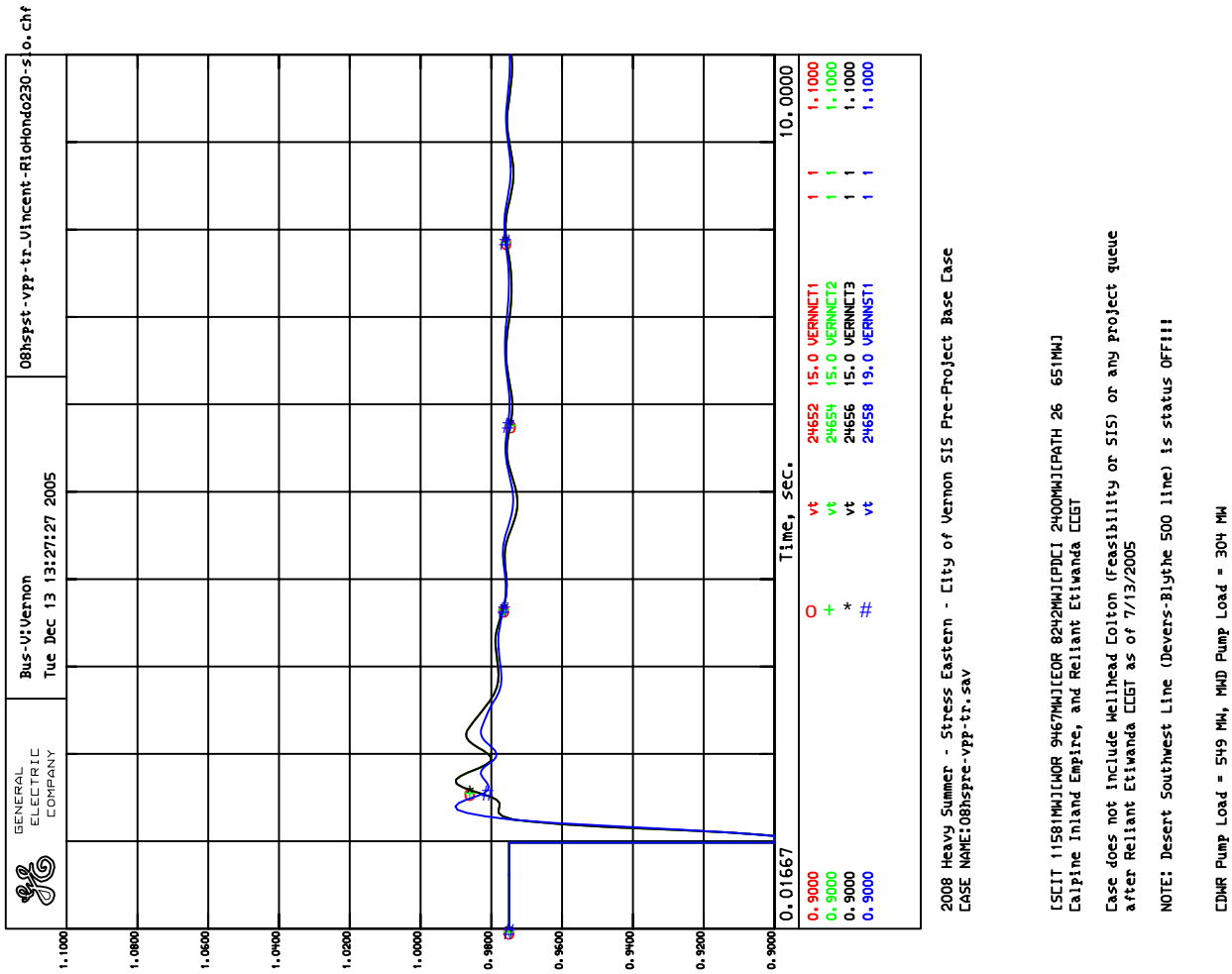
Plot 10 - 5: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



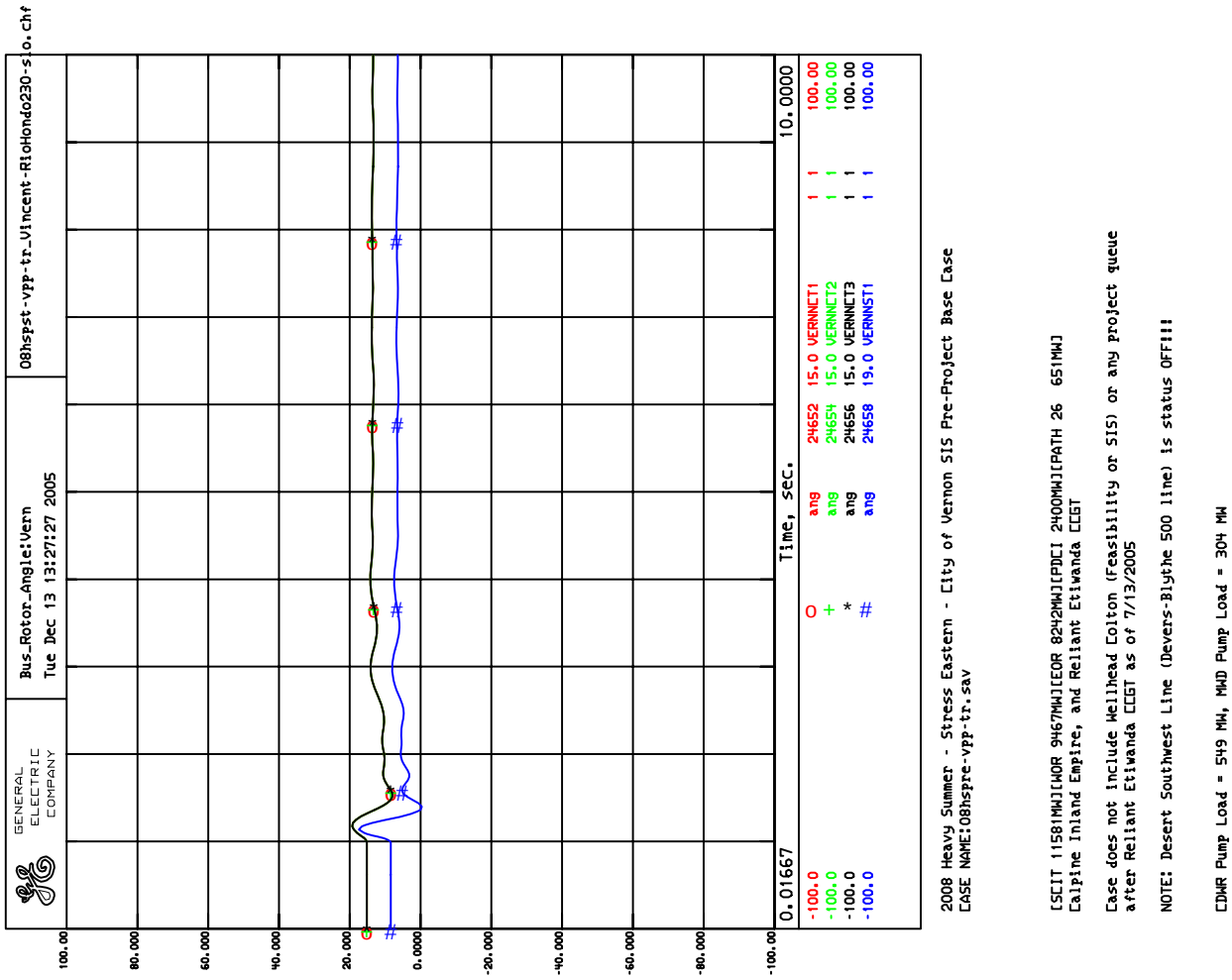
Plot 10 - 6: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



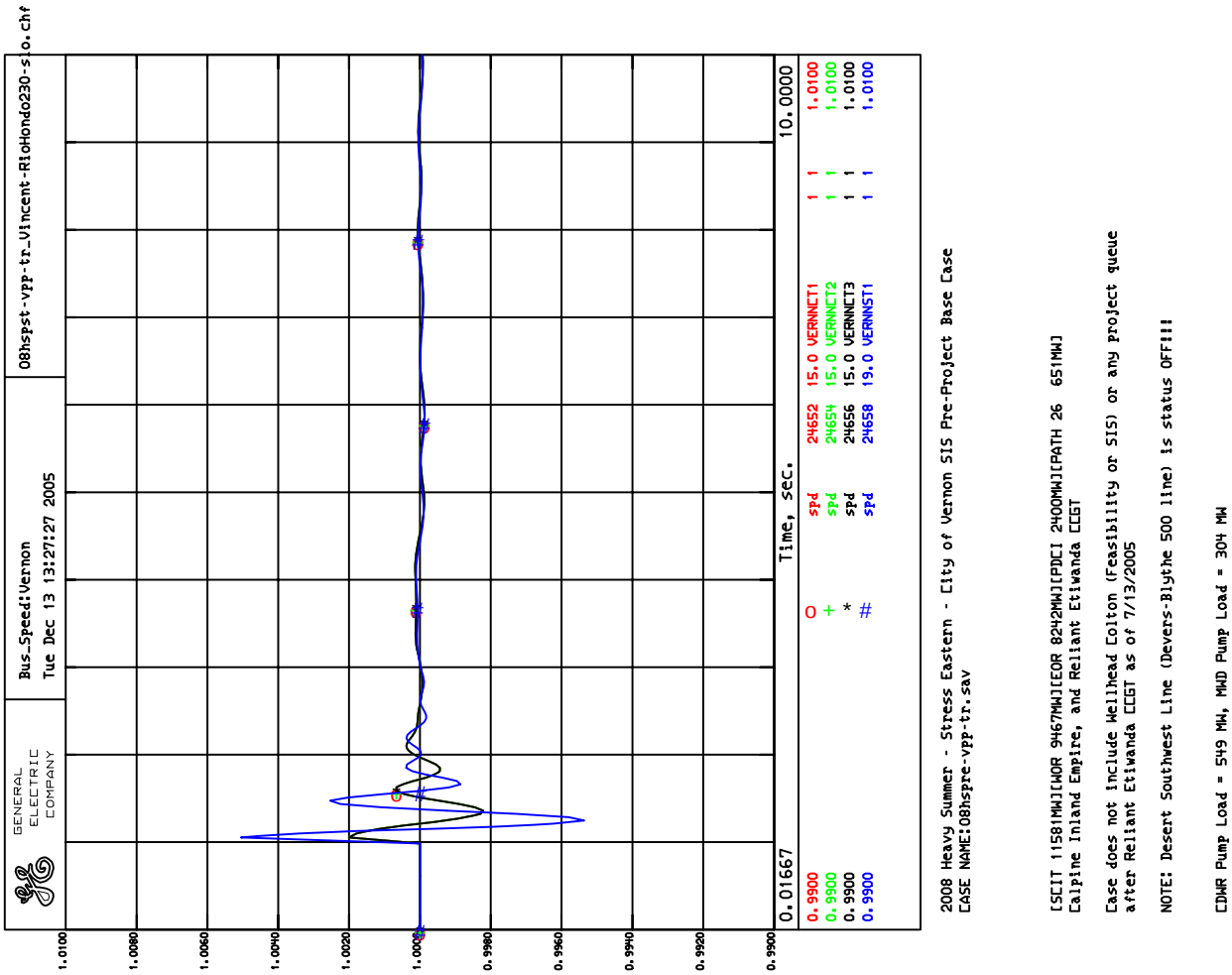
Plot 10 - 7: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



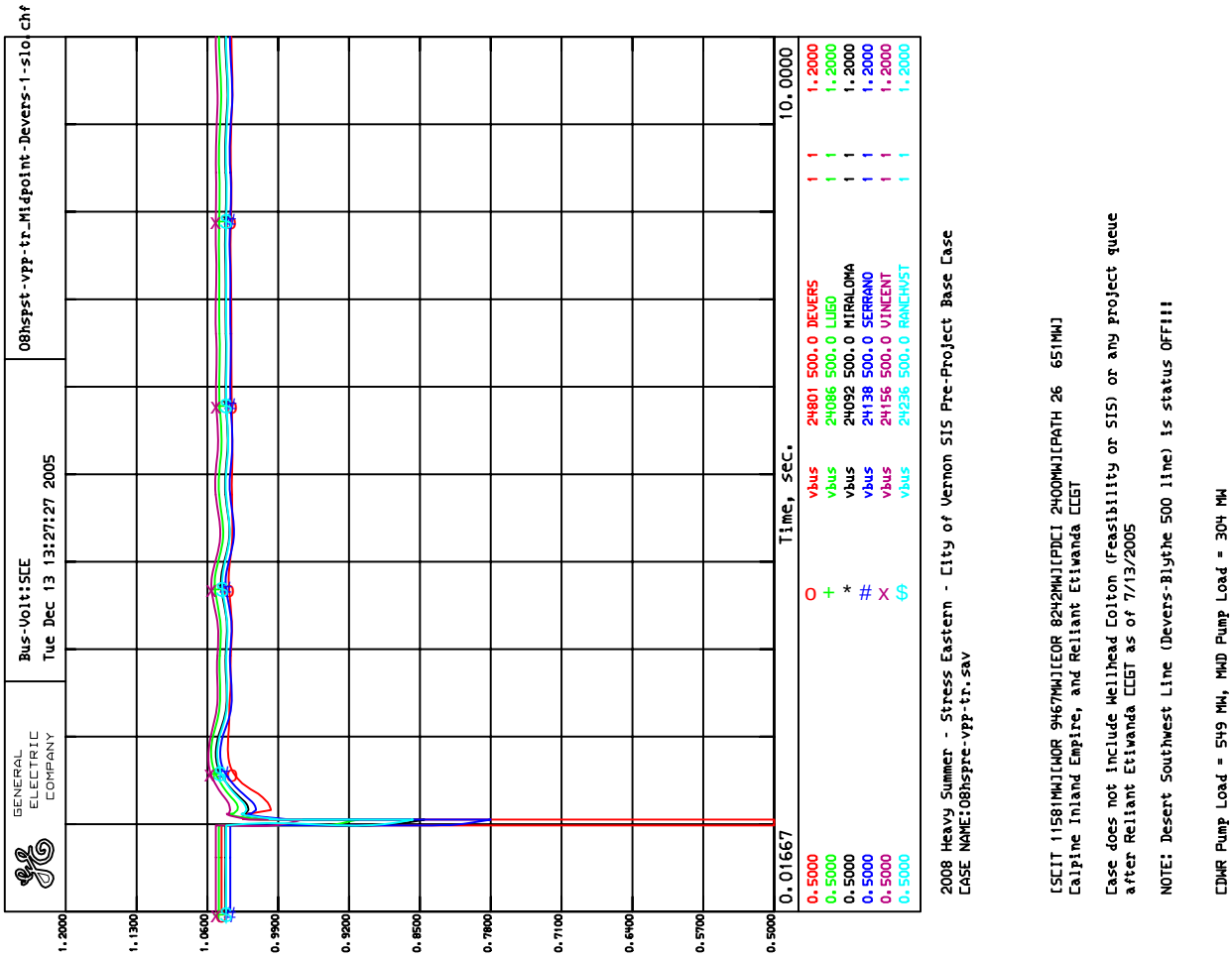
Plot 10 – 8: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



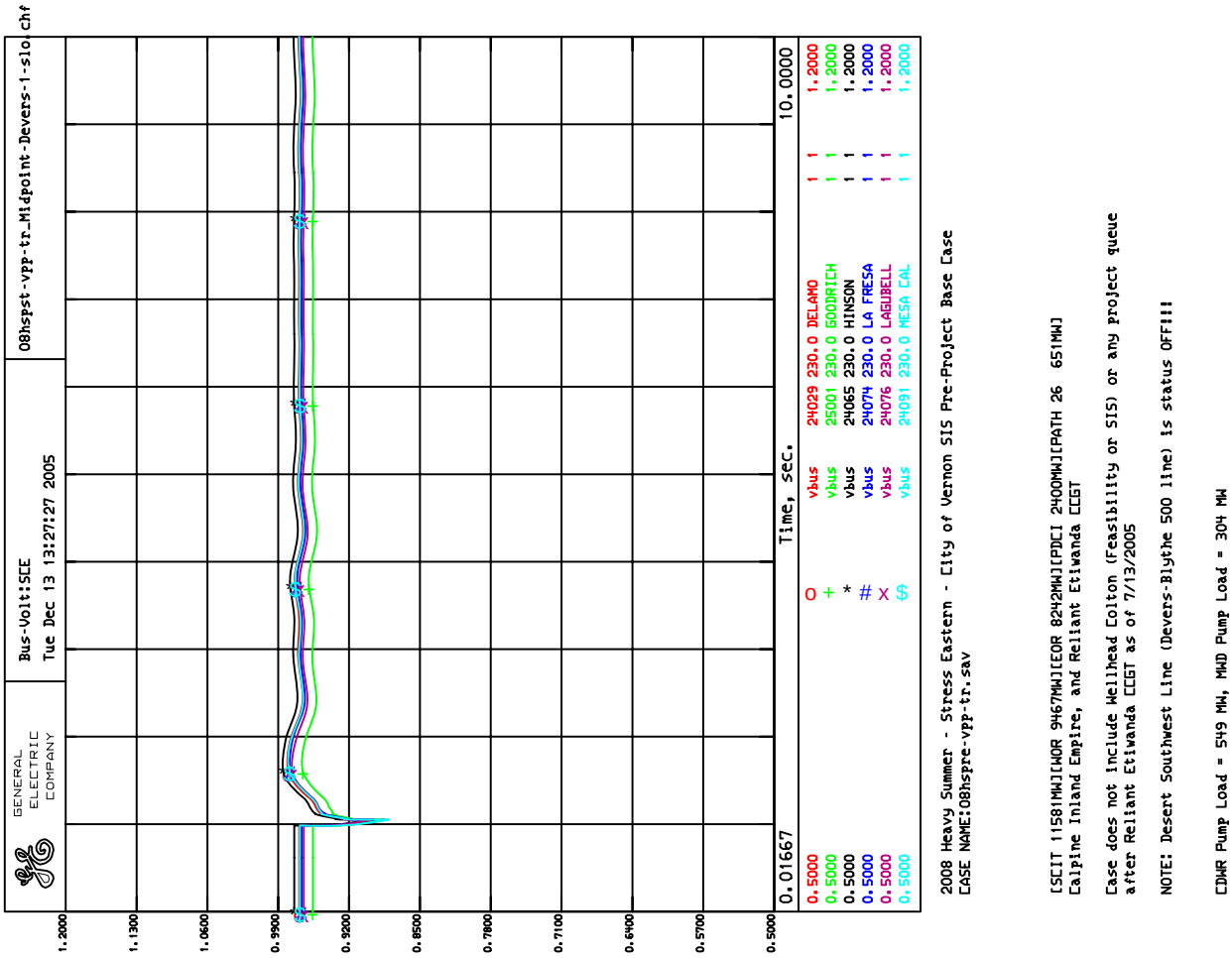
Plot 10 - 9: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



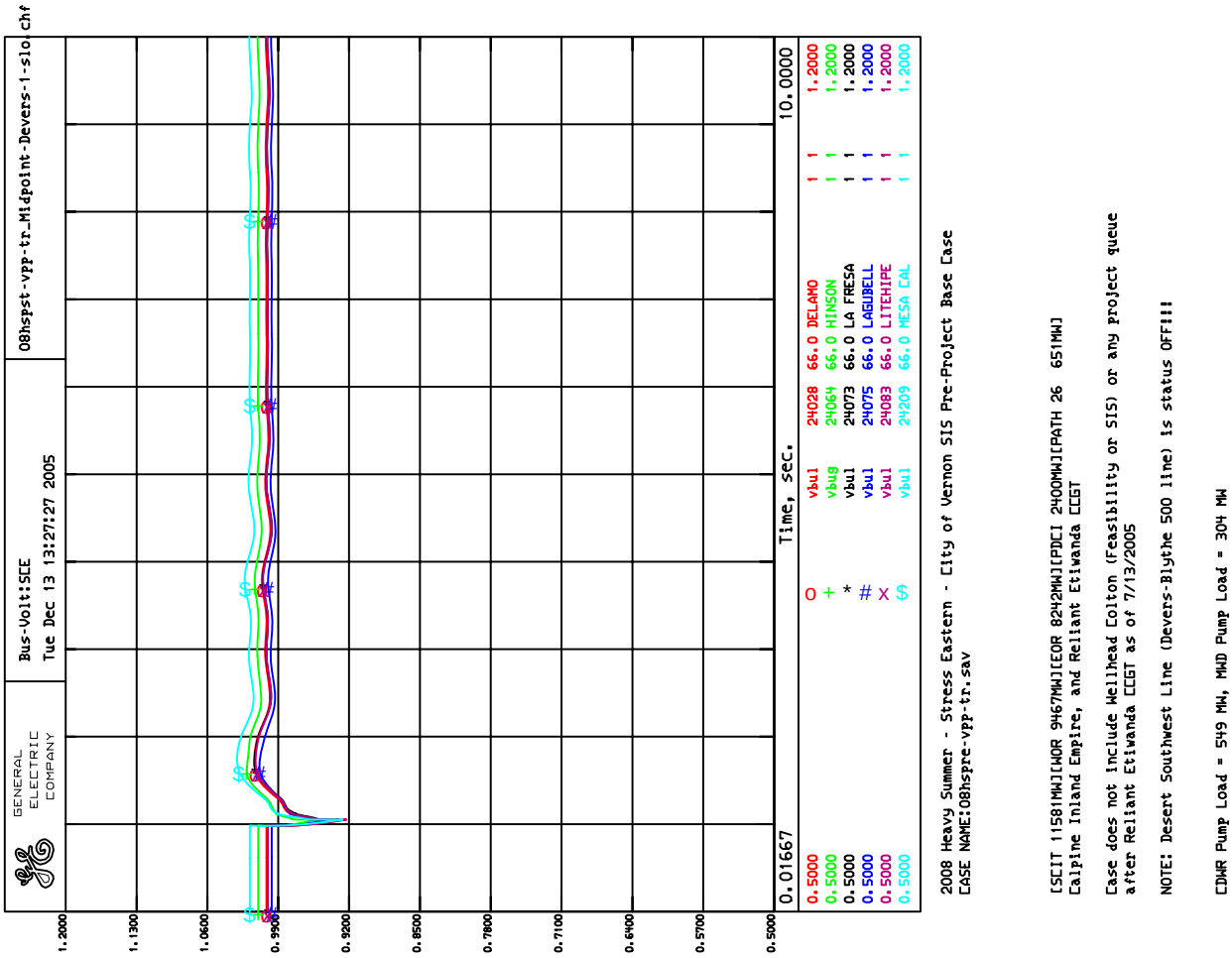
Plot 11 - 1: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



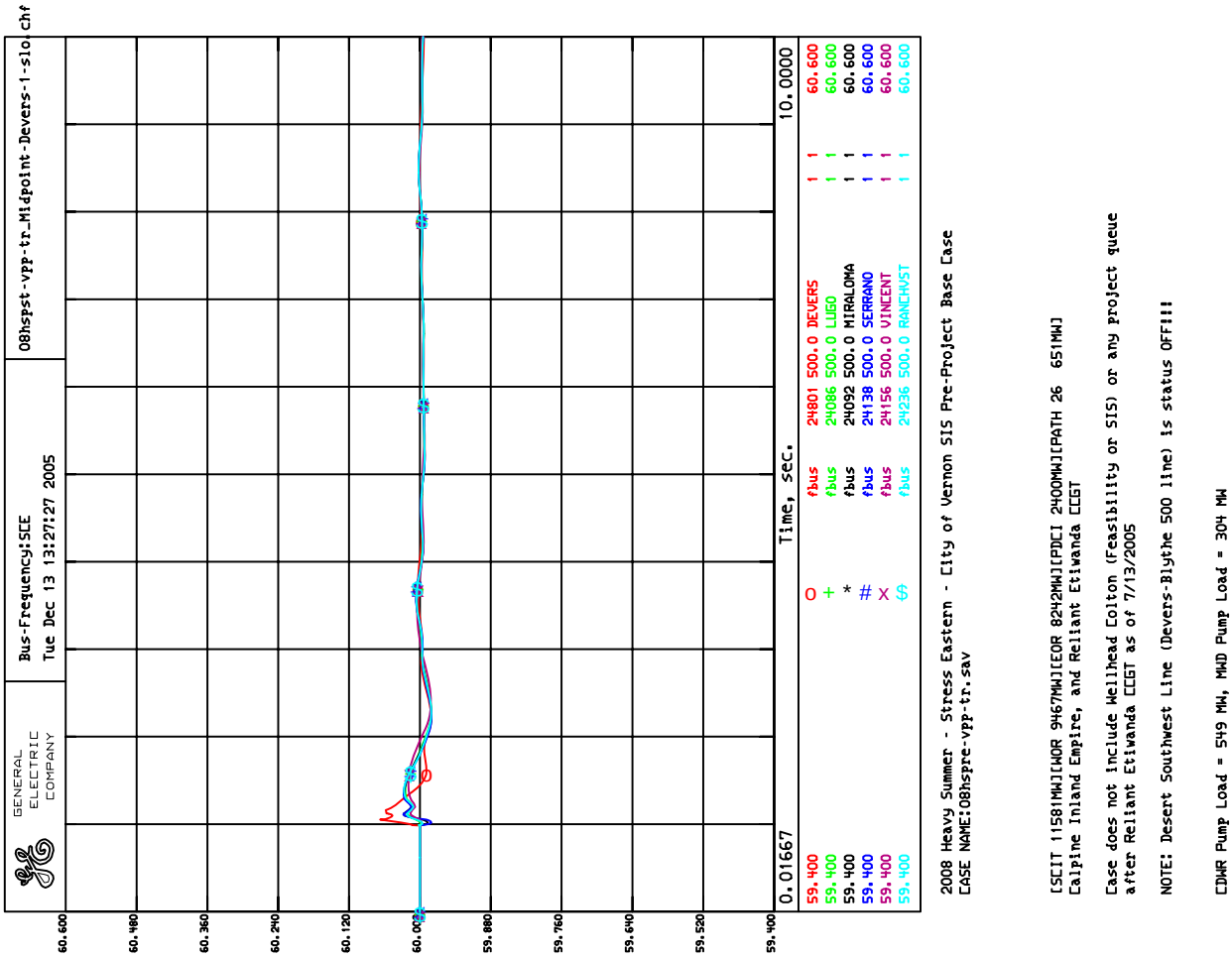
Plot 11 - 2: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



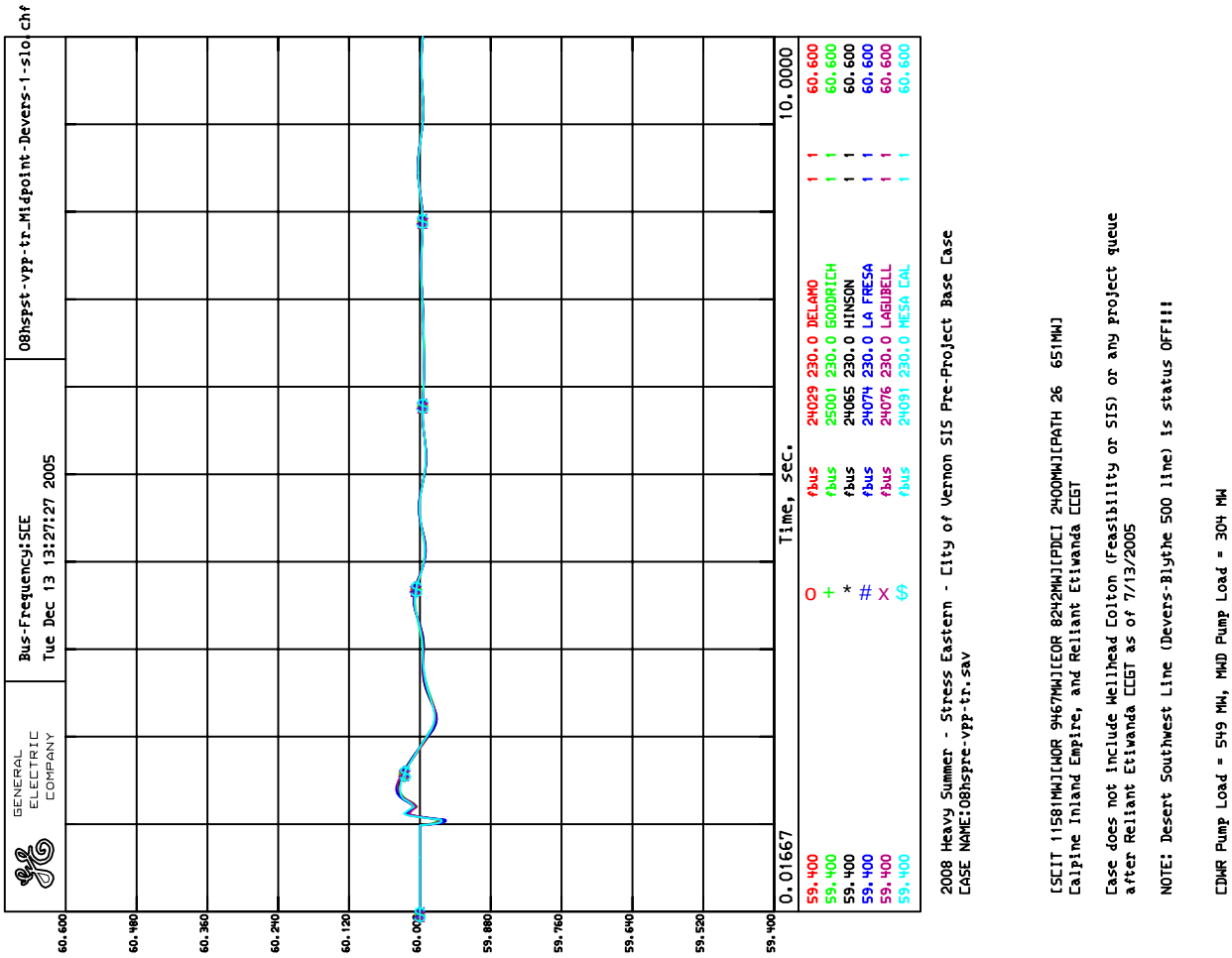
Plot 11 - 3: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



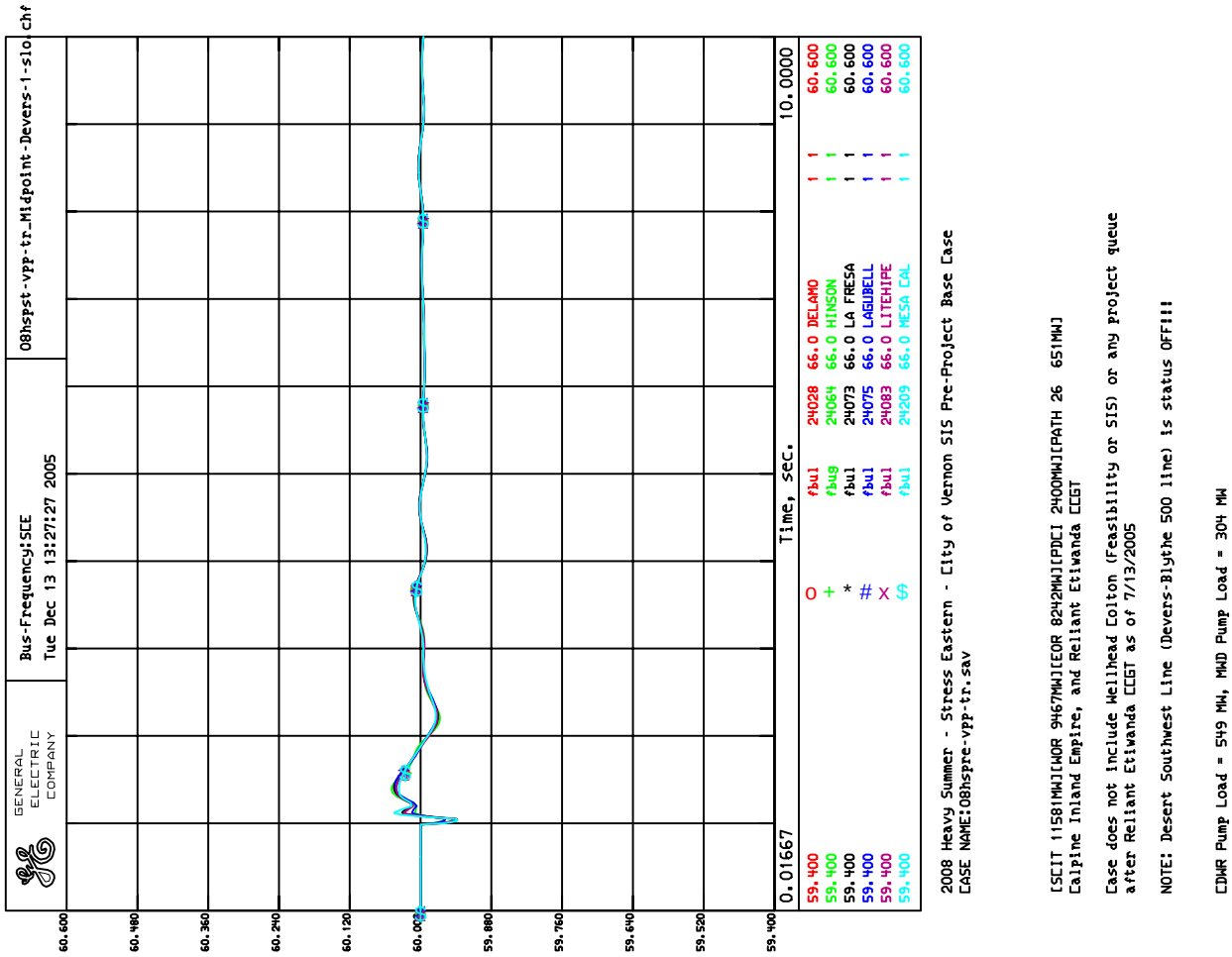
Plot 11 - 4: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



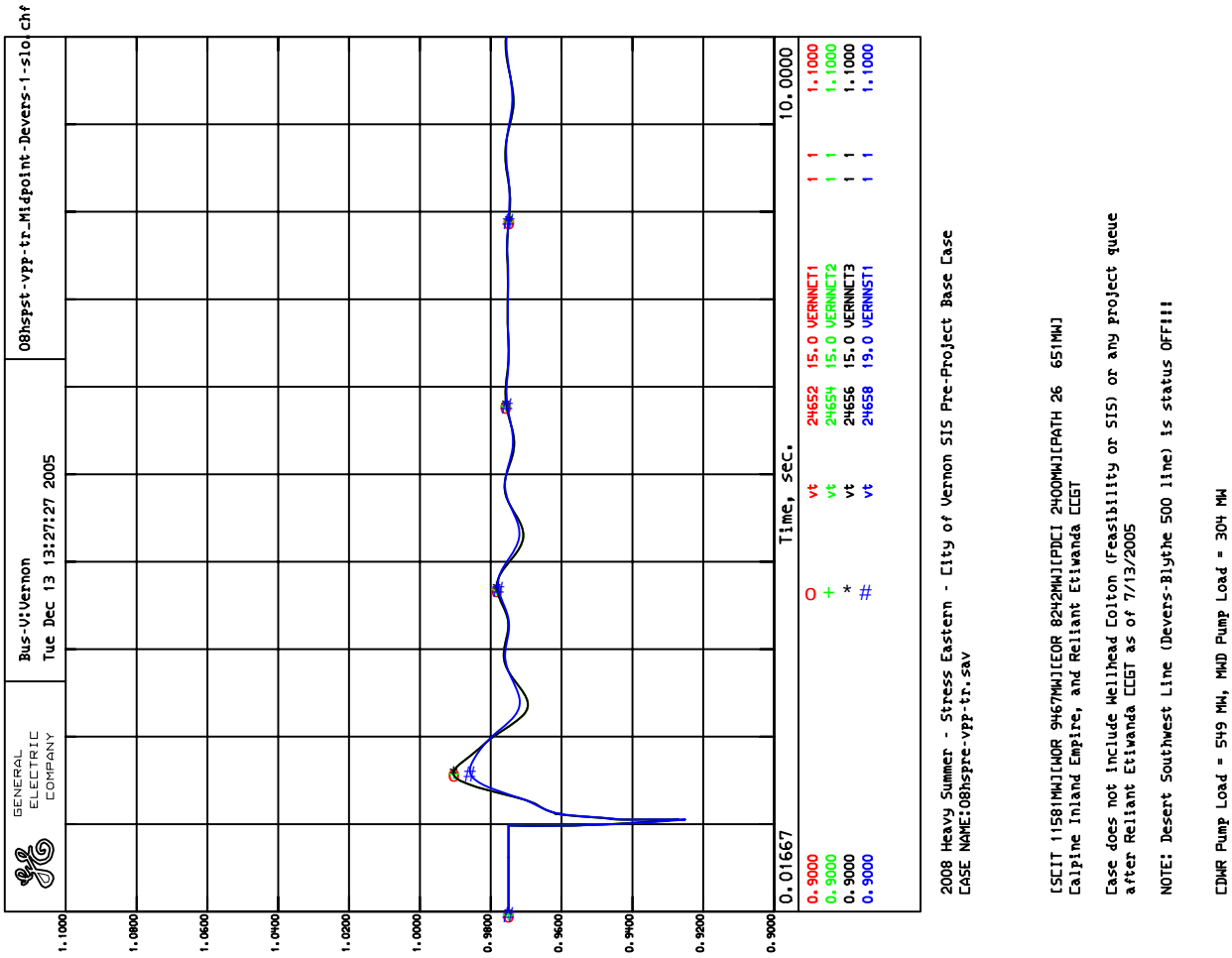
Plot 11 - 5: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



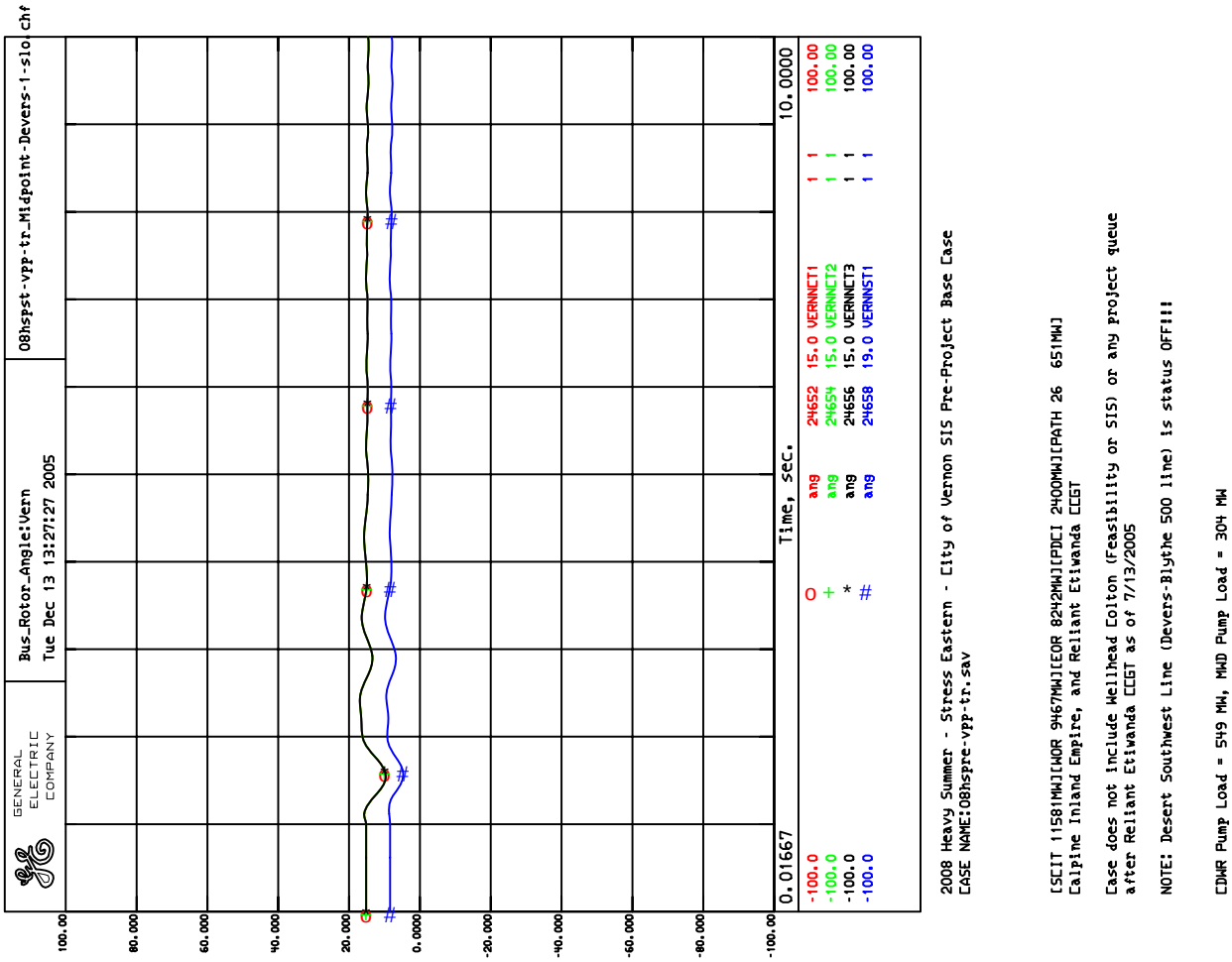
Plot 11 - 6: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



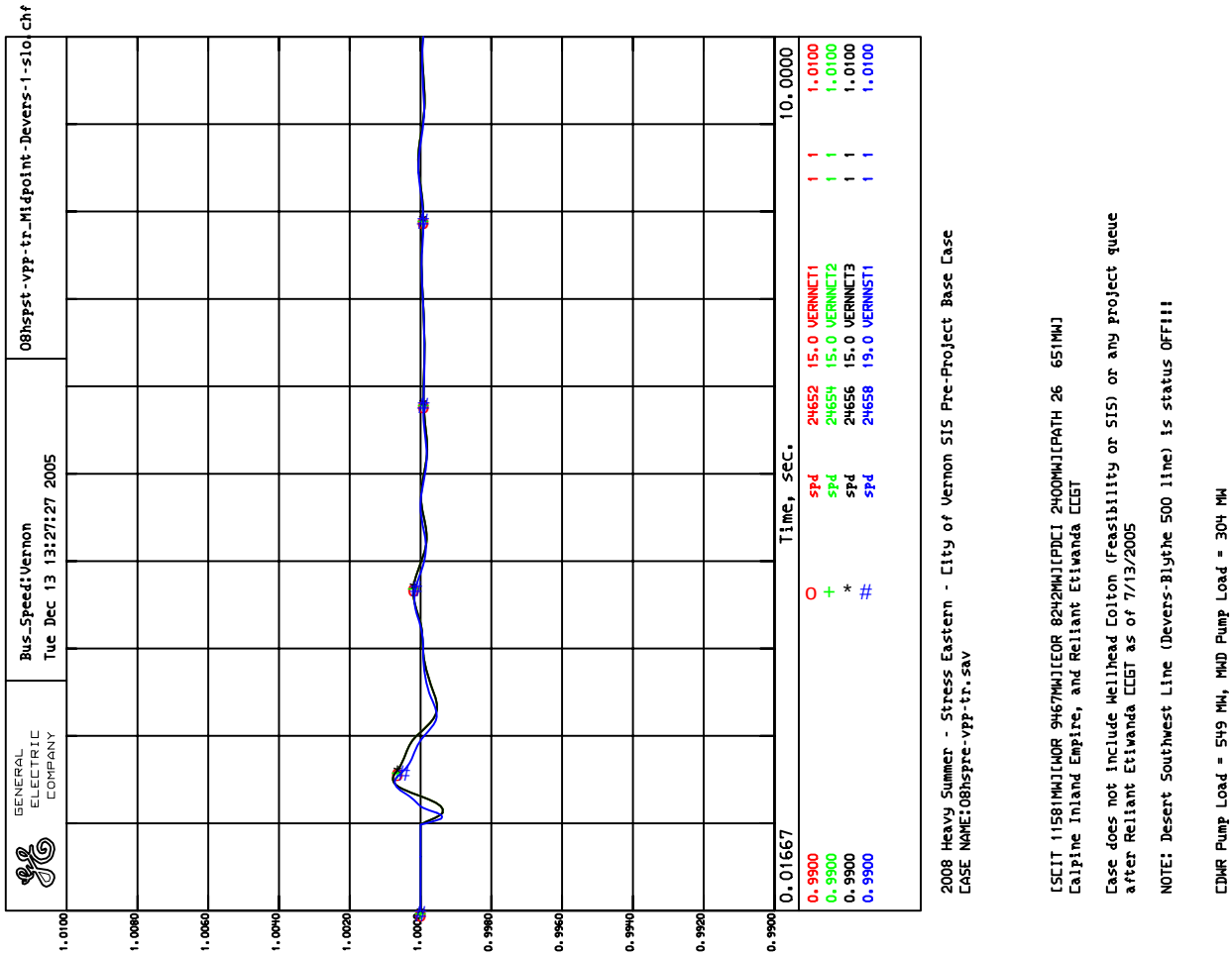
Plot 11 - 7: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



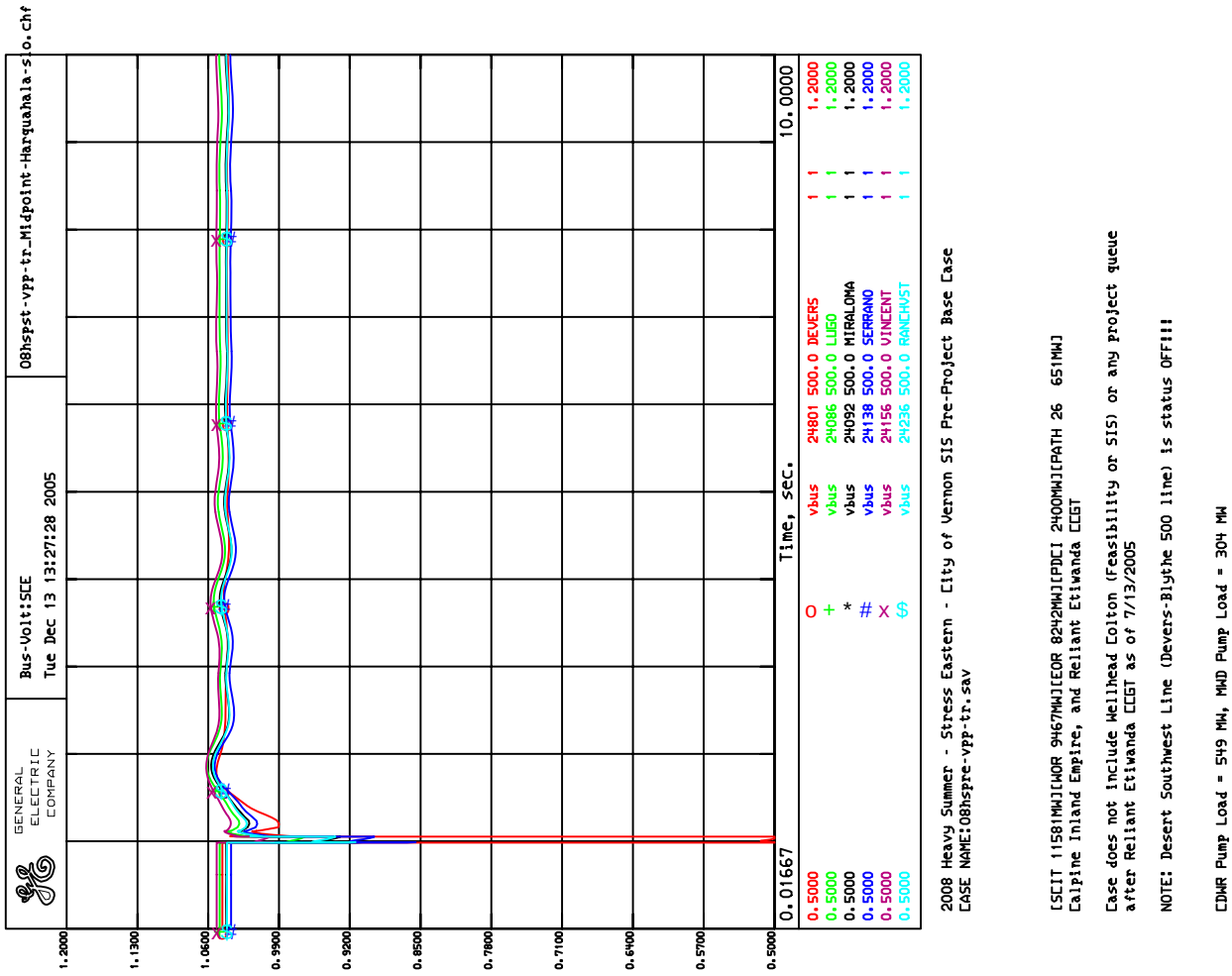
Plot 11 - 8: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



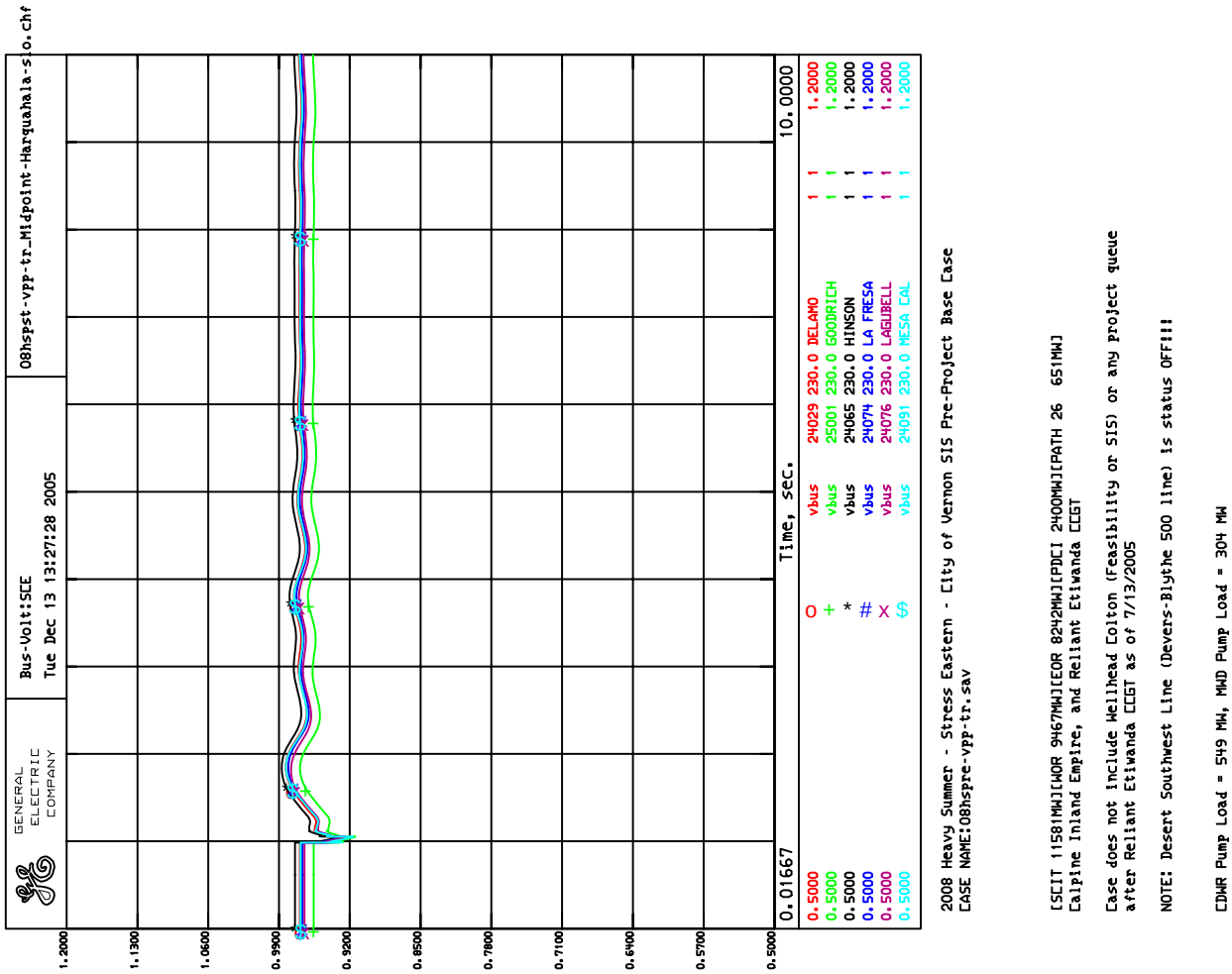
Plot 11 - 9: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



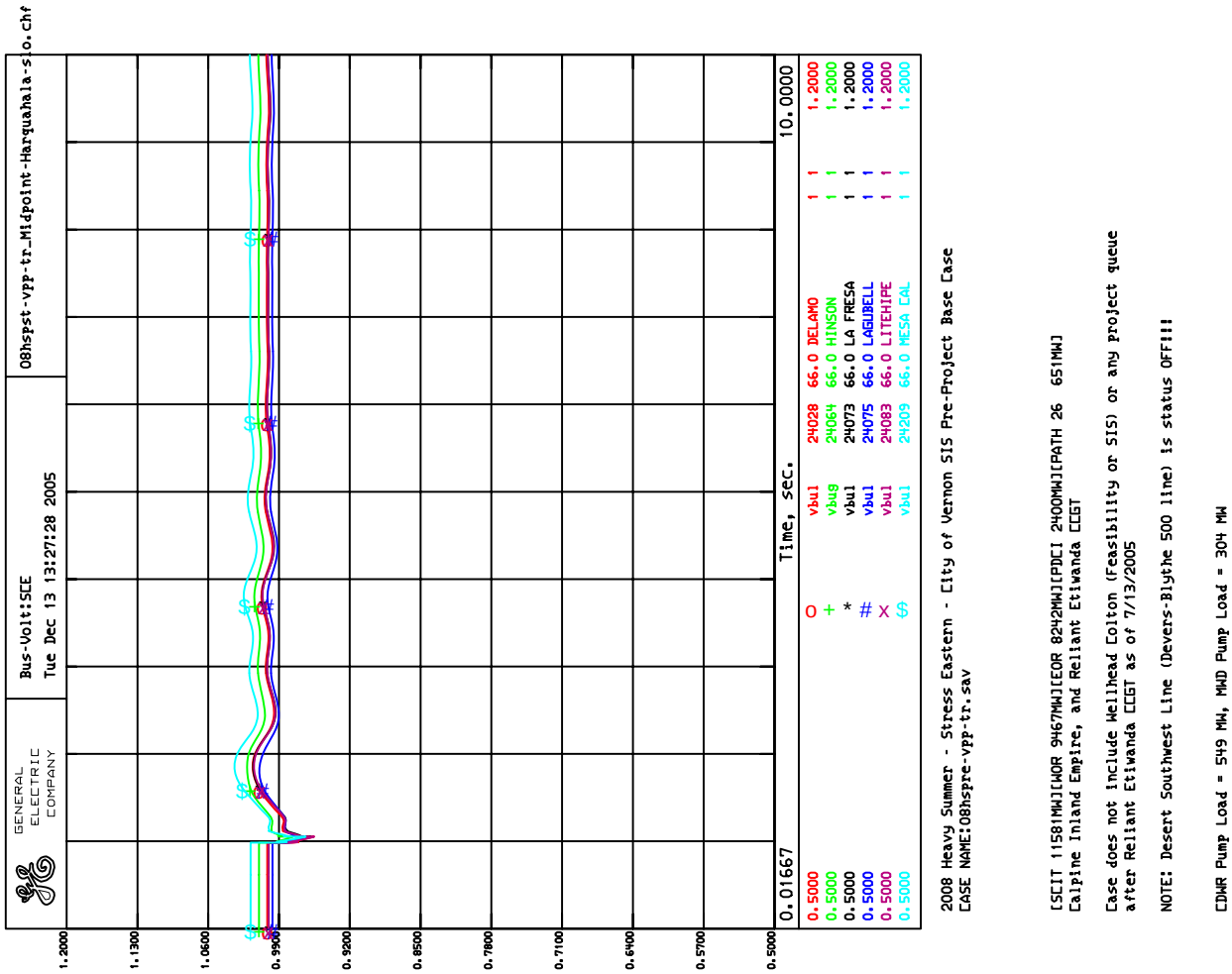
Plot 12 - 1: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



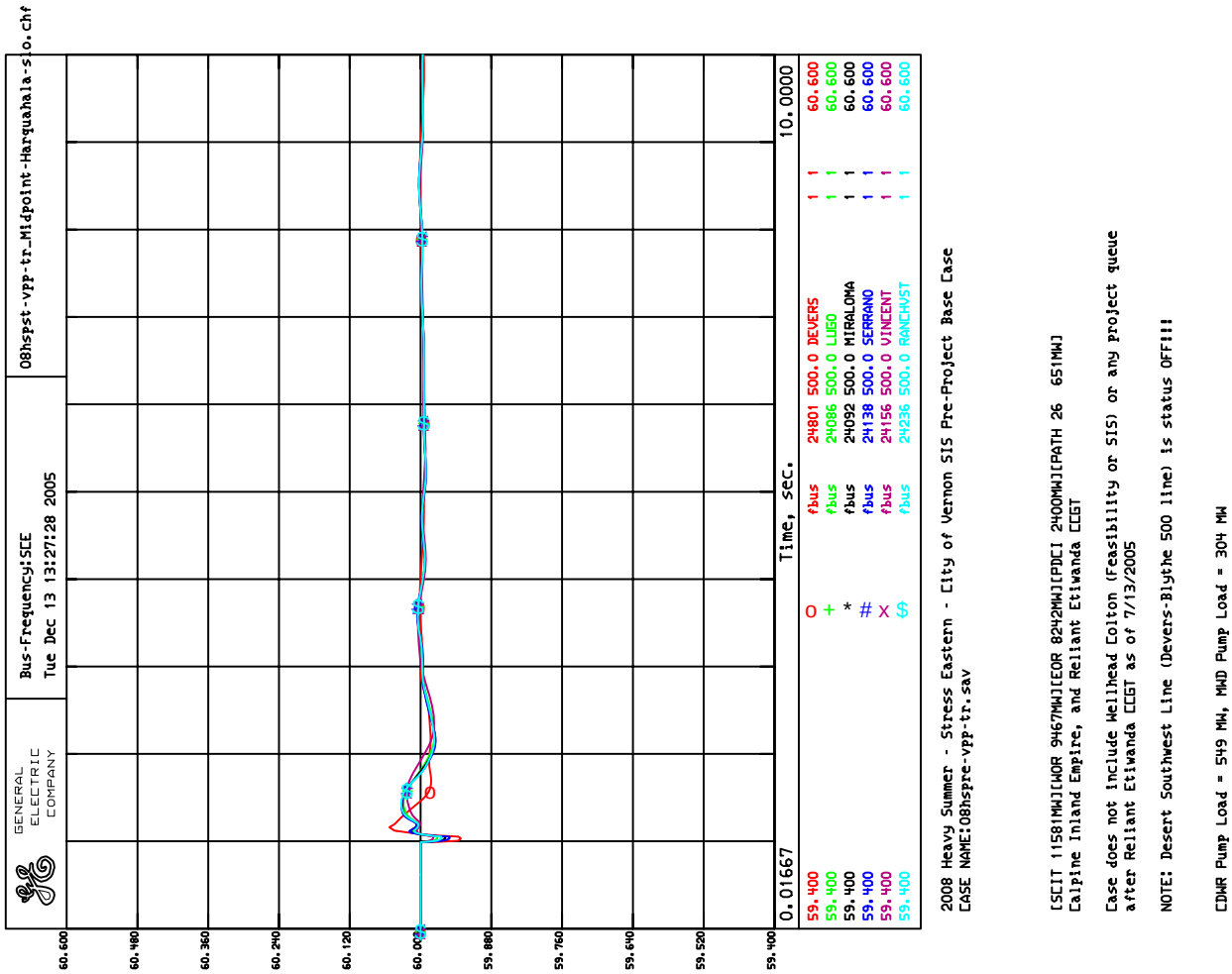
Plot 12 - 2: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



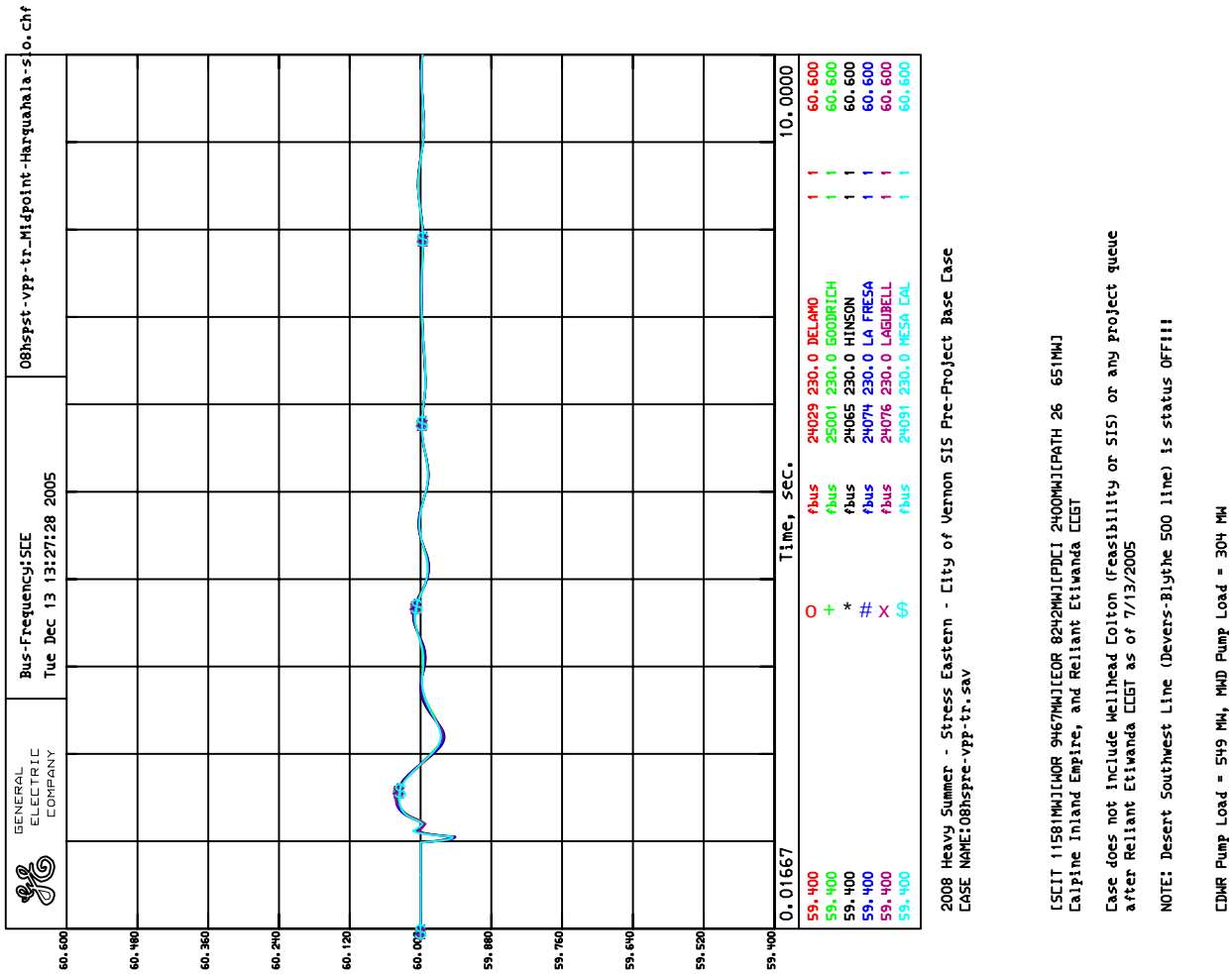
Plot 12 - 3: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



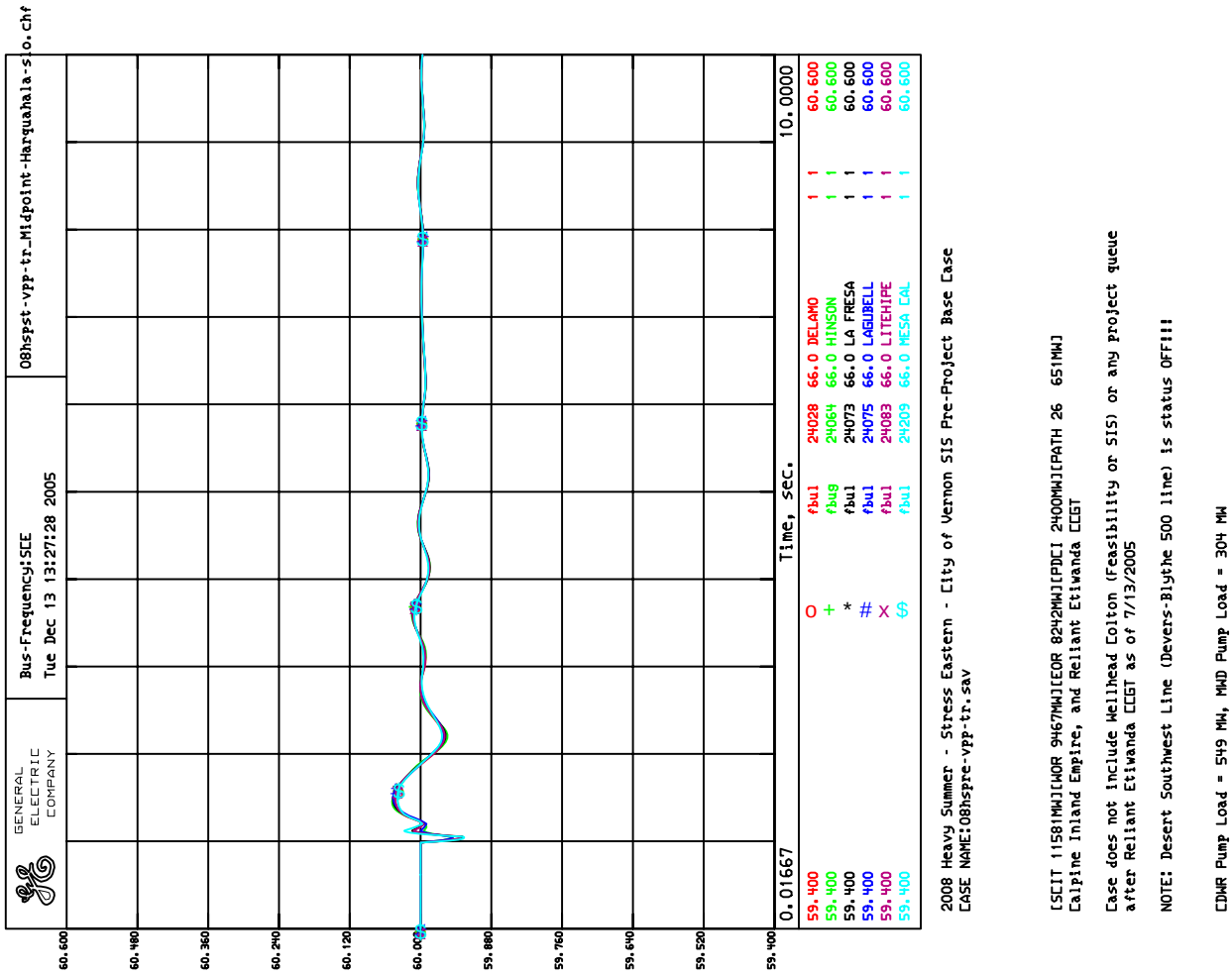
Plot 12 - 4: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



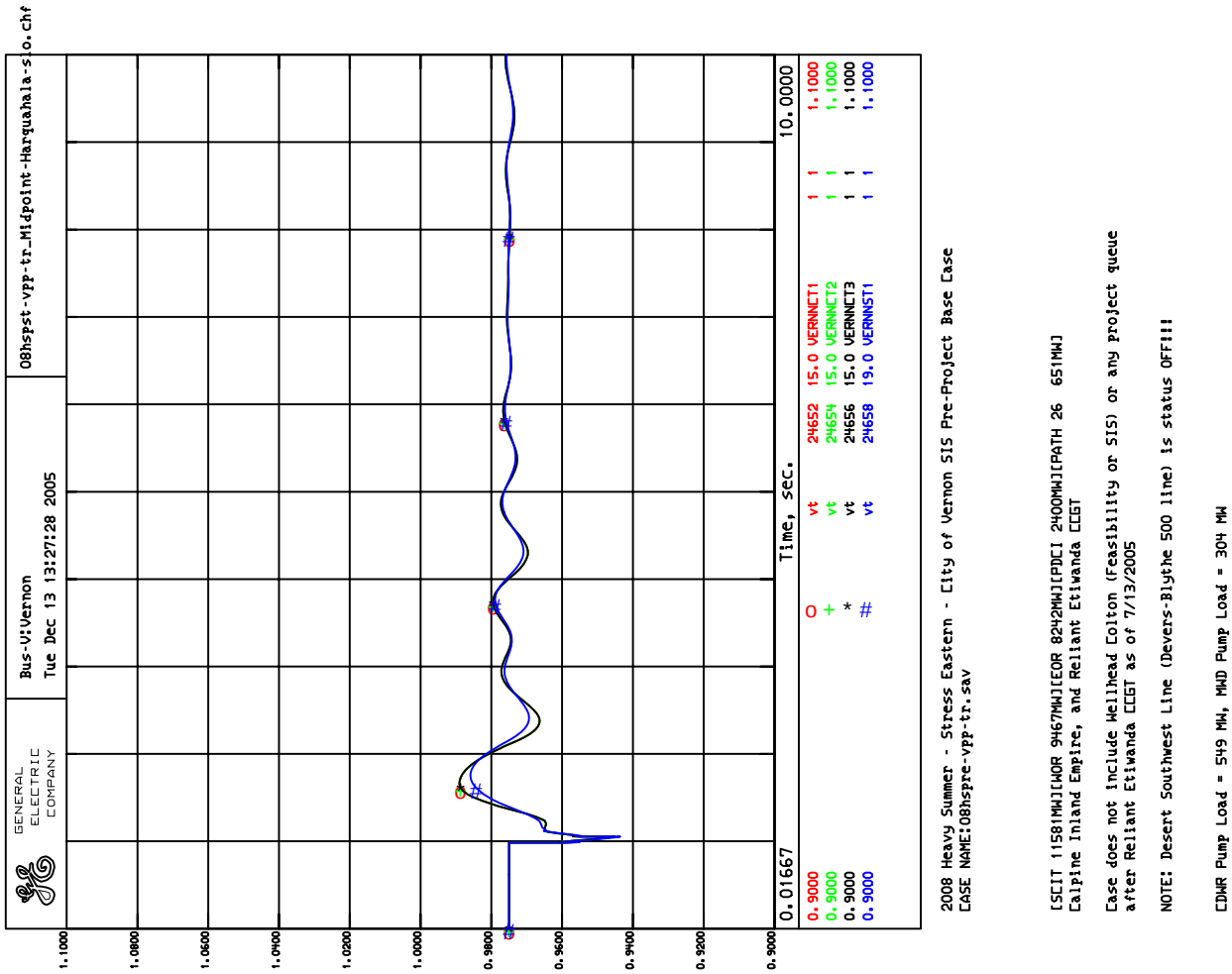
Plot 12 - 5: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



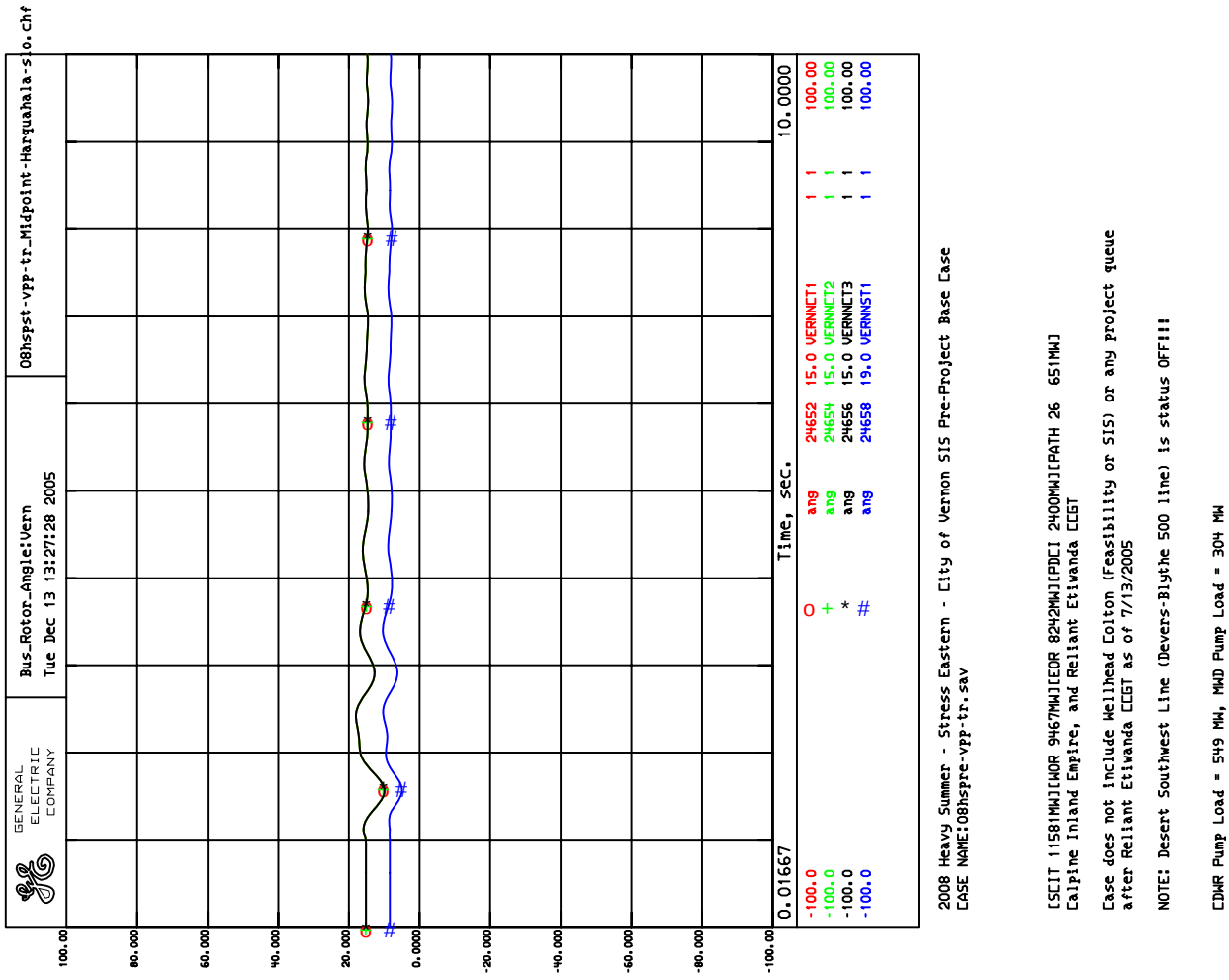
Plot 12 - 6: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



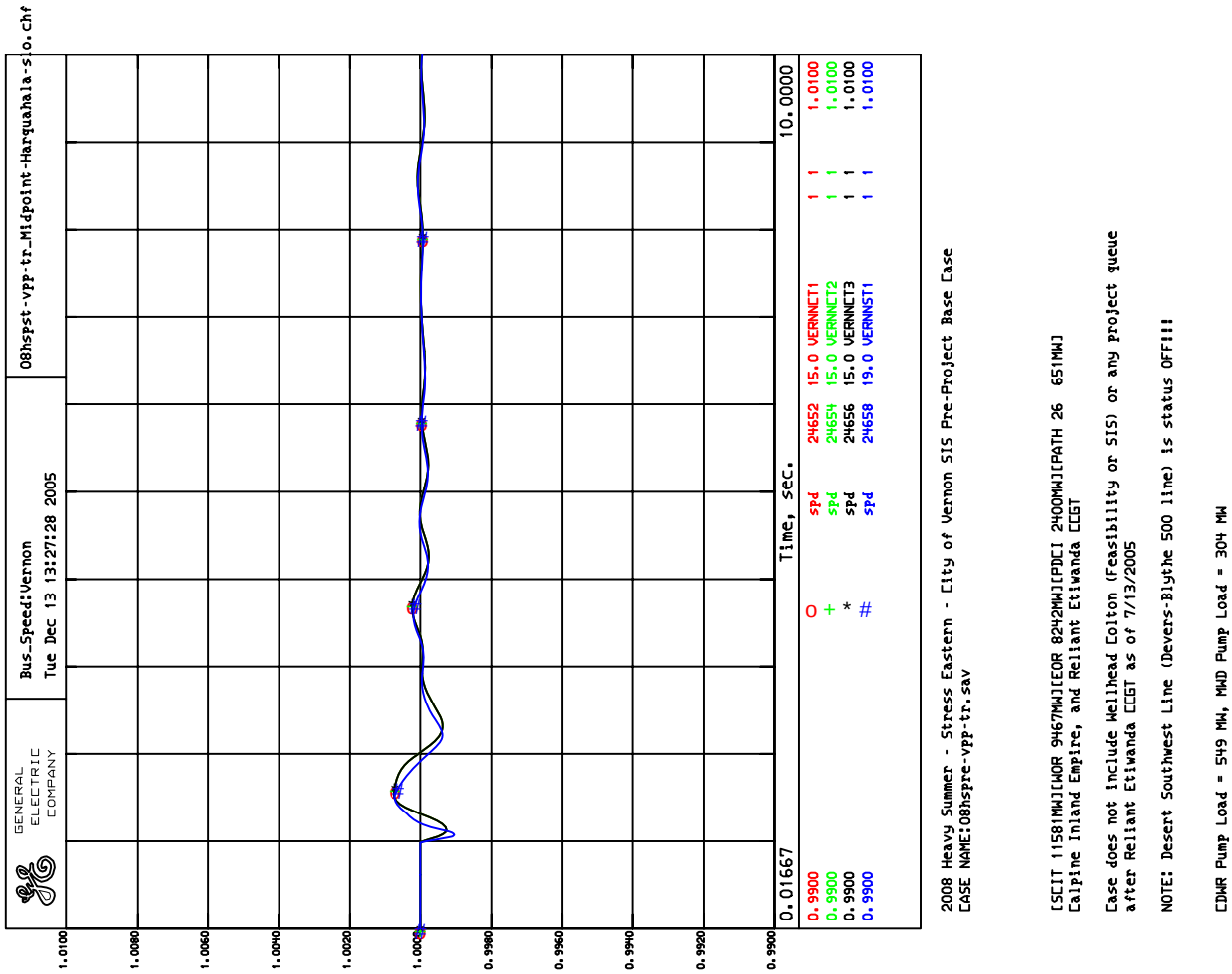
Plot 12 - 7: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



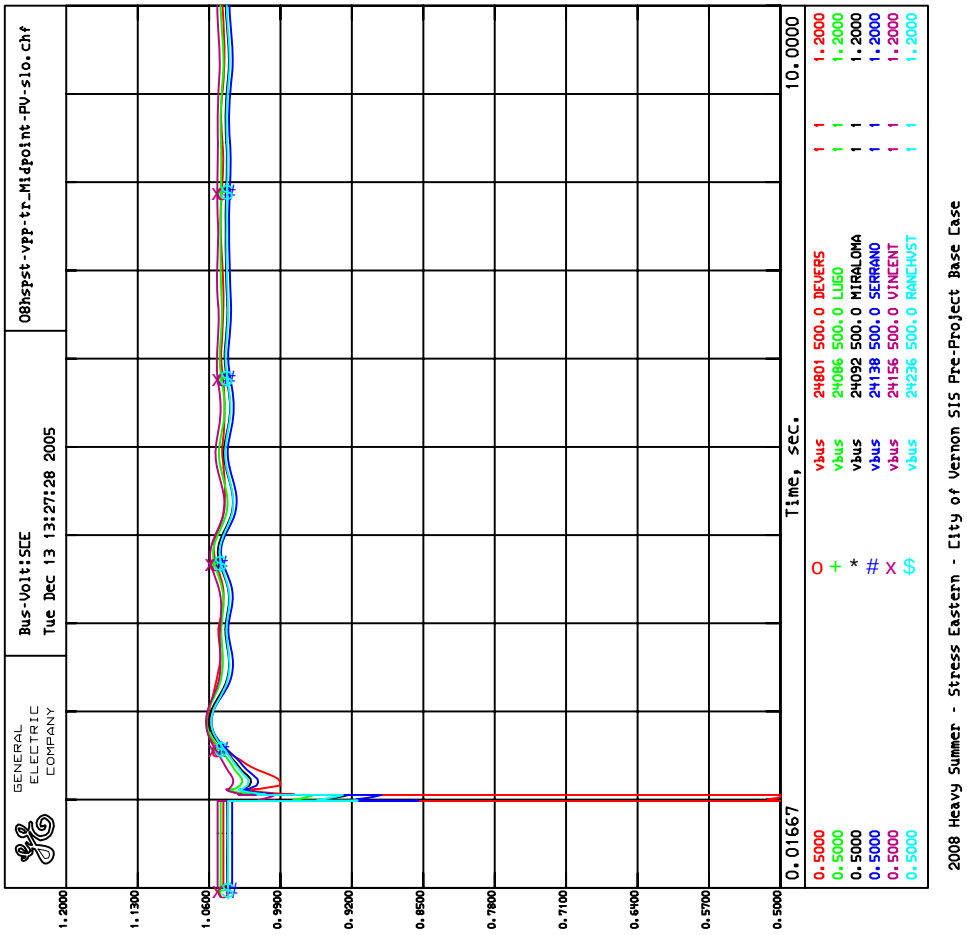
Plot 12 - 8: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



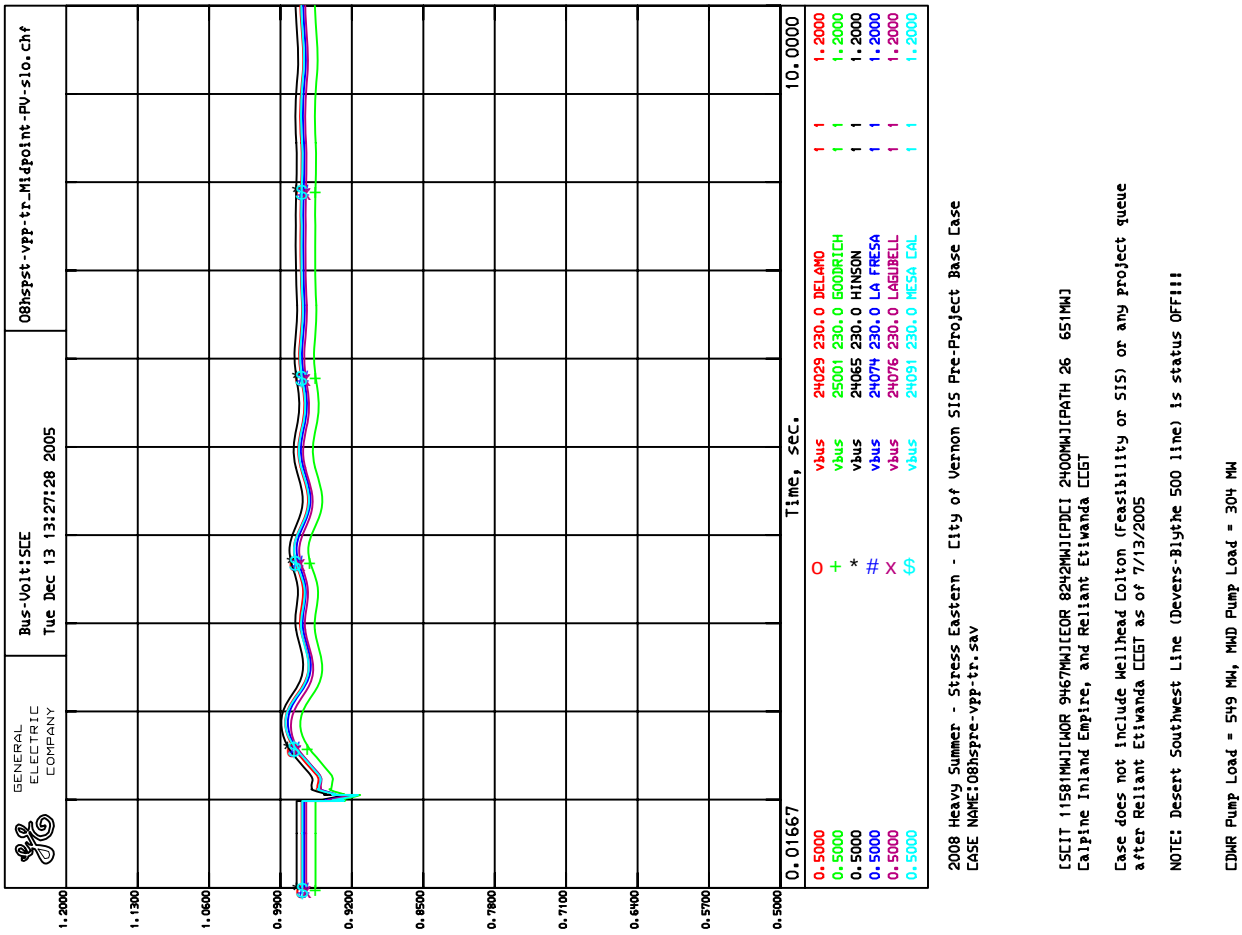
Plot 12 - 9: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



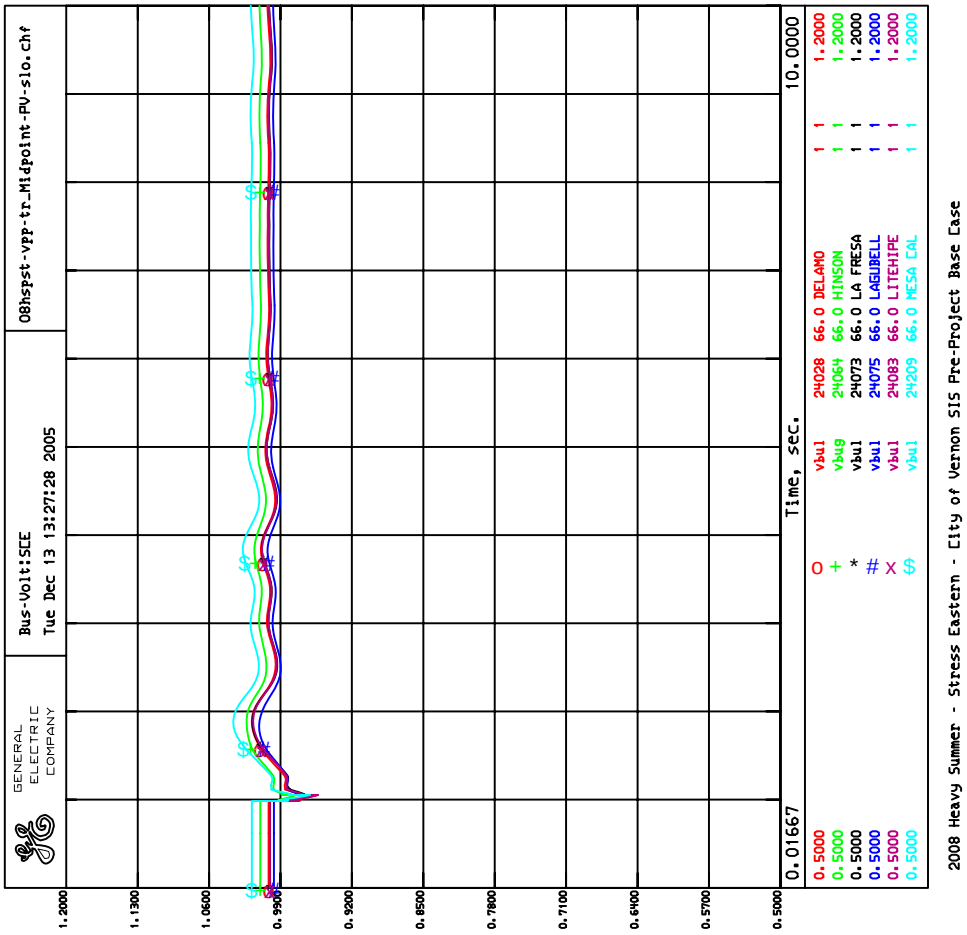
Plot 13 - 1: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



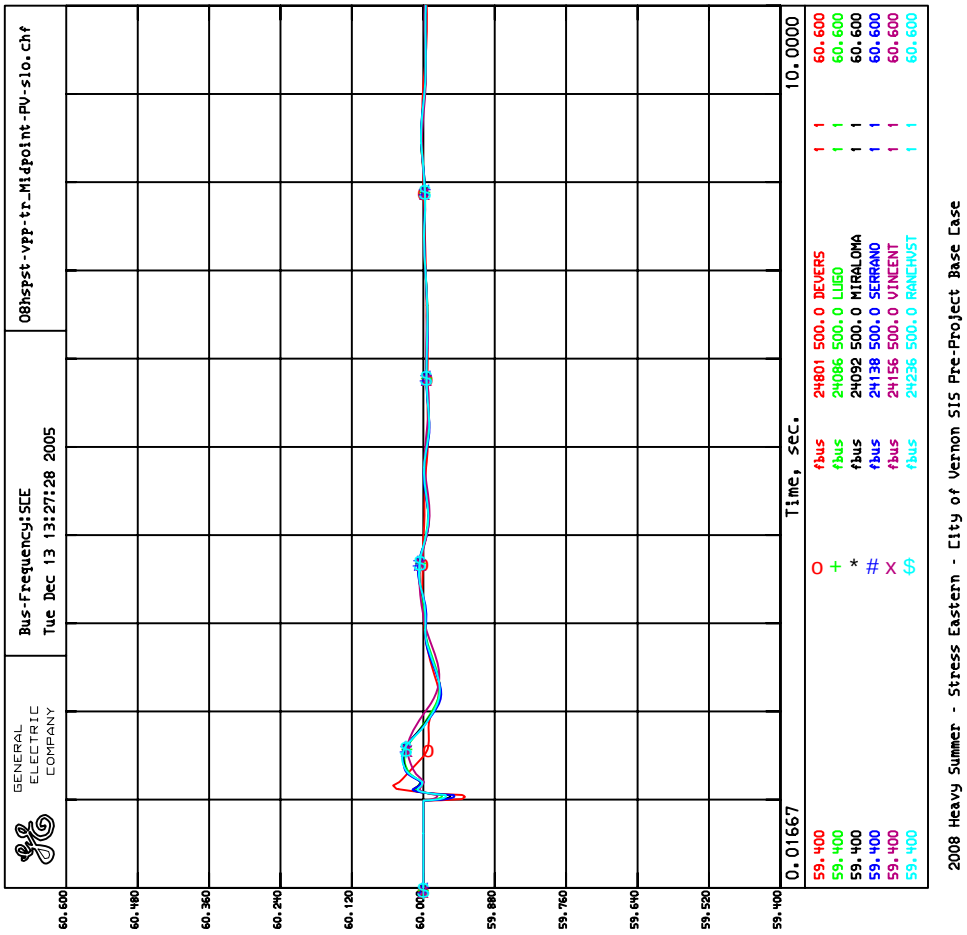
Plot 13 - 2: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



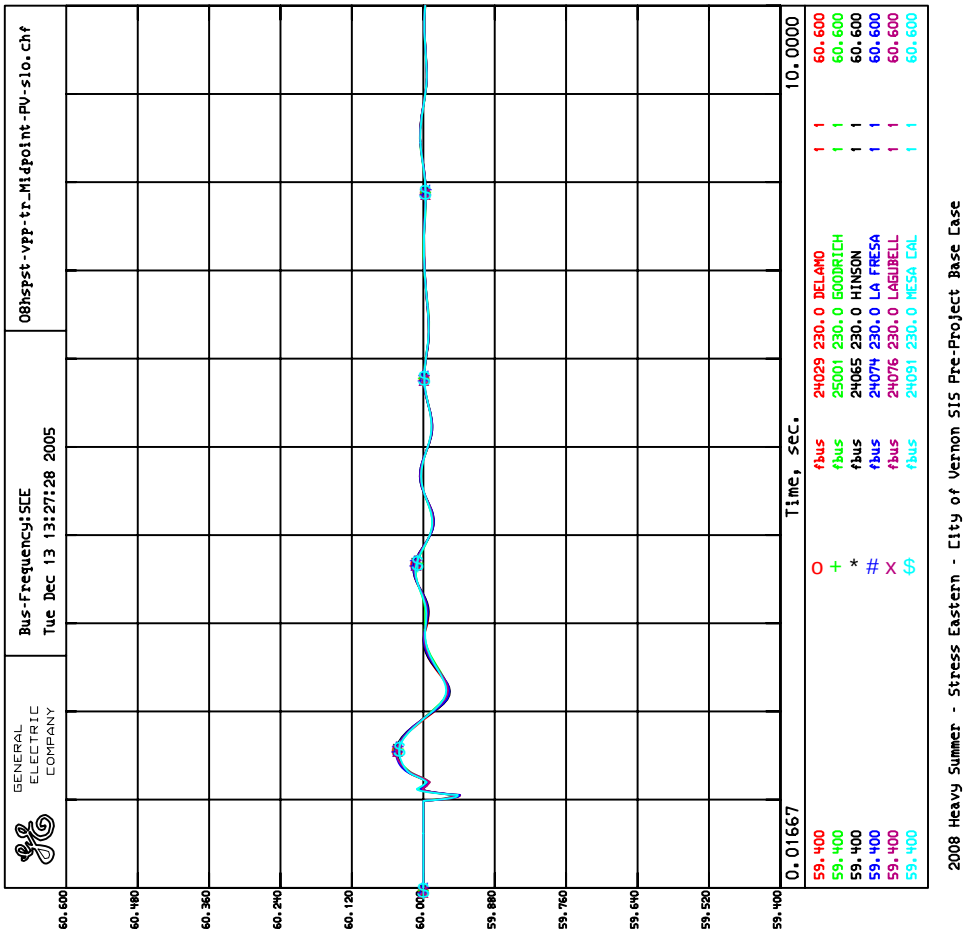
Plot 13 - 3: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



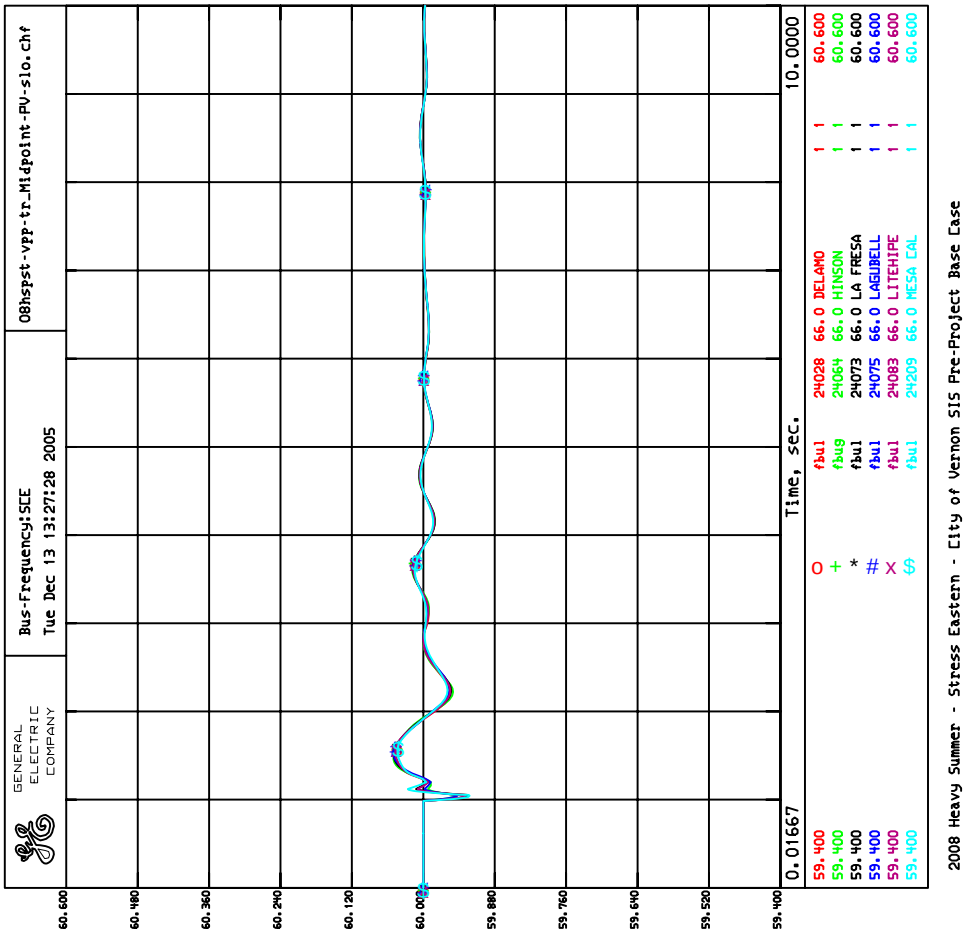
Plot 13 - 4: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



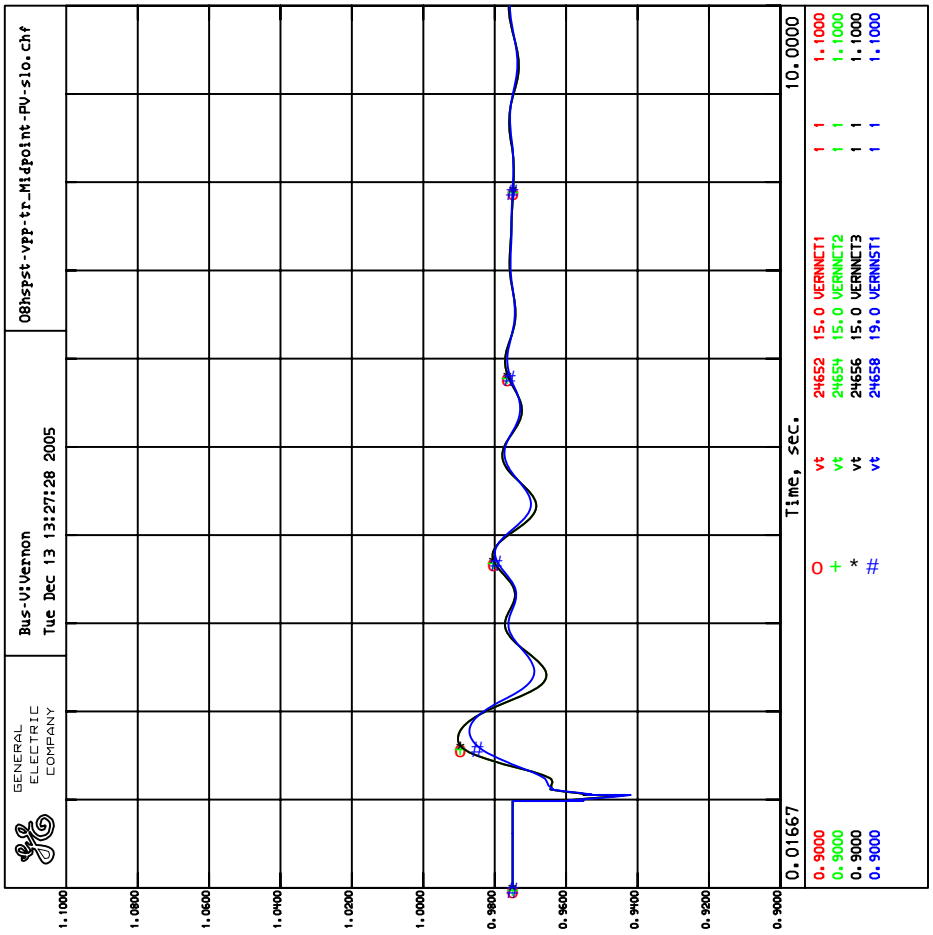
Plot 13 - 5: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



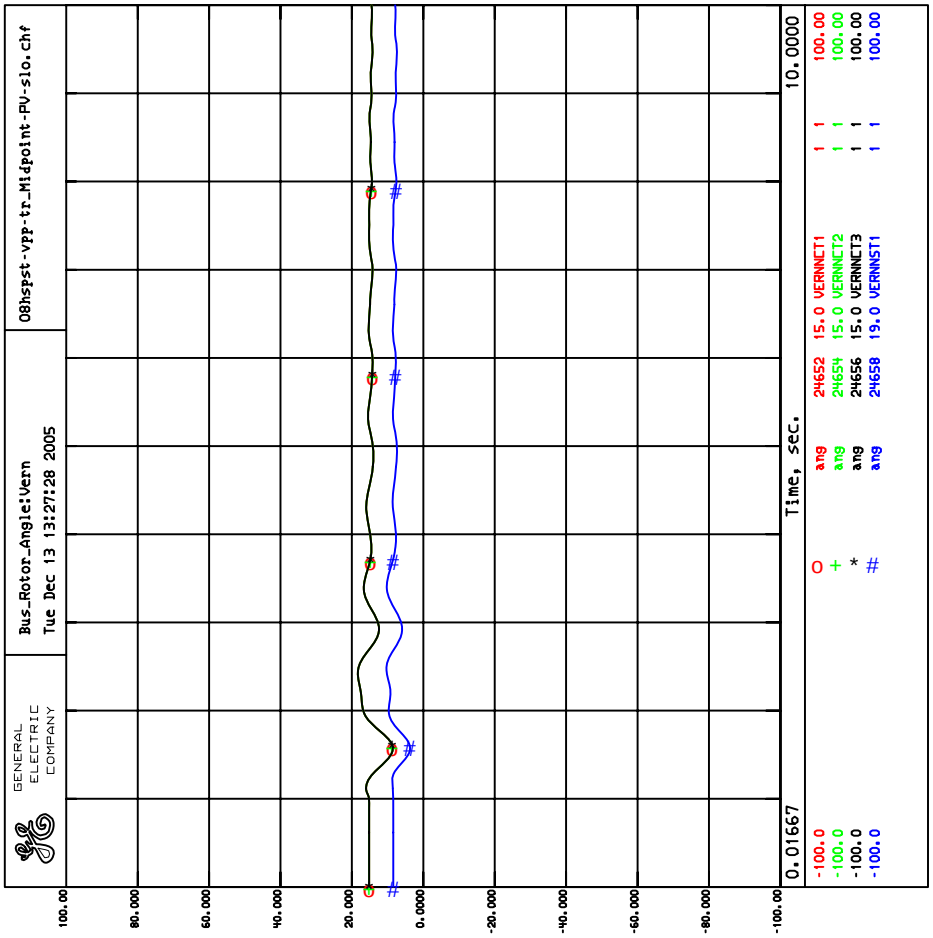
Plot 13 - 6: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



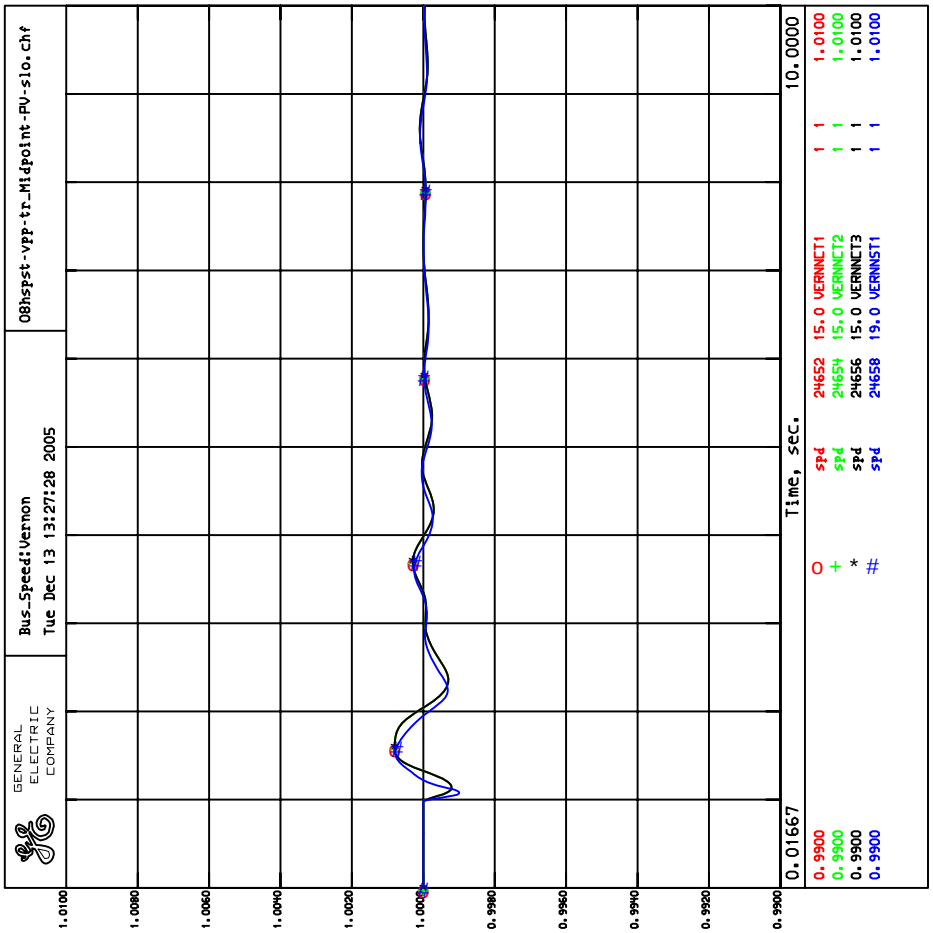
Plot 13 - 7: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



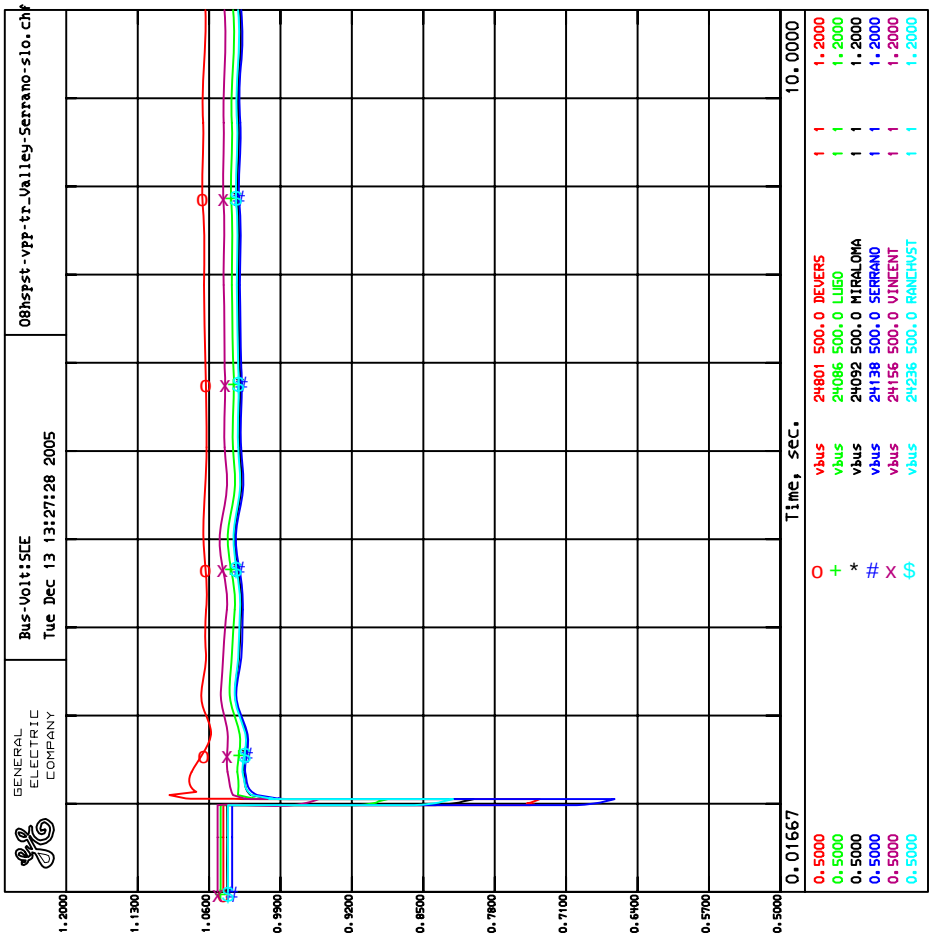
Plot 13 - 8: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



Plot 13 - 9: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



Plot 14 - 1: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



2008 Heavy Summer - Stress Eastern - City of Vernon SIS Pre-Project Base Case
CASE NAME:08hspre-vpp-tr.sav

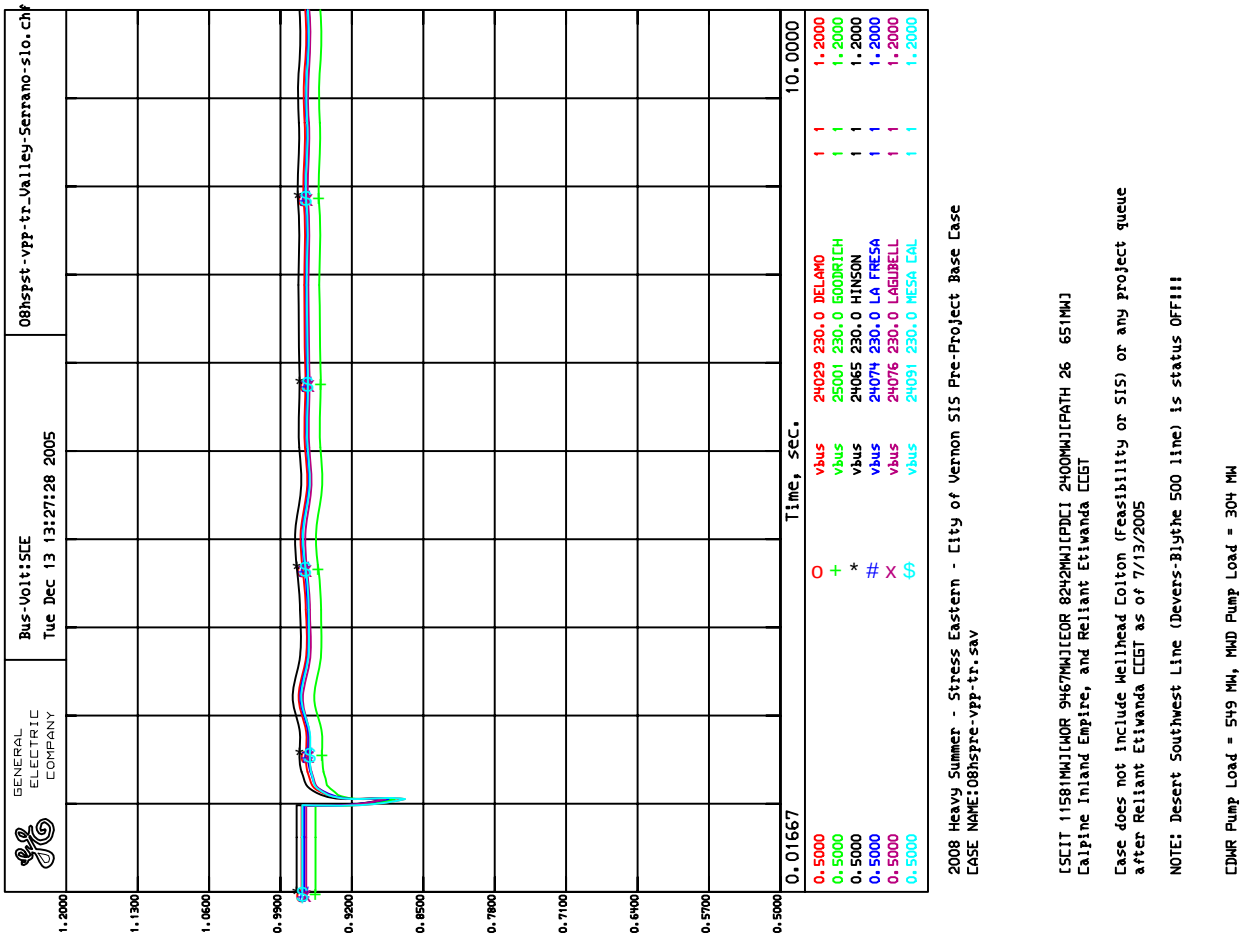
[SCIT 11581MW1CWOR 9467MW1EEOR 8242MW1CPDCI 2400MW1CPATH 26 651MW]
Calpine Inland Empire, and Reliant Etiwanda CCGT

Case does not include Wellhead Colton (Feasibility or SIS) or any project queue
after Reliant Etiwanda CCGT as of 7/13/2005

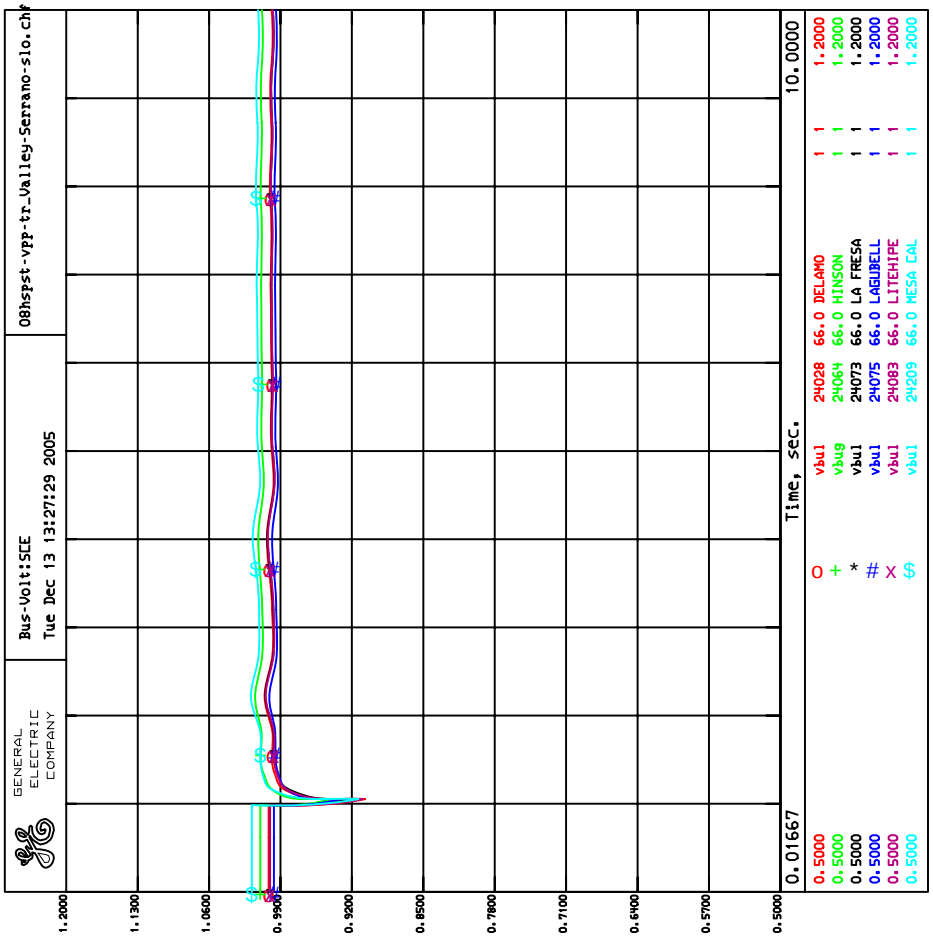
NOTE: Desert Southwest Line (Devers-Blythe 500 line) is status OFF!!!

CDWR Pump Load = 549 MW, MWD Pump Load = 304 MW

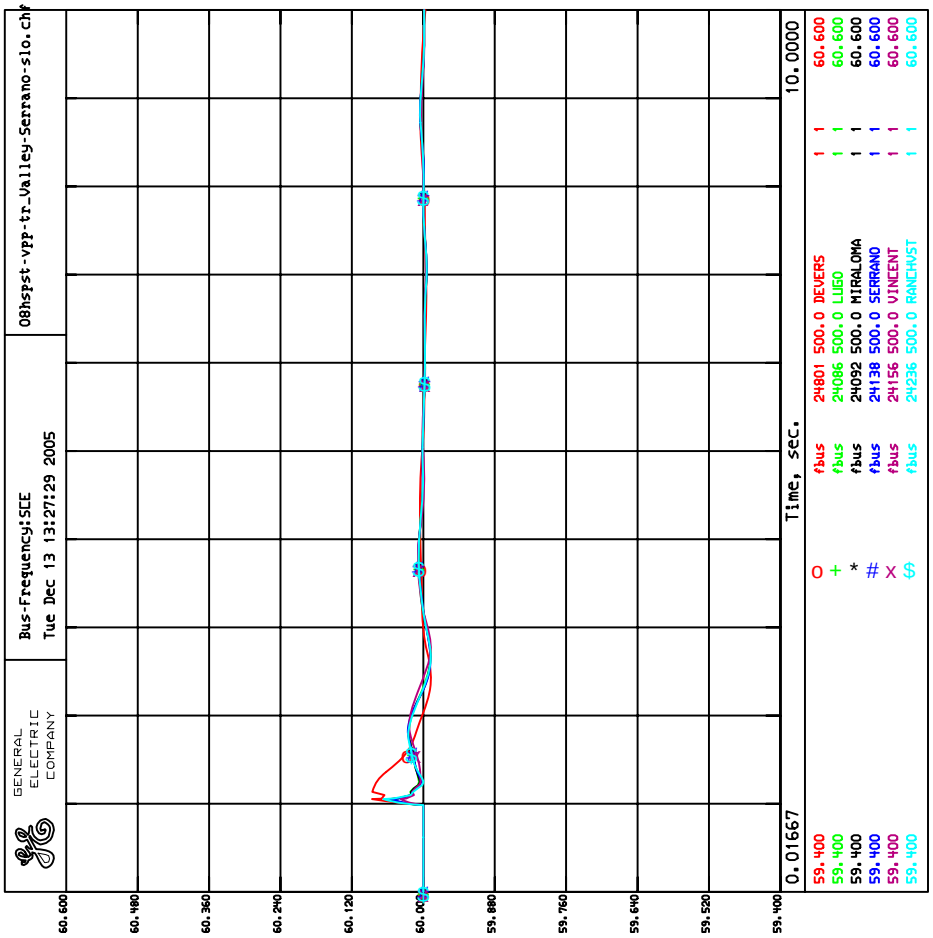
Plot 14 - 2: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



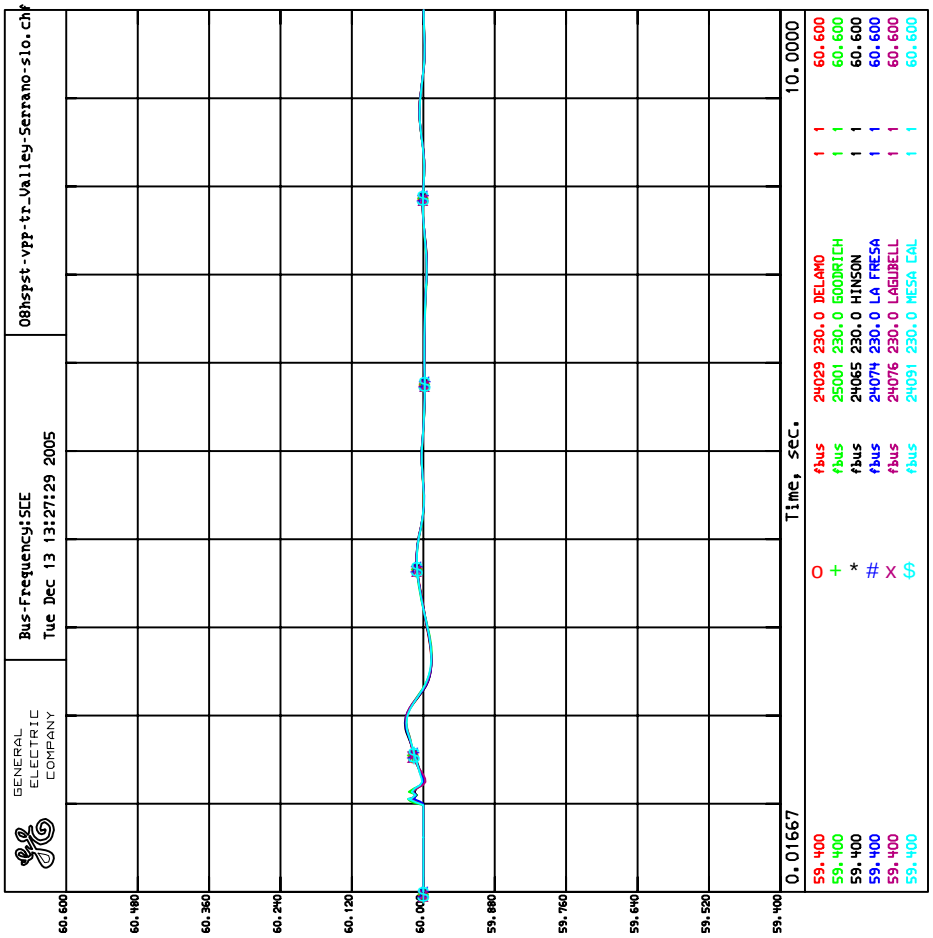
Plot 14 - 3: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



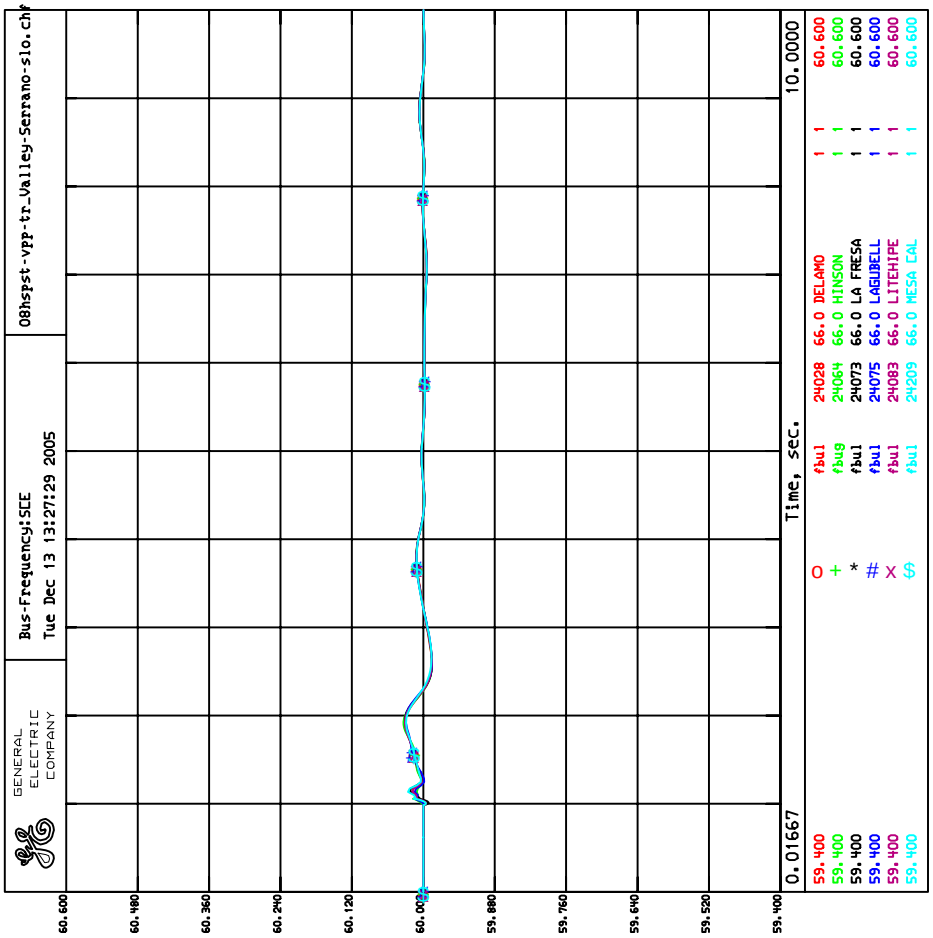
Plot 14 - 4: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



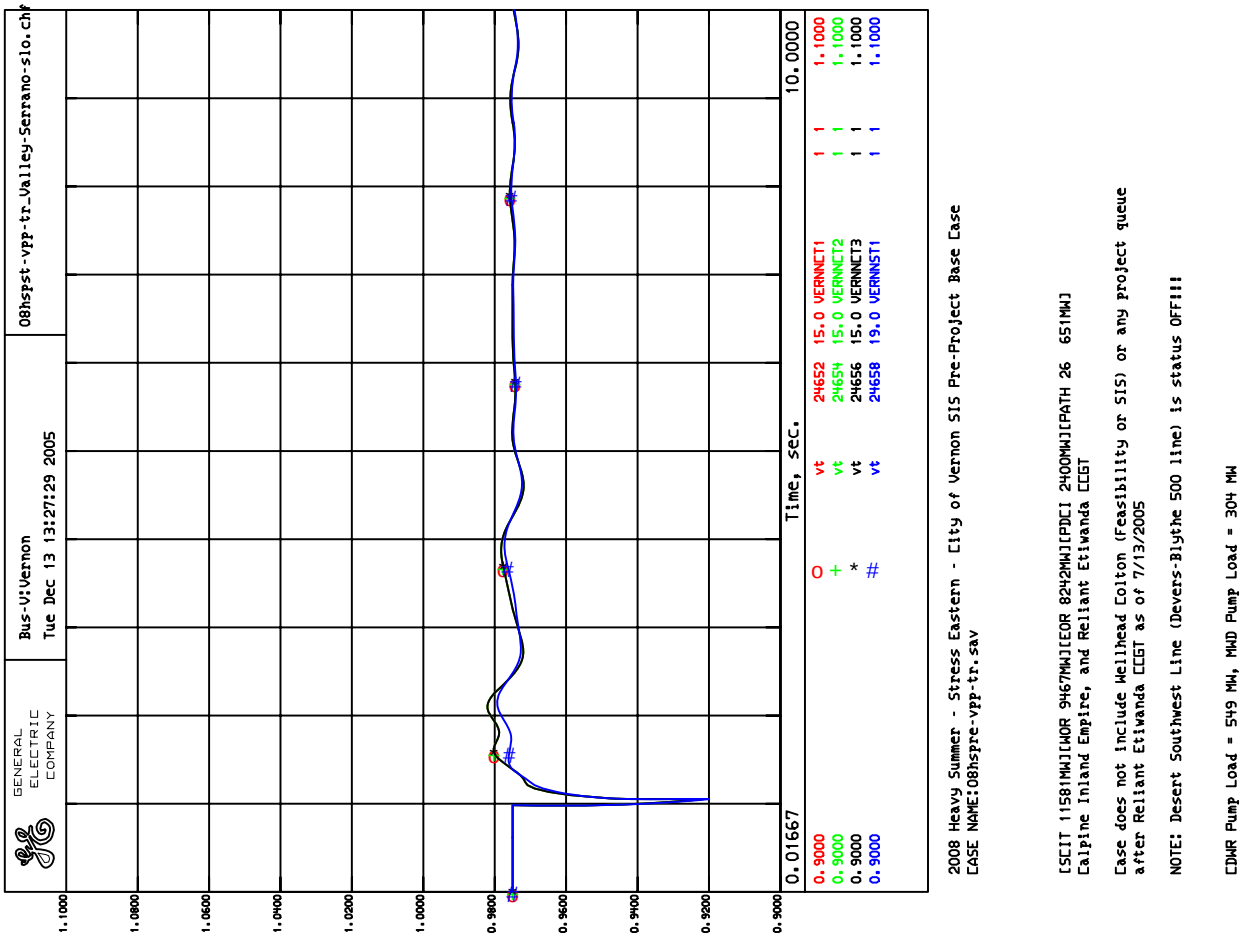
Plot 14 - 5: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



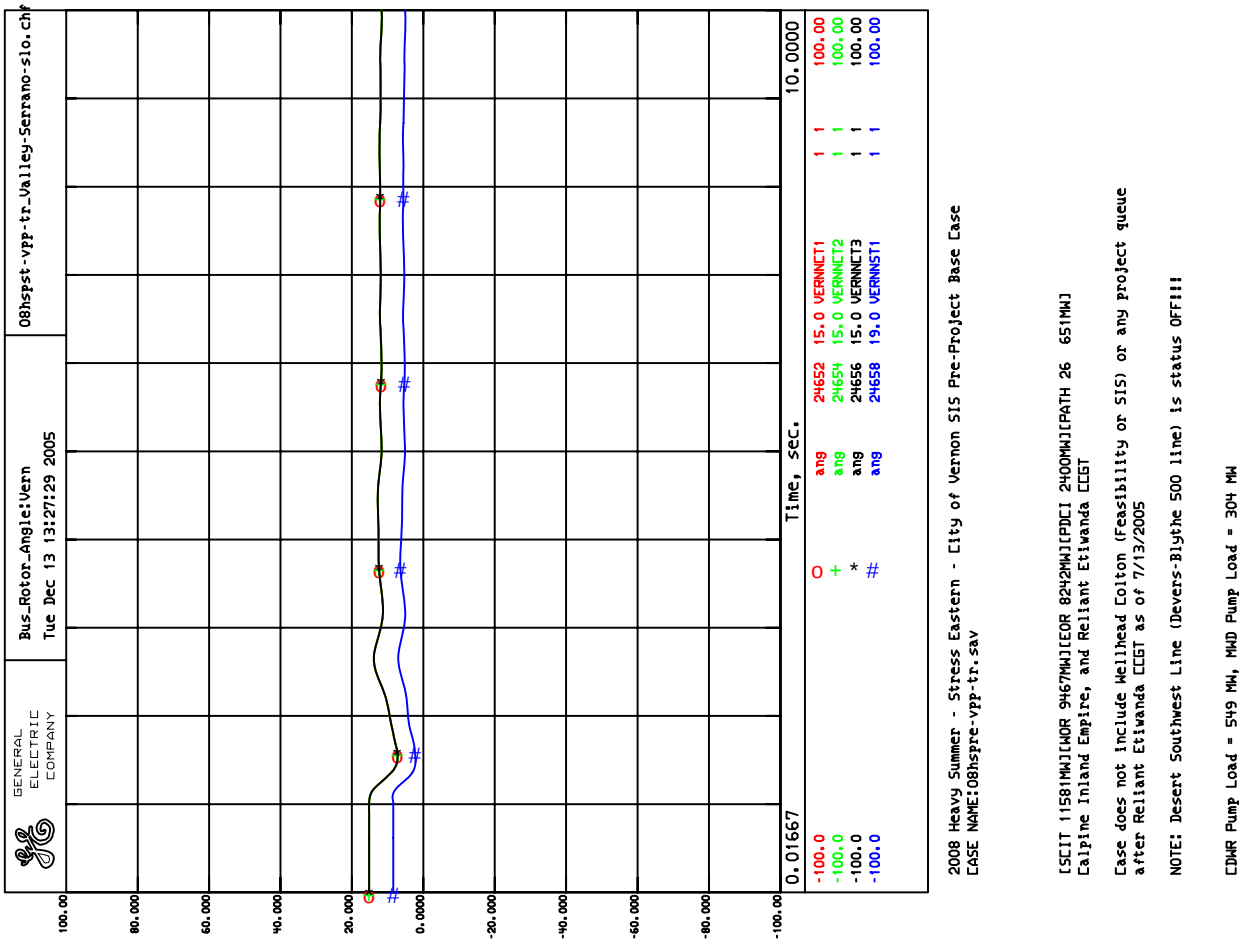
Plot 14 - 6: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



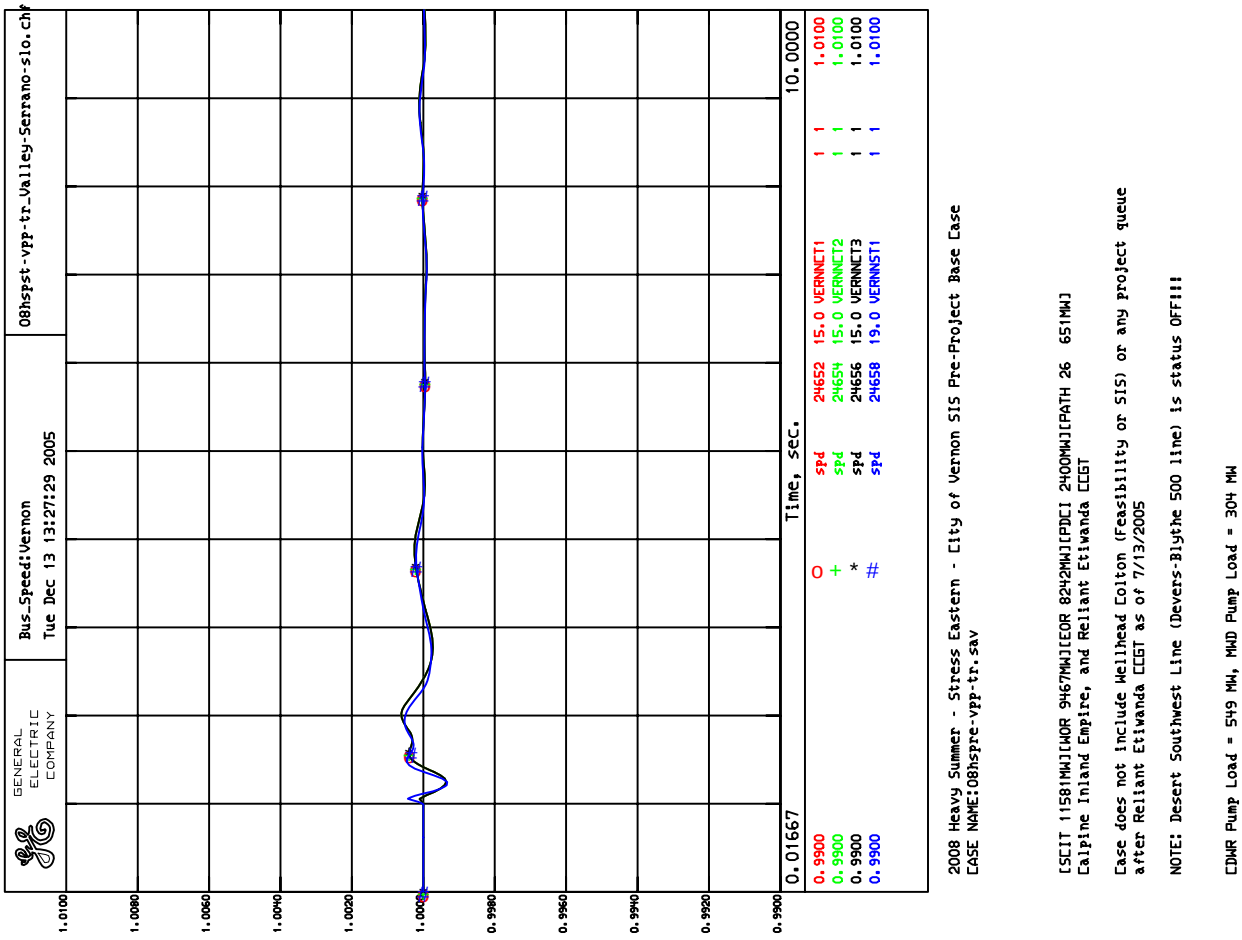
Plot 14 - 7: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



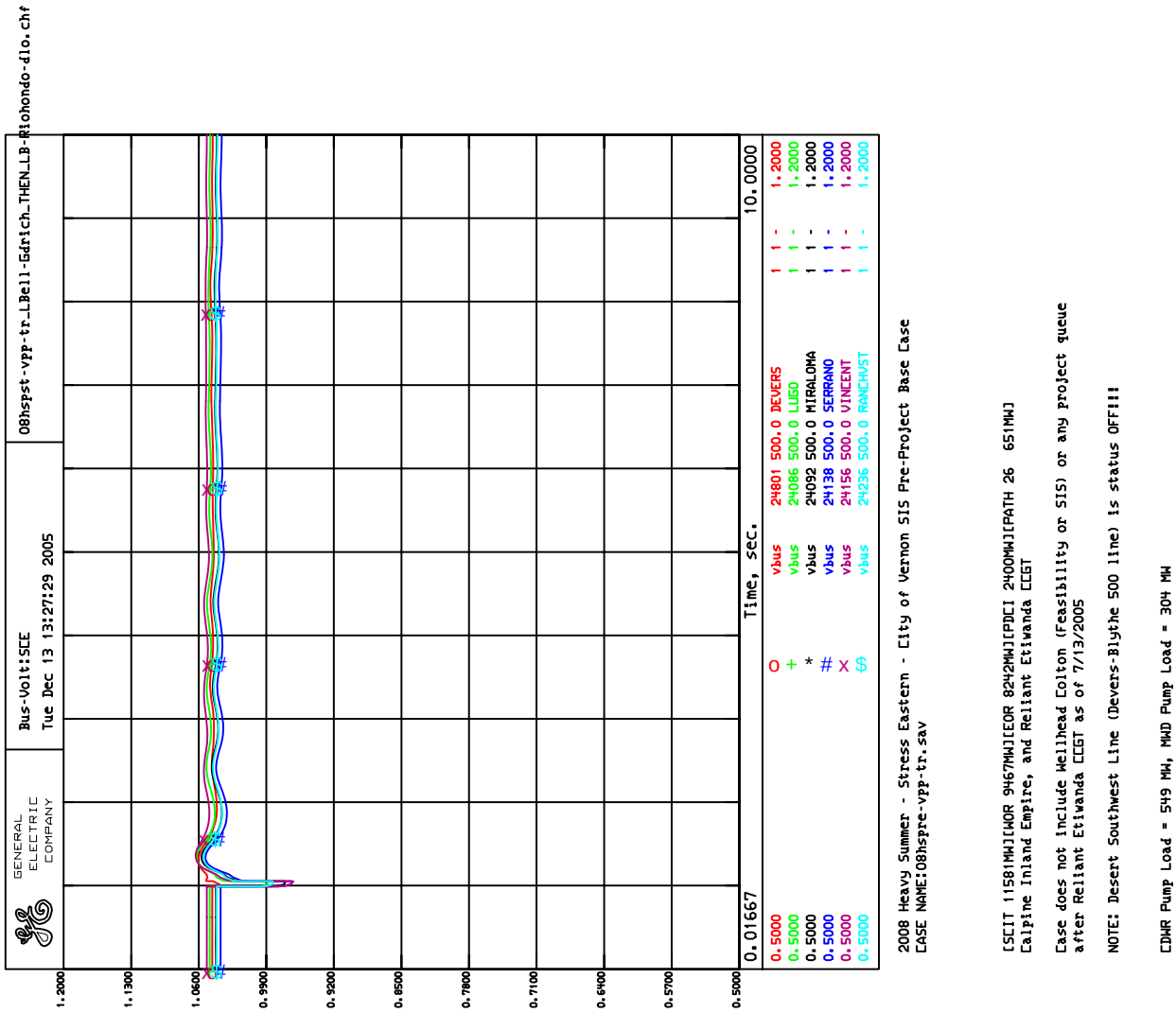
Plot 14 - 8: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



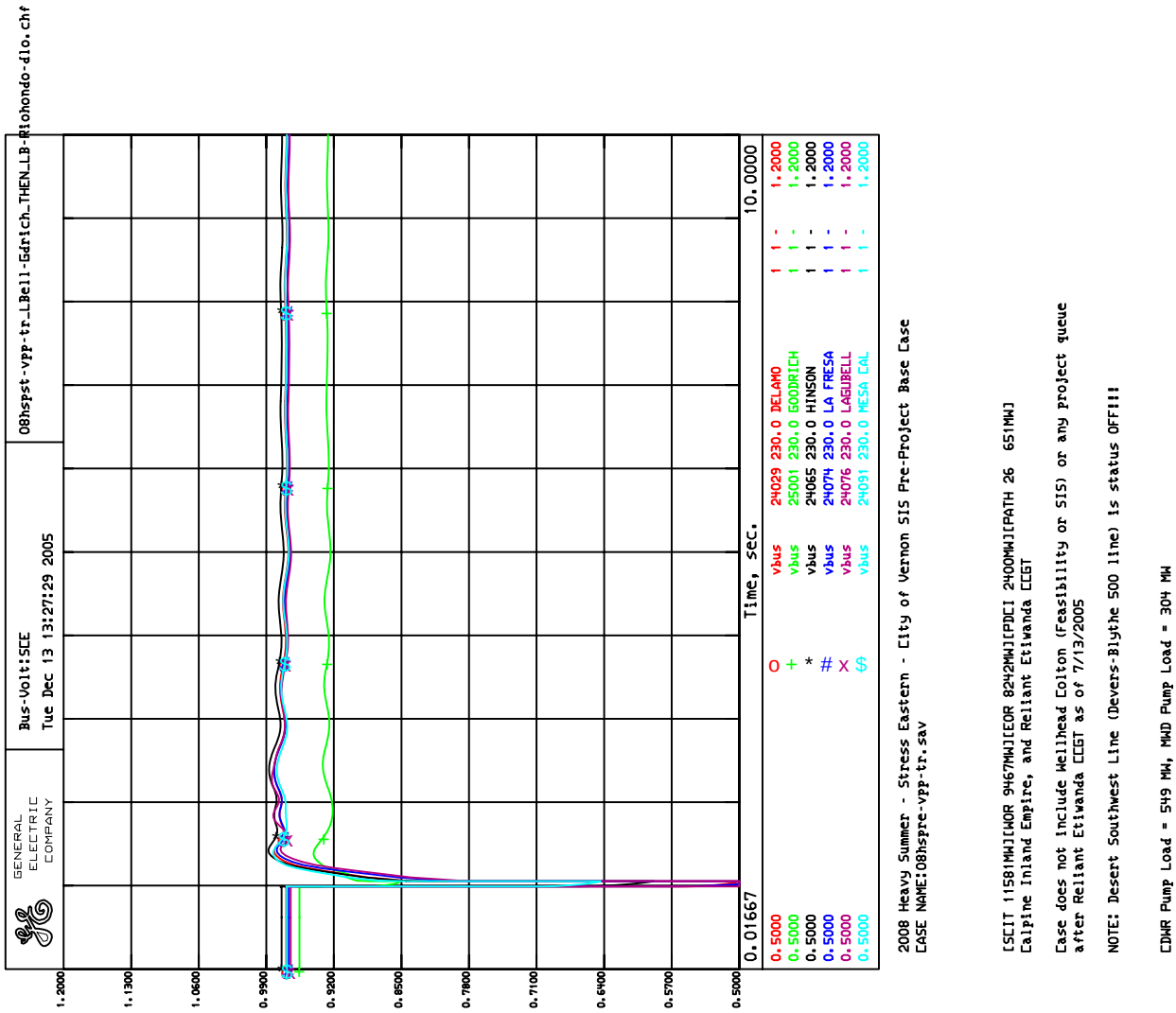
Plot 14 - 9: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



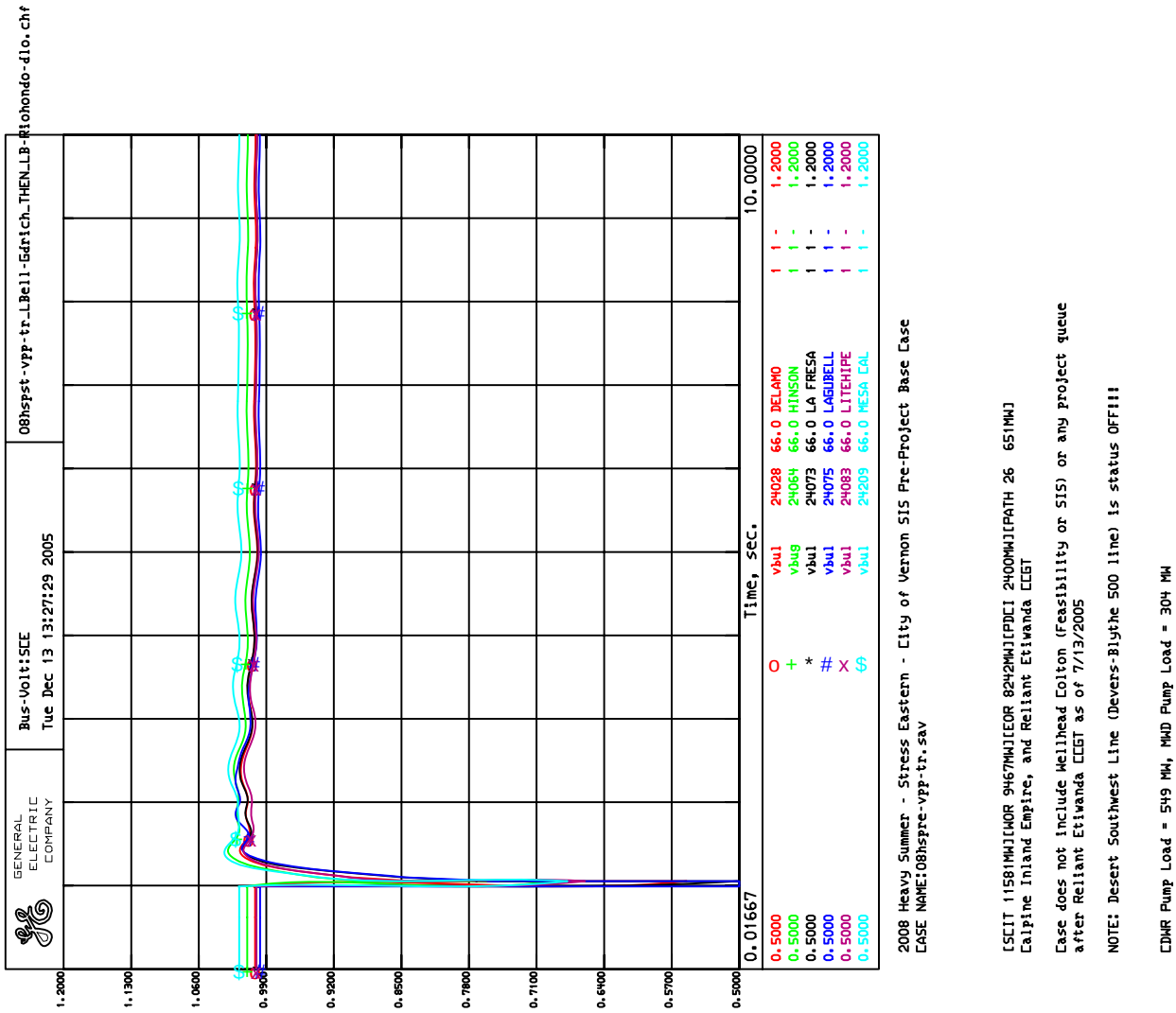
Plot 15 - 1: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



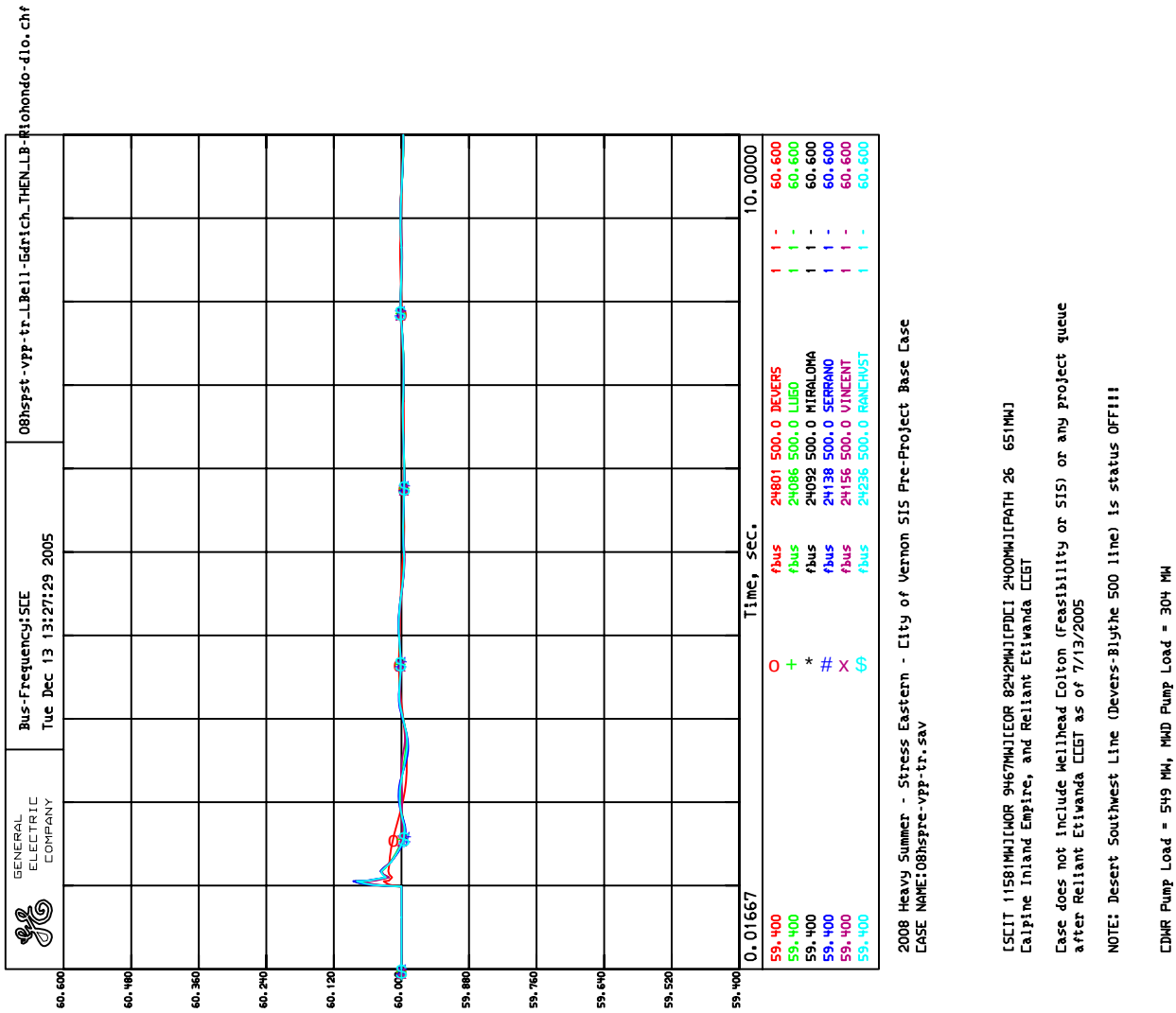
Plot 15 - 2: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



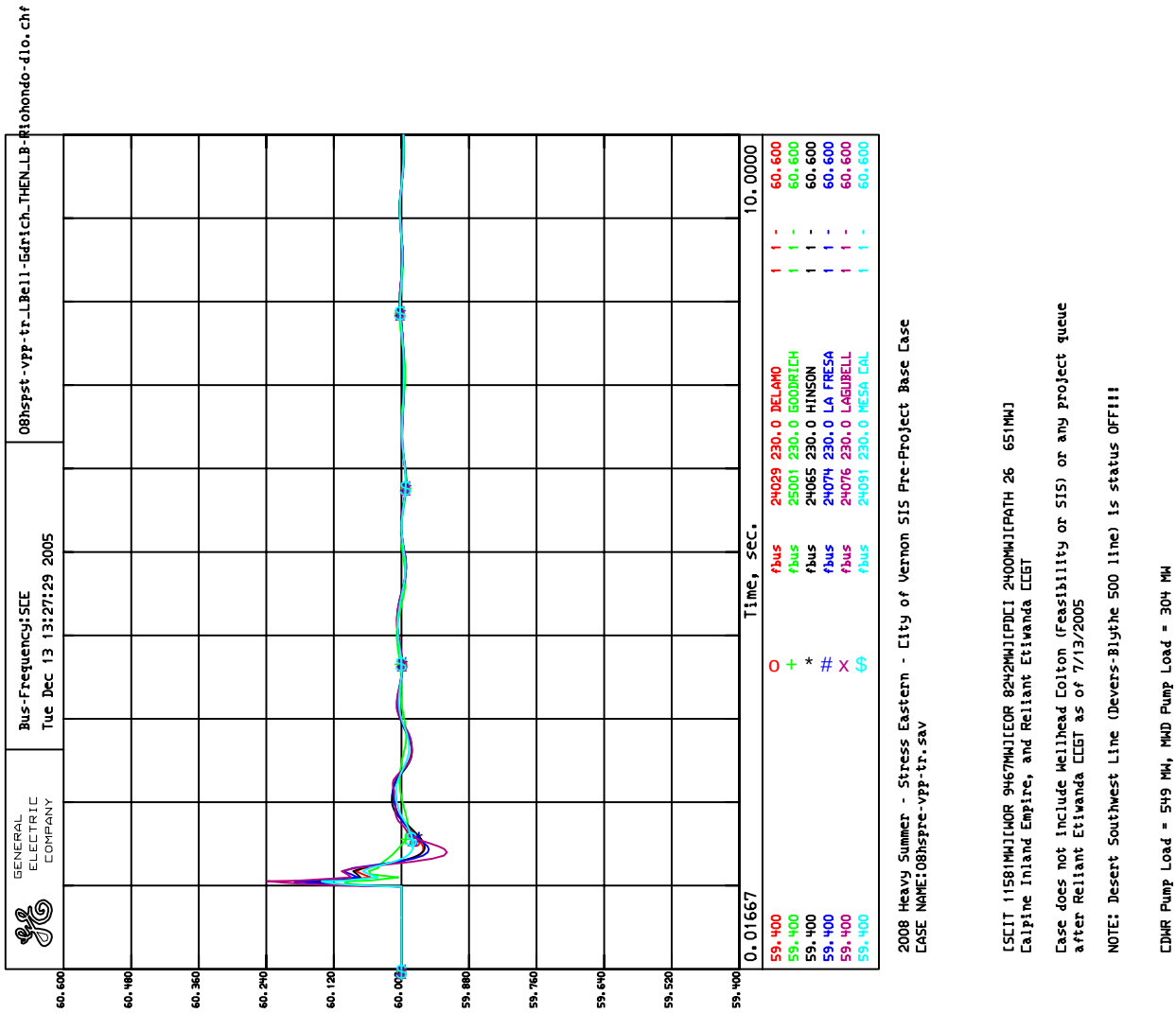
Plot 15 - 3: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



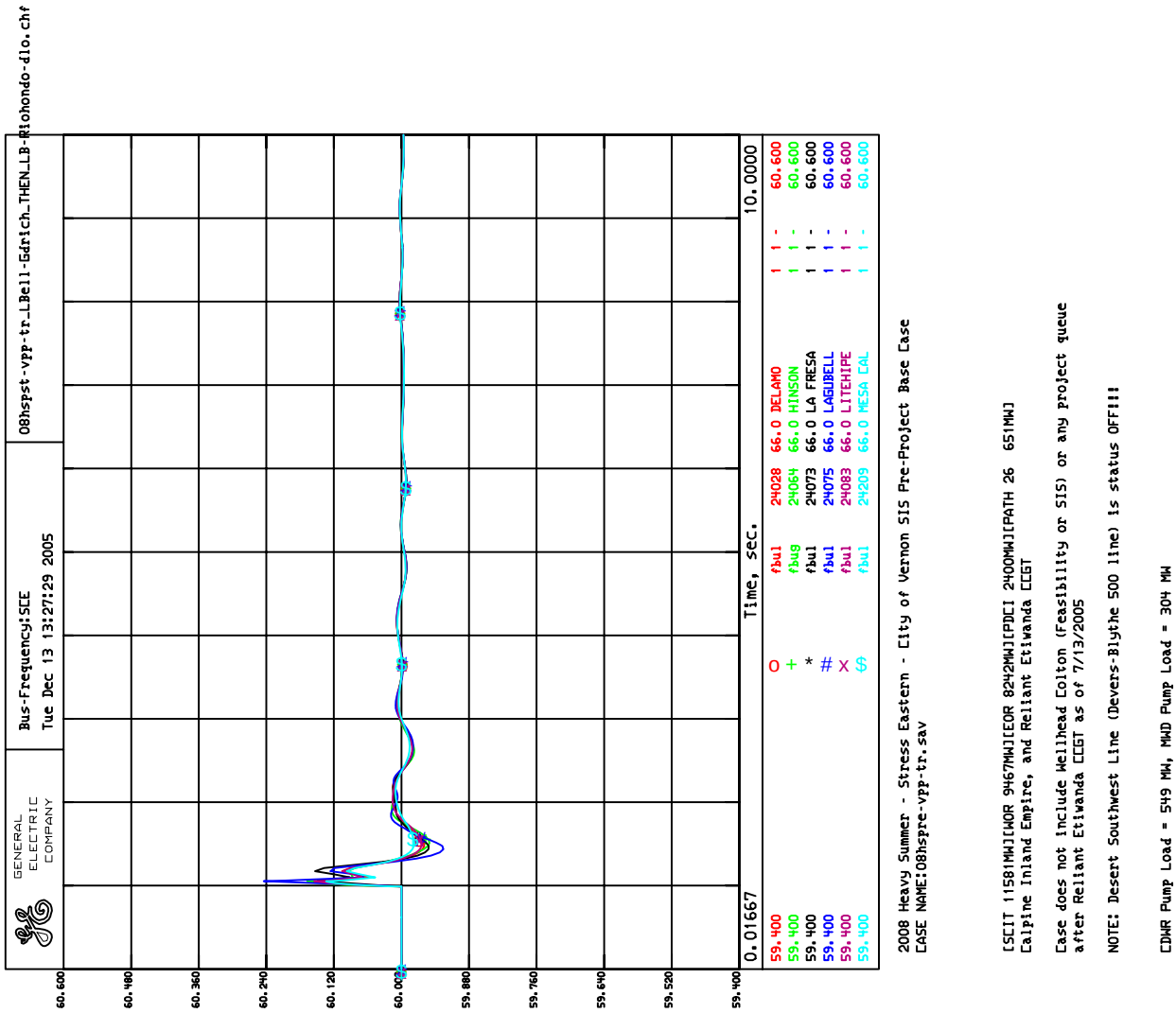
Plot 15 - 4: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



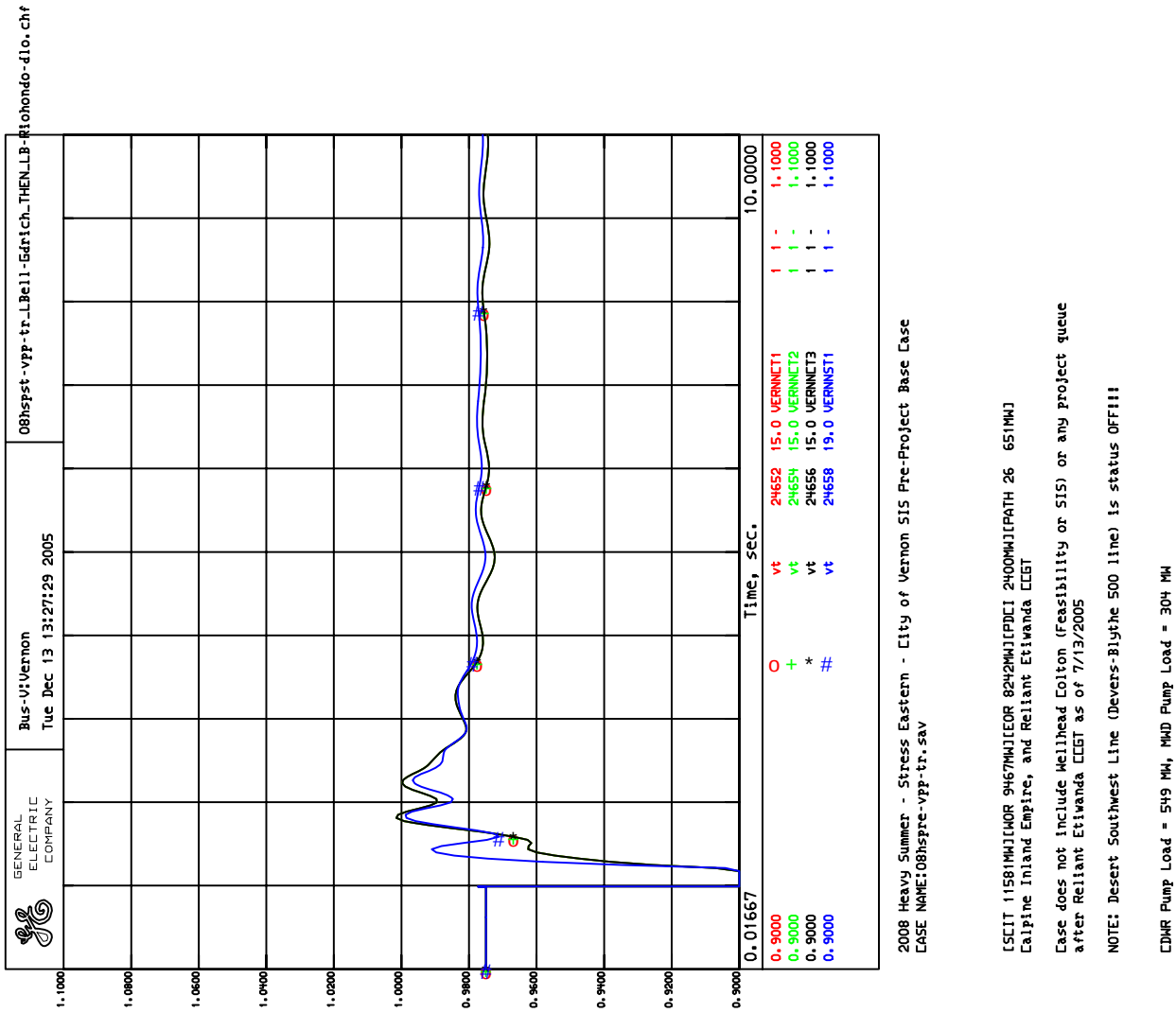
Plot 15 - 5: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



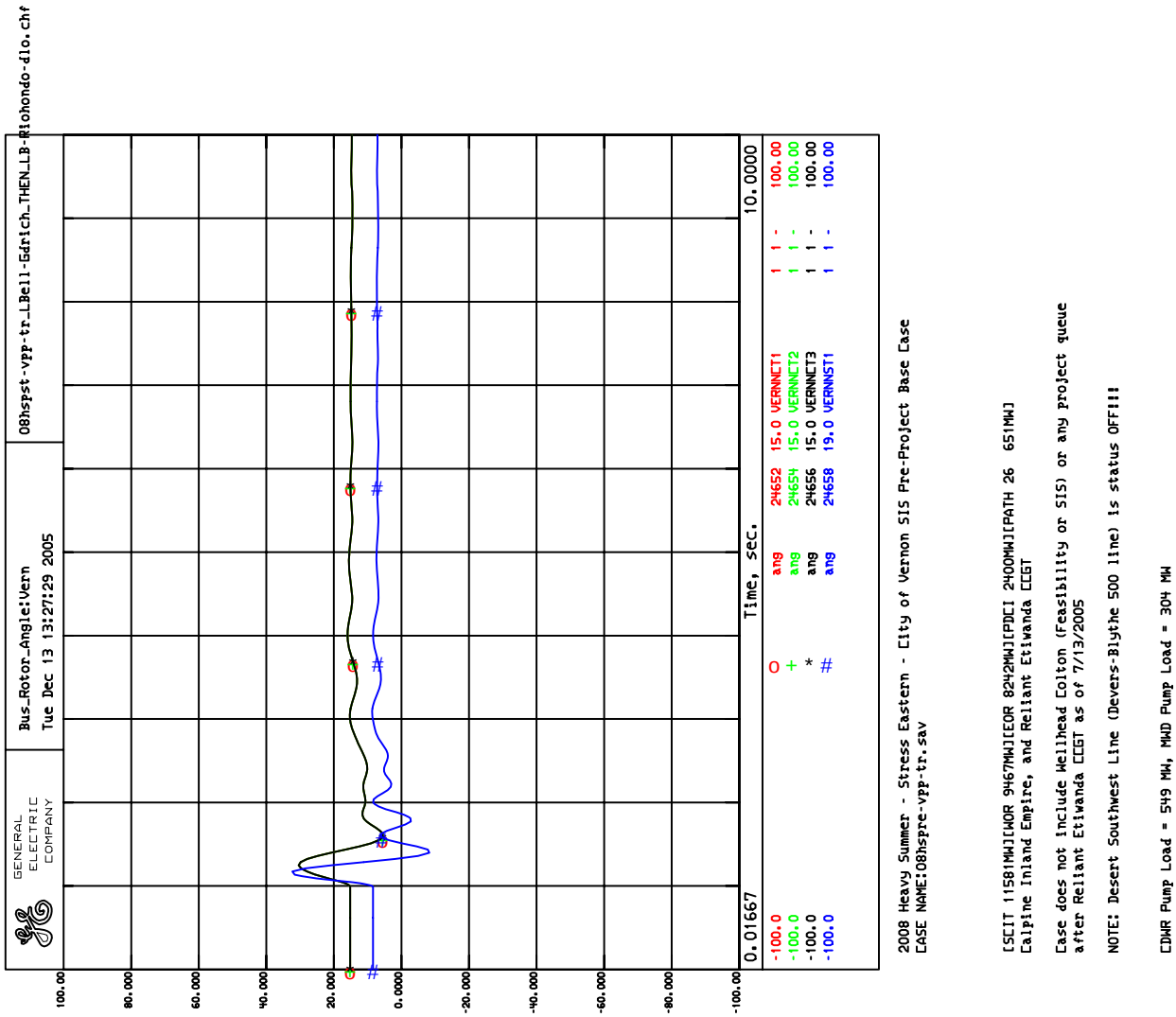
Plot 15 - 6: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



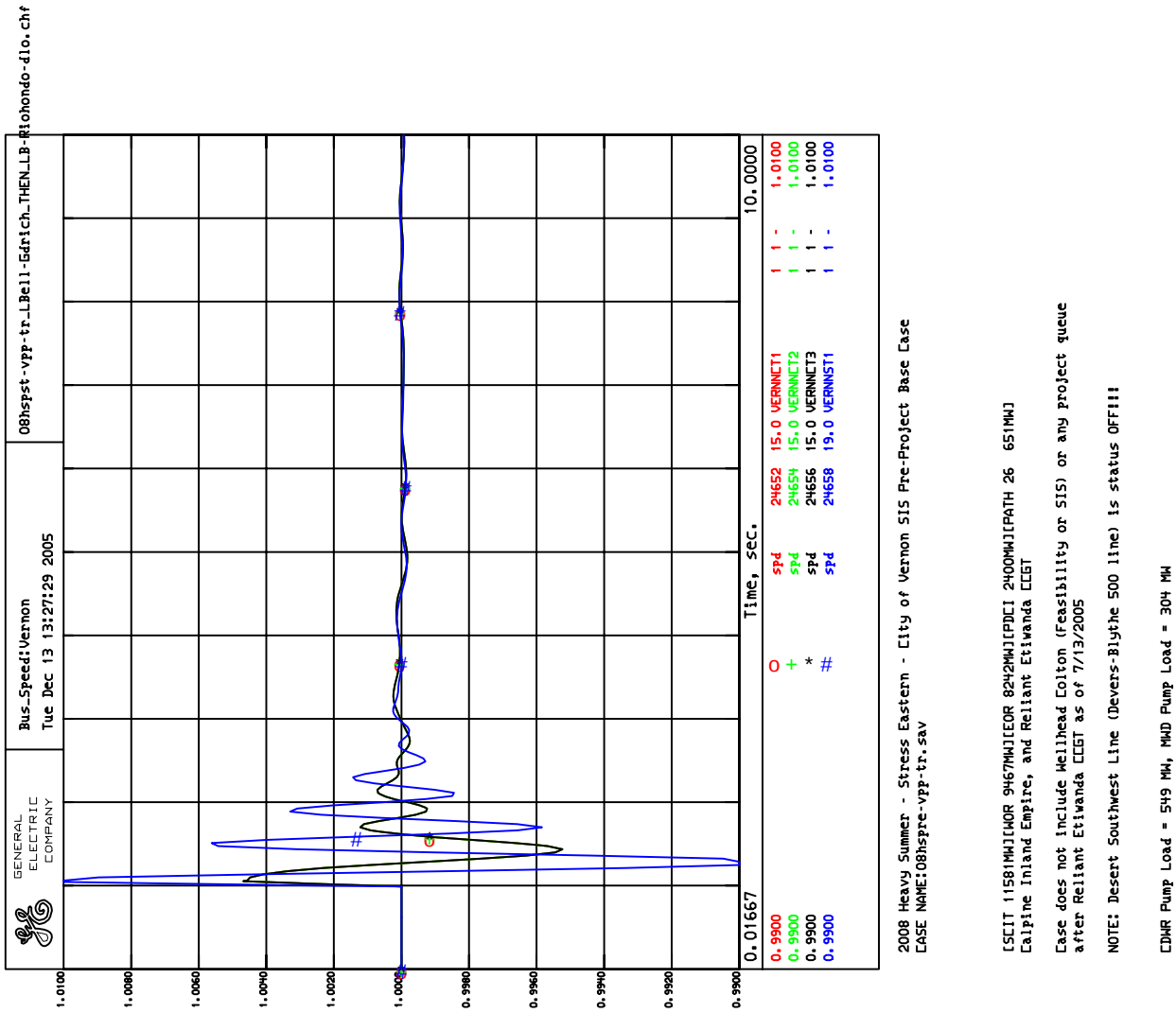
Plot 15 - 7: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



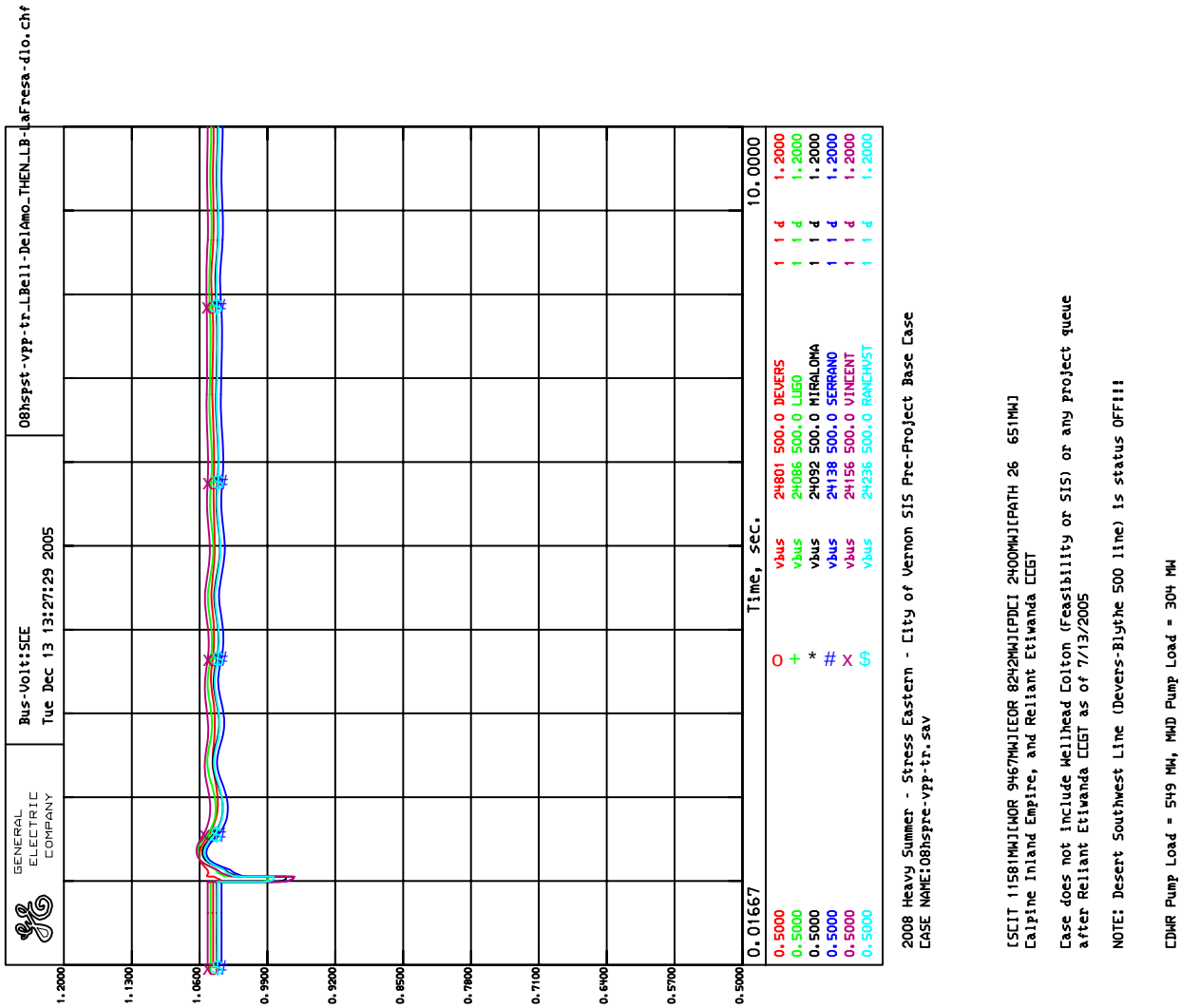
Plot 15 - 8: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



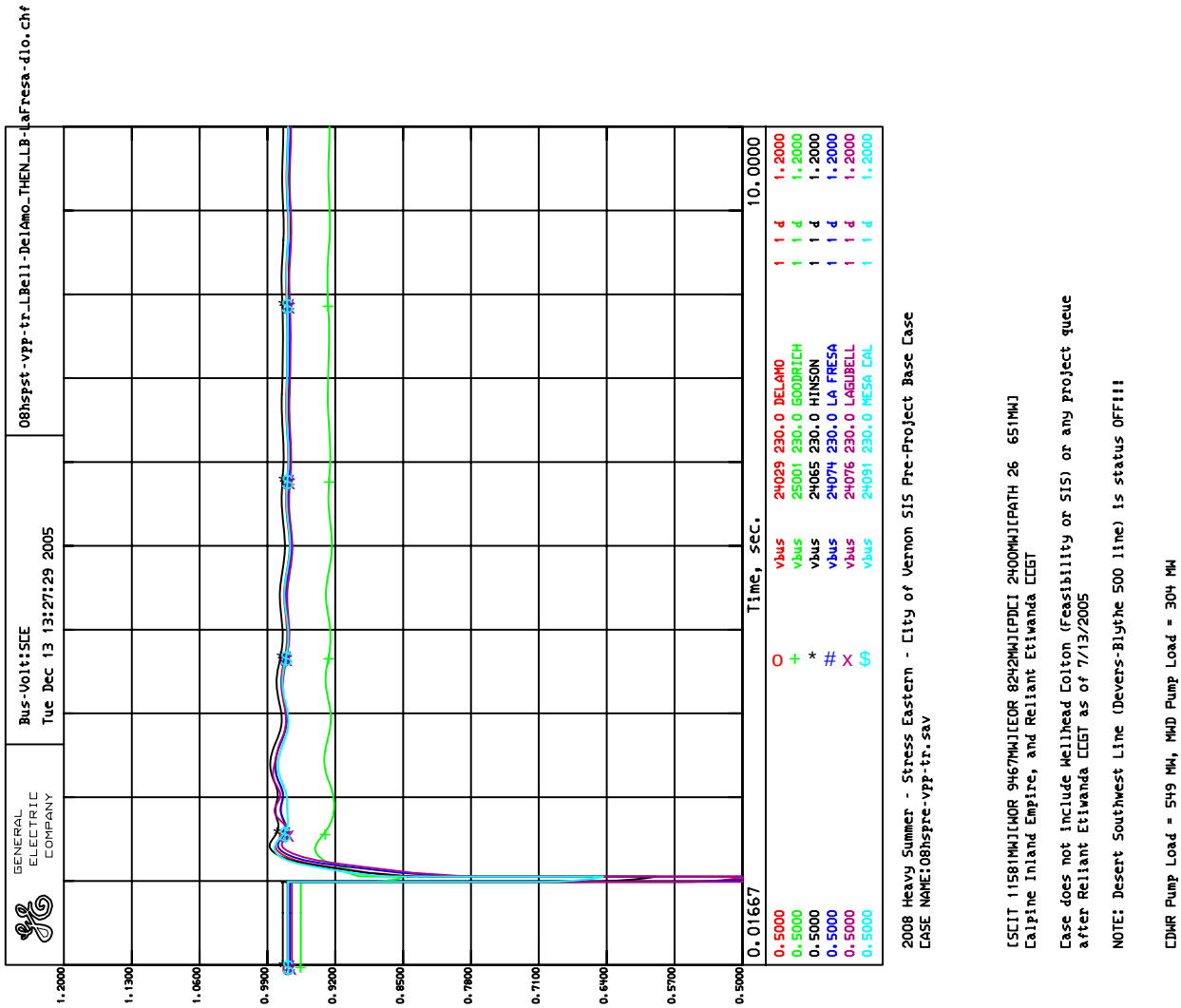
Plot 15 - 9: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



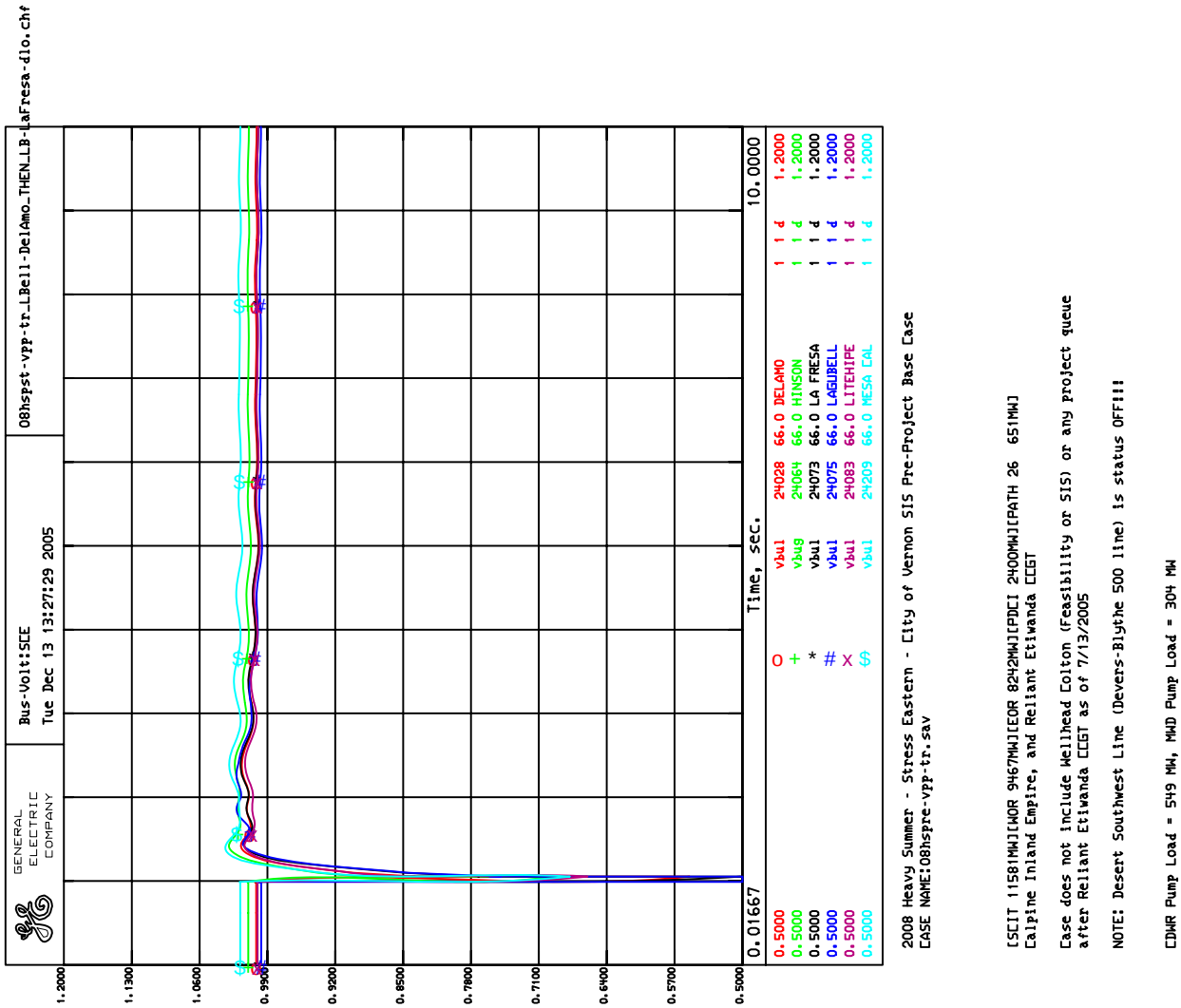
Plot 16 - 1: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



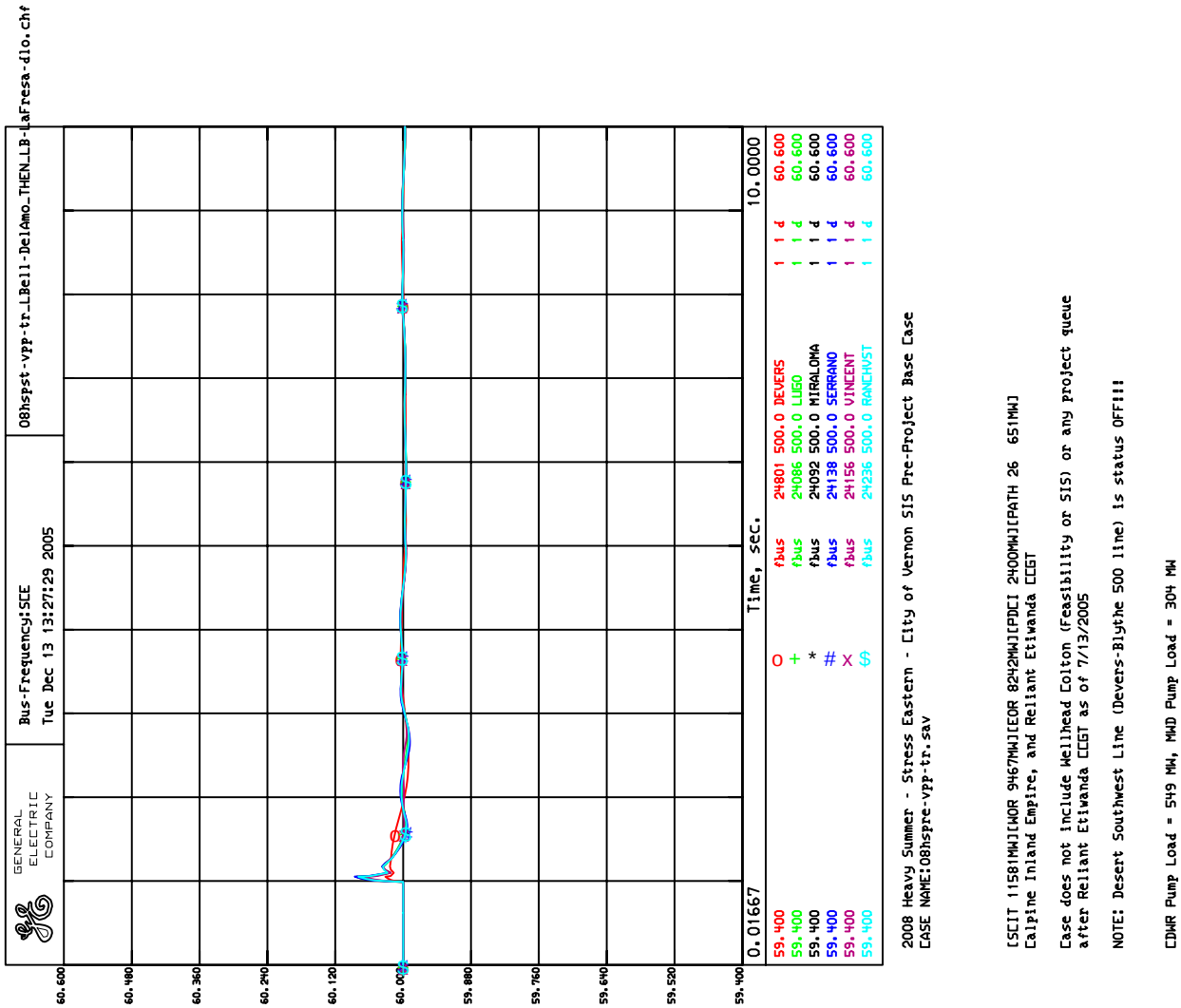
Plot 16 - 2: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



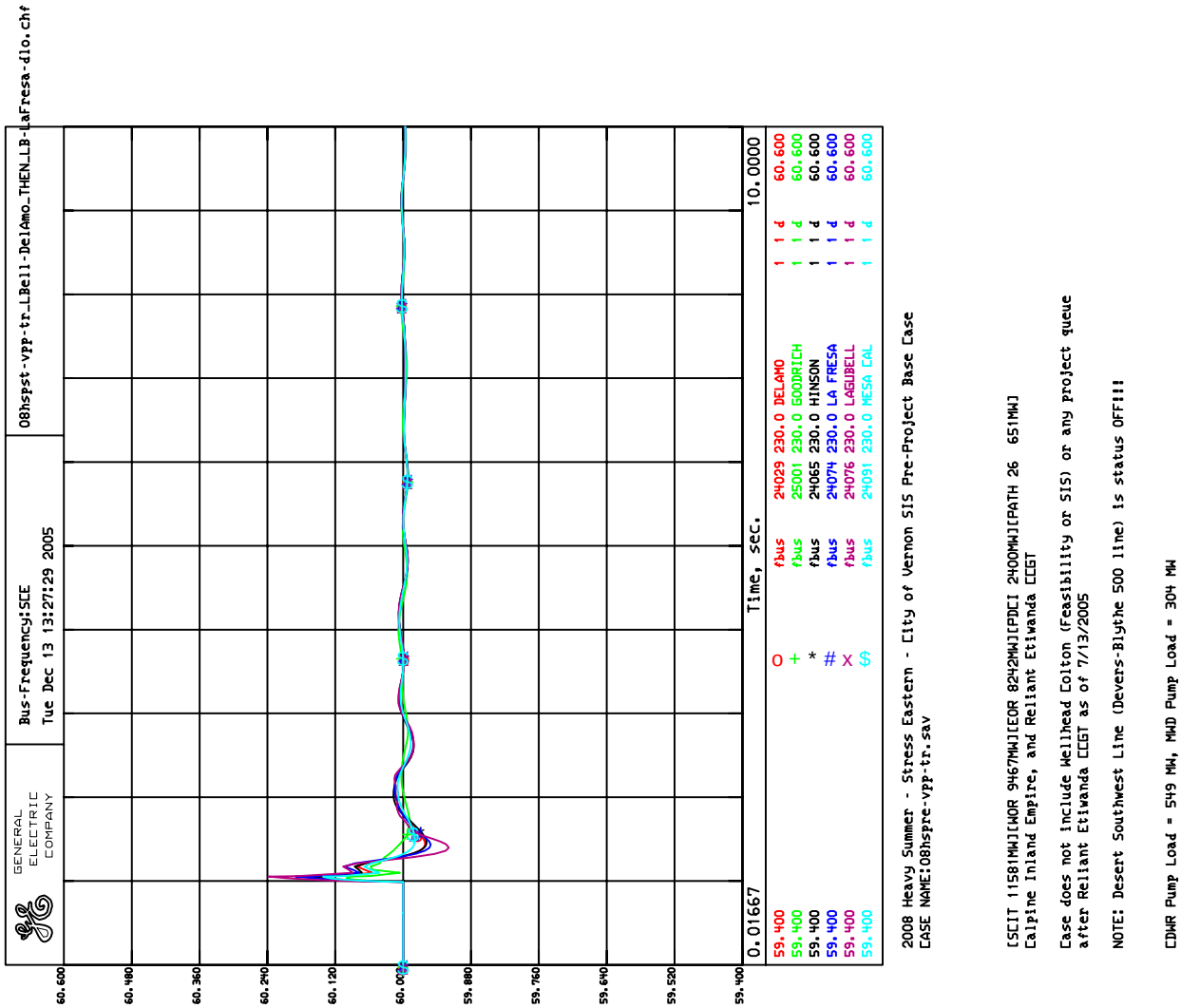
Plot 16 - 3: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



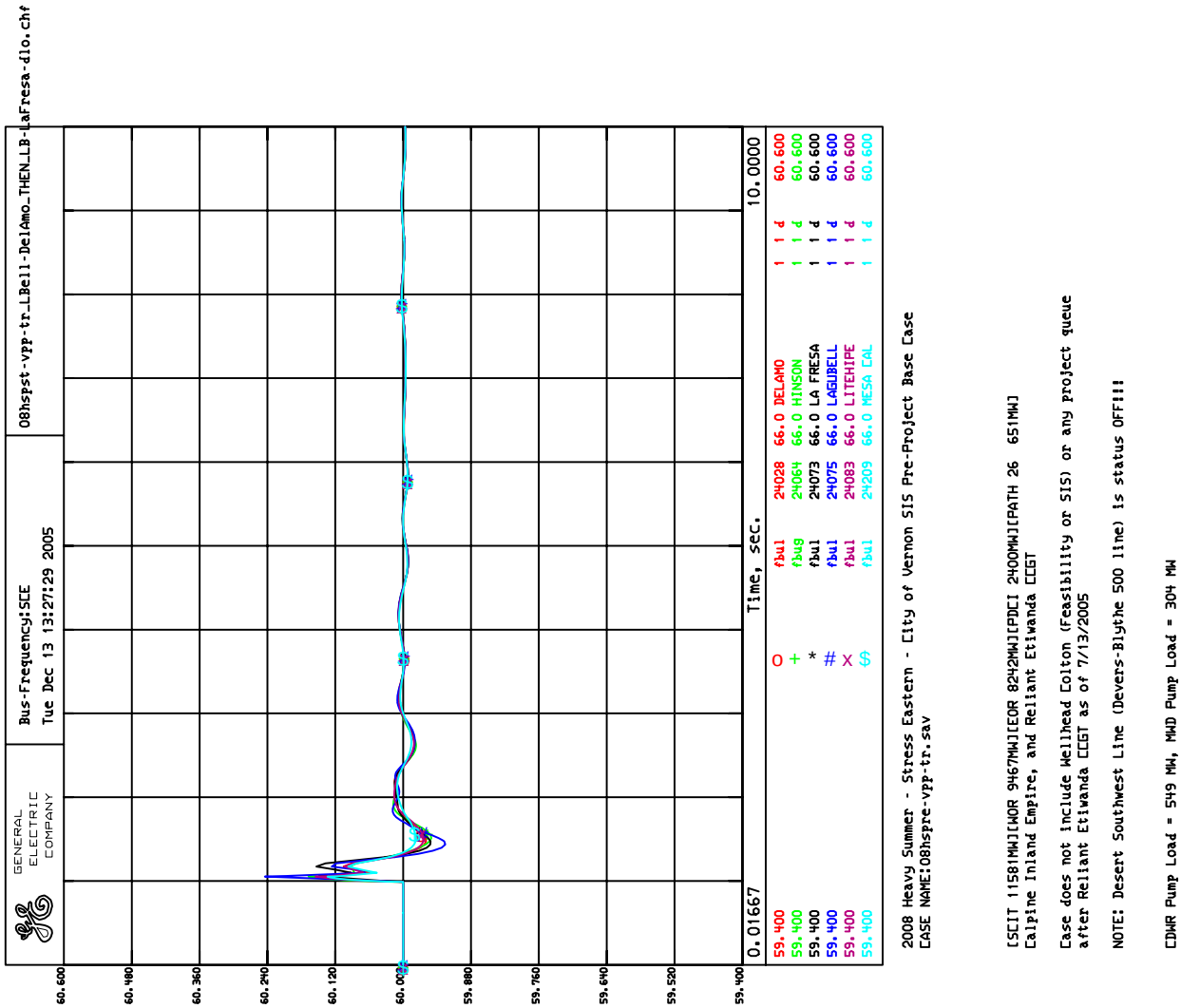
Plot 16 - 4: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



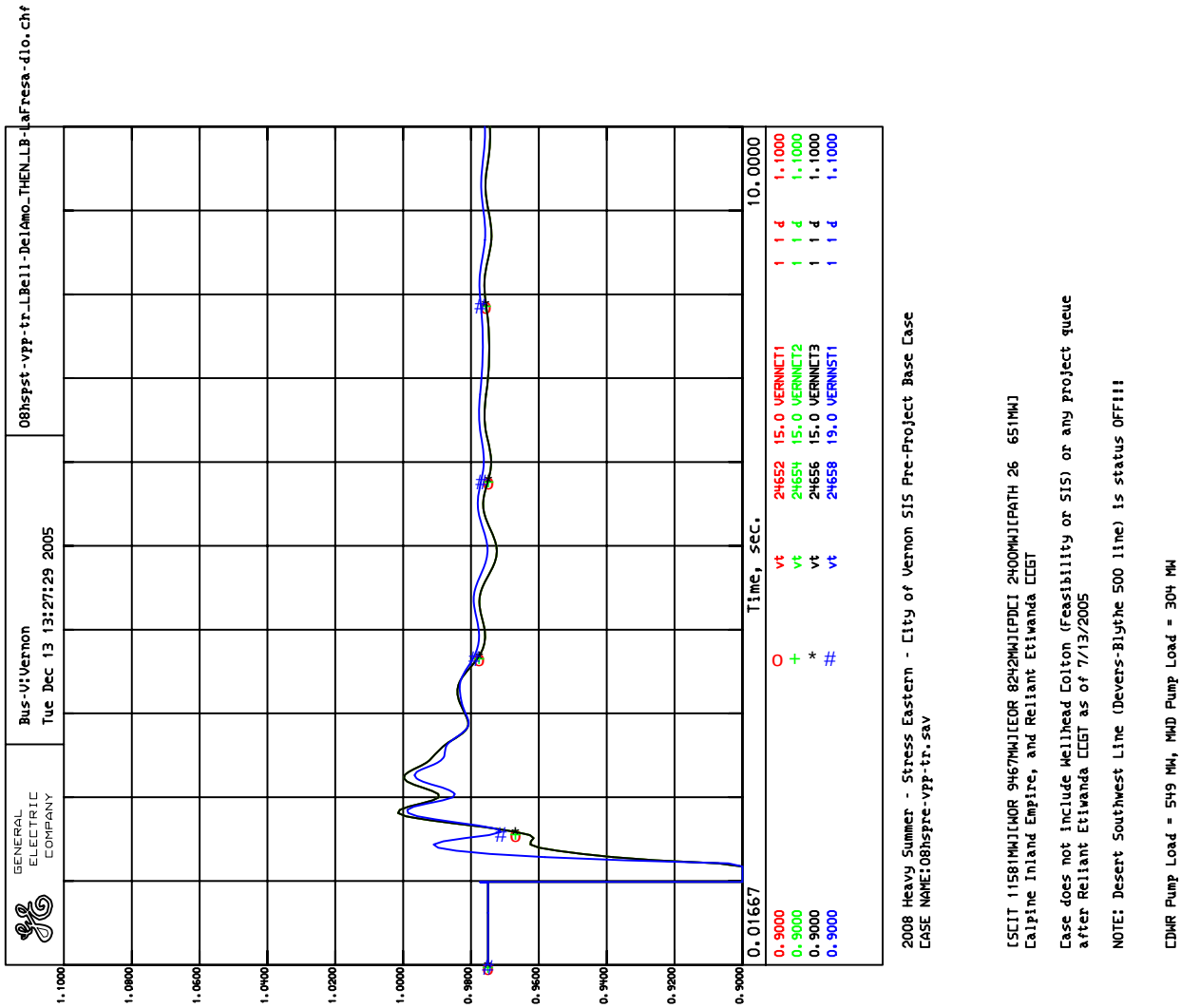
Plot 16 - 5: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



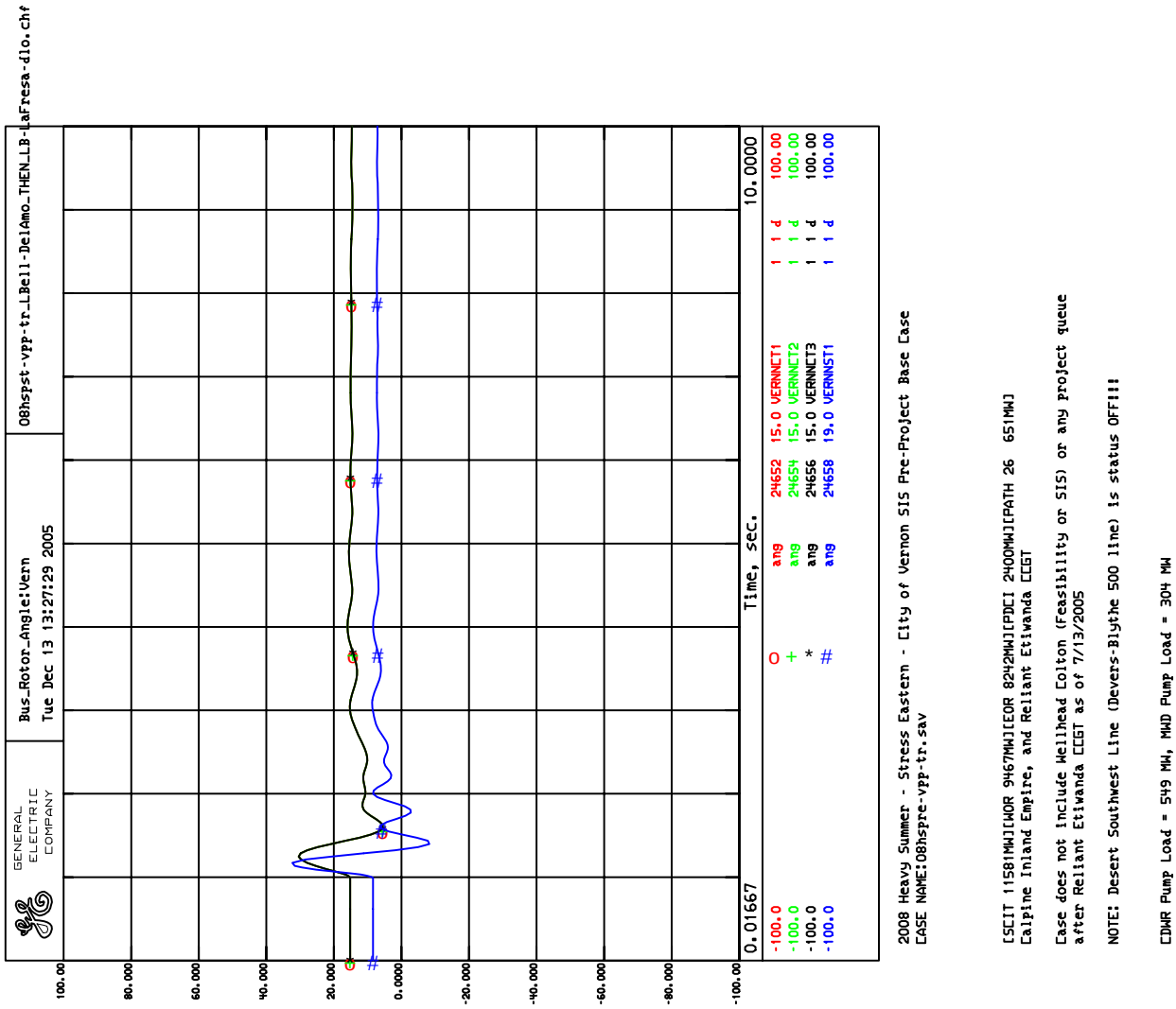
Plot 16 - 6: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



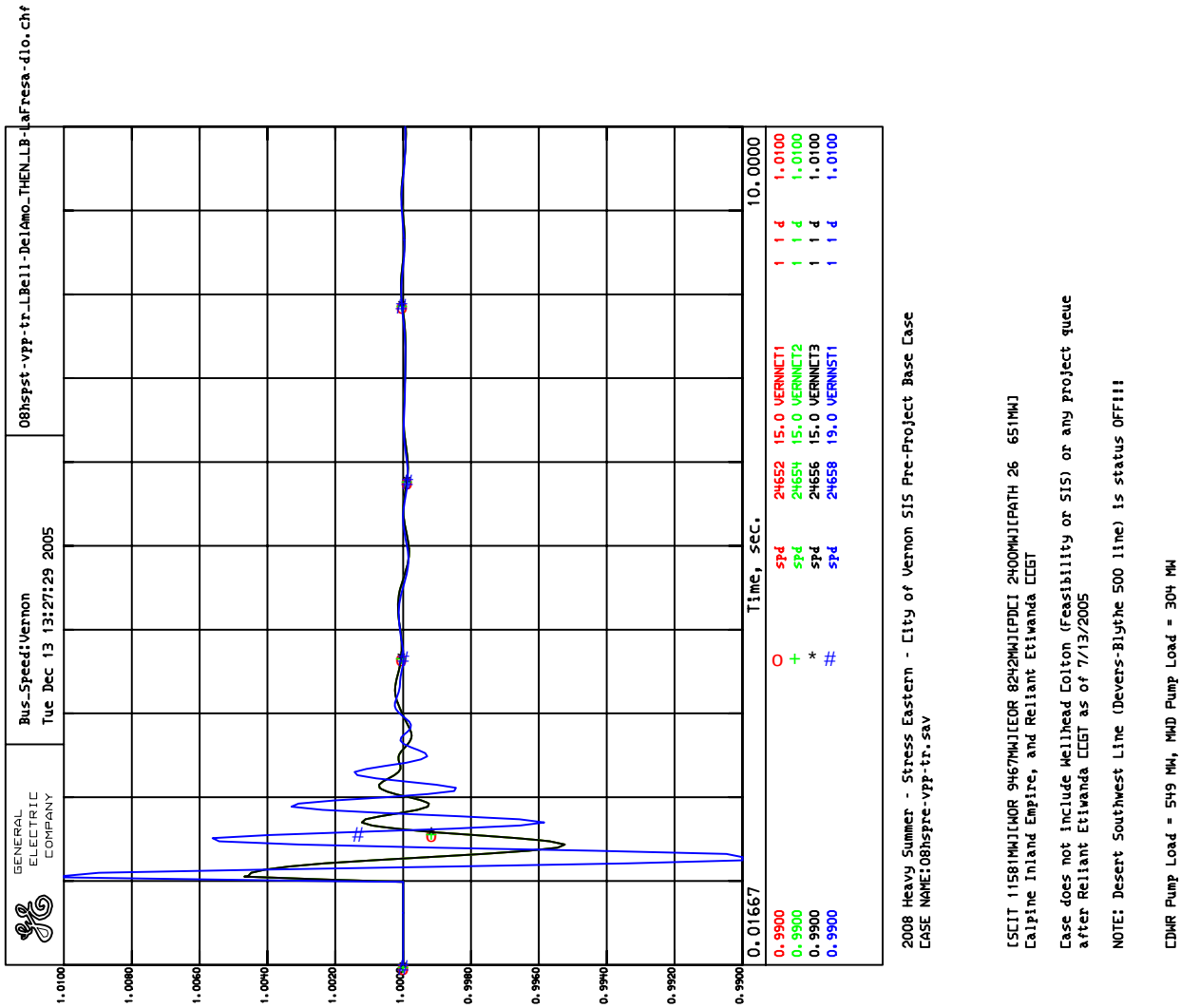
Plot 16 - 7: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



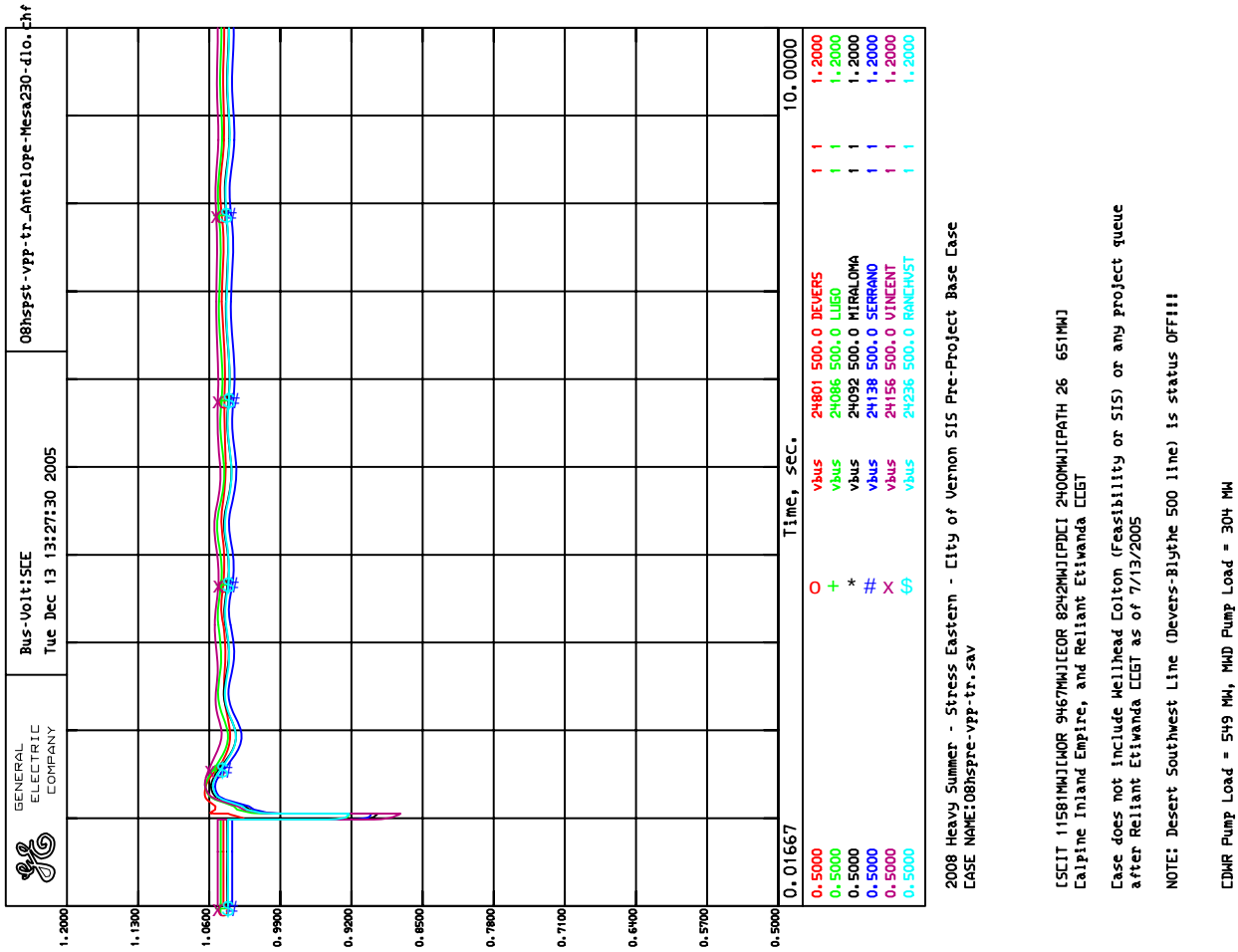
Plot 16 - 8: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



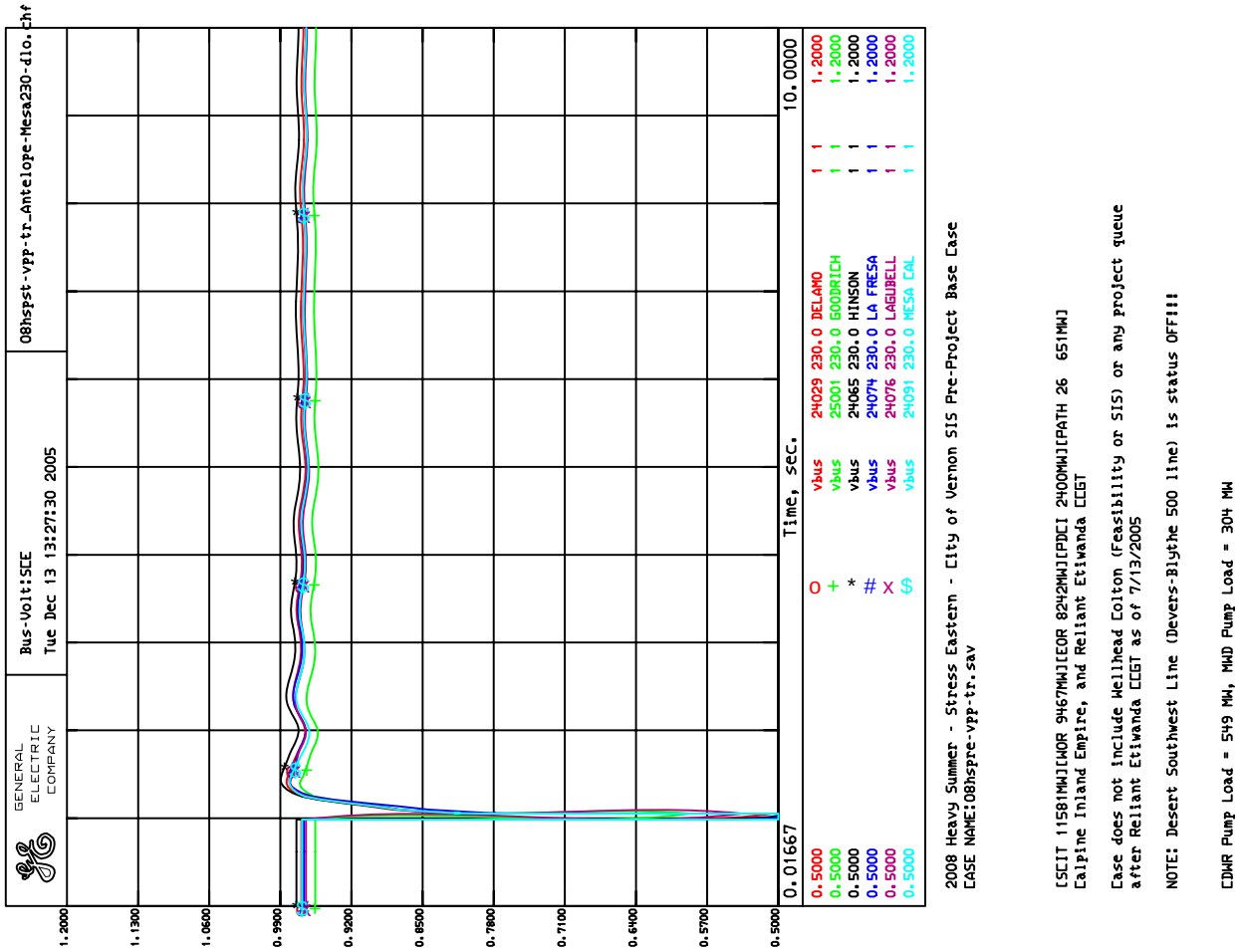
Plot 16 - 9: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



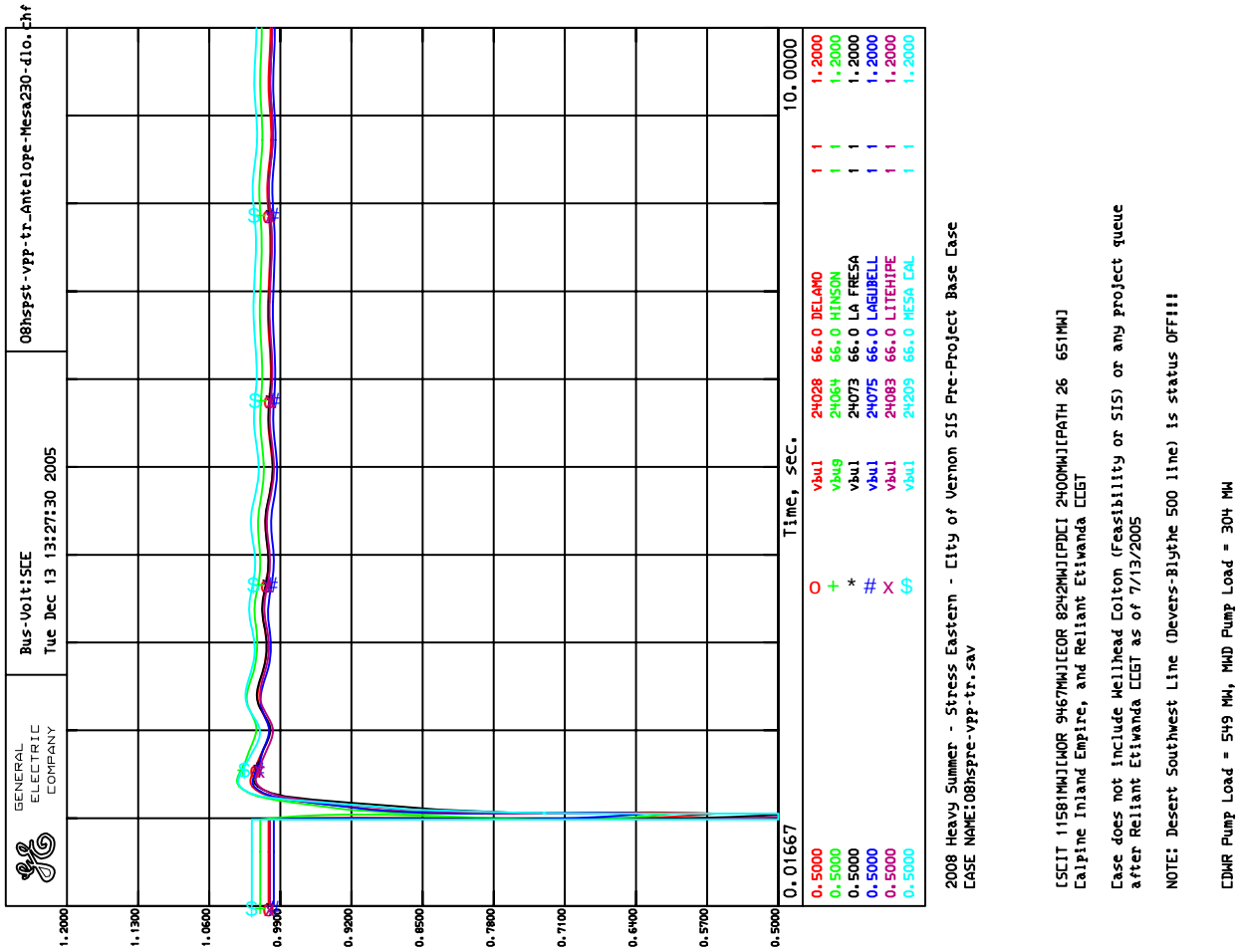
Plot 17 - 1: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



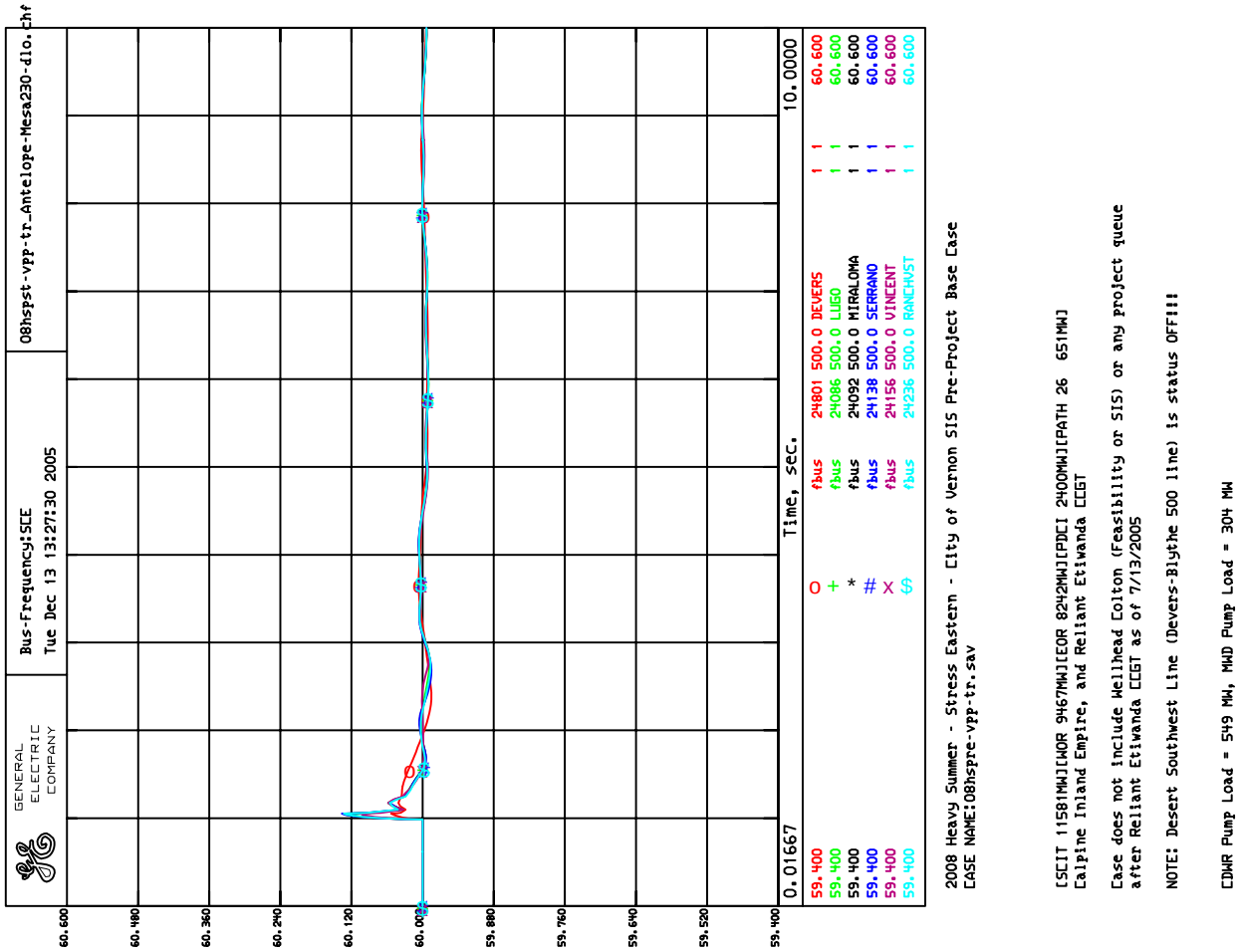
Plot 17 - 2: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



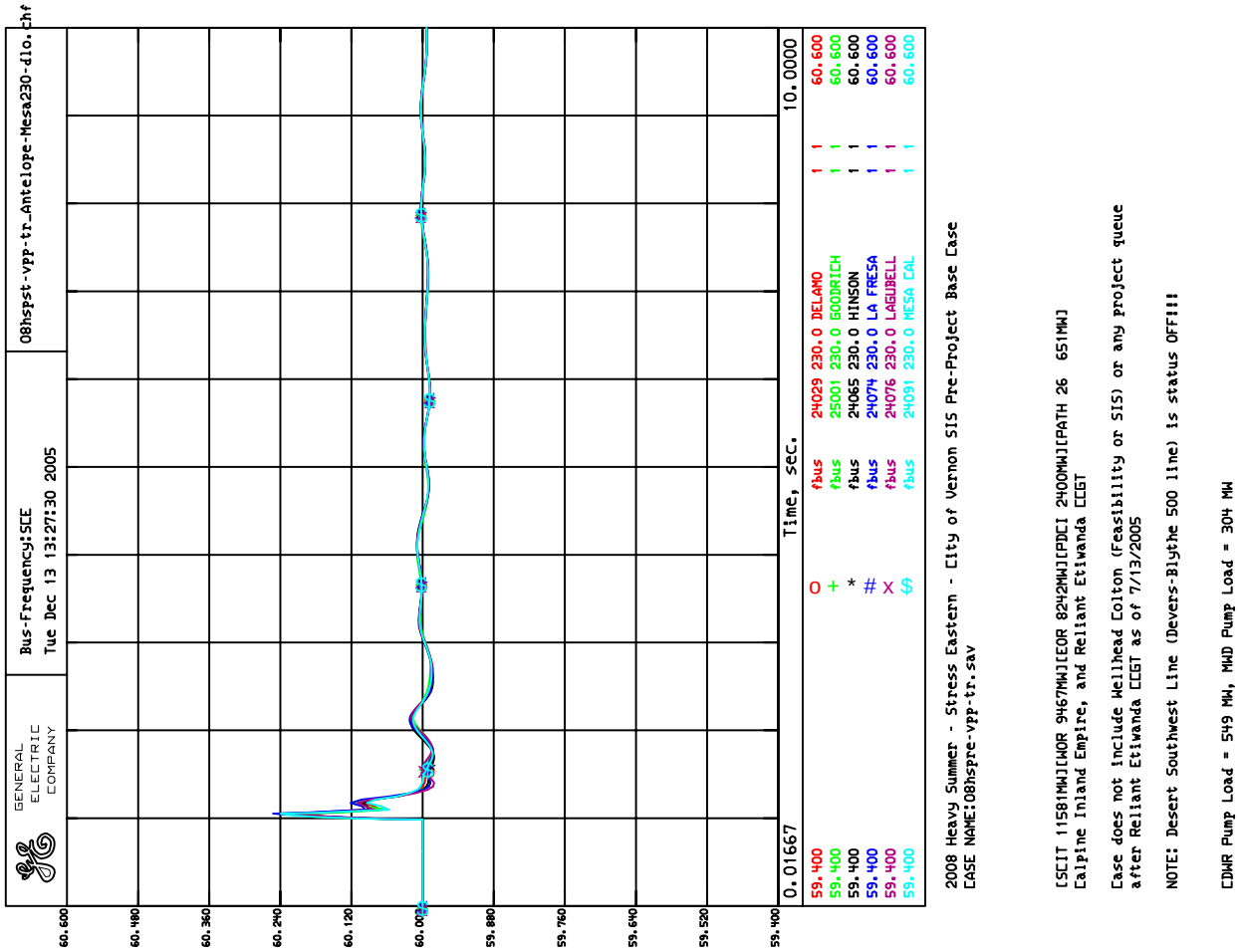
Plot 17 - 3: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



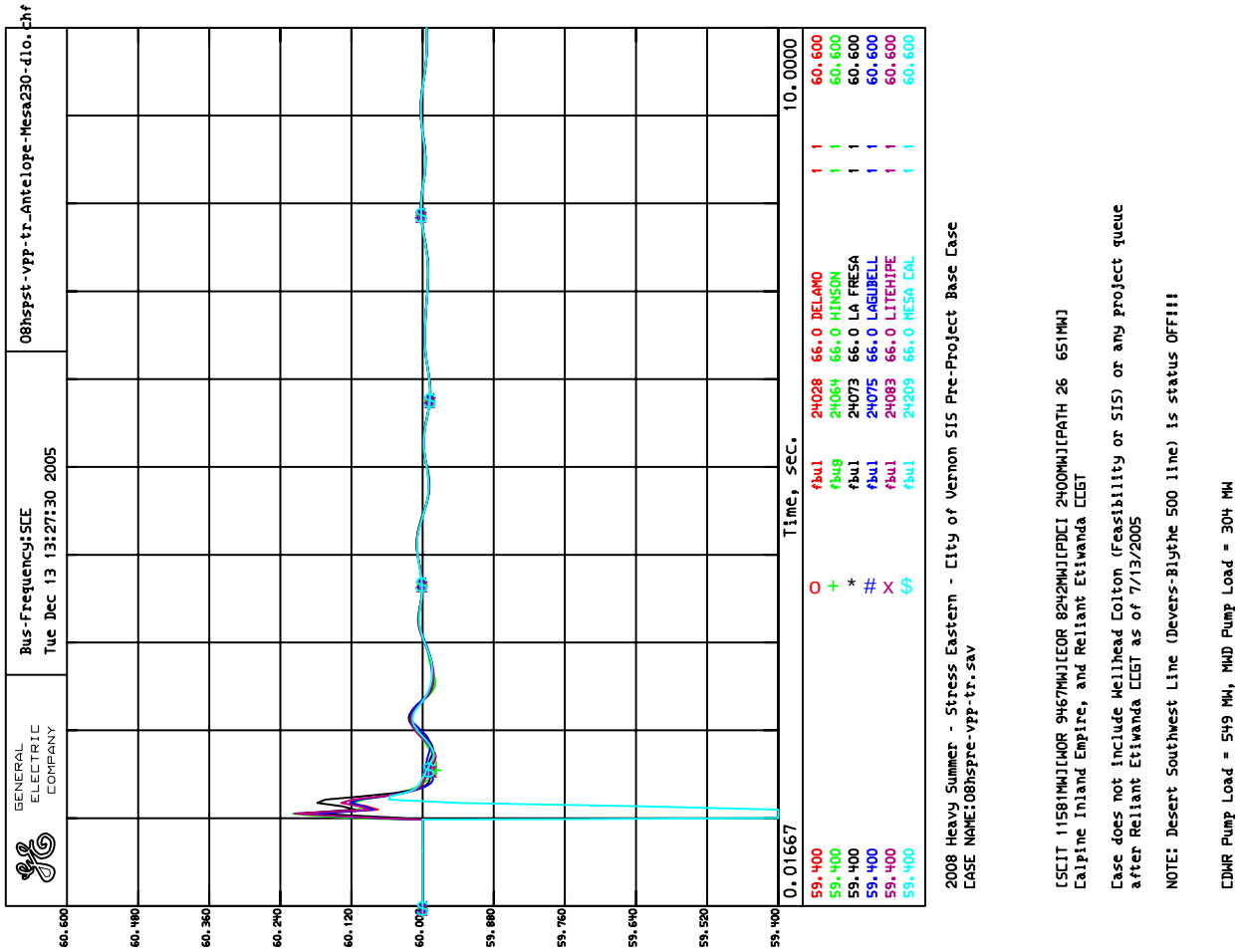
Plot 17 - 4: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



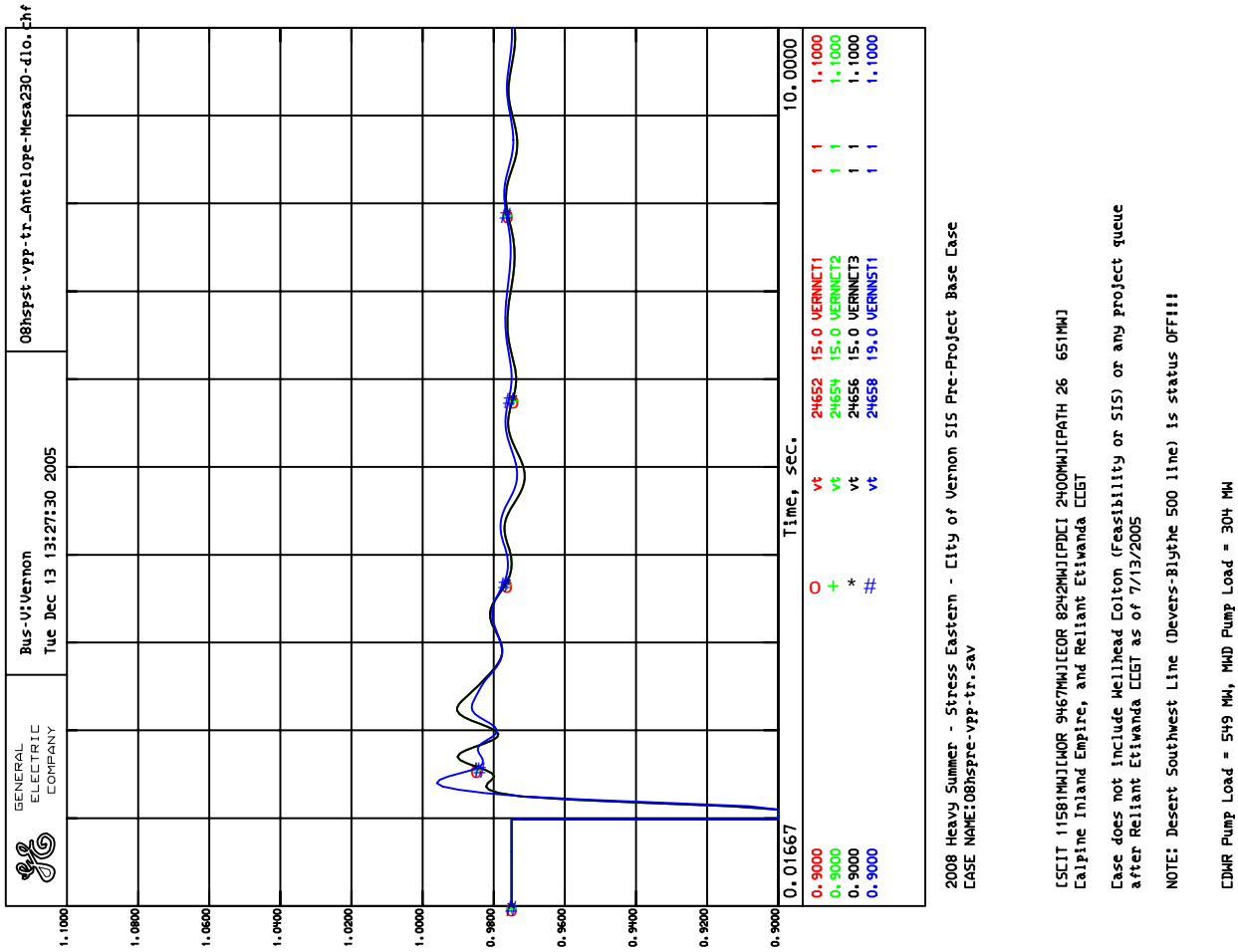
Plot 17 - 5: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



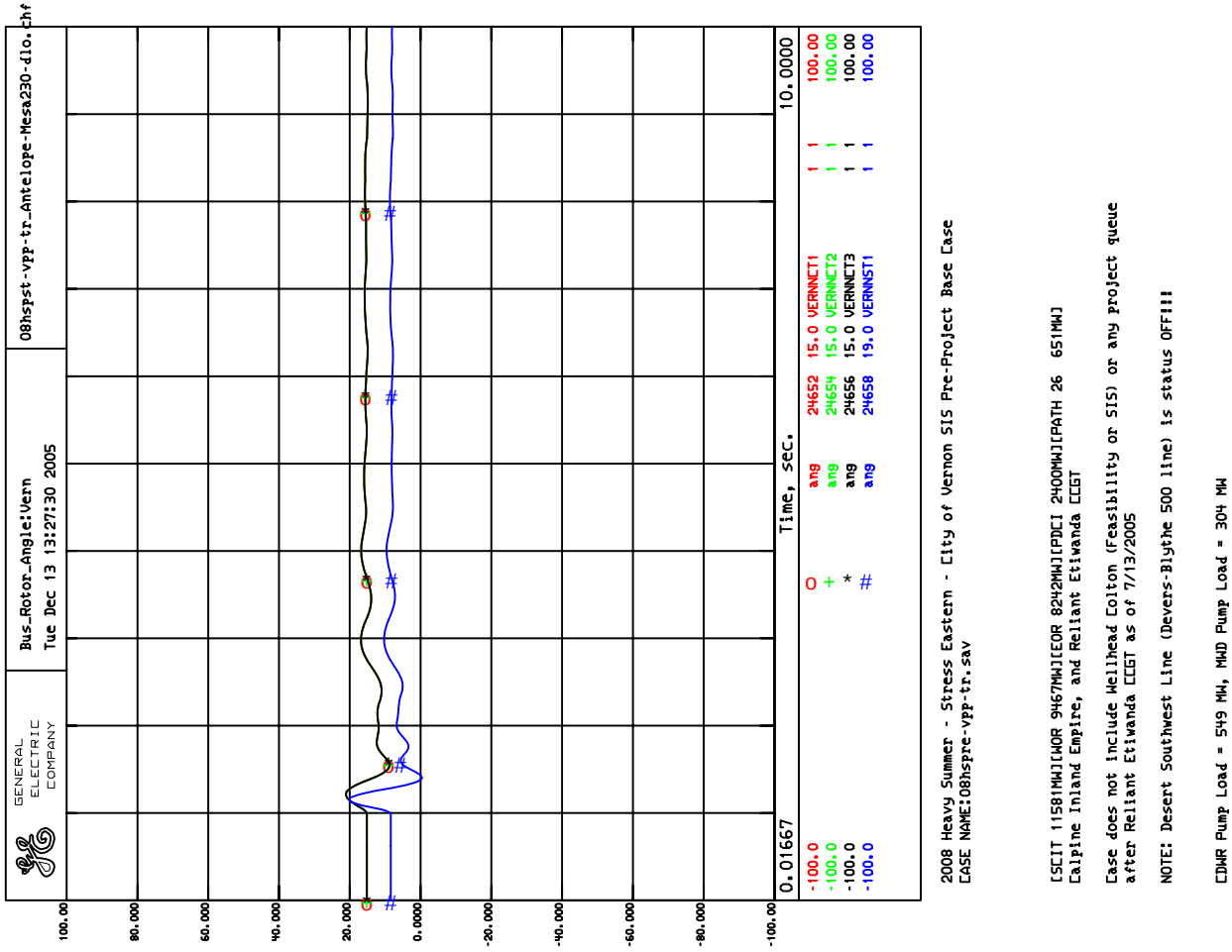
Plot 17 - 6: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



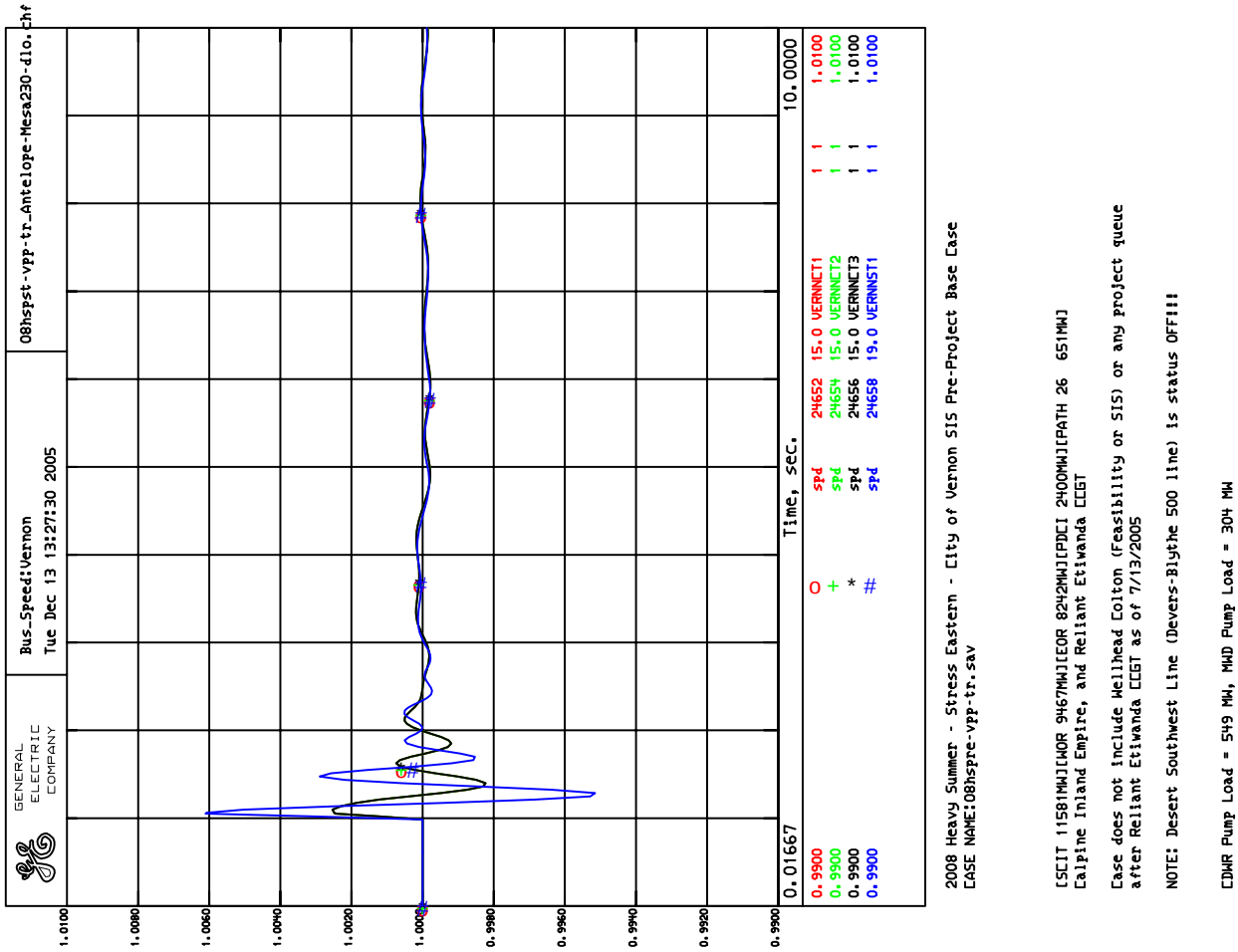
Plot 17 - 7: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



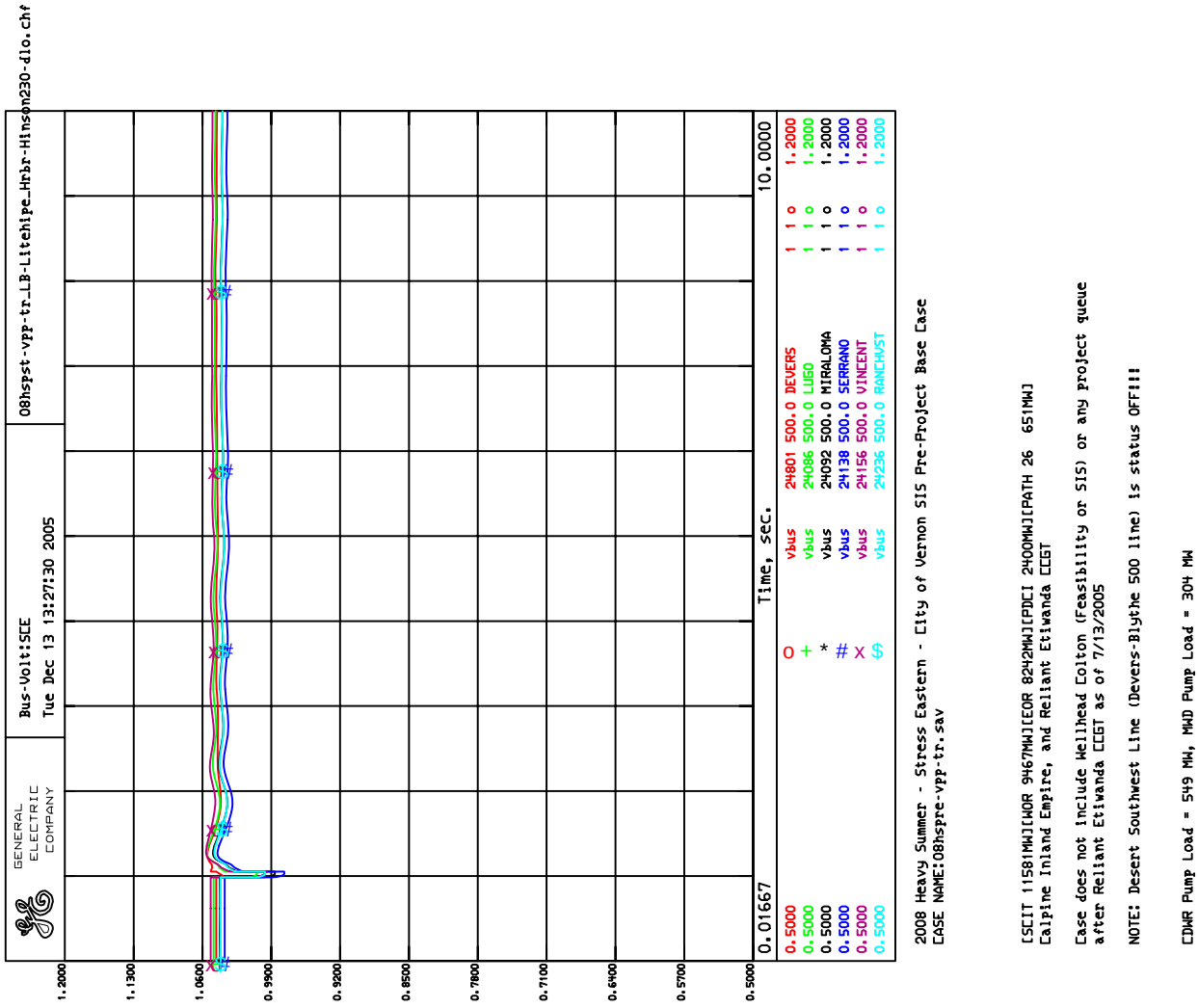
Plot 17 - 8: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



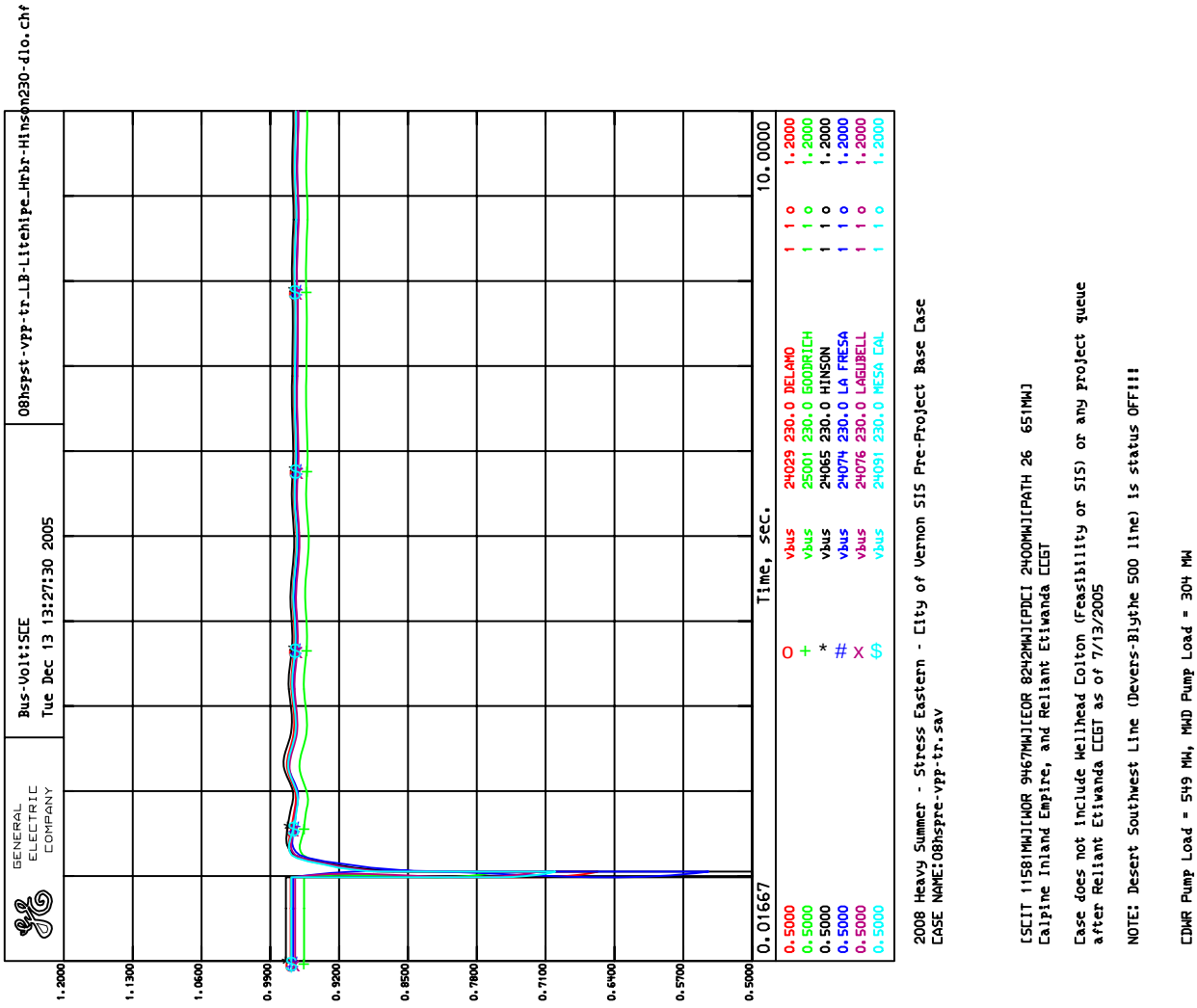
Plot 17 - 9: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



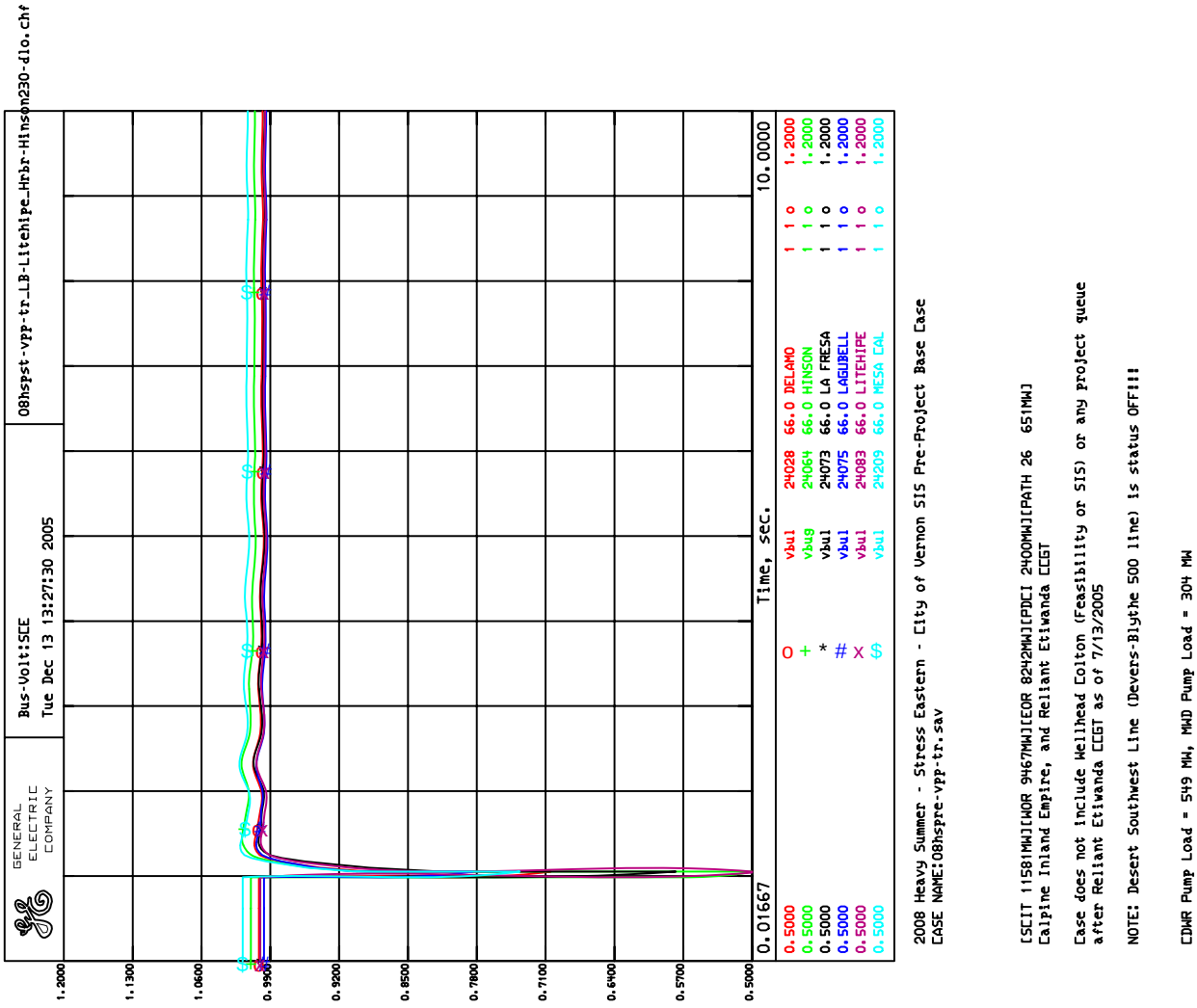
Plot 18 - 1: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



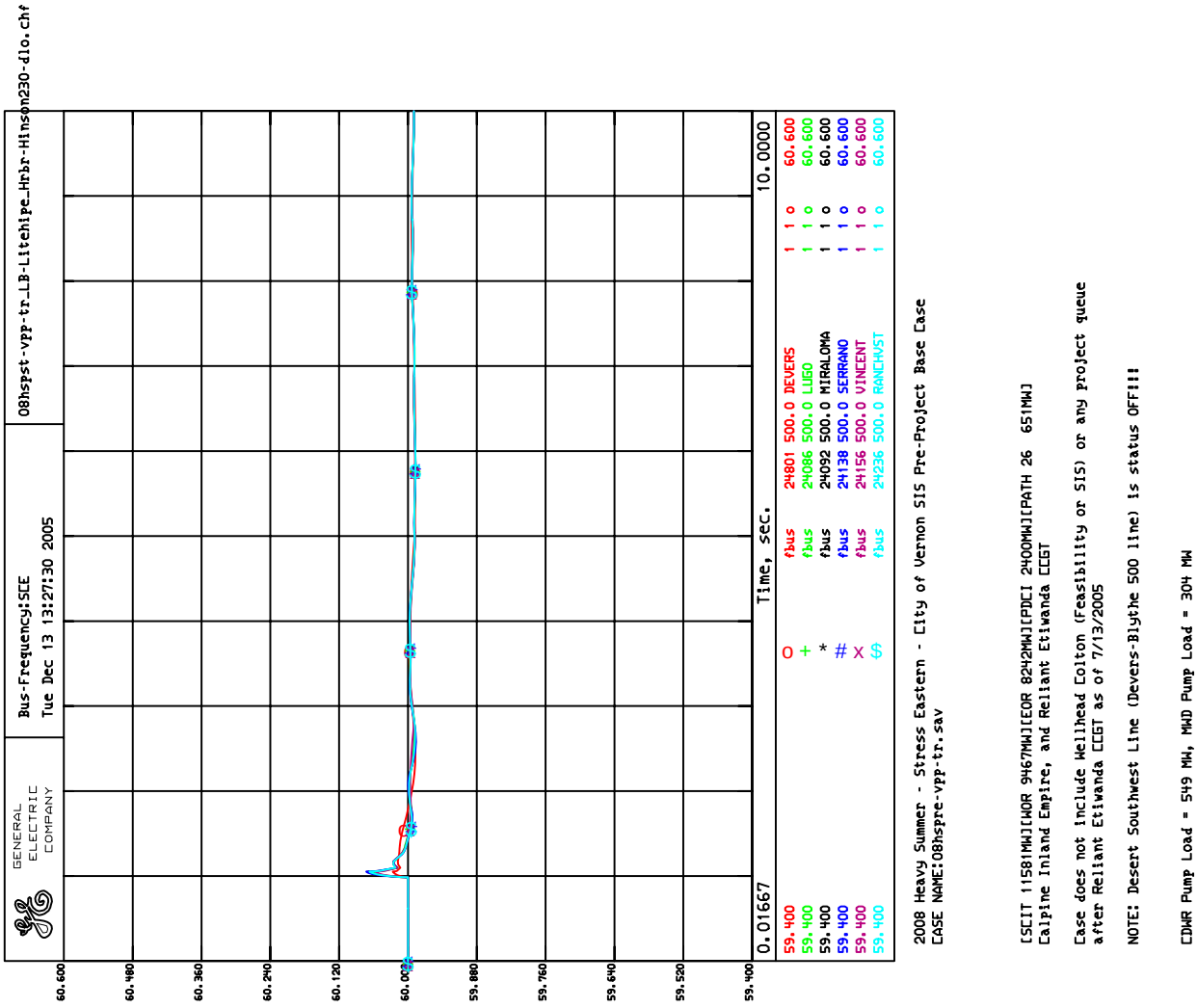
Plot 18 - 2: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



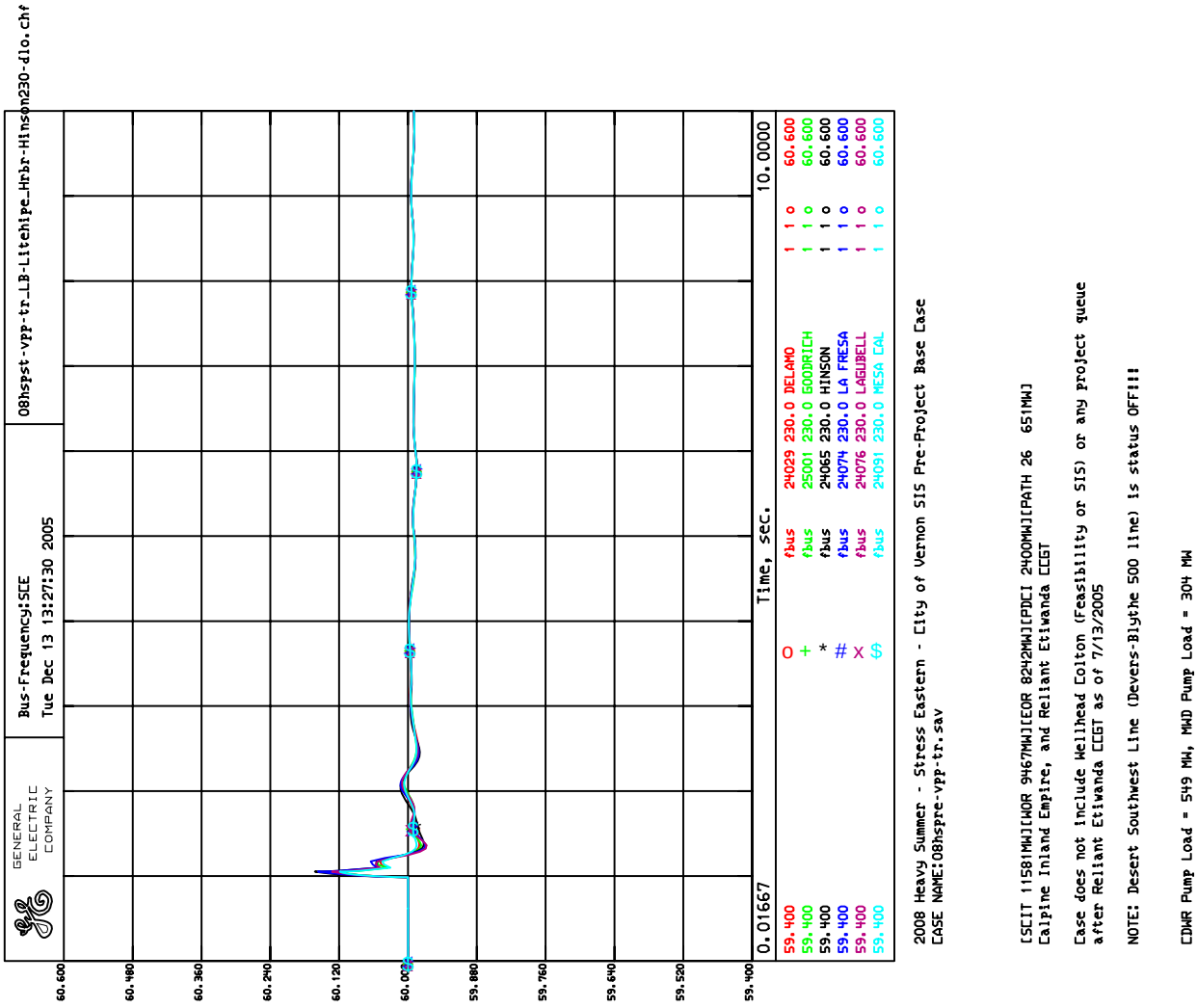
Plot 18 - 3: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



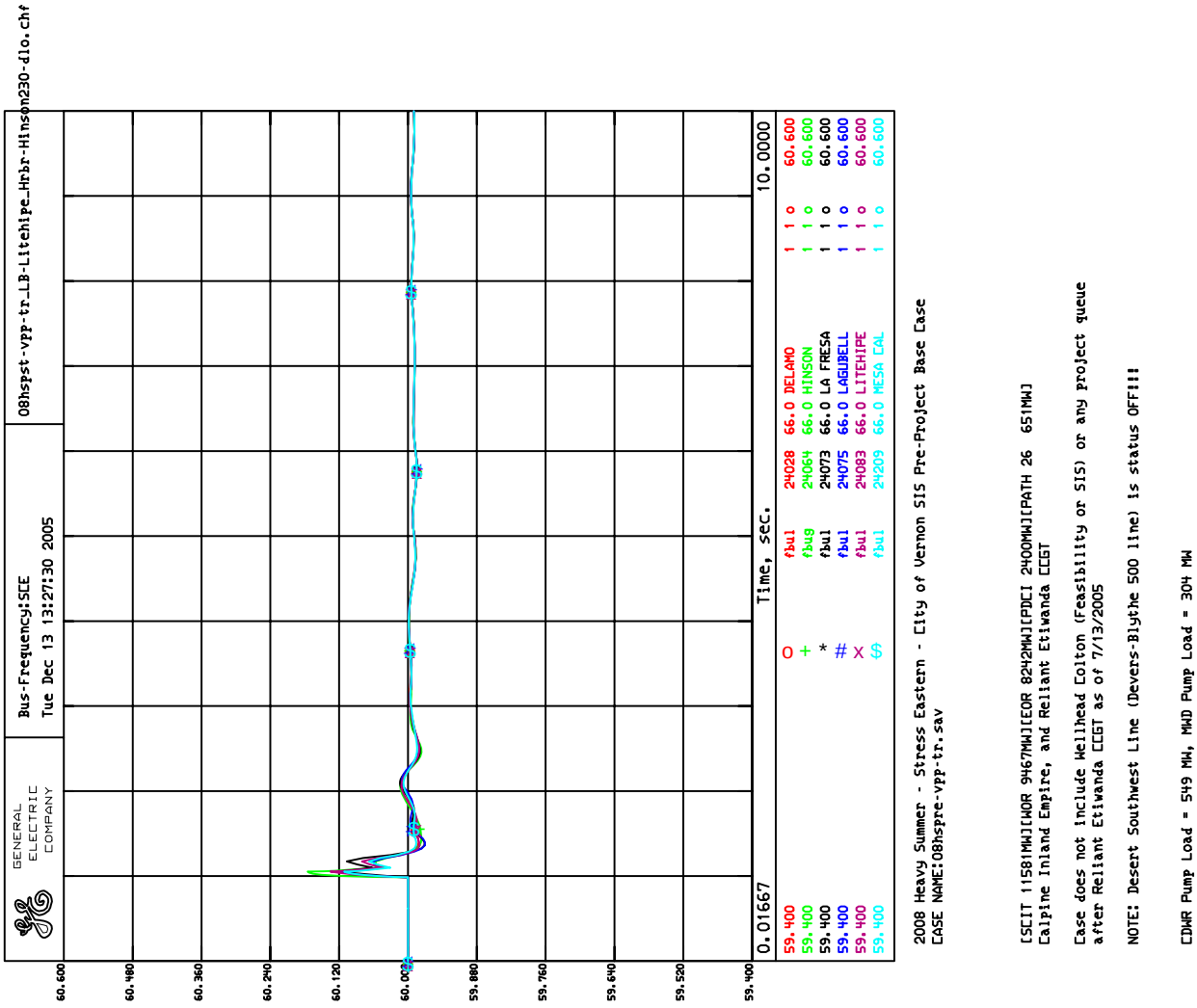
Plot 18 - 4: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



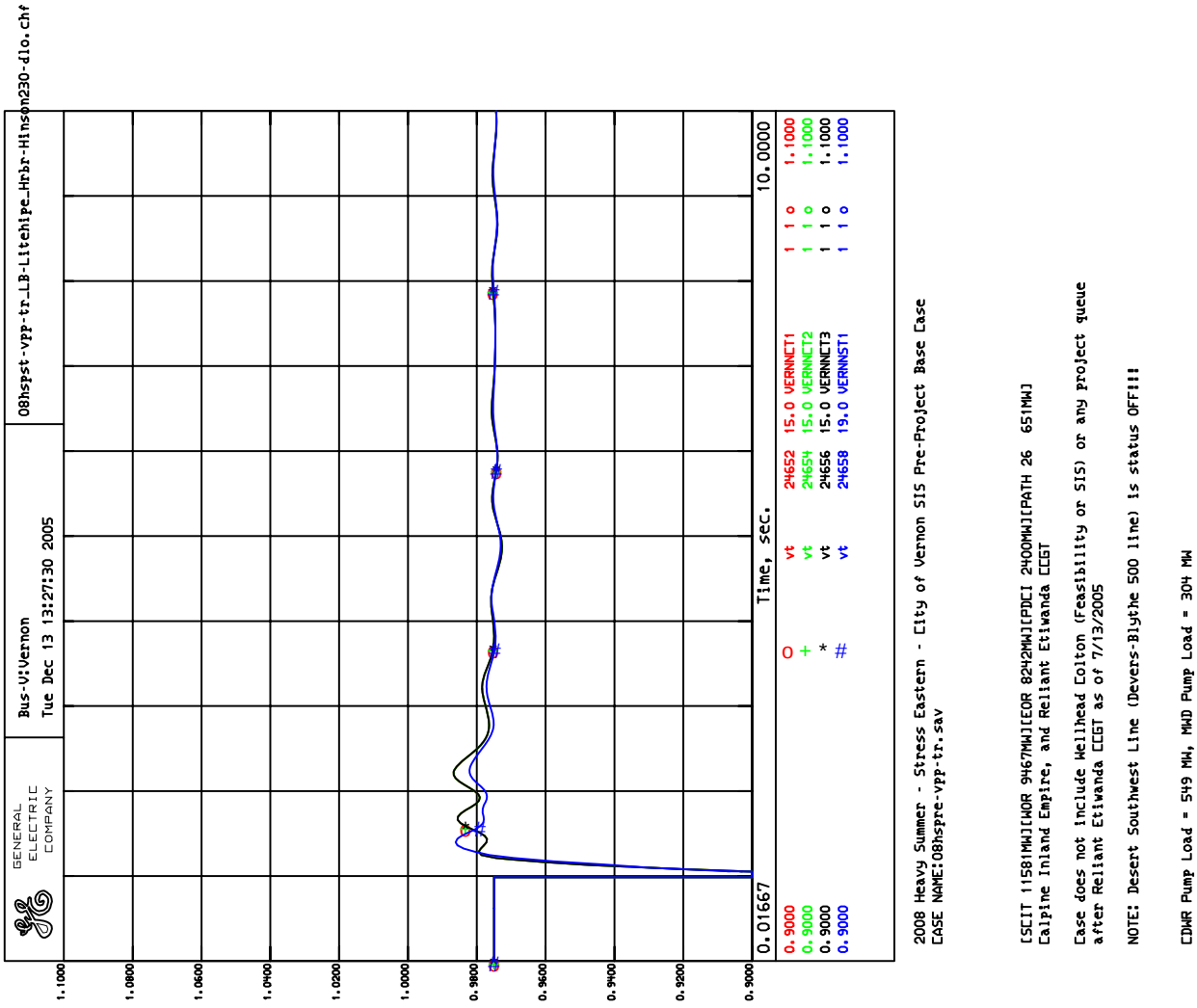
Plot 18 - 5: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



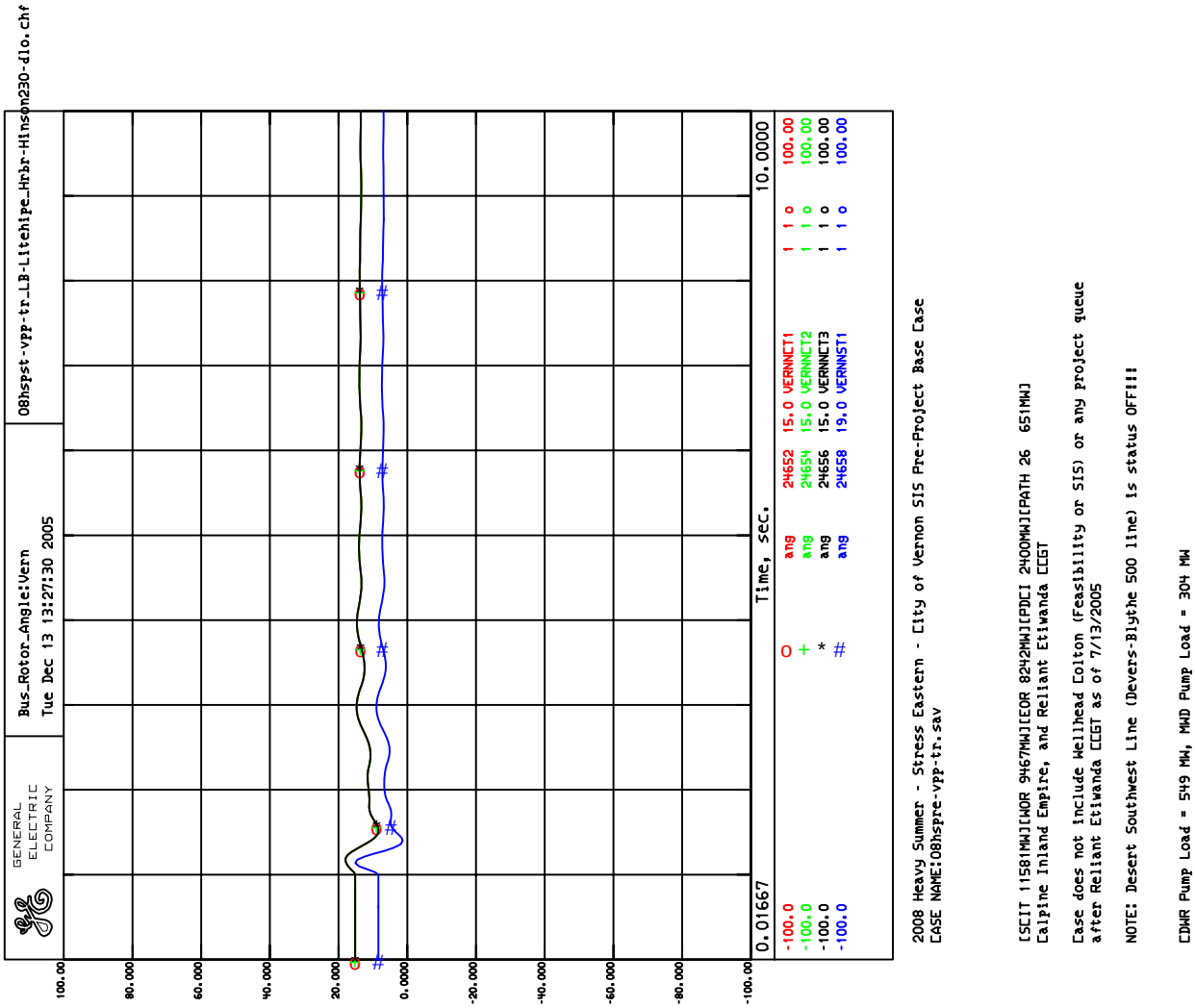
Plot 18 - 6: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



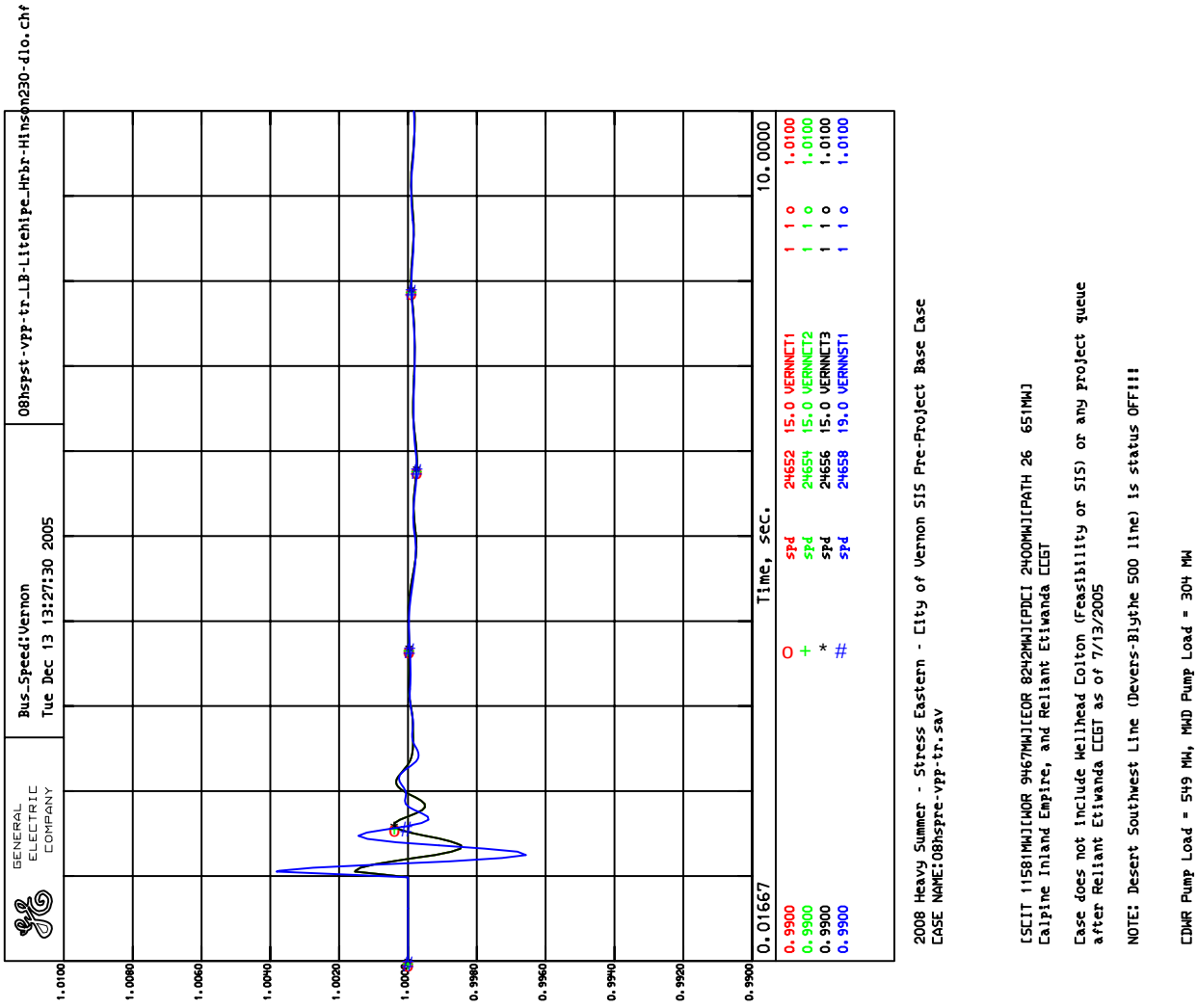
Plot 18 - 7: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



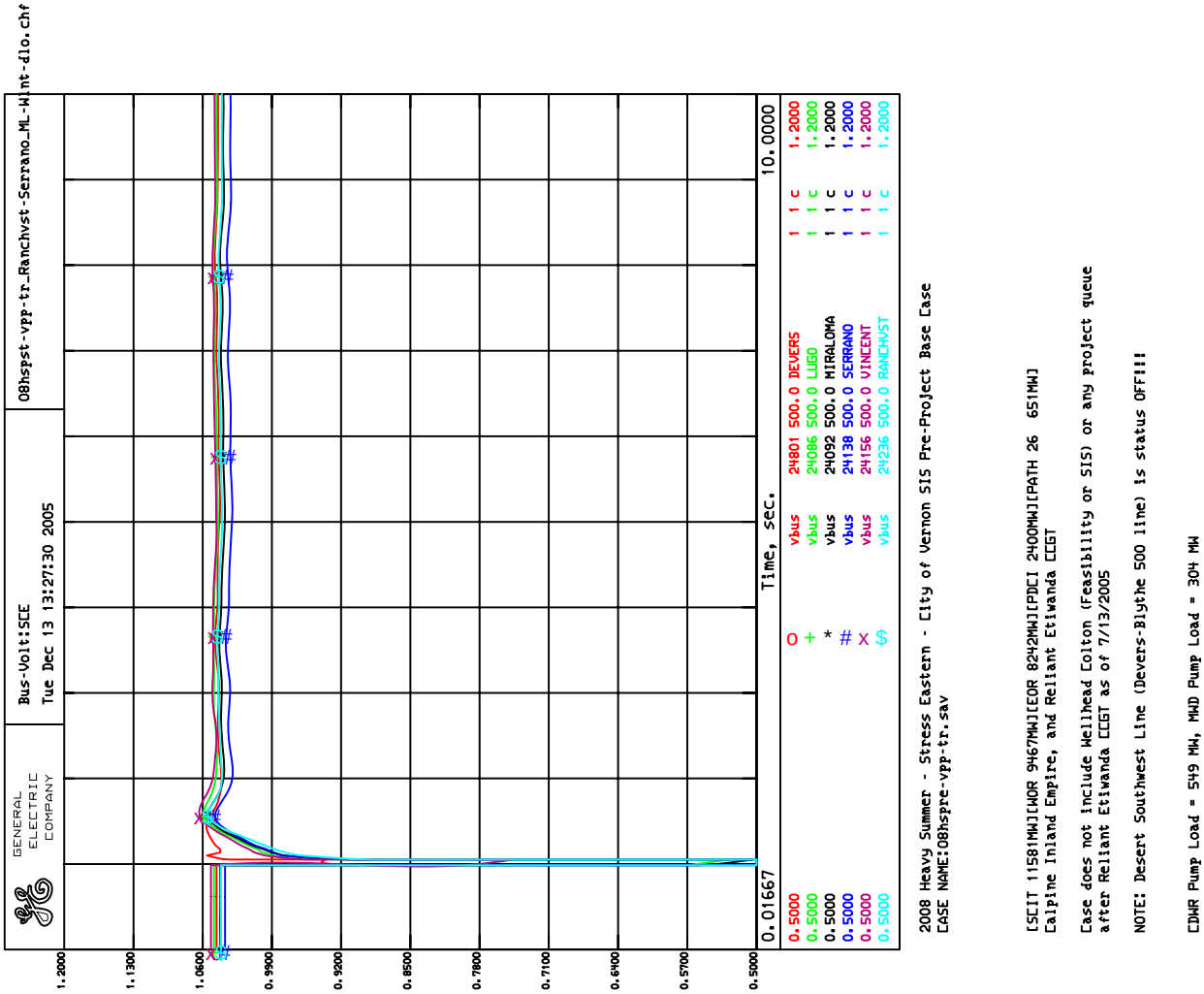
Plot 18 - 8: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



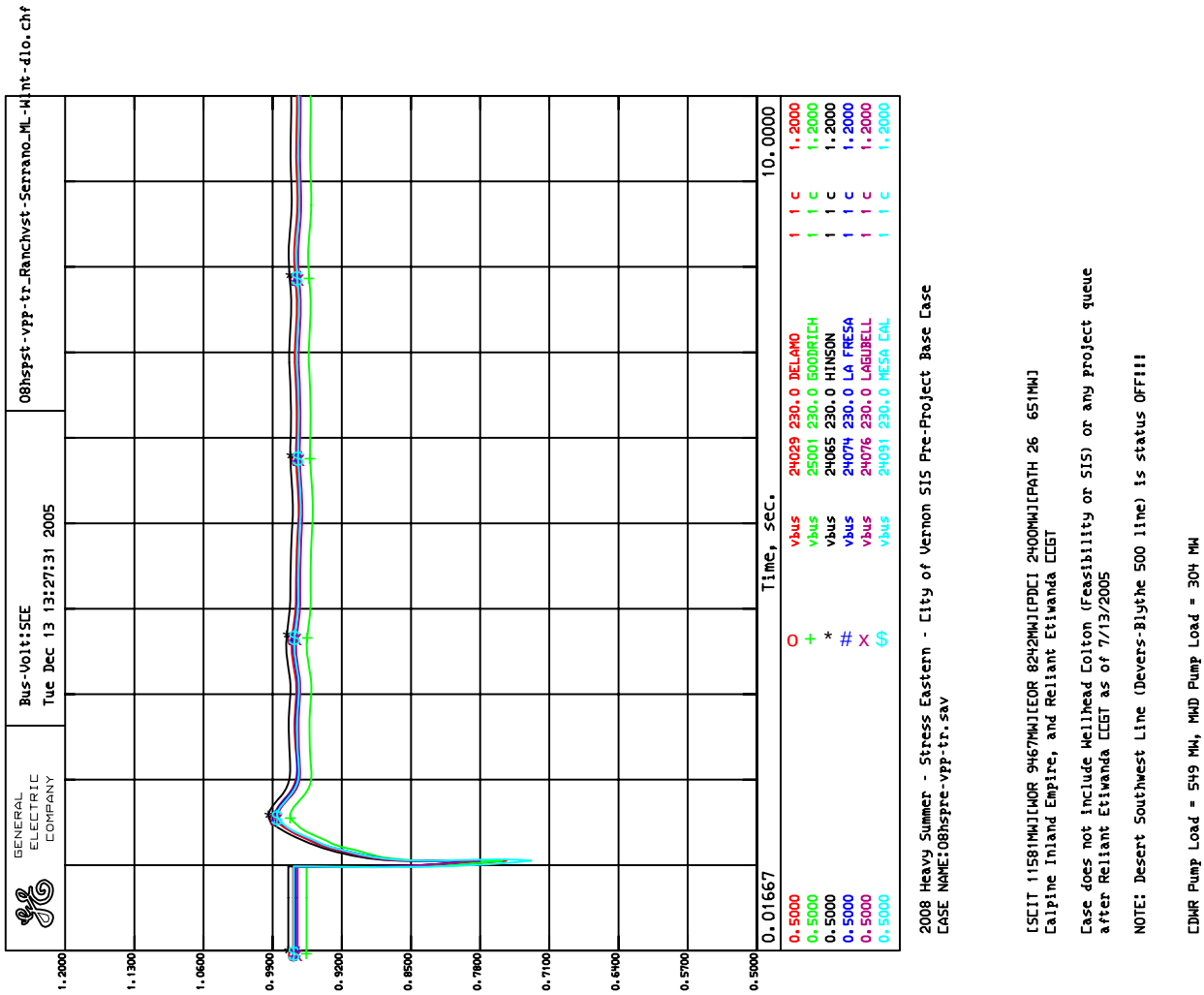
Plot 18 - 9: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



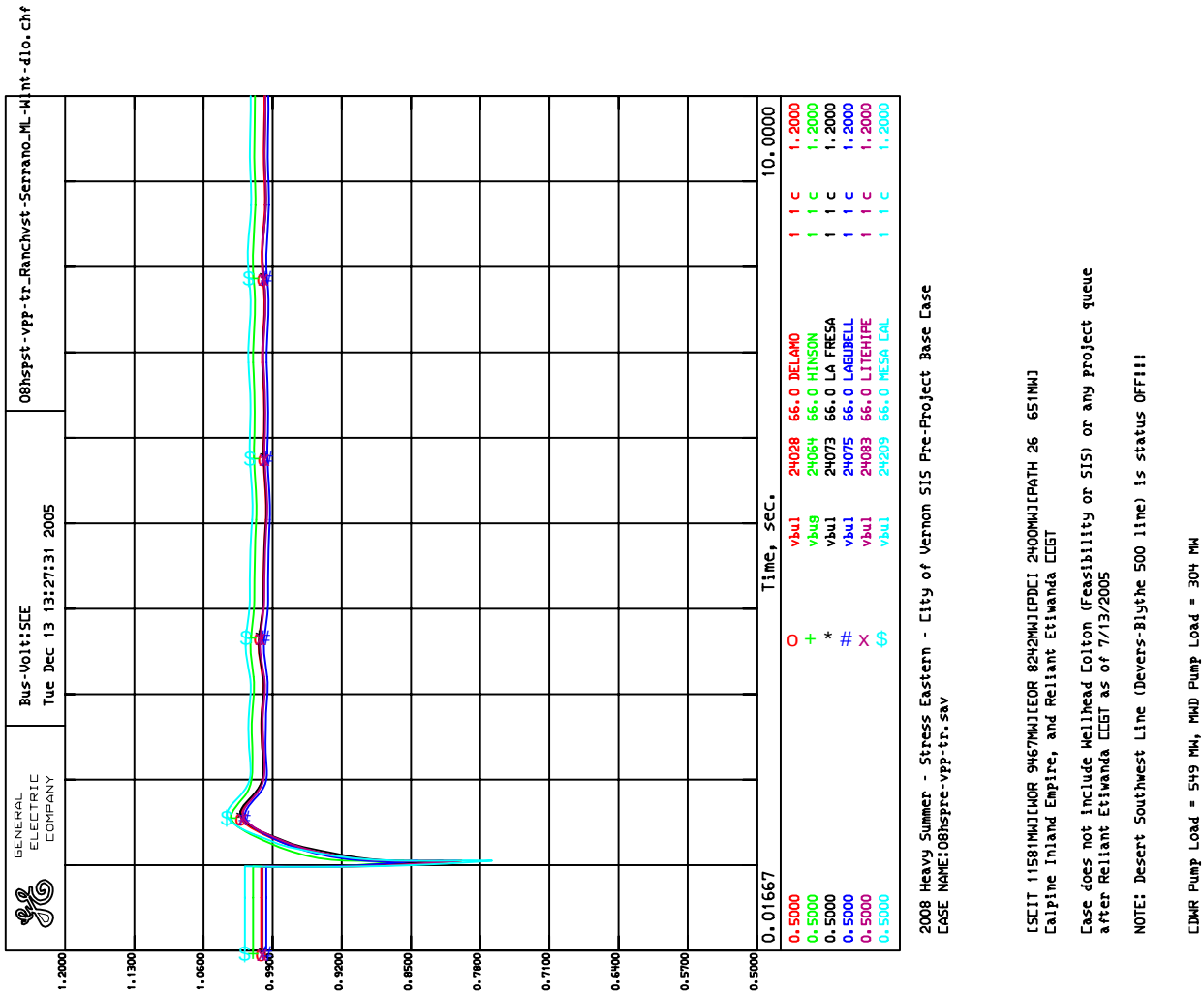
Plot 19 - 1: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



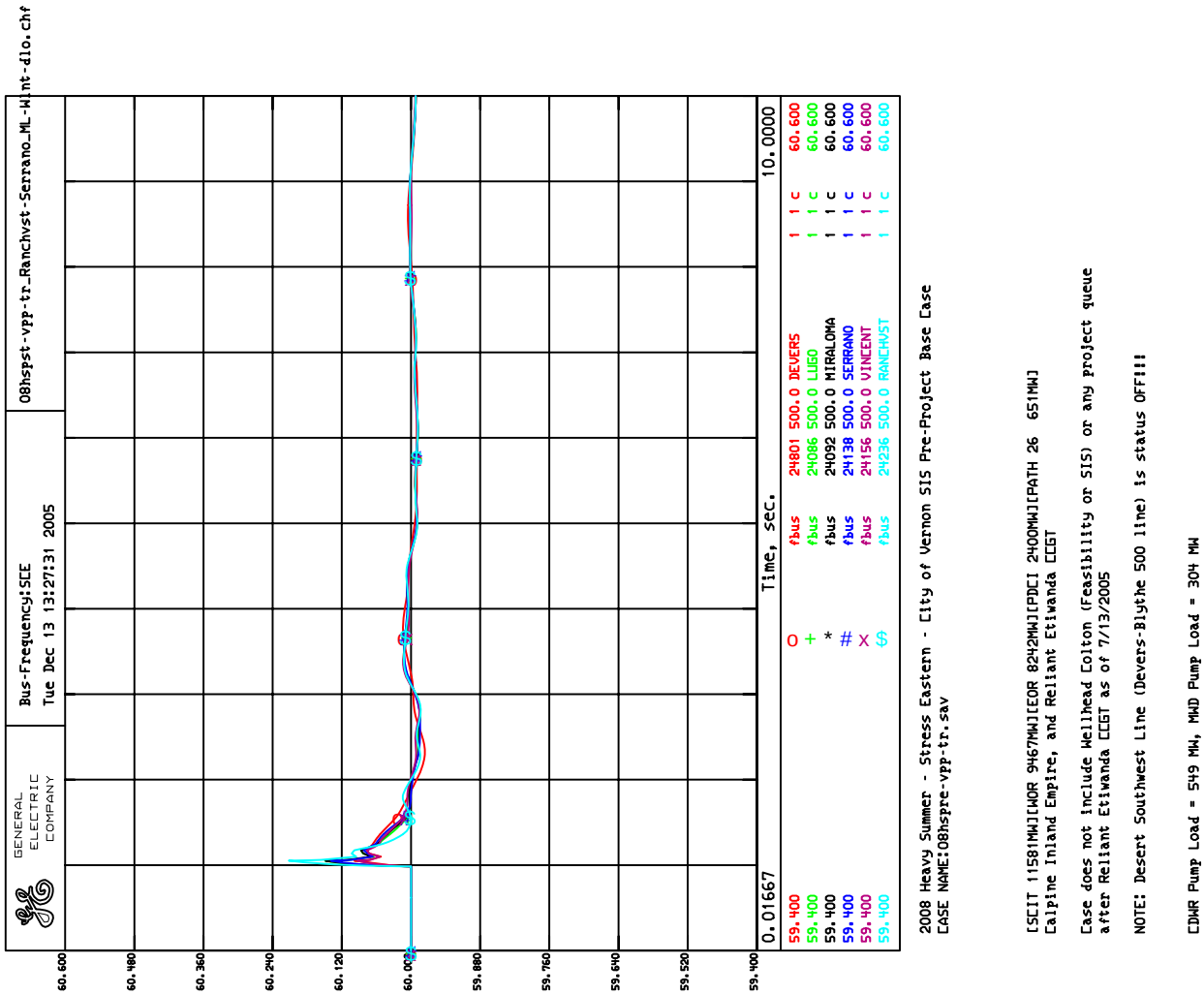
Plot 19 - 2: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



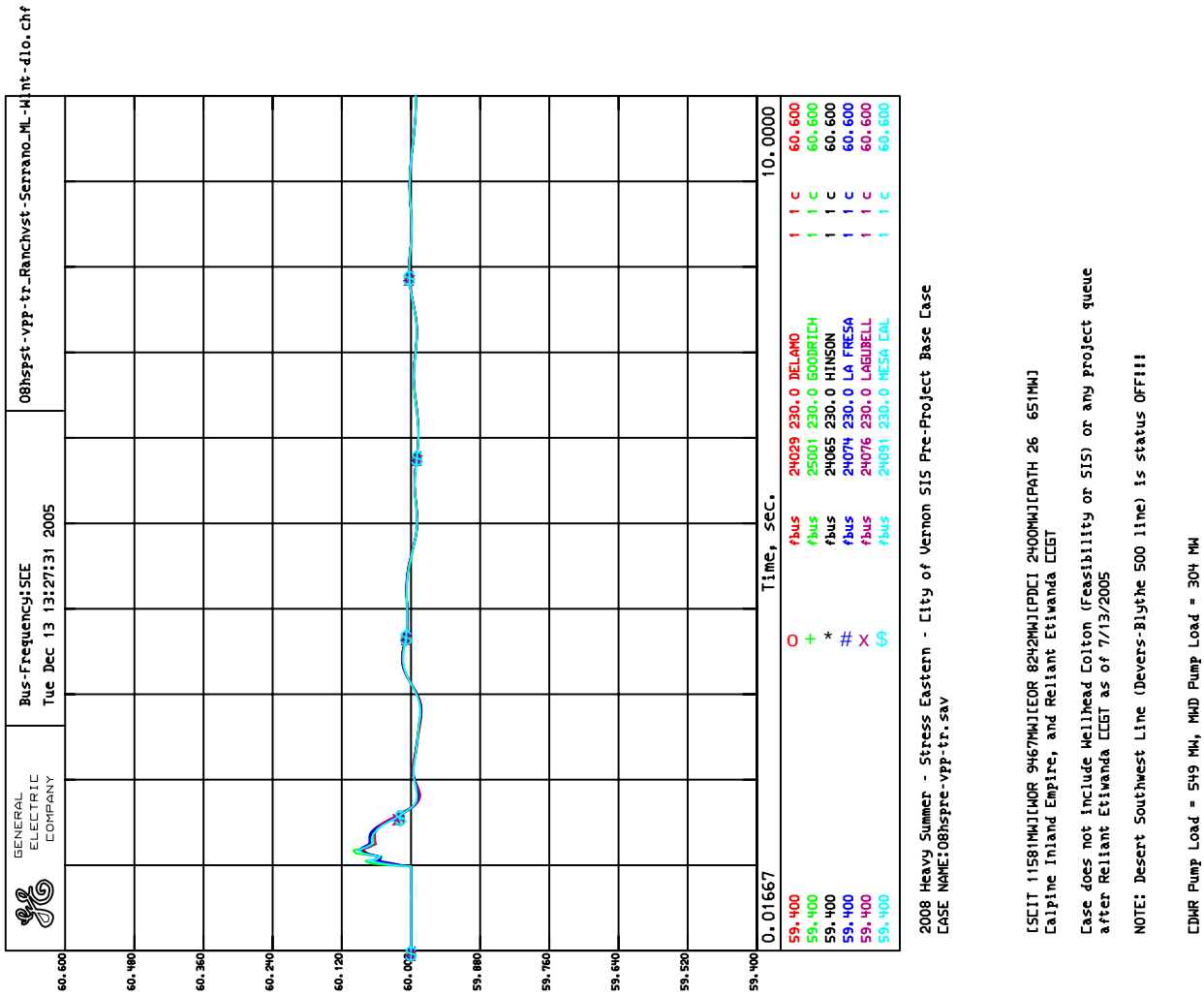
Plot 19 - 3: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



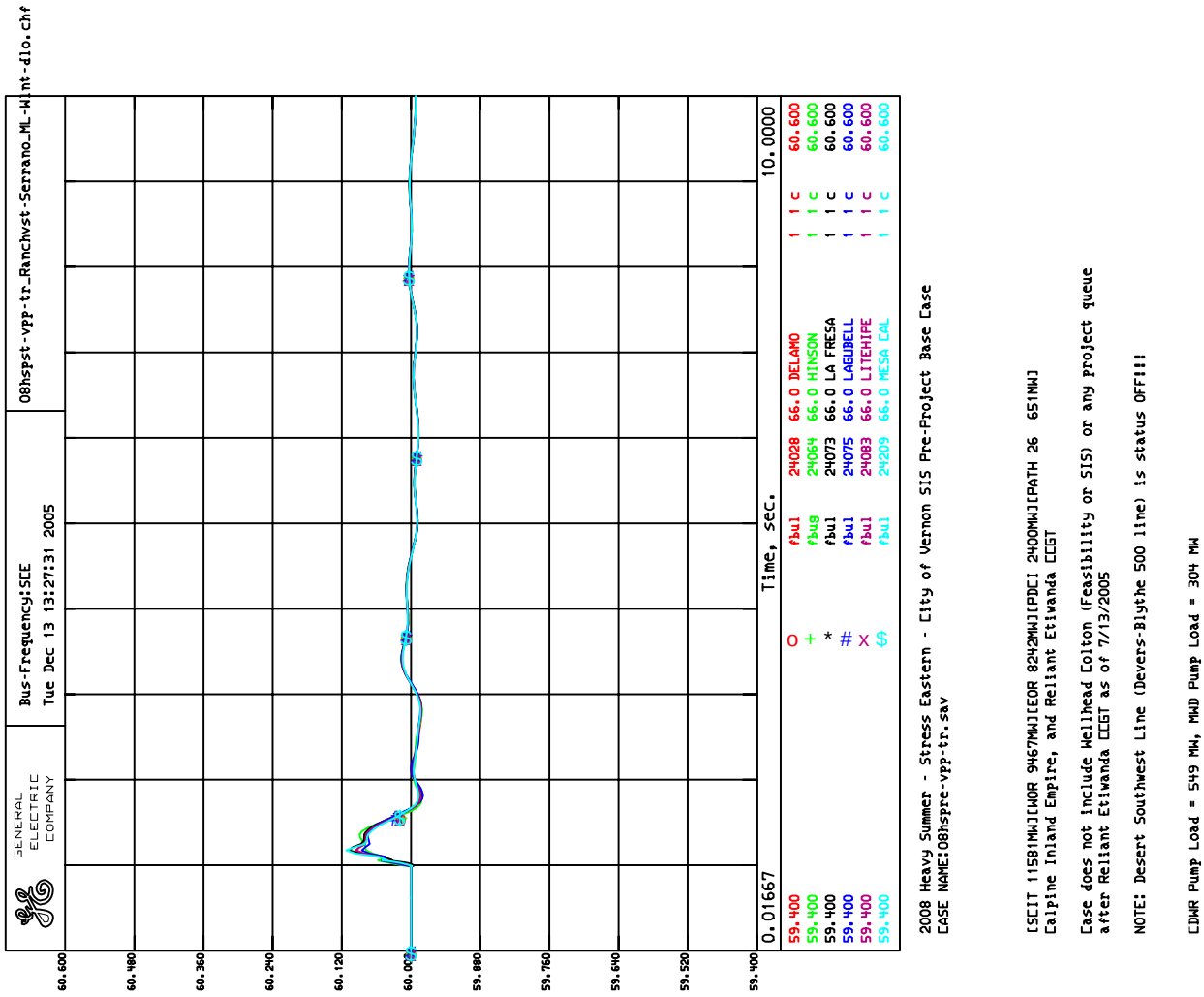
Plot 19 - 4: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



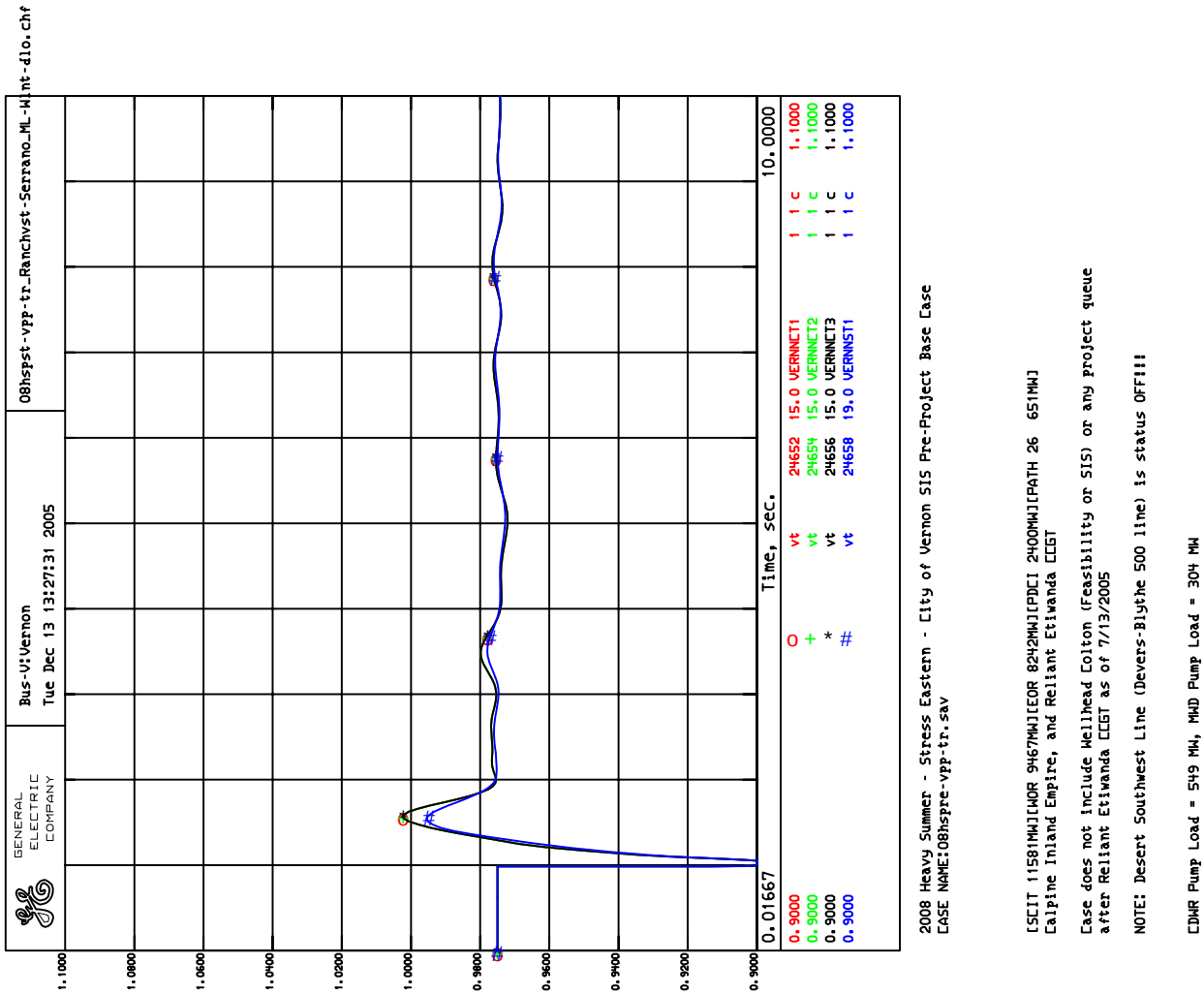
Plot 19 - 5: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



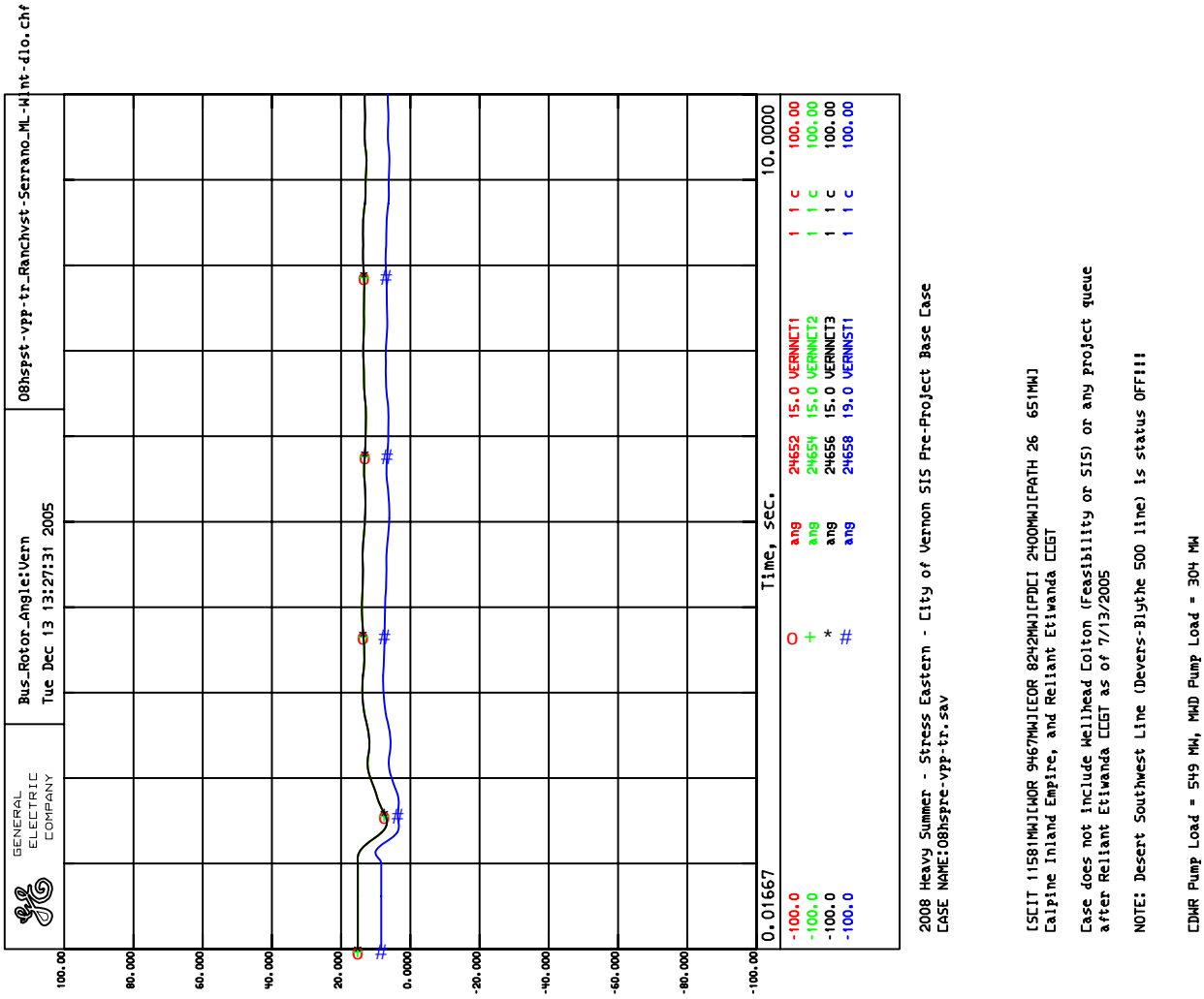
Plot 19 - 6: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



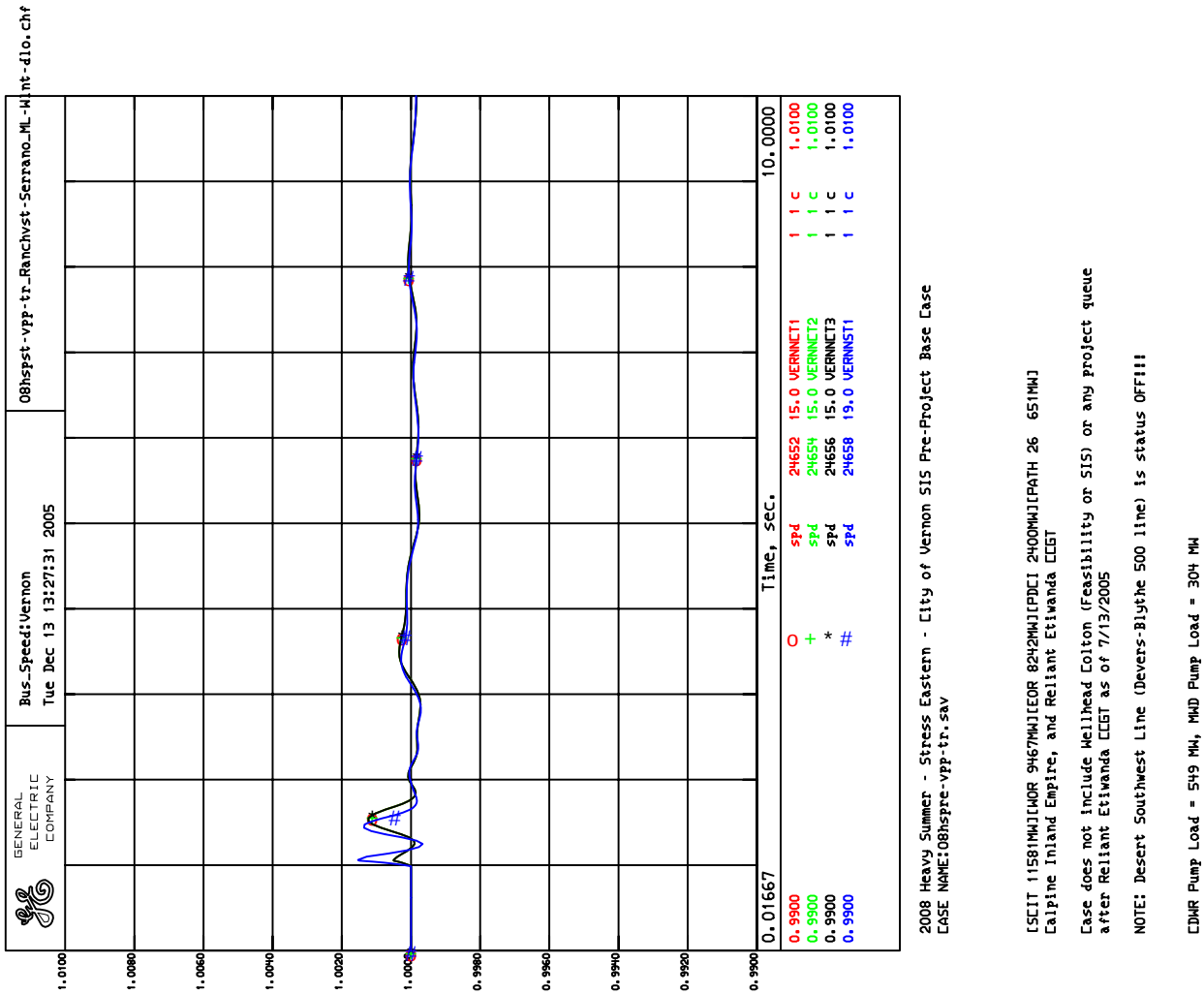
Plot 19 - 7: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



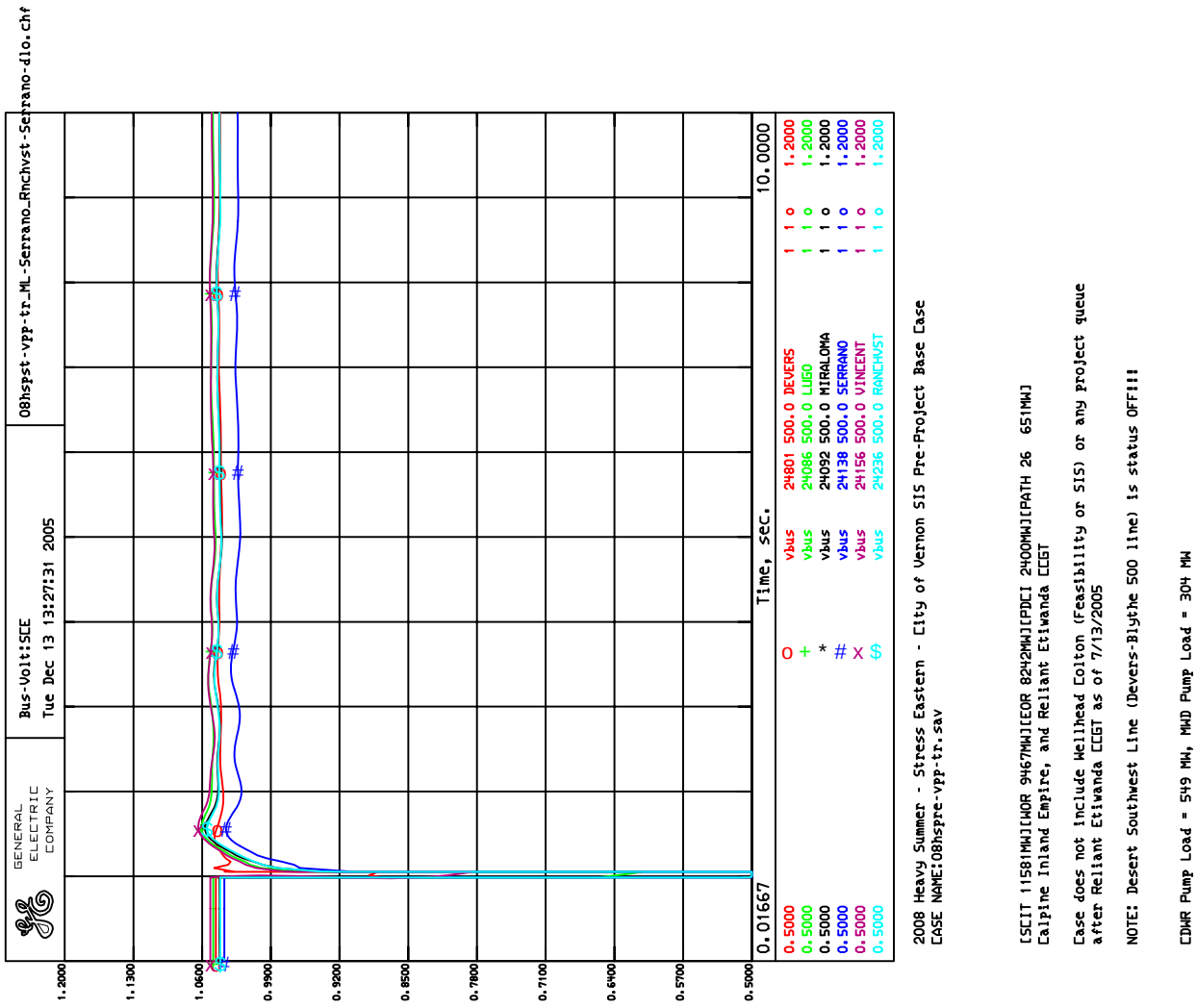
Plot 19 - 8: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



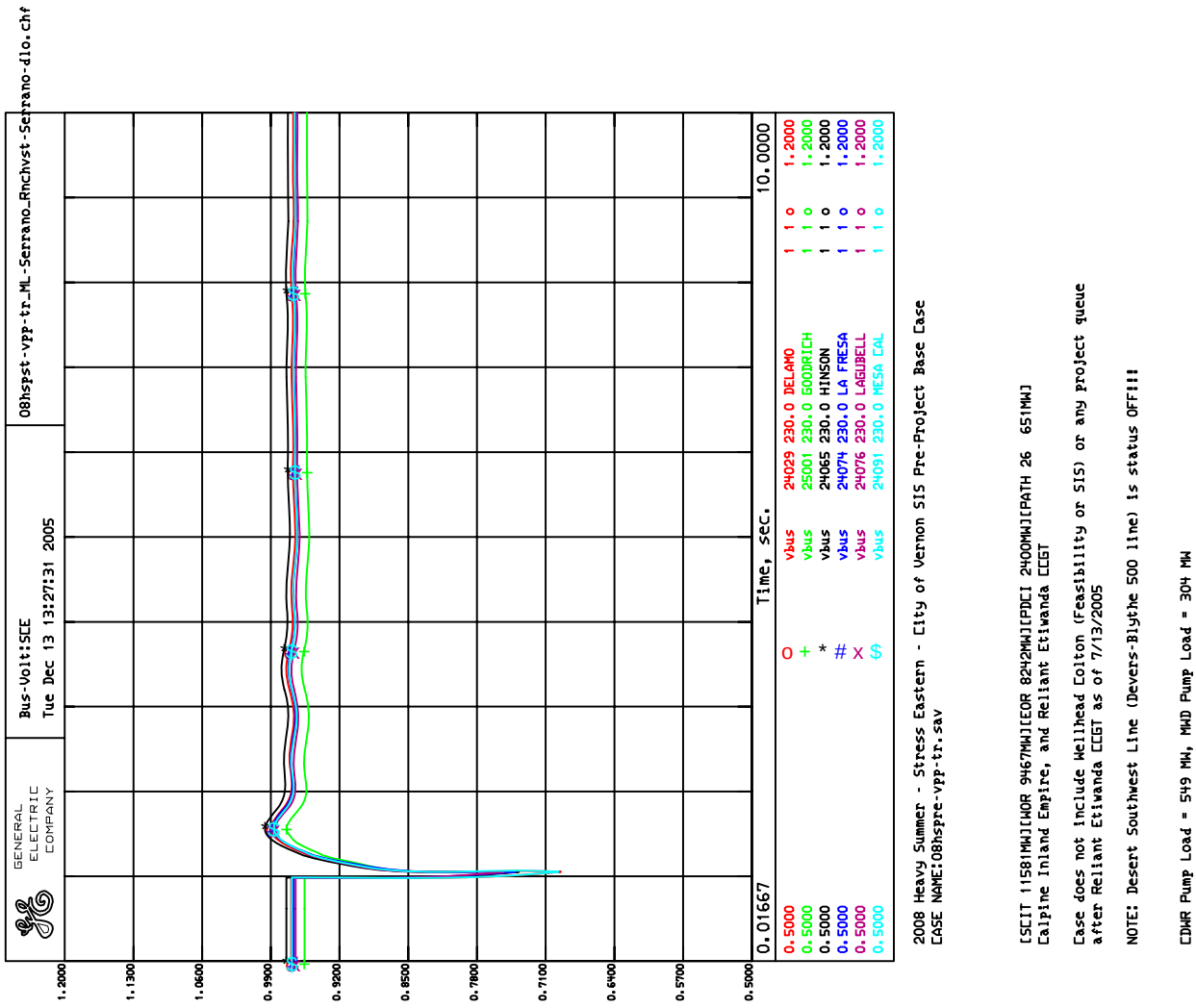
Plot 19 - 9: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



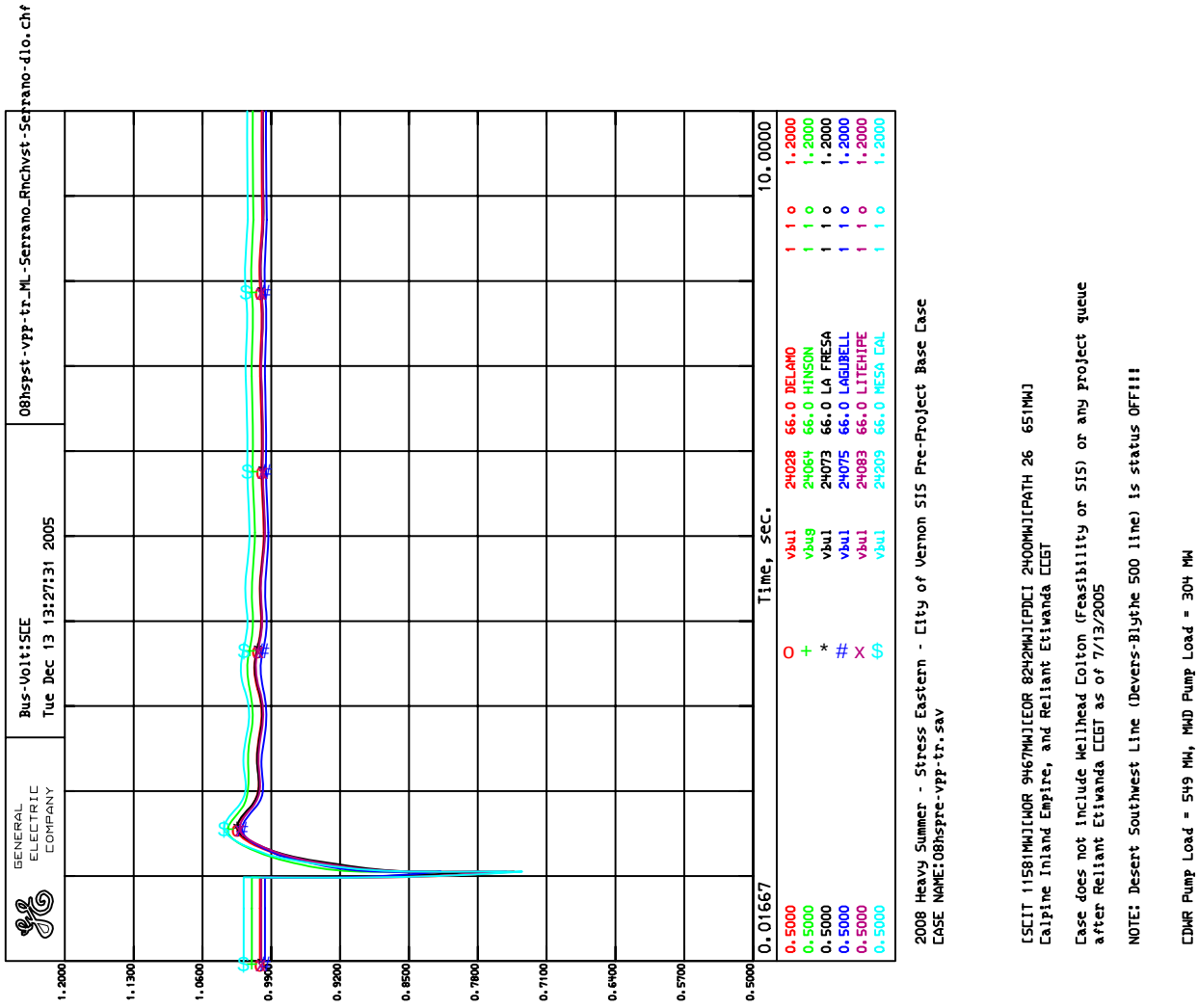
Plot 20 - 1: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



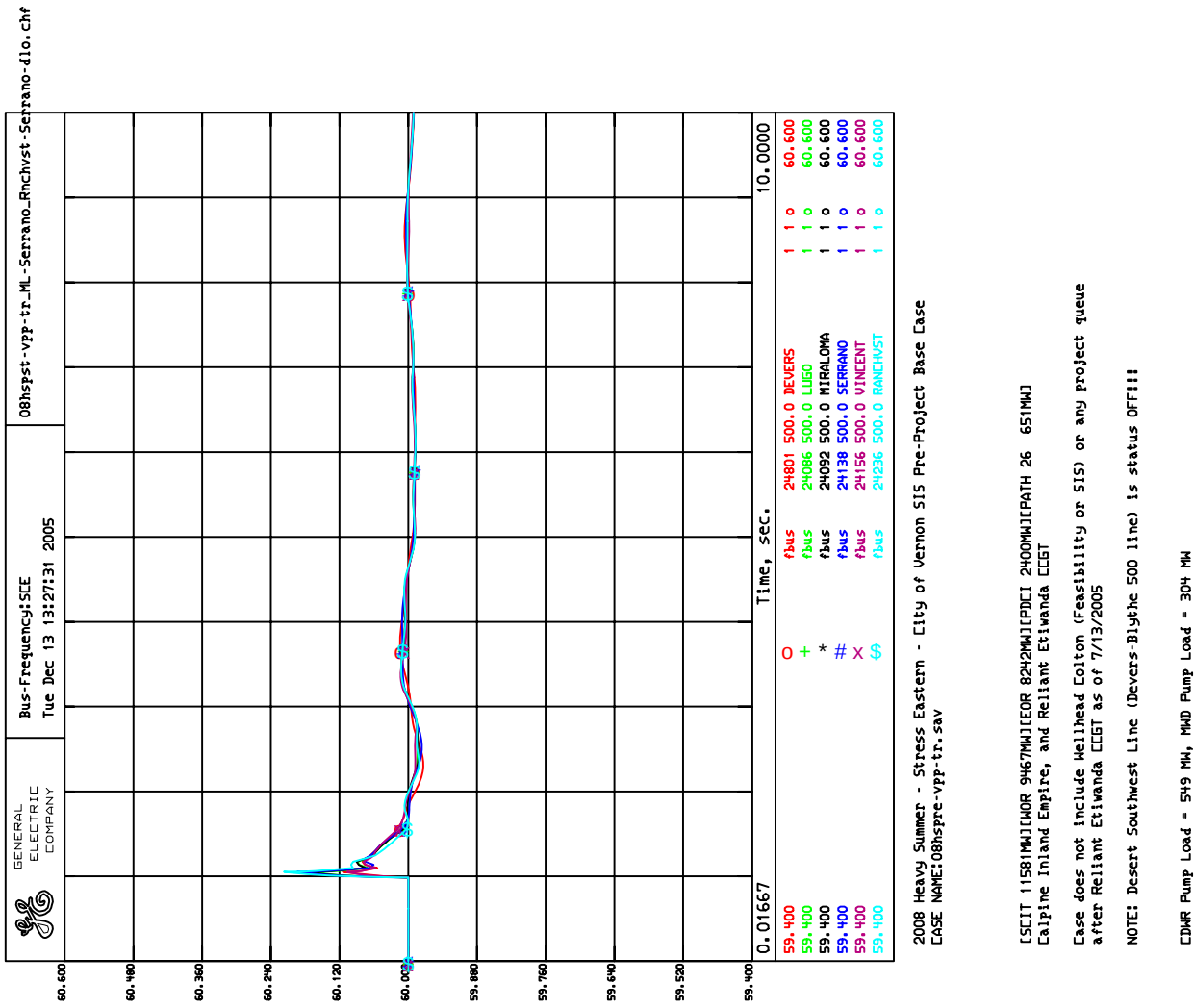
Plot 20 - 2: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



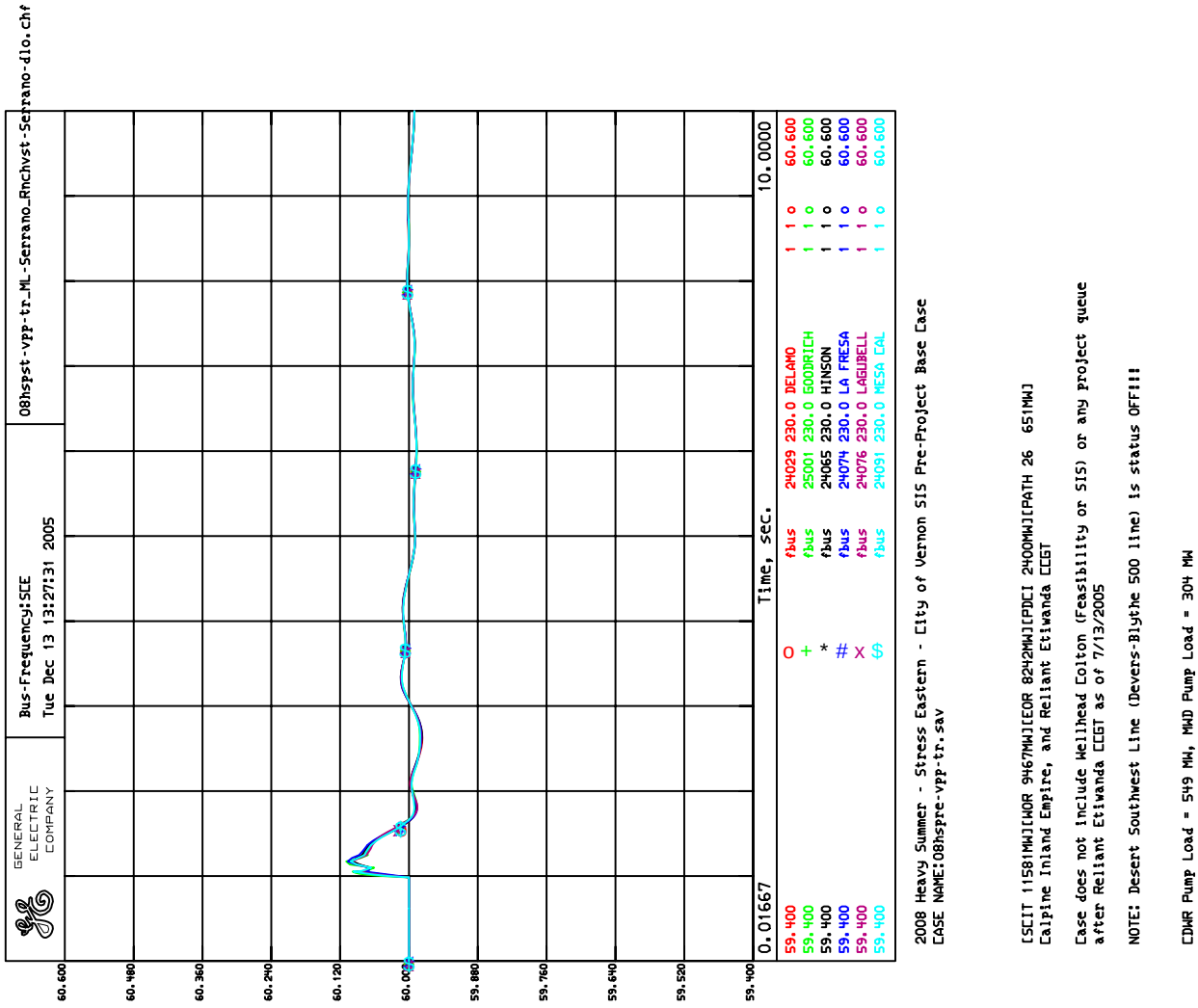
Plot 20 - 3: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



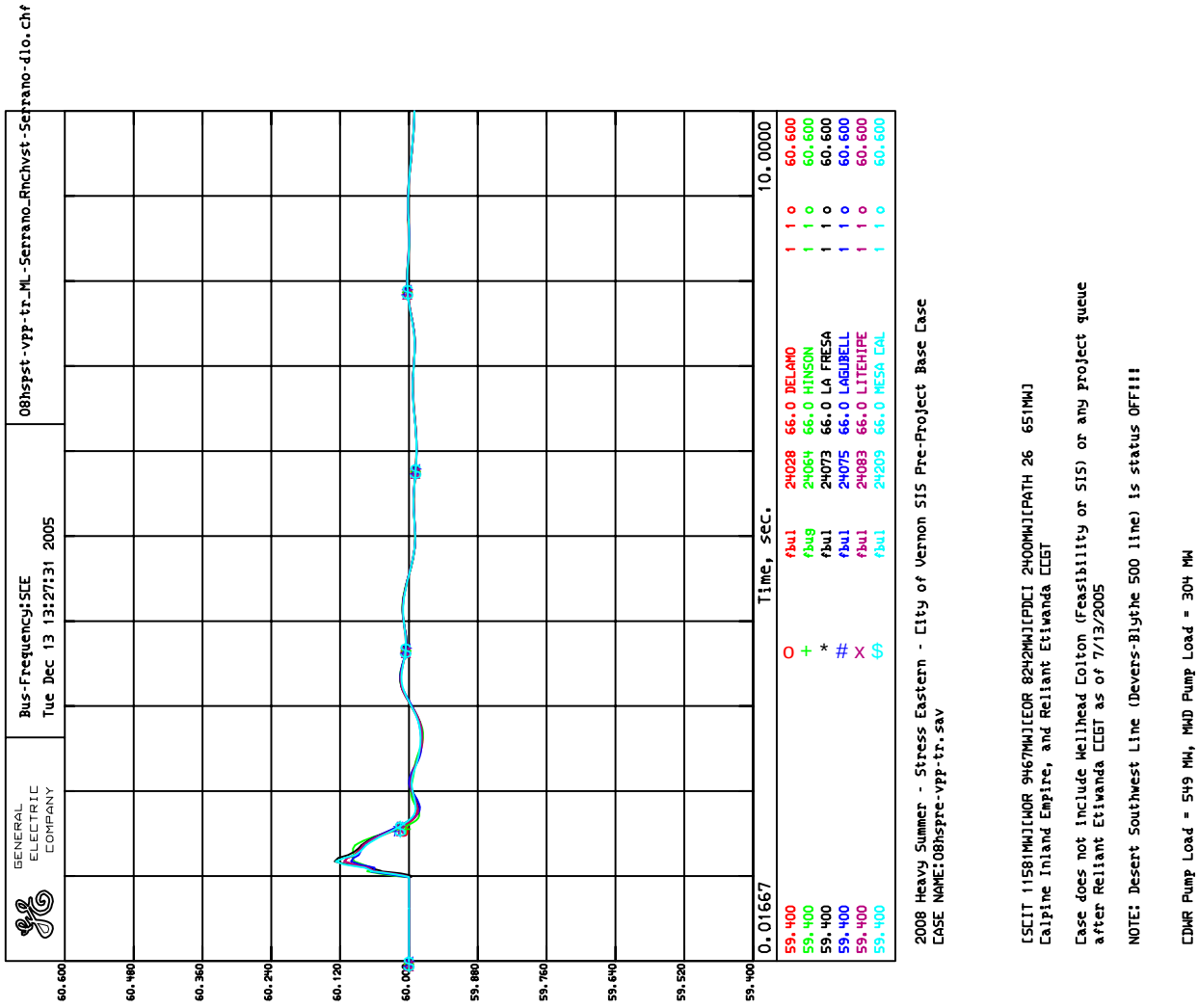
Plot 20 - 4: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



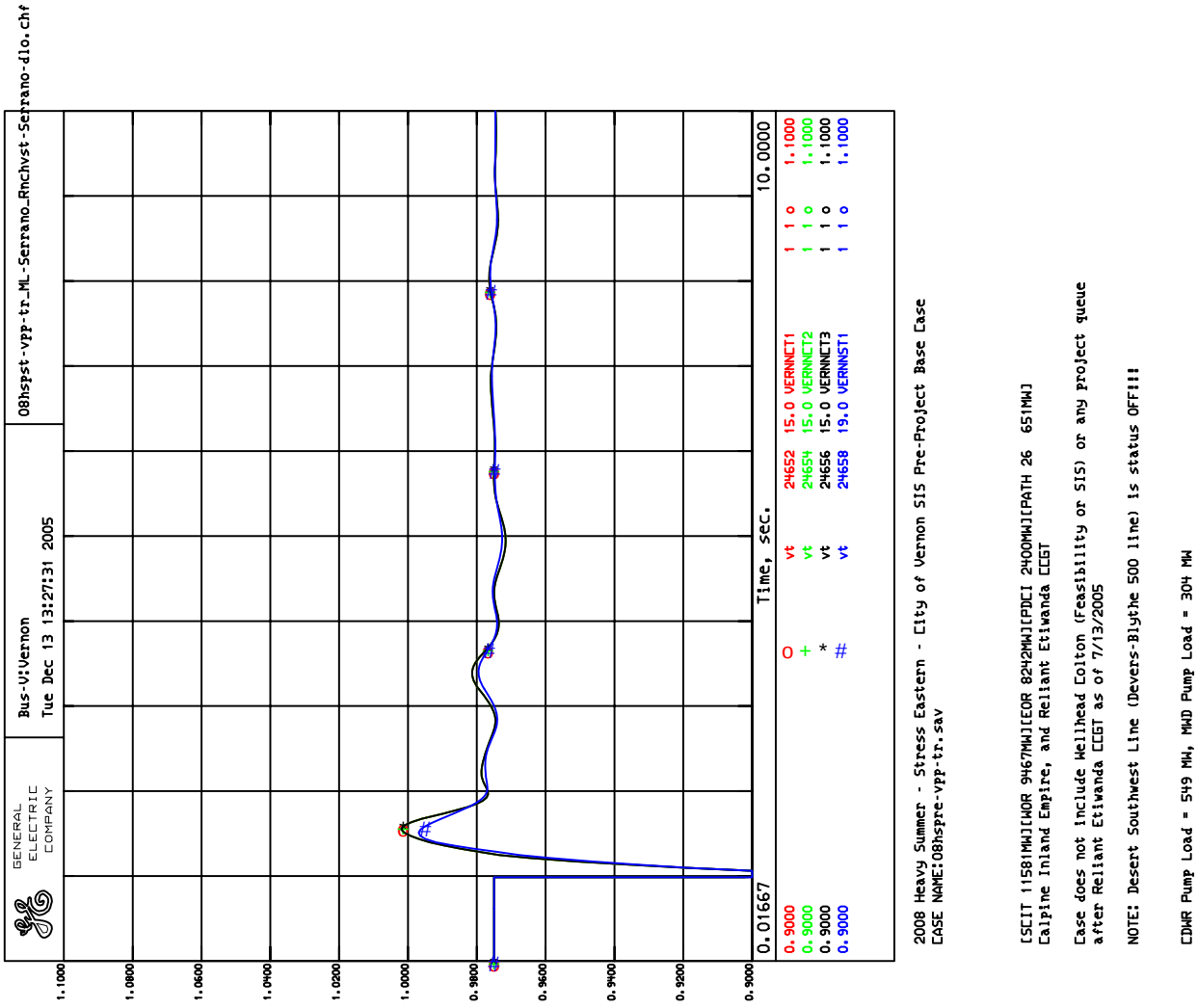
Plot 20 - 5: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



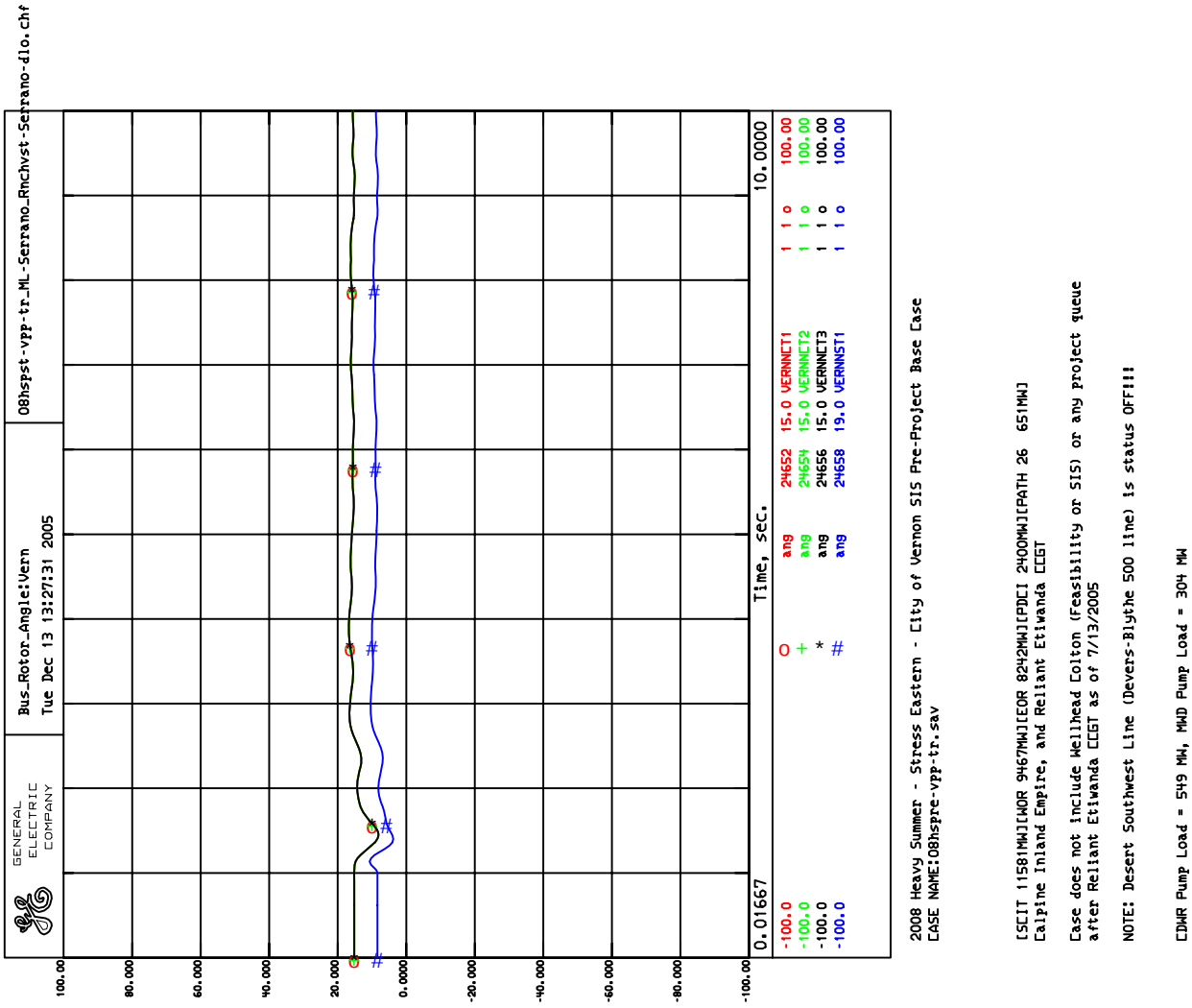
Plot 20 - 6: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



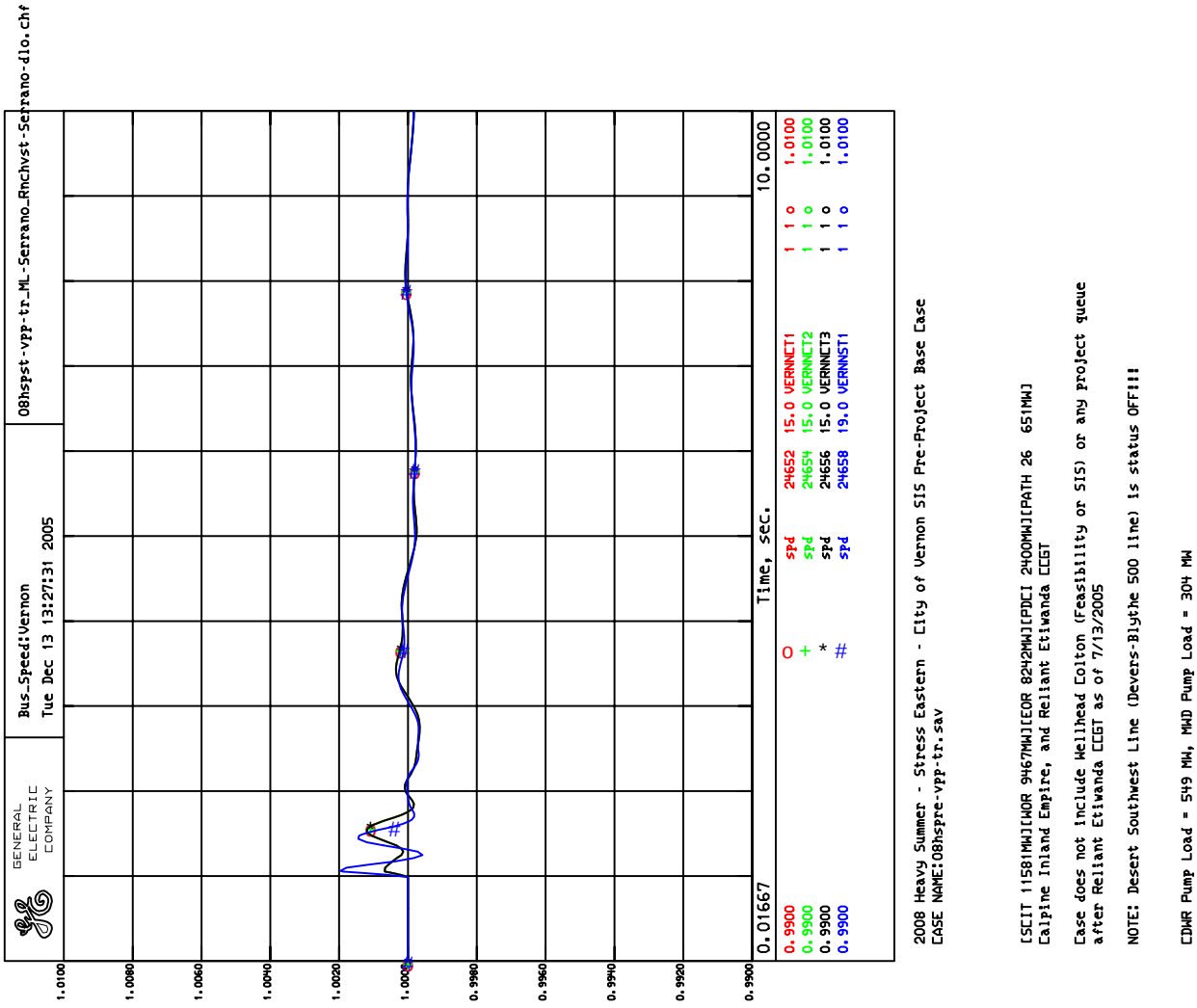
Plot 20 - 7: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



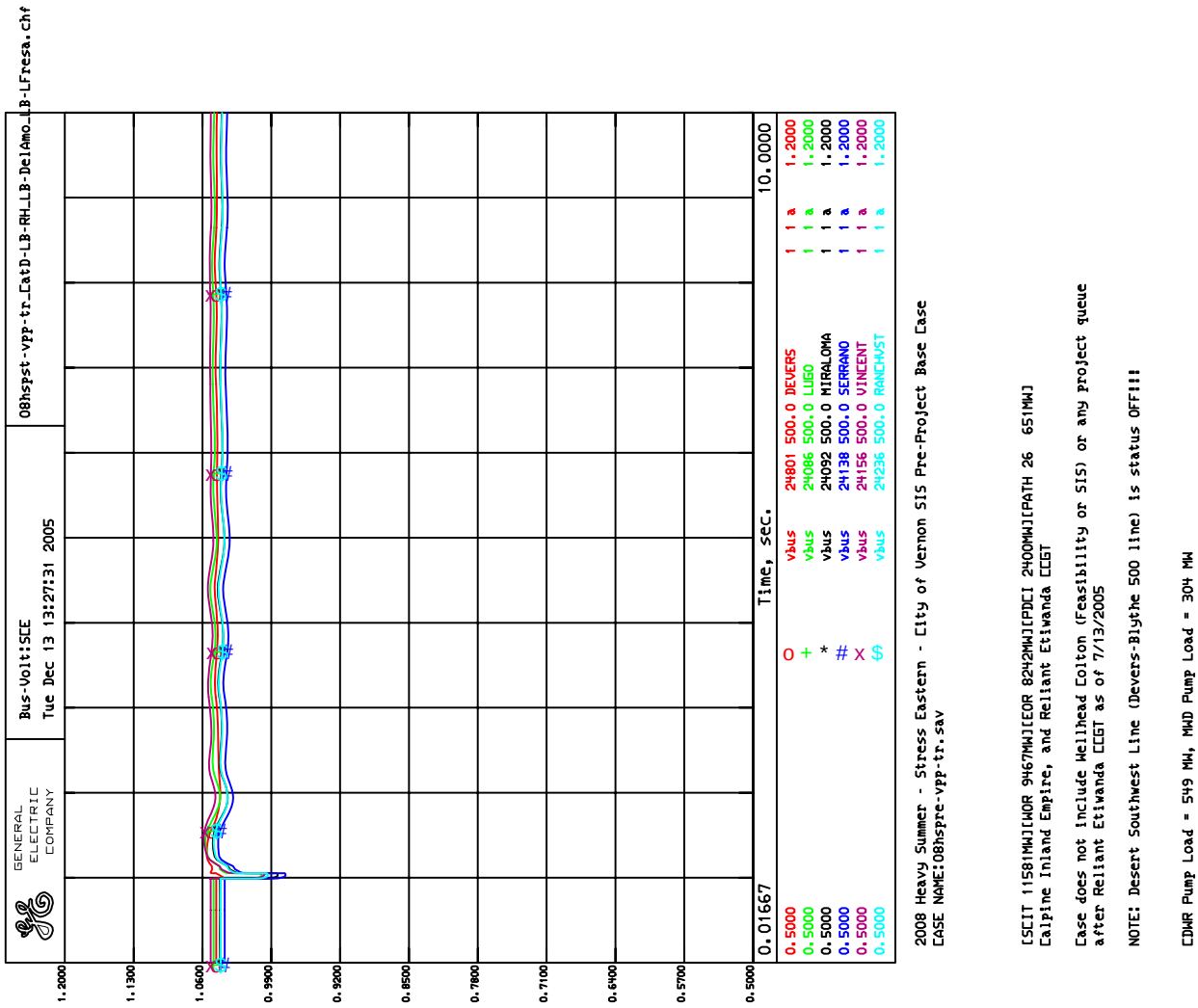
Plot 20 - 8: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



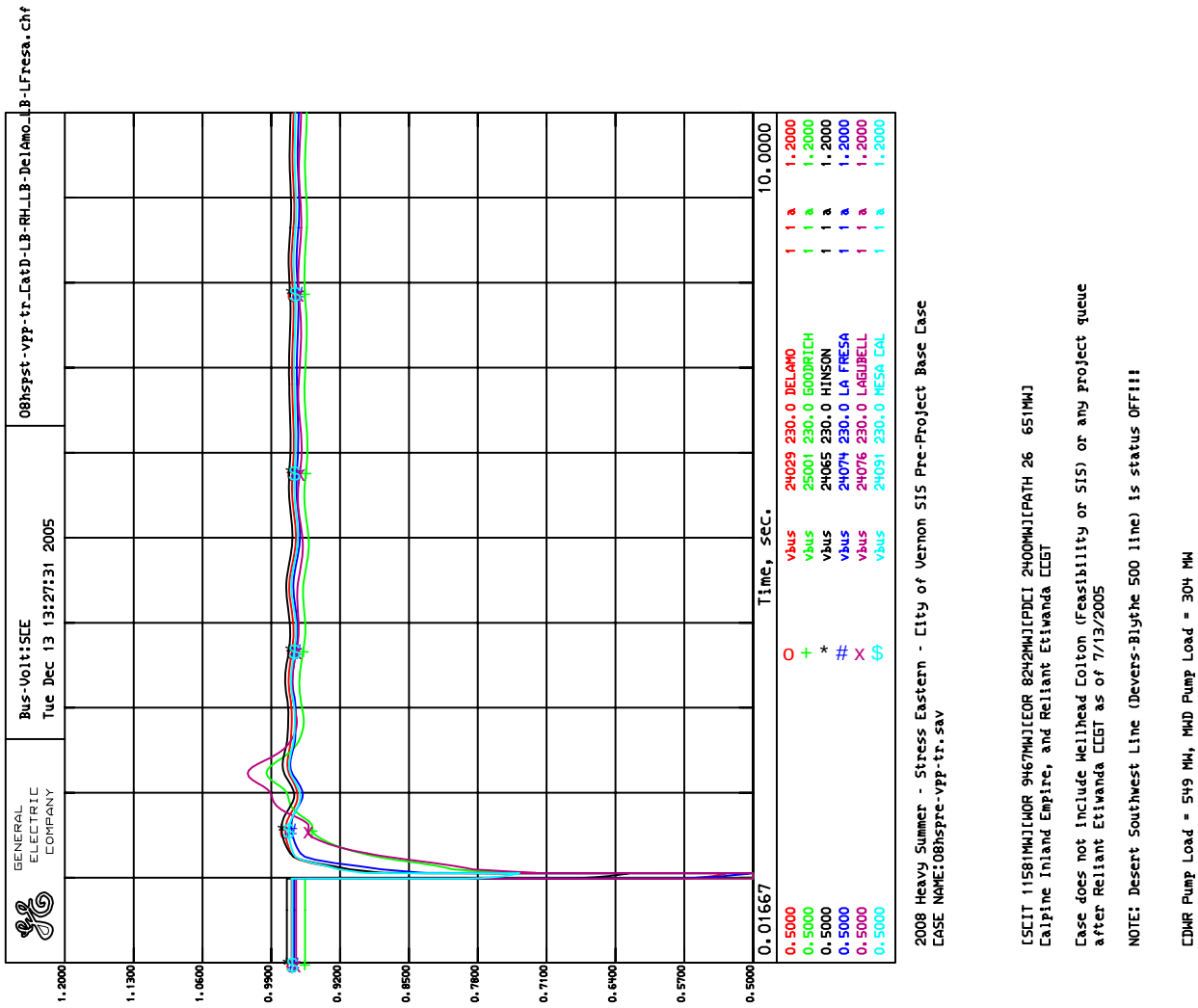
Plot 20 - 9: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



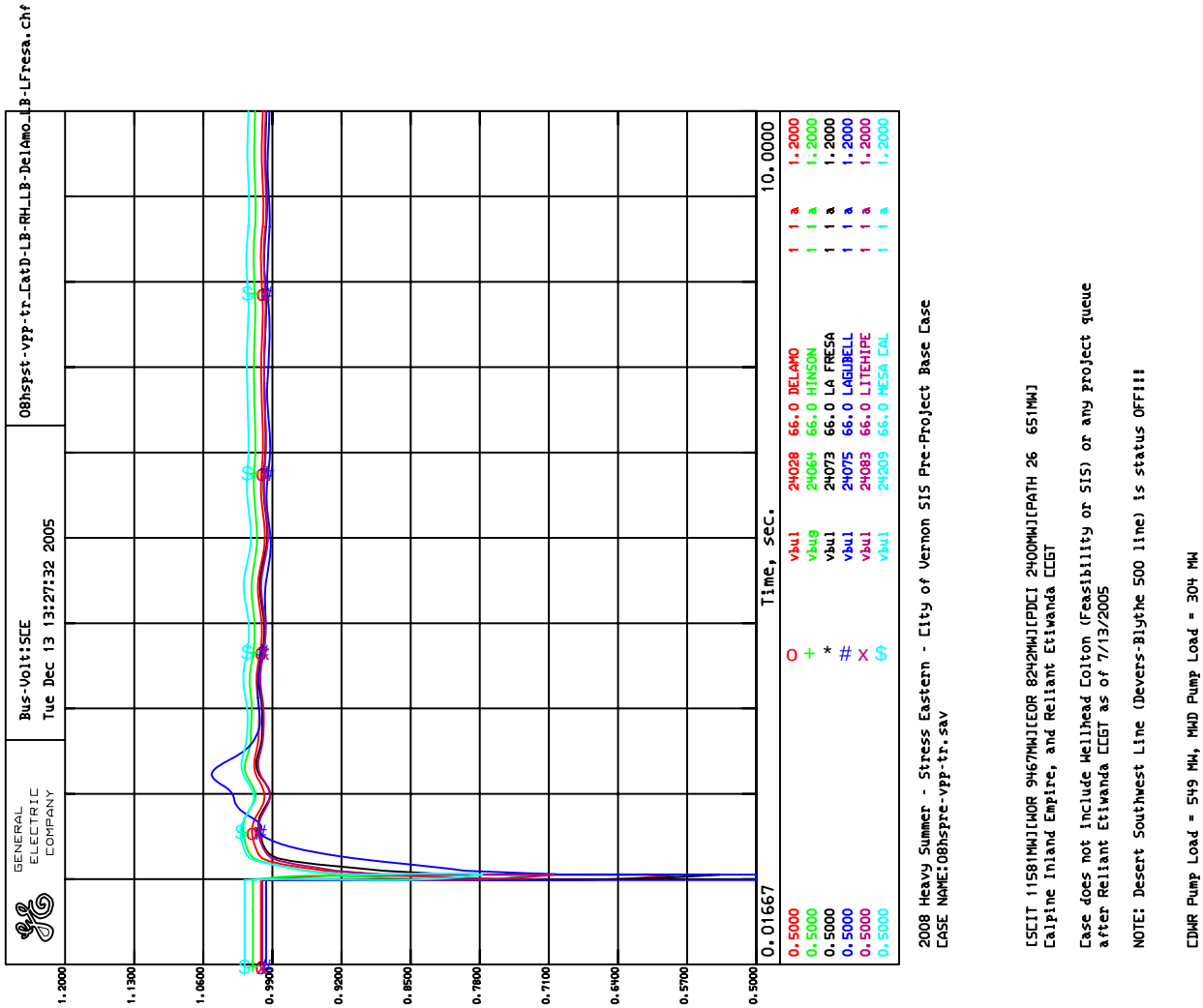
Plot 21 - 1: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



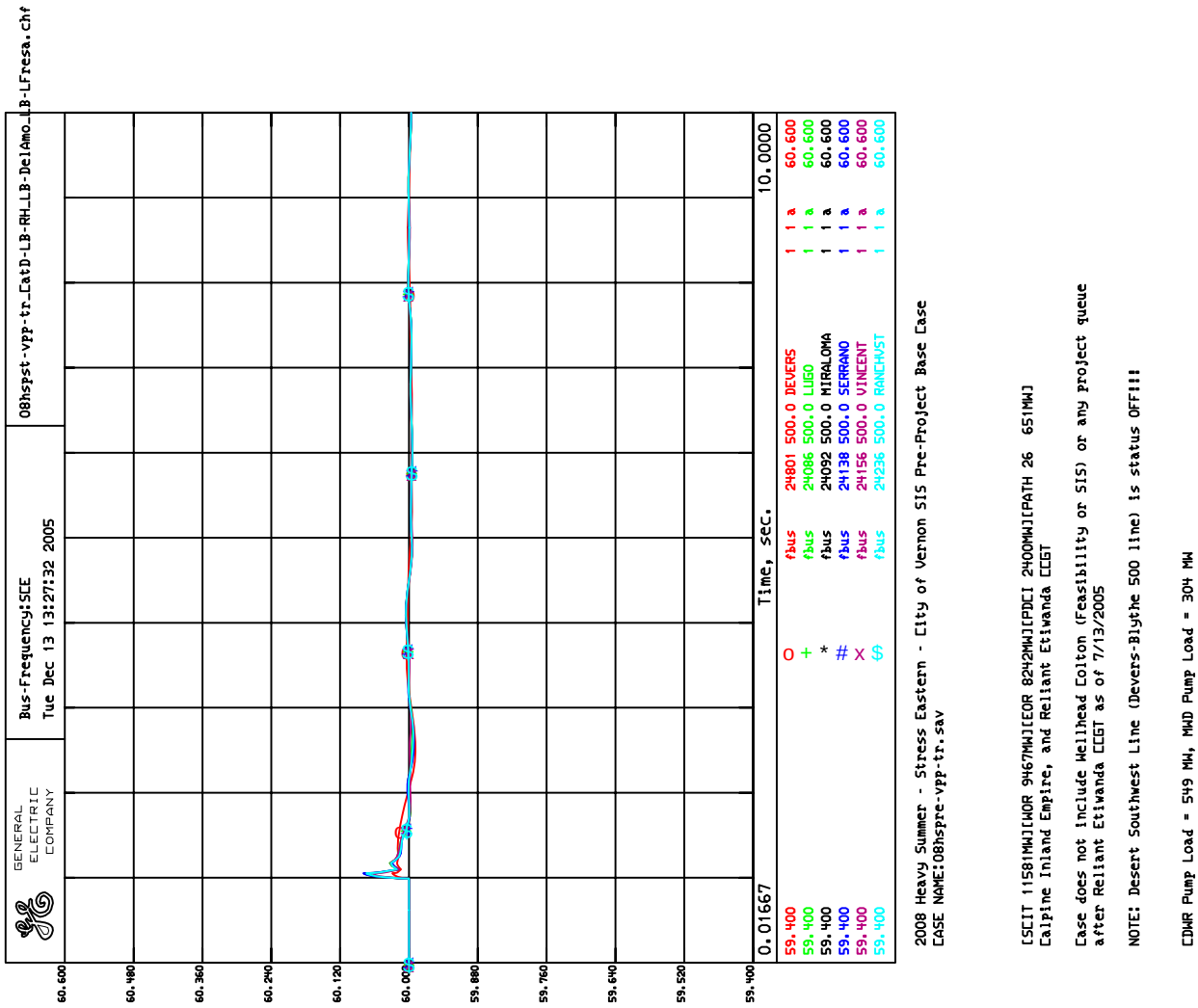
Plot 21 - 2: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



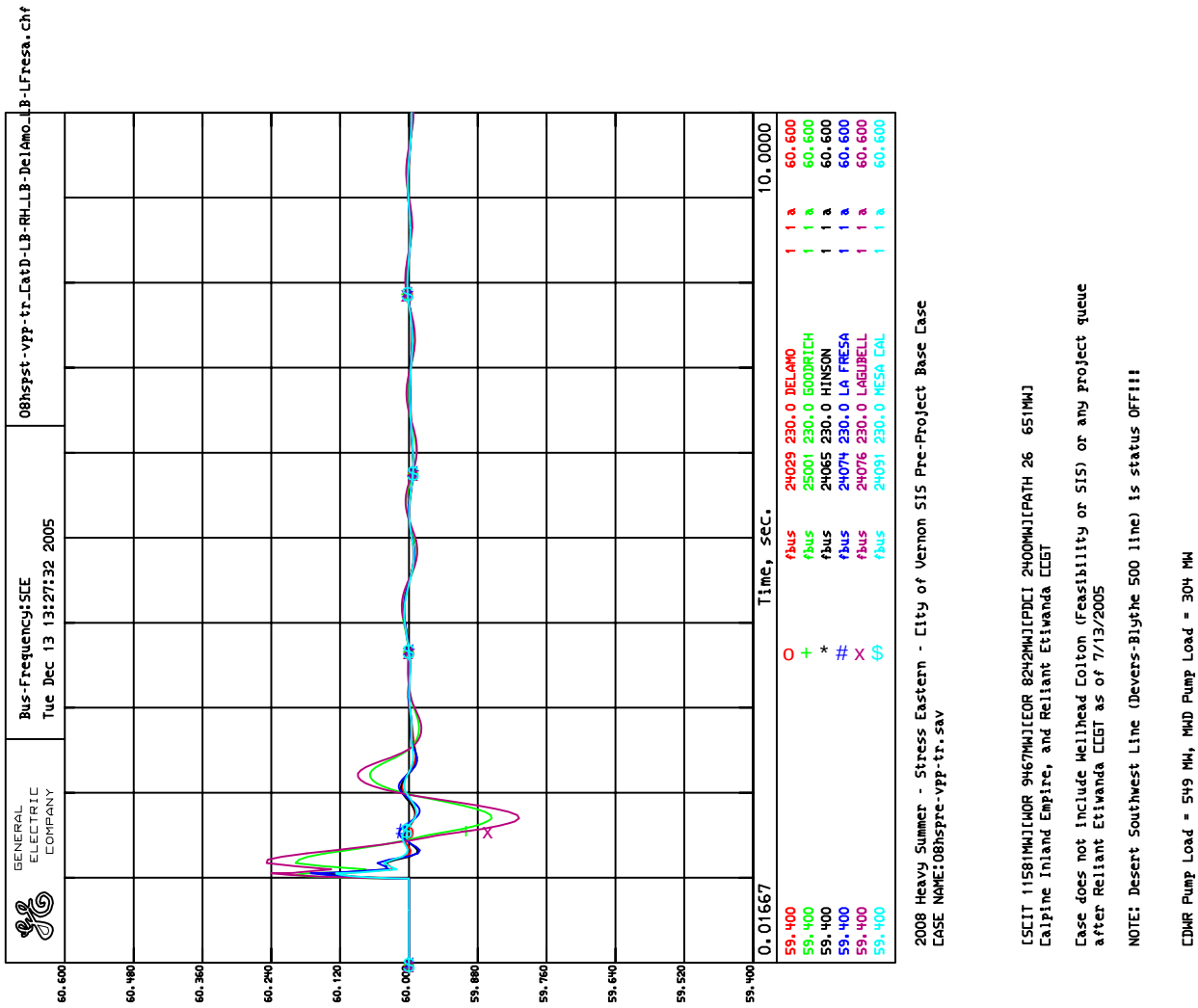
Plot 21 - 3: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



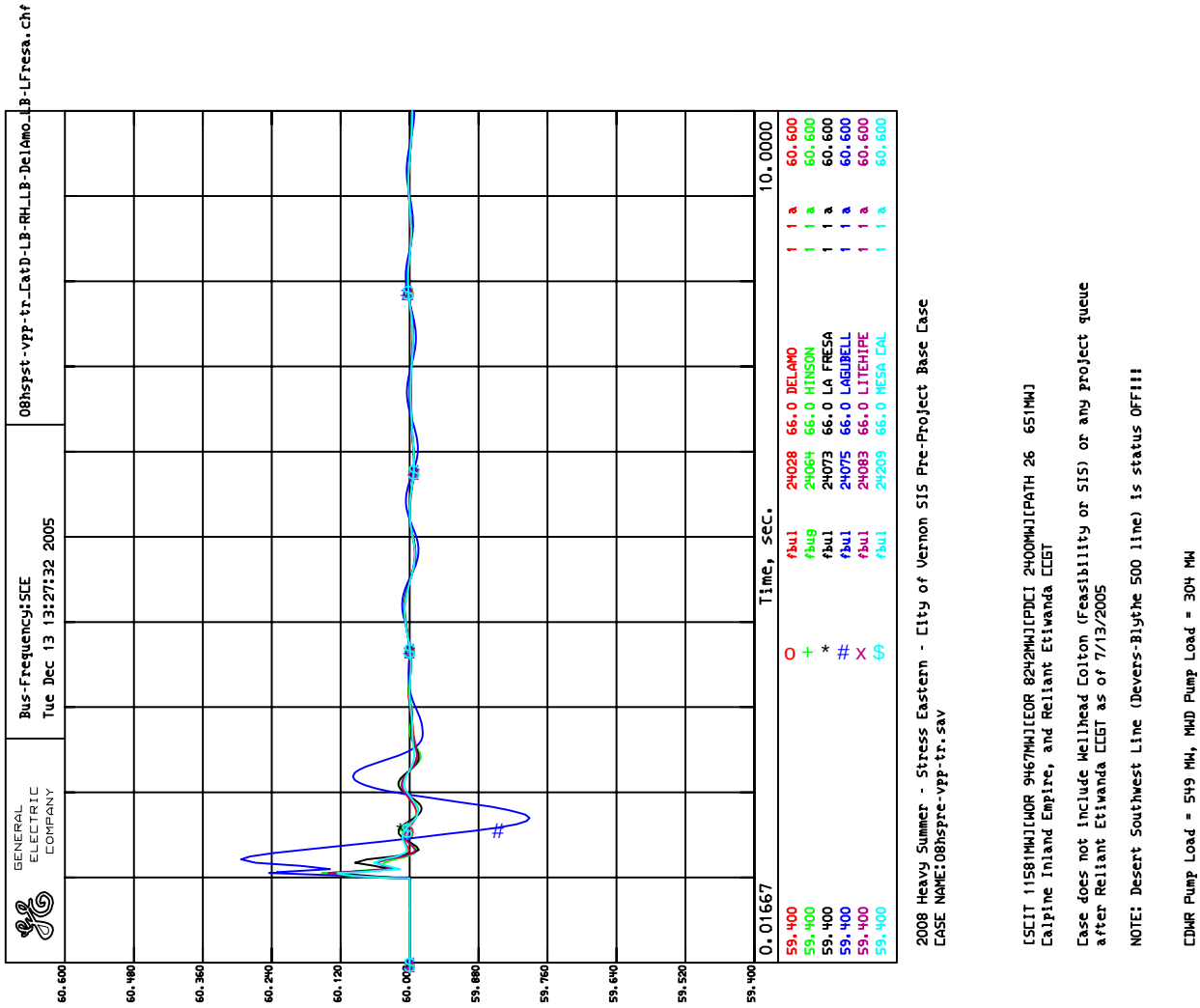
Plot 21 - 4: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



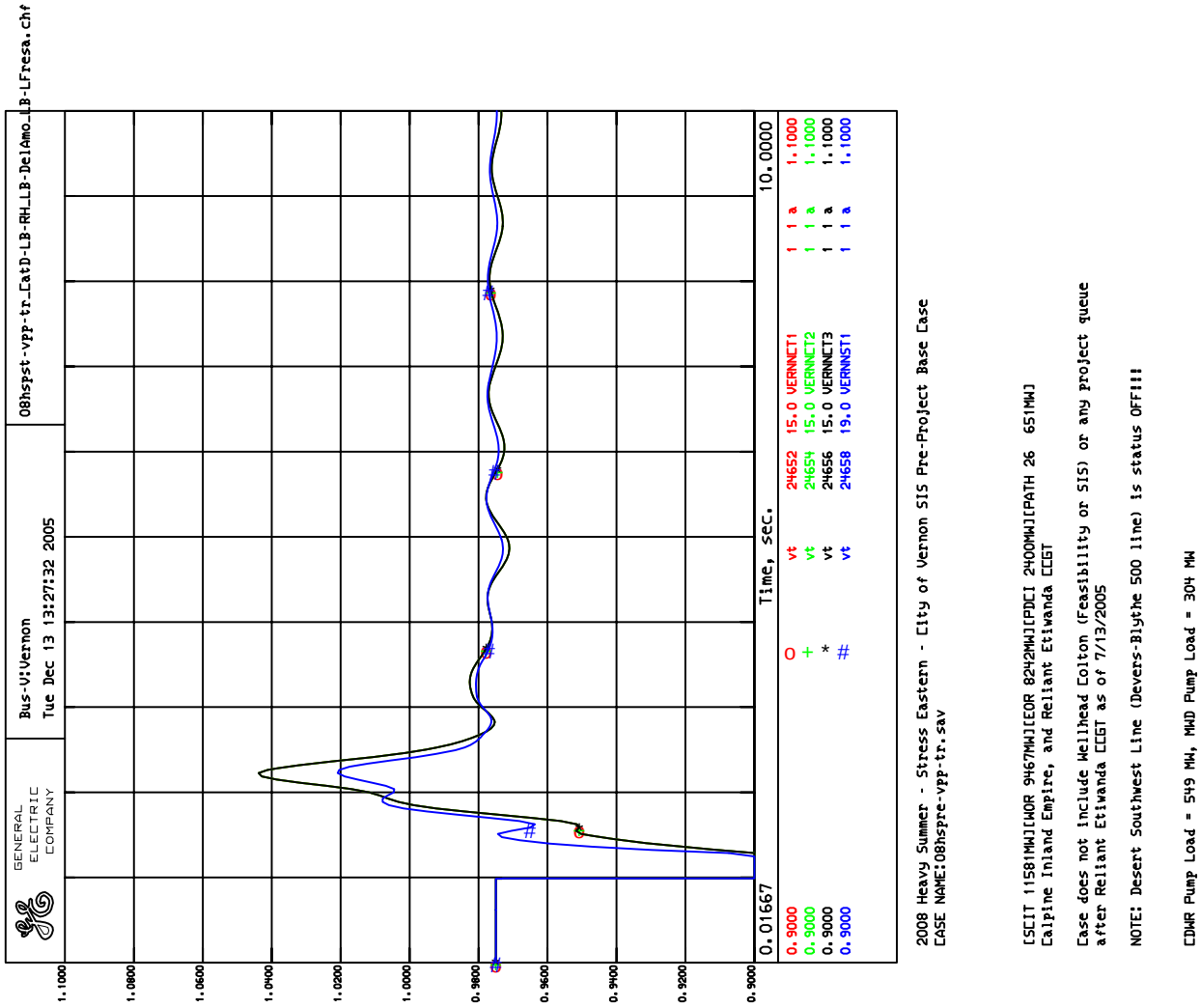
Plot 21 - 5: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



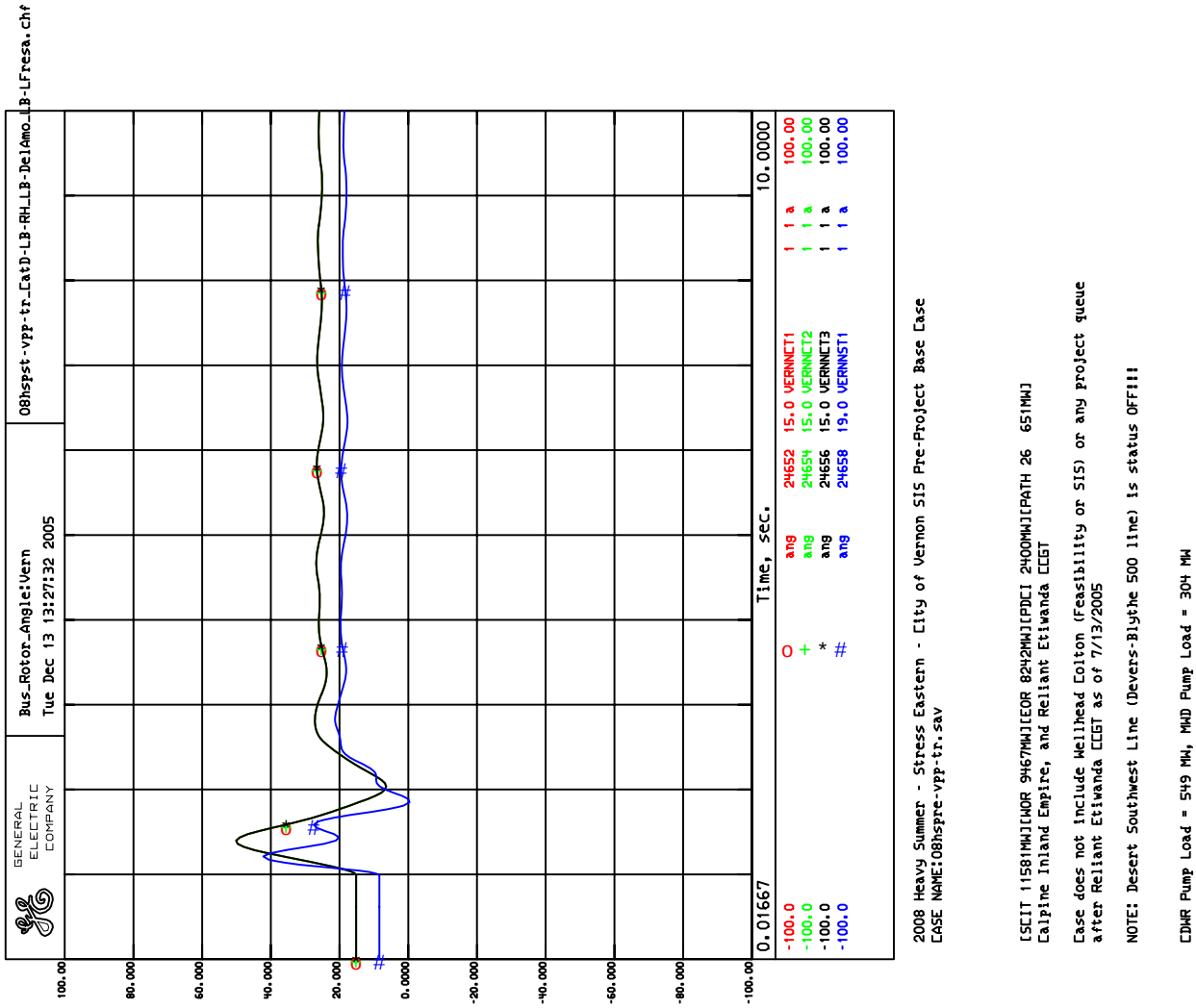
Plot 21 - 6: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



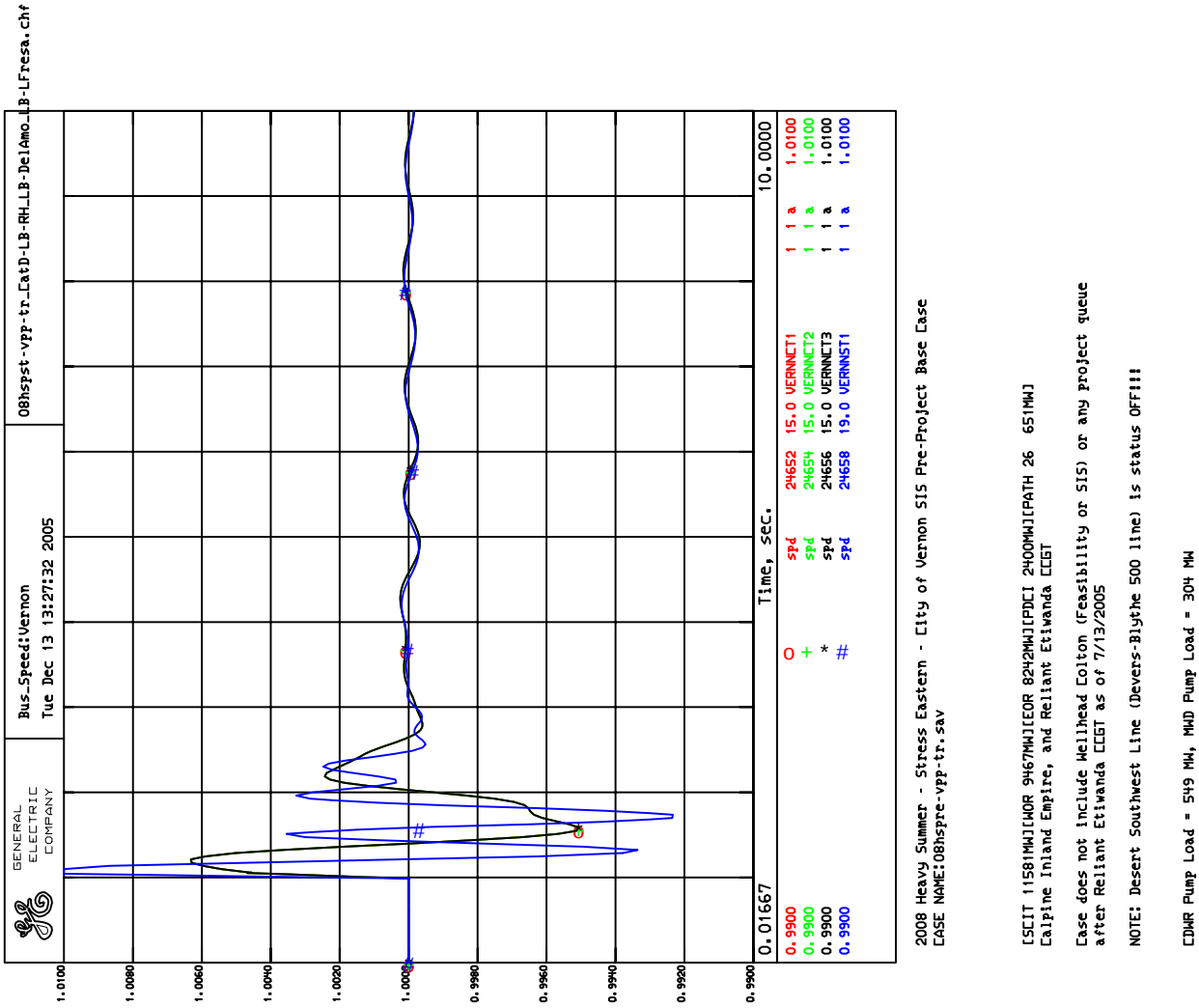
Plot 21 - 7: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



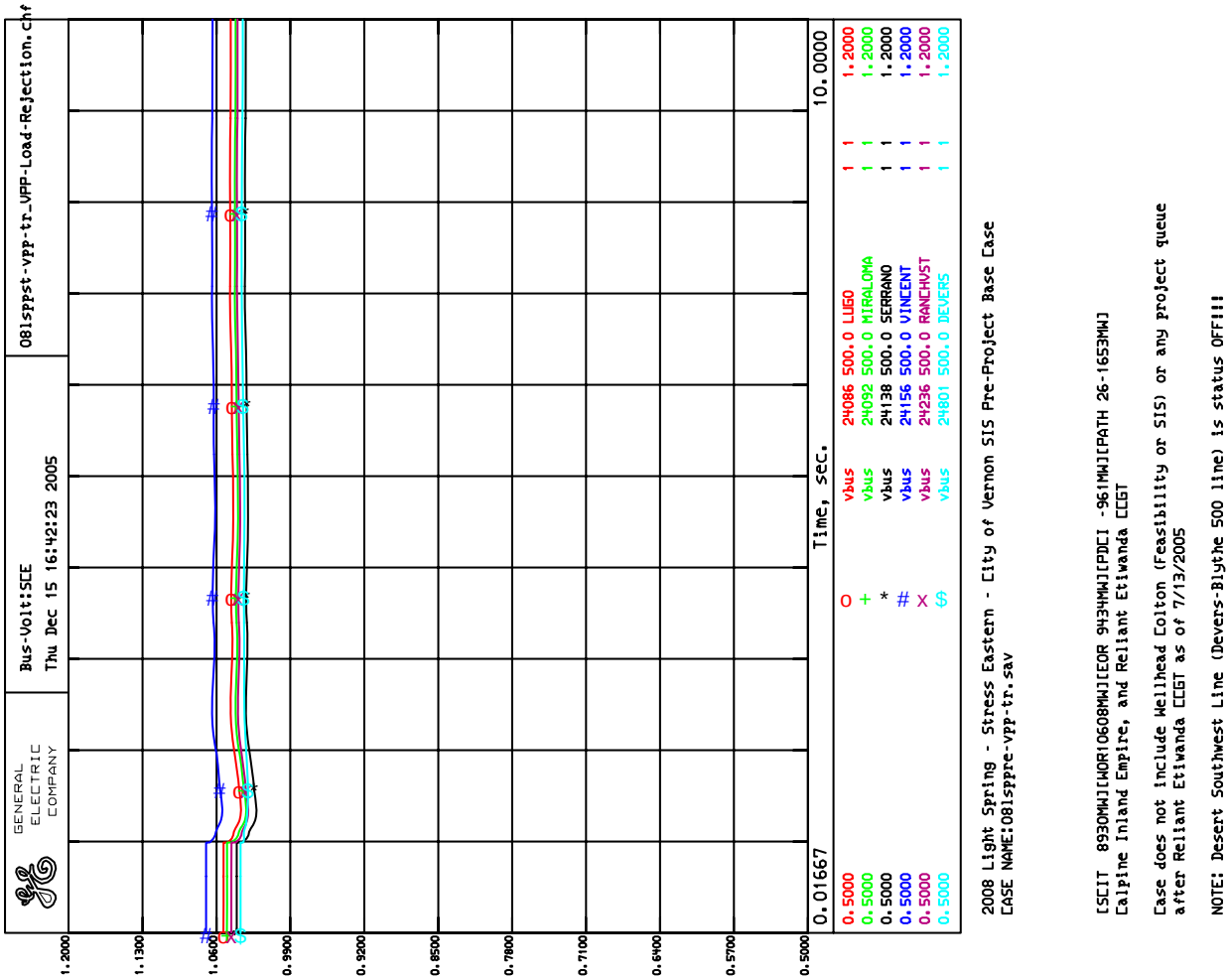
Plot 21 - 8: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



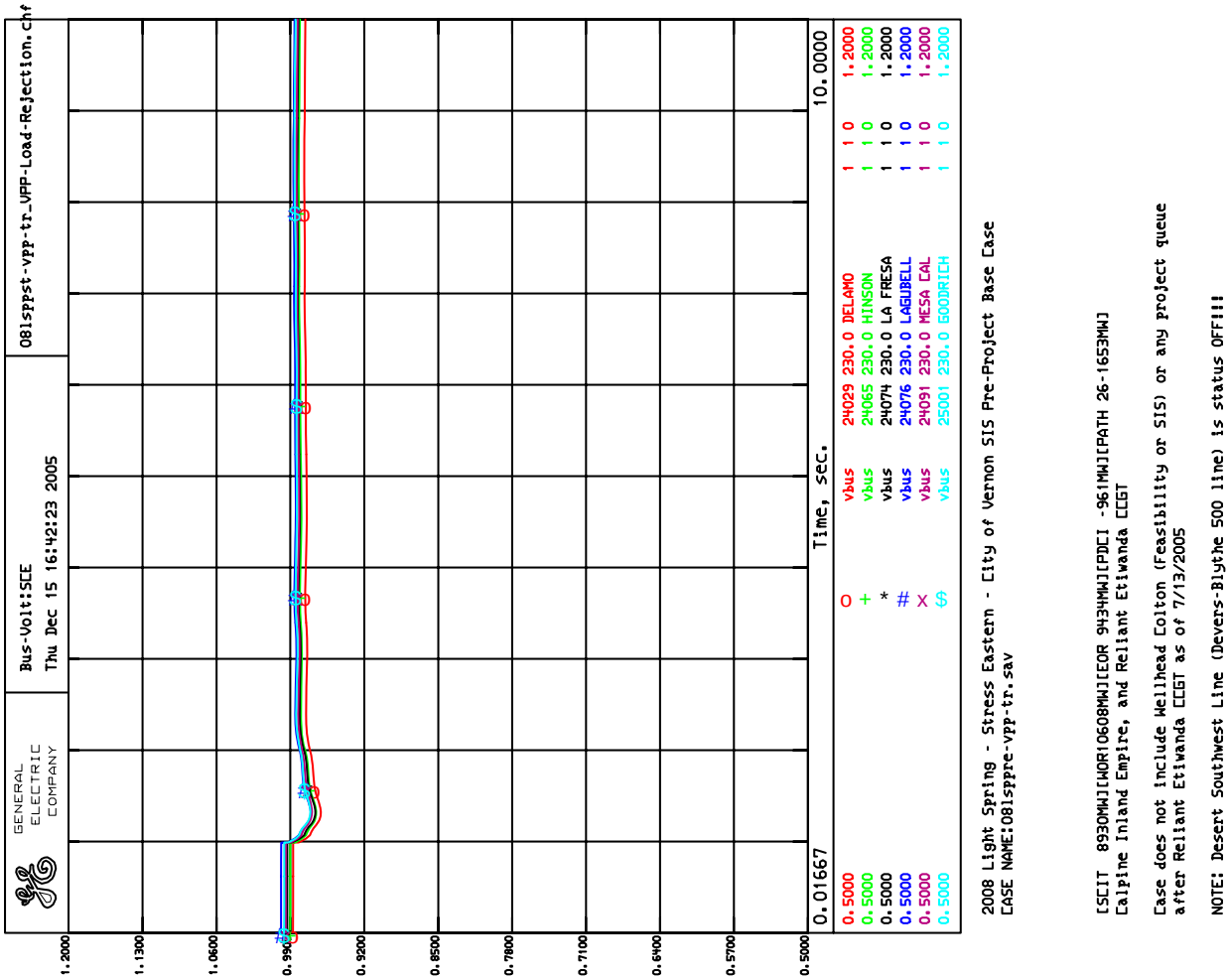
Plot 21 - 9: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



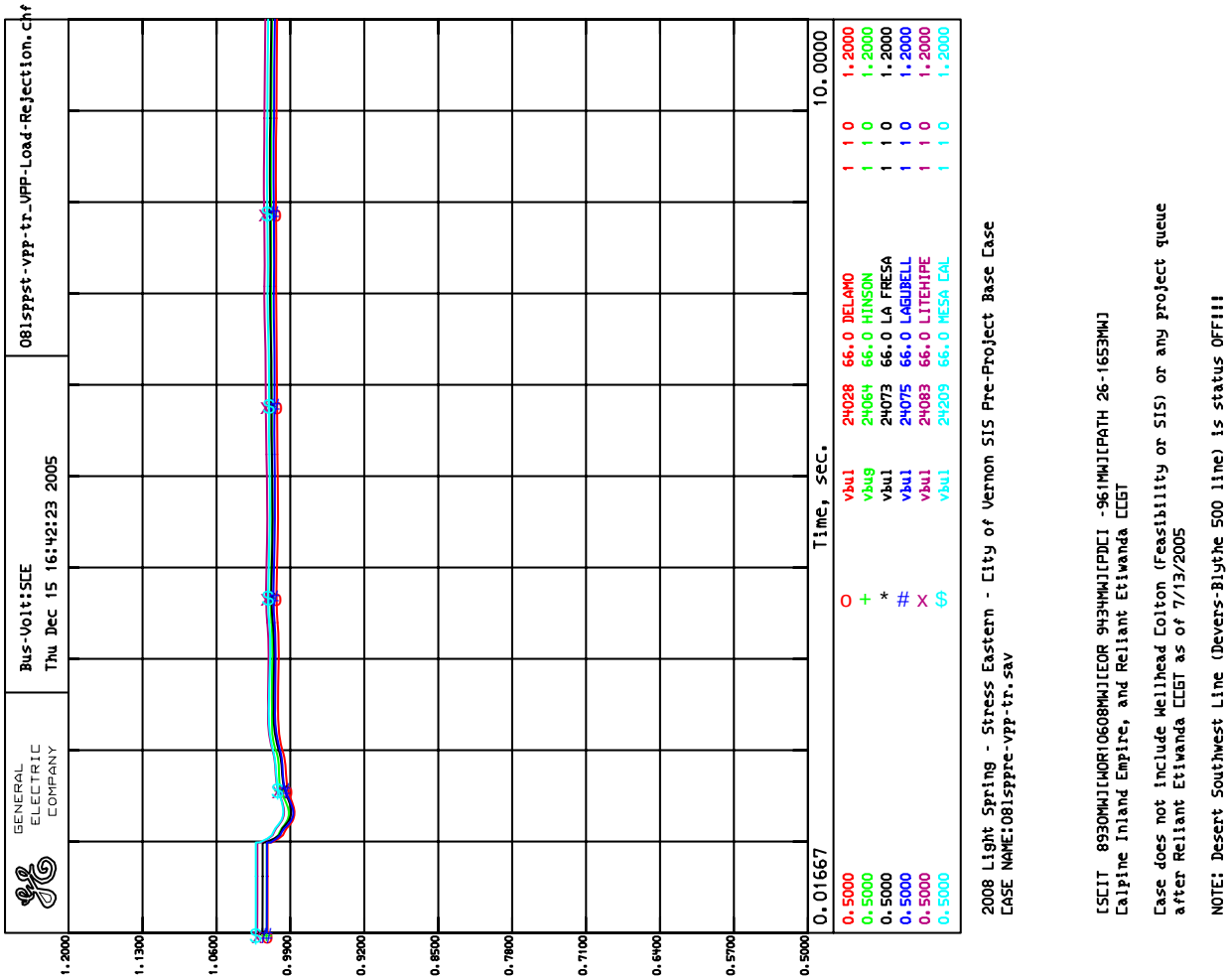
Plot 22 - 1: Full load rejection of the VPP.



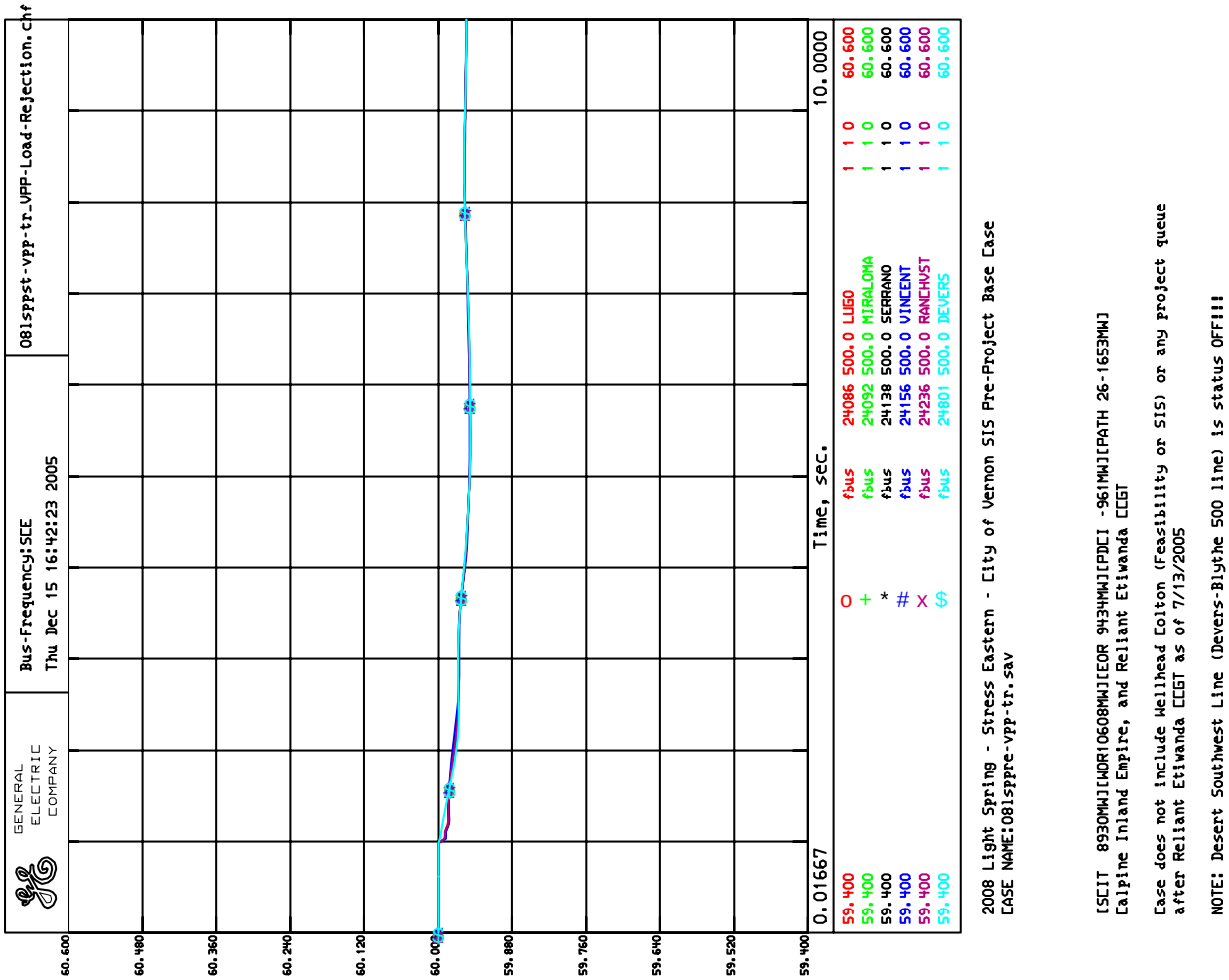
Plot 22 - 2: Full load rejection of the VPP.



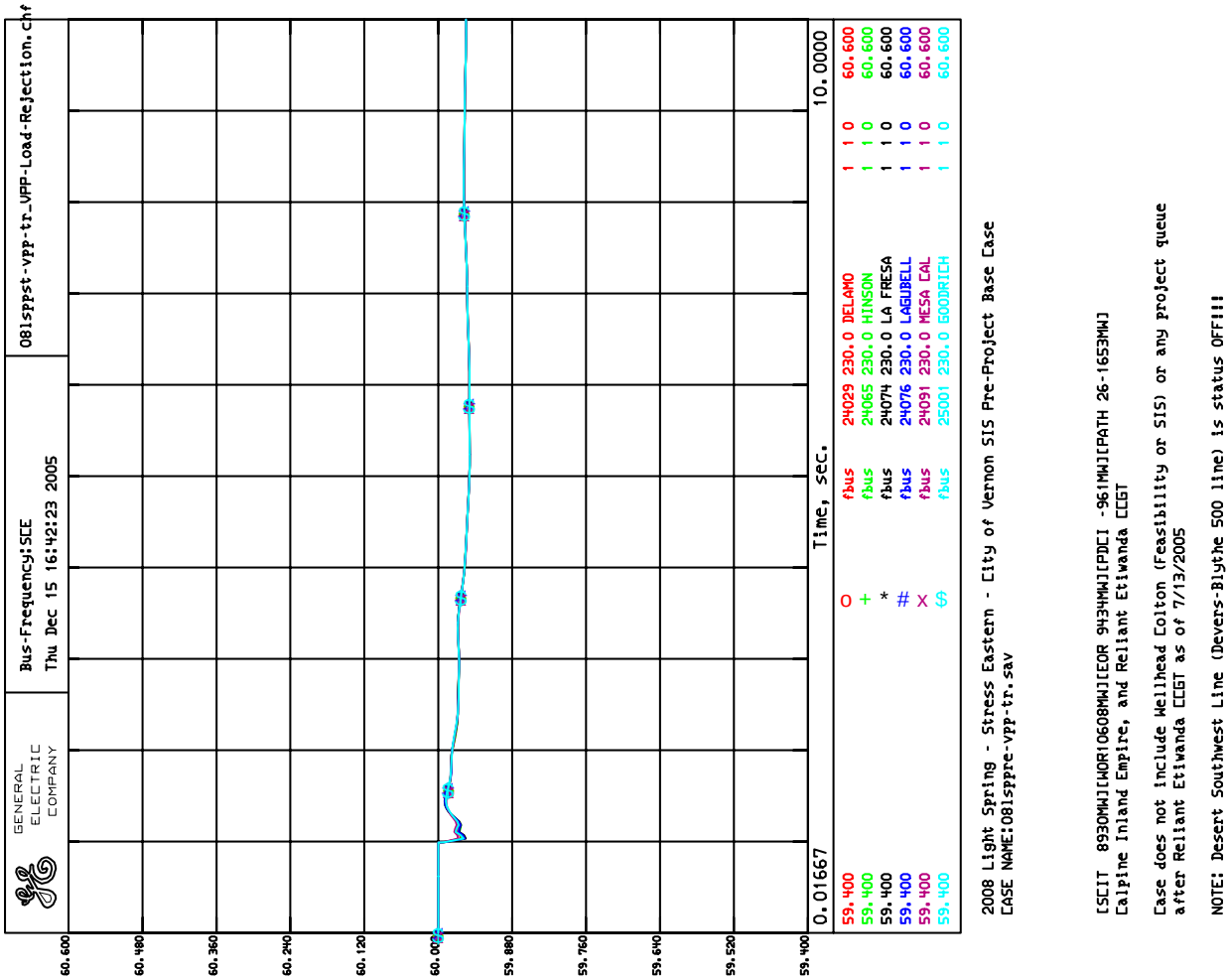
Plot 22 - 3: Full load rejection of the VPP.



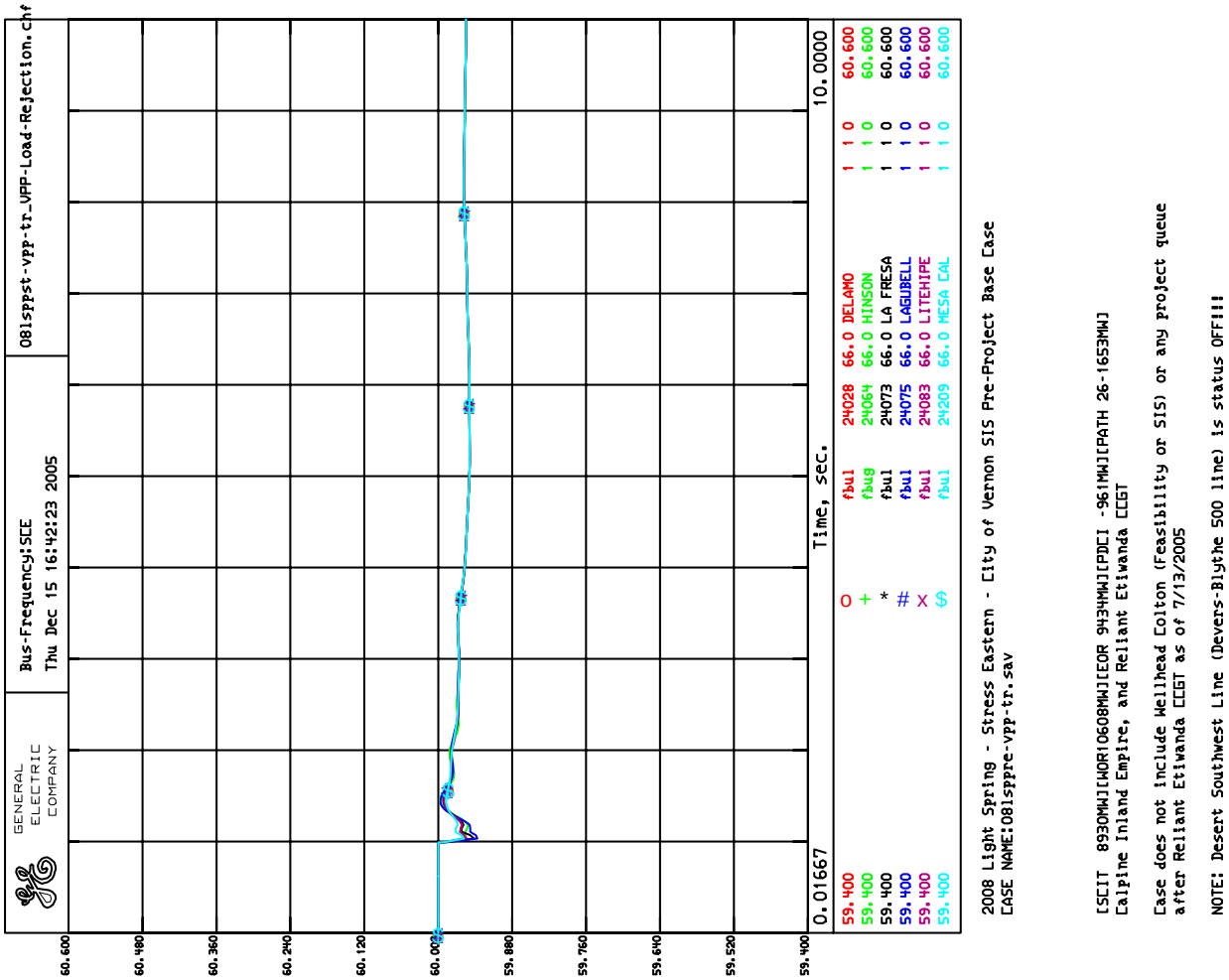
Plot 22 - 4: Full load rejection of the VPP.



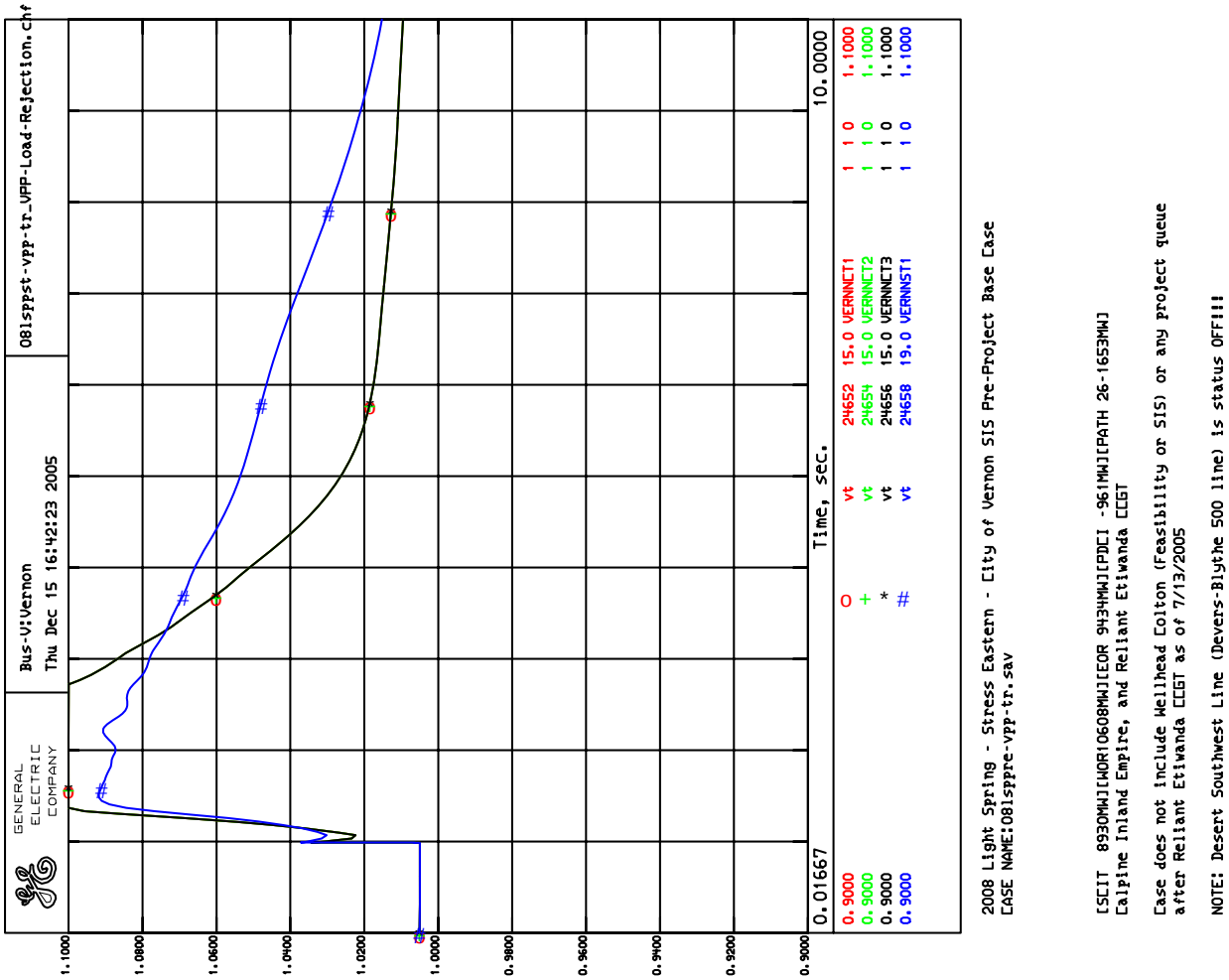
Plot 22 - 5: Full load rejection of the VPP.



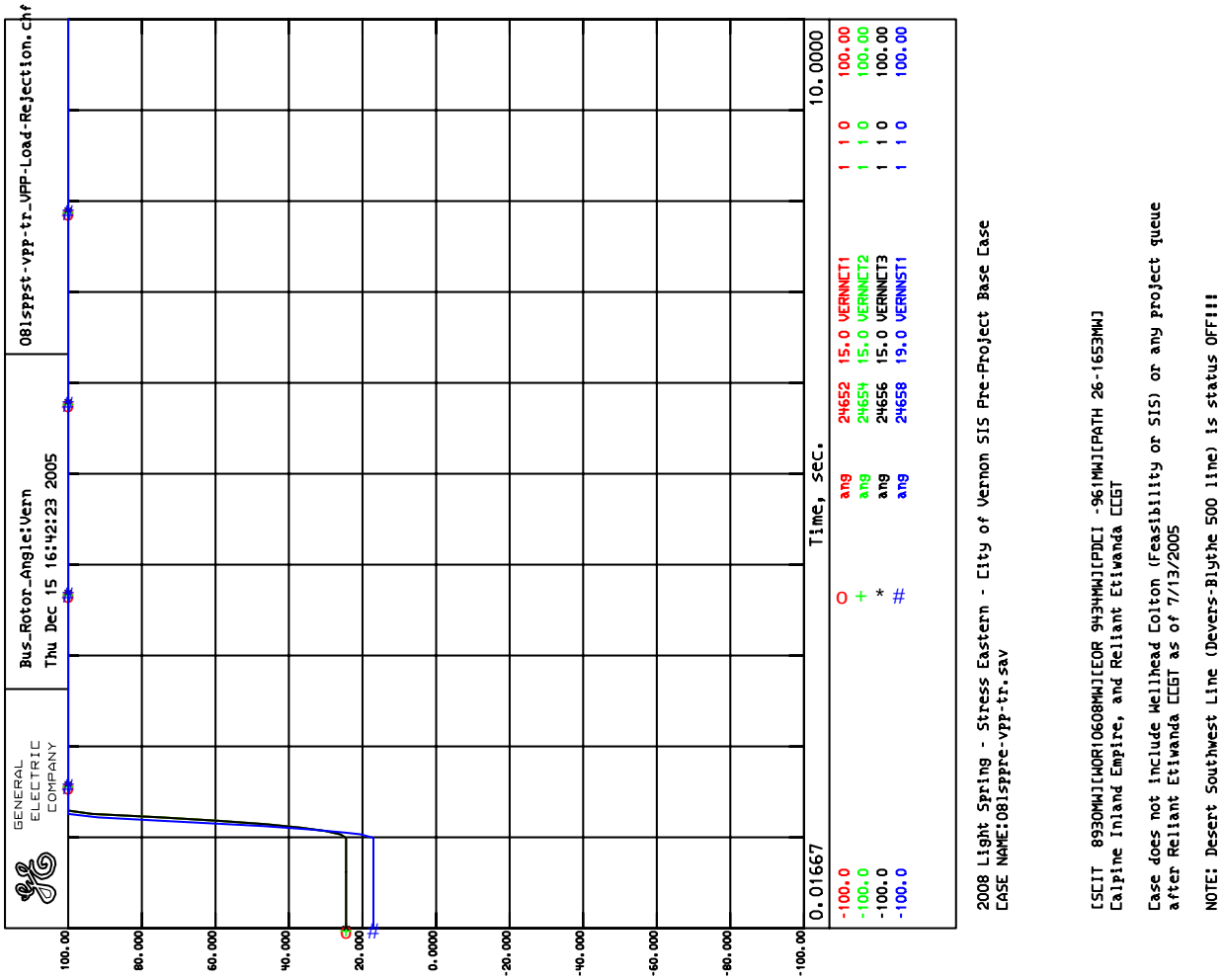
Plot 22 - 6: Full load rejection of the VPP.



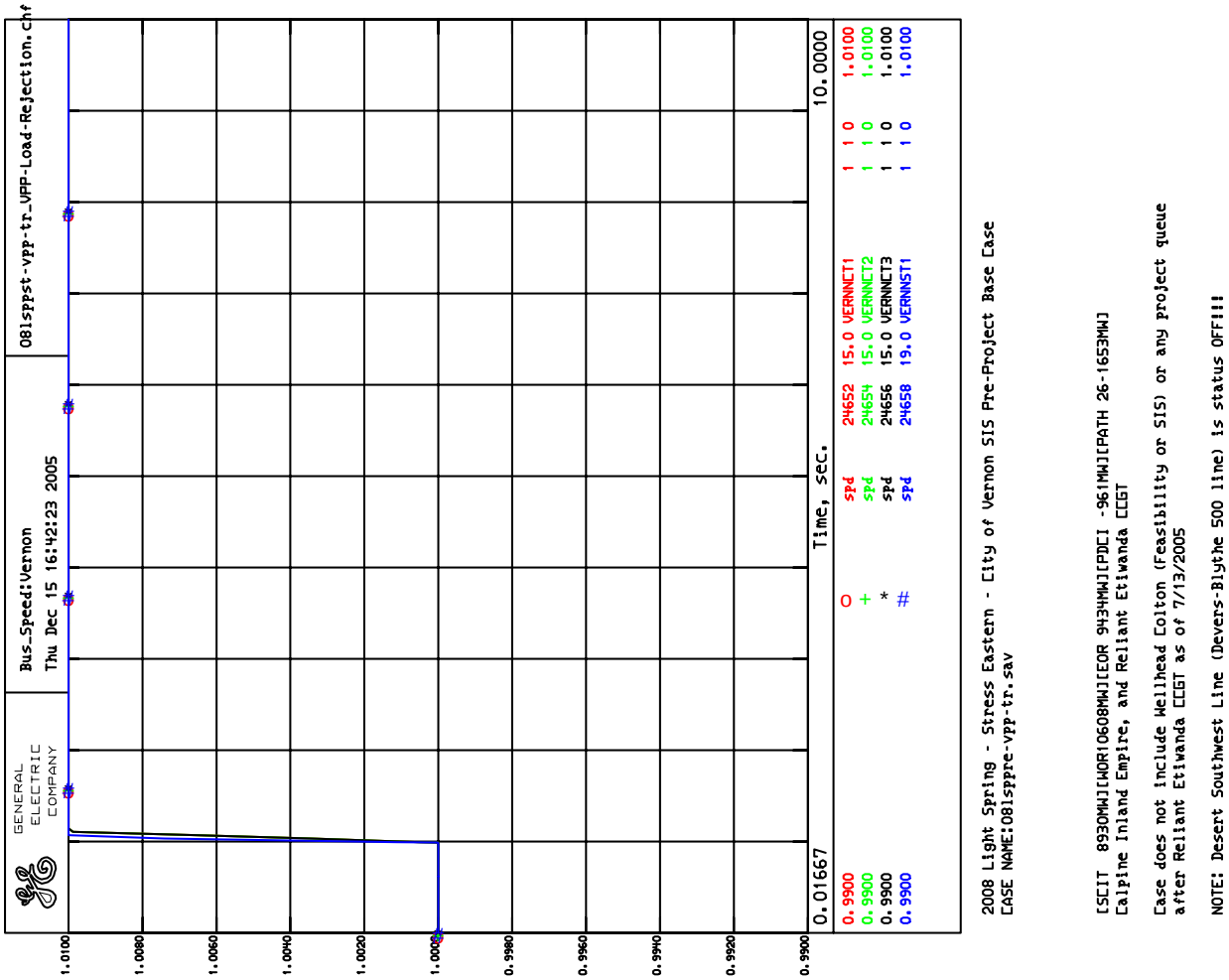
Plot 22 - 7: Full load rejection of the VPP.



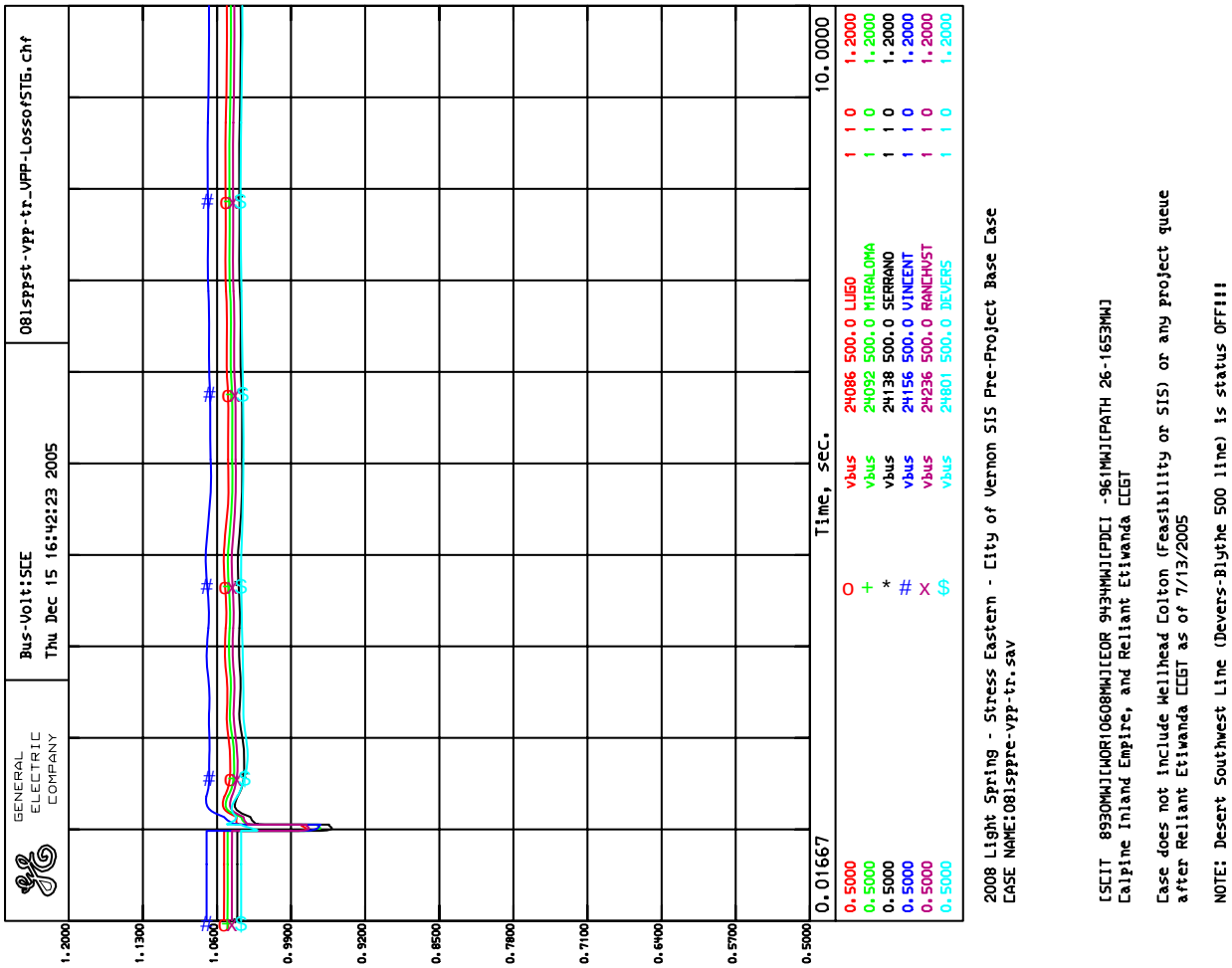
Plot 22 - 8: Full load rejection of the VPP.



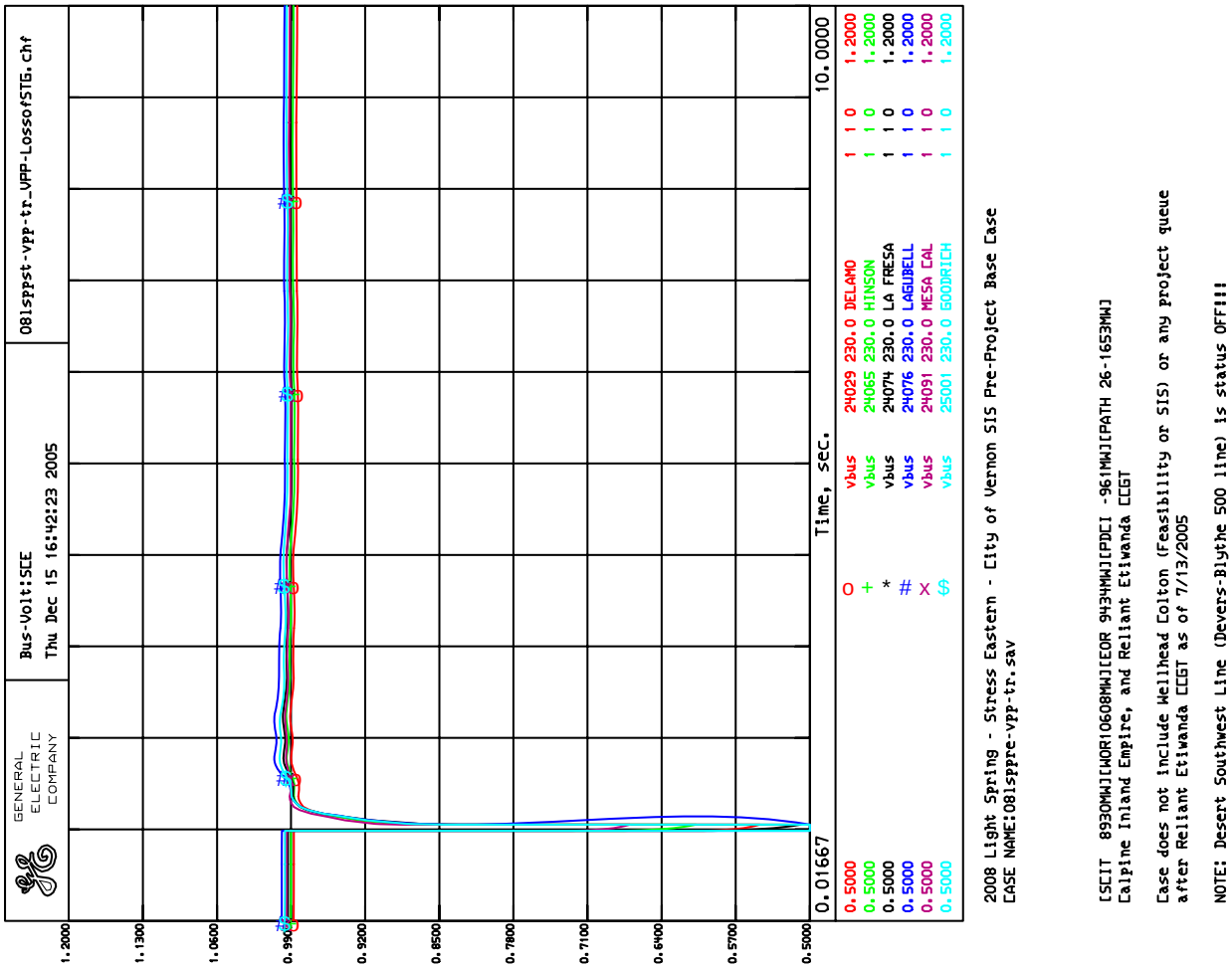
Plot 22 - 9: Full load rejection of the VPP.



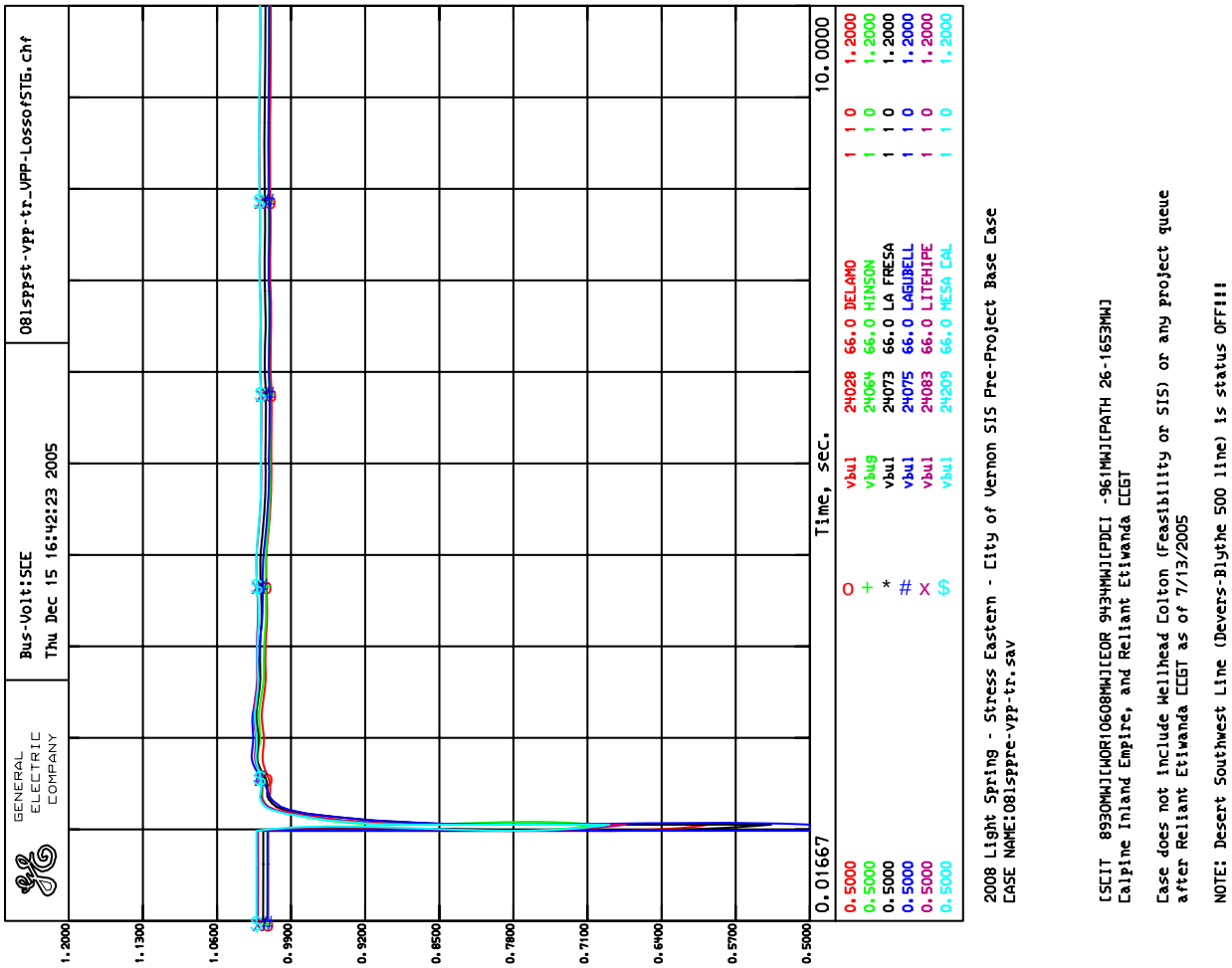
Plot 23 - 1: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



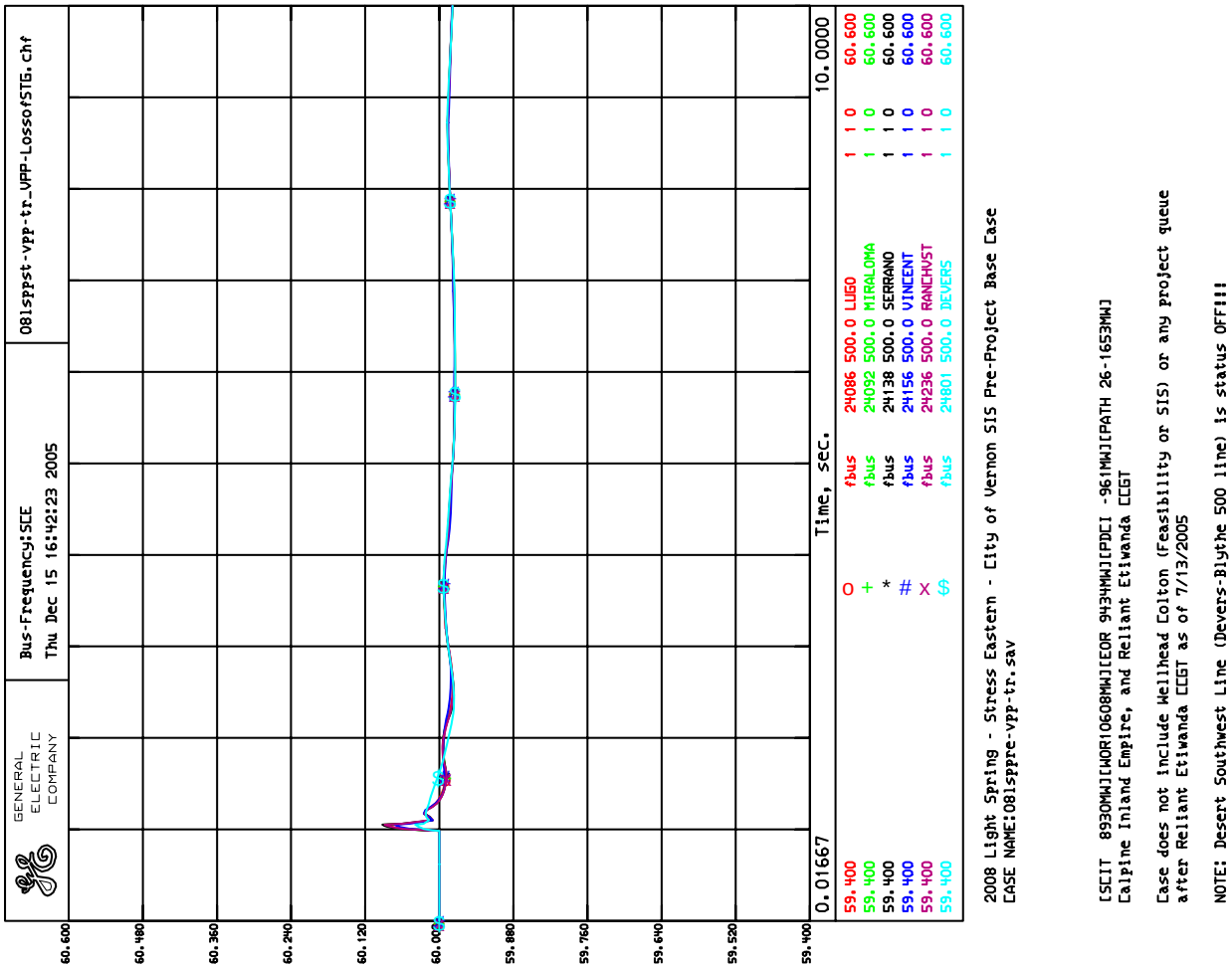
Plot 23 - 2: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



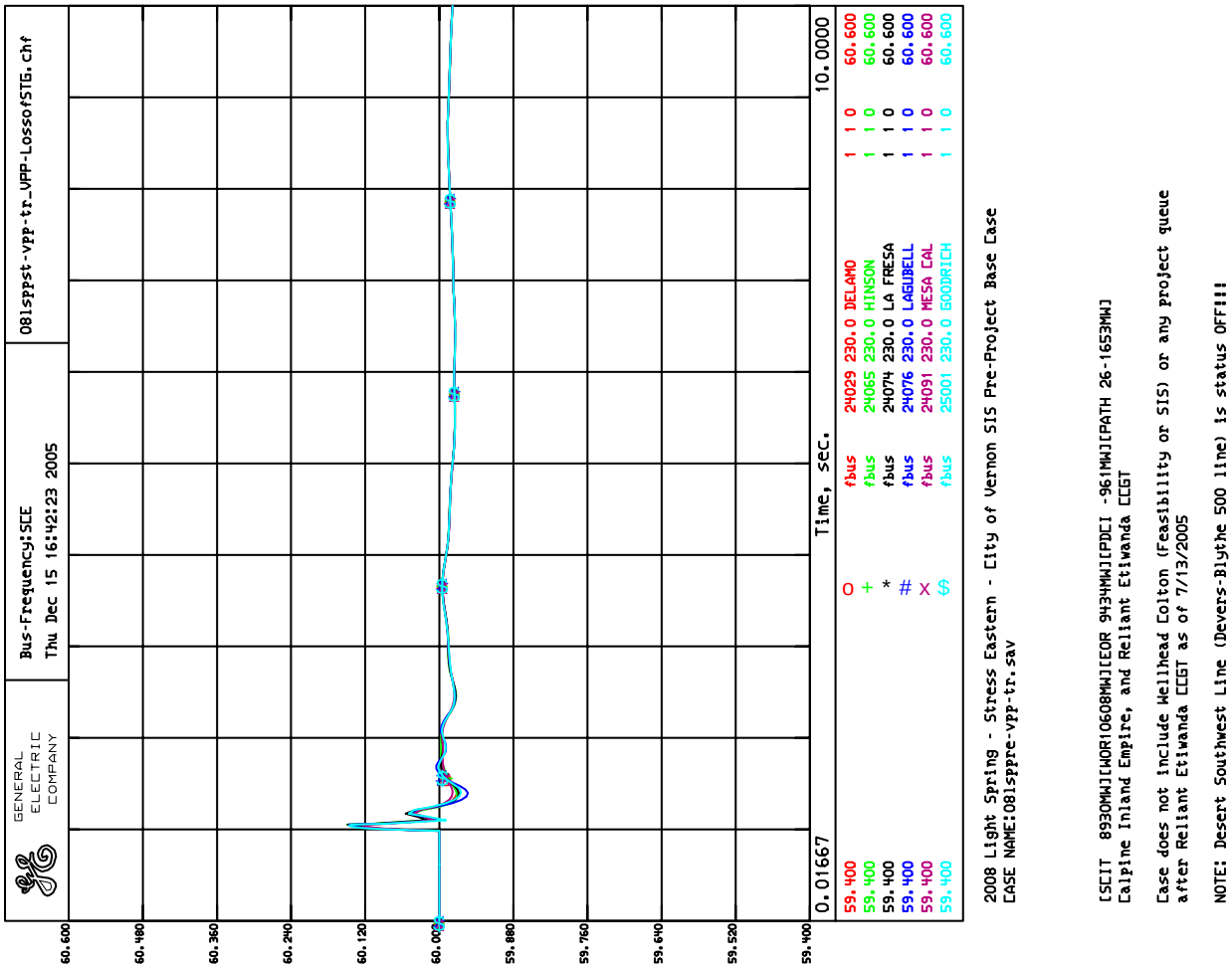
Plot 23 - 3: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



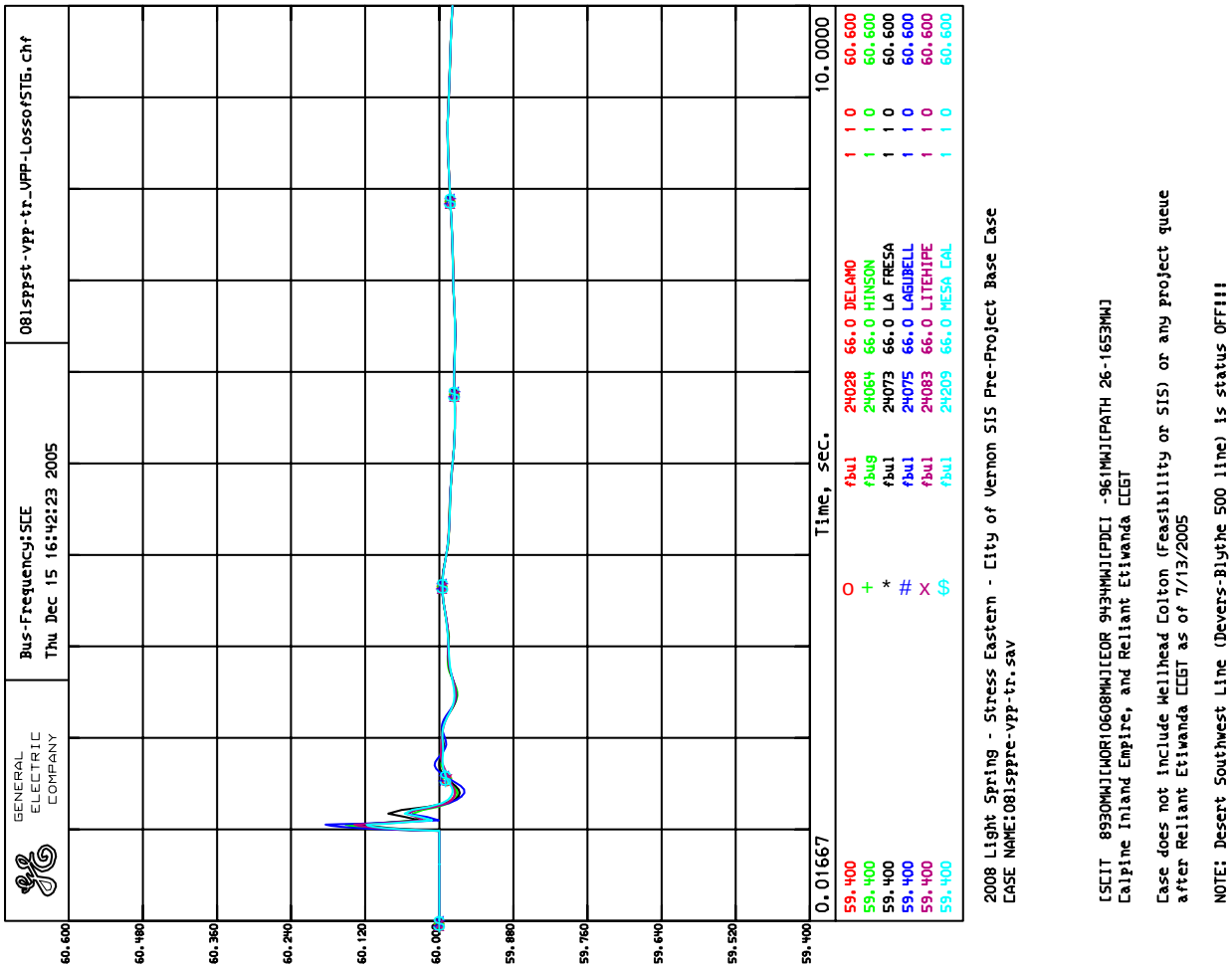
Plot 23 - 4: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



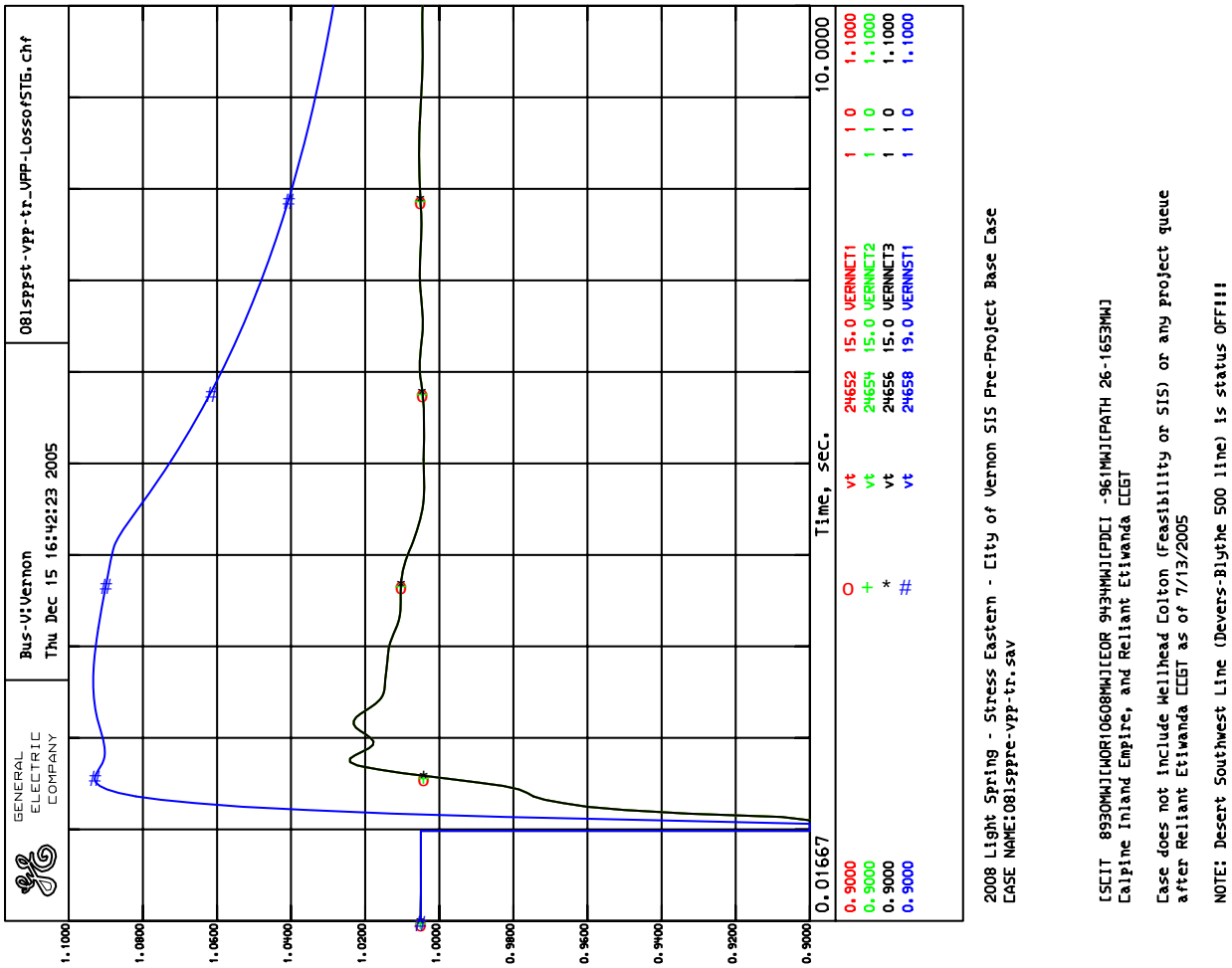
Plot 23 - 5: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



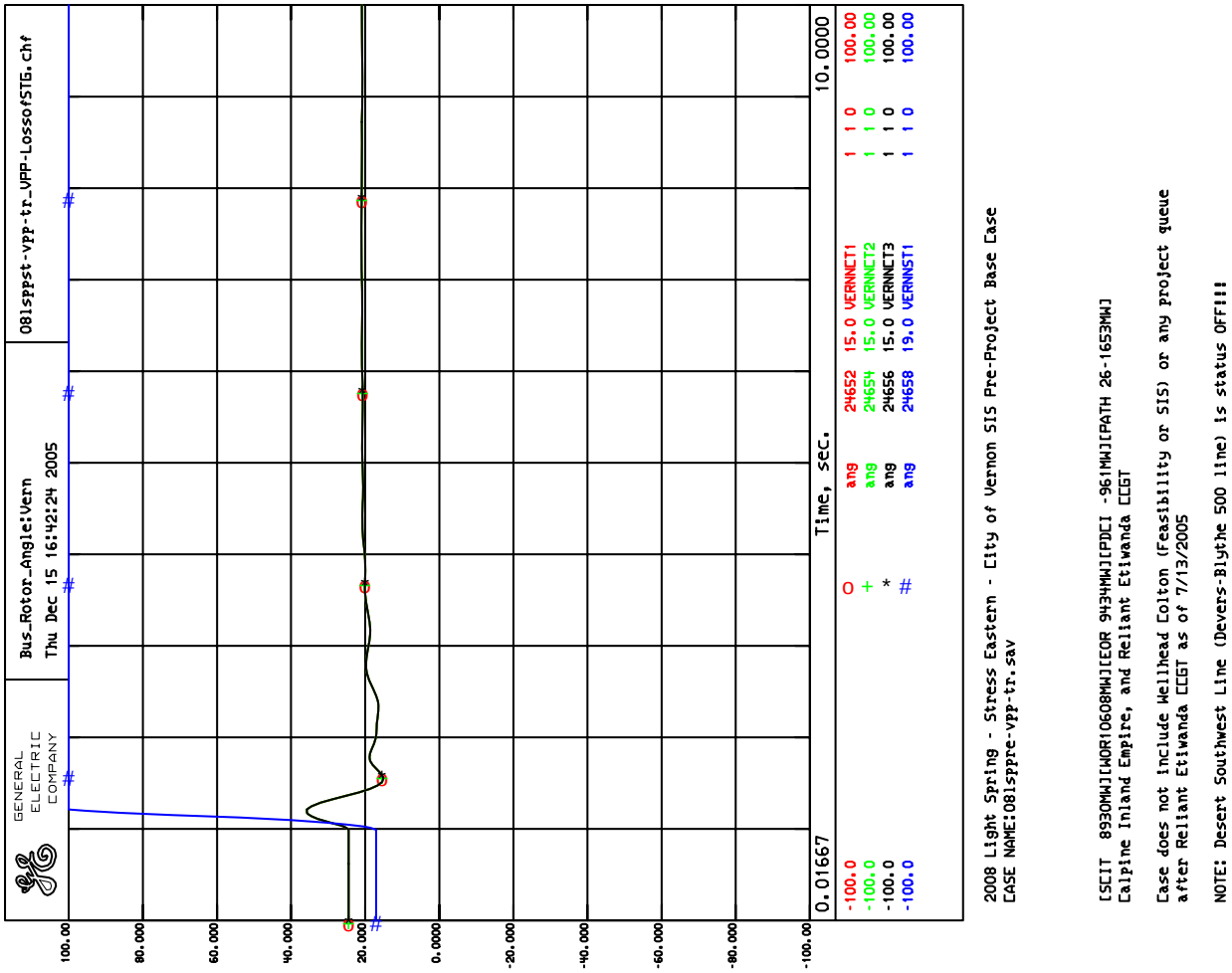
Plot 23 - 6: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



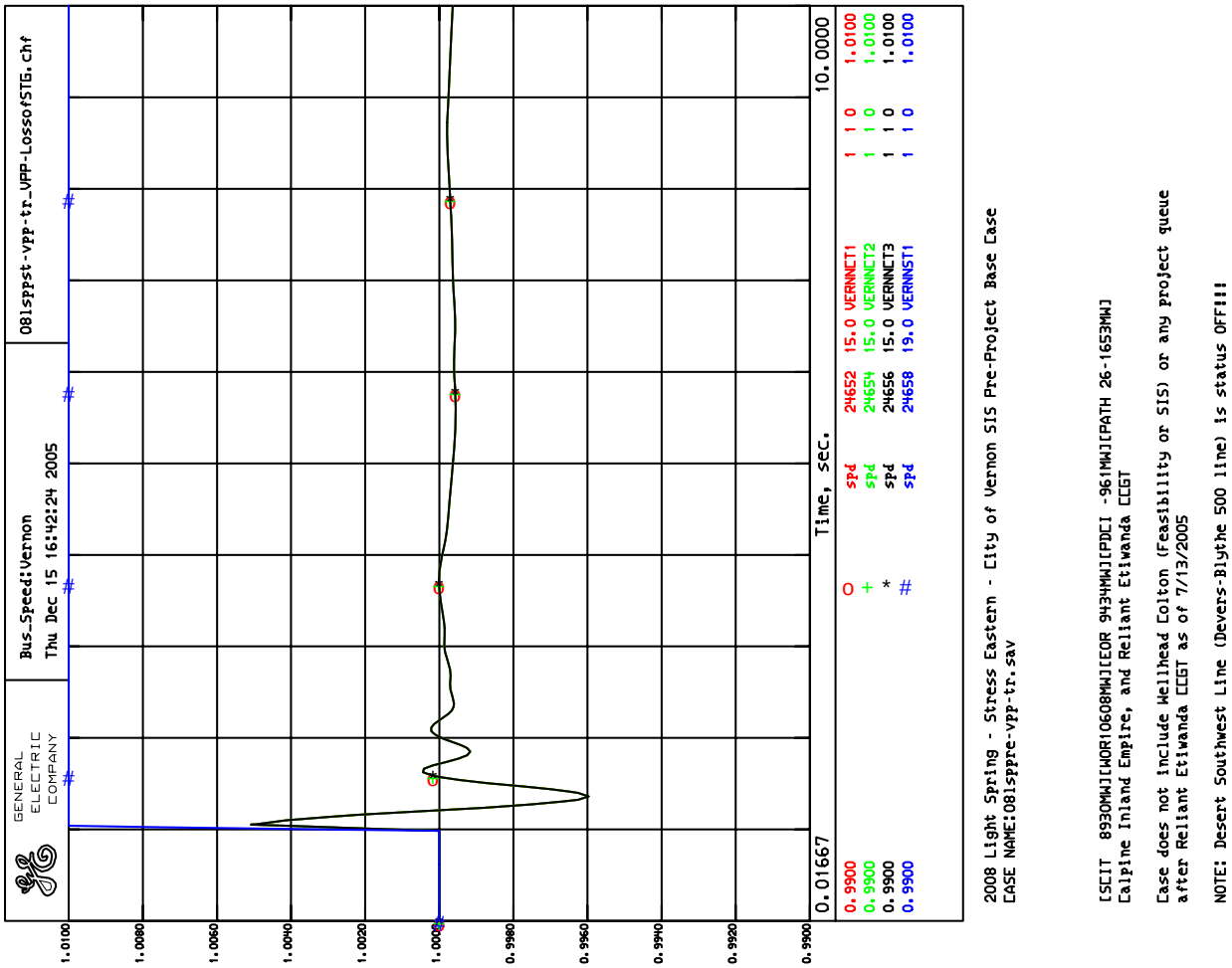
Plot 23 - 7: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



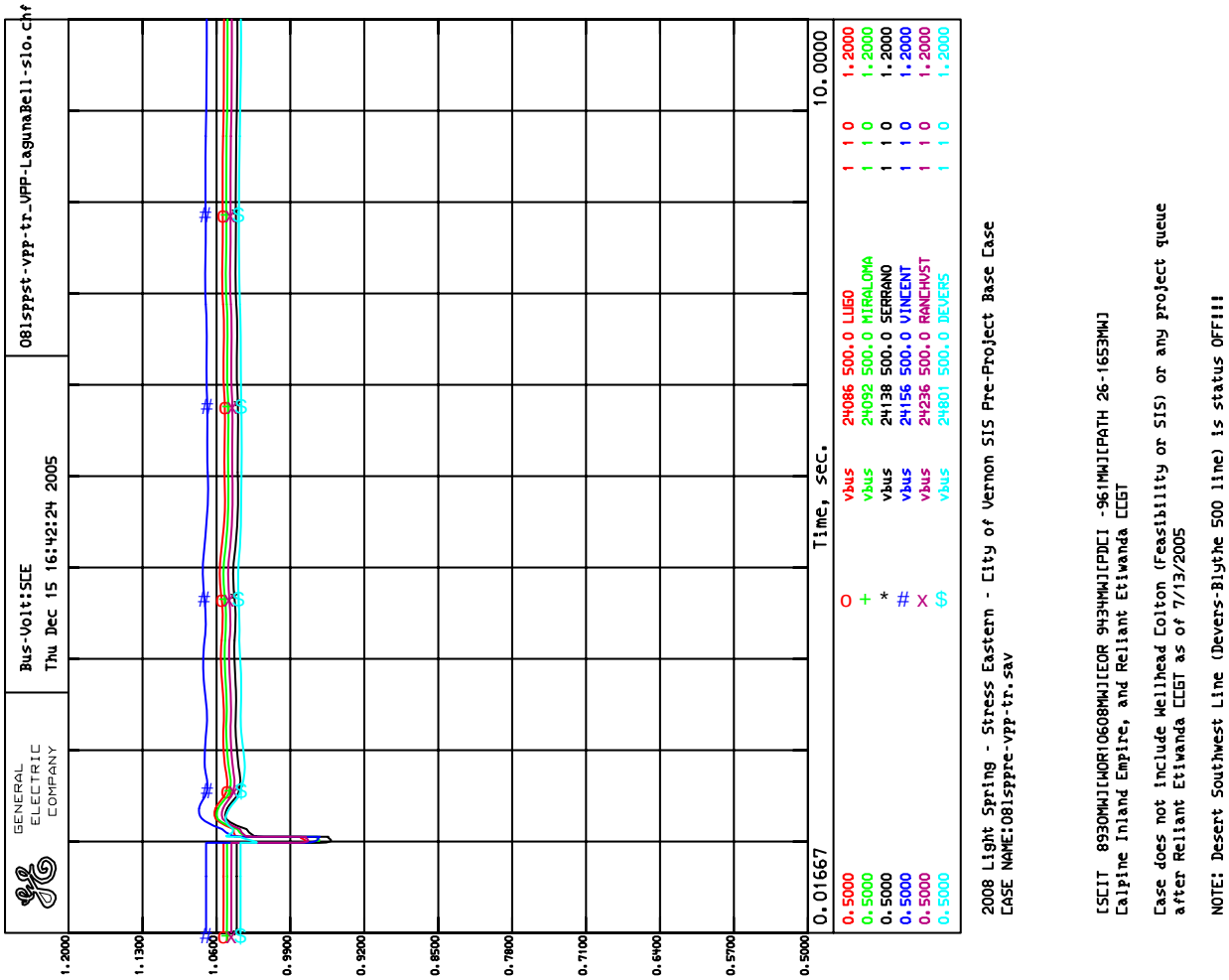
Plot 23 - 8: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



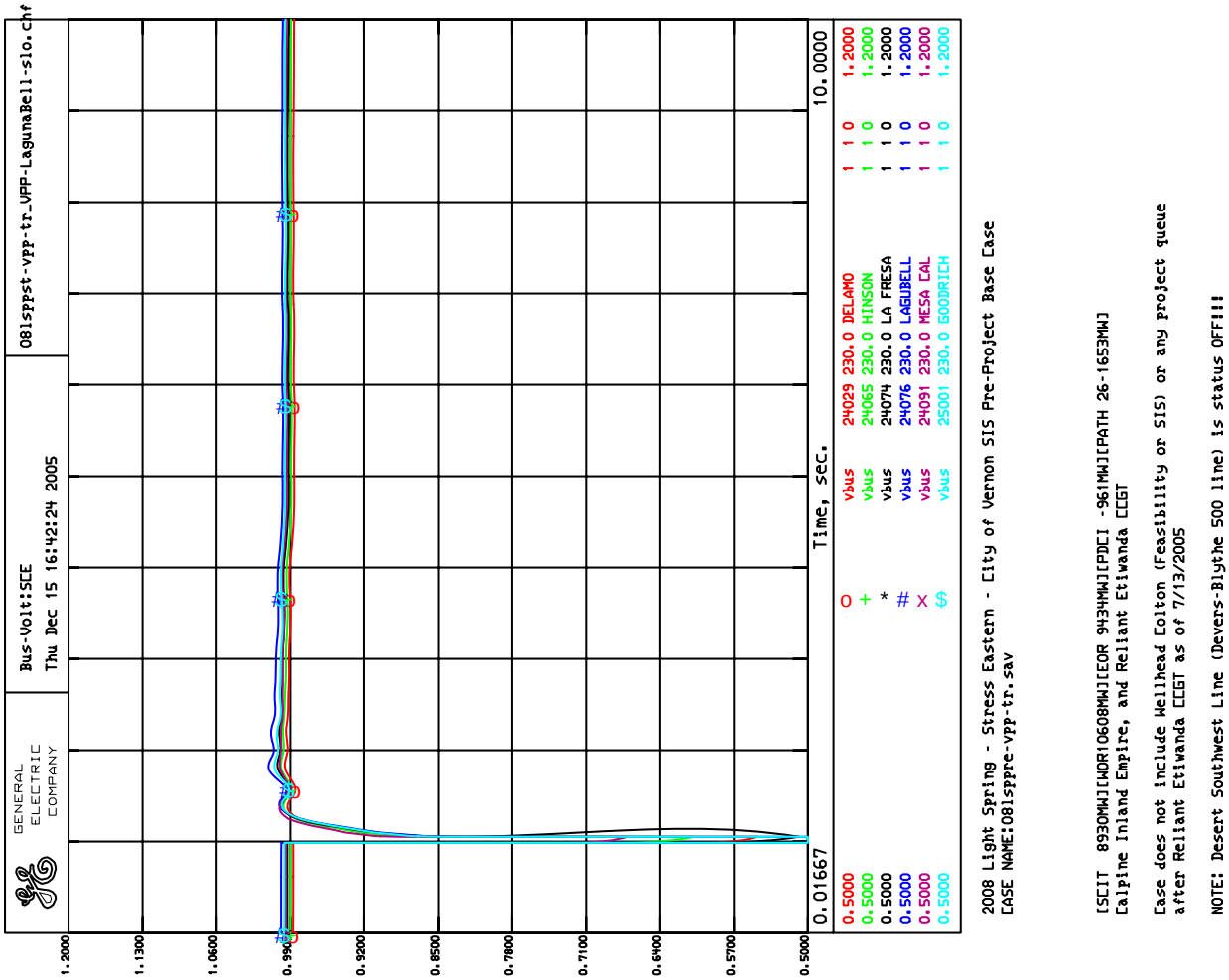
Plot 23 - 9: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.



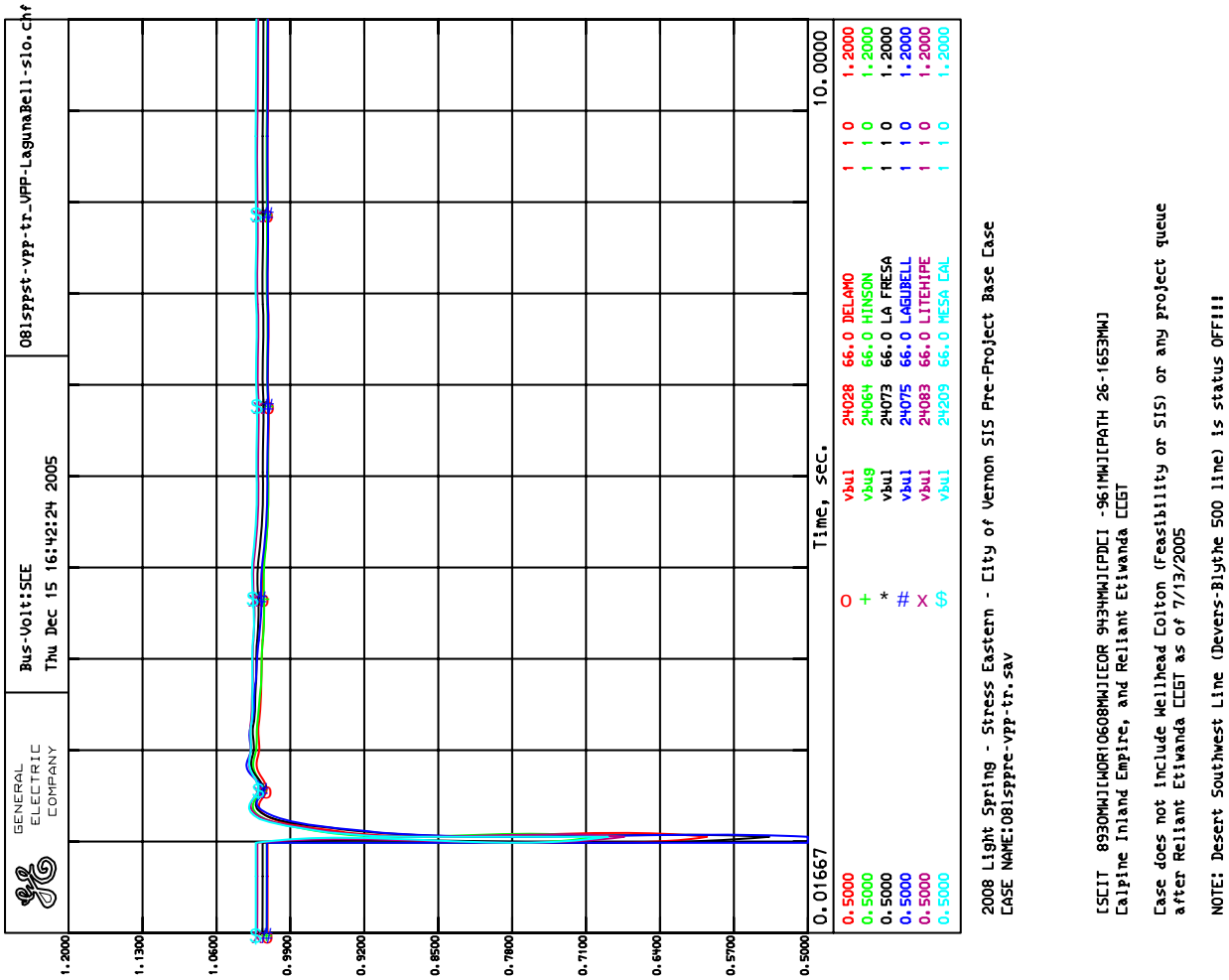
Plot 24 - 1: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



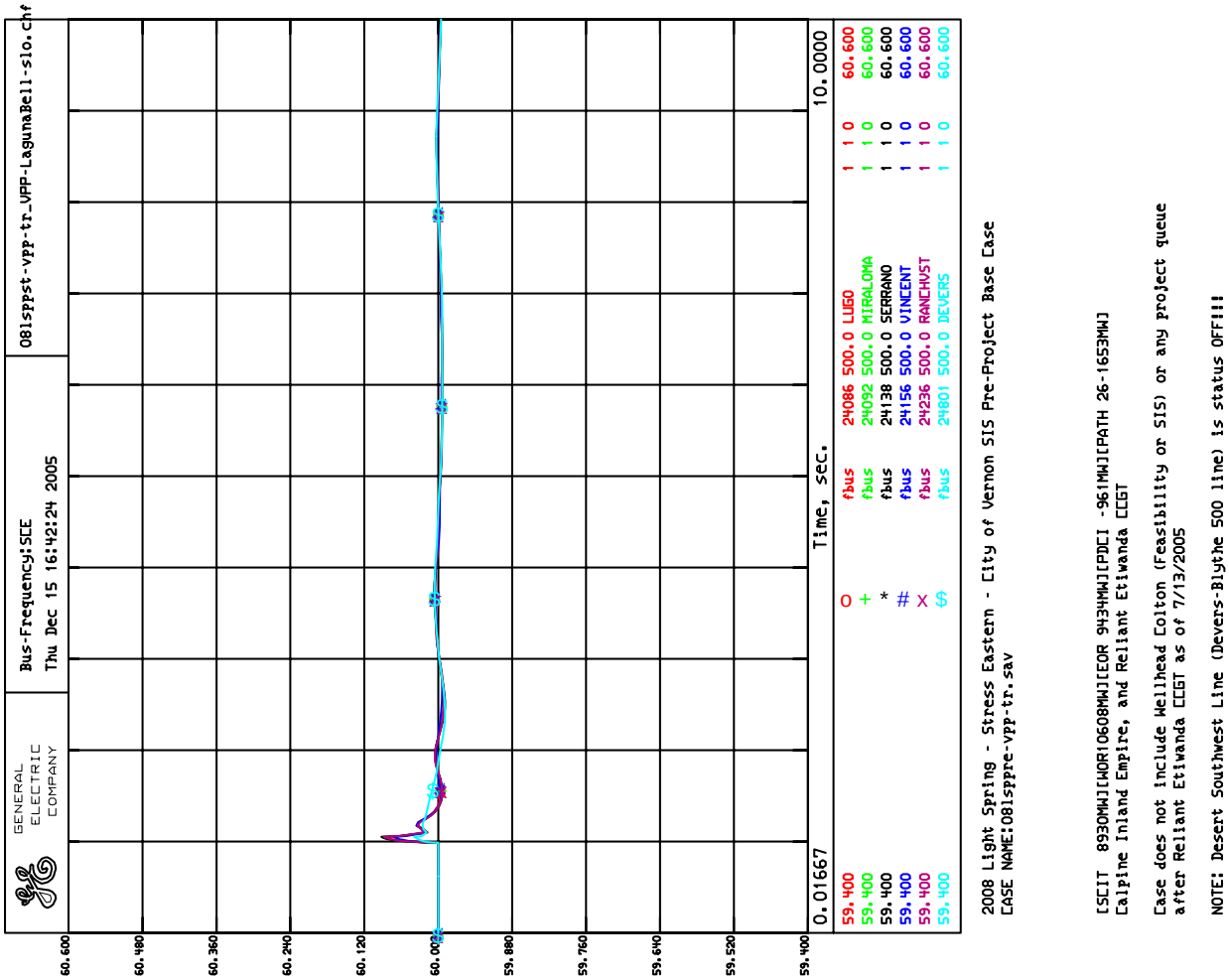
Plot 24 - 2: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



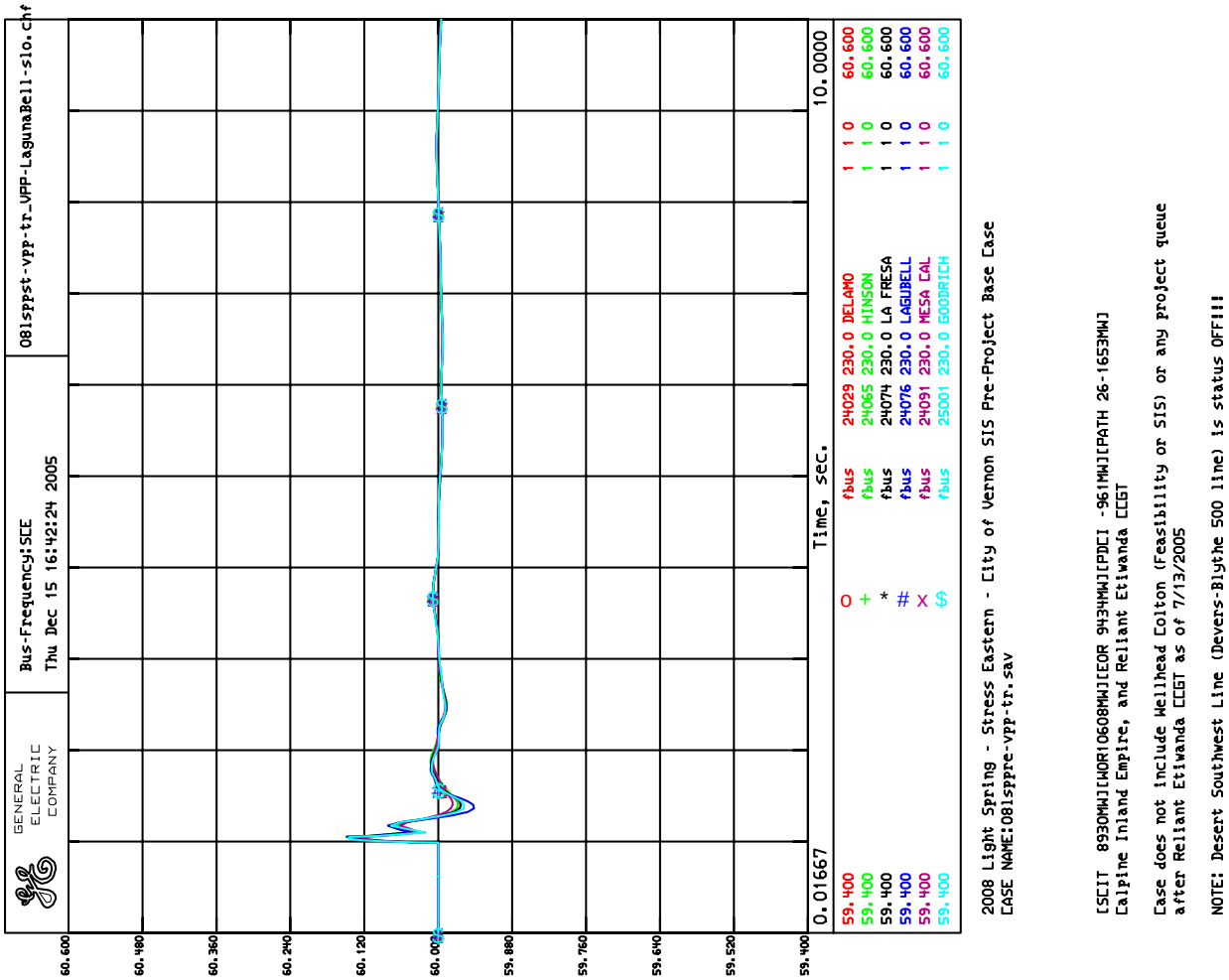
Plot 24 - 3: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



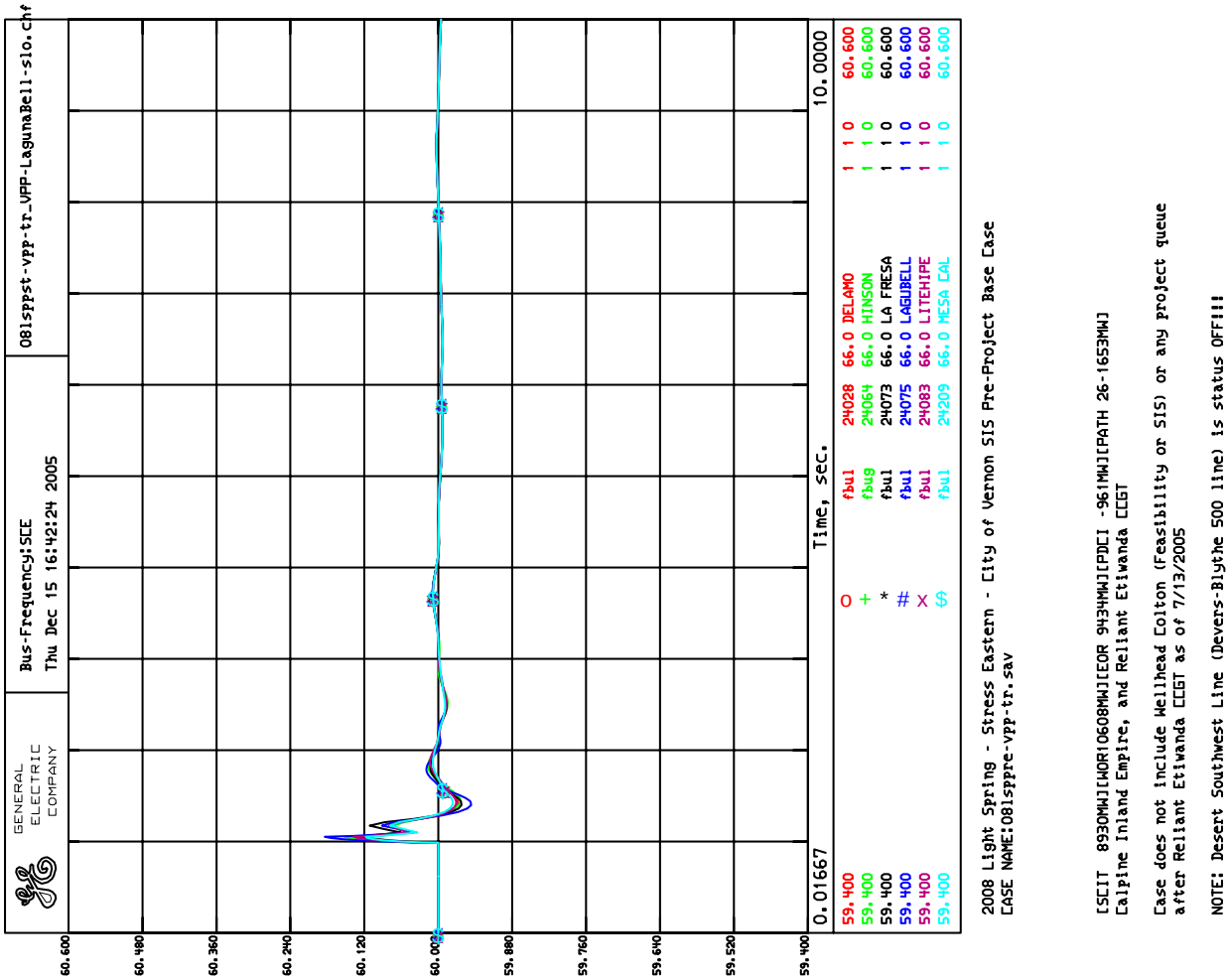
Plot 24 - 4: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



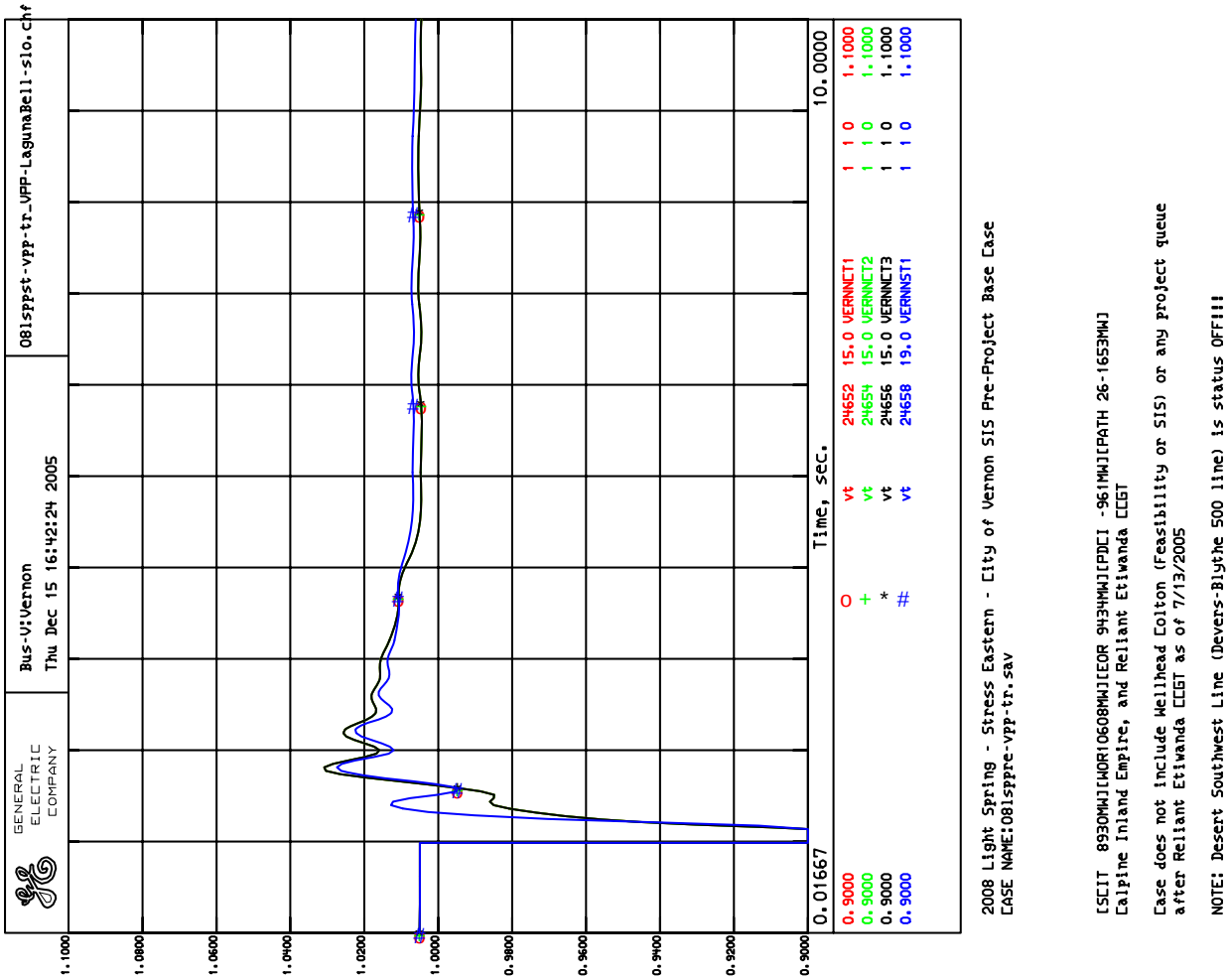
Plot 24 - 5: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



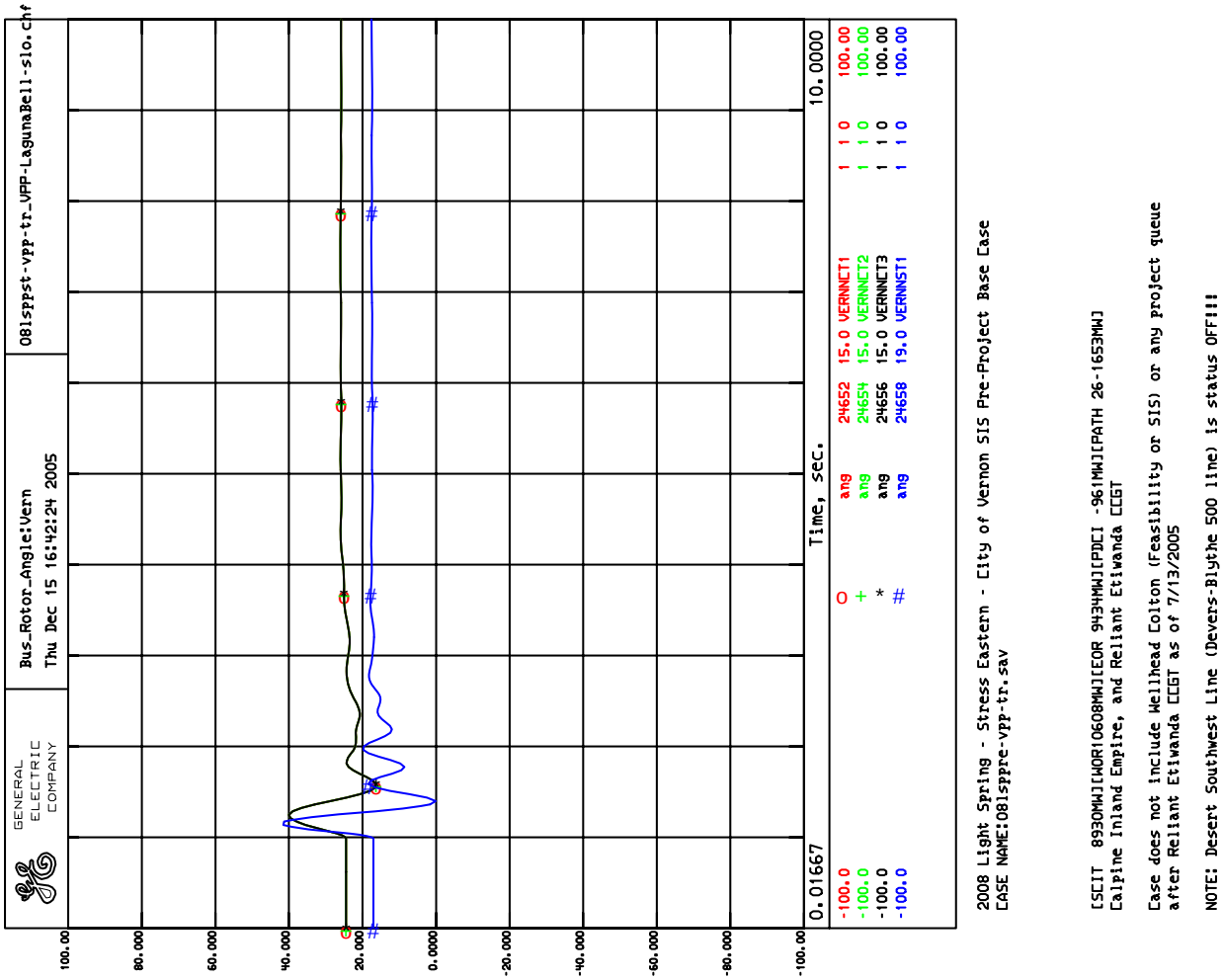
Plot 24 - 6: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



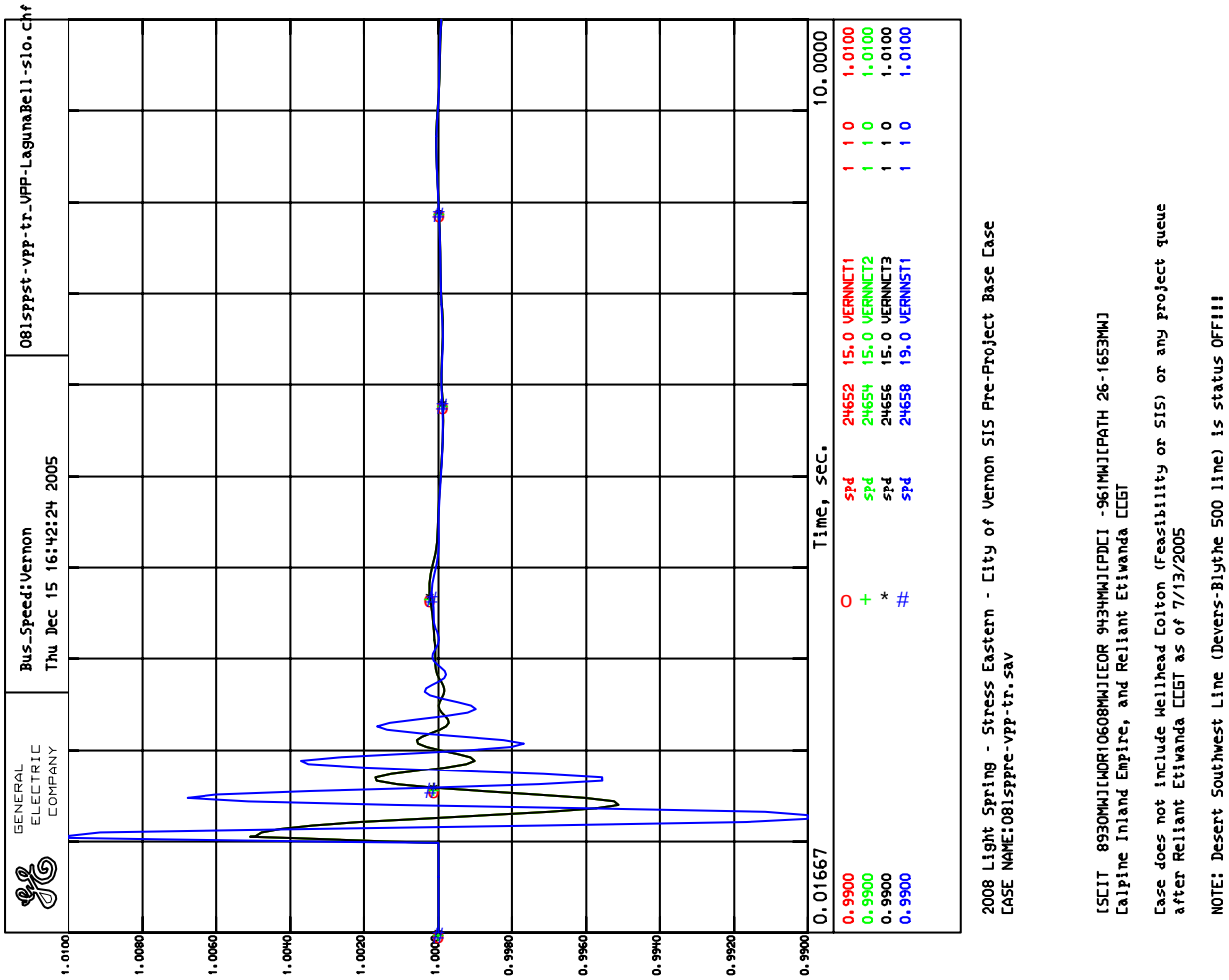
Plot 24 - 7: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



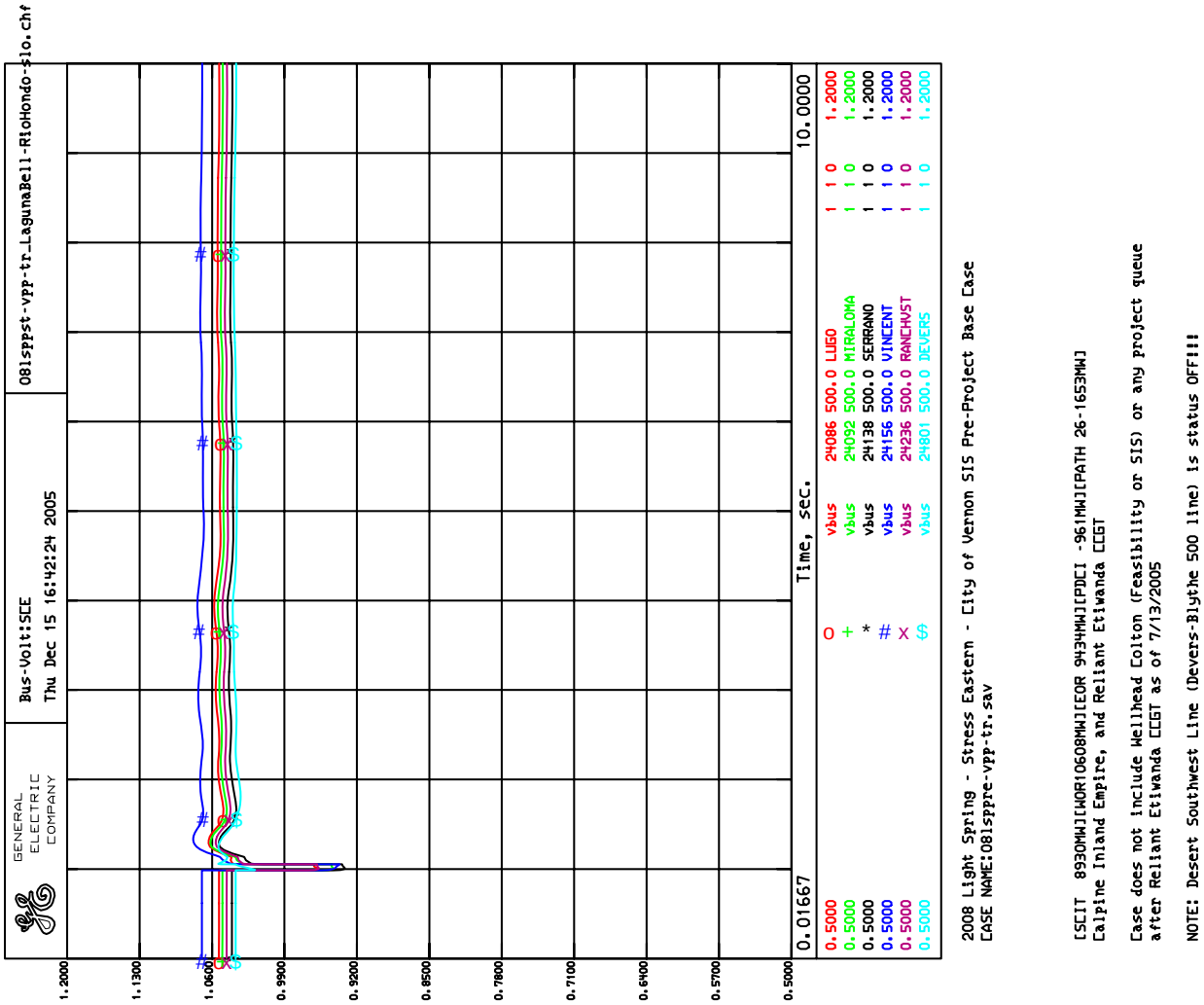
Plot 24 - 8: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



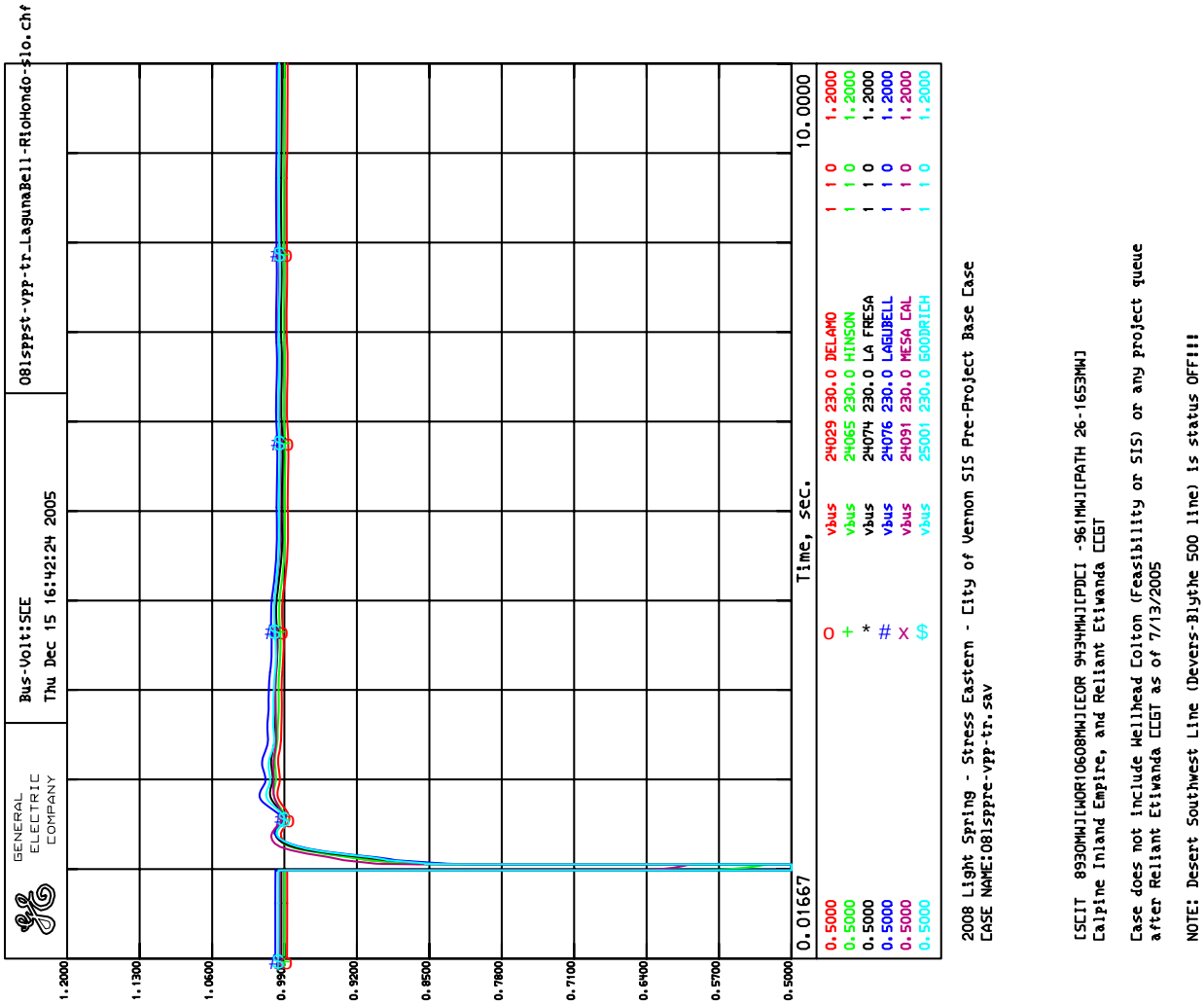
Plot 24 - 9: Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.



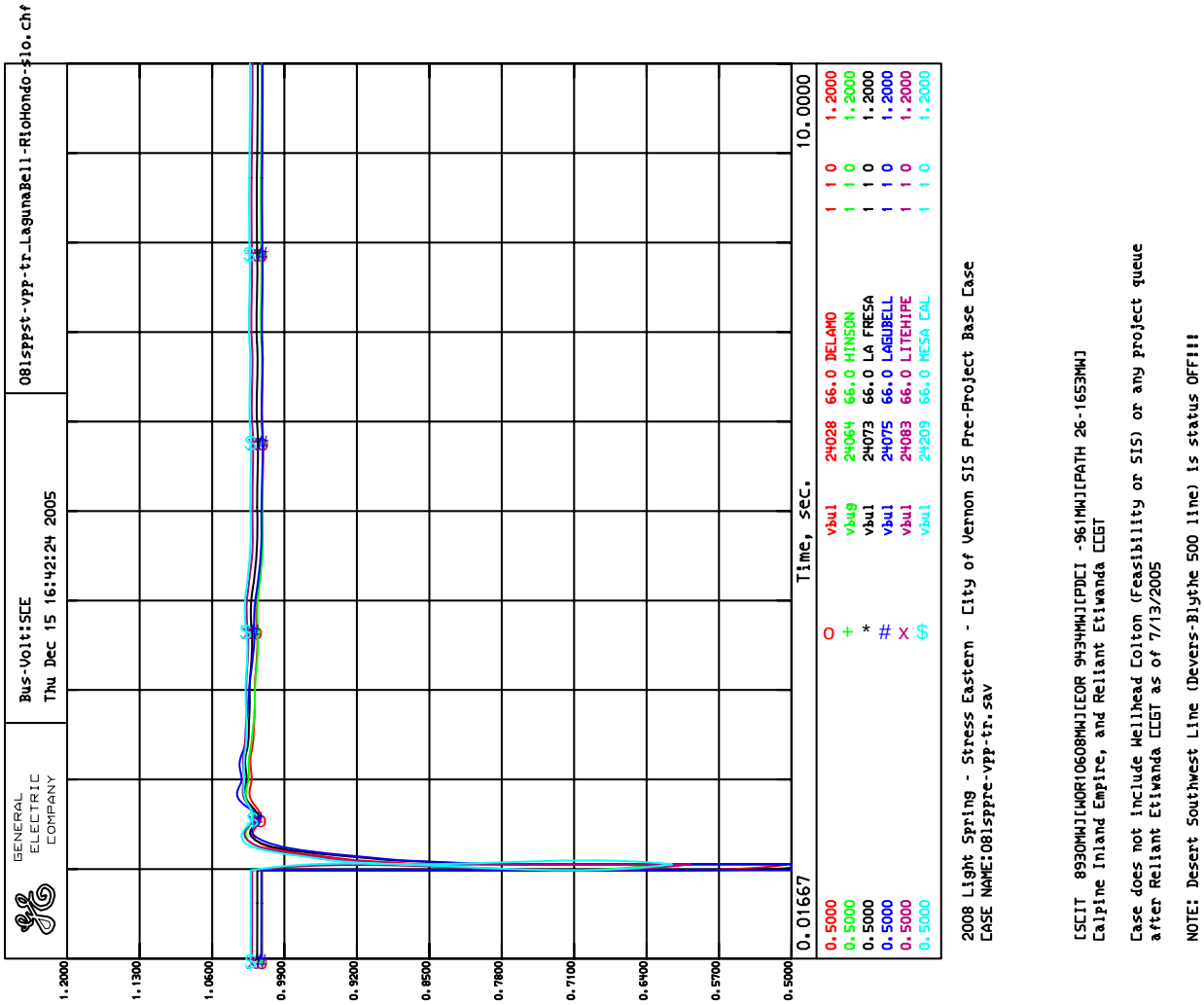
Plot 25 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



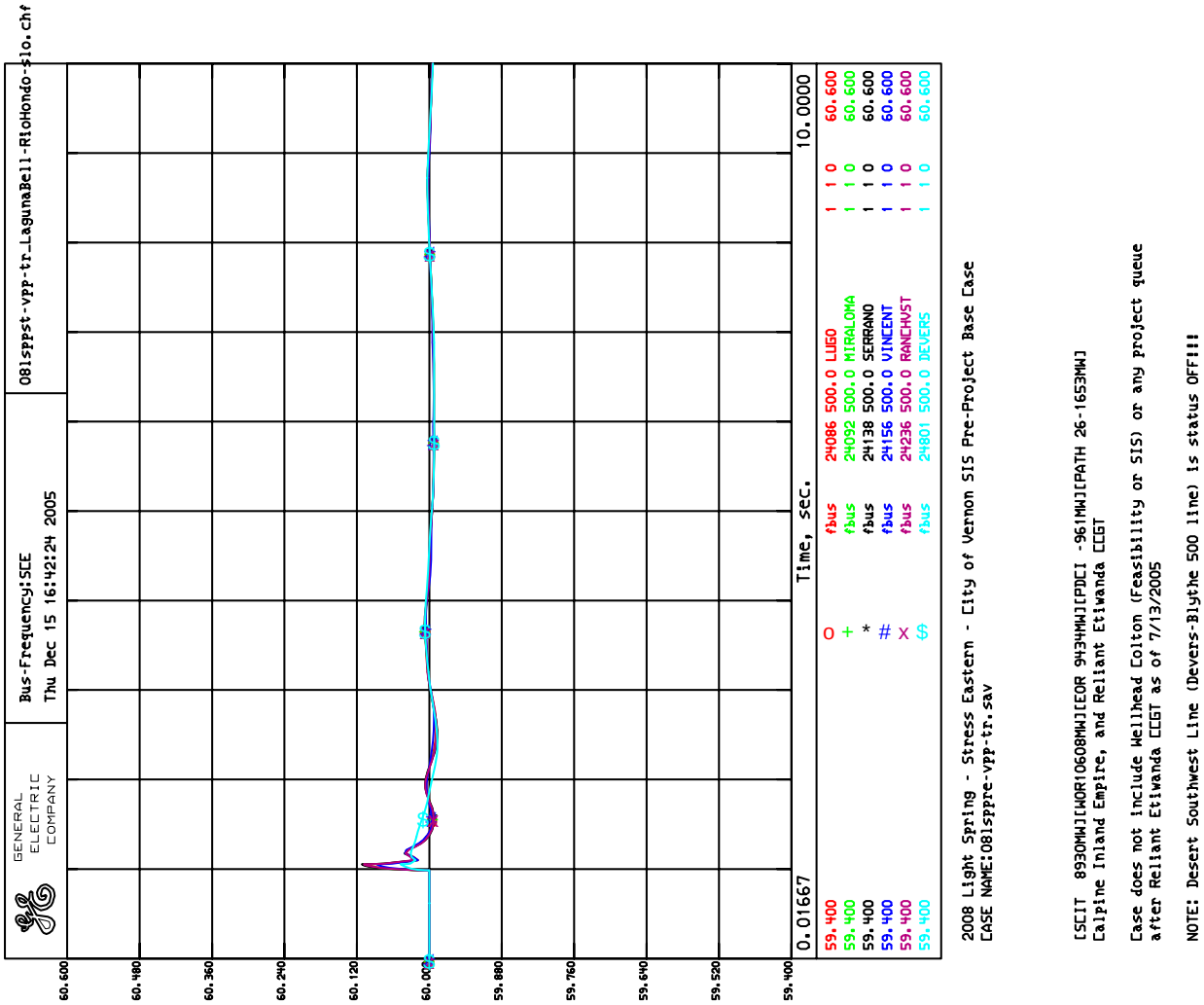
Plot 25 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



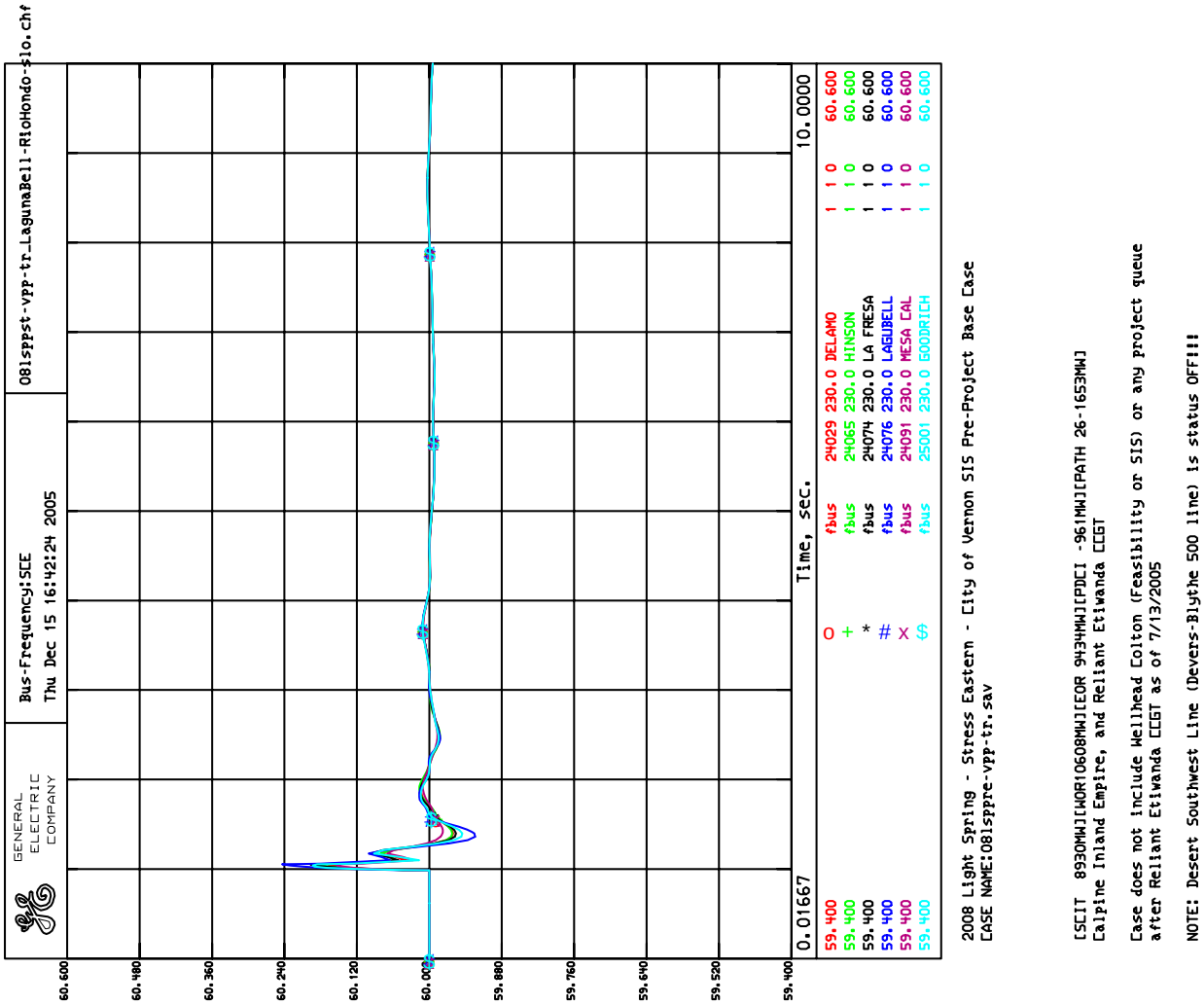
Plot 25 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



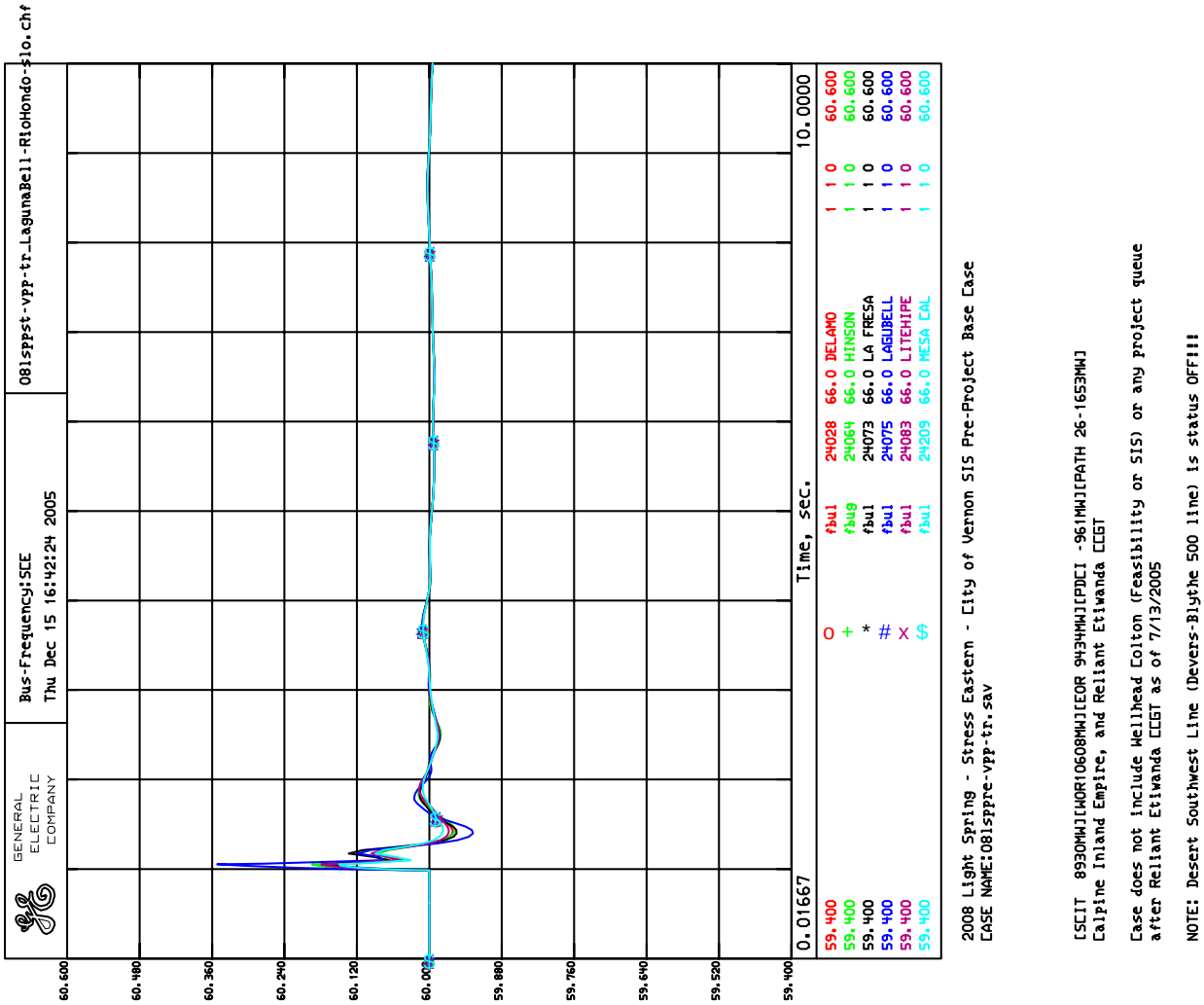
Plot 25 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



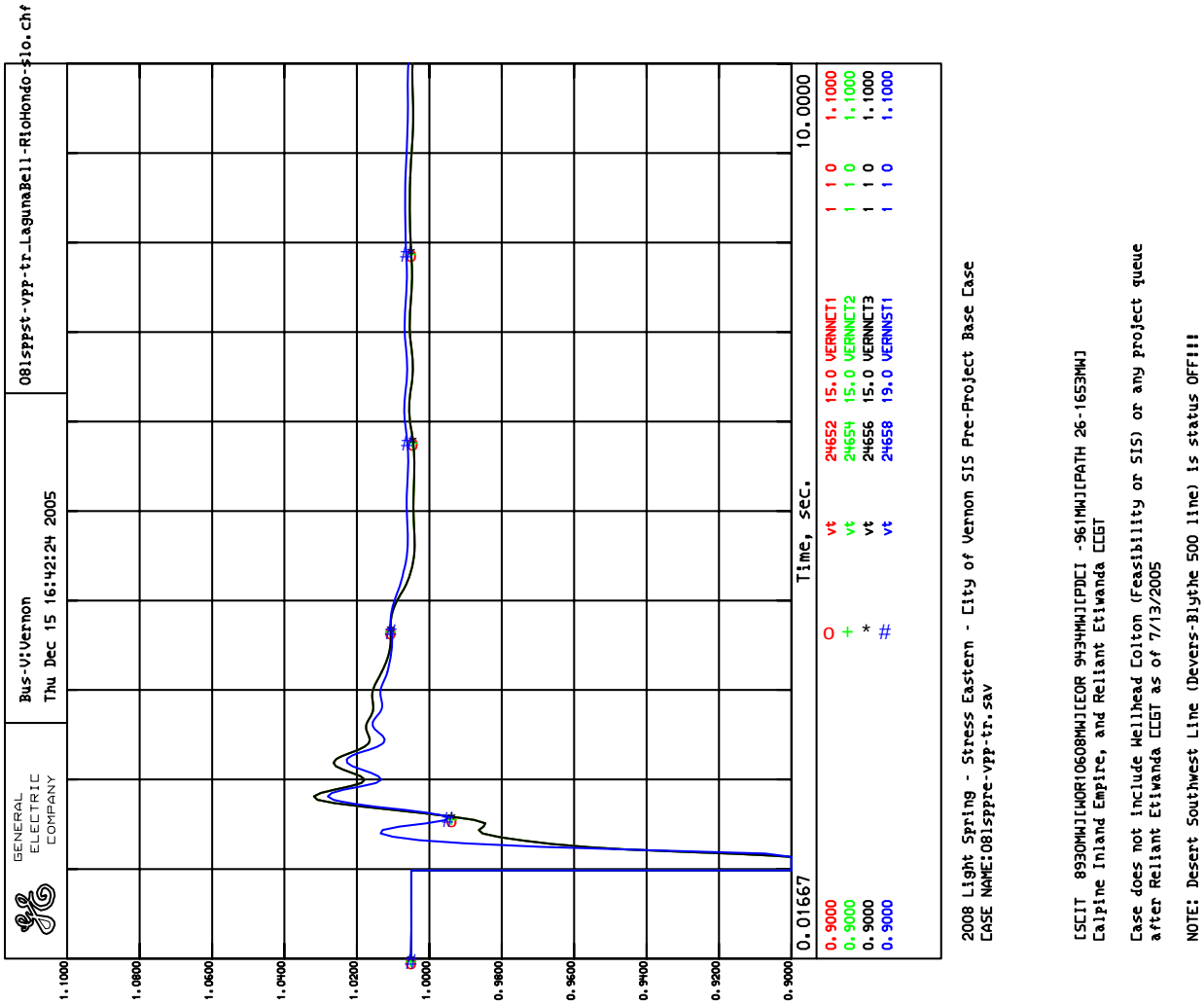
Plot 25 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



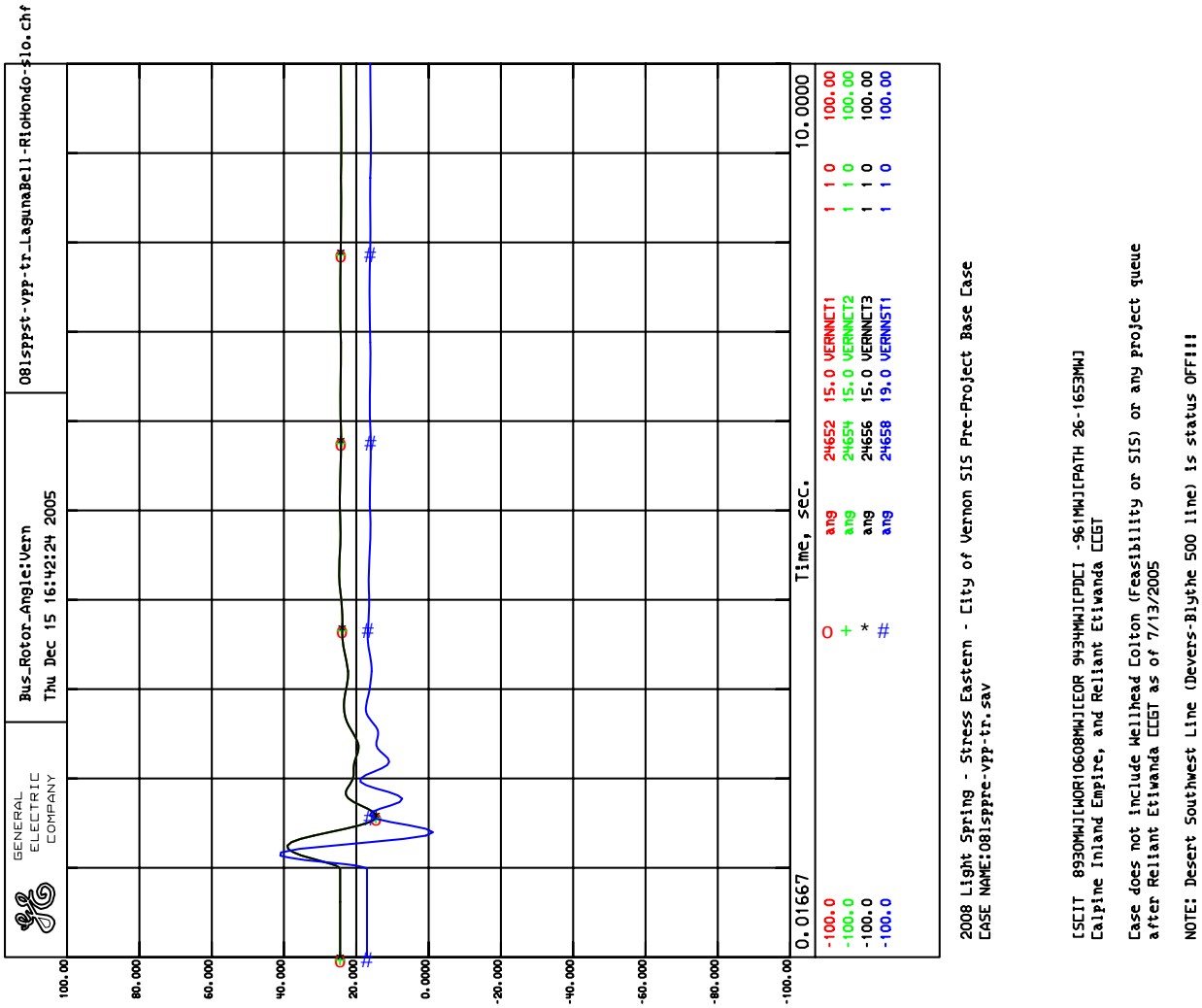
Plot 25 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



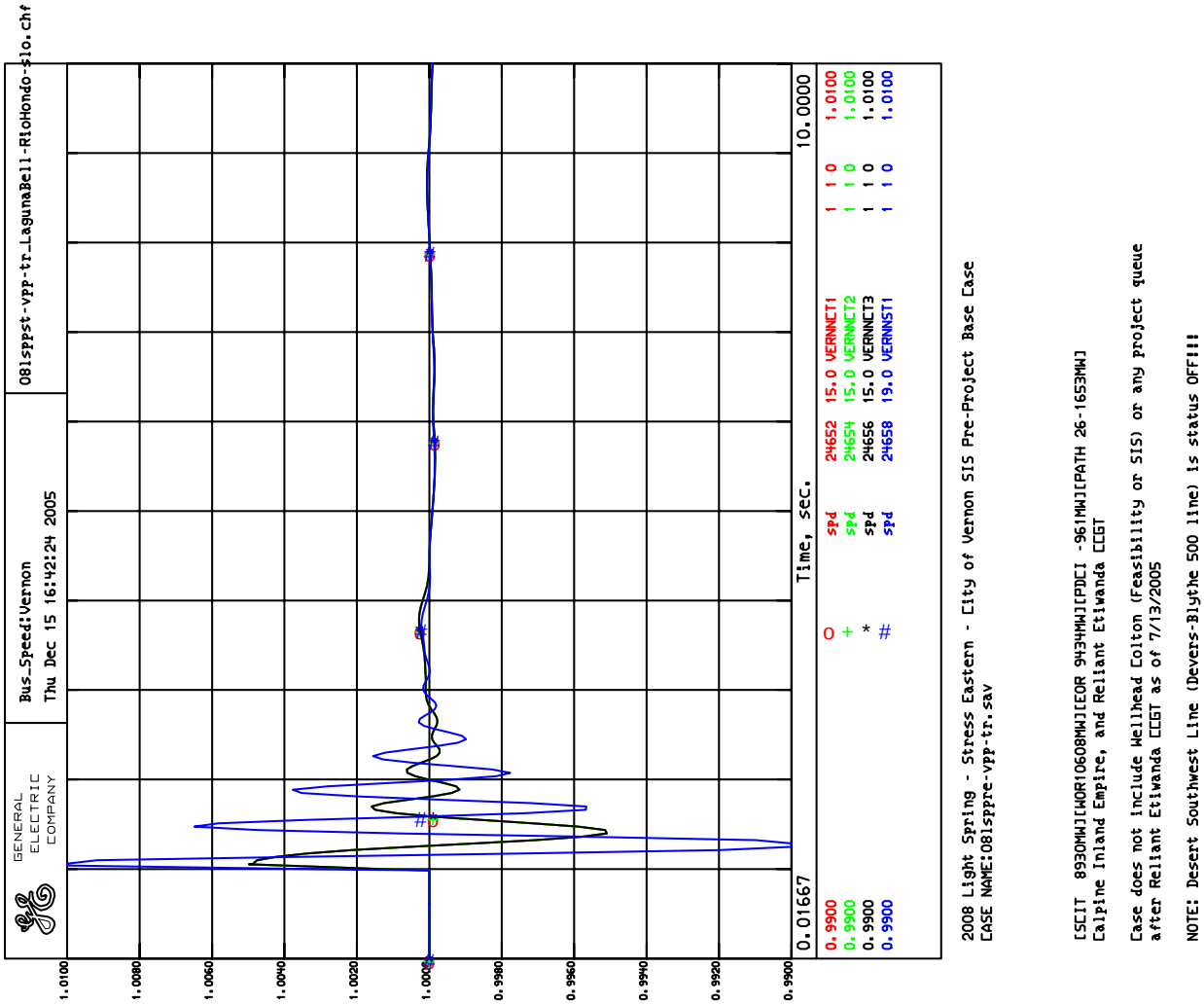
Plot 25 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



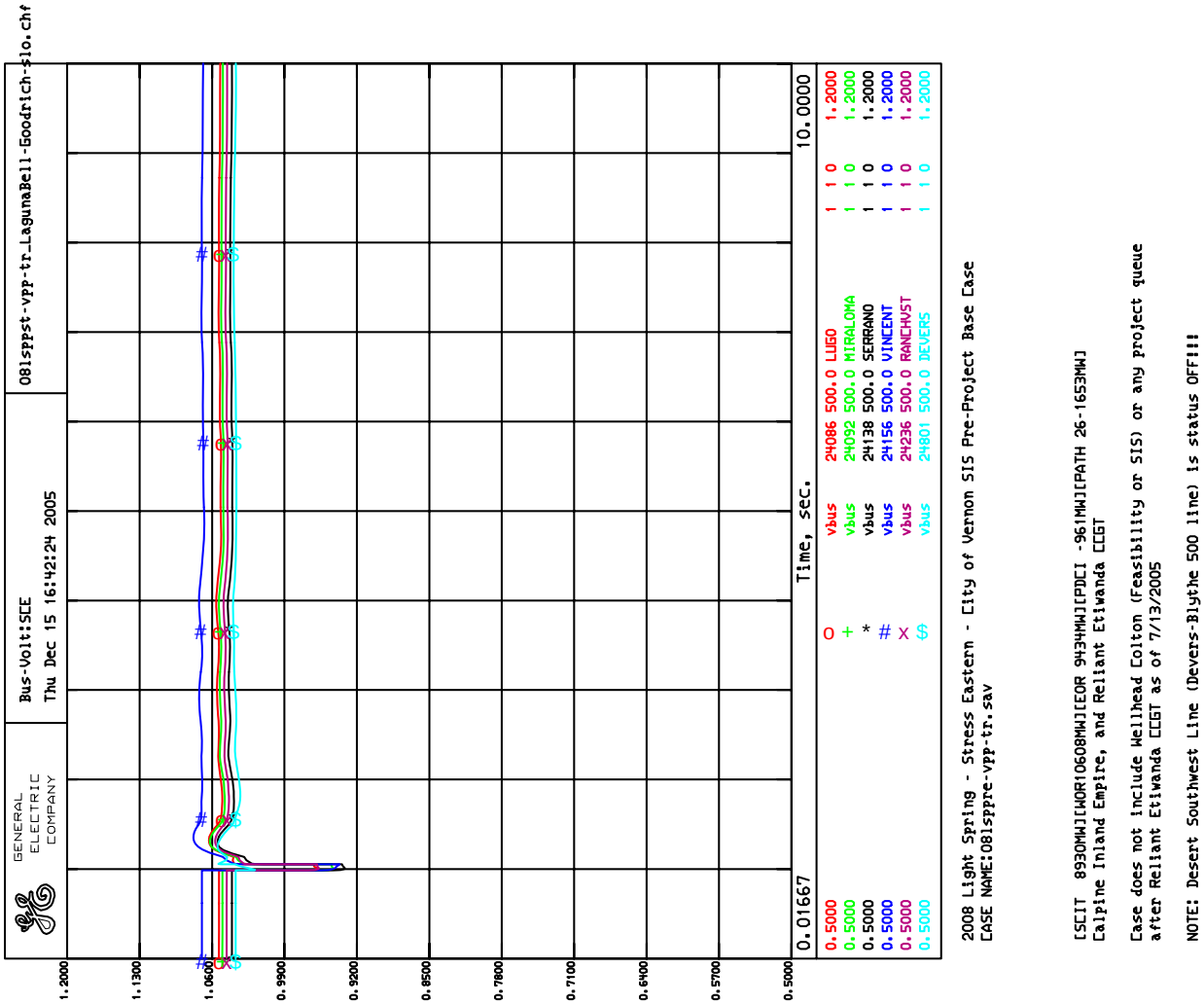
Plot 25 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



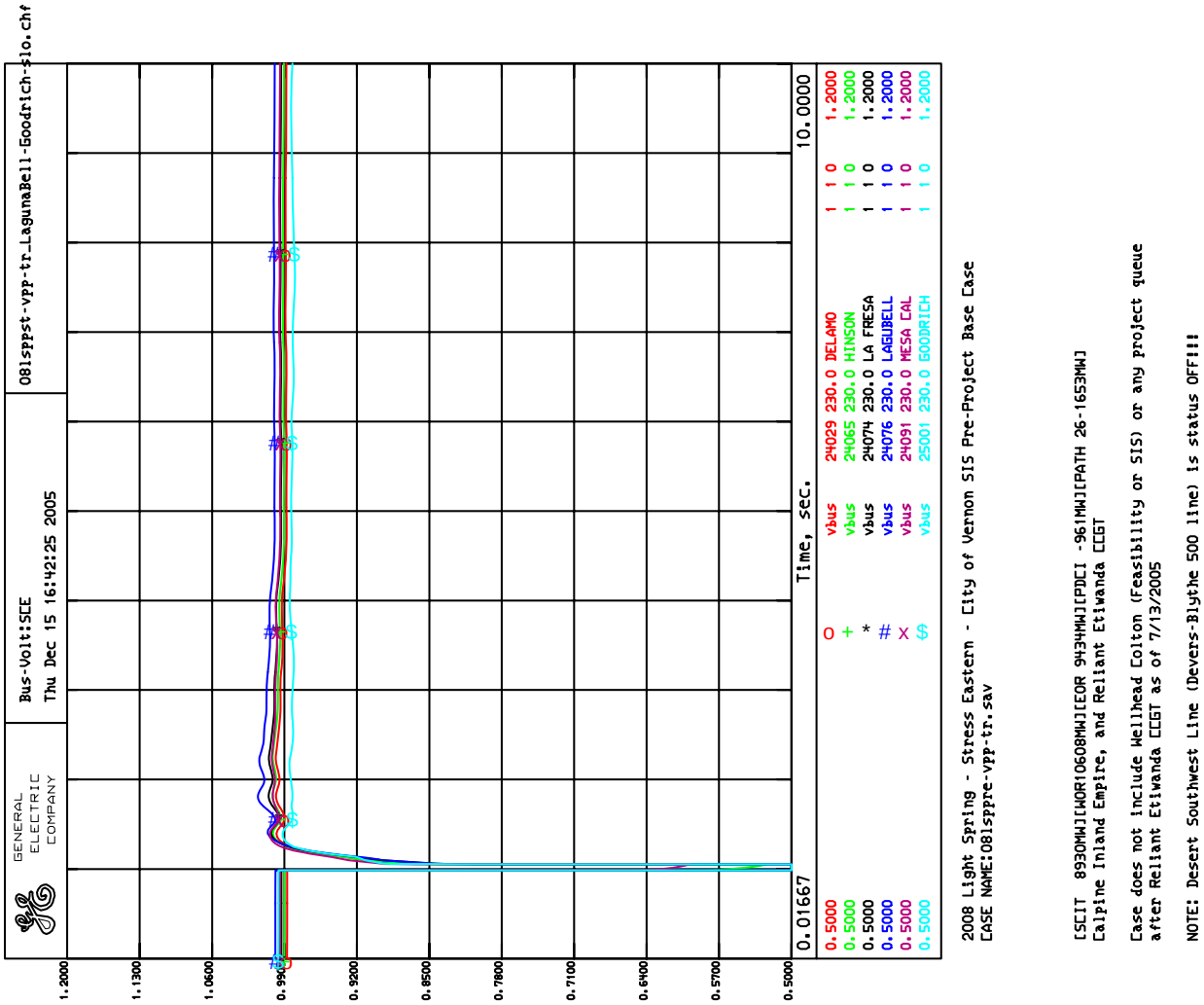
Plot 25 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.



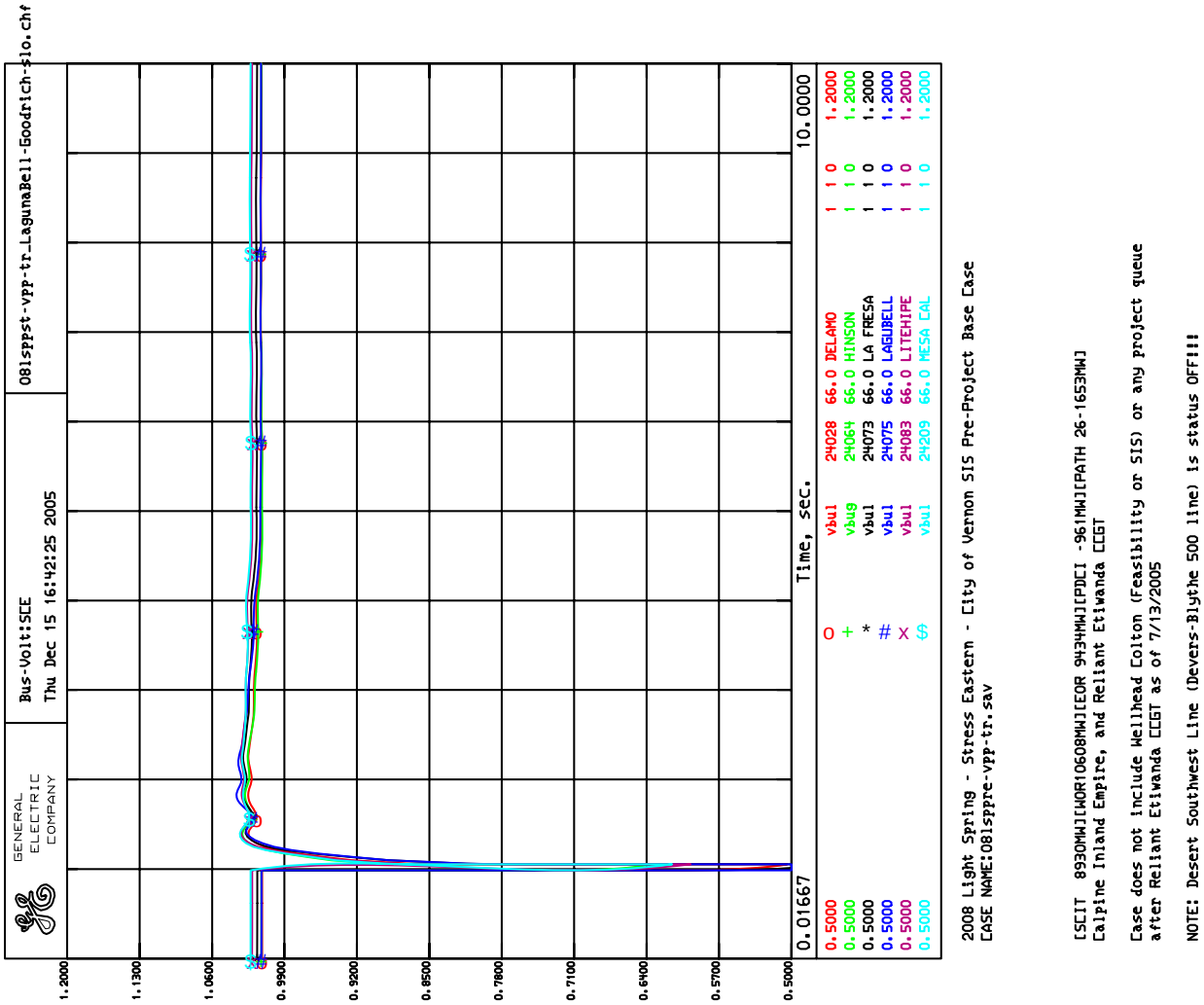
Plot 26 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



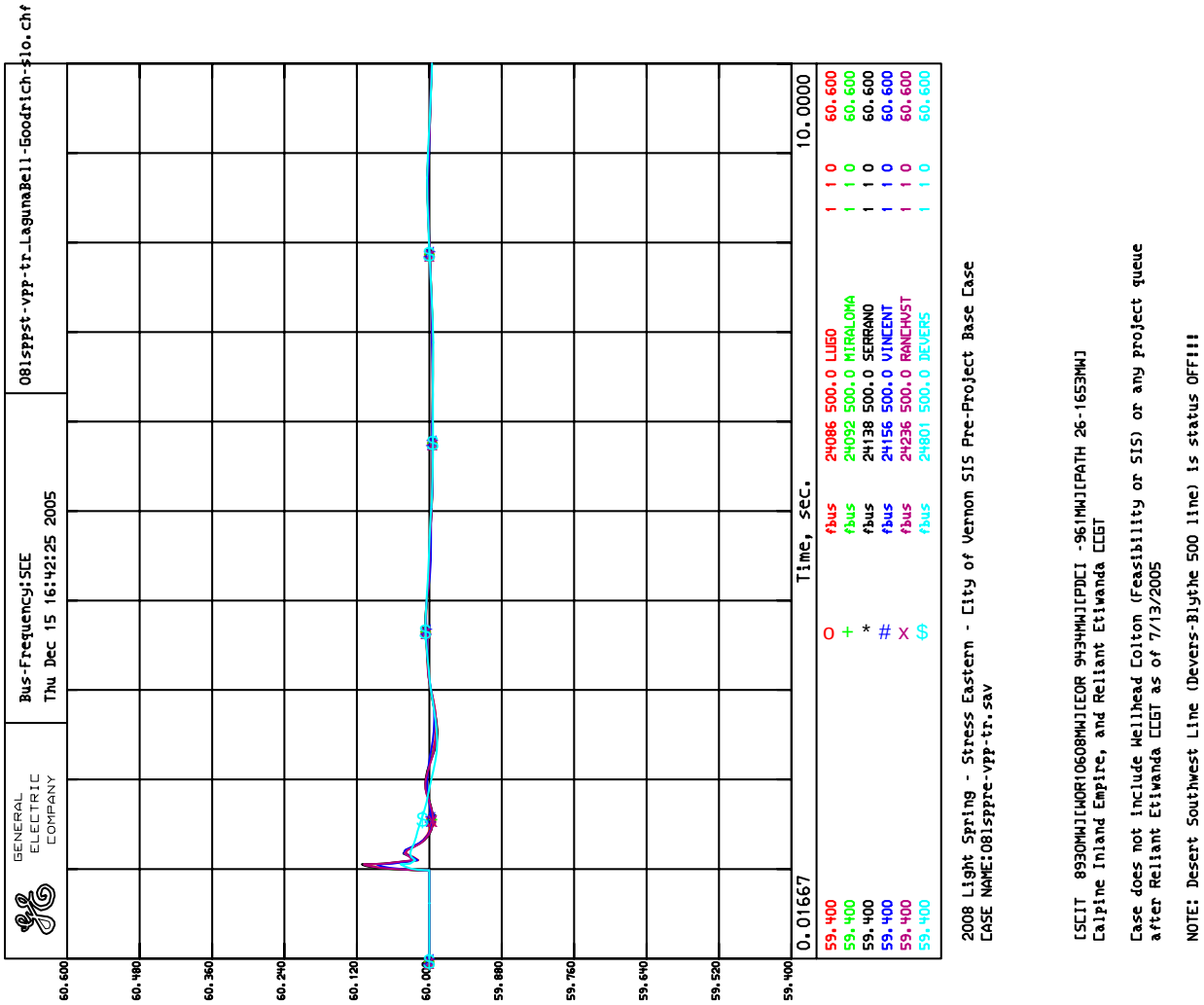
Plot 26 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



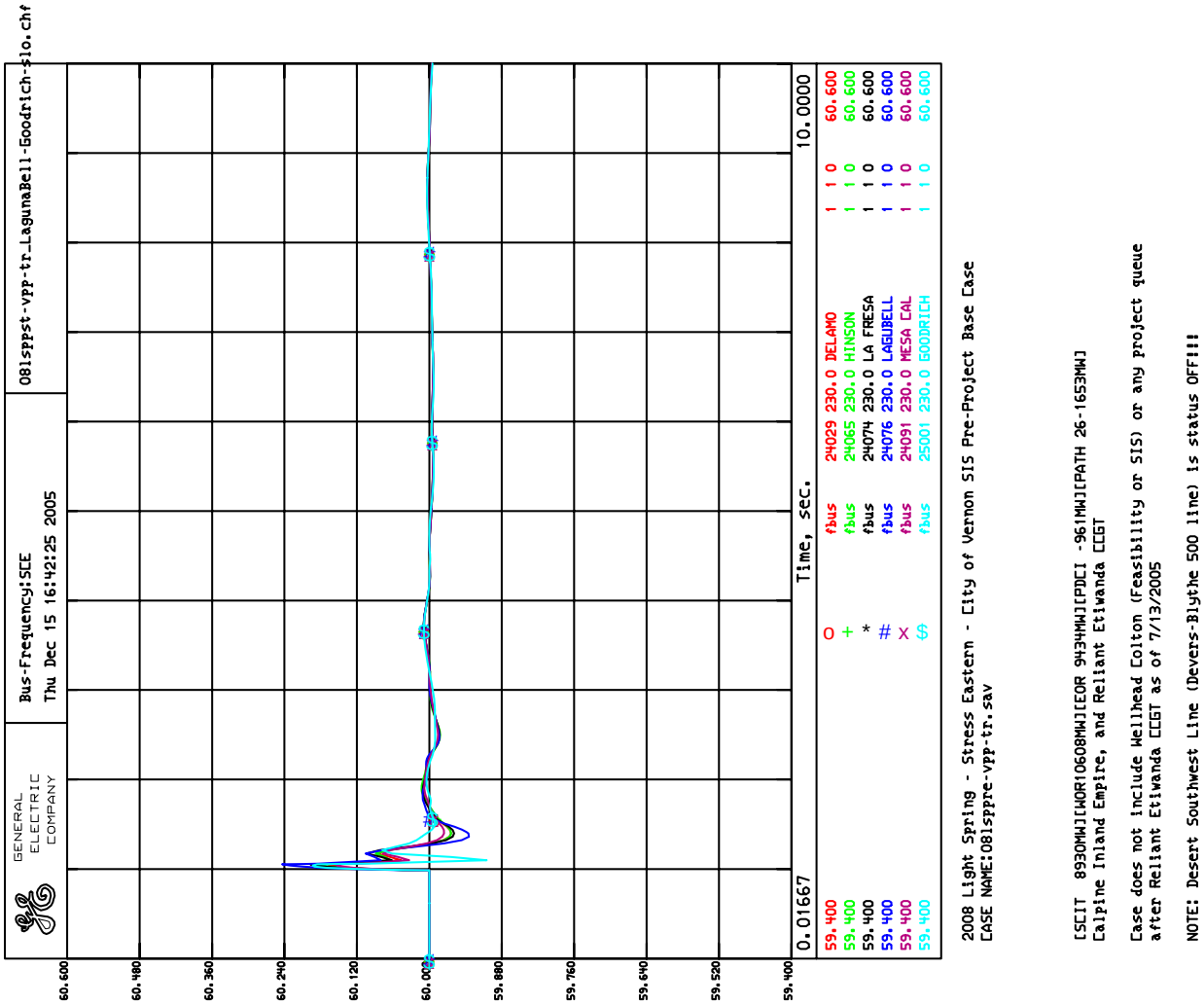
Plot 26 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



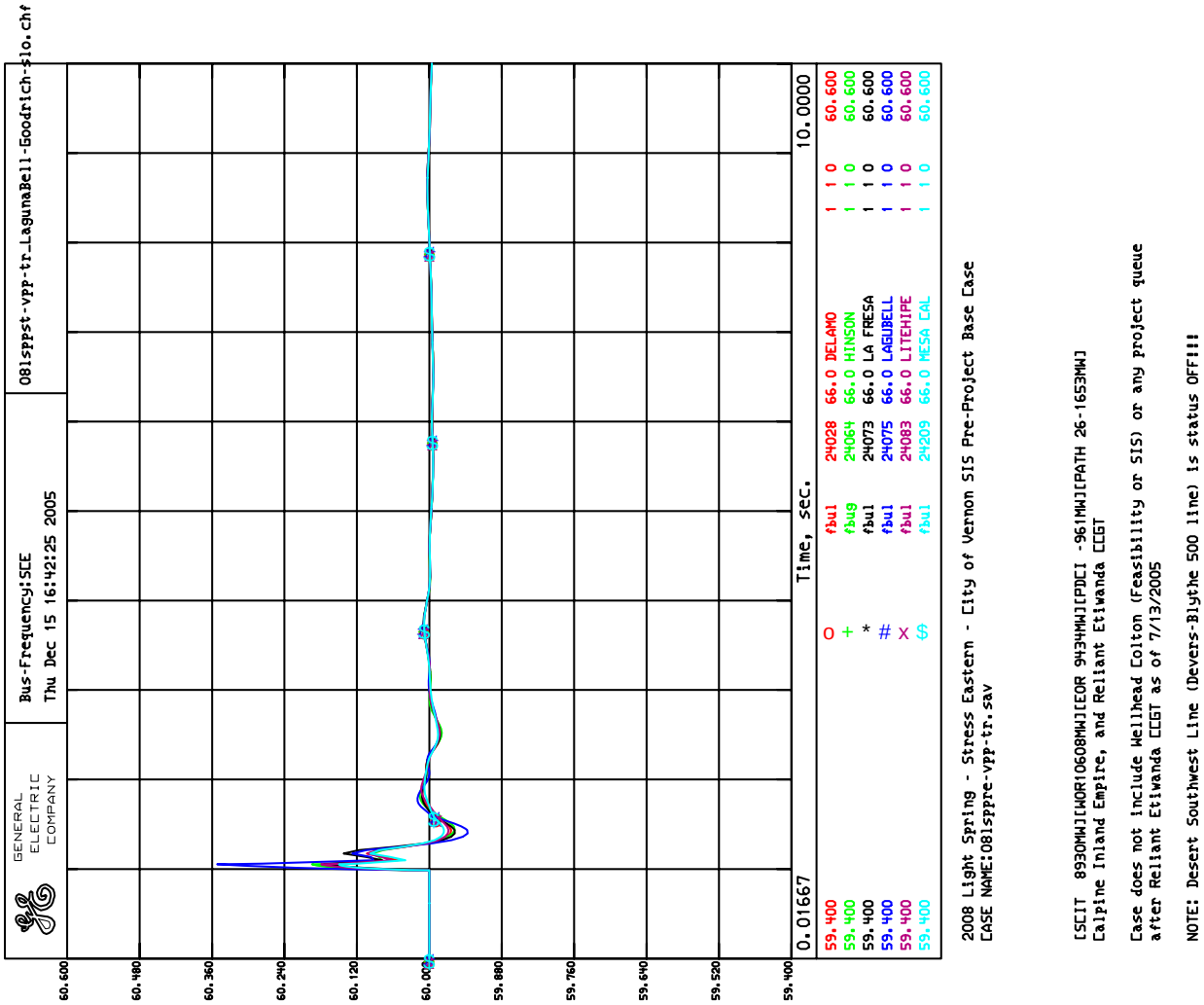
Plot 26 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



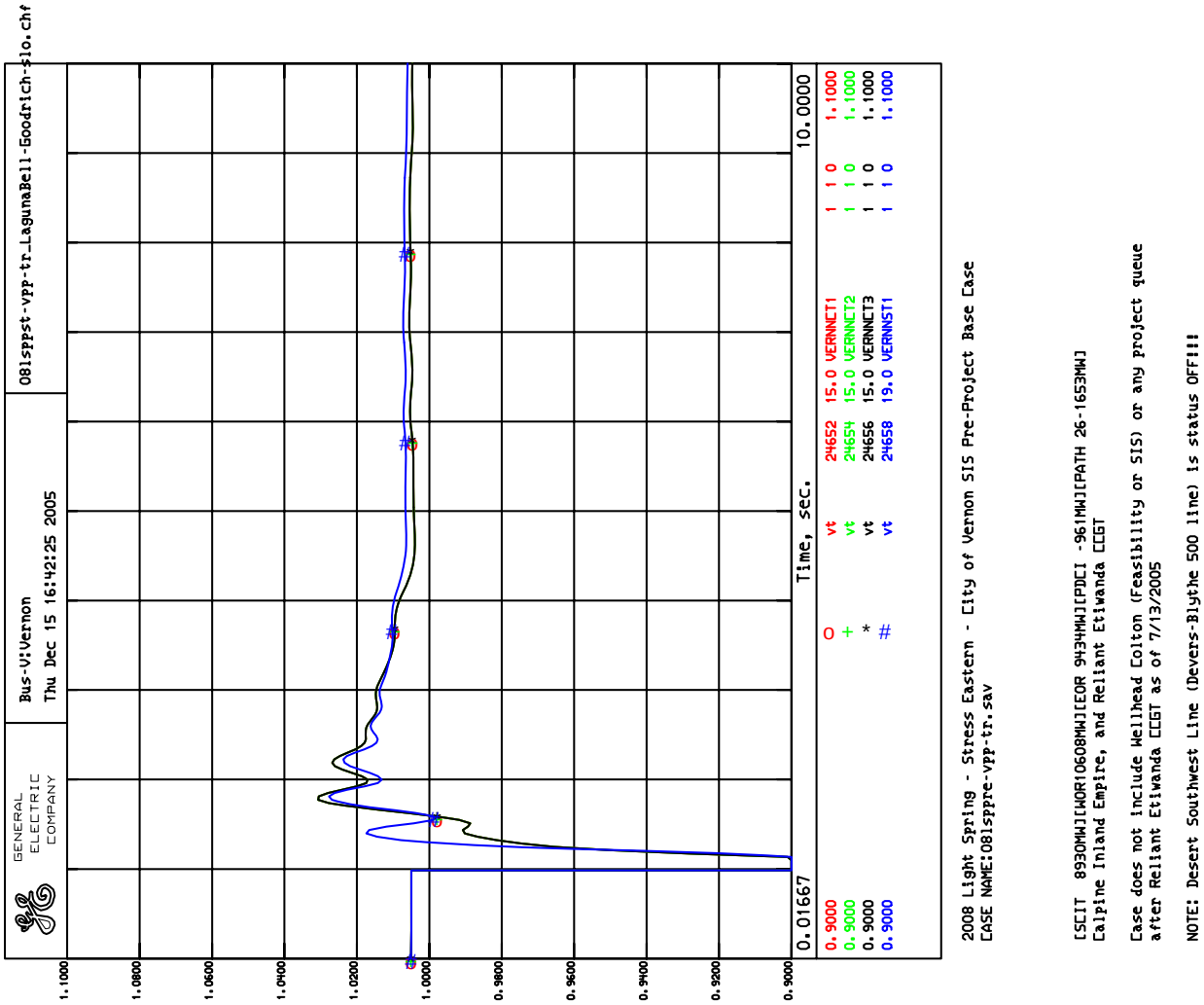
Plot 26 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



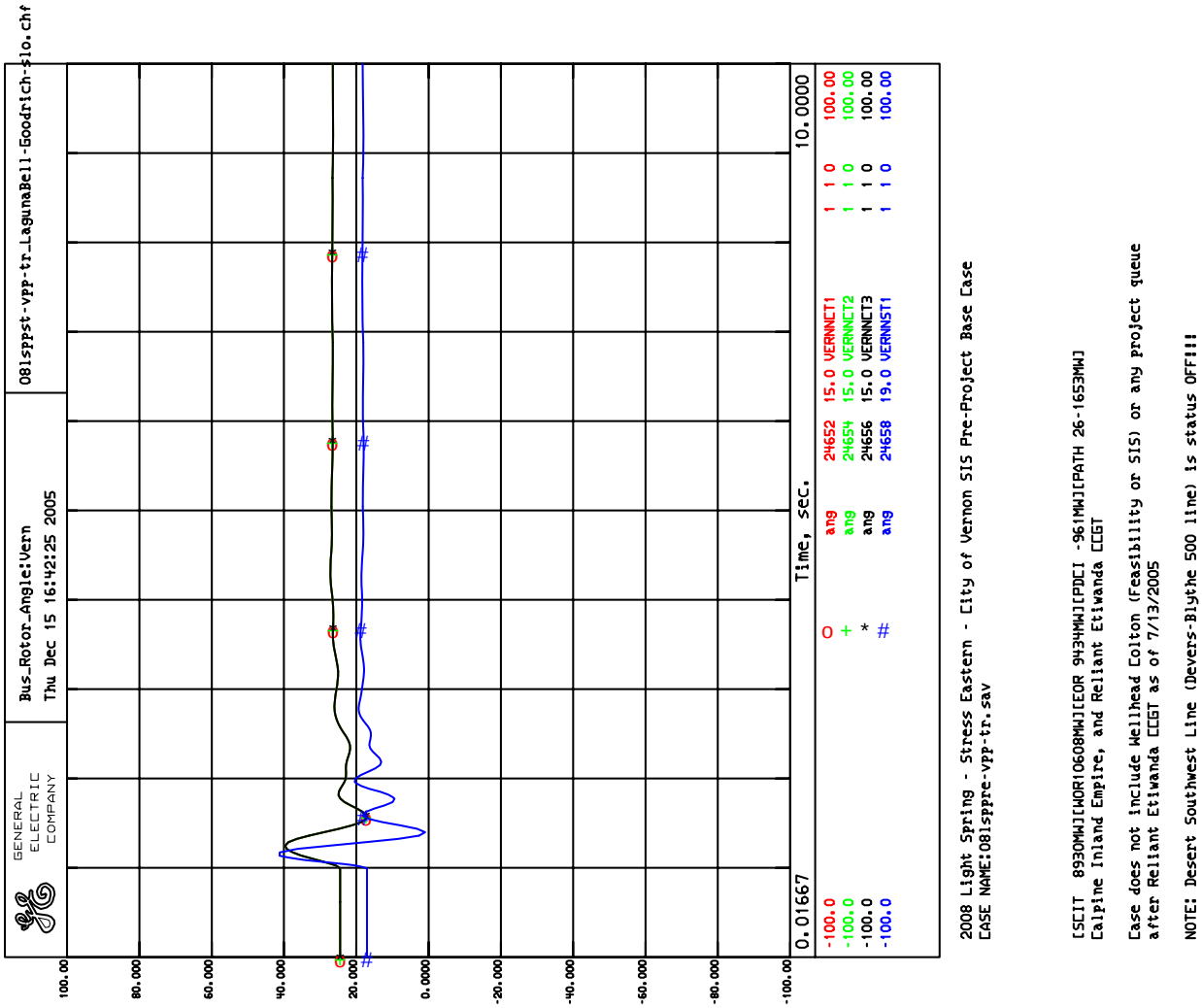
Plot 26 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



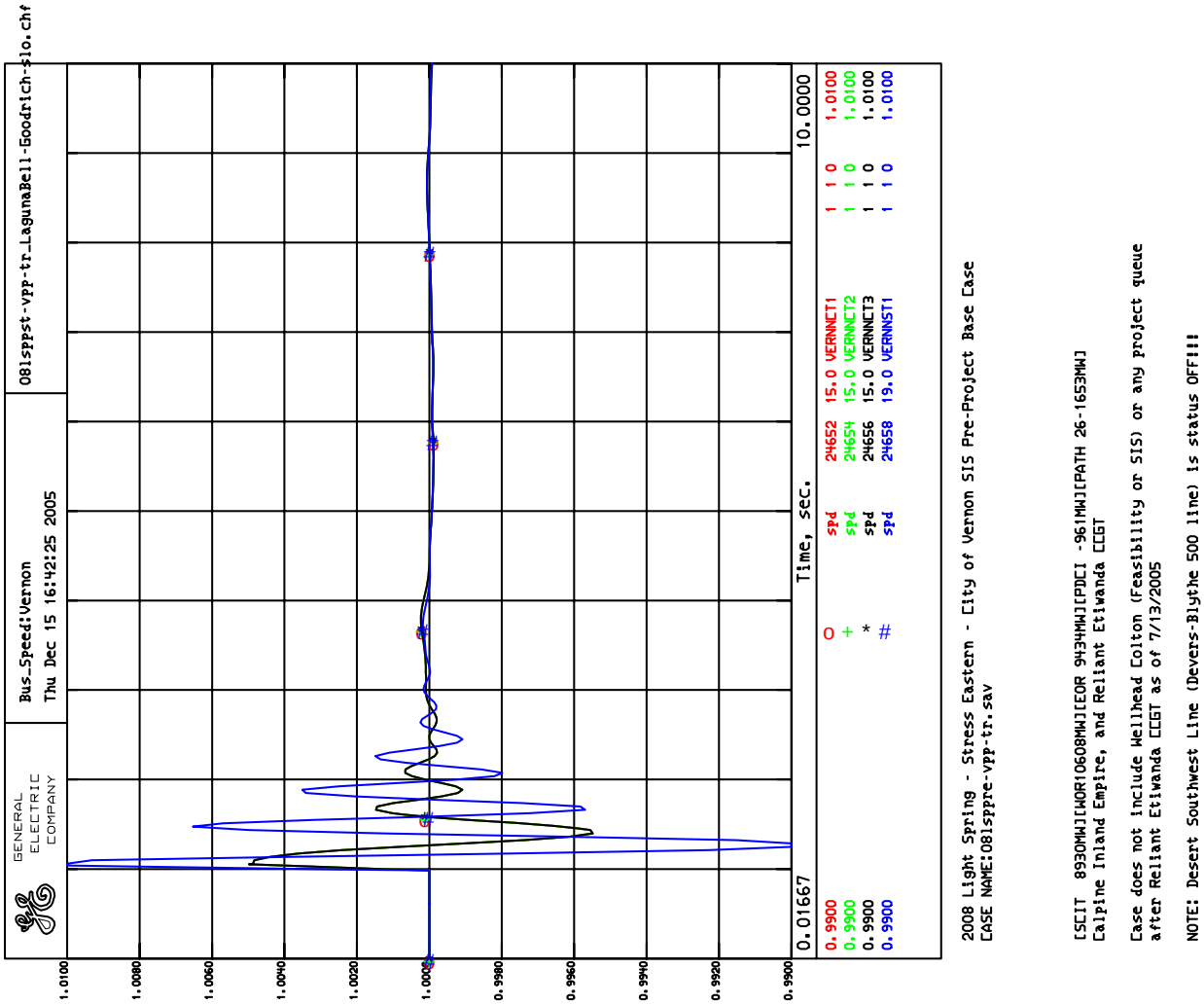
Plot 26 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



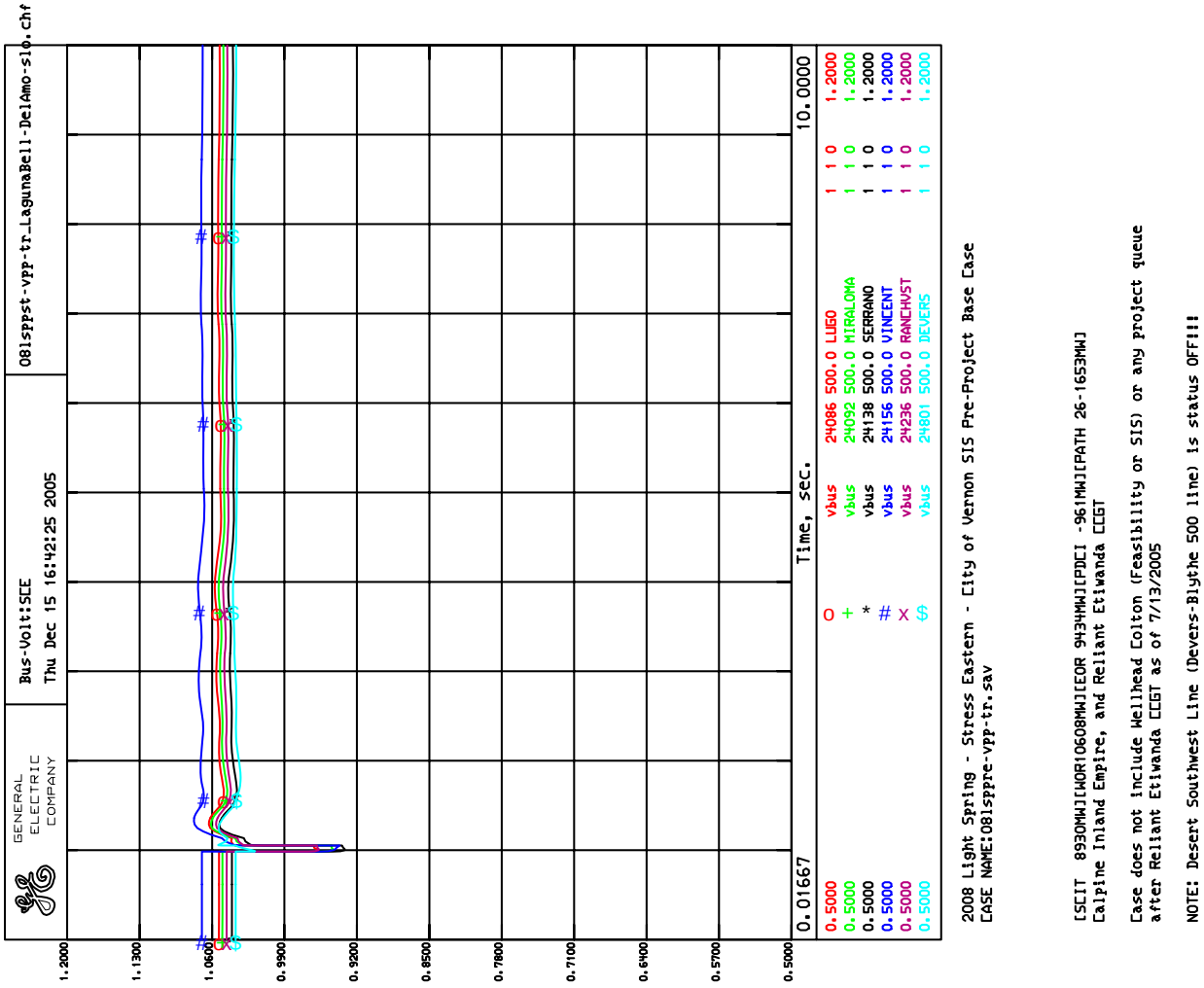
Plot 26 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



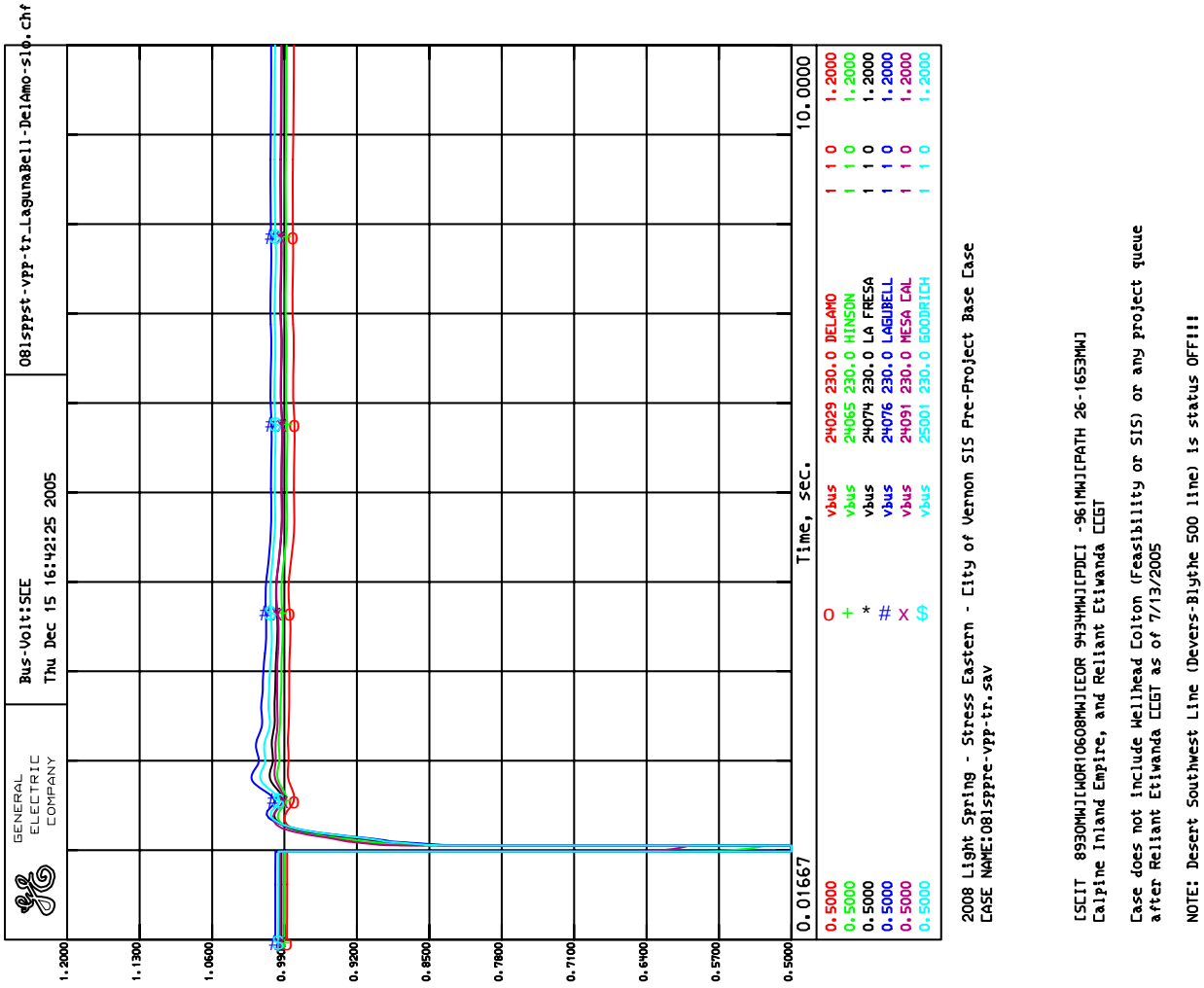
Plot 26 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.



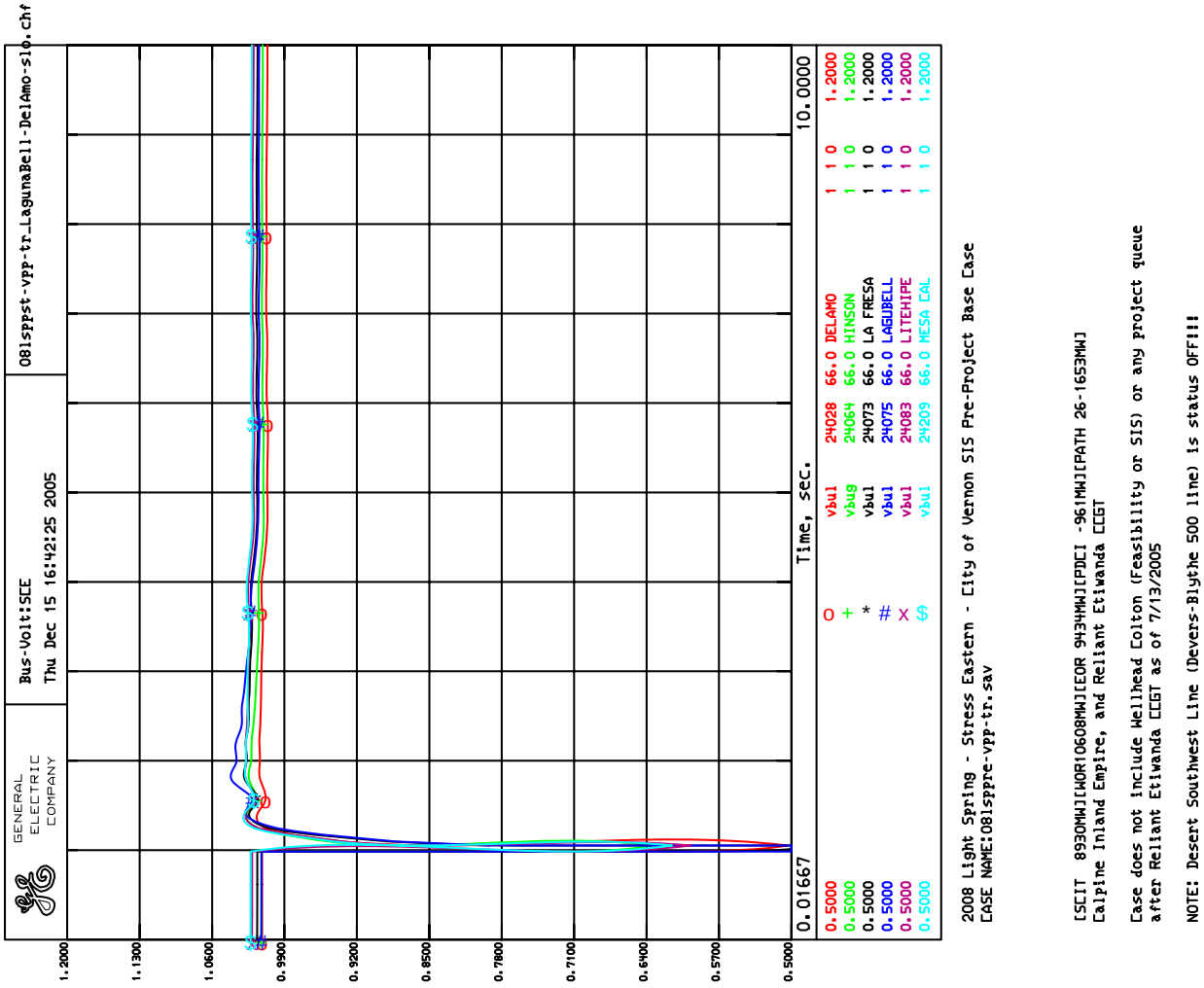
Plot 27 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



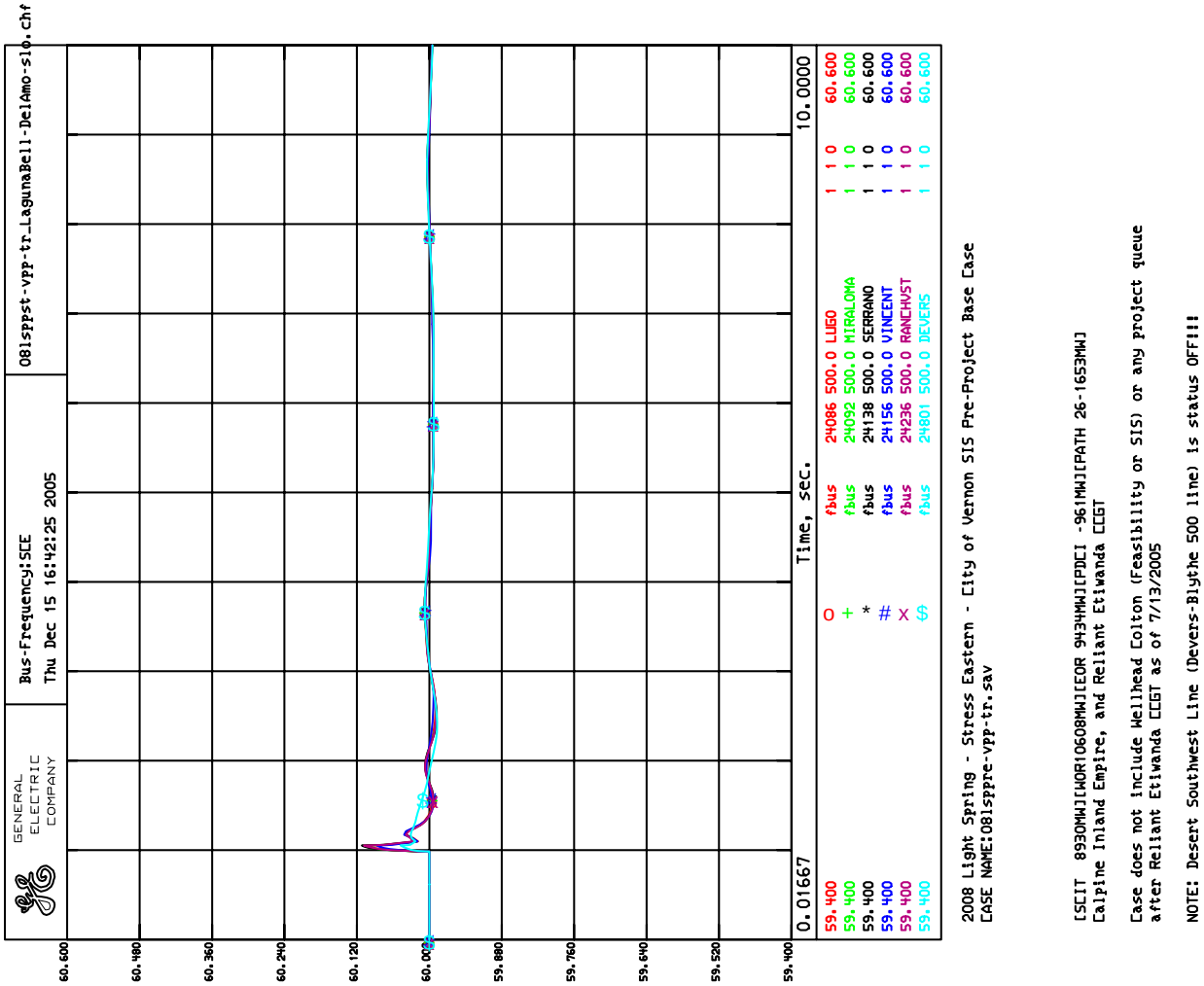
Plot 27 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



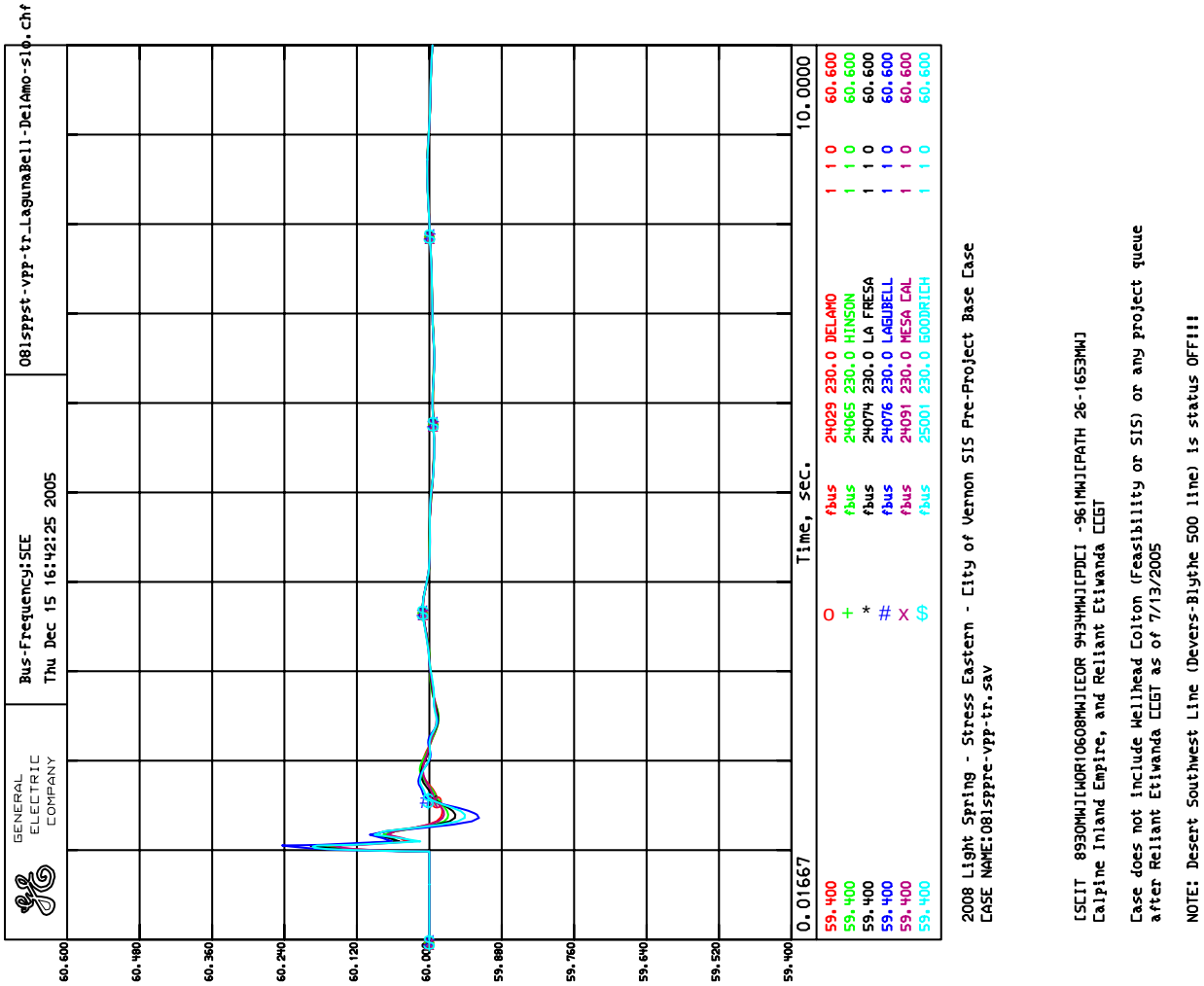
Plot 27 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



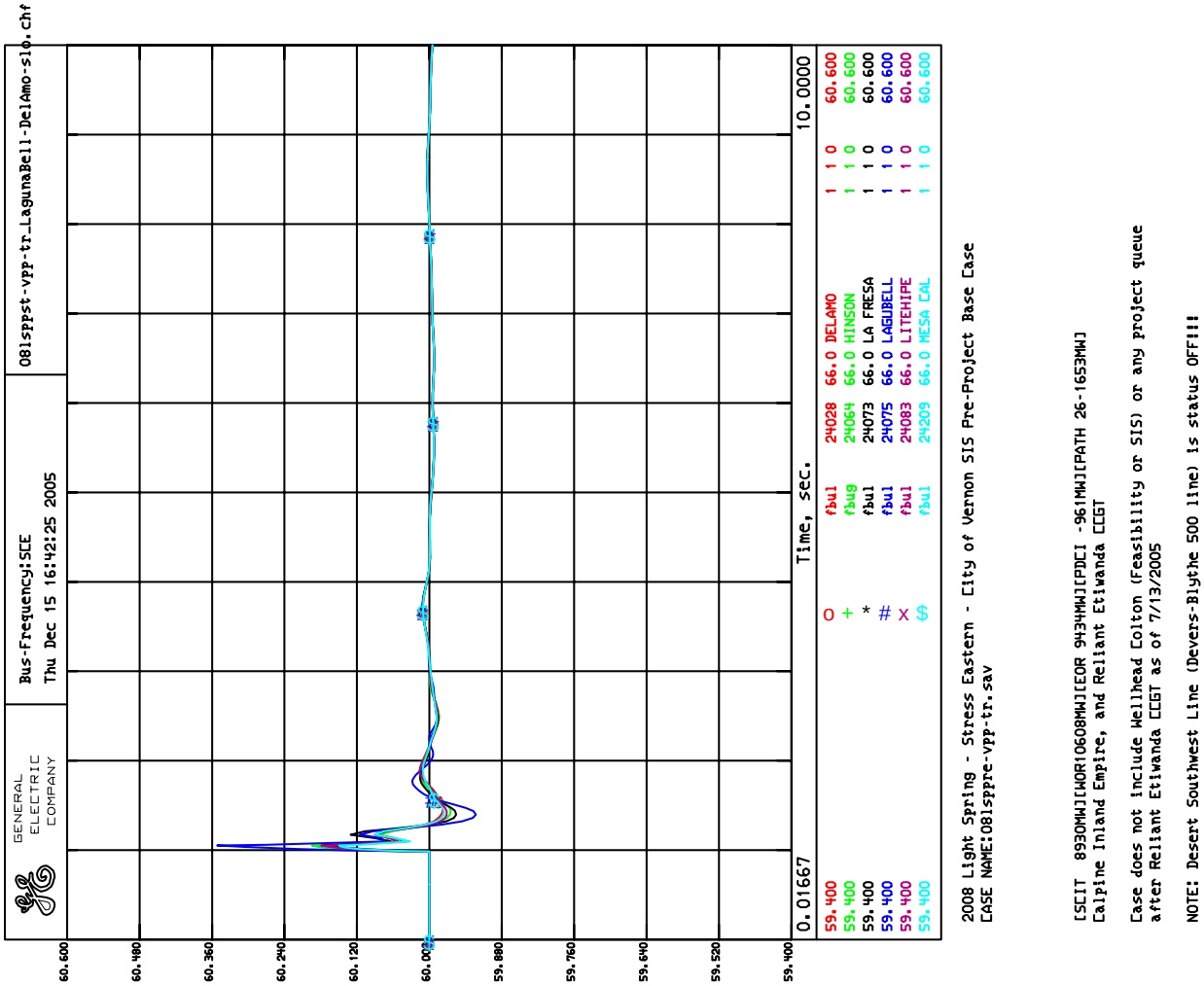
Plot 27 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



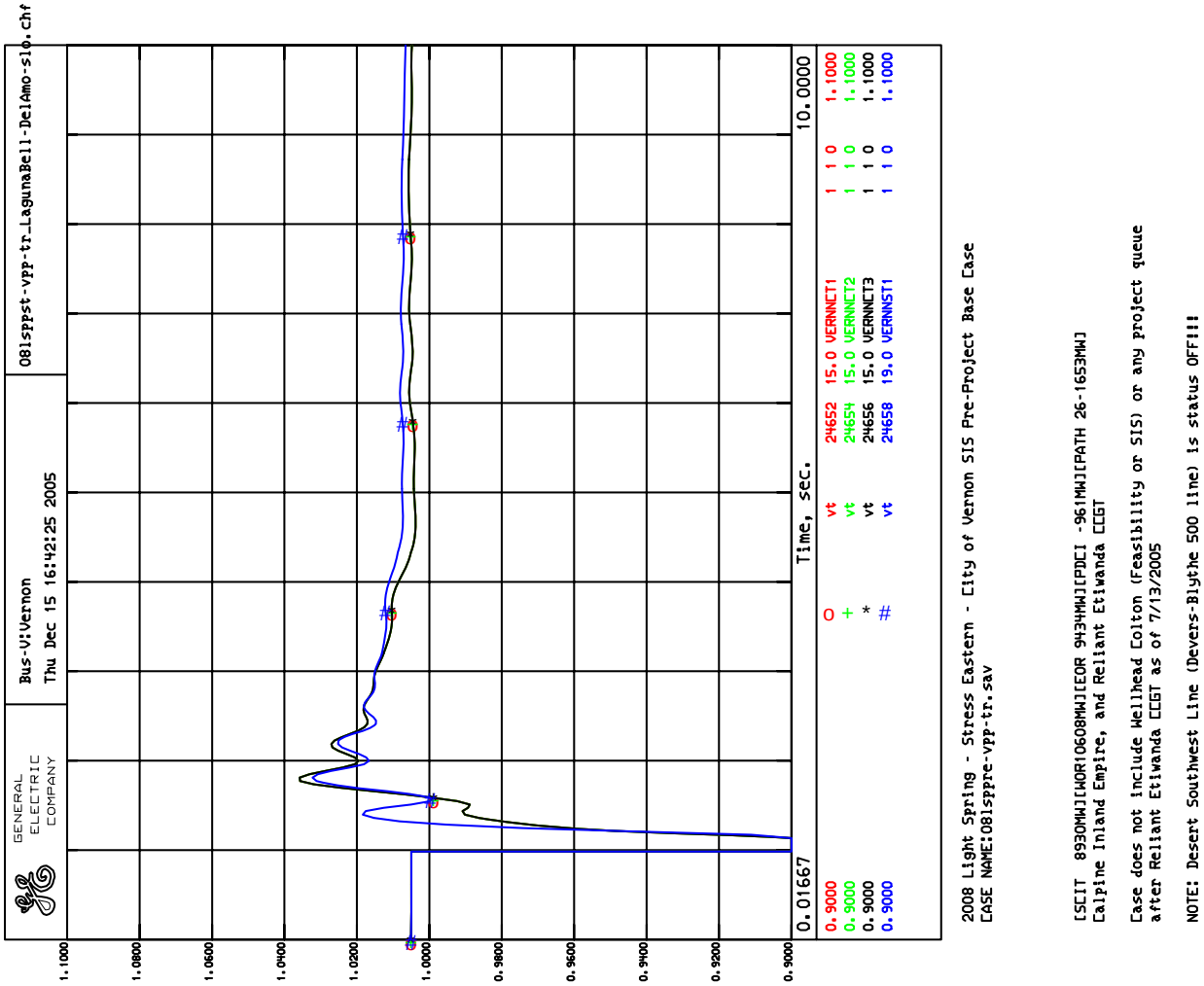
Plot 27 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



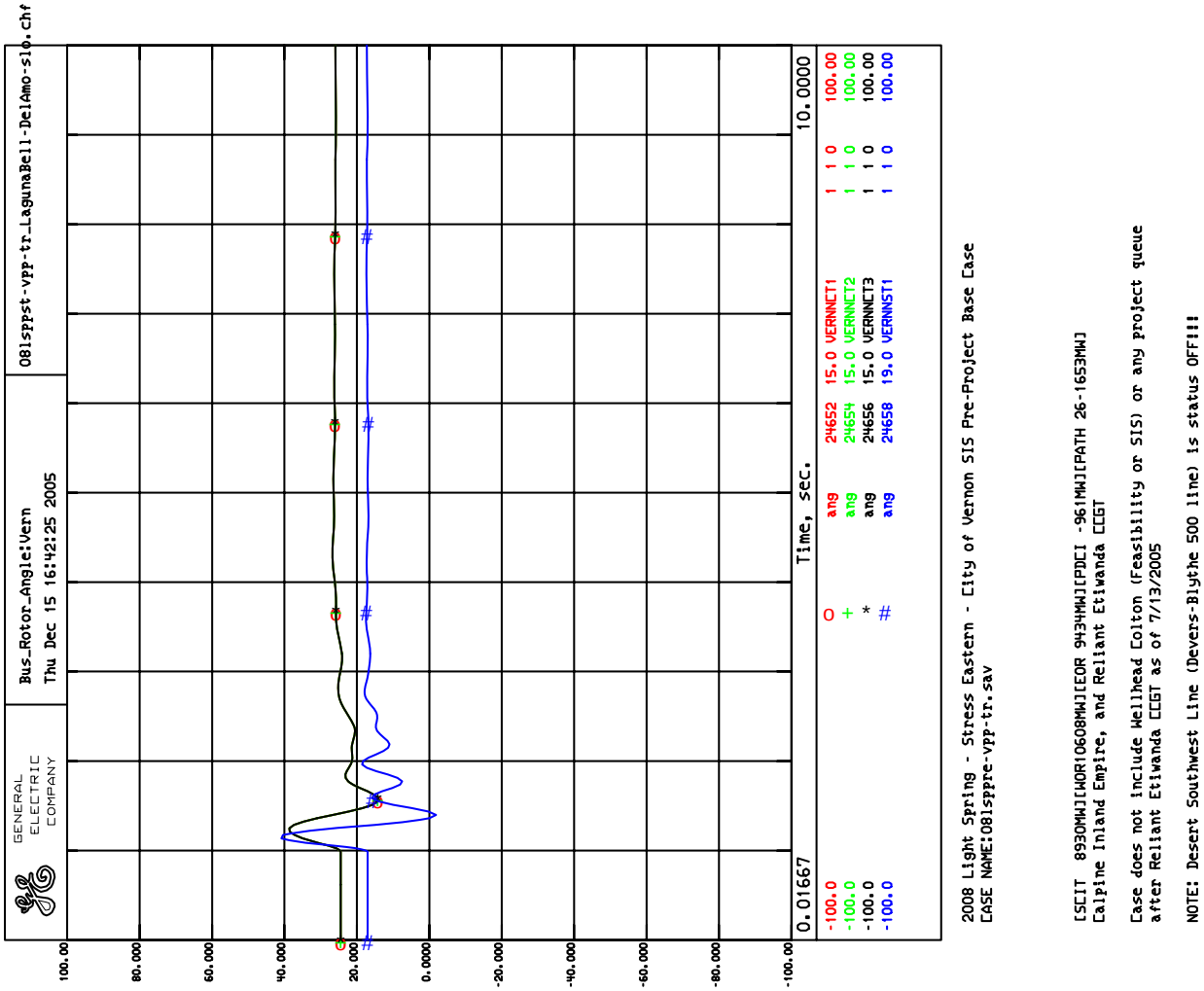
Plot 27 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



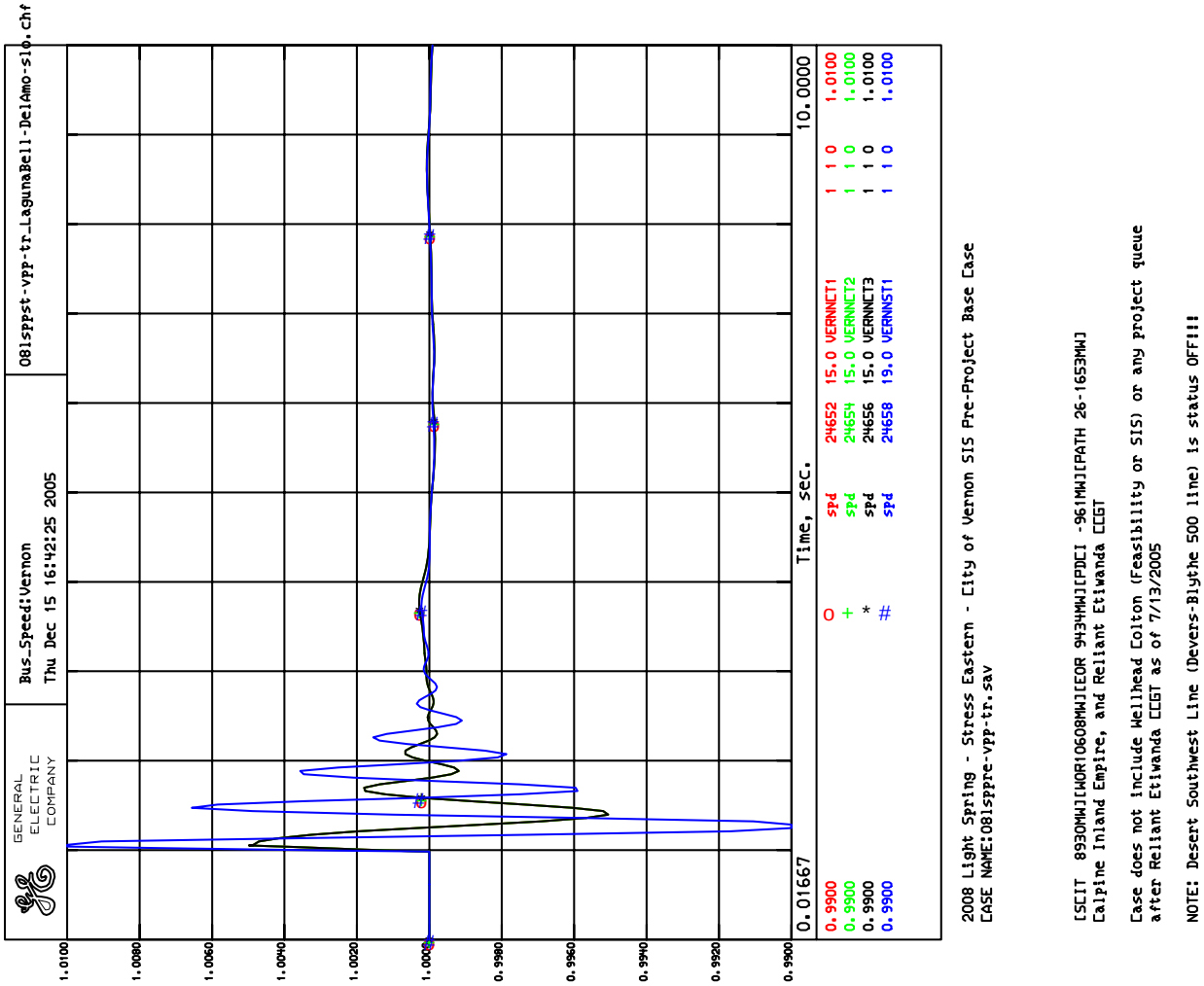
Plot 27 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



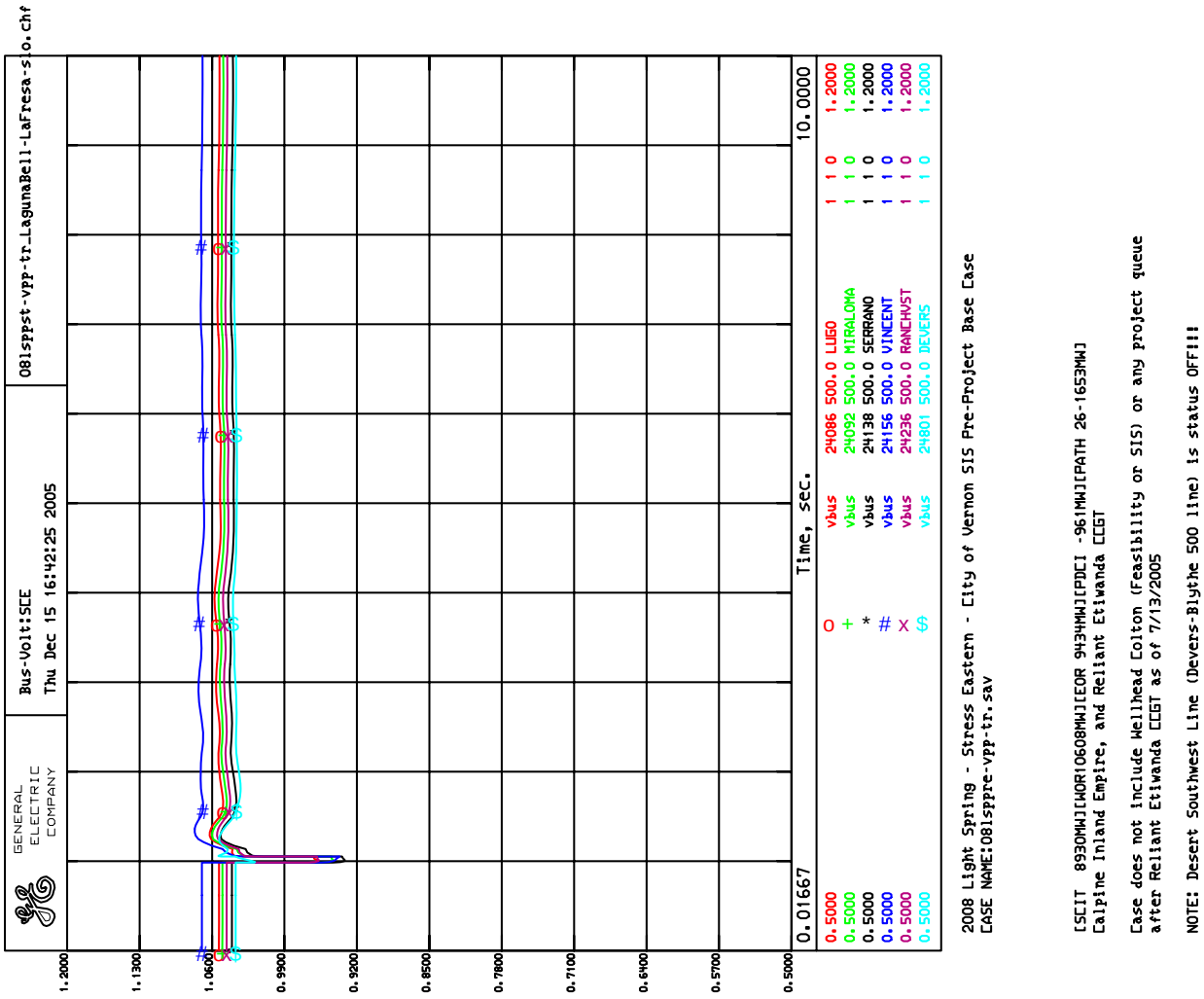
Plot 27 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



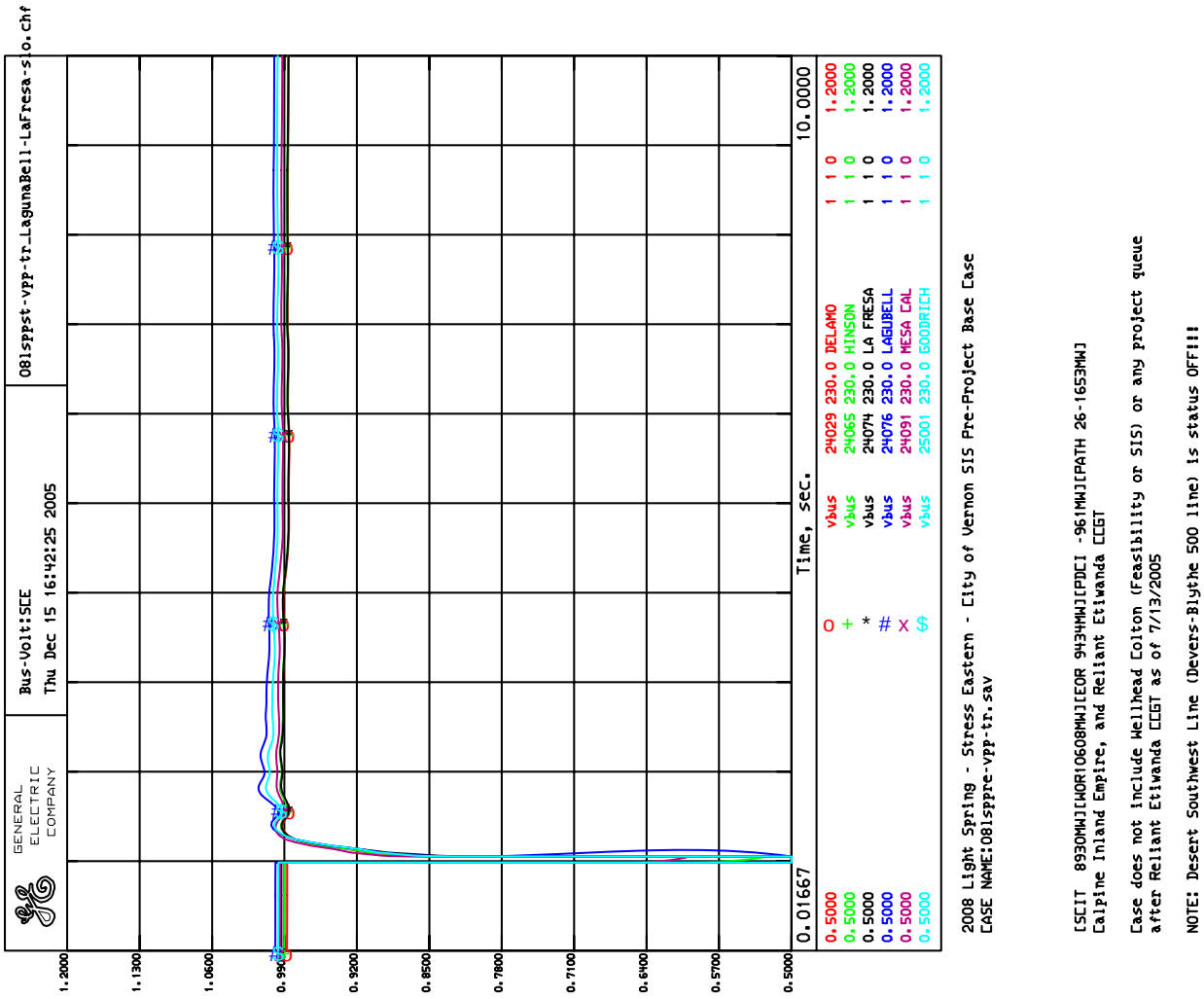
Plot 27 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.



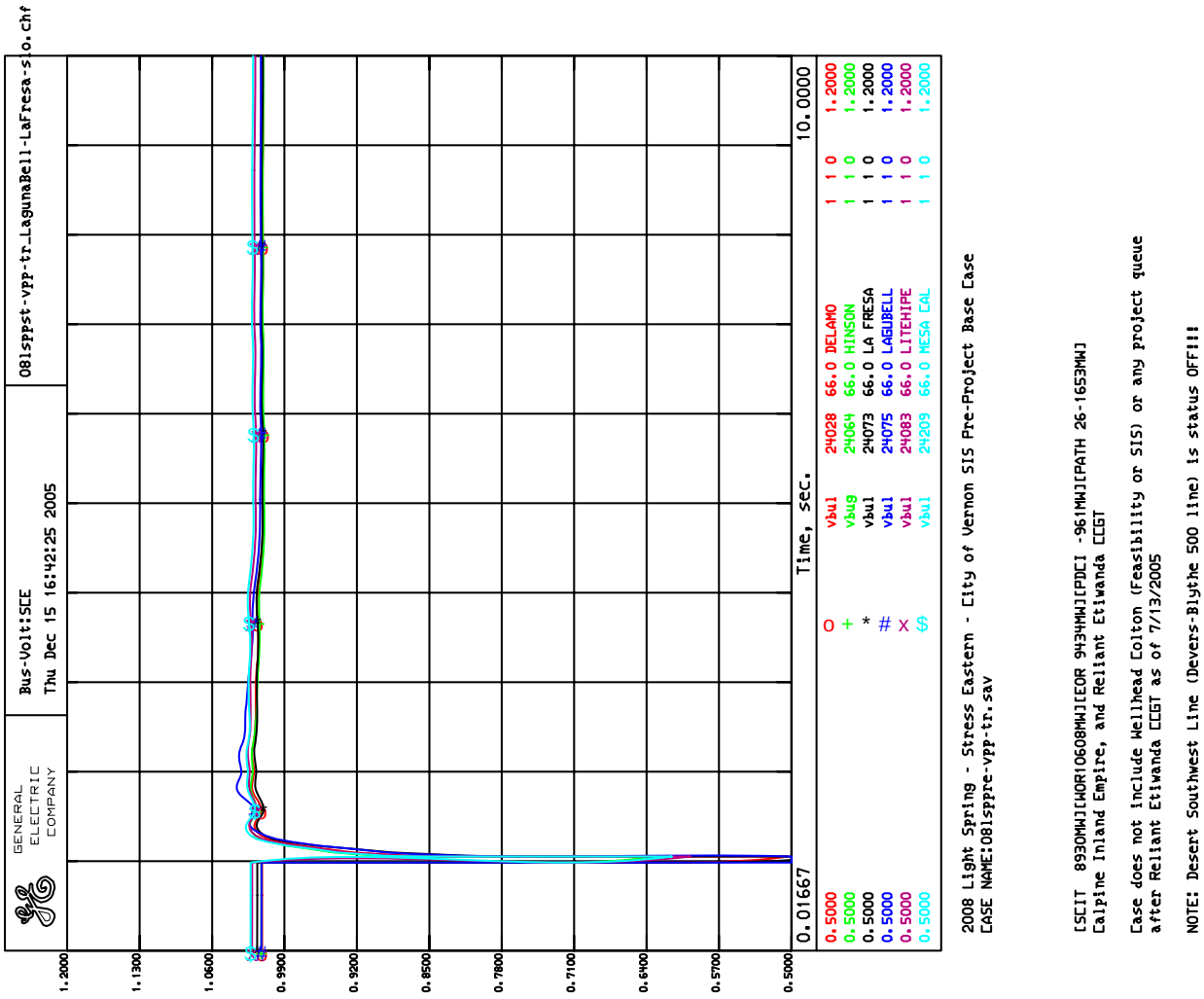
Plot 28 - 1: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



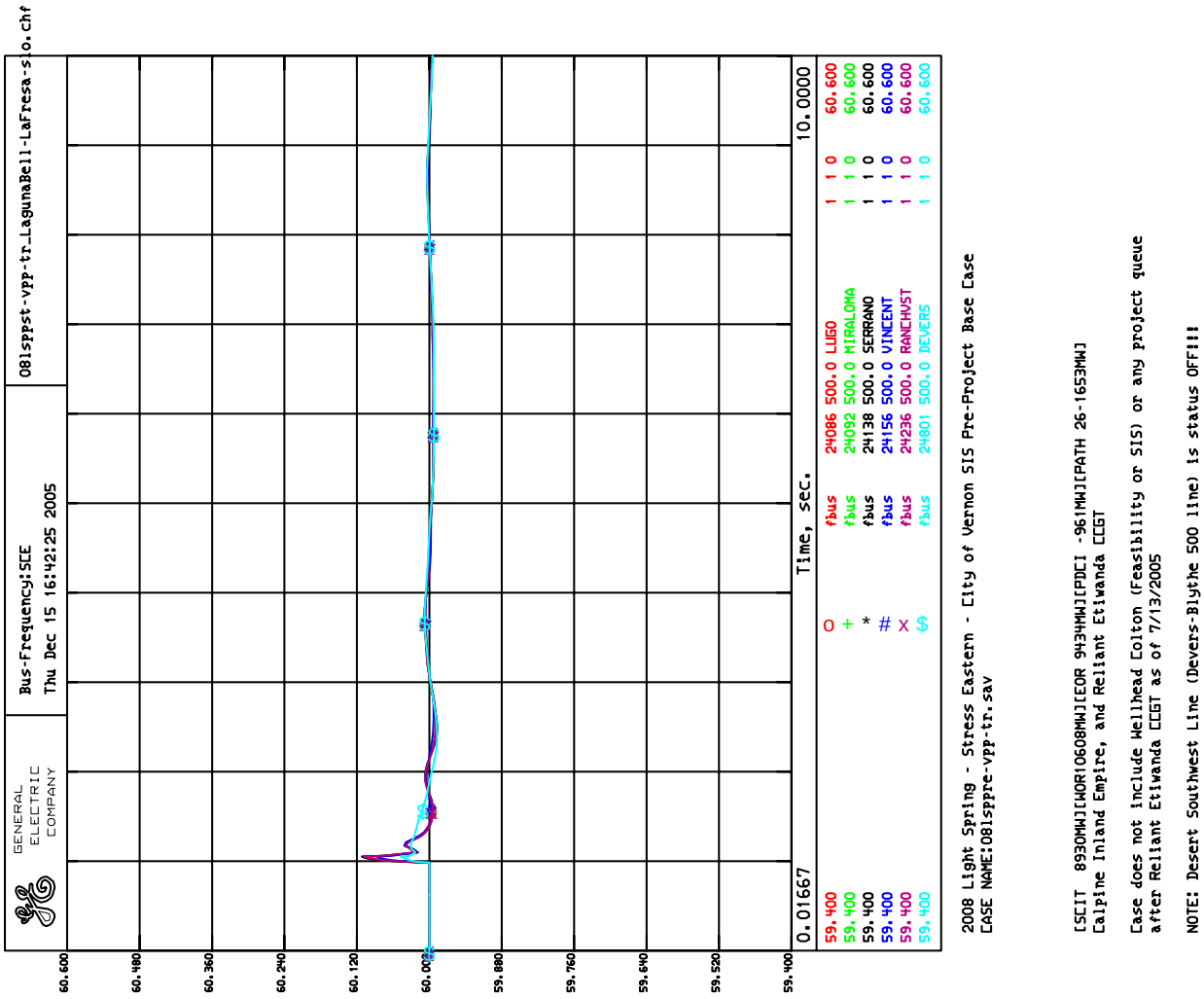
Plot 28 - 2: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



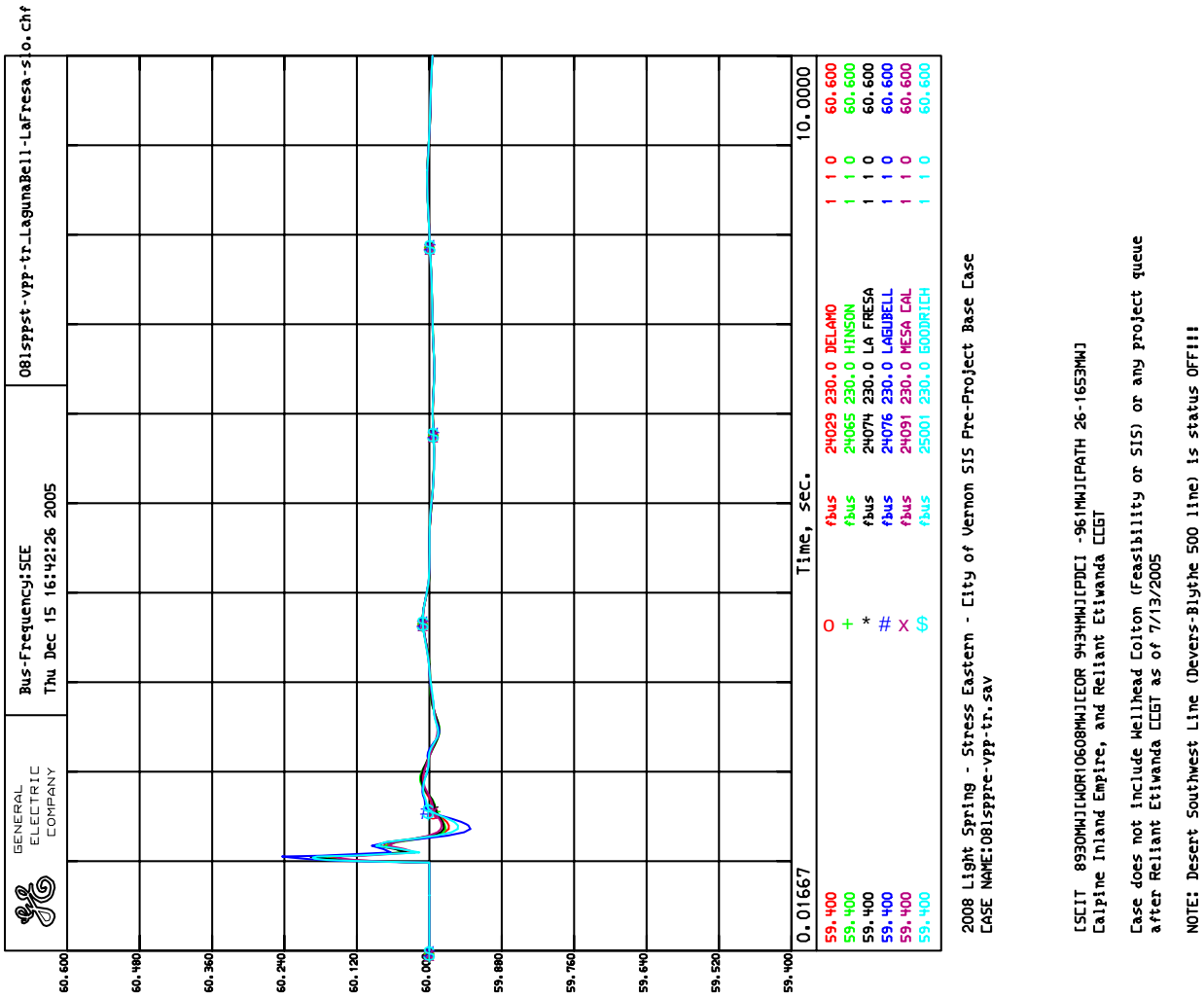
Plot 28 - 3: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



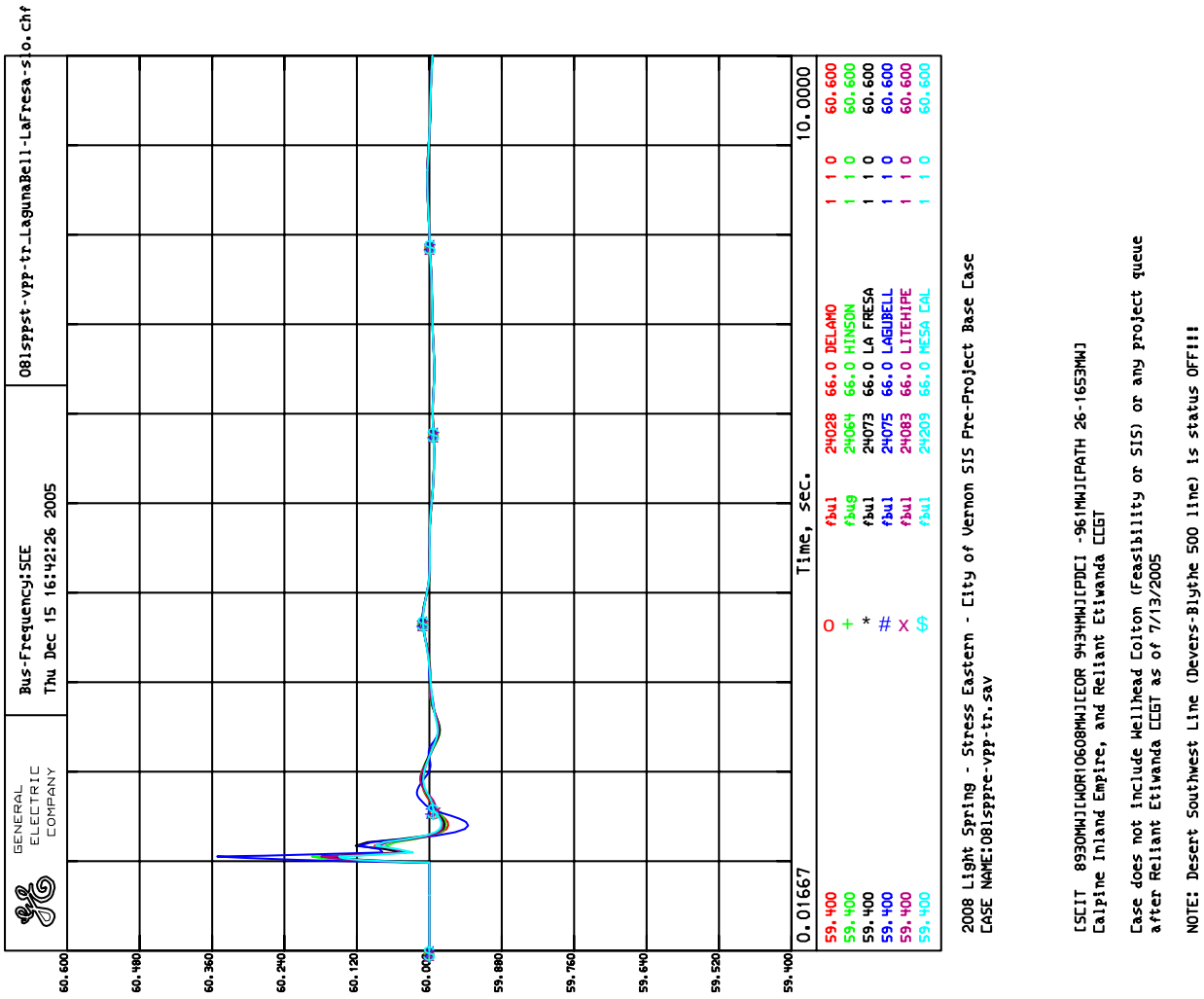
Plot 28 - 4: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



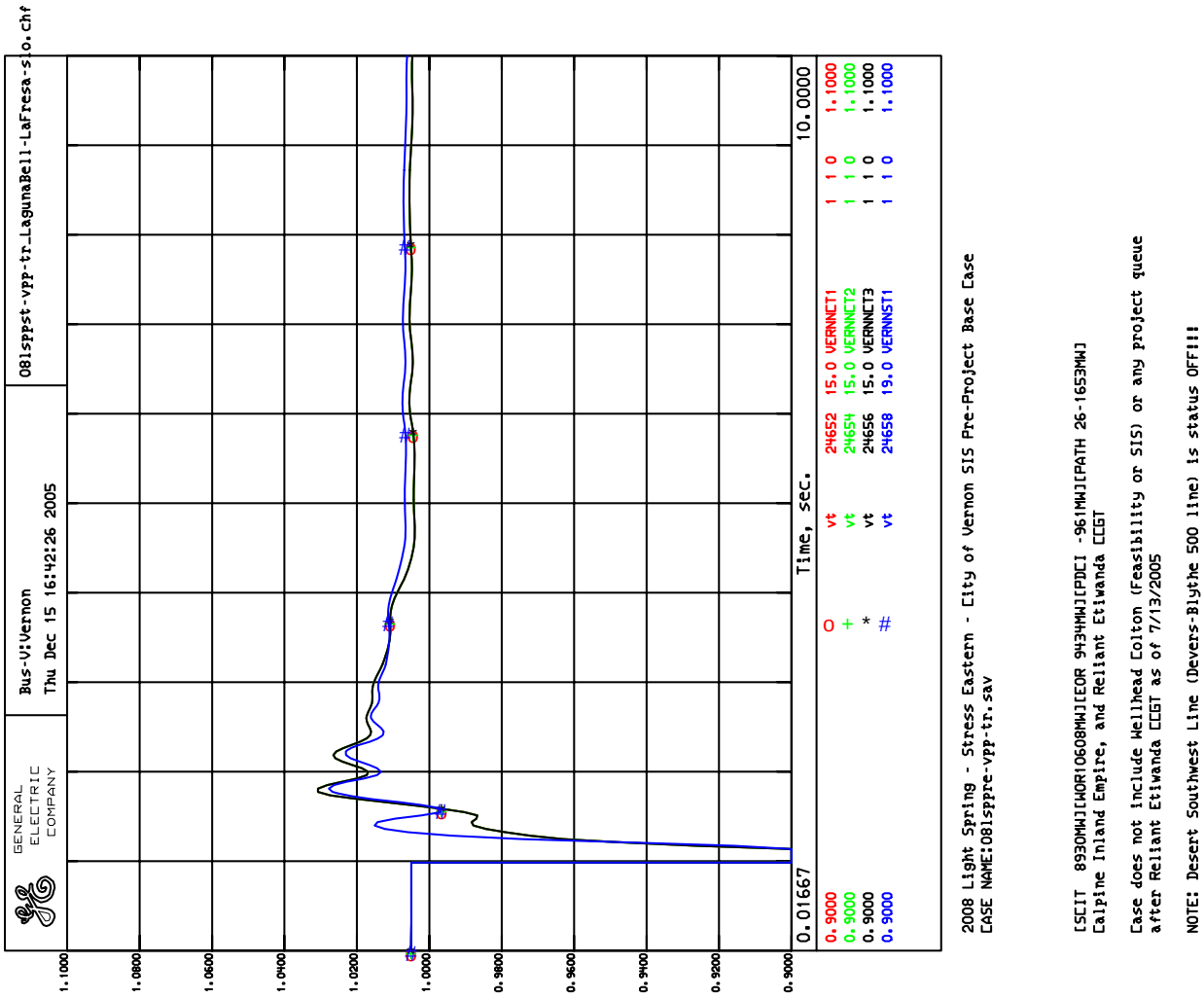
Plot 28 - 5: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



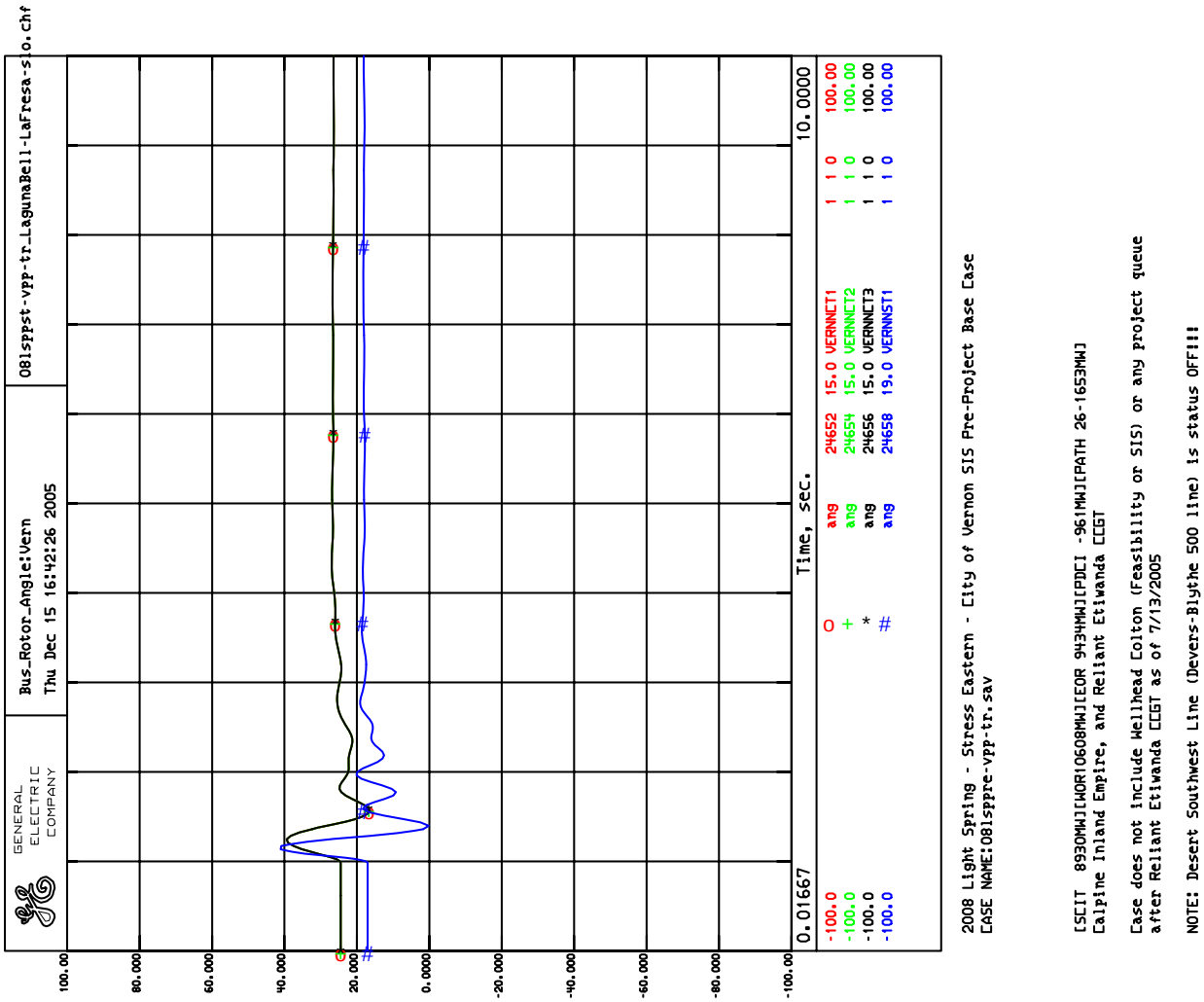
Plot 28 - 6: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



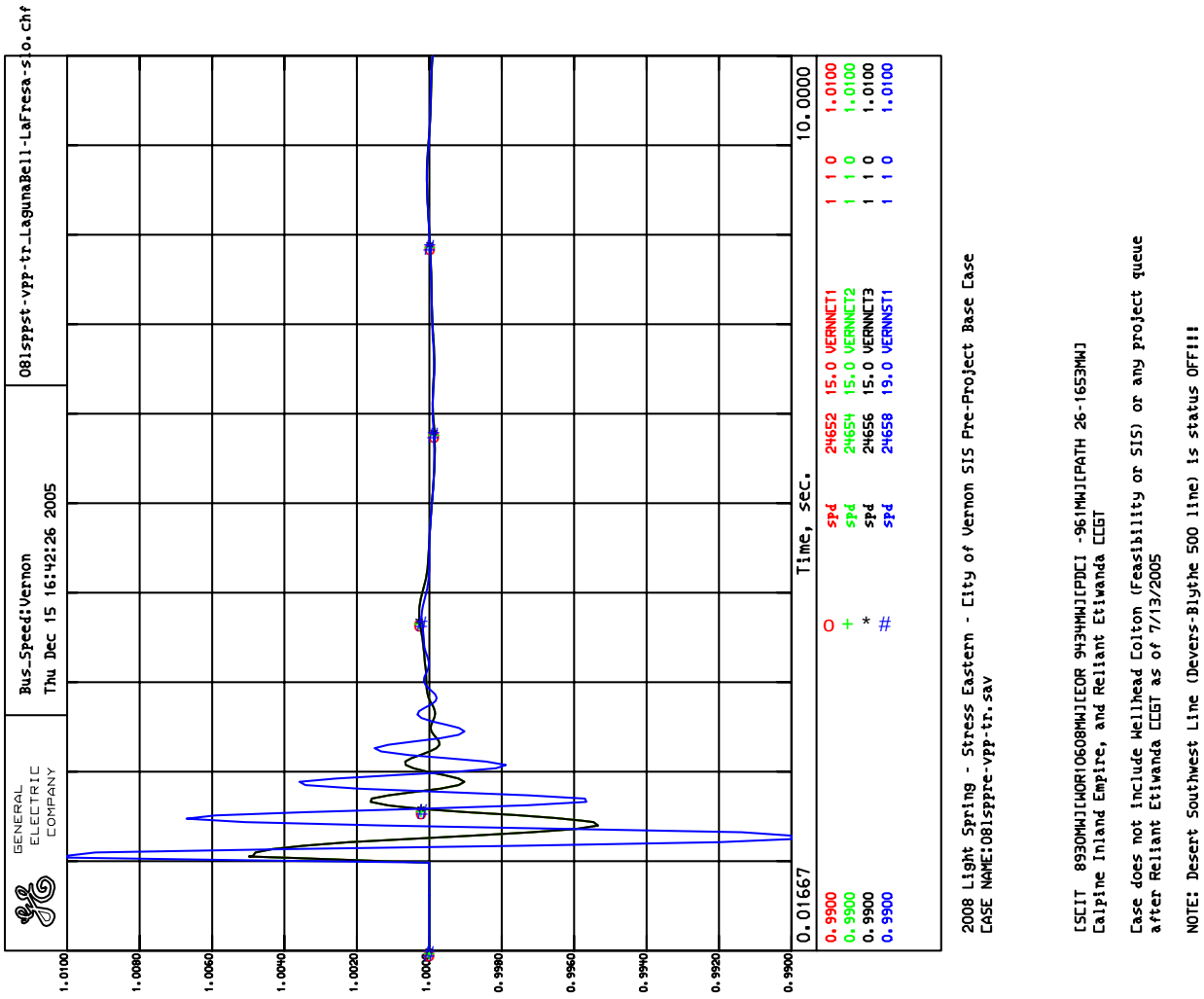
Plot 28 - 7: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



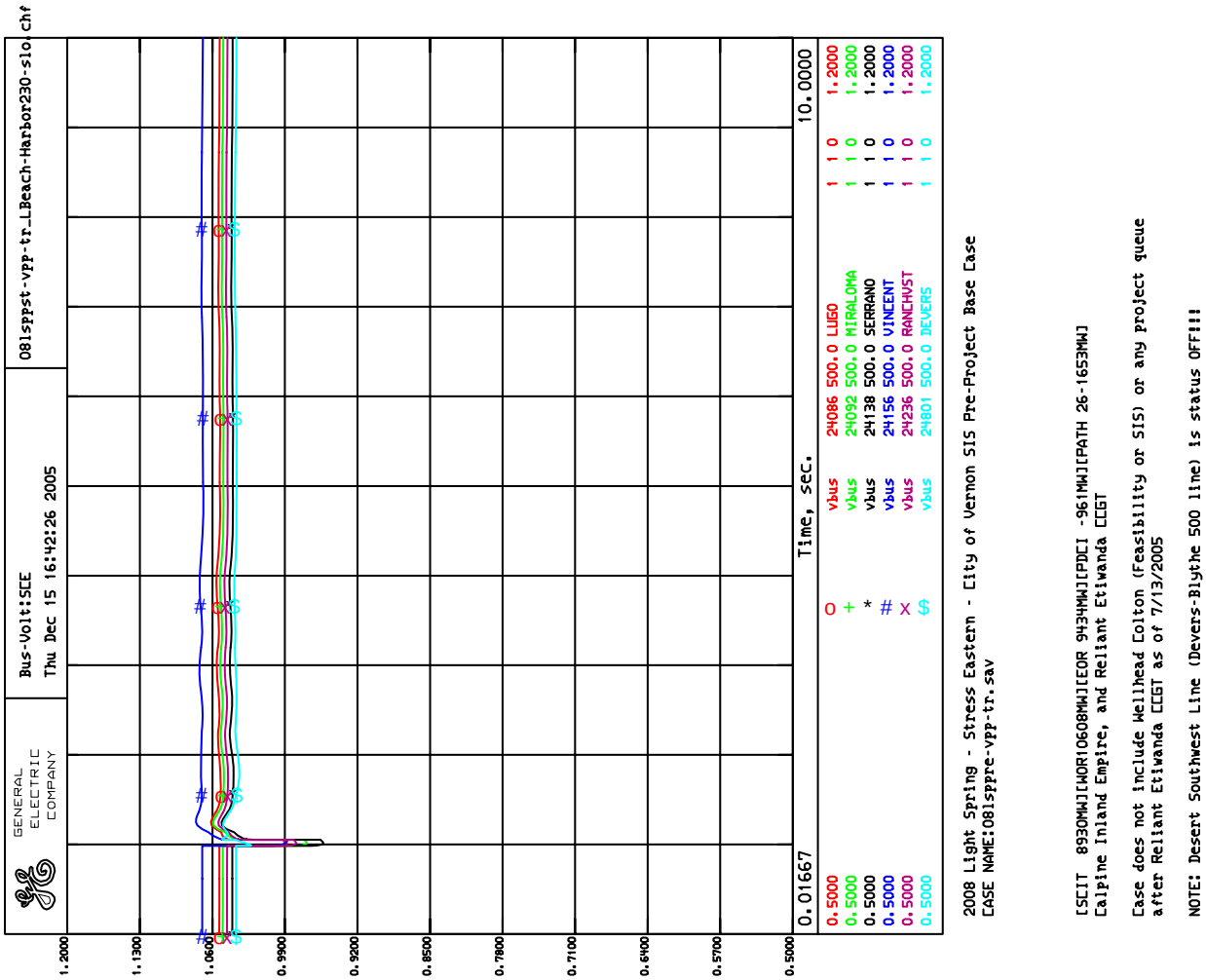
Plot 28 - 8: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



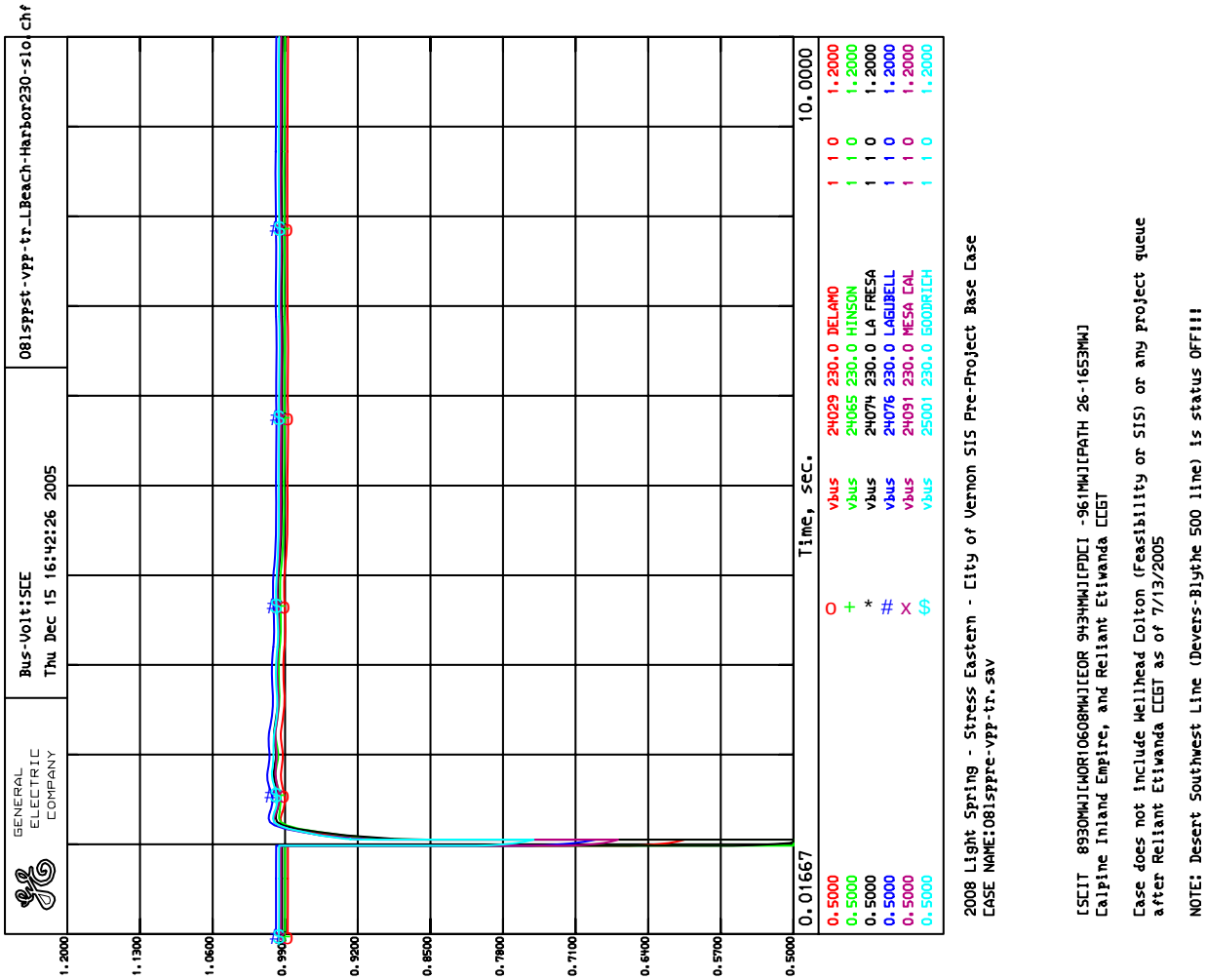
Plot 28 - 9: Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.



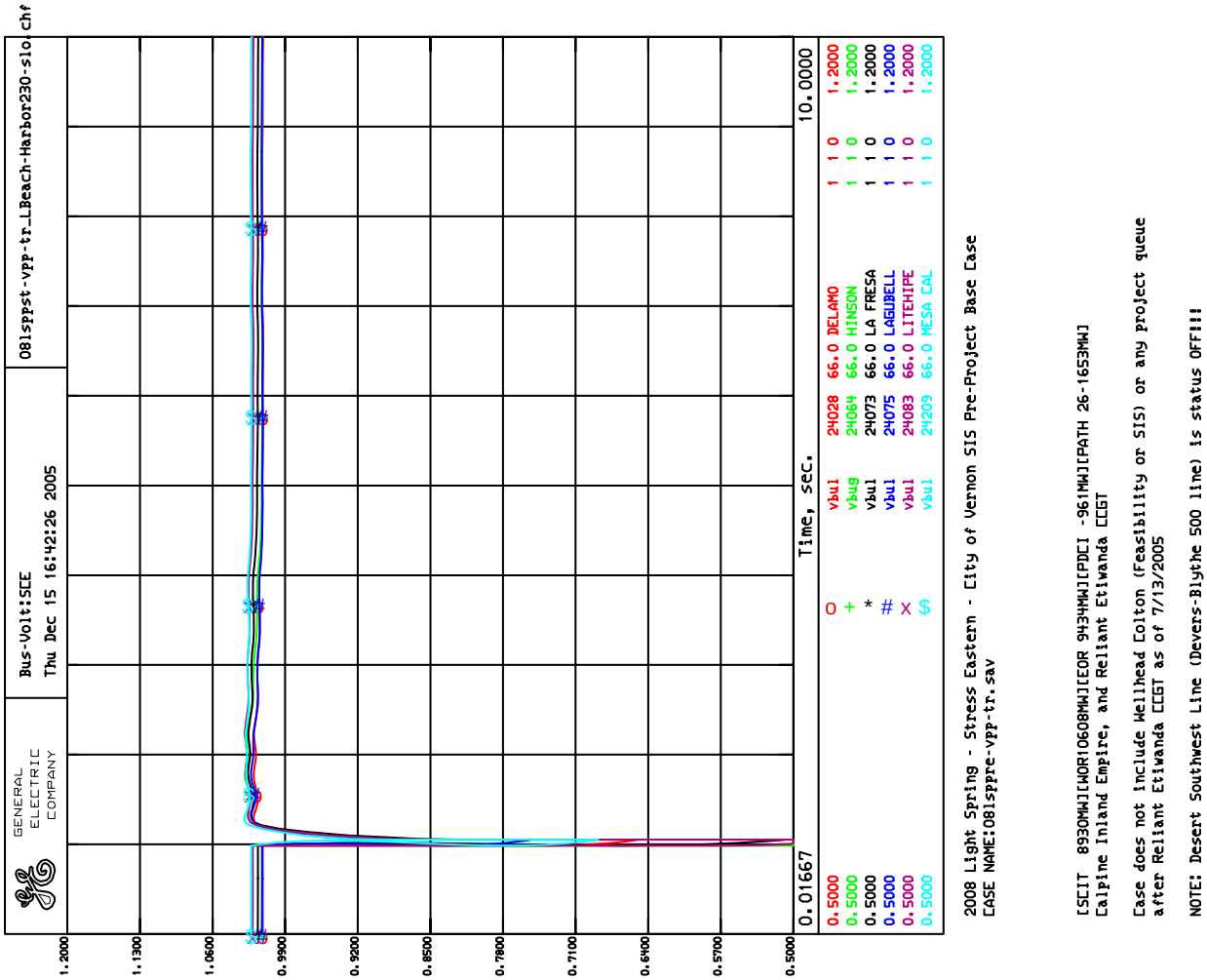
Plot 29 - 1: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



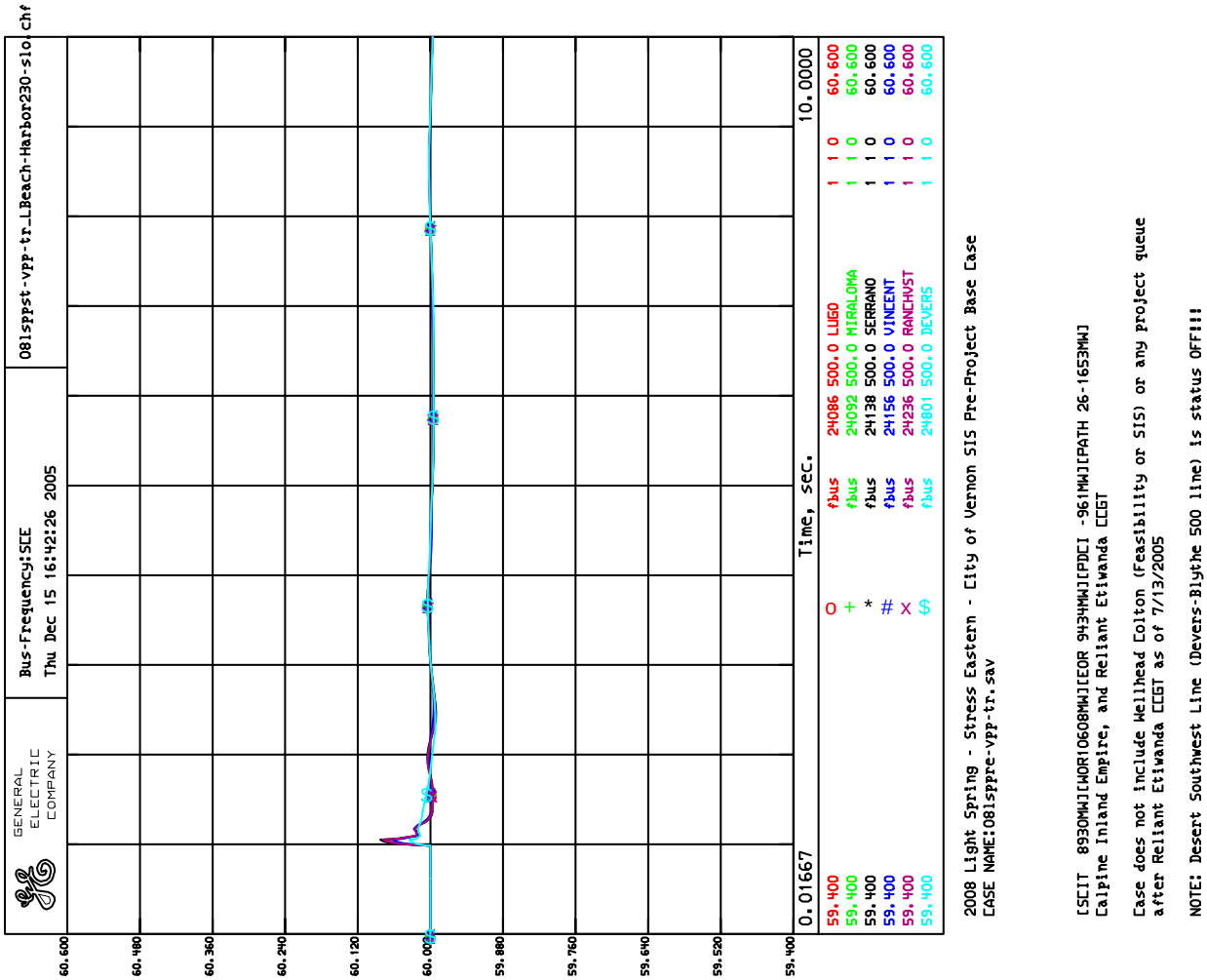
Plot 29 - 2: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



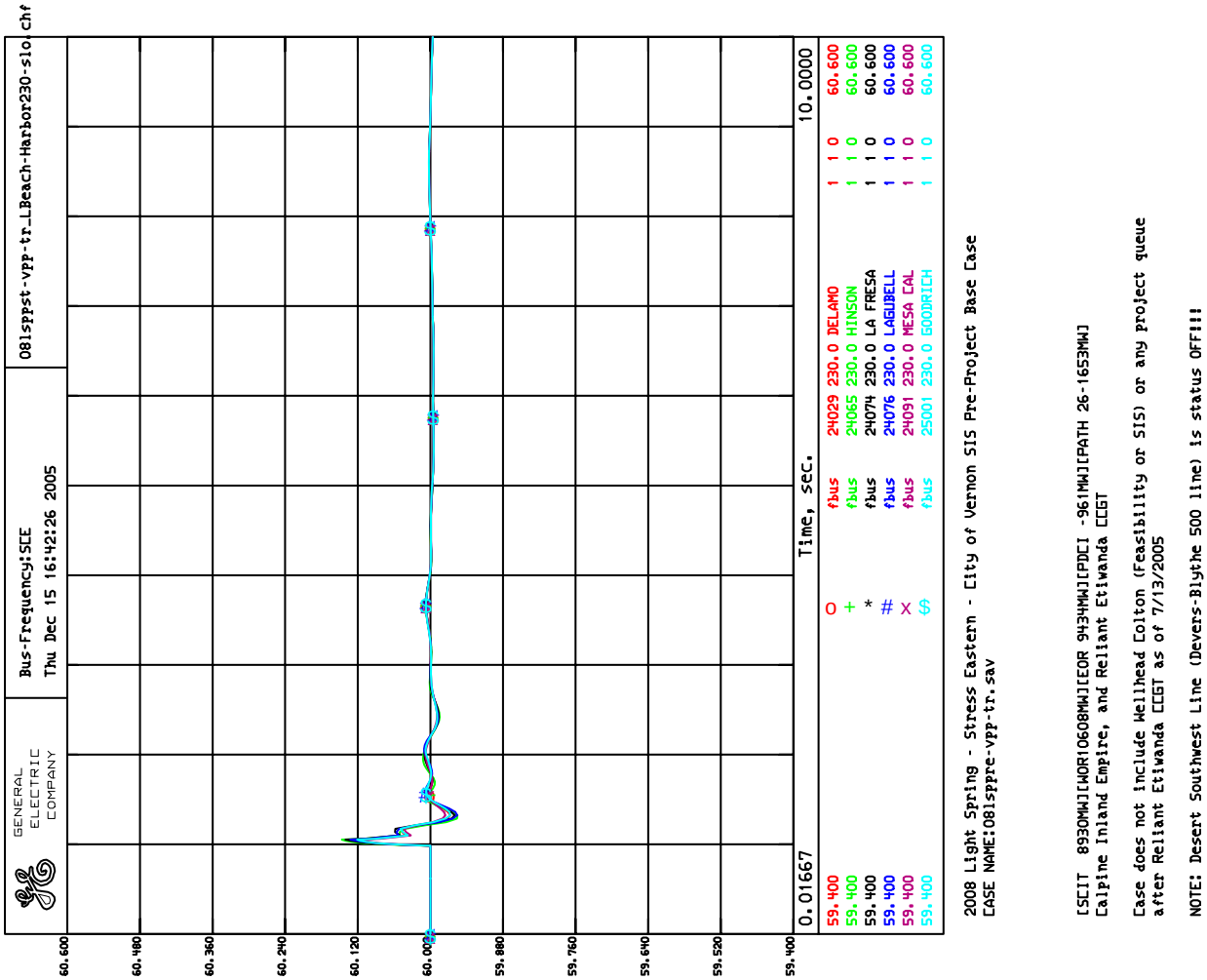
Plot 29 - 3: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



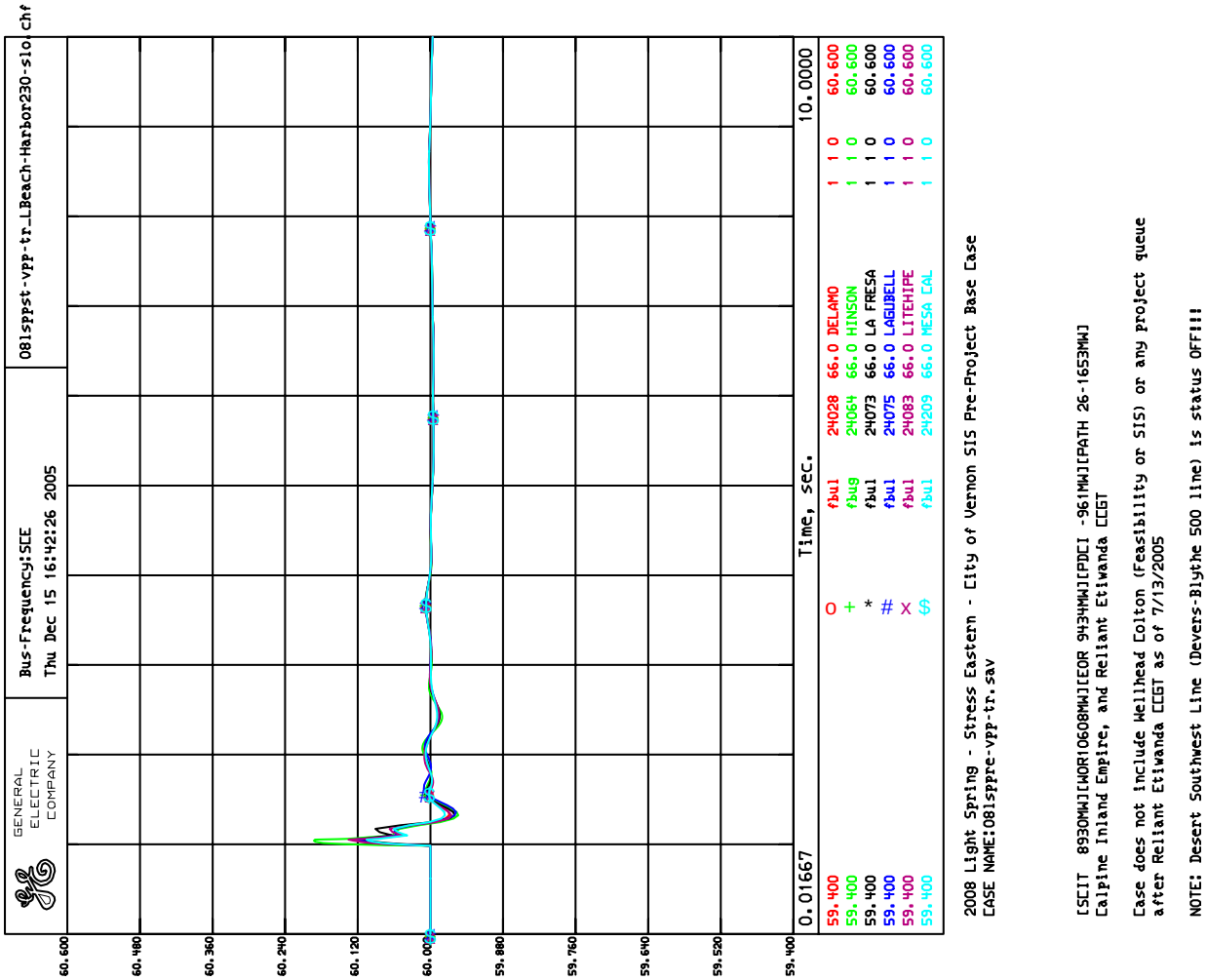
Plot 29 - 4: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



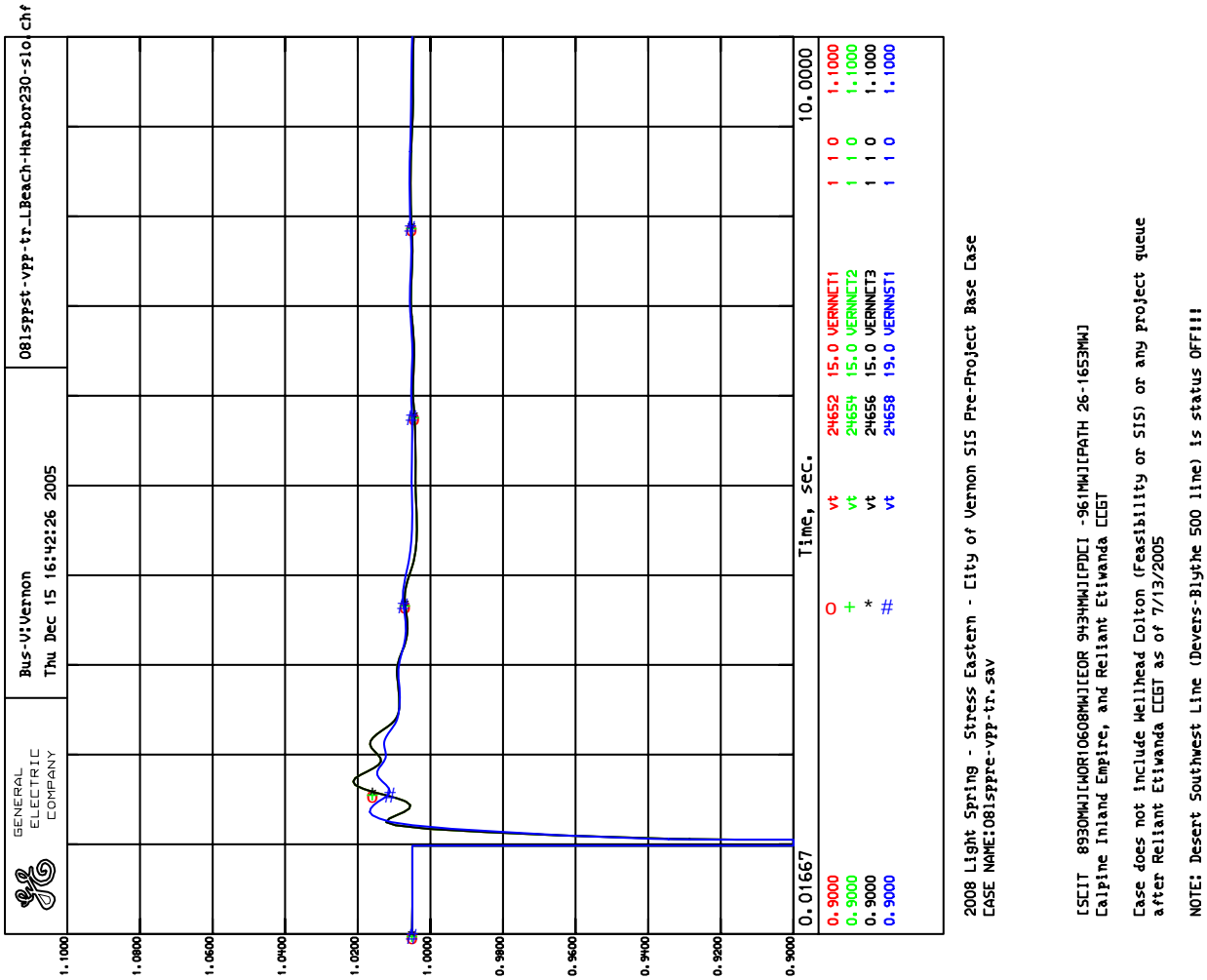
Plot 29 - 5: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



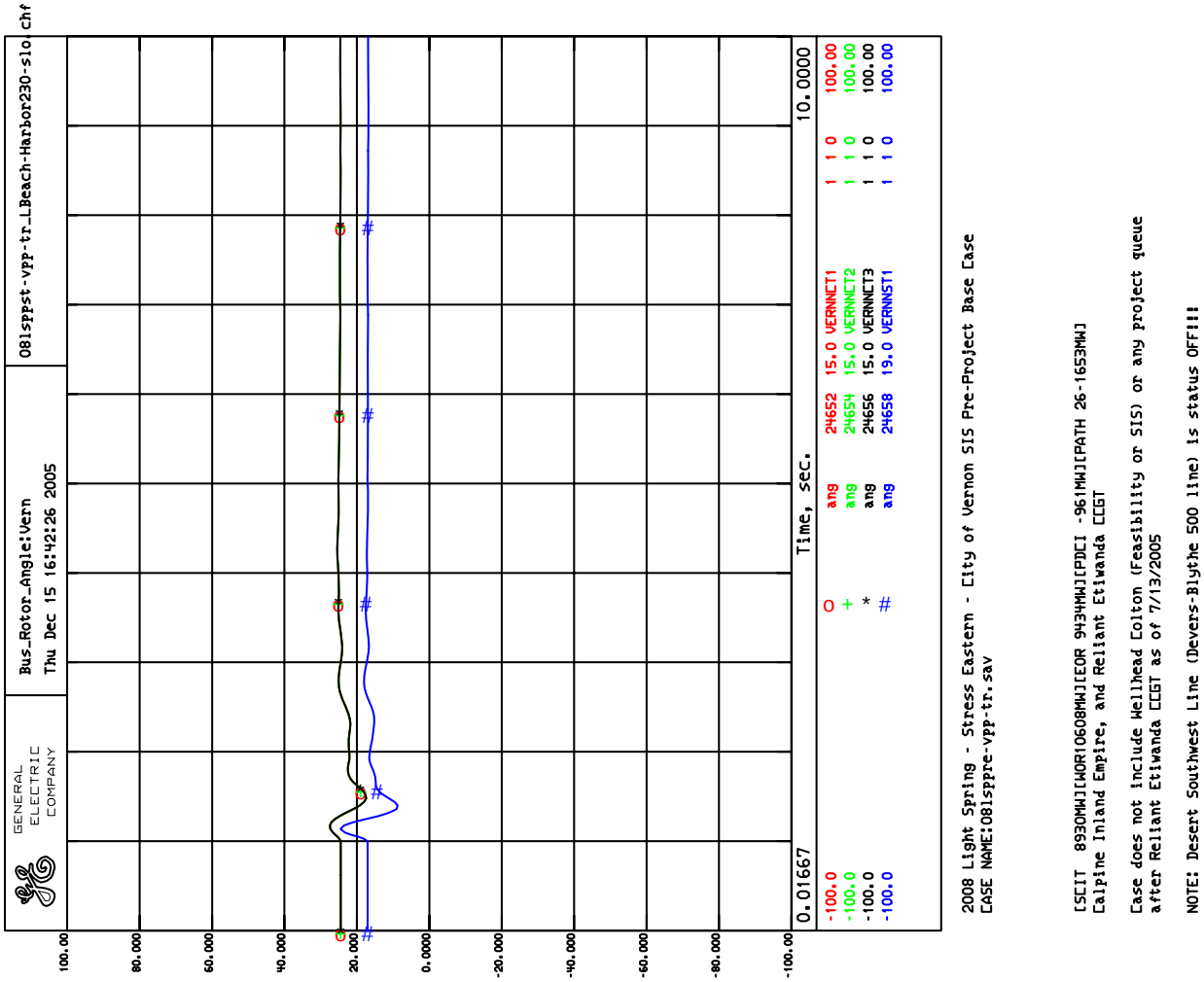
Plot 29 - 6: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



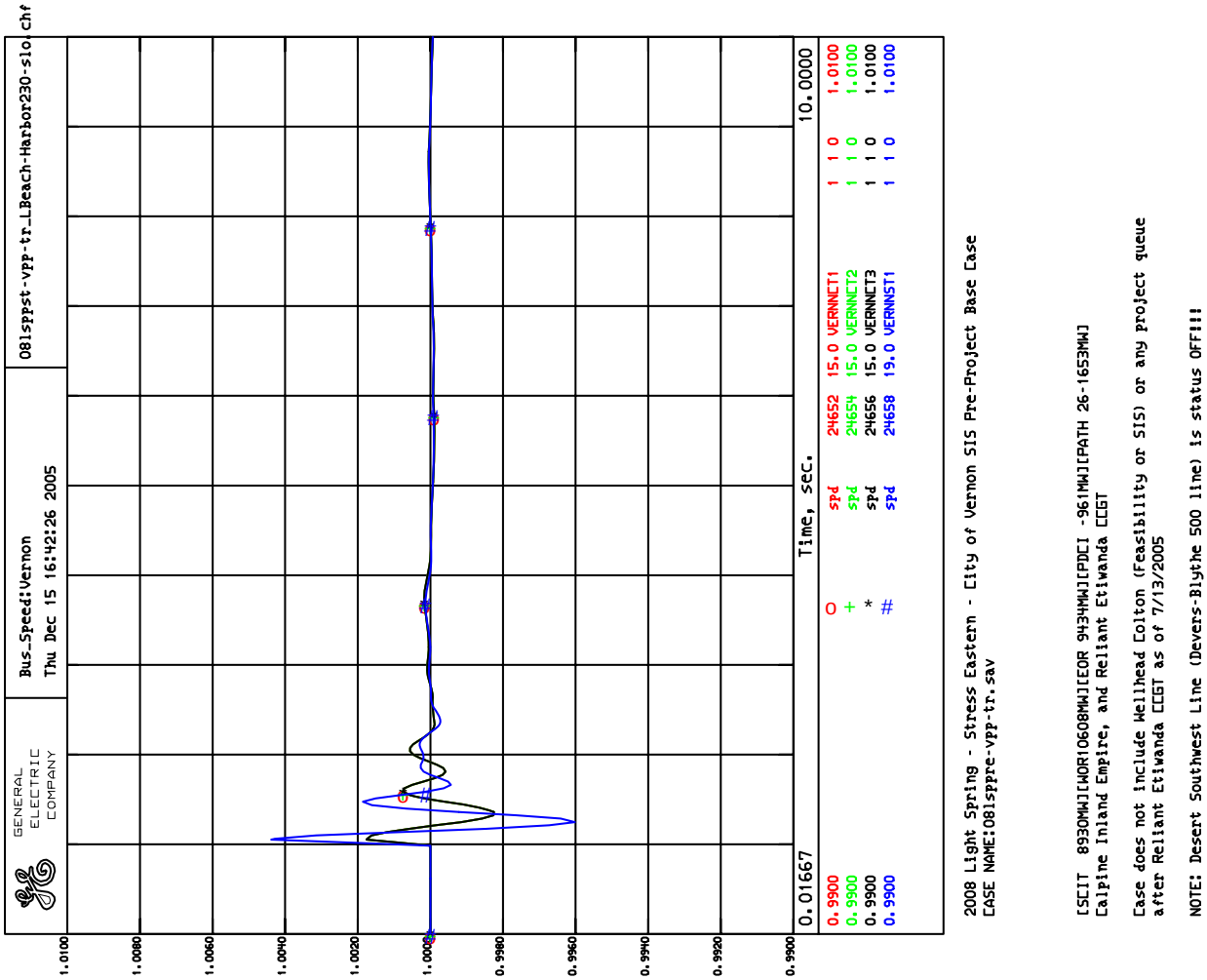
Plot 29 - 7: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



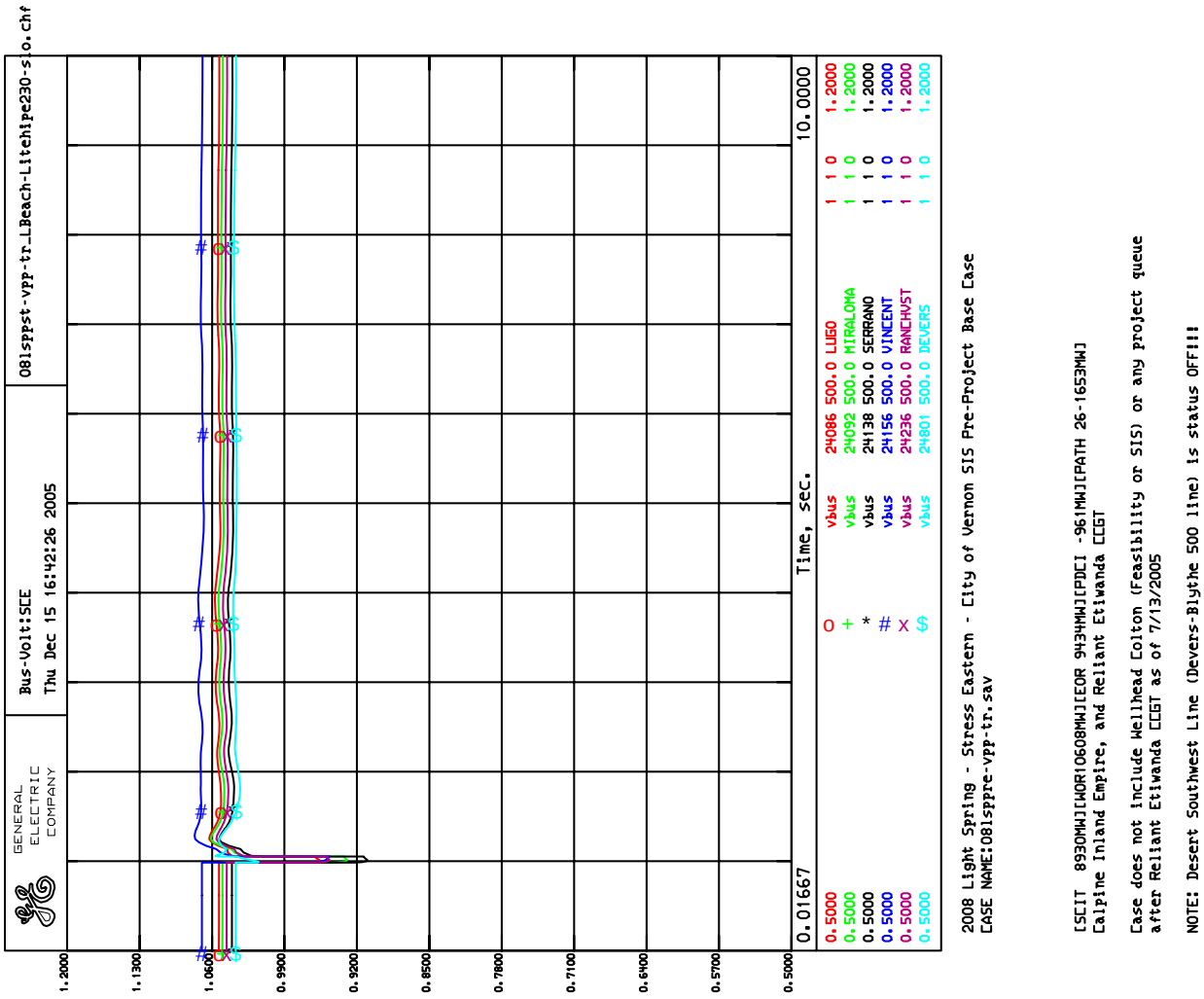
Plot 29 - 8: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



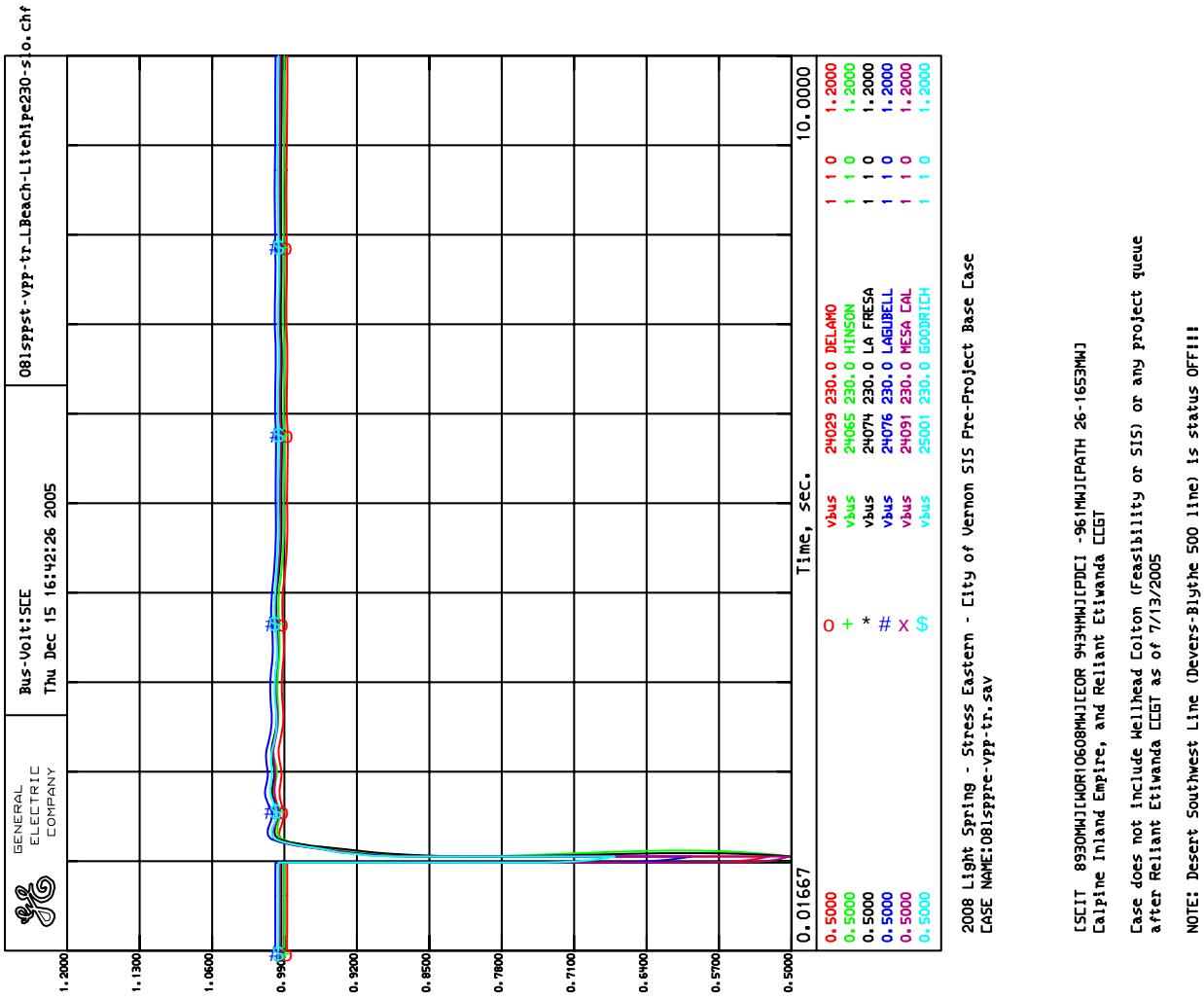
Plot 29 - 9: Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.



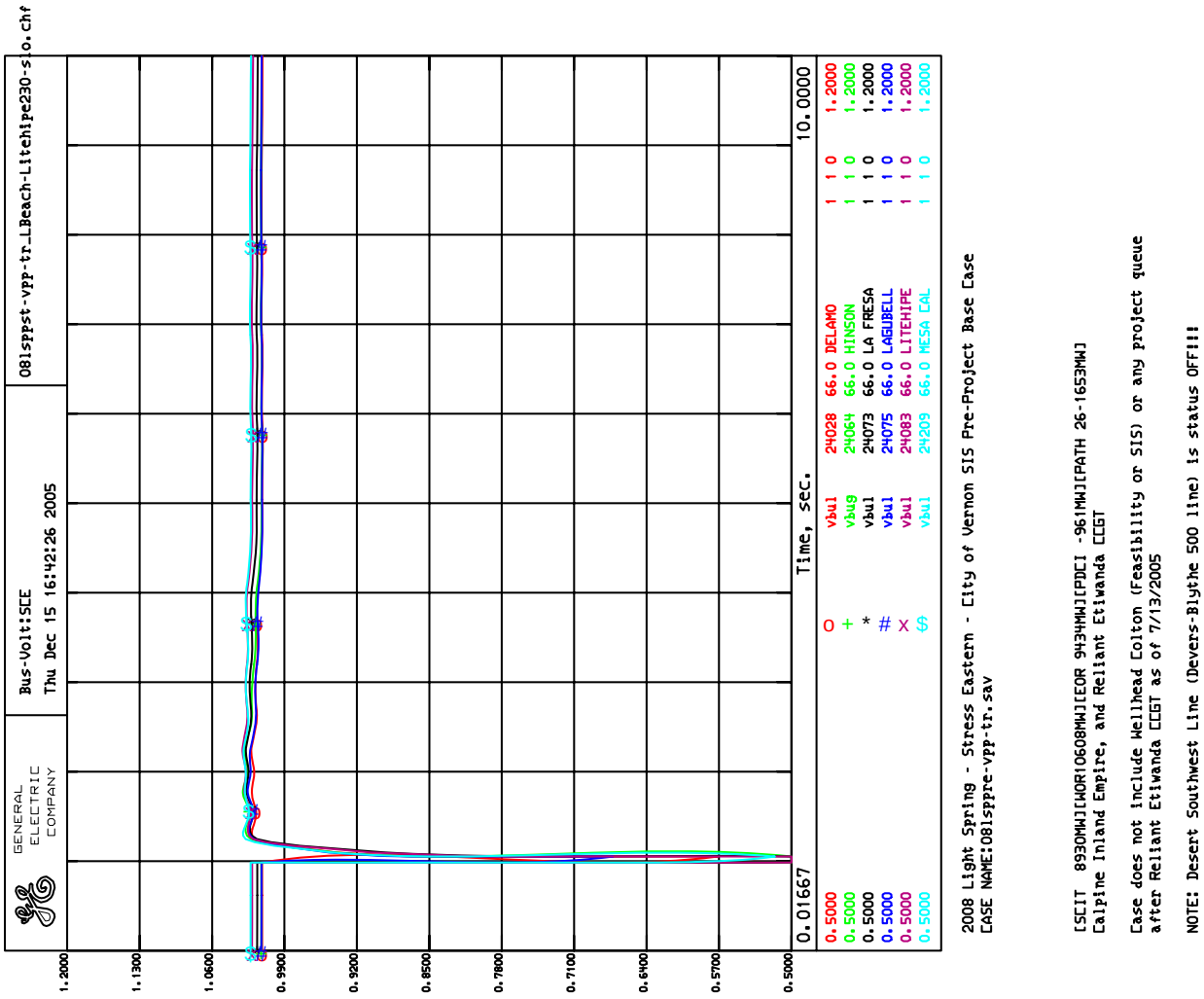
Plot 30 - 1: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



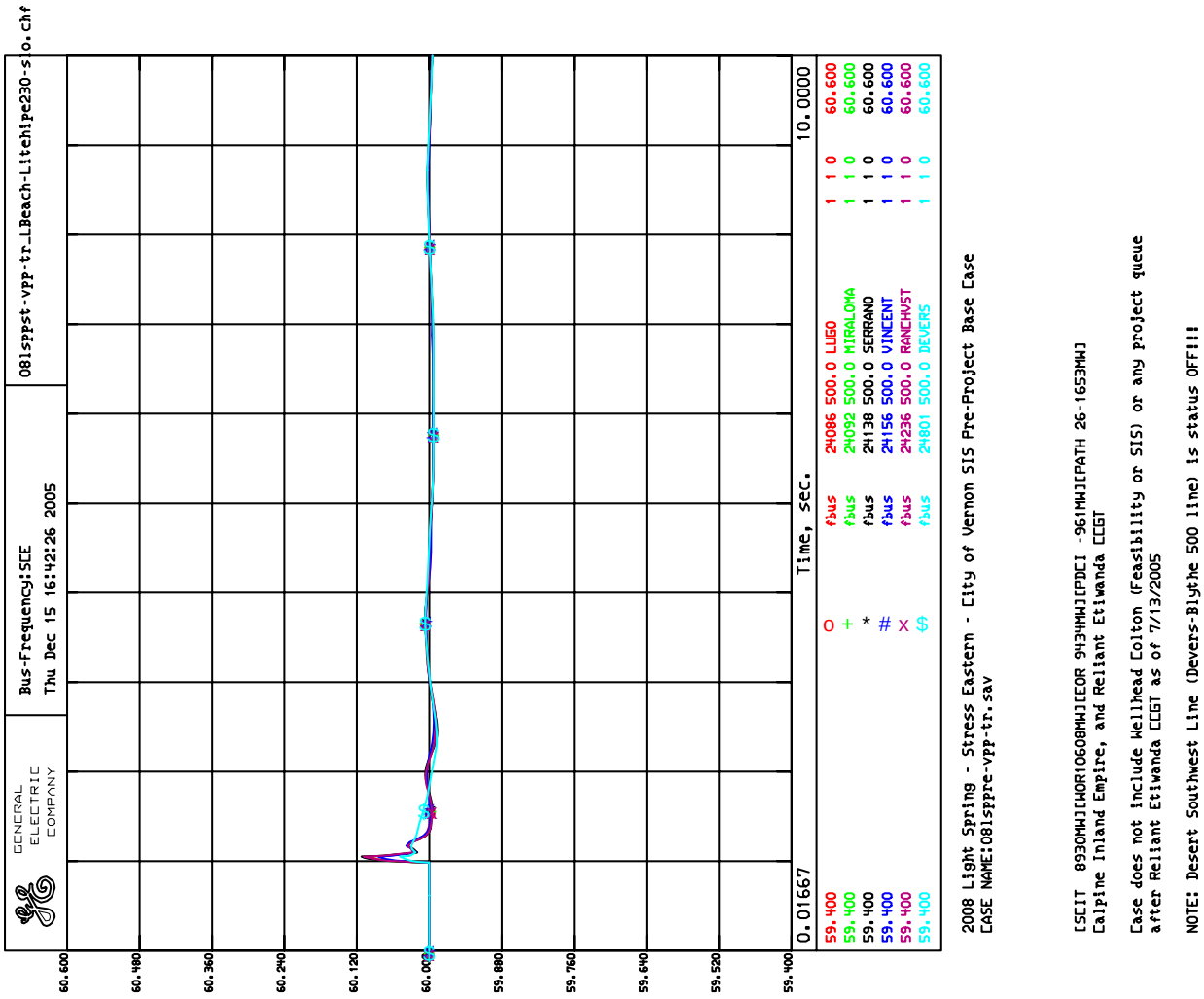
Plot 30 – 2: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



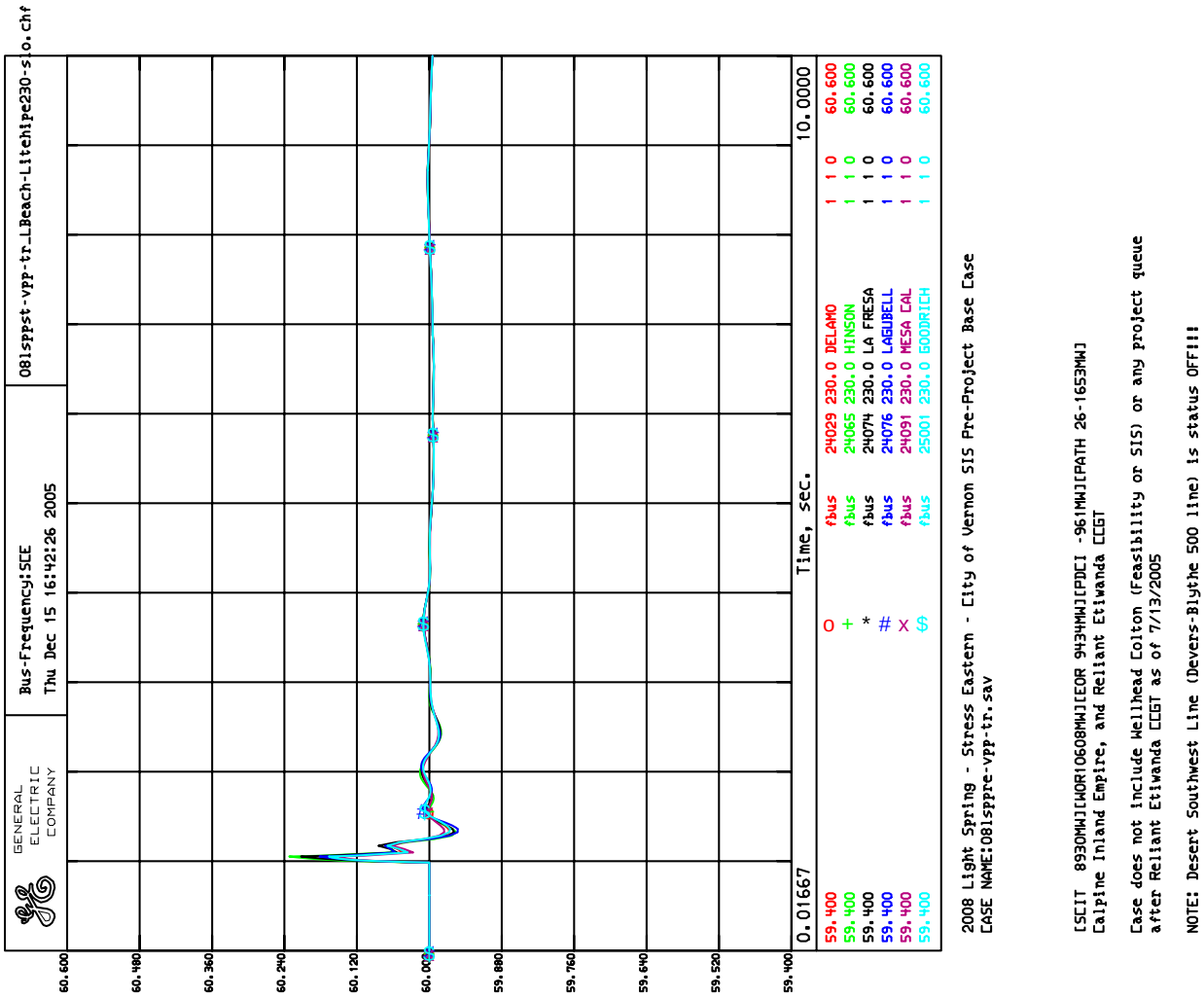
Plot 30 - 3: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



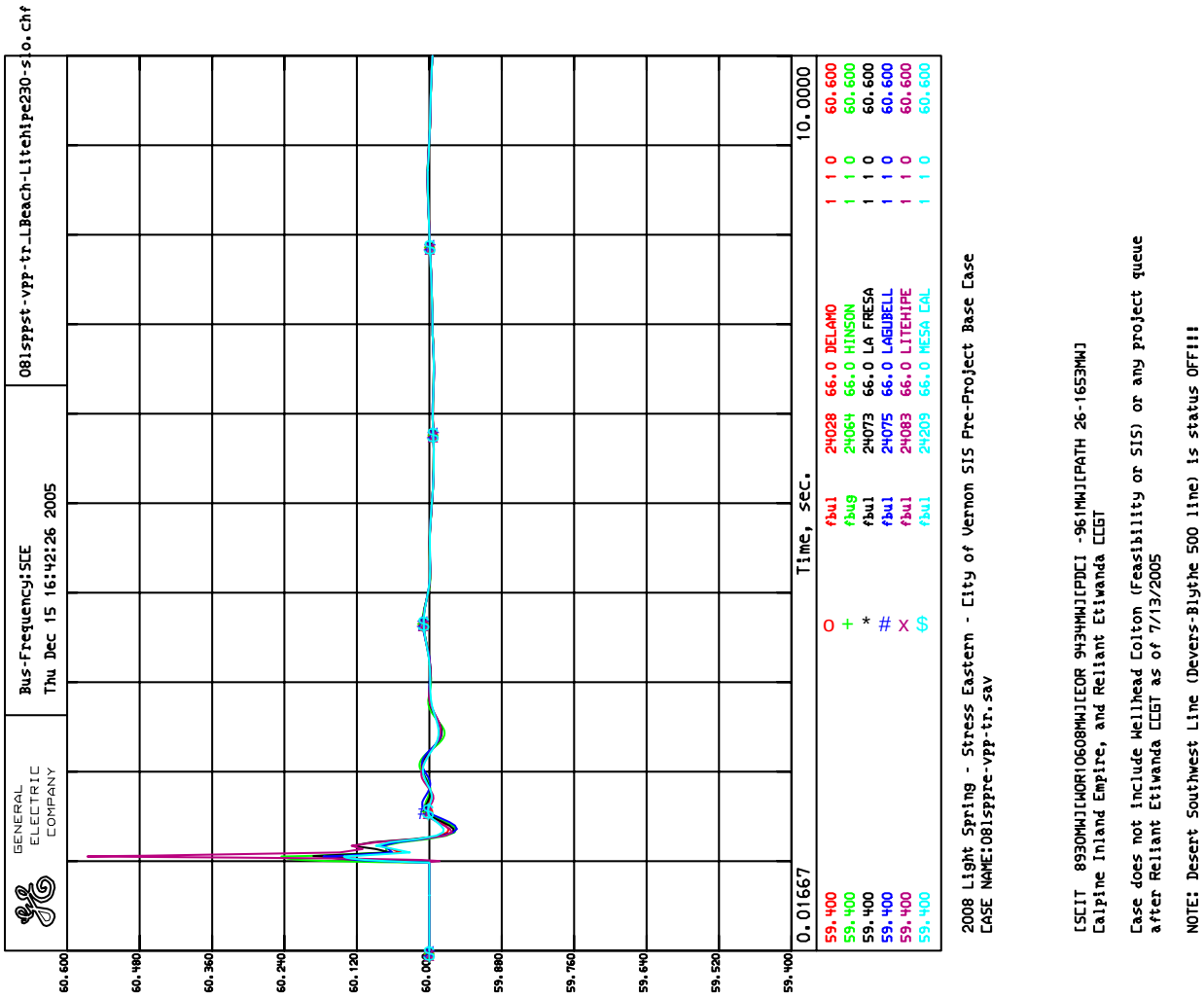
Plot 30 - 4: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



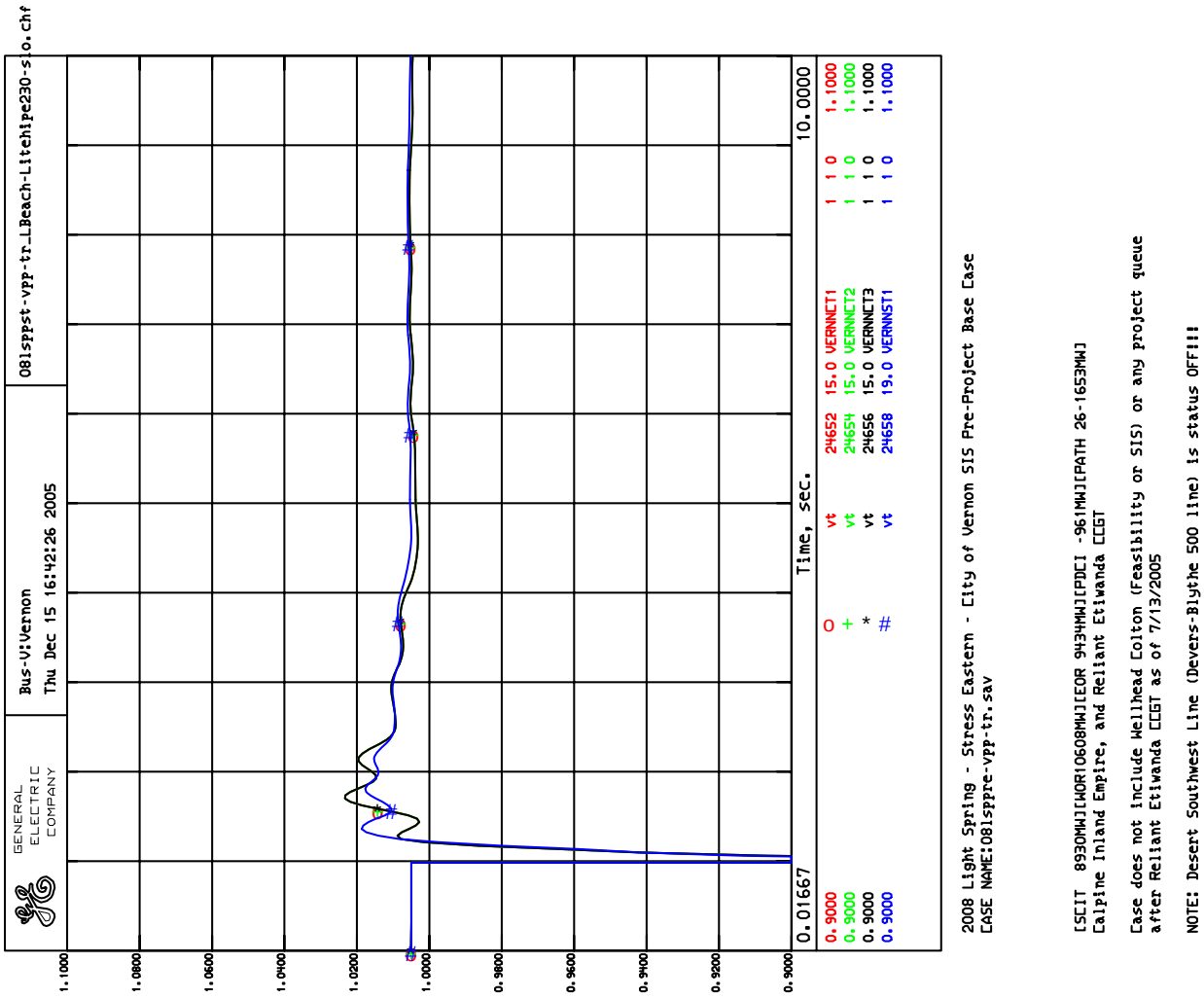
Plot 30 - 5: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



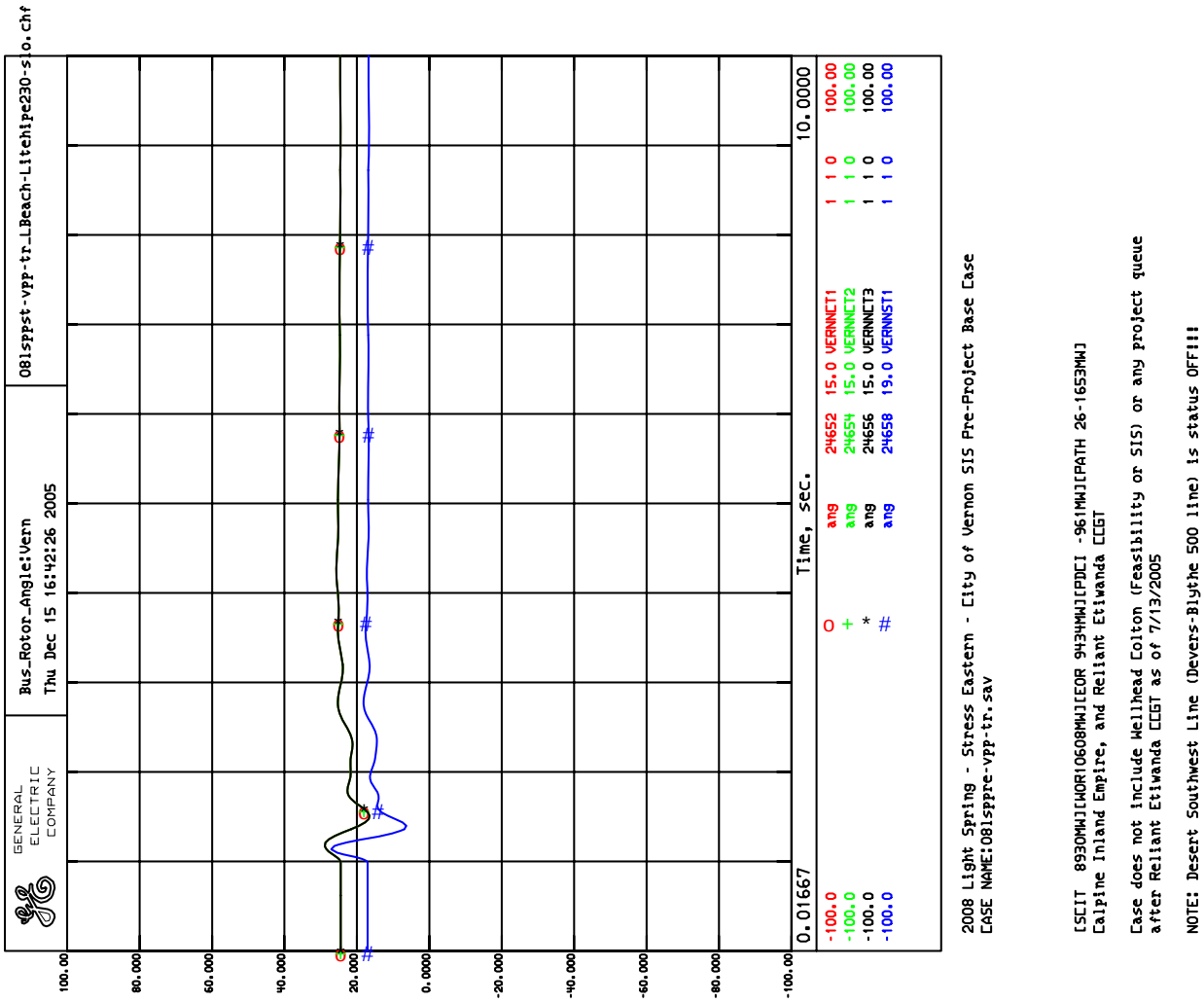
Plot 30 - 6: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



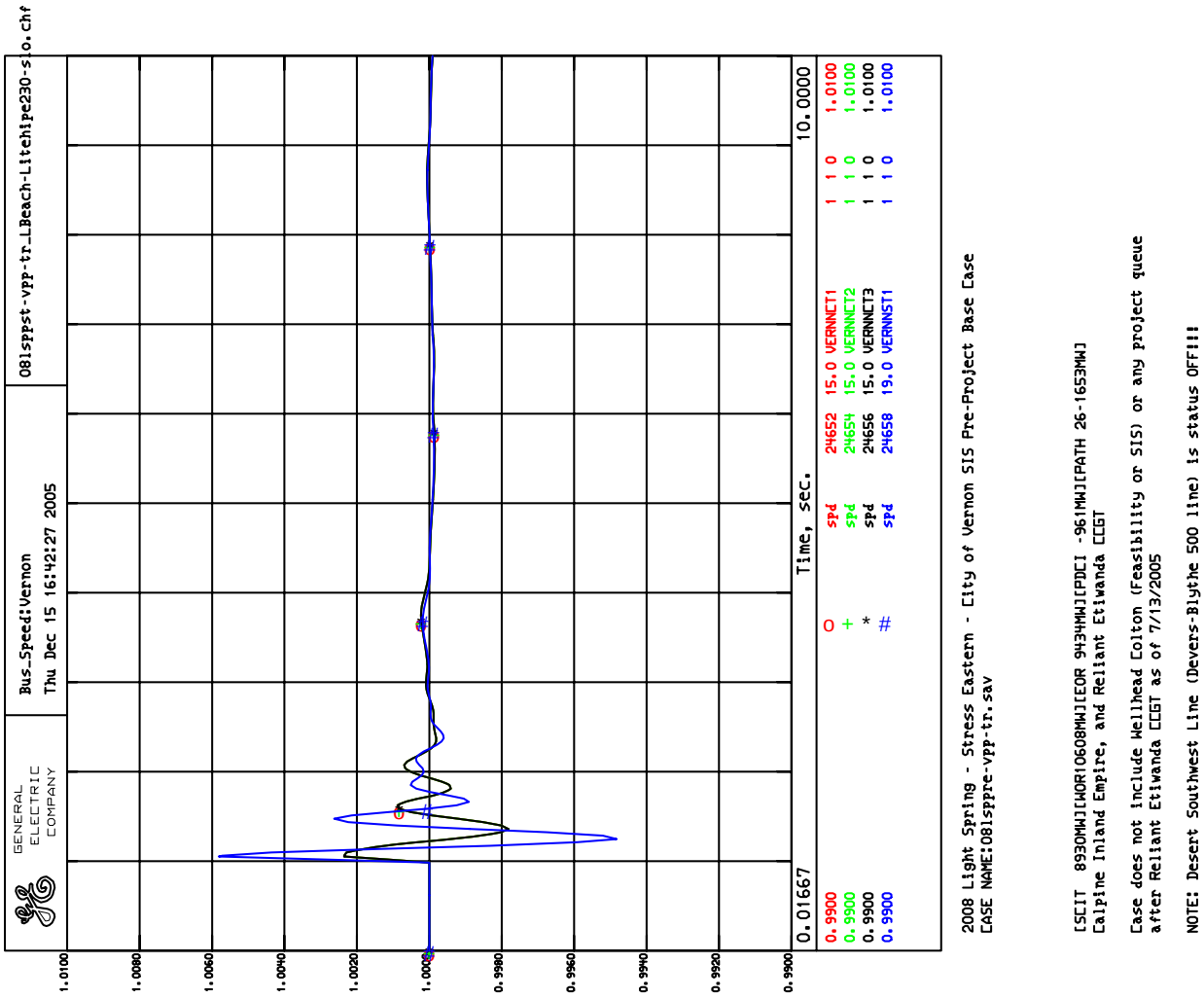
Plot 30 - 7: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



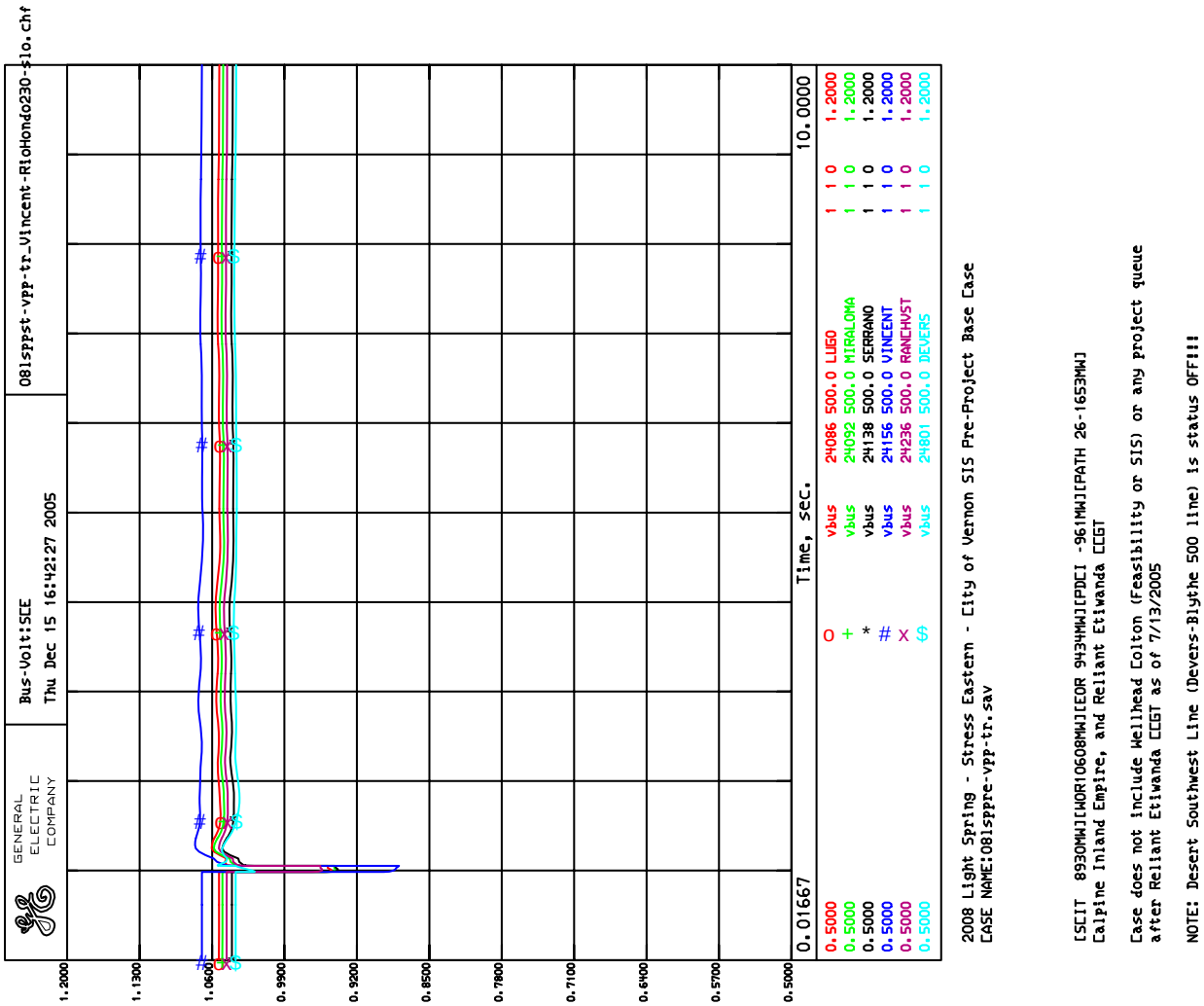
Plot 30 - 8: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



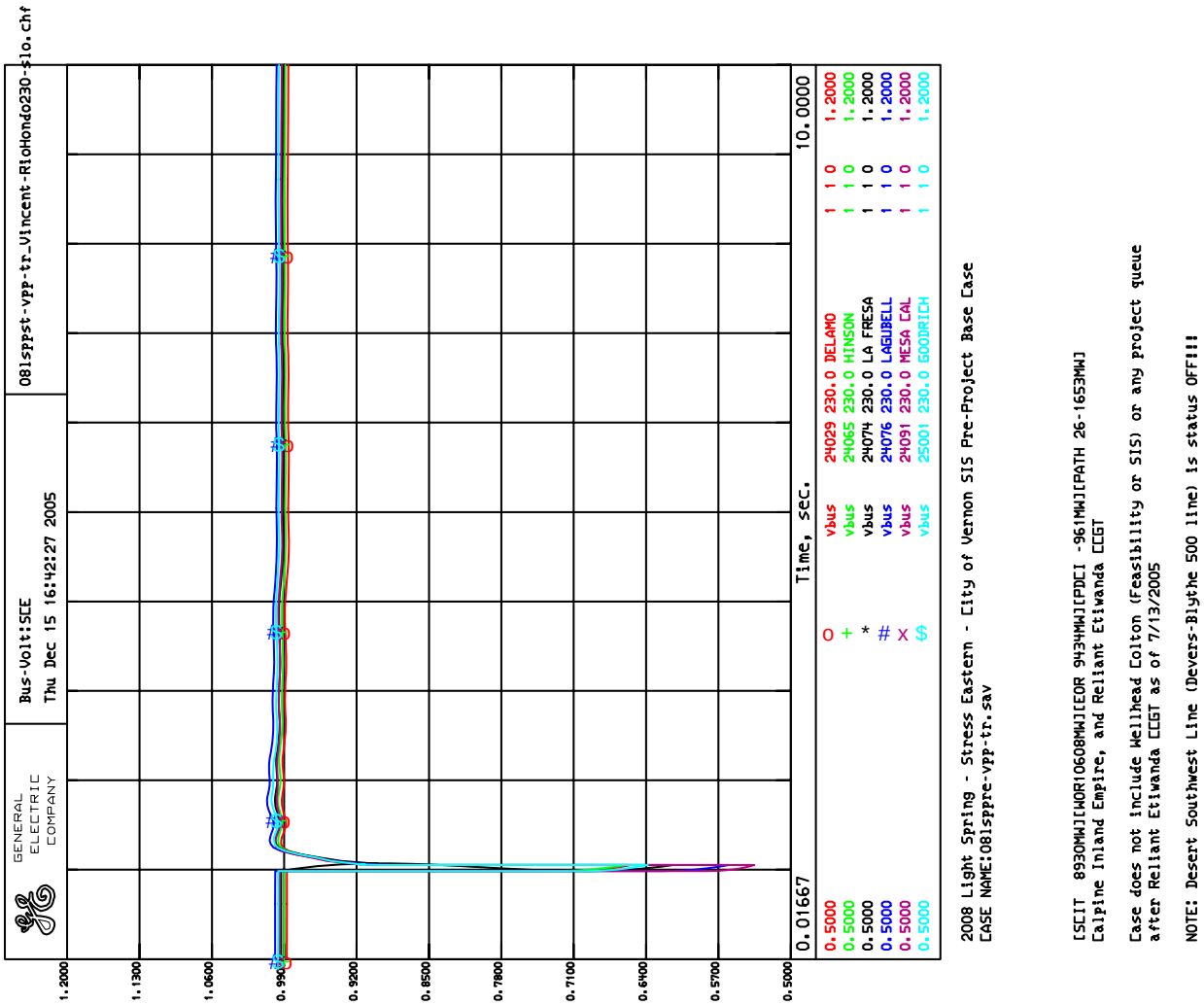
Plot 30 - 9: Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.



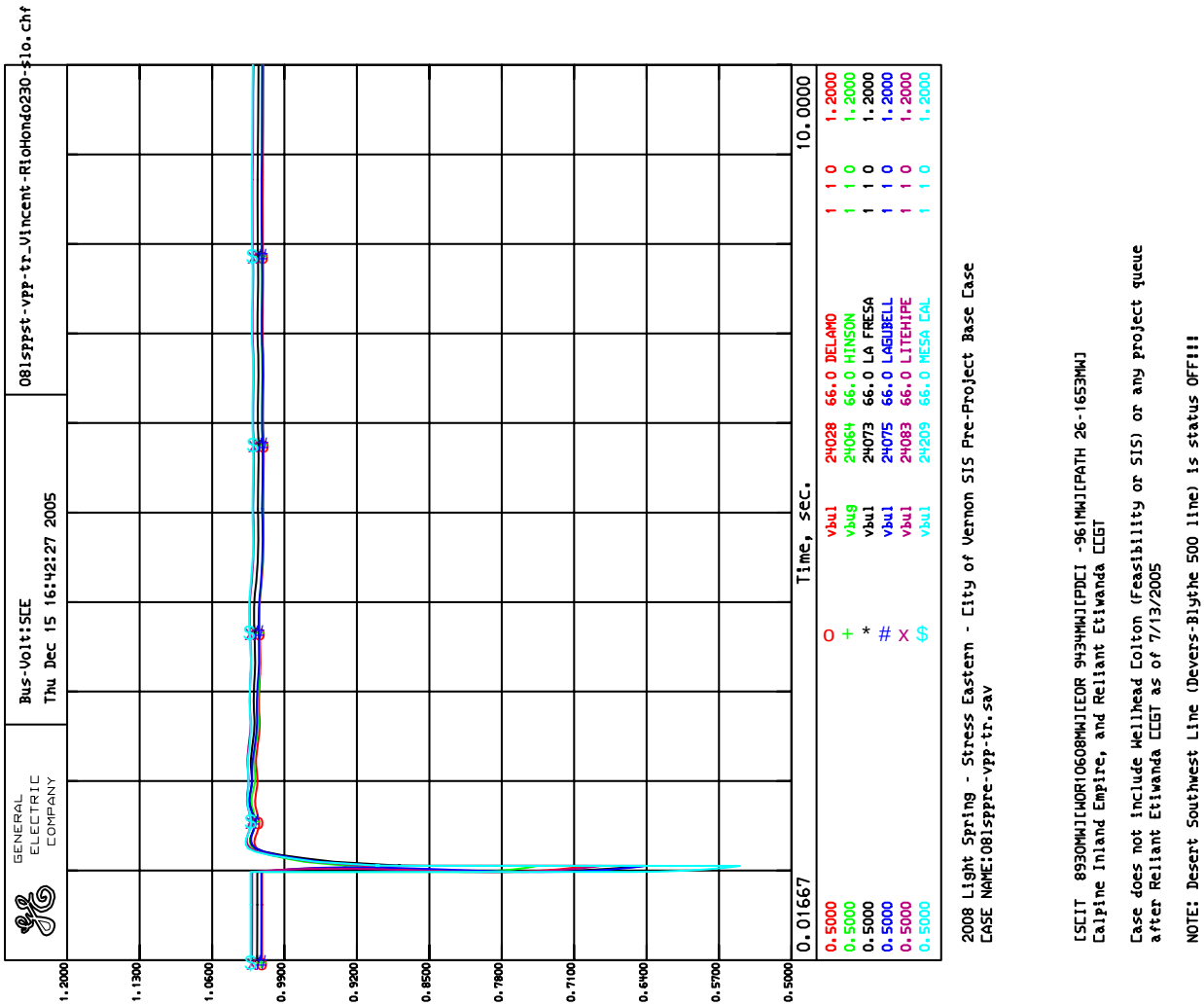
Plot 31 - 1: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



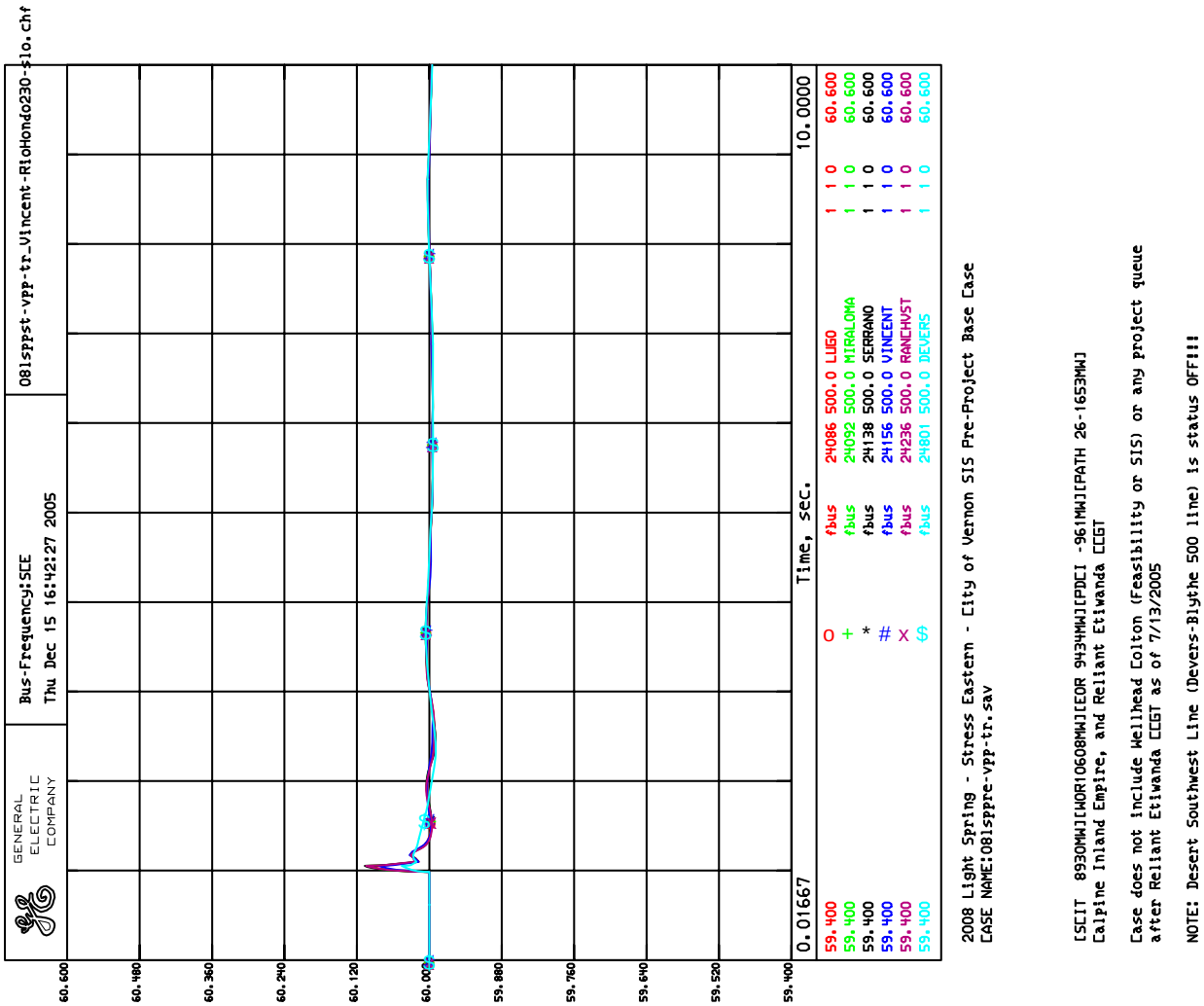
Plot 31 - 2: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



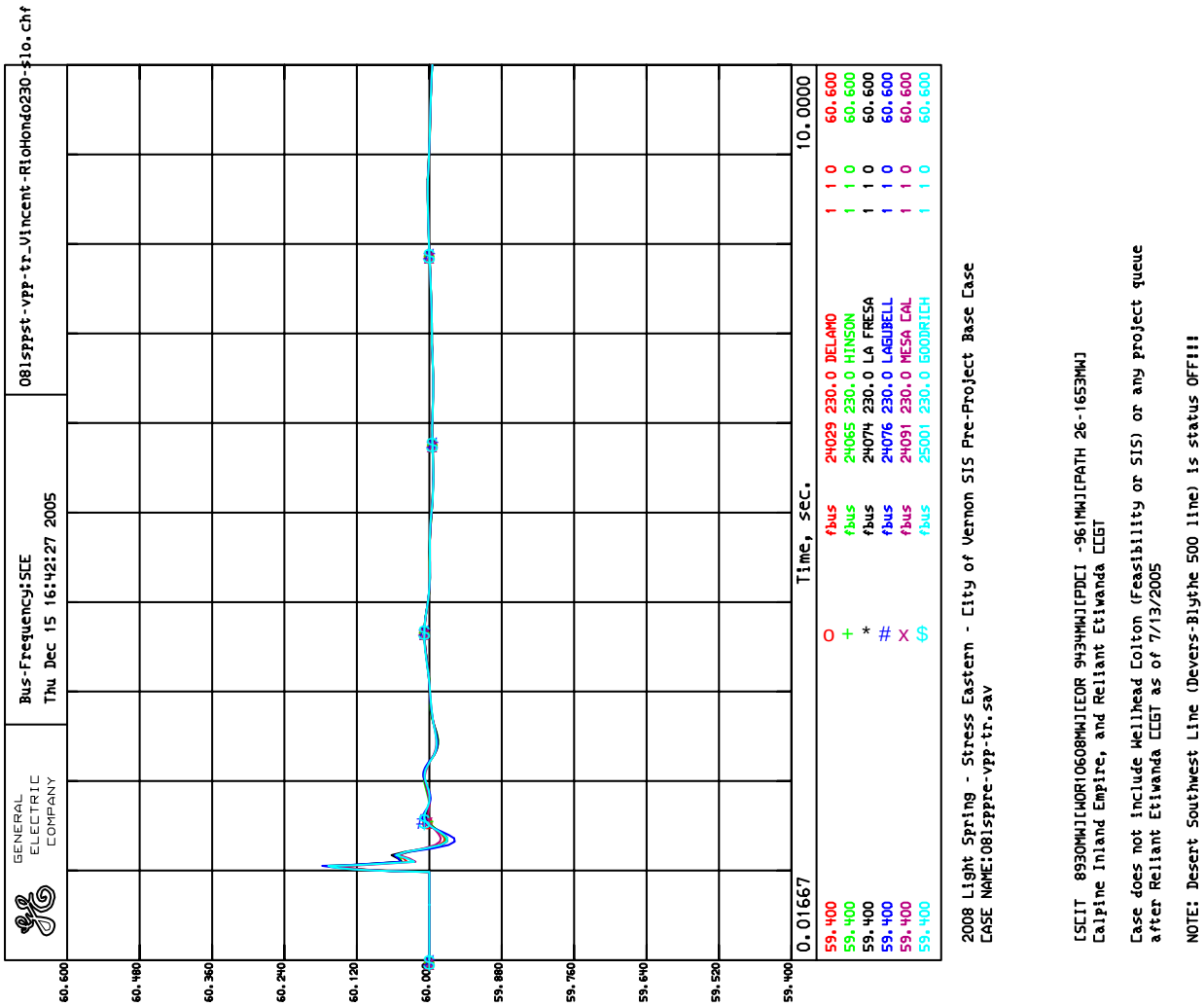
Plot 31 - 3: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



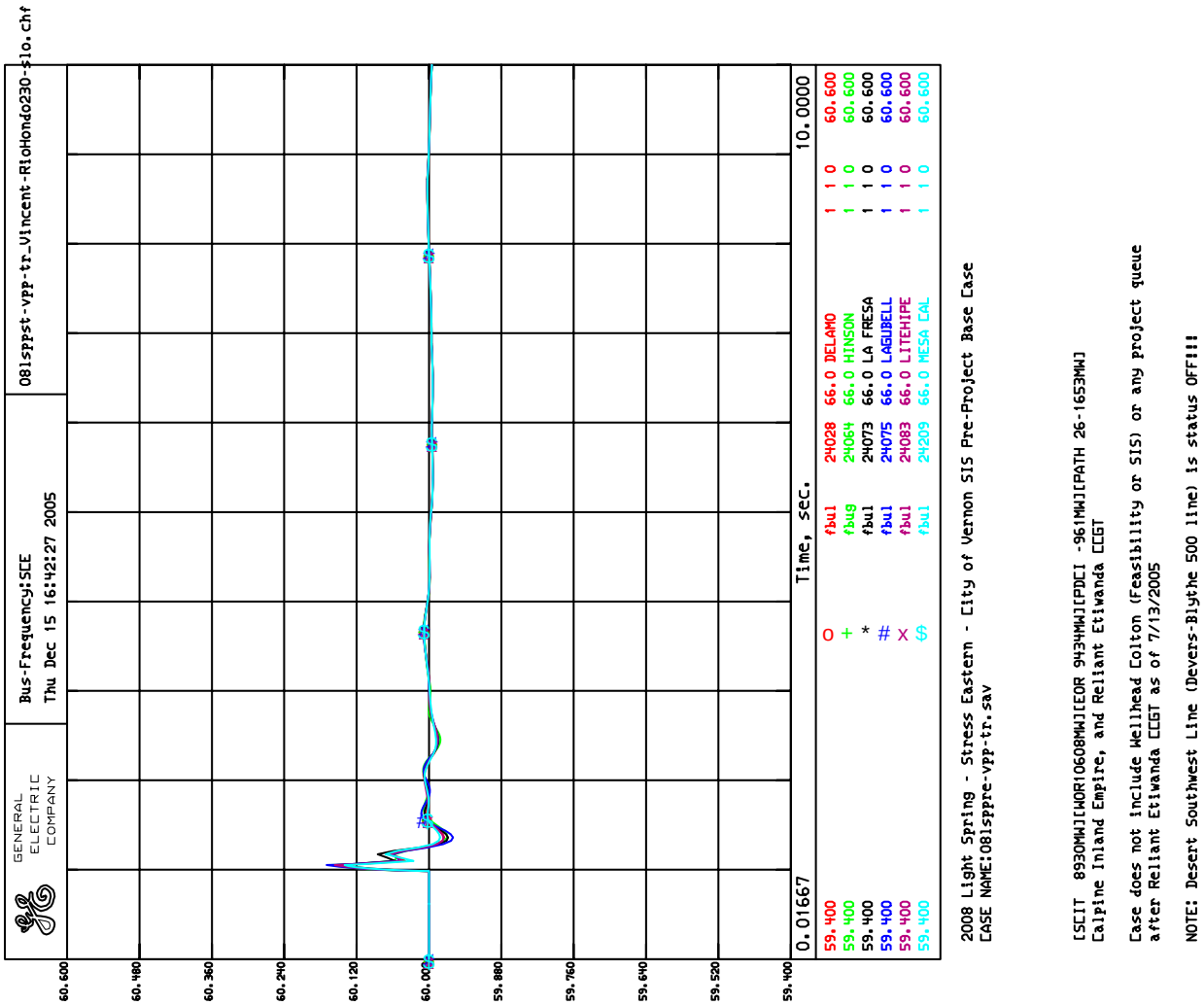
Plot 31 - 4: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



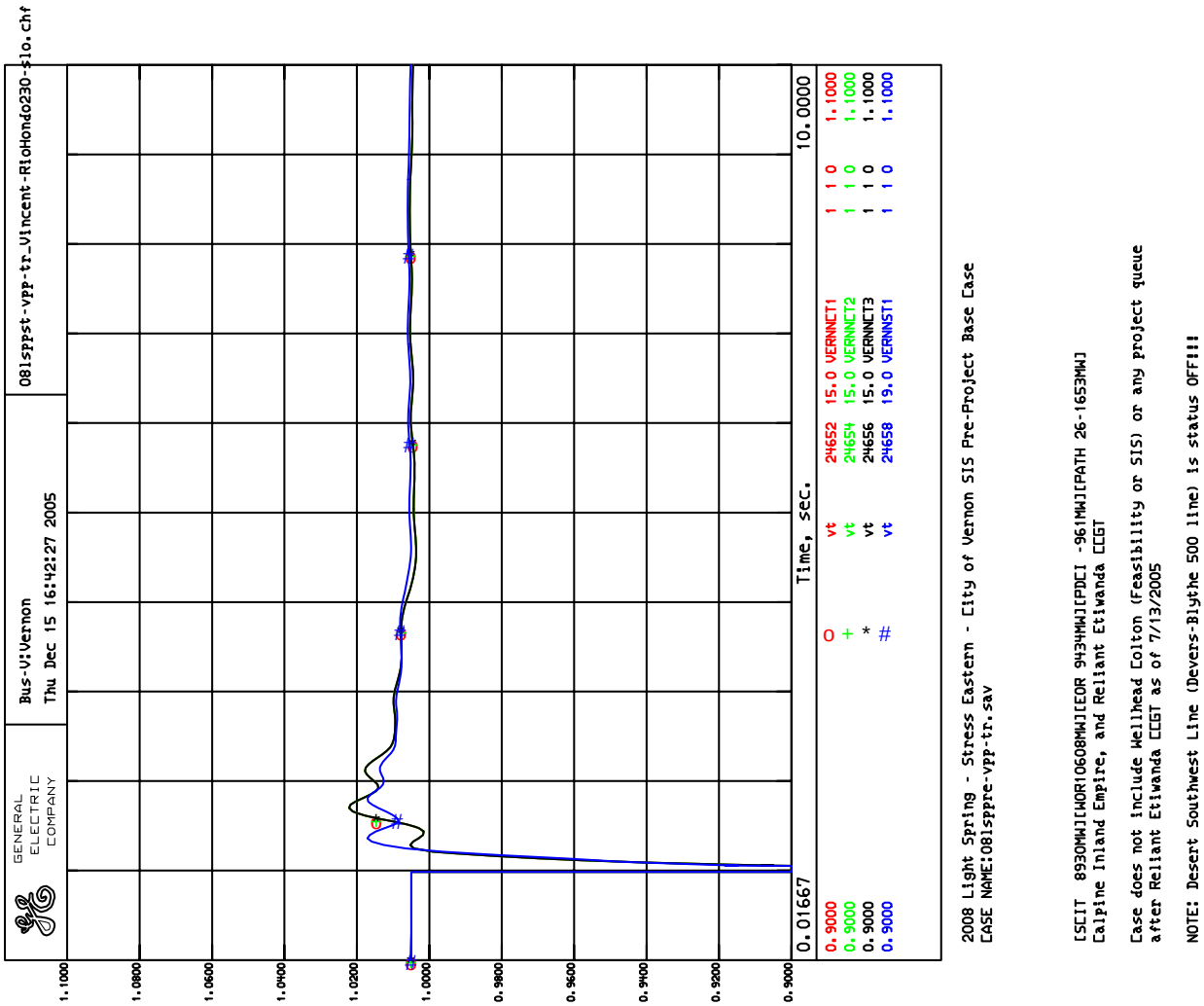
Plot 31 - 5: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



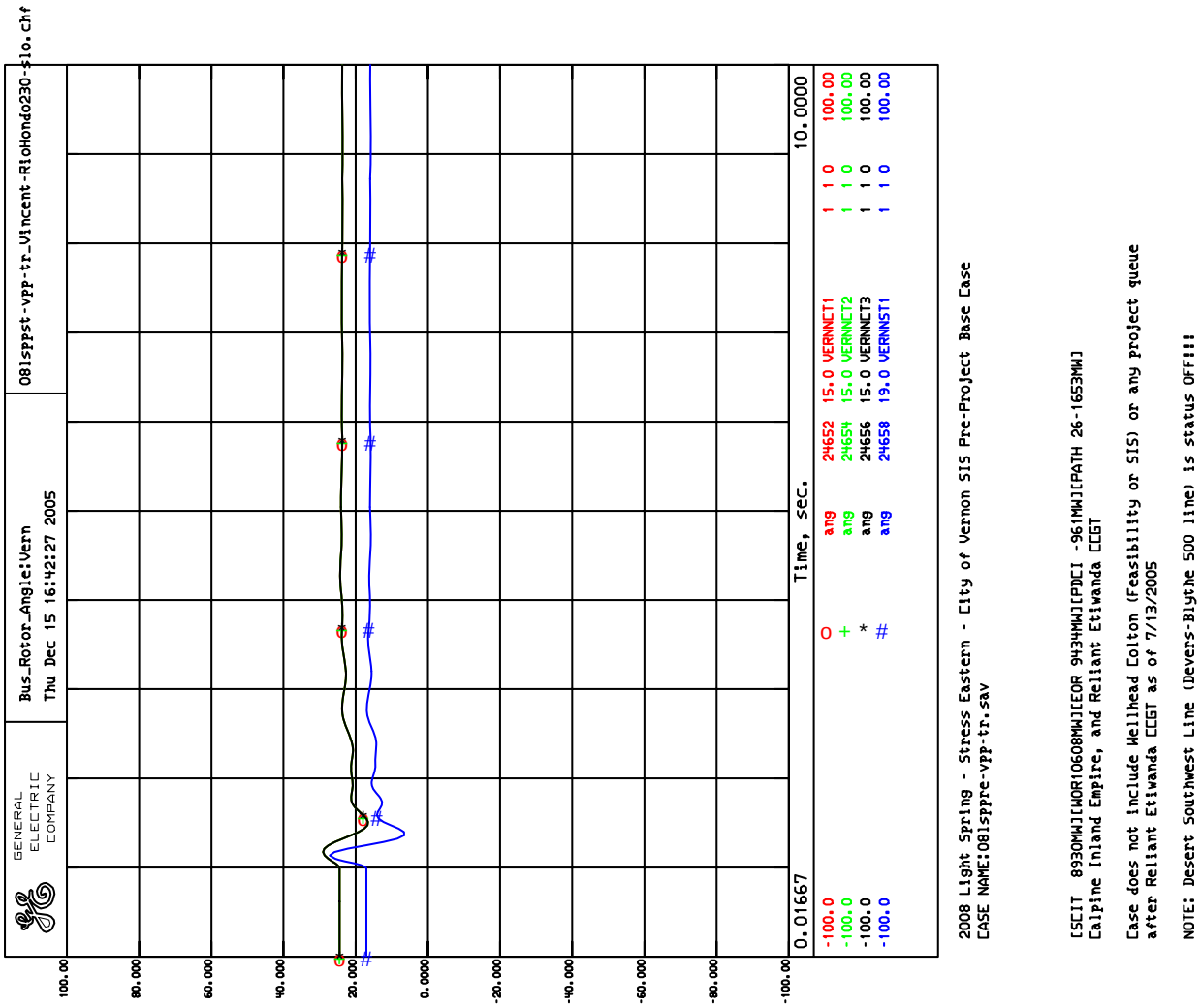
Plot 31 - 6: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



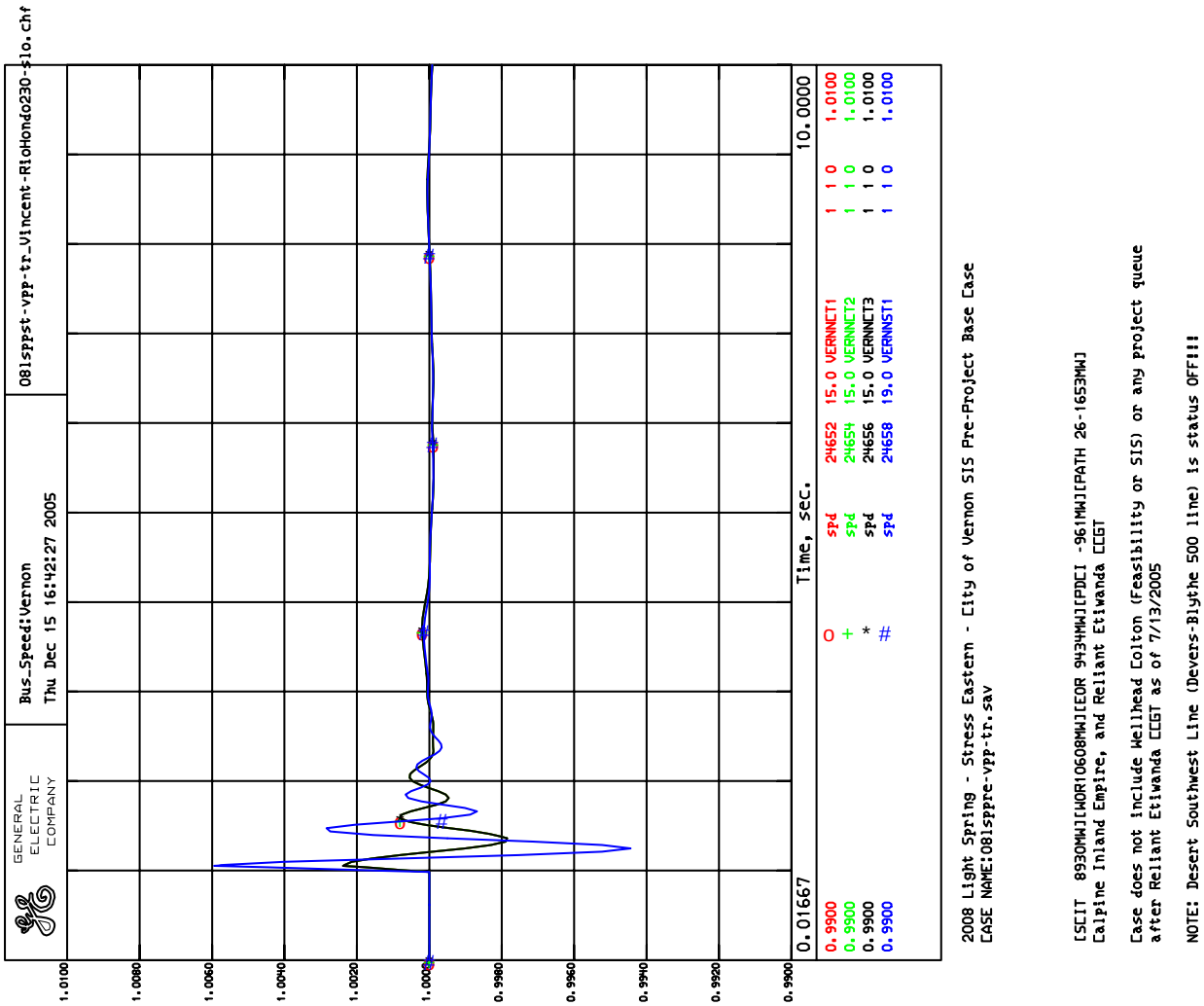
Plot 31 - 7: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



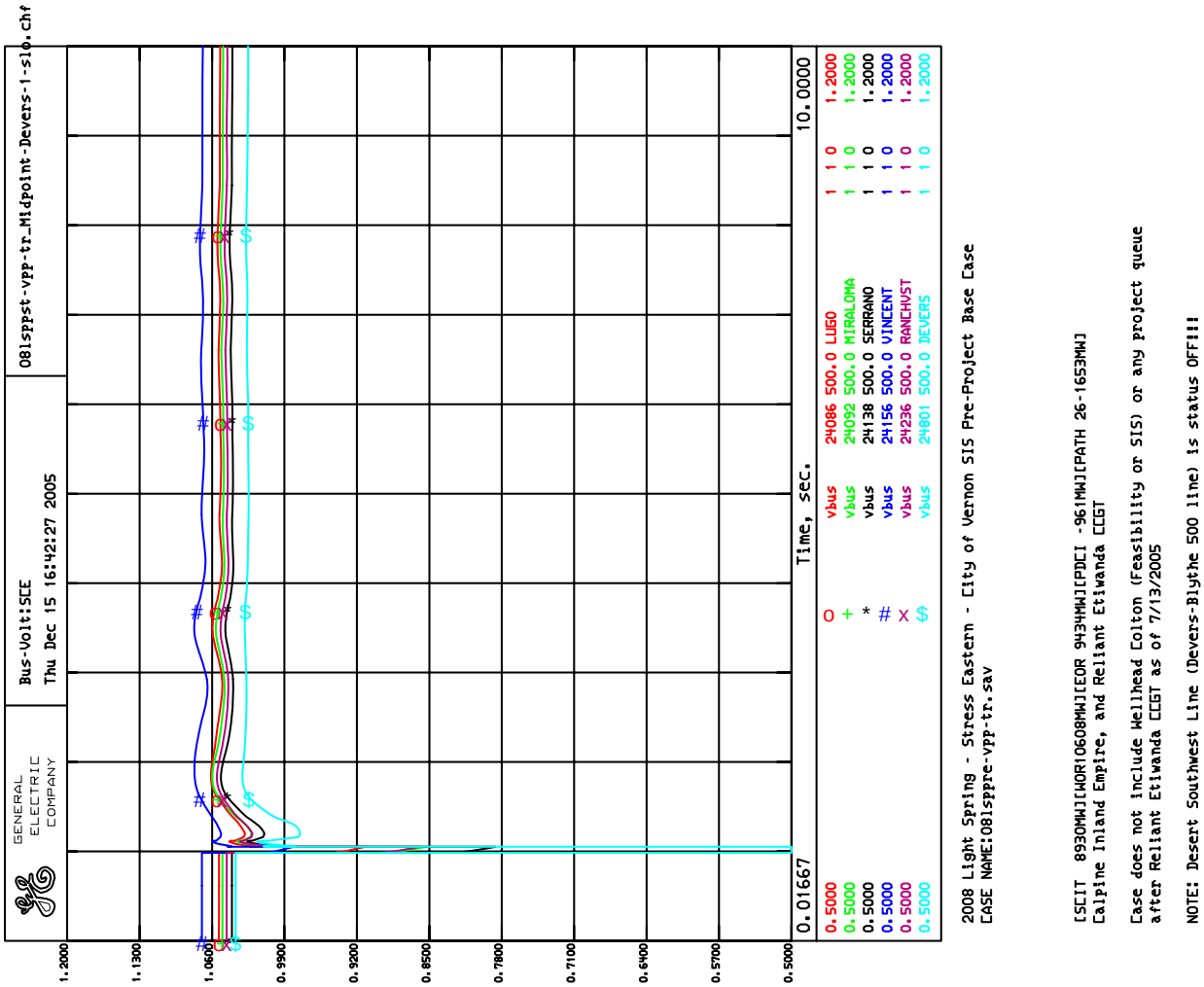
Plot 31 - 8: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



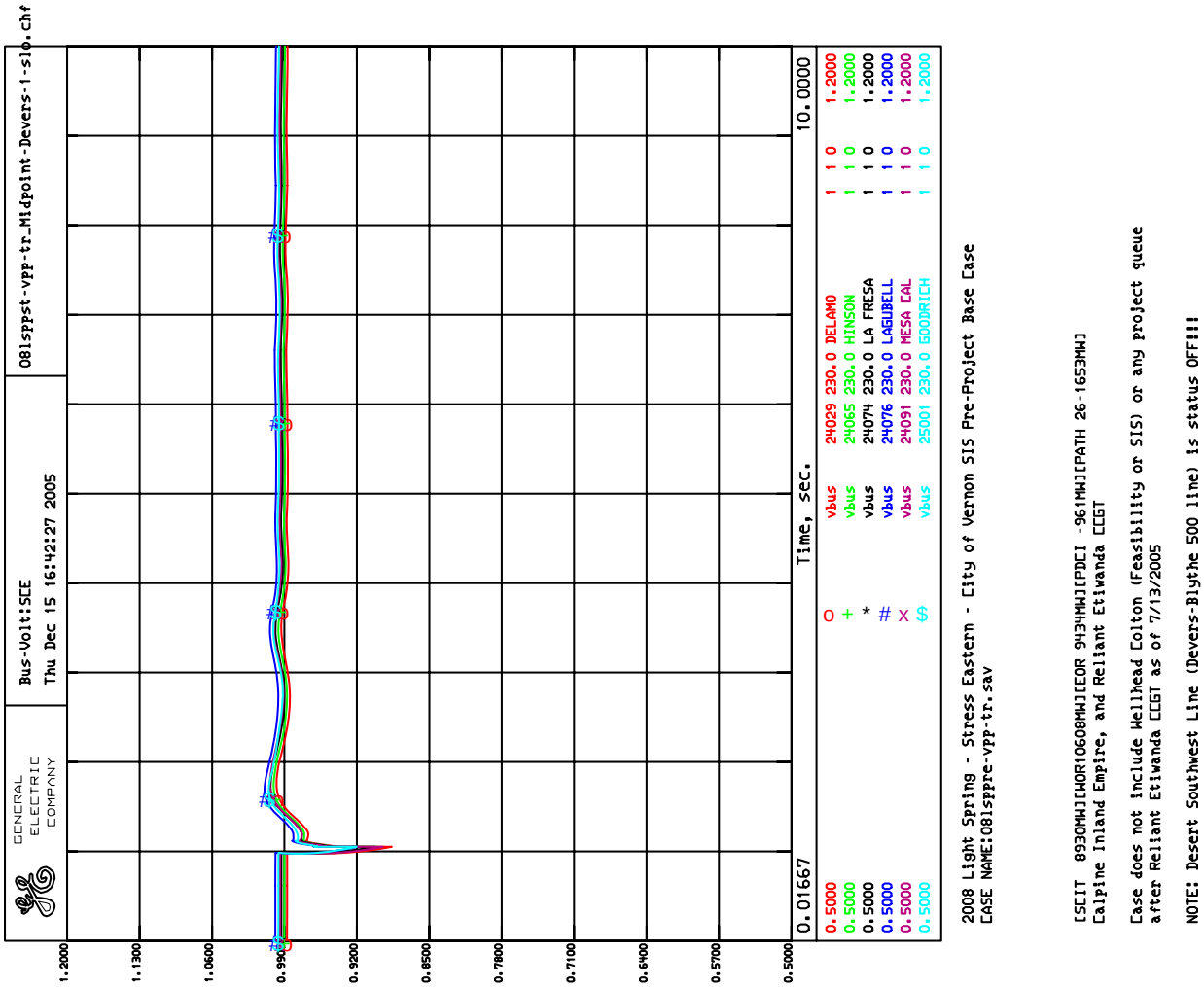
Plot 31 - 9: Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.



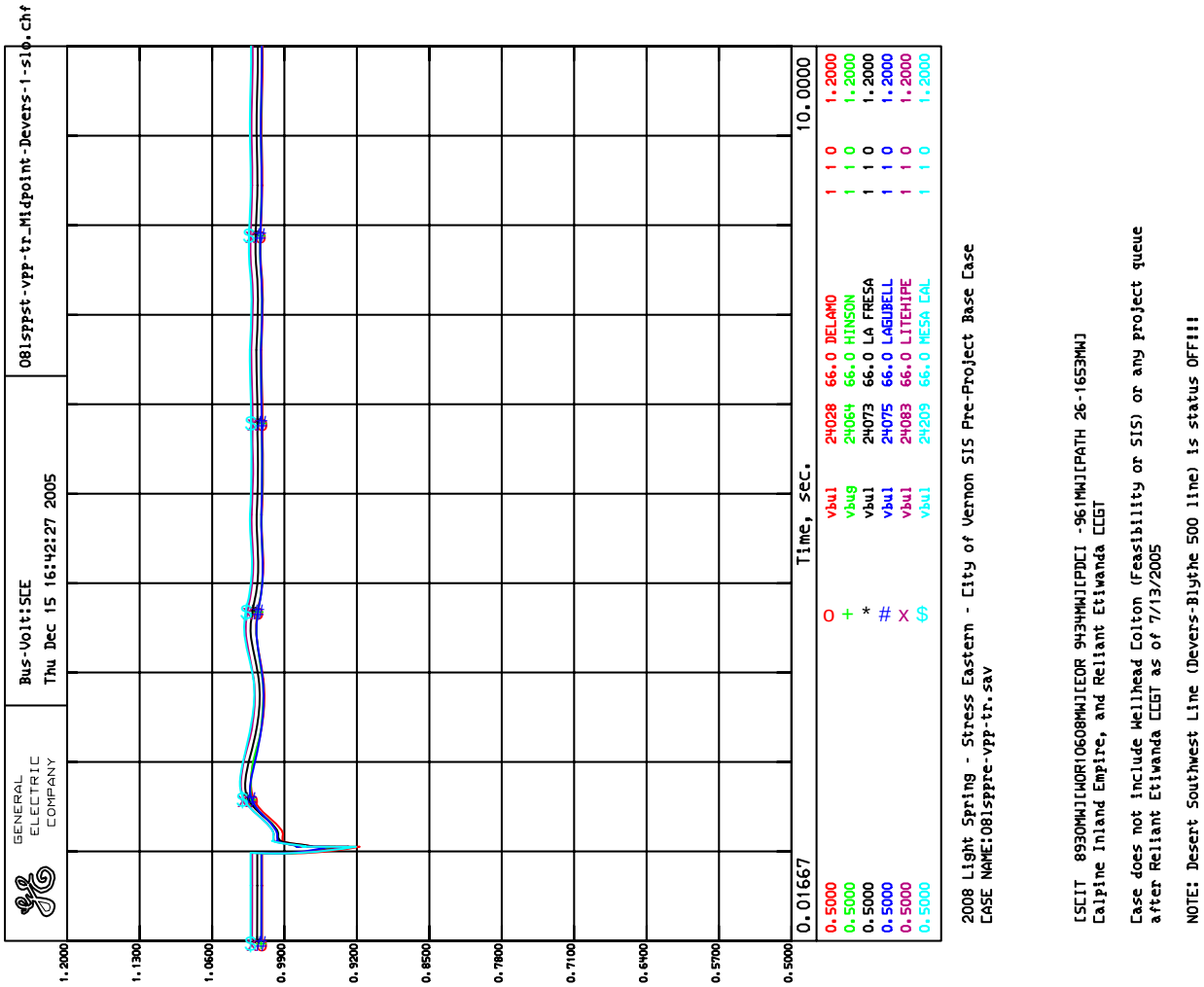
Plot 32 - 1: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



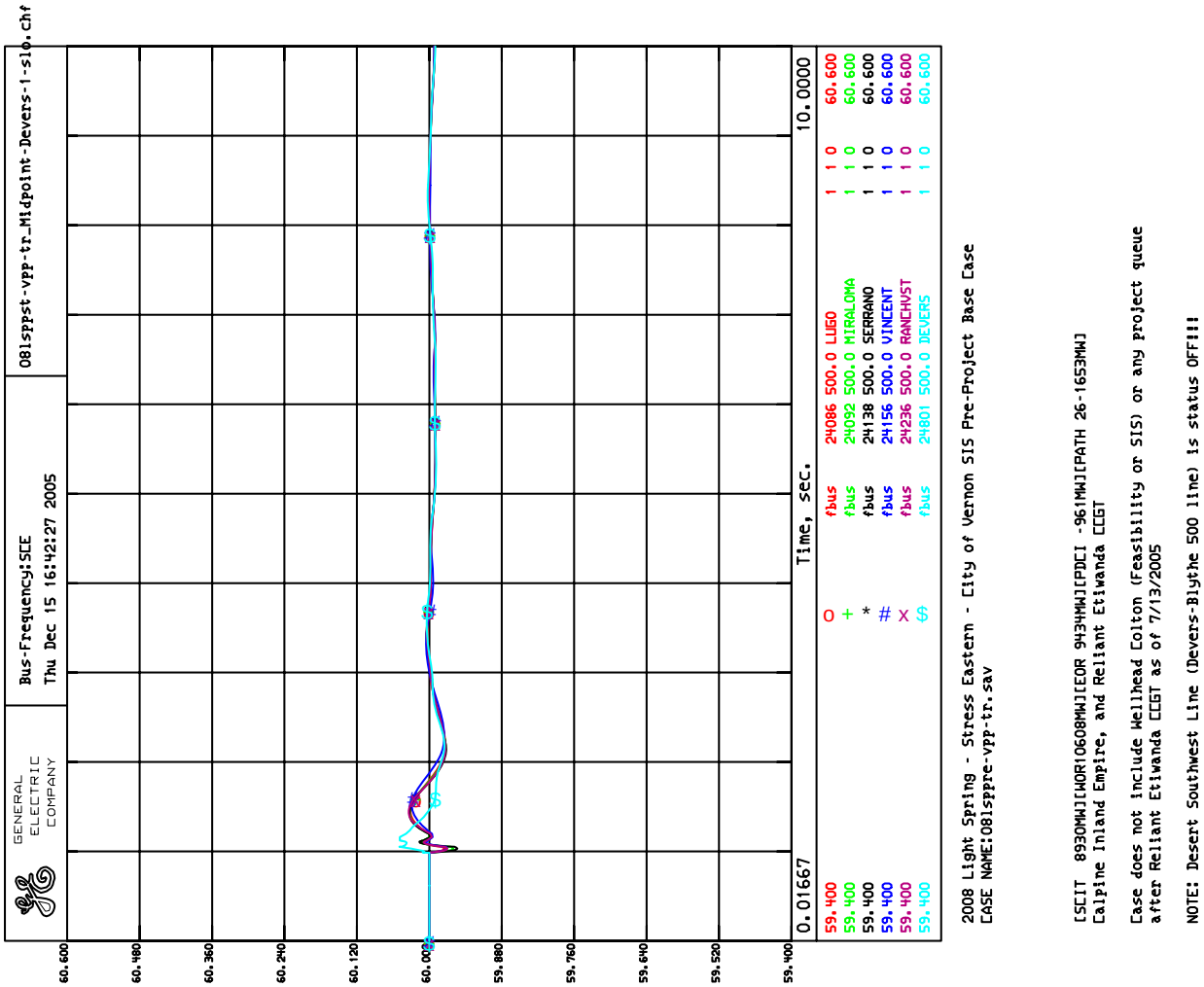
Plot 32 - 2: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



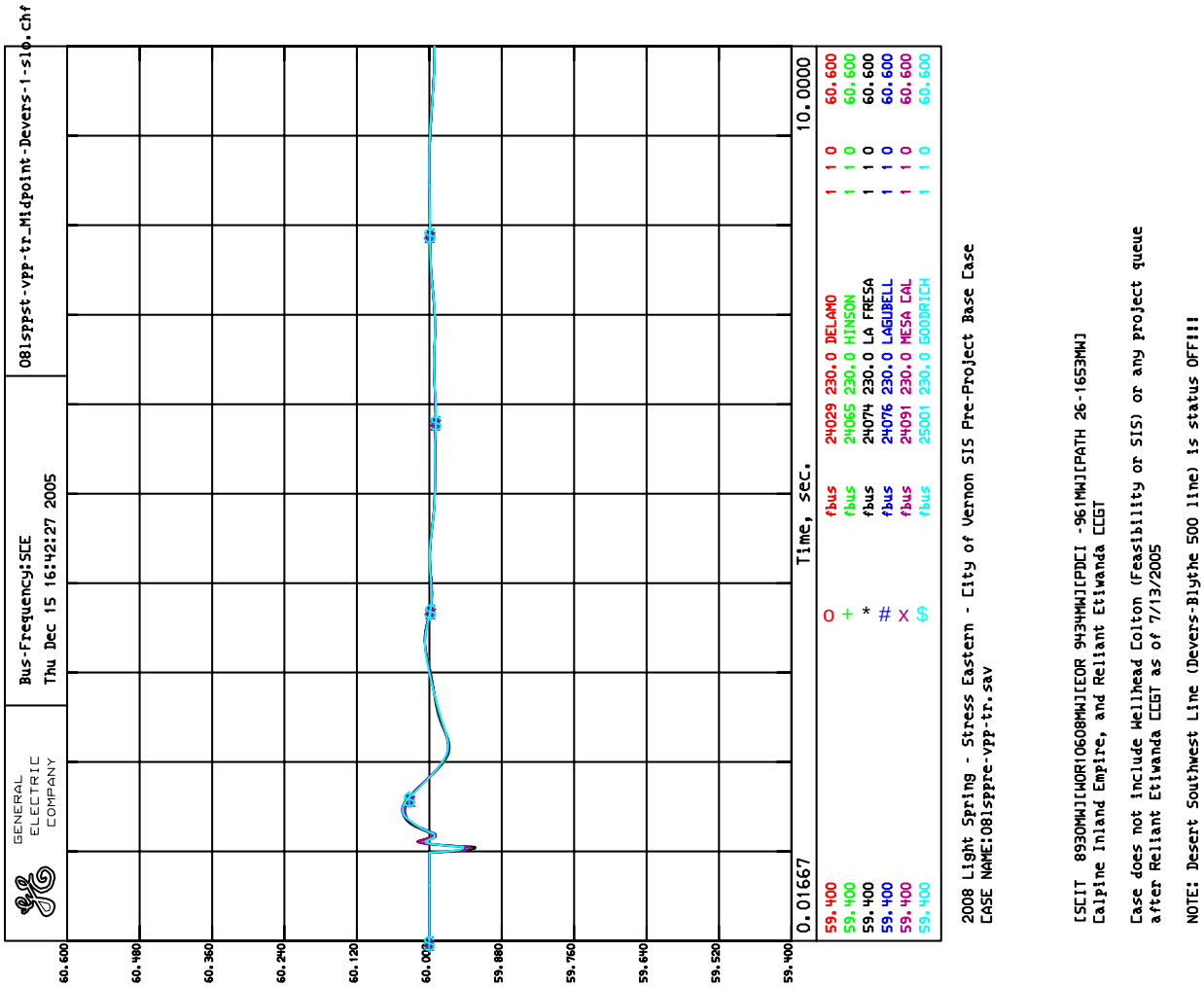
Plot 32 - 3: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



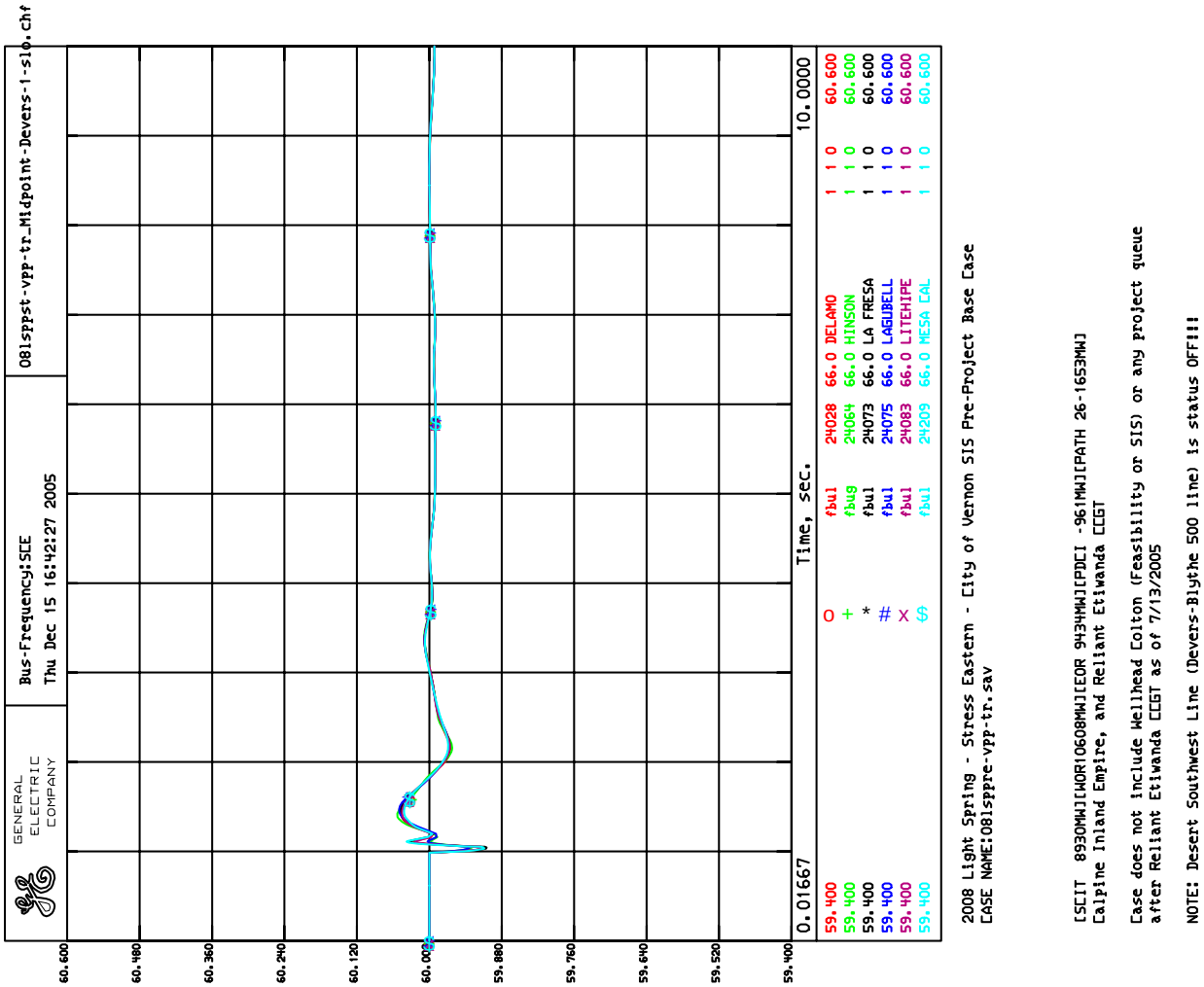
Plot 32 - 4: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



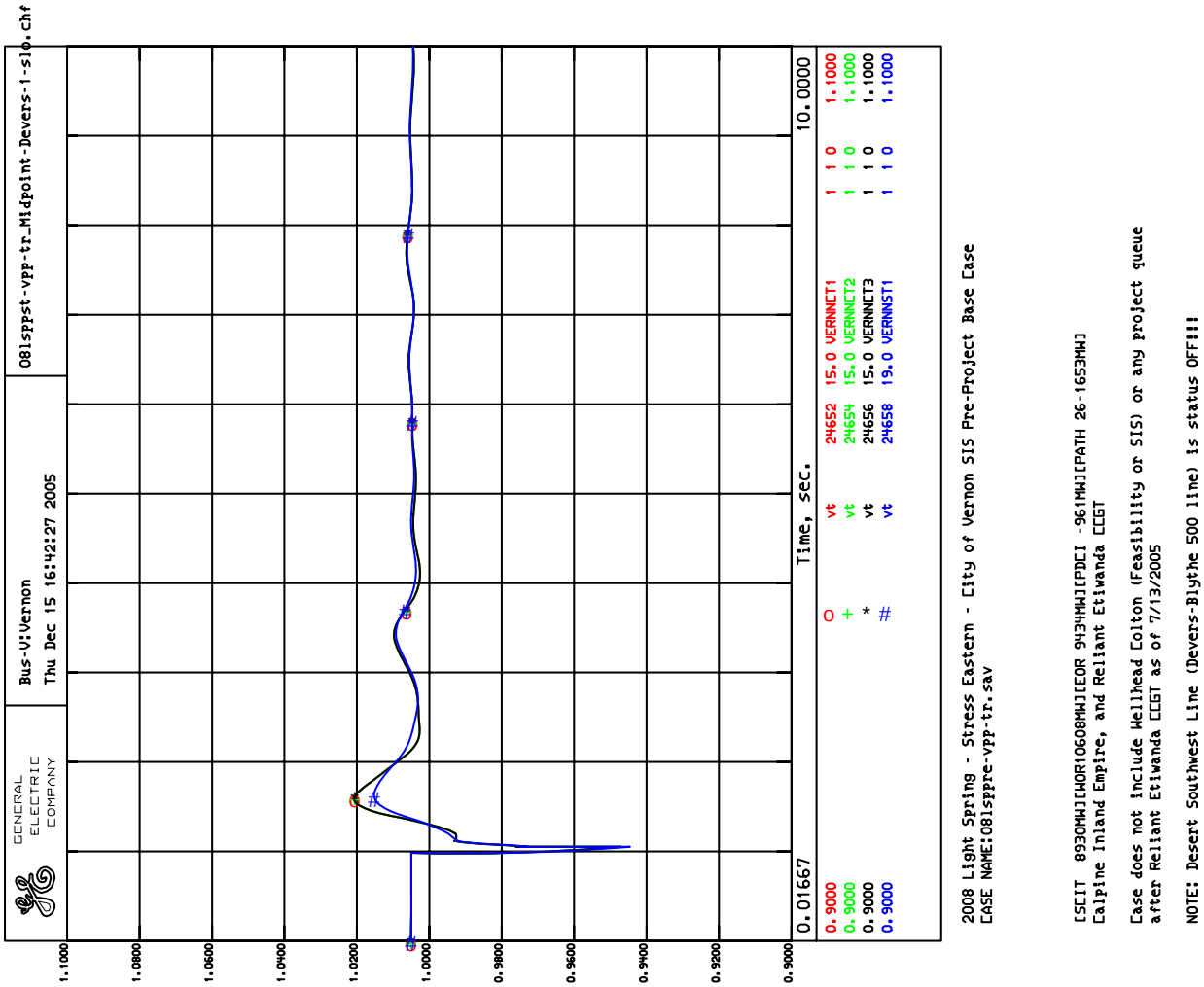
Plot 32 - 5: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



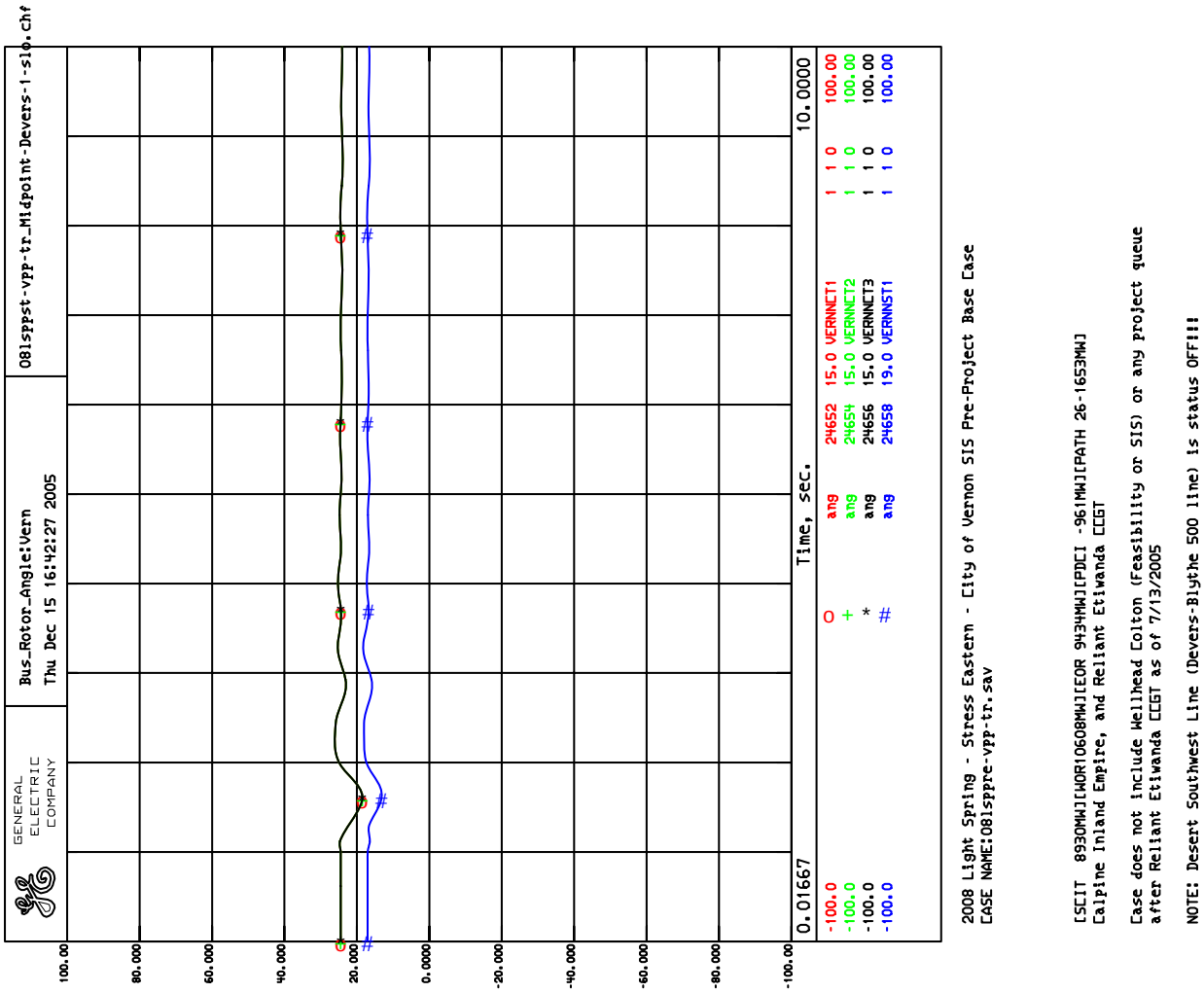
Plot 32 - 6: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



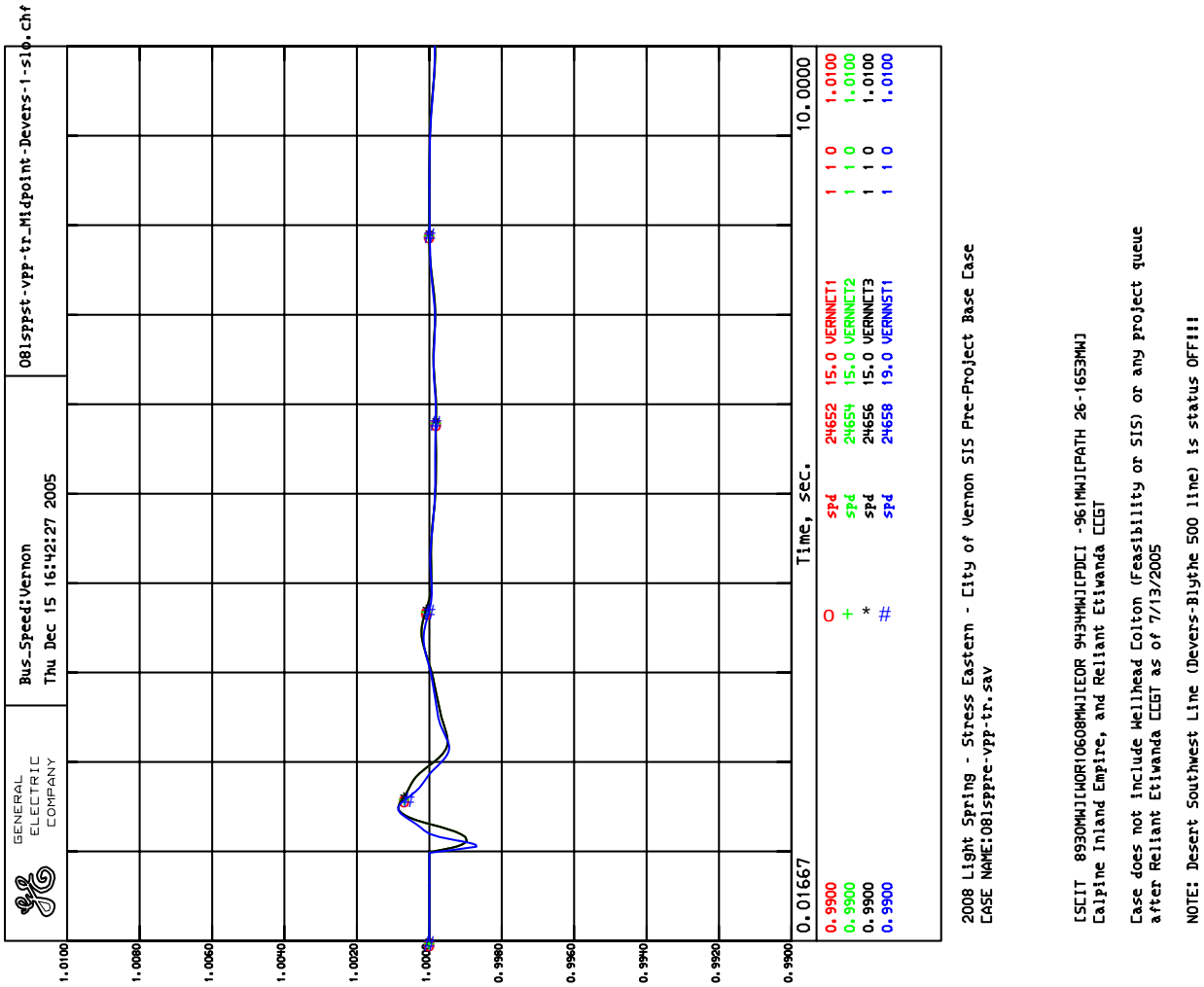
Plot 32 - 7: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



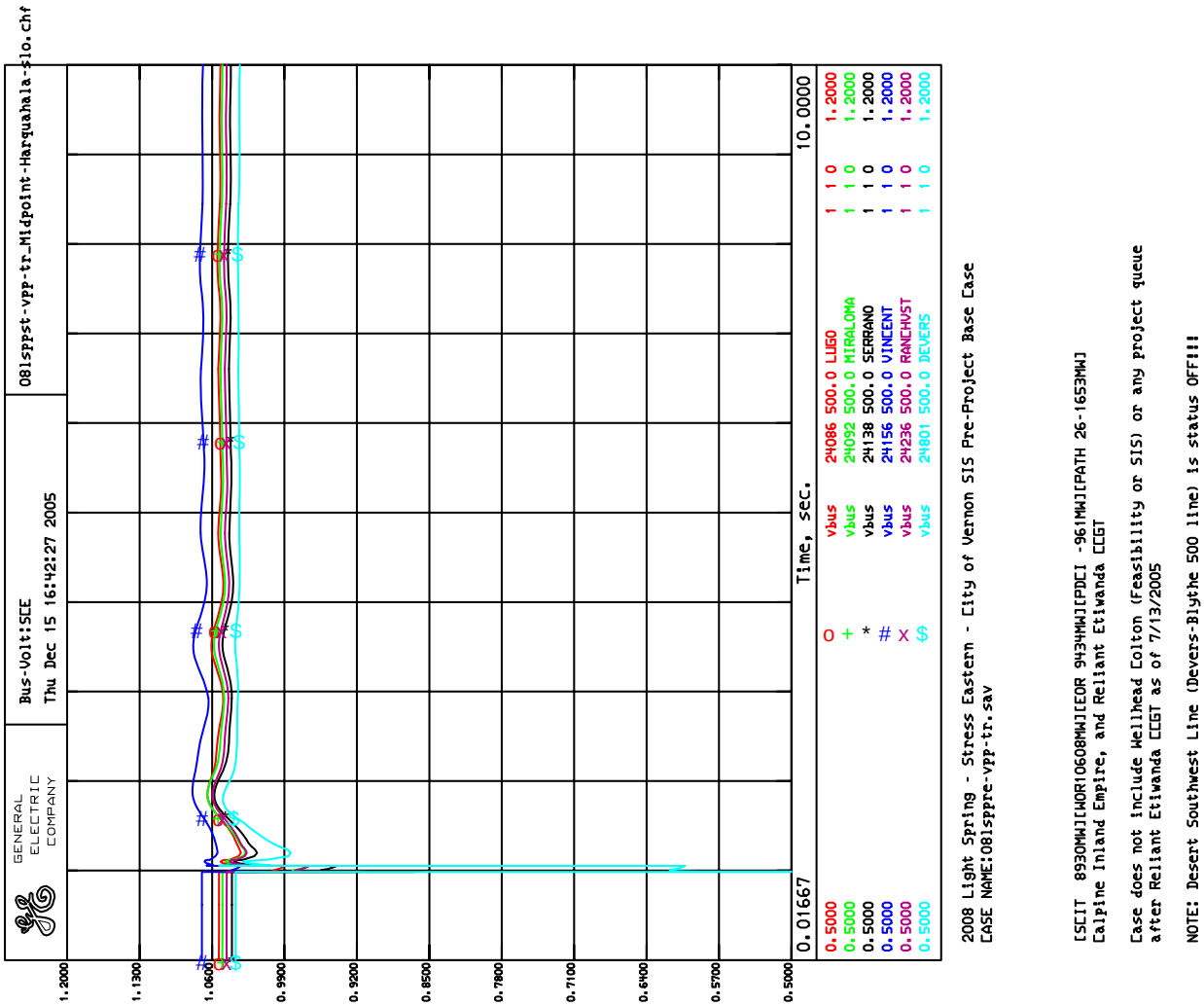
Plot 32 - 8: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



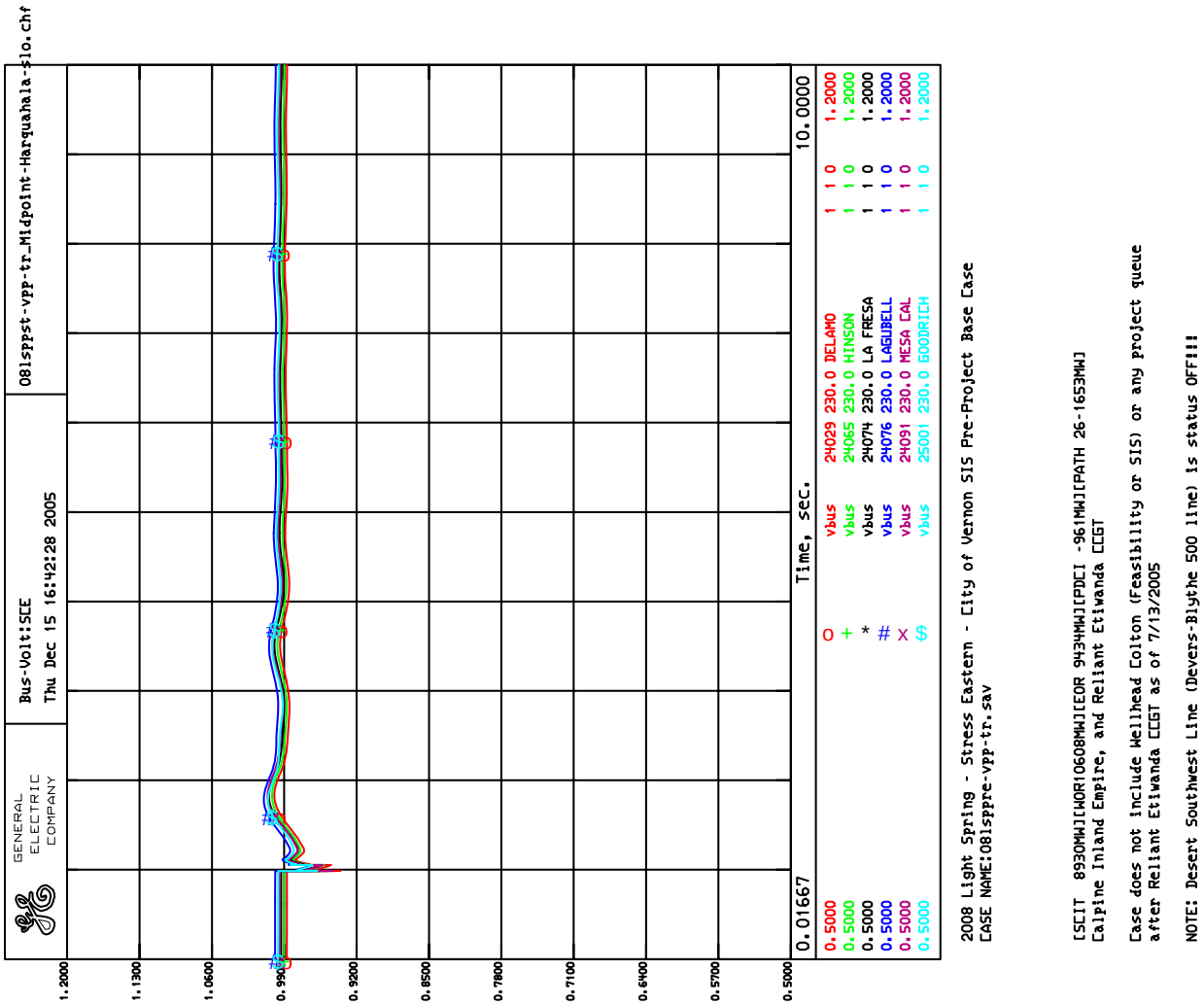
Plot 32 - 9: Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.



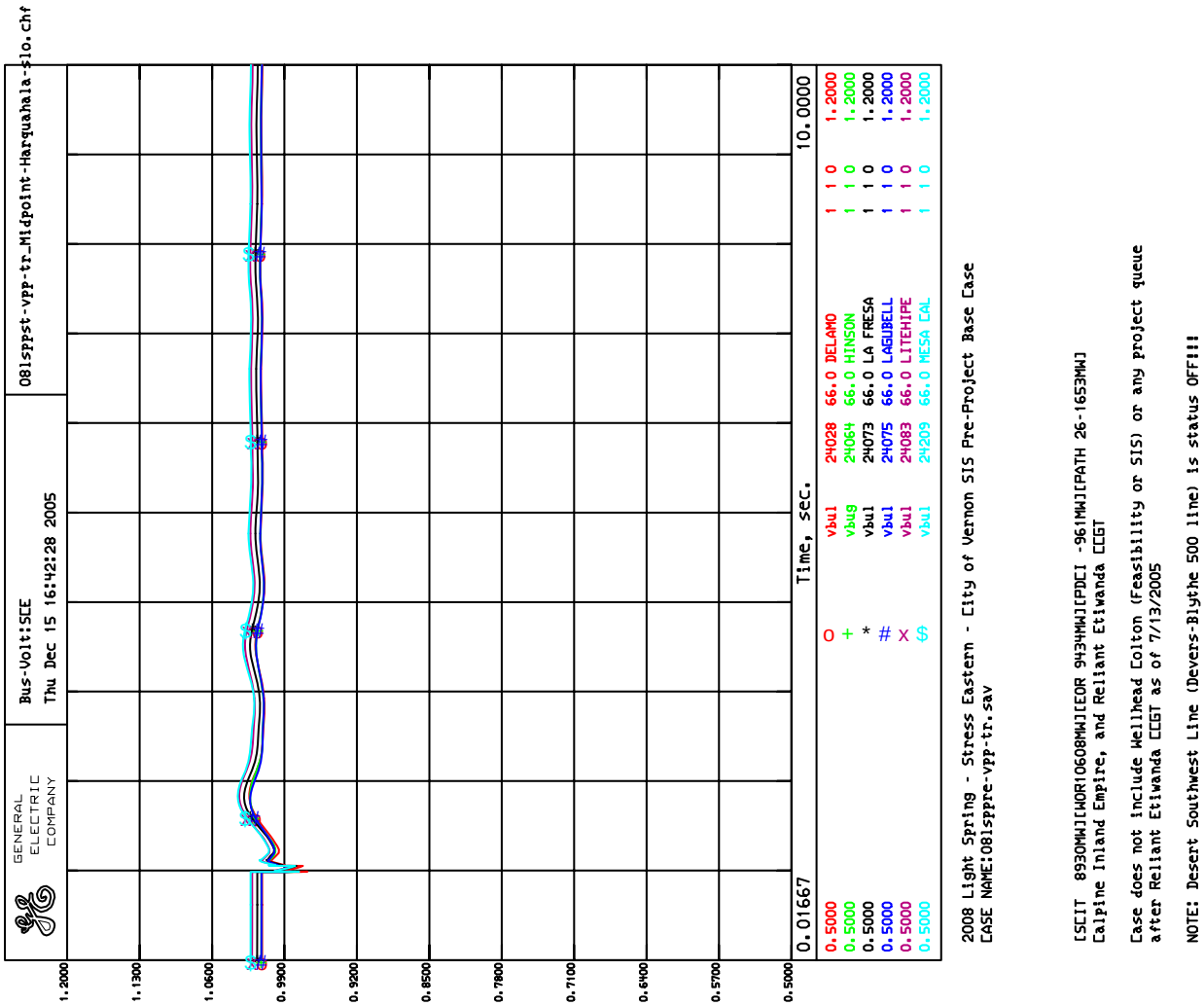
Plot 33 - 1: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



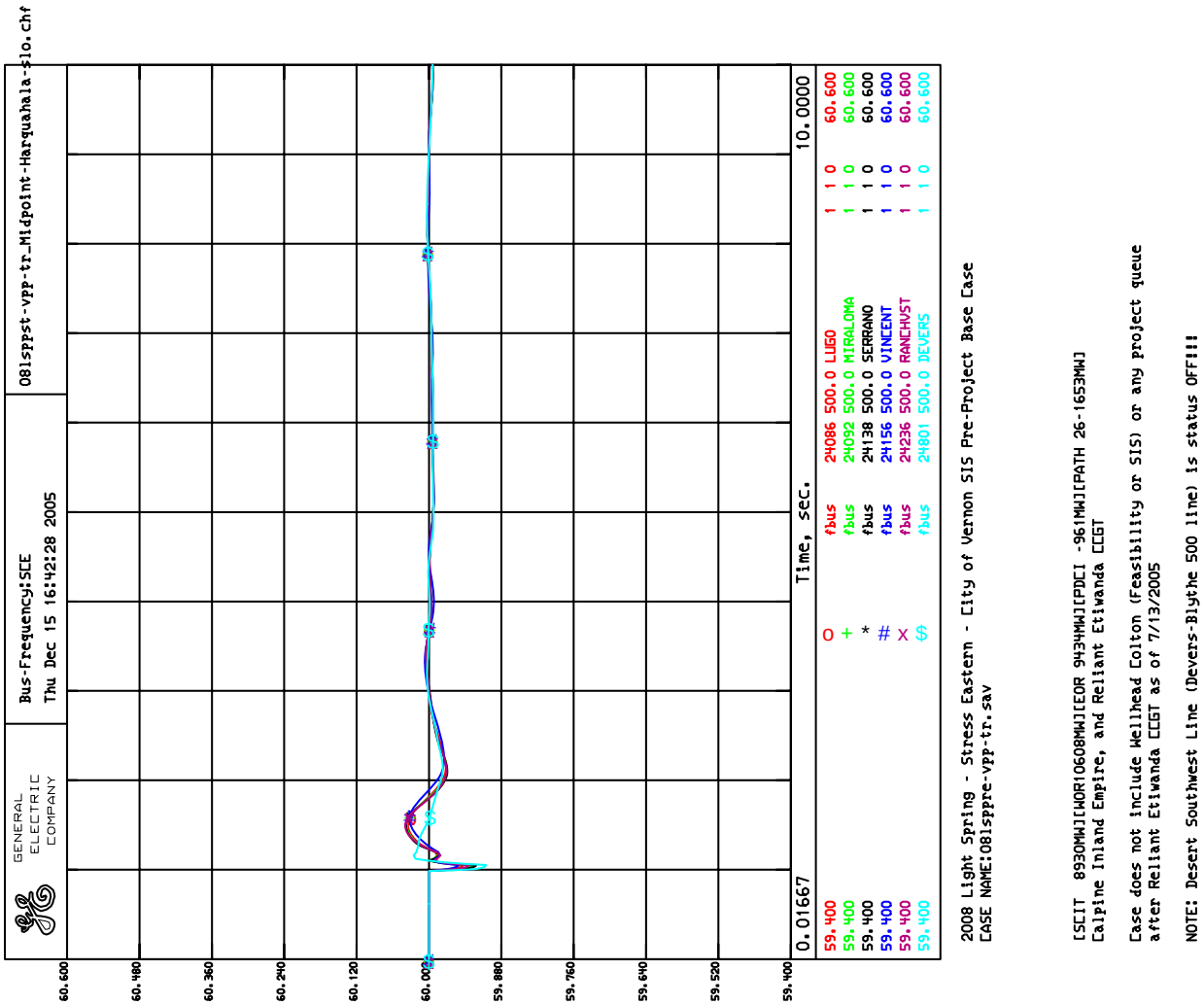
Plot 33 - 2: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



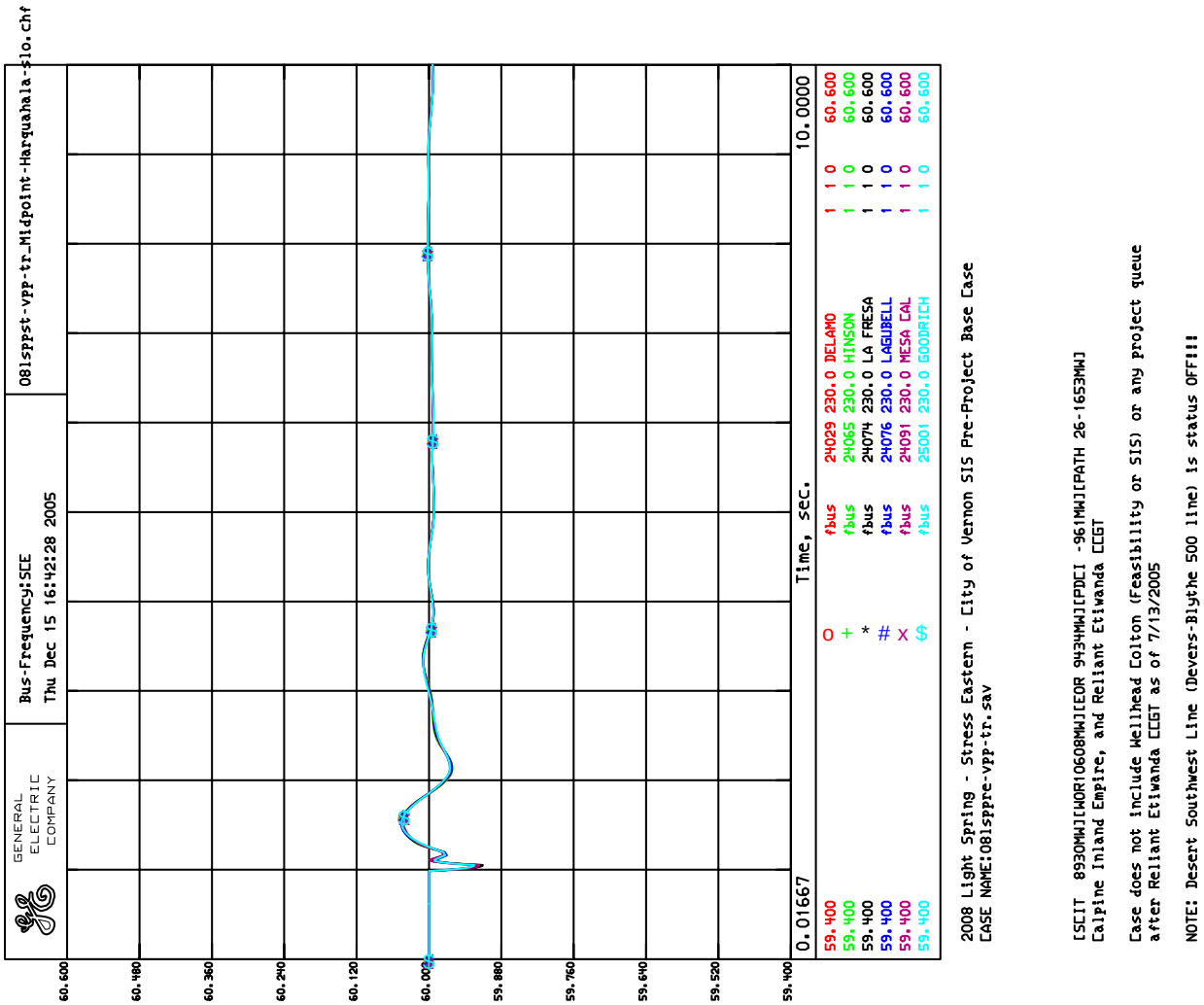
Plot 33 - 3: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



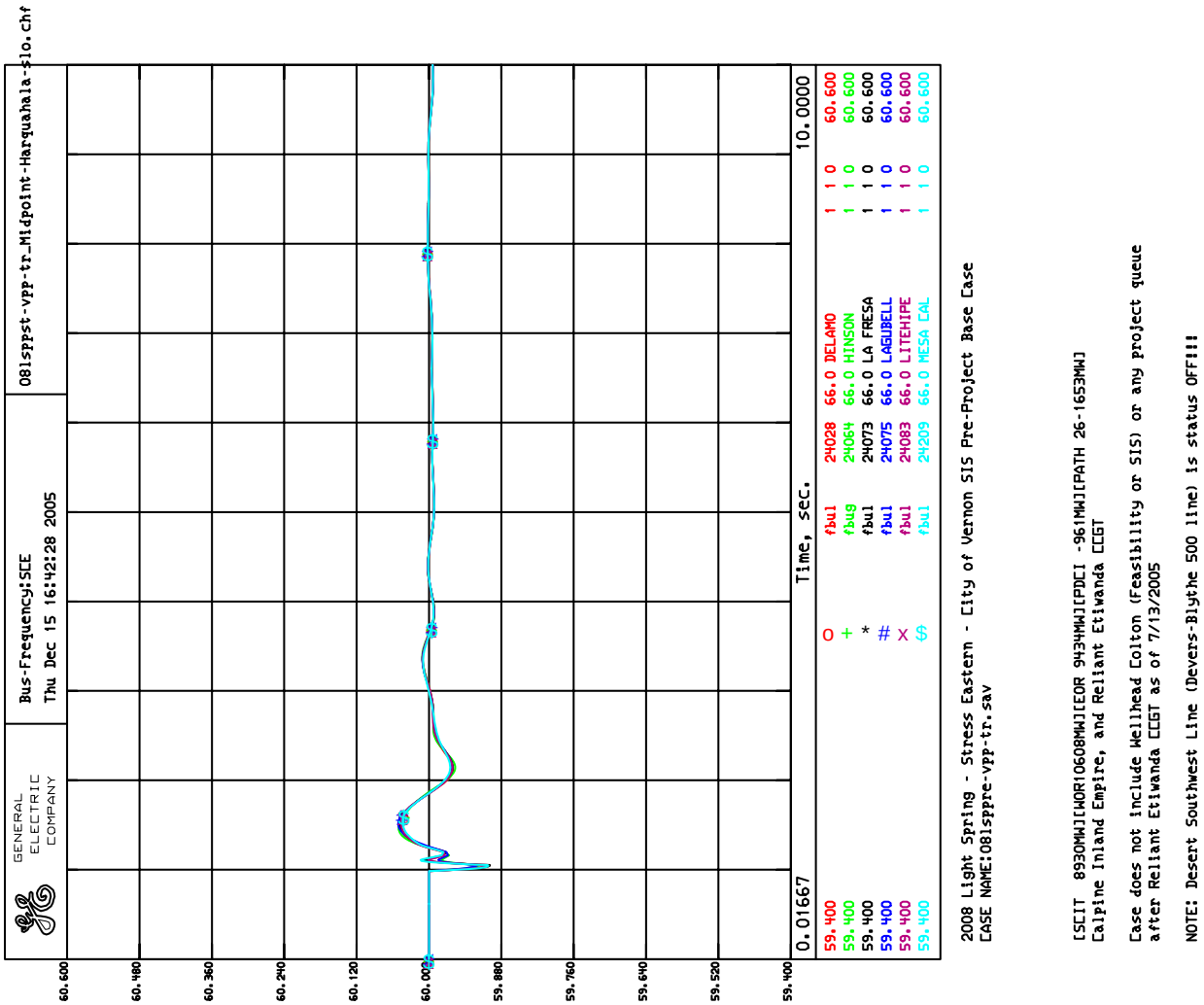
Plot 33 - 4: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



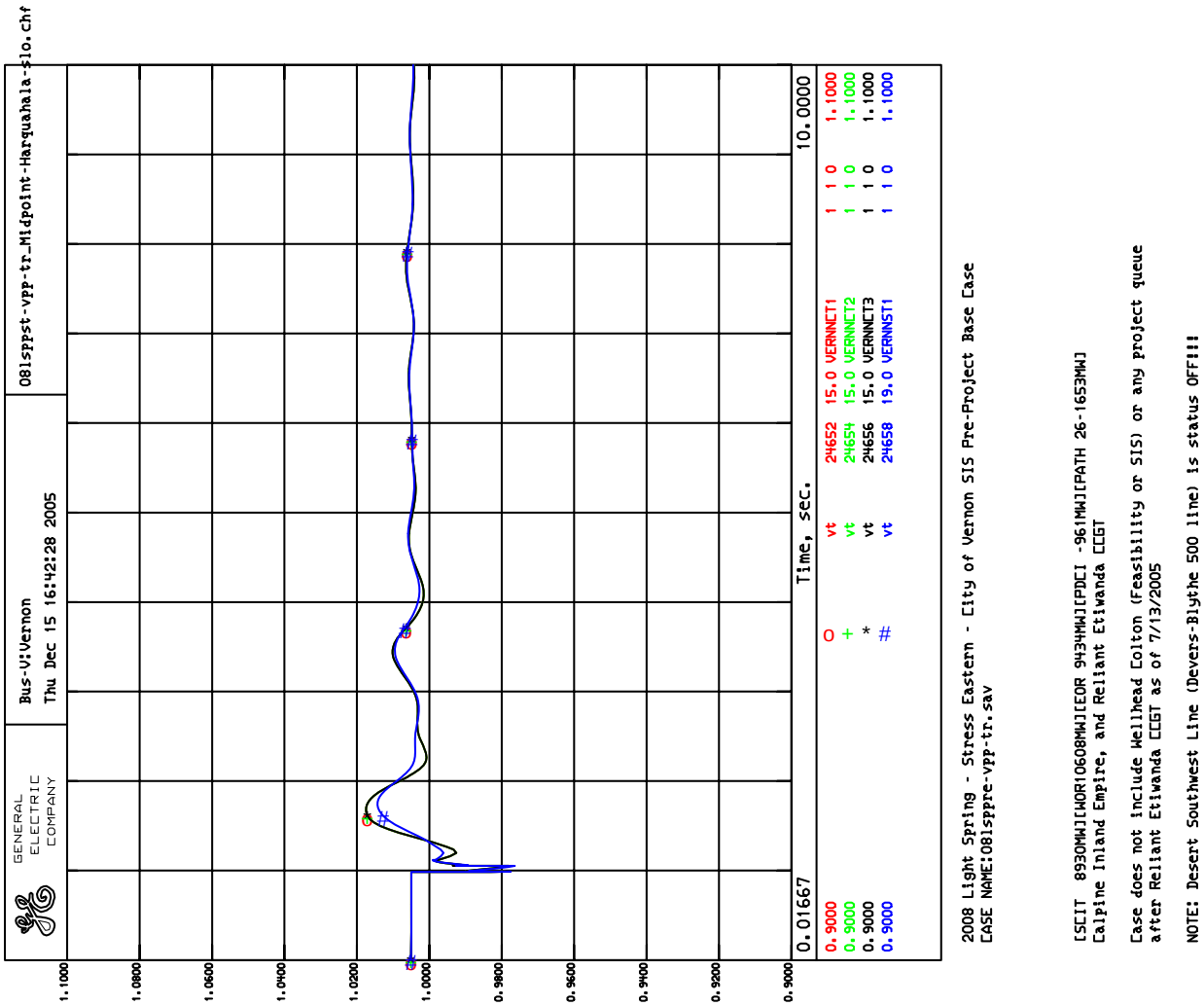
Plot 33 - 5: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



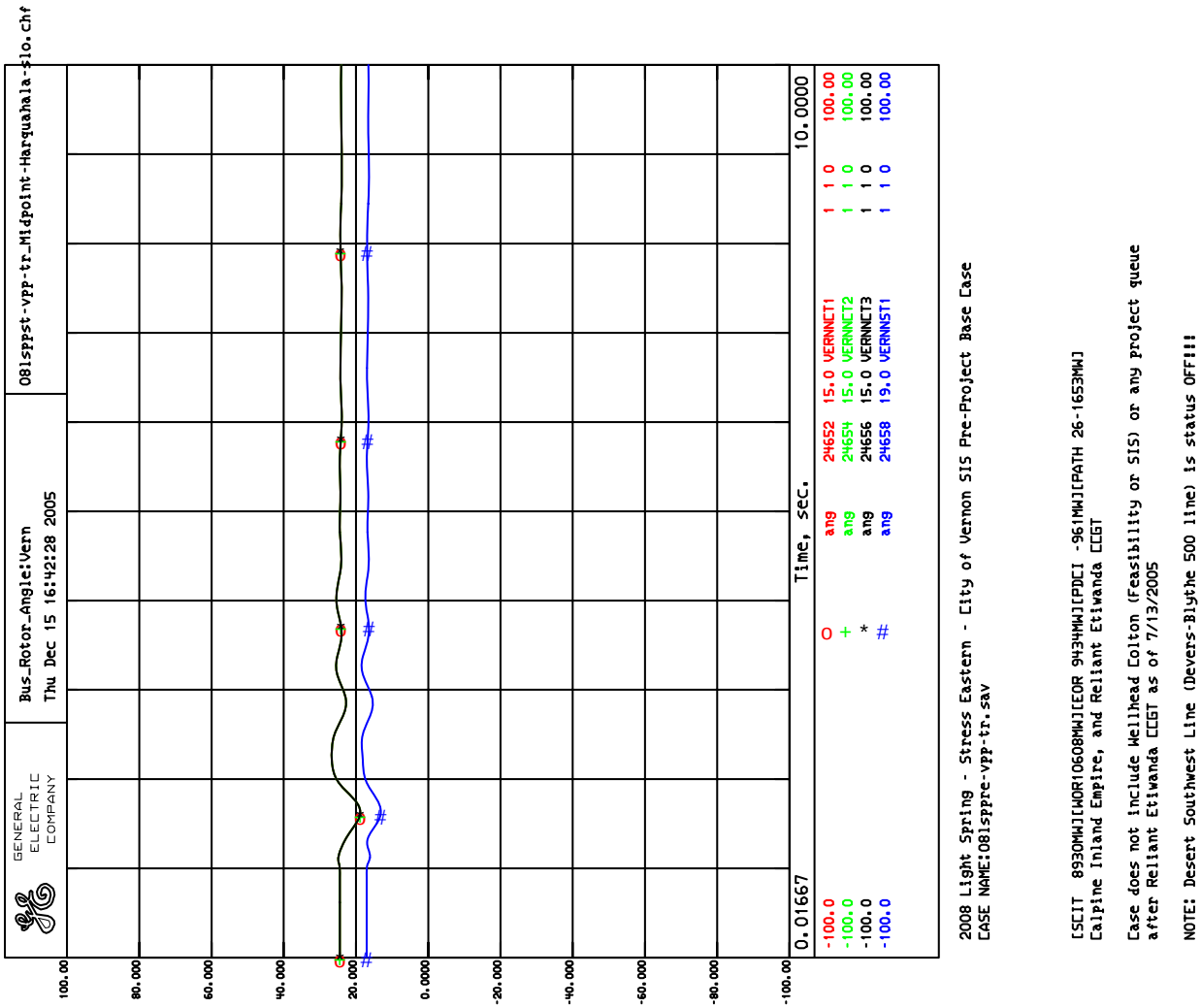
Plot 33 - 6: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



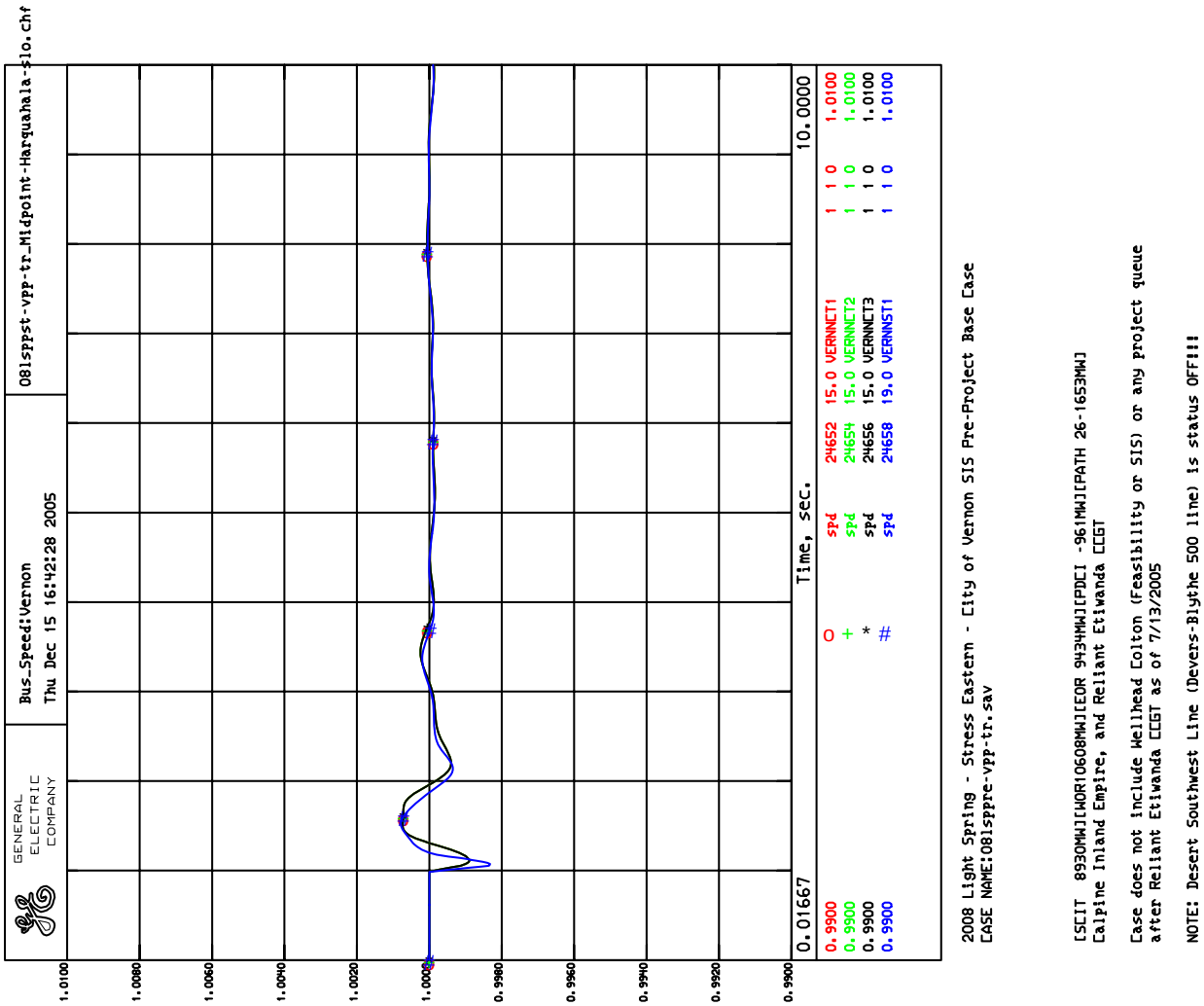
Plot 33 - 7: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



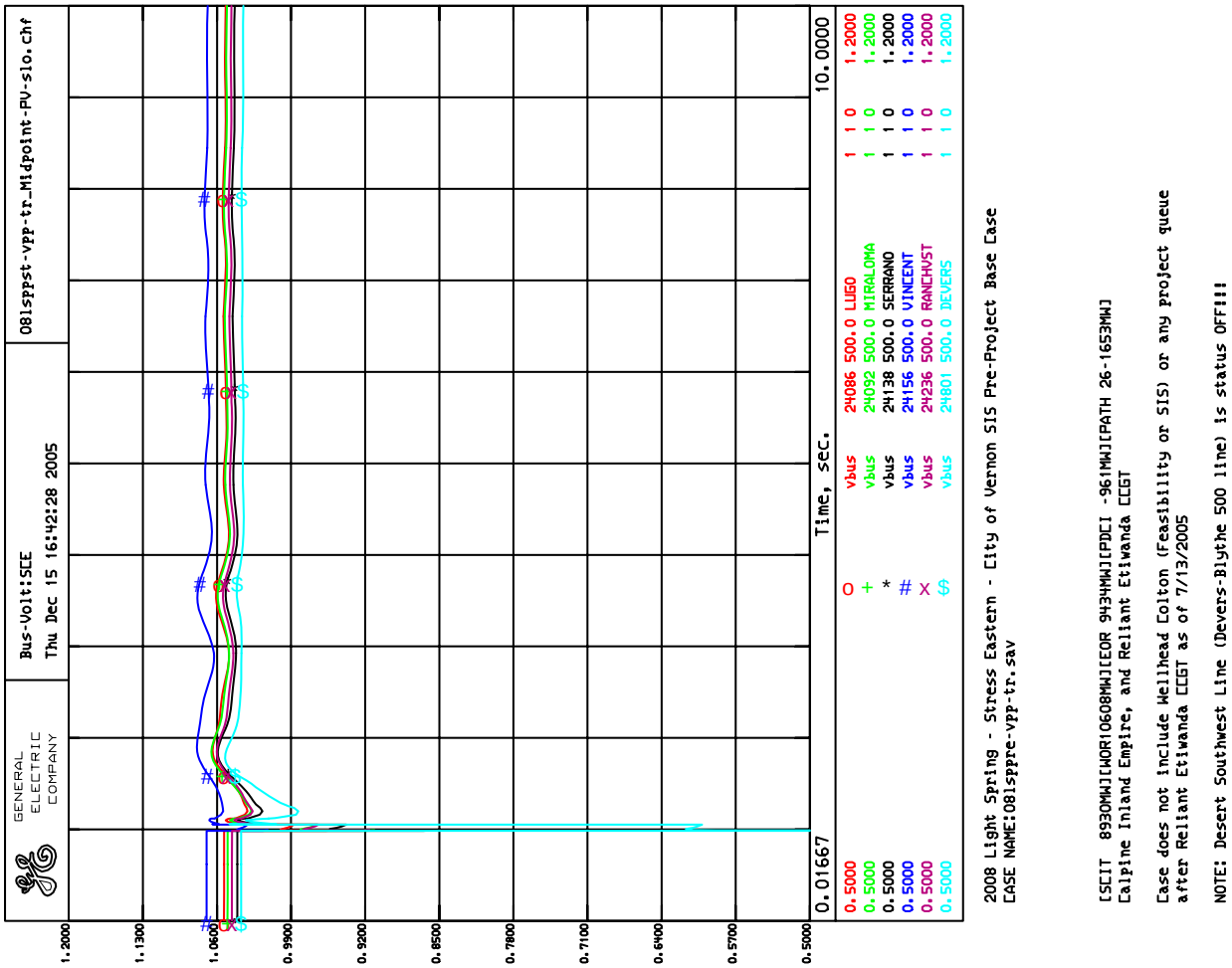
Plot 33 - 8: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



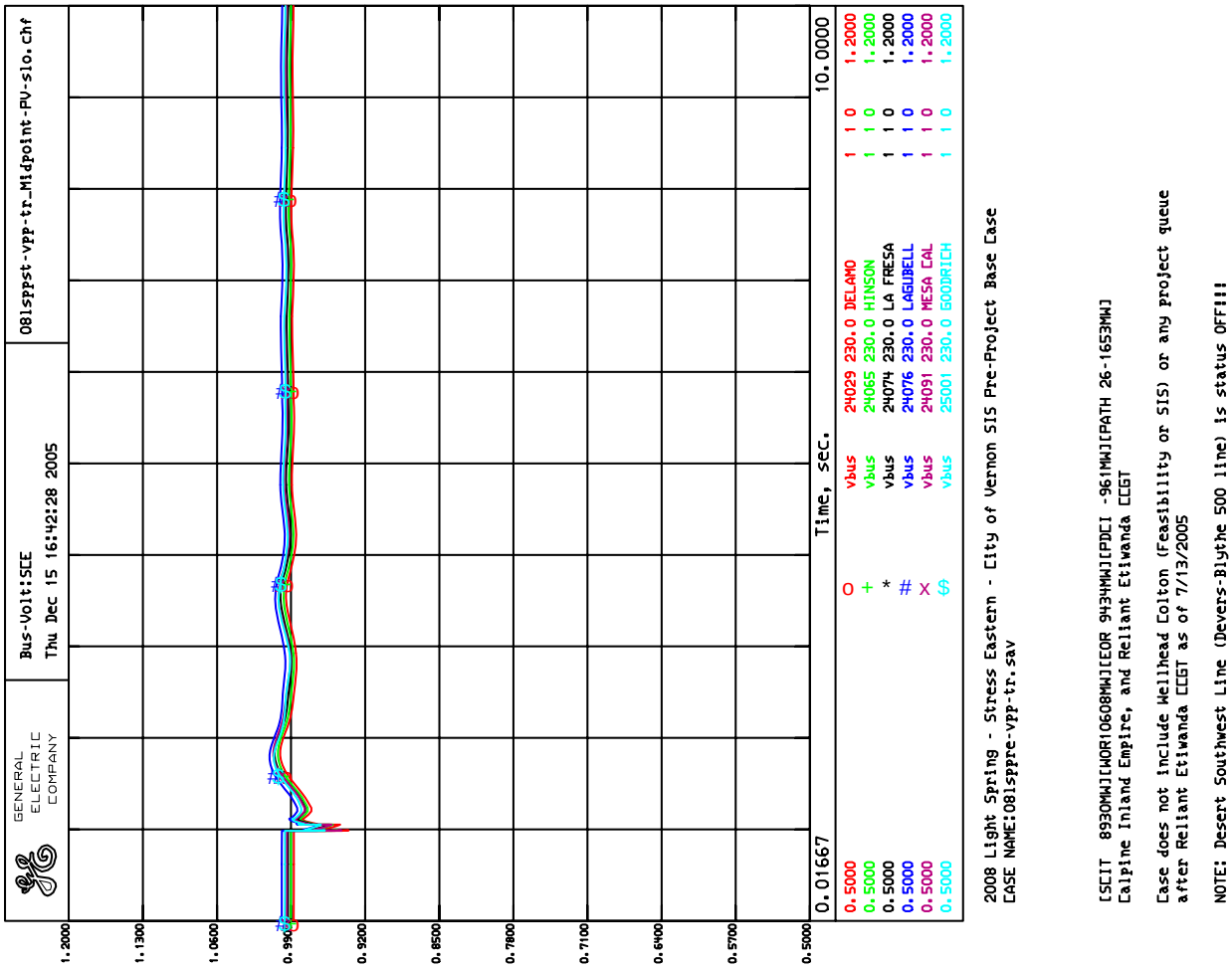
Plot 33 - 9: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.



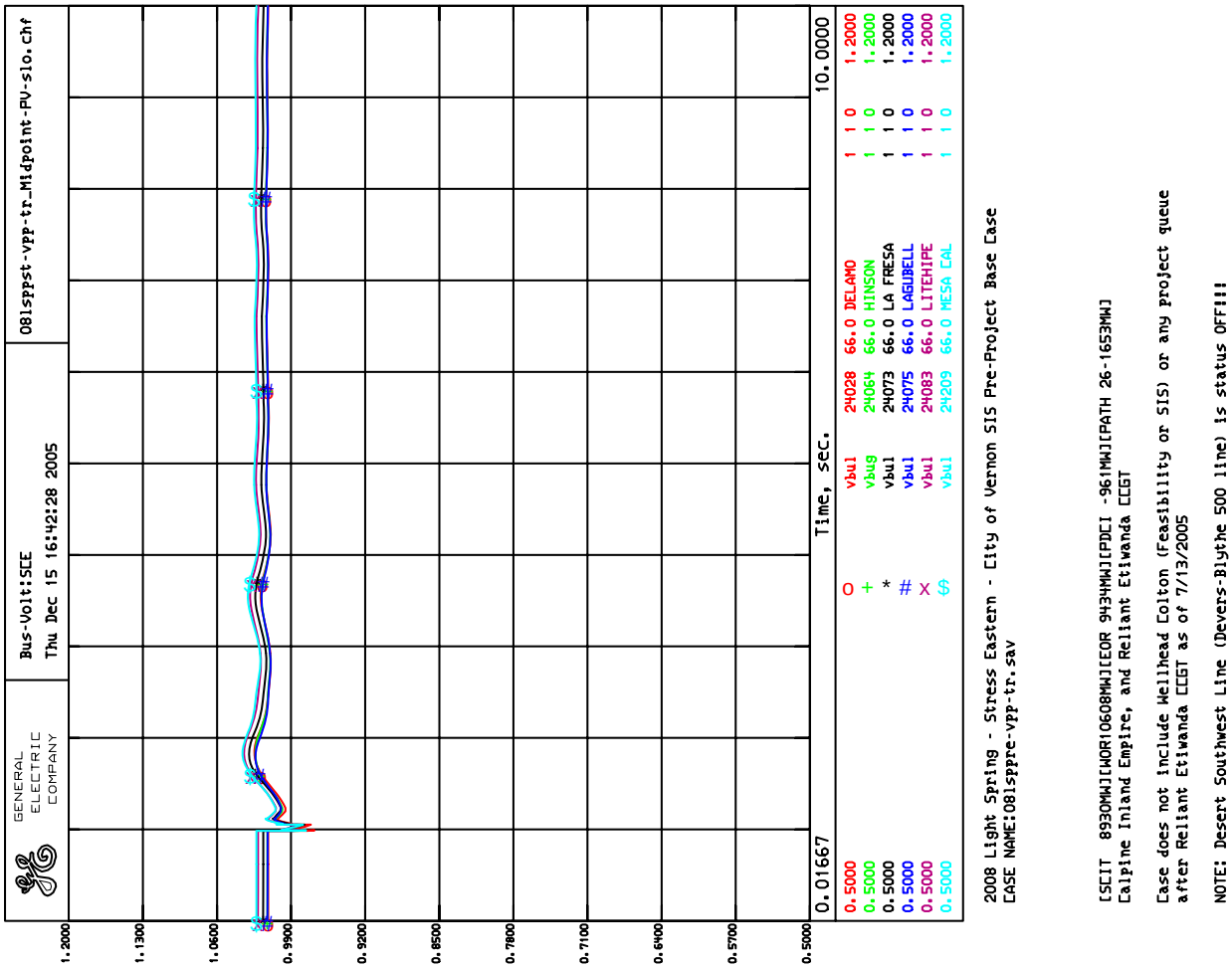
Plot 34 - 1: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



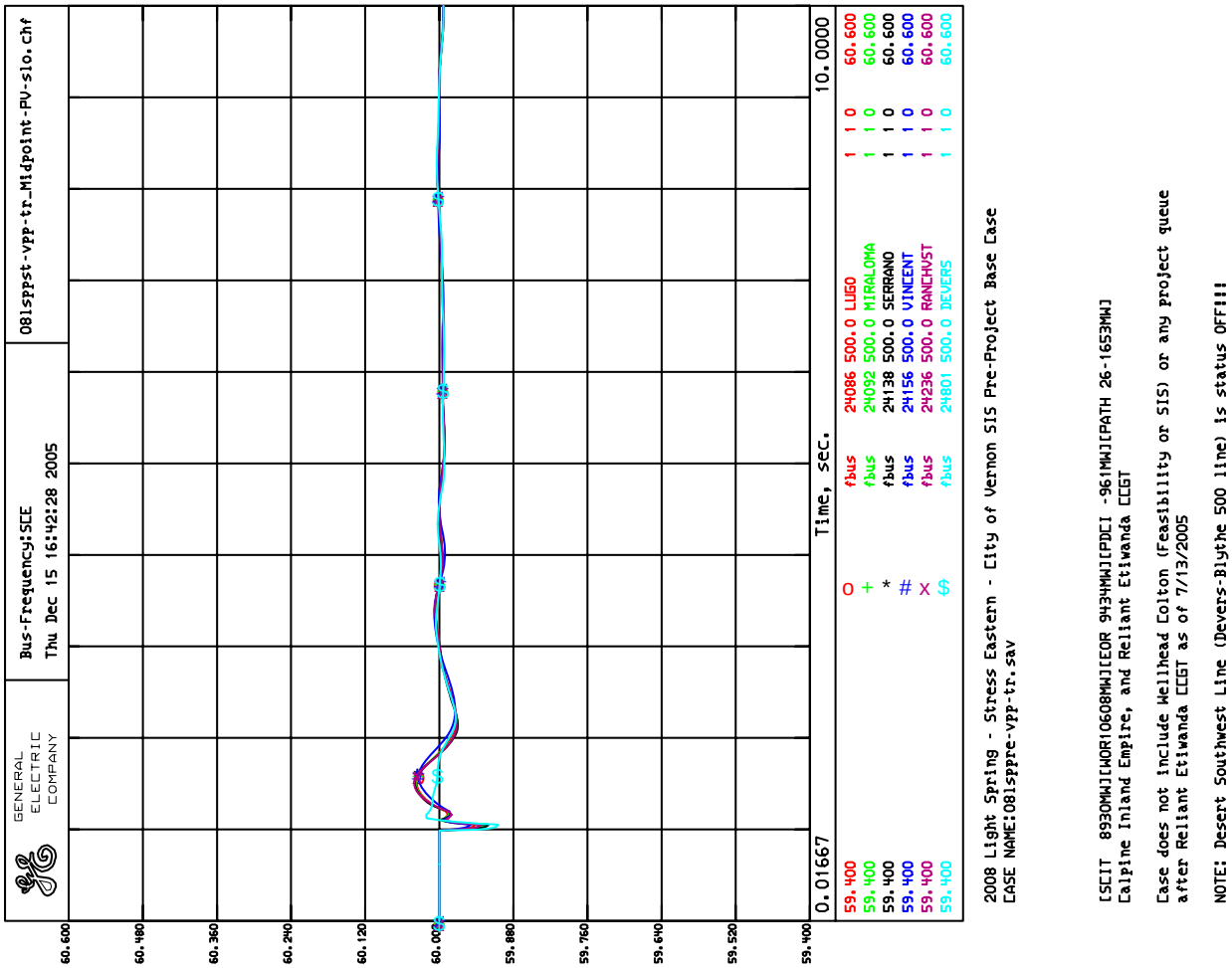
Plot 34 - 2: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



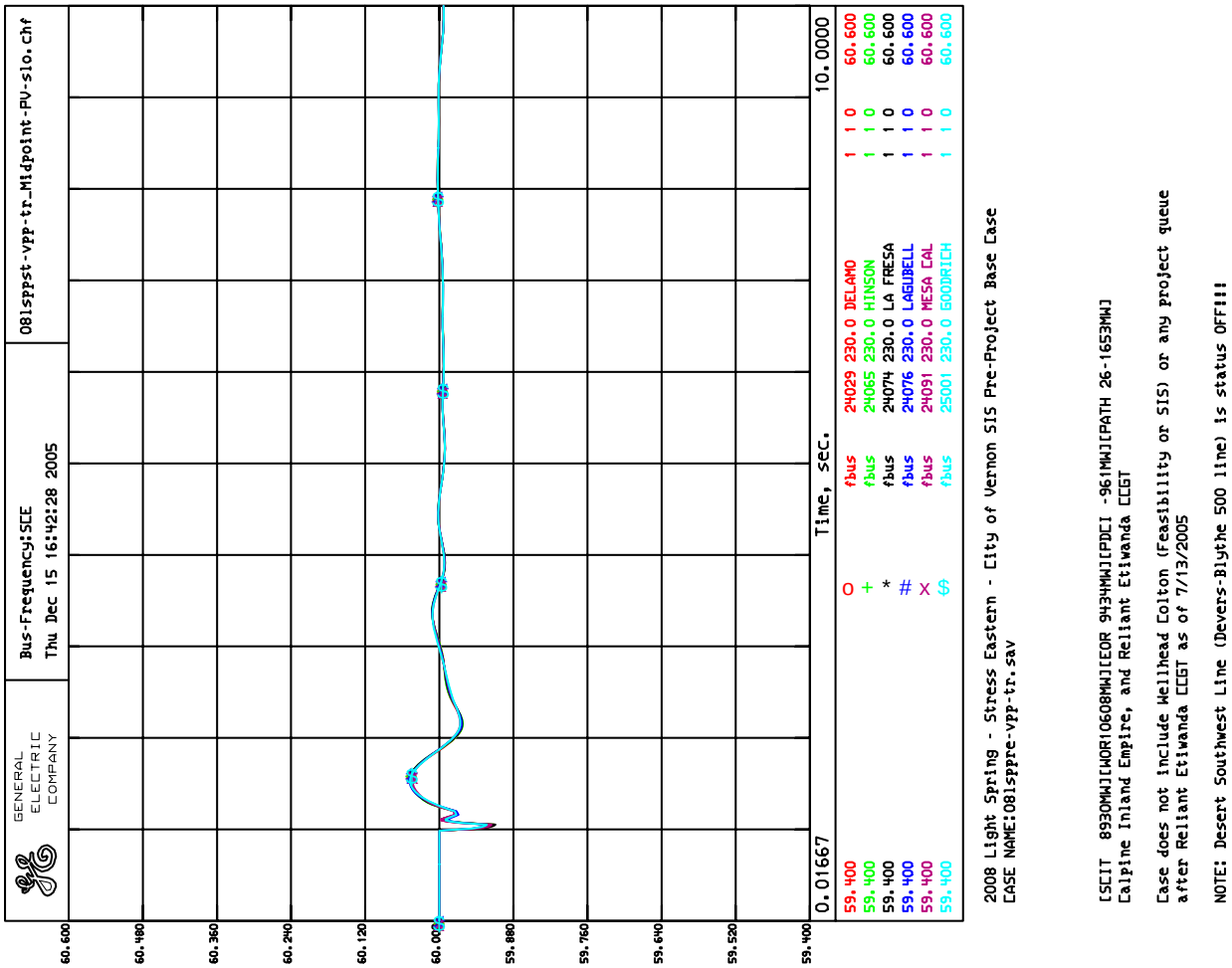
Plot 34 - 3: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



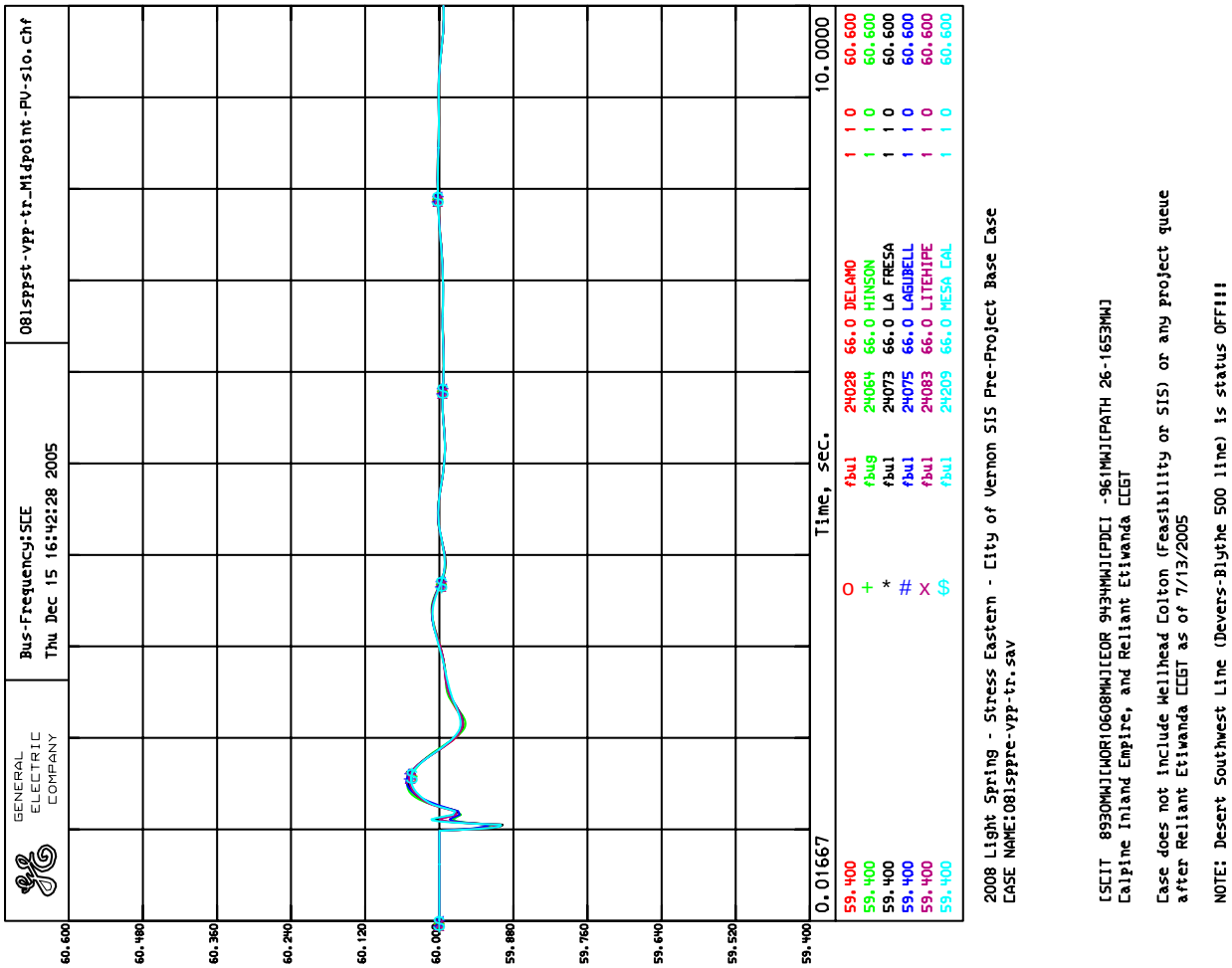
Plot 34 - 4: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



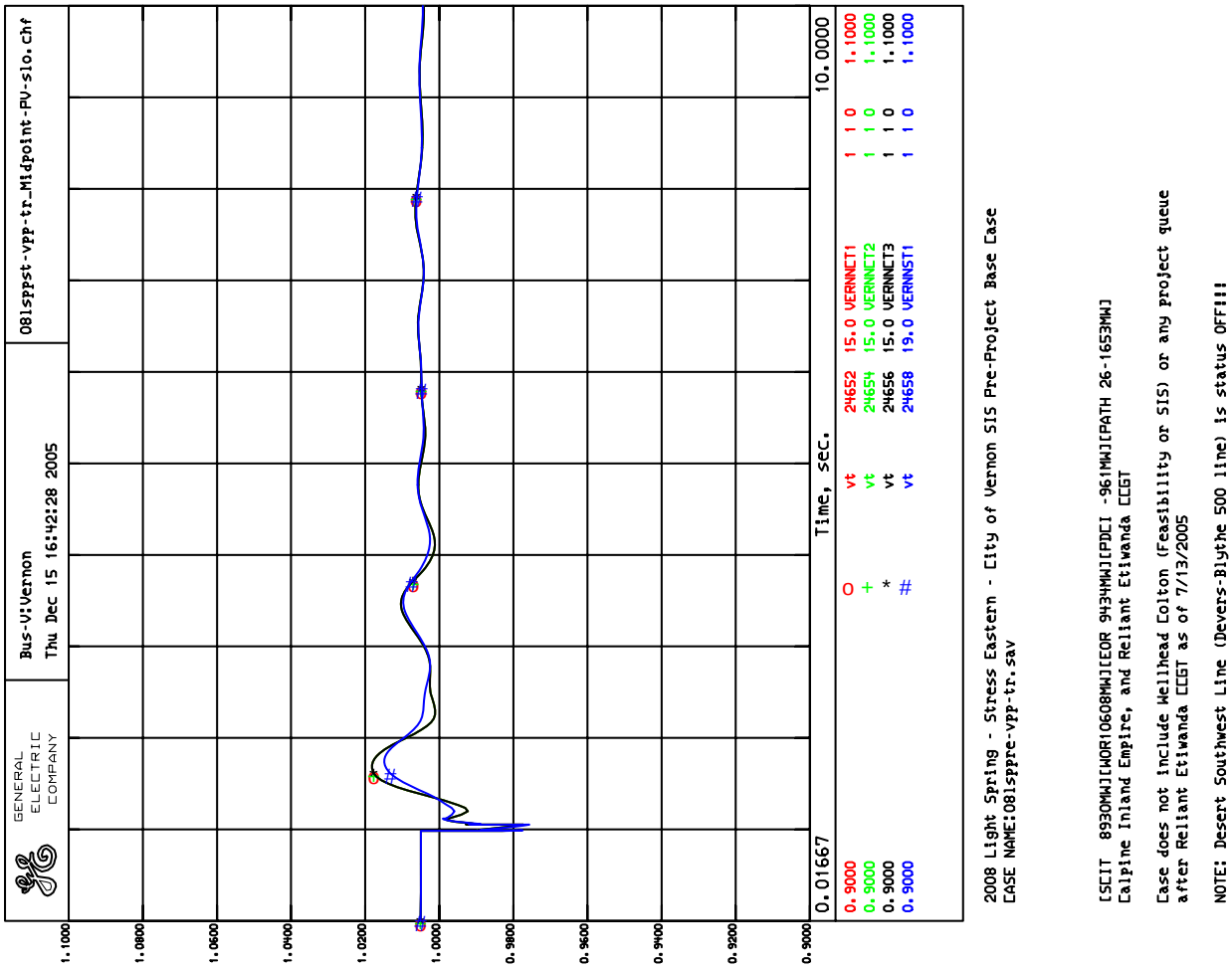
Plot 34 - 5: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



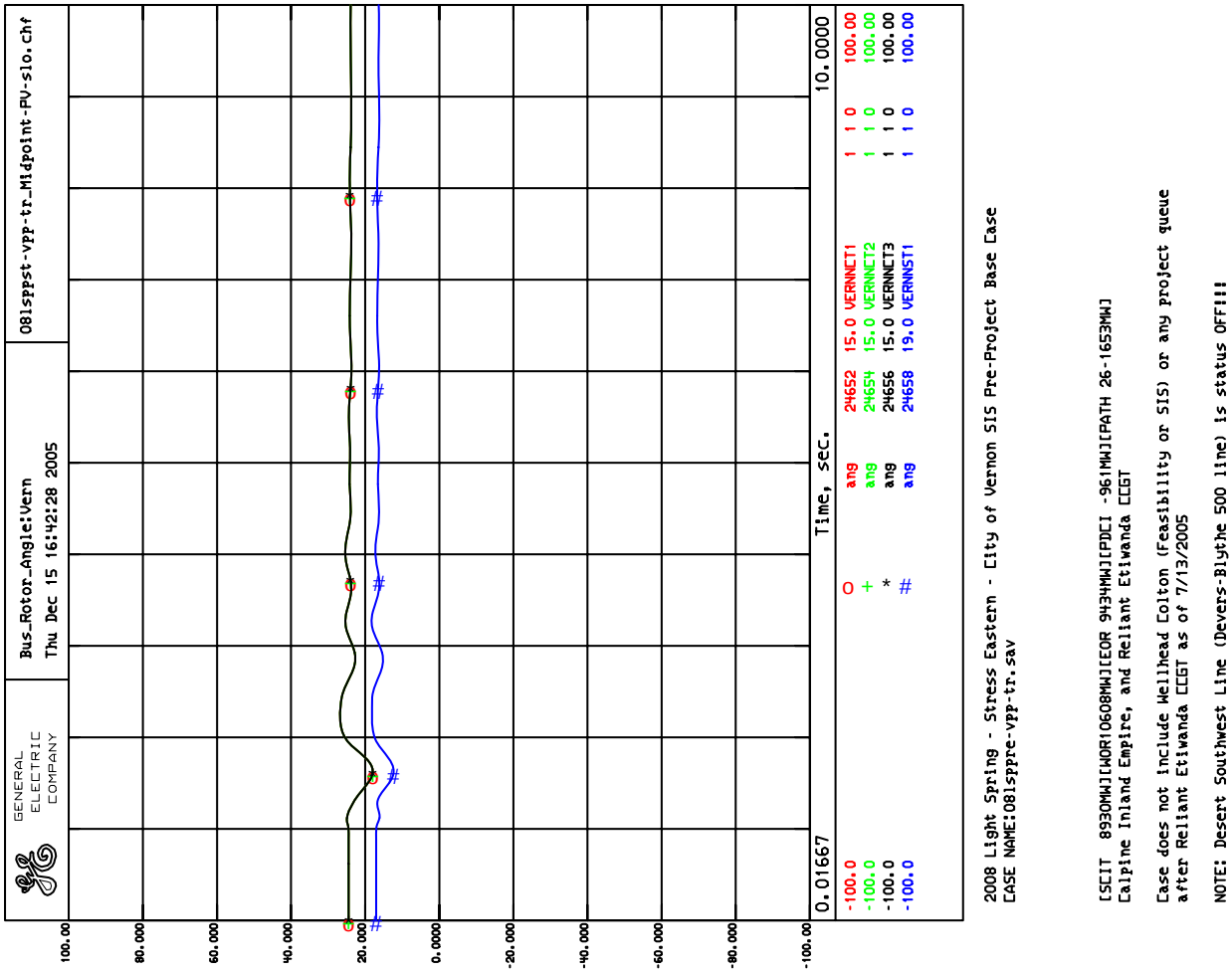
Plot 34 - 6: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



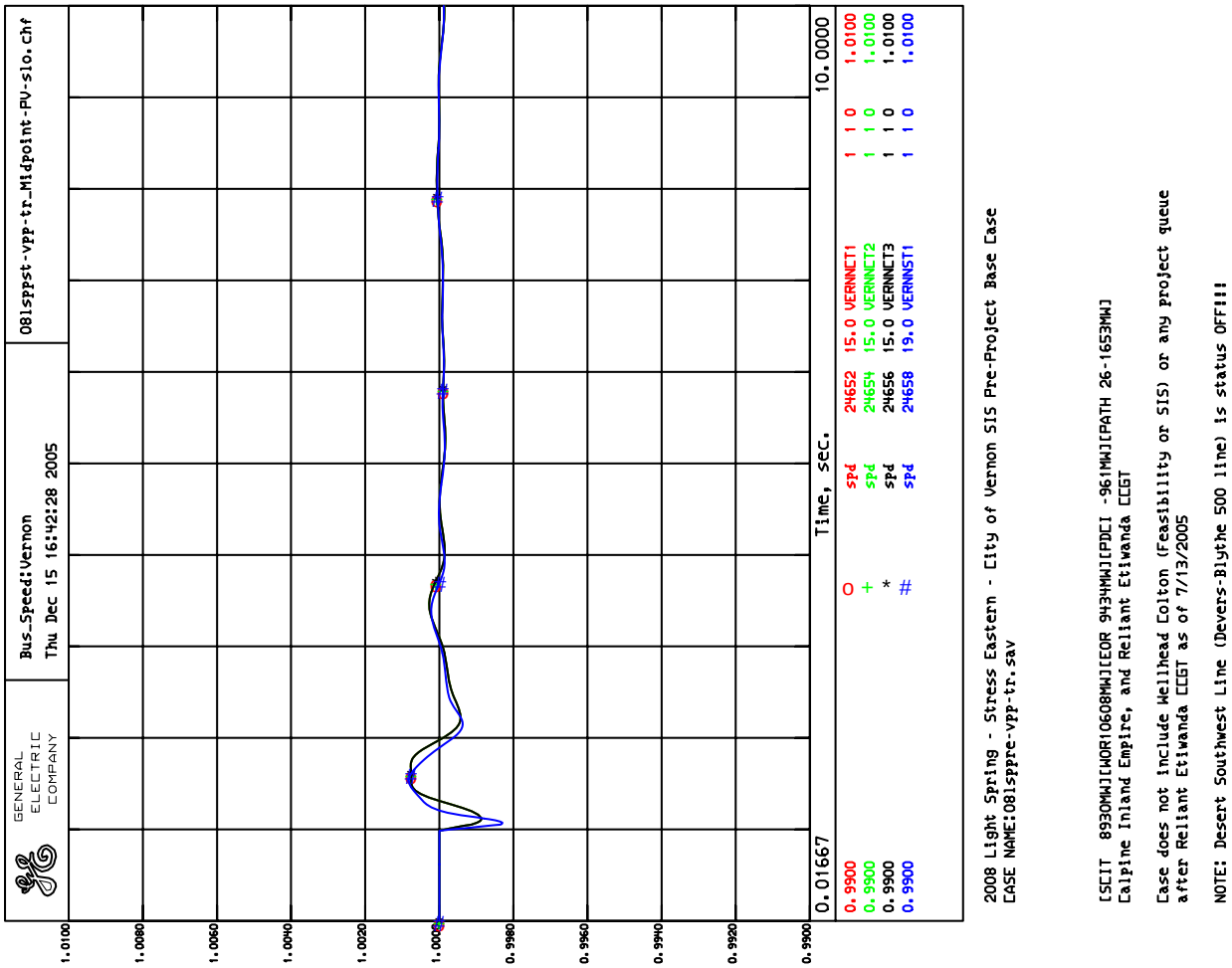
Plot 34 - 7: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



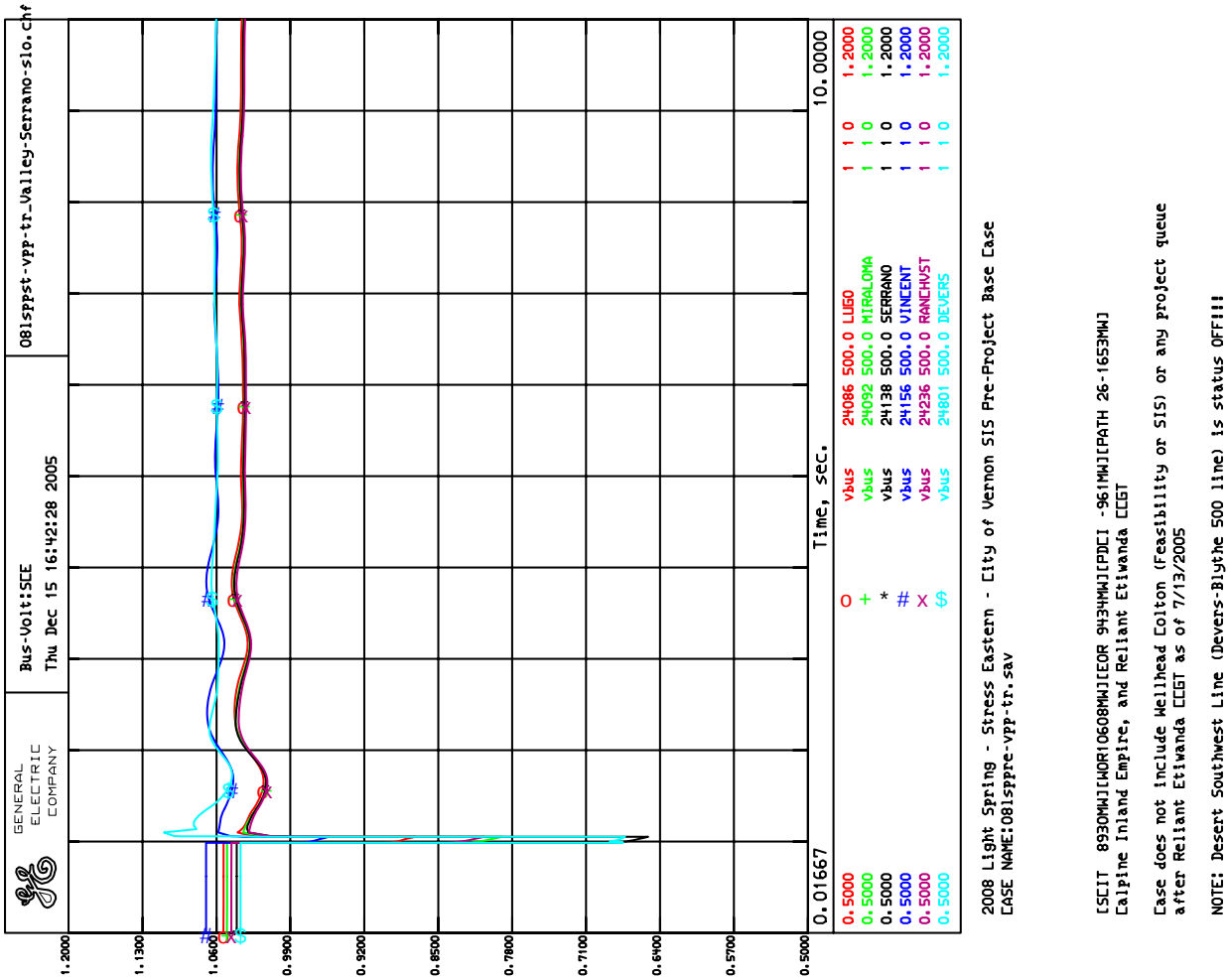
Plot 34 - 8: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



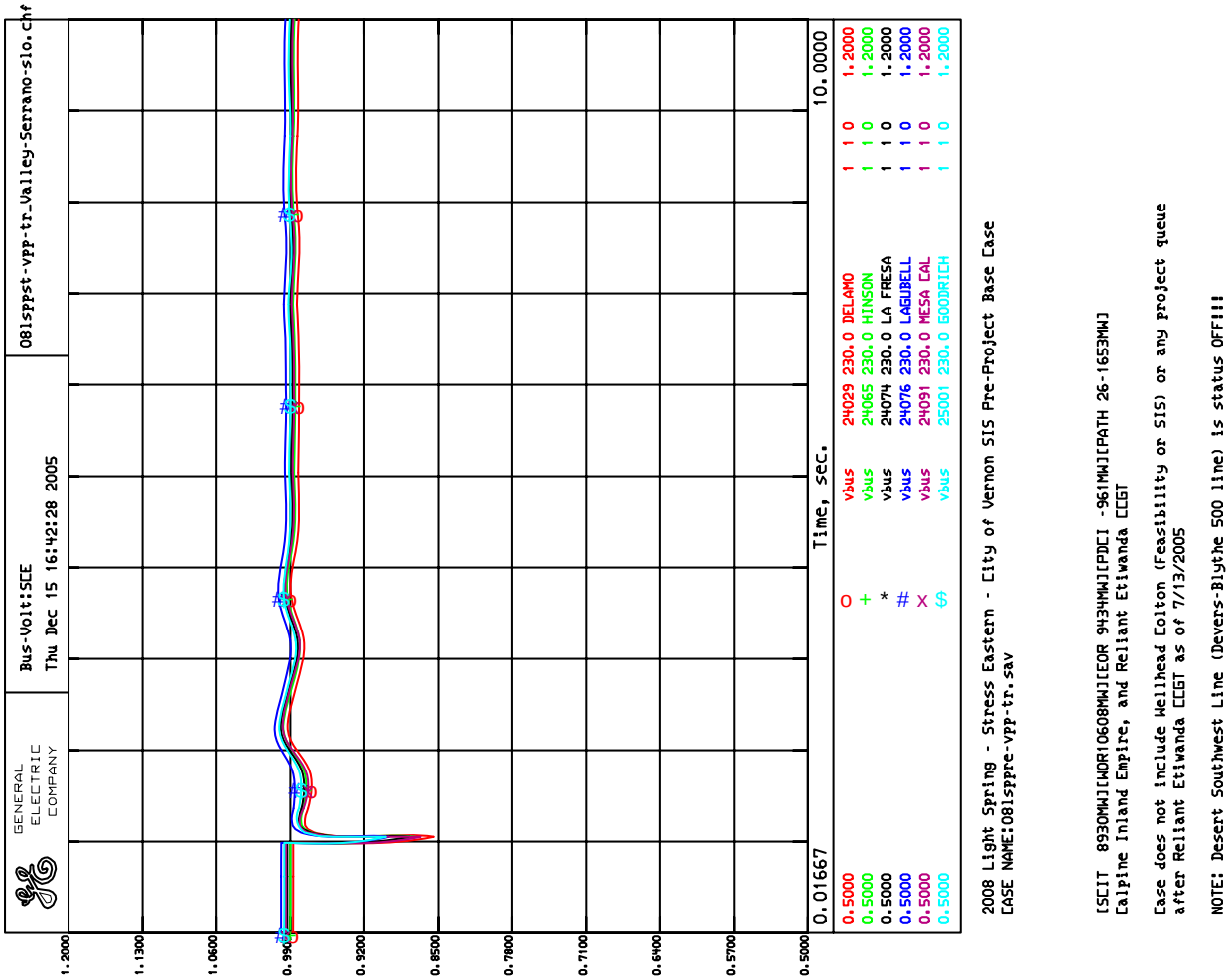
Plot 34 - 9: Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.



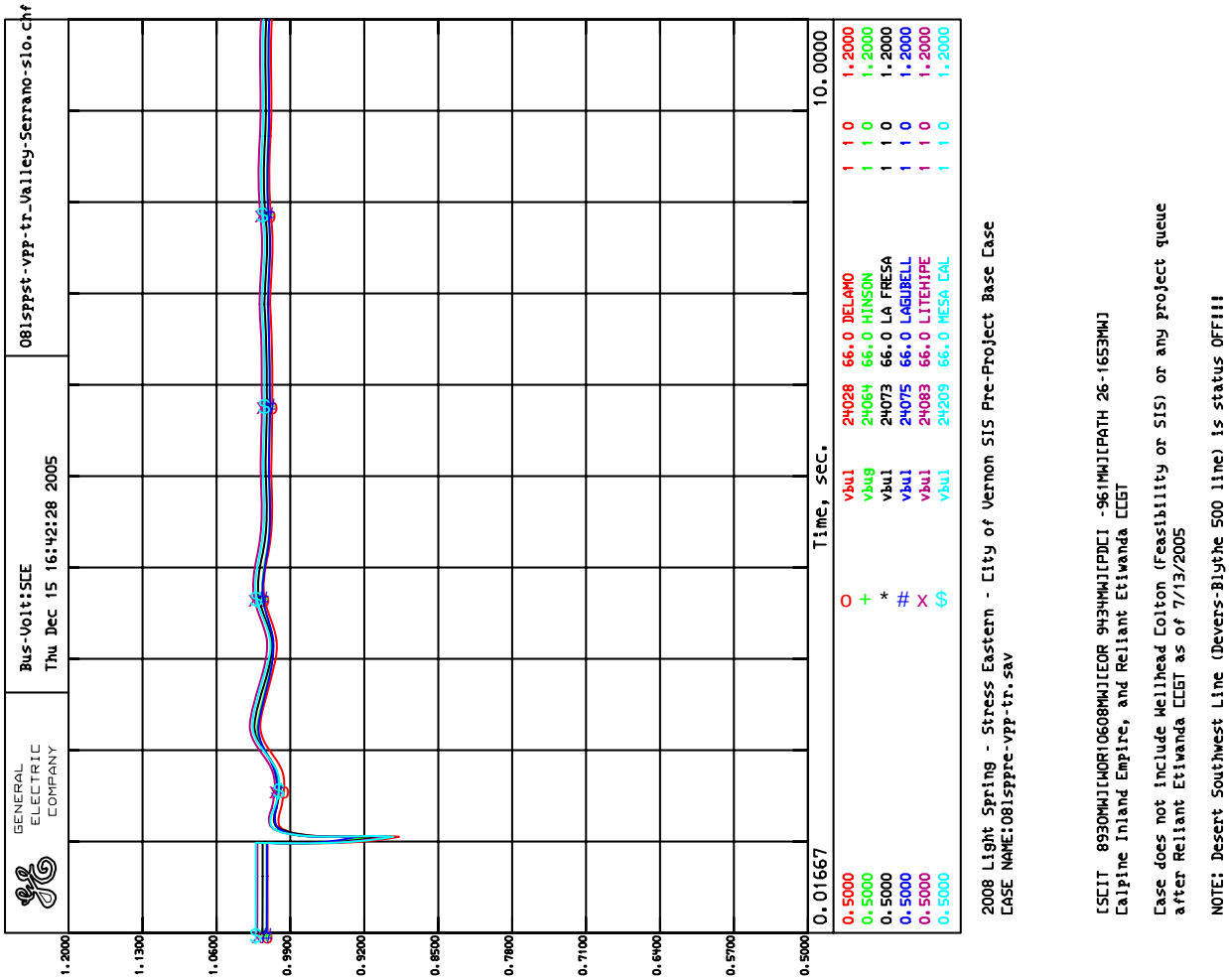
Plot 35 - 1: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



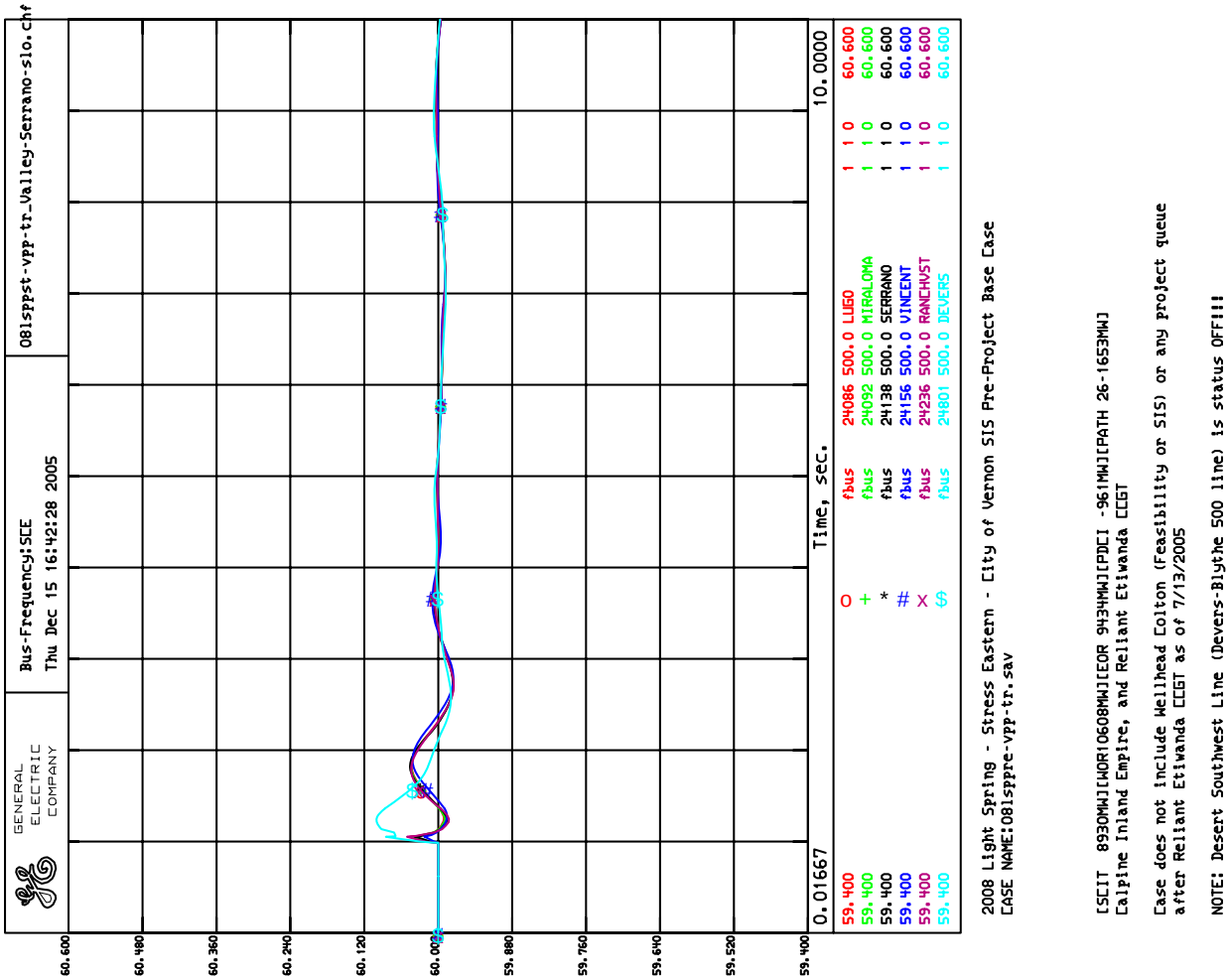
Plot 35 - 2: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



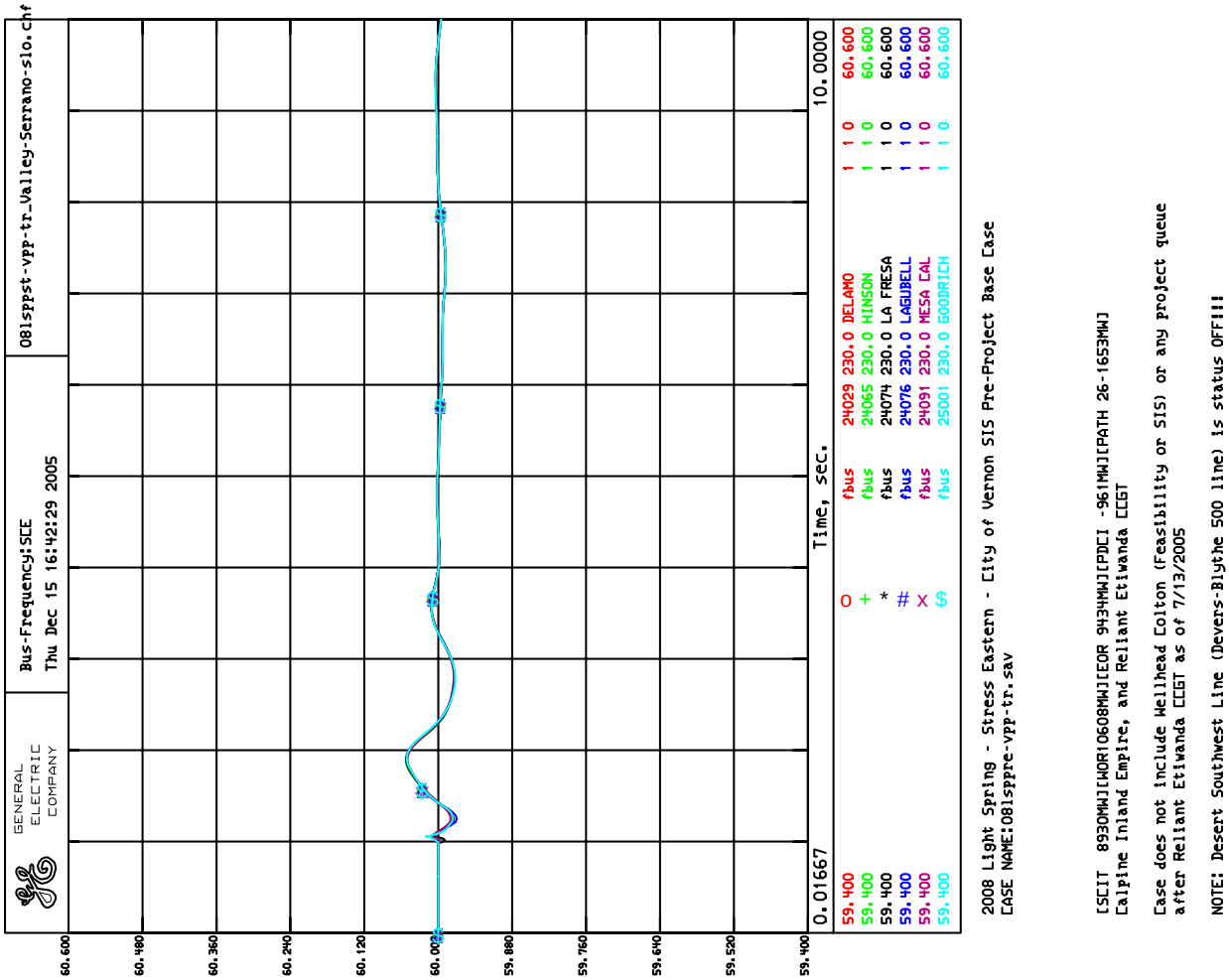
Plot 35 - 3: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



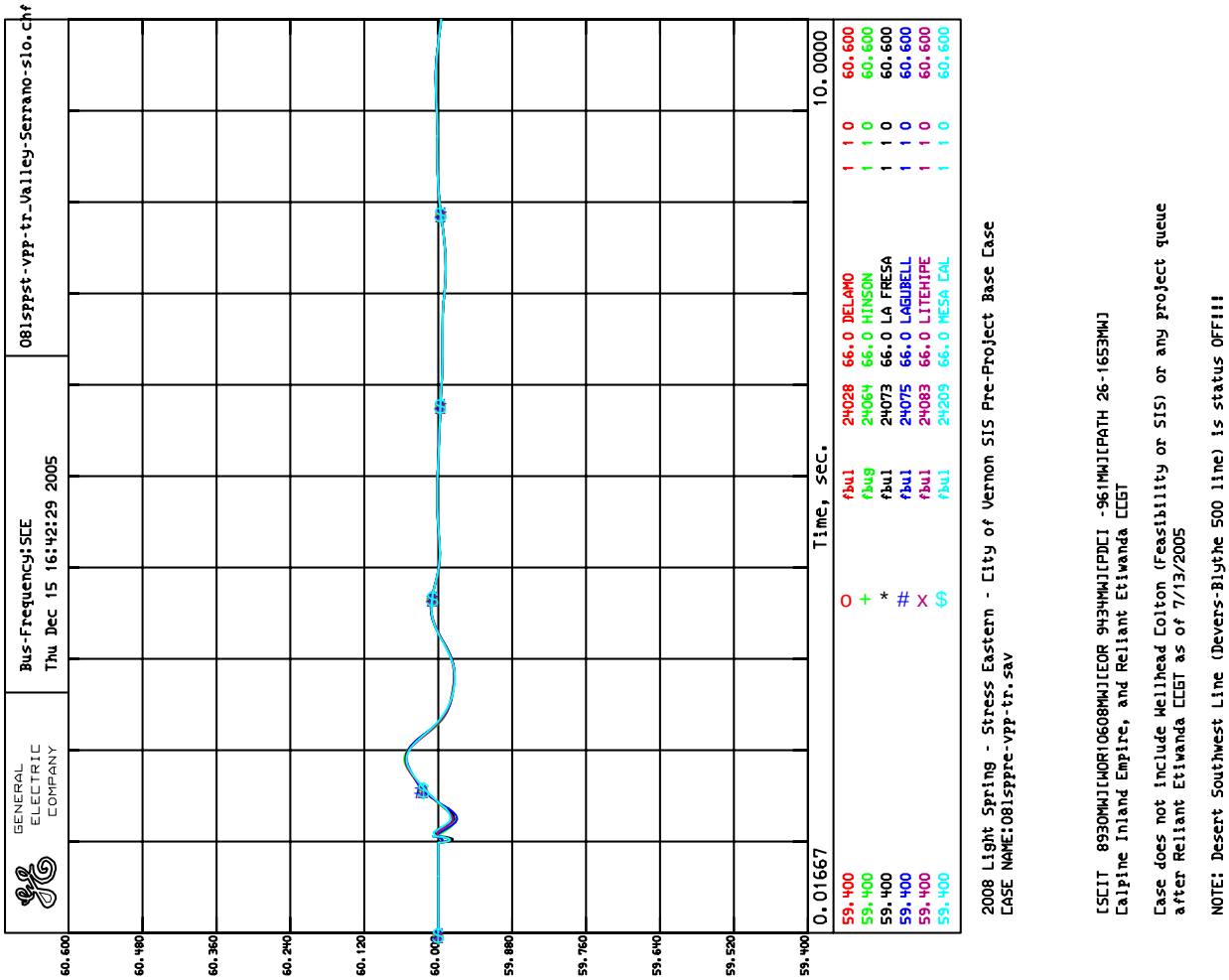
Plot 35 - 4: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



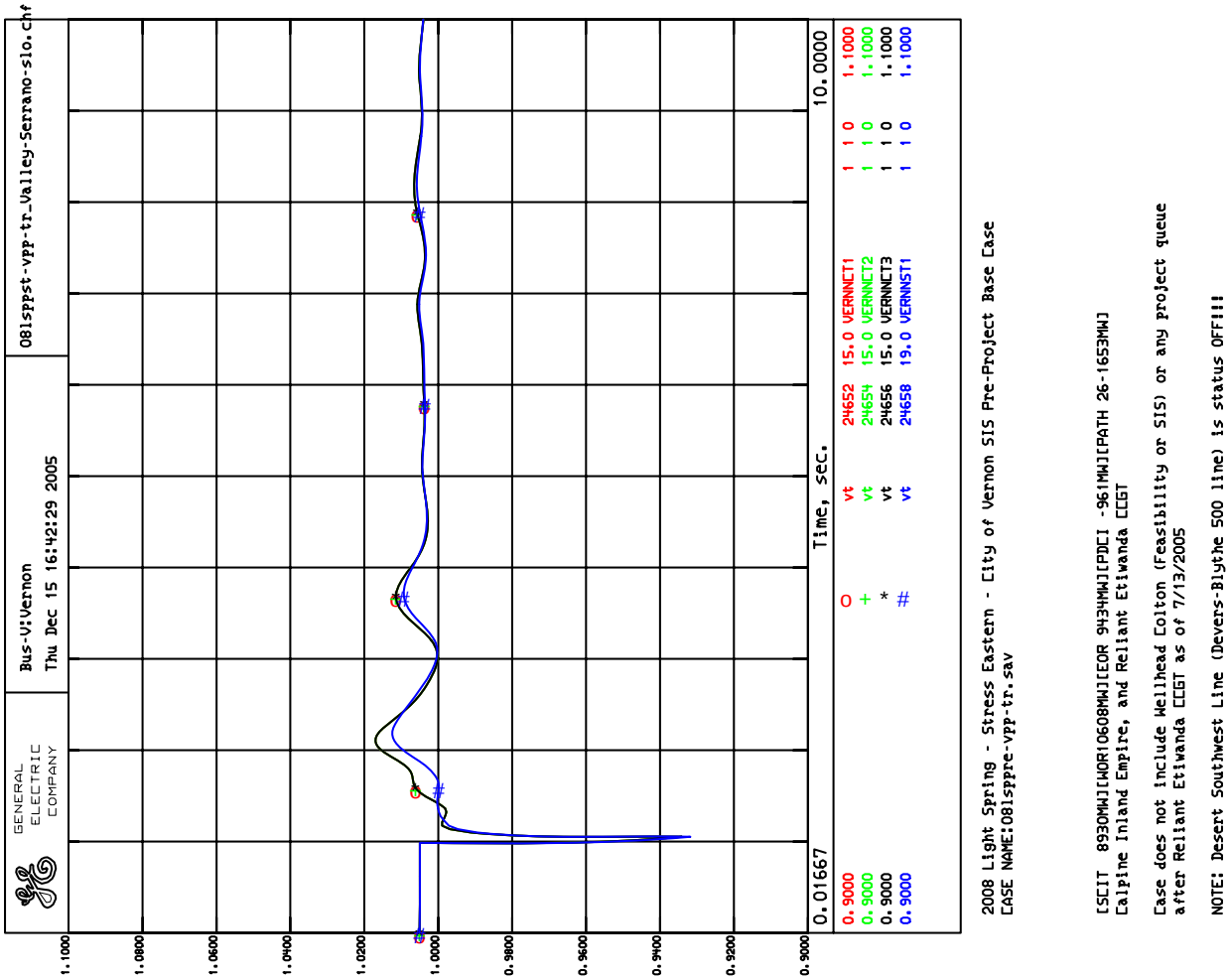
Plot 35 - 5: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



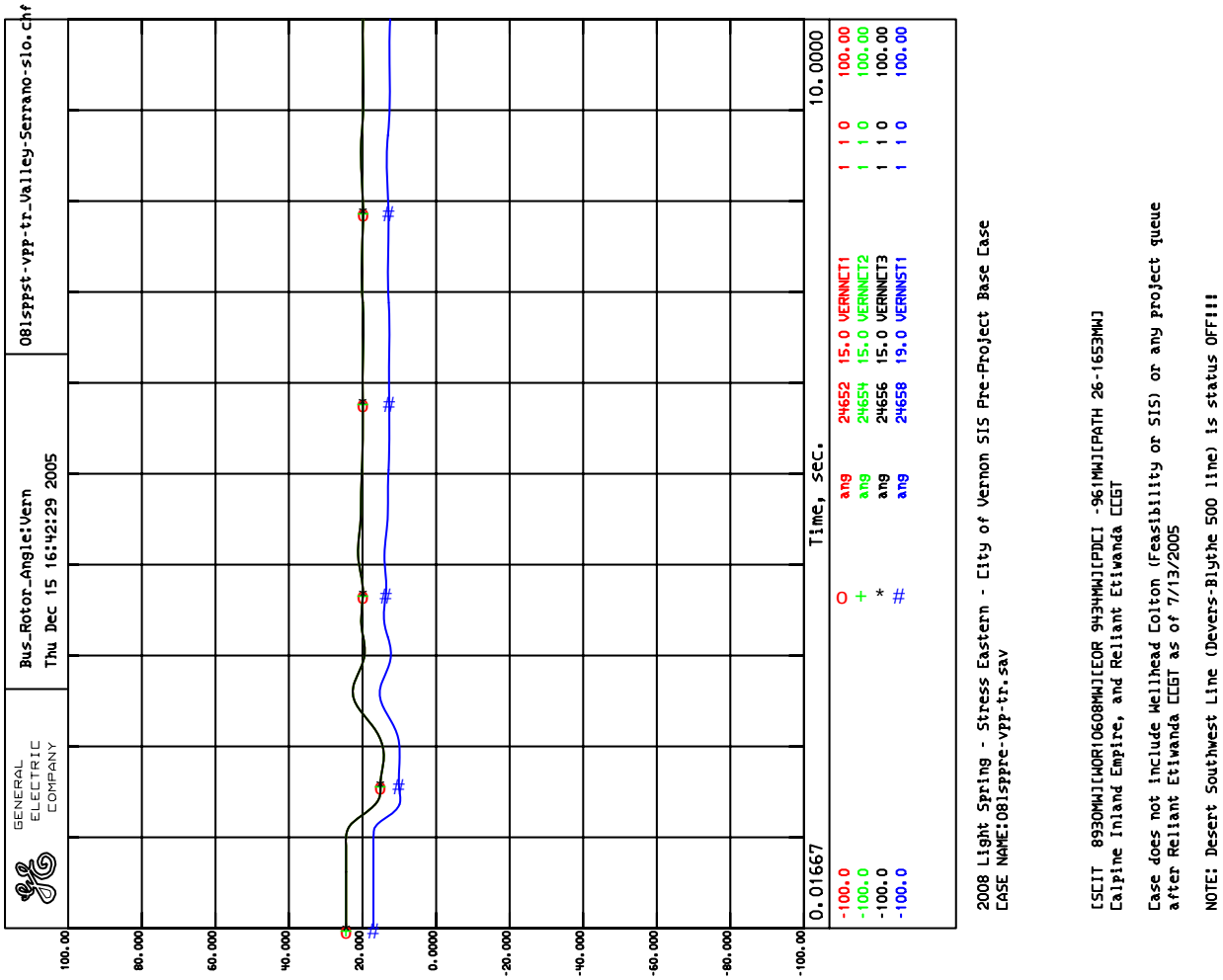
Plot 35 - 6: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



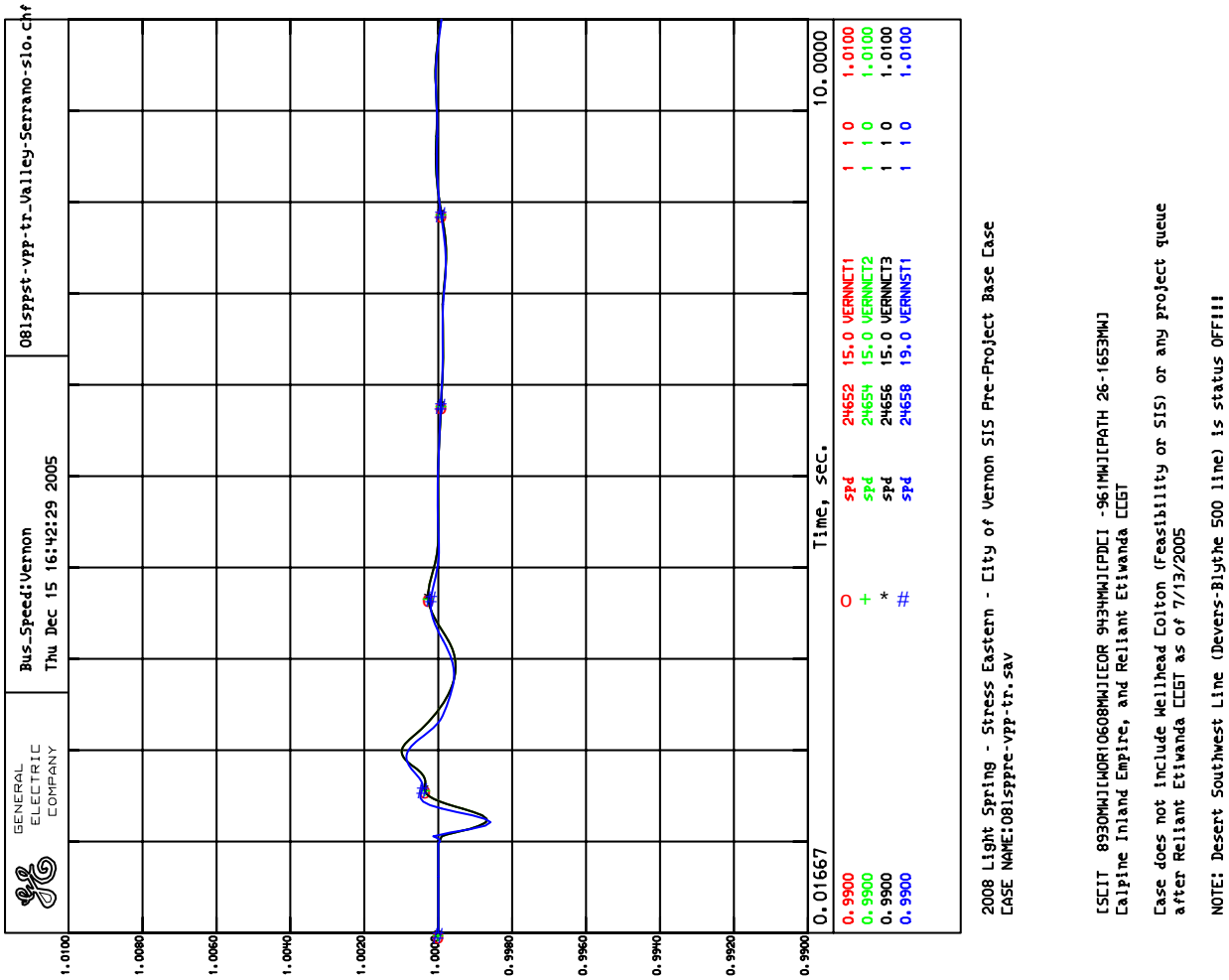
Plot 35 – 7: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



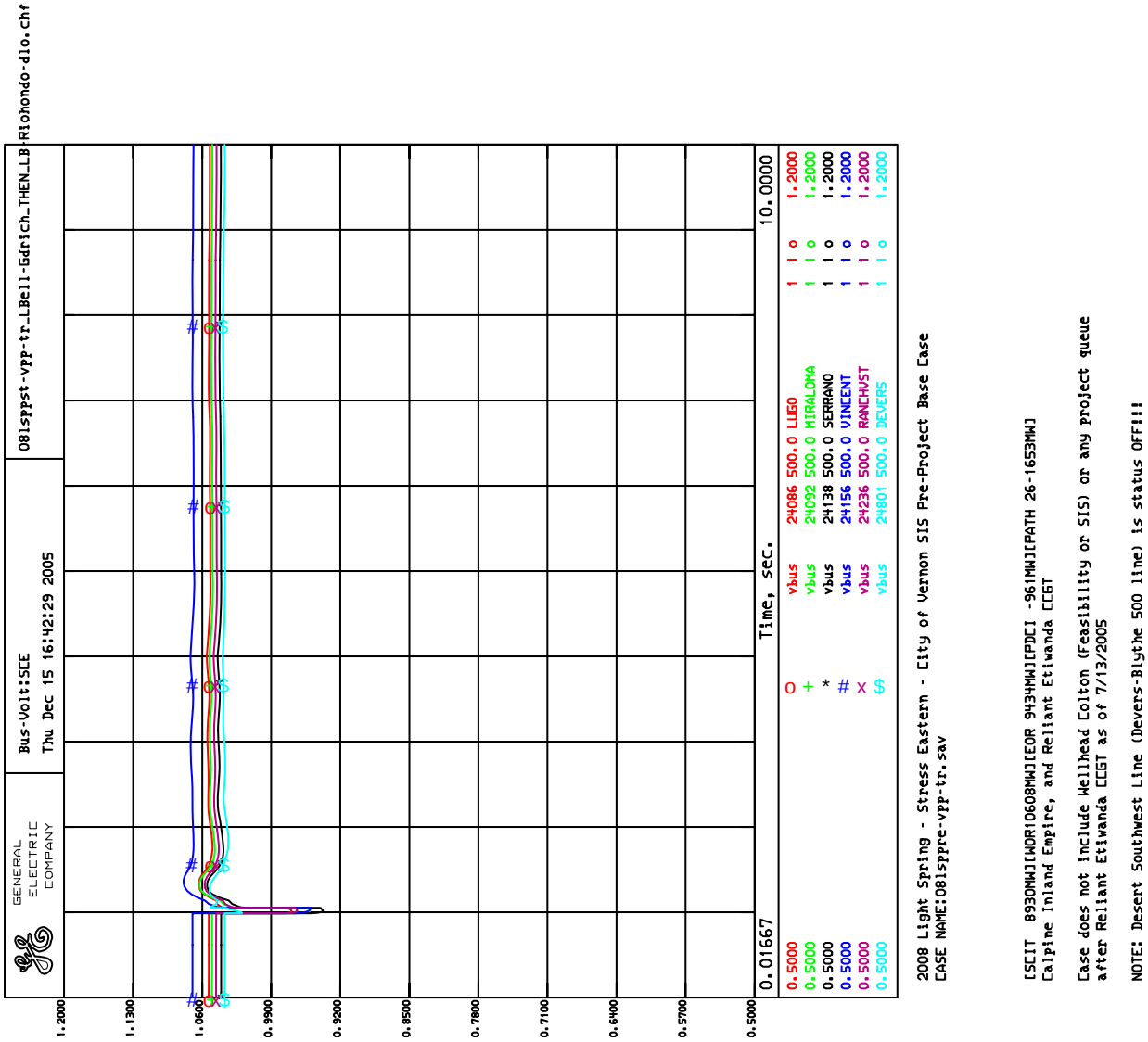
Plot 35 - 8: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



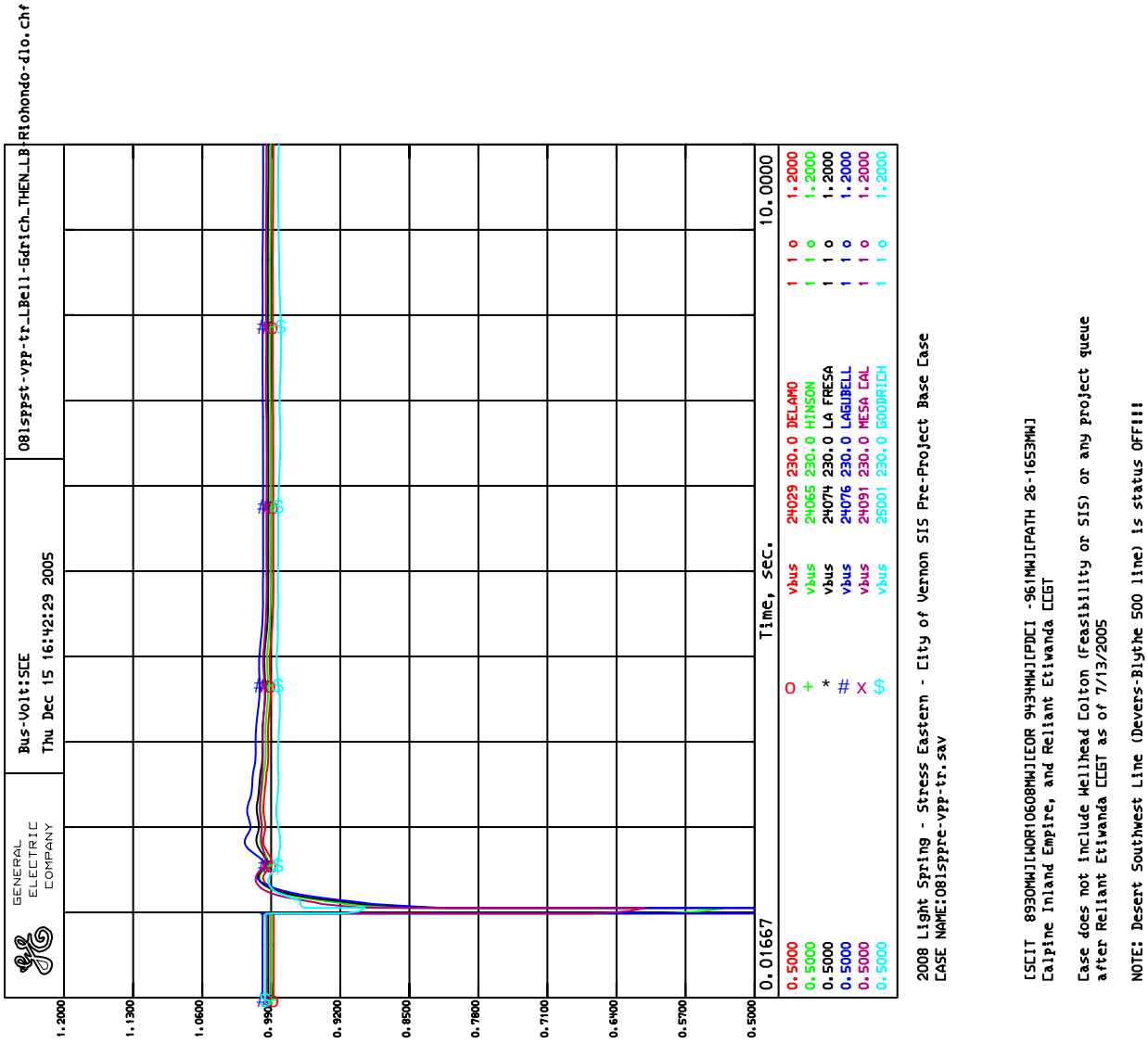
Plot 35 - 9: Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.



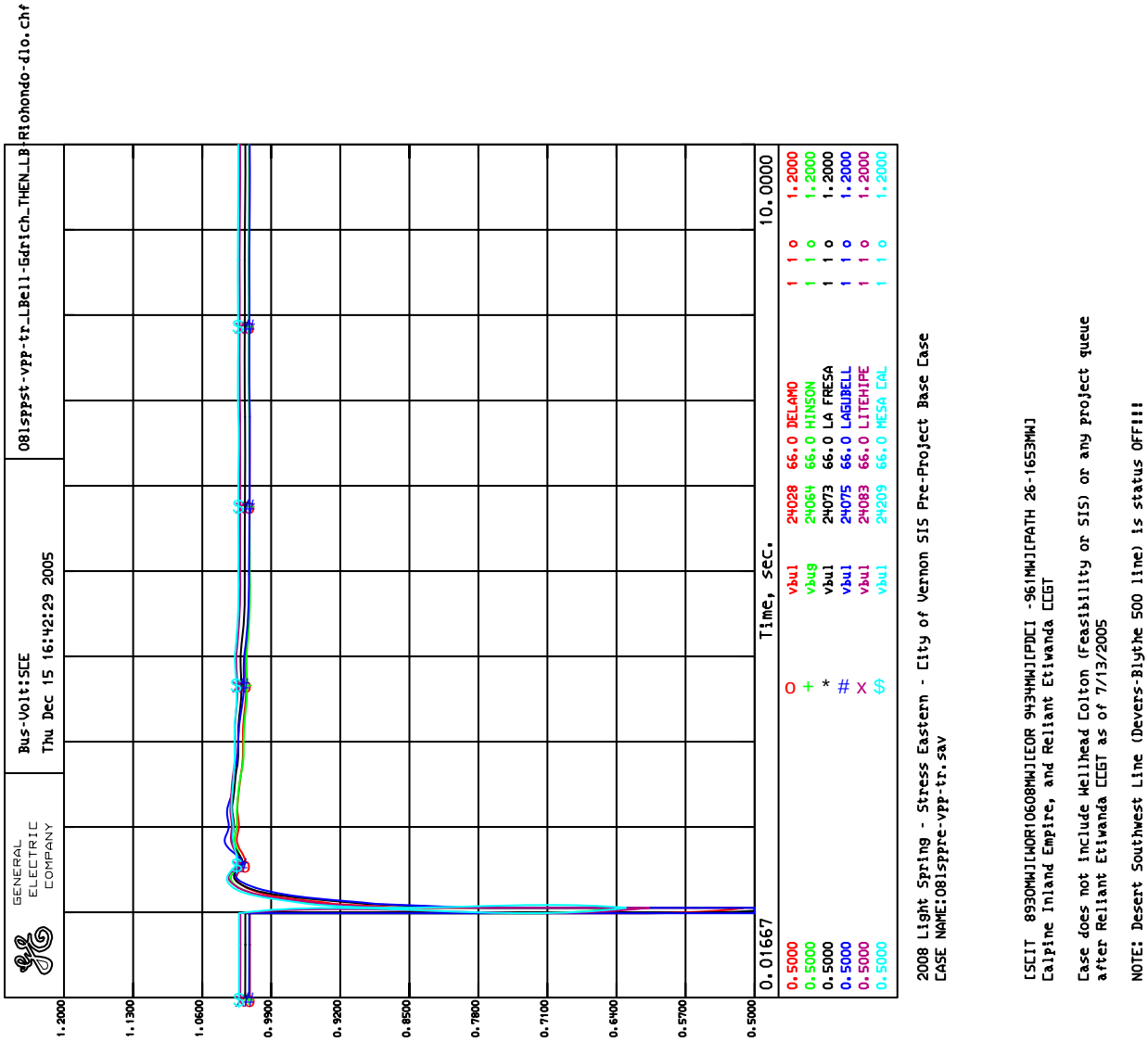
Plot 36 - 1: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



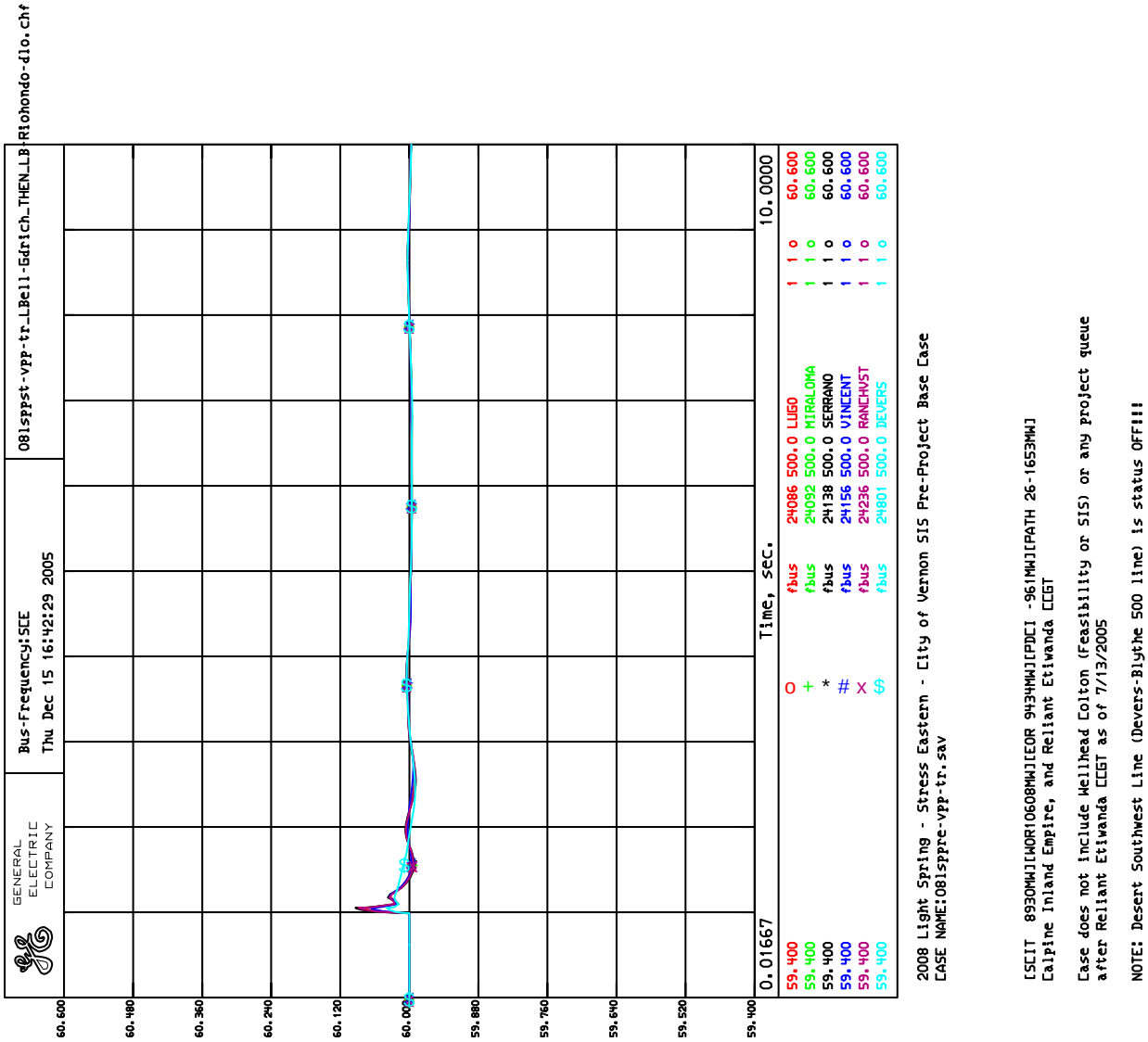
Plot 36 - 2: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



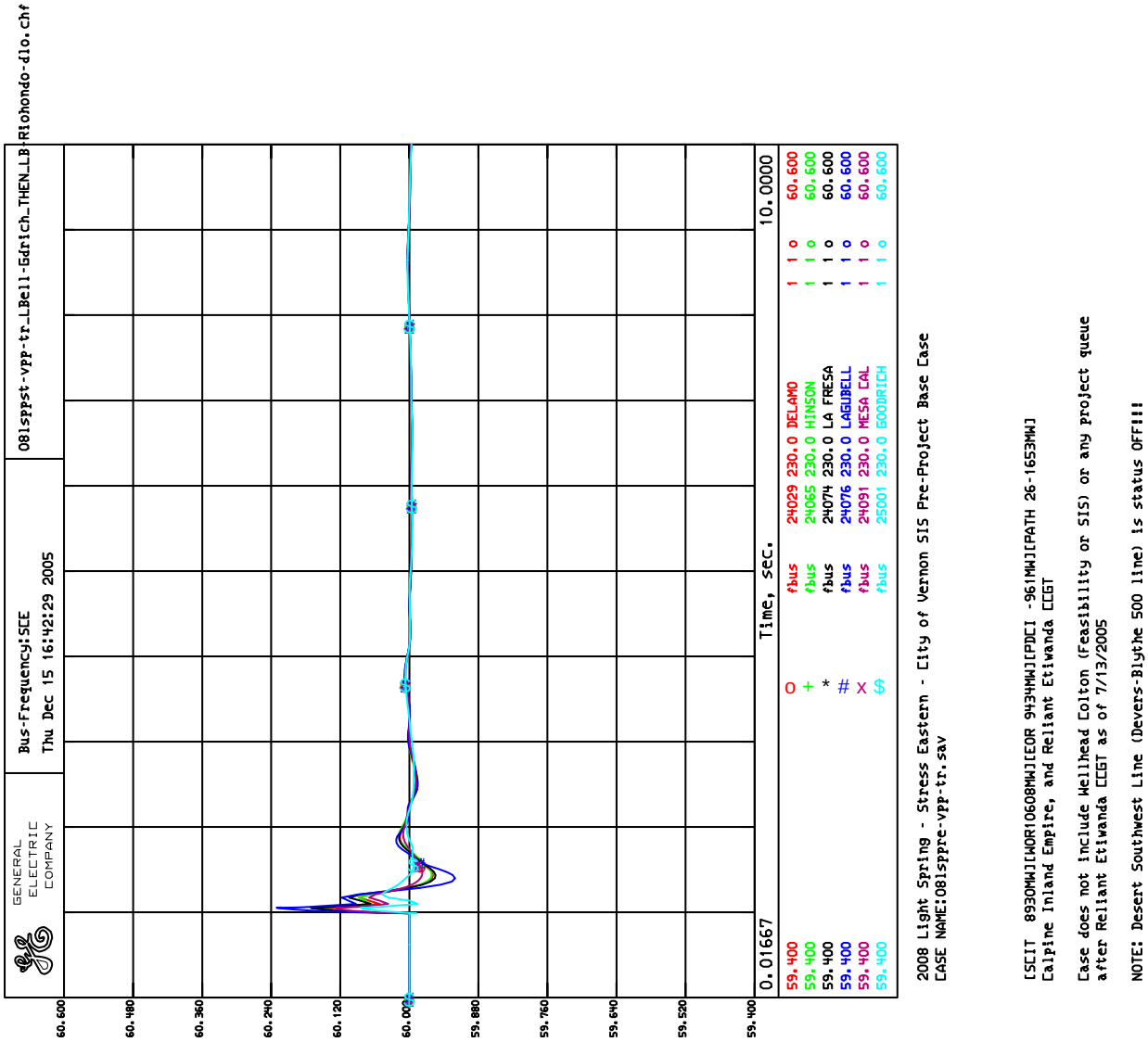
Plot 36 - 3: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



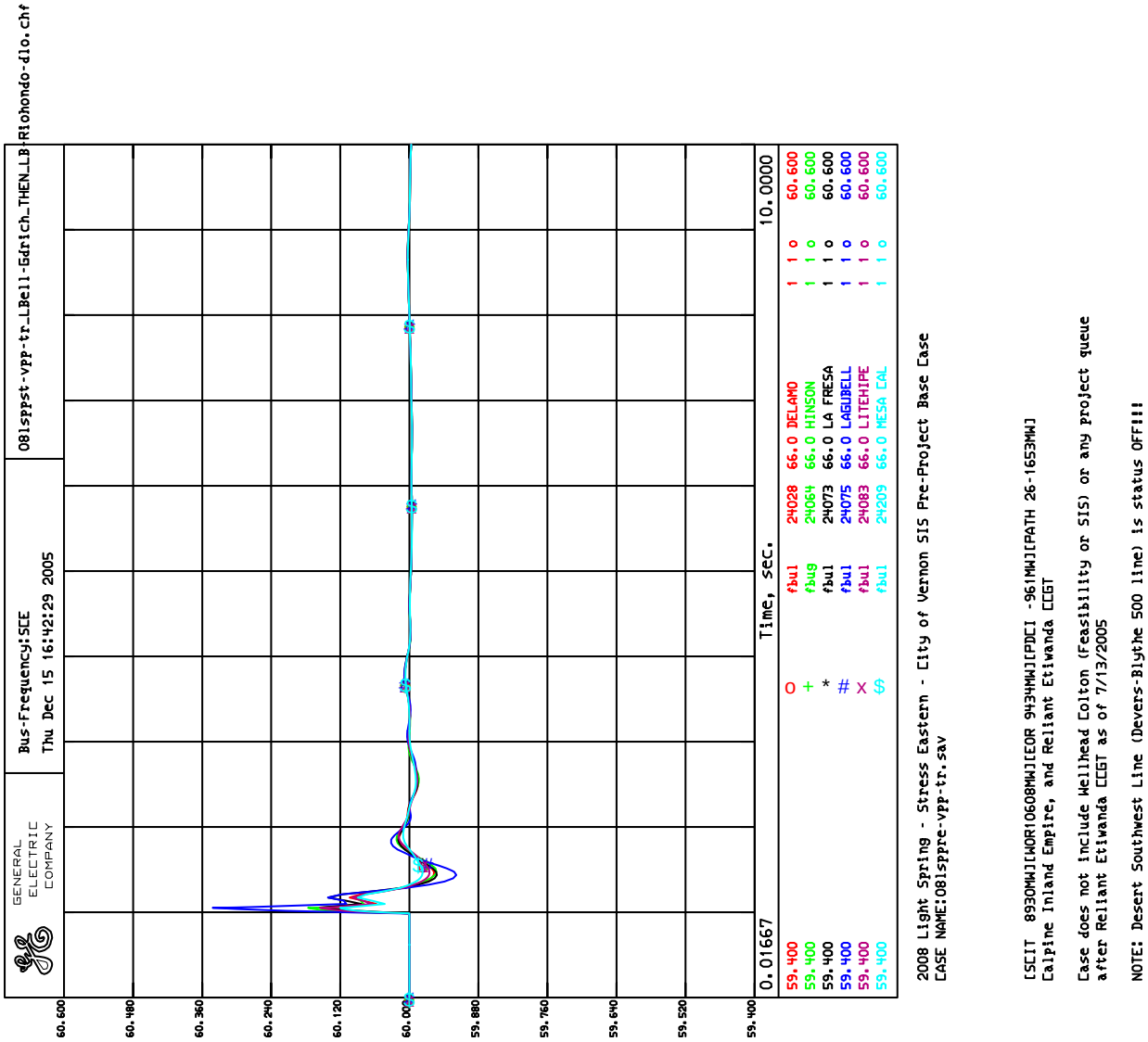
Plot 36 - 4: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



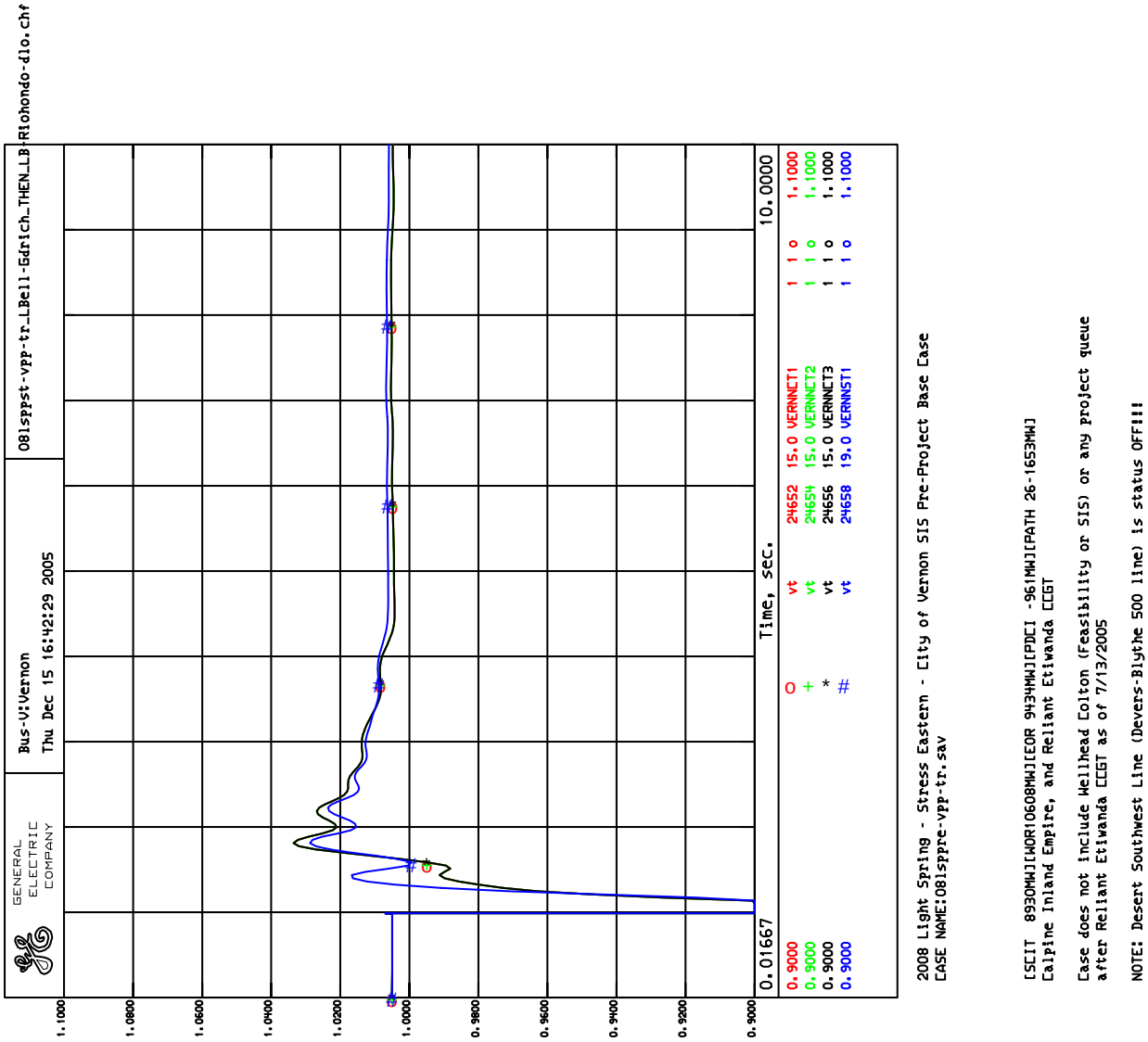
Plot 36 - 5: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



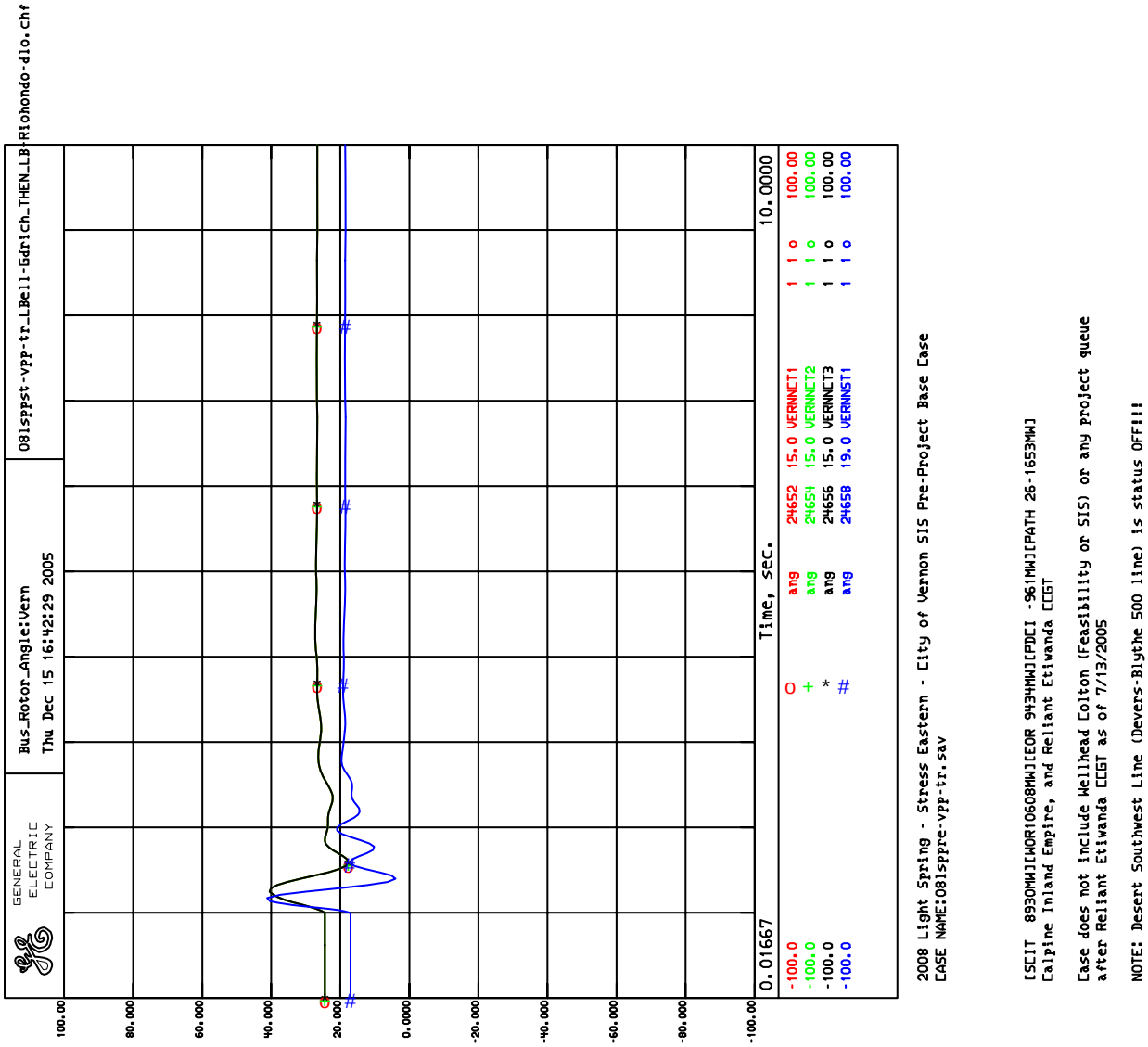
Plot 36 - 6: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



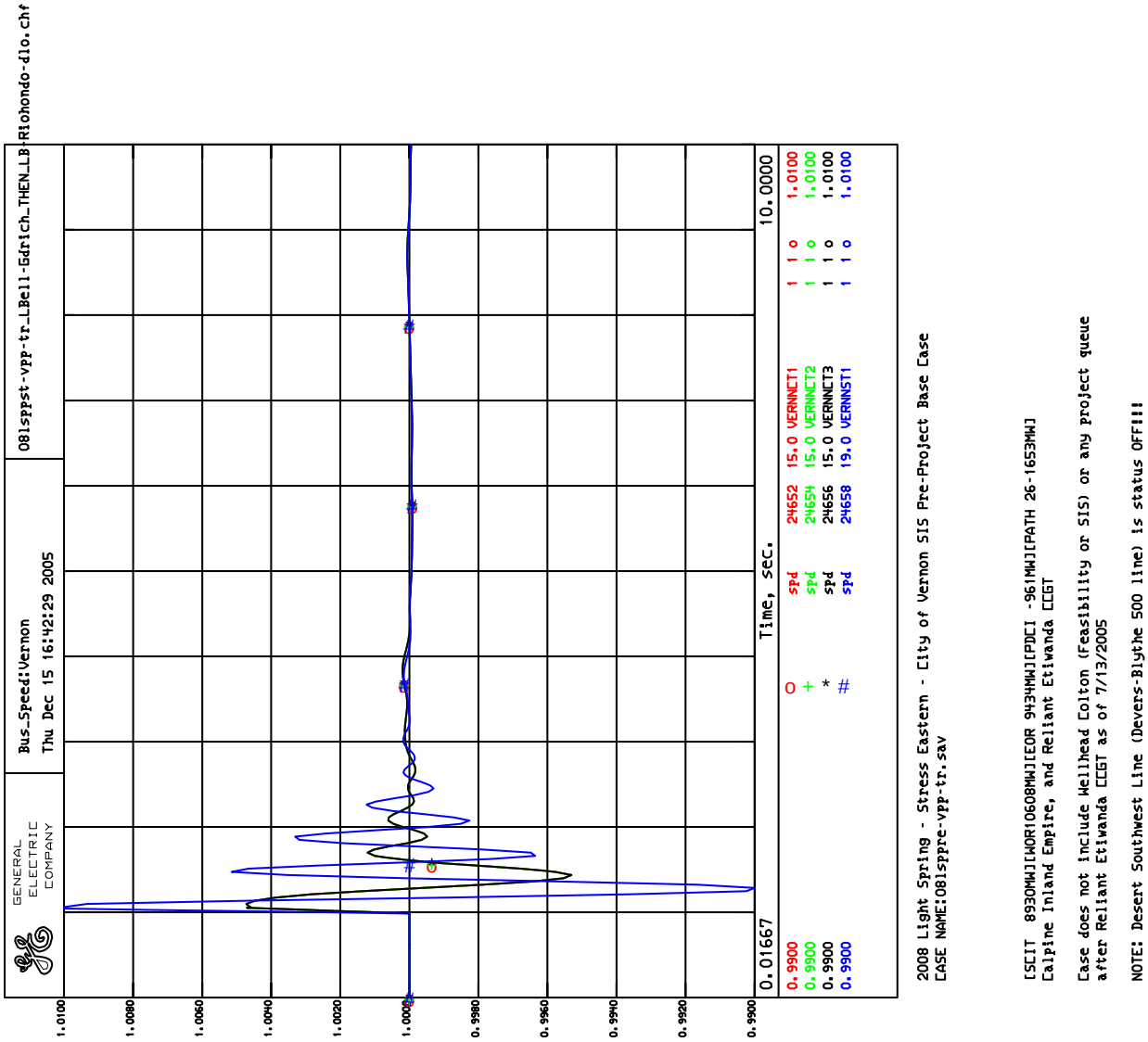
Plot 36 - 7: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



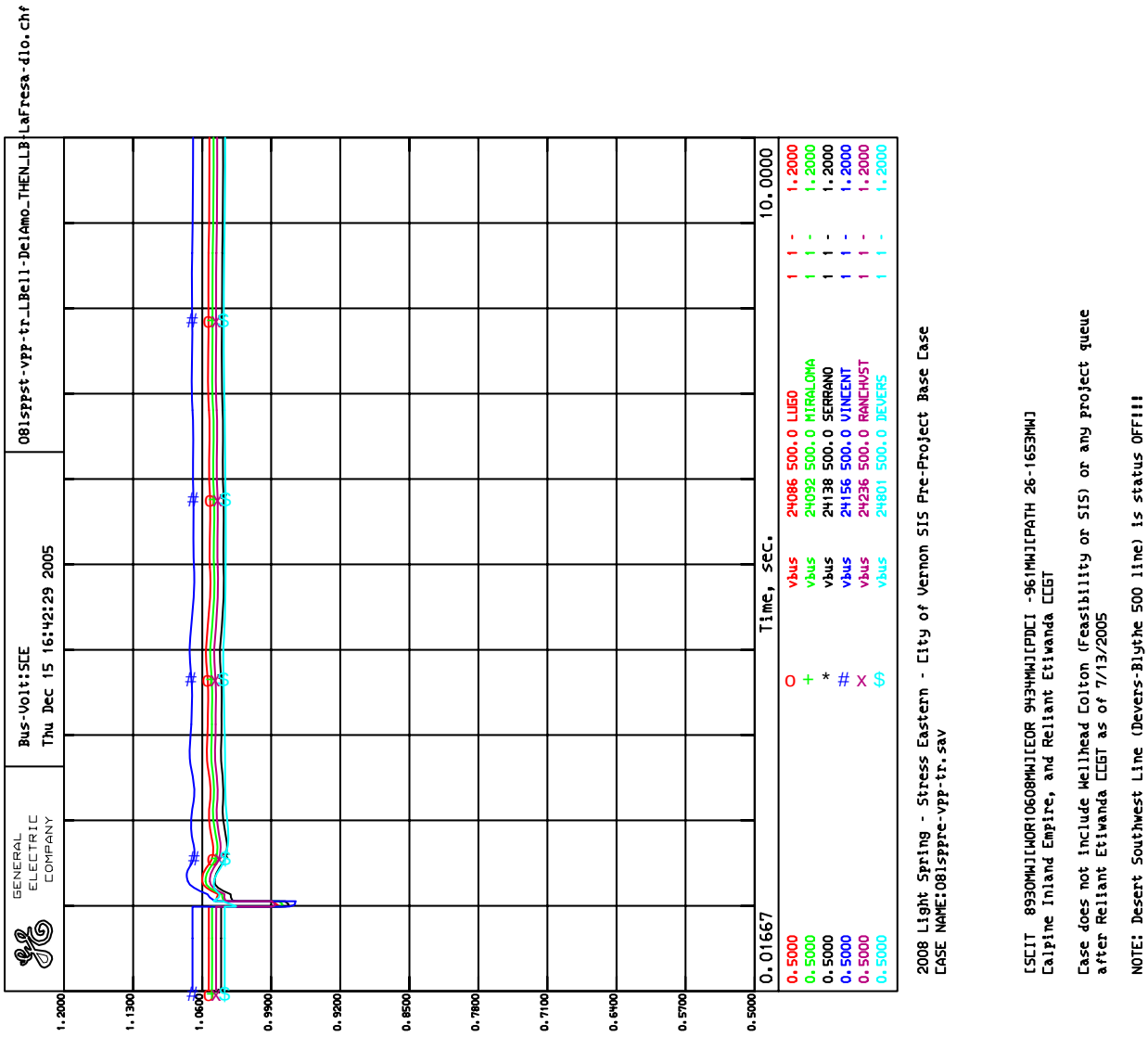
Plot 36 - 8: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



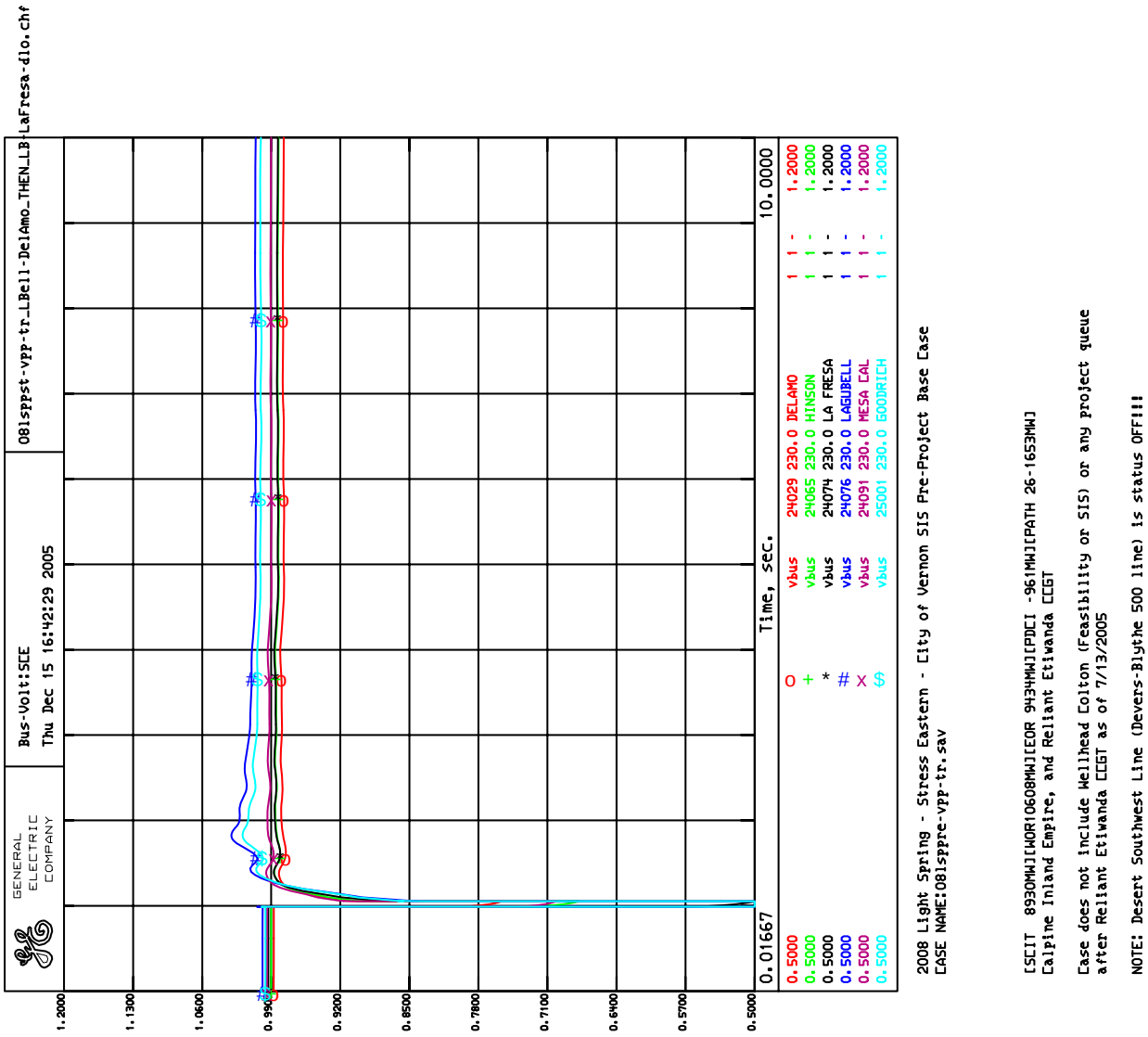
Plot 36 - 9: Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.



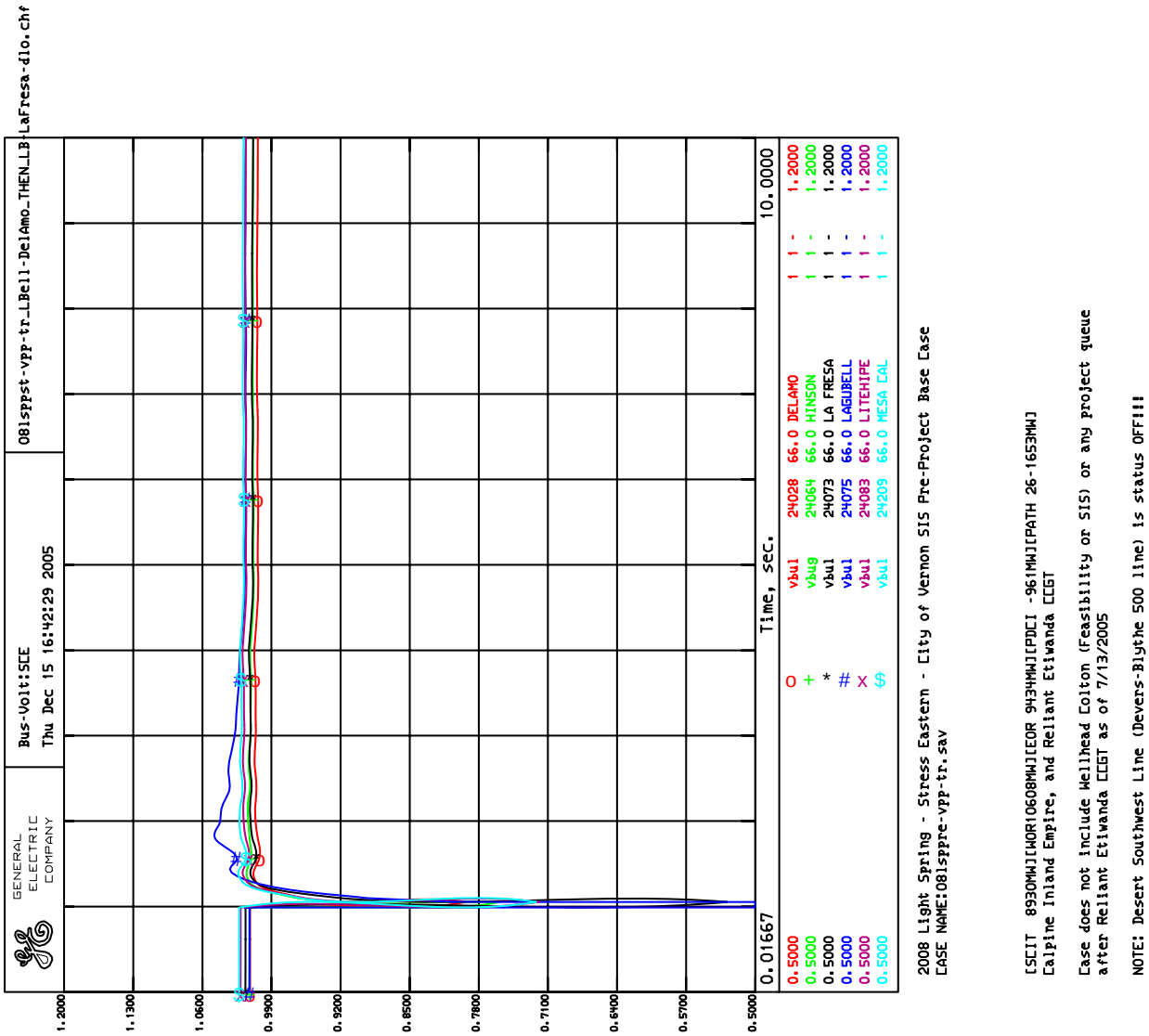
Plot 37 - 1: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



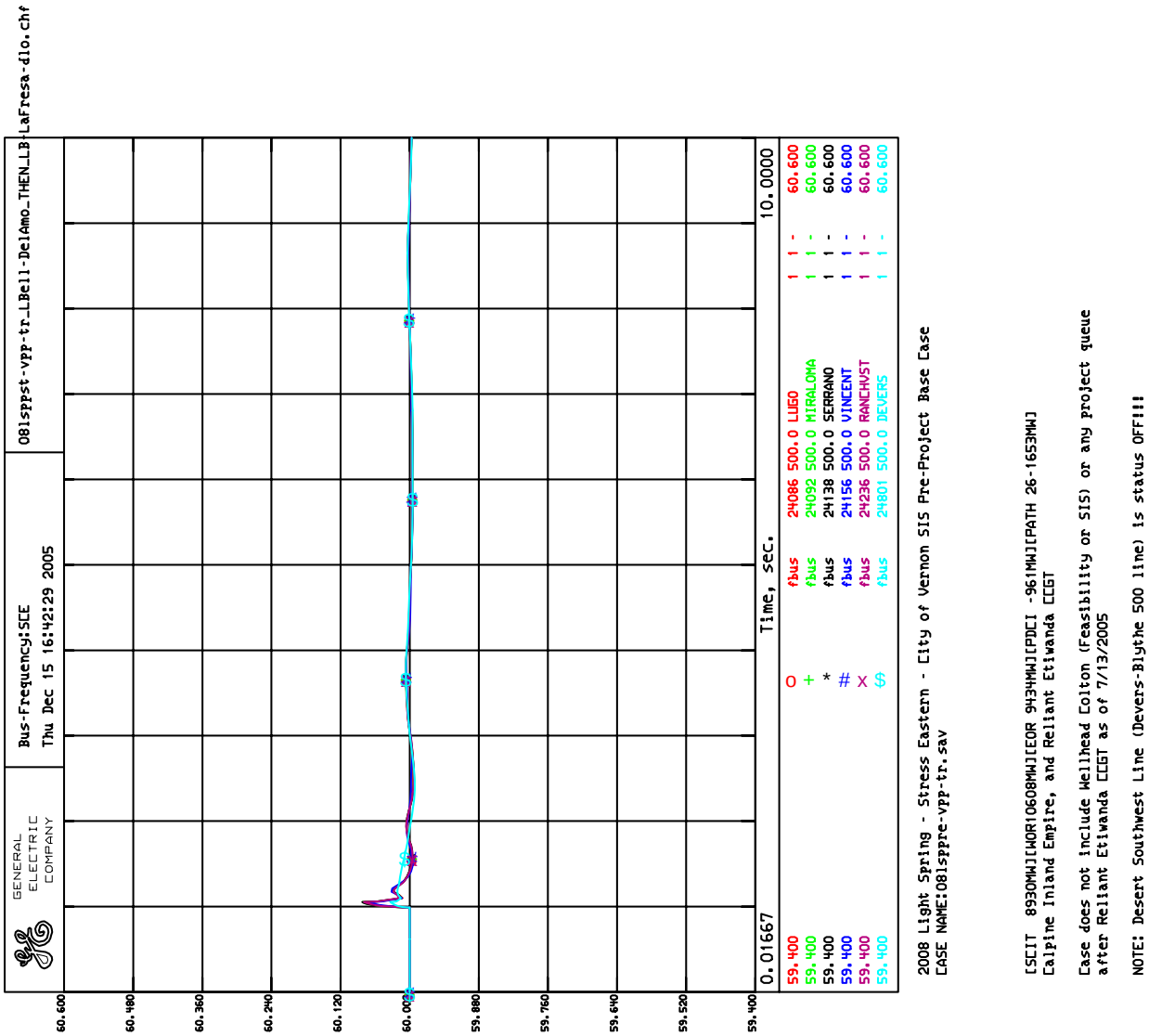
Plot 37 - 2: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



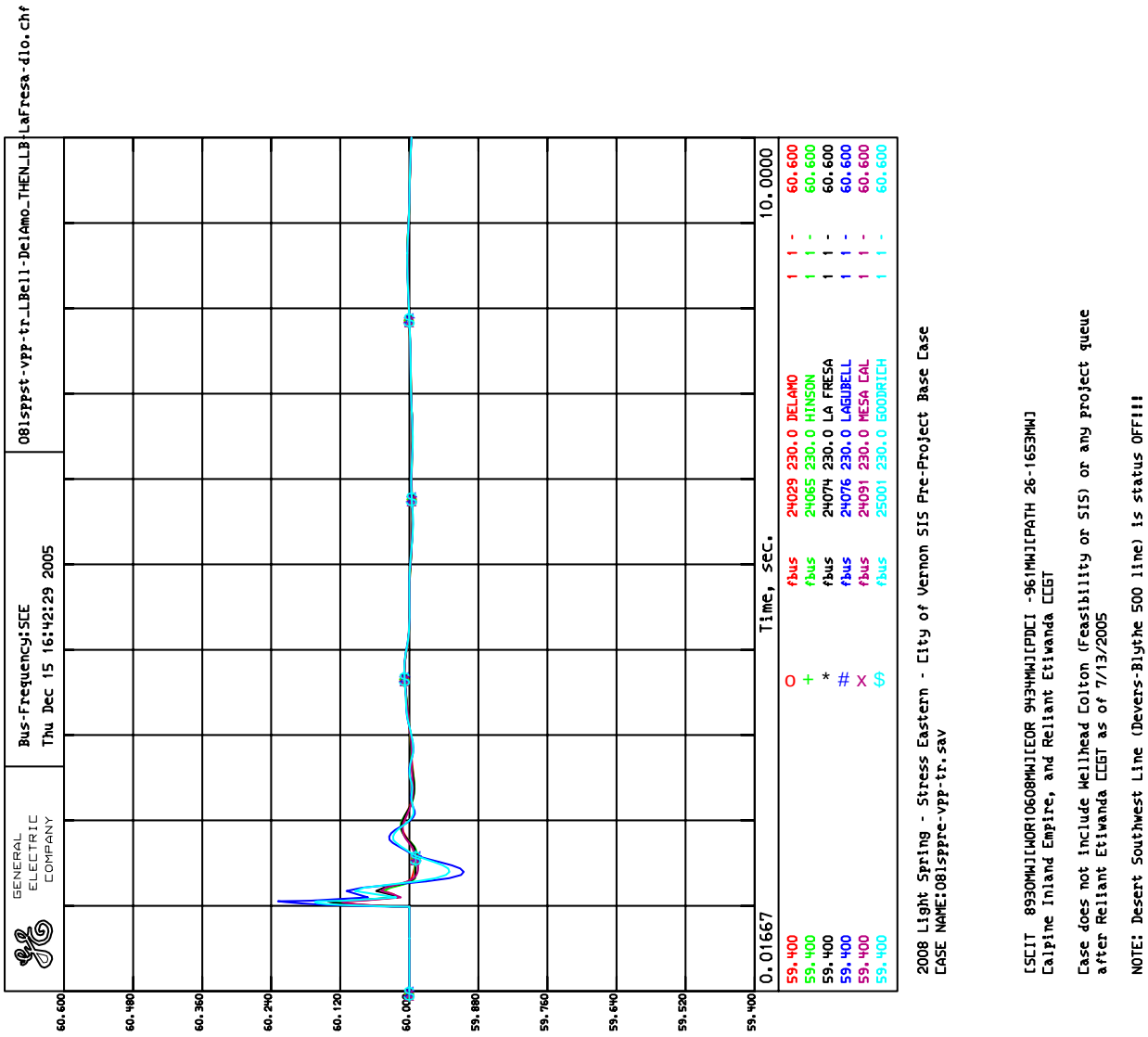
Plot 37 - 3: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



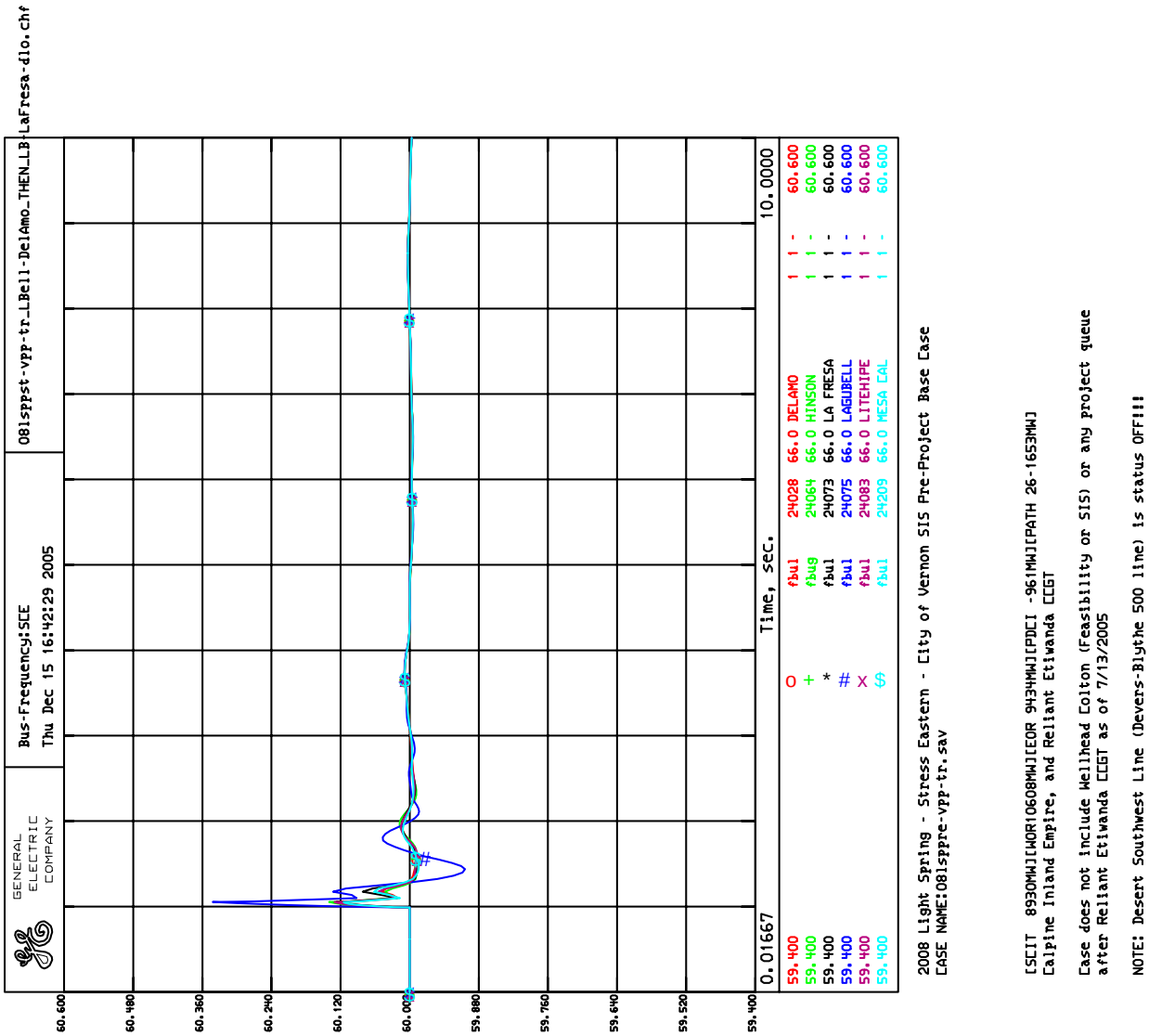
Plot 37 - 4: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



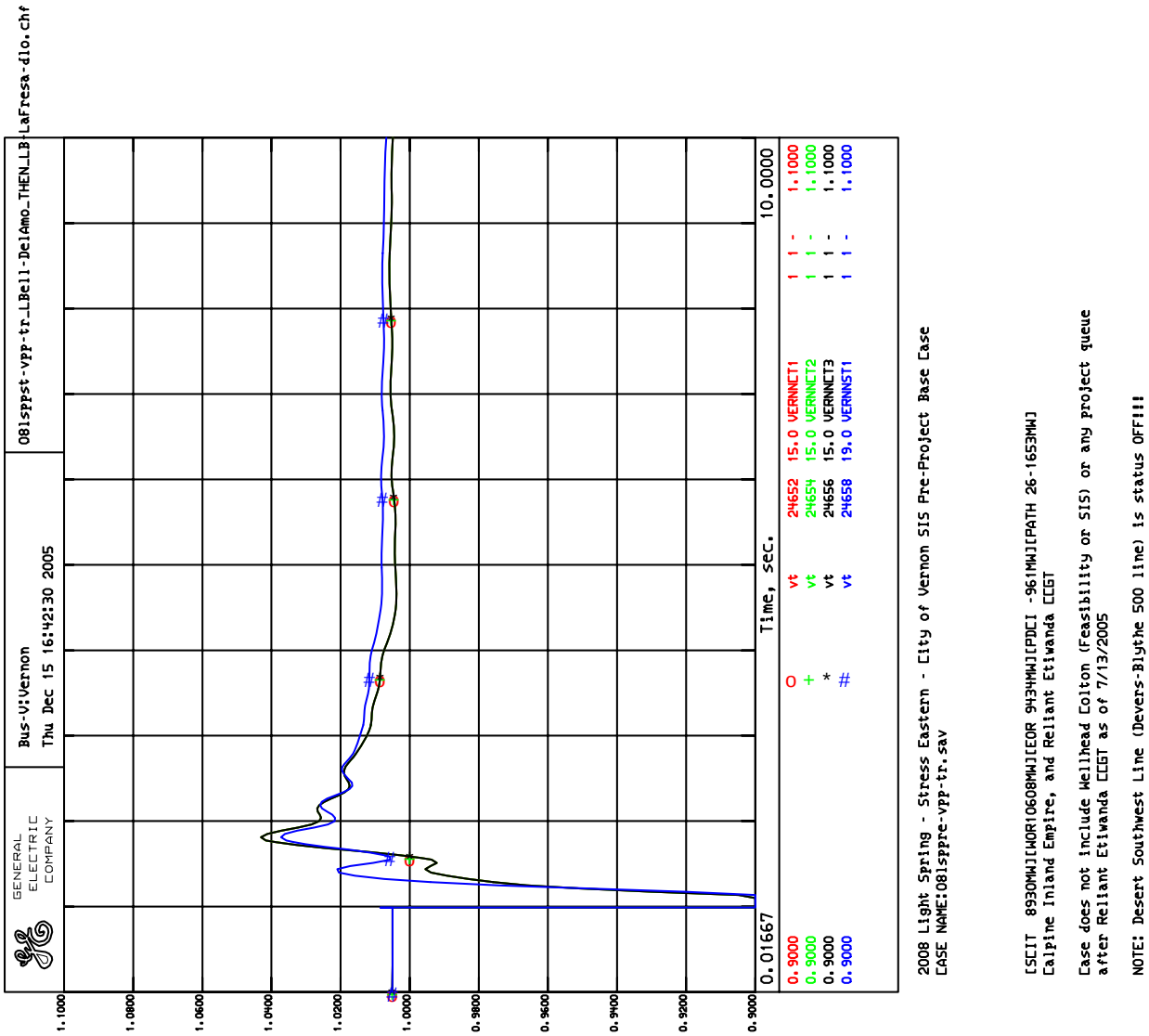
Plot 37 - 5: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



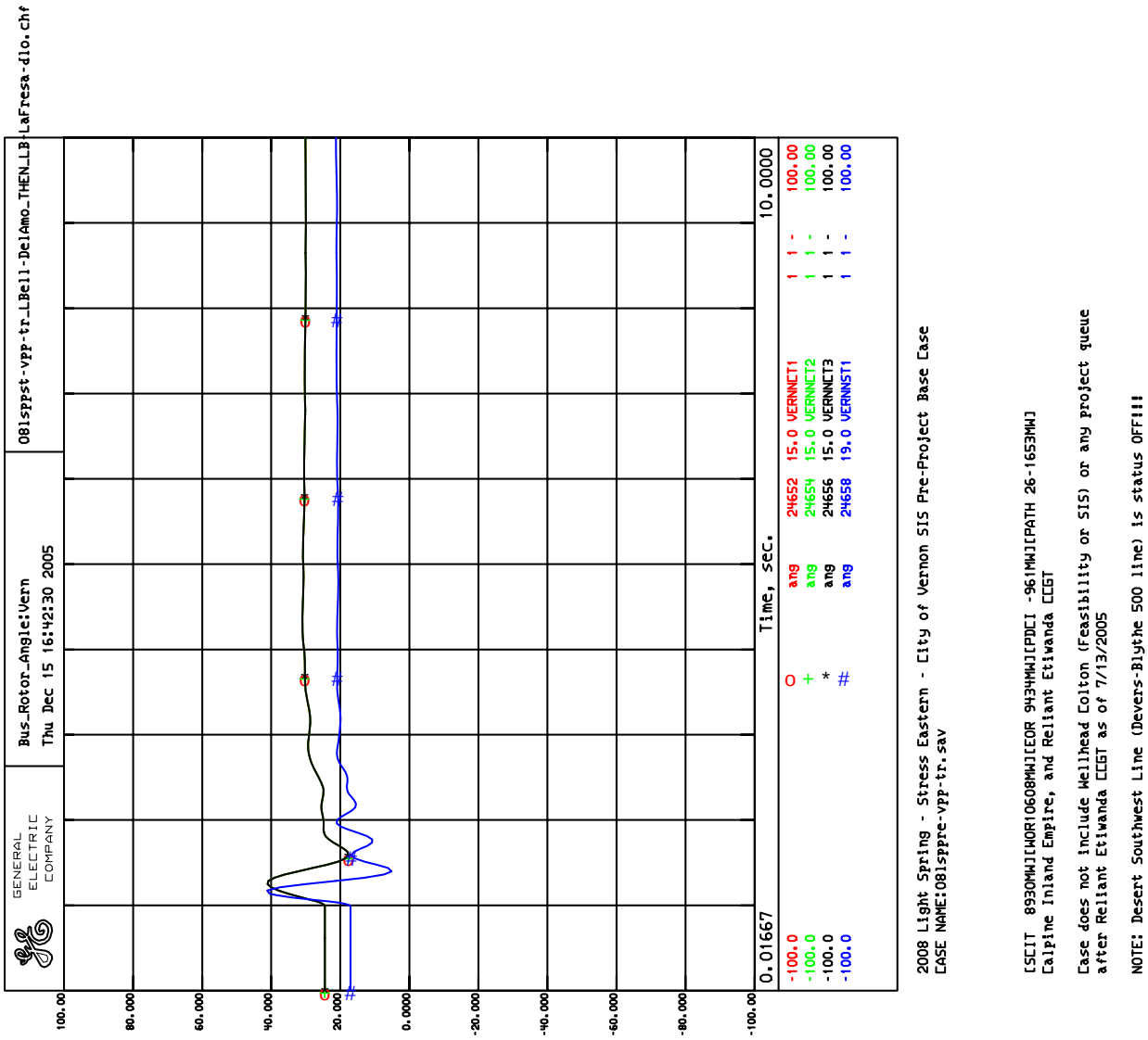
Plot 37 - 6: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



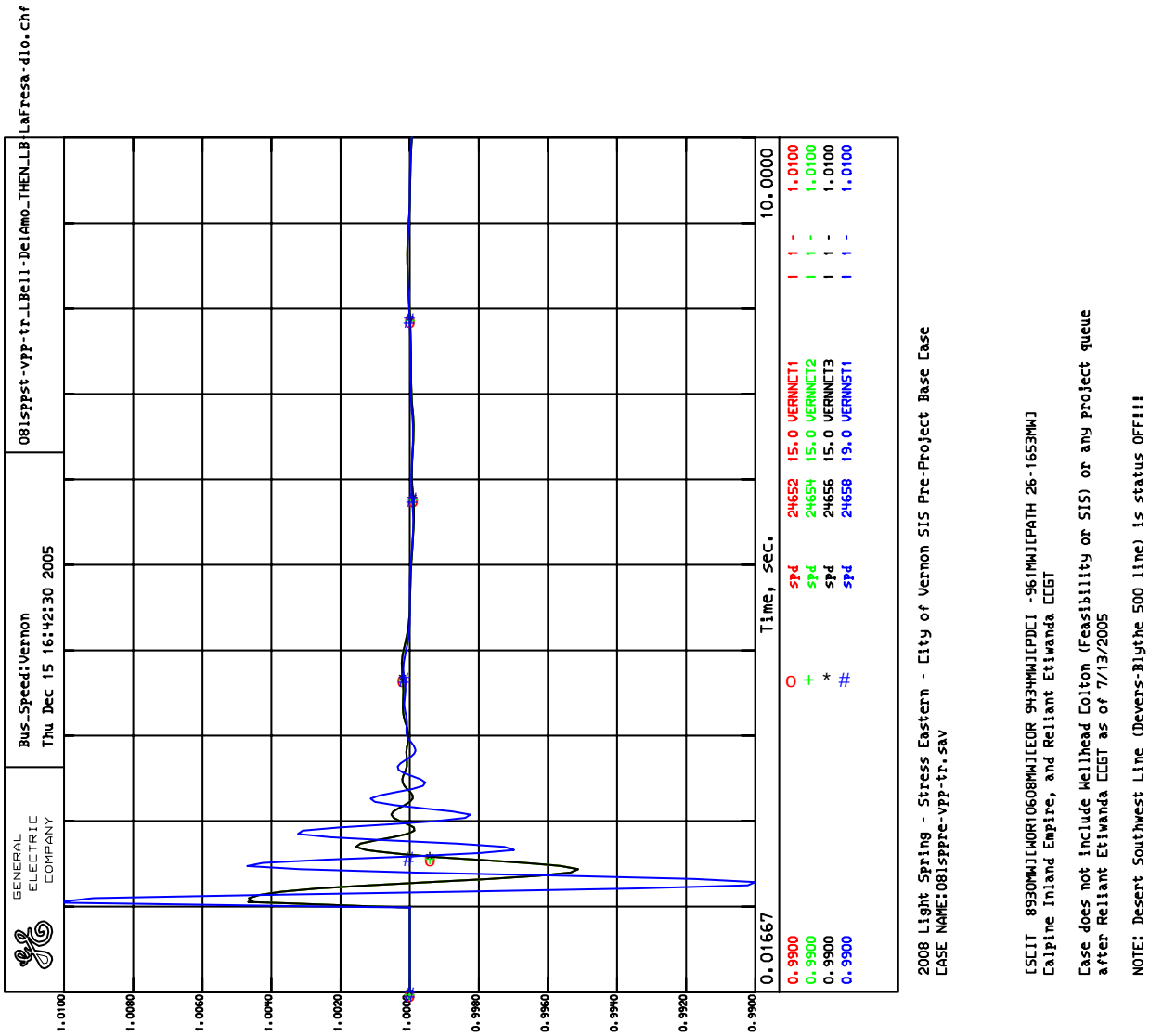
Plot 37 - 7: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



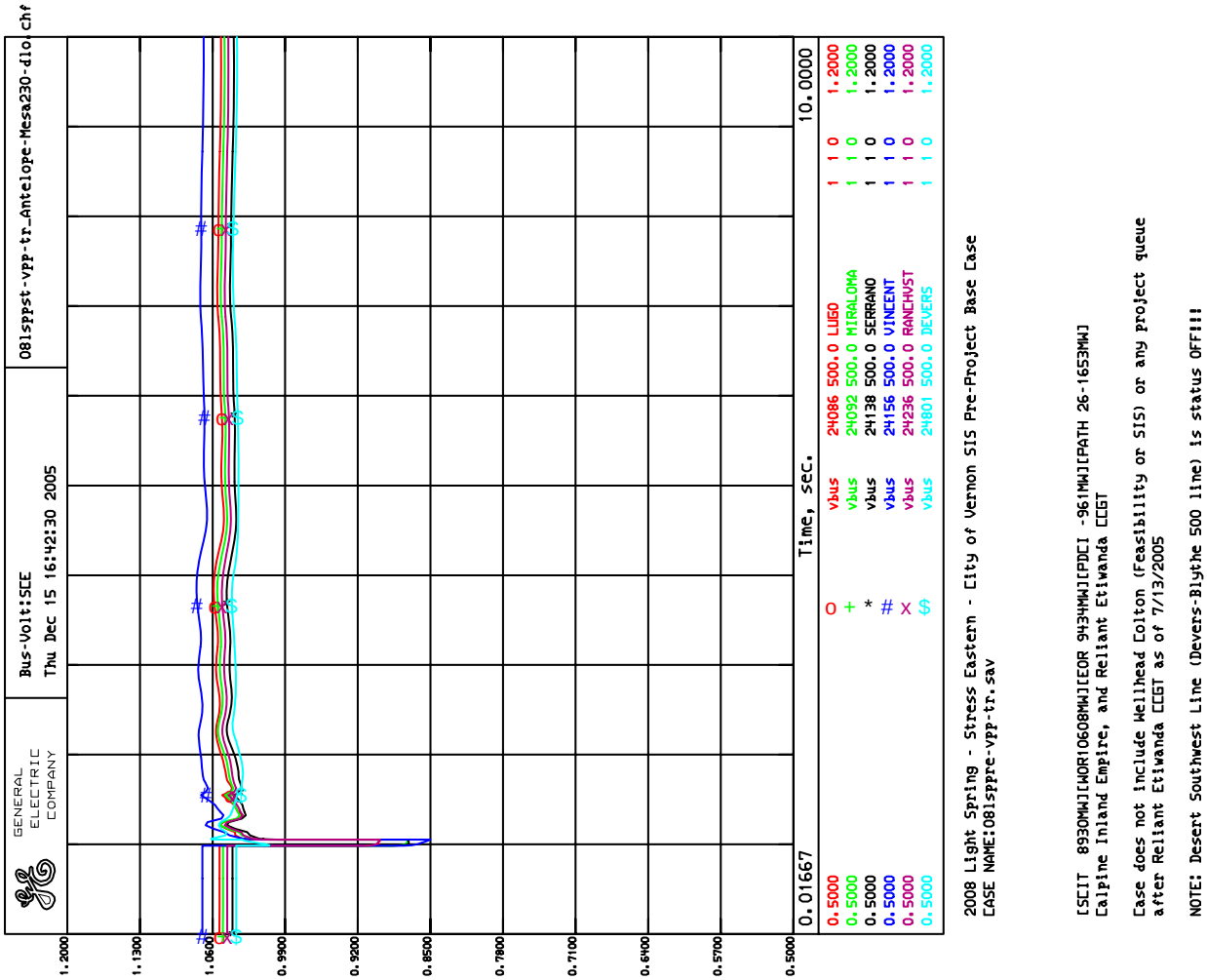
Plot 37 - 8: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



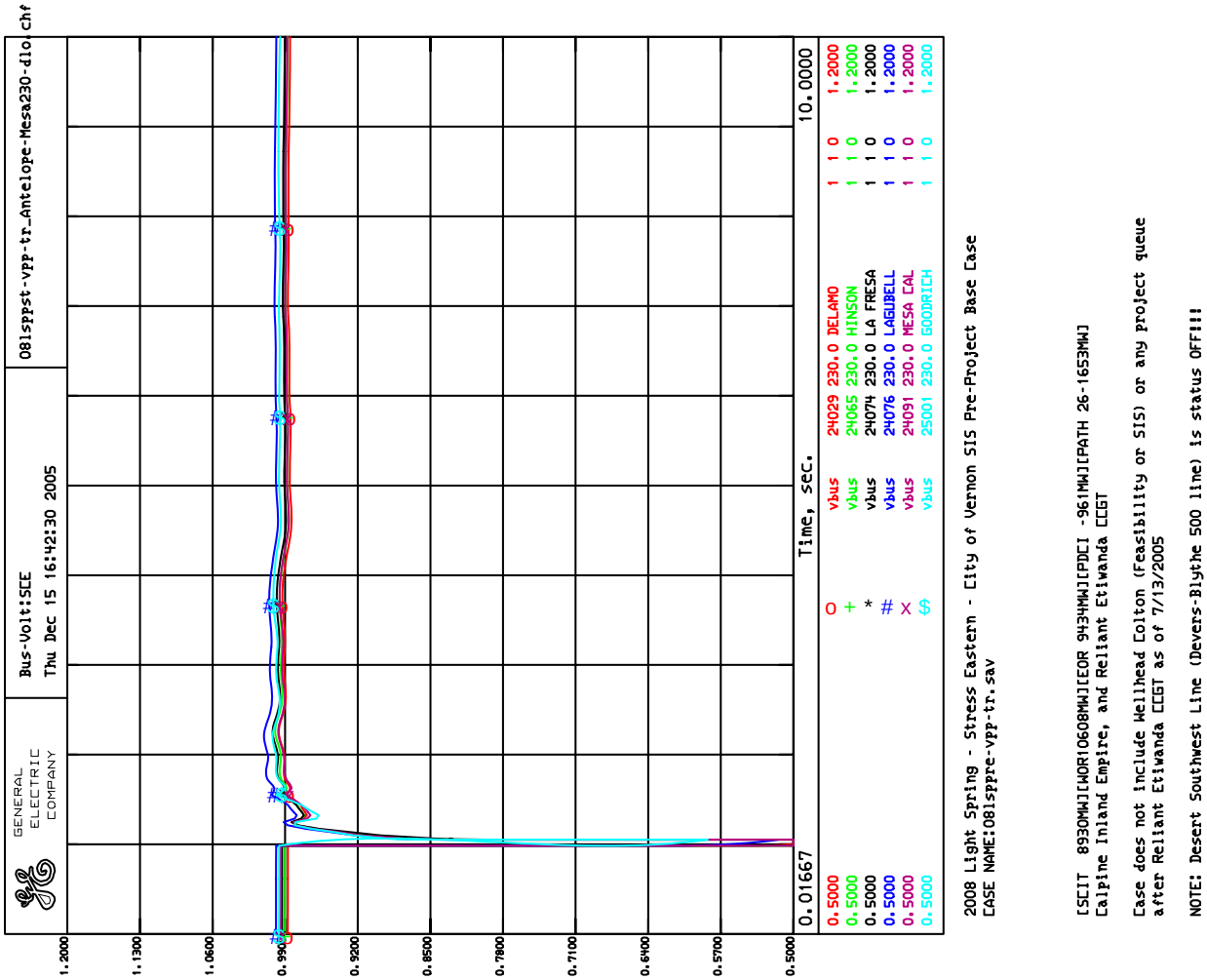
Plot 37 - 9: Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.



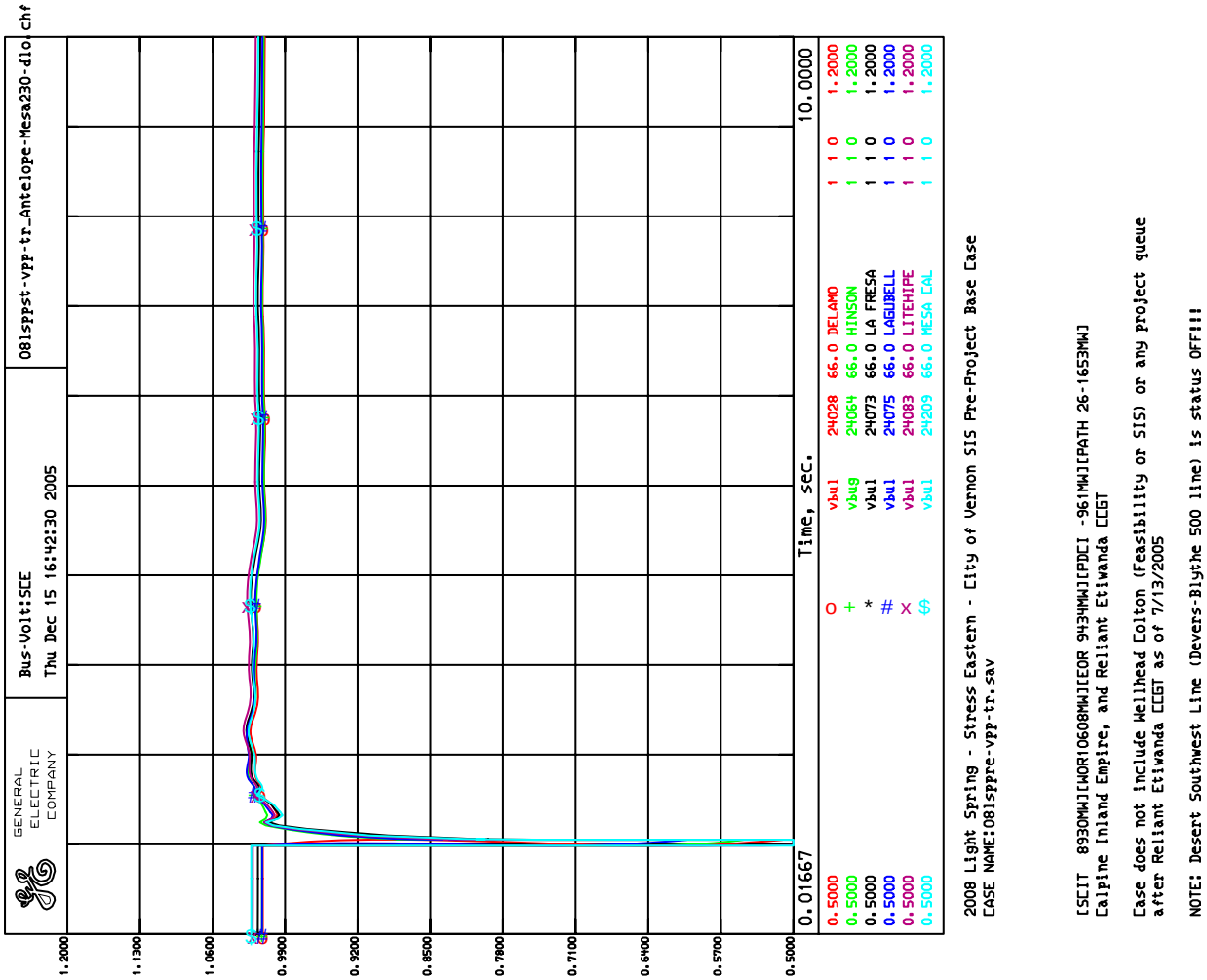
Plot 38 - 1: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



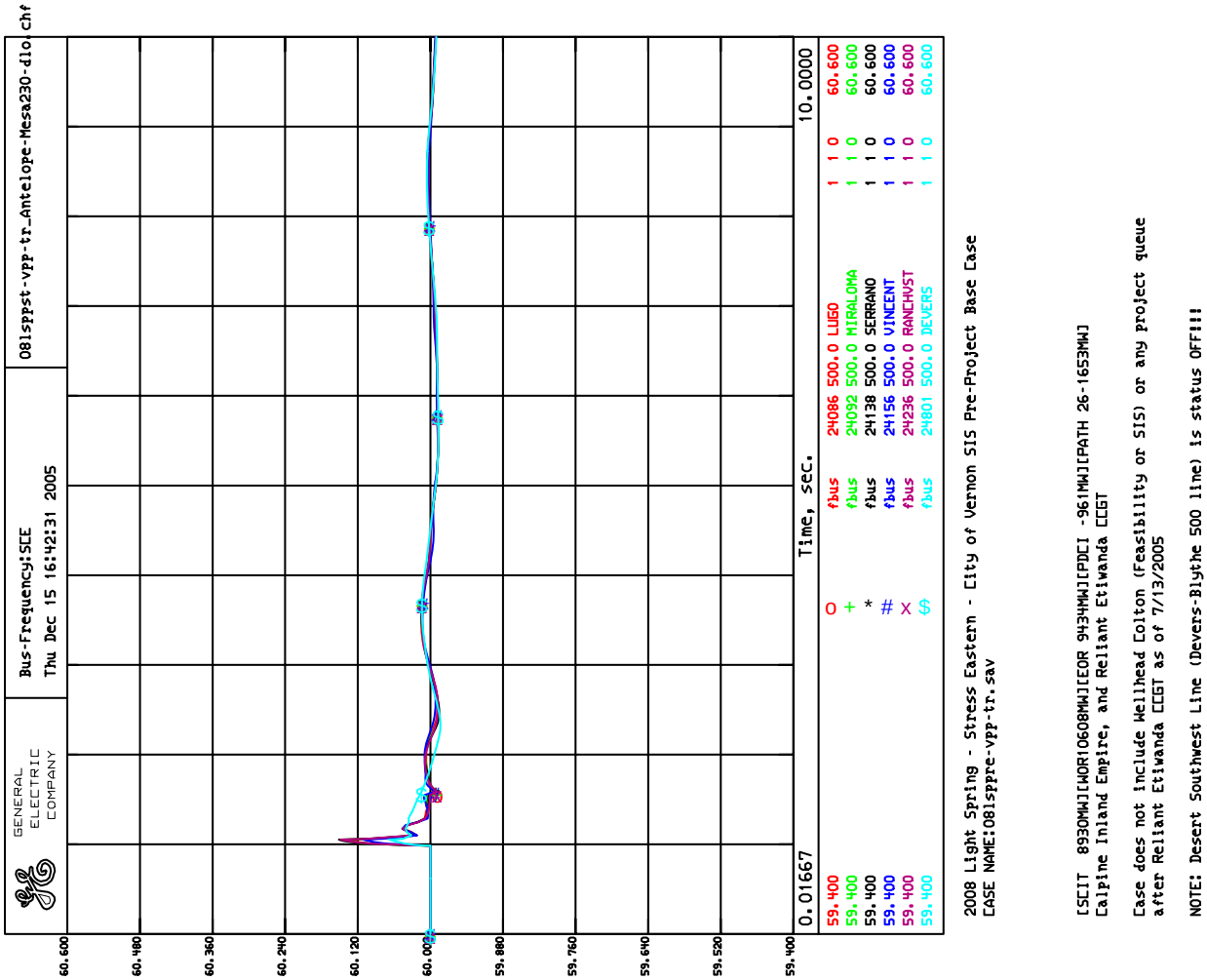
Plot 38 - 2: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



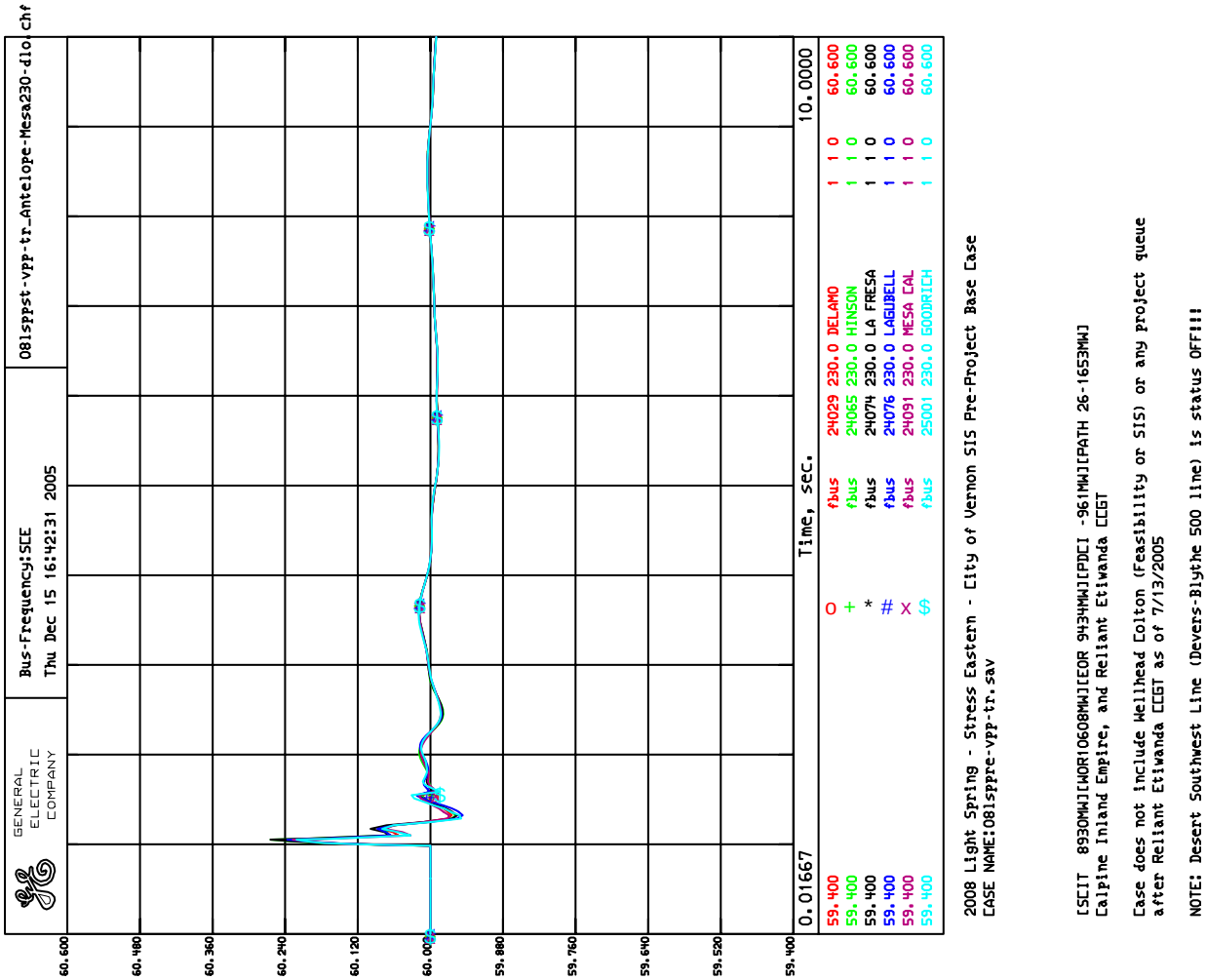
Plot 38 - 3: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



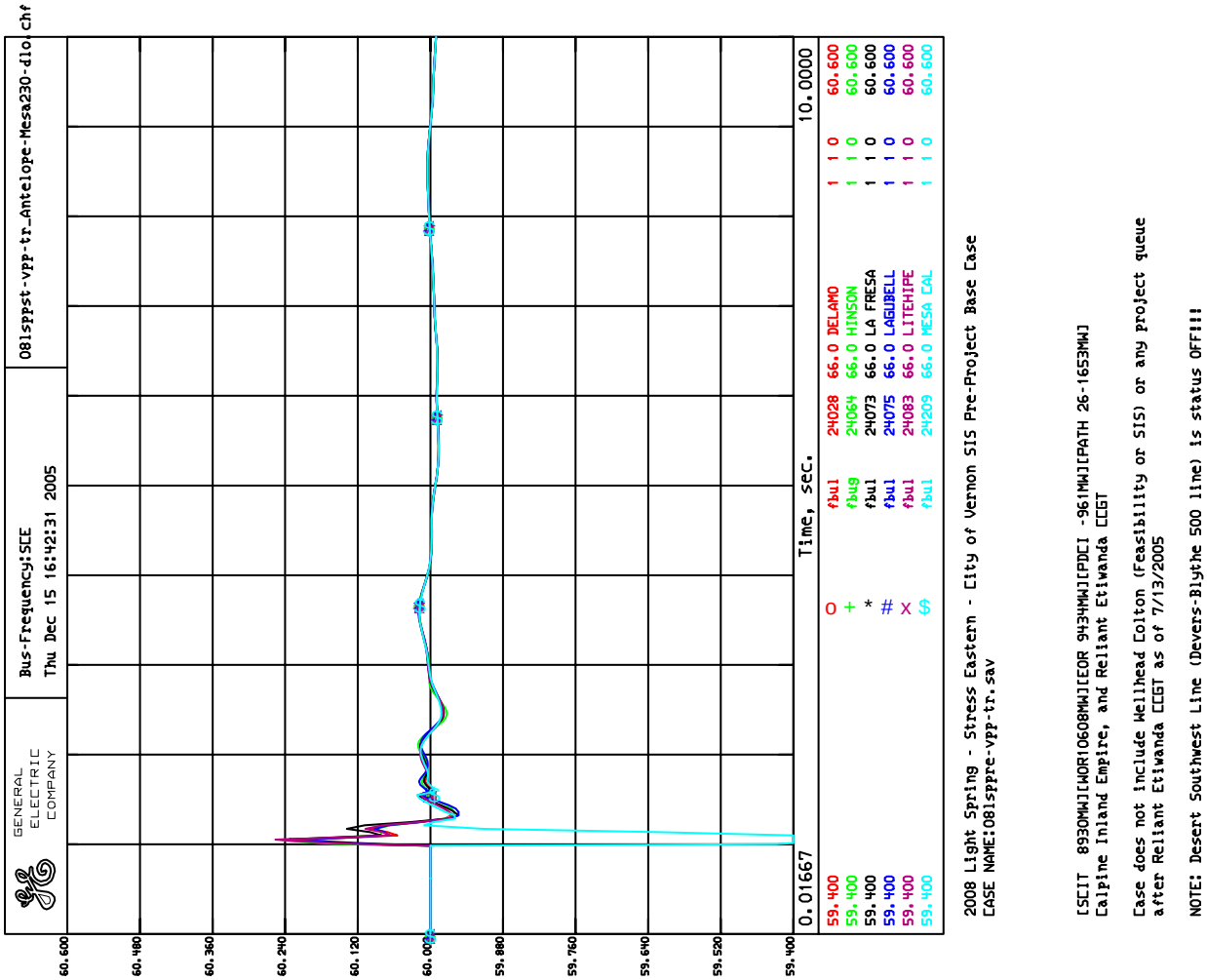
Plot 38 - 4: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



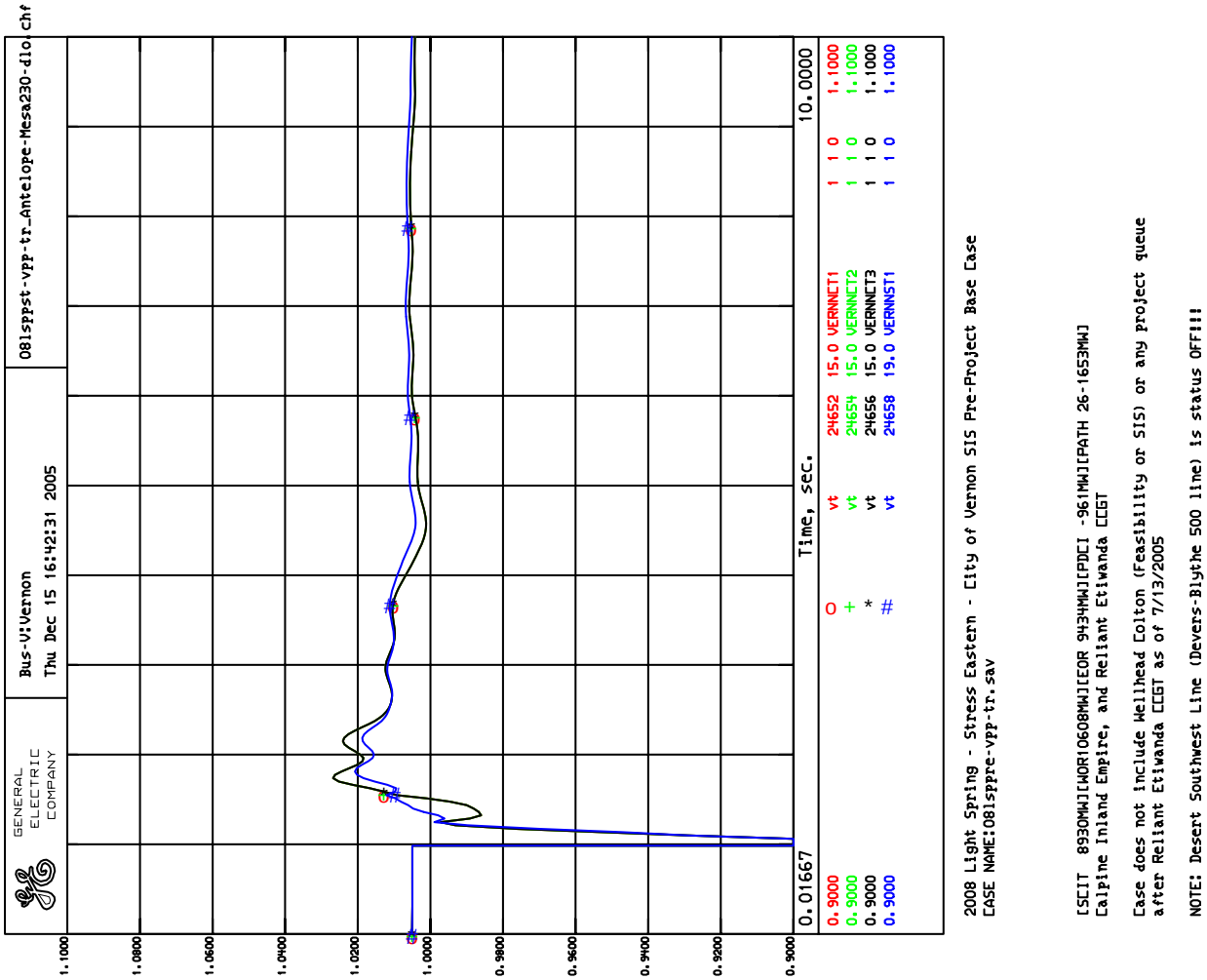
Plot 38 - 5: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



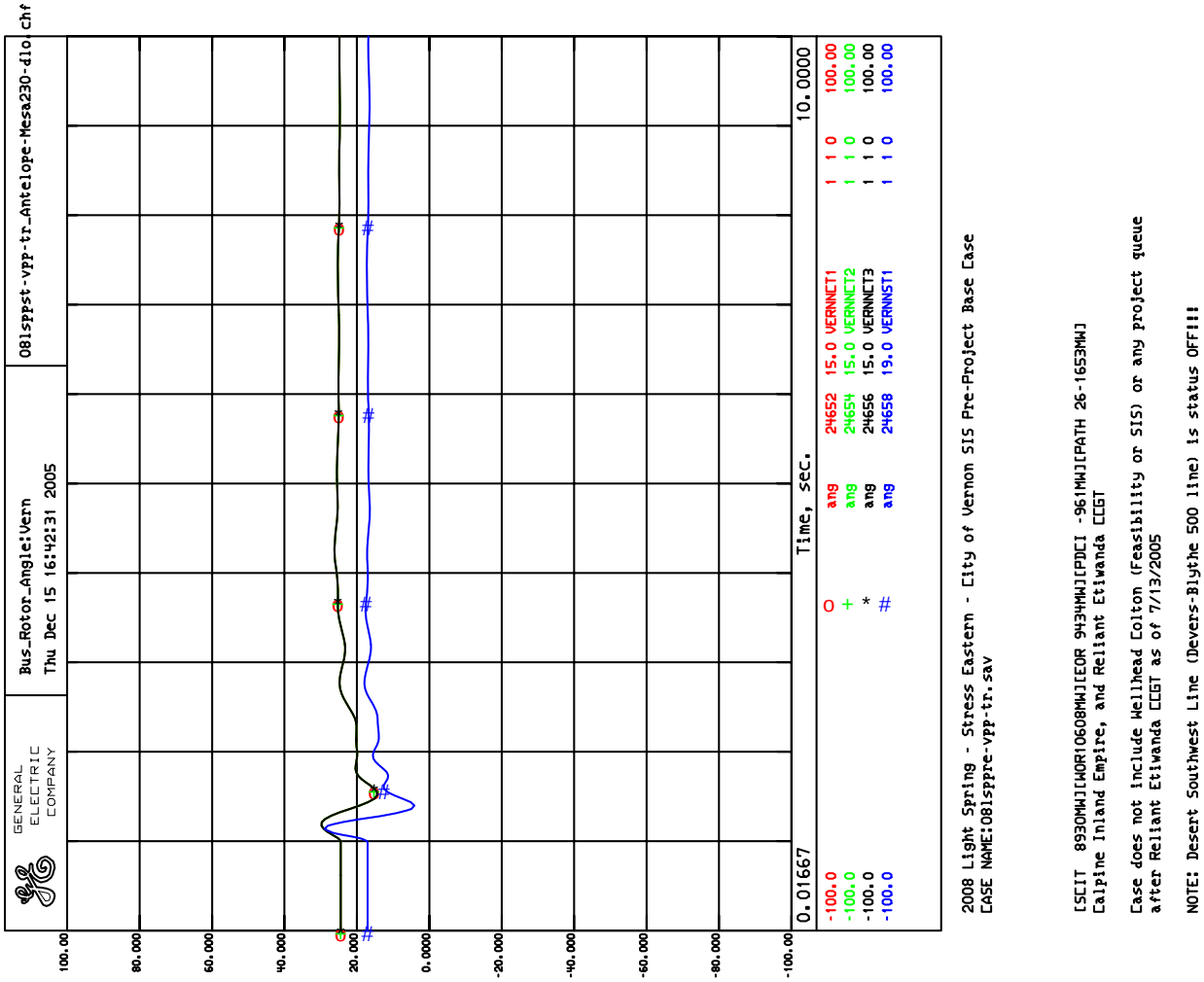
Plot 38 - 6: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



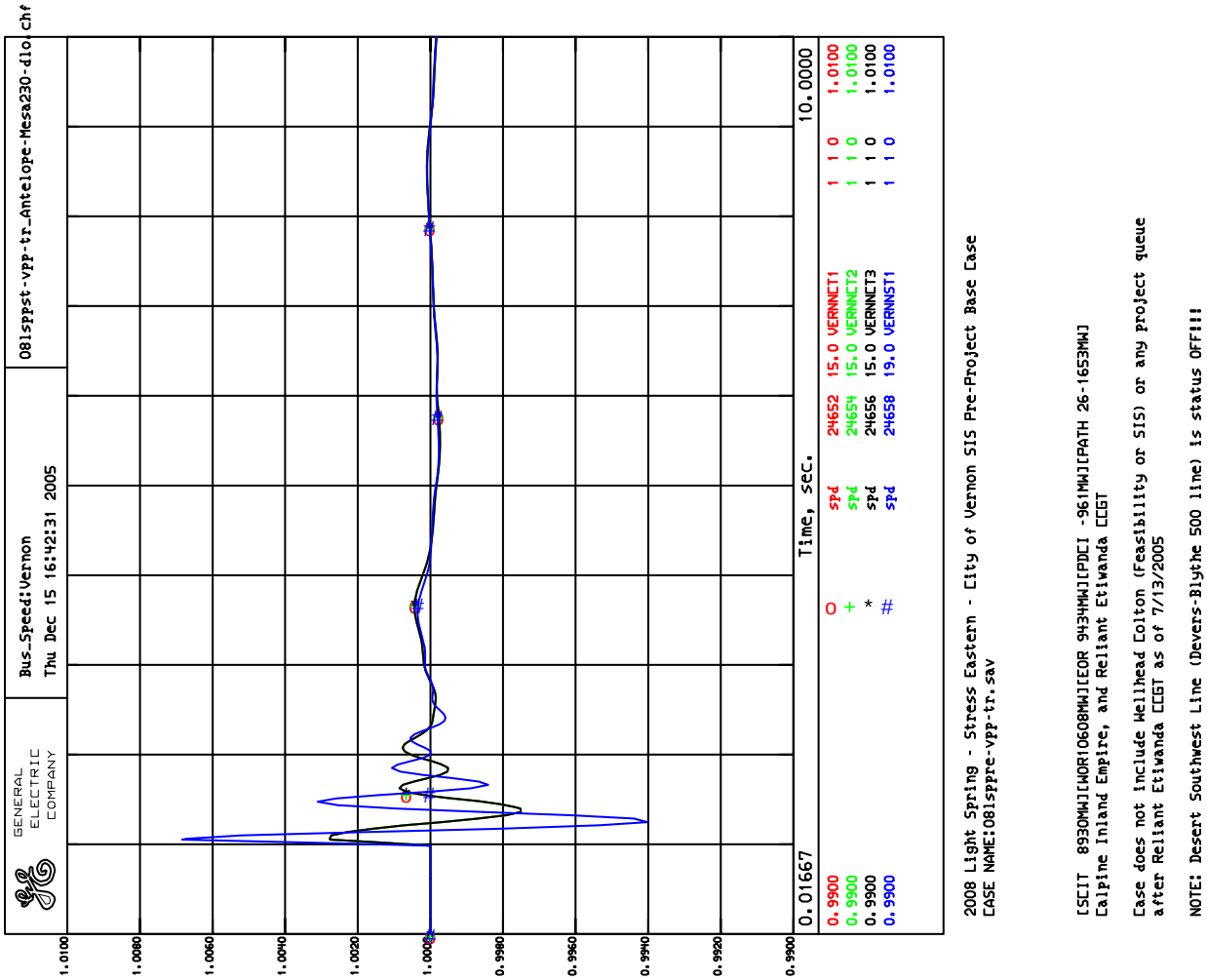
Plot 38 - 7: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



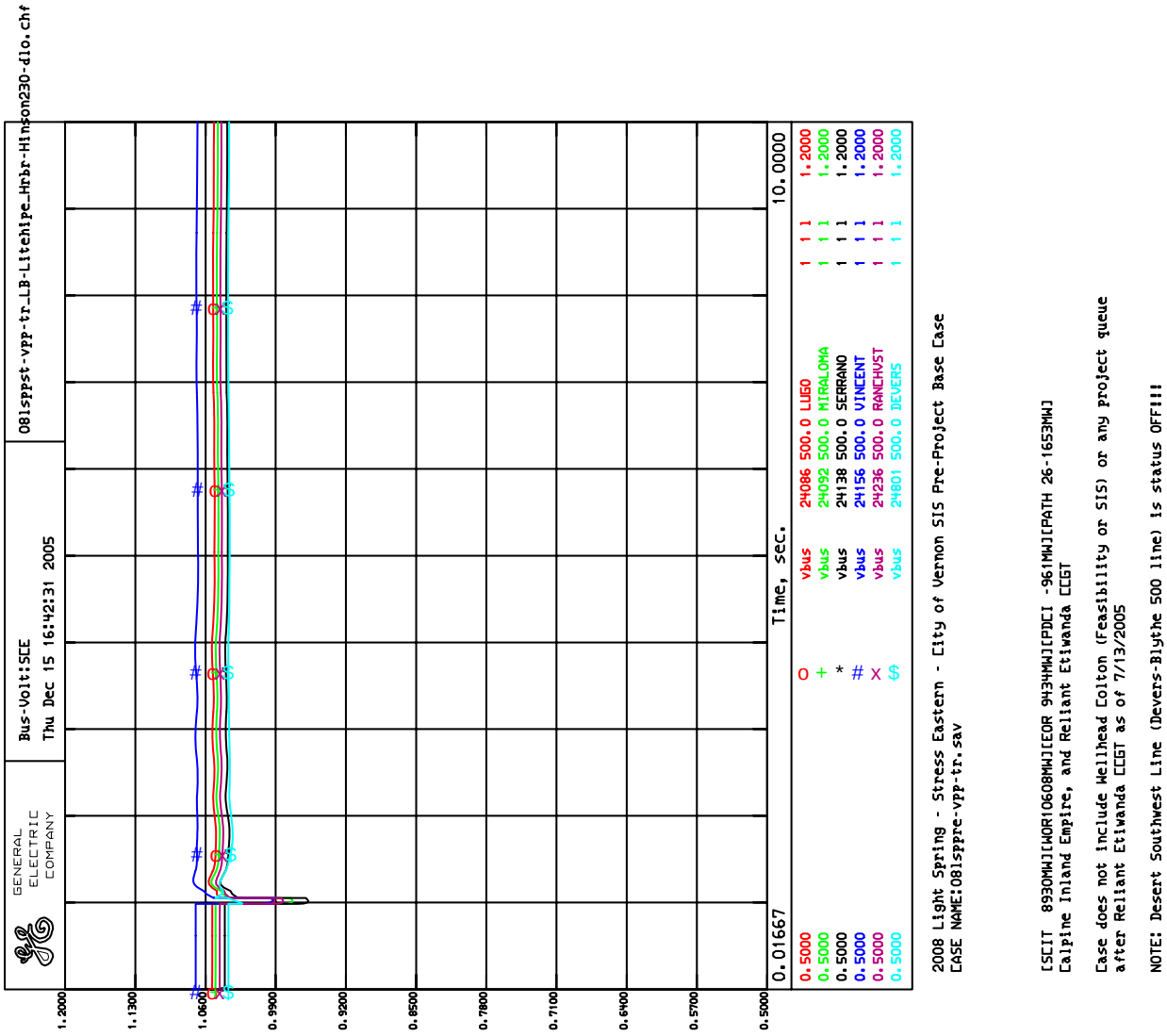
Plot 38 - 8: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



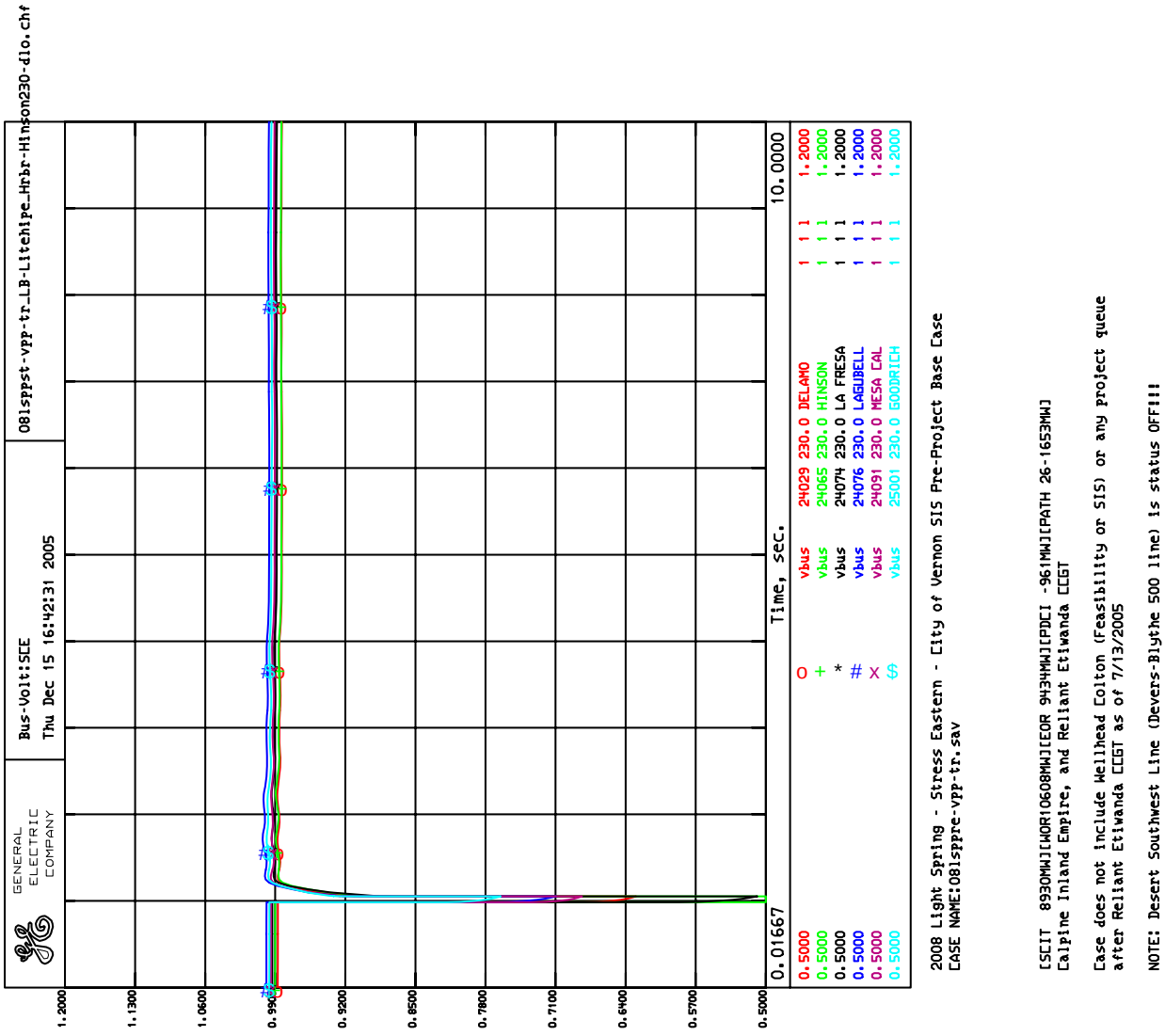
Plot 38 - 9: Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.



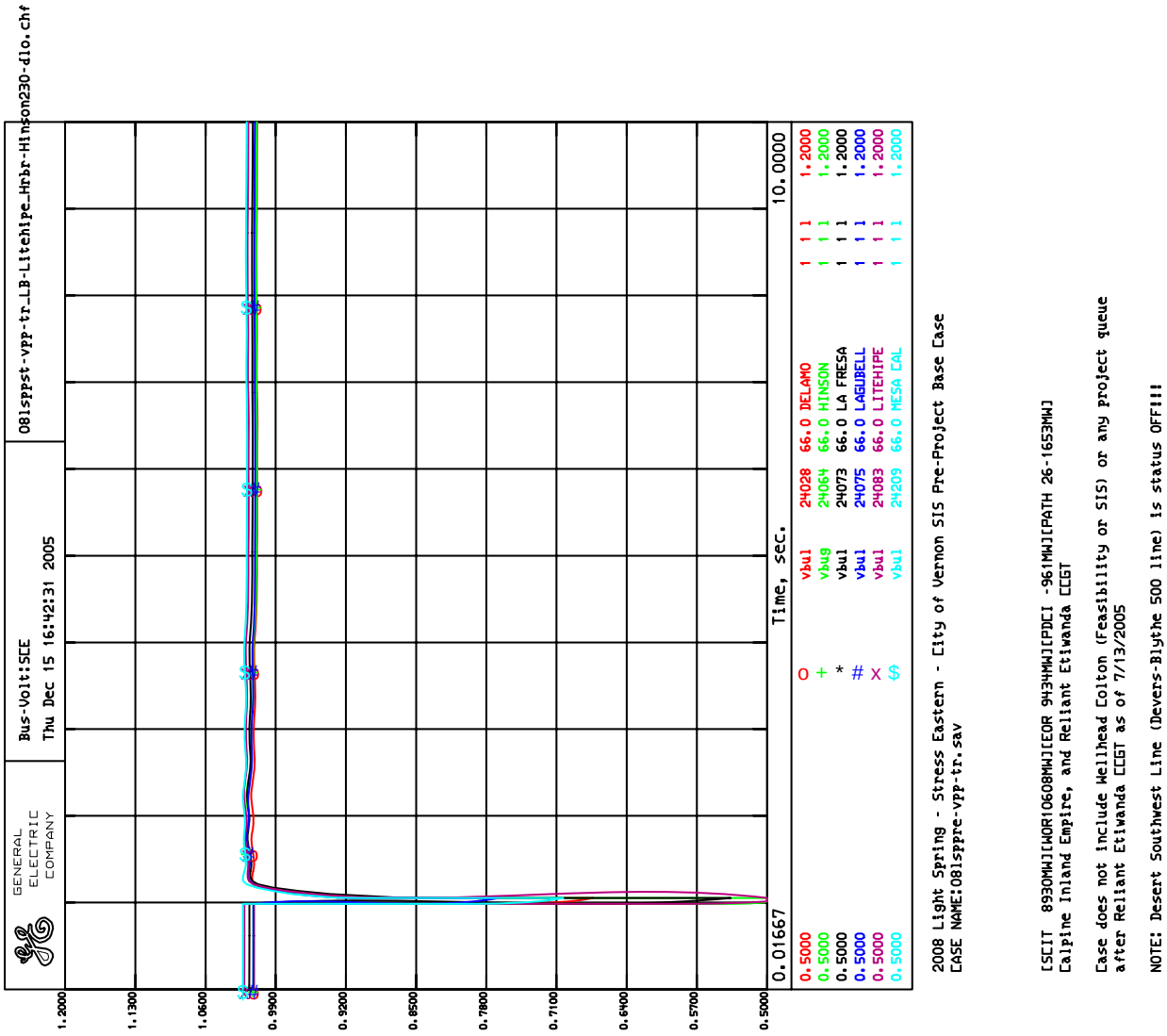
Plot 39 - 1: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



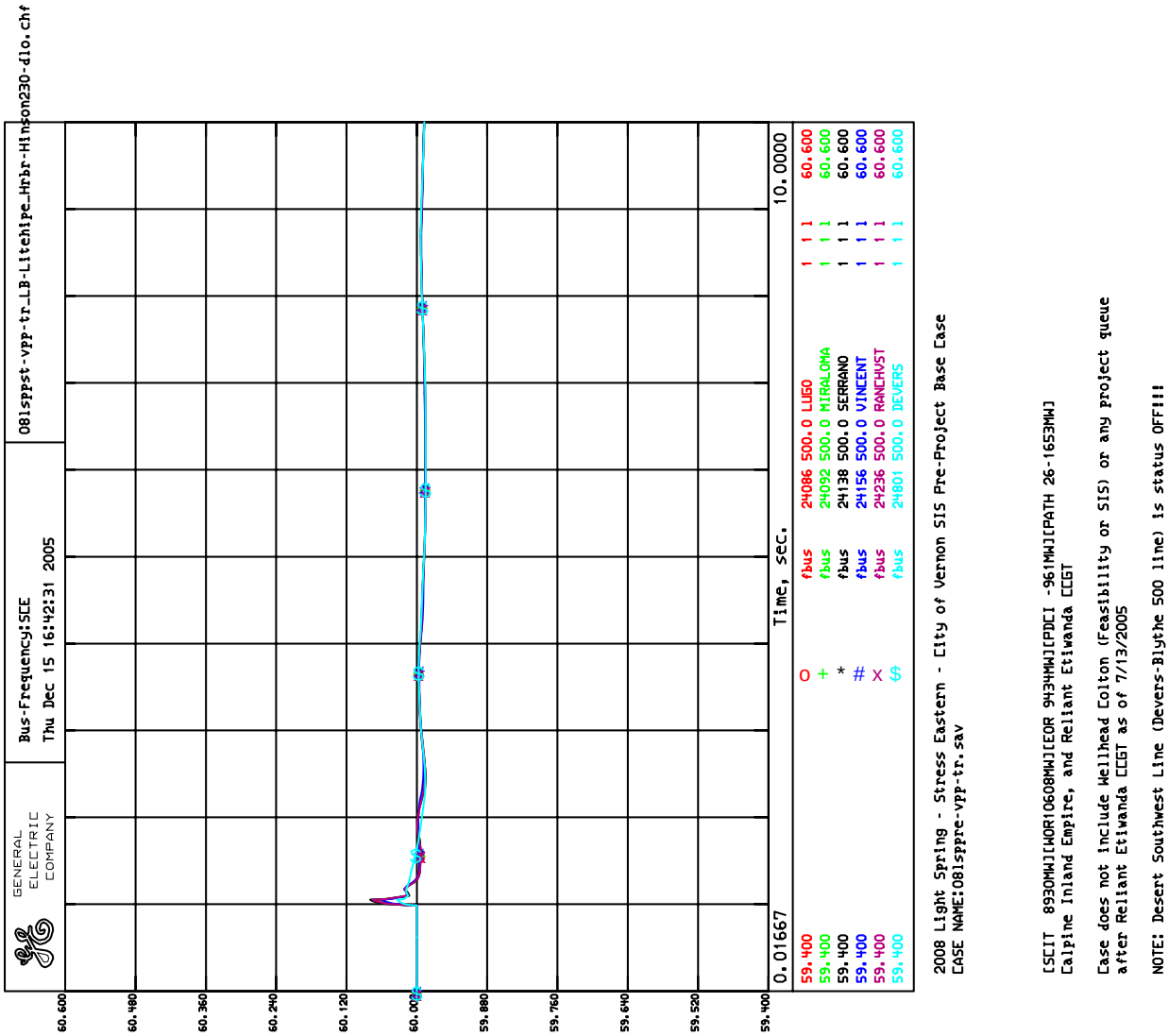
Plot 39 - 2: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



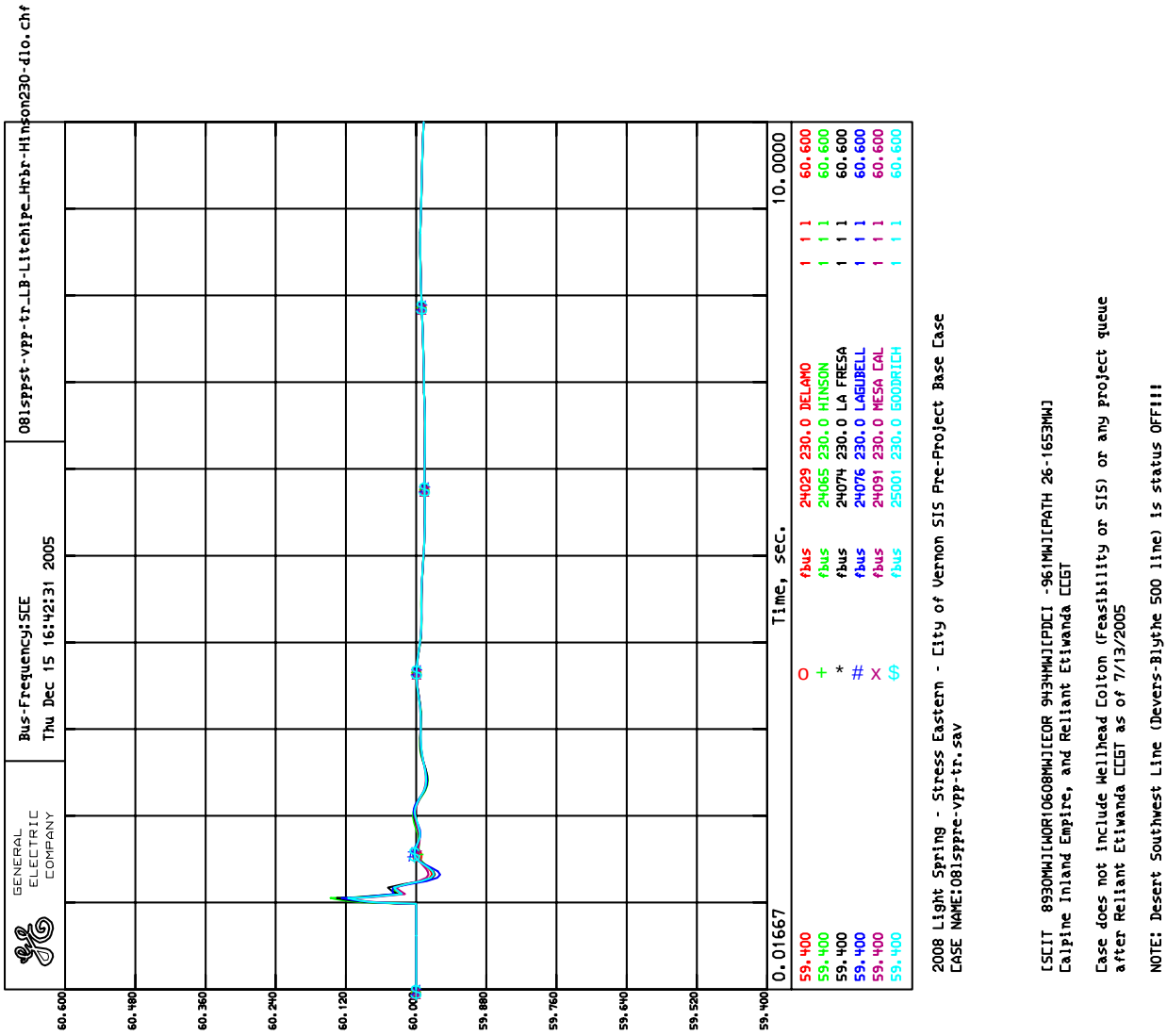
Plot 39 - 3: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



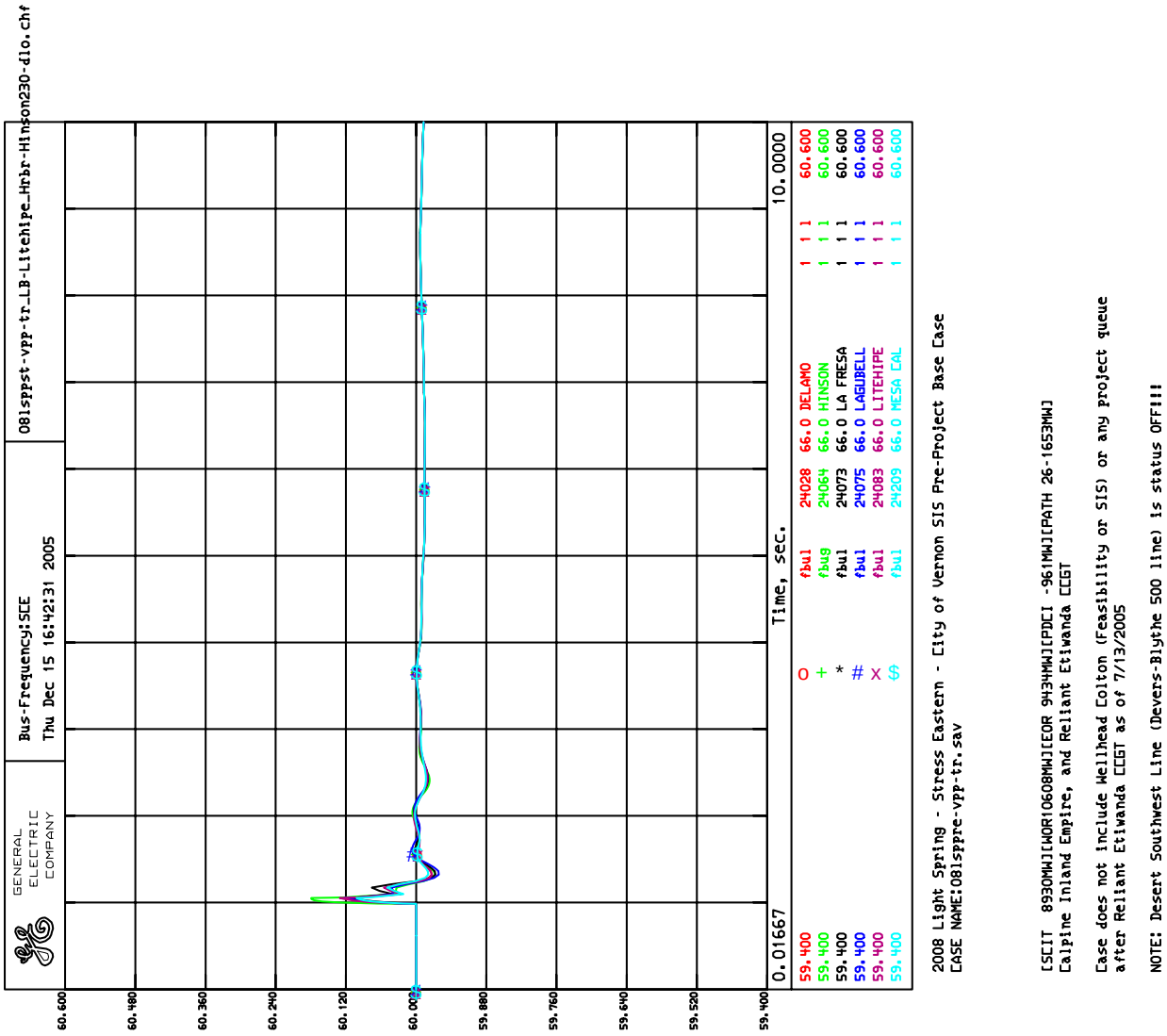
Plot 39 - 4: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



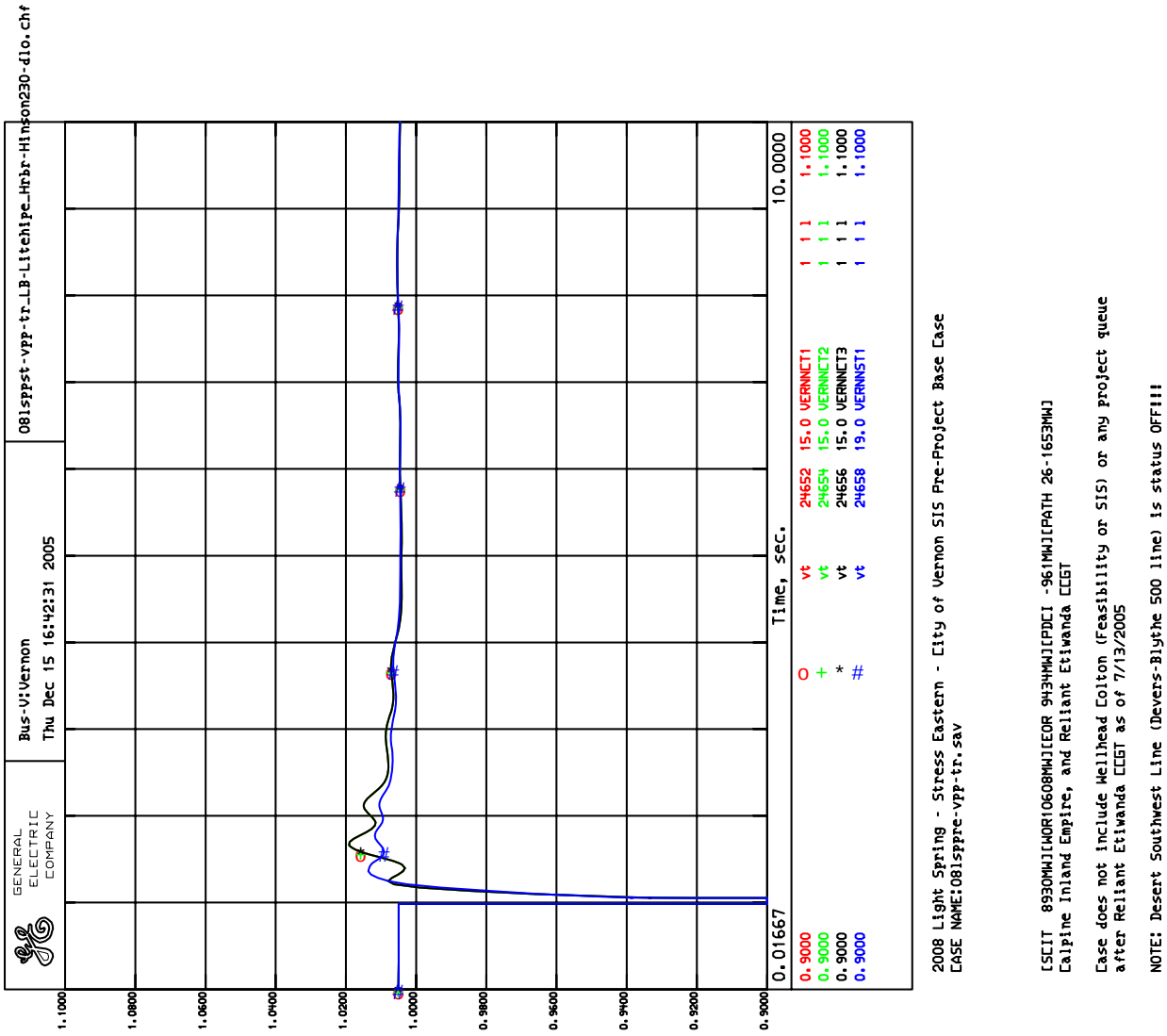
Plot 39 - 5: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



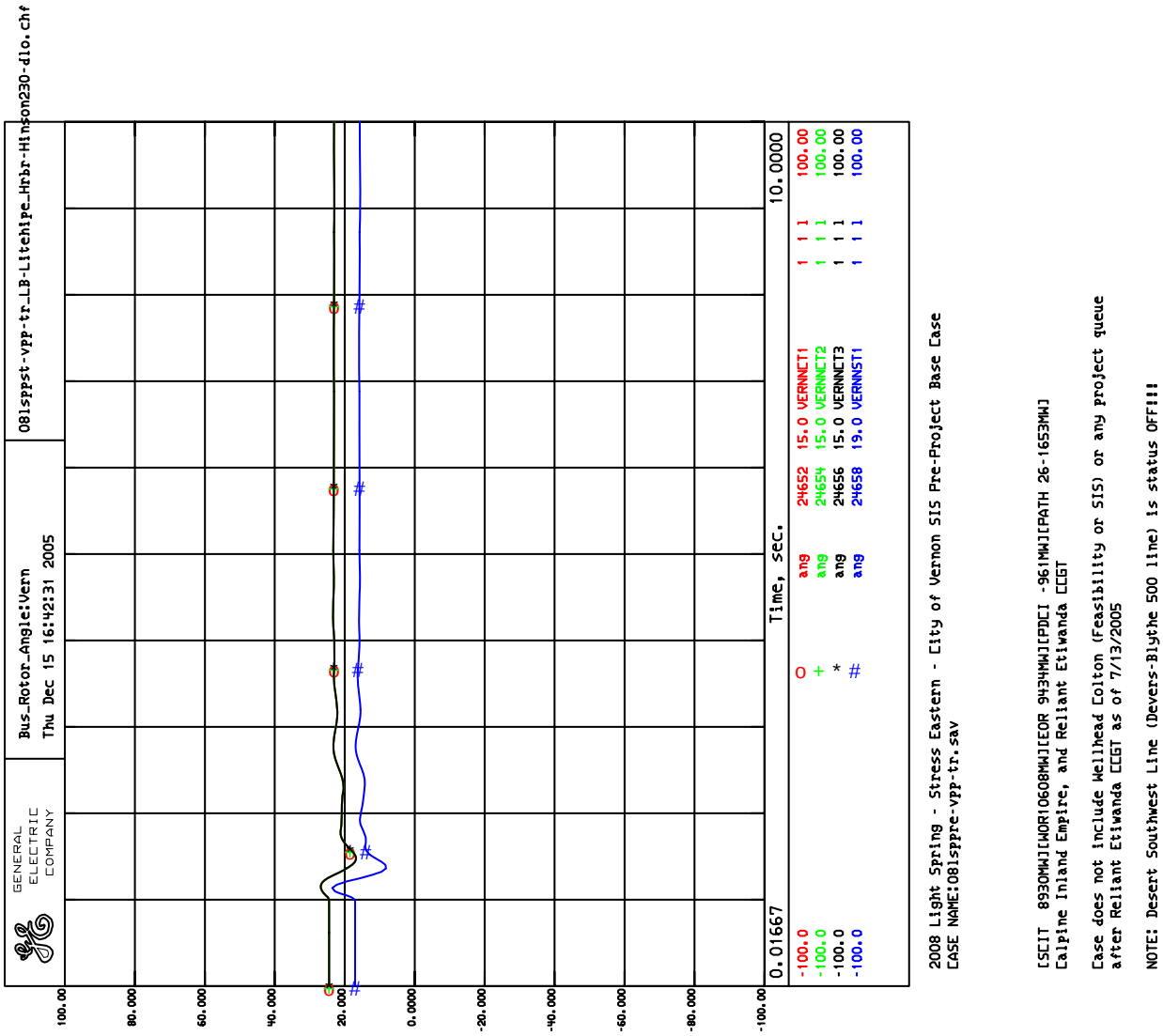
Plot 39 - 6: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



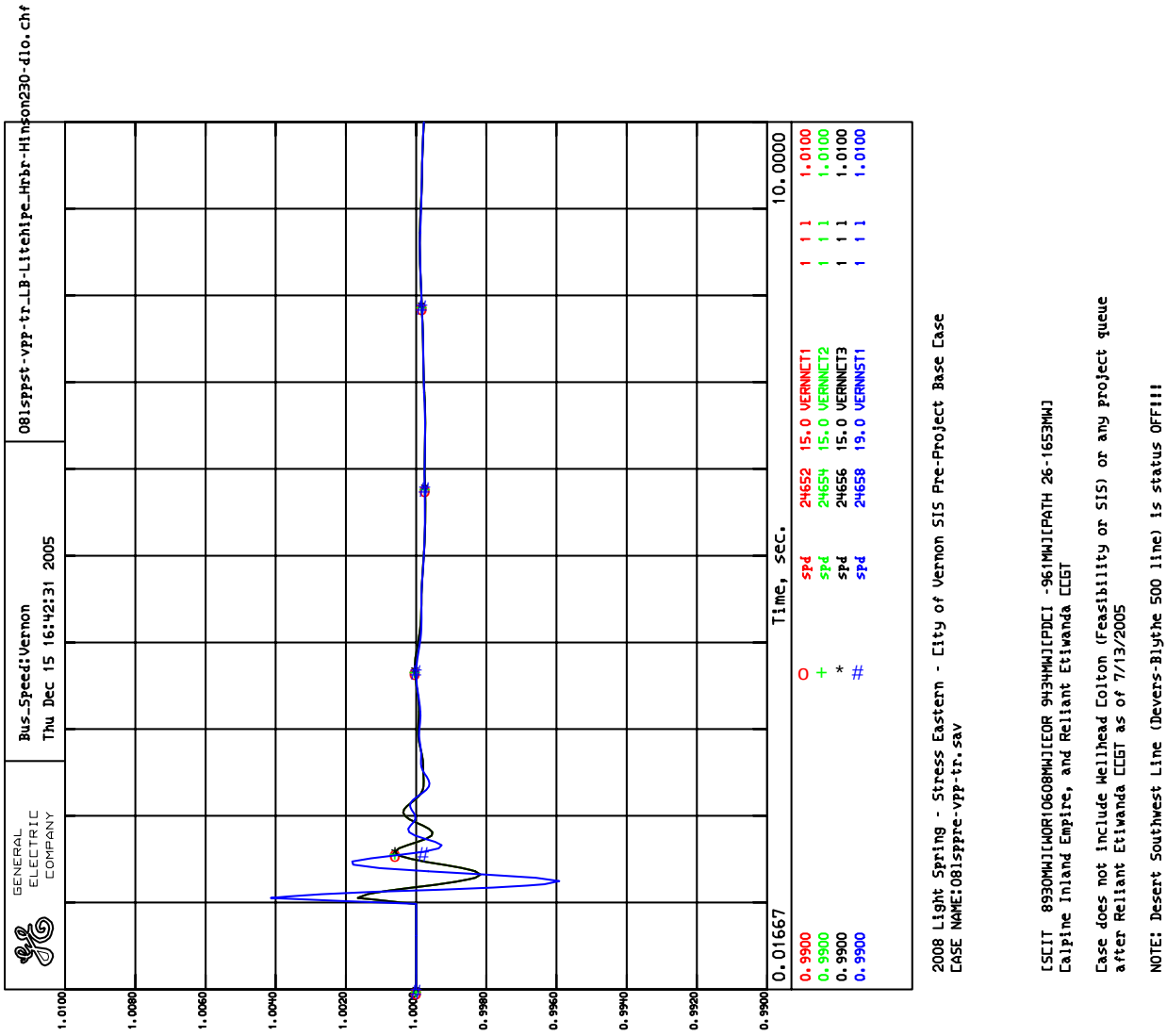
Plot 39 - 7: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



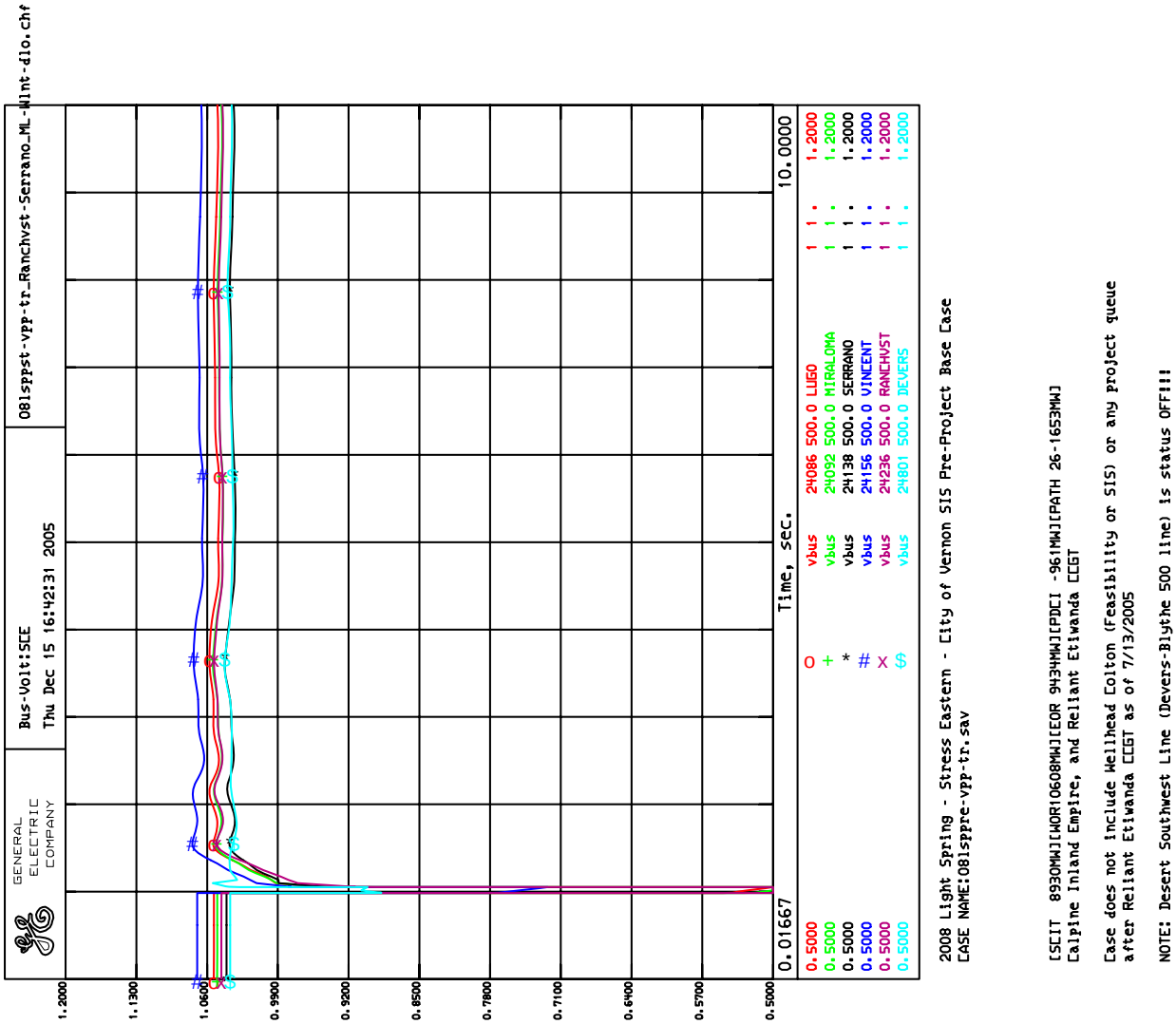
Plot 39 - 8: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



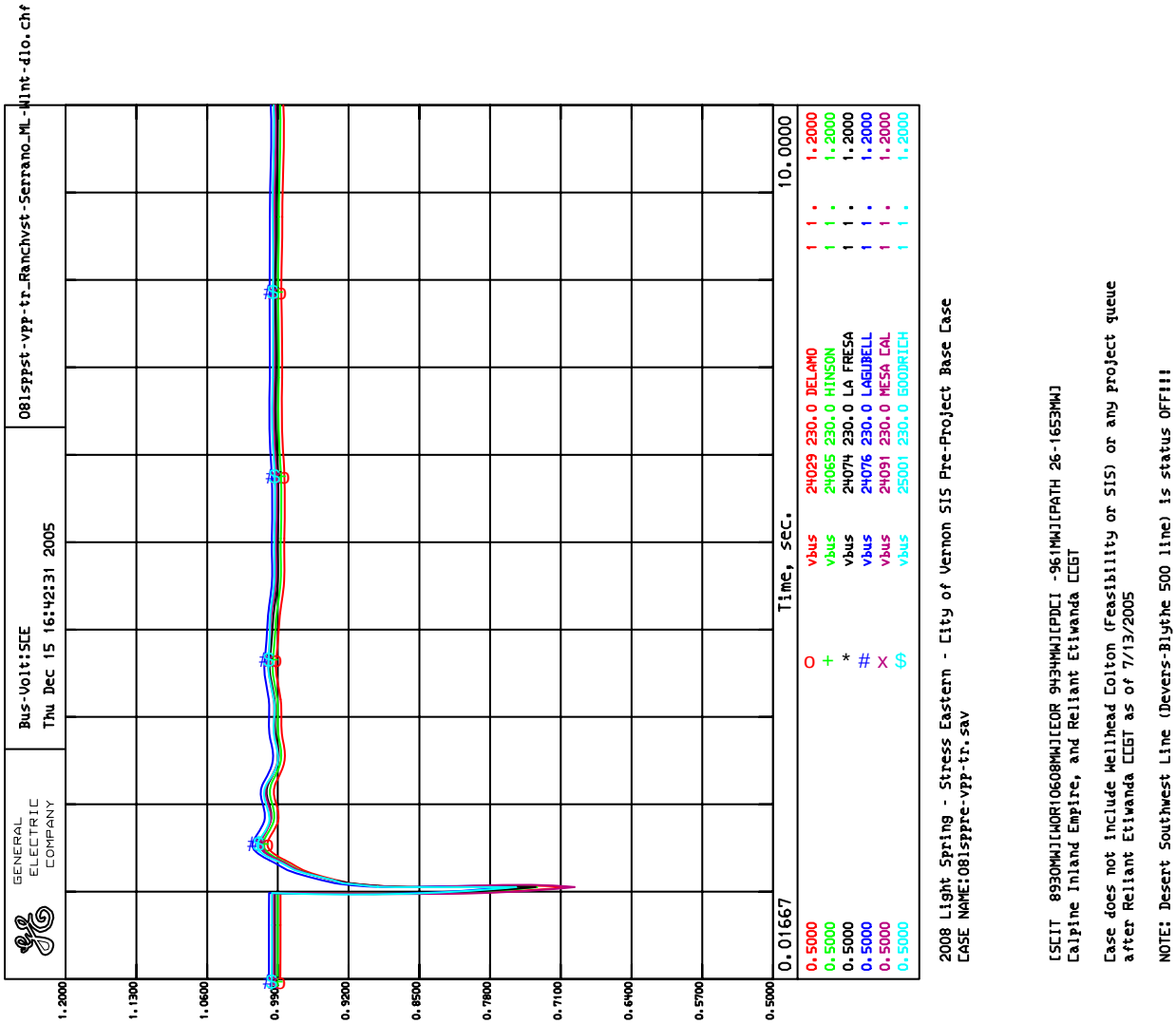
Plot 39 - 9: Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.



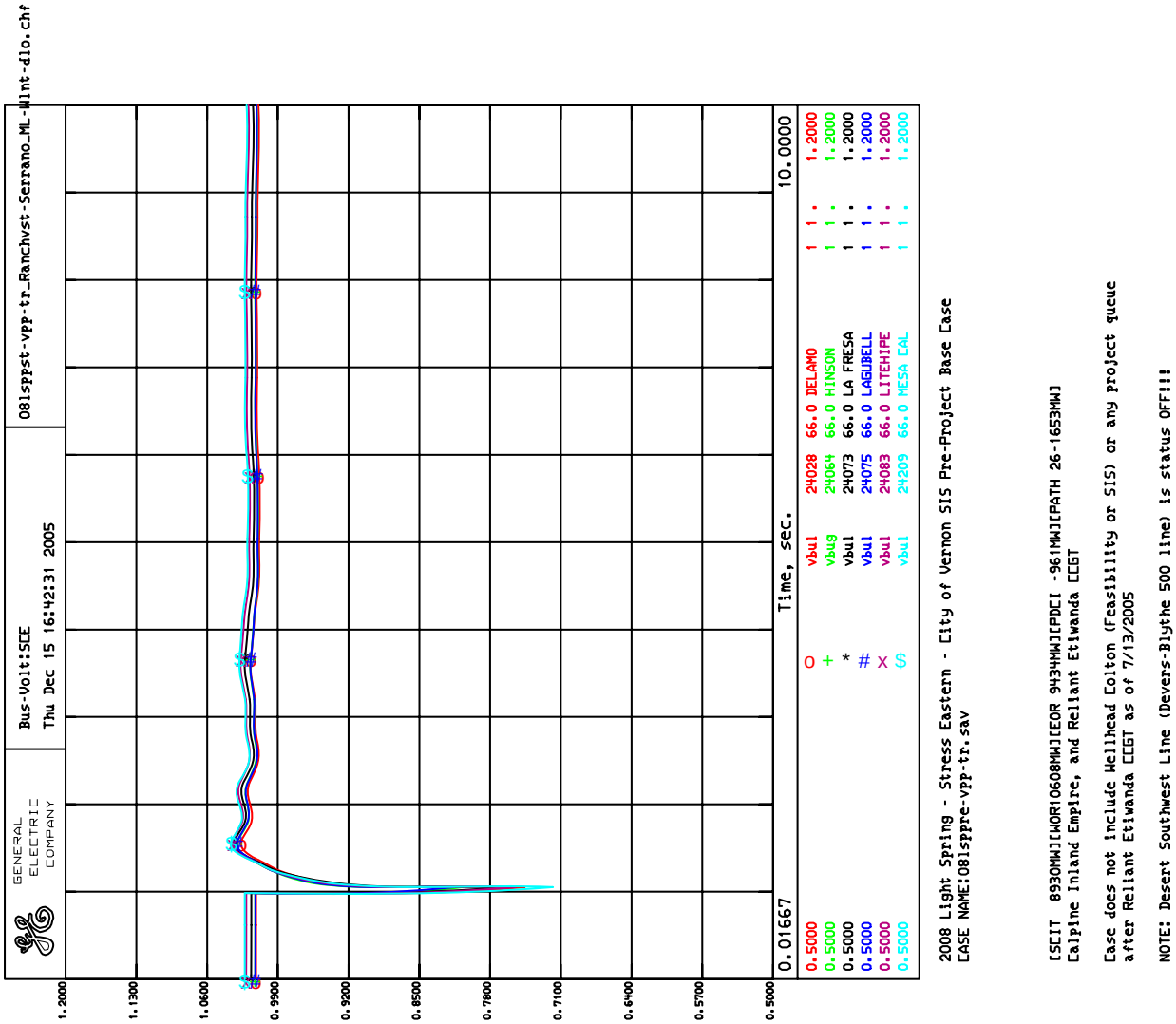
Plot 40 - 1: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



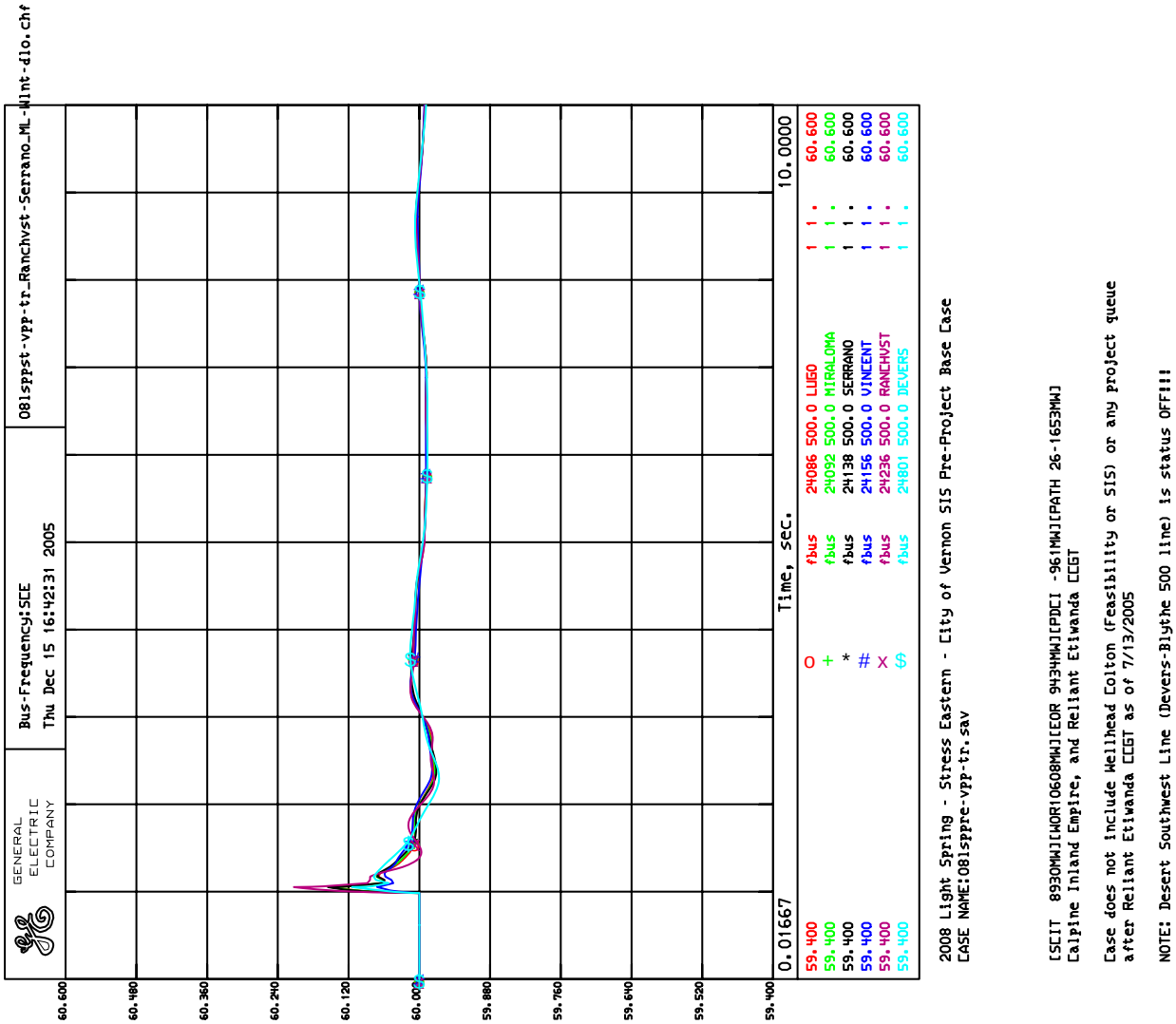
Plot 40 - 2: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



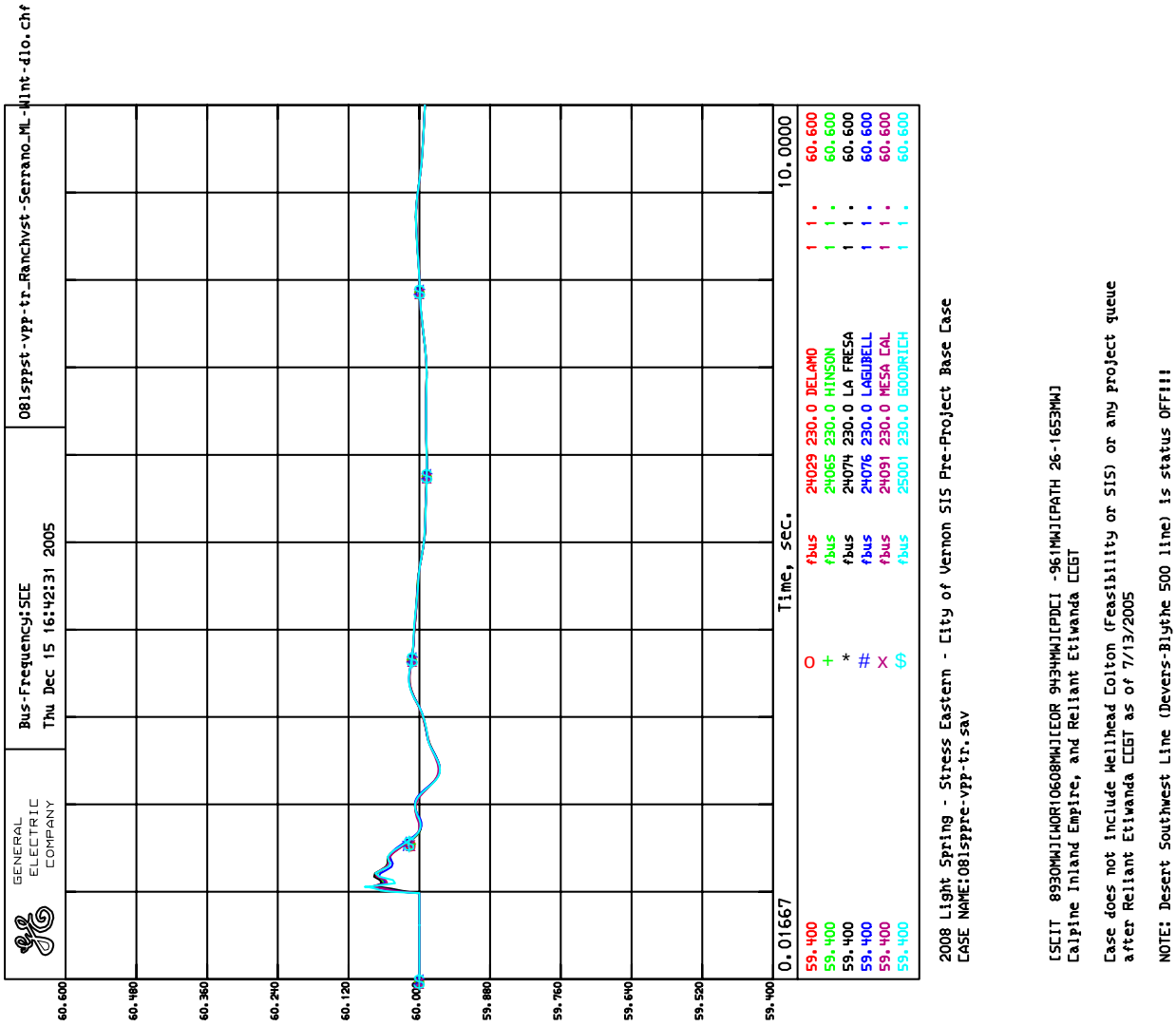
Plot 40 - 3: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



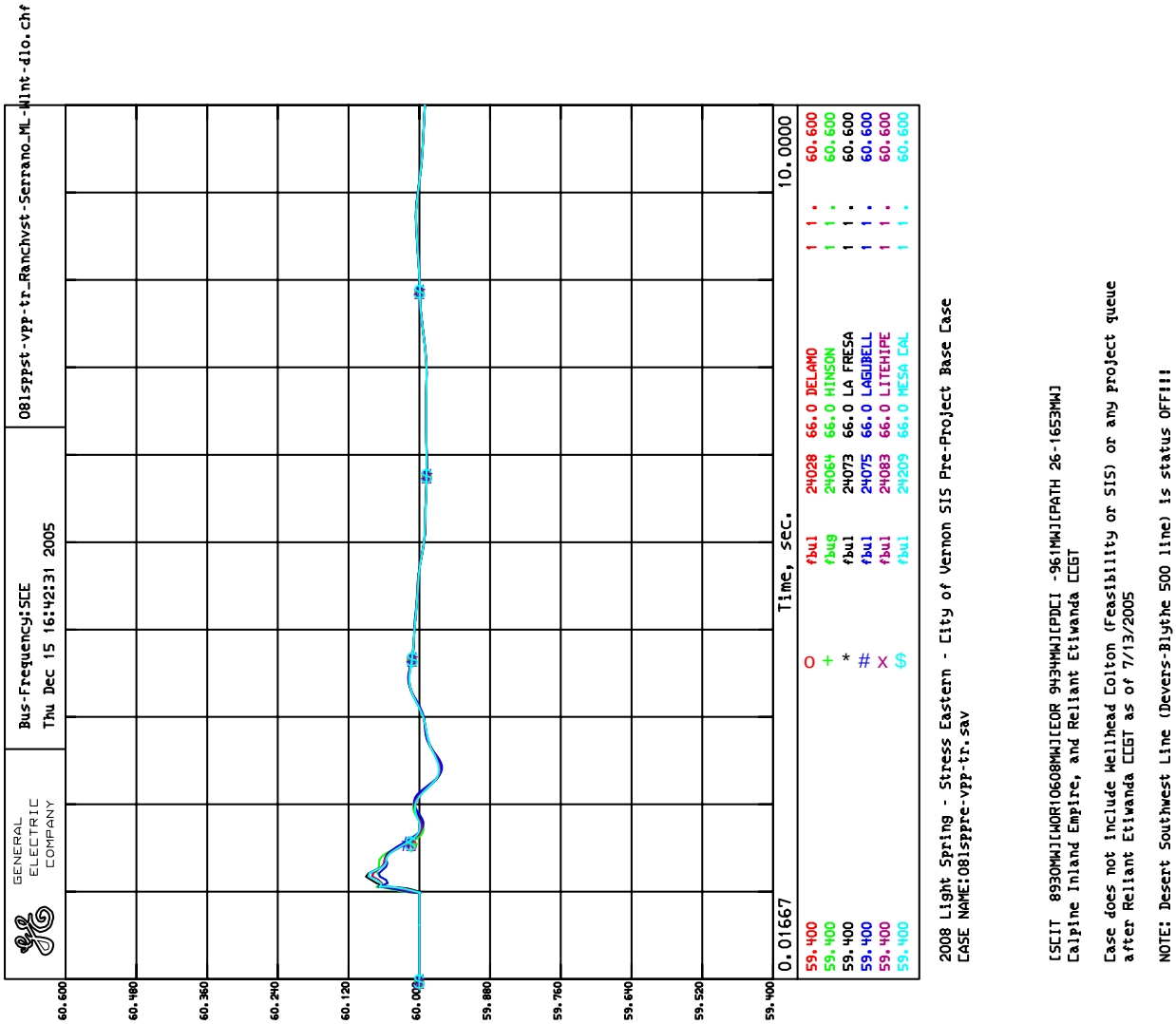
Plot 40 - 4: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



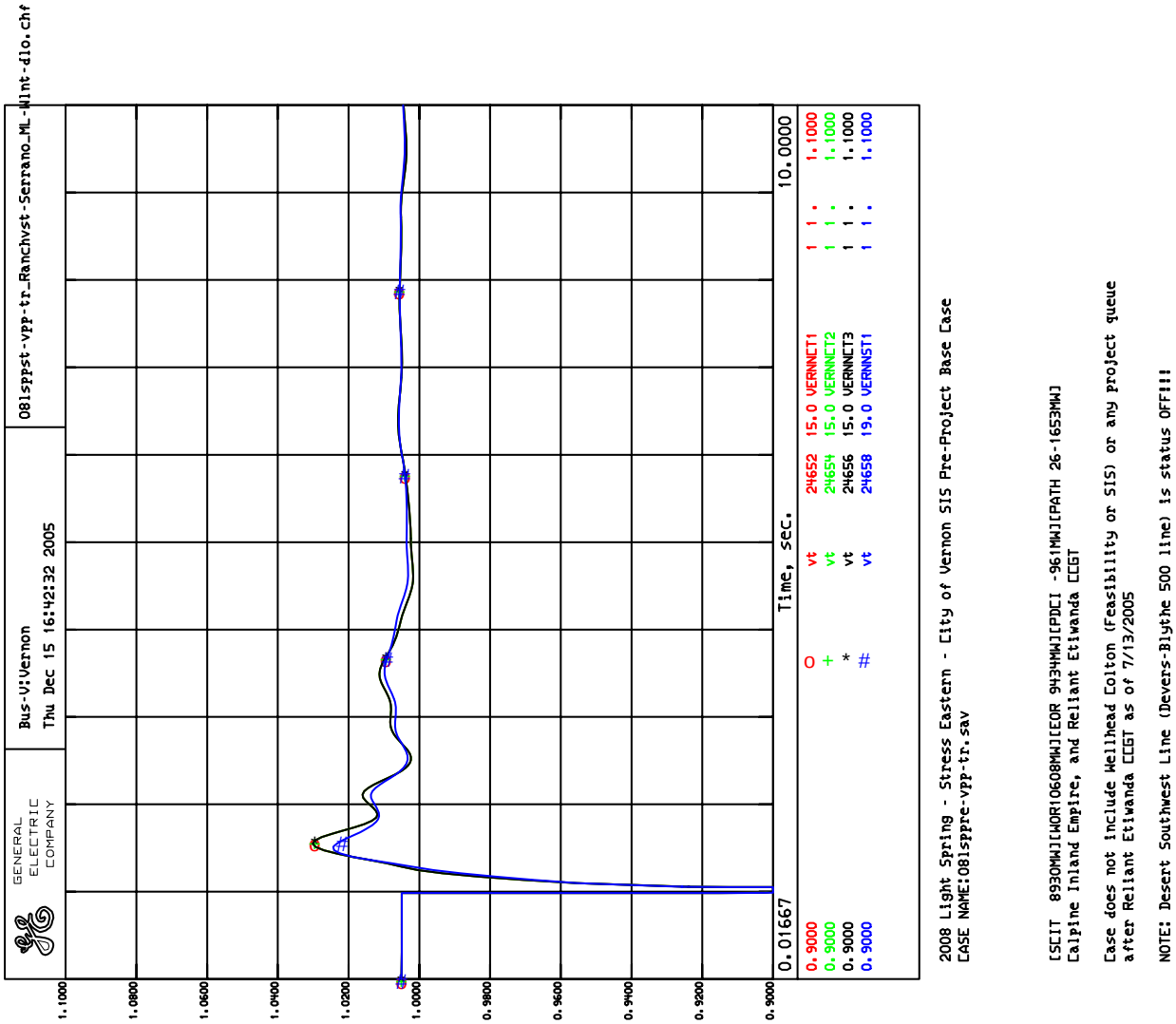
Plot 40 - 5: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



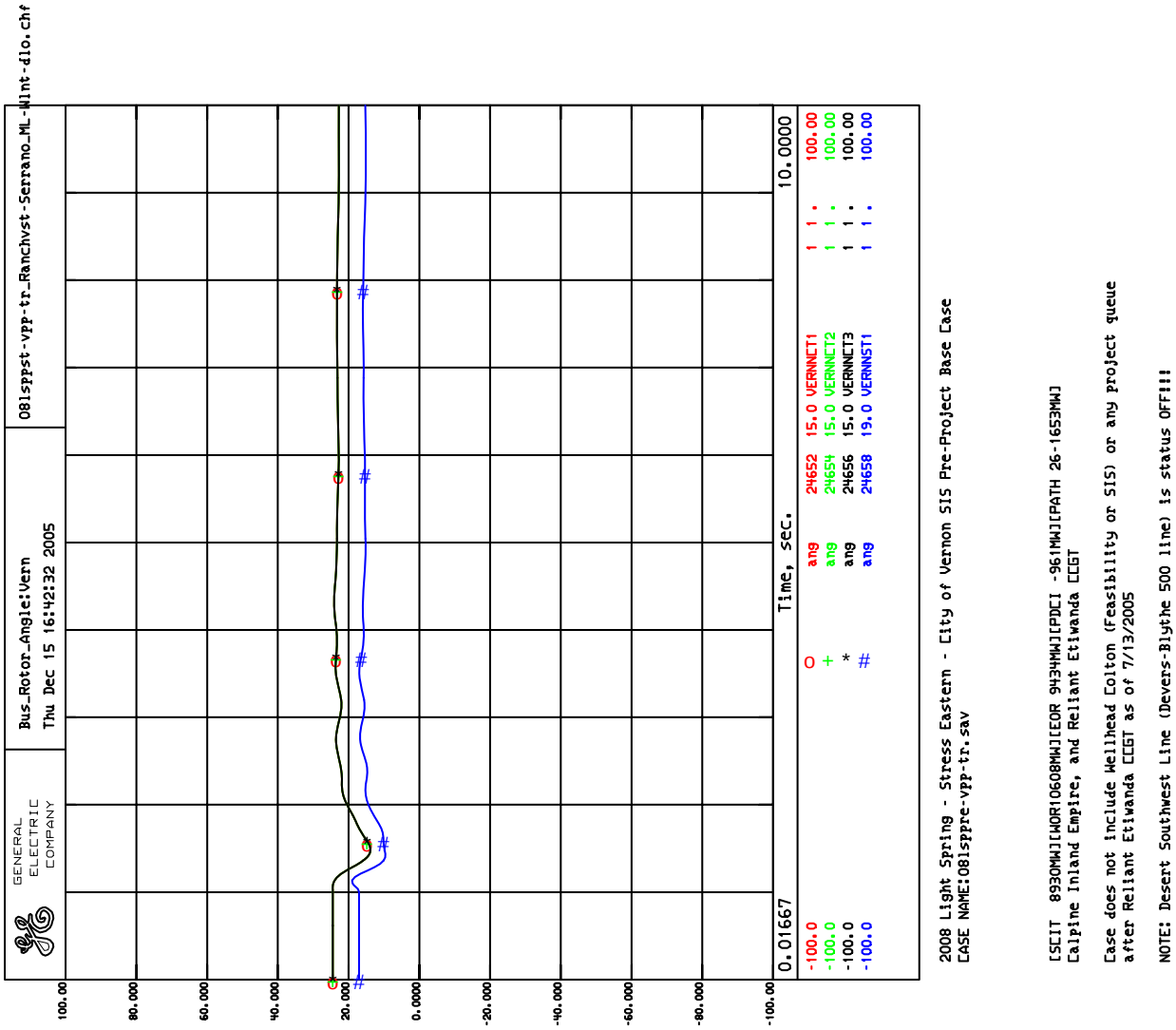
Plot 40 - 6: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



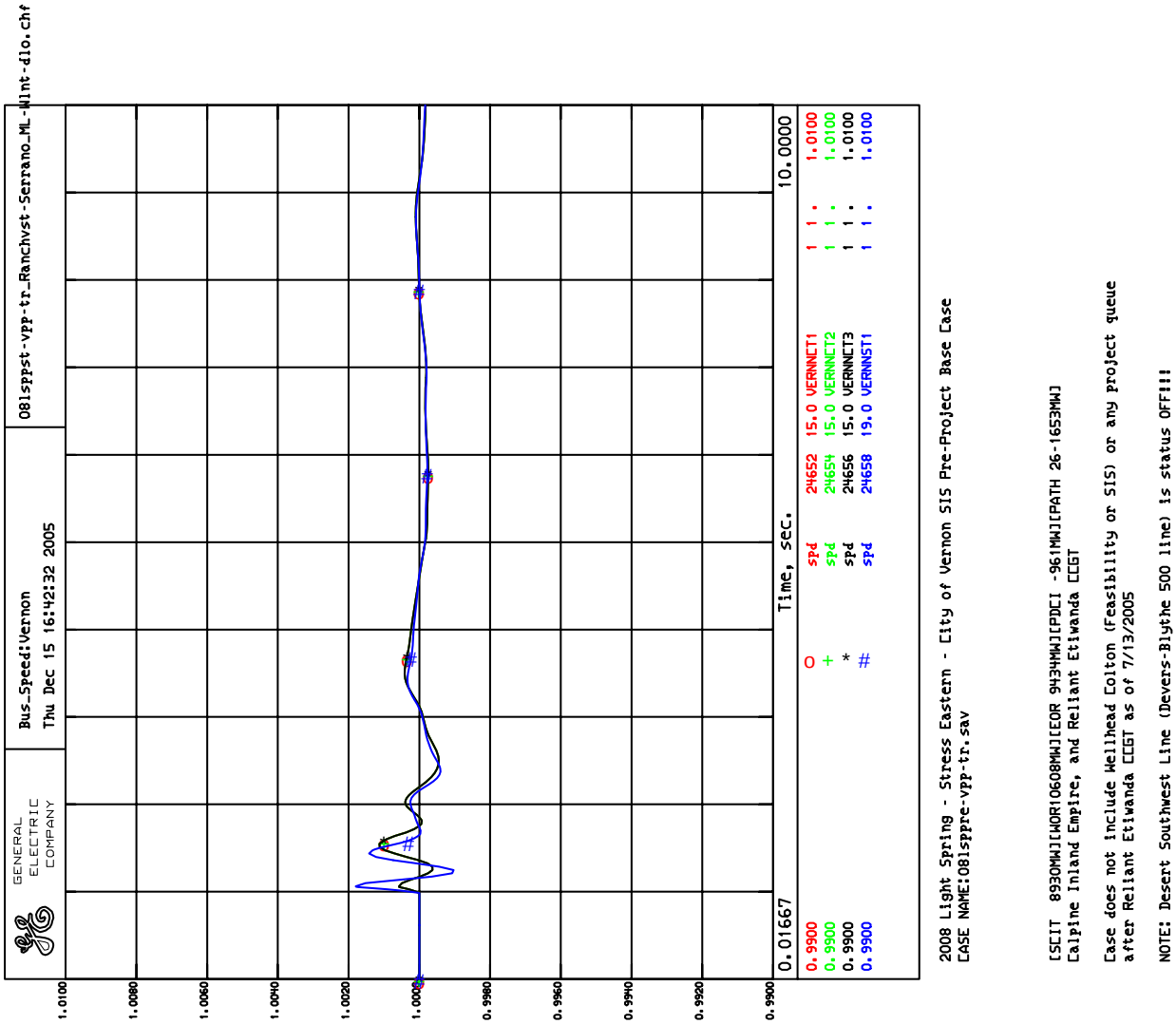
Plot 40 - 7: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



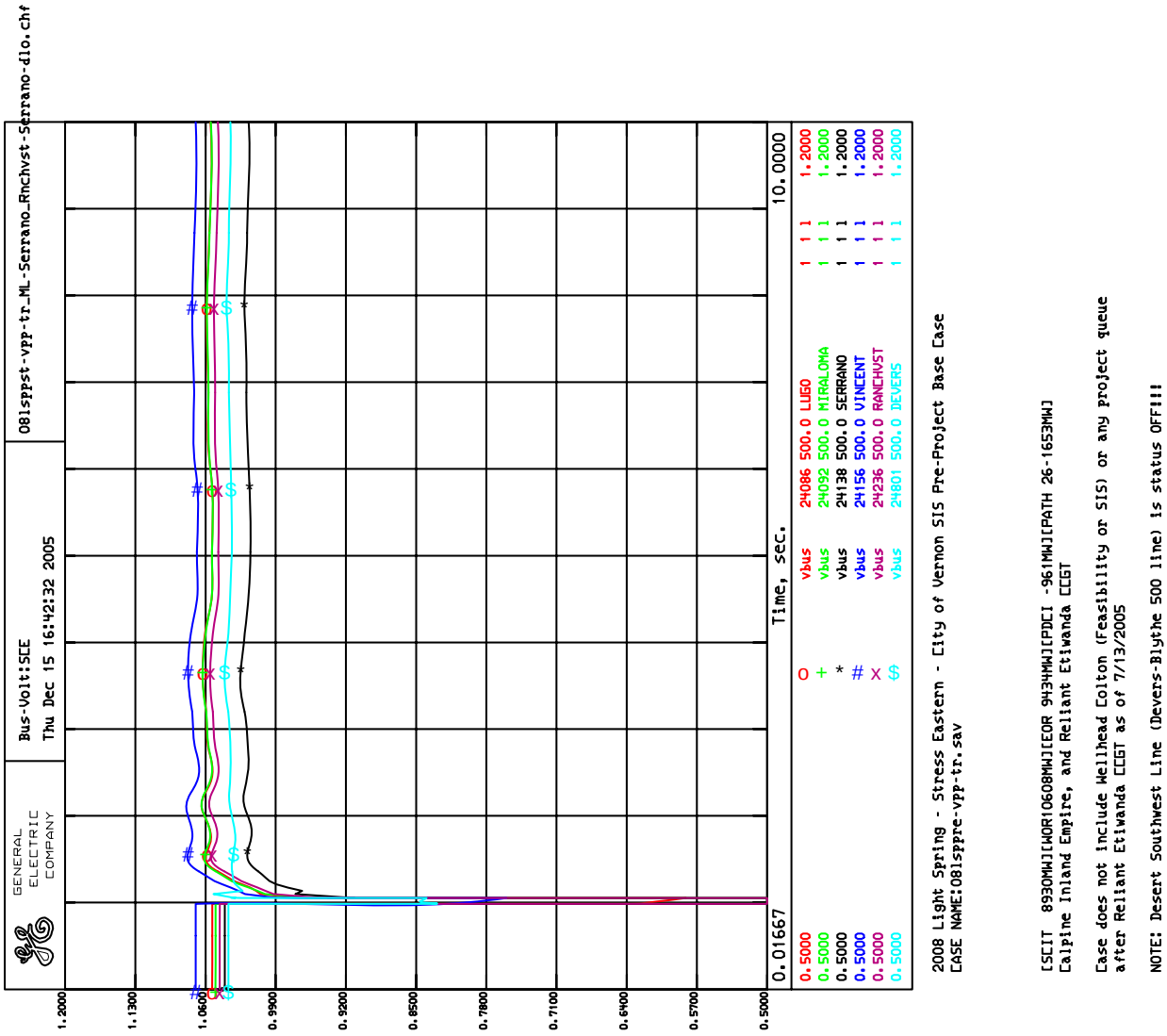
Plot 40 - 8: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



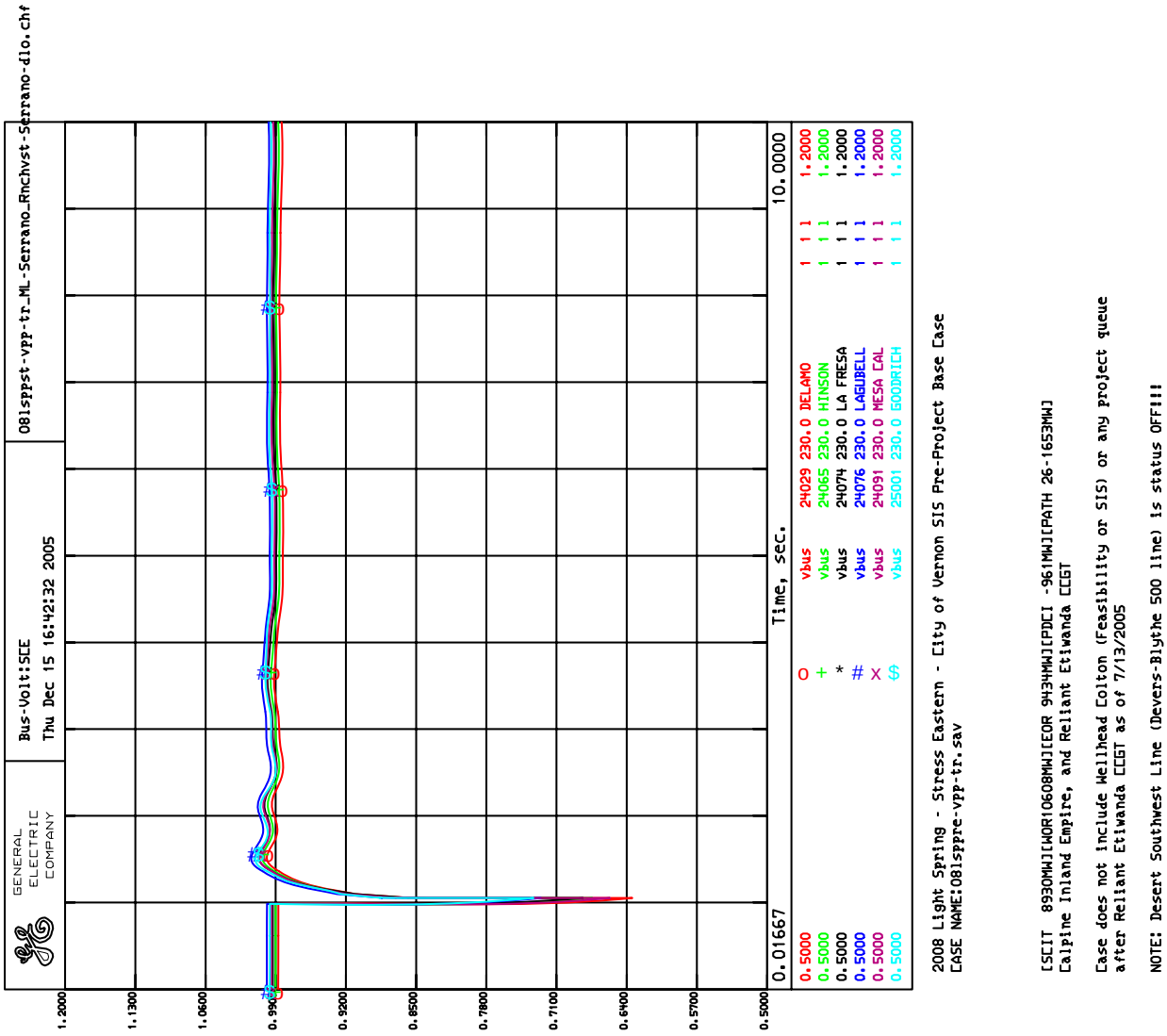
Plot 40 - 9: Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.



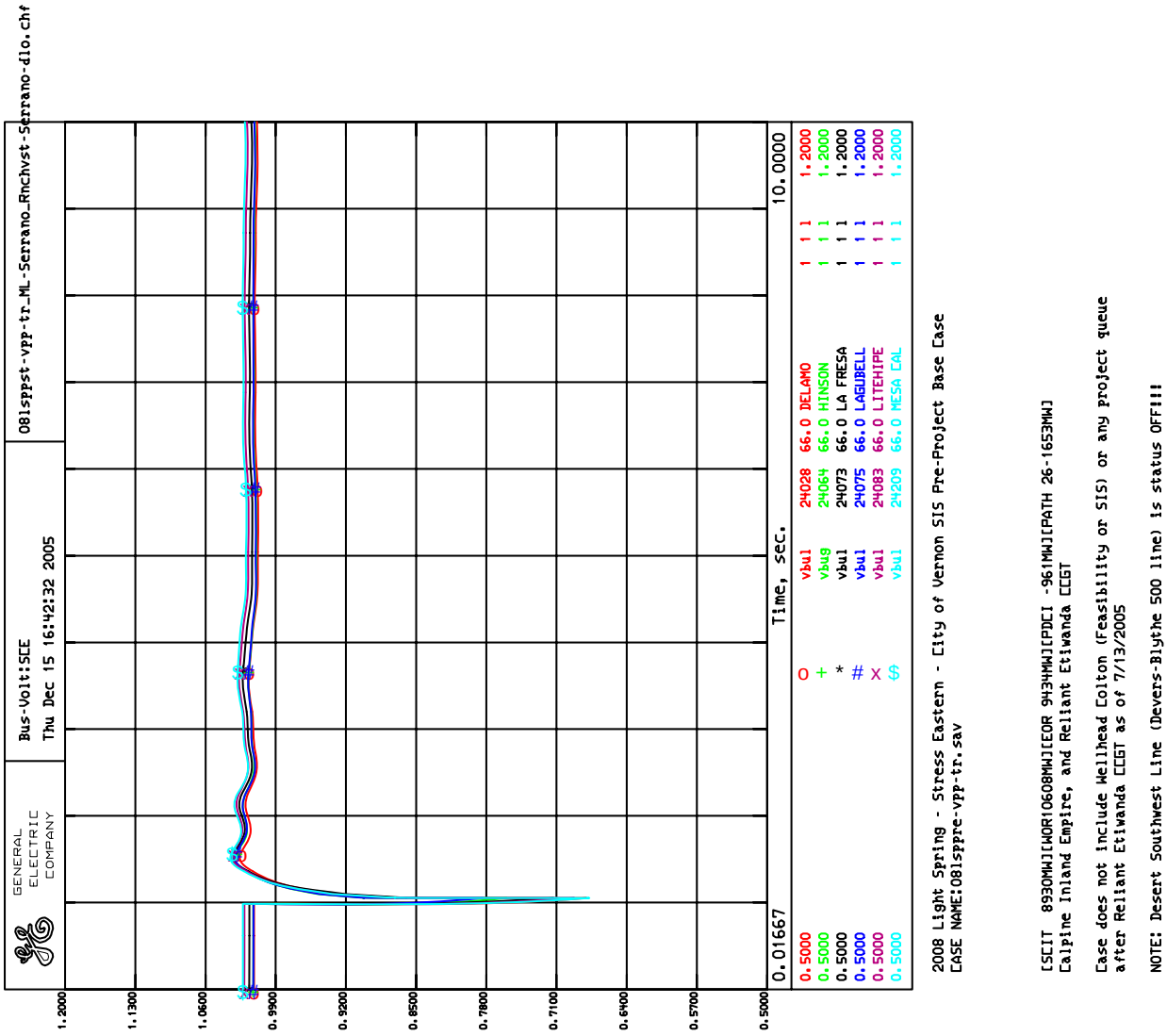
Plot 41 - 1: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



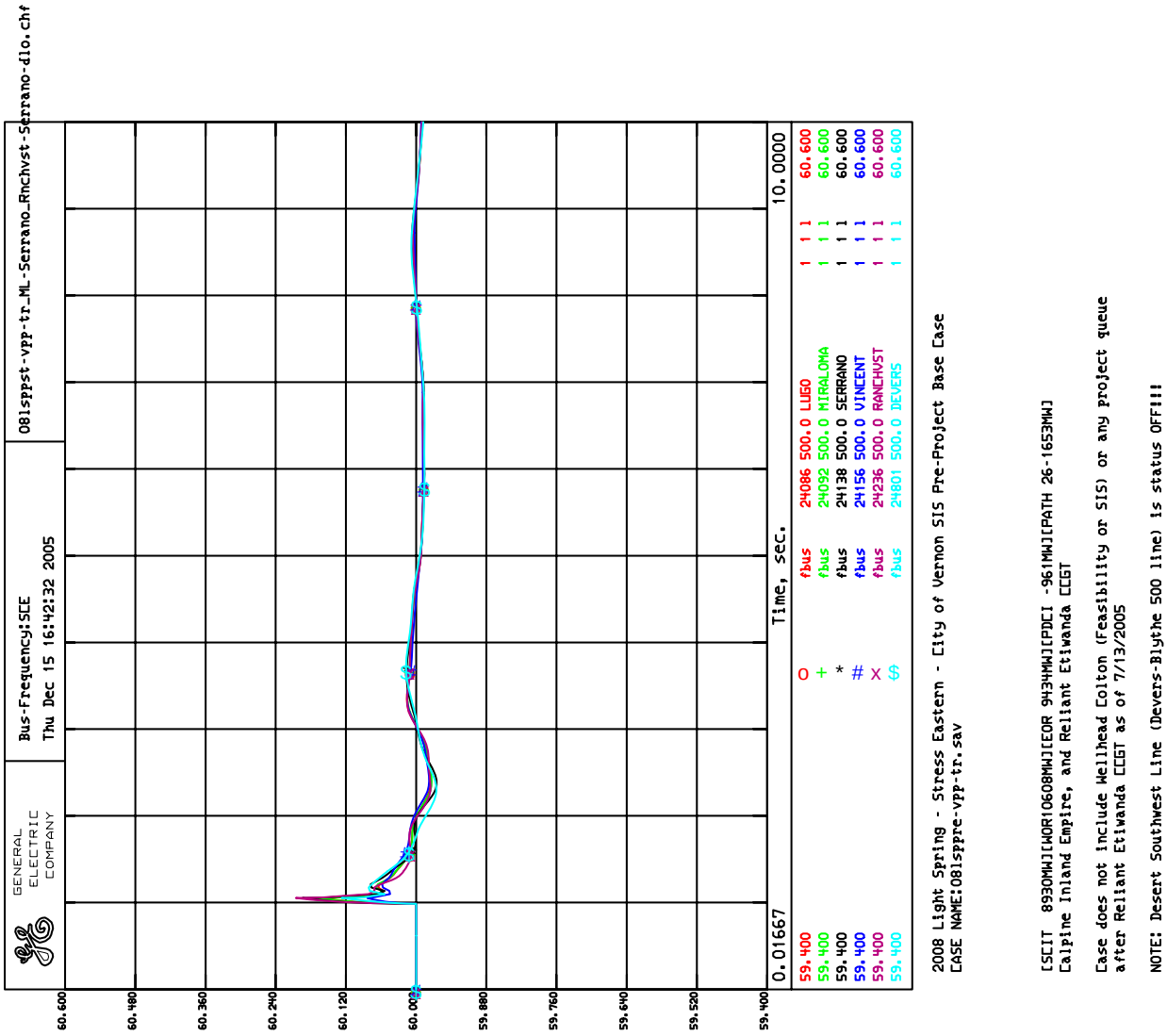
Plot 41 - 2: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



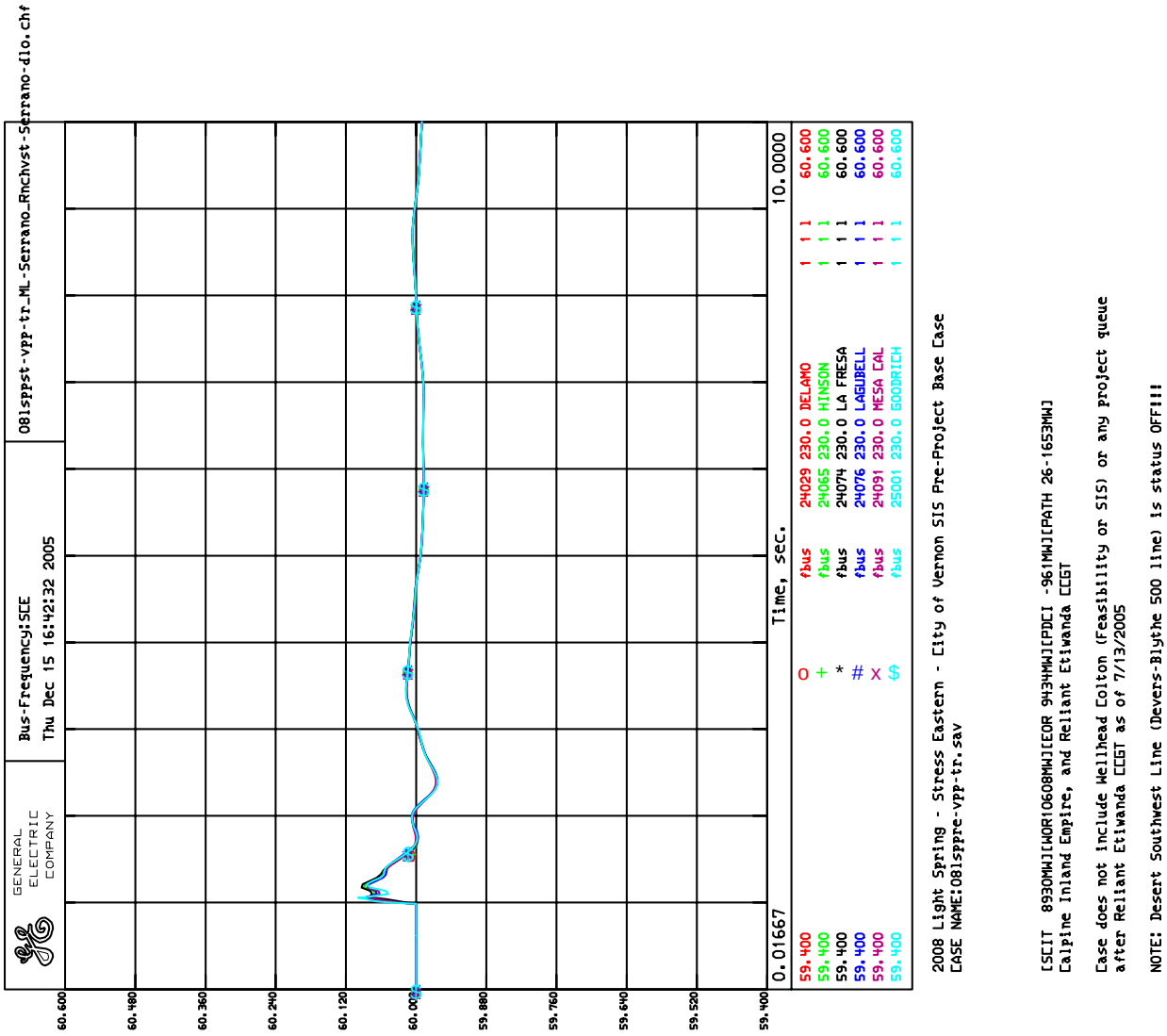
Plot 41 - 3: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



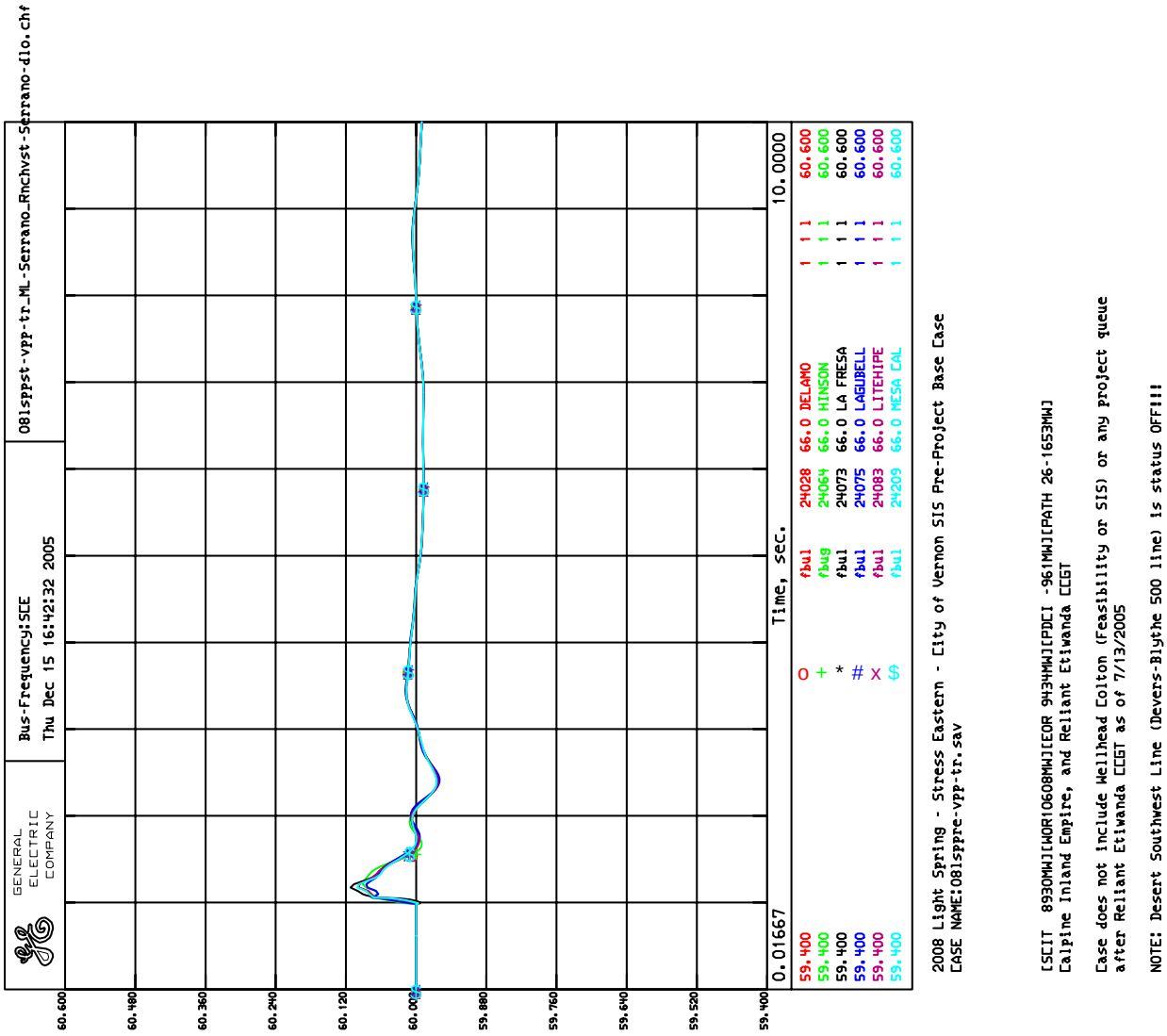
Plot 41 - 4: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



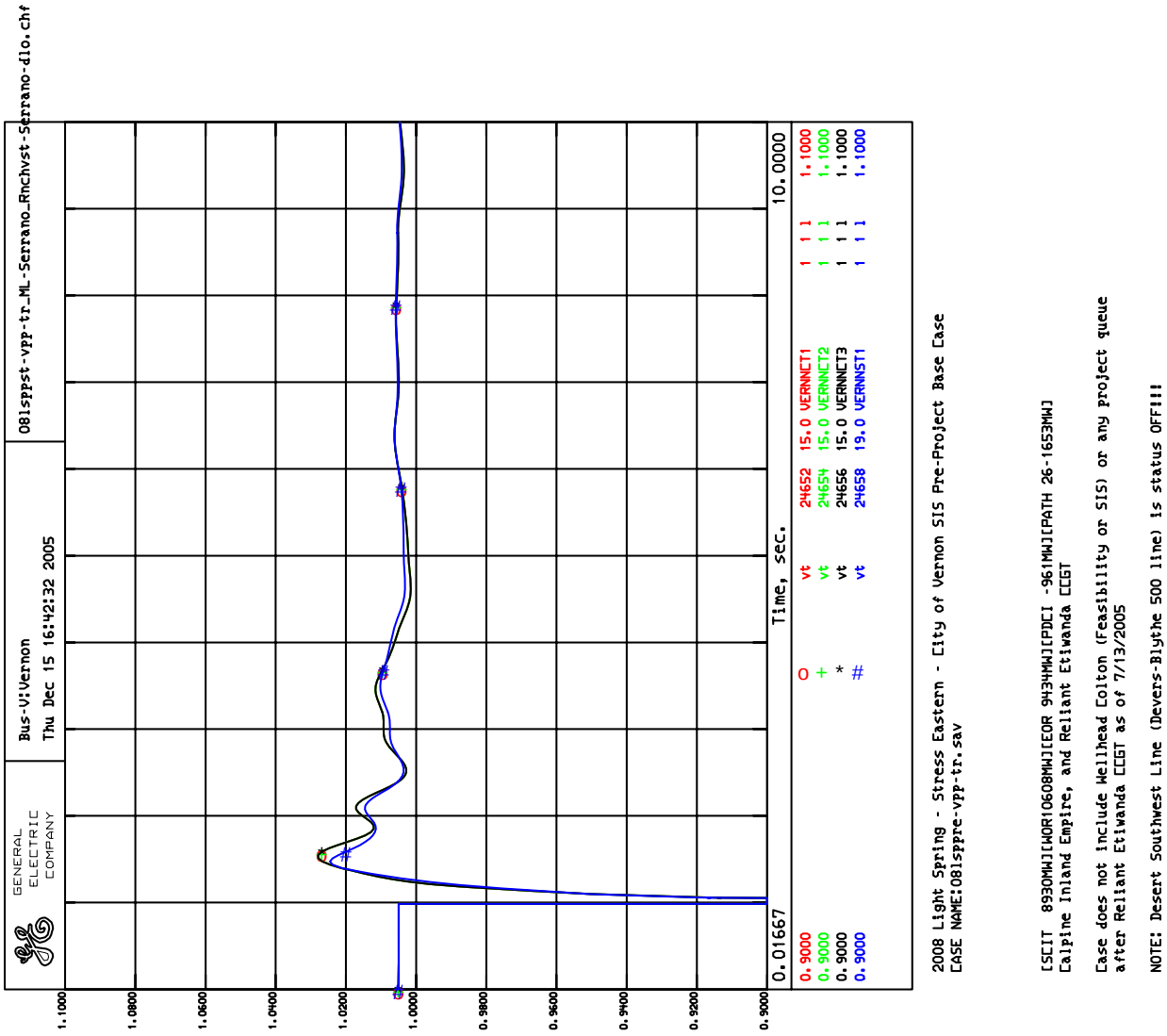
Plot 41 - 5: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



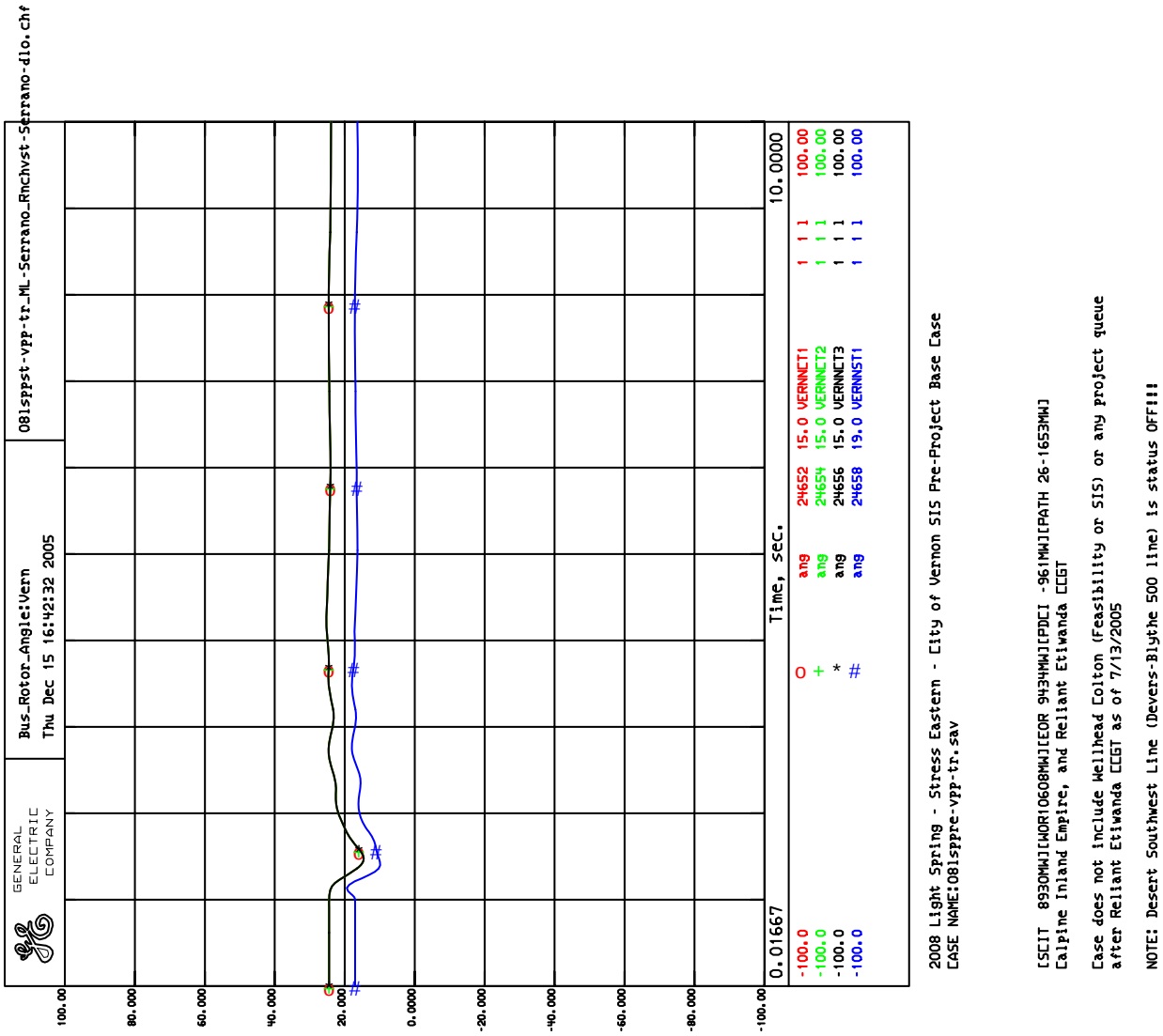
Plot 41 - 6: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



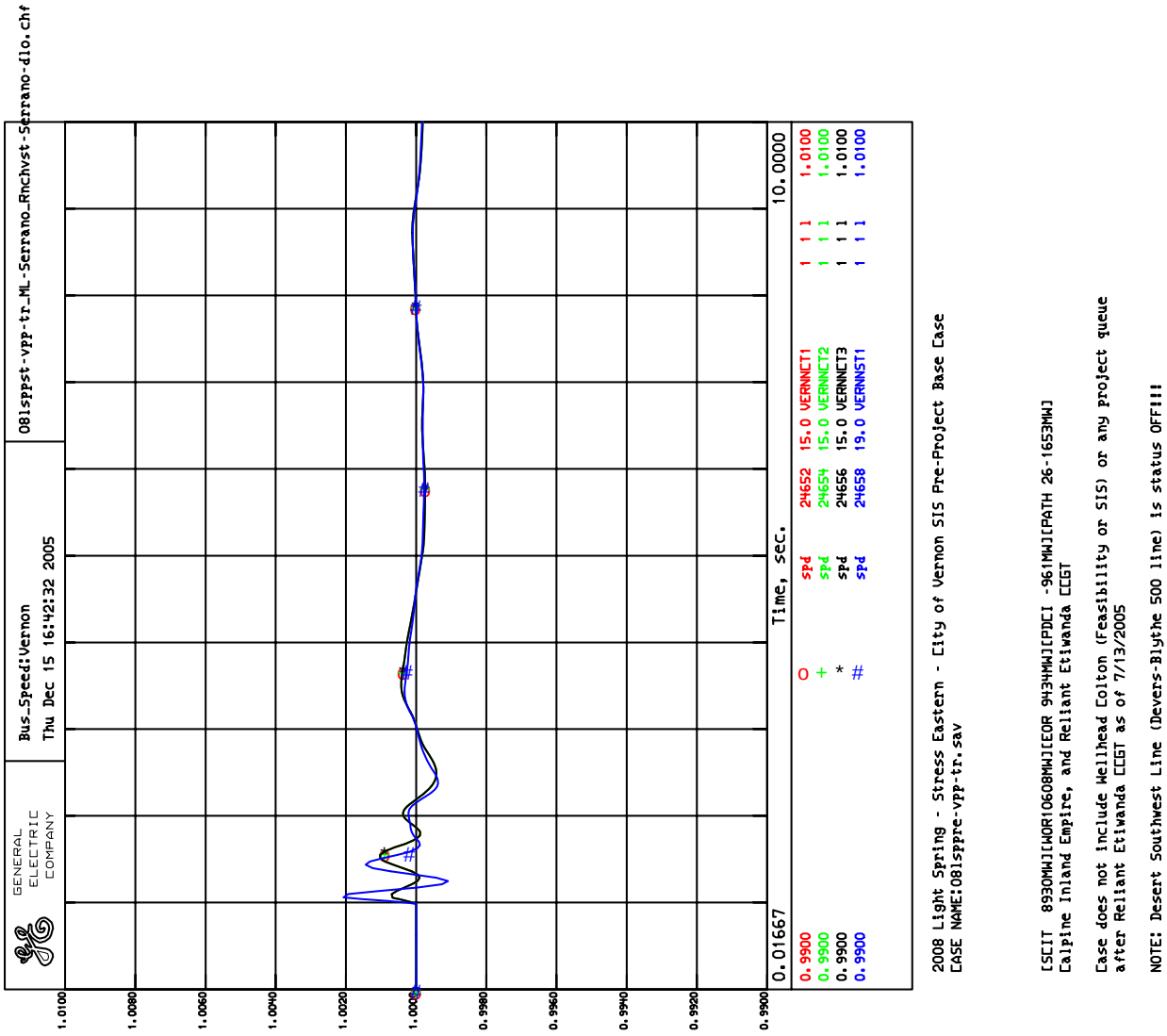
Plot 41 - 7: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



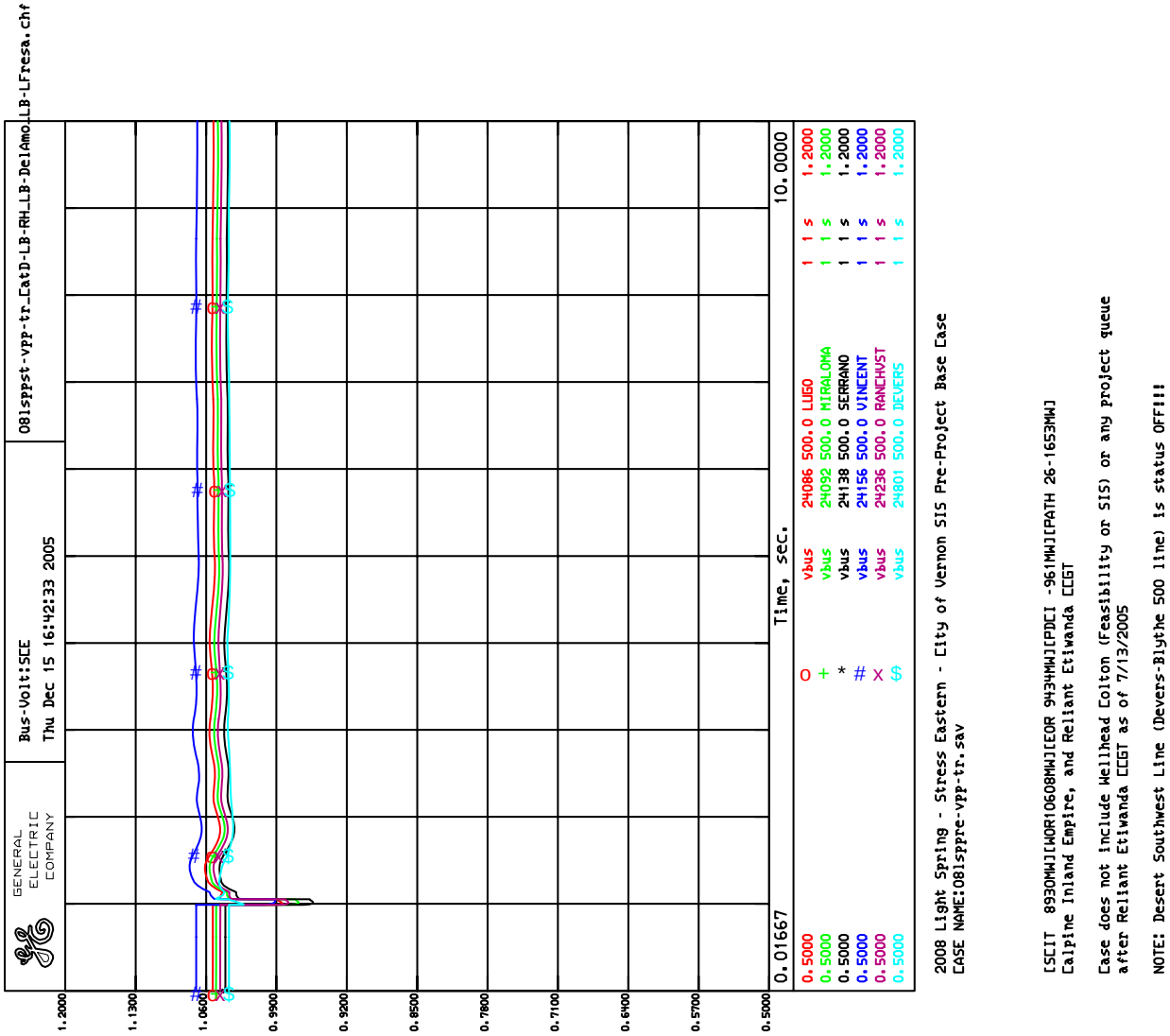
Plot 41 - 8: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



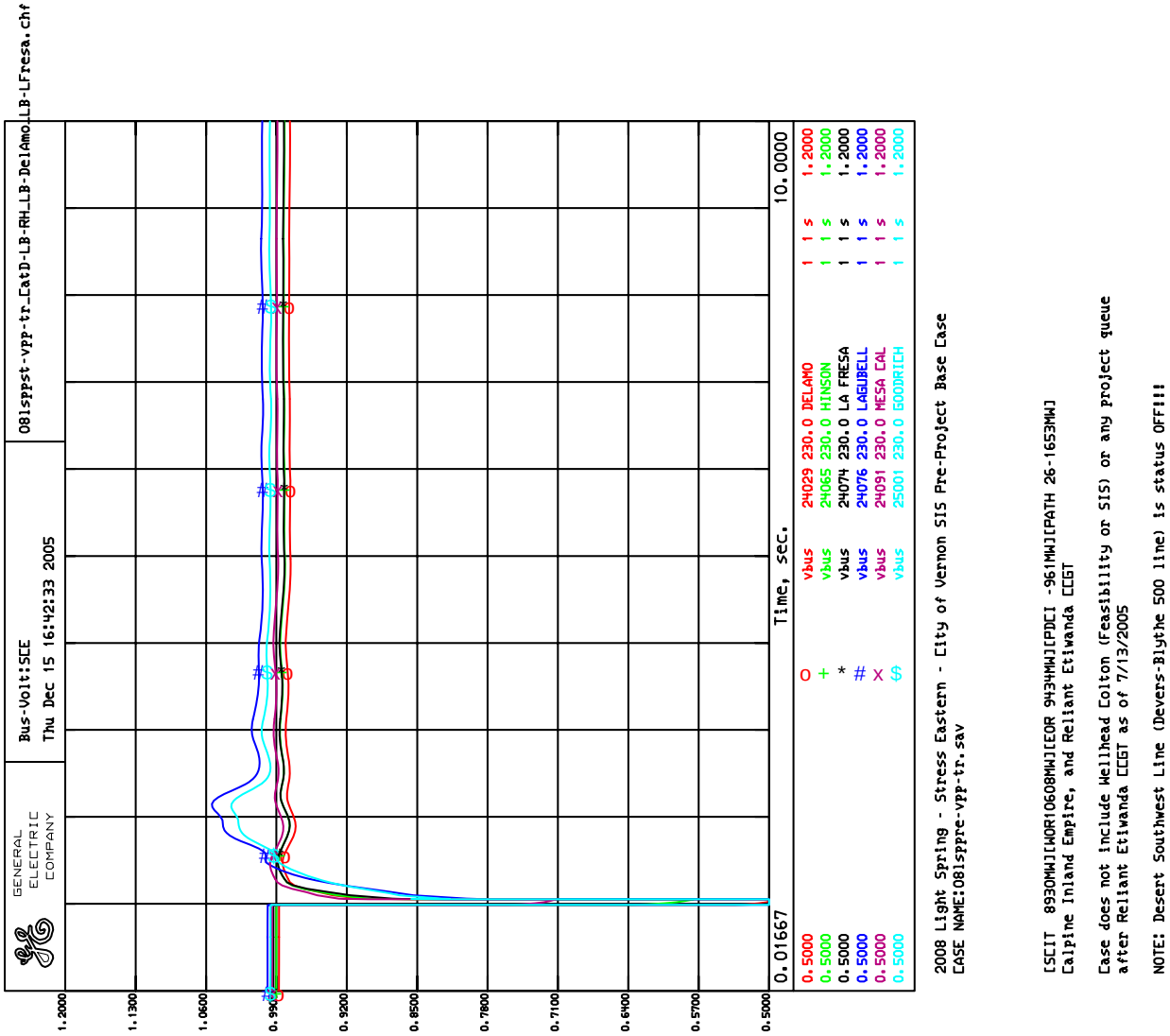
Plot 41 - 9: Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.



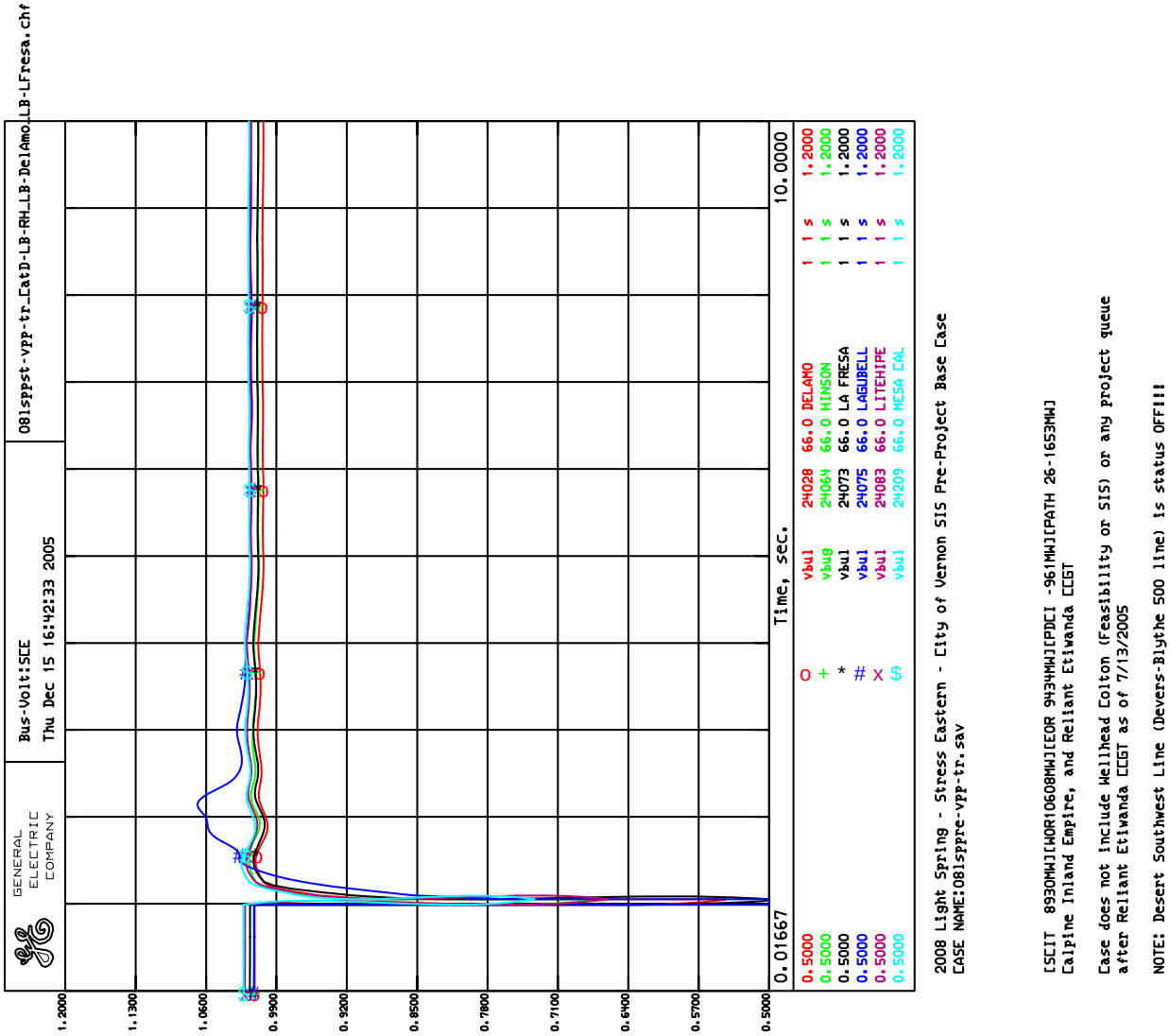
Plot 42 - 1: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



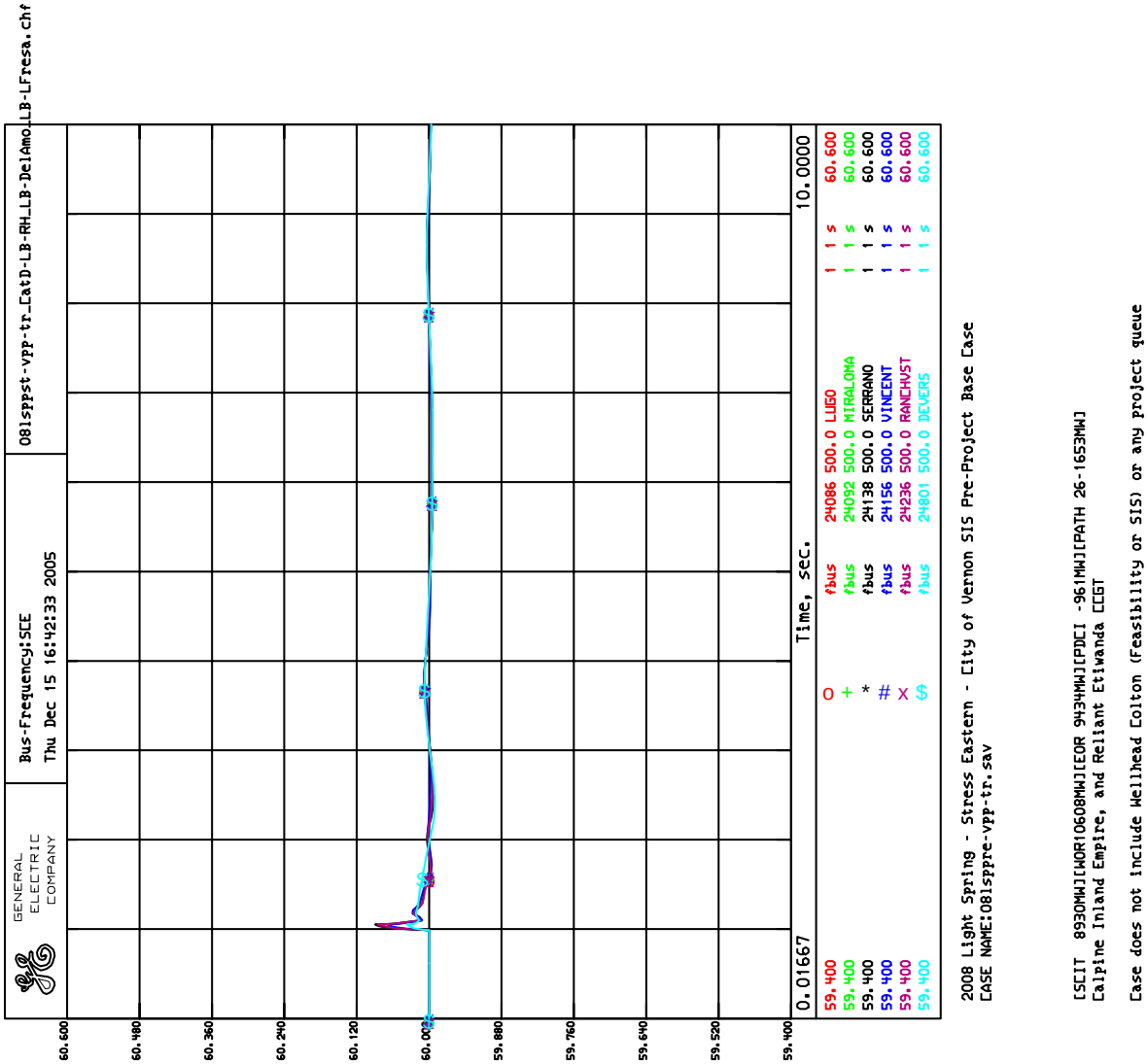
Plot 42 - 2: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



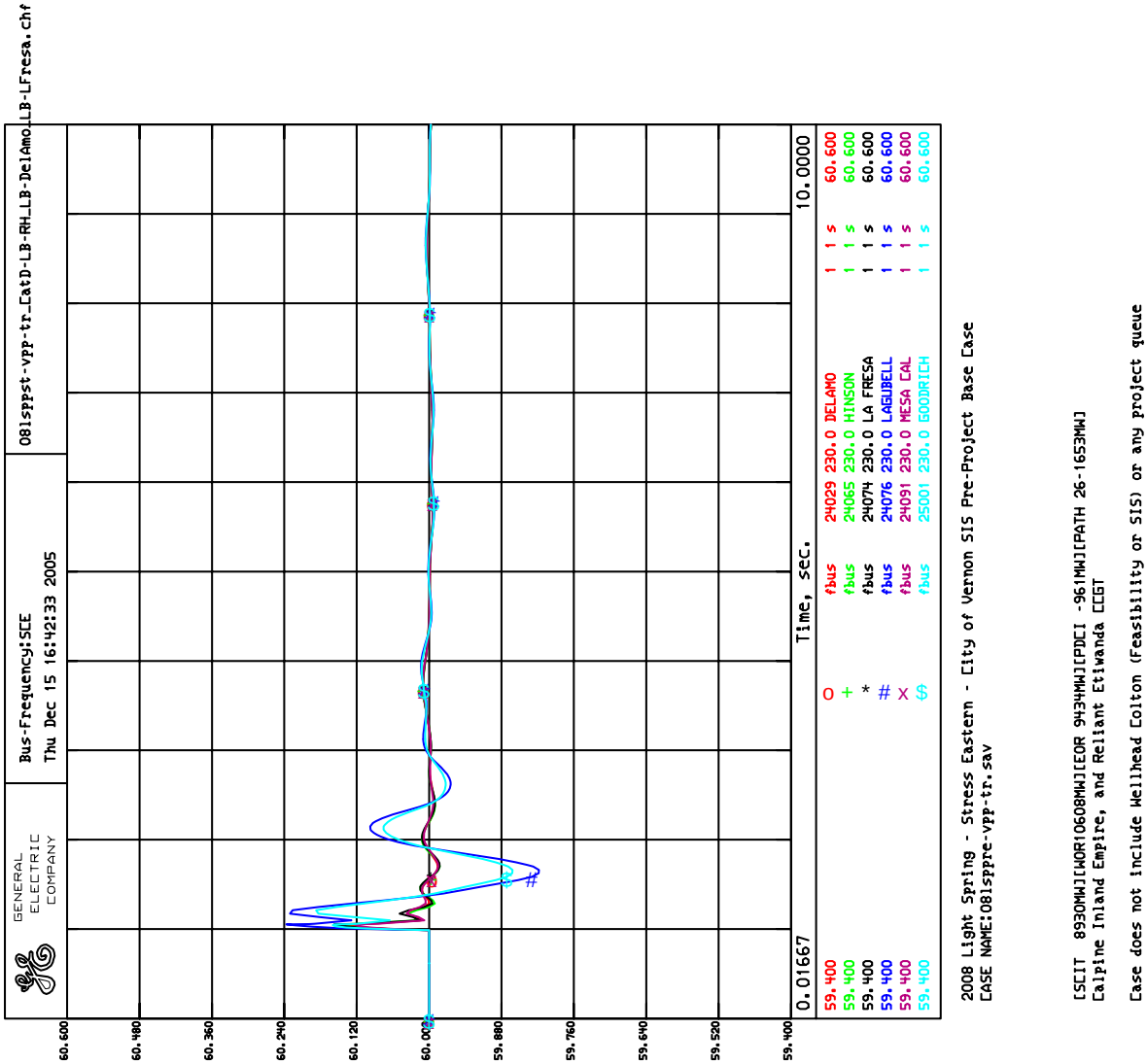
Plot 42 - 3: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



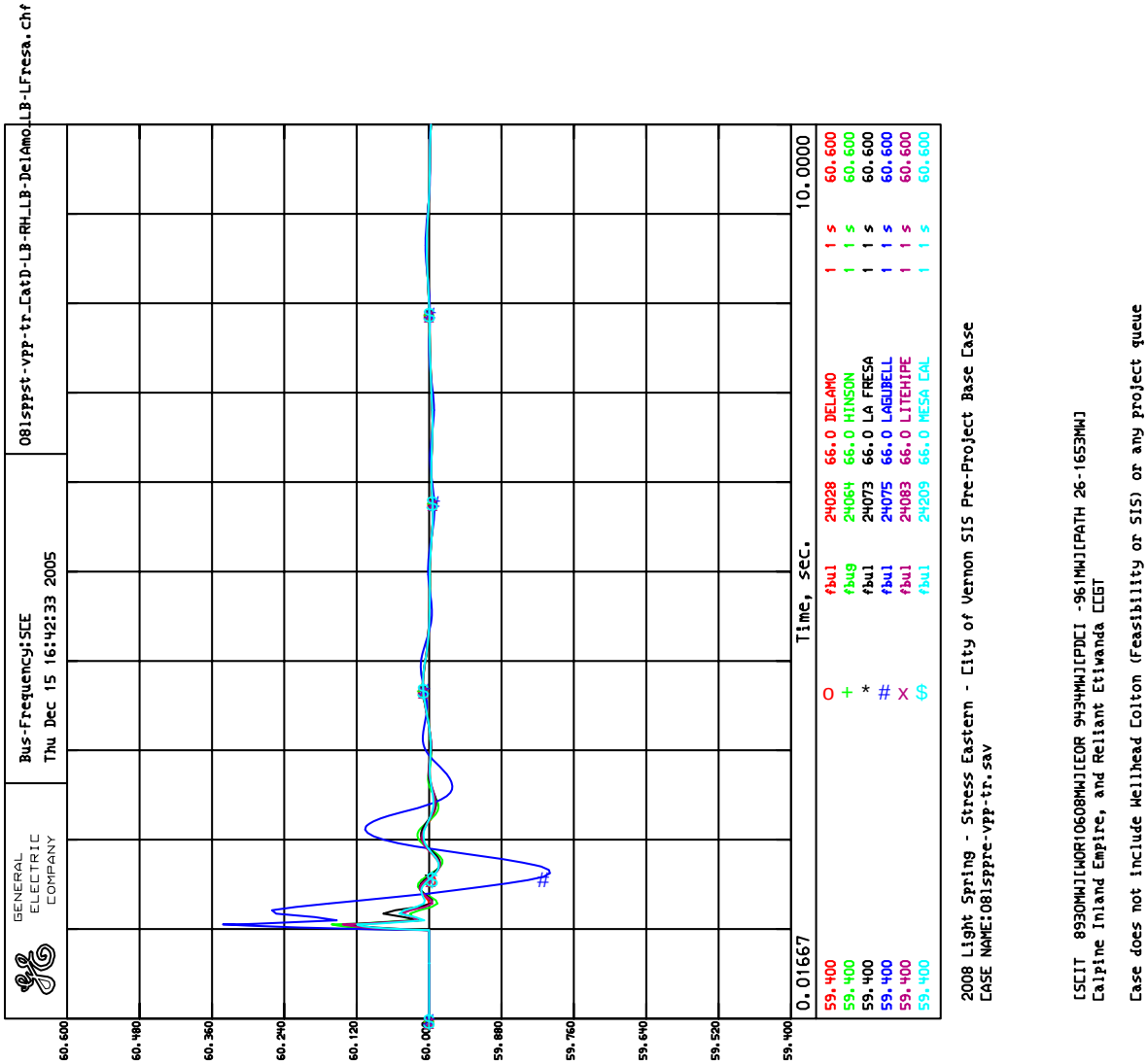
Plot 42 - 4: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



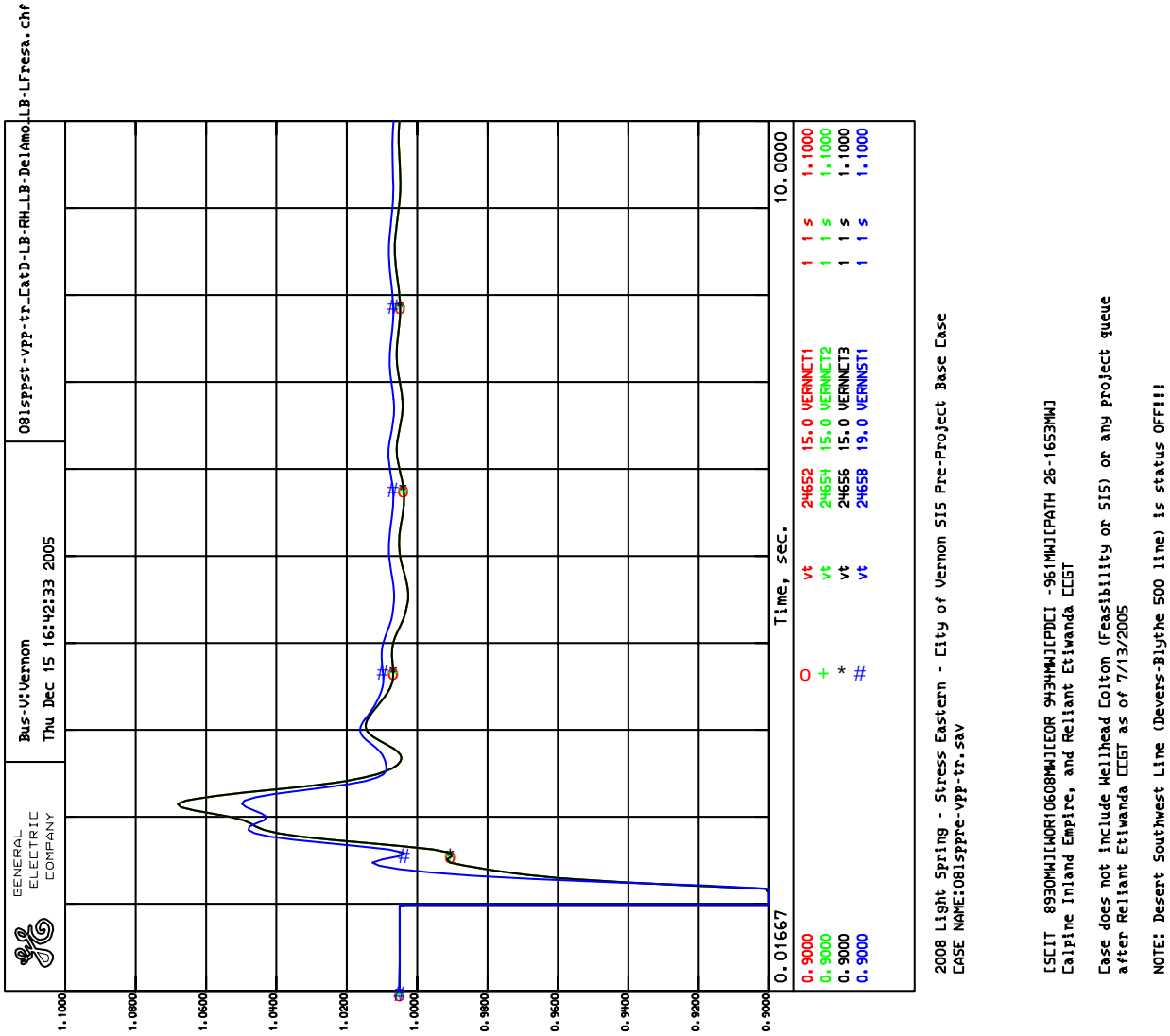
Plot 42 - 5: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



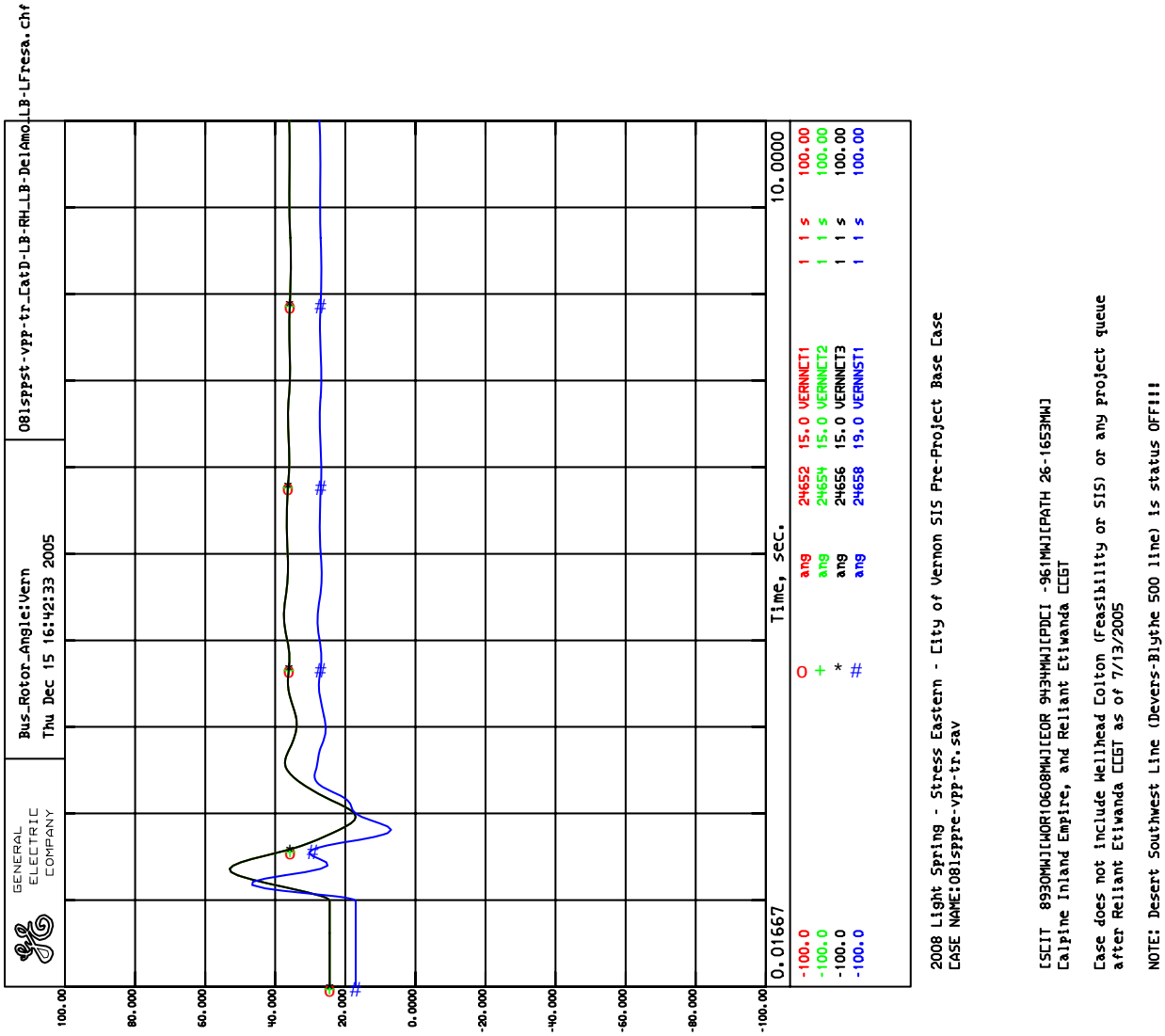
Plot 42 - 6: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



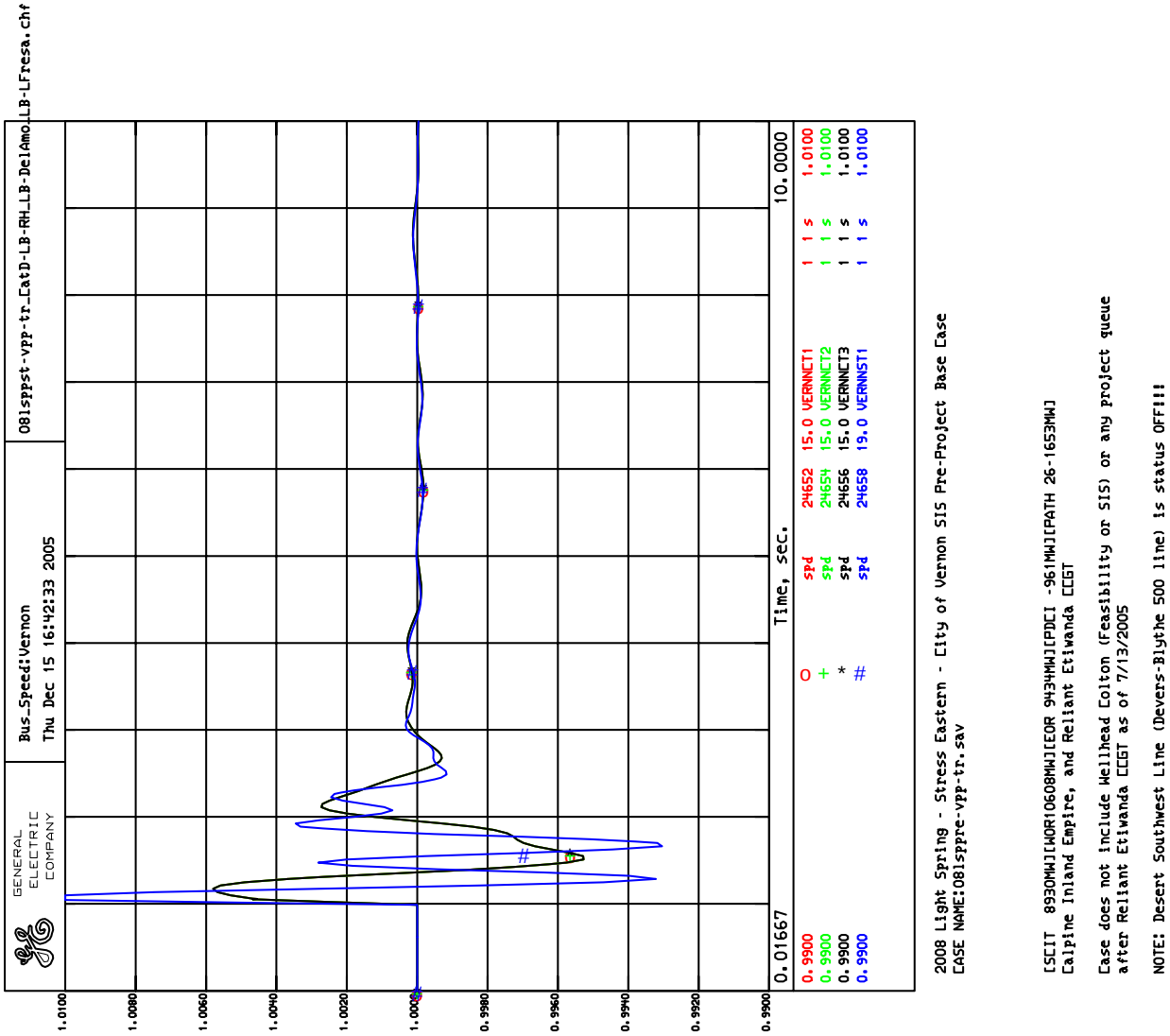
Plot 42 - 7: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



Plot 42 - 8: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



Plot 42 - 9: Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.



Appendix E

Transient Stability Modeling

```
# General transient stability models used for the Vernon Power Plant SIS study.
#
#MACHINES
gentpf   24658 "VERNNST1"  19.00 "1 " : #9 mva=405.0000  4.1000 0.0450 0.7200 0.0600 2.2070 0.0000 1.9000 1.8500 0.3020 0.3680 0.2230 0.2320 0.2350 0.1850 0.5310 0.0027 0.0000 0.0000 1.0000
gentpf   24652 "VERNNCT1"  15.00 "1 " : #9 mva=220.0000  2.0290 0.0430 1.0030 0.0810 5.6900 0.0000 2.4800 2.3900 0.2400 0.4500 0.1900 0.1900 0.1500 0.1000 0.2820 0.0010 0.0000 0.0000 1.0000
gentpf   24654 "VERNNCT2"  15.00 "1 " : #9 mva=220.0000  2.0290 0.0430 1.0030 0.0810 5.6900 0.0000 2.4800 2.3900 0.2400 0.4500 0.1900 0.1900 0.1500 0.1000 0.2820 0.0010 0.0000 0.0000 1.0000
gentpf   24656 "VERNNCT3"  15.00 "1 " : #9 mva=220.0000  2.0290 0.0430 1.0030 0.0810 5.6900 0.0000 2.4800 2.3900 0.2400 0.4500 0.1900 0.1900 0.1500 0.1000 0.2820 0.0010 0.0000 0.0000 1.0000
#
#EXCITERS
exst1    24658 "VERNNST1"  19.00 "1 " : #9 0.020000 0.300000 -0.300000   5.0000  50.0000   200.00 0.020000   5.2200  -4.6000 0.0 0.0 1.000000 1.000000 1.000000   5.2200  -4.6000 0.0  99.0000 0.0
exst1    24652 "VERNNCT1"  15.00 "1 " : #9 0.0 0.170000 -0.170000 1.000000   8.0000   250.00 0.020000   5.6100  -5.0490 0.111000 0.0 1.000000 0.0 0.0  99.0000 -99.0000 0.0  99.0000 0.0
exst1    24654 "VERNNCT2"  15.00 "1 " : #9 0.0 0.170000 -0.170000 1.000000   8.0000   250.00 0.020000   5.6100  -5.0490 0.111000 0.0 1.000000 0.0 0.0  99.0000 -99.0000 0.0  99.0000 0.0
exst1    24656 "VERNNCT3"  15.00 "1 " : #9 0.0 0.170000 -0.170000 1.000000   8.0000   250.00 0.020000   5.6100  -5.0490 0.111000 0.0 1.000000 0.0 0.0  99.0000 -99.0000 0.0  99.0000 0.0
#
#GOVERNORS
ieeeg1   24658 "VERNNST1"  19.00 "1 " : #9 mwcap=364.5000  20.0000 0.0 0.0 0.100000 1.000000 -1.000000 1.000000 0.0 0.100000 1.000000 0.0  10.0000 0.0 0.210000   5.0000 0.0 0.280000 1.000000 0.0
0.510000 0.0 0.0 0.0 0.0 0.0 0.400000 0.750000 0.500000 0.910000 0.600000 0.980000 1.000000 1.000000   2.0000 1.000000
ggov1    24652 "VERNNCT1"  15.00 "1 " : #9 mwcap=198.0000   0.050000  1.000000 1.000000 0.050000 -0.050000  10.0000   2.0000 0.0 1.000000 1.000000 0.15 0.500000   1.5000 0.180000  0.5000   0.0000
0.0 0.0   3.0000 1.000000 0.200000 1.000000 0.0 1.000000 -1.000000 0.01    0.0  .01000  10.0000 1.000000 0.0
ggov1    24654 "VERNNCT2"  15.00 "1 " : #9 mwcap=198.0000   0.050000  1.000000 1.000000 0.050000 -0.050000  10.0000   2.0000 0.0 1.000000 1.000000 0.15 0.500000   1.5000 0.180000  0.5000   0.0000
0.0 0.0   3.0000 1.000000 0.200000 1.000000 0.0 1.000000 -1.000000 0.01    0.0  .01000  10.0000 1.000000 0.0
ggov1    24656 "VERNNCT3"  15.00 "1 " : #9 mwcap=198.0000   0.050000  1.000000 1.000000 0.050000 -0.050000  10.0000   2.0000 0.0 1.000000 1.000000 0.15 0.500000   1.5000 0.180000  0.5000   0.0000
0.0 0.0   3.0000 1.000000 0.200000 1.000000 0.0 1.000000 -1.000000 0.01    0.0  .01000  10.0000 1.000000 0.0
#
#POWER SYSTEM STABILIZERS
ieeest   24658 "VERNNST1"  19.00 "1 " : #9 1.000000 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.300000 0.030000 0.300000 0.030000   3.0000   3.0000   2.0000 0.050000 -0.050000 99.0 -99.0 0.0
pss2a    24652 "VERNNCT1"  15.00 "1 " : #9 3.0000 0.0   3.0000 0.0 0.200000 0.0 0.200000 0.0 0.020000   2.0000  0.0 0.0 0.0 0.0 0.427000 1.000000 1.000000  -2.0000 0.279600 0.042700  0.280700   1.1577
0.100000 -0.100000 0.0 0.0 0.0
pss2a    24654 "VERNNCT2"  15.00 "1 " : #9 3.0000 0.0   3.0000 0.0 0.200000 0.0 0.200000 0.0 0.020000   2.0000  0.0 0.0 0.0 0.0 0.427000 1.000000 1.000000  -2.0000 0.279600 0.042700  0.280700   1.1577
0.100000 -0.100000 0.0 0.0 0.0
pss2a    24656 "VERNNCT3"  15.00 "1 " : #9 3.0000 0.0   3.0000 0.0 0.200000 0.0 0.200000 0.0 0.020000   2.0000  0.0 0.0 0.0 0.0 0.427000 1.000000 1.000000  -2.0000 0.279600 0.042700  0.280700   1.1577
0.100000 -0.100000 0.0 0.0 0.0
```

Following are all Models from the GE PSLF Program.

Model Name: gentpf

Description Generator represented by uniform inductance ratios rotor modeling to match WSCC type F model; shaft speed effects are neglected

Prerequisites: Generator present in load flow working case

Inputs: Network boundary variables, Field Voltage, Turbine Power

Invocation: `gentpf [<n>] {<name> <kv>} <id> :`

Parameters:

EPCL Variable	*Default Data*	*Description*
Tpdo	7.0	D-axis transient rotor time constant
Tppdo	0.035	D-axis sub-transient rotor time constant
Tpqo	0.75	Q-axis transient rotor time constant
Tppqo	0.035	Q-axis sub-transient rotor time constant
H	3.0	Inertia constant, sec
D	0.0	Damping factor, pu
Ld	2.1	D-axis synchronous reactance
Lq	2.04	Q-axis synchronous reactance
Lpd	0.21	D-axis transient reactance
Lpq	0.4	Q-axis transient reactance
Lppd	0.18	D-axis transient reactance
Lppq	0.18	Q-axis sub-transient reactance
Ll	0.12	Stator leakage reactance, pu
S1	0.05	Saturation factor at 1 pu flux
S12	0.4	Saturation factor at 1.2 pu flux
Ra	0.0	Stator resistance, pu
Rcomp	0.0	Compounding resistance for voltage control, pu
Xcomp	0.0	Compounding reactance for voltage control, pu
accel	0.5	Acceleration factor for network boundary iter.

Notes:

a) To represent a solid rotor machine:
- All rotor time constants must be non-zero
- **Lpd, Lppd, Lpq, Lppq, Ll** must be non-zero
- (**Ra** +j **Lppd**) overwrites the generator subtransient R, X from the load flow

b) To represent a salient pole machine with a single amortisseur circuit on each axis (keeping compatibility with the WSCC program's method of handling such machines)
- Set **Tpdo, Tppdo** and **Tppqo** to non-zero values
- Set **Tpqo** to zero
- Set **Lpq** = **Lq**
- Set **Lppq** to the q-axis subtransient reactance
- (**Ra** +j **Lppd**) overwrites the generator subtransient R, X from the load flow

c) To represent a salient pole machine without amortisseur circuits (keeping compatibility with the WSCC program's method of handling of such machines)
- Set **Tpdo** to a non-zero value
- Set **Tppdo** = **Tpqo** = **Tppqo** = 0
- Set **Lpd** to the transient reactance
- Set **Lppd** = **Lpd** and **Lpq** = **Lppq** = **Lq**
- (**Ra** +j **Lpd**) overwrites the generator subtransient R, X from the load flow

d) All reactances entered in the parameter list must be unsaturated values. Saturated reactances are calculated internally.

e) It is not necessary for **Lppq** to be equal to **Lppd**.

f) **D** has the dimensions p.u. ΔP/ p.u. Δspeed.

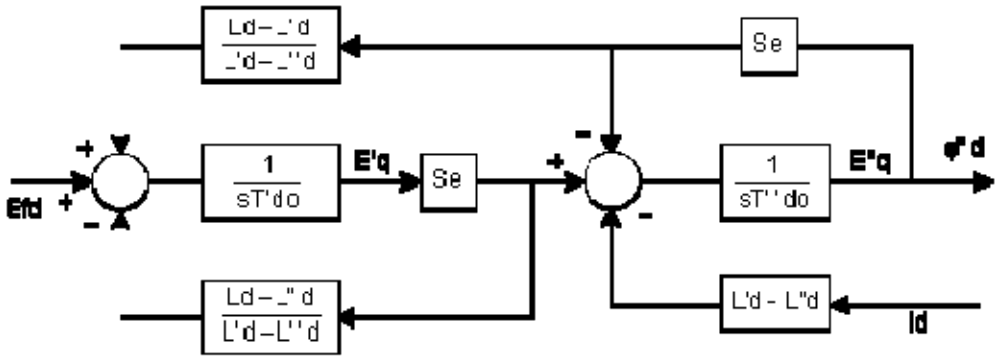
g) **S1** and **S12** are defined in Figure 3.11.2, and must be non- zero.

h) The acceleration factor, **accel**, must be less than unity and should normally be in the range 0.3 to 0.5.

i) If **accel** is absent from the data record read by RDYD, it is set to 0.4. If **Rcomp** and **Xcomp** are also absent, they are set to zero. If **Ra** is also absent, it is set to the resistance part of the machine subtransient impedance from the load flow generator data table.

Output Channels:

Record Level	*Name*	*Description*
1	ang	Rotor angle, degrees
1	vt	Terminal voltage, p.u.
2	efd	Field voltage, p.u.
3	it	Terminal current, p.u.
4	pg	Electrical power, MW
5	spd	Shaft speed, p.u.
6	qg	Reactive power, MVAR



$$Se = 1. + fnct(\varphi sg)$$

Q – Axis similar except:

$$Se = 1. + \frac{Lq}{Ld}(\varphi sg)$$

Model Name: exst1

Description IEEE type ST1 excitation system

Prerequisites: Generator model ahead of this model in dynamic models table

Inputs: Compounded generator terminal voltage, generator field current, generator speed

Invocation: `exst1 [<n>] {<name> <kv>} <id> :`

Parameters:

EPCL Variable	*Default Data*	*Description*
Tr	0.0	Filter time constant, sec.
Vimax	0.1	Maximum error, p.u.
Vimin	-.1	Minimum error, p.u.
Tc	1.0	Lead time constant, sec.
Tb	10.0	Lag time constant, sec.
Ka	200.0	Gain, p.u.
Ta	.02	Time constant, sec.
Vrmax	5.0	Maximum controller output, p.u.
Vrmin	-5.0	Minimum controller output, p.u.
Kc	.05	Excitation system regulation factor, p.u.
Kf	0.0	Rate feedback gain
Tf	1.0	Rate feedback time constant, sec.
Tc1	1.0	Lead time constant, sec.
Tb1	1.0	Lag time constant, sec.
Vamax	5.0	Maximum control element output, p.u.
Vamin	-5.0	Minimum control element output, p.u
Xe	.04	Excitation transformer effective reactance, p.u.
Ilr	2.8	Maximum field current, p.u.
Klr	5.0	Gain on field current limit

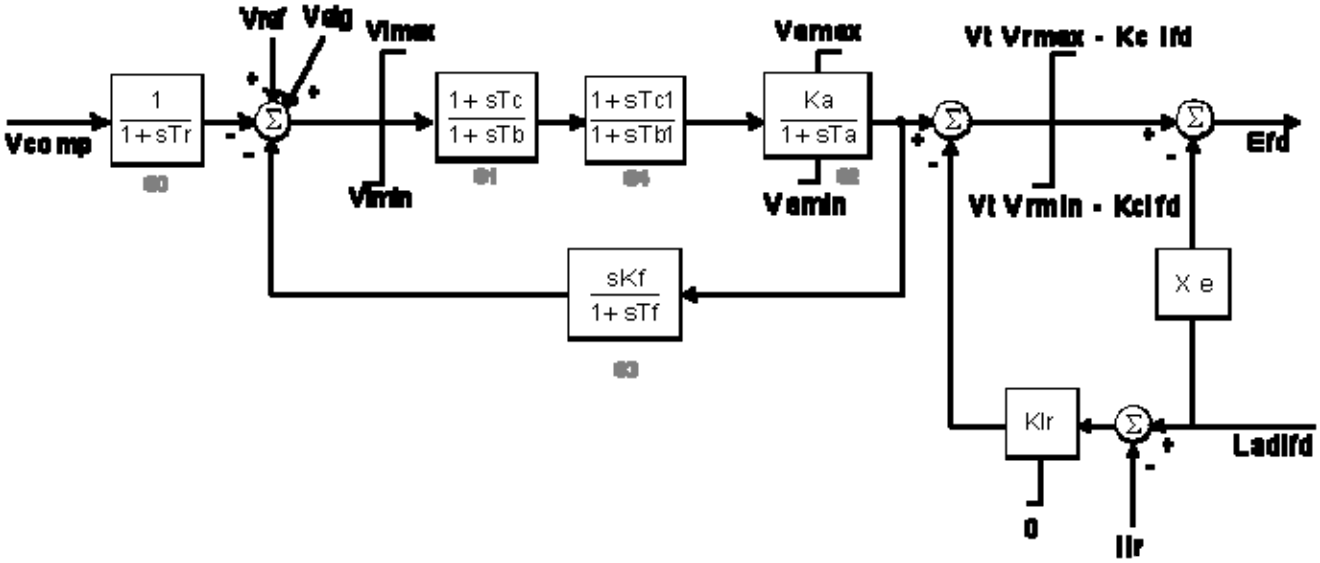
Notes:

a) This model can be used to represent a controlled-rectifier excitation system whose a.c. power source is a simple power transformer fed from the generator terminals. The voltage regulation of the excitation transformer and rectifier are approximated by the parameter Kc.

Output Channels:

Record Level	*Name*	*Description*
1	ifd	Generator field current, p.u.

Block Diagram:



Model Name: ieeeg1

Description IEEE steam turbine/governor model (with deadband and nonlinear valve gain added)

Prerequisites: One or two generator models ahead of this model in the dynamic models table

Inputs: Shaft speed

Invocation:

```
ieeeg1  [<nh>]  {<nameh>  <kvh>}  <idh>  [<nl>]
{<namel> <kvl>} <idl> : [mwcap=<value>]
```

Parameters:

EPCL Variable	*Default Data*	*Description*
K	25.0	Governor gain (reciprocal of droop), p.u.
T1	0.0	Governor lag time constant, sec.
T2	0.0	Governor lead time constant, sec.
T3	0.1	Valve positioner time constant, sec.
Uo	1.0	Maximum valve opening velocity, p.u./sec.
Uc	-10.0	Maximum valve closing velocity, p.u./sec (< 0.)
Pmax	1.0	Maximum valve opening, p.u. of mwcap.
Pmin	0.0	Minimum valve opening, p.u. of mwcap
T4	0.0	Inlet piping/steam bowl time constant, sec.
K1	0.0	Fraction of hp shaft power after first boiler pass
K2	0.0	Fraction of lp shaft power after first boiler pass
T5	0.0	Time constant of second boiler pass, sec
K3	0.0	Fraction of hp shaft power after second boiler pass
K4	0.0	Fraction of lp shaft power after second boiler pass
T6	0.0	Time constant of third boiler pass, sec.
K5	0.0	Fraction of hp shaft power after third boiler pass
K6	0.0	Fraction of lp shaft power after third boiler pass
T7	0.0	Time constant of fourth boiler pass, sec
K7	0.0	Fraction of hp shaft power after fourth boiler pass
K8	0.0	Fraction of lp shaft power after fourth boiler pass
db1	0.0	Intentional deadband width, Hz.
eps	0.0	Intentional db hysteresis, Hz.
db2	0.0	Unintentional deadband, MW
GV1	0.0	Nonlinear gain point 1, p.u. gv
Pgv1	0.0	Nonlinear gain point 1, p.u. power
GV2	0.0	Nonlinear gain point 2, p.u. gv
Pgv2	0.0	Nonlinear gain point 2, p.u. power
GV3	0.0	Nonlinear gain point 3, p.u. gv

Pgv3	0.0	Nonlinear gain point 3, p.u. power
GV4	0.0	Nonlinear gain point 4, p.u. gv
Pgv4	0.0	Nonlinear gain point 4, p.u. power
GV5	0.0	Nonlinear gain point 5, p.u. gv
Pgv5	0.0	Nonlinear gain point 5, p.u. power
GV6	0.0	Nonlinear gain point 6, p.u. gv
Pgv6	0.0	Nonlinear gain point 6, p.u. power

Notes:

a) Per unit parameters are on base of total turbine MW capability. If no value is entered for "mwcap", the generator MVA base is used. (If there are two generators, the sum of the MVA bases is used.)

b) T3 must be greater than zero. All other time constants may be zero.

c) <nh> <nameh> <kvh> <idh> identify the first of two generators controlled by this governor. These must identify a generator that is in the working case.

<nl> <namel> <kvl> <idl> identify the second of two generators controlled by this governor. These may be omitted if only one generator is controlled.

d) The two generators identified by the invocation of this model are normally the high and low pressure machines, respectively, of a cross compound steam turbine set, or the gas and steam turbine machines of a combined cycle plant. The second machine may be absent and, in this case, the model can be used to approximate the behavior of a wide range of types of single shaft turbine.

e) The gains K1-K8 and time constants T5-T7 describe the division of power output among turbine stages and the transfer of energy in the boiler or combustion prime mover.

f)) Each generator must be represented in the load flow by data stated on its own MVA base. The values of K1, K3, K5, K7 must be specified to describe the proportionate development of power on the first turbine shaft. K2, K4, K6, K8 must describe the second turbine shaft. Normally

K1 + K3 + K5 + K7 = 1.0
K2 + K4 + K6 + K8 = 1.0

The division of power between the two shafts is in proportion to the values of MBASE of the two generators. The initial condition load flow should, therefore, have the two generators loaded to the same fraction of the MVA base.

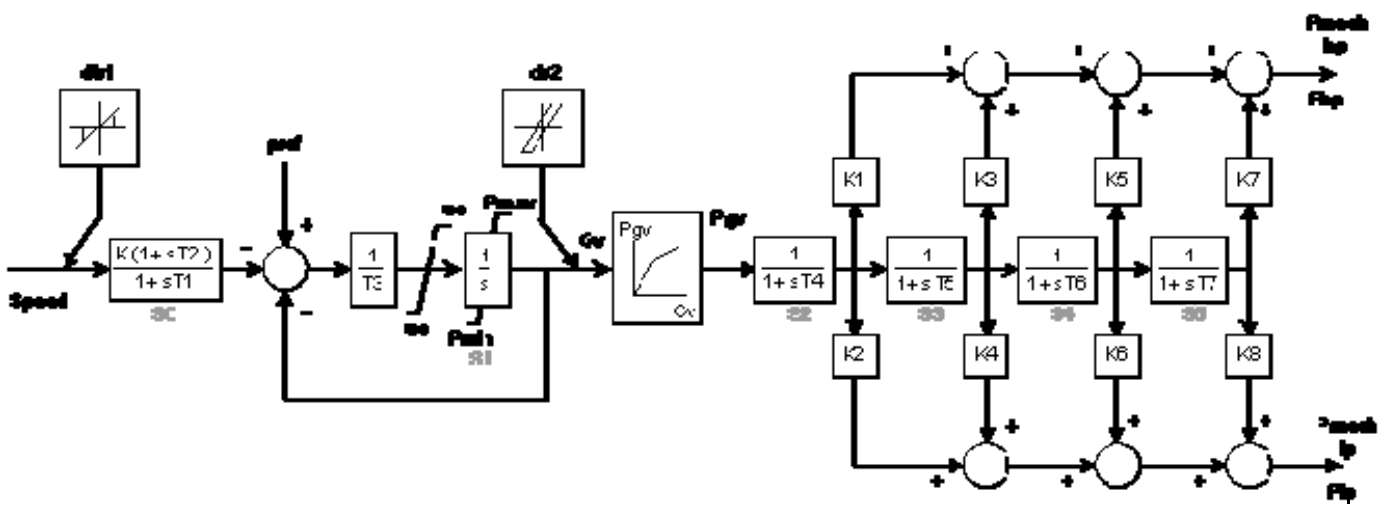
g) The deadbands are implemented as described in section 3.10.2.

h) The nonlinear gain between gate position and power may be input with up to 6 points. The (0.,0.) and (1.,1.) points are assumed and need not be input. The output is not allowed to go beyond 0. and 1. However, if Pmax > 1., the input and output are scaled by Pmax.

If GV1 is input as a negative number, the default full-arc steam valve curve (see section 3.10.2) will be used. If input is omitted or if all zero values are input, a straight line is used.

Output Channels:

Record Level	*Name*	*Description*
1	ph	High pressure turbine shaft power, MW.
1	pl	Low pressure turbine shaft power, MW



Model Name: ieeeg1

Description IEEE steam turbine/governor model (with deadband and nonlinear valve gain added)

Prerequisites: One or two generator models ahead of this model in the dynamic models table

Inputs: Shaft speed

Invocation:

```
ieeeg1  [<nh>]  {<nameh>  <kvh>}  <idh>  [<nl>]
{<namel> <kvl>} <idl> : [mwcap=<value>]
```

Parameters:

EPCL Variable	*Default Data*	*Description*
K	25.0	Governor gain (reciprocal of droop), p.u.
T1	0.0	Governor lag time constant, sec.
T2	0.0	Governor lead time constant, sec.
T3	0.1	Valve positioner time constant, sec.
Uo	1.0	Maximum valve opening velocity, p.u./sec.
Uc	-10.0	Maximum valve closing velocity, p.u./sec (< 0.)
Pmax	1.0	Maximum valve opening, p.u. of mwcap.
Pmin	0.0	Minimum valve opening, p.u. of mwcap
T4	0.0	Inlet piping/steam bowl time constant, sec.
K1	0.0	Fraction of hp shaft power after first boiler pass
K2	0.0	Fraction of lp shaft power after first boiler pass
T5	0.0	Time constant of second boiler pass, sec
K3	0.0	Fraction of hp shaft power after second boiler pass
K4	0.0	Fraction of lp shaft power after second boiler pass
T6	0.0	Time constant of third boiler pass, sec.
K5	0.0	Fraction of hp shaft power after third boiler pass
K6	0.0	Fraction of lp shaft power after third boiler pass
T7	0.0	Time constant of fourth boiler pass, sec
K7	0.0	Fraction of hp shaft power after fourth boiler pass
K8	0.0	Fraction of lp shaft power after fourth boiler pass
db1	0.0	Intentional deadband width, Hz.
eps	0.0	Intentional db hysteresis, Hz.
db2	0.0	Unintentional deadband, MW
GV1	0.0	Nonlinear gain point 1, p.u. gv
Pgv1	0.0	Nonlinear gain point 1, p.u. power
GV2	0.0	Nonlinear gain point 2, p.u. gv
Pgv2	0.0	Nonlinear gain point 2, p.u. power
GV3	0.0	Nonlinear gain point 3, p.u. gv

Pgv3	0.0	Nonlinear gain point 3, p.u. power
GV4	0.0	Nonlinear gain point 4, p.u. gv
Pgv4	0.0	Nonlinear gain point 4, p.u. power
GV5	0.0	Nonlinear gain point 5, p.u. gv
Pgv5	0.0	Nonlinear gain point 5, p.u. power
GV6	0.0	Nonlinear gain point 6, p.u. gv
Pgv6	0.0	Nonlinear gain point 6, p.u. power

Notes:

a) Per unit parameters are on base of total turbine MW capability. If no value is entered for "mwcap", the generator MVA base is used. (If there are two generators, the sum of the MVA bases is used.)

b) T3 must be greater than zero. All other time constants may be zero.

c) <nh> <nameh> <kvh> <idh> identify the first of two generators controlled by this governor. These must identify a generator that is in the working case.

<nl> <namel> <kvl> <idl> identify the second of two generators controlled by this governor. These may be omitted if only one generator is controlled.

d) The two generators identified by the invocation of this model are normally the high and low pressure machines, respectively, of a cross compound steam turbine set, or the gas and steam turbine machines of a combined cycle plant. The second machine may be absent and, in this case, the model can be used to approximate the behavior of a wide range of types of single shaft turbine.

e) The gains K1-K8 and time constants T5-T7 describe the division of power output among turbine stages and the transfer of energy in the boiler or combustion prime mover.

f)) Each generator must be represented in the load flow by data stated on its own MVA base. The values of K1, K3, K5, K7 must be specified to describe the proportionate development of power on the first turbine shaft. K2, K4, K6, K8 must describe the second turbine shaft. Normally

K1 + K3 + K5 + K7 = 1.0
K2 + K4 + K6 + K8 = 1.0

The division of power between the two shafts is in proportion to the values of MBASE of the two generators. The initial condition load flow should, therefore, have the two generators loaded to the same fraction of the MVA base.

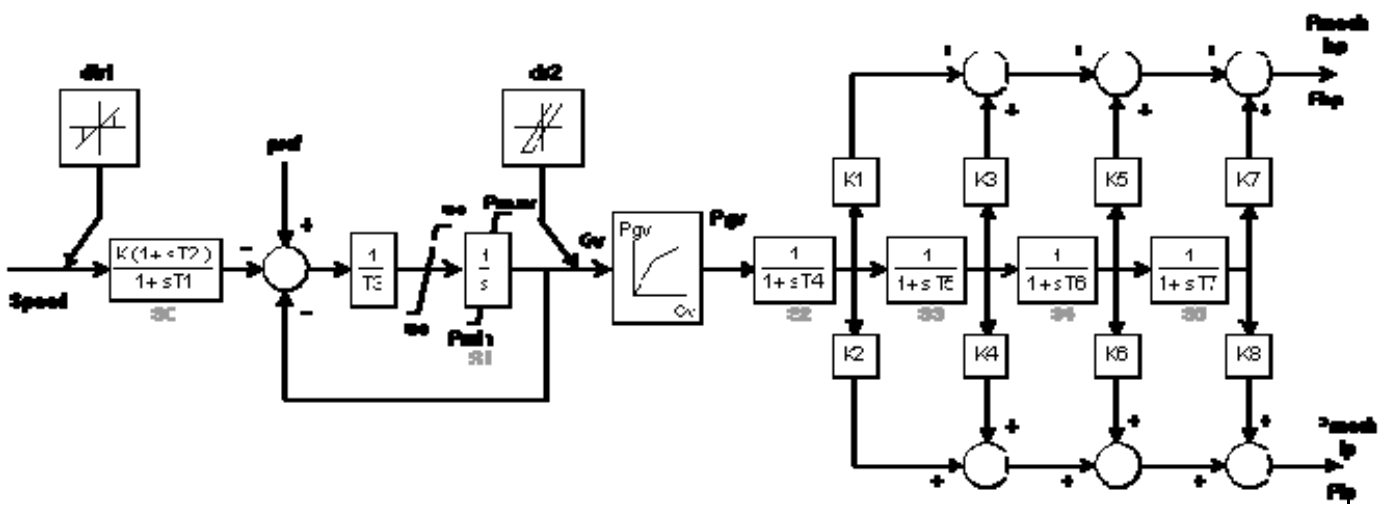
g) The deadbands are implemented as described in section 3.10.2.

h) The nonlinear gain between gate position and power may be input with up to 6 points. The (0.,0.) and (1.,1.) points are assumed and need not be input. The output is not allowed to go beyond 0. and 1. However, if Pmax > 1., the input and output are scaled by Pmax.

If GV1 is input as a negative number, the default full-arc steam valve curve (see section 3.10.2) will be used. If input is omitted or if all zero values are input, a straight line is used.

Output Channels:

Record Level	*Name*	*Description*
1	ph	High pressure turbine shaft power, MW.
1	pl	Low pressure turbine shaft power, MW



Model Name: ieeest

Description Power system stabilizer

Prerequisites: Generator model ahead of this model in dynamic models table

Inputs:

Generator shaft speed

Frequency of generator terminal or system bus voltage

Generator electric power or accelerating power

Voltage amplitude of generator terminal bus or system bus

Current amplitude in generator step-up transformer branch

Invocation:

```
ieeest [<n>] {<name> <kv>} <id> :
```

Parameters:

EPCL Variable	*Default Data*	*Description*
j	0.0	Input signal code
k	0.0	Remote signal bus number
A1	0.0	Notch filter parameters
A2	0.0	Notch filter parameters
A3	0.0	Notch filter parameters
A4	0.0	Notch filter parameters
A5	0.0	Notch filter parameters
A6	0.0	Notch filter parameters
T1	0.0	Lead/lag time constant, sec.
T2	0.0	Lead/lag time constant, sec.
T3	0.0	Lead/lag time constant, sec.
T4	0.0	Lead/lag time constant, sec.
T5	0.0	Washout numerator time constant, sec.
T6	0.0	Washout denominator time constant, sec.
Ks	0.0	Stabilizer gain
Lsmax	0.0	Maximum stabilizer output, p.u.
Lsmin	0.0	Minimum stabilizer output, p.u.
Vcu	0.0	Stabilizer input cutoff threshold, p.u.
Vcl	0.0	Stabilizer input cutoff threshold, p.u.
Tdelay	0.0	Time delay, sec.

Notes:

a) T2, T4, T5, T6 must be greater than zero.

b) T1, T3 and Tdelay may be zero.

c) Set T1 = T2 and/or T3 = T4 to obtain null effect from a lead/lag block.

d) Ks may be positive or negative depending on the input signal that is active. Ks should normally be:

positive	for shaft speed or frequency input
negative	for electrical power input

e) The input signal code, j, and the remote bus number, k, specify the input signal used by the stabilizer. If k is zero the signal is taken from the shaft or terminals of the generator on which the stabilizer is located. If k is non-zero the signal is taken from bus number k (for j = 1, 2, 3, 4, or 5). The input signal code, j, is:

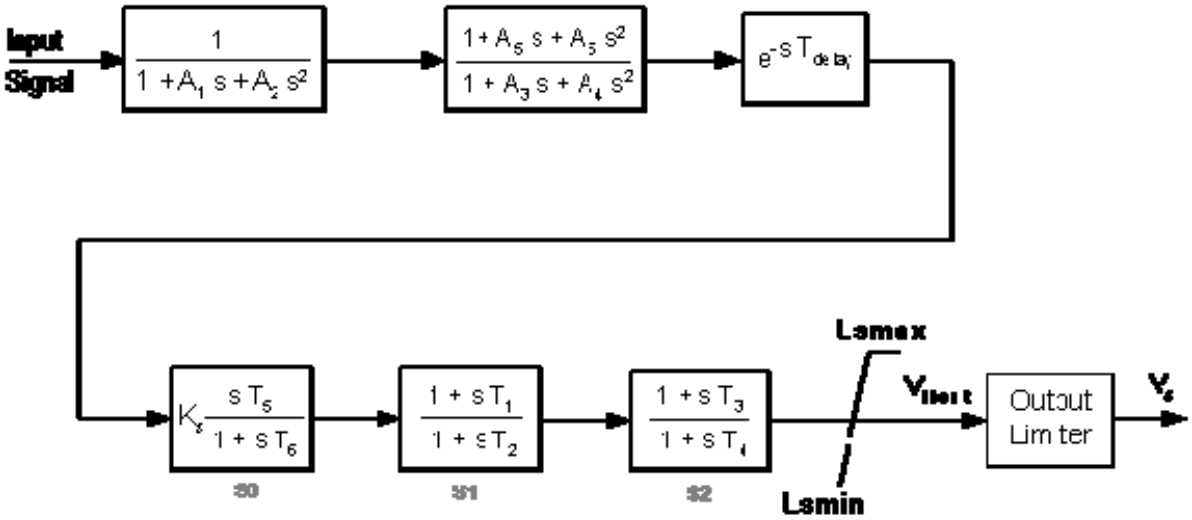
1	for shaft speed deviation
2	for frequency deviation of bus voltage
3	for generator electrical power
4	for generator accelerating power
5	for amplitude of bus voltage
6	not used
7	for amplitude of branch current

f) A1 through A6 may be zero. Set all A values to zero to ignore filter.

g) Tdelay should not exceed ten time steps.

Output Channels:

Record Level	*Name*	*Description*
1	vs	Stabilizer output signal, p.u.




```
Output    Limiter

if ( Vcu && ( Vct > Vcu ) )
        Vs = 0.0
if ( Vcl && ( Vct < Vcl ) )
        Vs = 0.0
else
        Vs = Vllout


Vct = Compensating
        voltage
        ( genbc[k].vcomp )
```

Model Name: pss2a

Description Dual input Power system stabilizer (IEEE type PSS2A)

Prerequisites: Generator model ahead of this model in dynamic models table

Inputs: Generator shaft speed Frequency of generator terminal or system bus voltage
Generator electric power or accelerating power

Voltage amplitude of generator terminal bus or system bus
Current amplitude specified branch

Invocation: `psssa [<n>] {<name> <kv>} <id> :`

Parameters:

EPCL Variable	*Default Data*	*Description*
J1	1.0	Input signal #1 code
K1	0.0	Input signal #1 remote bus number
J2	3.0	Input signal #2 code
K2	0.0	Input signal #2 remote bus number
Tw1	2.0	First washout on signal #1, sec.
Tw2	2.0	Second washout on signal #1, sec.
Tw3	2.0	First washout on signal #2, sec.
Tw4	0.0	Second washout on signal #2, sec.
T6	0.0	Time constant on signal #1, sec.
T7	2.0	Time constant on signal #2, sec.
Ks2	0.2	Gain on signal #2
Ks3	1.0	Gain on signal #2
Ks4	1.0	Gain on signal #2
T8	0.5	Lead of ramp tracking filter
T9	0.1	Lag of ramp tracking filter
n	1.0	Order of ramp tracking filter
m	5.0	Order of ramp tracking filter
Ks1	10.0	Stabilizer gain
T1	0.25	Lead/lag time constant, sec.
T2	0.04	Lead/lag time constant, sec.
T3	0.2	Lead/lag time constant, sec.
T4	0.03	Lead/lag time constant, sec.
Vstmax	0.1	Stabilizer output max limit, p.u.

Vstmin	-0.1	Stabilizer output min limit, p.u.
a	1.	Lead/lag num. Gain. (not in IEEE model)
Ta	0.	Lead/lag time constant, sec. (not in IEEE model)
Tb	0.	Lead/lag time constant, sec. (not in IEEE model)

Notes:

a) TW1 and TW3 must be greater than zero.

b) Setting TW2 or TW4 to zero will bypass the washout function.

c) Ta, Tb, a, T1, T2, T3, T4, T6, T7, T8, and T9 may be zero.

d) Set T9 = 0 or n = 0 to get a null effect from the ramp tracking filter.

e) The product of n*m cannot be greater than 10.

f) The input signal code, j, and the remote bus number, k, specify the input signal used by the stabilizer. If k is zero the signal is taken from the shaft or terminals of the generator on which the stabilizer is located. If k is non-zero the signal is taken from bus number k (for j = 1, 2, 3, 4, or 5).

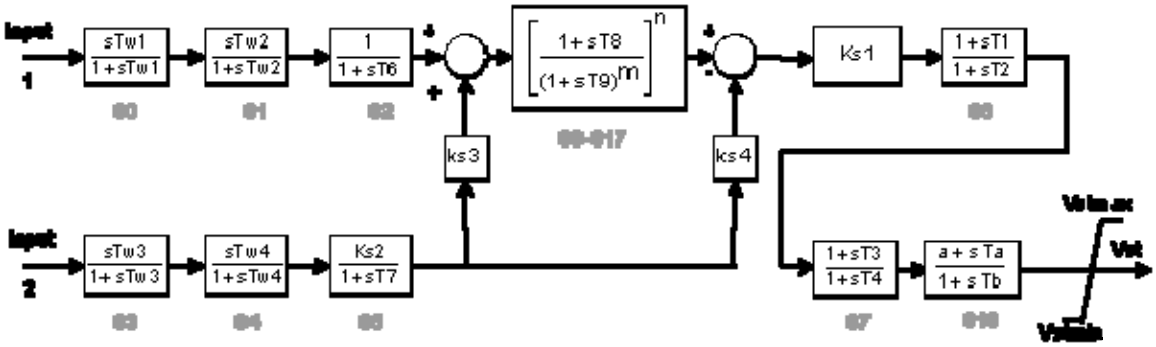
g) To use branch current as an input, the branch is specified using the ([<mon_i>] {<name> <kv>} [<mon_j>] {<name> <kv>} <ck> <sec>) data in the DYD file or in the "edds" table. Note that only one branch current may be used as input to this model.

The input signal code, j, is

1	for shaft speed
2	for frequency of bus voltage
3	for generator electrical power
4	for generator accelerating power
5	for amplitude of bus voltage
6	or amplitude of branch current

Output Channels:

Record Level	*Name*	*Description*
1	vs	Stabilizer output signal, p.u.


Input 1
sTw1 / 1+sTw1
sTw2 / 1+sTw2
1 / 1+sT6
+
+
[(1+sT8) / (1+sT9)^m]^n
+
-
Ks1
1+sT1 / 1+sT2
ks3
ks4
Input 2
sTw3 / 1+sTw3
sTw4 / 1+sTw4
Ks2 / 1+sT7
1+sT3 / 1+sT4
a+sTa / 1+sTb
Vt

Appendix F

Transient Stability Switching Sequences

Full load rejection of the VPP.

```
RUN
*   Vernon Power Plant Full Load Rejection
*
*  CC cards for post-transient only
CC  DRP 908
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*
*   Trip Vernon Power Plant - Laguna Bell 230kV lines
*
DL   60.0 "LAGUBELL" 230. "VPWRPLNT" 230. "1 "
DL   60.0 "LAGUBELL" 230. "VPWRPLNT" 230. "2 "
*
```

Three-phase fault at the VPP 230 kV bus followed by loss of the VPP STG.

```
RUN
*   Vernon Power Plant, Loss of the VPP STG
*   3 phase 4 cycle fault at VPP 230kV bus
*
*  CC cards for post-transient only
CC  DRP 344
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at VPP 230kV bus
*
FB   60.0 "VPWRPLNT" 230.
*
*   Clear fault at VPP 230kV bus
CFB  64.0 "VPWRPLNT" 230.
*
*   Trip Vernon Power Plant STG
*
TG   64.0 "VERNNST1"  19.00 "1 "
*
```

Three-phase fault at the VPP 230 kV bus followed by loss of the VPP – Laguna Bell 230 kV #1 circuit.

```
RUN
*   Vernon Power Plant, Loss of VPP-Laguna Bell 230kV Line
*   3 phase 4 cycle fault at VPP 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at VPP 230kV bus
*
FB   60.0 "VPWRPLNT" 230.
*
*   Clear fault at VPP 230kV bus
CFB  64.0 "VPWRPLNT" 230.
*
*   Trip Vernon Power Plant - Laguna Bell 230kV lines
*
DL   64.0 "LAGUBELL" 230. "VPWRPLNT" 230. "1 "
*
```

Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV #1 circuit.

```
RUN
*   Vernon Power Plant, Loss of Laguna Bell - Rio Hondo 230kV Line
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - Rio Hondo 230kV lines
*
DL   64.0 "LAGUBELL" 230. "RIOHONDO" 230. "1 "
*
```

Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Goodrich 230 kV #1 circuit.

```
RUN
*   Vernon Power Plant, Loss of Laguna Bell - Goodrich 230kV Line
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - Goodrich 230kV lines
*
DL   64.0 "LAGUBELL" 230. "GOODRICH" 230. "1 "
*
```

Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV #1 circuit.

```
RUN
*   Vernon Power Plant, Loss of Laguna Bell - Del Amo 230kV Line
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - Del Amo 230kV lines
*
DL   64.0 "LAGUBELL" 230. "DELAMO  " 230. "1 "
*
```

Three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV circuit.

```
RUN
*   Vernon Power Plant, Loss of Laguna Bell - La Fresa 230kV Line
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - La Fresa 230kV lines
*
DL   64.0 "LAGUBELL" 230. "LA FRESA" 230. "1 "
*
```

Three-phase fault at the Harbor Gen 230 kV bus followed by loss of the Long Beach – Harbor Gen 230 kV circuit.

```
RUN
*   Loss of Long Beach - Harbor 230 kV Line
*   3 phase 4 cycle fault at Long Beach 230-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Long Beach 230-kV bus
FB   60.0 "HARBOR  " 230.
*
*   Clear fault at Long Beach 230-kV bus
CFB  64.0 "HARBOR  " 230.
*
*   Trip Long Beach - Harbor 230 kV Line
*
DL   64.0 "HARBOR  " 230. "LBEACH  " 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Lighthipe 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV circuit.

```
RUN
*   Loss of Long Beach - Litehipe 230 kV Line
*   3 phase 4 cycle fault at Litehipe 230-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Litehipe 230-kV bus
FB   60.0 "LITEHIPE" 230.
*
*   Clear fault at Litehipe 230-kV bus
CFB  64.0 "LITEHIPE" 230.
*
*   Trip Long Beach - Litehipe 230 kV Line
*
DL   64.0 "LBEACH  " 230. "LITEHIPE" 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Rio Hondo 230 kV bus followed by loss of the Vincent – Rio Hondo 230 kV circuit.

```
RUN
*   Loss of Vincent - Rio Hondo 230 kV Line
*   3 phase 4 cycle fault at Rio Hondo 230-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Rio Hondo 230-kV bus
FB   60.0 "RIOHONDO" 230.
*
*   Clear fault at Rio Hondo 230-kV bus
CFB  64.0 "RIOHONDO" 230.
*
*   Trip Vincent - Rio Hondo 230 kV Line
*
DL   64.0 "VINCENT " 230. "RIOHONDO" 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Devers 500 kV bus followed by loss of the Midpoint – Devers 500 kV #1 circuit.

```
RUN
*   Loss of Devers - Midpoint #1 500-kV Line
*
*  CC cards for post-transient only
*
*   Readjust Northwest SVC's
*
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Devers
*
FB   60.0 "DEVERS  " 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   60.0 "PALOVRD1" 24. "1 "  0.072485
GFD   60.0 "PALOVRD2" 24. "1 "  0.072485
GFD   60.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
*FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   60.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   60.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
FC   60.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
FC   60.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   60.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   60.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   60.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Devers
CFB  64.0 "DEVERS  " 500.
*
*   Trip Devers - Midpoint #1 500 kV Line
*
DL   64.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 1
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   64.0 "PALOVRD1" 24. "1 " 0.0
GFD   64.0 "PALOVRD2" 24. "1 " 0.0
GFD   64.0 "PALOVRD3" 24. "1 " 0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
*RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
```

```
RC   64.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   64.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
RC   64.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
RC   64.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   64.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   68.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   68.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
```

Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Harquahala 500 kV circuit.

```
RUN
*   Loss of Midpoint - Harquahala #1 500-kV Line
*
*  CC cards for post-transient only
*
*   Readjust Northwest SVC's
*
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Midpoint
*
FB   60.0 "MIDPINTS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   60.0 "PALOVRD1" 24. "1 "  0.072485
GFD   60.0 "PALOVRD2" 24. "1 "  0.072485
GFD   60.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
FC   60.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
*FC   60.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
FC   60.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
FC   60.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   60.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   60.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   60.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Midpoint
CFB  64.0 "MIDPINTS" 500.
*
*   Trip Midpoint - Harquahala #1 500 kV Line
*
DL   64.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 1
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   64.0 "PALOVRD1" 24. "1 " 0.0
GFD   64.0 "PALOVRD2" 24. "1 " 0.0
GFD   64.0 "PALOVRD3" 24. "1 " 0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
```

```
RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
RC   64.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
*RC   64.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
RC   64.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
RC   64.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   64.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   68.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   68.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
```

Three-phase fault at the Midpoint 500 kV bus followed by loss of the Midpoint – Palo Verde 500 kV circuit.

```
RUN
*   Loss of Palo Verde - Midpoint #1 500-kV Line
*
*  CC cards for post-transient only
*
*   Readjust Northwest SVC's
*
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Midpoint
*
FB   60.0 "MIDPINTS" 500.
*
*  Apply fault damping to each Palo Verde Unit
*
GFD   60.0 "PALOVRD1" 24. "1 "  0.072485
GFD   60.0 "PALOVRD2" 24. "1 "  0.072485
GFD   60.0 "PALOVRD3" 24. "1 "  0.072485
*
*   Flash series capacitors in following 500 kV Lines
*
FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
FC   60.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
*FC   60.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
FC   60.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
FC   60.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
FC   60.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
FC   60.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
FC   60.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
FC   60.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
FC   60.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
FC   60.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*   Clear fault at Midpoint
CFB  64.0 "MIDPINTS 500.
*
*   Trip Devers - Midpoint #1 500 kV Line
*
DL   64.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 1
*
*  Remove fault damping to each Palo Verde Unit
*
GFD   64.0 "PALOVRD1" 24. "1 " 0.0
GFD   64.0 "PALOVRD2" 24. "1 " 0.0
GFD   64.0 "PALOVRD3" 24. "1 " 0.0
*
*   Reinsert series capacitors in following 500 kV Lines
*
RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "1 " 2
RC   64.0 "MIDPINTS" 500. "DEVERS  " 500. "2 " 2
```

```
*RC   64.0 "PALOVRDE" 500. "MIDPINTS" 500. "1 " 2
RC   64.0 "HARQUAHA" 500. "MIDPINTS" 500. "2 " 2
RC   64.0 "HASSYAMP" 500. "N.GILA  " 500. "1 " 3
RC   64.0 "N.GILA  " 500. "IMPRLVLY" 500. "1 " 2
RC   64.0 "IMPRLVLY" 500. "MIGUEL  " 500. "1 " 1
RC   68.0 "MOENKOPI" 500. "YAVAPAI " 500. "1 " 1
RC   68.0 "YAVAPAI " 500. "WESTWING" 500. "1 " 2
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 1
RC   68.0 "NAVAJO  " 500. "WESTWING" 500. "1 " 3
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 1
RC   68.0 "MEAD    " 500. "PERKINS " 500. "1 " 3
*
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
```

Three-phase fault at the Valley 500 kV bus followed by loss of the Valley – Serrano 500 kV circuit.

```
RUN
*   Loss of Valley-Serrano 500 kV Line
*   3 phase 4 cycle fault at Valley 500-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Valley 500-kV bus
FB   60.0 "VALLEYSC" 500.
*
*   Clear fault at Valley 500-kV bus
CFB  64.0 "VALLEYSC" 500.
*
*   Trip Serrano-Valley 500 kV Line
*
DL   64.0 "SERRANO " 500. "VALLEYSC" 500. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Pre-fault outage of the Laguna Bell – Goodrich 230 kV circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – Rio Hondo 230 kV circuit.

```
RUN
*   Vernon Power Plant, Pre-fault loss of Laguna Bell - Goodrich 230kV Line THEN
*   post-fault loss of the Laguna Bell - Rio Hondo 230kV Line.
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Trip Laguna Bell - Goodrich 230kV lines
*
DL   60.0 "LAGUBELL" 230. "GOODRICH" 230. "1 "
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - Rio Hondo 230kV lines
*
DL   64.0 "LAGUBELL" 230. "RIOHONDO" 230. "1 "
*
```

Pre-fault outage of the Laguna Bell – Del Amo 230 kV #1 circuit, then a three-phase fault at the Laguna Bell 230 kV bus followed by loss of the Laguna Bell – La Fresa 230 kV #2 circuit.

```
RUN
*   Vernon Power Plant, Pre-fault loss of Laguna Bell - Del Amo 230kV Line THEN
*   post-fault loss of the Laguna Bell - La Fresa 230kV Line.
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Trip Laguna Bell - Del Amo 230kV lines
*
DL   60.0 "LAGUBELL" 230. "DELAMO  " 230. "1 "
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - La Fresa 230kV line
*
DL   64.0 "LAGUBELL" 230. "LA FRESA" 230. "1 "
*
```

Three-phase fault at the Mesa Cal 230 kV bus followed by loss of the Mesa Cal – Antelope 230 kV and Mesa Cal – Rio Hondo 230 kV transmission lines.

```
RUN
*   Loss of Antelope - Mesa 230 kV & Mesa - Rio Hondo 230 kV Lines
*   3 phase 4 cycle fault at Mesa 230-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Mesa 230-kV bus
FB   60.0 "MESA CAL" 230.
*
*   Clear fault at Mesa 230-kV bus
CFB  64.0 "MESA CAL" 230.
*
*   Trip Antelope - Mesa 230 kV & Mesa - Rio Hondo 230 kV Lines
*
DL   64.0 "MESA CAL" 230. "ANTELOPE" 230. "1 "
DL   64.0 "MESA CAL" 230. "RIOHONDO" 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Long Beach 230 kV bus followed by loss of the Long Beach – Lighthipe 230 kV and Harbor Gen – Hinson 230 kV transmission lines.

```
RUN
*   Loss of Long Beach - Litehipe 230 kV and Harborgen - Hinson 230 kV Lines
*   3 phase 4 cycle fault at Long Beach 230-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Long Beach 230-kV bus
FB   60.0 "LBEACH  " 230.
*
*   Clear fault at Long Beach 230-kV bus
CFB  64.0 "LBEACH  " 230.
*
*   Trip Long Beach - Litehipe 230 kV and Harborgen - Hinson 230 kV Lines
*
DL   64.0 "LBEACH  " 230. "LITEHIPE" 230. "1 "
DL   64.0 "HARBOR  " 230. "HINSON  " 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Rancho Vista 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Walnut 230 kV transmission lines.

```
RUN
*   Loss of Rancho Vista - Serrano 500 kV Line & Mira Loma - Walnut 230 kV Line
*   3 phase 4 cycle fault at Rancho Vista 500-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Rancho Vista 500-kV bus
FB   60.0 "RANCHVST" 500.
*
*   Clear fault at Rancho Vista 500-kV bus
CFB  64.0 "RANCHVST" 500.
*
*   Trip Rancho Vista - Serrano 500 kV Line & Mira Loma - Walnut 230 kV Line
*
DL   64.0 "RANCHVST" 500. "SERRANO " 500. "1 "
DL   64.0 "MIRALOMW" 230. "WALNUT  " 230. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Three-phase fault at the Serrano 500 kV bus followed by loss of the Rancho Vista – Serrano 500 kV and Mira Loma – Serrano 500 kV transmission lines.

```
RUN
*   Loss of Mira Loma - Serrano 500 kV & Rancho Vista - Serrano 500 kV Lines
*   3 phase 4 cycle fault at Serrano 500-kV bus
*
*  CC cards for post-transient only
*
DRP 0
*
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Fault bus at Serrano 500-kV bus
FB   60.0 "SERRANO " 500.
*
*   Clear fault at Serrano 500-kV bus
CFB  64.0 "SERRANO " 500.
*
*   Trip Mira Loma - Serrano 500 kV & Rancho Vista - Serrano 500 kV Lines
*
DL   64.0 "MIRALOMA" 500. "SERRANO " 500. "1 "
DL   64.0 "RANCHVST" 500. "SERRANO " 500. "1 "
*
*  Add SVC's at Marketplace and Adelanto
*
CC  MBS  180.0 "ADELSVC " 500. "sv" "A" 0.0 1.320
CC  MBS  180.0 "MKTPSVC " 500. "sv" "A" 0.0 1.320
*
```

Pre-fault outage of the Laguna Bell – Rio Hondo 230 kV circuit, then three-phase fault at the VPP 230 kV bus followed by loss of the Laguna Bell – Del Amo 230 kV and the Laguna Bell – La Fresa 230 kV transmission lines.

```
RUN
*   Vernon Power Plant, Pre-fault loss of Laguna Bell - Rio Hondo 230kV Line THEN
*   post-fault loss of the Laguna Bell - Del Amo and Laguna Bell - La Fresa 230kV Lines.
*   3 phase 4 cycle fault at Laguna Bell 230kV bus
*
*  CC cards for post-transient only
CC  DRP 0
*
*  Readjust Northwest SVC's
CC  MSV 60.0 "KEEL-SVC" 19.60 "1 "  350. -300.
CC  MSV 60.0 "MV-SVC  " 19.60 "1 "  350. -300.
*  CC  RG  60.0 "DALLES 3"  13.8 "1 "  180. -270.
*
*   Trip Laguna Bell - Rio Hondo 230kV lines
*
DL   60.0 "LAGUBELL" 230. "RIOHONDO" 230. "1 "
*
*   Fault bus at Laguna Bell 230kV bus
*
FB   60.0 "LAGUBELL" 230.
*
*   Clear fault at Laguna Bell 230kV bus
CFB  64.0 "LAGUBELL" 230.
*
*   Trip Laguna Bell - Del Amo and Laguna Bell - La Fresa 230kV Lines
*
DL   64.0 "LAGUBELL" 230. "DELAMO  " 230. "1 "
DL   64.0 "LAGUBELL" 230. "LA FRESA" 230. "1 "
*
```