System Impact Study Report
PID 206
168 MW Plant
Jacinto

Prepared by:
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Revision: 1

Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	10/10/2007	Final for Review	BMH	JDH
1	10/16/2007	Added Stability Recommendations	BMH	JDH

Objective:

This System Impact Study is the second step of the interconnection process and is based on PID-206 request for interconnection on Entergy's transmission system at Jacinto 138 kV substation. This report is organized in two sections, namely, Section – A, Energy Resource Interconnection Service (ERIS) and Section – B, Network Resource Interconnection Service (NRIS – Section B).

The Scope for the ERIS section (Section – A) includes load flow (steady state) analysis, transient stability analysis and short circuit analysis as defined in FERC orders 2003, 2003A and 2003B. The NRIS section (Section – B) contains details of load flow (steady state) analysis only, however, transient stability analysis and short circuit analysis of Section – A are also applicable to Section – B. Additional information on scope for NRIS study can be found in Section – B.

Requestor for PID-206 did request ERIS, however it was determined that a load flow (steady state) analysis was not required because the generator would not be exporting power. Therefore Section-B is not included in this report.

PID-206 intends to install a substation with two 83.8 MW combustion turbine units with a maximum capacity of 101.8 MVA. The point of interconnection will be connected approximately 4 miles north of the existing Jacinto 138 kV substation. The study evaluates injection of 168 MW from the PID 206 plant to the Entergy Transmission System between the Jacinto and Shepherd substations.

The proposed in-service date for this facility is January 1, 2009.

Section – A

Energy Resource Interconnection Service

TABLE OF CONTENTS FOR SECTION –A (ERIS)

I. Introduction

This Energy Resource Interconnection Service (ERIS) is based on the PID-206 request for interconnection on Entergy's transmission system at Jacinto substation. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission system with respect to the steady state and transient stability performance of the system as well as its effects on the system's existing short circuit current capability. It is also intended to determine whether the transmission system meets standards established by NERC Reliability Standards and Entergy's planning guidelines when the plant is connected to Entergy's transmission system. If not, transmission improvements will be identified.

The System Impact Study process required a load flow analysis to determine if the existing transmission lines are adequate to handle the full output from the plant for simulated transfers to adjacent control areas. A short circuit analysis was performed to determine if the generation would cause the available fault current to surpass the fault duty of existing equipment within the Entergy transmission system. A transient stability analysis was conducted to determine if the new units would cause a stability problem on the Entergy system.

This ERIS System Impact Study was based on information provided by PID-206 and assumptions made by Entergy's Transmission Technical System Planning group. All supplied information and assumptions are documented in this report. If the actual equipment installed is different from the supplied information or the assumptions made, the results outlined in this report are subject to change.

II. Short Circuit Analysis / Breaker Rating Analysis

A. Model Information

The short circuit analysis was performed on the Entergy system short circuit model using ASPEN software. This model includes all generators interconnected to the Entergy system or interconnected to an adjacent system and having an impact on this interconnection request, IPP's with signed IOAs, and approved future transmission projects on the Entergy transmission system including the proposed PID-206 unit.

B. Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID-206 generation is as follows:

1. Three phase and single phase to ground faults were simulated on the Entergy base case short circuit model and the worst case short circuit level was determined at each station. The PID-206 generator as well as the necessary NRIS upgrades shown in Section B, IV were then modeled in the base case to generate a revised short circuit model. The base case short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID-206 generation. The breakers identified to be upgraded through this comparison are *mandatory* upgrades.

C. Analysis Results

The results of the short circuit analysis indicates that the additional generation due to PID 206 generator does not cause an increase in short circuit current such that they exceed the fault interrupting capability of the high voltage circuit breakers within the Entergy Transmission system.

D. Problem Resolution

There were no problems identified for this part of the study that were a result of the additional PID 206 generation.

III. Transient Stability Analysis

A. Model Information

The dynamic database representing the 2010 summer peak system was used in this transient stability analysis. The analysis was carried out using the PSS/E powerflow case with the upgrades identified for PID-206. Figure IV-1 provides a transmission system area map of the local Entergy System in and around Jacinto with PID-206 identified.

The following upgrades/ changes were included in the powerflow case with PID-206.

- New Jacinto (North) 138 kV switching station approximately 4 miles from the existing Jacinto 138/230 kV substation along the Jacinto–Shepherd 138 kV transmission line.

PID 206 includes the following key components to be installed at the proposed North Jacinto 138 kV switching station:

- two 83.8 MW combustion turbine generator units (total capacity of 168 MW) connected at 13.8 kV
- two 120 MVA, 13.8/138 kV generator step up (GSU) transformers
- two 138 kV, circuit breakers

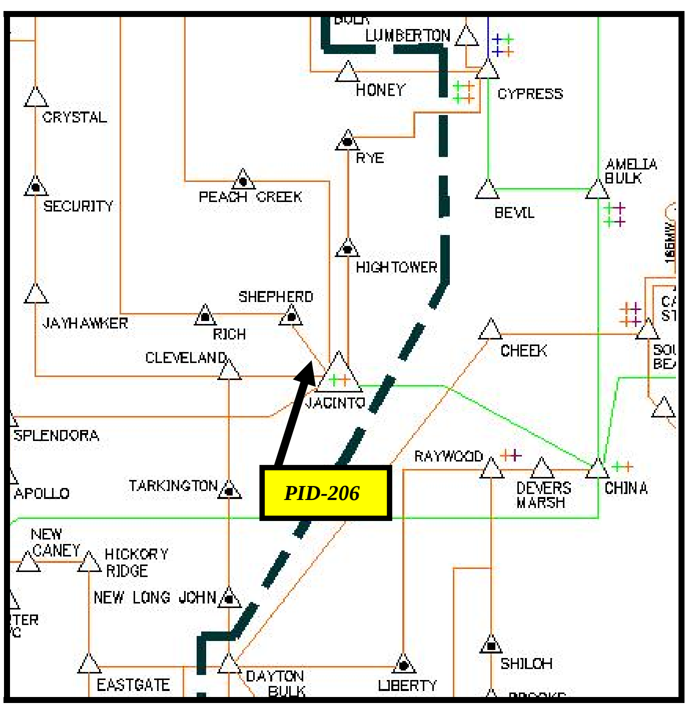


Figure IV-1. Transmission System Area Map Identifying PID-206

Figure IV-2 shows the one-line diagram of the existing bus/breaker configuration of the existing Jacinto 138/230 kV Substation WITHOUT PID-206, and Figure IV-3 illustrates the inclusion of PID-206. For this analysis, the PID-206 generation was dispatched against the load in the selected zones in the PSS/E database.

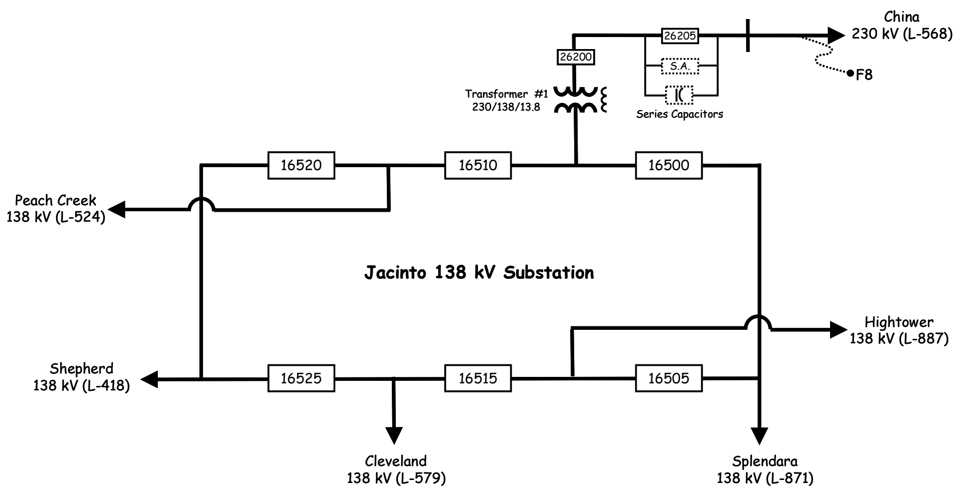


Figure IV-2. Existing Bus/Breaker Configuration of the Existing Jacinto 138/230 kV Substation WITHOUT PID-206

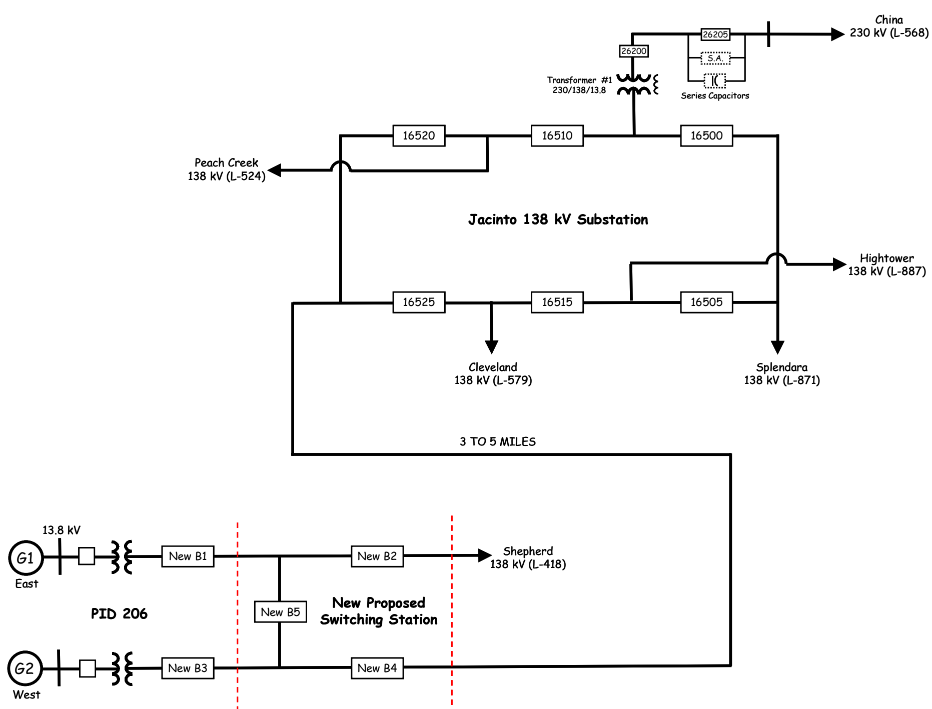


Figure IV-3. Bus/Breaker Configuration of the Proposed Jacinto 138 kV Switching Station, WITH PID 206, and the Existing Jacinto 138/230 kV Substation

The stability studies were conducted to assess the impact of the power injection of 168 MW into Entergy's system. The loads in the Entergy system were represented as follows: for the active part, 100% was modeled with a constant current model; all of the reactive part, on the other hand, was modeled with a constant impedance model. The simulations were conducted with each of the PID-206 units generating approximately 83.8 MW, thus injecting 168 MW net into the Entergy System.

PID-206 provided dynamic model data for representation of their generation equipment in this study. The generator was modeled using the standard PSS/E **GENROU** model.

PID-206 provided data for the excitation system. The data for the PID-206 excitation system represents a static excitation system, and was modeled using the PSS/E **EXAC2** dynamic model. Also, Power System Stabilizer (PSS) data was provided with the interconnection request. The PSS was modeled using the PSS/E **PSS2A** dynamic model. PID-206 provided the data for the turbine-governor controls, which were modeled using the PSS/E **GGOV1** model.

The data used for the proposed PID-206 generator, exciter, PSS and governor models is shown in **Appendix A-A.**

B. Transient Stability Analysis

Stability simulations were run to examine the transient behavior of the PID-206 generator and its effect on the Entergy system. Stability analysis was performed using the following procedure. First, three-phase faults with breaker failure were simulated on the transmission lines connected to the Proposed New Jacinto Switching Station and the Existing Jacinto Substation. If a three phase fault with three-phase breaker failure was found to be unstable, then a single phase fault followed by breaker failure and a normally cleared three phase fault were studied. This procedure is being followed since if the units are stable for a more severe fault (such as three phase fault with breaker failure), the need to study stability for a less severe fault (such as single-phase fault with breaker failure and normally cleared three phase) does not arise. The stability analysis was performed using the PSS/E powerflow and dynamics program. The fault clearing times used for the simulations are given in Table IV-1.

Table IV-1 Fault Clearing Times

Contingency at kV level	Normal Clearing	Delayed Clearing
138	6 cycles	6+13 cycles
230	6 cycles	6+9 cycles

The breaker failure scenario was simulated with the following sequence of events:

1) At the normal clearing time for the primary breakers, the faulted line is tripped at the far end from the fault by normal breaker opening.

2) The fault remains in place for three-phase stuck-breakers. For single-phase faults the fault is appropriately adjusted to account for the line trip of step 1). For an IPO breaker, the 3-phase fault is replaced by a line-to-ground fault (2 phases of the faulted-end breaker clear and one phase sticks).

3) The fault is then cleared by back-up clearing. If the system is shown to be unstable for this condition, then stability of the system without the PID-206 plant needs to be verified.

All line trips are assumed to be permanent (i.e. no high speed re-closure).

The stability analysis was performed using the PSS/E dynamics program, which only simulates the positive sequence network. Unbalanced faults involve the positive, negative, and zero sequence networks. For unbalanced faults, the equivalent fault admittance must be inserted in the PSS/E positive sequence model between the faulted bus and ground to simulate the effect of the negative and zero sequence networks. For a single-line-to-ground (SLG) fault, the fault admittance equals the inverse of the sum of the positive, negative and zero sequence Thevenin impedances at the faulted bus. Since PSS/E inherently models the positive sequence fault impedance, the sum of the negative and zero sequence Thevenin impedances needs to be added and entered as the fault impedance at the faulted bus.

For three-phase faults, a fault admittance of –j2E9 is used (essentially infinite admittance or zero impedance).

Fault scenarios were formulated by examining the system configuration shown in Figure IV-4. Table IV-2A and Table IV-2B list all the fault cases that were simulated in this study.

Faults 0 through 7 in Table IV-2A represent normal clearing 3-phase faults in 6 cycles, and faults 1a through 8a in Table IV-2B represent the stuck breaker cases with the appropriate delayed back-up clearing times. Fault F2c illustrates the benefit of reducing the delayed clearing time from 13 cycles to 10 cycles.

For all cases analyzed, the initial disturbance was applied at t = 0.1 seconds. The breaker clearing was applied at the appropriate time following this fault inception.

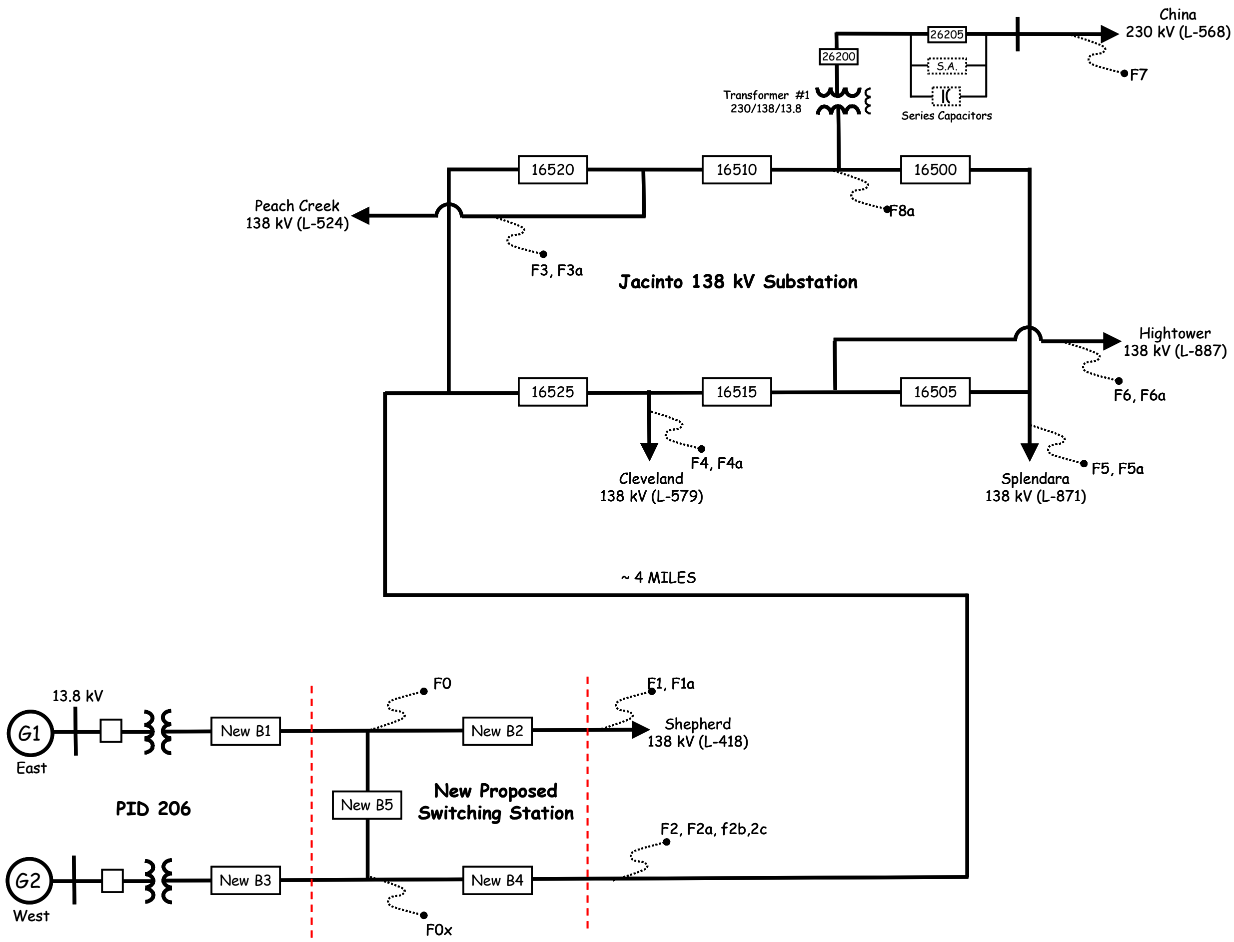


Figure IV-4. Bus/Breaker Configuration of the Proposed Jacinto 138 kV Switching Station, PID 206, and the Existing Jacinto 138/230 kV Substation

Table IV-2A Fault Cases Simulated in this Study: Three-phase faults with normal clearing

CASE	Prior Outage Element	LOCATION	TYPE	Clearing Time (cy)	PRIMARY BRK TRIP #	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
FAULT-0	--	New Jacinto 138 kV	3 PH	6	B1,B2,B5	PID-206 (G1 only)	YES	YES
FAULT 0X	--	New Jacinto 138 kV	3 PH	6	B3,B4,B5	PID-206 (G2 only)	YES	YES
FAULT-1	--	New Jacinto – Shepherd 138 kV	3 PH	6	B2	New Jacinto – Shepherd 138 kV	YES	YES
FAULT-2	--	New Jacinto – Jacinto 138 kV	3 PH	6	B4,16520,16525	New Jacinto – Jacinto 138 kV	YES	YES
FAULT-3	--	Jacinto – Peach Creek 138 kV	3 PH	6	16520,16510	Jacinto – Peach Creek 138 kV	YES	YES
FAULT-4	--	Jacinto – Cleveland 138 kV	3 PH	6	16525,16515	Jacinto – Cleveland 138 kV	YES	YES
FAULT-5	--	Jacinto – Splendora 138 kV	3 PH	6	16505,16500	Jacinto – Splendora 138 kV	YES	YES
FAULT-6	--	Jacinto – Hightower138 kV	3 PH	6	16515,16505	Jacinto – Hightower 138 kV	YES	YES
FAULT-7	--	Jacinto – China 230 kV	3 PH	6	16510,16500, 26200	Jacinto 138/230 kV Transfomer #1, Jacinto – China 230 kV	YES	YES

Table IV-2B Fault Cases Simulated in this Study: Faults with stuck breaker

CASE	LOCATION	TYPE	CLEARING TIME (cycles)		STUCK BRK #	PRIMARY BRK TRIP #	SECONDARY BRK TRIP	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
			PRIMARY	BACK-UP						
FAULT-1a	New Jacinto – Shepherd 138 kV	3 PH	6	13	B2	BRK @ Shepherd	B1,B5	PID-206 G1 only, New Jacinto – Shepherd 138 kV	YES	YES
FAULT-2a	New Jacinto – Jacinto 138 kV	3 PH	6	13	16525	B4, 16520	16515	New Jacinto-Jacinto 138 kV, Jacinto – Cleveland 138 kV	YES	YES
FAULT-2b	New Jacinto – Jacinto 138 kV	3 PH	6	13	B4	16525, 16520	B5, B3	PID-206 (G2 only), New Jacinto 138 kV	NO	NO
FAULT-2c	New Jacinto – Jacinto 138 kV	3 PH	6	10	B4	16525, 16520	B5, B3	PID-206 (G2 only), New Jacinto 138 kV	YES	YES
FAULT-3a	Jacinto – Peach Creek 138 kV	3 PH	6	13	16510	16520	16500,26200	Jacinto – Peach Creek 138 kV, Jacinto 138/230 kV Transformer #1, Jacinto – China 230 kV	YES	YES
FAULT-4a	Jacinto – Cleveland 138 kV	3 PH	6	13	16515	16525	16505	Jacinto – Cleveland 138 kV, Jacinto – Hightower 138 kV	YES	YES
FAULT-5a	Jacinto – Spendora 138 kV	3 PH	6	13	16500	16505	16510, 26200	Jacinto – Splendora 138 kV, Jacinto 138/230 kV Transformer #1, Jacinto-China 230 kV	YES	YES
FAULT-6a	Jacinto – Hightower 138 kV	3 PH	6	13	16505	16500	16515	Jacinto – Spendora 138 kV, Jacinto Hightower 138 kV	YES	YES
FAULT-8a	Jacinto 138 kV–side Transformer #1	3 PH	6	13	16510	16500,26200	16520	Jacinto 138/230 kV Transformer #1, Jacinto-Peach Creek 138 kV, (bypass Jacinto-China series caps)	YES	YES

C. Analysis Results

All of the three-phase fault cases with stuck breaker remained stable except for case F2b. After further investigation, it was observed that by decreasing the delayed clearing time from 13 cycles to 10 cycles, transient stability was maintained for case F2b (as illustrated in case F2c). For completeness, three-phase faults with normal clearing were simulated for all cases for which the system remained stable.

The plots are provided in Appendix A-E.

Based on the results of the various cases and sensitivities thereof, it would be highly recommended that:

1) a dual transfer-trip protection scheme be installed on all lines coming out of the New Jacinto substation, namely the New Jacinto – Jacinto 138 kV line and the New Jacinto – Shepherd 138 kV line. This is to ensure that the PID 206 generators remain in synchronism with the Entergy system.
2) install out-of-step protection on the proposed PID 206 generators (R vs. X plot from case F2b is included in Figure IV-5 and IV-6 to assist in setting of out-step relays)
3) breaker failure timers on all the breakers at the New Jacinto 138 kV substation be set at 10 cycles or below. This is to ensure the stability of the PID 206 generators.
4) install breakers with the fastest possible clearing times for the New Jacinto 138 kV substation. This would further help the PID 206 generators to maintain stability in the event of a severe fault.

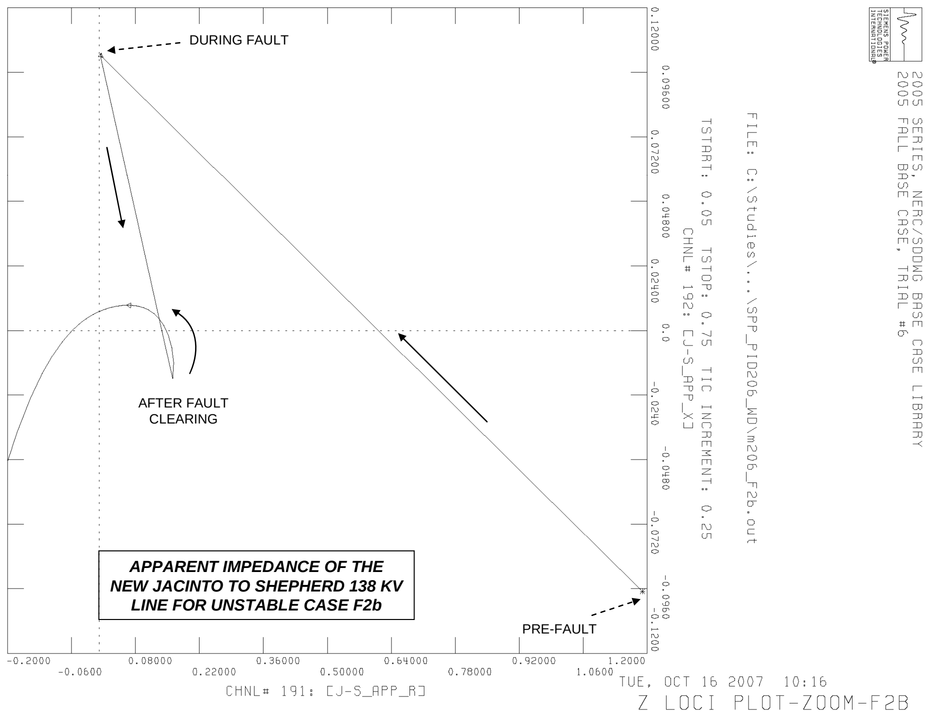


Figure IV-5. R vs. X plot of the New Jacinto to Shepherd 138 kV line for unstable case F2b

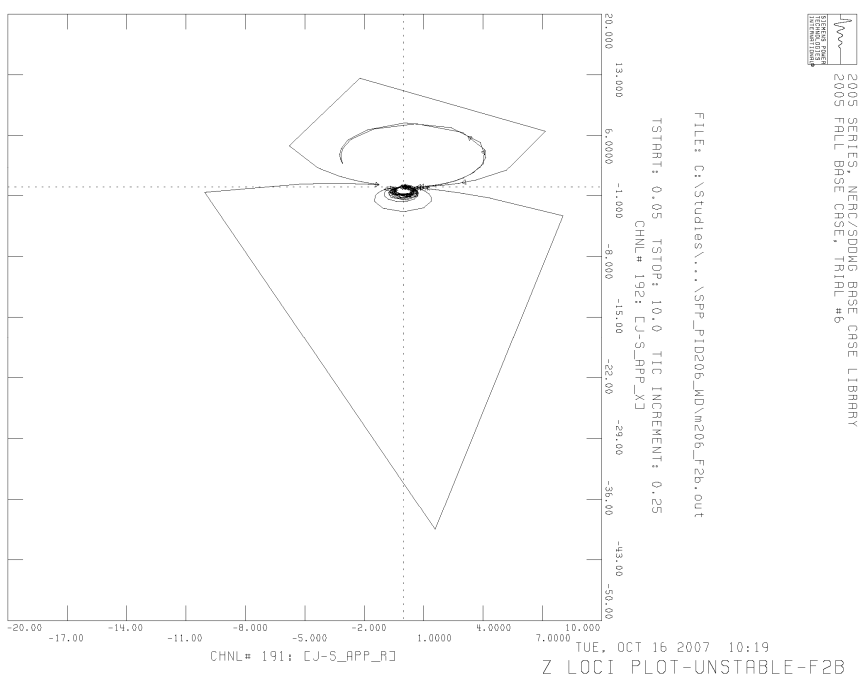


Figure IV-6. R vs. X plot of the New Jacinto to Shepherd 138 kV line for unstable case F2b

In addition to criteria for the stability of the machines, Entergy has evaluation criteria for the transient voltage dip as follows:

- 3-phase fault or single-line-ground fault with normal clearing resulting in the loss of a single component (generator, transmission circuit or transformer) or a loss of a single component without fault:

  Not to exceed 20% for more than 20 cycles at any bus

  Not to exceed 25% at any load bus

  Not to exceed 30% at any non-load bus

- 3-phase faults with normal clearing resulting in the loss of two or more components (generator, transmission circuit or transformer), and SLG fault with delayed clearing resulting in the loss of one or more components:

  Not to exceed 20% for more than 40 cycles at any bus

  Not to exceed 30% at any bus

The duration of the transient voltage dip excludes the duration of the fault. The transient voltage dip criteria will not be applied to three-phase faults followed by stuck breaker conditions unless the determined impact is extremely widespread.

The voltages at all buses in the Entergy system (115 kV and above) were monitored during each of the fault cases as appropriate. No voltage violations were observed for normally cleared three-phase faults.

The results indicated that there are no widespread voltage dip criteria violations following stuck breaker faults.

Hence, it can be concluded that the proposed PID-206 unit does not degrade the Entergy system performance.

In summary, when considering the new PID-206 (168 MW) generation at the proposed Jacinto N 138 kV switching station, all the simulated faults are stable (considering a small decrease in delayed clearing time for one case/line). No violations of the voltage dip criteria were observed. This meets Entergy's performance criteria when the PID-206 plant is in-service.

Due to restructuring of the utility industry, there has been a large increase of merchant generation activity on the Entergy system. These generators are equipped with modern exciters that have a high gain and a fast response to enhance transient stability. However, these fast response exciters, if used without stabilizers, can lead to oscillatory instability affecting local or regional reliability. This problem is exacerbated particularly in areas where there is a large amount of generation with limited transmission available for exporting power. Stability studies carried out at Entergy have validated this concern. Furthermore, based on the understanding of operational problems experienced in the WECC area over the last several years and the opinion of leading experts in the stability area, Power System Stabilizers (PSS) are an effective and a low cost means of mitigating dynamic stability problems. In particular, PSS cost can be low if it is included in power plant procurement specifications.

Therefore, as a pre-emptive measure, Entergy requires all generation intending to interconnect to its transmission system to install PSS on their respective units. Please refer to Appendix A-I for Entergy's Policy Statement on PSS Requirements.

APPENDIX A.A DATA PROVIDED BY CUSTOMER

A.A.1 LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 101,800 °F ________ Voltage 13.8 kV
Power Factor 0.85
Speed (RPM) 57 Connection Wye
Short Circuit Ratio 0.57 Frequency, Hertz 60
Stator Amperes at Rated kVA 4,259 Field Volts 129
Max Turbine MW 93.520 °F 25

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 5.6 kW sec/kVA
Moment-of-Inertia, WR^2 = n/a lb. ft.^{2}

REACTANCE DATA (PER UNIT-RATED KVA)

		DIRECT AXIS		QUADRATURE AXIS
Synchronous – saturated	X_{dv}	1.76	X_{qv}	1.41
Synchronous – unsaturated	X_{di}	1.98	X_{qi}	1.81
Transient – saturated	X'_{dv}	0.164	X'_{qv}	N/A
Transient – unsaturated	X'_{di}	0.208	X'_{qi}	0.30
Subtransient – saturated	X''_{dv}	0.117	X''_{qv}	0.14
Subtransient – unsaturated	X''_{di}	0.150	X''_{qi}	0.18
Negative Sequence – saturated	$X2_v$	0.114		
Negative Sequence – unsaturated	$X2_i$	0.146		
Zero Sequence – saturated	$X0_v$	N/A		
Zero Sequence – unsaturated	$X0_i$	0.074		
Leakage Reactance	Xl_m	0.06-0.10		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	12.8	T'_{qo}	3.90
Three-Phase Short Circuit Transient	T'_{d3}	0.84	T'_{q}	0.42
Line to Line Short Circuit Transient	T'_{d2}	1.70		
Line to Neutral Short Circuit Transient	T'_{d1}	2.10		
Short Circuit Subtransient	T''_{d}	0.04	T''_{q}	0.04
Open Circuit Subtransient	T''_{do}	0.05	T''_{qo}	0.05

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.310
Line to Line Short Circuit	T_{a2}	0.310
Line to Neutral Short Circuit	T_{a1}	0.27

NOTE: If requested information is not applicable, indicate by marking "N/A."

MW CAPABILITY AND PLANT CONFIGURATION
LARGE GENERATING FACILITY DATA

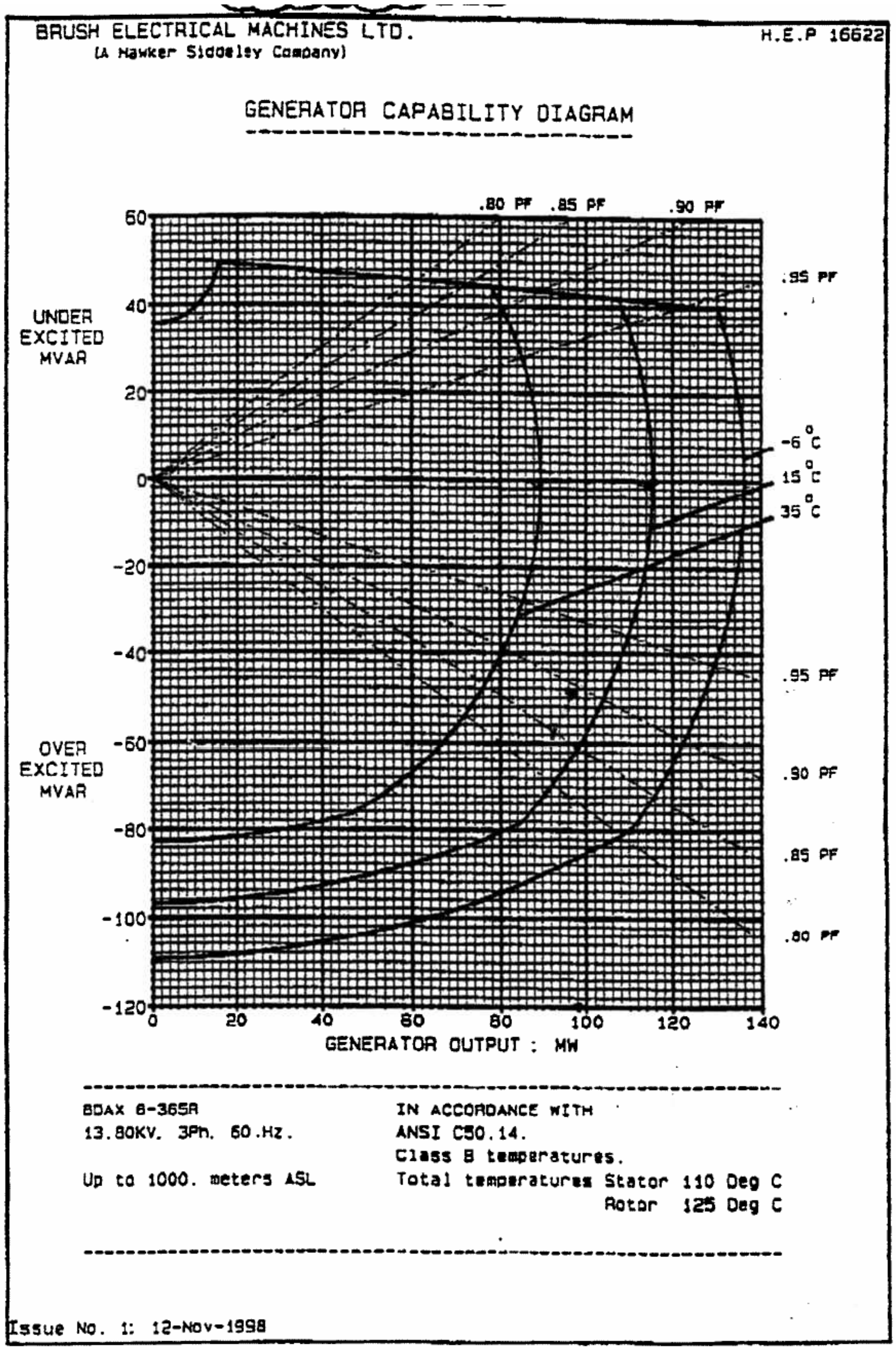
ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R_1	0.00303
Negative	R_2	0.0186
Zero	R_0	0.0045

Rotor Short Time Thermal Capacity I_2^2t = See plot
Field Current at Rated kVA, Armature Voltage and PF = 1392 amps
Field Current at Rated kVA and Armature Voltage, 0 PF = N/A amps
Three Phase Armature Winding Capacitance = 0.40 microfarad
Field Winding Resistance = 0.065/0.092 ohms 20/125 °C
Armature Winding Resistance (Per Phase) = 0.0015/0.00197 ohms 20/75 °C

CURVES

Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves. Designate normal and emergency Hydrogen Pressure operating range for multiple curves.



GENERATOR STEP-UP TRANSFORMER DATA RATINGS
(SEE DATASHEET BELOW)

Capacity -- Self-cooled / Maximum Nameplate
____________90,000___/____120,000___________kVA

Voltage Ratio (Generator Side/System side/Tertiary)
_______13.8______/__138.0___________/______________kV

Winding Connections (Low V/High V/Tertiary V (Delta or Wye))
____Delta_______/____Wye_______/_______________

Fixed Taps Available __+/-5% , +/- 2.5% , rated___

Present Tap Setting ________________

IMPEDANCE

Positive Z_1 (on 90 MVA base)_____9________ % __38____ X/R

Zero Z_0 _______________ % _________ X/R

GSU TRANSFORMER DATA SHEET

UTILITY ENGINEERING®

SPECIFICATION
SECTION 481923

GENERATOR STEP-UP TRANSFORMER

GSU UNITS 1 and 2 DATA SHEET
JACINTO STATION

RATINGS

Winding	MVA Ratings at 65°C	Rated Voltage (kV)	Line BIL (kV)	Neutral BIL (kV)	Connection
High Voltage (H)	90/120 MVA ONAN/ONAF @ 65°C	138	550	110	Ground Wye
Low Voltage (X)		13.8	110	N/A	Delta

MECHANICAL FEATURES

COOLING CLASS	ONAN/ONAF
VECTOR GROUP	STANDARD - HV LEADS LV BY 30°
ALTITUDE FOR DESIGN	Less than 3300 ft.
TEMPERATURE RISE	63°C above 42°C max. ambient
MIN./MAX. AMBIENT TEMPERATURES FOR DESIGN	12°F(-11°C) to 108°F (42°C)
AUDIBLE SOUND AT MAX MVA (dba)	85db
TRANSFORMER TYPE	STEP-UP, TWO WINDINGS
OIL PRESERVATION SYSTEM	OIL CONSERVATOR TYPE
WINDING MATERIAL	COPPER
SEISMIC ZONE	Seismic USE Group=III, Table 1604.5 Seismic Site Design Response Accelerations Ss-0.115, S1-0.052 Seismic Importance Factor, I=1.25, Table 1604.5
BASIC WIND SPEED	100 MPH

IMPEDANCE

Windings	Positive Sequence Impedance (%)
H-X	9% on a 90 MVA base

Note: Impedance tolerance shall be +/- 7.5%.

TAP CHANGERS

Winding	Type	No. of Plus Steps	No. of Minus Steps	Total % Above Rated kV	Total % Below Rated kV
High Voltage, H	De-energized Tap Changer	2	2	5	5

UTILITY ENGINEERING®

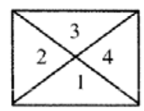
SPECIFICATION
SECTION 481923

GENERATOR STEP-UP TRANSFORMER

BUSHINGS

	BIL (kV)	Minimum Creep	Term. Compt.?	Term. Flange?	Term. Type	Location	AMP Rating	Seg-ment
H	650	36mm/L-gnd Kv (113 inches)	NO	NO	O/H LINE	COVER	1200A	3
X	110	MFR'S STANDARD	NO	YES	NON_SEG FLANGE	WALL	5000A	1
H0	110	MFR'S STANDARD	NO	NO	Bus to ground pad	COVER	600A	2

The physical arrangement and terminal identification shall be X1-X2-X3 from left to right when facing the X or the Y side, and H1-H2-H3 from right to left when facing H side



CURRENT TRANSFORMERS

Location	Ratio	Accuracy Class	Position on Bushing 1-Upper 4-Bottoms	Qty per Bushing	Total
HV BUSHINGS	1200:5 MR	C800	1/2/4	3	9
HV BUSHINGS	1200:5 MR	0.3B1.8	3	1	3
LV BUSHINGS	8,000:5 MR	C800	1/2	2	6
HO BUSHING	600:5 MR	C800	1/2	2	2

MR = MULTI-RATIO; SR = SINGLE RATIO

SURGE ARRESTERS

HV Arrestor Rating: 113 kV
Max. Continuous Operating Voltage (MCOV): 98 kV (Line-Ground)
Discharge Counter: Yes

POWER SUPPLIES

	Nominal Voltage	Number of Sources
AUXILIARY POWER	480V 3pH, 50kA sym.	2
CONTROL DC	125VDC, 10kA	1
SPACE HEATER & OUTLET	120V SINGLE PHASE	1

SYSTEM SOURCE DATA

Maximum 3-phase fault symmetrical = 40 kA at 138 kV
3-phase Fault X/R ratio = 15.6

GENERATOR DATA (tolerance of estimated data is +/- 15%)

Base Rating: 107650 KVA @ 0.85 P.F
Line Voltage: 13.8 kV
Maximum MVAR: 71 MVAR
Minimum MVAR: -44 MVAR

EXCITATION SYSTEM DATA

Identify appropriate IEEE model block diagram of excitation system and power system stabilizer (PSS) for computer representation in power system stability simulations and the corresponding excitation system and PSS constants for use in the model.

SIZE	DWG NO	SH	REV
A	364A2064	1	A

THIRD ANGLE PROJECTION

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A	WRITE MISMATCH CORRECTED	00-12-07	HC Sandellson
	WAS SCR 0.53, IS SCR		
	0.57	10-12-14	BJ.

THIS DOCUMENT SHALL BE REVISED IN ITS ENTIRETY. ALL SHEETS OF THIS DOCUMENT ARE THE SAME REVISION LEVEL AS INDICATED IN THE REVISION BLOCK.

ENTERGY WHOLESALE OPERATION
WARREN POWER PEAKING PROJECT
VICKSBURG, MISSISSIPPI
GEN S/N: 338X962-338X965
GT DM: GR0587
PPE DM: 510Z0032

UNLESS OTHERWISE SPECIFIED	SIGNATURES	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON:	DRAWN	00-05-18
2 PL DECIMALS +/-	CHECKED	00-05-18
3 PL DECIMALS +/-	ENGRG Harold C. Sandellson	00-05-18
ANGLES +/-	SQA	
FRACTIONS +/- ✓	ISSUED A J Sebert	00-05-31
APPLIED PRACTICES		
	SIM TO:	

GE Power Generation — GENERAL ELECTRIC COMPANY, SCHENECTADY, NY

EXCITATION
SYSTEM MODEL CONSTANTS

FIRST MADE FOR: 338X962 MLI: C900

SIZE	CAGE CODE	DWG NO
A		364A2064

SCALE	05/18/2000	SHEET 1 OF 3

DT-2N CE1E

EXCITATION SYSTEM DATA (continued)

SIZE	DWG NO	SH	REV
A	364A2064	2	A

Customer	Entergy - Mississippi			
Unit	7EA BRUSH			
Generator	338X962			
Design	BRUSHGN			
MVA Rating	101.8		KV Rating	13.8
RPM	3600		PF	0.85
SCR	0.57		H2PSI	0
Volts DC	300		RFG @ 100 C	0.085
AFAG amps	480		AFFL amps	1392
IEEE DEFINITION of 1981 MODEL			AC2 (@)	
REGULATOR TYPE			STATIC EX2000BR W/O PMG	
MINIMUM DESIGN RESPONSE RATIO			0.5	

TA	REGULATOR TIME CONSTANT	0.010
TB	REGULATOR LAG TIME CONSTANT	1.000
TC	REGULATOR LEAD TIME CONSTANT	1.000
TE	EXCITER TIME CONSTANT	1.300
TF	STABILIZING TIME CONSTANT	1 *
TR	REGULATOR INPUT FILTER TIME CONSTANT	0.010
KA	REGULATOR GAIN	1000 *
KB	GAIN	1.000
KC	RECTIFIER LOADING FACTOR	0.100
KD	DEMAGNETIZING FACTOR	0.770
KE	SELF EXCITED FIELD CONSTANT	1.000
KF	EXCITER FIELD CURRENT RATE COMPENSATION	0.05 *
KH	EXCITER FIELD CURRENT COMPENSATION	0.000
KL	EXCITER FIELD CURRENT LIMIT GAIN	4.000
VLR	EXCITER FIELD CURRENT LIMIT VOLTAGE	9.370
VAMAX	MAXIMUM INTERNAL REGULATOR VOLTAGE	7.2
VAMIN	MINIMUM INTERNAL REGULATOR VOLTAGE	-7.2
VRMAX	MAXIMUM OUTPUT REGULATOR VOLTAGE	29.1
VRMIN	MINIMUM OUTPUT REGULATOR VOLTAGE	-29.1
EFDMAX	VOLTAGE AT SATURATION POINT	4.060
SEMAX	SATURATION FACTOR	0.010
EFD.75MAX	VOLTAGE AT 0.75 OF SATURATION POINT	3.040
SE.75MAX	SATURATION FACTOR	0.010

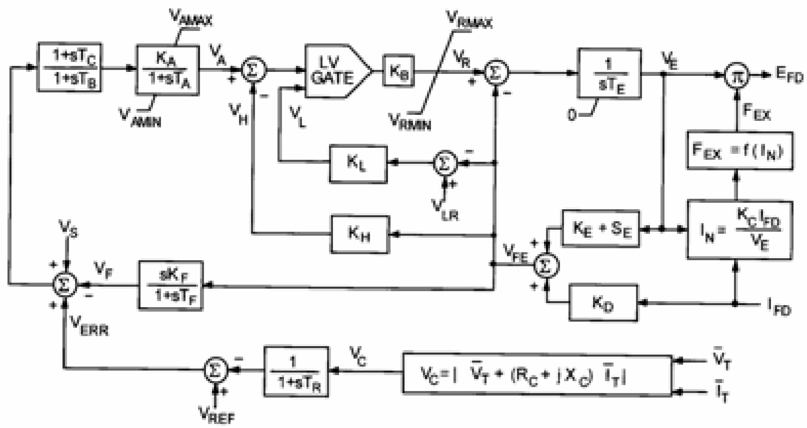
@ = Reference: IEEE Transactions on Power Apparatus and Systems
Vol. PAS-100, No. 2, February 1981, Page 494-509.

* = Use Field Settings.

GE Power Generation — GENERAL ELECTRIC COMPANY, SCHENECTADY, NY	SIZE A	CAGE CODE	DRW NO	364A2064
DRAWN Harold C. Sanderson				
ISSUED	SCALE	5/18/00	SHEET	2

EXCITATION SYSTEM DATA (continued)

SIZE	DWG NO	SH	REV
A	364A2064	3	A

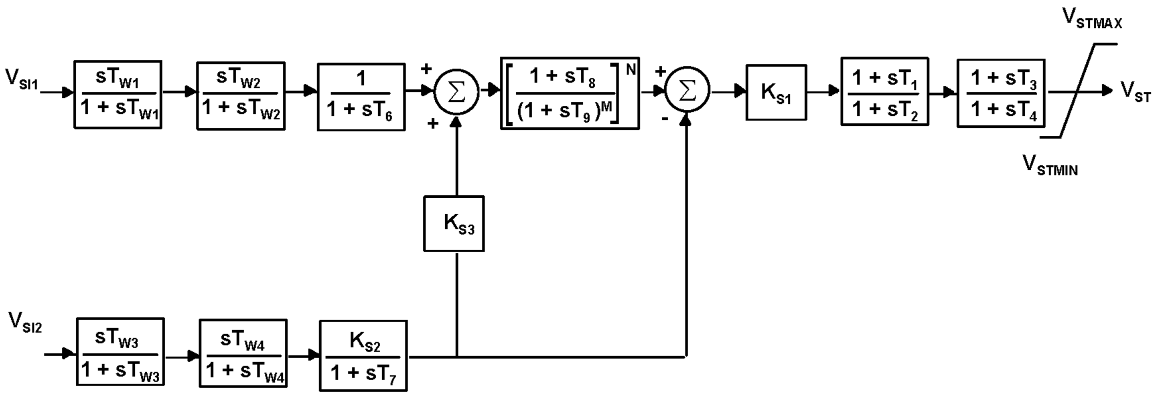


Type AC2, High Initial Response Alternator-Rectifier Excitation System With Non-Controlled Rectifiers, (Ref. IEEE Transactions on Power Systems Aparatus and System, Vol. PAS-100, Feb. 81)

Vc = Compensated Generator Terminal Voltage (per unit).
Vt = Generator Terminal Voltage (per unit).
Rc = Active (real component) Generator Terminal Current Compensation, Zero For GE Units.
Xc = Reactive (imaginary component) Generator Terminal Current Compensation, Use Field Setting.
It = Generator Terminal Current (per unit).
IFD = Generator Field Current (per unit of air gap).
EFD = Generator Field Voltage (per unit of air gap).

GE Power Generation — GENERAL ELECTRIC COMPANY, SCHENECTADY, NY	SIZE A	CAGE CODE	DRW NO 364A2064	
DRAWN Harold C. Sanderson				
ISSUED	SCALE	5/18/00	SHEET 3	

POWER SYSTEM STABILIZER (PSS) DATA



IEEE Type PSS2A Dual Input Stabilizer Model

Figure 2.4: Block Diagram of the IEEE PSS2A

Parameter	Description	Value
VS1	Input #1 - Speed (pu)	
VS2	Input #2 - Electrical Power (pu)	
TW1	Washout T.C.	5
TW2	Washout T.C.	5
TW3	Washout T.C.	5
TW4	Washout T.C.	0
T1	Lead T.C.	0.2
T2	Lag T.C.	0.02
T3	Lead T.C.	0.2
T4	Lag T.C.	0.02
T6	Filter T.C.	0
T7	Filter T.C.	5
T8	RTF Numerator	0.5
T9	RTF Denominator	0.1
N	RTF Order	1
M	RTF # Poles	5
KS1	PSS Gain	15
KS2	Inertia Gain (=Tw/2H)	0.445
KS3	Pe Gain	1
VSTmax	Positive Output Limit (pu)	0.1
VSTmin	Negative Output Limit (pu)	-0.1

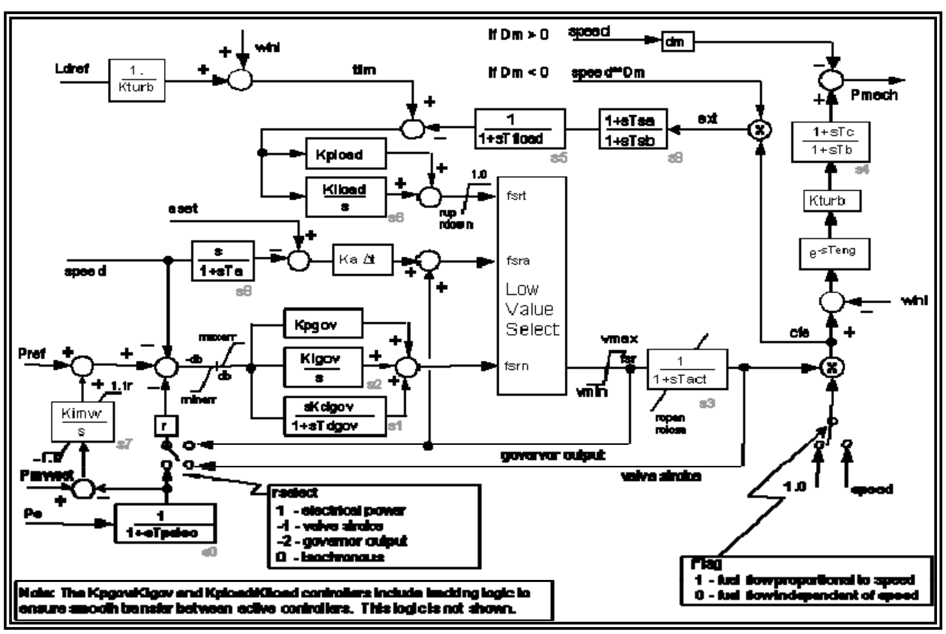
GOVERNOR SYSTEM DATA

Identify appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.

Model Name: **ggov1**

Description General Governor Model

VALUE		PARAMETER	PARAMETER DESCRIPTION	VALUE GIVEN IN
73.32 (35°C) 83.82 (15°C)		MWCAP	Turbine MW Capability	MW
0.0400		R	Permanent Droop	Per Unit
1.0000		Rselect	Feedback Signal For Droop	
5.0000		Tpelec	Electrical Power Transducer Time Constant	Seconds
0.0500		Maxerr	Maximum Value For Speed Error Signal	
-0.0500		Minerr	Minimum Value For Speed Error Signal	
10.0000		Kpgov	Governor Proportional Gain	
2.0000		Kigov	Governor Integral Gain	
0.0000		Kdgov	Governor Derivative Gain	
1.0000		Tdgov	Governor Derivative Controller Time Constant	Seconds
1.0000		Vmax	Maximum Valve Position Limit	Per Unit
0.1500		Vmin	Minimum Valve Position Limit	Per Unit
0.5000		Tact	Actuator Time Constant	Seconds
2.0000		Kturb	Turbine Gain	
0.1800		Wfnl	No Load Fuel Flow	Per Unit
0.1000		Tb	Turbine Lag Time Constant	Seconds
0.0000		Tc	Turbine Lead Time Constant	Seconds
1.0000		Flag	Switch For Fuel Source Characteristic	
0.0000		Teng	Transport Lag Time Constant For Diesel Engine	Seconds
3.0000		Tfload	Load Limiter Time Constant	Seconds
3.3000		Kpload	Load Limiter Proportional Gain For PI Controller	
1.0000		Kiload	Load Limiter Integral Gain For PI Controller	
1.0000		Ldref	Load Limiter Reference Value	Per Unit
0.0000		Dm	Speed Sensitivity Coefficient	Per Unit
0.1000		Ropen	Maximum Valve Opening Rate	Per Unit/Seconds
-0.1000		Rclose	Minimum Valve Closing Rate	Per Unit/Seconds
0.0000		Kimw	Power Controller (Reset) Gain	
0.0000		Pmwset	Power Controller Setpoint	MW
0.1000		Aset	Acceleration Limiter Setpoint	Per Unit/Seconds
10.0000		Ka	Acceleration Limiter Gain	
0.1000		Ta	Acceleration Limiter Time Constant	Seconds
0.0000		Db	Speed Governor Dead Band	
4.0000		Tsa	Temperature Detection Lead Time Constant	Seconds
5.0000		Tsb	Temperature Detection Lag Time Constant	Seconds
99.0000		Rup	Maximum Rate of Load Limit Increase	
-99.0000		Rdown	Maximum Rate of Load Limit Decrease	



A.A.2 DATA USED IN POWERFLOW AND STABILITY MODELS

Powerflow Models

The **PID-206** plant equipment data are listed in Appendix A-A. No other elements were added to the Entergy system.

Powerflow Data

```
##############################################################
<<<<< POWERFLOW MACHINE 1 >>>>><<<<< POWERFLOW MACHINE 1 >>>>>
##############################################################
<<<<< MACHINE 1 POWERFLOW DATA >>>>>
0,   100.00          / PSS/E-30.3    TUE, OCT 09 2007  17:11
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
 97901,'G1PID206    ',  13.8000,2,     0.000,     0.000, 151, 104,1.00190, -21.3880,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
 97901,'1 ',    83.800,    -6.835,    71.000,   -44.000,1.01000, 97556,   101.800,
0.00000,   0.15000,   0.00000,   0.00000,1.00000,1,  100.0,    83.820,     0.000,
1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
 97556, 97901,     0,'1 ',2,2,1,   0.00000,   0.00000,2,'            ',1,   1,1.0000
   0.00316,   0.12000,   120.00
138.000, 138.000,   0.000,   120.00,   120.00,   120.00, 0,
0,144.9000,131.1000,144.9000,131.1000,   5, 0, 0.00000, 0.00000
13.8000,  13.800
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
 151, 99343,   324.000,     5.000,'EES         '
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
 104,'GSTNCN      '
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
   1,'APC         '
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

Powerflow Data (continued)

```
##############################################################
<<<<< POWERFLOW MACHINE 2 >>>>><<<<< POWERFLOW MACHINE 2 >>>>>
##############################################################
0,   100.00          / PSS/E-30.3    TUE, OCT 09 2007  17:12
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
 97902,'G2PID206    ',  13.8000,2,     0.000,     0.000, 151, 104,1.00190, -21.3880,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
 97902,'1 ',    83.800,    -6.835,    71.000,   -44.000,1.01000, 97556,   101.800,
0.00000,   0.15000,   0.00000,   0.00000,1.00000,1,  100.0,    83.820,     0.000,
1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
 97556, 97902,     0,'1 ',2,2,1,   0.00000,   0.00000,2,'            ',1,   1,1.0000
   0.00316,   0.12000,   120.00
138.000, 138.000,   0.000,   120.00,   120.00,   120.00, 0,      0,144.9000,131.1000,
1.05000, 0.95000,   5, 0, 0.00000, 0.00000
13.8000,  13.800
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
 151, 99343,   324.000,     5.000,'EES         '
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
 104,'GSTNCN      '
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
   1,'APC         '
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

Stability Models

The **PID-206** plant equipment stability model data are listed in Appendix A-A. The resulting PSS/E model data is a follows:

Dynamics Data for Stability Models

```
<<<<< MACHINE 1 >>>>>
 PLANT MODELS

 REPORT FOR ALL MODELS                     BUS 97901 [G1PID206    13.800] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            97901 G1PID206     13.800 1   31587-31600   14663-14668

            MBASE     Z S O R C E         X T R A N       GENTAP
            101.8  0.00000+J 0.15000  0.00000+J 0.00000  1.00000

  T'D0 T''D0  T'Q0 T''Q0     H   DAMP   XD     XQ     X'D    X'Q   X''D    XL
 12.80 0.050  3.90 0.050   5.60  0.00 1.9800 1.8100 0.2080 0.3000 0.1500 0.0800

                               S(1.0)  S(1.2)
                               0.1400  0.4194


 ** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C
O N S
            97901 G1PID206     13.800 1   34506-34522   16821-16836     693-696
874-879

                   IC1 REMBUS1     IC2 REMBUS2       M       N
                     1       0       3       0       5       1

      TW1      TW2      T6       TW3      TW4      T7       KS2      KS3
     5.000    5.000    0.000    5.000    0.000    5.000    0.445    1.000

      T8       T9      KS1       T1       T2       T3       T4      VSTMAX   VSTMIN
     0.500    0.100   15.000    0.200    0.020    0.200    0.020    0.100   -0.100


 ** EXAC2 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            97901 G1PID206     13.800 1   63592-63614   25111-25115

     TR      TB      TC       KA       TA    VAMAX   VAMIN     KB    VRMAX   VRMIN
   0.010   1.000   1.000  1000.0   0.010   7.200  -7.200     1.0    29.1   -29.1

       TE      KL       KH       KF       TF       KC       KD       KE       VLR
      1.300   4.000   0.000   0.050   1.000   0.100   0.770   1.000   9.370

                          E1      S(E1)     E2      S(E2)
                        4.0600   0.0100   3.0400   0.0100


  **  GGOV1 ** BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S
ICONS
            97901 G1PID206     13.800 1   80914-80946   31071-31080    3931-3950
1062-1063

     R    TPELEC   MAXERR  MINERR  KPGOV    KIGOV   KDGOV   TDGOV    VMAX    VMIN
   0.040   5.000   0.050  -0.050  10.000   2.000   0.000   1.000   1.000   0.150

    TACT   KTURB    WFNL     TB       TC     TENG   TFLOAD  KPLOAD   KILOAD  LDREF
   0.500   2.000   0.180   0.100   0.000   0.000   3.000   3.300   1.000   1.000

     DM     ROPEN  RCLOSE    KIMW     ASET      KA      TA    TRATE     DB
   0.000   0.100  -0.100   0.000   0.100  10.000   0.100  83.800   0.000

    TSA     TSB      RUP     RDOWN
   4.000   5.000  99.000 -99.000
```

Dynamics Data for Stability Models (continued)

```
<<<<< MACHINE 2 >>>>>
PLANT MODELS

 REPORT FOR ALL MODELS                     BUS 97902 [G2PID206    13.800] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            97902 G2PID206     13.800 1   31601-31614   14669-14674

            MBASE     Z S O R C E         X T R A N       GENTAP
            101.8  0.00000+J 0.15000  0.00000+J 0.00000  1.00000

  T'D0 T''D0  T'Q0 T''Q0     H   DAMP   XD     XQ     X'D    X'Q   X''D    XL
 12.80 0.050  3.90 0.050   5.60  0.00 1.9800 1.8100 0.2080 0.3000 0.1500 0.0800

                                S(1.0)  S(1.2)
                                0.1400  0.4194


 ** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C
O N S
            97902 G2PID206     13.800 1   34523-34539   16837-16852     697-700
880-885

                   IC1 REMBUS1     IC2 REMBUS2       M       N
                     1       0       3       0       5       1

      TW1      TW2      T6       TW3      TW4      T7       KS2      KS3
     5.000    5.000    0.000    5.000    0.000    5.000    0.445    1.000

      T8       T9      KS1       T1       T2       T3       T4      VSTMAX   VSTMIN
     0.500    0.100   15.000    0.200    0.020    0.200    0.020    0.100   -0.100


 ** EXAC2 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            97902 G2PID206     13.800 1   63615-63637   25116-25120

    TR      TB      TC       KA       TA    VAMAX   VAMIN     KB    VRMAX   VRMIN
   0.010   1.000   1.000  1000.0   0.010   7.200  -7.200     1.0    29.1   -29.1

       TE      KL      KH      KF      TF      KC      KD      KE      VLR
      1.300   4.000   0.000   0.050   1.000   0.100   0.770   1.000   9.370

                          E1      S(E1)     E2      S(E2)
                        4.0600   0.0100   3.0400   0.0100


  **  GGOV1 ** BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S
ICONS
            97902 G2PID206     13.800 1   80947-80979   31081-31090    3952-3971
1064-1065

     R    TPELEC   MAXERR  MINERR  KPGOV   KIGOV   KDGOV   TDGOV    VMAX    VMIN
   0.040   5.000   0.050  -0.050  10.000   2.000   0.000   1.000   1.000   0.150

    TACT   KTURB    WFNL     TB      TC     TENG   TFLOAD  KPLOAD   KILOAD  LDREF
   0.500   2.000   0.180   0.100   0.000   0.000   3.000   3.300   1.000   1.000

     DM    ROPEN  RCLOSE    KIMW    ASET      KA      TA    TRATE    DB
   0.000   0.100  -0.100   0.000   0.100  10.000   0.100  83.800   0.000

    TSA     TSB     RUP    RDOWN
   4.000   5.000  99.000 -99.000
```

APPENDIX A.B Stability Issues in the Western Region of the Entergy System Due to Independent Power Generation

Introduction

The WOTAB (West of the Atchafalaya Basin) Area in defined as Entergy's systems in Southwestern Louisiana, and Southeastern Texas. The WOTAB area is a major load center for the Entergy System. The load to generation ratio requires a significant amount of power to be imported into the WOTAB area. However, because of the influx of new generating projects proposed for the area, it is likely that by the year 2003 this area may turn into a significant exporter of power. There have been a significant number of requests for interconnection studies to evaluate the potential interconnection of new generating facilities in the WOTAB area. It is anticipated that by 2003 there may be approximately 4000 – 6000 MW of new merchant generation within the WOTAB area.

Entergy's transmission system was planned, designed and built to serve approximately 5000 – 6000 MW of native and network loads in the WOTAB area. The addition of a significant amount of merchant generation will result in the export of power out of the WOTAB area. A high level of export power has the potential to create major problems, such as voltage and dynamic stability. The main objective of this study is to establish an estimated power export limit for the WOTAB area based on stability criteria.

Signing an interconnection agreement provides the generator the right to interconnection to the transmission system, but does not provide it any right to move its power onto or over the transmission system. The right to use the transmission system to transmit power can only be obtained by submitting a transmission request for service pursuant to Entergy's FERC-approved transmission tariff. Solutions to stability problems to increase export limits, such as construction of 500 kV line, have very long lead-times and tend to be very expensive.

Entergy believes that it is important to post this study publicly on its OASIS site so that entities that have already executed interconnection agreements, as well as entities that are proposing to site new generation within the WOTAB area, can incorporate this information into their decision-making process.

Analysis

In order to establish stability limits from the WOTAB area, all merchant generating]that have signed an interconnection agreement were dispatched at their maximum capability along with the native generation in the area. In order to accommodate this export and simulate a worst case scenario, generation was reduced in the northern part of the Entergy System.

In this analysis the export limits were determined without the addition of any Power System Stabilizers (PSSs). However, sensitivity studies were conducted to determine the impact of stabilizers. If voltage stability limits were found to be lower than the dynamic stability limits, they were captured in this analysis.

One important assumption made in this study was to ignore thermal limitations. Thermal issues will be addressed as part of Transmission Service Request as they are based on source to sink information and generation dispatch within the WOTAB area.

The two cases analyzed in this study are as follows:

1. Base case with no merchant generation
2. Base case with merchant generation

Voltage stability analysis was performed for the pre-contingency condition and contingencies on four critical lines: Hartburg-Mt. Olive 500 kV, Richard–Webre 500 kV, Nelson–Richard 500 kV, and Grimes–Crockett 345 kV lines. As part of the voltage stability analysis, PV curves were developed in order to determine the maximum power that can be exported from the WOTAB area without experiencing voltage decline or voltage collapse. Entergy's guideline on voltage decline states that voltage at any station should not fall below 0.92 pu of nominal system voltage on single contingency.

Transient stability analysis was performed by applying a 3 phase to ground fault on the lines mentioned earlier. The fault clearing time was assumed to be 5 cycles for 500 kV and 345 kV lines and 6 cycles for the 230 kV lines. The transient stability plots show the machine angle as a function of time and indicate whether machine is stable and well damped, transiently unstable or dynamically unstable. A three percent damping criteria was used to screen the damping problem.

Results

Case 1 – Base Case with no Merchant Generation

No voltage stability problems were identified in this case. The transient stability plots in Figures 1 and 2 for a three-phase fault on the Hartburg – Mt.Olive 500 kV and Richard – Webre 500 kV lines show that the machines are stable and well damped.

Case 2 – Base case with Merchant Generation

A. Voltage Stability Analysis

The voltage stability plot or PV Curve for this case is shown in Figure 3. The X-axis of this plot is the power export level from the WOTAB area corresponding to the pre-contingency condition and the contingency of the four critical lines described earlier. The Y-axis represents the voltage at the Cane River 115 kV bus in the North Louisiana area. This station is representative of the voltage collapse occurring in that area. From the PV plot it can be observed that the most limiting contingency from the point of view of export from the area is the Hartburg – Mt. Olive 500 kV line. Based on the voltage decline guideline, the export limit from the area on the contingency of Hartburg-Mt. Olive line is 2100 MW. Figure 3 also shows that voltage collapse will eventually occur at about 3300 MW.

B. Transient/Dynamic Stability Analysis

The transient stability simulations were performed with the assumption that there are no Power System Stabilizers (PSS) installed on the proposed merchant generating units. The maximum export under this condition where the units are marginally damped was determined to be approximately 2700 MW. The stability plot for this simulation is shown in Figure 4. It was determined that export limits can be improved by adding PSS to the merchant generation. Henceforth, it will be a requirement that all new units in the area be equipped with stabilizers.

<u>Conclusions:</u>

The West of the Atchafalaya Basin (WOTAB) area can experience a voltage and dynamic stability problem if a significant amount of new merchant generation is operating in the area by year 2003. The export limit from this area is determined to be 2700 MW based on dynamic stability and 2100 MW based on voltage decline. As this area can experience dynamic problems beyond a certain export limit it will be mandatory for all IPPs in the area to install PSS on their units. Any *further* increase in the export level may require major upgrades, such as construction of 500 kV transmission lines.

The thermal limits were not evaluated in this study because they are source and sink specific and based on the generation dispatch. These limits will be evaluated when transmission service is requested and a System Impact Study is conducted.

APPENDIX A.C POLICY STATEMENT/GUIDELINES FOR POWER SYSTEM STABILIZER ON THE ENTERGY SYSTEM

Background:

A Power System Stabilizer (PSS) is an electronic feedback control that is a part of the excitation system control for generating units. The PSS acts to modulate the generator field voltage to damp the Power System oscillation.

Due to restructuring of the utility industry, there has been a significant amount of merchant generation activity on the Entergy system. These generators are typically equipped with modern exciters that have a high gain and a fast response to enhance transient stability. However, these fast response exciters, if used without stabilizers, can lead to oscillatory instability affecting local or regional reliability. This problem is exacerbated particularly in areas where there is a large amount of generation with limited transmission available for exporting power.

Stability studies carried out at Entergy have validated this concern. Furthermore, based on the understanding of operational problems experienced in the WSCC area over the last several years and the opinion of leading experts in the stability area, PSS are an effective and a low cost means of mitigating dynamic stability problems. In particular, PSS cost can be low if it is included in power plant procurement specifications.

Therefore, as a pre-emptive measure, Entergy requires all new generation (including affiliates and qualifying facilities) intending to interconnect to its transmission system to install PSS on their respective units.

The following guidelines shall be followed for PSS installation:

- PSS shall be installed on all new synchronous generators (50 MVA and larger) connecting to the transmission system that were put into service after January 1, 2000.

- PSS shall be installed on synchronous generators (50 MVA and larger) installed before January 1, 2000 subject to confirmation by Entergy that these units are good candidates for PSS and installing PSS on these units will enhance stability in the region. The decision to install PSS on a specific unit will be based on the effectiveness of the PSS in controlling oscillations, the suitability of the excitation system, and cost of retrofitting.

- In areas where a dynamic stability problem has not been explicitly identified, all synchronous generators (50 MVA and larger) will still be required to install stabilizers. However, in such cases the tuning will not be required and the stabilizer may remain disconnected until further advised by Entergy.

- Need for testing and tuning of PSS on units requesting transmission service from areas where stability problem has not been explicitly identified will be determined on an as-needed basis as part of transmission service study.

- The plants are responsible for testing and tuning of exciter and stabilizer controls for optimum performance and providing PSS model and data for use with PSS/E stability program.

- PSS equipment shall be tested and calibrated in conjunction with automatic voltage regulation (AVR) testing and calibration at-least every five years in accordance with the NERC Compliance Criteria on Generator Testing. PSS re-calibration must be performed if AVR parameters are modified.

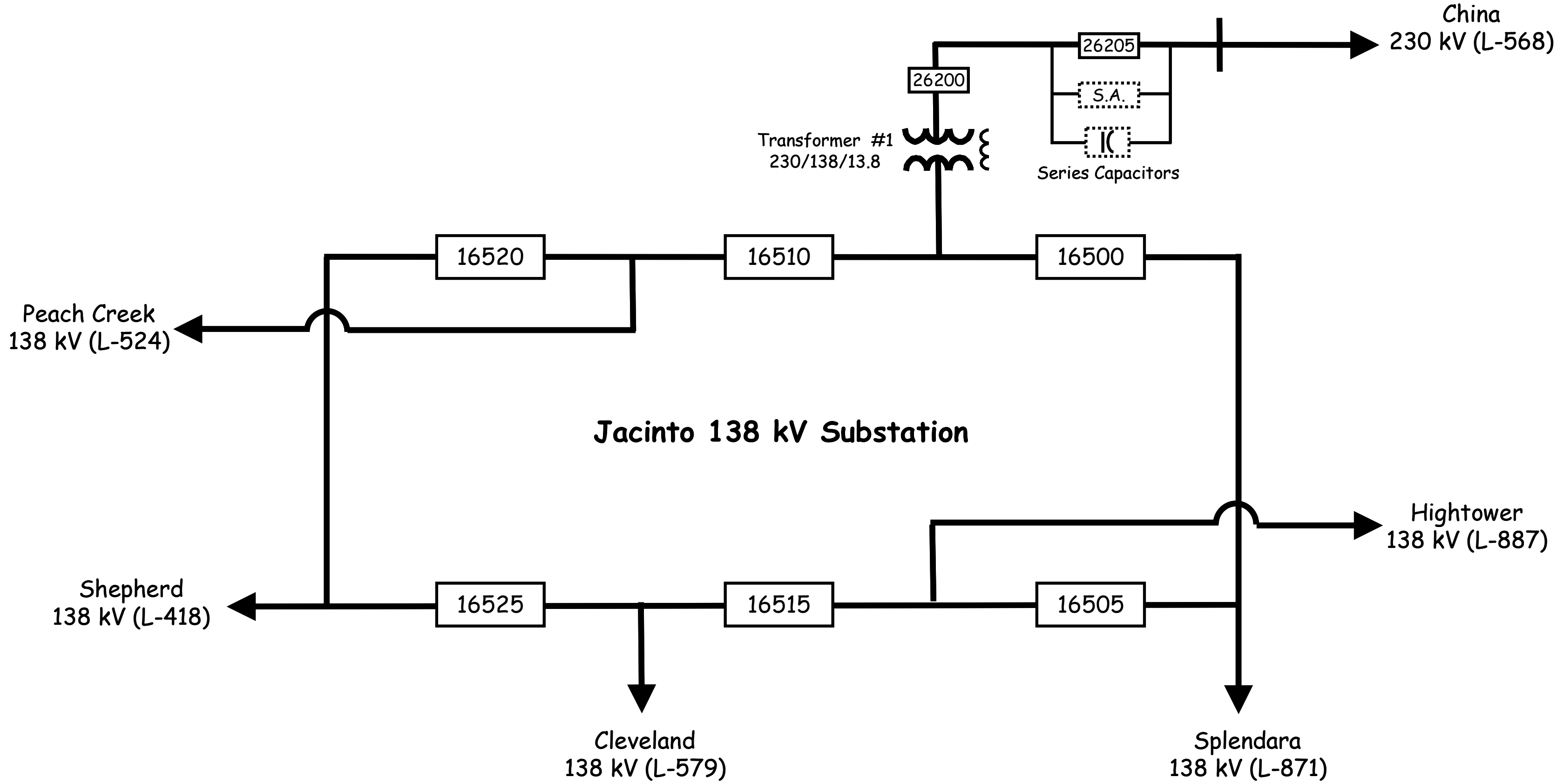
    - The PSS equipment to be installed is required to be of the Delta-P-omega type.

References:

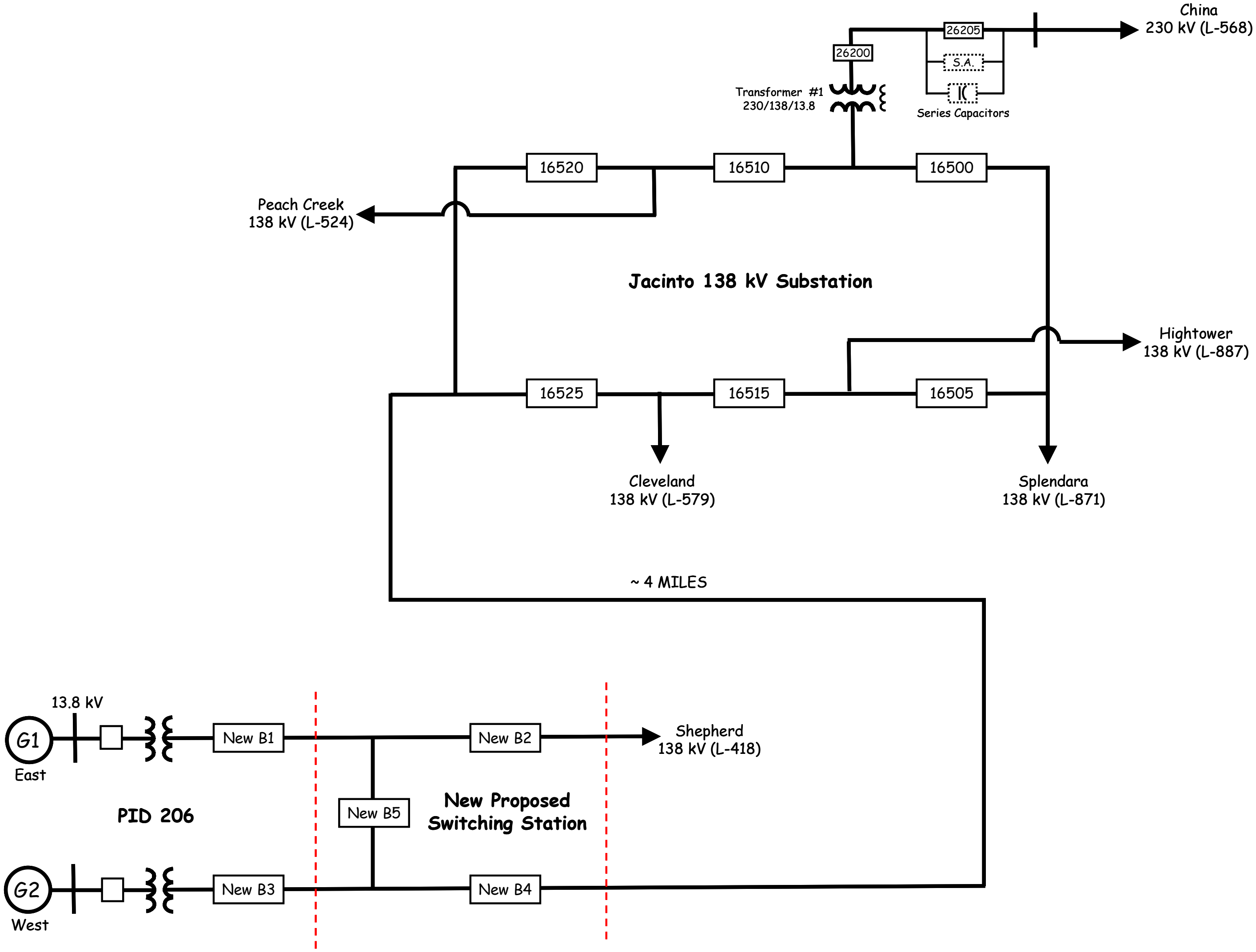
WOTAB Area Stability Study for the Entergy System
WSCC Draft Policy Statement on Power System Stabilizers
PSEC Application Notes: Power System Stabilizer helps need plant stability margins for Simple Cycle and Combined Cycle Power Plants

APPENDIX A.D SUBSTATION CONFIGURATION WITH AND WITHOUT PID-206

JACINTO 138/230 KV PRE-PID-206



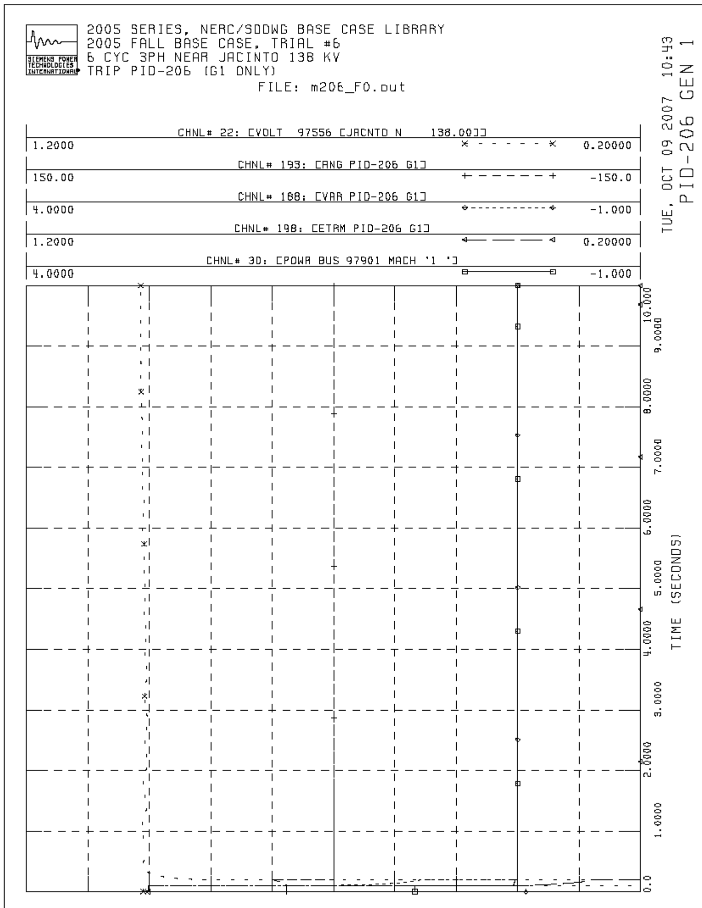
JACINTO 138/230 KV POST-PID-206



APPENDIX A.E Transient Stability DATA & Plots

Plots illustrating the results from the simulated cases have been provided.

FAULT-0
6 CYC 3PH NEAR JACINTO 138 KV
TRIP PID-206 (G1 ONLY)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TRIP PID-206 (G1 ONLY)
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CHNL# 188: [VAR PID-206 G1] 4.0000 -1.000
CHNL# 198: [ETRM PID-206 G1] 1.2000 0.20000
CHNL# 30: [POWR BUS 97901 MACH '1 '] 4.0000 -1.000
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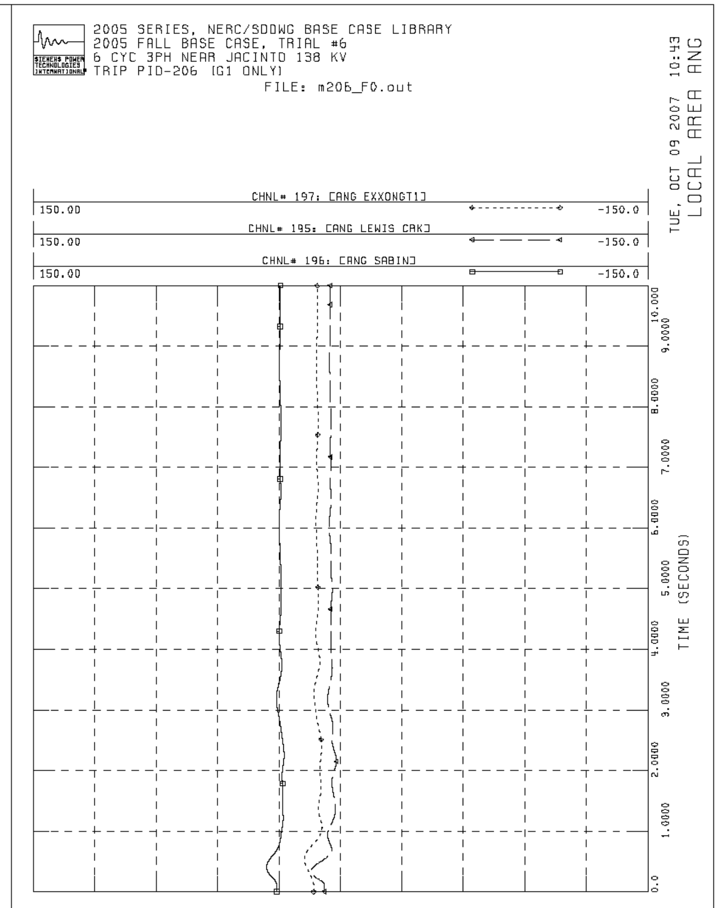
TUE, OCT 09 2007 10:43
PID-206 GEN 1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6 CYC 3PH NEAR JACINTO 138 KV
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CHNL# 195: [ANG LEWIS CRK] 150.00 -150.0
CHNL# 196: [ANG SABIN] 150.00 -150.0
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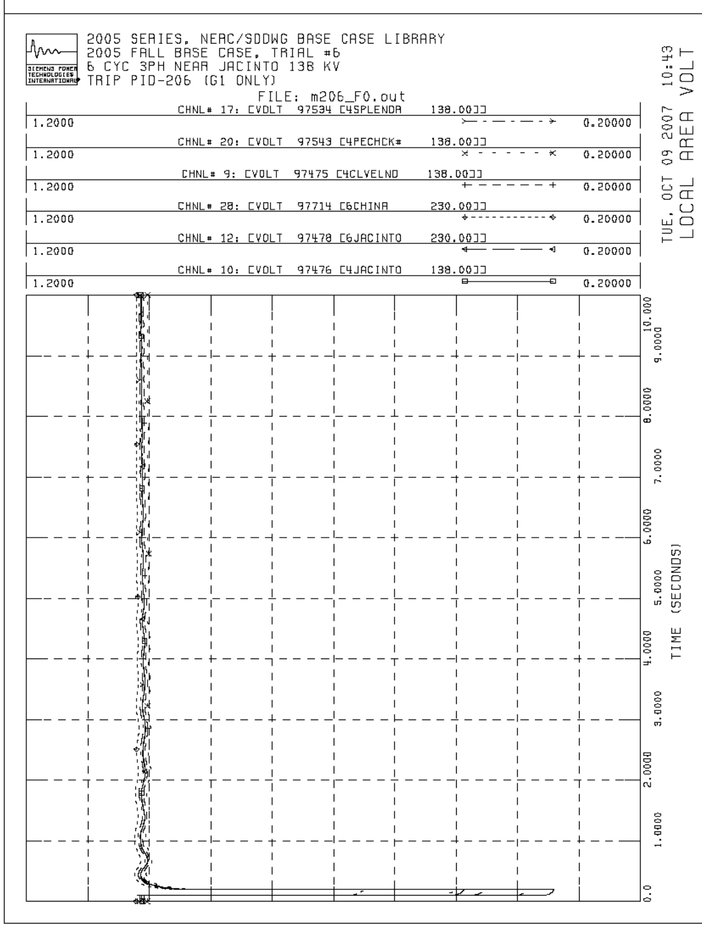
TUE, OCT 09 2007 10:43
LOCAL AREA ANG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CHNL# 9: [VOLT 97475 [4CLVELND 138.00]] 1.2000 0.20000
CHNL# 28: [VOLT 97714 [6CHINA 230.00]] 1.2000 0.20000
CHNL# 12: [VOLT 97478 [6JACINTO 230.00]] 1.2000 0.20000
CHNL# 10: [VOLT 97476 [4JACINTO 138.00]] 1.2000 0.20000
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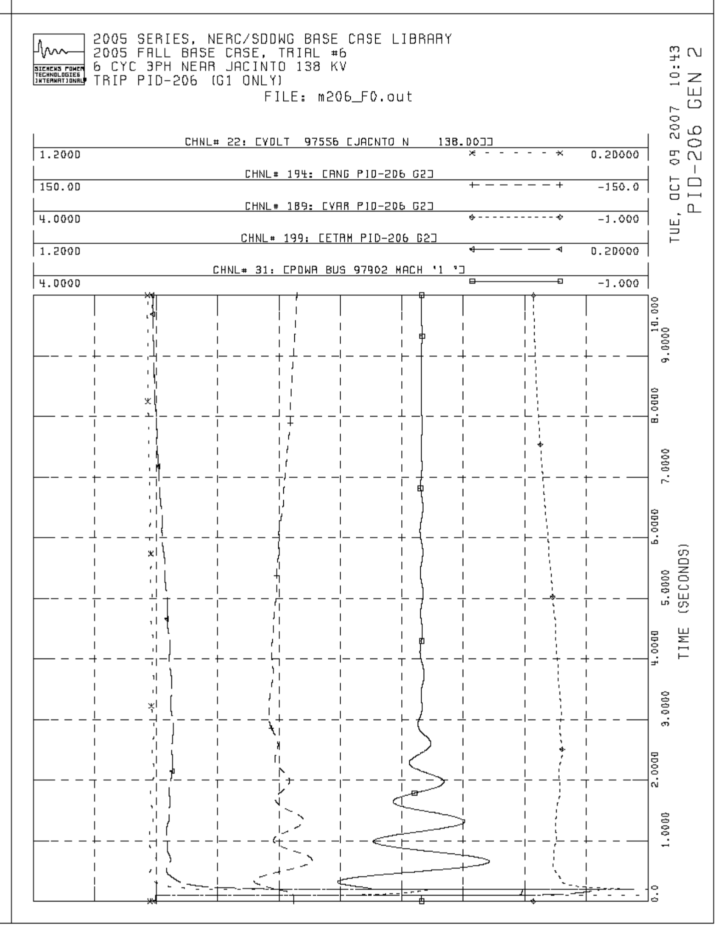
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT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CHNL# 199: [ETRM PID-206 G2] 1.2000 0.20000
CHNL# 31: [POWR BUS 97902 MACH '1 '] 4.0000 -1.000
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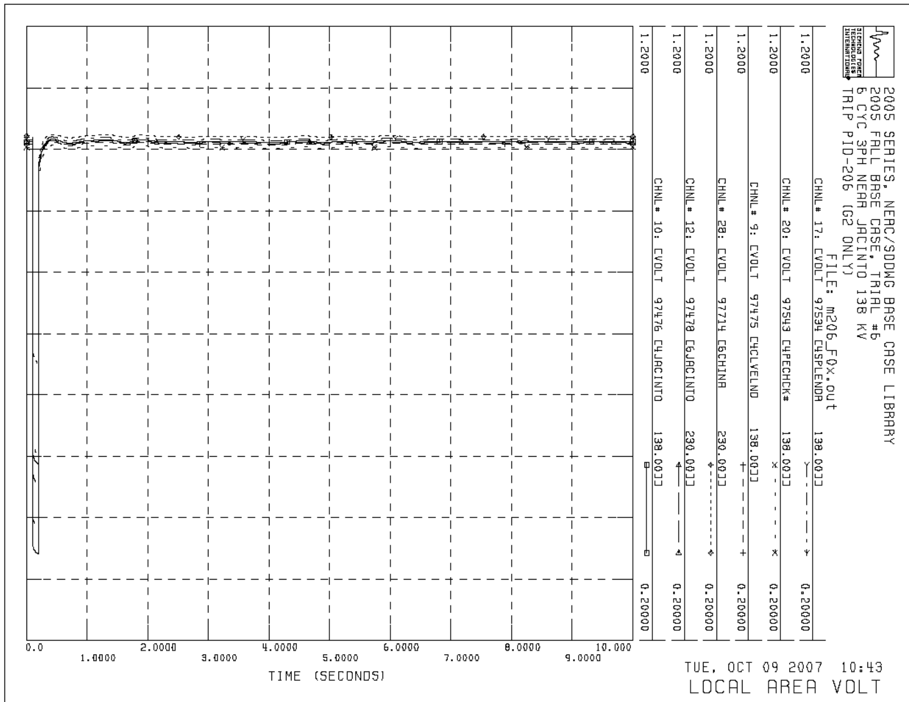
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 2

FAULT-0X
6 CYC 3PH NEAR JACINTO 138 KV
TRIP PID-206 (G2 ONLY)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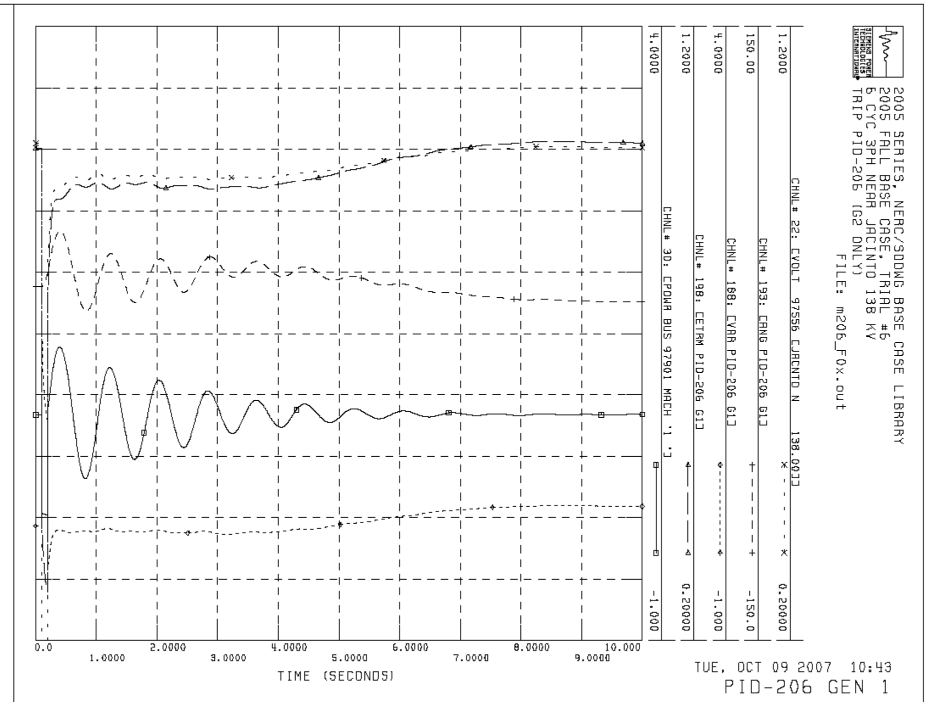
LOCAL AREA VOLT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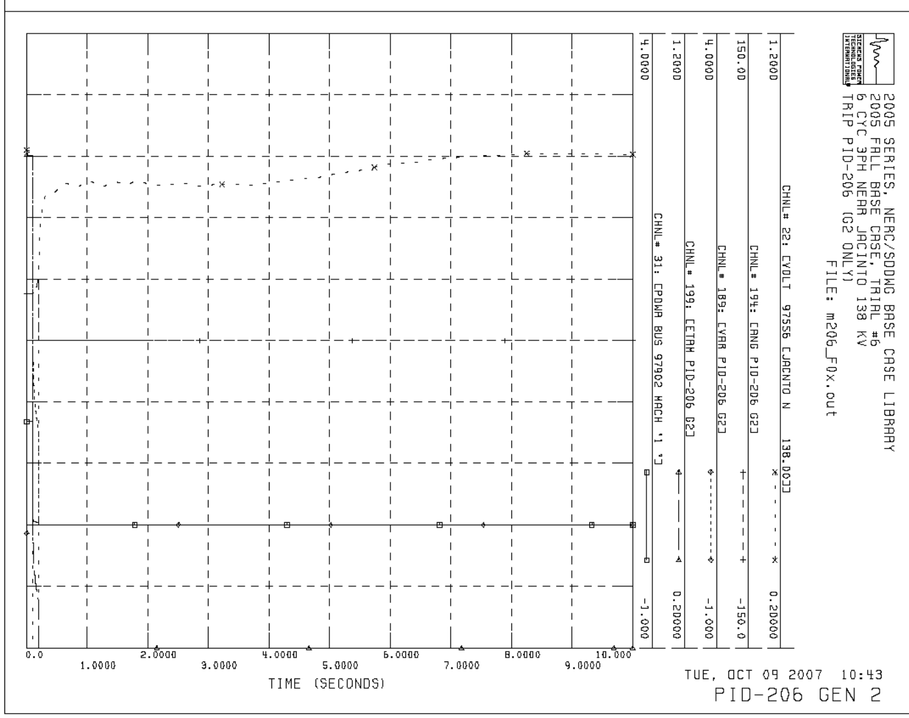
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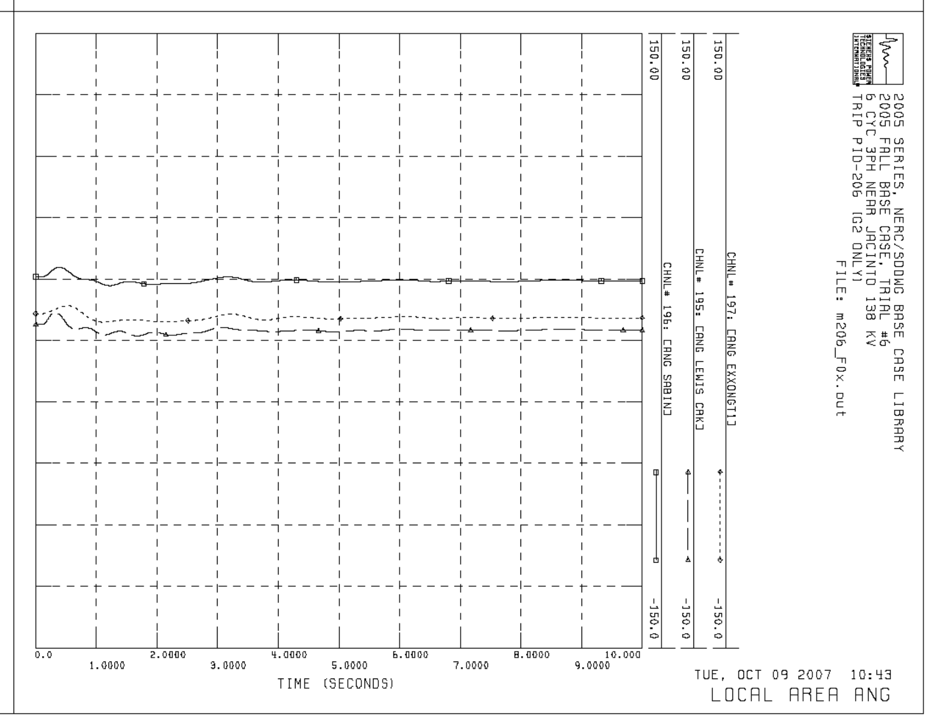
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CHNL# 196: [ANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT-1
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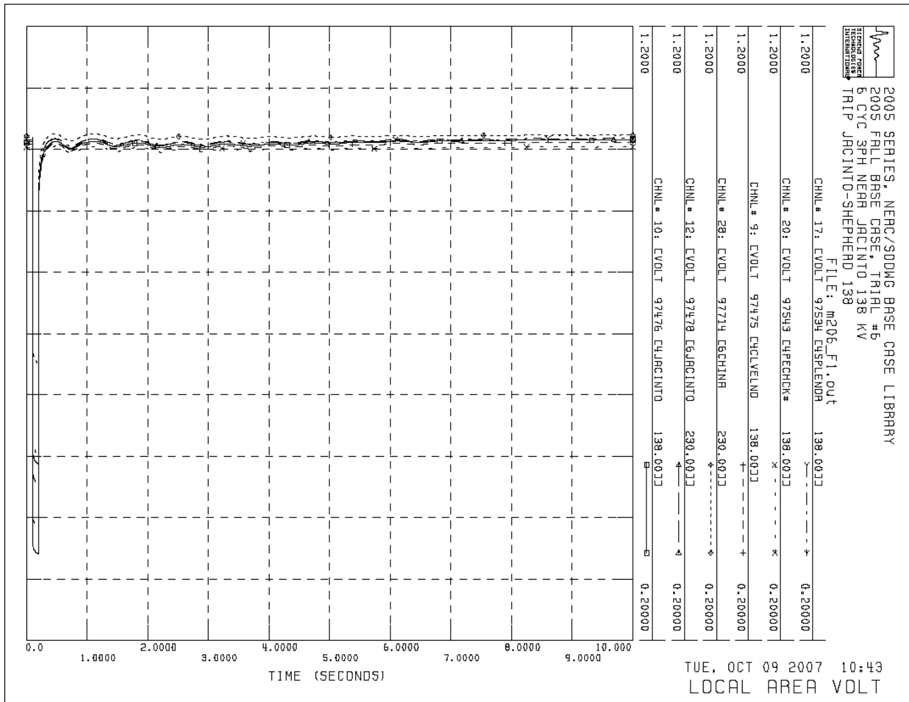
TRIP JACINTO-SHEPHERD 138



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CHNL# 12: [VOLT 97478 [6JACINTO 230.00]]
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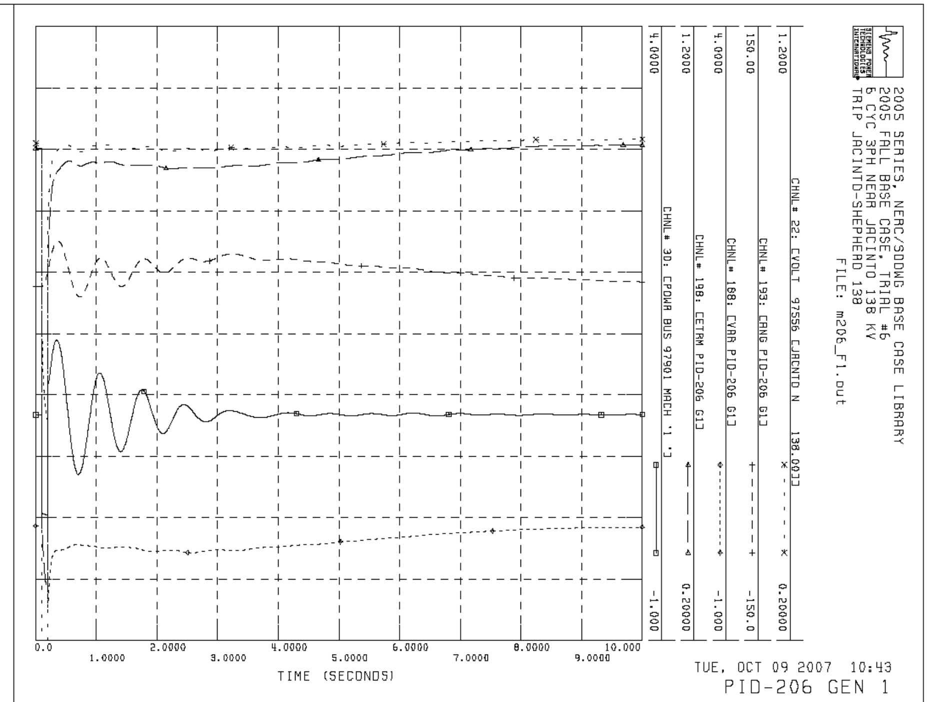
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT



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CHNL# 30: [POWR BUS 97901 MACH '1 ']
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1.2000
4.0000
0.20000
-150.0
-1.000
0.20000
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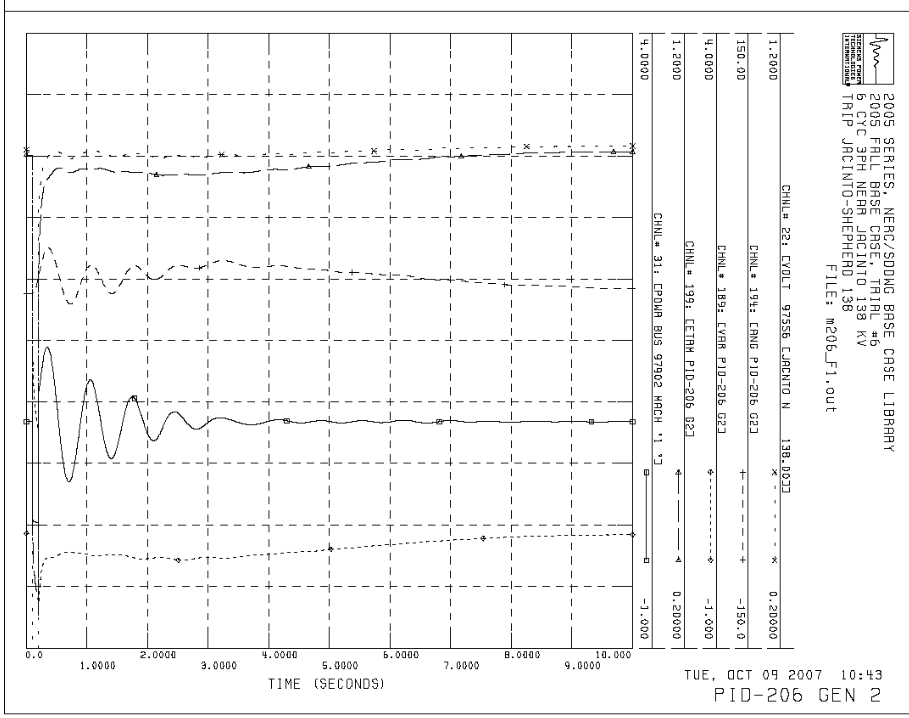
PID-206 GEN 1



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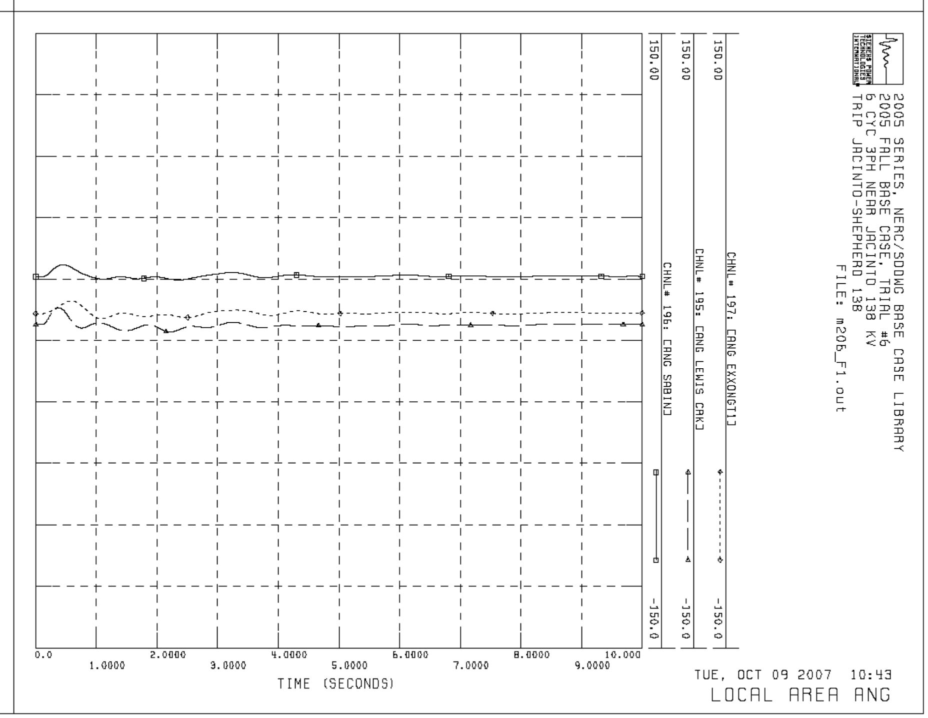
PID-206 GEN 2



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CHNL# 196: [ANG SABIN]
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150.00
150.00
-150.0
-150.0
-150.0
0.0
1.0000
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5.0000
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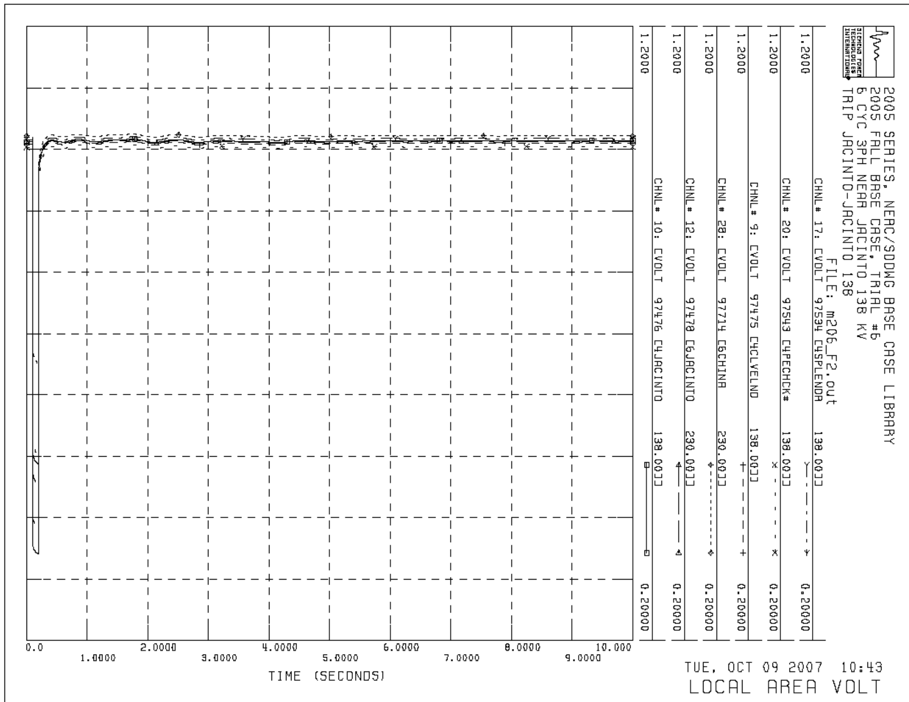
10.000
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT-2
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO 138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TRIP JACINTO-JACINTO 138
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.00] 1.2000 0.20000
CHNL# 9: CVOLT 97475 C4CLVELND 138.00] 1.2000 0.20000
CHNL# 28: CVOLT 97714 C6CHINA 230.00] 1.2000 0.20000
CHNL# 12: CVOLT 97478 C6JACINTO 230.00] 1.2000 0.20000
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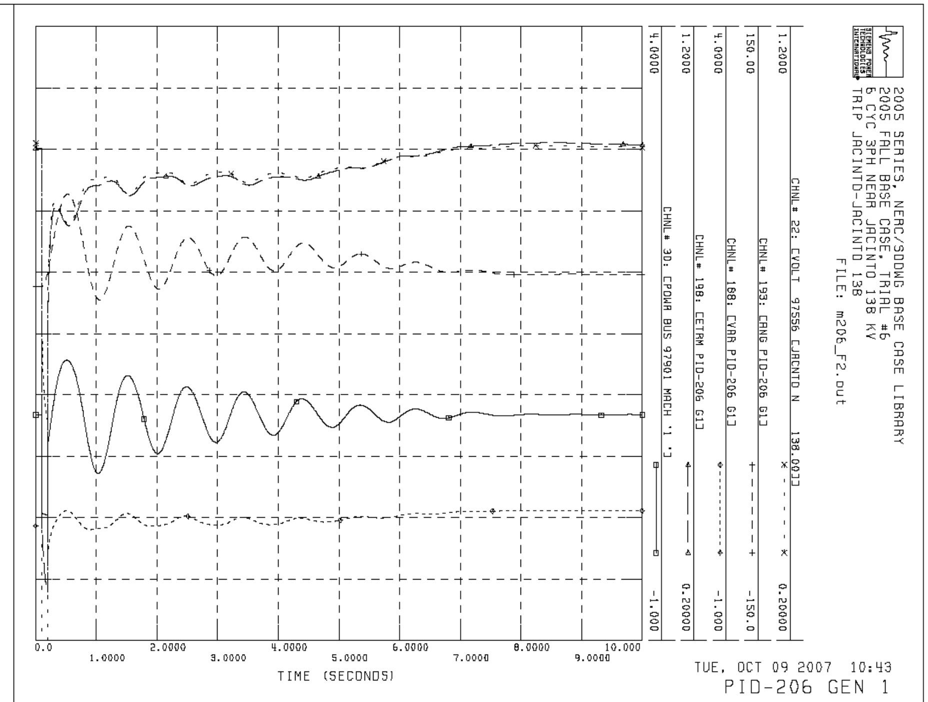
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT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2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO 138
FILE: m206_F2.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00] 1.2000 0.20000
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CHNL# 188: CVAR PID-206 G1] 4.0000 -1.000
CHNL# 198: CETRM PID-206 G1] 1.2000 0.20000
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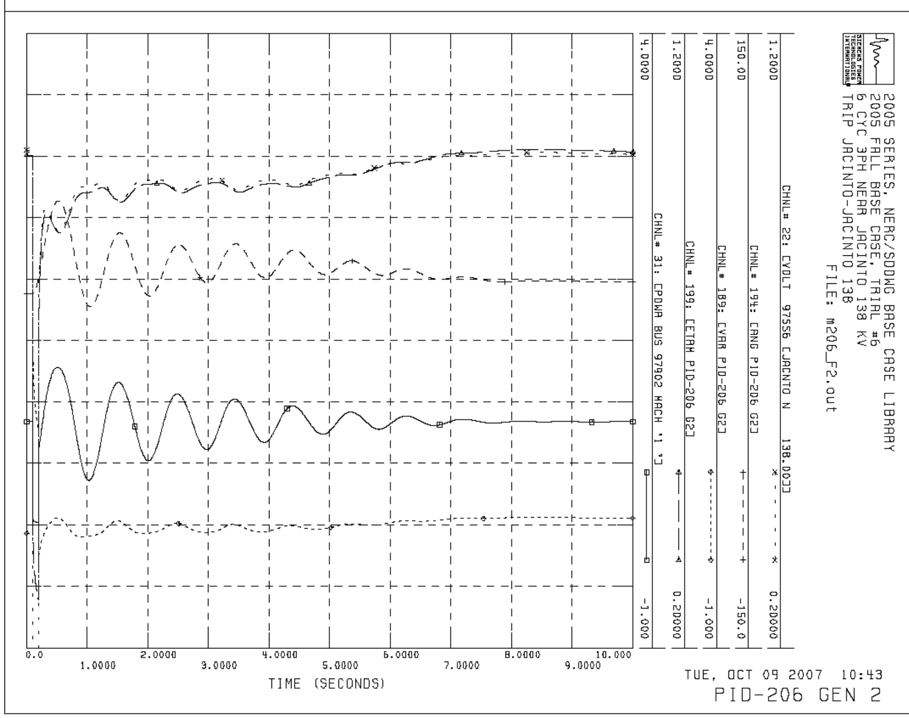
PID-206 GEN 1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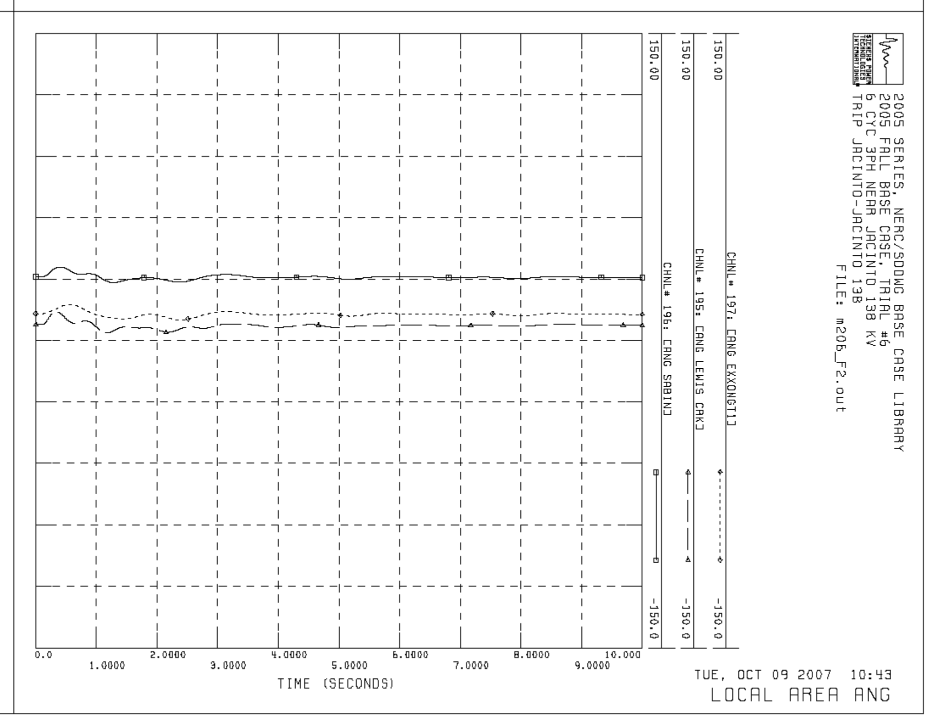
PID-206 GEN 2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6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO 138
FILE: m206_F2.out
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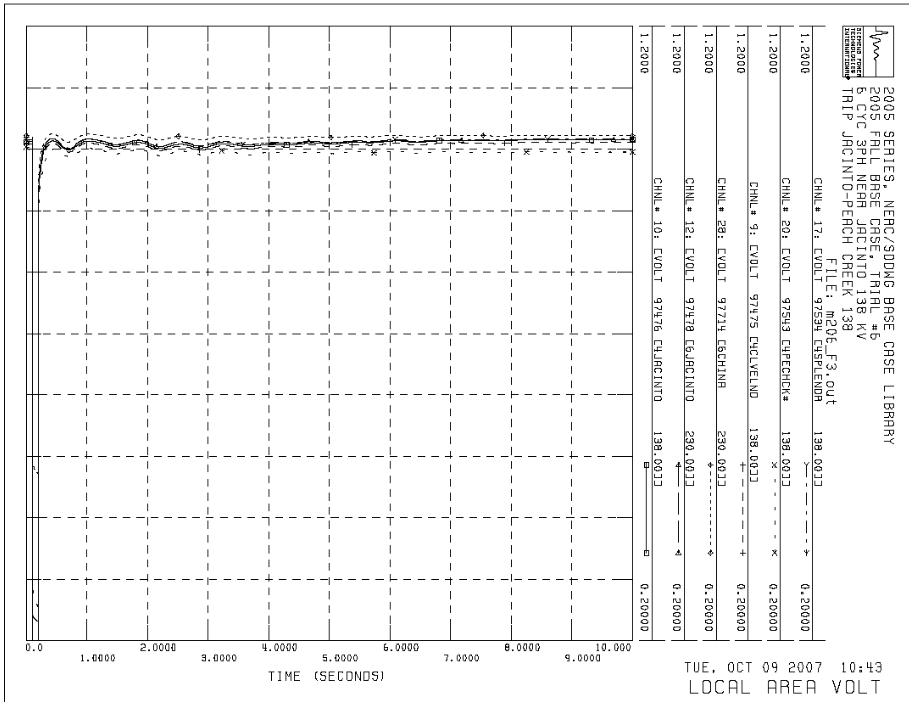
CHNL# 195: CANG LEWIS CRK] 150.00 -150.0
CHNL# 196: CANG SABIN] 150.00 -150.0
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT- 3
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138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TRIP JACINTO-PEACH CREEK 138
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CHNL# 9: [VOLT 97475 [4CLVELND 138.00]] 1.2000 0.20000
CHNL# 28: [VOLT 97714 [6CHINA 230.00]] 1.2000 0.20000
CHNL# 12: [VOLT 97478 [6JACINTO 230.00]] 1.2000 0.20000
CHNL# 10: [VOLT 97476 [4JACINTO 138.00]] 1.2000 0.20000
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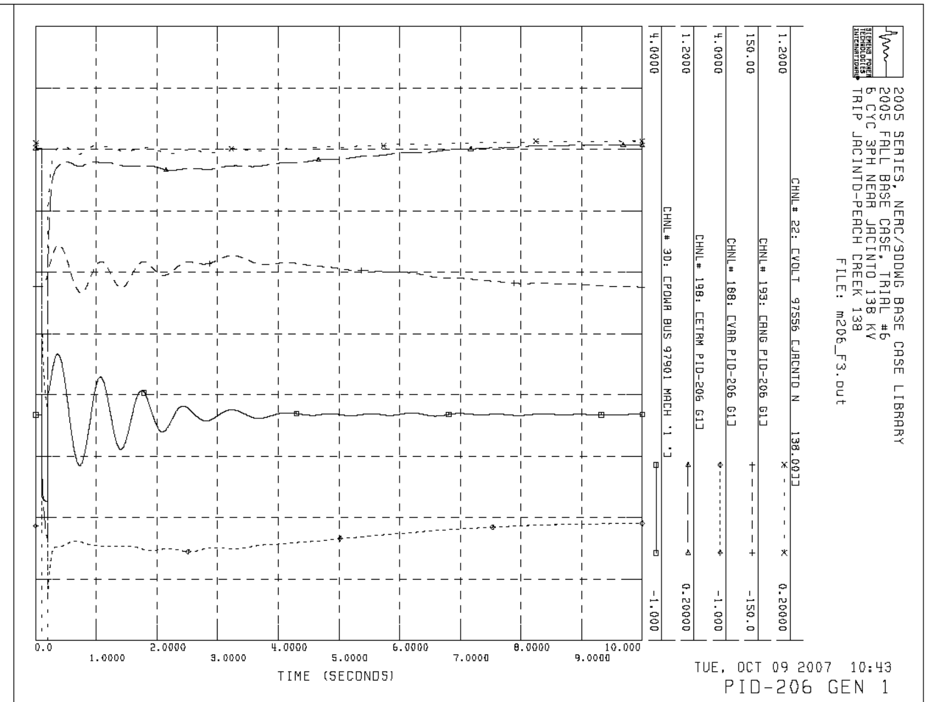
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT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CHNL# 193: [ANG PID-206 G1] 150.00 -150.0
CHNL# 188: [VAR PID-206 G1] 4.0000 -1.000
CHNL# 198: [ETRM PID-206 G1] 1.2000 0.20000
CHNL# 30: [POWR BUS 97901 MACH '1 '] 4.0000 -1.000
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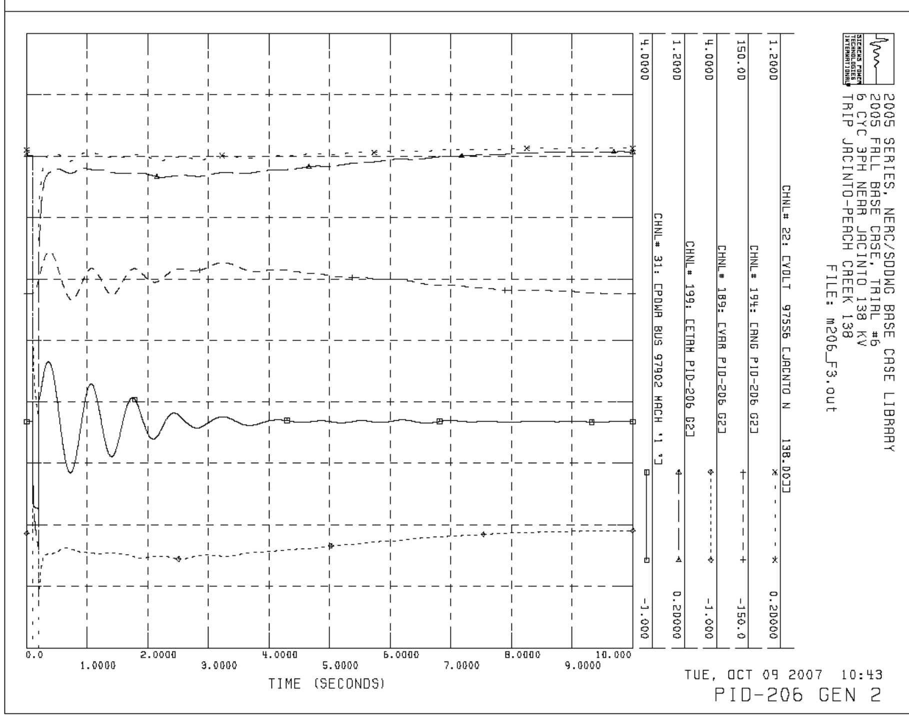
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1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TRIP JACINTO-PEACH CREEK 138
FILE: m206_F3.out
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CHNL# 189: [VAR PID-206 G2] 4.0000 -1.000
CHNL# 199: [ETRM PID-206 G2] 1.2000 0.20000
CHNL# 31: [POWR BUS 97902 MACH '1 '] 4.0000 -1.000
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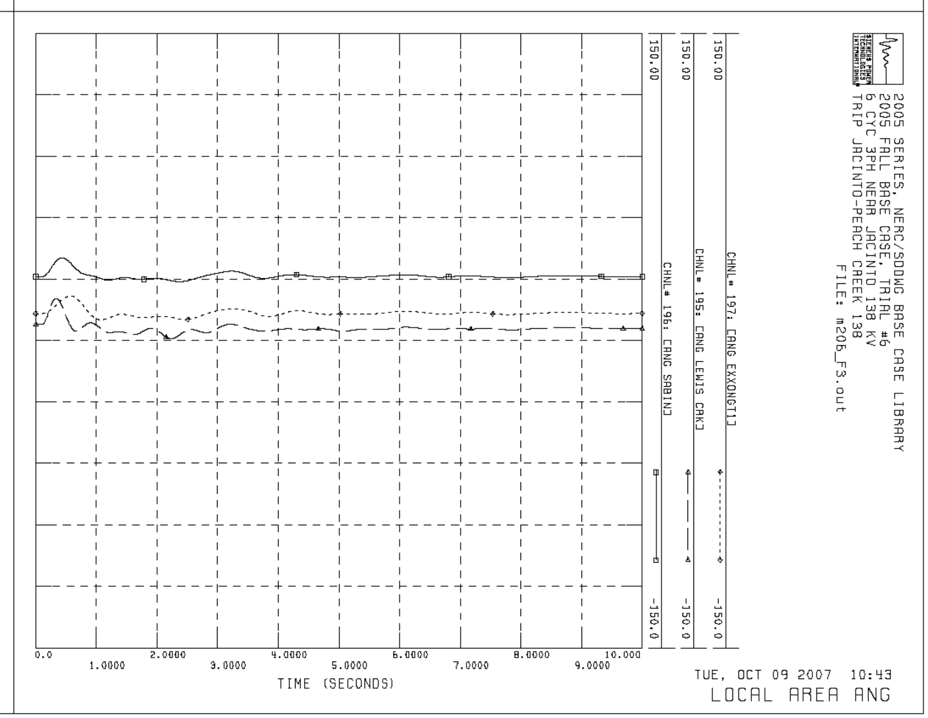
PID-206 GEN 2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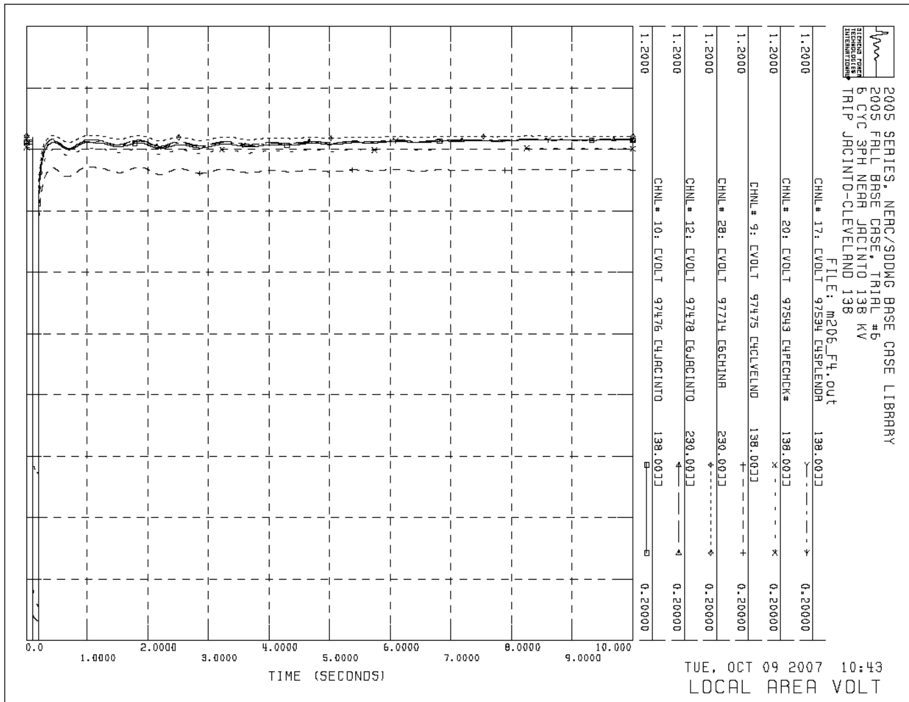
TRIP JACINTO-PEACH CREEK 138
FILE: m206_F3.out
CHNL# 197: [ANG EXXONGT1] 150.00 -150.0
CHNL# 195: [ANG LEWIS CRK] 150.00 -150.0
CHNL# 196: [ANG SABIN] 150.00 -150.0
0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT-4
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
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TRIP JACINTO-CLEVELAND 138
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CHNL# 9: [VOLT 97475 CHCLVELND 138.00]
CHNL# 28: [VOLT 97714 C6CHINA 230.00]
CHNL# 12: [VOLT 97478 C6JACINTO 230.00]
CHNL# 10: [VOLT 97476 C4JACINTO 138.00]
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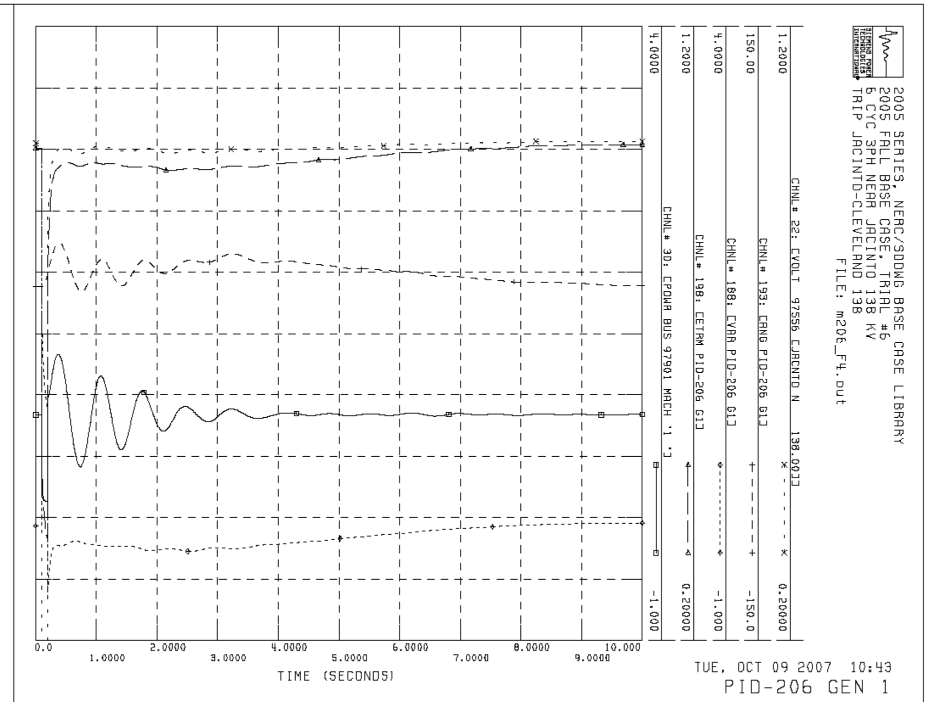
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138
FILE: m206_F4.out
CHNL# 22: [VOLT 97556 CJACNTO N 138.00]
CHNL# 193: [ANG PID-206 G1]
CHNL# 188: [VAR PID-206 G1]
CHNL# 198: [ETRM PID-206 G1]
CHNL# 30: [POWR BUS 97901 MACH '1 ']
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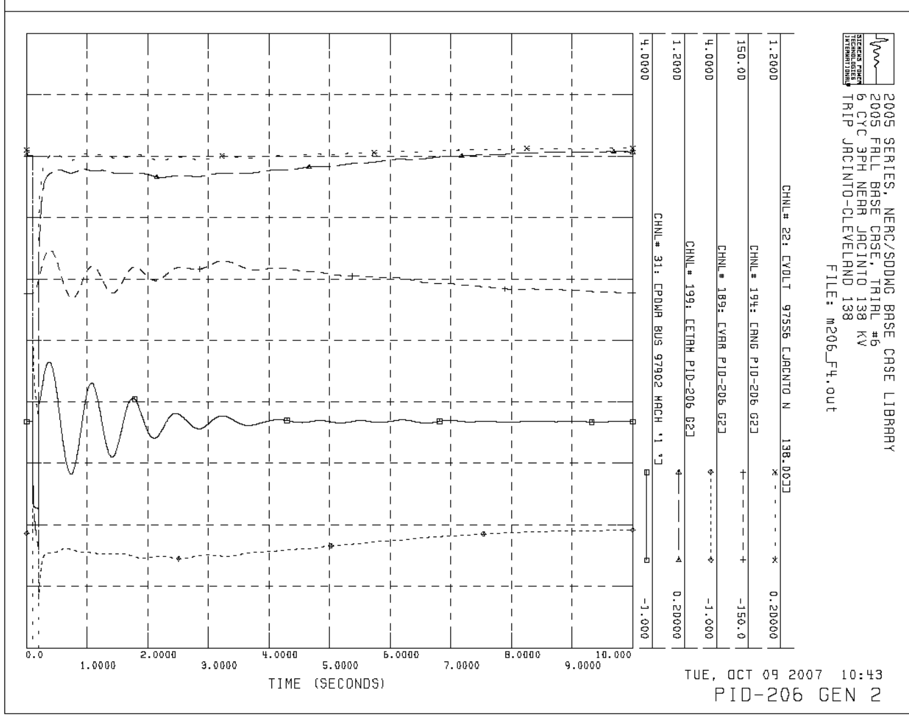
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1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2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138
FILE: m206_F4.out
CHNL# 22: [VOLT 97556 CJACNTO N 138.00]
CHNL# 194: [ANG PID-206 G2]
CHNL# 189: [VAR PID-206 G2]
CHNL# 199: [ETRM PID-206 G2]
CHNL# 31: [POWR BUS 97902 MACH '1 ']
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1.2000
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-150.0
-1.000
0.20000
-1.000
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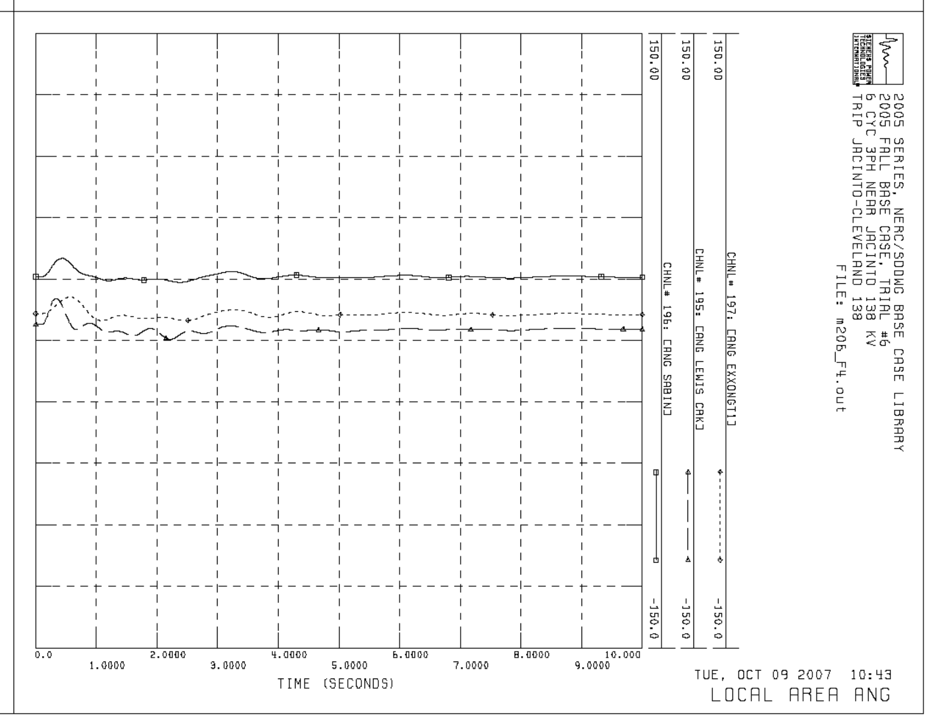
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 2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2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138
FILE: m206_F4.out
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CHNL# 195: [ANG LEWIS CRK]
CHNL# 196: [ANG SABIN]
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1.0000
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6.0000
7.0000
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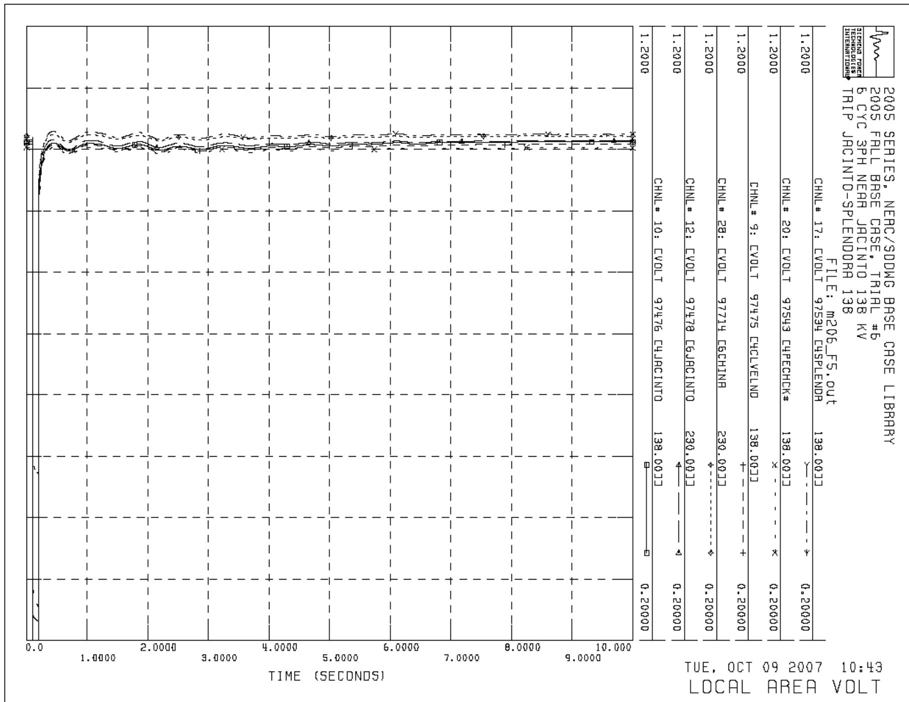
10.000
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT-5
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138
FILE: m206_FS.out
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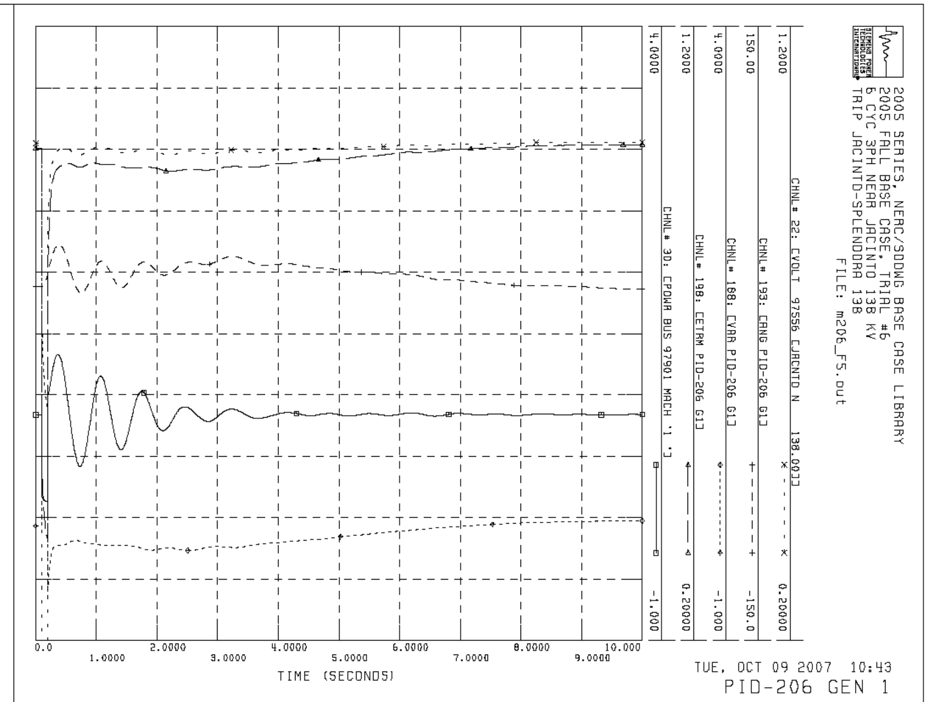
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 CHCLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT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2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138
FILE: m206_FS.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
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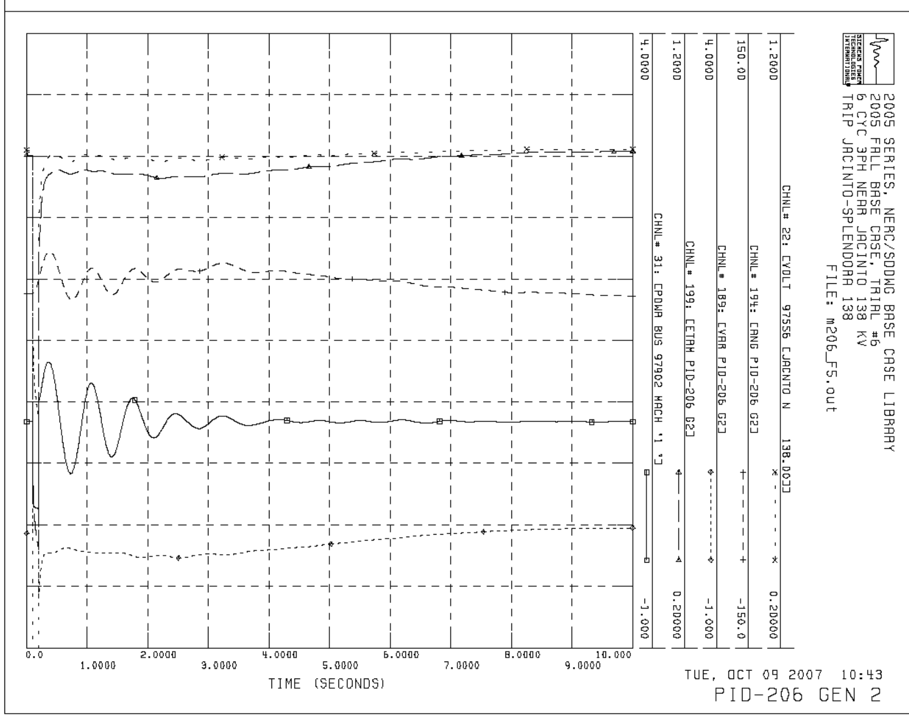
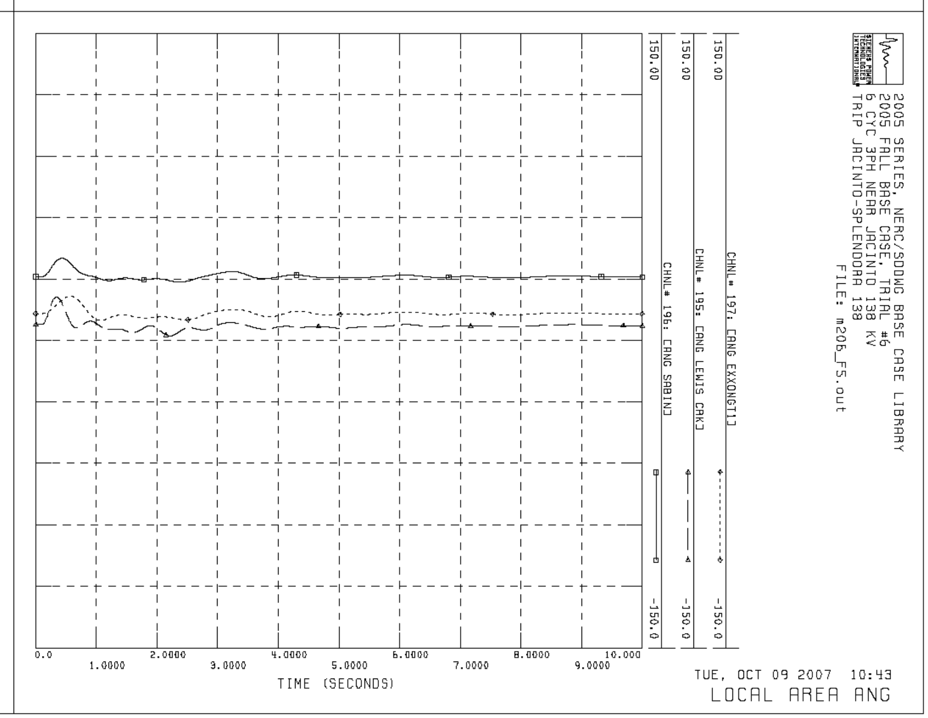
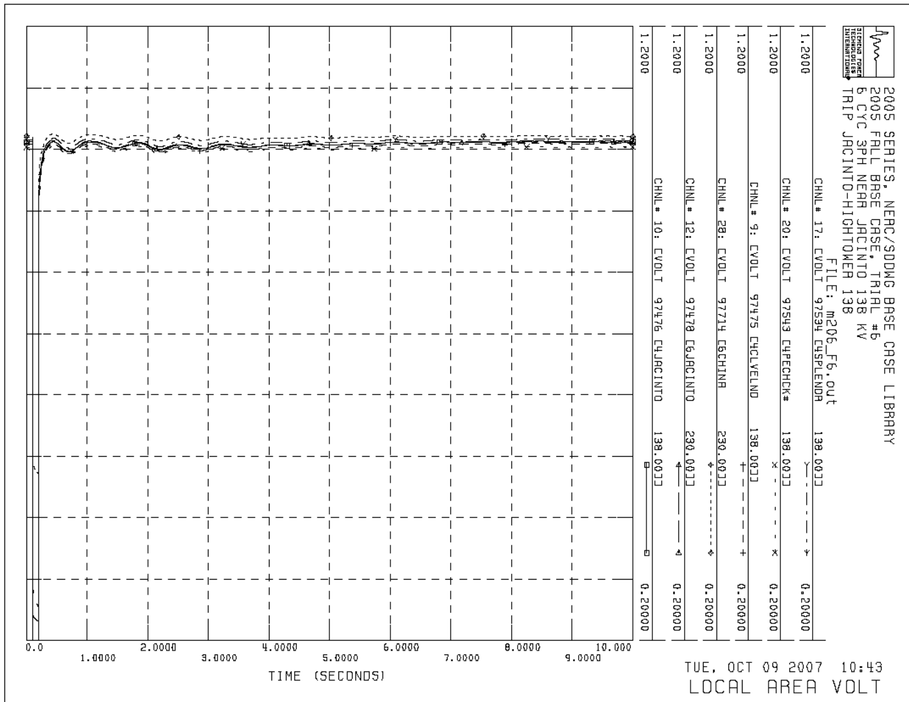
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138
FILE: m206_FS.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138
FILE: m206_FS.out
CHNL# 197: CANG EXXONG1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT- 6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138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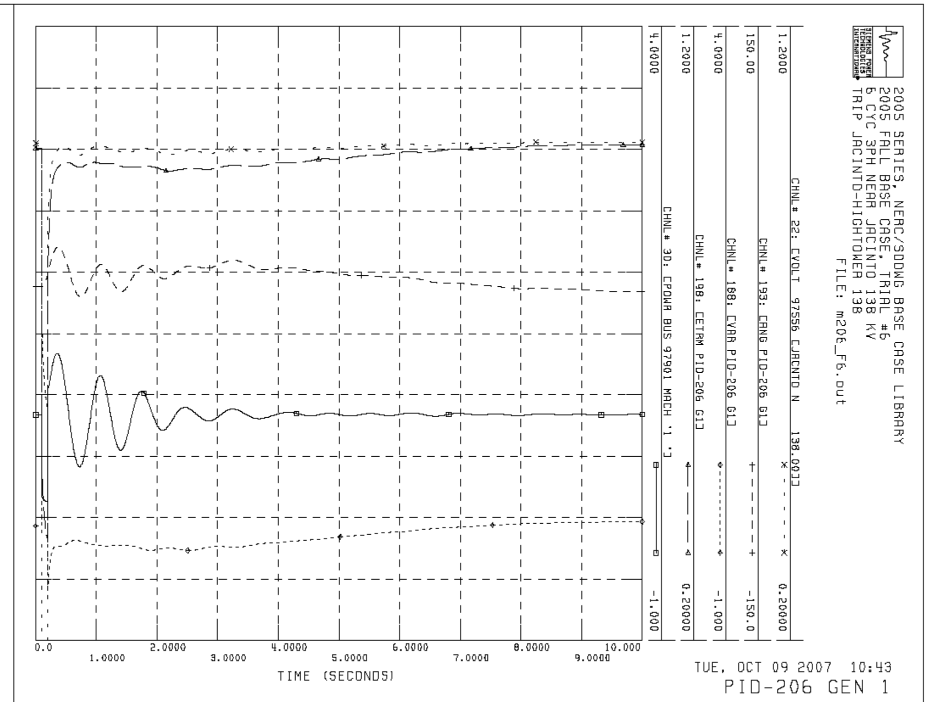
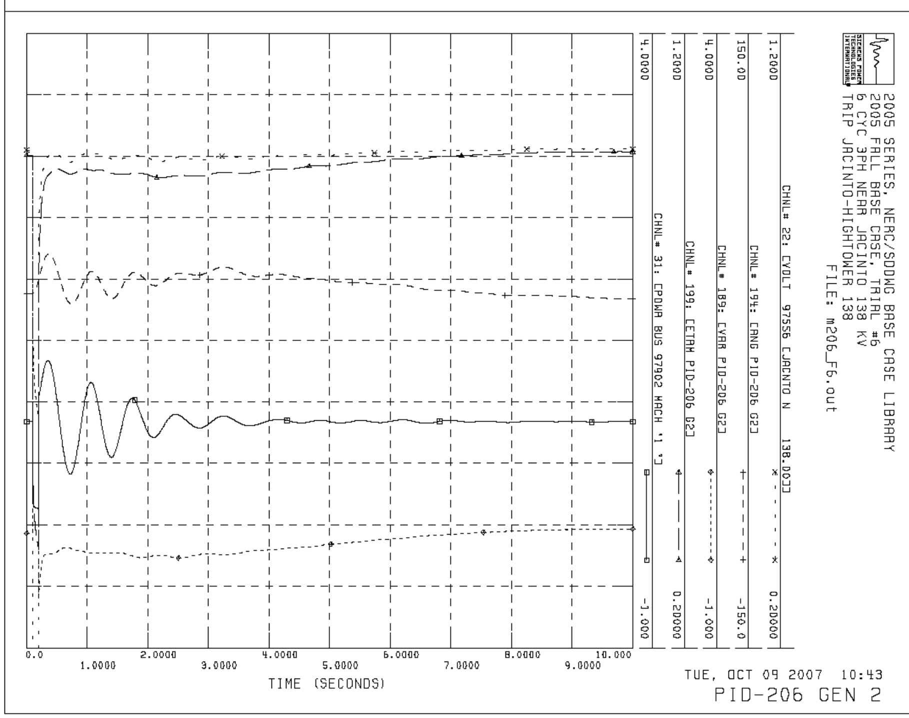
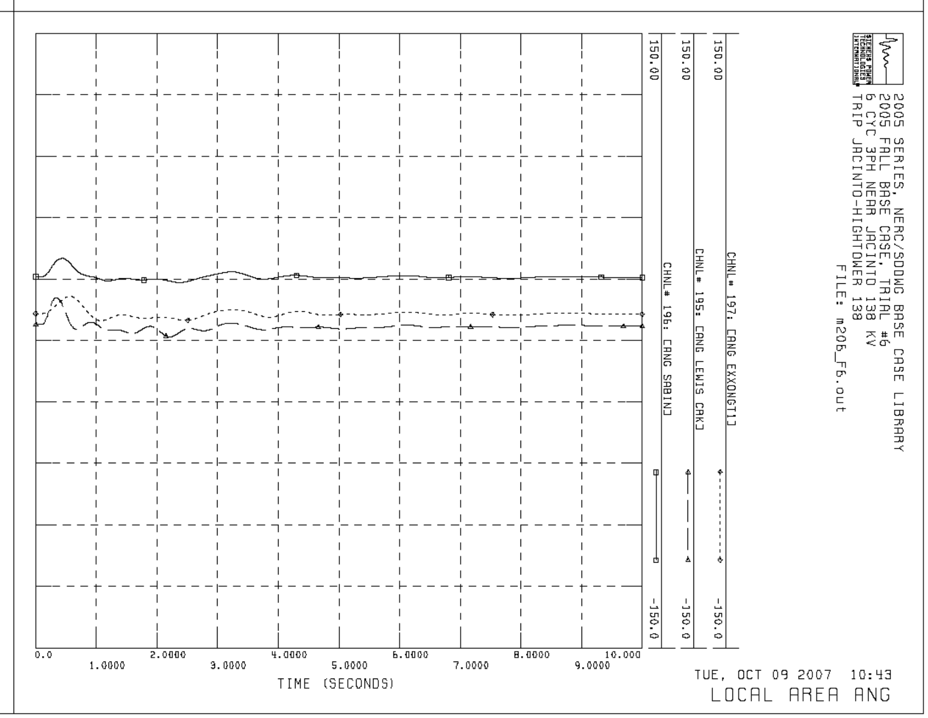
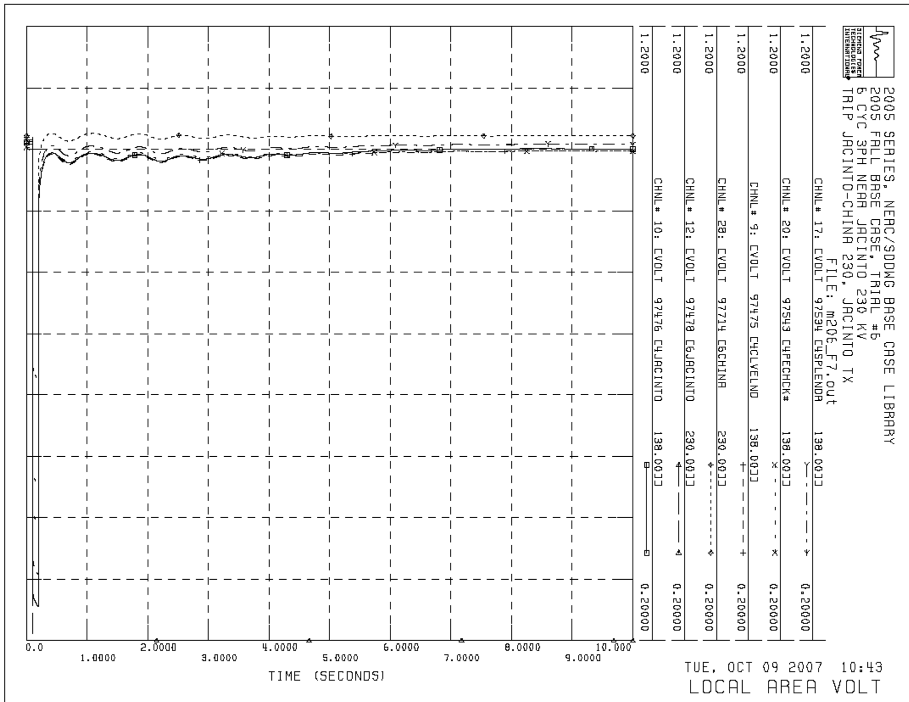
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138
FILE: m206_f6.out
CHNL# 17: [VOLT 97534 [4SPLENDA 138.00]]
CHNL# 20: [VOLT 97543 [4PECHCK# 138.00]]
CHNL# 9: [VOLT 97475 [4CLVELND 138.00]]
CHNL# 28: [VOLT 97214 [6CHINA 230.00]]
CHNL# 12: [VOLT 97478 [6JACINTO 230.00]]
CHNL# 10: [VOLT 97476 [4JACINTO 138.00]]
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138
FILE: m206_f6.out
CHNL# 22: [VOLT 97556 [JACNTO_N 138.00]]
CHNL# 193: [ANG PID-206 G1]
CHNL# 188: [VAR PID-206 G1]
CHNL# 198: [ETRM PID-206 G1]
CHNL# 30: [POWR BUS 97901 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138
FILE: m206_f6.out
CHNL# 22: [VOLT 97556 [JACNTO_N 138.00]]
CHNL# 194: [ANG PID-206 G2]
CHNL# 189: [VAR PID-206 G2]
CHNL# 199: [ETRM PID-206 G2]
CHNL# 31: [POWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138
FILE: m206_f6.out
CHNL# 197: [ANG EXXONGT1]
CHNL# 195: [ANG LEWIS CRK]
CHNL# 196: [ANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA ANG

FAULT- 7
6 CYC 3PH NEAR JACINTO 230 KV
TRIP JACINTO-CHINA 230, JACINTO TX


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 230 KV
TRIP JACINTO-CHINA 230, JACINTO TX
FILE: m206_F7.out
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.00] 1.2000 0.20000
CHNL# 9: CVOLT 97475 C4CLVELND 138.00] 1.2000 0.20000
CHNL# 28: CVOLT 97714 C6CHINA 230.00] 1.2000 0.20000
CHNL# 12: CVOLT 97478 C6JACINTO 230.00] 1.2000 0.20000
CHNL# 10: CVOLT 97476 C4JACINTO 138.00] 1.2000 0.20000
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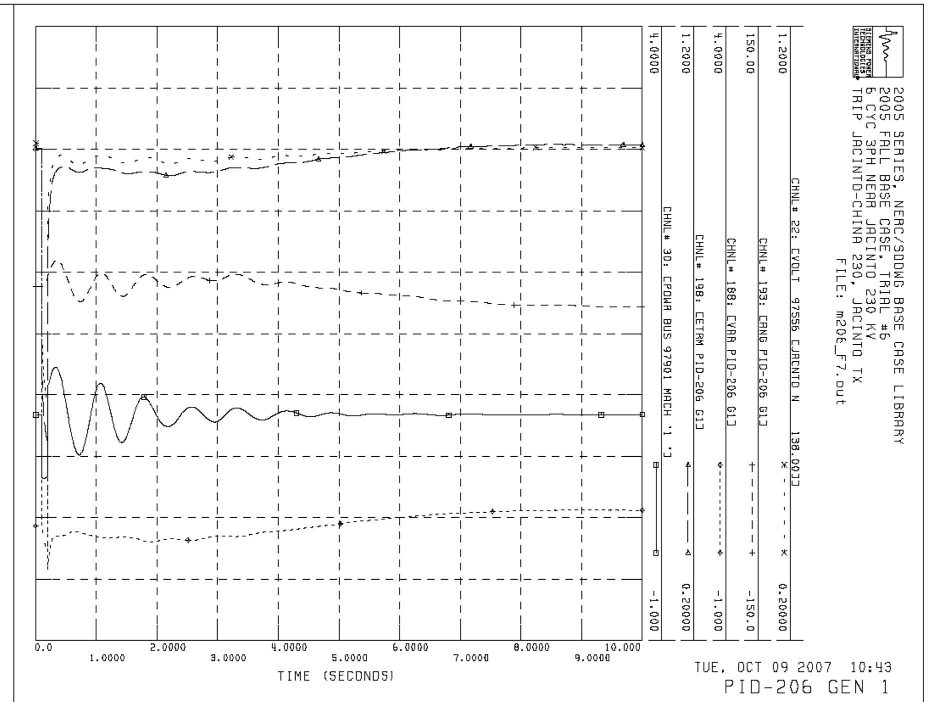
TIME (SECONDS)
TUE, OCT 09 2007 10:43
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 230 KV
TRIP JACINTO-CHINA 230, JACINTO TX
FILE: m206_F7.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00] 1.2000 0.20000
CHNL# 193: CANG PID-206 G1] 150.00 -150.0
CHNL# 188: CVAR PID-206 G1] 4.0000 -1.000
CHNL# 198: CETRM PID-206 G1] 1.2000 0.20000
CHNL# 30: CPOWR BUS 97901 MACH '1 '] 4.0000 -1.000
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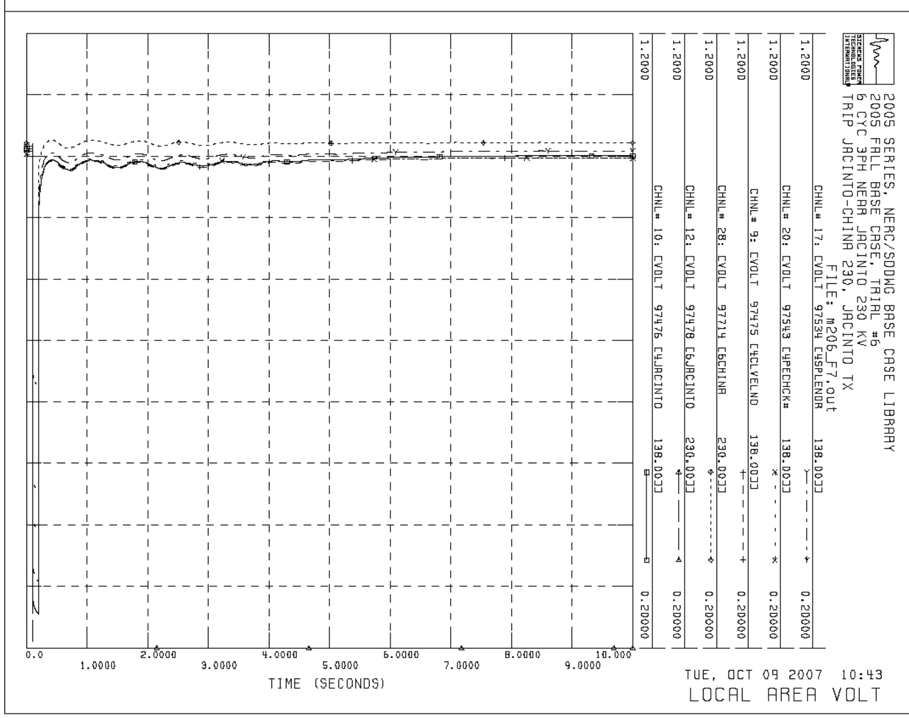
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1



2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 230 KV
TRIP JACINTO-CHINA 230, JACINTO TX
FILE: m206_F7.out
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.00] 1.2000 0.20000
CHNL# 9: CVOLT 97475 C4CLVELND 138.00] 1.2000 0.20000
CHNL# 28: CVOLT 97714 C6CHINA 230.00] 1.2000 0.20000
CHNL# 12: CVOLT 97478 C6JACINTO 230.00] 1.2000 0.20000
CHNL# 10: CVOLT 97476 C4JACINTO 138.00] 1.2000 0.20000
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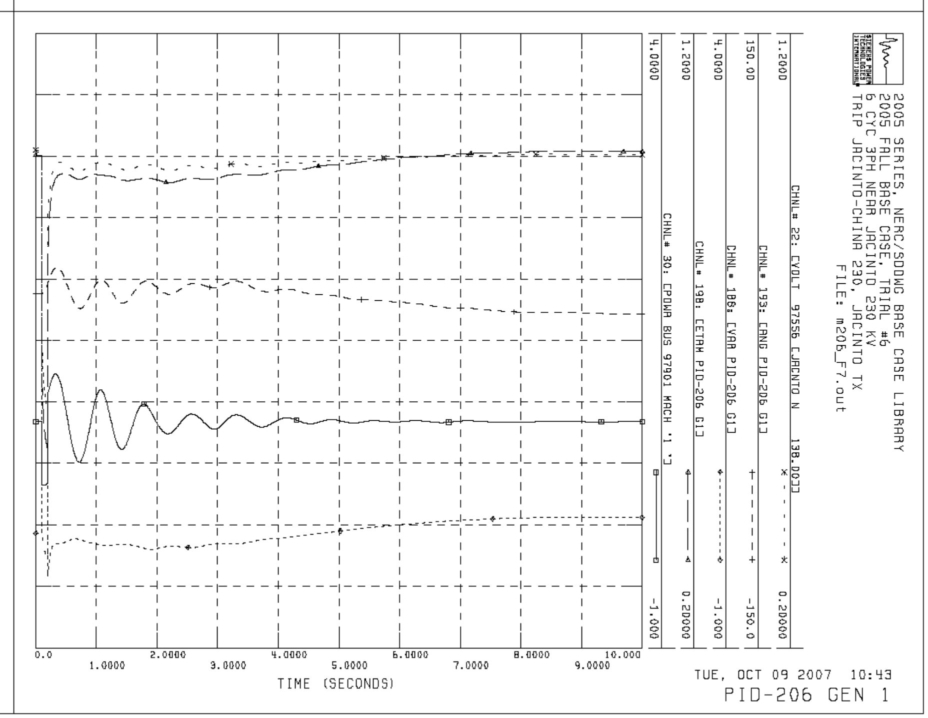
LOCAL AREA VOLT



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2005 FALL BASE CASE, TRIAL #6
6 CYC 3PH NEAR JACINTO 230 KV
TRIP JACINTO-CHINA 230, JACINTO TX
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CHNL# 188: CVAR PID-206 G1] 4.0000 -1.000
CHNL# 198: CETRM PID-206 G1] 1.2000 0.20000
CHNL# 30: CPOWR BUS 97901 MACH '1 '] 4.0000 -1.000
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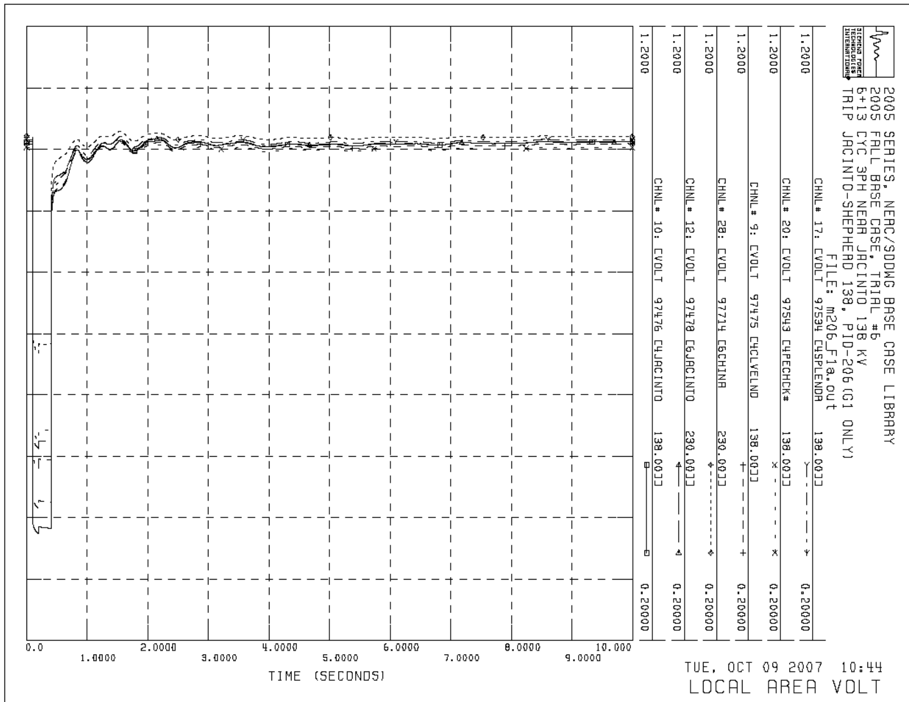
TIME (SECONDS)
TUE, OCT 09 2007 10:43
PID-206 GEN 1

FAULT- 1a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SHEPHERD 138, PID-206(G1 ONLY)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2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SHEPHERD 138, PID-206(G1 ONLY)
FILE: m206_f1a.out
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
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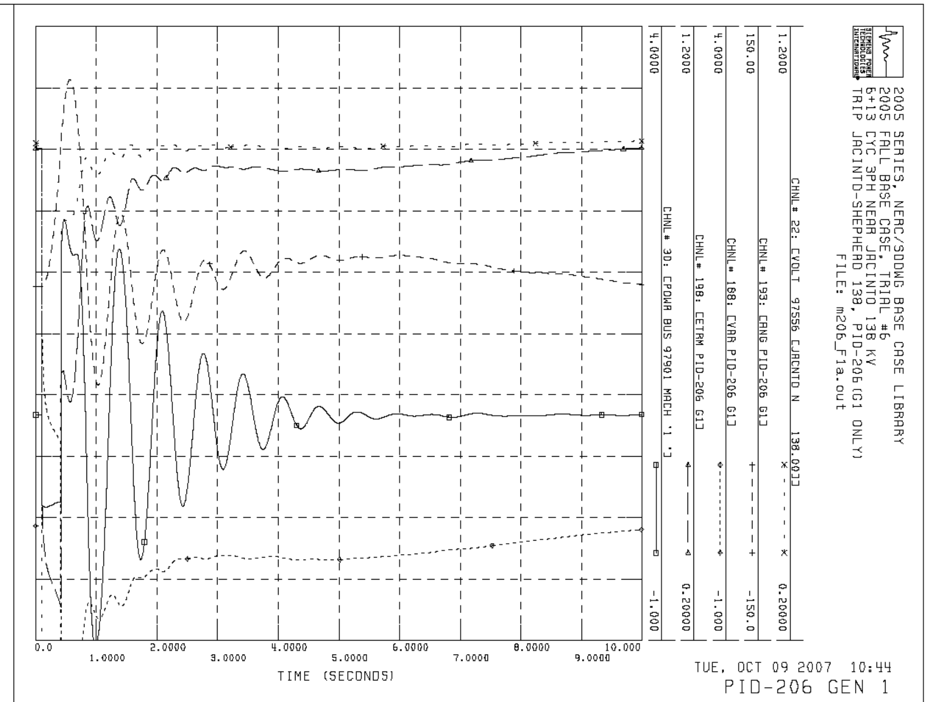
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SHEPHERD 138, PID-206(G1 ONLY)
FILE: m206_f1a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
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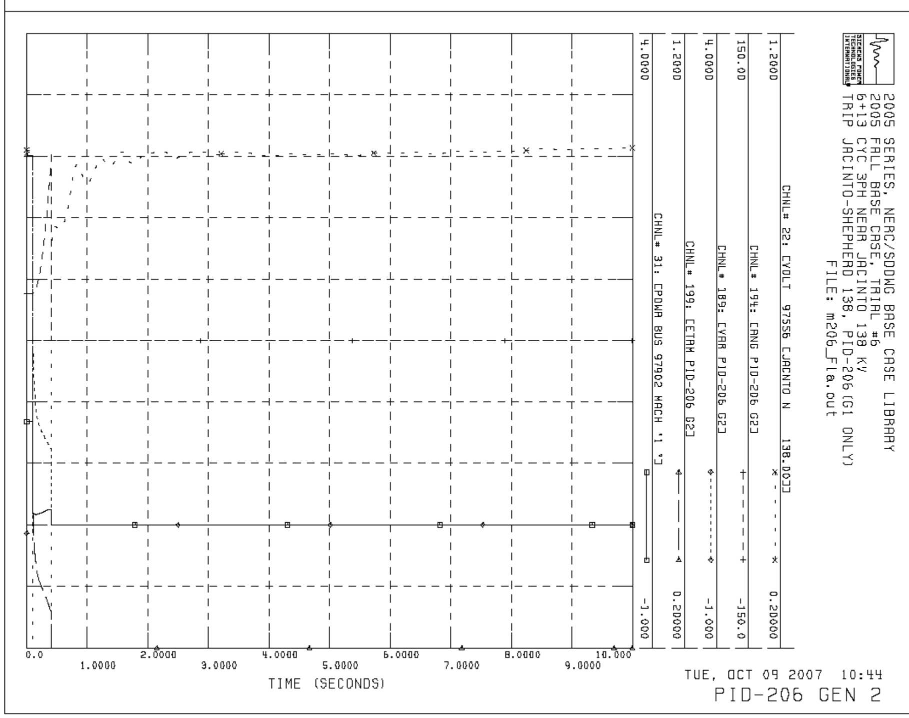
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SHEPHERD 138, PID-206(G1 ONLY)
FILE: m206_f1a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
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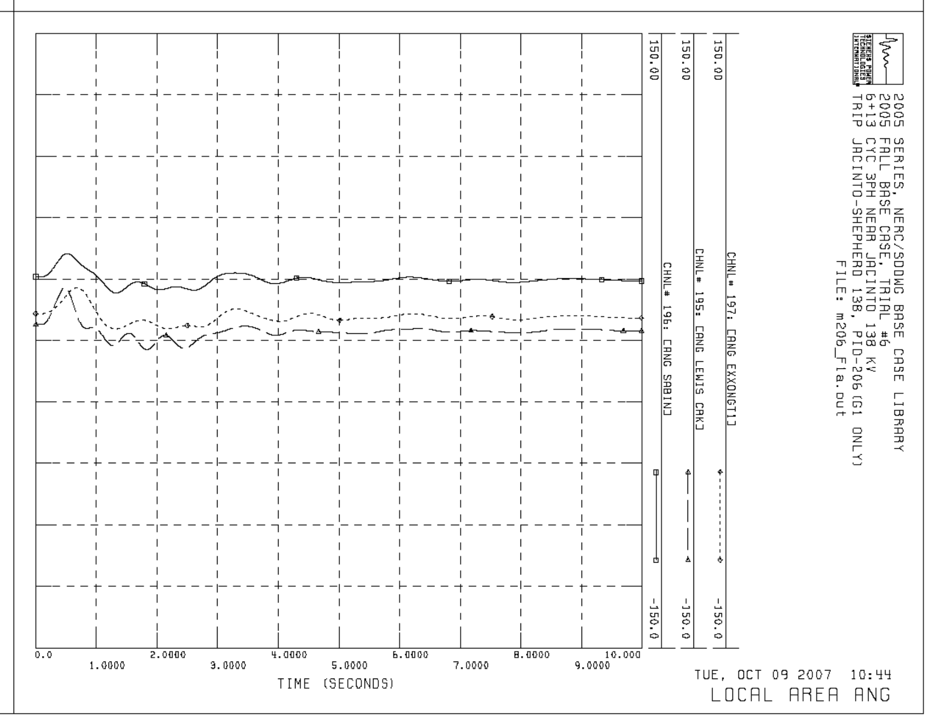
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SHEPHERD 138, PID-206(G1 ONLY)
FILE: m206_f1a.out
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CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
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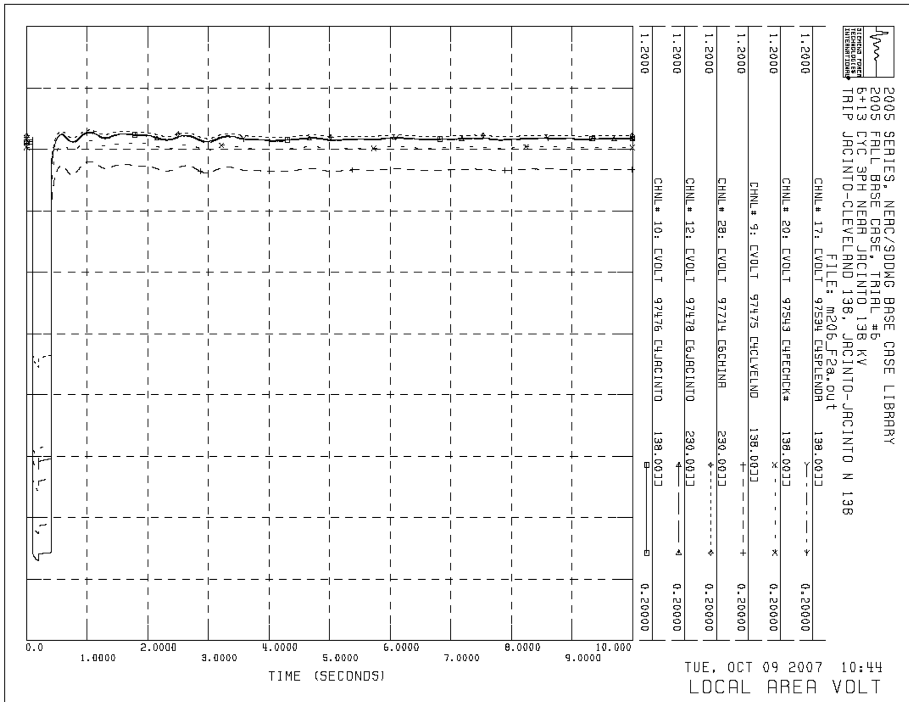
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 2a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-JACINTO N 138


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-JACINTO N 138
FILE: m206_f2a.out
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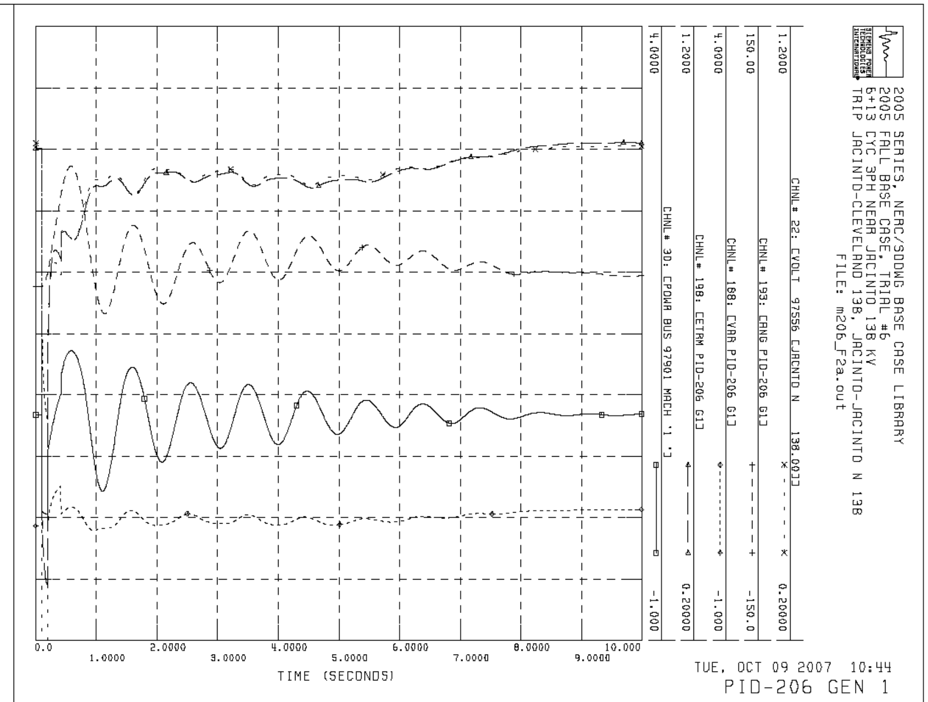
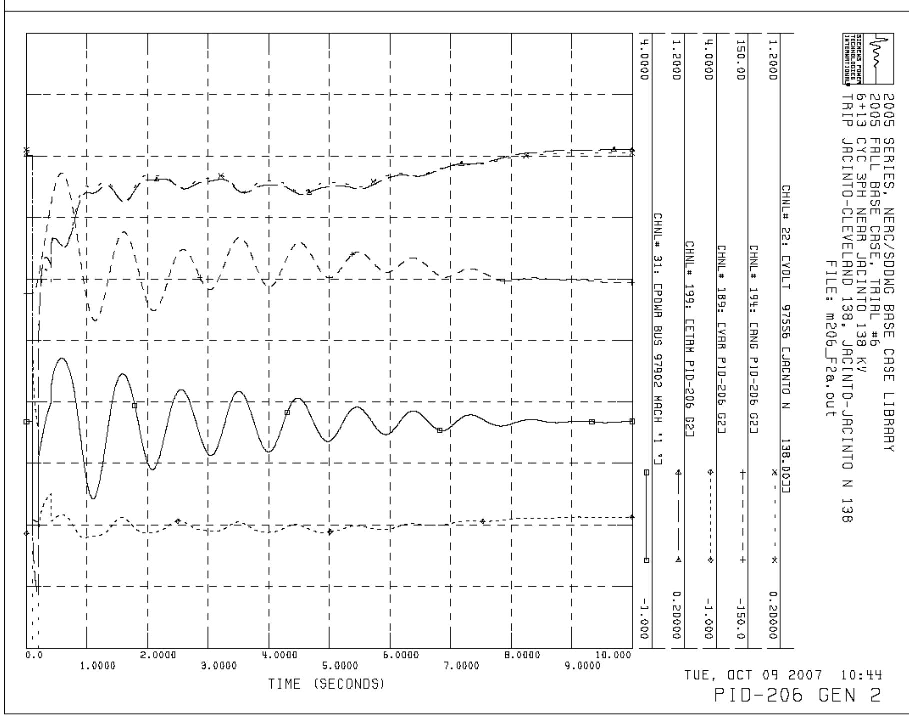
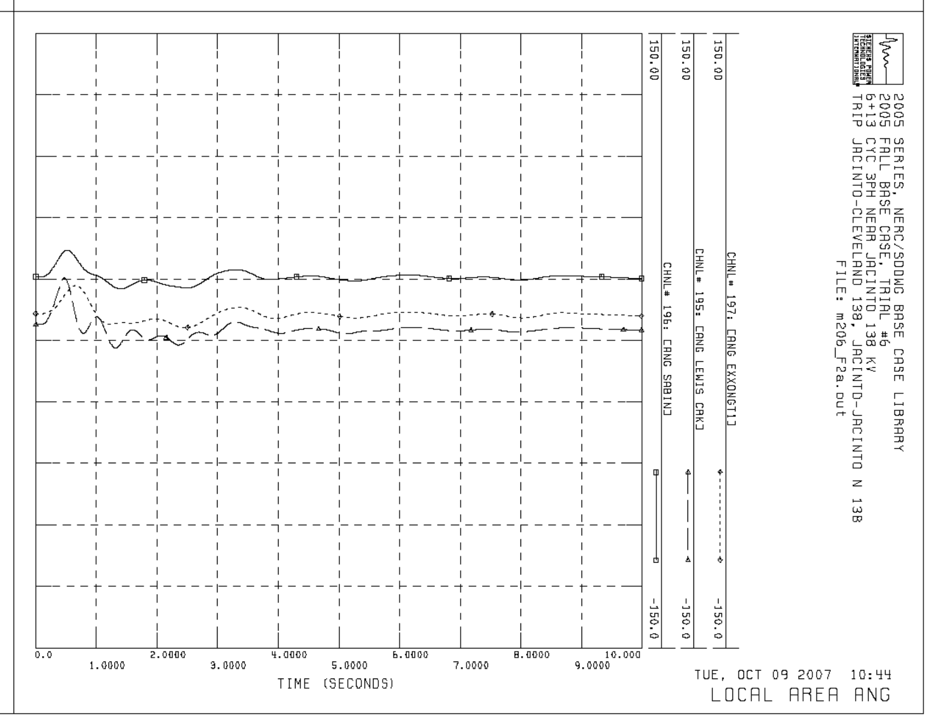
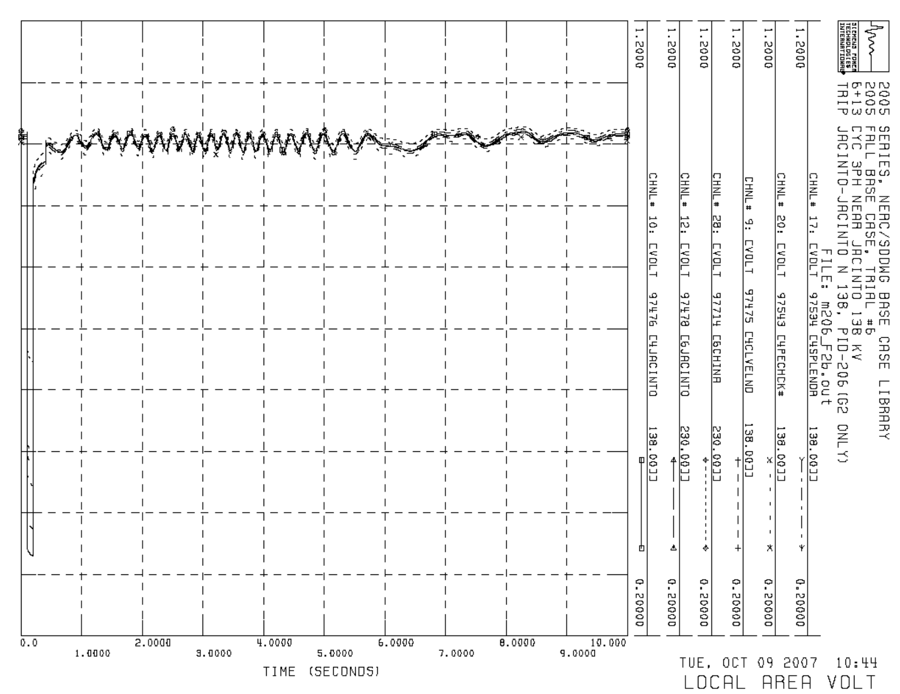
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 CHCLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-JACINTO N 138
FILE: m206_f2a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-JACINTO N 138
FILE: m206_f2a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-JACINTO N 138
FILE: m206_f2a.out
CHNL# 197: CANG EXXONGT1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 2b
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)


2005 SERIES, NERC/SDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
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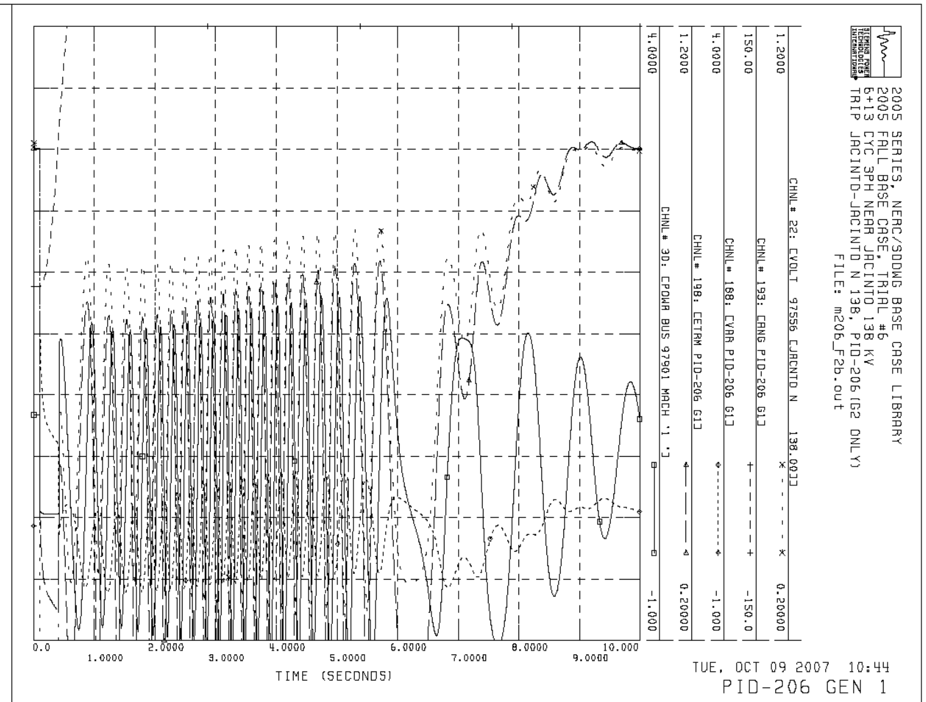
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_f2b.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
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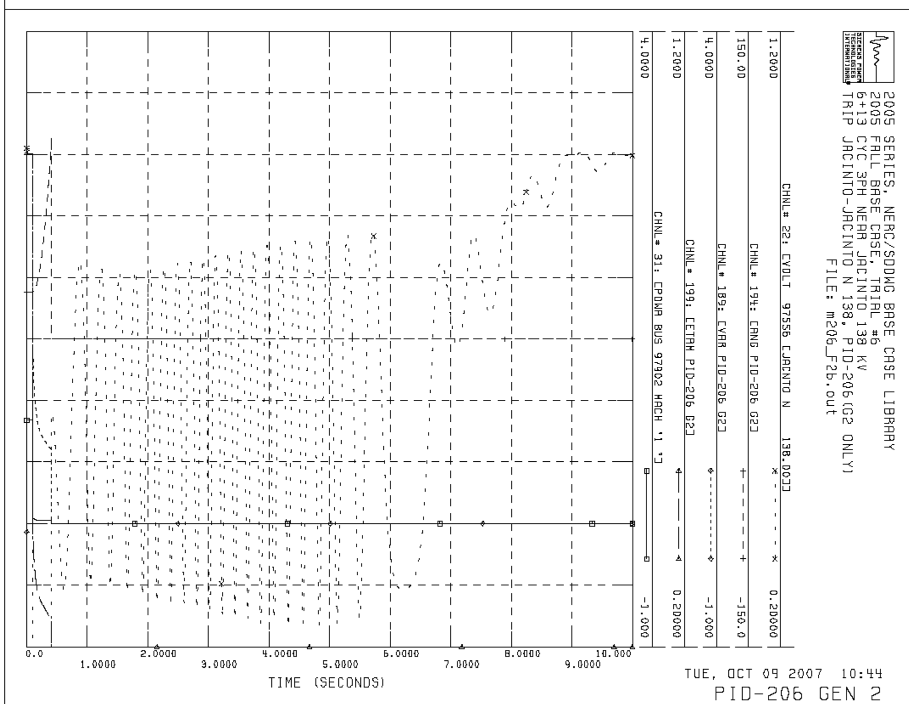
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1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2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_f2b.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
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4.0000 -1.000
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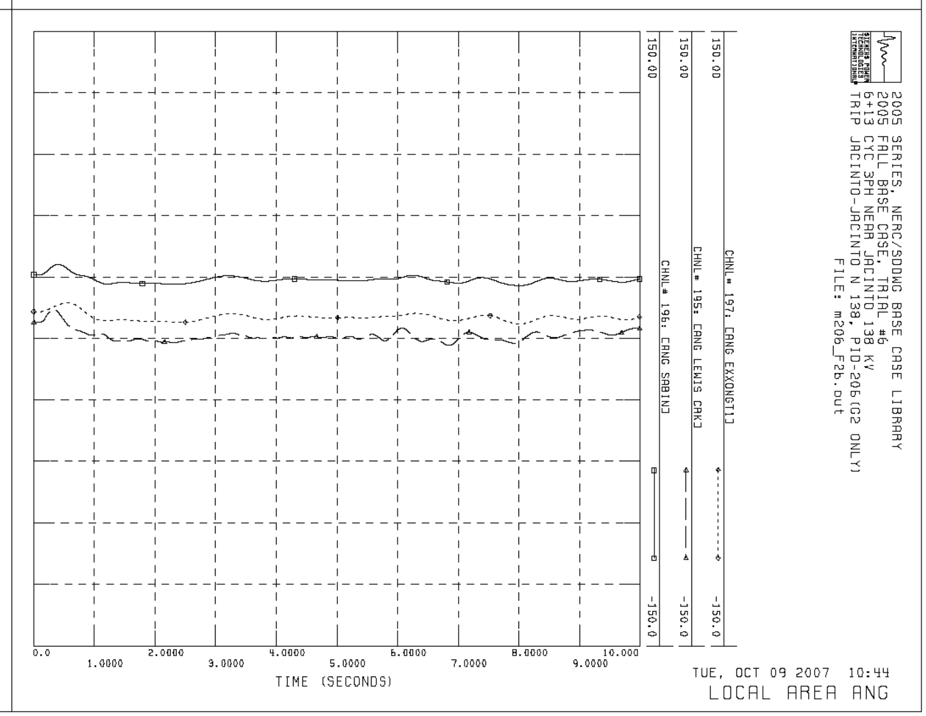
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_f2b.out
CHNL# 197: CANG EXXONG1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
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150.00 -150.0
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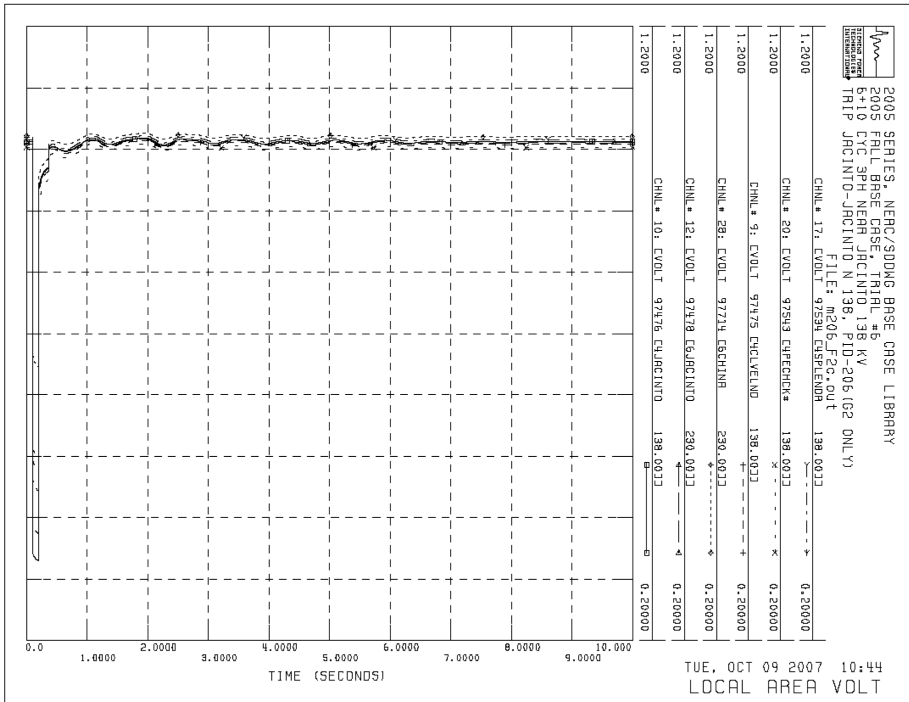
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 2c
6+10 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+10 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_F2c.out
CHNL# 17: CVOLT 97534 C4SPLENDR 138.00]
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
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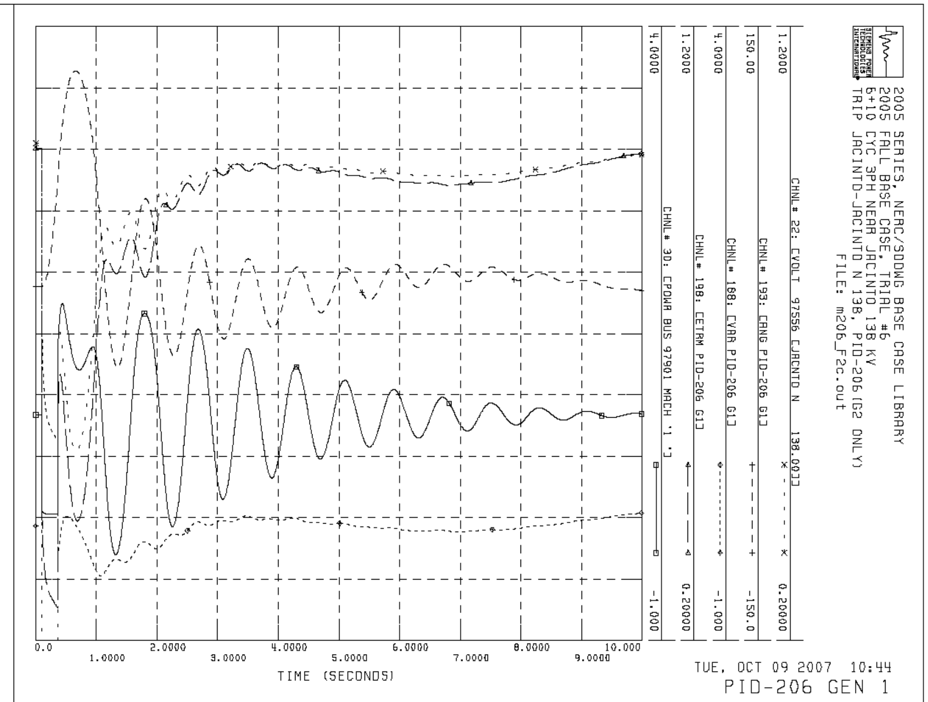
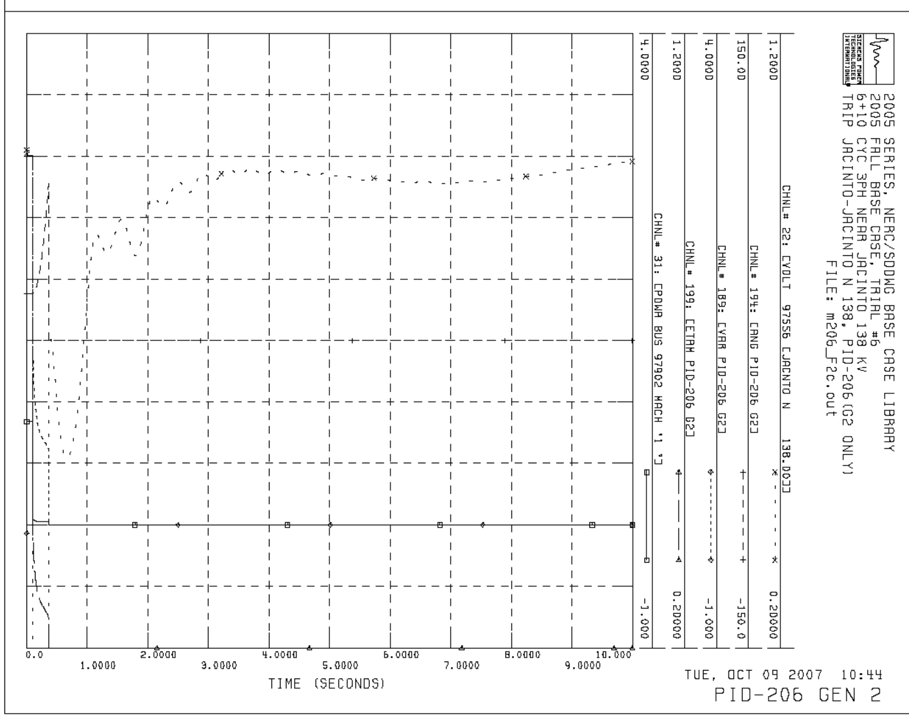
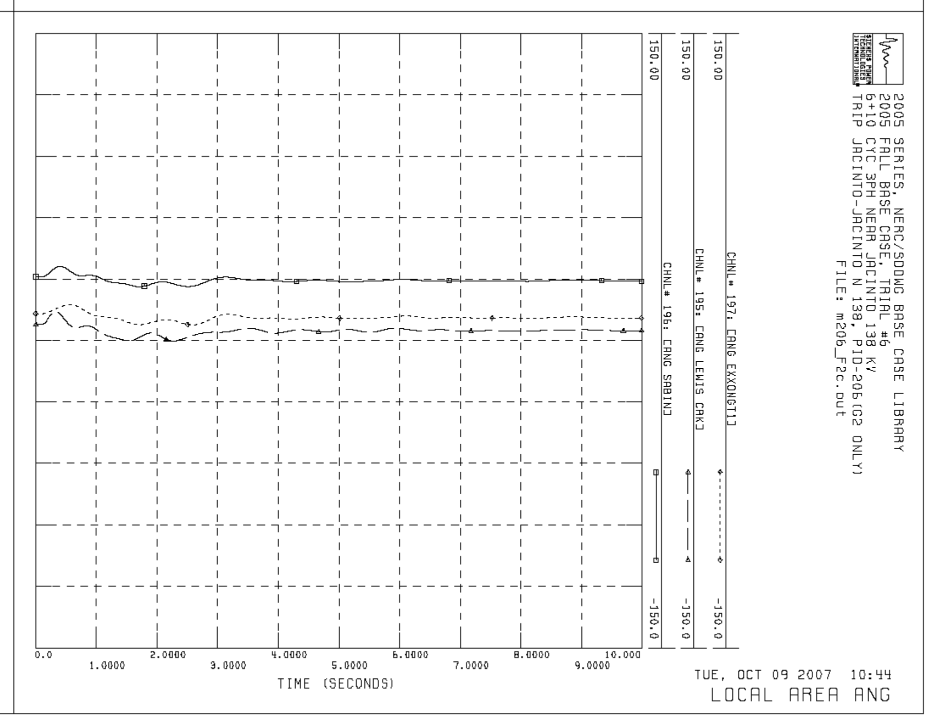
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+10 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_F2c.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+10 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_F2c.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+10 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-JACINTO N 138, PID-206(G2 ONLY)
FILE: m206_F2c.out
CHNL# 197: CANG EXXONGT1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
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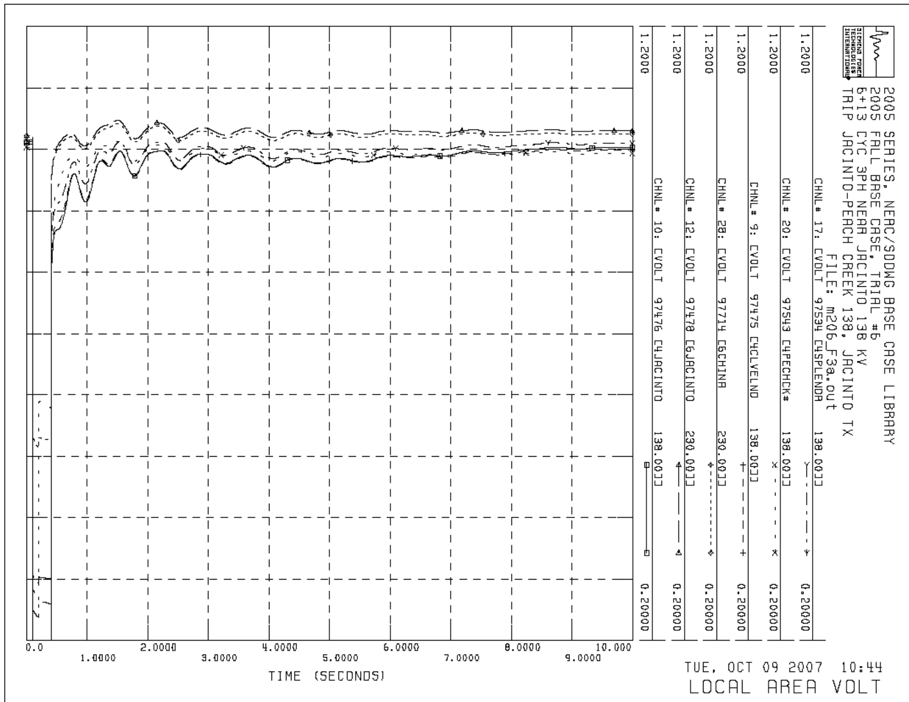
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 3a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138, JACINTO TX


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138, JACINTO TX
FILE: m206_F3a.out
CHNL# 17: CVOLT 97534 C4SPLENDA 138.00]
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
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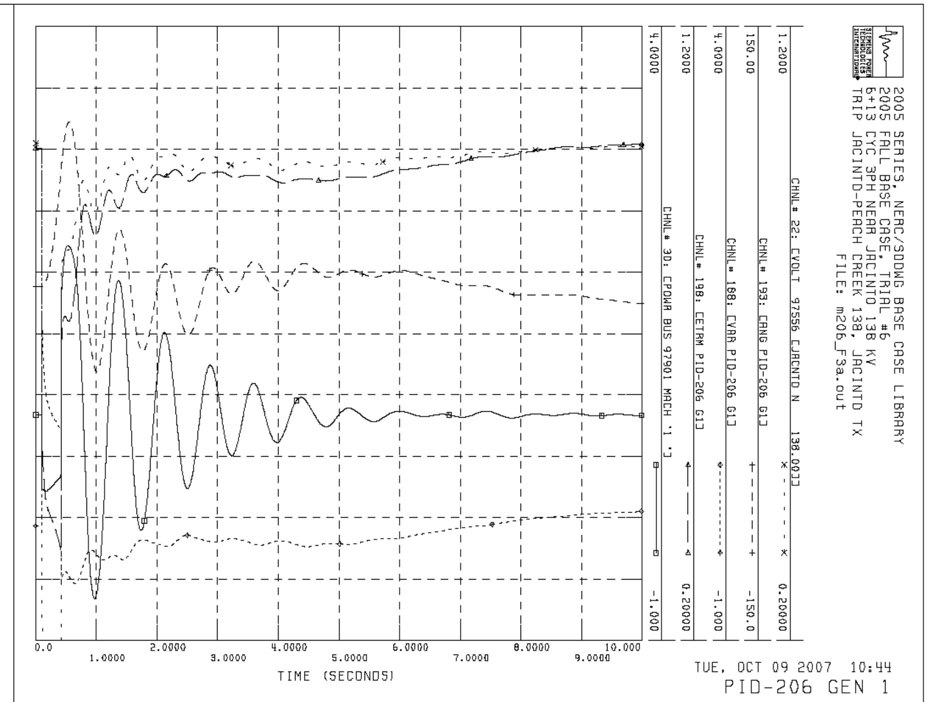
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138, JACINTO TX
FILE: m206_F3a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
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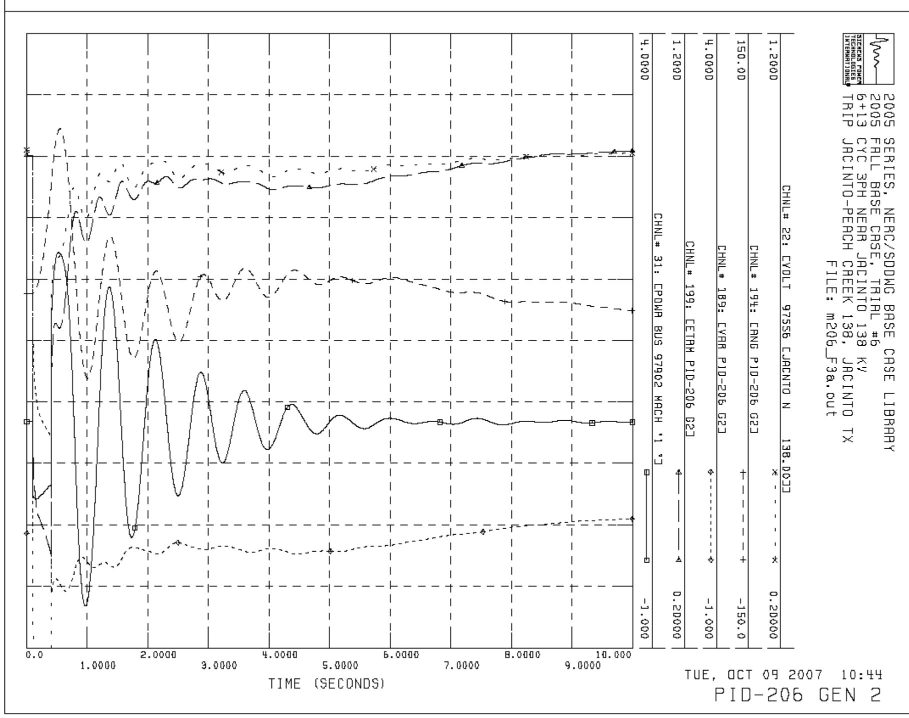
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138, JACINTO TX
FILE: m206_F3a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
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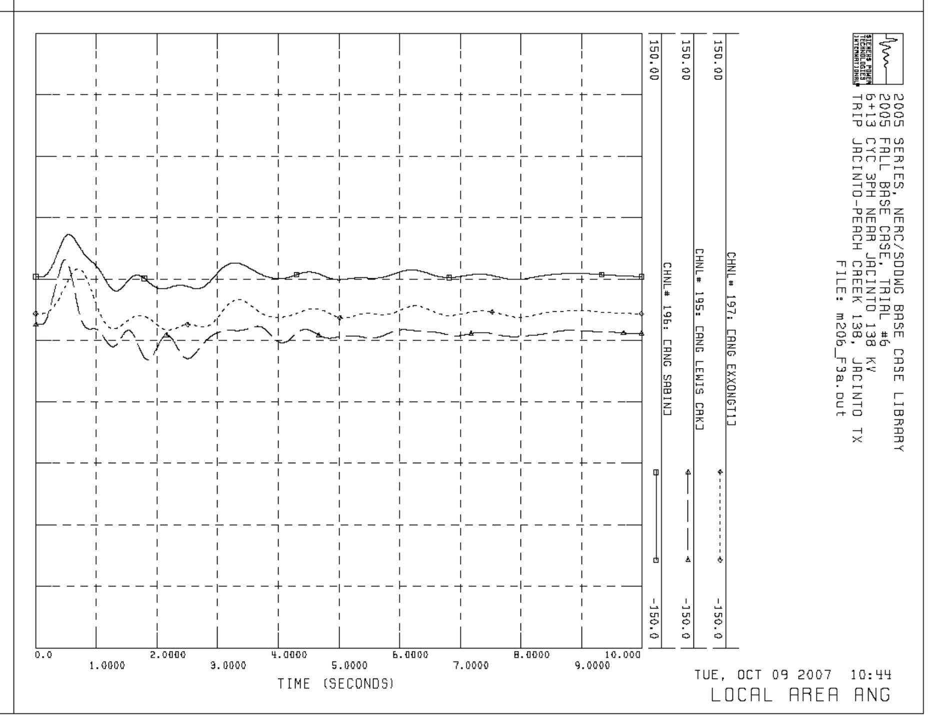
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-PEACH CREEK 138, JACINTO TX
FILE: m206_F3a.out
CHNL# 197: CANG EXXONGT1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
150.00 -150.0
150.00 -150.0
150.00 -150.0
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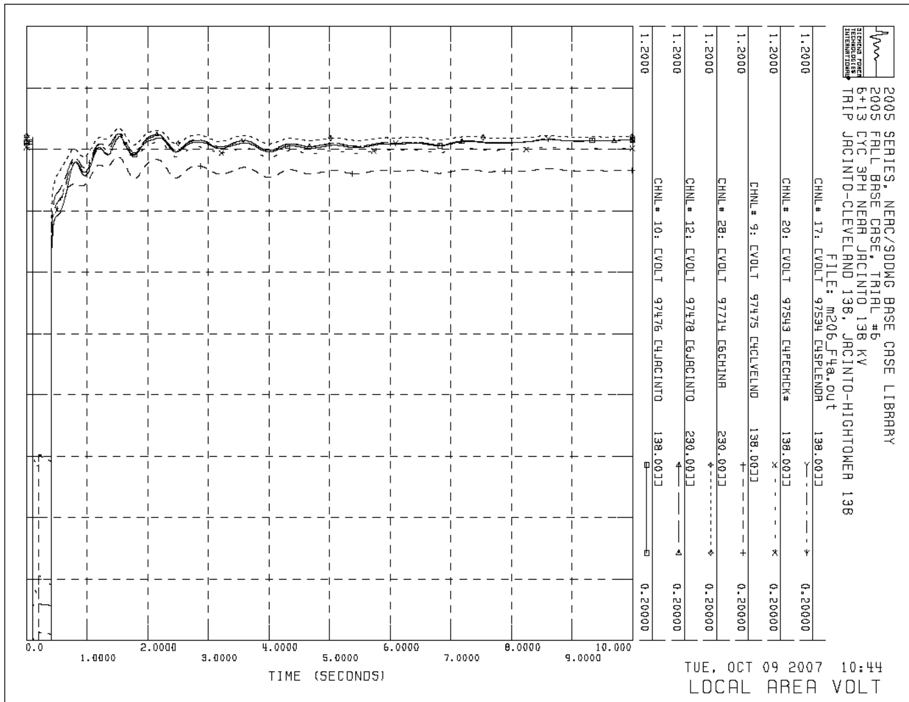
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 4a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-HIGHTOWER 138


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-HIGHTOWER 138
FILE: m206_f4a.out
CHNL# 17: [VOLT 97534 [4SPLENDA 138.00]] 1.2000 0.20000
CHNL# 20: [VOLT 97543 [4PECHCK# 138.00]] 1.2000 0.20000
CHNL# 9: [VOLT 97475 [4CLVELND 138.00]] 1.2000 0.20000
CHNL# 28: [VOLT 97714 [6CHINA 230.00]] 1.2000 0.20000
CHNL# 12: [VOLT 97478 [6JACINTO 230.00]] 1.2000 0.20000
CHNL# 10: [VOLT 97476 [4JACINTO 138.00]] 1.2000 0.20000
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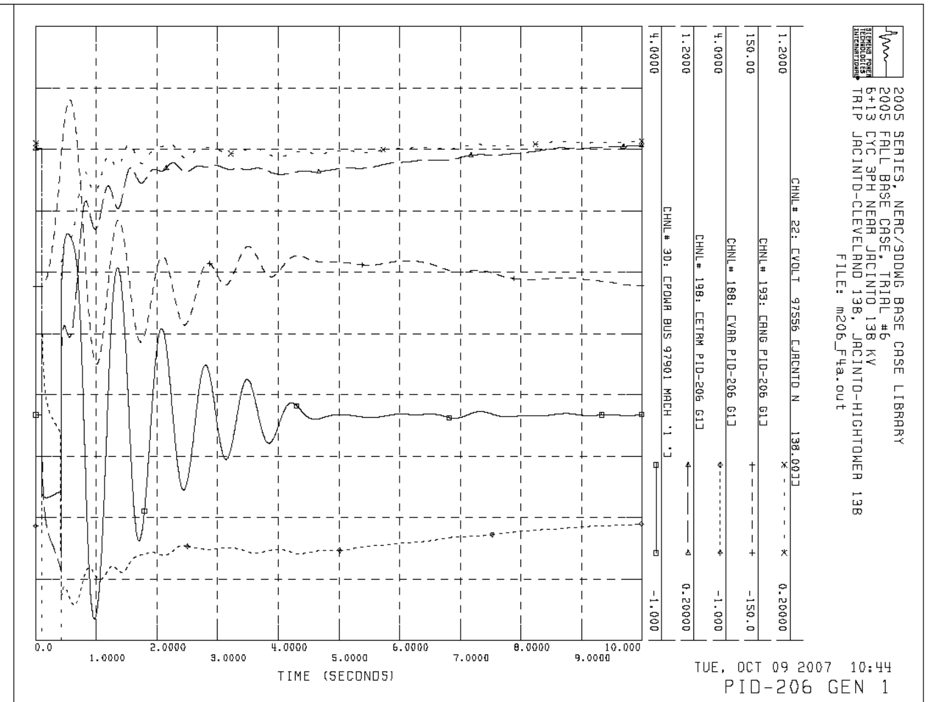
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-HIGHTOWER 138
FILE: m206_f4a.out
CHNL# 22: [VOLT 97556 [JACNTO N 138.00]] 1.2000 0.20000
CHNL# 193: [ANG PID-206 G1] 150.00 -150.0
CHNL# 188: [VAR PID-206 G1] 4.0000 -1.000
CHNL# 198: [ETRM PID-206 G1] 1.2000 0.20000
CHNL# 30: [POWR BUS 97901 MACH '1 '] 4.0000 -1.000
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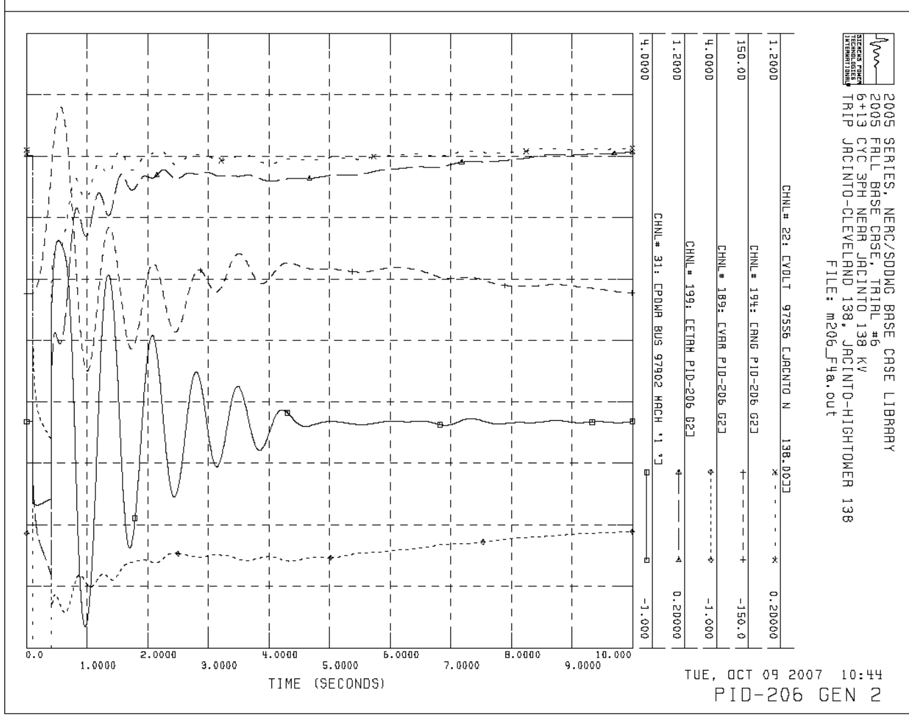
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-HIGHTOWER 138
FILE: m206_f4a.out
CHNL# 22: [VOLT 97556 [JACNTO N 138.00]] 1.2000 0.20000
CHNL# 194: [ANG PID-206 G2] 150.00 -150.0
CHNL# 189: [VAR PID-206 G2] 4.0000 -1.000
CHNL# 199: [ETRM PID-206 G2] 1.2000 0.20000
CHNL# 31: [POWR BUS 97902 MACH '1 '] 4.0000 -1.000
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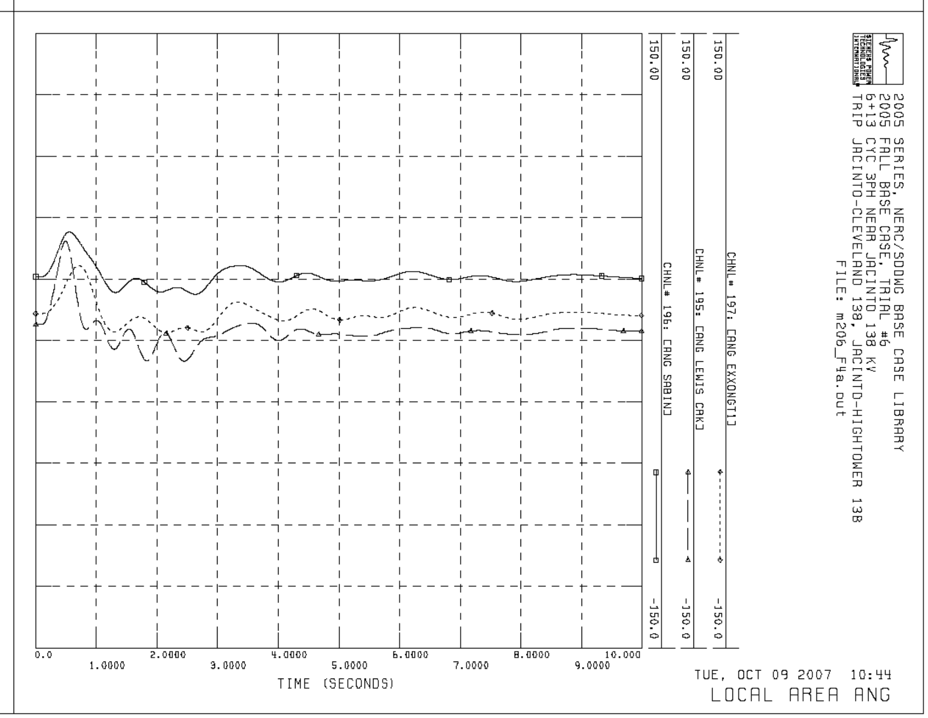
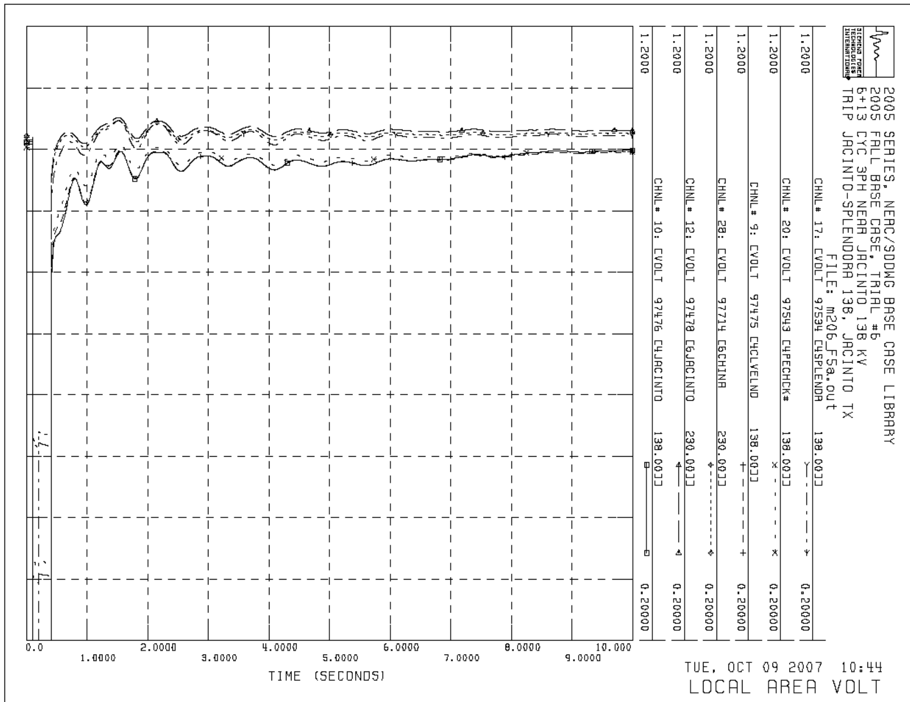
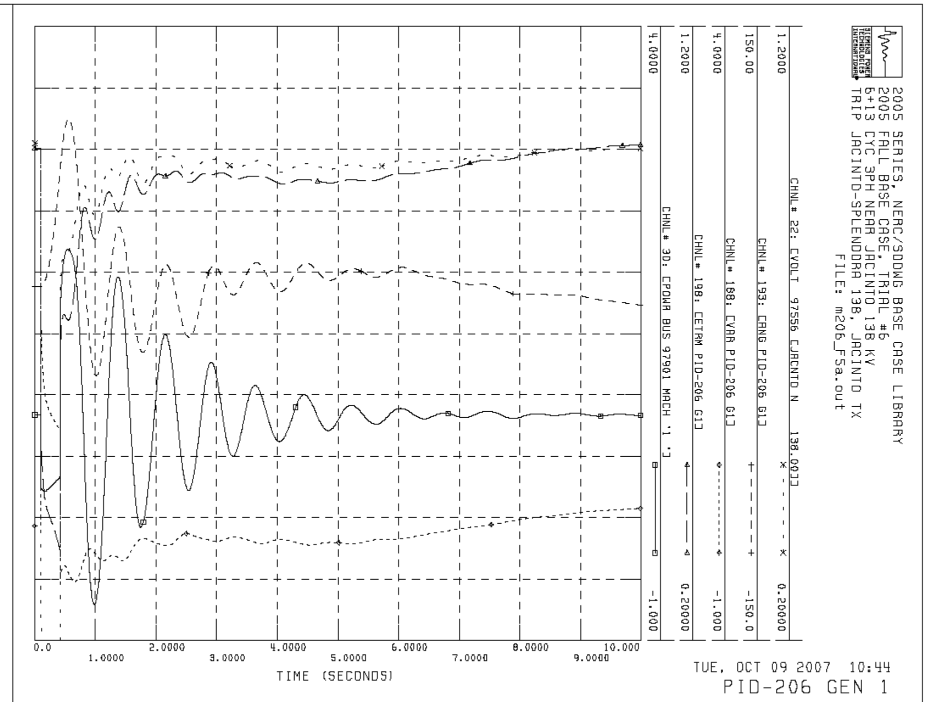
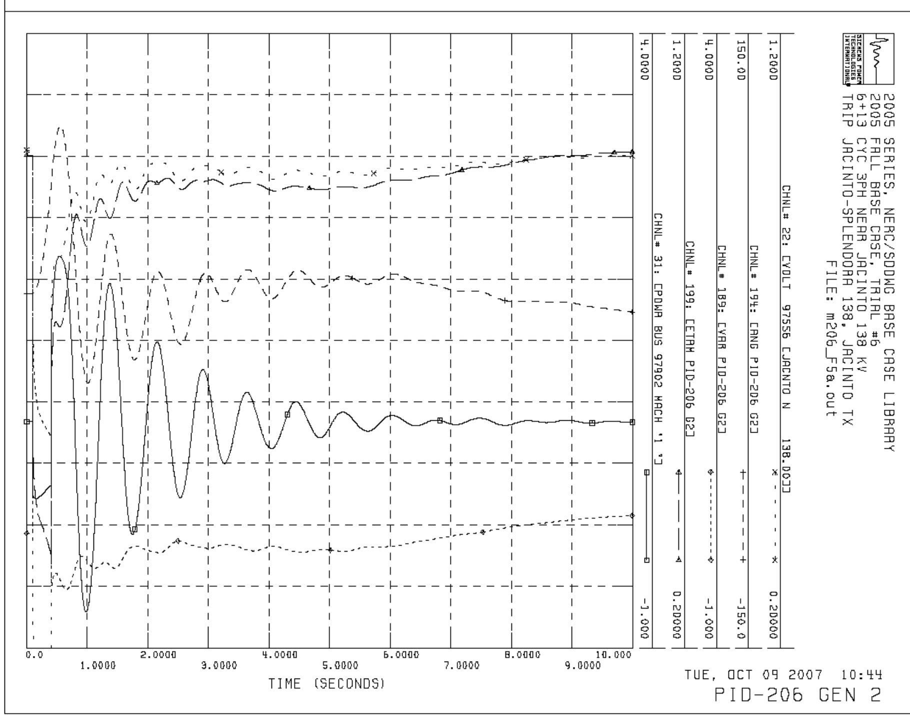
PID-206 GEN 2

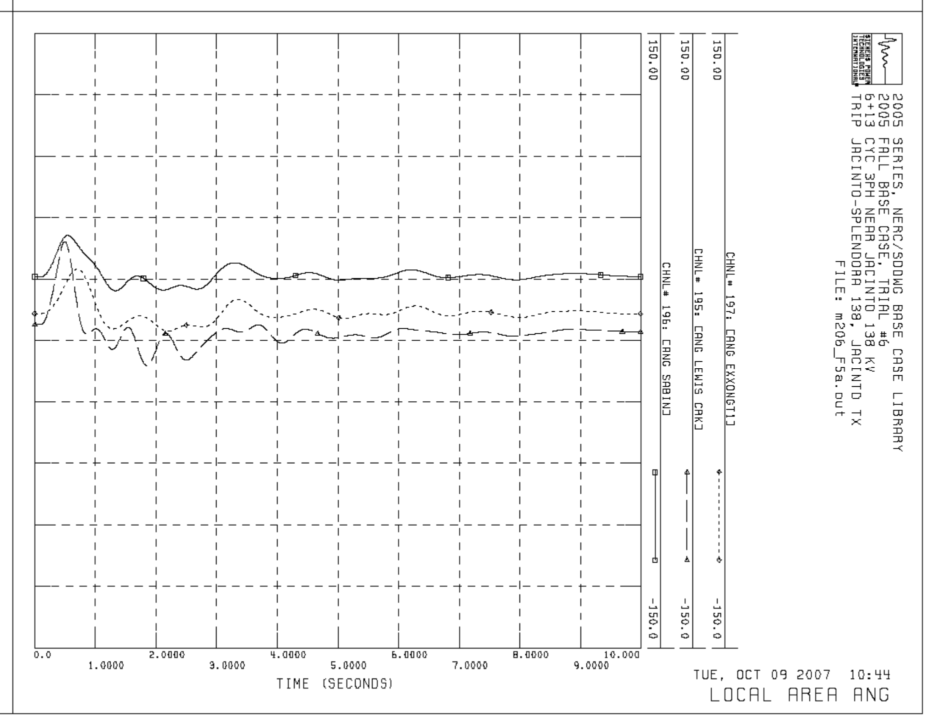

2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-CLEVELAND 138, JACINTO-HIGHTOWER 138
FILE: m206_f4a.out
CHNL# 197: [ANG EXXONG1] 150.00 -150.0
CHNL# 195: [ANG LEWIS CRK] 150.00 -150.0
CHNL# 196: [ANG SABIN] 150.00 -150.0
0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 5a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138, JACINTO TX

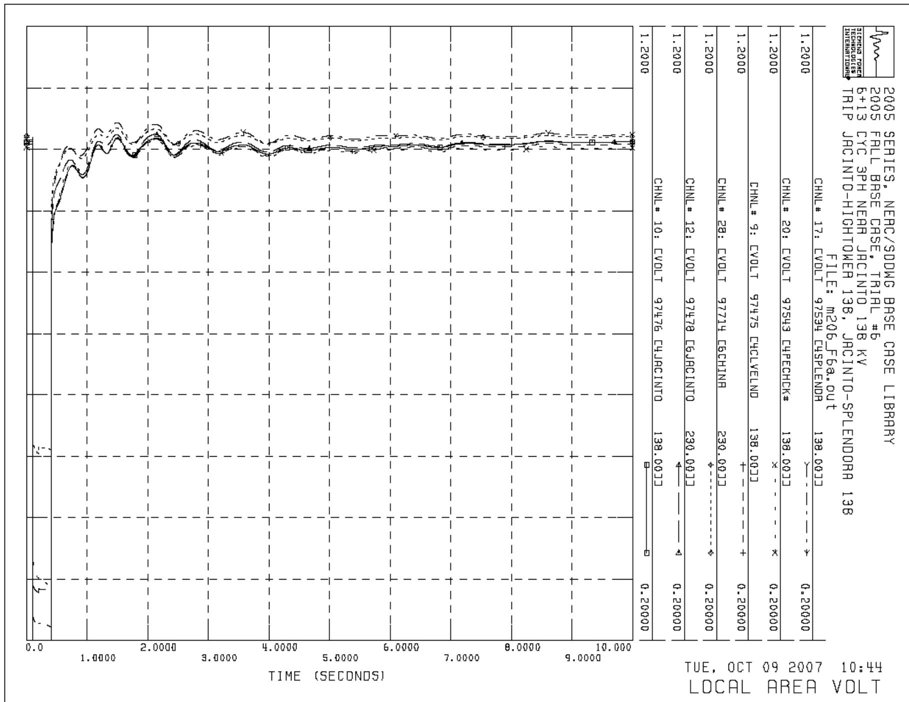

2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138, JACINTO TX
FILE: m206_f5a.out
CHNL# 17: CVOLT 97534 C4SPLENDA 138.00]
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138, JACINTO TX
FILE: m206_f5a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1

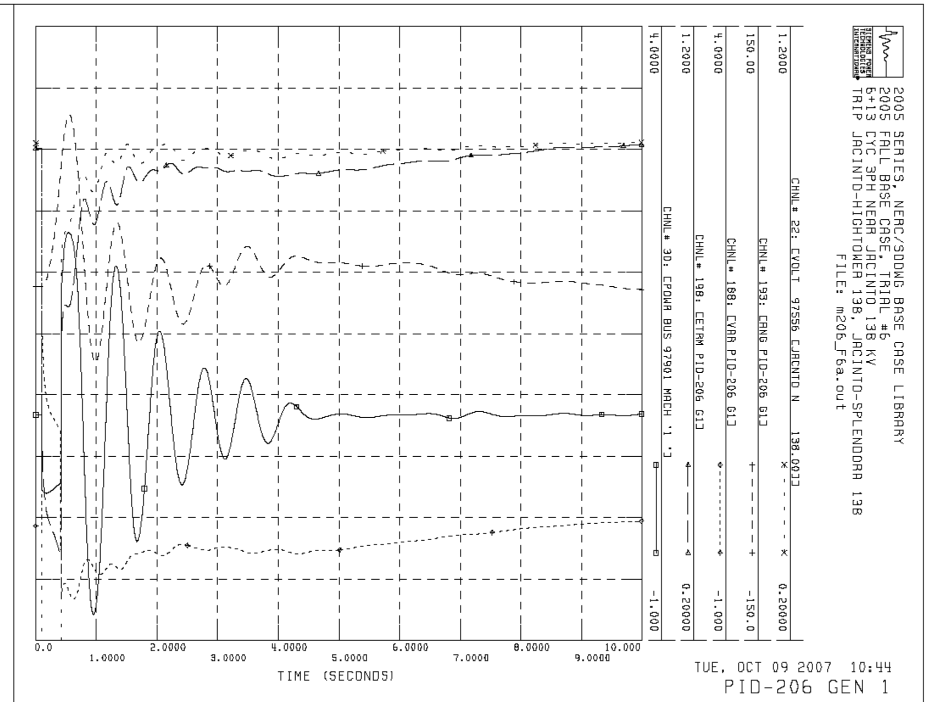

2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138, JACINTO TX
FILE: m206_f5a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2


2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-SPLENDORA 138, JACINTO TX
FILE: m206_f5a.out
CHNL# 197: CANG EXXONG1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

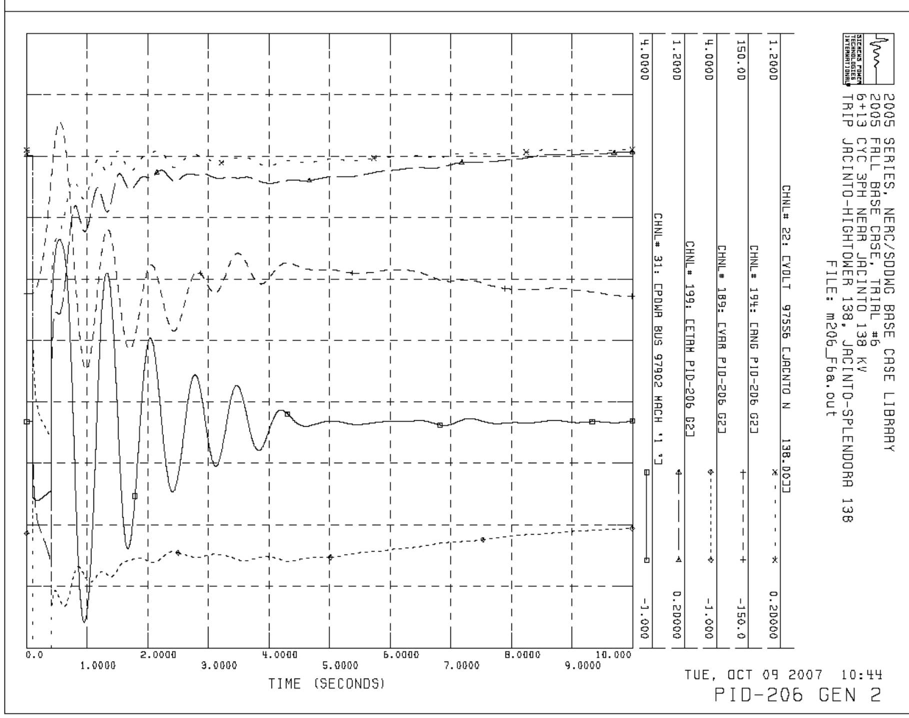
FAULT- 6a
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138, JACINTO-SPLENDORA 138



2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138, JACINTO-SPLENDORA 138
FILE: m206_f6a.out
CHNL# 17: CVOLT 97534 C4SPLENDA 138.00]
CHNL# 20: CVOLT 97543 C4PECHCK# 138.00]
CHNL# 9: CVOLT 97475 C4CLVELND 138.00]
CHNL# 28: CVOLT 97714 C6CHINA 230.00]
CHNL# 12: CVOLT 97478 C6JACINTO 230.00]
CHNL# 10: CVOLT 97476 C4JACINTO 138.00]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA VOLT



2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138, JACINTO-SPLENDORA 138
FILE: m206_f6a.out
CHNL# 22: CVOLT 97556 CJACNTO N 138.00]
CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
CHNL# 198: CETRM PID-206 G1]
CHNL# 30: CPOWR BUS 97901 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 1



2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138, JACINTO-SPLENDORA 138
FILE: m206_f6a.out
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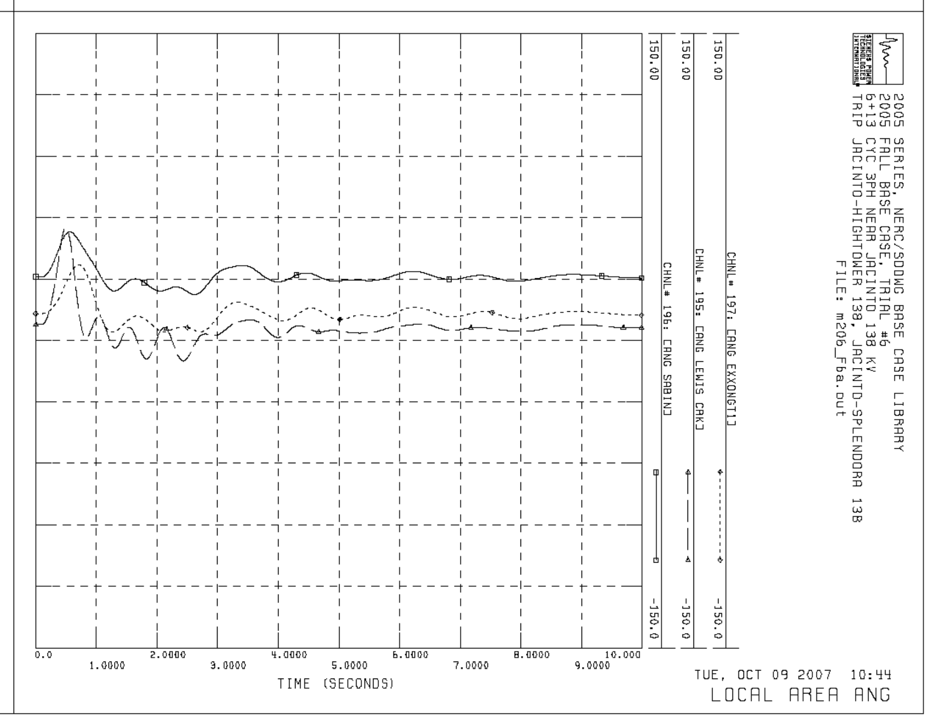
CHNL# 194: CANG PID-206 G2]
CHNL# 189: CVAR PID-206 G2]
CHNL# 199: CETRM PID-206 G2]
CHNL# 31: CPOWR BUS 97902 MACH '1 ']
TIME (SECONDS)
TUE, OCT 09 2007 10:44
PID-206 GEN 2



2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH NEAR JACINTO 138 KV
TRIP JACINTO-HIGHTOWER 138, JACINTO-SPLENDORA 138
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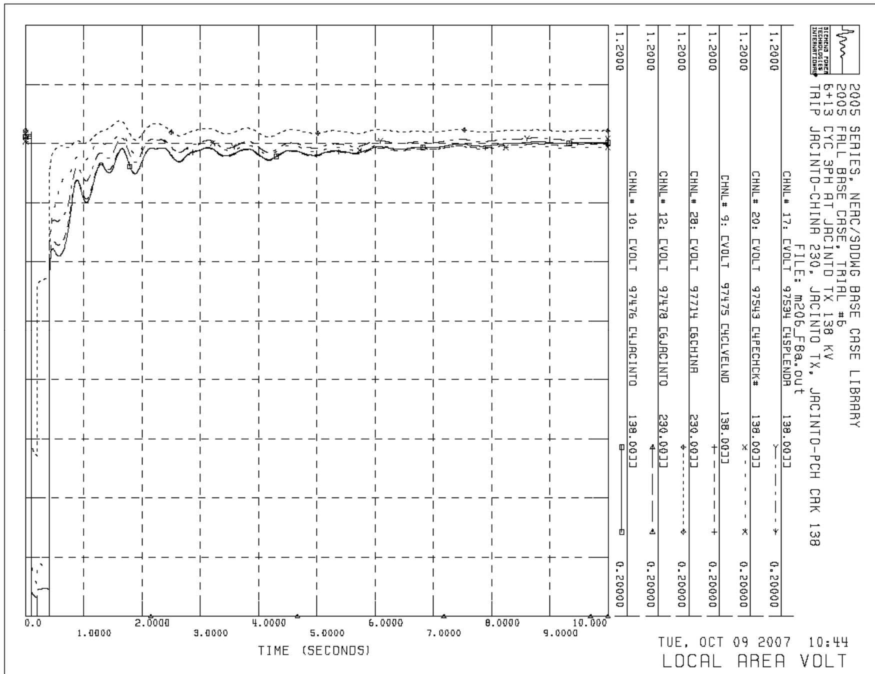
CHNL# 197: CANG EXXONGT1]
CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:44
LOCAL AREA ANG

FAULT- 8a
6+13 CYC 3PH AT JACINTO TX 138 KV
TRIP JACINTO-CHINA 230, JACINTO TX, JACINTO-PCH CRK 138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2005 FALL BASE CASE, TRIAL #6
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TRIP JACINTO-CHINA 230, JACINTO TX, JACINTO-PCH CRK 138
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CHNL# 20: CVOLT 97543 C4PECHCK# 138.0]
CHNL# 9: CVOLT 97475 C4CLVELND 138.0]
CHNL# 28: CVOLT 97714 C6CHINA 230.0]
CHNL# 12: CVOLT 97478 C6JACINTO 230.0]
CHNL# 10: CVOLT 97476 C4JACINTO 138.0]
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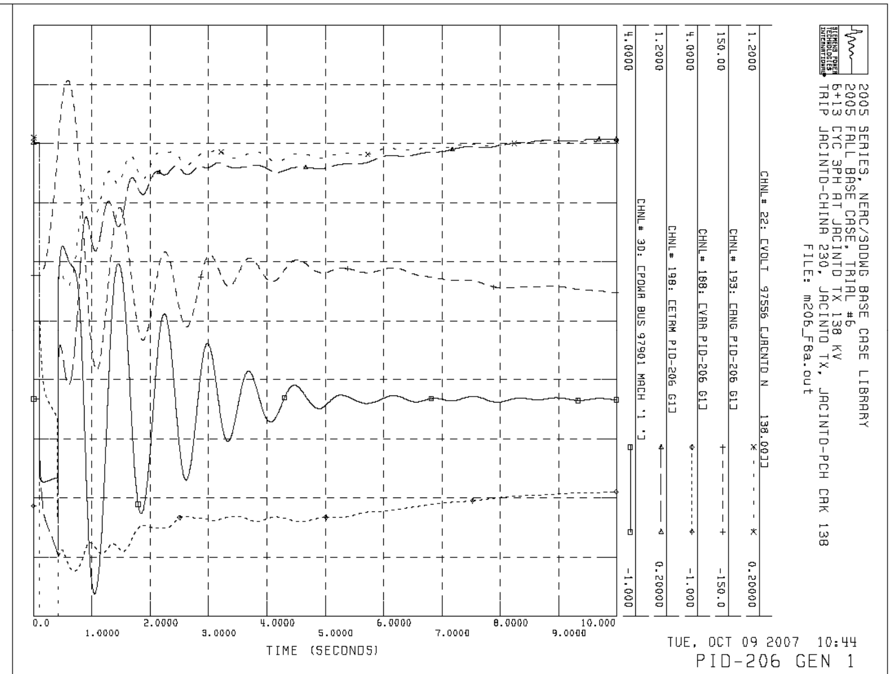
LOCAL AREA VOLT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2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH AT JACINTO TX 138 KV
TRIP JACINTO-CHINA 230, JACINTO TX, JACINTO-PCH CRK 138
FILE: m206_F8a.out
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CHNL# 193: CANG PID-206 G1]
CHNL# 188: CVAR PID-206 G1]
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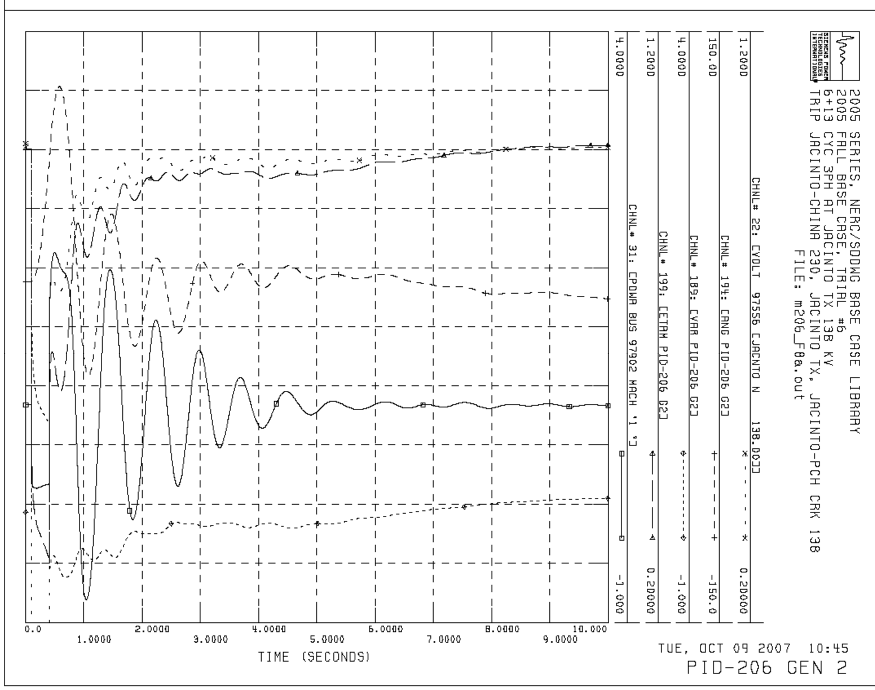
PID-206 GEN 1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2005 FALL BASE CASE, TRIAL #6
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TRIP JACINTO-CHINA 230, JACINTO TX, JACINTO-PCH CRK 138
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TIME (SECONDS)
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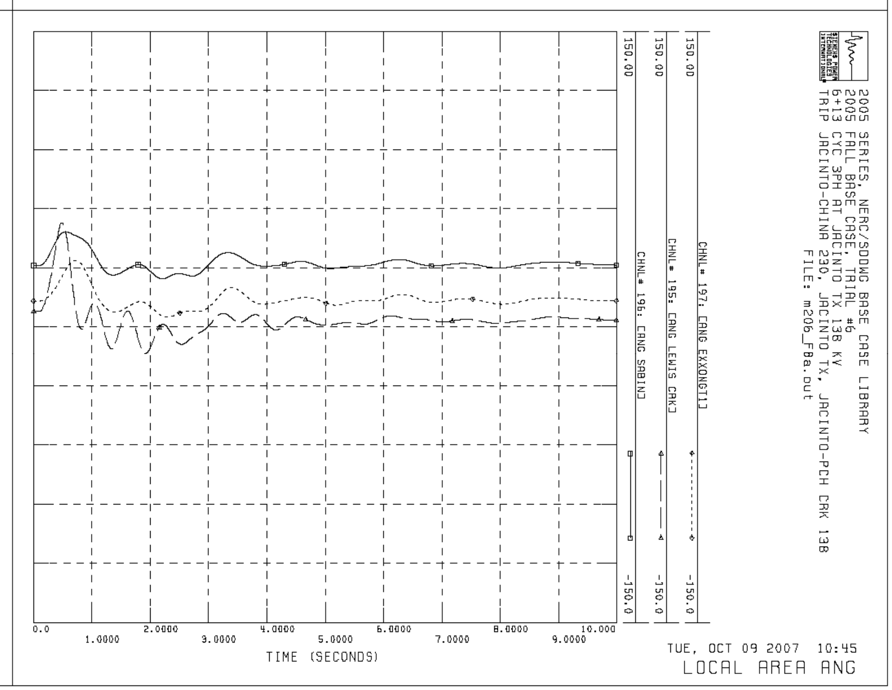
PID-206 GEN 2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2005 FALL BASE CASE, TRIAL #6
6+13 CYC 3PH AT JACINTO TX 138 KV
TRIP JACINTO-CHINA 230, JACINTO TX, JACINTO-PCH CRK 138
FILE: m206_F8a.out
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CHNL# 195: CANG LEWIS CRK]
CHNL# 196: CANG SABIN]
TIME (SECONDS)
TUE, OCT 09 2007 10:45
LOCAL AREA ANG