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August 9, 2000

Mr. Mike McBride
Ridley Electric Co Inc.
5800 Court Street Road
Syracuse, NY 13206

Re: **Power System Study**

HMT Job # 1717

Dear Mike:

Attached for your records, please find our calculations and TCC curves for the above referenced study.

Thank you for this opportunity to be of service. If you have any questions please feel free to contact me.

Sincerely

HMT, Inc.



William Dussing, PE
Sr. Project Engineer

PROTECTIVE DEVICE COORDINATION
STUDY

FOR

**STATE UNIVERSITY OF
NEW YORK AT
OSWEGO
PHASE II**

OSWEGO, NEW YORK

JULY 2000

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1.0 Executive Summary

1.1 Introduction

This report contains the results of a Short Circuit Study, Protective Device Coordination and Load Flow Study Phase II of the SUNY Oswego PCB Project. Sections 2, 3 and 4 deal with the System Data, Short Circuit Study and Protective Device Coordination Study respectively. The Short Circuit Study computer print outs are included in Section 5. The computer model one-line diagram is included under Section 6.

This study was performed in accordance with applicable ANSI, NEC and IEEE Standards and based upon data furnished by the customer and a previous report.

1.2 Results and Recommendations

Recommendations made as the result of the coordination study are listed on the following page.

The coordination curves and analysis are located in Section 4. Tabulated recommended protective device settings are also included in section 4.

RESULTS AND RECOMMENDATIONS

1. Culkin Hall & Penfield Library. The Primary Phase Overcurrent Device does not coordinate with the secondary main. The size of the transformers (2000 kVA) located at these buildings are 40% of the main (5000 kVA) transformer. Setting the secondary main breaker to get full output from the transformer and to coordinate with the downstream feeders, coordination between the primary and secondary transformer devices is sacrificed. Since both devices are in line with each other and tripping both devices does not effect other branches of the system, this misscoordination is acceptable.
2. Culkin Hall & Penfield Library's largest feeder breaker's instantaneous functions should be set to Minimum Setting for proper coordination with the secondary main breaker.
3. Lanigan Hall Secondary Main Breaker is smaller than required for a 1000 kVA transformer. This device limits the transformer output to 720 kVA. It is also recommended that the LSI programmer be replaced with an LS model for better coordination with the downstream devices.
4. Mahar Hall Secondary Main Breaker's LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.
5. Hewitt-1 Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices
6. Hewitt-2 Incoming Primary Phase Overcurrent Device does not coordinate with the secondary main breaker. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.
7. Hewitt-2's largest feeder breaker's instantaneous functions should be set to Minimum Setting for proper coordination with the secondary main breaker.
8. Tyler-1 Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.
9. Tyler-1's largest feeder breaker's instantaneous functions should be set to not more than 5.0X for proper coordination with the secondary main breaker.
10. Tyler-2 Incoming Primary Phase Overcurrent Device does not coordinate with the secondary main breaker. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.
11. Seneca Hall Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.

continued

RESULTS AND RECOMMENDATIONS
(continued)

12. Pathfinder Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.
13. Pathfinder's largest feeder breaker's instantaneous functions should be set to not more than 7.5X (mid-setting)for proper coordination with the secondary main breaker.
14. Onondaga Hall Incoming Primary Phase Overcurrent Device does not coordinate with the existing secondary main fuse. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.
15. Oneida Hall Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.
16. Cayuga Hall Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices
17. Little Page Secondary Main Breaker LSI programmer is recommended to be replaced with a LS model for better coordination with the downstream devices.
18. Little Page's largest feeder breaker's instantaneous functions should be set to not more than 7.5X (mid-setting)for proper coordination with the secondary main breaker.

2.0 SYSTEM DATA

2.1 Introduction

System Data was provided by Ridley Electric and Cutler Hammer. Where data was unavailable, best engineering estimates were used.

2.2 Utility Data

Utility data was obtained from the previous study performed in 1999.

Three Phase Symmetrical Fault @ 34.5 kV = 376 MVA

Line to Ground Symmetrical Fault 34.5 kV = 125 MVA

Three Phase X/R Ratio is 8

Single Line to Ground X/R Ratio is 11

2.3 Upstream Overcurrent Device

13.2kV Switchgear Main Devices (A Bus & B Bus)

GE Multilin SR750

Phase 0.29 AT, 6 TD Ext. Inverse
 1200:5 CT Ratio

Neutral: 0.05 AT, 5 TD Ext. Inverse
 1200:5 CT Ratio

3.0 SHORT CIRCUIT STUDY

3.1 Objective

The short circuit study was performed for two purposes:

- a. To evaluate the short circuit capabilities of the main protective devices applied at the 13.2 kV, 480V & 208V buses.
- b. To provide the basic data required for determining correct fuse sizes, and circuit breaker settings.

3.2 Results and recommendations

- a. The power system interconnections, bus and branch number designations as used in the study, are shown on the PDC Study Model one line diagram, included under section 6.
- b. Section 5 contains the computer printout of the short circuit analysis.
- c. This section contains the computer printouts for the Device Evaluation. This printout provides a listing of the devices included in the study, the bus location at which they are applied and their short circuit ratings contrasted to the calculated short circuit duties.

The table on the following pages list each device reviewed by this study. Devices are noted as Satisfactory, Recommend Replacement and Consider Replacement.

Based on the results of the study:

All devices were found to be satisfactory.

CAYUGA HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Cayuga Main Bkr	208	Cutler-Hammer DS-416H Air Circuit Breaker	65 kA	65kA	47.8 kA	62.6 kA	Satisfactory
Cayuga Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory
Cayuga Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory
Cayuga Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory

CULKIN HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Culkin Main Bkr	480	Cutler-Hammer DS-632 Air Circuit Breaker	65 kA	65kA	36.3 kA	48.2 kA	Satisfactory
Culkin Feeder	480	Cutler-Hammer FD Provision					
Culkin Feeder	480	Cutler-Hammer HFD Frame Bkr	65 kA	65 kA	36.3 kA	48.2 kA	Satisfactory
Culkin Feeder	480	Cutler-Hammer HJD Frame Bkr	65 kA	65 kA	36.3 kA	48.2 kA	Satisfactory
Culkin Feeder	480	Cutler-Hammer HKD Frame Bkr	65 kA	65 kA	36.3 kA	48.2 kA	Satisfactory
Culkin Feeder	480	Cutler-Hammer HMDL Frame Bkr	65 kA	65 kA	36.3 kA	48.2 kA	Satisfactory

HEWITT UNION

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Hewitt 1 Main Bkr	208	Cutler-Hammer DS-632 Air Circuit Breaker	65 kA	65kA	47.8 kA	62.6 kA	Satisfactory
Hewitt 1 Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory
Hewitt 1 Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory
Hewitt 1 Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory
Hewitt 1 Feeder	208	Cutler-Hammer ND Frame Bkr	65 kA	65 kA	47.8 kA	62.6 kA	Satisfactory

LANIGAN HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Lanigan Main Bkr	208	Cutler-Hammer DS-420 Air Circuit Breaker	65 kA	65kA	47.6 kA	62.2 kA	Satisfactory
Lanigan Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	47.6 kA	62.2 kA	Satisfactory
Lanigan Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	47.6 kA	62.2 kA	Satisfactory
Lanigan Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	47.6 kA	62.2 kA	Satisfactory
Lanigan Feeder	208	Cutler-Hammer LD Frame Bkr	65 kA	65 kA	47.6 kA	62.2 kA	Satisfactory
Lanigan Feeder	208	Cutler-Hammer MDL Frame Bkr	65 kA	65 kA	47.6 kA	62.2 kA	Satisfactory

LITTLE PAGE

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Little Page Main Bkr	208	Cutler-Hammer DS-416H Air Circuit Breaker	65 kA	65kA	15.8 kA	19.6 kA	Satisfactory
Little Page Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory
Little Page Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory
Little Page Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory

MAHAR HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Mahar Main Bkr	208	Cutler-Hammer DS-420 Air Circuit Breaker	65 kA	65kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer LD Frame Bkr	65 kA	65 kA	36.7 kA	46.3 kA	Satisfactory
Mahar Feeder	208	Cutler-Hammer MDL Frame Bkr	50 kA	50 kA	36.7 kA	46.3 kA	Satisfactory

ONEIDA HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Oneida Main Bkr	208	Cutler-Hammer DS-416H Air Circuit Breaker	65 kA	65kA	15.8 kA	19.6 kA	Satisfactory
Oneida Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory
Oneida Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory
Oneida Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	15.8 kA	19.6 kA	Satisfactory

ONONDAGA HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Onondaga Main Fuse	208	Gould Shawmut A4BY2500 Fuse	40.0 kA	40.0 kA	36.5 kA	45.9 kA	Satisfactory

PATHFINDER

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Pathfinder Main Bkr	208	Cutler-Hammer DS-416H Air Circuit Breaker	65 kA	65kA	15.9 kA	19.8 kA	Satisfactory
Pathfinder Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	15.9 kA	19.8 kA	Satisfactory
Pathfinder Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	15.9 kA	19.8 kA	Satisfactory
Pathfinder Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	15.9 kA	19.8 kA	Satisfactory

PENFEILD LIBRARY

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Penfield Main Bkr	480	Cutler-Hammer DS-632 Air Circuit Breaker	65 kA	65kA	36.3 kA	49.1 kA	Satisfactory
Penfield Feeder	480	Cutler-Hammer HFD Frame Bkr	65 kA	65 kA	36.3 kA	49.1 kA	Satisfactory
Penfield Feeder	480	Cutler-Hammer FD Provision					
Penfield Feeder	480	Cutler-Hammer HJD Frame Bkr	65 kA	65 kA	36.3 kA	49.1 kA	Satisfactory
Penfield Feeder	480	Cutler-Hammer HKD Frame Bkr	65 kA	65 kA	36.3 kA	49.1 kA	Satisfactory
Penfield Feeder	480	Cutler-Hammer DK Provsion					
Penfield Feeder	480	Cutler-Hammer HMDL Frame Bkr	65 kA	65 kA	36.3 kA	49.1 kA	Satisfactory
Penfield Feeder	480	Cutler-Hammer HND Frame Bkr	65 kA	65 kA	36.3 kA	49.1 kA	Satisfactory

SENECA HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Seneca Main Bkr	208	Cutler-Hammer DS-420 Air Circuit Breaker	65 kA	65kA	36.8 kA	46.4 kA	Satisfactory
Seneca Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	36.8 kA	46.4 kA	Satisfactory
Seneca Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	36.8 kA	46.4 kA	Satisfactory
Seneca Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	36.8 kA	46.4 kA	Satisfactory
Seneca Feeder	208	Cutler-Hammer LD Frame Bkr	65 kA	65 kA	36.8 kA	46.4 kA	Satisfactory

TYLER HALL

Device Location Device Name	Voltage (V)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Tyler 1 Main Bkr	208	Cutler-Hammer DS-632 Air Circuit Breaker	65 kA	65kA	47.7 kA	62.2 kA	Satisfactory
Tyler 1 Feeder	208	Cutler-Hammer FD Frame Bkr	65 kA	65 kA	47.7 kA	62.2 kA	Satisfactory
Tyler 1 Feeder	208	Cutler-Hammer JD Frame Bkr	65 kA	65 kA	47.7 kA	62.2 kA	Satisfactory
Tyler 1 Feeder	208	Cutler-Hammer DK Frame Bkr	65 kA	65 kA	47.7 kA	62.2 kA	Satisfactory
Tyler 2 Main Bkr	480	Cutler-Hammer FD3225 Air Circuit Breaker	25 kA	25 kA	6 kA	7.7 kA	Satisfactory
Tyler 2 Feeder	480	Cutler-Hammer MDL Frame Bkr	50 kA	50 kA	6 kA	7.7 kA	Satisfactory
Tyler 2 Feeder	480	Cutler-Hammer ND Frame Bkr	50 kA	50 kA	6 kA	7.7 kA	Satisfactory

VISTA SWITCHGEAR

Device Location Device Name	Voltage (kV)	Device Description	Device Rating		Device Duties		Device Status
			Int Amp	Mom Amp	Int Amp	Mom Amp	
Cayuga	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	3.3 kA	Satisfactory
Culkin	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	4.0 kA	Satisfactory
Hewitt	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	4.9 kA	Satisfactory
Lanigan	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	4.6 kA	Satisfactory
Little Page	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	3.3 kA	Satisfactory
Mahar	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	3.9 kA	Satisfactory
Oneida	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	3.2 kA	Satisfactory
Onondaga	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	3.5 kA	Satisfactory
Pathfinder	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	3.6 kA	Satisfactory
Penfield	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.3 kA	4.9 kA	Satisfactory
Seneca	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	3.9 kA	Satisfactory
Tyler 1	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	4.3 kA	Satisfactory
Tyler 2	13.2	S&C Vista Switchgear	12.5 kA	12.5 kA	2.2 kA	4.3 kA	Satisfactory

4.0 THE COORDINATION STUDY

4.1 Objective

The coordination Study was performed to determine the proper sizes, ratings and settings of protective devices to achieve optimum protection and selectivity in the system under study. This was accomplished by starting at the 480 Volt level, and ending with the 13.2kV feeder device.

4.2 Coordination Curves

- a. The coordination curves are listed in this section following the commentary. Each curve is accompanied by its TCC report and protective device calculation sheets.
- b. The coordination curves are plotted on log-log paper as operating time versus current magnitude to show protective device characteristics and coordination among protective devices.
- c. Consideration was given to both selective isolation of faults and maximum protection of equipment such as cables, and transformers. The minimum protection requirements of this equipment is outlined in the NEC, ANSI and IEEE Standards.
- d. The fault currents shown on the curves were derived from the Short Circuit Study.
- e. All devices were selected or set to achieve optimum protection and selectivity.

RELAY SETTINGS

Name/Type	Description	CT Ratio	Settings	Test Points
3A-50/51	MULTILIN	200A	OC Pickup 1.25	@2.0X, 6.977s
	SR750/760 Feeder Relay	5A	Ext Inverse 4.0; 1.0	@5.0X, 0.990s
3A-51G		50A	OC Pickup 1.0	@2.0X, 5.407s
		5A	Ext Inverse 3.1; 1.0	@5.0X, 0.767s
4A-50/51	MULTILIN	200A	OC Pickup 1.25	@2.0X, 6.977s
	SR750/760 Feeder Relay	5A	Ext Inverse 4.0, 1.0	@5.0X, 0.990s
4A-51G		50A	OC Pickup 1.0	@2.0X, 5.407s
		5A	Ext Inverse 3.1; 1.0	@5.0X, 0.767s
4B-50/51	MULTILIN	200A	OC Pickup 1.25	@2.0X, 6.977s
	SR750/760 Feeder Relay	5A	Ext Inverse 4.0; 1.0	@5.0X, 0.990s
4B-51G		50A	OC Pickup 1.0	@2.0X, 5.407s
		5A	Ext Inverse 3.1; 1.0	@5.0X, 0.767s
3B-50/51	MULTILIN	200A	OC Pickup 1.25	@2.0X, 6.977s
	SR750/760 Feeder Relay	5A	Ext Inverse 4.0; 1.0	@5.0X, 0.990s
3B-51G		50A	OC Pickup 1.0	@2.0X, 5.407s
		5A	Ext Inverse 3.1; 1.0	@5.0X, 0.767s
SEE ATTACHED RELAY SETTING SHEETS				

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
POINTS – S2 SYSTEM SETUP			
Current	PHASE CT PRIMARY: GROUND CT PRIMARY: SENSTV GND PRIMARY:	Range: 1-50000, in steps of 1 A Range: 1-50000, in steps of 1 A Range: 1-50000, in steps of 1 A	200 50 N/A
Bus Sensing	VT CONNECTION TYPE: NOMINAL VT SECONDARY VOLTAGE: VT RATIO:	Range: None, Wye, Delta Range: 50.0 TO 240.0 in steps of 0.1 V Range: 1.0 – 5000.0, in steps of 0.1 V	WYE 66.0 110.0
Line Sensing	VT CONNECTION TYPE: NOMINAL VT SECONDARY VOLTAGE: VT RATIO:	Range: Van, Vbn, Vcn, Vab, Vcb Range: 50.0 TO 240.0 in steps of 0.1 V Range: 1.0 – 5000.0, in steps of 0.1 V	N/A N/A N/A
Power	NOMINAL FREQUENCY: PHASE SEQUENCE: COST OF ENERGY:	Range: 25 TO 60 in steps of 1 Hz Range: ABC, ACB Range: 1.0 – 25.0, in steps of 0.1 c/kWh	60 ABC (by Others)

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
POINTS – S5 PROTECTION			
PHASE OVERCURRENT			
Phase Overcurrent Relay (51P1)	PHASE TIME OC 1 FUNCTION: PHASE TIME OC 1 RELAYS (3-7): PHASE TIME OC 1 PICKUP: PHASE TIME OC 1 CURVE: PHASE TIME OC 1 MUTIPLIER: PHASE TIME OC 1 RESET: PHASE TIME OC 1 DIRECTION: PHASE TIME OC 1 VOLTAGE RESTRAINT:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse* Range: Enabled, Disabled	Trip (by Others) 1.25 x CT Ext Inverse 4.00 Instantaneous Disabled
Phase Instantaneous Overcurrent Relay (50P1)	PHASE INST OC 1 FUNCTION: PHASE INST OC 1 RELAYS (3-7): PHASE INST OC 1 PICKUP: PHASE INST OC 1 DELAY: PHASE INST OC 1 OPERATION: PHASE INST OC 1 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: Disabled, Forward, Reverse*	Disabled
Phase Overcurrent Relay (51P2)	PHASE TIME OC 2 FUNCTION: PHASE TIME OC 2 RELAYS (3-7): PHASE TIME OC 2 PICKUP: PHASE TIME OC 2 CURVE: PHASE TIME OC 2 MUTIPLIER: PHASE TIME OC 2 RESET: PHASE TIME OC 2 DIRECTION: PHASE TIME OC 2 VOLTAGE RESTRAINT:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse* Range: Enabled, Disabled	Disabled
Phase Instantaneous Overcurrent Relay (50P2)	PHASE INST OC 2 FUNCTION: PHASE INST OC 2 RELAYS (3-7): PHASE INST OC 2 PICKUP: PHASE INST OC 2 DELAY: PHASE INST OC 2 OPERATION: PHASE INST OC 2 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: Disabled, Forward, Reverse*	Disabled
* If Direction set at REVERSE, then set the phase directional control element 67P below			
Phase Directional Overcurrent Relay (67P)	PHASE DIRECTIONAL FUNCTION: PHASE DIRECTIONAL RELAYS (3-7): PHASE DIRECTIONAL MTA: MINIMUM POLARIZATING VOLTAGE: BLK OC WHEN VOLT MEM EXPIRES:	Range: Disabled, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0 to 359 lead in steps of 1° Range: 0.00 to 1.25 in steps of 0.01 x VT Range: Disabled, Enabled	Disabled

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
NEUTRAL OVERCURRENT			
Neutral Overcurrent Relay (51N1)	NEUTRAL TIME OC 1 FUNCTION: NEUTRAL TIME OC 1 RELAYS (3-7): NEUTRAL TIME OC 1 PICKUP: NEUTRAL TIME OC 1 CURVE: NEUTRAL TIME OC 1 MUTIPLIER: NEUTRAL TIME OC 1 RESET: NEUTRAL TIME OC 1 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse*	Disabled
Neutral Instantaneous Overcurrent Relay (50N1)	NEUTRAL INST OC 1 FUNCTION: NEUTRAL INST OC 1 RELAYS (3-7): NEUTRAL INST OC 1 PICKUP: NEUTRAL INST OC 1 DELAY: NEUTRAL INST OC 1 OPERATION: NEUTRAL INST OC 1 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: Disabled, Forward, Reverse*	Disabled
Neutral Overcurrent Relay (51N2)	NEUTRAL TIME OC 2 FUNCTION: NEUTRAL TIME OC 2 RELAYS (3-7): NEUTRAL TIME OC 2 PICKUP: NEUTRAL TIME OC 2 CURVE: NEUTRAL TIME OC 2 MUTIPLIER: NEUTRAL TIME OC 2 RESET: NEUTRAL TIME OC 2 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse*	Disabled
Neutral Instantaneous Overcurrent Relay (50N2)	NEUTRAL INST OC 2 FUNCTION: NEUTRAL INST OC 2 RELAYS (3-7): NEUTRAL INST OC 2 PICKUP: NEUTRAL INST OC 2 DELAY: NEUTRAL INST OC 2 OPERATION: NEUTRAL INST OC 2 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: Disabled, Forward, Reverse*	Disabled
* If Direction set at REVERSE, then set the neutral directional control element 67N below			
Neutral Overcurrent Relay (67N)	NEUTRAL DIRECTIONAL FUNCTION: NEUTRAL DIRECTIONAL RELAYS (3-7): NEUTRAL DIRECTIONAL MTA: MINIMUM POLARIZATING VOLTAGE:	Range: Disabled, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0 to 359 lead in steps of 1° Range: 0.00 to 1.25 in steps of 0.01 x VT	Disabled

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
GROUND OVERCURRENT – Set this relay only if there is the external CT connected at G10 and H10 terminals			
Ground Overcurrent Relay (51G)	GROUND TIME OC FUNCTION: GROUND TIME OC RELAYS (3-7): GROUND TIME OC PICKUP: GROUND TIME OC CURVE: GROUND TIME OC MUTIPLIER: GROUND TIME OC RESET:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear	Trip (by Others) 1.0 x CT Ext. Inverse 3.1 Instantaneous
Ground Instantaneous Overcurrent Relay (50G)	GROUND INST OC FUNCTION: GROUND INST OC RELAYS (3-7): GROUND INST OC PICKUP: GROUND INST OC DELAY:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s	Disabled
SENSITIVE GROUND OVERCURRENT – Set this relay only if there is the external CT connected at G10 and H10 terminals			
Sensitive Ground Overcurrent Relay (51SG)	SENSTV GND TIME OC FUNCTION: SENSTV GND TIME OC RELAYS (3-7): SENSTV GND TIME OC PICKUP: SENSTV GND TIME OC CURVE: SENSTV GND TIME OC MUTIPLIER: SENSTV GND TIME OC RESET: SENSTV GND TIME OC DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.005 to 1.000 in steps of 0.001 Range: Ext Inverse, Very Inverse, Norm Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse*	Disabled
Sensitive Ground Instantaneous Overcurrent Relay (50SG)	SENSTV GND INST OC FUNCTION: SENSTV GND INST OC RELAYS (3-7): SENSTV GND INST OC PICKUP: SENSTV GND INST OC DELAY: SENSTV GND INST OC DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Disabled, Forward, Reverse*	Disabled
* If Direction set at REVERSE, then set the ground directional control element 67SG below			
Sensitive Ground Overcurrent Relay (67SG)	SENSTV GND DIRECTIONAL FUNCTION: SENSTV GND DIRECTIONAL RELAYS (3-7): SENSTV GND POLARIZING SENSTV GND DIRECTIONAL MTA: MINIMUM POLARIZATING VOLTAGE:	Range: Disabled, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: Voltage, Current Range: 0 to 359 lead in steps of 1° Range: 0.00 to 1.25 in steps of 0.01 x VT	Disabled

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
NEGATIVE SEQUENCE OVERCURRENT			
Negative Sequence Time Overcurrent Relay (46/51P1)	NEG SEQ TIME OC 1 FUNCTION: NEG SEQ TIME OC 1 RELAYS (3-7): NEG SEQ TIME OC 1 PICKUP: NEG SEQ TIME OC 1 CURVE: NEG SEQ TIME OC 1 MULTIPLIER: NEG SEQ TIME OC 1 RESET: NEG SEQ TIME OC 1 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inverse, Norm Inv, ... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse*	Trip (by Others) 0.75 x CT Very Inverse 2.0 Instantaneous Disabled
Negative Sequence Time Overcurrent Relay (46/51P2)	NEG SEQ TIME OC 1 FUNCTION: NEG SEQ TIME OC 1 RELAYS (3-7): NEG SEQ TIME OC 1 PICKUP: NEG SEQ TIME OC 1 CURVE: NEG SEQ TIME OC 1 MULTIPLIER: NEG SEQ TIME OC 1 RESET: NEG SEQ TIME OC 1 DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: Ext Inverse, Very Inv, Norm Inv.... Flex Curve B Range: 0.00 to 100.00 in steps of 0.01 Range: Instantaneous, Linear Range: Disabled, Forward, Reverse*	Disabled
Negative Sequence Instantaneous Overcurrent Relay (46/50)	NEG SEQ INST OC FUNCTION: NEG SEQ INST OC RELAYS (3-7): NEG SEQ INST OC PICKUP: NEG SEQ INST OC DELAY: NEG SEQ INST OC DIRECTION:	Range: Disabled, Trip, Trip & AR, Alarm Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.05 to 20.00 in steps of 0.01 x CT Range: 0.00 to 600.00 in steps of 0.01 s Range: Disabled, Forward, Reverse*	Disabled
* If Direction set at REVERSE, then set the negative sequence directional control element 46/67P below			
Negative Sequence Directional Overcurrent Relay (46/67P)	NEG SEQ DIRECTIONAL FUNCTION: NEG SEQ DIRECTIONAL RELAYS (3-7): NEG SEQ DIRECTIONAL MTA: MINIMUM POLARIZATING VOLTAGE:	Range: Disabled, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0 to 359 lead in steps of 1° Range: 0.00 to 1.25 in steps of 0.01 x VT	Alarm (by Others) 0.10 x VT 2.0 s
NEGATIVE SEQUENCE VOLTAGE			
Negative Sequence Voltage Relay (47)	NEG SEQ VOLTAGE FUNCTION: NEG SEQ VOLTAGE RELAYS (3-7): NEG SEQ VOLTAGE PICKUP: NEG SEQ VOLTAGE RELAY:	Range: Disabled, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 600.0 in steps of 0.1 s	Alarm (by Others) 0.10 x VT 2.0 s

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
VOLTAGE			
Bus Undervoltage Relay (27-1)	BUS UNDERVOLTAGE 1 FUNCTION: BUS UNDERVOLTAGE 1 RELAYS (3-7): BUS UNDERVOLTAGE 1 PICKUP: BUS UNDERVOLTAGE 1 CURVE: BUS UNDERVOLTAGE 1 DELAY: PHASES REQUIRED FOR OPERATION: MINIMUM OPERATING VOLTAGE:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: Definite Time, Inverse Time Range: 0.00 to 6000.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: 0.00 to 1.25 in steps of 0.01 x VT	Trip (by Others) 0.75 x VT Inverse Time 0.00 Any One 0.5 x VT
Bus Undervoltage Relay (27-2)	BUS UNDERVOLTAGE 2 FUNCTION: BUS UNDERVOLTAGE 2 RELAYS (3-7): BUS UNDERVOLTAGE 2 PICKUP: BUS UNDERVOLTAGE 2 CURVE: BUS UNDERVOLTAGE 2 DELAY: PHASES REQUIRED FOR OPERATION: MINIMUM OPERATING VOLTAGE:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: Definite Time, Inverse Time Range: 0.00 to 6000.00 in steps of 0.01 s Range: Any One, Any Two, All Three Range: 0.00 to 1.25 in steps of 0.01 x VT	Disabled
Line Undervoltage Relay (27-3)	LINE UNDERVOLTAGE 3 FUNCTION: LINE UNDERVOLTAGE 3 RELAYS (3-7): LINE UNDERVOLTAGE 3 PICKUP: LINE UNDERVOLTAGE 3 CURVE: LINE UNDERVOLTAGE 3 DELAY: MINIMUM OPERATING VOLTAGE:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: Definite Time, Inverse Time Range: 0.00 to 600.00 in steps of 0.01 s Range: 0.00 to 1.25 in steps of 0.01 x VT	Disabled
Line Undervoltage Relay (27-4)	LINE UNDERVOLTAGE 4 FUNCTION: LINE UNDERVOLTAGE 4 RELAYS (3-7): LINE UNDERVOLTAGE 4 PICKUP: LINE UNDERVOLTAGE 4 CURVE: LINE UNDERVOLTAGE 4 DELAY: MINIMUM OPERATING VOLTAGE:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: Definite Time, Inverse Time Range: 0.00 to 600.00 in steps of 0.01 s Range: 0.00 to 1.25 in steps of 0.01 x VT	Disabled
Overvoltage Relay (59-1)	OVERVOLTAGE 1 FUNCTION: OVERVOLTAGE 1 RELAYS (3-7): OVERVOLTAGE 1 PICKUP: OVERVOLTAGE 1 DELAY: PHASES REQUIRED FOR OPERATION:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three	Alarm (by Others) 1.20 x VT 2.0 s Any One
Overvoltage Relay (59-2)	OVERVOLTAGE 2 FUNCTION: OVERVOLTAGE 2 RELAYS (3-7): OVERVOLTAGE 2 PICKUP: OVERVOLTAGE 2 DELAY: PHASES REQUIRED FOR OPERATION:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 600.00 in steps of 0.01 s Range: Any One, Any Two, All Three	Disabled

**Recommended Protective Relay MULTILIN SR 750 Settings
13.2 KV PF-1 BUS – Feeder Circuit Breaker 3A, 3B, 4A & 4B**

Item No.	Program Menu Display Default Setting	Relay Ranges	Recommended Settings
FREQUENCY			
Underfrequency Relay (81U1)	UNDERFREQUENCY 1 FUNCTION: UNDERFREQUENCY 1 RELAYS (3-7): UNDERFREQUENCY 1 PICKUP: UNDERFREQUENCY 1 DELAY: MINIMUM OPERATING VOLTAGE: MINIMUM OPERATING CURRENT:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 20.00 TO 65.00 in steps of 0.01 Hz Range: 0.00 to 600.00 in steps of 0.01 s Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 20.00 in steps of 0.01 x CT	Disabled
Underfrequency Relay (81U2)	UNDERFREQUENCY 2 FUNCTION: UNDERFREQUENCY 2 RELAYS (3-7): UNDERFREQUENCY 2 PICKUP: UNDERFREQUENCY 2 DELAY: MINIMUM OPERATING VOLTAGE: MINIMUM OPERATING CURRENT:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 20.00 TO 65.00 in steps of 0.01 Hz Range: 0.00 to 600.00 in steps of 0.01 s Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 20.00 in steps of 0.01 x CT	Disabled
Frequency Decay Relay (81D)	FREQUENCY DECAY FUNCTION: FREQUENCY DECAY RELAYS (3-7): FREQUENCY DECAY RATE: FREQUENCY DECAY PICKUP: FREQUENCY DECAY DELAY: MINIMUM OPERATING VOLTAGE: MINIMUM OPERATING CURRENT:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.1 to 5.0 in steps of 0.1 Hz/s Range: 20.00 TO 65.00 in steps of 0.01 Hz Range: 0.00 to 600.00 in steps of 0.01 s Range: 0.00 to 1.25 in steps of 0.01 x VT Range: 0.00 to 20.00 in steps of 0.01 x CT	Disabled
BREAKER FAILURE			
Breaker Failure Relay (50BF)	NEUTRAL DIRECTIONAL FUNCTION: NEUTRAL DIRECTIONAL RELAYS (3-7): BREAKER FAILURE DELAY: BREAKER FAILURE CURRENT:	Range: Disabled, Trip, Alarm, Control Range: Any Combination of the 3 – 7 Auxiliary Relays Range: 0.03 to 1.00 in steps of 0.01 s Range: 0.05 to 20.00 in steps of 0.01 x CT	Disabled

VISTA SETTINGS

Name/Type	Description	Phase	Ground
Penfield Library	S&C Vista		
PEN-50/51	TCC Curve Type	Tap	Tap
PEN-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Hewitt Union #1	S&C Vista		
HEW-1-50/51	TCC Curve Type	Tap	Tap
HEW-1-51G	Min Pickup (amps)	150	50
1000 kVA Xfmr	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Hewitt Union #2	S&C Vista		
HEW-2-50/51	TCC Curve Type	E	N/A
HEW-2-51G	Min Pickup (amps)	65	N/A
500 kVA Xfmr	Inst. Pickup (kA)	N/A	N/A
	Definite Time (ms)	N/A	N/A
Tyler Hall	S&C Vista		
TY-1-50/51	TCC Curve Type	Tap	Tap
TY-1-51G	Min Pickup (amps)	150	50
1000 kVA Xfmr	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Tyler Hall	S&C Vista		
TY-2-50/51	TCC Curve Type	Tap	Tap
TY-2-51G	Min Pickup (amps)	65	50
225 kVA Xfmr	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Seneca Hall	S&C Vista		
SEN-50/51	TCC Curve Type	Tap	Tap
SEN-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Culkin Hall	S&C Vista		
CULK-50/51	TCC Curve Type	Tap	Tap
CULK-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off

VISTA SETTINGS

Name/Type	Description	Phase	Ground
Lanigan Hall	S&C Vista		
LAN-50/51	TCC Curve Type	Tap	Tap
LAN-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Mahar Hall	S&C Vista		
MAHAR-50/51	TCC Curve Type	Tap	Tap
MAHAR-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Ononaga Hall	S&C Vista		
ONON-50/51	TCC Curve Type	Tap	Tap
ONON-51G	Min Pickup (amps)	150	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Oneida Hall	S&C Vista		
ONEIDA-50/51	TCC Curve Type	Tap	Tap
ONEIDA-51G	Min Pickup (amps)	80	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Little Page	S&C Vista		
LP-50/51	TCC Curve Type	Tap	Tap
LP-51G	Min Pickup (amps)	80	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Cayuga Hall	S&C Vista		
CAYUGA-50/51	TCC Curve Type	Tap	Tap
CAYUGA-51G	Min Pickup (amps)	80	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off
Pathfinder	S&C Vista		
PATH-50/51	TCC Curve Type	Tap	Tap
PATH-51G	Min Pickup (amps)	80	50
	Inst. Pickup (kA)	Off	Off
	Definite Time (ms)	Off	Off

LV BREAKER SETTINGS

Name/Type	Description	Frame/Sensor	Settings
MAHAR SM	CUTLER-HAMMER	2000.0A	LD Setting 1
Static Trip	DS, LSI	2000.0A	LD Time Setting 20
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
MAHAR FDR	CUTLER-HAMMER	800.0A	Thermal Curve
Thermal Magnetic	MD	700.0A	Inst 6000A
	700-800A		
CAYUGA SM	CUTLER-HAMMER	1600.0A	LD Setting 0.6
Static Trip	DS, LSI	1600.0A	LD Time Setting 15
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
CAYUGA FDR	CUTLER HAMMER	400.0A	LTD
Thermal Magnetic	DK	400.0A	INST 7.0
	250-400A		
LP SM	CUTLER-HAMMER	1600.0A	LD Setting 1
Static Trip	DS, LSI	1200.0A	LD Time Setting 15
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
LP FDR	CUTLER HAMMER	400.0A	LTD
Thermal Magnetic	DK	400.0A	INST 7.5
	250-400A		
CULK SM	CUTLER-HAMMER	3200.0A	LD Setting 1
Static Trip	DS, LSG	2400.0A	LD Time Setting 20
	Digitrip RMS 510		SD Setting 2
			SD Time Setting 0.1(I ² T In)
			GF Setting E (1200a)
			GF Time Setting 0.5 (I ² T In)
CULK FDR	CUTLER-HAMMER	800.0A	Thermal Curve
Thermal Magnetic	MD	800.0A	Inst 3000A
	700-800A		
SEN SM	CUTLER-HAMMER	2000.0A	LD Setting 1
Static Trip	DS, LSI	2000.0A	LD Time Setting 7
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
SEN FDR	CUTLER HAMMER	600.0A	LTD
Thermal Magnetic	LDB, LD	600.0A	INST 10.0
	300-600A		

LV BREAKER SETTINGS

Name/Type	Description	Frame/Sensor	Settings
TY-1 SM	CUTLER-HAMMER	3200.0A	LD Setting 1
Static Trip	DS, LSI	3200.0A	LD Time Setting 4
	Digitrip RMS 510		SD Setting 2.5
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
TY-1 FDR	CUTLER HAMMER	1200.0A	LTPU 1.0
Static Trip	ND/CND	1000.0A	LTD LTD
	RMS310 LS		STPU 5.0
			STD-I2T STD(I ² T In)
TY-2 SM	CUTLER-HAMMER	225.0A	Thermal Curve
Thermal Magnetic	HFD	225.0A	Inst Fixed
EXISTING	175-225A		
HEW-1 SM	CUTLER-HAMMER	3200.0A	LD Setting 1
Static Trip	DS, LSI	3200.0A	LD Time Setting 4
	Digitrip RMS 510		SD Setting 3
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
HEW-1 FDR	CUTLER HAMMER	1200.0A	LTPU 1.0
Static Trip	ND/CND	1200.0A	LTD LTD
	RMS310 LS		STPU 5.0
			STD-I2T STD(I ² T In)
HEW-2 SM	CUTLER-HAMMER	800.0A	Thermal Curve
Thermal Magnetic	MD	800.0A	Inst 4000.0
	700-800A		
HEW-2 FDR	CUTLER HAMMER	400.0A	LTD
Thermal Magnetic	KDB, KD	400.0A	INST 5.0
	100-400A		
PATH SM	CUTLER-HAMMER	1600.0A	LD Setting 1
Static Trip	DS, LSI	1600.0A	LD Time Setting 15
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
PATH FDR	CUTLER HAMMER	400.0A	LTD
Thermal Magnetic	DK	400.0A	INST 7.5
	250-400A		
PEN SM	CUTLER-HAMMER	3200.0A	LD Setting 1
Static Trip	DS, LSG	2400.0A	LD Time Setting 20
	Digitrip RMS 510		SD Setting 2
			SD Time Setting 0.1(I ² T In)
			GF Setting E (1200a)
			GF Time Setting 0.5 (I ² T In)

LV BREAKER SETTINGS

Name/Type	Description	Frame/Sensor	Settings
PEN FDR	CUTLER-HAMMER	800.0A	Thermal Curve
Thermal Magnetic	MD	800.0A	Inst 3000A
	700-800A		
ONEIDA SM	CUTLER-HAMMER	1600.0A	LD Setting 1
Static Trip	DS, LSI	1600.0A	LD Time Setting 7
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
ONEIDA FDR	CUTLER HAMMER	400.0A	LTD
Thermal Magnetic	DK	300.0A	INST 10.0
	250-400A		
LAN SM	CUTLER-HAMMER	2000.0A	LD Setting 1
Static Trip	DS, LSI	2000.0A	LD Time Setting 20
	Digitrip RMS 510		SD Setting 4
			SD Time Setting 0.1(I ² T In)
			INST M2(12)
LAN FDR	CUTLER-HAMMER	800.0A	Thermal Curve
Thermal Magnetic	MD	700.0A	Inst 6000A
	700-800A		

FEEDER 3A

SUNY-Oswego II
Protective Device Coordination Study
Device Name: 3A-50/51
Feeder 3B Phase Overcurrent Relay

TCC: Culkin Hall

Device: Multilin SR-750 Relay

Existing Settings: 1.0 AT
4.0 TD Ext. Inverse
8x Inst.

CT Ratio: 200:5

Feeder: 1/0 15 kV Cable rated at 200 amps

Pickup:

Set to protect 200 amps rated cable.

Set not more than 600% cable ampacity per NEC. $200 \times 6 = 1200$ amps

Set to coordinate with upstream and downstream devices.

Note: This relay uses CT primary amps to calculate tap settings.

Set for 125% of rating $200 \times 1.25 = 250$

Set for 1.25 AT (250 amps)

Delay:

Set to coordinate with upstream and downstream devices.

Set for not less than 0.4 seconds below the upstream device.

Set for not less than 0.2 seconds above the downstream device curve.

Set above the combined inrush of all four transformers (1,085 amps) @ 0.1 seconds

Set for 4 TD on the Extremely Inverse Curve for 0.99 seconds @ 500%

Instantaneous:

Block to coordinate with downstream devices

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Culk-50/51

Culkin Hall Incoming Primary Phase Overcurrent Device

TCC: Culkin Hall

Device: S&C Vista

Existing Settings: None

Transformer: 2000 kVA with 5.35 min Z, 87.5 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600%. $87.5 \times 6 = 525$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

Note: The size of this transformer is 40% of the main (5000 kVA) transformer. Setting the secondary main breaker to get full output from the transformer and to coordinate with the downstream feeders, coordination between the primary and secondary transformer devices is sacrificed. Since both devices are in line with each other and tripping both devices does not effect other branches of the system, this misscoordination is acceptable.

SUNY-Oswego II
Protective Device Coordination Study
Device Name: Culk-SM
Culkin Hall Secondary Main Breaker

TCC: Culkin Hall & LV GF

Device: Cutler Hammer DS632 with Digitrip 510 LSG
3200 AF / 2400 Plug

Existing Settings: None – New Device

Transformer: 2000 kVA with 5.35 min Z, 2405.6 FLA @ 480V

Long Time Pickup:

Set for not more than 125% of transformer FLA.
 $2405 \times 1.25 = 3006$.
Set for max setting
Set for 1.0X (2400 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.
Set for 20 seconds @ 600%

Short Time Pickup

Set to coordinate with the upstream and downstream devices.
Set for 2X (4800 amps)

Short Time Delay

Set to coordinate with the upstream and downstream devices.
Set for 0.1 seconds with I^2T In

Ground Fault Pickup:

Set to max to attempt to coordinate with downstream devices
Set for E (1200 amps)

Ground Fault Delay:

Set to max to attempt coordination with downstream devices
Set for 0.5 seconds with I^2T In

Note:

Set largest feeder instantaneous to Minimum Setting for proper coordination with this device.

TCC Name: CULKIN HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	BUS A 50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2422.0A
Current Rating:	1200A / 5A	Curve Multiplier:	1.00000
Setting: 1) OC Pickup	0.29	Test Points:	
2) Ext Inverse	6.0 1.0	2.0X, 10.466s	
		5.0X, 1.484s	

Device Name:	CBL-3A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	CULK-50/51	Bus Name:	BUS 3A004
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2625.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting: 1) 150A			

Device Name:	CULK XFMR	Bus Name:	BUS 3A004
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 480V
Nominal Size:	2000.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

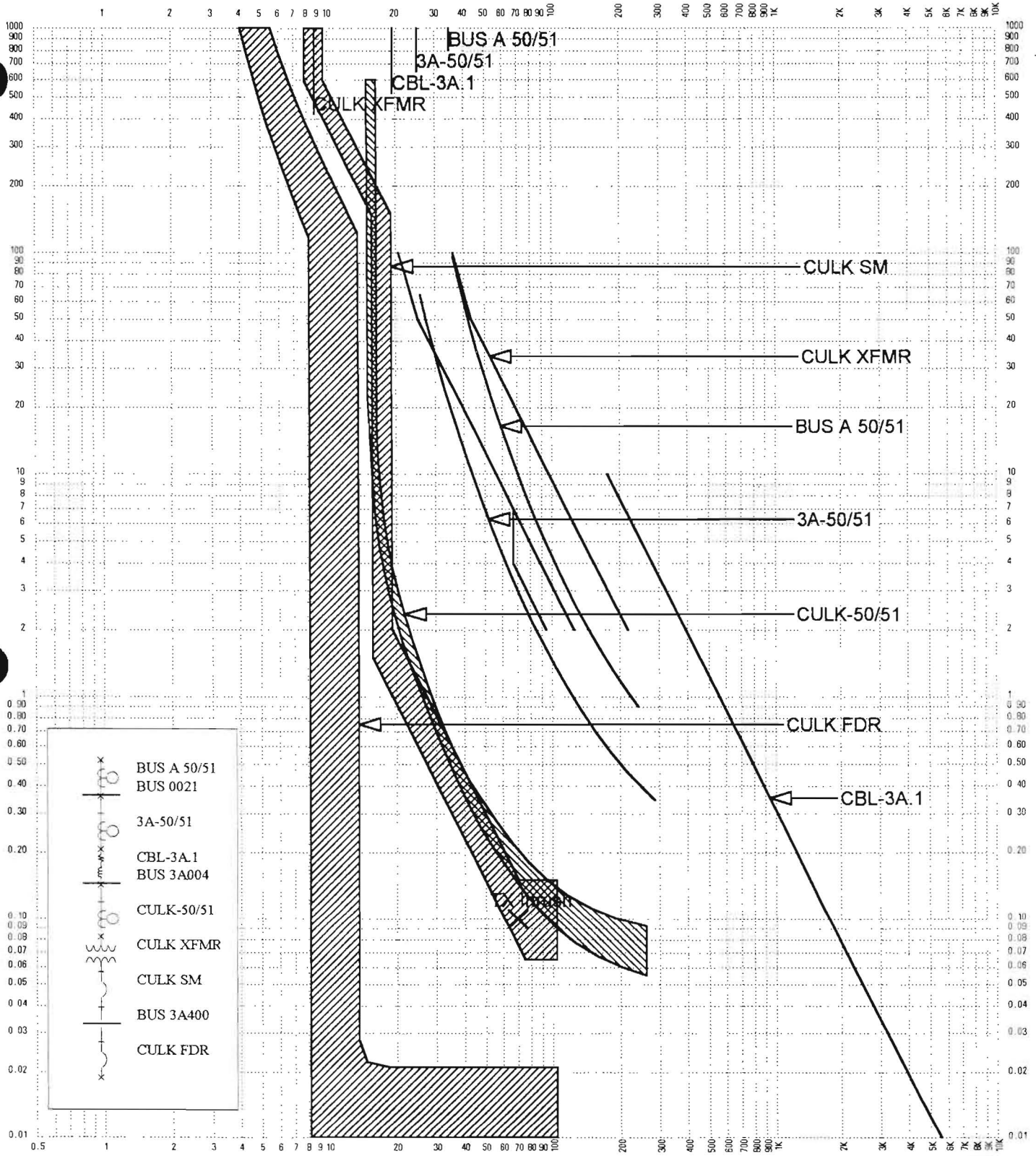
Device Name:	3A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2879.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting: 1) OC Pickup	1.25	Test Points:	
2) Ext Inverse	4.0 1.0	2.0X, 6.977s	
		5.0X, 0.990s	

Device Name:	CULK SM	Bus Name:	BUS 3A400
Description:	CUTLER-HAMMER-DS, LS-Digitrip RMS 510...	Bus Voltage:	480.0V
AIC Rating:	65kA	Fault Duty:	28879.0A
Frame:	DS-632 480V 3200A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	2400A		
Plug:	2400A		
Setting: 1) LD Setting	1		
2) LD Time Setting	20		
3) SD Setting	2		
4) SD Time Setting	0.1	I^2 t In	

Device Name: CULK FDR
Description: CUTLER-HAMMER-MD-700-800A
AIC Rating: 35kA
Frame: 800A 480V 800A 35kA
Trip: 800A
Setting: 1) Thermal Curve
 2) Inst 3000A

Bus Name: BUS 3A400
Bus Voltage: 480.0V
Fault Duty: 28879.0A
Curve Multiplier: 1.00000

CURRENT IN AMPERES



TIME IN SECONDS

TCC Name: CULKIN HALL	Current Scale: X10	Reference Voltage: 13200
Online: CULKIN HALL		
Date: 4 August, 2000 2:27 PM		SUNY OSWEGO II

FEEDER 3B

SUNY-Oswego II
Protective Device Coordination Study

Device Name: 3B-50/51

Feeder 3B Phase Overcurrent Relay

TCC: Penfield Lib.

Device: Multilin SR-750 Relay

Existing Settings: None

CT Ratio: 200:5

Feeder: 1/0 15 kV Cable rated at 200 amps

Pickup:

Set to protect 200 amps rated cable.

Set not more than 600% cable ampacity per NEC. $200 \times 6 = 1200$ amps

Set to coordinate with upstream and downstream devices.

Note: This relay uses CT primary amps to calculate tap settings.

Set for 125% of feeder rating. $1.25 \times 200 = 250$

Set for 1.25 AT (250 amps)

Delay:

Set to coordinate with upstream and downstream devices.

Set for not less than 0.4 seconds below the upstream device.

Set for not less than 0.2 seconds above the downstream device curve.

Set above the combined inrush of all three transformers (1,312 amps) @ 0.1 seconds

Set for 4 TD on the Extremely Inverse Curve for 0.99 seconds @ 500%

Instantaneous:

Block to coordinate with downstream devices

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Pen-50/51

Penfield Library Incoming Primary Phase Overcurrent Device

TCC: Penfield Lib.

Device: S&C Vista

Existing Settings: None

Transformer: 2000 kVA with 5.35 min Z, 87.5 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $87.5 \times 6 = 525$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

Note: The size of this transformer is 40% of the main (5000 kVA) transformer. Setting the secondary main breaker to get full output from the transformer and to coordinate with the downstream feeders, coordination between the primary and secondary transformer devices is sacrificed. Since both devices are in line with each other and tripping both devices does not effect other branches of the system, this misscoordination is acceptable.

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Pen-SM
Penfield Library Secondary Main Breaker

TCC: Penfield Lib. & LV GF.
Device: Cutler Hammer DS632 with Digitrip 510 LSG
3200 AF / 2400 Plug
Existing Settings: None – New Device
Transformer: 2000 kVA with 5.35 min Z, 2405.6 FLA @ 480V

Long Time Pickup:
Set for not more than 125% of transformer FLA.
 $2405 \times 1.25 = 3006.$
Set for max setting
Set for 1.0X (2400 amps)

Long Time Delay:
Set to coordinate with the upstream and downstream devices.
Set for 20 seconds @ 600%

Short Time Pickup
Set to coordinate with the upstream and downstream devices.
Set for 2X (4800 amps)

Short Time Delay
Set to coordinate with the upstream and downstream devices.
Set for 0.1 seconds with I^2T In

Ground Fault Pickup:
Set to max to attempt to coordinate with downstream devices
Set for E (1200 amps)

Ground Fault Delay:
Set to max to attempt coordination with downstream devices
Set for 0.5 seconds with I^2T In

Note: Set largest downstream device's instantaneous setting to min for proper coordination

TCC Name: PENFIELD LIB.tcc
 Reference Voltage: 13200
 Current Scale X 10¹

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Device Name:	CBL-3B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	PEN 50/51	Bus Name:	BUS 3B001
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2635.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

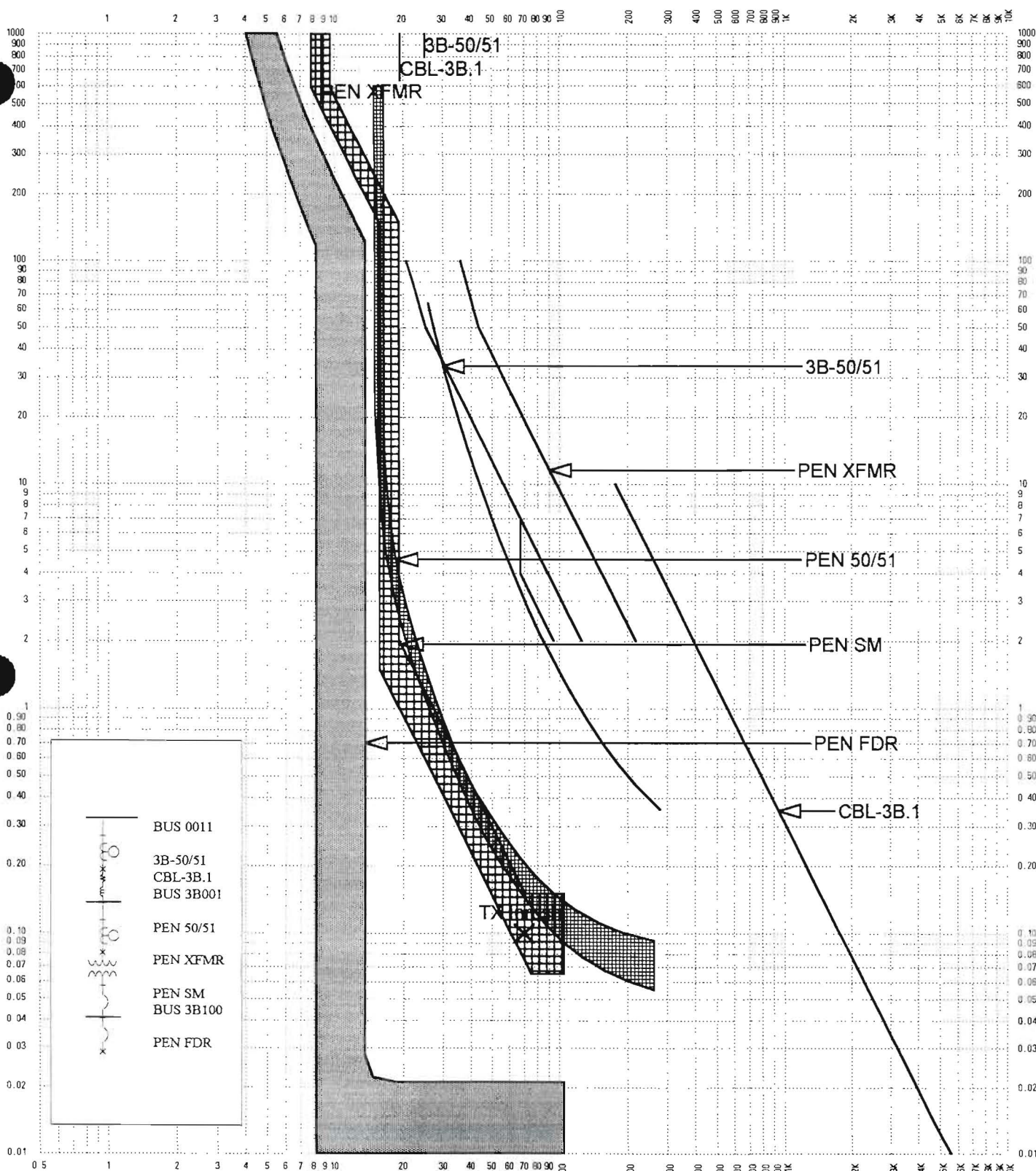
Device Name:	PEN XFMR	Bus Name:	BUS 3B001
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 480V
Nominal Size:	2000.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	3B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	⊖2.0X, 6.977s	
		⊖5.0X, 0.990s	

Device Name:	PEN SM	Bus Name:	BUS 3B100
Description:	CUTLER-HAMMER-DS, LS-Digitrip RMS 510...	Bus Voltage:	480.0V
AIC Rating:	65kA	Fault Duty:	28945.0A
Frame:	DS-632 480V 3200A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	2400A		
Plug:	2400A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 20		
	3) SD Setting 2		
	4) SD Time Setting 0.1 I ² t In		

Device Name:	PEN FDR	Bus Name:	BUS 3B100
Description:	CUTLER-HAMMER-MD-700-800A	Bus Voltage:	480.0V
AIC Rating:	35kA	Fault Duty:	28945.0A
Frame:	800A 480V 800A 35kA	Curve Multiplier:	1.00000
Trip:	800A		
Setting:	1) Thermal Curve		
	2) Inst 3000A		

CURRENT IN AMPERES



TCC Name: PENFIELD LIB	Current Scale: X10	Reference Voltage: 13200
Online: PENFIELD LIB		
Date: 2 August, 2000 9:24 AM		SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Lan-50/51

Lanigan Hall Incoming Primary Phase Overcurrent Device

TCC: Lanigan Hall

Device: S&C Vista

Existing Settings: None

Transformer: 1000 kVA with 5.35 min Z, 43.7 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $43.7 \times 6 = 262.2$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Lan-SM
Lanigan Hall Secondary Main Breaker

TCC: Lanigan Hall

Device: Cutler Hammer DS420 with Digitrip 510 LSI
2000 AF / 2000 Plug

Existing Settings: None – New Device

Transformer: 1000 kVA with 5.35 min Z, 2775.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.
 $2775.7 \times 1.25 = 3469.6$ amps
Set as high as possible. Set for Max.
Set for 1.0X (2000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.
Set for 20 seconds @ 600%

Short Time Pickup

Set above the downstream device.
Set below the upstream device
Set for 4X (4000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.
Set for 0.1 seconds with I^2T In

Instantaneous:

Set to max to attempt coordination with downstream devices
Set for M2 (12X) for 24000 amps

Notes:

1. This device limits the transformer output to 720 kVA.
2. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: LANIGAN HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-3B.2	Bus Name:	BUS 3B001
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	LAN-50/51	Bus Name:	BUS 3B002
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2612.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

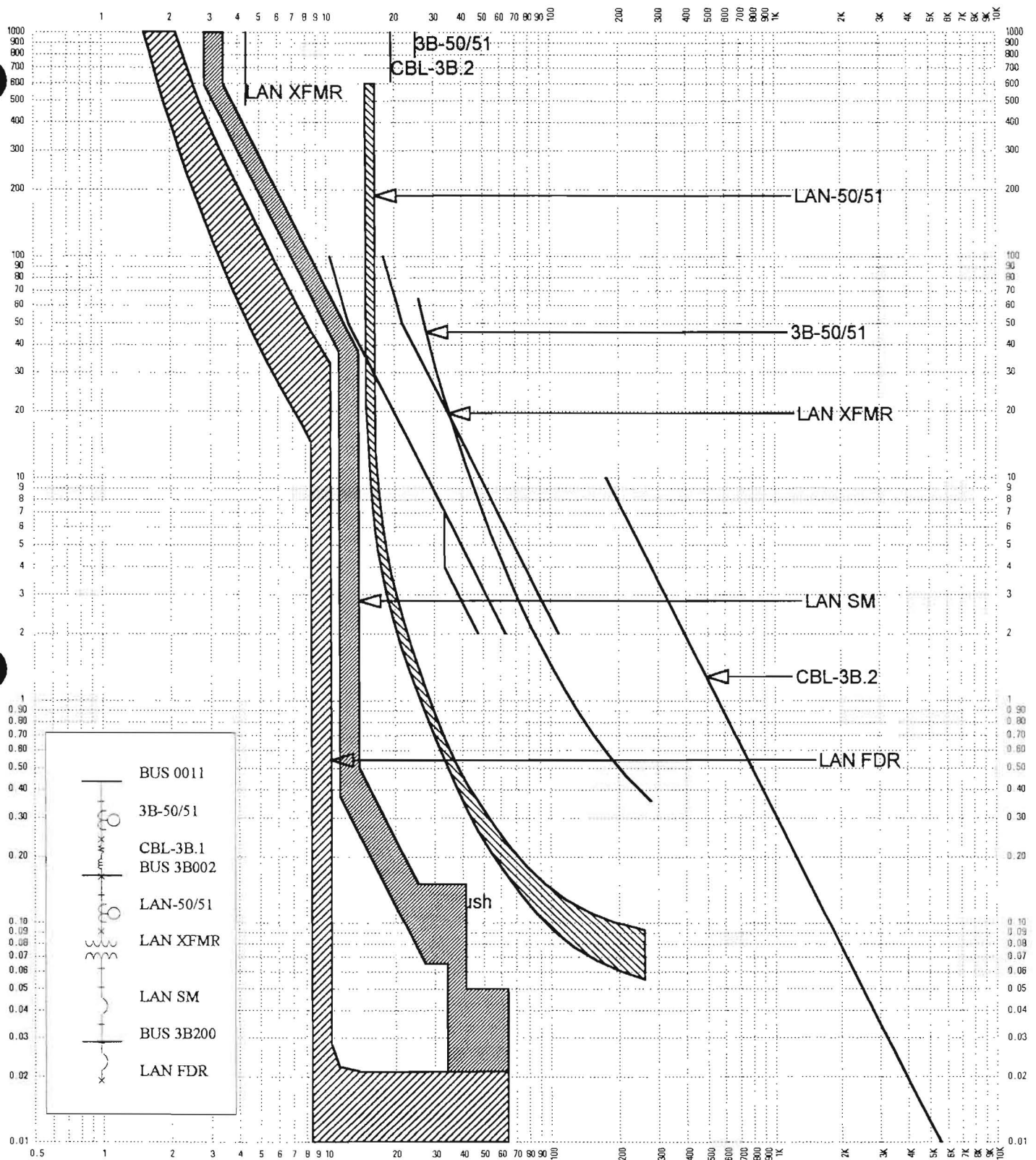
Device Name:	LAN XFMR	Bus Name:	BUS 3B002
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	1000.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	3B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	2.0X, 6.977s	
		5.0X, 0.990s	

Device Name:	LAN SM	Bus Name:	BUS 3B200
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	40836.0A
Frame:	DS-420 240V 2000A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	2000A		
Plug:	2000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 20		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	LAN FDR	Bus Name:	BUS 3B200
Description:	CUTLER-HAMMER-MD-700-800A	Bus Voltage:	208.0V
AIC Rating:	42kA	Fault Duty:	40836.0A
Frame:	800A 240V 800A 42kA	Curve Multiplier:	1.00000
Trip:	700A		
Setting:	1) Thermal Curve		
	2) Inst 6000A		

CURRENT IN AMPERES



TIME IN SECONDS

TCC Name: LANIGAN HALL
 Oonline: LANIGAN HALL
 Date: 24 July, 2000 4:18 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Mahar-50/51

Mahar Hall Incoming Primary Phase Overcurrent Device

TCC: Mahar Hall

Device: S&C Vista

Existing Settings: None

Transformer: 750 kVA with 5.35 min Z, 32.8 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $32.8 \times 6 = 196.8$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study
Device Name: Mahar-SM
Mahar Hall Secondary Main Breaker

TCC: Mahar Hall

Device: Cutler Hammer DS420 with Digitrip 510 LSI
2000 AF / 2000 Plug

Existing Settings: None – New Device

Transformer: 750 kVA with 5.35 min Z, 2081.8 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.
 $2081.8 \times 1.25 = 2602$ amps
Set as high as possible. Set for Max.
Set for 1.0X (2000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.
Set for 20 seconds @ 600%

Short Time Pickup

Set above the downstream device.
Set below the upstream device
Set for 4X (4000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.
Set for 0.1 seconds with I²T In

Instantaneous:

Set to max to attempt coordination with downstream devices
Set for M2 (12X) for 24000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: MAHAR HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-3B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	MAHAR-50/51	Bus Name:	BUS 3B003
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2544.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

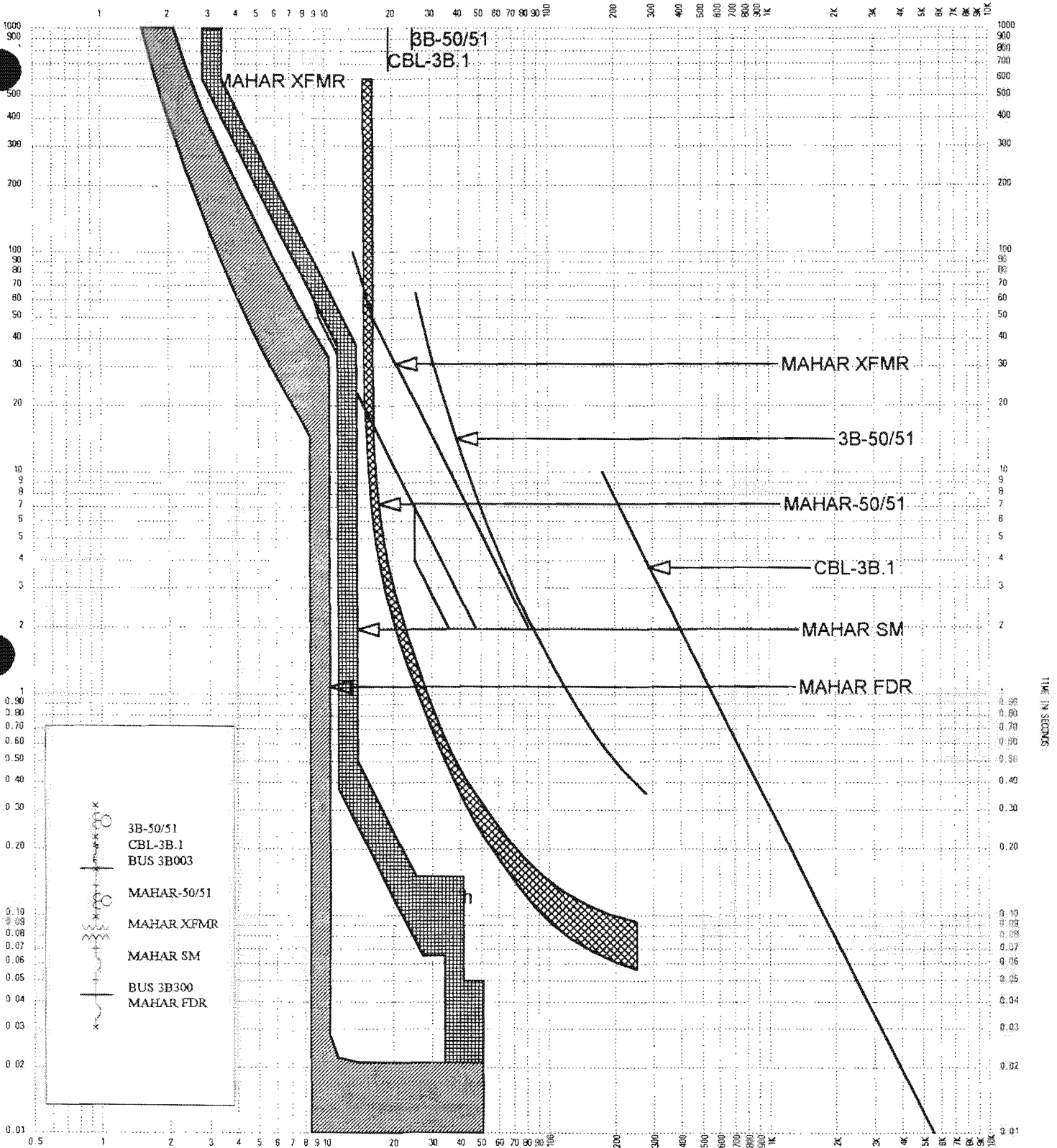
Device Name:	MAHAR XFMR	Bus Name:	BUS 3B003
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	750.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	3B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	⊖2.0X, 6.977s	
		⊖5.0X, 0.990s	

Device Name:	MAHAR SM	Bus Name:	BUS 3B300
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	32258.0A
Frame:	DS-420 240V 2000A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	2000A		
Plug:	2000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 20		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	MAHAR FDR	Bus Name:	BUS 3B300
Description:	CUTLER-HAMMER-MD-700-800A	Bus Voltage:	208.0V
AIC Rating:	42kA	Fault Duty:	32258.0A
Frame:	800A 240V 800A 42kA	Curve Multiplier:	1.00000
Trip:	700A		
Setting:	1) Thermal Curve		
	2) Inst 6000A		

CURRENT IN AMPERES



TCC Name: MAHAR HALL
Online: MAHAR HALL
Date: 24 July, 2000 4:25 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

FEEDER 4A

SUNY-Oswego II
Protective Device Coordination Study

Device Name: 4A-50/51

Feeder 4A Phase Overcurrent Relay

TCC: Hewitt-1

Device: Multilin SR-750 Relay

Existing Settings: None

CT Ratio: 200:5

Feeder: 1/0 15 kV Cable rated at 200 amps

Pickup:

Set to protect 200 amps rated cable.

Set not more than 600% cable ampacity per NEC. $200 \times 6 = 1200$ amps

Set to coordinate with upstream and downstream devices.

Note: This relay uses CT primary amps to calculate tap settings.

Set for 125% of the feeder rating. $1.25 \times 200 = 250$

Set for 1.25 AT (250 amps)

Delay:

Set to coordinate with upstream and downstream devices.

Set for not less than 0.4 seconds below the upstream device.

Set for not less than 0.2 seconds above the downstream device curve.

Set above the combined inrush of all six transformers (1,321 amps) @ 0.1 seconds

Set for 4 TD on the Extremely Inverse Curve for 0.99 seconds @ 500%

Instantaneous:

Block to coordinate with downstream devices

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Hew-1-50/51

Hewitt-1 Incoming Primary Phase Overcurrent Device

TCC: Hewitt-1

Device: S&C Vista

Existing Settings: None

Transformer: 1000 kVA with 5.35 min Z, 43.7 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $43.7 \times 6 = 262.2$ amps.

Set above downstream device.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Hew-1-SM
Hewitt-1 Secondary Main Breaker

TCC: Hewitt-1

Device: Cutler Hammer DS632 with Digitrip 510 LSI
3200 AF / 3000 Plug

Existing Settings: None – New Device

Transformer: 1000 kVA with 5.35 min Z, 2775.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$2775.7 \times 1.25 = 3469.6$ amps

Set for Max.

Set for 1.0X (3000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 4 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 3X (9000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I²T In

Instantaneous:

Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 36000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: HEWITT-1.tcc
 Reference Voltage: 13200
 Current Scale X 10¹

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Device Name:	CBL-4A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	HEW-1-50/51	Bus Name:	BUS 4A001
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2714.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

Device Name:	HEW-1 XFMR	Bus Name:	BUS 4A001
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	1000.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2794.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0		2.0X, 6.977s
			5.0X, 0.990s

Device Name:	HEW-1 SM	Bus Name:	BUS 4A101
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	85kA	Fault Duty:	41165.0A
Frame:	DS-632 240V 3200A 85kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	3200A		
Plug:	3000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 4		
	3) SD Setting 3		
	4) SD Time Setting 0.1 I ² t In		
	5) INST M2(12)		

Device Name: HEW-1 FDR
Description: WESTINGHOUSE-ND/CND-RMS310 LS
AIC Rating: 65kA
Frame: 1200 240V 1200A 65kA 14kA 0kA
Sensor: 1200A

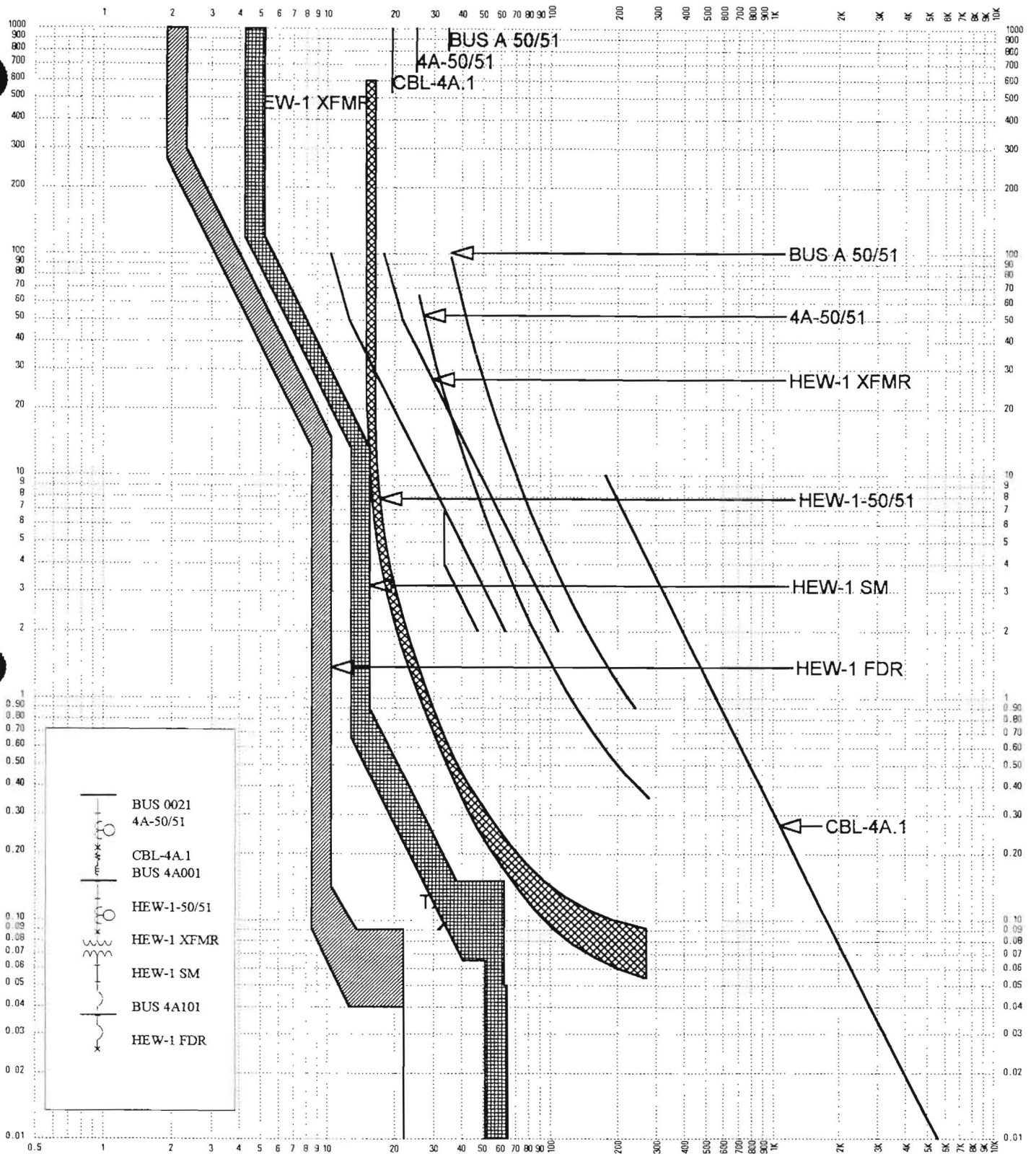
Bus Name: BUS 4A101
Bus Voltage: 208.0V
Fault Duty: 41165.0A
Curve Multiplier: 1.00000

Plug:
Setting: 1) LTPU 1.0
2) LTD LTD
3) STPU 5.0
4) STD-I2T STD I^2 t In

Device Name: BUS A 50/51
Description: MULTILIN-SR750/760 Feeder Relay-5A CT Sec
AIC Rating: N/A
Current Rating: 1200A / 5A
Setting: 1) OC Pickup 0.29
2) Ext Inverse 6.0 1.0

Bus Name: BUS 0021
Bus Voltage: 13200.0V
Fault Duty: 2422.0A
Curve Multiplier: 1.00000
Test Points:
2.0X, 10.466s
5.0X, 1.484s

CURRENT IN AMPERES



TIME IN SECONDS

TCC Name: HEWITT-1
 Online: HEWITT-1
 Date: 2 August, 2000 9:03 AM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Hew-2-50/51

Hewitt-2 Incoming Primary Phase Overcurrent Device

TCC: Hewitt-2

Device: S&C Vista

Existing Settings: None

Transformer: 500 kVA with 5.35 min Z, 21.9 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

(This device emulated S&C Std "E" fuse curves as well as breaker like curves)

Use "E" Curves for better coordination with downstream feeder devices.

Set for not more than 300% . $21.9 \times 3 = 65.7$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for E Curve 65E setting

Instantaneous N/A

Definite Time N/A

Ground Fault

None available. When an E-speed curve is selected, the ground-overcurrent pickup setting is disabled as are the instantaneous-pickup and definite-time delay attributes.

Note: This device does not coordinate with the secondary main breaker. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Hew-2-SM
Hewitt-2 Secondary Main Breaker

TCC: Hewitt-2

Device: Cutler Hammer MDL3800 Thermal Magnetic Breaker
800 AF / 800 AT

Existing Settings: None – New Device

Transformer: 500 kVA with 5.35 min Z, 601.4 FLA @ 480V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$601.4 \times 1.25 = 751.75$ amps.

750 AT not available, go to 800 amps

Set for 800 amps

Instantaneous:

Set to instantaneous setting less than mid way thru band

Set for 4000 amps

Note: Set the largest downstream breaker's instantaneous setting to minimum to coordinate with the upstream breaker.

TCC Name: HEWITT-2.tcc
 Reference Voltage: 13200
 Current Scale X 10¹

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Device Name:	CBL-4A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	HEW-2 50/51	Bus Name:	BUS 4A001
Description:	S&C-SM-4, 14.4kV E-Rated-3E-200E Stan...	Bus Voltage:	13200.0V
AIC Rating:	13kA	Fault Duty:	2660.0A
Cartridge:	65E 13200V 65A 13kA	Curve Multiplier:	1.00000
Size:	65A		

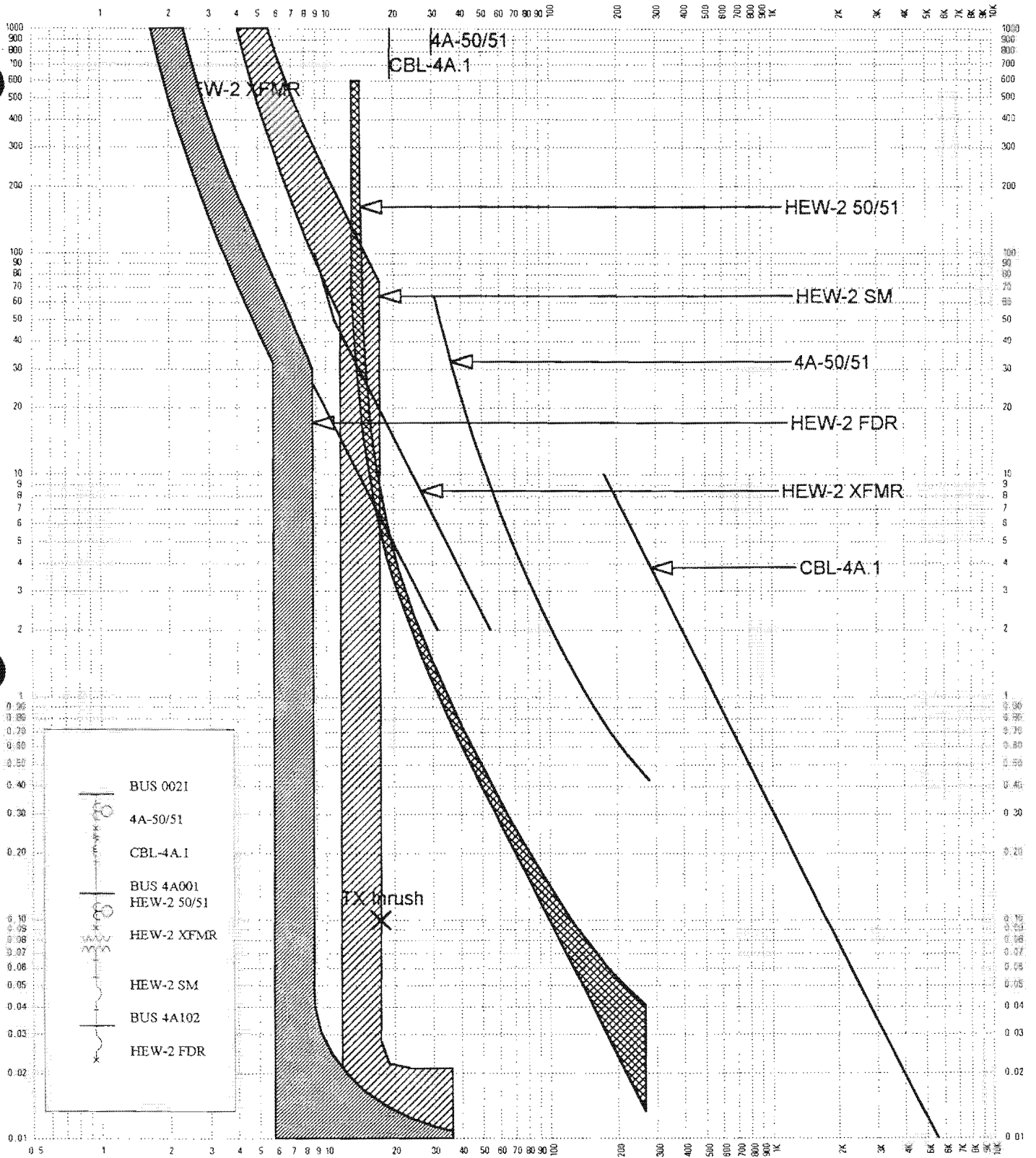
Device Name:	HEW-2 XFMR	Bus Name:	BUS 4A001
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 480V
Nominal Size:	500.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2794.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting: 1) OC Pickup	1.5	Test Points:	
2) Ext Inverse	4.0 1.0	2.0X, 6.977s	
		5.0X, 0.990s	

Device Name:	HEW-2 SM	Bus Name:	BUS 4A102
Description:	CUTLER-HAMMER-MD-700-800A	Bus Voltage:	480.0V
AIC Rating:	35kA	Fault Duty:	9972.0A
Frame:	800A 480V 800A 35kA	Curve Multiplier:	1.00000
Trip:	800A		
Setting: 1) Thermal Curve			
2) Inst	4000.0		

Device Name:	HEW-2 FDR	Bus Name:	BUS 4A102
Description:	WESTINGHOUSE-KDB, KD-100-400A	Bus Voltage:	480.0V
AIC Rating:	35kA	Fault Duty:	9972.0A
Frame:	400 480V 400A 35kA	Curve Multiplier:	1.00000
Trip:	400A		
Setting: 1) LTD			
2) INST	5.0		

CURRENT IN AMPERES



SECTION IN SECTIONS

TCC Name: HEWITT-2
 Online: HEWITT-2
 Date: 14 July, 2000 3:55 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Ty-1-50/51

Tyler-1 Incoming Primary Phase Overcurrent Device

TCC: Tyler-1

Device: S&C Vista

Existing Settings: None

Transformer: 1000 kVA with 5.35 min Z, 43.7 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $43.7 \times 6 = 262.2$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study
Device Name: Ty-1-SM
Tyler-1 Secondary Main Breaker

TCC: Tyler-1

Device: Cutler Hammer DS632 with Digitrip 510 LSI
3200 AF / 3000 Plug

Existing Settings: None – New Device

Transformer: 1000 kVA with 5.35 min Z, 2775.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$2775.7 \times 1.25 = 3469$ amps

Set for max setting

Set for 1.0X (3000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 4 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 2.5X (750 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I^2T In

Instantaneous:

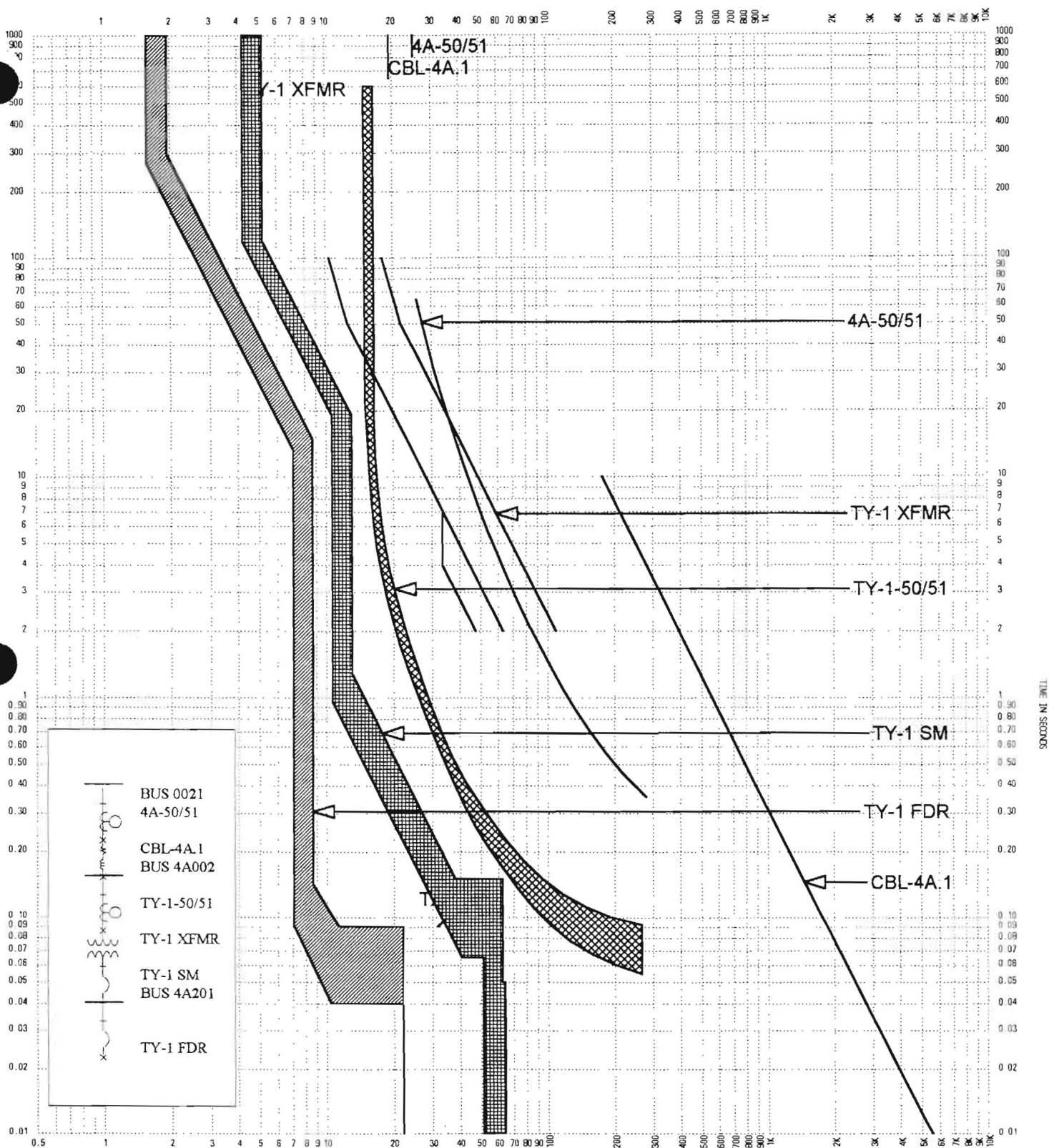
Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 36000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.
2. Set the largest downstream breaker not more than 5.0X

CURRENT IN AMPERES



TCC Name: TYLER-1
Online: TYLER-1
Date: 24 July, 2000 4:58 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Ty-2-50/51

Tyler-2 Incoming Primary Phase Overcurrent Device

TCC: Tyler-2

Device: S&C Vista

Existing Settings: None

Transformer: 225 kVA with 5.35 min Z, 9.84 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600%. $9.84 \times 6 = 59$ amps.

Set above existing FD3225 downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

There is no 60 amp setting. Go to next size higher fuse

Set for Tap Curve 65 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

Note: This device does not coordinate with the secondary main breaker. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.

TCC Name: TYLER-2.tcc
Reference Voltage: 13200
Current Scale X 10^1

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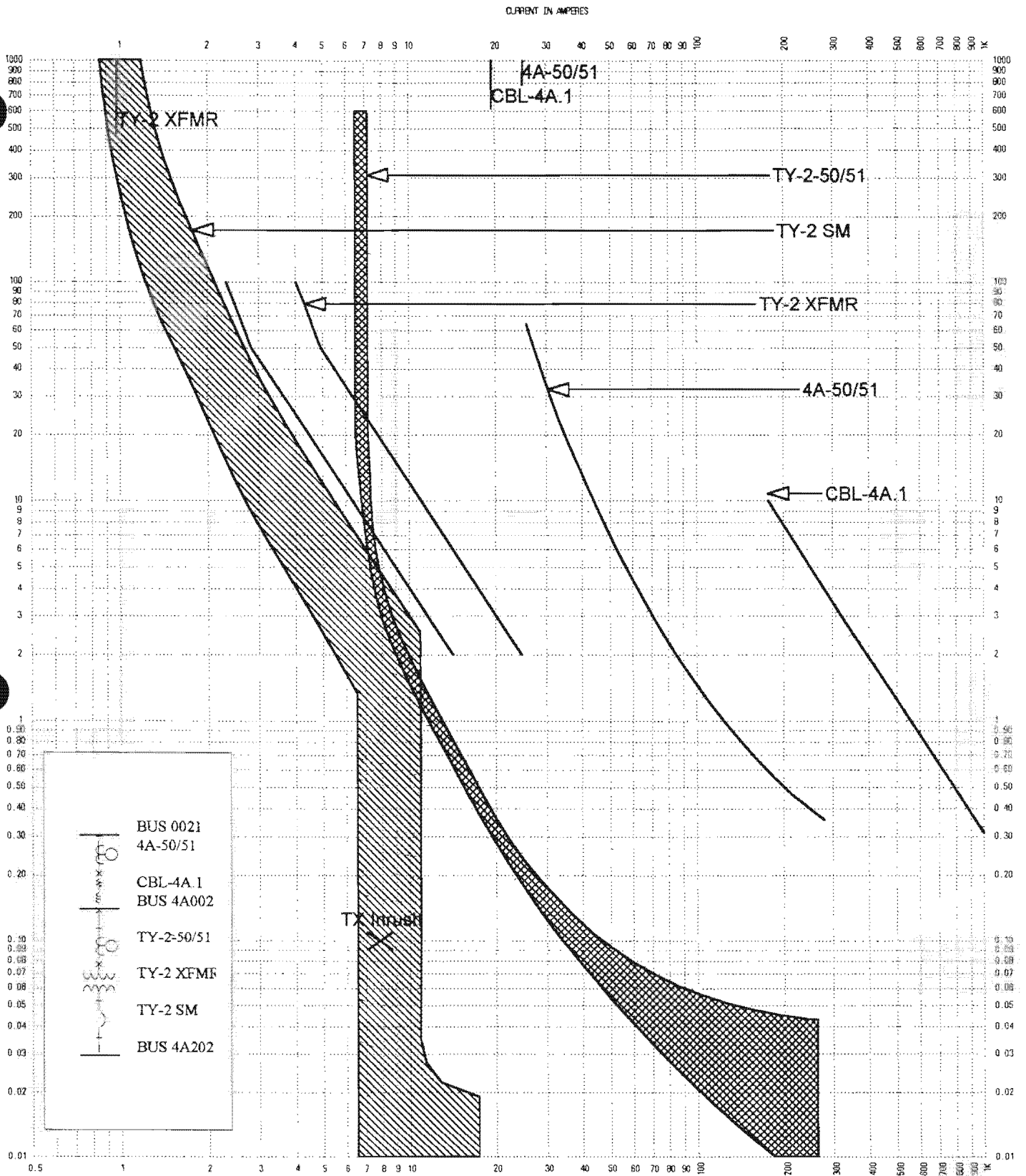
Device Name:	CBL-4A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	TY-2-50/51	Bus Name:	BUS 4A002
Description:	S&C-Vista-Tap Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2635.0A
Frame:	Tap Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 65A		

Device Name:	TY-2 XFMR	Bus Name:	BUS 4A002
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 480V
Nominal Size:	225.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2794.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup	Test Points:	
	2) Ext Inverse	@2.0X, 6.977s	
		@5.0X, 0.990s	

Device Name:	TY-2 SM	Bus Name:	BUS 4A202
Description:	CUTLER-HAMMER-HFD-175-225A	Bus Voltage:	480.0V
AIC Rating:	65kA	Fault Duty:	4796.0A
Frame:	HFD 480V 225A 65kA	Curve Multiplier:	1.00000
Trip:	225A		
Setting:	1) Thermal Curve		
	2) Inst	Fixed	



TCC Name: TYLER-2
 Oonline: TYLER-2
 Date: 25 July, 2000 11:46 AM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Sen-50/51

Seneca Hall Incoming Primary Phase Overcurrent Device

TCC: Seneca Hall

Device: S&C Vista

Existing Settings: None

Transformer: 750 kVA with 5.35 min Z, 32.8 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $32.8 \times 6 = 196.8$ amps.

Set above downstream device.

Set not less than 0.2 seconds under the upstream relay.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Sen-SM
Seneca Hall Secondary Main Breaker

TCC: Seneca Hall

Device: Cutler Hammer DS420 with Digitrip 510 LSI
2000 AF / 2000 Plug

Existing Settings: None – New Device

Transformer: 750 kVA with 5.35 min Z, 2081.8 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$2081.8 \times 1.25 = 2602.3$ amps

Set for Max.

Set for 1.0X (2000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 7 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 4X (8000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I^2T In

Instantaneous:

Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 24000 amps

Note: Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: SENECA HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-4A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	SEN-50/51	Bus Name:	BUS 4A003
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2612.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

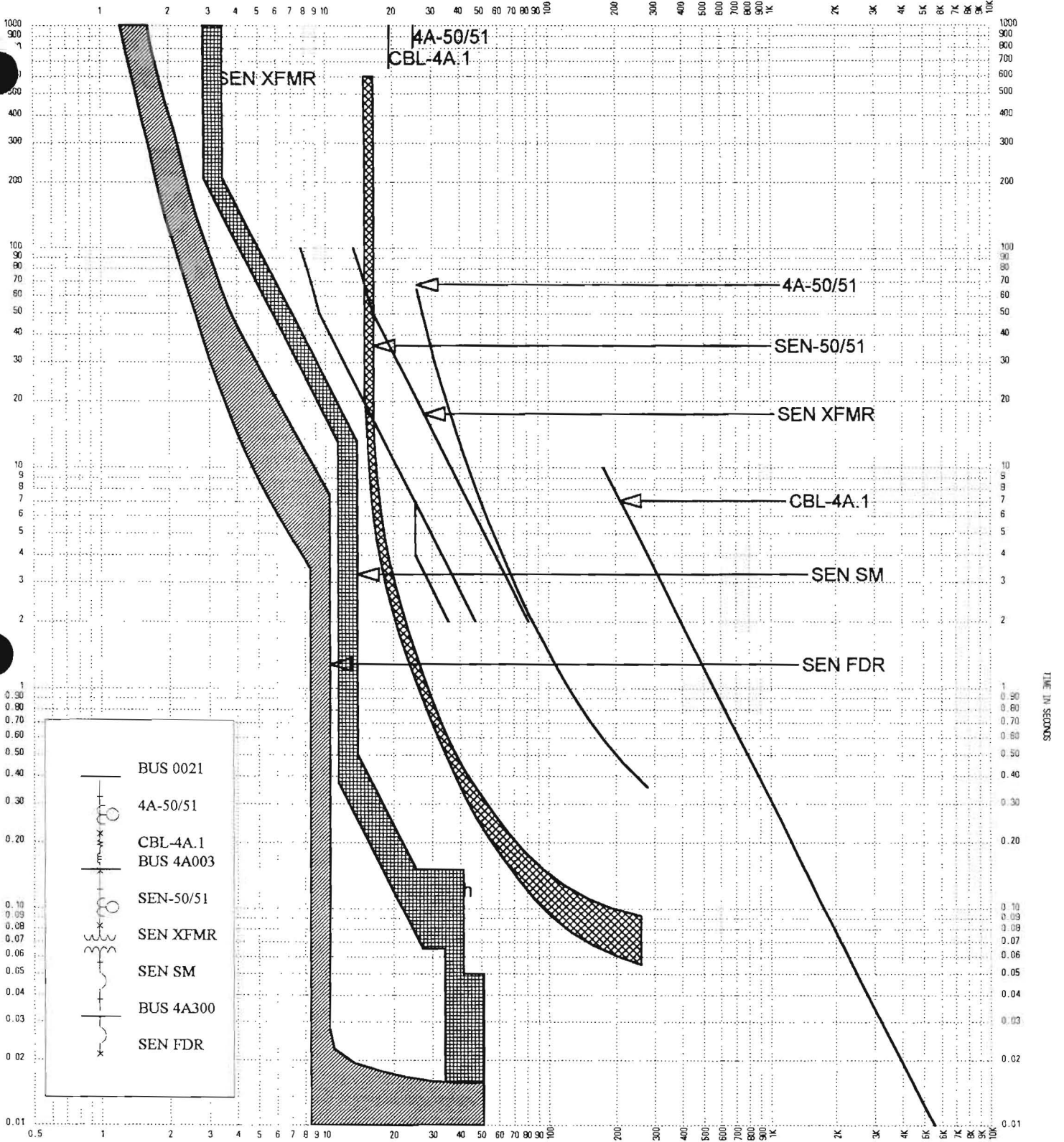
Device Name:	SEN XFMR	Bus Name:	BUS 4A003
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	750.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2794.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	⊙2.0X, 6.977s	
		⊙5.0X, 0.990s	

Device Name:	SEN SM	Bus Name:	BUS 4A300
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	32404.0A
Frame:	DS-420 240V 2000A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	2000A		
Plug:	2000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 7		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	SEN FDR	Bus Name:	BUS 4A300
Description:	WESTINGHOUSE-LDB, LD-300-600A	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	32404.0A
Frame:	600 240V 600A 65kA	Curve Multiplier:	1.00000
Trip:	600A		
Setting:	1) LTD		
	2) INST 10.0		

CURRENT IN AMPERES



TCC Name: SENECA HALL
Online: SENECA
Date: 25 July, 2000 8:24 AM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Path-50/51

Path Finder Incoming Primary Phase Overcurrent Device

TCC: Path Finder

Device: S&C Vista

Existing Settings: None

Transformer: 300 kVA with 5.35 min Z, 13.1 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $13.1 \times 6 = 78.6$ amps.

Set above downstream device.

Set not less than 0.2 seconds under the upstream relay.

Go to next higher size

Set for Tap Curve 80 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Path-SM
Pathfinder Secondary Main Breaker

TCC: Pathfinder

Device: Cutler Hammer DS416H with Digitrip 510 LSI
1600 AF / 1000 Plug

Existing Settings: None – New Device

Transformer: 300 kVA with 5.35 min Z, 832.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$832.7 \times 1.25 = 1040.9$ amps

Set for Max.

Set for 1.0X (1000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 15 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 4X (4000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I^2T In

Instantaneous:

Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 12000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.
2. Set largest downstream device instantaneous setting not more than 7.5X (min setting).

TCC Name: PATHFINDER.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-4A.1	Bus Name:	BUS 0021
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

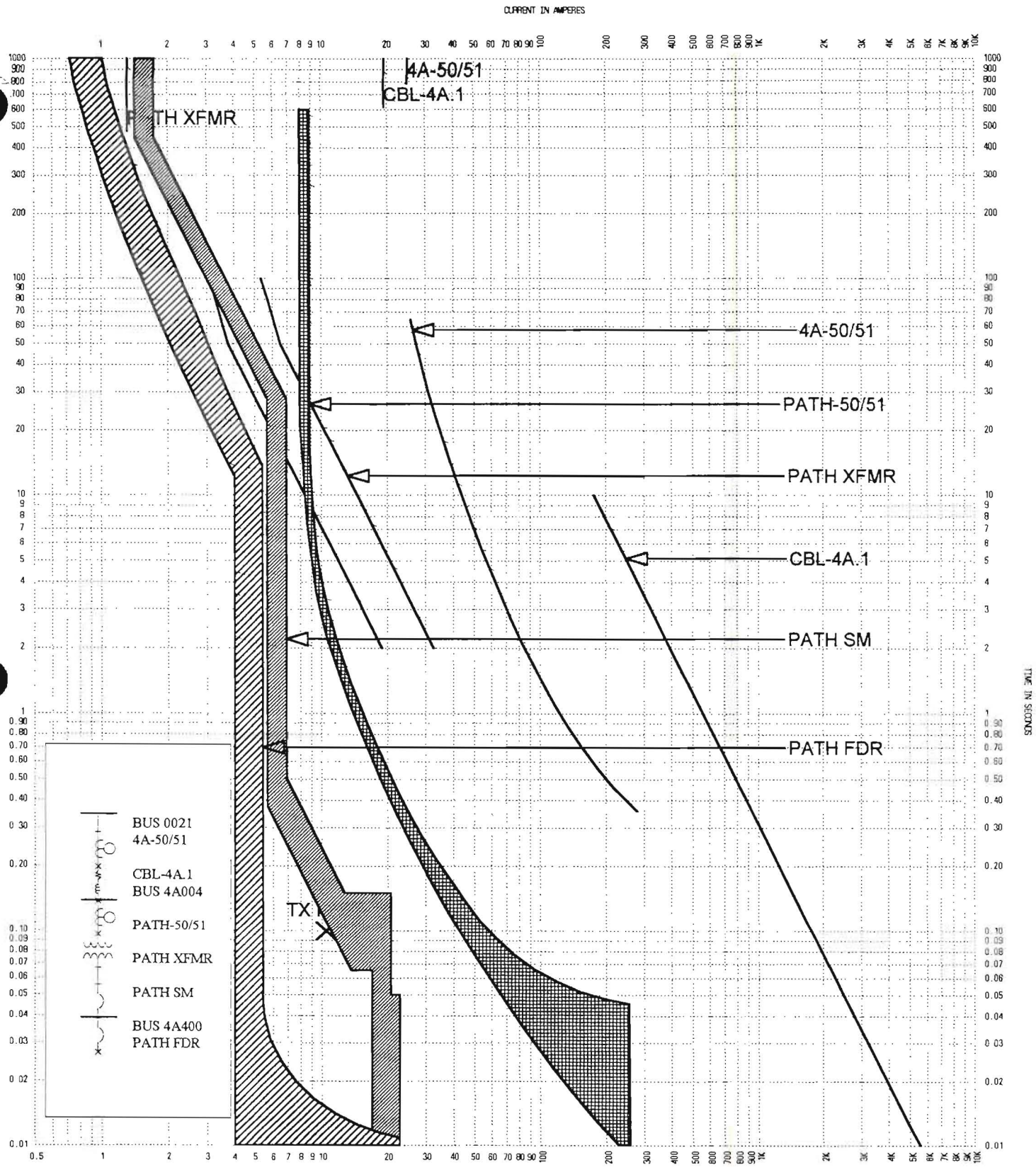
Device Name:	PATH XFMR	Bus Name:	BUS 4A004
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	300.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4A-50/51	Bus Name:	BUS 0021
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2794.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting: 1) OC Pickup	1.25	Test Points:	
2) Ext Inverse	4.0 1.0	⊗2.0X, 6.977s	
		⊗5.0X, 0.990s	

Device Name:	PATH-50/51	Bus Name:	BUS 4A004
Description:	S&C-Vista-Tap Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2577.0A
Frame:	Tap Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting: 1) 80A			

Device Name:	PATH SM	Bus Name:	BUS 4A400
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14445.0A
Frame:	DS-416H 240V 1600A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	1600A		
Plug:	1000A		
Setting: 1) LD Setting	1		
2) LD Time Setting	15		
3) SD Setting	4		
4) SD Time Setting	0.1	I^2 t In	
5) INST	M2(12)		

Device Name:	PATH FDR	Bus Name:	BUS 4A400
Description:	WESTINGHOUSE-DK-250-400A	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14445.0A
Frame:	400 240V 400A 65kA	Curve Multiplier:	1.00000
Trip:	400A		
Setting: 1) LTD			
2) INST	7.5		



TCC Name: PATHFINDER	Current Scale: X10	Reference Voltage: 13200
Online: PATHFINDER		
Date: 25 July, 2000 12:13 PM		SUNY OSWEGO II

FEEDER 4B

SUNY-Oswego II
Protective Device Coordination Study

Device Name: 4B-50/51

Feeder 4B Phase Overcurrent Relay

TCC: Onondaga Hall

Device: Multilin SR-750 Relay

Existing Settings: None

CT Ratio: 200:5

Feeder: 1/0 15 kV Cable rated at 200 amps

Pickup:

Set to protect 200 amps rated cable.

Set not more than 600% cable ampacity per NEC. $200 \times 6 = 1200$ amps

Set to coordinate with upstream and downstream devices.

Note: This relay uses CT primary amps to calculate tap settings.

Set for 125% of the feeder rating. $1.25 \times 200 = 250$ amps

Set for 1.25 AT (250 amps)

Delay:

Set to coordinate with upstream and downstream devices.

Set for not less than 0.4 seconds below the upstream device.

Set for not less than 0.2 seconds above the downstream device curve.

Set above combined inrush of all five transformers (682.3 amps) @ 0.1 seconds

Set for 4 TD on the Extremely Inverse Curve for 0.99 seconds @ 500%

Instantaneous:

Block to coordinate with downstream devices

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Onon-50/51

Onondaga Hall Incoming Primary Phase Overcurrent Device

TCC: Onondaga Hall.

Device: S&C Vista

Existing Settings: None

Transformer: 750 kVA with 5.35 min Z, 32.8 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $32.8 \times 6 = 196.8$ amps.

Set above downstream A4BY2500 fuse.

Set not less than 0.2 seconds under the upstream relay.

Go to next higher size.

Set for Tap Curve 150 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

Note: This device does not coordinate with the existing secondary main fuse. Since this misscoordination does not effect other branches of the system and the device does coordinate with the largest feeder breaker, it is acceptable.

TCC Name: ONONDAGA HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-4B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	ONON-50/51	Bus Name:	BUS 4B001
Description:	S&C-Vista-Main Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2479.0A
Frame:	Main Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 150A		

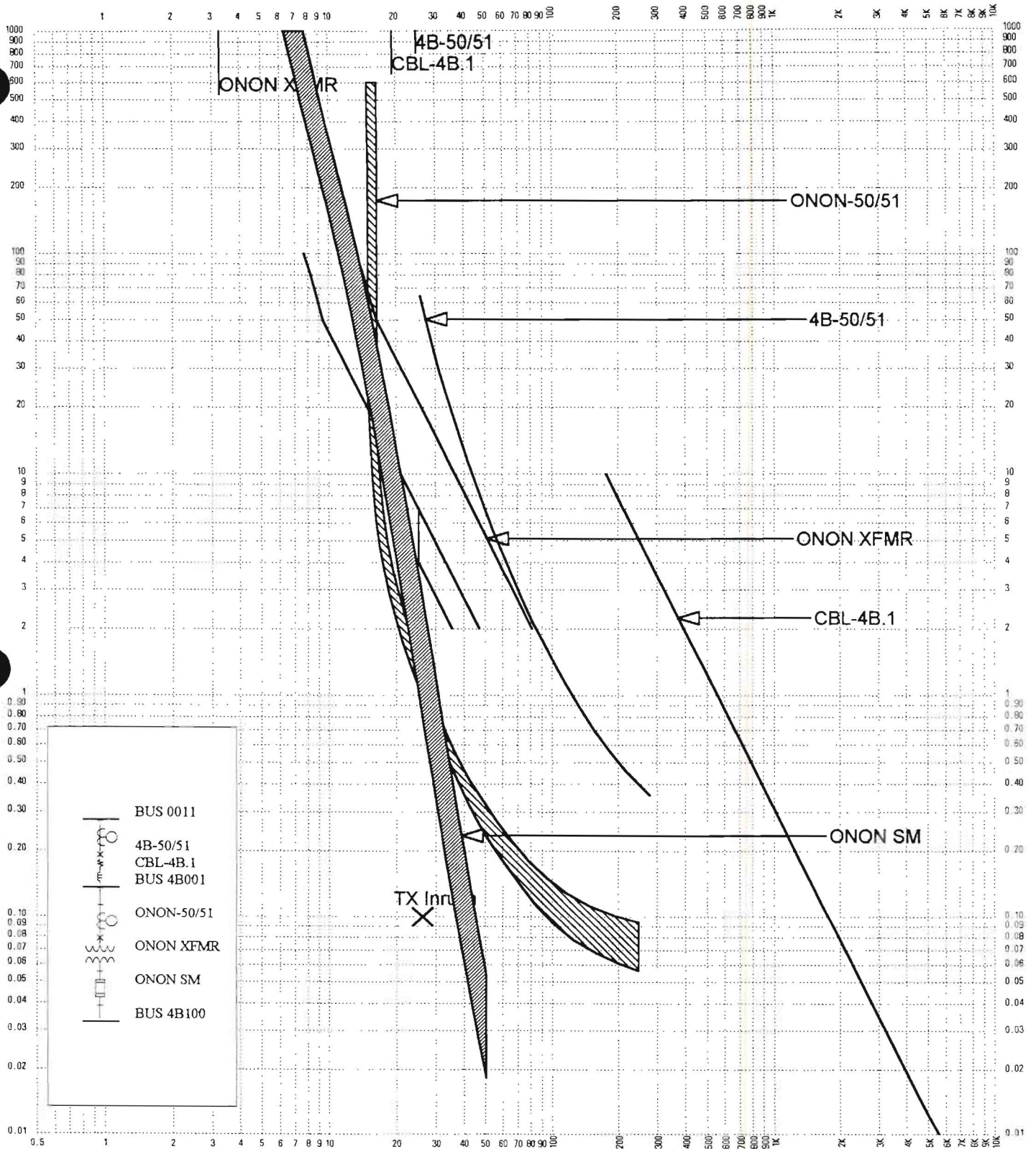
Device Name:	ONON XFMR	Bus Name:	BUS 4B001
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	750.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0		@2.0X, 6.977s
			@5.0X, 0.990s

Device Name:	ONON SM	Bus Name:	BUS 4B100
Description:	GOULD SHAWMUT-A4BY, 600V Class L-200-...	Bus Voltage:	208.0V
AIC Rating:	200kA	Fault Duty:	32080.0A
Cartridge:	2500A 600V 2500A 200kA	Curve Multiplier:	1.00000
Size:	2500A		

Device Name:	ONON FDR	Bus Name:	BUS 4B100
Description:		Bus Voltage:	208.0V
AIC Rating:	0kA	Fault Duty:	200000.0A
Frame:		Curve Multiplier:	1.00000
Sensor:			
Plug:			
Setting:			

CURRENT IN AMPERES



TIME IN SECONDS

TCC Name: ONONDAGA HALL
 Online: ONONDAGA HALL
 Date: 4 August, 2000 2:45 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Oneida-50/51

Oneida Hall Incoming Primary Phase Overcurrent Device

TCC: Oneida Hall

Device: S&C Vista

Existing Settings: None

Transformer: 300 kVA with 5.35 min Z, 13.1 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $13.1 \times 6 = 78.6$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Go to next higher size

Set for Tap Curve 80 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Oneida-SM
Oneida Hall Secondary Main Breaker

TCC: Oneida Hall

Device: Cutler Hammer DS416H with Digitrip 510 LSI
1600 AF / 1000 Plug

Existing Settings: None – New Device

Transformer: 300 kVA with 5.35 min Z, 832.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$832.7 \times 1.25 = 1040.9$ amps

Set for Max.

Set for 1.0X (1000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 7 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 4X (4000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I²T In

Instantaneous:

Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 12000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: ONEIDA HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-4B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	ONEIDA-50/51	Bus Name:	BUS 4B002
Description:	S&C-Vista-Tap Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2422.0A
Frame:	Tap Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 80A		

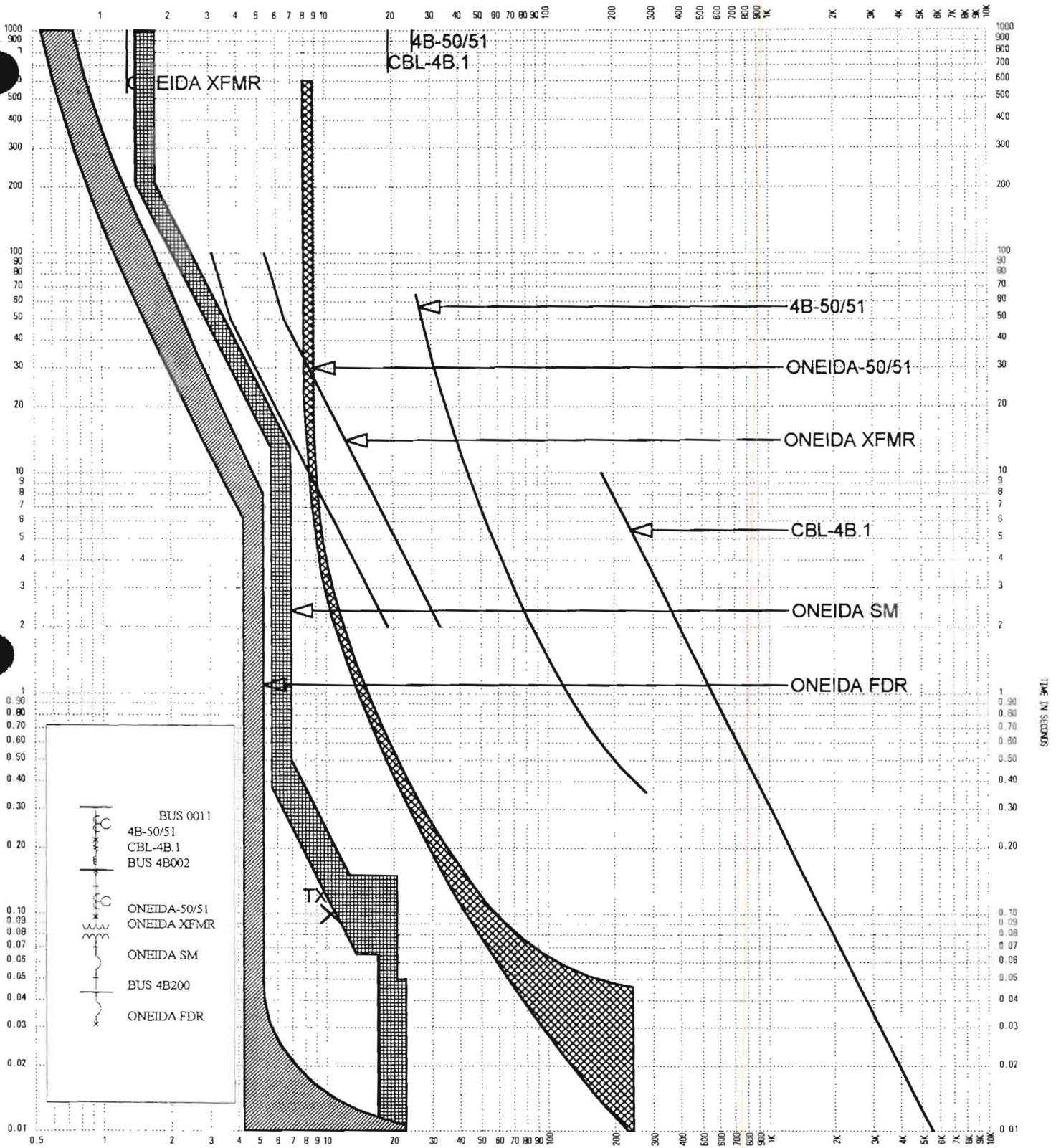
Device Name:	ONEIDA XFMR	Bus Name:	BUS 4B002
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	300.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	2.0X, 6.977s	
		5.0X, 0.990s	

Device Name:	ONEIDA SM	Bus Name:	BUS 4B200
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14370.0A
Frame:	DS-416H 240V 1600A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	1600A		
Plug:	1000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 7		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	ONEIDA FDR	Bus Name:	BUS 4B200
Description:	WESTINGHOUSE-DK-250-400A	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14370.0A
Frame:	400 240V 400A 65kA	Curve Multiplier:	1.00000
Trip:	300A		
Setting:	1) LTD		
	2) INST 10.0		

CURRENT IN AMPERES



TCC Name: ONEIDA HALL
Online: ONEIDA HALL
Date: 25 July, 2000 9:29 AM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Cayuga-50/51

Cayuga Hall Incoming Primary Phase Overcurrent Device

TCC: Cayuga Hall

Device: S&C Vista

Existing Settings: None

Transformer: 300 kVA with 5.35 min Z, 13.1 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $13.1 \times 6 = 78.6$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Go to next size higher fuse

Set for Tap Curve 80 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: Cayuga-SM
Cayuga Hall Secondary Main Breaker

TCC: Cayuga Hall

Device: Cutler Hammer DS420 with Digitrip 510 LSI
1600 AF / 1600 Plug

Existing Settings: None – New Device

Transformer: 300 kVA with 5.35 min Z, 832.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.
 $832.7 \times 1.25 = 1040.9$ amps $1040.9 / 1600 = 0.65$
Go to 0.6 setting
Set for 0.6 X (960 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.
Set for 15 seconds @ 600%

Short Time Pickup

Set above the downstream device.
Set below the upstream device
Set for 4X (4800 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.
Set for 0.1 seconds with I²T In

Instantaneous:

Set to max to attempt coordination with downstream devices.
Set above the 14333 available fault amps
Set for M2 (12X) for 19200 amps

Note: Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.

TCC Name: CAYUGA HALL.tcc
 Reference Voltage: 13200
 Current Scale X 10^1

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Device Name:	CBL-4B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	CAYUGA-50/51	Bus Name:	BUS 4B004
Description:	S&C-Vista-Tap Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2347.0A
Frame:	Tap Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 80A		

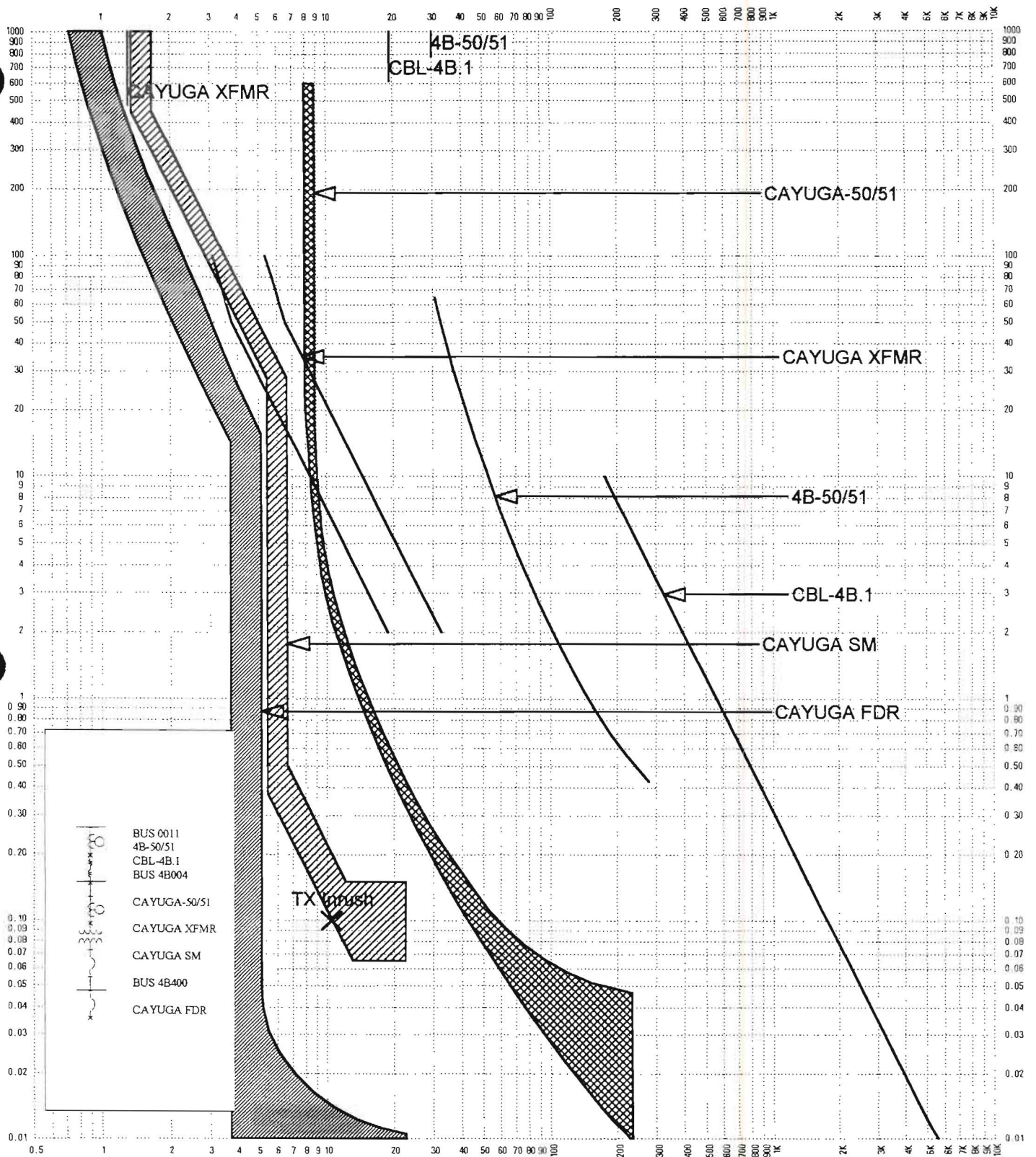
Device Name:	CAYUGA XFMR	Bus Name:	BUS 4B004
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	300.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	⊙2.0X, 6.977s	
		⊙5.0X, 0.990s	

Device Name:	CAYUGA SM	Bus Name:	BUS 4B400
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14333.0A
Frame:	DS-416H 240V 1600A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	1600A		
Plug:	1600A		
Setting:	1) LD Setting 0.6		
	2) LD Time Setting 15		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	CAYUGA FDR	Bus Name:	BUS 4B400
Description:	WESTINGHOUSE-DK-250-400A	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14333.0A
Frame:	400 240V 400A 65kA	Curve Multiplier:	1.00000
Trip:	400A		
Setting:	1) LTD		
	2) INST 7.0		

CURRENT IN AMPERES



TCC Name: CAYUGA HALL
 Oonline: CAYUGA HALL
 Date: 24 July, 2000 4:14 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II
Protective Device Coordination Study

Device Name: LP-50/51

Little Page Incoming Primary Phase Overcurrent Device

TCC: Little Page

Device: S&C Vista

Existing Settings: None

Transformer: 300 kVA with 5.35 min Z, 13.1 FLA @ 13.2 kV

Phase Overcurrent Pickup:

Set to protect transformer Primary.

Set for not more than 600% . $13.1 \times 6 = 78.6$ amps.

Set above downstream breaker.

Set not less than 0.2 seconds under the upstream relay.

Go to next size higher fuse

Set for Tap Curve 80 Amps

Instantaneous Off

Definite Time Off

Ground Fault

See GF section of the report for setting logic

Set for Tap Curve 50 Amps

Instantaneous Off

Definite Time Off

SUNY-Oswego II
Protective Device Coordination Study

Device Name: LP-SM

Little Page Secondary Main Breaker

TCC: Little Page

Device: Cutler Hammer DS420 with Digitrip 510 LSI
1600 AF / 1000 Plug

Existing Settings: None – New Device

Transformer: 300 kVA with 5.35 min Z, 832.7 FLA @ 208V

Long Time Pickup:

Set for not more than 125% of transformer FLA.

$832.7 \times 1.25 = 1040.9$ amps

Set to max setting

Set for 1.0 X (1000 amps)

Long Time Delay:

Set to coordinate with the upstream and downstream devices.

Set for 15 seconds @ 600%

Short Time Pickup

Set above the downstream device.

Set below the upstream device

Set for 4X (4000 amps)

Short Time Delay

Set to coordinate with the upstream and downstream device.

Set for 0.1 seconds with I²T In

Instantaneous:

Set to max to attempt coordination with downstream devices

Set for M2 (12X) for 12000 amps

Notes:

1. Recommend replacing the LSI programmer with an LS model for better coordination with the downstream devices.
2. Set the downstream device not more than 7.5X (mid setting)

TCC Name: LITTLE PAGE.tcc
Reference Voltage: 13200
Current Scale X 10^1

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Device Name:	CBL-4B.1	Bus Name:	BUS 0011
Description:	Cable Damage Curve	Bus Voltage:	13200V
Size:	1/0	Fault Duty:	200000.0A
Material:	Copper	Cont. Temp:	75 deg C.
Qty/Ph:	1	Damage Temp:	150 deg C.

Device Name:	LP-50/51	Bus Name:	BUS 4B003
Description:	S&C-Vista-Tap Fault Interrupter	Bus Voltage:	13200.0V
AIC Rating:	12500kA	Fault Duty:	2392.0A
Frame:	Tap Fault Int. 15500V 600A 12500kA 0kA 0kA	Curve Multiplier:	1.00000
Sensor:	600A		
Plug:			
Setting:	1) 80A		

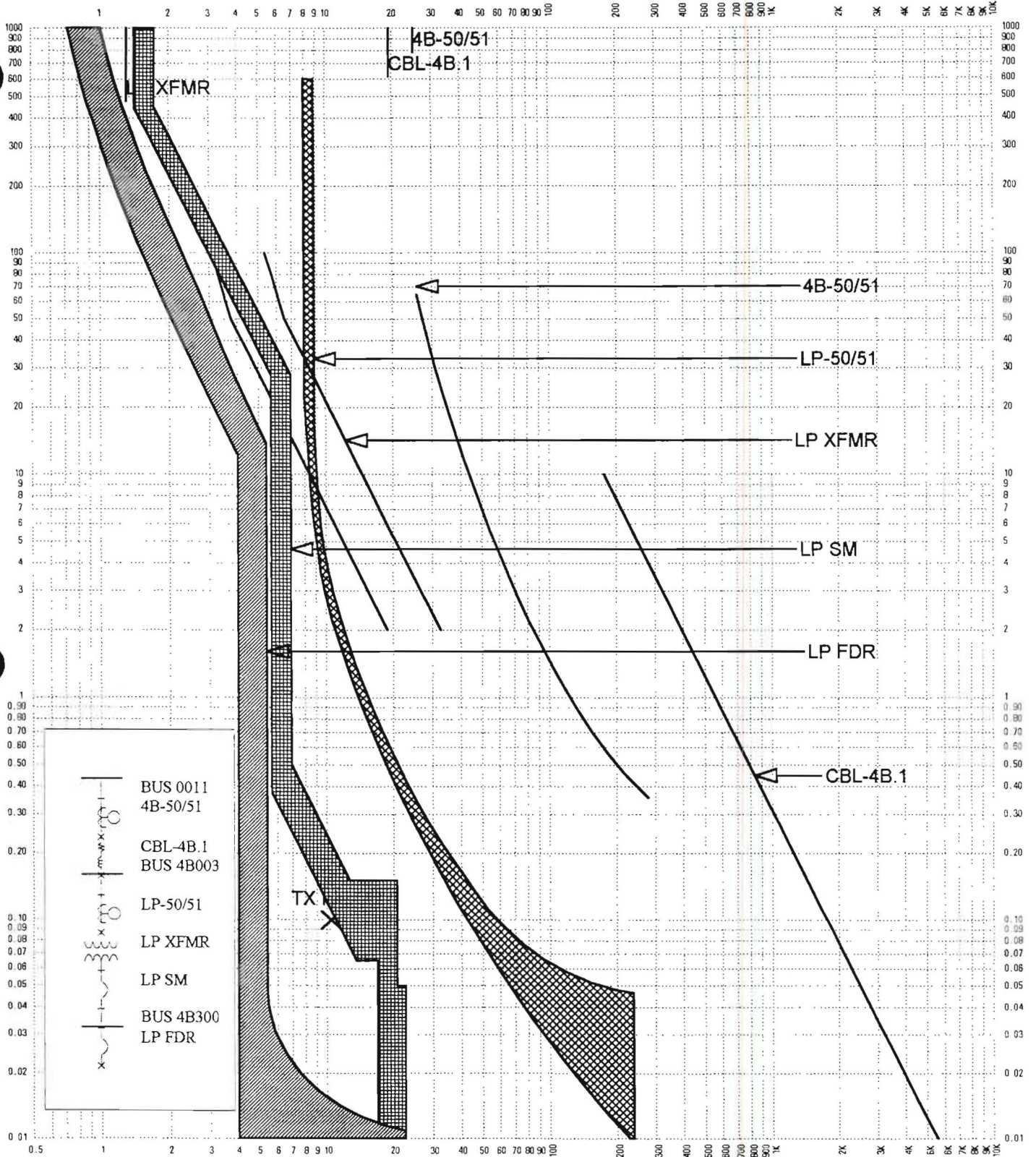
Device Name:	LP XFMR	Bus Name:	BUS 4B003
Description:	2-Winding Transformer Damage Curve	Bus Voltage:	13200V / 208V
Nominal Size:	300.0kVA	Fault Duty:	200000.0A
Impedance (%Z):	5.3200	Pri Connection:	Delta
Inrush Factor:	8.0x	Sec Connection:	Wye-Ground

Device Name:	4B-50/51	Bus Name:	BUS 0011
Description:	MULTILIN-SR750/760 Feeder Relay-5A CT Sec	Bus Voltage:	13200.0V
AIC Rating:	N/A	Fault Duty:	2797.0A
Current Rating:	200A / 5A	Curve Multiplier:	1.00000
Setting:	1) OC Pickup 1.25	Test Points:	
	2) Ext Inverse 4.0 1.0	⊙2.0X, 6.977s	
		⊙5.0X, 0.990s	

Device Name:	LP SM	Bus Name:	BUS 4B300
Description:	CUTLER-HAMMER-DS, LSI-Digitrip RMS 51...	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14356.0A
Frame:	DS-416H 240V 1600A 65kA 0kA 65kA	Curve Multiplier:	1.00000
Sensor:	1200A		
Plug:	1000A		
Setting:	1) LD Setting 1		
	2) LD Time Setting 15		
	3) SD Setting 4		
	4) SD Time Setting 0.1 I^2 t In		
	5) INST M2(12)		

Device Name:	LP FDR	Bus Name:	BUS 4B300
Description:	WESTINGHOUSE-DK-250-400A	Bus Voltage:	208.0V
AIC Rating:	65kA	Fault Duty:	14356.0A
Frame:	400 240V 400A 65kA	Curve Multiplier:	1.00000
Trip:	400A		
Setting:	1) LTD		
	2) INST 7.5		

CURRENT IN AMPERES



TCC Name: LITTLE PAGE Current Scale: X10 Reference Voltage: 13200
Online: LITTLE PAGE
Date: 25 July, 2000 10:26 AM SUNY OSWEGO II

GROUND FAULT

SUNY-Oswego II

Protective Device Coordination Study

Device Name: 4B-51G (typical for 3A-51G, 3B-51G & 4A-51G)

Feeder 4B Ground Fault Relay

TCC: 15kV GF.

Device: Multilin SR-750 Relay

CT Ratio: 50:5

Pickup:

Set under upstream device with 60 amp pickup.

Note: This relay uses CT primary amps to calculate tap settings.

Set for 50 amps

Set for 1 AT (50 amps)

Delay:

Set to coordinate with upstream and downstream devices.

Set for not less than 0.4 seconds below the upstream device.

Set for not less than 0.2 seconds above the downstream Device curve.

Set for 3.1 TD on the Extremely Inverse Curve for 0.767 seconds @ 500%

Instantaneous:

Block to coordinate with downstream devices

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Onon-50G (typical for all Vista Devices except as noted)

Primary Ground Fault Device

TCC: 15kV GF

Device: S&C Vista

Existing Settings: None

Ground Fault Setting:

Last device in chain, set as low as possible.

Set time delay not less than 0.2 seconds above the upstream relay @ 400 amps.

Set for Tap Curve 50 Amps (Minimum Setting)

Instantaneous Off

Definite Time Off

Note: When an E-speed curve is selected for the phase overcurrent device, the ground-overcurrent pickup setting is disabled as are the instantaneous-pickup and definite-time delay attributes

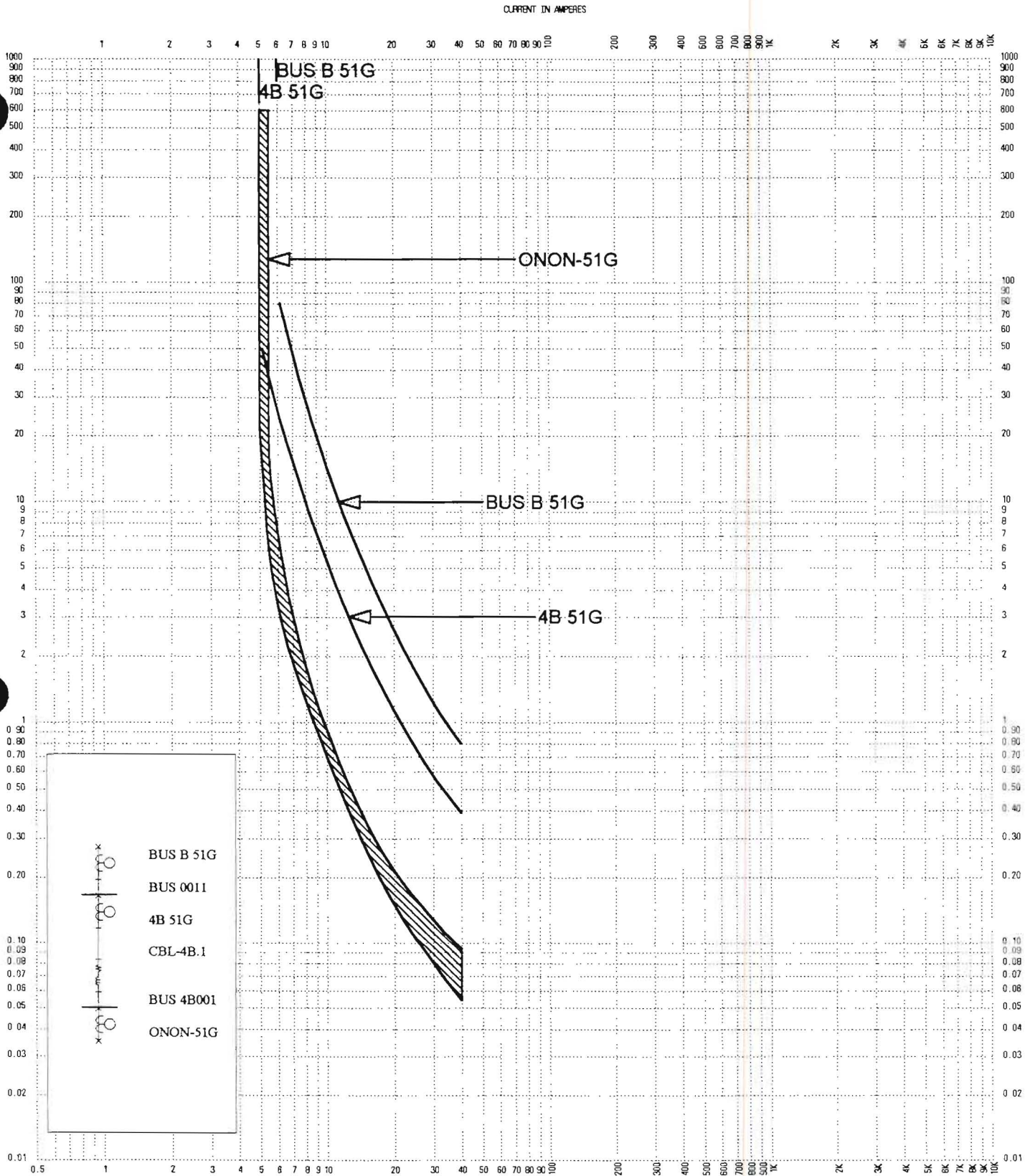
TCC Name: 15KV GF.tcc
Reference Voltage: 13200
Current Scale X 10^1

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Device Name: BUS B 51G Bus Name: BUS 0011
Description: MULTILIN-SR750/760 Feeder Relay-5A CT Sec Bus Voltage: 13200.0V
AIC Rating: N/A Fault Duty: 400.0A
Current Rating: 1200A / 5A Curve Multiplier: 1.00000
Setting: 1) OC Pickup 0.05 Test Points:
2) Ext Inverse 5.0 1.0 @2.0X, 8.722s
@5.0X, 1.237s

Device Name: 4B 51G Bus Name: BUS 0011
Description: MULTILIN-SR750/760 Feeder Relay-5A CT Sec Bus Voltage: 13200.0V
AIC Rating: N/A Fault Duty: 400.0A
Current Rating: 50A / 5A Curve Multiplier: 1.00000
Setting: 1) OC Pickup 1.0 Test Points:
2) Ext Inverse 3.1 1.0 @2.0X, 5.407s
@5.0X, 0.767s

Device Name: ONON-51G Bus Name: BUS 4B001
Description: S&C-Vista-Tap Fault Interrupter Bus Voltage: 13200.0V
AIC Rating: 12500kA Fault Duty: 400.0A
Frame: Tap Fault Int. 15500V 600A 12500kA 0kA 0kA Curve Multiplier: 1.00000
Sensor: 600A
Plug:
Setting: 1) 50A



TCC Name: 15kV GF
 Oonline: 15kV GF
 Date: 25 July, 2000 1:48 PM

Current Scale: X10

Reference Voltage: 13200

SUNY OSWEGO II

SUNY-Oswego II

Protective Device Coordination Study

Device Name: Culk-SM GF (typical for Pen-SM-GF)

Culkin Hall Secondary Main Breaker

TCC: Culkin Hall & LV GF

Device: Cutler Hammer DS632 with Digitrip 510 LSG
3200 AF / 2400 Plug

Existing Settings: None – New Device

Ground Fault Pickup:

Set to max to attempt to coordinate with downstream devices

Set for E (1200 amps)

Ground Fault Delay:

Set to max to attempt coordination with downstream devices

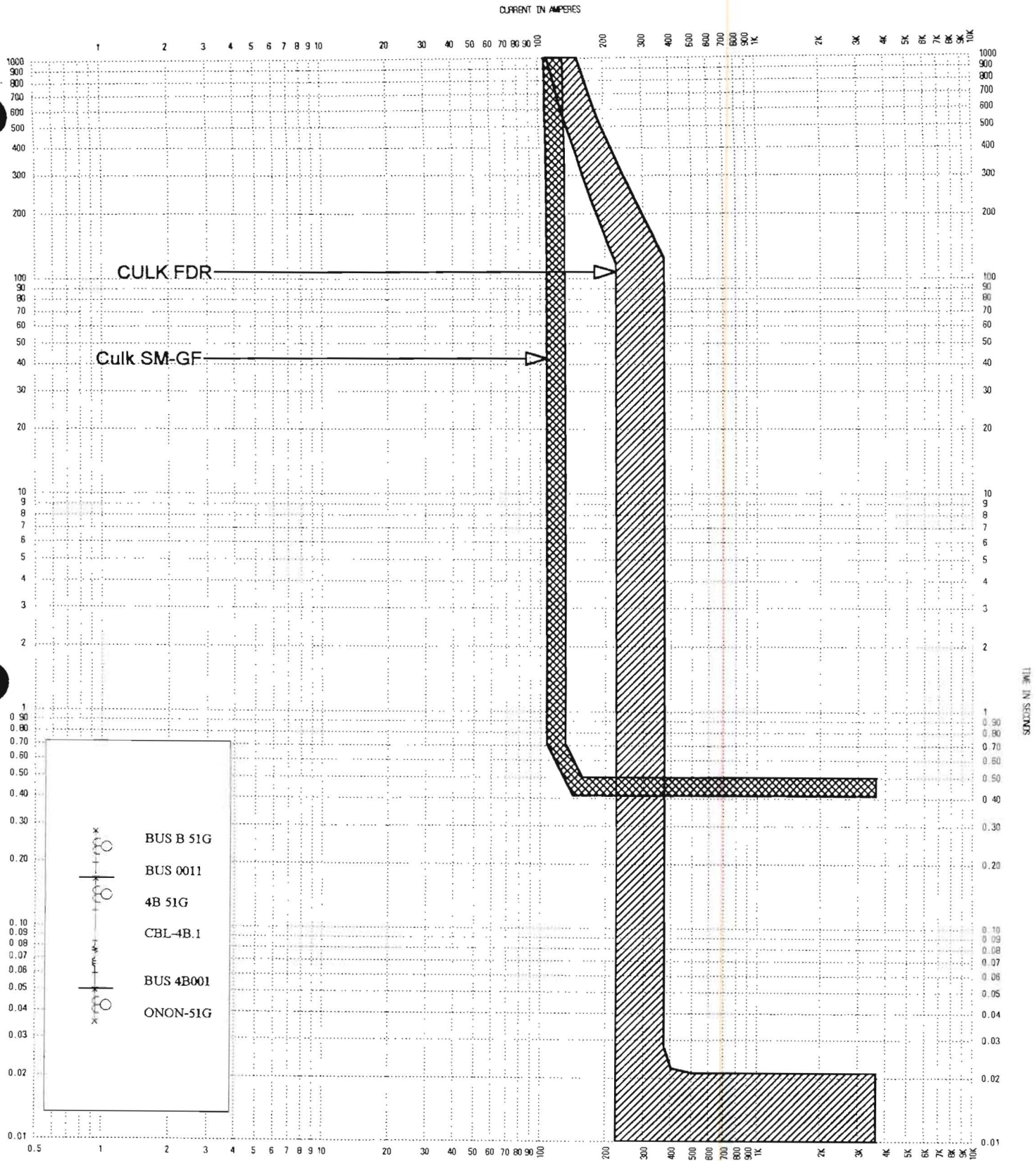
Set for 0.5 seconds with I²T In

TCC Name: LV GF.tcc
Reference Voltage: 480
Current Scale X 10^1

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Device Name: CULK FDR Bus Name: BUS 3A400
Description: CUTLER-HAMMER-MD-700-800A Bus Voltage: 480.0V
AIC Rating: 35kA Fault Duty: 36250.0A
Frame: 800A 480V 800A 35kA Curve Multiplier: 1.00000
Trip: 800A
Setting: 1) Thermal Curve
2) Inst 3000A

Device Name: Culk SM-GF Bus Name: BUS 3A400
Description: CUTLER-HAMMER-DS, 2400A=In-Digitrip R... Bus Voltage: 480.0V
AIC Rating: 65kA Fault Duty: 36250.0A
Frame: DS-632 480V 3200A 65kA 0kA 65kA Curve Multiplier: 1.00000
Sensor: 2400A
Plug: 2400A
Setting: 1) GF Setting E
2) GF Delay 0.5 I^2 t In



TCC Name: LV GF
 Online: 15kV GF
 Date: 25 July, 2000 1:59 PM

Current Scale: X10

Reference Voltage: 480

SUNY OSWEGO II

5.0 SHORT CIRCUIT REPORT COMPUTER PRINTOUTS

This section contains the results of the Short Circuit Study Report

Jul 11, 2000 08:52:57

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SKM POWER*TOOLS FOR WINDOWS
A_FAULT SHORT CIRCUIT ANALYSIS REPORT
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THREE PHASE FAULT REPORT

(FOR APPLICATION OF LOW VOLTAGE BREAKERS)

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

BUS 0000	FAULT: 6.795 KA AT -82.94 DEG (406.07 MVA)	X/R: 8.09
	VOLTAGE: 34500. EQUIV. IMPEDANCE= .3601 + J 2.9089 OHMS	
	CONTRIBUTIONS: NMPC 6.292 KA ANG: -82.87	
	BUS 0001 .503 KA ANG: -83.79	
BUS 0001	FAULT: 6.795 KA AT -82.94 DEG (406.07 MVA)	X/R: 8.09
	VOLTAGE: 34500. EQUIV. IMPEDANCE= .3601 + J 2.9089 OHMS	
	CONTRIBUTIONS: BUS 0020 .263 KA ANG: -83.72	
	BUS 0000 6.292 KA ANG: -82.87	
	BUS 0010 .241 KA ANG: -83.86	
BUS 0010	FAULT: 3.319 KA AT -85.11 DEG (75.88 MVA)	X/R: 12.15
	VOLTAGE: 13200. EQUIV. IMPEDANCE= .1957 + J 2.2878 OHMS	
	CONTRIBUTIONS: BUS 0001 2.521 KA ANG: -85.70	
	BUS 0011 .798 KA ANG: -83.23	
BUS 0011	FAULT: 3.238 KA AT -83.68 DEG (74.03 MVA)	X/R: 9.04
	VOLTAGE: 13200. EQUIV. IMPEDANCE= .2592 + J 2.3393 OHMS	
	CONTRIBUTIONS: FDR 1B MTR LD .224 KA ANG: -84.29	
	FDR 2B MTR LD .224 KA ANG: -84.29	
	BUS 0010 2.430 KA ANG: -83.60	
	BUS 4B001 .109 KA ANG: -83.29	
	BUS 3B001 .252 KA ANG: -83.49	
BUS 0020	FAULT: 3.413 KA AT -84.99 DEG (78.03 MVA)	X/R: 11.96
	VOLTAGE: 13200. EQUIV. IMPEDANCE= .1951 + J 2.2244 OHMS	
	CONTRIBUTIONS: BUS 0001 2.520 KA ANG: -85.70	
	BUS 0021 .894 KA ANG: -82.97	
BUS 0021	FAULT: 3.335 KA AT -83.63 DEG (76.24 MVA)	X/R: 8.99
	VOLTAGE: 13200. EQUIV. IMPEDANCE= .2534 + J 2.2712 OHMS	
	CONTRIBUTIONS: FDR 1A MTR LD .224 KA ANG: -84.29	
	FDR 2A MTR LD .224 KA ANG: -84.29	
	BUS 0020 2.429 KA ANG: -83.60	
	BUS 3A001 .156 KA ANG: -83.65	
	BUS 4A001 .302 KA ANG: -82.91	
BUS 3A001	FAULT: 3.185 KA AT -79.15 DEG (72.81 MVA)	X/R: 5.32
	VOLTAGE: 13200. EQUIV. IMPEDANCE= .4503 + J 2.3502 OHMS	
	CONTRIBUTIONS: BUS 0021 3.029 KA ANG: -78.91	
	BUS 3A002 .157 KA ANG: -83.89	

T H R E E P H A S E F A U L T R E P O R T
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

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BUS 3A002  FAULT:   3.144 KA AT -78.05 DEG ( 71.89 MVA) X/R:   4.84
            VOLTAGE: 13200.  EQUIV. IMPEDANCE=  .5020 + J 2.3713 OHMS
            CONTRIBUTIONS:  BUS 3A001      2.988 KA   ANG:  -77.74
                           BUS 3A003      .157 KA   ANG:  -83.96

BUS 3A003  FAULT:   3.116 KA AT -77.29 DEG ( 71.23 MVA) X/R:   4.57
            VOLTAGE: 13200.  EQUIV. IMPEDANCE=  .5382 + J 2.3861 OHMS
            CONTRIBUTIONS:  BUS 3A002      2.960 KA   ANG:  -76.93
                           BUS 3A300      .021 KA   ANG:  -83.72
                           BUS 3A004      .136 KA   ANG:  -84.04

BUS 3A004  FAULT:   3.021 KA AT -74.88 DEG ( 69.07 MVA) X/R:   3.88
            VOLTAGE: 13200.  EQUIV. IMPEDANCE=  .6579 + J 2.4354 OHMS
            CONTRIBUTIONS:  BUS 3A003      2.886 KA   ANG:  -74.45
                           BUS 3A400      .137 KA   ANG:  -84.17

BUS 3A100  FAULT:  14.537 KA AT -71.66 DEG ( 5.24 MVA) X/R:   3.02
            VOLTAGE:   208.  EQUIV. IMPEDANCE=  .0026 + J .0078 OHMS
            LOW VOLTAGE POWER CIRCUIT BREAKER 14.537 KA
            MOLDED CASE CIRCUIT BREAKER < 20KA 14.537 KA
            MOLDED CASE CIRCUIT BREAKER > 20KA 14.537 KA
            CONTRIBUTIONS:  BUS 3A001      14.537 KA   ANG:  -71.66

BUS 3A200  FAULT:  23.073 KA AT -76.20 DEG ( 8.31 MVA) X/R:   4.08
            VOLTAGE:   208.  EQUIV. IMPEDANCE=  .0012 + J .0051 OHMS
            LOW VOLTAGE POWER CIRCUIT BREAKER 23.073 KA
            MOLDED CASE CIRCUIT BREAKER > 20KA 23.073 KA
            CONTRIBUTIONS:  BUS 3A002      23.073 KA   ANG:  -76.20

BUS 3A300  FAULT:  15.907 KA AT -78.06 DEG ( 5.73 MVA) X/R:   4.98
            VOLTAGE:   208.  EQUIV. IMPEDANCE=  .0016 + J .0074 OHMS
            LOW VOLTAGE POWER CIRCUIT BREAKER 15.907 KA
            MOLDED CASE CIRCUIT BREAKER < 20KA 17.762 KA
            MOLDED CASE CIRCUIT BREAKER > 20KA 15.967 KA
            CONTRIBUTIONS:  HART MTR LD      1.418 KA   ANG:  -84.29
                           BUS 3A003      14.497 KA   ANG:  -77.45

BUS 3A400  FAULT:  32.966 KA AT -80.37 DEG ( 27.41 MVA) X/R:   6.12
            VOLTAGE:   480.  EQUIV. IMPEDANCE=  .0014 + J .0083 OHMS
  
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T H R E E P H A S E F A U L T R E P O R T
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

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=====
LOW VOLTAGE POWER CIRCUIT BREAKER  32.966 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 34.523 KA
CONTRIBUTIONS:  CULK MTR LD          4.097 KA    ANG:  -84.29
                  BUS 3A004          28.879 KA    ANG:  -79.82

BUS 3B001  FAULT:   3.053 KA AT  -78.14 DEG ( 69.81 MVA) X/R:   4.96
VOLTAGE:  13200.  EQUIV. IMPEDANCE=  .5130 + J  2.4427 OHMS
CONTRIBUTIONS:  BUS 0011           2.802 KA    ANG:  -77.61
                  BUS 3B100         .137 KA    ANG:  -84.17
                  BUS 3B002         .116 KA    ANG:  -83.87

BUS 3B002  FAULT:   3.025 KA AT  -77.35 DEG ( 69.15 MVA) X/R:   4.65
VOLTAGE:  13200.  EQUIV. IMPEDANCE=  .5519 + J  2.4585 OHMS
CONTRIBUTIONS:  BUS 3B001           2.909 KA    ANG:  -77.09
                  BUS 3B200         .068 KA    ANG:  -83.98
                  BUS 3B003         .048 KA    ANG:  -83.81

BUS 3B003  FAULT:   2.936 KA AT  -74.98 DEG ( 67.13 MVA) X/R:   3.89
VOLTAGE:  13200.  EQUIV. IMPEDANCE=  .6725 + J  2.5069 OHMS
CONTRIBUTIONS:  BUS 3B002           2.889 KA    ANG:  -74.84
                  BUS 3B300         .048 KA    ANG:  -83.85

BUS 3B100  FAULT:  33.037 KA AT  -81.47 DEG ( 27.47 MVA) X/R:   6.87
VOLTAGE:   480.   EQUIV. IMPEDANCE=  .0012 + J  .0083 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER  33.280 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 35.334 KA
CONTRIBUTIONS:  PEN MTR LD          4.097 KA    ANG:  -84.29
                  BUS 3B001          28.945 KA    ANG:  -81.07

BUS 3B200  FAULT:  45.550 KA AT  -80.28 DEG ( 16.41 MVA) X/R:   6.06
VOLTAGE:   208.   EQUIV. IMPEDANCE=  .0004 + J  .0026 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER  45.550 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 47.610 KA
CONTRIBUTIONS:  LAN MTR LD          4.728 KA    ANG:  -84.29
                  BUS 3B002          40.836 KA    ANG:  -79.81

BUS 3B300  FAULT:  35.550 KA AT  -78.60 DEG ( 12.81 MVA) X/R:   5.22
VOLTAGE:   208.   EQUIV. IMPEDANCE=  .0007 + J  .0033 OHMS
  
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THREE PHASE FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

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=====
LOW VOLTAGE POWER CIRCUIT BREAKER 35.550 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 36.047 KA
CONTRIBUTIONS: MAHAR MTR LD      3.309 KA      ANG: -84.29
                 BUS 3B003      32.258 KA      ANG: -78.01

BUS 4A001  FAULT: 3.139 KA AT -77.96 DEG ( 71.77 MVA) X/R: 4.89
VOLTAGE: 13200. EQUIV. IMPEDANCE= .5062 + J 2.3743 OHMS
CONTRIBUTIONS: BUS 0021      2.836 KA      ANG: -77.36
                 BUS 4A002      .173 KA      ANG: -83.55
                 BUS 4A101      .068 KA      ANG: -83.98
                 BUS 4A102      .063 KA      ANG: -83.24

BUS 4A002  FAULT: 3.080 KA AT -76.43 DEG ( 70.43 MVA) X/R: 4.36
VOLTAGE: 13200. EQUIV. IMPEDANCE= .5805 + J 2.4050 OHMS
CONTRIBUTIONS: BUS 4A001      2.909 KA      ANG: -76.00
                 BUS 4A201      .068 KA      ANG: -83.98
                 BUS 4A202      .036 KA      ANG: -82.82
                 BUS 4A003      .069 KA      ANG: -83.77

BUS 4A003  FAULT: 3.011 KA AT -74.66 DEG ( 68.84 MVA) X/R: 3.83
VOLTAGE: 13200. EQUIV. IMPEDANCE= .6696 + J 2.4409 OHMS
CONTRIBUTIONS: BUS 4A002      2.943 KA      ANG: -74.45
                 BUS 4A300      .048 KA      ANG: -83.85
                 BUS 4A004      .021 KA      ANG: -83.71

BUS 4A004  FAULT: 2.964 KA AT -73.49 DEG ( 67.76 MVA) X/R: 3.54
VOLTAGE: 13200. EQUIV. IMPEDANCE= .7307 + J 2.4653 OHMS
CONTRIBUTIONS: BUS 4A003      2.944 KA      ANG: -73.42
                 BUS 4A400      .021 KA      ANG: -83.72

BUS 4A101  FAULT: 45.881 KA AT -80.41 DEG ( 16.53 MVA) X/R: 6.14
VOLTAGE: 208. EQUIV. IMPEDANCE= .0004 + J .0026 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER 45.881 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 48.067 KA
CONTRIBUTIONS: HEW-1 MTR LD    4.728 KA      ANG: -84.29
                 BUS 4A001     41.165 KA      ANG: -79.97

BUS 4A102  FAULT: 12.012 KA AT -78.67 DEG ( 9.99 MVA) X/R: 5.45
VOLTAGE: 480. EQUIV. IMPEDANCE= .0045 + J .0226 OHMS
  
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T H R E E P H A S E F A U L T R E P O R T
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

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=====
LOW VOLTAGE POWER CIRCUIT BREAKER  12.012 KA
MOLDED CASE CIRCUIT BREAKER < 20KA 13.673 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 12.291 KA
CONTRIBUTIONS: HEW-2 MTR LD      2.052 KA      ANG:  -84.29
                  BUS 4A001      9.972 KA      ANG:  -77.52

BUS 4A201  FAULT:  45.722 KA AT  -80.10 DEG ( 16.47 MVA) X/R:   5.97
VOLTAGE:   208.  EQUIV. IMPEDANCE= .0005 + J .0026 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER  45.722 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 47.653 KA
CONTRIBUTIONS: TY-1 MTR LD      4.728 KA      ANG:  -84.29
                  BUS 4A002     41.009 KA      ANG:  -79.62

BUS 4A202  FAULT:   6.018 KA AT  -78.28 DEG (  5.00 MVA) X/R:   5.41
VOLTAGE:   480.  EQUIV. IMPEDANCE= .0094 + J .0451 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER   6.018 KA
MOLDED CASE CIRCUIT BREAKER < 10KA  8.068 KA
MOLDED CASE CIRCUIT BREAKER < 20KA  6.838 KA
MOLDED CASE CIRCUIT BREAKER > 20KA  6.147 KA
CONTRIBUTIONS: TY-2 MTR LD      1.231 KA      ANG:  -84.29
                  BUS 4A002     4.796 KA      ANG:  -76.74

BUS 4A300  FAULT:  35.695 KA AT  -78.56 DEG ( 12.86 MVA) X/R:   5.21
VOLTAGE:   208.  EQUIV. IMPEDANCE= .0007 + J .0033 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER  35.695 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 36.180 KA
CONTRIBUTIONS: SEN MTR LD      3.309 KA      ANG:  -84.29
                  BUS 4A003     32.404 KA      ANG:  -77.97

BUS 4A400  FAULT:  15.853 KA AT  -77.79 DEG (  5.71 MVA) X/R:   4.90
VOLTAGE:   208.  EQUIV. IMPEDANCE= .0016 + J .0074 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER  15.853 KA
MOLDED CASE CIRCUIT BREAKER < 20KA 17.633 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 15.853 KA
CONTRIBUTIONS: PATH MTR LD      1.418 KA      ANG:  -84.29
                  BUS 4A004     14.445 KA      ANG:  -77.16

BUS 4B001  FAULT:   2.838 KA AT  -72.52 DEG ( 64.89 MVA) X/R:   3.32
VOLTAGE:  13200. EQUIV. IMPEDANCE= .8065 + J 2.5611 OHMS
CONTRIBUTIONS: BUS 0011      2.731 KA      ANG:  -72.07
                  BUS 4B100     .048 KA      ANG:  -83.85
  
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T H R E E P H A S E F A U L T R E P O R T
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

	CONTRIBUTIONS TO BUS 4B001	(CONTINUED)		
	BUS 4B002	.061 KA	ANG:	-83.66
BUS 4B002	FAULT:	2.766 KA AT -70.79 DEG (63.24 MVA)	X/R:	3.01
	VOLTAGE:	13200. EQUIV. IMPEDANCE=	.9066 + J	2.6018 OHMS
	CONTRIBUTIONS:	BUS 4B001	2.706 KA	ANG: -70.50
		BUS 4B200	.021 KA	ANG: -83.72
		BUS 4B003	.041 KA	ANG: -83.70
BUS 4B003	FAULT:	2.727 KA AT -69.88 DEG (62.35 MVA)	X/R:	2.86
	VOLTAGE:	13200. EQUIV. IMPEDANCE=	.9611 + J	2.6239 OHMS
	CONTRIBUTIONS:	BUS 4B002	2.687 KA	ANG: -69.67
		BUS 4B300	.021 KA	ANG: -83.72
		BUS 4B004	.021 KA	ANG: -83.71
BUS 4B004	FAULT:	2.668 KA AT -68.52 DEG (61.00 MVA)	X/R:	2.66
	VOLTAGE:	13200. EQUIV. IMPEDANCE=	1.0461 + J	2.6579 OHMS
	CONTRIBUTIONS:	BUS 4B003	2.648 KA	ANG: -68.40
		BUS 4B400	.021 KA	ANG: -83.72
BUS 4B100	FAULT:	35.369 KA AT -78.17 DEG (12.74 MVA)	X/R:	5.06
	VOLTAGE:	208. EQUIV. IMPEDANCE=	.0007 + J	.0033 OHMS
	LOW VOLTAGE POWER CIRCUIT BREAKER	35.369 KA		
	MOLDED CASE CIRCUIT BREAKER > 20KA	35.613 KA		
	CONTRIBUTIONS:	ONON MTR LD	3.309 KA	ANG: -84.29
		BUS 4B001	32.080 KA	ANG: -77.54
BUS 4B200	FAULT:	15.778 KA AT -77.57 DEG (5.68 MVA)	X/R:	4.82
	VOLTAGE:	208. EQUIV. IMPEDANCE=	.0016 + J	.0074 OHMS
	LOW VOLTAGE POWER CIRCUIT BREAKER	15.778 KA		
	MOLDED CASE CIRCUIT BREAKER < 20KA	17.490 KA		
	MOLDED CASE CIRCUIT BREAKER > 20KA	15.778 KA		
	CONTRIBUTIONS:	ONEIDA MTR LD	1.418 KA	ANG: -84.29
		BUS 4B002	14.370 KA	ANG: -76.91
BUS 4B300	FAULT:	15.763 KA AT -77.50 DEG (5.68 MVA)	X/R:	4.80
	VOLTAGE:	208. EQUIV. IMPEDANCE=	.0016 + J	.0074 OHMS

THREE PHASE FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

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LOW VOLTAGE POWER CIRCUIT BREAKER 15.763 KA
MOLDED CASE CIRCUIT BREAKER < 20KA 17.453 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 15.763 KA
CONTRIBUTIONS: LP MTR LD 1.418 KA ANG: -84.29
                BUS 4B003 14.356 KA ANG: -76.83

BUS 4B400 FAULT: 15.740 KA AT -77.38 DEG ( 5.67 MVA) X/R: 4.76
VOLTAGE: 208. EQUIV. IMPEDANCE= .0017 + J .0074 OHMS
LOW VOLTAGE POWER CIRCUIT BREAKER 15.740 KA
MOLDED CASE CIRCUIT BREAKER < 20KA 17.396 KA
MOLDED CASE CIRCUIT BREAKER > 20KA 15.740 KA
CONTRIBUTIONS: CAYUGA MTR LD 1.418 KA ANG: -84.29
                BUS 4B004 14.333 KA ANG: -76.70
    
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UNBALANCED FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT DUTIES	KA (RMS)	X/R	EQUIVALENT (PU) FAULT IMPEDANCE	ASYM. KA AT 0.5 CYCLES * MAX. RMS	AVG. RMS *
BUS 0000	3 PHASE:	6.795	8.	Z1= .2463	9.416	8.163
	SLG DUTY:	6.600	11.	Z2= .2463	9.675	
34500. VOLTS	LN/LN	5.885		Z0= .2690		
	LN/LN/GND	6.507 (	6.409	GND RETURN KA)		
BUS 0001	3 PHASE:	6.795	8.	Z1= .2463	9.416	8.163
	SLG DUTY:	6.600	11.	Z2= .2463	9.675	
34500. VOLTS	LN/LN	5.885		Z0= .2690		
	LN/LN/GND	6.507 (	6.409	GND RETURN KA)		
BUS 0010	3 PHASE:	3.319	12.	Z1= 1.3178	4.914	4.159
	SLG DUTY:	.394	0.	Z2= 1.3178	.394	
13200. VOLTS	LN/LN	2.874		Z0= 32.8451		
	LN/LN/GND	2.973 (	.199	GND RETURN KA)		
BUS 0011	3 PHASE:	3.238	9.	Z1= 1.3508	4.577	3.939
	SLG DUTY:	.392	0.	Z2= 1.3508	.392	
13200. VOLTS	LN/LN	2.804		Z0= 32.9643		
	LN/LN/GND	2.902 (	.198	GND RETURN KA)		
BUS 0020	3 PHASE:	3.413	12.	Z1= 1.2815	5.043	4.271
	SLG DUTY:	.394	0.	Z2= 1.2815	.394	
13200. VOLTS	LN/LN	2.956		Z0= 32.8451		
	LN/LN/GND	3.054 (	.199	GND RETURN KA)		
BUS 0021	3 PHASE:	3.335	9.	Z1= 1.3116	4.709	4.054
	SLG DUTY:	.392	0.	Z2= 1.3116	.392	
13200. VOLTS	LN/LN	2.888		Z0= 32.9643		
	LN/LN/GND	2.986 (	.198	GND RETURN KA)		
BUS 3A001	3 PHASE:	3.185	5.	Z1= 1.3734	4.045	3.629
	SLG DUTY:	.387	0.	Z2= 1.3734	.387	
13200. VOLTS	LN/LN	2.758		Z0= 33.1695		
	LN/LN/GND	2.853 (	.197	GND RETURN KA)		
BUS 3A002	3 PHASE:	3.144	5.	Z1= 1.3911	3.910	3.538
	SLG DUTY:	.385	0.	Z2= 1.3911	.385	
13200. VOLTS	LN/LN	2.723		Z0= 33.2238		
	LN/LN/GND	2.817 (	.196	GND RETURN KA)		

UNBALANCED FAULT REPORT

(FOR APPLICATION OF LOW VOLTAGE BREAKERS)

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT DUTIES	KA (RMS)	X/R	EQUIVALENT (PU) FAULT IMPEDANCE	ASYM. KA AT 0.5 CYCLES * MAX. RMS	AVG. RMS *
BUS 3A003	3 PHASE:	3.116	5.	Z1= 1.4038	3.824	3.479
	SLG DUTY:	.384	0.	Z2= 1.4038	.384	
13200. VOLTS	LN/LN	2.698		Z0= 33.2617		
	LN/LN/GND	2.792 (		.196 GND RETURN KA)		
BUS 3A004	3 PHASE:	3.021	4.	Z1= 1.4478	3.569	3.301
	SLG DUTY:	.381	0.	Z2= 1.4478	.381	
13200. VOLTS	LN/LN	2.616		Z0= 33.3861		
	LN/LN/GND	2.708 (		.195 GND RETURN KA)		
BUS 3A100	3 PHASE:	14.537	3.	Z1= 19.0936	16.251	15.406
	SLG DUTY:	14.891	3.	Z2= 19.0936	16.608	
208. VOLTS	LN/LN	12.590		Z0= 17.7333		
	LN/LN/GND	14.765 (		15.263 GND RETURN KA)		
BUS 3A200	3 PHASE:	23.073	4.	Z1= 12.0301	27.584	25.381
	SLG DUTY:	23.997	4.	Z2= 12.0301	28.647	
208. VOLTS	LN/LN	19.982		Z0= 10.6401		
	LN/LN/GND	23.598 (		24.999 GND RETURN KA)		
BUS 3A300	3 PHASE:	15.907	5.	Z1= 17.4502	19.912	17.968
	SLG DUTY:	15.821	5.	Z2= 17.4502	19.644	
208. VOLTS	LN/LN	13.775		Z0= 17.7333		
	LN/LN/GND	15.911 (		15.737 GND RETURN KA)		
BUS 3A400	3 PHASE:	32.966	6.	Z1= 3.6487	43.195	38.264
	SLG DUTY:	36.246	7.	Z2= 3.6487	48.150	
480. VOLTS	LN/LN	28.549		Z0= 2.6600		
	LN/LN/GND	34.499 (		40.243 GND RETURN KA)		
BUS 3B001	3 PHASE:	3.053	5.	Z1= 1.4325	3.819	3.447
	SLG DUTY:	.385	0.	Z2= 1.4325	.385	
13200. VOLTS	LN/LN	2.644		Z0= 33.2497		
	LN/LN/GND	2.739 (		.196 GND RETURN KA)		
BUS 3B002	3 PHASE:	3.025	5.	Z1= 1.4461	3.727	3.385
	SLG DUTY:	.384	0.	Z2= 1.4461	.384	
13200. VOLTS	LN/LN	2.619		Z0= 33.2895		
	LN/LN/GND	2.713 (		.196 GND RETURN KA)		

UNBALANCED FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT DUTIES	KA (RMS)	X/R	EQUIVALENT (PU) FAULT IMPEDANCE	ASYM. KA AT 0.5 CYCLES * MAX. RMS	AVG. RMS *
BUS 3B003 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	2.936 .381 2.543 2.635 (	4. 0.	Z1= 1.4896 Z2= 1.4896 Z0= 33.4071 .195 GND RETURN KA)	3.471 .381	3.209
BUS 3B100 480. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	33.037 36.298 28.611 34.745 (	7. 7.	Z1= 3.6408 Z2= 3.6408 Z0= 2.6600 40.272 GND RETURN KA)	44.334 49.093	38.907
BUS 3B200 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	45.550 47.564 39.448 46.578 (	6. 6.	Z1= 6.0937 Z2= 6.0937 Z0= 5.3200 49.763 GND RETURN KA)	59.558 62.147	52.803
BUS 3B300 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	35.550 36.669 30.787 36.124 (	5. 5.	Z1= 7.8080 Z2= 7.8080 Z0= 7.0933 37.860 GND RETURN KA)	44.975 46.246	40.409
BUS 4A001 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	3.139 .385 2.719 2.813 (	5. 0.	Z1= 1.3933 Z2= 1.3933 Z0= 33.2581 .196 GND RETURN KA)	3.912 .385	3.537
BUS 4A002 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	3.080 .383 2.668 2.761 (	4. 0.	Z1= 1.4199 Z2= 1.4199 Z0= 33.3372 .196 GND RETURN KA)	3.738 .383	3.418
BUS 4A003 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	3.011 .381 2.608 2.699 (	4. 0.	Z1= 1.4526 Z2= 1.4526 Z0= 33.4254 .195 GND RETURN KA)	3.548 .381	3.285
BUS 4A004 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	2.964 .379 2.567 2.658 (	4. 0.	Z1= 1.4757 Z2= 1.4757 Z0= 33.4840 .194 GND RETURN KA)	3.429 .379	3.201

UNBALANCED FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT DUTIES	KA (RMS)	X/R	EQUIVALENT (PU) FAULT IMPEDANCE	ASYM. KA AT 0.5 CYCLES * MAX. RMS	AVG. RMS *
BUS 4A101	3 PHASE:	45.881	6.	Z1= 6.0498	60.145	53.269
	SLG DUTY:	47.803	6.	Z2= 6.0498	62.572	
208. VOLTS	LN/LN	39.734		Z0= 5.3200		
	LN/LN/GND	46.887	(	49.894 GND RETURN KA)		
BUS 4A102	3 PHASE:	12.012	5.	Z1= 10.0136	15.344	13.732
	SLG DUTY:	11.767	5.	Z2= 10.0136	14.794	
480. VOLTS	LN/LN	10.402		Z0= 10.6400		
	LN/LN/GND	11.965	(	11.531 GND RETURN KA)		
BUS 4A201	3 PHASE:	45.722	6.	Z1= 6.0708	59.593	52.901
	SLG DUTY:	47.689	6.	Z2= 6.0708	62.173	
208. VOLTS	LN/LN	39.597		Z0= 5.3200		
	LN/LN/GND	46.682	(	49.831 GND RETURN KA)		
BUS 4A202	3 PHASE:	6.018	5.	Z1= 19.9875	7.673	6.872
	SLG DUTY:	5.672	5.	Z2= 19.9875	7.077	
480. VOLTS	LN/LN	5.212		Z0= 23.6445		
	LN/LN/GND	5.905	(	5.364 GND RETURN KA)		
BUS 4A300	3 PHASE:	35.695	5.	Z1= 7.7762	45.140	40.563
	SLG DUTY:	36.772	5.	Z2= 7.7762	46.362	
208. VOLTS	LN/LN	30.913		Z0= 7.0933		
	LN/LN/GND	36.238	(	37.915 GND RETURN KA)		
BUS 4A400	3 PHASE:	15.853	5.	Z1= 17.5087	19.764	17.865
	SLG DUTY:	15.786	5.	Z2= 17.5087	19.549	
208. VOLTS	LN/LN	13.729		Z0= 17.7333		
	LN/LN/GND	15.846	(	15.719 GND RETURN KA)		
BUS 4B001	3 PHASE:	2.838	3.	Z1= 1.5410	3.237	3.041
	SLG DUTY:	.378	0.	Z2= 1.5410	.378	
13200. VOLTS	LN/LN	2.458		Z0= 33.5213		
	LN/LN/GND	2.548	(	.194 GND RETURN KA)		
BUS 4B002	3 PHASE:	2.766	3.	Z1= 1.5813	3.089	2.930
	SLG DUTY:	.375	0.	Z2= 1.5813	.375	
13200. VOLTS	LN/LN	2.395		Z0= 33.6205		
	LN/LN/GND	2.484	(	.193 GND RETURN KA)		

UNBALANCED FAULT REPORT
 (FOR APPLICATION OF LOW VOLTAGE BREAKERS)
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT DUTIES	KA (RMS)	X/R	EQUIVALENT (PU) FAULT IMPEDANCE	ASYM. KA AT 0.5 CYCLES * MAX. RMS	AVG. RMS *
BUS 4B003 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	2.727 .374 2.362 2.450 (	3. 0.	Z1= 1.6038 Z2= 1.6038 Z0= 33.6737 .193 GND RETURN KA)	3.016 .374	2.873
BUS 4B004 13200. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	2.668 .372 2.311 2.397 (	3. 0.	Z1= 1.6393 Z2= 1.6393 Z0= 33.7555 .192 GND RETURN KA)	2.909 .372	2.790
BUS 4B100 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	35.369 36.540 30.630 35.896 (	5. 5.	Z1= 7.8480 Z2= 7.8480 Z0= 7.0933 37.792 GND RETURN KA)	44.417 45.852	40.028
BUS 4B200 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	15.778 15.736 13.664 15.765 (	5. 5.	Z1= 17.5926 Z2= 17.5926 Z0= 17.7333 15.694 GND RETURN KA)	19.601 19.443	17.744
BUS 4B300 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	15.763 15.726 13.651 15.747 (	5. 5.	Z1= 17.6091 Z2= 17.6091 Z0= 17.7333 15.689 GND RETURN KA)	19.559 19.416	17.715
BUS 4B400 208. VOLTS	3 PHASE: SLG DUTY: LN/LN LN/LN/GND	15.740 15.711 13.631 15.718 (	5. 5.	Z1= 17.6348 Z2= 17.6348 Z0= 17.7333 15.682 GND RETURN KA)	19.494 19.373	17.670

FAULT STUDY SUMMARY
(FOR APPLICATION OF LOW VOLTAGE BREAKERS)

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

BUS RECORD NO NAME	VOLTAGE AVAILABLE			FAULT DUTIES (KA)	
	L-L	3 PHASE	X/R	LINE/GRND	X/R
BUS 0000	34500.	6.795	8.09	6.600	11.33
BUS 0001	34500.	6.795	8.09	6.600	11.33
BUS 0010	13200.	3.319	12.15	.394	.12
BUS 0011	13200.	3.238	9.04	.392	.13
BUS 0020	13200.	3.413	11.96	.394	.12
BUS 0021	13200.	3.335	8.99	.392	.13
BUS 3A001	13200.	3.185	5.32	.387	.13
BUS 3A002	13200.	3.144	4.84	.385	.13
BUS 3A003	13200.	3.116	4.57	.384	.13
BUS 3A004	13200.	3.021	3.88	.381	.14
BUS 3A100	208.	14.537	3.02	14.891	2.99
BUS 3A200	208.	23.073	4.08	23.997	4.06
BUS 3A300	208.	15.907	4.98	15.821	4.81
BUS 3A400	480.	32.966	6.12	36.246	6.54
BUS 3B001	13200.	3.053	4.96	.385	.14
BUS 3B002	13200.	3.025	4.65	.384	.14
BUS 3B003	13200.	2.936	3.89	.381	.14
BUS 3B100	480.	33.037	6.87	36.298	7.14
BUS 3B200	208.	45.550	6.06	47.564	6.04
BUS 3B300	208.	35.550	5.22	36.669	5.15
BUS 4A001	13200.	3.139	4.89	.385	.13
BUS 4A002	13200.	3.080	4.36	.383	.14
BUS 4A003	13200.	3.011	3.83	.381	.14
BUS 4A004	13200.	2.964	3.54	.379	.14
BUS 4A101	208.	45.881	6.14	47.803	6.09
BUS 4A102	480.	12.012	5.45	11.767	5.08
BUS 4A201	208.	45.722	5.97	47.689	5.98
BUS 4A202	480.	6.018	5.41	5.672	4.91
BUS 4A300	208.	35.695	5.21	36.772	5.14
BUS 4A400	208.	15.853	4.90	15.786	4.75
BUS 4B001	13200.	2.838	3.32	.378	.14
BUS 4B002	13200.	2.766	3.01	.375	.14
BUS 4B003	13200.	2.727	2.86	.374	.15
BUS 4B004	13200.	2.668	2.66	.372	.15
BUS 4B100	208.	35.369	5.06	36.540	5.04
BUS 4B200	208.	15.778	4.82	15.736	4.71
BUS 4B300	208.	15.763	4.80	15.726	4.69
BUS 4B400	208.	15.740	4.76	15.711	4.67

38 FAULTED BUSES, 59 BRANCHES, 22 CONTRIBUTIONS
UNBALANCED FAULTS REQUESTED

*** SHORT CIRCUIT STUDY COMPLETE ***

THREE PHASE MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

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=====
BUS 0000      E/Z:      6.569 KA AT -82.93 DEG ( 392.54 MVA) X/R:      8.07
              SYM*1.6:  10.511 KA      MOMENTARY BASED ON X/R:    9.098 KA
              SYM*2.7:  17.737 KA      CREST BASED ON X/R:    15.585 KA
              VOLTAGE:  34500.  EQUIV. IMPEDANCE= .3734 + J 3.0091 OHMS
              CONTRIBUTIONS:  NMPC      6.292 KA      ANG:    -82.87
                              BUS 0001  .277 KA      ANG:    -84.11

BUS 0001      E/Z:      6.569 KA AT -82.93 DEG ( 392.54 MVA) X/R:      8.07
              SYM*1.6:  10.511 KA      MOMENTARY BASED ON X/R:    9.098 KA
              SYM*2.7:  17.737 KA      CREST BASED ON X/R:    15.585 KA
              VOLTAGE:  34500.  EQUIV. IMPEDANCE= .3734 + J 3.0091 OHMS
              CONTRIBUTIONS:  BUS 0020  .151 KA      ANG:    -84.01
                              BUS 0000  6.292 KA      ANG:    -82.87
                              BUS 0010  .126 KA      ANG:    -84.22

BUS 0010      E/Z:      2.885 KA AT -85.48 DEG ( 65.97 MVA) X/R:     12.80
              SYM*1.6:  4.617 KA      MOMENTARY BASED ON X/R:    4.303 KA
              SYM*2.7:  7.790 KA      CREST BASED ON X/R:    7.273 KA
              VOLTAGE:  13200.  EQUIV. IMPEDANCE= .2084 + J 2.6331 OHMS
              CONTRIBUTIONS:  BUS 0001  2.515 KA      ANG:    -85.70
                              BUS 0011  .371 KA      ANG:    -83.98

BUS 0011      E/Z:      2.797 KA AT -83.69 DEG ( 63.94 MVA) X/R:      9.06
              SYM*1.6:  4.475 KA      MOMENTARY BASED ON X/R:    3.955 KA
              SYM*2.7:  7.551 KA      CREST BASED ON X/R:    6.751 KA
              VOLTAGE:  13200.  EQUIV. IMPEDANCE= .2994 + J 2.7086 OHMS
              CONTRIBUTIONS:  FDR 1B MTR LD .186 KA      ANG:    -84.29
                              FDR 2B MTR LD .186 KA      ANG:    -84.29
                              BUS 0010  2.424 KA      ANG:    -83.60

BUS 0020      E/Z:      2.968 KA AT -85.39 DEG ( 67.85 MVA) X/R:     12.64
              SYM*1.6:  4.748 KA      MOMENTARY BASED ON X/R:    4.418 KA
              SYM*2.7:  8.013 KA      CREST BASED ON X/R:    7.470 KA
              VOLTAGE:  13200.  EQUIV. IMPEDANCE= .2066 + J 2.5597 OHMS
              CONTRIBUTIONS:  BUS 0001  2.513 KA      ANG:    -85.69
                              BUS 0021  .455 KA      ANG:    -83.68

BUS 0021      E/Z:      2.880 KA AT -83.67 DEG ( 65.85 MVA) X/R:      9.04
              SYM*1.6:  4.608 KA      MOMENTARY BASED ON X/R:    4.071 KA
              SYM*2.7:  7.777 KA      CREST BASED ON X/R:    6.950 KA
              VOLTAGE:  13200.  EQUIV. IMPEDANCE= .2916 + J 2.6298 OHMS
              CONTRIBUTIONS:  FDR 1A MTR LD .186 KA      ANG:    -84.29
                              FDR 2A MTR LD .186 KA      ANG:    -84.29
                              BUS 0020  2.422 KA      ANG:    -83.60
                              BUS 4A001 .085 KA      ANG:    -83.07

BUS 3A001     E/Z:      2.758 KA AT -79.37 DEG ( 63.05 MVA) X/R:      5.33
              SYM*1.6:  4.412 KA      MOMENTARY BASED ON X/R:    3.505 KA
              SYM*2.7:  7.445 KA      CREST BASED ON X/R:    6.063 KA
              VOLTAGE:  13200.  EQUIV. IMPEDANCE= .5098 + J 2.7163 OHMS
              CONTRIBUTIONS:  BUS 0021  2.758 KA      ANG:    -79.37

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T H R E E P H A S E M O M E N T A R Y D U T Y R E P O R T

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

BUS 3A002	E/Z:	2.724 KA AT	-78.30 DEG (	62.29 MVA)	X/R:	4.83
	SYM*1.6:	4.359 KA	MOMENTARY BASED ON X/R:			3.386 KA
	SYM*2.7:	7.356 KA	CREST BASED ON X/R:			5.864 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.5674 + J	2.7391	OHMS
	CONTRIBUTIONS:	BUS 3A001	2.724 KA		ANG:	-78.30
BUS 3A003	E/Z:	2.701 KA AT	-77.56 DEG (	61.76 MVA)	X/R:	4.54
	SYM*1.6:	4.322 KA	MOMENTARY BASED ON X/R:			3.309 KA
	SYM*2.7:	7.293 KA	CREST BASED ON X/R:			5.732 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.6078 + J	2.7551	OHMS
	CONTRIBUTIONS:	BUS 3A002	2.701 KA		ANG:	-77.56
BUS 3A004	E/Z:	2.625 KA AT	-75.24 DEG (	60.02 MVA)	X/R:	3.80
	SYM*1.6:	4.200 KA	MOMENTARY BASED ON X/R:			3.086 KA
	SYM*2.7:	7.088 KA	CREST BASED ON X/R:			5.336 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.7397 + J	2.8073	OHMS
	CONTRIBUTIONS:	BUS 3A003	2.625 KA		ANG:	-75.24
BUS 3A100	VOLTAGE:	208.	(SEE LOW VOLTAGE REPORT)			
BUS 3A200	VOLTAGE:	208.	(SEE LOW VOLTAGE REPORT)			
BUS 3A300	VOLTAGE:	208.	(SEE LOW VOLTAGE REPORT)			
BUS 3A400	VOLTAGE:	480.	(SEE LOW VOLTAGE REPORT)			
BUS 3B001	E/Z:	2.635 KA AT	-77.97 DEG (	60.24 MVA)	X/R:	4.70
	SYM*1.6:	4.216 KA	MOMENTARY BASED ON X/R:			3.254 KA
	SYM*2.7:	7.114 KA	CREST BASED ON X/R:			5.635 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.6028 + J	2.8287	OHMS
	CONTRIBUTIONS:	BUS 0011	2.635 KA		ANG:	-77.97
BUS 3B002	E/Z:	2.612 KA AT	-77.23 DEG (	59.72 MVA)	X/R:	4.41
	SYM*1.6:	4.179 KA	MOMENTARY BASED ON X/R:			3.180 KA
	SYM*2.7:	7.053 KA	CREST BASED ON X/R:			5.507 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.6450 + J	2.8455	OHMS
	CONTRIBUTIONS:	BUS 3B001	2.612 KA		ANG:	-77.23
BUS 3B003	E/Z:	2.544 KA AT	-75.11 DEG (	58.17 MVA)	X/R:	3.76
	SYM*1.6:	4.071 KA	MOMENTARY BASED ON X/R:			2.985 KA
	SYM*2.7:	6.869 KA	CREST BASED ON X/R:			5.159 KA
	VOLTAGE:	13200.	EQUIV. IMPEDANCE=	.7698 + J	2.8949	OHMS
	CONTRIBUTIONS:	BUS 3B002	2.544 KA		ANG:	-75.11
BUS 3B100	VOLTAGE:	480.	(SEE LOW VOLTAGE REPORT)			
BUS 3B200	VOLTAGE:	208.	(SEE LOW VOLTAGE REPORT)			
BUS 3B300	VOLTAGE:	208.	(SEE LOW VOLTAGE REPORT)			

THREE PHASE MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

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BUS 4A001  E/Z:      2.714 KA AT -77.98 DEG ( 62.04 MVA) X/R:    4.75
            SYM*1.6:   4.342 KA      MOMENTARY BASED ON X/R:   3.360 KA
            SYM*2.7:   7.327 KA      CREST BASED ON X/R:   5.819 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .5846 + J 2.7468 OHMS
            CONTRIBUTIONS: BUS 0021      2.629 KA      ANG:  -77.81
                           BUS 4A002    .031 KA      ANG:  -83.01
                           BUS 4A102    .054 KA      ANG:  -83.40

BUS 4A002  E/Z:      2.666 KA AT -76.51 DEG ( 60.96 MVA) X/R:    4.22
            SYM*1.6:   4.266 KA      MOMENTARY BASED ON X/R:   3.212 KA
            SYM*2.7:   7.199 KA      CREST BASED ON X/R:   5.562 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .6666 + J 2.7795 OHMS
            CONTRIBUTIONS: BUS 4A001    2.635 KA      ANG:  -76.44
                           BUS 4A202    .031 KA      ANG:  -83.03

BUS 4A003  E/Z:      2.612 KA AT -74.90 DEG ( 59.73 MVA) X/R:    3.75
            SYM*1.6:   4.180 KA      MOMENTARY BASED ON X/R:   3.062 KA
            SYM*2.7:   7.053 KA      CREST BASED ON X/R:   5.291 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .7600 + J 2.8165 OHMS
            CONTRIBUTIONS: BUS 4A002    2.612 KA      ANG:  -74.90

BUS 4A004  E/Z:      2.577 KA AT -73.86 DEG ( 58.91 MVA) X/R:    3.49
            SYM*1.6:   4.123 KA      MOMENTARY BASED ON X/R:   2.972 KA
            SYM*2.7:   6.957 KA      CREST BASED ON X/R:   5.125 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .8221 + J 2.8411 OHMS
            CONTRIBUTIONS: BUS 4A003    2.577 KA      ANG:  -73.86

BUS 4A101  VOLTAGE:   208. ( SEE LOW VOLTAGE REPORT )

BUS 4A102  VOLTAGE:   480. ( SEE LOW VOLTAGE REPORT )

BUS 4A201  VOLTAGE:   208. ( SEE LOW VOLTAGE REPORT )

BUS 4A202  VOLTAGE:   480. ( SEE LOW VOLTAGE REPORT )

BUS 4A300  VOLTAGE:   208. ( SEE LOW VOLTAGE REPORT )

BUS 4A400  VOLTAGE:   208. ( SEE LOW VOLTAGE REPORT )

BUS 4B001  E/Z:      2.479 KA AT -73.16 DEG ( 56.67 MVA) X/R:    3.31
            SYM*1.6:   3.966 KA      MOMENTARY BASED ON X/R:   2.825 KA
            SYM*2.7:   6.692 KA      CREST BASED ON X/R:   4.860 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .8908 + J 2.9428 OHMS
            CONTRIBUTIONS: BUS 0011     2.479 KA      ANG:  -73.16

BUS 4B002  E/Z:      2.422 KA AT -71.55 DEG ( 55.38 MVA) X/R:    3.00
            SYM*1.6:   3.876 KA      MOMENTARY BASED ON X/R:   2.704 KA
            SYM*2.7:   6.540 KA      CREST BASED ON X/R:   4.627 KA
            VOLTAGE: 13200.  EQUIV. IMPEDANCE= .9958 + J 2.9844 OHMS
            CONTRIBUTIONS: BUS 4B001    2.422 KA      ANG:  -71.55

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THREE PHASE MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

BUS 4B003 E/Z: 2.392 KA AT -70.71 DEG (54.70 MVA) X/R: 2.86
SYM*1.6: 3.828 KA MOMENTARY BASED ON X/R: 2.645 KA
SYM*2.7: 6.460 KA CREST BASED ON X/R: 4.511 KA
VOLTAGE: 13200. EQUIV. IMPEDANCE= 1.0521 + J 3.0067 OHMS
CONTRIBUTIONS: BUS 4B002 2.392 KA ANG: -70.71

BUS 4B004 E/Z: 2.347 KA AT -69.47 DEG (53.66 MVA) X/R: 2.67
SYM*1.6: 3.755 KA MOMENTARY BASED ON X/R: 2.561 KA
SYM*2.7: 6.337 KA CREST BASED ON X/R: 4.344 KA
VOLTAGE: 13200. EQUIV. IMPEDANCE= 1.1385 + J 3.0409 OHMS
CONTRIBUTIONS: BUS 4B003 2.347 KA ANG: -69.47

BUS 4B100 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4B200 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4B300 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4B400 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

UNBALANCED MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT TYPE	E/Z KA	X/R	EQUIVALENT IMPEDANCE (PU)	MOMENTARY FAULT DUTIES E/Z * 1.6 @ 0.5 CYCLE	
BUS 0000 34500. VOLTS	3 PHASE:	6.57	8.1	Z1= .2548	10.51	9.10
	SLG DUTY:	6.46	11.2	Z2= .2548	10.33	9.45
	LN/LN	5.69		Z0= .2690		
	LN/LN/GND	6.32 (	6.34	GND RETURN KA)		
BUS 0001 34500. VOLTS	3 PHASE:	6.57	8.1	Z1= .2548	10.51	9.10
	SLG DUTY:	6.46	11.2	Z2= .2548	10.33	9.45
	LN/LN	5.69		Z0= .2690		
	LN/LN/GND	6.32 (	6.34	GND RETURN KA)		
BUS 0010 13200. VOLTS	3 PHASE:	2.89	12.8	Z1= 1.5159	4.62	4.30
	SLG DUTY:	.39	.1	Z2= 1.5159	.63	.39
	LN/LN	2.50		Z0= 32.8451		
	LN/LN/GND	2.60 (	.20	GND RETURN KA)		
BUS 0011 13200. VOLTS	3 PHASE:	2.80	9.1	Z1= 1.5640	4.47	3.95
	SLG DUTY:	.39	.1	Z2= 1.5640	.62	.39
	LN/LN	2.42		Z0= 32.9643		
	LN/LN/GND	2.52 (	.20	GND RETURN KA)		
BUS 0020 13200. VOLTS	3 PHASE:	2.97	12.6	Z1= 1.4738	4.75	4.42
	SLG DUTY:	.39	.1	Z2= 1.4738	.63	.39
	LN/LN	2.57		Z0= 32.8451		
	LN/LN/GND	2.67 (	.20	GND RETURN KA)		
BUS 0021 13200. VOLTS	3 PHASE:	2.88	9.0	Z1= 1.5186	4.61	4.07
	SLG DUTY:	.39	.1	Z2= 1.5186	.63	.39
	LN/LN	2.49		Z0= 32.9643		
	LN/LN/GND	2.59 (	.20	GND RETURN KA)		
BUS 3A001 13200. VOLTS	3 PHASE:	2.76	5.3	Z1= 1.5862	4.41	3.51
	SLG DUTY:	.39	.1	Z2= 1.5862	.62	.39
	LN/LN	2.39		Z0= 33.1695		
	LN/LN/GND	2.48 (	.20	GND RETURN KA)		
BUS 3A002 13200. VOLTS	3 PHASE:	2.72	4.8	Z1= 1.6054	4.36	3.39
	SLG DUTY:	.38	.1	Z2= 1.6054	.61	.38
	LN/LN	2.36		Z0= 33.2238		
	LN/LN/GND	2.45 (	.20	GND RETURN KA)		

UNBALANCED MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT TYPE	E/Z KA	X/R	EQUIVALENT IMPEDANCE (PU)	MOMENTARY FAULT DUTIES E/Z * 1.6 @ 0.5 CYCLE	
BUS 3A003 13200. VOLTS	3 PHASE:	2.70	4.5	Z1= 1.6192	4.32	3.31
	SLG DUTY:	.38	.1	Z2= 1.6192	.61	.38
	LN/LN	2.34		Z0= 33.2617		
	LN/LN/GND	2.43 (		.20 GND RETURN KA)		
BUS 3A004 13200. VOLTS	3 PHASE:	2.63	3.8	Z1= 1.6662	4.20	3.09
	SLG DUTY:	.38	.1	Z2= 1.6662	.61	.38
	LN/LN	2.27		Z0= 33.3861		
	LN/LN/GND	2.37 (		.19 GND RETURN KA)		
BUS 3B001 13200. VOLTS	3 PHASE:	2.63	4.7	Z1= 1.6599	4.22	3.25
	SLG DUTY:	.38	.1	Z2= 1.6599	.61	.38
	LN/LN	2.28		Z0= 33.2497		
	LN/LN/GND	2.38 (		.20 GND RETURN KA)		
BUS 3B002 13200. VOLTS	3 PHASE:	2.61	4.4	Z1= 1.6745	4.18	3.18
	SLG DUTY:	.38	.1	Z2= 1.6745	.61	.38
	LN/LN	2.26		Z0= 33.2895		
	LN/LN/GND	2.36 (		.20 GND RETURN KA)		
BUS 3B003 13200. VOLTS	3 PHASE:	2.54	3.8	Z1= 1.7192	4.07	2.98
	SLG DUTY:	.38	.2	Z2= 1.7192	.61	.38
	LN/LN	2.20		Z0= 33.4071		
	LN/LN/GND	2.30 (		.19 GND RETURN KA)		
BUS 4A001 13200. VOLTS	3 PHASE:	2.71	4.8	Z1= 1.6118	4.34	3.36
	SLG DUTY:	.38	.1	Z2= 1.6118	.61	.38
	LN/LN	2.35		Z0= 33.2581		
	LN/LN/GND	2.44 (		.20 GND RETURN KA)		
BUS 4A002 13200. VOLTS	3 PHASE:	2.67	4.2	Z1= 1.6405	4.27	3.21
	SLG DUTY:	.38	.1	Z2= 1.6405	.61	.38
	LN/LN	2.31		Z0= 33.3372		
	LN/LN/GND	2.40 (		.20 GND RETURN KA)		
BUS 4A003 13200. VOLTS	3 PHASE:	2.61	3.7	Z1= 1.6743	4.18	3.06
	SLG DUTY:	.38	.2	Z2= 1.6743	.61	.38
	LN/LN	2.26		Z0= 33.4254		
	LN/LN/GND	2.35 (		.19 GND RETURN KA)		

UNBALANCED MOMENTARY DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

LOCATION VOLTAGE	FAULT TYPE	E/Z KA	X/R	EQUIVALENT IMPEDANCE (PU)	MOMENTARY FAULT DUTIES E/Z * 1.6 @ 0.5 CYCLE	
BUS 4A004 13200. VOLTS	3 PHASE:	2.58	3.5	Z1= 1.6975	4.12	2.97
	SLG DUTY:	.38	.2	Z2= 1.6975	.60	.38
	LN/LN	2.23		Z0= 33.4840		
	LN/LN/GND	2.32 (		.19 GND RETURN KA)		
BUS 4B001 13200. VOLTS	3 PHASE:	2.48	3.3	Z1= 1.7646	3.97	2.82
	SLG DUTY:	.38	.2	Z2= 1.7646	.60	.38
	LN/LN	2.15		Z0= 33.5213		
	LN/LN/GND	2.24 (		.19 GND RETURN KA)		
BUS 4B002 13200. VOLTS	3 PHASE:	2.42	3.0	Z1= 1.8056	3.88	2.70
	SLG DUTY:	.37	.2	Z2= 1.8056	.60	.37
	LN/LN	2.10		Z0= 33.6205		
	LN/LN/GND	2.19 (		.19 GND RETURN KA)		
BUS 4B003 13200. VOLTS	3 PHASE:	2.39	2.9	Z1= 1.8282	3.83	2.64
	SLG DUTY:	.37	.2	Z2= 1.8282	.60	.37
	LN/LN	2.07		Z0= 33.6737		
	LN/LN/GND	2.16 (		.19 GND RETURN KA)		
BUS 4B004 13200. VOLTS	3 PHASE:	2.35	2.7	Z1= 1.8635	3.76	2.56
	SLG DUTY:	.37	.2	Z2= 1.8635	.59	.37
	LN/LN	2.03		Z0= 33.7555		
	LN/LN/GND	2.12 (		.19 GND RETURN KA)		

M O M E N T A R Y D U T Y S U M M A R Y R E P O R T

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

BUS RECORD NO NAME	VOLTAGE L-L	* 3 P H A S E *		* * * SLG * * *	
		E/Z	X/R	E/Z	X/R
BUS 0000	34500.	9.098	8.07	9.449	11.21
BUS 0001	34500.	9.098	8.07	9.449	11.21
BUS 0010	13200.	4.303	12.80	.393	.14
BUS 0011	13200.	3.955	9.06	.390	.14
BUS 0020	13200.	4.418	12.64	.394	.13
BUS 0021	13200.	4.071	9.04	.391	.14
BUS 3A001	13200.	3.505	5.33	.385	.14
BUS 3A002	13200.	3.386	4.83	.384	.15
BUS 3A003	13200.	3.309	4.54	.383	.15
BUS 3A004	13200.	3.086	3.80	.380	.15
BUS 3B001	13200.	3.254	4.70	.383	.15
BUS 3B002	13200.	3.180	4.41	.382	.15
BUS 3B003	13200.	2.985	3.76	.379	.15
BUS 4A001	13200.	3.360	4.75	.383	.15
BUS 4A002	13200.	3.212	4.22	.381	.15
BUS 4A003	13200.	3.062	3.75	.379	.15
BUS 4A004	13200.	2.972	3.49	.377	.15
BUS 4B001	13200.	2.825	3.31	.376	.16
BUS 4B002	13200.	2.704	3.00	.374	.16
BUS 4B003	13200.	2.645	2.86	.372	.16
BUS 4B004	13200.	2.561	2.67	.370	.16

21 FAULTED BUSES, 59 BRANCHES, 22 CONTRIBUTIONS
UNBALANCED FAULTS REQUESTED

*** SHORT CIRCUIT STUDY COMPLETE ***

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

BUS 0000 E/Z: 6.413 KA AT -82.90 DEG (383.24 MVA) X/R: 8.03
 VOLTAGE: 34500. EQUIV. IMPEDANCE= .3839 + J 3.0820 OHMS
 CONTRIBUTIONS: NMPC 6.292 KA ANG: -82.87
 BUS 0001 .121 KA ANG: -84.20

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 6.292 .00 R
 TOTAL REMOTE: 6.292 KA NACD RATIO: .9811

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.001
DUTY (KA) :	6.413	6.413	6.413	6.419

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.148	1.023	1.000	1.000
DUTY (KA) :	7.364	6.564	6.413	6.413

BUS 0001 E/Z: 6.413 KA AT -82.90 DEG (383.24 MVA) X/R: 8.03
 VOLTAGE: 34500. EQUIV. IMPEDANCE= .3839 + J 3.0820 OHMS
 CONTRIBUTIONS: BUS 0020 .067 KA ANG: -84.15
 BUS 0000 6.292 KA ANG: -82.87
 BUS 0010 .054 KA ANG: -84.26

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 6.292 .00 R
 TOTAL REMOTE: 6.292 KA NACD RATIO: .9811

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.001
DUTY (KA) :	6.413	6.413	6.413	6.419

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.148	1.023	1.000	1.000
DUTY (KA) :	7.364	6.564	6.413	6.413

BUS 0010 E/Z: 2.658 KA AT -85.60 DEG (60.78 MVA) X/R: 13.07
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .2198 + J 2.8582 OHMS
 CONTRIBUTIONS: BUS 0001 2.510 KA ANG: -85.69
 BUS 0011 .149 KA ANG: -84.16

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.483 .85 R
 TOTAL REMOTE: 2.483 KA NACD RATIO: .9341

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.026
DUTY (KA) :	2.658	2.658	2.658	2.728

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000
MODEL TRANSFORMER TAPS: NO
NACD OPTION: INTERPOLATED

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TOT2 TOT3 TOT5 TOT8
MULT. FACT: 1.287 1.116 1.041 1.003
DUTY (KA) : 3.422 2.967 2.767 2.667

BUS 0011 E/Z: 2.568 KA AT -83.64 DEG (58.72 MVA) X/R: 8.97
VOLTAGE: 13200. EQUIV. IMPEDANCE= .3289 + J 2.9491 OHMS
CONTRIBUTIONS: FDR 1B MTR LD .075 KA ANG: -84.29
FDR 2B MTR LD .075 KA ANG: -84.29
BUS 0010 2.419 KA ANG: -83.60

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
NMPC 2.394 .85 R
TOTAL REMOTE: 2.394 KA NACD RATIO: .9320

SYM2 SYM3 SYM5 SYM8
MULT. FACT: 1.000 1.000 1.000 1.002
DUTY (KA) : 2.568 2.568 2.568 2.574

TOT2 TOT3 TOT5 TOT8
MULT. FACT: 1.178 1.038 1.002 1.000
DUTY (KA) : 3.026 2.667 2.573 2.568

BUS 0020 E/Z: 2.695 KA AT -85.57 DEG (61.61 MVA) X/R: 13.01
VOLTAGE: 13200. EQUIV. IMPEDANCE= .2183 + J 2.8197 OHMS
CONTRIBUTIONS: BUS 0001 2.509 KA ANG: -85.69
BUS 0021 .186 KA ANG: -84.03

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
NMPC 2.488 .85 R
TOTAL REMOTE: 2.488 KA NACD RATIO: .9231

SYM2 SYM3 SYM5 SYM8
MULT. FACT: 1.000 1.000 1.000 1.025
DUTY (KA) : 2.695 2.695 2.695 2.763

TOT2 TOT3 TOT5 TOT8
MULT. FACT: 1.286 1.115 1.040 1.003
DUTY (KA) : 3.464 3.003 2.802 2.702

BUS 0021 E/Z: 2.605 KA AT -83.64 DEG (59.55 MVA) X/R: 8.98
VOLTAGE: 13200. EQUIV. IMPEDANCE= .3242 + J 2.9077 OHMS
CONTRIBUTIONS: FDR 1A MTR LD .075 KA ANG: -84.29
FDR 2A MTR LD .075 KA ANG: -84.29
BUS 0020 2.418 KA ANG: -83.60

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

CONTRIBUTIONS TO 1

CONTRIBUTIONS TO BUS 0021 (CONTINUED)
 BUS 4A001 .037 KA ANG: -83.75

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.398 .85 R
 TOTAL REMOTE: 2.398 KA NACD RATIO: .9205

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.002
DUTY (KA) :	2.605	2.605	2.605	2.611

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.178	1.038	1.002	1.000
DUTY (KA) :	3.070	2.705	2.610	2.605

BUS 3A001 E/Z: 2.505 KA AT -79.73 DEG (57.26 MVA) X/R: 5.52
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .5424 + J 2.9941 OHMS
 CONTRIBUTIONS: BUS 0021 2.505 KA ANG: -79.73

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.305 .86 R
 TOTAL REMOTE: 2.305 KA NACD RATIO: .9205

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.505	2.505	2.505	2.505

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.066	1.000	1.000	1.000
DUTY (KA) :	2.669	2.505	2.505	2.505

BUS 3A002 E/Z: 2.478 KA AT -78.75 DEG (56.64 MVA) X/R: 5.03
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .6000 + J 3.0170 OHMS
 CONTRIBUTIONS: BUS 3A001 2.478 KA ANG: -78.75

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.281 .86 R
 TOTAL REMOTE: 2.281 KA NACD RATIO: .9205

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.478	2.478	2.478	2.478

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.050	1.000	1.000	1.000
DUTY (KA) :	2.601	2.478	2.478	2.478

BUS 3A003 E/Z: 2.459 KA AT -78.08 DEG (56.21 MVA) X/R: 4.74
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .6404 + J 3.0329 OHMS
 CONTRIBUTIONS: BUS 3A002 2.459 KA ANG: -78.08

GENERATOR NAME	--	AT BUS	--	KA	VOLTS	PU	LOCAL/REMOTE
NMPC				2.263		.86	R
TOTAL REMOTE:				2.263 KA		NACD RATIO:	.9205

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.459	2.459	2.459	2.459

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.046	1.000	1.000	1.000
DUTY (KA) :	2.571	2.459	2.459	2.459

BUS 3A004 E/Z: 2.396 KA AT -75.95 DEG (54.79 MVA) X/R: 4.00
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .7723 + J 3.0852 OHMS
 CONTRIBUTIONS: BUS 3A003 2.396 KA ANG: -75.95

GENERATOR NAME	--	AT BUS	--	KA	VOLTS	PU	LOCAL/REMOTE
NMPC				2.206		.87	R
TOTAL REMOTE:				2.206 KA		NACD RATIO:	.9205

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.396	2.396	2.396	2.396

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.037	1.000	1.000	1.000
DUTY (KA) :	2.485	2.396	2.396	2.396

BUS 3A100 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 3A200 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 3A300 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

BUS 3A400 VOLTAGE: 480. (SEE LOW VOLTAGE REPORT)

BUS 3B001 E/Z: 2.432 KA AT -78.36 DEG (55.60 MVA) X/R: 4.86
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .6322 + J 3.0692 OHMS
 CONTRIBUTIONS: BUS 0011 2.432 KA ANG: -78.36

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.267 .86 R

TOTAL REMOTE: 2.267 KA NACD RATIO: .9320

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.432	2.432	2.432	2.432

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.048	1.000	1.000	1.000
DUTY (KA) :	2.548	2.432	2.432	2.432

BUS 3B002 E/Z: 2.413 KA AT -77.67 DEG (55.16 MVA) X/R: 4.58
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .6745 + J 3.0859 OHMS
 CONTRIBUTIONS: BUS 3B001 2.413 KA ANG: -77.67

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.249 .86 R

TOTAL REMOTE: 2.249 KA NACD RATIO: .9320

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.413	2.413	2.413	2.413

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.044	1.000	1.000	1.000
DUTY (KA) :	2.520	2.413	2.413	2.413

BUS 3B003 E/Z: 2.355 KA AT -75.70 DEG (53.85 MVA) X/R: 3.92
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .7993 + J 3.1354 OHMS
 CONTRIBUTIONS: BUS 3B002 2.355 KA ANG: -75.70

GENERATOR NAME -- AT BUS -- KA VOLTS PU LOCAL/REMOTE
 NMPC 2.195 .87 R

TOTAL REMOTE: 2.195 KA NACD RATIO: .9320

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.355	2.355	2.355	2.355

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.037	1.000	1.000	1.000
DUTY (KA) :	2.442	2.355	2.355	2.355

BUS 3B100 VOLTAGE: 480. (SEE LOW VOLTAGE REPORT)

BUS 3B200 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 3B300 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4A001 E/Z: 2.464 KA AT -78.30 DEG (56.34 MVA) X/R: 4.86
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .6272 + J 3.0282 OHMS
 CONTRIBUTIONS: BUS 0021 2.427 KA ANG: -78.21
 BUS 4A002 .014 KA ANG: -83.72
 BUS 4A102 .023 KA ANG: -83.90

GENERATOR NAME	-- AT BUS --	KA	VOLTS PU	LOCAL/REMOTE
NMPC		2.267	.86	R
TOTAL REMOTE:	2.267 KA	NACD RATIO:	.9198	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.464	2.464	2.464	2.464

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.047	1.000	1.000	1.000
DUTY (KA) :	2.581	2.464	2.464	2.464

BUS 4A002 E/Z: 2.425 KA AT -76.94 DEG (55.45 MVA) X/R: 4.34
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .7102 + J 3.0612 OHMS
 CONTRIBUTIONS: BUS 4A001 2.411 KA ANG: -76.90
 BUS 4A202 .014 KA ANG: -83.73

GENERATOR NAME	-- AT BUS --	KA	VOLTS PU	LOCAL/REMOTE
NMPC		2.230	.87	R
TOTAL REMOTE:	2.230 KA	NACD RATIO:	.9197	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.425	2.425	2.425	2.425

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.041	1.000	1.000	1.000
DUTY (KA) :	2.525	2.425	2.425	2.425

BUS 4A003 E/Z: 2.381 KA AT -75.46 DEG (54.44 MVA) X/R: 3.88
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .8036 + J 3.0982 OHMS
 CONTRIBUTIONS: BUS 4A002 2.381 KA ANG: -75.46

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.190	.87	R
TOTAL REMOTE:		2.190 KA		NACD RATIO:	.9197	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.381	2.381	2.381	2.381

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.036	1.000	1.000	1.000
DUTY (KA) :	2.466	2.381	2.381	2.381

BUS 4A004 E/Z: 2.352 KA AT -74.51 DEG (53.77 MVA) X/R: 3.63
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .8657 + J 3.1228 OHMS
 CONTRIBUTIONS: BUS 4A003 2.352 KA ANG: -74.51

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.163	.87	R
TOTAL REMOTE:		2.163 KA		NACD RATIO:	.9197	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.352	2.352	2.352	2.352

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.033	1.000	1.000	1.000
DUTY (KA) :	2.429	2.352	2.352	2.352

BUS 4A101 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4A102 VOLTAGE: 480. (SEE LOW VOLTAGE REPORT)

BUS 4A201 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

T H R E E P H A S E I N T E R R U P T I N G D U T Y R E P O R T

PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

BUS 4A202 VOLTAGE: 480. (SEE LOW VOLTAGE REPORT)

BUS 4A300 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4A400 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

BUS 4B001 E/Z: 2.300 KA AT -73.88 DEG (52.58 MVA) X/R: 3.46
 VOLTAGE: 13200. EQUIV. IMPEDANCE= .9202 + J 3.1833 OHMS
 CONTRIBUTIONS: BUS 0011 2.300 KA ANG: -73.88

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.144	.87	R
TOTAL REMOTE:				2.144 KA	NACD RATIO: .9320	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.300	2.300	2.300	2.300

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.031	1.000	1.000	1.000
DUTY (KA) :	2.372	2.300	2.300	2.300

BUS 4B002 E/Z: 2.252 KA AT -72.36 DEG (51.49 MVA) X/R: 3.15
 VOLTAGE: 13200. EQUIV. IMPEDANCE= 1.0252 + J 3.2249 OHMS
 CONTRIBUTIONS: BUS 4B001 2.252 KA ANG: -72.36

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.099	.87	R
TOTAL REMOTE:				2.099 KA	NACD RATIO: .9320	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.252	2.252	2.252	2.252

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.028	1.000	1.000	1.000
DUTY (KA) :	2.314	2.252	2.252	2.252

BUS 4B003 E/Z: 2.227 KA AT -71.58 DEG (50.91 MVA) X/R: 3.00
 VOLTAGE: 13200. EQUIV. IMPEDANCE= 1.0815 + J 3.2472 OHMS
 CONTRIBUTIONS: BUS 4B002 2.227 KA ANG: -71.58

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.075	.88	R
TOTAL REMOTE:				2.075 KA	NACD RATIO: .9320	

THREE PHASE INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.227	2.227	2.227	2.227

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.026	1.000	1.000	1.000
DUTY (KA) :	2.284	2.227	2.227	2.227

BUS 4B004 E/Z: 2.188 KA AT -70.41 DEG (50.03 MVA) X/R: 2.81
 VOLTAGE: 13200. EQUIV. IMPEDANCE= 1.1679 + J 3.2814 OHMS
 CONTRIBUTIONS: BUS 4B003 2.188 KA ANG: -70.41

GENERATOR NAME	--	AT BUS	--	KA	VOLTS PU	LOCAL/REMOTE
NMPC				2.039	.88	R
TOTAL REMOTE:		2.039 KA	NACD RATIO:		.9320	

	SYM2	SYM3	SYM5	SYM8
MULT. FACT:	1.000	1.000	1.000	1.000
DUTY (KA) :	2.188	2.188	2.188	2.188

	TOT2	TOT3	TOT5	TOT8
MULT. FACT:	1.024	1.000	1.000	1.000
DUTY (KA) :	2.240	2.188	2.188	2.188

- BUS 4B100 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)
- BUS 4B200 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)
- BUS 4B300 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)
- BUS 4B400 VOLTAGE: 208. (SEE LOW VOLTAGE REPORT)

UNBALANCED INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 0000	3 PHASE:	6.41	8.0	SYM2:	1.00	1.00	6.41 6.36
VOLTS: 34500.0	SLG:	6.36	11.1	SYM3:	1.00	1.00	6.41 6.36
NACD: .981	LN/LN:	5.55		SYM5:	1.00	1.00	6.41 6.36
	LN/LN/GND:	6.20		SYM8:	1.00	1.01	6.42 6.43
	GND RETURN:	6.29		TOT2:	1.15	1.24	7.36 7.87
	Z1(PU):		.26094	TOT3:	1.02	1.08	6.56 6.84
	Z2(PU):		.26094	TOT5:	1.00	1.02	6.41 6.48
	Z0(PU):		.26898	TOT8:	1.00	1.00	6.41 6.36
BUS 0001	3 PHASE:	6.41	8.0	SYM2:	1.00	1.00	6.41 6.36
VOLTS: 34500.0	SLG:	6.36	11.1	SYM3:	1.00	1.00	6.41 6.36
NACD: .981	LN/LN:	5.55		SYM5:	1.00	1.00	6.41 6.36
	LN/LN/GND:	6.20		SYM8:	1.00	1.01	6.42 6.43
	GND RETURN:	6.29		TOT2:	1.15	1.24	7.36 7.87
	Z1(PU):		.26094	TOT3:	1.02	1.08	6.56 6.84
	Z2(PU):		.26094	TOT5:	1.00	1.02	6.41 6.48
	Z0(PU):		.26898	TOT8:	1.00	1.00	6.41 6.36
BUS 0010	3 PHASE:	2.66	13.1	SYM2:	1.00	1.00	2.66 .39
VOLTS: 13200.0	SLG:	.39	.1	SYM3:	1.00	1.00	2.66 .39
NACD: .934	LN/LN:	2.30		SYM5:	1.00	1.00	2.66 .39
	LN/LN/GND:	2.40		SYM8:	1.03	1.00	2.73 .39
	GND RETURN:	.20		TOT2:	1.29	1.00	3.42 .39
	Z1(PU):		1.64525	TOT3:	1.12	1.00	2.97 .39
	Z2(PU):		1.64525	TOT5:	1.04	1.00	2.77 .39
	Z0(PU):		32.84515	TOT8:	1.00	1.00	2.67 .39
BUS 0011	3 PHASE:	2.57	9.0	SYM2:	1.00	1.00	2.57 .39
VOLTS: 13200.0	SLG:	.39	.2	SYM3:	1.00	1.00	2.57 .39
NACD: .932	LN/LN:	2.22		SYM5:	1.00	1.00	2.57 .39
	LN/LN/GND:	2.32		SYM8:	1.00	1.00	2.57 .39
	GND RETURN:	.20		TOT2:	1.18	1.00	3.03 .39
	Z1(PU):		1.70302	TOT3:	1.04	1.00	2.67 .39
	Z2(PU):		1.70302	TOT5:	1.00	1.00	2.57 .39
	Z0(PU):		32.96431	TOT8:	1.00	1.00	2.57 .39

UNBALANCED INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 0020	3 PHASE:	2.69	13.0	SYM2:	1.00	1.00	2.69 .39
VOLTS: 13200.0	SLG:	.39	.1	SYM3:	1.00	1.00	2.69 .39
NACD: .923	LN/LN:	2.33		SYM5:	1.00	1.00	2.69 .39
	LN/LN/GND:	2.43		SYM8:	1.03	1.00	2.76 .39
	GND RETURN:	.20		TOT2:	1.29	1.00	3.46 .39
	Z1(PU):	1.62311		TOT3:	1.11	1.00	3.00 .39
	Z2(PU):	1.62311		TOT5:	1.04	1.00	2.80 .39
	Z0(PU):	32.84515		TOT8:	1.00	1.00	2.70 .39
BUS 0021	3 PHASE:	2.60	9.0	SYM2:	1.00	1.00	2.60 .39
VOLTS: 13200.0	SLG:	.39	.1	SYM3:	1.00	1.00	2.60 .39
NACD: .921	LN/LN:	2.26		SYM5:	1.00	1.00	2.60 .39
	LN/LN/GND:	2.35		SYM8:	1.00	1.00	2.61 .39
	GND RETURN:	.20		TOT2:	1.18	1.00	3.07 .39
	Z1(PU):	1.67913		TOT3:	1.04	1.00	2.70 .39
	Z2(PU):	1.67913		TOT5:	1.00	1.00	2.61 .39
	Z0(PU):	32.96431		TOT8:	1.00	1.00	2.60 .39
BUS 3A001	3 PHASE:	2.50	5.5	SYM2:	1.00	1.00	2.50 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.50 .38
NACD: .921	LN/LN:	2.17		SYM5:	1.00	1.00	2.50 .38
	LN/LN/GND:	2.26		SYM8:	1.00	1.00	2.50 .38
	GND RETURN:	.20		TOT2:	1.07	1.00	2.67 .38
	Z1(PU):	1.74637		TOT3:	1.00	1.00	2.50 .38
	Z2(PU):	1.74637		TOT5:	1.00	1.00	2.50 .38
	Z0(PU):	33.16953		TOT8:	1.00	1.00	2.50 .38
BUS 3A002	3 PHASE:	2.48	5.0	SYM2:	1.00	1.00	2.48 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.48 .38
NACD: .921	LN/LN:	2.15		SYM5:	1.00	1.00	2.48 .38
	LN/LN/GND:	2.24		SYM8:	1.00	1.00	2.48 .38
	GND RETURN:	.20		TOT2:	1.05	1.00	2.60 .38
	Z1(PU):	1.76541		TOT3:	1.00	1.00	2.48 .38
	Z2(PU):	1.76541		TOT5:	1.00	1.00	2.48 .38
	Z0(PU):	33.22375		TOT8:	1.00	1.00	2.48 .38

UNBALANCED INTERRUPTING DUTY REPORT

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 3A003	3 PHASE:	2.46	4.7	SYM2:	1.00	1.00	2.46 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.46 .38
NACD: .921	LN/LN:	2.13		SYM5:	1.00	1.00	2.46 .38
	LN/LN/GND:	2.22		SYM8:	1.00	1.00	2.46 .38
	GND RETURN:	.20		TOT2:	1.05	1.00	2.57 .38
	Z1(PU):	1.77904		TOT3:	1.00	1.00	2.46 .38
	Z2(PU):	1.77904		TOT5:	1.00	1.00	2.46 .38
	Z0(PU):	33.26173		TOT8:	1.00	1.00	2.46 .38
BUS 3A004	3 PHASE:	2.40	4.0	SYM2:	1.00	1.00	2.40 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.40 .38
NACD: .921	LN/LN:	2.08		SYM5:	1.00	1.00	2.40 .38
	LN/LN/GND:	2.17		SYM8:	1.00	1.00	2.40 .38
	GND RETURN:	.19		TOT2:	1.04	1.00	2.49 .38
	Z1(PU):	1.82530		TOT3:	1.00	1.00	2.40 .38
	Z2(PU):	1.82530		TOT5:	1.00	1.00	2.40 .38
	Z0(PU):	33.38613		TOT8:	1.00	1.00	2.40 .38
BUS 3B001	3 PHASE:	2.43	4.9	SYM2:	1.00	1.00	2.43 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.43 .38
NACD: .932	LN/LN:	2.11		SYM5:	1.00	1.00	2.43 .38
	LN/LN/GND:	2.20		SYM8:	1.00	1.00	2.43 .38
	GND RETURN:	.20		TOT2:	1.05	1.00	2.55 .38
	Z1(PU):	1.79847		TOT3:	1.00	1.00	2.43 .38
	Z2(PU):	1.79847		TOT5:	1.00	1.00	2.43 .38
	Z0(PU):	33.24968		TOT8:	1.00	1.00	2.43 .38
BUS 3B002	3 PHASE:	2.41	4.6	SYM2:	1.00	1.00	2.41 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.41 .38
NACD: .932	LN/LN:	2.09		SYM5:	1.00	1.00	2.41 .38
	LN/LN/GND:	2.18		SYM8:	1.00	1.00	2.41 .38
	GND RETURN:	.20		TOT2:	1.04	1.00	2.52 .38
	Z1(PU):	1.81290		TOT3:	1.00	1.00	2.41 .38
	Z2(PU):	1.81290		TOT5:	1.00	1.00	2.41 .38
	Z0(PU):	33.28947		TOT8:	1.00	1.00	2.41 .38

UNBALANCED INTERRUPTING DUTY REPORT
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 3B003	3 PHASE:	2.36	3.9	SYM2:	1.00	1.00	2.36 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.36 .38
NACD: .932	LN/LN:	2.04		SYM5:	1.00	1.00	2.36 .38
	LN/LN/GND:	2.13		SYM8:	1.00	1.00	2.36 .38
	GND RETURN:	.19		TOT2:	1.04	1.00	2.44 .38
	Z1(PU):	1.85701		TOT3:	1.00	1.00	2.36 .38
	Z2(PU):	1.85701		TOT5:	1.00	1.00	2.36 .38
	Z0(PU):	33.40714		TOT8:	1.00	1.00	2.36 .38
BUS 4A001	3 PHASE:	2.46	4.9	SYM2:	1.00	1.00	2.46 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.46 .38
NACD: .920	LN/LN:	2.13		SYM5:	1.00	1.00	2.46 .38
	LN/LN/GND:	2.23		SYM8:	1.00	1.00	2.46 .38
	GND RETURN:	.20		TOT2:	1.05	1.00	2.58 .38
	Z1(PU):	1.77485		TOT3:	1.00	1.00	2.46 .38
	Z2(PU):	1.77485		TOT5:	1.00	1.00	2.46 .38
	Z0(PU):	33.25812		TOT8:	1.00	1.00	2.46 .38
BUS 4A002	3 PHASE:	2.43	4.3	SYM2:	1.00	1.00	2.43 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.43 .38
NACD: .920	LN/LN:	2.10		SYM5:	1.00	1.00	2.43 .38
	LN/LN/GND:	2.19		SYM8:	1.00	1.00	2.43 .38
	GND RETURN:	.20		TOT2:	1.04	1.00	2.52 .38
	Z1(PU):	1.80356		TOT3:	1.00	1.00	2.43 .38
	Z2(PU):	1.80356		TOT5:	1.00	1.00	2.43 .38
	Z0(PU):	33.33725		TOT8:	1.00	1.00	2.43 .38
BUS 4A003	3 PHASE:	2.38	3.9	SYM2:	1.00	1.00	2.38 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.38 .38
NACD: .920	LN/LN:	2.06		SYM5:	1.00	1.00	2.38 .38
	LN/LN/GND:	2.15		SYM8:	1.00	1.00	2.38 .38
	GND RETURN:	.19		TOT2:	1.04	1.00	2.47 .38
	Z1(PU):	1.83698		TOT3:	1.00	1.00	2.38 .38
	Z2(PU):	1.83698		TOT5:	1.00	1.00	2.38 .38
	Z0(PU):	33.42537		TOT8:	1.00	1.00	2.38 .38

UNBALANCED INTERRUPTING DUTY REPORT
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 4A004	3 PHASE:	2.35	3.6	SYM2:	1.00	1.00	2.35 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.35 .38
NACD: .920	LN/LN:	2.04		SYM5:	1.00	1.00	2.35 .38
	LN/LN/GND:	2.13		SYM8:	1.00	1.00	2.35 .38
	GND RETURN:	.19		TOT2:	1.03	1.00	2.43 .38
	Z1(PU):	1.85985		TOT3:	1.00	1.00	2.35 .38
	Z2(PU):	1.85985		TOT5:	1.00	1.00	2.35 .38
	Z0(PU):	33.48396		TOT8:	1.00	1.00	2.35 .38
BUS 4B001	3 PHASE:	2.30	3.5	SYM2:	1.00	1.00	2.30 .38
VOLTS: 13200.0	SLG:	.38	.2	SYM3:	1.00	1.00	2.30 .38
NACD: .932	LN/LN:	1.99		SYM5:	1.00	1.00	2.30 .38
	LN/LN/GND:	2.08		SYM8:	1.00	1.00	2.30 .38
	GND RETURN:	.19		TOT2:	1.03	1.00	2.37 .38
	Z1(PU):	1.90176		TOT3:	1.00	1.00	2.30 .38
	Z2(PU):	1.90176		TOT5:	1.00	1.00	2.30 .38
	Z0(PU):	33.52131		TOT8:	1.00	1.00	2.30 .38
BUS 4B002	3 PHASE:	2.25	3.1	SYM2:	1.00	1.00	2.25 .37
VOLTS: 13200.0	SLG:	.37	.2	SYM3:	1.00	1.00	2.25 .37
NACD: .932	LN/LN:	1.95		SYM5:	1.00	1.00	2.25 .37
	LN/LN/GND:	2.04		SYM8:	1.00	1.00	2.25 .37
	GND RETURN:	.19		TOT2:	1.03	1.00	2.31 .37
	Z1(PU):	1.94209		TOT3:	1.00	1.00	2.25 .37
	Z2(PU):	1.94209		TOT5:	1.00	1.00	2.25 .37
	Z0(PU):	33.62047		TOT8:	1.00	1.00	2.25 .37
BUS 4B003	3 PHASE:	2.23	3.0	SYM2:	1.00	1.00	2.23 .37
VOLTS: 13200.0	SLG:	.37	.2	SYM3:	1.00	1.00	2.23 .37
NACD: .932	LN/LN:	1.93		SYM5:	1.00	1.00	2.23 .37
	LN/LN/GND:	2.02		SYM8:	1.00	1.00	2.23 .37
	GND RETURN:	.19		TOT2:	1.03	1.00	2.28 .37
	Z1(PU):	1.96427		TOT3:	1.00	1.00	2.23 .37
	Z2(PU):	1.96427		TOT5:	1.00	1.00	2.23 .37
	Z0(PU):	33.67372		TOT8:	1.00	1.00	2.23 .37

UNBALANCED INTERRUPTING DUTY REPORT
 PRE FAULT VOLTAGE: 1.0000
 MODEL TRANSFORMER TAPS: NO
 NACD OPTION: INTERPOLATED

LOCATION	FAULT TYPE	E/Z KA	X/R	ANSI AC/DC DECREMENT FACT.		INTERRUPTING DUTIES (KA)	
				3 PHASE	SLG	3 PHASE	SLG
BUS 4B004	3 PHASE:	2.19	2.8	SYM2:	1.00	1.00	2.19 .37
VOLTS: 13200.0	SLG:	.37	.2	SYM3:	1.00	1.00	2.19 .37
NACD: .932	LN/LN:	1.89		SYM5:	1.00	1.00	2.19 .37
	LN/LN/GND:	1.98		SYM8:	1.00	1.00	2.19 .37
	GND RETURN:	.19		TOT2:	1.02	1.00	2.24 .37
	Z1(PU):	1.99899		TOT3:	1.00	1.00	2.19 .37
	Z2(PU):	1.99899		TOT5:	1.00	1.00	2.19 .37
	Z0(PU):	33.75546		TOT8:	1.00	1.00	2.19 .37

I N T E R R U P T I N G D U T Y S U M M A R Y R E P O R T

PRE FAULT VOLTAGE: 1.0000

MODEL TRANSFORMER TAPS: NO

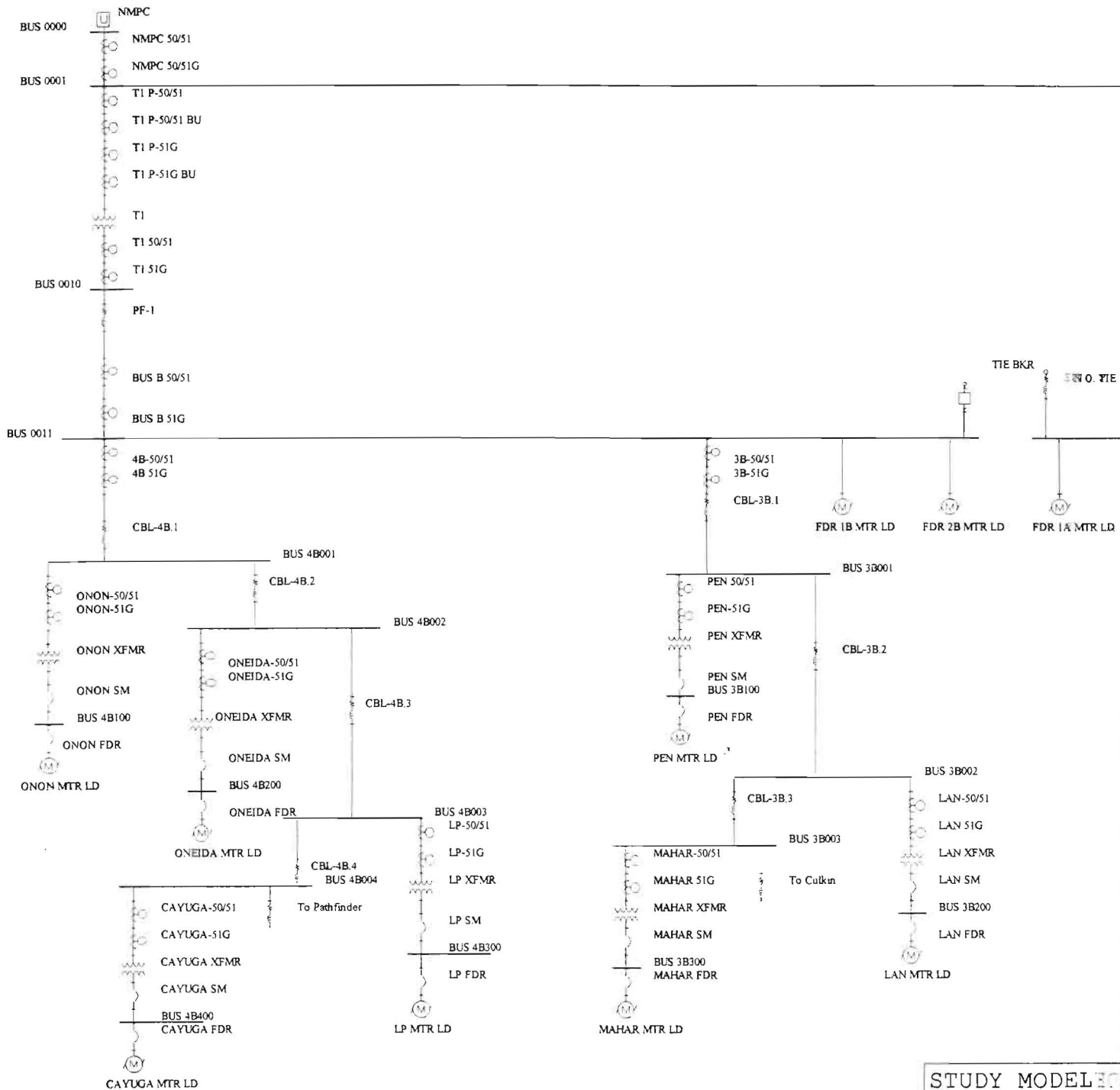
NACD OPTION: INTERPOLATED

BUS RECORD NO NAME	VOLTAGE L-L	NACD RATIO	* 3 P H A S E *		* * * S L G * * *	
			E/Z KA	X/R	E/Z KA	X/R
BUS 0000	34500.	.981	6.413	8.03	6.355	11.10
BUS 0001	34500.	.981	6.413	8.03	6.355	11.10
BUS 0010	13200.	.934	2.658	13.07	.393	.14
BUS 0011	13200.	.932	2.568	8.97	.390	.15
BUS 0020	13200.	.923	2.695	13.01	.393	.14
BUS 0021	13200.	.921	2.605	8.98	.390	.15
BUS 3A001	13200.	.921	2.505	5.52	.384	.15
BUS 3A002	13200.	.921	2.478	5.03	.383	.16
BUS 3A003	13200.	.921	2.459	4.74	.382	.16
BUS 3A004	13200.	.921	2.396	4.00	.379	.16
BUS 3B001	13200.	.932	2.432	4.86	.382	.16
BUS 3B002	13200.	.932	2.413	4.58	.381	.16
BUS 3B003	13200.	.932	2.355	3.92	.378	.16
BUS 4A001	13200.	.920	2.464	4.86	.382	.16
BUS 4A002	13200.	.920	2.425	4.34	.380	.16
BUS 4A003	13200.	.920	2.381	3.88	.378	.16
BUS 4A004	13200.	.920	2.352	3.63	.376	.16
BUS 4B001	13200.	.932	2.300	3.46	.375	.16
BUS 4B002	13200.	.932	2.252	3.15	.373	.16
BUS 4B003	13200.	.932	2.227	3.00	.371	.17
BUS 4B004	13200.	.932	2.188	2.81	.369	.17

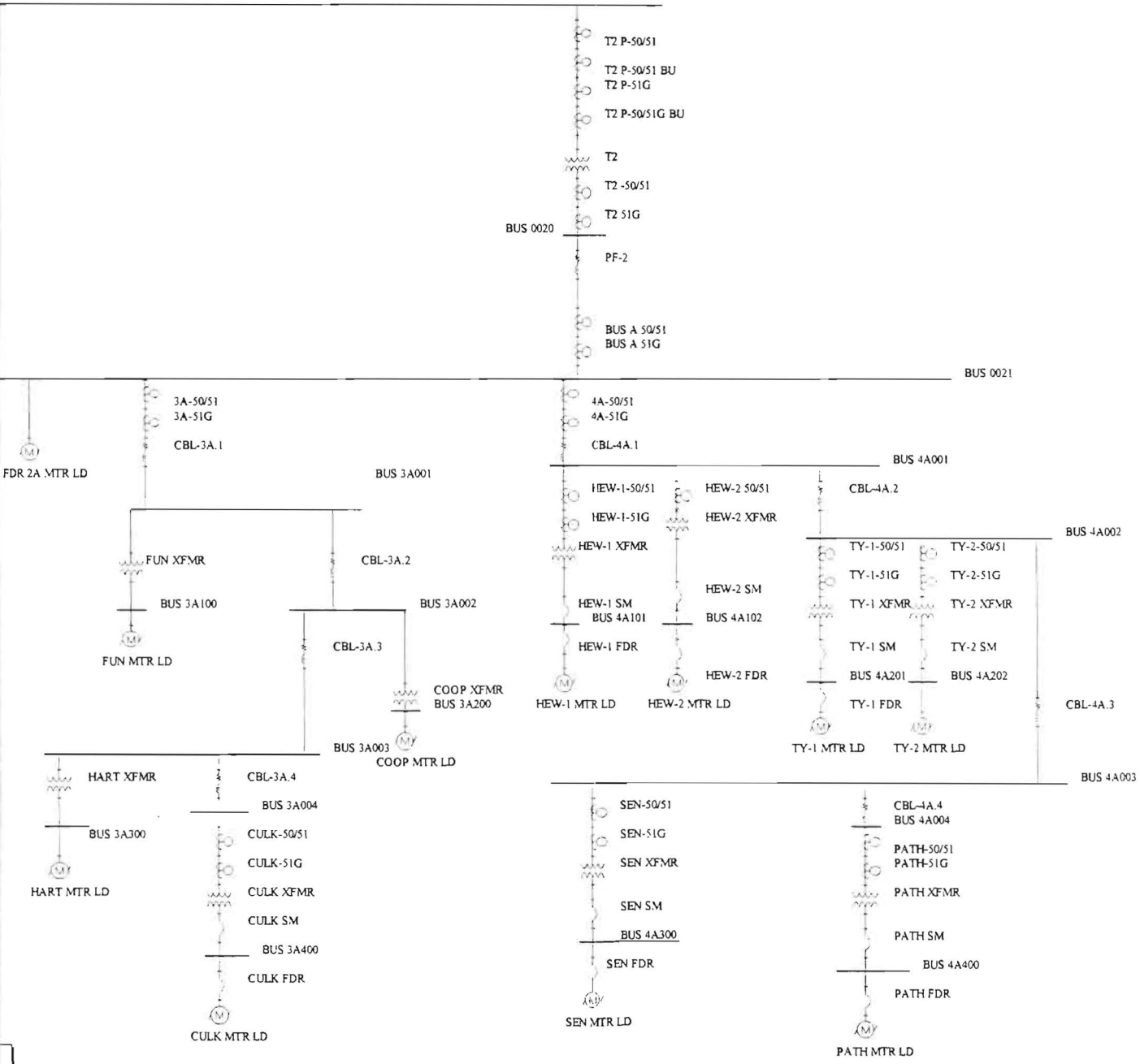
21 FAULTED BUSES, 59 BRANCHES, 22 CONTRIBUTIONS
UNBALANCED FAULTS REQUESTED

*** SHORT CIRCUIT STUDY COMPLETE ***

6.0 PDC STUDY MODEL (One Line Diagram)



STUDY MODEL
ONE LINE DIAGRAM



AM