



Cutler-Hammer



ENGINEERING SERVICES & SYSTEMS

**3 Chelsea Parkway
Suite 304
Boothwyn, Pa 19061**

**G.O. # ELY000502
TQS1456.001**

Date Report Completed: 5/11/99

POWER MEASUREMENTS

FOR

**NORTHROP GRUMMAN CORP.
RADAR TEST FACILITY
CHILLER 2A**

SYKESVILLE, MD

**C-H ESS
CUTLER-HAMMER ENGINEERING SERVICES AND SYSTEMS DIVISION**

-D84-

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3 Chelsea Parkway
Suite 304
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General Order #	ELY000502
TQS #	1456.001
Preliminary Report Completed:	4/23/99
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Report Completed By:	Alton W. Baum, P.E.

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NORTHROP GRUMMAN CORP.
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CHILLER 2A

SYKESVILLE, MD

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Northrop Grumman (TQS1456.001)

-D85-

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Northrop Grumman (TQS1155.001)

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1 OVERVIEW

The Northrop Grumman Radar Test Laboratory in Sykesville, Maryland recently installed an active line power conditioner, called the USES unit. The USES is connected to a 150 horsepower compressor motor identified by the facility as "Chiller 2A". The motor of Chiller 2A is a low voltage induction motor started across-the-line. The USES is a three phase passive line conditioner that functions to: a) reduce demand from the power system, b) provide transient surge protection, c) reduce harmonics, and d) improve power factor. The USES unit under test is model # CMES 3D 480.

In April 1999, Northrop Grumman Corp. in conjunction with the USES distributor, Pure Power Systems, Inc. contracted Cutler-Hammer Engineering Services and Systems (C-HESS) to measure and record power and harmonic data on Chiller 2A. This report documents the measurement techniques, test equipment specifications, system details, and test results. Data are summarized in section 7 of this report, with complete details of the testing shown in subsequent data section. These power measurements of the USES Unit are intended to be the first of a series of tests which will include harmonics and transient attenuation.

2 PERSONNEL

Mohan Ray, PE	Sr. Facilities Design Engineer	Northrop Grumman
Robert Emmet, PhD	Product Sales Representative	Pure Power Systems
Jim Kerr	Plant Electrician	Northrop Grumman
Doug Shade	Service Technician	McQuay, Inc.
Dennis Lofink	Sr. Sales Engineer	C-HESS
Alton Baum, PE	Power Systems Engineer	C-HESS

3 SYSTEM DESCRIPTION

Chiller 2A is rated 150hp at 480V, with full load current (running load amperes, RLA) equal to 180A. The USES Unit is connected in parallel to the 3-phase motor feed on the line-side of the motor starter contactor. The USES Unit has its own 30A molded case breaker for switched isolation.

The cut-away oneline diagram shows the electrical configuration of Chiller 2A and its feed from Substation #4, 225A molded case breaker. Also shown in this layout are the connection points of both the USES and the power monitoring.

4 MOTOR/COMPRESSOR DATA

Mfgr.: McQuay International, Inc.
460V, 3-phase, 60Hz., 182 FLA (RLA), 409 LRA (wye), 1,228 LRA (delta)
0.882 rated power factor (FLA)

Unit Shop Order # 506180010
Motor Style# 704826CGO6
Compressor Model# CE063JAP 18ROX
Compressor Style# 701620AG70
Compressor Serial# 5WFOO75602

5 POWER ANALYZER DESCRIPTION

The Power Platform PP1, manufactured by Dranetz-BMI, Inc., Edison, NJ was used as the primary recording device for this project. The PP1, when used with the Task8000 taskcard allows the meter to measure and record power parameters for both single-phase and three-phase systems. These parameters include: voltage, current, real power, reactive power, apparent power, power factor, and voltage and current harmonics.

In conjunction with the PP1, two other power meters were used as comparable data measurements. These were the ACE2000, manufactured by CPM, Inc., Toronto, Ont., and the Fluke 41 B. Data from these units are not included in this report, however, verification of recorded parameters of these units compared favorably with the Dranetz PP1 data.

The PP1 was last calibrated on 7/21/98, and is due for updated calibration on 7/21/99. Technical specifications of the unit follow section 8 of this report.

6 TEST PROCEDURE

The overall purpose of this testing was to measure and record power parameters of Chiller 2A under various load conditions both with and without the USES unit connected to the feeder. The power analyzer (PPI) was connected to the load side of the 225A feeder breaker. Power measurements were recorded by manual initiation, as opposed to threshold triggering, during specific loading conditions and USES operation. For instance, with Chiller 2A running at 100% RLA and the USES unit breaker closed, measurements were initiated. At this same loading, the USES breaker was opened, and a new set of measurements was recorded.

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Load was changed on the chiller by varying the programmable chilled water temperature point. This adjustment allowed for a load range from 100% to 50% RLA. Consequently, power measurements were recorded under 100%, 90%, 75% and 50% load conditions for the USES connected and disconnected to the feeder.

7 TEST RESULTS

7.1 Printed results from the PP1 recorded measurements are provided through pages A-1 to E-5. These data sheets contain power measurements, voltage and current phasor diagrams and sinusoidal waveforms, and harmonic data. For ease of comparison, these measurements are summarized in the Data Summary Table below for each load condition and with the USES Unit switched on and off.

DATA SUMMARY TABLE

	100% RLA		90% RLA		75% RLA		50% RLA	
	ON	OFF	ON	OFF	ON	OFF	ON	OFF
V_L	495.3	495.5	497.2	495.8	496.1	497.3	497.9	495.8
Abs. Chg.	-0.2		1.4		-1.2		2.1	
I_L	170.6	188.6	143.1	162.4	115.4	131.2	89.9	93.2
% Chg.	-9.5%		-11.9%		-12.0%		-25.0%	
PF	0.998	0.996	1.000	0.991	0.997	0.968	0.915	0.836
% Chg.	0.20%		0.90%		2.90%		7.90%	
kW	84.3	93.1	71.1	79.8	57.1	63.1	31.8	38.6
% Chg.	-9.5%		-10.9%		-9.5%		-17.8%	
kVARS	-5.1	8.1	0.6	10.9	4.1	16.3	14.1	25.4
% Chg.	-163.0%		-94.5%		-74.8%		-44.5%	
kVA	84.5	93.5	71.0	80.5	57.2	65.2	34.8	46.2
% Chg.	-9.6%		-11.8%		-12.3%		-24.7%	
V_{THD}	1.965	1.949	2.084	1.932	2.026	1.965	2.119	2.033
% Chg.	0.8%		7.9%		3.1%		4.2%	
I_{THD}	1.938	2.844	2.372	3.310	2.884	4.206	3.990	4.911
% Chg.	-31.9%		-28.3%		-31.4%		-18.8%	

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7.2 As shown in the Data Summary Table, the percentage change in demand; i.e., I_L and kVA; is significantly more pronounced at the lower load levels. Over the load ranges of 50% to 100% RLA and USES on, load current I_L and kVA decreased an average of 14.6%, demand in kW decreased an average of 11.8%, and total current harmonic distortion I_{THD} decreased by an average of 27.6%. The effects of the USES Unit are more pronounced at the lower RLA values.

The power factor increased by an average of 11.9% with the USES Unit connected to the feeder, with measured values significantly above the rated 0.882 (at 100% RLA). This measured power factor infers that power factor correction has been added to this motor in the past, however, records of this installation were not available at the time of this writing. The USES Unit improves the power factor to 0.998 from the already improved value of 0.996.

7.3 Analysis of the Harmonic Mitigation of the USES resulted in a slight increase in V_{THD} of 0.8% at 100% RLA, which is insignificant. The current harmonic values I_{THD} , however, were reduced by 31.9% at the same load. Total harmonic distortion (THD) measurements taken by the PP1 are a function of the 60Hz. fundamental value of the waveform. Future measurements will more exactly describe these efforts.

8 CONCLUSION

The results of this test provide conclusive evidence that the USES Unit does reduce amperage demand and power demand of an inductive-type load. These results are more clearly seen at lower load levels. Also, the test results show that the USES is able to improve the displacement angle between the voltage and current of each phase of a three phase inductive load, which is directly related to improved power factor of the load. This again is more noticeable at lower load conditions. The other pronounced functions of harmonic distortion reduction and transient voltage suppression were not proven during this testing, however, this testing was not designed to show these features of the USES. Further testing will describe more completely the harmonic and transient mitigation properties of the USES Unit.

PPI Specifications

<u>Parameter</u>	<u>Specifications</u>
Voltage measurements	4 fully differential channels 10-600Vrms Accuracy: $\pm 1\%$ reading $\pm 0.05\%$ full scale
Voltage transients	50-6000 Vpk 1 microsecond minimum duration Accuracy: $\pm 10\%$ reading $\pm 1\%$ full scale Requires TASKCard PQPlus
Current measurements	4 fully independent current channels 10 - 200% of full-scale current probe rating Accuracy: $\pm 1\%$ reading $\pm 0.05\%$ full scale (at fundamental, plus current probe accuracy)
Current transients	10-300% CT full scale except Chan D 2-200% CT full scale 1 microsecond minimum duration Accuracy: $\pm 10\%$ reading $\pm 1\%$ full scale plus probe Requires TASKCard PQPlus
Frequency	Fundamental range 30 - 450 Hz Accuracy $\pm 0.2\%$ of reading
Update rates	All parameters updated once per second (Harmonic-based parameters updated every 5 seconds)
Environment	41°F to 113°F +5°C to +45°C Humidity 10% - 90% non-condensing
Battery	2 hours operation 3 hours full recharge (continuous operation from battery eliminator)
PC Software package	DRAN-VIEW

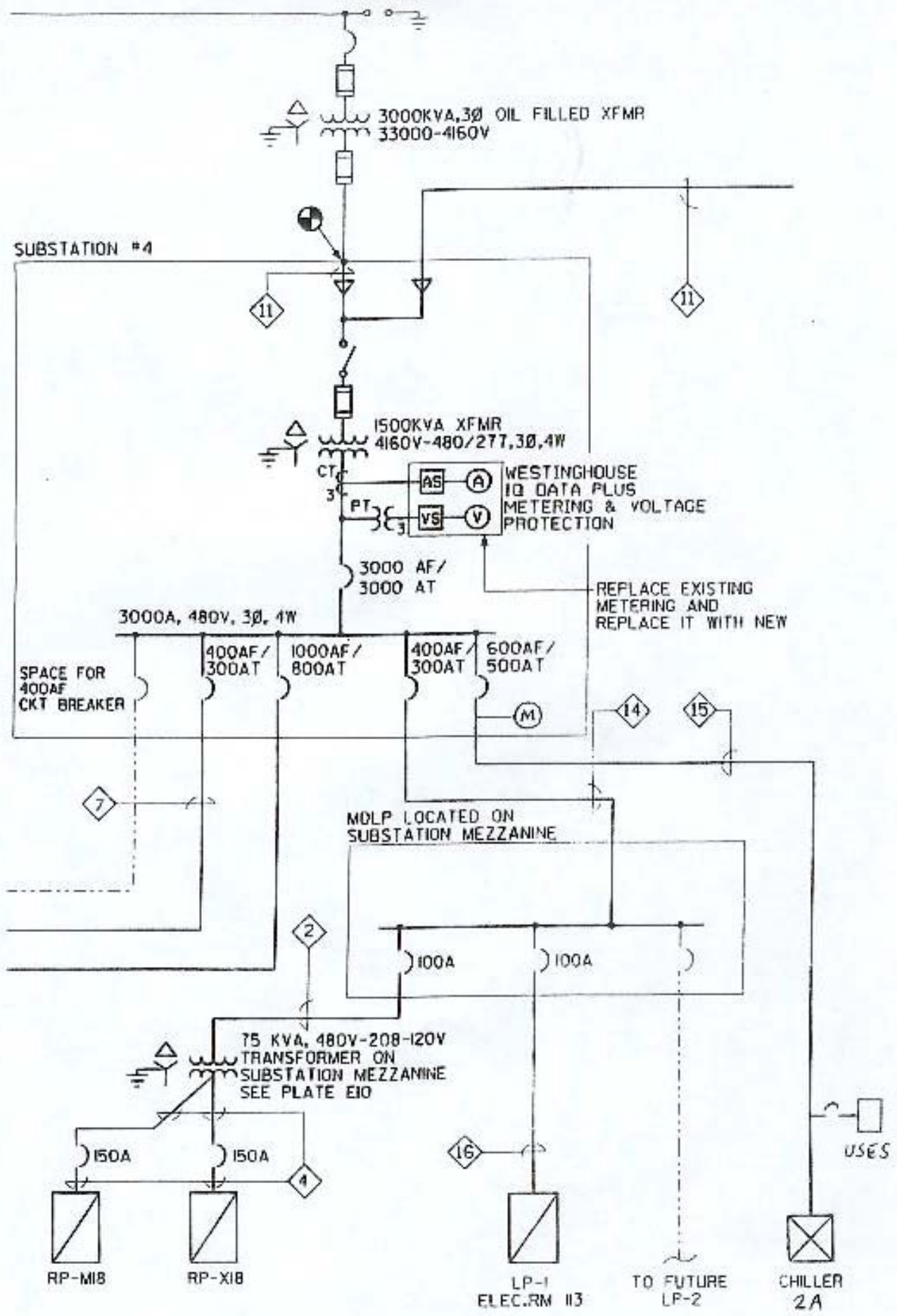
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Certifications

(CE certification for model PP1 E, UL listing for model PPI)

Latest released version

PQPlus V2.4
TASK8000 V2.3
Inrush V1.2
TaskCard Flicker V1.0



FEEDER DATA

<u>I.D.</u>	<u>SIZE</u>
2	3 - #2 + 1 - #8 GRD, 1-1/4" C
4	4 - #1/0 + 1 - #6 GRD, 2" C
7	3 - #350 kcmil + 1 - #4 GRD, 3" C
11	2 Sets of 3 - #4/0 + 1 - 2/0 Bare Cu. GRD, 3" C
14	4 - #350 kcmil + 1 - #4 GRD, 3" C
15	2 Sets of 3 - #250 kcmil + 1 - #2 GRD, 2-1/2" C
16	4 - #2 + 1 - #8 GRD, 1-1/4" C

Note: I.D. numbers for feeders shown in diamonds on oneline diagram.

100% RLA - USES ON

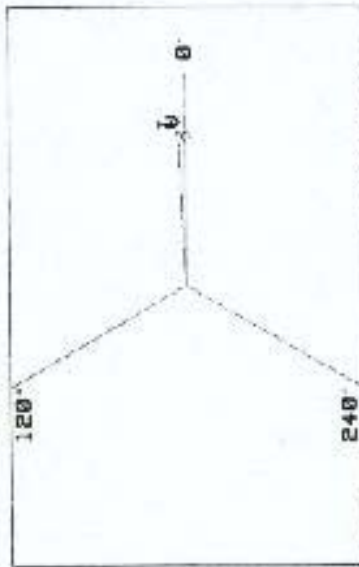
DRANETZ PPI-3000 N-G 2R 11-02-20 Apr--08-99
 ALL CHANNELS SUMMARY REPORT F= 50.00Hz (H)
 --R-- --C-- --O-- --RGC--
 495.0 496.2 174.0 0.046 495.3
 166.8 171.0 84.70k 0.000 511.8
 62.37k 84.70k 85.95k 0.000 253.0k
 -0.998 0.999 -0.998 0.000 0.998
 82.57k 84.85k 86.06k 0.000 253.5k
 -5.621k -3.584k -5.972k 0.000 -15.30k
 1.401 1.397 1.396 2.755
 1.445 1.443 1.418 0.000
 1.865 1.000 1.857 0.000
 1.938 1.955 2.059 0.000
 7.545k 9.357k 7.064k 0.000
 6.121k 7.735k 7.600k 0.000
 9.998 0.998 0.990 1.000
 -9.998 -1.000 -0.990 0.000
 PH V 858.5 857.2
 PRESENT DEMAND: 253.0kW
 ACCUM ENERGY: 769.7kWh PROJ. DEMAND: 287.9kW

100% RLA - USES OFF

DRANETZ PPI-3000 N-G 2R 11-22-10 Apr--06-99
 ALL CHANNELS SUMMARY REPORT F= 50.00Hz (H)
 --R-- --C-- --O-- --RGC--
 495.2 496.6 189.6 0.044 495.5
 184.3 189.6 93.62k 0.000 555.9
 98.98k 93.62k 94.70k 0.000 279.3k
 0.997 0.995 0.997 0.000 0.996
 91.26k 94.13k 94.98k 0.000 200.4k
 7.259k 9.840k 7.259k 0.000 24.36k
 1.397 1.396 1.394 3.406
 1.453 1.442 1.420 0.000
 1.949 1.069 1.963 0.000
 2.044 2.771 2.769 0.000
 3.755k 4.850k 3.634k 0.000
 3.171k 3.141k 3.356k 0.000
 0.998 0.998 0.998 1.000
 0.998 0.995 0.998 0.000
 PH V 859.0 857.6
 PRESENT DEMAND: 279.3kW
 ACCUM ENERGY: 856.2kWh PROJ. DEMAND: 291.5kW

100% RLA - USES ON

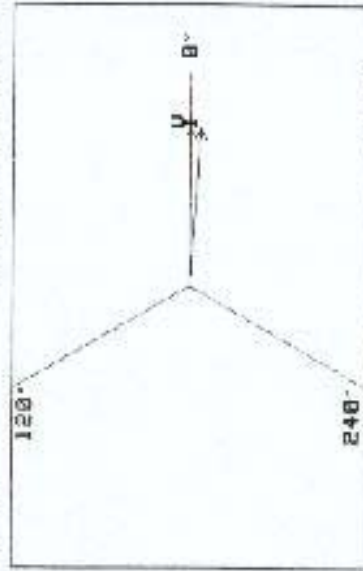
DRANETZ PP1-8000 N-G 2A 11:03:52 Apr-08-99



PHASOR: A
 VOLTAGE:
 496 @ 000°
 CURRENT:
 165 @ 003°

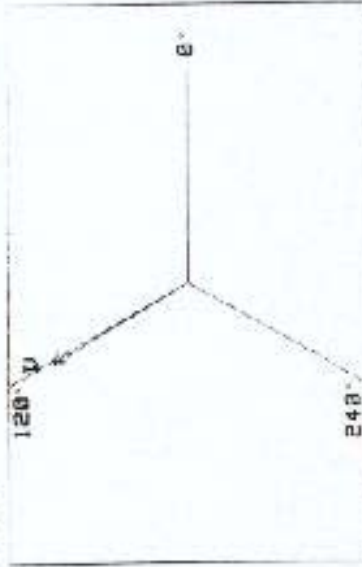
100% RLA - USES OFF

DRANETZ PP1-8000 N-G 2A 11:23:43 Apr-08-99



PHASOR: A
 VOLTAGE:
 494 @ 000°
 CURRENT:
 165 @ 356°

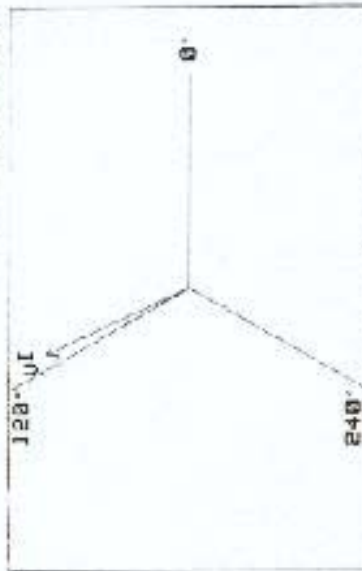
DRANETZ PP1-8000 N-G 2A 11:03:57 Apr-08-99



PHASOR: B
 VOLTAGE:
 498 @ 120°
 CURRENT:
 171 @ 121°

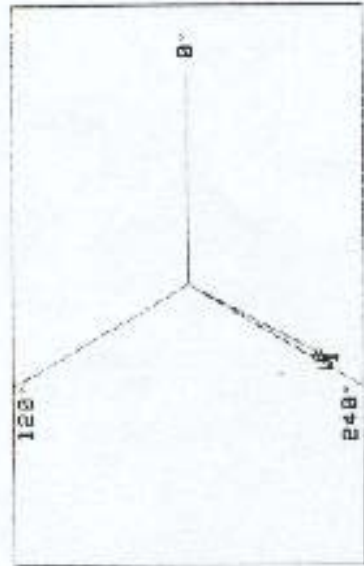
-D97-

DRANETZ PP1-8000 N-G 2A 11:23:49 Apr-08-99



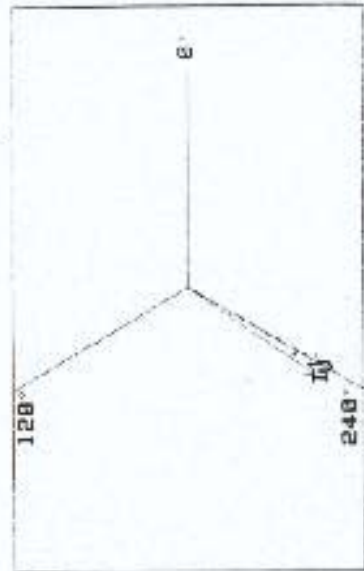
PHASOR: B
 VOLTAGE:
 495 @ 120°
 CURRENT:
 190 @ 115°

DRANETZ PP1-8000 N-G 2A 11:04:01 Apr-08-99



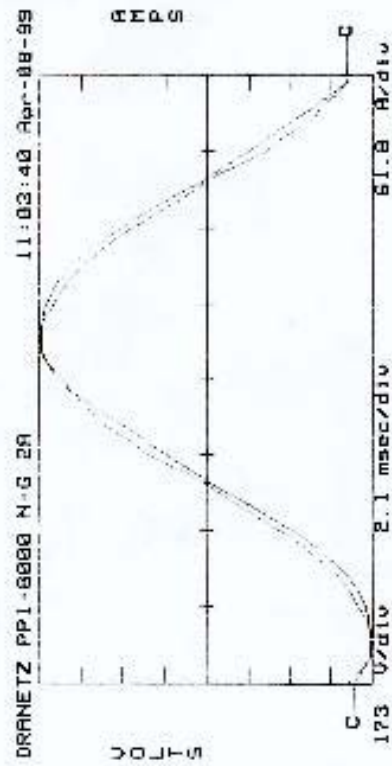
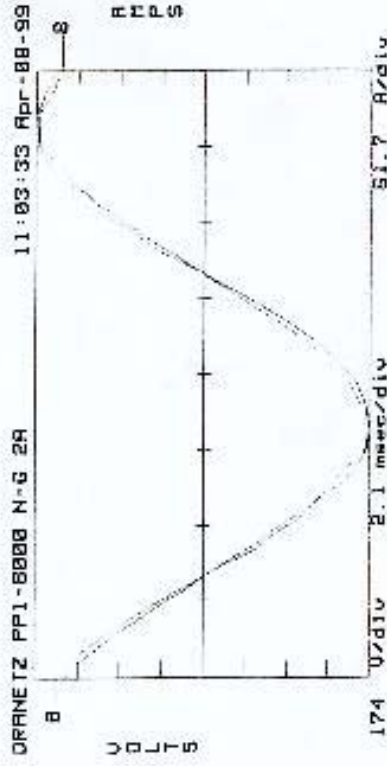
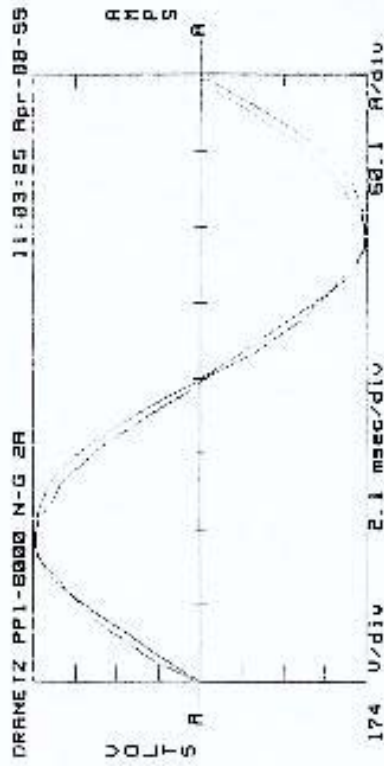
PHASOR: C
 VOLTAGE:
 456 @ 240°
 CURRENT:
 175 @ 243°

DRANETZ PP1-8000 N-G 2A 11:23:54 Apr-08-99

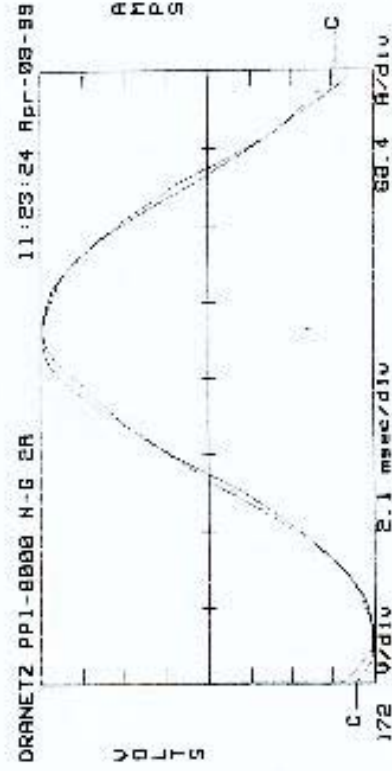
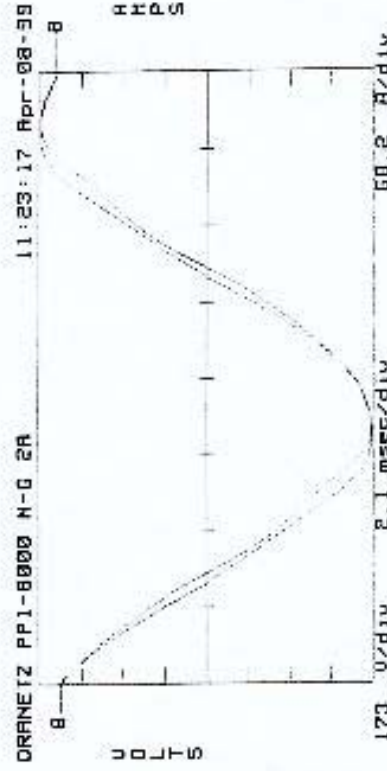
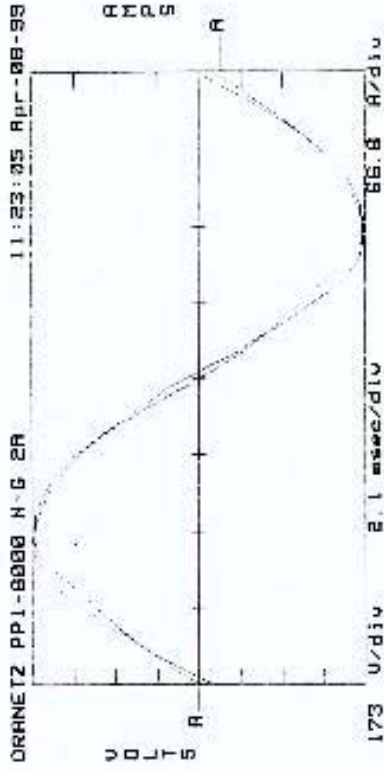


PHASOR: C
 VOLTAGE:
 454 @ 240°
 CURRENT:
 152 @ 236°

100% RLA - USES ON



100% RLA - USES OFF



100% RLA - USES ON

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH A REF 495.0 V. 50.0HZ Apr-88-99 11:04:25

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.022	238	19	0.000	214	35	0.000	346
03	0.148	238	19	0.000	166	38	0.000	166
04	0.074	123	22	0.000	267	39	0.000	210
05	1.052	123	22	0.000	175	39	0.000	238
06	0.646	238	19	0.000	257	40	0.000	149
07	0.646	238	19	0.000	172	41	0.000	212
08	0.054	238	19	0.000	075	42	0.000	269
09	0.054	238	19	0.000	104	43	0.000	259
10	0.011	175	39	0.000	162	44	0.000	273
11	0.032	165	38	0.000	184	45	0.000	190
12	0.011	167	39	0.000	240	46	0.000	386
13	0.065	124	30	0.000	009	47	0.000	125
14	0.011	065	31	0.000	310	49	0.000	224
15	0.043	106	32	0.000	208	49	0.000	116
16	0.000	154	34	0.000	067	50	0.000	158
17	0.215	154	34	0.000	127			
18	0.000	244	35	0.000	180			

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH B REF 497.2 V. 50.0HZ Apr-88-99 11:04:30

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	238	19	0.000	245	35	0.000	079
03	0.171	180	20	0.000	123	37	0.000	226
04	0.859	123	22	0.000	057	38	0.000	060
05	1.759	123	22	0.000	159	40	0.000	352
06	0.671	238	19	0.000	109	41	0.000	183
07	0.032	238	19	0.000	112	42	0.000	346
08	0.021	238	19	0.000	106	43	0.000	111
09	0.021	238	19	0.000	125	44	0.000	121
10	0.021	238	19	0.000	259	45	0.000	324
11	0.075	136	30	0.000	285	46	0.000	306
12	0.011	143	31	0.000	308	47	0.000	332
13	0.011	234	32	0.000	237	48	0.000	242
14	0.075	234	32	0.000	144	49	0.000	188
15	0.011	234	32	0.000	103			
16	0.148	234	32	0.000	143			
17	0.000	234	32	0.000				
18	0.000	234	32	0.000				

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH C REF 495.5 V. 50.0HZ Apr-88-99 11:04:35

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.032	234	19	0.000	277	36	0.000	041
03	0.043	234	19	0.000	119	37	0.000	066
04	0.012	234	19	0.000	083	38	0.000	060
05	0.822	124	23	0.000	298	40	0.000	359
06	0.592	234	19	0.000	127	42	0.000	127
07	0.032	192	20	0.000	267	43	0.000	255
08	0.032	192	20	0.000	217	44	0.000	309
09	0.054	192	20	0.000	210	45	0.000	269
10	0.011	021	21	0.000	276	46	0.000	256
11	0.075	106	22	0.000	207	47	0.000	050
12	0.000	143	23	0.000	207	48	0.000	242
13	0.043	208	24	0.000	210	49	0.000	252
14	0.011	208	24	0.000				
15	0.237	208	24	0.000				
16	0.011	208	24	0.000				
17	0.011	208	24	0.000				
18	0.011	208	24	0.000				

100% RLA - USES OFF

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH A REF 493.8 V. 50.0HZ Apr-88-99 11:24:14

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.022	233	19	0.000	329	36	0.000	083
03	0.141	233	19	0.000	179	37	0.000	069
04	0.032	123	22	0.000	041	38	0.000	242
05	1.704	123	22	0.000	251	39	0.000	147
06	0.622	233	19	0.000	199	40	0.000	078
07	0.622	233	19	0.000	089	41	0.000	240
08	0.054	233	19	0.000	123	42	0.000	100
09	0.054	233	19	0.000	123	43	0.000	193
10	0.011	173	20	0.000	121	44	0.000	202
11	0.065	146	21	0.000	243	45	0.000	042
12	0.000	167	22	0.000	029	47	0.000	277
13	0.054	115	23	0.000	294	47	0.000	104
14	0.022	156	23	0.000	182	48	0.000	205
15	0.022	217	24	0.000	194	49	0.000	164
16	0.000	237	25	0.000	074	50	0.000	125
17	0.000	000		0.000	157			
18	0.000	000		0.000				

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH B REF 495.1 V. 0.0HZ Apr-88-99 11:24:20

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	242	19	0.000	126	36	0.000	338
03	0.162	091	20	0.000	142	37	0.000	304
04	1.579	091	20	0.000	163	38	0.000	324
05	0.646	233	19	0.000	075	40	0.000	097
06	0.646	233	19	0.000	119	41	0.000	097
07	0.054	233	19	0.000	112	42	0.000	194
08	0.054	233	19	0.000	199	43	0.000	150
09	0.011	115	20	0.000	277	44	0.000	220
10	0.011	202	21	0.000	277	44	0.000	220
11	0.075	056	22	0.000	274	47	0.000	051
12	0.000	231	22	0.000	141	48	0.000	051
13	0.043	231	22	0.000	216	49	0.000	051
14	0.000	243	23	0.000	177			
15	0.000	243	23	0.000				
16	0.000	243	23	0.000				
17	0.000	243	23	0.000				
18	0.000	243	23	0.000				

DRANETZ PPI-8000 N-G 2A
HARMONICS:CH C REF 493.5 V. 0.0HZ Apr-88-99 11:24:26

<FUND	Uthd	PHS	H#	MAG%	PHS	H#	MAG%	PHS
02	0.022	246	19	0.000	004	36	0.000	002
03	0.110	214	20	0.000	145	37	0.000	326
04	0.832	094	21	0.000	251	38	0.000	150
05	1.711	094	21	0.000	200	40	0.000	348
06	0.654	233	19	0.000	150	41	0.000	098
07	0.654	233	19	0.000	150	42	0.000	098
08	0.043	115	20	0.000	150	43	0.000	105
09	0.043	115	20	0.000	250	44	0.000	105
10	0.024	154	21	0.000	250	44	0.000	105
11	0.011	203	22	0.000	250	44	0.000	105
12	0.011	194	23	0.000	250	44	0.000	105
13	0.000	100	24	0.000	250	44	0.000	105
14	0.000	100	24	0.000	250	44	0.000	105
15	0.000	100	24	0.000	250	44	0.000	105
16	0.000	100	24	0.000	250	44	0.000	105
17	0.000	100	24	0.000	250	44	0.000	105
18	0.000	100	24	0.000	250	44	0.000	105

90% RLA - USES ON

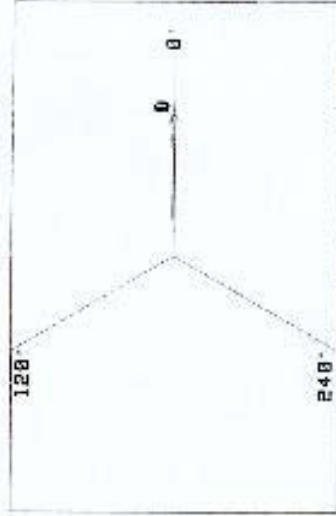
DRANETZ PPL-8000 N-G 2R 11:32:58 Apr-88-93
 ALL CHANNELS SUMMARY REPORT f= 59.98Hz (R)
 --C-- --D-- --R-- --ABC--
 V 456.8 498.8 495.7 0.042 497.2
 I 135.3 143.4 146.3 0.000 429.2
 M 65.17k 71.36k 72.70k 0.000 213.2k
 PF 0.959 0.959 0.959 0.000 1.000
 UR 65.22k 71.44k 72.75k 0.000 213.2k
 URR -2.337k 3.226k -2.612k 0.000 -1.923k
 VCF 1.401 1.397 1.396 2.546
 ICF 1.458 1.447 1.422 0.000
 Ithd 2.004 1.985 1.996 0.000
 Utlf 2.372 2.277 2.427 0.000
 I11f 5.148k 5.718k 5.182k 0.000
 I11f 3.767k 3.594k 3.553k 0.000
 TDF 0.598 0.598 0.598 1.000
 OPF -1.000 1.000 -1.000 0.000
 PH V 861.6 861.5 860.4 0
 PRESENT DEMAND: 213.2kW
 ACCUM ENERGY: 580.5kWhR
 PROJ. DEMAND: 254.4kW

90% RLA - USES OFF

DRANETZ PPL-8000 N-G 2R 11:29:89 Apr-88-93
 ALL CHANNELS SUMMARY REPORT f= 59.98Hz (R)
 --C-- --D-- --R-- --ABC--
 V 495.4 495.4 495.3 0.044 495.8
 I 156.2 163.4 165.7 0.000 487.2
 M 77.72k 80.16k 81.43k 0.000 239.3k
 PF 0.992 0.988 0.993 0.000 0.991
 UR 76.35k 81.18k 82.04k 0.000 241.5k
 URR 9.891k 12.79k 9.547k 0.000 32.65k
 VCF 1.397 1.396 1.385 2.927
 ICF 1.449 1.434 1.421 0.000
 Ithd 3.010 3.237 3.224 0.000
 Utlf 4.310k 5.031k 3.707k 0.000
 I11f 2.751k 2.558k 2.829k 0.000
 TDF 0.990 0.998 0.990 1.000
 OPF 0.993 0.988 0.993 0.000
 PH V 859.4 859.3 858.1 0
 PRESENT DEMAND: 239.3kW
 ACCUM ENERGY: 382.3kWhR
 PROJ. DEMAND: 266.5kW

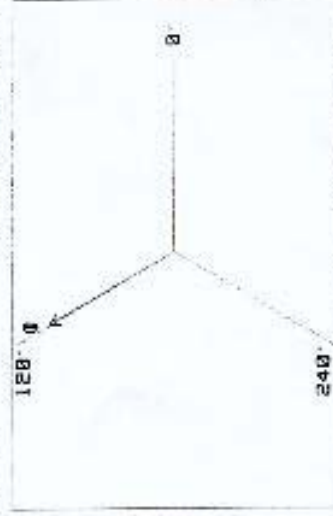
90% RLA - USES ON

DRANETZ PPI-8000 N-G 2R 11:33:31 Apr-08-99



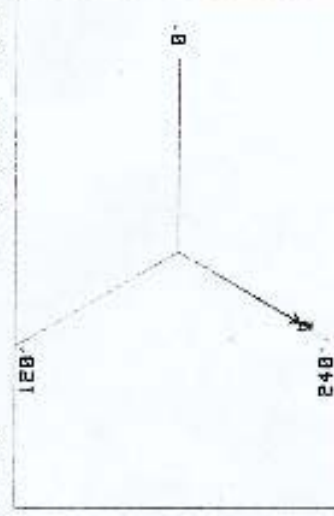
PHASOR: A
VOLTAGE:
497 @ 120°
CURRENT:
140 @ 001°

DRANETZ PPI-8000 N-G 2R 11:33:48 Apr-08-99



PHASOR: B
VOLTAGE:
498 @ 120°
CURRENT:
144 @ 119°

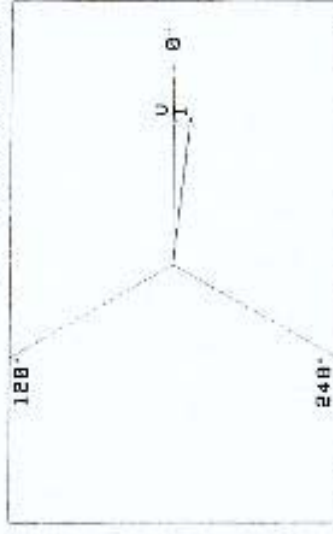
DRANETZ PPI-8000 N-G 2R 11:34:00 Apr-08-99



PHASOR: C
VOLTAGE:
497 @ 120°
CURRENT:
148 @ 241°

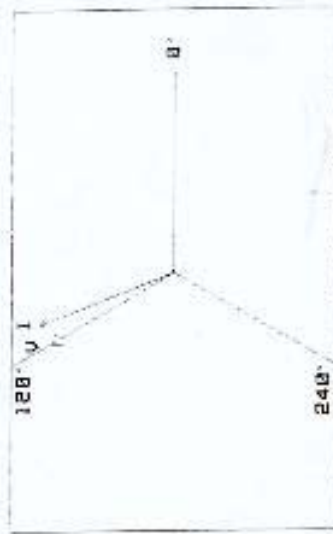
90% RLA - USES OFF

DRANETZ PPI-8000 N-G 2R 11:28:48 Apr-08-99



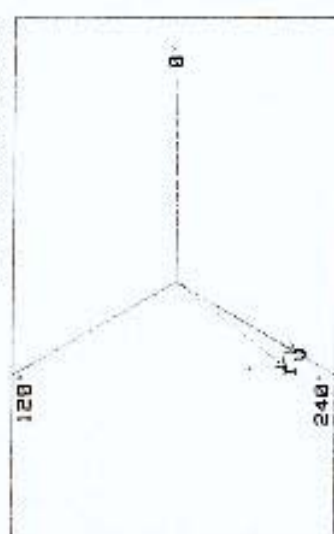
PHASOR: A
VOLTAGE:
495 @ 000°
CURRENT:
168 @ 353°

DRANETZ PPI-8000 N-G 2R 11:29:36 Apr-08-99



PHASOR: B
VOLTAGE:
497 @ 120°
CURRENT:
161 @ 111°

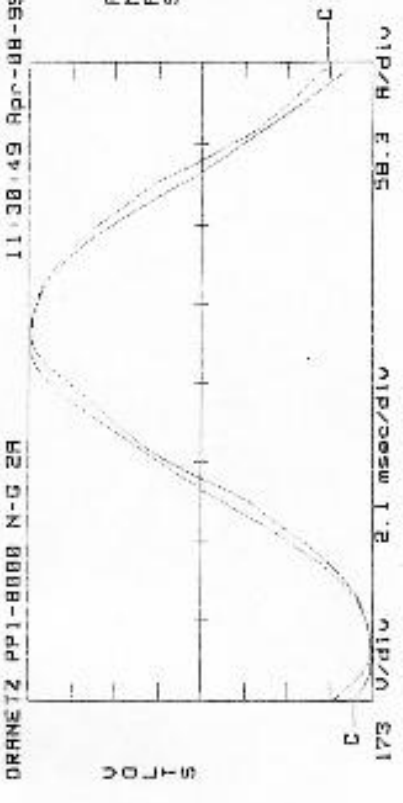
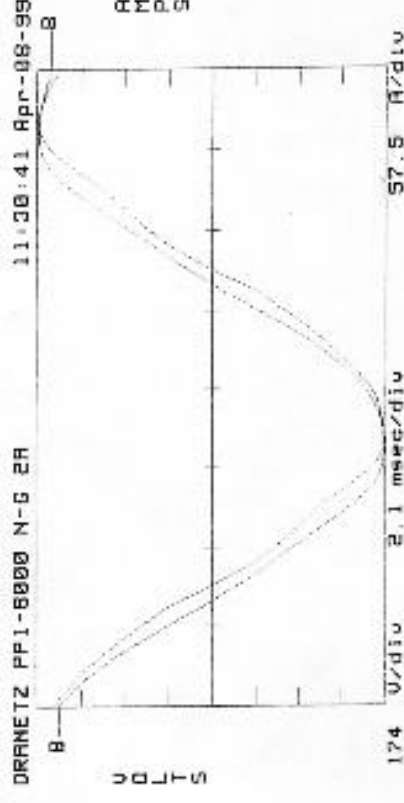
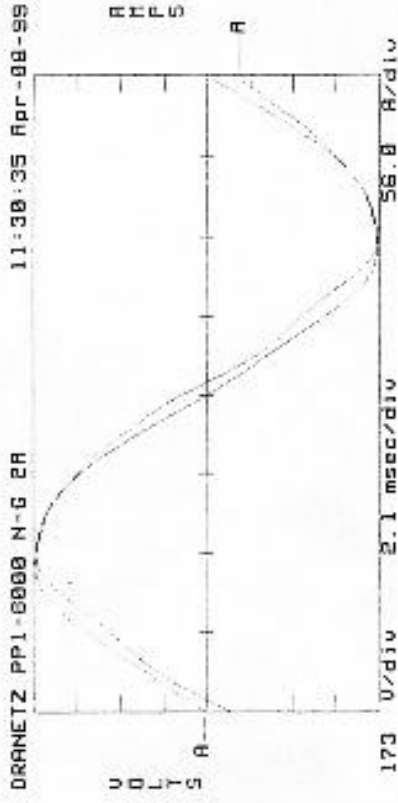
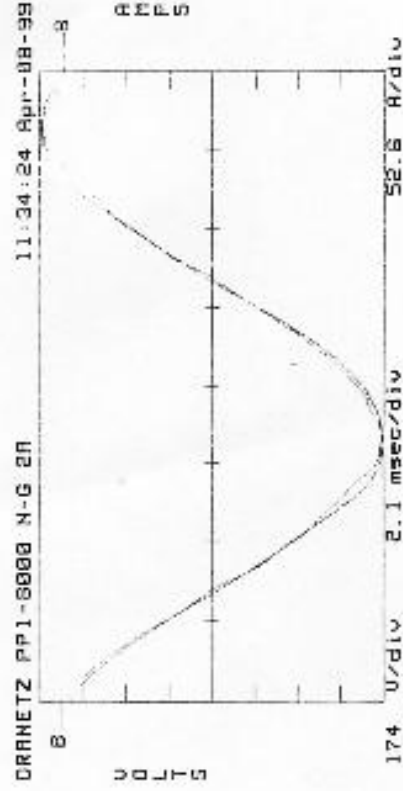
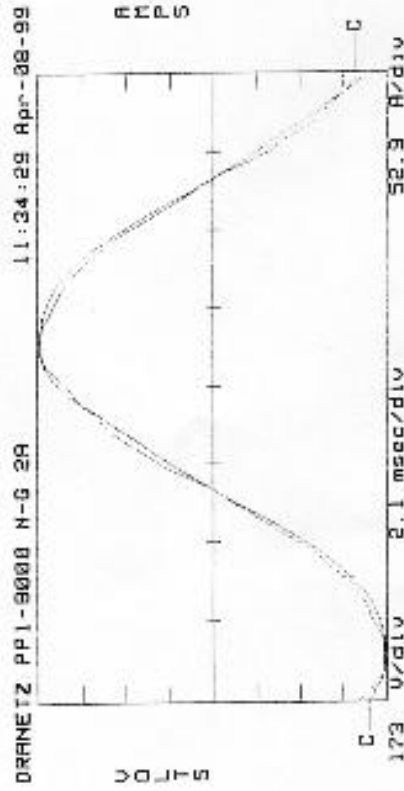
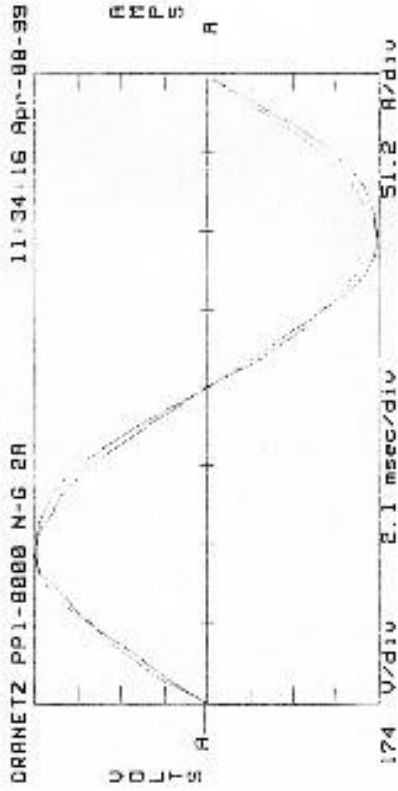
DRANETZ PPI-8000 N-G 2R 11:29:43 Apr-08-99



PHASOR: C
VOLTAGE:
496 @ 240°
CURRENT:
164 @ 233°

90% RLA - USES ON

90% RLA - USES OFF



75% RLA - USES ON

DRANETZ PP1-0000 N-G 2R 14:25:46 Apr-00-99
 ALL CHANNELS SUMMARY REPORT F= 60.00Hz (A)
 ==A== ==B== ==C== ==D== ==E== ==F== ==G== ==H==
 U 495.6 497.0 495.0 0.000 0.000 496.1
 I 111.7 115.5 118.9 0.000 0.000 346.1
 H 55.27k 57.10k 58.84k 0.000 0.000 171.2k
 PF 0.996 0.995 0.998 0.000 0.000 0.997
 UR 55.36k 57.38k 58.95k 0.000 0.000 171.7k
 URR 3.186k 5.664k 5.584k 0.000 0.000 12.43k
 UCF 1.401 1.396 1.394 2.240
 ICF 1.448 1.447 1.418 0.000
 Uthd 2.026 1.865 1.885 0.000
 Ithd 2.884 2.792 2.845 0.000
 Utif 7.235k 7.844k 5.900k 0.000
 Itif 5.806k 7.384k 6.415k 0.000
 TDF 0.997 0.996 0.997 1.000
 OPF 0.999 0.996 0.999 0.000
 PH U 059.0 059.0 058.5 0
 PRESENT DEMAND: 171.2kW PROJ. DEMAND: 180.5kW
 ACCUM ENERGY: 1.458MkWh

75% RLA - USES OFF

DRANETZ PP1-0000 N-G 2R 14:33:39 Apr-00-99
 ALL CHANNELS SUMMARY REPORT F= 59.99Hz (A)
 ==A== ==B== ==C== ==D== ==E== ==F== ==G== ==H==
 U 496.5 498.6 496.0 0.000 0.000 497.3
 I 126.3 132.0 135.2 0.000 0.000 393.5
 H 68.95k 63.89k 65.34k 0.000 0.000 189.4k
 PF 0.972 0.959 0.973 0.000 0.000 0.969
 UR 62.72k 65.79k 67.15k 0.000 0.000 195.6k
 URR 14.65k 18.64k 15.49k 0.000 0.000 46.79k
 UCF 1.398 1.396 1.394 2.402
 ICF 1.427 1.405 1.393 0.000
 Uthd 1.965 1.825 1.853 0.000
 Ithd 4.208 3.934 3.941 0.000
 Utif 4.115k 4.102k 3.906k 0.000
 Itif 2.096k 1.950k 2.115k 0.000
 TDF 0.997 0.997 0.997 1.000
 OPF 0.974 0.968 0.974 0.000
 PH U 061.0 062.1 060.2 0
 PRESENT DEMAND: 189.4kW PROJ. DEMAND: 178.1kW
 ACCUM ENERGY: 1.481MkWh

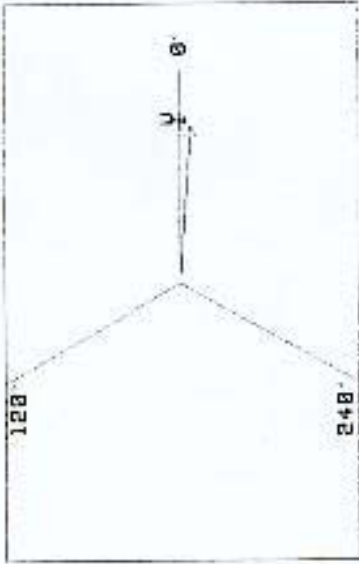
75% RLA - USES ON

DRANETZ PPI-8000 N-G 2R

14:27:58 Apr-08-99

PHASOR: A

VOLTAGE:
497 @ 240°
CURRENT:
186 @ 356°

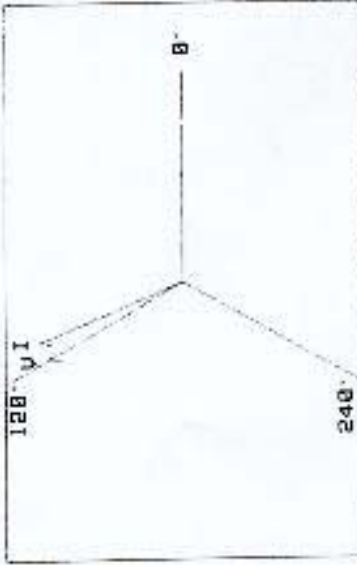


DRANETZ PPI-8000 N-G 2R

14:28:05 Apr-08-99

PHASOR: B

VOLTAGE:
498 @ 120°
CURRENT:
111 @ 113°

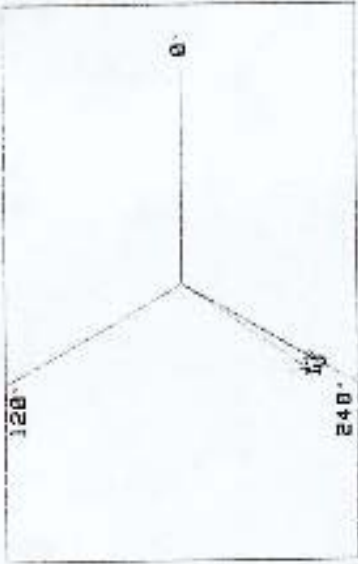


DRANETZ PPI-8000 N-G 2R

14:28:18 Apr-08-99

PHASOR: C

VOLTAGE:
497 @ 240°
CURRENT:
114 @ 236°



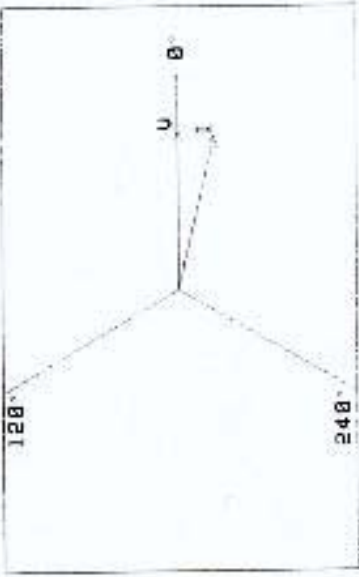
75% RLA - USES OFF

DRANETZ PPI-8000 N-G 2R

14:34:28 Apr-08-99

PHASOR: A

VOLTAGE:
497 @ 000°
CURRENT:
120 @ 348°

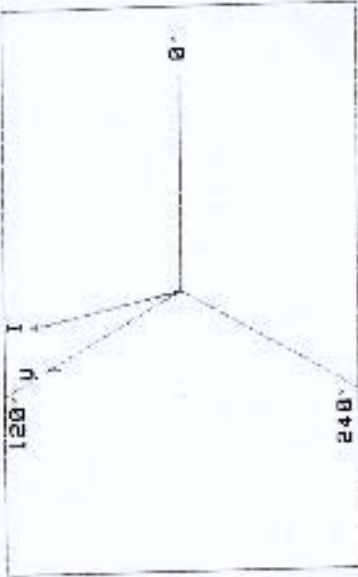


DRANETZ PPI-8000 N-G 2R

14:34:33 Apr-08-99

PHASOR: B

VOLTAGE:
499 @ 120°
CURRENT:
132 @ 183°

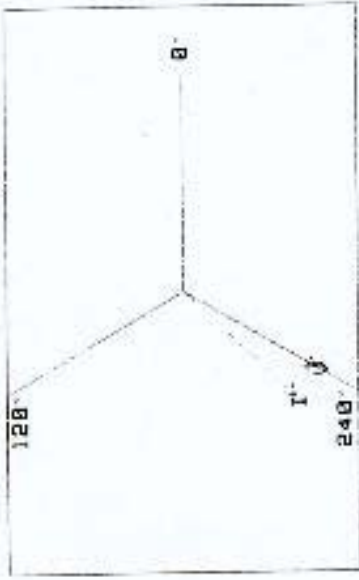


DRANETZ PPI-8000 N-G 2R

14:34:37 Apr-08-99

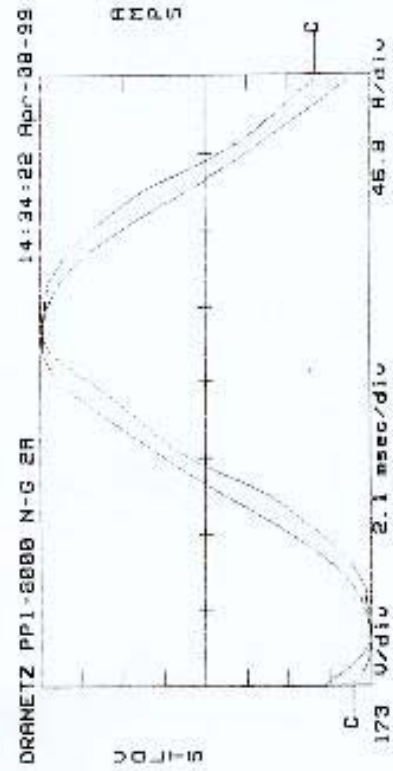
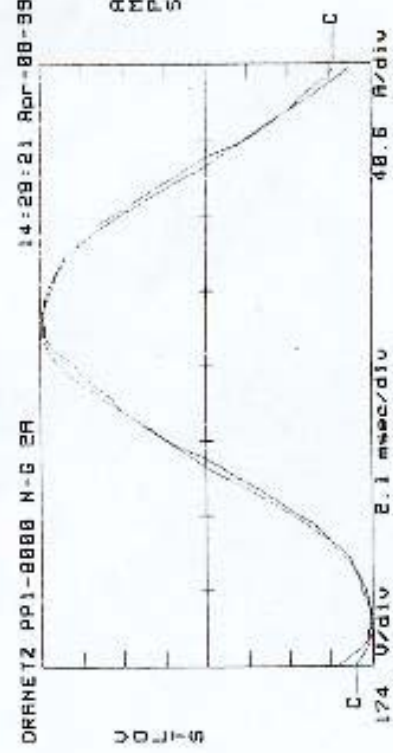
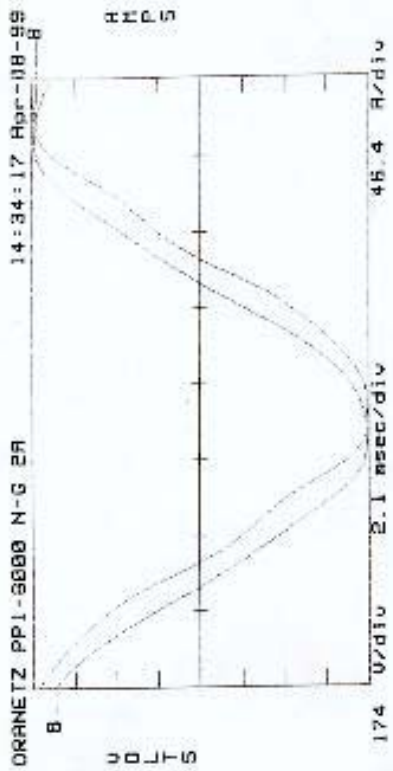
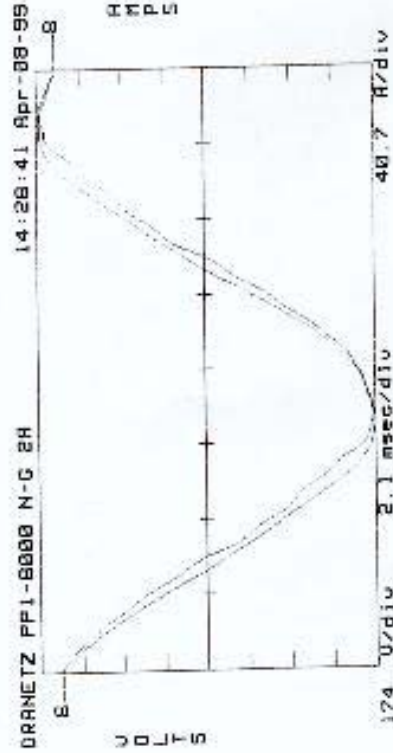
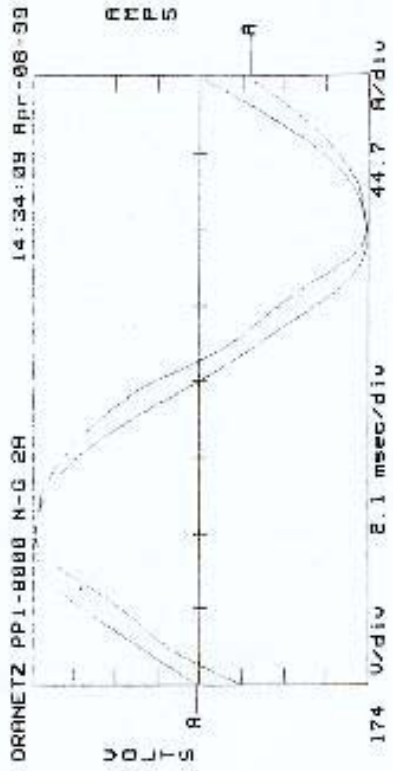
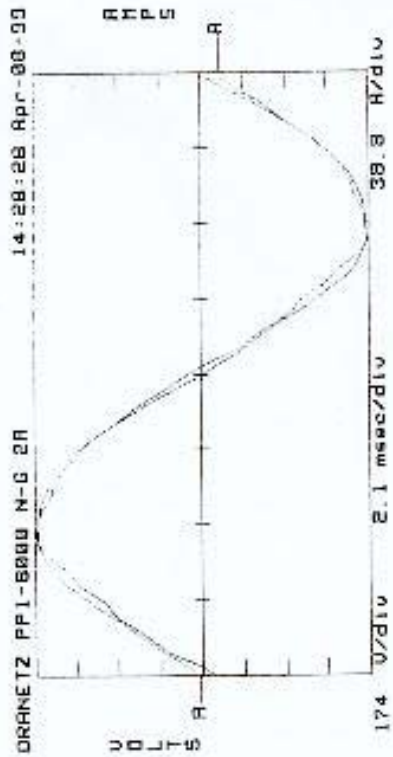
PHASOR: C

VOLTAGE:
497 @ 240°
CURRENT:
135 @ 227°



75% RLA - USES ON

75% RLA - USES OFF



75% RLA - USES ON

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH A
 REF 189.4 R 60.0Hz
 Apr-08-99 14:29:22

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.165	19	0.000	046	06	0.000	047
03	1.055	20	0.000	109	07	0.000	260
04	0.866	21	0.000	109	08	0.000	214
05	1.879	22	0.000	266	09	0.000	056
06	1.714	23	0.000	248	10	0.000	012
07	0.000	24	0.000	271	11	0.000	267
08	0.000	25	0.000	302	12	0.000	114
09	0.000	26	0.000	146	13	0.000	102
10	0.000	27	0.000	165	14	0.000	162
11	0.000	28	0.000	273	15	0.000	291
12	0.000	29	0.000	167	16	0.000	237
13	0.000	30	0.000	332	17	0.000	267
14	0.000	31	0.000	190	18	0.000	204
15	0.000	32	0.000	190	19	0.000	823
16	0.000	33	0.000	191			
17	0.751	34	0.000	353			
18	0.066	35	0.000				

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH B
 REF 113.8 R 60.0Hz
 Apr-08-99 14:29:27

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.554	19	0.568	056	06	0.000	246
03	0.554	20	0.000	210	07	0.000	066
04	1.783	21	0.000	070	08	0.000	010
05	1.735	22	0.000	177	09	0.000	221
06	0.000	23	0.000	162	10	0.000	049
07	0.000	24	0.000	104	11	0.000	310
08	0.000	25	0.000	194	12	0.000	047
09	0.000	26	0.000	193	13	0.000	252
10	0.000	27	0.000	043	14	0.000	110
11	0.000	28	0.000	144	15	0.000	198
12	0.000	29	0.000	127	16	0.000	167
13	0.000	30	0.000	105	17	0.000	287
14	0.000	31	0.000				
15	0.000	32	0.000				
16	0.000	33	0.000				
17	0.000	34	0.000				
18	0.000	35	0.000				

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH C
 REF 119.0 R 60.0Hz
 Apr-08-99 14:29:33

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.124	19	0.000	075	06	0.000	261
03	1.274	20	0.000	204	07	0.000	261
04	0.261	21	0.000	027	08	0.000	304
05	1.031	22	0.000	207	09	0.000	319
06	1.001	23	0.000	215	10	0.000	219
07	0.000	24	0.000	174	11	0.000	119
08	0.000	25	0.000	106	12	0.000	191
09	0.000	26	0.000	202	13	0.000	177
10	0.000	27	0.000	027	14	0.000	039
11	0.000	28	0.000	027	15	0.000	035
12	0.000	29	0.000	027	16	0.000	035
13	0.000	30	0.000	027	17	0.000	035
14	0.000	31	0.000	027	18	0.000	035
15	0.000	32	0.000	027	19	0.000	035
16	0.000	33	0.000	027	20	0.000	035
17	0.000	34	0.000	027	21	0.000	035
18	0.000	35	0.000	027	22	0.000	035

75% RLA - USES OFF

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH A
 REF 126.8 R 60.0Hz
 Apr-08-99 14:35:41

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.146	19	0.000	077	06	0.000	169
03	0.916	20	0.000	240	07	0.000	336
04	0.057	21	0.000	123	08	0.000	211
05	0.414	22	0.000	063	09	0.000	202
06	0.028	23	0.000	303	10	0.000	015
07	0.000	24	0.000	200	11	0.000	022
08	0.000	25	0.000	156	12	0.000	147
09	0.000	26	0.000	200	13	0.000	170
10	0.000	27	0.000	156	14	0.000	186
11	0.000	28	0.000	102	15	0.000	106
12	0.142	29	0.000	190	16	0.000	063
13	0.000	30	0.000	350	17	0.000	063
14	0.000	31	0.000	138	18	0.000	232
15	0.000	32	0.000	130	19	0.000	032
16	0.000	33	0.000	219	20	0.000	032
17	0.142	34	0.000	061	21	0.000	034
18	0.000	35	0.000		22	0.000	044

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH B
 REF 133.4 R 60.0Hz
 Apr-08-99 14:35:47

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.100	19	0.100	129	06	0.000	004
03	0.619	20	0.000	082	07	0.000	004
04	0.001	21	0.000	100	08	0.000	000
05	0.122	22	0.000	170	09	0.000	000
06	0.153	23	0.000	047	10	0.000	000
07	0.000	24	0.000	047	11	0.000	000
08	0.000	25	0.000	021	12	0.000	000
09	0.000	26	0.000	021	13	0.000	000
10	0.000	27	0.000	127	14	0.000	000
11	0.000	28	0.000	147	15	0.000	000
12	0.000	29	0.000	053	16	0.000	000
13	0.000	30	0.000	159	17	0.000	000
14	0.000	31	0.000	215	18	0.000	000
15	0.000	32	0.000	169	19	0.000	000
16	0.000	33	0.000		20	0.000	000
17	0.000	34	0.000		21	0.000	000
18	0.000	35	0.000		22	0.000	000

DRANETZ PPL-8000 N-G 2A
 HARMONICS:CH C
 REF 135.9 R 60.0Hz
 Apr-08-99 14:35:52

<FUND	I Lhd	H#	MAG%	PMS	H#	MAG%	PMS
02	0.060	19	0.100	075	06	0.000	000
03	1.273	20	0.000	240	07	0.000	000
04	0.000	21	0.000	100	08	0.000	000
05	0.000	22	0.000	100	09	0.000	000
06	0.000	23	0.000	100	10	0.000	000
07	0.000	24	0.000	100	11	0.000	000
08	0.000	25	0.000	100	12	0.000	000
09	0.000	26	0.000	100	13	0.000	000
10	0.000	27	0.000	100	14	0.000	000
11	0.000	28	0.000	100	15	0.000	000
12	0.000	29	0.000	100	16	0.000	000
13	0.000	30	0.000	100	17	0.000	000
14	0.000	31	0.000	100	18	0.000	000
15	0.000	32	0.000	100	19	0.000	000
16	0.000	33	0.000	100	20	0.000	000
17	0.000	34	0.000	100	21	0.000	000
18	0.000	35	0.000	100	22	0.000	000

50% RLA - USES ON

DRANETZ PPI-8000 M-G 2A 13:30:19 Apr-88-99
 ALL CHANNELS SUMMARY REPORT f= 59.99hz (A)
 ==R== ==C== ==O==
 U 497.3 497.3 0.000 497.9
 I 64.95 72.10 0.000 209.9
 M 29.65k 31.39k 0.000 95.49k
 PF 8.918 8.689 0.000 0.915
 VA 32.38k 35.98k 0.000 104.4k
 VAR 12.79k 16.48k 0.000 42.10k
 UCF 1.488 1.308 2.853
 ICF 1.388 1.421 1.487
 Uthd 2.119 1.967 1.486
 Ithd 3.990 3.279 1.594
 Utif 5.188k 5.628k 3.718
 Itif 4.989k 5.561k 5.178k
 TDF 0.994 0.994 5.524k
 DPF 0.917 0.887 0.934
 PH U 863.8 663.8 661.4
 PRESENT DEMAND: 95.49kW
 ACCUM ENERGY: 1.342MWH
 PROJ. DEMAND: 143.8kW

DRANETZ PPI-8000 M-G 2A 13:24:49 Apr-88-99
 ALL CHANNELS SUMMARY REPORT f= 59.99hz (A)
 ==R== ==C== ==O==
 U 495.3 495.3 0.000 495.8
 I 86.89 95.78 0.000 279.7
 M 36.70k 38.96k 0.000 115.9k
 PF 0.834 0.817 0.856
 VA 44.07k 47.58k 47.07k
 VAR 24.52k 27.45k 24.31k
 UCF 1.388 1.397 1.394
 ICF 1.374 1.486 1.413
 Uthd 2.033 1.886 1.900
 Ithd 4.511 4.204 4.449
 Utif 5.207k 4.942k 5.118k
 Itif 2.343k 2.158k 2.098k
 TDF 0.886 0.897 0.887
 DPF 0.854 0.810 0.857
 PH U 829.1 859.1 856.8
 PRESENT DEMAND: 115.9kW
 ACCUM ENERGY: 1.331MWH
 PROJ. DEMAND: 179.8kW

50% RLA - USES OFF

50% RLA - USES ON

DRANETZ PPI-8000 N-G 2R REF 497.5 U. 60.0Hz Apr-88-99 13:31:56
 HARMONICS:CH A

H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	227	36	0.000	338
03	0.150	314	37	0.000	250
04	0.021	324	38	0.000	314
05	0.017	121	39	0.000	155
06	0.036	199	40	0.000	138
07	0.076	341	41	0.000	302
08	0.054	367	42	0.000	270
09	0.011	140	43	0.000	367
10	0.110	240	44	0.000	267
11	0.110	165	45	0.000	215
12	0.064	105	46	0.000	307
13	0.041	65	47	0.000	345
14	0.043	142	48	0.000	395
15	0.000	130	49	0.000	366
16	0.172	150	50	0.000	125
17	0.011	242			

DRANETZ PPI-8000 N-G 2R REF 499.1 U. 8.0Hz Apr-88-99 13:32:02
 HARMONICS:CH B

H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	247	36	0.000	343
03	0.181	385	37	0.000	370
04	0.042	119	38	0.000	294
05	1.032	200	39	0.000	174
06	0.711	346	40	0.000	110
07	0.021	107	41	0.000	390
08	0.035	187	42	0.000	740
09	0.021	107	43	0.000	157
10	0.064	245	44	0.000	338
11	0.084	245	45	0.000	156
12	0.000	273	46	0.000	298
13	0.074	332	47	0.000	362
14	0.011	334	48	0.000	265
15	0.064	182	49	0.000	163
16	0.000	171	50	0.000	169
17	0.138	171			
18	0.000	134			

DRANETZ PPI-8000 N-G 2R REF 497.4 U. 0.0Hz Apr-88-99 13:32:07
 HARMONICS:CH C

H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	242	36	0.000	308
03	0.118	216	37	0.000	360
04	0.032	100	38	0.000	287
05	1.091	169	39	0.000	231
06	0.021	100	40	0.000	188
07	0.021	209	41	0.000	350
08	0.054	320	42	0.000	237
09	0.021	119	43	0.000	172
10	0.066	161	44	0.000	116
11	0.011	309	45	0.000	100
12	0.064	341	46	0.000	310
13	0.000	341	47	0.000	277
14	0.000	109	48	0.000	227
15	0.000	153	49	0.000	125
16	0.172	171	50	0.000	125
17	0.011	331			
18	0.000	85			

50% RLA - USES OFF

DRANETZ PPI-8000 N-G 2R REF 496.2 U. 60.0Hz Apr-88-99 13:26:07
 HARMONICS:CH A

H#	MAG%	PHS	H#	MAG%	PHS
02	0.022	226	36	0.000	266
03	0.151	317	37	0.000	327
04	0.022	377	38	0.000	169
05	1.028	123	39	0.000	297
06	0.032	199	40	0.000	270
07	0.011	155	41	0.000	332
08	0.011	350	42	0.000	284
09	0.043	367	43	0.000	353
10	0.011	172	44	0.000	345
11	0.011	209	45	0.000	193
12	0.011	104	46	0.000	277
13	0.032	167	47	0.000	134
14	0.000	147	48	0.000	134
15	0.000	147	49	0.000	134
16	0.000	126	50	0.000	134
17	0.075	211			
18	0.000	331			

DRANETZ PPI-8000 N-G 2R REF 497.4 U. 0.0Hz Apr-88-99 13:26:12
 HARMONICS:CH B

H#	MAG%	PHS	H#	MAG%	PHS
02	0.021	246	36	0.000	284
03	0.170	185	37	0.000	236
04	0.043	370	38	0.000	247
05	1.778	119	39	0.000	300
06	0.032	200	40	0.000	161
07	0.021	344	41	0.000	341
08	0.021	270	42	0.000	252
09	0.021	116	43	0.000	352
10	0.053	238	44	0.000	240
11	0.011	104	45	0.000	185
12	0.011	335	46	0.000	175
13	0.000	307	47	0.000	341
14	0.050	328	48	0.000	148
15	0.011	197	49	0.000	148
16	0.000	200	50	0.000	349
17	0.064	280			
18	0.000	331			

DRANETZ PPI-8000 N-G 2R REF 496.1 U. 0.0Hz Apr-88-99 13:26:17
 HARMONICS:CH C

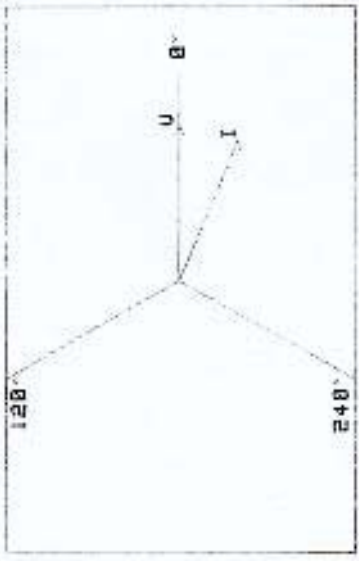
H#	MAG%	PHS	H#	MAG%	PHS
02	0.022	244	36	0.000	303
03	0.037	222	37	0.000	180
04	0.032	324	38	0.000	160
05	1.788	124	39	0.000	291
06	0.022	175	40	0.000	130
07	0.022	323	41	0.000	273
08	0.043	120	42	0.000	302
09	0.022	149	43	0.000	300
10	0.053	269	44	0.000	130
11	0.011	100	45	0.000	250
12	0.011	332	46	0.000	250
13	0.000	307	47	0.000	233
14	0.000	126	48	0.000	233
15	0.000	205	49	0.000	266
16	0.065	215	50	0.000	266
17	0.000	123			
18	0.000	123			

50% RLA - USES ON

DRANETZ PPI-8000 N-G 2R

13:52:25 Apr-08-99

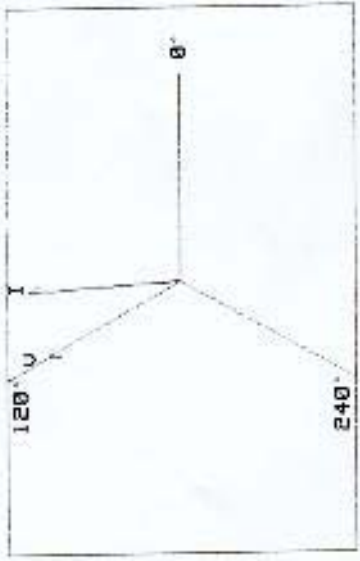
PHASOR: A
VOLTAGE:
498 @ 120°
CURRENT:
67 @ 337°



DRANETZ PPI-8000 N-G 2R

13:52:30 Apr-08-99

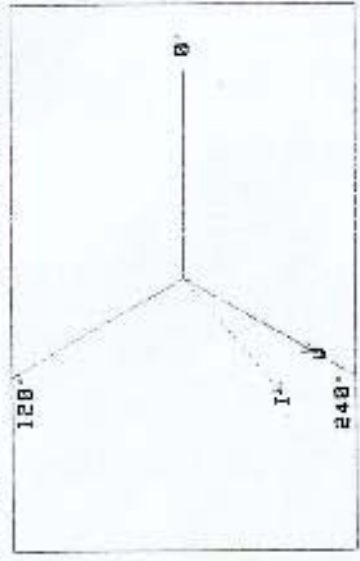
PHASOR: B
VOLTAGE:
499 @ 120°
CURRENT:
74 @ 894°



DRANETZ PPI-8000 N-G 2R

13:52:34 Apr-08-99

PHASOR: C
VOLTAGE:
498 @ 240°
CURRENT:
74 @ 220°

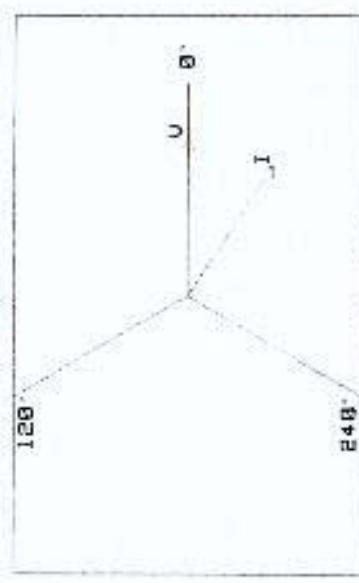


50% RLA - USES OFF

DRANETZ PPI-8000 N-G 2R

13:45:31 Apr-08-99

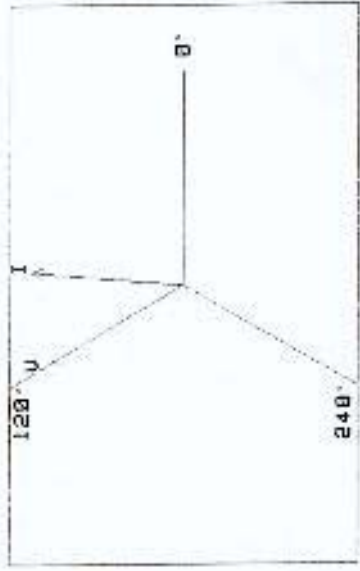
PHASOR: A
VOLTAGE:
497 @ 880°
CURRENT:
98 @ 325°



DRANETZ PPI-8000 N-G 2R

13:45:35 Apr-08-99

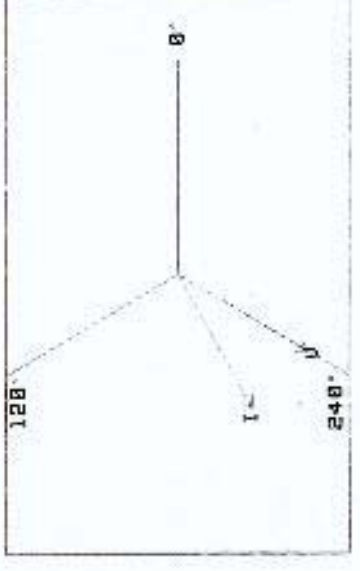
PHASOR: B
VOLTAGE:
499 @ 120°
CURRENT:
98 @ 885°



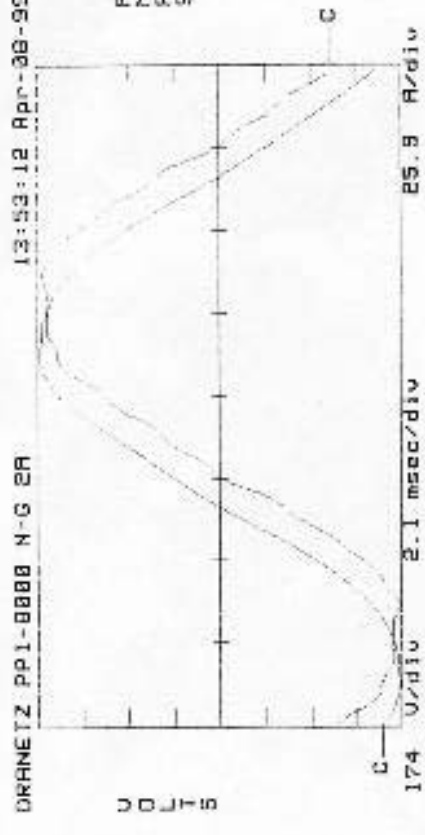
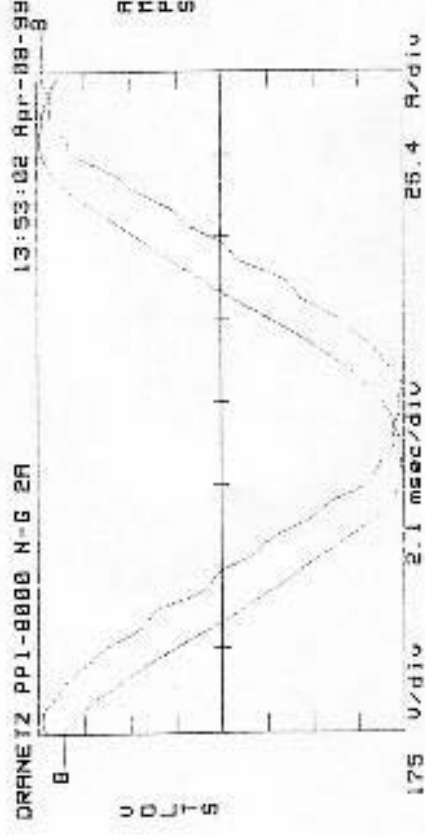
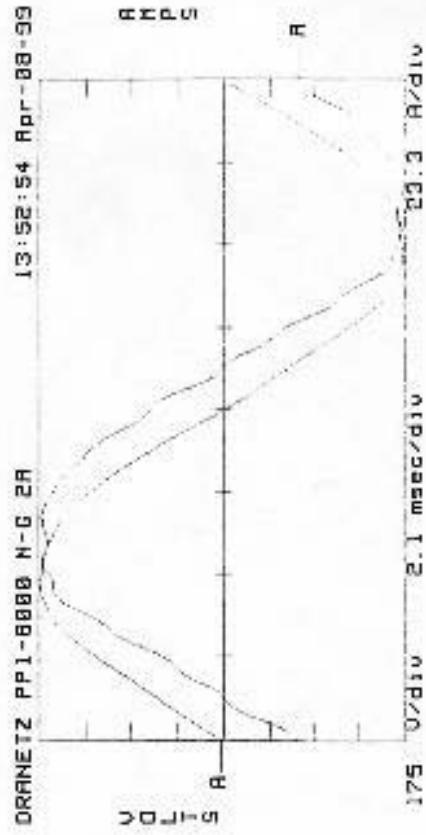
DRANETZ PPI-8000 N-G 2R

13:45:40 Apr-08-99

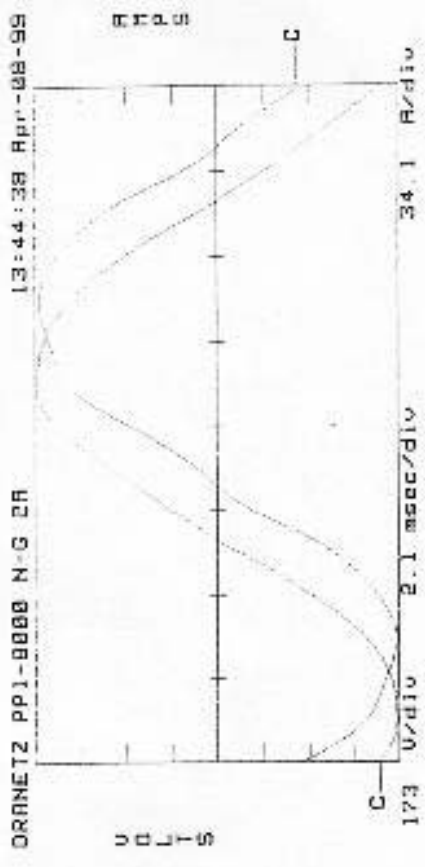
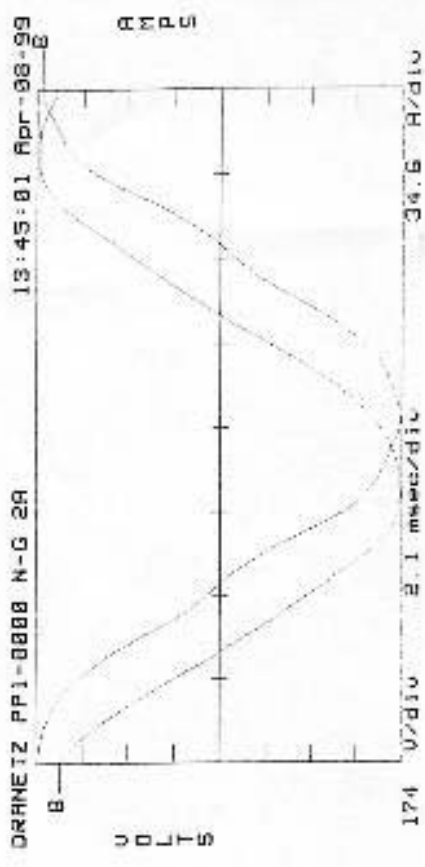
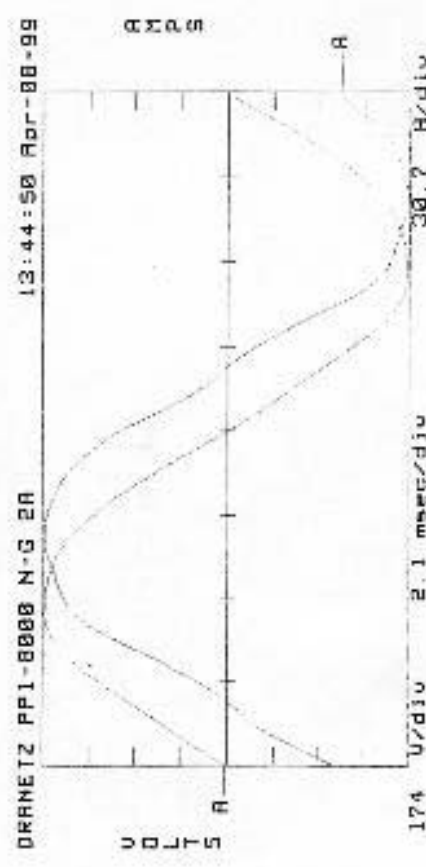
PHASOR: C
VOLTAGE:
497 @ 240°
CURRENT:
96 @ 210°



50% RLA - USES ON



50% RLA - USES OFF



50% RLA - USES ON

DRFNETZ PPI-8000 N-G 2A REF 497.6 U. 60.0Hz Apr-88-99 13:31:56

HARMONICS:CH A HARMONICS:CH R

%FUND	MAGX	U/thd	PHS	H#	MAGX	PHS	H#	MAGX	PHS	H#
02	0.021	247	100	36	0.000	338	36	0.000	338	36
03	0.181	290	100	37	0.000	350	37	0.000	350	37
04	0.274	314	100	38	0.000	314	38	0.000	195	38
05	0.316	319	100	39	0.000	195	39	0.000	200	39
06	0.350	325	100	40	0.000	200	40	0.000	202	40
07	0.377	330	100	41	0.000	202	41	0.000	203	41
08	0.404	335	100	42	0.000	203	42	0.000	204	42
09	0.429	341	100	43	0.000	204	43	0.000	205	43
10	0.454	347	100	44	0.000	205	44	0.000	206	44
11	0.478	353	100	45	0.000	206	45	0.000	207	45
12	0.501	359	100	46	0.000	207	46	0.000	208	46
13	0.524	365	100	47	0.000	208	47	0.000	209	47
14	0.546	371	100	48	0.000	209	48	0.000	210	48
15	0.568	377	100	49	0.000	210	49	0.000	211	49
16	0.589	383	100	50	0.000	211	50	0.000	212	50
17	0.611	389	100							
18	0.632	395	100							

DRFNETZ PPI-8000 N-G 2A REF 499.1 U. 0.0Hz Apr-88-99 13:32:02

HARMONICS:CH B HARMONICS:CH B

%FUND	MAGX	U/thd	PHS	H#	MAGX	PHS	H#	MAGX	PHS	H#
02	0.021	247	100	36	0.000	343	36	0.000	343	36
03	0.181	290	100	37	0.000	378	37	0.000	378	37
04	0.242	319	100	38	0.000	294	38	0.000	294	38
05	0.285	325	100	39	0.000	174	39	0.000	174	39
06	0.322	330	100	40	0.000	180	40	0.000	180	40
07	0.354	335	100	41	0.000	189	41	0.000	189	41
08	0.385	341	100	42	0.000	194	42	0.000	194	42
09	0.415	347	100	43	0.000	197	43	0.000	197	43
10	0.444	353	100	44	0.000	201	44	0.000	201	44
11	0.472	359	100	45	0.000	205	45	0.000	205	45
12	0.500	365	100	46	0.000	209	46	0.000	209	46
13	0.527	371	100	47	0.000	213	47	0.000	213	47
14	0.554	377	100	48	0.000	217	48	0.000	217	48
15	0.580	383	100	49	0.000	221	49	0.000	221	49
16	0.606	389	100	50	0.000	225	50	0.000	225	50
17	0.632	395	100							
18	0.658	401	100							

-D107-

50% RLA - USES OFF

DRANETZ PPI-8000 N-G 2A REF 496.2 U. 60.0Hz Apr-88-99 13:26:07

HARMONICS:CH R HARMONICS:CH R

%FUND	MAGX	U/thd	PHS	H#	MAGX	PHS	H#	MAGX	PHS	H#
02	0.022	248	100	36	0.000	326	36	0.000	326	36
03	0.151	286	100	37	0.000	177	37	0.000	177	37
04	0.199	297	100	38	0.000	143	38	0.000	189	38
05	0.245	308	100	39	0.000	120	39	0.000	207	39
06	0.289	319	100	40	0.000	108	40	0.000	220	40
07	0.331	330	100	41	0.000	108	41	0.000	232	41
08	0.371	341	100	42	0.000	108	42	0.000	252	42
09	0.411	352	100	43	0.000	108	43	0.000	260	43
10	0.449	363	100	44	0.000	108	44	0.000	245	44
11	0.487	374	100	45	0.000	108	45	0.000	189	45
12	0.524	385	100	46	0.000	108	46	0.000	218	46
13	0.561	396	100	47	0.000	108	47	0.000	277	47
14	0.597	407	100	48	0.000	108	48	0.000	134	48
15	0.633	418	100	49	0.000	108	49	0.000	108	49
16	0.668	429	100	50	0.000	108	50	0.000	108	50
17	0.703	440	100							
18	0.738	451	100							

DRANETZ PPI-8000 N-G 2A REF 497.4 U. 0.0Hz Apr-88-99 13:26:12

HARMONICS:CH B HARMONICS:CH B

%FUND	MAGX	U/thd	PHS	H#	MAGX	PHS	H#	MAGX	PHS	H#
02	0.021	246	100	36	0.000	328	36	0.000	328	36
03	0.170	285	100	37	0.000	190	37	0.000	333	37
04	0.243	297	100	38	0.000	167	38	0.000	347	38
05	0.319	310	100	39	0.000	154	39	0.000	380	39
06	0.392	323	100	40	0.000	154	40	0.000	440	40
07	0.465	336	100	41	0.000	154	41	0.000	440	41
08	0.537	349	100	42	0.000	154	42	0.000	440	42
09	0.609	362	100	43	0.000	154	43	0.000	440	43
10	0.681	375	100	44	0.000	154	44	0.000	440	44
11	0.753	388	100	45	0.000	154	45	0.000	440	45
12	0.825	401	100	46	0.000	154	46	0.000	440	46
13	0.897	414	100	47	0.000	154	47	0.000	440	47
14	0.969	427	100	48	0.000	154	48	0.000	440	48
15	1.041	440	100	49	0.000	154	49	0.000	440	49
16	1.113	453	100	50	0.000	154	50	0.000	440	50
17	1.185	466	100							
18	1.257	479	100							

DRANETZ PPI-8000 N-G 2A REF 496.1 U. 0.0Hz Apr-88-99 13:26:17

HARMONICS:CH C HARMONICS:CH C

%FUND	MAGX	U/thd	PHS	H#	MAGX	PHS	H#	MAGX	PHS	H#
02	0.021	244	100	36	0.000	326	36	0.000	326	36
03	0.118	282	100	37	0.000	185	37	0.000	185	37
04	0.132	287	100	38	0.000	285	38	0.000	185	38
05	0.147	291	100	39	0.000	287	39	0.000	185	39
06	0.161	295	100	40	0.000	289	40	0.000	185	40
07	0.175	299	100	41	0.000	291	41	0.000	185	41
08	0.189	303	100	42	0.000	293	42	0.000	185	42
09	0.203	307	100	43	0.000	295	43	0.000	185	43
10	0.217	311	100	44	0.000	297	44	0.000	185	44
11	0.231	315	100	45	0.000	299	45	0.000	185	45
12	0.245	319	100	46	0.000	301	46	0.000	185	46
13	0.259	323	100	47	0.000	303	47	0.000	185	47
14	0.273	327	100	48	0.000	305	48	0.000	185	48
15	0.287	331	100	49	0.000	307	49	0.000	185	49
16	0.301	335	100	50	0.000	309	50	0.000	185	50
17	0.315	339	100							
18	0.329	343	100							

50% RLA - USES ON

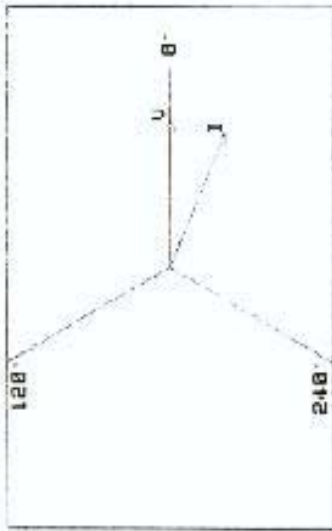
DRANETZ PPI-8000 N-G 2A 13:51:59 Apr--08-99
 ALL CHANNELS SUMMARY REPORT f= 59.99hz (A)
 --R-- --C-- --D-- --REC--
 U 497.9 499.5 497.6 0.042 486.3
 I 66.49 73.99 74.32 0.000 0.000
 W 38.60k 33.20k 34.83k 0.000 98.63k
 PF 0.924 0.898 0.942 0.000 0.922
 VAR 33.18k 36.96k 36.96k 0.000 186.9k
 UCF 12.63k 16.23k 12.44k 0.000 41.38k
 ICF 1.481 1.397 1.397 0.000
 Uthd 1.376 1.412 1.354 0.000
 Ithd 2.056 1.987 2.002 0.000
 Utilf 3.935 3.228 3.669 0.000
 I11f 5.388k 5.877k 5.511k 0.000
 I11f 5.352k 5.552k 5.640k 0.000
 TOF 0.993 0.995 0.994 0.000
 DPF 0.923 0.898 0.942 0.000
 PH U 863.6 863.3 862.8 0
 PRESENT DEMAND: 98.63kW PROJ. DEMAND: 115.2kW
 ACCUM ENERGY: 1.388MWHR

50% RLA - USES OFF

DRANETZ PPI-8000 N-G 2A 13:43:56 Apr--08-99
 ALL CHANNELS SUMMARY REPORT f= 59.01hz (A)
 --R-- --C-- --D-- --REC--
 U 456.9 496.5 496.5 0.041 497.3
 I 89.75 98.83 98.62 0.000 284.4
 W 37.18k 39.98k 41.35k 0.000 118.4k
 PF 0.834 0.816 0.833 0.000 0.898
 VAR 44.68k 48.87k 47.98k 0.000 141.4k
 UCF 24.63k 28.22k 24.34k 0.000 77.19k
 ICF 1.398 1.396 1.407 0.000
 Uthd 1.374 1.411 1.407 0.000
 Ithd 1.955 1.892 1.927 0.000
 Utilf 4.824 4.289 4.464 0.000
 I11f 5.795k 5.438k 5.679k 0.000
 I11f 2.303k 2.168k 2.280k 0.000
 TOF 0.996 0.997 0.997 0.000
 DPF 0.834 0.818 0.862 0.000
 PH U 862.5 862.2 868.9 0
 PRESENT DEMAND: 118.4kW PROJ. DEMAND: 99.53kW
 ACCUM ENERGY: 1.364MWHR

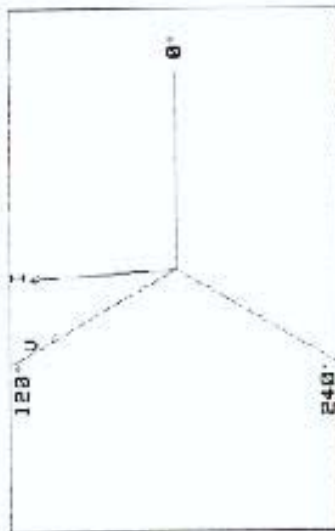
50% RLA - USES ON

DRANETZ PPI-8000 N-G 2A 13:52:25 Apr-08-99



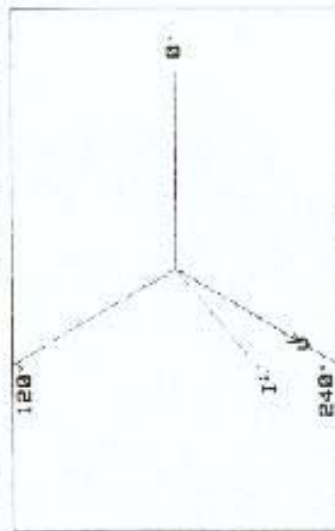
PHASOR: A
 VOLTAGE: 498 ∠ 0°
 CURRENT: 57 ∠ 33°

DRANETZ PPI-8000 N-G 2A 13:52:38 Apr-08-99



PHASOR: B
 VOLTAGE: 499 ∠ 120°
 CURRENT: 74 ∠ 94°

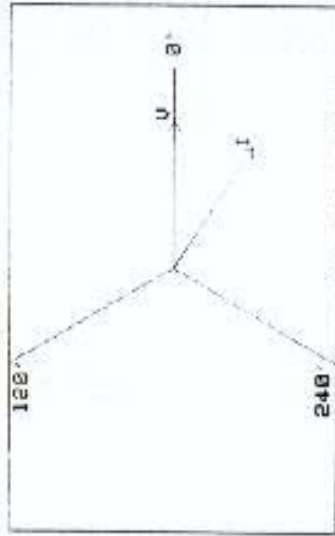
DRANETZ PPI-8000 N-G 2A 13:52:34 Apr-08-99



PHASOR: C
 VOLTAGE: 498 ∠ 240°
 CURRENT: 74 ∠ 220°

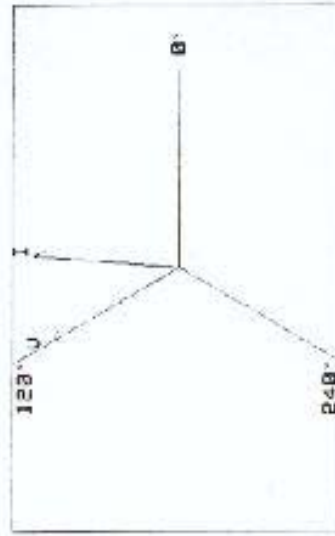
50% RLA - USES OFF

DRANETZ PPI-8000 N-G 2A 13:45:31 Apr-08-99



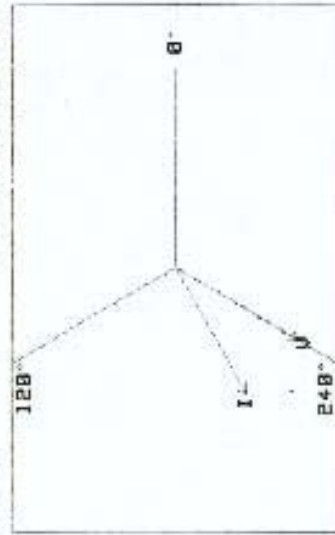
PHASOR: A
 VOLTAGE: 497 ∠ 0°
 CURRENT: 58 ∠ 32°

DRANETZ PPI-8000 N-G 2A 13:45:35 Apr-08-99



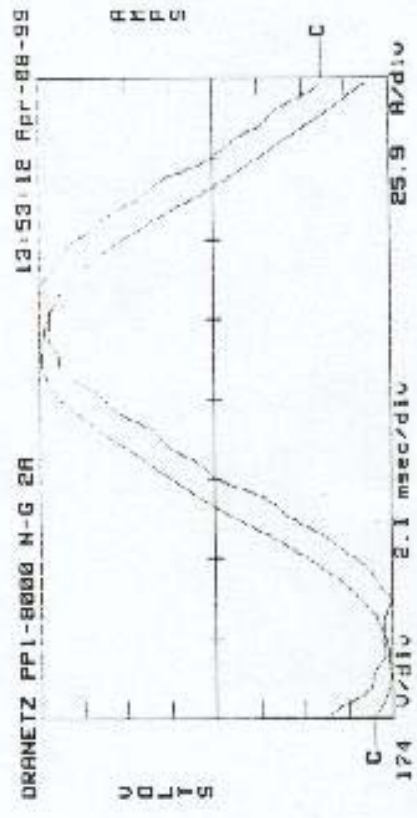
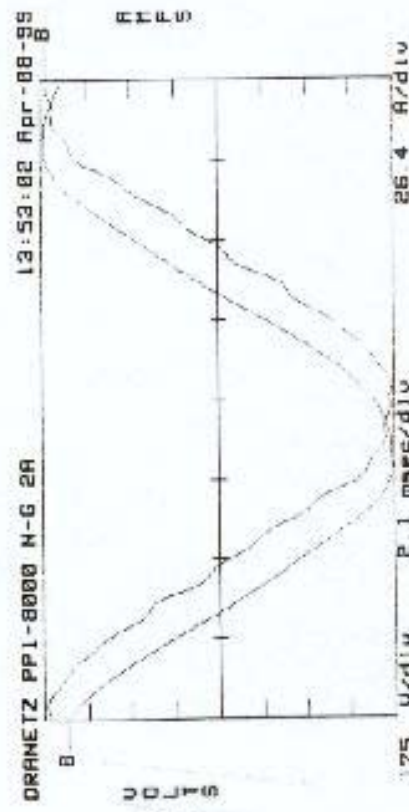
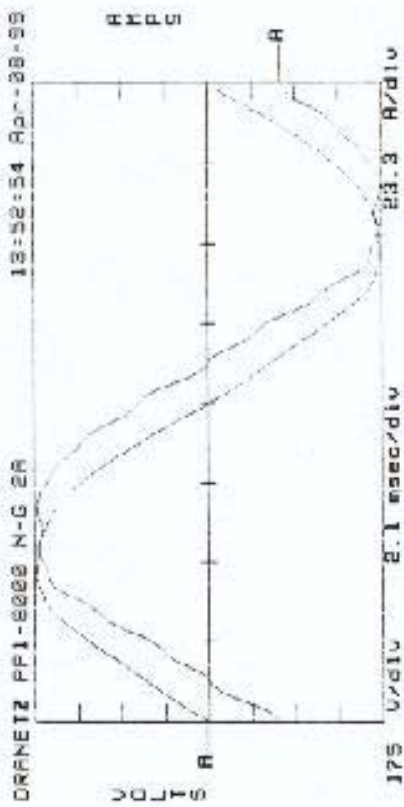
PHASOR: B
 VOLTAGE: 499 ∠ 120°
 CURRENT: 58 ∠ 85°

DRANETZ PPI-8000 N-G 2A 13:45:40 Apr-08-99

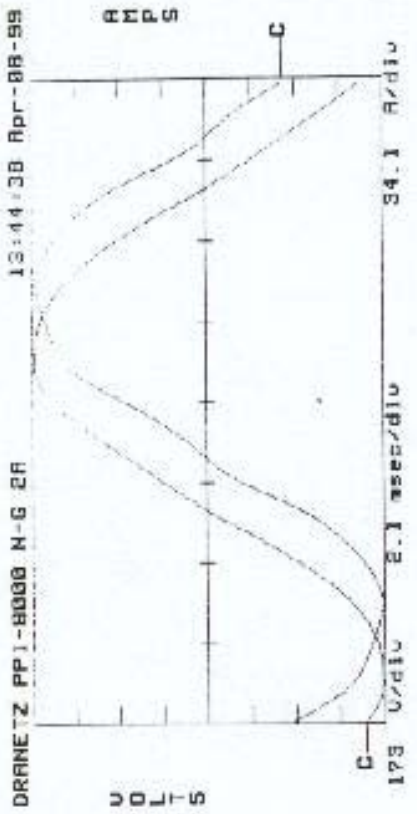
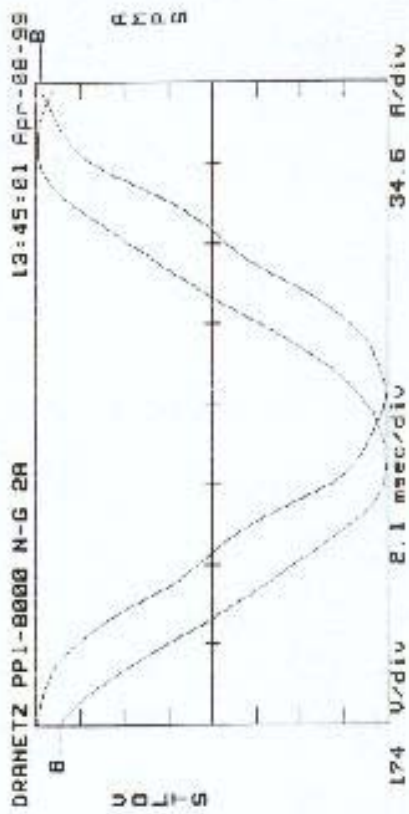
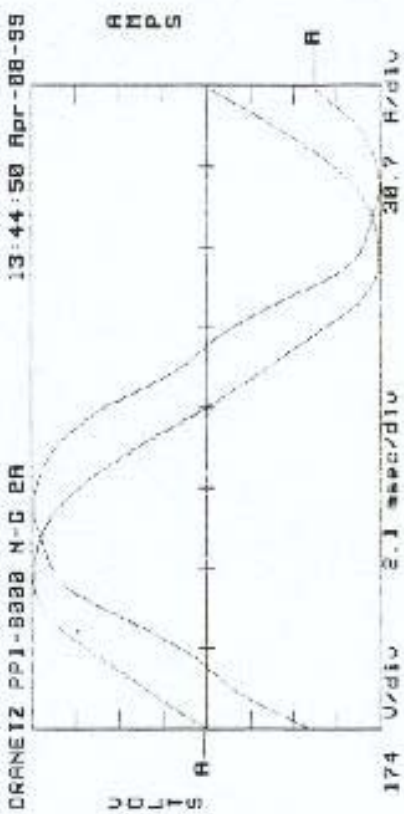


PHASOR: C
 VOLTAGE: 497 ∠ 240°
 CURRENT: 56 ∠ 210°

50% RLA - USES ON



50% RLA - USES OFF



-D110-

